

# 30V, N 通道 NexFET™ 功率金属氧化物半导体场效应晶体管 (MOSFET)

 查询样品: **CSD17553Q5A**

## 特性

- 超低  $Q_g$  和  $Q_{gd}$
- 低热阻
- 雪崩级
- 无铅端子镀层
- 符合 RoHS 标准
- 无卤素
- 小外形尺寸无引线 (SON) 5mm x 6mm 塑料封装

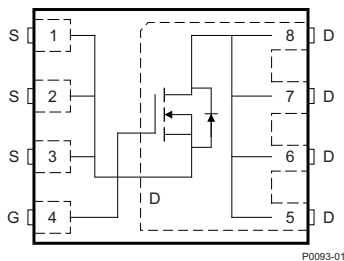
## 应用范围

- 网络互联、电信和计算系统中的负载点同步降压
- 针对控制和同步 FET 应用进行了优化

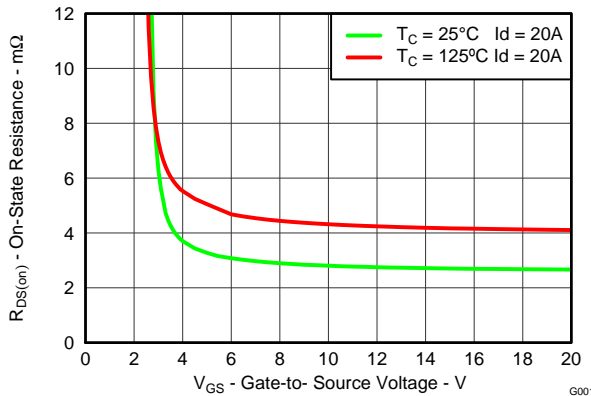
## 说明

NexFET™ 功率 MOSFET 被设计用于大大减少功率转换应用中的功率损失。

顶视图



P0093-01

 $R_{DS(on)}$  与  $V_{GS}$  间的关系


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## 产品概述

$V_{DS}$	漏源电压	30	V
$Q_g$	栅极电荷总量 (4.5V)	17.5	nC
$Q_{gd}$	栅漏栅极电荷	4.7	nC
$R_{DS}$ (接通)	漏源导通电阻	$V_{GS}=4.5V$	3.5 mΩ
		$V_{GS}=10V$	2.7 mΩ
$V_{GS(th)}$	阈值电压	1.5	V

## 订购信息

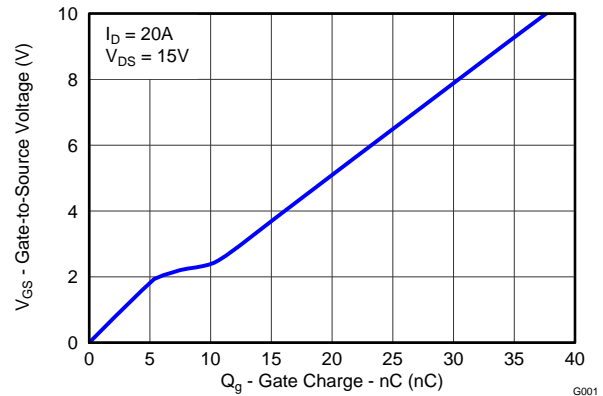
器件	封装	介质	数量	出货
CSD17553Q5A	5mm x 6mm SON 塑料封装	13 英寸卷带	2500	卷带封装

## 绝对最大额定值

$T_A=25^\circ C$ 时测得, 除非另外说明		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, $T_C=25^\circ C$ 时测得	100	A
	持续漏极电流, $T_A=25^\circ C$ 时测得 <sup>(1)</sup>	23.5	A
$I_{DM}$	脉冲漏极电流, $T_A=25^\circ C$ 时测得 <sup>(2)</sup>	151	A
$P_D$	功率耗散 <sup>(1)</sup>	3.1	W
$T_J, T_{STG}$	运行结温和储存温度范围	-55 至 150	$^\circ C$
$E_{AS}$	雪崩能量, 单一脉冲 $I_D=45A, L=0.1mH, R_G=25\Omega$	101	mJ

- (1)  $R_{\theta JA} = 40.5^\circ C/W$ , 这是在一个厚度为 0.06 英寸 (1.52mm) 的 FR4 印刷电路板 (PCB) 上的 1 英寸<sup>2</sup> (6.45cm<sup>2</sup>), 2 盎司 (厚度 0.071mm) 的铜过渡垫片上测得的典型值。
- (2) 脉冲持续时间  $\leq 300\mu s$ , 占空比  $\leq 2\%$

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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.

## ELECTRICAL CHARACTERISTICS

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

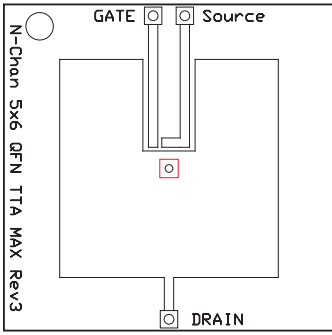
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Static Characteristics</b>						
$V_{DSS}$	Drain to Source Voltage	$V_{GS} = 0V, I_D = 250\mu A$	30			V
$I_{DSS}$	Drain to Source Leakage Current	$V_{GS} = 0V, V_{DS} = 24V$			1	$\mu A$
$I_{GSS}$	Gate to Source Leakage Current	$V_{DS} = 0V, V_{GS} = 20V$			100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	1.5	1.9	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 4.5V, I_D = 20A$		3.5	4	$m\Omega$
		$V_{GS} = 10V, I_D = 20A$		2.7	3.1	$m\Omega$
$g_{fs}$	Transconductance	$V_{DS} = 15V, I_D = 20A$		106		S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = 15V,$ $f = 1MHz$		2710	3252	pF
$C_{oss}$	Output Capacitance			635	762	pF
$C_{riss}$	Reverse Transfer Capacitance			48	60	pF
$R_G$	Series Gate Resistance	$V_{DS} = 15V, I_D = 20A$		0.7	0.9	$\Omega$
$Q_g$	Gate Charge Total (4.5V)			17.5	21.5	nC
$Q_{gd}$	Gate Charge Gate to Drain			4.7		nC
$Q_{gs}$	Gate Charge Gate to Source			5.8		nC
$Q_{g(th)}$	Gate Charge at $V_{th}$			4.1		nC
$Q_{oss}$	Output Charge	$V_{DS} = 15V, V_{GS} = 0V$		19.6		nC
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = 15V, V_{GS} = 4.5V,$ $I_{DS} = 20A, R_G = 0.75\Omega$		9.7		ns
$t_r$	Rise Time			17		ns
$t_{d(off)}$	Turn Off Delay Time			14.8		ns
$t_f$	Fall Time			5.2		ns
<b>Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage	$I_{DS} = 20A, V_{GS} = 0V$		0.8	1	V
$Q_{rr}$	Reverse Recovery Charge	$V_{DS} = 14V, I_F = 20A, di/dt = 300A/\mu s$		23.8		nC
$t_{rr}$	Reverse Recovery Time			23.1		ns

## THERMAL CHARACTERISTICS

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

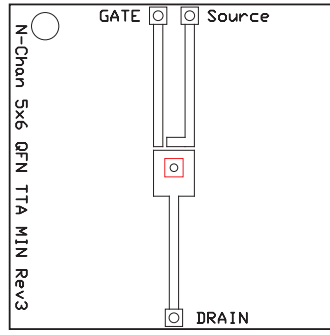
PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case <sup>(1)</sup>			1.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient <sup>(1)(2)</sup>			50.6	$^\circ\text{C/W}$

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



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Max  $R_{\theta JA} = 50.6^{\circ}\text{C/W}$   
when mounted on  
1 inch<sup>2</sup> (6.45-cm<sup>2</sup>) of 2-  
oz. (0.071-mm thick)  
Cu.



M0137-02

Max  $R_{\theta JA} = 122.4^{\circ}\text{C/W}$   
when mounted on a  
minimum pad area of  
2-oz. (0.071-mm thick)  
Cu.

### TYPICAL MOSFET CHARACTERISTICS

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

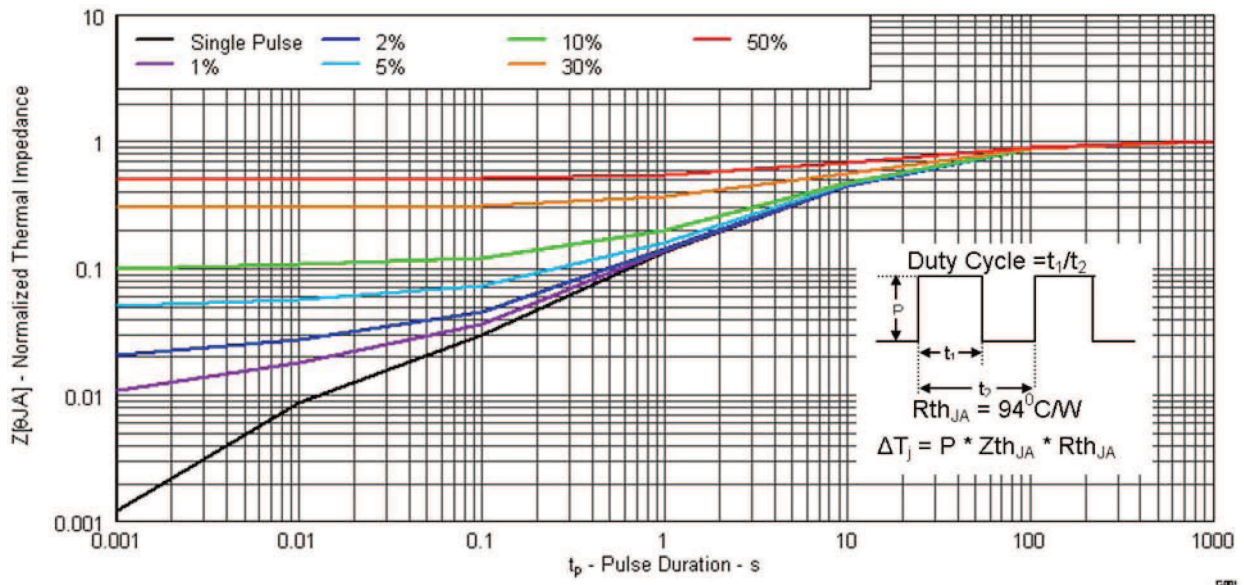
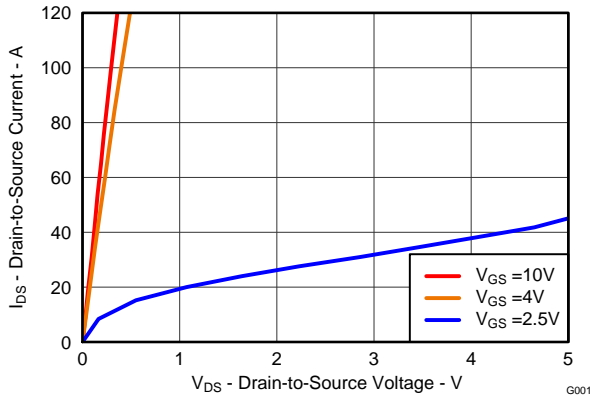


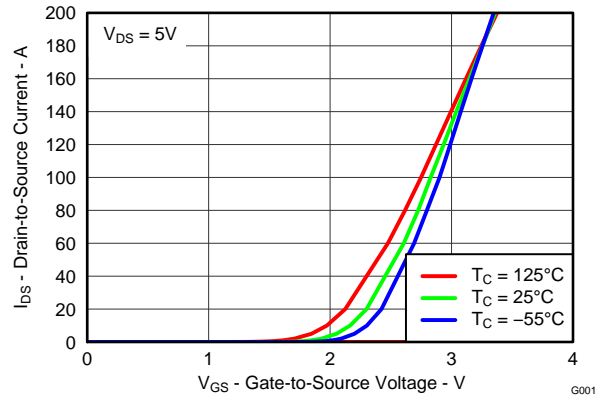
Figure 1. Transient Thermal Impedance

**TYPICAL MOSFET CHARACTERISTICS (continued)**

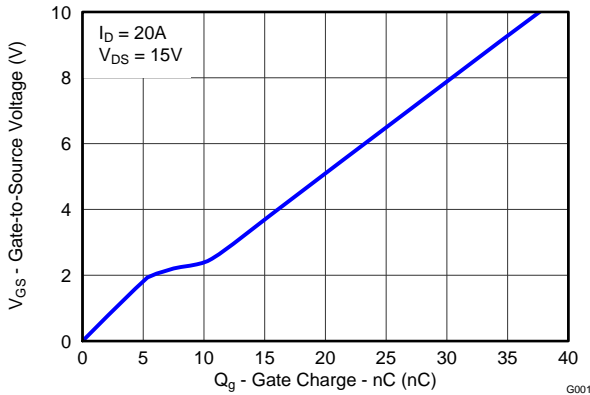
( $T_A = 25^\circ\text{C}$  unless otherwise stated)



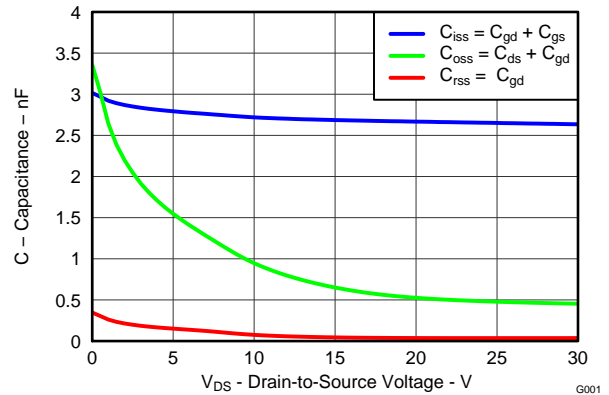
**Figure 2. Saturation Characteristics**



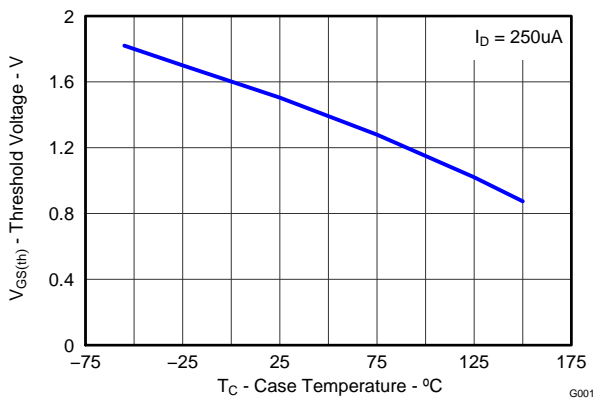
**Figure 3. Transfer Characteristics**



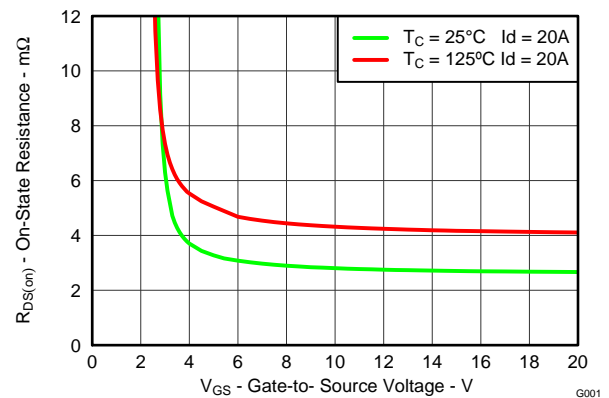
**Figure 4. Gate Charge**



**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)

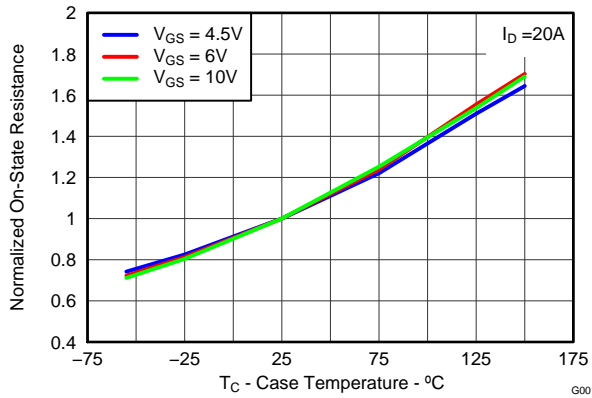


Figure 8. Normalized On-State Resistance vs. Temperature

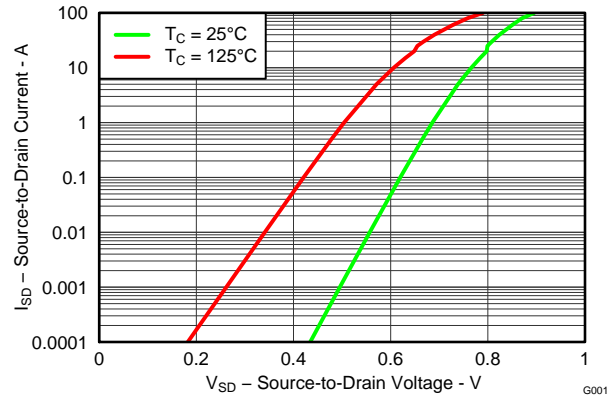


Figure 9. Typical Diode Forward Voltage

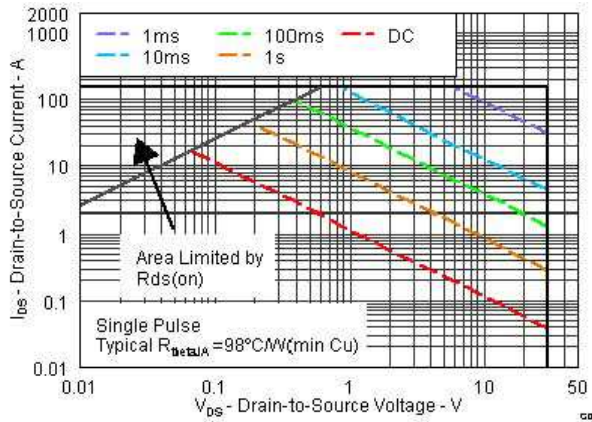


Figure 10. Maximum Safe Operating Area

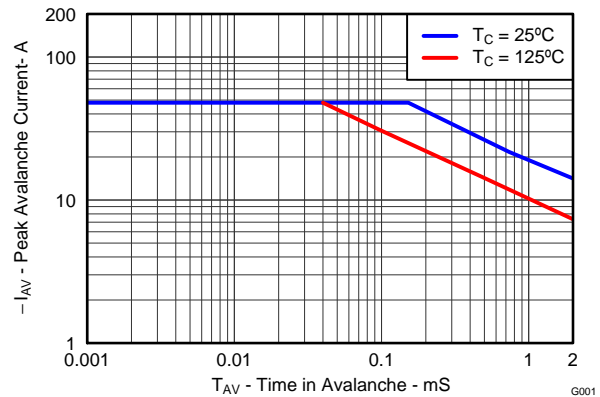


Figure 11. Single Pulse Unclamped Inductive Switching

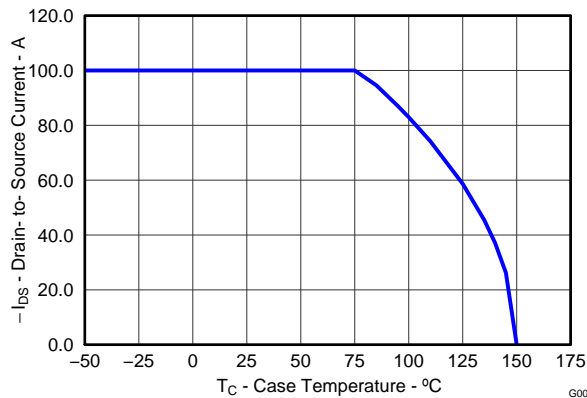
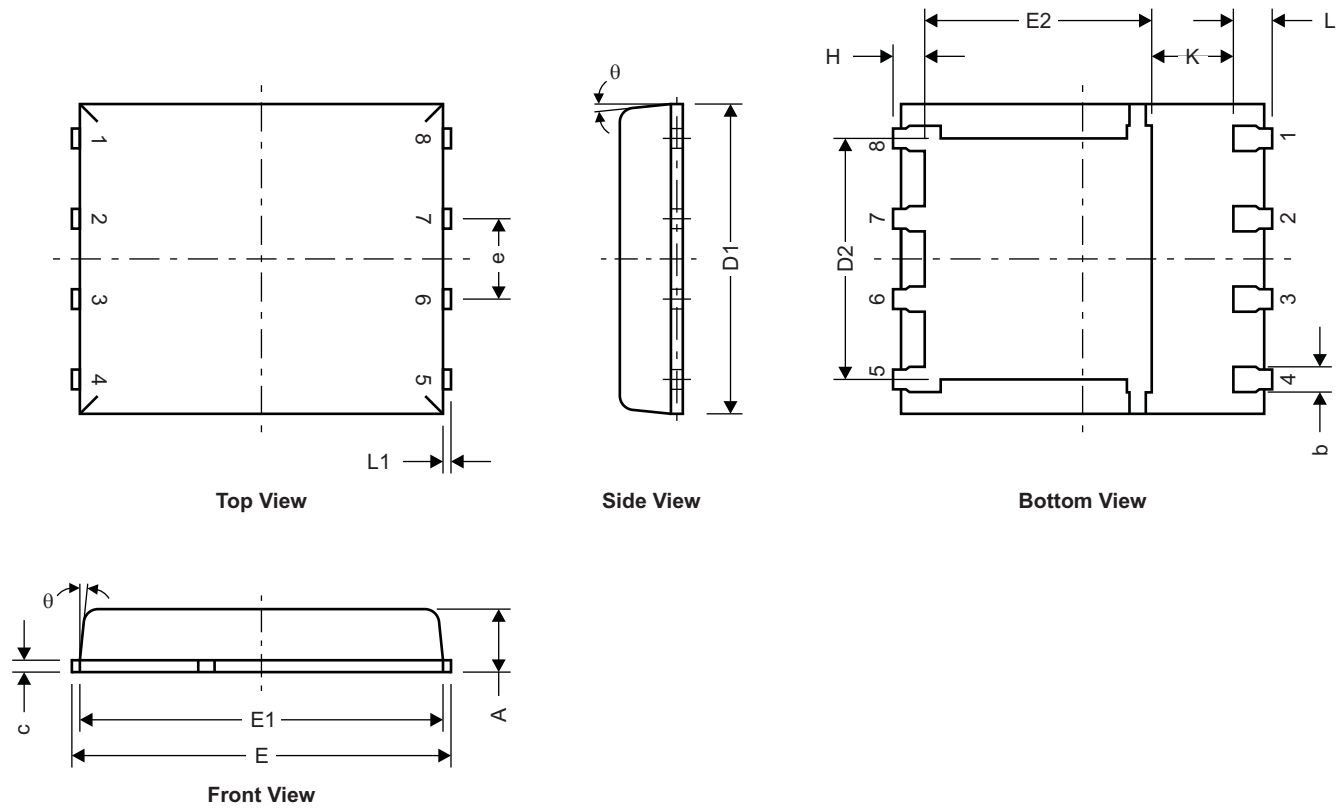


Figure 12. Maximum Drain Current vs. Temperature

**MECHANICAL DATA**

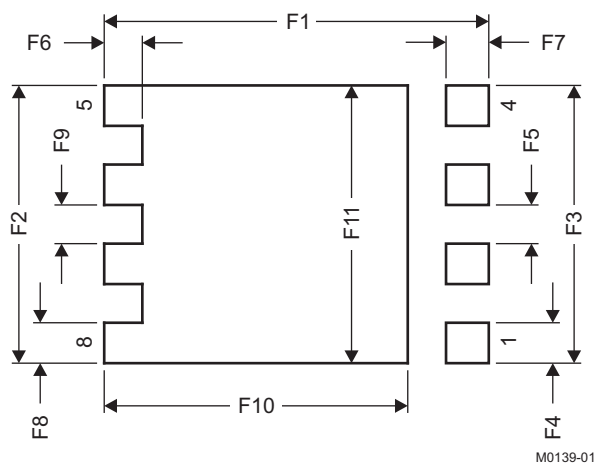
**Q5A Package Dimensions**



M0135-01

DIM	MILLIMETERS		
	MIN	NOM	MAX
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
e	1.17	1.27	1.37
H	0.41	0.56	0.71
K	1.10		
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
$\theta$	0°		12°

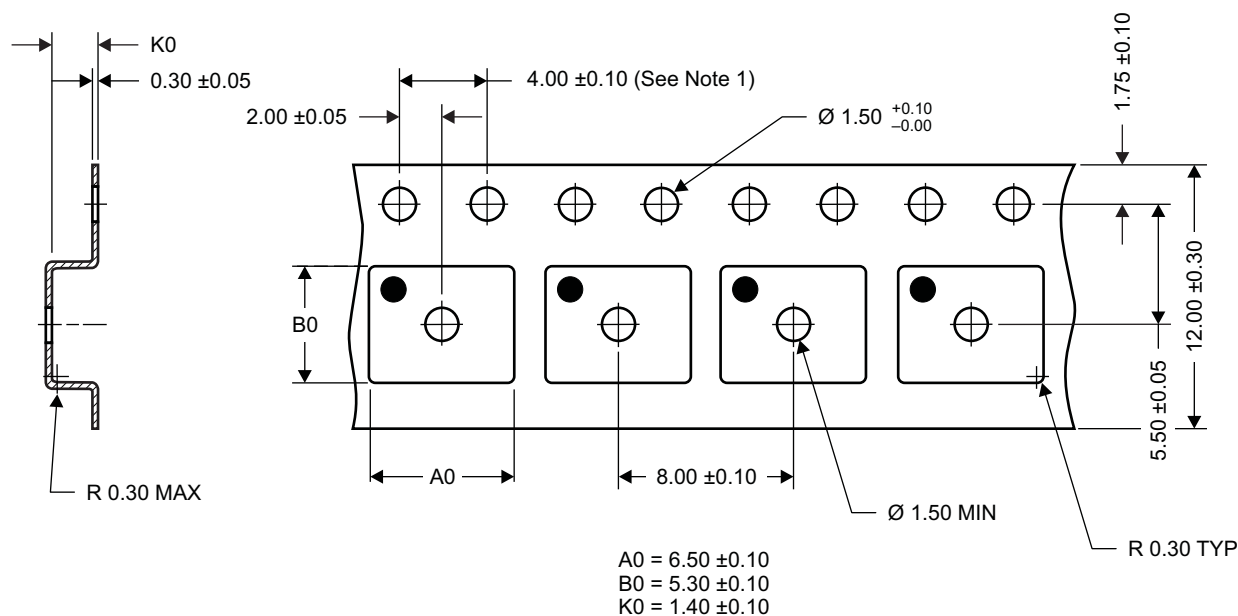
Figure 13. Recommended PCB Pattern



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
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

For recommended circuit layout for PCB designs, see application note [SLPA005 – Reducing Ringing Through PCB Layout Techniques](#).

### Q5A Tape and Reel Information




M0138-01

### Notes:

1. 10-sprocket hole-pitch cumulative tolerance  $\pm 0.2$
2. Camber not to exceed 1mm in 100mm, noncumulative over 250mm
3. Material: black static-dissipative polystyrene
4. All dimensions are in mm (unless otherwise specified)
5. A0 and B0 measured on a plane 0.3mm above the bottom of the pocket

**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
CSD17553Q5A	ACTIVE	VSONP	DQJ	8	2500	RoHS-Exempt & Green	SN	Level-1-260C-UNLIM	-55 to 150	CSD17553	

(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.

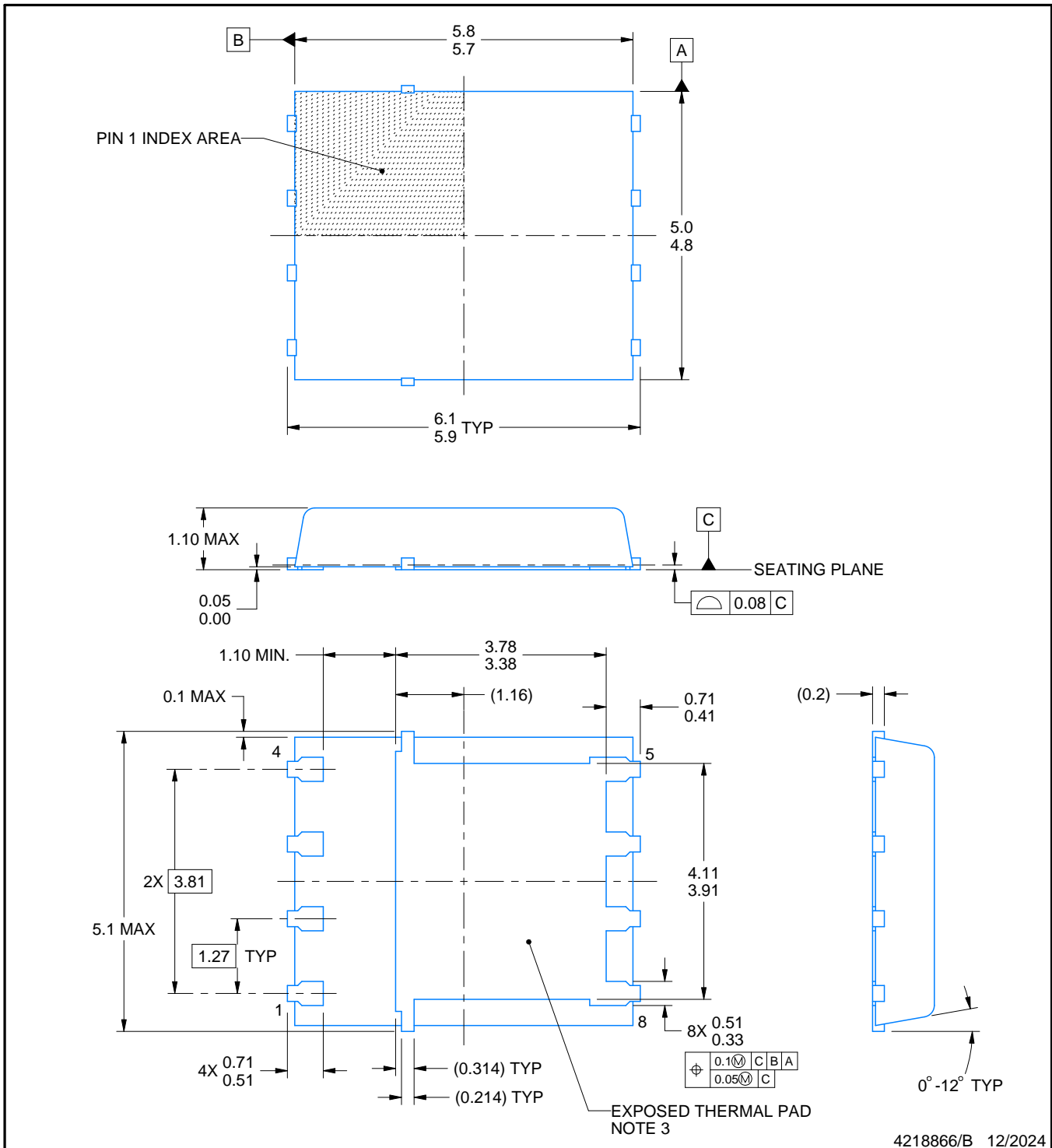
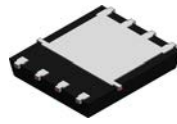
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(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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NOTES:

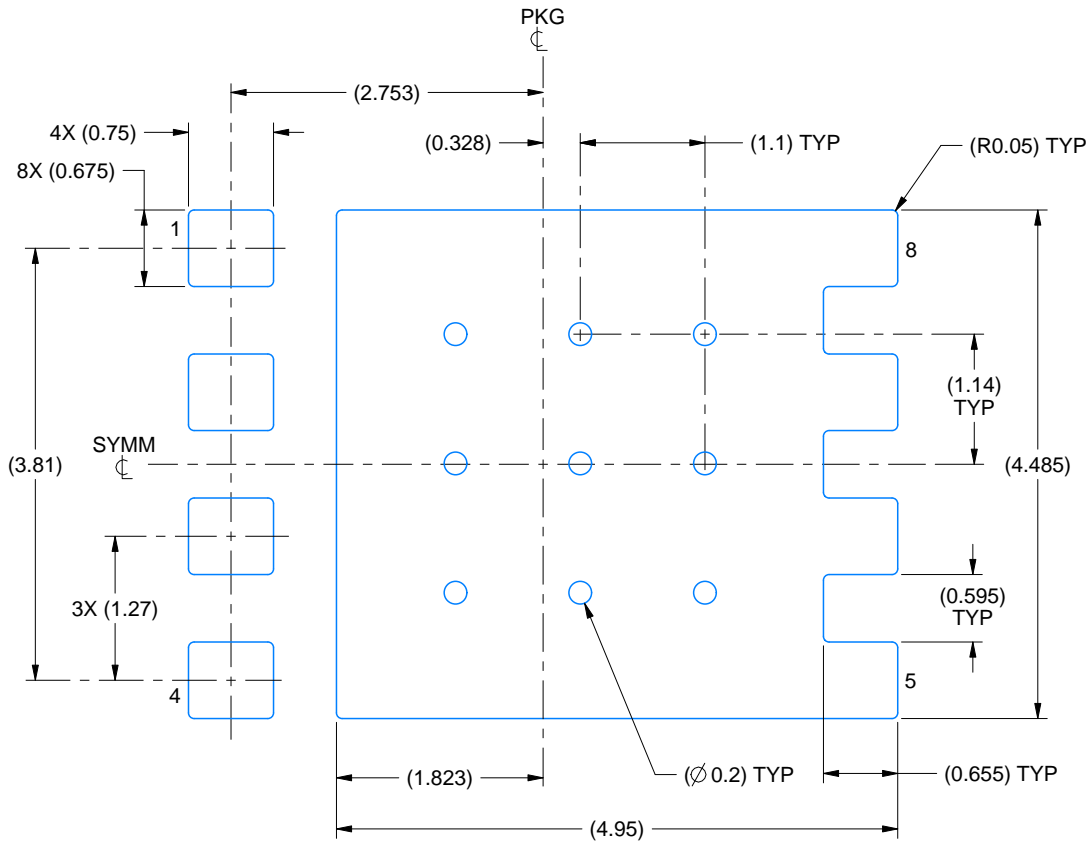
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.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

# EXAMPLE BOARD LAYOUT

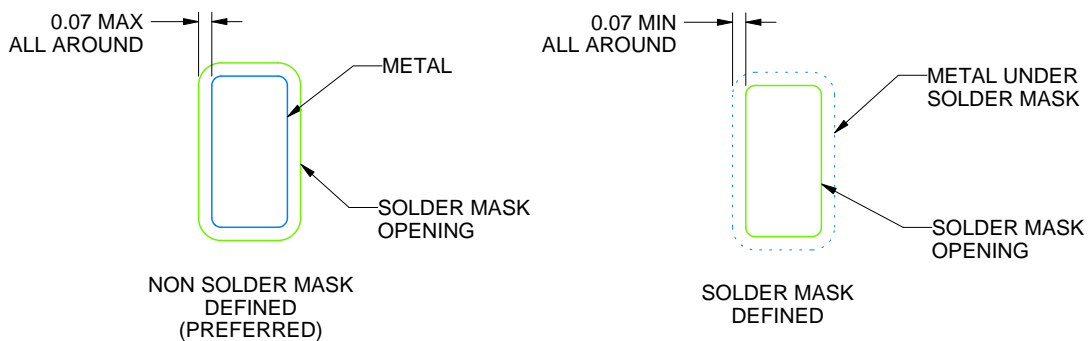
DQJ0008A

VSONP - 1.1 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE  
SOLDER MASK DEFINED  
SCALE: 15X



SOLDER MASK DETAILS

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NOTES: (continued)

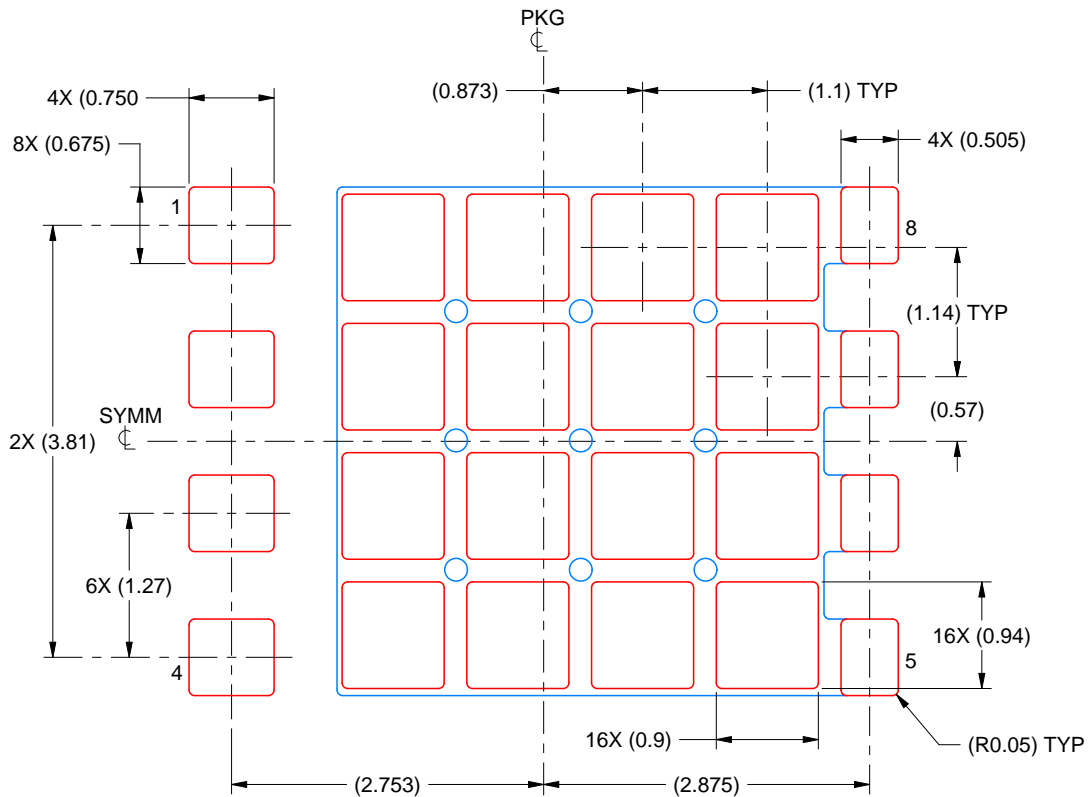
6. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
7. Vias are optional depending on application, refer to device data sheet. If some or all are implemented,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

# EXAMPLE STENCIL DESIGN

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)

8. 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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