

CSD87313DMS 30V 双路 N 通道 NexFET™ 功率 MOSFET

1 特性

- 低源极至源极导通电阻
- 双共漏极 N 通道 MOSFET
- 针对 5V 栅极驱动进行了优化
- 低 Q_g 和 Q_{gd}
- 低热阻
- 雪崩额定值
- 无铅引脚镀层
- 符合 RoHS 标准
- 无卤素
- 小外形尺寸无引线 (SON) 3.3mm × 3.3mm 塑料封装

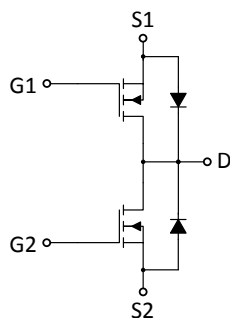
2 应用范围

- USB Type-C™ 和电力传输 (PD) VBus 保护
- 电池保护
- 负载开关

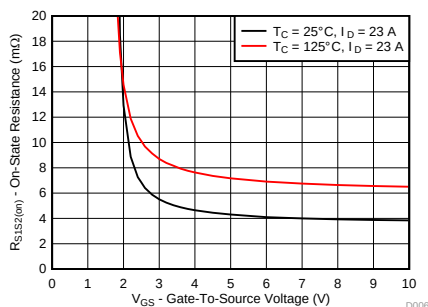
3 说明

CSD87313DMS 是一款 30V 共漏极、双路 N 通道器件，专为 USB Type-C/PD 和电池保护而设计。此 3.3mm × 3.3mm SON 器件具有低源极至源极导通电阻，可最大限度地减少损耗，且具有较少的组件数量，适用于空间受限的应用。

原理图



$R_{S1S2(ON)}$ 与 V_{GS} 对比



产品概要

$T_A = 25^\circ\text{C}$		数值	单位
V_{S1S2}	源极 1 到源极 2 电压	30	V
Q_g	栅极电荷总量 (4.5V)	28	nC
Q_{gd}	栅极电荷 (栅极到漏极)	6.0	nC
$R_{S1S2(on)}$	源极 1 到源极 2 最大导通电阻	$V_{GS} = 2.5\text{V}$	9.6
		$V_{GS} = 4.5\text{V}$	5.5
$V_{GS(th)}$	阈值电压	0.9	V

器件信息(1)

器件	数量	包装介质	封装	运输
CSD87313DMS	2500	13 英寸卷带	SON 3.30mm × 3.30mm 塑料封装	卷带封装
CSD87313DMST	250	7 英寸卷带		

(1) 要了解所有可用封装，请见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_{S1S2}	源极 1 到源极 2 电压	30	V
V_{GS}	栅源电压 ⁽¹⁾	±10	V
I_{S1S2}	持续源极电流 ⁽²⁾	17	A
I_{SM}	脉冲源极电流， $T_A = 25^\circ\text{C}$ 时测得 ⁽²⁾⁽³⁾	120	A
P_D	功率耗散 ⁽²⁾	2.7	W
	功率耗散 ⁽⁴⁾	1	
T_J, T_{stg}	工作结温， 储存温度	-55 至 150	°C
E_{AS}	雪崩能量，单一脉冲， $I_D = 100\text{A}$ ， $L = 0.1\text{mH}$ ， $R_G = 25\Omega$	67	mJ

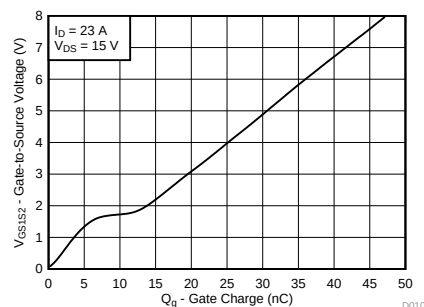
(1) V_{G1S1} 不应超过 ±10V， V_{G2S2} 不应超过 ±10V。

(2) 典型 $R_{\theta JA} = 45^\circ\text{C/W}$ (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)。

(3) 占空比 ≤ 2%，脉冲持续时间 ≤ 300μs。

(4) 典型 $R_{\theta JA} = 125^\circ\text{C/W}$ (在 2oz 铜焊盘上)。

栅极电荷



目录

1	特性	1	6.1	接收文档更新通知	8
2	应用范围	1	6.2	社区资源	8
3	说明	1	6.3	商标	8
4	修订历史记录	2	6.4	静电放电警告	8
5	Specifications	3	6.5	Glossary	8
	5.1 Electrical Characteristics	3	7	机械、封装和可订购信息	9
	5.2 Thermal Information	3	7.1	DMS 封装尺寸	9
	5.3 Typical MOSFET Characteristics	4	7.2	建议 PCB 布局	10
6	器件和文档支持	8	7.3	建议模板开口	11

4 修订历史记录

日期	修订版本	注释
2017 年 4 月	*	最初发布。

5 Specifications

5.1 Electrical Characteristics

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

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
STATIC CHARACTERISTICS							
I _{S1S2}	Source1-to-Source2 leakage current	V _{G1S1} = 0 V, V _{G2S2} = 0 V, V _{S1S2} = 24 V	1			μA	
I _{GSS}	Gate-to-source leakage current	V _{S1S2} = 0 V, V _{GS} = 10 V	100			nA	
V _{GS(th)}	Gate-to-source threshold voltage	V _{S1S2} = V _{GS} , I _{S1S2} = 250 μA	0.6	0.9	1.2	V	
R _{S1S2(on)}	Source1-to-Source2 on resistance	V _{GS} = 2.5 V, I _{S1S2} = 20 A	6.7			9.6	mΩ
		V _{GS} = 4.5 V, I _{S1S2} = 23 A	4.6				
g _{fs}	Transconductance	V _{S1S2} = 3 V, I _{S1S2} = 23 A	149			S	
DYNAMIC CHARACTERISTICS ⁽¹⁾							
C _{ISS}	Input capacitance	V _{GS} = 0 V, V _{S1S2} = 15 V, f = 1 MHz	3300		4290	pF	
C _{OSS}	Output capacitance		281		365	pF	
C _{RSS}	Reverse transfer capacitance		154		200	pF	
Q _g	Gate charge total (4.5 V)	V _{S1S2} = 15 V, I _{S1S2} = 23 A V _{G1S1} = 4.5 V, V _{G2S2} = 0 V	28			nC	
Q _{gd}	Gate charge gate-to-drain		6.0			nC	
Q _{gs}	Gate charge gate-to-source		6.3			nC	
Q _{g(th)}	Gate charge at V _{th}		3.2			nC	
t _{d(on)}	Turnon delay time	V _{S1S2} = 15 V, I _{S1S2} = 23 A V _{GS} = 4.5 V, R _{GEN} = 0 Ω	9			ns	
t _r	Rise time		27			ns	
t _{d(off)}	Turnoff delay time		41			ns	
t _f	Fall time		13			ns	
DIODE CHARACTERISTICS							
I _{fss}	Maximum continuous Source1-to-Source2 diode forward current ⁽²⁾	V _{G1S1} = 0 V, V _{G2S2} = 4.5 V	2			A	
V _{fss}	Source1-to-Source2 diode forward voltage	V _{G1S1} = 0 V, V _{G2S2} = 4.5 V, I _{fss} = 23 A	0.8		1.0	V	

(1) Dynamic characteristic measurements are for a single FET.

(2) Typical $R_{\theta JA} = 125^\circ\text{C/W}$ on a minimum 2-oz Cu pad.

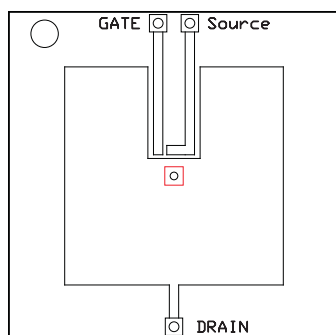
5.2 Thermal Information

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

THERMAL METRIC	UNIT
$R_{\theta JA}$ Junction-to-case thermal resistance ⁽¹⁾	125 $^\circ\text{C/W}$
$R_{\theta JA}$ Junction-to-ambient thermal resistance ⁽¹⁾⁽²⁾	45 $^\circ\text{C/W}$

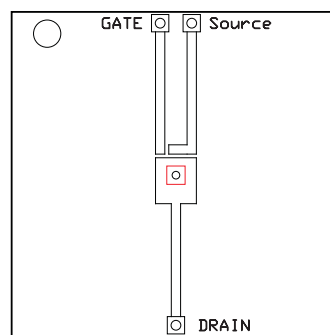
(1) Device mounted on minimum 2-oz (0.071-mm) thick Cu.

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



M0161-01

$R_{\theta JA} = 45^\circ\text{C/W}$ when mounted on 1 in² (6.45 cm²) of 2-oz (0.071-mm) thick Cu.



M0161-02

$R_{\theta JA} = 125^\circ\text{C/W}$ when mounted on a minimum pad area of 2-oz (0.071-mm) thick Cu.

5.3 Typical MOSFET Characteristics

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

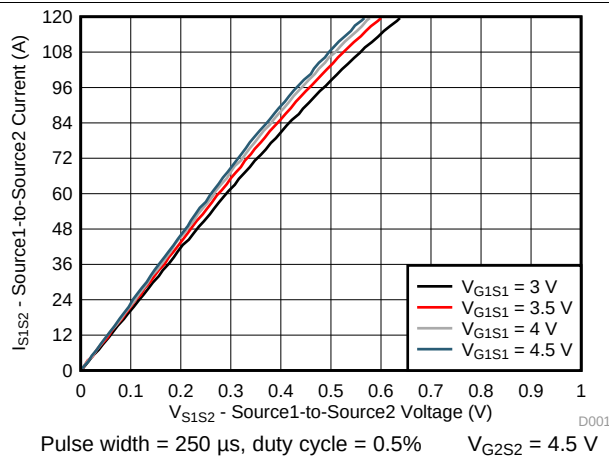


Figure 1. Saturation Characteristics

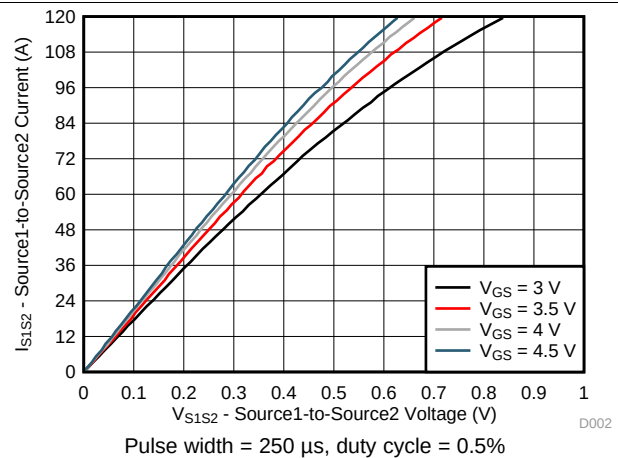


Figure 2. Saturation Characteristics

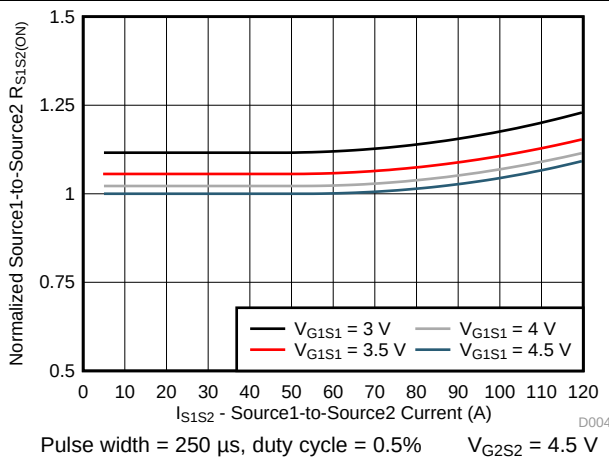


Figure 3. Saturation Characteristics

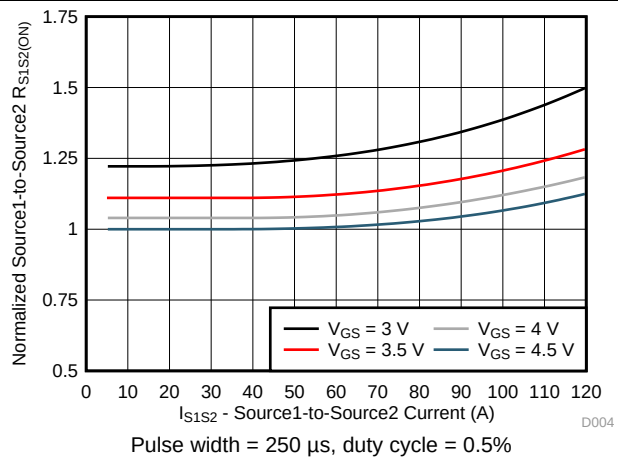


Figure 4. Saturation Characteristics

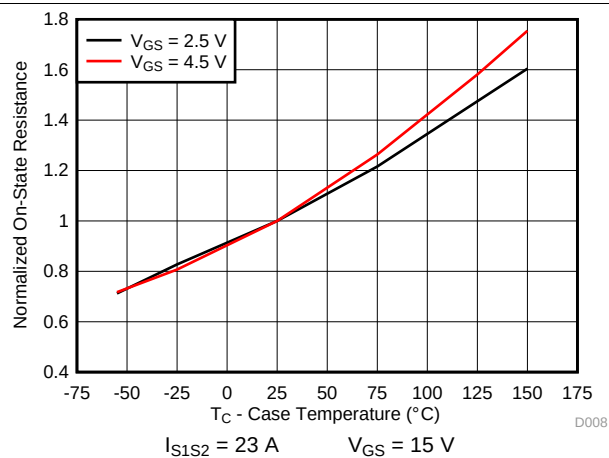


Figure 5. Normalized On-State Resistance vs Temperature

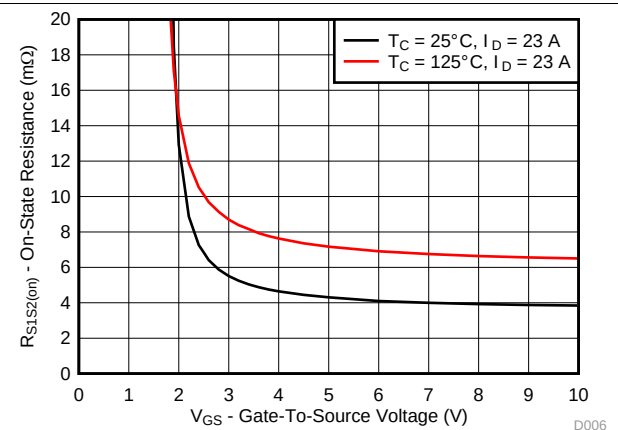


Figure 6. On-State Resistance vs Gate-to-Source Voltage

Typical MOSFET Characteristics (continued)

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

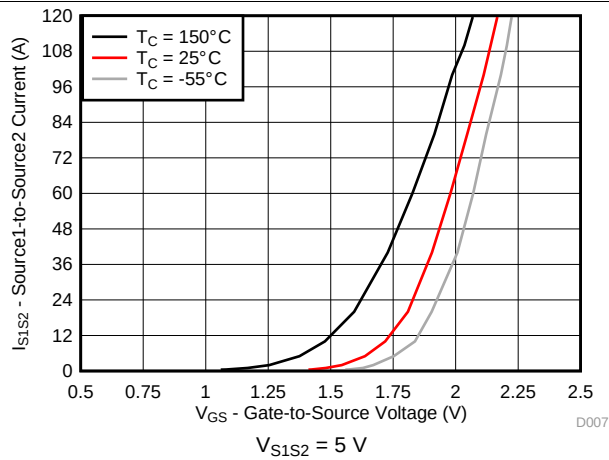


Figure 7. Transfer Characteristics

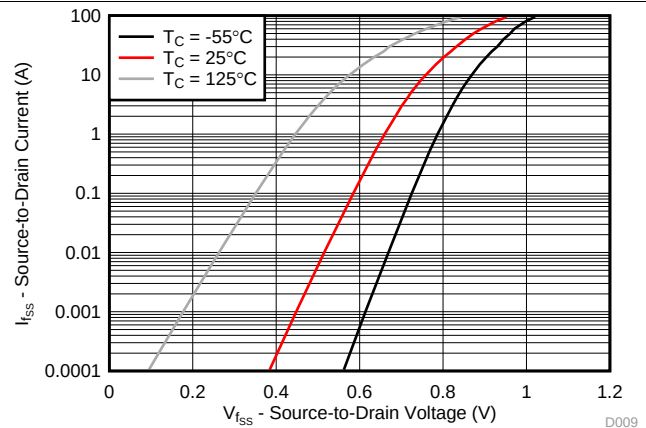


Figure 8. Typical Diode Forward Voltage

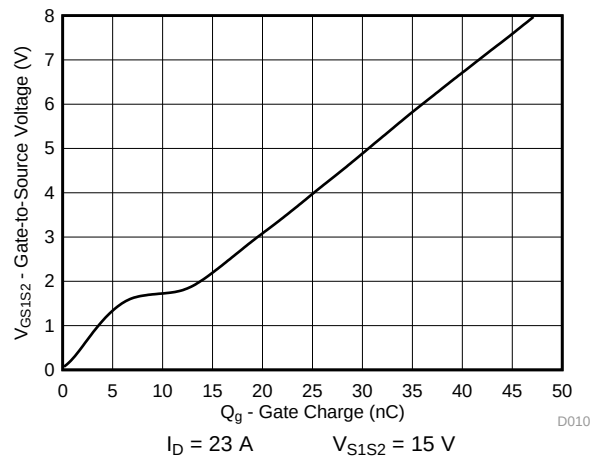


Figure 9. Gate Charge

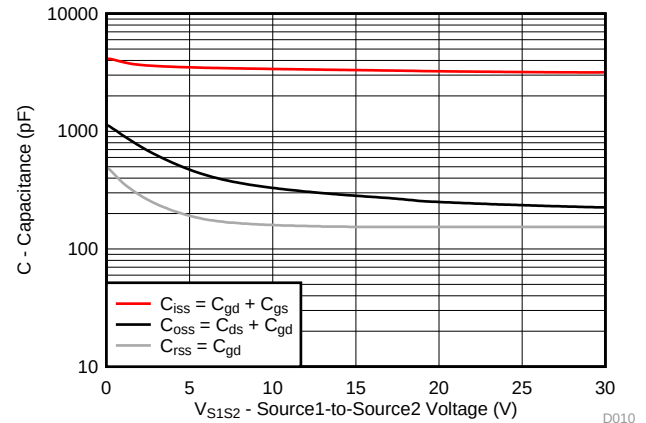


Figure 10. Capacitance

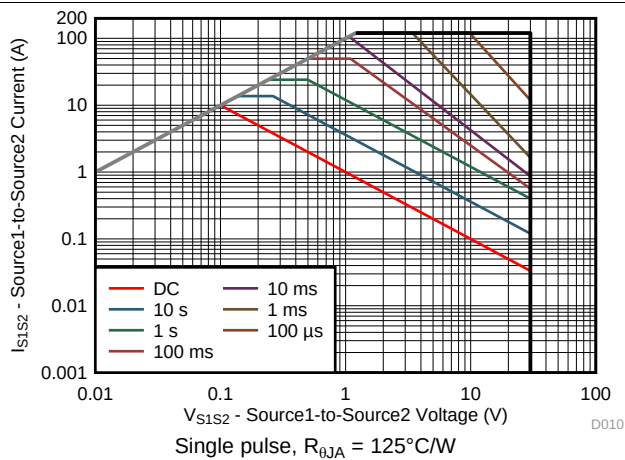


Figure 11. Maximum Safe Operating Area

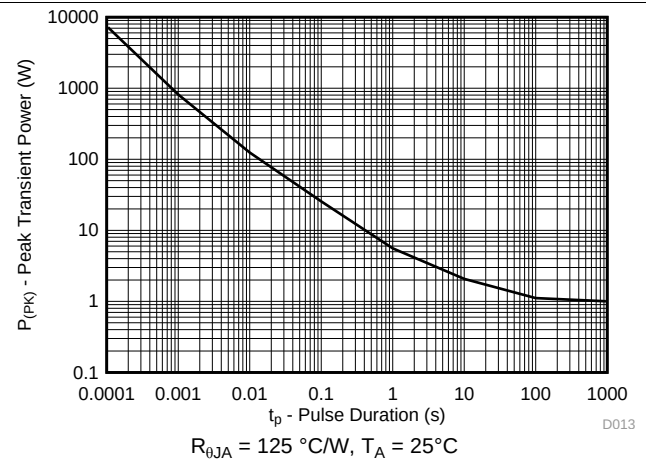


Figure 12. Single Pulse Maximum Power Dissipation

Typical MOSFET Characteristics (continued)

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

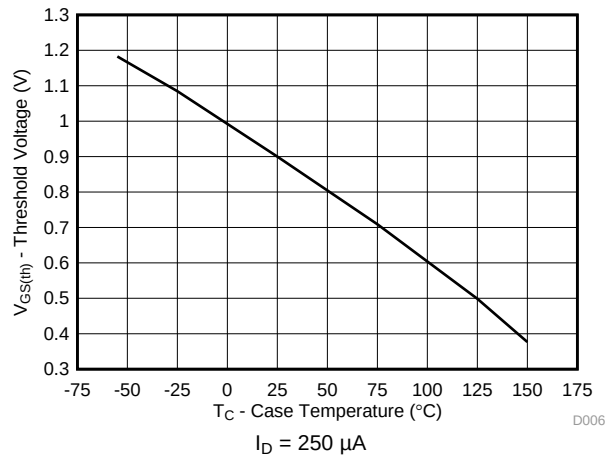


Figure 13. Threshold Voltage vs Temperature

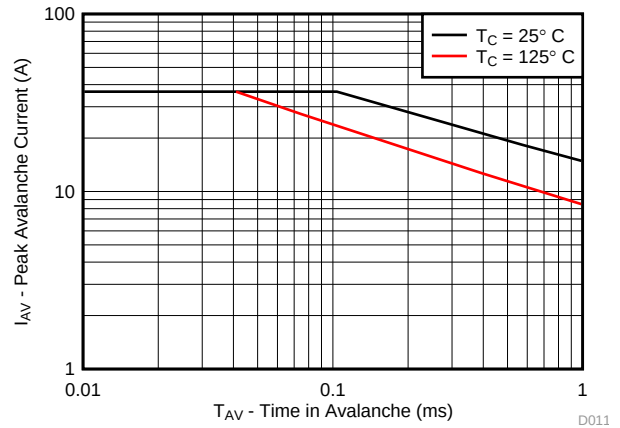


Figure 14. Single Pulse Unclamped Inductive Switching

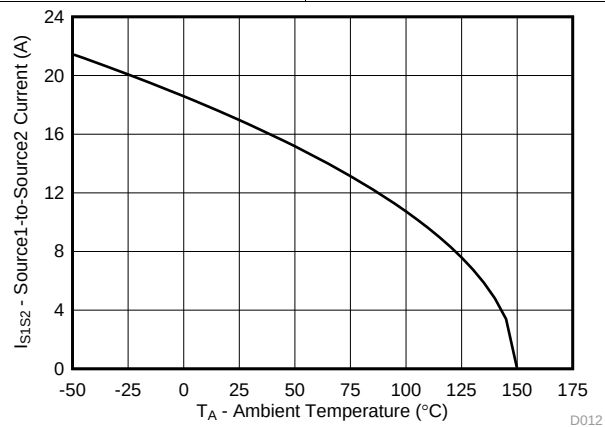
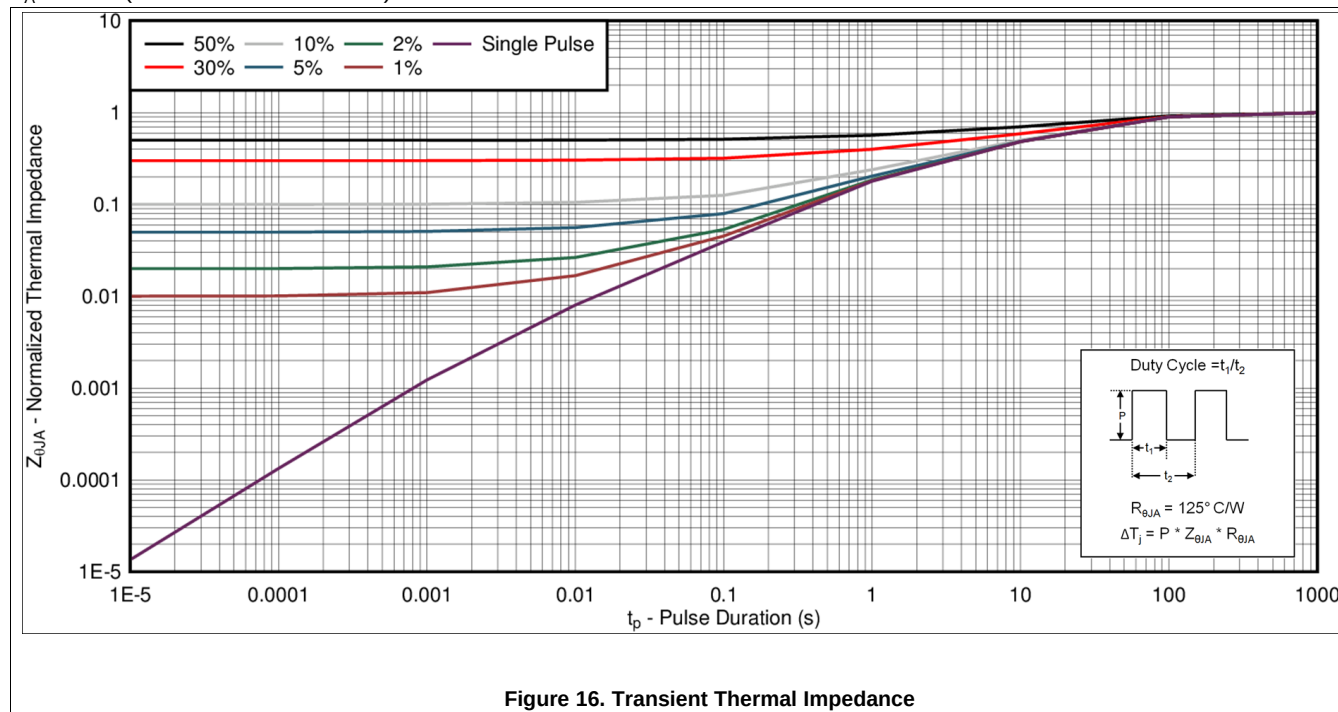


Figure 15. Maximum Source1-to-Source2 Current vs Temperature

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

如需接收文档更新通知，请访问 www.ti.com.cn 网站上的器件产品文件夹。点击右上角的提醒我 (Alert me) 注册后，即可每周定期收到已更改的产品信息。有关更改的详细信息，请查阅已修订文档中包含的修订历史记录。

6.2 社区资源

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

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

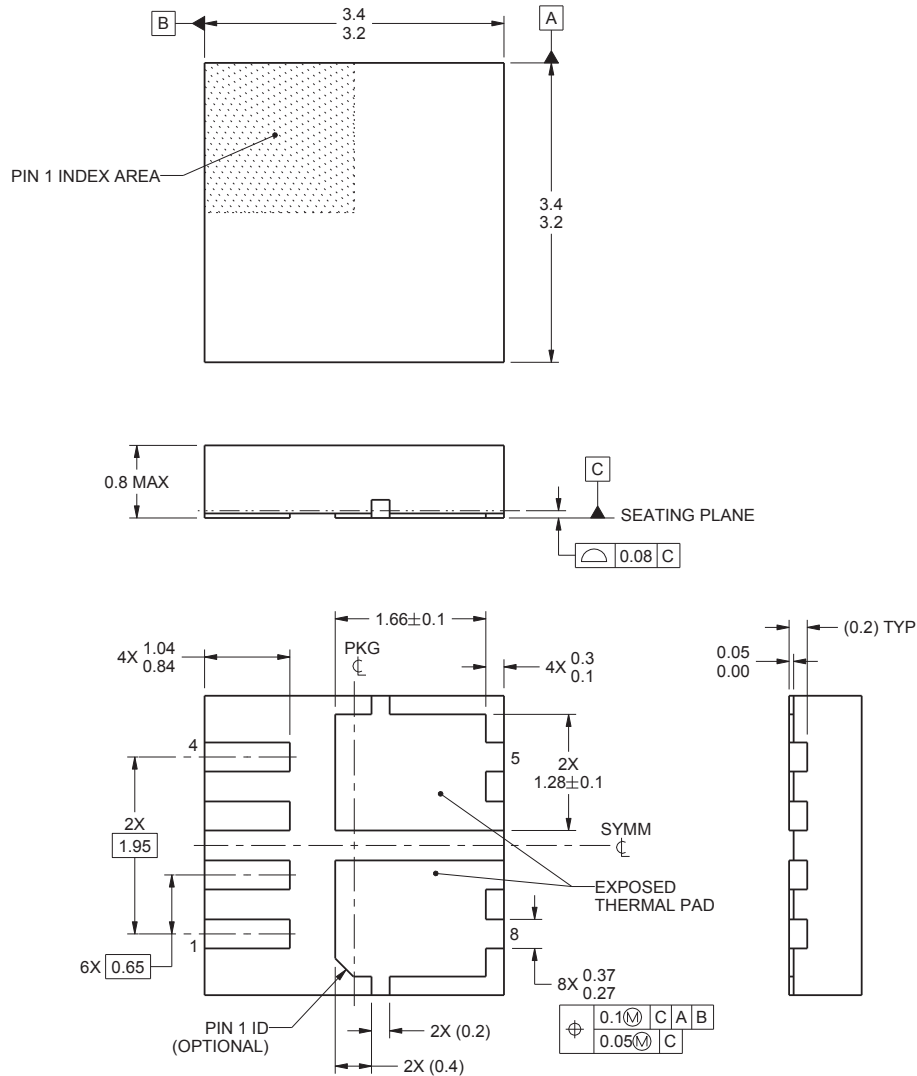
SLYZ022 — *TI Glossary*.

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

7 机械、封装和可订购信息

以下页中包括机械、封装和可订购信息。这些信息是针对指定器件可提供的最新数据。这些数据会在无通知且不对本文档进行修订的情况下发生改变。欲获得该数据表的浏览器版本，请查阅左侧的导航栏

7.1 DMS 封装尺寸



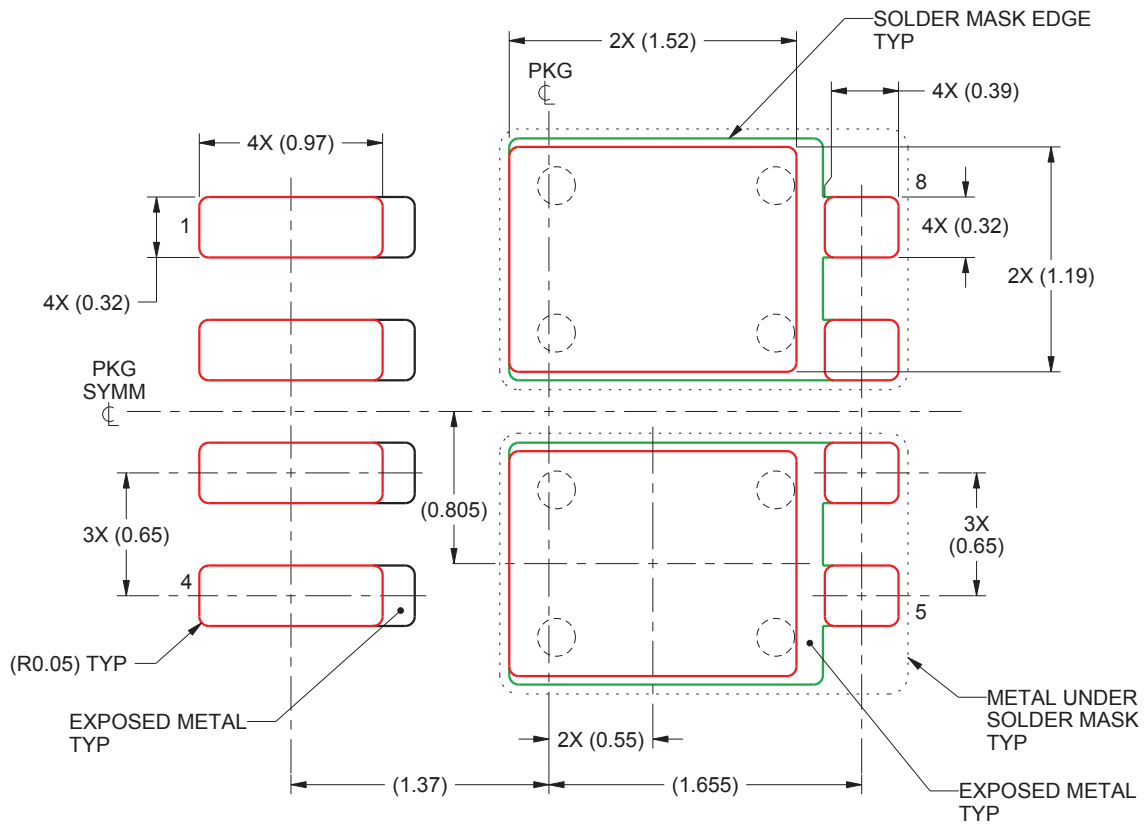
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- (1) 所有线性尺寸的单位均为毫米。括号中的任何尺寸仅供参考。尺寸和容限值遵循 ASME Y14.5M。
- (2) 本图纸如有变更，恕不通知。
- (3) 必须在印刷电路板上焊接封装散热焊盘，以获得良好的散热和机械性能。

表 1. 引脚配置表

位置	名称	位置	名称
1	栅极 1	5	源极 2
2	漏极	6	源极 2
3	漏极	7	源极 1
4	栅极 2	8	源极 1

7.3 建议模板开口



- (1) 具有漏斗形壁和圆角的激光切割窗孔将提供更佳的焊锡膏脱离。IPC-7525 可能提供其他替代性设计建议。

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
CSD87313DMS	Active	Production	WSO N (DMS) 8	2500 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	CSD87313
CSD87313DMS.B	Active	Production	WSO N (DMS) 8	2500 LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-55 to 150	CSD87313
CSD87313DMST	Active	Production	WSO N (DMS) 8	250 SMALL T&R	ROHS Exempt	SN	Level-1-260C-UNLIM	-55 to 150	CSD87313
CSD87313DMST.B	Active	Production	WSO N (DMS) 8	250 SMALL T&R	ROHS Exempt	SN	Level-1-260C-UNLIM	-55 to 150	CSD87313

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts 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.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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