

CSD17578Q3A 30V N 通道 NexFET™ 功率 MOSFET

1 特性

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

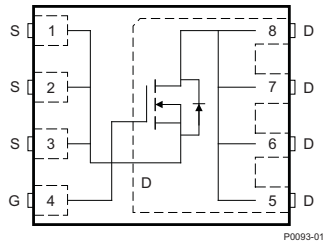
2 应用

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

3 说明

这款 30V, 6.3mΩ, SON 3.3mm × 3.3mm NexFET™ 功率 MOSFET 旨在最大限度地降低功率转换应用中的损耗。

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	30		V
Q_g	总栅极电荷 (4.5V)	7.9		nC
Q_{gd}	栅极电荷 栅极到漏极	1.7		nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = 4.5\text{V}$	8.2	mΩ
		$V_{GS} = 10\text{V}$	6.3	mΩ
$V_{GS(th)}$	阈值电压	1.5		V

订购信息⁽¹⁾

器件	包装介质	数量	封装	发货
CSD17578Q3A	13 英寸卷带	2500	SON 3.3mm x 3.3mm 塑料封装	卷带封装
CSD17578Q3AT	7 英寸卷带	250		

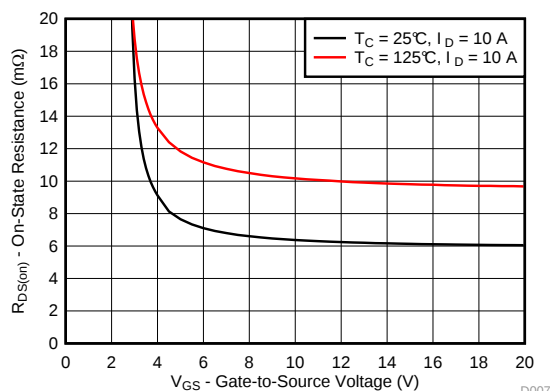
(1) 如需了解所有可用封装, 请参阅产品说明书末尾的可订购产品附录。

绝对最大额定值

$T_A = 25^\circ\text{C}$		值	单位
V_{DS}	漏源电压	30	V
V_{GS}	栅源电压	±20	V
I_D	持续漏极电流 (受封装限制)	20	A
	持续漏极电流 (受芯片限制), $T_C = 25^\circ\text{C}$ 时测得	54	
	持续漏极电流 ⁽¹⁾	14	
I_{DM}	脉冲漏极电流 ⁽²⁾	142	A
P_D	功率耗散 ⁽¹⁾	2.5	W
	功率耗散, $T_C = 25^\circ\text{C}$	37	
T_J, T_{stg}	工作结温, 储存温度	-55 至 150	°C
E_{AS}	雪崩能量, 单脉冲 $I_D = 22\text{A}, L = 0.1\text{mH}, R_G = 25\Omega$	24	mJ

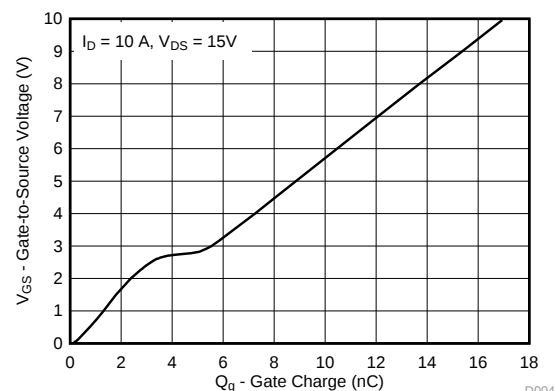
(1) $R_{\theta JA} = 50^\circ\text{C/W}$, 这是在厚度为 0.06 英寸的 FR4 PCB 上将其安装在 1 平方英寸 2 盎司厚的铜焊盘上测得的典型值。

(2) 最大 $R_{\theta JC} = 4.2^\circ\text{C/W}$, 脉冲持续时间 $\leq 100\mu\text{s}$, 占空比 $\leq 1\%$

 $R_{DS(on)}$ 与 V_{GS} 对比

D007

栅极电荷



D004



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4 修订历史记录

注：之前版本的页码可能与当前版本有所不同。

Changes from Original (September 2014) to Revision A	Page
• 在绝对最大额定值表中更新了功率耗散值	1
• 已添加 社区资源 部分	7
• 更新了封装尺寸图	8
• 更新了 PCB 图	9
• 更新了模板布局图	9

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	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	1.1	1.5	1.9	V
R _{DS(on)}	Drain-to-Source On-Resistance	V _{GS} = 4.5 V, I _D = 10 A	8.2		9.4	mΩ
		V _{GS} = 10 V, I _D = 10 A	6.3		7.3	mΩ
g _{fs}	Transconductance	V _{DS} = 3 V, I _D = 10 A	48			S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 15 V, f = 1 MHz	1150		1590	pF
C _{oss}	Output Capacitance		134		174	pF
C _{rss}	Reverse Transfer Capacitance		56		73	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 = 10 A	7.9		10.3	nC
Q _g	Gate Charge Total (10 V)		17.1		22.2	
Q _{gd}	Gate Charge Gate-to-Drain		1.7			nC
Q _{gs}	Gate Charge Gate-to-Source		3.3			nC
Q _{g(th)}	Gate Charge at V _{th}		1.6			nC
Q _{oss}	Output Charge		4.2			nC
t _{d(on)}	Turn On Delay Time	V _{DS} = 15 V, V _{GS} = 10 V, I _{DS} = 10 A, R _G = 0 Ω	2			ns
t _r	Rise Time		6			ns
t _{d(off)}	Turn Off Delay Time		13			ns
t _f	Fall Time		1			ns
DIODE CHARACTERISTICS						
V _{SD}	Diode Forward Voltage	I _{SD} = 10 A, V _{GS} = 0 V	0.8		1.0	V
Q _{rr}	Reverse Recovery Charge	V _{DS} = 15 V, I _F = 10 A, di/dt = 300 A/μs	4.4			nC
t _{rr}	Reverse Recovery Time		6			ns

5.2 Thermal Information

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

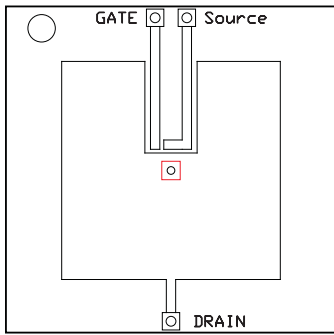
THERMAL METRIC		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Junction-to-Case Thermal Resistance ⁽¹⁾			4.2	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Junction-to-Ambient Thermal Resistance ⁽¹⁾⁽²⁾			60	

- $R_{\theta JC}$ 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.

CSD17578Q3A

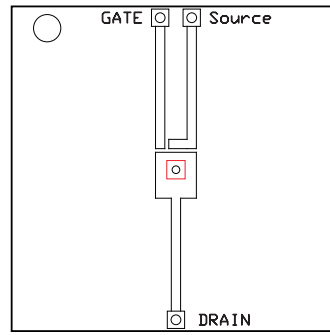
ZHCST2A–SEPTEMBER 2014–REVISED JANUARY 2016

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Max $R_{\theta JA} = 60^{\circ}\text{C/W}$
when mounted on
1 inch² (6.45 cm²) of
2-oz. (0.071-mm thick)
Cu.

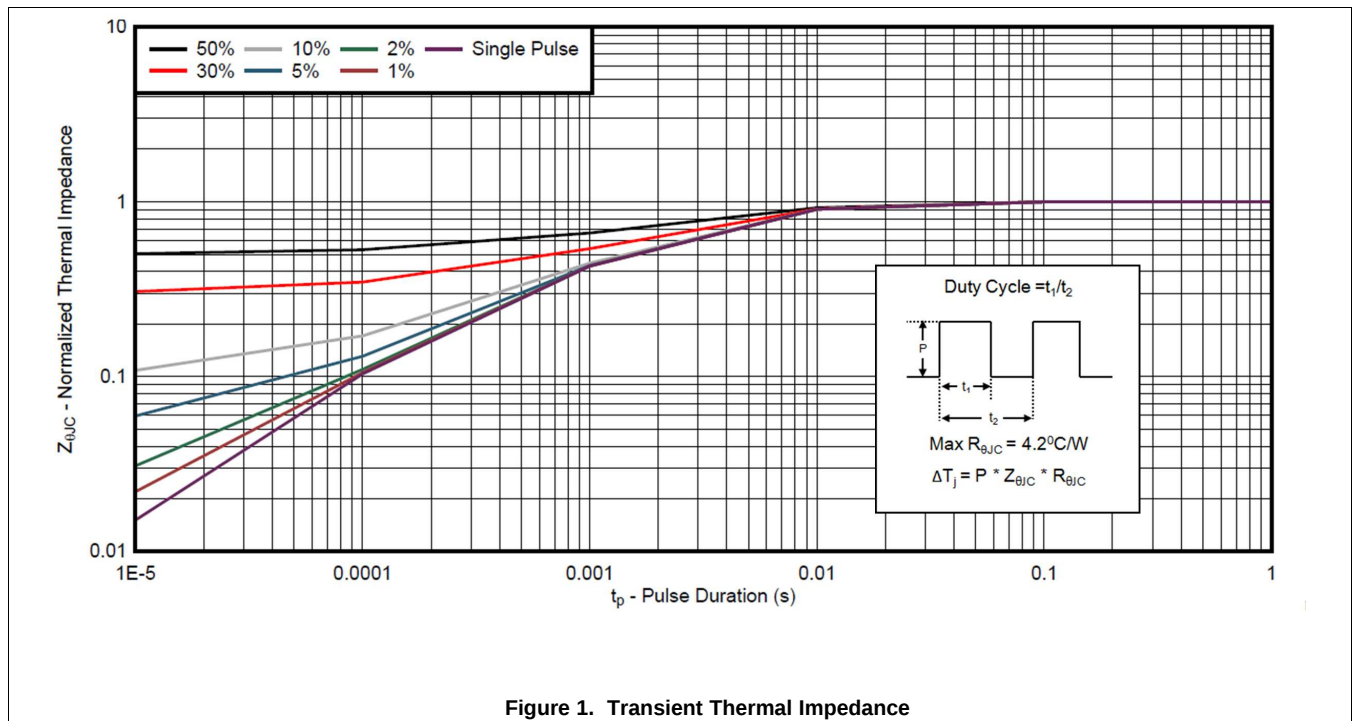


M0161-02

Max $R_{\theta JA} = 145^{\circ}\text{C/W}$
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)

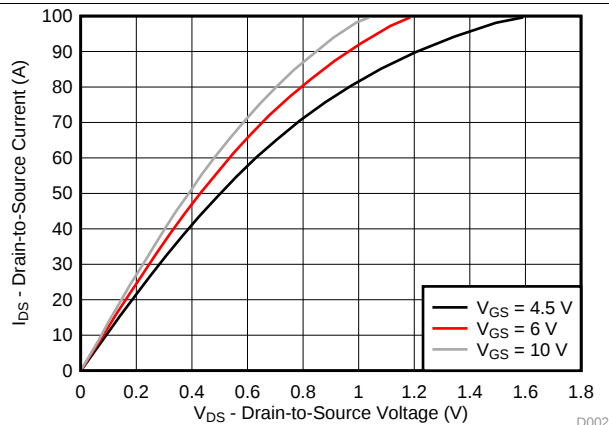


Figure 2. Saturation Characteristics

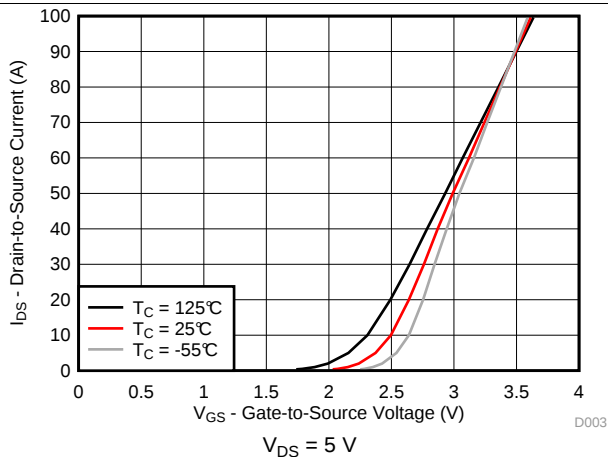


Figure 3. Transfer Characteristics

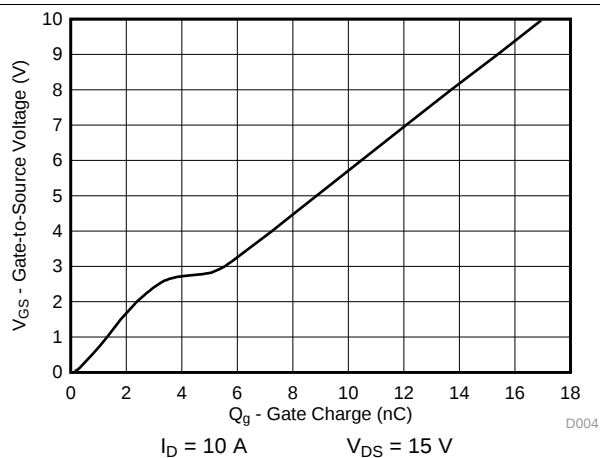


Figure 4. Gate Charge

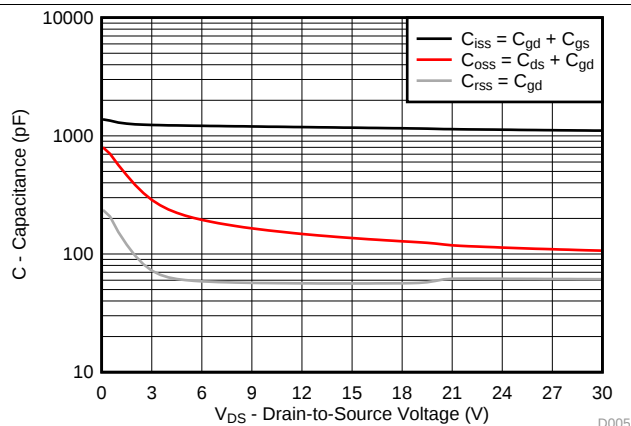


Figure 5. Capacitance

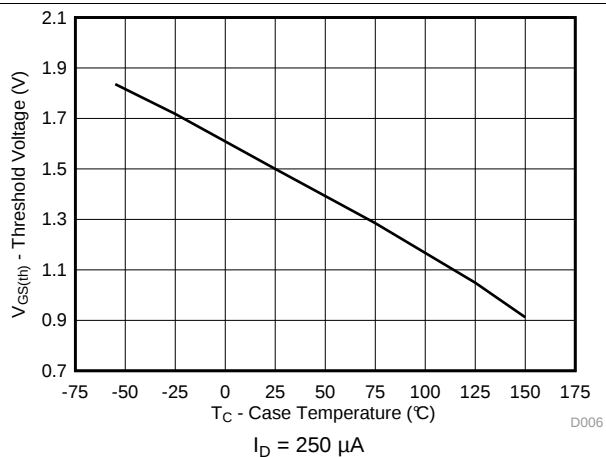


Figure 6. Threshold Voltage vs Temperature

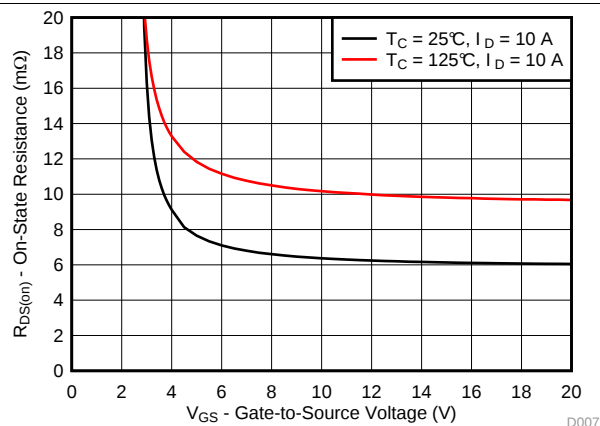


Figure 7. On-State Resistance vs Gate-to-Source Voltage

Typical MOSFET Characteristics (continued)

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

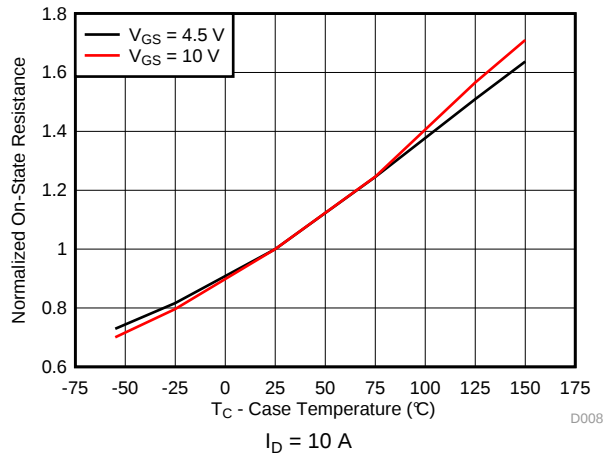


Figure 8. Normalized On-State Resistance vs Temperature

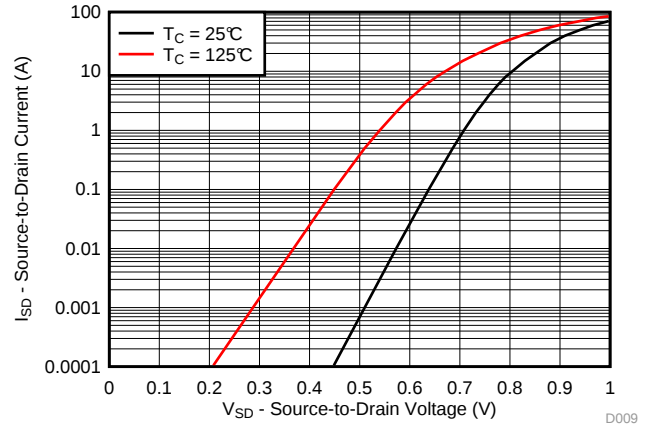


Figure 9. Typical Diode Forward Voltage

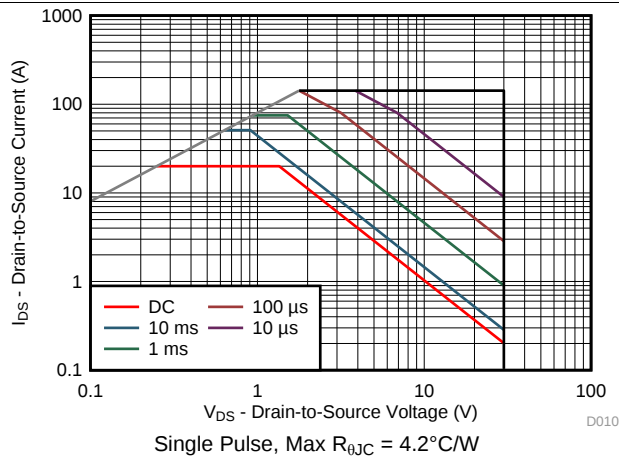


Figure 10. Maximum Safe Operating Area (SOA)

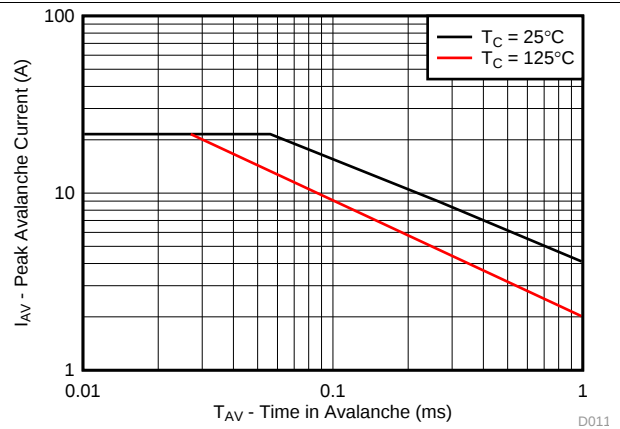


Figure 11. Single Pulse Unclamped Inductive Switching

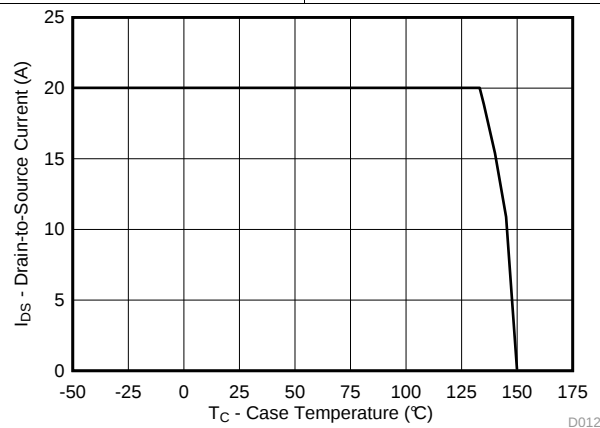


Figure 12. Maximum Drain Current vs Temperature

6 器件和文档支持

6.1 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》。

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设计支持 *TI 参考设计支持* 可帮助您快速查找有帮助的 E2E 论坛、设计支持工具以及技术支持的联系信息。

6.2 商标

NexFET, E2E are trademarks of Texas Instruments.
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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 Glossary

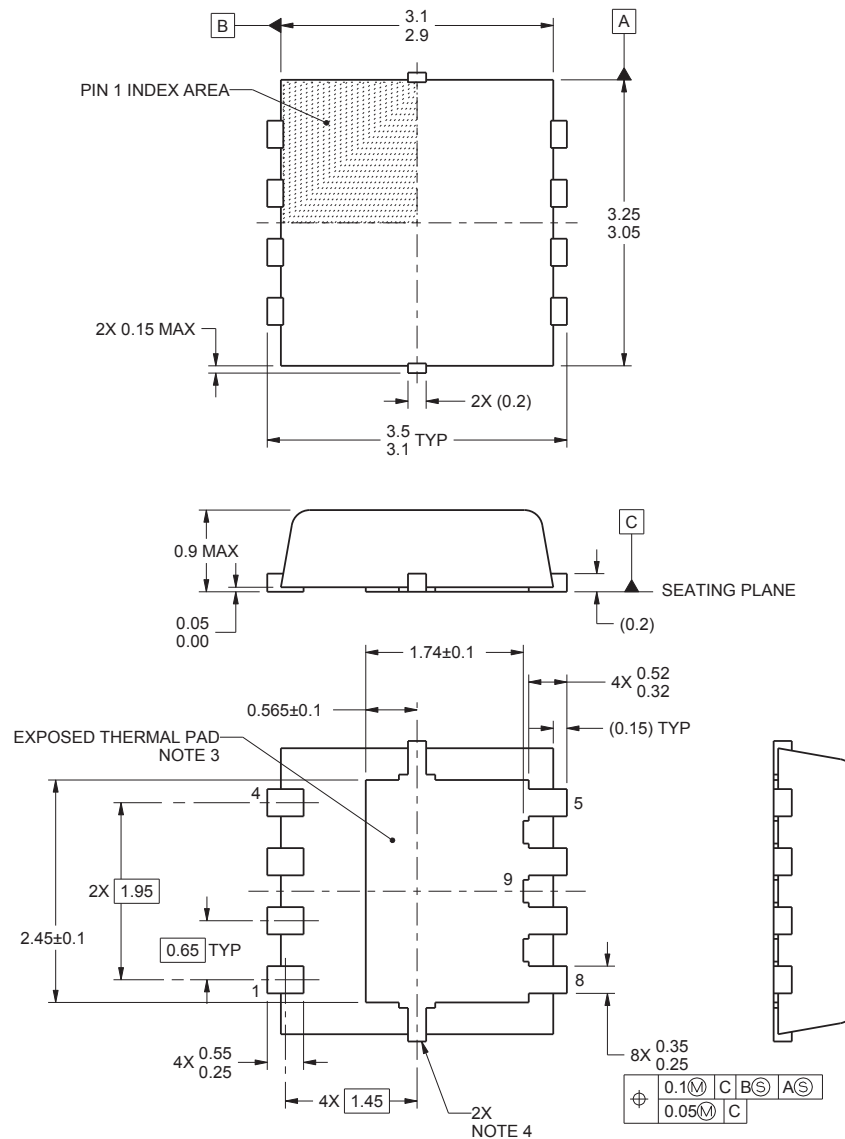
SLYZ022 — *TI Glossary*.

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

7 机械、封装和可订购信息

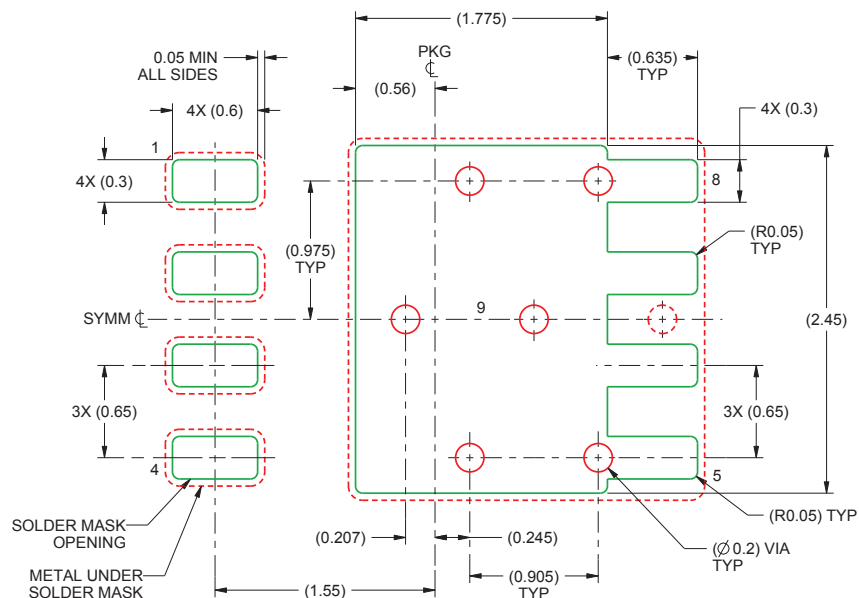
以下页面包含机械、封装和可订购信息。这些信息是指定器件的最新可用数据。这些数据如有变更，恕不另行通知和修订此文档。如欲获取此产品说明书的浏览器版本，请参阅左侧的导航。

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。尺寸和公差值符合 ASME Y14.5M 标准。
2. 本图如有变更，恕不另行通知。
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。

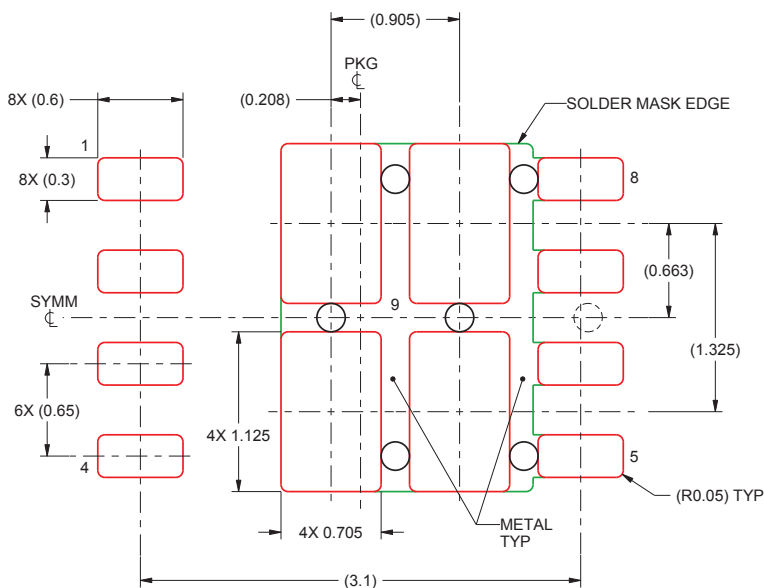
7.2 Q3A 建议的 PCB 布局



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

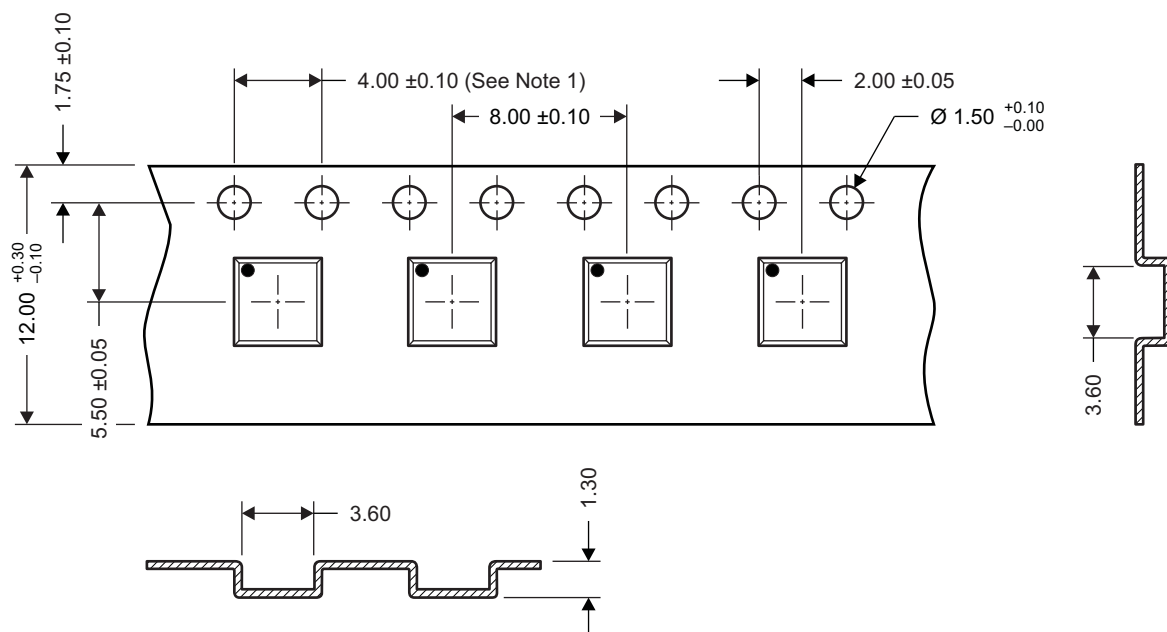
要获得与印刷电路板 (PCB) 设计相关的建议电路布局布线, 请参阅《应用说明》[SLPA005 - 通过 PCB 布局布线技巧来减少振铃](#)。

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孔可提供更佳的锡膏脱离。IPC-7525 可能提供其他替代性设计建议。

7.4 Q3A 卷带信息



M0144-01

- Notes:
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
 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 ± 0.05 mm
 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)
CSD17578Q3A	Active	Production	VSONP (DNH) 8	2500 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-	17578
CSD17578Q3A.B	Active	Production	VSONP (DNH) 8	2500 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	17578
CSD17578Q3AT	Active	Production	VSONP (DNH) 8	250 SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	17578
CSD17578Q3AT.B	Active	Production	VSONP (DNH) 8	250 SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	17578

⁽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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