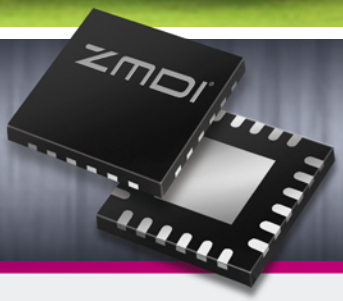
ZMDI®

The Analog Mixed Signal Company

PINK IS THE NEW GREEN®

ENABLING ENERGY EFFICIENT SOLUTIONS



Global Brochure

ZENTRUM MIKROELEKTRONIK DRESDEN AG

50 YEARS OF INNOVATION

ZMDI®

The Analog Mixed Signal Company

PINK IS THE NEW GREEN®

ENABLING ENERGY EFFICIENT SOLUTIONS

ZMDI is a global provider of energy efficient mixed signal solutions

- Over 50 years of system and applications know-how applied to every customized and standard product
- Turnkey solution delivery from specification to final product
- Continuous strategic investment in talent and state-of-the-art engineering and test facilities
- Long-term commitment to "1st-Time Right" strategy for IC development
- High-level modeling for system simulation
- Well-established record of excellence in serving an international customer base

Zentrum Mikroelektronik Dresden AG (ZMDI) is an innovation-driven, customer-focused enterprise. ZMDI has been providing high-performance analog and mixed signal semiconductor solutions for over 50 years. We offer our customers high-quality products and services at great value. That's our performance promise, and our proven ability to make good on this pledge has earned us our customers' trust. ZMDI's solutions enable our customers to create the most energy-efficient products in power management, lighting and sensors.

Germany • Bulgaria • France • Ireland • Italy • Japan • Korea • Taiwan • United States

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The Analog Mixed Signal Company

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ZSPM1000 True Digital PWM Controller (Single-Phase, Single-Rail)

ZSPM9000 Ultra-Compact, High-Performance DrMOS Device

ZSPM9010 Ultra-Compact, High-Performance, High-Frequency DrMOS

ZSPM9060 Ultra-Compact, High-Performance, High-Frequency DrMOS Device

ANALOG POWER INTEGRATED CIRCUITS

ZSPM4011 High Efficiency 1A Synchronous Buck Converter

ZSPM4011B High Efficiency 1A Synchronous Buck Converter

ZSPM4012 High Efficiency 2A Synchronous Buck Converter

ZSPM4012B High Efficiency 2A Synchronous Buck Converter

ZSPM4013 High Efficiency 3A Synchronous Buck Converter

ZSPM4013B High Efficiency 3A Synchronous Buck Converter

ZSPM4121 Under-Voltage Load Switch for Smart Battery Management

ZSPM4141 Ultra-Low-Power Linear Regulator with Minimal Quiescent Current Technology

ZSPM4521 High-Efficiency Charger for Li-Ion Batteries with Photovoltaic Sources

ZSPM4523 High-Efficiency Solar PV MPPT Regulator for Super Cap Systems

ZSPM4551 High-Efficiency Charger for Li-Ion Batteries

LED LIGHTING INTEGRATED CIRCUITS

ZLED7000 40V LED Driver with Internal Switch

ZLED7001 Universal LED Driv er with Temperature Compensation

ZLED7002 Toggle (Side-Step) Dual-Channel LED Driver

ZLED7010 40V LED Driver with Temperature Compensation

ZLED7012 Low-Voltage Four-Channel LED Driver

ZLED7015 1.0MHz Boost Converter with Internal 35V Switch

ZLED7020 High Current 40V LED Driver with Internal Switch

ZLED7022 Low-Voltage Six-Channel LED Driver

ZLED7030 High Current 40V LED Driver with Switch Dimming

ZSLS7025 Boost LED Driver

MOBILE SENSING INTEGRATED CIRCUITS

ZSSC3016 Low-Power 16-Bit Sensor Signal Conditioner

ZSSC3026 Low-Power 16-Bit Sensor Signal Conditioner

INTERFACE INTEGRATED CIRCUITS

ASI4U / ASI4U-E / ASI4U-F Spec. 3.0 Compliant Universal AS-I IC

SAP5S / SAP51 Universal Actuator-Sensor Interface IC

ZIOL2201 IO-Link compliant HV Line Driver (Single Channel)

ZIOL2211 IO-Link-Compliant HV Line Driver (Single Channel)

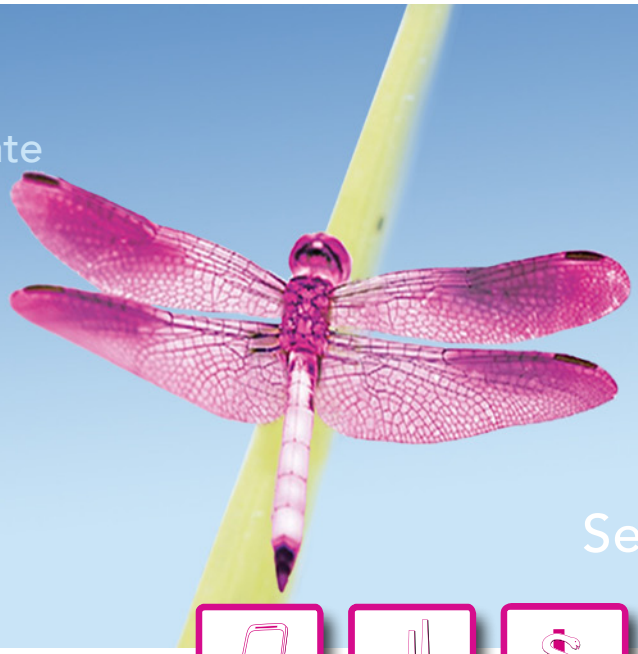
ZIOL2401 IO-Link compliant HV Line Driver (Dual Channel)

ZWIR4501 IEEE 802.15.4 868/915MHz Transceiver

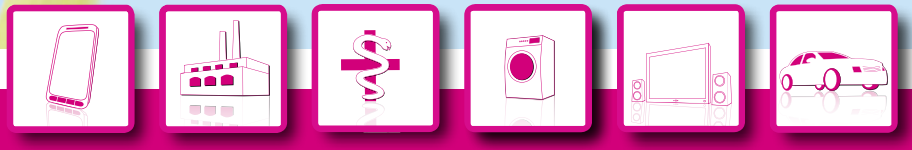
ZWIR4512 Secure Low-Power Wireless IPv6 Module

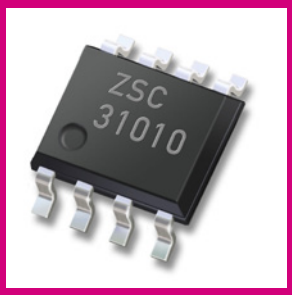
Precise
and Deliberate

ZMDI®
The Analog Mixed Signal Company



Sensor Interface ICs





Key Features

- Sensor signal conditioner product family for easy development of sensor platforms
- Combined pressure and temperature sensor for industrial process automation
- Humidity, pressure and temperature measurements in HVAC applications
- Lower total system cost through single-pass calibration
- Excellent support tools for fast migration to production

Industry Applications

Highly efficient, high-value application specific and standard product sensor signal conditioners:

- Humidity
- Pressure
- Flow
- Position
- Applications across multiple growth markets

www.zmdi.com **SSC@zmdi.com**

ZSSC/ZSC Selection Guide

Sensor Signal Conditioner Product Family

The Analog Mixed Signal Company

ZMDI is an innovative provider of high-performance analog and mixed-signal semiconductor solutions for automotive, industrial, medical and consumer markets. We enable our customers to create the most energy-efficient products available for power management, lighting, and sensors.

- A global provider of energy-efficient mixed-signal solutions with a well-established record of excellence in serving an international tier-one customer base
- Over 50 years of system and applications know-how applied to every customized and standard product
- Turnkey solution delivery from specification to final product
- Continuous strategic investment in talent and state-of-the-art engineering and test facilities
- Long-term commitment to “1st-Time Right” strategy for IC development
- High-level modeling for system simulation

SSC Family Benefits

- Family approach offers the best-fitting IC selection for building cost-optimized applications
- Excellent for low-voltage and low-power battery applications
- No external trimming components required
- PC-controlled configuration and single-pass calibration: simple, cost-efficient, quick, and precise
- Optimized for automotive environments with robust protection circuitries, excellent electromagnetic compatibility and AEC-Q100 qualification depending on part number

Brief Description

ZMDI's Sensor Signal Conditioner (SSC) Family ICs interface with two main sensor types: resistive bridges and differential capacitors. For each sensor type, further specialization allows selecting the optimal balance between price and performance for the required operating voltage and temperature range, gain, resolution, input/output format, and qualification level. ZMDI's SSC ICs offer digital compensation of sensor offset, sensitivity, temperature drift, and nonlinearity in wide operational temperature ranges: -50°C to +150°C (maximum range). See the selection tables for details about our automotive-qualified products. Contact ZMDI Sales for more about our energy-efficient battery-optimized SSCs.

Quick, precise, single-pass end-of-line calibration minimizes production costs for calibration and configuration programming without requiring external trimming components. Our energy-efficient products can minimize current consumption to as low as 950µA in operating mode or 40nA in sleep mode. Options include integrated diagnostics and over-voltage protection circuitry.

ZSSC/ZSC Selection Tree

		Maximum Analog Gain 420		Maximum Analog Gain 192/105/96		Maximum Analog Gain 72/48	
		Analog Output	Digital Output	Analog Output	Digital Output	Analog Output	Digital Output
Resistive Sensor Signal Conditioner	Sensor Signal Conditioner	ZSC31050	ZSC31050	ZSC31015	ZSC31014	ZSC31010	ZSSC3016 ZSSC3026
	Automotive-Qualified Sensor Signal Conditioner	ZSC31150 ZSSC3138 ZSSC3154	ZSSC3170	ZSSC3131 ZSSC3135 ZSSC3136			

		Maximum Input Capacitance 10pF		Maximum Input Capacitance 260pF	
		PDM Output	Digital Output	PDM Output	Digital Output
Capacitive Sensor Signal Conditioner	Sensor Signal Conditioner	ZSSC3122	ZSSC3122	ZSSC3123	ZSSC3123

For more information, contact ZMDI via SSC@zmdi.com.

ZSSC/ZSC Selection Guide

Sensor Signal Conditioner Product Family

The Analog Mixed Signal Company

	Product Name	Adjustable Analog Gain Values	ADC Resolution	Sample Rate	Temperature Compensation / Ext.Temperature Sensor	Interface Options (*Note: I²C™ is a trademark of NXP)	Operation Temperature Range in °C	Supply Voltage in V DC	Current Consumption (see data sheet for conditions)	Package Options
Resistive	ZSC31010	6 / 12 / 24 / 48	14 Bit	Up to 1.0kHz	✓/ -	Ratiometric Voltage Absolute Voltage 0 to 1V or 5V ZACwire™	-50 to +150	2.7 to 5.5 (>5.5V with ext. JFET)	0.25mA	SOP8 / Die
	ZSC31014	1.5 / 3 / 6 / 12 / 24 / 48 / 96 / 192	14 Bit	Up to 2.0kHz	✓/✓	I²C™ & SPI	-40 to +125	2.7 to 5.5	70µA (2µA Sleep Mode)	SOP8 / Die
	ZSC31015	6 / 24 / 48 / 96	14 Bit	Up to 1.0kHz	✓/ ✓	Ratiometric Voltage Absolute Voltage 0 to 1V or 5V ZACwire™ (12-Bit DAC)	-50 to +150	2.7 to 5.5 (>5.5V with ext. JFET)	250µA	SOP8 / Die
	ZSC31050	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	9 to 15 Bit	Up to 3.9kHz	✓/ ✓	Ratiometric or Absolute Voltage; 4mA to 20mA Two PWMs; Two Alarms; I²C™ & SPI & ZACwire™ (11-Bit DAC)	-40 to +150 (depends on part number; see data sheet)	2.7 to 5.5 (>5.5V with ext. JFET)	2.5mA	SSOP16 / Die
	ZSSC3016	13.2 to 72	16 Bit	Up to 175Hz	✓/ -	I²C™ & SPI	-40 to +85	1.8 to 3.6	900µA (40nA Sleep Mode)	Die
	ZSSC3026	13.2 to 72	16 Bit	Up to 175Hz	✓/ -	I²C™ & SPI	-40 to +85	1.8 to 3.6	900µA (40nA Sleep Mode)	PQFN24 / Die
Resistive Automotive AEC Q-100 Qualified	ZSC31150	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	13 to 16 Bit	Up to 7.8kHz	✓/ ✓	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)	-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
	ZSSC3131	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105	13 to 14 Bit	Up to 200Hz	✓/ -	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)	-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
	ZSSC3135	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105	13 to 14 Bit	Up to 200Hz	✓/ ✓	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)	-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
	ZSSC3136	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105	13 to 14 Bit	Up to 200Hz	✓/ ✓	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)	-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
	ZSSC3138	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	13 to 16 Bit	Up to 7.8kHz	✓/ -	Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)	-40 to +150	4.5 to 5.5	5.5mA	SSOP14 / Die
	ZSSC3170	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	13 to 14 Bit	Up to 430Hz	✓/ ✓	PWM (12-Bit) LIN (1.3 / 2.0 / 2.1)	-40 to +150	7 to 18	7mA (40µA Sleep Mode)	SSOP20 / Die
	ZSSC3154	3 / 7 / 9 / 14 / 26 / 35 / 52 / 70 / 105 / 140 / 210 / 280 / 420	14 Bit	Up to 2.0kHz	✓/ ✓	Dual Analog Out Ratiometric 0 to 5V I²C™ & ZACwire™ (12-Bit DAC)	-40 to +125	4.5 to 5.5	10mA	5x5mm QFN32 / Die
Capacitive		Input Capacitance Ranges in pF								
	ZSSC3122	2 to 10	8 to 14 Bit	Up to 1.0kHz	✓/ -	I²C™ & SPI (only MISO) PDM (ratiometric analog output possible - RC filter) Two Alarms	-40 to +125	1.8 to 5.5	60µA (1µA Sleep Mode)	TSSOP14 / Die
	ZSSC3123	2 to 8 8 to 32 32 to 130 130 to 260	8 to 14 Bit	Up to 1.0kHz	✓/ -	I²C™ & SPI (only MISO) PDM (ratiometric analog output possible - RC filter) Two Alarms	-40 to +125	2.3 to 5.5	60µA (1µA Sleep Mode)	TSSOP14 / Die

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ZSC31010

RBic$_{Lite}$™ Analog Output Sensor Signal Conditioner

The Analog Mixed Signal Company

Brief Description

The RBic$_{Lite}$™ ZSC31010 is a sensor signal conditioner integrated circuit, which enables easy and precise calibration of resistive bridge sensors via EEPROM. When mated to a resistive bridge sensor, it will digitally correct offset and gain with the option to correct offset and gain coefficients and linearity over temperature. A second-order compensation can be enabled for temperature coefficients of gain or offset or bridge linearity. The RBic$_{Lite}$™ communicates via ZMDI's ZACwire™ serial interface to the host computer and is easily mass calibrated in a Windows® environment. Once calibrated, the output pin Sig™ can provide selectable 0 to 1 V, rail-to-rail ratiometric analog output, or digital serial output of bridge data with optional temperature data.

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Accommodates differential sensor signal spans, from 1.2 mV/V to 60 mV/V
- ZACwire™ One-Wire Interface (OWI)
- Internal temperature compensation and detection via bandgap PTAT (proportional to absolute temperature)
- Output options: rail-to-rail analog output voltage, absolute analog voltage, digital ZACwire™ One-Wire Interface (OWI)
- Optional sequential output of both temperature and bridge readings on ZACwire™ digital output
- Fast response time, 1 ms (typical)
- High voltage protection up to 30 V with external JFET
- Chopper-stabilized true differential ADC
- Buffered and chopper-stabilized output DAC

Benefits

- No external trimming components required
- Simple PC-controlled configuration and calibration via ZACwire™ One-Wire Interface
- High accuracy (±0.1% FSO @ -25 to 85°C; ±0.25% FSO @ -50 to 150°C)
- Single pass calibration – quick and precise
- Suitable for battery-powered applications
- Small SOP8 package

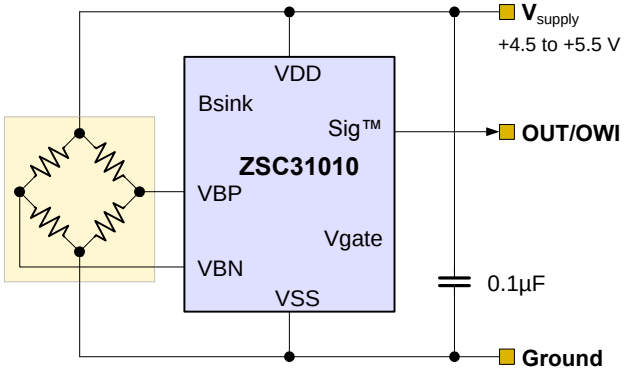
Available Support

- Development Kit available
- Multi-Unit Calibrator Kit available
- Support for industrial mass calibration available
- Quick circuit customization possible for large production volumes

Physical Characteristics

- Supply voltage 2.7 to 5.5 V, with external JFET 5.5V to 30 V
- Current consumption depending on adjusted sample rate: 0.25 mA to 1 mA
- Wide operational temperature: –50 to +150°C

ZSC31010 Application Circuit – Digital Output



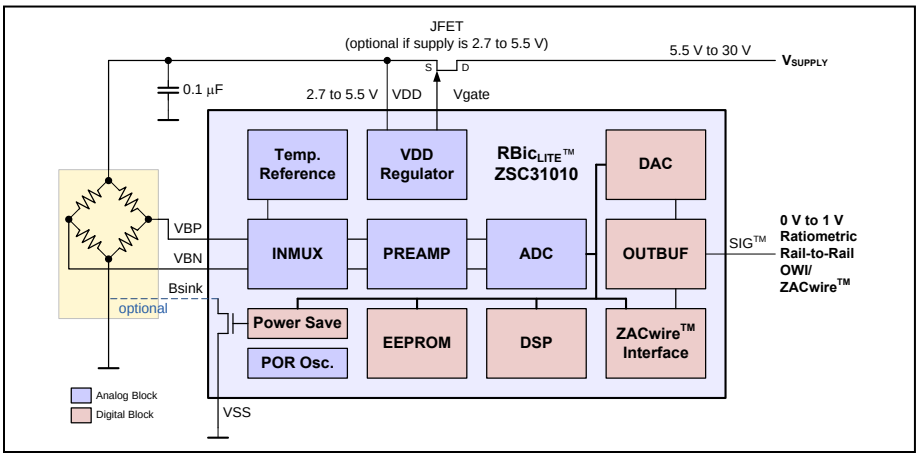
For more information, contact ZMDI via SSC@zmdi.com.

ZSC31010

RBic$_{Lite}$™ Analog Output Sensor Signal Conditioner

The Analog Mixed Signal Company

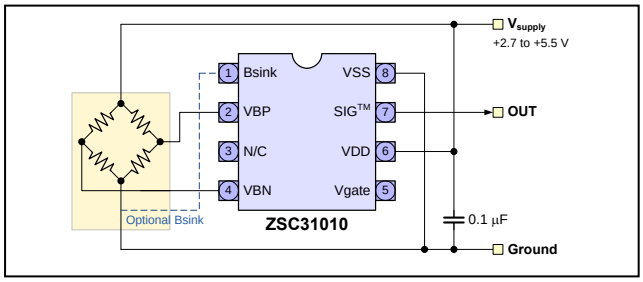
ZSC31010 Block Diagram



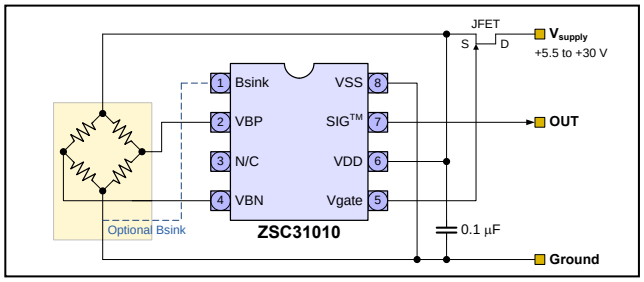
Highly Versatile Applications in Many Markets Including

- ***Industrial***
- ***Building Automation***
- ***Office Automation***
- ***White Goods***
- ***Automotive***
- ***Portable Devices***
- ***Your Innovative Designs***

Rail-to-Rail Ratiometric Voltage Output Applications



Absolute Analog Voltage Output Applications



Ordering Examples *(Please contact ZMDI Sales for additional options.)*

Sales Code	Description	Package
ZSC31010CEB	ZSC31010 RBic$_{Lite}$™ Die — Temperature range: -50°C to +150°C	Unsawn on Wafer
ZSC31010CEC	ZSC31010 RBic$_{Lite}$™ Die — Temperature range: -50°C to +150°C	Sawn on Wafer Frame
ZSC31010CED	ZSC31010 RBic$_{Lite}$™ Die — Temperature range: -50°C to +150°C	Waffle Pack
ZSC31010CEG1	ZSC31010 RBic$_{Lite}$™ SOP8 (150 mil) — Temperature range: -50°C to +150°C	Tube: add “-T” to sales code Reel: add “-R”
ZSC31010KIT	ZSC31010 ZACwire™ SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, Evaluation Software, USB Cable, 5 IC Samples	Kit

Sales and Further Information

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ZSC31014

RBic$_{iLite}$™ Digital Output Sensor Signal Conditioner

The Analog Mixed Signal Company

Brief Description

The ZSC31014 RBic$_{iLite}$™ is a CMOS integrated circuit for highly accurate amplification and analog-to-digital conversion of differential and half-bridge input signals. The RBic$_{iLite}$™ can compensate the measured signal for offset, 1st and 2nd order span, and 1st and 2nd order temperature (Tco and Tcg). It is well suited for sensor-specific correction of bridge sensors. Digital compensation of signal offset, sensitivity, temperature drift, and non-linearity is accomplished via an internal digital signal processor running a correction algorithm with calibration coefficients stored in a non-volatile EEPROM.

The RBic$_{iLite}$™ is adjustable to nearly all piezo-resistive bridge sensors. Measured and corrected bridge values are provided at digital output pins, which can be configured as I^{2}C™* or SPI. The digital I^{2}C™ interface can be used for a simple PC-controlled calibration procedure to program calibration coefficients into an on-chip EEPROM. The calibrated RBic$_{iLite}$™ and a specific sensor are mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or laser trimming.

Integrated diagnostics functions make the RBic$_{iLite}$™ particularly well suited for safety-critical applications.

Features

- High accuracy (±0.1% FSO @ -25 to +85°C; ±0.25% FSO @ -40 to +125°C)
- 2nd order charge-balancing analog-to-digital converter provides low noise, 14-bit data at sample rates exceeding 2kHz
- Fast power-up to data output response: 3ms at 4MHz
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Eight programmable analog gain settings combine with a digital gain term; accommodates bridges with spans <1mV/V and high offset
- Internal temperature compensation for sensor correction and for corrected temperature output
- 48-bit customer ID field for module traceability

* I^{2}C™ is a trademark of NXP.

Benefits

- Simple PC-controlled configuration and single-pass digital calibration via I^{2}C™ interface – quick and precise; SPI option for measurement mode
- Eliminates need for external trimming components
- On-chip diagnostic features add safety to the application (e.g., EEPROM signature, bridge connection checks, bridge short detection).
- Low-power Sleep Mode lengthens battery life
- Enables multiple sensor networks

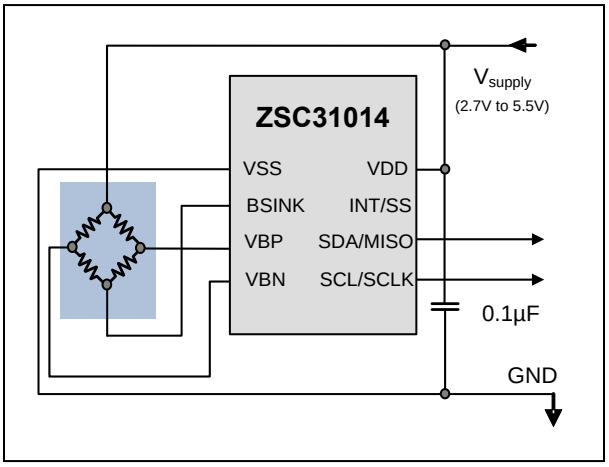
Available Support

- Evaluation Kit
- Application Notes
- Mass Calibration Solution

Physical Characteristics

- Wide supply voltage capability: 2.7V to 5.5V
- Current consumption as low as 70µA depending on programmed sample rate
- Low-power Sleep Mode (<2µA @ 25°C)
- Operation temperature: -40°C to +125°C
- Small SOP8 package

ZSC31014 Application: I^{2}C™ Interface, Low-Power Bsink Option, Internal Temperature Correction



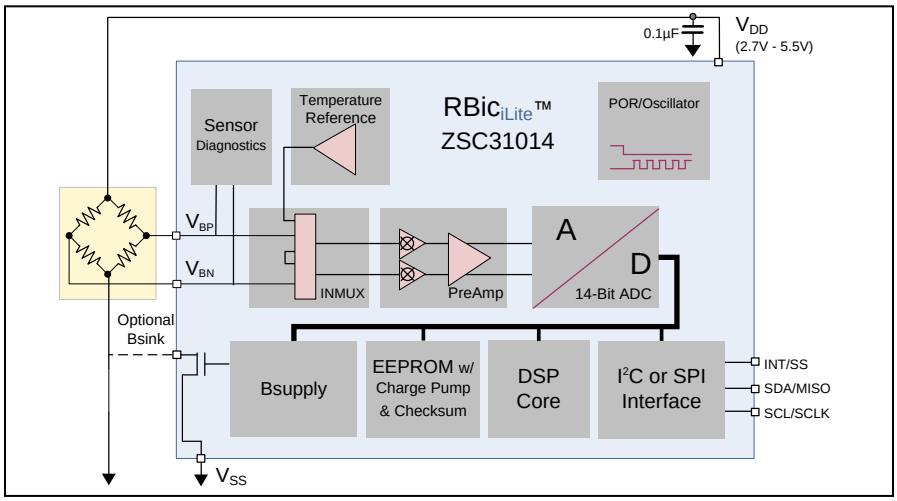
For more information, contact ZMDI via SSC@zmdi.com.

ZSC31014

RBic$_{iLite}$™ Digital Output Sensor Signal Conditioner

The Analog Mixed Signal Company

ZSC31014 Block Diagram



Applications:

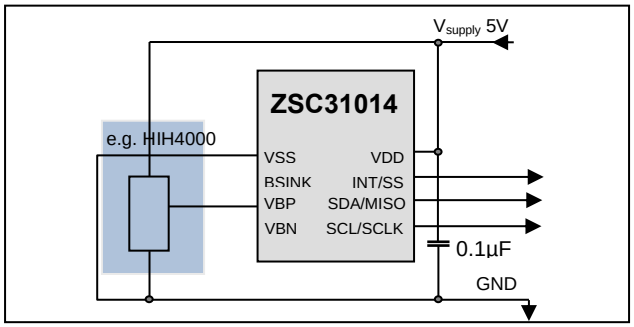
Industrial: building automation, data loggers, pressure meters, leak detection monitoring

Medical: infusion pumps, blood pressure meters, air mattresses, apnea monitors

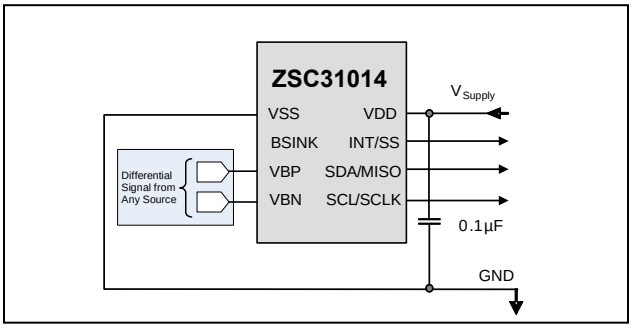
White Goods / Appliances: fluid level, refrigerant

Consumer: body monitors, portable monitors, desktop weather stations, bathroom scales, toys/games

Application: *Half-Bridge Voltage Measurement*



Application: *Generic Differential A2D Converter*



Ordering Examples *(Please refer to section 10 in the data sheet for additional options.)*

Sales Code	Description	Package
ZSC31014EAB	ZSC31014 RBic$_{iLite}$™ Die — Temperature range: -40°C to +125°C	Unsawn on Wafer
ZSC31014EAC	ZSC31014 RBic$_{iLite}$™ Die — Temperature range: -40°C to +125°C	Sawn on Wafer Frame
ZSC31014EAD	ZSC31014 RBic$_{iLite}$™ Die — Temperature range: -40°C to +125°C	Waffle Pack
ZSC31014EAG1	ZSC31014 RBic$_{iLite}$™ SOP8 (150 mil) — Temperature range: -40° to +125°C	Tube: add "-T" to sales code / Reel: add "-R"
ZSC31014KIT	ZSC31014 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, Software, USB Cable, 5 IC Samples	Kit

Sales and Further Information

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ZSC31015

RBic$_{dLite}$™ Analog Output Sensor Signal Conditioner w/ Diagnostic Features

The Analog Mixed Signal Company

Brief Description

The RBic$_{dLite}$™ is adjustable to nearly all piezo-resistive bridge sensors. Measured and corrected bridge values are provided at the SIG™ pin, which can be configured as an analog voltage output or as a one-wire serial digital output.

The digital one-wire interface (OWI) can be used for a simple PC-controlled calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. The calibrated RBic$_{dLite}$™ and a specific sensor are mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or laser. Integrated diagnostics functions make the RBic$_{dLite}$™ particularly well-suited for automotive applications.*

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Programmable analog gain and digital gain; accommodates bridges with spans < 1mV/V and high offset
- Many diagnostic features on chip (e.g., EEPROM signature, bridge connection checks, bridge short detection, power loss detection)
- Independently programmable high and low clipping levels
- 24-bit customer ID field for module traceability
- Internal temperature compensation reference (no external components)
- Option for external temperature compensation with addition of single diode
- Output options: rail-to-rail ratiometric analog voltage (12-bit resolution), absolute analog voltage, digital one-wire interface
- Fast power-up to data out response; output available 5ms after power-up
- Current consumption depends on programmed sample rate: 1mA down to 250µA (typical)
- Fast response time: 1ms (typical)
- High voltage protection up to 30V with external JFET

Benefits

- No external trimming components required
- Simple PC-controlled configuration and calibration via one-wire interface
- High accuracy (±0.1% FSO @ -25 to 85°C; ±0.25% FSO @ -50 to 150°C)
- Single-pass calibration – quick and precise

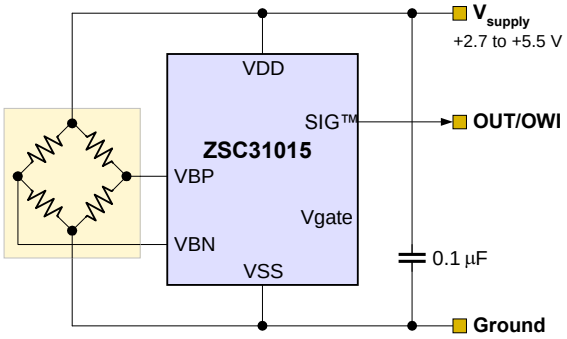
Available Support

- Development Kit available
- Multi-Unit Calibrator Kit available
- Support for industrial mass calibration available
- Quick circuit customization possible for large production volumes

Physical Characteristics

- Wide operation temperature: –50°C to +150°C
- Supply voltage 2.7 to 5.5V; with external JFET, 5.5 to 30V
- Small SOP8 package

ZSC31015 Application Circuit



* Not AEC-Q100-qualified.

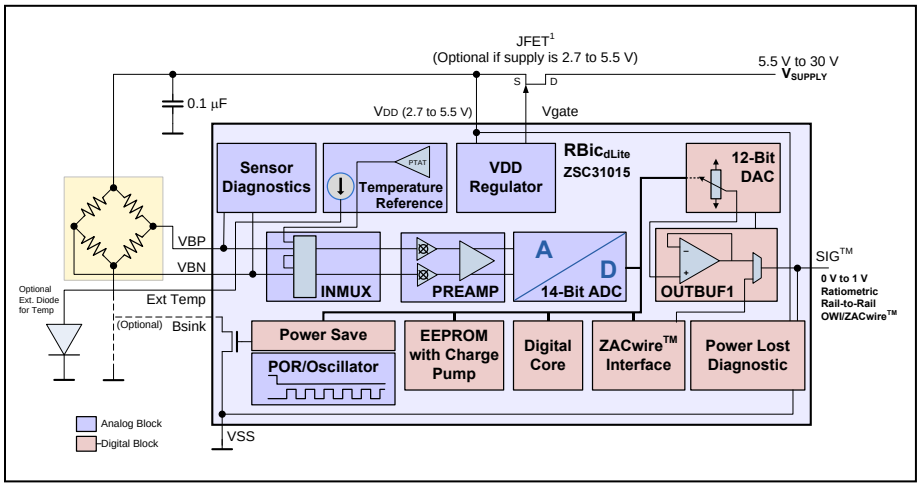
For more information, contact ZMDI via SSC@zmdi.com.

ZSC31015

RBic$_{dLite}$™ Analog Output Sensor Signal Conditioner w/ Diagnostic Features

The Analog Mixed Signal Company

ZSC31015 Block Diagram

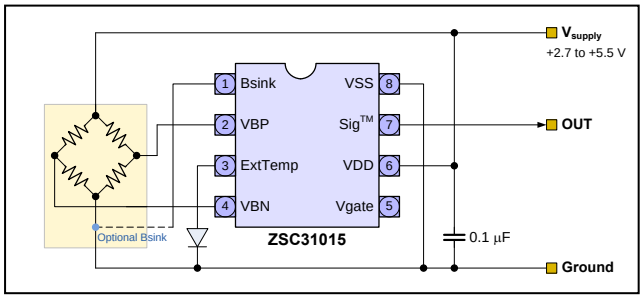


Highly Versatile Applications in Many Markets Including

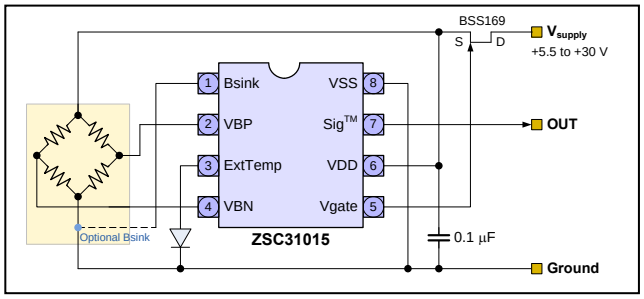
- ***Industrial***
- ***Building Automation***
- ***Office Automation***
- ***White Goods***
- ***Automotive ****
- ***Portable Devices***
- ***Your Innovative Designs***

* Not AEC-Q100-qualified.

Rail-to-Rail Ratiometric Voltage Output Applications



Absolute Analog Voltage Output Applications



Ordering Examples *(Please see section 11 of the data sheet for additional temperature range options.)*

Sales Code	Description	Package
ZSC31015EEB	ZSC31015 RBic$_{dLite}$™ Die — Temperature range: -50°C to +150°C	Unsawn on Wafer
ZSC31015EEC	ZSC31015 RBic$_{dLite}$™ Die — Temperature range: -50°C to +150°C	Sawn on Wafer Frame
ZSC31015EED	ZSC31015 RBic$_{dLite}$™ Die — Temperature range: -50°C to +150°C	Waffle Pack
ZSC31015EEG1	ZSC31015 RBic$_{dLite}$™ SOP8 (150 mil) — Temperature range: -50°C to +150°C	Tube: add “-T” to sales code. Reel: add “-R”
ZSC31015KIT	ZSC31015 ZACwire™ SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, Evaluation Software, USB Cable, 5 IC Samples	Kit

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ZSC31050

Advanced Differential Sensor Signal Conditioner

The Analog Mixed Signal Company

Brief Description

ZSC31050 is a CMOS integrated circuit for highly accurate amplification and sensor-specific correction of bridge sensor and temperature sensor signals. The device provides digital compensation of sensor offset, sensitivity, temperature drift and non-linearity by a 16-bit RISC micro-controller running a polynomial correction algorithm.

ZSC31050 accommodates virtually any bridge sensor type (e.g. piezo-resistive, ceramic-thickfilm or steel membrane based). In addition, the IC can interface to a separate temperature sensor. The bi-directional digital interfaces (I^2C, SPI, and ZACwire™) can be used for a simple PC-controlled one-shot calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. Thus a specific sensor and a ZSC31050 can be mated digitally: fast, precise and without the cost overhead associated with trimming by external devices or laser. The ZACwire™ interface enables an end-of-line calibration of the sensor module.

ZSC31050 has been designed for industrial, medical and consumer applications and is specifically engineered for most pressure sensors. It can also be used with force, torque, acceleration, angle, position and revolution sensors.

Benefits

- No external trimming components required
- PC-controlled configuration and calibration via digital bus interface – simple, low cost
- High accuracy (±0.1% FSO @ -25 to 85°C; ±0.25% FSO @ -40 to 125°C) *

Available Support

- Application kit available (including calibration board, SSOP16 samples, software, technical documentation)
- Support for industrial mass calibration available
- Quick circuit customization possible for large production volumes

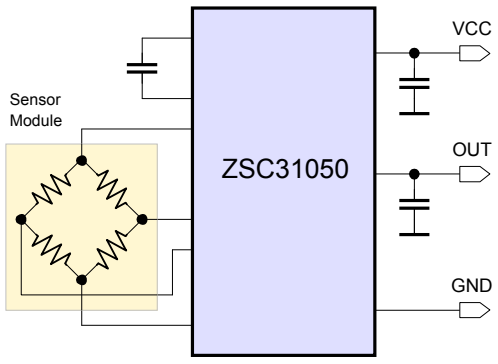
Features

- Digital compensation of sensor offset, sensitivity, temperature drift and non-linearity
- Accommodates nearly all bridge sensor types (signal spans from 1 up to 275mV/V processable)
- Digital one-shot calibration: quick and precise
- Selectable compensation temperature T1 source: bridge, thermistor, internal or external diode
- Output options: voltage (0 to 5V), current (4 to 20mA), PWM, I^2C, SPI, ZACwire™ (one-wire interface), PWM, alarm
- Adjustable output resolution (up to 15 bits) versus sampling rate (up to 3.9kHz)
- Current consumption: typ. 2.5mA
- Selectable bridge excitation: ratiometric voltage, constant voltage or constant current
- Input channel for separate temperature sensor
- Sensor connection and common mode check (sensor aging detection)

Physical Characteristics

- Operation temperature -40 to +125°C (-40 to +150°C derated, depending on product version)
- Supply voltage 2.7 to 5.5 V with external JFET 5 to 40V
- Available in SSOP16 package or as die

ZSC31050 Overview



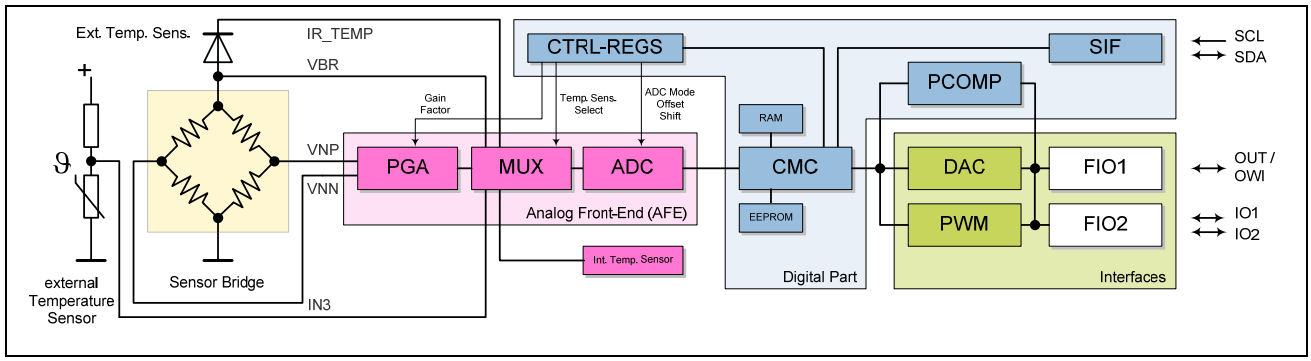
* digital output signal

ZSC31050

Advanced Differential Sensor Signal Conditioner

The Analog Mixed Signal Company

ZSC31050 Block Diagram



Ordering Information

Example: **ZSC31050 D I G1 - T**

ZMDI Product Sales Name

Design Revision
The revision level is indicated alphabetically beginning with A for first revision level

Target Application Area/
Normal Operating Temperature Range
- C = Consumer (0°C to +70°C)
- I = Industrial (-25°C to 85°C)
- A = Automotive (-40°C to +125°C)
- E = Extended Automotive (-40°C to +150°C)

Delivery Form *
- T = Delivery in tube
- R = Delivery in tape on reel

Die/Package Options
- B = Tested dice on unsawn wafer
- C = Tested dice on frame
- D = Tested dice in waffle pack
- G1 = Finished parts, RoHS-compliant, in plastic package

* Only for finished parts in plastic package

Not all possible combinations are available. Please ask ZMDI sales

Product Sales Code	Description	Package
ZSC31050KIT Evaluation Kit V3.0	Modular evaluation and development boards for ZSC31050	KIT boards, IC samples, USB cable, DVD with software and documentation
ZSC31050 Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSC31050	MCS boards, cable, connectors, DVD with software and documentation

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ZSSC3016

Low Power 16 Bit Sensor Signal Conditioner IC

The Analog Mixed Signal Company

Brief Description

The ZSSC3016 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential input signal. Designed for high resolution altimeter module applications, the ZSSC3016 can perform offset, span, and 1st and 2nd order temperature compensation of the measured signal. Developed for correction of resistive bridge sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected bridge values are provided at the digital output pins, which can be configured as I²C* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via an 18-bit internal digital signal processor (DSP) running a correction algorithm. Calibration coefficients are stored on-chip in a highly reliable, non-volatile, multiple-time programmable (MTP) memory. Programming the ZSSC3016 is simple via the serial interface and the PC-controlled calibration software provided in the ZMDI Development Kit. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory. The digital mating is fast and precise, eliminating the overhead normally associated with trimming external components and multi-pass calibration routines.

Features

- Flexible, programmable analog front-end design; up to 16-bit scalable, charge-balancing two-segment analog-to-digital converter (ADC)
- Fully programmable gain amplifier accepting sensors from 14 to 72 (linear factor)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1st and 2nd order digital compensation of sensor gain
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Intelligent power management unit
- Layout customized for die-die bonding with sensor for high-density chip-on-board assembly
- Typical sensor elements can achieve accuracy of less than ±0.10% FSO @ -40 to 85 °C

* I²C is a registered trademark of NXP.

Benefits

- Integrated 18-bit calibration math DSP
- Fully corrected signal at digital output
- Minimize calibration costs through the one-pass calibration concept
- No external trimming components required
- Highly integrated CMOS design
- Excellent for low-voltage and low-power battery applications

Physical Characteristics

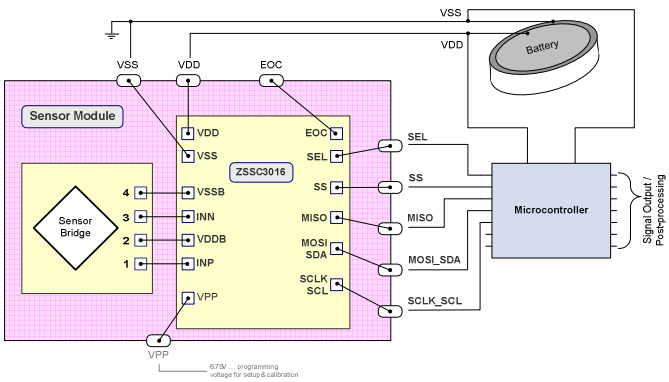
- Supply voltage range: 1.8 to 3.6V
- Current consumption: 1mA (operating mode)
- Sleep State current <250nA (25°C)
- Temperature resolution: <0.003K/LSB
- Operation temperature: –40°C to +85 °C
- Small die size: 1.5mm²
- Delivery options: die for wafer bonding

Typical Applications

The ZSSC3016 is designed for operation in calibrated resistive (pressure) sensor modules:

- Barometric altitude measurement for portable navigation
- Altitude measurement for emergency call systems
- Altitude measurement for car navigation
- Inside hard disk pressure measurement
- Weather forecast
- Fan control

ZSSC3016 Application Example.

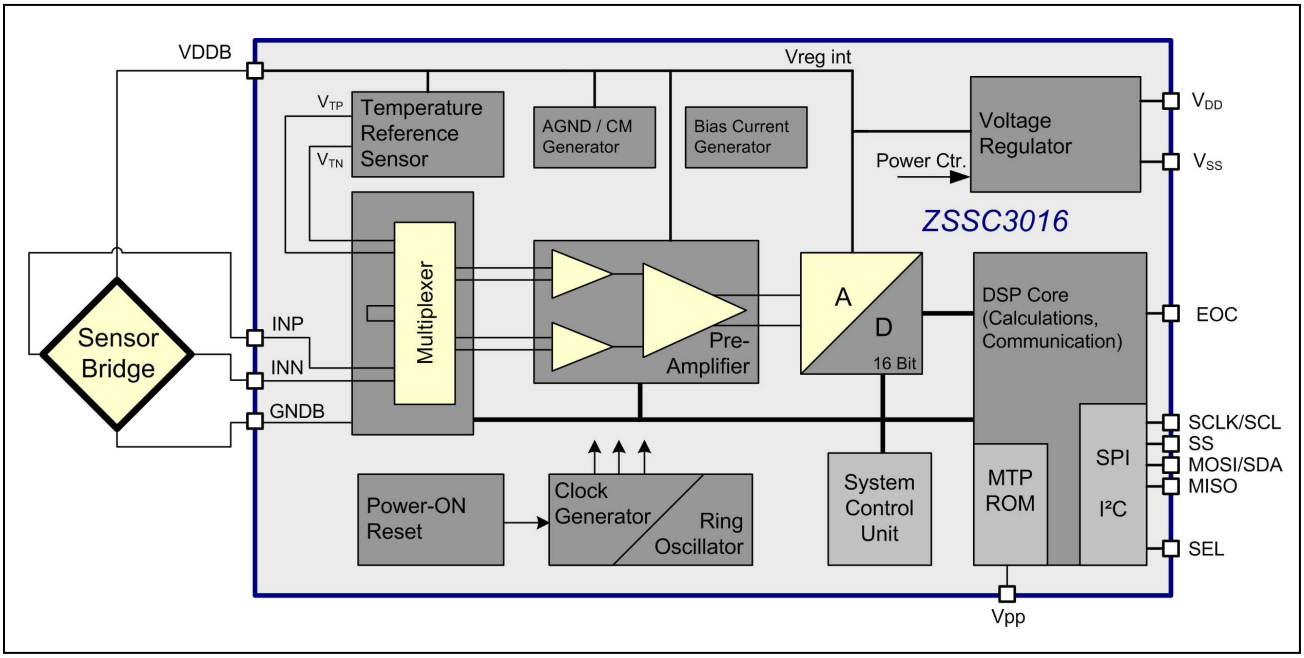


ZSSC3016

Low Power 16 Bit Sensor Signal Conditioner IC

The Analog Mixed Signal Company

ZSSC3016 Block Diagram



Ordering Information

Ordering Examples *	Description	Package
ZSSC3016CC1B	Temperature range: –40°C to +85 °C, Consumer-Level: Parameter according Data Sheet	Wafer (304um) unsawn
ZSSC3016CI1B	Temperature range: –40°C to +85 °C, Industrial-Level: 10 years MTP-Data Retention; 20FIT	Wafer (304um) unsawn
ZSSC3016CI1D ES	Engineering Samples, Temperature range: –40°C to +85 °C	Dice in Waffle Pack
ZSSC3016KIT	ZSSC3016 Evaluation Kit, including sample, modular evaluation board, and evaluation software.	Kit

* Please contact ZMDI Sales for additional options.

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ZSSC3026

Low Power 16 Bit Sensor Signal Conditioner IC

The Analog Mixed Signal Company

Brief Description

The ZSSC3026 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential input signal. Designed for high resolution altimeter module applications, the ZSSC3026 can perform offset, span, and 1st and 2nd order temperature compensation of the measured signal. Developed for correction of resistive bridge sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected bridge values are provided at the digital output pins, which can be configured as I²C* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via an 18-bit internal digital signal processor (DSP) running a correction algorithm. Calibration coefficients are stored on-chip in a highly reliable, non-volatile, multiple-time programmable (MTP) memory. Programming the ZSSC3026 is simple via the serial interface. The IC-internal charge pump provides the MTP programming voltage. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory. The digital mating is fast and precise, eliminating the overhead normally associated with trimming external components and multi-pass calibration routines.

Features

- Flexible, programmable analog front-end design; up to 16-bit scalable, charge-balancing two-segment analog-to-digital converter (ADC)
- Fully programmable gain amplifier accepting sensors from 14 to 72 (linear factor)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1st and 2nd order digital compensation of sensor gain
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Intelligent power management unit
- Layout customized for die-die bonding with sensor for high-density chip-on-board assembly
- Typical sensor elements can achieve accuracy of less than ±0.10% FSO @ -40 to 110°C

* I²C is a registered trademark of NXP.

Benefits

- Integrated 18-bit calibration math DSP
- Fully corrected signal at digital output
- Minimize calibration costs through the one-pass calibration concept
- No external trimming components required
- Highly integrated CMOS design
- Excellent for low-voltage and low-power battery applications

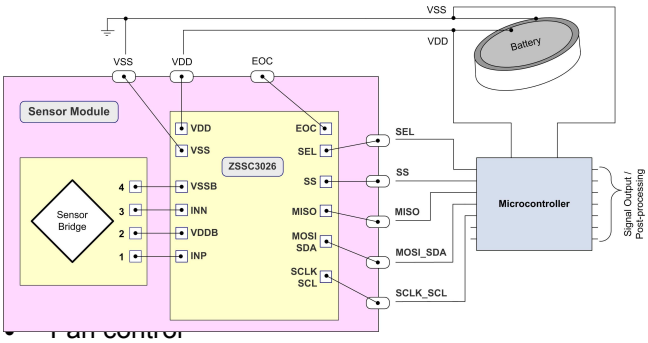
Physical Characteristics

- Supply voltage range: 1.8 to 3.6V
- Current consumption: 1mA (operating mode)
- Sleep State current: 50nA (typical)
- Temperature resolution: <0.003K/LSB
- Operation temperatures: –40°C to +85°C
  –40°C to +110°C
- Small die size: 1.5mm²
- Delivery options: die for wafer bonding, bumped die for Flip Chip, PQFN24

Typical Applications

The ZSSC3026 is designed for operation in calibrated resistive (pressure) sensor modules:

- Barometric altitude measurement for portable navigation
- Altitude measurement for emergency call systems
- Altitude measurement for car navigation
- Inside hard disk pressure measurement
- Weather forecast



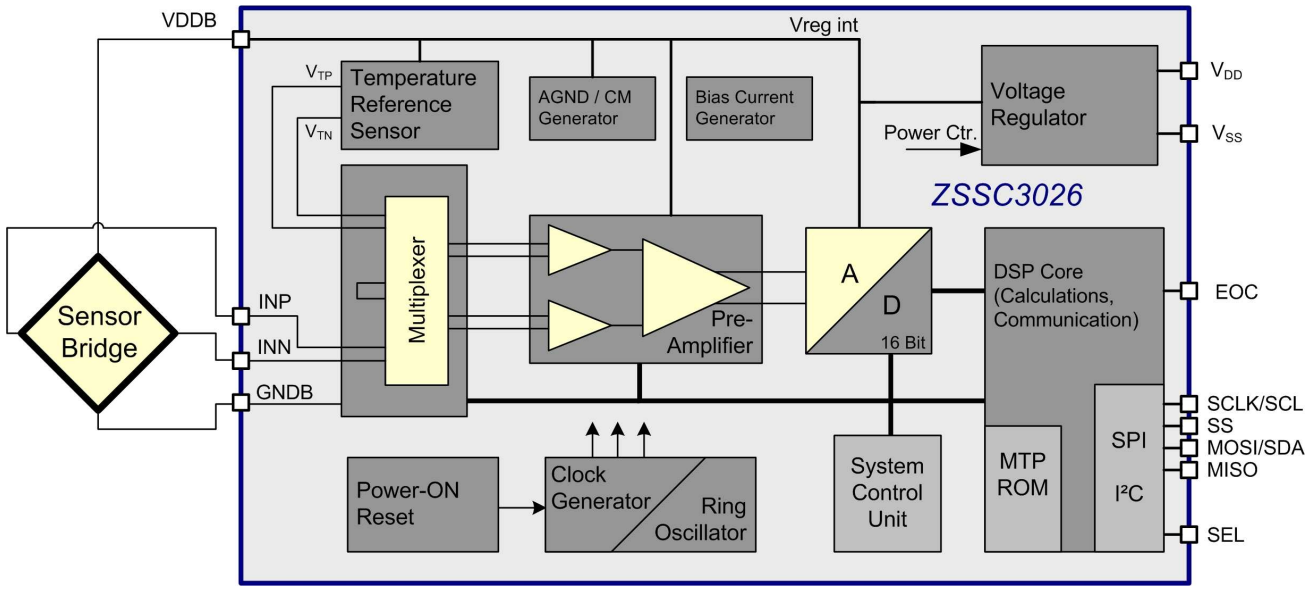
ZSSC3026 Application Example.

ZSSC3026

Low Power 16 Bit Sensor Signal Conditioner IC

The Analog Mixed Signal Company

ZSSC3026 Block Diagram



Ordering Information

Ordering Examples *	Description	Package
ZSSC3026CC1B	Temperature range: –40°C to +85 °C, Consumer-Level: Parameter according Data Sheet	Chips, Wafer (304um) unsawn, tested
ZSSC3026CI1B	Temperature range: –40°C to +85 °C, Industrial-Level: 10 years MTP-Data Retention	Chips, Wafer (304um) unsawn, tested
ZSSC3026CI4	Temperature range: –40°C to +110 °C, Industrial	PQFN24 4x4, tested
ZSSC30x6KIT	Evaluation Kit for ZSSC30x6 Product Family	Boards, cable, software-CD, 1 sample

* Please contact ZMDI Sales for additional options.

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ZSSC3122

cLite™ Low Voltage Capacitive Sensor Signal Conditioner

The Analog Mixed Signal Company

Brief Description

The ZSSC3122 cLite™ is a CMOS integrated circuit for accurate capacitance-to-digital conversion and sensor-specific correction of capacitive sensor signals. Digital compensation of sensor offset, sensitivity, and temperature drift is accomplished via an internal digital signal processor running a correction algorithm with calibration coefficients stored in a non-volatile EEPROM.

The ZSSC3122 is configurable for capacitive sensors with capacitances up to 10pF and a sensitivity of 125aF/LSB. It is compatible with both single capacitive sensors (both terminals must be accessible) and differential capacitive sensors. Measured and corrected sensor values can be output as I²C™ *, SPI, PDM, or alarms.

The I²C™ interface can be used for a simple PC-controlled calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. The calibrated ZSSC3122 and a specific sensor are mated digitally: fast, precise, and without the cost overhead of trimming by external devices or laser.

Features

- Maximum Target input capacitance: 10pF
- Sampling rates as fast as 0.7ms at 8-bit resolution; 1.6ms at 10-bit; 5.0ms at 12-bit; 18.5ms at14-bit
- Digital compensation of sensor: piece-wise 1st and 2nd order sensor compensation or up to 3rd order single-region sensor compensation
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Internal temperature compensation reference (no external components)
- Programmable capacitance span and offset
- Layout customized for die-die bonding with sensor for low-cost, high-density chip-on-board assembly
- Accuracy † as high as
  ±0.25% FSO@ -40 to 125°C, 3V, 5V, Vsupply ±10%

Benefits

- Minimized calibration costs: no laser trimming, one-pass calibration using a digital interface
- Excellent for low-power battery applications

Interfaces

- I²C™ or SPI interface—easy connection to a µC
- PDM outputs (Filtered Analog Ratiometric) for both capacitance and temperature
- Up to two alarms that can act as full push-pull or open-drain switches

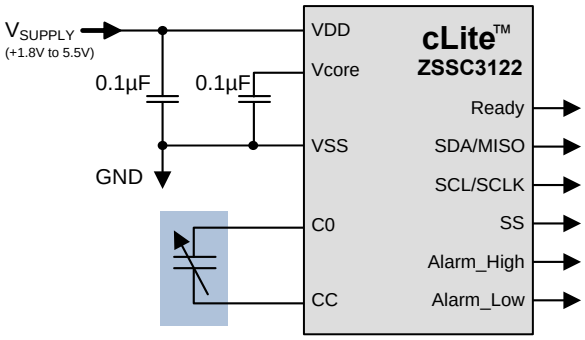
Physical Characteristics

- Supply voltage: 1.8 to 5.5V
- Typical current consumption 650µA down to 60µA depending on configuration
- Typical Sleep Mode current: ≤ 1µA at 85°C
- Operation temperature: –40°C to +125°C
- Die or TSSOP14 package

Available Support

- ZSSC3122 SSC Evaluation Kit available: SSC Evaluation Board, samples, software, documentation.
- Support for industrial mass calibration available.
- Quick circuit customization option for large production volumes.

Application: Digital Output, Alarms



* I²C™ is a registered trademark of NXP.

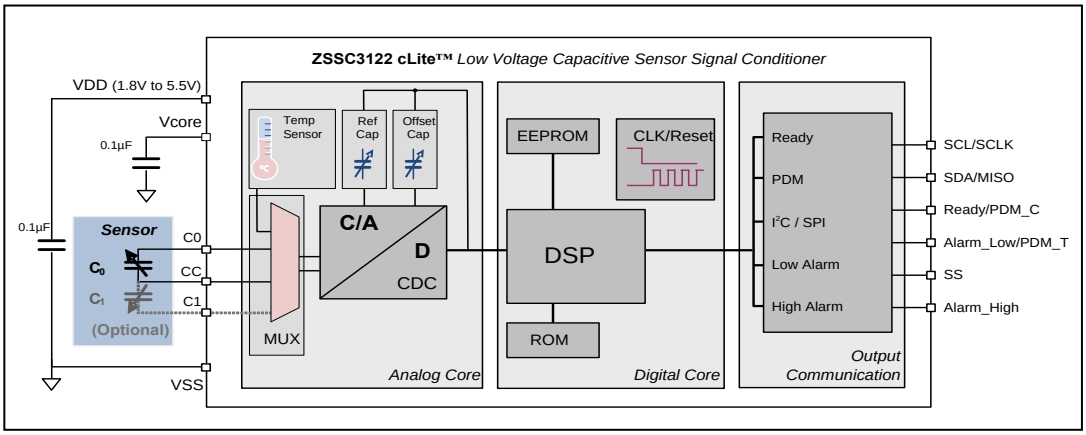
† See data sheet section 1.3 for restrictions.

ZSSC3122

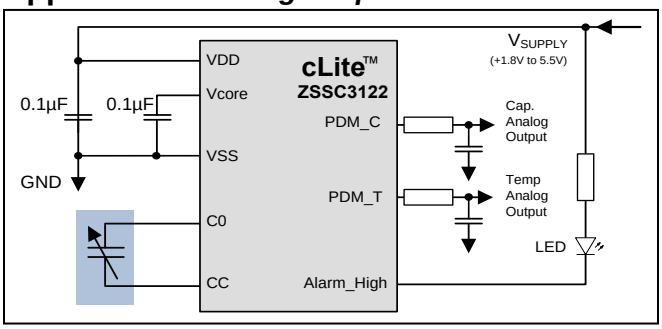
cLite™ Low Voltage Capacitive Sensor Signal Conditioner

The Analog Mixed Signal Company

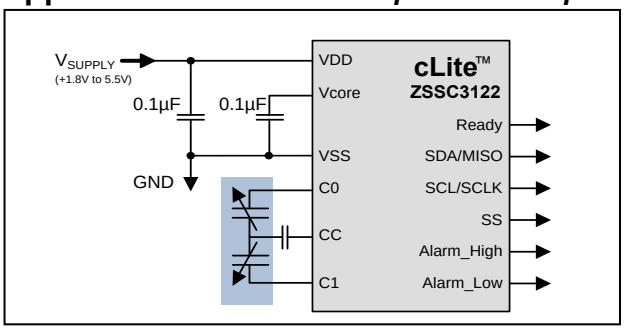
cLite™ ZSSC3122 Block Diagram



Application: *Analog Output*



Application: *Differential Capacitance Input*



Ordering Codes

Sales Code	Description	Package
ZSSC3122AA1B	ZSSC3122 cLite™ die — Temperature range: -40°C to +125°C	Tested dice on un-sawn wafer
ZSSC3122AA1C	ZSSC3122 cLite™ die — Temperature range: -40°C to +125°C	Tested dice on frame
ZSSC3122AA2	ZSSC3122 cLite™ TSSOP14 — Temperature range: -40°C to +125°C – Lead-free package	Tube: add "T" to sales code Reel: add "R"
ZSSC3122KIT	ZSSC3122 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, Evaluation Software, USB Cable, 5 IC Samples	Kit

Sales and Further Information

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ZSSC3123

cLite™ Capacitive Sensor Signal Conditioner

The Analog Mixed Signal Company

Brief Description

The ZSSC3123 cLite™ is a CMOS integrated circuit for accurate capacitance-to-digital conversion and sensor-specific correction of capacitive sensor signals. Digital compensation of sensor offset, sensitivity, and temperature drift is accomplished via an internal digital signal processor running a correction algorithm with calibration coefficients stored in a non-volatile EEPROM.

The ZSSC3123 is configurable for capacitive sensors with capacitances up to 260pF and a sensitivity of 125aF/LSB to 1pF/LSB depending on resolution, speed, and range settings. It is compatible with both single capacitive sensors (both terminals must be accessible) and differential capacitive sensors. Measured and corrected sensor values can be output as I²C™ *, SPI, PDM, or alarms.

The I²C™ interface can be used for a simple PC-controlled calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. The calibrated ZSSC3123 and a specific sensor are mated digitally: fast, precise, and without the cost overhead of trimming by external devices or laser.

Features

- Maximum Target input capacitance: 260pF
- Sampling rates as fast as 0.7ms at 8-bit resolution; 1.6ms at 10-bit; 5.0ms at 12-bit; 18.5ms at 14-bit
- Digital compensation of sensor: piece-wise 1st and 2nd order sensor compensation or up to 3rd order single-region sensor compensation
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Internal temperature compensation reference (no external components)
- Programmable capacitance span and offset
- Layout customized for die-die bonding with sensor for low-cost, high-density chip-on-board assembly
- Accuracy † as high as
  ±0.25% FSO@ -40 to 125°C, 3V, 5V, Vsupply ±10%

Benefits

- Minimized calibration costs: no laser trimming, one-pass calibration using a digital interface
- Wide capacitance range to support a broad portfolio of different sensor elements
- Excellent for low-power battery applications

Interfaces

- I²C™ or SPI interface—easy connection to a µC
- PDM outputs (Filtered Analog Ratiometric) for both capacitance and temperature
- Up to two alarms that can act as full push-pull or open-drain switches

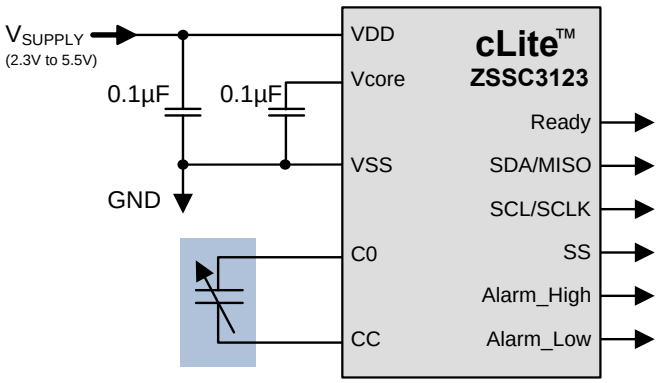
Physical Characteristics

- Supply voltage: 2.3V to 5.5V
- Typical current consumption 650µA down to 60µA depending on configuration
- Typical Sleep Mode current: ≤ 1µA at 85°C
- Operation temperature: –40°C to +125°C
- Die or TSSOP14 package

Available Support

- ZSSC3123 SSC Evaluation Kit available: SSC Evaluation Board, samples, software, documentation.
- Support for industrial mass calibration available.
- Quick circuit customization option for large production volumes.

Application: Digital Output, Alarms



* I²C™ is a registered trademark of NXP.

† See data sheet section 1.3 for restrictions.

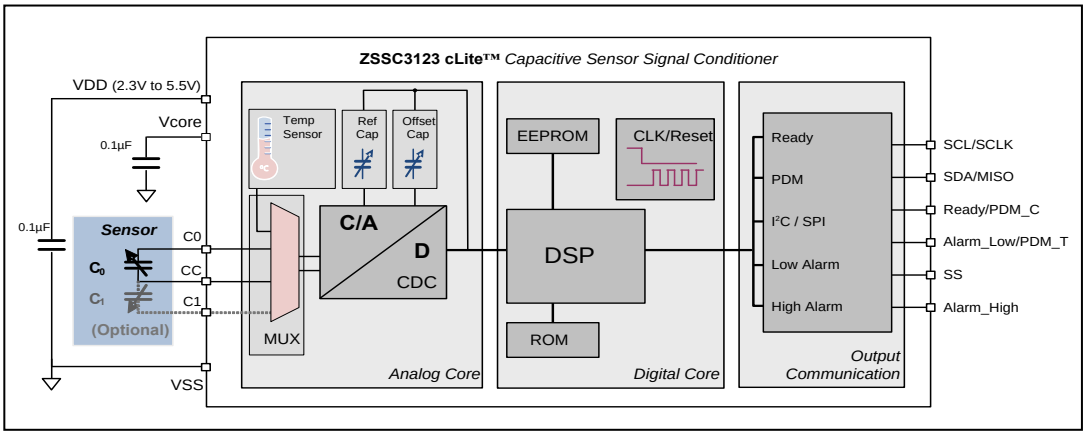
For more information, contact us at SSC@zmdi.com.

ZSSC3123

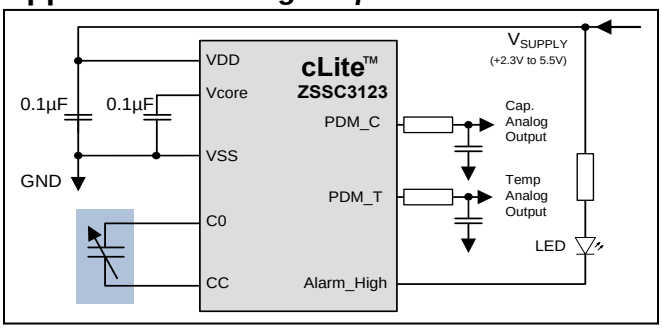
cLite™ Capacitive Sensor Signal Conditioner

The Analog Mixed Signal Company

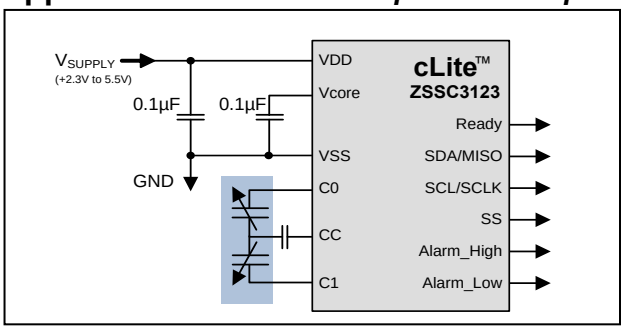
cLite™ ZSSC3123 Block Diagram



Application: *Analog Output*



Application: *Differential Capacitance Input*



Ordering Codes

Sales Code	Description	Package
ZSSC3123AA1B	ZSSC3123 cLite™ die — Temperature range: -40°C to +125°C	*Tested dice on un-sawn wafer*
ZSSC3123AA1C	ZSSC3123 cLite™ die — Temperature range: -40°C to +125°C	*Tested dice on frame*
ZSSC3123AA2	ZSSC3123 cLite™ TSSOP14 — Temperature range: -40°C to +125°C – Lead-free package	Tube: add "T" to sales code Reel: add "R"
ZSSC3123KIT	ZSSC3123 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, Evaluation Software, USB Cable, 5 IC Samples	Kit

Sales and Further Information

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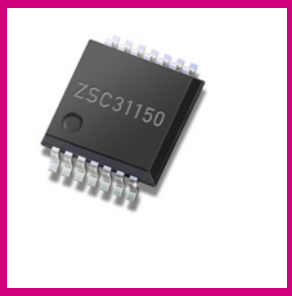
ZMDI®
The Analog Mixed Signal Company

Automotive ICs



Key Features

- Extremely robust sensor signal conditioner ICs
- Highest precision signal conditioning
- Interface options; e.g., LIN, SENT
- Built-in diagnostic functions
- Enabling of SIL2 applications without redundancy
- Operation at up to +160°C and 40 V

Automotive Applications

Intelligent sensing solutions for resistive, capacitive, inductive, magnetic and ultrasonic sensors:

- Position sensing
- Pressure sensing
- Oil-level sensing
- Ethanol content
- Passenger detection
- Temperature

www.zmdi.com

SSC@zmdi.com

ZSC31150

Fast Automotive Sensor Signal Conditioner

The Analog Mixed Signal Company

Brief Description

The ZSC31150 is a CMOS integrated circuit for highly accurate amplification and sensor-specific correction of bridge sensor signals. Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity is accomplished via an internal 16-bit RISC microcontroller running a correction algorithm, with calibration coefficients stored in an EEPROM.

The ZSC31150 is adjustable to nearly all bridge sensor types. Measured values are provided at the analog voltage output or at the digital ZACwire™ and I²C™* interface. The digital interface can be used for a simple PC-controlled calibration procedure in order to program a set of calibration coefficients into an on-chip EEPROM. A specific sensor and a ZSC31150 can be mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or a laser.

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Adjustable to nearly all bridge sensor types
- Analog gain of 420, overall gain up to 2000
- Output options: ratiometric analog voltage output (5% to 95% maximum, 12.4-bit resolution) or ZACwire™ (digital one-wire-interface)
- Temperature compensation: internal or external diode, bridge resistance, thermistor
- Sensor biasing by voltage or constant current
- Sample rate: up to 7.8 kHz
- High voltage protection up to 33 V
- Supply current: max. 5.5mA
- Reverse polarity and short-circuit protection
- Wide operation temperature depending on part number: up to -40 to +150°C
- Traceability by user-defined EEPROM entries
- Safety and diagnostic functions

Benefits

- No external trimming components required
- Only a few external protection devices needed
- PC-controlled configuration and single pass calibration via I²C™ or ZACwire™ interface: Simple, cost efficient, quick, and precise
- End-of-line calibration via I²C™ or ZACwire™ interface
- High accuracy (0.25% FSO @ -25 to 85°C; 0.5% FSO @ -40 to 125°C)
- The ZSC31150 is optimized for automotive environments by its special protection circuitry and excellent electromagnetic compatibility

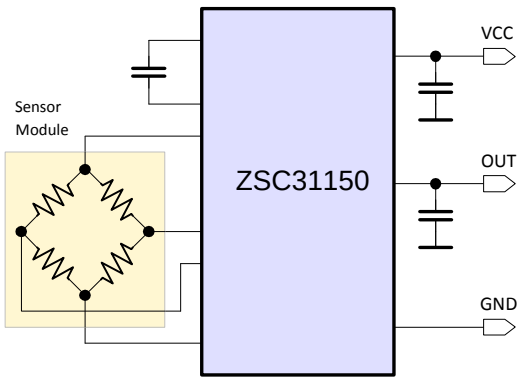
Available Support

- Evaluation Kits
- Application Notes
- Mass calibration setup

Physical Characteristics

- Supply voltage: 4.5 to 5.5 V
- Operation temperature: -40°C to 125°C (-40°C to +150°C de-rated, depending on product version)
- Available in SSOP14 or as die

ZSC31150 Application Circuit



* I²C™ is a trademark of NXP.

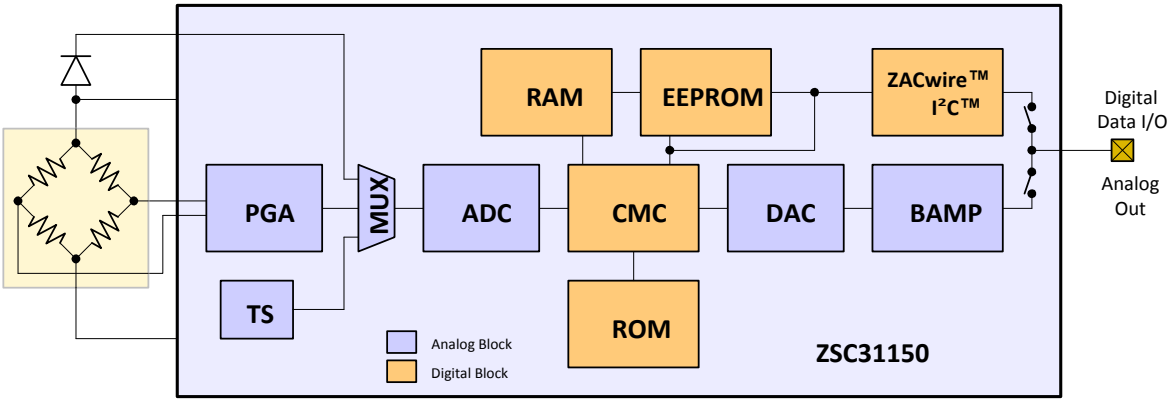
For more information, contact ZMDI via SSC@zmdi.com.

ZSC31150

Fast Automotive Sensor Signal Conditioner

The Analog Mixed Signal Company

ZSC31150 Block Diagram



Ordering Information *(Please refer to section 8 in the data sheet for additional options.)*

Product Sales Code	Description	Package
ZSC31150GEB	ZSC31150 Die — Temperature range: -40°C to +150°C	Unsawn on Wafer
ZSC31150GEC	ZSC31150 Die — Temperature range: -40°C to +150°C	Sawn on Wafer Frame
ZSC31150GED	ZSC31150 Die — Temperature range: -40°C to +150°C	Waffle Pack
ZSC31150GEG1	ZSC31150 SSOP-14— Temperature range: -40°C to +150°C	Tube: add “-T” to sales code Reel: add “-R”
ZSC31150KIT Evaluation Kit V1.0	ZSC31150 SSC Evaluation Kit: 3 interconnecting boards, 5 ZSC31150 SSOP-14 samples, USB cable, software/documentation DVD	Kit
ZSC31150 Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSC31150: MCS boards, cable, connectors, DVD with software and documentation	Kit

Sales and Further Information

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ZSSC3015

RBic$_{dLite-Auto}$™ Sensor Signal Conditioner with Diagnostics

The Analog Mixed Signal Company

Brief Description

The ZSSC3015 RBic$_{dLite-Auto}$™ sensor signal conditioner IC is adjustable to nearly all piezo-resistive bridge sensors. Measured and corrected bridge values are provided at the Sig™ pin, which can be configured as an analog voltage output or as a one-wire serial digital output.

The ZACwire™ digital one-wire interface (OWI) can be used for a simple PC-controlled calibration procedure to program a set of calibration coefficients into an on-chip EEPROM. The calibrated ZSSC3015 and a specific sensor are mated digitally: fast, precise, and without the cost overhead associated with trimming by external devices or laser. Integrated diagnostics functions make the ZSSC3015 particularly well-suited for automotive applications.

Features

- Digital compensation of sensor offset, sensitivity, temperature drift, and nonlinearity
- Programmable analog gain and digital gain; accommodates bridges with spans < 1mV/V and high offset
- Many diagnostic features on chip (e.g., EEPROM signature, bridge connection checks, bridge short detection, power loss detection)
- Independently programmable high and low clipping levels
- 24-bit customer ID field for module traceability
- Internal temperature compensation reference (no external components)
- Option for external temperature compensation with addition of single diode
- Output options: rail-to-rail ratiometric analog voltage (12-bit resolution), absolute analog voltage, ZACwire™ digital one-wire interface
- Fast power-up to data out response; output available 5ms after power-up
- Current consumption depends on programmed sample rate and mode: 1mA down to 300µA (typ.)
- Fast response time: 1.4ms typical
- High voltage protection: ≤ 30V with external JFET
- AEC-Q100 qualified

Benefits

- No external trimming components required
- PC-controlled configuration and calibration via ZACwire™ one-wire interface – simple, low cost
- High accuracy (as high as ±0.1% FSO @ -25 to 85°C; ±0.25% FSO @ -50 to 150°C)
- Single-pass calibration – quick and precise

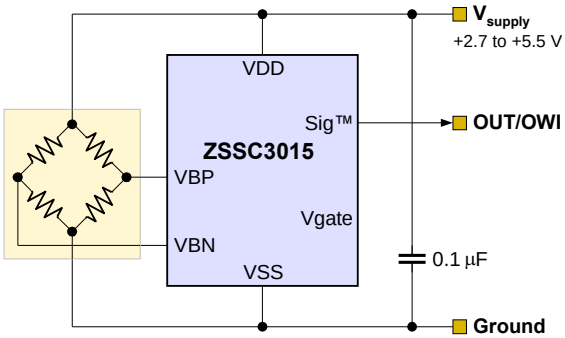
Available Support

- Evaluation Kit available
- Mass Calibration System available
- Support for industrial mass calibration available
- Quick circuit customization possible for large production volumes

Physical Characteristics

- Wide operation temperature: –50°C to +150°C
- Supply voltage 2.7 to 5.5V; with external JFET, 5.5 to 30V
- Small SOP8 package

ZSSC3015 Application Circuit



For more information, contact ZMDI via SSC@zmdi.com.

ZSSC3015

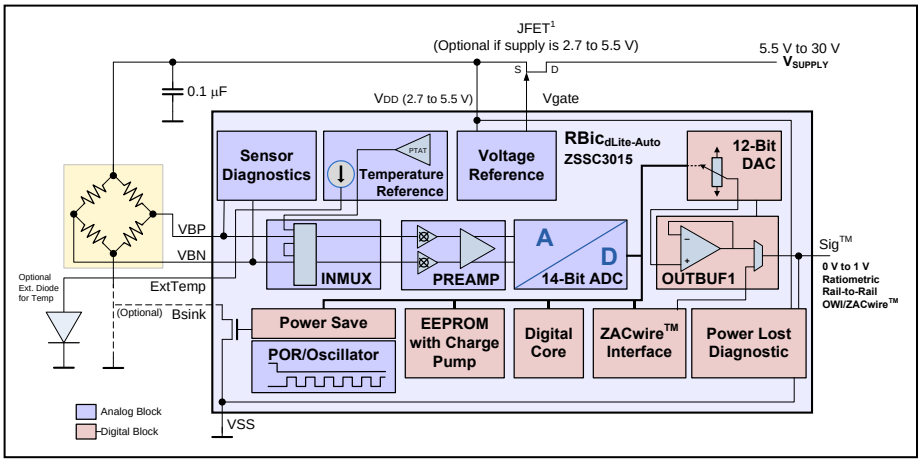
RBic$_{dLite-Auto}$™ Sensor Signal Conditioner with Diagnostics

The Analog Mixed Signal Company

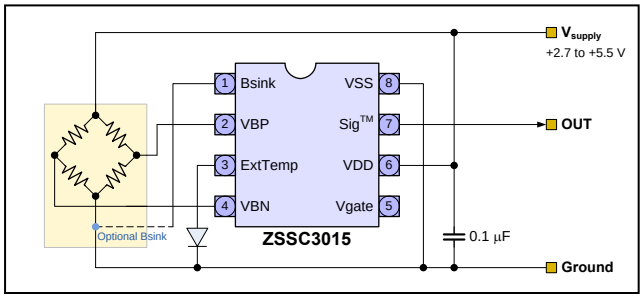
ZSSC3015 Block Diagram

Highly Versatile Applications in Many Markets Including

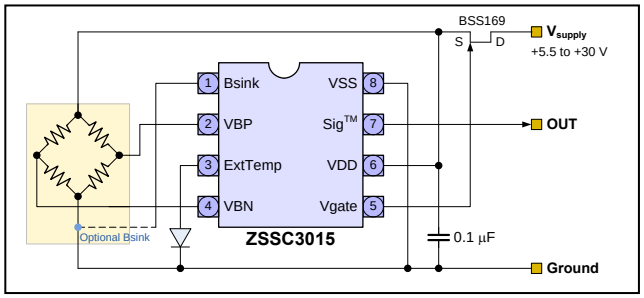
- *Industrial*
- *Building Automation*
- *Office Automation*
- *White Goods*
- *Automotive*
- *Portable Devices*
- *Your Innovative Designs*



Rail-to-Rail Ratiometric Voltage Output Applications



Absolute Analog Voltage Output Applications



Part Ordering Examples *(See section 11 in the data sheet for additional options.)*

Sales Code	Description	Package
ZSSC3015NE1B	ZSSC3015 RBic$_{dLite-Auto}$™ Die — Temperature range: -50°C to +150°C	Unsawn on Wafer
ZSSC3015NE1C	ZSSC3015 RBic$_{dLite-Auto}$™ Die — Temperature range: -50°C to +150°C	Sawn on Wafer Frame
ZSSC3015NE1D	ZSSC3015 RBic$_{dLite-Auto}$™ Die — Temperature range: -50°C to +150°C	Waffle Pack
ZSSC3015NE2T(R)	ZSSC3015 RBic$_{dLite-Auto}$™ SOP8 (150 mil) — Temperature range: -50°C to +150°C	Tube: add "-T" to sales code. Reel: add "-R"
ZSSC3015KIT	ZSSC3015 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement Board, Evaluation Software, USB Cable, 5 IC Samples	Kit

Sales and Further Information

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ZSSC3131

Sensor Signal Conditioner for Cost-Optimized Switch Applications

Brief Description

The ZSSC3131 is a member of the ZSSC313x product family of CMOS integrated circuits designed for automotive/ industrial sensor applications. All family members are well suited for highly-accurate amplification and sensor-specific correction of resistive bridge sensor signals. An internal 16-bit RISC microcontroller running a correction algorithm compensates sensor offset, sensitivity, temperature drift, and non-linearity of the connected sensor element. The required calibration coefficients are stored by the one-pass calibration procedure in an on-chip EEPROM.

The ZSSC3131 is optimized for simple switch and cost-sensitive sensor applications. The integrated adjustable digital filter enables building fast-switching real-time applications as well as stabilized applications for switching input signals that are unstable or disrupted.

Features

- Adjustable to nearly all resistive bridge sensor types: maximum analog gain of 105; maximum overall gain of 420
- Sample rate up to 200 Hz
- ADC resolution 13/14 bit
- Internal temperature compensation
- Integrated adjustable digital filter
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Output options: ratiometric analog voltage output (5 - 95% maximum, 12.4 bit resolution) or ZACwire™ (digital One-Wire Interface (OWI))
- Sensor biasing by voltage
- High voltage protection up to 33 V
- Supply current: Max. 5.5mA
- Reverse polarity and short circuit protection
- Wide operation temperature range: -40 to +150°C
- Traceability by user-defined EEPROM entries

* Note: I²C™ is a trademark of NXP.

** FSO = Full Scale Output.

Benefits

- Family approach offers the best fitting IC selection to build cost-optimized applications
- No external trimming components required
- Low number of external components needed
- PC-controlled configuration and One-Pass/ end-of-line calibration via I²C™* or ZACwire™ interface: Simple, cost-efficient, quick, and precise
- High accuracy (0.25% FSO** @ -25 to +85°C; 0.5% FSO @ -40 to +125°C)
- Optimized for automotive/industrial environments due to robust protection circuitries, excellent electromagnetic compatibility, and AEC-Q100 qualification

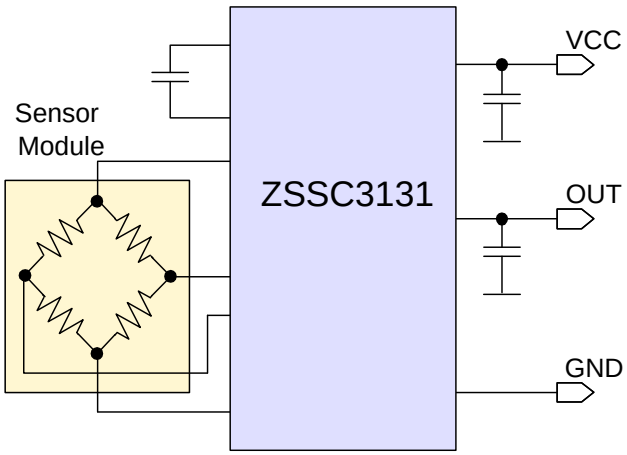
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

Physical Characteristics

- Supply voltage 4.5 to 5.5 V
- Operation temperature: -40°C to +125°C (-40°C to +150°C extended temperature range depending on product version)
- Available in RoHS-compliant JEDEC-SSOP14 package or delivery as die

ZSSC3131 Minimum Application Requirements



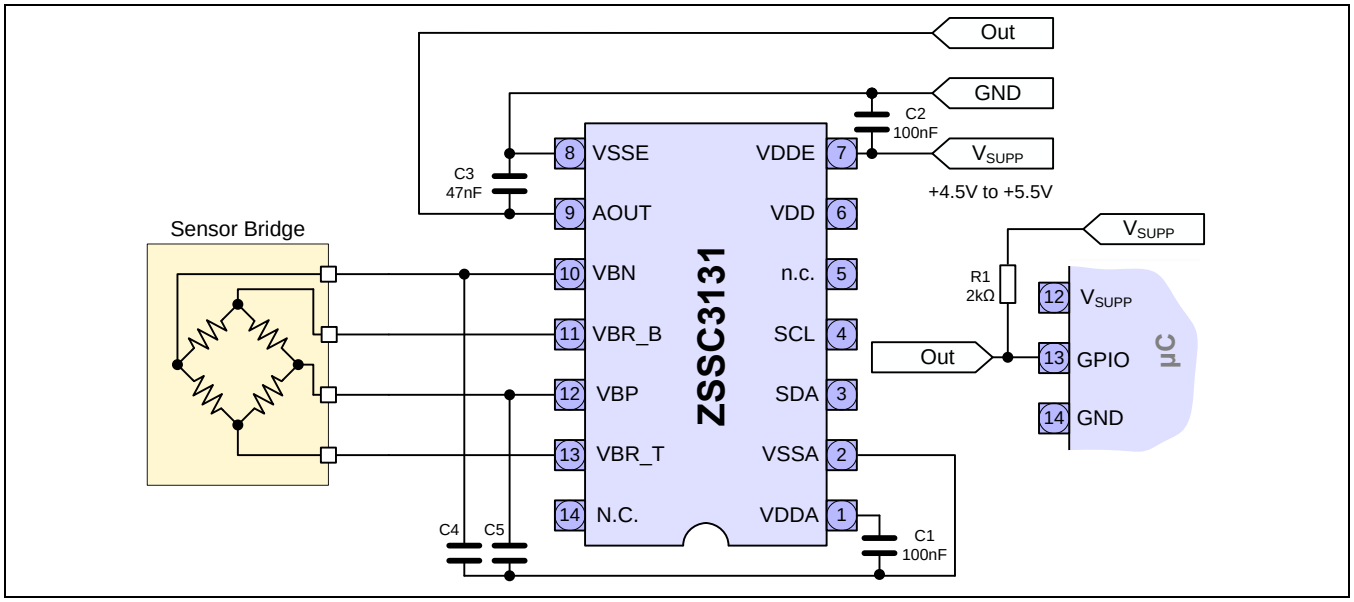
For more information, contact ZMDI via SSC@zmdi.com

ZSSC3131

Sensor Signal Conditioner for Cost-Optimized Switch Applications

The Analog Mixed Signal Company

ZSSC3131 Switch Application Example



Ordering Information *(See data sheet section 8 for complete delivery options.)*

Product Sales Code	Description	Package
ZSSC3131BA2T	ZSSC3131 SSOP14 – temperature range -40 to +125°C	Tube
ZSSC3131BA2R	ZSSC3131 SSOP14 – temperature range -40 to +125°C	Reel
ZSSC3131BE2T	ZSSC3131 SSOP14 – temperature range -40 to +150°C	Tube
ZSSC3131BE2R	ZSSC3131 SSOP14 – temperature range -40 to +150°C	Reel
ZSSC313xKITV1.0	ZSSC313x Evaluation Kit, version 1.0, including Evaluation Board, IC samples, USB cable, DVD with software and documentation	Kit
ZSSC313x Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSSC313x including MCS boards, cable, connectors, software DVD with documentation	Kit

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ZSSC3135

Sensor Signal Conditioner for Piezoresistive Bridge Sensors

Brief Description

The ZSSC3135 is a member of the ZSSC313x family of CMOS integrated circuits designed for automotive/industrial sensor applications. All family members are well suited for highly accurate amplification and sensor-specific correction of resistive bridge sensor signals. An internal 16-bit RISC microcontroller running a correction algorithm compensates sensor offset, sensitivity, temperature drift, and non-linearity of the connected sensor element. The required calibration coefficients are stored by the one-pass calibration procedure in an on-chip EEPROM.

The ZSSC3135 is specially designed for piezoresistive bridge sensor elements. The amplification stage with an analog gain of 105 in combination with optional temperature compensation using an external temperature sensor fits the requirements of piezoresistive sensor applications perfectly.

Features

- Adjustable to nearly all resistive bridge sensor types: analog gain of 105, maximum overall gain of 420
- Sample rate up to 200 Hz
- ADC resolution 13/14 bit
- Safety functionality sensor connection
- External temperature sensor
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Output options: ratiometric analog voltage output (5 - 95% maximum, 12.4 bit resolution) or ZACwire™ (digital One-Wire Interface (OWI))
- Sensor biasing by voltage
- High voltage protection up to 33 V
- Supply current: max. 5.5mA
- Reverse polarity and short circuit protection
- Wide operation temperature range: -40 to +150°C
- Traceability by user-defined EEPROM entries

* Note: I²C™ is a trademark of NXP.

** FSO = Full Scale Output.

Benefits

- Family approach offers the best fitting IC selection to build cost-optimized applications
- No external trimming components required
- Low number of external components needed
- PC-controlled configuration and one-pass/end-of-line calibration via I²C™* or ZACwire™ interface: simple, cost-efficient, quick, and precise
- High accuracy (0.25% FSO** @ -25 to +85°C; 0.5% FSO @ -40 to +125°C)
- Optimized for automotive/industrial environments due to robust protection circuitries, excellent electromagnetic compatibility and AEC-Q100 qualification

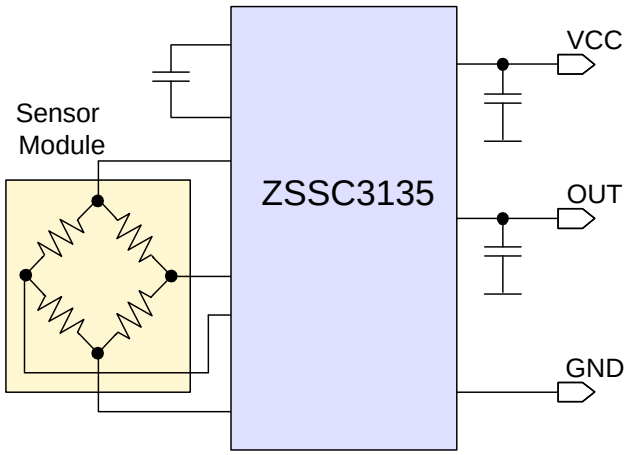
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

Physical Characteristics

- Supply voltage: 4.5 to 5.5 V
- Operation temperature: -40°C to +125°C (-40°C to +150°C extended temperature range depending on product version)
- Available in RoHS-compliant JEDEC-SSOP14 package or delivery as die

ZSSC3135 Minimum Application Requirements



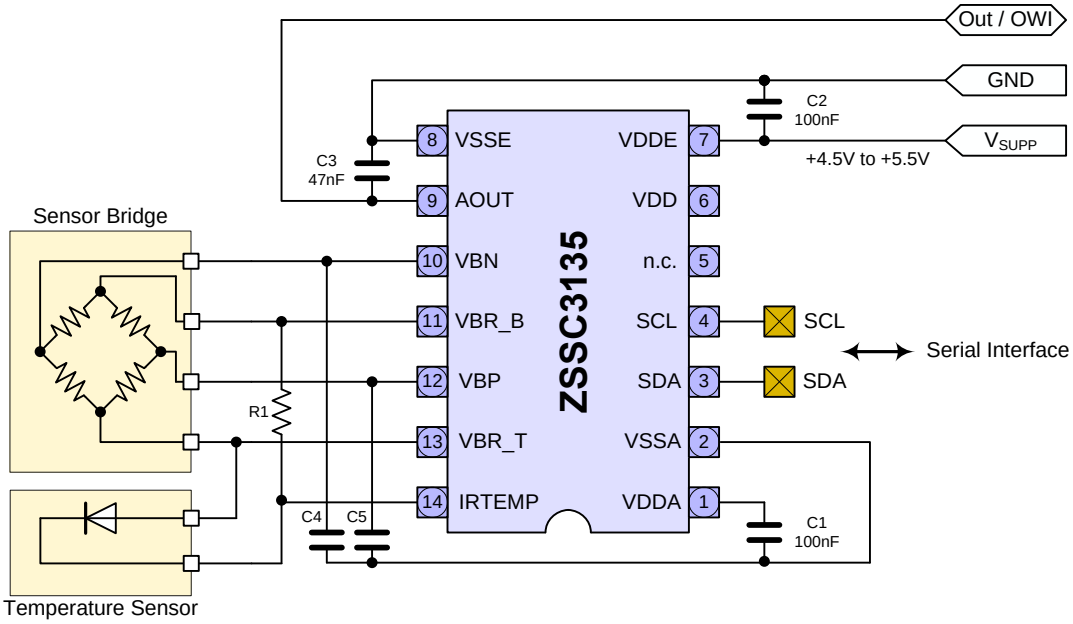
For more information, contact ZMDI via SSC@zmdi.com.

ZSSC3135

Sensor Signal Conditioner for Piezoresistive Bridge Sensors

The Analog Mixed Signal Company

ZSSC3135 Application Example



Ordering Information *(See data sheet section 8 for complete delivery options.)*

Product Sales Code	Description	Package
ZSSC3135BA2T	ZSSC3135 SSOP14 – temperature range -40 to +125°C	Tube
ZSSC3135BA2R	ZSSC3135 SSOP14 – temperature range -40 to +125°C	Reel
ZSSC3135BE2T	ZSSC3135 SSOP14 – temperature range -40 to +150°C	Tube
ZSSC3135BE2R	ZSSC3135 SSOP14 – temperature range -40 to +150°C	Reel
ZSSC313xKITV1.0	ZSSC313x Evaluation Kit, version 1.0, including Evaluation Board, IC samples, USB cable, DVD with software and documentation	Kit
ZSSC313x Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSSC313x including MCS boards, cable, connectors, software DVD with documentation	Kit

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ZSSC3136

Sensor Signal Conditioner for Safety Switch Applications

The Analog Mixed Signal Company

Brief Description

The ZSSC3136 is a member of the ZSSC313x family of CMOS integrated circuits for automotive/ industrial sensor applications. All family members are well suited for highly accurate amplification and sensor-specific correction of resistive bridge sensor signals. An internal 16-bit RISC microcontroller running a correction algorithm compensates sensor offset, sensitivity, temperature drift, and non-linearity of the connected sensor element. The required calibration coefficients are stored by the one-pass calibration procedure in an on-chip EEPROM.

The ZSSC3136 is optimized for SIL (Safety Integrity Level) rated switch applications. The integrated adjustable digital filter offers the possibility of setting up fast switching real-time applications as well as stabilized switching applications in the case of disturbed or unstable input signals.

In addition to the general features for switch applications, the ZSSC3136 offers the capability to set up safety-relevant SIL2 rated switches due to its extended safety functionalities.

Features

- Analog gain of 105, maximum overall gain of 420
- Sample rate: 200 Hz maximum
- ADC resolution: 13/14 bit
- External temperature sensor
- Safety functionalities: Calibration microcontroller, sensor connection, analog front-end
- Adjustable to nearly all resistive bridge sensor types
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Output options: ratiometric analog voltage output (5 - 95% in maximum, 12.4 bit resolution) or ZACwire™ (digital One-Wire Interface (OWI))
- Sensor biasing by voltage
- High voltage protection up to 33 V
- Supply current: max. 5.5mA
- Reverse polarity and short circuit protection
- Wide operation temperature: -40 to +150°C
- Traceability by user-defined EEPROM entries

Benefits

- Capability for setting up SIL level 2 applications
- Application-focused feature set
- No external trimming components required
- Only a few external protection devices needed
- PC-controlled configuration and one-pass/ end-of-line calibration via I²C™* or ZACwire™ interface: simple, cost-efficient, quick, and precise
- High accuracy (0.25% FSO** @ -25 to +85°C; 0.5% FSO @ -40 to +125°C)
- Optimized for automotive/ industrial environment due to robust protection circuitries, excellent electromagnetic compatibility and AEC-Q100 qualification

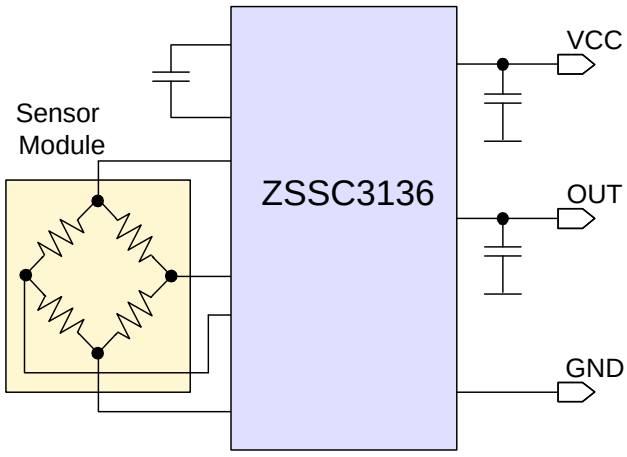
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

Physical Characteristics

- Supply voltage 4.5 to 5.5 V
- Operation temperature: -40°C to +125°C (-40°C to +150°C extended temperature range depending on product version)
- Available in RoHS-compliant JEDEC-SSOP14 package or delivery as die

ZSSC3136 Minimum Application Requirements



* Note: I²C™ is a trademark of NXP.

** FSO = Full Scale Output.

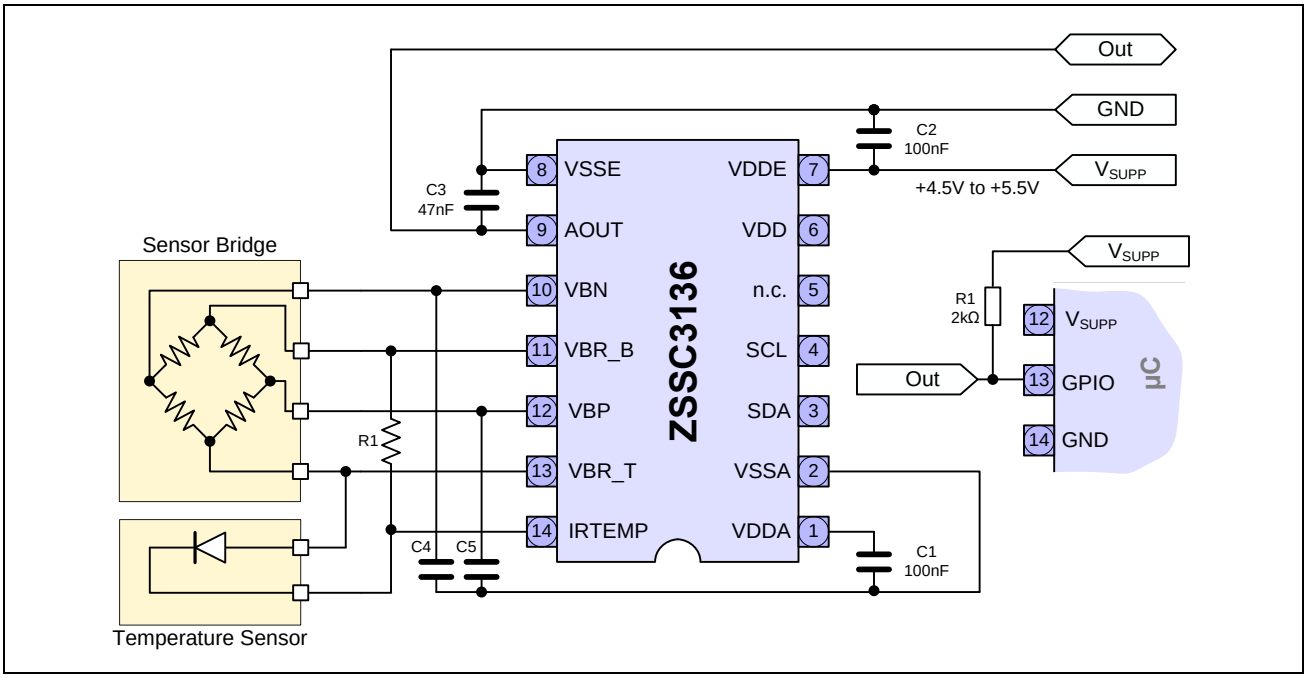
For more information, contact ZMDI via SSC@zmdi.com.

ZSSC3136

Sensor Signal Conditioner for Safety Switch Applications

The Analog Mixed Signal Company

ZSSC3136 Switch Application Example



Ordering Information *(See data sheet section 8 for complete delivery options.)*

Product Sales Code	Description	Package
ZSSC3136BA2T	ZSSC3136 SSOP14 – temperature range -40 to +125°C	Tube
ZSSC3136BA2R	ZSSC3136 SSOP14 – temperature range -40 to +125°C	Reel
ZSSC3136BE2T	ZSSC3136 SSOP14 – temperature range -40 to +150°C	Tube
ZSSC3136BE2R	ZSSC3136 SSOP14 – temperature range -40 to +150°C	Reel
ZSSC313xKITV1.0	ZSSC313x Evaluation Kit, version 1.0, including Evaluation Board, IC samples, USB cable, DVD with software and documentation	Kit
ZSSC313x Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSSC313x including MCS boards, cable, connectors, software DVD with documentation	Kit

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ZSSC3138

Sensor Signal Conditioner for Ceramic Sensor Applications

The Analog Mixed Signal Company

Brief Description

The ZSSC3138 is a member of the ZSSC313x product family of CMOS integrated circuits designed for automotive/ industrial sensor applications. All family members are well suited for highly accurate amplification and sensor-specific correction of resistive bridge sensor signals. An internal 16-bit RISC microcontroller running a correction algorithm compensates sensor offset, sensitivity, temperature drift, and non-linearity of the connected sensor element. The required calibration coefficients are stored by the one-pass calibration procedure on chip (EEPROM).

The ZSSC3138 offers a maximum analog gain of 420 and two offset compensation features. These fit perfectly with the requirements of ceramic thick-film-based sensor elements as well as strain gauges. The high amplification in combination with the offset compensation offers the capability to set up ceramic thick-film-based sensor applications without laser trimming, which leads to better long-term stability.

Features

- Adjustable to nearly all resistive bridge sensor types, analog gain of 420, maximum overall gain of 1680
- Enhanced sample rate: 7.8 kHz maximum
- High ADC resolution 15/16 bit
- Safety functionality sensor connection
- Internal temperature compensation
- Digital compensation of sensor offset, sensitivity, temperature drift, and non-linearity
- Output options: ratiometric analog voltage output (5 - 95% maximum, 12.4 bit resolution) or ZACwire™ (digital One-Wire Interface (OWI))
- Sensor biasing by voltage
- High voltage protection up to 33 V
- Supply current: 5.5mA maximum
- Reverse polarity and short circuit protection
- Wide operation temperature range between -40 to +150°C
- Traceability by user-defined EEPROM entries

* Note: I²C™ is a trademark of NXP.

** FSO = Full Scale Output.

Benefits

- Family approach offers the best fitting IC selection to build cost-optimized applications
- No external trimming components required
- Low number of external components needed
- PC-controlled configuration and one-pass/ end-of-line calibration via I²C™* or ZACwire™ interface: simple, cost efficient, quick, and precise
- High accuracy (0.25% FSO** @ -25 to +85°C; 0.5% FSO @ -40 to +125°C)
- Optimized for automotive/industrial environments due to robust protection circuitries, excellent electromagnetic compatibility and AEC-Q100 qualification

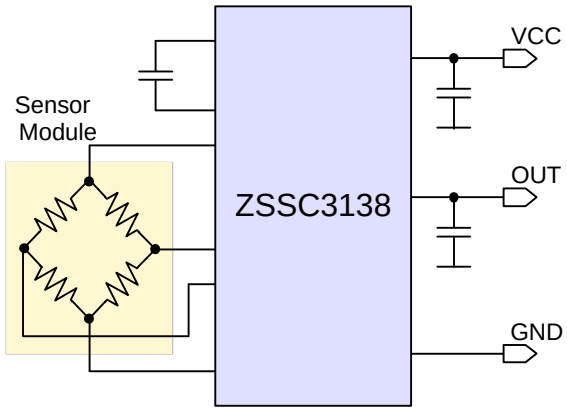
Available Support

- Evaluation Kits
- Application Notes
- Mass Calibration System

Physical Characteristics

- Supply voltage 4.5 to 5.5 V
- Operation temperature: -40°C to +125°C (-40°C to +150°C extended temperature range depending on product version)
- Available in RoSH-compliant JEDEC-SSOP14 package or delivery as die

ZSSC3138 Minimum Application Requirements



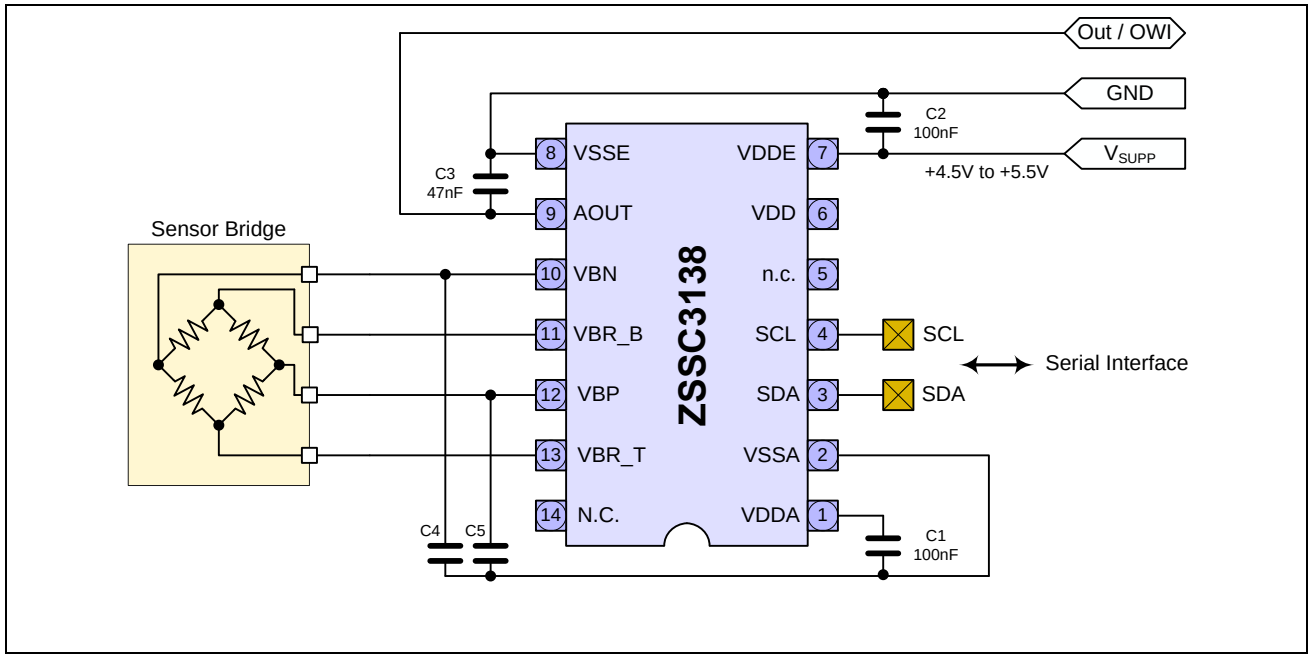
For more information, contact ZMDI via SSC@zmdi.com.

ZSSC3138

Sensor Signal Conditioner for Ceramic Sensor Applications

The Analog Mixed Signal Company

ZSSC3138 Application Example



Ordering Information *(See data sheet section 8 for complete delivery options.)*

Product Sales Code	Description	Package
ZSSC3138AA2T	ZSSC3138 SSOP14 – temperature range -40 to +125°C	Tube
ZSSC3138AA2R	ZSSC3138 SSOP14 – temperature range -40 to +125°C	Reel
ZSSC3138AE2T	ZSSC3138 SSOP14 – temperature range -40 to +150°C	Tube
ZSSC3138AE2R	ZSSC3138 SSOP14 – temperature range -40 to +150°C	Reel
ZSSC313xKITV1.0	ZSSC313x Evaluation Kit, version 1.0, including Evaluation Board, IC samples, USB cable, DVD with software and documentation	Kit
ZSSC313x Mass Calibration System V1.1	Modular Mass Calibration System (MSC) for ZSSC313x including MCS boards, cable, connectors, software DVD with documentation	Kit

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ZSSC3154

Automotive Sensor Signal Conditioner with Dual Analog Output

The Analog Mixed Signal Company

Brief Description

The ZSSC3154 is an integrated circuit for highly accurate amplification and sensor-specific correction of a bridge sensor signal. Up to two temperature sensors can also be read in parallel.

The circuitry provides different configurations of the analog outputs to show two measurement results simultaneously. This also allows generating a complementary bridge sensor signal, which is often a requirement in safety-relevant applications.

The ZSSC3154 can measure and process two external temperature sensors to compensate the temperature drift of the bridge sensor signal and to output a separate temperature signal.

An integrated calibration microcontroller with an on-chip EEPROM performs the digital compensation of the sensor offset, the sensitivity, the temperature drift, and the nonlinearity of a sensor signal.

The one-pass digital end-of-line calibration combined with the integrated broken-chip detection supports an automatic and highly efficient mass production.

Features

- Differential bridge sensor input
- Half-bridge sensor or temperature sensor input
- Digital compensation of offset, gain, nonlinearity, and temperature dependency
- Two analog outputs; behavior programmable by EEPROM configuration
- Sequential analog output mode provides two measurement values at one output pin
- Various on-chip diagnostic and safety features including sensor connection diagnostic and broken-chip detection
- 2 EEPROM words for arbitrary user data

Benefits

- Various configurable output options
- Bridge sensor signal validation for safety applications via two antivalent analog outputs or via half-bridge sensor measurement output
- Simultaneous measurement of sensor signals, including temperature signal for compensation and for temperature output
- Efficient use of non-calibrated elements for bridge sensors and temperature sensors without external trimming components
- One-pass end-of-line calibration algorithm minimizes production costs
- Excellent EMC/ESD robustness and AEC-Q100 qualification

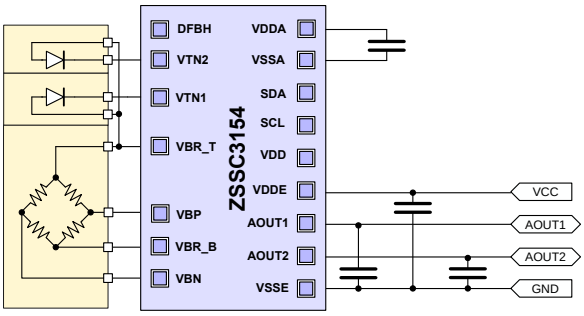
Available Support

- Evaluation Kit
- Application Notes
- Calculation Tools

Physical Characteristics

- Supply voltage: 4.5 to 5.5V
- Maximum supply voltage: 7.7V
- Input span: 1.8 to 267mV/V
- ADC resolution: 14 bit
- Output resolution: > 12 bit from 10% to 90%
- Operating temperature range: -40°C to 125°C
- Package: QFN32 5x5 or die

ZSSC3154 Basic Circuit

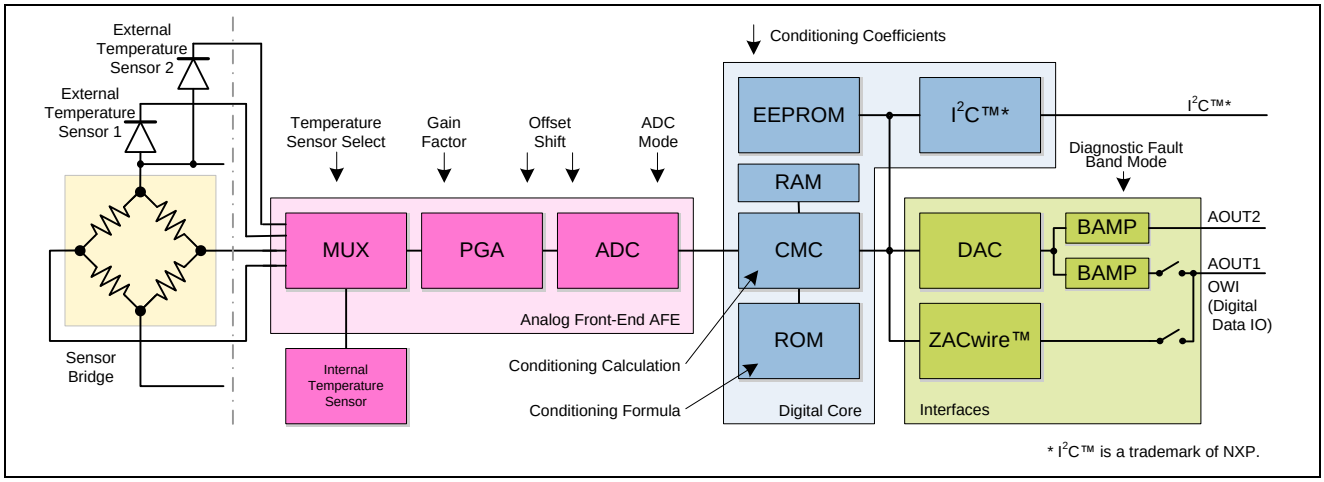


ZSSC3154

Automotive Sensor Signal Conditioner with Dual Analog Output

The Analog Mixed Signal Company

ZSSC3154 Block Diagram



Ordering Information (Examples)

Product Sales Code	Description	Package
ZSSC3154BA1D	ZSSC3154 Die - Temperature Range -40 to 125°C	Waffle pack
ZSSC3154BA2R	ZSSC3154 QFN32 5x5 - Temperature Range -40 to 125°C	Reel
ZSSC3154KIT	ZSSC3154 SSC Evaluation Kit: Communication Board, SSC Board, Sensor Replacement, Software, Documentation, 5 QFN32 5x5 Samples	Kit
For a complete set of product options, refer to the "Ordering Information" section in the *ZSSC3154 Data Sheet.*		

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ZSSC3170

Automotive Sensor Signal Conditioner with LIN & PWM Interface

The Analog Mixed Signal Company

Brief Description

The ZSSC3170 is a CMOS integrated circuit for highly accurate amplification and sensor specific correction of bridge sensor signals. Featuring a maximum analog gain of 420, as well as extended offset compensation capabilities, the ZSSC3170 is adjustable to nearly all resistive bridge sensor types.

Digital compensation of offset, sensitivity, temperature drift, and nonlinearity is accomplished via a 16-bit RISC microcontroller. Conditioning coefficients are stored in an EEPROM certified for automotive applications.

Measured values are provided by one of the digital LIN or PWM interfaces. Each interface can support end-of-line calibration using the sensor output. Noise sensitivity is greatly reduced because the calibration equipment and the ZSSC3170 are mated digitally.

For quick and easy evaluation and support for calibrating prototypes, ZMDI offers the ZSSC3170 SSC Evaluation Kit, which includes evaluation hardware, SSOP20 samples, and software.

Features

- Complies with LIN specifications 1.3 / 2.0 / 2.1
- Configurable LIN publisher frame content
- Data conversion rate of up to 430Hz fully utilizes the maximum LIN channel capacity of 20kbit/s
- PWM high-side and low-side switches, support for LIN communication for end-of-line calibration
- Digital compensation of offset, gain, temperature effects up to 2nd order, and nonlinearity up to 3rd order. Compensation of temperature sensor offset, gain, and nonlinearity up to 2nd order.
- Internal or external temperature reference
- Media temperature sensing by diode or RTD
- Load dump protection of the LIN pin up to ±40V
- Accuracy ±0.25% FSO @ -20 to 85°C
  ±0.50% FSO @ -40 to 125°C
  ±1.00% FSO @ -40 to 150°C
- 3 EEPROM words available for optional user data

Benefits

- Measurand and temperature signal available via one output pin
- Compatible with nearly all resistive bridge inputs
- No external trimming components required
- Single-pass calibration minimizes calibration costs
- End-of-line calibration using sensor output
- Optimized for automotive environments with special protection circuitry, excellent electro-magnetic compatibility, and numerous diagnostic features

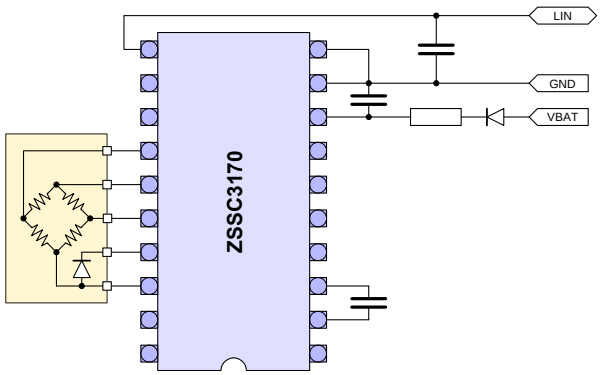
Available Support

- Evaluation Kit
- Application Notes
- Calculation Tools

Physical Characteristics

- Supply voltage: 7 to 18 V
- Current consumption in Sleep Mode: ≤ 100µA
- Input span: 1.8 to 267 mV/V
- ADC resolution: 13 to 14 bit
- Output resolution: up to 12-bit (LIN and PWM)
- Operating temperature range: -40 to 125°C
- Extended operating temperature range: ≤150°C
- Package: SSOP20 or die

ZSSC3170 Basic Circuit



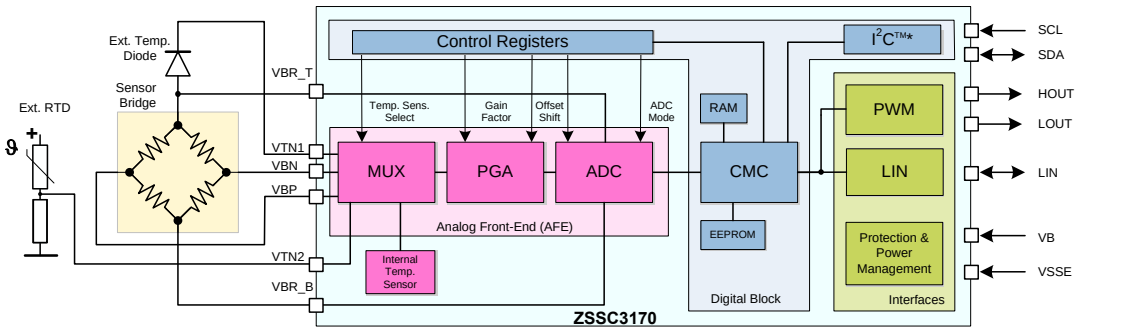
For more information, contact ZMDI via SSC@zmdi.com.

ZSSC3170

Automotive Sensor Signal Conditioner with LIN & PWM Interface

The Analog Mixed Signal Company

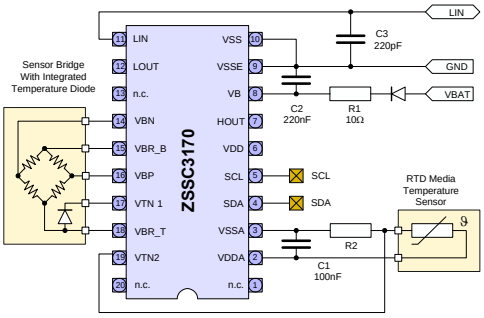
ZSSC3170 Block Diagram



Applications

LOCAL INTERCONNECT NETWORK

LIN Pressure Sensor with Temperature Sensor



Ordering Information *(See section 7 in the data sheet for additional options.)*

Product Sales Code	Description	Package
ZSSC3170EE1B	ZSSC3170 Die — Temperature range: -40°C to +150°C	Unsawn on Wafer, 2450 pcs.
ZSSC3170EE1C	ZSSC3170 Die — Temperature range: -40°C to +150°C	Sawn on Wafer Frame, 2450 pcs.
ZSSC3170EE1D	ZSSC3170 Die — Temperature range: -40°C to +150°C	Waffle Pack, 50 pcs.
ZSSC3170EE2R	ZSSC3170— SSOP20 — Temperature range: -40°C to +150°C	13” Reel, 2000 pcs.
ZSSC3170EE2T	ZSSC3170— SSOP20 — Temperature range: -40°C to +150°C	Tube, 660 pcs.
ZSSC3170KIT	ZSSC3170 Evaluation Kit and 5 SSOP20 Samples	Kit

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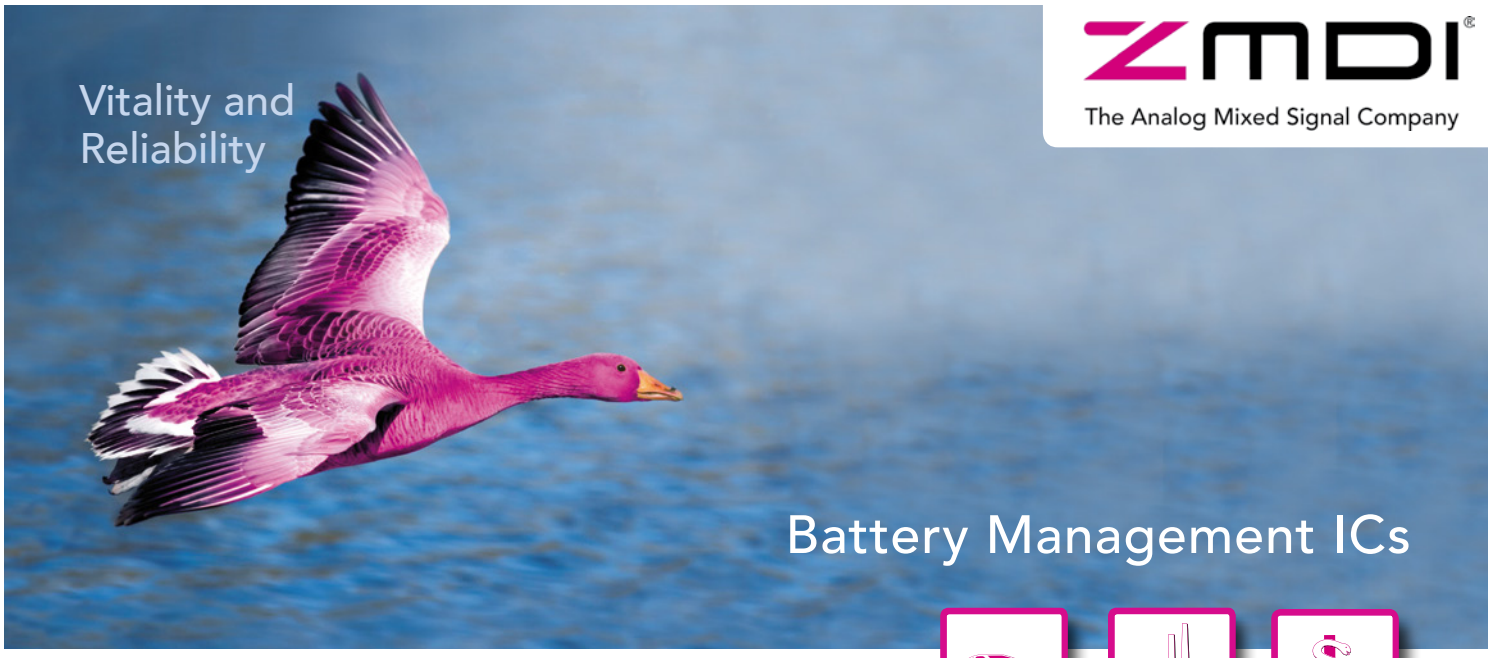

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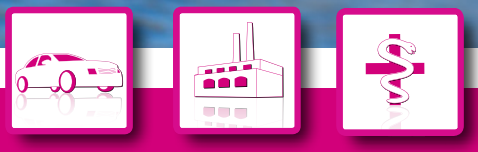
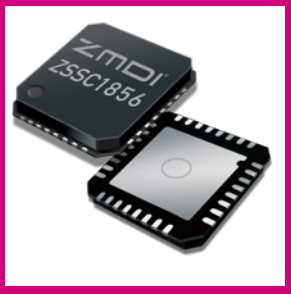
Battery Management ICs





Key Features

- Dual-channel ADC IC with an embedded micro-controller for smart battery sensing/management in automotive, industrial, and medical systems
- Smallest footprint package on the market
- Best-in-class power consumption
- Software compatibility due to automotive standard ARM®* core
- Most robust power-on-reset concept on the market
- Diagnostics and built-in self-tests
- Calibrated on-chip temperature sensor

Industry Applications

- Management for lead acid batteries in cars
- Future solutions for HEV and EV
- High-performance data acquisition system

Awards

- Frost & Sullivan New Product Innovation Award for ZMDI's ZSSC1856

* ARM® is a trademark of ARM, Ltd.

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ZSSC1856

Intelligent Battery Sensor IC

The Analog Mixed Signal Company

Brief Description

The ZSSC1856 is a dual-channel ADC with an embedded microcontroller for battery sensing/management in automotive, industrial, and medical systems.

One of the two input channels measures the battery current IBAT via the voltage drop at the external shunt resistor. The second channel measures the battery voltage VBAT and the temperature. An integrated flash memory is provided for customer-specific software; e.g., dedicated algorithms for calculating the battery state.

During Sleep Mode (e.g., engine off), the system makes periodic measurements to monitor the discharge of the battery. Measurement cycles are controlled by the software and include various wake-up conditions. The ZSSC1856 is optimized for ultra-low power consumption and draws only 100µA or less in this mode.

Features

- High-precision 18-bit sigma-delta ADC with on-chip voltage reference (5ppm/K)
- Current channel
  - I_{BAT} offset error: ≤ 10mA
  - I_{BAT} resolution: ≤ 1mA
  - Programmable gain: 4 to 512
  - Sampling rate: 1Hz to 16kHz
- Voltage channel
  - Input range: 4 to 28.8V
  - Voltage accuracy: ± 2mV
- Temperature channel
  - Internal temperature sensor: ± 2℃
  - External temperature sensor (NTC)
- On-chip precision oscillator (1%)
- On-chip low-power oscillator
- ARM® Cortex™-M0* microcontroller: 32-bit core, 10MHz to 20MHz
- 96kB Flash/EE Memory with ECC, 8kB SRAM
- LIN2.1 / SAE J2602-1 Transceiver
- Directly connected to 12V battery supply
- Current consumption
  - Normal Mode: 10mA to 20mA
  - Low-Power Mode: ≤ 100µA

* The ARM®, Cortex™, and Thumb®-2 trademarks are owned by ARM, Ltd. The I²C™ trademark is owned by NXP.

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EUROPEAN
BATTERY SENSOR INTEGRATED CIRCUITS
NEW PRODUCT INNOVATION AWARD

Benefits

- Precision measurement solution for accurate prediction of battery state of health (SOH), state of charge (SOC) or state of function (SOF)
- Flexible wake-up modes allow minimum power consumption without sacrificing performance
- No temperature calibration or external trimming components required
- Optimized code density through small instruction set architecture Thumb®-2 *
- Robust POR concept for harsh automotive environments
- Industry's smallest footprint allows minimal module size and cost
- AEC-Q100 qualified solution

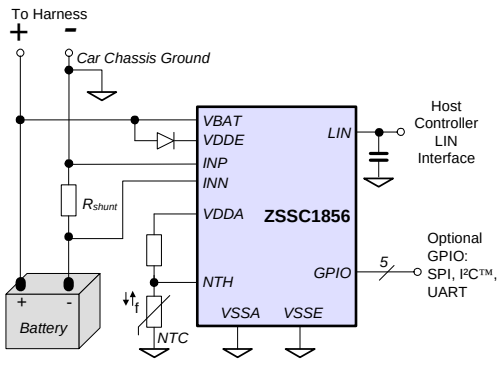
Available Support

- Evaluation Kit & Application Notes

Physical Characteristics

- Wide operation temperature: -40℃ to +125℃
- Supply voltage: 3.5 to 18 V
- Small footprint package: PQFN32 5x5 mm

Basic ZSSC1856 Application Circuit

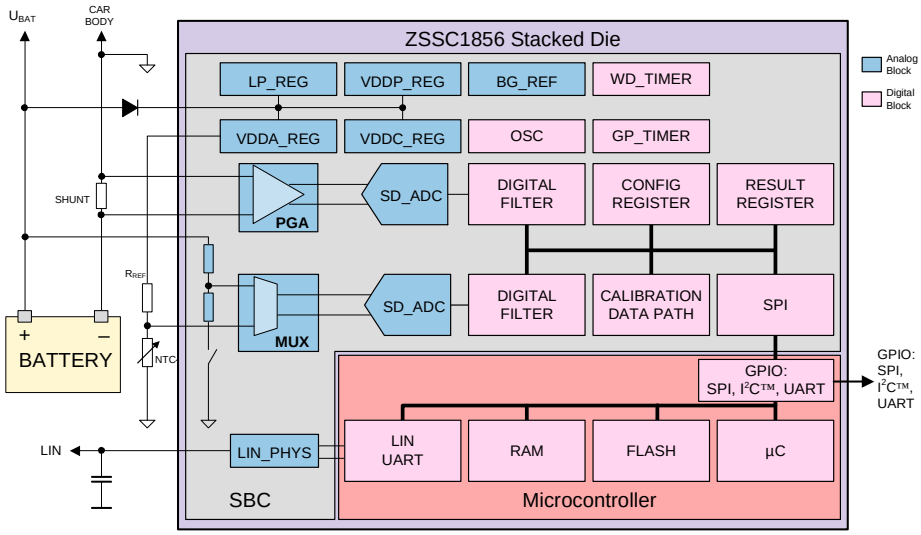


ZSSC1856

Intelligent Battery Sensor IC

The Analog Mixed Signal Company

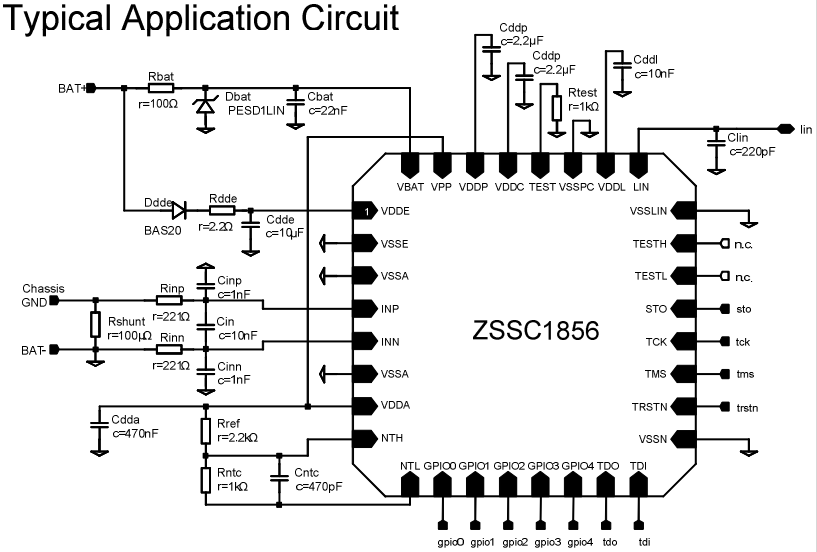
ZSSC1856 Block Diagram



Applications

- Intelligent battery sensing for automotive applications; e.g., start/stop systems, e-bikes, scooters, and e-carts
- Industrial and medical applications requiring precise battery SOC, SOH and SOF monitoring; e.g., emergency lighting, uninterruptable power supplies, hospital equipment, alarm systems, and more

Typical Application Circuit



Ordering Information

Product Sales Code	Description	Package
ZSSC1856CA6R	ZSSC1856 battery sensing IC – temperature range -40°C to +125°C	PQFN32 5x5 mm (reel)
ZSSC1856KIT V1.0	Modular evaluation and development board for ZSSC1856	Kit boards, IC samples, USB cable, DVD with software and documentation

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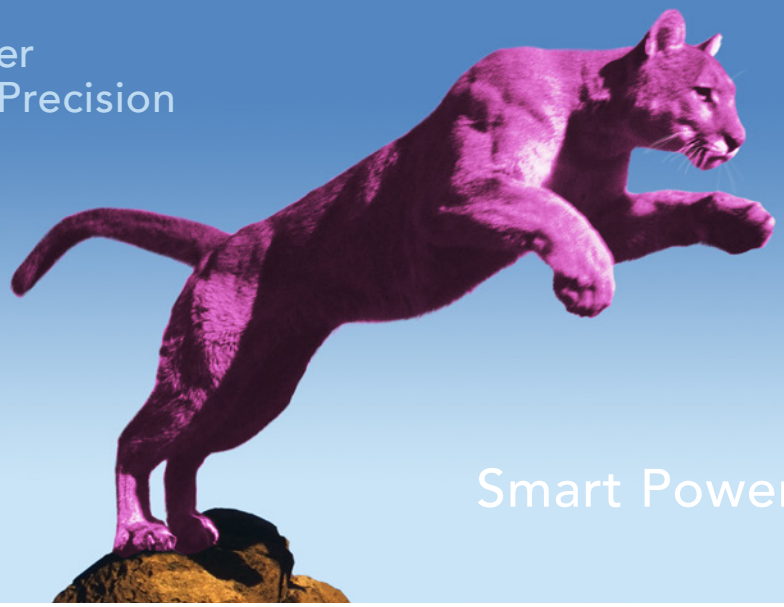
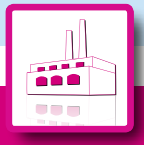
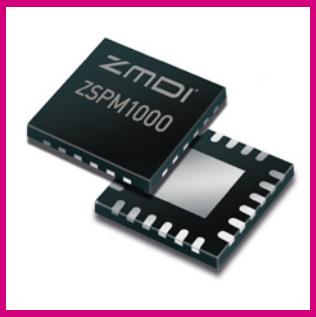
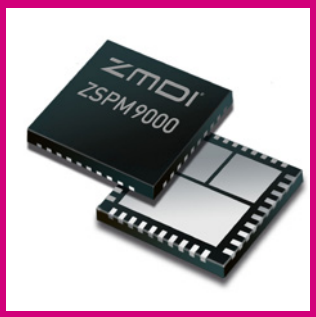
Power
and Precision



Smart Power Management ICs







Key Features

- True-Digital Smart Power Solution
- Energy-efficient controller family for point-of-load applications
- Fully programmable for a quick and easy customized solution
- Smallest footprint package on the market
- Digital communication for system level integration (PMBus™)

Industry Applications for Smart Power

- Server and storage units
- Telecommunication
- Base stations
- FPGAs
- Network equipment and more

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Smart Power Solutions from ZMDI

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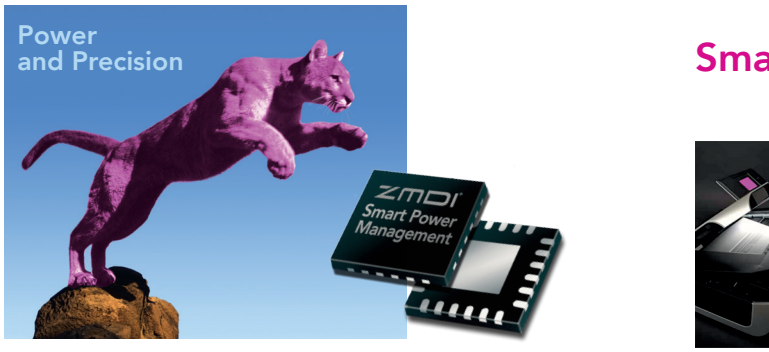

Smart Power Management ICs




ZSPM401x DC/DC Internal FET Synchronous Buck Family

Features

- Capable of up to 95% efficiency
- Operates with a wide input range from 4.5 to 24 VDC
- Transitions automatically between PFM and PWM mode for maximum efficiency
- Available in either fixed or variable output voltage versions: 1.5V, 1.8V, 2.5V, 3.3V, 5V or 0.9 to 5.5V
- Built-in thermal shutdown, over-current, output over-voltage and input under-voltage protection
- Power-good detection and soft-start function
- Less than 10µA in Disabled Mode
- Switching frequency: 1MHz
- Broad range of applications: outputs up to 3A

Applications

- Wireless access points, cable modems
- Set-top boxes
- DVD, LCD supplies
- Mobile GPS
- Industrial embedded devices
- Printers

ZSPM100x / ZSPM90xx Smart Power Family

ZSPM100x Controller Features

- True-digital single-phase PWM controller for point-of-load (POL) solutions
- Advanced digital control techniques for maximum flexibility and excellent transient performance
- Extensive fault monitoring and handling
- Optional PMBus™ communications interface
- Pink Power Designer™ GUI for easy device configuration

Note: PMBus™ is a trademark of SMIF, Inc.

ZSPM90xx DrMOS Features

- Intel® 4.0 DrMOS standard
- Optional integrated 5V linear regulator (LDO)
- Zero-current detection, Skip Mode and tri-state PWM
- Under-voltage lockout, over-temperature and shoot-through protection

Applications

- Telecom switches
- Servers and storage
- Base stations
- Network routers
- Industrial applications
- Single-rail/single-phase supplies for processors, ASICs, FPGAs, DSPs

ZSPM41x1, ZSPM45xx Smart Battery Management

ZSPM45xx Charger Features

- Digitally programmable, 92% efficient 1.5A battery or supercap charger
- Suitable for up to 3000mAh Li-Ion battery technologies (ZSPM4551, ZSPM4521)
- Compatible with supercapacitors with termination voltages from 2.48 to 2.74V ±1% (ZSPM4523)
- Temperature independent photovoltaic maximum power point tracking (MPPT) (ZSPM4521, ZSPM4523)
- Low standby current: < 10µA
- Downloadable GUI for easy configuration via I²C™

Note: I²C™ is a trademark of NXP.

ZSPM4121 Load Switch or ZSPM4141 Linear Regulator Features

- Best-in-class standby current: 100pA
- 1% accurate linear regulation voltages from 1.2 to 4.2V with low dropout
- Supervisory over-current limit shutdown and controlled turn-on slew rate
- Small 2mm x 2mm DFN packaging

Applications

- Battery-powered medical devices
- Portable industrial test equipment
- Handheld point-of-sale equipment
- Mobile GPS
- Handsets
- Tablets

Smart Power Solutions from ZMDI

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Part Number	Technology	Type		Topologies	Vin (V)	Vout (V)	Iout max. (A)	MHz	Ta (°C) * Tj (°C)	Efficiency	Output Current Accuracy	Standby Current (A)	Package (mmxmm)
		Internal switch	External switch										
ZSPM1000ZI1R	Digital DC/DC Controller		√	PWM Controller	3.3 or 5	-†	-†	≤1	-40 - 85	n/a	± 1%	n/a	QFN24 (4x4)
ZSPM1000ZA1R	Digital DC/DC Controller		√	PWM Controller	3.3 or 5	-†	-†	≤1	-40 - 125	n/a	± 1%	n/a	QFN24 (4x4)
ZSPM1005ZA1R	Digital DC/DC Controller		√	PWM Controller	3.3 or 5	-†	-†	≤1	-40 - 125	n/a	± 1%	n/a	QFN24 (4x4)
ZSPM9000AI1R	DrMOS	√		Buck Internal LDO	3 - 15	0.5 - 5	50	≤1	-40 - 125	93%	n/a	n/a	PQFN40 (6x6)
ZSPM9010ZA1R	DrMOS	√		Buck	3 - 15	0.5 - 5	50	≤1	-40 - 125	93%	n/a	n/a	PQFN40 (6x6)
ZSPM9015ZI1R	DrMOS	√		Buck	4.5 - 25	0.5 - 5	35	≤1	0 - 150*	93%	n/a	n/a	PQFN40 (6x6)
ZSPM9060ZA1R	DrMOS	√		Buck	3 - 16	0.5 - 5	60	≤1	-40 - 125	93%	n/a	n/a	PQFN40 (6x6)
ZSPM4011BA1Wxx	DC/DC	√		Buck	4.5 - 24	0.9 - 5.5	1	1	-40 - 125*	95%	2%	10µ	QFN16
ZSPM4012BA1Wxx	DC/DC	√		Buck	4.5 - 24	0.9 - 5.5	2	1	-40 - 125*	95%	2%	10µ	QFN16
ZSPM4013BA1Wxx	DC/DC	√		Buck	4.5 - 18	0.9 - 5.5	3	1	-40 - 125*	95%	2%	10µ	QFN16
ZSPM4121AI1Wxx	Ultra Low-Power Switch	√		Load Switch	1.2 - 5.5	1.2 - 4.2	1.5	n/a	-20 - 85*	n/a	5%	100p	DFN8 (2x2)
ZSPM4141AI1Wxx	Linear Regulator	√		Regulator	2.5 - 5.5	1.2 - 4.2	200m	n/a	-20 - 85*	n/a	n/a	100p	DFN8 (2x2)
ZSPM4521AA1x	Li-Ion PV Charger	√		Buck	4.0 - 7.2	3.9 - 4.2	1.5	1	-40 - 125*	92%	10%	10µ	PQFN16 (4x4)
ZSPM4523AA1x	Li-Ion Charger	√		Buck	3.2 - 7.2	2.48 - 4.74	1.5	1	-40 - 125*	92%	5%	10µ	PQFN16 (4x4)
ZSPM4551AA1x	Li-Ion Charger	√		Buck	3.5 - 7.2	3.9 - 4.2	1.5	1	-40 - 125*	92%	10%	10µ	PQFN16 (4x4)

† Limited by external switch

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ZSPM1000

True Digital PWM Controller (Single-Phase, Single-Rail)

Brief Description

The ZSPM1000 is a configurable true-digital single-phase PWM controller for high-current, non-isolated DC/DC supplies. It operates as a synchronous step-down converter in a single-rail and single-phase configuration.

The ZSPM1000 integrates a digital control loop, optimized for maximum flexibility and stability, as well as load step and steady-state performance. In addition, a rich set of protection and monitoring functions is provided. On-chip, non-volatile memory (NVM) and an I²C™ * interface facilitate configuration.

The PC-based ZMDI's Pink Power Designer™ provides a user-friendly and easy-to-use interface to the device for communication and configuration. It can guide the user through the design of the digital compensator and offers intuitive configuration methods for additional features, such as protection and sequencing.

Features

- Programmable digital control loop
- Advanced digital control techniques
  - Tru-sample Technology™
  - State-Law Control™ (SLC)
  - Sub-cycle Response™ (SCR)
- Improved transient response and noise immunity
- Protection features
  - Over-current protection
  - Over-voltage protection (VIN, VOUT)
  - Under-voltage protection (VIN, VOUT)
  - Overloaded startup
  - Restart and delay
- Support for SMOD and ZCD drivers
- Fuse-based NVM for improved reliability
- Operation from a single 5V or 3.3V supply
- Optional PMBus™ address selection without external resistors

Benefits

- Fast configurability and design flexibility
- Simplified design and integration
- Reduced component count through system level integration
- Simplified monitoring for system power and thermal management
- Higher energy efficiency across all output loading conditions

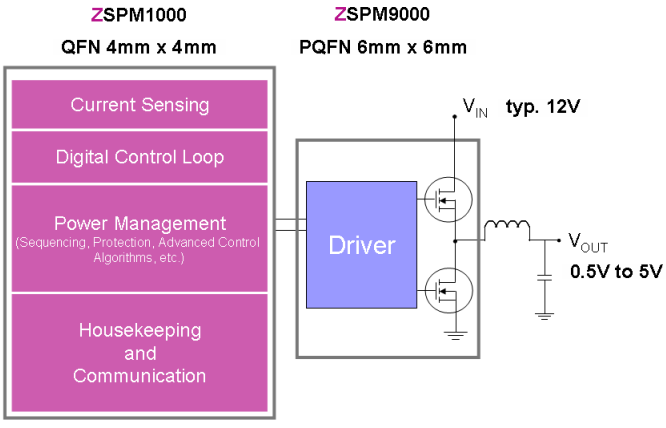
Available Support

- Evaluation Kit
- PC-based Pink Power Designer™

Physical Characteristics

- Operation temperature: -40°C to +125°C**
- V_{OUT} max: 5V
- Lead free (RoHS compliant) 24-pin QFN package (4 mm x 4 mm)

ZSPM1000 Typical Application Diagram



* I²C™ is a registered trademark of NXP.

** Subject to product type.

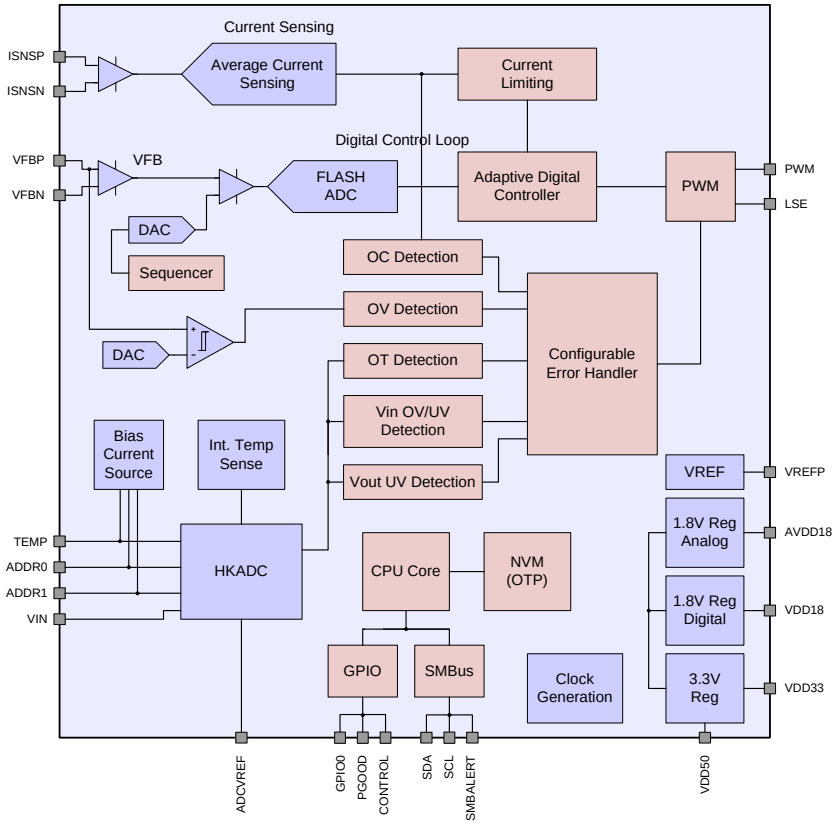
For more information, contact ZMDI via SPM@zmdi.com.

ZSPM1000

True Digital PWM Controller (Single-Phase, Single-Rail)

The Analog Mixed Signal Company

ZSPM1000 Block Diagram



Typical Applications

- *Telecom Switches*
- *Servers and Storage*
- *Base Stations*
- *Network Routers*
- *Industrial Applications*
- *Single-Rail/Single-Phase Supplies for Processors, ASICs, FPGAs, DSPs*

Ordering Information *(See additional options in section 7 of the ZSPM1000 Data Sheet.)*

Sales Code	Description	Package
ZSPM1000ZI1R 1	ZSPM1000 Lead-free QFN24 — Temperature range: -40°C to +85°C	Reel
ZSPM1000ZA1R 1	ZSPM1000 Lead-free QFN24 — Temperature range: -40°C to +125°C	Reel
ZSPM8000-KIT	Evaluation Kit for ZSPM1000 with PMBus™ Communication Interface and Pink Power Designer™ GUI	Kit

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ZSPM9000

Ultra-Compact, High-Performance DrMOS Device

Brief Description

The ZSPM9000 DrMOS is a fully optimized, ultra-compact, integrated MOSFET plus driver power-stage solution for high-current, high-frequency, synchronous buck DC-DC applications. The device incorporates a driver IC, two power MOSFETs, and a bootstrap Schottky diode in a thermally enhanced, ultra-compact 6mmx6mm PQFN40 package.

With an integrated approach, the ZSPM9000's complete switching power stage is optimized for driver and MOSFET dynamic performance, system inductance, and power MOSFET $R_{DS(ON)}$. It uses innovative high-performance MOSFET technology, which dramatically reduces switch ringing, eliminating the snubber circuit in most buck converter applications.

An innovative driver IC with reduced dead times and propagation delays further enhances performance. An internal 12V to 5V linear regulator enables the ZSPM9000 to operate from a single 12V supply. A thermal warning function (THWN) warns of potential over-temperature situations. The ZSPM9000 also incorporates features such as Skip Mode (SMOD) for improved light-load efficiency and a tri-state 3.3V pulse-width modulation (PWM) input for compatibility with a wide range of PWM controllers.

The ZSPM9000 DrMOS is ideally compatible with ZMDI's ZSPM1000, a leading-edge configurable digital power-management system controller for non-isolated point-of-load (POL) supplies.

Features

- Based on the Intel® 4.0 DrMOS standard
- Internal 12V to 5V linear regulator (LDO)
- High-current handling: up to 50A
- High-performance copper-clip package
- Tri-state 3.3V PWM input driver
- Skip Mode (low-side gate turn off) input (SMOD#)
- Warning flag for over-temperature conditions
- Driver output disable function (DISB# pin)
- Internal pull-up and pull-down for SMOD# and DISB# inputs, respectively
- Integrated Schottky diode technology in the low-side MOSFET
- Integrated bootstrap Schottky diode
- Adaptive gate drive timing for shoot-through protection
- Under-voltage lockout (UVLO)
- Optimized for switching frequencies up to 1MHz

Benefits

- Fully optimized system efficiency: >93% peak
- Clean switching waveforms with minimal ringing
- 72% space-saving compared to conventional discrete solutions
- Ideally compatible with ZMDI's ZSPM1000 true digital PWM controller

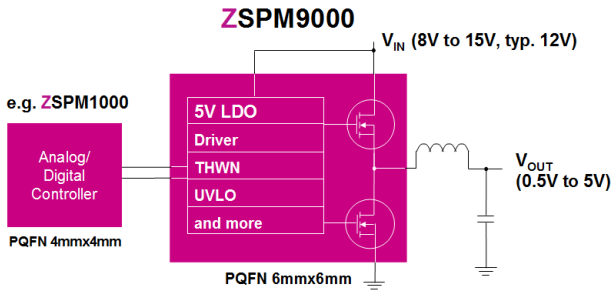
Available Support

- ZSPM8000-KIT: Closed Loop Evaluation Kit combined for the ZSPM9000 and ZSPM1000

Physical Characteristics

- Operation temperature: -40°C to +125°C
- V_{IN}: 8V to 15V (typical 12V)
- I_{OUT}: 40A (average), 50A (maximum)
- Low-profile SMD package: 6mmx6mm PQFN40
- ZMDI green packaging and RoHS compliant

Typical Application

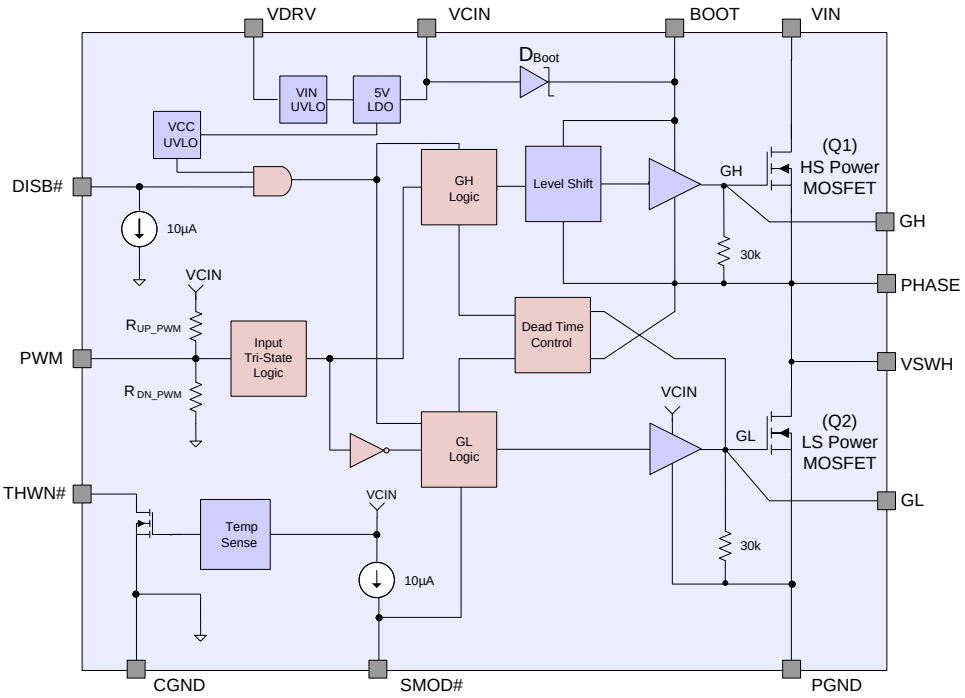


For more information, contact ZMDI via SPM@zmdi.com.

ZSPM9000

Ultra-Compact, High-Performance DrMOS Device

ZSPM9000 Block Diagram



Typical Applications

- Telecom switches
- Servers and storage
- Desktop computers
- Workstations
- High-performance gaming motherboards
- Base stations
- Network routers
- Industrial applications

Ordering Information

Product Sales Code	Description	Package
ZSPM9000AI1R	ZSPM9000 Lead-free PQFN40 — Temperature range: -40°C to +125°C	Reel
ZSPM8000-KIT	Integrated Evaluation Kit for ZSPM9000 and ZSPM1000	Kit

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ZSPM9010

Ultra-Compact, High-Performance, High-Frequency DrMOS

The Analog Mixed Signal Company

Brief Description

The ZSPM9010 DrMOS is a fully optimized, ultra-compact, integrated MOSFET plus driver power stage solution for high-current, high-frequency, synchronous buck DC-DC applications. The ZSPM9010 incorporates a driver IC, two power MOSFETs, and a bootstrap Schottky diode in a thermally enhanced, ultra-compact PQFN40 package (6mmx6mm).

With an integrated approach, the ZSPM9010's complete switching power stage is optimized for driver and MOSFET dynamic performance, system inductance, and power MOSFET $R_{DS(ON)}$. It uses innovative high-performance MOSFET technology, which dramatically reduces switch ringing, eliminating the snubber circuit in most buck converter applications.

An innovative driver IC with reduced dead times and propagation delays further enhances performance. A thermal warning function (THWN) warns of potential over-temperature situations. The ZSPM9010 also incorporates features such as Skip Mode (SMOD) for improved light-load efficiency with a tri-state 3.3V pulse-width modulation (PWM) input for compatibility with a wide range of PWM controllers.

The ZSPM9010 DrMOS is compatible with ZMDI's ZSPM1000, a leading-edge configurable digital power-management system controller for non-isolated point-of-load (POL) supplies.

Features

- Based on the Intel® 4.0 DrMOS standard
- High-current handling: up to 50A
- High-performance copper-clip package
- Tri-state 3.3V PWM input driver
- Skip Mode (low-side gate turn-off) input (SMOD#)
- Warning flag for over-temperature conditions
- Driver output disable function (DISB# pin)
- Internal pull-up and pull-down for SMOD# and DISB# inputs, respectively
- Integrated Schottky diode technology in the low-side MOSFET
- Integrated bootstrap Schottky diode
- Adaptive gate drive timing for shoot-through protection
- Under-voltage lockout (UVLO)
- Optimized for switching frequencies up to 1MHz

Benefits

- Fully optimized system efficiency: >93% peak
- Clean switching waveforms with minimal ringing
- 72% space-saving compared to conventional discrete solutions
- Optimized for use with ZMDI's ZSPM1000 true digital PWM controller

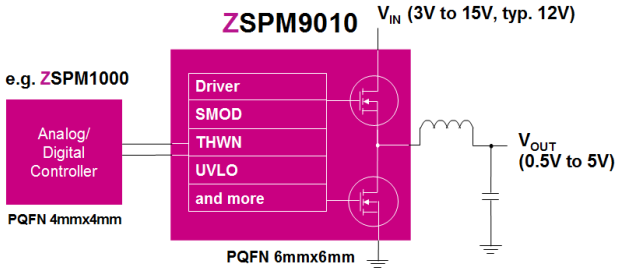
Available Support

- ZSPM8010-KIT: Open-Loop Evaluation Board for ZSPM9010

Physical Characteristics

- Operation temperature: -40°C to +125°C
- V_{IN}: 3V to 15V (typical 12V)
- I_{OUT}: 40A (average), 50A (maximum)
- Low-profile SMD package: 6mmx6mm PQFN40
- ZMDI green packaging and RoHS compliant

Typical Application



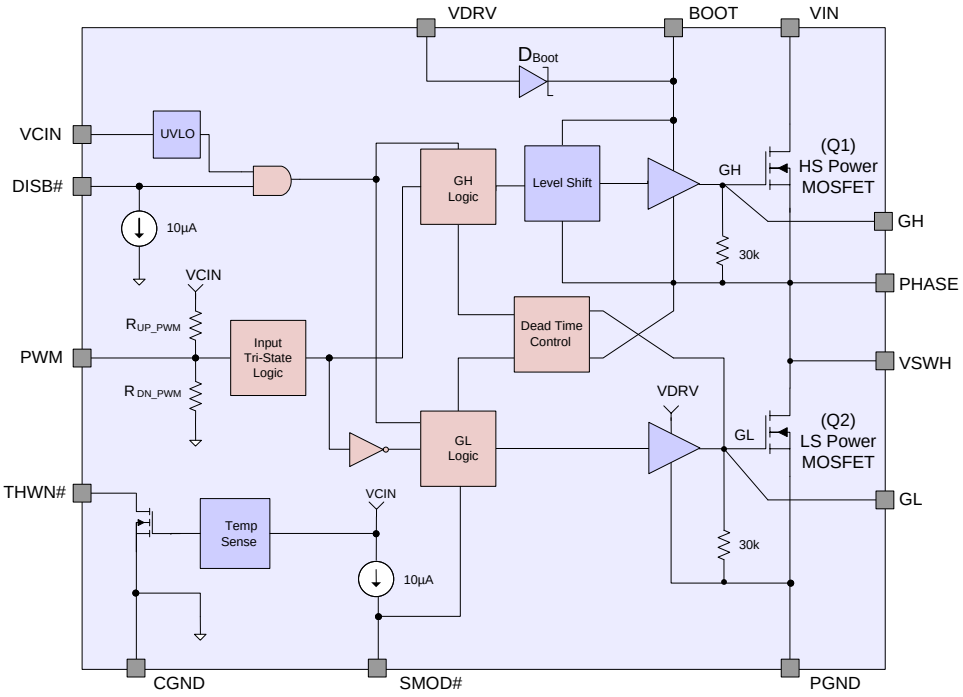
For more information, contact ZMDI via SPM@zmdi.com.

ZSPM9010

Ultra-Compact, High-Performance, High-Frequency DrMOS

The Analog Mixed Signal Company

ZSPM9010 Block Diagram



Typical Applications

- Telecom switches
- Servers and storage
- Desktop computers
- Workstations
- High-performance gaming motherboards
- Base stations
- Network routers
- Industrial applications

Ordering Information

Product Sales Code	Description	Package
ZSPM9010ZA1R	ZSPM9010 Lead-Free PQFN40 — Temperature range: -40°C to +125°C	Reel
ZSPM8010-KIT	Open-Loop Evaluation Board for ZSPM9010	Kit

Sales and Further Information

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ZSPM9060

Ultra-Compact, High-Performance, High-Frequency DrMOS Device

The Analog Mixed Signal Company

Brief Description

The ZSPM9060 is ZMDI's next-generation, fully optimized, ultra-compact, integrated MOSFET plus driver power stage solution for high-current, high-frequency, synchronous buck DC-DC applications. The ZSPM9060 integrates a driver IC, two power MOSFETs, and a bootstrap Schottky diode into a thermally enhanced, ultra-compact 6x6mm package.

With an integrated approach, the complete switching power stage is optimized with regard to driver and MOSFET dynamic performance, system inductance, and power MOSFET $R_{DS(ON)}$. The ZSPM9060 uses innovative high-performance MOSFET technology, which dramatically reduces switch ringing, eliminating the need for a snubber circuit in most buck converter applications.

A driver IC with reduced dead times and propagation delays further enhances the performance. A thermal warning function warns of a potential over-temperature situation. The ZSPM9060 also incorporates a Skip Mode (SMOD#) for improved light-load efficiency. The ZSPM9060 also provides a tri-state 3.3V PWM input for compatibility with a wide range of PWM controllers.

The ZSPM9060 DrMOS is compatible with ZMDI's ZSPM1000, a leading-edge configurable digital power-management system controller for non-isolated point-of-load (POL) supplies.

Features

- Based on the Intel® 4.0 DrMOS standard
- High-current handling: up to 60A
- High-performance PQFN copper-clip package
- Tri-state 3.3V PWM input driver
- Skip Mode (low-side gate turn-off) input (SMOD#)
- Warning flag for over-temperature conditions
- Driver output disable function (DISB# pin)
- Internal pull-up and pull-down for SMOD# and DISB# inputs, respectively
- Integrated Schottky diode technology in the low-side MOSFET
- Integrated bootstrap Schottky diode
- Adaptive gate drive timing for shoot-through protection
- Under-voltage lockout (UVLO)
- Optimized for switching frequencies up to 1MHz

Benefits

- Fully optimized system efficiency: >93% peak
- Clean switching waveforms with minimal ringing
- 72% space-saving compared to conventional discrete solutions
- High current handling
- Optimized for use with ZMDI's ZSPM1000 true digital PWM controller

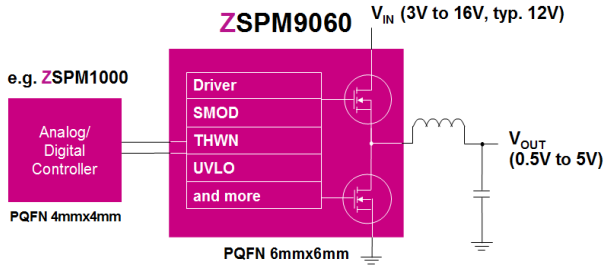
Available Support

- ZSPM8060-KIT: Open-Loop Evaluation Board for ZSPM9060

Physical Characteristics

- Operation temperature: -40°C to +125°C
- V_{IN}: 3V to 16V (typical 12V)
- I_{OUT}: up to 60A
- Low-profile SMD package: 6mmx6mm PQFN40
- ZMDI green packaging and RoHS compliant

Typical Application



For more information, contact ZMDI via SPM@zmdi.com.

ZSPM9060

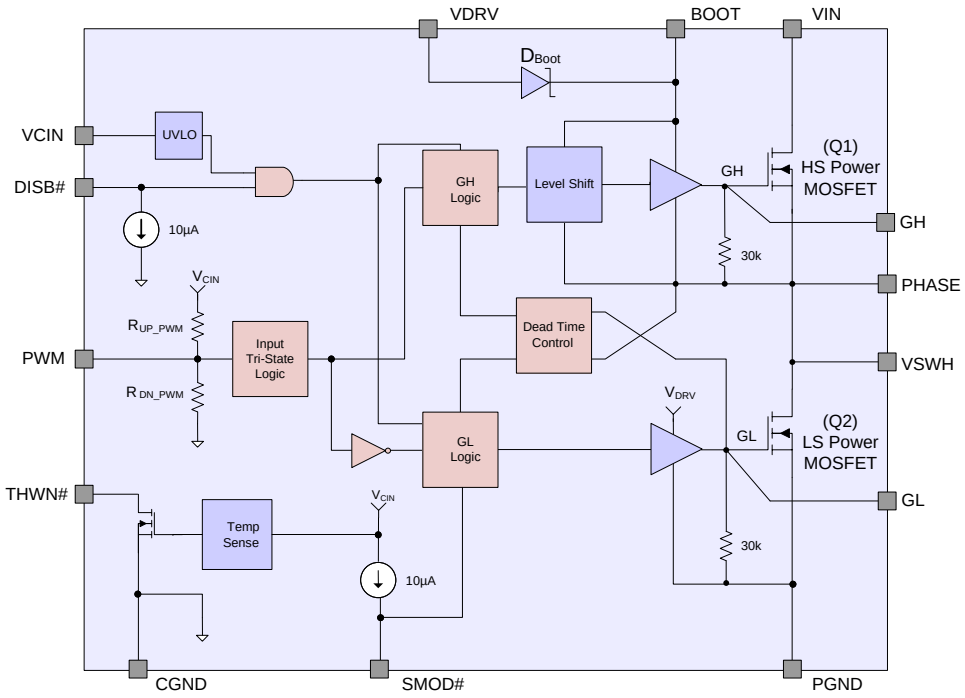
Ultra-Compact, High-Performance, High-Frequency DrMOS Device

The Analog Mixed Signal Company

ZSPM9060 Block Diagram

Typical Applications

- High-performance gaming motherboards
- Compact blade servers, Vcore and non-Vcore DC-DC converters
- Desktop computers, Vcore and Non-Vcore DC-DC converters
- Workstations
- High-current DC-DC point-of-load converters
- Networking and telecom microprocessor voltage regulators
- Small form-factor voltage regulator modules



Ordering Information

Product Sales Code	Description	Package
ZSPM9060ZA1R	ZSPM9060 RoHS-Compliant Clip-Bond PQFN40 - Temperature range: -40°C to +125°C	Reel
ZSPM8060-KIT	Open-Loop Evaluation Board for ZSPM9060	Circuit Board

Sales and Further Information

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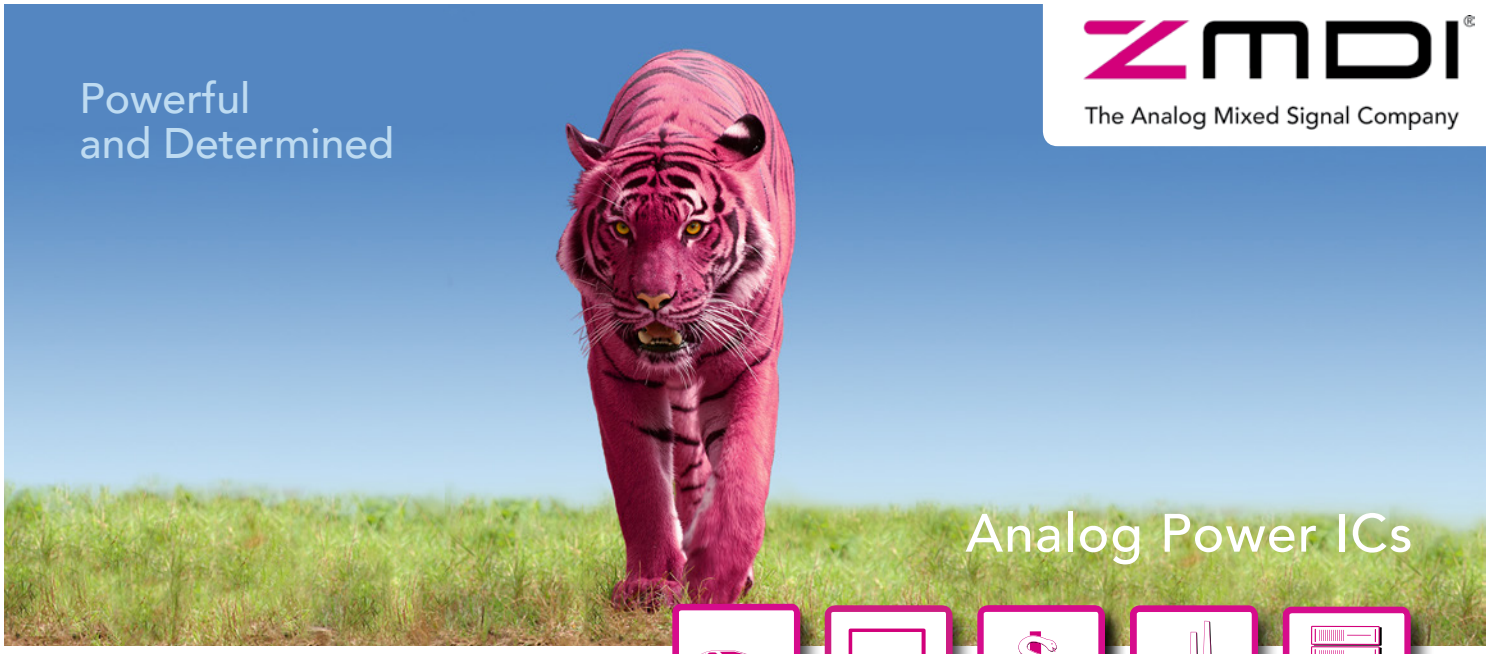
The Analog Mixed Signal Company

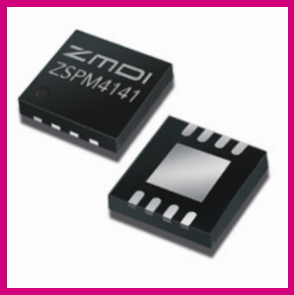
Powerful
and Determined



Analog Power ICs

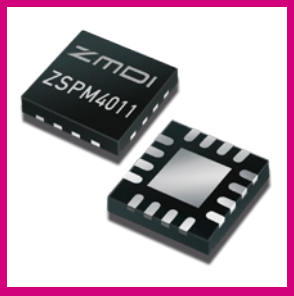
Key Features

- Efficient synchronous buck DC/DC converters
- Ultra-low power linear regulator
- Li-Ion and super capacitor charging ICs



Industry Applications for Analog Power

- Portable battery-operated electronics
- Notebooks
- Set-top boxes
- Base stations



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ZSPM4011

High Efficiency 1A Synchronous Buck Converter

The Analog Mixed Signal Company

Brief Description

The ZSPM4011 is a DC/DC synchronous switching regulator with fully integrated power switches, internal compensation, and full fault protection. The 1MHz switching frequency enables using small filter components, resulting in reduced board space and reduced bill-of-materials costs.

The ZSPM4011 utilizes current mode feedback in normal regulation pulse-width modulation (PWM) mode. When the regulator is disabled (EN pin is low), the ZSPM4011 draws less than 10µA quiescent current.

The ZSPM4011 integrates a wide range of protection circuitry, including input supply undervoltage lockout, output voltage soft start, current limit, V_{OUT} over-voltage, and thermal shutdown.

The ZSPM4011 includes supervisory reporting through the PG (Power Good) open drain output to interface other components in the system.

Features

- Output voltage options depending on order code:
  - Fixed output voltages: 1.5V, 1.8V, 2.5V, 3.3V, or 5V with +/- 2% output tolerance
  - Adjustable output voltage range: 0.9V to 5V with +/- 1.5% reference
- Wide input voltage range: 6V to 24V
- 1MHz +/- 10% fixed switching frequency
- 1A continuous output current
- High efficiency – up to 95%
- Current mode PWM control with pulse-frequency modulation (PFM) mode for improved light load efficiency
- Voltage supervisor for V_{OUT} reported at the PG pin
- Input supply under voltage lockout
- Soft start for controlled startup with no overshoot
- Full protection for over-current, over-temperature, and V_{OUT} over-voltage
- Less than 10µA in Disabled Mode
- Low external component count

Benefits

- Increased battery life
- Minimal external component count (3 capacitors, 1 inductor)
- Inherent fault protection and reporting

Available Support

- Evaluation Kit
- Documentation

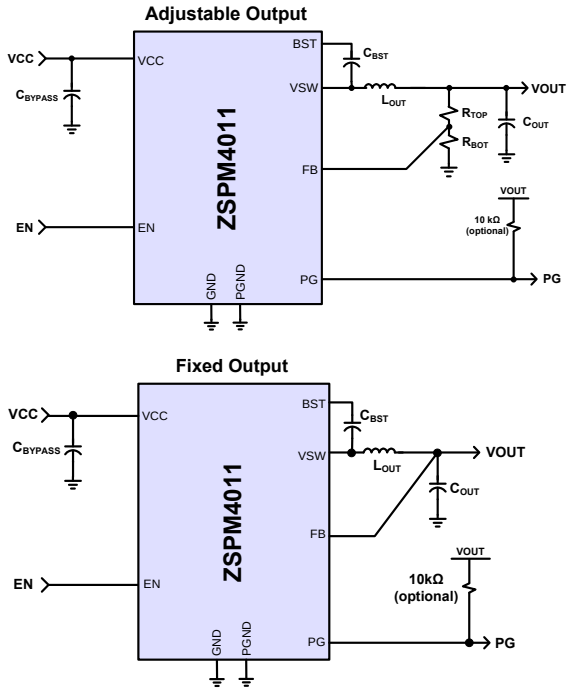
Physical Characteristics

- Junction operating temperature -40°C to 125°C
- Packaged in a 16pin QFN (3x3mm)

Related ZMDI Products

- ZSPM4012/ZSPM4013: 2A/3A synchronous buck converters, available with adjustable output from 0.9 to 5V or fixed output voltages at 1.5V, 1.8V, 2.5V, 3.3V, 5.0V(16-pin 3x3 QFN)
- ZSPM1000: >5A single-phase, single-rail, true digital PWM controller (24-lead 4x4mm QFN)

ZSPM4011 Application Circuits



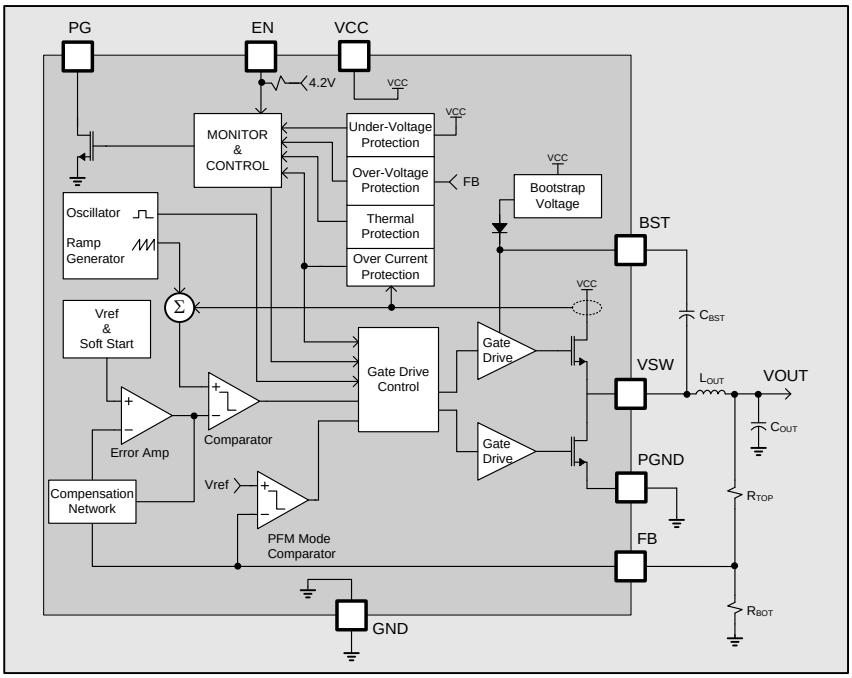
For more information, contact ZMDI via analog@zmdi.com.

ZSPM4011

High Efficiency 1A Synchronous Buck Converter

The Analog Mixed Signal Company

ZSPM4011 Block Diagram



Typical Applications

- Wireless access points, cable modems
- Set-top boxes
- DVD, LCD, LED supplies
- Portable products, including GPS, smart phones, tablet PCs
- Printers

Ordering Information

Ordering Code	Description	Package
ZSPM4011AA1W00	ZSPM4011, 1A Synchronous Buck Converter: adjustable output, 0.9V to 5V, 16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011AA1W15	ZSPM4011, 1A Synchronous Buck Converter: fixed output, 1.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011AA1W18	ZSPM4011, 1A Synchronous Buck Converter: fixed output, 1.8V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011AA1W25	ZSPM4011, 1A Synchronous Buck Converter: fixed output, 2.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011AA1W33	ZSPM4011, 1A Synchronous Buck Converter: fixed output, 3.3V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011AA1W50	ZSPM4011, 1A Synchronous Buck Converter: fixed output, 5.0V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011KIT	ZSPM4011KIT, Evaluation Kit for 1A Synchronous Buck Converter	Kit

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ZSPM4011B

High Efficiency 1A Synchronous Buck Converter

The Analog Mixed Signal Company

Brief Description

The ZSPM4011B is a DC/DC synchronous switching regulator with fully integrated power switches, internal compensation, and full fault protection. The 1MHz switching frequency enables using small filter components, resulting in reduced board space and reduced bill-of-materials costs.

The ZSPM4011B utilizes current mode feedback in normal regulation pulse-width modulation (PWM) mode. When the regulator is disabled (EN pin is low), the ZSPM4011B draws less than 10µA quiescent current.

The ZSPM4011B integrates a wide range of protection circuitry, including input supply undervoltage lockout, output voltage soft start, current limit, V_{OUT} over-voltage, and thermal shutdown. The ZSPM4011B includes supervisory reporting through the PG (Power Good) open drain output to interface other components in the system.

Features

- Output voltage options (depends on order code):
  - Fixed output voltages: 1.5V, 1.8V, 2.5V, 3.3V, or 5V with +/- 2% output tolerance
  - Adjustable output voltage range: 0.9V to 5V with +/- 1.5% reference
- Wide input voltage range: 4.5V to 24V
- 1MHz +/- 10% fixed switching frequency
- 1A continuous output current
- High efficiency – up to 95%
- Current mode PWM control with pulse-frequency modulation (PFM) mode for improved light load efficiency
- Voltage supervisor for V_{OUT} reported at the PG pin
- Input supply under voltage lockout
- Soft start for controlled startup with no overshoot
- Full protection for over-current, over-temperature, and V_{OUT} over-voltage
- Less than 10µA in Disabled Mode
- Low external component count

Benefits

- Increased battery life
- Minimal external component count (3 capacitors, 1 inductor)
- Inherent fault protection and reporting

Available Support

- Evaluation Kit
- Documentation

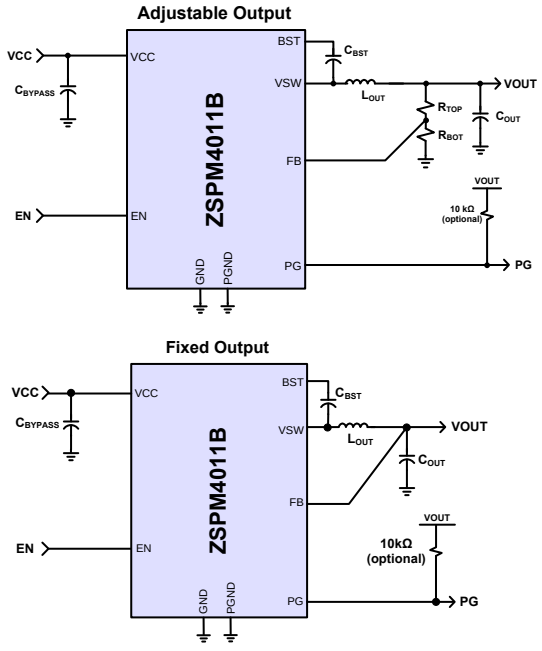
Physical Characteristics

- Junction operating temperature -40°C to 125°C
- Packaged in a 16pin QFN (3x3mm)

Related ZMDI Products

- ZSPM4012B/ZSPM4013B: 2A/3A synchronous buck converters, available with adjustable output from 0.9 to 5V or fixed output voltages at 1.5V, 1.8V, 2.5V, 3.3V, 5.0V (16-pin 3x3 QFN)
- ZSPM1000: >5A single-phase, single-rail, true digital PWM controller (24-lead 4x4mm QFN)

ZSPM4011B Application Circuits



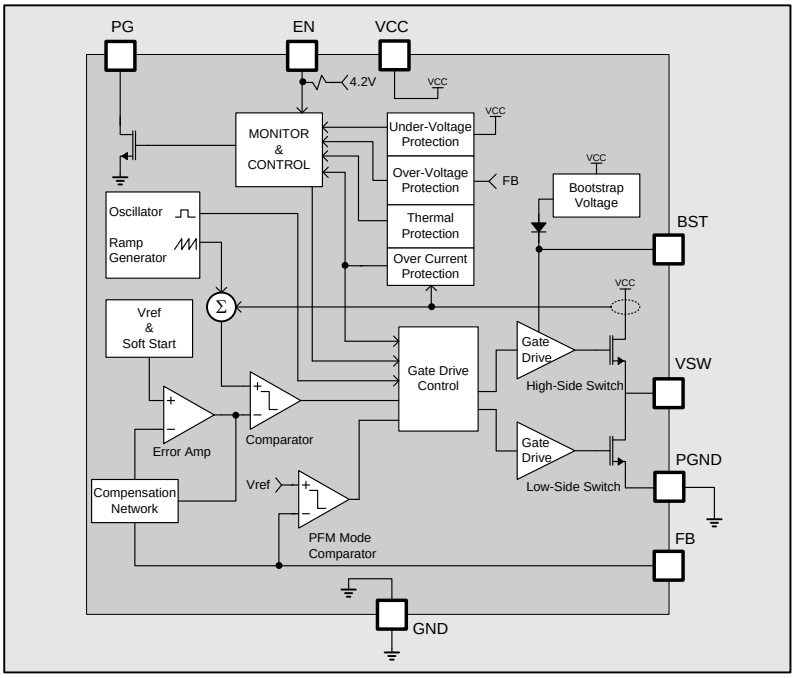
For more information, contact ZMDI via Analog@zmdi.com.

ZSPM4011B

High Efficiency 1A Synchronous Buck Converter

The Analog Mixed Signal Company

ZSPM4011B Block Diagram



Typical Applications

- Wireless access points, cable modems
- Set-top boxes
- DVD, LCD, LED supplies
- Portable products, including GPS, smart phones, tablet PCs
- Printers

Ordering Information

Ordering Code	Description	Package
ZSPM4011BA1W00	1A Synchronous Buck Converter: adjustable output, 0.9V to 5V, 16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011BA1W15	1A Synchronous Buck Converter: fixed output, 1.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011BA1W18	1A Synchronous Buck Converter: fixed output, 1.8V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011BA1W25	1A Synchronous Buck Converter: fixed output, 2.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011BA1W33	1A Synchronous Buck Converter: fixed output, 3.3V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011BA1W50	1A Synchronous Buck Converter: fixed output, 5.0V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4011BKIT	ZSPM4011BKIT, Evaluation Kit for 1A Synchronous Buck Converter	Kit

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ZSPM4012

High Efficiency 2A Synchronous Buck Converter

The Analog Mixed Signal Company

Brief Description

The ZSPM4012 is a DC/DC synchronous switching regulator with fully integrated power switches, internal compensation, and full fault protection. The 1MHz switching frequency enables using small filter components, resulting in reduced board space and reduced bill-of-materials costs.

The ZSPM4012 utilizes current mode feedback in normal regulation pulse-width modulation (PWM) mode. When the regulator is disabled (EN pin is low), the ZSPM4012 draws less than 10µA quiescent current.

The ZSPM4012 integrates a wide range of protection circuitry, including input supply under-voltage lockout, output voltage soft start, current limit, V_{OUT} over-voltage, and thermal shutdown.

The ZSPM4012 includes supervisory reporting through the PG (Power Good) open drain output to interface other components in the system.

Features

- Output voltage options depending on order code:
  - Fixed output voltages: 1.5V, 1.8V, 2.5V, 3.3V, or 5V with +/- 2% output tolerance
  - Adjustable output voltage range: 0.9V to 5V with +/- 1.5% reference
- Wide input voltage range: 6V to 24V
- 1MHz +/- 10% fixed switching frequency
- 2A continuous output current
- High efficiency – up to 95%
- Current mode PWM control with pulse-frequency modulation (PFM) mode for improved light load efficiency
- Voltage supervisor for V_{OUT} reported at the PG pin
- Input supply under voltage lockout
- Soft start for controlled startup with no overshoot
- Full protection for over-current, over-temperature, and V_{OUT} over-voltage
- Less than 10µA in Disabled Mode
- Low external component count

Benefits

- Increased battery life
- Minimal external component count (3 capacitors, 1 inductor)
- Inherent fault protection and reporting

Available Support

- Evaluation Kit
- Documentation

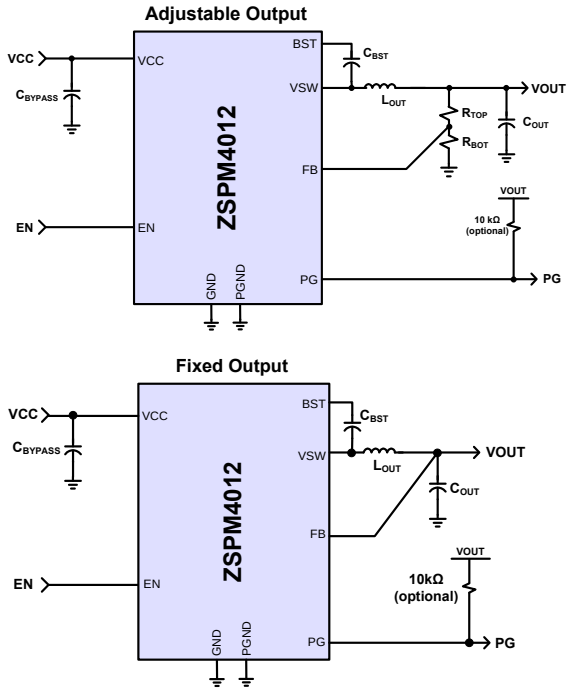
Physical Characteristics

- Junction operating temperature -40°C to 125°C
- Packaged in a 16pin QFN (3x3mm)

Related ZMDI Products

- ZSPM4011/ZSPM4013: 1A/3A synchronous buck converters, available with adjustable output from 0.9 to 5V or fixed output voltages at 1.5V, 1.8V, 2.5V, 3.3V, 5.0V (16-pin 3x3 QFN)
- ZSPM1000: >5A single-phase, single-rail, true digital PWM controller (24-pin 4x4mm QFN)

ZSPM4012 Application Circuits



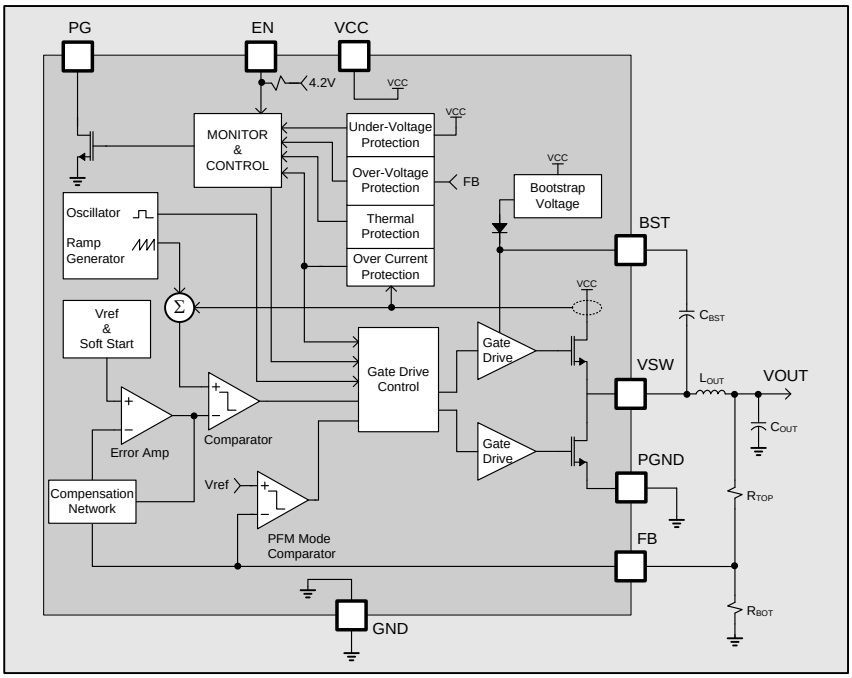
For more information, contact ZMDI via analog@zmdi.com.

ZSPM4012

High Efficiency 2A Synchronous Buck Converter

The Analog Mixed Signal Company

ZSPM4012 Block Diagram



Typical Applications

- Wireless access points, cable modems
- Set-top boxes
- DVD, LCD, LED supplies
- Portable products, including GPS, smart phones, tablet PCs
- Printers

Ordering Information

Ordering Code	Description	Package
ZSPM4012AA1W00	ZSPM4012, 2A Synchronous Buck Converter: adjustable output, 0.9V to 5V, 16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4012AA1W15	ZSPM4012, 2A Synchronous Buck Converter: fixed output, 1.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4012AA1W18	ZSPM4012, 2A Synchronous Buck Converter: fixed output, 1.8V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4012AA1W25	ZSPM4012, 2A Synchronous Buck Converter: fixed output, 2.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4012AA1W33	ZSPM4012, 2A Synchronous Buck Converter: fixed output, 3.3V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4012AA1W50	ZSPM4012, 2A Synchronous Buck Converter: fixed output, 5.0V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4012KIT	ZSPM4012KIT, Evaluation Kit for 2A Synchronous Buck Converter	Kit

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ZSPM4012B

High Efficiency 2A Synchronous Buck Converter

The Analog Mixed Signal Company

Brief Description

The ZSPM4012B is a DC/DC synchronous switching regulator with fully integrated power switches, internal compensation, and full fault protection. The 1MHz switching frequency enables using small filter components, resulting in reduced board space and reduced bill-of-materials costs.

The ZSPM4012B utilizes current mode feedback in normal regulation pulse-width modulation (PWM) mode. When the regulator is disabled (EN pin is low), the ZSPM4012B draws less than 10µA quiescent current.

The ZSPM4012B integrates a wide range of protection circuitry, including input supply undervoltage lockout, output voltage soft start, current limit, V_{OUT} over-voltage, and thermal shutdown. The ZSPM4012B includes supervisory reporting through the PG (Power Good) open drain output to interface other components in the system.

Features

- Output voltage options (depends on order code):
  - Fixed output voltages: 1.5V, 1.8V, 2.5V, 3.3V, or 5V with +/- 2% output tolerance
  - Adjustable output voltage range: 0.9V to 5V with +/- 1.5% reference
- Wide input voltage range: 4.5V to 24V
- 1MHz +/- 10% fixed switching frequency
- 2A continuous output current
- High efficiency – up to 95%
- Current mode PWM control with pulse-frequency modulation (PFM) mode for improved light load efficiency
- Voltage supervisor for V_{OUT} reported at the PG pin
- Input supply under voltage lockout
- Soft start for controlled startup with no overshoot
- Full protection for over-current, over-temperature, and V_{OUT} over-voltage
- Less than 10µA in Disabled Mode
- Low external component count

Benefits

- Increased battery life
- Minimal external component count (3 capacitors, 1 inductor)
- Inherent fault protection and reporting

Available Support

- Evaluation Kit
- Documentation

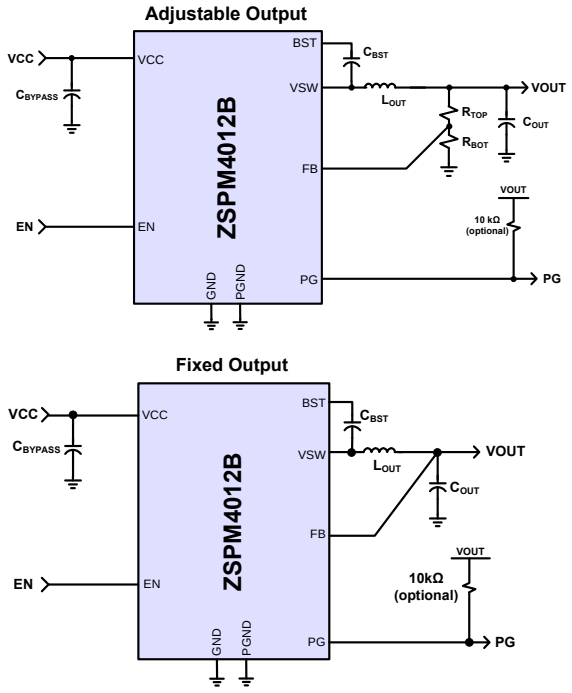
Physical Characteristics

- Junction operating temperature -40°C to 125°C
- Packaged in a 16pin QFN (3x3mm)

Related ZMDI Products

- ZSPM4011B/ZSPM4013B: 1A/3A synchronous buck converters, available with adjustable output from 0.9 to 5V or fixed output voltages at 1.5V, 1.8V, 2.5V, 3.3V, 5.0V (16-lead 3x3mm QFN)
- ZSPM1000: >5A single-phase, single-rail, true digital PWM controller (24-pin 4x4mm QFN)

ZSPM4012B Application Circuits



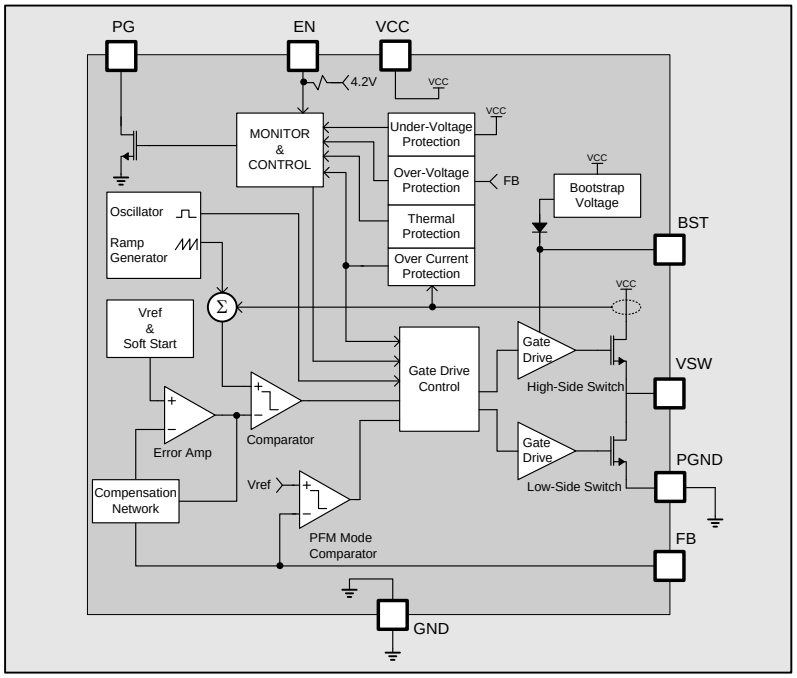
For more information, contact ZMDI via Analog@zmdi.com.

ZSPM4012B

High Efficiency 2A Synchronous Buck Converter

The Analog Mixed Signal Company

ZSPM4012B Block Diagram



Typical Applications

- Wireless access points, cable modems
- Set-top boxes
- DVD, LCD, LED supplies
- Portable products, including GPS, smart phones, tablet PCs
- Printers

Ordering Information

Ordering Code	Description	Package
ZSPM4012BA1W00	2A Synchronous Buck Converter: adjustable output, 0.9V to 5V, 16-pin 3x3mm QFN	7" reel with 1000 ICs
ZSPM4012BA1W15	2A Synchronous Buck Converter: fixed output, 1.5V,16-pin 3x3mm QFN	7" reel with 1000 ICs
ZSPM4012BA1W18	2A Synchronous Buck Converter: fixed output, 1.8V,16-pin 3x3mm QFN	7" reel with 1000 ICs
ZSPM4012BA1W25	2A Synchronous Buck Converter: fixed output, 2.5V,16-pin 3x3mm QFN	7" reel with 1000 ICs
ZSPM4012BA1W33	2A Synchronous Buck Converter: fixed output, 3.3V,16-pin 3x3mm QFN	7" reel with 1000 ICs
ZSPM4012BA1W50	2A Synchronous Buck Converter: fixed output, 5.0V,16-pin 3x3mm QFN	7" reel with 1000 ICs
ZSPM4012BKIT	ZSPM4012B Evaluation Kit for 2A Synchronous Buck Converter	Kit

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ZSPM4013

High Efficiency 3A Synchronous Buck Converter

The Analog Mixed Signal Company

Brief Description

The ZSPM4013 is a DC/DC synchronous switching regulator with fully integrated power switches, internal compensation, and full fault protection. The 1MHz switching frequency enables using small filter components, resulting in reduced board space and reduced bill-of-materials costs.

The ZSPM4013 utilizes current mode feedback in normal regulation pulse-width modulation (PWM) mode. When the regulator is disabled (EN pin is low), the ZSPM4013 draws less than 10µA quiescent current.

The ZSPM4013 integrates a wide range of protection circuitry, including input supply under-voltage lockout, output voltage soft start, current limit, V_{OUT} over-voltage, and thermal shutdown. The ZSPM4013 includes supervisory reporting through the PG (Power Good) open drain output to interface other components in the system.

Features

- Output voltage options (depends on order code):
  - Fixed output voltages: 1.5V, 1.8V, 2.5V, 3.3V, or 5V with +/- 2% output tolerance
  - Adjustable output voltage range: 0.9V to 5V with +/- 1.5% reference
- Wide input voltage range: 6V to 18V
- 1MHz +/- 10% fixed switching frequency
- 3A continuous output current
- High efficiency – up to 95%
- Current mode PWM control with pulse-frequency modulation (PFM) mode for improved light load efficiency
- Voltage supervisor for V_{OUT} reported at the PG pin
- Input supply under voltage lockout
- Soft start for controlled startup with no overshoot
- Full protection for over-current, over-temperature, and V_{OUT} over-voltage
- Less than 10µA in Disabled Mode
- Low external component count

Benefits

- Increased battery life
- Minimal external component count (3 capacitors, 1 inductor)
- Inherent fault protection and reporting

Available Support

- Evaluation Kit
- Documentation

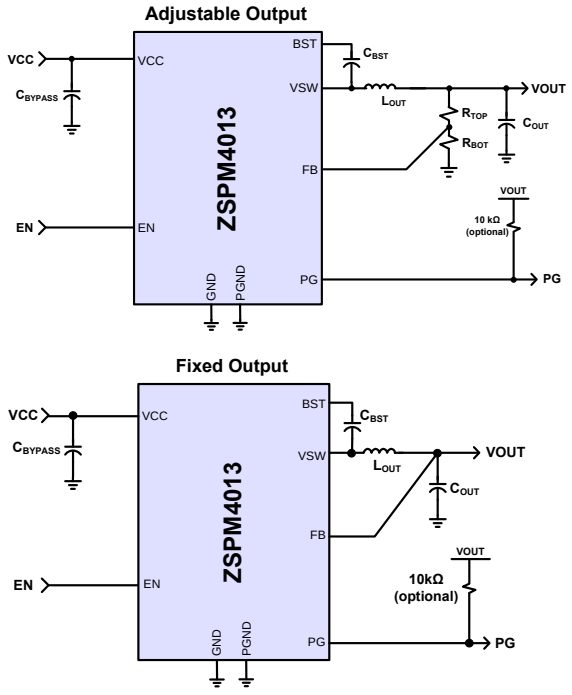
Physical Characteristics

- Junction operating temperature -40°C to 125°C
- Packaged in a 16pin QFN (3x3mm)

Related ZMDI Products

- ZSPM4011/ZSPM4012: 1A/2A synchronous buck converters, available with adjustable output from 0.9 to 5V or fixed output voltages at 1.5V, 1.8V, 2.5V, 3.3V, 5.0V (16-lead 3x3mm QFN)
- ZSPM1000: >5A single-phase, single-rail, true digital PWM controller (24-lead 4x4mm QFN)

ZSPM4013 Application Circuits



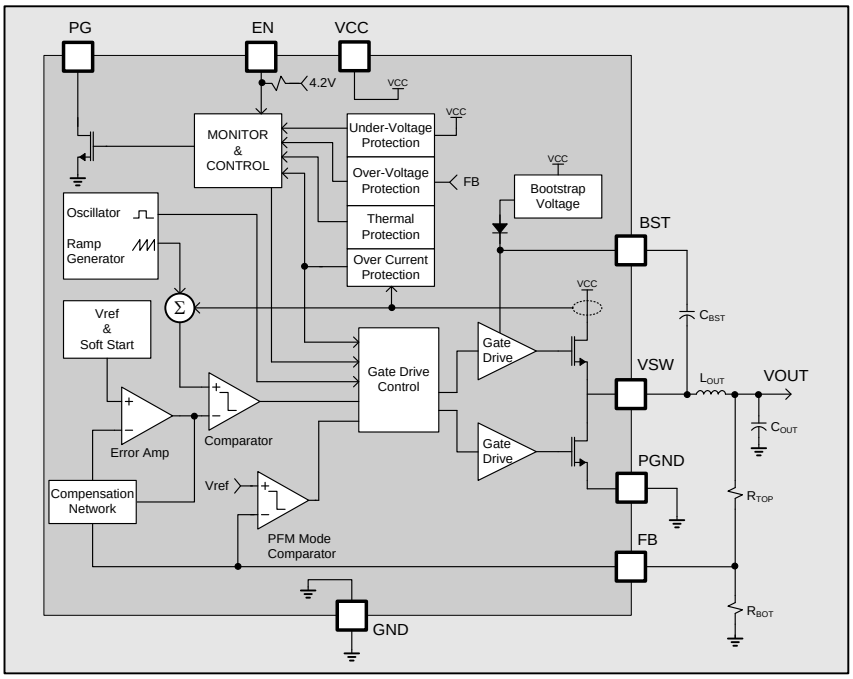
For more information, contact ZMDI via analog@zmdi.com.

ZSPM4013

High Efficiency 3A Synchronous Buck Converter

The Analog Mixed Signal Company

ZSPM4013 Block Diagram



Typical Applications

- Wireless access points, cable modems
- Set-top boxes
- DVD, LCD, LED supplies
- Portable products, including GPS, smart phones, tablet PCs
- Printers

Ordering Information

Ordering Code	Description	Package
ZSPM4013AA1W00	ZSPM4013, 3A Synchronous Buck Converter: adjustable output, 0.9V to 5V, 16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013AA1W15	ZSPM4013, 3A Synchronous Buck Converter: fixed output, 1.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013AA1W18	ZSPM4013, 3A Synchronous Buck Converter: fixed output, 1.8V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013AA1W25	ZSPM4013, 3A Synchronous Buck Converter: fixed output, 2.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013AA1W33	ZSPM4013, 3A Synchronous Buck Converter: fixed output, 3.3V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013AA1W50	ZSPM4013, 3A Synchronous Buck Converter: fixed output, 5.0V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013KIT	ZSPM4013KIT, Evaluation Kit for 3A Synchronous Buck Converter	Kit

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ZSPM4013B

High Efficiency 3A Synchronous Buck Converter

The Analog Mixed Signal Company

Brief Description

The ZSPM4013B is a DC/DC synchronous switching regulator with fully integrated power switches, internal compensation, and full fault protection. The 1MHz switching frequency enables using small filter components, resulting in reduced board space and reduced bill-of-materials costs.

The ZSPM4013B utilizes current mode feedback in normal regulation pulse-width modulation (PWM) mode. When the regulator is disabled (EN pin is low), the ZSPM4013B draws less than 10µA quiescent current.

The ZSPM4013B integrates a wide range of protection circuitry, including input supply under-voltage lockout, output voltage soft start, current limit, V_{OUT} over-voltage, and thermal shutdown. The ZSPM4013B includes supervisory reporting through the PG (Power Good) open-drain output to interface other components in the system.

Features

- Output voltage options (depends on order code):
  - Fixed output voltages: 1.5V, 1.8V, 2.5V, 3.3V, or 5V with +/- 2% output tolerance
  - Adjustable output voltage range: 0.9V to 5V with +/- 1.5% reference
- Wide input voltage range: 4.5V to 18V
- 1MHz +/- 10% fixed switching frequency
- 3A continuous output current
- High efficiency – up to 95%
- Current mode PWM control with pulse-frequency modulation (PFM) mode for improved light load efficiency
- Voltage supervisor for V_{OUT} reported at the PG pin
- Input supply under-voltage lockout
- Soft start for controlled startup with no overshoot
- Full protection for over-current, over-temperature, and V_{OUT} over-voltage
- Less than 10µA in Disabled Mode
- Low external component count

Benefits

- Increased battery life
- Minimal external component count (3 capacitors, 1 inductor)
- Inherent fault protection and reporting

Available Support

- Evaluation Kit
- Documentation

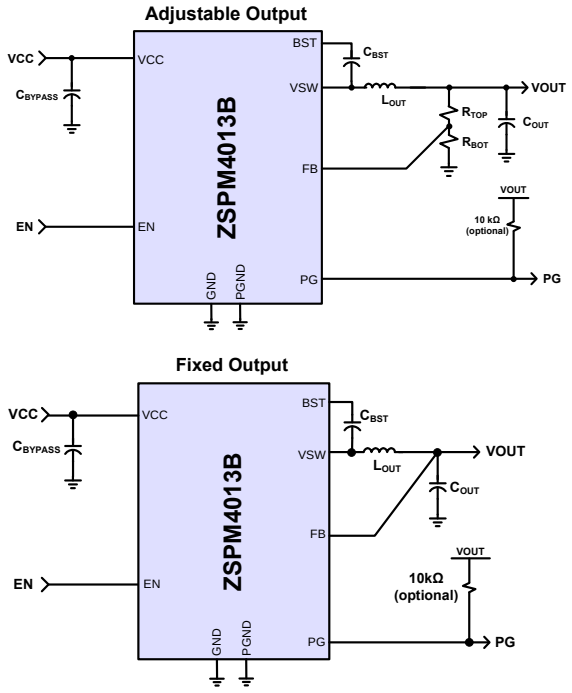
Physical Characteristics

- Junction operating temperature: -40°C to 125°C
- Packaged in a 16-pin QFN (3x3mm)

Related ZMDI Products

- ZSPM4011B/ZSPM4012B: 1A/2A synchronous buck converters, available with adjustable output from 0.9 to 5V or fixed output voltages at 1.5V, 1.8V, 2.5V, 3.3V, 5.0V (16-lead 3x3mm QFN)
- ZSPM1000: >5A single-phase, single-rail, true digital PWM controller (24-lead 4x4mm QFN)

ZSPM4013B Application Circuits



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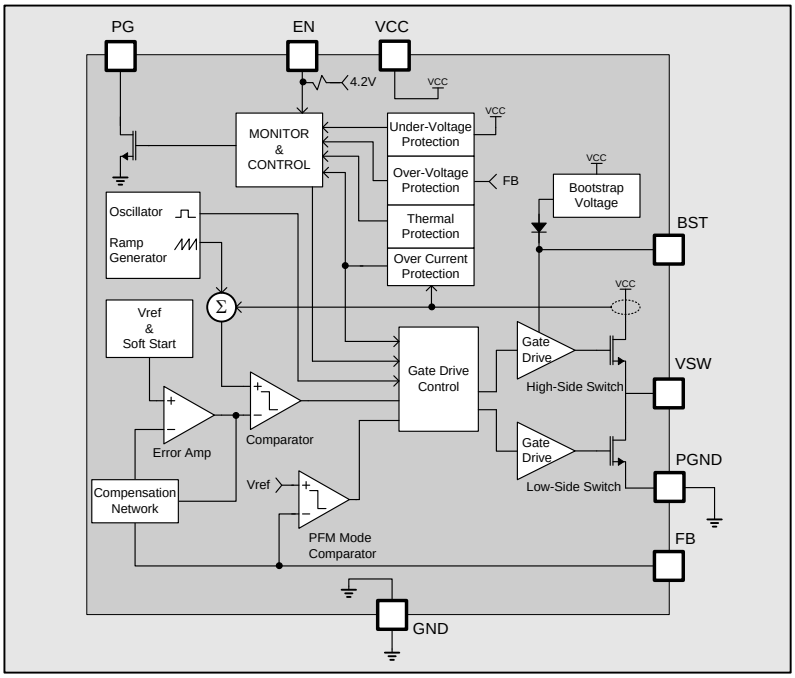
ZSPM4013B

High Efficiency 3A Synchronous Buck Converter

The Analog Mixed Signal Company

ZSPM4013B Block Diagram



Typical Applications

- Wireless access points, cable modems
- Set-top boxes
- DVD, LCD, LED supplies
- Portable products, including GPS, smart phones, tablet PCs
- Printers

Ordering Information

Ordering Code	Description	Package
ZSPM4013BA1W00	3A Synchronous Buck Converter: adjustable output, 0.9V to 5V, 16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013BA1W15	3A Synchronous Buck Converter: fixed output, 1.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013BA1W18	3A Synchronous Buck Converter: fixed output, 1.8V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013BA1W25	3A Synchronous Buck Converter: fixed output, 2.5V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013BA1W33	3A Synchronous Buck Converter: fixed output, 3.3V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013BA1W50	3A Synchronous Buck Converter: fixed output, 5.0V,16-pin 3x3mm QFN	7” reel with 1000 ICs
ZSPM4013BKIT	ZSPM4013BKIT, Evaluation Kit for 3A Synchronous Buck Converter	Kit

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ZSPM4121

Under-Voltage Load Switch for Smart Battery Management

The Analog Mixed Signal Company

Brief Description

The ZSPM4121 battery management load switch can be used to protect a battery from excessive discharge. It actively monitors the battery voltage and disconnects the battery from the load if the battery drops below a set voltage threshold. When the input battery voltage reaches 500mV above the set voltage threshold, the load switch turns on and connects the battery to the load. The 500mV hysteresis between the Off Mode and the On Mode prevents intermittent operation.

The voltage threshold (V_{THRESH}) can be programmed at manufacturing to a customer-selected set point in the voltage range of 1.2V to 4.2V in 100mV increments to support a wide range of applications in consumer, medical, portable, and industrial applications.

This device has ultra-low quiescent current, which makes it ideal for battery-powered applications. Typical quiescent current is 100pA in the Off Mode and 70nA in the On Mode.

The ZSPM4121 includes a slew rate control P-channel load switch, over-current protection, and an open-drain power indicator pin (NPG). The slew-rate controlled turn-on characteristic prevents inrush current and voltage droop on the voltage. The over-current limit protects the device in case of an overload, short-circuit, or ground fault event.

Benefits

- Best-in-class ultra-low quiescent current in Off Mode: 100pA (typical)
- Ultra-low quiescent current in On Mode: 70nA (typical)
- Accurate on/off voltage threshold
- Low Rds(on): 175mΩ (typical) @ 5V

Features

- Threshold voltage options of 1.2V to 4.2V in 100mV steps (factory programmed)
- Wide input voltage range: 1.2V to 5.5V
- Supervisory over-current limit shutdown: (3A)
- Low drop-out disconnect from VCC to loads
- Controlled turn-on slew rate
- 500mV Off Mode to On Mode hysteresis

Related ZMDI Smart Power Products

- ZSPM4141 Ultra-Low-Power Linear Regulator

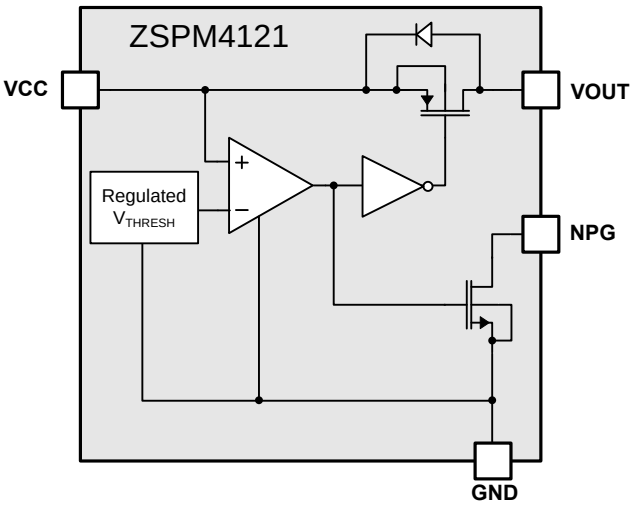
Available Support

- Evaluation Kit
- Support Documentation

Physical Characteristics

- Package: 8-pin DFN (2mm x 2mm)

ZSPM4121 Block Diagram



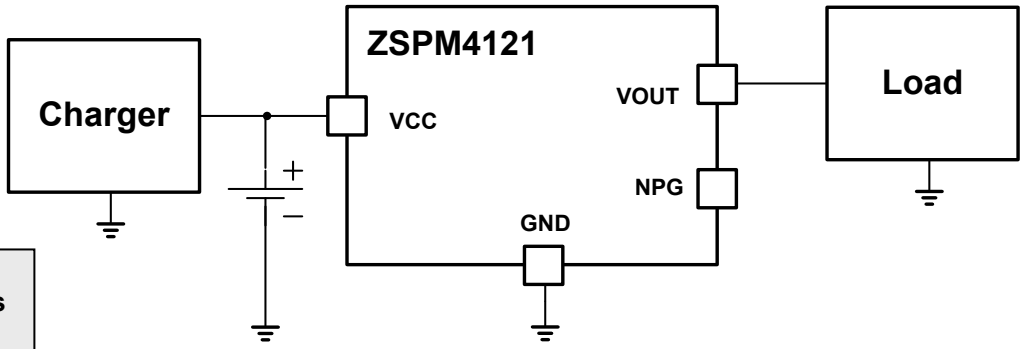
For more information, contact ZMDI via Analog@zmdi.com.

ZSPM4121

Under-Voltage Load Switch for Smart Battery Management

The Analog Mixed Signal Company

Typical Application Circuit



Typical Applications

- Portable batteries
- Industrial
- Medical
- Smart cards
- RFID

Ordering Information

Ordering Code*	Description	Package
ZSPM4121AI1*W*17	ZSPM4121 Under-Voltage Load Switch—V_{THRESH} factory set to 1.7V	8-pin DFN / 7” Reel (2500)
ZSPM4121AI1*W*21	ZSPM4121 Under-Voltage Load Switch—V_{THRESH} factory set to 2.1V	8-pin DFN / 7” Reel (2500)
ZSPM4121AI1*W*23	ZSPM4121 Under-Voltage Load Switch—V_{THRESH} factory set to 2.3V	8-pin DFN / 7” Reel (2500)
ZSPM4121AI1*W*24	ZSPM4121 Under-Voltage Load Switch—V_{THRESH} factory set to 2.4V	8-pin DFN / 7” Reel (2500)
ZSPM4121AI1*W*25	ZSPM4121 Under-Voltage Load Switch—V_{THRESH} factory set to 2.5V	8-pin DFN / 7” Reel (2500)
ZSPM4121AI1*W*26	ZSPM4121 Under-Voltage Load Switch—V_{THRESH} factory set to 2.6V	8-pin DFN / 7” Reel (2500)
ZSPM4121AI1*W*28	ZSPM4121 Under-Voltage Load Switch—V_{THRESH} factory set to 2.8V	8-pin DFN / 7” Reel (2500)
ZSPM4121AI1*W*30	ZSPM4121 Under-Voltage Load Switch—V_{THRESH} factory set to 3.0V	8-pin DFN / 7” Reel (2500)
ZSPM4121KIT	ZSPM4121 Evaluation Kit	

* For a 13” reel (3300 parts), replace the W in the ordering code with an R. Custom V_{THRESH} values are also available: 1.2V to 4.2V (typical) in 100mV increments.

Sales and Further Information

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ZSPM4141

Ultra-Low-Power Linear Regulator w/ Minimal Quiescent Current Technology

The Analog Mixed Signal Company

Brief Description

The ZSPM4141 is an ultra-low-power linear regulator optimized for minimal quiescent current losses via advanced, proprietary technology. It can improve energy efficiency and reduce heat due to power dissipation because it draws low nA-level quiescent current for light loads, yet it can regulate current loads as high as 200mA. The linear regulated output voltage is factory-configured to an option from 1.2V to 4.2V in 100mV steps. The ZSPM4141 also provides over-current protection.

Features

- Low operating voltage range: 2.5V to 5.5V
- Power-Down Mode for 100pA quiescent current
- Over-current protection: 250mA
- Output voltage options of 1.2V to 4.2V in 100mV steps (programmed at manufacturing)

Benefits

- Ultra-low 100pA quiescent current in power down mode
- Best-in-class quiescent current of 20nA at I_{LOAD}=0
- 0.5% DC line regulation (typical)
- Extends battery life
- Enables power harvesting applications
- High level of integration minimizes board space

Related ZMDI Smart Power Products

- ZSPM4121 Under-Voltage Load Switch for Smart Battery Management

Available Support

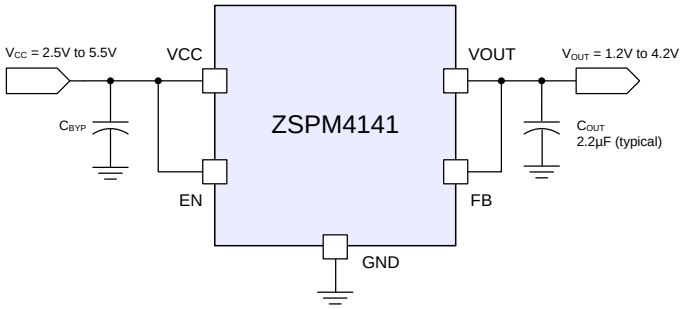
- ZSPM4141W12KIT Evaluation Kit
- Support Documentation

Physical Characteristics

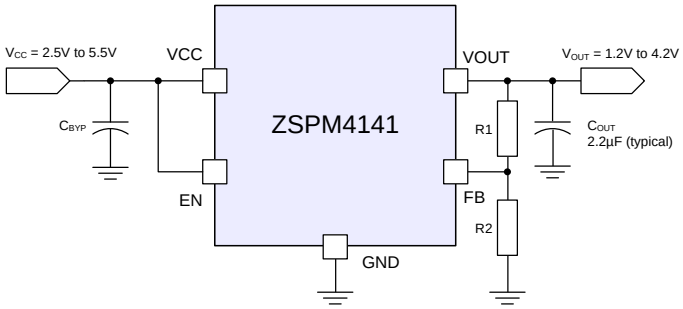
- Package: 8-pin DFN (2mm x2mm)

Typical ZSPM4141 Application Circuits

ZSPM4141 Basic (Fixed Output) Application



ZSPM4141AI1W12 Variable VOUT via Resistor Divider



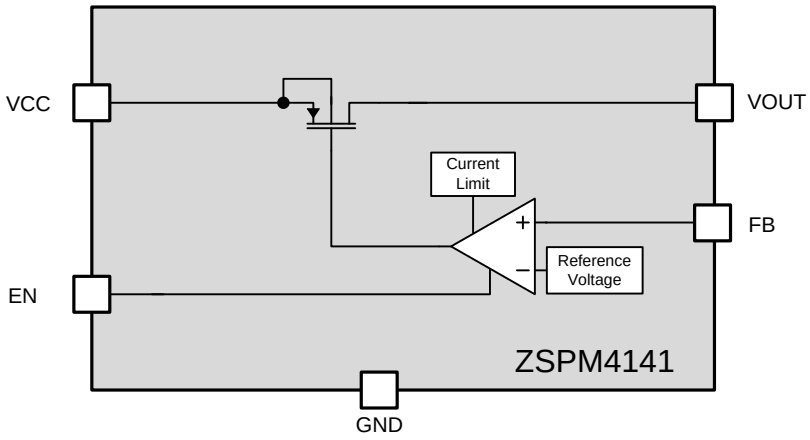
For more information, contact ZMDI via Analog@zmdi.com.

ZSPM4141

Ultra-Low-Power Linear Regulator w/ Minimal Quiescent Current Technology

The Analog Mixed Signal Company

ZSPM4141 Block Diagram



Typical Applications

- Portable Electronics
- Industrial
- Medical
- Smart Cards
- RFID
- Energy-Harvesting Systems

Ordering Information

Ordering Code*	Description	Package
ZSPM4141AI1*W*12	ZSPM4141 Ultra-Low Power Line Regulator —V_{OUT} factory set to 1.2V	8-pin DFN / Reel
ZSPM4141AI1*W*18	ZSPM4141 Ultra-Low Power Line Regulator —V_{OUT} factory set to 1.8V	8-pin DFN / Reel
ZSPM4141AI1*W*25	ZSPM4141 Ultra-Low Power Line Regulator —V_{OUT} factory set to 2.5V	8-pin DFN / Reel
ZSPM4141AI1*W*30	ZSPM4141 Ultra-Low Power Line Regulator —V_{OUT} factory set to 3.0V	8-pin DFN / Reel
ZSPM4141AI1*W*31	ZSPM4141 Ultra-Low Power Line Regulator —V_{OUT} factory set to 3.1V	8-pin DFN / Reel
ZSPM4141AI1*W*33	ZSPM4141 Ultra-Low Power Line Regulator —V_{OUT} factory set to 3.3V	8-pin DFN / Reel
ZSPM4141AI1*W*42	ZSPM4141 Ultra-Low Power Line Regulator —V_{OUT} factory set to 4.2V	8-pin DFN / Reel
ZSPM4141W12KIT	ZSPM4141 Evaluation Kit w/Vout adjusting resistors (default 1.2 Vout)	

* W for 7" reel with 2500 parts. Custom V_{OUT} values are also available: 1.2V to 4.2V (typical) in 100mV increments.

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ZSPM4521

High-Efficiency Charger for Li-Ion Batteries with Photovoltaic Sources

The Analog Mixed Signal Company

Brief Description

The ZSPM4521 is a DC/DC synchronous switching lithium-ion (Li-Ion) battery charger with fully integrated power switches, internal compensation, and full fault protection. It uses a temperature-independent photovoltaic maximum power point tracking (MPPT) function to optimize power output from the source during Full-Charge Constant-Current (CC) Mode. Its switching frequency of 1MHz enables the use of small filter components, resulting in smaller board space and reduced bill-of material costs.

During Full-Charge Constant-Current Mode, the duty cycle is controlled by the MPPT regulator. Once the battery's termination voltage is reached, the regulator operates in Constant Voltage Mode. In this mode, the ZSPM4521 modulates the charging current until the battery reaches full charge. When the regulator is disabled (the EN pin is low), the device draws 10µA (typical) quiescent current (Disabled Mode).

The ZSPM4521 includes supervisory reporting through the NFLT (inverted fault) open-drain output to interface other components in the system. Device programming is achieved by an I²C™* interface through the SCL and SDA pins.

Benefits

- Up to 1.5A of continuous output current in Full-Charge Constant Current (CC) Mode
- High efficiency – up to 92% with typical loads

Available Support

- Evaluation Kit
- Documentation

Features

- Temperature-independent photovoltaic maximum power tracking (MPPT) regulator
- VBAT reverse-current blocking
- Programmable temperature-compensated termination voltage: 3.94V to 4.18V ± 1%
- User programmable maximum charge current: 50mA to 1500mA
- Supervisor for V_{BAT} reported at the NFLT pin
- Input supply under-voltage lockout
- Full protection for VBAT over-current, over-temperature, VBAT over-voltage, and charging timeout
- Charge status indication
- I^2C™ program interface with EEPROM registers

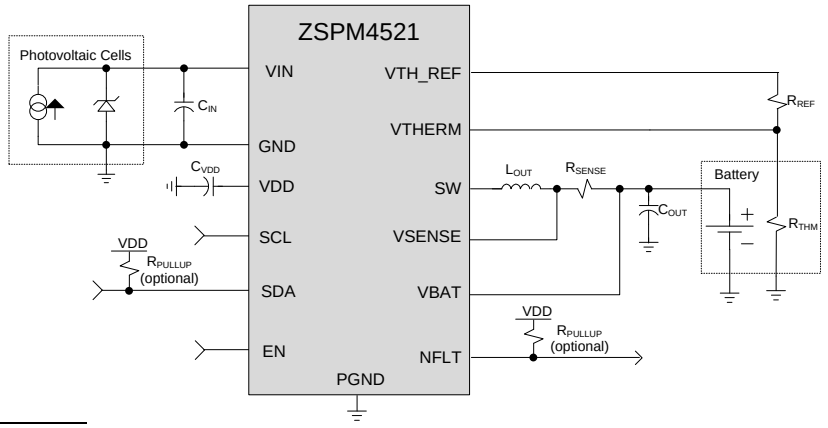
Related ZMDI Smart Power Products

- ZSPM4523 DC/DC Synchronous Switching Super Capacitor Charger With MPPT Regulator
- ZSPM4551 High-Efficiency Li-Ion Battery Charger
- ZSPM4121 Ultra-low Power Under-Voltage Switch
- ZSPM4141 Ultra-Low-Power Linear Regulator

Physical Characteristics

- Wide input voltage range: 4.0V to 7.2V
- Junction operating temperature: -40°C to 125°C
- Package: 16-pin PQFN (4mm x 4mm)

ZSPM4521 Application Circuit



* I^2C™ is a trademark of NXP.

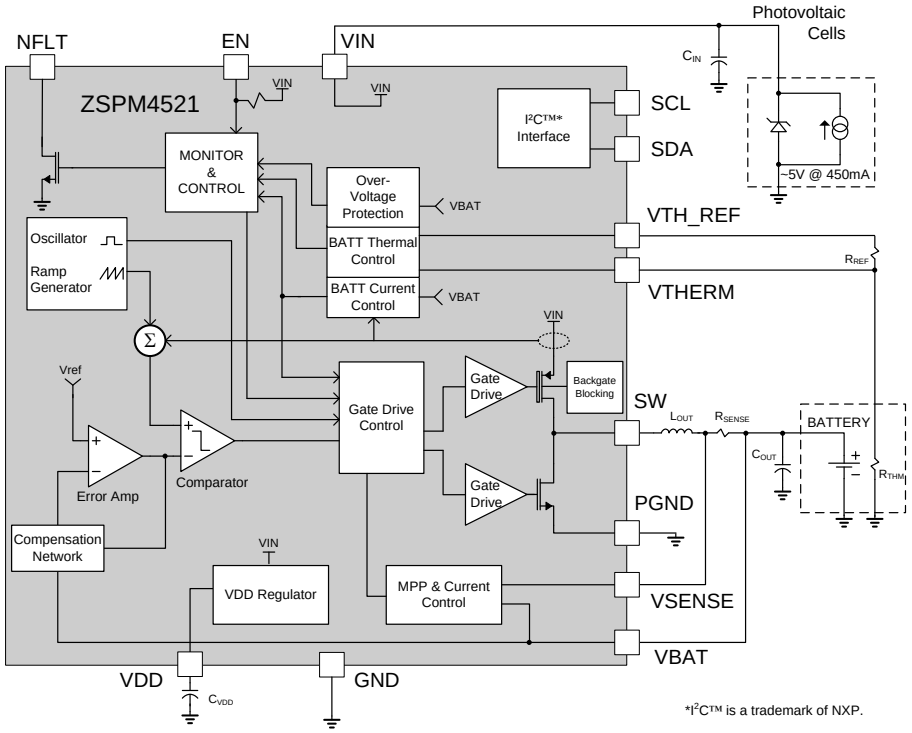
For more information, contact ZMDI via analog@zmdi.com.

ZSPM4521

High-Efficiency Charger for Li-Ion Batteries with Photovoltaic Sources

The Analog Mixed Signal Company

ZSPM4521 Block Diagram



*I²C™ is a trademark of NXP.

Typical Applications

- Portable solar chargers
- Off-grid systems
- Wireless sensor networks
- HVAC controls

Ordering Information

Ordering Code	Description	Package
ZSPM4521AA1W	ZSPM4521 High Efficiency Li-Ion Battery Charger for Photovoltaic Sources	16-pin PQFN / 7” Reel (1000 parts)
ZSPM4521AA1R	ZSPM4521 High Efficiency Li-Ion Battery Charger for Photovoltaic Sources	16-pin PQFN / 13” Reel (3300 parts)
ZSPM4521KIT	ZSPM4521 Evaluation Kit	

Sales and Further Information

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ZSPM4523

High-Efficiency Solar PV MPPT Regulator for Super Cap Systems

The Analog Mixed Signal Company

Brief Description

The ZSPM4523 is a DC/DC synchronous switching super capacitor charger with fully integrated power switches, internal compensation, and full fault protection. It uses a temperature-independent photovoltaic maximum power point tracking (MPPT) calculator to optimize power output from the source during Full-Charge Mode. Its 1MHz switching frequency allows using small filter components, which results in smaller board space and reduced bill-of-material costs.

In Full-Charge Mode, the duty cycle is controlled by the MPPT function. Once the termination voltage is reached, the regulator operates in Constant Voltage Mode. When the regulator is disabled (the EN pin is low), the device draws 10µA (typical) quiescent current from V_{OUT}.

The ZSPM4523 integrates a wide range of protection circuitry, including input supply under-voltage lockout, output over-voltage protection, current limiting, and thermal shutdown.

The ZSPM4523 includes supervisory reporting via the NFLT (Inverted Fault) open-drain output to interface other components in the system. Device programming is achieved by the I²C™* interface through the SCL and SDA pins.

Benefits

- Up to 1.5A continuous output current
- High efficiency – up to 92% at typical load

Features

- Temperature-independent MPPT regulation
- V_{OUT} reverse-current blocking
- Programmable temperature-compensated termination voltage: 2.48 to 2.74 V ± 1%
- User programmable maximum charge current: 50mA to 1500mA
- Input supply under-voltage lockout
- Full protection for V_{OUT} over-voltage
- I^2C™ program interface with EEPROM registers
- Charge status indication

Related ZMDI Smart Power Products

- ZSPM4521 High-Efficiency Charger for Li-Ion Batteries with MPPT Regulator
- ZSPM4551 High-Efficiency Charger for Li-Ion Batteries
- ZSPM4121 Ultra-low Power Under-Voltage Switch
- ZSPM4141 Ultra-Low-Power Linear Regulator

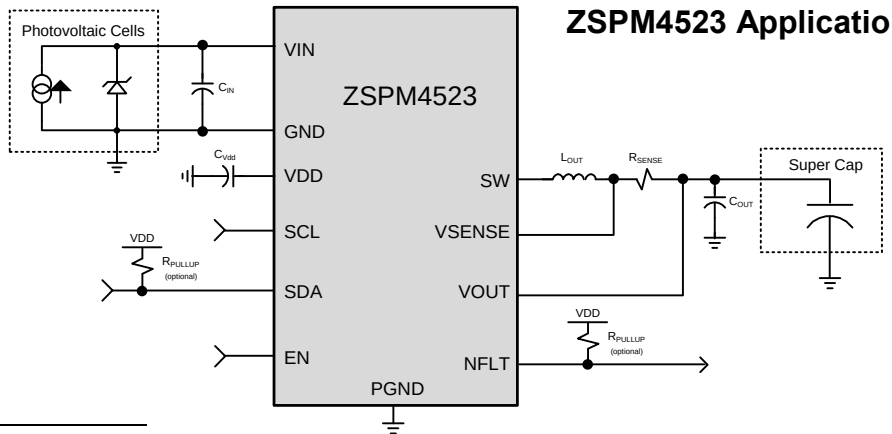
Available Support

- Evaluation Kit
- Support Documentation

Physical Characteristics

- Wide input voltage range: 3.2V to 7.2V
- Junction operating temperature -40°C to 125°C
- Packaged in a 16-pin PQFN (4mm x 4mm)

ZSPM4523 Application Circuit



* I^2C™ is a trademark of NXP.

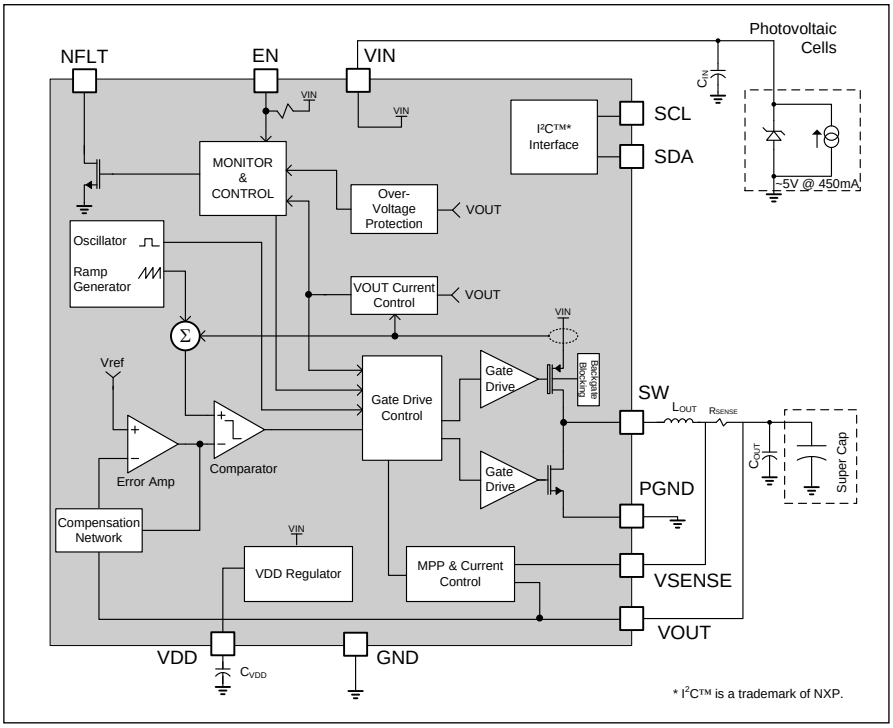
For more information, contact ZMDI via analog@zmdi.com.

ZSPM4523

High-Efficiency Solar PV MPPT Regulator for Super Cap Systems

The Analog Mixed Signal Company

ZSPM4523 Block Diagram



Typical Applications

- Portable solar chargers
- Off-grid systems
- Wireless sensor networks

Ordering Information

Ordering Code	Description	Package
ZSPM4523AA1W	ZSPM4523 High-Efficiency Regulator for Super Cap Systems	16-pin PQFN / 7” Reel (1000 parts)
ZSPM4523AA1R	ZSPM4523 High-Efficiency Regulator for Super Cap Systems	16-pin PQFN / 13” Reel (3300 parts)
ZSPM4523KIT	ZSPM4523 Evaluation Kit	

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ZSPM4551

High-Efficiency Charger for Li-Ion Batteries

The Analog Mixed Signal Company

Brief Description

The ZSPM4551 is a DC/DC synchronous switching lithium-ion (Li-Ion) battery charger with fully integrated power switches, internal compensation, and full fault protection.

Its switching frequency of 1MHz enables the use of small filter components, resulting in smaller board space and reduced BOM costs.

In Full-Charge Constant-Current Mode, the regulation is for constant current (CC). Once termination voltage is reached, the regulator operates in voltage mode. When the regulator is disabled (the EN pin is low), the device draws 10µA (typical) quiescent current.

The ZSPM4551 includes supervisory reporting through the NFLT (inverted fault) open-drain output to interface other components in the system. Device programming is achieved by an I²C™* interface through the SCL and SDA pins.

Benefits

- Up to 1.5A of continuous output current in Full-Charge Constant-Current (CC) Mode
- High efficiency – up to 92% with typical loads

Available Support

- Evaluation Kit
- Support Documentation

Features

- VBAT reverse-current blocking
- Programmable temperature-compensated termination voltage: 3.94V to 4.18V ± 1%
- User programmable maximum charge current: 50mA to 1500mA
- Current mode PWM control in constant voltage
- Supervisor for VBAT reported at the NFLT pin
- Input supply under-voltage lockout
- Full protection for over-current, over-temperature, VBAT over-voltage, and charging timeout
- Charge status indication
- I^2C™ program interface with EEPROM registers

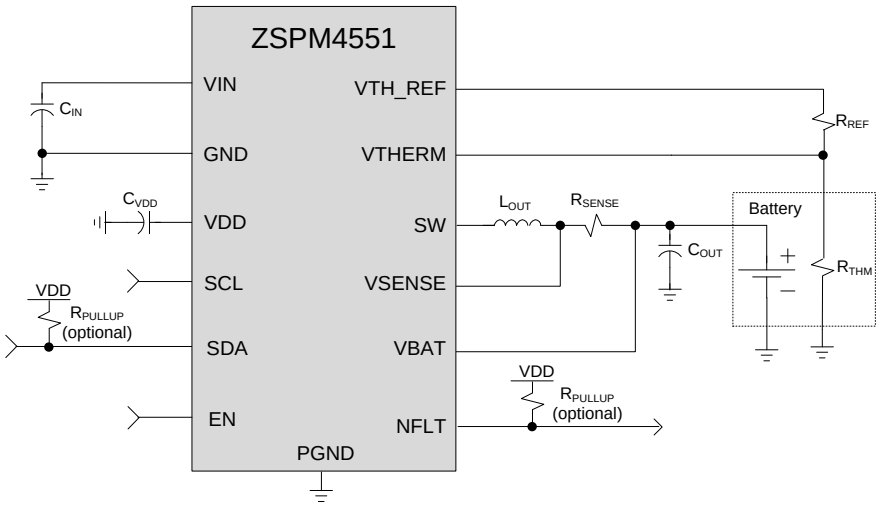
Related ZMDI Smart Power Products

- ZSPM4121 Ultra-low Power Under-Voltage Switch
- ZSPM4141 Ultra-Low-Power Linear Regulator

Physical Characteristics

- Wide input voltage range: V_{BAT} + 0.3V (3.5V min.) to 7.2V
- Junction operating temperature: -40°C to 125°C
- Package: 16-pin PQFN (4mm x 4mm)

ZSPM4551 Application Circuit



* I^2C™ is a trademark of NXP.

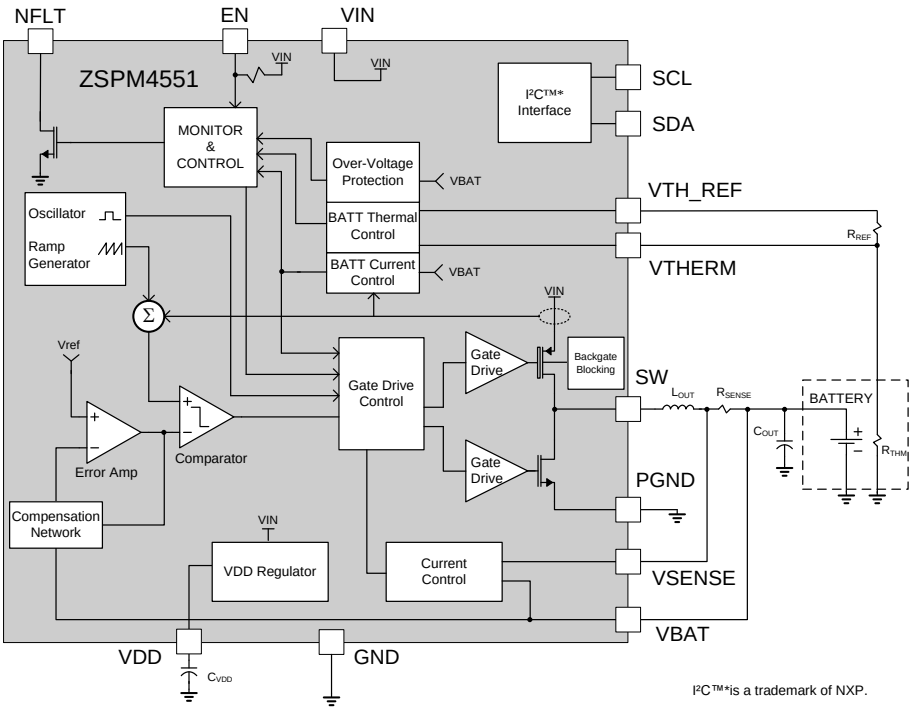
For more information, contact ZMDI via Analog@zmdi.com.

ZSPM4551

High-Efficiency Charger for Li-Ion Batteries

The Analog Mixed Signal Company

ZSPM4551 Block Diagram



I²C™*is a trademark of NXP.

Typical Applications

- Portable battery chargers
- Smart phones
- Laptops
- Tablets/e-readers

Ordering Information

Ordering Code	Description	Package
ZSPM4551AA1W	ZSPM4551 High-Efficiency Li-Ion Battery Charger	16-pin PQFN / 7” Reel (1000 parts)
ZSPM4551AA1R	ZSPM4551 High-Efficiency Li-Ion Battery Charger	16-pin PQFN / 13” Reel (3300 parts)
ZSPM4551KIT	ZSPM4551 Evaluation Kit	

Sales and Further Information

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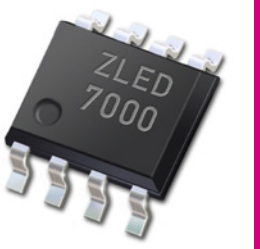
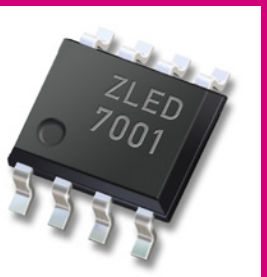
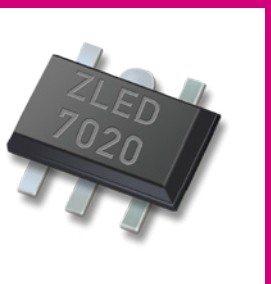
The Analog Mixed Signal Company

LED Lighting ICs







Key Features

- Up to 98% efficiency and 3% accuracy
- Built-in FETs drive 350mA to 1.2A
- Dimmable with DC, PWM and power switch
- Wide input voltage range:
  - 6VDC to 40VDC
  - 8VDC to 450VDC (offline)
- Small SMD packages
- Optimized bill of materials

Industry Applications

- Replacements for fluorescent and incandescent lighting
- LED luminaries for home, commercial, industrial and outdoor lighting

www.zmdi.com

LED_Drivers@zmdi.com

ZLED7000

40V LED Driver with Internal Switch

The Analog Mixed Signal Company

Brief Description

The ZLED7000, one of our ZLED Family of LED control ICs, is an inductive step-down converter that is optimal for driving a single LED or multiple LEDs (connected in series) from a voltage source greater than the voltage rating of the LED. The ZLED7000 operates in continuous mode. Capable of operating efficiently with voltage supplies ranging from 6 VDC to 40 VDC, it is ideal for low-voltage lighting applications. The ZLED7000 minimizes current consumption by remaining in a low-current standby mode (output is off) until a voltage of ≥0.3V is applied to the ADJ pin.

In operating mode, the ZLED7000 can source LEDs with an output current of ≤ 750mA (≤ 30 watts of output power) that is externally adjustable.* The ZLED7000's integrated output switch and high-side current sensing circuit use an external resistor to adjust the average output current. Linearity is achieved via an external control signal at the ZLED7000's ADJ pin, implemented either as a pulse-width modulation (PWM) waveform for a gated output current or a DC voltage for a continuous current.

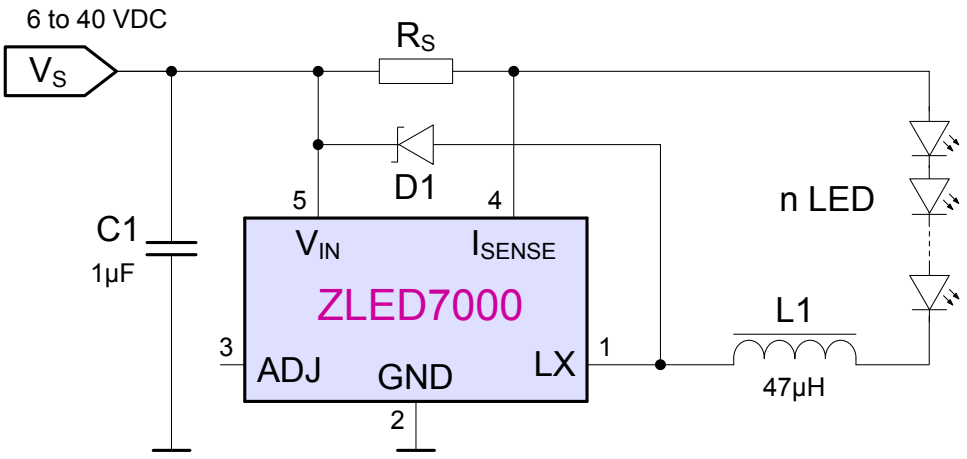
Features

- Capable of up to 95% efficiency*
- Operates in continuous mode with a wide input range from 6 VDC to 40 VDC
- Integrated 40V power switch
- One pin on/off or brightness control via PWM or DC voltage control signal input
- Switching frequency: ≤ 1MHz
- Dimming rate: 1200:1 (typical)
- Output current accuracy: 5% (typical)
- Built-in thermal shutdown and open-circuit protection for LED
- Very few external components needed for operation
- Broad range of applications: outputs up to ≤750mA
- SOT89-5 package

Application Examples

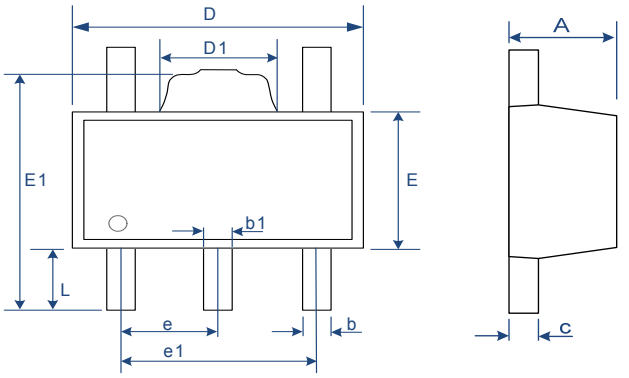
- Illuminated LED signs and other displays
- LED traffic and street lighting (low-voltage)
- Architectural LED lighting, including low-voltage applications for buildings
- Halogen replacement LEDs (low-voltage)
- LED backlighting
- General purpose exterior and interior LED lighting, including applications requiring low-voltage
- General purpose low-voltage industrial applications

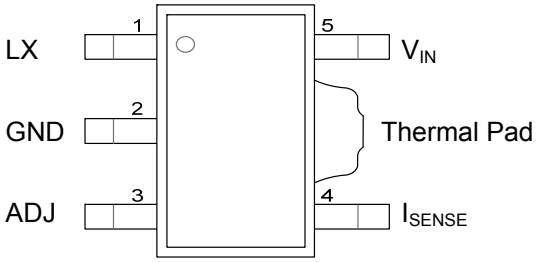
ZLED7000 Application Circuit



* See section 2.3 in the data-sheet for details

SOT89-5 Package Dimensions and Pin Assignments





Symbol	Dimension (mm)		Symbol	Dimension (mm)	
	Min	Max		Min	Max
A	1.400	1.600	E	2.300	2.600
b	0.320	0.520	E1	3.940	4.250
b1	0.360	0.560	e	1.500 Typ	
c	0.350	0.440	e1	2.900	3.100
D	4.400	4.600	L	0.900	1.100
D1	1.400	1.800			

Ordering Information

Product Sales Code	Description	Package
ZLED7000-ZI1R	ZLED7000 – 40V LED Driver	SOT89-5 (Tape & Reel)
ZLED7000KIT-D1	ZLED7000 used in a MR16 Halogen replacement Demo Kit 12VAC/VDC, including 1 ZLED-PCB1	Kit
ZLED-PCB1	Test PCB with one 3W white High Brightness (HB) LED, cascadable to one multiple LED string	Printed Circuit Board (PCB)
ZLED-PCB2	10 unpopulated test PCBs for modular LED string with footprints of 9 common HB LED types	Printed Circuit Board (PCB)

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ZLED7001

Universal LED Driver with Temperature Compensation

The Analog Mixed Signal Company

Brief Description

The ZLED7001, one of our ZLED family of LED control ICs, is a peak current-mode control LED driver IC that is optimal for buck LED driver applications. The ZLED7001 operates in constant off-time mode. Capable of operating efficiently with voltage sources ranging from 8 VDC to 450 VDC or rectified 110 VAC/ 220 VAC, it is ideal for High Brightness (HB) LED applications. The ZLED7001 provides a PWM input for an external dimming control signal. The ZLED7001's linear dimming input can be used both for linear dimming (0 to 240 mV) and temperature compensation of the LED current.

Because the ZLED7001's response time is limited only by the rate of change in the inductor current, it attains a high performance pulse-width modulation (PWM) dimming response. The ZLED7001 ensures proper output current regulation, without loop compensation, via peak current-mode operation.

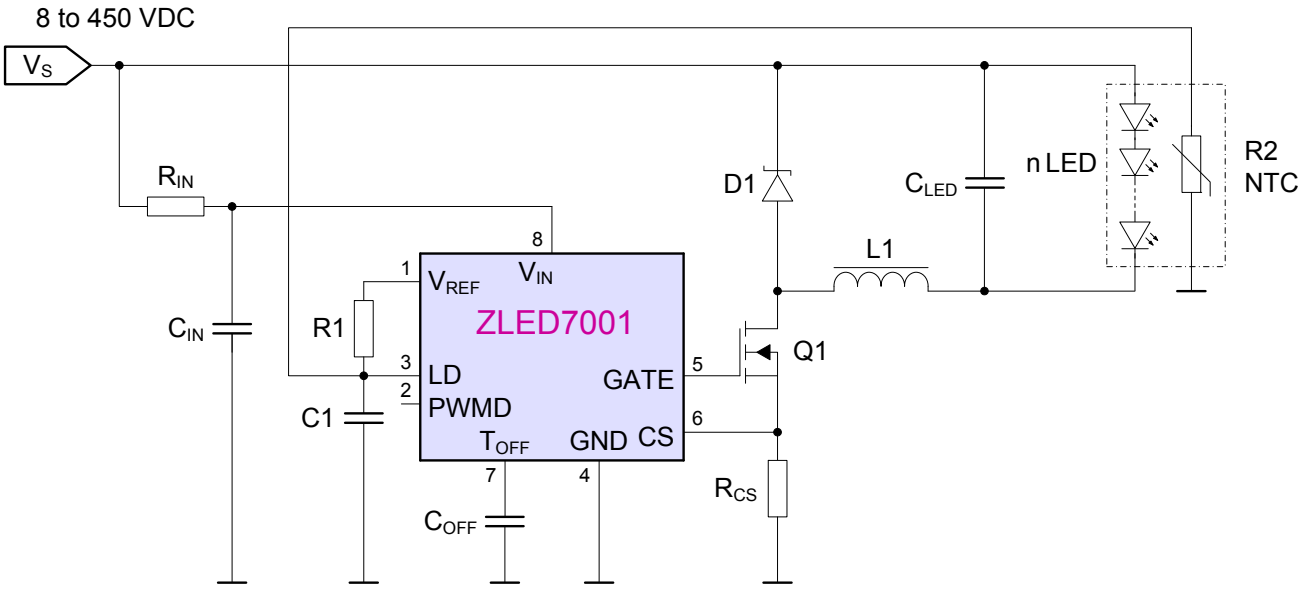
ZLED7001 Features

- Wide input range from 8 VDC to 450 VDC or 110 VAC/220 VAC
- Temperature compensation to protect the LEDs and extend LED lifetime
- Operates in constant off-time mode
- Both PWM and linear dimming control signal inputs available
- Very few external components needed for operation
- Broad range of applications: outputs greater than 1A

Application Examples

- Line-powered replacement LED lighting
- Illuminated LED signs and other displays
- LED street and traffic lighting
- Constant-current source for general purposes
- Architecture / building LED lighting
- LED backlighting
- Line powered LED flood lighting
- Interior / exterior LED lighting

ZLED7001 Application Circuit

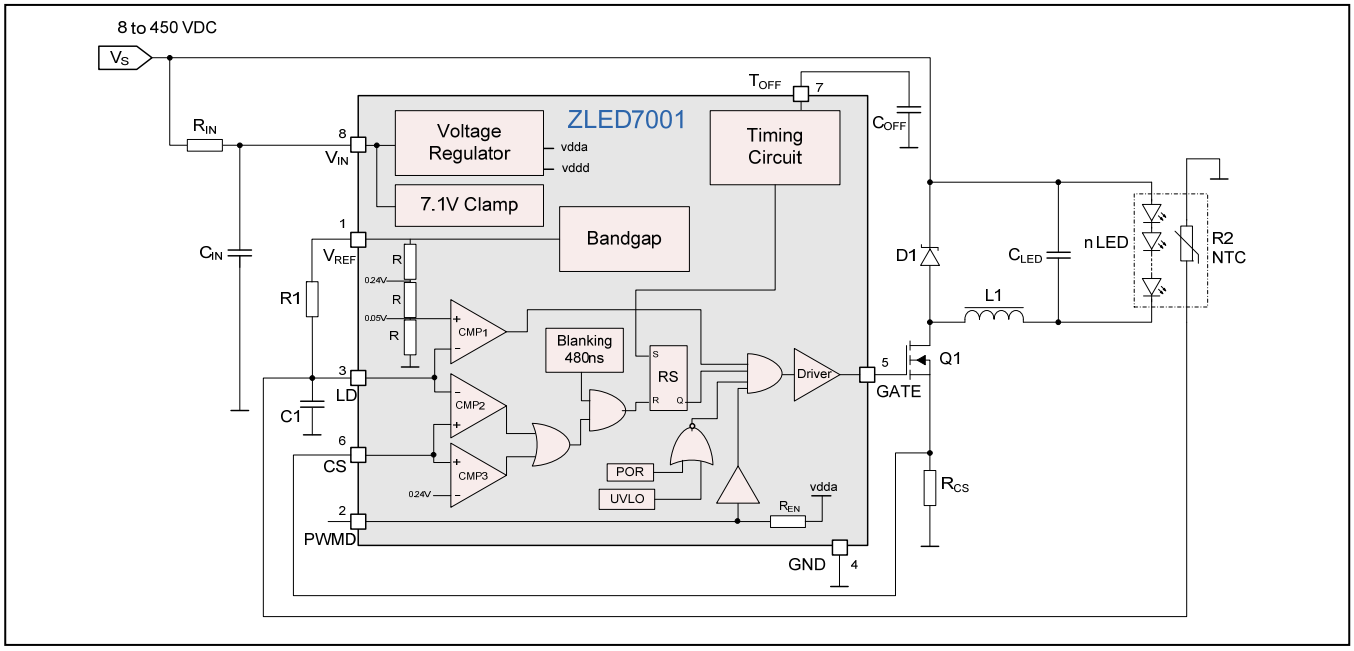


ZLED7001

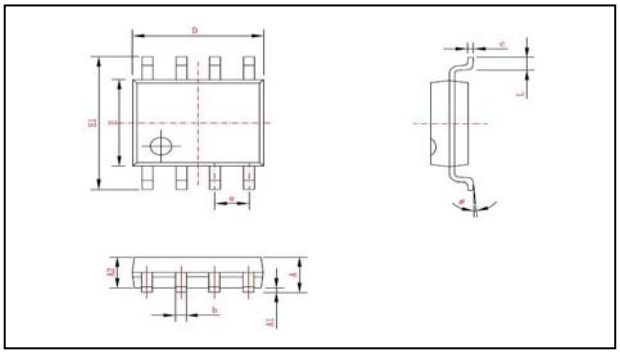
Universal LED Driver with Temperature Compensation

The Analog Mixed Signal Company

ZLED7001 Block Diagram



SOP-8 Package Dimensions (mm, except θ)			
A	1.550 ± 0.200	**E**	3.900 ± 0.100
A1	0.175 ± 0.075	**E1**	6.020 ± 0.220
A2	1.450 Typical	**e**	1.270 Typical
b	0.420 ± 0.070	**L**	0.835 ± 0.435
c	0.214 ± 0.036	**θ**	4° ± 4°
D	4.900 ± 0.100		



Ordering Information

Sales Code	Description	Package
ZLED7001-ZI1R	ZLED7001 – Universal LED Driver with Temperature Compensation	SOP8 (Tape & Reel)
ZLED7001Kit-E1	ZLED7001 Evaluation Board up to 24VAC / 40VDC, including 1 ZLED-PCB1	Kit
ZLED-PCB1	Test PCB with one 3W white HB-LED, cascadable to one multiple LED string	Printed Circuit Board
ZLED-PCB2	10 unpopulated test PCBs for modular LED string with footprints of 9 common HB-LED types	Printed Circuit Board

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ZLED7002

Toggle (Side-Step) Dual-Channel LED Driver

The Analog Mixed Signal Company

Brief Description

The ZLED7002 toggle (side-step) dual-channel LED driver is one of our ZLED family of LED control ICs. It operates in the lower DC voltage supply range of 2.7V to 5.5V. This unique LED driver is capable of controlling a MAIN channel and a SUB channel. Typically, only one of the two channels is active and the ZLED7002 toggles between the channels automatically in response to the voltage supply level and the related voltage at the UV (under-voltage protection) pin. A high-to-low transition of the power supply causes the output current to switch from the MAIN channel to the SUB channel if the UV pin voltage ($V_{UV\text{-}PIN}$) is below the ZLED7002's under-voltage threshold ($V_{UVTHRSH}$=1.17V, typical). A low-to-high transition switches the output current from the SUB channel to the MAIN channel if the UV pin voltage is 80mV (typical) above the under-voltage threshold.

The MAIN channel is a configurable constant current source driving the MAIN LED string with a maximum current draw of 250mA. The MAIN LED channel current is set by an external resistor (R3) connected to the Iset pin. Alternately, the SUB channel is activated when the ZLED7002's SUB pin is pulled to ground. Its current is determined by the forward voltage of the SUB LED and external components. The SUB channel can drive up to 100mA current through the LED channel when active.

The ZLED7002 enables voltage-level indicator applications and low-power battery-driven lighting applications that require switching to a lower-current LED channel when the supply is low, which extends the lighting lifetime. Because the dropout voltage (V_{DP}) is minimal (as low as 0.1V when the MAIN channel output current is ~200mA), the ZLED7002 is optimal for battery-powered applications. Capable of operating efficiently with DC voltage supplies ranging from 2.7V to 5.5V, it is ideal for small portable lighting applications.

The ZLED7002 can also reduce bill-of-material costs because very few external components are required for most applications, making it an optimal fit for small devices for which lighting lifetime is critical. Only four resistors, a diode, and a capacitor are needed for a typical basic application.

Features

- Automatic MAIN channel short-circuit protection switches the output current to the SUB channel if the MAIN LED is shorted
- Under-voltage power supply detection
- Over-temperature protection

Benefits

- Extends lighting life-time by switching to a lower-current LED channel when the supply is low
- 80mV (typical) hysteresis prevents unintended switching activation due to power supply ripple
- Ultra low quiescent current: 250µA typical
- Very few external components needed for operation

Available Support

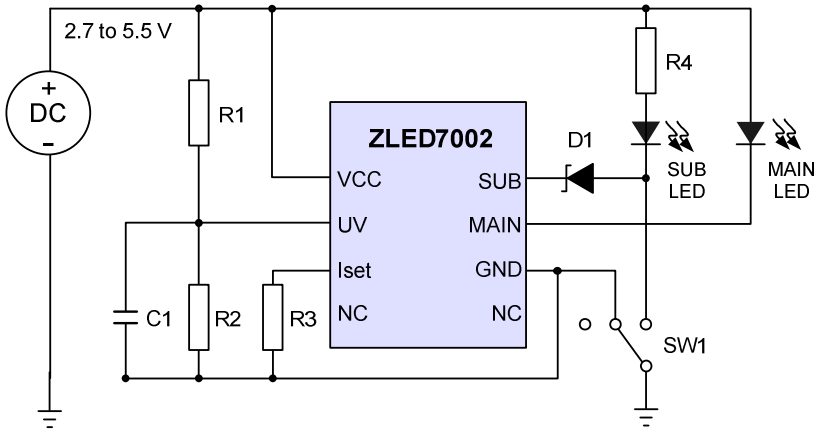
- Evaluation Kit

Physical Characteristics

- Voltage supply: 2.7V to 5.5V DC
- Operating temperature: -25℃ to 85℃
- Small SOP8 package

For additional information on our ZLED driver family, visit www.zmdi.com/products/led-drivers/

ZLED7002 Typical Application Circuit

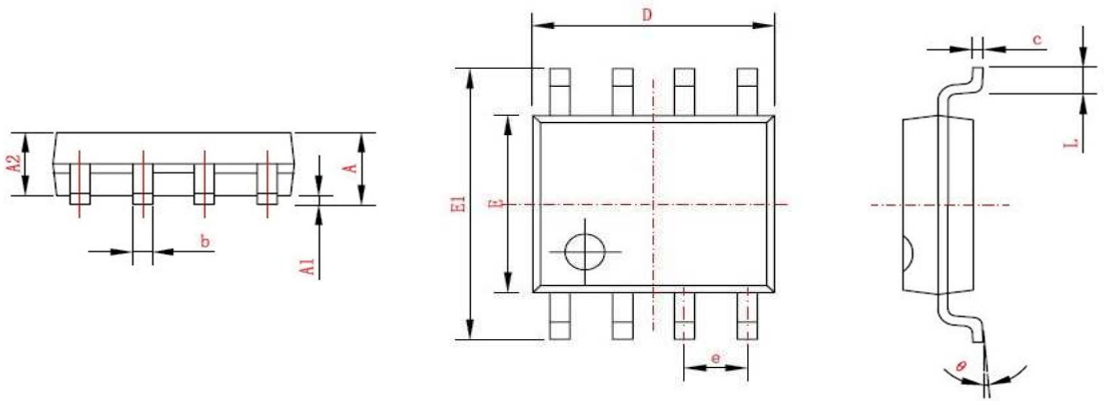


ZLED7002

Toggle (Side-Step) Dual-Channel LED Driver

The Analog Mixed Signal Company

SOP8 Package Dimensions and Pin Assignments



Symbol	Dimension (mm, except θ)	
	Min	Max
A	1.350	1.750
A1	0.100	0.250
A2	1.450 Typical	
b	0.350	0.490
c	0.178	0.250
D	4.800	5.000
E	3.800	4.000
E1	5.800	6.240
e	1.270 Typical	
L	0.400	1.270
θ	0°	8°

Typical Applications

- *Battery-driven LED lighting including*
  - *Helmet lighting*
  - *Bicycle lighting*
  - *Miner lamps*
  - *Pocket lights*
- *Voltage-level indicators*
- *General purpose low-voltage industrial and consumer LED applications*

Ordering Information

Product Sales Code	Description	Package
ZLED7002-ZI1R	ZLED7002 – Toggle (Side-Step) Dual-Channel LED Driver	SOP8 (Tape & Reel)
ZLED7002KIT-E1	ZLED7002 Evaluation Kit	Kit

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ZLED7010

40V LED Driver with Temperature Compensation

Brief Description

The ZLED7010, one of our ZLED Family of LED control ICs, is an inductive step-down converter that is optimal for driving a single LED or multiple LEDs (connected in series) from a voltage source greater than the voltage rating of the LED. The ZLED7010 operates in continuous mode. Capable of operating efficiently with voltage supplies ranging from 6 VDC to 40 VDC, it is ideal for low-voltage lighting applications. The ZLED7010 minimizes current consumption by remaining in a low-current standby mode (output is off) until a voltage of ≥0.3V is applied to the ADJ_I pin.

In operating mode, the ZLED7010 can source LEDs with an output current of ≤ 750mA (≤ 30 watts of output power*) that is externally adjustable. The ZLED7010's integrated output switch and high-side current sensing circuit use an external resistor to adjust the average output current. LED control is achieved via an external control signal at the ZLED7010's ADJ_I pin, implemented as a pulse-width modulation (PWM) waveform for a gated output current or a DC voltage for continuous current.

The ZLED7010 provides a temperature compensation function for maintaining stable and reliable LED operation. LED over-temperature conditions are detected via a negative temperature coefficient (NTC) thermistor mounted close to the LEDs. If an over-temperature condition occurs, the NTC value reaches the value of a threshold resistor and the IC reduces LED current automatically. After the circuit recovers to a safe temperature, current returns to the set value.

ADJ_O outputs and ADJ_I inputs of consecutive ICs can be interconnected as a driver chain deploying the temperature compensation information of the predecessor. This reduces the part count because only the first stage of the series requires an NTC.

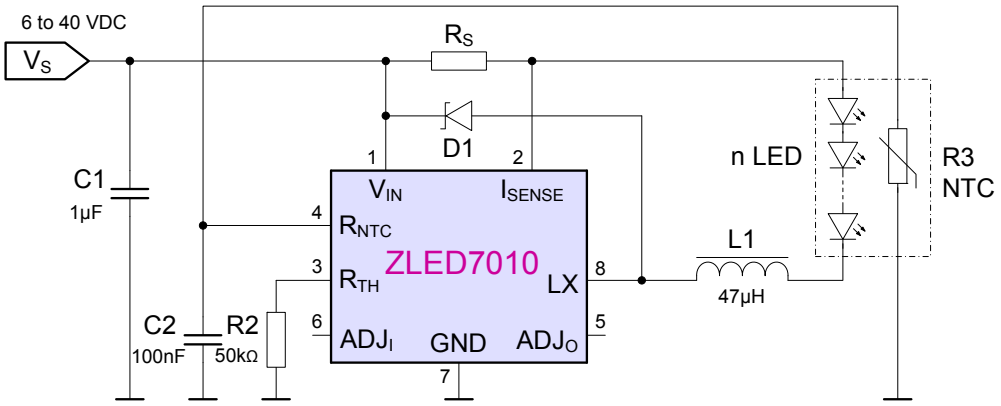
Features

- Capable of 95% efficiency*
- Operates in continuous mode with a wide input range from 6 VDC to 40 VDC
- Integrated 40V power switch
- One-pin on/off or brightness control via DC voltage or PWM control signal
- Switching frequency: ≤ 1MHz
- Dimming rate: 1200:1 (typical)
- Output current accuracy: 5% (typical)
- Built-in temperature compensation and open-circuit protection for LEDs
- Thermal shutdown protection for the ZLED7010
- Very few external components needed for operation
- Broad range of applications: outputs up to ≤750mA
- SOP-8 package

Application Examples

- Illuminated LED signs and other displays
- LED traffic and street lighting (low-voltage)
- Architectural LED lighting, including low-voltage applications for buildings
- Halogen replacement LEDs (low-voltage)
- LED flood-lighting
- LED backlighting
- General purpose exterior and interior LED lighting, including applications requiring low-voltage
- General purpose low-voltage industrial applications

ZLED7010 Application Circuit



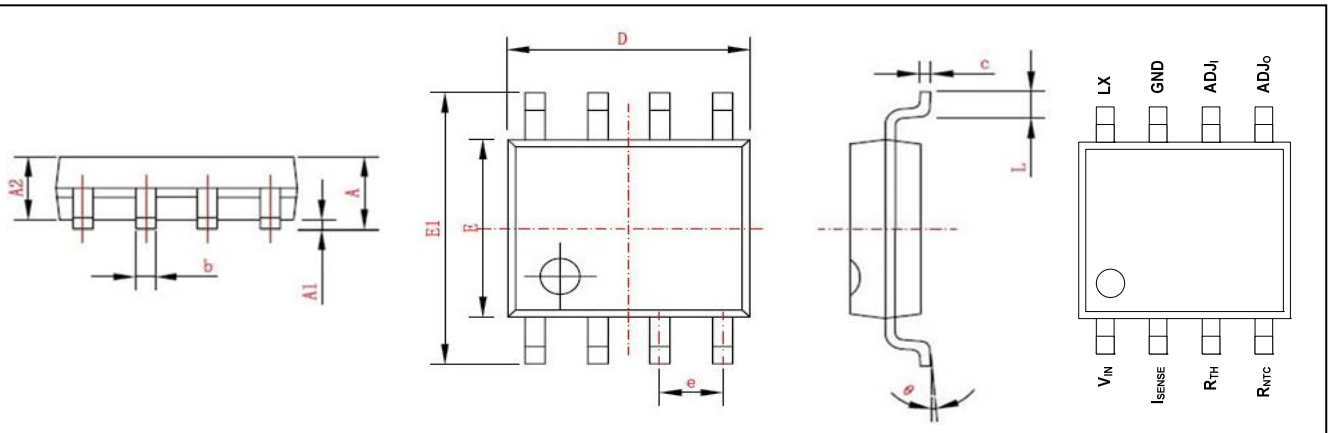
* See section 2.3 in the data-sheet for details

ZLED7010

40V LED Driver with Temperature Compensation

The Analog Mixed Signal Company

SOP-8 Package Dimensions and Pin Assignments



Symbol	Dimension (mm)		Symbol	Dimension (mm, except θ)	
	Min	Max		Min	Max
A	1.350	1.750	E	3.800	4.000
A1	0.100	0.250	E1	5.800	6.240
A2	1.450 Typical		e	1.270 Typical	
b	0.350	0.490	L	0.400	1.270
c	0.178	0.250	θ	0°	8°
D	4.800	5.000			

Ordering Information

Product Sales Code	Description	Package
ZLED7010-ZI1R	ZLED7010 – 40V LED Driver with Temperature Compensation	SOP8 (Tape & Reel)
ZLED7010KIT-D1	ZLED7010 Demo Board with LED on Cool Body 12VAC/VDC	Kit
ZLED-PCB1	Test PCB with one 3W white HB-LED, cascadable to 1 multiple LED string	Printed Circuit Board
ZLED-PCB2	10 unpopulated test PCBs for modular LED string with footprints of 9 common HB-LED types	Printed Circuit Board

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ZLED7012

Low-Voltage Four-Channel LED Driver

The Analog Mixed Signal Company

Brief Description

The ZLED7012, one of our ZLED family of LED control ICs, is a low-noise, constant-frequency charge pump DC/DC converter that can drive up to four LED channels, providing a programmable constant current level ranging from 1.8mA to 20mA per LED channel. It can also drive higher current LEDs because its current sinks can operate in parallel. It enables white or other color LED applications that require uniform intensity and/or linear progressions in brightness. Capable of operating efficiently with DC voltage supplies ranging from 2.8V to 5.5V, it is ideal for small, battery-powered applications because very few external components are needed: typically one small-dimension 1µF capacitor across the C+ and C- pins and two small-dimension 2.2µF capacitors to GND from the VCC and Vout pins.

The ZLED7012's Pulse Count Control (PCC) serial digital input is used to enable/disable the LEDs and set the current level (14 settings using a nearly logarithmic scale to provide a linear brightness progression). This simple, high-speed interface allows efficient real-time management of LEDs via microcontrollers or control systems.

The ZLED7012's features include integrated soft-start circuitry to protect against excessive in-rush current during power-on and a low-current shutdown mode that reduces quiescent current consumption to approximately 1µA (typical) by disconnecting the load from the input when the EN/SET pin is low for a specified time.

Features

- Low quiescent current in low-current shutdown mode: 1µA typical; <2µA maximum
- Integrated thermal shutdown protection prevents damage by shutting down the ZLED7012 if the die junction temperature exceeds 160°C (typical)
- Fixed charge pump switching frequency: 1MHz (typ.)
- Soft-start feature protects against excessive inrush current during power-on

Benefits

- Current matching accuracy: ±0.9% (typical)
- One-pin on/off or brightness control for up to four LEDs via a simple PCC serial interface—no pulse-width modulation or additional control circuit needed
- 14 programmable current levels for achieving real-time control of effects such as LED fade-out or sudden changes in brightness
- Low EMI and back-injected noise because the charge pump is not inductor-based
- Very few external components needed for operation
- Flexible design enables diverse LED applications: up to 20mA per channel
- LED driver family concept with low-voltage six-channel LED driver ZLED7022

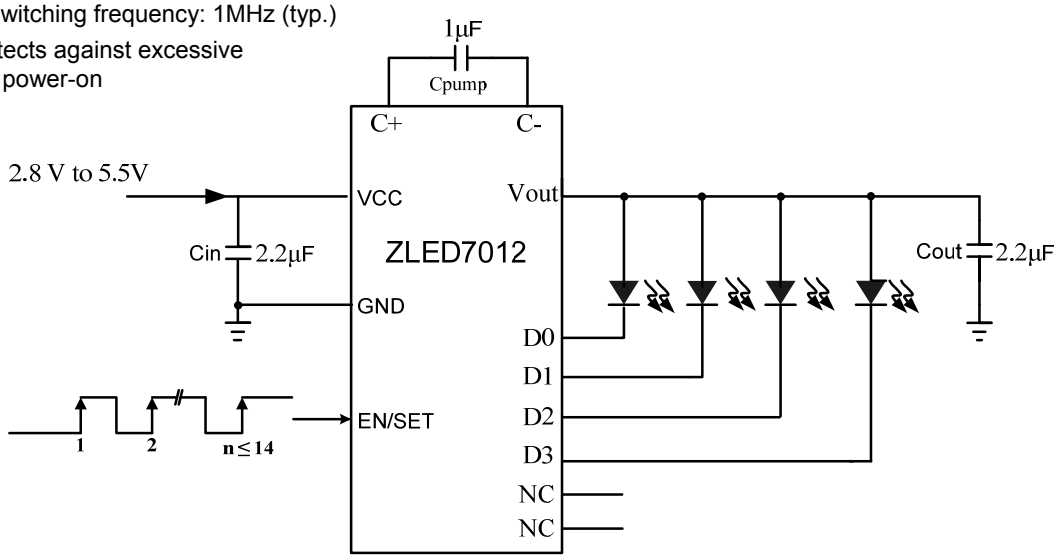
Available Support

- Evaluation Kit

Physical Characteristics

- Voltage supply: 2.8V to 5.5V DC
- Operating temperature: -40°C to 85°C
- Small footprint 12-pin UTQFN package (2mm×2mm)

ZLED7012 Application Circuit

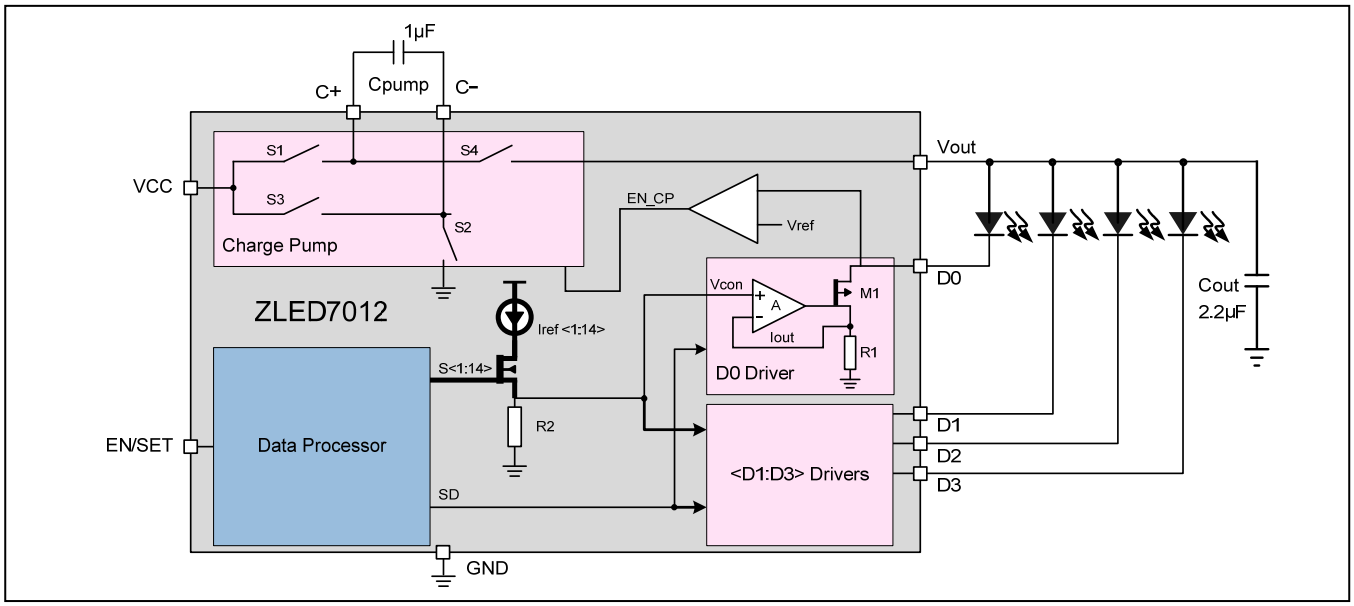


ZLED7012

Low-Voltage Four-Channel LED Driver

The Analog Mixed Signal Company

Block Diagram



Typical Applications

- *LED backlighting for portable devices*
- *LED lighting for cell phones, smartphones. PDAs*
- *Illumination of digital photo frames*
- *Backlighting for GPS / navigation systems*
- *Low voltage LED lighting fixtures*
- *General purpose low-voltage industrial and consumer applications*

Ordering Information

Product Sales Code	Description	Package
ZLED7012-ZI1R	ZLED7012 – Low-Voltage Four-Channel LED Driver	UTQFN12 (2x2)mm Tape & Reel
ZLED7012KIT-E1	ZLED7012 Evaluation Board	Kit

Sales and Further Information

www.zmdi.com

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ZLED7015

1.0MHz Boost Converter with Internal 35V Switch

The Analog Mixed Signal Company

Brief Description

The ZLED7015, one of our ZLED family of LED control ICs, is a constant current boost converter with an internal high-power 35V switch. It is optimal for driving multiple white LEDs connected in series so that the LED current is uniform for better brightness and color control. It can also drive devices that require a constant voltage and is capable of operating efficiently with voltage supplies ranging from 6VDC to 30VDC. It is ideal for diverse lighting applications requiring low supply voltages such as SELV applications. Typically, smaller, less expensive external components can be used since the ZLED7015 switches at 1.0MHz (typical).

The ZLED7015 output current is adjustable via an external current sense resistor R_S connected from the FB pin to ground.

The ZLED7015 improves efficiency and minimizes power losses in the current setting resistor R_S by use of an internal 0.3V feedback reference voltage.

Dimming can be controlled using a pulse-width modulation (PWM) waveform or a DC voltage applied to the FB pin.

The ZLED7015 provides a “soft-start” function to prevent excessive in-rush current on start-up and ensures a controlled rise of the output voltage.

Over-voltage protection is adjustable via external resistors R_1 and R_2.

Features

- Integrated 35V power switch
- Wide input range: 6VDC to 30VDC
- Over-temperature protection
- Over-voltage (open LED string) protection adjusted via external resistor divider
- Under-voltage lockout ensures reliable circuit operation
- Control of output current during start-up via internal “soft-start”
- Switching frequency: 1.0MHz
- Single pin on/off or brightness control via PWM, microcontroller, or DC voltage control signal input
- MSOP-10 package

Benefits

- High efficiency: up to 95% efficiency
- Few small, low-profile components needed for operation
- Small form-factor package

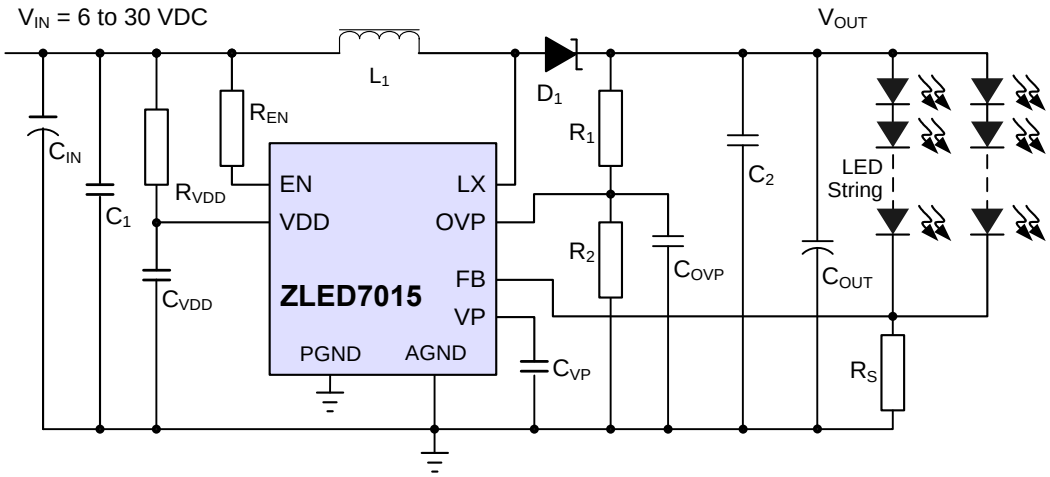
Available Support

- Evaluation Kit

Physical Characteristics

- Operating temperature: -40°C to 85°C
- RoHS-compliant

ZLED7015 Typical Application Circuit

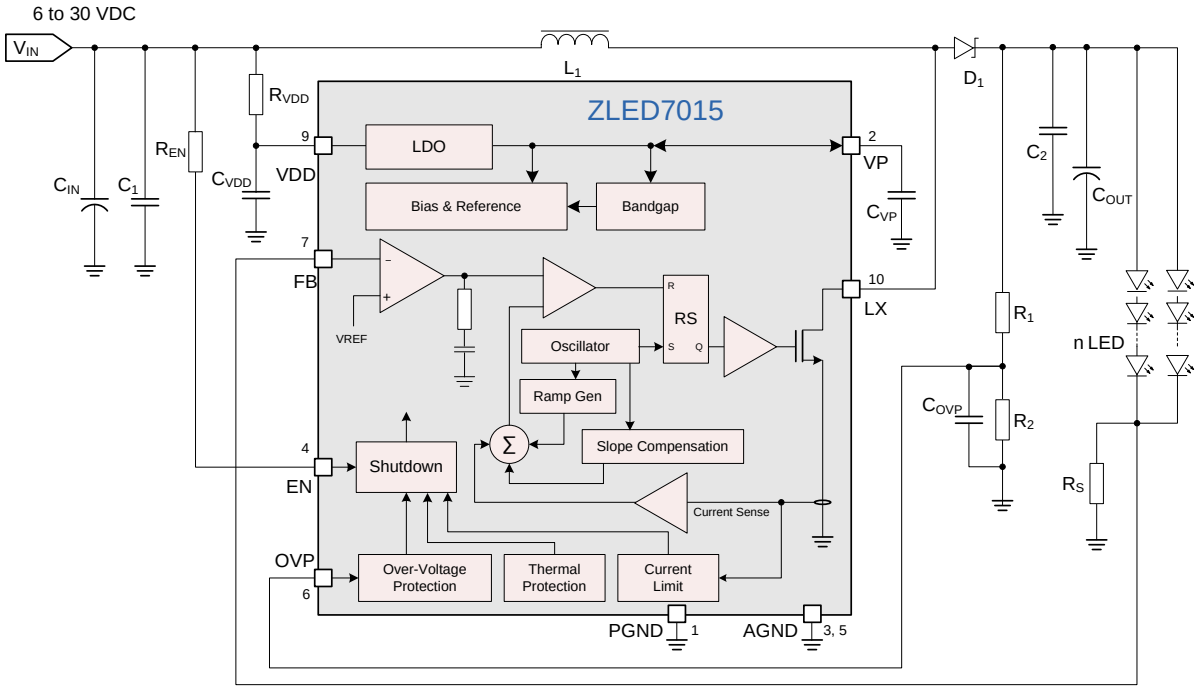


ZLED7015

1.0MHz Boost Converter with Internal 35V Switch

The Analog Mixed Signal Company

ZLED7015 Block Diagram



Typical Applications

- *Low-Voltage Retro-fit Lighting*
- *MR16 Lights*
- *SELV Lighting*
- *Signage and Outdoor Lighting*
- *Architectural/Building Lighting*
- *Replacement Tubes*
- *LED Backlighting*
- *General Purpose Low-Voltage Industrial and Consumer Applications*

Ordering Information

Product Sales Code	Description	Package
ZLED7015-ZI1R	ZLED7015 – 1.0MHz Boost Converter with Internal 35V Switch	MSOP-10 (Tape & Reel)
ZLED7015KIT-E1	ZLED7015-E1 Evaluation Board, 1 ZLED-PCB10, and 5 ZLED7015 ICs	Kit

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ZLED7020

High Current 40V LED Driver with Internal Switch

Brief Description

The ZLED7x20 continuous-mode inductive step-down converter family is part of our line of LED-control ICs. It is designed for applications requiring high brightness and high current. It can efficiently drive a single LED or multiple series-connected LEDs from a voltage input higher than the LED forward voltage: Vin = 6 to 40 VDC. It provides an adjustable output current ≤1.2A, which is set via an external resistor and controlled by the ZLED7x20's integrated high-side output current-sensing circuit and high speed internal 40V power switch. An external control signal, which can be a DC voltage, PWM, or microcontroller-generated waveform, on the ADJ pin can also be used to linearly adjust a continuous output current or to control a gated output current.

The output can be turned off by applying a voltage lower than 0.2V to the ADJ pin, which puts the ZLED7x20 in a low-current standby state.

The ZLED7x20 enables diverse industrial and consumer lighting applications requiring high driving currents, wide operating voltage range, high efficiency, and variable brightness control. It offers over-temperature and LED open-circuit protection. The ZLED7x20 can also minimize bill-of-material costs because very few external components are required for most applications. Only a resistor, a diode, an inductor, and three capacitors are needed for a typical basic application.

Features

- Up to 1.2A output current
- Internal 40V power switch
- Wide DC input voltage range 6 to 40 VDC
- Output current accuracy: 3% (typical)
- Dimming ratio: 1200:1
- LED open-circuit protection
- Thermal shutdown protection

Benefits

- High efficiency: up to 98%
- Single pin on/off and brightness control using DC voltage or PWM
- Very few external components needed for operation
- Footprint compatible to our ZLED7000 depending on the application.

Available Support

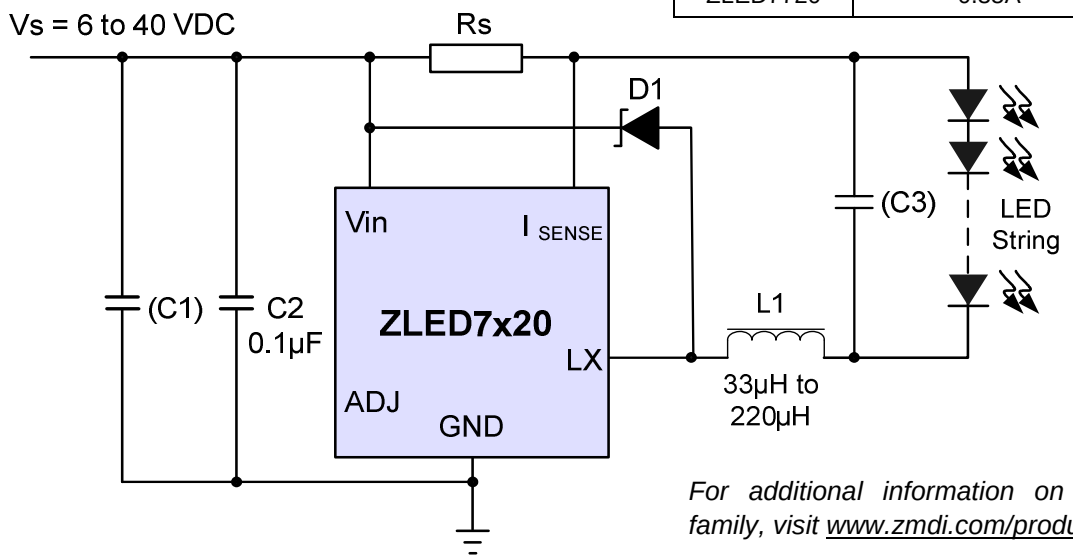
- Evaluation Kit

Physical Characteristics

- Operating temperature: -40℃ to 105℃
- Switching frequency: up to 1MHz

ZLED7x20 Family Selection Matrix		
Product	**Max. Current Output**	**Package**
ZLED7020	1.2A	SOT89-5
ZLED7320	1.0A	DFN-5
ZLED7520	0.75A	DFN-5
ZLED7720	0.35A	DFN-5

ZLED7x20 Typical Application Circuit



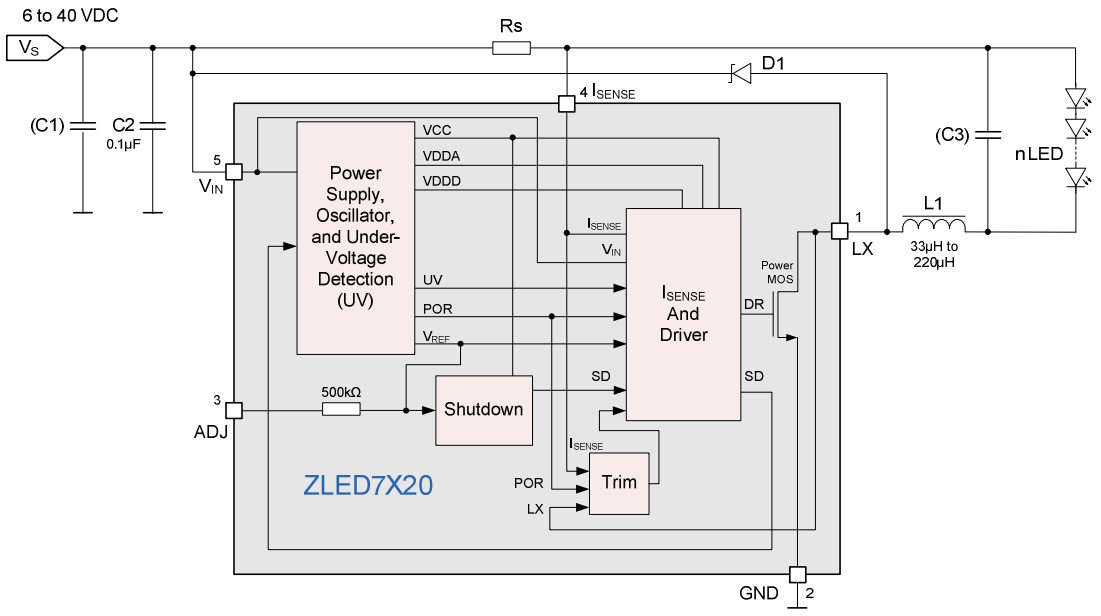
For additional information on our ZLED driver family, visit www.zmdi.com/products/led-drivers/

ZLED7020

High Current 40V LED Driver with Internal Switch

The Analog Mixed Signal Company

ZLED7x20 Block Diagram



Typical Applications

- *Illuminated LED signs and other displays*
- *LED street and traffic lighting (low voltage)*
- *Architecture/building LED lighting*
- *LED backlighting*
- *Interior/exterior LED lighting*
- *MR16 LED spot lights*
- *Retrofit LED lighting fixtures*
- *General purpose industrial and consumer LED applications*

Ordering Information

Product Sales Code	Description	Package
ZLED7020-ZI1R	ZLED7020 – High Current (1200mA) 40V LED Driver with Internal Switch	SOT89-5 (Tape & Reel)
ZLED7320-ZI1R	ZLED7320 – High Current (1000mA) 40V LED Driver with Internal Switch	DFN-5 (Tape & Reel)
ZLED7520-ZI1R	ZLED7520 – High Current (750mA) 40V LED Driver with Internal Switch	DFN-5 (Tape & Reel)
ZLED7720-ZI1R	ZLED7720 – High Current (350mA) 40V LED Driver with Internal Switch	DFN-5 (Tape & Reel)
ZLED7020KIT-D1	ZLED7020-D1 Demo Board, 1 ZLED-PCB8 and 5 ZLED7020 ICs	Kit
ZLED-PCB8	Test PCB with one 5W white High Brightness (HB) LED, cascadable to one multiple LED string	Printed Circuit Board (PCB)

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ZLED7022

Low-Voltage Six-Channel LED Driver

The Analog Mixed Signal Company

Brief Description

The ZLED7022, one of our ZLED family of LED control ICs, is a low-noise, constant-frequency charge pump DC/DC converter that can drive up to six LED channels, providing a programmable constant current level ranging from 1.8mA to 20mA per LED channel. It can also drive higher current LEDs because its current sinks can operate in parallel. It enables white or other color LED applications that require uniform intensity and/or linear progressions in brightness. Capable of operating efficiently with DC voltage supplies ranging from 2.8V to 5.5V, it is ideal for small, battery-powered applications because very few external components are needed: typically one small-dimension 1µF capacitor across the C+ and C- pins and two small-dimension 2.2µF capacitors to GND from the VCC and Vout pins.

The ZLED7022's Pulse Count Control (PCC) serial digital input is used to enable/disable the LEDs and set the current level (14 settings using a nearly logarithmic scale to provide a linear brightness progression). This simple, high-speed interface allows efficient real-time management of LEDs via microcontrollers or control systems.

The ZLED7022's features include integrated soft-start circuitry to protect against excessive in-rush current during power-on and a low-current shutdown mode that reduces quiescent current consumption to approximately 1µA (typical) by disconnecting the load from the input when the EN/SET pin is low for a specified time.

Features

- Low quiescent current in low-current shutdown mode: 1µA typical; <2µA maximum
- Integrated thermal shutdown protection prevents damage by shutting down the ZLED7022 if the die junction temperature exceeds 160°C (typical)
- Fixed charge pump switching frequency: 1MHz (typ.)
- Soft-start feature protects against excessive inrush current during power-on

Benefits

- Current matching accuracy: ±0.9% (typical)
- One-pin on/off or brightness control for up to six LEDs via a simple PCC serial interface—no pulse-width modulation or additional control circuit needed
- 14 programmable current levels for achieving real-time control of effects such as LED fade-out or sudden changes in brightness
- Low EMI and back-injected noise because the charge pump is not inductor-based
- Very few external components needed for operation
- Flexible design enables diverse LED applications: up to 20mA per channel
- LED driver family concept with low-voltage four-channel LED driver ZLED7012

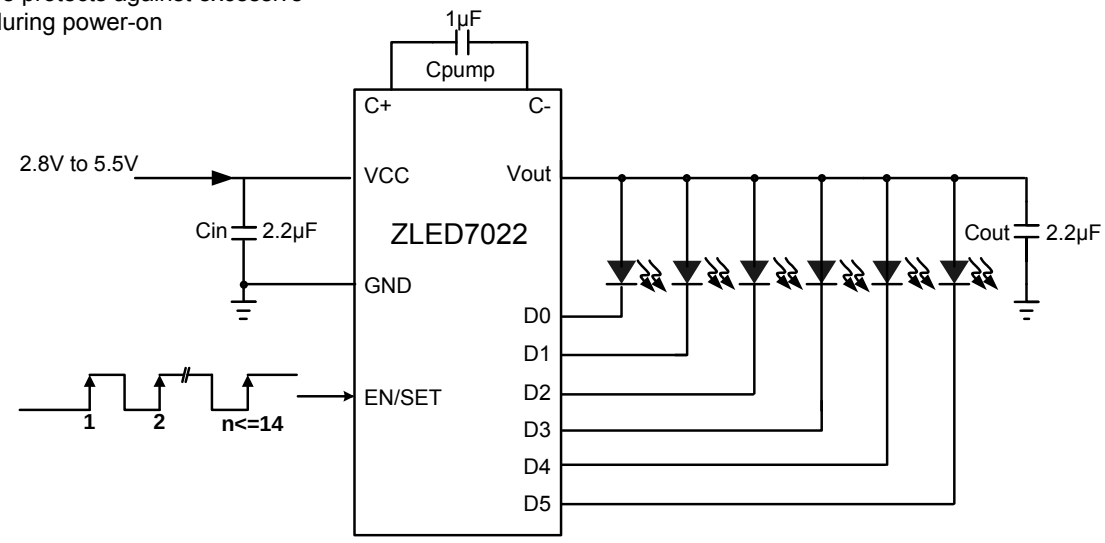
Available Support

- Evaluation Kit

Physical Characteristics

- Voltage supply: 2.8V to 5.5V DC
- Operating temperature: -40°C to 85°C
- Small footprint 12-pin UTQFN package (2mm×2mm)

ZLED7022 Application Circuit

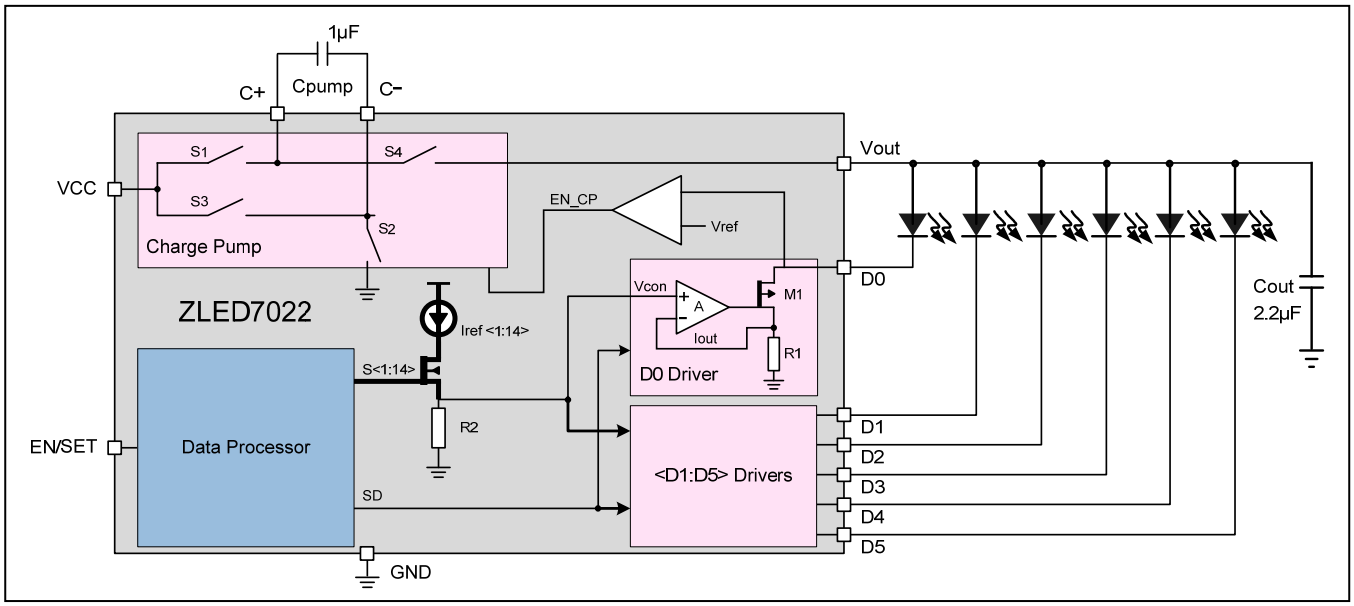


ZLED7022

Low-Voltage Six-Channel LED Driver

The Analog Mixed Signal Company

Block Diagram



Typical Applications

- *LED backlighting for portable devices*
- *LED lighting for cell phones, smartphones. PDAs*
- *Illumination of digital photo frames*
- *Backlighting for GPS / navigation systems*
- *Low voltage LED lighting fixtures*
- *General purpose low-voltage industrial and consumer applications*

Ordering Information

Product Sales Code	Description	Package
ZLED7022-ZI1R	ZLED7022 – Low-Voltage Six-Channel LED Driver	UTQFN12 (2x2)mm - Tape & Reel
ZLED7022KIT-E1	ZLED7022 Evaluation Board	Kit

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ZLED7030

High Current 40V LED Driver with Switch Dimming

Brief Description

The ZLED7x30 continuous-mode inductive step-down converter family is one of our ZLED LED-control ICs. It is designed for applications requiring high brightness and high current. The ZLED7x30 can efficiently drive a single LED or multiple series-connected LEDs from a voltage input higher than the LED forward voltage (Vin = 8.5 to 40VDC). It provides an adjustable output current (1.2A maximum), which is set via an external resistor and controlled by the ZLED7x30's integrated high-side output current-sensing circuit and high speed internal 40V power switch. Its low conducting impedance ensures high system efficiency.

The ZLED7x30 provides a switch dimming function. It detects external switch action to adjust output current, allowing dimming functionality to be achieved without changing the original lighting system circuitry.

The switch dimming is implemented in either two-level mode or three-level mode. The output current of every level and the total number of levels are customer selected by setting the corresponding input conditions of DIM1 and DIM2 pin.

The ZLED7x30 enables diverse industrial and consumer lighting applications requiring high driving currents, wide operating voltage range, high efficiency, and variable brightness control. It offers over-temperature and LED open-circuit protection. The ZLED7x30 can also minimize bill-of-material costs because very few external components are required for most applications. Only a resistor, a diode, an inductor, and three capacitors are needed for a typical basic application.

Features

- Switch dimming with multiple levels
- Three modes for output level settings
- Up to 1.2A output current
- Internal 40V power switch
- Wide DC input voltage range 8.5 to 40 VDC
- Output current accuracy: 5% (typical)
- LED open-circuit protection
- Thermal shutdown protection

Benefits

- High efficiency: up to 98%
- Very few external components needed for operation
- Adds switch dimming function to existing installation

Available Support

- Evaluation Kit

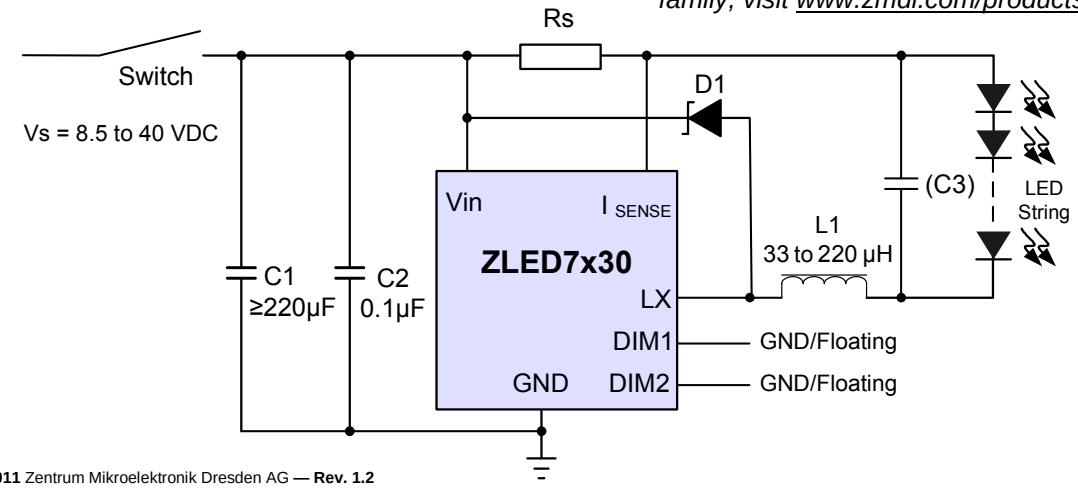
Physical Characteristics

- Operating temperature: -40℃ to 105℃
- Switching frequency: up to 1MHz
- SOP-8 package

ZLED7x30 Family Selection Matrix		
Product	**Max. Current Output**	**Package**
ZLED7030	1.2A	SOP-8
ZLED7330	1.0A	SOP-8
ZLED7530	0.75A	SOP-8
ZLED7730	0.35A	SOP-8

For additional information on our ZLED driver family, visit www.zmdi.com/products/led-drivers/

ZLED7x30 Typical Application Circuit

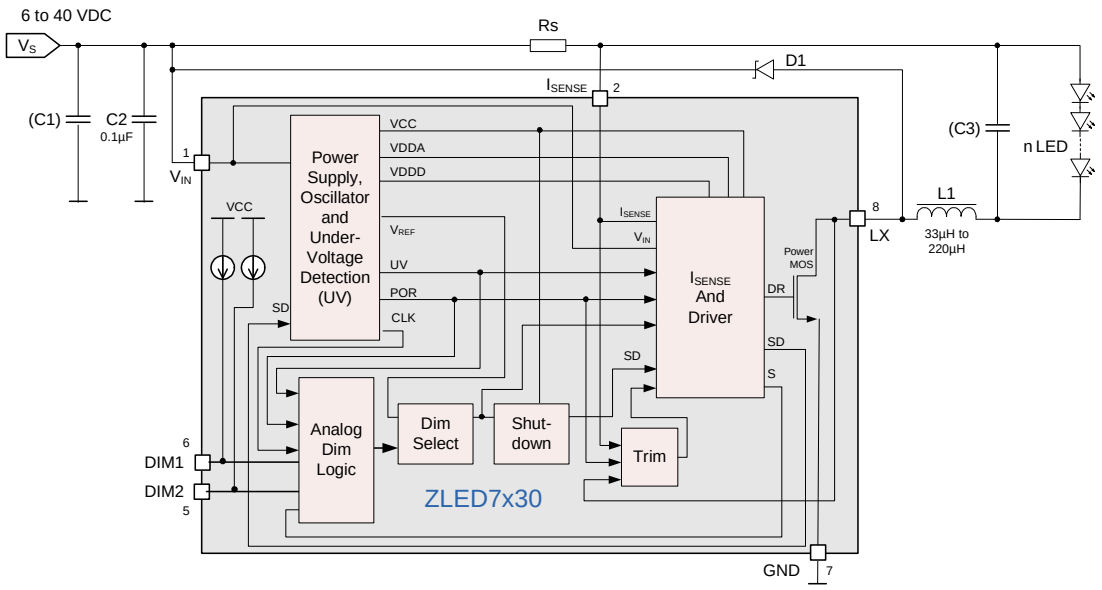


ZLED7030

High Current 40V LED Driver with Switch Dimming

The Analog Mixed Signal Company

ZLED7x30 Block Diagram



Typical Applications

- *Illuminated LED signs and other displays*
- *LED street and traffic lighting (low voltage)*
- *Architecture/building LED lighting*
- *LED backlighting*
- *Interior/exterior LED lighting*
- *MR16 LED spot lights*
- *Retrofit LED lighting fixtures*
- *General purpose industrial and consumer LED applications*

Ordering Information

Product Sales Code	Description	Package
ZLED7030-ZI1R	ZLED7030 – High Current (1200mA) 40V LED Driver with Switch Dimming	SOP-8 (Tape & Reel)
ZLED7330-ZI1R	ZLED7330 – High Current (1000mA) 40V LED Driver with Switch Dimming	SOP-8 (Tape & Reel)
ZLED7530-ZI1R	ZLED7530 – High Current (750mA) 40V LED Driver with Switch Dimming	SOP-8 (Tape & Reel)
ZLED7730-ZI1R	ZLED7730 – High Current (350mA) 40V LED Driver with Switch Dimming	SOP-8 (Tape & Reel)
ZLED7030KIT-D1	ZLED7030-D1 Demo Board, 1 ZLED-PCB8 and 5 ZLED7030 ICs	Kit
ZLED-PCB8	Test PCB with one 5W white High Brightness (HB) LED, cascadable to one multiple LED string	Printed Circuit Board (PCB)

Sales and Further Information

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ZSLS7025

Boost LED Driver

Brief Description

The ZSLS7025, one of our ZSLS Family of LED control ICs, is a constant current boost converter designed for driving high-brightness LEDs. It is optimal for driving multiple white LEDs connected in series so that the LED current is uniform for better brightness and color control. The wide input range and high output current enables diverse industrial, after-market automotive, and consumer lighting applications.

The ZSLS7025 output current is adjustable via an external current sense resistor and can deliver stable constant output current from a few milliamps up to 2A or higher.

The ZSLS7025 drives a constant current into the load. The control loop features a pulse frequency modulated (PFM) architecture that is inherently stable and does not need loop compensation.

The ZSLS7025 supports pulse-width modulation (PWM) or linear voltage dimming, which allows flexible control of the LED luminance.

The ZSLS7025 can operate in applications with a wide input voltage range from 5V to 100V. An integrated over-voltage protection (OVP) circuit protects the system, even under no-load conditions. The over-voltage protection is adjustable via external resistors R_1 and R_2.

Features

- Wide application input voltage range: 5V to 100V (Higher voltage supported. See section 2.1 in the data sheet.)
- Constant current output limited only by external component selection
- No loop compensation required
- Internal over-voltage protection
- Internal over-temperature protection
- Brightness control via PWM or DC voltage control signal input
- SOP-8 package

Benefits

- High efficiency: up to 95%
- Minimum bill of materials
- Small form-factor package

Available Support

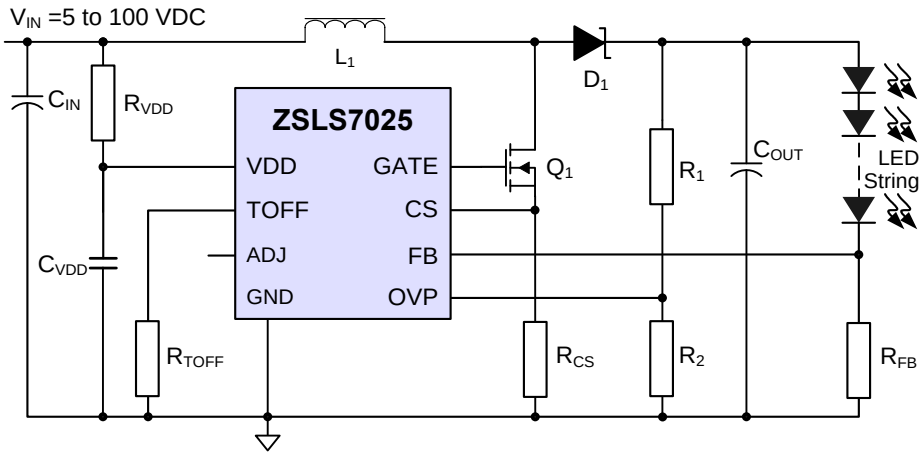
- Demonstration Kit

Physical Characteristics

- Junction temperature: -40°C to 125°C
- RoHS compliant

For additional information on our LED driver family, visit www.zmdi.com/products/led-drivers/

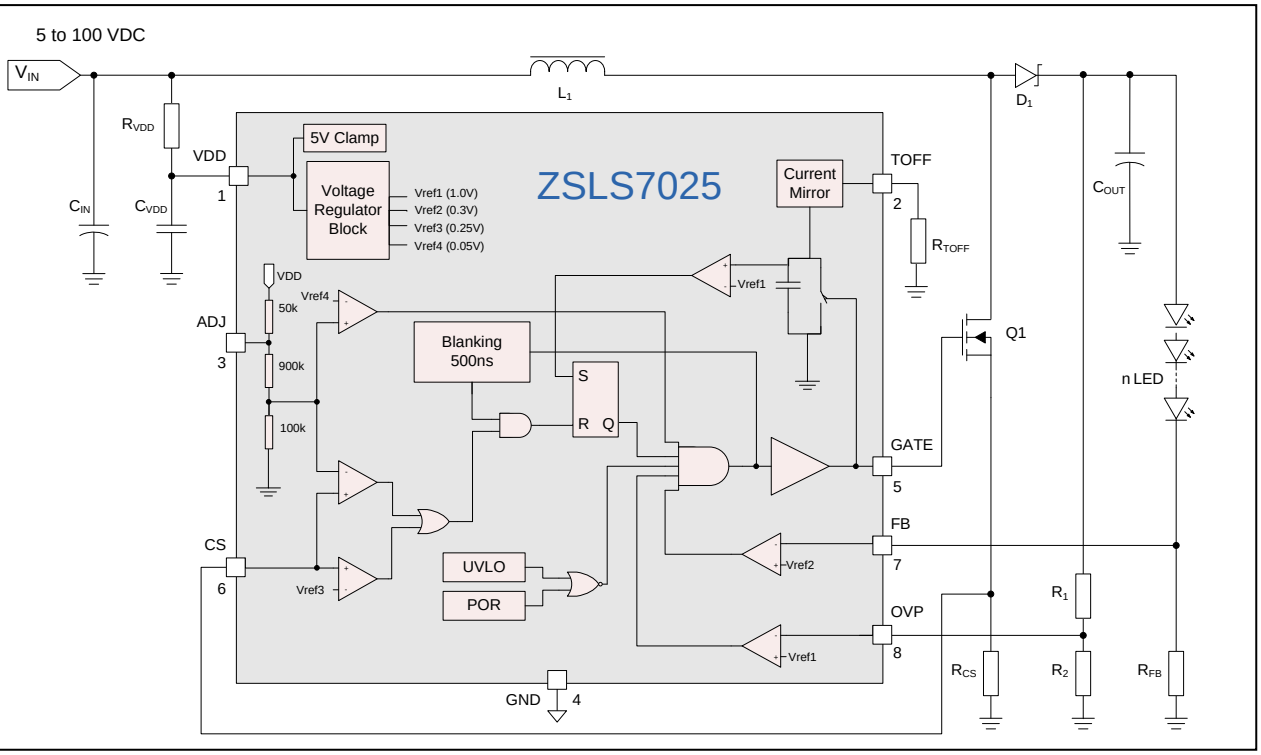
ZSLS7025 Typical Application Circuit



ZSLS7025

Boost LED Driver

ZSLS7025 Block Diagram



Typical Applications

- *Retro-fit Lighting*
- *MR16 Lights*
- *SELV Lighting*
- *Signage and Outdoor Lighting*
- *Architectural/Building Lighting*
- *Replacement Tubes*
- *LED Backlighting*
- *General Purpose Low-Voltage Industrial and Consumer Applications*

Ordering Information

Product Sales Code	Description	Package
ZSLS7025-ZI1R	ZSLS7025 – Boost LED Driver	SOP-8 (Tape & Reel)
ZSLS7025KIT-D1	ZSLS7025PCB-D1 Demo Board, 1 ZLED-PCB10, and 5 ZSLS7025 ICs	Kit

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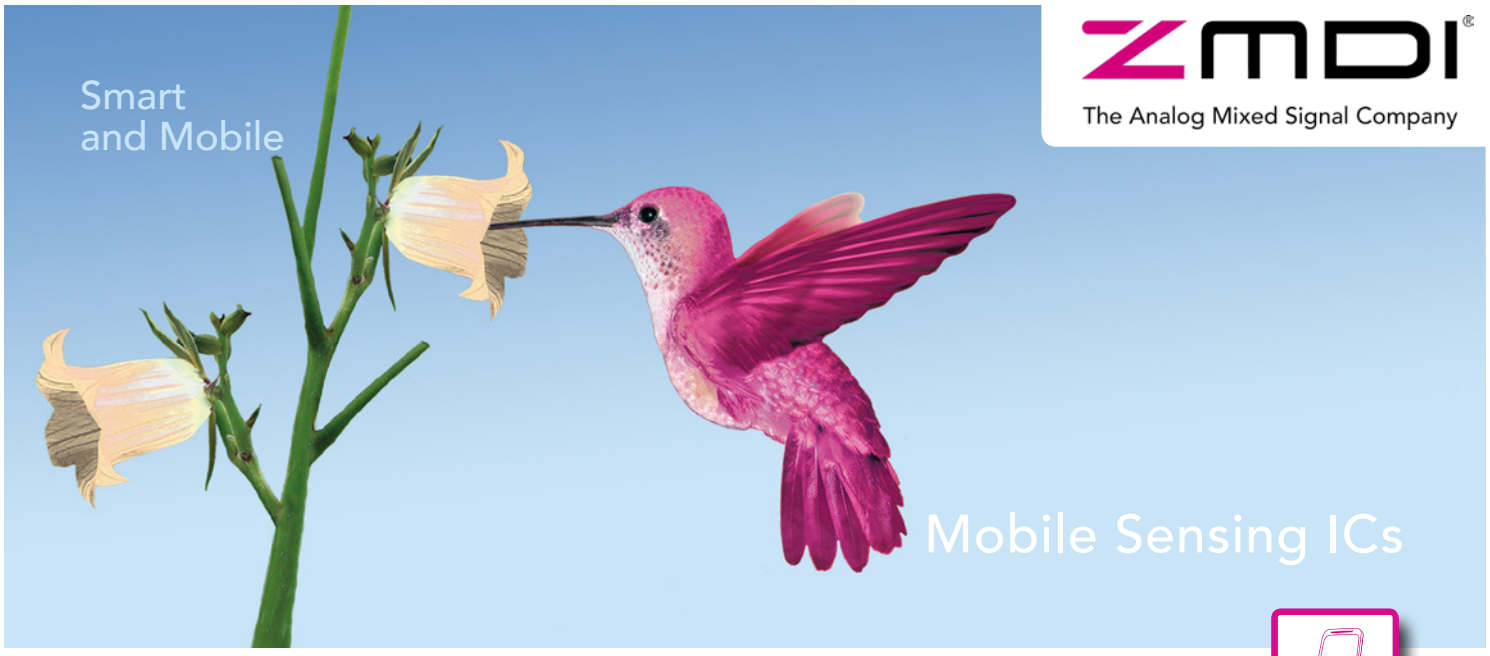

ZMDI®
The Analog Mixed Signal Company

Mobile Sensing ICs

Key Features

- High accuracy and resolution for precise sensor signal conditioning
- Best-in-class power consumption
- Smallest in size and flexible delivery form
- Minimal number of external components
- Single-pass calibration
- Integrated correction algorithm

Industry Applications

Innovative mobile sensing solutions based on diverse sensor technologies:

- Altimeter/barometric
- Proximity sensing
- Ambient light/color sensing
- Temperature sensing
- Vital parameter sensing
- Humidity sensing

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ZSSC3016

Low Power 16 Bit Sensor Signal Conditioner IC

The Analog Mixed Signal Company

Brief Description

The ZSSC3016 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential input signal. Designed for high resolution altimeter module applications, the ZSSC3016 can perform offset, span, and 1st and 2nd order temperature compensation of the measured signal. Developed for correction of resistive bridge sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected bridge values are provided at the digital output pins, which can be configured as I²C* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via an 18-bit internal digital signal processor (DSP) running a correction algorithm. Calibration coefficients are stored on-chip in a highly reliable, non-volatile, multiple-time programmable (MTP) memory. Programming the ZSSC3016 is simple via the serial interface and the PC-controlled calibration software provided in the ZMDI Development Kit. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory. The digital mating is fast and precise, eliminating the overhead normally associated with trimming external components and multi-pass calibration routines.

Features

- Flexible, programmable analog front-end design; up to 16-bit scalable, charge-balancing two-segment analog-to-digital converter (ADC)
- Fully programmable gain amplifier accepting sensors from 14 to 72 (linear factor)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1st and 2nd order digital compensation of sensor gain
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Intelligent power management unit
- Layout customized for die-die bonding with sensor for high-density chip-on-board assembly
- Typical sensor elements can achieve accuracy of less than ±0.10% FSO @ -40 to 85 °C

* I²C is a registered trademark of NXP.

Benefits

- Integrated 18-bit calibration math DSP
- Fully corrected signal at digital output
- Minimize calibration costs through the one-pass calibration concept
- No external trimming components required
- Highly integrated CMOS design
- Excellent for low-voltage and low-power battery applications

Physical Characteristics

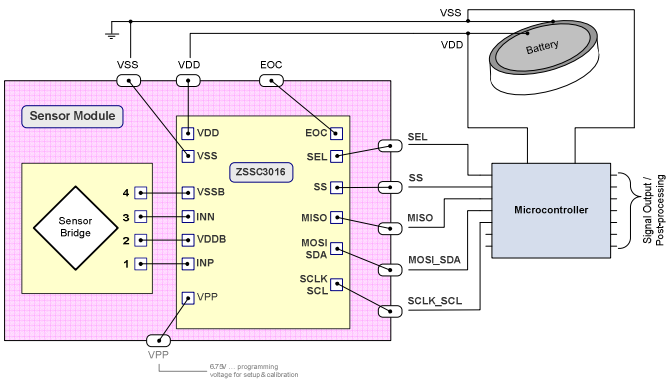
- Supply voltage range: 1.8 to 3.6V
- Current consumption: 1mA (operating mode)
- Sleep State current <250nA (25°C)
- Temperature resolution: <0.003K/LSB
- Operation temperature: –40°C to +85 °C
- Small die size: 1.5mm²
- Delivery options: die for wafer bonding

Typical Applications

The ZSSC3016 is designed for operation in calibrated resistive (pressure) sensor modules:

- Barometric altitude measurement for portable navigation
- Altitude measurement for emergency call systems
- Altitude measurement for car navigation
- Inside hard disk pressure measurement
- Weather forecast
- Fan control

ZSSC3016 Application Example.

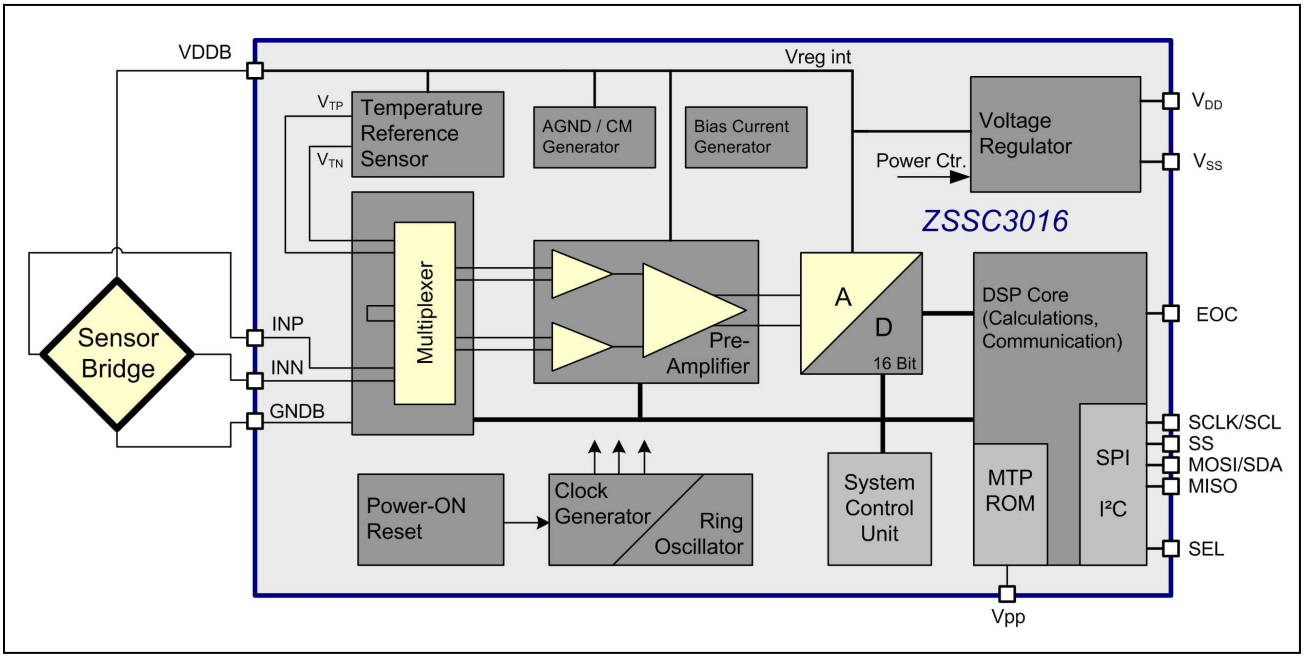


ZSSC3016

Low Power 16 Bit Sensor Signal Conditioner IC

The Analog Mixed Signal Company

ZSSC3016 Block Diagram



Ordering Information

Ordering Examples *	Description	Package
ZSSC3016CC1B	Temperature range: –40°C to +85 °C, Consumer-Level: Parameter according Data Sheet	Wafer (304um) unsawn
ZSSC3016CI1B	Temperature range: –40°C to +85 °C, Industrial-Level: 10 years MTP-Data Retention; 20FIT	Wafer (304um) unsawn
ZSSC3016CI1D ES	Engineering Samples, Temperature range: –40°C to +85 °C	Dice in Waffle Pack
ZSSC3016KIT	ZSSC3016 Evaluation Kit, including sample, modular evaluation board, and evaluation software.	Kit

* Please contact ZMDI Sales for additional options.

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ZSSC3026

Low Power 16 Bit Sensor Signal Conditioner IC

The Analog Mixed Signal Company

Brief Description

The ZSSC3026 is a sensor signal conditioner (SSC) integrated circuit for high-accuracy amplification and analog-to-digital conversion of a differential input signal. Designed for high resolution altimeter module applications, the ZSSC3026 can perform offset, span, and 1st and 2nd order temperature compensation of the measured signal. Developed for correction of resistive bridge sensors, it can also provide a corrected temperature output measured with an internal sensor.

The measured and corrected bridge values are provided at the digital output pins, which can be configured as I²C* (≤ 3.4MHz) or SPI (≤ 20MHz). Digital compensation of signal offset, sensitivity, temperature, and non-linearity is accomplished via an 18-bit internal digital signal processor (DSP) running a correction algorithm. Calibration coefficients are stored on-chip in a highly reliable, non-volatile, multiple-time programmable (MTP) memory. Programming the ZSSC3026 is simple via the serial interface. The IC-internal charge pump provides the MTP programming voltage. The interface is used for the PC-controlled calibration procedure, which programs the set of calibration coefficients in memory. The digital mating is fast and precise, eliminating the overhead normally associated with trimming external components and multi-pass calibration routines.

Features

- Flexible, programmable analog front-end design; up to 16-bit scalable, charge-balancing two-segment analog-to-digital converter (ADC)
- Fully programmable gain amplifier accepting sensors from 14 to 72 (linear factor)
- Internal auto-compensated temperature sensor
- Digital compensation of individual sensor offset; 1st and 2nd order digital compensation of sensor gain
- Digital compensation of 1st and 2nd order temperature gain and offset drift
- Intelligent power management unit
- Layout customized for die-die bonding with sensor for high-density chip-on-board assembly
- Typical sensor elements can achieve accuracy of less than ±0.10% FSO @ -40 to 110°C

* I²C is a registered trademark of NXP.

Benefits

- Integrated 18-bit calibration math DSP
- Fully corrected signal at digital output
- Minimize calibration costs through the one-pass calibration concept
- No external trimming components required
- Highly integrated CMOS design
- Excellent for low-voltage and low-power battery applications

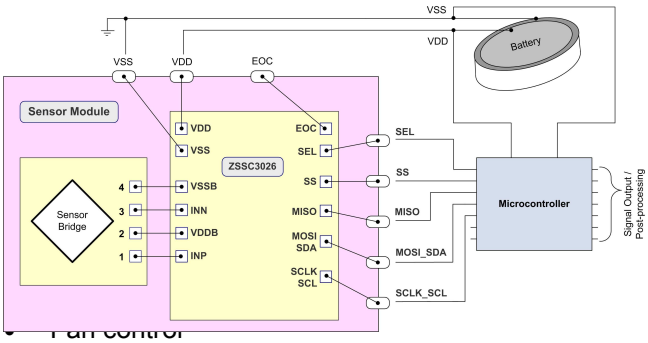
Physical Characteristics

- Supply voltage range: 1.8 to 3.6V
- Current consumption: 1mA (operating mode)
- Sleep State current: 50nA (typical)
- Temperature resolution: <0.003K/LSB
- Operation temperatures: –40°C to +85°C
  –40°C to +110°C
- Small die size: 1.5mm²
- Delivery options: die for wafer bonding, bumped die for Flip Chip, PQFN24

Typical Applications

The ZSSC3026 is designed for operation in calibrated resistive (pressure) sensor modules:

- Barometric altitude measurement for portable navigation
- Altitude measurement for emergency call systems
- Altitude measurement for car navigation
- Inside hard disk pressure measurement
- Weather forecast



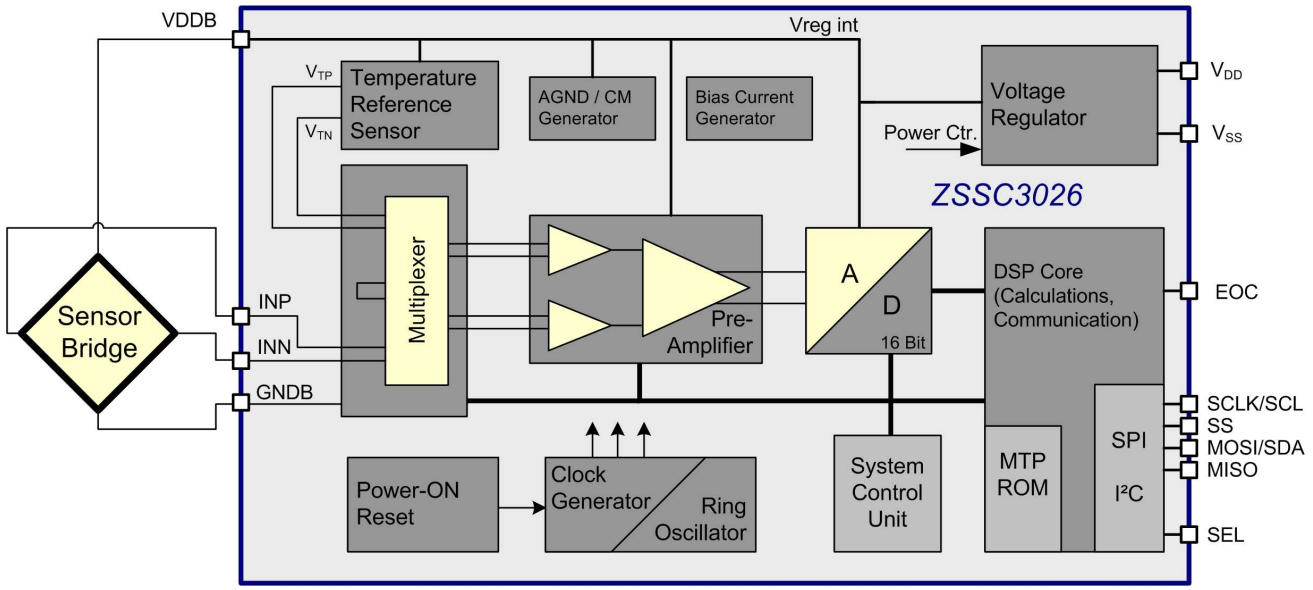
ZSSC3026 Application Example.

ZSSC3026

Low Power 16 Bit Sensor Signal Conditioner IC

The Analog Mixed Signal Company

ZSSC3026 Block Diagram



Ordering Information

Ordering Examples *	Description	Package
ZSSC3026CC1B	Temperature range: –40°C to +85 °C, Consumer-Level: Parameter according Data Sheet	Chips, Wafer (304um) unsawn, tested
ZSSC3026CI1B	Temperature range: –40°C to +85 °C, Industrial-Level: 10 years MTP-Data Retention	Chips, Wafer (304um) unsawn, tested
ZSSC3026CI4	Temperature range: –40°C to +110 °C, Industrial	PQFN24 4x4, tested
ZSSC30x6KIT	Evaluation Kit for ZSSC30x6 Product Family	Boards, cable, software-CD, 1 sample

* Please contact ZMDI Sales for additional options.

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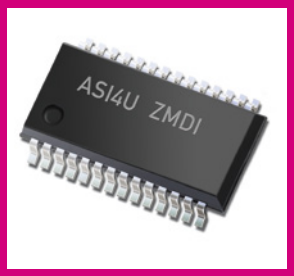
ZMDI®
The Analog Mixed Signal Company

Interface ICs

Key Features of IO-Link

- High-voltage line driver ICs
- IO-Link compliant physical-layer transceiver
- Master and device applications
- Pin-compatible IC family concept
- Operating temperature: -40 to +85°C



Key Features of AS-Interface

- CMOS IC for ASI networks
- AS-Interface Complete Specification v3.0 compliant
- Master, slave, repeater, bus-monitor applications
- On-chip electronic inductor
- Special AS-I safety options

Key Features of 6LoWPAN

- Secure low-power wireless IPv6 communication
- Royalty-free library bundle of custom firmware
- ARM® Cortex™ M3* 32-bit microcontroller
- 19 GPIOs with multiplexed peripheral functions
- Energy-efficient low power modes

*ARM® Cortex™ is a trademark of ARM, Ltd.

Industry Applications

Industry, process and home automation and security

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ASI4U / ASI4U-E / ASI4U-F

Spec. 3.0 Compliant Universal AS-I IC

The Analog Mixed Signal Company

Brief Description

ASI4U is a new generation CMOS integrated circuit for AS-I networks.

The low-level field bus AS-I (Actuator Sensor Interface) was designed for easy, safe and cost-effective interconnection of sensors, actuators and switches. It transports both power and data over the same two-wire unshielded cable.

ASI4U is used as a part of a master or slave node and works as an interface to the physical bus. The device realizes power supply, physical data transfer and communication protocol handling. ASI4U is fully compliant with AS-I Complete Specification 3.0 and functioning and PIN compatible with the A²SI IC.

All configuration data are stored in an internal EEPROM that can be easily programmed by a stationary or handheld programming device. The special AS-I safety option assures short response times regarding security related events.

Features

- Compliant with AS-I Complete Specification V3.0
- Universal application: in slaves, masters, repeaters and bus-monitors
- Compatible with A²SI
- Floating AS-I transmitter and receiver for high symmetrical high power applications
- On-chip electronic inductor with current drive capability of 55 mA
- Two configurable LED outputs to support all Spec. V3.0 status indication modes
- Several data pre-processing functions, including configurable data input filters and bit selective data inverting
- Additional addressing channel for easy wireless module setup
- Support of 8 / 16 MHz crystals by automatic frequency detection
- Special AS-I safety option
- Clock watchdog for high system security

Benefits

- Flexible, separated I/Os
- Flexible AS-I Bus adoption (isolated transceiver)
- Very small package SSOP 28 (ASI4U)
- Supports AS-I complete Specification V3.0
- Supports high ambient temperature applications (ASI4U-E)

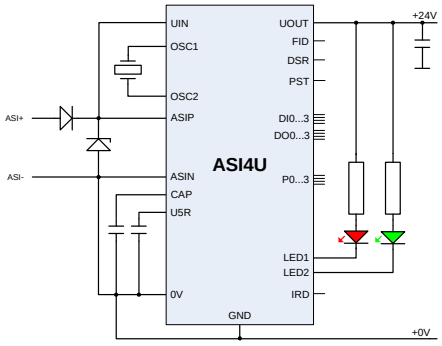
Available Support

- ZMDI AS-Interface Programmer Kit USB
- ZMDI ASI4U Evaluation Board V2.0

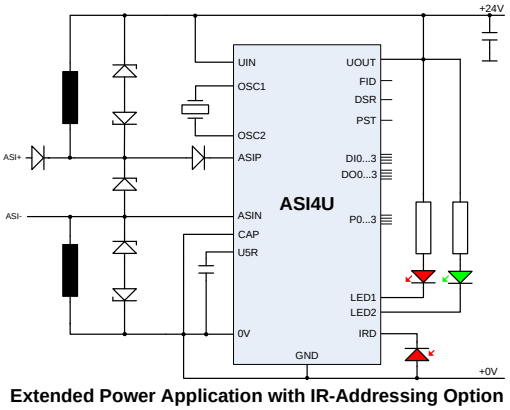
Physical Characteristics

- Operational temp. range: -25 to +85°C (ASI4U)
- Operational temp. range: -40 to +85°C (ASI4U-F)
- Operational temp. range: -25 to +105°C (ASI4U-E)
- SSOP28 (ASI4U) / SOP28 (ASI4U-E) package

ASI4U Basic Application Circuit



Standard Application



Extended Power Application with IR-Addressing Option

ASI4U / ASI4U-E / ASI4U-F

Spec. 3.0 Compliant Universal AS-I IC

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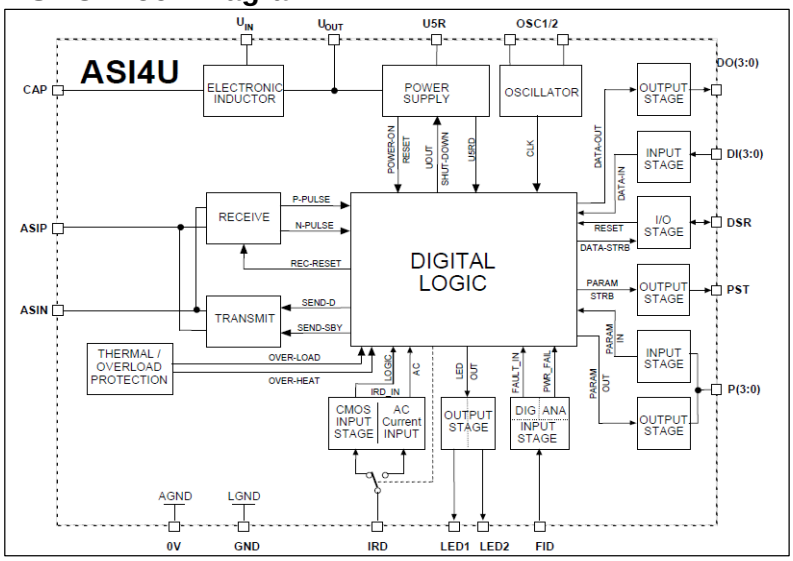
Typical Applications

- AS-I Master Modules
- AS-I Slave Modules
- AS-I Safety Modules

ASI4U Block Diagram



Ordering Information

Ordering Code	Type	Operating Temperature Range	Package Type	RoHS Conform	Packaging	Minumum Order Quantity
ASI4UE-G1-ST	Standard	-25°C to +85°C	SSOP28 / 5.3mm	Y	Tube (47 parts/tube)	470 pcs. (10 tubes)
ASI4UE-G1-SR	Standard	-25°C to +85°C	SSOP28 / 5.3mm	Y	Tape & Reel (1500 parts/reel)	1500 pcs. (one reel)
ASI4UE-G1-SR-7	Standard	-25°C to +85°C	SSOP28 / 5.3mm	Y	Tape & Reel (500 parts/reel)	500 pcs. (one 7" reel)
ASI4UE-G1-MT	Master	-25°C to +85°C	SSOP28 / 5.3mm	Y	Tube (47 parts/tube)	470 pcs. (10 tubes)
ASI4UE-G1-MR	Master	-25°C to +85°C	SSOP28 / 5.3mm	Y	Tape & Reel (1500 parts/reel)	1500 pcs. (one reel)
ASI4UE-E-G1-ST	Standard	-25°C to +105°C	SOP28 / 300 mil	Y	Tube (27 parts/tube)	270 pcs. (10 tubes)
ASI4UE-E-G1-SR	Standard	-25°C to +105°C	SOP28 / 300 mil	Y	Tape & Reel (1000 parts/reel)	1000 pcs. (one reel)
ASI4UE-F-G1-ST	Standard	-40°C to +85°C	SSOP28 / 5.3mm	Y	Tube (47 parts/tube)	470 pcs. (10 tubes)
ASI4UE-F-G1-SR	Standard	-40°C to +85°C	SSOP28 / 5.3mm	Y	Tape & Reel (1500 parts/reel)	1500 pcs. (one reel)

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SAP5S / SAP51

Universal Actuator-Sensor Interface IC

The Analog Mixed Signal Company

Brief Description

SAP5S/SAP51 is a new generation CMOS integrated circuit for AS-I networks.

The low-level field bus AS-I (Actuator Sensor Interface) was designed for easy, safe and cost-effective interconnection of sensors, actuators and switches. It transports both power and data over the same two-wire unshielded cable.

SAP5S/SAP51 is used as a part of a master or slave node and works as an interface to the physical bus.

The device realizes power supply, physical data transfer and communication protocol handling and is fully compliant with AS-Interface Complete Specification V3.0.

SAP5S/SAP51 can be programmed by the user to operate in Standard Slave Mode, Safety Mode SAP5S only) or Master Mode.

The special AS-I Safety Mode (SAP5S only) assures short response times regarding security related events.

All configuration data are stored in an internal EEPROM that can be easily programmed by a stationary or handheld programming device.

SAP5S / SAP51 is optimized for harsh environments by it's special burst protection circuitry and excellent electromagnetic compatibility.

Features

- Compliant with ASI Complete Specification V3.0
- Integrated safety code generator (SAP5S only)
- Universal application: in slaves, masters, repeaters and bus-monitors
- On-chip electronic inductor: 55 mA current drive capability
- Two LED outputs to support Spec. V3.0 status indication modes
- User programmable to operation in Standard Slave Mode, Safety Mode or Master Mode
- Supports 5.33/16 MHz crystals by automatic frequency detection
- Data pre-processing functions
- Special burst protection circuitry
- Excellent electromagnetic compatibility
- Clock and communication watchdogs for high system security

Benefits

- Cost savings due to integrated Safety code Generator (SAP5S)
- Functional and pin compatible to SAP4.1
- Automatic x-tal detection (5,3333MHz or 16,0000MHz)
- Supports AS-I complete Specification 3.0

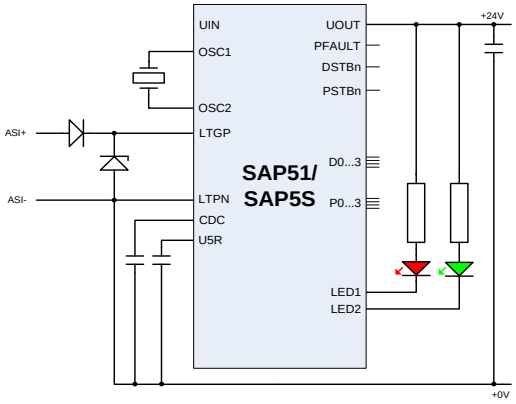
Available Support

- ZMDI AS-Interface Programmer Kit USB
- ZMDI SAP5 Evaluation Board V2.0

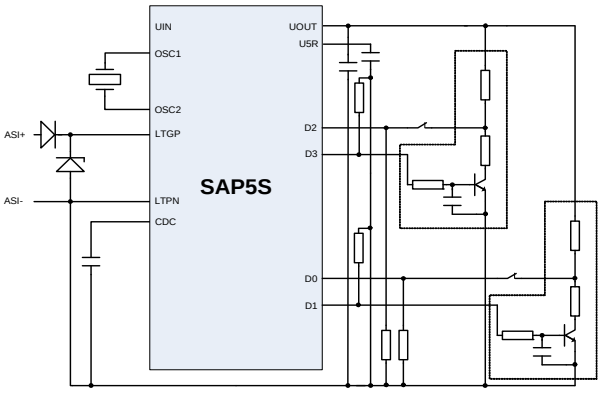
Physical Characteristics

- Operational temperature range: -25 to +85°C
- SOP16 and SOP20 package

SAP5S/SAP51 Basic Application Circuit



Standard Application



Safety Mode Slave Application

SAP5S / SAP51

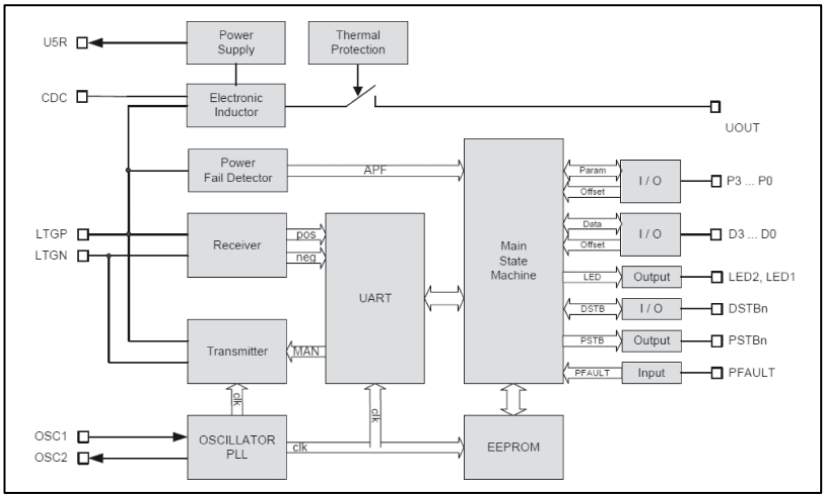
Universal Actuator-Sensor Interface IC

The Analog Mixed Signal Company

Typical Applications

- AS-I Master Modules
- AS-I Slave Modules
- AS-I Safety Modules (SAP5S only)

SAP5S/SAP51 Block Diagram



Ordering Information

Ordering Code	Operating Temperature Range	Package Type	RoHS Conform	Packaging	Minimum Order Quantity
SAP5SD-A-G1-T	-25°C to +85°C	SOP20 / 300 mil	Y	Tubes (37 parts/tube)	370 pcs. (10 tubes)
SAP51D-A-G1-T					
SAP5SD-A-G1-R	-25°C to +85°C	SOP20 / 300 mil	Y	Tape & Reel (1000 parts/reel)	1000 pcs. (one reel)
SAP51D-A-G1-R					
SAP5SD-B-G1-T	-25°C to +85°C	SOP16 / 300 mil	Y	Tubes (46 parts/tube)	460 pcs. (10 tubes)
SAP51D-B-G1-T					
SAP5SD-B-G1-R	-25°C to +85°C	SOP16 / 300 mil	Y	Tape & Reel (1000 parts/reel)	1000 pcs. (one reel)
SAP51D-B-G1-R					

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ZIOL2201

IO-Link compliant HV Line Driver (Single Channel)

Brief Description

The ZIOL2201 is a smart power solution of a line driver/level shifter IC containing an HV[1] I/O-channel having a wide range of configurable system features. It addresses the physical layer of sensor/actuator systems in factory automation and is especially designed to support the communication standard IO-Link.

The output driver is a push pull stage which reaches an R_{DSon} of less than 6.6 Ohms at all operational temperatures.

The configuration is stored in an on-chip EEPROM and automatically loaded into the IC's control register during power up. The IC also provides status information, such as overload and over temperature. An implemented SPI interface supports access to configuration and status registers.

The IC is produced in a powerful CMOS Mixed Signal Technology that allows supply voltages up to 40V. The EEPROM read/write functionality is guaranteed within the entire operating temperature range in combination with a low Voltage core supply of 3.3V.

Features

- Output current limitation (50 … 300mA)
- Standard cable driver/ physical layer transceiver for IO-Link (Device)
- Slew-rate controlled driver
- Wide range of configurable feature set which is automatically loaded after power on reset
- Onboard DC/DC converter
- IO-Link specific WURQ[2] detection
- On chip registers and EEPROM for system configuration and status information
- SPI to access on chip registers and EEPROM
- Dig. interface: 3.3V output, 5V tolerant inputs
- Chip temperature monitoring/diagnosis
- Over-current and -temperature signaling

Benefits

- Configurable feature set
- Non volatile storage of system configuration
- Excellent EMC performance due to adjustable output slew rate control
- Low R_{DSon} of 6.6 Ohms
- Programmable limitation of driver output current
- DC/DC converter on Chip
- EEPROM read/write functionality within entire operating temperature range
- Space saving 4x4 mm² 24 pin QFN

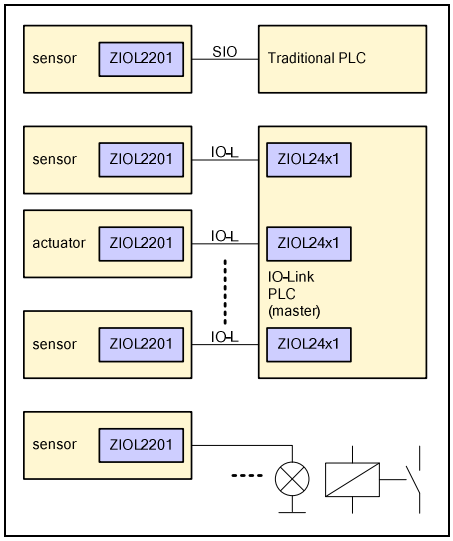
Available Support

- Evaluation Kits
- Application Notes

Physical Characteristics

- Operation temperature -40 to +85 °C
- Supply voltage 8.0 to 36.0 V
- QFN 24 package

ZIOL2201 Application Circuits



[1] High Voltage (max. power supply / signal swing is 36 volt)
[2] IO-Link device wake-up

ZIOL2201

IO-Link compliant HV Line Driver (Single Channel)

The Analog Mixed Signal Company

Typical Applications

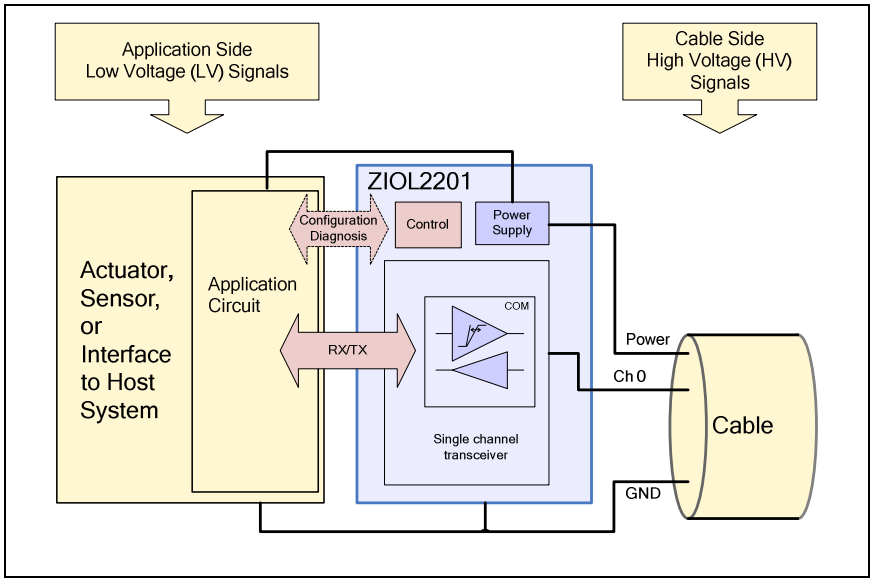
The ZIOL2201 application field is acting as universal cable driver. Furthermore the IC supports IO-Link communications as physical layer transceiver (PHY) for IO-Link master ports and IO-Link devices.

An integrated DC/DC converter in combination with two linear voltage regulators allows optimizing the power supply of the application.

- 24V line driver/level shifter
- IO-Link compliant devices

Note: The datasheet **ZIOL2xxx IC Family** contains detailed technical information

ZIOL2201 Overview



Ordering Information (# stands for the device revision)

Product Sales Code	Description	Package
ZIOL2201#*I1R*	Single Channel IO-Link compliant HV Line Driver IC, packing: 13” reel	PQFN24, 4x4
ZIOL2201#*I1W*	Single Channel IO-Link compliant HV Line Driver IC, packing: 7” tray	PQFN24, 4x4
ZIOL2401 *-Lab Kit*	ZIOL2401 LabKit for detailed lab evaluation (suitable for **ZIOL2xxx**) (configurable IC-/Communication/Controller PCB, software, USB-cable)	
ZIOL2401 *-Starter Kit*	ZIOL2401 Introduction tool (USB stick, extension board, software) (suitable for **ZIOL2xxx**)	

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ZIOL2211

IO-Link-Compliant HV Line Driver (Single Channel)

ZMDI
The Analog Mixed Signal Company

Brief Description

The ZIOL2211 is a line driver/level shifter IC that provides an HV[1] I/O channel with a wide range of configurable system features. It addresses the physical layer of sensor/actuator systems in factory automation applications, and it is specifically designed to support the communication standard IO-Link [2].

The output driver is a push-pull stage that reaches an R_{DSon} of less than 6.6Ω at all operational temperatures.

The configuration is stored in an on-chip EEPROM and automatically loaded into the ZIOL2211's control register during power-up. The ZIOL2211 also provides status information, such as overload and overtemperature. An integrated SPI interface supports access to configuration and status registers.

The ZIOL2211 is fabricated in a powerful CMOS Mixed Signal Technology that allows supply voltages up to 40V. The EEPROM read/write functionality is guaranteed within the entire operating temperature range in combination with a low-voltage core supply of 3.3V.

Features

- Output current limitation: 50mA to 410mA
- Standard cable driver / physical-layer transceiver for IO-Link (device)
- Slew-rate controlled driver
- Wide range for configurable feature set that is automatically loaded after power-on reset
- IO-Link specific WURQ[3] detection
- On-chip registers and EEPROM for system configuration and status information
- SPI interface for access on chip registers and EEPROM
- Digital interface: 3.3V output, 5V-tolerant inputs
- Chip temperature monitoring/diagnosis
- Over-current and over-temperature indication

Benefits

- Configurable feature set
- Nonvolatile storage of system configuration
- Excellent electromagnetic compatibility (EMC) performance due to adjustable output slew rate control
- Low R_{DSon}: 6.6Ω
- Programmable limitation of driver output current
- EEPROM read/write functionality within entire operating temperature range
- Space saving package options

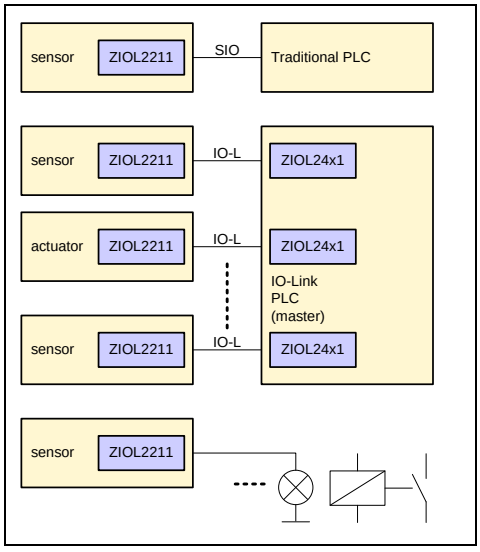
Available Support

- Evaluation Kits
- Application Notes

Physical Characteristics

- Operation temperature: -40 to +85 °C
- Supply voltage: 8.0V to 36.0V
- Package options: PQFN 24 4x4 mm, WL-CSP 35 2.5x2.5mm

ZIOL2211 Application Circuits



[1] HV: high voltage (maximum power supply / signal swing is 36V)
[2] ZMDI is a member of the IO-Link Consortium: www.io-link.com
[3] IO-Link device wake-up

ZIOL2211

IO-Link-Compliant HV Line Driver (Single Channel)

The Analog Mixed Signal Company

Typical Applications

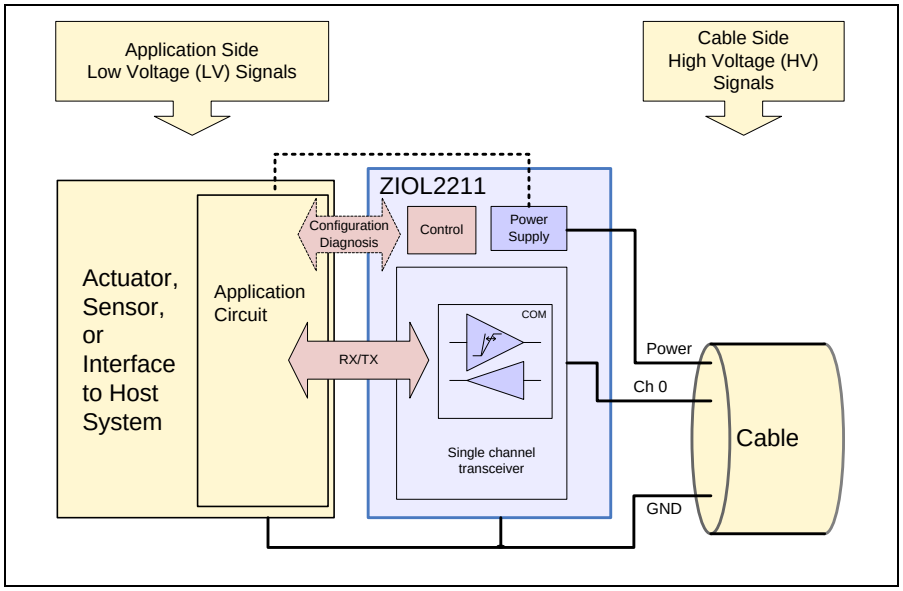
In field applications, the ZIOL2211 acts as a universal cable driver. The ZIOL2211 can support IO-Link communications as a physical-layer transceiver (PHY) for IO-Link master ports and IO-Link devices.

Common applications:

- 24V line driver/level shifter
- IO-Link-compliant devices

*See the **ZIOL2xxx IC Family** datasheet for detailed technical information.*

ZIOL2211 Block Diagram



Ordering Information

Product Sales Code	Description	IC Package
ZIOL2211BI1R	Single Channel IO-Link-compliant HV Line Driver IC, packaging; 13” reel	PQFN24, 4x4mm
ZIOL2211BI1W	Single Channel IO-Link-compliant HV Line Driver IC, packaging; 7” tray	PQFN24, 4x4mm
ZIOL2211BI2R (CSP)	Single Channel IO-Link-compliant HV Line Driver IC, packaging; reel	WL-CSP35, 2.5x2.5mm
ZIOL2401-Lab Kit	ZIOL2401 lab kit for evaluation of the ZIOL2xxx family including ZIOL2211: configurable IC/communication/controller circuit board, software, USB cable	
ZIOL2401-Starter Kit	ZIOL2401 demonstration tool for the ZIOL2xxx family including ZIOL2211(USB stick, extension board, software)	

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ZIOL2401

IO-Link compliant HV Line Driver (Dual Channel)

ZMDI
The Analog Mixed Signal Company

Brief Description

The ZIOL2401 is a smart power solution of a line driver/level shifter IC with two independent HV[1] I/O-channels having a wide range of configurable system features. It addresses the physical layer of sensor/actuator systems in factory automation and is especially designed to support the communication standard IO-Link.

The output drivers are push pull stages which reach in tandem mode an R_{DSon} of less than 3.3 Ohms at all operational temperatures.

The configuration is stored in an on-chip EEPROM and automatically loaded into the IC's control register during power up. The IC also provides status information, such as overload and over temperature. An implemented SPI interface supports access to configuration and status registers.

The IC is produced in a powerful CMOS Mixed Signal Technology that allows supply voltages up to 40V. The EEPROM read/write functionality is guaranteed within the entire operating temperature range in combination with a low Voltage core supply of 3.3V.

Features

- Output current limitation (50 to 300mA)
- Standard cable driver/ physical layer transceiver for IO-Link (Master & Device)
- Slew-rate controlled drivers
- Wide range of configurable feature set which is automatically loaded after power on reset
- Onboard DC/DC converter
- IO-Link specific WURQ[2] detection
- On chip registers and EEPROM for system configuration and status information
- SPI to access on chip registers and EEPROM
- Dig. interface: 3.3V output, 5V tolerant inputs
- Chip temperature monitoring/diagnosis
- Over-current and -temperature signaling

Benefits

- Configurable feature set
- Non volatile storage of system configuration
- Excellent EMC performance due to adjustable output slew rate control
- Low R_{DSon} of 3.3 Ohms in tandem mode
- Programmable limitation of driver output current
- DC/DC converter on Chip
- EEPROM read/write functionality within entire operating temperature range
- Space saving 4x4 mm 24 pin PQFN

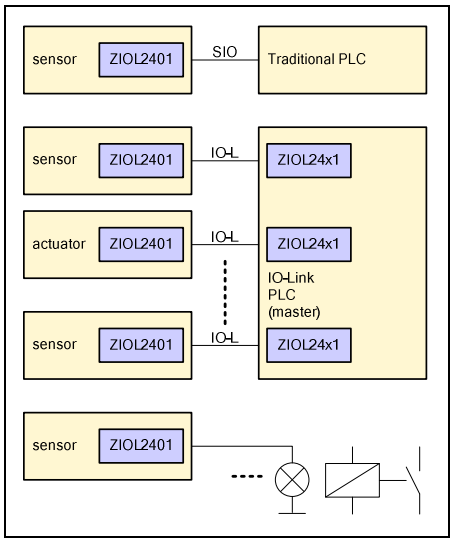
Available Support

- Evaluation Kits
- Application Notes

Physical Characteristics

- Operation temperature -40 to +85 °C
- Supply voltage 8.0 to 36.0 V
- PQFN 24 (4x4 mm) package

ZIOL2401 Application Circuits



[1] High Voltage (max. power supply / signal swing is 36 volt)
[2] IO-Link device wake-up

ZIOL2401

IO-Link compliant HV Line Driver (Dual Channel)

The Analog Mixed Signal Company

Typical Applications

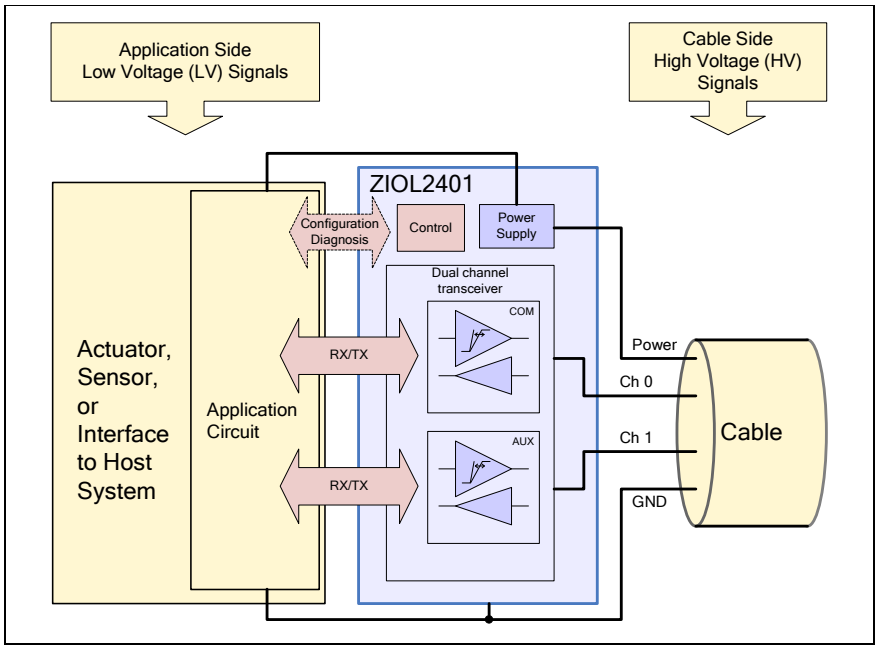
The ZIOL2401 application field is acting as universal cable driver. Furthermore the IC supports IO-Link communications as physical layer transceiver (PHY) for IO-Link master ports and IO-Link devices.

An integrated DC/DC converter in combination with two linear voltage regulators allows optimizing the power supply of the application.

- 24V line driver/level shifter
- IO-Link compliant master
- IO-Link compliant device

Note: The datasheet **ZIOL2xxx IC Family** contains detailed technical information.

ZIOL2401 Block Diagram



Ordering Information (# stands for the device revision)

Product Sales Code	Description	Package
ZIOL2401#*I1R*	Dual Channel IO-Link compliant HV Line Driver, packing: 13” reel	PQFN24, 4x4
ZIOL2401#*I1W*	Dual Channel IO-Link compliant HV Line Driver, packing: 7” reel	PQFN24, 4x4
ZIOL2401 *-Lab Kit*	ZIOL2401 LabKit for detailed lab evaluation (configurable IC-/Communication/Controller PCB, software, USB-cable)	
ZIOL2401 *-Starter Kit*	ZIOL2401 Introduction tool (USB stick, extension board, software)	

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ZIOL2411

IO-Link compliant HV Line Driver (Dual Channel)

The Analog Mixed Signal Company

Brief Description

The ZIOL2411 is a line driver/level shifter IC with two independent HV[1] I/O-channels having a wide range of configurable system features. It addresses the physical layer of sensor/actuator systems in factory automation and is especially designed to support the communication standard IO-Link.

The output drivers are push pull stages which reach in tandem mode an R_{DSon} of less than 3.3 Ohms at all operational temperatures.

The configuration is stored in an on-chip EEPROM and automatically loaded into the IC's control register during power up. The IC also provides status information, such as overload and over temperature. An implemented SPI interface supports access to configuration and status registers.

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Features

- Output current limitation (50 … 300mA)
- Standard cable driver/ physical layer transceiver for IO-Link (Master & Device)
- Slew-rate controlled drivers
- Wide range of configurable feature set which is automatically loaded after power on reset
- IO-Link specific WURQ[2] detection
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- Chip temperature monitoring/diagnosis
- Over-current and -temperature signaling

Benefits

- Configurable feature set
- Non volatile storage of system configuration
- Excellent EMC performance due to adjustable output slew rate control
- Low R_{DSon} of 3.3 Ohms in tandem mode
- Programmable limitation of driver output current
- EEPROM read/write functionality within entire operating temperature range
- Space saving 4x4 mm² 24 pin QFN

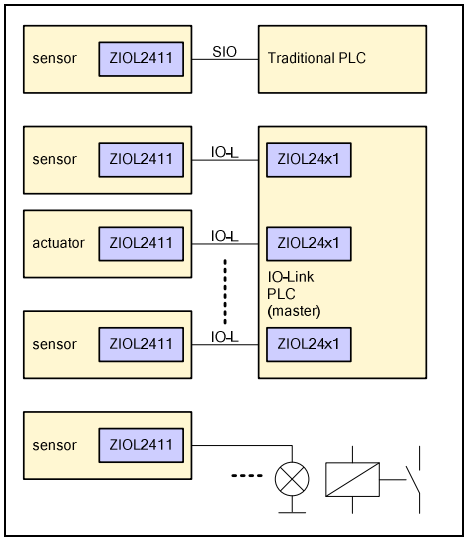
Available Support

- Evaluation Kits
- Application Notes

Physical Characteristics

- Operation temperature -40 to +85 °C
- Supply voltage 8.0 to 36.0 V
- QFN 24 package

ZIOL2411 Application Circuits



[1] High Voltage (max. power supply / signal swing is 36 volt)
[2] IO-Link device wake-up

ZIOL2411

IO-Link compliant HV Line Driver (Dual Channel)

The Analog Mixed Signal Company

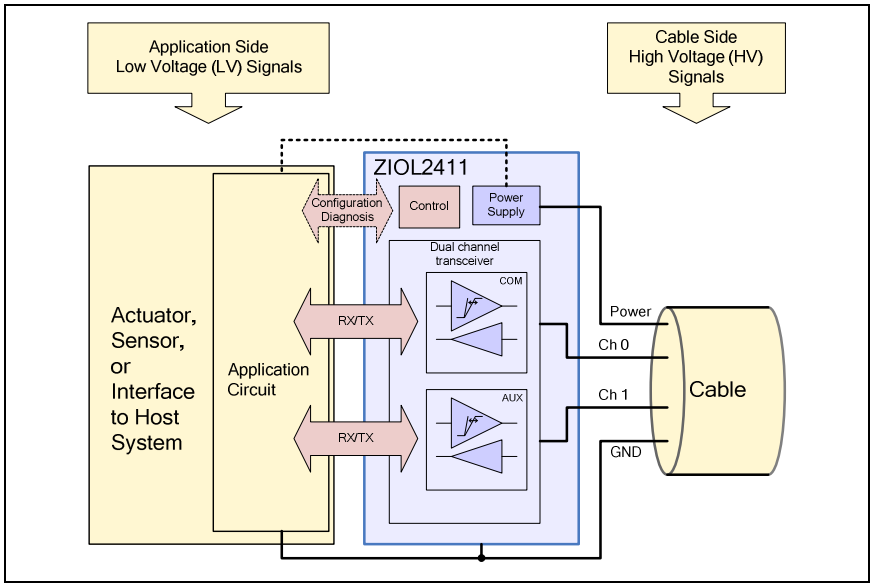
Typical Applications

The ZIOL2411 application field is acting as universal cable driver. Furthermore the IC supports IO-Link communications as physical layer transceiver (PHY) for IO-Link master ports and IO-Link devices.

- 24V line driver/level shifter
- IO-Link compliant master
- IO-Link compliant device

Note: The datasheet **ZIOL2xxx IC Family** contains detailed technical information.

ZIOL2411 Overview



Ordering Information (# stands for the device revision)

Product Sales Code	Description	Package
ZIOL2411#*I1R*	Dual Channel IO-Link compliant HV Line Driver, packing: 13” reel	QFN24, 4x4
ZIOL2411#*I1W*	Dual Channel IO-Link compliant HV Line Driver, packing: 7” reel	QFN24, 4x4
ZIOL2401 *-Lab Kit*	ZIOL2401 LabKit for detailed lab evaluation (suitable for **ZIOL2xxx**) (configurable IC-/Communication/Controller PCB, software, USB-cable)	
ZIOL2401 *-Starter Kit*	ZIOL2401 Introduction tool (USB stick, extension board, software) (suitable for **ZIOL2xxx**)	

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The Analog Mixed Signal Company

ZWIR4501

Brief Description

The ZWIR4501 is a fully integrated system-on-chip CMOS transceiver providing license-free multi-channel operation in the 868.3 MHz (EU) and 902 MHz to 928 MHz (North America) ISM bands. This low-power RF transceiver is optimized for data rates up to 40 kbit/s and incorporates direct sequence spread spectrum technology (DSSS) to ensure reliable data transfer in hostile RF environments. The high level of integration, shown below, includes a thin Media Access Control (MAC) layer, resulting in a minimum of external components and lower application costs.

Applications

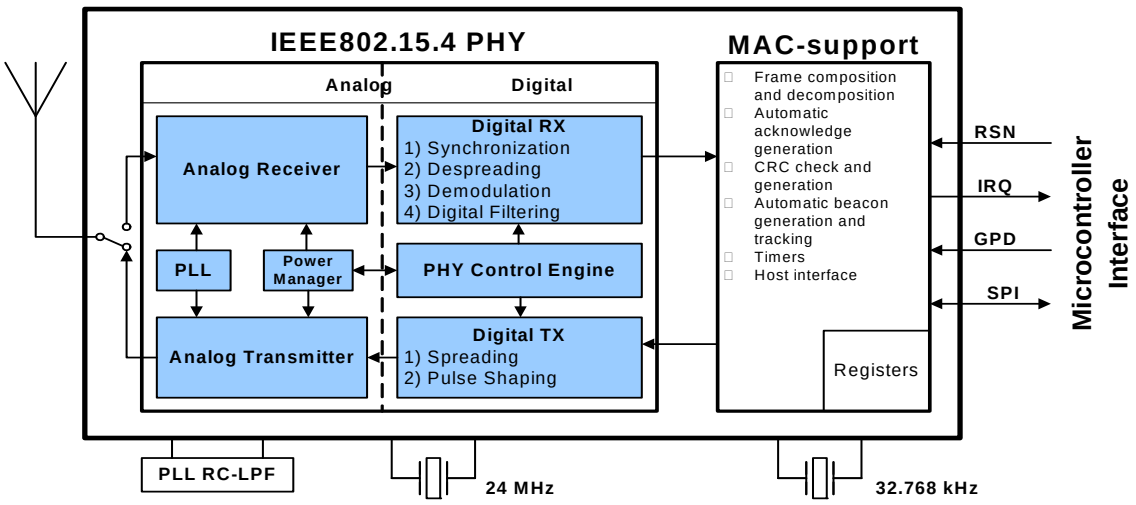
- Smart Home
- Smart Metering
- Remote Control
- Wireless Sensor Networks
- Industrial Networks
- Health Monitor Networking

Key Features

- IEEE 802.15.4 compliant
- Sub-G Frequency Band
- 6loWPAN & ZigBee™ ready
- ISM band transceiver with RF and baseband
- Integrated compliant PHY and Thin HW-MAC
- Direct Sequence Spread Spectrum (DSSS)
- Burst data rate 20 kbit/s (EU), 40 kbit/s (US)
- Transmit range >250m (0 dBm, LoS)
- Low-power modes for battery-powered devices
- SPI interface
- 48-pin QFN (7 x 7 mm) package

Operating Data

Temperature Range	-40°C to +85°C
Supply Voltage, Core	+2.4 V
Supply Voltage, Digital I/O	+3.3 V
Supply Current, Tx active (0 dBm)	28 mA
Supply Current, Rx active	29 mA
Supply Current, Off Mode	1.3 µA
Frequency Bands	868 MHz and 915 MHz



ZWIR4512

Secure Low-Power Wireless IPv6 Module

The Analog Mixed Signal Company

Brief Description

The ZWIR4512 enables secure low-power wireless IPv6 communication for sensors and small devices. ZMDI provides a user-programmable, royalty-free 6LoWPAN stack with mesh routing capability with the ZWIR4512. 6LoWPAN is an Internet Engineering Task Force (IETF) standard to build wireless, low-power IP-based sensor and device networks. These networks can easily be integrated into existing information technology infrastructure or can operate autonomously.

Secure communication is provided by standard-compliant implementations of the Internet Protocol Security (IPSec) protocol suite and the Internet Key Exchange Protocol version 2 (IKEv2), which enable highly secure end-to-end communication, including over unsecure network nodes.

The module is powered by an ARM™ Cortex M3 microcontroller and provides a rich set of GPIO and peripheral interfaces. Up to 192kB of flash memory and 32kB of RAM are available for the user application. Different low-power modes are provided to save energy in battery-operated devices. The modules provide superior radio properties without the need for complicated external RF design.

Hardware Features

- ARM Cortex M3 32-Bit Microcontroller
- Up to 192kB flash memory for user application
- Up to 32kB RAM for user application
- Unique EUI64 address
- 2D barcode address label
- 4 (10) channels in EU (US) mode
- 19 GPIOs with multiplexed peripheral functions:
  - 2 x UART, SPI, 3 x ADC, 2 x DAC, 11 x PWM, USB, CAN, I^2C, 8 x timer
  - Several 5V tolerant I/Os available
- Low current consumption:
  - 3.7µA Standby Mode
  - 13.5mA Receive Mode
  - 18.5mA Transmit Mode @ 0 dBm
- Two modulation schemes
  - BPSK (20kBps EU, 40kBps US)
  - O-QPSK (100kBps EU, 250kBps US)
- Receiver sensitivity: up to -110dBm
- TX output power: up to 10dBm
- ETSI / FCC compliant

Firmware Features

- Serial command interface with built-in security and over-the-air update functionality
- Royalty-free library bundle of custom firmware
  - 6LoWPAN communication library with mesh routing capability
  - IPSec & IKEv2 security libraries
  - Over-the-air update library
  - Several peripheral libraries

Benefits

- Uniquely simple programmability
- Standard-compliant security solution
- No need for external microcontroller
- Plug-and-Play integration into local land wide-area networks
- No RF design required
- Superior radio propagation

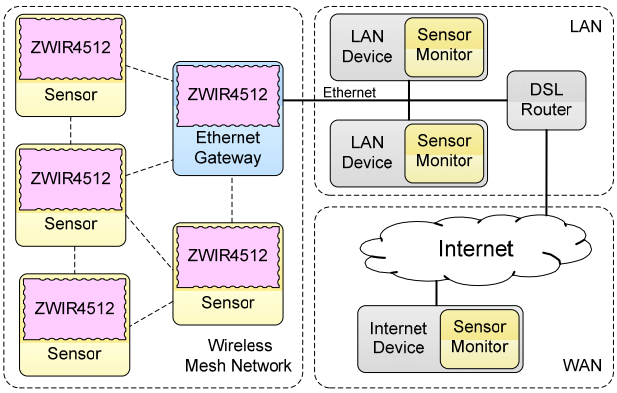
Available Support

- Development Kit
- Programming guide and application notes
- Ethernet-gateway firmware
- Example programs demonstrating C-API usage

Physical Characteristics

- Supply voltage: 2.0V to 3.6V
- Operating temperature: -20°C to +70°C
- 30-pin surface-mount package: 28mm x 16.5mm x 3.5mm

Typical ZWIR4512 Application Setup

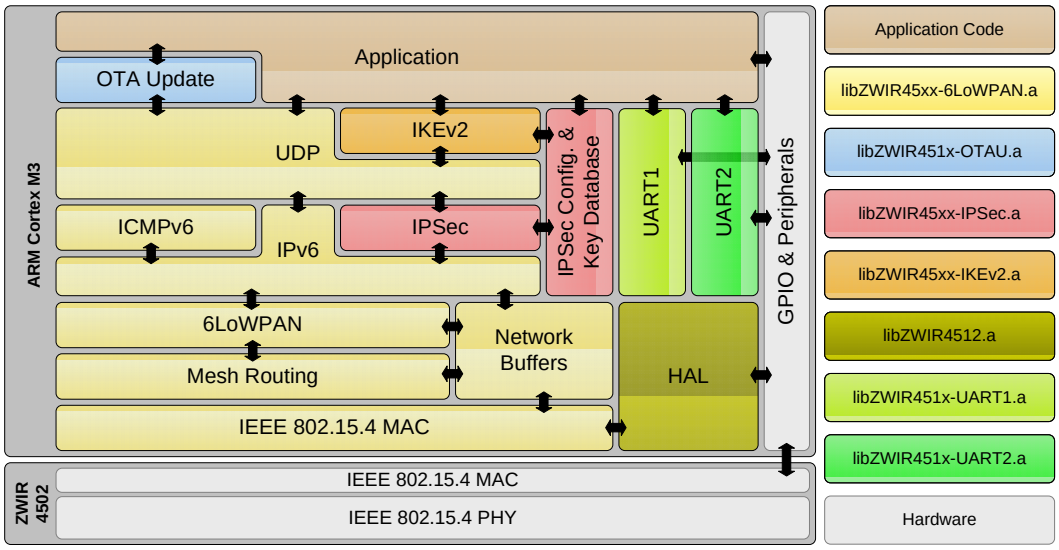


ZWIR4512

Secure Low-Power Wireless IPv6 Module

The Analog Mixed Signal Company

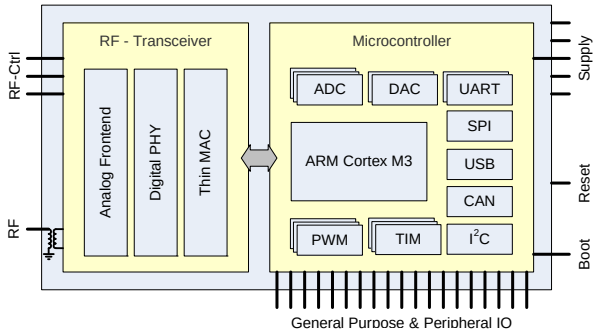
Stack Architecture



Applications

The ZWIR4512 serves as a universal secure radio communication module. Typical application domains include home and industry automation, health monitoring, smart-metering and smart-grid applications, keyless entry systems, and many other innovations. Its very low current consumption makes the module suitable for battery-operated devices.

ZWIR4512 Block Diagram



Ordering Information

Product Sales Code	Description	Delivery Form Code
ZWIR4512AC1[add form code]	Unprogrammed module for user application programs	Add RA to product sales code for large tape & reel; add WA for small tape & reel
ZWIR4512AC1[add form code]	Preprogrammed module with serial command interface	Add RI to product sales code for large tape & reel; add WI for small tape & reel
ZWIR4512-Devkit	ZWIR4512 Development Kit	

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