

DualCool™ N-Channel NexFET™ Power MOSFETs

 Check for Samples: **CSD16321Q5C**

FEATURES

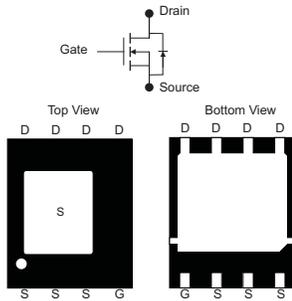
- DualCool™ Package SON 5x6mm
- Optimized for Two Sided Cooling
- Optimized for 5V Gate Drive
- Ultralow Q_g and Q_{gd}
- Low Thermal Resistance
- Avalanche Rated
- Pb Free Terminal Plating
- RoHS Compliant and Halogen Free

APPLICATIONS

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

DESCRIPTION

The NexFET™ power MOSFET has been designed to minimize losses in power conversion applications and optimized for 5V gate drive applications.



PRODUCT SUMMARY

V_{DS}	Drain to Source Voltage	25	V
Q_g	Gate Charge Total (4.5V)	14	nC
Q_{gd}	Gate Charge Gate to Drain	2.5	nC
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 3V$	2.8 mΩ
		$V_{GS} = 4.5V$	2.1 mΩ
		$V_{GS} = 8V$	1.9 mΩ
$V_{GS(th)}$	Threshold Voltage	1.1	V

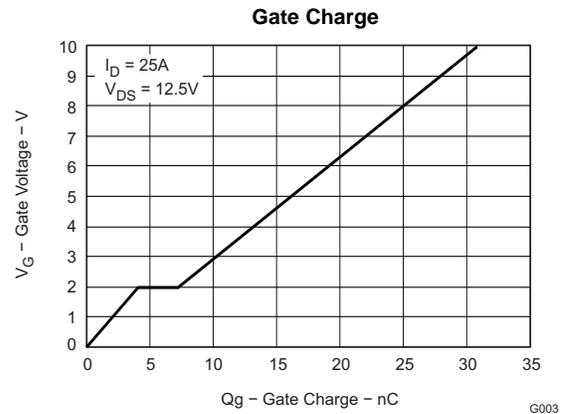
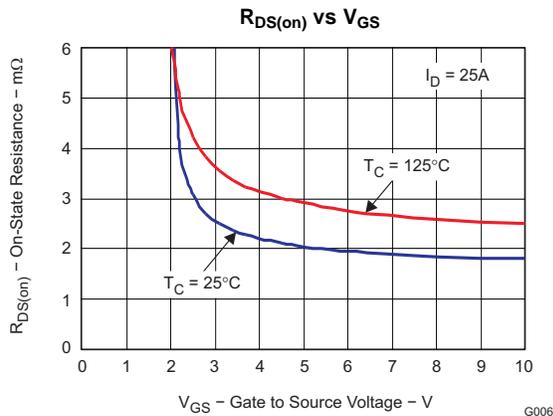
ORDERING INFORMATION

Device	Package	Media	Qty	Ship
CSD16321Q5C	SON 5x6-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	25	V
V_{GS}	Gate to Source Voltage	+10 / -8	V
I_D	Continuous Drain Current, $T_C = 25^\circ\text{C}$	100	A
	Continuous Drain Current ⁽¹⁾	31	A
I_{DM}	Pulsed Drain Current, $T_A = 25^\circ\text{C}$ ⁽²⁾	200	A
P_D	Power Dissipation ⁽¹⁾	3.1	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
E_{AS}	Avalanche Energy, single pulse $I_D = 66\text{A}, L = 0.1\text{mH}, R_G = 25\Omega$	218	mJ

- (1) Typical $R_{\theta JA} = 39^\circ\text{C/W}$ on 1-in² Cu (2-oz.) on a 0.060" 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

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

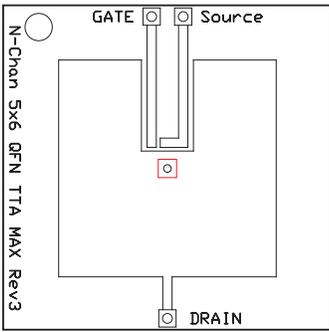
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV_{DSS}	Drain to Source Voltage	$V_{GS} = 0V, I_D = 250\mu A$	25			V
I_{DSS}	Drain to Source Leakage	$V_{GS} = 0V, V_{DS} = 20V$			1	μA
I_{GSS}	Gate to Source Leakage	$V_{DS} = 0V, V_{GS} = +10/-8V$			100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	0.9	1.1	1.4	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 3V, I_D = 25A$		2.8	3.8	m Ω
		$V_{GS} = 4.5V, I_D = 25A$		2.1	2.6	m Ω
		$V_{GS} = 8.0V, I_D = 25A$		1.9	2.4	m Ω
g_{fs}	Transconductance	$V_{DS} = 12.5V, I_D = 25A$		150		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{GS} = 0V, V_{DS} = 12.5V,$ $f = 1MHz$	2360	3100		pF
C_{oss}	Output Capacitance		1700	2200		pF
C_{rss}	Reverse Transfer Capacitance		115	150		pF
R_G	Series Gate Resistance		1.5	3		Ω
Q_g	Gate Charge Total (4.5V)	$V_{DS} = 12.5V,$ $I_{DS} = 25A$	14	19		nC
Q_{gd}	Gate Charge – Gate to Drain		2.5			nC
Q_{gs}	Gate Charge – Gate to Source		4			nC
$Q_{g(th)}$	Gate Charge at V_{th}		2.1			nC
Q_{oss}	Output Charge	$V_{DS} = 13.3V, V_{GS} = 0V$	36			nC
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = 12.5V, V_{GS} = 4.5V,$ $I_{DS} = 25A, R_G = 2\Omega$	9			ns
t_r	Rise Time		15			ns
$t_{d(off)}$	Turn Off Delay Time		27			ns
t_f	Fall Time		17			ns
Diode Characteristics						
V_{SD}	Diode Forward Voltage	$I_{DS} = 25A, V_{GS} = 0V$	0.8	1		V
Q_{rr}	Reverse Recovery Charge	$V_{DD} = 13.3V, I_F = 25A,$ $di/dt = 300A/\mu s$	33			nC
t_{rr}	Reverse Recovery Time		32			ns

THERMAL CHARACTERISTICS

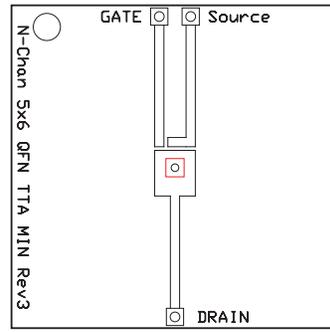
($T_A = 25^\circ\text{C}$ unless otherwise stated)

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case (Top Source) ⁽¹⁾			1.2	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case (Bottom drain) ⁽¹⁾			1.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient ⁽¹⁾⁽²⁾			48	$^\circ\text{C/W}$

- (1) $R_{\theta JC}$ is determined with the device mounted on a 1-inch² 2-oz. Cu pad on a 1.5 × 1.5-inch 0.060-inch thick FR4 board. $R_{\theta JC}$ is specified by design, whereas $R_{\theta CA}$ is determined by the user's board design.
 (2) Device mounted on FR4 material with 1-inch² of 2-oz. Cu.



Max $R_{\theta JA} = 48^{\circ}\text{C/W}$
when mounted on 1 in²
of 2-oz. Cu.



Max $R_{\theta JA} = 115^{\circ}\text{C/W}$
when mounted on
minimum pad area of
2-oz. Cu.

TYPICAL MOSFET CHARACTERISTICS

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

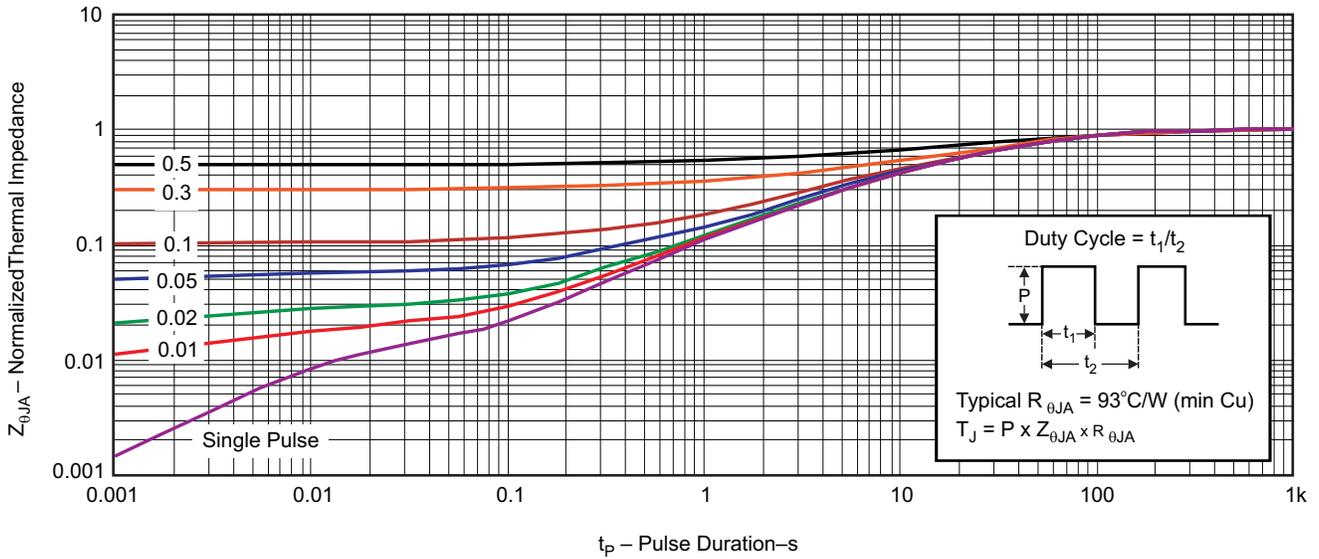


Figure 1. Transient Thermal Impedance

G012

TYPICAL MOSFET CHARACTERISTICS (continued)

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

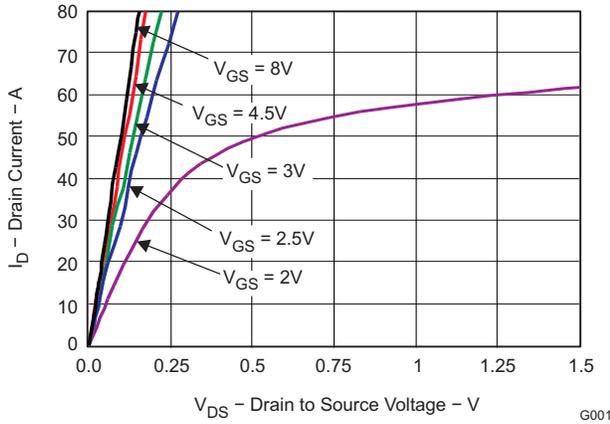


Figure 2. Saturation Characteristics

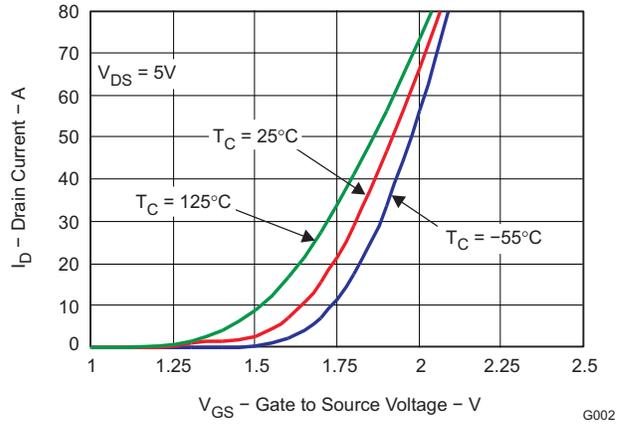


Figure 3. Transfer Characteristics

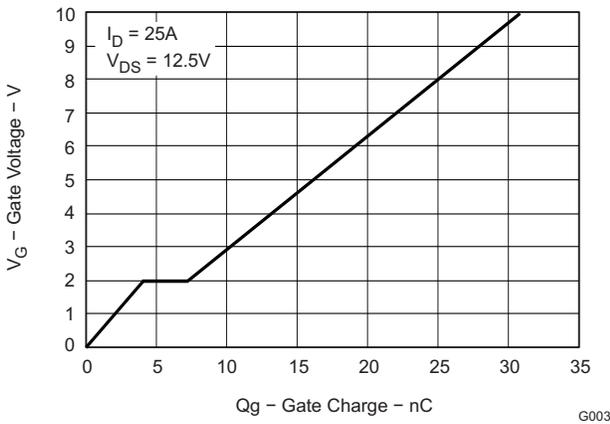


Figure 4. Gate Charge

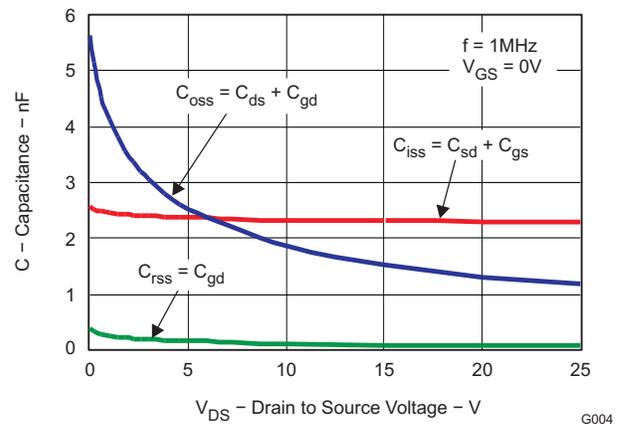


Figure 5. Capacitance

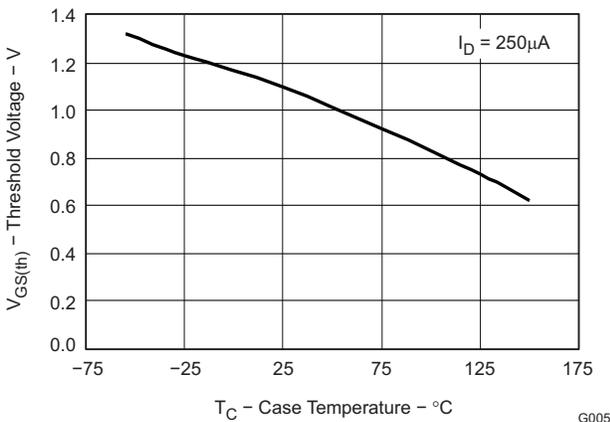


Figure 6. Threshold Voltage vs. Temperature

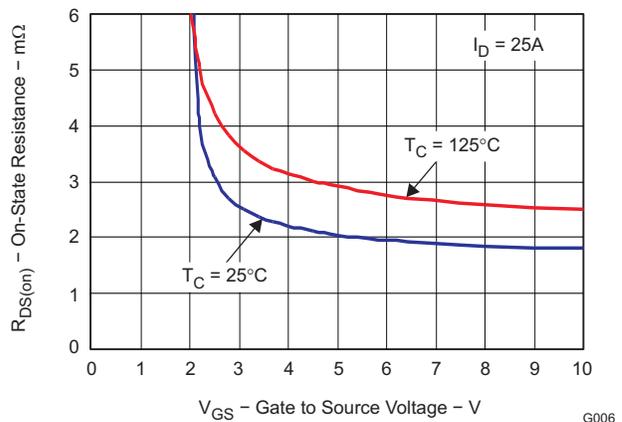


Figure 7. On Resistance vs. Gate Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

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

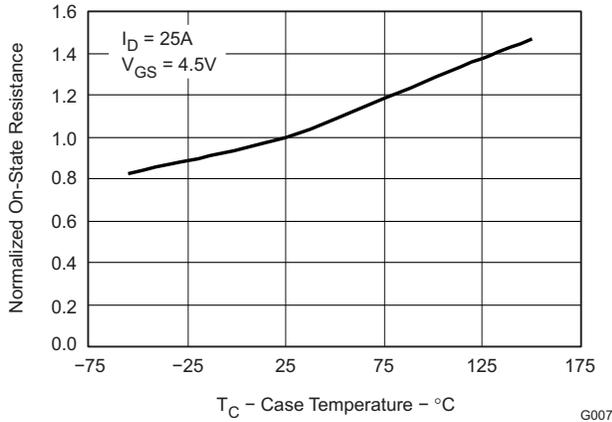


Figure 8. On Resistance vs. Temperature

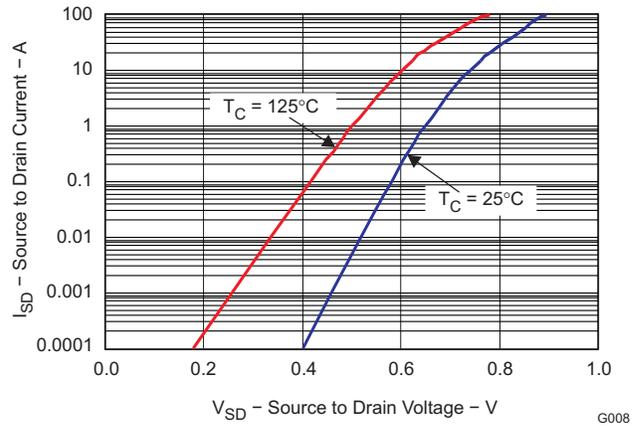


Figure 9. Typical Diode Forward Voltage

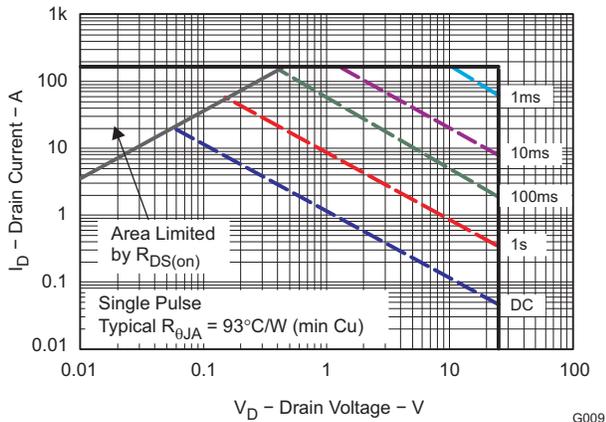


Figure 10. Maximum Safe Operating Area

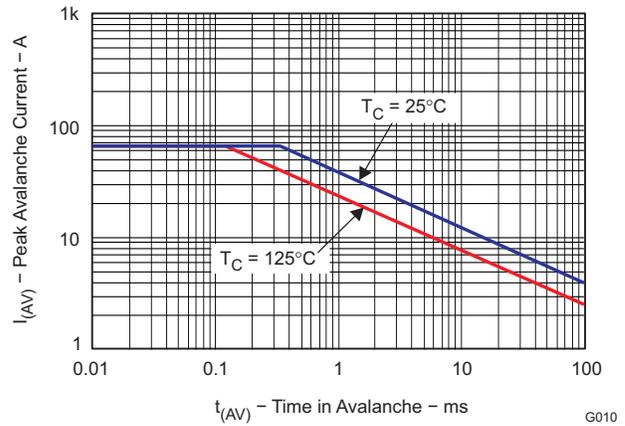


Figure 11. Single Pulse Unclamped Inductive Switching

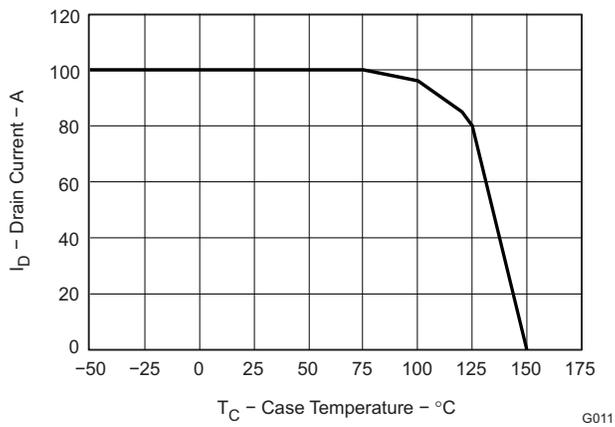
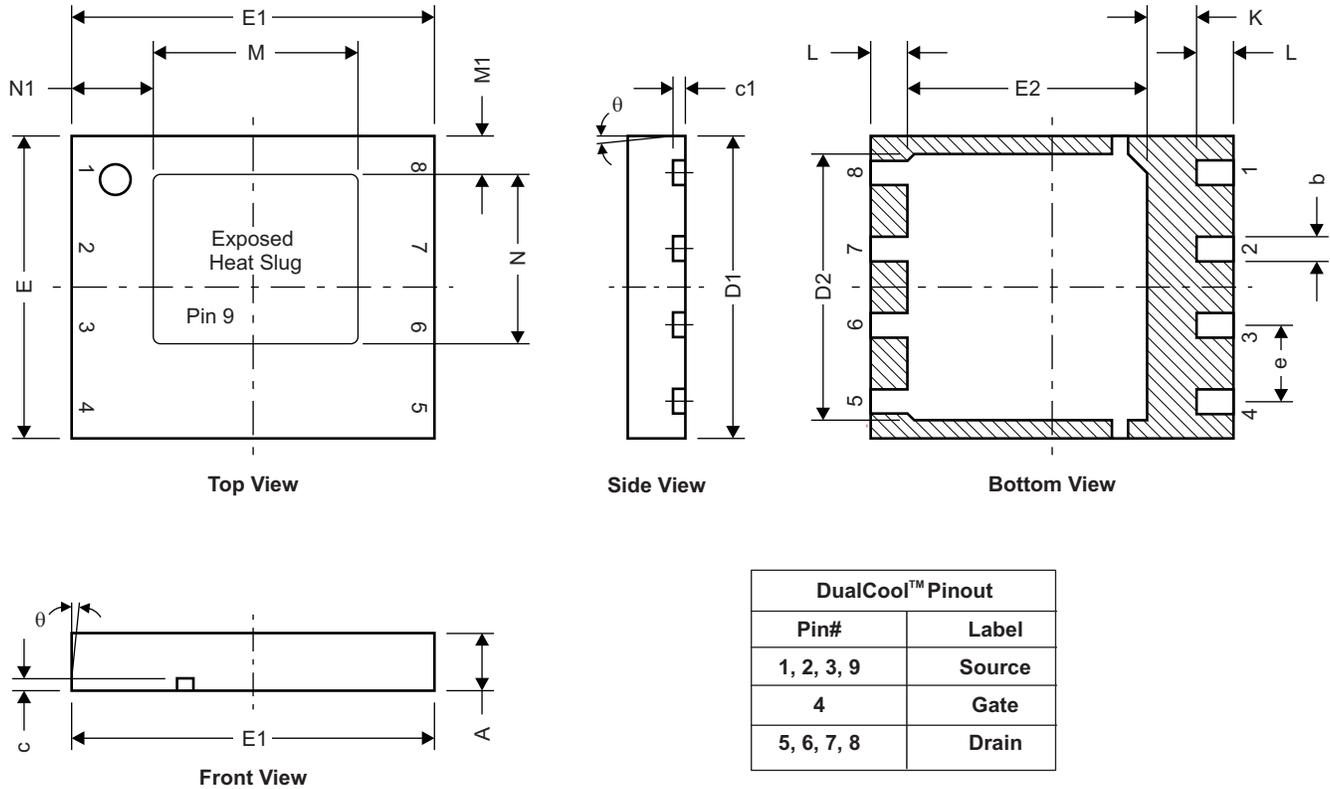


Figure 12. Maximum Drain Current vs. Temperature

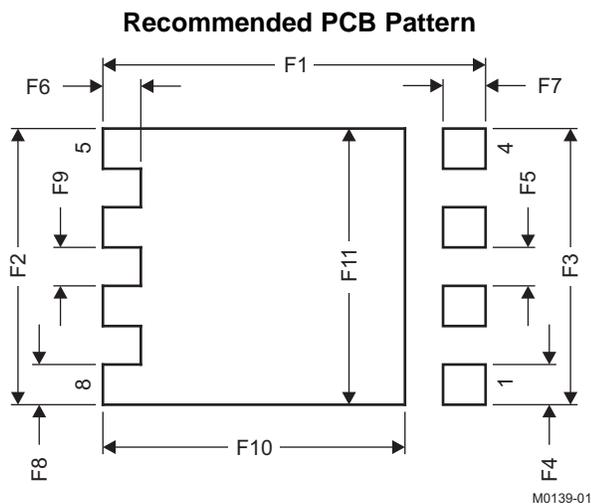
MECHANICAL DATA

Q5C Package Dimensions



M0162-01

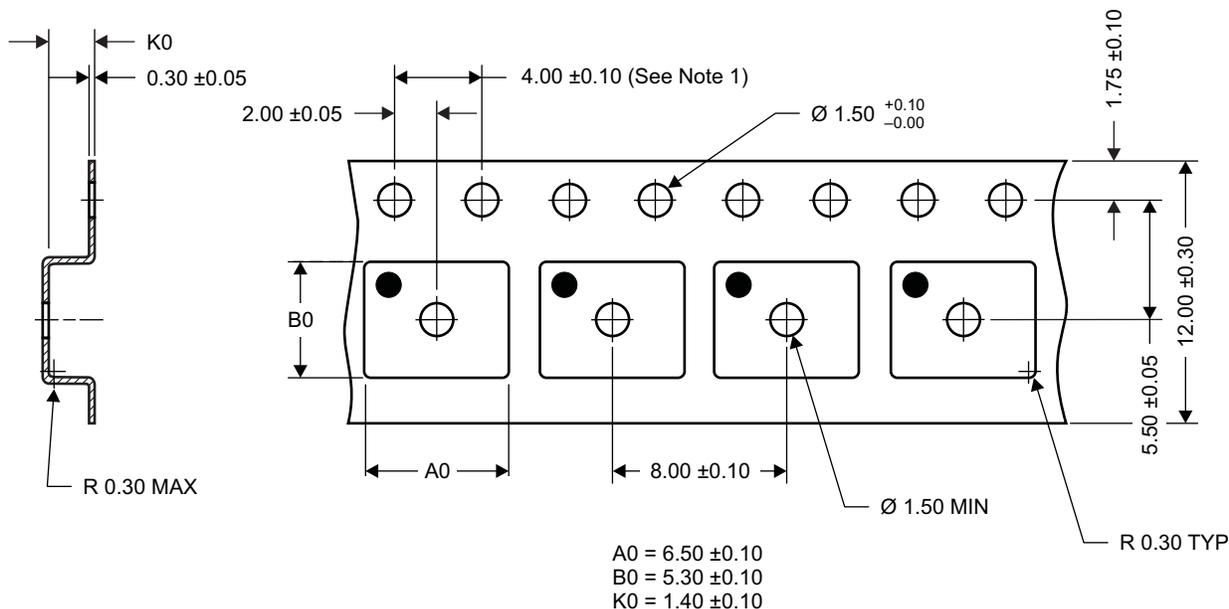
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.950	1.050	0.037	0.039
b	0.360	0.460	0.014	0.018
c	0.150	0.250	0.006	0.010
c1	0.150	0.250	0.006	0.010
D1	4.900	5.100	0.193	0.201
D2	4.320	4.520	0.170	0.178
E	4.900	5.100	0.193	0.201
E1	5.900	6.100	0.232	0.240
E2	3.920	4.12	0.154	0.162
e	1.27 TYP		0.050	
L	0.510	0.710	0.020	0.028
theta	-	-	-	-
K	0.760	-	0.030	-
M	3.260	3.460	0.128	0.136
M1	0.520	0.720	0.020	0.028
N	2.720	2.920	0.107	0.115
N1	1.227	1.427	0.048	0.056



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
F1	6.205	6.305	0.244	0.248
F2	4.46	4.56	0.176	0.18
F3	4.46	4.56	0.176	0.18
F4	0.65	0.7	0.026	0.028
F5	0.62	0.67	0.024	0.026
F6	0.63	0.68	0.025	0.027
F7	0.7	0.8	0.028	0.031
F8	0.65	0.7	0.026	0.028
F9	0.62	0.67	0.024	0.026
F10	4.9	5	0.193	0.197
F11	4.46	4.56	0.176	0.18

For recommended circuit layout for PCB designs, see application note [SLPA005 – Reducing Ringing Through PCB Layout Techniques](#).

Q5C Tape and Reel Information



M0138-01

Notes:

- 10-sprocket hole-pitch cumulative tolerance ± 0.2
- Camber not to exceed 1mm in 100mm, noncumulative over 250mm
- Material: black static-dissipative polystyrene
- All dimensions are in mm, unless otherwise specified.
- A0 and B0 measured on a plane 0.3mm above the bottom of the pocket
- MSL1 260°C (IR and convection) PbF reflow compatible

REVISION HISTORY**Changes from Original (December 2009) to Revision A****Page**

-
- Changed the Mechanical Data dimensions table. Added dimensions for M, M1, N and N1 6
-

Changes from Revision A (January 2010) to Revision B**Page**

-
- Changed $R_{DS(on)}$ - $V_{GS} = 3V$, $I_D = 25A$ MAX value From: 3.5 To: 3.8 2
 - Deleted the Package Marking Information section 7
-

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
CSD16321Q5C	ACTIVE	SON	DQU	8	2500	Pb-Free (RoHS Exempt)	Call TI	Level-1-260C-UNLIM

⁽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⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
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