

# 30V N-Channel NexFET™ Power MOSFETs

 Check for Samples: [CSD17309Q3](#)

## FEATURES

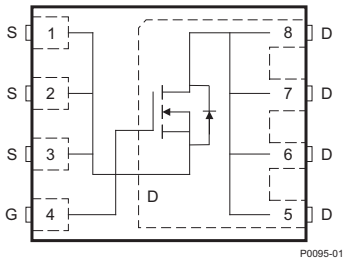
- Optimized for 5V Gate Drive
- Ultra Low  $Q_g$  and  $Q_{gd}$
- Low Thermal Resistance
- Avalanche Rated
- Pb Free Terminal Plating
- RoHS Compliant
- Halogen Free
- SON 3.3-mm x 3.3-mm Plastic Package

## APPLICATIONS

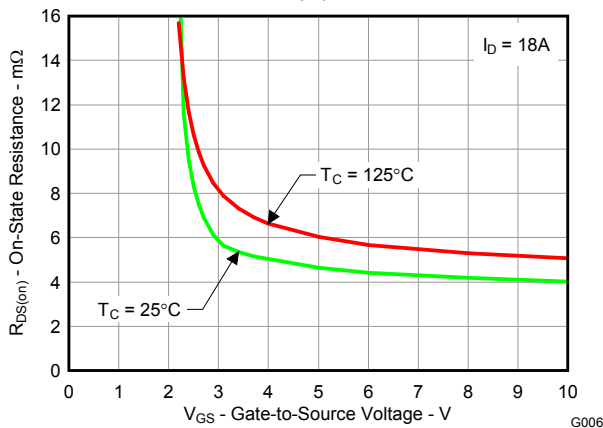
- Notebook Point of Load
- Point-of-Load Synchronous Buck in Networking, Telecom, and Computing Systems

## DESCRIPTION

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

**Top View**


P0095-01

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


G006

## PRODUCT SUMMARY

$V_{DS}$	Drain to Source Voltage	30	V
$Q_g$	Gate Charge Total (4.5V)	7.5	nC
$Q_{gd}$	Gate Charge Gate to Drain	1.7	nC
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 3V$	6.3 mΩ
		$V_{GS} = 4.5V$	4.9 mΩ
		$V_{GS} = 8V$	4.2 mΩ
$V_{GS(th)}$	Threshold Voltage	1.2	V

## ORDERING INFORMATION

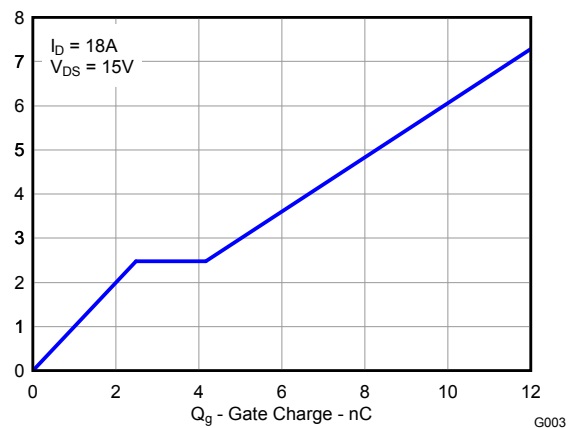
Device	Package	Media	Qty	Ship
CSD17309Q3	SON 3.3-mm x 3.3-mm Plastic Package	13-Inch Reel	2500	Tape and Reel

## 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	+10 / -8	V
$I_D$	Continuous Drain Current, $T_C = 25^\circ\text{C}$	60	A
	Continuous Drain Current <sup>(1)</sup>	20	A
$I_{DM}$	Pulsed Drain Current, $T_A = 25^\circ\text{C}$ <sup>(2)</sup>	112	A
$P_D$	Power Dissipation <sup>(1)</sup>	2.8	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$E_{AS}$	Avalanche Energy, Single Pulse $I_D = 57A, L = 0.1\text{mH}, R_G = 25\Omega$	162	mJ

(1) Typical  $R_{\theta JA} = 45^\circ\text{C/W}$  when mounted on a 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), 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  $\leq 2\%$

**GATE CHARGE**


G003



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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
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain to Source Voltage	$V_{GS} = 0V, I_D = 250\mu A$	30			V
$I_{DSS}$	Drain to Source Leakage Current	$V_{GS} = 0V, V_{DS} = 24V$			1	$\mu A$
$I_{GSS}$	Gate to Source Leakage Current	$V_{DS} = 0V, V_{GS} = +10 / -8V$			100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	0.9	1.2	1.7	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 3.0V, I_D = 18A$		6.3	8.5	m $\Omega$
		$V_{GS} = 4.5V, I_D = 18A$		4.9	6.3	m $\Omega$
		$V_{GS} = 8V, I_D = 18A$		4.2	5.4	m $\Omega$
$g_{fs}$	Transconductance	$V_{DS} = 15V, I_D = 18A$		67		S
<b>Dynamic Characteristics</b>						
$C_{ISS}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = 15V,$ $f = 1MHz$		1150	1440	pF
$C_{OSS}$	Output Capacitance			580	750	pF
$C_{RSS}$	Reverse Transfer Capacitance			43	56	pF
$R_g$	Series Gate Resistance			1.2	2.4	$\Omega$
$Q_g$	Gate Charge Total (4.5V)	$V_{DS} = 15V, I_D = 18A$		7.5	10	nC
$Q_{gd}$	Gate Charge Gate to Drain			1.7		nC
$Q_{gs}$	Gate Charge Gate to Source			2.5		nC
$Q_{g(th)}$	Gate Charge at $V_{th}$			1.3		nC
$Q_{OSS}$	Output Charge	$V_{DS} = 13V, V_{GS} = 0V$		15		nC
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = 15V, V_{GS} = 4.5V,$ $I_D = 18A, R_G = 2\Omega$		6.1		ns
$t_r$	Rise Time			9.9		ns
$t_{d(off)}$	Turn Off Delay Time			13.2		ns
$t_f$	Fall Time			3.6		ns
<b>Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage	$I_{DS} = 18A, V_{GS} = 0V$		0.85	1	V
$Q_{rr}$	Reverse Recovery Charge	$V_{DD} = 13V, I_F = 18A,$ $di/dt = 300A/\mu s$		30		nC
$t_{rr}$	Reverse Recovery Time			23		ns

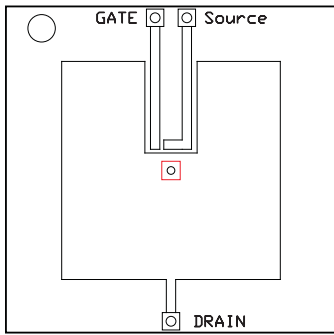
## THERMAL CHARACTERISTICS

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

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case <sup>(1)</sup>			2	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient <sup>(1)(2)</sup>			57	$^\circ\text{C/W}$

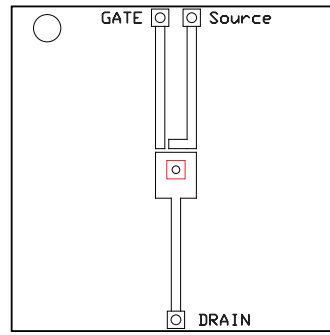
(1)  $R_{\theta JC}$  is determined with the device mounted on a 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), Cu pad on a 1.5-inch x 1.5-inch thick FR4 PCB.  $R_{\theta JC}$  is specified by design, whereas  $R_{\theta JA}$  is determined by the user's board design.

(2) Device mounted on FR4 material with 1-inch<sup>2</sup> 2-oz.Cu.



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Max  $R_{\theta JA} = 57^{\circ}\text{C/W}$   
when mounted on  
1 inch<sup>2</sup> (6.45 cm<sup>2</sup>) of  
2-oz. (0.071-mm thick)  
Cu.

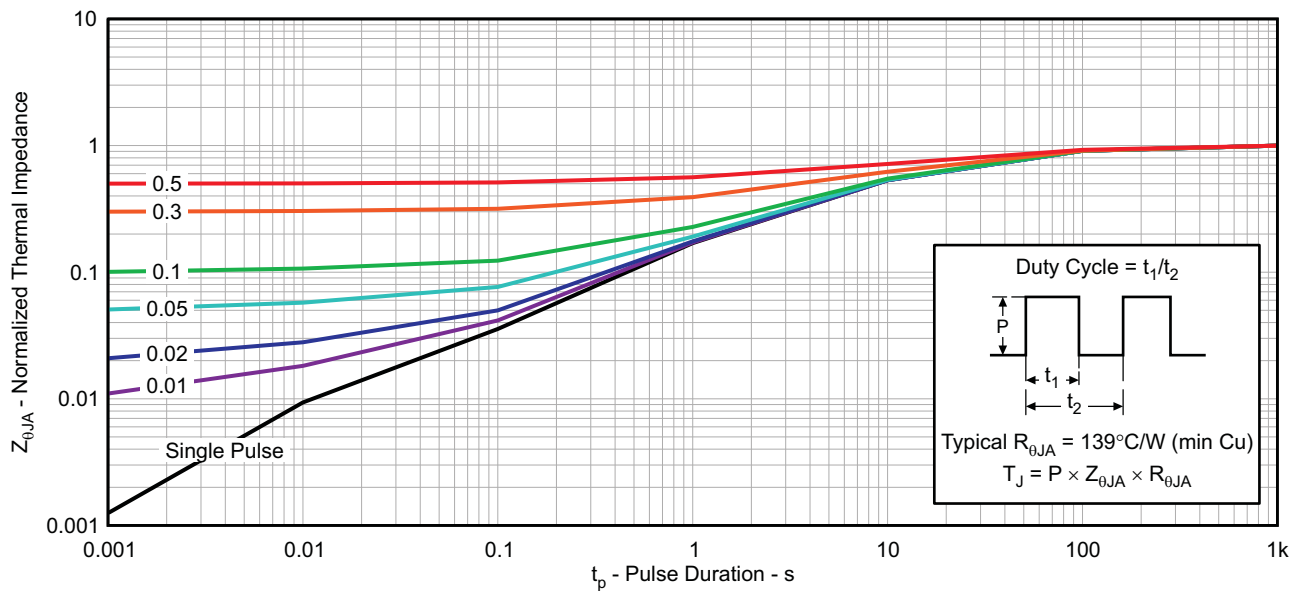


M0161-02

Max  $R_{\theta JA} = 174^{\circ}\text{C/W}$   
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)

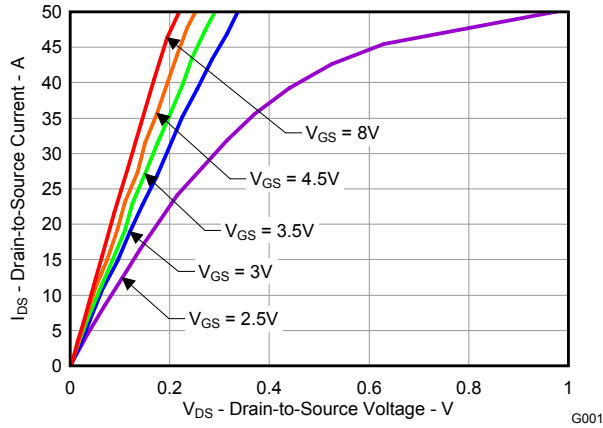


G012

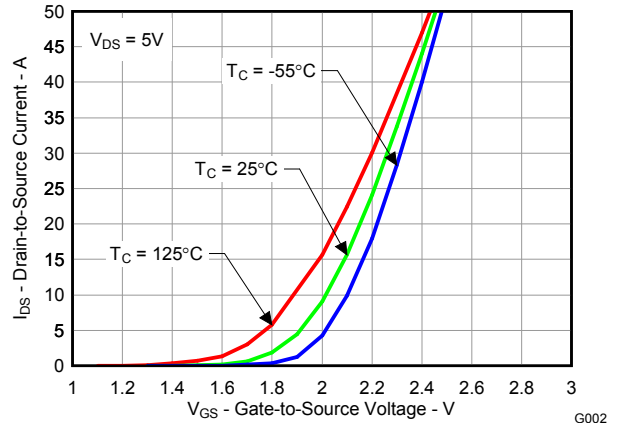
Figure 1. Transient Thermal Impedance

**TYPICAL MOSFET CHARACTERISTICS (continued)**

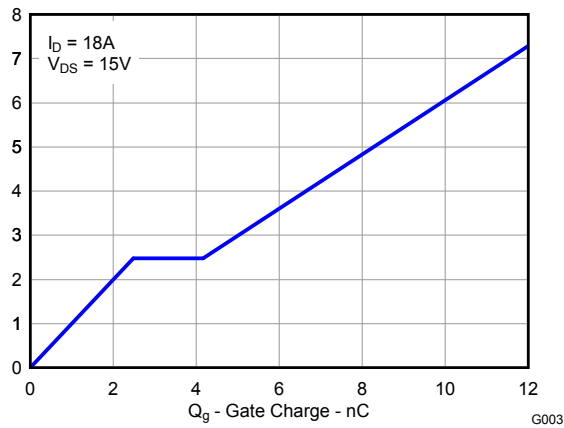
( $T_A = 25^\circ\text{C}$  unless otherwise stated)



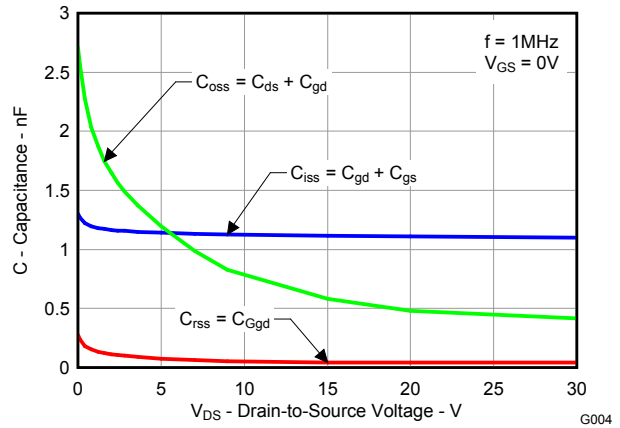
**Figure 2. Saturation Characteristics**



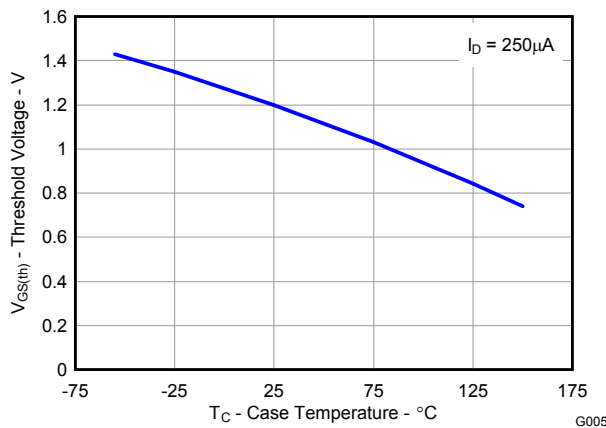
**Figure 3. Transfer Characteristics**



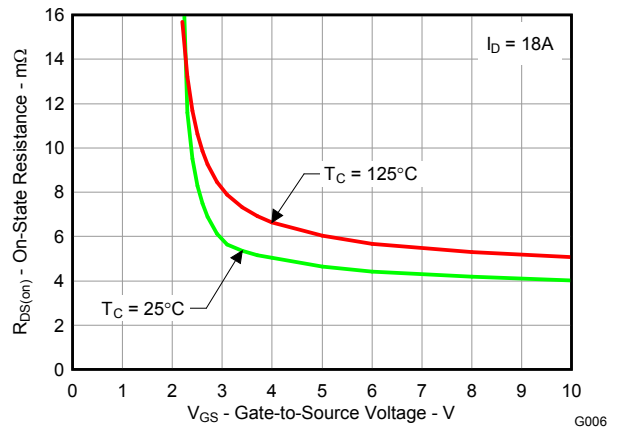
**Figure 4. Gate Charge**



**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)

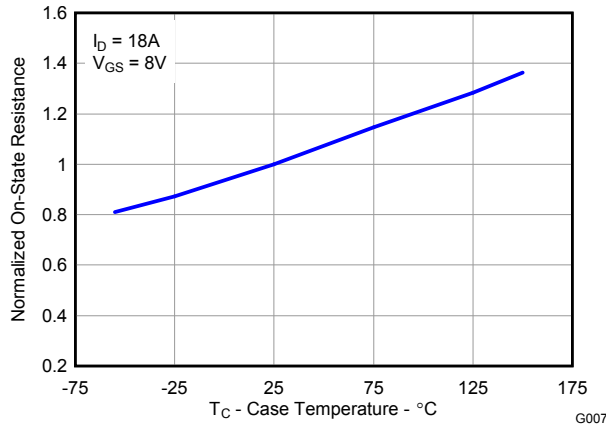


Figure 8. Normalized On-State Resistance vs. Temperature

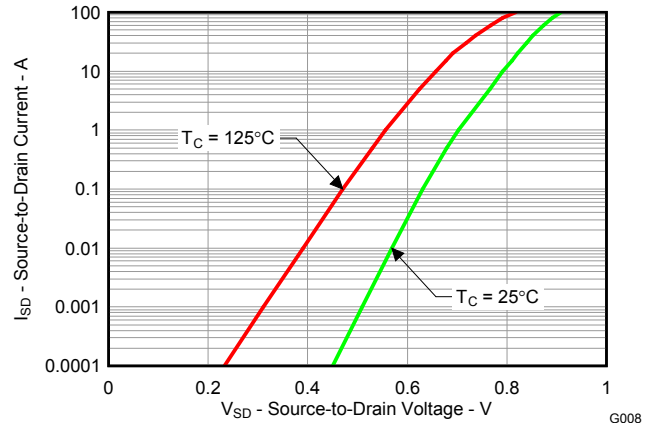


Figure 9. Typical Diode Forward Voltage

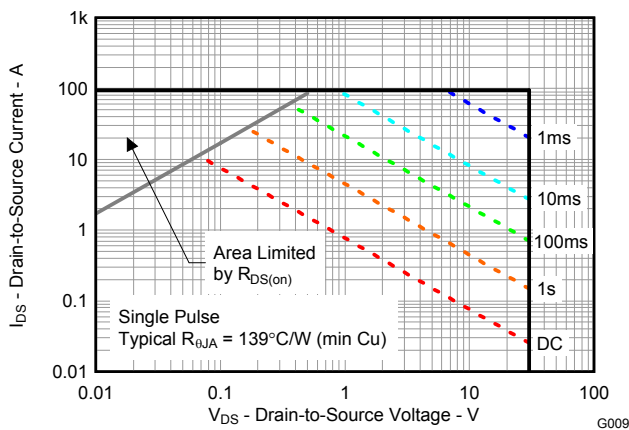


Figure 10. Maximum Safe Operating Area

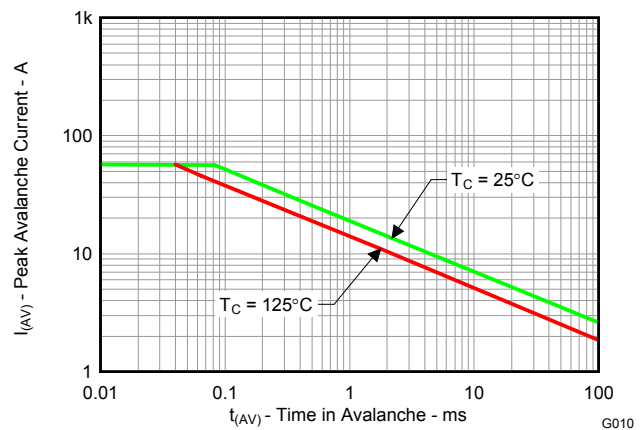


Figure 11. Single Pulse Unclamped Inductive Switching

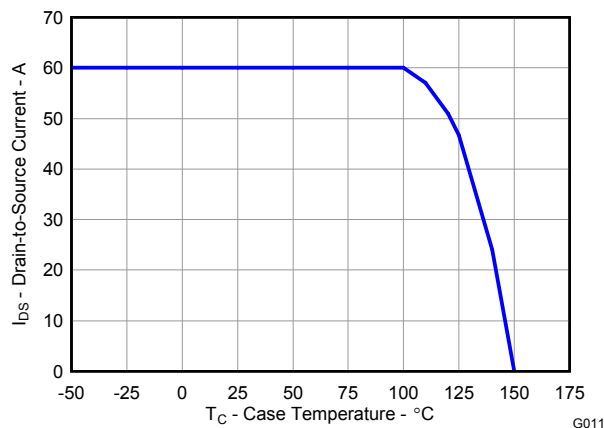
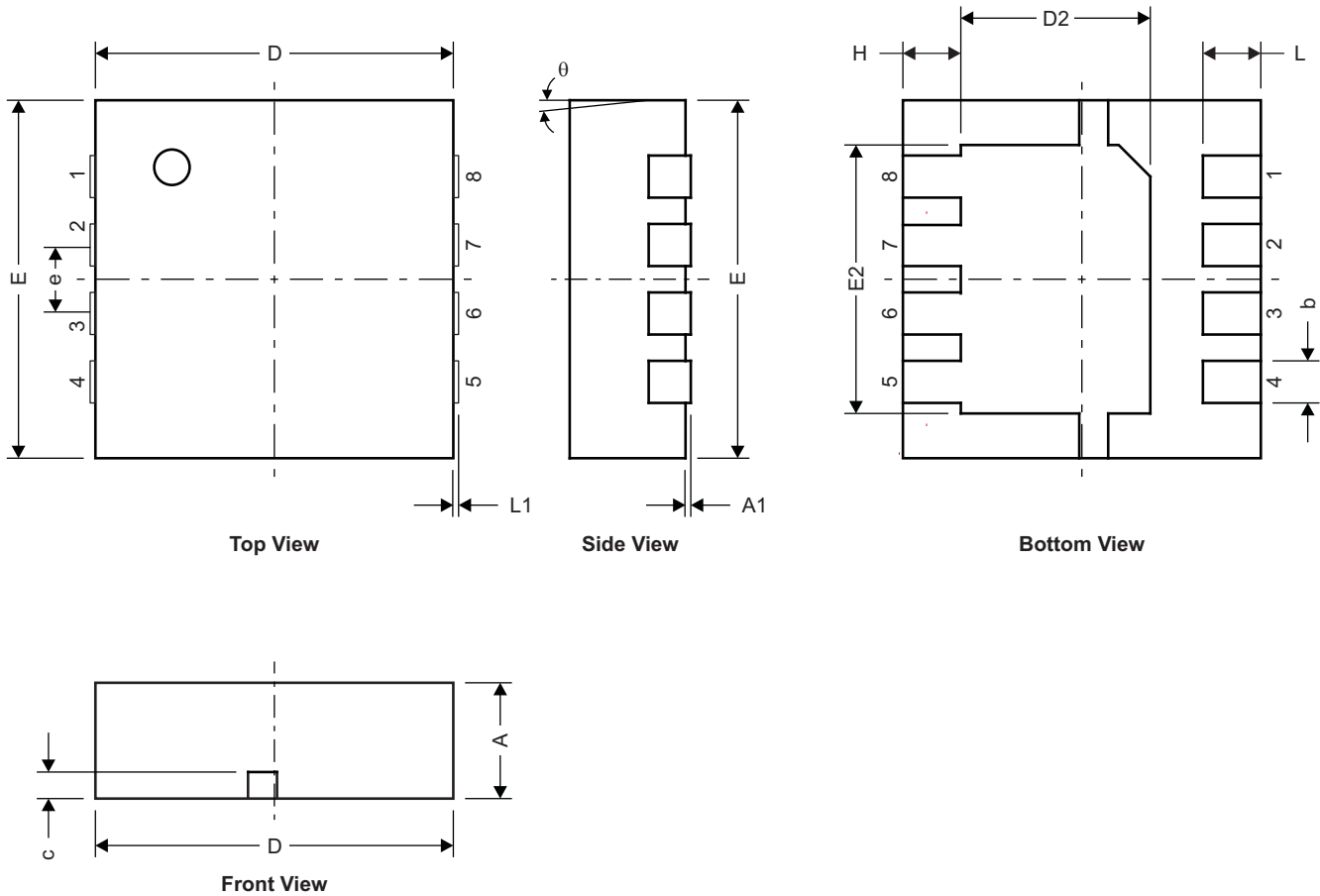


Figure 12. Maximum Drain Current vs. Temperature

**MECHANICAL DATA**

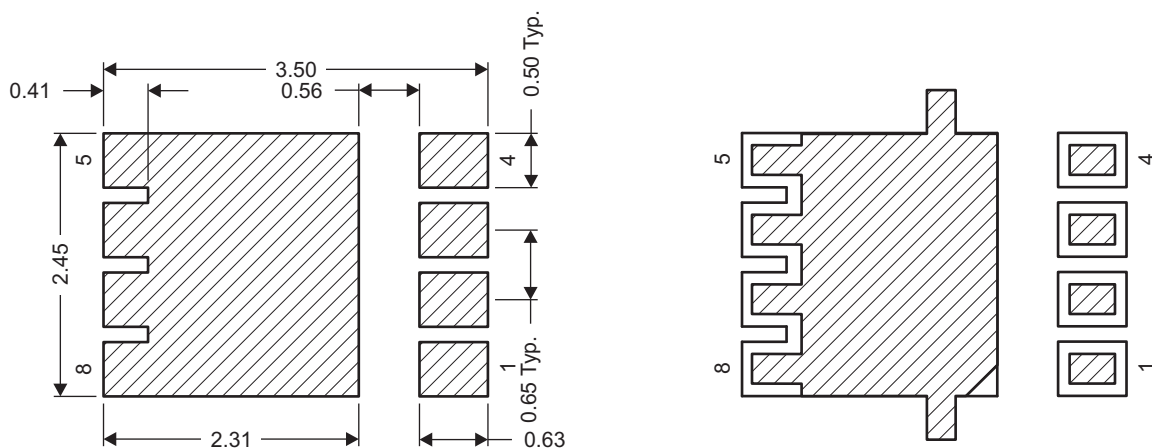
**Q3 Package Dimensions**



M0142-01

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.950	1.000	1.100	0.037	0.039	0.043
A1	0.000	0.000	0.050	0.000	0.000	0.002
b	0.280	0.340	0.400	0.011	0.013	0.016
c	0.150	0.200	0.250	0.006	0.008	0.010
D	3.200	3.300	3.400	0.126	0.130	0.134
D1	-	-	-	-	-	-
D2	1.650	1.750	1.800	0.065	0.069	0.071
E	3.200	3.300	3.400	0.126	0.130	0.134
E1	-	-	-	-	-	-
E2	2.350	2.450	2.550	0.093	0.096	0.100
e	0.650 TYP			0.026		
H	0.35	0.450	0.550	0.014	0.018	0.022
L	0.35	0.450	0.550	0.014	0.018	0.022
L1	-	-	-	-	-	-
theta	-	-	-	-	-	-

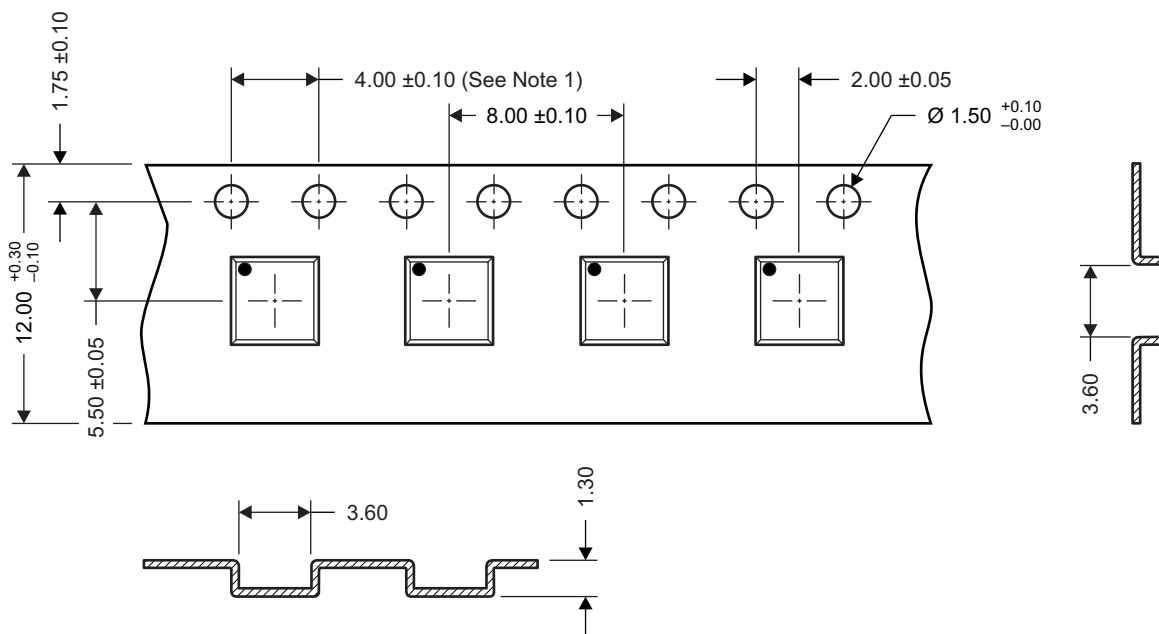
### Recommended PCB Pattern



M0143-01

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

### Q3 Tape and Reel Information



M0144-01

- Notes:
1. 10-sprocket hole-pitch cumulative tolerance  $\pm 0.2$
  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. Thickness:  $0.30 \pm 0.05$ mm
  6. MSL1 260°C (IR and convection) PbF reflow compatible

## REVISION HISTORY

Changes from Original (March 2010) to Revision A	Page
• Deleted the Package Marking Information section .....	<a href="#">7</a>



## 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
CSD17309Q3	SON	DQG	8	2500	330.0	12.8	3.6	3.6	1.2	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD17309Q3	SON	DQG	8	2500	335.0	335.0	32.0

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### Applications

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