

# CSD18512Q5B 40V N 通道 NexFET™ 功率 MOSFET

## 1 特性

- 低  $R_{DS(on)}$
- 低热阻
- 雪崩级
- 逻辑电平
- 无铅端子镀层
- 符合 RoHS
- 无卤素
- SON 5mm x 6mm 塑料封装

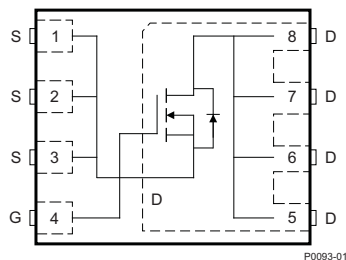
## 2 应用

- 直流/直流转换
- 次级侧同步整流器
- 电机控制

## 3 说明

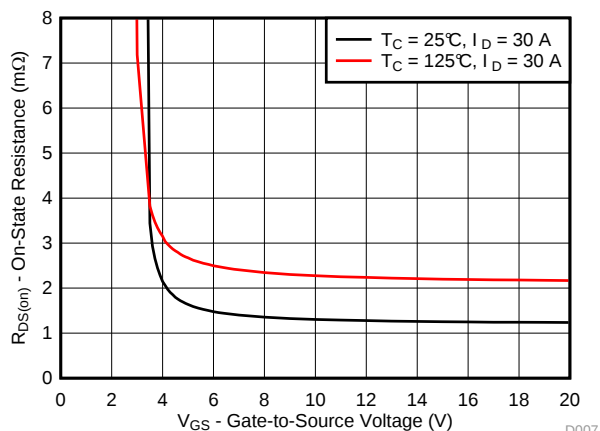
这款 40V、1.3mΩ、5mm × 6mm NexFET™ 功率 MOSFET 旨在用于最大程度降低功率转换应用中的损耗。

俯视图



P0093-01

$R_{DS(on)}$  与  $V_{GS}$  对比



D007

产品概要

| $T_A = 25^\circ\text{C}$ |              | 典型值                    |     | 单位 |
|--------------------------|--------------|------------------------|-----|----|
| $V_{DS}$                 | 漏源电压         | 40                     |     | V  |
| $Q_g$                    | 栅极电荷总量 (10V) | 75                     |     | nC |
| $Q_{gd}$                 | 栅漏栅极电荷       | 13.3                   |     | nC |
| $R_{DS(on)}$             | 漏源导通电阻       | $V_{GS} = 4.5\text{V}$ | 1.8 | mΩ |
|                          |              | $V_{GS} = 10\text{V}$  | 1.3 | mΩ |
| $V_{GS(th)}$             | 阈值电压         | 1.6                    |     | V  |

订购信息<sup>(1)</sup>

| 器件           | 数量   | 包装介质    | 封装                 | 配送   |
|--------------|------|---------|--------------------|------|
| CSD18512Q5B  | 2500 | 13 英寸卷带 | SON 5mm × 6mm 塑料封装 | 卷带封装 |
| CSD18512Q5BT | 250  | 7 英寸卷带  |                    |      |

(1) 如需了解所有可用封装，请参阅产品说明书末尾的可订购产品附录。

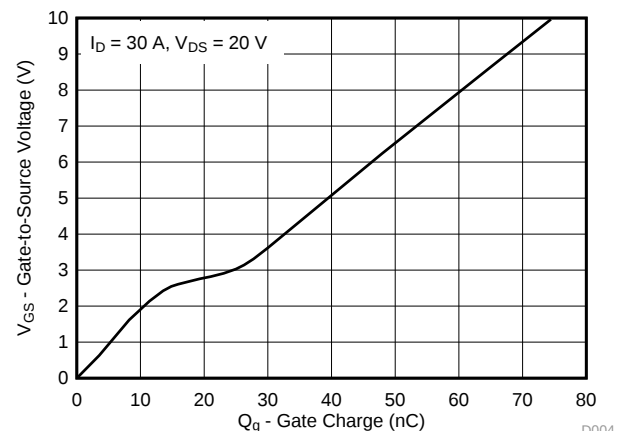
绝对最大额定值

| $T_A = 25^\circ\text{C}$ |                                                                          | 值         | 单位 |
|--------------------------|--------------------------------------------------------------------------|-----------|----|
| $V_{DS}$                 | 漏源电压                                                                     | 40        | V  |
| $V_{GS}$                 | 栅源电压                                                                     | ±20       | V  |
| $I_D$                    | 持续漏极电流 (受封装限制)                                                           | 100       | A  |
|                          | 持续漏极电流 (受芯片限制), $T_C = 25^\circ\text{C}$ 时测得                             | 211       |    |
|                          | 持续漏极电流 <sup>(1)</sup>                                                    | 32        |    |
| $I_{DM}$                 | 脉冲漏极电流 <sup>(2)</sup>                                                    | 400       | A  |
| $P_D$                    | 功耗 <sup>(1)</sup>                                                        | 3.1       | W  |
|                          | 功耗, $T_C = 25^\circ\text{C}$                                             | 139       |    |
| $T_J$ , $T_{stg}$        | 工作结温、贮存温度                                                                | -55 至 150 | °C |
| $E_{AS}$                 | 雪崩能量, 单一脉冲<br>$I_D = 64\text{A}$ , $L = 0.1\text{mH}$ , $R_G = 25\Omega$ | 205       | mJ |

(1)  $R_{\theta JA} = 40^\circ\text{C/W}$ , 这是在厚度为 0.06 英寸的环氧板 (FR4) 印刷电路板 (PCB) 上的 1 英寸<sup>2</sup> 2 盎司的铜焊盘上测得的典型值。

(2) 最大  $R_{\theta JC} = 0.9^\circ\text{C/W}$ , 脉冲持续时间  $\leq 100\mu\text{s}$ , 占空比  $\leq 1\%$

栅极电荷



D004



## 目录

|   |                                         |   |     |                           |    |
|---|-----------------------------------------|---|-----|---------------------------|----|
| 1 | 特性 .....                                | 1 | 6.1 | 社区资源.....                 | 7  |
| 2 | 应用 .....                                | 1 | 6.2 | 商标 .....                  | 7  |
| 3 | 说明 .....                                | 1 | 6.3 | 静电放电警告.....               | 7  |
| 4 | 修订历史记录 .....                            | 2 | 6.4 | 术语表 .....                 | 7  |
| 5 | <b>Specifications</b> .....             | 3 | 7   | <b>"机械、封装和可订购信息</b> ..... | 8  |
|   | 5.1 Electrical Characteristics.....     | 3 | 7.1 | Q5B 封装尺寸.....             | 8  |
|   | 5.2 Thermal Information .....           | 3 | 7.2 | 建议 PCB 布局 .....           | 9  |
|   | 5.3 Typical MOSFET Characteristics..... | 4 | 7.3 | 建议模板布局.....               | 9  |
| 6 | 器件和文档支持 .....                           | 7 | 7.4 | Q5B 卷带信息.....             | 10 |

## 4 修订历史记录

| Changes from Original (December 2016) to Revision A    | Page |
|--------------------------------------------------------|------|
| • Corrected the SOA in <a href="#">Figure 10</a> ..... | 5    |

## 5 Specifications

### 5.1 Electrical Characteristics

( $T_A = 25^\circ\text{C}$  unless otherwise stated)

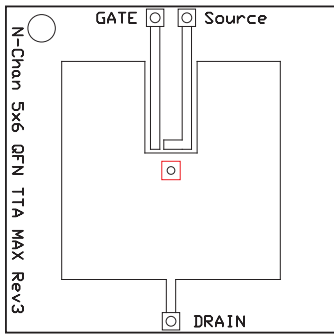
| PARAMETER               |                                  | TEST CONDITIONS                                                                                 | MIN  | TYP | MAX  | UNIT |
|-------------------------|----------------------------------|-------------------------------------------------------------------------------------------------|------|-----|------|------|
| STATIC CHARACTERISTICS  |                                  |                                                                                                 |      |     |      |      |
| BV <sub>DSS</sub>       | Drain to source voltage          | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA                                                  | 40   |     |      | V    |
| I <sub>DSS</sub>        | Drain to source leakage current  | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 32 V                                                   |      |     | 1    | μA   |
| I <sub>GSS</sub>        | Gate to source leakage current   | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = 20 V                                                   |      |     | 100  | nA   |
| V <sub>GS(th)</sub>     | Gate to source threshold voltage | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA                                     | 1.3  | 1.6 | 2.2  | V    |
| R <sub>DS(on)</sub>     | Drain to source on resistance    | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 30 A                                                  | 1.8  |     | 2.3  | mΩ   |
|                         |                                  | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 30 A                                                   | 1.3  |     | 1.6  | mΩ   |
| g <sub>fs</sub>         | Transconductance                 | V <sub>DS</sub> = 20 V, I <sub>D</sub> = 30 A                                                   | 136  |     |      | S    |
| DYNAMIC CHARACTERISTICS |                                  |                                                                                                 |      |     |      |      |
| C <sub>iss</sub>        | Input capacitance                | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 20 V, f = 1 MHz                                        | 5480 |     | 7120 | pF   |
| C <sub>oss</sub>        | Output capacitance               |                                                                                                 | 537  |     | 699  | pF   |
| C <sub>rss</sub>        | Reverse transfer capacitance     |                                                                                                 | 256  |     | 333  | pF   |
| R <sub>G</sub>          | Series gate resistance           |                                                                                                 | 1.0  | 2.0 |      | Ω    |
| Q <sub>g</sub>          | Gate charge total (4.5 V)        | V <sub>DS</sub> = 20 V, I <sub>D</sub> = 30 A                                                   | 37   |     | 48   | nC   |
| Q <sub>g</sub>          | Gate charge total (10 V)         |                                                                                                 | 75   |     | 98   | nC   |
| Q <sub>gd</sub>         | Gate charge gate to drain        |                                                                                                 | 13.3 |     |      | nC   |
| Q <sub>gs</sub>         | Gate charge gate to source       |                                                                                                 | 15.1 |     |      | nC   |
| Q <sub>g(th)</sub>      | Gate charge at V <sub>th</sub>   |                                                                                                 | 8.2  |     |      | nC   |
| Q <sub>oss</sub>        | Output charge                    | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 0 V                                                   | 23   |     |      | nC   |
| t <sub>d(on)</sub>      | Turn on delay time               | V <sub>DS</sub> = 20 V, V <sub>GS</sub> = 10 V,<br>I <sub>DS</sub> = 30 A, R <sub>G</sub> = 0 Ω | 7    |     |      | ns   |
| t <sub>r</sub>          | Rise time                        |                                                                                                 | 16   |     |      | ns   |
| t <sub>d(off)</sub>     | Turn off delay time              |                                                                                                 | 31   |     |      | ns   |
| t <sub>f</sub>          | Fall time                        |                                                                                                 | 7    |     |      | ns   |
| DIODE CHARACTERISTICS   |                                  |                                                                                                 |      |     |      |      |
| V <sub>SD</sub>         | Diode forward voltage            | I <sub>SD</sub> = 30 A, V <sub>GS</sub> = 0 V                                                   | 0.75 |     | 1.0  | V    |
| Q <sub>rr</sub>         | Reverse recovery charge          | V <sub>DS</sub> = 20 V, I <sub>F</sub> = 30 A,<br>di/dt = 300 A/μs                              | 22   |     |      | nC   |
| t <sub>rr</sub>         | Reverse recovery time            |                                                                                                 | 17   |     |      | ns   |

### 5.2 Thermal Information

( $T_A = 25^\circ\text{C}$  unless otherwise stated)

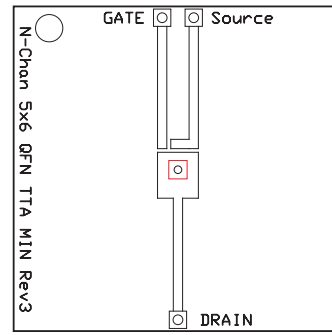
| THERMAL METRIC  |                                                                     | MIN | TYP | MAX | UNIT                      |
|-----------------|---------------------------------------------------------------------|-----|-----|-----|---------------------------|
| $R_{\theta JC}$ | Junction-to-case (top of package) thermal resistance <sup>(1)</sup> |     |     | 0.9 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance <sup>(1)(2)</sup>            |     |     | 50  | $^\circ\text{C}/\text{W}$ |

- $R_{\theta JC}$  is determined with the device mounted on a 1 inch<sup>2</sup> (6.45 cm<sup>2</sup>), 2 oz. (0.071 mm thick) Cu pad on a 1.5 inch  $\times$  1.5 inch (3.81 cm  $\times$  3.81 cm), 0.06 inch (1.52 mm) thick FR4 PCB.  $R_{\theta JC}$  is specified by design, whereas  $R_{\theta JA}$  is determined by the user's board design.
- Device mounted on FR4 material with 1 inch<sup>2</sup> (6.45 cm<sup>2</sup>), 2 oz. (0.071 mm thick) Cu.



M0137-01

Max  $R_{\theta JA} = 50^{\circ}\text{C/W}$   
when mounted on  
1 inch<sup>2</sup> (6.45 cm<sup>2</sup>) of 2  
oz. (0.071 mm thick)  
Cu.

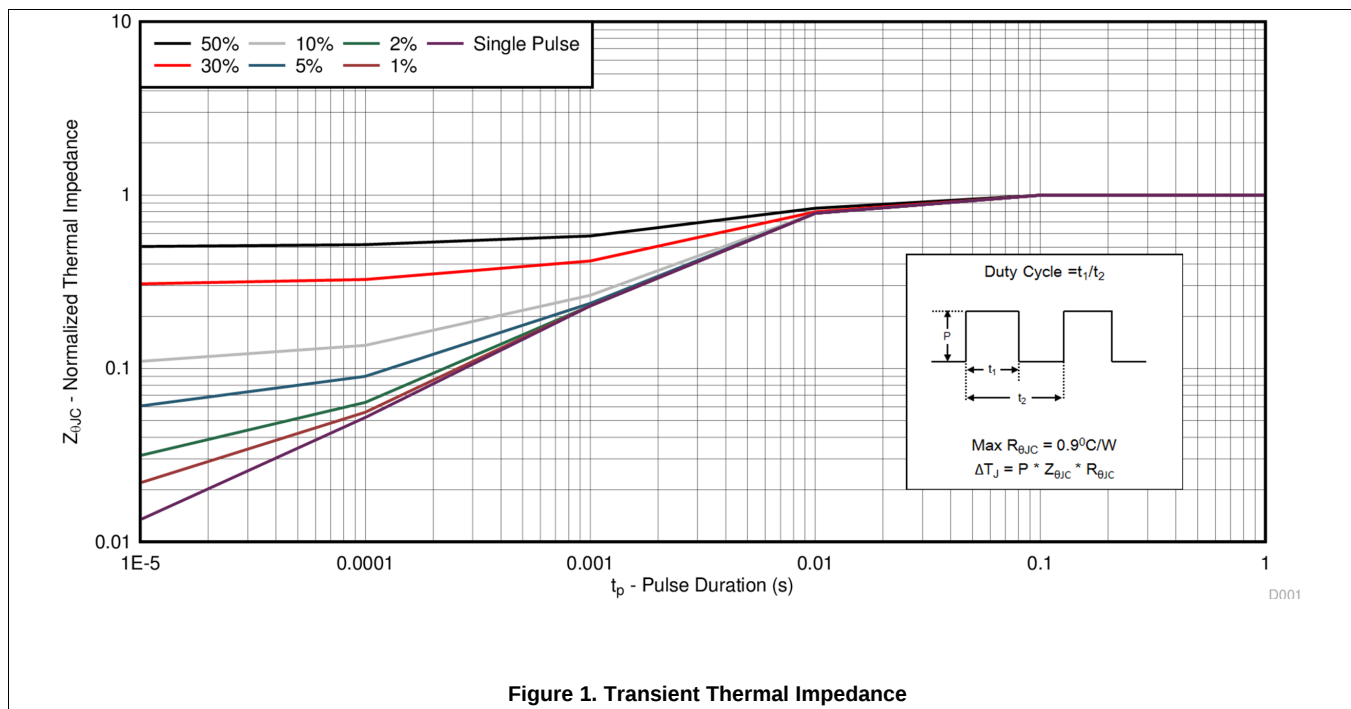


M0137-02

Max  $R_{\theta JA} = 125^{\circ}\text{C/W}$   
when mounted on a  
minimum pad area of 2  
oz. (0.071 mm thick)  
Cu.

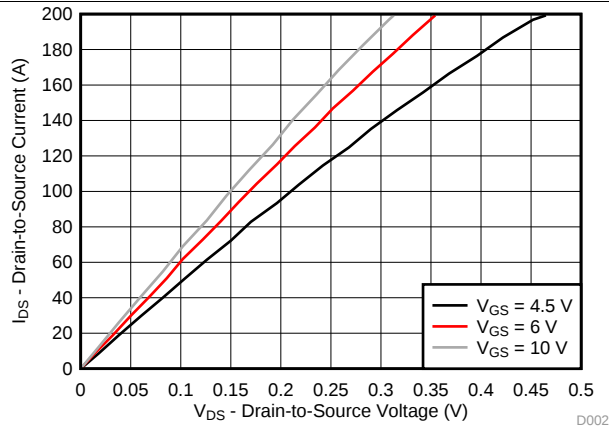
### 5.3 Typical MOSFET Characteristics

$T_A = 25^{\circ}\text{C}$  (unless otherwise stated)

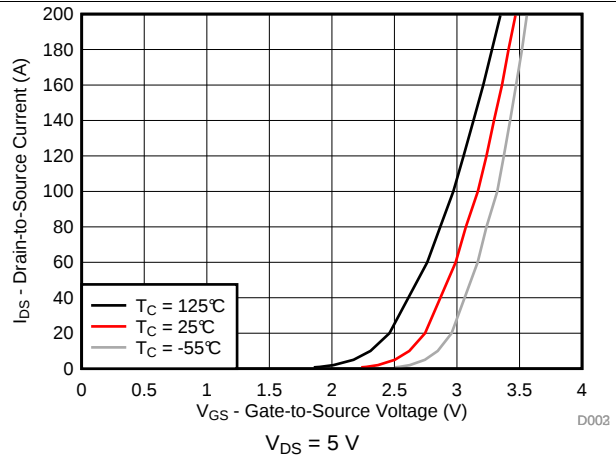


## Typical MOSFET Characteristics (continued)

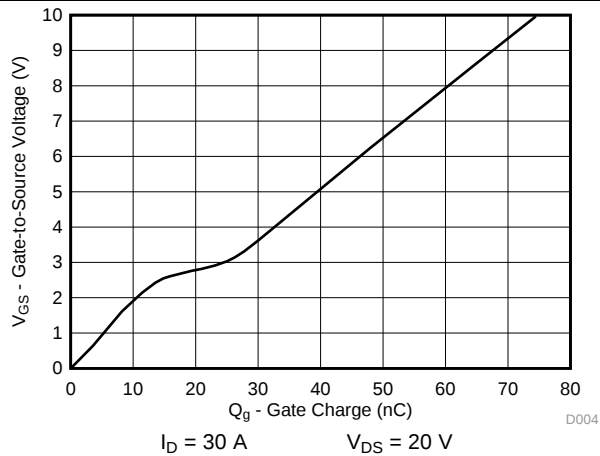
$T_A = 25^\circ\text{C}$  (unless otherwise stated)



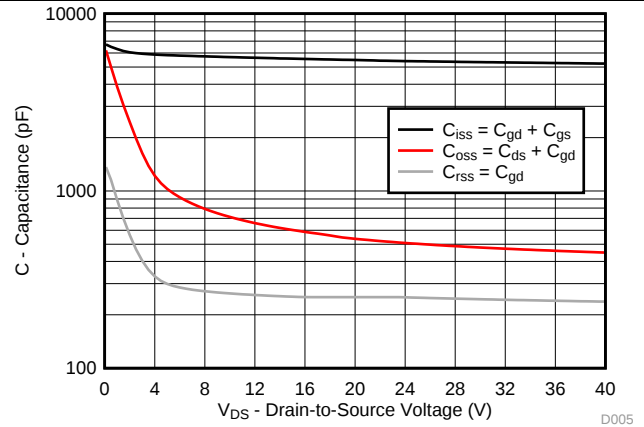
**Figure 2. Saturation Characteristics**



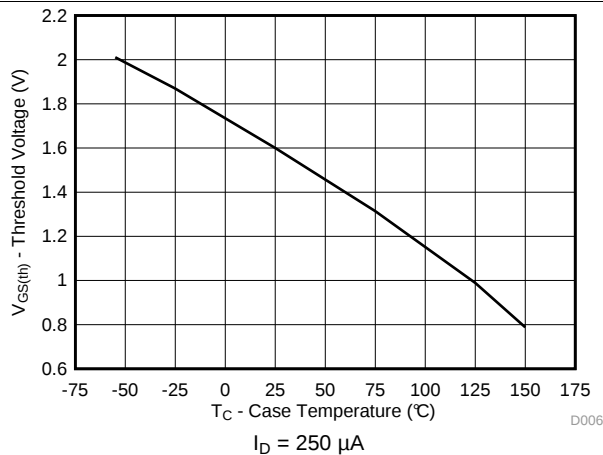
**Figure 3. Transfer Characteristics**



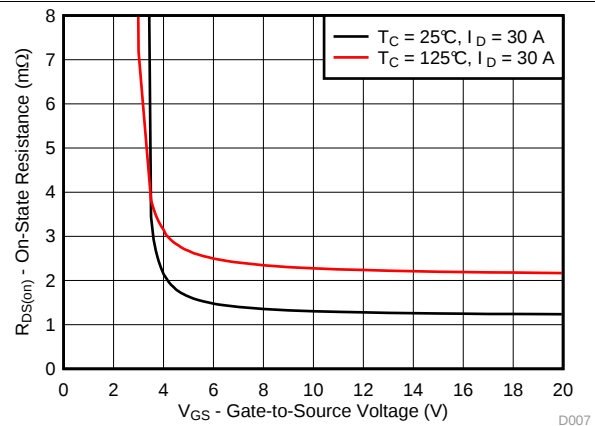
**Figure 4. Gate Charge**



**Figure 5. Capacitance**



**Figure 6. Threshold Voltage vs Temperature**



**Figure 7. On-State Resistance vs Gate-to-Source Voltage**

## Typical MOSFET Characteristics (continued)

$T_A = 25^\circ\text{C}$  (unless otherwise stated)

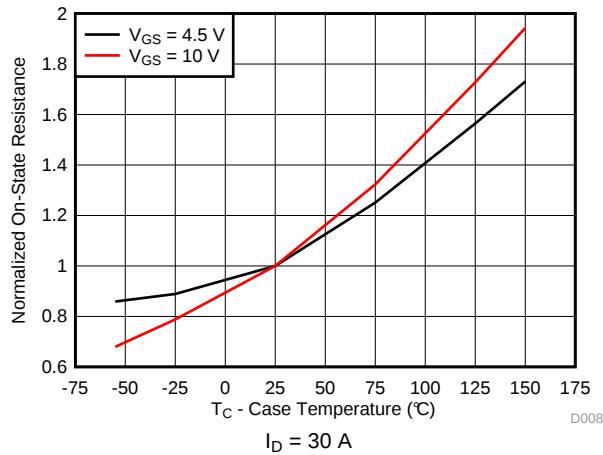


Figure 8. Normalized On-State Resistance vs Temperature

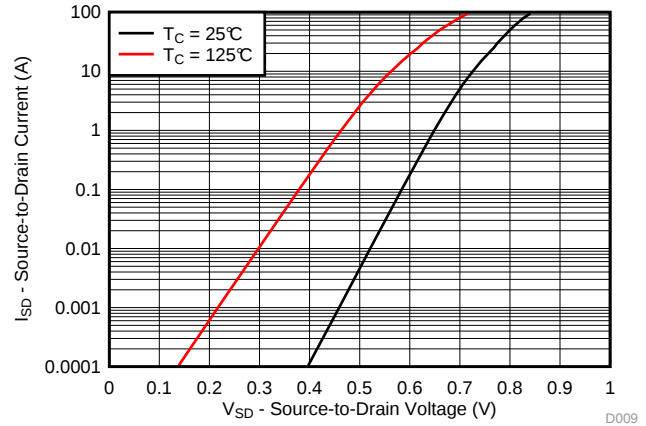


Figure 9. Typical Diode Forward Voltage

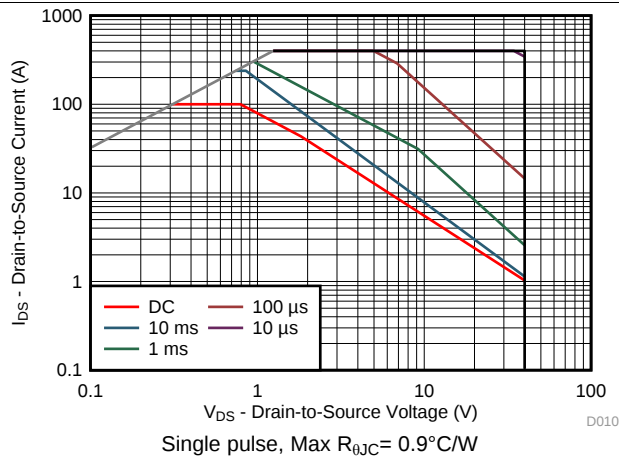


Figure 10. Maximum Safe Operating Area

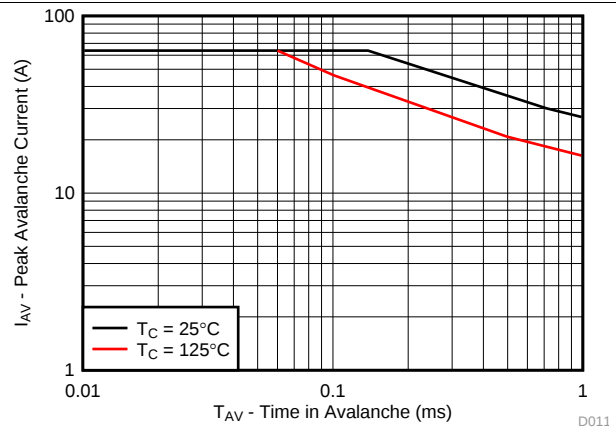


Figure 11. Single Pulse Unclamped Inductive Switching

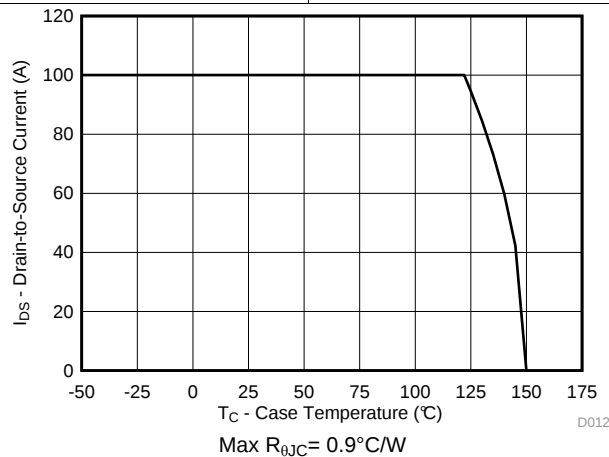


Figure 12. Maximum Drain Current vs Temperature

## 6 器件和文档支持

### 6.1 社区资源

下列链接提供到 TI 社区资源的连接。链接的内容由各个分销商“按照原样”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》。

**TI E2E™ Online Community** *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

**Design Support** *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

### 6.2 商标

NexFET, E2E are trademarks of Texas Instruments.  
All other trademarks are the property of their respective owners.

### 6.3 静电放电警告



这些装置包含有限的内置 ESD 保护。存储或装卸时，应将导线一起截短或将装置放置于导电泡棉中，以防止 MOS 门极遭受静电损伤。

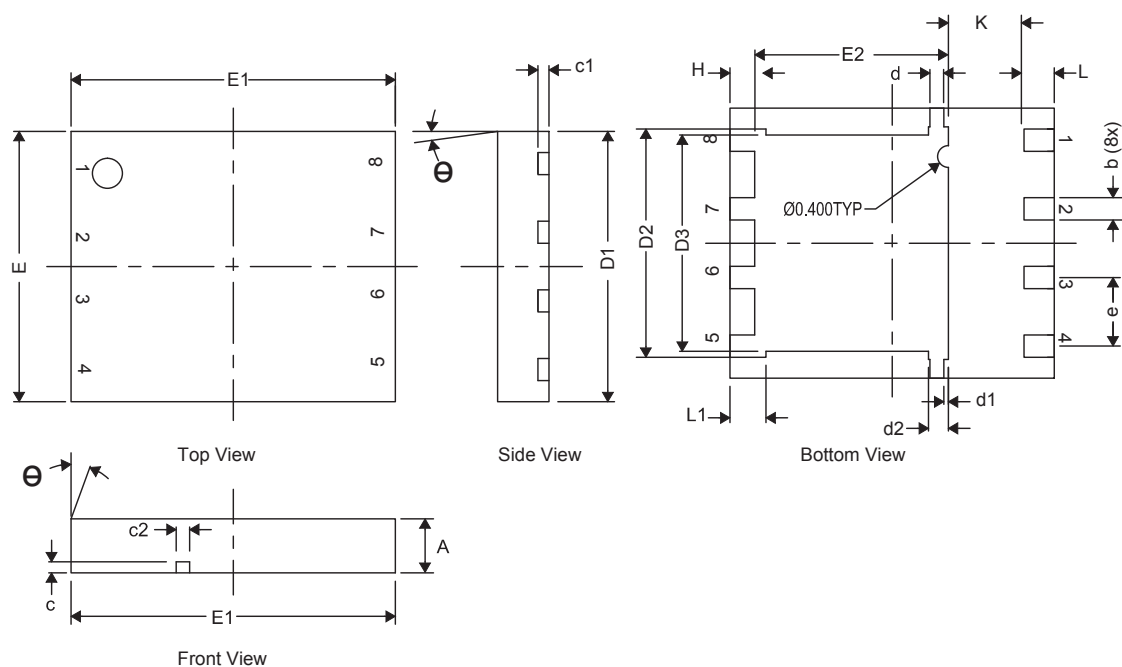
### 6.4 术语表

**SLYZ022** — TI 术语表。

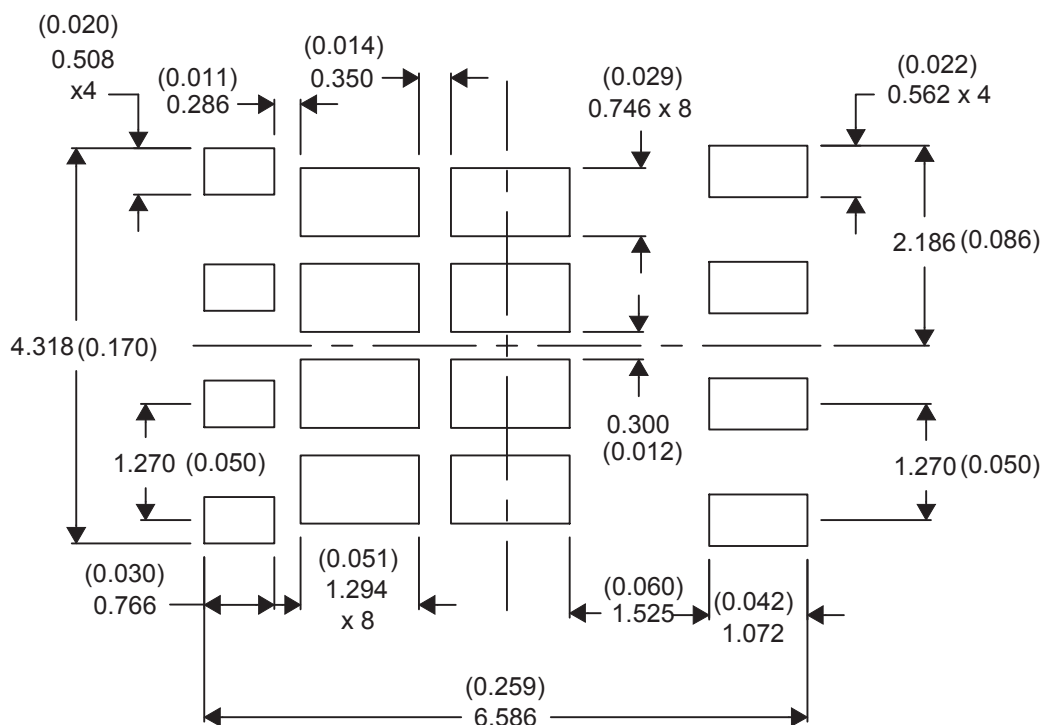
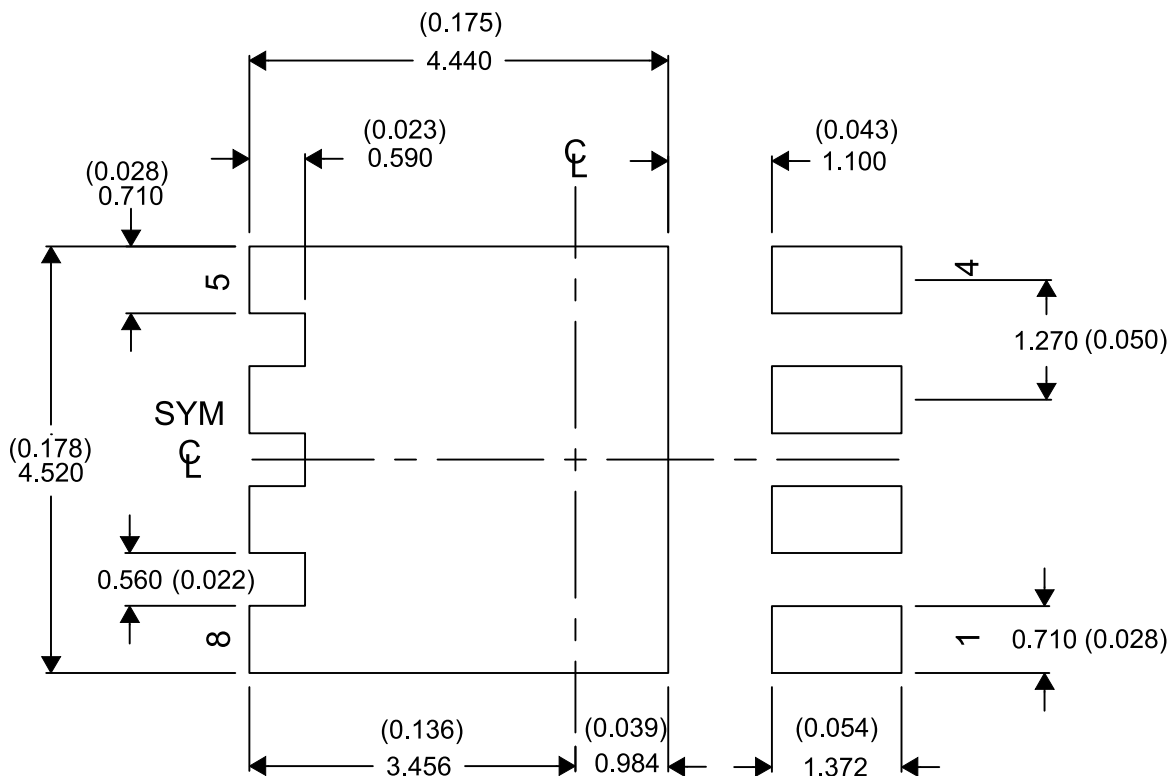
这份术语表列出并解释术语、缩写和定义。

## 7 "机械、封装和可订购信息

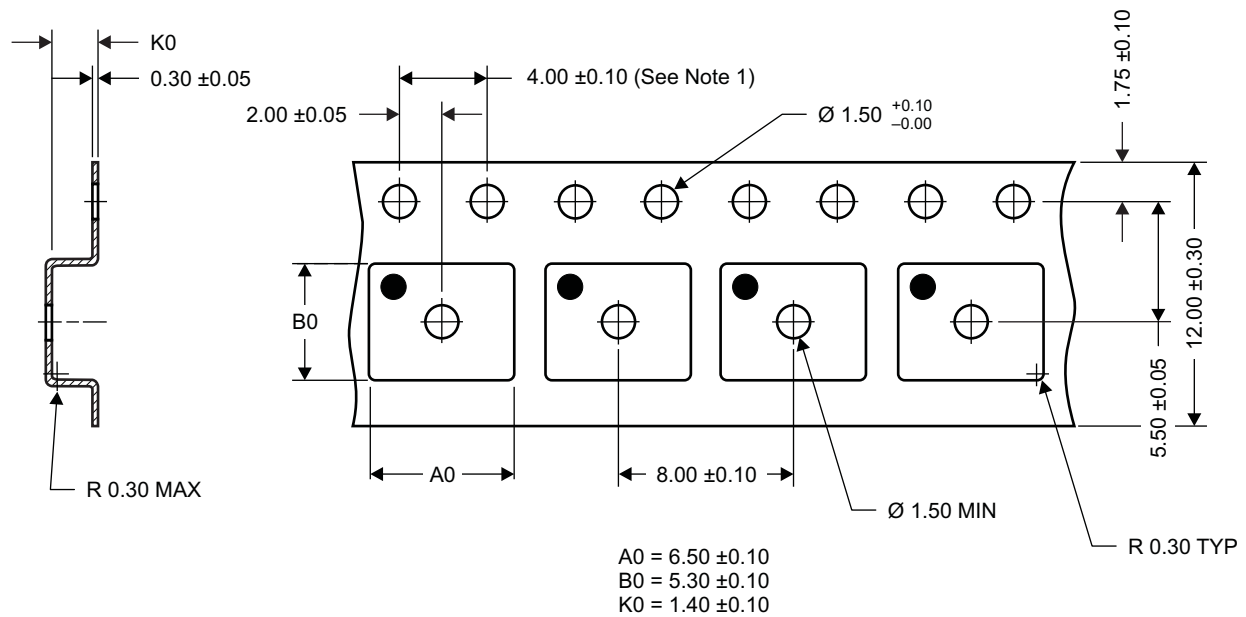
## 7.1 Q5B 封装尺寸



| DIM | 毫米        |       |       |
|-----|-----------|-------|-------|
|     | 最小值       | 标称值   | 最大值   |
| A   | 0.80      | 1.00  | 1.05  |
| b   | 0.36      | 0.41  | 0.46  |
| c   | 0.15      | 0.20  | 0.25  |
| c1  | 0.15      | 0.20  | 0.25  |
| c2  | 0.20      | 0.25  | 0.30  |
| D1  | 4.90      | 5.00  | 5.10  |
| D2  | 4.12      | 4.22  | 4.32  |
| D3  | 3.90      | 4.00  | 4.10  |
| d   | 0.20      | 0.25  | 0.30  |
| d1  | 0.085 典型值 |       |       |
| d2  | 0.319     | 0.369 | 0.419 |
| E   | 4.90      | 5.00  | 5.10  |
| E1  | 5.90      | 6.00  | 6.10  |
| E2  | 3.48      | 3.58  | 3.68  |
| e   | 1.27 典型值  |       |       |
| H   | 0.36      | 0.46  | 0.56  |
| L   | 0.46      | 0.56  | 0.66  |
| L1  | 0.57      | 0.67  | 0.77  |
| θ   | 0°        | -     | -     |
| K   | 1.40 典型值  |       |       |



## 7.4 Q5B 卷带信息



M0138-01

### 注释:

1. 10 个链齿孔的累积容差为  $\pm 0.2$ 。
2. 每 100mm 长度的翘曲不能超过 1mm，在 250mm 长度上不累积。
3. 材料：黑色抗静电聚苯乙烯。
4. 全部尺寸为 mm（除非另外注明）。
5. 高于孔眼底部 0.3mm 的平面上测量得到 A0 和 B0 值。

## PACKAGING INFORMATION

| Orderable part number        | Status<br>(1) | Material type<br>(2) | Package   Pins      | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|------------------------------|---------------|----------------------|---------------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">CSD18512Q5B</a>  | Active        | Production           | VSON-CLIP (DNK)   8 | 2500   LARGE T&R      | ROHS Exempt | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 150   | CSD18512            |
| CSD18512Q5B.B                | Active        | Production           | VSON-CLIP (DNK)   8 | 2500   LARGE T&R      | ROHS Exempt | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 150   | CSD18512            |
| <a href="#">CSD18512Q5BT</a> | Active        | Production           | VSON-CLIP (DNK)   8 | 250   SMALL T&R       | ROHS Exempt | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 150   | CSD18512            |
| CSD18512Q5BT.B               | Active        | Production           | VSON-CLIP (DNK)   8 | 250   SMALL T&R       | ROHS Exempt | NIPDAU                               | Level-1-260C-UNLIM                | -55 to 150   | CSD18512            |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts 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.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "-" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

**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.

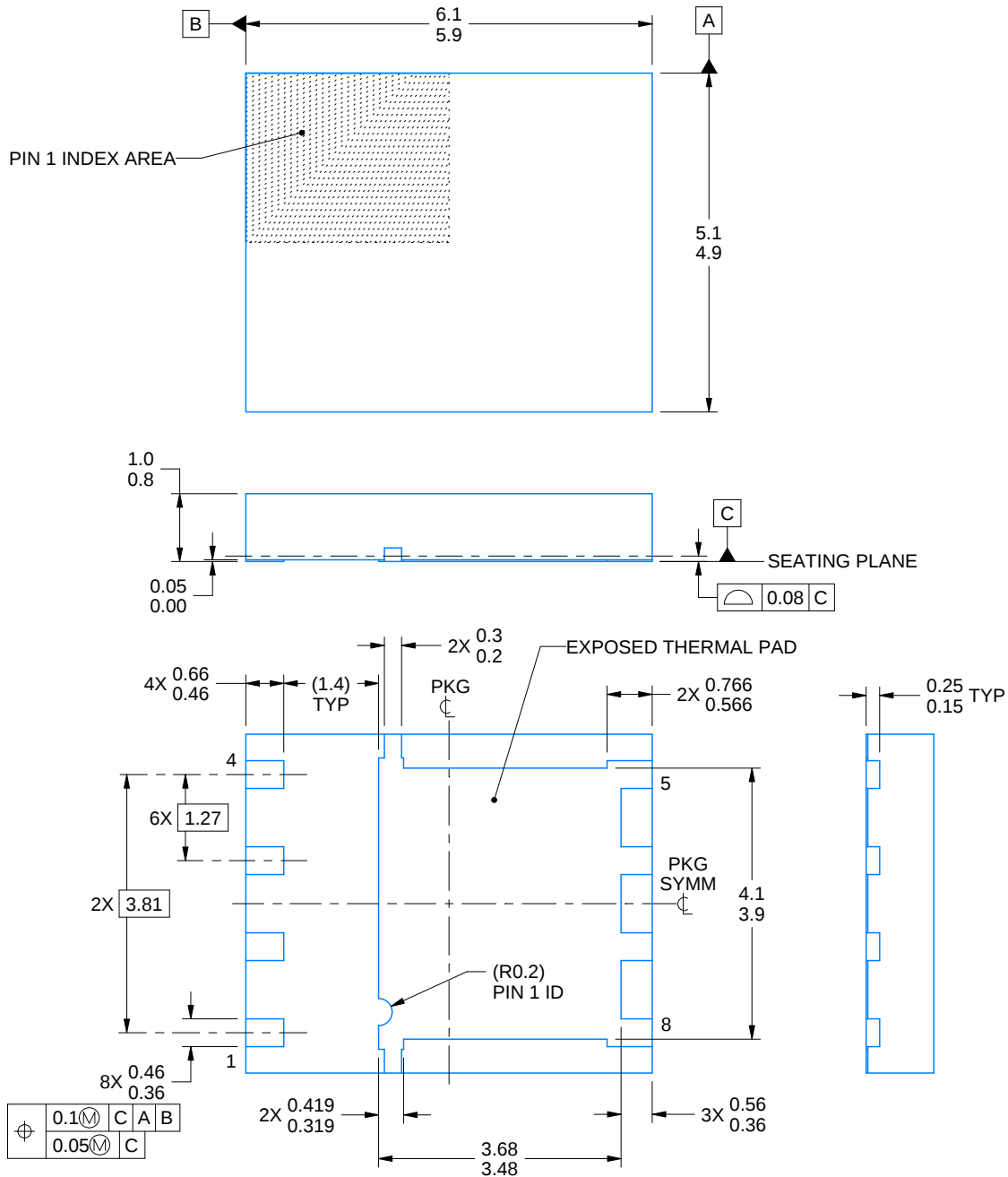
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

# PACKAGE OUTLINE

DNK0008A

VSON-CLIP - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4226669/A 04/2021

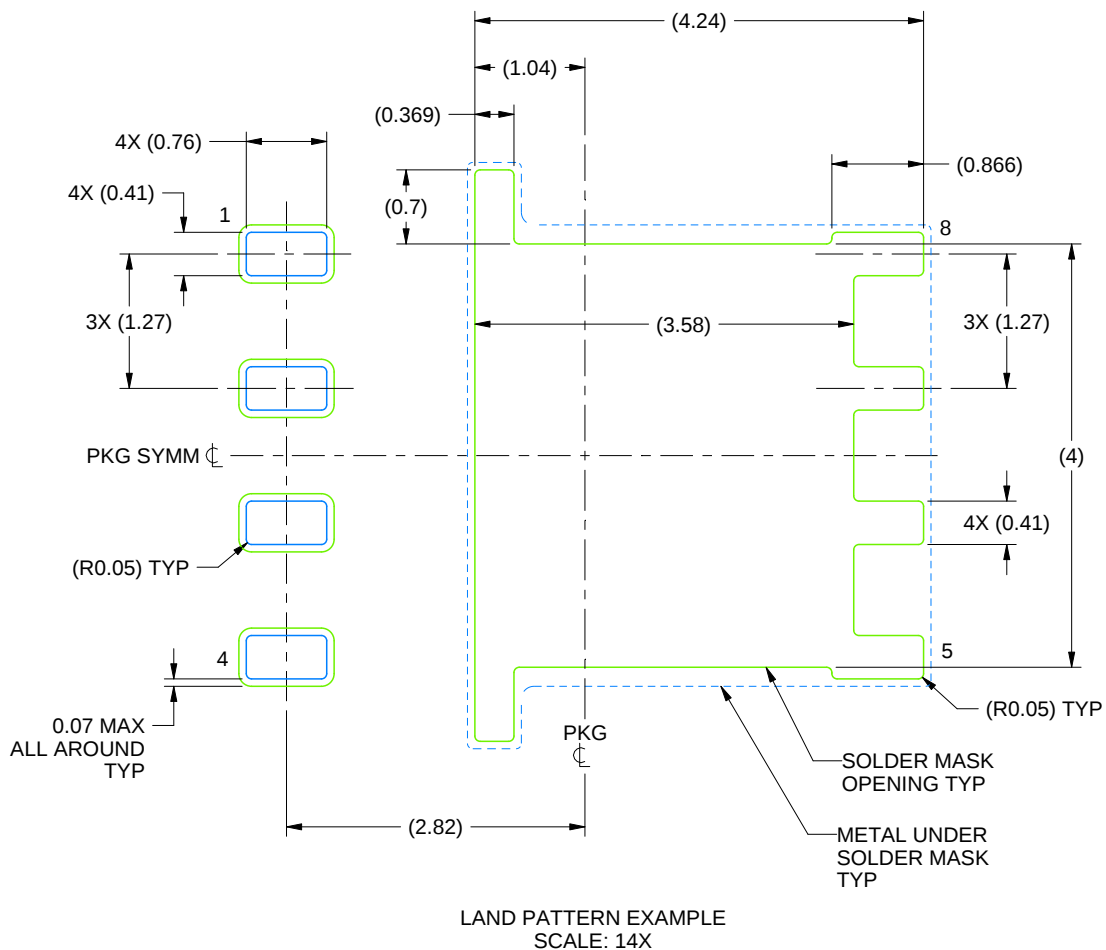
## NOTES:

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. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

**DNK0008A**

## VSON-CLIP - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4226669/A 04/2021

NOTES: (continued)

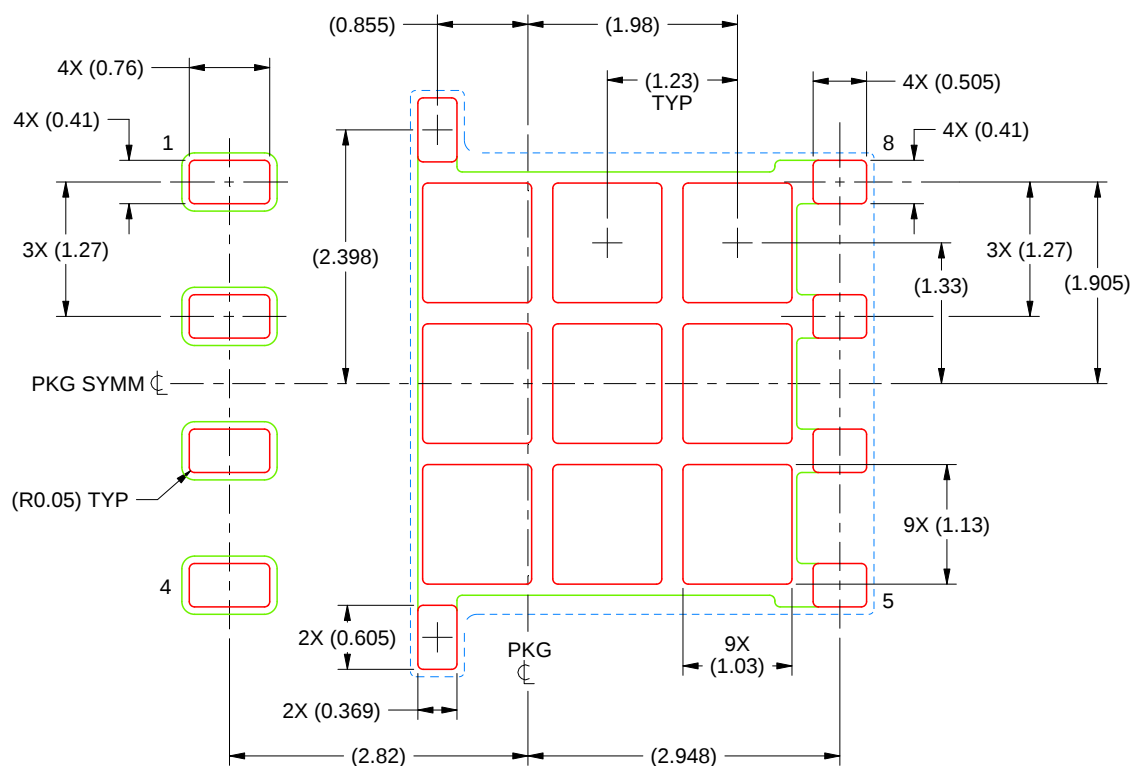
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
5. Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations are shown.

# EXAMPLE STENCIL DESIGN

DNK0008A

VSON-CLIP - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE  
 BASED ON 0.125 mm THICK STENCIL  
 SCALE: 14X

74% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

4226669/A 04/2021

NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

## 重要通知和免责声明

TI“按原样”提供技术和可靠性数据（包括数据表）、设计资源（包括参考设计）、应用或其他设计建议、网络工具、安全信息和其他资源，不保证没有瑕疵且不做任何明示或暗示的担保，包括但不限于对适销性、某特定用途方面的适用性或不侵犯任何第三方知识产权的暗示担保。

这些资源可供使用 TI 产品进行设计的熟练开发人员使用。您将自行承担以下全部责任：(1) 针对您的应用选择合适的 TI 产品，(2) 设计、验证并测试您的应用，(3) 确保您的应用满足相应标准以及任何其他功能安全、信息安全、监管或其他要求。

这些资源如有变更，恕不另行通知。TI 授权您仅可将这些资源用于研发本资源所述的 TI 产品的相关应用。严禁以其他方式对这些资源进行复制或展示。您无权使用任何其他 TI 知识产权或任何第三方知识产权。您应全额赔偿因在这些资源的使用中对 TI 及其代表造成的任何索赔、损害、成本、损失和债务，TI 对此概不负责。

TI 提供的产品受 [TI 的销售条款](#) 或 [ti.com](#) 上其他适用条款/TI 产品随附的其他适用条款的约束。TI 提供这些资源并不会扩展或以其他方式更改 TI 针对 TI 产品发布的适用的担保或担保免责声明。

TI 反对并拒绝您可能提出的任何其他或不同的条款。

邮寄地址：Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
版权所有 © 2025，德州仪器 (TI) 公司