CSD17581Q3A 30V N 沟道 NexFET™ 功率 MOSFET

1 特性

- 低 Q_g 和 Q_{gd}
- 低 $R_{DS(on)}$
- 低热阻抗
- 雪崩级
- 无铅
- 符合 RoHS 环保标准
- 无卤素
- 小外形尺寸无引线 (SON) 3.3mm × 3.3mm 塑料封装

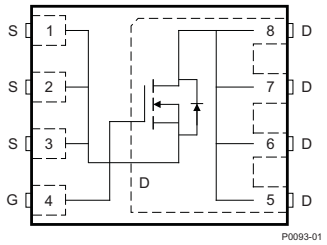
2 应用范围

- 用于网络互联、电信和计算系统的 负载点 同步降压转换器
- 电机控制 应用
- 针对控制场效应晶体管 (FET) 应用进行了 优化

3 说明

这款采用 3.3mm × 3.3mm SON 封装的 30V、3.2mΩ、 NexFET™功率 MOSFET 被设计成在功率转换应用中大大降低 损耗。

俯视图



产品概要

T_A=25°C		典型值		单位
V_{DS}	漏源极电压	30		V
Q_g	栅极电荷总量 (4.5V)	20		nC
Q_{gd}	栅极电荷（栅极到漏极）	4		nC
$R_{DS(on)}$	漏源导通电阻	V_{GS} = 4.5V	3.9	mΩ
		V_{GS} = 10V	3.2	mΩ
$V_{GS(th)}$	阈值电压	1.3		V

器件信息(1)

器件	包装介质	数量	封装	运输
CSD17581Q3A	13 英寸卷带	2500	小外形尺寸无引线 (SON) 3.30mm × 3.30mm 塑料封装	卷带式
CSD17581Q3AT	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。

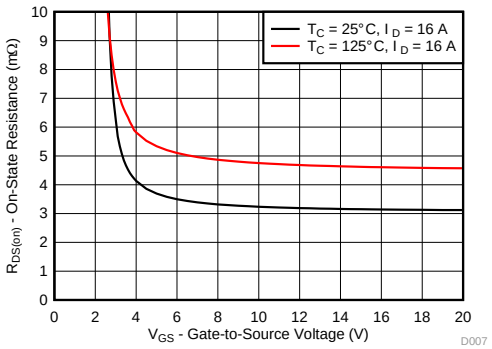
绝对最大额定值

T_A = 25°C		值	单位
V_{DS}	漏源极电压	30	V
V_{GS}	栅源电压	±20	V
I_D	持续漏极电流（受封装限制）	60	A
	持续漏极电流（受芯片限制），T_C = 25°C 时测得	101	
	持续漏极电流(1)	21	
I_{DM}	脉冲漏极电流(2)	154	A
P_D	功率耗散(1)	2.8	W
	功率耗散，T_C = 25°C	63	
T_J, T_{stg}	工作结温，储存温度	-55 至 150	°C
E_{AS}	雪崩能量，单一脉冲 I_D = 39A，L = 0.1mH，R_G = 25Ω	76	mJ

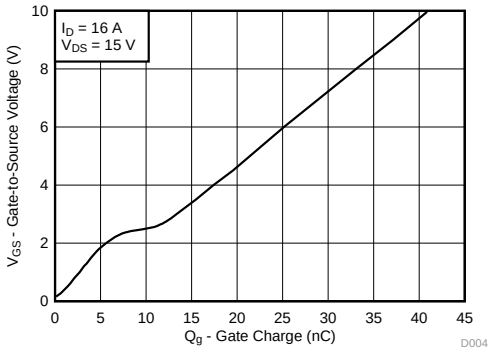
(1) $R_{\theta JA}$ = 45°C/W，这是在一块厚度为 0.06 英寸环氧树脂 (FR4) 印刷电路板 (PCB) 上的 1 英寸^2，2 盎司铜焊盘上测得的典型值。

(2) 最大 $R_{\theta JC}$ = 2°C/W，脉冲持续时间 ≤ 100µs，占空比 ≤ 1%。

$R_{DS(on)}$ 与 V_{GS} 间的关系



栅极电荷



目录

4 修订历史记录

日期	修订版本	注释
2016 年 10 月	*	最初发布。

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	30			V
I_{DSS}	Drain-to-source leakage current	V_{GS} = 0 V, V_{DS} = 24 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	1.0	1.3	1.7	V
$R_{DS(on)}$	Drain-to-source On-resistance	V_{GS} = 4.5 V, I_D = 16 A		3.9	4.7	mΩ
		V_{GS} = 10 V, I_D = 16 A		3.2	3.8	
g_{fs}	Transconductance	V_{DS} = 3 V, I_D = 16 A		78		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance	V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz		2800	3640	pF
C_{oss}	Output capacitance			342	445	pF
C_{rss}	Reverse transfer capacitance			150	195	pF
R_G	Series gate resistance			1.8	3.6	Ω
Q_g	Gate charge total (4.5 V)	V_{DS} = 15 V, I_D = 16 A		20	25	nC
Q_g	Gate charge total (10 V)			41	54	nC
Q_{gd}	Gate charge gate-to-drain			4.0		nC
Q_{gs}	Gate charge gate-to-source			6.9		nC
$Q_{g(th)}$	Gate charge at V_{th}			3.6		nC
Q_{oss}	Output charge	V_{DS} = 15 V, V_{GS} = 0 V		11.7		nC
$t_{d(on)}$	Turnon delay time	V_{DS} = 15 V, V_{GS} = 10 V, I_{DS} = 16 A, R_G = 0 Ω		12		ns
t_r	Rise time			23		ns
$t_{d(off)}$	Turnoff delay time			23		ns
t_f	Fall time			10		ns
DIODE CHARACTERISTICS						
V_{SD}	Diode forward voltage	I_{SD} = 16 A, V_{GS} = 0 V		0.8	1.0	V
Q_{rr}	Reverse recovery charge	V_{DS}= 15 V, I_F = 16 A, di/dt = 300 A/μs		10.2		nC
t_{rr}	Reverse recovery time			9.8		ns

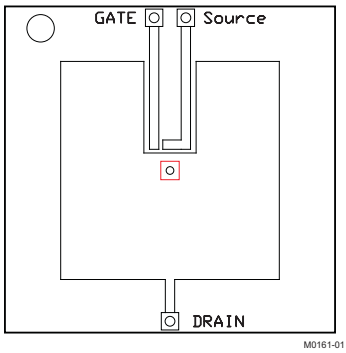
5.2 Thermal Information

T_A = 25°C (unless otherwise stated)

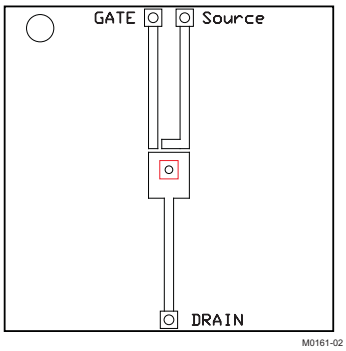
THERMAL METRIC		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction-to-case thermal resistance(1)			2	°C/W
$R_{\theta JA}$	Junction-to-ambient thermal resistance(1)(2)			55	

(1) $R_{\theta JC}$ is determined with the device mounted on a 1-in^2 (6.45-cm^2), 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^2 (6.45-cm^2), 2-oz (0.071-mm) thick Cu.



Max $R_{\theta JA}$ = 55°C/W when mounted on 1-in^2 (6.45-cm^2) of 2-oz (0.071-mm) thick Cu.



Max $R_{\theta JA}$ = 160°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°C (unless otherwise stated)

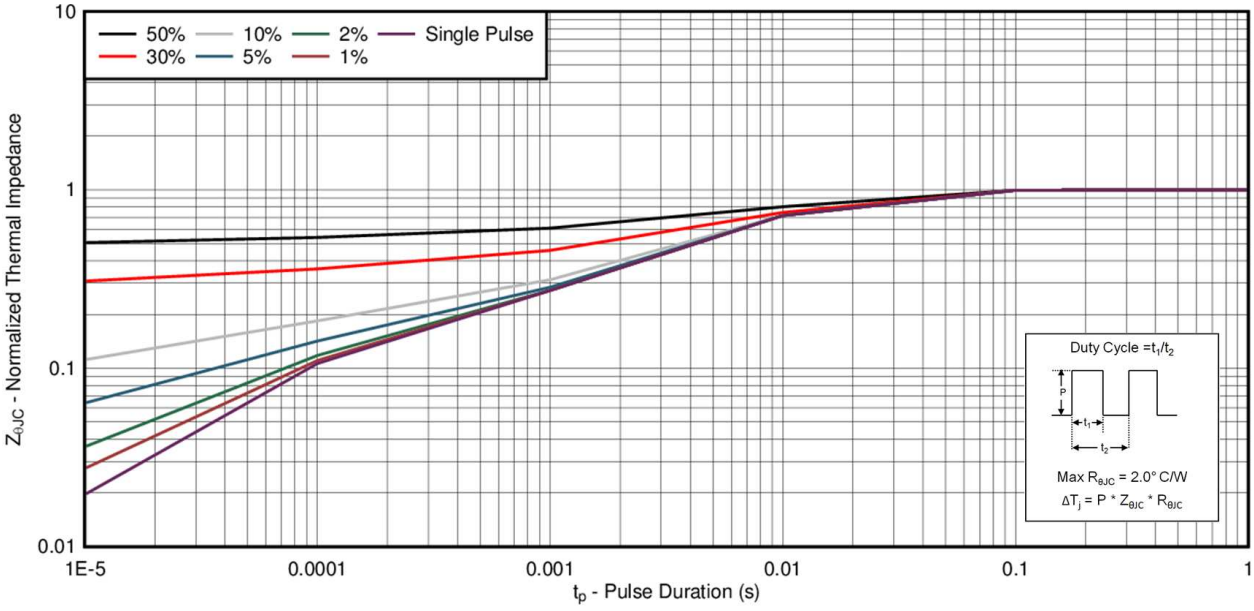


Figure 1. Transient Thermal Impedance

Typical MOSFET Characteristics (continued)

T_A = 25°C (unless otherwise stated)

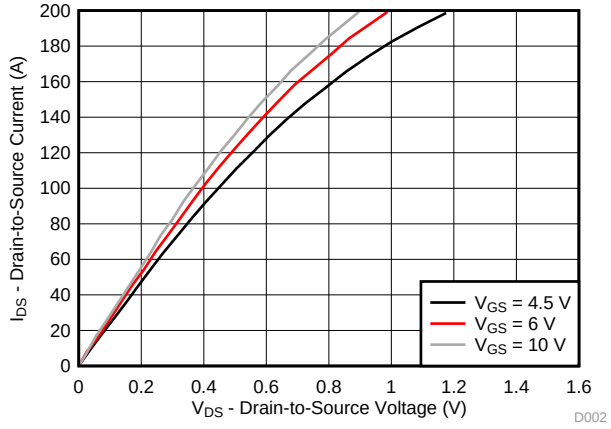


Figure 2. Saturation Characteristics

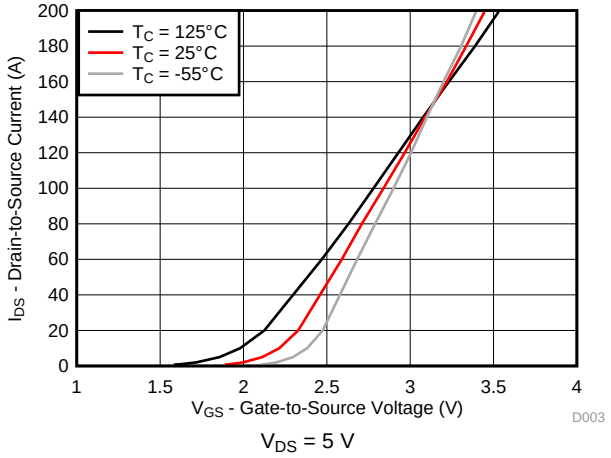


Figure 3. Transfer Characteristics

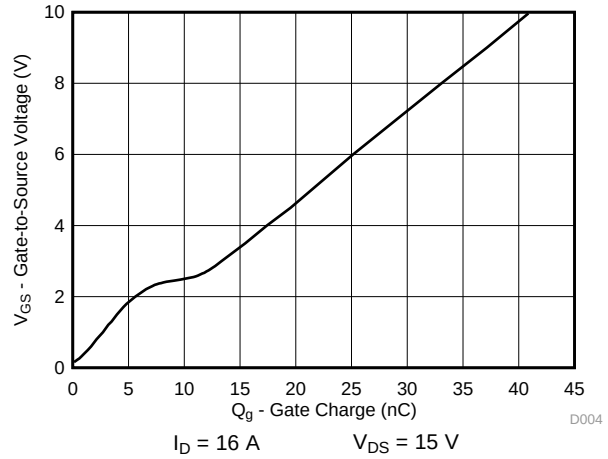


Figure 4. Gate Charge

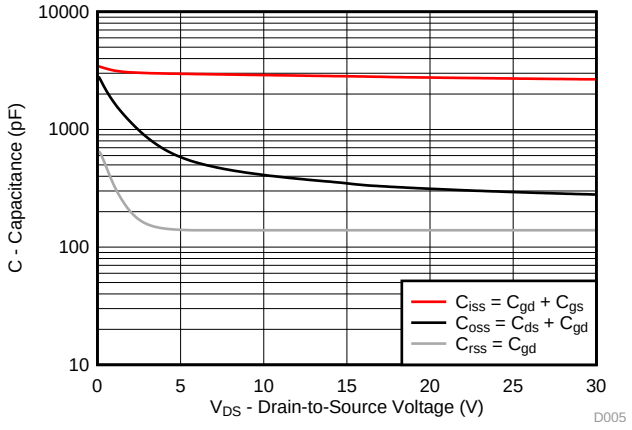


Figure 5. Capacitance

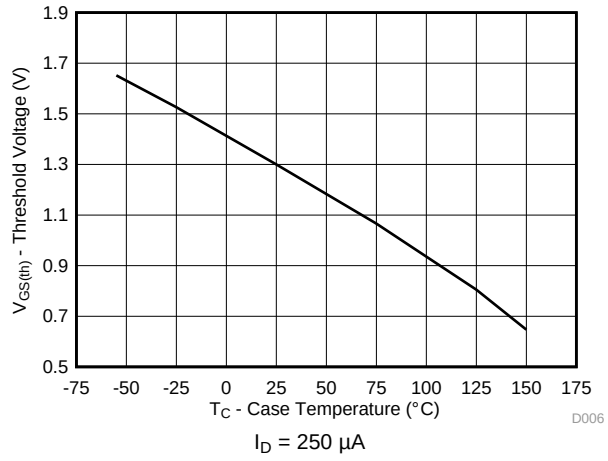


Figure 6. Threshold Voltage vs Temperature

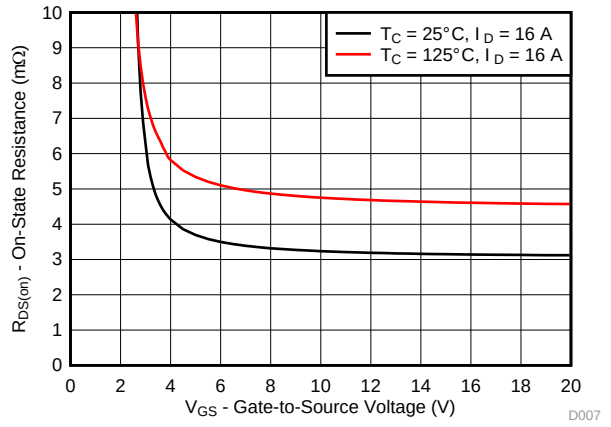


Figure 7. On-State Resistance vs Gate-to-Source Voltage

Typical MOSFET Characteristics (continued)

T_A = 25°C (unless otherwise stated)

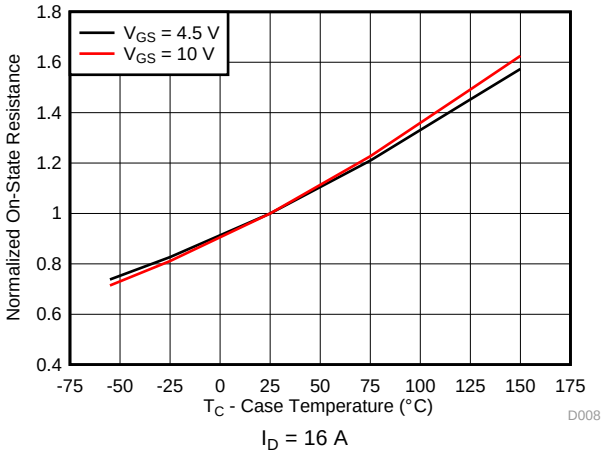


Figure 8. Normalized On-State Resistance vs Temperature

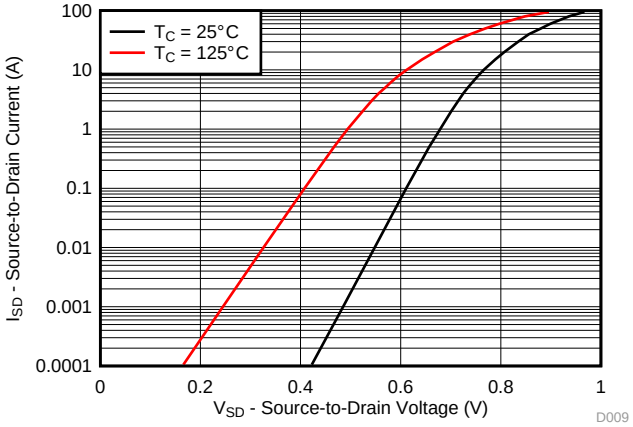


Figure 9. Typical Diode Forward Voltage

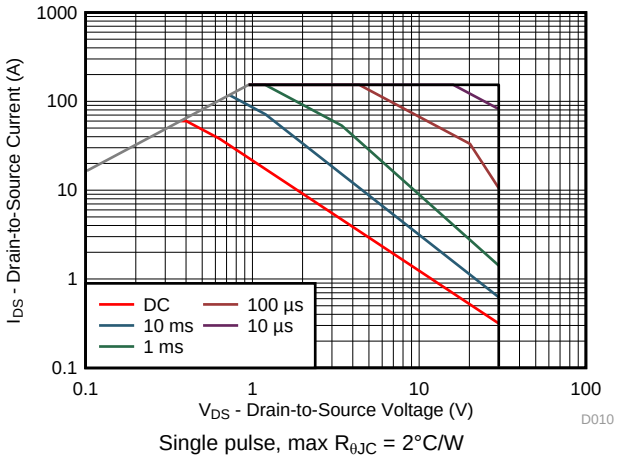


Figure 10. Maximum Safe Operating Area (SOA)

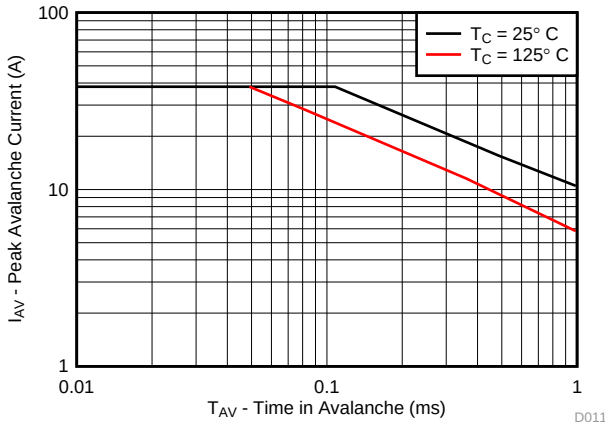


Figure 11. Single Pulse Unclamped Inductive Switching

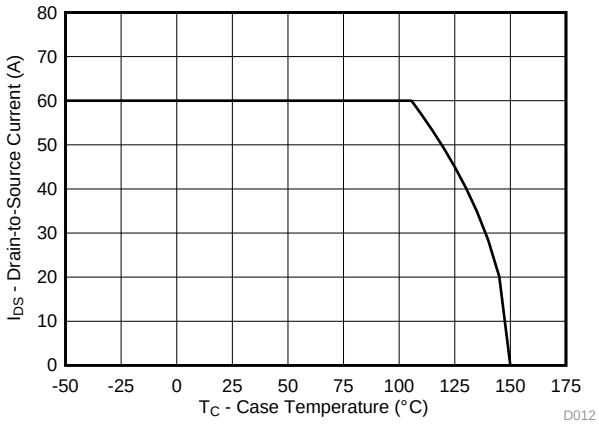


Figure 12. Maximum Drain Current vs Temperature

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

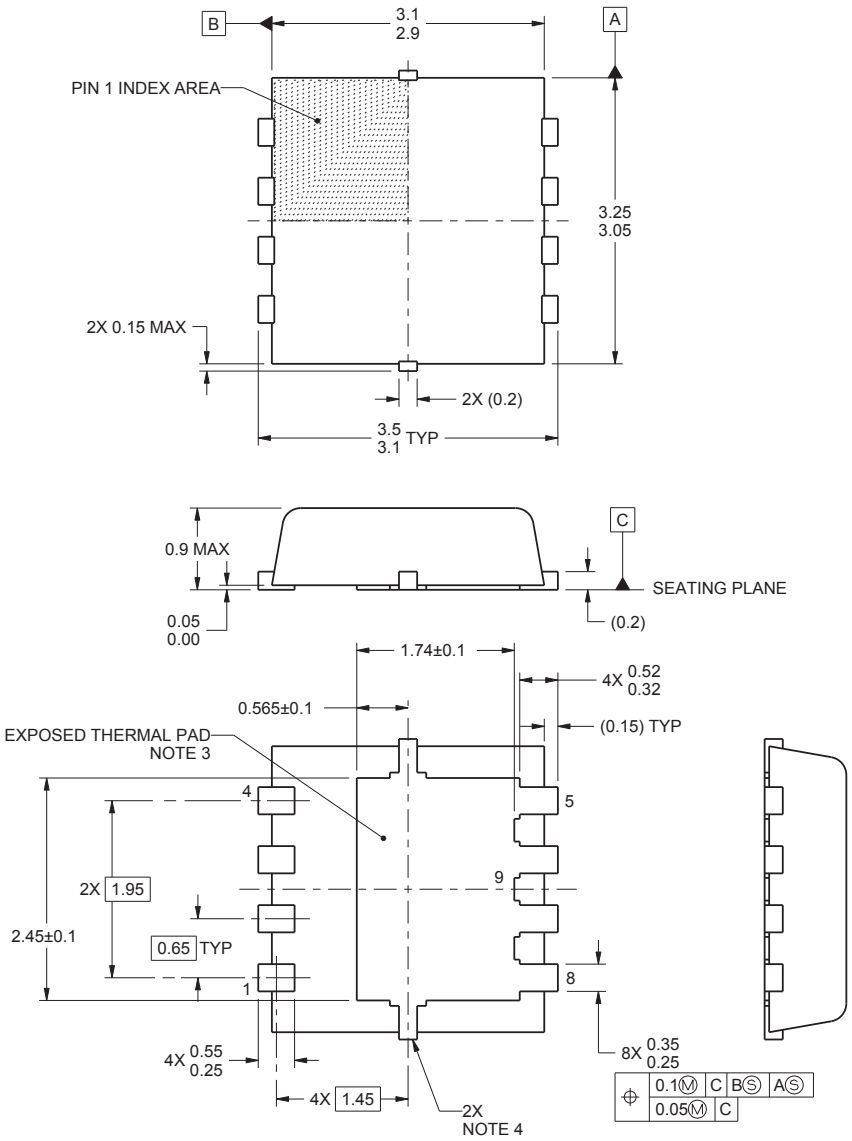
SLYZ022 — *TI Glossary*.

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

7 机械、封装和可订购信息

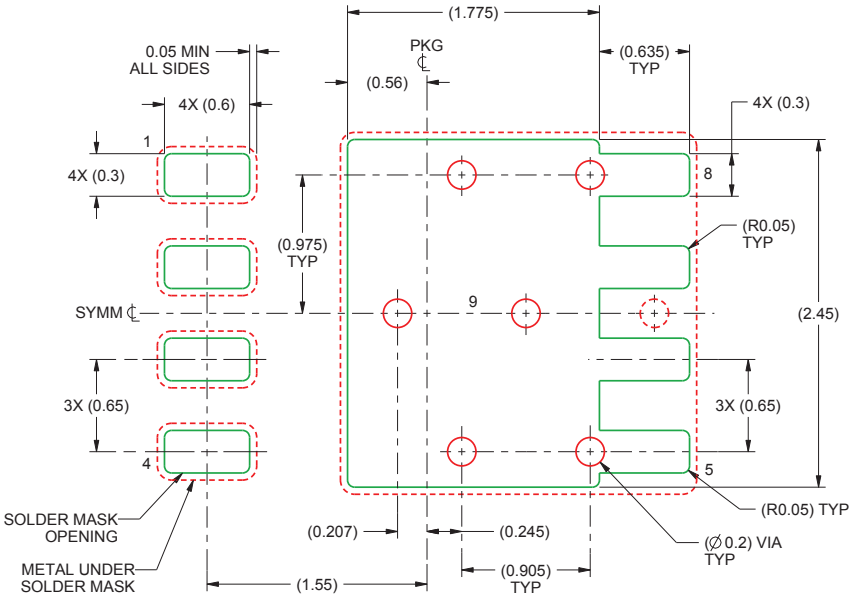
以下页中包括机械、封装和可订购信息。这些信息是针对指定器件可提供的最新数据。这些数据会在无通知且不对本文档进行修订的情况下发生改变。欲获得该数据表的浏览器版本，请查阅左侧的导航栏

7.1 Q3A 封装尺寸



1. 所有线性尺寸的单位均为毫米。括号中的任何尺寸仅供参考。尺寸和容限值遵循 ASME Y14.5M。
2. 本图纸如有变更，恕不通知。
3. 必须在印刷电路板上焊接封装散热焊盘，以获得良好的散热和机械性能。
4. 金属化 特性 为供应商选配特性，因此封装上可能不具备。
5. 所有尺寸不包括模具毛边或突出部分。

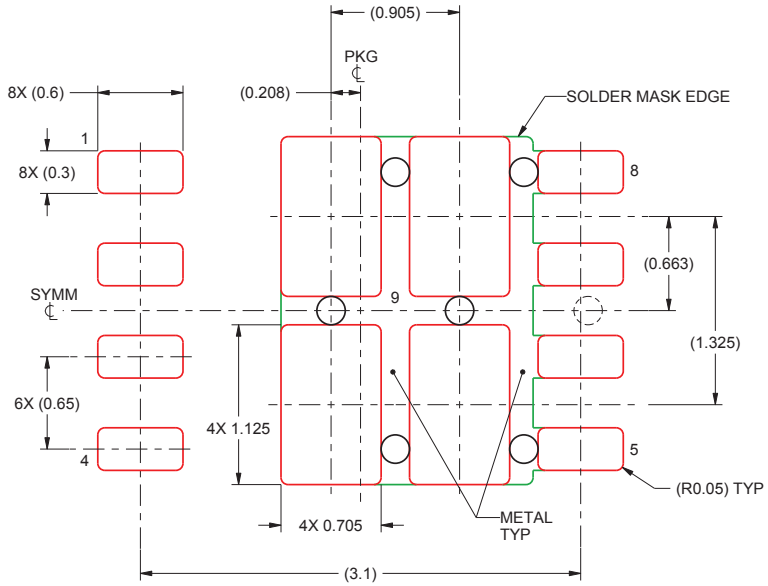
7.2 Q3A 建议的 PCB 布局



1. 此封装设计用于焊接到电路板的散热焊盘上。更多信息，请参见《QFN/SON PCB 连接》（文献编号：SLUA271）。
2. 根据应用决定是否选用过孔，详情请参见器件数据表。如果实现了部分或全部过孔，则会显示建议的过孔位置。

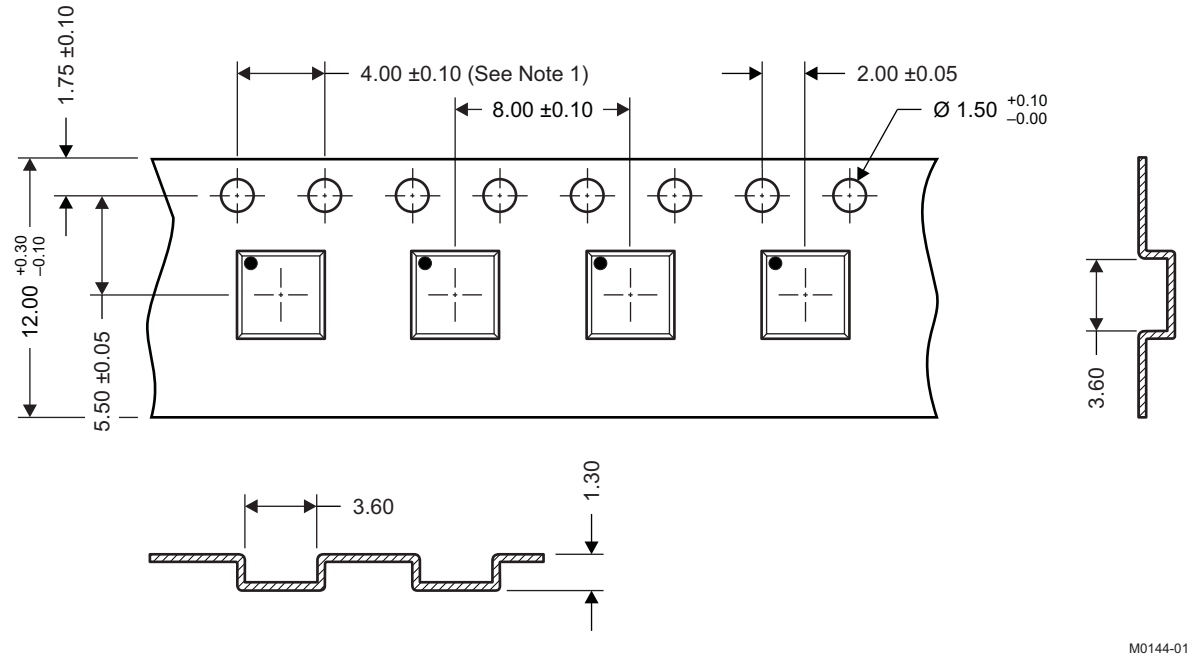
有关针对 PCB 设计的建议电路布局布线，请参见《通过 PCB 布局布线技巧来减少振铃》（文献编号：SLPA005）。

7.3 Q3A 建议的模板布局



1. 具有漏斗形壁和圆角的激光切割窗孔将提供更佳的焊锡膏脱离。IPC-7525 可能提供其他替代性设计建议。

7.4 Q3A 卷带信息



Notes: 1. 10 个链齿孔的累积容差为 ±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. 厚度：0.30 ± 0.05mm。
6. MSL1 260°C（红外 (IR) 和传导）PbF 回流焊兼容。

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)
CSD17581Q3A	Active	Production	VSONP (DNH) | 8	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	17581
CSD17581Q3A.B	Active	Production	VSONP (DNH) | 8	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	17581
CSD17581Q3AT	Active	Production	VSONP (DNH) | 8	250 | SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	17581
CSD17581Q3AT.B	Active	Production	VSONP (DNH) | 8	250 | SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	17581

(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.

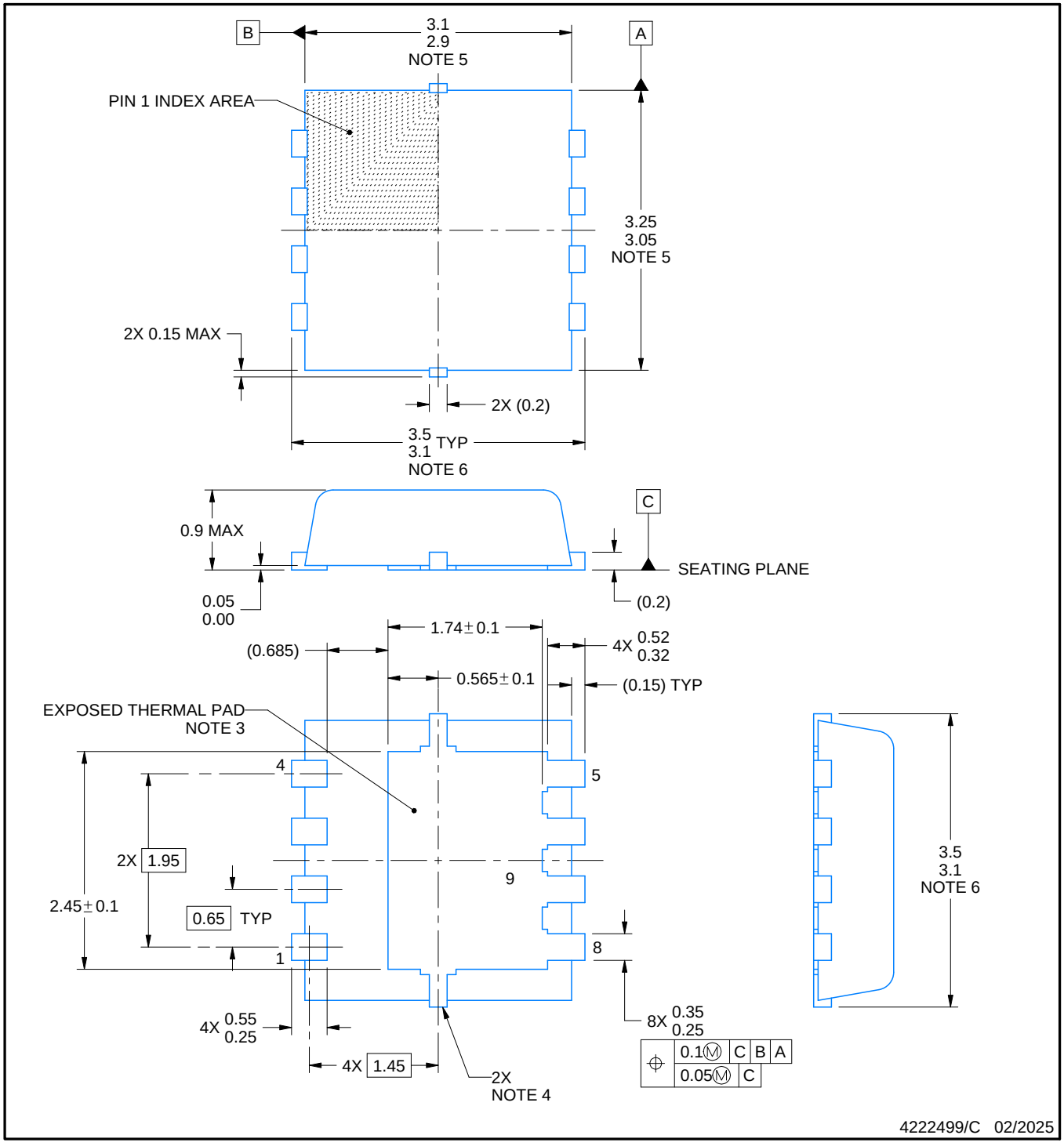
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

PACKAGE OUTLINE

DNH0008A

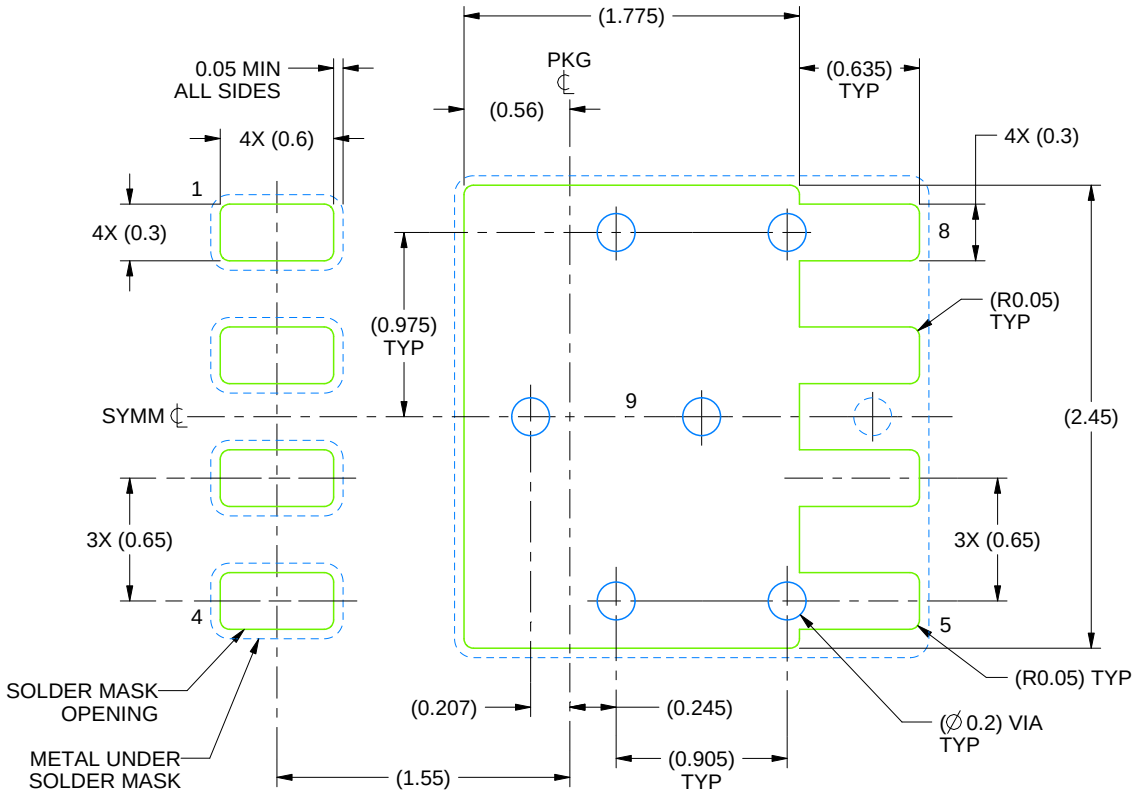
VSONP - 0.9 mm max height

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.
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.



LAND PATTERN EXAMPLE
SOLDER MASK DEFINED
SCALE: 25X

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NOTES: (continued)

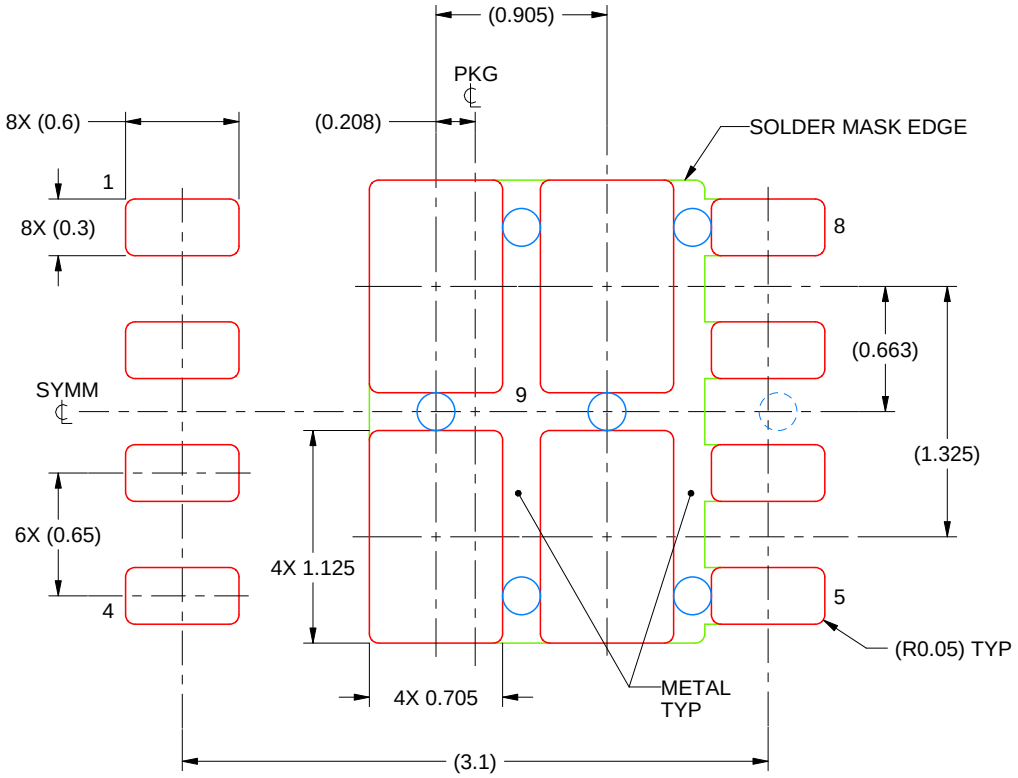
7. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
8. Vias are optional depending on application, refer to device data sheet. If some or all are implemented, recommended via locations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

EXAMPLE STENCIL DESIGN

DNH0008A

VSONP - 0.9 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD 9:
76% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE: 25X

4222499/C 02/2025

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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