

# CSD18510Q5B N 通道 NexFET™ 功率金属氧化物半导体场效应晶体管 (MOSFET)

## 1 特性

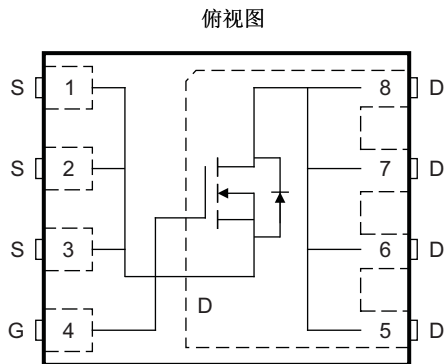
- 低  $R_{DS(ON)}$
- 低热阻
- 雪崩额定值
- 逻辑电平
- 无铅引脚镀层
- 符合 RoHS 环保标准
- 无卤素
- 小外形尺寸无引线 (SON) 5mm x 6mm 塑料封装

## 2 应用范围

- 直流 - 直流转换
- 次级侧同步整流器
- 电机控制

## 3 说明

这款采用 5mm x 6mm SON 封装的 40V、0.79mΩ、NexFET™ 功率 MOSFET 的设计旨在追求以最大限度降低功率转换应用中的功率损耗。



### 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)	118		nC
$Q_{gd}$	栅极电荷 (栅极到漏极)	21		nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = 4.5\text{V}$	1.2	mΩ
		$V_{GS} = 10\text{V}$	0.79	
$V_{GS(th)}$	阈值电压	1.7		V

### 器件信息(1)

器件	数量	包装介质	封装	运输
CSD18510Q5B	2500	13 英寸卷带	5.00mm x 6.00mm SON 塑料封装	卷带封装
CSD18510Q5BT	250	7 英寸卷带		

(1) 要了解所有可用封装，请见数据表末尾的可订购产品附录。

### 绝对最大额定值

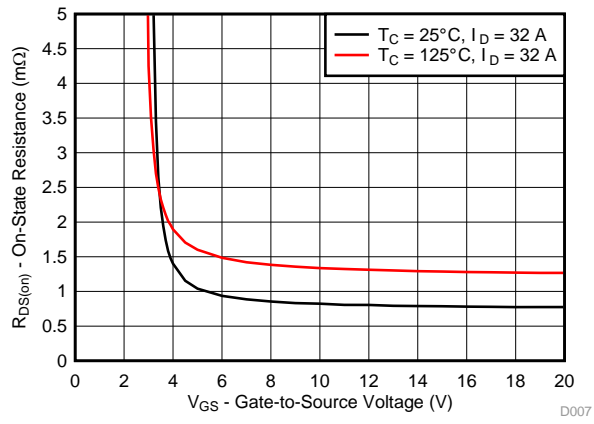
$T_A = 25^\circ\text{C}$		值	单位
$V_{DS}$	漏源电压	40	V
$V_{GS}$	栅源电压	$\pm 20$	V
$I_D$	持续漏极电流 (受封装限制)	100	A
	持续漏极电流 (受芯片限制), $T_C = 25^\circ\text{C}$ 时测得	300	
	持续漏极电流 <sup>(1)</sup>	42	
$I_{DM}$	脉冲漏极电流, $T_A = 25^\circ\text{C}$ 时测得 <sup>(2)</sup>	400	A
$P_D$	功率耗散 <sup>(1)</sup>	3.1	W
	功率耗散, $T_C = 25^\circ\text{C}$	156	
$T_J, T_{stg}$	工作结温, 储存温度	-55 至 150	$^\circ\text{C}$
$E_{AS}$	雪崩能量, 单一脉冲 $I_D = 81, L = 0.1\text{mH}, R_G = 25\Omega$	328	mJ

(1)  $R_{\theta JA} = 40^\circ\text{C}/\text{W}$ ，这是在一块厚度为 0.06 英寸环氧树脂 (FR4) 印刷电路板 (PCB) 上的 1 英寸<sup>2</sup>，2 盎司铜焊盘上测得的典型值。

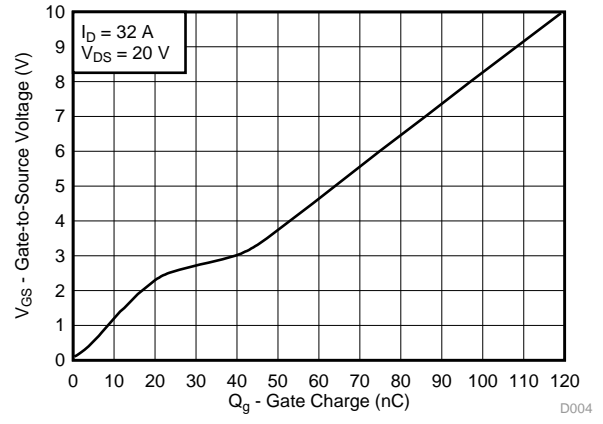
(2) 最大  $R_{\theta JC} = 0.8^\circ\text{C}/\text{W}$ ，脉冲持续时间  $\leq 100\mu\text{s}$ ，占空比  $\leq 1\%$ 。



$R_{DS(on)}$  与  $V_{GS}$  间的关系



栅极电荷



## 目录

<b>1</b>	特性 .....	<b>1</b>	<b>6.1</b>	接收文档更新通知 .....	<b>8</b>
<b>2</b>	应用范围 .....	<b>1</b>	<b>6.2</b>	社区资源 .....	<b>8</b>
<b>3</b>	说明 .....	<b>1</b>	<b>6.3</b>	商标 .....	<b>8</b>
<b>4</b>	修订历史记录 .....	<b>3</b>	<b>6.4</b>	静电放电警告 .....	<b>8</b>
<b>5</b>	<b>Specifications</b> .....	<b>4</b>	<b>6.5</b>	Glossary .....	<b>8</b>
	5.1 Electrical Characteristics .....	<b>4</b>	<b>7</b>	<b>机械、封装和可订购信息</b> .....	<b>9</b>
	5.2 Thermal Information .....	<b>4</b>	<b>7.1</b>	Q5B 封装尺寸 .....	<b>9</b>
	5.3 Typical MOSFET Characteristics .....	<b>5</b>	<b>7.2</b>	建议 PCB 布局 .....	<b>10</b>
<b>6</b>	器件和文档支持 .....	<b>8</b>	<b>7.3</b>	建议模板布局 .....	<b>10</b>
			<b>7.4</b>	Q5B 卷带信息 .....	<b>11</b>

## 4 修订历史记录

日期	修订版本	注释
2017 年 3 月	*	最初发布。

## 5 Specifications

### 5.1 Electrical Characteristics

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

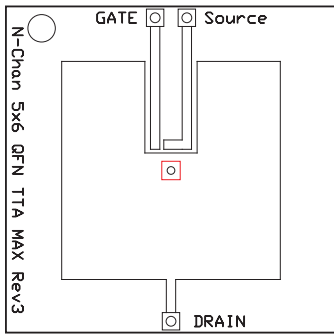
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
<b>STATIC CHARACTERISTICS</b>							
$V_{DSS}$	Drain-to-source voltage	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	40			V	
$I_{DSS}$	Drain-to-source leakage current	$V_{GS} = 0\text{ V}, V_{DS} = 32\text{ V}$			1	$\mu\text{A}$	
$I_{GSS}$	Gate-to-source leakage current	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA	
$V_{GS(th)}$	Gate-to-source threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1.2	1.7	2.3	V	
$R_{DS(on)}$	Drain-to-source on resistance	$V_{GS} = 4.5\text{ V}, I_D = 32\text{ A}$		1.2	1.6	m $\Omega$	
		$V_{GS} = 10\text{ V}, I_D = 32\text{ A}$		0.79	0.96		
$g_{fs}$	Transconductance	$V_{DS} = 4\text{ V}, I_D = 32\text{ A}$		147		S	
<b>DYNAMIC CHARACTERISTICS</b>							
$C_{iss}$	Input capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}, f = 1\text{ MHz}$		8770	11400	pF	
$C_{oss}$	Output capacitance			832	1080	pF	
$C_{rss}$	Reverse transfer capacitance			424	551	pF	
$R_G$	Series gate resistance			0.9	1.8	$\Omega$	
$Q_g$	Gate charge total (4.5 V)	$V_{DS} = 20\text{ V}, I_D = 32\text{ A}$		58	75	nC	
$Q_g$	Gate charge total (10 V)			118	153	nC	
$Q_{gd}$	Gate charge gate-to-drain			21		nC	
$Q_{gs}$	Gate charge gate-to-source			28		nC	
$Q_{g(th)}$	Gate charge at $V_{th}$			15		nC	
$Q_{oss}$	Output charge		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$		35		nC
$t_{d(on)}$	Turnon delay time				8		ns
$t_r$	Rise time	$V_{DS} = 20\text{ V}, V_{GS} = 10\text{ V}, I_{DS} = 32\text{ A}, R_G = 0\ \Omega$		17		ns	
$t_{d(off)}$	Turnoff delay time			44		ns	
$t_f$	Fall time			15		ns	
<b>DIODE CHARACTERISTICS</b>							
$V_{SD}$	Diode forward voltage	$I_{SD} = 32\text{ A}, V_{GS} = 0\text{ V}$		0.8	1.0	V	
$Q_{rr}$	Reverse recovery charge	$V_{DS} = 20\text{ V}, I_F = 32\text{ A}, di/dt = 300\text{ A}/\mu\text{s}$		31		nC	
$t_{rr}$	Reverse recovery time			19		ns	

### 5.2 Thermal Information

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

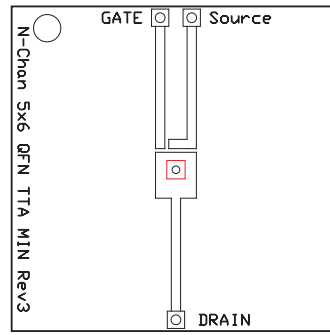
THERMAL METRIC		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction-to-case thermal resistance <sup>(1)</sup>			0.8	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-ambient thermal resistance <sup>(1)(2)</sup>			50	$^\circ\text{C}/\text{W}$

- (1)  $R_{\theta JC}$  is determined with the device mounted on a 1-in<sup>2</sup> (6.45-cm<sup>2</sup>), 2-oz (0.071-mm) thick Cu pad on a 1.5-in × 1.5-in (3.81-cm × 3.81-cm), 0.06-in (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.
- (2) Device mounted on FR4 material with 1-in<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 in<sup>2</sup>  
(6.45 cm<sup>2</sup>) of  
2-oz (0.071-mm) thick  
Cu.

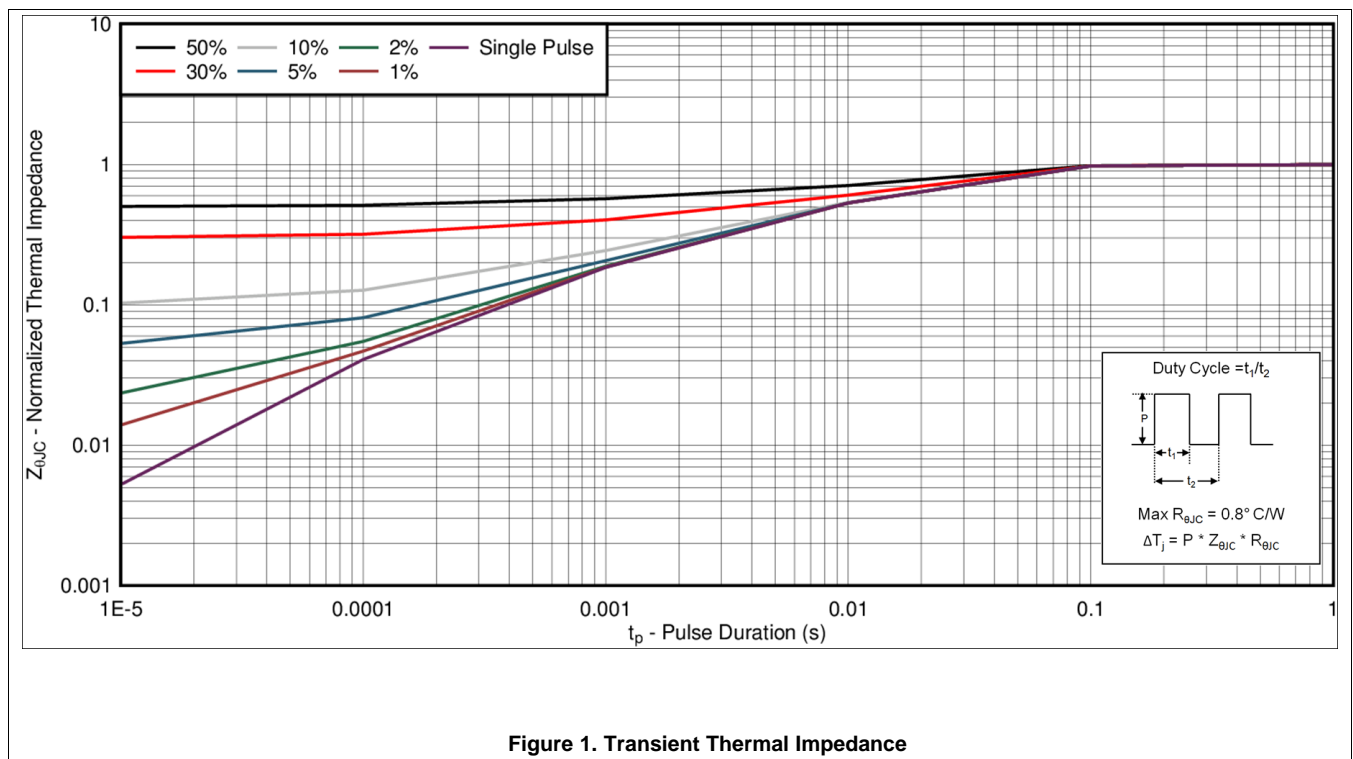


M0137-02

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

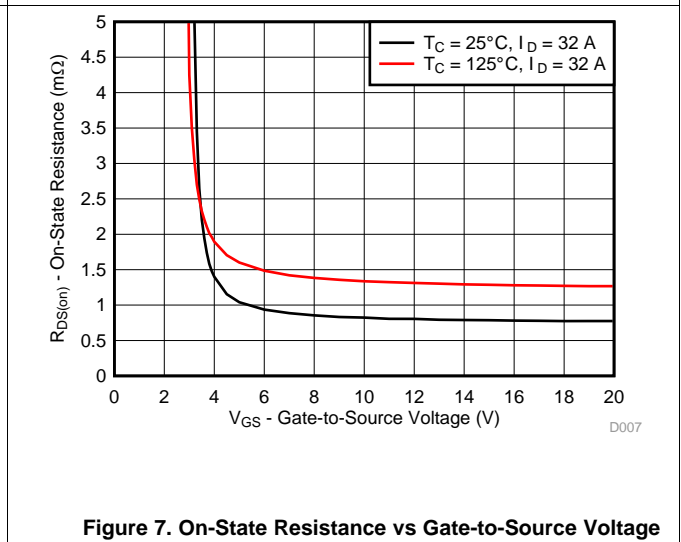
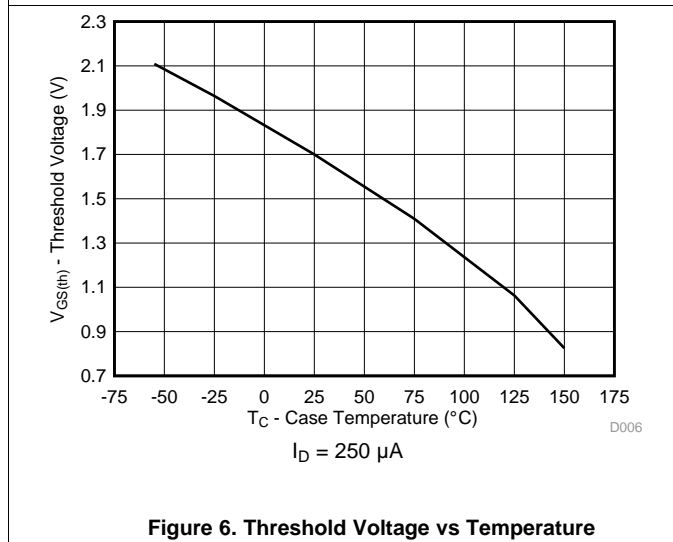
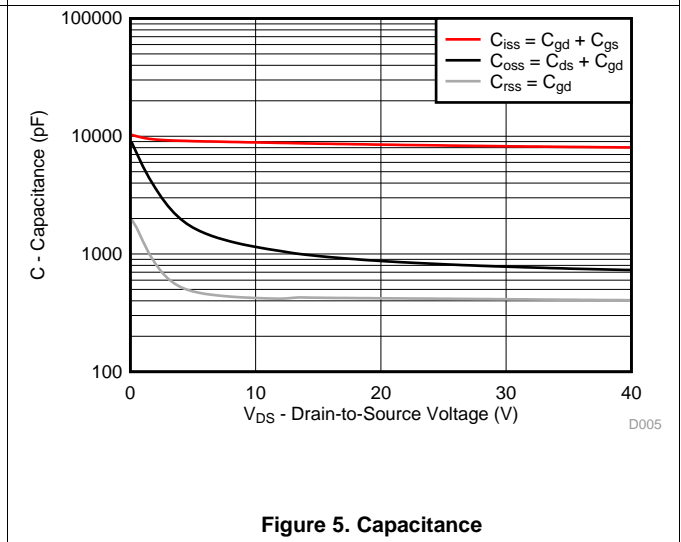
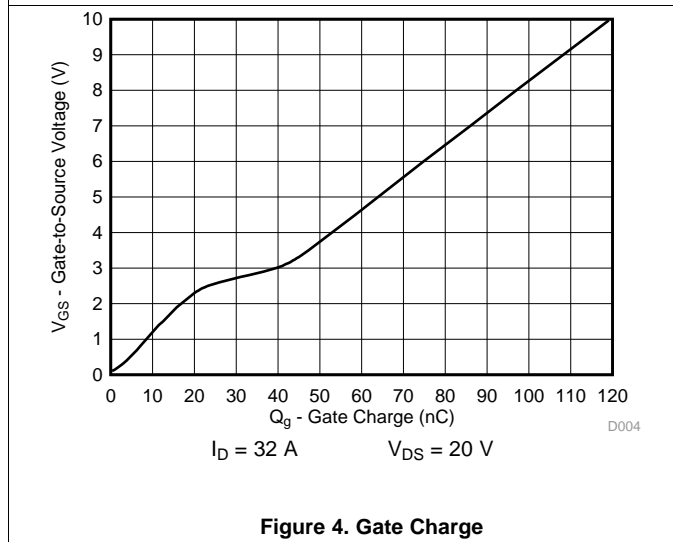
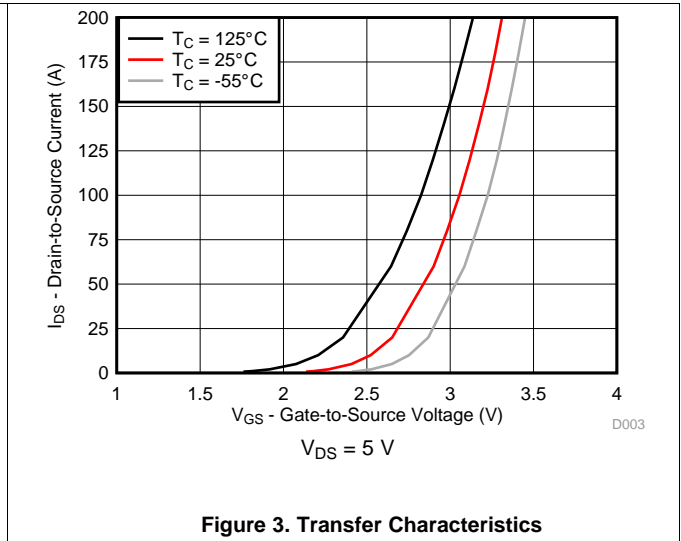
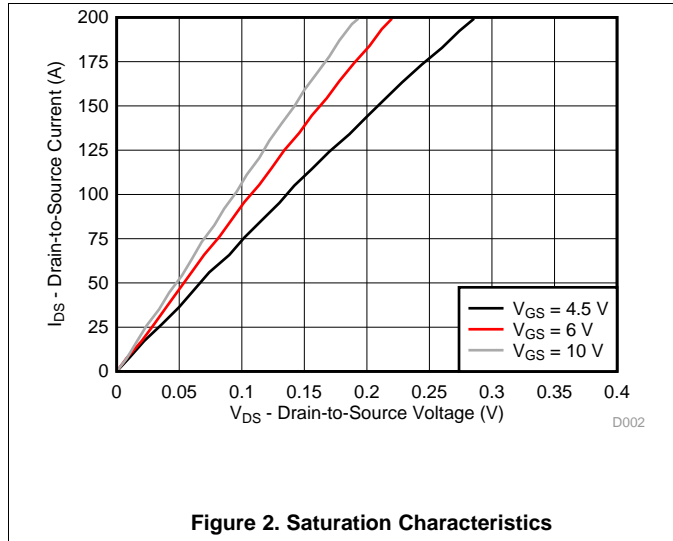
### 5.3 Typical MOSFET Characteristics

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



Typical MOSFET Characteristics (continued)

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



Typical MOSFET Characteristics (continued)

T<sub>A</sub> = 25°C (unless otherwise stated)

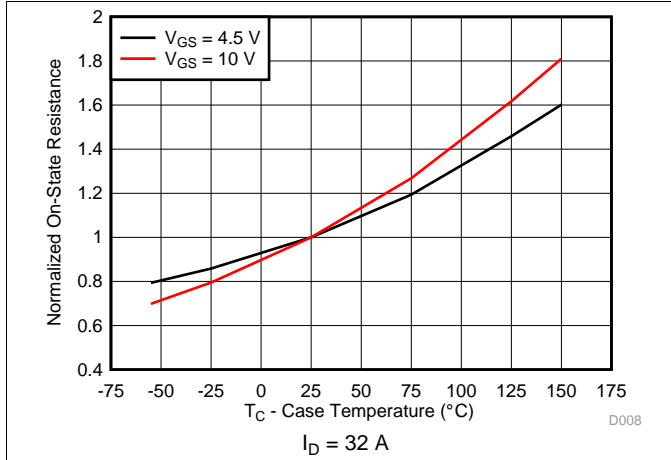


Figure 8. Normalized On-State Resistance vs Temperature

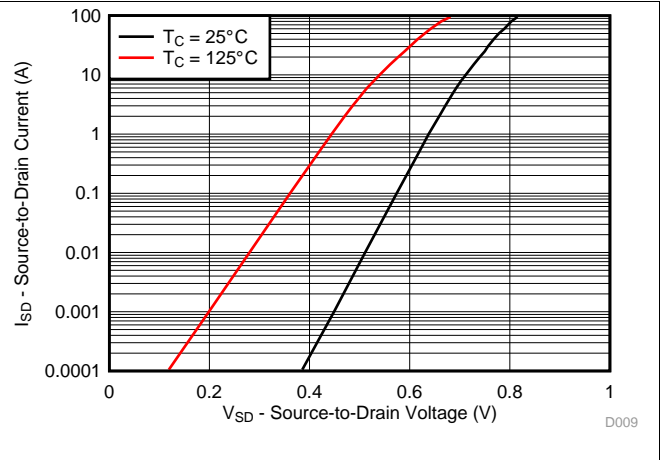


Figure 9. Typical Diode Forward Voltage

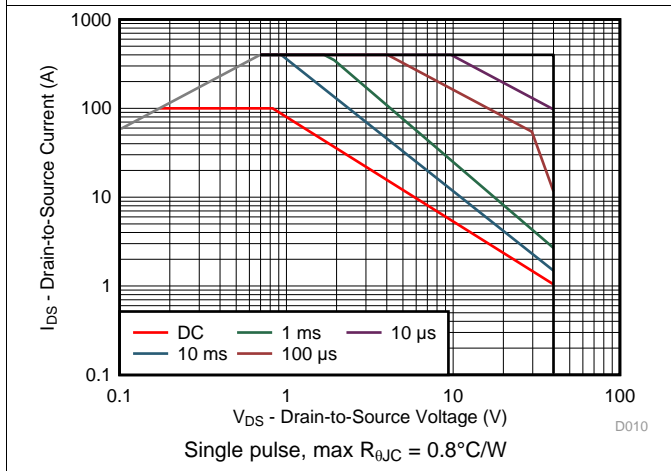


Figure 10. Maximum Safe Operating Area

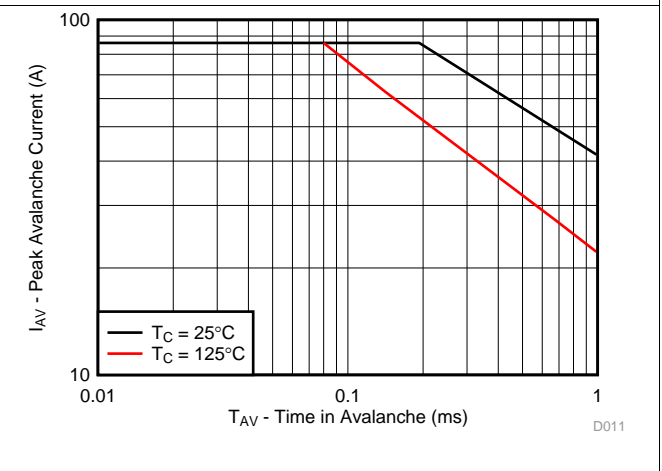


Figure 11. Single Pulse Unclamped Inductive Switching

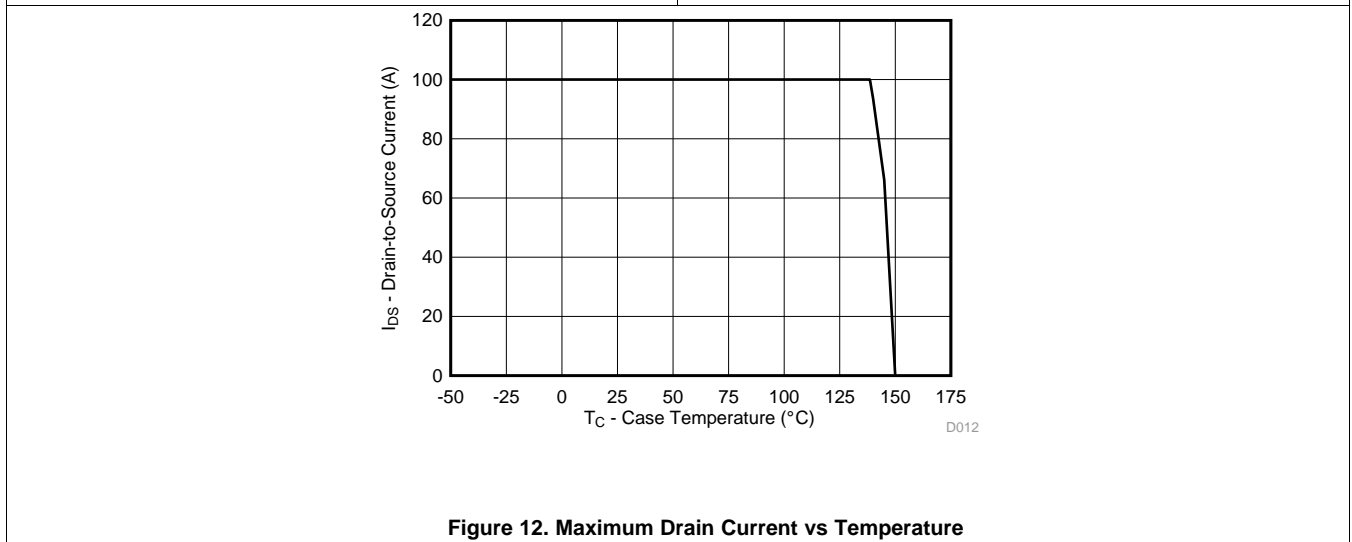


Figure 12. Maximum Drain Current vs Temperature

## 6 器件和文档支持

### 6.1 接收文档更新通知

如需接收文档更新通知，请访问 [www.ti.com.cn](http://www.ti.com.cn) 网站上的器件产品文件夹。点击右上角的提醒我 (Alert me) 注册后，即可每周定期收到已更改的产品信息。有关更改的详细信息，请查阅已修订文档中包含的修订历史记录。

### 6.2 社区资源

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

**TI E2E™ Online Community** *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At [e2e.ti.com](http://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.

### 6.3 商标

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

### 6.4 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。

### 6.5 Glossary

[SLYZ022](#) — *TI Glossary*.

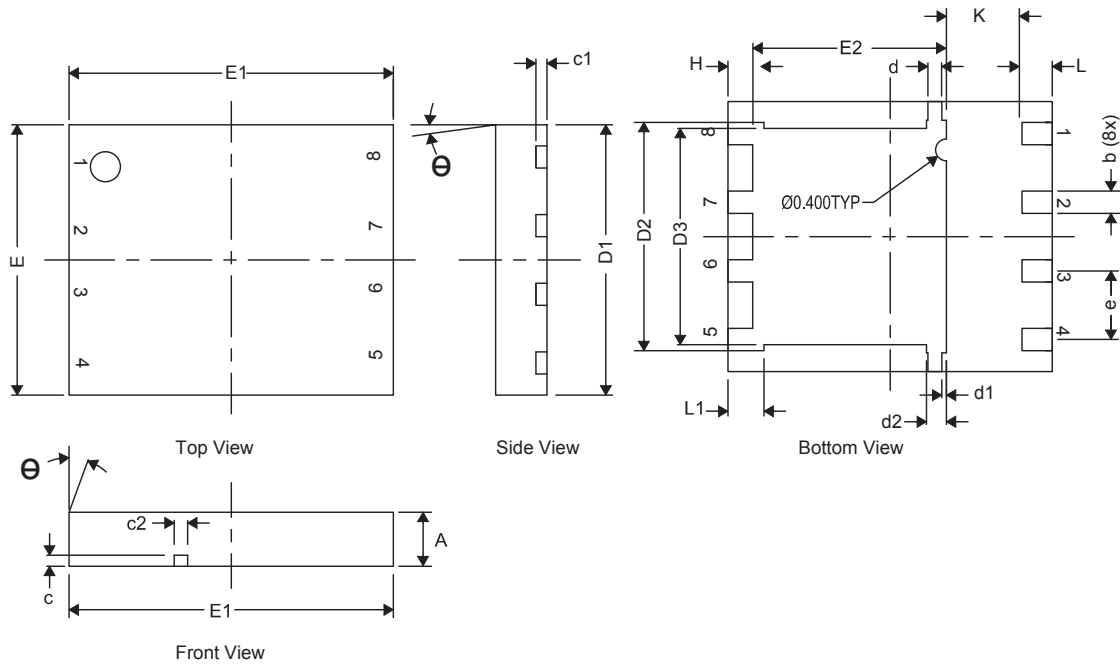
This glossary lists and explains terms, acronyms, and definitions.



## 7 机械、封装和可订购信息

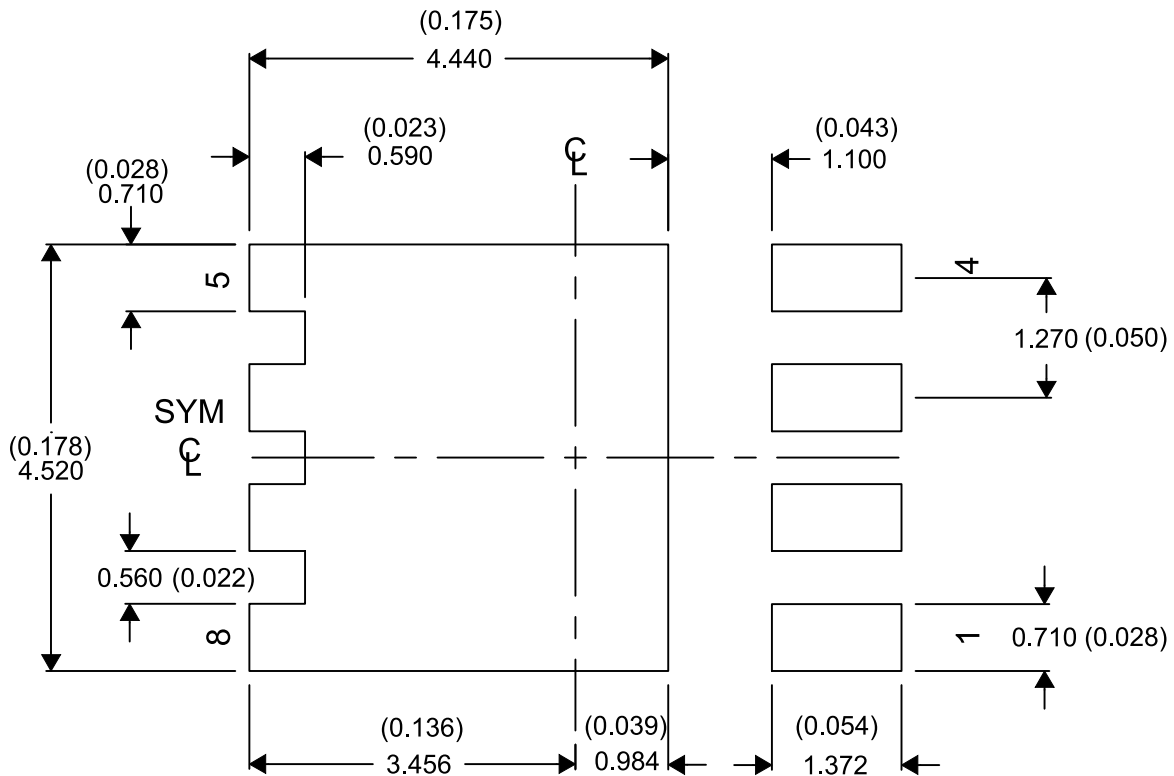
以下页中包括机械、封装和可订购信息。这些信息是针对指定器件可提供的最新数据。这些数据会在无通知且不对本文档进行修订的情况下发生改变。要获得这份数据表的浏览器版本，请查阅左侧的导航栏。

### 7.1 Q5B 封装尺寸



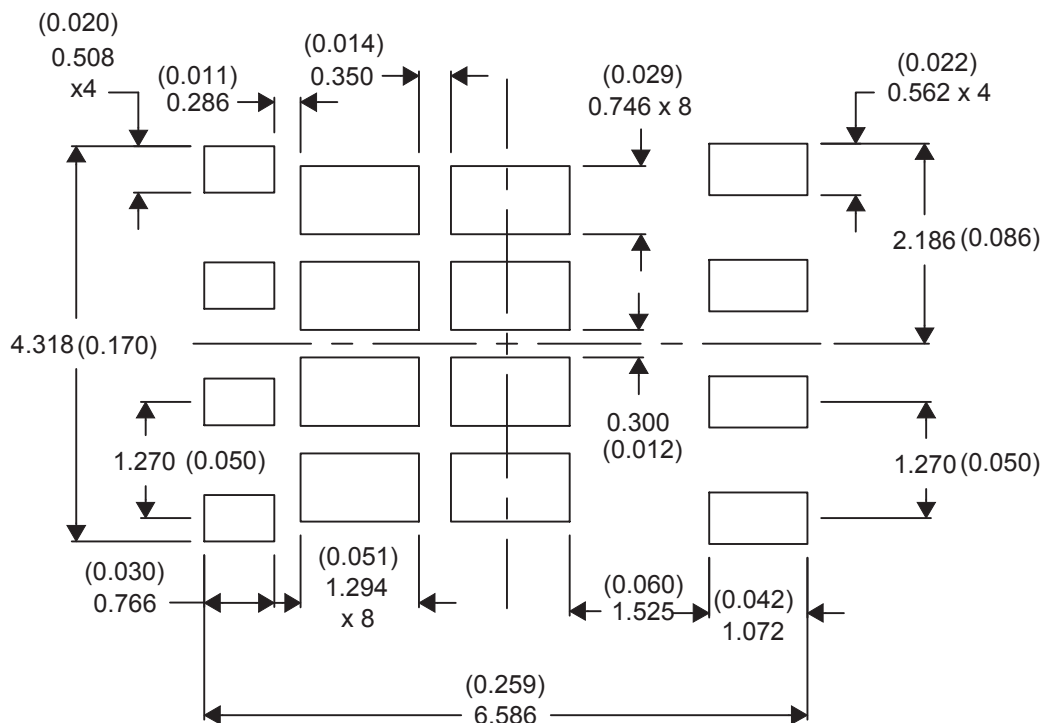
DIM	毫米		
	最小值	标称值	最大值
A	0.80	1.00	1.05
b	0.36	0.41	0.46
c	0.15	0.20	0.25
c1	0.15	0.20	0.25
c2	0.20	0.25	0.30
D1	4.90	5.00	5.10
D2	4.12	4.22	4.32
D3	3.90	4.00	4.10
d	0.20	0.25	0.30
d1	0.085 典型值		
d2	0.319	0.369	0.419
E	4.90	5.00	5.10
E1	5.90	6.00	6.10
E2	3.48	3.58	3.68
e	1.27 典型值		
H	0.36	0.46	0.56
L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

## 7.2 建议 PCB 布局

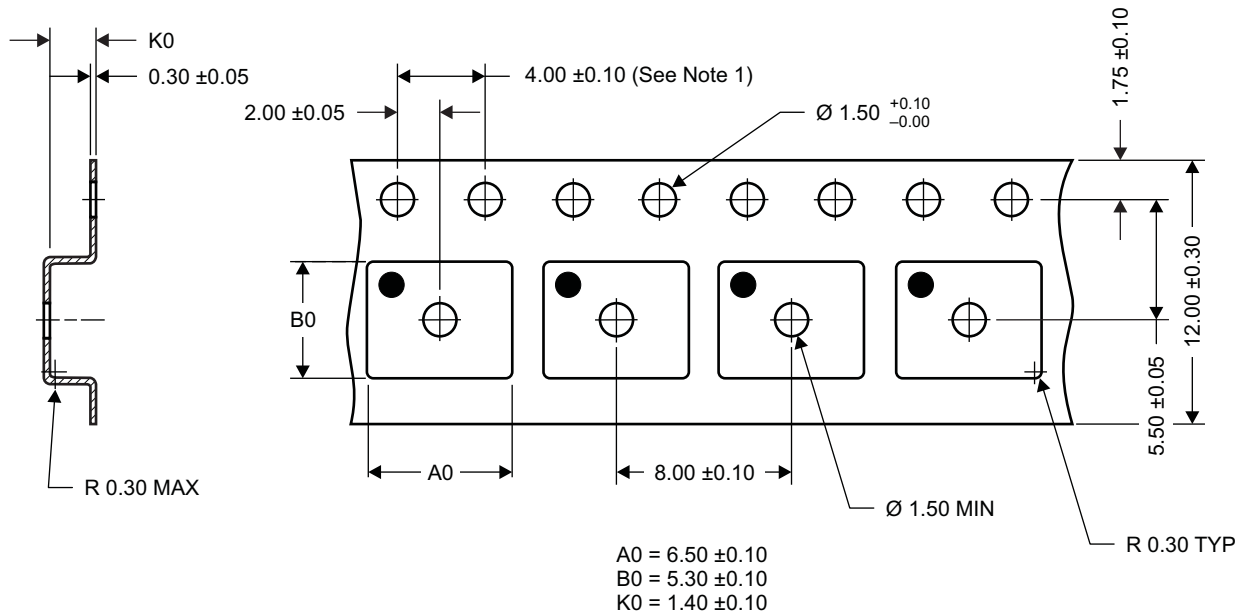


有关针对 PCB 设计的建议电路布局布线，请参见《通过 PCB 布局布线技巧来减少振铃》（文献编号：SLPA005）。

## 7.3 建议模板布局



**7.4 Q5B 卷带信息**



M0138-01

**注释:**

1. 10 链齿孔距累积容差  $\pm 0.2$ 。
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. 全部尺寸单位为 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 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
CSD18510Q5B	ACTIVE	VSON-CLIP	DNK	8	2500	RoHS-Exempt & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 150	CSD18510	<a href="#">Samples</a>
CSD18510Q5BT	ACTIVE	VSON-CLIP	DNK	8	250	RoHS-Exempt & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 150	CSD18510	<a href="#">Samples</a>

(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.

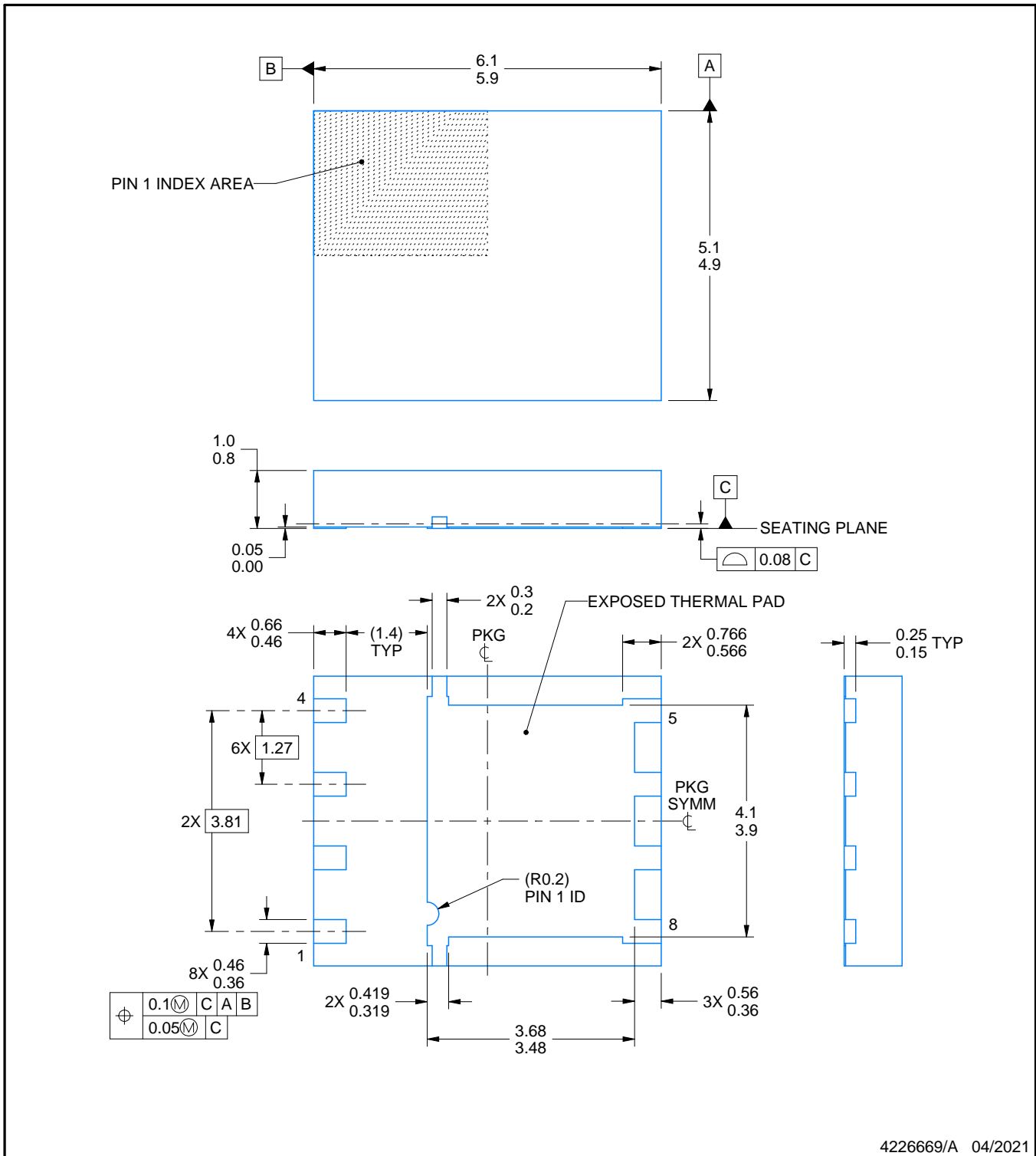


# PACKAGE OUTLINE

DNK0008A

VSON-CLIP - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



**NOTES:**

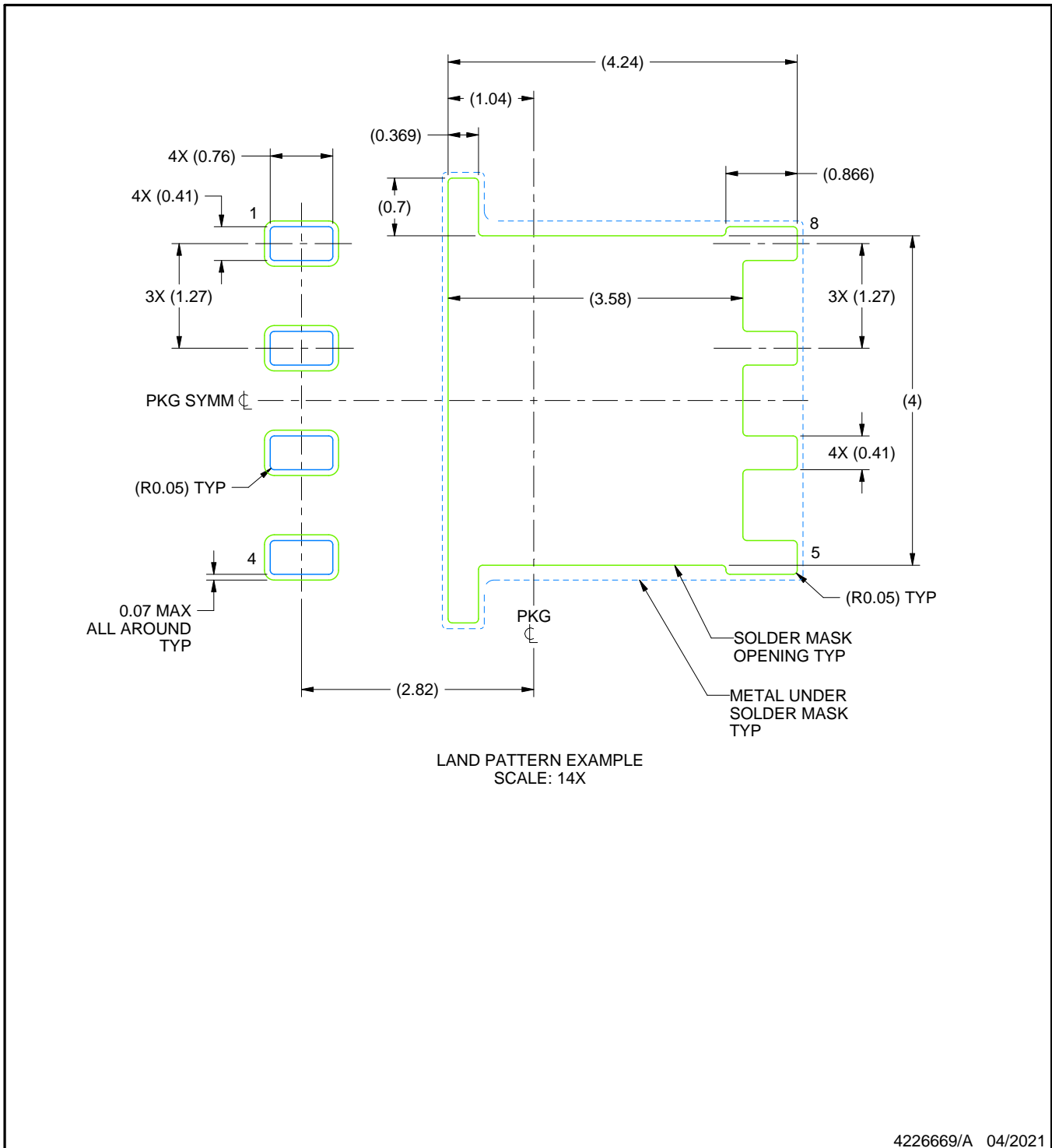
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

DNK0008A

VSON-CLIP - 1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



NOTES: (continued)

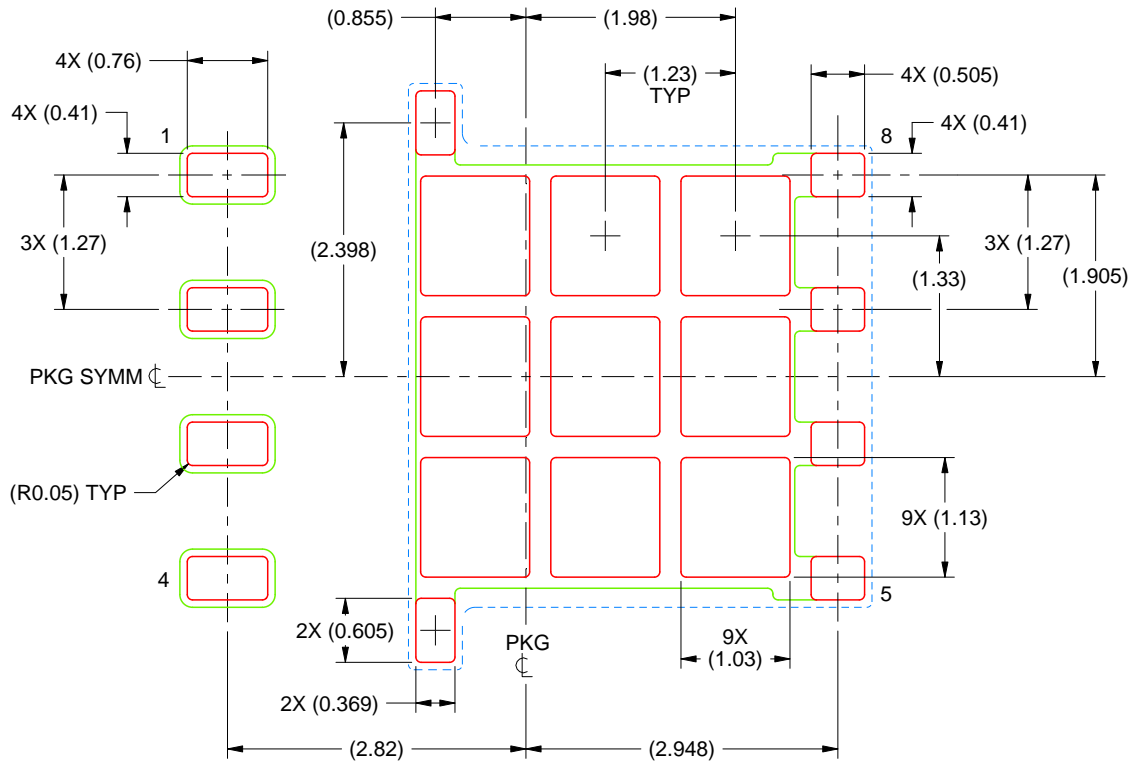
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/sluea271](http://www.ti.com/lit/sluea271)).
5. Vias are optional depending on application, refer to device data sheet. If some or all are implemented, 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.



## 重要声明和免责声明

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