CSD25501F3 –20V P 沟道 FemtoFET™MOSFET

1 特性

- 低导通电阻
- 超低 Q_g 和 Q_{gd}
- 超小尺寸
  - 0.7mm × 0.6mm
- 薄型
  - 最大高度为 0.22mm
- 集成型静电放电 (ESD) 保护二极管
- 无铅且无卤素
- 符合 RoHS 标准

2 应用

- 针对负载开关应用 优化
- 电池 应用
- 手持式和移动类 应用

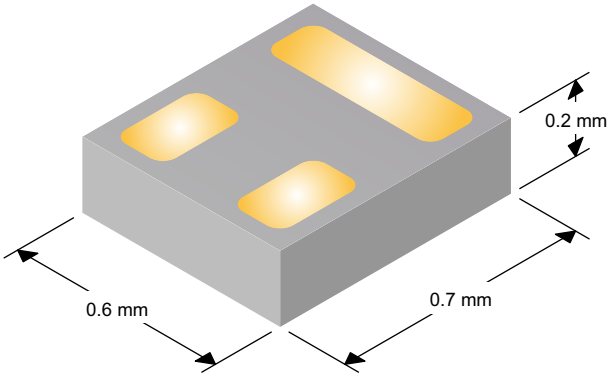
3 说明

这款 –20V、64mΩ、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。集成的 10kΩ 钳位电阻器 (R_C) 可根据占空比让栅极电压 (V_{GS}) 高于最大内部栅极氧化值 –6V。通过二极管的栅极泄漏 (I_{GSS}) 随着 V_{GS} 增加到高于 –6V 而增加。

产品概要

T_A = 25°C		典型值	单位
V_{DS}	漏源电压	-20	V

典型器件尺寸



产品概要 (接下页)

T_A = 25°C		典型值		单位
Q_g	总栅极电荷 (–4.5V)	1.02		nC
Q_{gd}	栅极电荷（栅极到漏极）	0.09		nC
$R_{DS(on)}$	漏源导通电阻	V_{GS} = –1.8V	120	mΩ
		V_{GS} = -2.5V	86	
		V_{GS} = –4.5V	64	
$V_{GS(th)}$	阈值电压	-0.75		V

器件信息(1)

器件	数量	包装介质	封装	发货
CSD25501F3	3000	7 英寸卷带	Femto 0.73mm × 0.64mm 基板栅格阵列 (LGA)	卷带
CSD25501F3T	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。

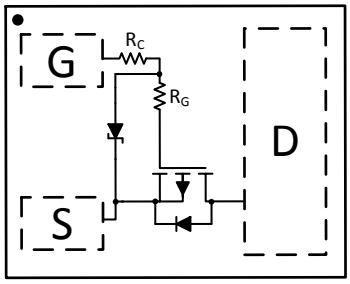
绝对最大额定值

T_A = 25°C（除非另外注明）		值	单位
V_{DS}	漏源电压	-20	V
V_{GS}	栅源电压	-20	V
I_D	持续漏极电流(1)	–3.6	A
I_{DM}	脉冲漏极电流(1)(2)	–13.6	A
P_D	功率耗散(1)	500	mW
$V_{(ESD)}$	人体放电模型 (HBM)	4000	V
	充电器件模型 (CDM)	2000	
T_J、T_{stg}	工作结温、贮存温度	–55 至 150	°C

(1) 安装在覆铜区域极小的 FR4 材料上时的典型 $R_{\theta JA}$ = 255° C/W。

(2) 脉冲持续时间 ≤ 100µs，占空比 ≤ 1%。

顶视图



目录

4 修订历史记录

Changes from Original (October 2017) to Revision A **Page**

- 已添加 机械尺寸信息和表 1 ... 8

5 Specifications

5.1 Electrical Characteristics

T_A = 25°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} = –6 V			–50	nA
		V_{DS} = 0 V, V_{GS} = –16 V			–1	mA
$V_{GS(th)}$	Gate-to-source threshold voltage	V_{DS} = V_{GS}, I_{DS} = –250 μA	–0.45	–0.75	–1.05	V
$R_{DS(on)}$	Drain-to-source on-resistance	V_{GS} = –1.8 V, I_{DS} = –0.1 A		120	260	mΩ
		V_{GS} = –2.5 V, I_{DS} = –0.4 A		86	125	
		V_{GS} = –4.5 V, I_{DS} = –0.4 A		64	76	
g_{fs}	Transconductance	V_{DS} = –2 V, I_{DS} = –0.4 A		3.4		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance	V_{GS} = 0 V, V_{DS} = –10 V, f = 100 kHz		295	385	pF
C_{oss}	Output capacitance			70	91	pF
C_{rss}	Reverse transfer capacitance			4.1	5.3	pF
R_G	Series gate resistance			33		Ω
R_C	Series clamp resistance			10,000		Ω
Q_g	Gate charge total (–4.5 V)	V_{DS} = –10 V, I_{DS} = –0.4 A		1.02	1.33	nC
Q_{gd}	Gate charge gate-to-drain			0.09		nC
Q_{gs}	Gate charge gate-to-source			0.45		nC
$Q_{g(th)}$	Gate charge at V_{th}			0.36		nC
Q_{oss}	Output charge	V_{DS} = –10 V, V_{GS} = 0 V		1.8		nC
$t_{d(on)}$	Turnon delay time	V_{DS} = –10 V, V_{GS} = –4.5 V, I_{DS} = –0.4 A, R_G = 0 Ω		474		ns
t_r	Rise time			428		ns
$t_{d(off)}$	Turnoff delay time			1154		ns
t_f	Fall time			945		ns
DIODE CHARACTERISTICS						
V_{SD}	Diode forward voltage	I_{SD} = –0.4 A, V_{GS} = 0 V		–0.73	–0.95	V
Q_{rr}	Reverse recovery charge	V_{DS} = –10 V, I_F = –0.4 A, di/dt = 200 A/μs		3.0		nC
t_{rr}	Reverse recovery time			7.4		ns

5.2 Thermal Information

T_A = 25°C (unless otherwise stated)

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

(1) Device mounted on FR4 material with 1-in^2 (6.45-cm^2), 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°C (unless otherwise stated)

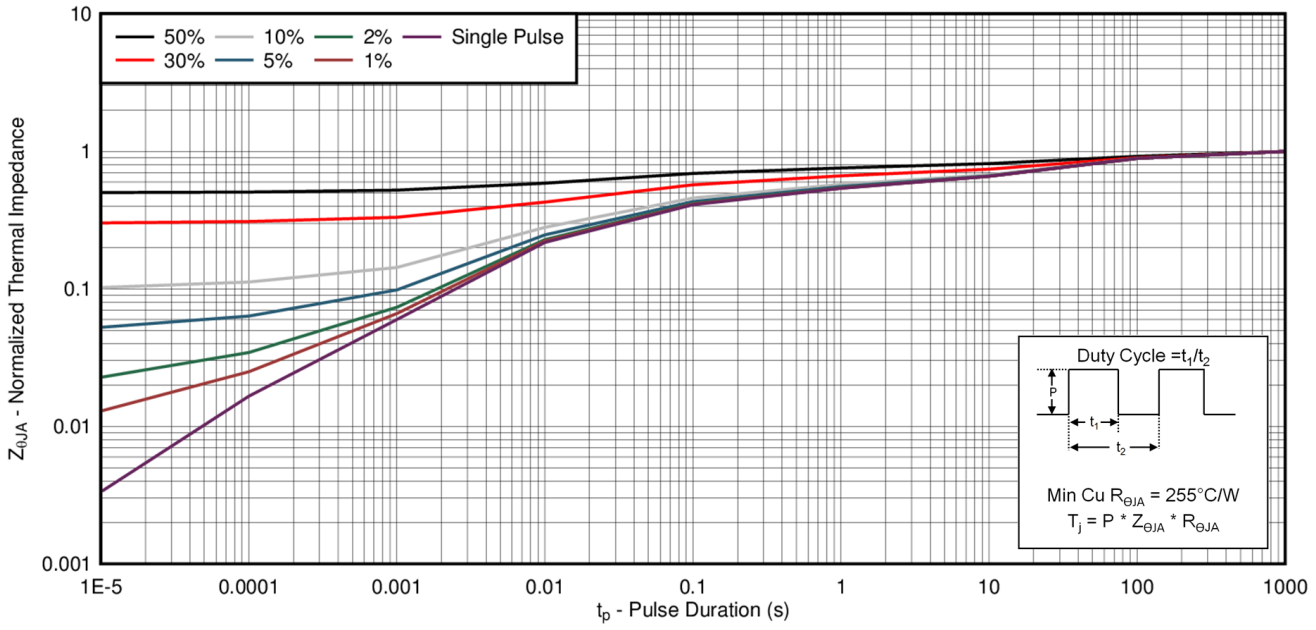


Figure 1. Transient Thermal Impedance

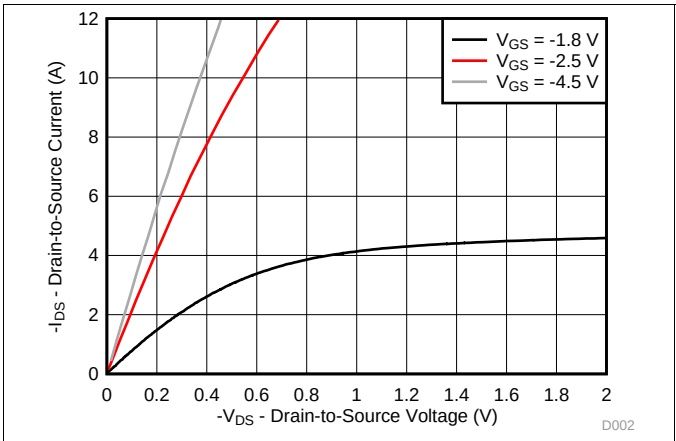


Figure 2. Saturation Characteristics

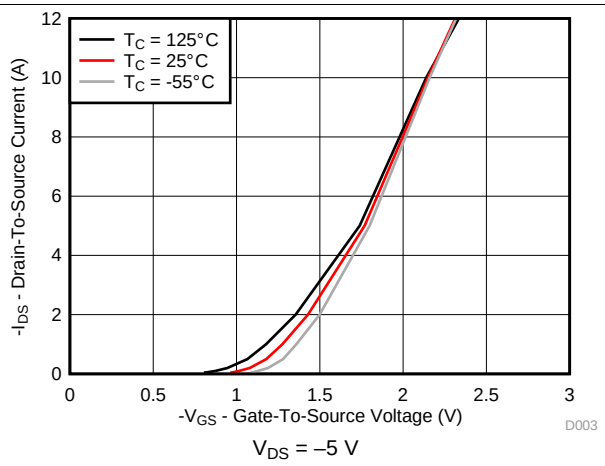


Figure 3. Transfer Characteristics

Typical MOSFET Characteristics (continued)

T_A = 25°C (unless otherwise stated)

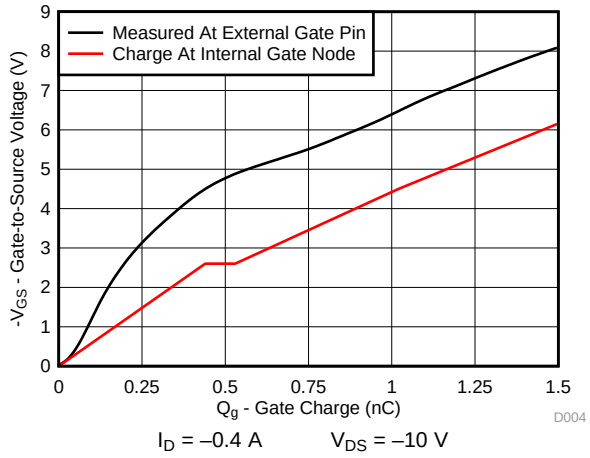


Figure 4. Gate Charge

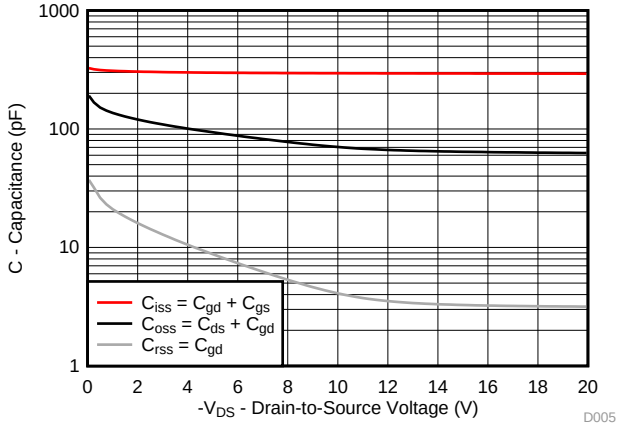


Figure 5. Capacitance

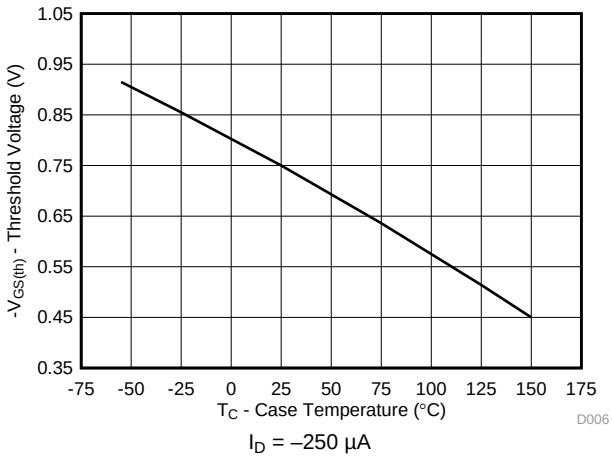


Figure 6. Threshold Voltage vs Temperature

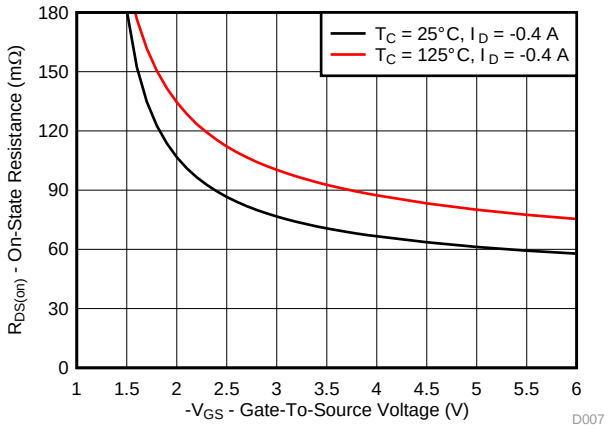


Figure 7. On-State Resistance vs Gate-to-Source Voltage

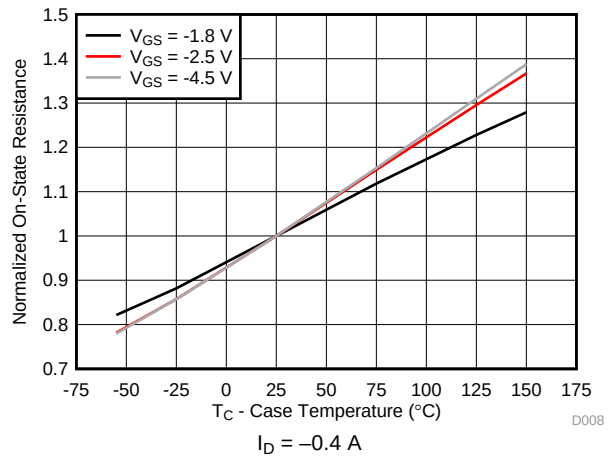


Figure 8. Normalized On-State Resistance vs Temperature

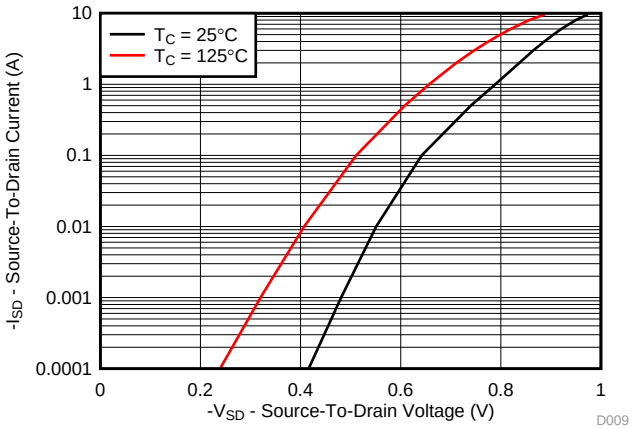
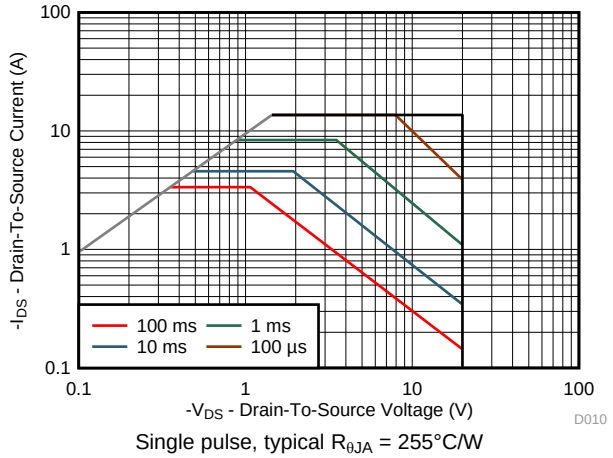


Figure 9. Typical Diode Forward Voltage

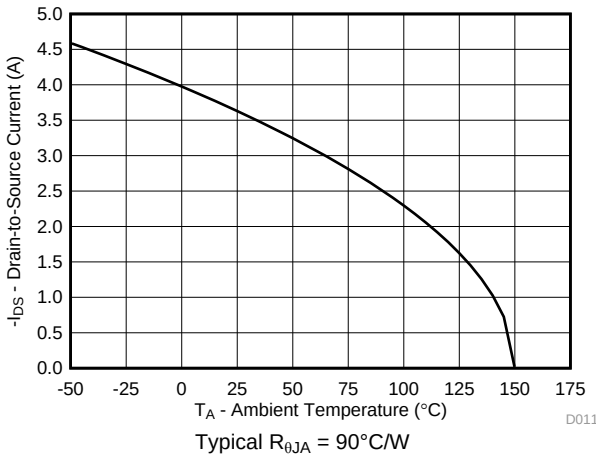
Typical MOSFET Characteristics (continued)

T_A = 25°C (unless otherwise stated)



Single pulse, typical $R_{\theta JA}$ = 255°C/W

Figure 10. Maximum Safe Operating Area



Typical $R_{\theta JA}$ = 90°C/W

Figure 11. Maximum Drain Current vs Temperature

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。单击右上角的*通知我* 进行注册，即可每周接收产品信息更改摘要。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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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

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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

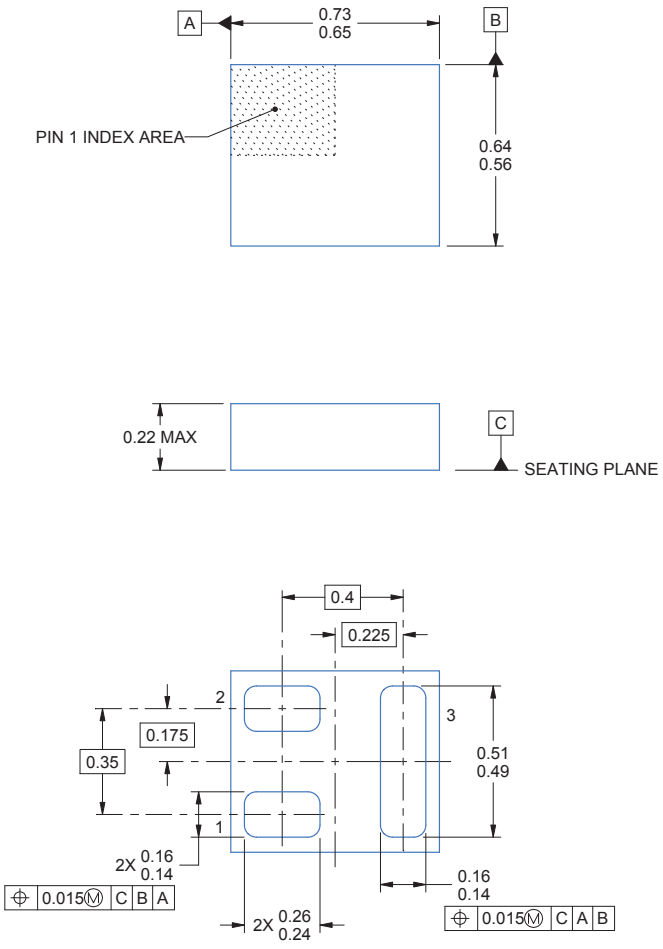
SLYZ022 — *TI Glossary*.

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

7 机械、封装和可订购信息

以下几页包括机械、封装和可订购信息。这些信息是指定器件的最新可用数据。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



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(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) 此封装为无铅凸点设计。凸点涂料可能有所不同。要确定确切的涂料，请参阅器件数据表或联系当地的 TI 代表。

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

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
CSD25501F3	ACTIVE	PICOSTAR	YJN	3	3000	RoHS & Green	Call TI	Level-1-260C-UNLIM	-55 to 150	V	Samples
CSD25501F3T	ACTIVE	PICOSTAR	YJN	3	250	RoHS & Green	Call TI	Level-1-260C-UNLIM	-55 to 150	V	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.

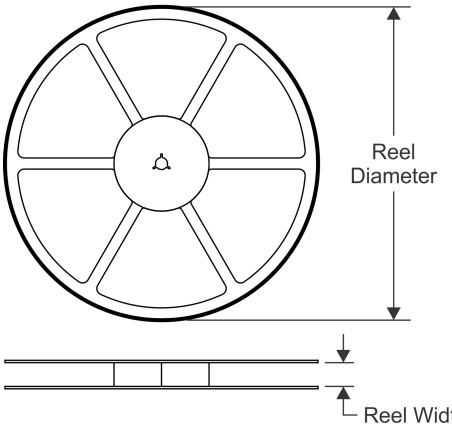
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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.

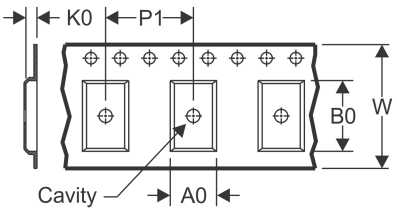
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

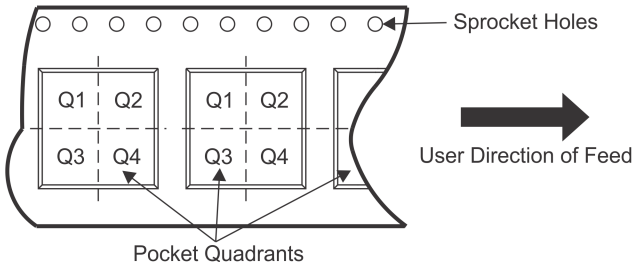


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

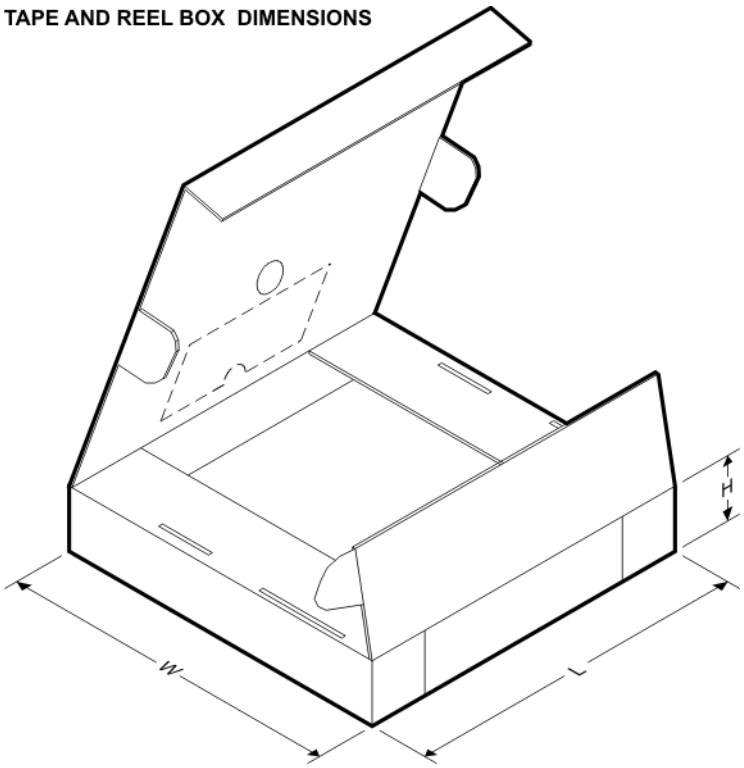
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
CSD25501F3	PICOSTAR	YJN	3	3000	180.0	8.4	0.7	0.79	0.31	4.0	8.0	Q2
CSD25501F3T	PICOSTAR	YJN	3	250	180.0	8.4	0.7	0.79	0.31	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)
CSD25501F3	PICOSTAR	YJN	3	3000	182.0	182.0	20.0
CSD25501F3T	PICOSTAR	YJN	3	250	182.0	182.0	20.0

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