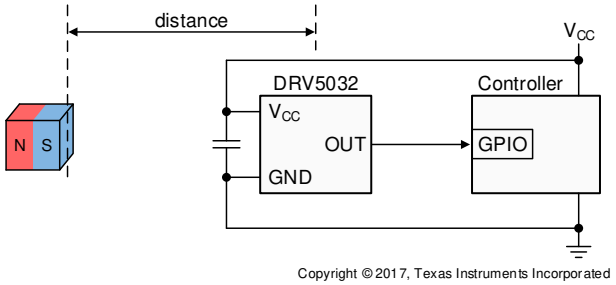
# DRV5032 Ultra-Low-Power Digital-Switch Hall Effect Sensor

## 1 Features

- Industry-leading ultra-low power consumption
  - 5Hz version: 0.54µA
  - 20Hz versions: 1.3µA
  - 80Hz version: 5.2µA
- Operating $V_{CC}$ range: 1.65V to 5.5V
- Operating temperature range: –40°C to +85°C
- Magnetic threshold options (maximum $B_{OP}$):
  - DG Version: 3.4mT
  - DU Version: 3.9mT
  - FA, FB, FC, FD Versions: 4.8mT
  - AJ Version: 9.5mT
  - ZE Version: 63mT
- Omnipolar and unipolar options
- Open-drain and push-pull output options
- SOT-23, X2SON and TO-92 package options

## 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




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**Typical Schematic**

## 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 magnetic thresholds, sampling rates, output drivers, and packages to accommodate various applications.

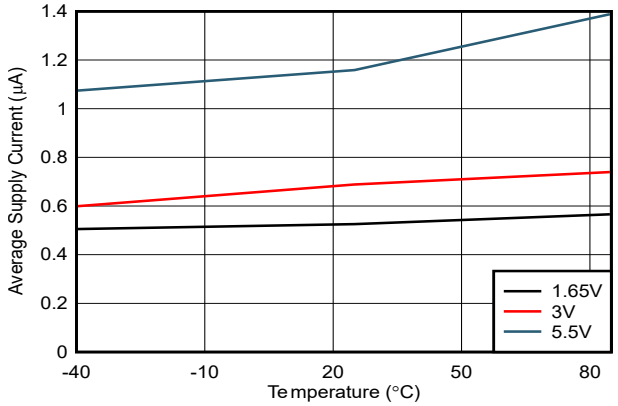
When the applied magnetic flux density exceeds the $B_{OP}$ threshold, the device outputs a low voltage. The output stays low until the flux density decreases to less than $B_{RP}$, and then the output either drives a high voltage or becomes high impedance, depending on the device version. By incorporating an internal oscillator, the device samples the magnetic field and updates the output at a rate of 80Hz, 20Hz or 5Hz for the lowest current consumption. Omnipolar and unipolar magnetic responses are available.

The device operates from a $V_{CC}$ range of 1.65V to 5.5V, and is packaged in a standard SOT-23, TO-92 and small X2SON.

**Package Information**

| PART NUMBER | PACKAGE(1) | PACKAGE SIZE(2) |
|---|---|---|
| DRV5032 | DBZ (SOT-23, 3) | 2.92mm × 2.37mm |
| | DMR (X2SON, 4) | 1.4mm × 1.1mm |
| | LPG (TO-92, 3) | 4mm × 1.52mm |

(1) For all available packages, see the orderable addendum at the end of the data sheet.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.




**Current Consumption of 5Hz Version**

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. PRODUCTION DATA.

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## 4 Device Comparison

**Table 4-1. Device Comparison**

| VERSION | MAXIMUM THRESHOLD | MAGNETIC RESPONSE | OUTPUT TYPE | SAMPLING RATE | PACKAGES AVAILABLE |
|---|---|---|---|---|---|
| DRV5032DG | 3.4 mT | Unipolar | Push-pull | 80 Hz | X2SON |
| DRV5032DU | 3.9 mT | Unipolar | Push-pull | 20 Hz | SOT-23, X2SON, TO-92 |
| DRV5032FA | 4.8 mT | Omnipolar | Push-pull | 20 Hz | SOT-23, X2SON, TO-92 |
| DRV5032FB | | Omnipolar | Push-pull | 5 Hz | SOT-23, X2SON, TO-92 |
| DRV5032FC | | Omnipolar | Open-drain | 20 Hz | SOT-23, TO-92 |
| DRV5032FD | | Unipolar | Push-pull | 20 Hz | X2SON, TO-92 |
| DRV5032AJ | 9.5 mT | Omnipolar | Open-drain | 20 Hz | SOT-23, X2SON, TO-92 |
| DRV5032ZE | 63 mT | Omnipolar | Open-drain | 20 Hz | SOT-23, TO-92 |


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## 5 Pin Configuration and Functions

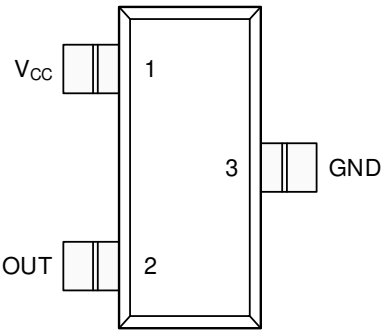



**Figure 5-1. FA, FB, FC, AJ, ZE Versions DBZ Package 3-Pin SOT-23 Top View**

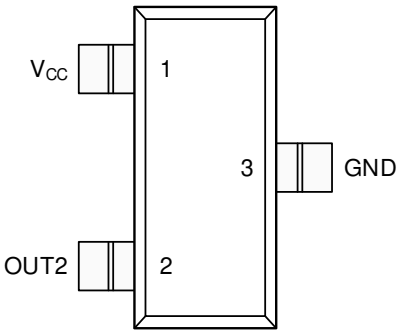



**Figure 5-2. DU Version DBZ Package 3-Pin SOT-23 Top View**

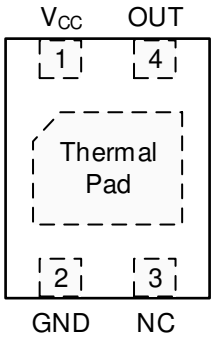



**Figure 5-3. FA, FB, AJ Versions DMR Package 4-Pin X2SON Top View**

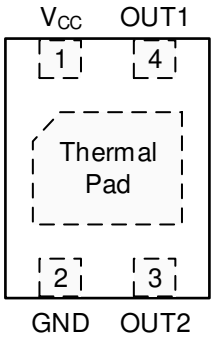



**Figure 5-4. DU, DG, FD Versions DMR Package 4-Pin X2SON Top View**

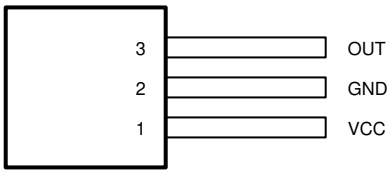



**Figure 5-5. FA, FB, FC, AJ, ZE Versions LPG Package 3-Pin TO-92 Top View**

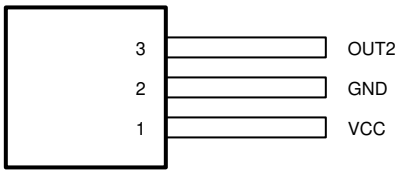



**Figure 5-6. DU, FD Versions LPG Package 3-Pin TO-92 Top View**

**Table 5-1. Pin Functions**

| PIN | | | | | | | I/O | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|
| NAME | SOT-23 (FA, FB, FC, AJ, ZE) | SOT-23 (DU) | TO-92 (FA, FB, FC, AJ, ZE) | TO-92 (DU, FD) | X2SON (FA, FB, AJ) | X2SON (DU, DG, FD) | | |
| GND | 3 | 3 | 2 | 2 | 2 | 2 | — | Ground reference |
| OUT | 2 | — | 3 | — | 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 | — | 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. Leave this pin floating or tied to ground. Solder the pin to the board for mechanical support. |
| $V_{CC}$ | 1 | 1 | 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 µF. |
| Thermal Pad | — | — | — | — | PAD | PAD | — | No-connect. Leave this pin floating or tied to ground. Solder the pin to the board for mechanical support. |

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# 6 Specifications

## 6.1 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.

## 6.2 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.

## 6.3 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 |

## 6.4 Thermal Information

| THERMAL METRIC(1) | | DRV5032 | | | UNIT |
|---|---|---|---|---|---|
| | | DBZ (SOT-23) | DMR (X2SON) | LPG (TO-92) | |
| | | 3 PINS | 4 PINS | 3 PINS | |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance | 356 | 159 | 183.1 | °C/W |
| $R_{\theta JC(top)}$ | Junction-to-case (top) thermal resistance | 128 | 77 | 74.2 | °C/W |
| $R_{\theta JB}$ | Junction-to-board thermal resistance | 94 | 102 | 158.8 | °C/W |
| $\Psi_{JT}$ | Junction-to-top characterization parameter | 11.4 | 0.9 | 15.2 | °C/W |
| $\Psi_{JB}$ | Junction-to-board characterization parameter | 92 | 100 | 158.8 | °C/W |

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


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## 6.5 Electrical Characteristics

for $V_{CC}$ = 1.65V to 5.5V, 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 | $I_{OUT}$ = –1mA | $V_{CC}$ – 0.35 | $V_{CC}$ – 0.1 | | V |
| $V_{OL}$ | Low-level output voltage | $I_{OUT}$ = 1mA | | 0.1 | 0.3 | V |
| **OPEN-DRAIN OUTPUT** | | | | | | |
| $I_{OZ}$ | High impedance output leakage current | $V_{CC}$ = 5.5V, OUT = 5.5V | | 5 | 100 | nA |
| $V_{OL}$ | Low-level output voltage | $I_{OUT}$ = 1mA | | 0.1 | 0.3 | V |
| **DG VERSION** | | | | | | |
| $f_S$ | Frequency of magnetic sampling | | 40 | 80 | 120 | Hz |
| $t_S$ | Period of magnetic sampling | | 8 | 12.5 | 25 | ms |
| $I_{CC(AVG)}$ | Average current consumption | $V_{CC}$ = 1.8V | | 5.2 | | µA |
| | | $V_{CC}$ = 3V | | 5.7 | 7.9 | |
| | | $V_{CC}$ = 5V | | 6 | | |
| **DU, FA, FC, FD, AJ, ZE VERSIONS** | | | | | | |
| $f_S$ | 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 | $V_{CC}$ = 1.8V | | 1.3 | | µA |
| | | $V_{CC}$ = 3V | | 1.6 | 3.5 | |
| | | $V_{CC}$ = 5V | | 2.3 | | |
| **FB VERSION** | | | | | | |
| $f_S$ | 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 | $V_{CC}$ = 1.8V | | 0.54 | | µA |
| | | $V_{CC}$ = 3V | | 0.69 | 1.8 | |
| | | $V_{CC}$ = 5V | | 1.06 | | |
| **ALL VERSIONS** | | | | | | |
| $I_{CC(PK)}$ | Peak current consumption | | | 2 | 2.7 | mA |
| $t_{ON}$ | Power-on time (see Figure 8-7) | | | 55 | 100 | µs |
| $t_{ACTIVE}$ | Active time period (see Figure 8-7) | | | 40 | | µs |

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## 6.6 Magnetic Characteristics

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

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| **DG VERSION** | | | | | | |
| $B_{OP}$ | Magnetic threshold operate point | OUT1 pin (north)(2) $T_A$ = 25C | –3.32 | –2.5 | –1.72 | mT |
| | | OUT1 pin (north)(2) | –3.40 | –2.5 | –1.56 | |
| | | OUT2 pin (south) $T_A$ = 25C | 1.72 | 2.5 | 3.32 | |
| | | OUT2 pin (south) | 1.56 | 2.5 | 3.40 | |
| $B_{RP}$ | Magnetic threshold release point | OUT1 pin (north)(2) $T_A$ = 25C | –2.62 | –1.8 | –1.17 | mT |
| | | OUT1 pin (north)(2) | –2.73 | –1.8 | –0.9 | |
| | | OUT2 pin (south) $T_A$ = 25C | 1.17 | 1.8 | 2.62 | |
| | | OUT2 pin (south) | 0.9 | 1.8 | 2.73 | |
| $B_{HYS}$ | Magnetic hysteresis: $\lvert B_{OP} - B_{RP} \rvert$ | Each output $T_A$ = 25C | 0.21 | 0.7 | 1.19 | mT |
| | | Each output | 0.13 | 0.7 | 1.27 | |
| **DU VERSION** | | | | | | |
| $B_{OP}$ | Magnetic threshold operate point | OUT1 pin (north)(2) | –3.9 | –2.5 | –1.2 | mT |
| | | OUT2 pin (south) | 1.2 | 2.5 | 3.9 | |
| $B_{RP}$ | Magnetic threshold release point | OUT1 pin (north)(2) | –3.5 | –1.8 | –0.9 | mT |
| | | OUT2 pin (south) | 0.9 | 1.8 | 3.5 | |
| $B_{HYS}$ | Magnetic hysteresis: $\lvert B_{OP} - B_{RP} \rvert$ | Each output | 0.1 | 0.7 | 1.9 | mT |
| **FA, FB, FC VERSIONS** | | | | | | |
| $B_{OP}$ | 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 |
| **FD VERSION** | | | | | | |
| $B_{OP}$ | Magnetic threshold operate point | OUT1 pin (north)(2) | –4.8 | –3 | –1.5 | mT |
| | | OUT2 pin (south) | 1.5 | 3 | 4.8 | |
| $B_{RP}$ | Magnetic threshold release point | OUT1 pin (north)(2) | –3 | –1.5 | –0.5 | mT |
| | | OUT2 pin (south) | 0.5 | 1.5 | 3 | |
| $B_{HYS}$ | Magnetic hysteresis: $\lvert B_{OP} - B_{RP} \rvert$ | Each output | 0.8 | 1.5 | 3 | mT |
| **AJ VERSION** | | | | | | |
| $B_{OP}$ | Magnetic threshold operate point | | ±4 | ±7 | ±9.5 | mT |
| $B_{RP}$ | Magnetic threshold release point | | ±3 | ±5.6 | ±7.5 | mT |
| $B_{HYS}$ | Magnetic hysteresis: $\lvert B_{OP} - B_{RP} \rvert$ | | 0.5 | 1.4 | 3 | mT |
| **ZE VERSION** | | | | | | |
| $B_{OP}$ | Magnetic threshold operate point | | ±33 | ±47 | ±63 | mT |
| $B_{RP}$ | Magnetic threshold release point | | ±30 | ±43 | ±58 | mT |
| $B_{HYS}$ | Magnetic hysteresis: $\lvert B_{OP} - B_{RP} \rvert$ | | 1.2 | 4 | 8.5 | mT |

(1) For a graphical description of magnetic thresholds, see the *Magnetic Response* section.
(2) X2SON package only.


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## 6.7 Typical Characteristics

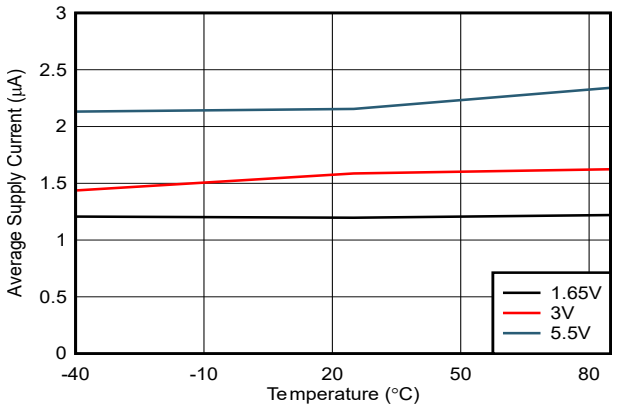



**Figure 6-1. $I_{CC(AVG)}$ vs Temperature (20-Hz versions)**

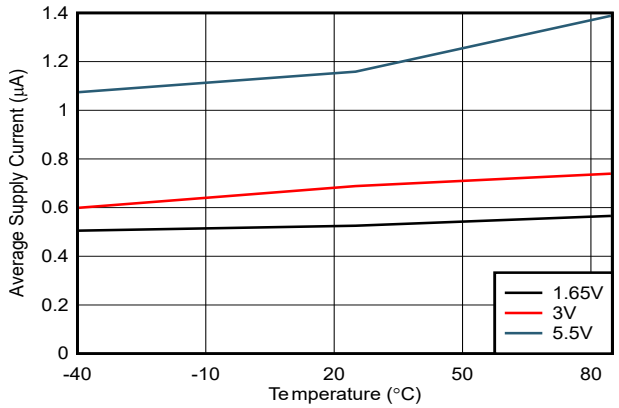



**Figure 6-2. $I_{CC(AVG)}$ vs Temperature (5-Hz version)**

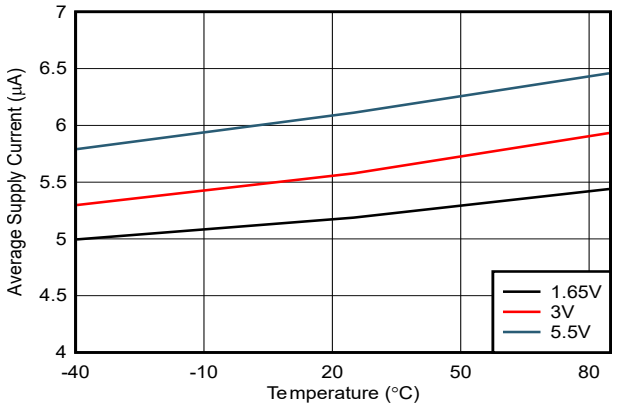



**Figure 6-3. $I_{CC(AVG)}$ vs Temperature (40-Hz version)**

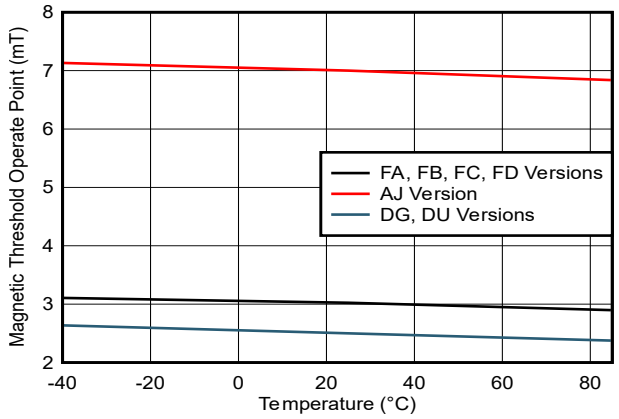



**Figure 6-4. $|B_{OP}|$ vs Temperature**

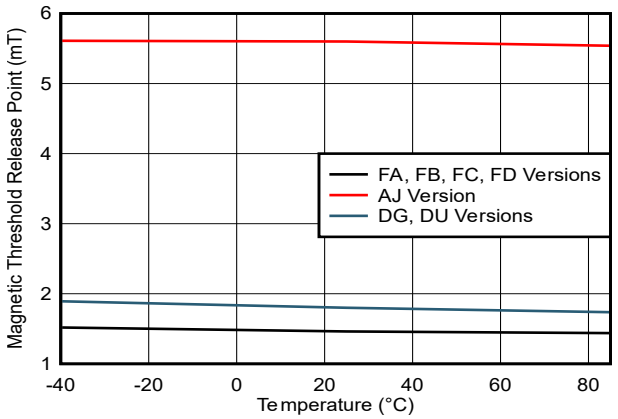



**Figure 6-5. $|B_{RP}|$ vs Temperature**

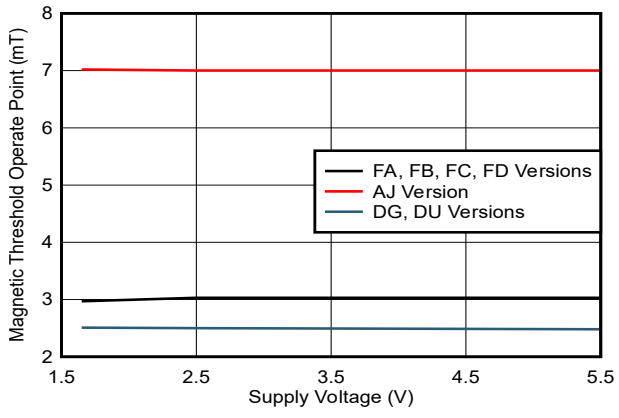



**Figure 6-6. $|B_{OP}|$ vs $V_{CC}$**

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## 6.7 Typical Characteristics (continued)

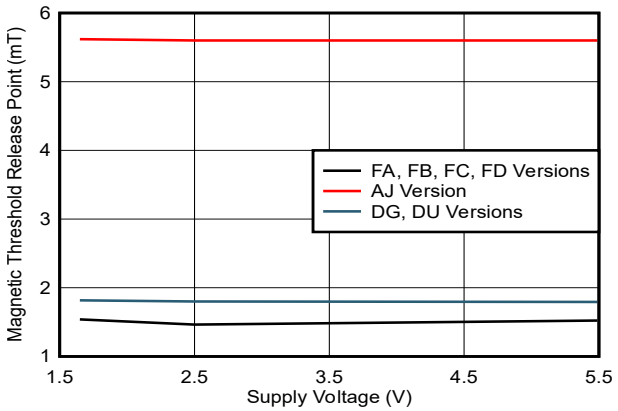



**Figure 6-7. $|B_{RP}|$ vs $V_{CC}$**

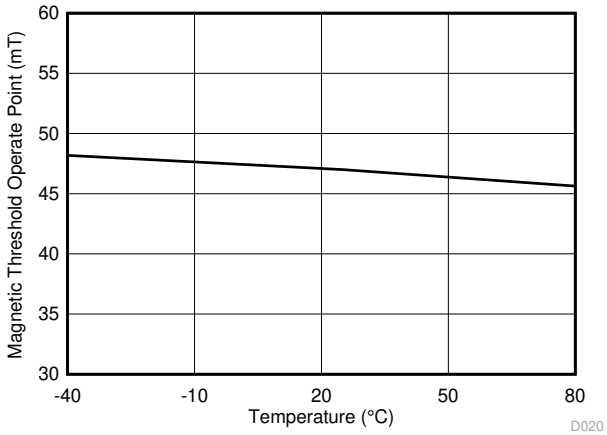



**Figure 6-8. ZE Version $|B_{OP}|$ vs Temperature**

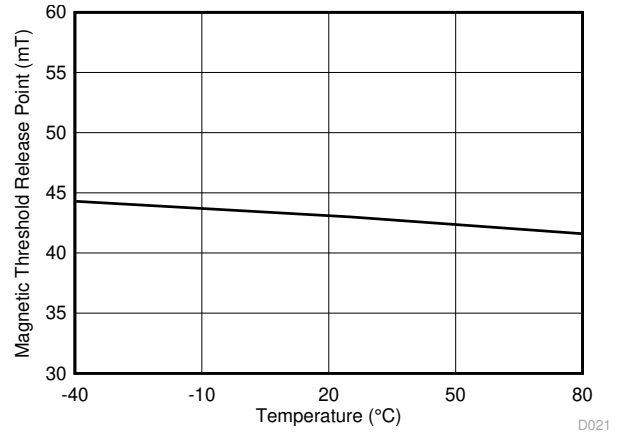



**Figure 6-9. ZE Version $|B_{RP}|$ vs Temperature**

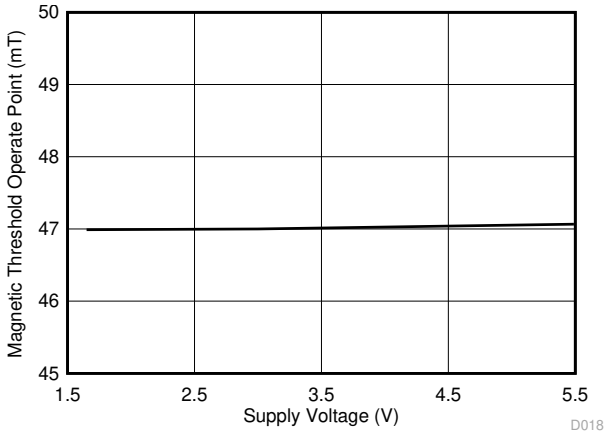



**Figure 6-10. ZE Version $|B_{OP}|$ vs $V_{CC}$**

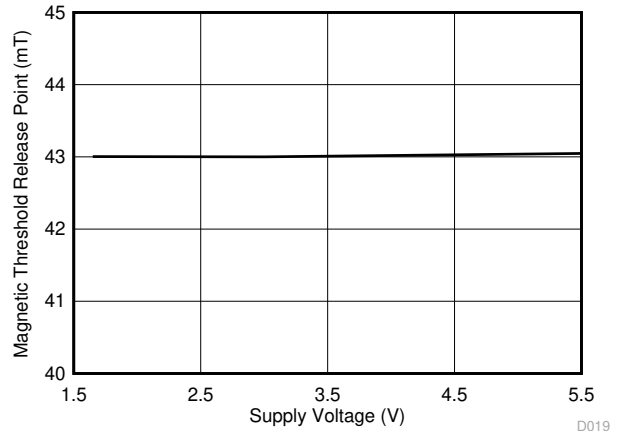
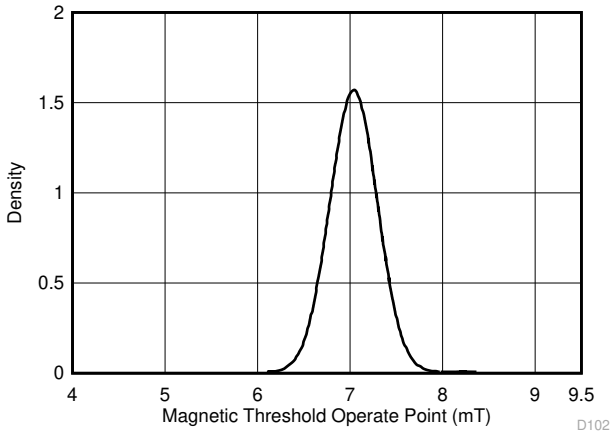



**Figure 6-11. ZE Version $|B_{RP}|$ vs $V_{CC}$**

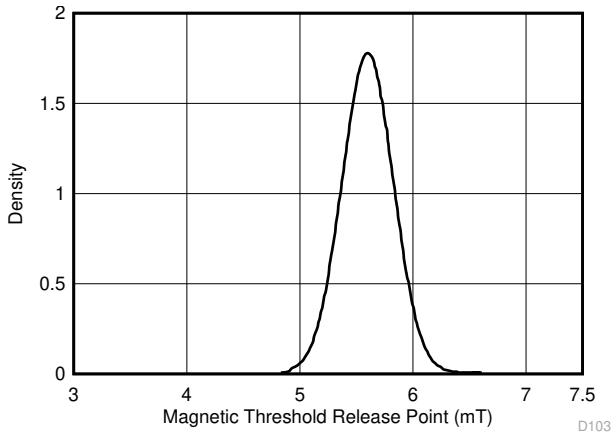



$T_A$ = 25°C, $V_{CC}$ = 1.65 V to 5.5 V

**Figure 6-12. AJ Version $B_{OP}$ Probability Density Function**

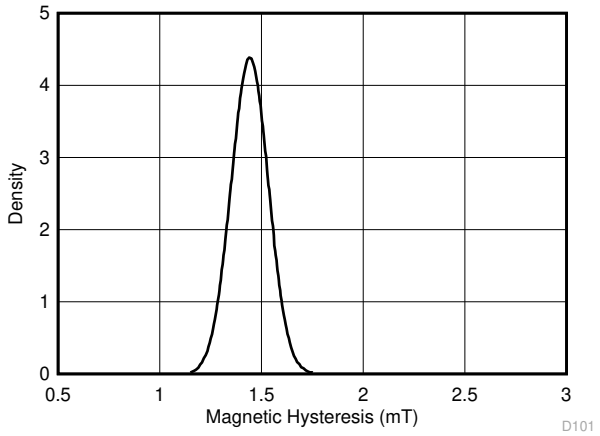

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## 6.7 Typical Characteristics (continued)




$T_A$ = 25°C, $V_{CC}$ = 1.65 V to 5.5 V

**Figure 6-13. AJ Version $B_{RP}$ Probability Density Function**




$T_A$ = 25°C, $V_{CC}$ = 1.65 V to 5.5 V

**Figure 6-14. AJ Version $B_{HYS}$ Probability Density Function**

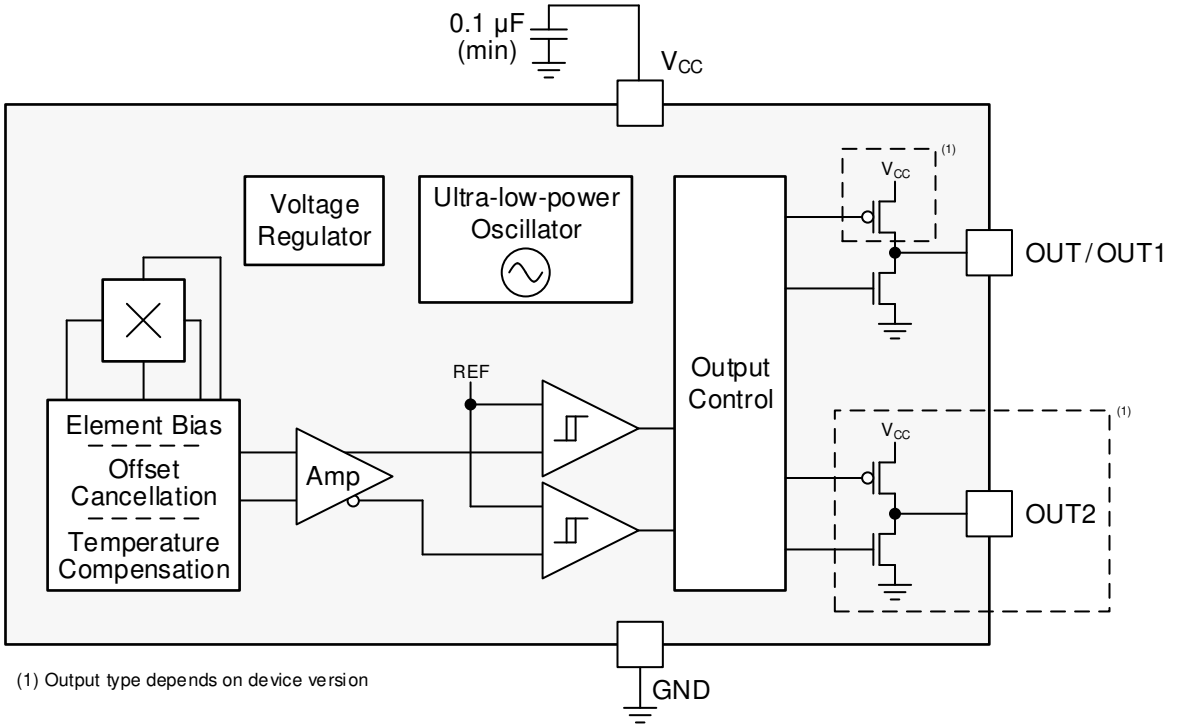
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# 7 Detailed Description

## 7.1 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.

## 7.2 Functional Block Diagram




(1) Output type depends on device version

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## 7.3 Feature Description

### *7.3.1 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 7-1).

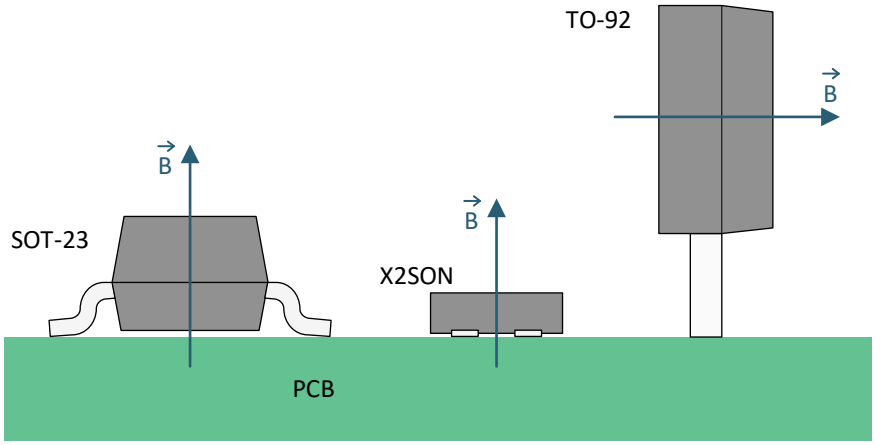



**Figure 7-1. Direction of Sensitivity**

The 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. The magnetic flux that travels from the top to the bottom of the package results in negative millitesla values.

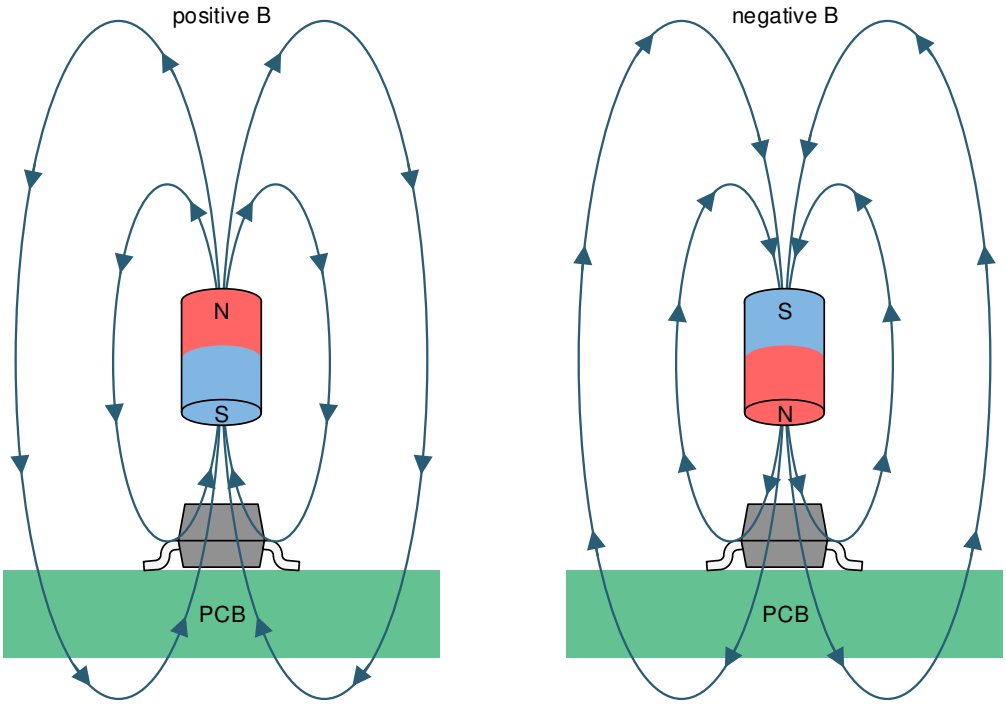



**Figure 7-2. Flux Direction Polarity**

### 7.3.2 Device Version Comparison

The following table lists the available device versions.

| VERSION | MAXIMUM THRESHOLD | MAGNETIC RESPONSE | OUTPUT TYPE | SAMPLING RATE | PACKAGES AVAILABLE |
|---|---|---|---|---|---|
| DRV5032DG | 3.4 mT | Unipolar | Push-pull | 80 Hz | X2SON |
| DRV5032DU | 3.9 mT | Unipolar | Push-pull | 20 Hz | SOT-23, X2SON, TO-92 |
| DRV5032FA | 4.8 mT | Omnipolar | Push-pull | 20 Hz | SOT-23, X2SON, TO-92 |
| DRV5032FB | | Omnipolar | Push-pull | 5 Hz | SOT-23, X2SON, TO-92 |
| DRV5032FC | | Omnipolar | Open-drain | 20 Hz | SOT-23, TO-92 |
| DRV5032FD | | Unipolar | Push-pull | 20 Hz | X2SON, TO-92 |
| DRV5032AJ | 9.5 mT | Omnipolar | Open-drain | 20 Hz | SOT-23, X2SON, TO-92 |
| DRV5032ZE | 63 mT | Omnipolar | Open-drain | 20 Hz | SOT-23, TO-92 |

#### 7.3.2.1 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.

#### 7.3.2.2 Magnetic Response

The FA, FB, FC, AJ, and ZE device versions have omnipolar functionality, and these versions all respond to the north and south poles the same way as shown in Figure 7-3.

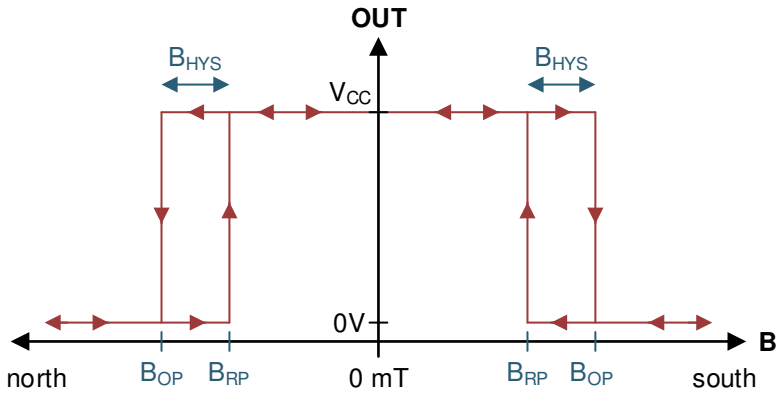



**Figure 7-3. Omnipolar Functionality**

The DU, DG 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).

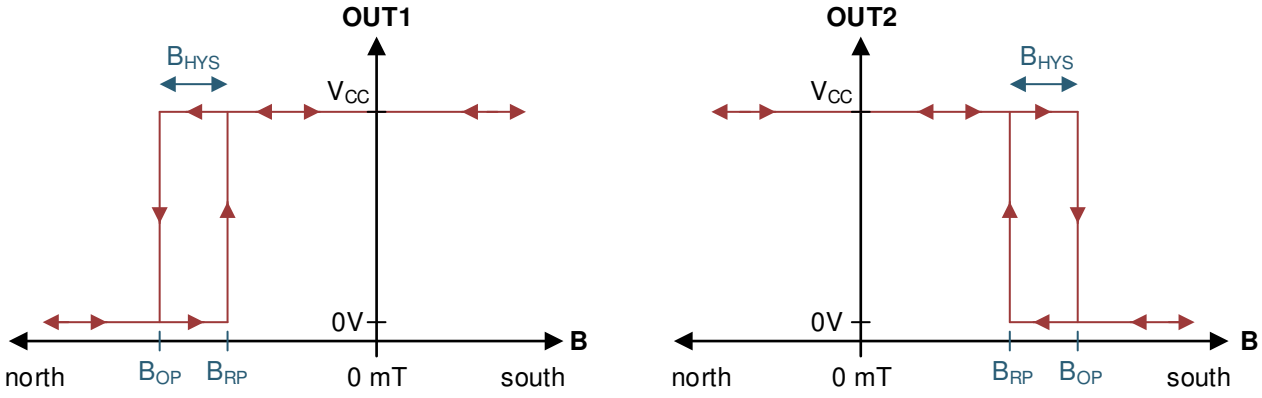



**Figure 7-4. Unipolar Functionality**


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#### 7.3.2.3 Output Type

The DU, DG, 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. For these versions, an external pullup resistor must be used.

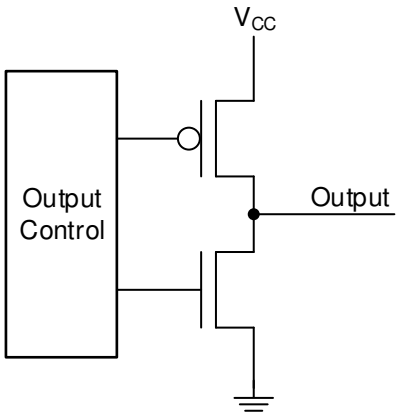



**Figure 7-5. Push-Pull Output (Simplified)**

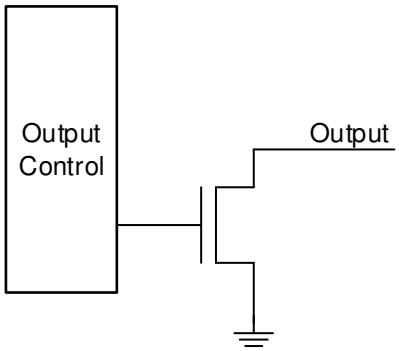



**Figure 7-6. Open-Drain Output (Simplified)**

#### 7.3.2.4 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, the device measures a new sample and updates the output, if necessary. If the magnetic field does not change between periods, the output does not change.

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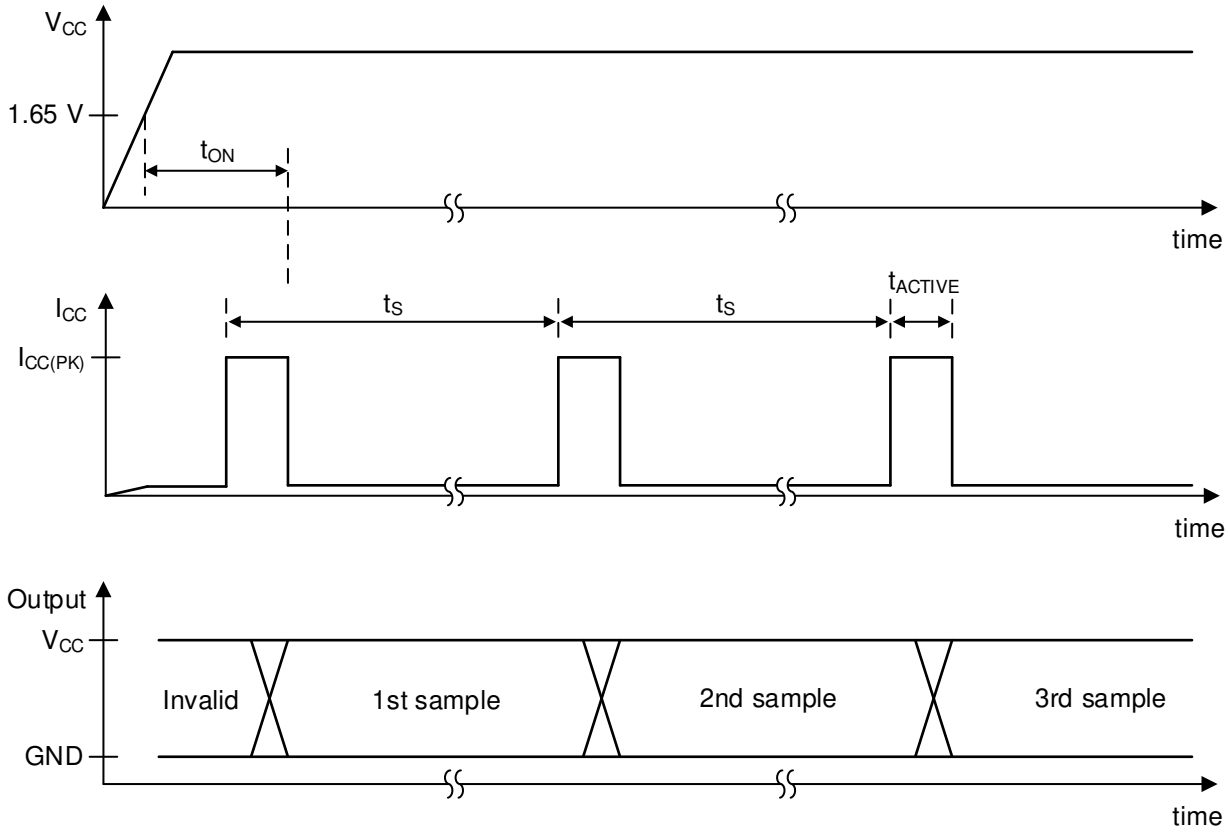



**Figure 7-7. Timing Diagram**


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### 7.3.3 Hall Element Location

The sensing element inside the device is in the center of both packages when viewed from the top. Figure 7-8 shows the tolerances and side-view dimensions.

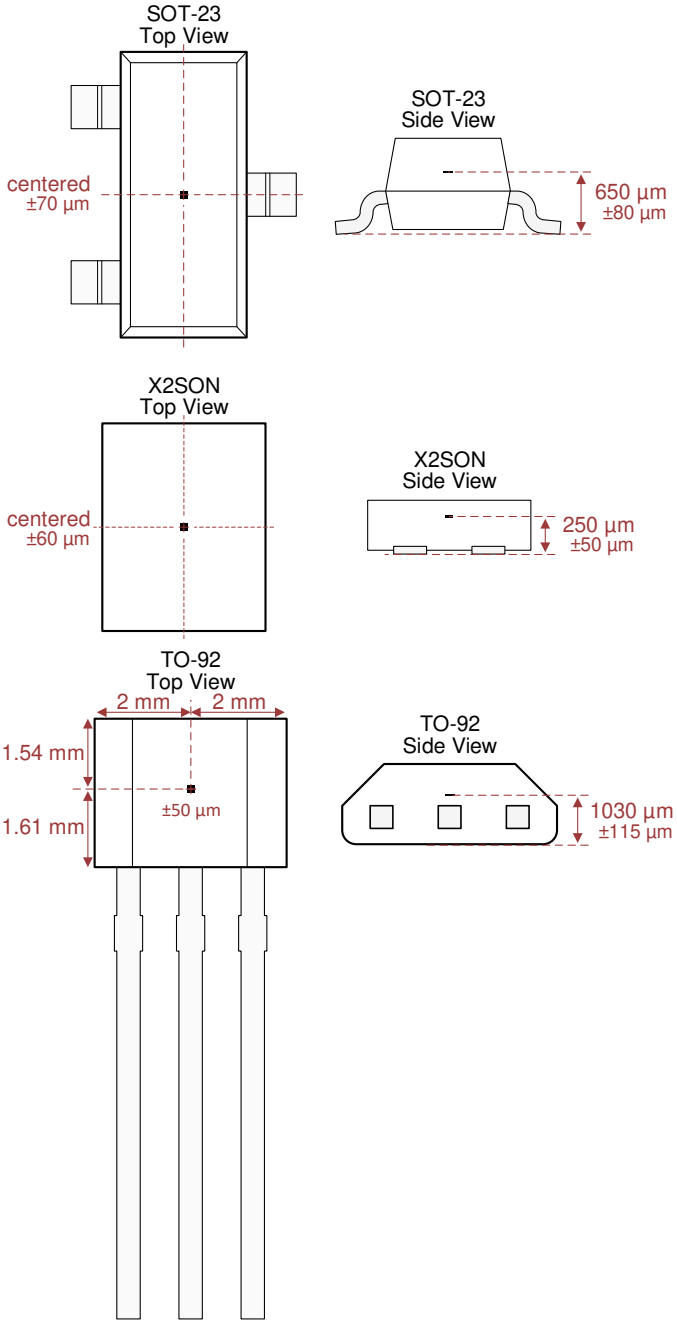



**Figure 7-8. Hall Element Location**

## 7.4 Device Functional Modes

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

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# 8 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, as well as validating and testing their design implementation to confirm system functionality.

## 8.1 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.

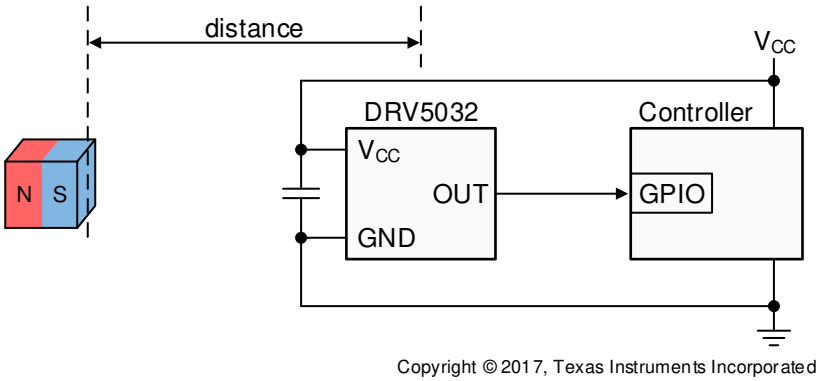
### *8.1.1 Output Type Tradeoffs*

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

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.

## 8.2 Typical Applications

### *8.2.1 General-Purpose Magnet Sensing*




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**Figure 8-1. Typical Application Diagram**

#### 8.2.1.1 Design Requirements

For this design example, use the parameters listed in Table 8-1.

**Table 8-1. 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 |

#### 8.2.1.2 Detailed Design Procedure

When designing a digital-switch magnetic sensing system, consider these three variables: the magnet, sensing distance, and threshold of the sensor.


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

Magnets are made from various ferromagnetic materials that have trade-offs 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) the magnet 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.

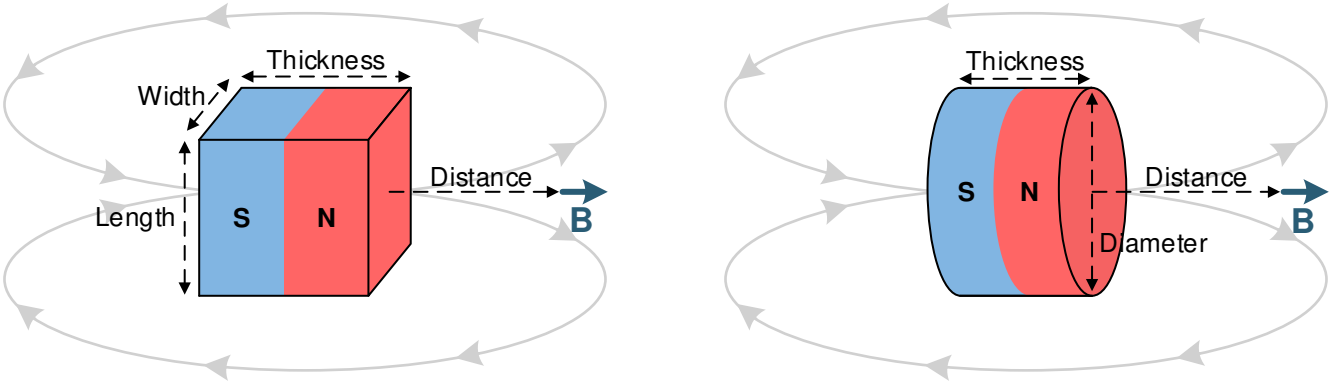



**Figure 8-2. Rectangular Block and Cylinder Magnets**

Use Equation 1 for the rectangular block shown in Figure 8-2:

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

Use Equation 2 for the cylinder shown in Figure 8-2:

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

where

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

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. Make sure the systems have margin to account for this, as well as for mechanical tolerances.

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#### 8.2.1.3 Application Curve

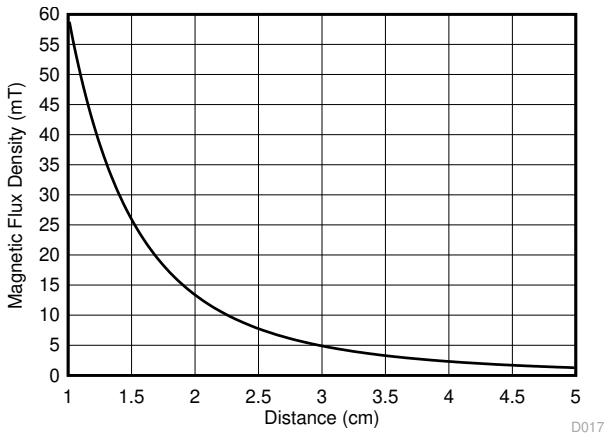



**Figure 8-3. Magnetic Profile of a 1-cm Cube NdFeB Magnet**

### *8.2.2 Three-Position Switch*

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

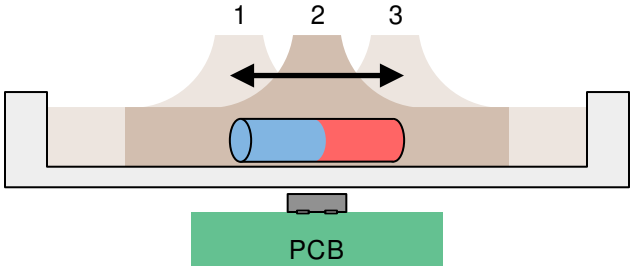



**Figure 8-4. Three-Position Slider Switch With Embedded Magnet**

#### 8.2.2.1 Design Requirements

For this design example, use the parameters listed in Table 8-2.

**Table 8-2. 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 |

#### 8.2.2.2 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, the device 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 the magnet applies the strongest perpendicular flux component.


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To determine the magnitude of magnetic flux density for a given magnet and distance, TI recommends to either use simulation software, test with a linear Hall effect sensor, or test with a gaussmeter.

#### 8.2.2.3 Application Curve

Figure 8-5 shows the typical magnetic flux lines around a 2-pole magnet.

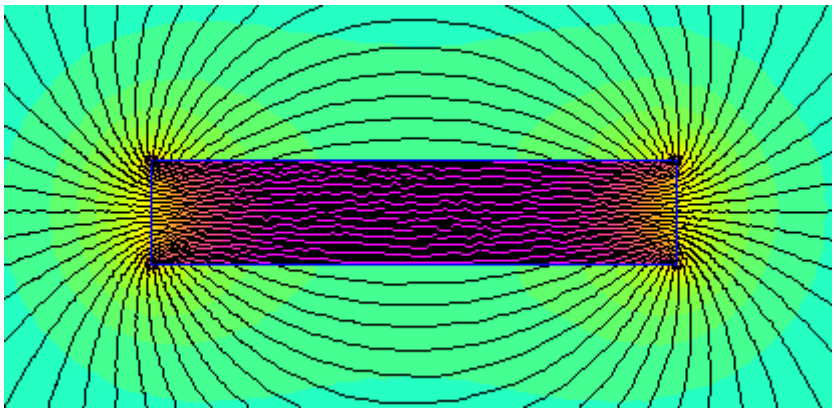


**Figure 8-5. Typical Magnetic Flux Lines**

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## 8.3 Best Design Practices

The Hall element is sensitive to magnetic fields that are perpendicular to the top of the package, therefore a correct magnet approach must be used for the sensor to detect the field. Figure 8-6 shows correct and incorrect approaches.

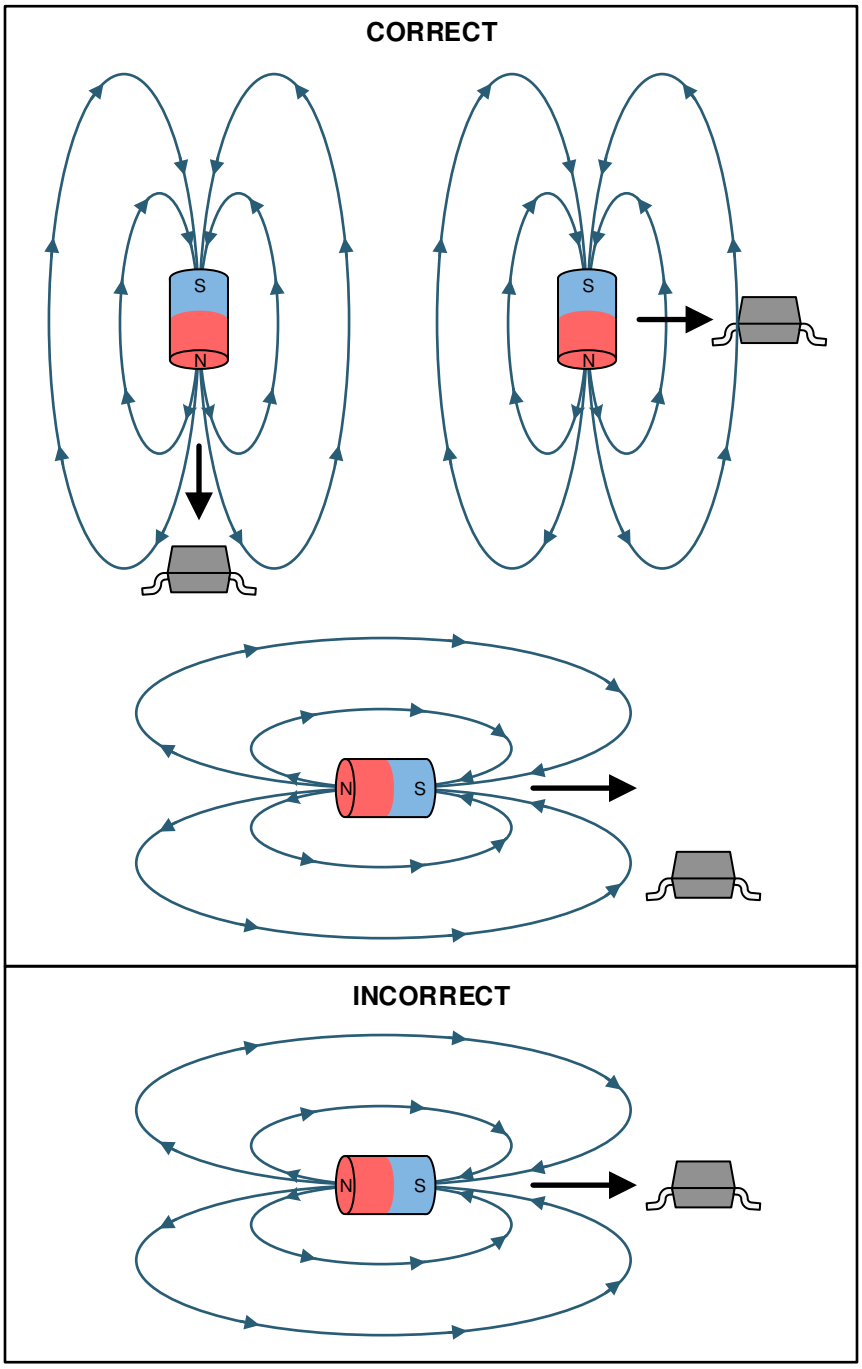



**Figure 8-6. Correct and Incorrect Magnet Approaches**


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## 8.4 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.

## 8.5 Layout

### *8.5.1 Layout Guidelines*

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

### *8.5.2 Layout Examples*

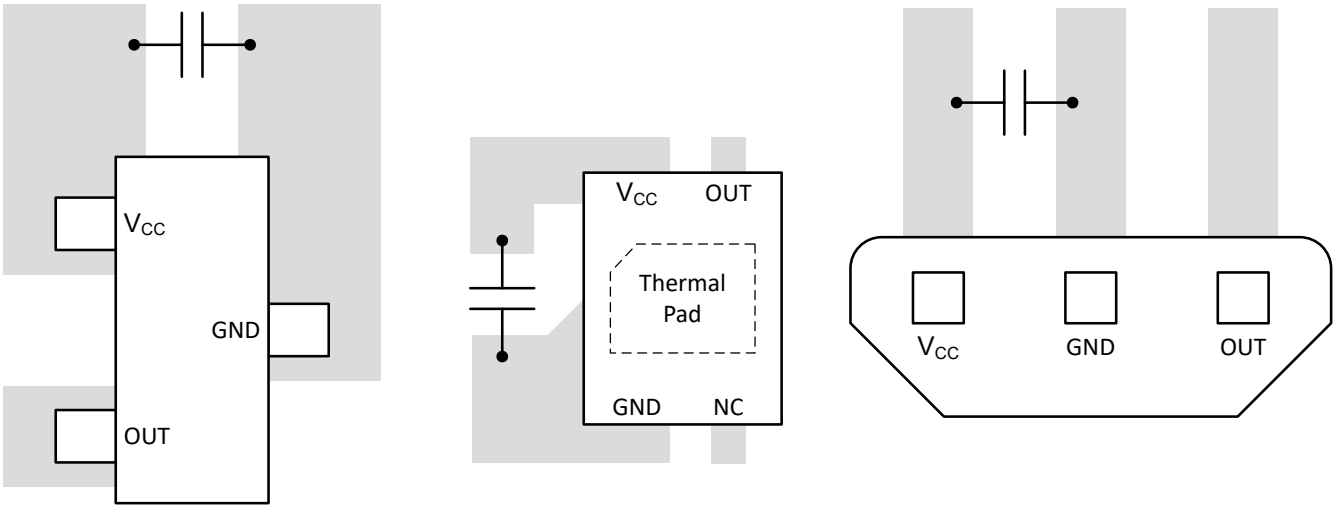



**Figure 8-7. Layout Examples**

# 9 Device and Documentation Support

## 9.1 Documentation Support

### 9.1.1 Related Documentation

For related documentation see the following:

- Texas Instruments, *DRV5032-SOLAR-EVM* user guide
- Texas Instruments, *Power Gating Systems with Magnetic Sensors* application brief
- Texas Instruments, *Low-Power Door and Window Sensor With Sub-1GHz and 10-Year Coin Cell Battery Life* design guide
- Texas Instruments, *Magnetic Tamper Detection Using Low-Power Hall Effect Sensors* design guide
- Texas Instruments, *Fault Monitoring for Overhead Fault Indicators Using Ultra-Low-Power* design guide

## 9.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* 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.

## 9.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is 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.

## 9.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

## 9.5 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## 9.6 Glossary

| | |
|---|---|
| TI Glossary | This glossary lists and explains terms, acronyms, and definitions. |

# 10 Revision History

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

| Changes from Revision G (July 2024) to Revision H (December 2024) | Page |
|---|---|
| • Changed the status of the FB device version in the DMR package from *Preview* to *Active* | 1 |

| Changes from Revision F (February 2022) to Revision G (July 2024) | Page |
|---|---|
| • Added DG device version to the DMR (X2SON) package | 1 |
| • Added preview FB device version information for the DMR (X2SON) package | 1 |
| • Changed *Device Information* table to *Package Information* | 1 |
| • Changed the X2SON package in the layout examples image to match the pinout image in the *Pin Configuration and Functions* section | 21 |


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**Changes from Revision E (January 2020) to Revision F (February 2022)** **Page**

- Updated the numbering format for tables, figures, and cross-references throughout the document..... 1

**Changes from Revision D (November 2017) to Revision E (January 2020)** **Page**

- Added LPG (TO-92) package ..... 1
- Added notes for the DU and FD package magnetic threshold operate points in the Magnetic Characteristics table..... 6
- Added probability density function plots for $B_{OP}$, $B_{RP}$, and $B_{HYS}$ to the *Typical Characteristics* section..... 7

**Changes from Revision C (September 2017) to Revision D (November 2017)** **Page**

- Added the DU device version to the data sheet ..... 2

**Changes from Revision B (August 2017) to Revision C (September 2017)** **Page**

- Changed the status of the AJ device version from *Preview* to *Active* ..... 2

**Changes from Revision A (May 2017) to Revision B (August 2017)** **Page**

- Added the ZE device version and the preview AJ device version..... 2

**Changes from Revision * (April 2017) to Revision A (May 2017)** **Page**

- Added the FA and FD device versions..... 1

## 11 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.

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## PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package \| Pins | Package qty \| Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|---|---|---|---|---|---|---|---|---|---|
| DRV5032AJDBZR | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1M6W, 2AJ) |
| DRV5032AJDBZR.A | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1M6W, 2AJ) |
| DRV5032AJDMRR | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2AJ |
| DRV5032AJDMRR.A | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2AJ |
| DRV5032AJDMRT | Obsolete | Production | X2SON (DMR) \| 4 | - | - | Call TI | Call TI | -40 to 85 | 2AJ |
| DRV5032AJLPG | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32AJ |
| DRV5032AJLPG.A | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32AJ |
| DRV5032AJLPGM | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32AJ |
| DRV5032AJLPGM.A | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32AJ |
| DRV5032DGDMRR | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2DG |
| DRV5032DGDMRR.A | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2DG |
| DRV5032DUDBZR | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2DU |
| DRV5032DUDBZR.A | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2DU |
| DRV5032DUDBZT | Obsolete | Production | SOT-23 (DBZ) \| 3 | - | - | Call TI | Call TI | -40 to 85 | 2DU |
| DRV5032DUDMRR | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2DU |
| DRV5032DUDMRR.A | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2DU |
| DRV5032DUDMRT | Obsolete | Production | X2SON (DMR) \| 4 | - | - | Call TI | Call TI | -40 to 85 | 2DU |
| DRV5032DULPG | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32DU |
| DRV5032DULPG.A | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32DU |
| DRV5032DULPGM | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32DU |
| DRV5032DULPGM.A | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32DU |
| DRV5032FADBZR | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1LVW, 2FA) |
| DRV5032FADBZR.A | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1LVW, 2FA) |
| DRV5032FADBZT | Obsolete | Production | SOT-23 (DBZ) \| 3 | - | - | Call TI | Call TI | -40 to 85 | (1LVW, 2FA) |
| DRV5032FADMRR | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2FA |
| DRV5032FADMRR.A | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2FA |
| DRV5032FADMRT | Obsolete | Production | X2SON (DMR) \| 4 | - | - | Call TI | Call TI | -40 to 85 | 2FA |
| DRV5032FALPG | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FA |
| DRV5032FALPG.A | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FA |

| Orderable part number | Status (1) | Material type (2) | Package \| Pins | Package qty \| Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|---|---|---|---|---|---|---|---|---|---|
| DRV5032FALPGM | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FA |
| DRV5032FALPGM.A | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FA |
| DRV5032FBDBZR | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1LWW, 2FB) |
| DRV5032FBDBZR.A | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1LWW, 2FB) |
| DRV5032FBLPG | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FB |
| DRV5032FBLPG.A | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FB |
| DRV5032FBLPGM | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FB |
| DRV5032FBLPGM.A | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FB |
| DRV5032FCDBZR | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1M7W, 2FC) |
| DRV5032FCDBZR.A | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1M7W, 2FC) |
| DRV5032FCLPG | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FC |
| DRV5032FCLPG.A | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FC |
| DRV5032FCLPGM | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FC |
| DRV5032FCLPGM.A | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FC |
| DRV5032FDDMRR | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2FD |
| DRV5032FDDMRR.A | Active | Production | X2SON (DMR) \| 4 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | 2FD |
| DRV5032FDDMRT | Obsolete | Production | X2SON (DMR) \| 4 | - | - | Call TI | Call TI | -40 to 85 | 2FD |
| DRV5032FDLPG | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FD |
| DRV5032FDLPG.A | Active | Production | TO-92 (LPG) \| 3 | 1000 \| BULK | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FD |
| DRV5032FDLPGM | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FD |
| DRV5032FDLPGM.A | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32FD |
| DRV5032ZEDBZR | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1M8W, 2ZE) |
| DRV5032ZEDBZR.A | Active | Production | SOT-23 (DBZ) \| 3 | 3000 \| LARGE T&R | Yes | SN | Level-1-260C-UNLIM | -40 to 85 | (1M8W, 2ZE) |
| DRV5032ZEDBZT | Obsolete | Production | SOT-23 (DBZ) \| 3 | - | - | Call TI | Call TI | -40 to 85 | (1M8W, 2ZE) |
| DRV5032ZELPG | Active | Production | TO-92 (LPG) \| 3 | 1000 \| SMALL T&R | Yes | SN | N/A for Pkg Type | -40 to 85 | 32ZE |
| DRV5032ZELPG.A | Active | Production | TO-92 (LPG) \| 3 | 1000 \| SMALL T&R | Yes | SN | N/A for Pkg Type | -40 to 85 | 32ZE |
| DRV5032ZELPGM | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32ZE |
| DRV5032ZELPGM.A | Active | Production | TO-92 (LPG) \| 3 | 3000 \| AMMO | Yes | SN | N/A for Pkg Type | -40 to 85 | 32ZE |

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

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

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

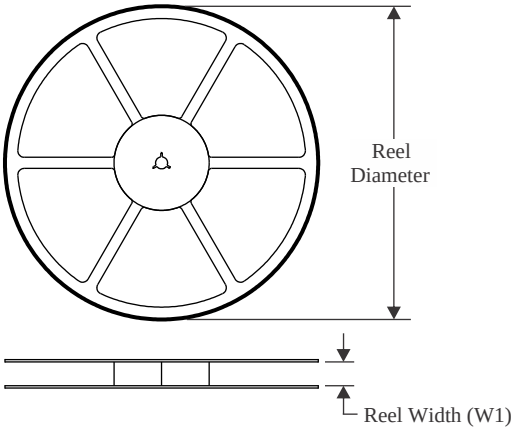
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

**Important Information and Disclaimer:**The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

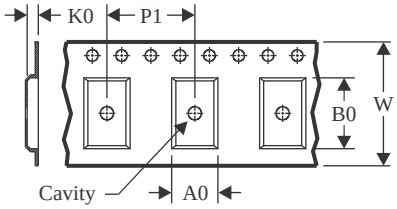
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

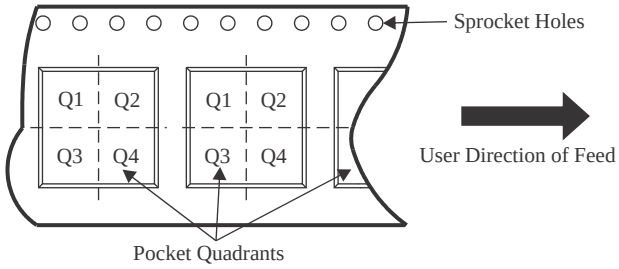



**TAPE DIMENSIONS**




| | |
|---|---|
| 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**

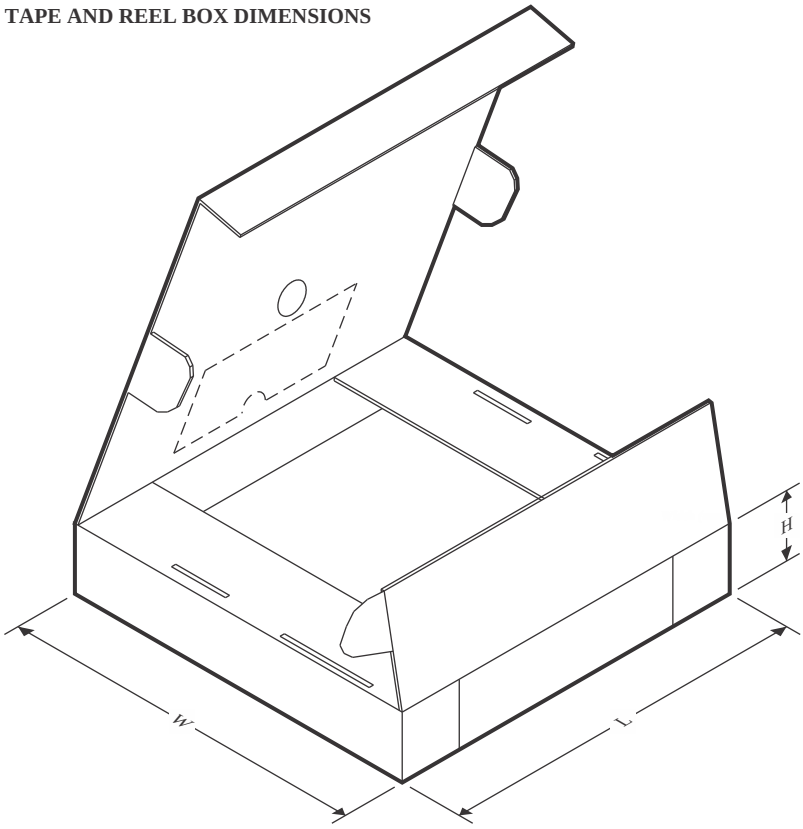



*All dimensions are nominal

| 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 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| 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 | 3.2 | 2.85 | 1.3 | 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 |
| DRV5032DGDMRR | X2SON | DMR | 4 | 3000 | 180.0 | 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 |
| DRV5032DUDMRR | X2SON | DMR | 4 | 3000 | 180.0 | 8.4 | 1.27 | 1.57 | 0.5 | 4.0 | 8.0 | Q1 |
| DRV5032FADBZR | SOT-23 | DBZ | 3 | 3000 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5032FADBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| DRV5032FADBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 3.2 | 2.85 | 1.3 | 4.0 | 8.0 | Q3 |
| DRV5032FADBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 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 |
| 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 | 180.0 | 8.4 | 3.2 | 2.85 | 1.3 | 4.0 | 8.0 | Q3 |
| DRV5032FBDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 4.0 | 8.0 | Q3 |
| DRV5032FCDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 180.0 | 8.4 | 3.2 | 2.85 | 1.3 | 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 |
| DRV5032ZEDBZR | SOT-23 | DBZ | 3 | 3000 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5032ZEDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 3.2 | 2.85 | 1.3 | 4.0 | 8.0 | Q3 |
| DRV5032ZEDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 2.9 | 3.35 | 1.35 | 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 | 210.0 | 185.0 | 35.0 |
| DRV5032AJDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5032AJDBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| DRV5032AJDMRR | X2SON | DMR | 4 | 3000 | 200.0 | 183.0 | 25.0 |
| DRV5032DGDMRR | X2SON | DMR | 4 | 3000 | 200.0 | 183.0 | 25.0 |
| DRV5032DUDBZR | SOT-23 | DBZ | 3 | 3000 | 183.0 | 183.0 | 20.0 |
| DRV5032DUDMRR | X2SON | DMR | 4 | 3000 | 210.0 | 185.0 | 35.0 |
| DRV5032FADBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5032FADBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| DRV5032FADBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| DRV5032FADBZR | SOT-23 | DBZ | 3 | 3000 | 183.0 | 183.0 | 20.0 |
| DRV5032FADMRR | X2SON | DMR | 4 | 3000 | 200.0 | 183.0 | 25.0 |
| DRV5032FBDBZR | SOT-23 | DBZ | 3 | 3000 | 183.0 | 183.0 | 20.0 |
| DRV5032FBDBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| DRV5032FBDBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| DRV5032FCDBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| DRV5032FCDBZR | SOT-23 | DBZ | 3 | 3000 | 183.0 | 183.0 | 20.0 |
| DRV5032FCDBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| DRV5032FDDMRR | X2SON | DMR | 4 | 3000 | 200.0 | 183.0 | 25.0 |
| DRV5032ZEDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5032ZEDBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |
| DRV5032ZEDBZR | SOT-23 | DBZ | 3 | 3000 | 210.0 | 185.0 | 35.0 |

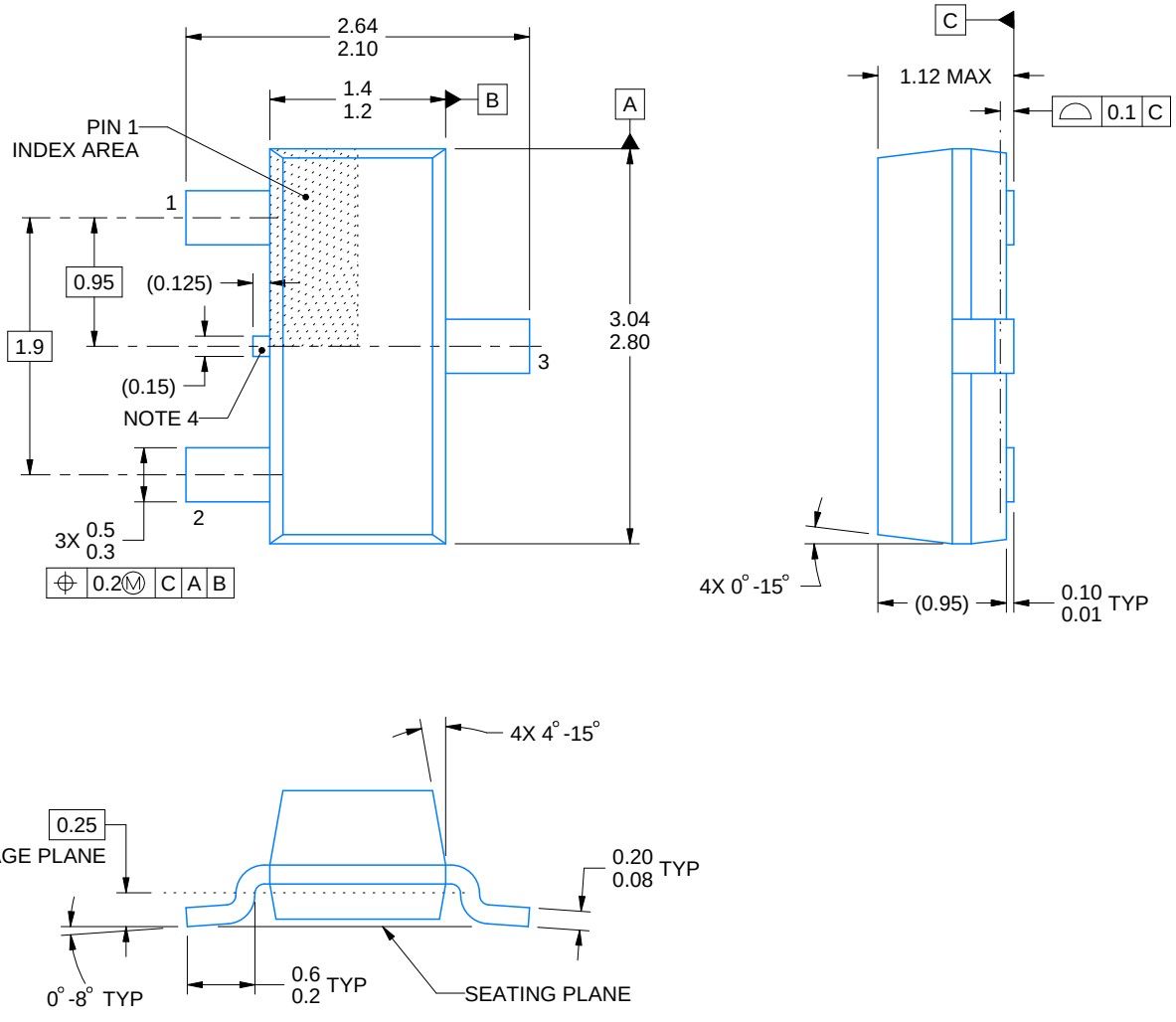
# PACKAGE OUTLINE

## DBZ0003A



## SOT-23 - 1.12 mm max height

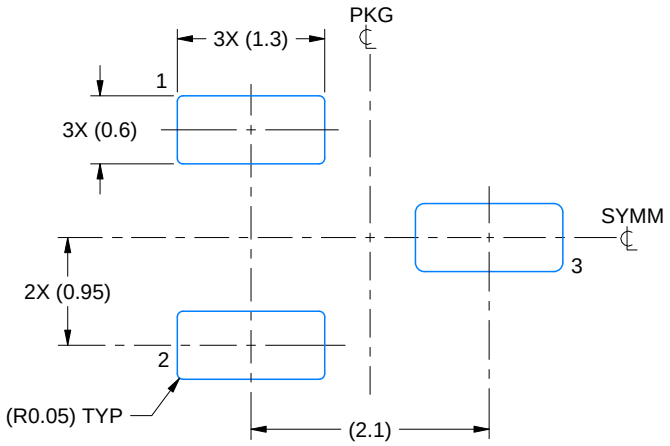
SMALL OUTLINE TRANSISTOR



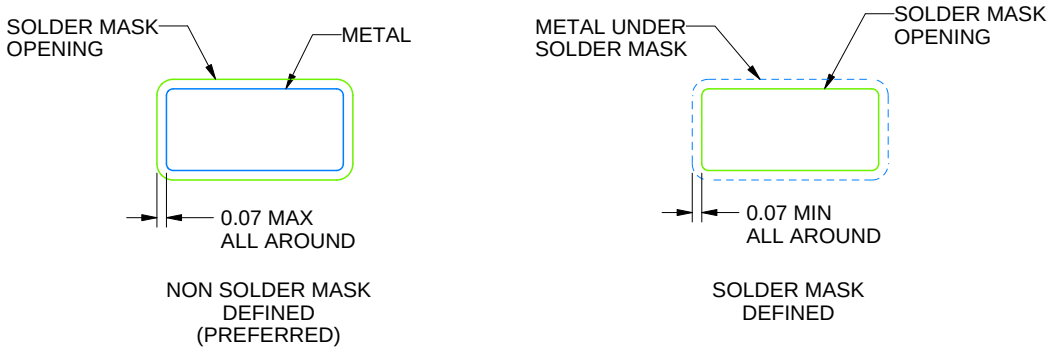

4214838/F 08/2024

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.
4. Support pin may differ or may not be present.
5. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side




LAND PATTERN EXAMPLE
SCALE:15X

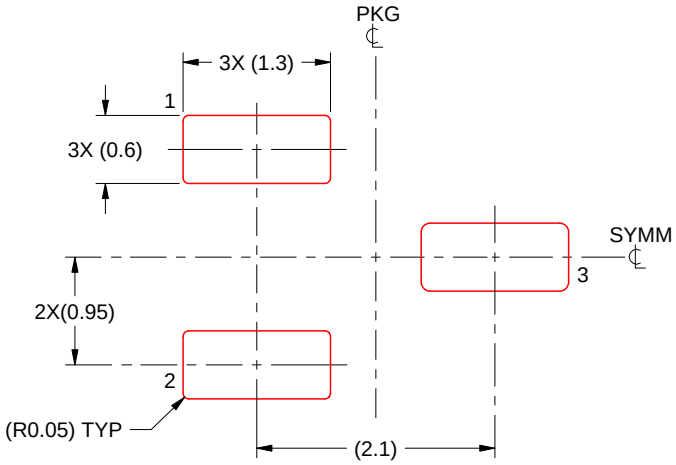



SOLDER MASK DETAILS

4214838/F 08/2024

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.
6. 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/F 08/2024

NOTES: (continued)

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

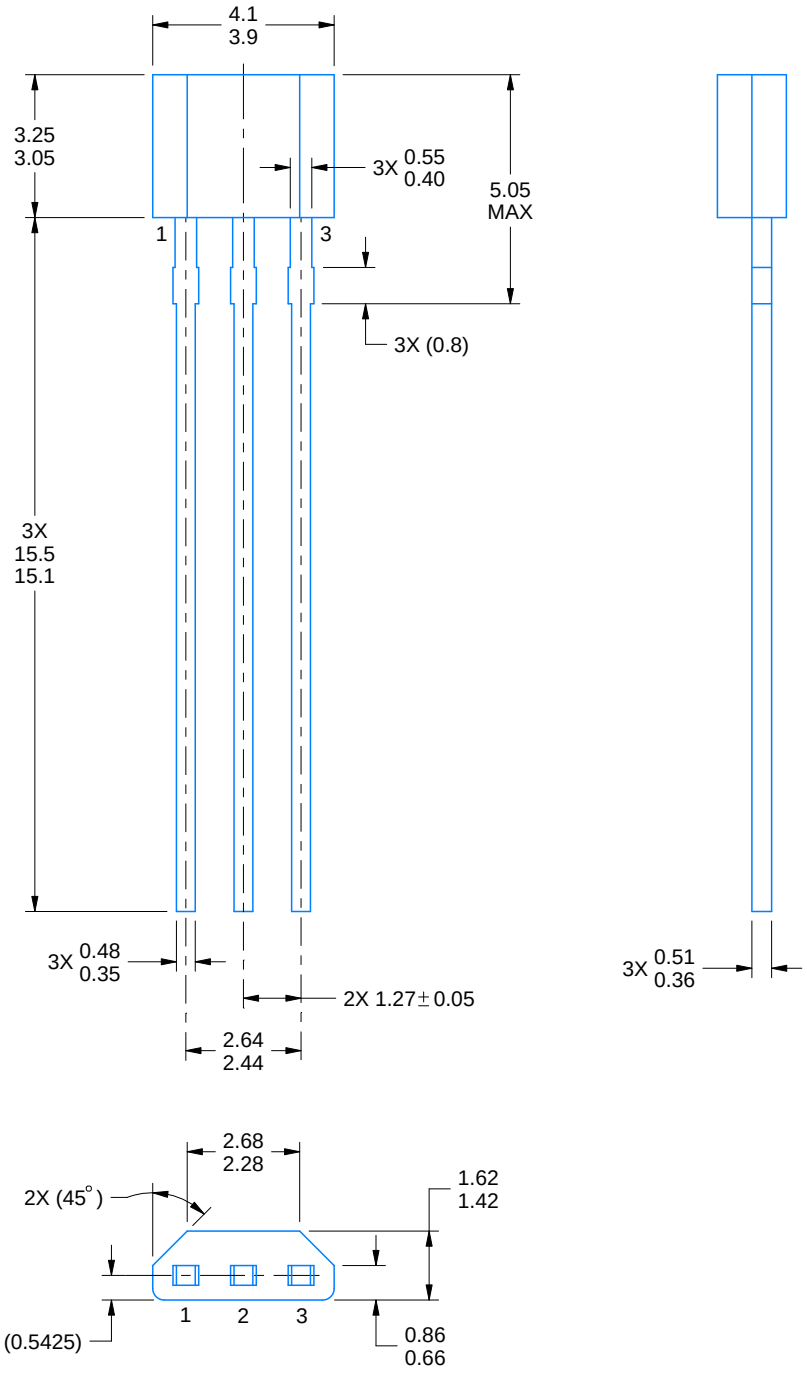


# PACKAGE OUTLINE

## LPG0003A

## TO-92 - 5.05 mm max height

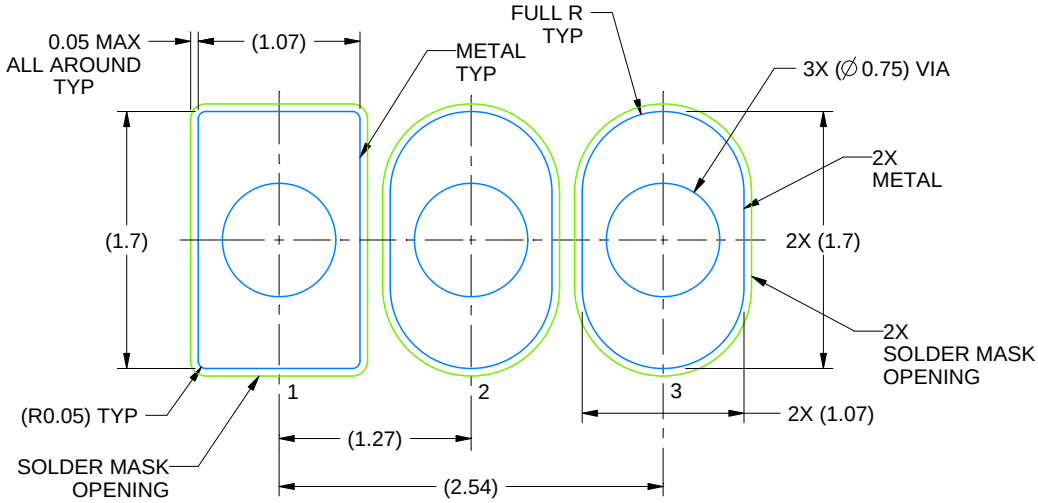
TRANSISTOR OUTLINE




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.




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

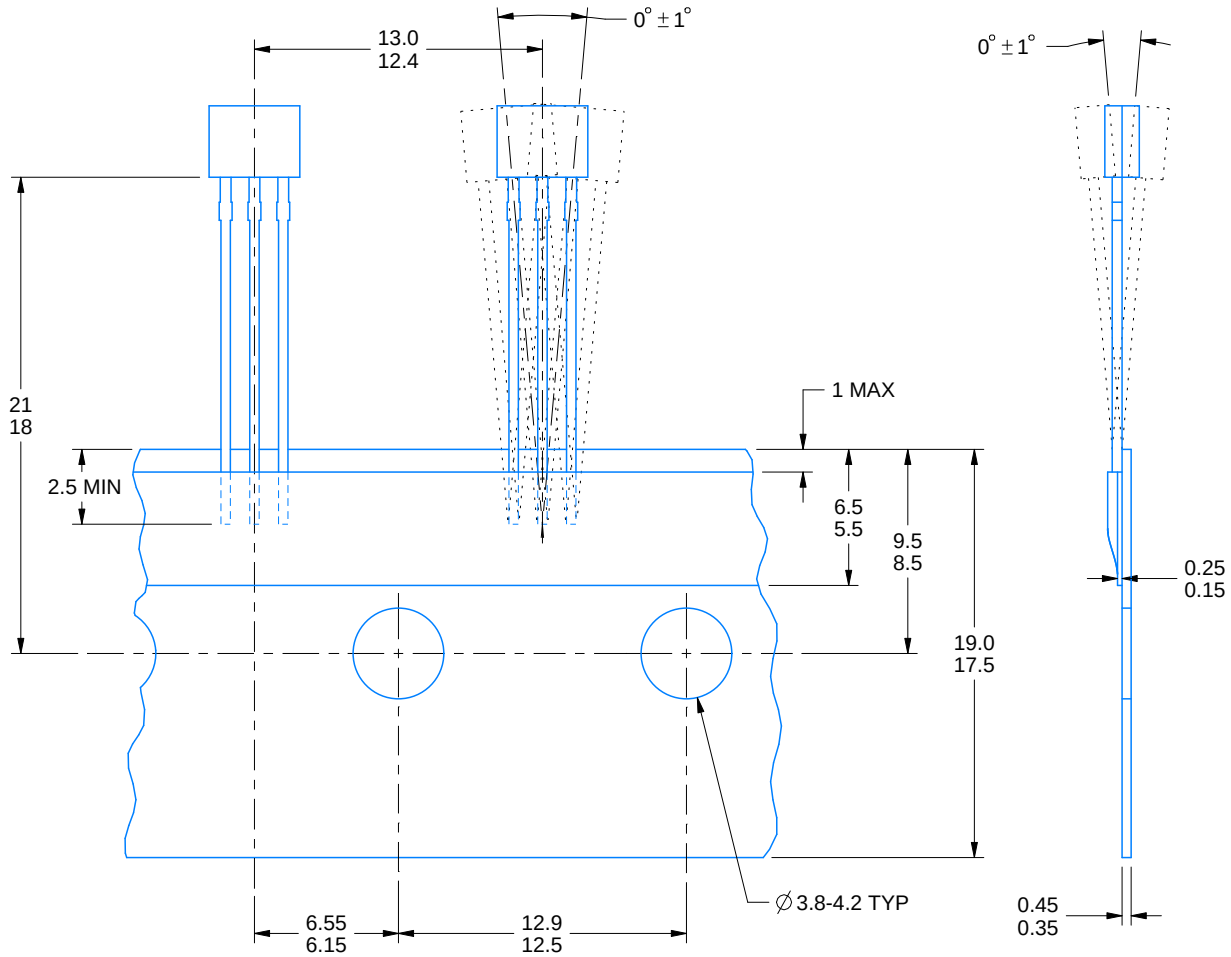
4221343/C 01/2018

# TAPE SPECIFICATIONS

## LPG0003A

## TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE




4221343/C 01/2018

# GENERIC PACKAGE VIEW

## DMR 4

## X2SON - 0.4 mm max height

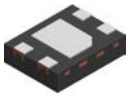
**1.1 x 1.4, 0.5 mm pitch**

PLASTIC SMALL OUTLINE - NO LEAD

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.




4229480/A

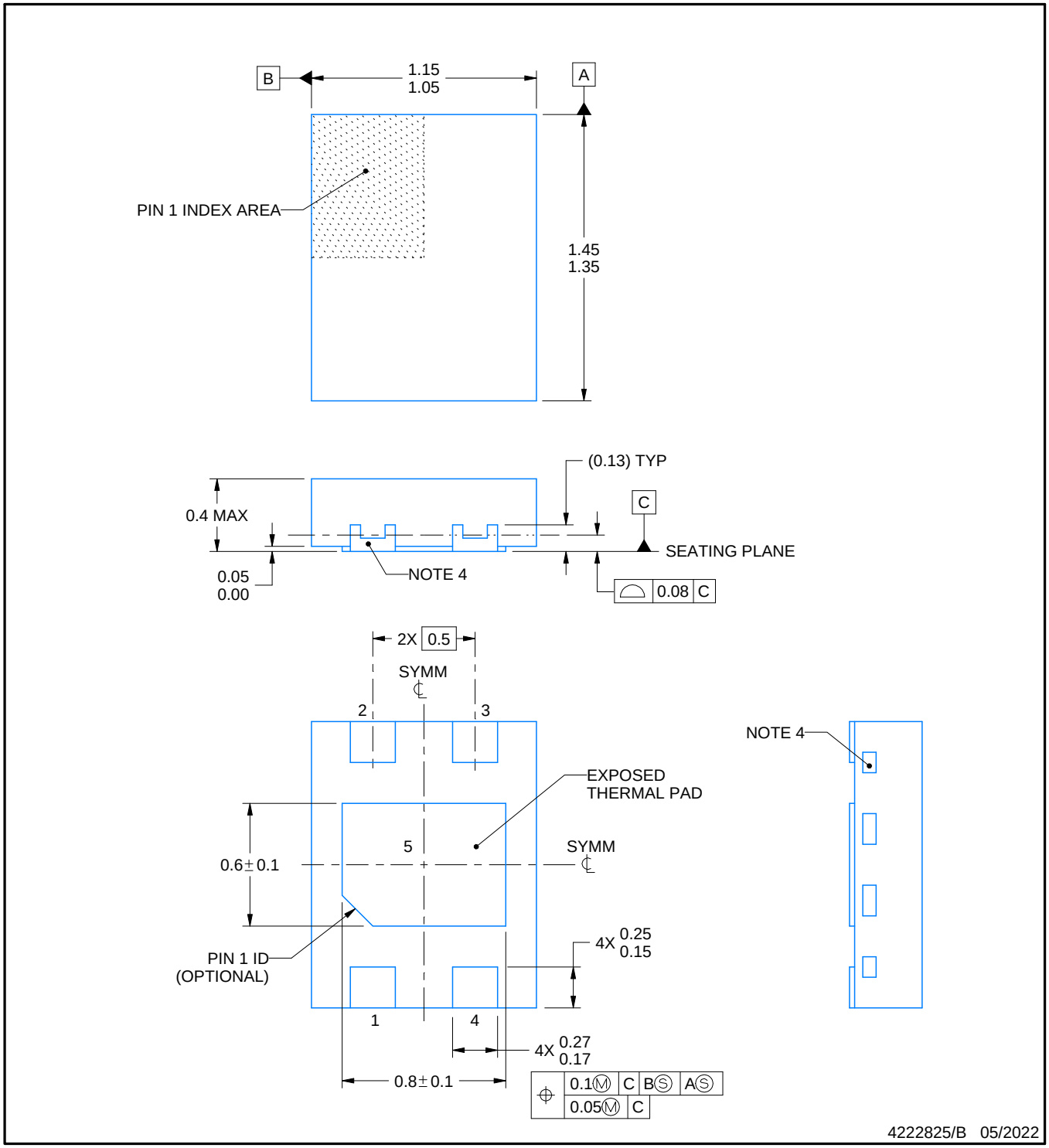


# PACKAGE OUTLINE

## DMR0004A

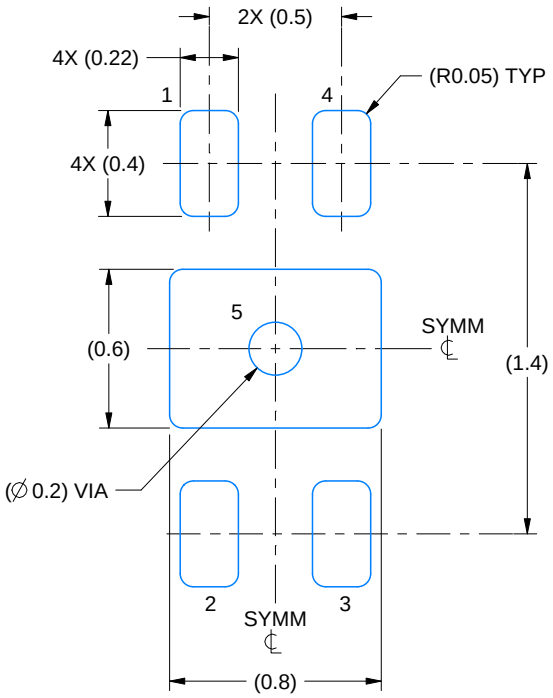
## X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD

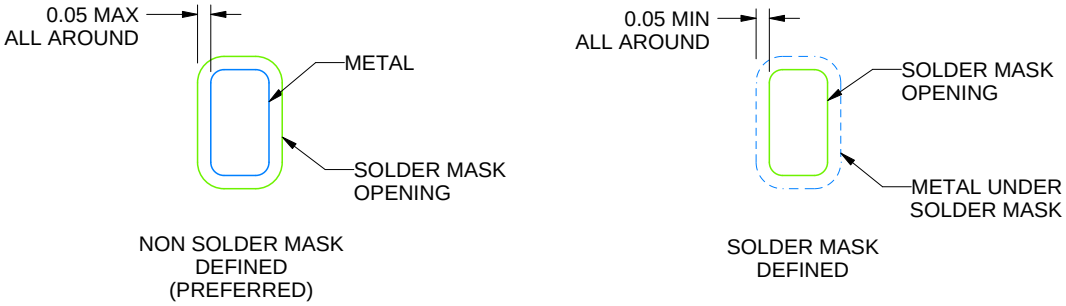



NOTES:

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.
4. Quantity and shape of side wall metal may vary.




LAND PATTERN EXAMPLE
SCALE:35X

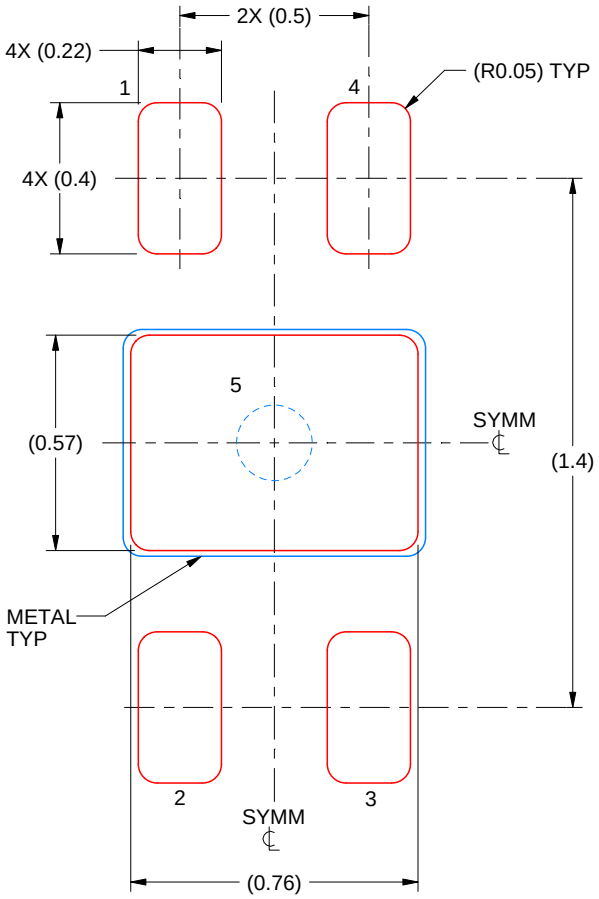



SOLDER MASK DETAILS

4222825/B 05/2022

NOTES: (continued)

5. 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).
6. 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.



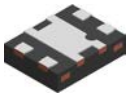

SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL

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

4222825/B 05/2022

NOTES: (continued)

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

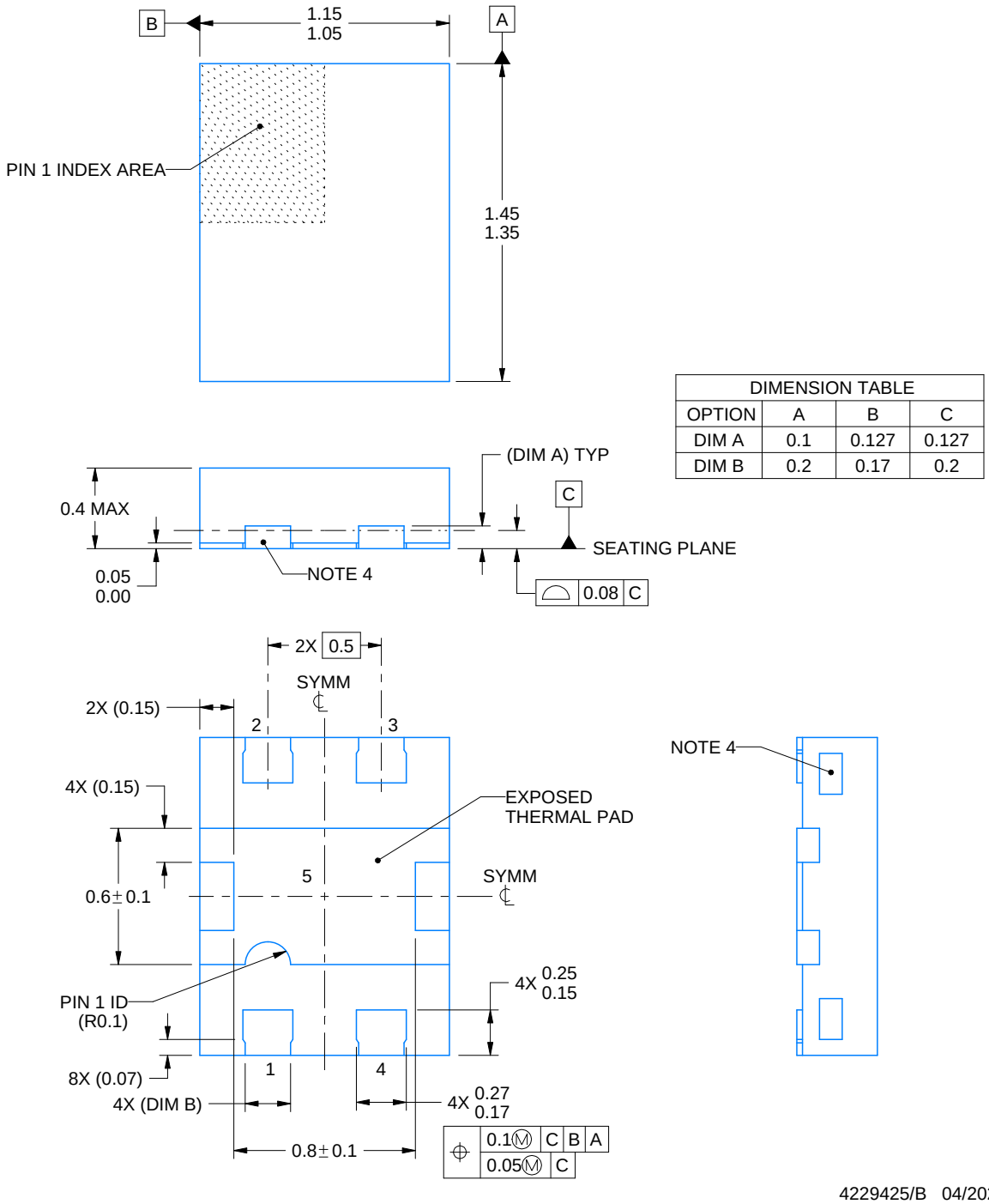


# PACKAGE OUTLINE

## DMR0004B

## X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD

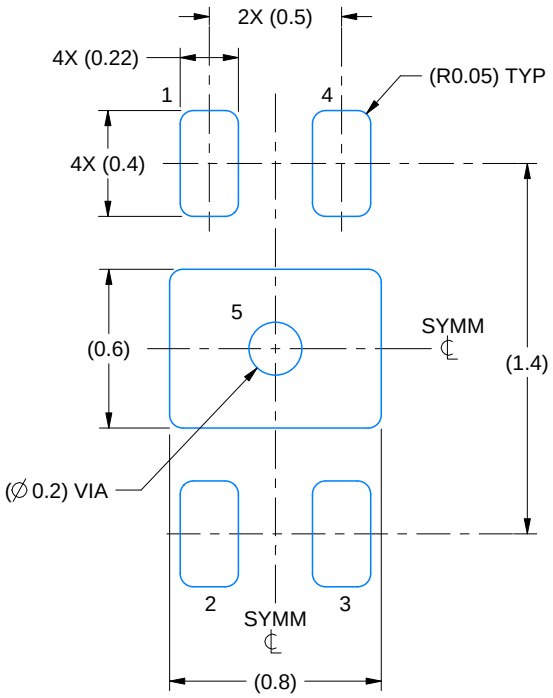



| DIMENSION TABLE | | | |
|---|---|---|---|
| OPTION | A | B | C |
| DIM A | 0.1 | 0.127 | 0.127 |
| DIM B | 0.2 | 0.17 | 0.2 |

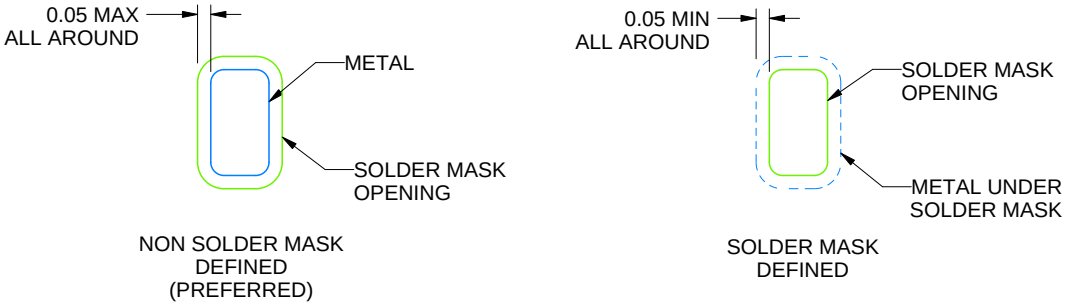
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NOTES:

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.
4. Quantity, shape and location of side wall metal may vary.




LAND PATTERN EXAMPLE
SCALE:35X




SOLDER MASK DETAILS

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NOTES: (continued)

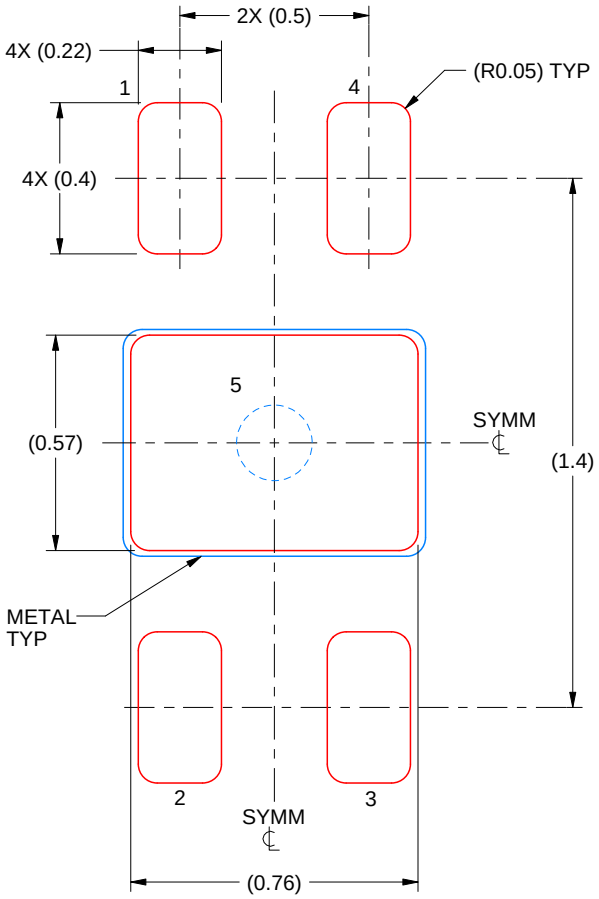
5. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
6. Vias are optional depending on application, refer to device data sheet. If all or some are implemented, recommended via locations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

# EXAMPLE STENCIL DESIGN

## DMR0004B

## 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

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NOTES: (continued)

7. 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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