DRV5055 レシオメトリック・リニア・ホール効果センサ

1 特長

- レシオメトリック・リニア・ホール効果磁気センサ
- 3.3V および 5V の電源で動作
- $V_{CC}/2$ の静止オフセット付きのアナログ出力
- 磁気感度オプション (V_{CC} = 5V 時)
  - A1/Z1：100mV/mT、±21mT 範囲
  - A2/Z2：50mV/mT、±42mT 範囲
  - A3/Z3：25mV/mT、±85mT 範囲
  - A4/Z4：12.5mV/mT、±169mT 範囲
- 高速な 20kHz センシング帯域幅
- ±1mA 駆動の低ノイズ出力
- A バージョンでは磁石の温度ドリフトの補償があるが、Z バージョンでは補償なし
- 標準の産業用パッケージ:
  - 表面実装の SOT-23
  - スルーホールの TO-92

2 アプリケーション

- 高精度の位置センシング
- 産業用オートメーションおよびロボティクス
- 家電製品
- ゲームパッド、ペダル、キーボード、トリガ
- 高さレベリング、傾き、重量の測定
- 流量率測定
- 医療機器
- 絶対角度のエンコード
- 電流検出

3 概要

DRV5055 は、リニア・ホール効果センサで、磁束密度に正比例して応答します。このデバイスは、広範なアプリケーションにおいて、正確な位置センシングに使用できます。

このデバイスは、3.3V または 5V の電源で動作します。磁界が存在しないとき、アナログ出力は V_{CC} の半分に駆動されます。出力は、印加される磁束密度に対して線形的に変化し、4 つの感度オプションによって、必要なセンシング範囲に基づいて出力電圧スイングを最大化できます。磁界の N 極と S 極がそれぞれ固有の電圧を生成します。

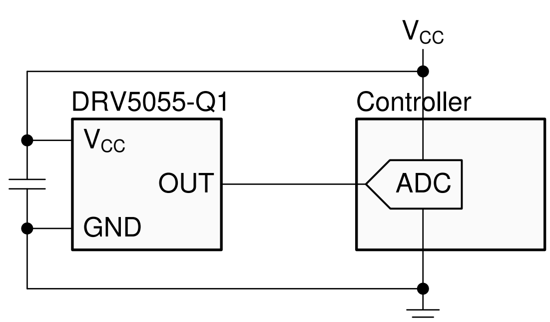
パッケージの上面に垂直な磁束が検出され、2 つのパッケージ・オプションでセンシング方向が異なります。

このデバイスは、レシオメトリック・アーキテクチャを使用し、外部のアナログ / デジタル・コンバータ (ADC) が基準として同じ V_{CC} を使用しているとき、V_{CC} 許容範囲から誤差を除去できます。さらに、デバイスには磁石温度補償が搭載されており、磁石のドリフトを補償することで、-40℃～+125℃の広い温度範囲にわたって線形のパフォーマンスを実現します。磁石のドリフトの温度補償を行わないデバイスも選択できます。

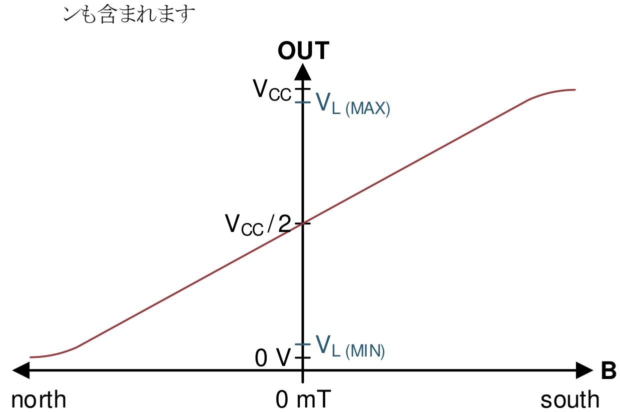
パッケージ情報

部品番号	パッケージ (1)	パッケージ・サイズ (2)
DRV5055	DBZ (SOT-23、3)	2.92mm × 2.37mm
	LPG (TO-92、3)	4.00mm × 1.52mm

(1) 利用可能なすべてのパッケージについては、データシートの末尾にある注文情報を参照してください。
(2) パッケージ サイズ (長さ×幅) は公称値であり、該当する場合はピンも含まれます



代表的な回路図



磁気応答 (A1、A2、A3、A4 バージョン)

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4 Pin Configuration and Functions

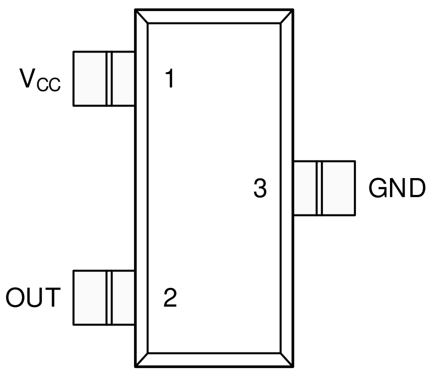


図 4-1. DBZ Package 3-Pin SOT-23 Top View

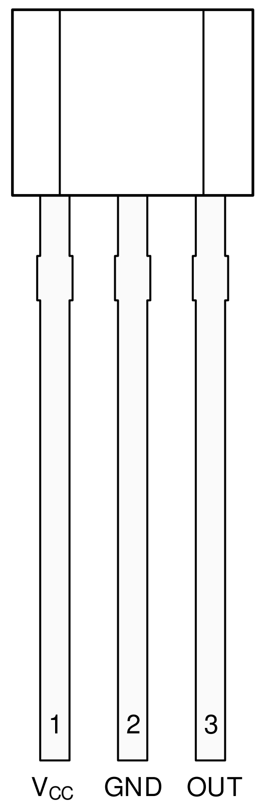


図 4-2. LPG Package 3-Pin TO-92 Top View

表 4-1. Pin Functions

PIN			I/O	DESCRIPTION
NAME	SOT-23	TO-92		
V_{CC}	1	1	—	Power supply. TI recommends connecting this pin to a ceramic capacitor to ground with a value of at least 0.01 µF.

表 4-1. Pin Functions (続き)

PIN			I/O	DESCRIPTION
NAME	SOT-23	TO-92		
OUT	2	3	O	Analog output
GND	3	2	—	Ground reference

5 Specifications

5.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
Power supply voltage	V_{CC}	–0.3	7	V
Output voltage	OUT	–0.3	V_{CC} + 0.3	V
Magnetic flux density, B_{MAX}		Unlimited		T
Operating junction temperature, T_J		–40	170	°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.

5.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001[1]	±2500	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.

5.3 Recommended Operating Conditions

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

		MIN	MAX	UNIT
V_{CC}	Power supply voltage[1]	3	3.63	V
		4.5	5.5	
I_O	Output continuous current	–1	1	mA
T_A	Operating ambient temperature[2]	–40	125	°C

(1) There are two isolated operating V_{CC} ranges.
(2) Power dissipation and thermal limits must be observed.

5.4 Thermal Information

THERMAL METRIC[1]		DRV5055		UNIT
		SOT-23 (DBZ)	TO-92 (LPG)	
		3 PINS	3 PINS	
$R_{θJA}$	Junction-to-ambient thermal resistance	170	121	°C/W
$R_{θJC(top)}$	Junction-to-case (top) thermal resistance	66	67	°C/W
$R_{θJB}$	Junction-to-board thermal resistance	49	97	°C/W
Y_{JT}	Junction-to-top characterization parameter	1.7	7.6	°C/W
Y_{JB}	Junction-to-board characterization parameter	48	97	°C/W

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

5.5 Electrical Characteristics

for V_{CC} = 3 V to 3.63 V and 4.5 V to 5.5 V, over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS[(1)]		MIN	TYP	MAX	UNIT
I_{CC}	Operating supply current	VCC = 5.0 V, B = 0 mT			3	5	mA
I_{CC}	Operating supply current	VCC = 3.3 V, B = 0 mT			2	4	mA
t_{ON}	Power-on time	VCC = 5.0 V, B = 0 mT, no load on OUT			40	100	µs
t_{ON}	Power-on time	VCC = 3.3 V, B = 0 mT, no load on OUT			40	70	µs
f_{BW}	Sensing bandwidth				20		kHz
t_d	Propagation delay time	From change in B to change in OUT			10	15	µs
B_{ND}	Input-referred RMS noise density	V_{CC} = 5 V			130		$nT/\sqrt{Hz}$
		V_{CC} = 3.3 V			215		
B_N	Input-referred noise	$B_{ND} \times 6.6 \times \sqrt{20\ kHz}$	V_{CC} = 5 V		0.12		mT_{PP}
			V_{CC} = 3.3 V		0.2		
V_N	Output-referred noise[(2)]	$B_N \times S$	DRV5055A1/ DRV5055Z1		12		mV_{PP}
			DRV5055A2/ DRV5055Z2		6		
			DRV5055A3/ DRV5055Z3		3		
			DRV5055A4/ DRV5055Z4		1.5		

(1) B is the applied magnetic flux density.
(2) V_N describes voltage noise on the device output. If the full device bandwidth is not needed, noise can be reduced with an RC filter.

5.6 Magnetic Characteristics

for V_{CC} = 3 V to 3.63 V and 4.5 V to 5.5 V, over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS[(1)]		MIN	TYP	MAX	UNIT
V_Q	Quiescent voltage	B = 0 mT, T_A = 25°C	V_{CC} = 5 V	2.43	2.5	2.57	V
			V_{CC} = 3.3 V	1.59	1.65	1.71	
$V_{Q\Delta T}$	Quiescent voltage temperature drift	B = 0 mT, T_A = -40°C to 125°C versus 25°C	VCC = 5.0 V		±1% × VCC		V
$V_{Q\Delta T}$			VCC = 3.3 V		±1% × VCC		V
V_{QRE}	Quiescent voltage ratiometry error				±0.2		%
$V_{Q\Delta L}$	Quiescent voltage lifetime drift	High-temperature operating stress for 1000 hours			<0.5	1	%
S	Sensitivity	V_{CC} = 5 V, T_A = 25°C	DRV5055A1/ DRV5055Z1	95	100	105	mV/mT
			DRV5055A2/ DRV5055Z2	47.5	50	52.5	
			DRV5055A3/ DRV5055Z3	23.8	25	26.2	
			DRV5055A4/ DRV5055Z4	11.9	12.5	13.2	
		V_{CC} = 3.3 V, T_A = 25°C	DRV5055A1/ DRV5055Z1	57	60	63	
			DRV5055A2/ DRV5055Z2	28.5	30	31.5	
			DRV5055A3/ DRV5055Z3	14.3	15	15.8	
			DRV5055A4/ DRV5055Z4	7.1	7.5	7.9	
B_L	Linear magnetic sensing range[(2)]	V_{CC} = 5 V, T_A = 25°C	DRV5055A1/ DRV5055Z1	±21			mT
			DRV5055A2/ DRV5055Z2	±42			
			DRV5055A3/ DRV5055Z3	±85			
			DRV5055A4/ DRV5055Z4	±169			
		V_{CC} = 3.3 V, T_A = 25°C	DRV5055A1/ DRV5055Z1	±22			
			DRV5055A2/ DRV5055Z2	±44			
			DRV5055A3/ DRV5055Z3	±88			
			DRV5055A4/ DRV5055Z4	±176			
V_L	Linear range of output voltage			0.2		V_{CC} – 0.2	V
S_{TC}	Sensitivity temperature compensation for magnets[(3)]	DRV5055A1/A2/A3/A4		0.04	0.12	0.2	%/°C
S_{TC}	Sensitivity temperature compensation for magnets[(3)]	DRV5055Z1/Z2/Z3/Z4			0		%/°C
S_{LE}	Sensitivity linearity error	V_{OUT} is within V_L			±1		%
S_{SE}	Sensitivity symmetry error	V_{OUT} is within V_L			±1		%

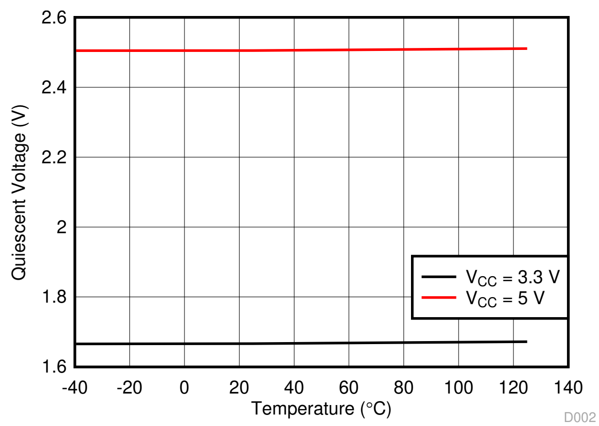
for V_{CC} = 3 V to 3.63 V and 4.5 V to 5.5 V, over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS[(1)]	MIN	TYP	MAX	UNIT
S_{RE}	Sensitivity ratiometry error	T_A = 25°C, with respect to V_{CC} = 3.3 V or 5 V	–2.5		2.5	%
$S_{\Delta L}$	Sensitivity lifetime drift	High-temperature operating stress for 1000 hours		<0.5	1	%

(1) B is the applied magnetic flux density.
(2) B_L describes the minimum linear sensing range at 25°C taking into account the maximum V_Q and Sensitivity tolerances.
(3) S_{TC} describes the rate the device increases Sensitivity with temperature.

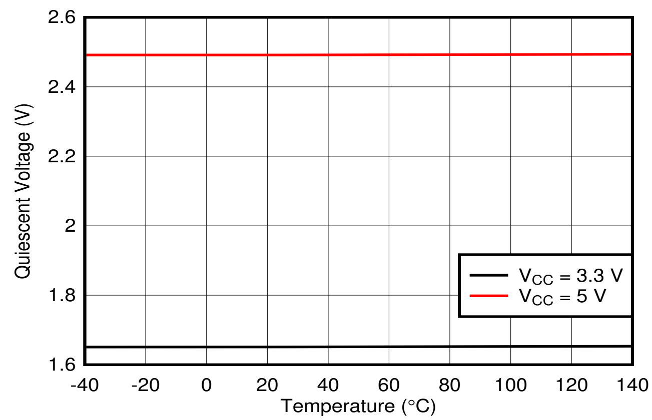
5.7 Typical Characteristics

for T_A = 25°C (unless otherwise noted)



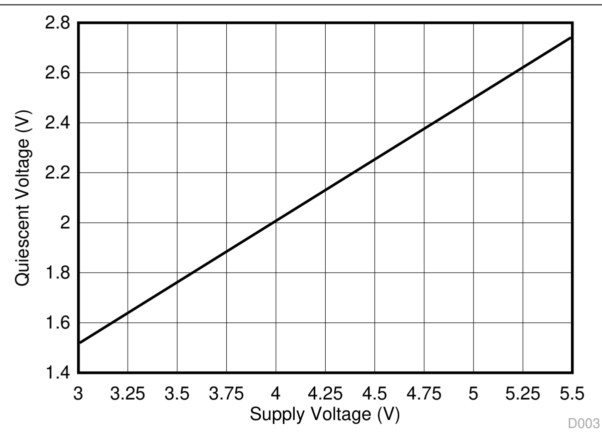
DRV5055A1/A2/A3/A4

図 5-1. Quiescent Voltage vs Temperature



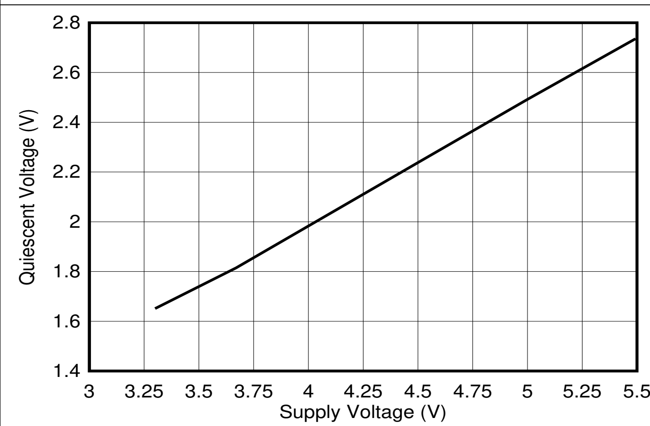
DRV5055Z1/Z2/Z3/Z4

図 5-2. Quiescent Voltage vs Temperature



DRV5055A1/A2/A3/A4

図 5-3. Quiescent Voltage vs Supply Voltage

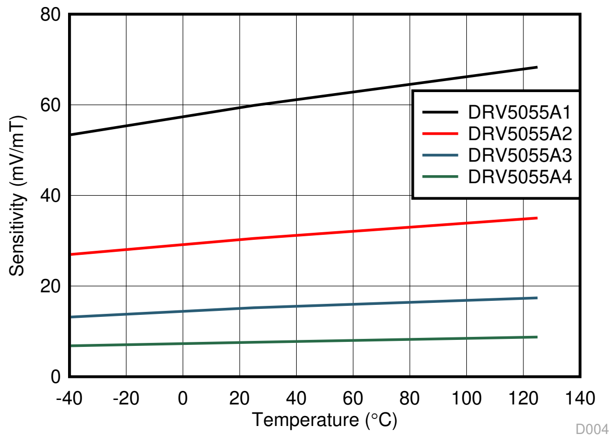


DRV5055Z1/Z2/Z3/AZ

図 5-4. Quiescent Voltage vs Supply Voltage

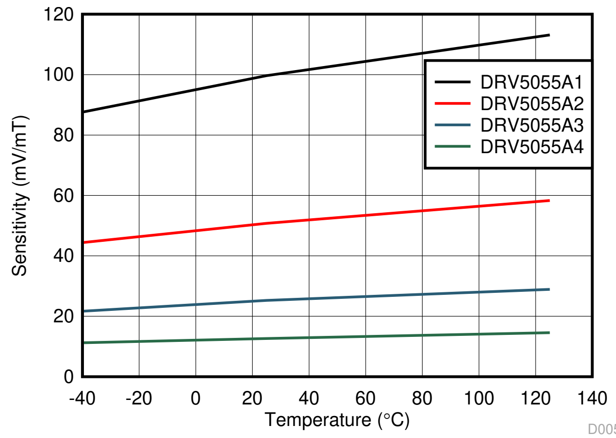
5.7 Typical Characteristics (continued)

for T_A = 25°C (unless otherwise noted)



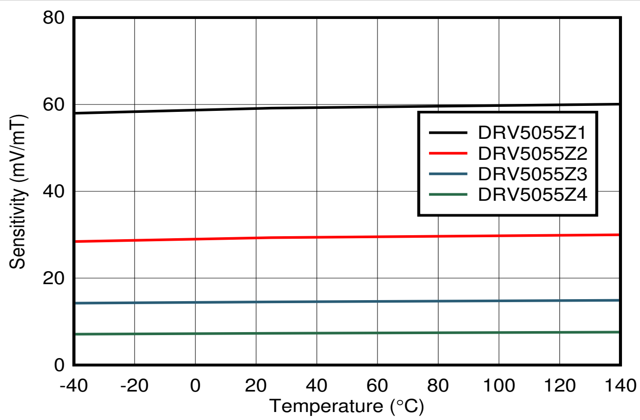
V_{CC} = 3.3 V

図 5-5. Sensitivity vs Temperature



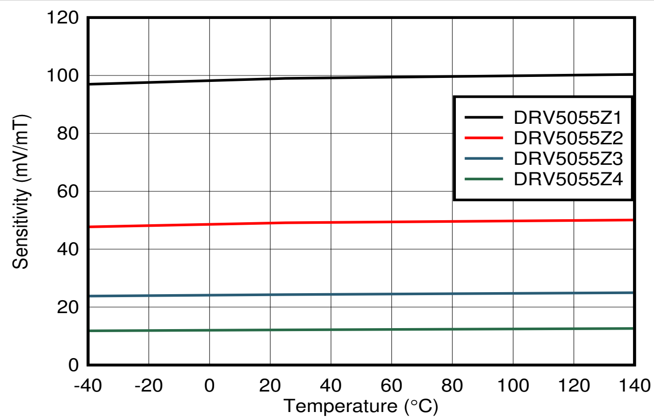
V_{CC} = 5 V

図 5-6. Sensitivity vs Temperature



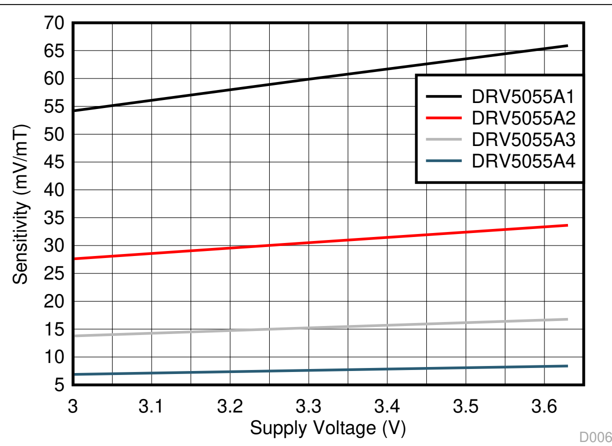
V_{CC} = 3.3 V

図 5-7. Sensitivity vs Temperature



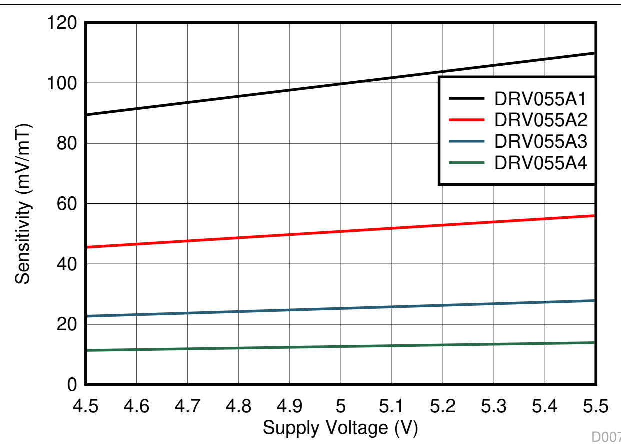
V_{CC} = 5 V

図 5-8. Sensitivity vs Temperature



V_{CC} = 3.3 V ±10%

図 5-9. Sensitivity vs Supply Voltage

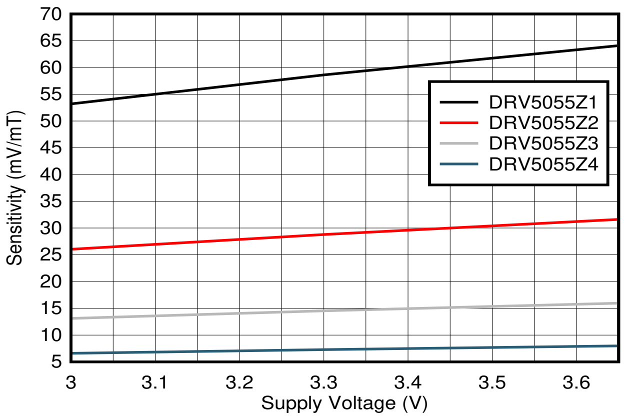


V_{CC} = 5 V ±10%

図 5-10. Sensitivity vs Supply Voltage

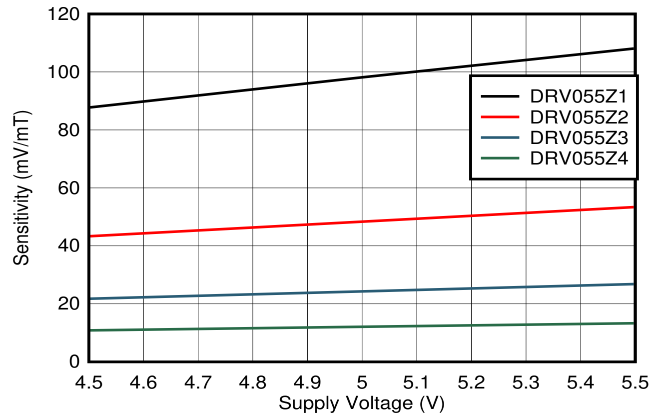
5.7 Typical Characteristics (continued)

for T_A = 25°C (unless otherwise noted)



V_{CC} = 3.3 V ±10%

図 5-11. Sensitivity vs Supply Voltage



V_{CC} = 5 V ±10%

図 5-12. Sensitivity vs Supply Voltage

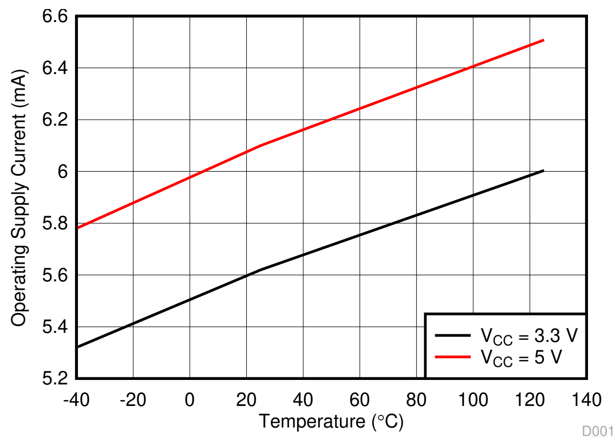


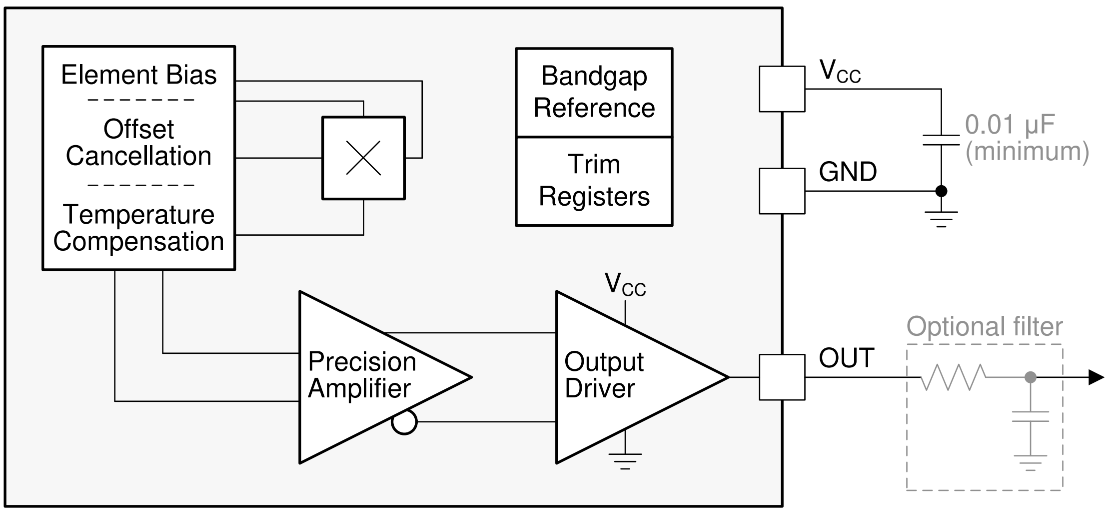
図 5-13. Operating Supply Current vs Temperature

6 Detailed Description

6.1 Overview

The DRV5055 is a 3-pin linear Hall effect sensor with fully integrated signal conditioning, temperature compensation circuits, mechanical stress cancellation, and amplifiers. The device operates from 3.3-V and 5-V (±10%) power supplies, measures magnetic flux density, and outputs a proportional analog voltage that is referenced to V_{CC}.

6.2 Functional Block Diagram



6.3 Feature Description

6.3.1 Magnetic Flux Direction

As shown in 図 6-1, the DRV5055 is sensitive to the magnetic field component that is perpendicular to the top of the package.

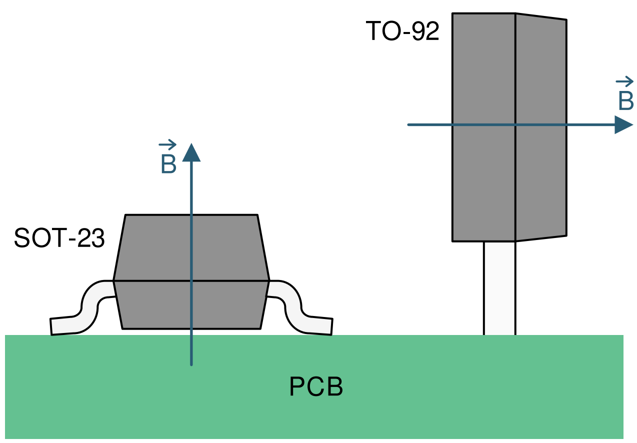


図 6-1. Direction of Sensitivity

Magnetic flux that travels from the bottom to the top of the package is considered positive in this document. This condition exists when a south magnetic pole is near the top (marked-side) of the package. Magnetic flux that travels from the top to the bottom of the package results in negative millitesla values.

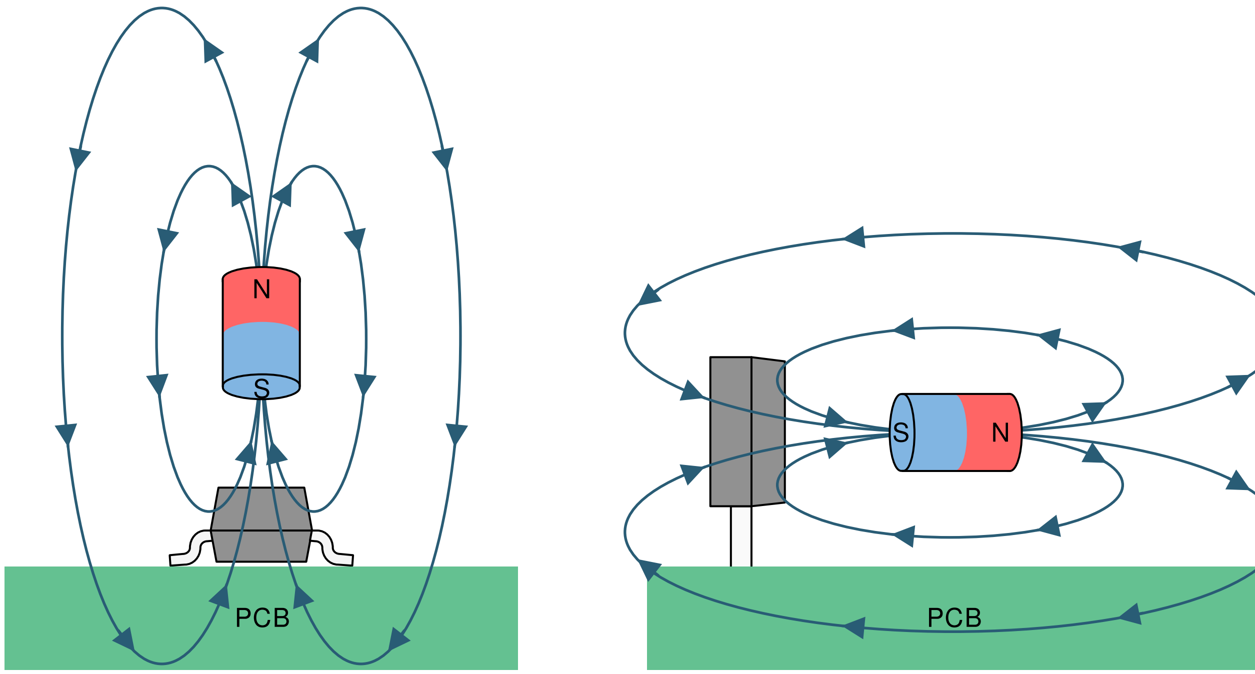


図 6-2. The Flux Direction for Positive B

6.3.2 Magnetic Response

When the DRV5055 is powered, the DRV5055 outputs an analog voltage according to 式 1:

$$V_{OUT} = V_Q + B \times \left(\text{Sensitivity}_{(25°C)} \times (1 + S_{TC} \times (T_A - 25°C))\right) \quad (1)$$

where

- V_Q is typically half of V_{CC}
- B is the applied magnetic flux density
- $\text{Sensitivity}_{(25°C)}$ depends on the device option and V_{CC}
- S_{TC} is typically 0.12%/°C for device options DRV5055A1 - DRV5055A4 and is 0%/°C for DRV5055Z1 - DRV5055Z4 options
- T_A is the ambient temperature
- V_{OUT} is within the V_L range

As an example, consider the DRV5055A3 with V_{CC} = 3.3 V, a temperature of 50°C, and 67 mT applied. Excluding tolerances, V_{OUT} = 1650 mV + 67 mT × (15 mV/mT × (1 + 0.0012/°C × (50°C – 25°C))) = 2685 mV.

6.3.3 Sensitivity Linearity

The device produces a linear response when the output voltage is within the specified V_L range. Outside this range, sensitivity is reduced and nonlinear. 図 6-3 graphs the magnetic response.

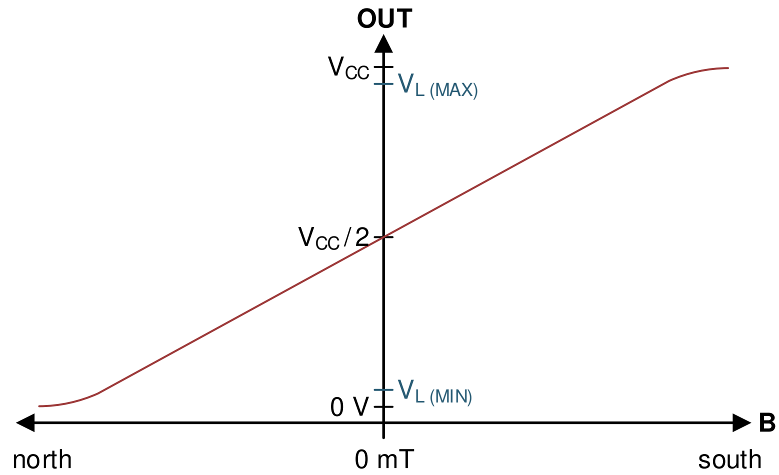


図 6-3. Magnetic Response

式 2 calculates parameter B_L, the minimum linear sensing range at 25°C taking into account the maximum quiescent voltage and sensitivity tolerances.

$$B_{L(MIN)} = \frac{V_{L(MAX)} - V_{Q(MAX)}}{S_{(MAX)}} \tag{2}$$

The parameter S_{LE} defines linearity error as the difference in sensitivity between any two positive B values, and any two negative B values, while the output is within the V_L range.

The parameter S_{SE} defines symmetry error as the difference in sensitivity between any positive B value and the negative B value of the same magnitude, while the output voltage is within the V_L range.

6.3.4 Ratiometric Architecture

The DRV5055 has a ratiometric analog architecture that scales the quiescent voltage and sensitivity linearly with the power-supply voltage. For example, the quiescent voltage and sensitivity are 5% higher when V_{CC} = 5.25 V compared to V_{CC} = 5 V. This behavior enables external ADCs to digitize a consistent value regardless of the power-supply voltage tolerance, when the ADC uses V_{CC} as its reference.

式 3 calculates the sensitivity ratiometry error:

$$S_{RE} = 1 - \frac{S_{(VCC)} / S_{(5V)}}{V_{CC} / 5V} \text{ for } V_{CC} = 4.5\text{ V to } 5.5\text{ V}, \qquad S_{RE} = 1 - \frac{S_{(VCC)} / S_{(3.3V)}}{V_{CC} / 3.3V} \text{ for } V_{CC} = 3\text{ V to } 3.63\text{ V} \tag{3}$$

where

- $S_{(VCC)}$ is the sensitivity at the current V_{CC} voltage
- $S_{(5V)}$ or $S_{(3.3V)}$ is the sensitivity when V_{CC} = 5 V or 3.3 V
- V_{CC} is the current V_{CC} voltage

式 4 calculates quiescent voltage ratiometry error:

$$V_{QRE} = 1 - \frac{V_{Q(VCC)} / V_{Q(5V)}}{V_{CC} / 5V} \text{ for } V_{CC} = 4.5\text{ V to } 5.5\text{ V}, \qquad V_{QRE} = 1 - \frac{V_{Q(VCC)} / V_{Q(3.3V)}}{V_{CC} / 3.3V} \text{ for } V_{CC} = 3\text{ V to } 3.63\text{ V} \tag{4}$$

where

- $V_{Q(VCC)}$ is the quiescent voltage at the current V_{CC} voltage
- $V_{Q(5V)}$ or $V_{Q(3.3V)}$ is the quiescent voltage when V_{CC} = 5 V or 3.3 V

- V_{CC} is the current V_{CC} voltage

6.3.5 Operating V_{CC} Ranges

The DRV5055 has two recommended operating V_{CC} ranges: 3 V to 3.63 V and 4.5 V to 5.5 V. When V_{CC} is in the middle region between 3.63 V to 4.5 V, the device continues to function, but sensitivity is less known because there is a crossover threshold near 4 V that adjusts device characteristics.

6.3.6 Sensitivity Temperature Compensation for Magnets

Magnets generally produce weaker fields as temperature increases. The DRV5055 can either compensate by increasing sensitivity with temperature or by keeping the sensitivity constant, as defined by the parameters S_{TC} and S_{TCz}, respectively. For device options DRV5055A1 - DRV5055A4, the sensitivity at T_A = 125°C is typically 12% higher than at T_A = 25°C. For device options DRV5055Z1 - DRV5055Z4, the sensitivity at T_A = 125°C is typically same as the value at T_A = 25°C.

6.3.7 Power-On Time

After the V_{CC} voltage is applied, the DRV5055 requires a short initialization time before the output is set. The parameter t_{ON} describes the time from when V_{CC} crosses 3 V until OUT is within 5% of V_Q, with 0 mT applied and no load attached to OUT. 図 6-4 shows this timing diagram.

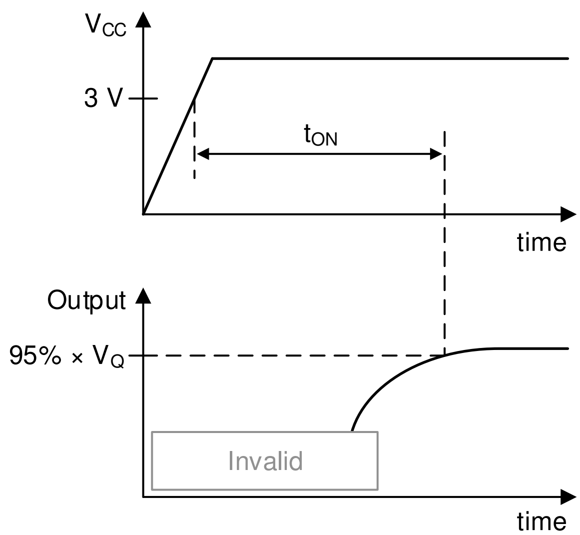


図 6-4. t_{ON} Definition

6.3.8 Hall Element Location

図 6-5 shows the location of the sensing element inside each package option.

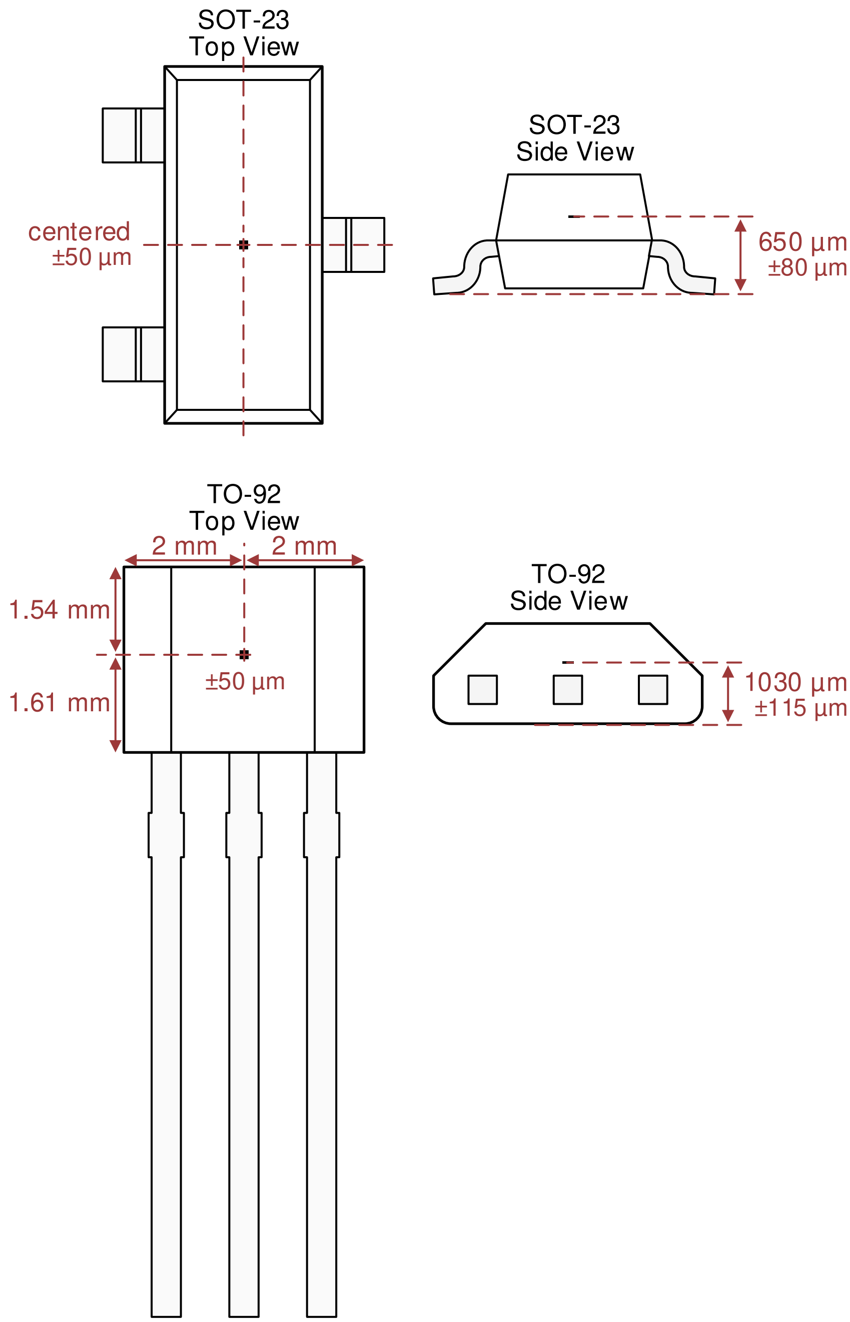


図 6-5. Hall Element Location

6.4 Device Functional Modes

The DRV5055 has one mode of operation that applies when the *Recommended Operating Conditions* are met.

7 Application and Implementation

注

以下のアプリケーション情報は、TI の製品仕様に含まれるものではなく、TI ではその正確性または完全性を保証いたしません。個々の目的に対する製品の適合性については、お客様の責任で判断していただくことになります。お客様は自身の設計実装を検証しテストすることで、システムの機能を確認する必要があります。

7.1 Application Information

7.1.1 Selecting the Sensitivity Option

Select the highest DRV5055 sensitivity option that can measure the required range of magnetic flux density, so that the output voltage swing is maximized.

Larger-sized magnets and farther sensing distances can generally enable better positional accuracy than very small magnets at close distances, because magnetic flux density increases exponentially with the proximity to a magnet. TI created an online tool to help with simple magnet calculations at https://www.ti.com/product/drv5013.

7.1.2 Temperature Compensation for Magnets

The DRV5055 temperature compensation is designed to directly compensate the average drift of neodymium (NdFeB) magnets and partially compensate ferrite magnets. The residual induction (B_r) of a magnet typically reduces by 0.12%/°C for NdFeB, and 0.20%/°C for ferrite. When the operating temperature of a system is reduced, temperature drift errors are also reduced.

7.1.3 Adding a Low-Pass Filter

As shown in *Functional Block Diagram*, an RC low-pass filter can be added to the device output for the purpose of minimizing voltage noise when the full 20-kHz bandwidth is not needed. This filter can improve the signal-to-noise ratio (SNR) and overall accuracy. Do not connect a capacitor directly to the device output without a resistor in between because doing so can make the output unstable.

7.1.4 Designing for Wire Break Detection

Some systems must detect if interconnect wires become open or shorted. The DRV5055 can support this function.

First, select a sensitivity option that causes the output voltage to stay within the V_L range during normal operation. Second, add a pullup resistor between OUT and V_{CC}. TI recommends a value between 20 kΩ to 100 kΩ, and the current through OUT must not exceed the I_O specification, including current going into an external ADC. Then, if the output voltage is ever measured to be within 150 mV of V_{CC} or GND, a fault condition exists. 図 7-1 shows the circuit, and 表 7-1 describes fault scenarios.

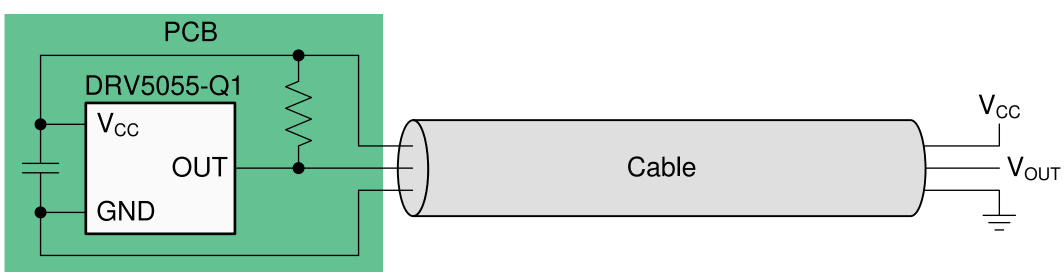


図 7-1. Wire Fault Detection Circuit

表 7-1. Fault Scenarios and the Resulting V_{OUT}

FAULT SCENARIO	V_{OUT}
V_{CC} disconnects	Close to GND
GND disconnects	Close to V_{CC}
V_{CC} shorts to OUT	Close to V_{CC}
GND shorts to OUT	Close to GND

7.2 Typical Application

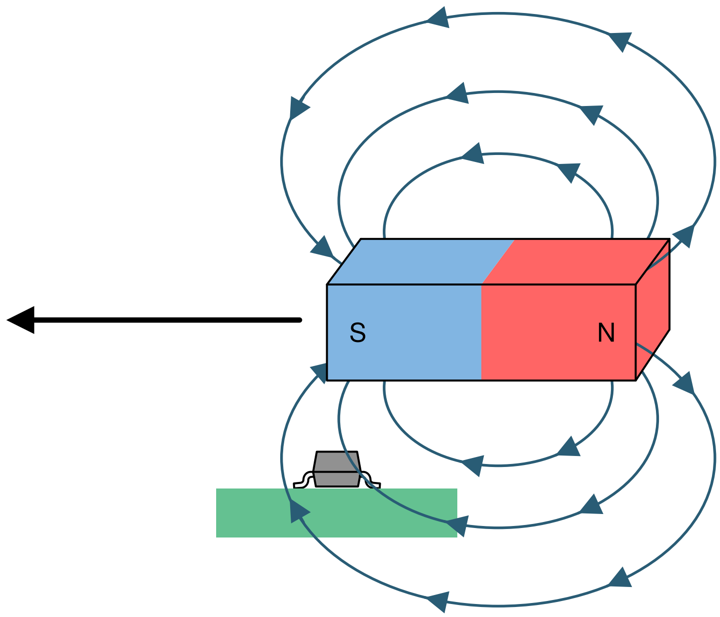


図 7-2. Common Magnet Orientation

7.2.1 Design Requirements

Use the parameters listed in 表 7-2 for this design example.

表 7-2. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
V_{CC}	5 V
Magnet	15 × 5 × 5 mm NdFeB
Travel distance	12 mm
Maximum B at the sensor at 25°C	±75 mT
Device option	DRV5055A3

7.2.2 Detailed Design Procedure

Linear Hall effect sensors provide flexibility in mechanical design, because many possible magnet orientations and movements produce a usable response from the sensor. 図 7-2 shows one of the most common orientations, which uses the full north to south range of the sensor and causes a close-to-linear change in magnetic flux density as the magnet moves across.

When designing a linear magnetic sensing system, always consider these three variables: the magnet, sensing distance, and the range of the sensor. Select the DRV5055 with the highest sensitivity that has a B_L (linear magnetic sensing range) that is larger than the maximum magnetic flux density in the application. To determine the magnetic flux density the sensor receives, TI recommends using magnetic field simulation software, referring to magnet specifications, and testing.

7.2.3 Application Curve

図 7-3 shows the simulated magnetic flux from a NdFeB magnet.

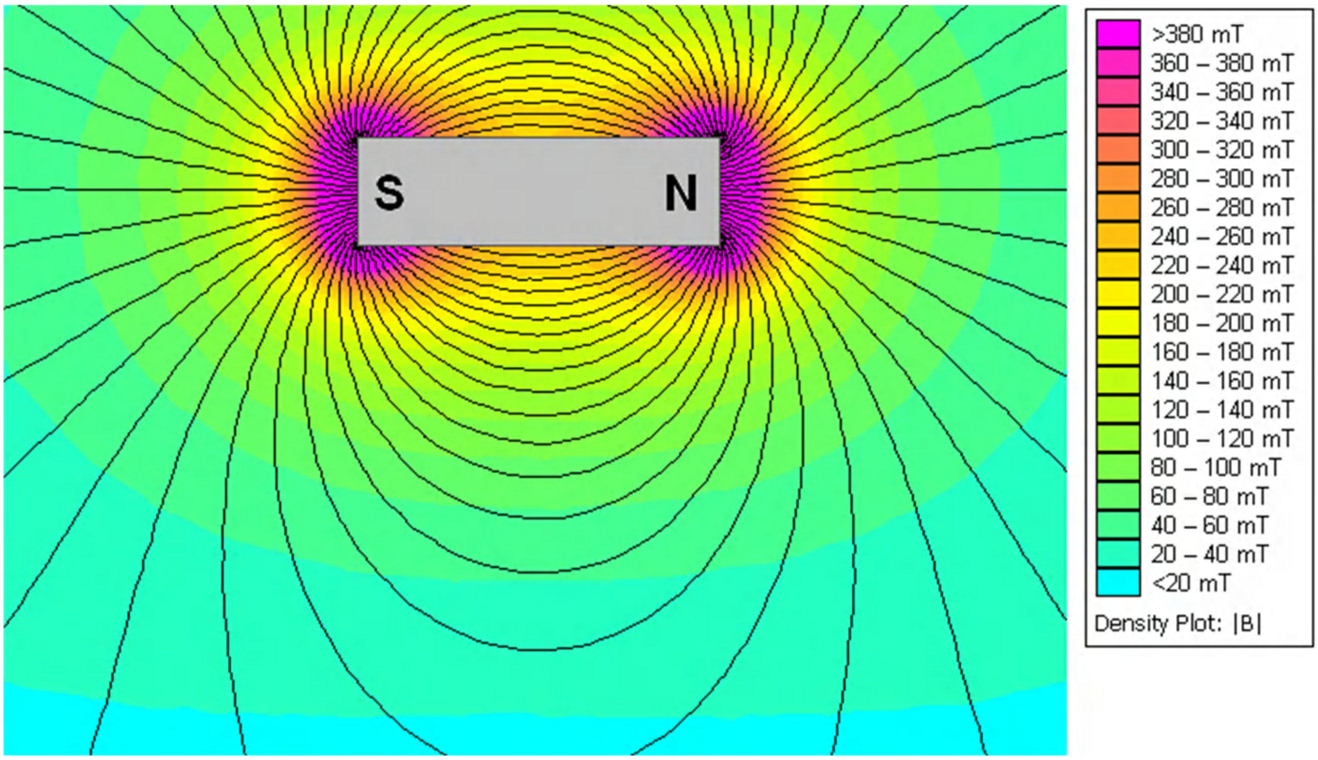


図 7-3. Simulated Magnetic Flux

7.3 Best Design Practices

Because the Hall element is sensitive to magnetic fields that are perpendicular to the top of the package, a correct magnet approach must be used for the sensor to detect the field. 図 7-4 shows correct and incorrect approaches.

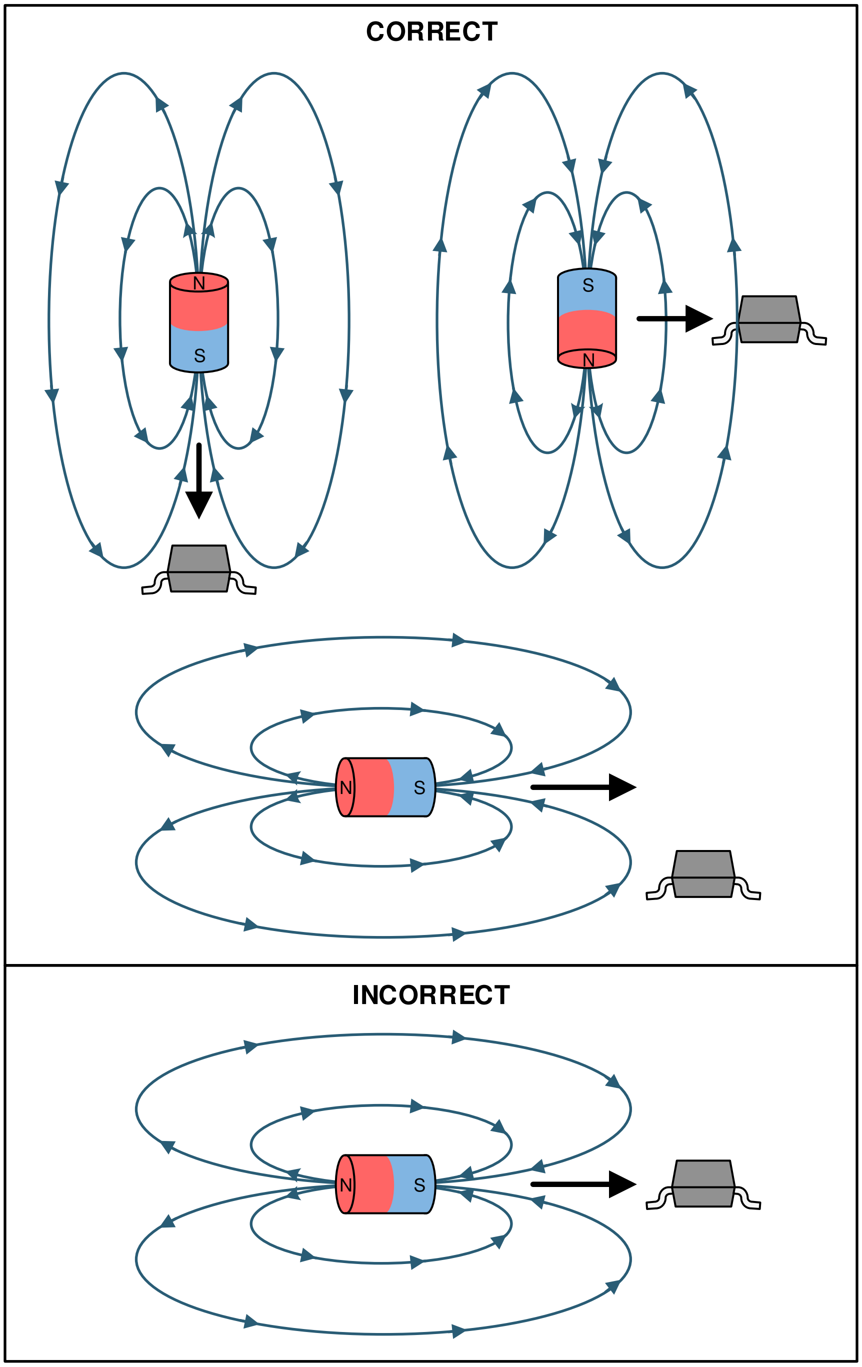


図 7-4. Correct and Incorrect Magnet Approaches

7.4 Power Supply Recommendations

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 0.01 µF.

7.5 Layout

7.5.1 Layout Guidelines

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

7.5.2 Layout Examples

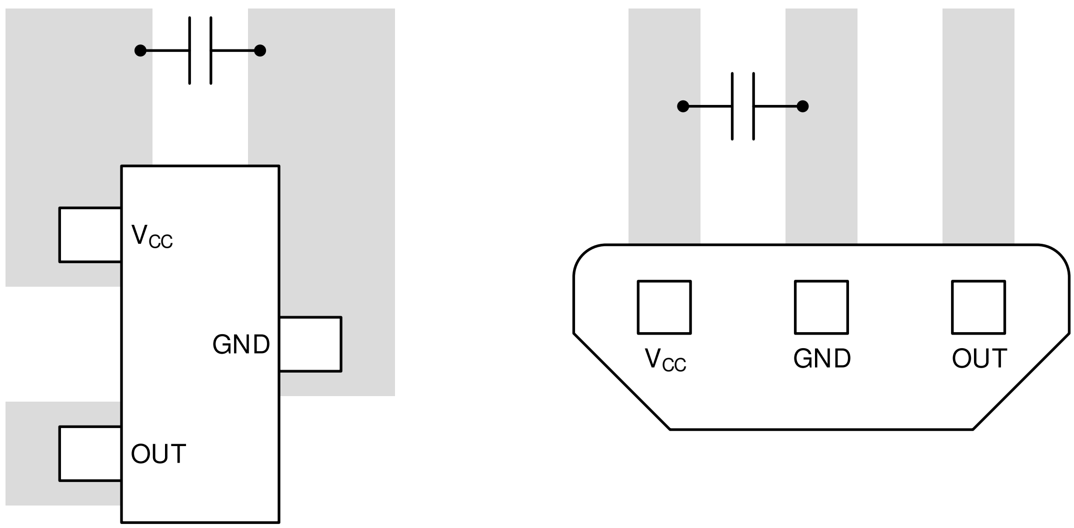


図 7-5. Layout Examples

8 Device and Documentation Support

8.1 Documentation Support

8.1.1 Related Documentation

For related documentation see the following:

- Texas Instruments, *Overview Using Linear Hall Effect Sensors to Measure Angle* application brief
- Texas Instruments, *Incremental Rotary Encoder Design Considerations* application brief

8.2 ドキュメントの更新通知を受け取る方法

ドキュメントの更新についての通知を受け取るには、www.tij.co.jp のデバイス製品フォルダを開いてください。[通知] をクリックして登録すると、変更されたすべての製品情報に関するダイジェストを毎週受け取ることができます。 変更の詳細については、改訂されたドキュメントに含まれている改訂履歴をご覧ください。

8.3 サポート・リソース

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8.4 Trademarks

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8.5 静電気放電に関する注意事項

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ESD による破損は、わずかな性能低下からデバイスの完全な故障まで多岐にわたります。精密な IC の場合、パラメータがわずかに変化するだけで公表されている仕様から外れる可能性があるため、破損が発生しやすくなっています。

8.6 用語集

テキサス・インスツルメンツ用語集　　この用語集には、用語や略語の一覧および定義が記載されています。

9 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

Changes from Revision B (April 2021) to Revision C (December 2023) **Page**

- Changed the operating supply current and power-on time parameters.......... 5
- Added the maximum propagation delay time value.......... 5
- Added test conditions to the quiescent voltage temperature drift parameter.......... 6
- Added the maximum quiescent voltage lifetime drift value to the Magnetic Characteristics table.......... 6
- Added the sensitivity linearity lifetime drift parameter to the Magnetic Characteristics table.......... 6

Changes from Revision A (June 2020) to Revision B (April 2021) **Page**

- ドキュメント全体にわたって表、図、相互参照の採番方法を更新.......... 1
- Changed the absolute maximum operating junction temperature from: 150°C to: 170°C.......... 4
- Removed the Product Preview tablenote from the Magnetic Characteristics table.......... 6

Changes from Revision * (January 2018) to Revision A (June 2020) **Page**

- データシートにゼロ TC 感度オプションを追加.......... 1

- Added Zero TC information to the Electrical Characteristics....................5
- Added Zero TC information to the Magnetic Characteristics table....................6
- Added graphs for DV5055Z1/Z2/Z3/Z4 options in the *Typical Characteristics* section.................... 7
- Updated S_{TC} definition in 式 1 11
- Updated the *Sensitivity Temperature Compensation for Magnets* section for Zero TC options....................13

10 Mechanical, Packaging, and Orderable Information

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

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
DRV5055A1QDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 125	55A1	Samples
DRV5055A1QDBZT	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	55A1	
DRV5055A1QLPG	ACTIVE	TO-92	LPG	3	1000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	55A1	Samples
DRV5055A1QLPGM	ACTIVE	TO-92	LPG	3	3000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	55A1	Samples
DRV5055A2QDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 125	55A2	Samples
DRV5055A2QLPG	ACTIVE	TO-92	LPG	3	1000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	55A2	Samples
DRV5055A2QLPGM	ACTIVE	TO-92	LPG	3	3000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	55A2	Samples
DRV5055A3QDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 125	55A3	Samples
DRV5055A3QDBZT	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	55A3	
DRV5055A3QLPG	ACTIVE	TO-92	LPG	3	1000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	55A3	Samples
DRV5055A3QLPGM	ACTIVE	TO-92	LPG	3	3000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	55A3	Samples
DRV5055A4QDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 125	55A4	Samples
DRV5055A4QDBZT	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	55A4	
DRV5055A4QLPG	ACTIVE	TO-92	LPG	3	1000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	55A4	Samples
DRV5055A4QLPGM	ACTIVE	TO-92	LPG	3	3000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	55A4	Samples
DRV5055Z1QDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 125	55Z1	Samples
DRV5055Z1QDBZT	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	55Z1	
DRV5055Z2QDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 125	55Z2	Samples
DRV5055Z2QDBZT	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	55Z2	
DRV5055Z3QDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 125	55Z3	Samples
DRV5055Z3QDBZT	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	55Z3	
DRV5055Z4QDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-2-260C-1 YEAR	-40 to 125	55Z4	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
DRV5055Z4QDBZT	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	55Z4	

(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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OTHER QUALIFIED VERSIONS OF DRV5055 :

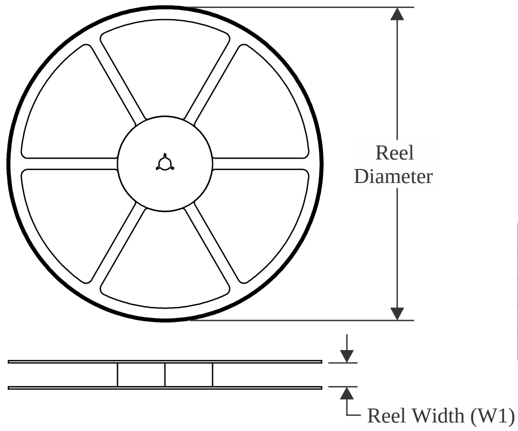
- Automotive : DRV5055-Q1

NOTE: Qualified Version Definitions:

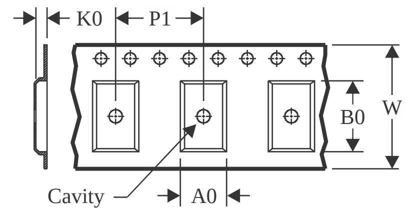
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION

REEL DIMENSIONS

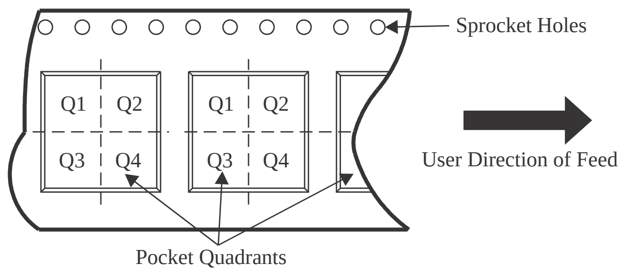


TAPE DIMENSIONS



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

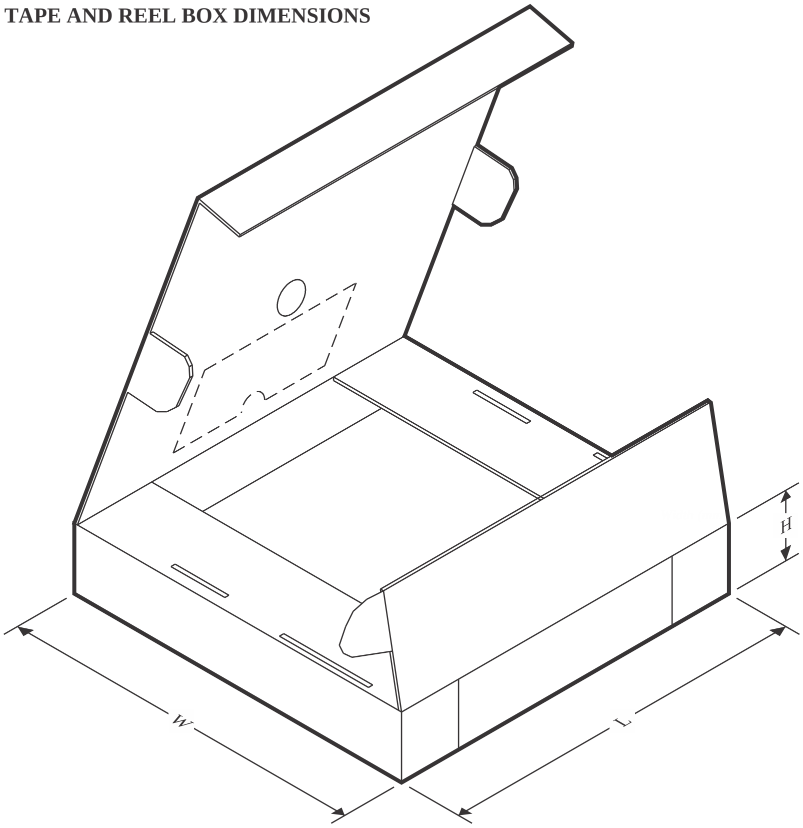
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

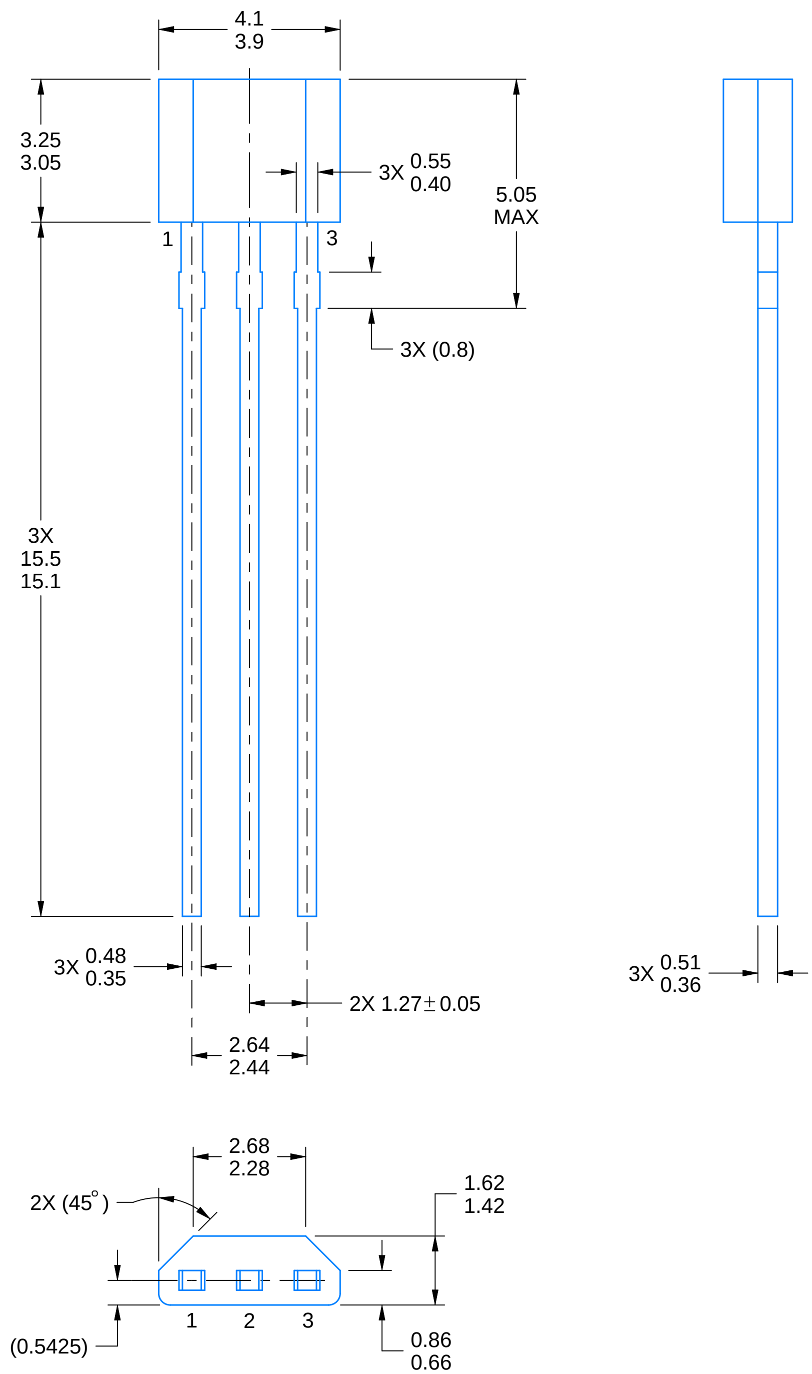
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
DRV5055A1QDBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
DRV5055A1QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5055A2QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
DRV5055A3QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5055A4QDBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
DRV5055A4QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
DRV5055A4QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5055Z1QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
DRV5055Z1QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
DRV5055Z2QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
DRV5055Z3QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
DRV5055Z3QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
DRV5055Z4QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3
DRV5055Z4QDBZR	SOT-23	DBZ	3	3000	180.0	8.4	3.2	2.85	1.3	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

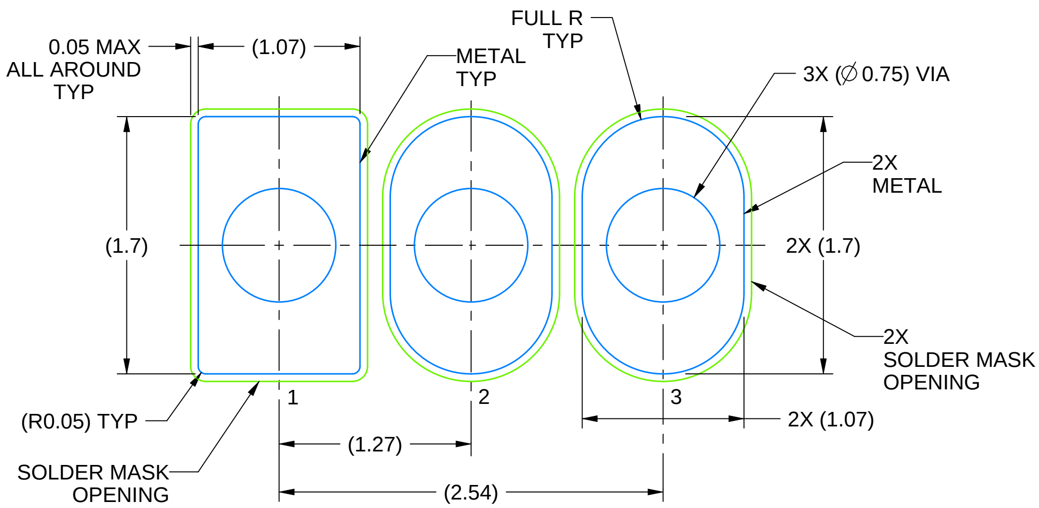
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
DRV5055A1QDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0
DRV5055A1QDBZR	SOT-23	DBZ	3	3000	213.0	191.0	35.0
DRV5055A2QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0
DRV5055A3QDBZR	SOT-23	DBZ	3	3000	213.0	191.0	35.0
DRV5055A4QDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0
DRV5055A4QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0
DRV5055A4QDBZR	SOT-23	DBZ	3	3000	213.0	191.0	35.0
DRV5055Z1QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0
DRV5055Z1QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0
DRV5055Z2QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0
DRV5055Z3QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0
DRV5055Z3QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0
DRV5055Z4QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0
DRV5055Z4QDBZR	SOT-23	DBZ	3	3000	210.0	185.0	35.0



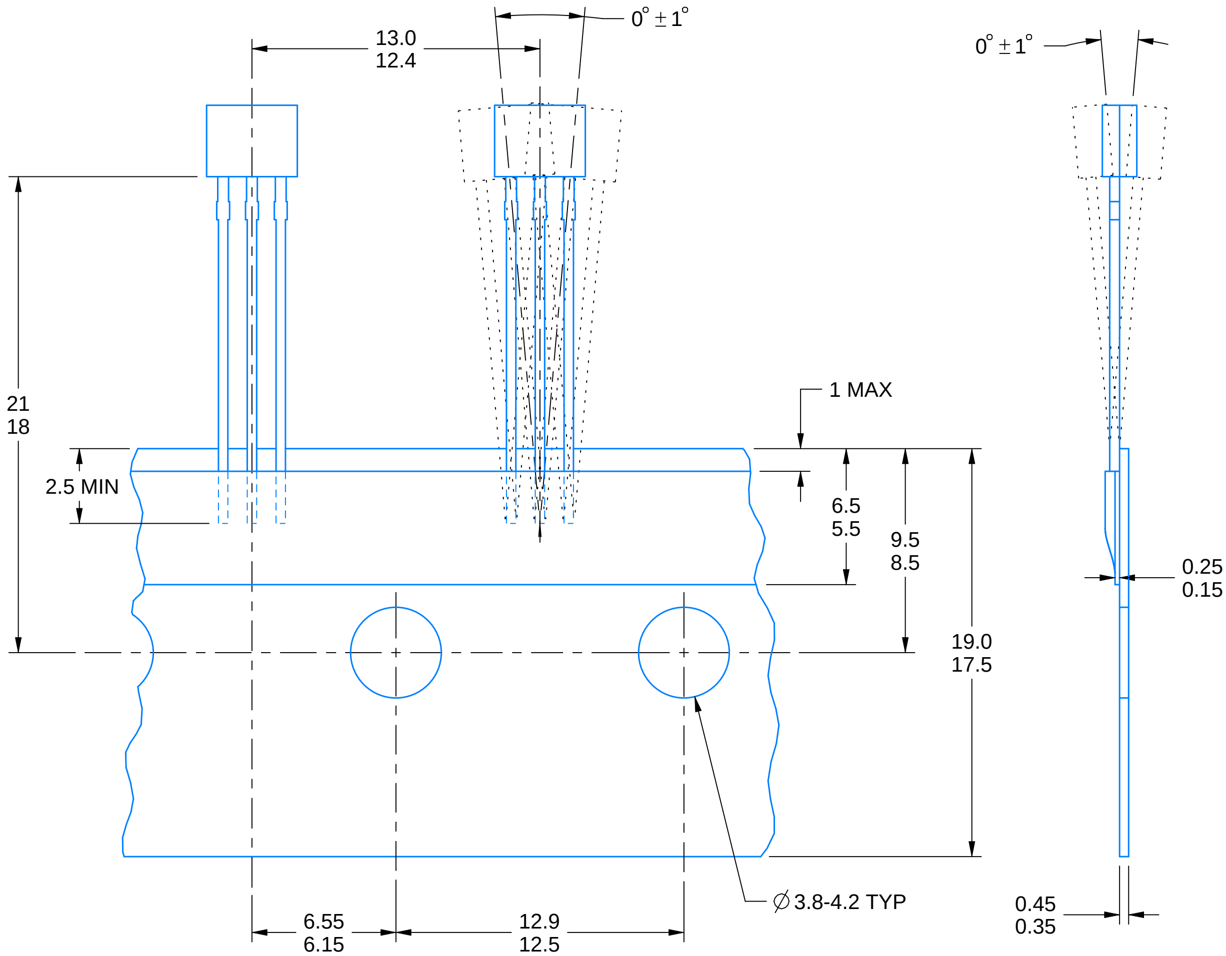
4221343/C 01/2018

NOTES:

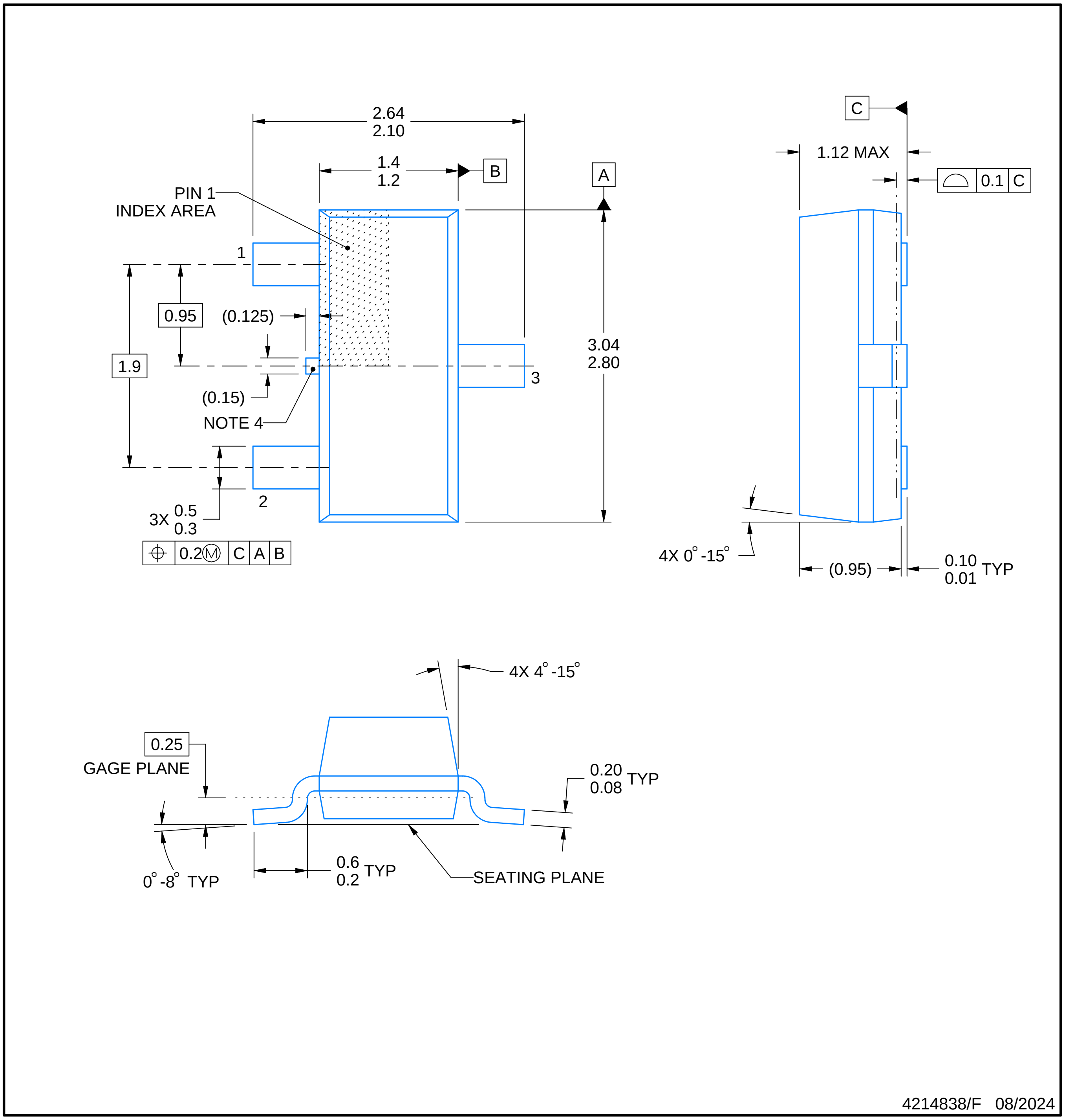
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.



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



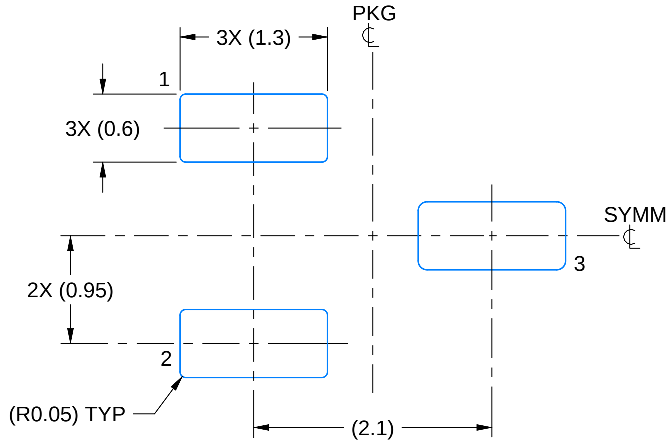
4221343/C 01/2018



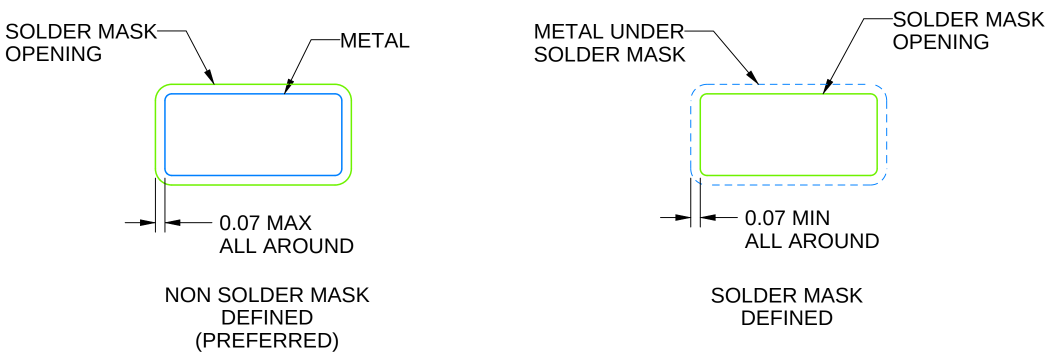
4214838/F 08/2024

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

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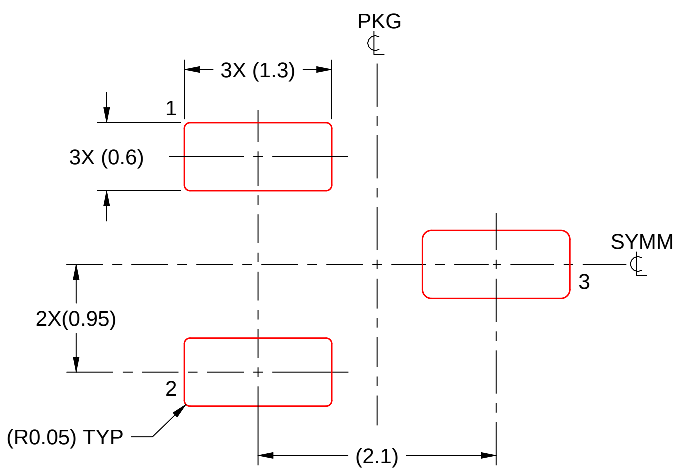
NOTES: (continued)

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

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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.
8. Board assembly site may have different recommendations for stencil design.

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