

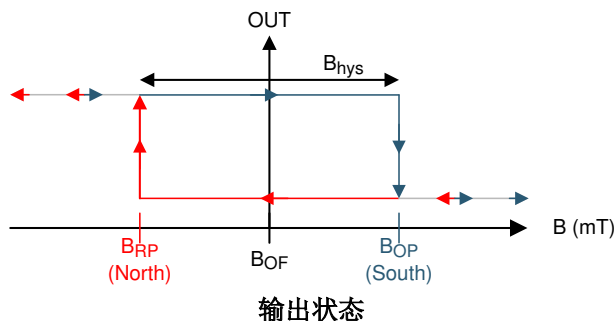
TMAG5115 高速、低抖动霍尔效应锁存器

1 特性

- 高速数字双极锁存霍尔传感器
 - 低传播延迟：5 μ s
 - 低抖动：5 μ s
 - 带宽 (BW)：60kHz
- 支持宽电压范围：
 - 2.5 V 至 26 V
 - 无需外部稳压器
- 快速开通时间：62.5 μ s
- 高精度阈值：
 - ± 3 mT，最大变化为 ± 1 mT
 - ± 1 mT，最大变化为 ± 0.7 mT
- 保护特性：
 - 输出短路保护
 - 输出电流限制
 - 过温保护
- 开漏输出 (15mA 灌电流)
- 宽工作温度范围：
 - 40°C 至 125°C
- 小型封装和外形尺寸：
 - 表面贴装 3 引脚 SOT-23
 - 2.92mm \times 1.30mm

2 应用

- 无线电动工具
- 扫地机器人
- 计算机风扇
- 阀和电磁阀状态
- 工业无刷直流电机



3 说明

TMAG5115 器件是一款高性能霍尔效应锁存传感器，具有快速传播延迟和低抖动。该器件还在整个温度范围内具有高灵敏度稳定性，并为需要高 RPM 的应用提供了集成保护功能。低抖动和低传播延迟相结合有助于提高功效并降低系统级寄生噪声。

该器件配有一个灌电流能力达 15mA 的开漏输出级。TMAG5115 具有 2.5V 至 26V 的宽工作电压范围，专为各种工业和商业应用而设计。针对输出短路、过流和过热情况提供内部保护功能。

TMAG5115 采用业界通用的 SOT-23 封装。

封装信息⁽¹⁾

| 器件型号 | 封装 | 封装尺寸 (标称值) |
|----------|------------|------------------------|
| TMAG5115 | SOT-23 (3) | 2.92mm \times 1.30mm |

(1) 如需了解所有可用封装，请参阅数据表末尾的封装选项附录。

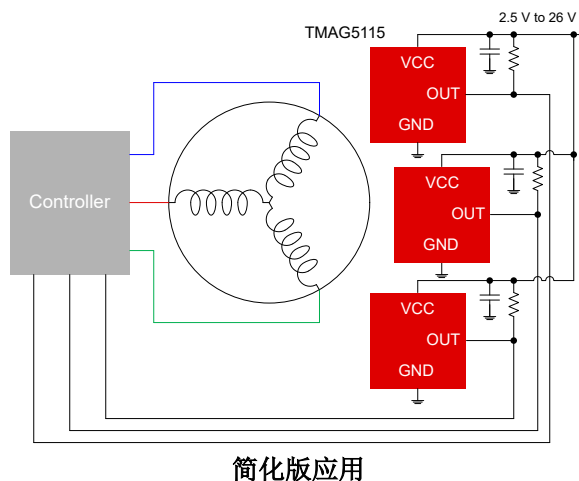


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4 Revision History

注：以前版本的页码可能与当前版本的页码不同

| Changes from Revision * (December 2022) to Revision A (February 2023) | Page |
|---|------|
| • 向特性部分添加了 TMAG5115A 阈值..... | 1 |
| • Added <i>Device Comparison</i> table..... | 3 |
| • Added TMAG5115A magnetic specifications..... | 5 |
| • Added typical characteristic curves for TMAG5115A..... | 6 |

5 Device Comparison

表 5-1. Device Comparison

| VERSION | TYPICAL THRESHOLD | TYPICAL HYSTERESIS | MAGNETIC RESPONSE | OUTPUT TYPE | SENSOR ORIENTATION | BANDWIDTH | PACKAGES AVAILABLE |
|-------------|-------------------|--------------------|-------------------|-------------|--------------------|-----------|--------------------|
| TMAG5115A1C | 3 mT | 6 mT | Active Low | Open-drain | Z | 60 kHz | SOT-23 |
| TMAG5115B1C | 1.8 mT | 0.6 mT | Active Low | Open-drain | Z | 60 kHz | SOT-23 |

6 Pin Configuration and Functions

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

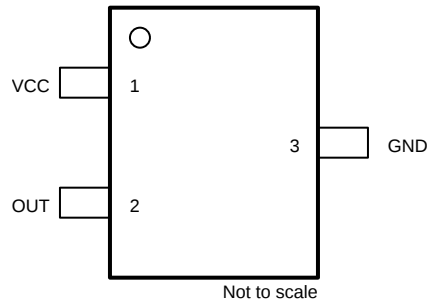


图 6-1. DBZ Package 3-Pin SOT-23 Top View

表 6-1. 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 k Ω . |
| V _{CC} | 1 | P | Supply pin. 2.5 V to 26 V. TI recommends to use a minimum 0.01- μ F capacitor. |

7 Specifications

7.1 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.

7.2 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.

7.3 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.

7.4 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.

7.5 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 |

7.6 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 |

7.7 Typical Characteristics

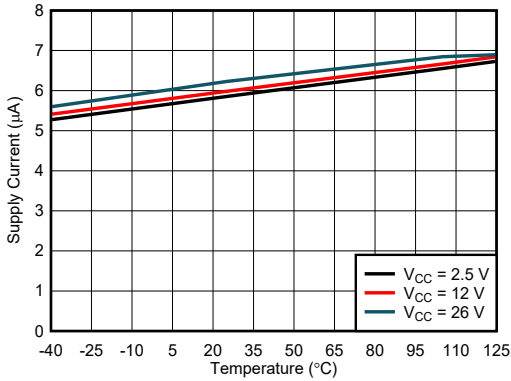
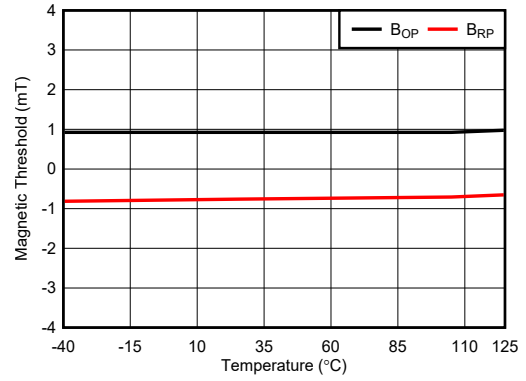
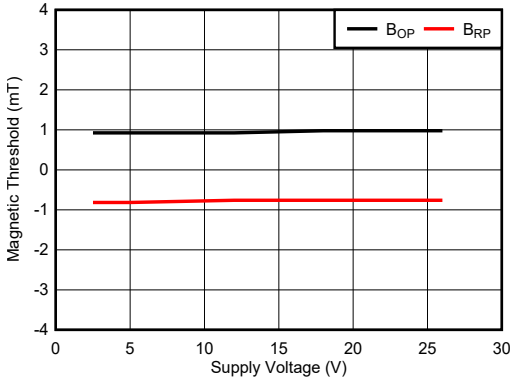


图 7-1. I_{CC} vs T_A



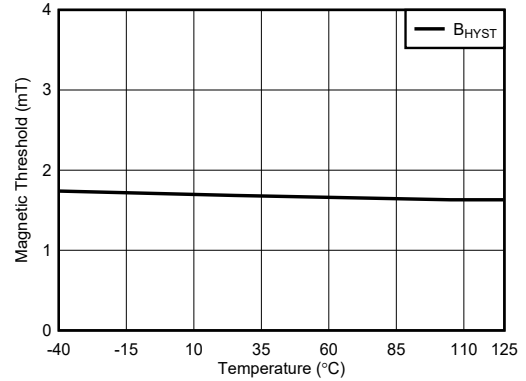
$V_{CC} = 12\text{ V}$

图 7-2. TMAG5115A B_{OP} and B_{RP} vs T_A



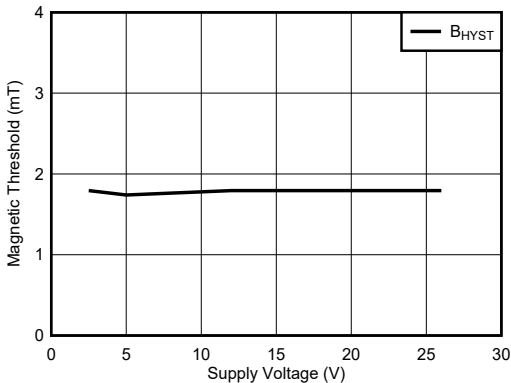
$T_A = 25^\circ\text{C}$

图 7-3. TMAG5115A B_{OP} and B_{RP} vs V_{CC}



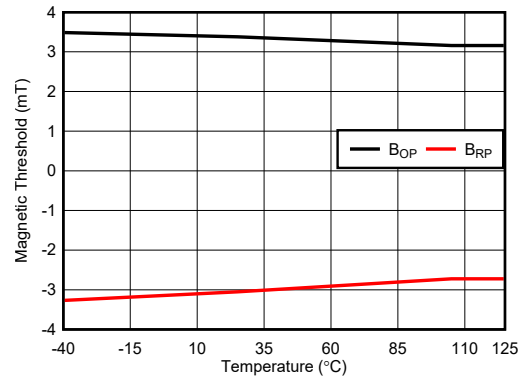
$V_{CC} = 12\text{ V}$

图 7-4. TMAG5115A B_{HYST} vs T_A



$T_A = 25^\circ\text{C}$

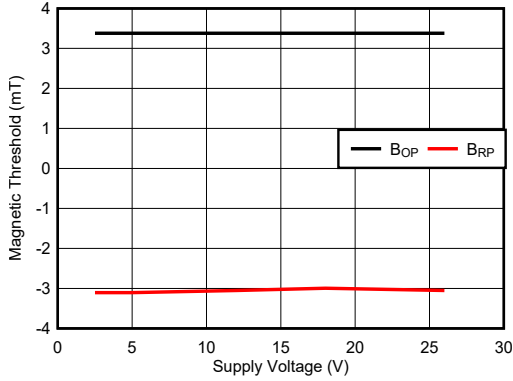
图 7-5. TMAG5115A B_{HYST} vs V_{CC}



$V_{CC} = 12\text{ V}$

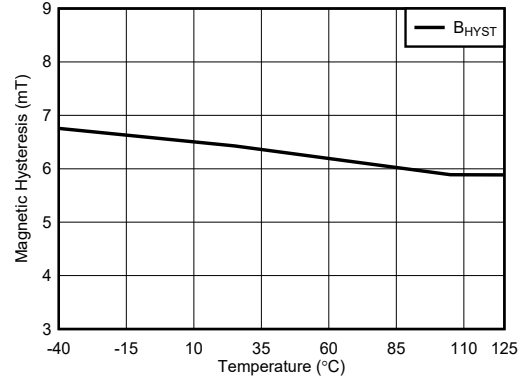
图 7-6. TMAG5115B B_{OP} and B_{RP} vs T_A

7.7 Typical Characteristics (continued)



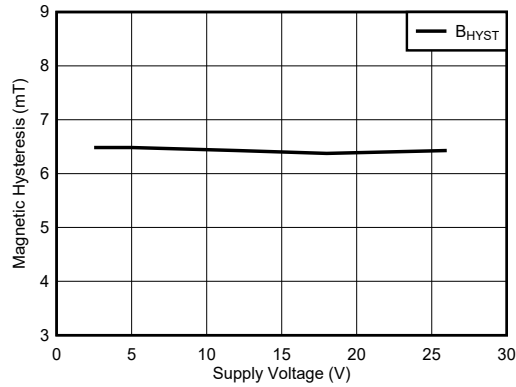
$T_A = 25^\circ\text{C}$

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



$V_{CC} = 12\text{ V}$

图 7-8. TMAG5115B B_{HYST} vs T_A



$T_A = 25^\circ\text{C}$

图 7-9. TMAG5115B B_{HYST} vs V_{CC}

8 Detailed Description

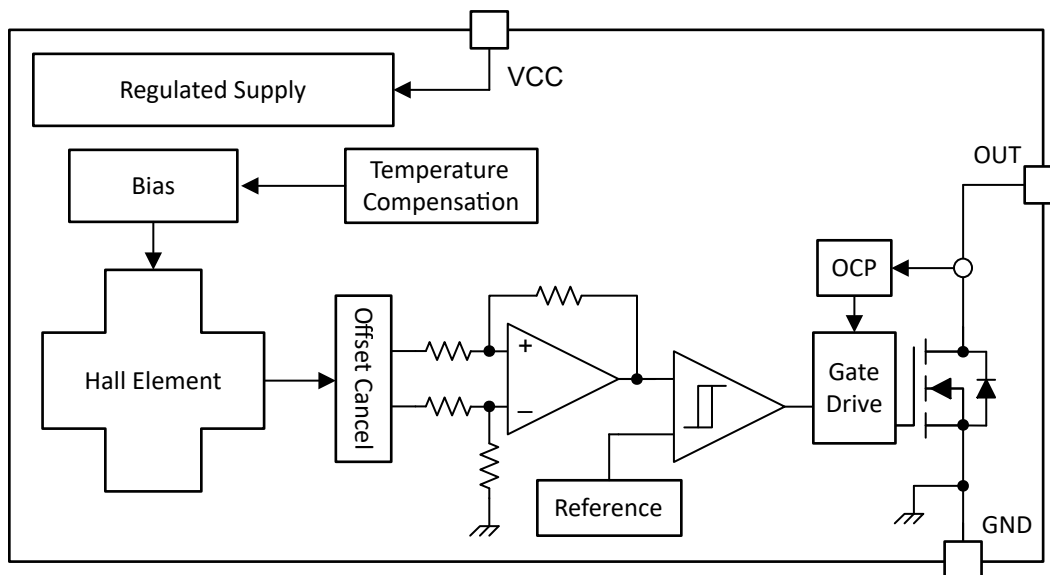
8.1 Overview

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.

8.2 Functional Block Diagram



8.3 Feature Description

8.3.1 Field Direction Definition

图 8-1 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.

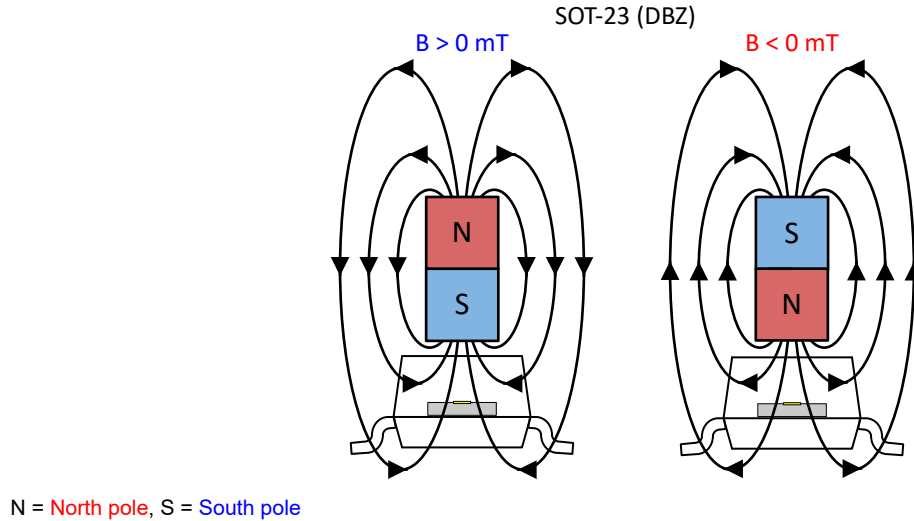


图 8-1. Field Direction Definition

8.3.2 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.

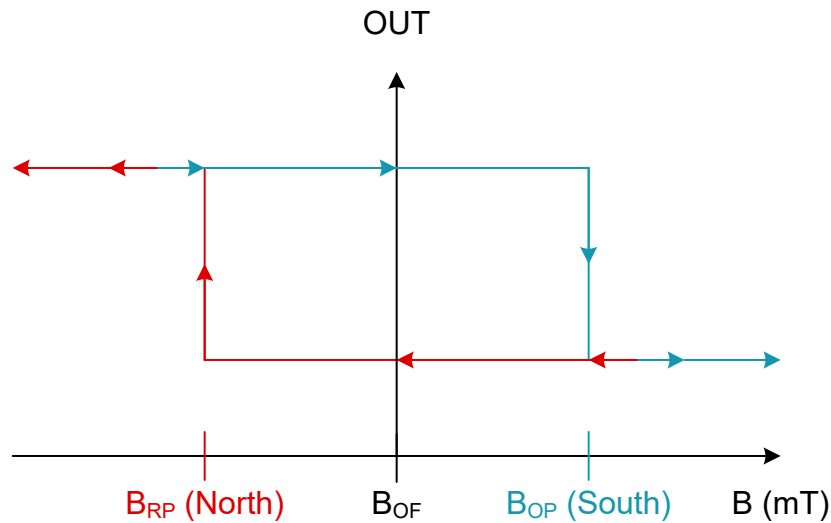


图 8-2. TMAG5115 $B_{OP} > 0$

8.3.3 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 图 8-3 and 图 8-4 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 (图 8-3) and Case 2 (图 8-4), the output is defined assuming a constant magnetic field $B > B_{OP}$ and $B < B_{RP}$.

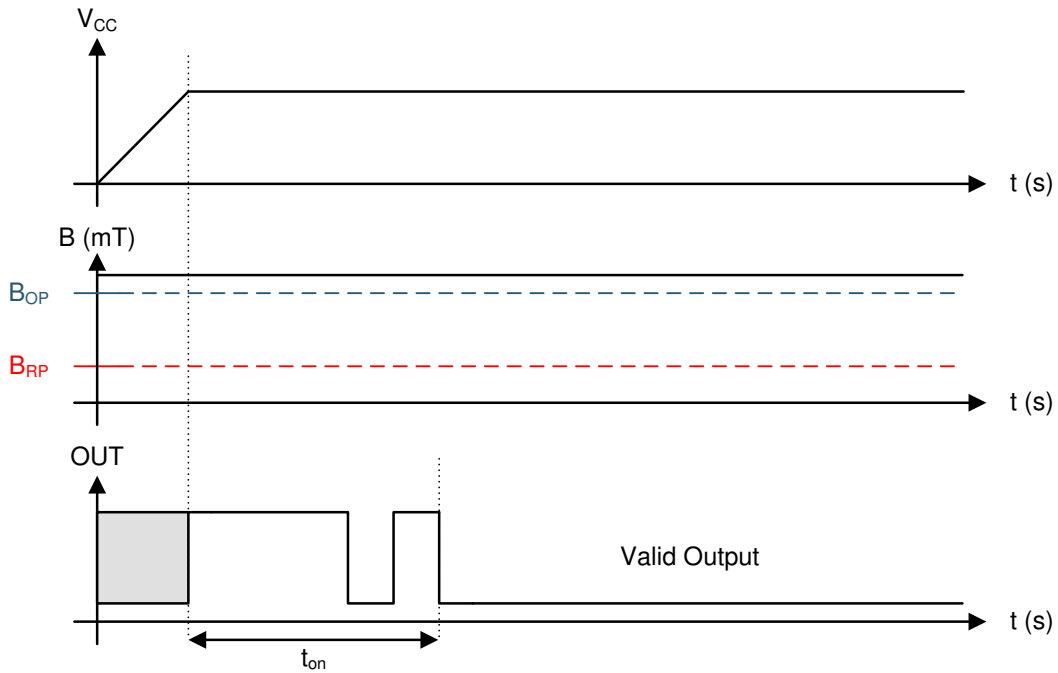


图 8-3. Case 1: Power On When $B > B_{OP}$

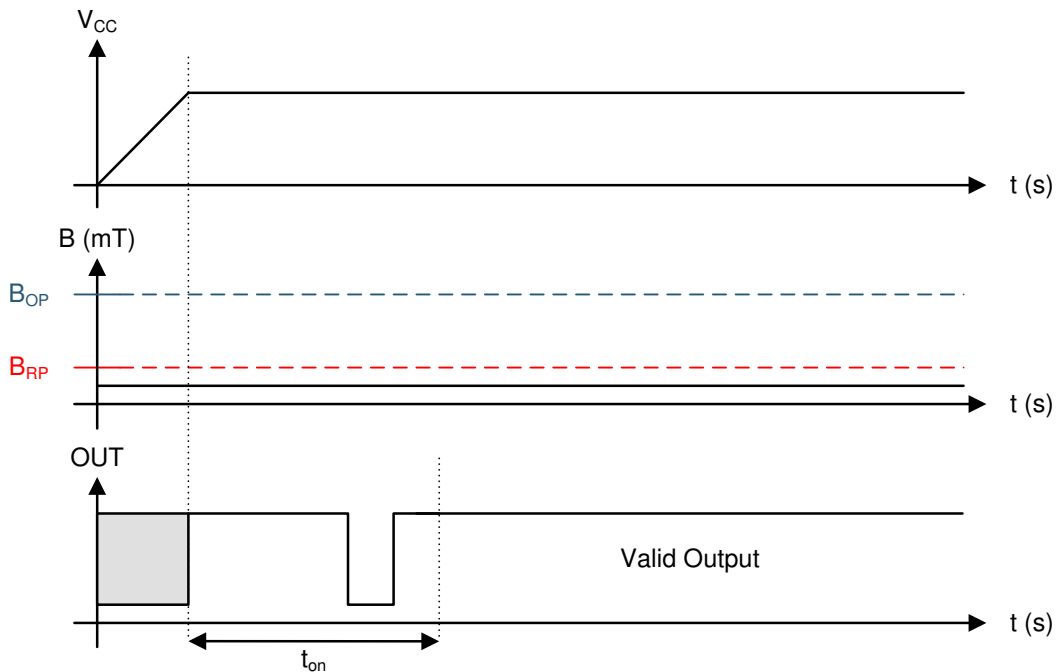


图 8-4. Case 2: Power On When $B < B_{RP}$

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 (图 8-5) and Case 4 (图 8-6) show examples of this behavior.

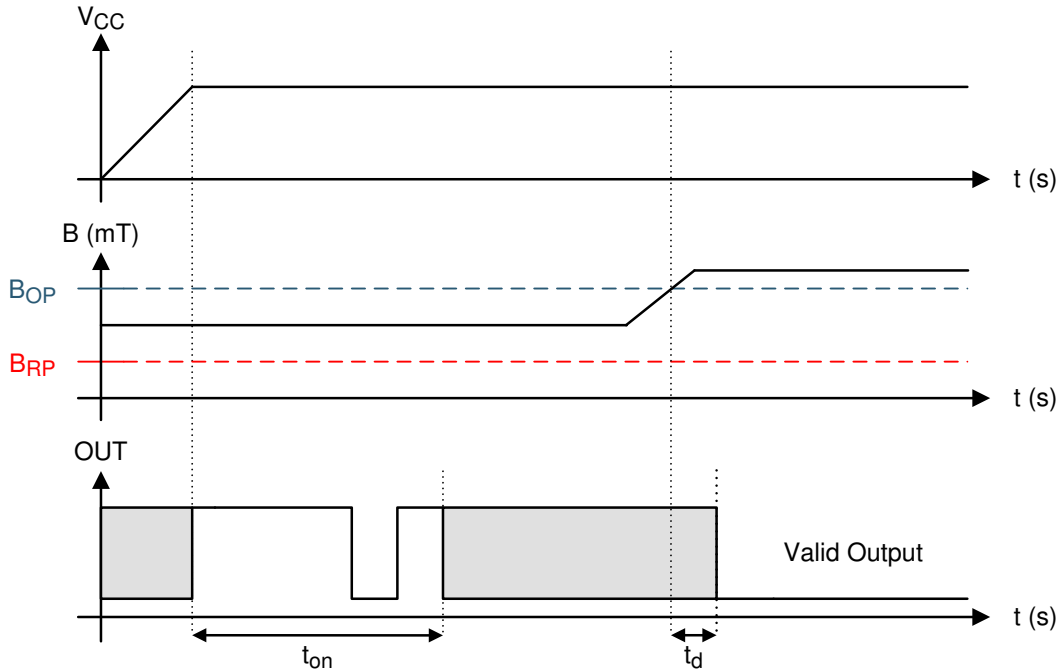


图 8-5. Case 3: Power On When $B_{RP} < B < B_{OP}$, Followed by $B > B_{OP}$

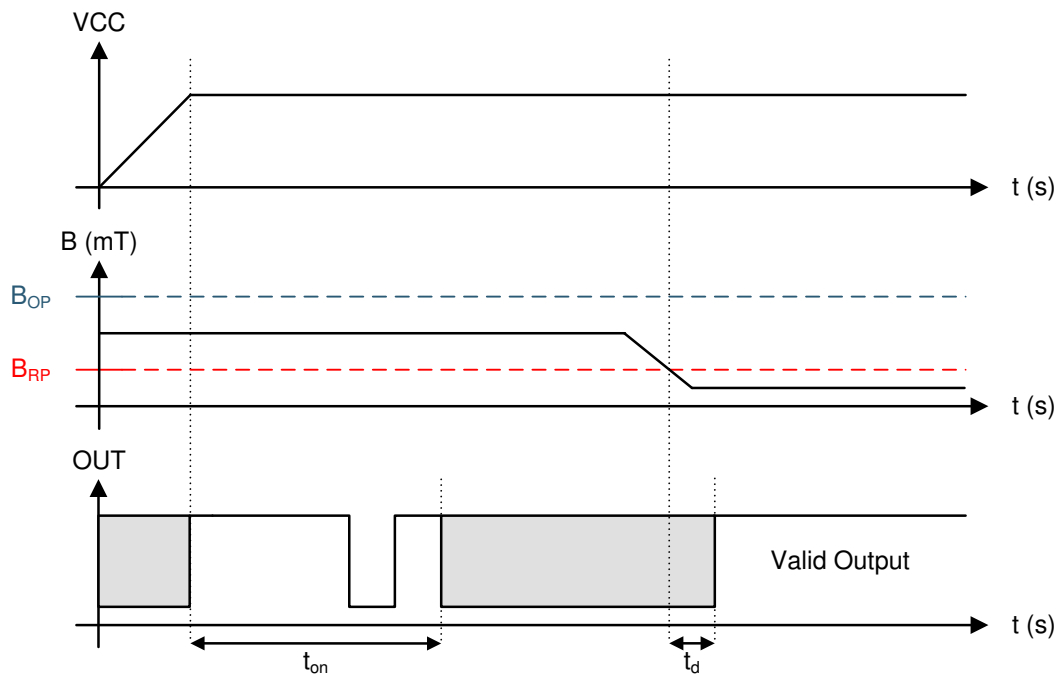


图 8-6. Case 4: Power On When $B_{RP} < B < B_{OP}$, Followed by $B < B_{RP}$

8.3.4 Output Stage

图 8-7 shows the TMAG5115 open-drain NMOS output structure, rated to sink up to 15 mA of current.

备注

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

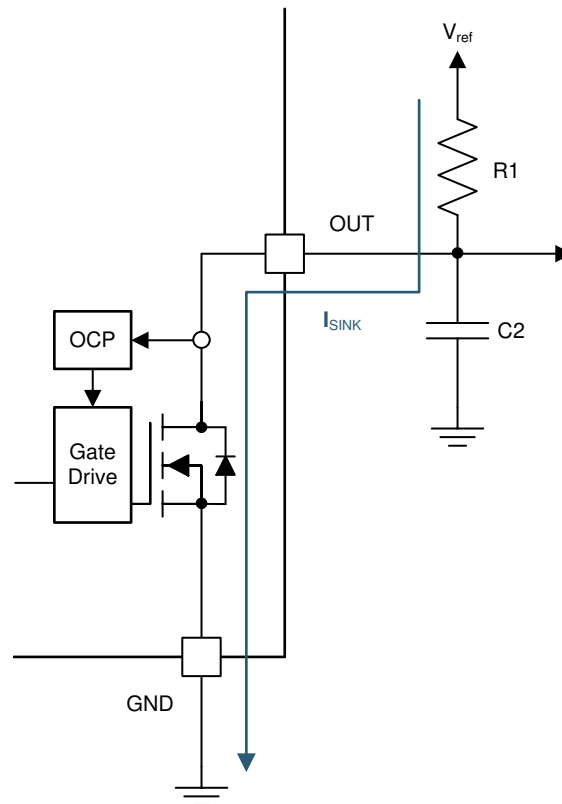


图 8-7. NMOS Open-Drain Output

Select a value for C2 based on the system bandwidth specifications as shown in [方程式 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.

8.3.5 Protection Circuits

The TMAG5115 device is fully protected against overcurrent and overtemperature conditions. 表 8-1 lists a summary of the protection circuits.

表 8-1. 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 will shutdown until recovery temperature is reached | $T_J \leq 156^\circ\text{C}$ |

8.3.5.1 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.

8.3.5.2 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 High-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.

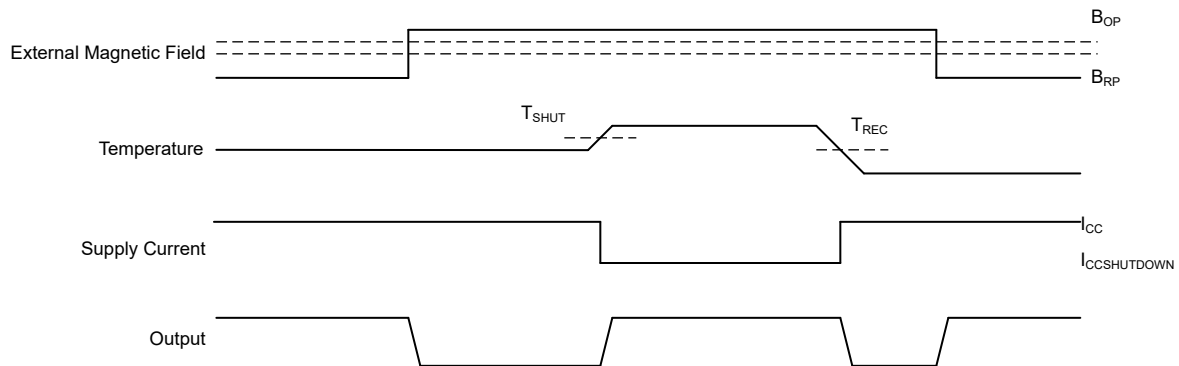


图 8-8. TMAG5115 Overtemperature Protection Diagram

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 could exceed the thermal shutdown limit. This can cause a device shutdown. TI recommends to not exceed a temperature and supply combination shown in 图 8-9.

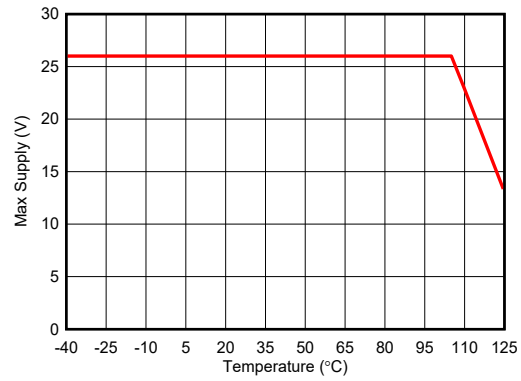


图 8-9. TMAG5115 Recommended Supply and Temperature Curve

8.4 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.

9 Application and Implementation

备注

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.

9.1 Application Information

The TMAG5115 is used in magnetic position sensing applications. The device features a high-speed architecture to facilitate more 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.

9.2 Typical Applications

9.2.1 Standard Circuit

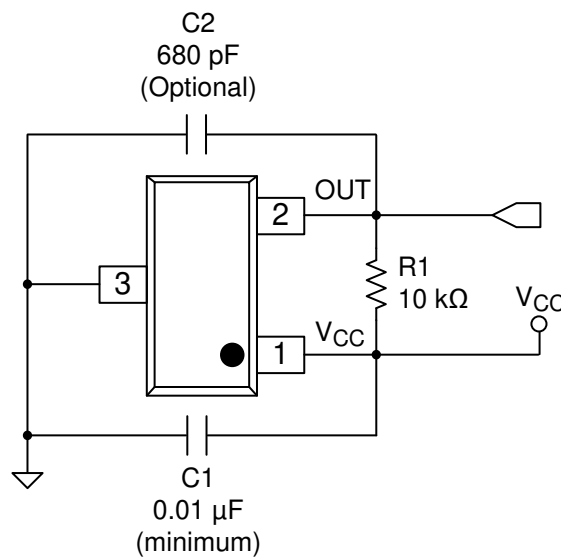


图 9-1. Typical Application Circuit

9.2.1.1 Design Requirements

For this design example, use the parameters listed in [表 9-1](#) as the input parameters.

表 9-1. Design Parameters

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

9.2.1.2 Detailed Design Procedure

表 9-2. 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}.

9.2.1.2.1 Configuration Example

In a 3.3-V system, $3.0\text{ V} \leq V_{\text{ref}} \leq 3.6\text{ V}$. Use [方程式 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 [方程式 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 ([方程式 4](#)), select a value between 500 Ω and 32 kΩ for R1.

Assuming a system bandwidth of 10 kHz, use [方程式 5](#) to calculate the value of C2.

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

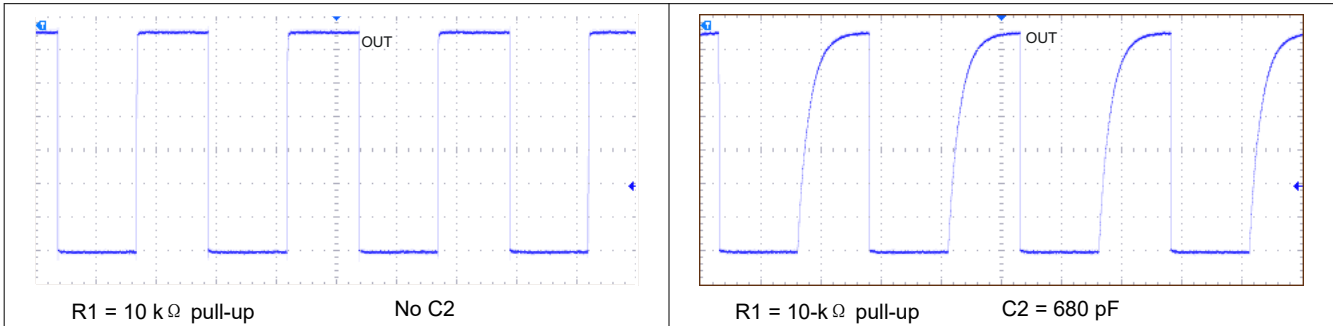
For this design example, use [方程式 6](#) to calculate the value of C2.

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

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 would cause a low-pass filter with a corner frequency of 23.4 kHz.

9.2.1.3 Application Curves



R1 = 10 k Ω pull-up

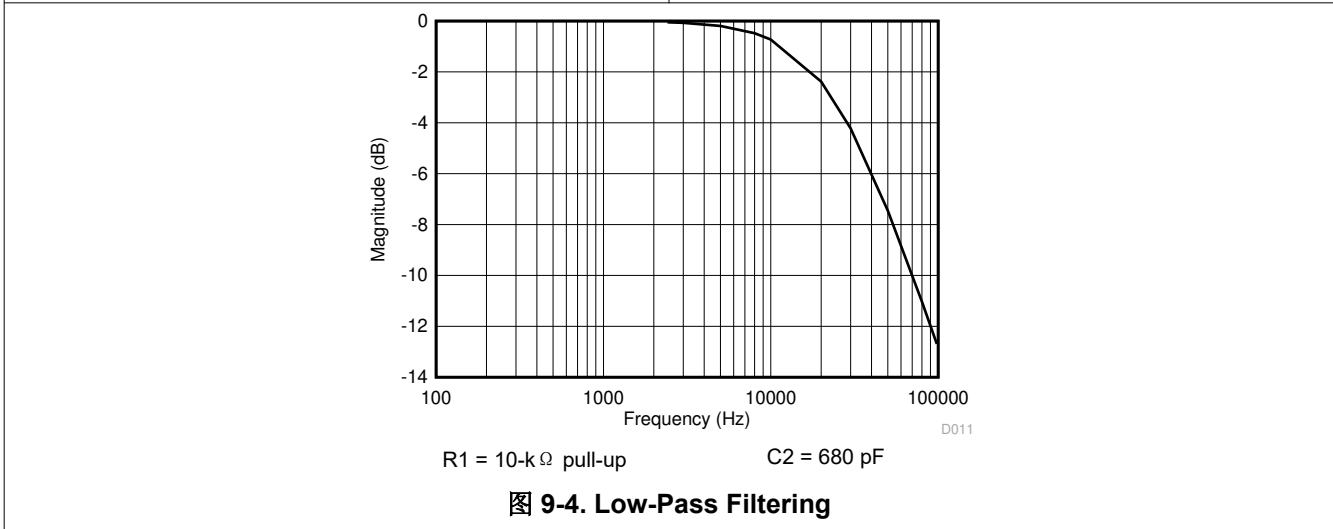
No C2

R1 = 10-k Ω pull-up

C2 = 680 pF

图 9-2. 10-kHz Switching Magnetic Field

图 9-3. 10-kHz Switching Magnetic Field



R1 = 10-k Ω pull-up

C2 = 680 pF

图 9-4. Low-Pass Filtering

9.3 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- μ F ceramic capacitor rated for V_{CC} must be placed as close to the TMAG5115 as possible. Larger values of the bypass capacitor 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}.

9.4 Layout

9.4.1 Layout Guidelines

The bypass capacitor should be placed near the TMAG5115 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 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, if nearby system components contain iron or nickel, they may redirect magnetic flux in unpredictable ways.

9.4.2 Layout Example

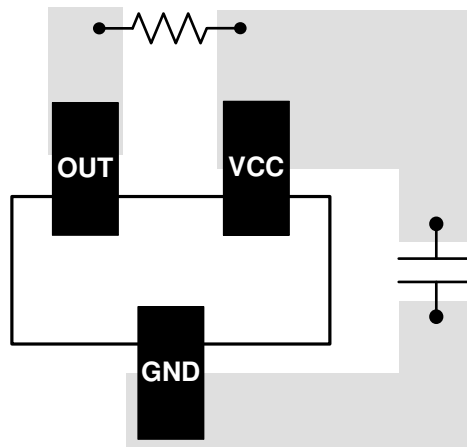


图 9-5. TMAG5115 Layout Example

10 Device and Documentation Support

10.1 Device Support

10.1.1 Hall Sensor Location

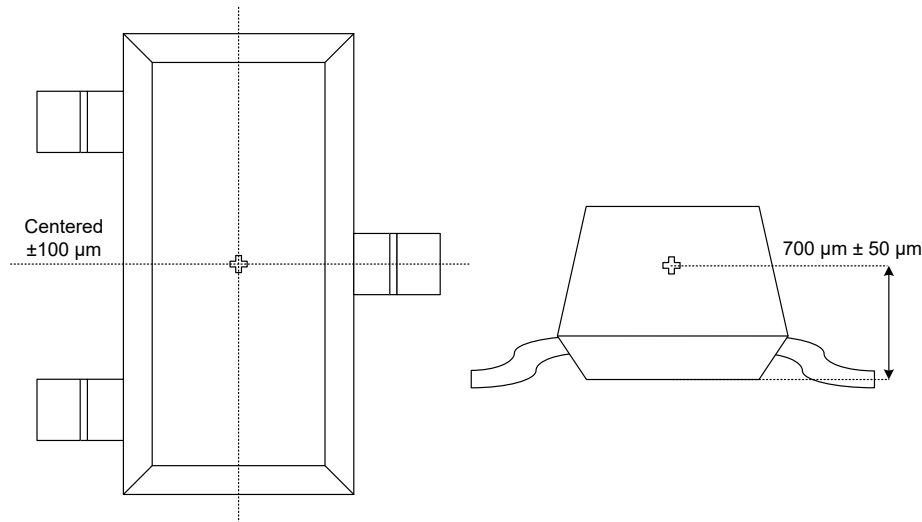


图 10-1. Hall Sensor Location (Not to Scale)

10.2 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。点击 [订阅更新](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

10.3 支持资源

[TI E2E™ 支持论坛](#) 是工程师的重要参考资料，可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的《[使用条款](#)》。

10.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

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10.5 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

10.6 术语表

[TI 术语表](#) 本术语表列出并解释了术语、首字母缩略词和定义。

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.

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.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 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 |

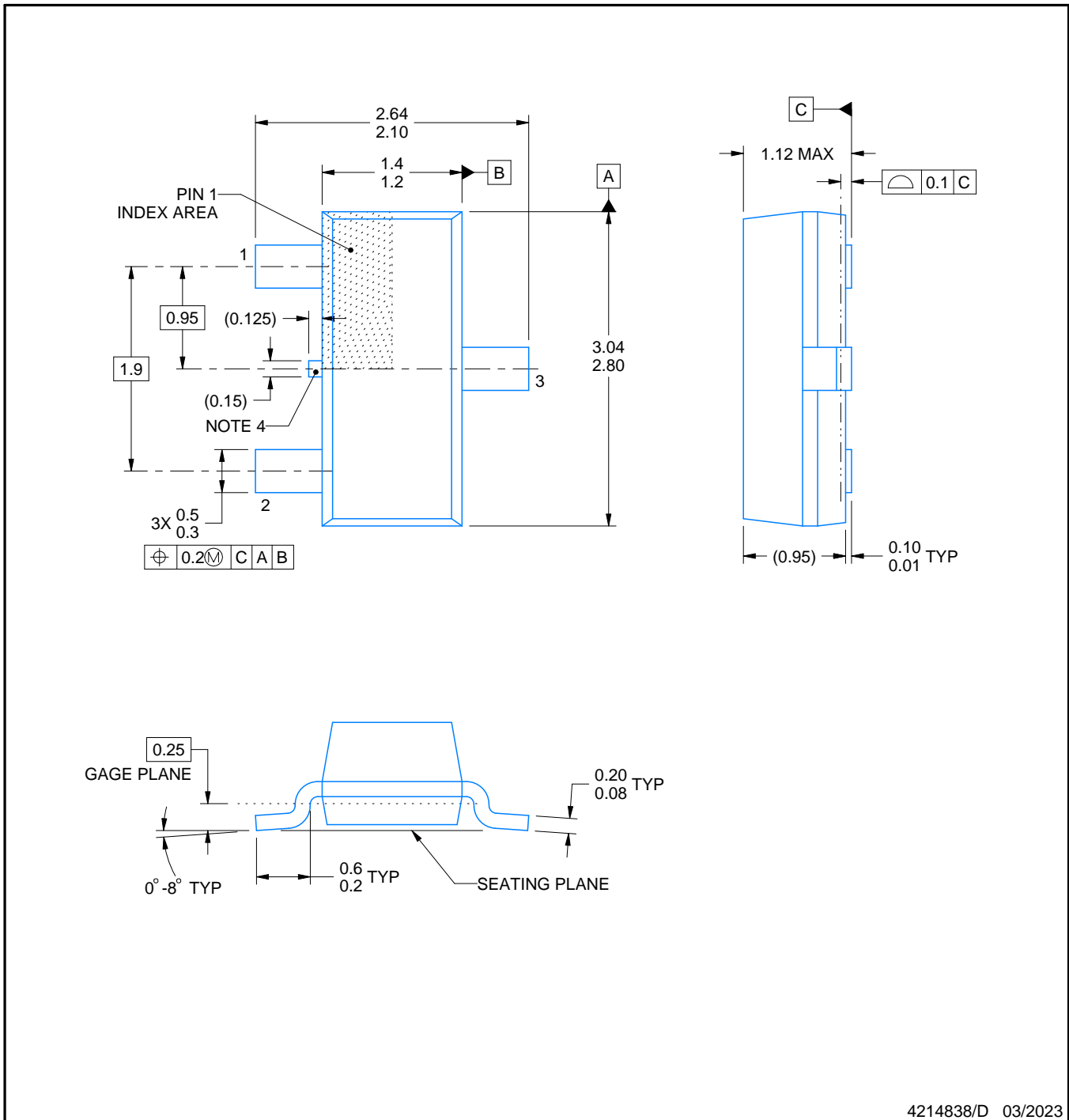
DBZ0003A



PACKAGE OUTLINE

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



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NOTES:

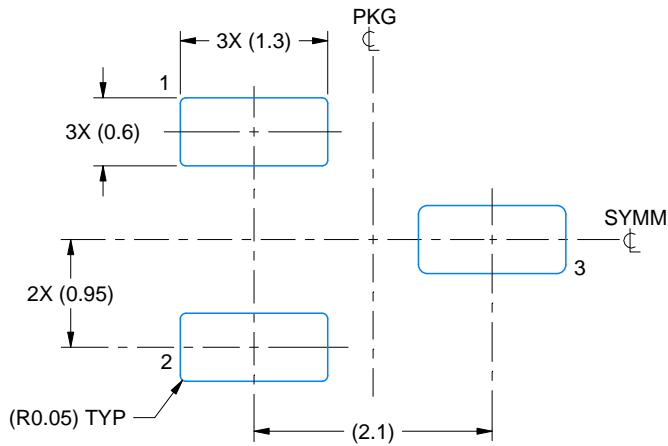
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration TO-236, except minimum foot length.
4. Support pin may differ or may not be present.

EXAMPLE BOARD LAYOUT

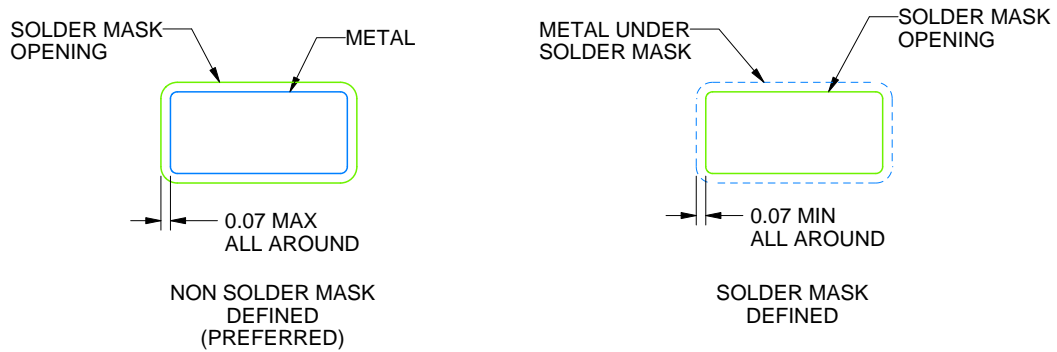
DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
SCALE:15X



SOLDER MASK DETAILS

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NOTES: (continued)

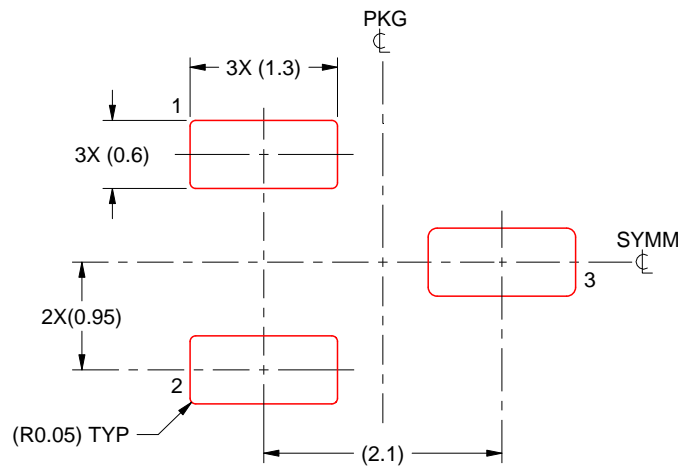
4. Publication IPC-7351 may have alternate designs.
5. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DBZ0003A

SOT-23 - 1.12 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE
BASED ON 0.125 THICK STENCIL
SCALE:15X

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NOTES: (continued)

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

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