

CSD23285F5 -12V P 通道 FemtoFET™ MOSFET

1 特性

- 低导通电阻
- 低 Q_g 和 Q_{gd}
- 超小尺寸
 - 1.53mm x 0.77mm
 - 0.5mm 焊盘间距
- 薄型
 - 高度为 0.35mm
- 集成静电放电 (ESD) 保护二极管
 - 额定值 > 4kV 人体放电模式 (HBM)
 - 额定值 > 2kV 组件充电模式 (CDM)
- 无铅且无卤素
- 符合 RoHS 环保标准

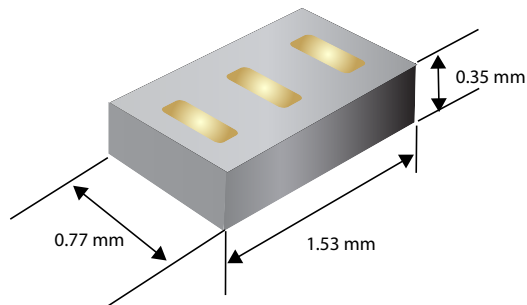
2 应用范围

- 针对负载开关应用进行了优化
- 针对通用开关应用进行了应用

3 说明

这款 29mΩ、-12V P 沟道 FemtoFET™ MOSFET 技术经过了设计和优化，能够以最大限度减小许多手持式和移动类应用中的封装尺寸。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。

典型部件尺寸



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	栅极电荷总量 (-4.5V)	3.2	nC
Q_{gd}	栅极电荷 (栅极到漏极)	0.48	nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = -1.5V$	64
		$V_{GS} = -1.8V$	49
		$V_{GS} = -2.5V$	38
		$V_{GS} = -4.5V$	29
$V_{GS(th)}$	阈值电压	-0.65	V

器件信息(1)

器件	数量	包装介质	封装	运输
CSD23285F5	3000	7 英寸卷带	Femto 1.53mm x 0.77mm SMD 无引线	卷带式
CSD23285F5T	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

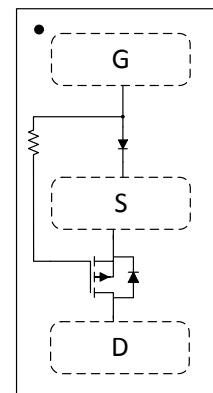
$T_A = 25^\circ\text{C}$		值	单位
V_{DS}	漏源电压	-12	V
V_{GS}	栅源电压	-6	V
I_D	持续漏极电流(1)	-3.3	A
	持续漏极电流(2)	-5.4	
I_{DM}	脉冲漏极电流(1)(3)	-31	A
P_D	功率耗散(1)	0.5	W
	功率耗散(2)	1.4	
$V_{(ESD)}$	人体模型 (HBM)	4000	V
	组件充电模式 (CDM)	2000	
T_J, T_{stg}	工作结温, 储存温度	-55 至 150	$^\circ\text{C}$

(1) $R_{\theta JA} = 245^\circ\text{C/W}$ (覆铜面积最小时的典型值)。

(2) $R_{\theta JA} = 90^\circ\text{C/W}$ (覆铜面积最大时的典型值)。

(3) 脉冲持续时间 $\leq 100\mu\text{s}$, 占空比 $\leq 1\%$ 。

顶视图



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4 修订历史记录

Changes from Original (August 2016) to Revision A	Page
• 已添加 表 1 添加到了 机械尺寸 部分	8

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			−100	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} = −1 A		64	130	mΩ
		V _{GS} = −1.8 V, I _{DS} = −1 A		49	80	
		V _{GS} = −2.5 V, I _{DS} = −1 A		38	47	
		V _{GS} = −4.5 V, I _{DS} = −1 A		29	35	
g _{fs}	Transconductance	V _{DS} = −1.2 V, I _{DS} = −1 A		8.9		S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input capacitance	V _{GS} = 0 V, V _{DS} = −6 V, f = 1 MHz		483	628	pF
C _{oss}	Output capacitance			305	397	pF
C _{rss}	Reverse transfer capacitance			37	48	pF
R _G	Series gate resistance			17		Ω
Q _g	Gate charge total (−4.5 V)	V _{DS} = −6 V, I _{DS} = −1 A		3.2	4.2	nC
Q _{gd}	Gate charge gate-to-drain			0.48		nC
Q _{gs}	Gate charge gate-to-source			0.66		nC
Q _{g(th)}	Gate charge at V _{th}			0.40		nC
Q _{oss}	Output charge	V _{DS} = −6 V, V _{GS} = 0 V		4.8		nC
t _{d(on)}	Turnon delay time	V _{DS} = −6 V, V _{GS} = −4.5 V, I _{DS} = −1 A, R _G = 2 Ω		15		ns
t _r	Rise time			5		ns
t _{d(off)}	Turnoff delay time			30		ns
t _f	Fall time			13		ns
DIODE CHARACTERISTICS						
V _{SD}	Diode forward voltage	I _{SD} = −1 A, V _{GS} = 0 V		−0.73	−1	V

5.2 Thermal Information

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

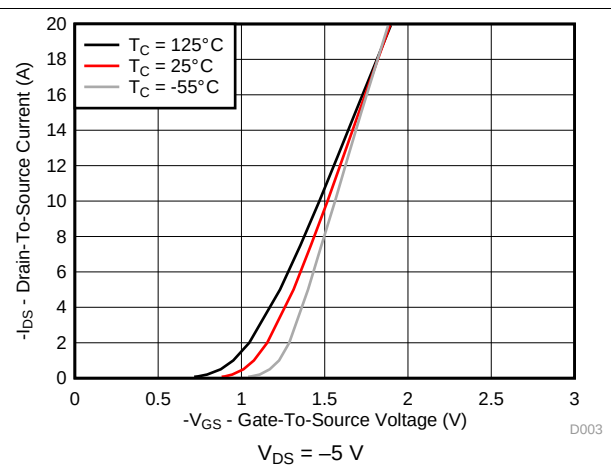
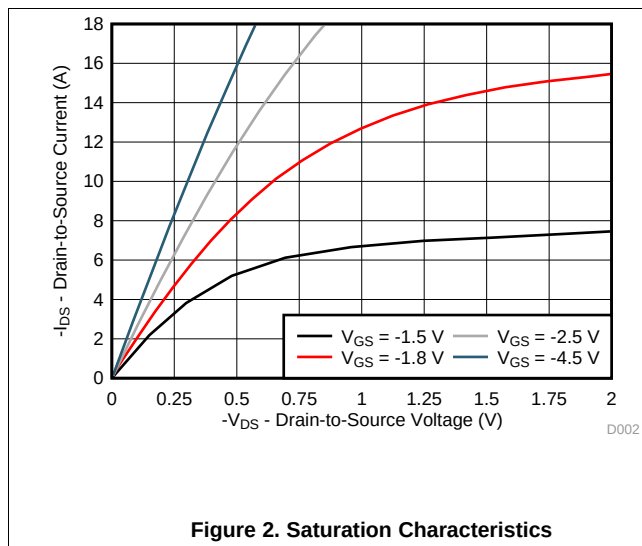
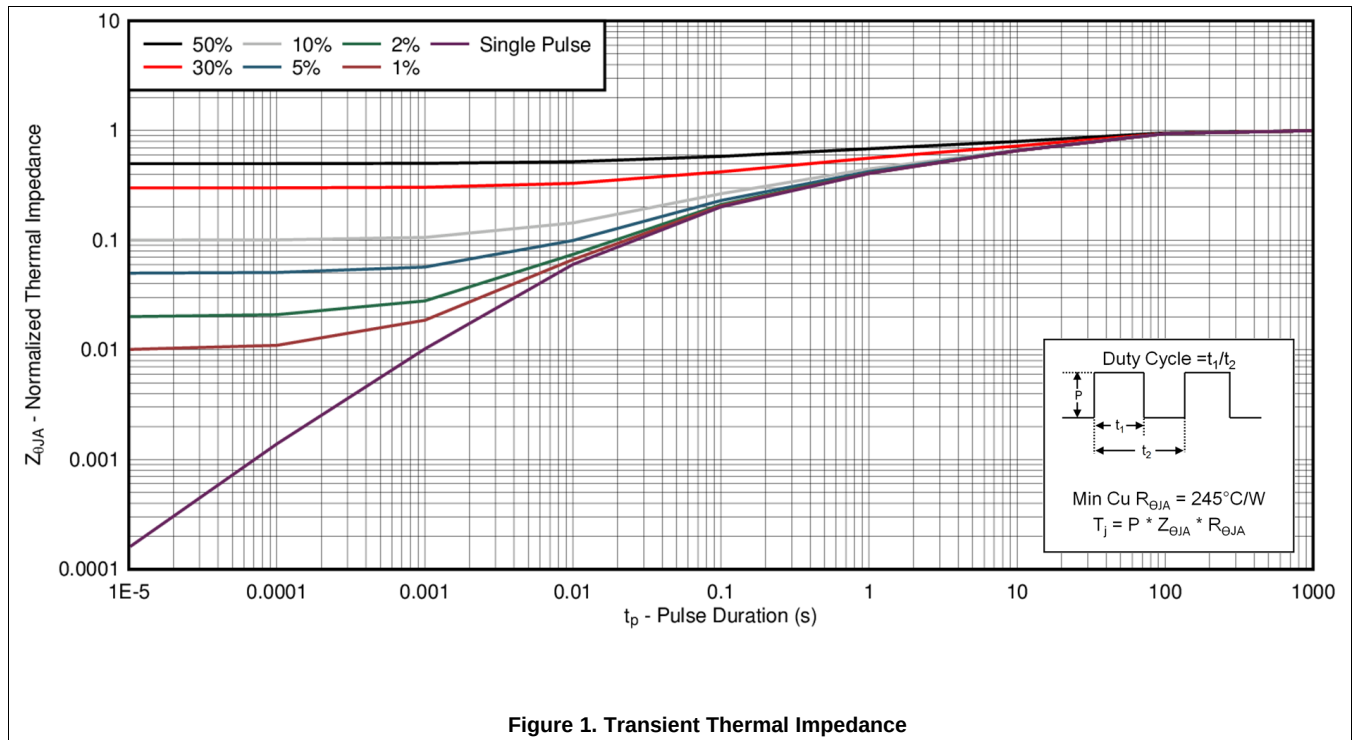
THERMAL METRIC		MIN	TYP	MAX	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance ⁽¹⁾		90		$^\circ\text{C/W}$
	Junction-to-ambient thermal resistance ⁽²⁾		245		

(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)

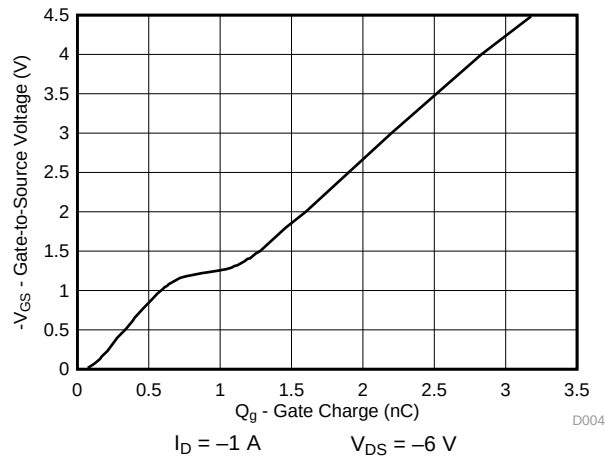


Figure 4. Gate Charge

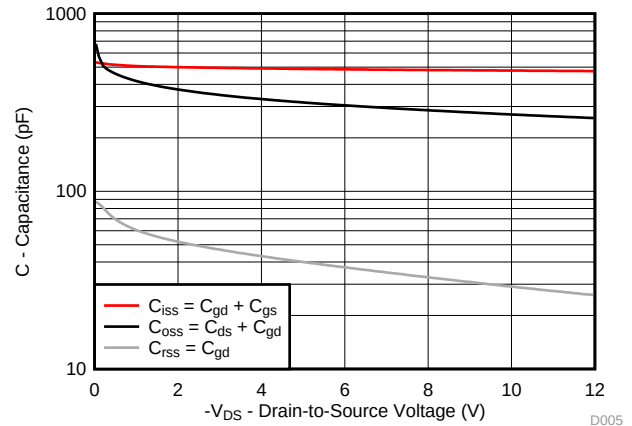


Figure 5. Capacitance

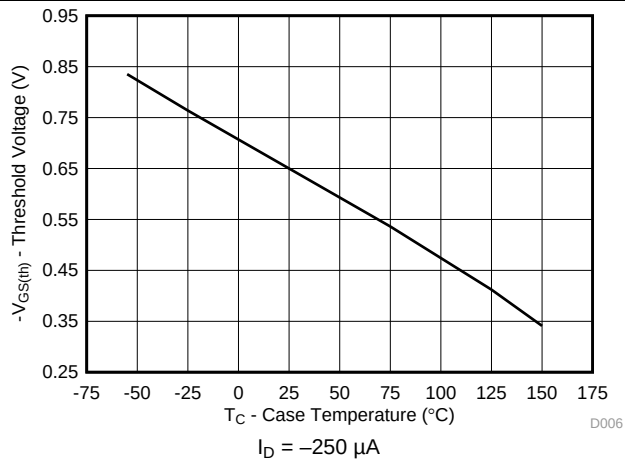


Figure 6. Threshold Voltage vs Temperature

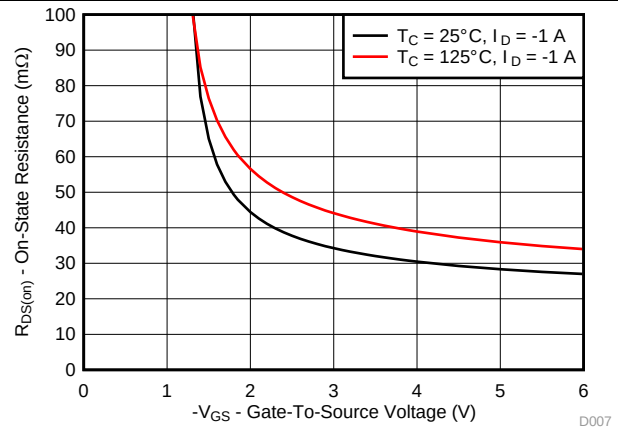


Figure 7. On-State Resistance vs Gate-to-Source Voltage

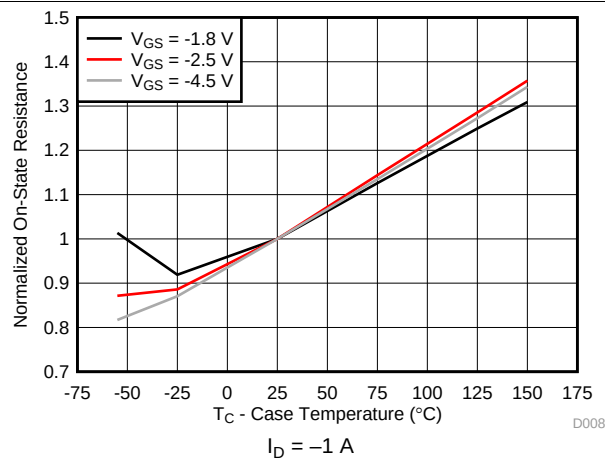


Figure 8. Normalized On-State Resistance vs Temperature

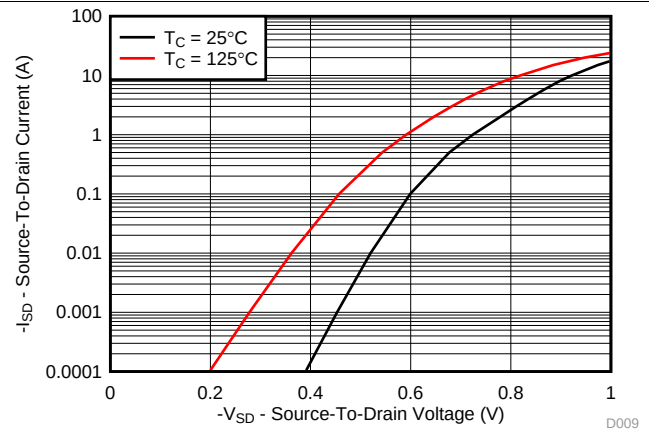
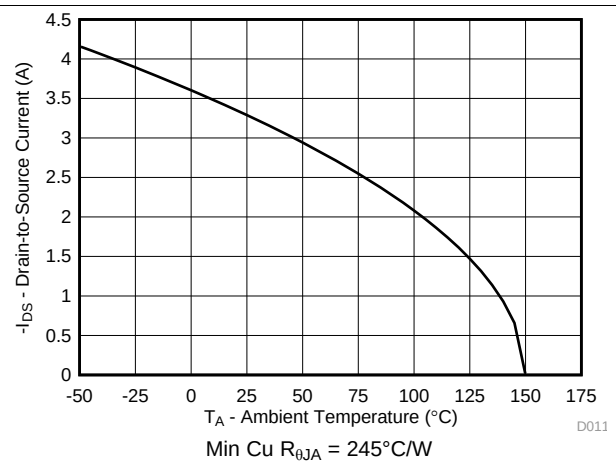
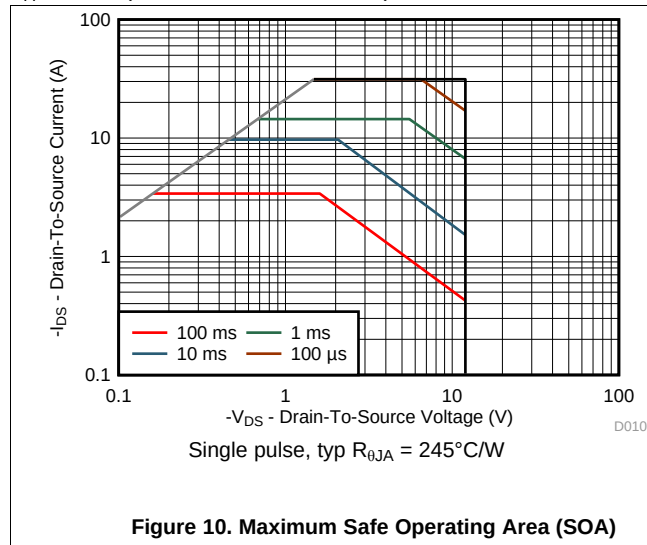


Figure 9. Typical Diode Forward Voltage

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，即可收到任意产品信息更改每周摘要。有关更改的详细信息，请查看任意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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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。

6.3 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

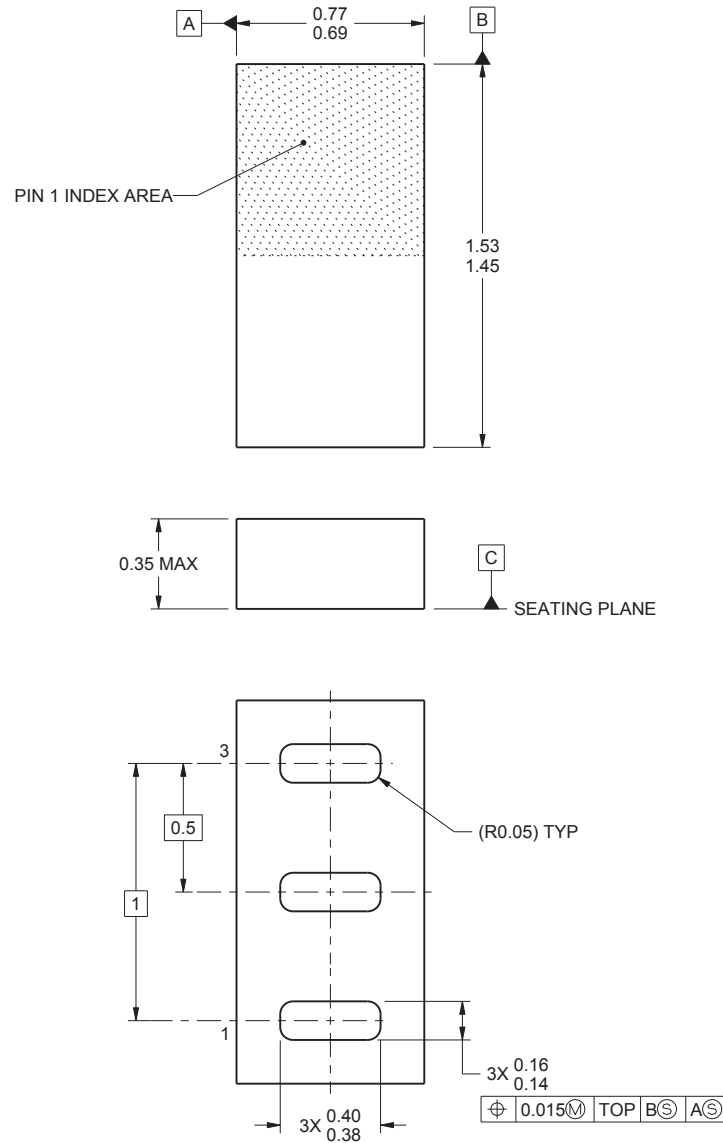
SLYZ022 — TI Glossary.

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

7 机械、封装和可订购信息

以下页面包括机械、封装和可订购信息。这些信息是指定器件的最新可用数据。这些数据发生变化时，我们可能不会另行通知或修订此文档。如欲获取此产品说明书的浏览器版本，请参见左侧的导航栏。

7.1 机械尺寸

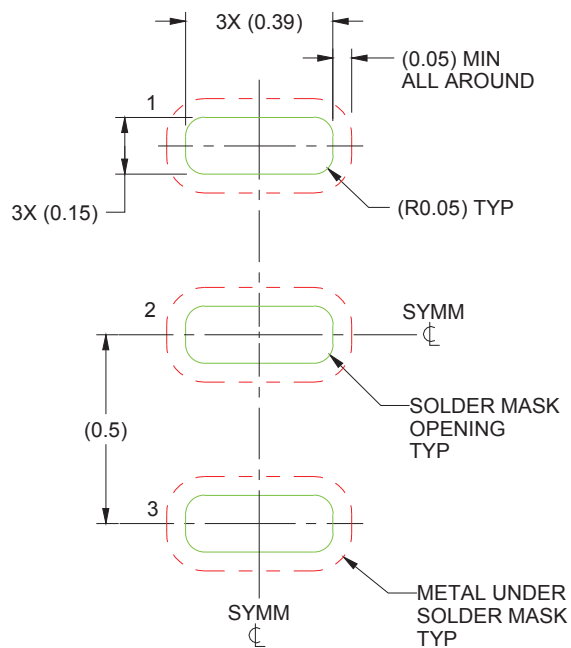


- (1) 所有线性尺寸的单位都是毫米（尺寸和容限值遵循 AME T14.5M-1994）。
- (2) 本图纸如有变更，恕不通知。
- (3) 此封装采用无铅焊盘设计。

将
表 1. 引脚配置

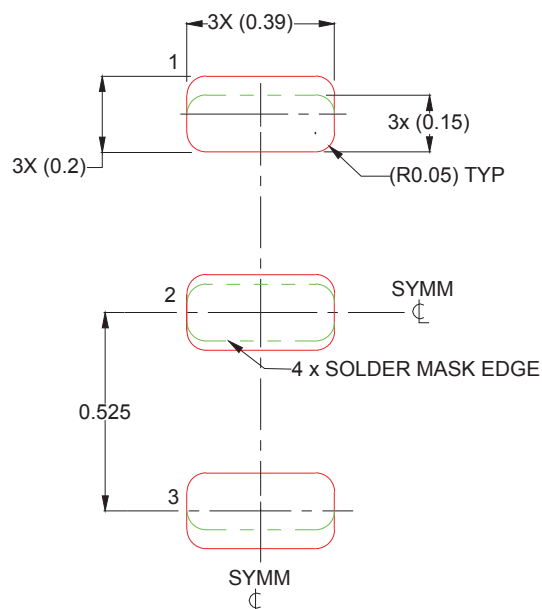
位置	名称
引脚 1	栅极
引脚 2	源极
引脚 3	漏极

7.2 推荐的最小 PCB 布局



(1) 所有尺寸的单位都是毫米。

7.3 推荐的模板布局



(1) 所有尺寸的单位都是毫米。

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
CSD23285F5	ACTIVE	PICOSTAR	YJK	3	3000	RoHS & Green	Call TI	Level-1-260C-UNLIM	-55 to 150	4S	Samples
CSD23285F5T	ACTIVE	PICOSTAR	YJK	3	250	RoHS & Green	Call TI	Level-1-260C-UNLIM	-55 to 150	4S	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.

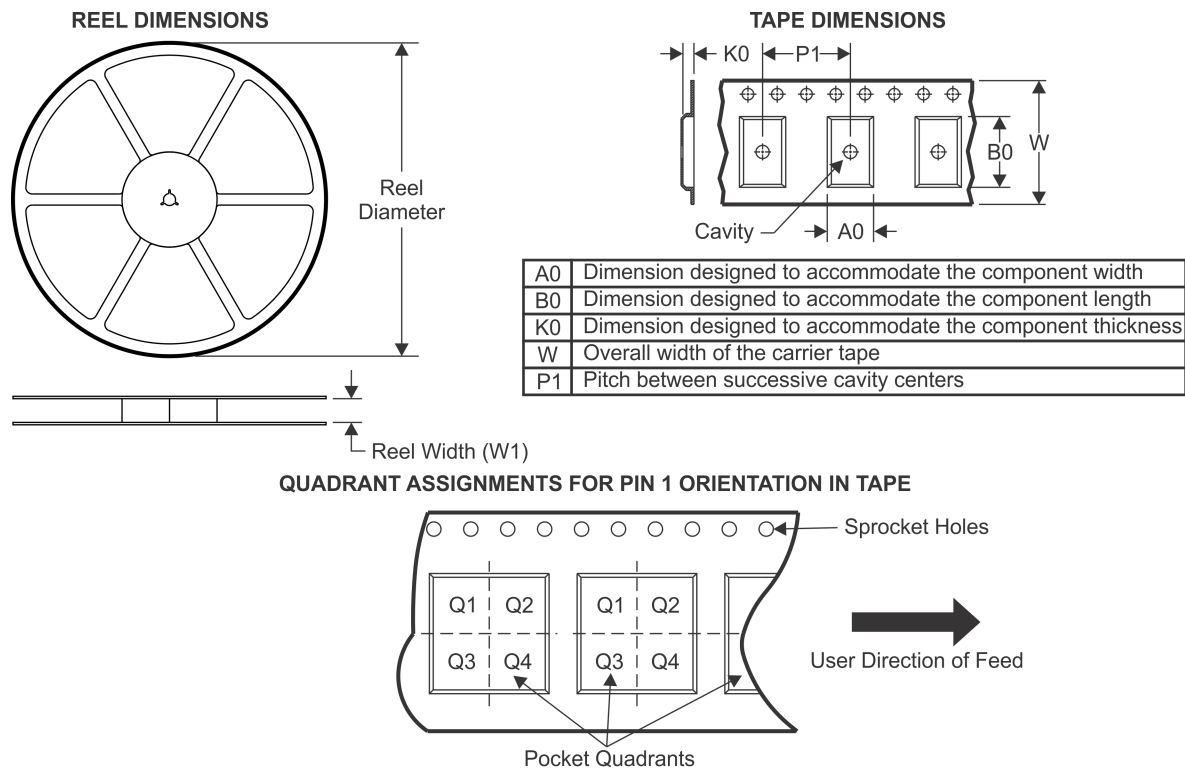
⁽⁴⁾ There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽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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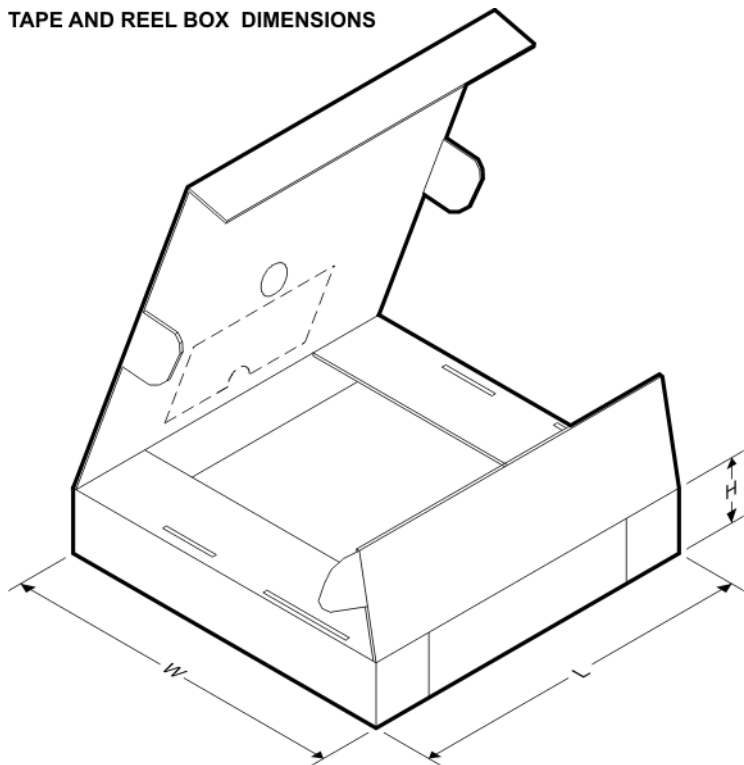
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TAPE AND REEL INFORMATION


*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
CSD23285F5	PICOST AR	YJK	3	3000	178.0	8.4	0.92	1.68	0.42	4.0	8.0	Q1
CSD23285F5	PICOST AR	YJK	3	3000	180.0	8.4	0.92	1.68	0.42	4.0	8.0	Q1
CSD23285F5T	PICOST AR	YJK	3	250	180.0	8.4	0.92	1.68	0.42	4.0	8.0	Q1
CSD23285F5T	PICOST AR	YJK	3	250	178.0	8.4	0.92	1.68	0.42	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD23285F5	PICOSTAR	YJK	3	3000	220.0	220.0	35.0
CSD23285F5	PICOSTAR	YJK	3	3000	182.0	182.0	20.0
CSD23285F5T	PICOSTAR	YJK	3	250	182.0	182.0	20.0
CSD23285F5T	PICOSTAR	YJK	3	250	220.0	220.0	35.0

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