CSD25310Q2 20V P 沟道 NexFET™ 功率 MOSFET

1 特性

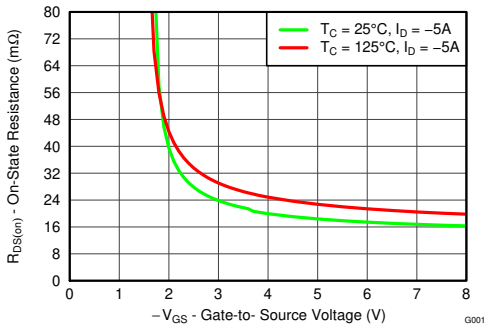
- 超低 Q_g 和 Q_{gd}
- 低导通电阻
- 低热阻
- 无铅
- 符合 RoHS
- 无卤素
- SON 2mm × 2mm 塑料封装

2 应用

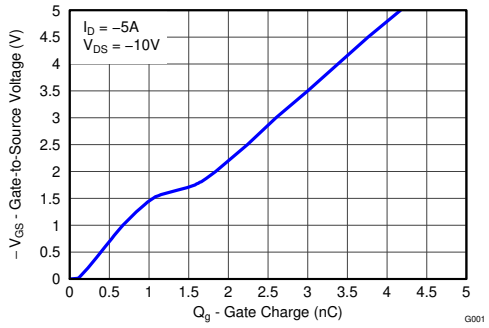
- 电池管理
- 负载管理
- 电池保护

3 说明

这款 19.9mΩ、–20V P 沟道器件旨在以超薄且具有出色散热特性的极小封装提供更低的导通电阻和栅极电荷。该器件将低导通电阻与 SON 2mm × 2mm 塑料封装的极小封装尺寸融为一体，堪称电池供电型空间受限应用的理想之选。



$R_{DS(on)}$ 与 V_{GS} 之间的关系



栅极电荷

产品概要

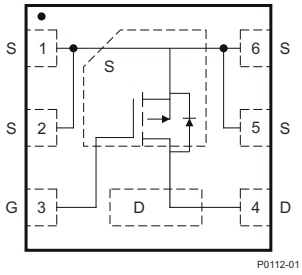
T_A = 25°C		典型值		单位
V_{DS}	漏源电压	-20		V
Q_g	栅极电荷总量 (-4.5V)	3.6		nC
Q_{gd}	栅漏栅极电荷	0.5		nC
$R_{DS(on)}$	漏源导通电阻	V_{GS} = -1.8V	59.0	mΩ
		V_{GS} = -2.5V	27.0	mΩ
		V_{GS} = -4.5V	19.9	mΩ
$V_{GS(th)}$	阈值电压	-0.85		V

订购信息

器件	介质	数量	封装	运输
CSD25310Q2	7 英寸卷带	3000	SON 2mm x 2mm 塑料封装	卷带包装
CSD25310Q2T	7 英寸卷带	250		

绝对最大额定值

T_A = 25°C		值	单位
V_{DS}	漏源电压	-20	V
V_{GS}	栅源电压	±8	V
I_D	持续漏极电流（受封装限制）	-20	A
	持续漏极电流(1)	-9.6	A
I_{DM}	脉冲漏极电流(2)	48	A
P_D	功率耗散 1. $R_{\theta JA}$ = 43°C/W，这是在一块厚度为 0.06 英寸环氧树脂 (FR4) 印刷电路板 (PCB) 上的 1 平方英寸（2 盎司）覆铜上测得的典型值。	2.9	W
T_J，T_{stg}	运行结温和储存温度范围	-55 至 150	°C



顶视图

Table of Contents

4 Specifications

4.1 Electrical Characteristics

T_A = 25°C, unless otherwise specified

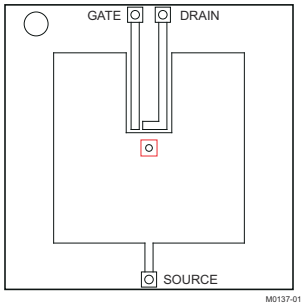
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
BV_{DSS}	Drain-to-Source Voltage	V_{GS} = 0V, I_D = –250 µA	–20			V
I_{DSS}	Drain-to-Source Leakage Current	V_{GS} = 0V, V_{DS} = –16V			–1	µA
I_{GSS}	Gate-to-Source Leakage Current	V_{DS} = 0V, V_{GS} = –8V			–100	nA
$V_{GS(th)}$	Gate-to-Source Threshold Voltage	V_{DS} = V_{GS}, I_{DS} = –250 µA	–0.55	–0.85	–1.10	V
$R_{DS(on)}$	Drain-to-Source On Resistance	V_{GS} = –1.8V, I_{DS} = –5A		59.0	89.0	mΩ
		V_{GS} = –2.5V, I_{DS} = –5A		27.0	32.5	mΩ
		V_{GS} = –4.5V, I_{DS} = –5A		19.9	23.9	mΩ
g_{fs}	Transconductance	V_{DS} = –16V, I_{DS} = –5A		34		S
DYNAMIC CHARACTERISTICS						
C_{ISS}	Input Capacitance	V_{GS} = 0V, V_{DS} = –10V, f = 1MHz		504	655	pF
C_{OSS}	Output Capacitance			281	365	pF
C_{RSS}	Reverse Transfer Capacitance			16.7	21.7	pF
R_g	Series Gate Resistance			1.9		Ω
Q_g	Gate Charge Total (–4.5 V)	V_{DS} = –10V, I_{DS} = –5A		3.6	4.7	nC
Q_{gd}	Gate Charge Gate to Drain			0.5		nC
Q_{gs}	Gate Charge Gate to Source			1.1		nC
$Q_{g(th)}$	Gate Charge at V_{th}			0.6		nC
Q_{OSS}	Output Charge	V_{DS} = –10V, V_{GS} = 0V		5.0		nC
$t_{d(on)}$	Turn On Delay Time	V_{DS} = –10V, V_{GS} = –4.5V, I_{DS} = –5A R_G = 2Ω		8		ns
t_r	Rise Time			15		ns
$t_{d(off)}$	Turn Off Delay Time			15		ns
t_f	Fall Time			5		ns
DIODE CHARACTERISTICS						
V_{SD}	Diode Forward Voltage	I_{DS} = –5A, V_{GS} = 0V		–0.8	–1.0	V
Q_{rr}	Reverse Recovery Charge	V_{DD} = –10V, I_F = –5A, di/dt = 200A/µs		9.2		nC
t_{rr}	Reverse Recovery Time			13		ns

4.2 Thermal Information

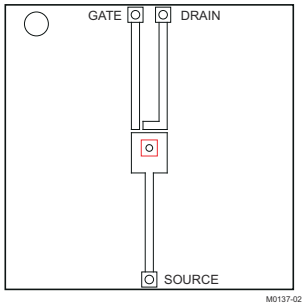
(T_A = 25°C unless otherwise stated)

THERMAL METRIC		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case(1)			4.5	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient(1) (2)			55	

(1) $R_{\theta JC}$ is determined with the device mounted on a 1 inch^2 (6.45cm^2), 2oz. (0.071mm thick) Cu pad on a 1.5 inch × 1.5 inch (3.81cm × 3.81cm), 0.06 inch (1.52mm) thick FR4 PCB. $R_{\theta JC}$ is specified by design, whereas $R_{\theta JA}$ is determined by the user's board design.
(2) Device mounted on FR4 material with 1 inch^2 (6.45cm^2), 2oz. (0.071mm thick) Cu.



Max $R_{\theta JA}$ = 55 when mounted on 1 inch^2 (6.45cm^2) of 2oz. (0.071mm thick) Cu.



Max $R_{\theta JA}$ = 215 when mounted on minimum pad area of 2oz. (0.071mm thick) Cu.

4.3 Typical MOSFET Characteristics

(T_A = 25°C unless otherwise stated)

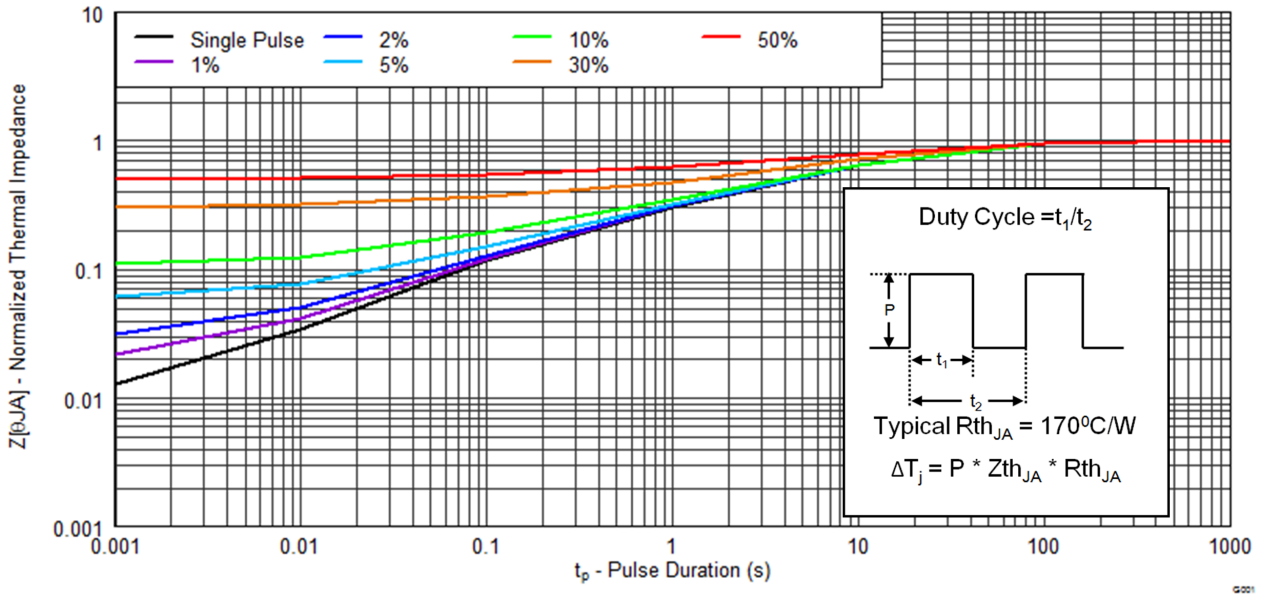


图 4-1. Transient Thermal Impedance

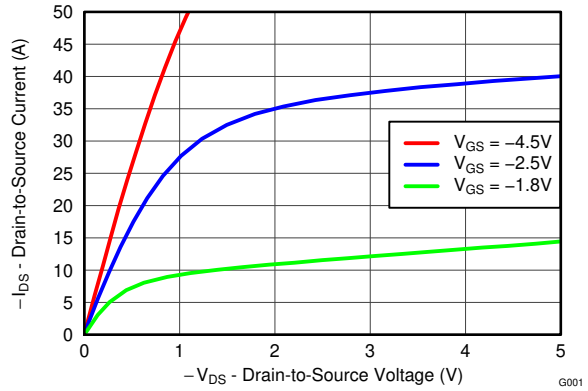


图 4-2. Saturation Characteristics

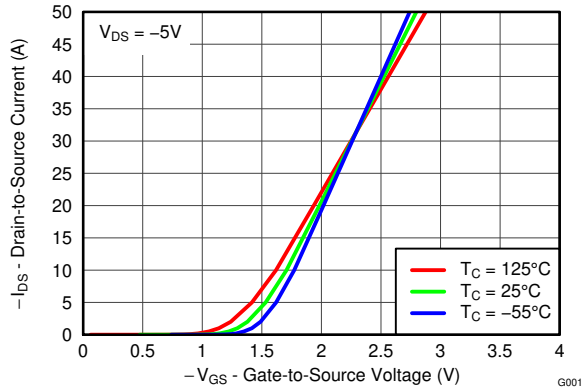


图 4-3. Transfer Characteristics

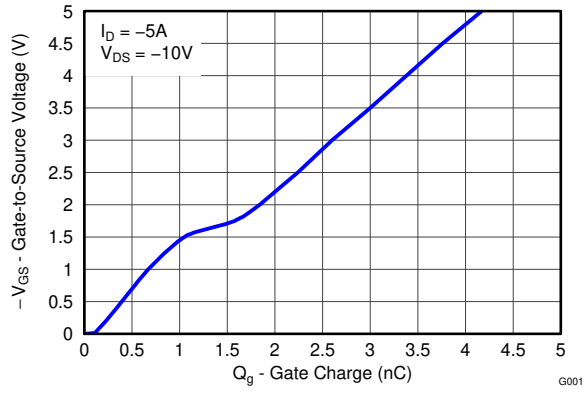


图 4-4. Gate Charge

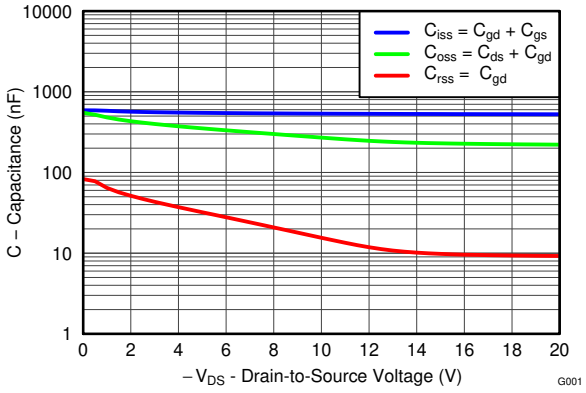


图 4-5. Capacitance

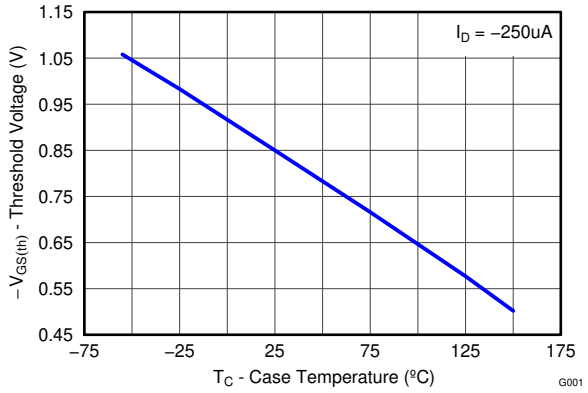


图 4-6. Threshold Voltage vs Temperature

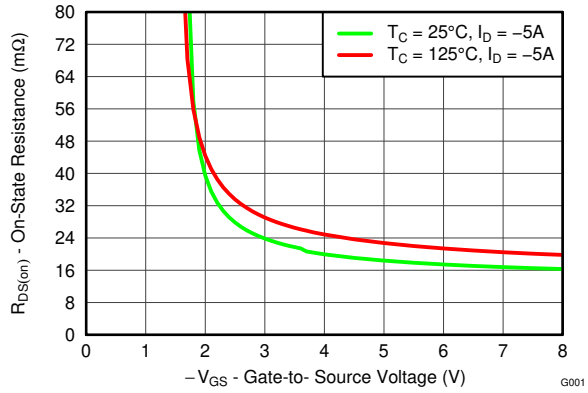


图 4-7. On-State Resistance vs Gate-to-Source Voltage

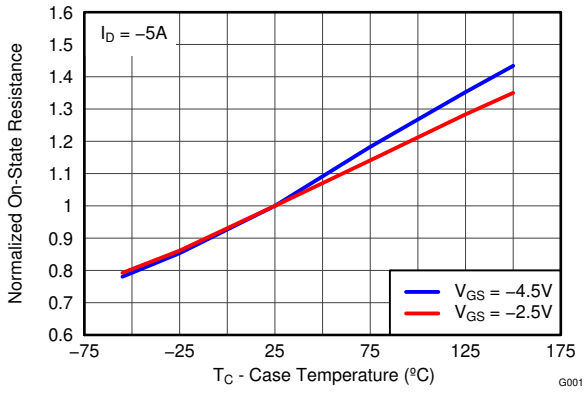


图 4-8. Normalized On-State Resistance vs Temperature

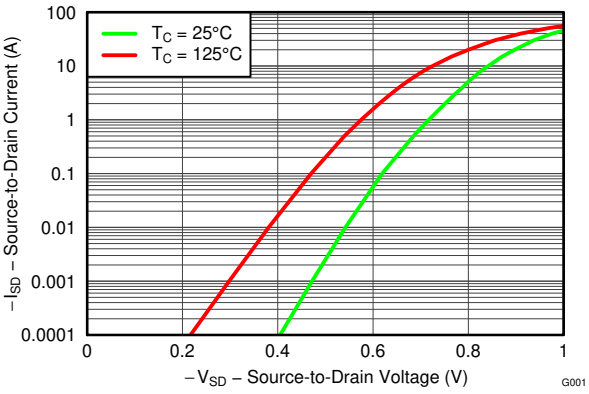


图 4-9. Typical Diode Forward Voltage

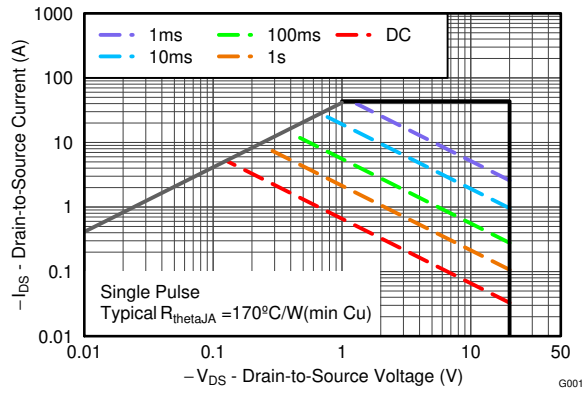


图 4-10. Maximum Safe Operating Area

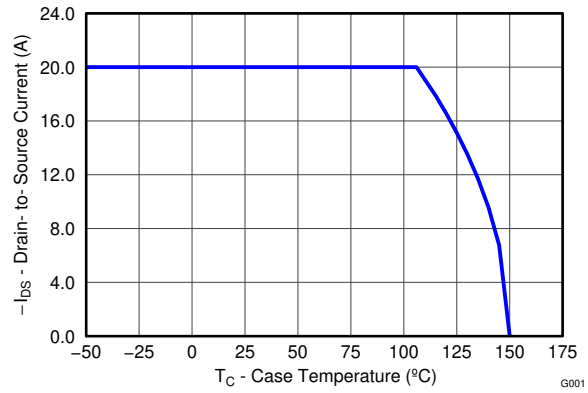


图 4-11. Maximum Drain Current vs Temperature

5 Device and Documentation Support

5.1 第三方产品免责声明

TI 发布的与第三方产品或服务有关的信息，不能构成与此类产品或服务或保修的适用性有关的认可，不能构成此类产品或服务单独或与任何 TI 产品或服务一起的表示或认可。

5.2 Documentation Support

5.2.1 Related Documentation

5.3 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。点击*通知* 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。

5.4 支持资源

TI E2E™ 中文支持论坛是工程师的重要参考资料，可直接从专家处获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题，获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”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。

5.5 Trademarks

NexFET™ is a trademark of TI.
TI E2E™ is a trademark of Texas Instruments.
所有商标均为其各自所有者的财产。

5.6 静电放电警告

静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

5.7 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。

6 Revision History

Changes from Revision B (March 2022) to Revision C (February 2025)	Page
• 更新了整个文档中的表格、图和交叉参考的编号格式	1

Changes from Revision A (June 2014) to Revision B (March 2022)	Page
• Updated drain and source connection images	4

Changes from Revision * (January 2014) to Revision A (June 2014)	Page
• 已将“无铅端子镀层”修改为唯一状态“无铅”	1
• 在订购信息表中添加了小卷带选项	1

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.

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
CSD25310Q2	ACTIVE	WSON	DQK	6	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 150	2530	Samples
CSD25310Q2T	ACTIVE	WSON	DQK	6	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-55 to 150	2530	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.

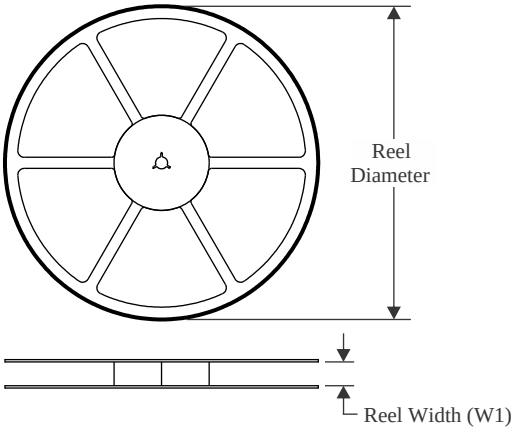
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(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.

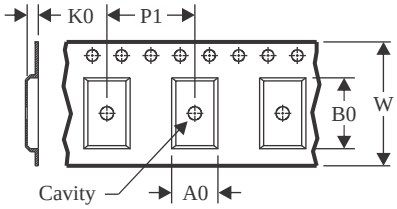
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

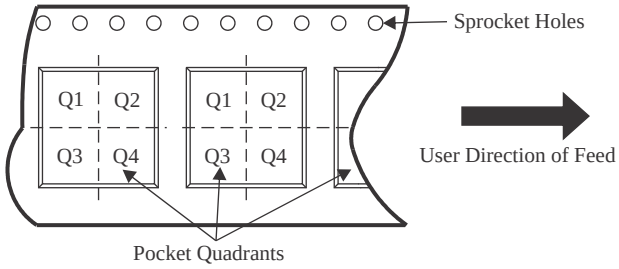


TAPE DIMENSIONS



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

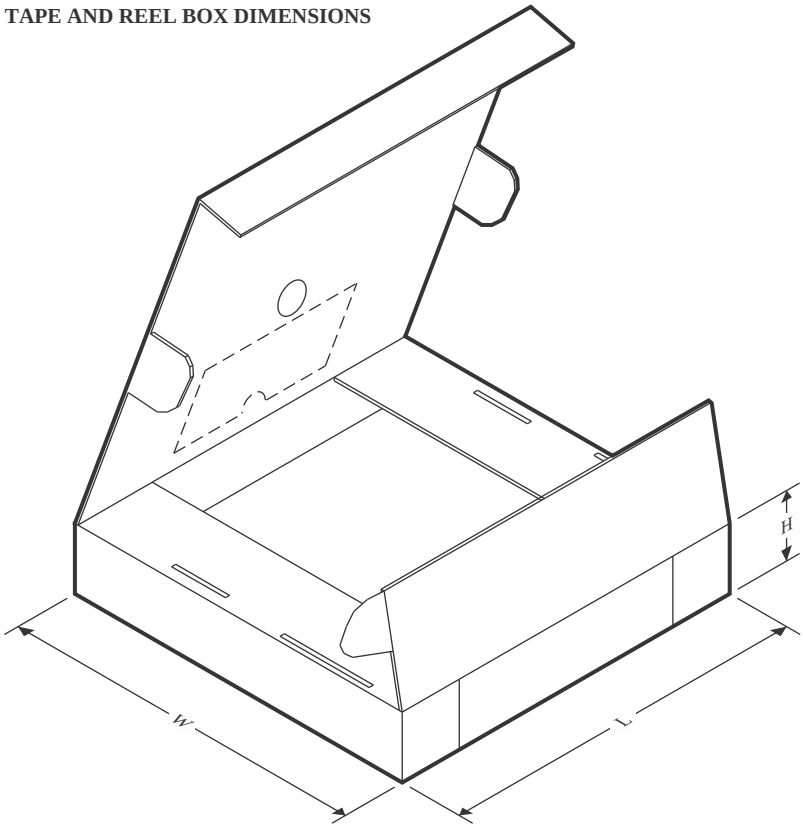
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
CSD25310Q2	WSON	DQK	6	3000	180.0	9.5	2.3	2.3	1.0	4.0	8.0	Q1
CSD25310Q2T	WSON	DQK	6	250	180.0	9.5	2.3	2.3	1.0	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)
CSD25310Q2	WSON	DQK	6	3000	189.0	185.0	36.0
CSD25310Q2T	WSON	DQK	6	250	189.0	185.0	36.0

GENERIC PACKAGE VIEW

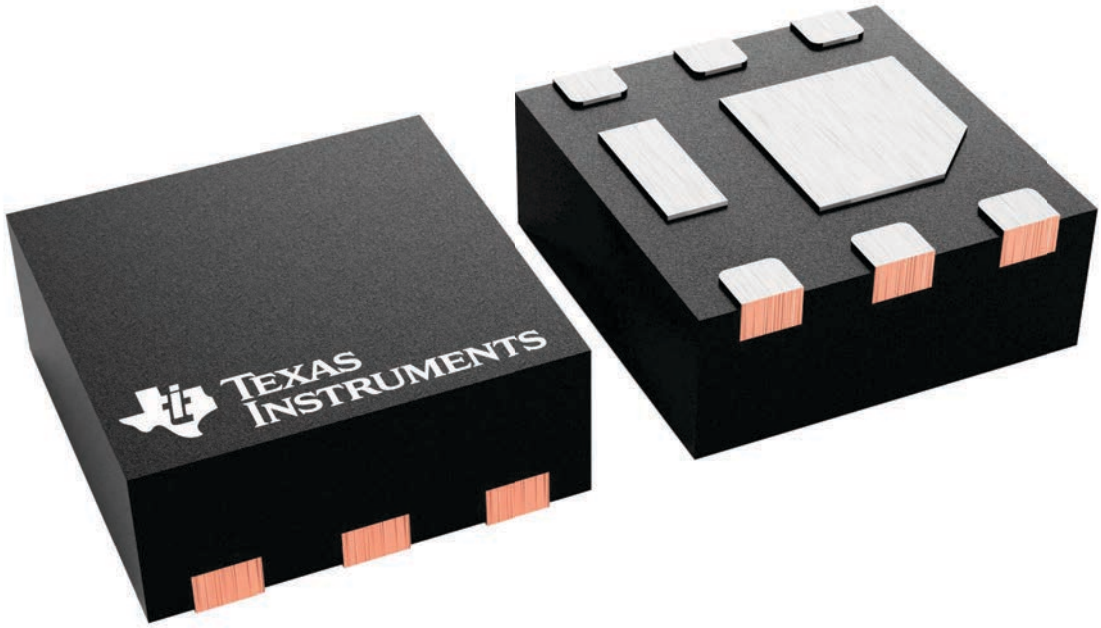
DQK 6

WSON - 0.8 mm max height

2 x 2, 0.65 mm pitch

PLASTIC SMALL OUTLINE - NO LEAD

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



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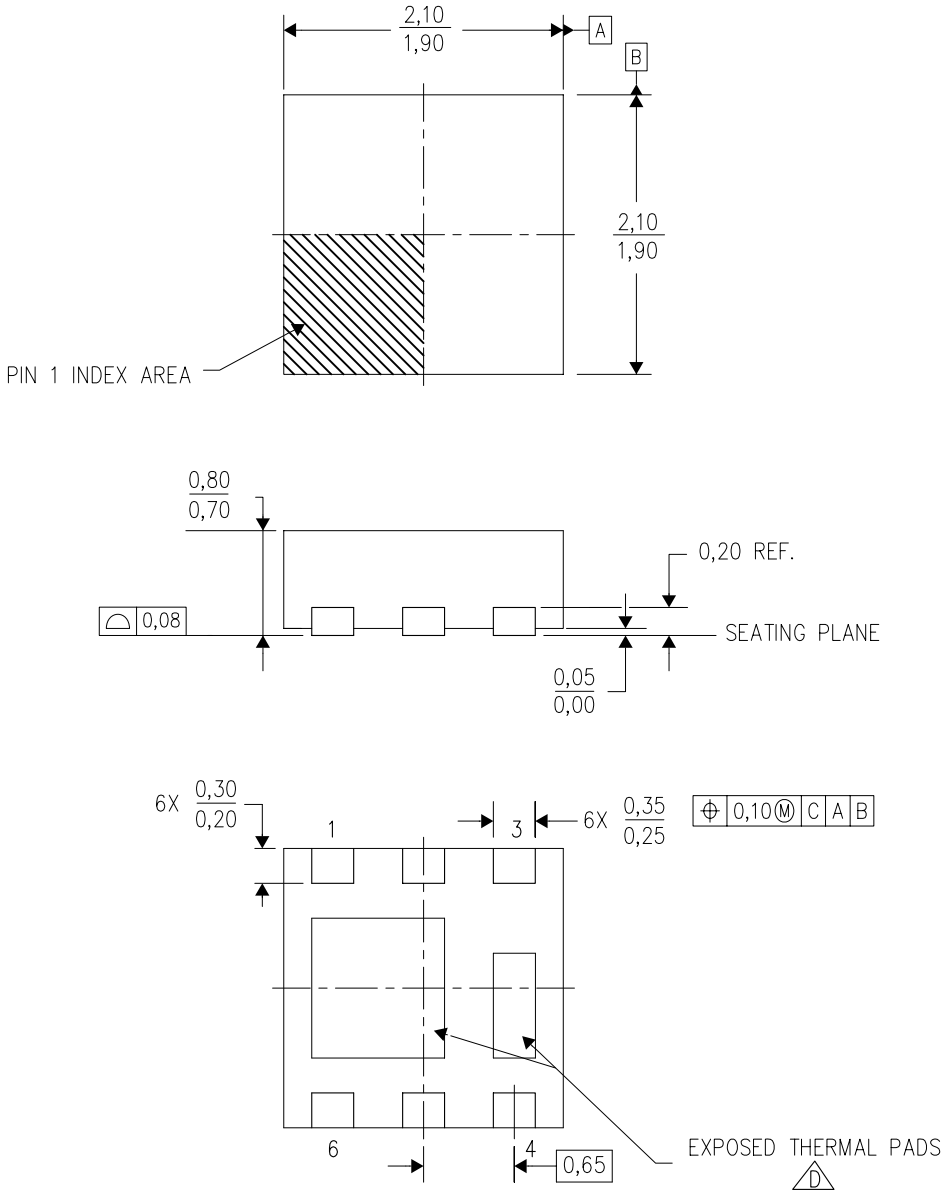
DQK (S–PWSON–N6) PLASTIC SMALL OUTLINE NO–LEAD



4210192/B 01/10

NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Small Outline No–Lead (SON) package configuration.
D. The package thermal pads must be soldered to the board for thermal and mechanical performance.

THERMAL PAD MECHANICAL DATA

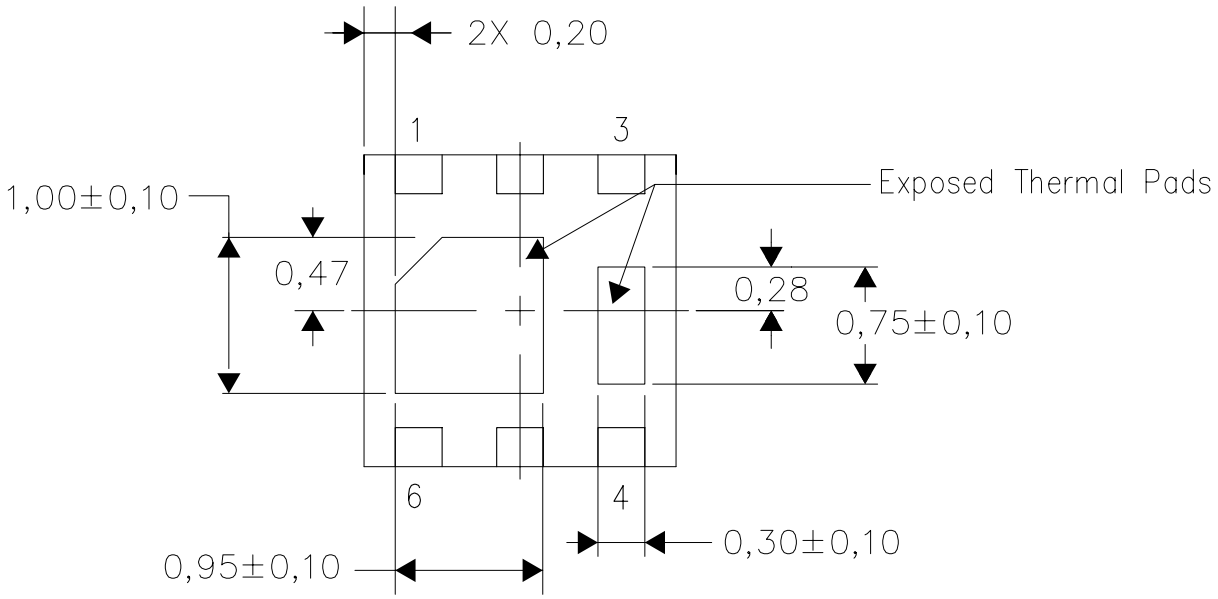
DQK (S–PWSON–N6)

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No–Lead (QFN) package and its advantages, refer to Application Report, Quad Flatpack No–Lead Logic Packages, Texas Instruments Literature No. SCBA017. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

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