DRV5053 Analog-Bipolar Hall Effect Sensor

1 Features

- Linear Output Hall Sensor
- Superior Temperature Stability
  - Sensitivity ±10% Over Temperature
- High Sensitivity Options:
  - –11 mV/mT (OA)
  - –23 mV/mT (PA)
  - –45 mV/mT (RA)
  - –90 mV/mT (VA)
  - +23 mV/mT (CA)
  - +45 mV/mT (EA)
- Supports a Wide Voltage Range
  - 2.5 to 38 V
  - No External Regulator Required
- Wide Operating Temperature Range
  - T_A = –40 to 125°C (Q)
- Amplified Output Stage
  - 2.3-mA Sink, 300 µA Source
- Output voltage: 0.2 ~ 1.8 V
  - B = 0 mT, OUT = 1 V
- Fast Power-On: 35 µs
- Small Package and Footprint
  - Surface Mount 3-Pin SOT-23 (DBZ)
    - 2.92 mm × 2.37 mm
  - Through-Hole 3-Pin SIP (LPG)
    - 4.00 mm × 3.15 mm
- **Protection Features**
  - Reverse Supply Protection (up to –22 V)
  - Supports up to 40-V Load Dump
  - Output Short-Circuit Protection
  - Output Current Limitation

2 Applications

- Flow Meters
- Docking Adjustment
- Vibration Correction
- Damper Controls

3 Description

The DRV5053 device is a chopper-stabilized Hall IC that offers a magnetic sensing solution with superior sensitivity stability over temperature and integrated protection features.

The 0- to 2-V analog output responds linearly to the applied magnetic flux density, and distinguishes the polarity of magnetic field direction. A wide operating voltage range from 2.5 to 38 V with reverse polarity protection up to –22 V makes the device suitable for a wide range of industrial and consumer applications.

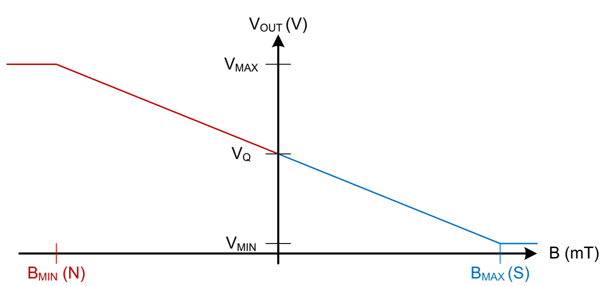
Internal protection functions are provided for reverse supply conditions, load dump, and output short circuit or overcurrent.

Device Information(1)

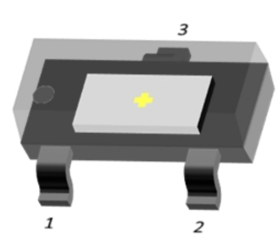
PART NUMBER	PACKAGE	BODY SIZE (NOM)
DRV5053	SOT-23 (3)	2.92 mm × 2.37 mm
	SIP (3)	4.00 mm × 3.15 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

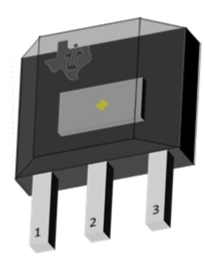
4 Output State



SOT-23



SIP



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5 Revision History

Changes from Revision A (August 2014) to Revision B — **Page**

- Updated high sensitivity options 1
- Updated the sensitivity device values and typicals. Updated typical and max values for DRV5053VA: –80 mV/mT 6
- Updated *Typical Characteristics* graphs 7

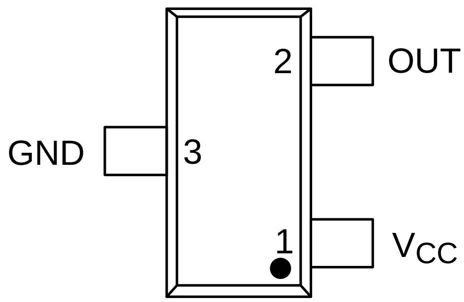
Changes from Original (May 2014) to Revision A — **Page**

- Updated device status to production data 1
- Changed the maximum T_J value from 175°C to 150°C 4
- Updated *Magnetic Characteristics* table. 5

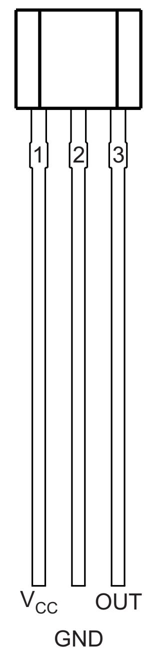
6 Pin Configuration and Functions

For additional configuration information, see *Device Markings* and *Mechanical, Packaging, and Orderable Information*.

3-Pin SOT-23
DBZ Package
(Top View)



3-Pin SIP
LPG Package
(Top View)



Pin Functions

PIN			TYPE	DESCRIPTION
NAME	NUMBER			
	DBZ	LPG		
GND	3	2	GND	Ground pin
V_{CC}	1	1	Power	2.5 to 38 V power supply. Bypass this pin to the GND pin with a 0.01-µF (minimum) ceramic capacitor rated for V_{CC}.
OUT	2	3	Output	Hall sensor analog output. 1 V output corresponds to B = 0 mT

7 Specifications

7.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

		MIN	MAX	UNIT
Power supply voltage	V_{CC}	–22 (2)	40	V
	Voltage ramp rate (V_{CC}), V_{CC} < 5 V	Unlimited		V/µs
	Voltage ramp rate (V_{CC}), V_{CC} > 5 V	0	2	
Output pin voltage	OUT	–0.5	2.5	V
Output pin reverse current during reverse supply condition	OUT	0	–20	mA
Operating junction temperature	T_J	–40	150 (3)	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) Ensured by design. Only tested to –20 V.
(3) Tested in production to T_A = 125°C.

7.2 Handling Ratings

			MIN	MAX	UNIT
T_{stg}	Storage temperature range		–65	150	°C
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins(1)	–2.5	2.5	kV
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins(2)	–500	500	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	MAX	UNIT
V_{CC}	Power supply voltage	2.5	38	V
V_{OUT}	Output pin voltage (OUT)	0	2	V
I_{SOURCE}	Output pin current source (OUT)	0	300	µA
I_{SINK}	Output pin current sink (OUT)	0	2.3	mA
T_A	Operating ambient temperature	–40	125	°C

7.4 Thermal Information

THERMAL METRIC(1)		DRV5053		UNIT
		DBZ	LPG	
		3 PINS	3 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	333.2	180	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	99.9	98.6	
$R_{\theta JB}$	Junction-to-board thermal resistance	66.9	154.9	
ψ_{JT}	Junction-to-top characterization parameter	4.9	40	
ψ_{JB}	Junction-to-board characterization parameter	65.2	154.9	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, SPRA953.

7.5 Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLIES (V_{CC})						
V_{CC}	V_{CC} operating voltage		2.5		38	V
I_{CC}	Operating supply current	V_{CC} = 2.5 to 38 V, T_A = 25°C		2.7		mA
		V_{CC} = 2.5 to 38 V, T_A = 125°C		3	3.6	
t_{on}	Power-on time			35	50	µs
PROTECTION CIRCUITS						
V_{CCR}	Reverse supply voltage		–22			V
$I_{OCP,SOURCE}$	Overcurrent protection level	Sourcing current		300		µA
$I_{OCP,SINK}$	Overcurrent protection level	Sinking current		2.3		mA

7.6 Switching Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
ANALOG OUTPUT (OUT)						
t_d	Output delay time	T_A = 25°C		13	25	µs

7.7 Magnetic Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT (1)
V_Q	Quiescent output	B = 0 mT T_A = –40°C to 125°C	0.9	1.02	1.15	V
f_{BW}	Bandwidth (2)		20			kHz
B_N	Input-referred noise (3)	C_{OUT} = 50 pF T_A = –40°C to 125°C	0.40	0.58	0.79	mT_{pp}
Le	Linearity (4)	$–B_{SAT} < B < B_{SAT}$		1%		
$V_{OUT\ MIN}$	Output saturation voltage (min)	$B < –B_{SAT}$			0.2	V
$V_{OUT\ MAX}$	Output saturation voltage (max)	$B > B_{SAT}$	1.8			V
DRV5053OA: –11 mV/mT						
S	Sensitivity	V_{CC} = 3.3 V T_A = –40°C ~ 125°C	–17.5	–11	–5	mV/mT
V_N	Output-referred noise (3)	V_{CC} = 3.3 V; R_{OUT} = 10 kΩ; C_{OUT} = 50 pF T_A = –40°C ~ 125°C		6		mV_{pp}
B_{SAT}	Input saturation field	V_{CC} = 3.3 V T_A = –40°C ~ 125°C		73		mT
DRV5053PA: –23 mV/mT						
S	Sensitivity	V_{CC} = 3.3 V T_A = –40°C ~ 125°C	–35	–23	–10	mV/mT
V_N	Output-referred noise (3)	V_{CC} = 3.3 V; R_{OUT} = 10 kΩ; C_{OUT} = 50 pF T_A = –40°C ~ 125°C		13		mV_{pp}
B_{SAT}	Input saturation field	V_{CC} = 3.3 V T_A = –40°C ~ 125°C		35		mT

(1) 1 mT = 10 Gauss
(2) Bandwidth describes the fastest changing magnetic field that can be detected and translated to the output.
(3) Not tested in production; limits are based on characterization data.
(4) Linearity describes the change in sensitivity across the B-range. The sensitivity near B_{SAT} is typically within 1% of the sensitivity near B = 0.

Magnetic Characteristics (continued)

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT[1]
DRV5053RA: –45 mV/mT						
S	Sensitivity	V_{CC} = 3.3 V T_A = –40°C ~ 125°C	–70	–45	–20	mV/mT
V_N	Output-referred noise[5]	V_{CC} = 3.3 V; R_{OUT} = 10 kΩ; C_{OUT} = 50 pF T_A = –40°C ~ 125°C		26		mV_{pp}
B_{SAT}	Input saturation field	V_{CC} = 3.3 V T_A = –40°C ~ 125°C		18		mT
DRV5053VA: –90 mV/mT						
S	Sensitivity	V_{CC} = 3.3 V T_A = –40°C ~ 125°C	–140	–90	–45	mV/mT
V_N	Output-referred noise[5]	V_{CC} = 3.3 V; R_{OUT} = 10 kΩ; C_{OUT} = 50 pF T_A = –40°C ~ 125°C		52		mV_{pp}
B_{SAT}	Input saturation field	V_{CC} = 3.3 V T_A = –40°C ~ 125°C		9		mT
DRV5053CA: 23 mV/mT						
S	Sensitivity	V_{CC} = 3.3 V T_A = –40°C ~ 125°C	10	23	35	mV/mT
V_N	Output-referred noise[5]	V_{CC} = 3.3 V; R_{OUT} = 10 kΩ; C_{OUT} = 50 pF T_A = –40°C ~ 125°C		13		mV_{pp}
B_{SAT}	Input saturation field	V_{CC} = 3.3 V T_A = –40°C ~ 125°C		35		mT
DRV5053EA: 45 mV/mT						
S	Sensitivity	V_{CC} = 3.3 V T_A = –40°C ~ 125°C	20	45	70	mV/mT
V_N	Output-referred noise[5]	V_{CC} = 3.3 V; R_{OUT} = 10 kΩ; C_{OUT} = 50 pF T_A = –40°C ~ 125°C		26		mV_{pp}
B_{SAT}	Input saturation field	V_{CC} = 3.3 V T_A = –40°C ~ 125°C		18		mT

(5) Not tested in production; limits are based on characterization data.

7.8 Typical Characteristics

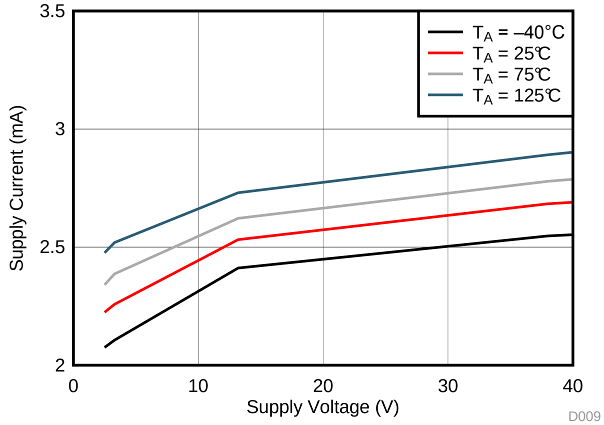


Figure 1. I_{CC} vs V_{CC}

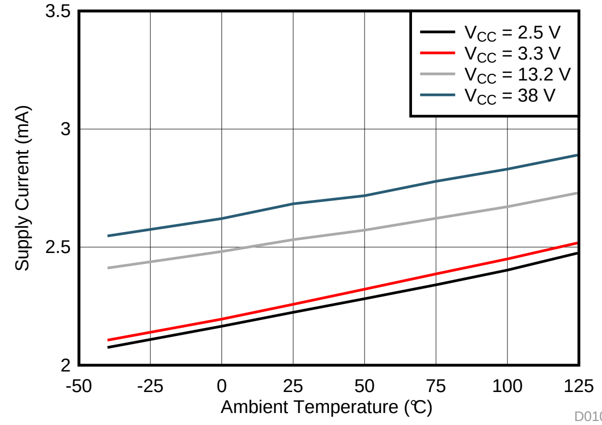
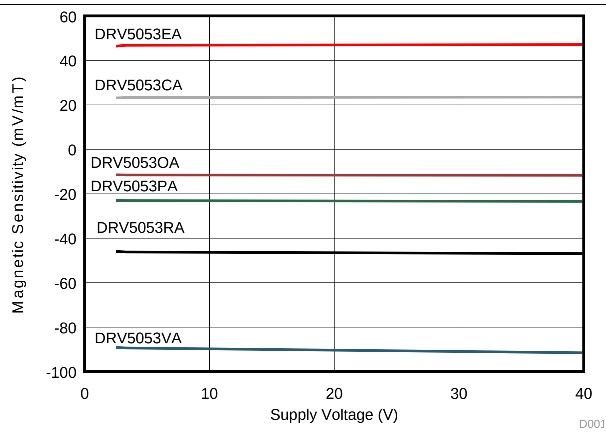
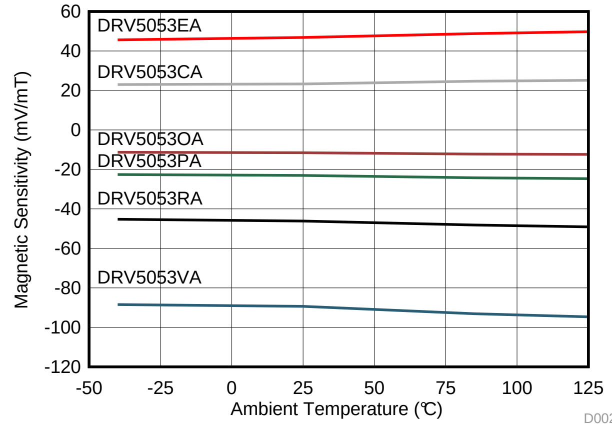


Figure 2. I_{CC} vs Temperature



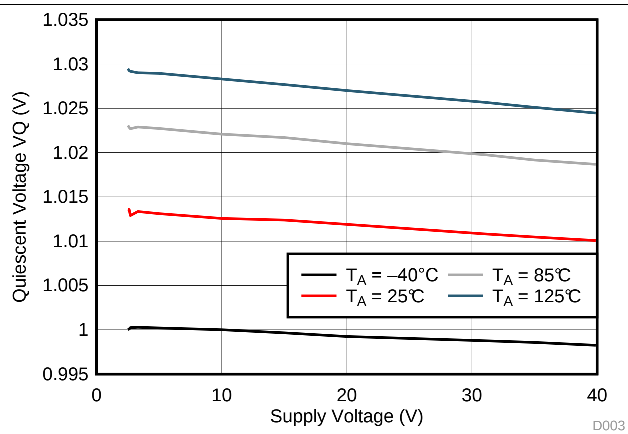
$T_A = 25°C$

Figure 3. Sensitivity vs V_{CC}



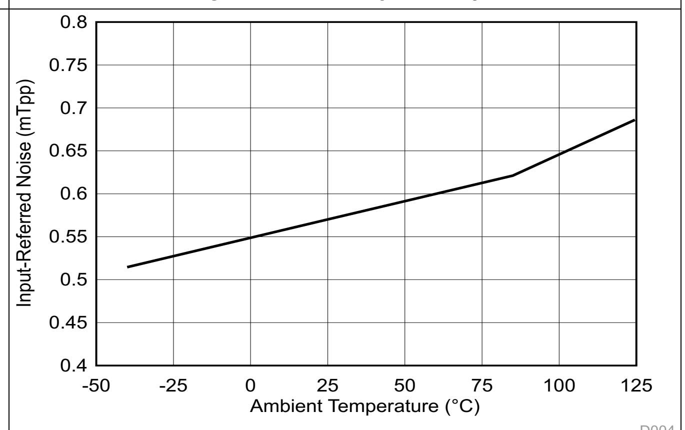
$V_{CC} = 3.3$ V

Figure 4. Sensitivity vs Temperature



$T_A = 25°C$

Figure 5. DRV5053AD, V_Q vs V_{CC}



$V_{CC} = 3.3$ V

Figure 6. DRV5053AD, B_N vs Temperature

8 Detailed Description

8.1 Overview

The DRV5053 device is a chopper-stabilized hall sensor with an analog output for magnetic sensing applications. The DRV5053 device can be powered with a supply voltage between 2.5 and 38 V, and will survive –22 V reverse battery conditions continuously. Note that the DRV5053 device will not be operating when approximately –22 to 2.4 V is applied to V_{CC} (with respect to GND). In addition, the device can withstand supply voltages up to 40 V for transient durations.

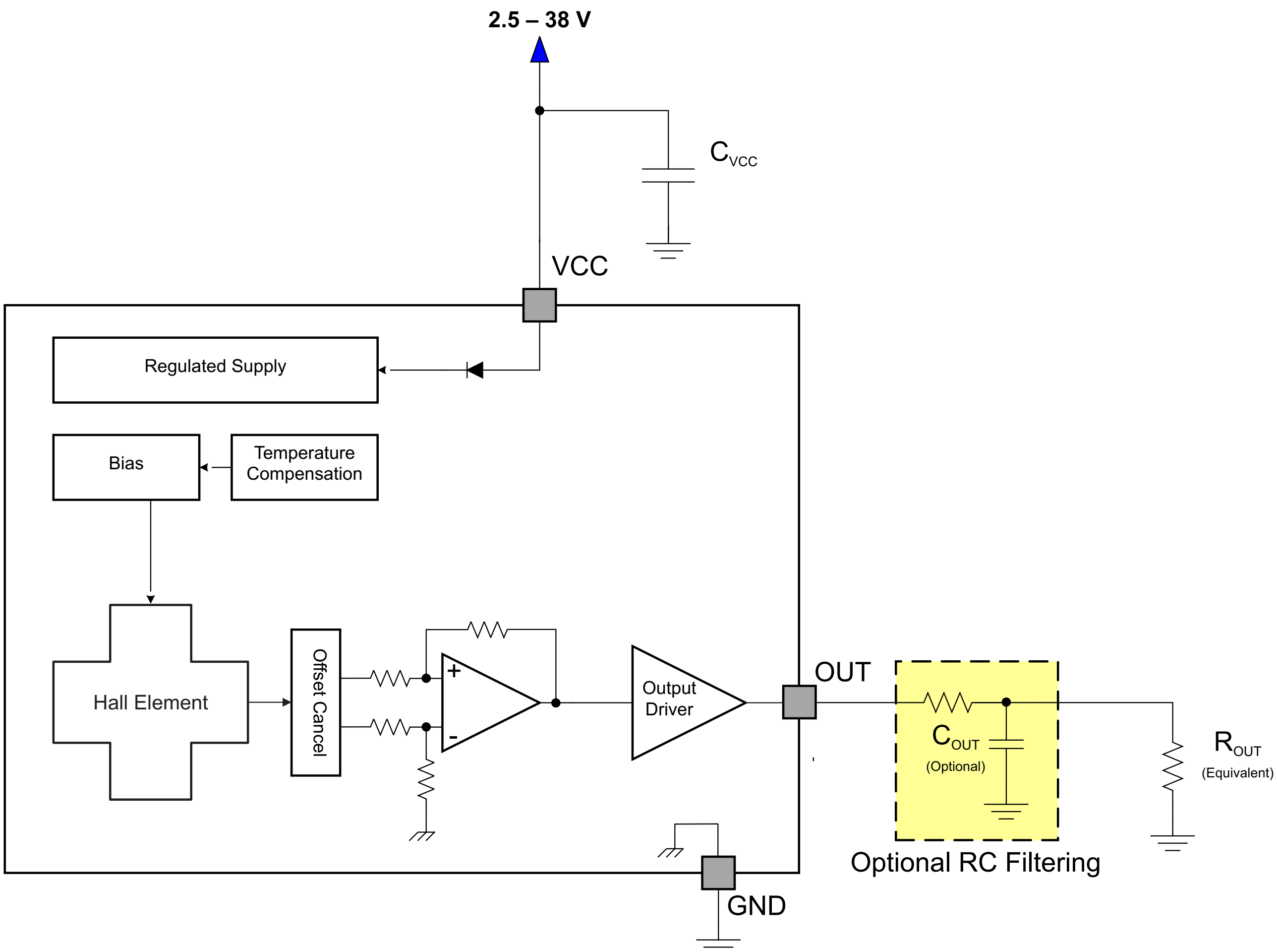
The output voltage is dependent on the magnetic field perpendicular to the package. The absence of a magnetic field will result in OUT = 1 V. A magnetic field will cause the output voltage to change linearly with the magnetic field.

The field polarity is defined as follows: a south pole near the marked side of the package is a positive magnetic field. A north pole near the marked side of the package is a negative magnetic field.

For devices with a negative sensitivity (that is, DRV5053RA: –40 mV/mT), a south pole will cause the output voltage to drop below 1 V, and a north pole will cause the output to rise above 1 V.

For devices with a positive sensitivity (that is, DRV5053EA: +40 mV/mT), a south pole will cause the output voltage to rise above 1 V, and a north pole will cause the output to drop below 1 V.

8.2 Functional Block Diagram



8.3 Feature Description

8.3.1 Field Direction Definition

A positive magnetic field is defined as a south pole near the marked side of the package as shown in Figure 7.

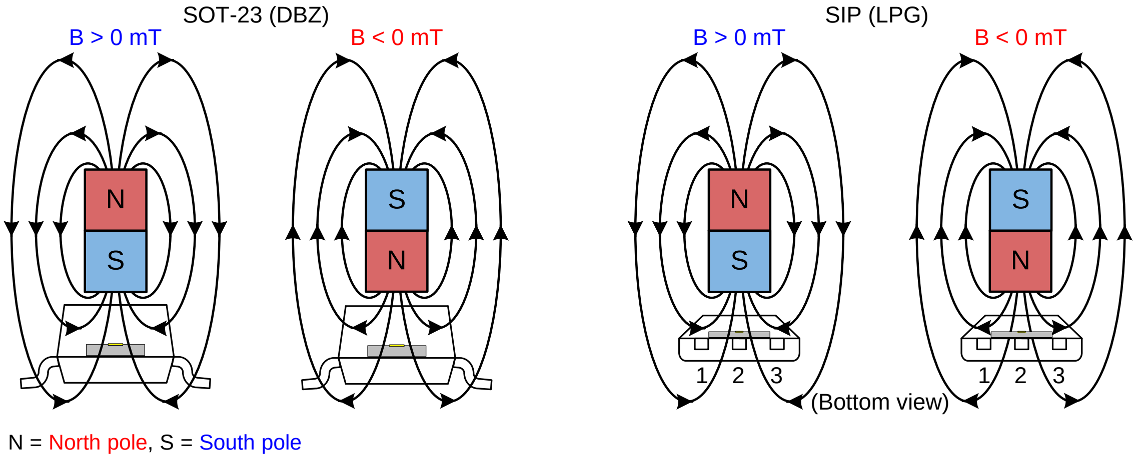


Figure 7. Field Direction Definition

8.3.2 Device Output

The DRV5053 device output is defined below for negative sensitivity (that is, –45 mV/mT, RA) and positive sensitivity (that is, +45 mV/mT, EA):

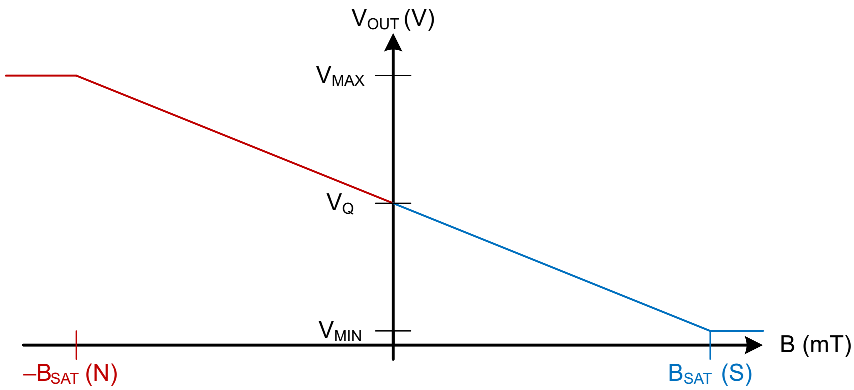


Figure 8. DRV5053 – Negative Sensitivity

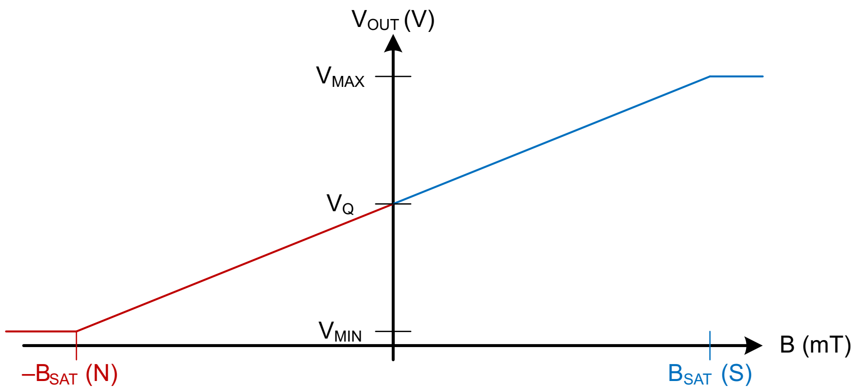


Figure 9. DRV5053 – Positive Sensitivity

Feature Description (continued)

8.3.3 Power-On Time

After applying V_{CC} to the DRV5053 device, t_{on} must elapse before OUT is valid. Figure 10 shows Case 1 and Figure 11 shows case 2; the output is defined assuming a negative sensitivity device and a constant magnetic field $-B_{SAT} < B < B_{SAT}$.

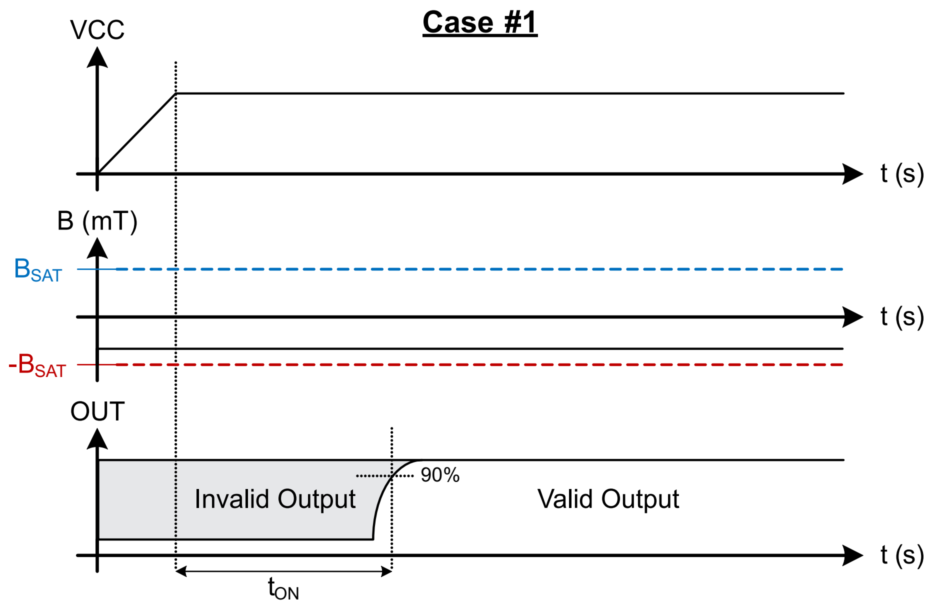


Figure 10. Case 1: Power On When B < 0, North

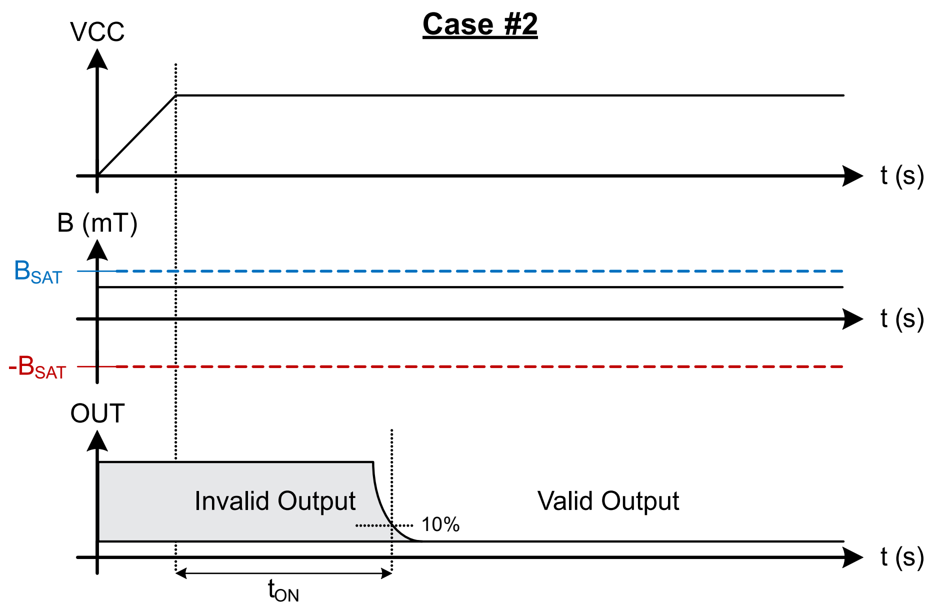


Figure 11. Case 2: Power On When B > 0, South

Feature Description (continued)

8.3.4 Output Stage

The DRV5053 output stage is capable of up to 300 µA of current source or 2.3 mA sink.

For proper operation, ensure that equivalent output load ROUT > 10 kΩ. In addition, ensure that the load capacitance C_{OUT} < 10 nF.

8.3.5 Protection Circuits

An analog current limit circuit limits the current through the output driver. The driver current will be clamped to I_{OCP}

8.3.5.1 Overcurrent Protection (OCP)

An analog current-limit circuit limits the current through the FET. The driver current is clamped to I_{OCP}. During this clamping, the $r_{DS(on)}$ of the output FET is increased from the nominal value.

8.3.5.2 Load Dump Protection

The DRV5053 device operates at DC V_{CC} conditions up to 38 V nominally, and can additionally withstand V_{CC} = 40 V. No current-limiting series resistor is required for this protection.

8.3.5.3 Reverse Supply Protection

The DRV5053 device is protected in the event that the V_{CC} pin and the GND pin are reversed (up to –22 V).

NOTE

In a reverse supply condition, the OUT pin reverse-current must not exceed the ratings specified in the *Absolute Maximum Ratings*.

FAULT	CONDITION	DEVICE	DESCRIPTION	RECOVERY
FET overload (OCP)	$I_{SINK} \geq I_{OCP}$	Operating	Output current is clamped to I_{OCP}	$I_O < I_{OCP}$
Load Dump	38 V < V_{CC} < 40 V	Operating	Device will operate for a transient duration	V_{CC} ≤ 38 V
Reverse Supply	–22 V < V_{CC} < 0 V	Disabled	Device will survive this condition	V_{CC} ≥ 2.5 V

8.4 Device Functional Modes

The DRV5053 device is active only when V_{CC} is between 2.5 and 38 V.

When a reverse supply condition exists, the device is inactive.

9 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

The DRV5053 device is used in magnetic-field sensing applications.

9.2 Typical Applications

9.2.1 Typical Application With No Filter

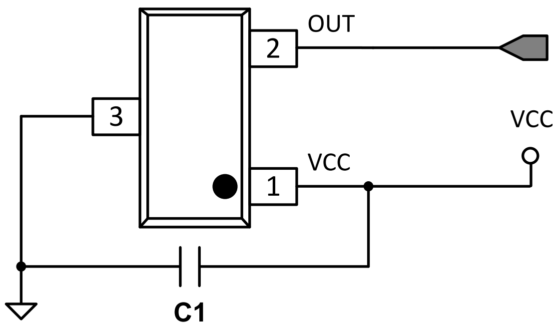


Figure 12. Typical Application Schematic – No Filter

9.2.1.1 Design Requirements

For this design example, use the parameters listed in Table 1 as the input parameters.

Table 1. Design Parameters

DESIGN PARAMETER	REFERENCE	EXAMPLE VALUE
System bandwidth	f_{BW}	15 kHz

9.2.1.2 Detailed Design Procedure

The DRV5053 has internal filtering that limits the bandwidth to at least 20 kHz. For this application no external components are required other than the C1 bypass capacitor, which is 0.01 µF minimum. If the analog output OUT is tied to a microcontroller ADC input, the equivalent load must be R > 10 kΩ and C < 10 nF.

Table 2. External Components

COMPONENT	PIN 1	PIN 2	RECOMMENDED
C1	V_{CC}	GND	A 0.01-µF (minimum) ceramic capacitor rated for V_{CC}

9.2.1.3 *Application Curve*

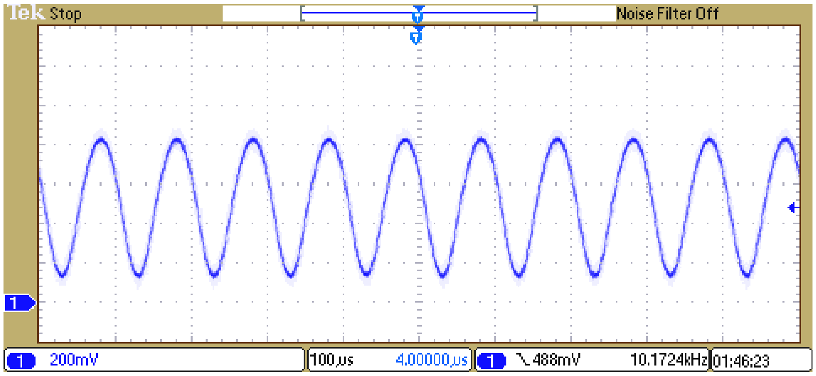


Figure 13. 10-kHz Switching Magnetic Field

9.2.2 Filtered Typical Application

For lower noise on the analog output OUT, additional RC filtering can be added to further reduce the bandwidth.

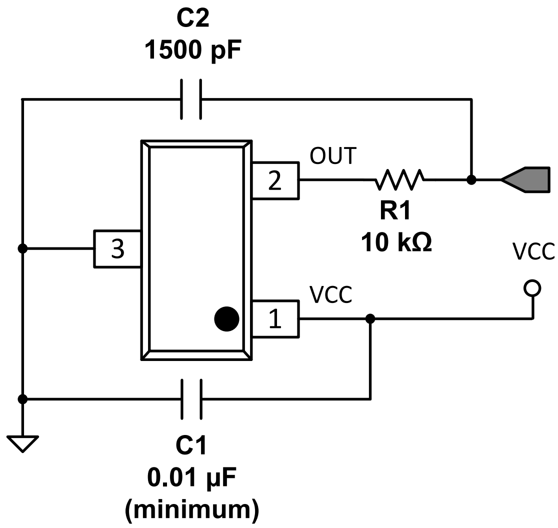


Figure 14. Filtered Typical Application Schematic

9.2.2.1 *Design Requirements*

For this design example, use the parameters listed in Table 3 as the input parameters.

Table 3. Design Parameters

DESIGN PARAMETER	REFERENCE	EXAMPLE VALUE
System bandwidth	f_{BW}	5 kHz

9.2.2.2 Detailed Design Procedure

In this example we will add an external RC filter in order to reduce the output bandwidth.

In order to preserve the signal at the frequencies of interest, we will conservatively select a low-pass filter bandwidth (–3-dB point) at twice the system bandwidth (10 kHz).

$$10\ \text{kHz} < \frac{1}{2\pi \times R_1 \times C_2} \quad (1)$$

If we guess R1 = 10 kΩ, then C2 < 1590 pF. So we select C2 = 1500 pF.

9.2.2.3 Application Curves

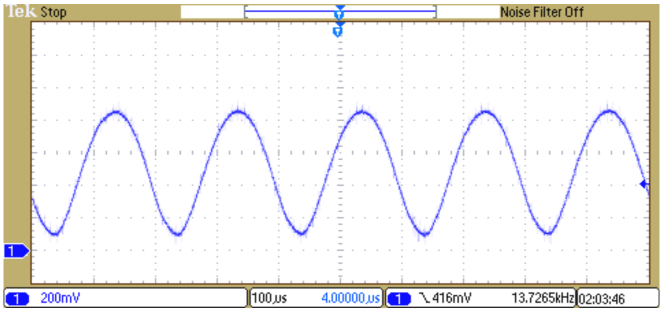
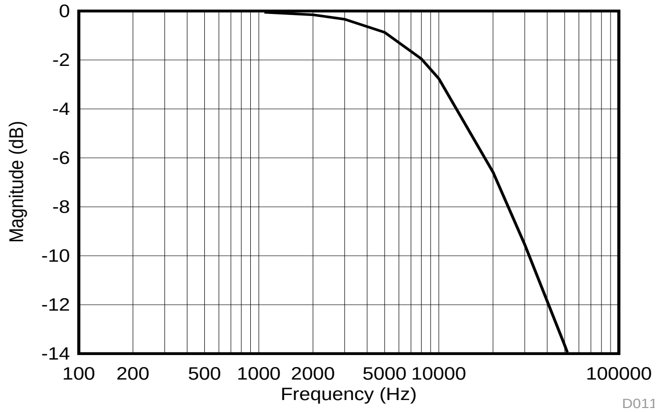


Figure 15. 5-kHz Switching Magnetic Field



R1 = 10-kΩ pullup C2 = 680 pF

Figure 16. Low-Pass Filtering

10 Power Supply Recommendations

The DRV5053 device is designed to operate from an input voltage supply (VM) range between 2.5 and 38 V. A 0.01-µF (minimum) ceramic capacitor rated for V_{CC} must be placed as close to the DRV5053 device as possible.

11 Device and Documentation Support

11.1 Device Support

11.1.1 Device Nomenclature

Figure 17 shows a legend for reading the complete device name for and DRV5053 device.

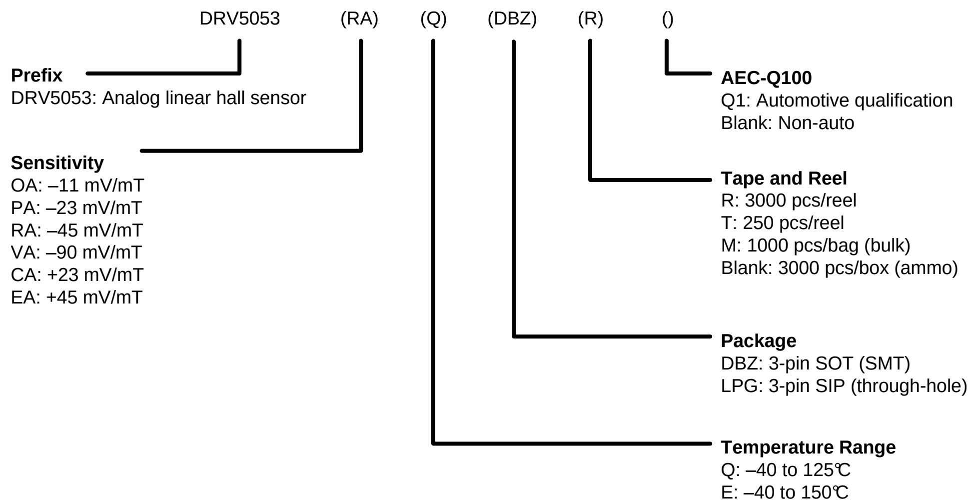


Figure 17. Device Nomenclature

11.1.2 Device Markings

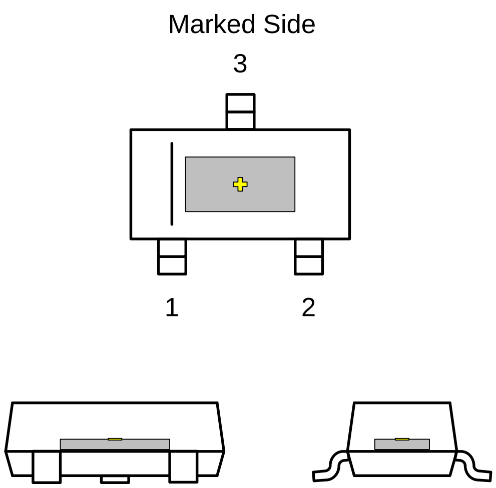


Figure 18. SOT-23 (DBZ) Package

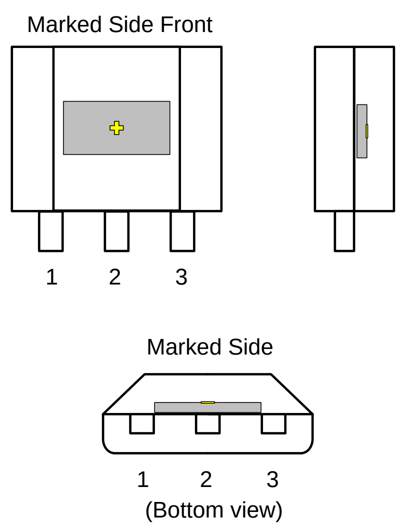


Figure 19. SIP (LPG) Package

✚ indicates the Hall effect sensor (not to scale). The Hall element is located in the center of the package with a tolerance of ±100 µm. The height of the Hall element from the bottom of the package is 0.7 mm ±50 µm in the DBZ package and 0.987 mm ±50 µm in the LPG package.

11.2 Trademarks

All trademarks are the property of their respective owners.

11.3 Electrostatic Discharge Caution

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

11.4 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

12 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
DRV5053CAQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALCA	Samples
DRV5053CAQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALCA	Samples
DRV5053CAQLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALCA	Samples
DRV5053CAQLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALCA	Samples
DRV5053EAQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALEA	Samples
DRV5053EAQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALEA	Samples
DRV5053EAQLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALEA	Samples
DRV5053EAQLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALEA	Samples
DRV5053OAQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALOA	Samples
DRV5053OAQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALOA	Samples
DRV5053OAQLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALOA	Samples
DRV5053OAQLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALOA	Samples
DRV5053PAQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALPA	Samples
DRV5053PAQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALPA	Samples
DRV5053PAQLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALPA	Samples
DRV5053PAQLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALPA	Samples
DRV5053RAQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALRA	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
DRV5053RAQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALRA	Samples
DRV5053RAQLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALRA	Samples
DRV5053RAQLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALRA	Samples
DRV5053VAQDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALVA	Samples
DRV5053VAQDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	+ALVA	Samples
DRV5053VAQLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALVA	Samples
DRV5053VAQLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 125	+ALVA	Samples
PDRV5053CAQDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI	-40 to 125		
PDRV5053CAQLPG	PREVIEW	TO-92	LPG	3	2000	TBD	Call TI	Call TI	-40 to 125		
PDRV5053EAQDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI	-40 to 125		
PDRV5053EAQLPG	PREVIEW	TO-92	LPG	3	2000	TBD	Call TI	Call TI	-40 to 125		
PDRV5053OAQDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI	-40 to 125		
PDRV5053OAQLPG	PREVIEW	TO-92	LPG	3	2000	TBD	Call TI	Call TI	-40 to 125		
PDRV5053PAQDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI	-40 to 125		
PDRV5053PAQLPG	PREVIEW	TO-92	LPG	3	2000	TBD	Call TI	Call TI	-40 to 125		
PDRV5053RAQDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI	-40 to 125		
PDRV5053RAQLPG	PREVIEW	TO-92	LPG	3	2000	TBD	Call TI	Call TI	-40 to 125		
PDRV5053VAQDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI	-40 to 125		
PDRV5053VAQLPG	PREVIEW	TO-92	LPG	3	2000	TBD	Call TI	Call TI	-40 to 125		

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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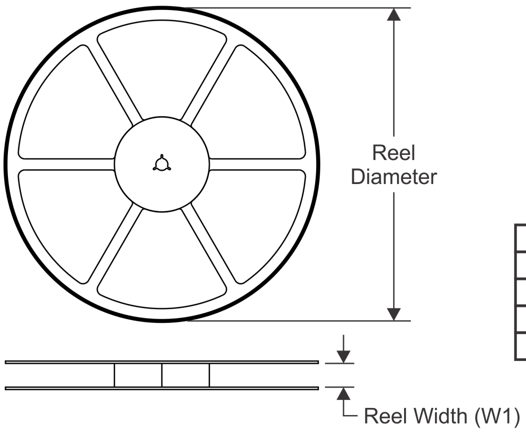
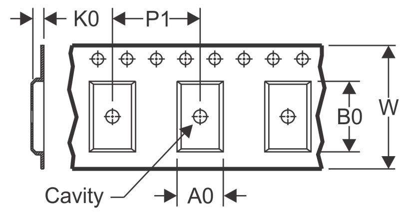
TAPE AND REEL INFORMATION

REEL DIMENSIONS

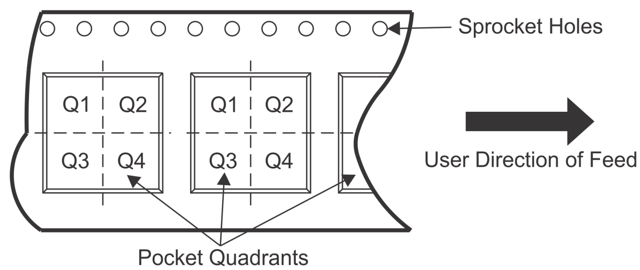


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

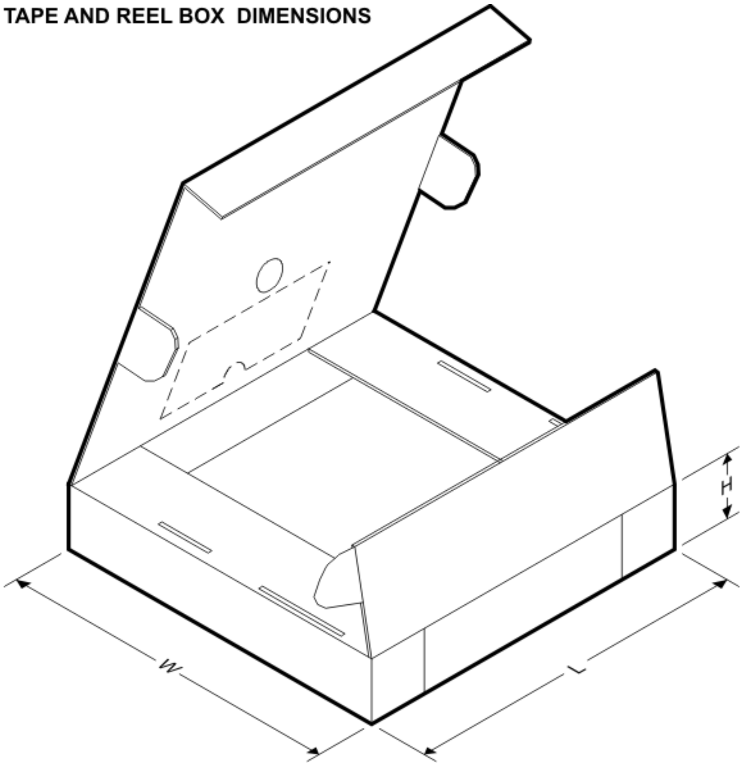
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

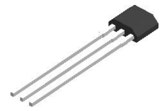
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
DRV5053CAQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053CAQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053EAQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053EAQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053OAQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053OAQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053PAQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053PAQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053RAQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053RAQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053VAQDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5053VAQDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DRV5053CAQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5053CAQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
DRV5053EAQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5053EAQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
DRV5053OAQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5053OAQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
DRV5053PAQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5053PAQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
DRV5053RAQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5053RAQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
DRV5053VAQDBZR	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5053VAQDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0

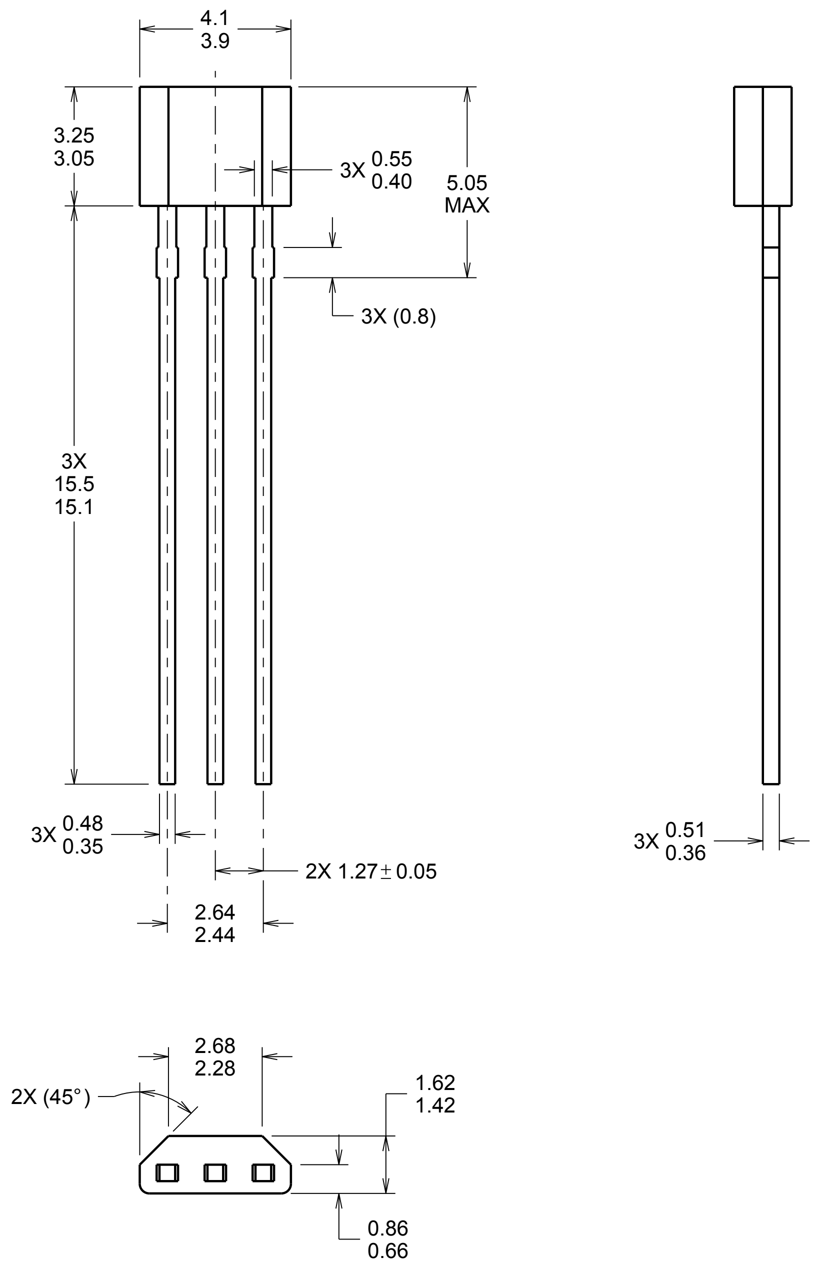


PACKAGE OUTLINE

LPG0003A

TO-92 - 5.05 mm max height

TO-92

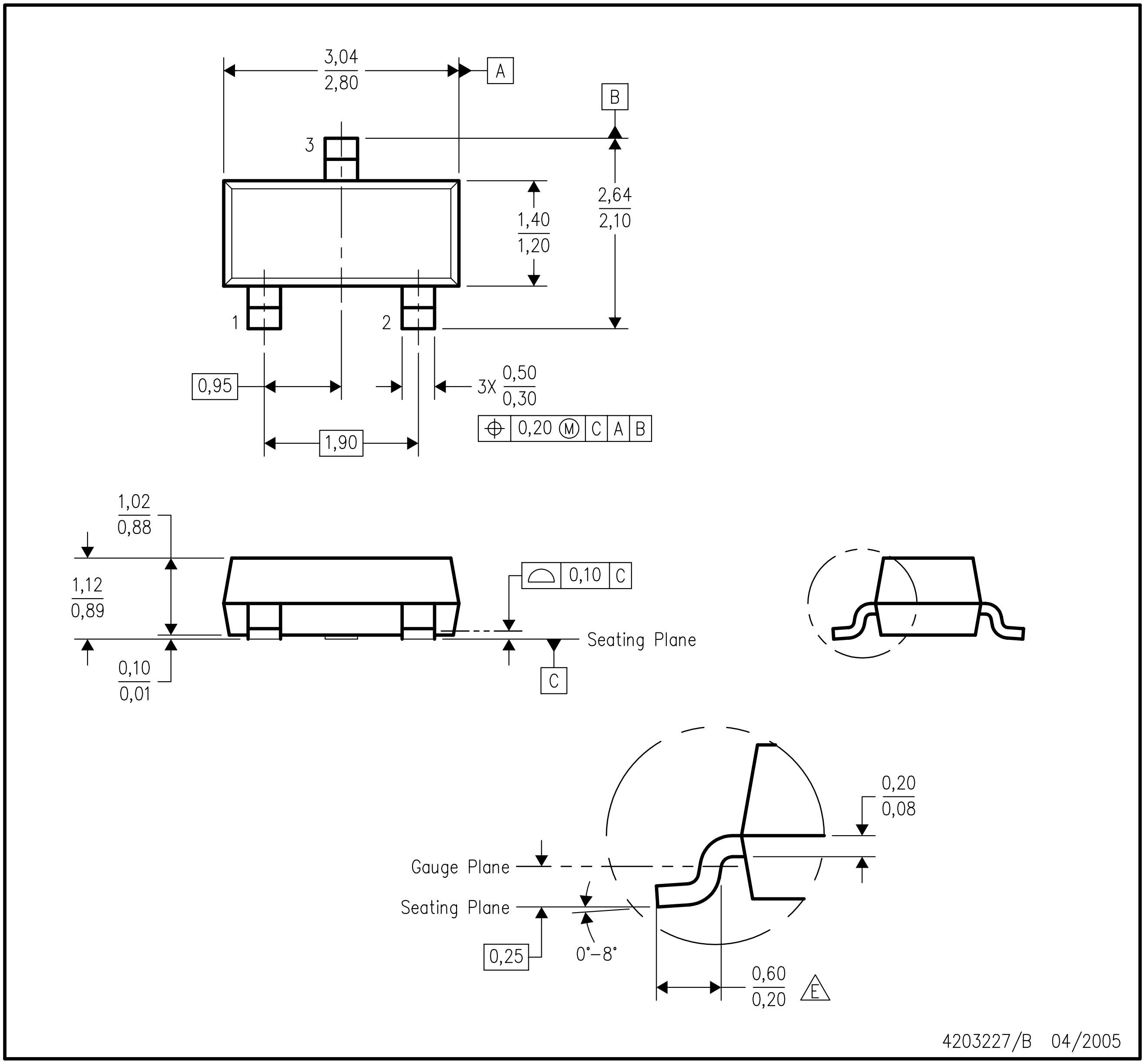


4221343/A 02/2014

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

DBZ (R-PDSO-G3) PLASTIC SMALL-OUTLINE



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
B. This drawing is subject to change without notice.
C. Lead dimensions are inclusive of plating.
D. Body dimensions are exclusive of mold flash and protrusion. Mold flash and protrusion not to exceed 0.25 per side.
E. Falls within JEDEC TO—236 variation AB, except minimum foot length.

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