

CSD18511Q5A 40V N 沟道 NexFET™ 功率 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 标准
- 无卤素
- 小外形尺寸无引线 (SON) 5mm x 6mm 塑料封装

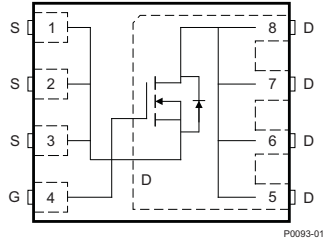
2 应用范围

- 直流 - 直流转换
- 次级侧同步整流
- 电池电机控制

3 说明

这款 40V, 1.9mΩ, SON 5mm × 6mm 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。

俯视图



P0093-01

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)	63		nC
Q_{gd}	栅极电荷 (栅极到漏极)	11.2		nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = 4.5\text{V}$	2.7	mΩ
		$V_{GS} = 10\text{V}$	1.9	mΩ
$V_{GS(th)}$	阈值电压	1.8		V

订购信息⁽¹⁾

器件	数量	介质	封装	出货
CSD18511Q5A	2500	13 英寸卷带	SON 5mm × 6mm 塑料封装	卷带封装
CSD18511Q5AT	250	7 英寸卷带		

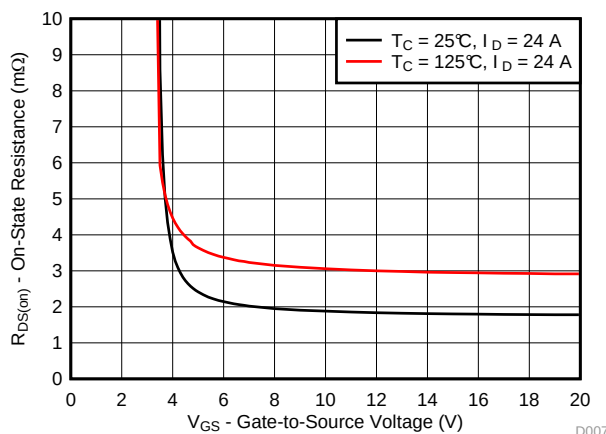
(1) 要了解所有可用封装, 请见数据表末尾的可订购产品附录。

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	±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	159	
	持续漏极电流 ⁽¹⁾	27	
I_{DM}	脉冲漏极电流 ⁽²⁾	400	A
P_D	功率耗散 ⁽¹⁾	3.1	W
	功率耗散, $T_C = 25^\circ\text{C}$	104	
T_J, T_{stg}	运行结温和储存温度范围	-55 至 150	°C
E_{AS}	雪崩能量, 单一脉冲 $I_D = 56\text{A}, L = 0.1\text{mH}, R_G = 25\Omega$	157	mJ

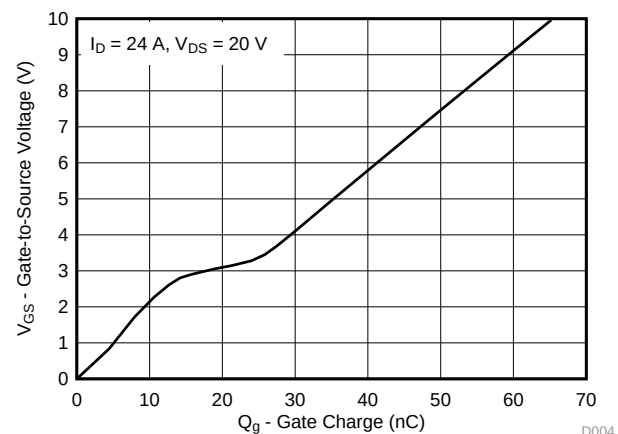
(1) $R_{\theta JA} = 42^\circ\text{C/W}$, 这是在一块厚度为 0.06 英寸 (1.52mm) 的 FR4 印刷电路板 (PCB) 上的一英寸², 2 盎司铜过渡垫片上测得的典型值。

(2) 最大 $R_{\theta JC} = 1.2^\circ\text{C/W}$, 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

D007

栅极电荷



D004



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4 修订历史记录

日期	修订版本	注释
2016 年 12 月	*	最初发布。

5 Specifications

5.1 Electrical Characteristics

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

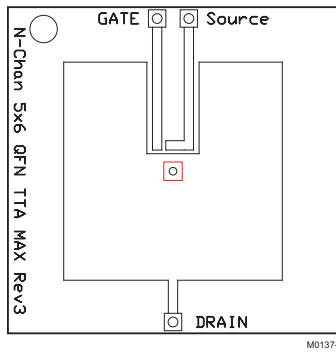
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
BV _{DSS}	Drain-to-Source Voltage	V _{GS} = 0 V, I _D = 250 μA	40			V
I _{DSS}	Drain-to-Source Leakage Current	V _{GS} = 0 V, V _{DS} = 32 V			1	μA
I _{GSS}	Gate-to-Source Leakage Current	V _{DS} = 0 V, V _{GS} = 20 V			100	nA
V _{GS(th)}	Gate-to-Source Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	1.5	1.8	2.4	V
R _{DS(on)}	Drain-to-Source On-Resistance	V _{GS} = 4.5 V, I _D = 24 A	2.7		3.5	mΩ
		V _{GS} = 10 V, I _D = 24 A	1.9		2.3	mΩ
g _{fs}	Transconductance	V _{DS} = 20 V, I _D = 24 A	5.2			S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 20 V, f = 1 MHz	4500		5850	pF
C _{oss}	Output Capacitance		452		588	pF
C _{rss}	Reverse Transfer Capacitance		238		309	pF
R _G	Series Gate Resistance		0.7	1.4		Ω
Q _g	Gate Charge Total (10 V)	V _{DS} = 20 V, I _D = 24 A	63		82	nC
Q _g	Gate Charge Total (4.5 V)		31		41	nC
Q _{gd}	Gate Charge Gate-to-Drain		11.2			nC
Q _{gs}	Gate Charge Gate-to-Source		13.2			nC
Q _{g(th)}	Gate Charge at V _{th}		8.2			nC
Q _{oss}	Output Charge	V _{DS} = 20 V, V _{GS} = 0 V	20			nC
t _{d(on)}	Turn On Delay Time	V _{DS} = 20 V, V _{GS} = 10 V, I _{DS} = 24 A, R _G = 0	6			ns
t _r	Rise Time		15			ns
t _{d(off)}	Turn Off Delay Time		24			ns
t _f	Fall Time		5			ns
DIODE CHARACTERISTICS						
V _{SD}	Diode Forward Voltage	I _{DS} = 24 A, V _{GS} = 0 V	0.75		1	V
Q _{rr}	Reverse Recovery Charge	V _{DS} = 20 V, I _F = 24 A, di/dt = 300 A/μs	17			nC
t _{rr}	Reverse Recovery Time		14			ns

5.2 Thermal Information

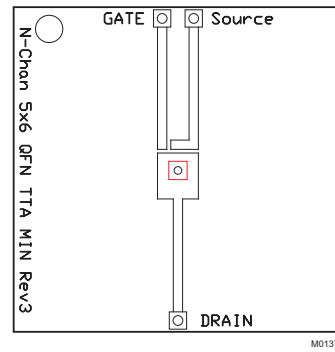
($T_A = 25^\circ\text{C}$ unless otherwise stated)

THERMAL METRIC		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction-to-Case Thermal Resistance ⁽¹⁾			1.2	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient Thermal Resistance ⁽¹⁾⁽²⁾			50	

- $R_{\theta JC}$ is determined with the device mounted on a 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu pad on a 1.5-inches $\times$ 1.5-inches (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-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu.



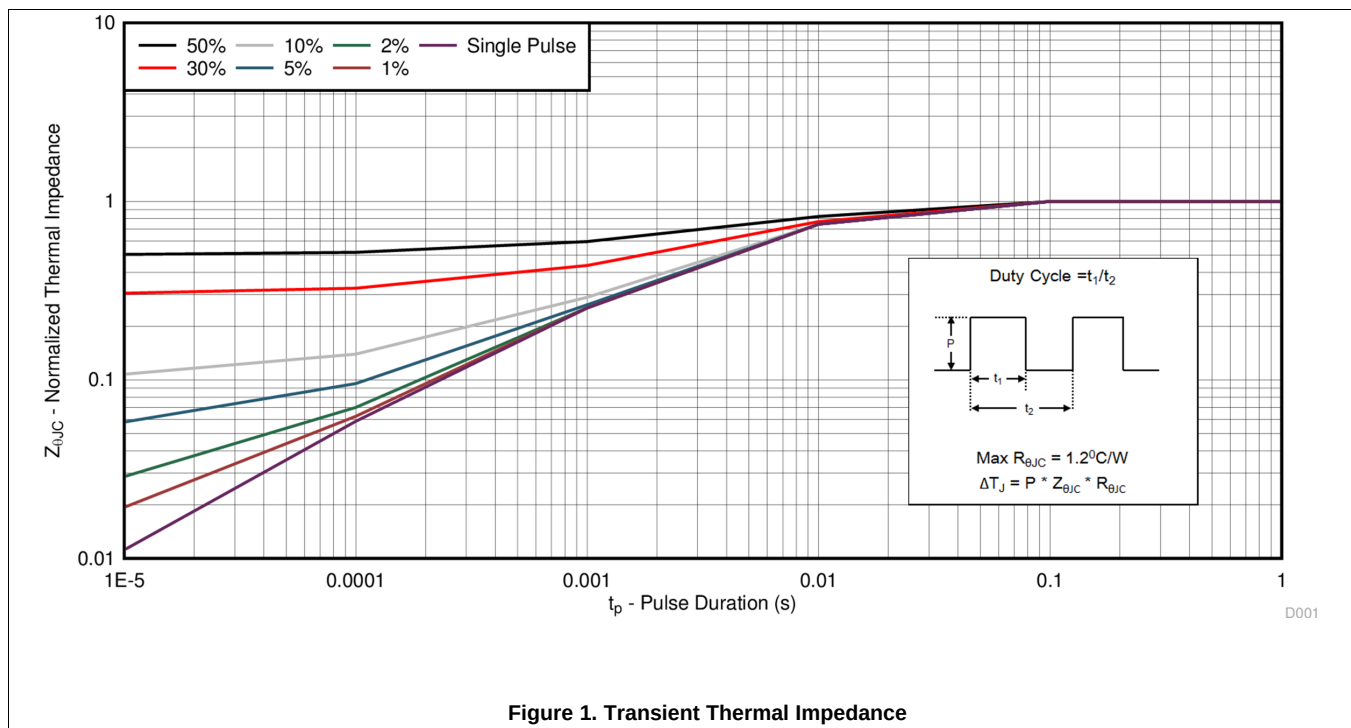
Max $R_{\theta JA} = 50^{\circ}\text{C/W}$
when mounted on
1 inch² (6.45-cm²) of
2-oz. (0.071-mm thick)
Cu.



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)

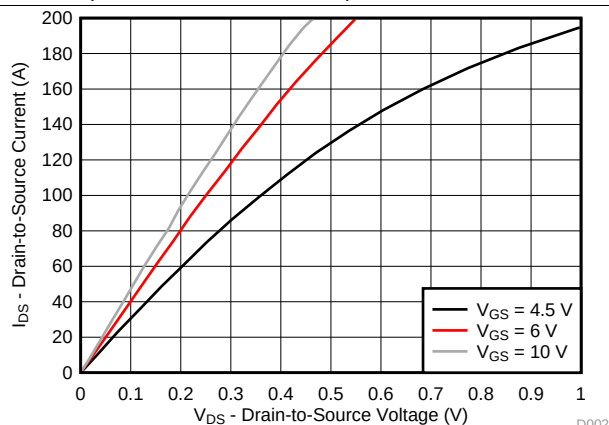


Figure 2. Saturation Characteristics

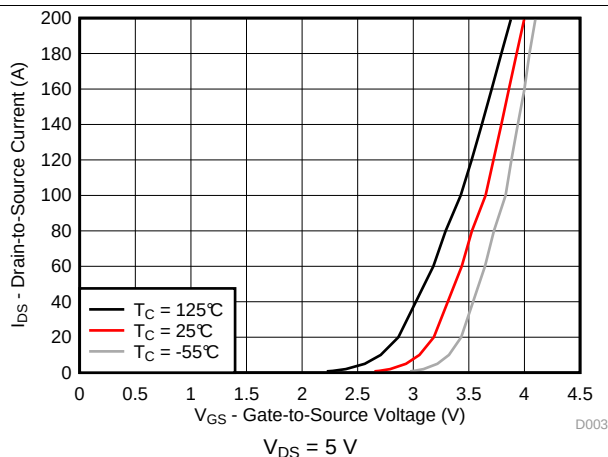


Figure 3. Transfer Characteristics

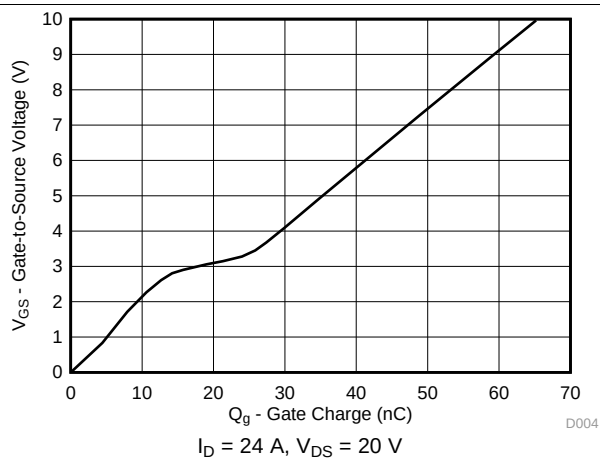


Figure 4. Gate Charge

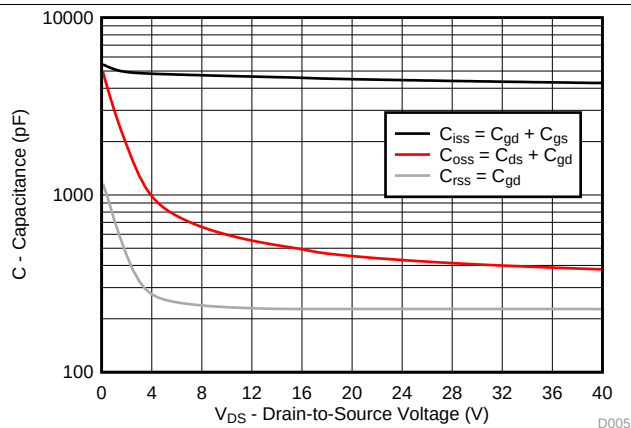


Figure 5. Capacitance

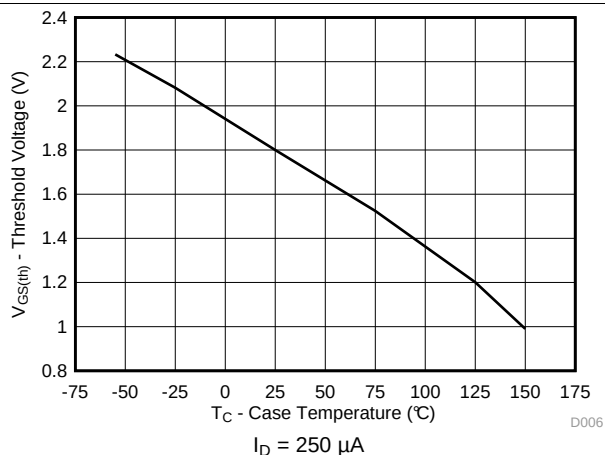


Figure 6. Threshold Voltage vs Temperature

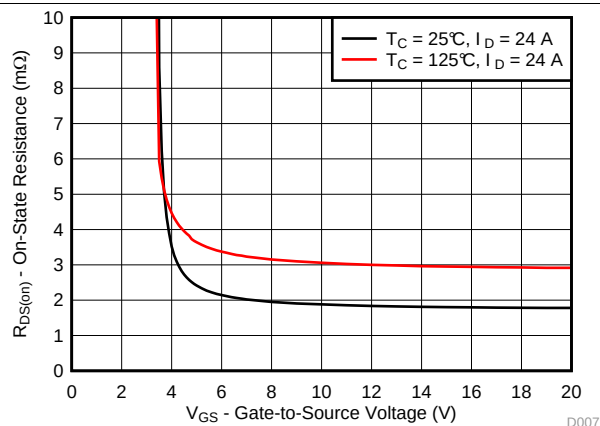


Figure 7. On-State Resistance vs Gate-to-Source Voltage

Typical MOSFET Characteristics (continued)

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

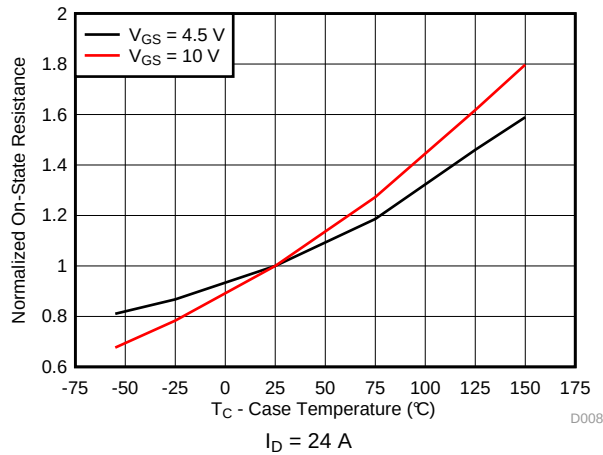


Figure 8. Normalized On-State Resistance vs Temperature

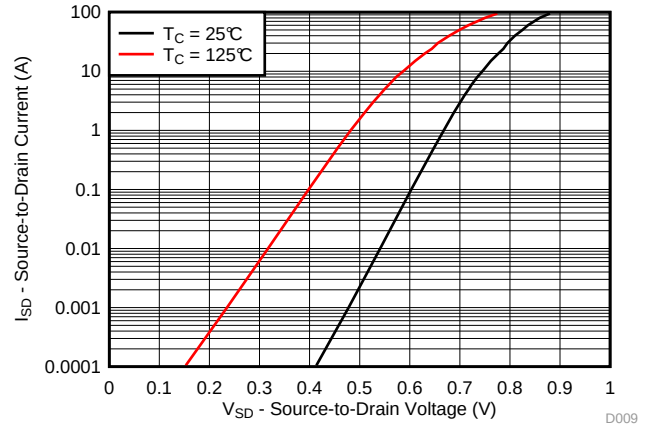


Figure 9. Typical Diode Forward Voltage

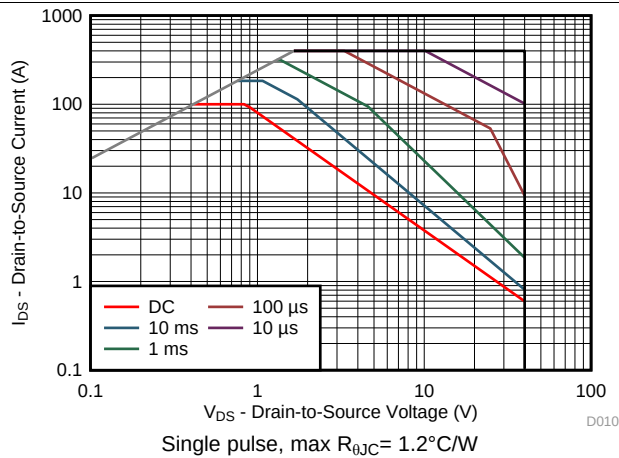


Figure 10. Maximum Safe Operating Area

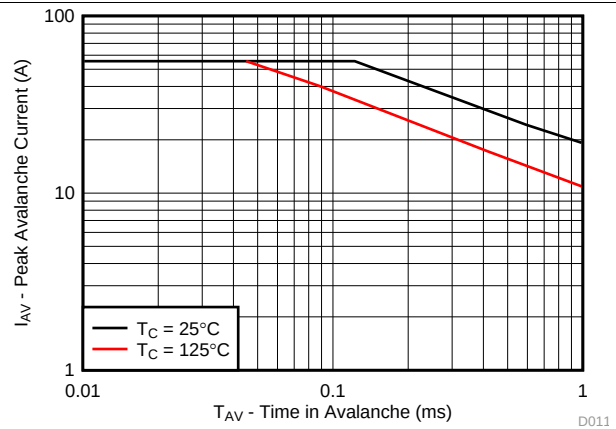


Figure 11. Single Pulse Unclamped Inductive Switching

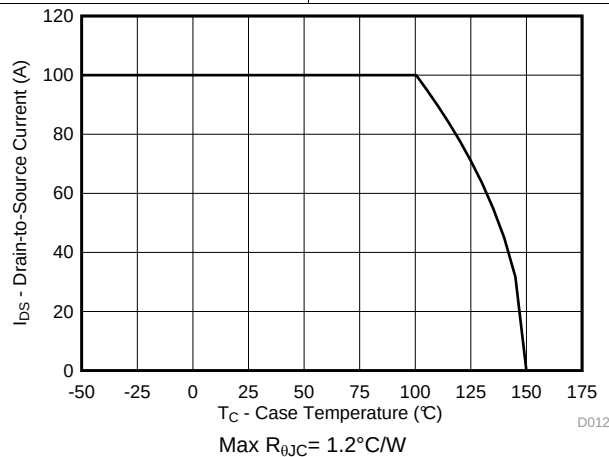


Figure 12. Maximum Drain Current vs Temperature

6 器件和文档支持

6.1 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 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, 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

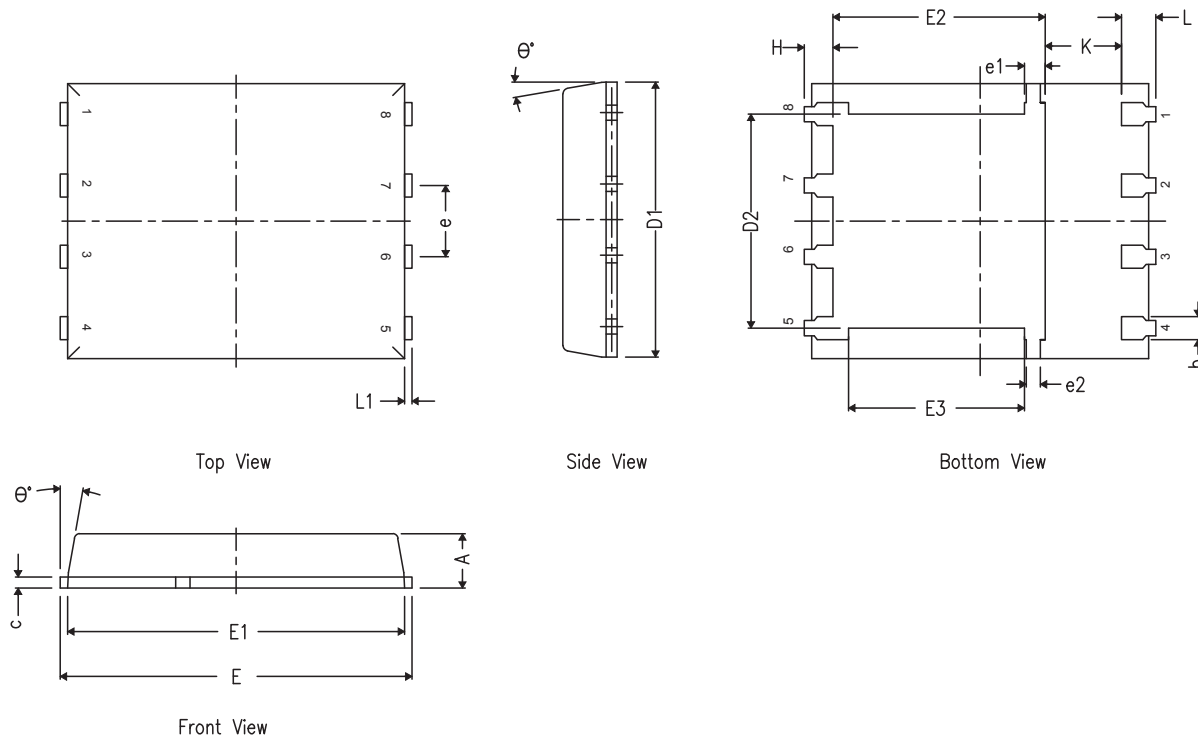
SLYZ022 — *TI Glossary*.

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

7 机械、封装和可订购信息

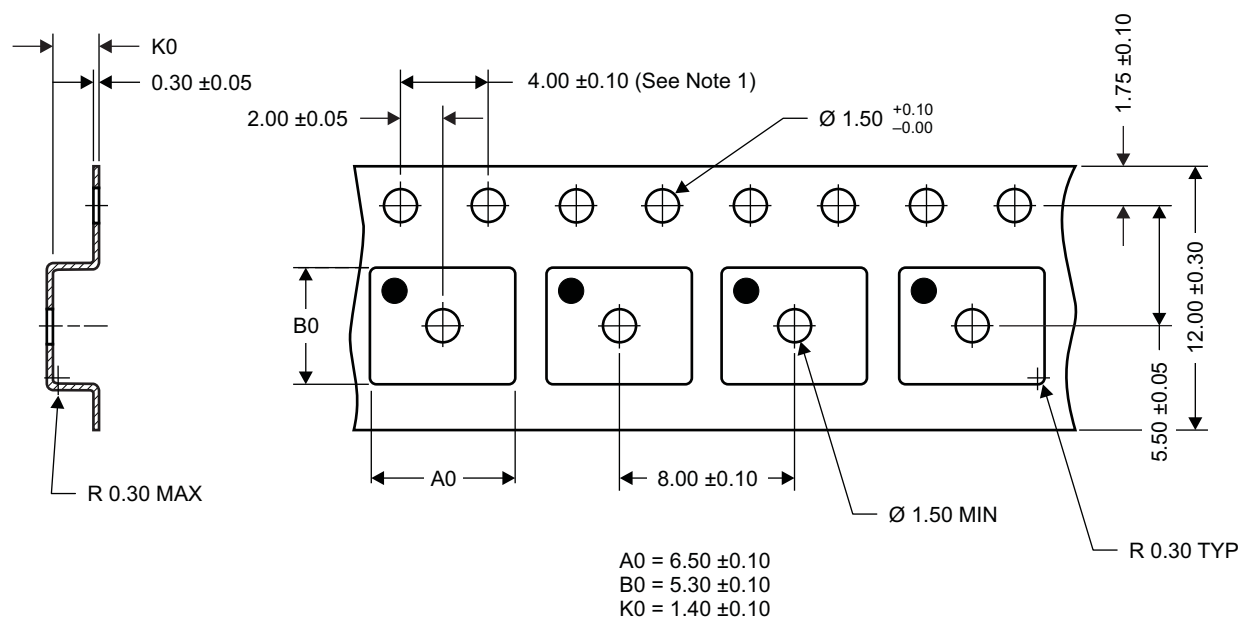
以下页中包括机械、封装和可订购信息。这些信息是针对指定器件可提供的最新数据。这些数据会在无通知且不对本文档进行修订的情况下发生改变。要获得这份数据表的浏览器版本，请查阅左侧的导航栏。

7.1 Q5A 封装尺寸



DIM	毫米		
	最小值	标称值	最大值
A	0.90	1.00	1.10
b	0.33	0.41	0.51
c	0.20	0.25	0.34
D1	4.80	4.90	5.00
D2	3.61	3.81	4.02
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
E3	3.03	3.13	3.23
e	1.17	1.27	1.37
e1	0.27	0.37	0.47
e2	0.15	0.25	0.35
H	0.41	0.56	0.71
K	1.10	-	-
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
θ	0°	-	12°

7.4 Q5A 卷带信息



M0138-01

注:

- 10 链轮孔距累积容差 ± 0.2
- 每 100mm 长度的翘曲不能超过 1mm, 在 250mm 长度上不累积 (Camber not to exceed 1 mm in 100 mm, noncumulative over 250 mm)
- 材料: 黑色抗静电聚苯乙烯
- 全部尺寸单位为 mm (除非另外注明)
- 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 (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
CSD18511Q5A	Active	Production	VSONP (DQJ) 8	2500 LARGE T&R	ROHS Exempt	SN	Level-1-260C-UNLIM	-55 to 150	CSD18511
CSD18511Q5A.B	Active	Production	VSONP (DQJ) 8	2500 LARGE T&R	ROHS Exempt	SN	Level-1-260C-UNLIM	-55 to 150	CSD18511
CSD18511Q5AT	Active	Production	VSONP (DQJ) 8	250 SMALL T&R	ROHS Exempt	SN	Level-1-260C-UNLIM	-55 to 150	CSD18511
CSD18511Q5AT.B	Active	Production	VSONP (DQJ) 8	250 SMALL T&R	ROHS Exempt	SN	Level-1-260C-UNLIM	-55 to 150	CSD18511

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

⁽²⁾ **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.

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

⁽⁴⁾ **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.

⁽⁵⁾ **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.

⁽⁶⁾ **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.

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VSONP - 1.1 mm max height

Top View:

- Overall width: 5.8 mm (0.230 inches)
- Overall height: 5.0 mm (0.197 inches)
- Pin 1 Index Area: Indicated by a shaded square in the top-left corner.
- Width of Pin 1 Index Area: 5.7 mm (0.224 inches)
- Height of Pin 1 Index Area: 4.8 mm (0.189 inches)
- Width of Pin 1 Index Area (Typical): 6.1 mm (0.240 inches)
- Width of Pin 1 Index Area (Note 6): 5.9 mm (0.232 inches)

Side View:

- Seating Plane: Indicated by a dashed line.
- Height of Seating Plane: 1.10 mm (0.043 inches) MAX
- Height of Seating Plane: 0.05 mm (0.002 inches) MIN
- Radius of Seating Plane: 0.08 mm (0.003 inches) C

Detail View:

- Exposed Thermal Pad: Indicated by a dashed line.
- Width of Exposed Thermal Pad: 0.1 mm (0.004 inches) MAX
- Height of Exposed Thermal Pad: 0.71 mm (0.028 inches) MIN
- Width of Exposed Thermal Pad (Typical): 3.78 mm (0.149 inches)
- Width of Exposed Thermal Pad (Note 6): 3.38 mm (0.133 inches)
- Width of Exposed Thermal Pad (Typical): (1.16) mm (0.046 inches)
- Width of Exposed Thermal Pad (Note 6): 0.71 mm (0.028 inches)
- Width of Exposed Thermal Pad (Note 6): 0.41 mm (0.016 inches)
- Width of Exposed Thermal Pad (Note 6): 0.21 mm (0.008 inches)
- Width of Exposed Thermal Pad (Note 6): 0.1 mm (0.004 inches)
- Width of Exposed Thermal Pad (Note 6): 0.05 mm (0.002 inches)
- Width of Exposed Thermal Pad (Note 6): 0.025 mm (0.001 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0125 mm (0.0005 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00625 mm (0.00025 inches)
- Width of Exposed Thermal Pad (Note 6): 0.003125 mm (0.000125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0015625 mm (0.0000625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00078125 mm (0.00003125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000390625 mm (0.000015625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0001953125 mm (0.0000078125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00009765625 mm (0.00000390625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000048828125 mm (0.000001953125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000244140625 mm (0.0000009765625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00001220703125 mm (0.00000048828125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000006103515625 mm (0.000000244140625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000030517578125 mm (0.0000001220703125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000152587890625 mm (0.00000006103515625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000762939453125 mm (0.000000030517578125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000003814697265625 mm (0.0000000152587890625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000019073486328125 mm (0.00000000762939453125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000095367431640625 mm (0.000000003814697265625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000476837158203125 mm (0.0000000019073486328125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000002384185791015625 mm (0.00000000095367431640625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000011920928955078125 mm (0.000000000476837158203125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000059604644775390625 mm (0.0000000002384185791015625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000000298023223876953125 mm (0.00000000011920928955078125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000001490116119384765625 mm (0.000000000059604644775390625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000007450580596923828125 mm (0.0000000000298023223876953125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000000037252902984619140625 mm (0.00000000001490116119384765625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000000186264514923095703125 mm (0.000000000007450580596923828125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000000931322574615478515625 mm (0.0000000000037252902984619140625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000000004656612873077392578125 mm (0.00000000000186264514923095703125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000000023283064365386962890625 mm (0.000000000000931322574615478515625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000000116415321826934814453125 mm (0.0000000000004656612873077392578125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000000000582076609134674072265625 mm (0.00000000000023283064365386962890625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000000002910383045673370361328125 mm (0.000000000000116415321826934814453125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000000014551915228366851806640625 mm (0.0000000000000582076609134674072265625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000000000072759576141834259033203125 mm (0.00000000000002910383045673370361328125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000000000363797880709171295166015625 mm (0.000000000000014551915228366851806640625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000000001818989403545856475830078125 mm (0.0000000000000072759576141834259033203125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000000000009094947017729282379150390625 mm (0.00000000000000363797880709171295166015625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000000000045474735088646411895751953125 mm (0.000000000000001818989403545856475830078125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000000000227373675443232059478759765625 mm (0.0000000000000009094947017729282379150390625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000000000001136868377216160297393798828125 mm (0.00000000000000045474735088646411895751953125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.000000000000005684341886080801486968994140625 mm (0.000000000000000227373675443232059478759765625 inches)
- Width of Exposed Thermal Pad (Note 6): 0.0000000000000028421709430404007434844970703125 mm (0.0000000000000001136868377216160297393798828125 inches)
- Width of Exposed Thermal Pad (Note 6): 0.00000000000000142108547152020037174224853515625 mm (0.00000000

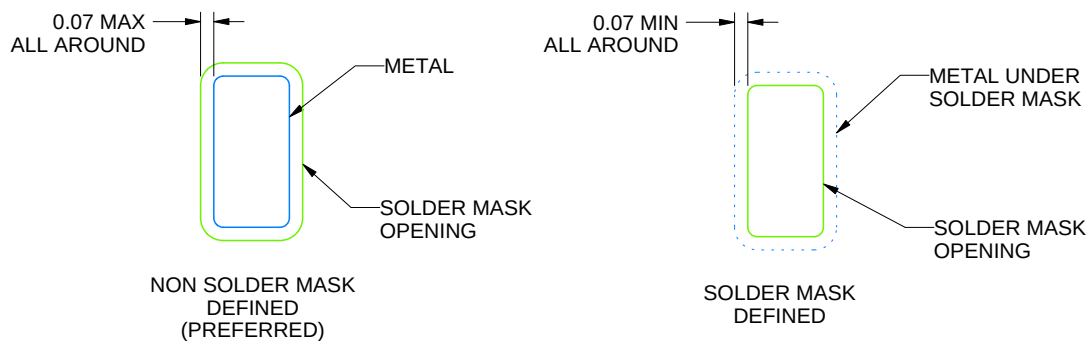
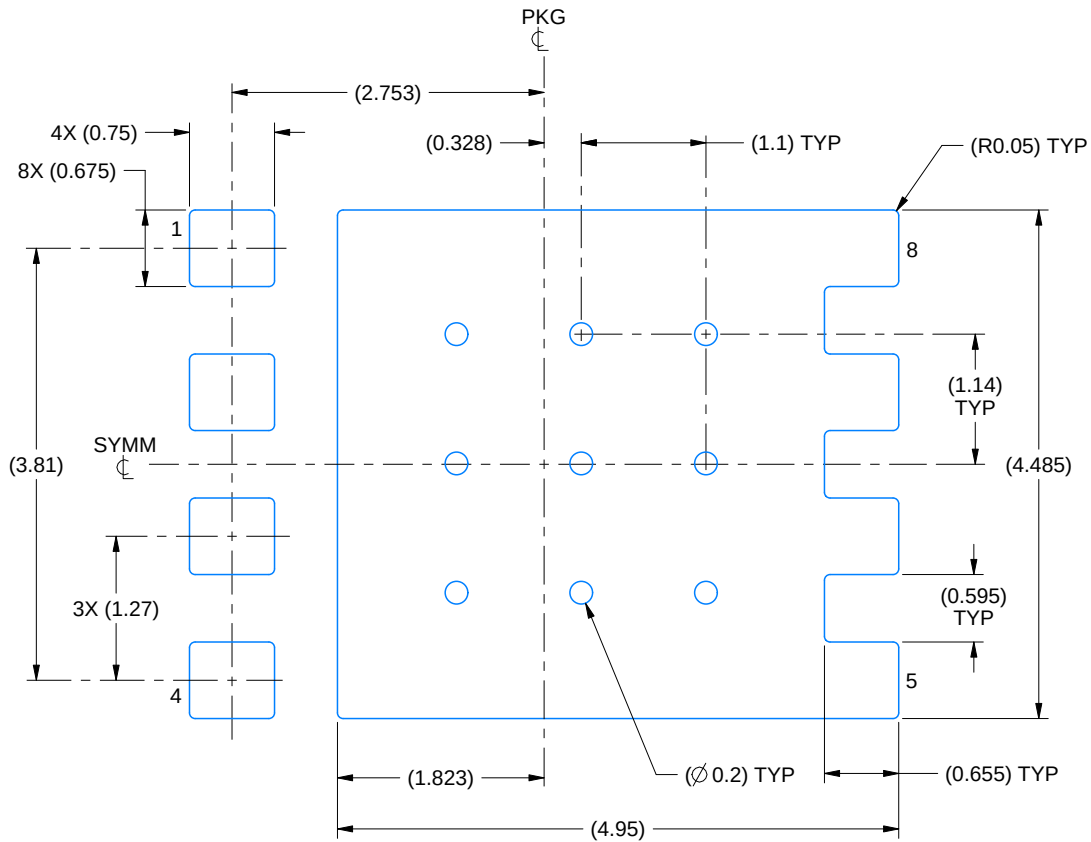
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.
4. Metalized features are supplier options and may not be on the package.
5. These dimensions do not include mold flash protrusions or gate burrs.
6. These dimensions include interterminal flash or protrusion. Interterminal flash or protrusion shall not exceed 0.25 mm per side.

EXAMPLE BOARD LAYOUT

DQJ0008A

VSONP - 1.1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER MASK DETAILS

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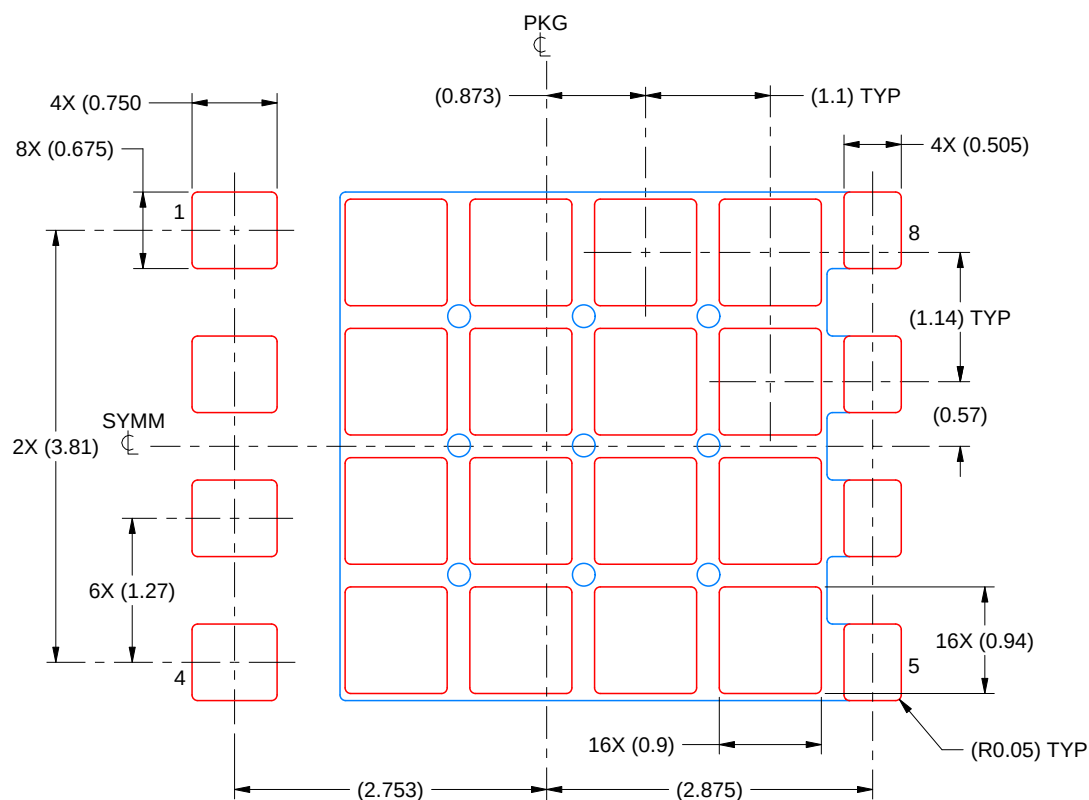
NOTES: (continued)

7. 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).
8. Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations are shown.

DQJ0008A

VSONP - 1.1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD:
70% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE: 15X

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NOTES: (continued)

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

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