

CSD23280F3 –12V P 沟道 FemtoFET™ MOSFET

1 特性

- 低导通电阻
- 超低 Q_g 和 Q_{gd}
- 高工作漏极电流
- 超小尺寸
 - 0.73mm × 0.64mm
- 超薄
 - 最大高度为 0.35mm
- 集成 ESD 保护二极管
 - 额定值 > 4kV HBM
 - 额定值 > 2kV CDM
- 无铅且无卤素
- 符合 RoHS 标准

2 应用

- 针对负载开关应用进行了优化
- 针对通用开关应用进行了优化
- 电池应用
- 手持式和移动类应用

3 说明

这款 –12V、97mΩ、P 沟道 FemtoFET™ MOSFET 的设计经过了优化，能够最大限度地减小许多手持式和移动类应用的尺寸。这项技术能够在替代标准小信号 MOSFET 的同时大幅减小封装尺寸。

产品概要

$T_A = 25^\circ\text{C}$		典型值	单位
V_{DS}	漏源电压	–12	V
Q_g	总栅极电荷 (4.5V)	0.95	nC
Q_{gd}	栅极电荷 (栅极到漏极)	0.068	nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = -1.5\text{V}$	230
		$V_{GS} = -1.8\text{V}$	180
		$V_{GS} = -2.5\text{V}$	129
		$V_{GS} = -4.5\text{V}$	97
$V_{GS(th)}$	阈值电压	–0.65	V

器件信息(1)

器件	数量	包装介质	封装	发货
CSD23280F3	3000	7 英寸卷带	Femto 0.73mm × 0.64mm 基板栅格阵列 (LGA)	卷带
CSD23280F3T	250			

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。

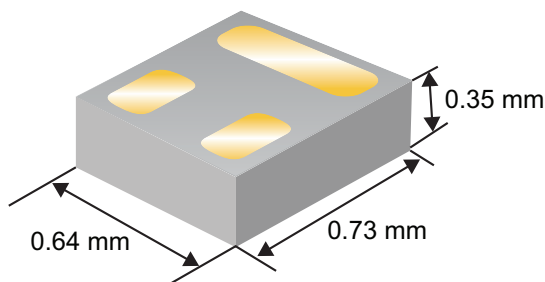
绝对最大额定值

$T_A = 25^\circ\text{C}$		值	单位
V_{DS}	漏源电压	–12	V
V_{GS}	栅源电压	–6	V
I_D	持续漏极电流 ⁽¹⁾	1.8	A
I_{DM}	脉冲漏极电流 ⁽¹⁾⁽²⁾	11.4	A
P_D	功率耗散 ⁽¹⁾	500	mW
$V_{(ESD)}$	人体模型 (HBM)	4000	V
	充电器件模型 (CDM)	2000	
T_J 、 T_{stg}	工作结温、 储存温度	–55 至 150	°C

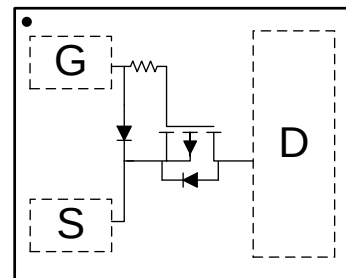
(1) $R_{\theta JA}$ 典型值 = 255°C/W (当在 0.06 英寸 (1.52mm) 厚的 FR4 PCB 上将其安装在 1 平方英寸 (6.45cm²)、2oz (0.071mm) 厚的铜焊盘上时)。

(2) 脉冲持续时间 ≤ 100μs，占空比 ≤ 1%。

典型器件尺寸



顶视图



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4 修订历史记录

Changes from Original (April 2016) to Revision A	Page
• 已添加 在 中添加了 接收文档更新通知器件和文档支持	7
• 更新了 建议的模版布局	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 _{DS} = −250 μA	−12			V
I _{DSS}	Drain-to-source leakage current	V _{GS} = 0 V, V _{DS} = −9.6 V	−50			nA
I _{GSS}	Gate-to-source leakage current	V _{DS} = 0 V, V _{GS} = −5 V	−25			nA
V _{GS(th)}	Gate-to-source threshold voltage	V _{DS} = V _{GS} , I _{DS} = −250 μA	−0.40	−0.65	−0.95	V
R _{DS(on)}	Drain-to-source on-resistance	V _{GS} = −1.5 V, I _{DS} = −0.1 A	230			mΩ
		V _{GS} = −1.8 V, I _{DS} = −0.4 A	180			
		V _{GS} = −2.5 V, I _{DS} = −0.4 A	129			
		V _{GS} = −4.5 V, I _{DS} = −0.4 A	97			
g _{fs}	Transconductance	V _{DS} = −1.2 V, I _{DS} = −0.4 A	3			S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input capacitance	V _{GS} = 0 V, V _{DS} = −6 V, f = 1 MHz	180			pF
C _{oss}	Output capacitance		73			pF
C _{rss}	Reverse transfer Capacitance		8.5			pF
R _G	Series gate resistance		9			Ω
Q _g	Gate charge total (4.5 V)	V _{DS} = −6 V, I _{DS} = −0.4 A	0.95			nC
Q _{gd}	Gate charge gate-to-drain		0.068			nC
Q _{gs}	Gate charge gate-to-source		0.30			nC
Q _{g(th)}	Gate charge at V _{th}		0.15			nC
Q _{oss}	Output charge	V _{DS} = −6 V, V _{GS} = 0 V	1.07			nC
t _{d(on)}	Turnon delay time	V _{DS} = −6 V, V _{GS} = −4.5 V, I _{DS} = −0.4 A, R _G = 0 Ω	8			ns
t _r	Rise time		4			ns
t _{d(off)}	Turnoff delay time		21			ns
t _f	Fall time		8			ns
DIODE CHARACTERISTICS						
V _{SD}	Diode forward voltage	I _{SD} = −0.4 A, V _{GS} = 0 V	−0.73			V

5.2 Thermal Information

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

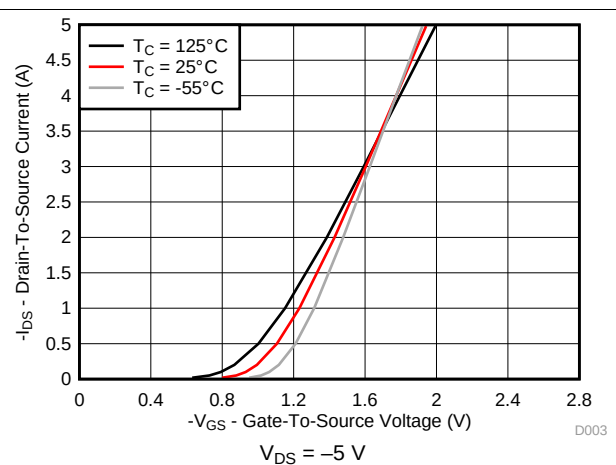
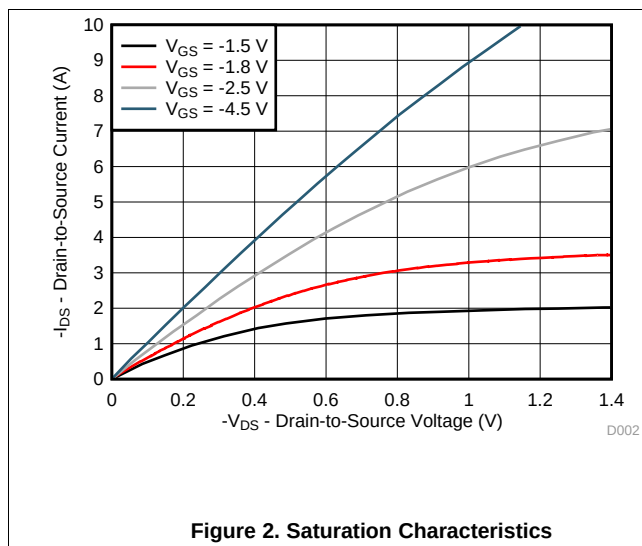
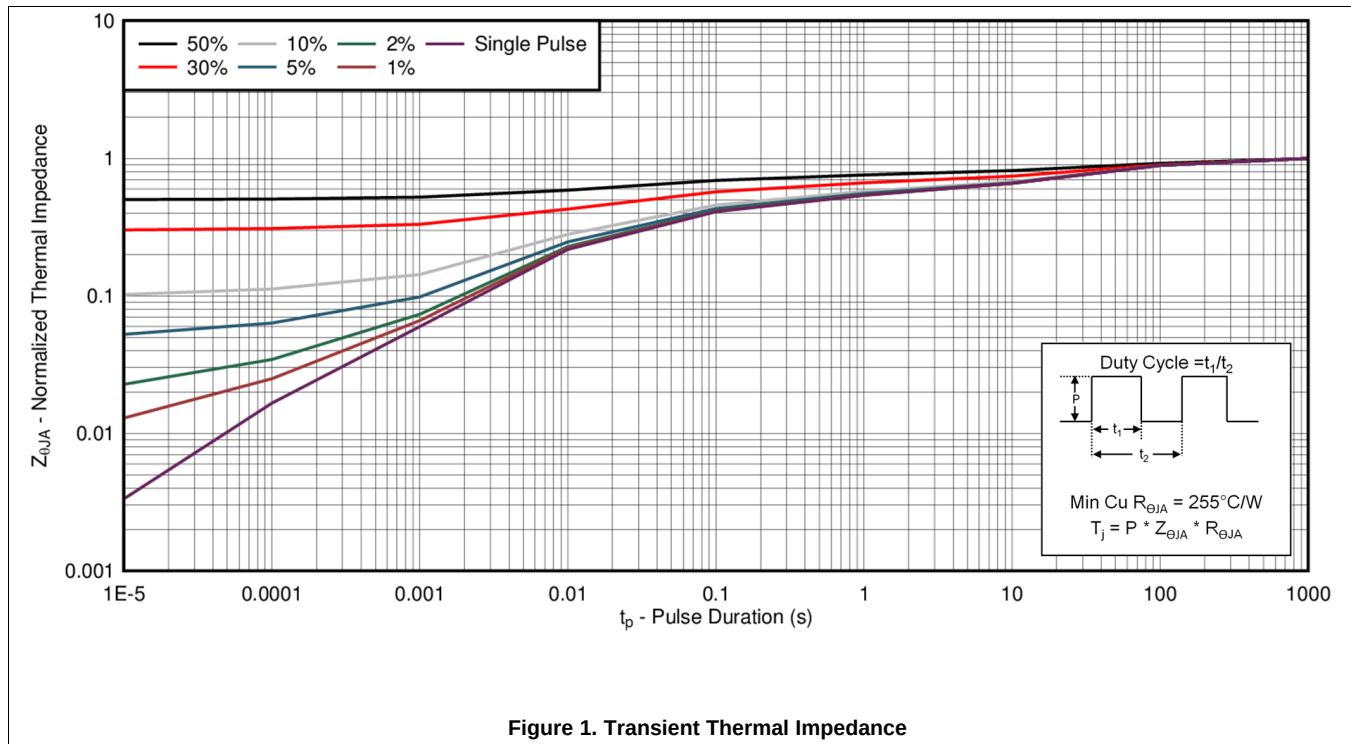
THERMAL METRIC		TYPICAL VALUES	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance ⁽¹⁾	90	$^\circ\text{C/W}$
	Junction-to-ambient thermal resistance ⁽²⁾	255	

(1) Device mounted on FR4 material with 1-in² (6.45-cm²), 2-oz. (0.071-mm) thick Cu.

(2) Device mounted on FR4 material with minimum Cu mounting area.

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)

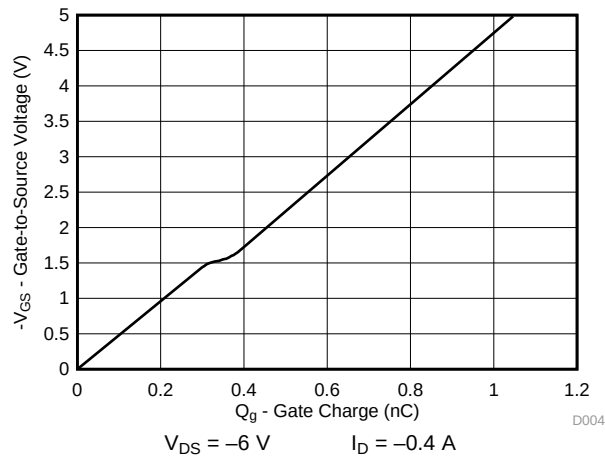


Figure 4. Gate Charge

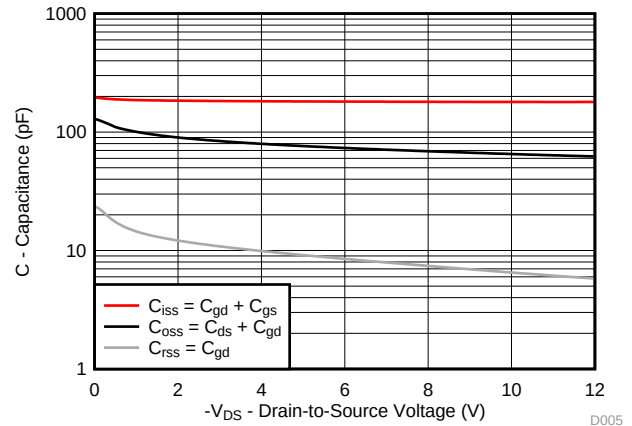


Figure 5. Capacitance

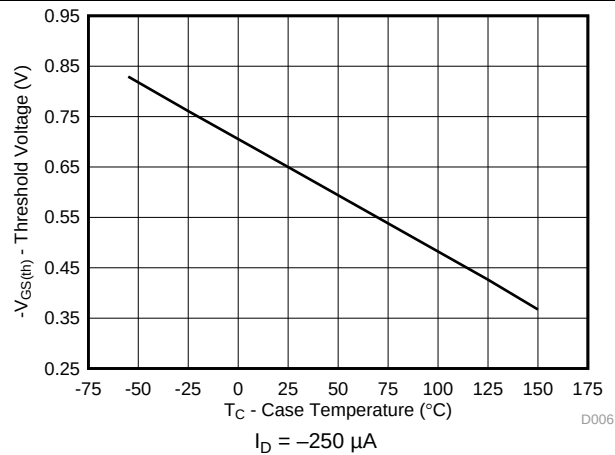


Figure 6. Threshold Voltage vs Temperature

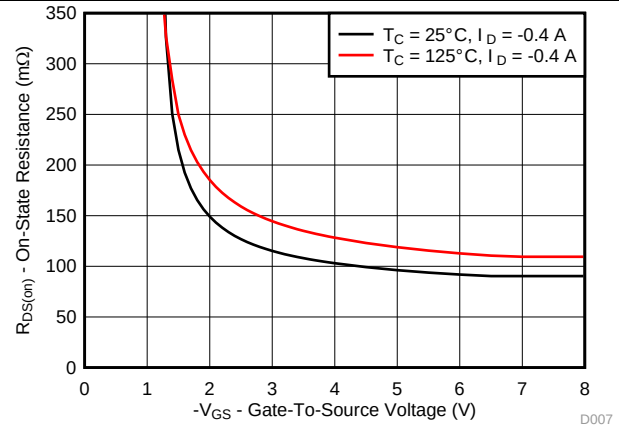


Figure 7. On-State Resistance vs Gate-to-Source Voltage

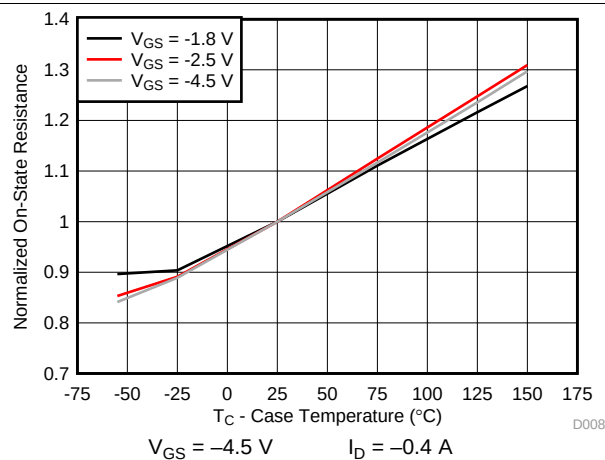


Figure 8. Normalized On-State Resistance vs Temperature

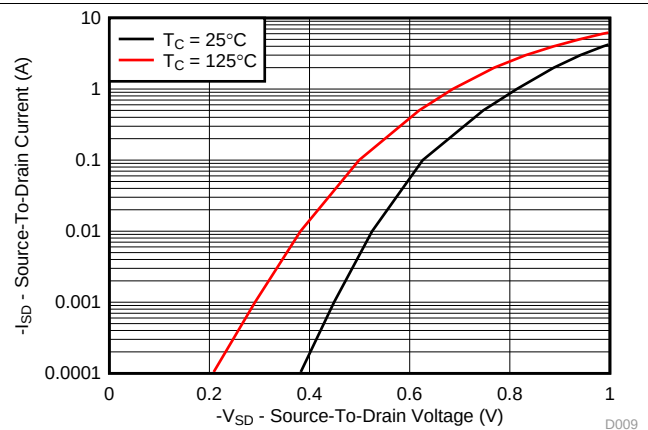
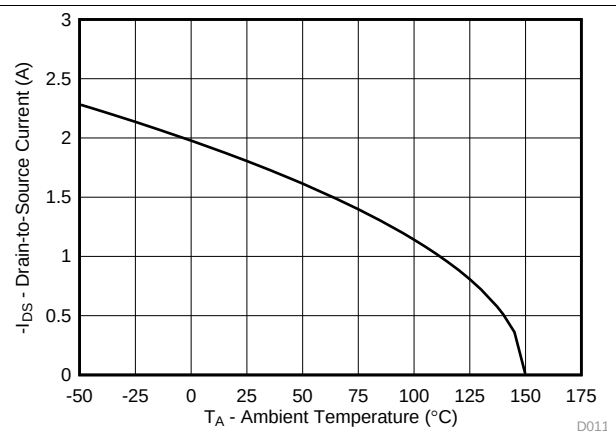
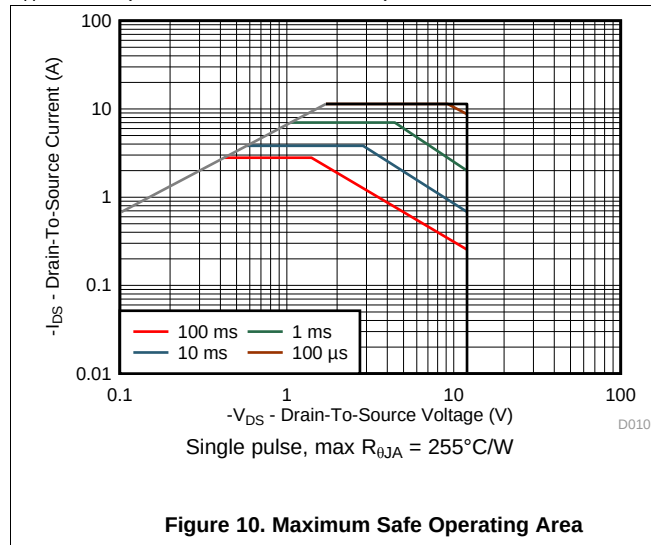


Figure 9. Typical Diode Forward Voltage

Typical MOSFET Characteristics (continued)

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



6 器件和文档支持

6.1 接收文档更新通知

要接收文档更新通知，请导航至 ti.com 上的器件产品文件夹。请单击右上角的通知我进行注册，即可收到所有产品信息更改每周摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

6.2 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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6.3 商标

FemtoFET, E2E are trademarks of Texas Instruments.
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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

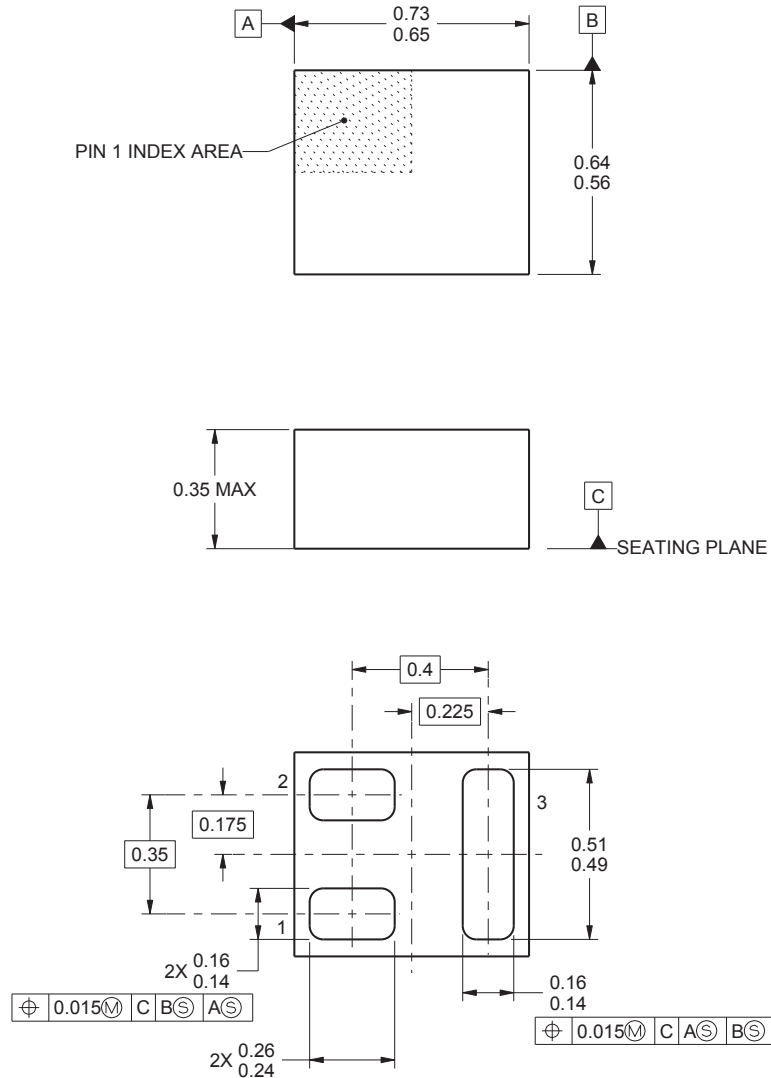
SLYZ022 — *TI Glossary*.

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。如欲获取此数据表的浏览器版本，请参阅左侧的导航。

7.1 机械尺寸

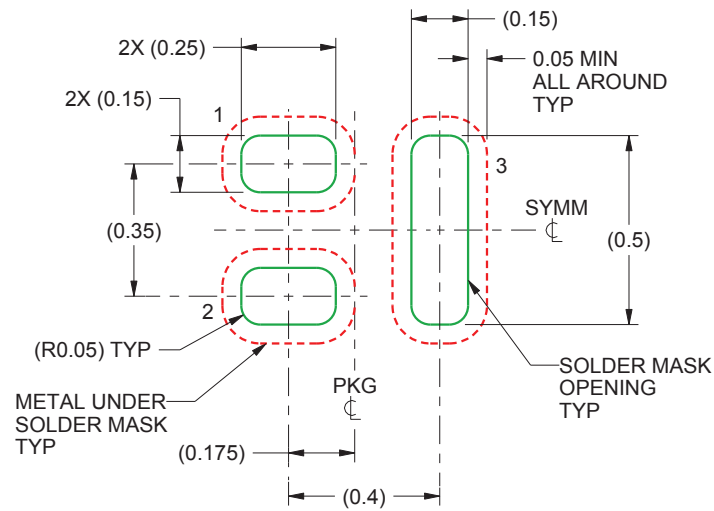


- (1) 所有线性尺寸的单位均为毫米（尺寸和公差符合 AME T14.5M-1994 标准）。
- (2) 本图如有变更，恕不另行通知。
- (3) 此封装为无铅焊盘设计。

表 1. 引脚配置

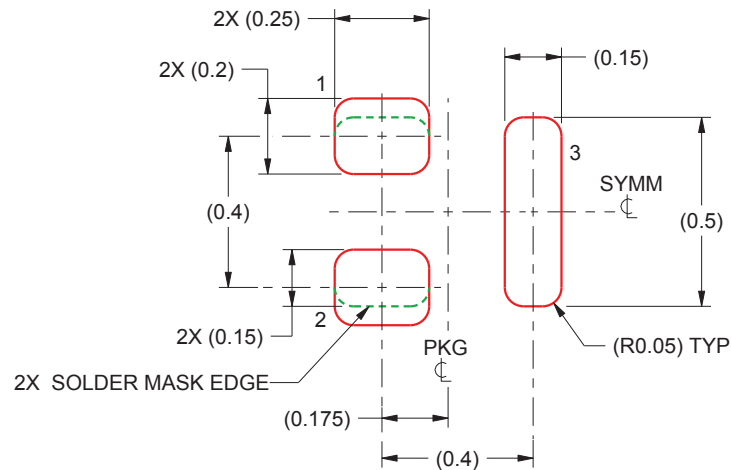
位置	名称
引脚 1	栅极
引脚 2	源极
引脚 3	漏极

7.2 建议的最小 PCB 布局



(1) 所有尺寸的单位均为毫米。

7.3 建议的模版布局



(1) 所有尺寸的单位均为毫米。

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
CSD23280F3	ACTIVE	PICOSTAR	YJM	3	3000	RoHS & Green	Call TI	Level-1-260C-UNLIM	-55 to 150	5	Samples
CSD23280F3T	ACTIVE	PICOSTAR	YJM	3	250	RoHS & Green	Call TI	Level-1-260C-UNLIM	-55 to 150	5	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.

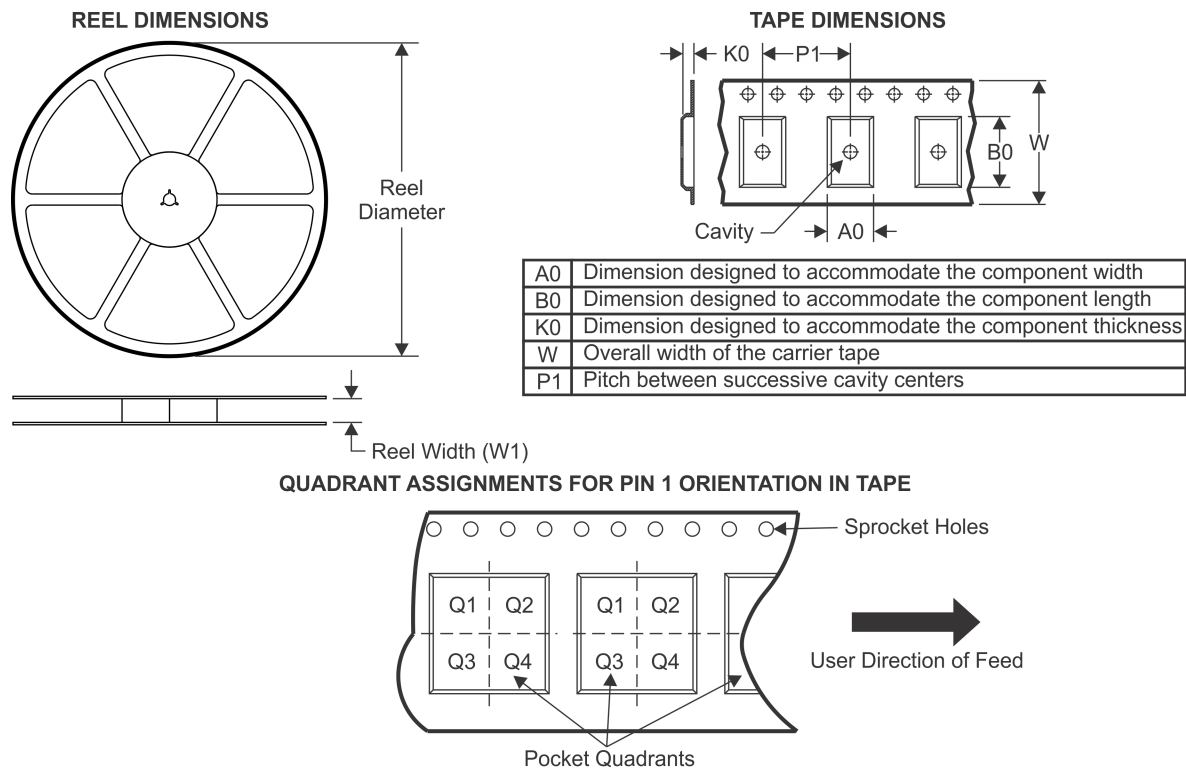
⁽⁴⁾ There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽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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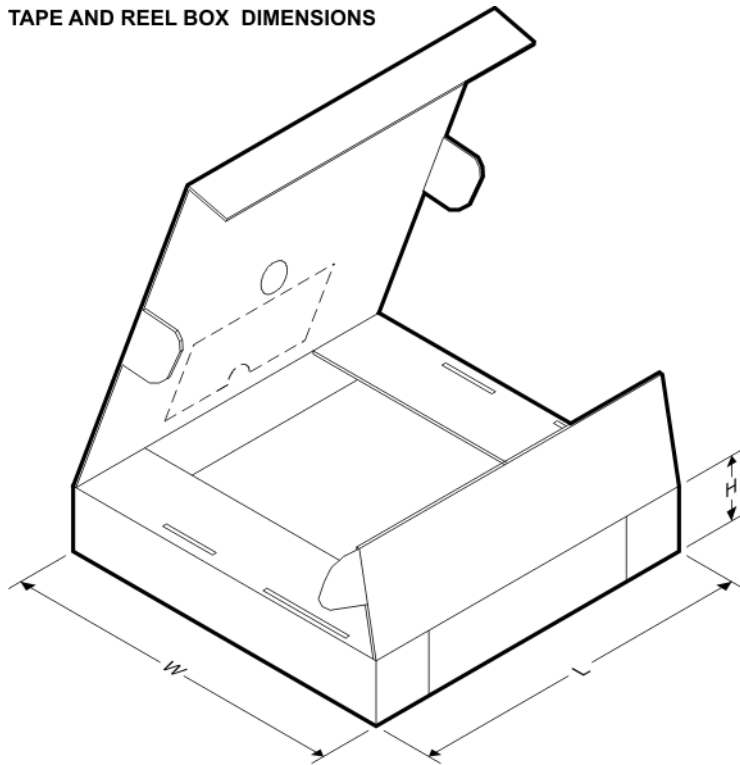
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TAPE AND REEL INFORMATION


*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
CSD23280F3	PICOST AR	YJM	3	3000	178.0	8.4	0.7	0.79	0.44	4.0	8.0	Q2
CSD23280F3	PICOST AR	YJM	3	3000	180.0	8.4	0.7	0.79	0.44	4.0	8.0	Q2
CSD23280F3T	PICOST AR	YJM	3	250	180.0	8.4	0.7	0.79	0.44	4.0	8.0	Q2

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD23280F3	PICOSTAR	YJM	3	3000	220.0	220.0	35.0
CSD23280F3	PICOSTAR	YJM	3	3000	182.0	182.0	20.0
CSD23280F3T	PICOSTAR	YJM	3	250	182.0	182.0	20.0

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