RapidCharge™ AC/DC Primary-Side Digital Quasi-Resonant Flyback Controller for Secondary-Side Regulation

1 Description

The iW9809 is a high-performance AC/DC primary-side digital flyback controller with adaptive multi-mode-control (MMC) working with secondary-side regulation (SSR) for applications requiring high resolution in output voltage/current setting. The device can support rapid charge applications such as travel adapters (TA) of 25W (5V/3A, 9V/2.77A, etc.). It operates in quasi-resonant switching mode and supports optional continuous conduction mode (CCM) for low line voltage and it uses multi-mode control (MMC) including PWM, PFM and burst mode to achieve less power loss and low EMI. It also provides a number of key built-in protection features. The iW9809 is optimized to work with Dialog's secondary-side controller, the iW70x, for SSR, synchronous rectifier (SR) control and USB PD 3.0 w/PPS protocol support. The iW9809/iW70x chipset can achieve tight multi-level constant voltage (CV) and multi-level constant current (CC) regulation in very fine steps for rapid charge applications. With SSR digital compensation, the chipset eliminates the need for external loop compensation components while maintaining stability under all operating conditions.

The iW9809 and iW70x chipset can support USB PD to achieve fast and smooth CV/CC transitions upon request by mobile devices (MD). The iW9809 and iW70x chipset can meet no-load power consumption of less than 20mW for a typical 25W design when output USB cable is detached.

Dialog's innovative proprietary technology ensures that power supplies designed with the iW9809 and iW70x chipset can achieve high efficiency, high accuracy voltage/current control and fast dynamic load response.

2 Features

- Supports Rapid Charge adapters applications of typical 25W and other power profiles
- Supports constant-voltage (CV) and constant-current (CC) regulation in fine steps using secondary-side regulation (SSR) control
- Proprietary constant-frequency switching with quasi-resonant (QR) operation achieves best size, effiiciency and common mode noise
- Adaptive QR mode and optional continuous conduction mode (CCM) operation at low line voltage
- Adaptive multi-mode control (MMC) using PWM/PFM/Burst modes based on input voltage and output voltage/current improves efficiency and eliminates audible noise
- Built-in single-point fault protections against AC line voltage brown-out, output short-circuit, output over-voltage, and optocoupler failure
- User programable internal OTP threshold for various thermal requirement
- < 20mW no load standby power with ample margin at $230V_{AC}$ when output USB cable is detached.
- 8-lead SOIC package

3 Applications

- Rapid-charging AC/DC adapters for smart phones, tablets and other portable devices

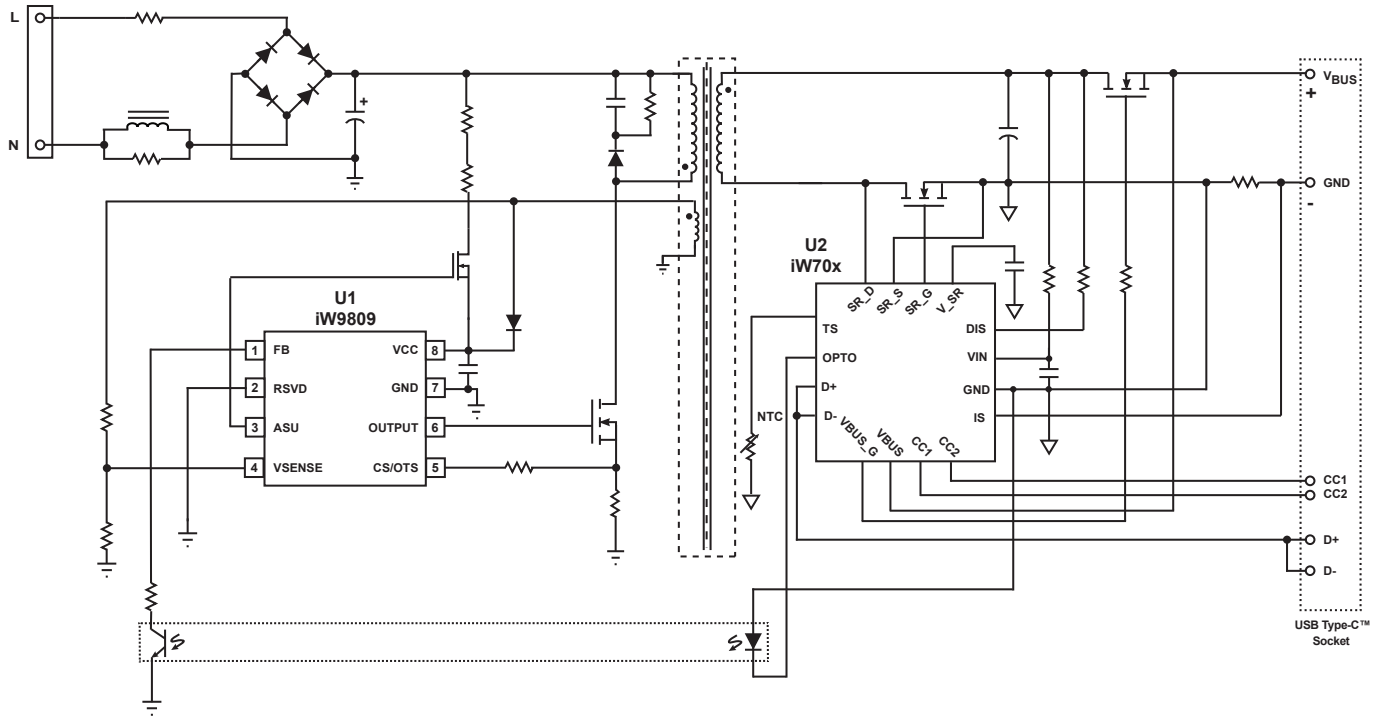


Figure 3.1 : iW9809 Typical Application Circuit with Active Start-up Circuit (Using iW70x as Secondary-Side Controller. Achieving Multi-Level CV/CC Regulation)

4 Pinout Description

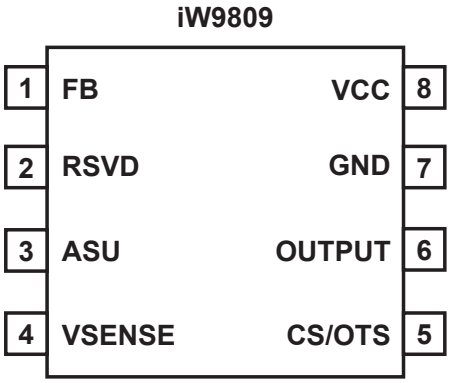


Figure 4.1 : 8-Lead SOIC Package

Pin Number	Pin Name	Type	Pin Description
1	FB	Analog Input	Feedback voltage. Used for determining multi-mode control and cycle-by-cycle peak current control.
2	RSVD	Reserved	Reserved. It is recommended that this pin be connected to GND.
3	ASU	Analog Output	Control Signal. Used for active start-up device (BJT or depletion mode N-FET).
4	VSENSE	Analog Intput	Voltage sensing. Used output voltage sensing and auxiliary winding ringing voltage sensing.
5	CS/OTS	Analog Input	Current sensing. Used for cycle-by-cycle peak-current control and limit. During configuration stage, it can be used to configure certain parameters, such as internal over-temperature protection setting.
6	OUTPUT	Analog Output	Gate drive for power MOSFET.
7	GND	Ground	Ground.
8	VCC	Power Input	IC power supply.

5 Absolute Maximum Ratings

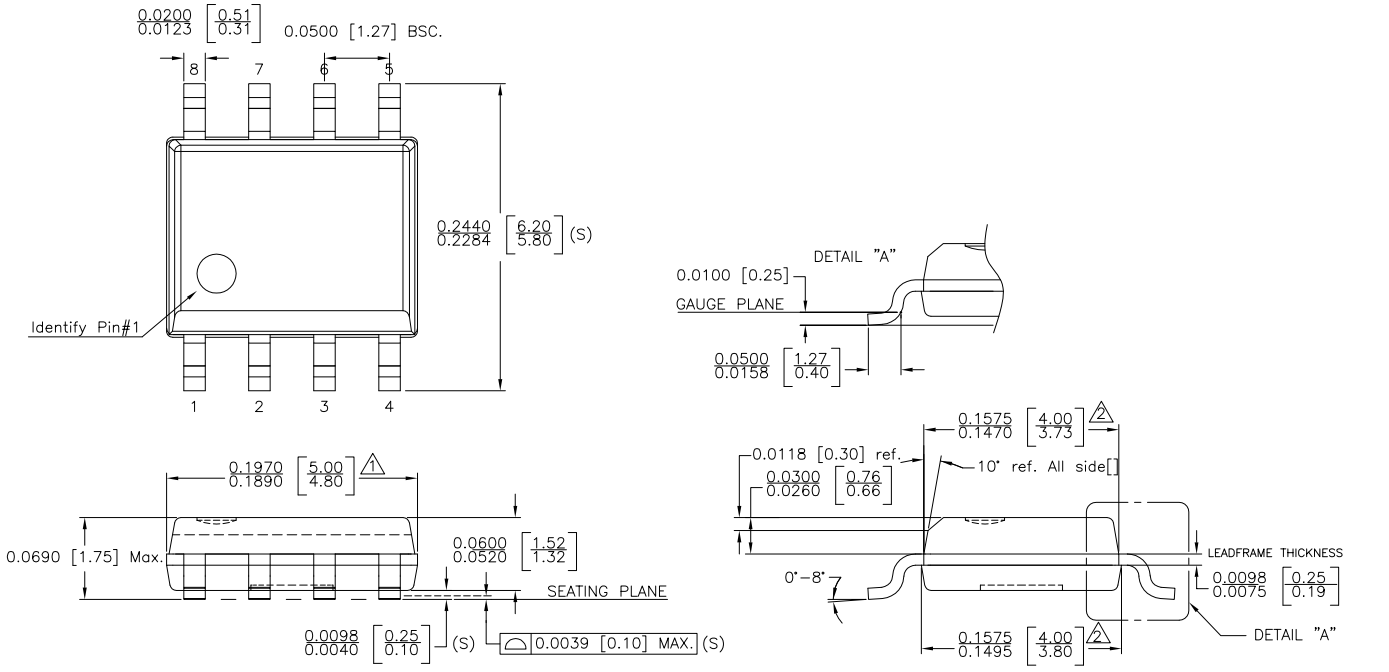
Absolute maximum ratings are the parameter values or ranges which can cause permanent damage if exceeded.

Parameter	Symbol	Value	Units
DC supply voltage range	V_{VCC}	-0.3 to 45	V
Continuous DC supply current at VCC pin (V_{VCC} = 15V)	I_{VCC}	20	mA
VSENSE input (I_{VSENSE} ≤ 10mA)		-0.7 to 10	V
FB voltage		-0.3 to 5.0	V
ASU voltage		-0.3 to 45	V
CS/OTS voltage		-0.3 to 5.5	V
OUTPUT voltage		-0.3 to 20	V
Maximum junction temperature	T_{JMAX}	150	°C
Operating junction temperature	T_{JOPT}	-40 to 150	°C
Storage temperature	T_{STO}	-65 to 150	°C
Thermal Resistance Junction-to-Ambient	θ_{JA}	160	°C/W
ESD rating per JEDEC JS-001-2017		±2,000	V
Latch-up test per JESD78E		±100	mA

Notes:

Note 1. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, so functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

6 Physical Dimensions



NOTE :

1. DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED .006 INCH PER SIDE.
2. DOES NOT INCLUDE INTER–LEAD FLASH OR PROTRUSIONS. INTER–LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED .010 INCH PER SIDE.
3. THIS PART IS COMPLIANT WITH JEDEC SPECIFICATION MS–012.
4. LEAD SPAN/STAND OFF HEIGHT/COPLANARITY ARE CONSIDERED AS SPECIAL CHARACTERISTIC.(S)
5. CONTROLLING DIMENSIONS IN INCHES. [mm]

dialog SEMICONDUCTOR	
STATUS: RELEASED	SCALE: DO NOT SCALE
TERMINAL FINISH: 100% Sn or NiPdAu (PPF)	
TITLE: 8 SOIC PACKAGE OUTLINE	
REV: D / REVISION NOTE: EJECTOR CHANGED TO DASHED LINE	DATE: 18–JUN–2020

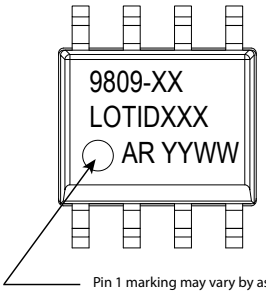
Figure 6.1 : 8-Lead SOIC package outline drawing

7 Ordering Information

Part no.	Options					Package	Description
	V_{BUS} range	CCM	$F_{SW(MAX)}$ at low line	$F_{SW(MAX)}$ at high line	V_{BUS}/ V_{SENSE}		
iW9809-00	3.3V to 11V	Yes	70kHz	75kHz	5:1	SOIC-8	Tape & Reel[1]
iW9809-02	3.3V to 21V	Yes	90kHz	95kHz	5:0.7	SOIC-8	Tape & Reel[1]

Note 1: Tape & Reel packing quantity is 2,500/reel. Minimum packing quantity is 2,500.

8 Top Marking



9809:	iW9809
XX:	Product Option
LOTIDXXX:	Lot Number (can be up to 8 characters)
A:	Assembly Location Code
R:	Product Revision
YY:	Year
WW:	Work Week

Pin 1 marking may vary by assembly supplier, so line 3 left alignment may vary.

Note 1: Font size and text alignment may vary by assembly supplier.

Figure 8.1 : Top Marking for the iW9809

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