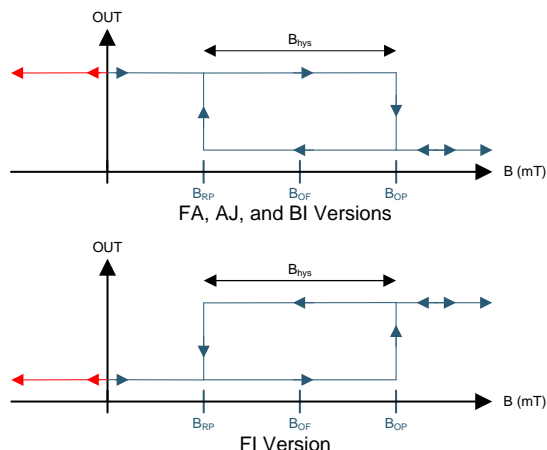


DRV5023-Q1 車載用デジタル・スイッチ・ホール効果センサ

1 特長

- デジタル・ユニポーラスイッチ・ホール・センサ
- 車載アプリケーション用にAEC-Q100認定済み
 - グレード1: $T_A = -40^{\circ}\text{C} \sim 125^{\circ}\text{C}$ (Q、[デバイスの項目表記を参照](#))
 - グレード0: $T_A = -40^{\circ}\text{C} \sim 150^{\circ}\text{C}$ (E、[デバイスの項目表記を参照](#))
- 逆出力オプション(FI)
- 優れた温度安定性
 - 温度範囲の全体で感度 $\pm 10\%$
- 複数の感度オプション(B_{OP} / B_{RP})
 - 3.5/2mT (FA, FI、[デバイスの項目表記を参照](#))
 - 6.9/3.2mT (AJ、[デバイスの項目表記を参照](#))
 - 14.5/6mT (BI、[デバイスの項目表記を参照](#))
- 広い範囲の電圧をサポート
 - 2.7~38V
 - 外部レギュレータ不要
- オープン・ドレイン出力(30mAシンク)
- 高速な電源オン時間: 35 μs
- 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
 - OUTからバッテリーへの短絡保護

出力状態



2 アプリケーション

- ドッキング検出
- ドアの開閉検出
- 近接センシング
- バルブの位置決め
- パルスのカウント

3 概要

DRV5023-Q1デバイスはチョップ安定化されたホール効果センサで、全温度範囲で優れた感度安定性を持つ磁気センシングソリューションを備え、保護機能を内蔵しています。

周囲の磁束密度が B_{OP} スレッショルドを超えると、DRV5023-Q1のオープン・ドレイン出力がLOWに変化します。磁場が B_{RP} 未満に低下するまで出力はLOWに維持され、その後で出力がハイ・インピーダンスになります。出力電流のシンク能力は30mAです。2.7~38Vまでの広い範囲の電圧で動作し、-22Vまでの逆電圧から保護されるため、広範な車載アプリケーションに適したデバイスです。

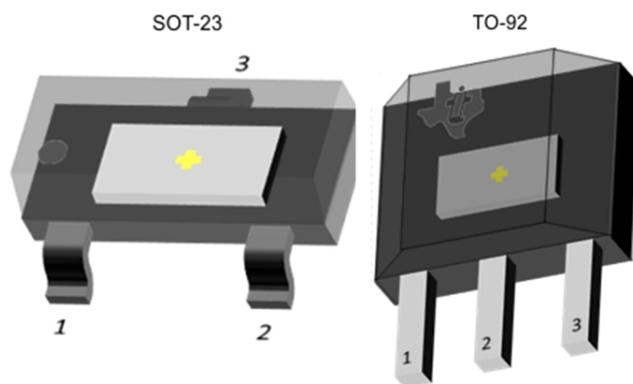
逆電圧の状態、負荷ダンプ、および出力短絡や過電流に対して、内部的な保護機能が搭載されています。

製品情報⁽¹⁾

型番	パッケージ	本体サイズ(公称)
DRV5023-Q1	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。

デバイスパッケージ



目次

1	特長	1	7.4	Device Functional Modes	15
2	アプリケーション	1	8	Application and Implementation	16
3	概要	1	8.1	Application Information	16
4	改訂履歴	2	8.2	Typical Applications	16
5	Pin Configuration and Functions	4	9	Power Supply Recommendations	18
6	Specifications	5	10	Layout	19
6.1	Absolute Maximum Ratings	5	10.1	Layout Guidelines	19
6.2	ESD Ratings	5	10.2	Layout Example	19
6.3	Recommended Operating Conditions	5	11	デバイスおよびドキュメントのサポート	20
6.4	Thermal Information	5	11.1	デバイス・サポート	20
6.5	Electrical Characteristics	6	11.2	ドキュメントのサポート	21
6.6	Switching Characteristics	6	11.3	ドキュメントの更新通知を受け取る方法	21
6.7	Magnetic Characteristics	6	11.4	コミュニティ・リソース	21
6.8	Typical Characteristics	7	11.5	商標	21
7	Detailed Description	9	11.6	静電気放電に関する注意事項	21
7.1	Overview	9	11.7	Glossary	21
7.2	Functional Block Diagram	9	12	メカニカル、パッケージ、および注文情報	21
7.3	Feature Description	10			

4 改訂履歴

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。

Revision F (September 2016) から Revision G に変更		Page
•	Added the output jitter parameter to the <i>Switching Characteristics</i> table	6
•	Added the <i>Output Jitter Characteristic</i> section	15
Revision E (August 2016) から Revision F に変更		Page
•	Made changes to the Power-on time in the <i>Electrical Characteristics</i> table	6
Revision D (May 2016) から Revision E に変更		Page
•	Clarified the output description for the FI device version in the <i>Device Output</i> section	10
•	Added the <i>Layout</i> section	19
•	追加「ドキュメントの更新通知を受け取る方法」セクション	21
Revision C (February 2016) から Revision D に変更		Page
•	Revised preliminary limits for the FA version	6
Revision B (December 2015) から Revision C に変更		Page
•	FAおよびFIデバイス・オプション 追加	1
•	Added the typical bandwidth value to the <i>Magnetic Characteristics</i> table	6

Revision A (May 2015) から Revision B に変更
Page

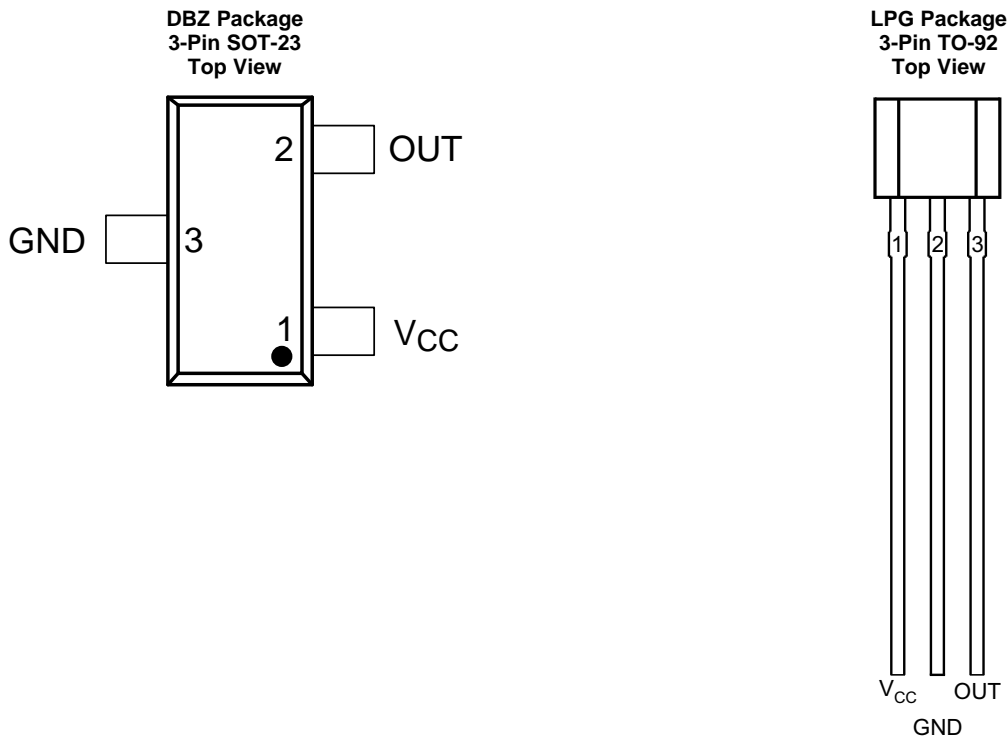
• SOT-23パッケージの本体サイズを訂正し、SIPパッケージ名をTO-92に訂正	1
• Added B _{MAX} to <i>Absolute Maximum Ratings</i>	5
• Removed table notes regarding testing for the operating junction temperature in <i>Absolute Maximum Ratings</i>	5
• パッケージのテープ&リールに関するMとブランクのオプションを更新	20
• 「 コミュニティ・リソース 」を追加	21

2014年12月発行のものから更新
Page

• デバイスのステータスを量産データに更新	1
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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

PIN			TYPE	DESCRIPTION
NAME	DBZ	LPG		
GND	3	2	GND	Ground pin
OUT	2	3	Output	Hall sensor open-drain output. The open drain requires a resistor pullup.
V _{CC}	1	1	Power	2.7 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} .

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/μs
	Voltage ramp rate (V _{CC}), V _{CC} > 5 V	0	2	
Output pin voltage		-0.5	40	V
Output pin reverse current during reverse supply condition		0	100	mA
Magnetic flux density, B _{MAX}		Unlimited		
Operating junction temperature, T _J	Q, see 26	-40	150	°C
	E, see 26	-40	175	
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 AEC Q100-002 ⁽¹⁾	±2500	V
	Charged-device model (CDM), per AEC Q100-011	±500	

- (1) AEC Q100-002 indicates that HBM stressing shall be in accordance with the ANSI/ESDA/JEDEC JS-001 specification.

6.3 Recommended Operating Conditions

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

		MIN	MAX	UNIT	
V _{CC}	Power supply voltage	2.7	38	V	
V _O	Output pin voltage (OUT)	0	38	V	
I _{SINK}	Output pin current sink (OUT) ⁽¹⁾	0	30	mA	
T _A	Operating ambient temperature	Q, see 26	-40	125	°C
		E, see 26	-40	150	

- (1) Power dissipation and thermal limits must be observed.

6.4 Thermal Information

THERMAL METRIC ⁽¹⁾		DRV5023-Q1		UNIT
		DBZ (SOT-23)	LPG (TO-92)	
		3 PINS	3 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	333.2	180	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	99.9	98.6	°C/W
R _{θJB}	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.

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		2.7		38	V
I _{CC}	Operating supply current	V _{CC} = 2.7 to 38 V, T _A = 25°C		2.7		mA
		V _{CC} = 2.7 to 38 V, T _A = T _{A, MAX} ⁽¹⁾		3	3.5	
t _{on}	Power-on time	AJ, BI versions		35	50	μs
		FA, FI versions		35	70	
OPEN DRAIN OUTPUT (OUT)						
r _{DS(on)}	FET on-resistance	V _{CC} = 3.3 V, I _O = 10 mA, T _A = 25°C		22		Ω
		V _{CC} = 3.3 V, I _O = 10 mA, T _A = 125°C		36	50	
I _{lkg(off)}	Off-state leakage current	Output Hi-Z			1	μA
PROTECTION CIRCUITS						
V _{CCR}	Reverse supply voltage		-22			V
I _{OCP}	Overcurrent protection level	OUT shorted V _{CC}	15	30	45	mA

 (1) T_{A, MAX} is 125°C for Q Grade 1 devices and 150°C for E Grade 0 devices (see [Figure 26](#))

6.6 Switching Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
OPEN DRAIN OUTPUT (OUT)						
t _d	Output delay time	B = B _{RP} – 10 mT to B _{OP} + 10 mT in 1 μs		13	25	μs
t _r	Output rise time (10% to 90%)	R1 = 1 kΩ, C _O = 50 pF, V _{CC} = 3.3 V		200		ns
t _f	Output fall time (90% to 10%)	R1 = 1 kΩ, C _O = 50 pF, V _{CC} = 3.3 V		31		ns
t _j	Output jitter	Measured from 20 000 cycles of B increasing at a rate of 50 mT/ms (see Figure 19)		±8.5		μs

6.7 Magnetic Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT ⁽¹⁾
f _{BW}	Bandwidth ⁽²⁾		20	30		kHz
DRV5023FA, DRV5023FI: 3.5 / 2 mT						
B _{OP}	Operate point (see Figure 12 and Figure 13)		1.8	3.5	6.8	mT
B _{RP}	Release point (see Figure 12 and Figure 13)		0.5	2	4.2	mT
B _{hys}	Hysteresis; B _{hys} = (B _{OP} – B _{RP})			1.5		mT
B _O	Magnetic offset, B _O = (B _{OP} + B _{RP}) / 2			2.8		mT
DRV5023AJ: 6.9 / 3.2 mT						
B _{OP}	Operate point (see Figure 12 and Figure 13)		3	6.9	12	mT
B _{RP}	Release point (see Figure 12 and Figure 13)		1	3.2	5	mT
B _{hys}	Hysteresis; B _{hys} = (B _{OP} – B _{RP})			3.7		mT
B _O	Magnetic offset, B _O = (B _{OP} + B _{RP}) / 2			5		mT
DRV5023BI: 14.5 / 6 mT						
B _{OP}	Operate point (see Figure 12 and Figure 13)		6	14.5	24	mT
B _{RP}	Release point (see Figure 12 and Figure 13)		3	6	9	mT
B _{hys}	Hysteresis; B _{hys} = (B _{OP} – B _{RP}) ⁽³⁾			8.5		mT
B _O	Magnetic offset, B _O = (B _{OP} + B _{RP}) / 2			10.3		mT

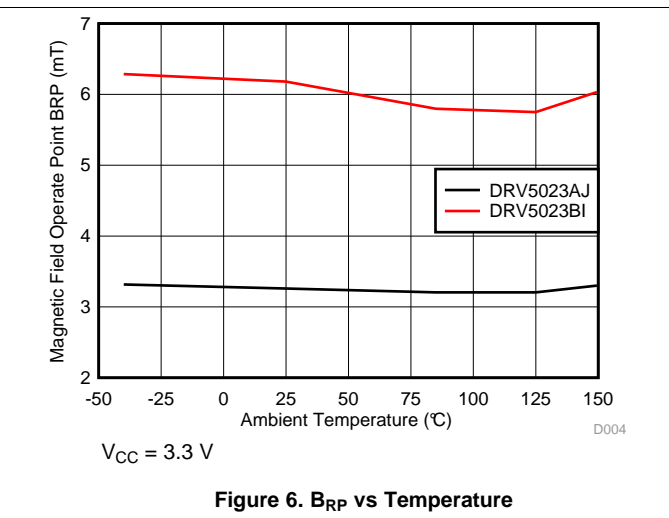
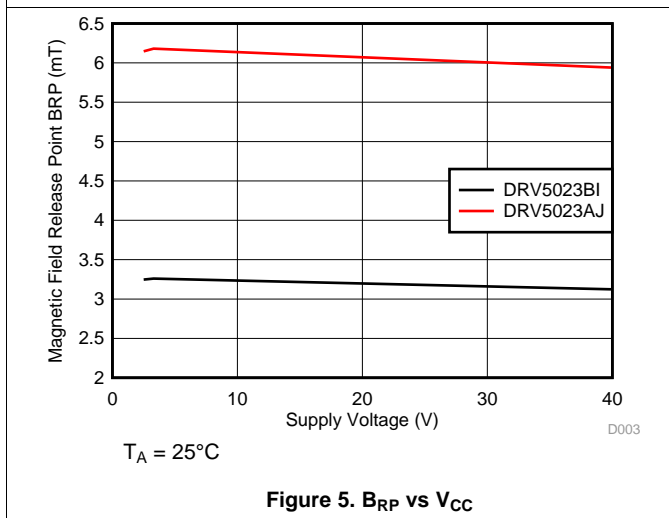
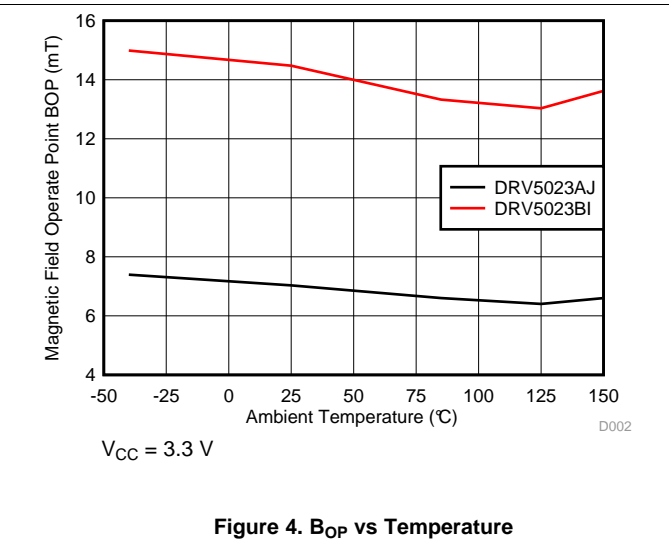
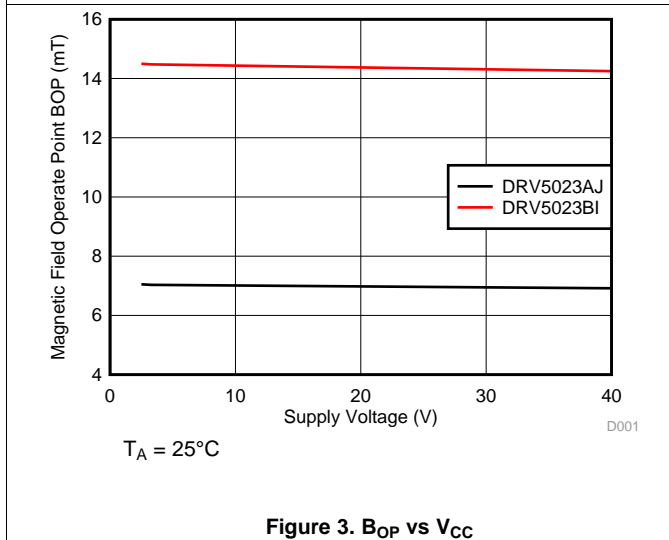
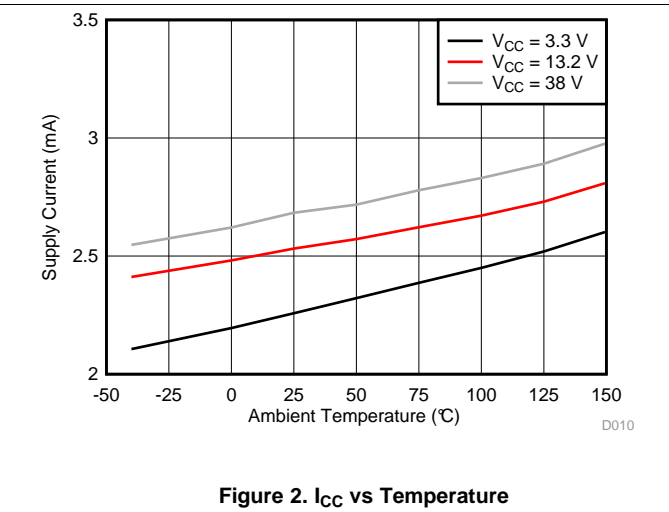
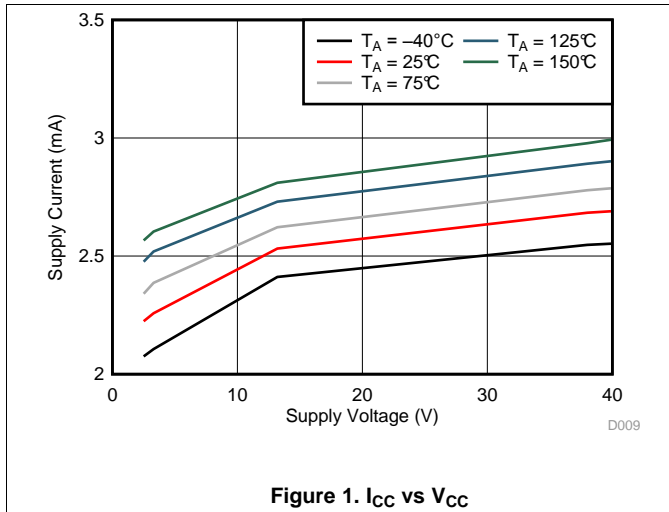
(1) 1 mT = 10 Gauss

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

 (3) |B_{OP}| is always greater than |B_{RP}|.

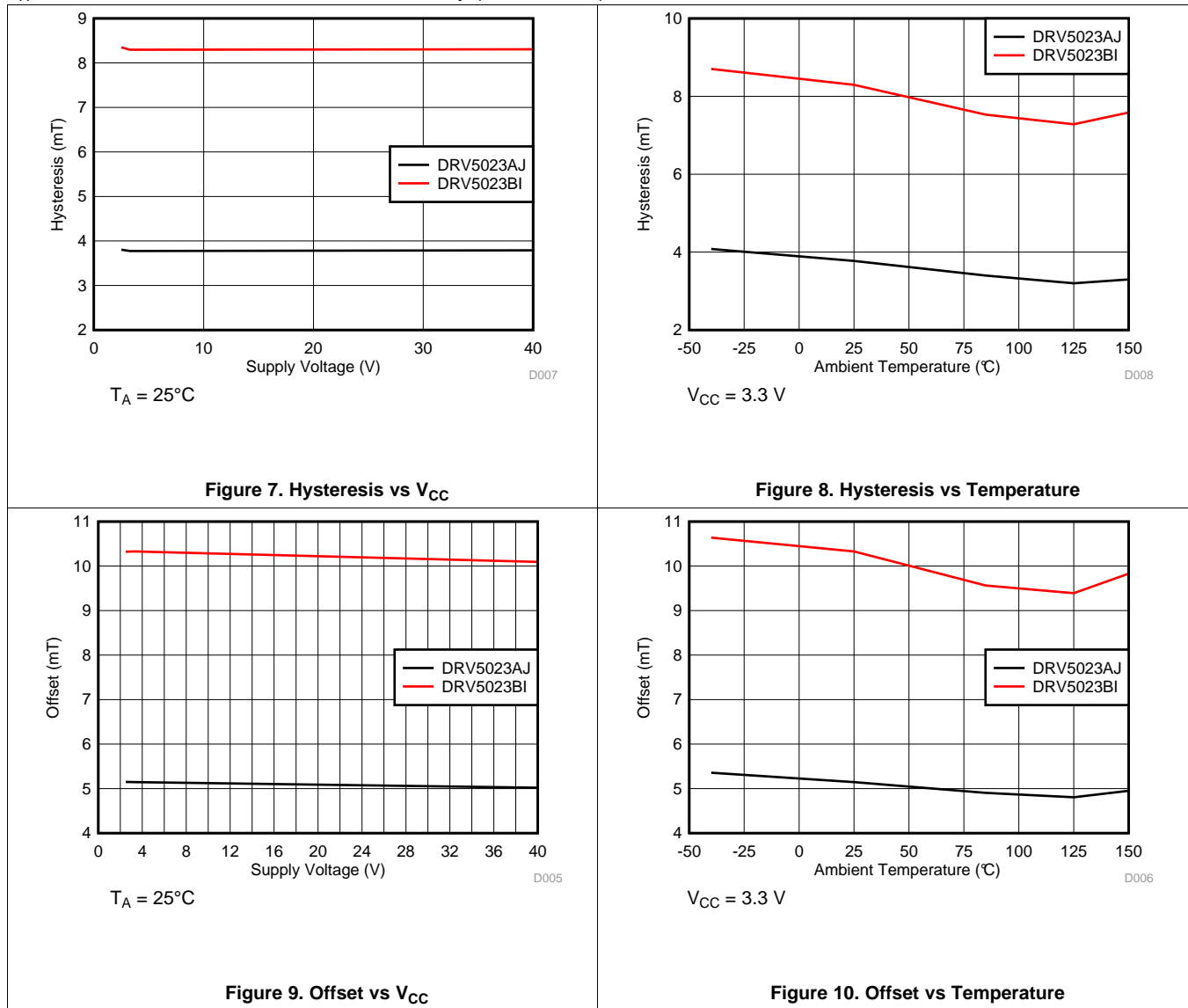
6.8 Typical Characteristics

$T_A > 125^\circ\text{C}$ data is valid for Grade 0 devices only (E, see [26](#))



Typical Characteristics (continued)

$T_A > 125^\circ\text{C}$ data is valid for Grade 0 devices only (E, see [26](#))



7 Detailed Description

7.1 Overview

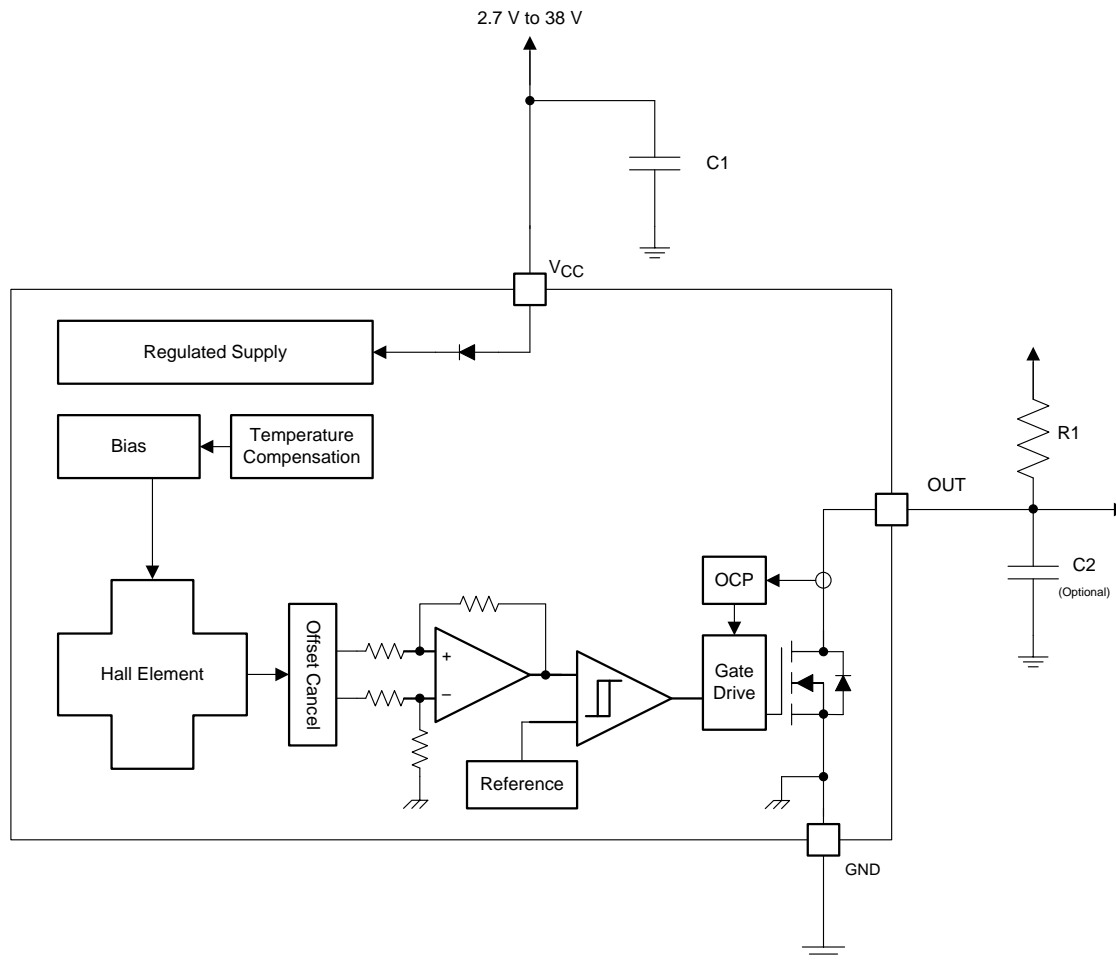
The DRV5023-Q1 device is a chopper-stabilized Hall sensor with a digital output for magnetic sensing applications. The DRV5023-Q1 device can be powered with a supply voltage between 2.7 and 38 V, and will survive –22 V reverse-battery conditions. The DRV5023-Q1 device does not operate when –22 to 2.4 V is applied to the V_{CC} pin (with respect to GND pin). In addition, the device can withstand supply voltages up to 40 V for transient durations.

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. The output state is dependent on the magnetic field perpendicular to the package.

For the FA, AJ, and BI device versions, a strong **south pole** near the marked side of the package causes the output to pull low, and the absence of a field makes the output high-impedance. The FI version has an inverted output response, where a strong **south pole** causes the output to be high-impedance, and the absence of a field makes the output pull low. Hysteresis is included in between the operate point and the release point to prevent toggling near the magnetic threshold.

An external pullup resistor is required on the OUT pin. The OUT pin can be pulled up to V_{CC} , or to a different voltage supply. This allows for easier interfacing with controller circuits.

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 11](#).

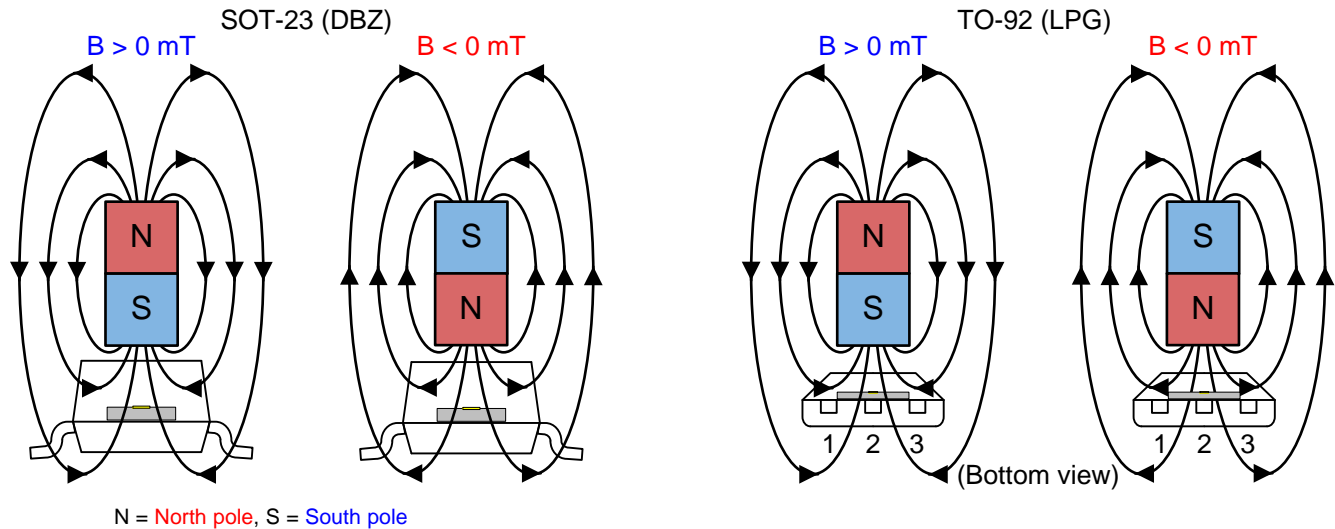


Figure 11. Field Direction Definition

7.3.2 Device Output

If the device is powered on with a magnetic field strength between B_{RP} and B_{OP} , then the device output is indeterminate and can either be Hi-Z or Low. For the FA, AJ, and BI device versions, if the field strength is greater than B_{OP} , then the output is pulled low; if the field strength is less than B_{RP} , then the output is released. For the FI device version, if the field strength is greater than B_{OP} , then the output is Hi-Z; if the field strength is less than B_{RP} , then the output is pulled Low.

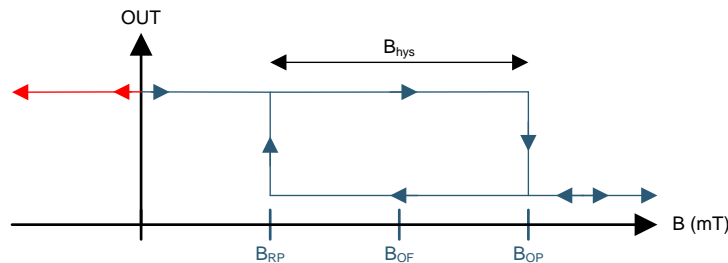


Figure 12. Output State of FA, AJ, BI Versions

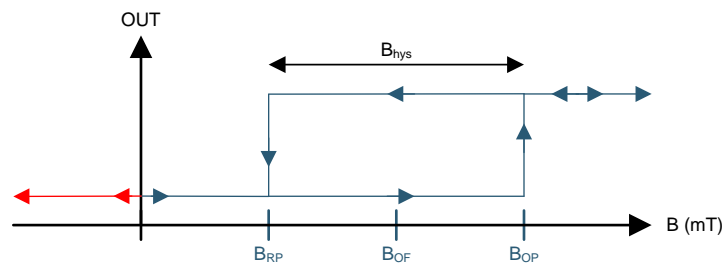


Figure 13. Output State of FI Version

Feature Description (continued)

7.3.3 Power-On Time

After applying V_{CC} to the DRV5023-Q1 device, t_{on} must elapse before the OUT pin is valid. During the power-up sequence, the output is Hi-Z. A pulse as shown in Figure 14 and Figure 15 occurs at the end of t_{on} . This pulse can allow the host processor to determine when the DRV5023-Q1 output is valid after startup. In Case 1 (Figure 14) and Case 2 (Figure 15), the output is defined assuming a constant magnetic field $B > B_{OP}$ and $B < B_{RP}$.

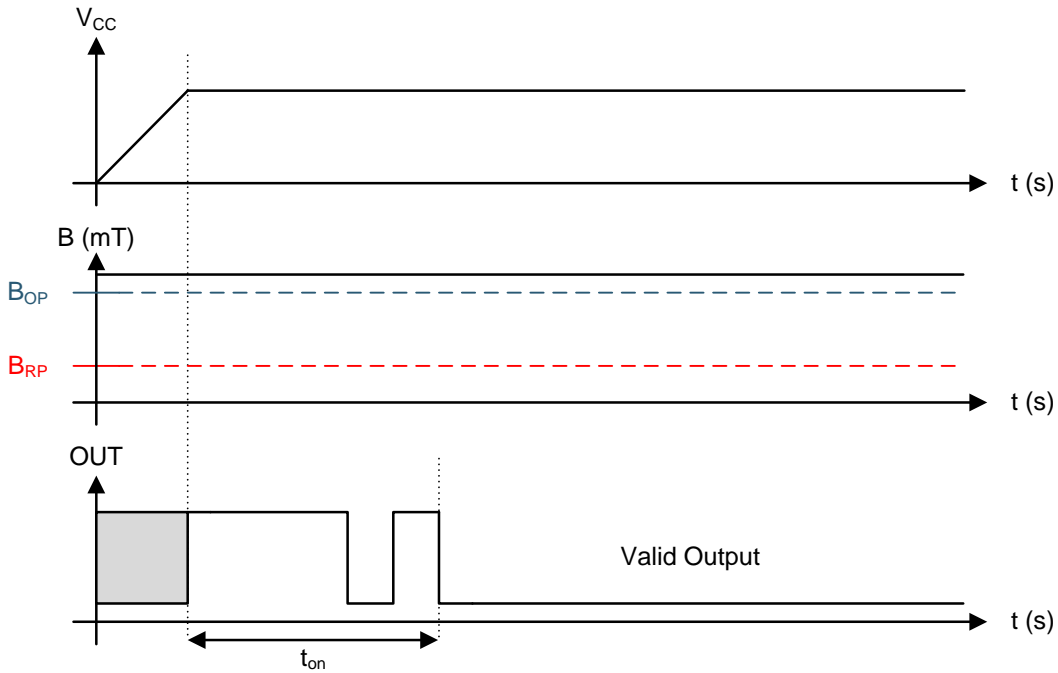


Figure 14. Case 1: Power On When $B > B_{OP}$

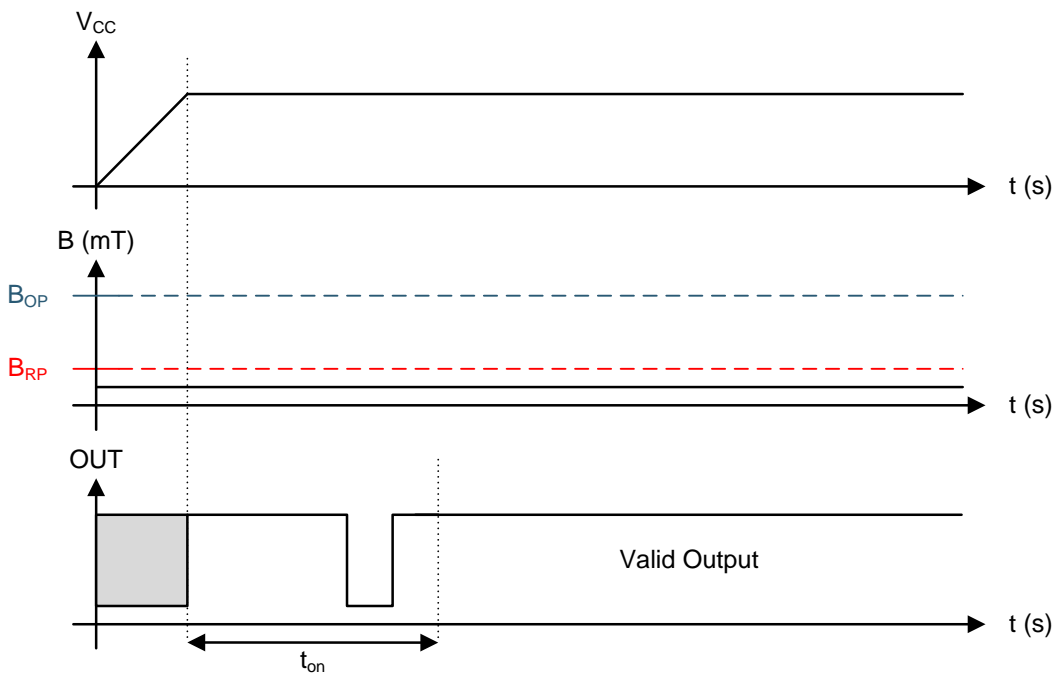


Figure 15. Case 2: Power On When $B < B_{RP}$

Feature Description (continued)

If the device is powered on with the magnetic field strength $B_{RP} < B < B_{OP}$, then the device output is indeterminate and can either be Hi-Z or pulled low. During the power-up sequence, the output is held Hi-Z until t_{on} has elapsed. At the end of t_{on} , a pulse is given on the OUT pin to indicate that t_{on} has elapsed. After t_{on} , if the magnetic field changes such that $B_{OP} < B$, the output is released. Case 3 (Figure 16) and Case 4 (Figure 17) show examples of this behavior.

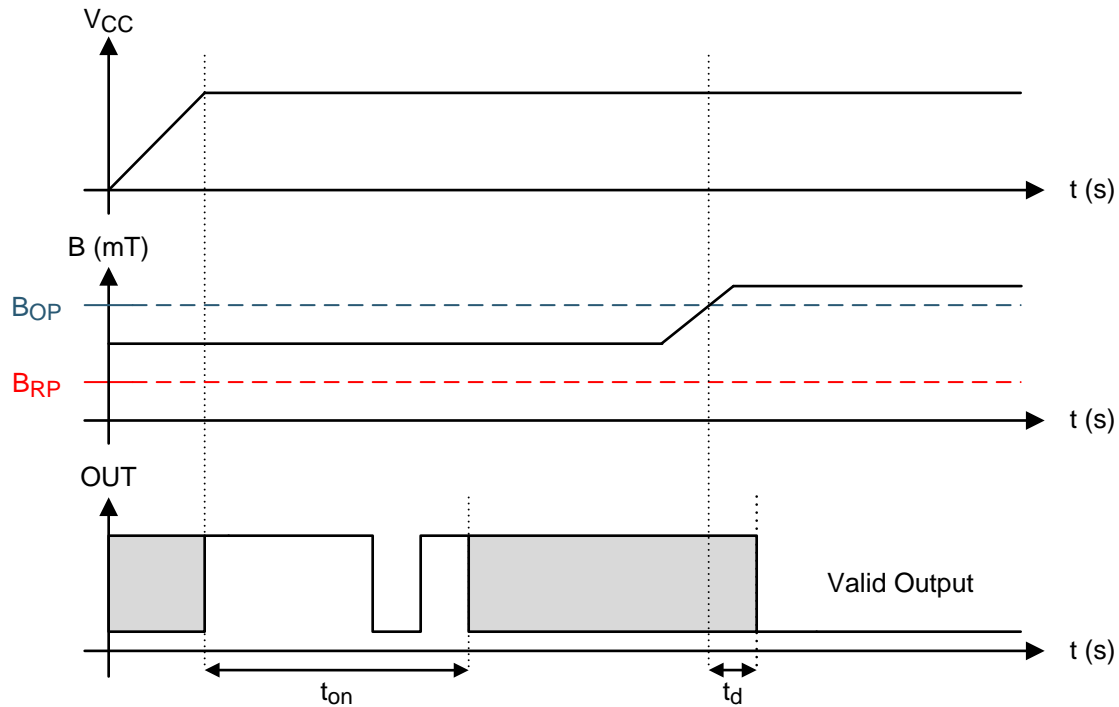


Figure 16. Case 3: Power On When $B_{RP} < B < B_{OP}$, Followed by $B > B_{OP}$

Feature Description (continued)

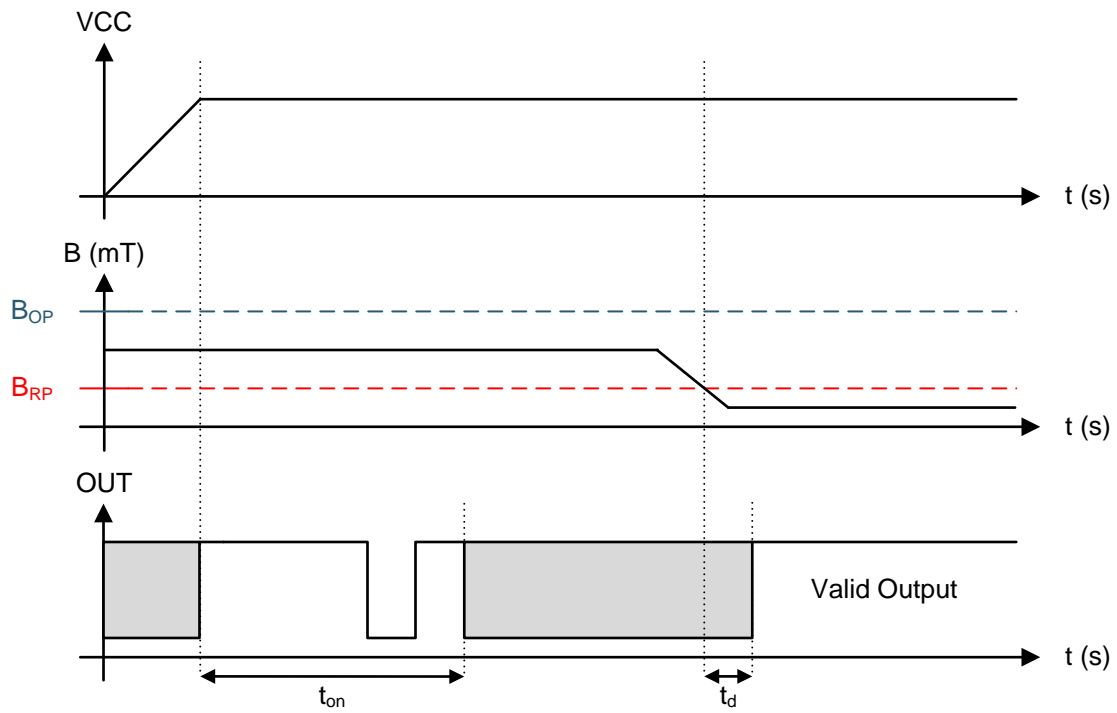


Figure 17. Case 4: Power On When $B_{RP} < B < B_{OP}$, Followed by $B < B_{RP}$

Feature Description (continued)

7.3.4 Output Stage

The DRV5023-Q1 output stage uses an open-drain NMOS, and it is rated to sink up to 30 mA of current. For proper operation, calculate the value of the pullup resistor R1 using [Equation 1](#).

$$\frac{V_{ref \max}}{30 \text{ mA}} \leq R1 \leq \frac{V_{ref \min}}{100 \mu\text{A}} \quad (1)$$

The size of R1 is a tradeoff between the OUT rise time and the current when OUT is pulled low. A lower current is generally better, however faster transitions and bandwidth require a smaller resistor for faster switching.

In addition, ensure that the value of R1 > 500 Ω to ensure the output driver can pull the OUT pin close to GND.

NOTE

V_{ref} is not restricted to V_{CC} . The allowable voltage range of this pin is specified in the [Absolute Maximum Ratings](#).

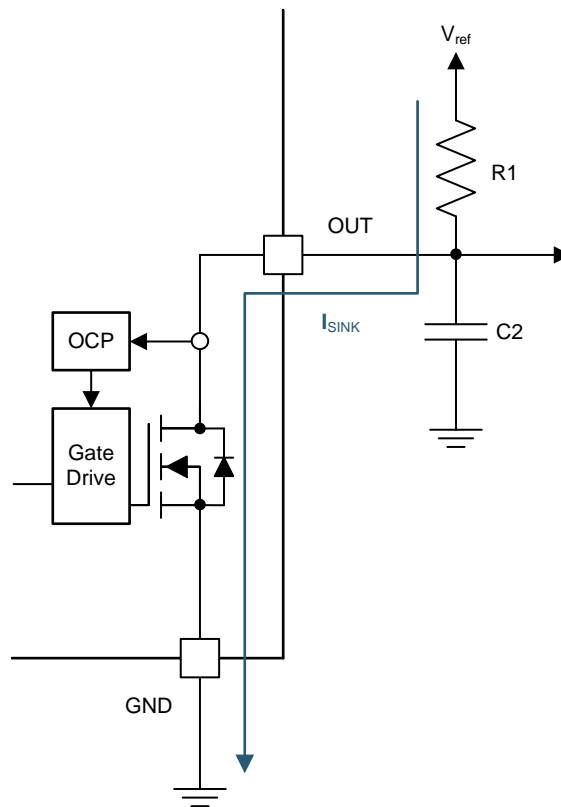


Figure 18.

Select a value for C2 based on the system bandwidth specifications as shown in [Equation 2](#).

$$2 \times f_{BW} \text{ (Hz)} < \frac{1}{2\pi \times R1 \times C2} \quad (2)$$

Most applications do not require this C2 filtering capacitor.

Feature Description (continued)

7.3.5 Protection Circuits

The DRV5023-Q1 device is fully protected against overcurrent and reverse-supply conditions.

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 DRV5023-Q1 device operates at DC V_{CC} conditions up to 38 V nominally, and can additionally withstand $V_{CC} = 40$ V. No current-limiting series resistor is required for this protection.

7.3.5.3 Reverse Supply Protection

The DRV5023-Q1 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	$V_{CC} \geq 2.7\text{ V}$

7.3.5.4 Output Jitter Characteristic

The DRV5023-Q1 propagation delay is not fully consistent. If a periodic magnetic field is applied, the device introduces a small amount of jitter on the output. The t_j parameter describes this characteristic and [Figure 19](#) shows the test waveform.

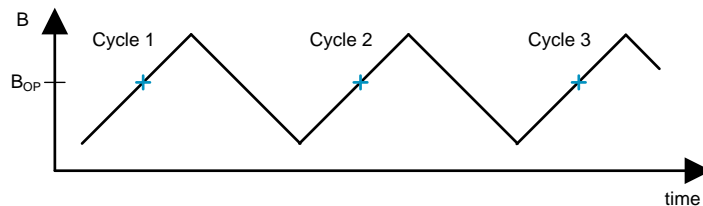


Figure 19. Test Waveform for t_j

7.4 Device Functional Modes

The DRV5023-Q1 device is active only when V_{CC} is between 2.7 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 DRV5023-Q1 device is used in magnetic-field sensing applications.

8.2 Typical Applications

8.2.1 Standard Circuit

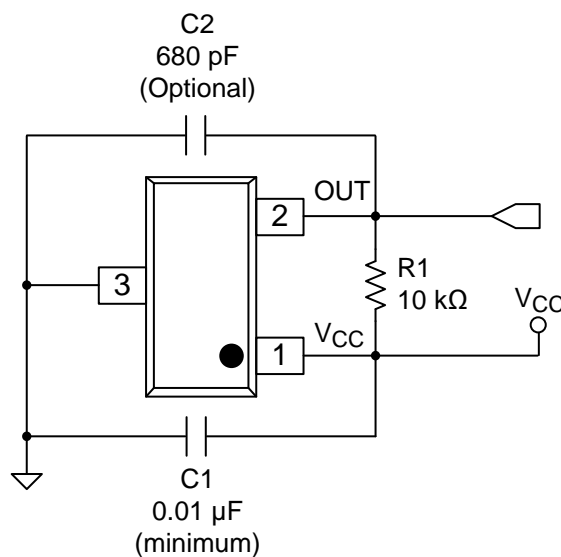


Figure 20. Typical Application Circuit

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
Supply voltage	V_{CC}	3.2 to 3.4 V
System bandwidth	f_{BW}	10 kHz

8.2.1.2 Detailed Design Procedure

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}
C2	OUT	GND	Optional: Place a ceramic capacitor to GND
R1	OUT	REF ⁽¹⁾	Requires a resistor pullup

(1) REF is not a pin on the DRV5023-Q1 device, but a REF supply-voltage pullup is required for the OUT pin; the OUT pin may be pulled up to V_{CC} .

8.2.1.2.1 Configuration Example

In a 3.3-V system, $3.2\text{ V} \leq V_{\text{ref}} \leq 3.4\text{ V}$. Use Equation 3 to calculate the allowable range for R1.

$$\frac{V_{\text{ref max}}}{30\text{ mA}} \leq R1 \leq \frac{V_{\text{ref min}}}{100\text{ }\mu\text{A}} \tag{3}$$

For this design example, use Equation 4 to calculate the allowable range of R1.

$$\frac{3.4\text{ V}}{30\text{ mA}} \leq R1 \leq \frac{3.2\text{ V}}{100\text{ }\mu\text{A}} \tag{4}$$

Therefore:

$$113\text{ }\Omega \leq R1 \leq 32\text{ k}\Omega \tag{5}$$

After finding the allowable range of R1 (Equation 5), select a value between 500 Ω and 32 k Ω for R1.

Assuming a system bandwidth of 10 kHz, use Equation 6 to calculate the value of C2.

$$2 \times f_{\text{BW}}\text{ (Hz)} < \frac{1}{2\pi \times R1 \times C2} \tag{6}$$

For this design example, use Equation 7 to calculate the value of C2.

$$2 \times 10\text{ kHz} < \frac{1}{2\pi \times R1 \times C2} \tag{7}$$

An R1 value of 10 k Ω and a C2 value less than 820 pF satisfy the requirement for a 10-kHz system bandwidth.

A selection of R1 = 10 k Ω and C2 = 680 pF would cause a low-pass filter with a corner frequency of 23.4 kHz.

8.2.1.3 Application Curves

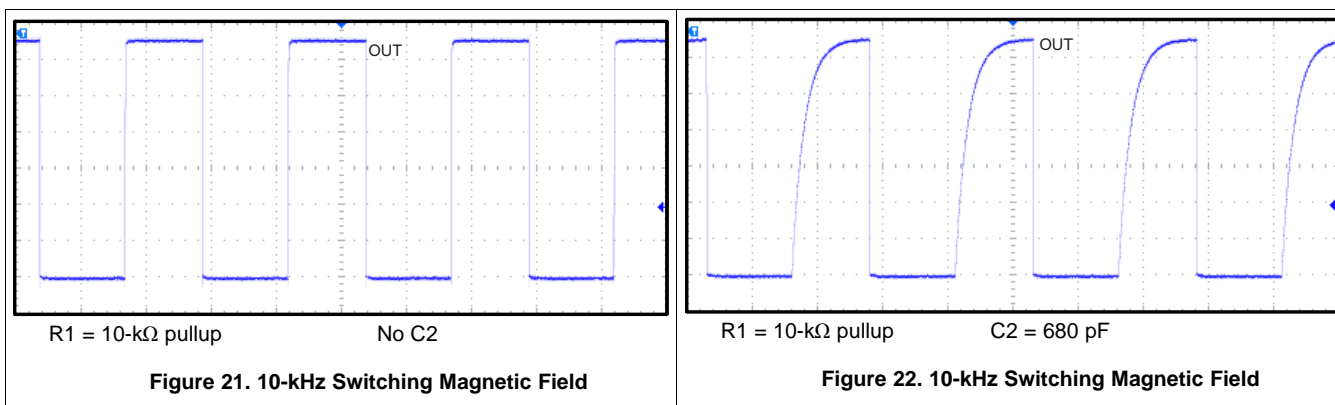


Figure 21. 10-kHz Switching Magnetic Field

Figure 22. 10-kHz Switching Magnetic Field

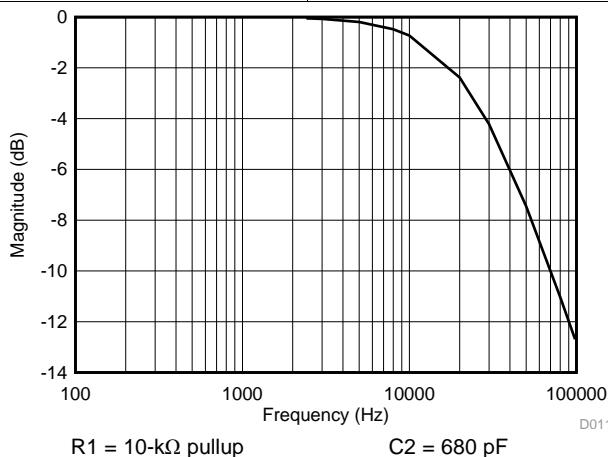


Figure 23. Low-Pass Filtering

8.2.2 Alternative Two-Wire Application

For systems that require minimal wire count, the device output can be connected to V_{CC} through a resistor, and the total supplied current can be sensed near the controller.

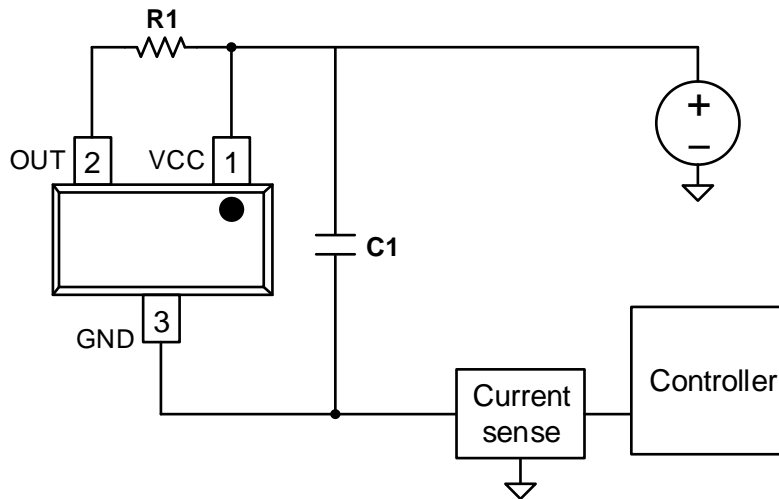


Figure 24. 2-Wire Application

Current can be sensed using a shunt resistor or other circuitry.

8.2.2.1 Design Requirements

Table 4 lists the related design parameters.

Table 4. Design Parameters

DESIGN PARAMETER	REFERENCE	EXAMPLE VALUE
Supply voltage	V_{CC}	12 V
OUT resistor	R1	1 k Ω
Bypass capacitor	C1	0.1 μ F
Current when $B < B_{RP}$	$I_{RELEASE}$	About 3 mA
Current when $B > B_{OP}$	$I_{OPERATE}$	About 15 mA

8.2.2.2 Detailed Design Procedure

When the open-drain output of the device is high-impedance, current through the path equals the I_{CC} of the device (approximately 3 mA).

When the output pulls low, a parallel current path is added, equal to $V_{CC} / (R1 + r_{DS(on)})$. Using 12 V and 1 k Ω , the parallel current is approximately 12 mA, making the total current approximately 15 mA.

The local bypass capacitor C1 should be at least 0.1 μ F, and a larger value if there is high inductance in the power line interconnect.

9 Power Supply Recommendations

The DRV5023-Q1 device is designed to operate from an input voltage supply (V_M) range between 2.7 and 38 V. A 0.01- μ F (minimum) ceramic capacitor rated for V_{CC} must be placed as close to the DRV5023-Q1 device as possible.

10 Layout

10.1 Layout Guidelines

The bypass capacitor should be placed near the DRV5023-Q1 device for efficient power delivery with minimal inductance. The external pullup resistor should be placed near the microcontroller input to provide the most stable voltage at the input; alternatively, an integrated pullup resistor within the GPIO of the microcontroller can be used.

Generally, using PCB copper planes underneath the DRV5023-Q1 device has no effect on magnetic flux, and does not interfere with device performance. This is because copper is not a ferromagnetic material. However, if nearby system components contain iron or nickel, they may redirect magnetic flux in unpredictable ways.

10.2 Layout Example

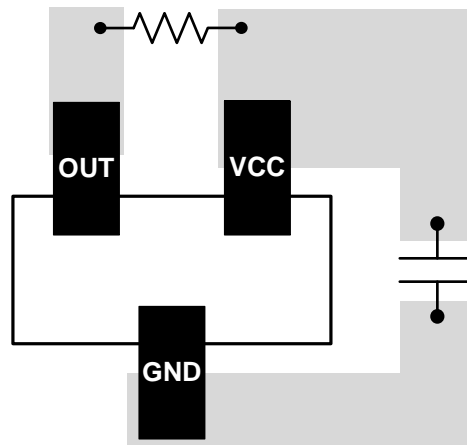


Figure 25. DRV5023-Q1 Layout Example

11 デバイスおよびドキュメントのサポート

11.1 デバイス・サポート

11.1.1 デバイスの項目表記

DRV5023-Q1デバイスの完全なデバイス名を読むための凡例を、[図 26](#)に示します。

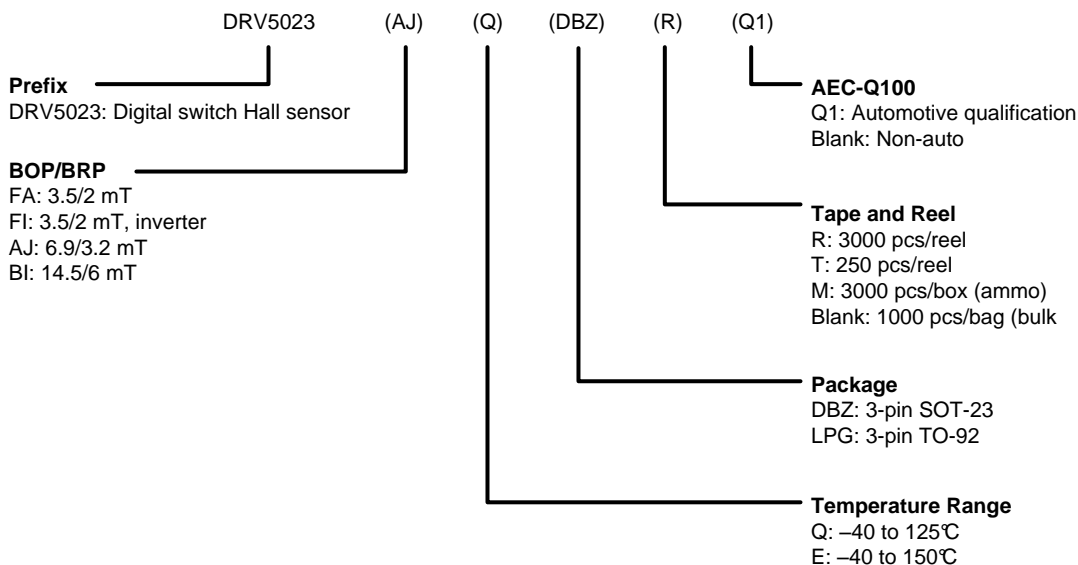


図 26. デバイス名の見方

11.1.2 デバイスのマーキング

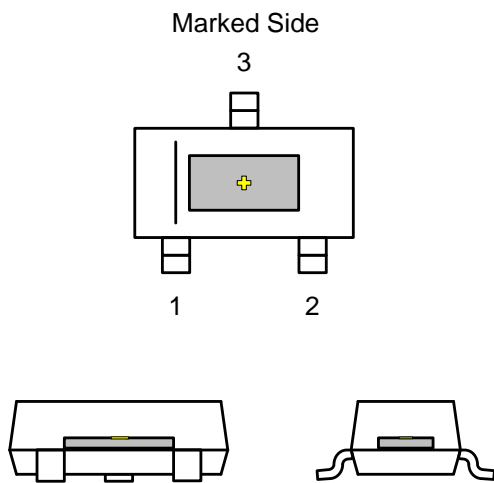


図 27. SOT-23 (DBZ)パッケージ

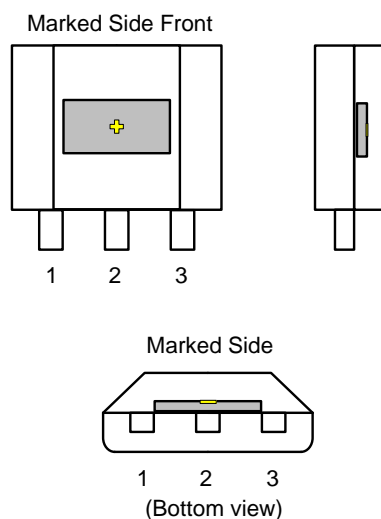


図 28. TO-92 (LPG)パッケージ

✦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。

11.2 ドキュメントのサポート

11.2.1 関連資料

関連資料については、以下を参照してください:

[『ホール効果センサの理解と適用』データシート](#)

11.3 ドキュメントの更新通知を受け取る方法

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11.4 コミュニティ・リソース

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11.7 Glossary

[SLYZ022](#) — *TI Glossary*.

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

12 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
DRV5023AJEDBZRQ1	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	NIPDAUAG	Level-1-260C-UNLIM	-40 to 150	+PJAJ	Samples
DRV5023AJEDBZTQ1	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 150	+PJAJ	
DRV5023AJELPGMQ1	ACTIVE	TO-92	LPG	3	3000	RoHS & Green	SN	N / A for Pkg Type	-40 to 150	+PJAJ	Samples
DRV5023AJELPGQ1	ACTIVE	TO-92	LPG	3	1000	RoHS & Green	SN	N / A for Pkg Type	-40 to 150	+PJAJ	Samples
DRV5023AJQDBZRQ1	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	+PKAJ	Samples
DRV5023AJQDBZTQ1	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	+PKAJ	
DRV5023AJQLPGMQ1	ACTIVE	TO-92	LPG	3	3000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	+PKAJ	Samples
DRV5023AJQLPGQ1	ACTIVE	TO-92	LPG	3	1000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	+PKAJ	Samples
DRV5023BIEDBZRQ1	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	NIPDAUAG	Level-1-260C-UNLIM	-40 to 150	+PJBI	Samples
DRV5023BIEDBZTQ1	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 150	+PJBI	
DRV5023BIELPGMQ1	ACTIVE	TO-92	LPG	3	3000	RoHS & Green	SN	N / A for Pkg Type	-40 to 150	+PJBI	Samples
DRV5023BIELPGQ1	ACTIVE	TO-92	LPG	3	1000	RoHS & Green	SN	N / A for Pkg Type	-40 to 150	+PJBI	Samples
DRV5023BIQDBZRQ1	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	+PKBI	Samples
DRV5023BIQDBZTQ1	OBSOLETE	SOT-23	DBZ	3		TBD	Call TI	Call TI	-40 to 125	+PKBI	
DRV5023BIQLPGMQ1	ACTIVE	TO-92	LPG	3	3000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	+PKBI	Samples
DRV5023BIQLPGQ1	ACTIVE	TO-92	LPG	3	1000	RoHS & Green	SN	N / A for Pkg Type	-40 to 125	+PKBI	Samples
DRV5023FAEDBZRQ1	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-1-260C-UNLIM	-40 to 150	+PJFA	Samples
DRV5023FIEDBZRQ1	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-1-260C-UNLIM	-40 to 150	+PJFI	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 ≤ 1000 ppm threshold. Antimony trioxide based flame retardants must also meet the ≤ 1000 ppm 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 DRV5023-Q1 :

- Catalog : [DRV5023](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

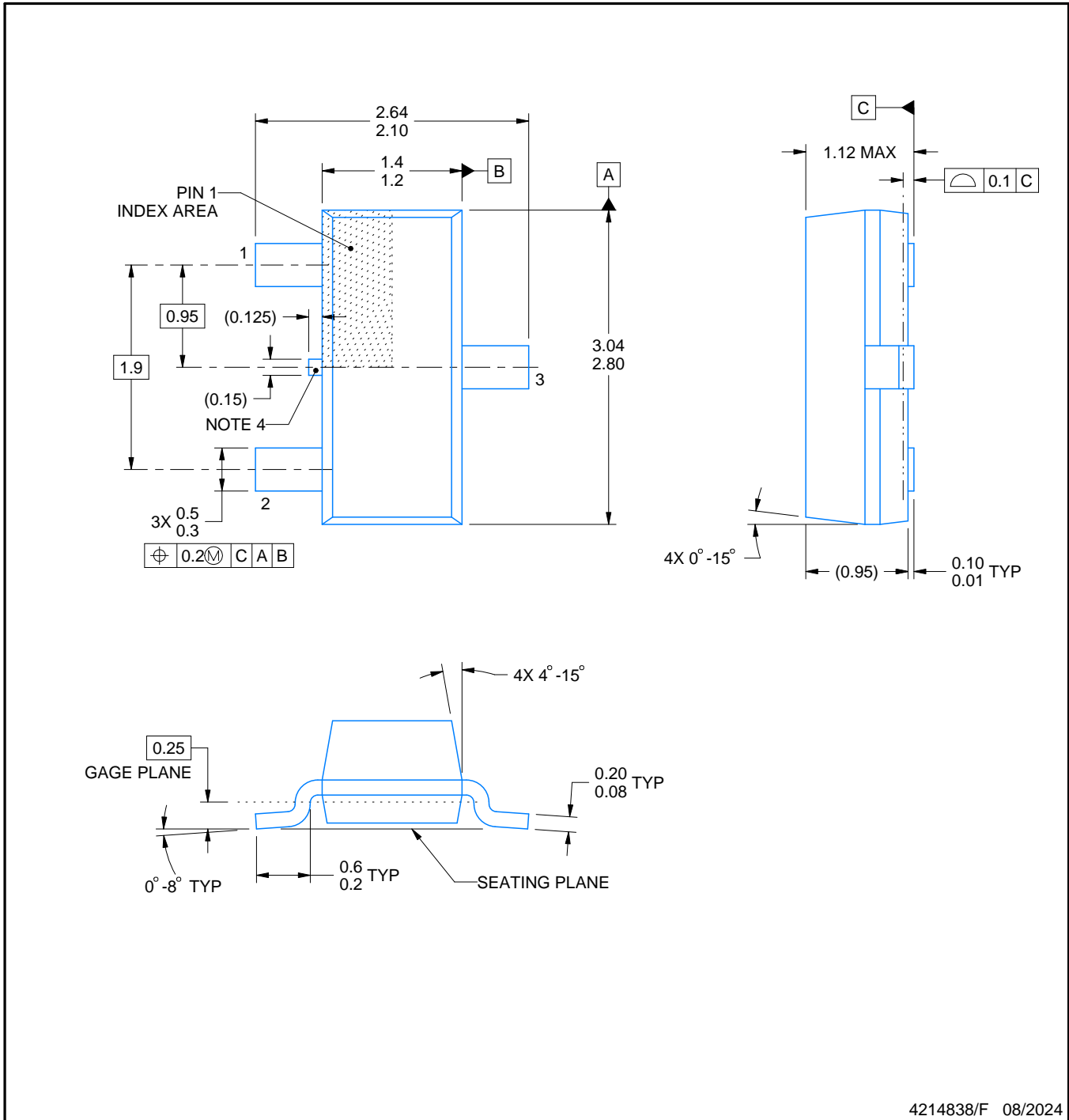
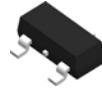

*All dimensions are nominal

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
DRV5023AJEDBZRQ1	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5023AJQDBZRQ1	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5023BIEDBZRQ1	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5023BIQDBZRQ1	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5023FAEDBZRQ1	SOT-23	DBZ	3	3000	180.0	8.4	3.15	2.77	1.22	4.0	8.0	Q3
DRV5023FIEDBZRQ1	SOT-23	DBZ	3	3000	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)
DRV5023AJEDBZRQ1	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5023AJQDBZRQ1	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5023BIEDBZRQ1	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5023BIQDBZRQ1	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5023FAEDBZRQ1	SOT-23	DBZ	3	3000	202.0	201.0	28.0
DRV5023FIEDBZRQ1	SOT-23	DBZ	3	3000	202.0	201.0	28.0



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

EXAMPLE BOARD LAYOUT

DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



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.

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/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.

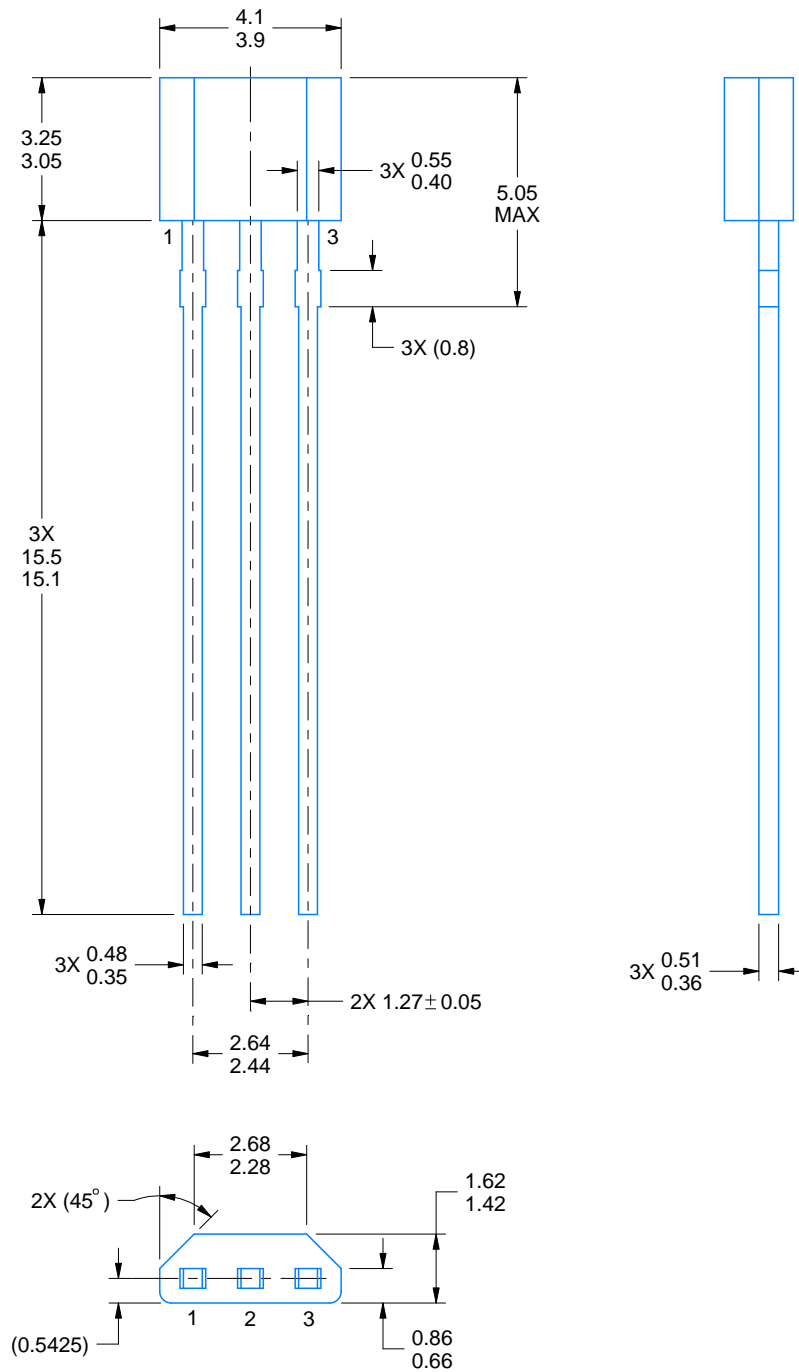
LPG0003A



PACKAGE OUTLINE

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



4221343/C 01/2018

NOTES:

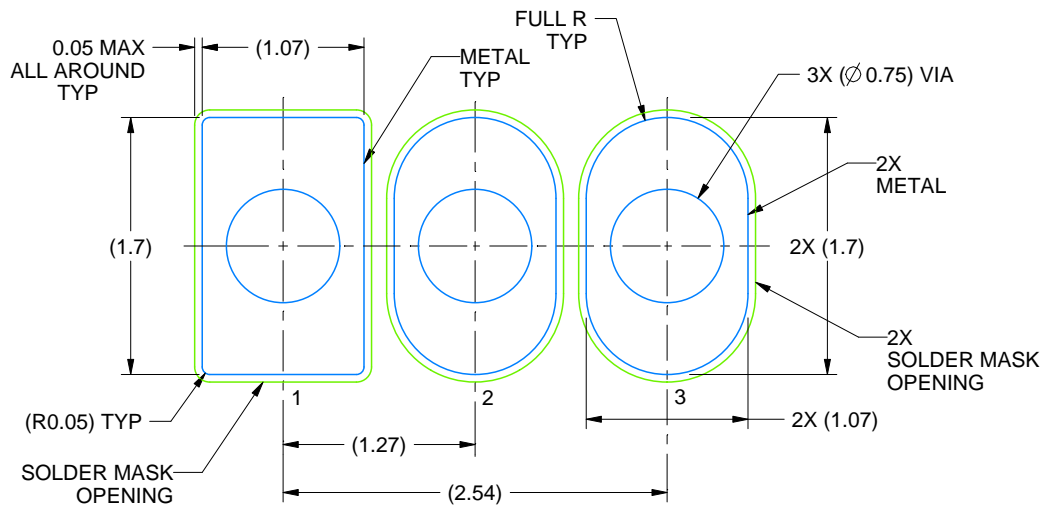
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

LPG0003A

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



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

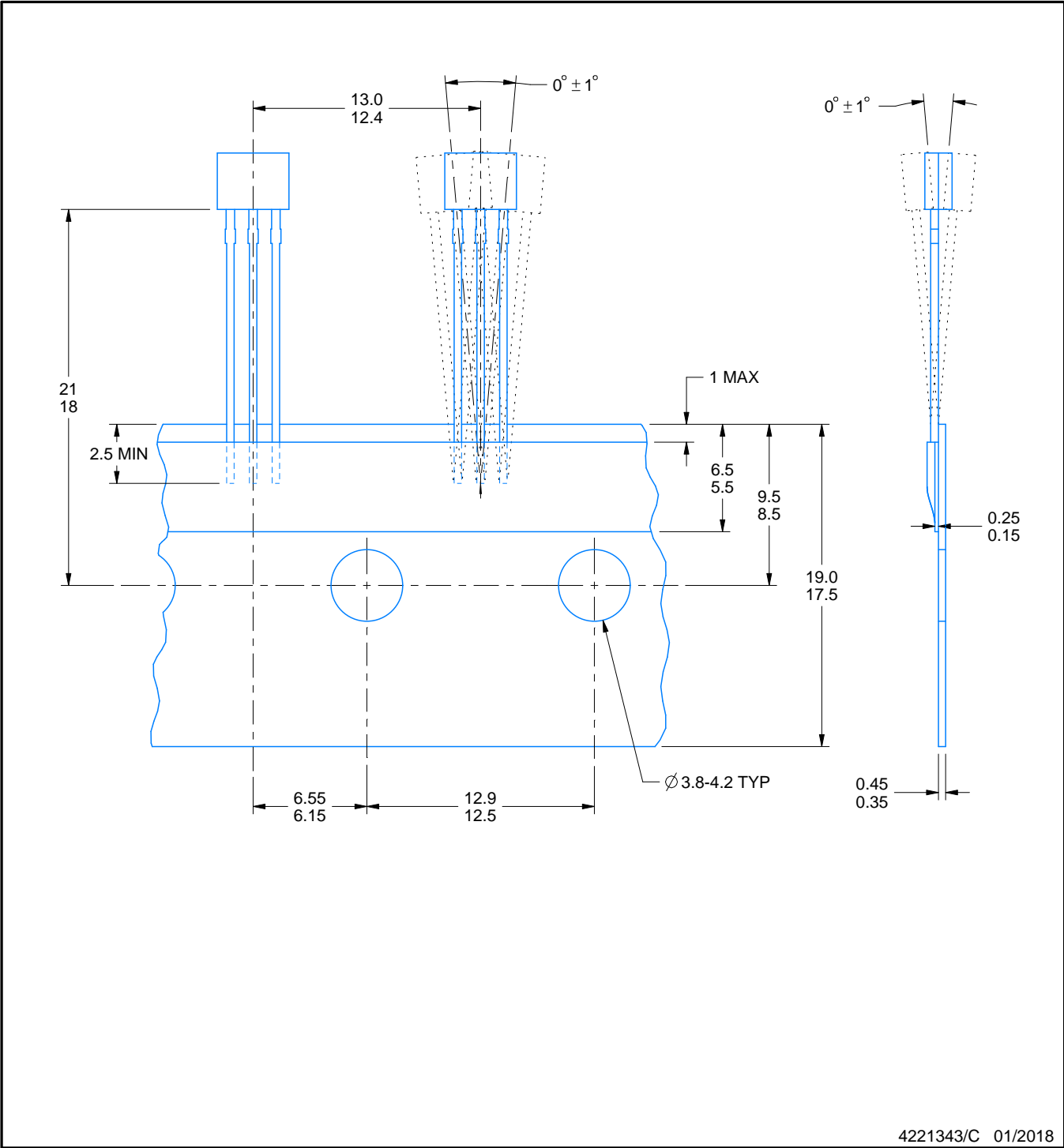
4221343/C 01/2018

TAPE SPECIFICATIONS

LPG0003A

TO-92 - 5.05 mm max height

TRANSISTOR OUTLINE



4221343/C 01/2018

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