

30V, N-Channel NexFET™ Power MOSFETs

Check for Samples: [CSD17510Q5A](#)

FEATURES

- **Ultralow Q_g and Q_{gd}**
- **Low Thermal Resistance**
- **Avalanche Rated**
- **Pb Free Terminal Plating**
- **RoHS Compliant**
- **Halogen Free**
- **SON 5-mm × 6-mm Plastic Package**

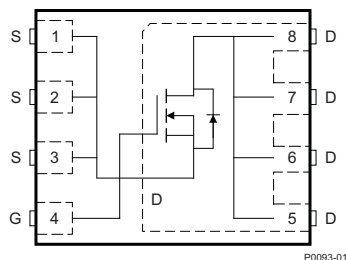
APPLICATIONS

- **Point-of-Load Synchronous Buck in Networking, Telecom, and Computing Systems**
- **Optimized for Control and Synchronous FET Applications**

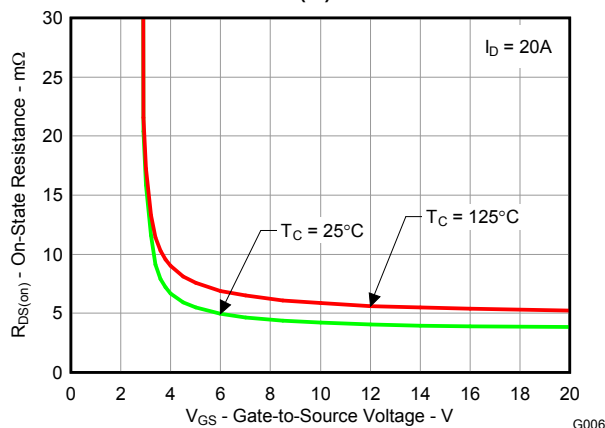
DESCRIPTION

The NexFET™ power MOSFET has been designed to minimize losses in power conversion applications.

Top View

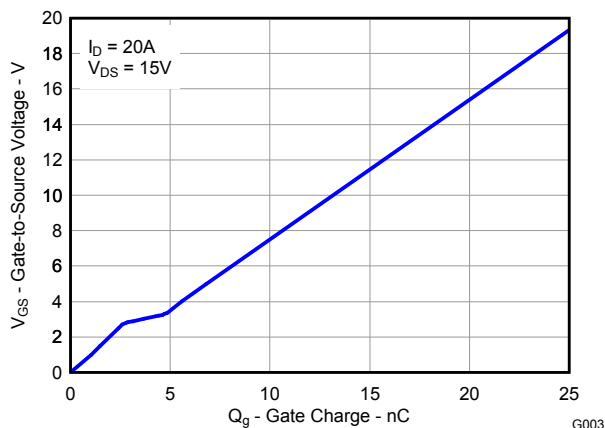


P0093-01

 $R_{DS(on)}$ vs V_{GS}


G006

GATE CHARGE



G003

PRODUCT SUMMARY

V_{DS}	Drain to Source Voltage	30	V
Q_g	Gate Charge Total (4.5V)	6.4	nC
Q_{gd}	Gate Charge Gate to Drain	1.9	nC
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 4.5V$	5.4 mΩ
		$V_{GS} = 10V$	4.1 mΩ
$V_{GS(th)}$	Threshold Voltage	1.5	V

ORDERING INFORMATION

Device	Package	Media	Qty	Ship
CSD17510Q5A	SON 5-mm × 6-mm Plastic Package	13-Inch Reel	2500	Tape and Reel

ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$ unless otherwise stated		VALUE	UNIT
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Continuous Drain Current, $T_C = 25^\circ\text{C}$	55	A
	Continuous Drain Current ⁽¹⁾	20	A
I_{DM}	Pulsed Drain Current, $T_A = 25^\circ\text{C}$ ⁽²⁾	129	A
P_D	Power Dissipation ⁽¹⁾	3	W
T_J , T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
E_{AS}	Avalanche Energy, single pulse $I_D = 54A$, $L = 0.1\text{mH}$, $R_G = 25\Omega$	146	mJ

(1) Typical $R_{\theta JA} = 41^\circ\text{C/W}$ on 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu pad on a 0.06-inch (1.52-mm) thick FR4 PCB.

(2) Pulse duration $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$



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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

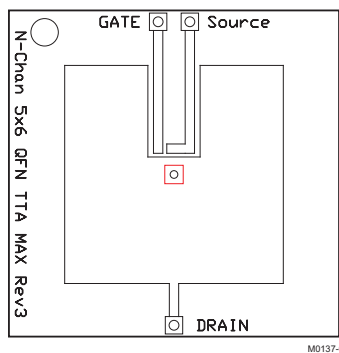
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV _{DSS}	Drain to Source Voltage	V _{GS} = 0V, I _{DS} = 250μA	30			V
I _{DSS}	Drain to Source Leakage Current	V _{GS} = 0V, V _{DS} = 24V			1	μA
I _{GSS}	Gate to Source Leakage Current	V _{DS} = 0V, V _{GS} = 20V			100	nA
V _{GS(th)}	Gate to Source Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = 250μA	1	1.5	2.1	V
R _{DS(on)}	Drain to Source On Resistance	V _{GS} = 4.5V, I _{DS} = 20A	5.4		7.3	mΩ
		V _{GS} = 10V, I _{DS} = 20A	4.1		5.2	mΩ
g _{fs}	Transconductance	V _{DS} = 15V, I _{DS} = 20A	59			S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 15V, f = 1MHz	960		1250	pF
C _{oss}	Output Capacitance		630		820	pF
C _{rss}	Reverse Transfer Capacitance		51		66	pF
R _G	Series Gate Resistance	V _{DS} = 15V, I _{DS} = 20A	0.85		1.7	Ω
Q _g	Gate Charge Total (4.5V)		6.4		8.3	nC
Q _{gd}	Gate Charge Gate to Drain		1.9			nC
Q _{gs}	Gate Charge Gate to Source		2.7			nC
Q _{g(th)}	Gate Charge at V _{th}		1.5			nC
Q _{oss}	Output Charge	V _{DS} = 13.5V, V _{GS} = 0V	16			nC
t _{d(on)}	Turn On Delay Time	V _{DS} = 15V, V _{GS} = 4.5V, I _{DS} = 20A, R _G = 2Ω	7			ns
t _r	Rise Time		11			ns
t _{d(off)}	Turn Off Delay Time		9			ns
t _f	Fall Time		4.1			ns
Diode Characteristics						
V _{SD}	Diode Forward Voltage	I _{SD} = 20A, V _{GS} = 0V	0.85		1	V
Q _{rr}	Reverse Recovery Charge	V _{DD} = 13.5V, I _F = 20A, di/dt = 300A/μs	25			nC
t _{rr}	Reverse Recovery Time		24			ns

THERMAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

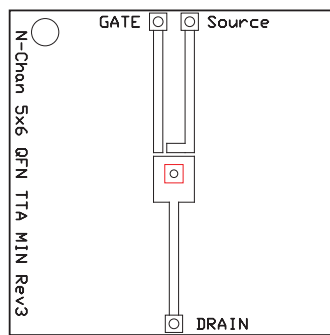
PARAMETER		MIN	TYP	MAX	UNIT
R _{θJC}	Thermal Resistance Junction to Case ⁽¹⁾			1.6	°C/W
R _{θJA}	Thermal Resistance Junction to Ambient ⁽¹⁾⁽²⁾			51	°C/W

- (1) R_{θJC} is determined with the device mounted on a 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu pad on a 1.5-inch × 1.5-inch (3.81-cm × 3.81-cm), 0.06-inch (1.52-mm) thick FR4 PCB. R_{θJC} is specified by design, whereas R_{θJA} is determined by the user's board design.
- (2) Device mounted on FR4 material with 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu.



M0137-01

Max $R_{\theta JA} = 51^{\circ}\text{C/W}$
when mounted on
1 inch² (6.45 cm²) of 2-
oz. (0.071-mm thick)
Cu.

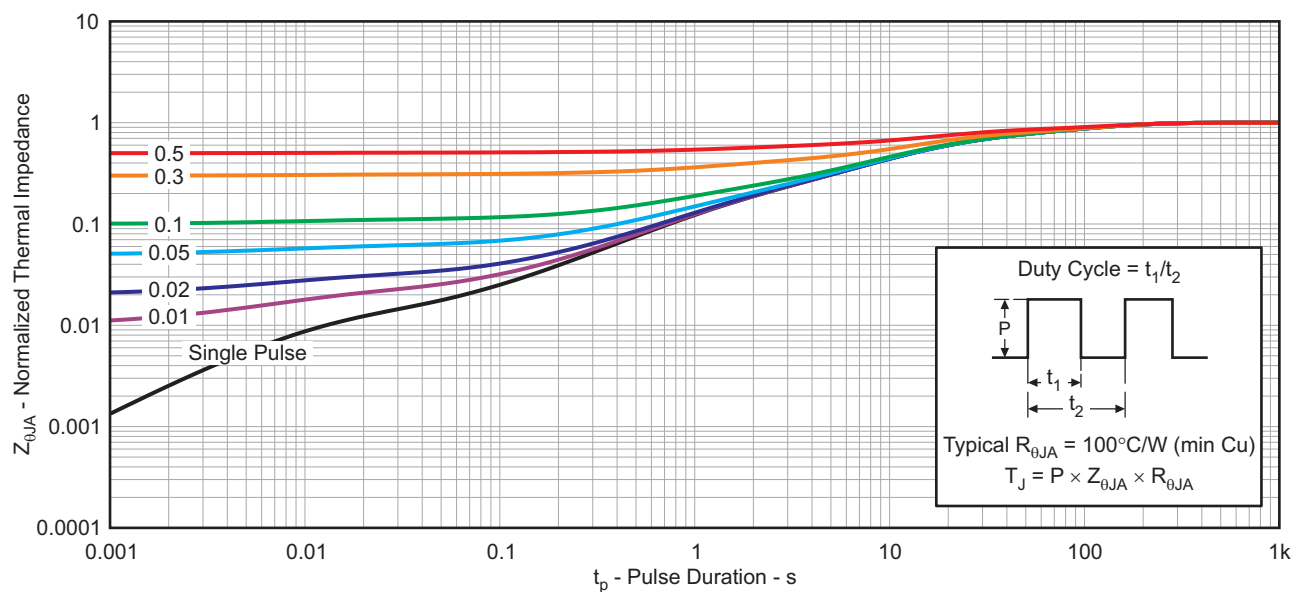


M0137-02

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

TYPICAL MOSFET CHARACTERISTICS

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



G012

Figure 1. Transient Thermal Impedance

TYPICAL MOSFET CHARACTERISTICS (continued)

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

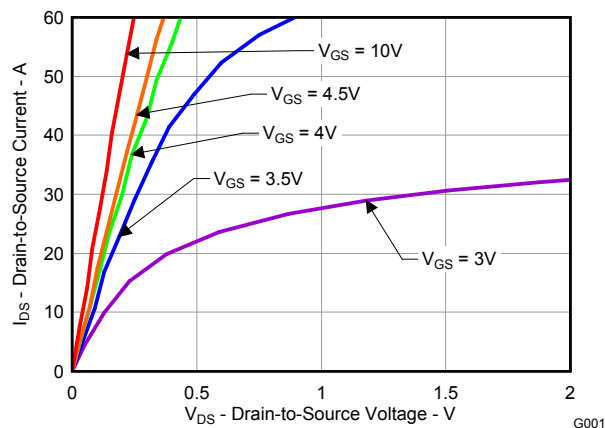


Figure 2. Saturation Characteristics

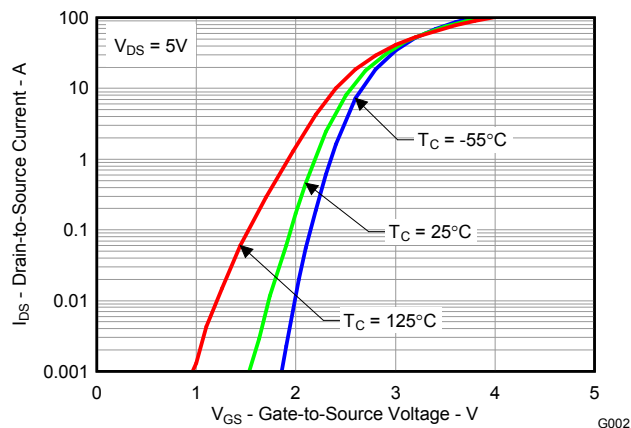


Figure 3. Transfer Characteristics

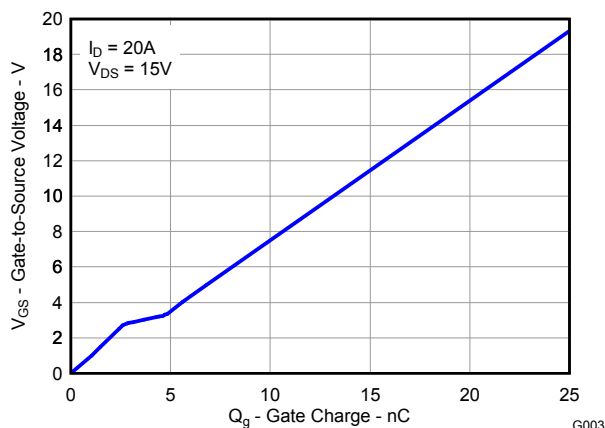


Figure 4. Gate Charge

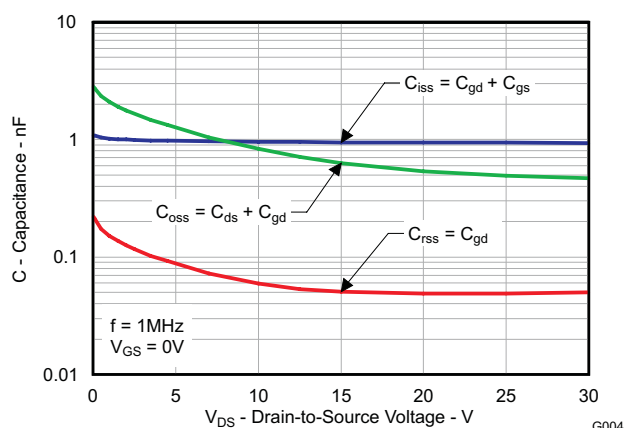


Figure 5. Capacitance

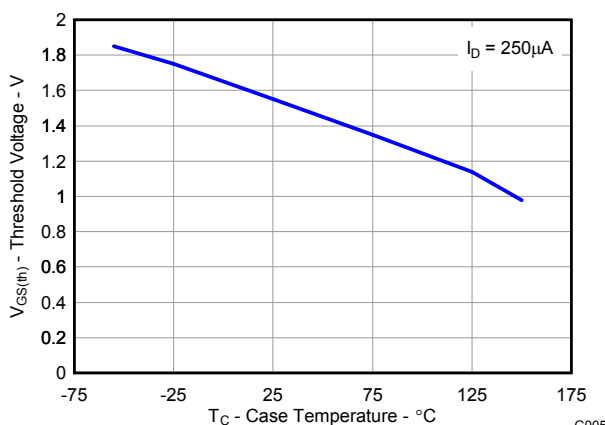


Figure 6. Threshold Voltage vs. Temperature

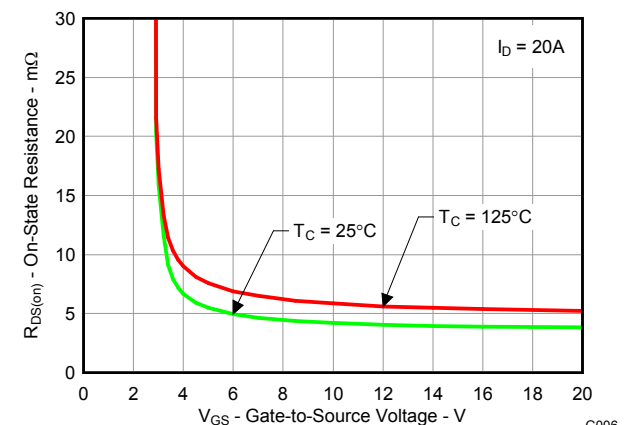


Figure 7. On-State Resistance vs. Gate-to-Source Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

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

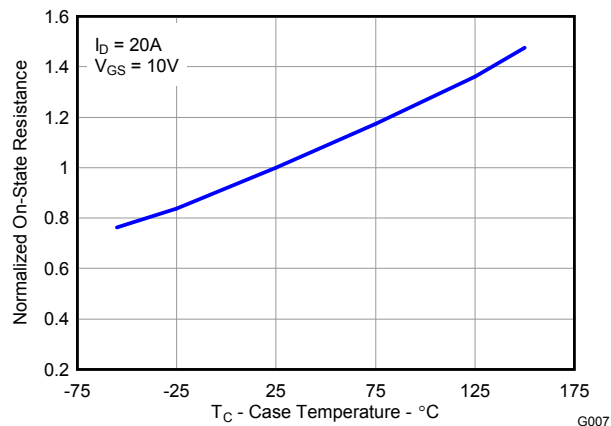


Figure 8. Normalized On-State Resistance vs. Temperature

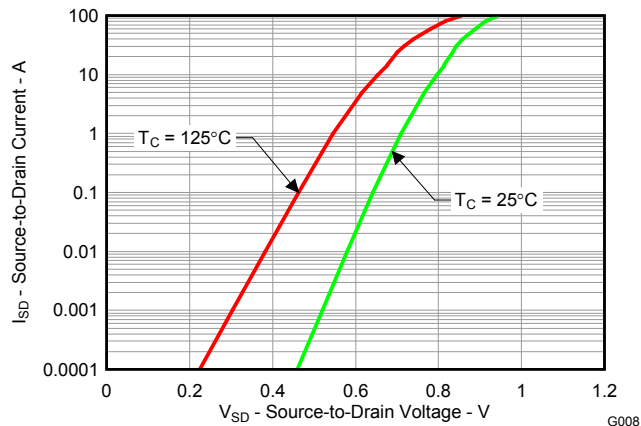


Figure 9. Typical Diode Forward Voltage

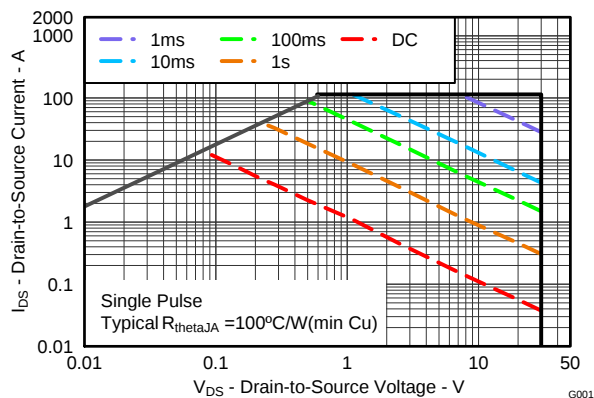


Figure 10. Maximum Safe Operating Area

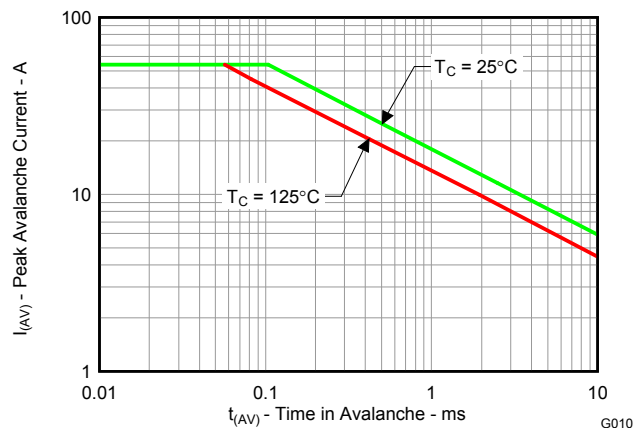


Figure 11. Single Pulse Unclamped Inductive Switching

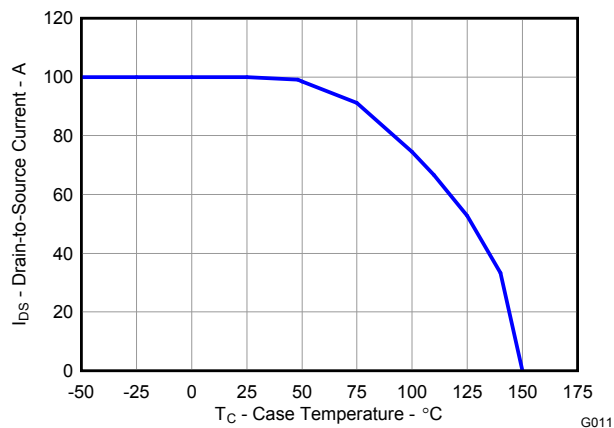
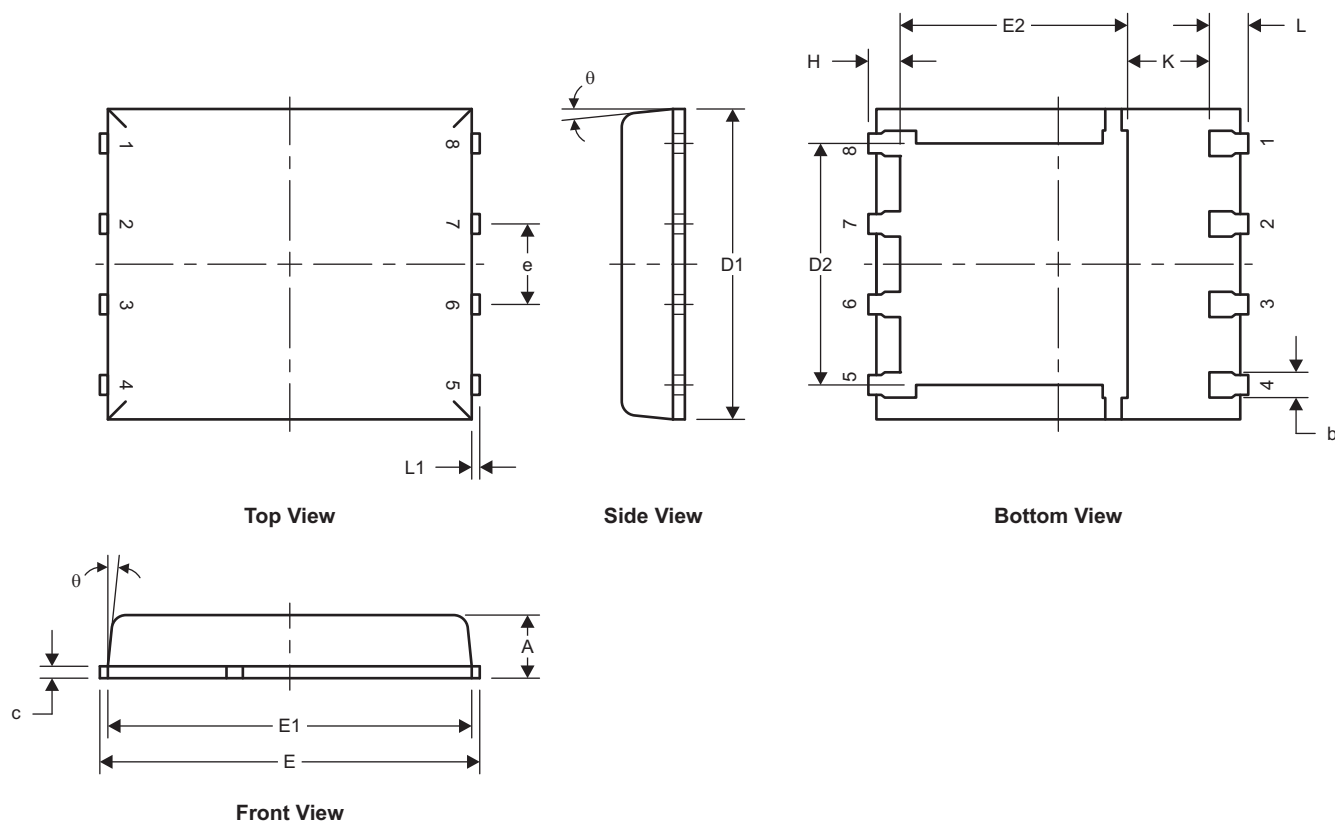


Figure 12. Maximum Drain Current vs. Temperature

MECHANICAL DATA

Q5A Package Dimensions



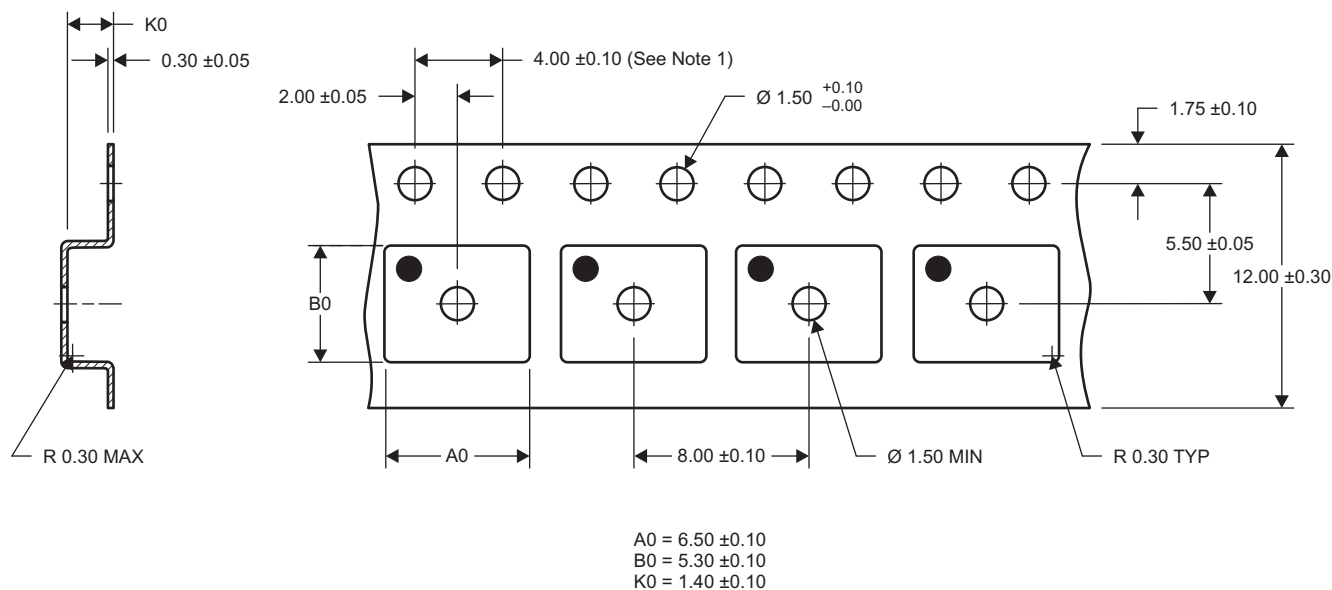
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DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
b	0.33	0.41	0.51
c	0.20	0.25	0.34
D1	4.80	4.90	5.00
D2	3.61	3.81	4.02
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e	1.17	1.27	1.37
H	0.41	0.56	0.71
K	1.10		
L	0.51	0.61	0.71
L1	0.06	0.13	0.20
θ	0°		12°

NOTE: Dimensions are in mm (inches).

NOTE: Dimensions are in mm (inches).

Q5A Tape and Reel Information



M0138-01

- NOTES:
1. 10-sprocket hole-pitch cumulative tolerance ± 0.2
 2. Camber not to exceed 1mm in 100mm, noncumulative over 250mm
 3. Material: black static-dissipative polystyrene
 4. All dimensions are in mm (unless otherwise specified)
 5. A0 and B0 measured on a plane 0.3mm above the bottom of the pocket

REVISION HISTORY

Changes from Original (July 2010) to Revision A	Page
Changed the Y axis scale for Figure 5	4
Changes from Revision A (August 2010) to Revision B	Page
Changed $R_{DS(on)}$ Test Conditions From $V_{GS} = 8V$ To: $V_{GS} = 10V$	2
Changes from Revision B (September 2010) to Revision C	Page
Absolute Maximum Ratings, changed the E_{AS} value from 45 to 146 mJ	1
Changes from Revision C (September 2010) to Revision D	Page
Added the Stencil Recommendation section	7
Changes from Revision D (November 2010) to Revision E	Page
Changed V_{GS} in the Abs Max Ratings table From: $+20/-12V$ To: $\pm 20V$	1
Changed from $+20/-12V$ to $20V$	2

Changes from Revision E (July 2011) to Revision F**Page**

- Changed the I_D Continuous Drain Current, $T_C = 25^\circ\text{C}$ value From: 100 A To: 55 A. [1](#)
 - Changed [Figure 10](#) [5](#)
-

Changes from Revision F (October 2011) to Revision G**Page**

- Changed [Figure 10](#) [5](#)
-

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
CSD17510Q5A	ACTIVE	VSONP	DQJ	8	2500	Green (RoHS & no Sb/Br)	SN	Level-1-260C-UNLIM	-55 to 150	CSD17510	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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