



CSD19531Q5A 100V N 通道 NexFET™ 功率金属氧化物半导体场效应晶体管 (MOSFET)

1 特性

- 超低 Q_g 和 Q_{gd}
- 低热阻
- 雪崩额定值
- 无铅端子镀层
- 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

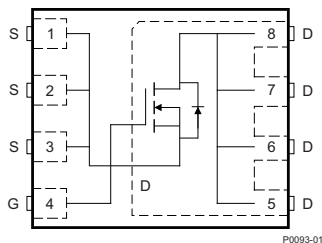
2 应用范围

- 初级侧电信应用
- 次级侧同步整流器
- 电机控制

3 说明

这款 100V, 5.3mΩ, SON 5mm × 6mm NexFET™ 功率 MOSFET 被设计成在功率转换应用中大大降低损耗。

顶视图



P0093-01

产品概要

$T_A = 25^\circ\text{C}$		典型值	单位
V_{DS}	漏源电压	100	V
Q_g	栅极电荷总量 (10V)	37	nC
Q_{gd}	栅漏栅极电荷	6.6	nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = 6V$	6.0
		$V_{GS} = 10V$	5.3
$V_{GS(th)}$	阈值电压	2.7	V

订购信息

器件	介质	数量	封装	出货
CSD19531Q5A	13 英寸卷带	2500	SON 5mm x 6mm 塑料封装	卷带封装
CSD19531Q5AT	7 英寸卷带	250		

(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。

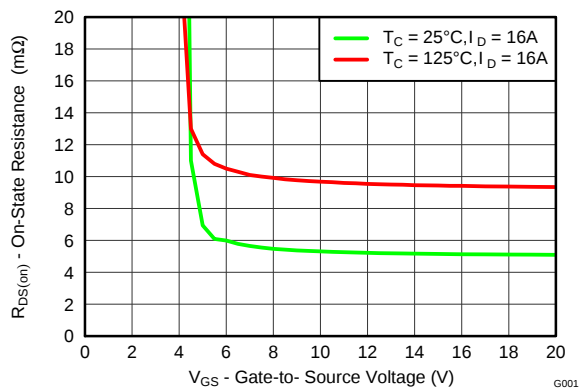
最大绝对额定值

$T_A = 25^\circ\text{C}$		值	单位
V_{DS}	漏源电压	100	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	110	
	持续漏极电流 ⁽¹⁾	16	
I_{DM}	脉冲漏极电流 ⁽²⁾	337	A
P_D	功率耗散 ⁽¹⁾	3.3	W
	功率耗散, $T_C = 25^\circ\text{C}$	125	
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 $I_D = 60A, L = 0.1mH, R_G = 25\Omega$	180	mJ

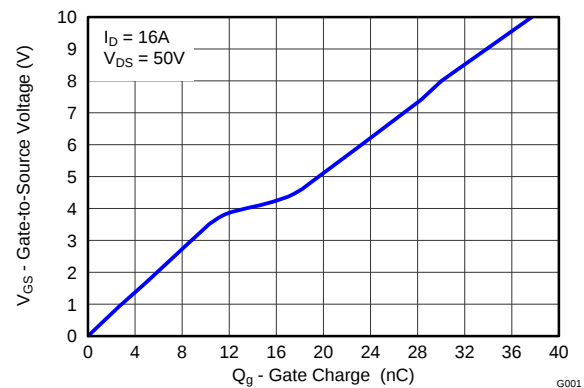
(1) $R_{\theta JA} = 40^\circ\text{C/W}$, 这是在一个厚度 0.06 英寸环氧树脂 (FR4) 印刷电路板 (PCB) 上的 1 英寸², 2 盎司 的铜过渡垫片上测得的典型值。

(2) 最大 $R_{\theta JC} = 1.0^\circ\text{C/W}$, 持续时间 ≤100μs, 占空比 ≤1%

$R_{DS(on)}$ 与 V_{GS} 间的关系



栅极电荷



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4 修订历史记录

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision A (January 2014) to Revision B	Page
• 已添加外壳温度保持在 25°C 时的最大功耗耗散一行	1
• Changed Figure 1 from a normalized $R_{\theta JA}$ curve to a normalized $R_{\theta JC}$ curve	4
• Updated the safe operating area in Figure 10	6

Changes from Original (September 2013) to Revision A	Page
• 已在说明中添加更多信息	1
• 已添加小卷带订购信息	1
• 已从绝对最大额定值表内的持续漏极电流（受封装限制）中删除 $T_C = 25^\circ\text{C}$ 条件	1
• 已将脉冲漏极电流增加为 337A	1
• 已更新脉冲漏极电流条件	1
• Changed Typ $R_{\theta JA} = 99^\circ\text{C/W}$ to $R_{\theta JA} = 100^\circ\text{C/W}$ in Figure 1	4

5 Specifications

5.1 Electrical Characteristics

(T_A = 25°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	100			V
I _{DSS}	Drain-to-Source Leakage Current	V _{GS} = 0 V, V _{DS} = 80 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	2.2	2.7	3.3	V
R _{DS(on)}	Drain-to-Source On Resistance	V _{GS} = 6 V, I _D = 16 A	6.0		7.8	mΩ
		V _{GS} = 10 V, I _D = 16 A	5.3		6.4	mΩ
g _{fs}	Transconductance	V _{DS} = 10 V, I _D = 16 A	82			S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 50 V, f = 1 MHz	2980		3870	pF
C _{oss}	Output Capacitance		560		728	pF
C _{rss}	Reverse Transfer Capacitance		13.0		16.9	pF
R _G	Series Gate Resistance		1.3		2.6	Ω
Q _g	Gate Charge Total (10 V)	V _{DS} = 50 V, I _D = 16 A	37		48	nC
Q _{gd}	Gate Charge Gate to Drain		6.6			nC
Q _{gs}	Gate Charge Gate to Source		10.5			nC
Q _{g(th)}	Gate Charge at V _{th}		7.3			nC
Q _{oss}	Output Charge	V _{DS} = 50 V, V _{GS} = 0 V	97			nC
t _{d(on)}	Turn On Delay Time	V _{DS} = 50 V, V _{GS} = 10 V, I _{DS} = 16 A, R _G = 0 Ω	6.0			ns
t _r	Rise Time		5.8			ns
t _{d(off)}	Turn Off Delay Time		18.4			ns
t _f	Fall Time		5.2			ns
DIODE CHARACTERISTICS						
V _{SD}	Diode Forward Voltage	I _{SD} = 16 A, V _{GS} = 0 V	0.8		1	V
Q _{rr}	Reverse Recovery Charge	V _{DS} = 50 V, I _F = 16 A, di/dt = 300 A/μs	226			nC
t _{rr}	Reverse Recovery Time		148			ns

5.2 Thermal Characteristics

(T_A = 25°C unless otherwise stated)

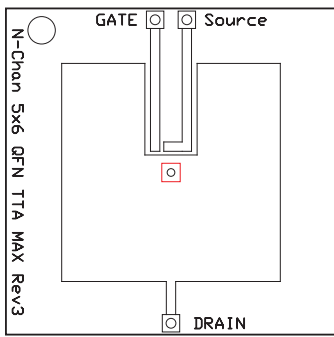
THERMAL METRIC		MIN	TYP	MAX	UNIT
R _{θJC}	Junction-to-Case Thermal Resistance ⁽¹⁾			1	°C/W
R _{θJA}	Junction-to-Ambient Thermal Resistance ⁽¹⁾⁽²⁾			50	

- (1) R_{θJC} 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-inch × 1.5-inch (3.81-cm × 3.81-cm), 0.06-inch (1.52-mm) thick FR4 PCB. R_{θJC} is specified by design, whereas R_{θJA} is determined by the user's board design.
- (2) Device mounted on FR4 material with 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu.

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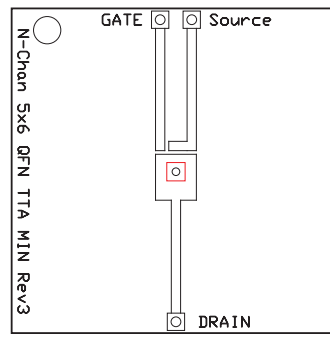
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Max $R_{\theta JA} = 50^{\circ}\text{C/W}$
when mounted on
1 inch² (6.45 cm²) of
2-oz. (0.071-mm thick)
Cu.

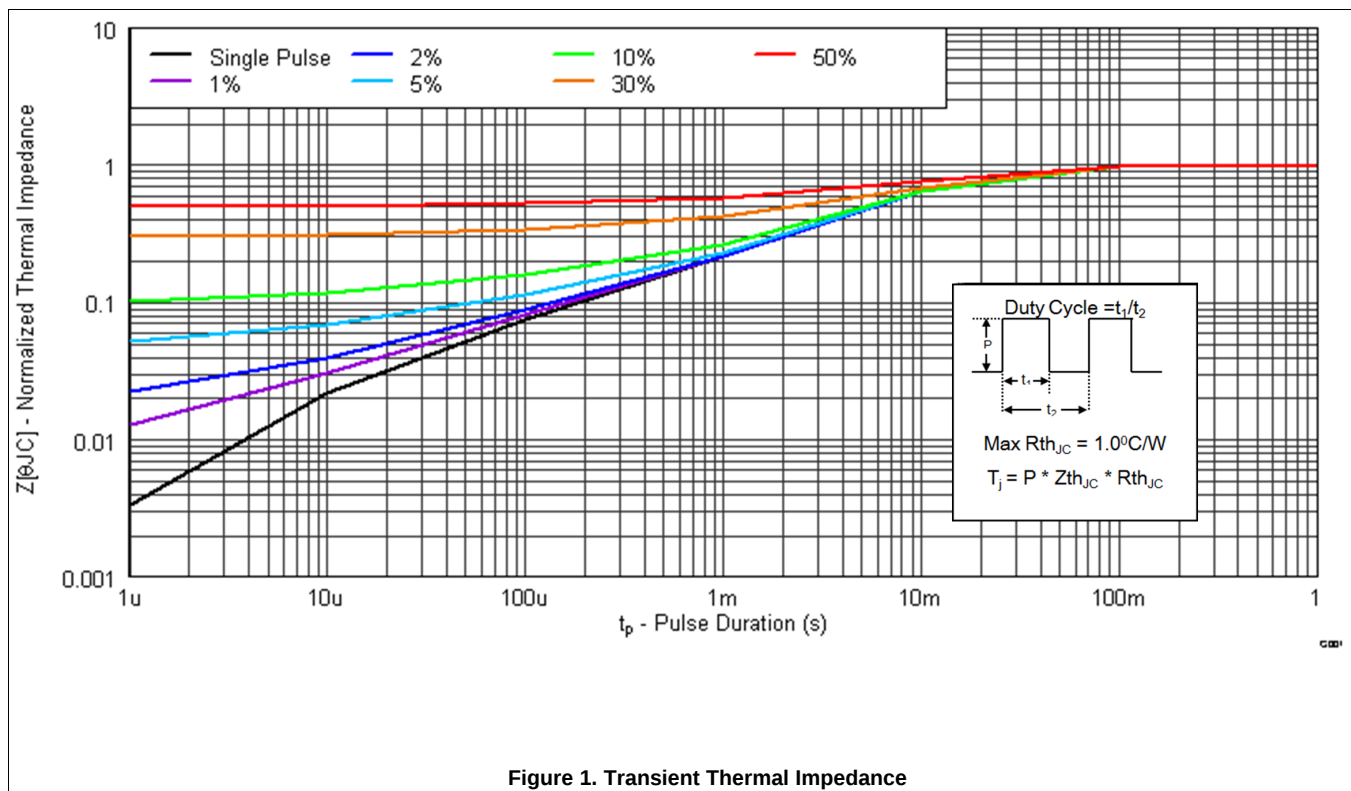


M0137-02

Max $R_{\theta JA} = 115^{\circ}\text{C/W}$
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)

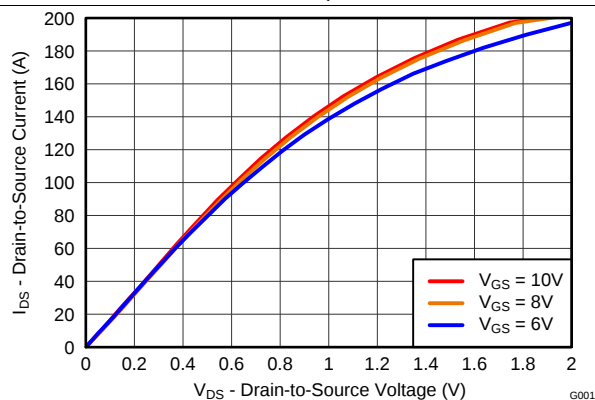


Figure 2. Saturation Characteristics

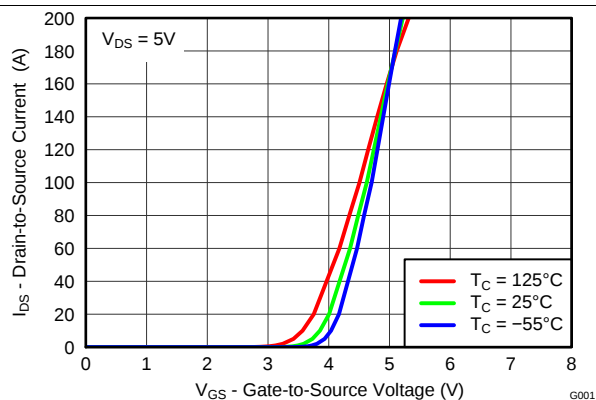


Figure 3. Transfer Characteristics

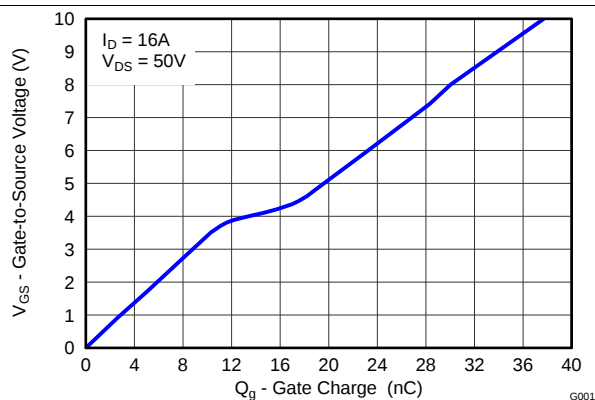


Figure 4. Gate Charge

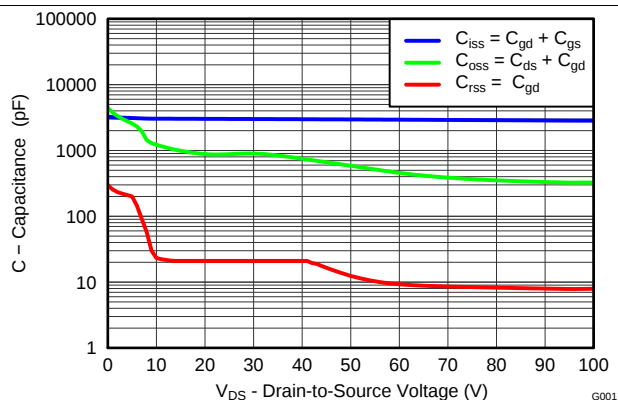


Figure 5. Capacitance

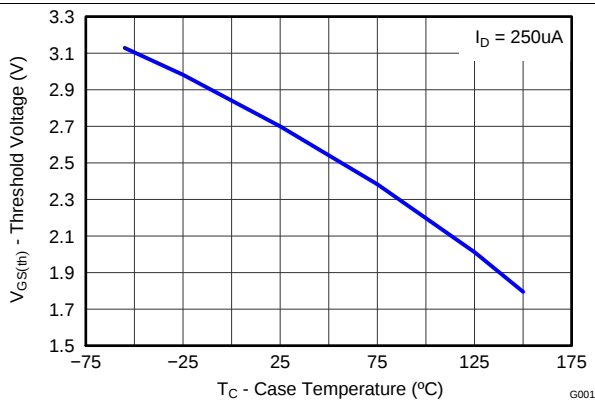


Figure 6. Threshold Voltage vs Temperature

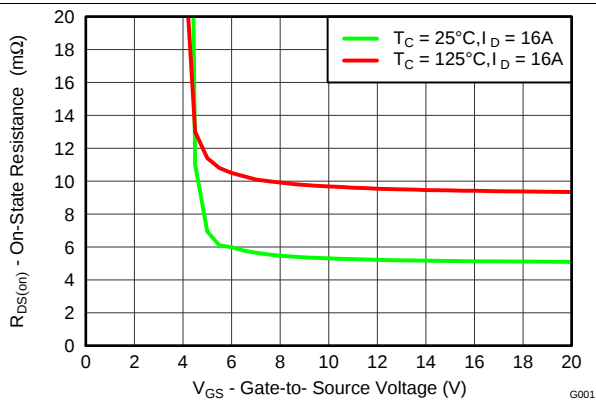


Figure 7. On-State Resistance vs Gate-To-Source Voltage

Typical MOSFET Characteristics (continued)

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

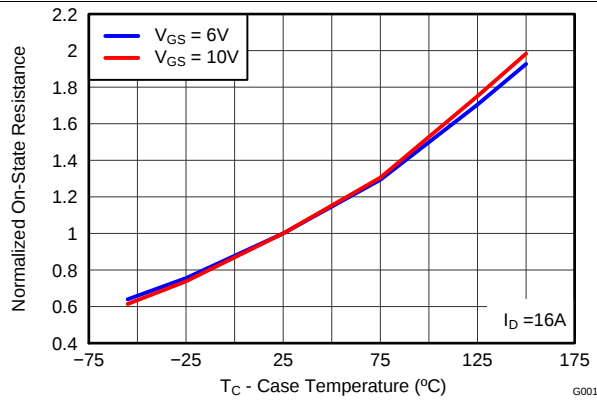


Figure 8. Normalized On-State Resistance vs Temperature

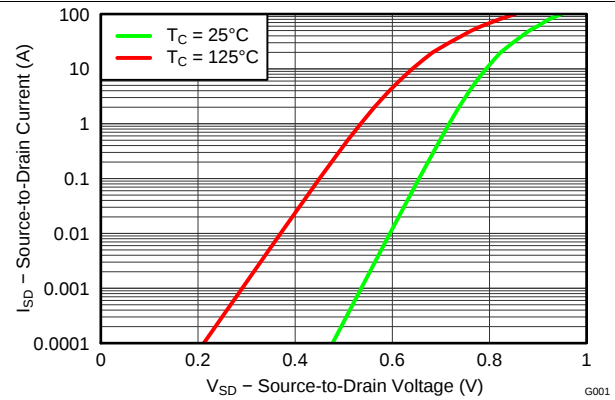


Figure 9. Typical Diode Forward Voltage

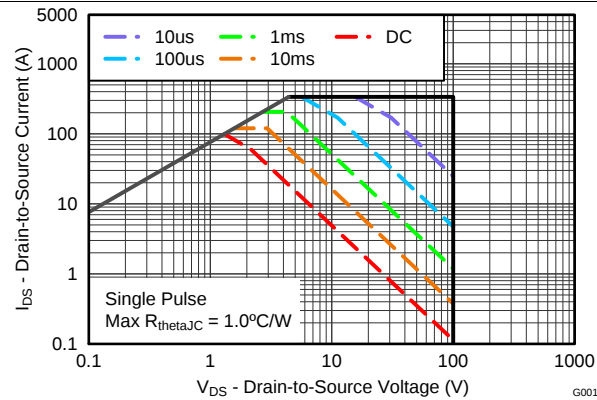


Figure 10. Maximum Safe Operating Area

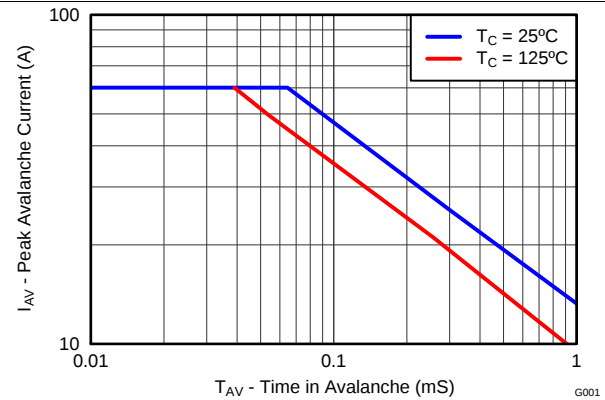


Figure 11. Single Pulse Unclamped Inductive Switching

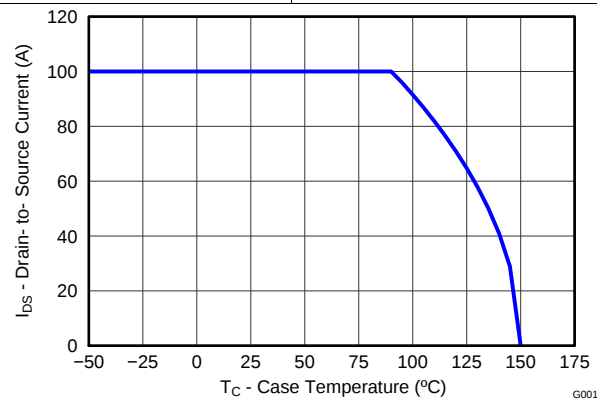


Figure 12. Maximum Drain Current vs Temperature

6 器件和文档支持

6.1 Trademarks

NexFET is a trademark of Texas Instruments.

6.2 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

6.3 Glossary

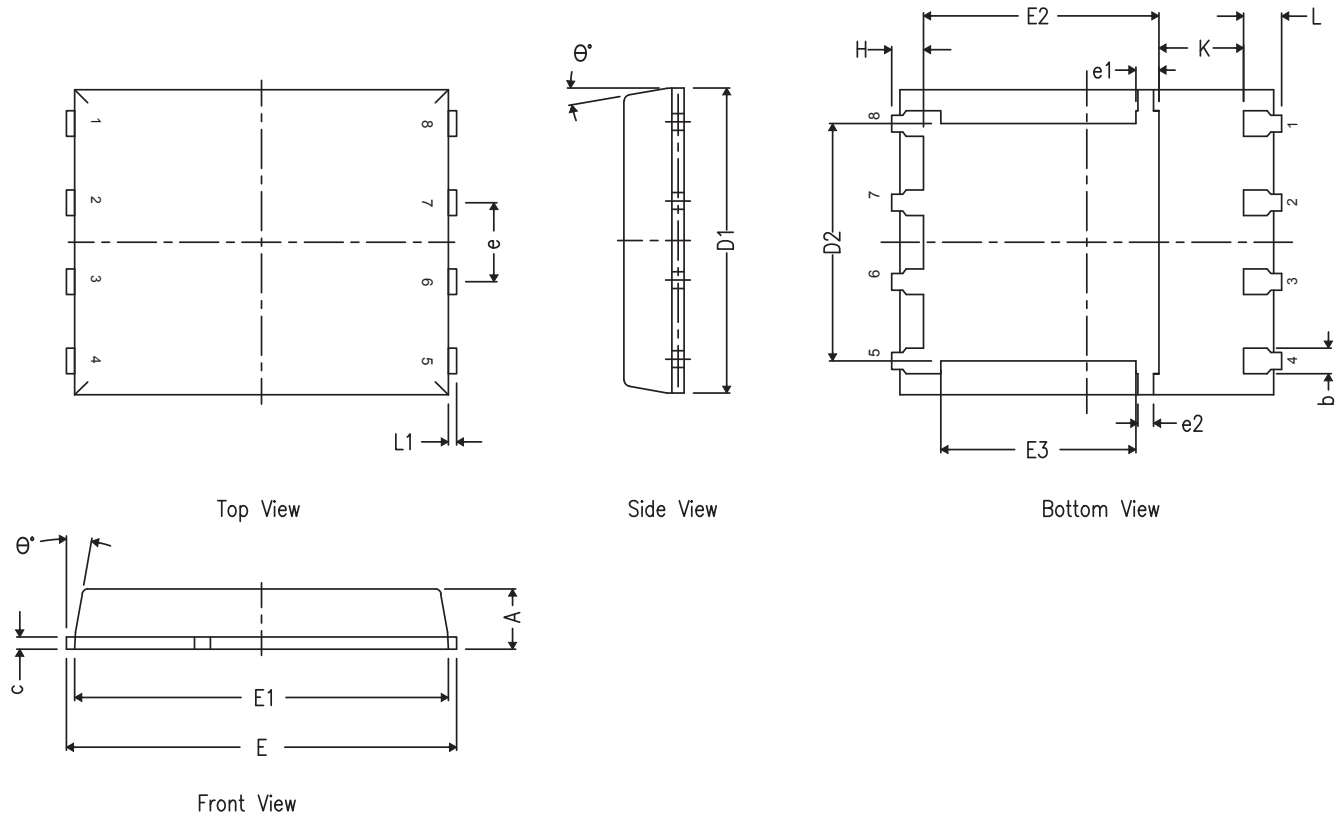
[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms and definitions.

7 机械封装和可订购信息

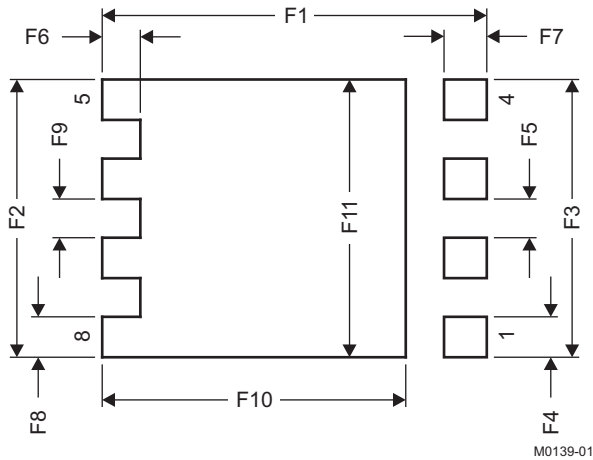
以下页中包括机械封装和可订购信息。 这些信息是针对指定器件可提供的最新数据。 这些数据会在无通知且不对本文档进行修订的情况下发生改变。 欲获得该数据表的浏览器版本，请查阅左侧的导航栏。

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°

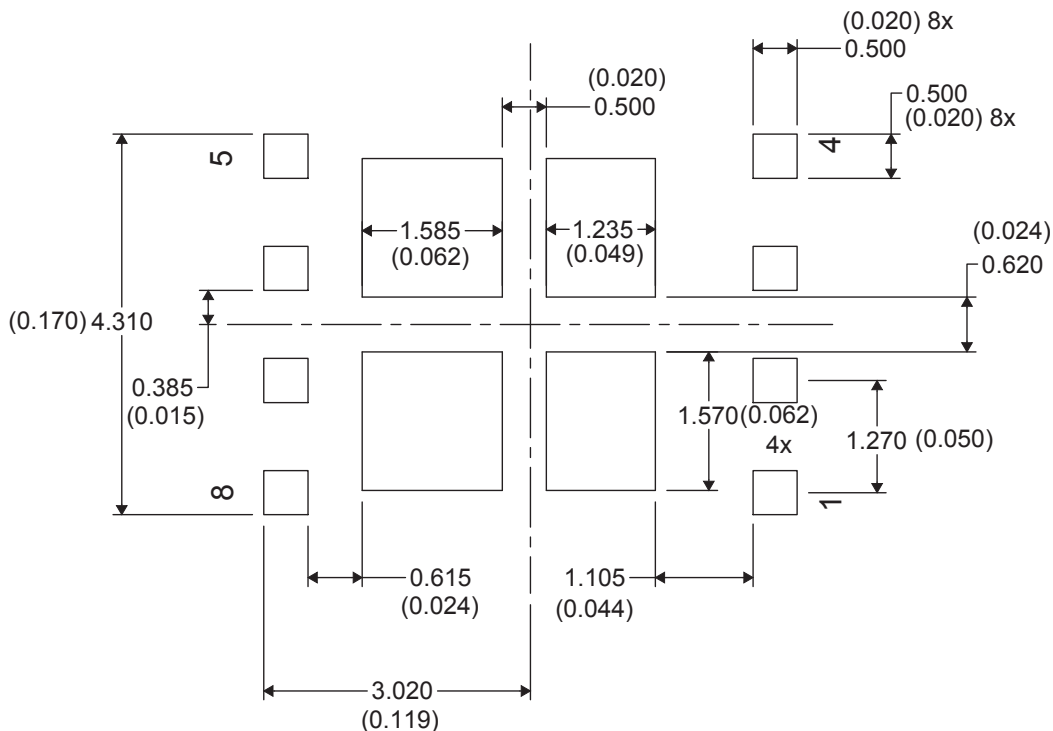
7.2 建议印刷电路板 (PCB) 布局



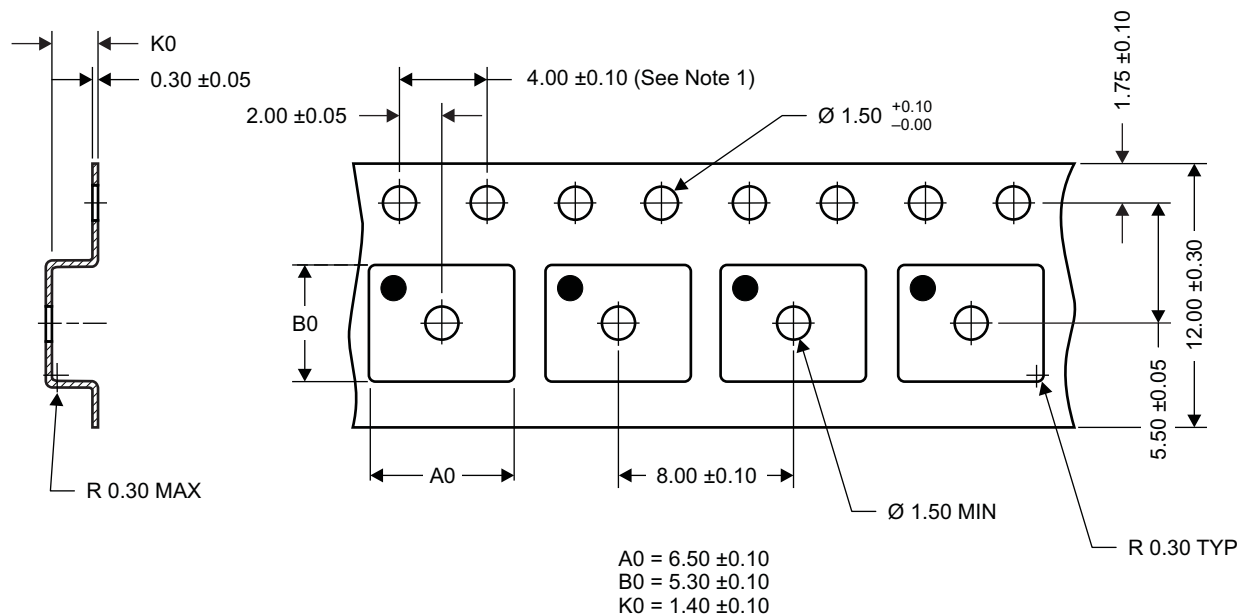
DIM	毫米		英寸	
	最小值	最大值	最小值	最大值
F1	6.205	6.305	0.244	0.248
F2	4.46	4.56	0.176	0.18
F3	4.46	4.56	0.176	0.18
F4	0.65	0.7	0.026	0.028
F5	0.62	0.67	0.024	0.026
F6	0.63	0.68	0.025	0.027
F7	0.7	0.8	0.028	0.031
F8	0.65	0.7	0.026	0.028
F9	0.62	0.67	0.024	0.026
F10	4.9	5	0.193	0.197
F11	4.46	4.56	0.176	0.18

要获得与印刷电路板 (PCB) 设计相关的建议电路布局布线, 请参见《应用说明》[SLPA005 - 通过 PCB 布局布线技巧来减少振铃](#)。

7.3 建议模板开口



7.4 Q5A 卷带信息



M0138-01

谨记:

1. 10 链轮孔距累积容差 ± 0.2
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)
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)。

Q5A 卷带信息 (continued)

5. 高于 (pocket) 底部 0.3mm 的平面上测得的 A0 和 B0。

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
CSD19531Q5A	ACTIVE	VSONP	DQJ	8	2500	RoHS-Exempt & Green	SN	Level-1-260C-UNLIM	-55 to 150	CSD19531	Samples
CSD19531Q5AT	ACTIVE	VSONP	DQJ	8	250	RoHS-Exempt & Green	SN	Level-1-260C-UNLIM	-55 to 150	CSD19531	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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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

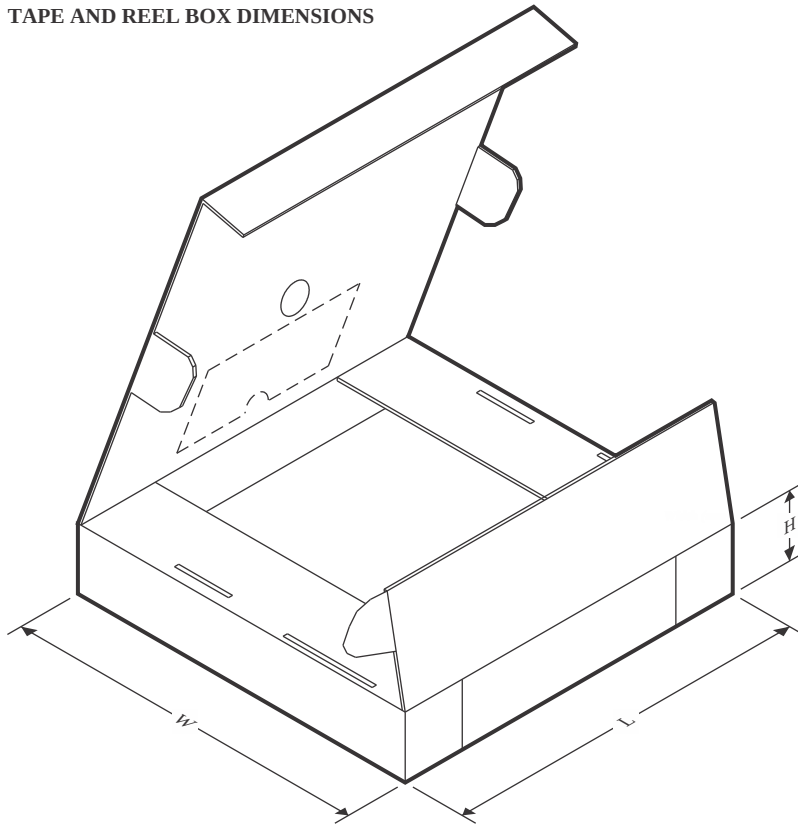
TAPE AND REEL INFORMATION



*All dimensions are nominal

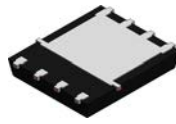
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CSD19531Q5A	VSONP	DQJ	8	2500	330.0	12.4	6.3	5.3	1.2	8.0	12.0	Q1
CSD19531Q5AT	VSONP	DQJ	8	250	180.0	12.4	6.3	5.3	1.2	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

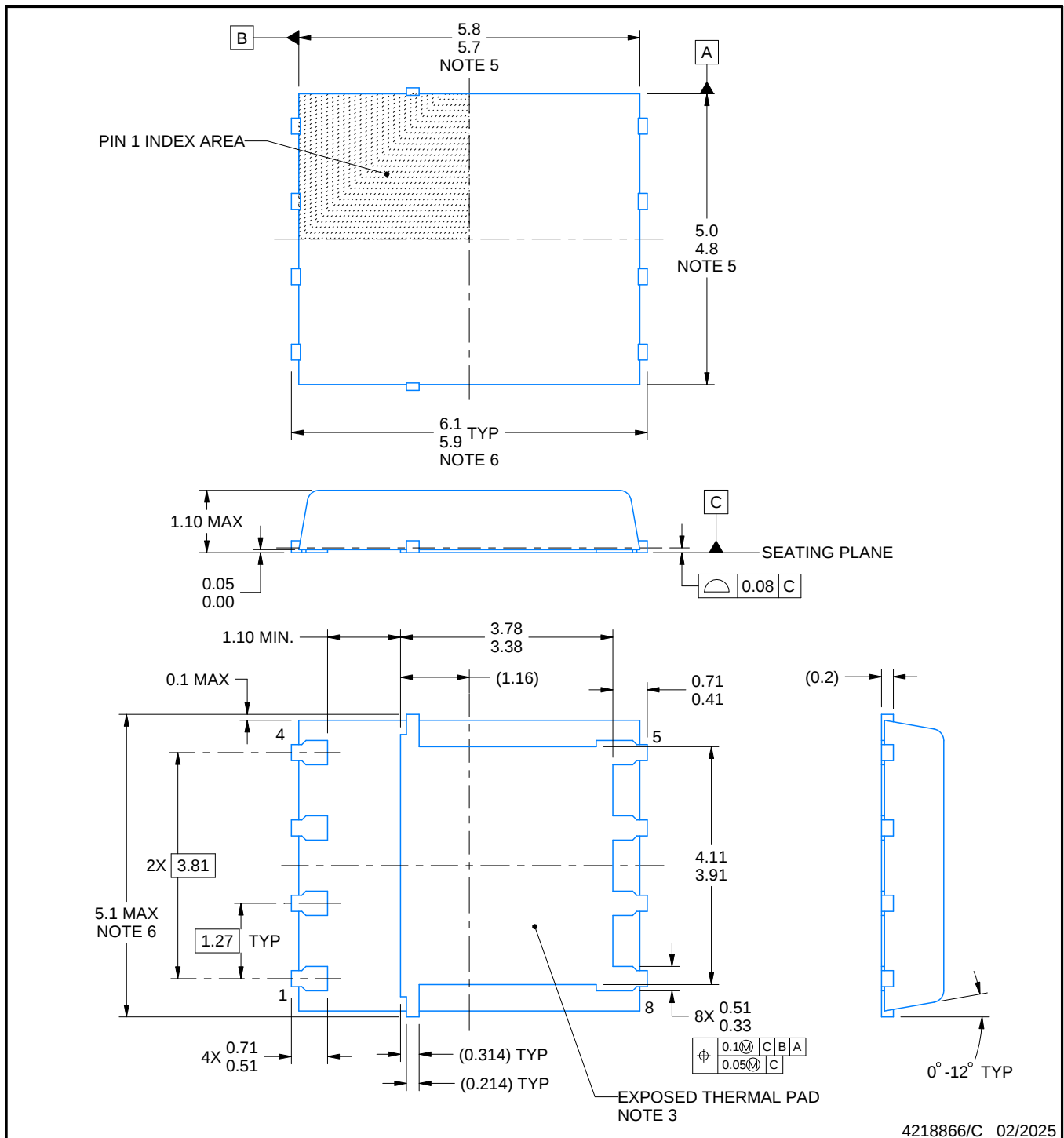


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD19531Q5A	VSONP	DQJ	8	2500	340.0	340.0	38.0
CSD19531Q5AT	VSONP	DQJ	8	250	190.0	190.0	30.0

DQJ0008A**PACKAGE OUTLINE****VSONP - 1.1 mm max height**

PLASTIC SMALL OUTLINE - NO LEAD



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NOTES:

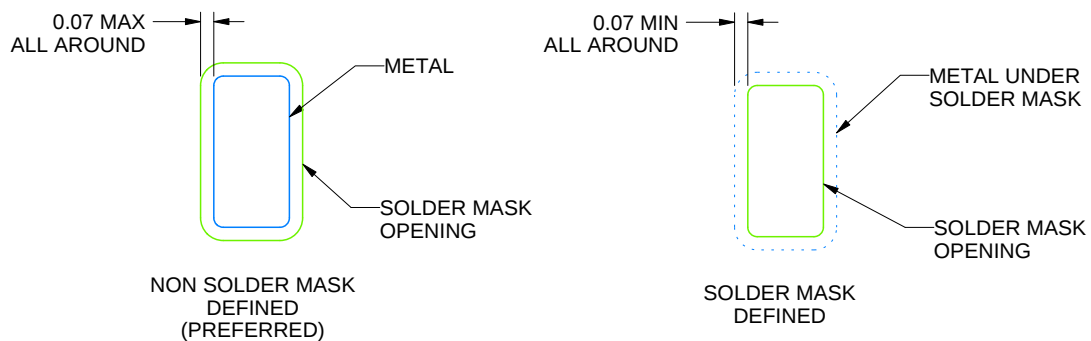
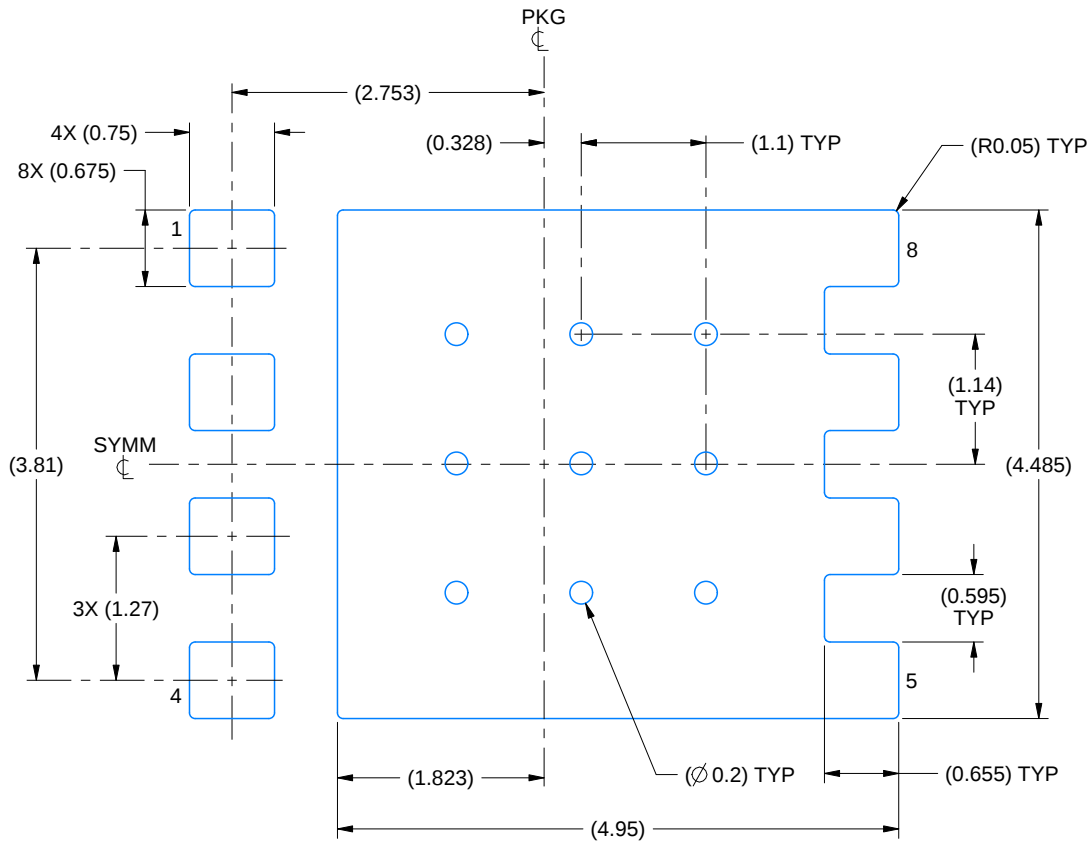
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.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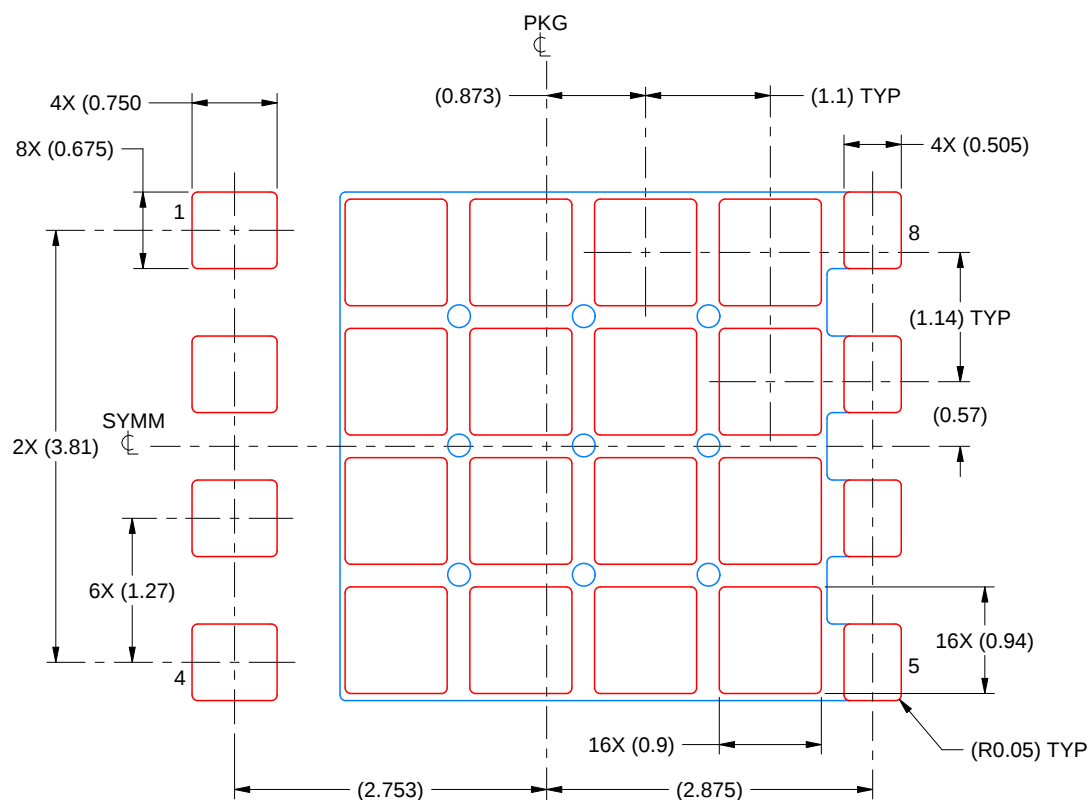
NOTES: (continued)

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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