DRV5032 Ultra-Low-Power Digital-Switch Hall Effect Sensor

1 Features

- Industry-Leading Ultra-Low Power Consumption
  - 5-Hz Version: 0.54 µA With 1.8 V
  - 20-Hz Versions: 1.6 µA With 3 V
- 1.65- to 5.5-V Operating V_{CC} Range
- Magnetic Threshold (Typical B_{OP}):
  - 3 mT, High Sensitivity
- Omnipolar and Dual-Unipolar Options
- 20-Hz and 5-Hz Sampling Rate Options
- Open-Drain and Push-Pull Output Options
- SOT-23 and X2SON Package Options
- –40°C to +85°C Operating Temperature Range

2 Applications

- Battery-Critical Position Sensing
- Electricity Meter Tamper Detection
- Cell Phone, Laptop, or Tablet Case Sensing
- E-locks, Smoke Detectors, Appliances
- Medical Devices, IoT Systems
- Valve or Solenoid Position Detection
- Contactless Diagnostics or Activation

3 Description

The DRV5032 device is an ultra-low-power digital-switch Hall effect sensor, designed for the most compact and battery-sensitive systems. The device is offered in multiple sampling rates, output drivers, and packages to accommodate various applications.

When the applied magnetic flux density exceeds the B_{OP} threshold, the device output drives a low voltage. The output stays low until the flux density decreases to less than B_{RP}, and then the output either drives a high voltage or becomes high impedance, depending on the device version. By incorporating an internal oscillator, the device samples the magnetic field and updates the output at a rate of 20 Hz, or 5 Hz for the lowest current consumption. Omnipolar and dual-unipolar magnetic responses are available.

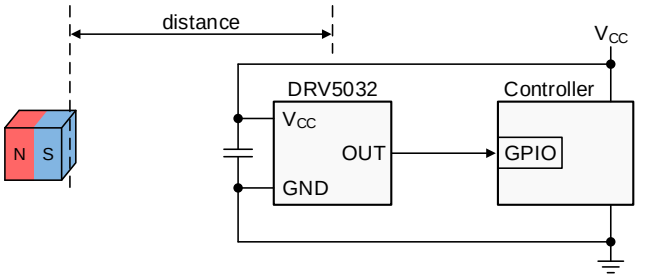
The device operates from a V_{CC} range of 1.65 V to 5.5 V, and is packaged in a standard SOT-23 and small X2SON.

Device Information(1)

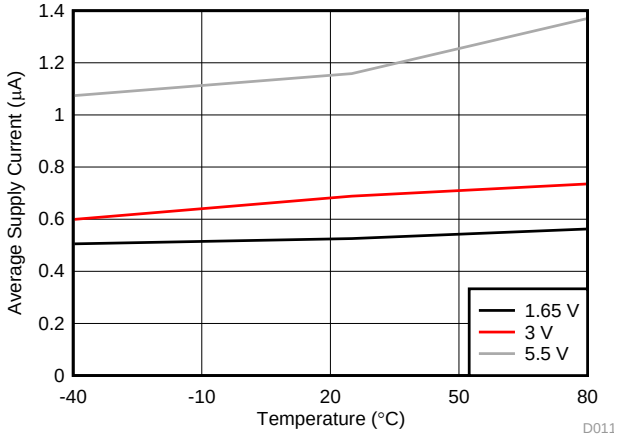
PART NUMBER	PACKAGE	BODY SIZE (NOM)
DRV5032	SOT-23 (3)	2.92 mm × 1.30 mm
	X2SON (4)	1.10 mm × 1.40 mm

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

Typical Schematic



Current Consumption of 5-Hz Version



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4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

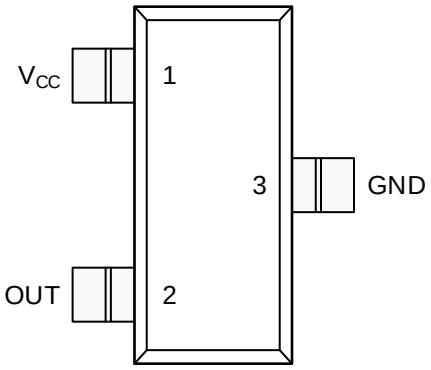
Changes from Original (April 2017) to Revision A	Page
• Added the FA and FD device versions	1

5 Device Comparison Table

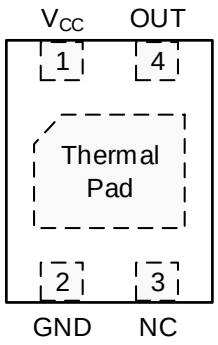
VERSION	MAGNETIC THRESHOLD	MAGNETIC RESPONSE	OUTPUT TYPE	SAMPLING RATE	PACKAGES AVAILABLE
FA	3 mT	Omnipolar	Push-pull	20 Hz	SOT-23, X2SON
FB				5 Hz	SOT-23
FC			Open-drain	20 Hz	SOT-23
FD		Dual-Unipolar	Push-pull	20 Hz	X2SON

6 Pin Configuration and Functions

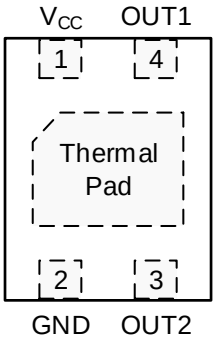
DBZ Package
3-Pin SOT-23
Top View



FA Version DMR Package
4-Pin X2SON
Top View



FD Version DMR Package
4-Pin X2SON
Top View



Pin Functions

PIN				I/O	DESCRIPTION
NAME	NO.				
	SOT-23	X2SON (FA)	X2SON (FD)		
GND	3	2	2	—	Ground reference
OUT	2	4	—	O	Omnipolar output that responds to north and south magnetic poles
OUT1	—	—	4	O	Unipolar output that responds to north magnetic poles near the top of the package
OUT2	—	—	3	O	Unipolar output that responds to south magnetic poles near the top of the package
NC	—	3	—	—	No-connect. This pin is not connected to the silicon. It should be left floating or tied to ground. It should be soldered to the board for mechanical support.
V_{CC}	1	1	1	—	1.65-V to 5.5-V power supply. TI recommends connecting this pin to a ceramic capacitor to ground with a value of at least 0.1 µF.
Thermal Pad	—	PAD	PAD	—	No-connect. This pin should be left floating or tied to ground. It should be soldered to the board for mechanical support.

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}	–0.3	5.5	V
Power supply voltage slew rate	V_{CC}	Unlimited		V / µs
Output voltage	OUT, OUT1, OUT2	–0.3	V_{CC} + 0.3	V
Output current	OUT, OUT1, OUT2	–5	5	mA
Magnetic flux density, B_{MAX}		Unlimited		T
Junction temperature, T_J			105	°C
Storage temperature, T_{stg}		–65	150	°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.

7.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	±6000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	±750	

(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	1.65	5.5	V
V_O	Output voltage	0	5.5	V
I_O	Output current	–5	5	mA
T_A	Operating ambient temperature	–40	85	°C

7.4 Thermal Information

THERMAL METRIC(1)		DRV5032		UNIT
		SOT-23 (DBZ)	X2SON (DMR)	
		3 PINS	4 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	356	159	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	128	77	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	94	102	°C/W
ψ_{JT}	Junction-to-top characterization parameter	11.4	0.9	°C/W
ψ_{JB}	Junction-to-board characterization parameter	92	100	°C/W

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

7.5 Electrical Characteristics

for V_{CC} = 1.65 V to 5.5 V, over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
PUSH-PULL OUTPUT DRIVER						
V_{OH}	High-level output voltage	I_{OUT} = –1 mA	V_{CC} – 0.35	V_{CC} – 0.1		V
V_{OL}	Low-level output voltage	I_{OUT} = 1 mA		0.1	0.3	V
OPEN-DRAIN OUTPUT						
I_{OZ}	High impedance output leakage current	V_{CC} = 5.5 V, OUT = 5.5 V		5	100	nA
V_{OL}	Low-level output voltage	I_{OUT} = 1 mA		0.1	0.3	V
DRV5032FA, DRV5032FC, DRV5032FD						
f_S	Frequency of magnetic sampling		13.3	20	37	Hz
t_S	Period of magnetic sampling		27	50	75	ms
$I_{CC(AVG)}$	Average current consumption	V_{CC} = 1.8 V		1.3		µA
		V_{CC} = 3 V		1.6	3.5	
		V_{CC} = 5 V		2.3		
DRV5032FB						
f_S	Frequency of magnetic sampling		3.5	5	8.5	Hz
t_S	Period of magnetic sampling		117	200	286	ms
$I_{CC(AVG)}$	Average current consumption	V_{CC} = 1.8 V		0.54		µA
		V_{CC} = 3 V		0.69	1.8	
		V_{CC} = 5 V		1.06		
ALL VERSIONS						
$I_{CC(PK)}$	Peak current consumption			2	2.7	mA
t_{ON}	Power-on time			55	100	µs
t_{ACTIVE}	Active time period (see Figure 13)			40		µs

7.6 Magnetic Characteristics

for V_{CC} = 1.65 V to 5.5 V, over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
DRV5032FA, DRV5032FB, DRV5032FC						
B_{OP}	Magnetic threshold operate point		±1.5	±3	±4.8	mT
B_{RP}	Magnetic threshold release point		±0.5	±1.5	±3	mT
B_{HYS}	Magnetic hysteresis: $\lvert B_{OP} - B_{RP} \rvert$		0.8	1.5	3	mT
DRV5032FD						
B_{OP}	Magnetic threshold operate point (see Figure 10)	OUT1 pin	–4.8	–3	–1.5	mT
		OUT2 pin	1.5	3	4.8	
B_{RP}	Magnetic threshold release point (see Figure 10)	OUT1 pin	–3	–1.5	–0.5	mT
		OUT2 pin	0.5	1.5	3	
B_{HYS}	Magnetic hysteresis: $\lvert B_{OP} - B_{RP} \rvert$	Each output	0.8	1.5	3	mT

7.7 Typical Characteristics

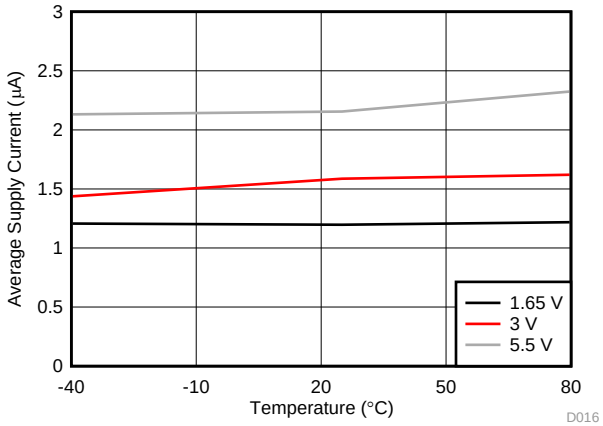


Figure 1. $I_{CC(AVG)}$ vs Temperature (20-Hz versions)

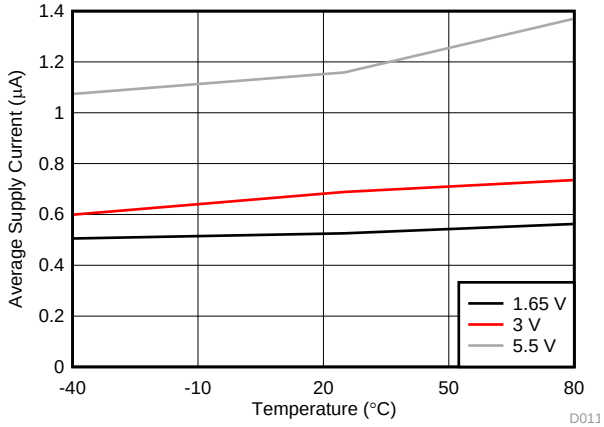


Figure 2. $I_{CC(AVG)}$ vs Temperature (5-Hz version)

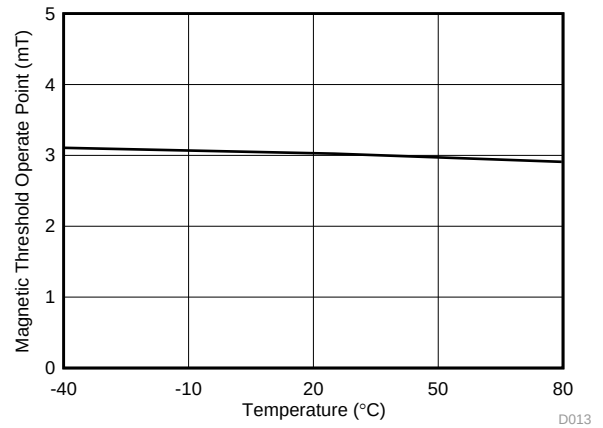


Figure 3. $|B_{OP}|$ vs Temperature

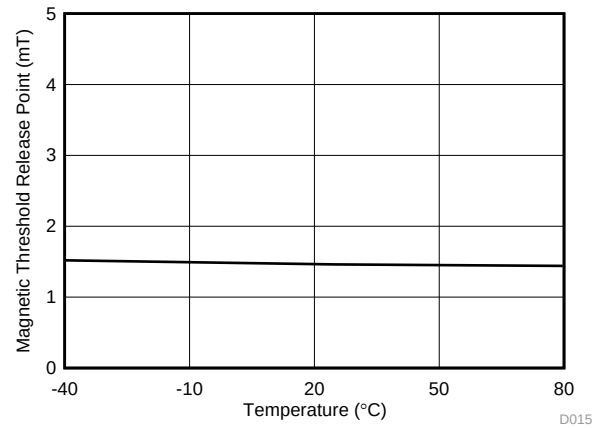


Figure 4. $|B_{RP}|$ vs Temperature

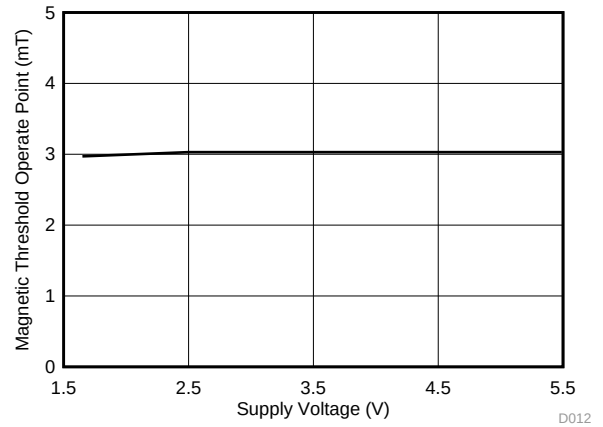


Figure 5. $|B_{OP}|$ vs V_{CC}

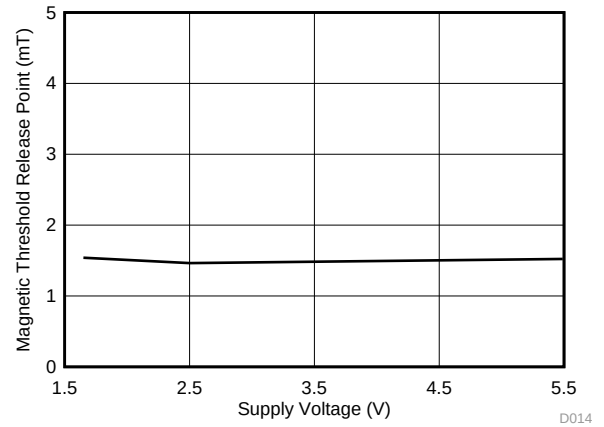


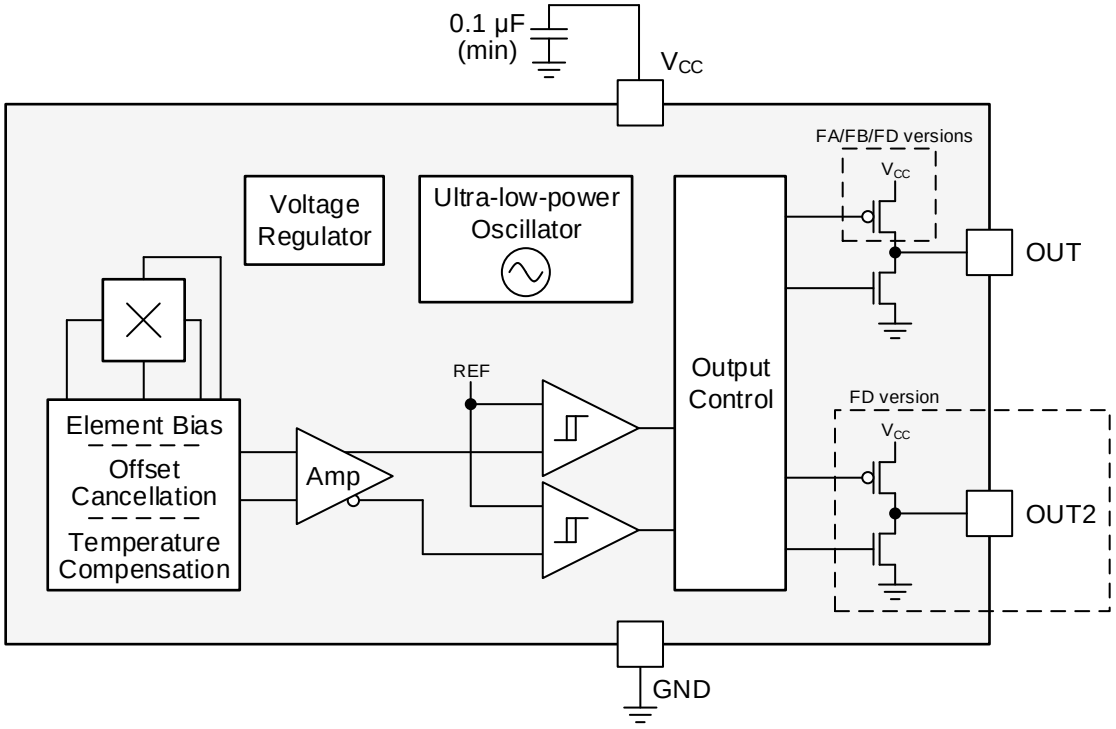
Figure 6. $|B_{RP}|$ vs V_{CC}

8 Detailed Description

8.1 Overview

The DRV5032 device is a magnetic sensor with a digital output that indicates when the magnetic flux density threshold has been crossed. The device integrates a Hall effect element, analog signal conditioning, and a low-frequency oscillator that enables ultra-low average power consumption. By operating from a 1.65-V to 5.5-V supply, the device periodically measures magnetic flux density, updates the output, and enters a low-power sleep state.

8.2 Functional Block Diagram



8.3 Feature Description

8.3.1 Magnetic Flux Direction

The DRV5032 device is sensitive to the magnetic field component that is perpendicular to the top of the package (as shown in Figure 7).

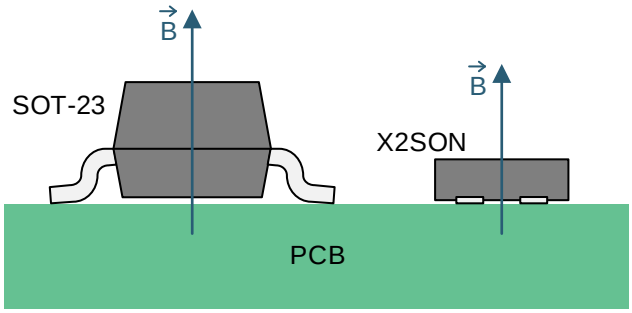


Figure 7. Direction of Sensitivity

Feature Description (continued)

Magnetic flux that travels from the bottom to the top of the package is considered positive in this data sheet. This condition exists when a south magnetic pole is near the top of the package. Magnetic flux that travels from the top to the bottom of the package results in negative millitesla values.

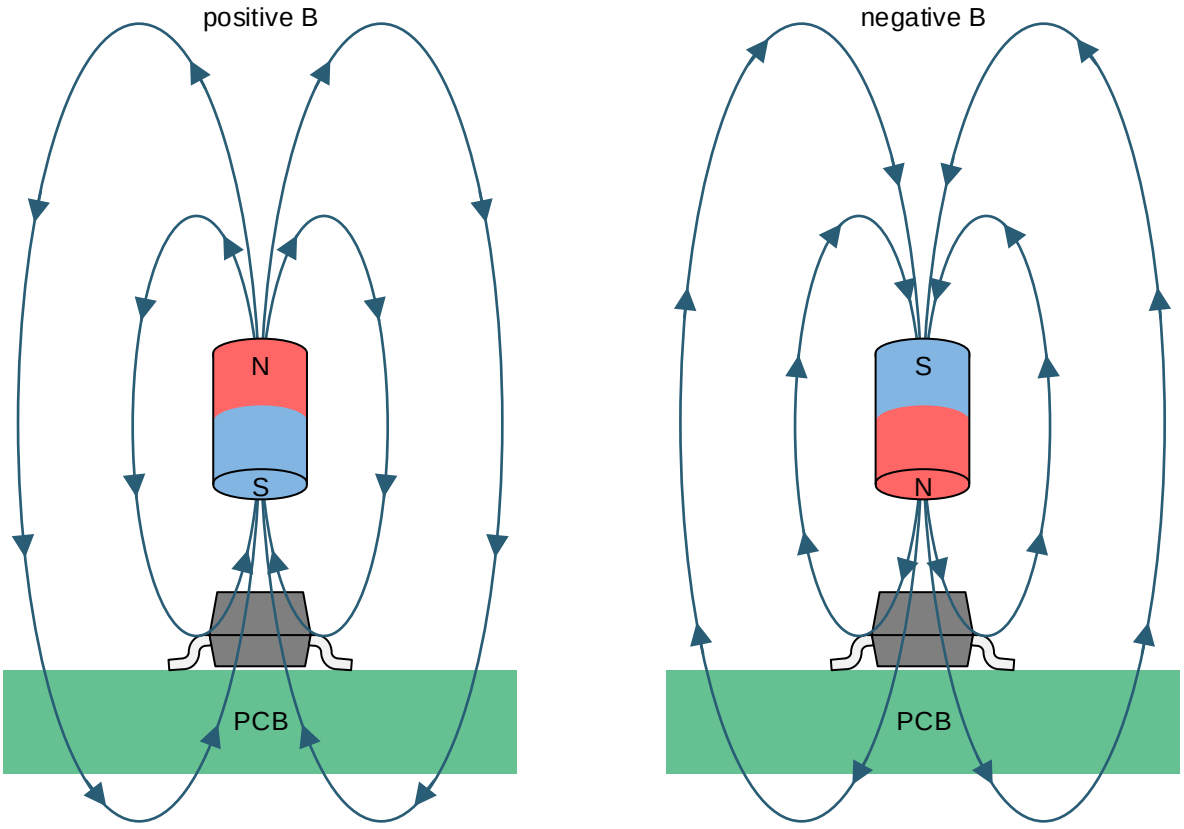


Figure 8. Flux Direction Polarity

8.3.2 Device Version Comparison

Figure 10 lists the available device versions.

VERSION	MAGNETIC THRESHOLD	MAGNETIC RESPONSE	OUTPUT TYPE	SAMPLING RATE	PACKAGES AVAILABLE
FA	3 mT	Omnipolar	Push-pull	20 Hz	SOT-23, X2SON
FB				5 Hz	SOT-23
FC			Open-drain	20 Hz	SOT-23
FD		Dual-Unipolar	Push-pull	20 Hz	X2SON

8.3.2.1 Magnetic Threshold

Devices that have a lower magnetic threshold detect magnets at a farther distance. Higher thresholds generally require a closer distance or larger magnet.

8.3.2.2 Magnetic Response

Omnipolar devices respond the same to north and south poles as shown in Figure 9.

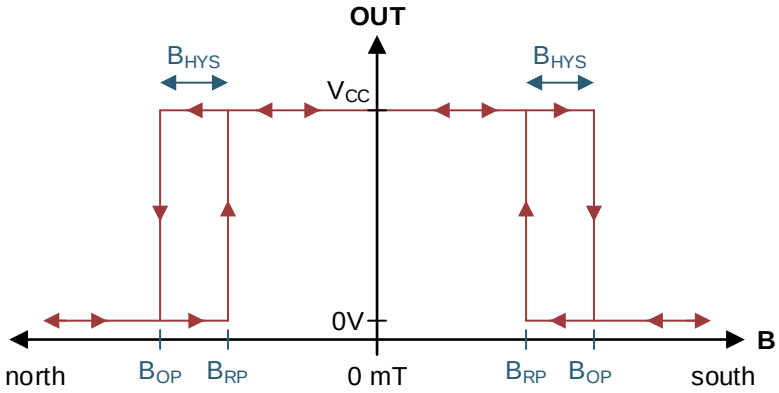


Figure 9. Omnipolar Functionality

The FD device version has two outputs, and each has a unipolar response. Pin OUT1 only responds to flux in the top-down direction (north), and pin OUT2 only responds to flux in the bottom-up direction (south).

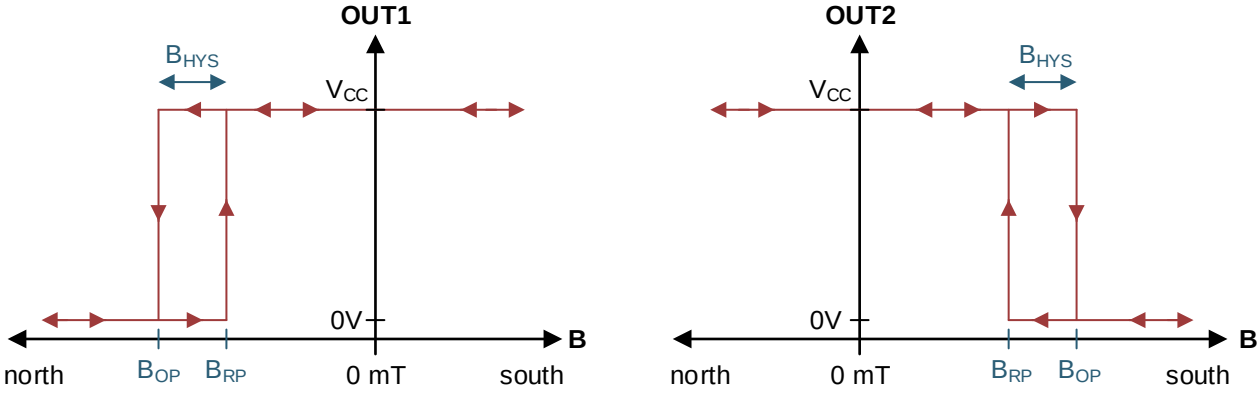


Figure 10. Dual-Unipolar Functionality

8.3.2.3 Output Type

The FB device version has a push-pull CMOS output that can drive a V_{CC} or ground level. The FC device version has an open-drain output that can become high impedance or drive ground, and an external pullup resistor must be used.

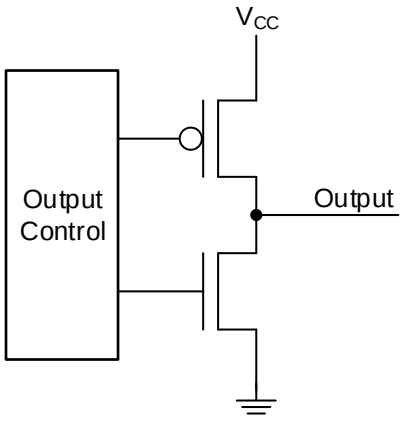


Figure 11. Push-Pull Output (Simplified)

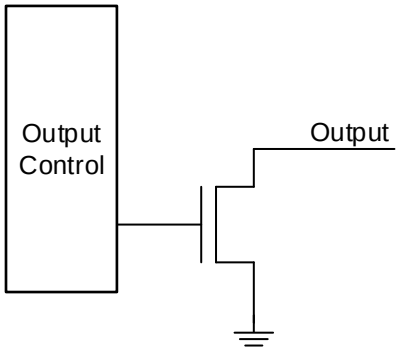


Figure 12. Open-Drain Output (Simplified)

8.3.2.4 Sampling Rate

When the DRV5032 device powers up, it measures the first magnetic sample and sets the output within the t_{ON} time. The output is latched, and the device enters an ultra-low-power sleep state. After each t_S time has passed, the device measures a new sample and updates the output if necessary. If the magnetic field does not change between periods, the output also does not change.

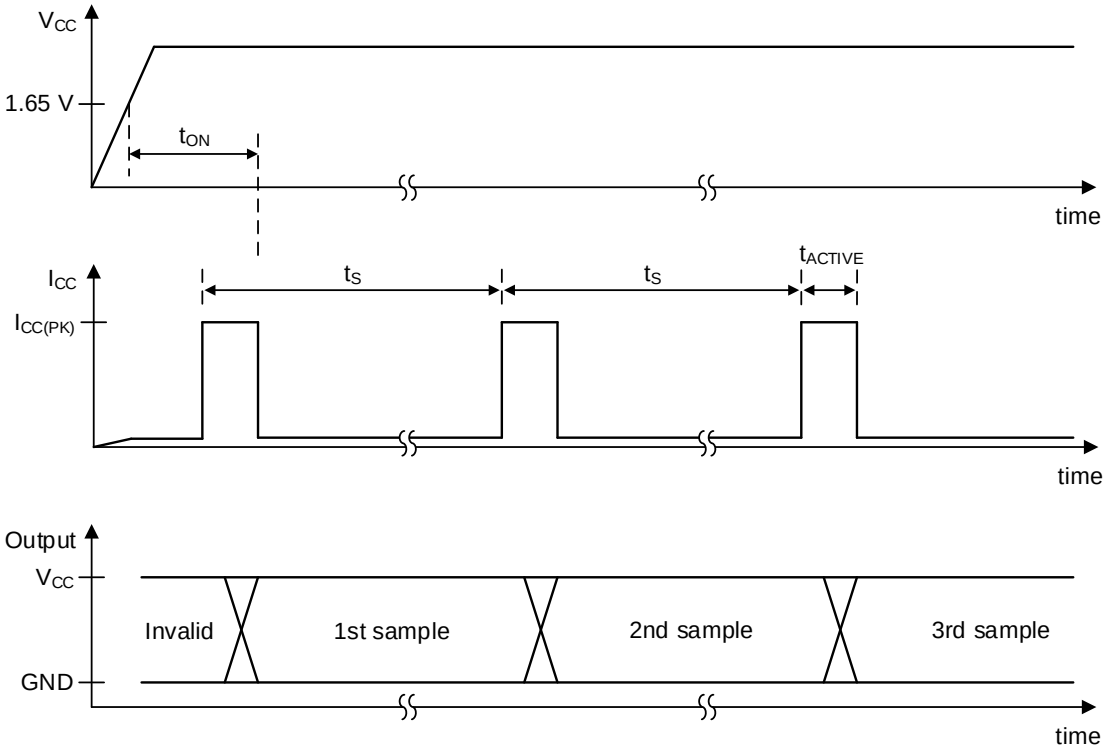


Figure 13. Timing Diagram

8.3.3 Hall Element Location

The sensing element inside the device is in the center of both packages when viewed from the top. Figure 14 shows the tolerances and side-view dimensions.

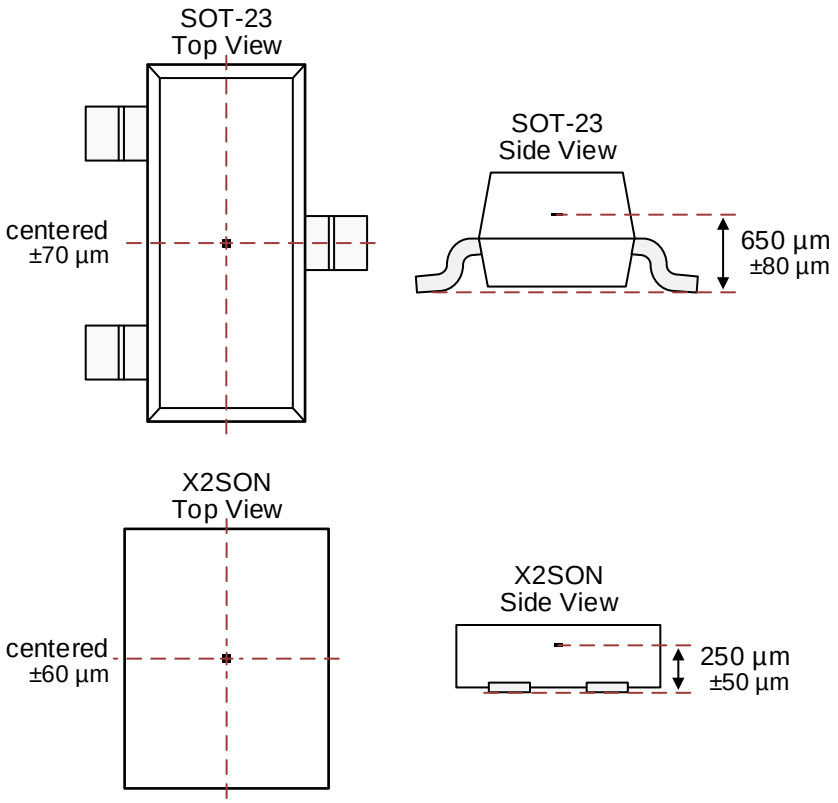


Figure 14. Hall Element Location

8.4 Device Functional Modes

The DRV5032 device has one mode of operation that applies when the *Recommended Operating Conditions* are met.

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 DRV5032 device is typically used to detect the proximity of a magnet. The magnet is often attached to a movable component in the system.

9.1.1 Output Type Tradeoffs

The push-pull output allows for the lowest system power consumption, since there is no current leakage path when the output drives high or low. The open-drain output involves a leakage path when the output drives low, through the external pullup resistor.

The open-drain outputs of multiple devices can be tied together to form a logical AND. In this setup, if any sensor drives low, the voltage on the shared node becomes low. This can allow a single GPIO to measure an array of sensors.

9.2 Typical Applications

9.2.1 General-Purpose Magnet Sensing

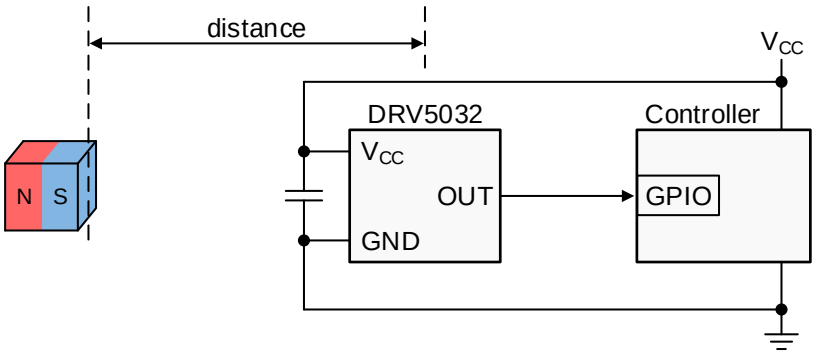


Figure 15. Typical Application Diagram

9.2.1.1 Design Requirements

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

Table 1. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
V_{CC}	3.3 V
Magnet	1-cm Cube NdFeB
Closest magnet distance	2.5 cm
Magnetic flux density at closest distance	7.8 mT
Magnetic flux density when magnet moves away	Close to 0 mT

9.2.1.2 Detailed Design Procedure

When designing a digital-switch magnetic sensing system, three variables should always be considered: the magnet, sensing distance, and threshold of the sensor.

Magnets are made from different ferromagnetic materials that have tradeoffs in cost, shift across temperature, absolute max temperature ratings, magnetic remanence, and magnetic coercivity. The magnetic remanence and the dimensions of a magnet determine the magnetic flux density it produces across a distance.

The DRV5032 device has a detection threshold specified by parameter B_{OP}. To reliably activate the sensor, the magnet must apply greater than the max specified B_{OP}. In such a system, the sensor typically detects the magnet before it has moved to the closest position. When the magnet moves away from the sensor, it must apply less than the minimum specified B_{RP} to reliably release the sensor.

9.2.1.3 Application Curve

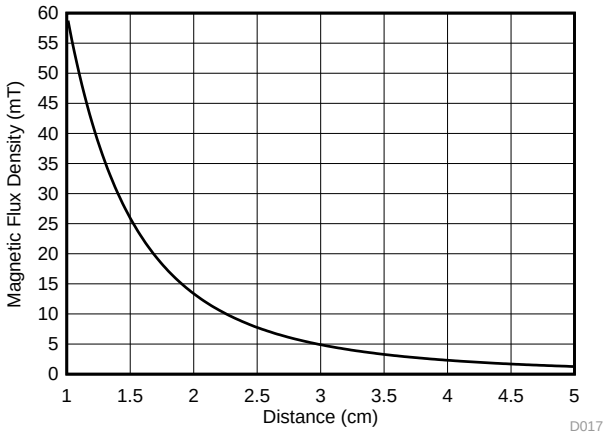


Figure 16. Magnetic Profile of a 1-cm Cube NdFeB Magnet

9.2.2 Three-Position Switch

This application uses the DRV5032FD for a three-position switch.

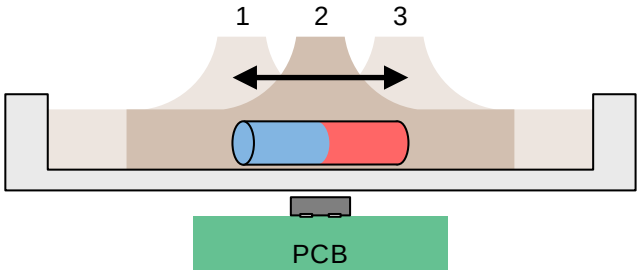


Figure 17. Three-Position Slider Switch with Embedded Magnet

9.2.2.1 Design Requirements

For this design example, use the parameters listed in Table 2.

Table 2. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Hall effect device	DRV5032FD
V_{CC}	5 V
Switch travel distance	5 mm in each direction
Magnet	10 mm cylinder
Mechanical tolerance per position	±0.5 mm

9.2.2.2 Detailed Design Procedure

A standard 2-pole magnet produces strong perpendicular flux components near the outer edges of the poles, and no perpendicular flux near the center at the north-south pole boundary. When the DRV5032FD is below the center of the magnet, it receives close to 0 mT, and both outputs drive high. If the switch with the embedded magnet moves left or right, the sensor receives a north or south field, and OUT1 or OUT2 drive low. This provides 3 digital states of detection.

The length of the magnet should ideally be two times the distance of travel toward each side. Then, when the switch is pushed to either side, the outer edge of the magnet is positioned directly above the sensor where it applies the strongest perpendicular flux component.

To determine the magnitude of perpendicular magnetic flux for a given magnet and distance, TI recommends using simulation software or testing with a linear Hall effect sensor.

9.2.2.3 Application Curve

Figure 18 shows the typical magnetic flux lines around a 2-pole magnet.

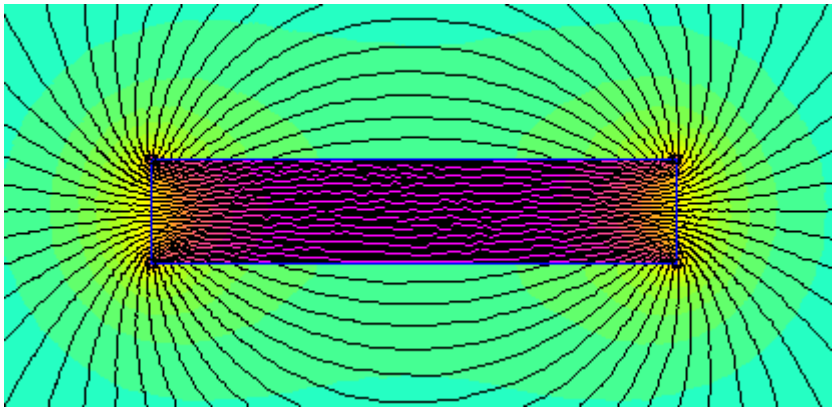


Figure 18. Typical Magnetic Flux Lines

9.3 Do's and Don'ts

Because the Hall element is sensitive to magnetic fields that are perpendicular to the top of the package, a correct magnet approach must be used for the sensor to detect the field. Figure 19 shows the correct and incorrect approaches.

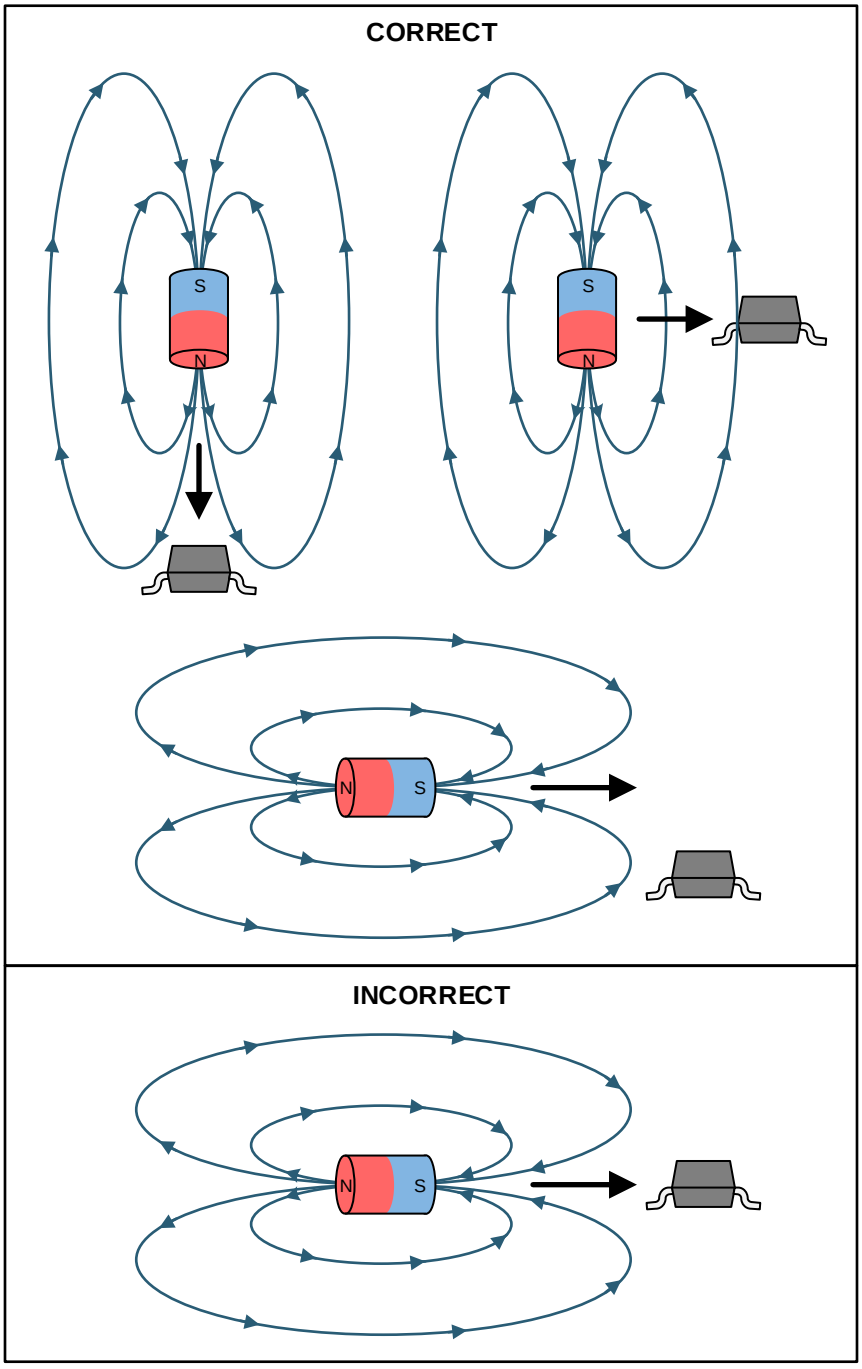


Figure 19. Correct and Incorrect Magnet Approaches

10 Power Supply Recommendations

The DRV5032 device is powered from 1.65-V to 5.5-V DC power supplies. A decoupling capacitor close to the device must be used to provide local energy with minimal inductance. TI recommends using a ceramic capacitor with a value of at least 0.1 µF.

11 Layout

11.1 Layout Guidelines

Magnetic fields generally pass through most nonferromagnetic materials with no significant disturbance. Embedding Hall effect sensors within plastic or aluminum enclosures and sensing magnets on the outside is common practice. Magnetic fields also easily pass through most printed-circuit boards, which makes placing the magnet on the opposite side possible.

11.2 Layout Example

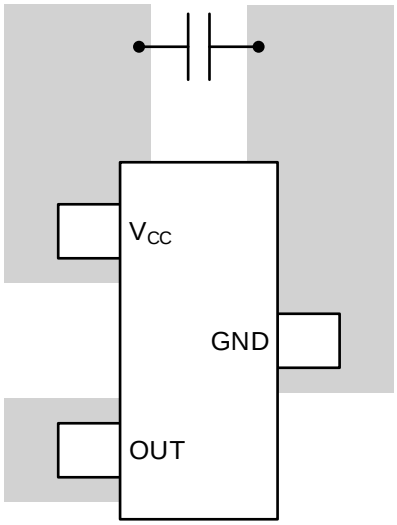


Figure 20. Layout Example

12 Device and Documentation Support

12.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

12.2 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E™ Online Community ***TI's Engineer-to-Engineer (E2E) Community.*** Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support ***TI's Design Support*** Quickly find helpful E2E forums along with design support tools and contact information for technical support.

12.3 Trademarks

E2E is a trademark of Texas Instruments.
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12.4 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.

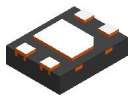
12.5 Glossary

SLYZ022 — *TI Glossary*.

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

13 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.

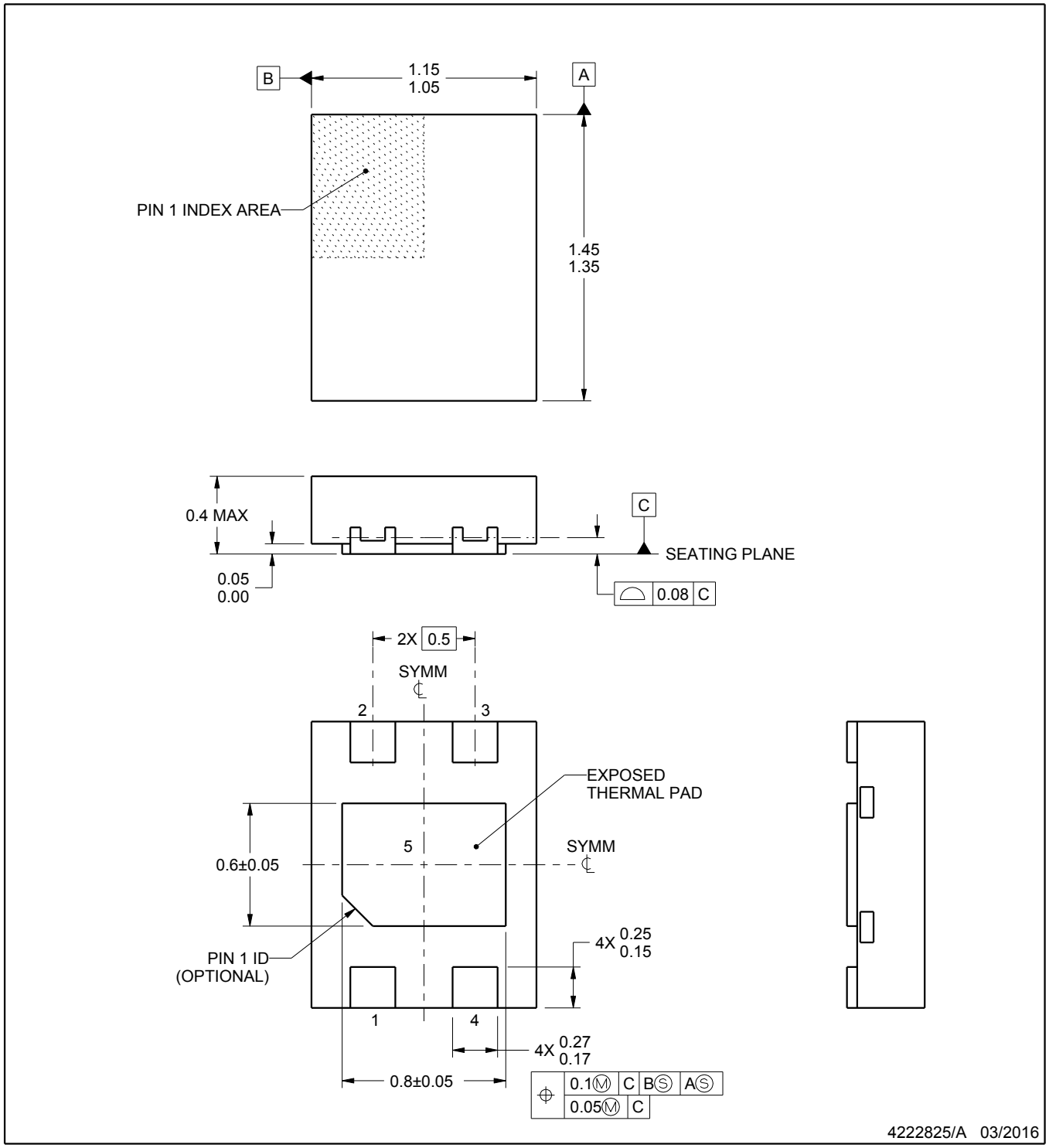


PACKAGE OUTLINE

DMR0004A

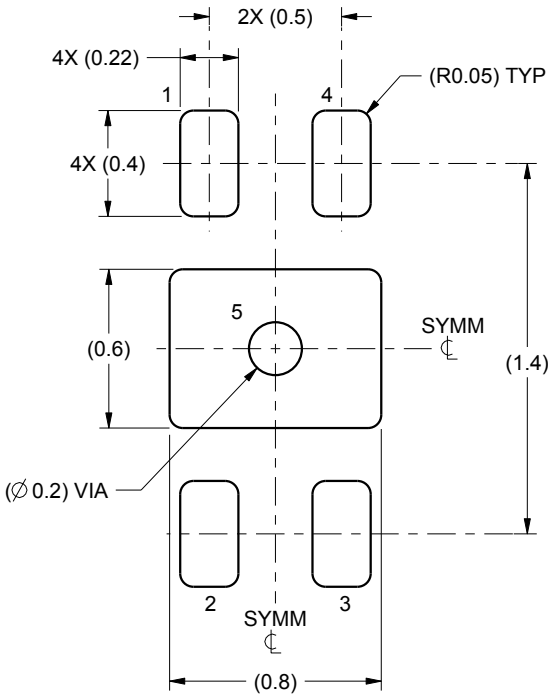
X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD

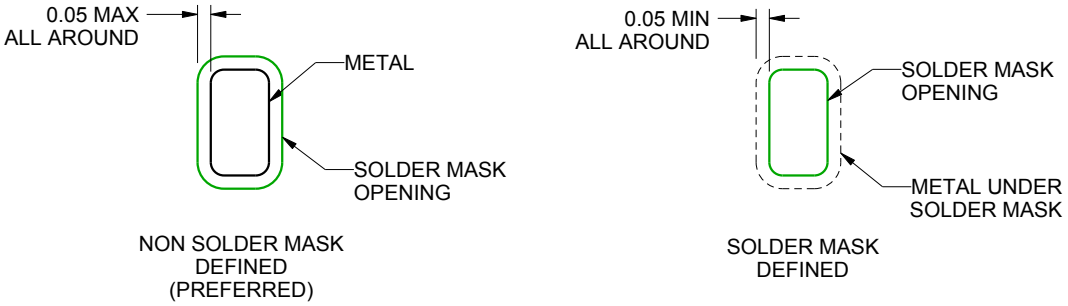


NOTES:

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.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.



LAND PATTERN EXAMPLE
SCALE:35X

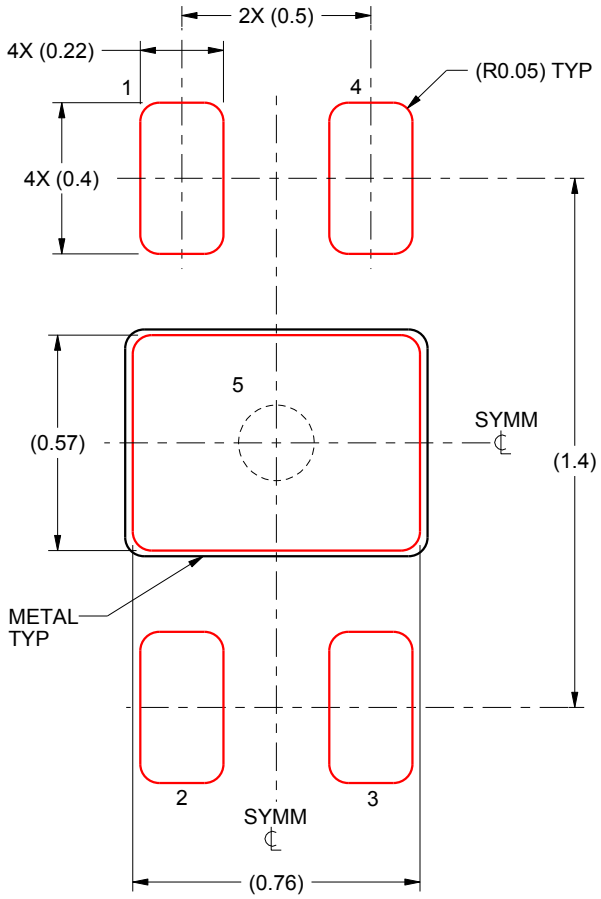


SOLDER MASK DETAILS

4222825/A 03/2016

NOTES: (continued)

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. Vias are optional depending on application, refer to device data sheet. If all or some are implemented, recommended via locations are shown. It is recommended that vias under paste be filled, plugged or tented.



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL

EXPOSED PAD 5:
90% PRINTED SOLDER COVERAGE BY AREA
SCALE:50X

4222825/A 03/2016

NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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
DRV5032AJDBZR	PREVIEW	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	2AJ	
DRV5032AJDMRR	PREVIEW	X2SON	DMR	4	3000	TBD	Call TI	Call TI	-40 to 85	2AJ	
DRV5032FADBZR	PREVIEW	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	2FA	
DRV5032FADBZT	PREVIEW	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	2FA	
DRV5032FADMRR	PREVIEW	X2SON	DMR	4	3000	TBD	Call TI	Call TI	-40 to 85	2FA	
DRV5032FADMRT	PREVIEW	X2SON	DMR	4	250	TBD	Call TI	Call TI	-40 to 85		
DRV5032FBDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	2FB	Samples
DRV5032FBDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	2FB	Samples
DRV5032FCDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	2FC	Samples
DRV5032FCDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	CU SN	Level-1-260C-UNLIM	-40 to 85	2FC	Samples
DRV5032FDDMRR	PREVIEW	X2SON	DMR	4	3000	TBD	Call TI	Call TI	-40 to 85	2FD	
DRV5032FDDMRT	PREVIEW	X2SON	DMR	4	250	TBD	Call TI	Call TI	-40 to 85	2FD	
DRV5032ZEDBZT	PREVIEW	SOT-23	DBZ	3	250	TBD	Call TI	Call TI	-40 to 85	2ZE	

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

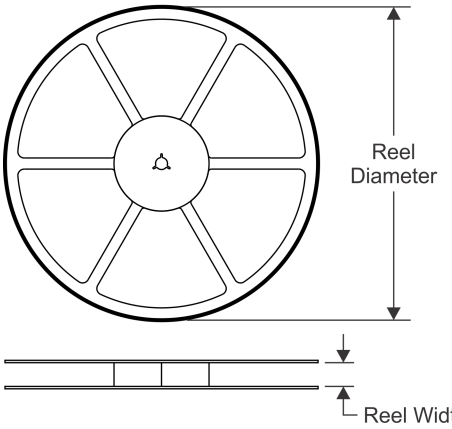
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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.

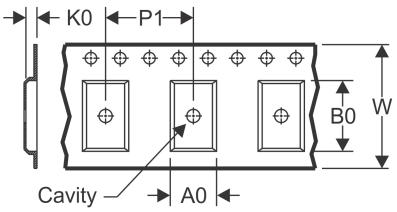
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

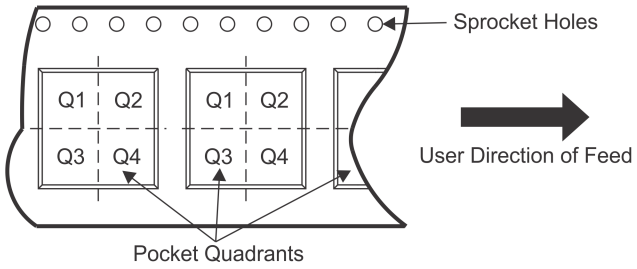


TAPE DIMENSIONS



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

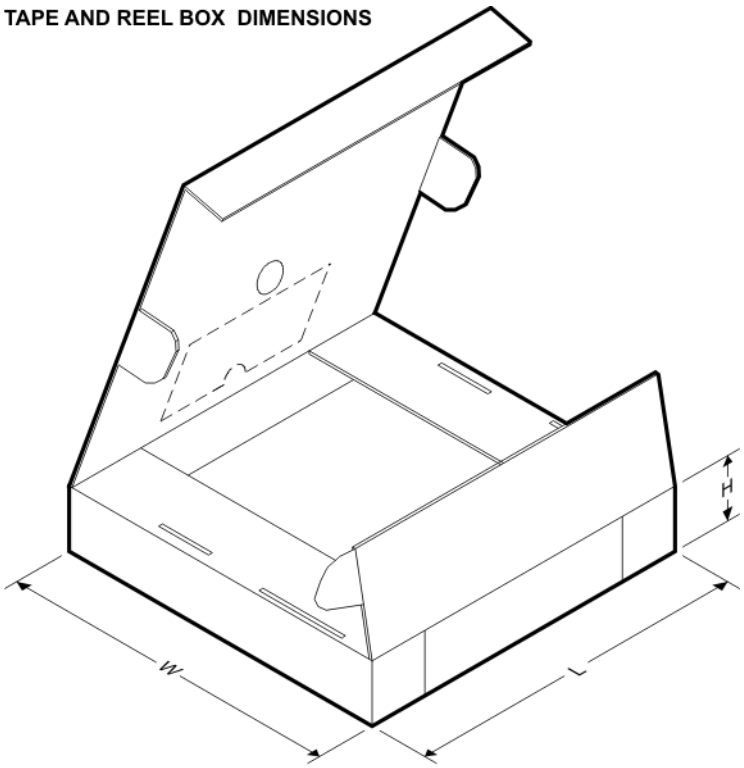
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
DRV5032FBDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FBDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FCDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FCDBZT	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



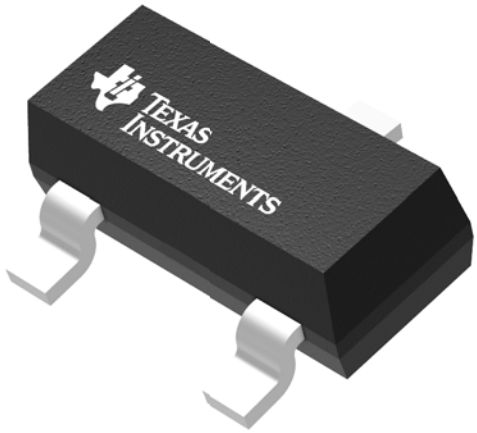
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DRV5032FBDBZR	SOT-23	DBZ	3	3000	183.0	183.0	20.0
DRV5032FBDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
DRV5032FCDBZR	SOT-23	DBZ	3	3000	183.0	183.0	20.0
DRV5032FCDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0

GENERIC PACKAGE VIEW

DBZ 3 SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



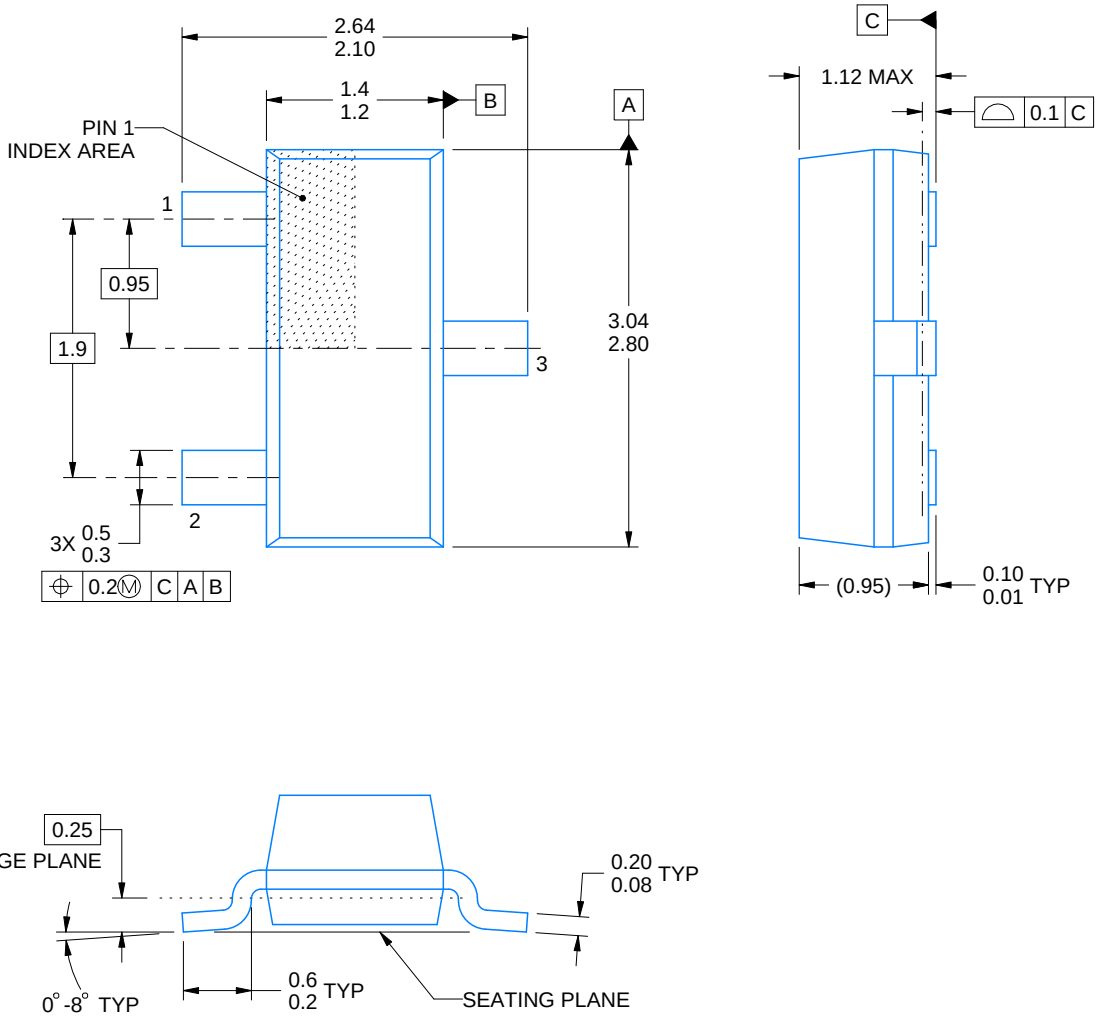
Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

PACKAGE OUTLINE

DBZ0003A

SOT-23 - 1.12 mm max height

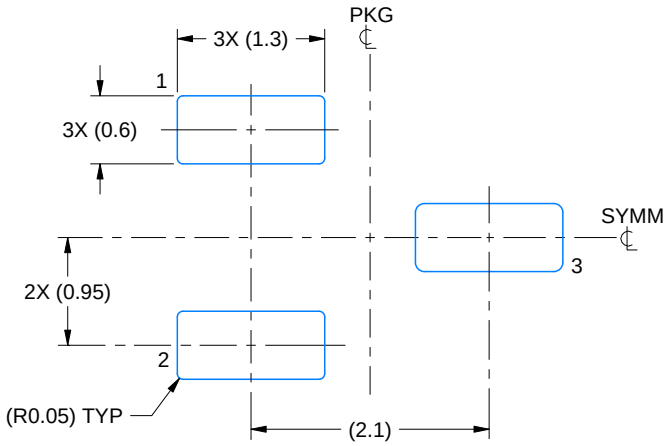
SMALL OUTLINE TRANSISTOR



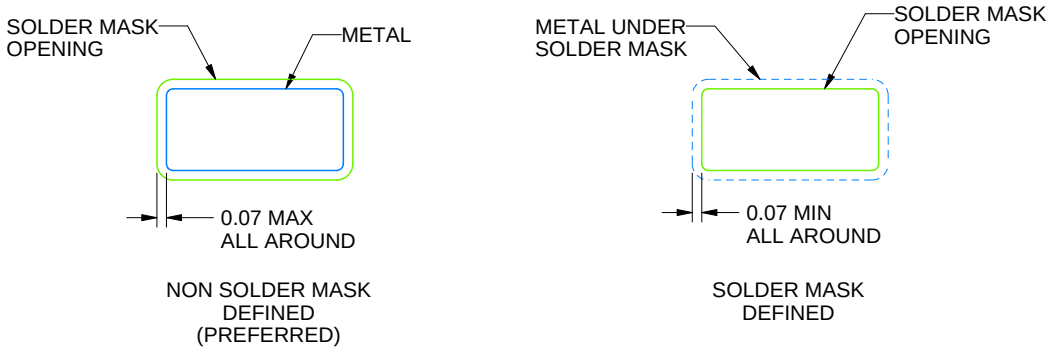
4214838/C 04/2017

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.
3. Reference JEDEC registration TO-236, except minimum foot length.



LAND PATTERN EXAMPLE
SCALE:15X

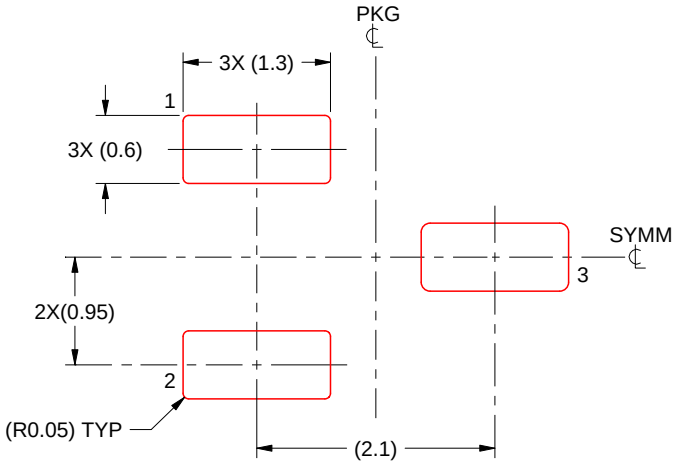


SOLDER MASK DETAILS

4214838/C 04/2017

NOTES: (continued)

4. Publication IPC-7351 may have alternate designs.
5. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 THICK STENCIL
SCALE:15X

4214838/C 04/2017

NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
7. Board assembly site may have different recommendations for stencil design.

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