

CSD17483F4 30V N 沟道 FemtoFET™ MOSFET

1 特性

- 低导通电阻
- 低 Q_g 和 Q_{gd}
- 低阈值电压
- 超小封装尺寸 (0402 外壳尺寸)
 - 1.0mm × 0.6mm
- 超薄型封装
 - 厚度为 0.36mm
- 集成型 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

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
- 单节电池应用
- 手持式和移动类应用

3 说明

该 200mΩ、30V N 沟道 FemtoFET™ MOSFET 技术经过设计和优化，能够最大限度地减小在许多手持式和移动应用中占用的空间。这项技术能够在替代标准小信号 MOSFET 的同时将封装尺寸减小至少 60%。

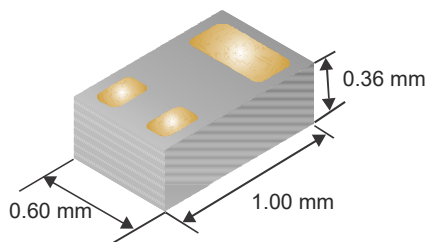


图 3-1. 典型器件尺寸

产品概要

$T_A = 25^\circ\text{C}$		典型值		单位
V_{DS}	漏源电压	30		V
Q_g	总栅极电荷 (4.5V)	1010		pC
Q_{gd}	栅极电荷 (栅极到漏极)	130		pC
$R_{DS(on)}$	漏源导通电阻	$V_{GS} = 1.8\text{V}$	370	mΩ
		$V_{GS} = 2.5\text{V}$	240	
		$V_{GS} = 4.5\text{V}$	200	
$V_{GS(th)}$	阈值电压	0.85		V

器件信息

器件 ⁽¹⁾	数量	介质	封装	配送
CSD17483F4	3000	7 英寸卷带	Femto (0402) 1.00mm × 0.60mm	卷带包装
CSD17483F4T	250		无引线 SMD	

(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

$T_A = 25^\circ\text{C}$ 时测得，除非另外注明		值	单位
V_{DS}	漏源电压	30	V
V_{GS}	栅源电压	12	V
I_D	持续漏极电流， $T_A = 25^\circ\text{C}$ 时测得 ⁽¹⁾	1.5	A
I_{DM}	脉冲漏极电流， $T_A = 25^\circ\text{C}$ ⁽²⁾	5	A
I_G	持续栅极钳位电流	35	mA
	脉冲栅极钳位电流 ⁽²⁾	350	
P_D	功率耗散 ⁽¹⁾	500	mW
$V_{(ESD)}$	人体放电模型 (HBM)	4	kV
	充电器件模型 (CDM)	2	
T_J 、 T_{stg}	工作结温、 贮存温度	-55 至 150	$^\circ\text{C}$
E_{AS}	雪崩能量，单脉冲 $I_D = 7.4\text{A}$ ， $L = 0.1\text{mH}$ ， $R_G = 25\Omega$	2.7	mJ

- (1) 典型 $R_{\theta JA} = 90^\circ\text{C/W}$ (在 0.06 英寸 (1.52mm) 厚的 FR4 PCB 上安装 1 平方英寸 (6.45cm²)、2oz、0.071mm 厚的铜焊盘时)。
- (2) 脉冲持续时间 $\leq 300\ \mu\text{s}$ ，占空比 $\leq 2\%$ 。

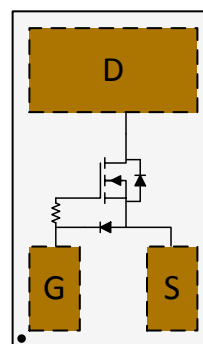


图 3-2. 顶视图



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4 Revision History

Changes from Revision E (April 2018) to Revision F (February 2022) Page

• 将超薄型封装要点中的厚度从 0.35mm 更改为 0.36mm.....	1
• 将超薄型封装图片中的厚度从 0.35mm 更新为 0.36mm.....	1
• Changed ultra-low profile image height from 0.35 mm to 0.36 mm.....	8
• Added FemtoFET Surface Mount Guide note.....	9

Changes from Revision D (December 2016) to Revision E (April 2018) Page

• Raised I_{DSS} Test Condition Voltage.....	3
• Raised I_{GSS} Test Condition Voltage.....	3

5 Specifications

5.1 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
V_{DSS}	Drain-to-source voltage	$V_{GS} = 0\text{ V}, I_{DS} = 250\ \mu\text{A}$	30			V
I_{DSS}	Drain-to-source leakage current	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$			100	nA
I_{GSS}	Gate-to-source leakage current	$V_{DS} = 0\text{ V}, V_{GS} = 10\text{ V}$			50	nA
$V_{GS(th)}$	Gate-to-source threshold voltage	$V_{DS} = V_{GS}, I_{DS} = 250\ \mu\text{A}$	0.65	0.85	1.10	V
$R_{DS(on)}$	Drain-to-source on-resistance	$V_{GS} = 1.8\text{ V}, I_{DS} = 0.5\text{ A}$		370	550	m Ω
		$V_{GS} = 2.5\text{ V}, I_{DS} = 0.5\text{ A}$		240	310	
		$V_{GS} = 4.5\text{ V}, I_{DS} = 0.5\text{ A}$		200	260	
		$V_{GS} = 8\text{ V}, I_{DS} = 0.5\text{ A}$		185	240	
g_{fs}	Transconductance	$V_{DS} = 15\text{ V}, I_{DS} = 0.5\text{ A}$		2.4		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 15\text{ V},$ $f = 1\text{ MHz}$		145	190	pF
C_{oss}	Output capacitance			42	55	pF
C_{rss}	Reverse transfer capacitance			2	3	pF
R_G	Series gate resistance			23		Ω
Q_g	Gate charge total (4.5 V)	$V_{DS} = 15\text{ V}, I_{DS} = 0.5\text{ A}$		1010	1300	pC
Q_{gd}	Gate charge gate-to-drain			130		pC
Q_{gs}	Gate charge gate-to-source			220		pC
$Q_{g(th)}$	Gate charge at V_{th}			145		pC
Q_{oss}	Output charge	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}$		1095		pC
$t_{d(on)}$	Turnon delay time	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V},$ $I_{DS} = 0.5\text{ A}, R_G = 2\ \Omega$		3.3		ns
t_r	Rise time			1.3		ns
$t_{d(off)}$	Turnoff delay time			10.6		ns
t_f	Fall time			3.4		ns
DIODE CHARACTERISTICS						
V_{SD}	Diode forward voltage	$I_{SD} = 0.5\text{ A}, V_{GS} = 0\text{ V}$		0.73	0.9	V
Q_{rr}	Reverse recovery charge	$V_{DS} = 15\text{ V}, I_F = 0.5\text{ A}, di/dt = 300\text{ A}/\mu\text{s}$		1475		pC
t_{rr}	Reverse recovery time			5.5		ns

5.2 Thermal Information

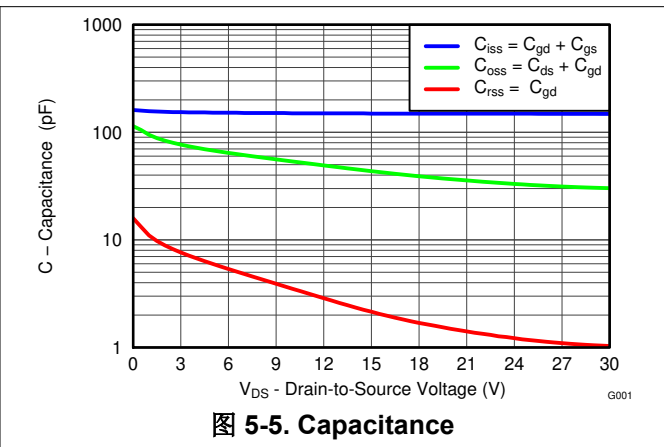
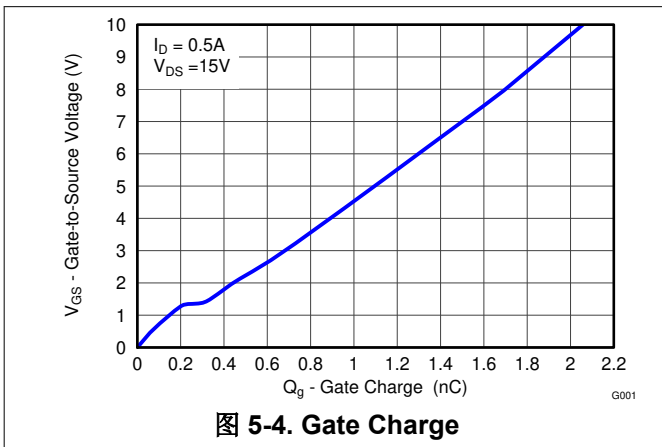
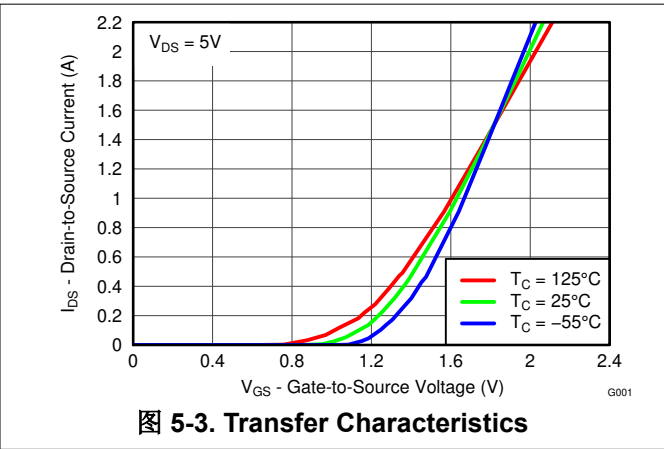
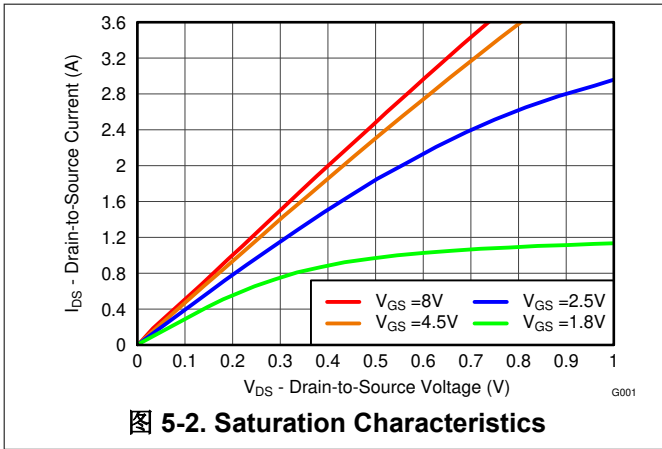
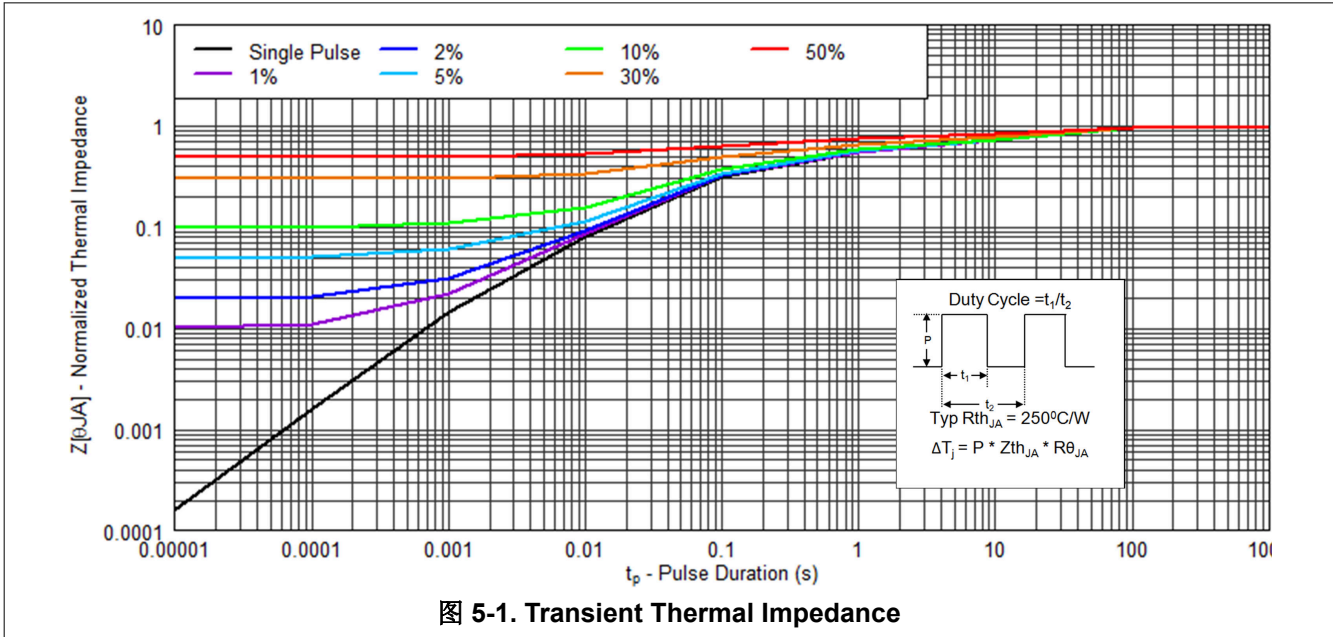
$T_A = 25^\circ\text{C}$ (unless otherwise stated)

THERMAL METRIC		TYPICAL VALUES	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance ⁽¹⁾	90	$^\circ\text{C}/\text{W}$
	Junction-to-ambient thermal resistance ⁽²⁾	250	

- (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°C (unless otherwise stated)



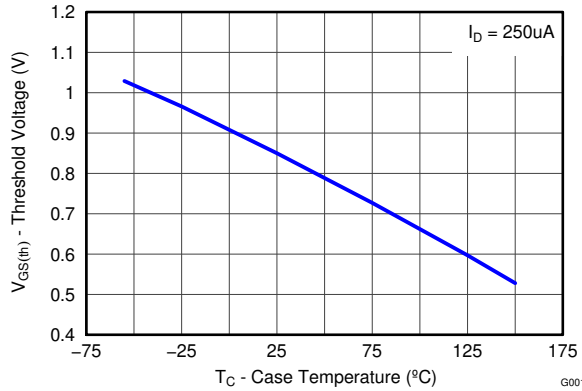


图 5-6. Threshold Voltage vs Temperature

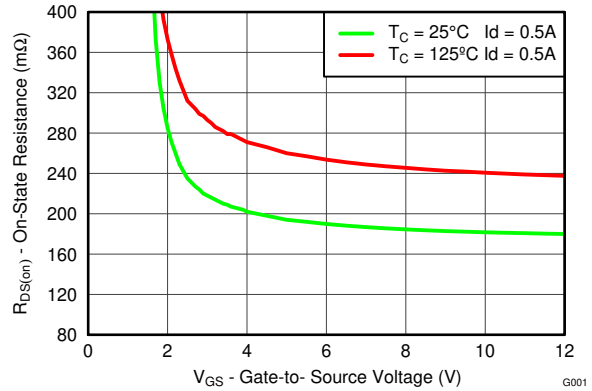


图 5-7. On-State Resistance vs Gate-to-Source Voltage

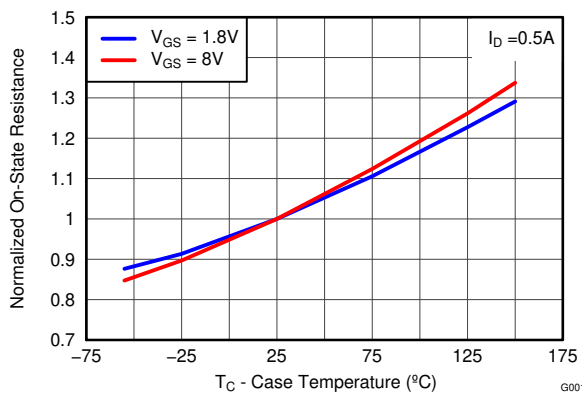


图 5-8. Normalized On-State Resistance vs Temperature

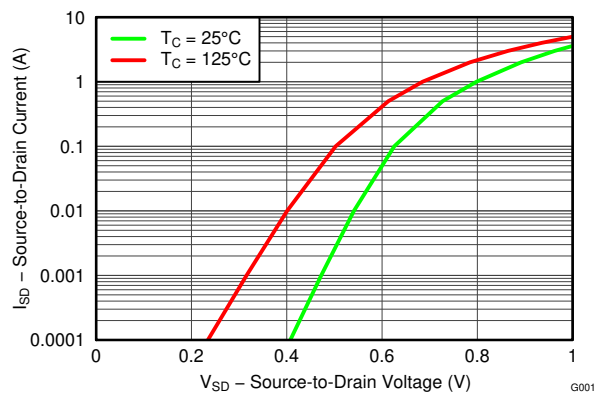


图 5-9. Typical Diode Forward Voltage

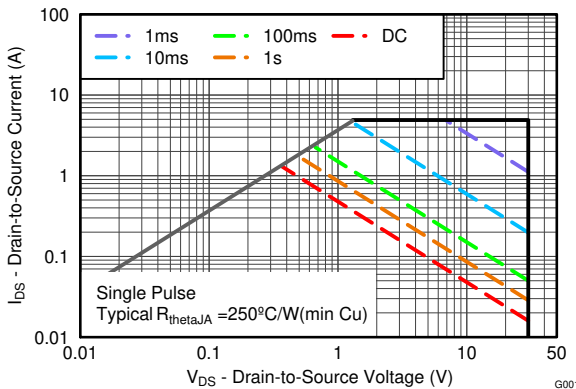


图 5-10. Maximum Safe Operating Area

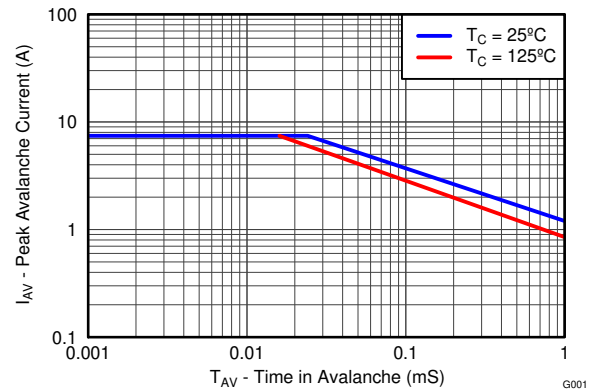


图 5-11. Single Pulse Unclamped Inductive Switching

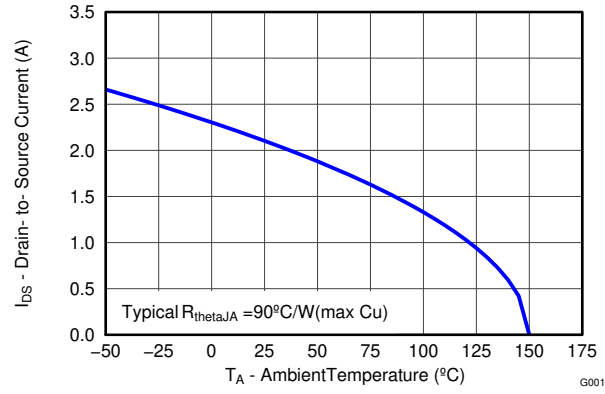


图 5-12. Maximum Drain Current vs Temperature

6 Device and Documentation Support

6.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

6.2 Trademarks

FemtoFET™ is a trademark of Texas Instruments.

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6.3 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

6.4 术语表

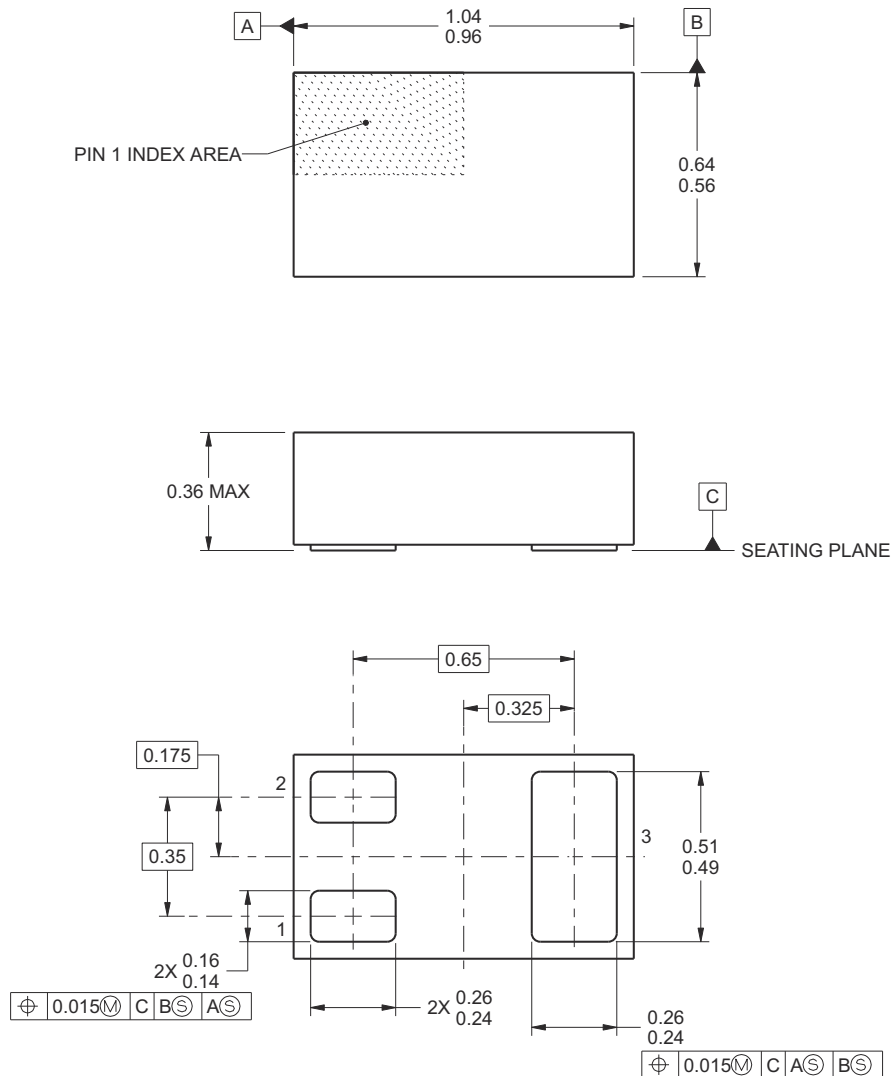
TI 术语表

本术语表列出并解释了术语、首字母缩略词和定义。

7 Mechanical, Packaging, and Orderable Information

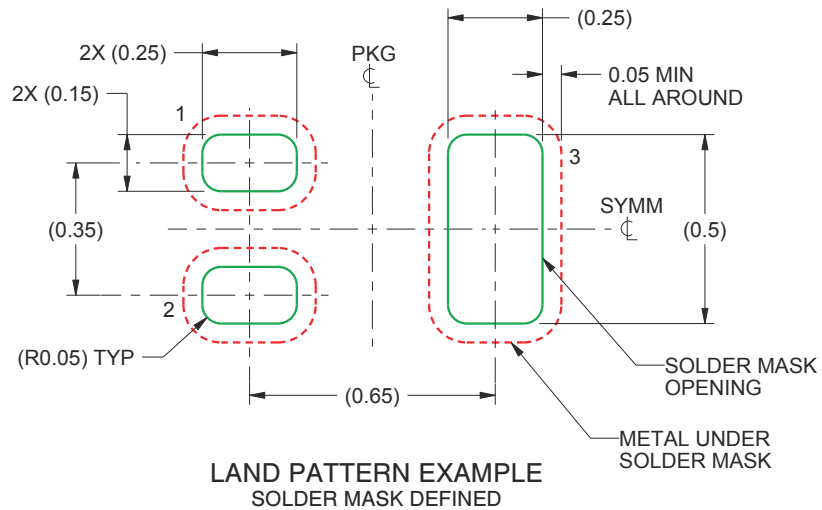
The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

7.1 Mechanical Dimensions



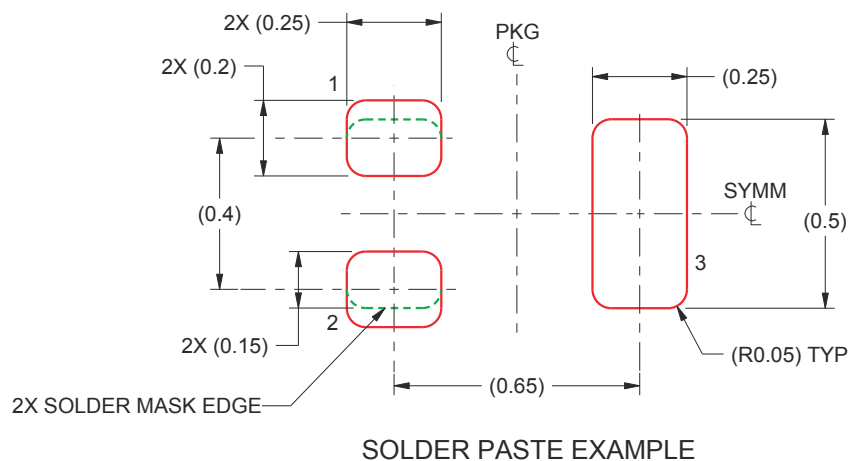
- A. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- B. This drawing is subject to change without notice.
- C. This package is a Pb-free bump design. Bump finish may vary. To determine the exact finish, refer to the device data sheet or contact a local TI representative.

7.2 Recommended Minimum PCB Layout



- A. All dimensions are in millimeters.
- B. For more information, see [FemtoFET Surface Mount Guide](#) (SLRA003D).

7.3 Recommended Stencil Pattern



- A. All dimensions are in millimeters.
- B. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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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
CSD17483F4	ACTIVE	PICOSTAR	YJC	3	3000	RoHS & Green	NIAU	Level-1-260C-UNLIM	-55 to 150	DP	Samples
CSD17483F4T	ACTIVE	PICOSTAR	YJC	3	250	RoHS & Green	NIAU	Level-1-260C-UNLIM	-55 to 150	DP	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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TAPE AND REEL INFORMATION

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
CSD17483F4	PICOST AR	YJC	3	3000	180.0	8.4	0.7	1.1	0.46	4.0	8.0	Q2
CSD17483F4	PICOST AR	YJC	3	3000	178.0	8.4	0.7	1.1	0.46	4.0	8.0	Q2
CSD17483F4T	PICOST AR	YJC	3	250	180.0	8.4	0.7	1.1	0.46	4.0	8.0	Q2
CSD17483F4T	PICOST AR	YJC	3	250	178.0	8.4	0.7	1.1	0.46	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)
CSD17483F4	PICOSTAR	YJC	3	3000	182.0	182.0	20.0
CSD17483F4	PICOSTAR	YJC	3	3000	220.0	220.0	35.0
CSD17483F4T	PICOSTAR	YJC	3	250	182.0	182.0	20.0
CSD17483F4T	PICOSTAR	YJC	3	250	220.0	220.0	35.0

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