

# DRV5032 超低功耗数字开关霍尔效应传感器

## 1 特性

- 行业领先的超低功耗
  - 5Hz 版本:  $0.54\mu A$ , 1.8V
  - 20Hz 版本:  $1.6\mu A$ , 3V
- $V_{CC}$  工作电压范围为 1.65V 至 5.5V
- 磁性阈值选项 (最大  $B_{OP}$ ) :
  - 3.9 mT, 最高灵敏度
  - 4.8 mT, 高灵敏度
  - 9.5 mT, 中等灵敏度
  - 63 mT, 最低灵敏度
- 全极和单极选项
- 20Hz 和 5Hz 采样率选项
- 开漏和推挽输出选项
- SOT-23 和 X2SON 封装选项
- 运行温度范围:  $-40^{\circ}C$  至  $+85^{\circ}C$

## 2 应用

- 电池关键型位置检测
- 电量计篡改检测
- 手机、笔记本电脑或平板电脑保护壳检测
- 电子锁、烟雾探测器、电器
- 医疗设备、物联网系统
- 阀门或电磁阀位置检测
- 非接触式诊断或激活

## 3 说明

DRV5032 器件是一款超低功耗数字开关霍尔效应传感器，专为最紧凑型系统和电池电量敏感型系统而设计。该器件可提供多种磁性阈值、采样率、输出驱动器和封装以适配各种应用。

当施加的磁通量密度超过  $B_{OP}$  阈值时，器件会输出低电压。输出会保持低电压，直到磁通量密度低于  $B_{RP}$ ，随后输出将驱动高电压或变成高阻抗，具体取决于器件版本。通过集成内部振荡器，该器件可对磁场进行采样，并以 20Hz 或 5Hz 的速率更新输出，以实现最低电流消耗。可提供全极和单极磁响应。

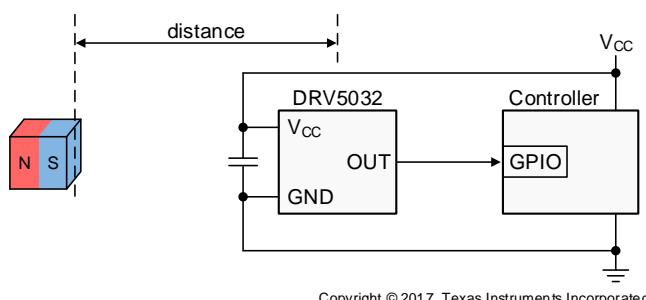
此器件可在 1.65V 至 5.5V 的  $V_{CC}$  范围内工作，并采用标准 SOT-23 和小型 X2SON 封装。

### 器件信息<sup>(1)</sup>

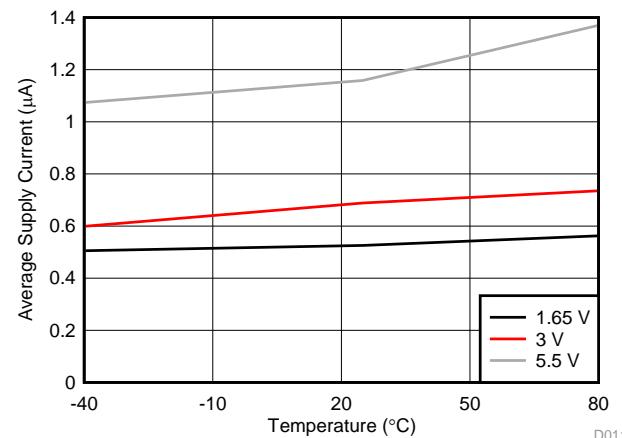
器件型号	封装	封装尺寸 (标称值)
DRV5032	SOT-23 (3)	2.92mm × 1.30mm
	X2SON (4)	1.10mm × 1.40mm

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。

典型原理图



5Hz 版本的电流消耗



An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. UNLESS OTHERWISE NOTED, this document contains PRODUCTION DATA.

English Data Sheet: [SLVSDC7](#)

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## 4 修订历史记录

注：之前版本的页码可能与当前版本有所不同。

### Changes from Revision C (September 2017) to Revision D Page

- Added the DU device version to the data sheet ..... 3

### Changes from Revision B (August 2017) to Revision C Page

- Changed the status of the AJ device version from *Preview* to *Active* ..... 3

### Changes from Revision A (May 2017) to Revision B Page

- Added the ZE device version and the preview AJ device version ..... 3

### Changes from Original (April 2017) to Revision A Page

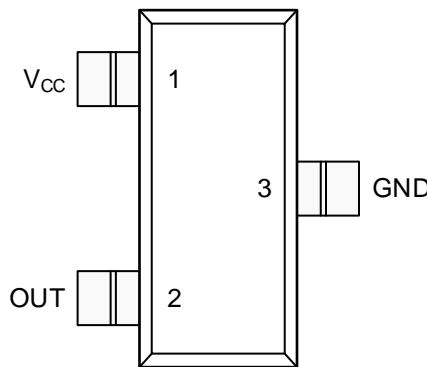
- 已添加 添加了 FA 和 FD 器件版本 ..... 1

## 5 Device Comparison Table

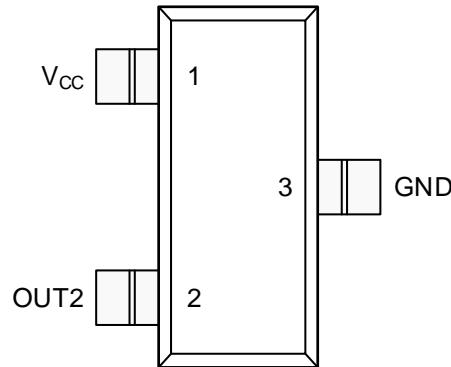
VERSION	MAXIMUM THRESHOLD	MAGNETIC RESPONSE	OUTPUT TYPE	SAMPLING RATE	PACKAGES AVAILABLE
DRV5032DU	3.9 mT	Unipolar	Push-pull	20 Hz	SOT-23, X2SON
DRV5032FA	4.8 mT	Omnipolar	Push-pull	20 Hz	SOT-23, X2SON
DRV5032FB		Omnipolar	Push-pull	5 Hz	SOT-23
DRV5032FC		Omnipolar	Open-drain	20 Hz	SOT-23
DRV5032FD		Unipolar	Push-pull	20 Hz	X2SON
DRV5032AJ	9.5 mT	Omnipolar	Open-drain	20 Hz	SOT-23, X2SON
DRV5032ZE	63 mT	Omnipolar	Open-drain	20 Hz	SOT-23

## 6 Pin Configuration and Functions

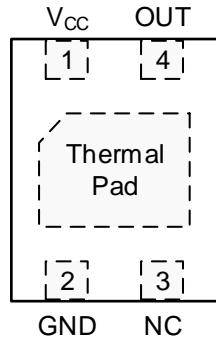
**FA, FB, FC, AJ, ZE Versions DBZ Package**  
3-Pin SOT-23  
Top View



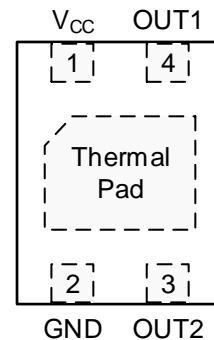
**DU Version DBZ Package**  
3-Pin SOT-23  
Top View



**FA, AJ Versions DMR Package**  
4-Pin X2SON  
Top View



**DU, FD Versions DMR Package**  
4-Pin X2SON  
Top View



### Pin Functions

NAME	PIN				I/O	DESCRIPTION
	SOT-23 (FA, FB, FC, AJ, ZE)	SOT-23 (DU)	X2SON (FA, AJ)	X2SON (DU, FD)		
GND	3	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	—	2	—	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.
Vcc	1	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 $\mu$ F.
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)<sup>(1)</sup>

		<b>MIN</b>	<b>MAX</b>	<b>UNIT</b>
Power supply voltage	V <sub>CC</sub>	-0.3	5.5	V
Power supply voltage slew rate	V <sub>CC</sub>	Unlimited		V / $\mu$ s
Output voltage	OUT, OUT1, OUT2	-0.3	V <sub>CC</sub> + 0.3	V
Output current	OUT, OUT1, OUT2	-5	5	mA
Magnetic flux density, B <sub>MAX</sub>		Unlimited		T
Junction temperature, T <sub>J</sub>		105		°C
Storage temperature, T <sub>STG</sub>		-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

		<b>VALUE</b>	<b>UNIT</b>
V <sub>(ESD)</sub>	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>	±6000	V
	Charged-device model (CDM), per JEDEC specification JESD22-C101 <sup>(2)</sup>	±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)

		<b>MIN</b>	<b>MAX</b>	<b>UNIT</b>
V <sub>CC</sub>	Power supply voltage	1.65	5.5	V
V <sub>O</sub>	Output voltage	0	5.5	V
I <sub>O</sub>	Output current	-5	5	mA
T <sub>A</sub>	Operating ambient temperature	-40	85	°C

### 7.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>	<b>DRV5032</b>		<b>UNIT</b>	
	<b>SOT-23 (DBZ)</b>	<b>X2SON (DMR)</b>		
	<b>3 PINS</b>	<b>4 PINS</b>		
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	356	159	°C/W
R <sub>θJC(top)</sub>	Junction-to-case (top) thermal resistance	128	77	°C/W
R <sub>θJB</sub>	Junction-to-board thermal resistance	94	102	°C/W
Ψ <sub>JT</sub>	Junction-to-top characterization parameter	11.4	0.9	°C/W
Ψ <sub>JB</sub>	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
<b>PUSH-PULL OUTPUT DRIVER</b>					
$V_{OH}$	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
<b>OPEN-DRAIN OUTPUT</b>					
$I_{OZ}$	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
<b>DU, FA, FC, FD, AJ, ZE VERSIONS</b>					
$f_S$	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			$\mu$ A
		1.6	3.5		
		2.3			
<b>FB VERSION</b>					
$f_S$	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			$\mu$ A
		0.69	1.8		
		1.06			
<b>ALL VERSIONS</b>					
$I_{CC(PK)}$	Peak current consumption	2	2.7		mA
$t_{ON}$	Power-on time (see <a href="#">图 17</a> )	55	100		$\mu$ s
$t_{ACTIVE}$	Active time period (see <a href="#">图 17</a> )	40			$\mu$ s

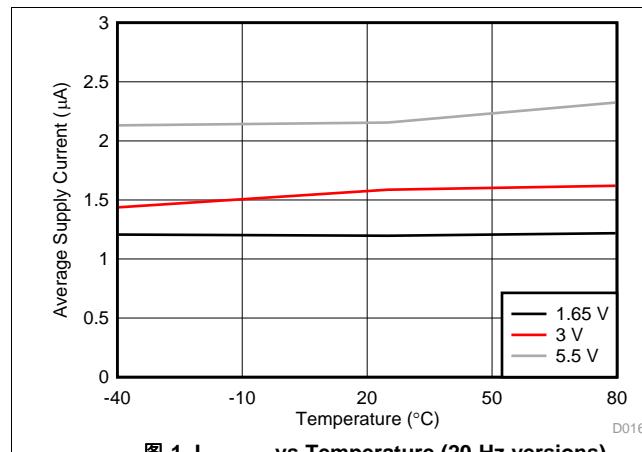
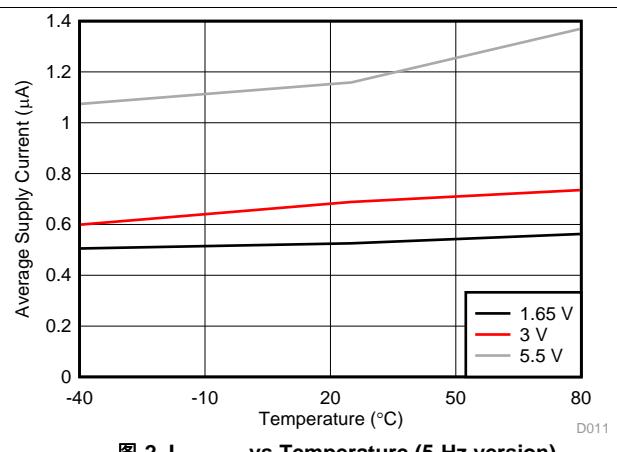
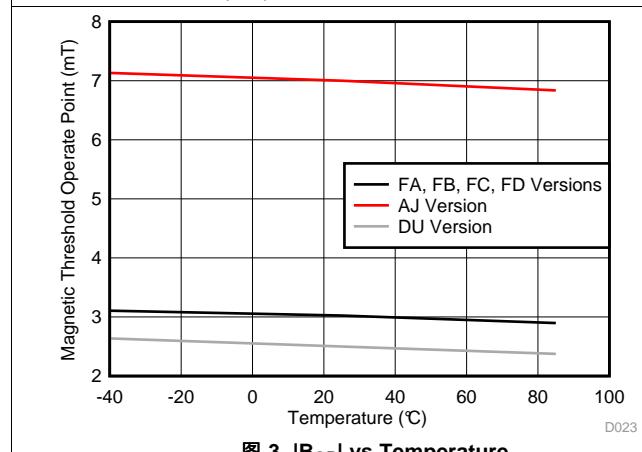
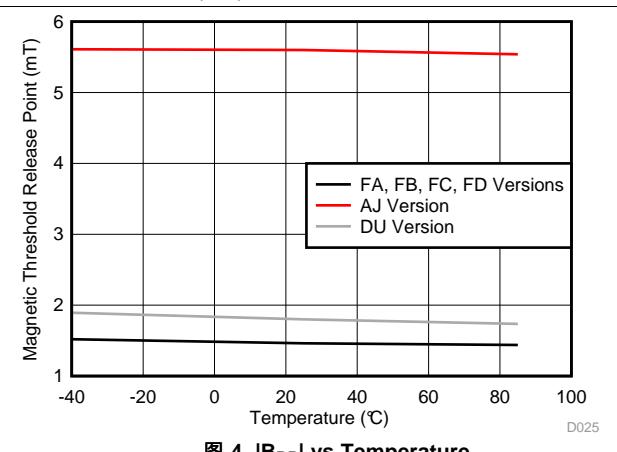
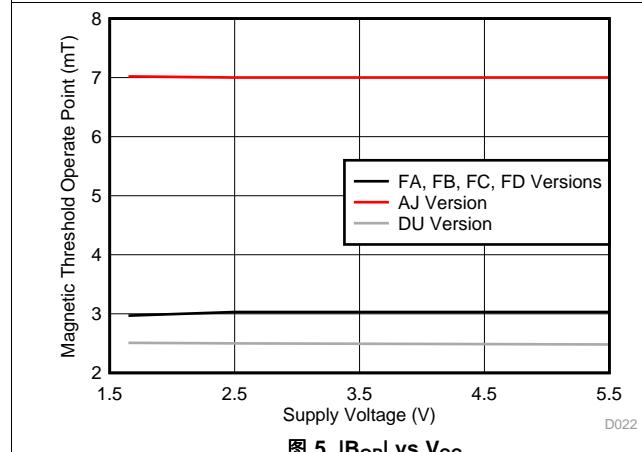
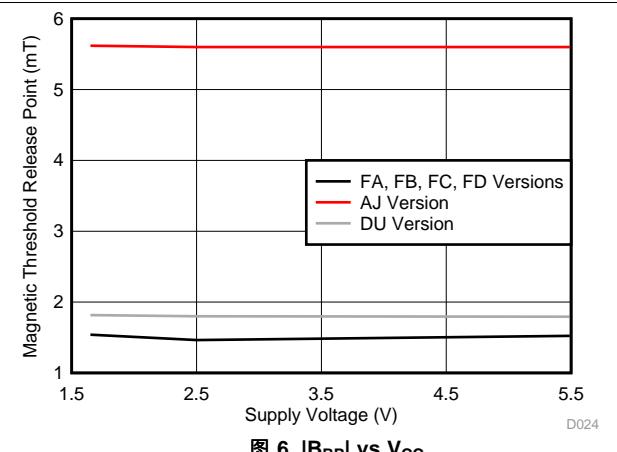
## 7.6 Magnetic Characteristics

for  $V_{CC} = 1.65$  V to 5.5 V, over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>DU VERSION</b>						
$B_{OP}$	OUT1 pin (north)	-3.9	-2.5	-1.2	mT	
	OUT2 pin (south)	1.2	2.5	3.9		
$B_{RP}$	OUT1 pin (north)	-3.5	-1.8	-0.9	mT	
	OUT2 pin (south)	0.9	1.8	3.5		
$B_{HYS}$	Magnetic hysteresis: $ B_{OP} - B_{RP} $	Each output	0.1	0.7	1.9	mT
<b>FA, FB, FC VERSIONS</b>						
$B_{OP}$	Magnetic threshold operate point		$\pm 1.5$	$\pm 3$	$\pm 4.8$	mT
$B_{RP}$	Magnetic threshold release point		$\pm 0.5$	$\pm 1.5$	$\pm 3$	mT
$B_{HYS}$	Magnetic hysteresis: $ B_{OP} - B_{RP} $		0.8	1.5	3	mT
<b>FD VERSION</b>						
$B_{OP}$	OUT1 pin (north)	-4.8	-3	-1.5	mT	
	OUT2 pin (south)	1.5	3	4.8		
$B_{RP}$	OUT1 pin (north)	-3	-1.5	-0.5	mT	
	OUT2 pin (south)	0.5	1.5	3		
$B_{HYS}$	Magnetic hysteresis: $ B_{OP} - B_{RP} $	Each output	0.8	1.5	3	mT
<b>AJ VERSION</b>						
$B_{OP}$	Magnetic threshold operate point		$\pm 4$	$\pm 7$	$\pm 9.5$	mT
$B_{RP}$	Magnetic threshold release point		$\pm 3$	$\pm 5.6$	$\pm 7.5$	mT
$B_{HYS}$	Magnetic hysteresis: $ B_{OP} - B_{RP} $		0.5	1.4	3	mT
<b>ZE VERSION</b>						
$B_{OP}$	Magnetic threshold operate point		$\pm 33$	$\pm 47$	$\pm 63$	mT
$B_{RP}$	Magnetic threshold release point		$\pm 30$	$\pm 43$	$\pm 58$	mT
$B_{HYS}$	Magnetic hysteresis: $ B_{OP} - B_{RP} $		1.2	4	8.5	mT

(1) For a graphical description of magnetic thresholds, see the [Magnetic Response](#) section.

## 7.7 Typical Characteristics

图 1.  $I_{CC(AVG)}$  vs Temperature (20-Hz versions)图 2.  $I_{CC(AVG)}$  vs Temperature (5-Hz version)图 3.  $|B_{Op}|$  vs Temperature图 4.  $|B_{RP}|$  vs Temperature图 5.  $|B_{Op}|$  vs  $V_{CC}$ 图 6.  $|B_{RP}|$  vs  $V_{CC}$

## Typical Characteristics (接下页)

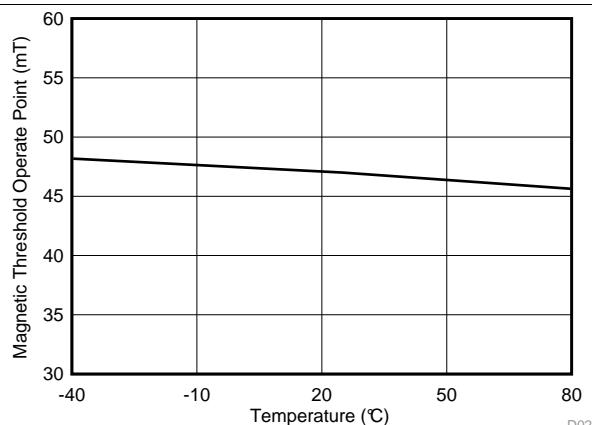


图 7. ZE Version  $|B_{Op}|$  vs Temperature

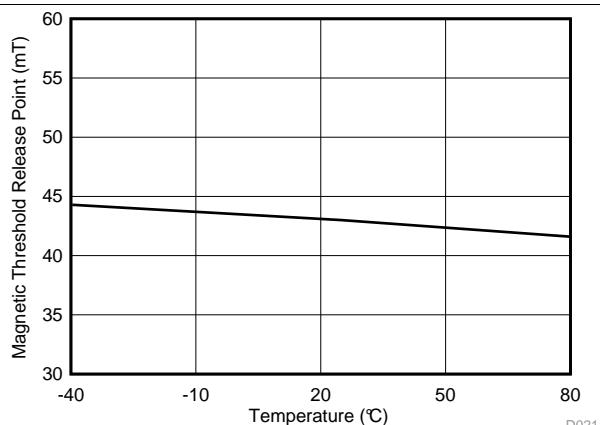


图 8. ZE Version  $|B_{RP}|$  vs Temperature

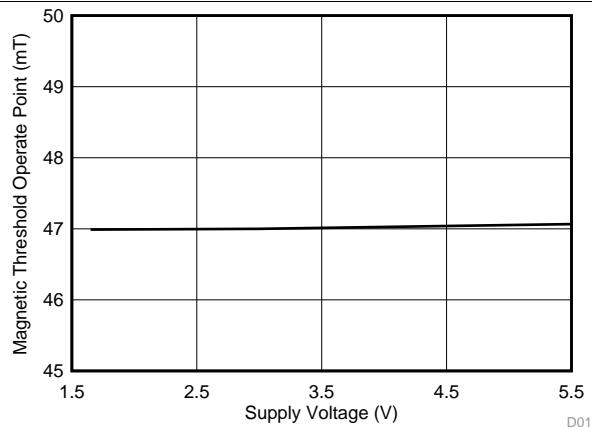


图 9. ZE Version  $|B_{Op}|$  vs V<sub>CC</sub>

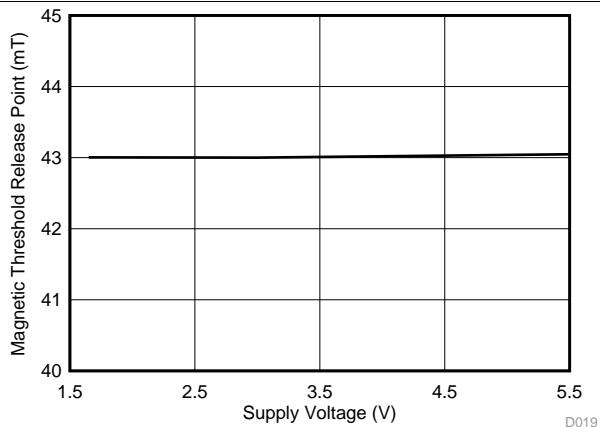


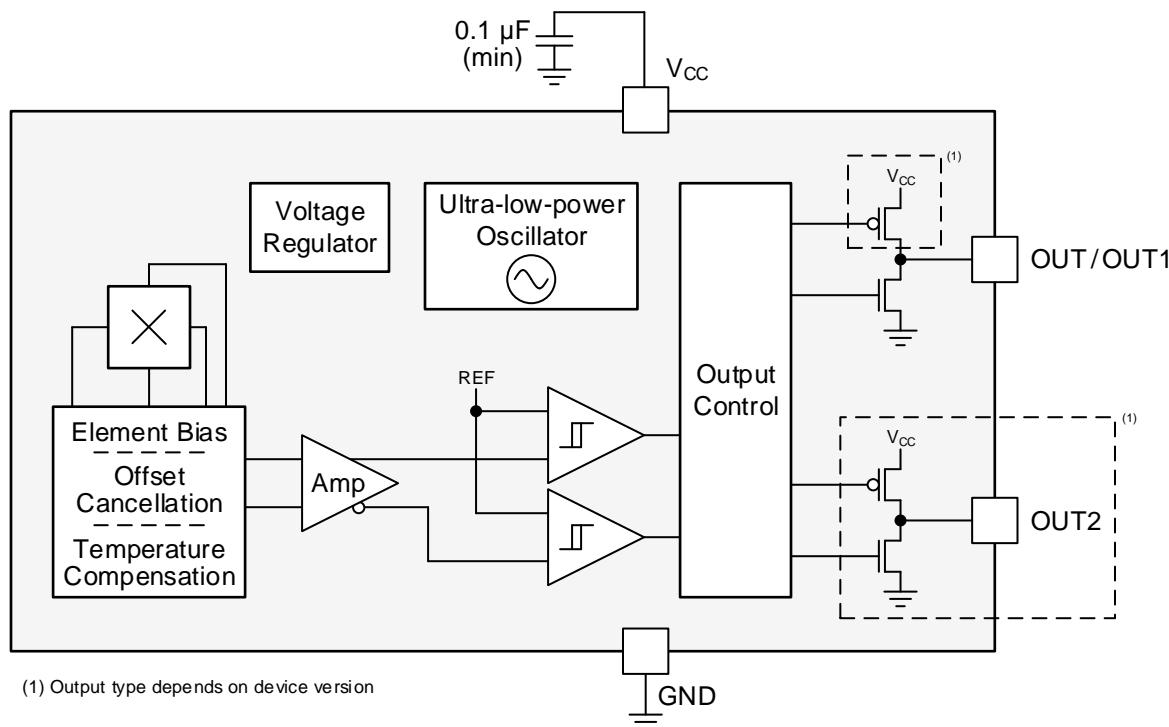
图 10. ZE Version  $|B_{RP}|$  vs V<sub>CC</sub>

## 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

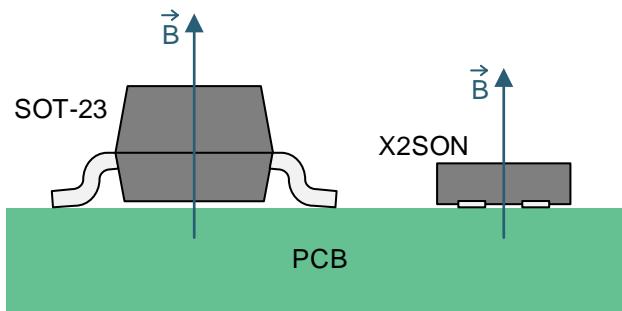


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### 8.3 Feature Description

#### 8.3.1 Magnetic Flux Direction

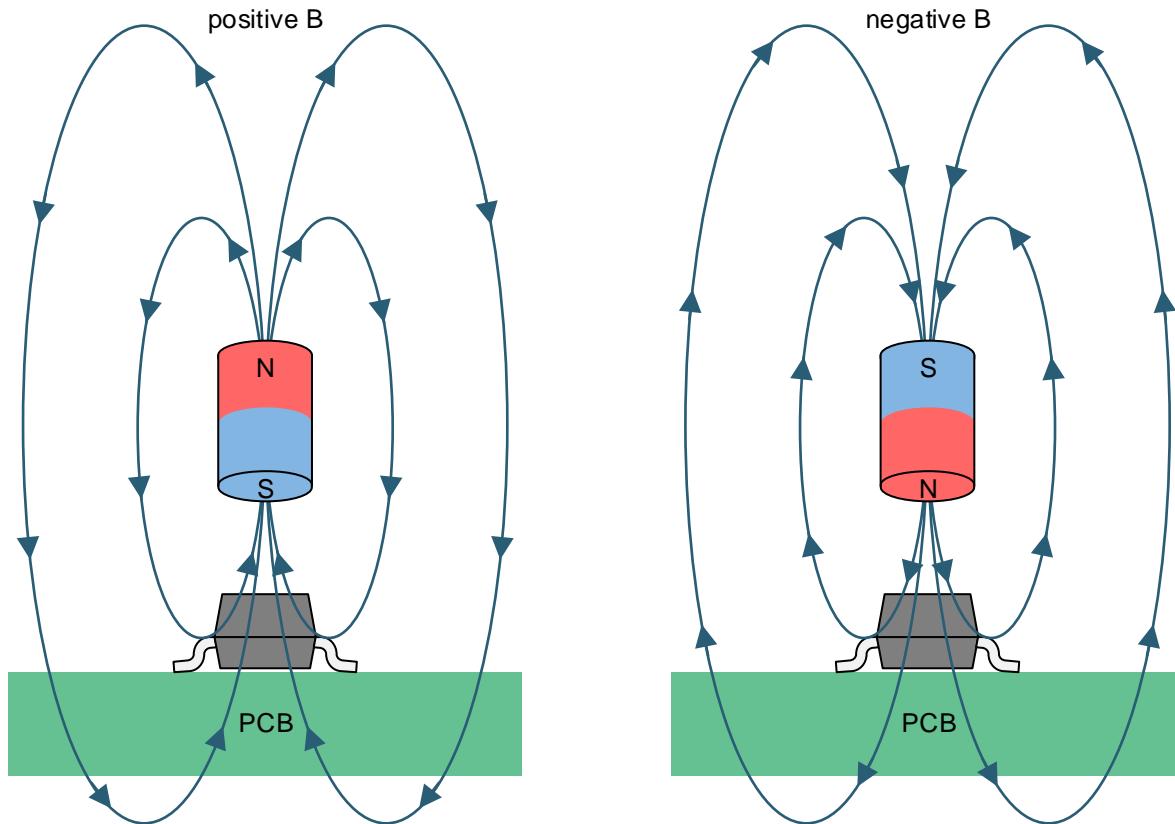
The DRV5032 device is sensitive to the magnetic field component that is perpendicular to the top of the package (as shown in [图 11](#)).



**图 11. Direction of Sensitivity**

## Feature Description (接下页)

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.



**图 12. Flux Direction Polarity**

### 8.3.2 Device Version Comparison

The following table lists the available device versions.

VERSION	MAXIMUM THRESHOLD	MAGNETIC RESPONSE	OUTPUT TYPE	SAMPLING RATE	PACKAGES AVAILABLE
DRV5032DU	3.9 mT 4.8 mT	Unipolar	Push-pull	20 Hz	SOT-23, X2SON
DRV5032FA		Omnipolar	Push-pull	20 Hz	SOT-23, X2SON
DRV5032FB		Omnipolar	Push-pull	5 Hz	SOT-23
DRV5032FC		Omnipolar	Open-drain	20 Hz	SOT-23
DRV5032FD		Unipolar	Push-pull	20 Hz	X2SON
DRV5032AJ		Omnipolar	Open-drain	20 Hz	SOT-23, X2SON
DRV5032ZE	63 mT	Omnipolar	Open-drain	20 Hz	SOT-23

#### 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

The FA, FB, FC, AJ, and ZE device versions have omnipolar functionality, and respond the same to north and south poles as shown in [图 13](#).

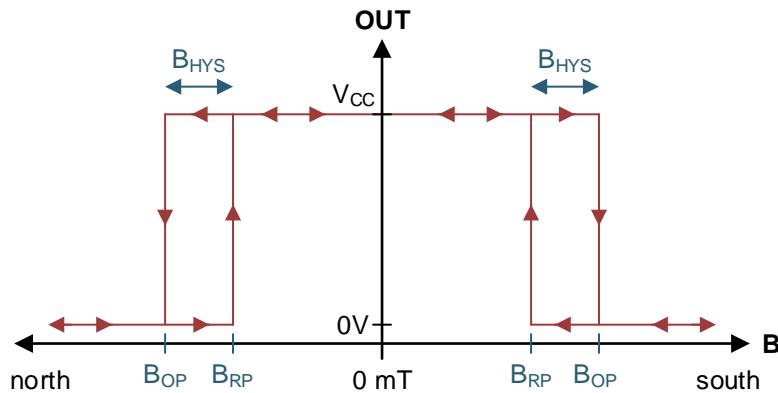


图 13. Omnipolar Functionality

The DU and FD device versions have unipolar functionality. 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).

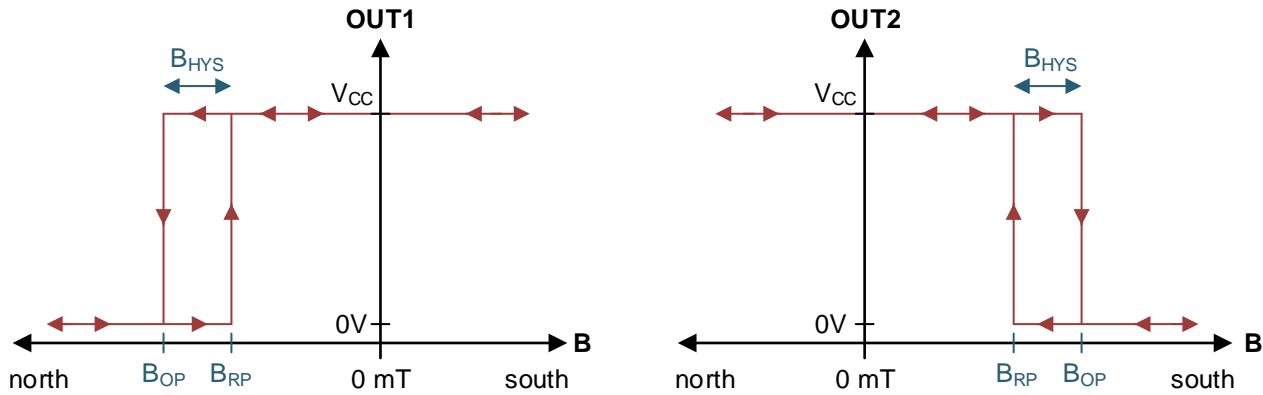


图 14. Unipolar Functionality

### 8.3.2.3 Output Type

The DU, FA, FB, and FD device versions have push-pull CMOS outputs that can drive a  $V_{CC}$  or ground level. The FC, AJ, and ZE device versions have open-drain outputs that can become high impedance or drive ground, and an external pullup resistor must be used.

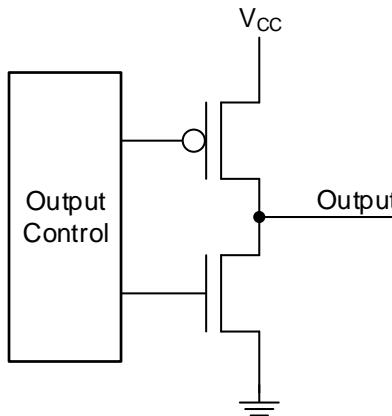


图 15. Push-Pull Output (Simplified)

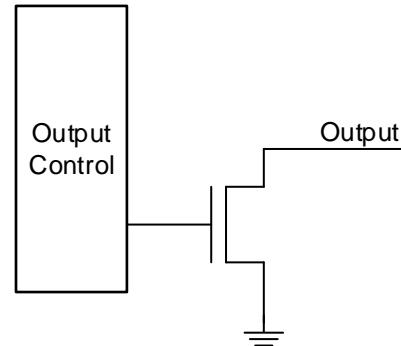


图 16. Open-Drain Output (Simplified)

### 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.

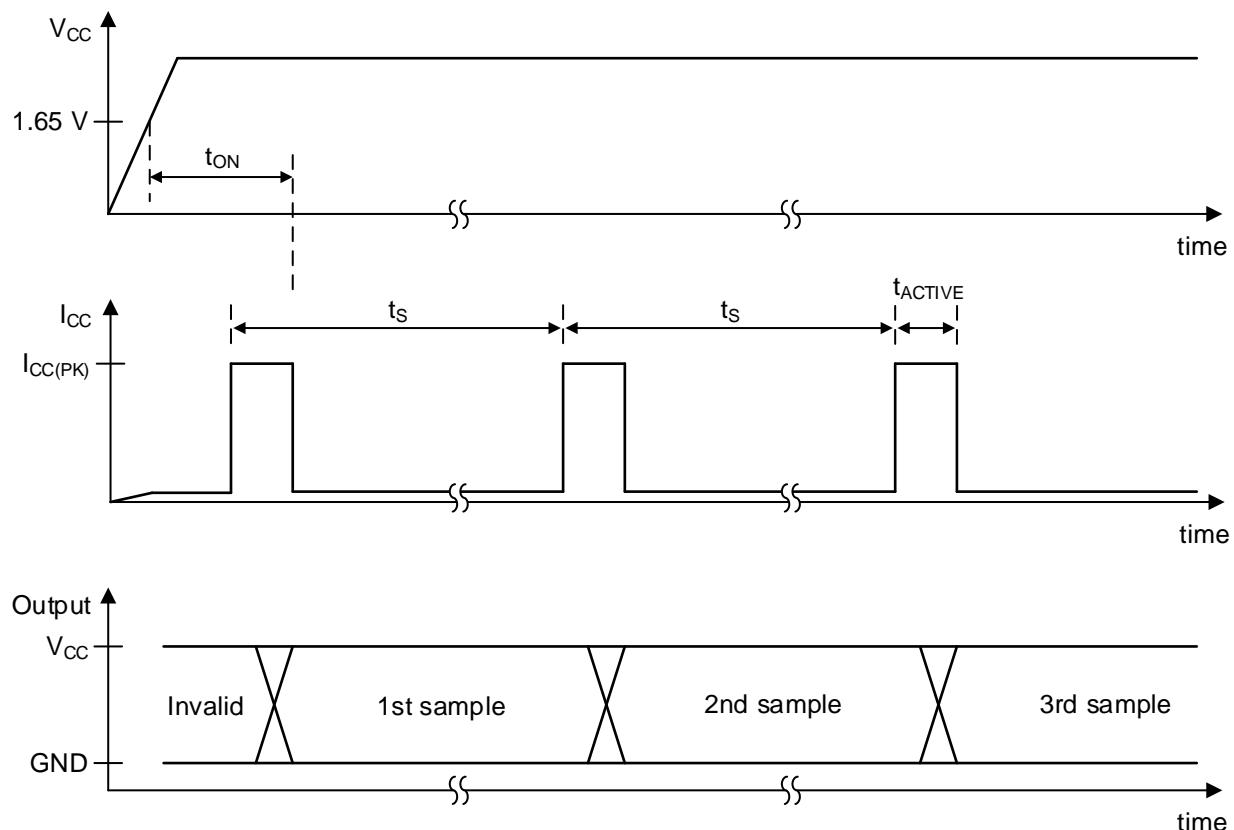


图 17. Timing Diagram

### 8.3.3 Hall Element Location

The sensing element inside the device is in the center of both packages when viewed from the top. 图 18 shows the tolerances and side-view dimensions.

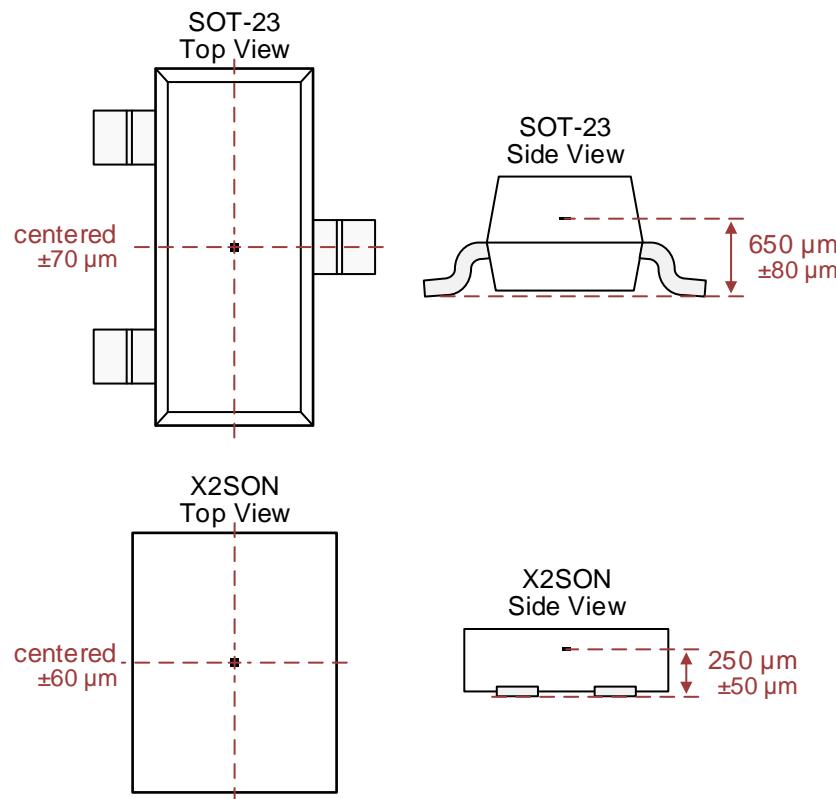


图 18. Hall Element Location

### 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

### 注

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.

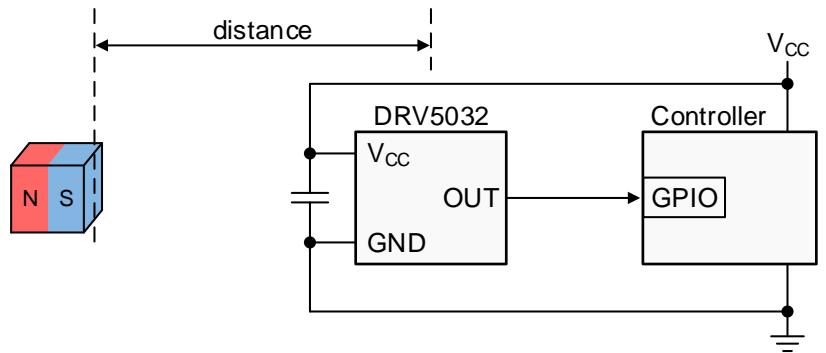
#### 9.1.1 Output Type Tradeoffs

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



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**图 19. Typical Application Diagram**

##### 9.2.1.1 Design Requirements

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

**表 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.

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.

Magnets are made from various ferromagnetic materials that have tradeoffs in cost, drift with temperature, absolute max temperature ratings, remanence or residual induction ( $B_r$ ), and coercivity ( $H_c$ ). The  $B_r$  and the dimensions of a magnet determine the magnetic flux density ( $B$ ) it produces in 3-dimensional space. For simple magnet shapes, such as rectangular blocks and cylinders, there are simple equations that solve  $B$  at a given distance centered with the magnet.

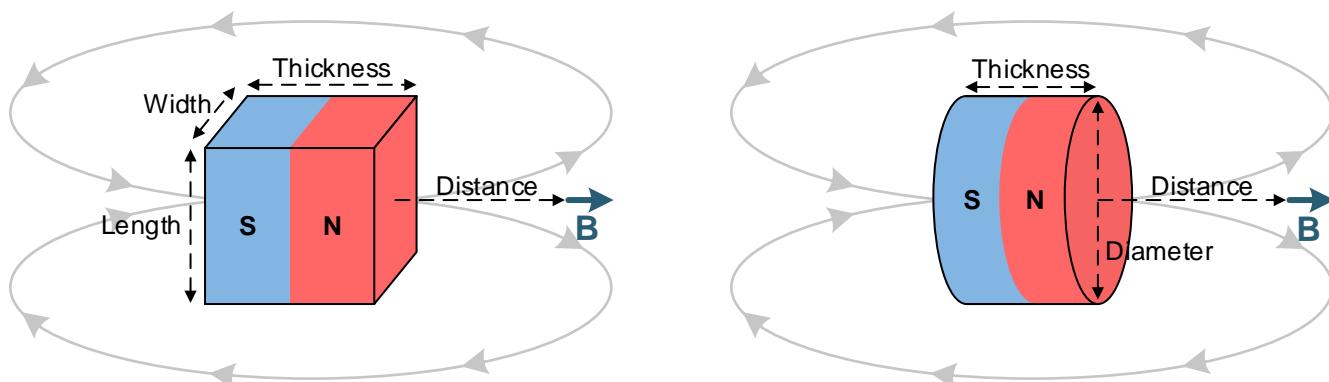


图 20. Rectangular Block and Cylinder Magnets

Use 公式 1 for the rectangular block shown in 图 20:

$$\vec{B} = \frac{B_r}{\pi} \left( \arctan\left(\frac{WL}{2D\sqrt{4D^2 + W^2 + L^2}}\right) - \arctan\left(\frac{WL}{2(D+T)\sqrt{4(D+T)^2 + W^2 + L^2}}\right) \right) \quad (1)$$

Use 公式 2 for the cylinder shown in 图 20:

$$\vec{B} = \frac{B_r}{2} \left( \frac{D+T}{\sqrt{(0.5C)^2 + (D+T)^2}} - \frac{D}{\sqrt{(0.5C)^2 + D^2}} \right)$$

where

- W is width.
- L is length.
- T is thickness (the direction of magnetization).
- D is distance.
- C is diameter.

(2)

An online tool that uses these formulas is located at <http://www.ti.com/product/drv5033>.

All magnetic materials generally have a lower  $B_r$  at higher temperatures. Systems should have margin to account for this, as well as for mechanical tolerances.

### 9.2.1.3 Application Curve

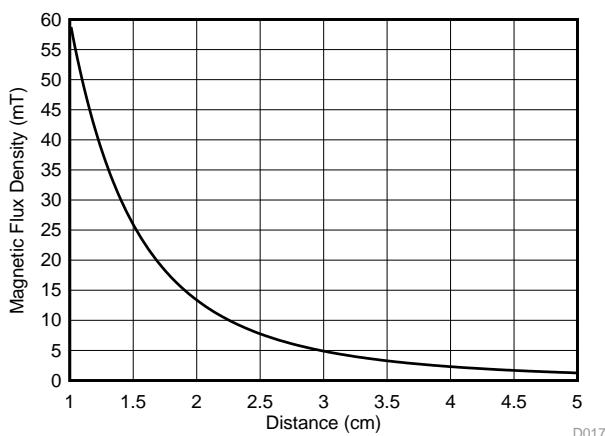


图 21. Magnetic Profile of a 1-cm Cube NdFeB Magnet

### 9.2.2 Three-Position Switch

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

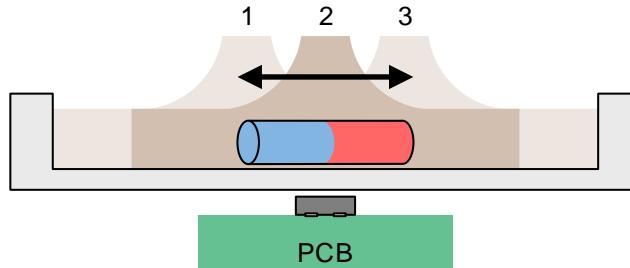


图 22. Three-Position Slider Switch with Embedded Magnet

#### 9.2.2.1 Design Requirements

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

表 2. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Hall effect device	DRV5032FD
V <sub>CC</sub>	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 magnetic flux density for a given magnet and distance, TI recommends using simulation software, testing with a linear Hall effect sensor, or testing with a gaussmeter.

### 9.2.2.3 Application Curve

图 23 显示了 2 极磁铁周围的典型磁通线。

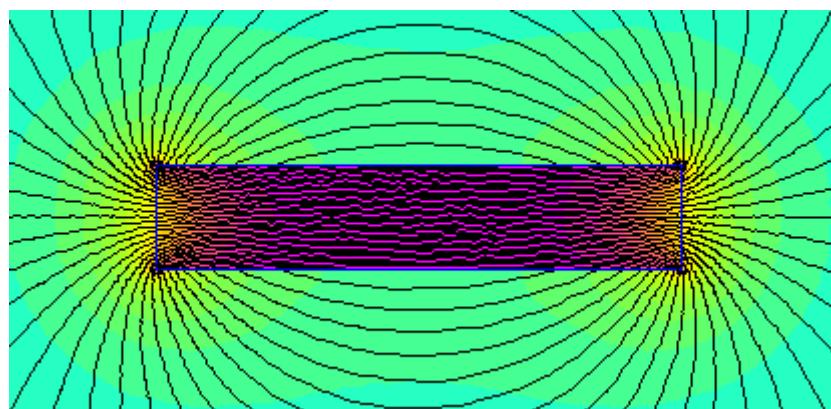


图 23. Typical Magnetic Flux Lines

### 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. 图 24 shows correct and incorrect approaches.

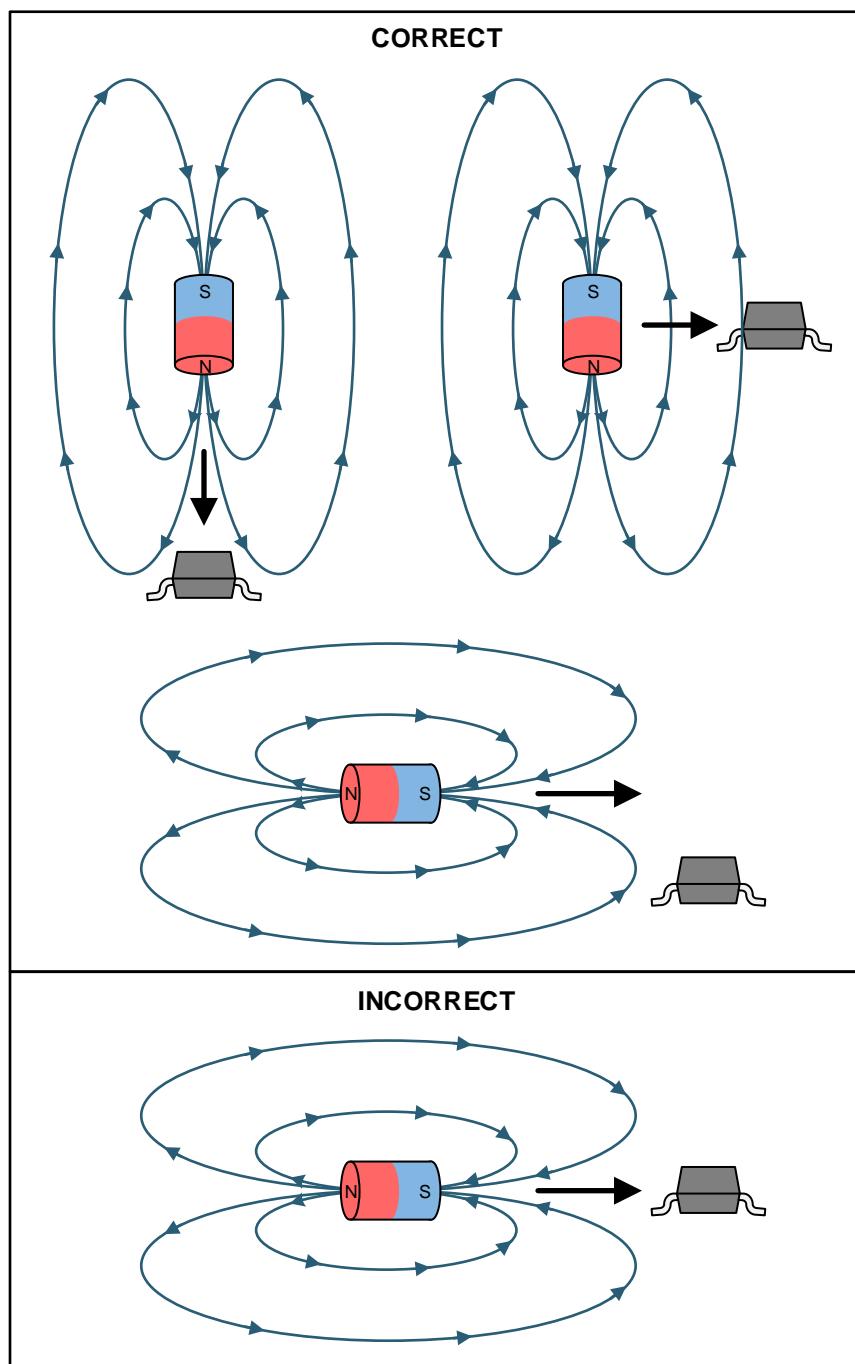


图 24. Correct and Incorrect Magnet Approaches

## 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  $\mu$ F.

## 11 Layout

### 11.1 Layout Guidelines

Magnetic fields 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 Examples

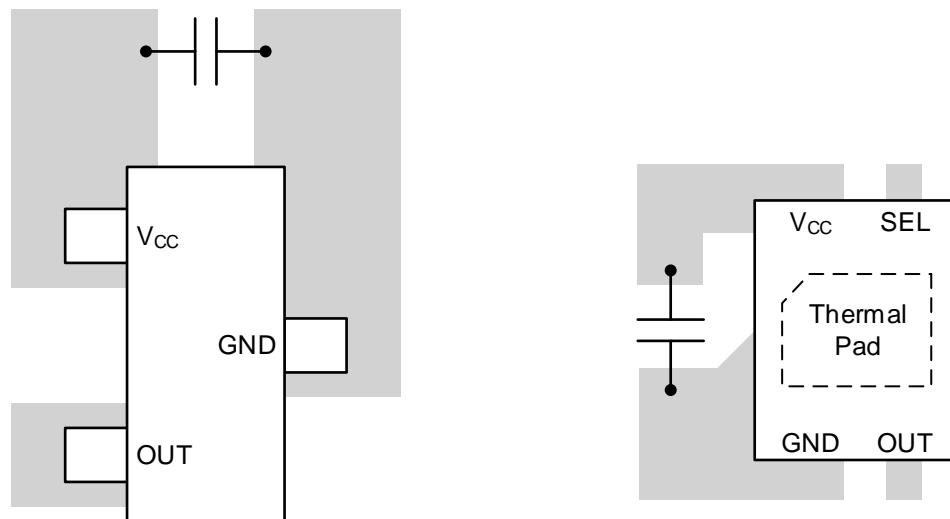


图 25. Layout Examples

## 12 器件和文档支持

### 12.1 文档支持

#### 12.1.1 相关文档

请参阅如下相关文档：

- 德州仪器 (TI), [《DRV5032-SOLAR-EVM 用户指南》](#)
- 德州仪器 (TI), [《具有磁传感器的电源门控系统》TI 技术手册](#)
- 德州仪器 (TI), [《支持低于 1GHz 技术并可实现 10 年纽扣电池寿命的低功耗车门和车窗传感器》](#)
- 德州仪器 (TI), [《采用低功耗霍尔效应传感器的磁篡改检测》](#)
- 德州仪器 (TI), [《使用超低功耗的高架故障指示灯故障监控》](#)

### 12.2 接收文档更新通知

要接收文档更新通知，请导航至 [TI.com](#) 上的器件产品文件夹。单击右上角的通知我 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

### 12.3 社区资源

下列链接提供到 TI 社区资源的连接。链接的内容由各个分销商“按照原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的 [《使用条款》](#)。

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**设计支持** **TI 参考设计支持** 可帮助您快速查找有帮助的 E2E 论坛、设计支持工具以及技术支持的联系信息。

### 12.4 商标

E2E is a trademark of Texas Instruments.

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### 12.5 静电放电警告



这些装置包含有限的内置 ESD 保护。存储或装卸时，应将导线一起截短或将装置放置于导电泡棉中，以防止 MOS 门极遭受静电损伤。

### 12.6 Glossary

[SLYZ022 — TI Glossary](#).

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

## 13 机械、封装和可订购信息

以下页面包含机械、封装和可订购信息。这些信息是指定器件的最新可用数据。数据如有变更，恕不另行通知和修订此文档。如欲获取此数据表的浏览器版本，请参阅左侧的导航。

**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	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1M6W, 2AJ)	<span style="background-color: red; color: white;">Samples</span>
DRV5032AJDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1M6W, 2AJ)	<span style="background-color: red; color: white;">Samples</span>
DRV5032AJDMRR	ACTIVE	X2SON	DMR	4	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2AJ	<span style="background-color: red; color: white;">Samples</span>
DRV5032AJDMRT	ACTIVE	X2SON	DMR	4	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2AJ	<span style="background-color: red; color: white;">Samples</span>
DRV5032AJLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32AJ	<span style="background-color: red; color: white;">Samples</span>
DRV5032AJLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32AJ	<span style="background-color: red; color: white;">Samples</span>
DRV5032DUDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2DU	<span style="background-color: red; color: white;">Samples</span>
DRV5032DUDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2DU	<span style="background-color: red; color: white;">Samples</span>
DRV5032DUDMRR	ACTIVE	X2SON	DMR	4	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2DU	<span style="background-color: red; color: white;">Samples</span>
DRV5032DUDMRT	ACTIVE	X2SON	DMR	4	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2DU	<span style="background-color: red; color: white;">Samples</span>
DRV5032DULPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32DU	<span style="background-color: red; color: white;">Samples</span>
DRV5032DULPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32DU	<span style="background-color: red; color: white;">Samples</span>
DRV5032FADBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1LVW, 2FA)	<span style="background-color: red; color: white;">Samples</span>
DRV5032FADBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1LVW, 2FA)	<span style="background-color: red; color: white;">Samples</span>
DRV5032FADMRR	ACTIVE	X2SON	DMR	4	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2FA	<span style="background-color: red; color: white;">Samples</span>
DRV5032FADMRT	ACTIVE	X2SON	DMR	4	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2FA	<span style="background-color: red; color: white;">Samples</span>
DRV5032FALPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32FA	<span style="background-color: red; color: white;">Samples</span>

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
DRV5032FALPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32FA	<span style="background-color: red; color: white;">Samples</span>
DRV5032FBDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1LWW, 2FB)	<span style="background-color: red; color: white;">Samples</span>
DRV5032FBDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1LWW, 2FB)	<span style="background-color: red; color: white;">Samples</span>
DRV5032FBLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32FB	<span style="background-color: red; color: white;">Samples</span>
DRV5032FBLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32FB	<span style="background-color: red; color: white;">Samples</span>
DRV5032FCDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1M7W, 2FC)	<span style="background-color: red; color: white;">Samples</span>
DRV5032FCDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1M7W, 2FC)	<span style="background-color: red; color: white;">Samples</span>
DRV5032FCLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32FC	<span style="background-color: red; color: white;">Samples</span>
DRV5032FCLPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32FC	<span style="background-color: red; color: white;">Samples</span>
DRV5032FDDMRR	ACTIVE	X2SON	DMR	4	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2FD	<span style="background-color: red; color: white;">Samples</span>
DRV5032FDDMRT	ACTIVE	X2SON	DMR	4	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	2FD	<span style="background-color: red; color: white;">Samples</span>
DRV5032FDLPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32FD	<span style="background-color: red; color: white;">Samples</span>
DRV5032ZEDBZR	ACTIVE	SOT-23	DBZ	3	3000	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1M8W, 2ZE)	<span style="background-color: red; color: white;">Samples</span>
DRV5032ZEDBZT	ACTIVE	SOT-23	DBZ	3	250	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-40 to 85	(1M8W, 2ZE)	<span style="background-color: red; color: white;">Samples</span>
DRV5032ZELPG	ACTIVE	TO-92	LPG	3	1000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32ZE	<span style="background-color: red; color: white;">Samples</span>
DRV5032ZELPGM	ACTIVE	TO-92	LPG	3	3000	Green (RoHS & no Sb/Br)	SN	N / A for Pkg Type	-40 to 85	32ZE	<span style="background-color: red; color: white;">Samples</span>

(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.

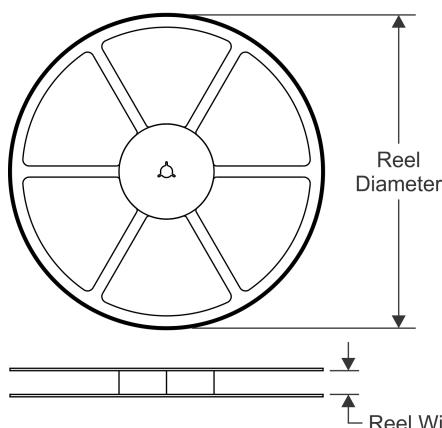
**(6) Lead/Ball Finish** - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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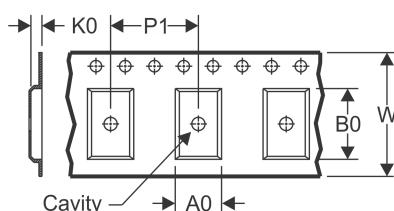
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS

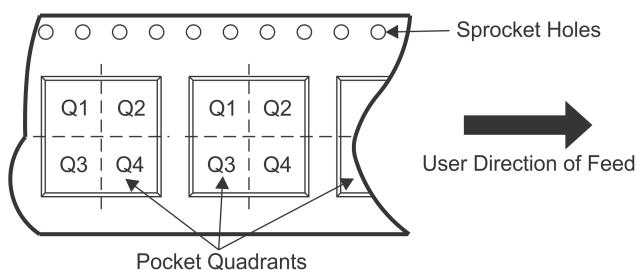


### TAPE DIMENSIONS



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

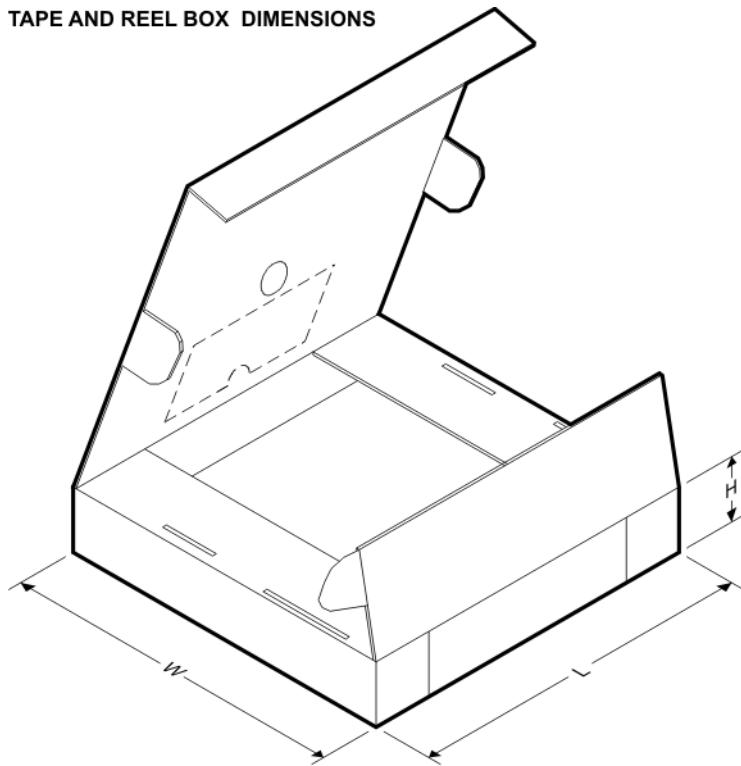
### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*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
DRV5032AJDBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032AJDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032AJDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032AJDBZT	SOT-23	DBZ	3	250	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032AJDMRR	X2SON	DMR	4	3000	179.0	8.4	1.27	1.57	0.5	4.0	8.0	Q1
DRV5032AJDMRT	X2SON	DMR	4	250	179.0	8.4	1.27	1.57	0.5	4.0	8.0	Q1
DRV5032DUDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032DUDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032DUDMRR	X2SON	DMR	4	3000	180.0	8.4	1.27	1.57	0.5	4.0	8.0	Q1
DRV5032DUDMRT	X2SON	DMR	4	250	180.0	8.4	1.27	1.57	0.5	4.0	8.0	Q1
DRV5032FADBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FADBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FADBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FADBZT	SOT-23	DBZ	3	250	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FADMRR	X2SON	DMR	4	3000	179.0	8.4	1.27	1.57	0.5	4.0	8.0	Q1
DRV5032FADMRT	X2SON	DMR	4	250	180.0	8.4	1.27	1.57	0.5	4.0	8.0	Q1
DRV5032FBDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FBDBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3

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
DRV5032FBDBZT	SOT-23	DBZ	3	250	178.0	9.0	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
DRV5032FCDBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032FCDBZT	SOT-23	DBZ	3	250	178.0	9.0	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
DRV5032FDDMRR	X2SON	DMR	4	3000	179.0	8.4	1.27	1.57	0.5	4.0	8.0	Q1
DRV5032FDDMRT	X2SON	DMR	4	250	180.0	8.4	1.27	1.57	0.5	4.0	8.0	Q1
DRV5032ZEDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032ZEDBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032ZEDBZT	SOT-23	DBZ	3	250	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5032ZEDBZT	SOT-23	DBZ	3	250	178.0	9.0	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)
DRV5032AJDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0
DRV5032AJDBZR	SOT-23	DBZ	3	3000	183.0	183.0	20.0
DRV5032AJDBZT	SOT-23	DBZ	3	250	183.0	183.0	20.0
DRV5032AJDBZT	SOT-23	DBZ	3	250	180.0	180.0	18.0
DRV5032AJDMRR	X2SON	DMR	4	3000	203.0	203.0	35.0

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DRV5032AJDMRT	X2SON	DMR	4	250	203.0	203.0	35.0
DRV5032DUDBZR	SOT-23	DBZ	3	3000	183.0	183.0	20.0
DRV5032DUDBZT	SOT-23	DBZ	3	250	183.0	183.0	20.0
DRV5032DUDMRR	X2SON	DMR	4	3000	203.0	203.0	35.0
DRV5032DUDMRT	X2SON	DMR	4	250	203.0	203.0	35.0
DRV5032FADBZR	SOT-23	DBZ	3	3000	183.0	183.0	20.0
DRV5032FADBZT	SOT-23	DBZ	3	3000	180.0	180.0	18.0
DRV5032FADBZT	SOT-23	DBZ	3	250	183.0	183.0	20.0
DRV5032FADBZT	SOT-23	DBZ	3	250	180.0	180.0	18.0
DRV5032FADMRR	X2SON	DMR	4	3000	203.0	203.0	35.0
DRV5032FADMRT	X2SON	DMR	4	250	203.0	203.0	35.0
DRV5032FBDBZR	SOT-23	DBZ	3	3000	183.0	183.0	20.0
DRV5032FBDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0
DRV5032FBDBZT	SOT-23	DBZ	3	250	180.0	180.0	18.0
DRV5032FBDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
DRV5032FCDBZR	SOT-23	DBZ	3	3000	183.0	183.0	20.0
DRV5032FCDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0
DRV5032FCDBZT	SOT-23	DBZ	3	250	180.0	180.0	18.0
DRV5032FCDBZT	SOT-23	DBZ	3	250	202.0	201.0	28.0
DRV5032FDDMRR	X2SON	DMR	4	3000	203.0	203.0	35.0
DRV5032FDDMRT	X2SON	DMR	4	250	203.0	203.0	35.0
DRV5032ZEDBZR	SOT-23	DBZ	3	3000	183.0	183.0	20.0
DRV5032ZEDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0
DRV5032ZEDBZT	SOT-23	DBZ	3	250	183.0	183.0	20.0
DRV5032ZEDBZT	SOT-23	DBZ	3	250	180.0	180.0	18.0

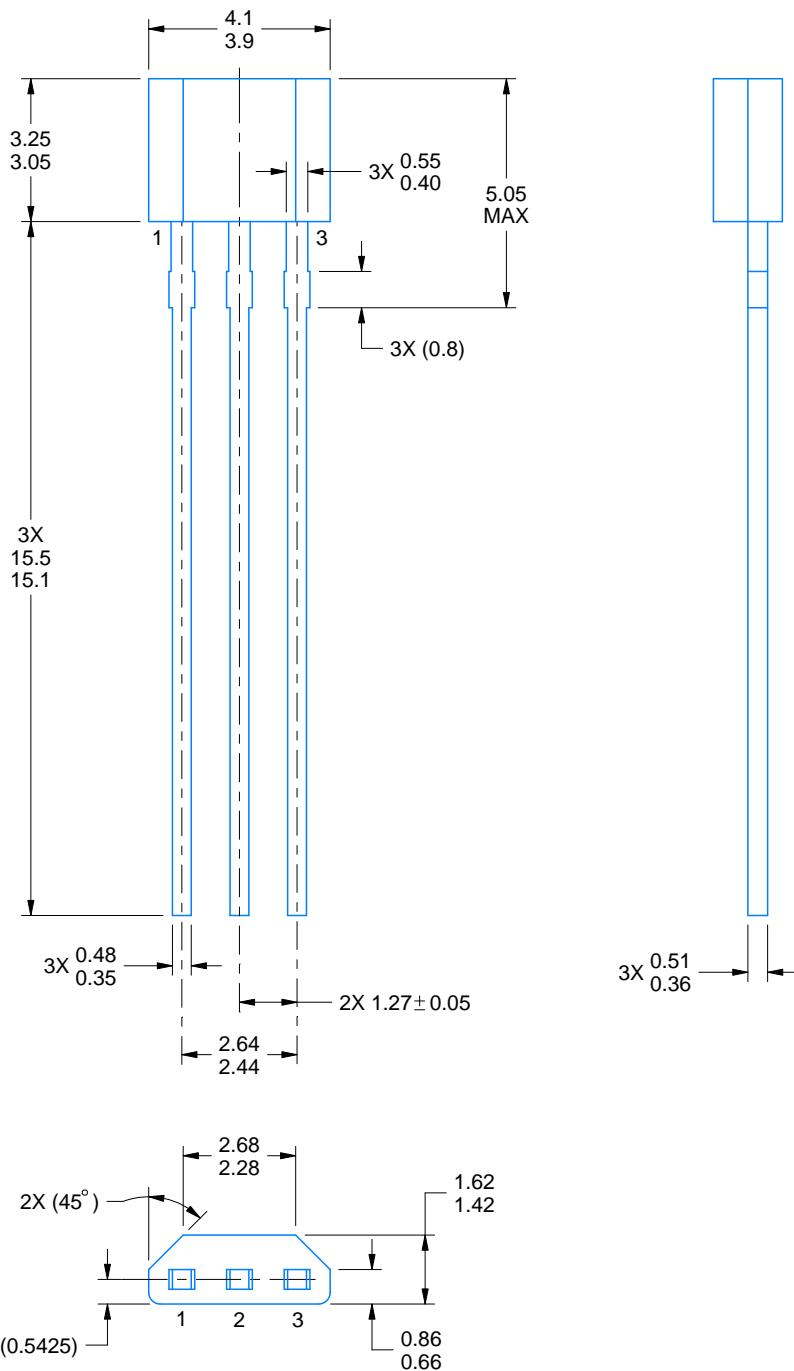
LPG0003A



# PACKAGE OUTLINE

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



4221343/C 01/2018

## NOTES:

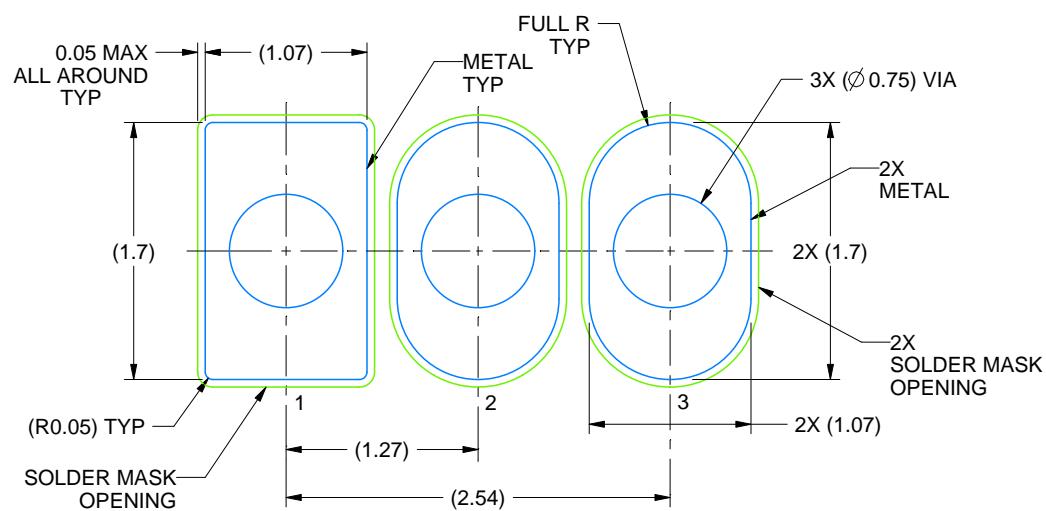
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

# EXAMPLE BOARD LAYOUT

LPG0003A

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



LAND PATTERN EXAMPLE  
NON-SOLDER MASK DEFINED  
SCALE:20X

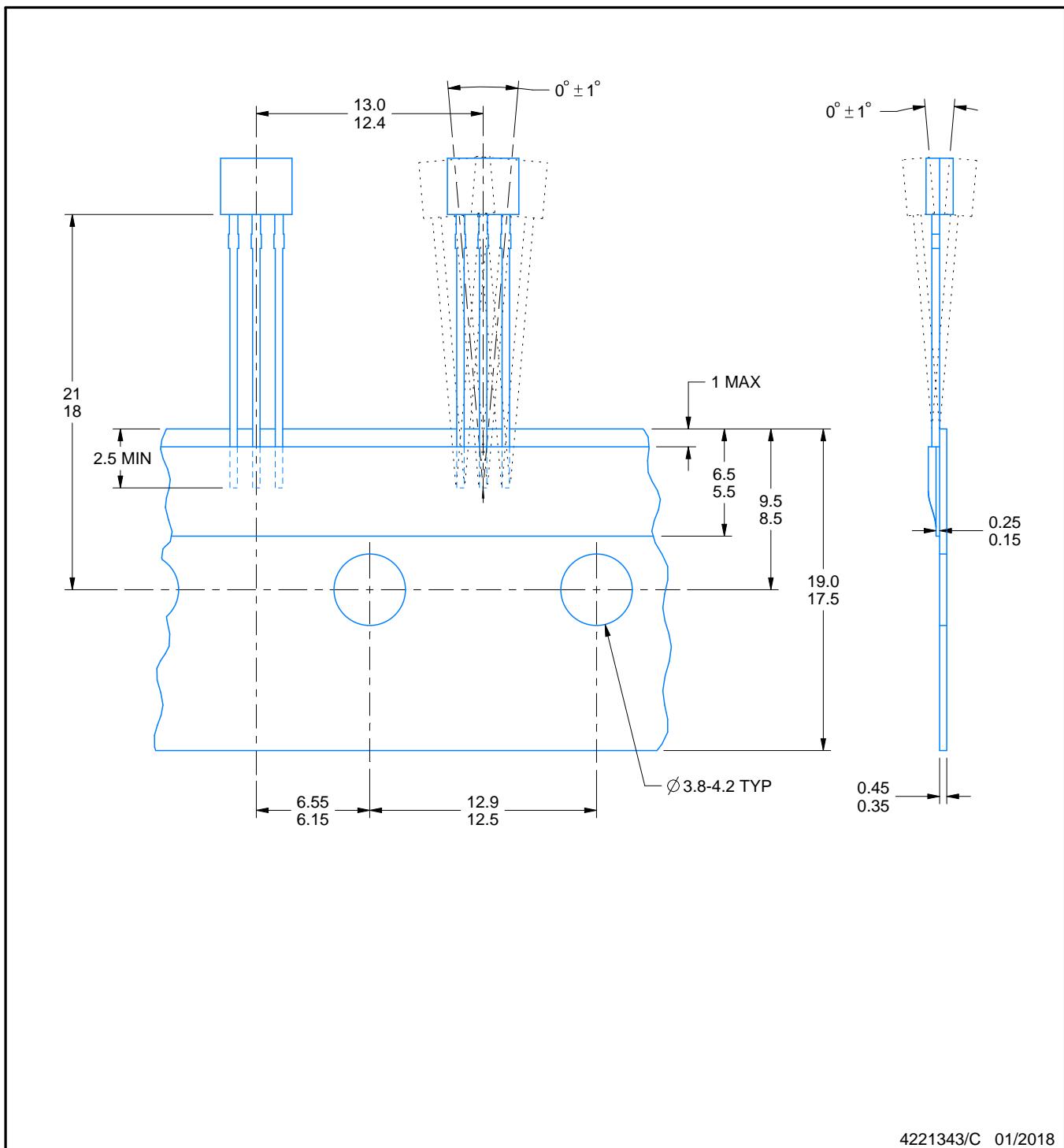
4221343/C 01/2018

# TAPE SPECIFICATIONS

LPG0003A

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



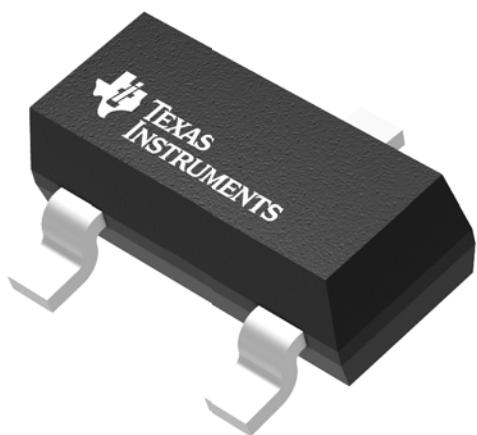
4221343/C 01/2018

## 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.

4203227/C

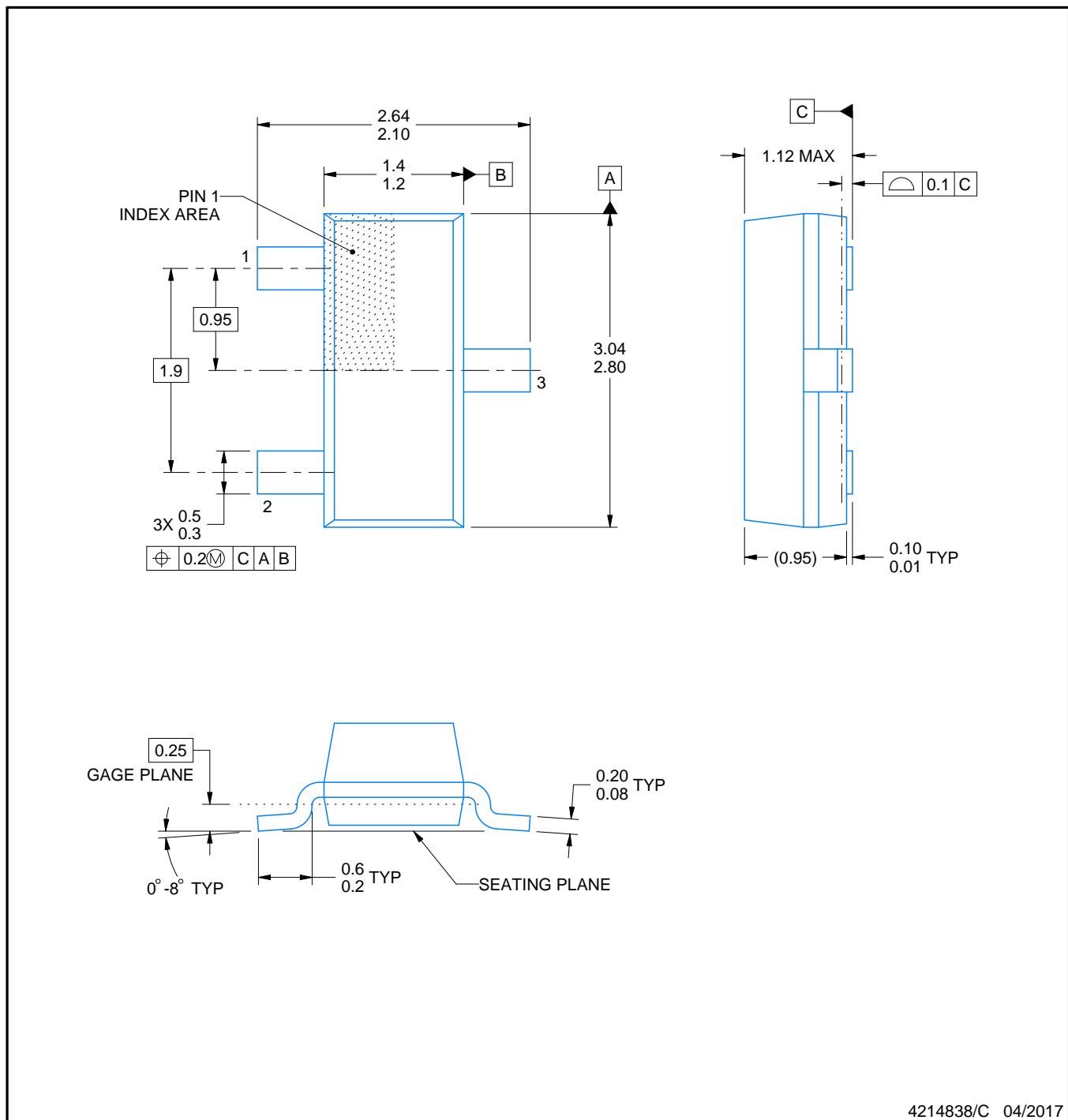
# PACKAGE OUTLINE

DBZ0003A



SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



NOTES:

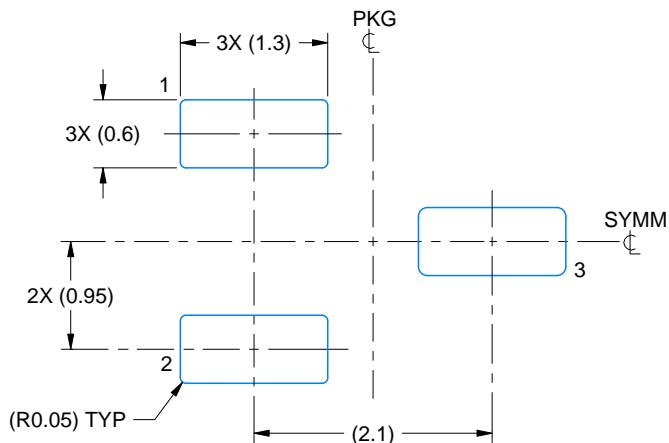
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration TO-236, except minimum foot length.

# EXAMPLE BOARD LAYOUT

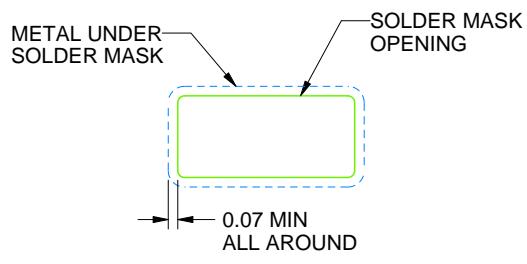
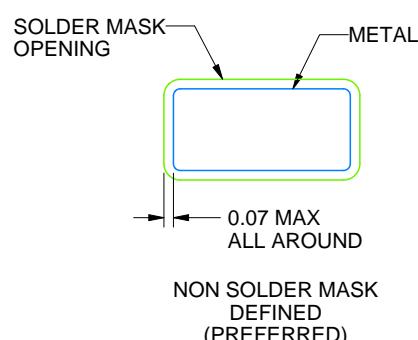
DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE  
SCALE:15X



SOLDER MASK DETAILS

4214838/C 04/2017

NOTES: (continued)

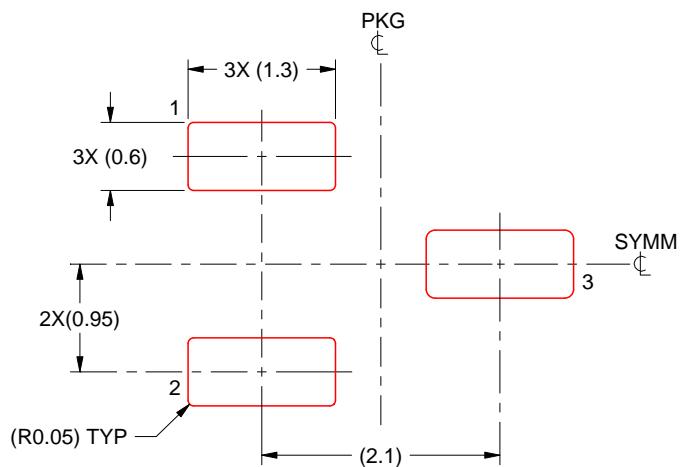
4. Publication IPC-7351 may have alternate designs.
5. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



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

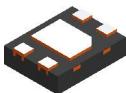
4214838/C 04/2017

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.

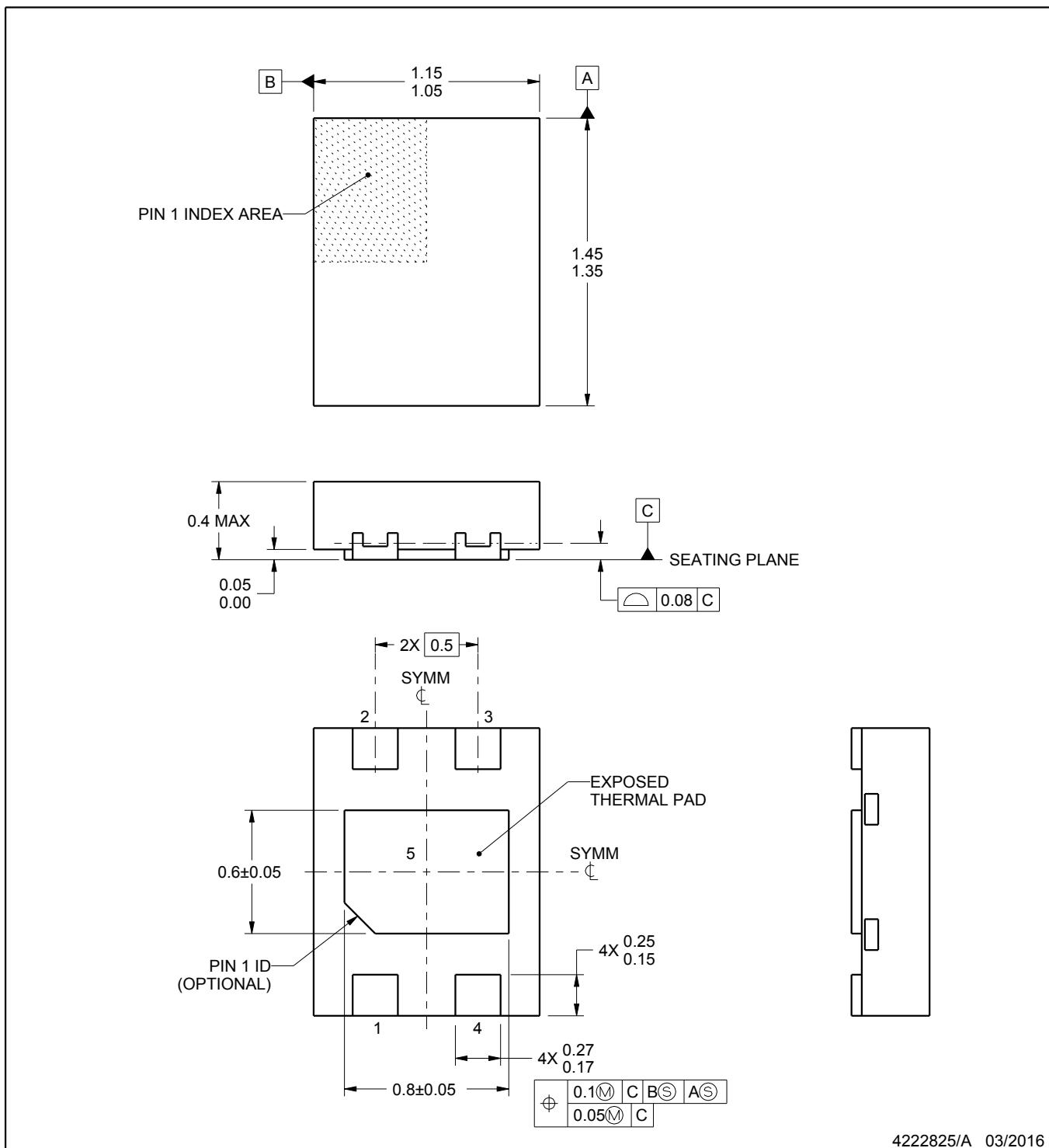
**DMR0004A**

# PACKAGE OUTLINE



**X2SON - 0.4 mm max height**

PLASTIC SMALL OUTLINE - NO LEAD



4222825/A 03/2016

NOTES:

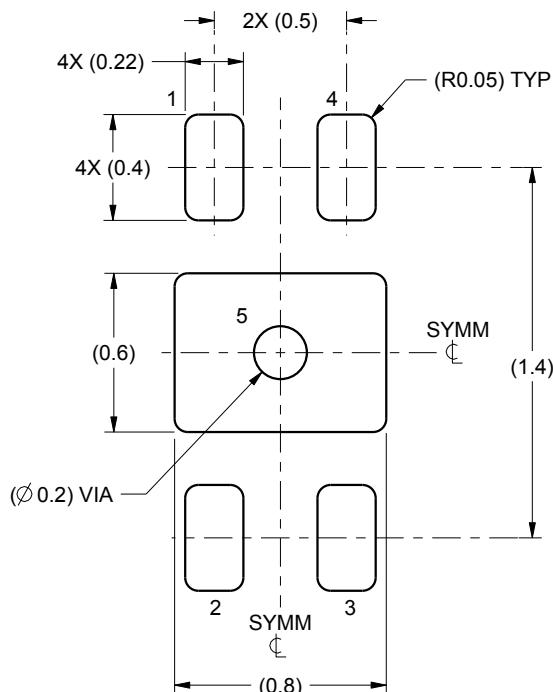
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

DMR0004A

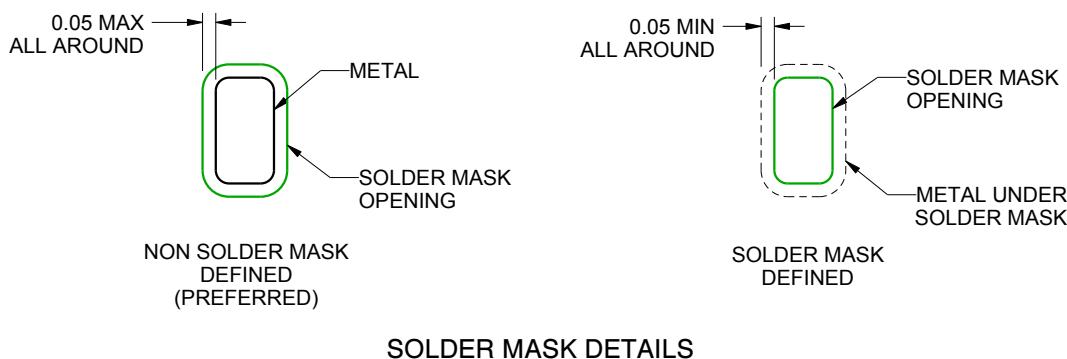
X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



## LAND PATTERN EXAMPLE

SCALE:35X



4222825/A 03/2016

NOTES: (continued)

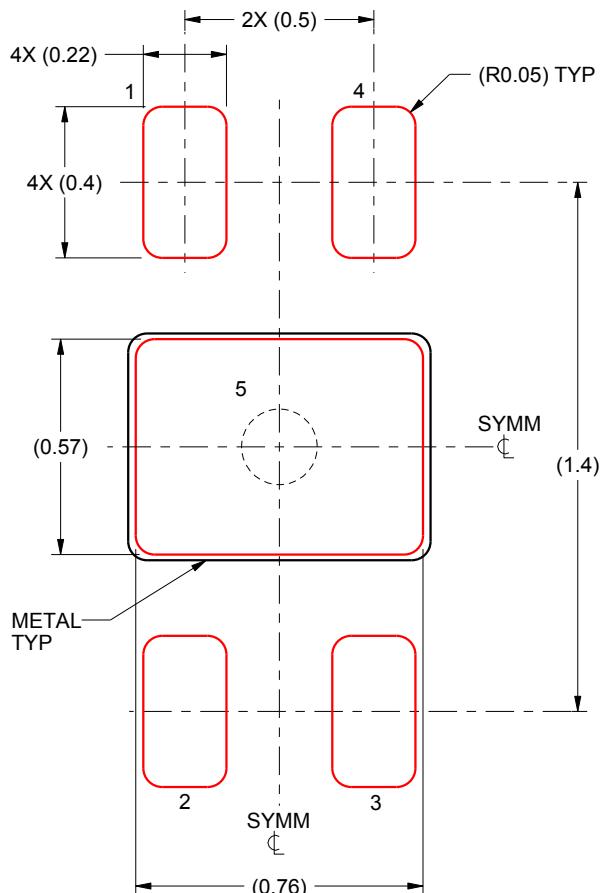
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
5. Vias are optional depending on application, refer to device data sheet. If all or some are implemented,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

# EXAMPLE STENCIL DESIGN

DMR0004A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



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.

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