

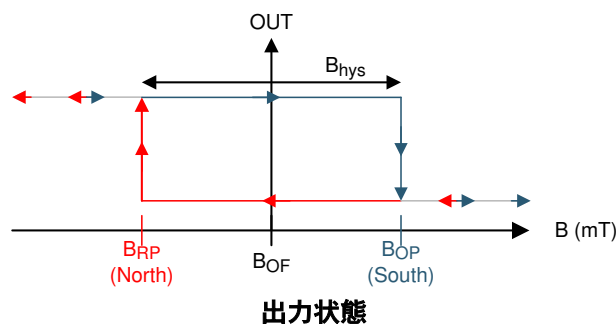
TMAG5115 高速、低ジッタ、ホール効果ラッチ

1 特長

- 高速デジタル双極性ラッチ ホール センサ
 - 小さい伝搬遅延: $5\mu\text{s}$
 - 低ジッタ: $5\mu\text{s}$
 - 帯域幅 (BW): 60kHz
- 広い電圧範囲をサポート:
 - $2.5\text{V}\sim 26\text{V}$
 - 外部レギュレータ不要
- 短いパワーオン時間: $62.5\mu\text{s}$
- 高精度スレッショルド:
 - $\pm 3\text{mT}$ (ばらつき $\pm 1\text{mT}$ 以下)
 - $\pm 1\text{mT}$ (ばらつき $\pm 0.7\text{mT}$ 以下)
- 保護機能:
 - 出力短絡保護
 - 出力電流制限
 - 過熱保護
- オープンドレイン出力 (15mA シンク)
- 広い動作温度範囲:
 - $-40^\circ\text{C}\sim 125^\circ\text{C}$
- 小さなパッケージと占有面積:
 - 表面実装の 3 ピン SOT-23
 - $2.92\text{mm} \times 2.37\text{mm}$

2 アプリケーション

- コードレス電動工具
- ロボット掃除機
- コンピュータ ファン
- バルブとソレノイドの状態
- 産業用ブラシレス DC モーター



3 概要

TMAG5115 デバイスは、高速伝搬遅延と低ジッタを実現する高性能ホール効果ラッチ センサです。このデバイスは温度範囲全体にわたって高い感度安定性を持ち、高い RPM を必要とするアプリケーション向けに設計された統合型保護機能も備えています。低ジッタと低伝搬遅延の組み合わせは、電力効率の向上やシステム レベルの寄生ノイズの低減に役立ちます。

15mA の電流シンク能力を持つオープンドレイン出力段を備えています。TMAG5115 は $2.5\text{V}\sim 26\text{V}$ の広い動作電圧範囲に対応し、産業用および商業用の幅広いアプリケーション向けに設計されています。出力短絡、過電流、過熱状態に対する内部保護機能が搭載されています。

TMAG5115 は業界標準の SOT-23 パッケージで供給されます。

パッケージ情報 (1)

部品番号	パッケージ	パッケージ サイズ ⁽²⁾
TMAG5115	DBZ (SOT-23, 3)	$2.92\text{mm} \times 2.37\text{mm}$

- 供給されているすべてのパッケージについては、[セクション 11](#) を参照してください。
- パッケージ サイズ (長さ \times 幅) は公称値であり、該当する場合はピンも含まれます。

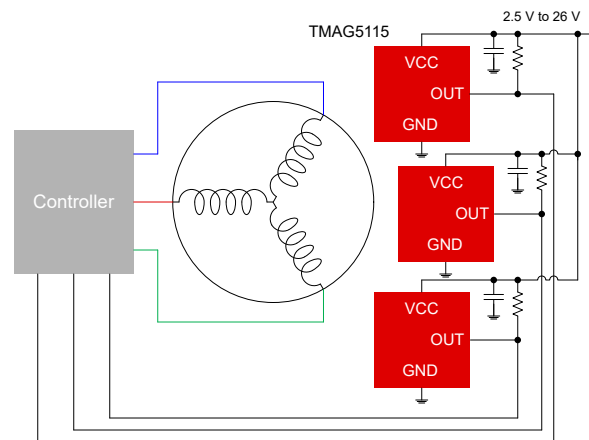


Table of Contents

1 特長	1	7.4 Device Functional Modes.....	14
2 アプリケーション	1	8 Application and Implementation	15
3 概要	1	8.1 Application Information.....	15
4 Device Comparison	3	8.2 Typical Applications.....	15
5 Pin Configuration and Functions	3	8.3 Power Supply Recommendations.....	18
6 Specifications	4	8.4 Layout.....	18
6.1 Absolute Maximum Ratings.....	4	9 Device and Documentation Support	19
6.2 ESD Ratings.....	4	9.1 Device Support.....	19
6.3 Recommended Operating Conditions.....	4	9.2 ドキュメントの更新通知を受け取る方法.....	19
6.4 Thermal Information.....	4	9.3 サポート・リソース.....	19
6.5 Electrical Characteristics.....	5	9.4 Trademarks.....	19
6.6 Magnetic Characteristics.....	5	9.5 静電気放電に関する注意事項.....	19
6.7 Typical Characteristics.....	6	9.6 用語集.....	19
7 Detailed Description	8	10 Revision History	20
7.1 Overview.....	8	11 Mechanical, Packaging, and Orderable Information	20
7.2 Functional Block Diagram.....	8		
7.3 Feature Description.....	9		

4 Device Comparison

表 4-1. Device Comparison

VERSION	TYPICAL THRESHOLD	TYPICAL HYSTERESIS	MAGNETIC RESPONSE	OUTPUT TYPE	SENSOR ORIENTATION	BANDWIDTH	PACKAGES AVAILABLE
TMAG5115A1C	1 mT	2 mT	Active Low	Open-drain	Z	60 kHz	SOT-23
TMAG5115B1C	3 mT	6 mT	Active Low	Open-drain	Z	60 kHz	SOT-23

5 Pin Configuration and Functions

For additional configuration information, see the [Mechanical, Packaging, and Orderable Information](#) section.

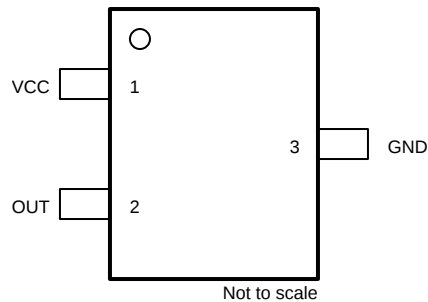


図 5-1. DBZ Package 3-Pin SOT-23 Top View

表 5-1. Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
GND	3	GND	Ground pin
OUT	2	O	Hall sensor open-drain output. Requires a resistor pullup, typically 10 kΩ.
V _{CC}	1	P	Supply pin. 2.5 V to 26 V. TI recommends to use a minimum 0.01-μF capacitor.

6 Specifications

6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V _{CC}	Power supply voltage	-0.3	30	V
I _{SINK}	Output sink current		30	mA
Magnetic flux density, B _{MAX}		Unlimited	Unlimited	T
Junction temperature, T _J		-65	150	°C
Storage temperature, T _{stg}		-65	150	°C

- (1) Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

6.2 ESD Ratings

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/ JEDEC JS-001 ⁽¹⁾	±2000	V
		Charged device model (CDM), ANSI/ESDA/ JEDEC JS-002 ⁽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 ⁽¹⁾	2.5	26	V
V _O	Output pin voltage	0	26	V
I _{SINK}	Output pin current sink	0	15	mA
T _A	Ambient temperature	-40	125	°C

- (1) Operating outside the [TMAG5115 Recommended Supply and Temperature Curve](#) can cause the device to enter a thermal shutdown state.

6.4 Thermal Information

THERMAL METRIC ⁽¹⁾		TMAG5115	UNIT
		DBZ (SOT-23)	
		3 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	208.2	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	102.3	°C/W
R _{θJB}	Junction-to-board thermal resistance	40.6	°C/W
Ψ _{JT}	Junction-to-top characterization parameter	9.7	°C/W
Ψ _{JB}	Junction-to-board characterization parameter	40.2	°C/W
R _{θJC(bot)}	Junction-to-case (bottom) thermal resistance	–	°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 SUPPLY						
I_{CC}	Operating supply current	$V_{CC} = 2.5\text{ V to }26\text{ V}$ $T_A = -40^\circ\text{C to }125^\circ\text{C}$		6	8	mA
t_{ON}	Power-on time			62.5		μs
P_{OS}	Power-on state	$V_{CC} > V_{CCmin}$ $t < t_{ON}$		High		
OUTPUT						
V_{OL}	Low-level output voltage	$I_{OL} = 5\text{ mA}$	0		0.7	V
I_{OH}	Output leakage current	$V_{CC} = 2.5\text{ V to }26\text{ V}$		0.1	1	μA
I_{SC}	Output short-circuit current protection		15	25	80	mA
t_R	Output rise time	$R_L = 10\text{ k}\Omega$ $C_L = 50\text{ pF}$ $V_{CC} = 12\text{ V}$		2		μs
t_F	Output fall time	$R_L = 10\text{ k}\Omega$ $C_L = 50\text{ pF}$ $V_{CC} = 12\text{ V}$		2		μs
t_{PD}	Propagation delay time			5	6	μs
Jitter	Output jitter window	1-kHz triangle magnetic wave with peak value at $\pm 8\text{ mT}$		5		μs
Jitter	Output jitter window	1-kHz square magnetic wave with peak value at $\pm 8\text{ mT}$		0.2		μs
Noise_{pp}	Internal Noise			125	200	μT
T_{SHUT}	Junction temperature shutdown threshold		156	168	180	$^\circ\text{C}$
T_{REC}	Junction temperature recovery threshold		131	143	155	$^\circ\text{C}$
FREQUENCY RESPONSE						
f_{CHOP}	Chopping frequency	TMAG5115xx		1000		kHz
f_{BW}	Signal bandwidth	TMAG5115xx		60		kHz

6.6 Magnetic Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
TMAG5115A						
B_{OP}	Magnetic field operating point	$V_{CC} = 2.5\text{ V to }26\text{ V}$	0.2	1	1.7	mT
B_{RP}	Magnetic field release point		-1.7	-1	-0.2	mT
B_{HYS}	Magnetic hysteresis $B_{OP} - B_{RP}$		0.4	2	3.4	mT
TMAG5115B						
B_{OP}	Magnetic field operating point	$V_{CC} = 2.5\text{ V to }26\text{ V}$	2	3	4	mT
B_{RP}	Magnetic field release point		-4	-3	-2	mT
B_{HYS}	Magnetic hysteresis $B_{OP} - B_{RP}$		4	6	8	mT

6.7 Typical Characteristics

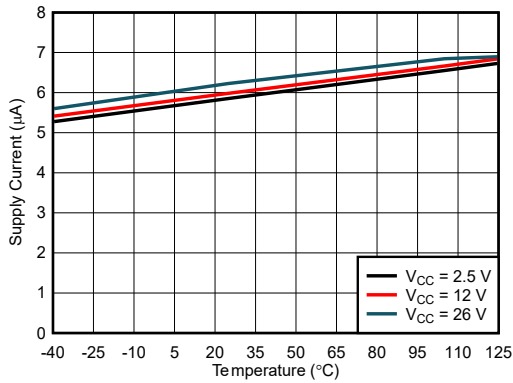
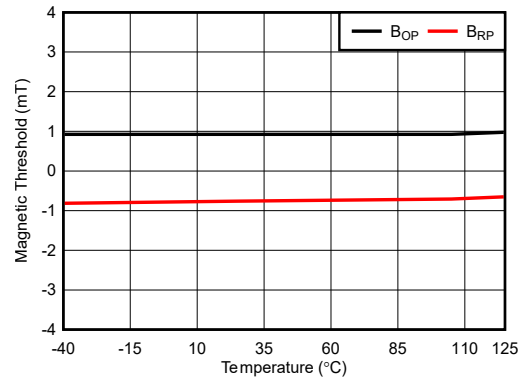
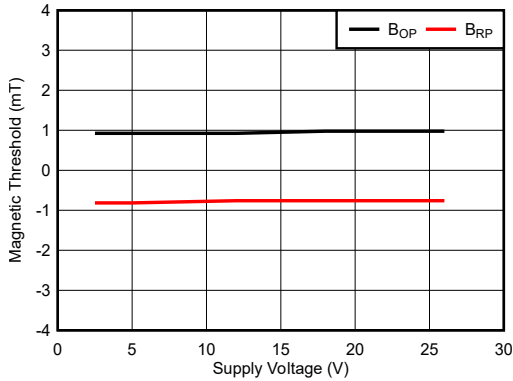


図 6-1. I_{CC} vs T_A



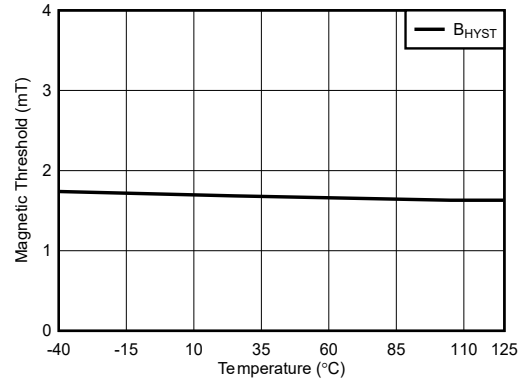
V_{CC} = 12 V

図 6-2. TMAG5115A B_{OP} and B_{RP} vs T_A



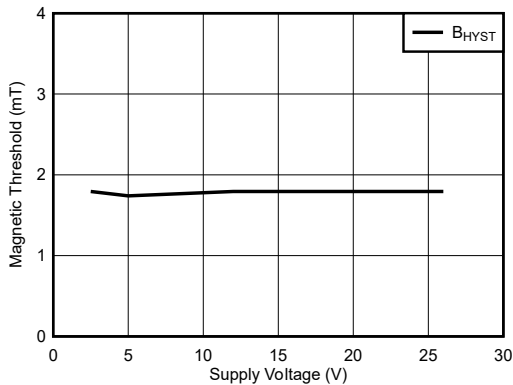
T_A = 25°C

図 6-3. TMAG5115A B_{OP} and B_{RP} vs V_{CC}



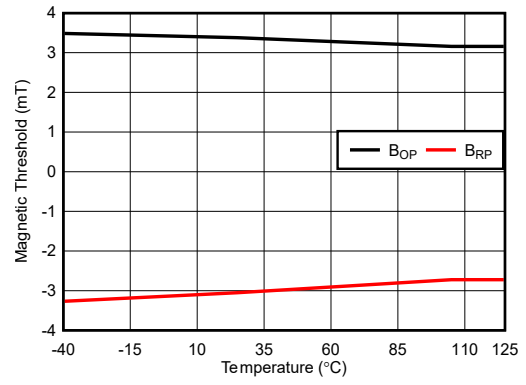
V_{CC} = 12 V

図 6-4. TMAG5115A B_{HYST} vs T_A



T_A = 25°C

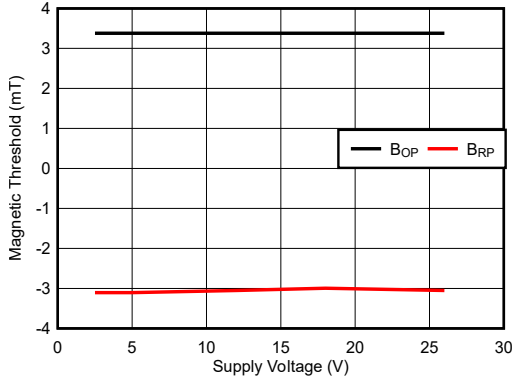
図 6-5. TMAG5115A B_{HYST} vs V_{CC}



V_{CC} = 12 V

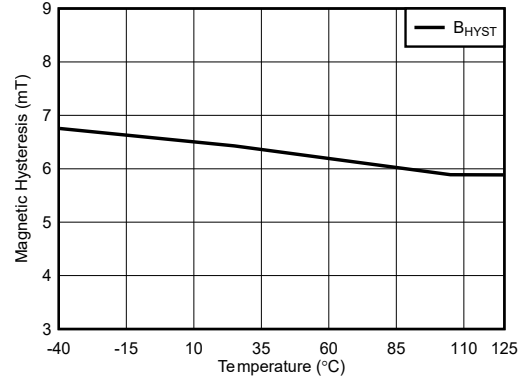
図 6-6. TMAG5115B B_{OP} and B_{RP} vs T_A

6.7 Typical Characteristics (continued)



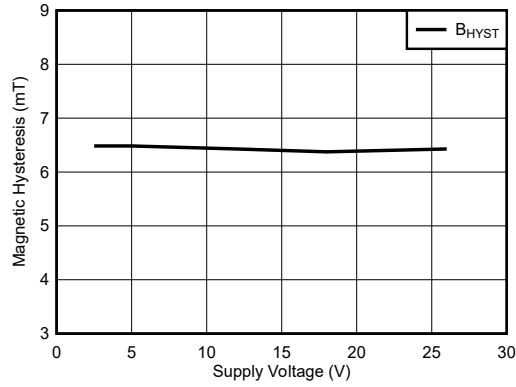
T_A = 25°C

图 6-7. TMAG5115B B_{OP} and B_{RP} vs V_{CC}



V_{CC} = 12 V

图 6-8. TMAG5115B B_{HYST} vs T_A



T_A = 25°C

图 6-9. TMAG5115B B_{HYST} vs V_{CC}

7 Detailed Description

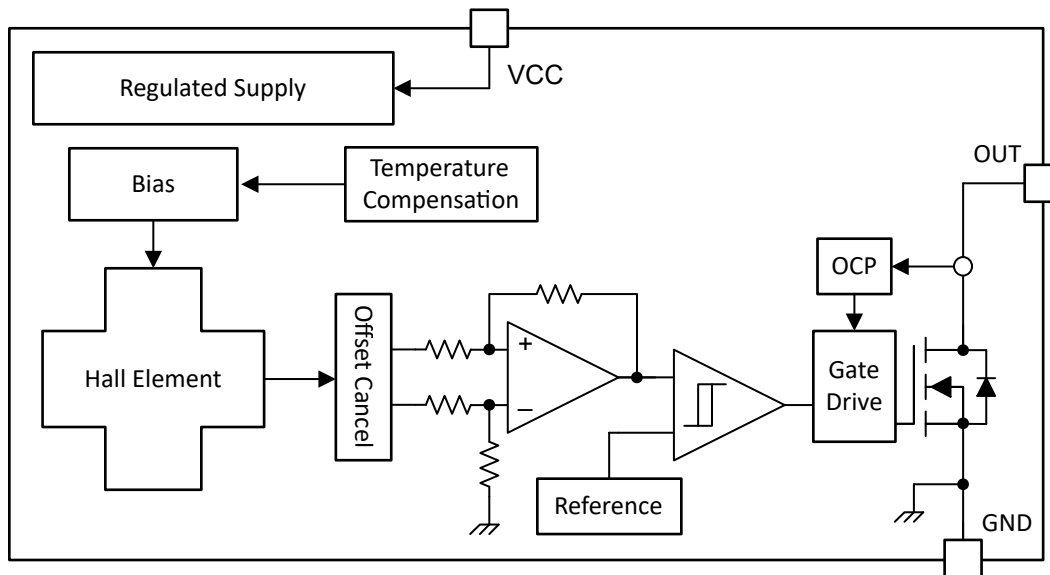
7.1 Overview

The TMAG5115 is a chopper-stabilized Hall sensor with a digital latched output for magnetic sensing applications. The TMAG5115 device can be powered with a supply voltage between 2.5 V and 26 V. The field polarity is defined as follows: a south pole near the marked side of the package is a positive magnetic field, and 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. A south pole near the marked side of the package causes the output to pull low (operate point, B_{OP}), and a north pole near the marked side of the package causes the output to release (release point, B_{RP}). Hysteresis is included in between the operate point and the release point therefore magnetic-field noise does not accidentally trip the output.

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 to allow for easier interfacing with controller circuits.

7.2 Functional Block Diagram



7.3 Feature Description

7.3.1 Field Direction Definition

Figure 7-1 shows the positive magnetic field defined as a south pole near the marked side of the package and the negative magnetic field defined as a north pole near the marked side of the package.

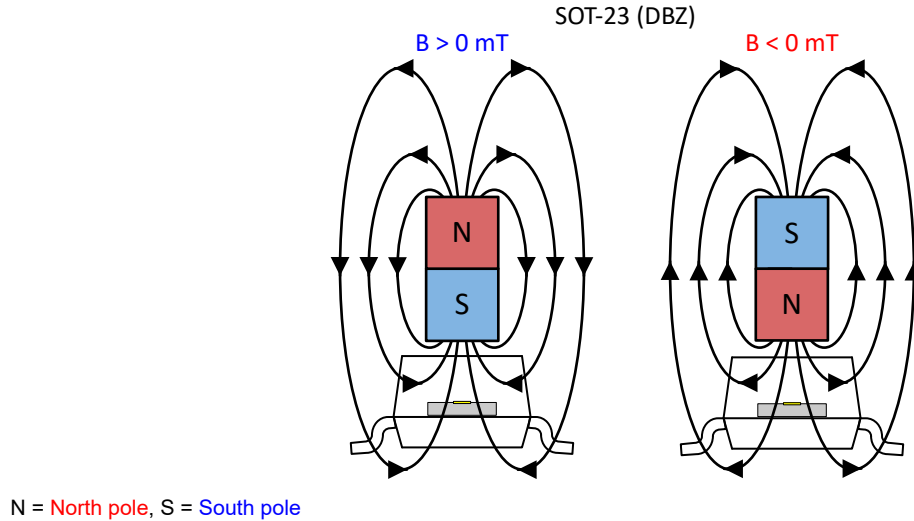


Figure 7-1. Field Direction Definition

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. 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.

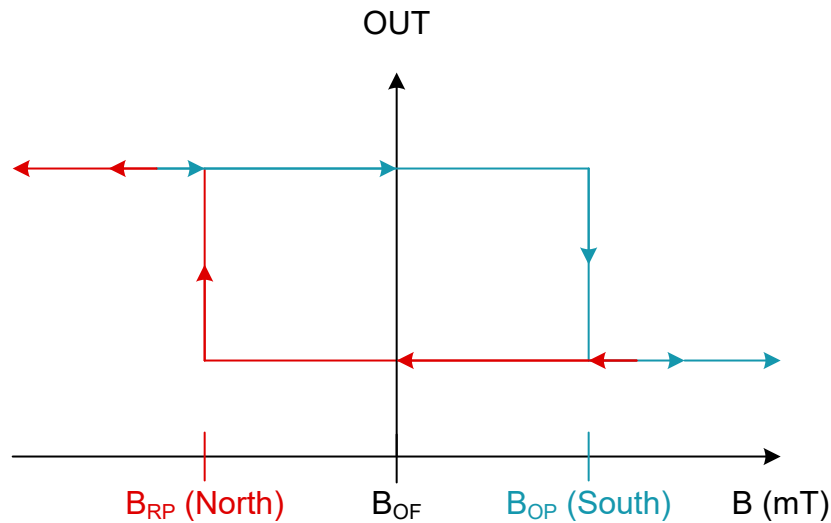


Figure 7-2. TMAG5115 $B_{OP} > 0$

7.3.3 Power-On Time

After applying V_{CC} to the TMAG5115, 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 7-3](#) and [Figure 7-4](#) occurs at the end of t_{on} . This pulse can allow the host processor to determine when the TMAG5115 output is valid after start-up. In Case 1 ([Figure 7-3](#)) and Case 2 ([Figure 7-4](#)), the output is defined assuming a constant magnetic field $B > B_{OP}$ and $B < B_{RP}$.

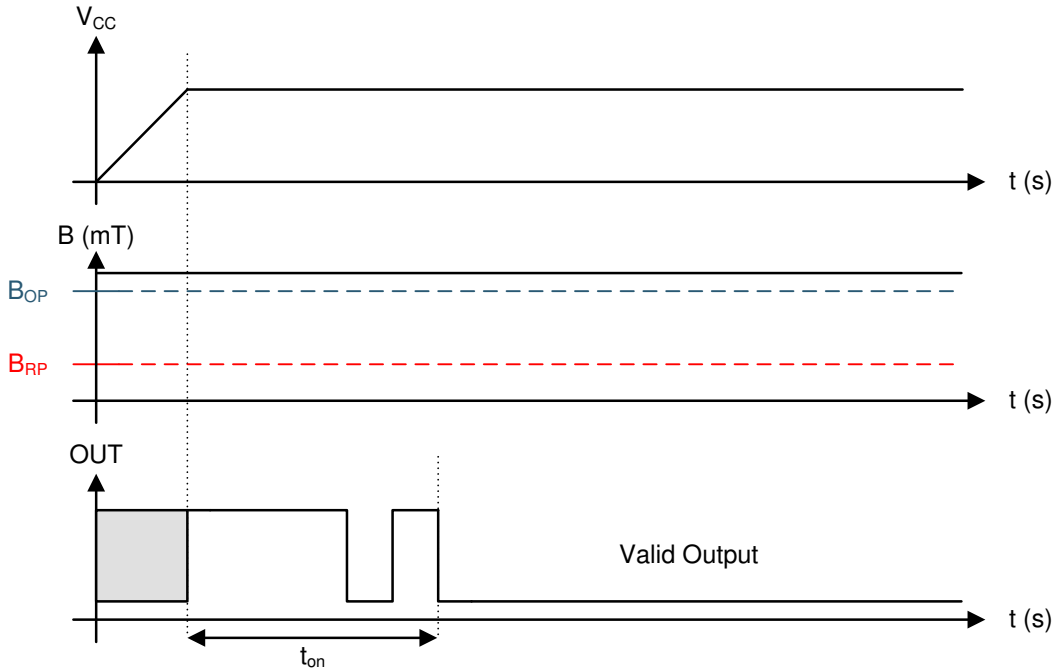


Figure 7-3. Case 1: Power On When $B > B_{OP}$

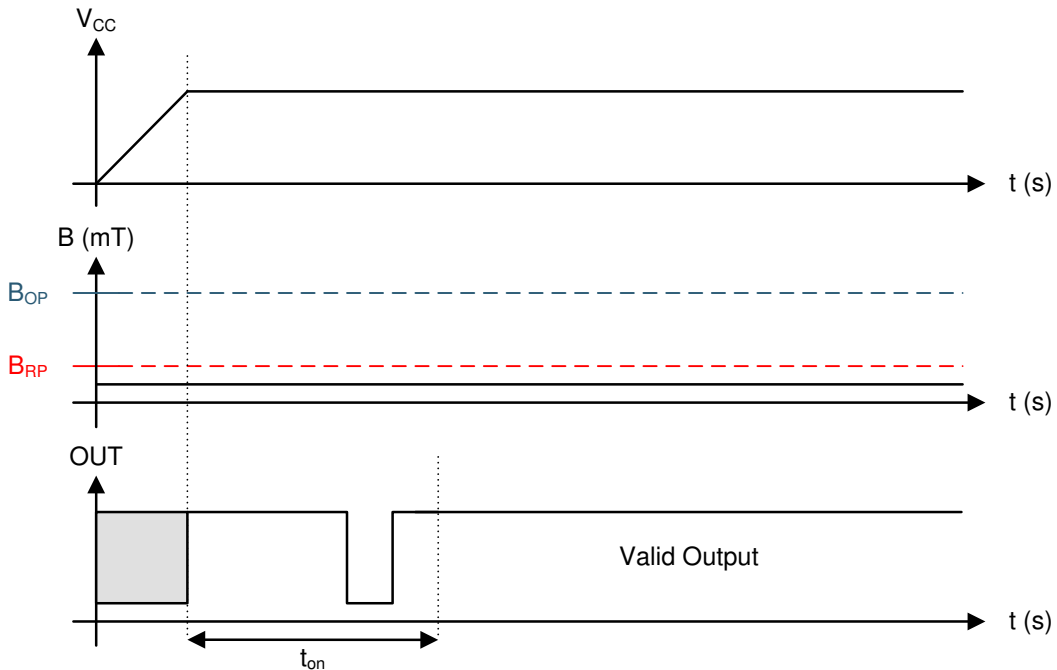


Figure 7-4. Case 2: Power On When $B < B_{RP}$

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 7-5) and Case 4 (Figure 7-6) show examples of this behavior.

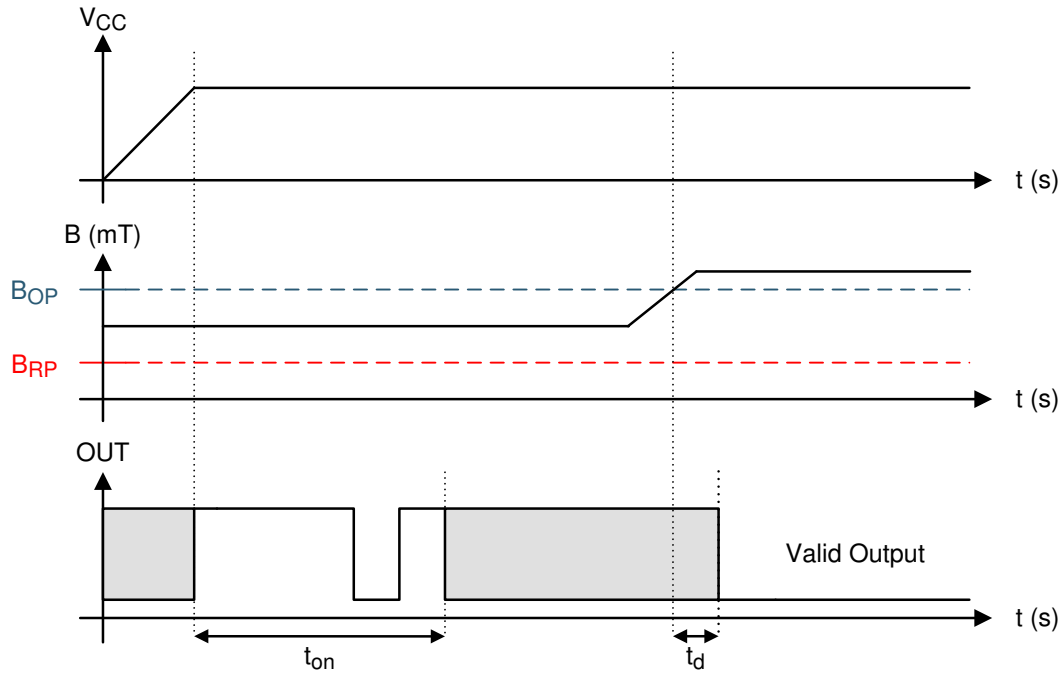


Figure 7-5. Case 3: Power On When $B_{RP} < B < B_{OP}$, Followed by $B > B_{OP}$

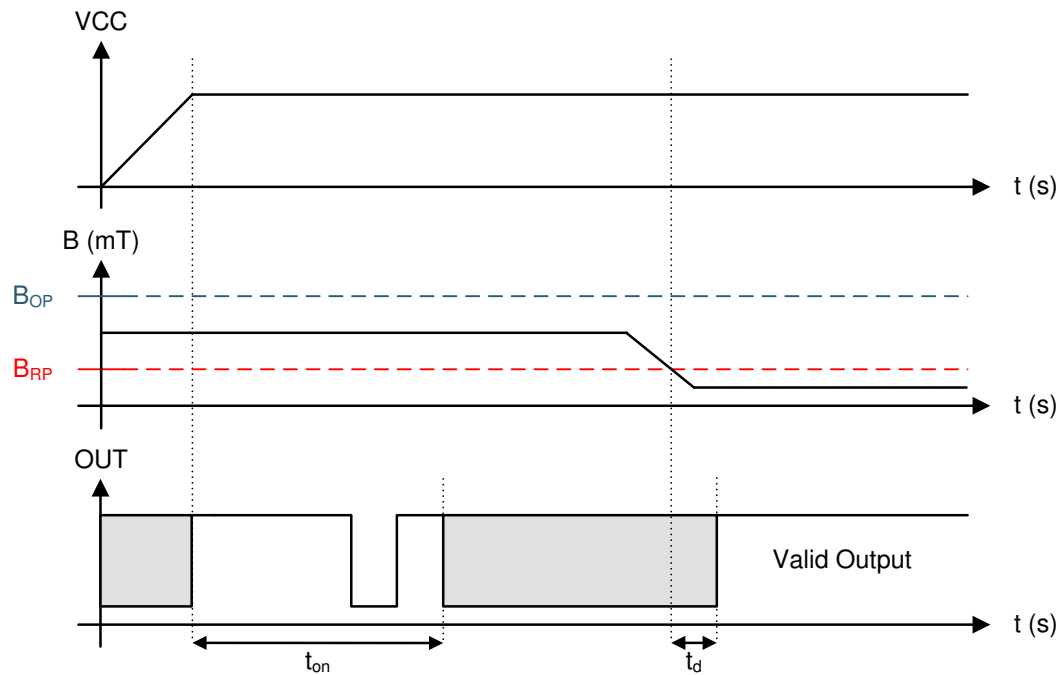


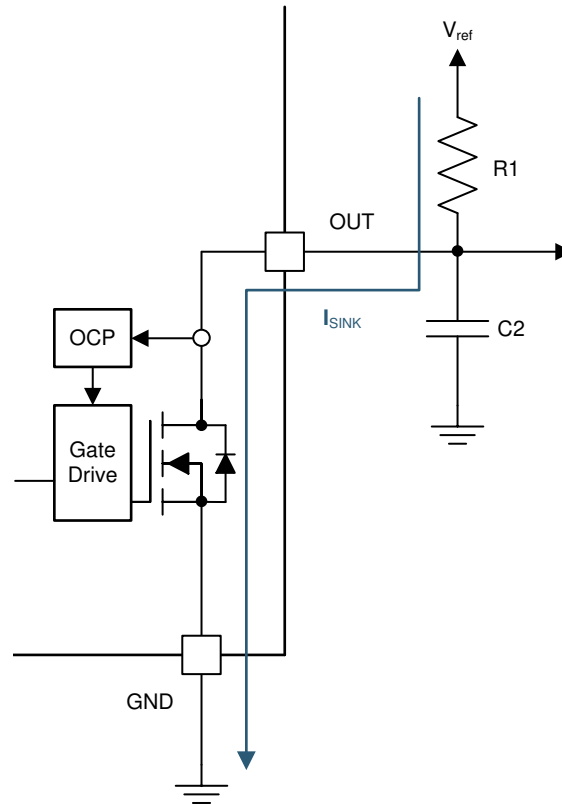
Figure 7-6. Case 4: Power On When $B_{RP} < B < B_{OP}$, Followed by $B < B_{RP}$

7.3.4 Output Stage

☒ 7-7 shows the TMAG5115 open-drain NMOS output structure, rated to sink up to 15 mA of current.

注

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



☒ 7-7. NMOS Open-Drain Output

Select a value for C2 based on the system bandwidth specifications as shown in 式 1.

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

Most applications do not require this C2 filtering capacitor.

7.3.5 Protection Circuits

The TMAG5115 device is fully protected against overcurrent and overtemperature conditions. 表 7-1 lists a summary of the protection circuits.

表 7-1. Protection Circuit Summary

FAULT	CONDITION	DEVICE	DESCRIPTION	RECOVERY
FET overload	$I_{SINK} \geq I_{SC}$	Operating	Output current is clamped to I_{SC}	$I_{SINK} < I_{SC}$
Overtemperature	$T_J \geq 156^\circ\text{C}$	Operating	Device shuts down until recovery temperature is reached	$T_J \leq 156^\circ\text{C}$

7.3.5.1 Short-Circuit Protection

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

7.3.5.2 Overtemperature Protection

The TMAG5115 features overtemperature protection to prevent damage to the device and system in the case of runaway thermal heating. If the output is short-circuited, there will be greater power dissipation through the device causing the junction temperature to rise. If the temperature rises to above the limits specified in the [Electrical Characteristics](#) table, the device will enter a thermal shutdown and the OUT pin will turn to Hi-Z regardless of the current magnetic field detected.

The TMAG5115 thermal shutdown can be differentiated from normal operation by viewing the supply current into the device. While in thermal shutdown, the supply current is lower than normal operation.

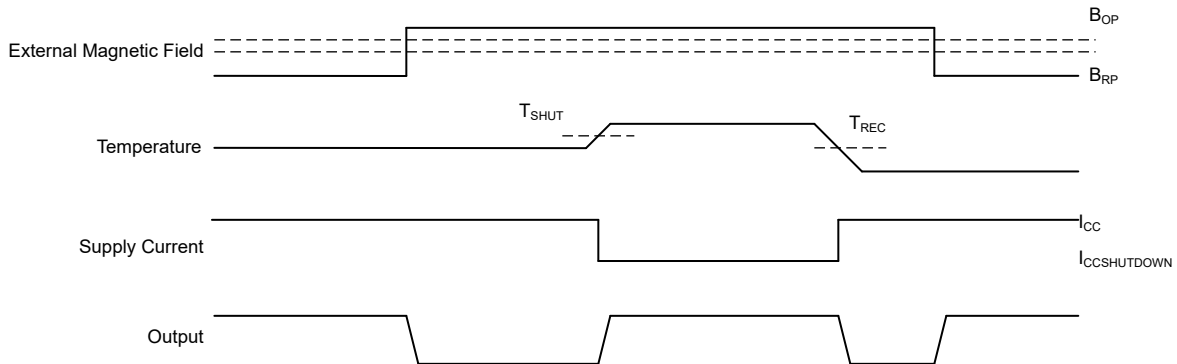


図 7-8. TMAG5115 Overtemperature Protection Diagram

The TMAG5115 can support a supply voltage of 2.5 V to 26 V. Higher temperature and supply conditions can increase the junction temperature of the device, however, which can exceed the thermal shutdown limit. This can cause a device shutdown. TI recommends to not exceed a temperature and supply combination shown in 図 7-9.

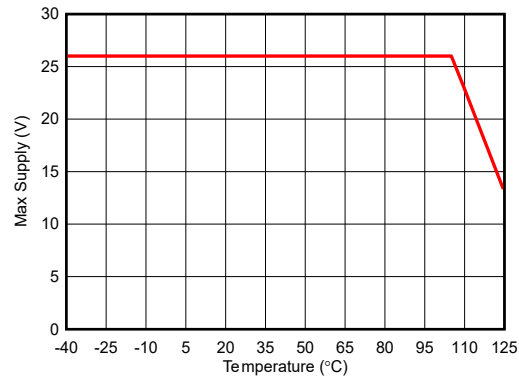


図 7-9. TMAG5115 Recommended Supply and Temperature Curve

7.4 Device Functional Modes

The TMAG5115 is active only when V_{CC} is between 2.5 V and 26 V and T_J is less than 156°C.

8 Application and Implementation

注

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

8.1 Application Information

The TMAG5115 is used in magnetic position sensing applications. The device features a high-speed architecture to facilitate precise field measurement. With latching magnetic characteristics, the output is turned low or high respectively with a sufficiently strong south or north pole facing the package top side. When removing the magnetic field, the device keeps its previous state.

For reliable functionality, the magnet must apply a flux density at the sensor greater than the corresponding maximum B_{OP} or B_{RP} numbers specified in the [Magnetic Characteristics](#) table. Add additional margin to account for mechanical tolerance, temperature effects, and magnet variation.

8.2 Typical Applications

8.2.1 Standard Circuit

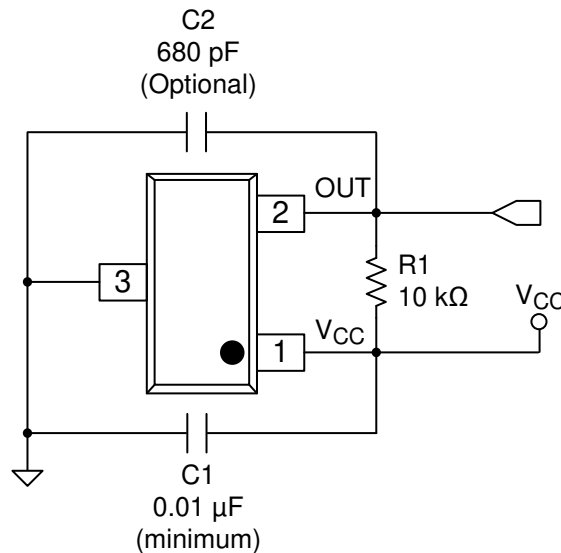


図 8-1. Typical Application Circuit

8.2.1.1 Design Requirements

For this design example, use the parameters listed in [表 8-1](#) as the input parameters.

表 8-1. Design Parameters

DESIGN PARAMETER	REFERENCE	EXAMPLE VALUE
Supply voltage	V_{CC}	3.0 V to 3.6 V
System bandwidth	f_{BW}	10 kHz

8.2.1.2 Detailed Design Procedure

表 8-2. External Components

COMPONENT	PIN 1	PIN 2	RECOMMENDED
C1	V _{CC}	GND	A 0.01-μF (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 TMAG5115 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, $3.0\text{ V} \leq V_{\text{ref}} \leq 3.6\text{ V}$. Use 式 2 to calculate the allowable range for R1.

$$\frac{V_{\text{ref max}}}{30\text{ mA}} \leq R1 \leq \frac{V_{\text{ref min}}}{100\text{ }\mu\text{A}} \quad (2)$$

For this design example, use 式 3 to calculate the allowable range of R1.

$$\frac{3.4\text{ V}}{30\text{ mA}} \leq R1 \leq \frac{3.2\text{ V}}{100\text{ }\mu\text{A}} \quad (3)$$

Therefore:

$$120\text{ }\Omega \leq R1 \leq 30\text{ k}\Omega \quad (4)$$

After finding the allowable range of R1 (式 4), select a value between 500 Ω and 32 kΩ for R1.

Assuming a system bandwidth of 10 kHz, use 式 5 to calculate the value of C2.

$$2 \times f_{\text{BW}} (\text{Hz}) < \frac{1}{2\pi \times R1 \times C2} \quad (5)$$

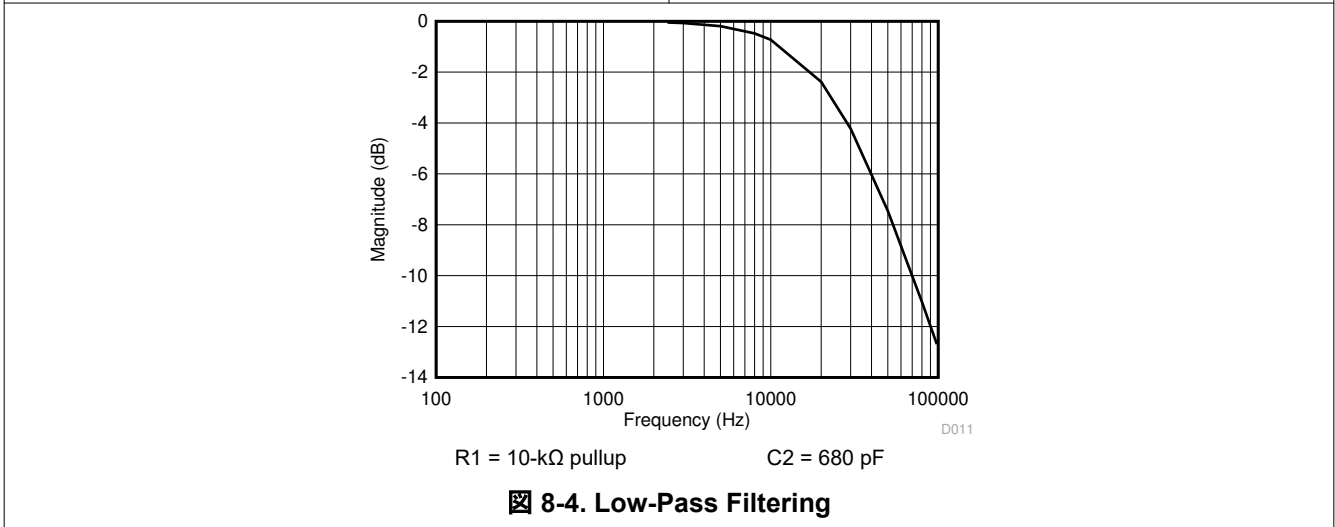
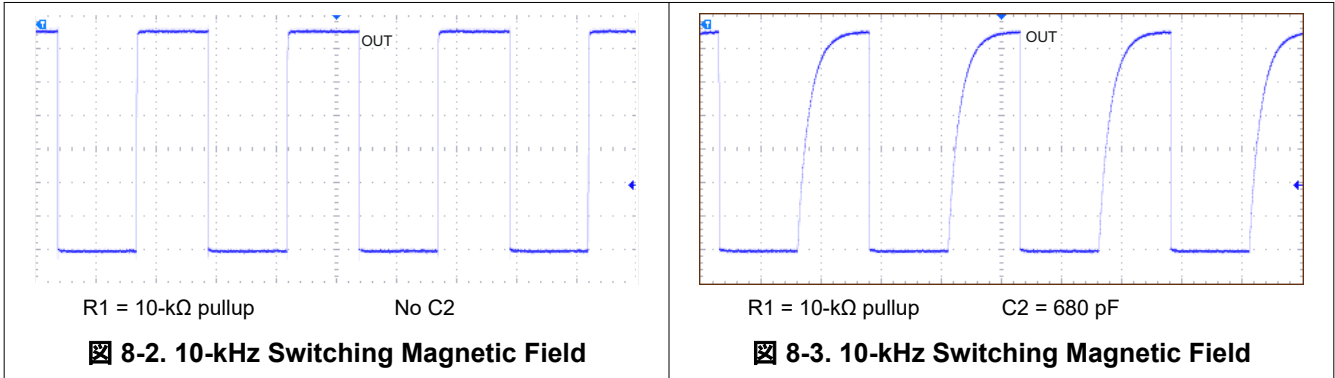
For this design example, use 式 6 to calculate the value of C2.

$$2 \times 10\text{ kHz} < \frac{1}{2\pi \times R1 \times C2} \quad (6)$$

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

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

8.2.1.3 Application Curves



8.3 Power Supply Recommendations

The TMAG5115 device is designed to operate from an input voltage supply range between 2.5 V and 26 V. A recommended 0.1- μF ceramic capacitor rated for V_{CC} must be placed as close to the TMAG5115 as possible. Bypass capacitor values larger than 0.1 μF may be required to attenuate any significant high-frequency ripple and noise components generated by the power source. TI recommends limiting the supply voltage variation to less than 50 mV_{PP}.

8.4 Layout

8.4.1 Layout Guidelines

TI recommends placing the bypass capacitor near the TMAG5115 device for efficient power delivery with minimal inductance. TI recommends placing the external pullup resistor 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 TMAG5115 device has no effect on magnetic flux and does not interfere with device performance. This is because copper is not a ferromagnetic material. However, nearby system components that contain iron or nickel can redirect magnetic flux in unpredictable ways.

8.4.2 Layout Example

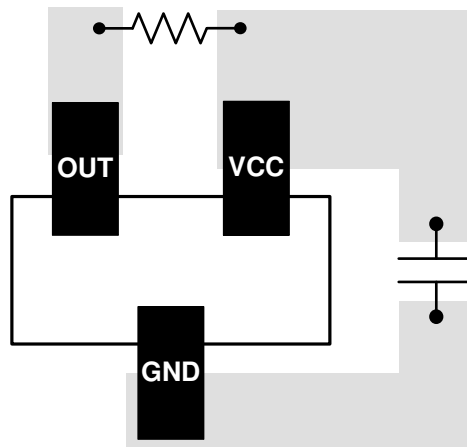


图 8-5. TMAG5115 Layout Example

9 Device and Documentation Support

9.1 Device Support

9.1.1 Hall Sensor Location

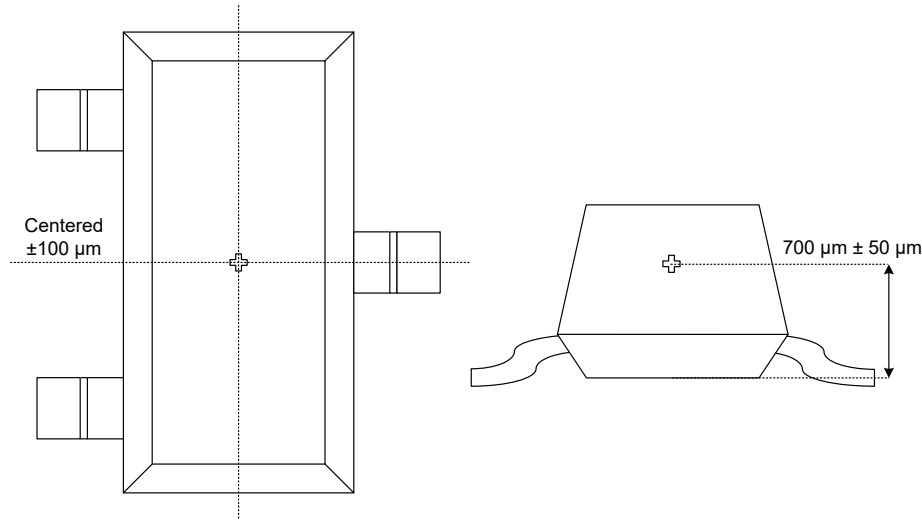


図 9-1. Hall Sensor Location (Not to Scale)

9.2 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。

9.3 サポート・リソース

テキサス・インスツルメンツ E2E™ サポート・フォーラムは、エンジニアが検証済みの回答と設計に関するヒントをエキスパートから迅速かつ直接得ることができる場所です。既存の回答を検索したり、独自の質問をしたりすることで、設計に必要な支援を迅速に得ることができます。

リンクされているコンテンツは、各寄稿者により「現状のまま」提供されるものです。これらはテキサス・インスツルメンツの仕様を構成するものではなく、必ずしもテキサス・インスツルメンツの見解を反映したものではありません。テキサス・インスツルメンツの[使用条件](#)を参照してください。

9.4 Trademarks

テキサス・インスツルメンツ E2E™ is a trademark of Texas Instruments.

すべての商標は、それぞれの所有者に帰属します。

9.5 静電気放電に関する注意事項



この IC は、ESD によって破損する可能性があります。テキサス・インスツルメンツは、IC を取り扱う際には常に適切な注意を払うことを推奨します。正しい取り扱いおよび設置手順に従わない場合、デバイスを破損するおそれがあります。

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。

9.6 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。

10 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 A (February 2023) to Revision B (August 2024)	Page
• 測定値の単位と値の間のスペースを削除.....	1
• 「製品情報」表を「パッケージ情報」に変更	1
• Changed the typical threshold and typical hysteresis values in the <i>Device Comparison</i> table to correctly match the values found in the <i>Magnetic Characteristics</i> table.....	3

Changes from Revision * (December 2022) to Revision A (February 2023)	Page
• Added <i>Device Comparison</i> table.....	3
• Added TMAG5115A magnetic specifications.....	5
• Added typical characteristic curves for TMAG5115A.....	6

11 Mechanical, Packaging, and Orderable Information

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

重要なお知らせと免責事項

テキサス・インスツルメンツは、技術データと信頼性データ (データシートを含みます)、設計リソース (リファレンス デザインを含みます)、アプリケーションや設計に関する各種アドバイス、Web ツール、安全性情報、その他のリソースを、欠陥が存在する可能性のある「現状のまま」提供しており、商品性および特定目的に対する適合性の黙示保証、第三者の知的財産権の非侵害保証を含むいかなる保証も、明示的または黙示的にかかわらず拒否します。

これらのリソースは、テキサス・インスツルメンツ製品を使用する設計の経験を積んだ開発者への提供を意図したものです。(1) お客様のアプリケーションに適した テキサス・インスツルメンツ製品の選定、(2) お客様のアプリケーションの設計、検証、試験、(3) お客様のアプリケーションに該当する各種規格や、その他のあらゆる安全性、セキュリティ、規制、または他の要件への確実な適合に関する責任を、お客様のみが単独で負うものとします。

上記の各種リソースは、予告なく変更される可能性があります。これらのリソースは、リソースで説明されている テキサス・インスツルメンツ製品を使用するアプリケーションの開発の目的でのみ、テキサス・インスツルメンツはその使用をお客様に許諾します。これらのリソースに関して、他の目的で複製することや掲載することは禁止されています。テキサス・インスツルメンツや第三者の知的財産権のライセンスが付与されている訳ではありません。お客様は、これらのリソースを自身で使用した結果発生するあらゆる申し立て、損害、費用、損失、責任について、テキサス・インスツルメンツおよびその代理人を完全に補償するものとし、テキサス・インスツルメンツは一切の責任を拒否します。

テキサス・インスツルメンツの製品は、[テキサス・インスツルメンツの販売条件](#)、または [ti.com](https://www.ti.com) やかかる テキサス・インスツルメンツ製品の関連資料などのいずれかを通じて提供する適用可能な条項の下で提供されています。テキサス・インスツルメンツがこれらのリソースを提供することは、適用されるテキサス・インスツルメンツの保証または他の保証の放棄の拡大や変更を意味するものではありません。

お客様がいかなる追加条項または代替条項を提案した場合でも、テキサス・インスツルメンツはそれらに異議を唱え、拒否します。

郵送先住所: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

Copyright © 2024, Texas Instruments Incorporated

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
TMAG5115A1CQDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-1-260C-UNLIM	-40 to 125	15A1	Samples
TMAG5115B1CQDBZR	ACTIVE	SOT-23	DBZ	3	3000	RoHS & Green	SN	Level-1-260C-UNLIM	-40 to 125	15B1	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.

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

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

TAPE AND REEL INFORMATION

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
TMAG5115A1CQDBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3
TMAG5115B1CQDBZR	SOT-23	DBZ	3	3000	178.0	9.0	3.15	2.77	1.22	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TMAG5115A1CQDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0
TMAG5115B1CQDBZR	SOT-23	DBZ	3	3000	180.0	180.0	18.0

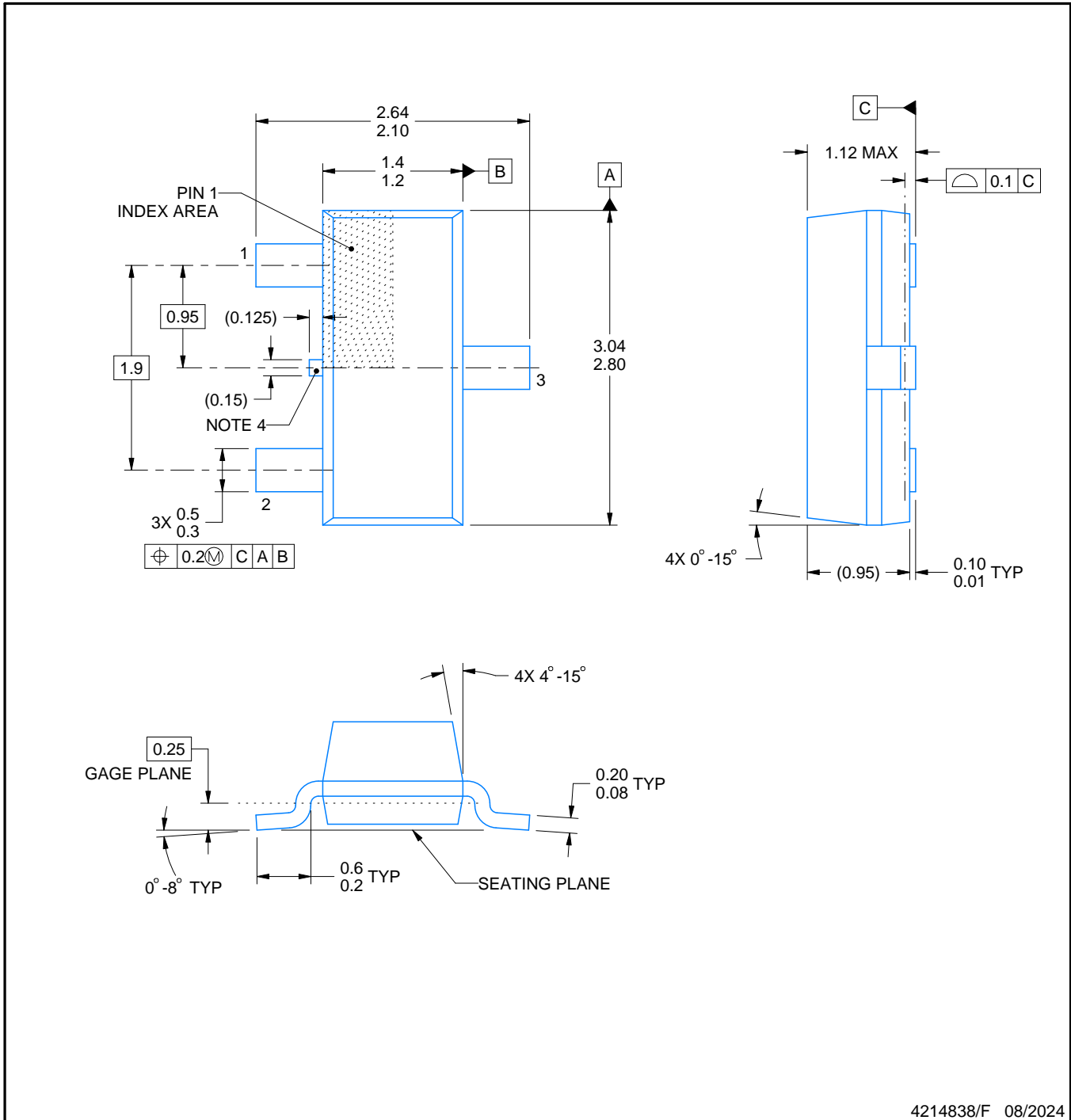
DBZ0003A



PACKAGE OUTLINE

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



4214838/F 08/2024

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration TO-236, except minimum foot length.
4. Support pin may differ or may not be present.
5. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side

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.

重要なお知らせと免責事項

TI は、技術データと信頼性データ(データシートを含みます)、設計リソース(リファレンス・デザインを含みます)、アプリケーションや設計に関する各種アドバイス、Web ツール、安全性情報、その他のリソースを、欠陥が存在する可能性のある「現状のまま」提供しており、商品性および特定目的に対する適合性の黙示保証、第三者の知的財産権の非侵害保証を含むいかなる保証も、明示的または黙示的にかかわらず拒否します。

これらのリソースは、TI 製品を使用する設計の経験を積んだ開発者への提供を意図したものです。(1) お客様のアプリケーションに適した TI 製品の選定、(2) お客様のアプリケーションの設計、検証、試験、(3) お客様のアプリケーションに該当する各種規格や、その他のあらゆる安全性、セキュリティ、規制、または他の要件への確実な適合に関する責任を、お客様のみが単独で負うものとします。

上記の各種リソースは、予告なく変更される可能性があります。これらのリソースは、リソースで説明されている TI 製品を使用するアプリケーションの開発の目的でのみ、TI はその使用をお客様に許諾します。これらのリソースに関して、他の目的で複製することや掲載することは禁止されています。TI や第三者の知的財産権のライセンスが付与されている訳ではありません。お客様は、これらのリソースを自身で使用した結果発生するあらゆる申し立て、損害、費用、損失、責任について、TI およびその代理人を完全に補償するものとし、TI は一切の責任を拒否します。

TI の製品は、[TI の販売条件](#)、または [ti.com](#) やかかる TI 製品の関連資料などのいずれかを通じて提供する適用可能な条項の下で提供されています。TI がこれらのリソースを提供することは、適用される TI の保証または他の保証の放棄の拡大や変更を意味するものではありません。

お客様がいかなる追加条項または代替条項を提案した場合でも、TI はそれらに異議を唱え、拒否します。

郵送先住所 : Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2024, Texas Instruments Incorporated