

DRV5053 アナログ・バイポーラ、ホール効果センサ

1 特長

- 線形出力ホール・センサ
- 優れた温度安定性
 - 温度範囲の全体で感度±10%
- 高感度オプション
 - -11mV/mT (OA、[図17](#)を参照)
 - -23mV/mT (PA)
 - -45mV/mT (RA)
 - -90mV/mT (VA)
 - +23mV/mT (CA)
 - +45mV/mT (EA)
- 広い範囲の電圧をサポート
 - 2.5~38V
 - 外部レギュレータ不要
- 広い範囲の温度で動作
 - $T_A = -40^{\circ}\text{C} \sim 125^{\circ}\text{C}$ (Q、[図17](#)を参照)
- 出力段の増幅
 - 2.3mAシンク、300 μ Aソース
- 出力電圧: 0.2~1.8V
 - $B = 0\text{mT}$ 、 $\text{OUT} = 1\text{V}$
- 高速パワーオン: 35 μ s
- 小さなパッケージと占有面積
 - 表面実装の3ピンSOT-23 (DBZ)
 - 2.92mm \times 2.37mm
 - スルーホールの3ピンTO-92 (LPG)
 - 4.00mm \times 3.15mm
- 保護機能
 - 逆電圧保護(最大-22V)
 - 40Vまでの負荷ダンプをサポート
 - 出力短絡保護
 - 出力電流制限

2 アプリケーション

- 流量計
- ドッキング調整
- 振動補正
- ダンパー制御

3 概要

DRV5053デバイスはチョッパ安定化されたホールICで、全温度範囲で優れた感度安定性を持ち、保護機能が内蔵された磁気センシング・ソリューションです。

0~2Vのアナログ出力は、印加された磁束密度に対して線形的に応答し、磁界方向の極性を区別します。このデバイスは2.5~38Vの広い動作電圧範囲と、-22Vまでの逆極性保護を持つため、広範な産業用および民生用アプリケーションに適しています。

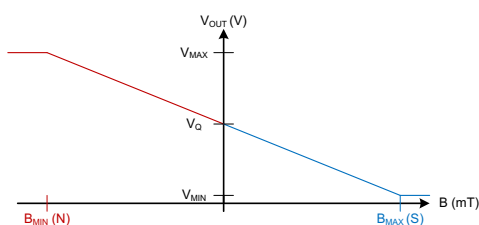
逆電圧の状態、負荷ダンプ、および出力短絡や過電流に対して、内部的な保護機能が搭載されています。

製品情報⁽¹⁾

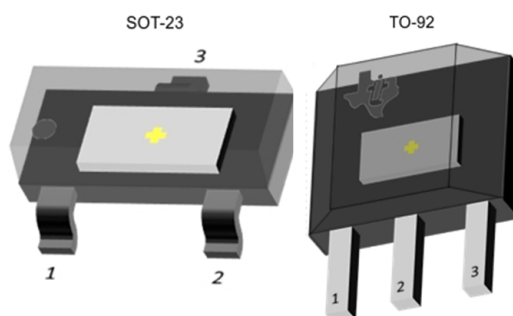
| 型番 | パッケージ | 本体サイズ(公称) |
|---------|------------|------------------------|
| DRV5053 | SOT-23 (3) | 2.92mm \times 1.30mm |
| | TO-92 (3) | 4.00mm \times 3.15mm |

(1) 提供されているすべてのパッケージについては、巻末の注文情報を参照してください。

出力状態



デバイスのパッケージ



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4 改訂履歴

Revision B (September 2014) から Revision C に変更

Page

| | |
|--|----|
| • SOT-23パッケージの本体サイズを訂正し、SIPパッケージ名をTO-92に訂正 | 1 |
| • Added B _{MAX} to <i>Absolute Maximum Ratings</i> | 4 |
| • Removed table note from junction temperature | 4 |
| • Updated the typical value for B _N and V _N for each version | 5 |
| • Updated Figure 6 | 7 |
| • Updated the <i>Functional Block Diagram</i> | 8 |
| • Updated <i>Output Stage</i> | 11 |
| • パッケージのテープ&リールに関するMとブランクのオプションを更新 | 15 |
| • コミュニティ・リソース を追加 | 16 |

Revision A (August 2014) から Revision B に変更

Page

| | |
|---|---|
| • 高感度オプションを更新 | 1 |
| • Updated the sensitivity device values and typicals. Updated typical and max values for DRV5053VA: –80 mV/mT | 6 |
| • Updated <i>Typical Characteristics</i> graphs | 7 |

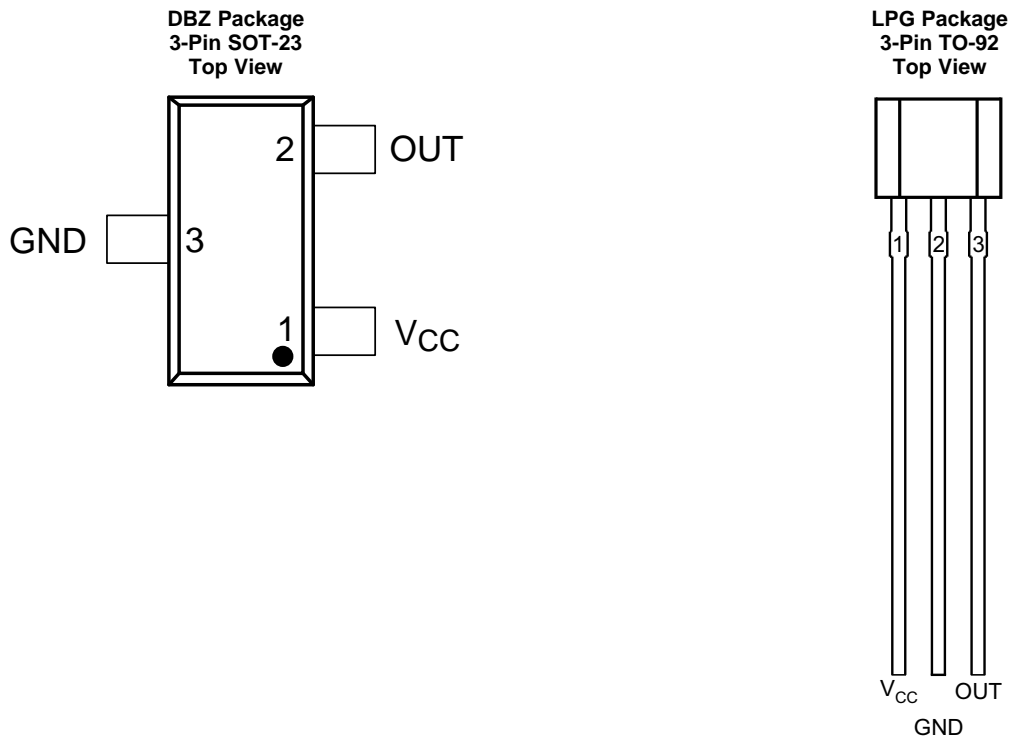
2014年5月発行のものから更新

Page

| | |
|--|---|
| • デバイスの状態を量産データに更新 | 1 |
| • Changed the maximum T _J value from 175°C to 150°C | 4 |
| • Updated <i>Magnetic Characteristics</i> table. | 5 |

5 Pin Configuration and Functions

For additional configuration information, see [デバイスのマーキング](#) and [メカニカル、パッケージ、および注文情報](#).



Pin Functions

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

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} | -22 ⁽²⁾ | 40 | V |
| | Voltage ramp rate (V_{CC}), $V_{CC} < 5$ V | Unlimited | | V/ μ s |
| | Voltage ramp rate (V_{CC}), $V_{CC} > 5$ V | 0 | 2 | |
| Output pin voltage | | -0.5 | 2.5 | V |
| Output pin reverse current during reverse supply condition | | 0 | -20 | mA |
| Magnetic flux density, B_{MAX} | | Unlimited | | |
| Operating junction temperature, T_J | | -40 | 150 | °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.
- (2) Ensured by design. Only tested to -20 V.

6.2 ESD Ratings

| | | | VALUE | UNIT |
|-------------|-------------------------|--|-------|------|
| $V_{(ESD)}$ | Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾ | ±2500 | V |
| | | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾ | ±500 | |

- (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 | 2.5 | 38 | V |
| V_{OUT} | Output pin voltage (OUT) | 0 | 2 | V |
| I_{SOURCE} | Output pin current source (OUT) | 0 | 300 | μ A |
| I_{SINK} | Output pin current sink (OUT) | 0 | 2.3 | mA |
| T_A | Operating ambient temperature | -40 | 125 | °C |

6.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | | DRV5053 | | UNIT |
|-------------------------------|--|--------------|-------------|------|
| | | DBZ (SOT-23) | LPG (TO-92) | |
| | | 3 PINS | 3 PINS | |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance | 333.2 | 180 | °C/W |
| $R_{\theta JC(top)}$ | Junction-to-case (top) thermal resistance | 99.9 | 98.6 | °C/W |
| $R_{\theta JB}$ | Junction-to-board thermal resistance | 66.9 | 154.9 | °C/W |
| ψ_{JT} | Junction-to-top characterization parameter | 4.9 | 40 | °C/W |
| ψ_{JB} | Junction-to-board characterization parameter | 65.2 | 154.9 | °C/W |

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

6.5 Electrical Characteristics

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

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

6.6 Switching Characteristics

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

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|----------------------------|-------------------|-----------------------|-----|-----|-----|------|
| ANALOG OUTPUT (OUT) | | | | | | |
| t _d | Output delay time | T _A = 25°C | | 13 | 25 | μs |

6.7 Magnetic Characteristics

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

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT ⁽¹⁾ |
|-----------------------------|-------------------------------------|---|-------|------|------|---------------------|
| V _Q | Quiescent output | B = 0 mT T _A = -40°C to 125°C | 0.9 | 1.02 | 1.15 | V |
| f _{BW} | Bandwidth ⁽²⁾ | | 20 | | | kHz |
| B _N | Input-referred noise ⁽³⁾ | C _{OUT} = 50 pF T _A = -40°C to 125°C | 0.40 | 0.49 | 0.79 | mT _{pp} |
| Le | Linearity ⁽⁴⁾ | -B _{SAT} < B < B _{SAT} | | 1% | | |
| V _{OUT MIN} | Output saturation voltage (min) | B < -B _{SAT} | | | 0.2 | V |
| V _{OUT MAX} | Output saturation voltage (max) | B > B _{SAT} | 1.8 | | | V |
| DRV5053OA: -11 mV/mT | | | | | | |
| S | Sensitivity | V _{CC} = 3.3 V T _A ≈ -40°C to 125°C | -17.5 | -11 | -5 | mV/mT |
| V _N | Output-referred noise | V _{CC} = 3.3 V; R _{OUT} = 10 kΩ; C _{OUT} = 50 pF T _A ≈ -40°C to 125°C | | 5 | | mV _{pp} |
| B _{SAT} | Input saturation field | V _{CC} = 3.3 V T _A ≈ -40°C to 125°C | | 73 | | mT |
| DRV5053PA: -23 mV/mT | | | | | | |
| S | Sensitivity | V _{CC} = 3.3 V T _A ≈ -40°C to 125°C | -35 | -23 | -10 | mV/mT |
| V _N | Output-referred noise | V _{CC} = 3.3 V; R _{OUT} = 10 kΩ; C _{OUT} = 50 pF T _A ≈ -40°C to 125°C | | 11 | | mV _{pp} |
| B _{SAT} | Input saturation field | V _{CC} = 3.3 V T _A ≈ -40°C to 125°C | | 35 | | mT |

(1) 1 mT = 10 Gauss

(2) Bandwidth describes the fastest changing magnetic field that can be detected and translated to the output.

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

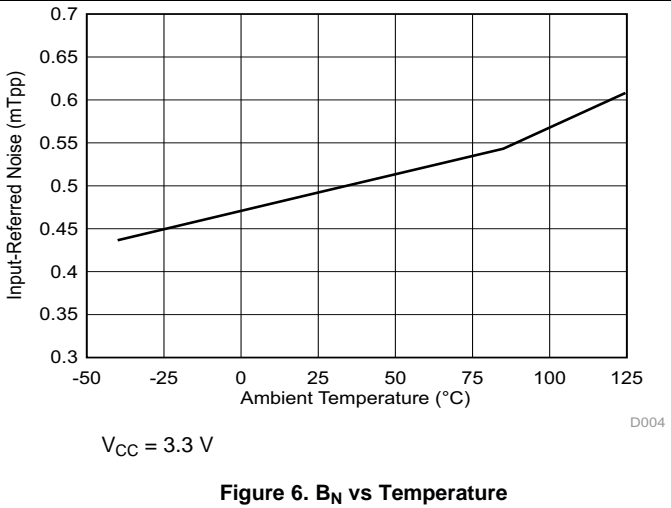
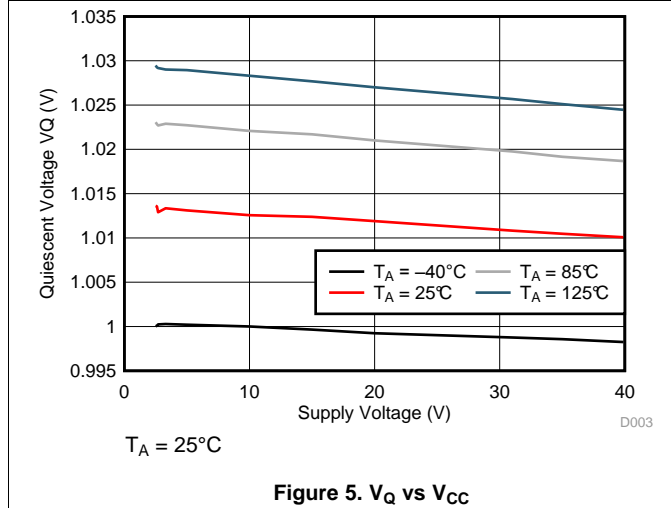
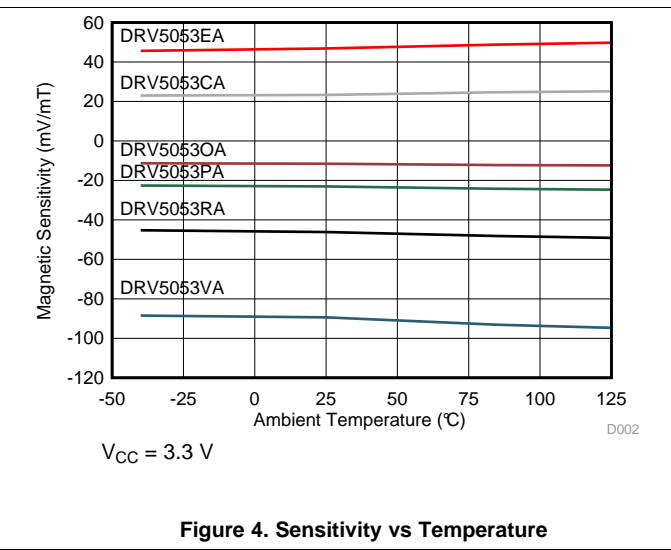
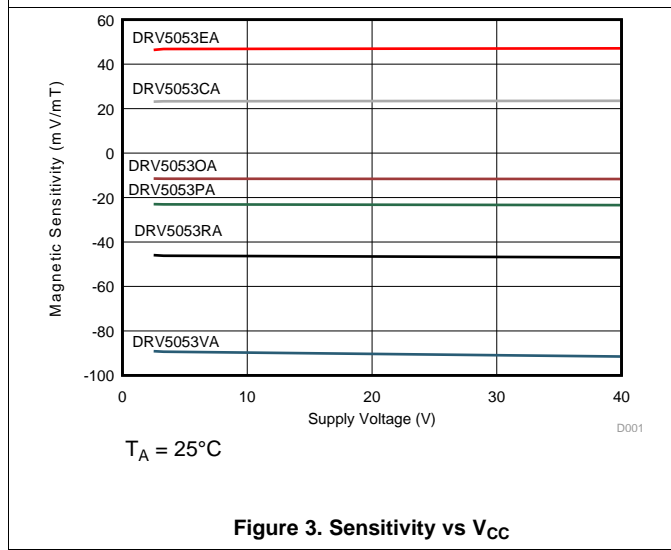
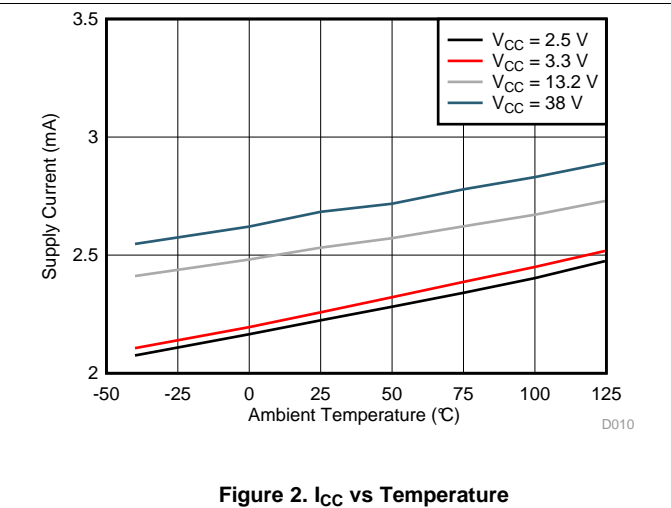
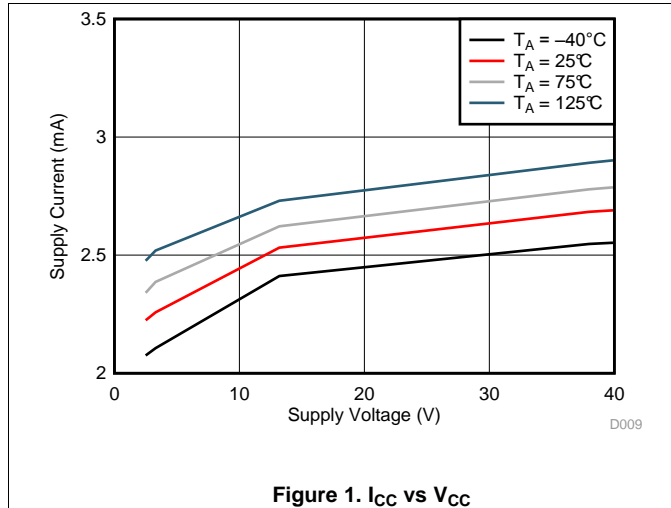
(4) Linearity describes the change in sensitivity across the B-range. The sensitivity near B_{SAT} is typically within 1% of the sensitivity near B = 0.

Magnetic Characteristics (continued)

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

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT ⁽¹⁾ |
|-----------------------------|------------------------|--|------|-----|-----|---------------------|
| DRV5053RA: –45 mV/mT | | | | | | |
| S | Sensitivity | $V_{CC} = 3.3\text{ V}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | –70 | –45 | –20 | mV/mT |
| V_N | Output-referred noise | $V_{CC} = 3.3\text{ V}$; $R_{OUT} = 10\text{ k}\Omega$; $C_{OUT} = 50\text{ pF}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | | 22 | | mV _{pp} |
| B_{SAT} | Input saturation field | $V_{CC} = 3.3\text{ V}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | | 18 | | mT |
| DRV5053VA: –90 mV/mT | | | | | | |
| S | Sensitivity | $V_{CC} = 3.3\text{ V}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | –140 | –90 | –45 | mV/mT |
| V_N | Output-referred noise | $V_{CC} = 3.3\text{ V}$; $R_{OUT} = 10\text{ k}\Omega$; $C_{OUT} = 50\text{ pF}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | | 44 | | mV _{pp} |
| B_{SAT} | Input saturation field | $V_{CC} = 3.3\text{ V}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | | 9 | | mT |
| DRV5053CA: 23 mV/mT | | | | | | |
| S | Sensitivity | $V_{CC} = 3.3\text{ V}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | 10 | 23 | 35 | mV/mT |
| V_N | Output-referred noise | $V_{CC} = 3.3\text{ V}$; $R_{OUT} = 10\text{ k}\Omega$; $C_{OUT} = 50\text{ pF}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | | 11 | | mV _{pp} |
| B_{SAT} | Input saturation field | $V_{CC} = 3.3\text{ V}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | | 35 | | mT |
| DRV5053EA: 45 mV/mT | | | | | | |
| S | Sensitivity | $V_{CC} = 3.3\text{ V}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | 20 | 45 | 70 | mV/mT |
| V_N | Output-referred noise | $V_{CC} = 3.3\text{ V}$; $R_{OUT} = 10\text{ k}\Omega$; $C_{OUT} = 50\text{ pF}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | | 22 | | mV _{pp} |
| B_{SAT} | Input saturation field | $V_{CC} = 3.3\text{ V}$ $T_A \approx -40^\circ\text{C to } 125^\circ\text{C}$ | | 18 | | mT |

6.8 Typical Characteristics



7 Detailed Description

7.1 Overview

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

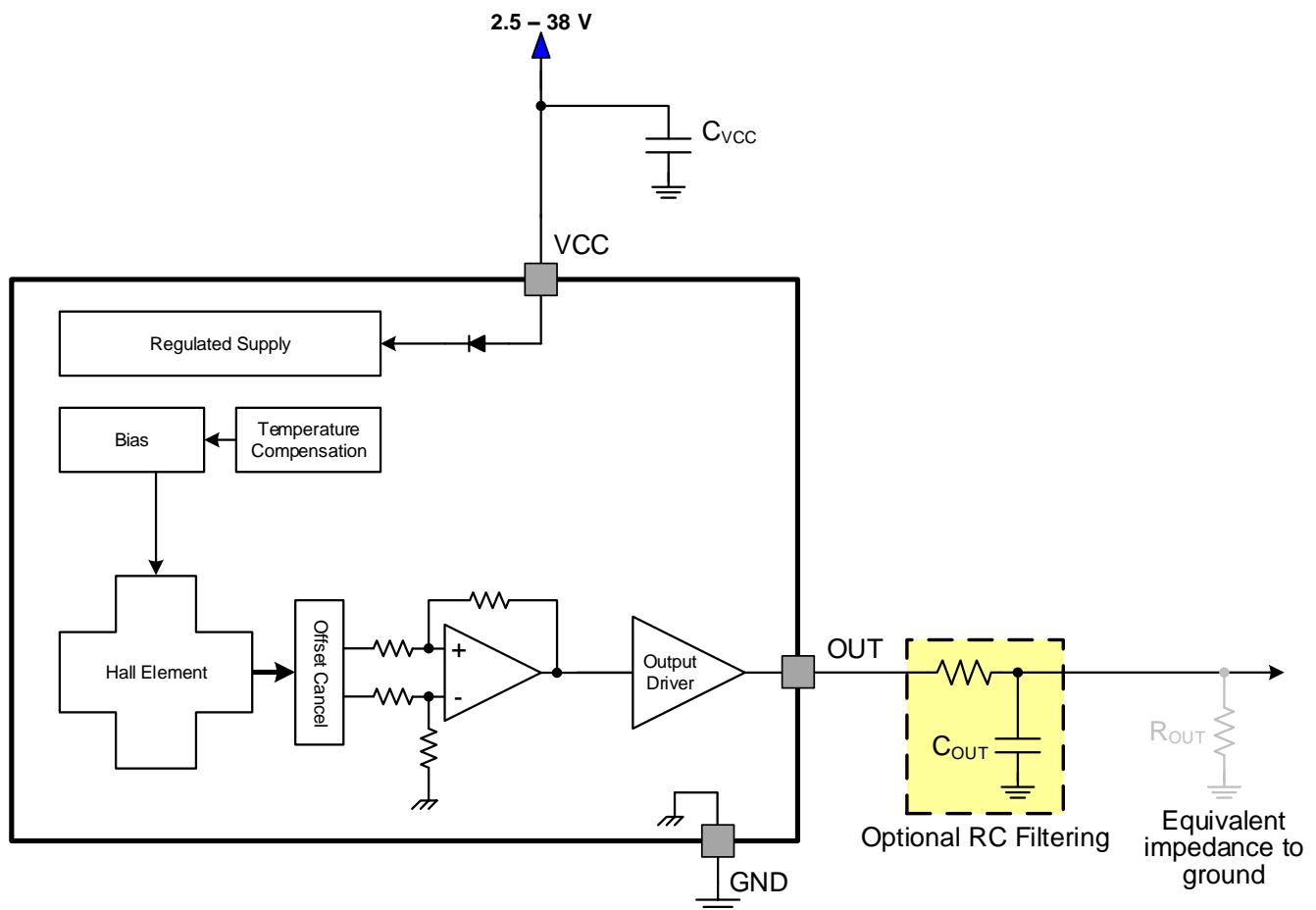
The output voltage is dependent on the magnetic field perpendicular to the package. The absence of a magnetic field will result in $OUT = 1$ V. A magnetic field will cause the output voltage to change linearly with the magnetic field.

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

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

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

7.2 Functional Block Diagram



7.3 Feature Description

7.3.1 Field Direction Definition

A positive magnetic field is defined as a **south pole** near the marked side of the package as shown in [Figure 7](#).

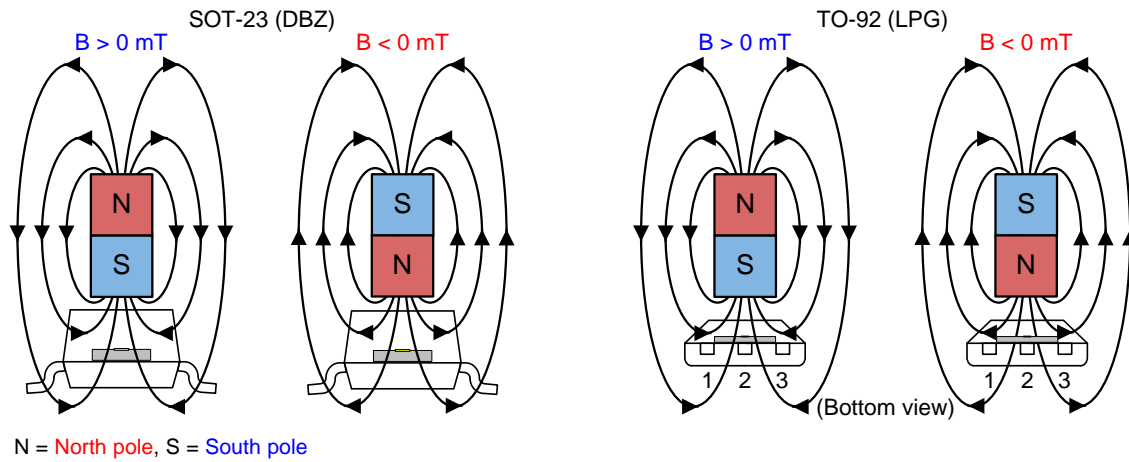


Figure 7. Field Direction Definition

7.3.2 Device Output

The DRV5053 device output is defined below for negative sensitivity (that is, -45 mV/mT , RA) and positive sensitivity (that is, $+45 \text{ mV/mT}$, EA):

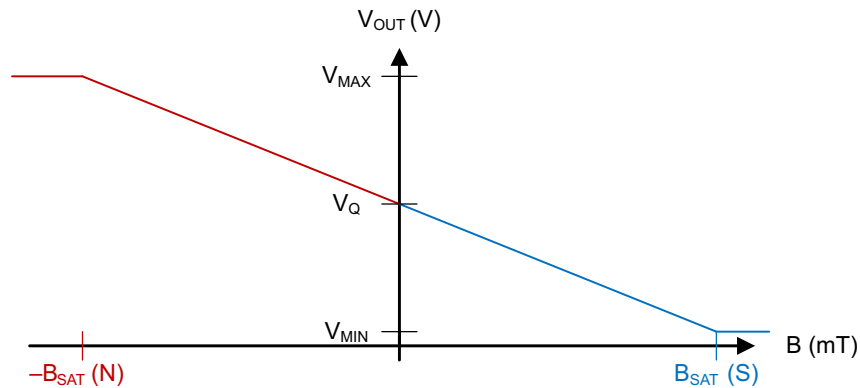


Figure 8. DRV5053 – Negative Sensitivity

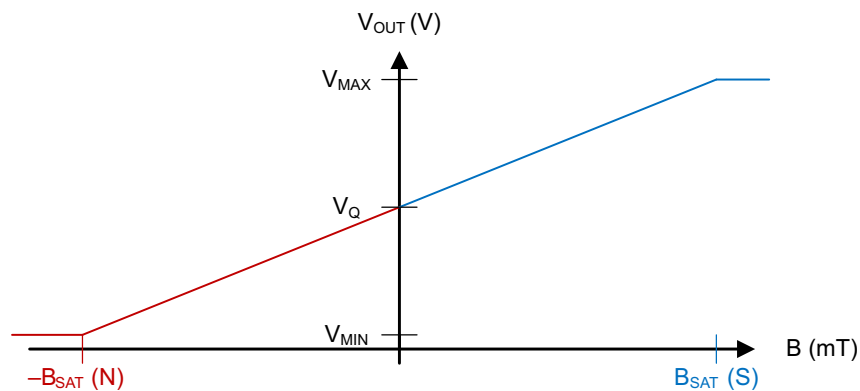


Figure 9. DRV5053 – Positive Sensitivity

Feature Description (continued)
7.3.3 Power-On Time

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

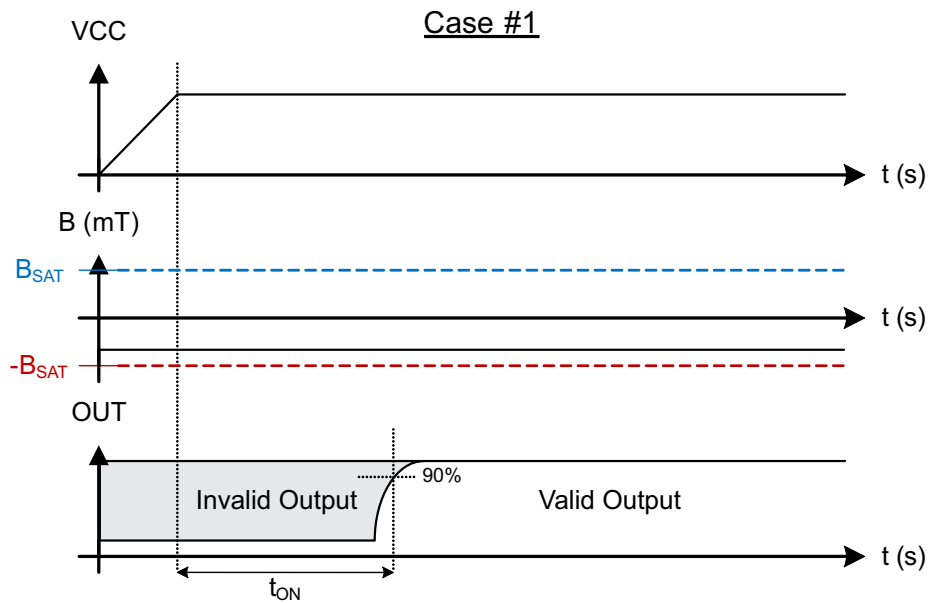


Figure 10. Case 1: Power On When $B < 0$, North

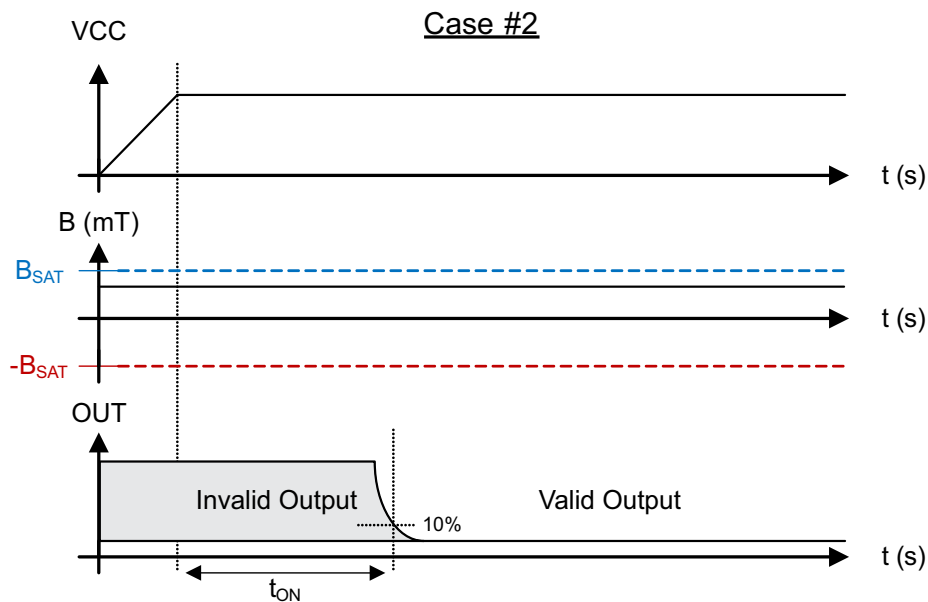


Figure 11. Case 2: Power On When $B > 0$, South

Feature Description (continued)

7.3.4 Output Stage

The DRV5053 output stage is capable of up to 300- μ A of current source or 2.3-mA sink. For proper operation, ensure that equivalent output load $R_{OUT} > 10\text{ k}\Omega$.

The capacitive load directly present on the OUT pin should be less than 10 nF to ensure the internal operational amplifier is stable. If an external RC filter is added to reduce noise, it is acceptable to use a resistor $\geq 200\ \Omega$ with a capacitor $\leq 0.1\ \mu\text{F}$. For an application example, see [Filtered Typical Application](#).

7.3.5 Protection Circuits

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

7.3.5.1 Overcurrent Protection (OCP)

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

7.3.5.2 Load Dump Protection

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

7.3.5.3 Reverse Supply Protection

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

NOTE

In a reverse supply condition, the OUT pin reverse-current must not exceed the ratings specified in the [Absolute Maximum Ratings](#).

Table 1.

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

7.4 Device Functional Modes

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

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

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. Customers should validate and test their design implementation to confirm system functionality.

8.1 Application Information

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

8.2 Typical Applications

8.2.1 Typical Application With No Filter

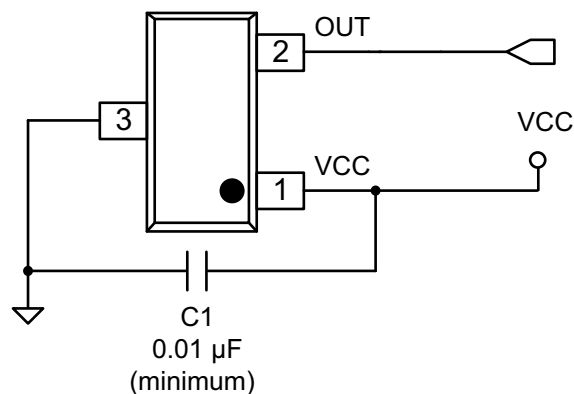


Figure 12. Typical Application Schematic – No Filter

8.2.1.1 Design Requirements

For this design example, use the parameters listed in [Table 2](#) as the input parameters.

Table 2. Design Parameters

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

8.2.1.2 Detailed Design Procedure

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

Table 3. External Components

| COMPONENT | PIN 1 | PIN 2 | RECOMMENDED |
|-----------|-----------------|-------|---|
| C1 | V _{CC} | GND | A 0.01- μ F (minimum) ceramic capacitor rated for V _{CC} |

8.2.1.3 Application Curve

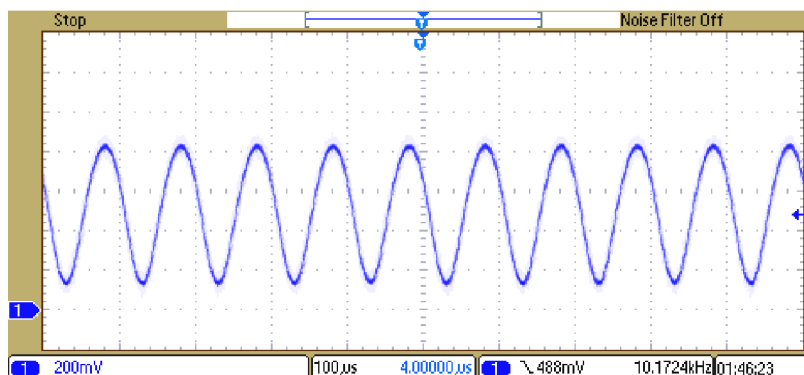


Figure 13. 10-kHz Switching Magnetic Field

8.2.2 Filtered Typical Application

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

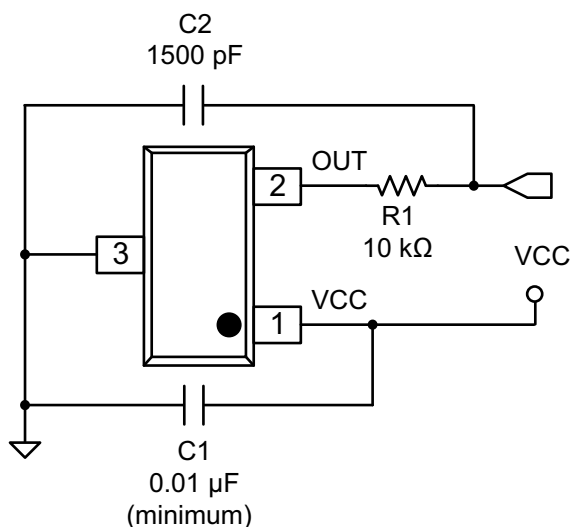


Figure 14. Filtered Typical Application Schematic

8.2.2.1 Design Requirements

For this design example, use the parameters listed in Table 4 as the input parameters.

Table 4. Design Parameters

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

8.2.2.2 Detailed Design Procedure

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

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

$$10 \text{ kHz} < \frac{1}{2\pi \times R_1 \times C_2} \tag{1}$$

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

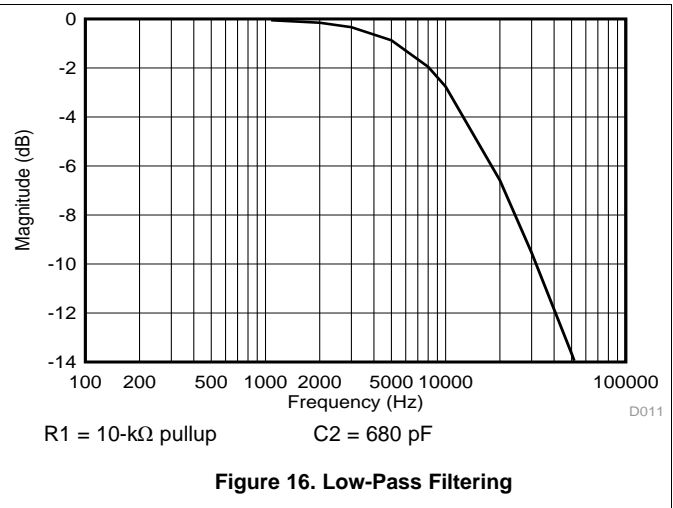
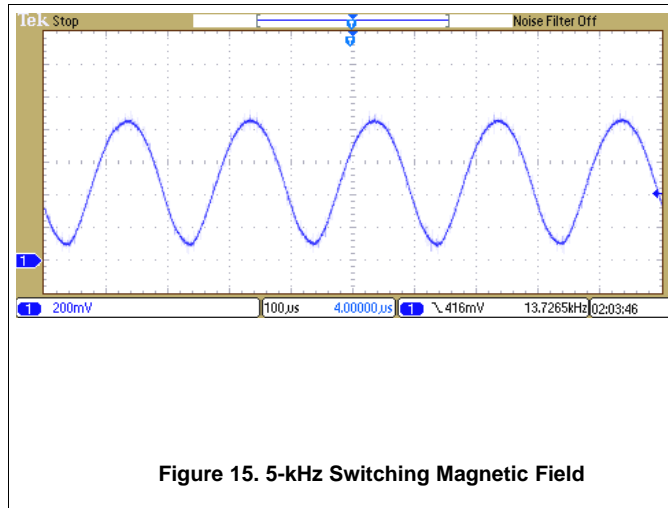
8.2.2.2.1 Typical Noise Versus Cutoff Frequency

RC filters are an effective way to reduce the noise present on OUT. The following shows typical noise measurements for different cutoff frequencies using the DRV5053VA.

Table 5. DRV5053VA Typical Noise Data

| R (Ω) | C (μF) | f _{CUTOFF} (kHz) | NOISE (mVpp) |
|-------|--------|---------------------------|--------------|
| 163 | 0.1 | 9.8 | 30.4 |
| 349 | 0.1 | 4.6 | 22.8 |
| 750 | 0.1 | 2.1 | 15.2 |
| 1505 | 0.1 | 1.1 | 9.7 |
| 3322 | 0.1 | 0.5 | 5.3 |
| 7510 | 0.1 | 0.2 | 2.5 |

8.2.2.3 Application Curves



9 Power Supply Recommendations

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

10 デバイスおよびドキュメントのサポート

10.1 デバイス・サポート

10.1.1 デバイスの項目表記

DRV5053デバイスの完全なデバイス名を読むための凡例を、[図 17](#)に示します。

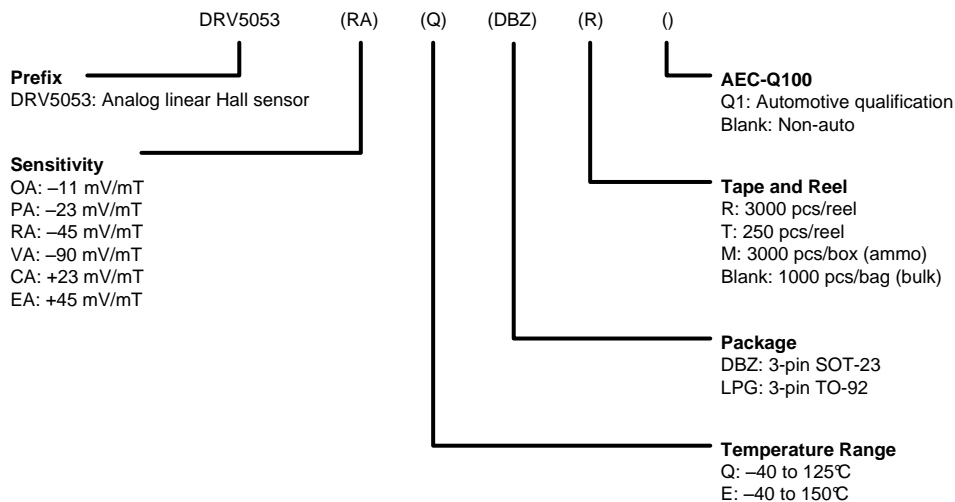


図 17. デバイス名の見方

10.1.2 デバイスのマーキング

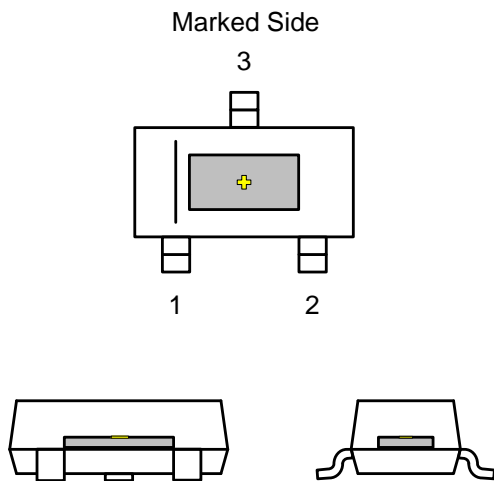


図 18. SOT-23 (DBZ)パッケージ

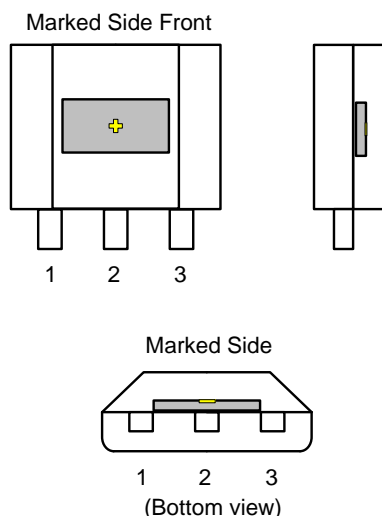


図 19. TO-92 (LPG)パッケージ

✦はホール効果センサを示します(実際の大きさに比例してはいません)。ホール素子はパッケージの中心に、許容誤差 $\pm 100\mu\text{m}$ で配置されています。ホール素子の高さは、パッケージの底面から計測して、DBZパッケージでは $0.7\text{mm}\pm 50\mu\text{m}$ 、LPGパッケージでは $0.987\text{mm}\pm 50\mu\text{m}$ です。

10.2 コミュニティ・リソース

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

TI E2E™オンライン・コミュニティ *TIのE2E (Engineer-to-Engineer)* コミュニティ。エンジニア間の共同作業を促進するために開設されたものです。e2e.ti.comでは、他のエンジニアに質問し、知識を共有し、アイデアを検討して、問題解決に役立てることができます。

設計サポート *TIの設計サポート* 役に立つE2Eフォーラムや、設計サポート・ツールをすばやく見つけることができます。技術サポート用の連絡先情報も参照できます。

10.3 商標

E2E is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.

10.4 静電気放電に関する注意事項



これらのデバイスは、限定的なESD (静電破壊) 保護機能を内蔵しています。保存時または取り扱い時は、MOSゲートに対する静電破壊を防止するために、リード線同士をショートさせておくか、デバイスを導電フォームに入れる必要があります。

10.5 Glossary

[SLYZ022](#) — *TI Glossary*.

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

11 メカニカル、パッケージ、および注文情報

以降のページには、メカニカル、パッケージ、および注文に関する情報が記載されています。この情報は、そのデバイスについて利用可能な最新のデータです。このデータは予告なく変更されることがあり、ドキュメントが改訂される場合もあります。本データシートのブラウザ版を使用されている場合は、画面左側の説明をご覧ください。

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| DRV5053CAQDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALCA, 1LX2) | Samples |
| DRV5053CAQDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALCA, 1LX2) | Samples |
| DRV5053CAQLPG | ACTIVE | TO-92 | LPG | 3 | 1000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALCA | Samples |
| DRV5053CAQLPGM | ACTIVE | TO-92 | LPG | 3 | 3000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALCA | Samples |
| DRV5053EAQDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALEA, 1LZ2) | Samples |
| DRV5053EAQDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALEA, 1LZ2) | Samples |
| DRV5053EAQLPG | ACTIVE | TO-92 | LPG | 3 | 1000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALEA | Samples |
| DRV5053EAQLPGM | ACTIVE | TO-92 | LPG | 3 | 3000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALEA | Samples |
| DRV5053OAQDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALOA, 1M12) | Samples |
| DRV5053OAQDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALOA, 1M12) | Samples |
| DRV5053OAQLPG | ACTIVE | TO-92 | LPG | 3 | 1000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALOA | Samples |
| DRV5053OAQLPGM | ACTIVE | TO-92 | LPG | 3 | 3000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALOA | Samples |
| DRV5053PAQDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALPA, 1M22) | Samples |
| DRV5053PAQDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALPA, 1M22) | Samples |
| DRV5053PAQLPG | ACTIVE | TO-92 | LPG | 3 | 1000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALPA | Samples |
| DRV5053PAQLPGM | ACTIVE | TO-92 | LPG | 3 | 3000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALPA | Samples |
| DRV5053RAQDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALRA, 1M32) | Samples |
| DRV5053RAQDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALRA, 1M32) | Samples |
| DRV5053RAQLPG | ACTIVE | TO-92 | LPG | 3 | 1000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALRA | Samples |
| DRV5053RAQLPGM | ACTIVE | TO-92 | LPG | 3 | 3000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALRA | Samples |

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| DRV5053VAQDBZR | ACTIVE | SOT-23 | DBZ | 3 | 3000 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALVA, 1M42) | Samples |
| DRV5053VAQDBZT | ACTIVE | SOT-23 | DBZ | 3 | 250 | RoHS & Green | NIPDAUAG SN | Level-1-260C-UNLIM | -40 to 125 | (+ALVA, 1M42) | Samples |
| DRV5053VAQLPG | ACTIVE | TO-92 | LPG | 3 | 1000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALVA | Samples |
| DRV5053VAQLPGM | ACTIVE | TO-92 | LPG | 3 | 3000 | RoHS & Green | SN | N / A for Pkg Type | -40 to 125 | +ALVA | Samples |

(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 finish/Ball material - Orderable Devices 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.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| DRV5053CAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053CAQDBZR | SOT-23 | DBZ | 3 | 3000 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053CAQDBZT | SOT-23 | DBZ | 3 | 250 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053CAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053EAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053EAQDBZR | SOT-23 | DBZ | 3 | 3000 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053EAQDBZT | SOT-23 | DBZ | 3 | 250 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053EAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053OAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053OAQDBZR | SOT-23 | DBZ | 3 | 3000 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053OAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053OAQDBZT | SOT-23 | DBZ | 3 | 250 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053PAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053PAQDBZR | SOT-23 | DBZ | 3 | 3000 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053PAQDBZT | SOT-23 | DBZ | 3 | 250 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053PAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053RAQDBZR | SOT-23 | DBZ | 3 | 3000 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053RAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |

| 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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| DRV5053RAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053RAQDBZT | SOT-23 | DBZ | 3 | 250 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053VAQDBZR | SOT-23 | DBZ | 3 | 3000 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053VAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053VAQDBZT | SOT-23 | DBZ | 3 | 250 | 178.0 | 9.0 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |
| DRV5053VAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 8.4 | 3.15 | 2.77 | 1.22 | 4.0 | 8.0 | Q3 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| DRV5053CAQDBZR | SOT-23 | DBZ | 3 | 3000 | 202.0 | 201.0 | 28.0 |
| DRV5053CAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5053CAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 180.0 | 18.0 |
| DRV5053CAQDBZT | SOT-23 | DBZ | 3 | 250 | 202.0 | 201.0 | 28.0 |
| DRV5053EAQDBZR | SOT-23 | DBZ | 3 | 3000 | 202.0 | 201.0 | 28.0 |
| DRV5053EAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5053EAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 180.0 | 18.0 |
| DRV5053EAQDBZT | SOT-23 | DBZ | 3 | 250 | 202.0 | 201.0 | 28.0 |
| DRV5053OAQDBZR | SOT-23 | DBZ | 3 | 3000 | 202.0 | 201.0 | 28.0 |
| DRV5053OAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5053OAQDBZT | SOT-23 | DBZ | 3 | 250 | 202.0 | 201.0 | 28.0 |

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| DRV5053OAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 180.0 | 18.0 |
| DRV5053PAQDBZR | SOT-23 | DBZ | 3 | 3000 | 202.0 | 201.0 | 28.0 |
| DRV5053PAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5053PAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 180.0 | 18.0 |
| DRV5053PAQDBZT | SOT-23 | DBZ | 3 | 250 | 202.0 | 201.0 | 28.0 |
| DRV5053RAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5053RAQDBZR | SOT-23 | DBZ | 3 | 3000 | 202.0 | 201.0 | 28.0 |
| DRV5053RAQDBZT | SOT-23 | DBZ | 3 | 250 | 202.0 | 201.0 | 28.0 |
| DRV5053RAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 180.0 | 18.0 |
| DRV5053VAQDBZR | SOT-23 | DBZ | 3 | 3000 | 180.0 | 180.0 | 18.0 |
| DRV5053VAQDBZR | SOT-23 | DBZ | 3 | 3000 | 202.0 | 201.0 | 28.0 |
| DRV5053VAQDBZT | SOT-23 | DBZ | 3 | 250 | 180.0 | 180.0 | 18.0 |
| DRV5053VAQDBZT | SOT-23 | DBZ | 3 | 250 | 202.0 | 201.0 | 28.0 |

GENERIC PACKAGE VIEW

DBZ 3

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



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

4203227/C

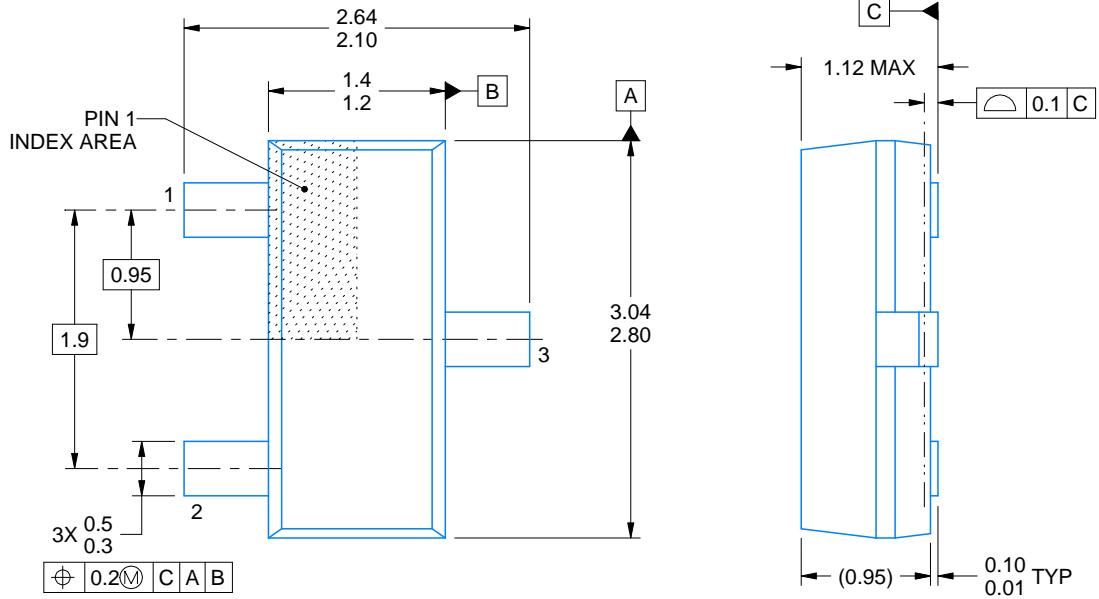
DBZ0003A



PACKAGE OUTLINE

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



4214838/C 04/2017

NOTES:

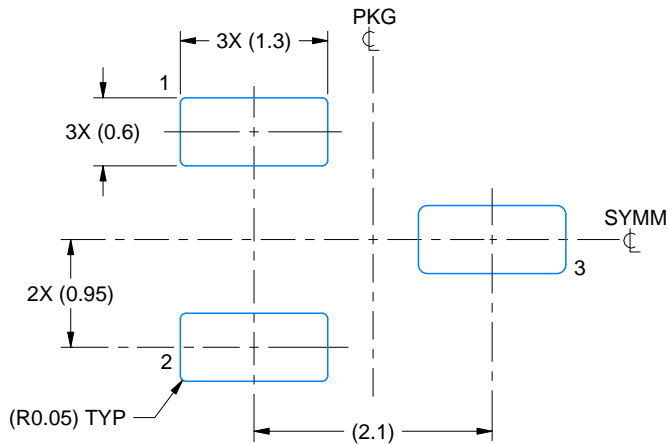
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration TO-236, except minimum foot length.

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.

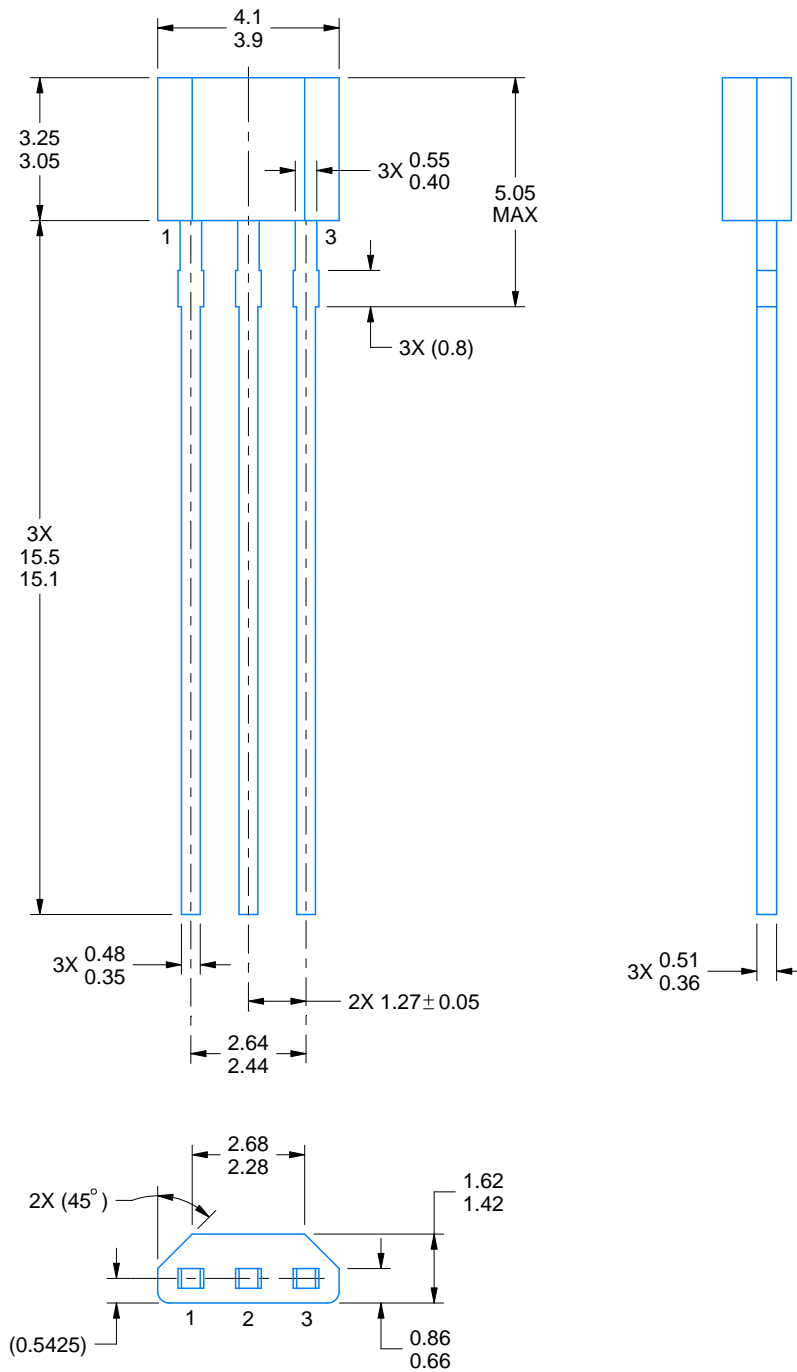
LPG0003A



PACKAGE OUTLINE

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



4221343/C 01/2018

NOTES:

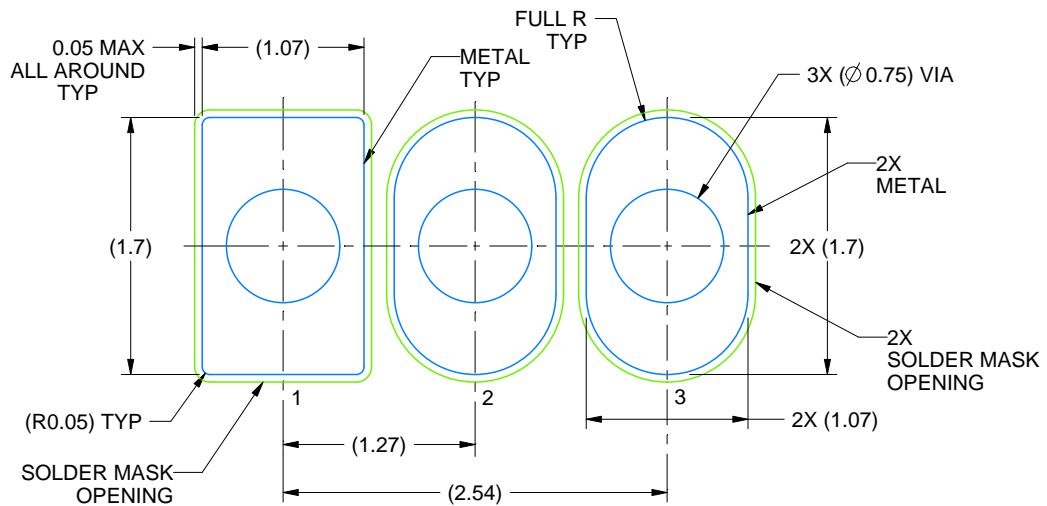
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

LPG0003A

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



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

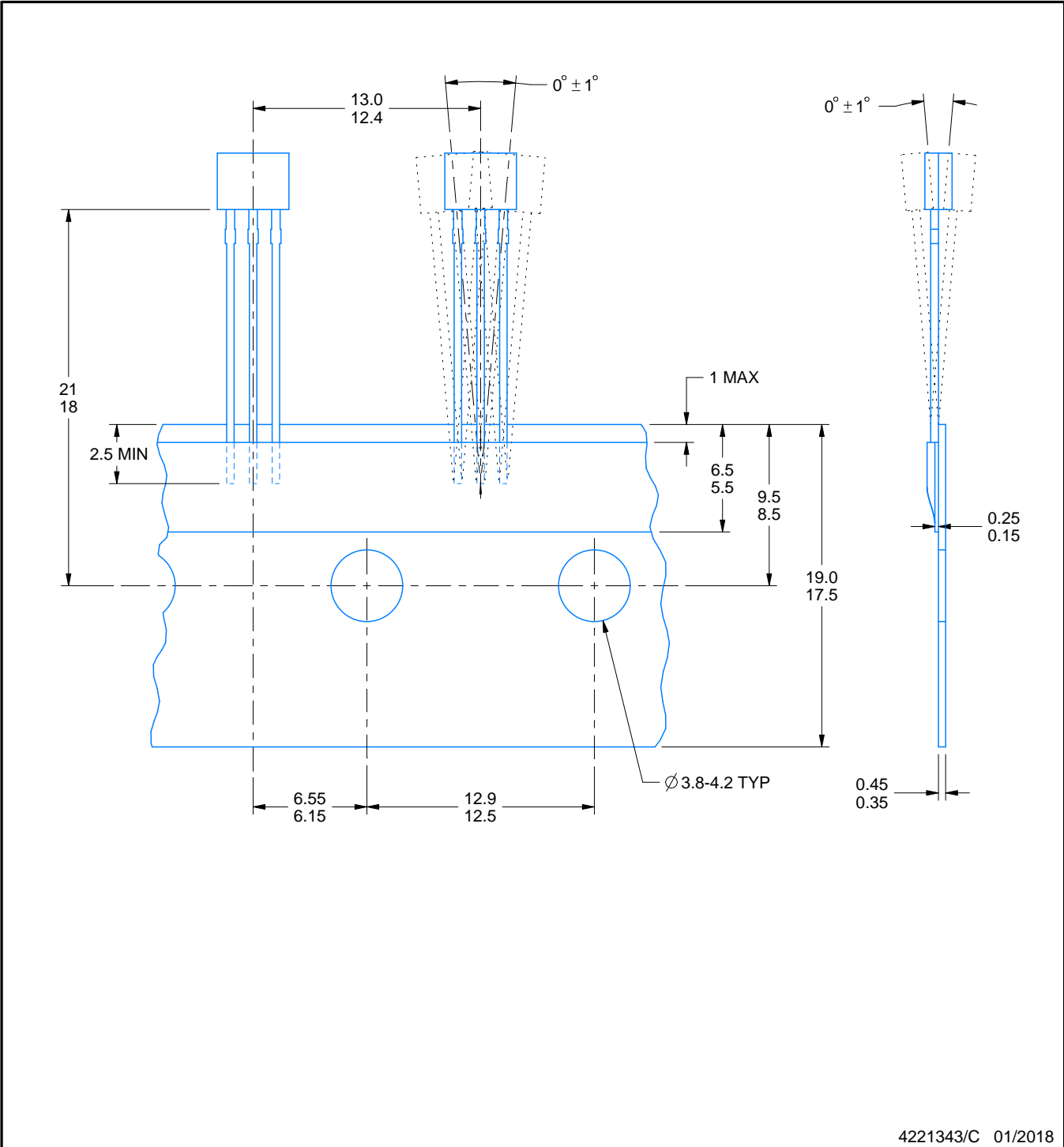
4221343/C 01/2018

TAPE SPECIFICATIONS

LPG0003A

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



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