

CSD15380F3 20V N 沟道 FemtoFET™ MOSFET

1 特性

- 超低 C_{ISS} 和 C_{OSS}
- 超低 Q_g 和 Q_{gd}
- 超小尺寸
 - 0.73mm x 0.64mm
- 超薄
 - 最大高度为 0.35mm
- 集成静电放电 (ESD) 保护二极管
 - 额定值 > 4kV 人体模型 (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 优化
- 电池 应用
- 手持式和移动类 应用

3 说明

这种 20V、990mΩ、N 沟道 FemtoFET™ MOSFET 经过了设计和优化，能够最大限度减小许多手持式和移动类应用的 尺寸中使用的高侧或低侧隔离式栅极驱动器提供参考解决方案。超低电容提高了开关速度。在数据线路 应用中，较低的电容可最大限度减少噪声耦合。这项技术能够在替代标准小信号金属氧化物半导体场效应晶体管 (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	20	V
Q_g	栅极电荷总量 (4.5V)	0.216	nC
Q_{gd}	栅极电荷 (栅极到漏极)	0.027	nC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = 2.5\text{V}$	2220
		$V_{GS} = 4.5\text{V}$	1170
		$V_{GS} = 8\text{V}$	990
$V_{GS(th)}$	阈值电压	1.1	V

器件信息(1)

器件	数量	包装介质	封装	运输
CSD15380F3	3000	7 英寸卷带	Femto 0.73mm x 0.64mm 接合栅格阵列 (LGA)	卷带
CSD15380F3T	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。

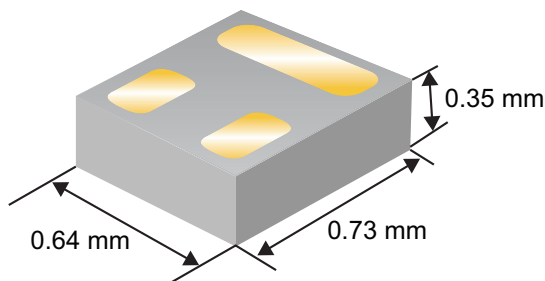
绝对最大额定值

$T_A = 25^\circ\text{C}$ (除非另外注明)		值	单位
V_{DS}	漏源电压	20	V
V_{GS}	栅源电压	10	V
I_D	持续漏极电流 ⁽¹⁾	0.5	A
I_{DM}	脉冲漏极电流 ⁽²⁾	1.6	A
P_D	功率耗散 ⁽¹⁾	500	mW
$V_{(ESD)}$	人体模型 (HBM)	4	kV
	带电器件模型 (CDM)	2	
T_J, T_{stg}	工作结温和 储存温度	-55 至 150	$^\circ\text{C}$

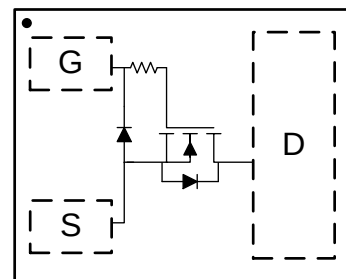
(1) $R_{\theta JA} = 255^\circ\text{C/W}$ ，这是一块厚度为 0.06 英寸 (1.52mm) 环氧树脂 (FR4) 印刷电路板 (PCB) 上的 1 英寸² (6.45 cm²)，2 盎司 (厚度 0.071mm) 铜焊盘上测得的典型值。

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

典型部件尺寸



顶视图



目录

1	特性	1	6.1	接收文档更新通知	7
2	应用范围	1	6.2	社区资源	7
3	说明	1	6.3	商标	7
4	修订历史记录	2	6.4	静电放电警告	7
5	Specifications	3	6.5	Glossary	7
	5.1 Electrical Characteristics	3	7	机械、封装和可订购信息	8
	5.2 Thermal Information	3	7.1	机械尺寸	8
	5.3 Typical MOSFET Characteristics	4	7.2	推荐的最小 PCB 布局	9
6	器件和文档支持	7	7.3	推荐的模板布局	9

4 修订历史记录

Changes from Original (May 2016) to Revision A	Page
• 已添加 将 接收文档更新通知 部分添加到 器件和文档支持	7
• 更新了 推荐的模板布局	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	20			V
I _{DSS}	Drain-to-Source leakage current	V _{GS} = 0 V, V _{DS} = 16 V	50			nA
I _{GSS}	Gate-to-source leakage current	V _{DS} = 0 V, V _{GS} = 10 V	25			nA
V _{GS(th)}	Gate-to-source threshold voltage	V _{DS} = V _{GS} , I _{DS} = 2.5 μA	0.85	1.10	1.35	V
R _{DS(on)}	Drain-to-source on-resistance	V _{GS} = 2.5 V, I _{DS} = 0.1 A	2220		4000	mΩ
		V _{GS} = 4.5 V, I _{DS} = 0.1 A	1170		1460	
		V _{GS} = 8 V, I _{DS} = 0.1 A	990		1190	
g _{fs}	Transconductance	V _{DS} = 2 V, I _{DS} = 0.1 A	0.64			S
DYNAMIC CHARACTERISTICS						
C _{iss}	Input capacitance	V _{GS} = 0 V, V _{DS} = 10 V, f = 1 MHz	8.1		10.5	pF
C _{oss}	Output capacitance		5.9		7.7	pF
C _{rss}	Reverse transfer capacitance		0.13		0.17	pF
R _G	Series gate resistance		9.6			Ω
Q _g	Gate charge total (4.5 V)	V _{DS} = 10 V, I _{DS} = 0.1 A	0.216		0.281	nC
Q _{gd}	Gate charge gate-to-drain		0.027			nC
Q _{gs}	Gate charge gate-to-source		0.077			nC
Q _{g(th)}	Gate charge at V _{th}		0.048			nC
t _{d(on)}	Turnon delay time	V _{DS} = 10 V, V _{GS} = 4.5 V, I _{DS} = 0.1 A, R _G = 0 Ω	3			ns
t _r	Rise time		1			ns
t _{d(off)}	Turnoff delay time		7			ns
t _f	Fall time		7			ns
DIODE CHARACTERISTICS						
V _{SD}	Diode forward voltage	I _{SD} = 0.1 A, V _{GS} = 0 V	0.85		1	V

5.2 Thermal Information

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

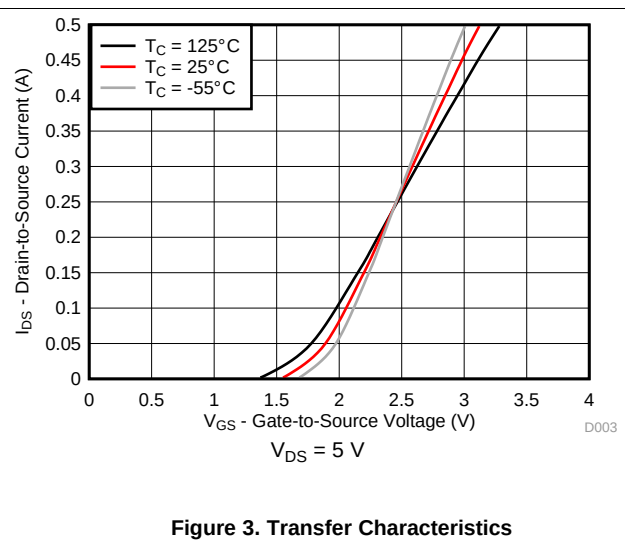
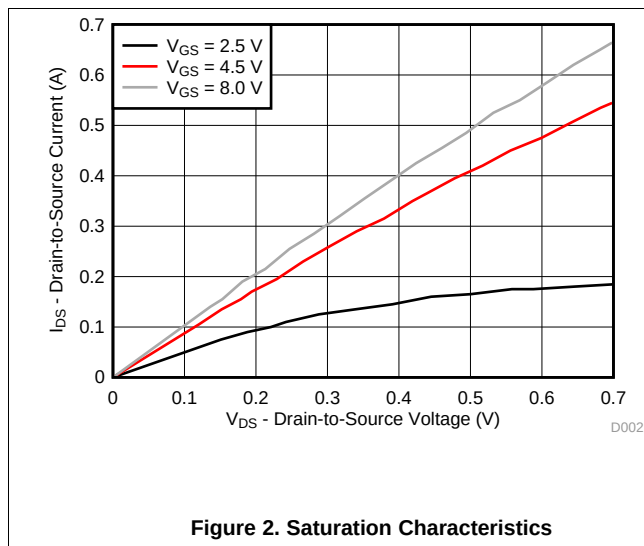
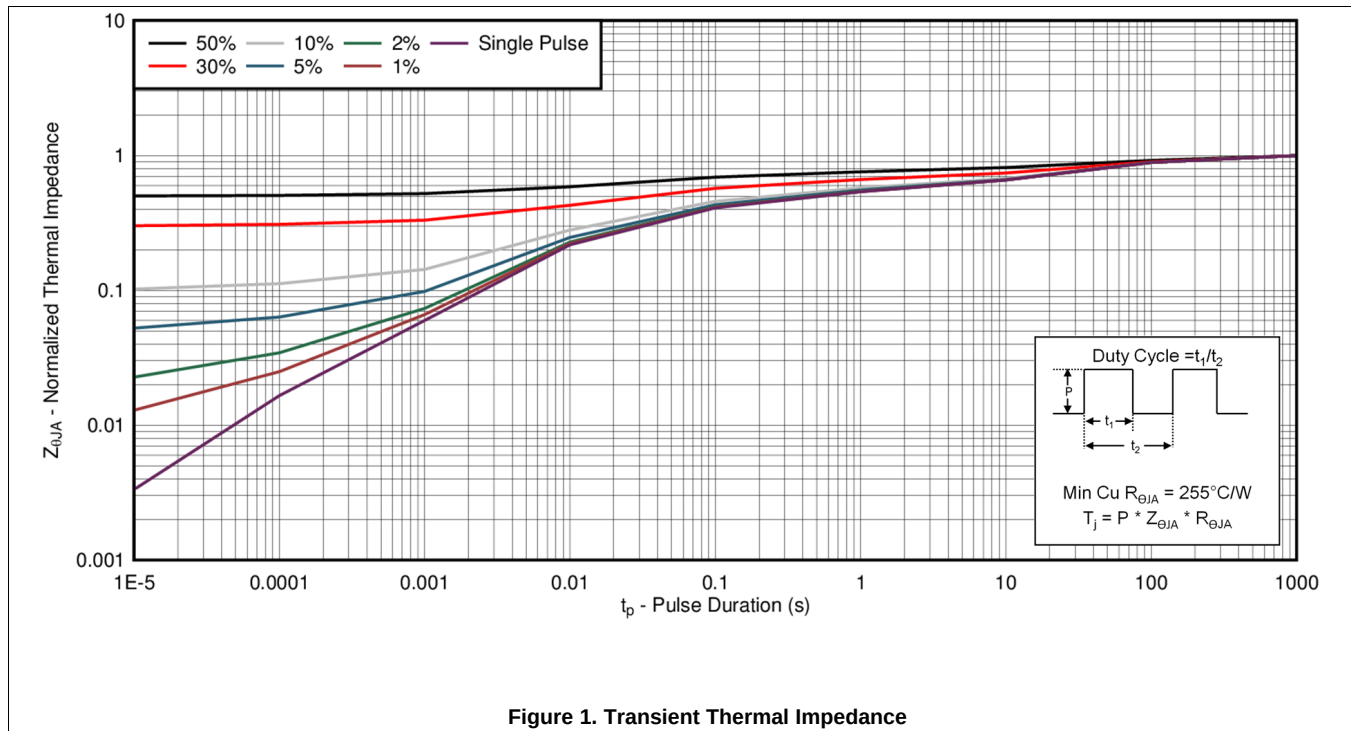
THERMAL METRIC		TYPICAL VALUES	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance ⁽¹⁾	90	$^\circ\text{C/W}$
	Junction-to-ambient thermal resistance ⁽²⁾	255	

(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)

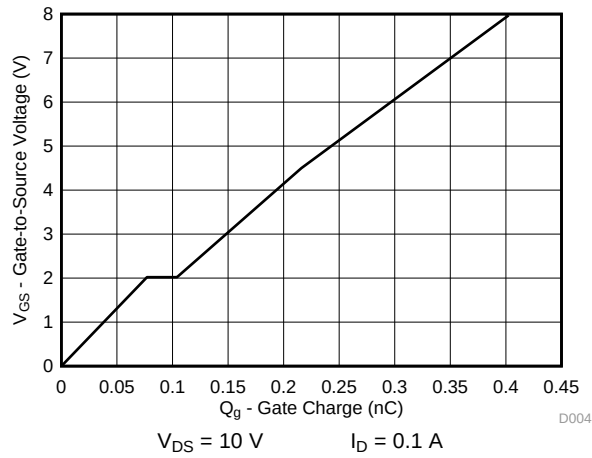


Figure 4. Gate Charge

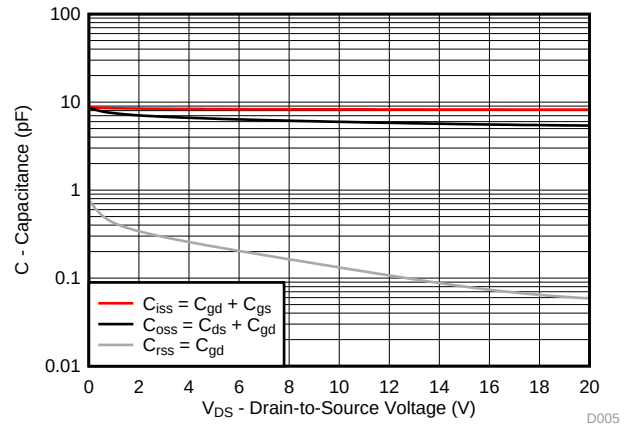


Figure 5. Capacitance

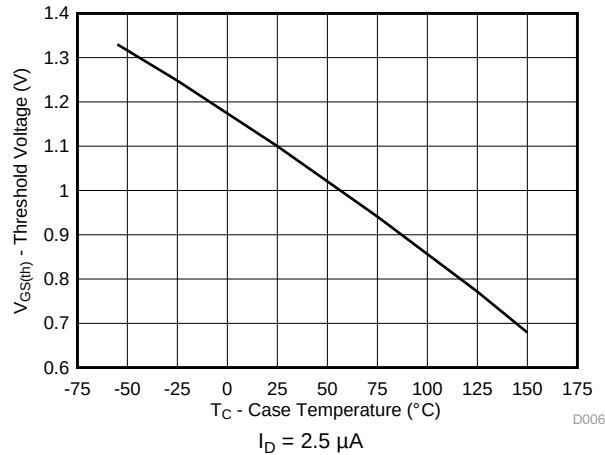


Figure 6. Threshold Voltage vs Temperature

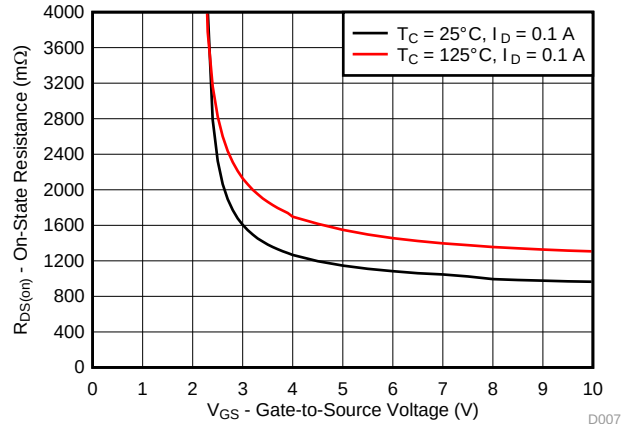


Figure 7. On-State Resistance vs Gate-to-Source Voltage

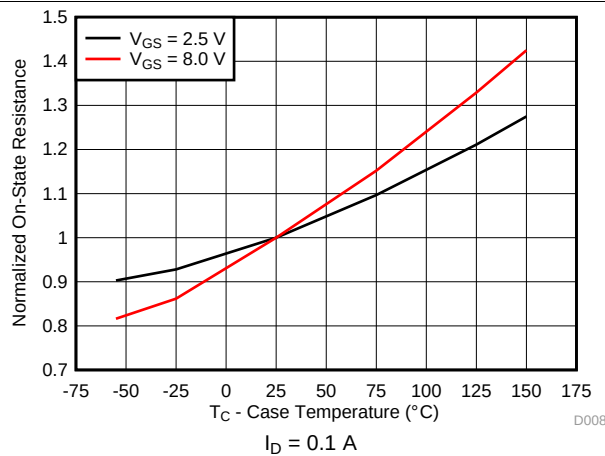


Figure 8. Normalized On-State Resistance vs Temperature

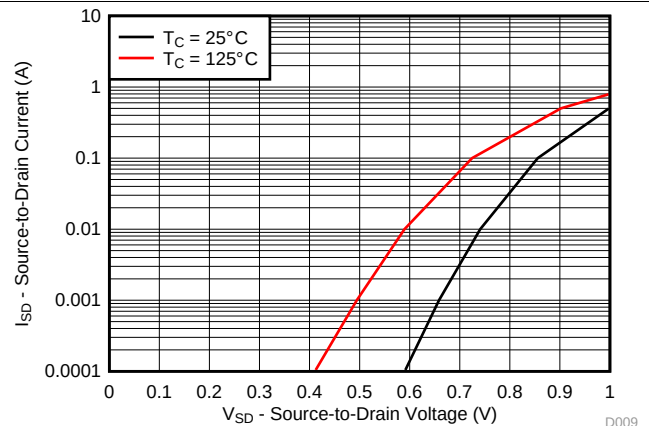
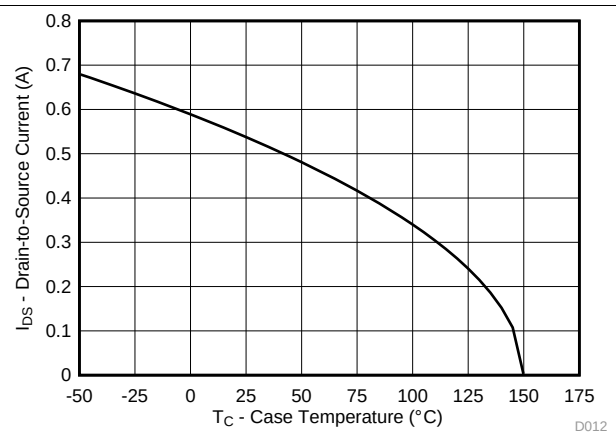
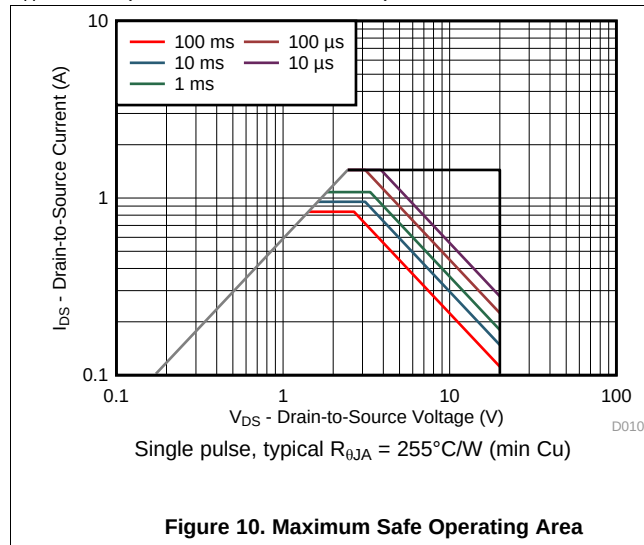


Figure 9. Typical Diode Forward Voltage

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》](#)。

TI E2E™ 在线社区 [TI 的工程师对工程师 \(E2E\) 社区](#)。此社区的创建目的在于促进工程师之间的协作。在 e2e.ti.com 中，您可以咨询问题、分享知识、拓展思路并与同行工程师一道帮助解决问题。

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

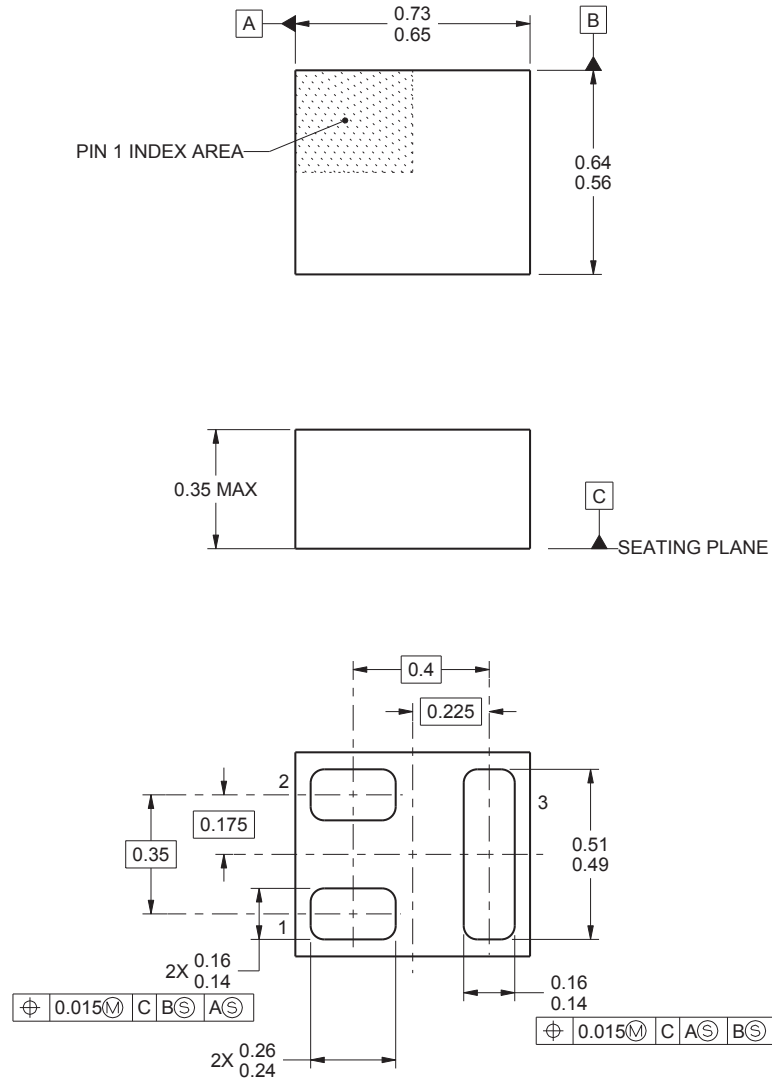
[SLYZ022](#) — *TI Glossary*.

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

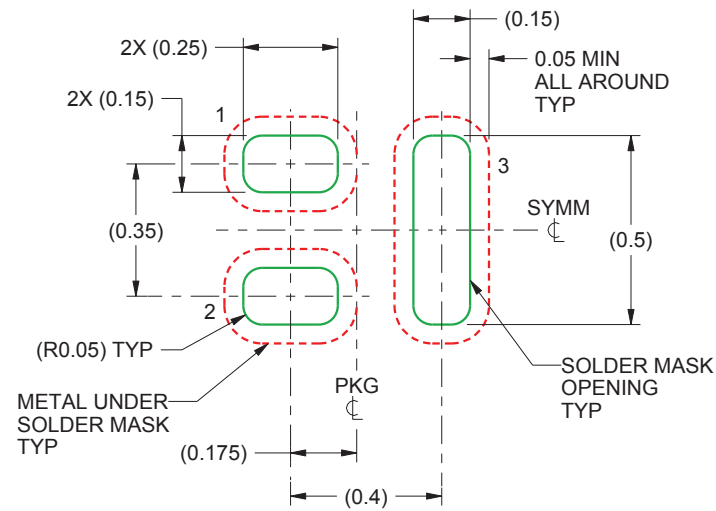


- (1) 所有线性尺寸的单位都是毫米（尺寸和容限值遵循 AME T14.5M-1994）。
- (2) 本图纸如有变更，恕不通知。
- (3) 此封装为无铅焊盘设计。

表 1. 引脚配置

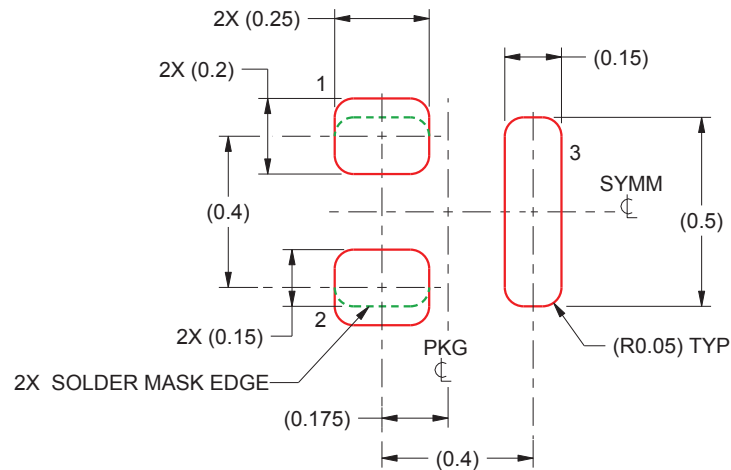
位置	名称
引脚 1	栅极
引脚 2	源极
引脚 3	漏极

7.2 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/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CSD15380F3	ACTIVE	PICOSTAR	YJM	3	3000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	-55 to 150	6	Samples
CSD15380F3T	ACTIVE	PICOSTAR	YJM	3	250	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	-55 to 150	6	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.

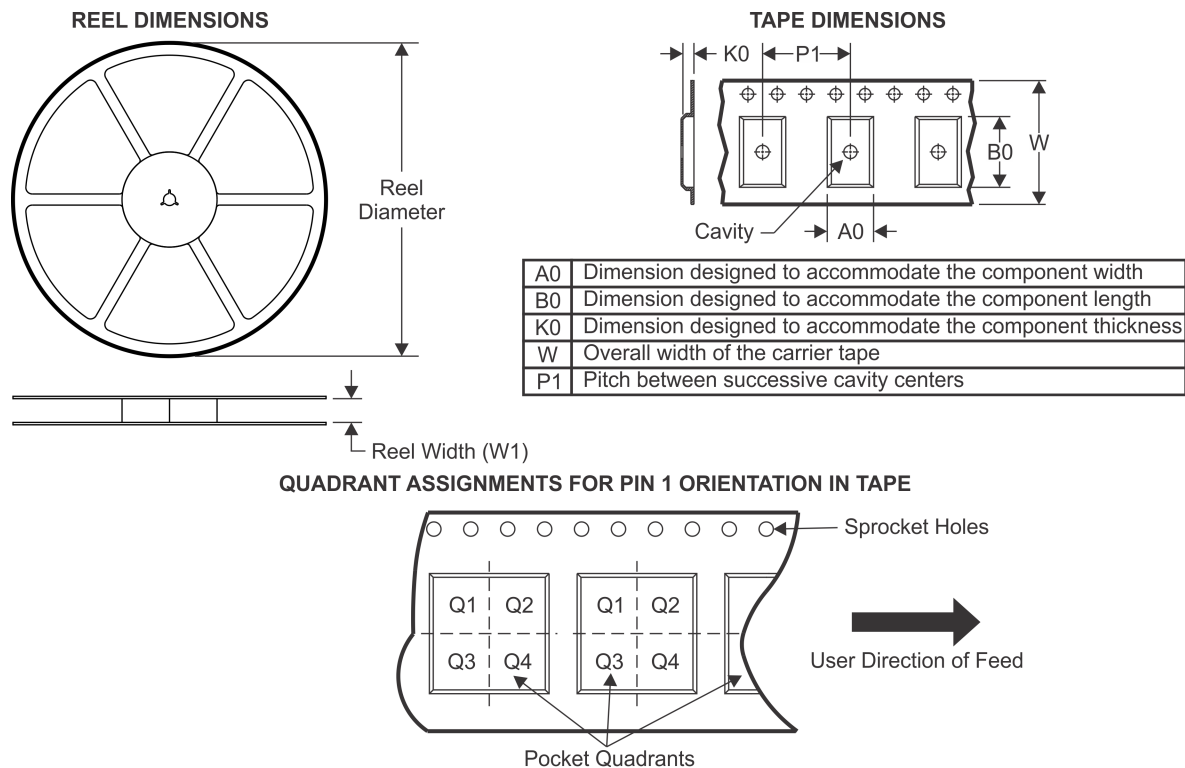
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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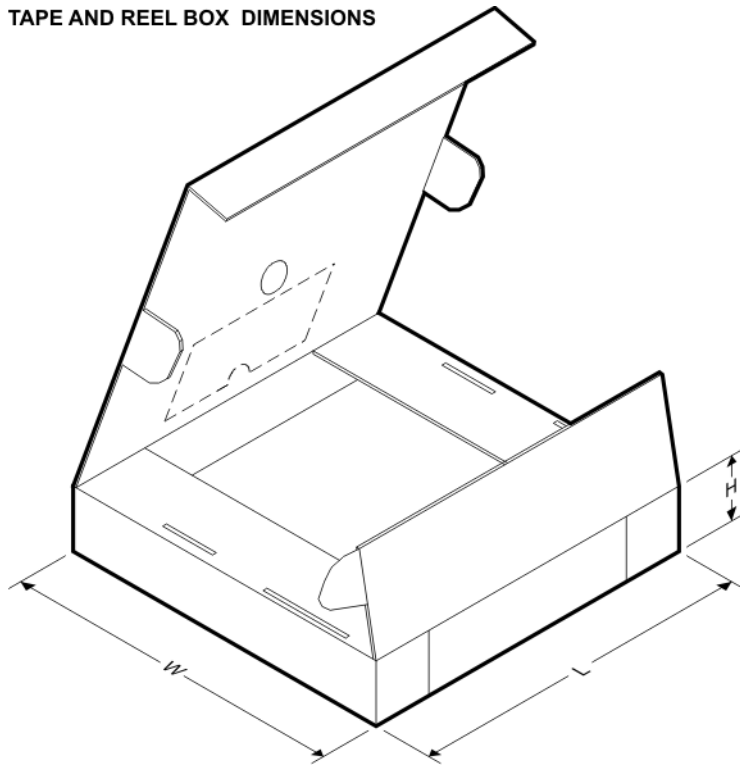
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TAPE AND REEL INFORMATION


*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
CSD15380F3	PICOST AR	YJM	3	3000	178.0	8.4	0.7	0.79	0.44	4.0	8.0	Q2
CSD15380F3	PICOST AR	YJM	3	3000	180.0	8.4	0.7	0.79	0.44	4.0	8.0	Q2
CSD15380F3T	PICOST AR	YJM	3	250	178.0	8.4	0.7	0.79	0.44	4.0	8.0	Q2
CSD15380F3T	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)
CSD15380F3	PICOSTAR	YJM	3	3000	220.0	220.0	35.0
CSD15380F3	PICOSTAR	YJM	3	3000	182.0	182.0	20.0
CSD15380F3T	PICOSTAR	YJM	3	250	220.0	220.0	35.0
CSD15380F3T	PICOSTAR	YJM	3	250	182.0	182.0	20.0

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