TEXAS INSTRUMENTS

"CSD17309Q3"

CSD17309Q3

www.ti.com   SLPS261A – MARCH 2010 – REVISED OCTOBER 2010

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**
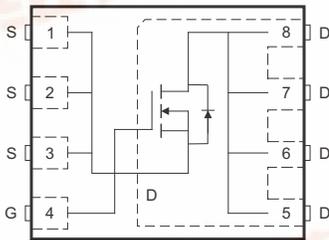- **SON 3.3-mm × 3.3-mm Plastic Package**

APPLICATIONS

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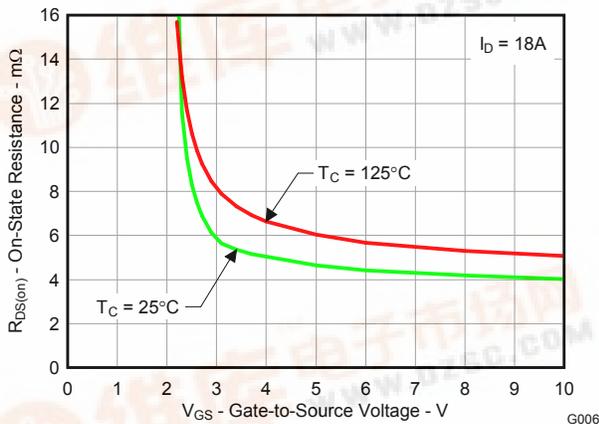- **Point-of-Load Synchronous Buck in Networking, Telecom, and Computing Systems**

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

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 × 3.3-mm Plastic Package	13-Inch Reel	2500	Tape and Reel

ABSOLUTE MAXIMUM RATINGS

T_A = 25°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°C	60	A
	Continuous Drain Current[1]	20	A
I_{DM}	Pulsed Drain Current, T_A = 25°C[2]	112	A
P_D	Power Dissipation[1]	2.8	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range	−55 to 150	°C
E_{AS}	Avalanche Energy, Single Pulse I_D = 57A, L = 0.1mH, R_G = 25Ω	162	mJ

(1) Typical $R_{\theta JA}$ = 45°C/W when mounted on a 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 ≤300μs, duty cycle ≤2%

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

G006

GATE CHARGE

G003
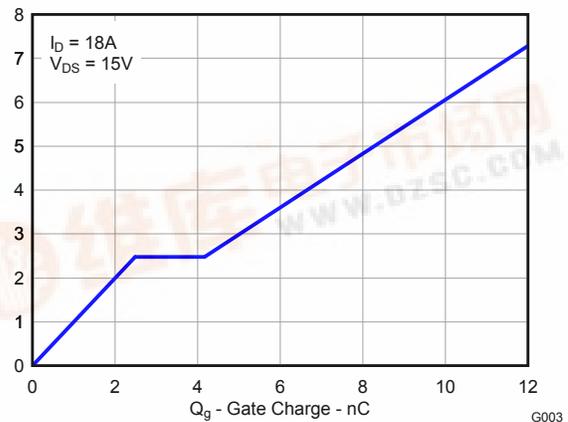
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CSD17309Q3

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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.

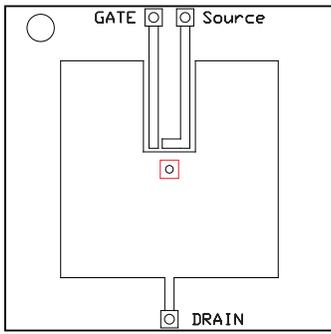## ELECTRICAL CHARACTERISTICS

(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_D = 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} = +10 / −8V			100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250µA	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	mΩ
		V_{GS} = 4.5V, I_D = 18A		4.9	6.3	mΩ
		V_{GS} = 8V, I_D = 18A		4.2	5.4	mΩ
g_{fs}	Transconductance	V_{DS} = 15V, I_D = 18A		67		S
Dynamic Characteristics						
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	Ω
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 Vth			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 = 2Ω		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
Diode Characteristics						
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/µs		30		nC
t_{rr}	Reverse Recovery Time			23		ns

THERMAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case[1]			2	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient[1][2]			57	°C/W

(1) $R_{\theta JC}$ is determined with the device mounted on a 1-inch^2 (6.45-cm^2), Cu pad on a 1.5-inch × 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^2 2-oz.Cu.

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TEXAS INSTRUMENTS

CSD17309Q3

GATE Source

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

DRAIN

M0161-01

GATE Source
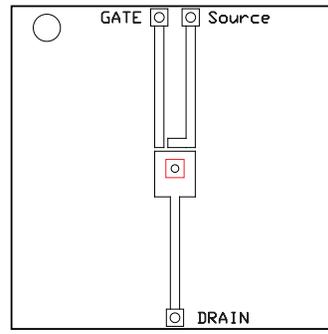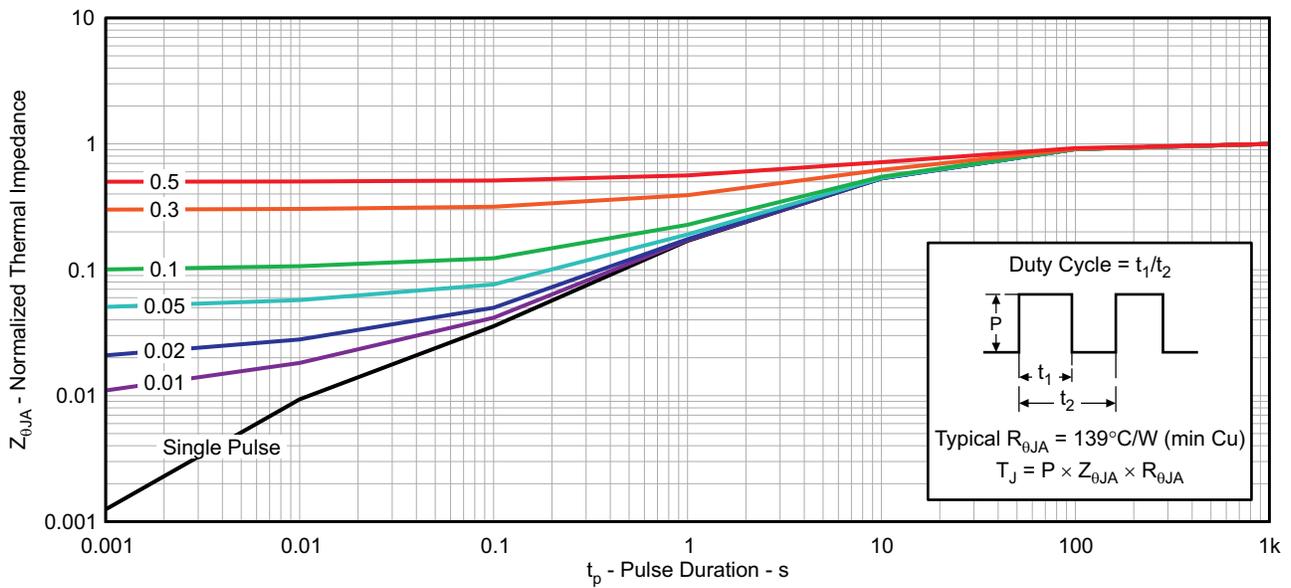
Max $R_{\theta JA}$ = 174°C/W when mounted on a minimum pad area of 2-oz. (0.071-mm thick) Cu.

DRAIN

M0161-02

TYPICAL MOSFET CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

$Z_{\theta JA}$ - Normalized Thermal Impedance

0.5
0.3
0.1
0.05
0.02
0.01

Single Pulse

Duty Cycle = t_1/t_2

P

t_1

t_2

Typical $R_{\theta JA}$ = 139°C/W (min Cu)

$T_J = P \times Z_{\theta JA} \times R_{\theta JA}$

t_p - Pulse Duration - s

G012

Figure 1. Transient Thermal Impedance

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TYPICAL MOSFET CHARACTERISTICS (continued)

$(T_A = 25°C$ unless otherwise stated)
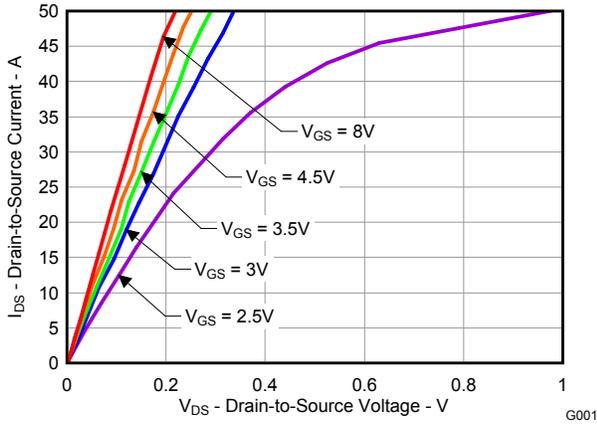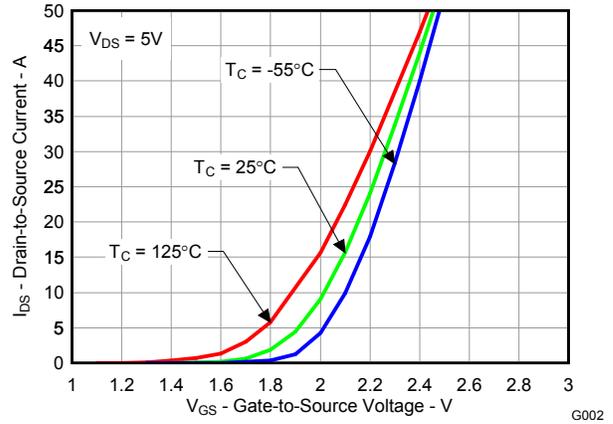

Figure 2. Saturation Characteristics
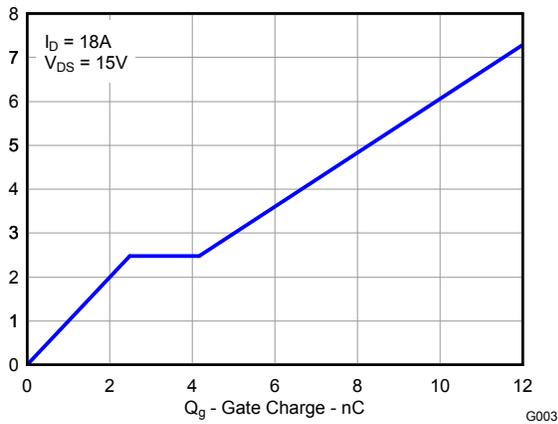

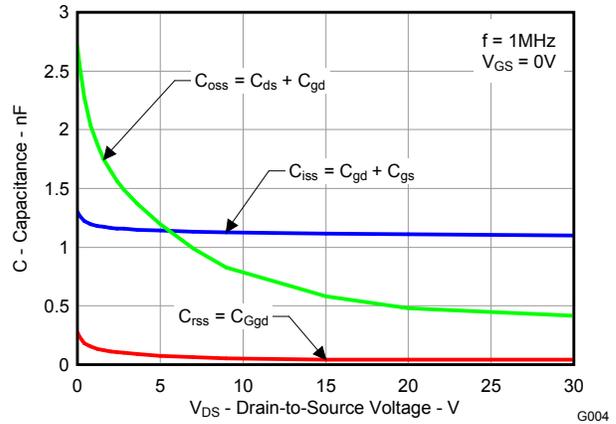Figure 3. Transfer Characteristics

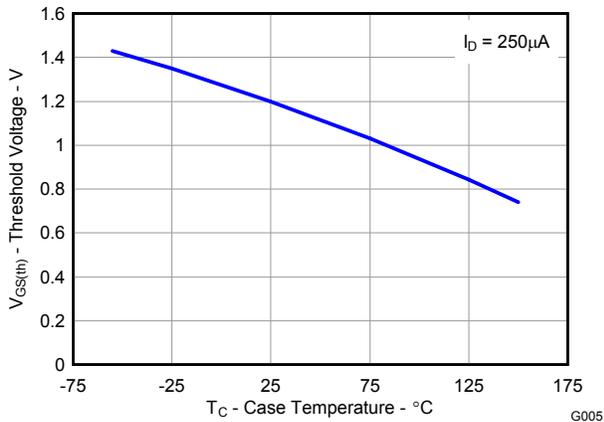Figure 4. Gate Charge

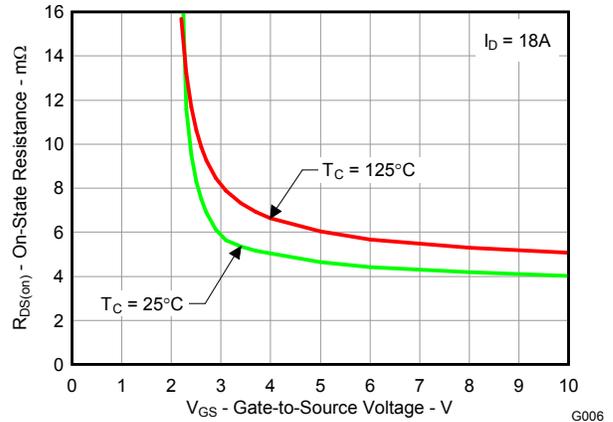Figure 5. Capacitance

Figure 6. Threshold Voltage vs. Temperature

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

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TYPICAL MOSFET CHARACTERISTICS (continued)

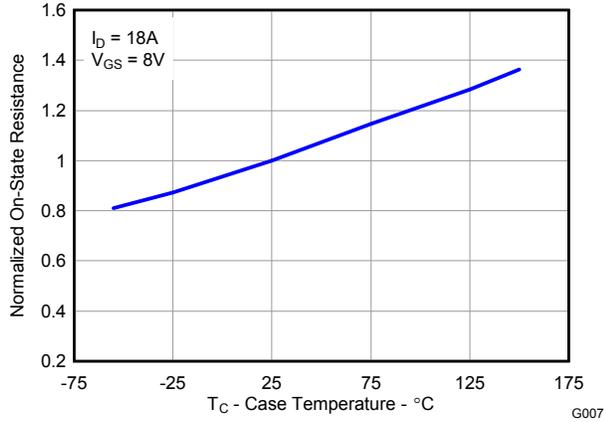(T_A = 25°C unless otherwise stated)

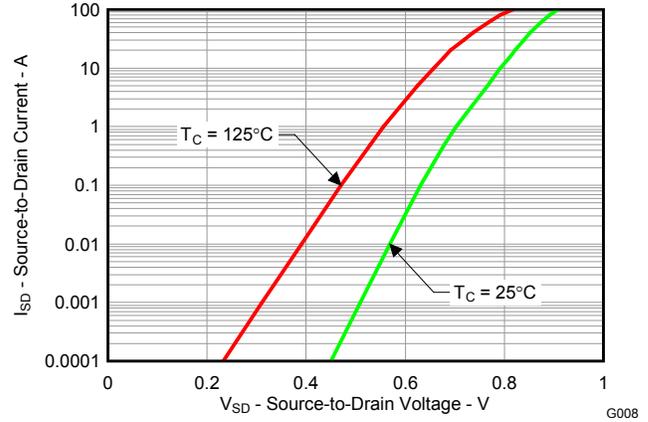**Figure 8. Normalized On-State Resistance vs. Temperature**
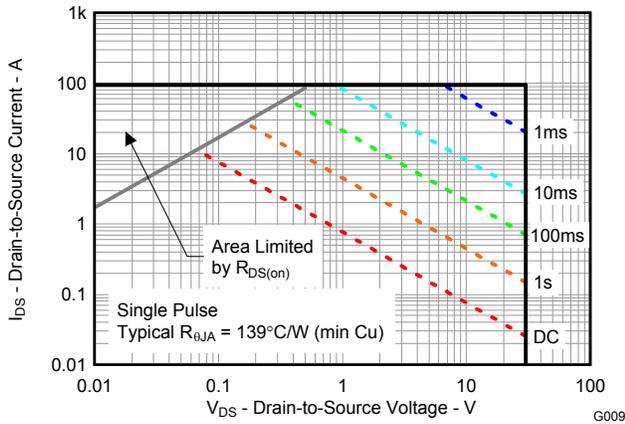
Figure 9. Typical Diode Forward Voltage
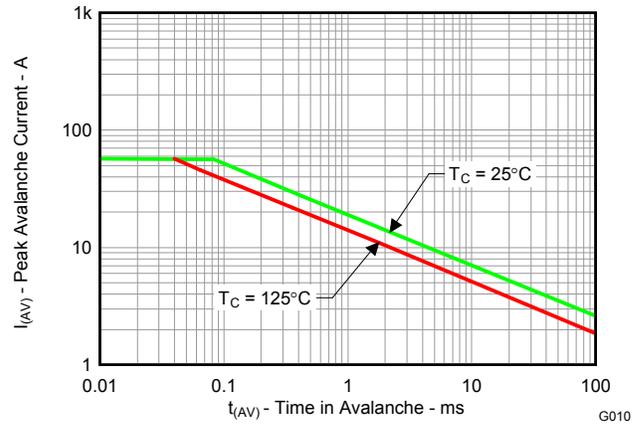
Figure 10. Maximum Safe Operating Area
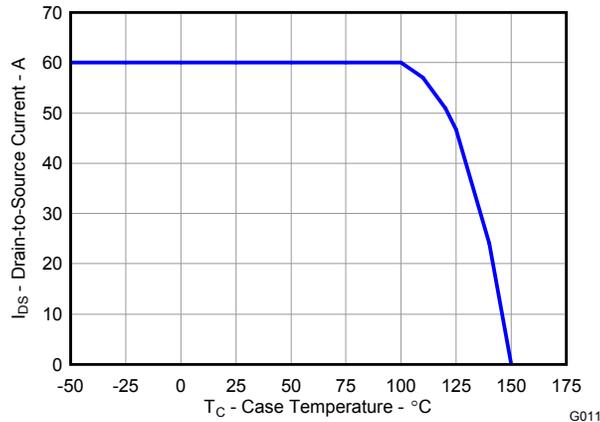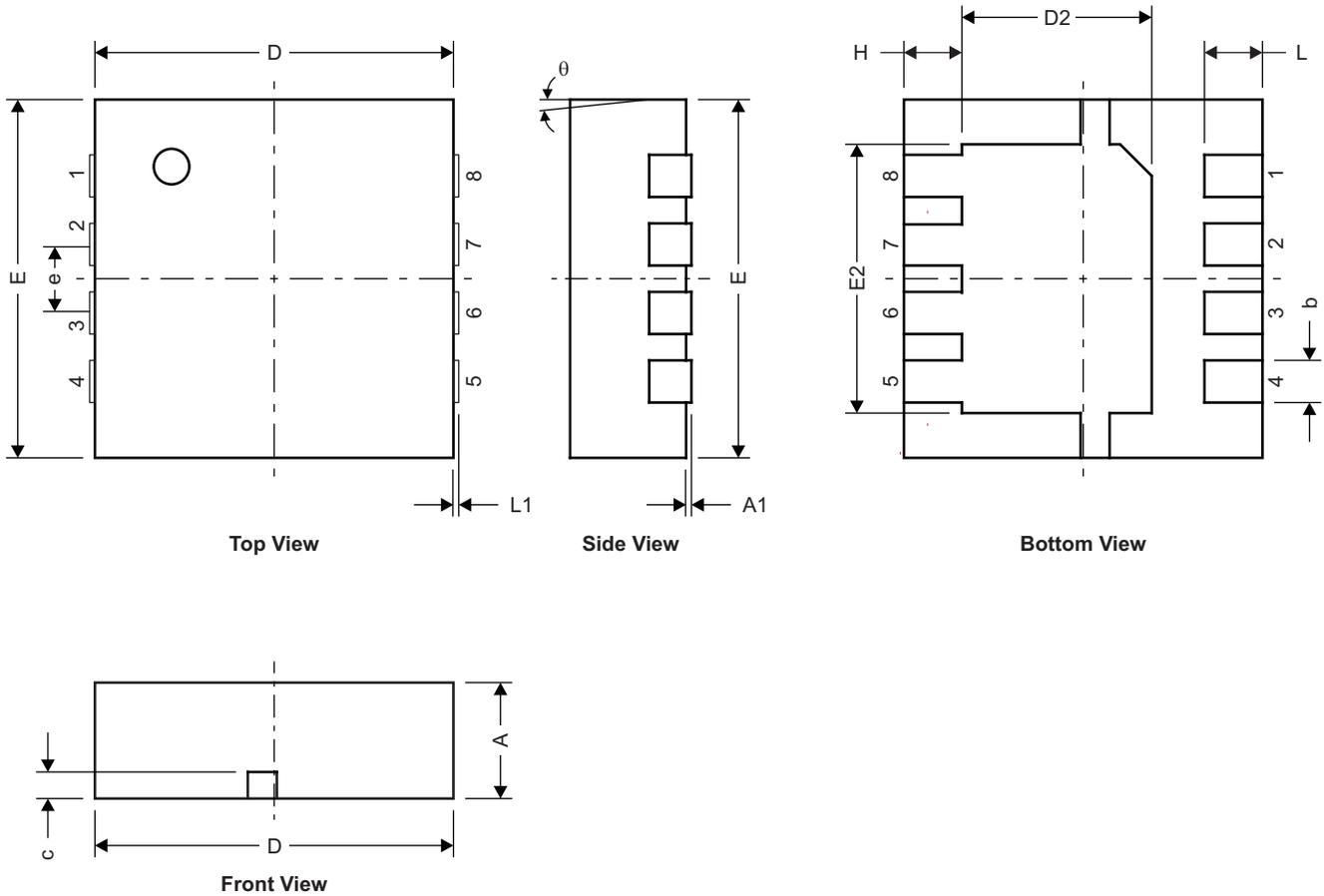
Figure 11. Single Pulse Unclamped Inductive Switching

Figure 12. Maximum Drain Current vs. Temperature

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MECHANICAL DATA

Q3 Package Dimensions

Top View

Side View

Bottom View

Front View

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	–	–	–	–	–	–
θ	–	–	–	–	–	–

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Recommended PCB Pattern
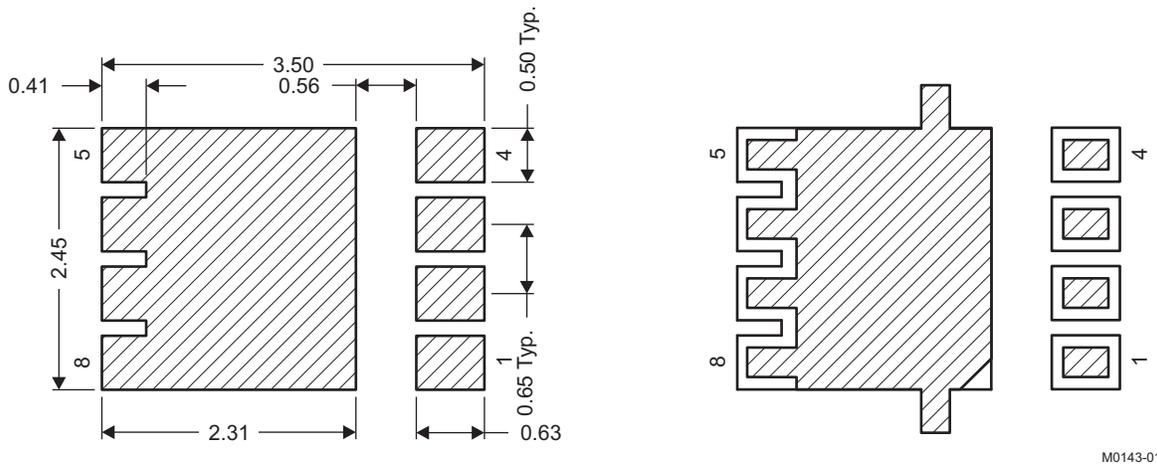
M0143-01

For recommended circuit layout for PCB designs, see application note SLPA005 – *Reducing Ringing Through PCB Layout Techniques*.

Q3 Tape and Reel Information
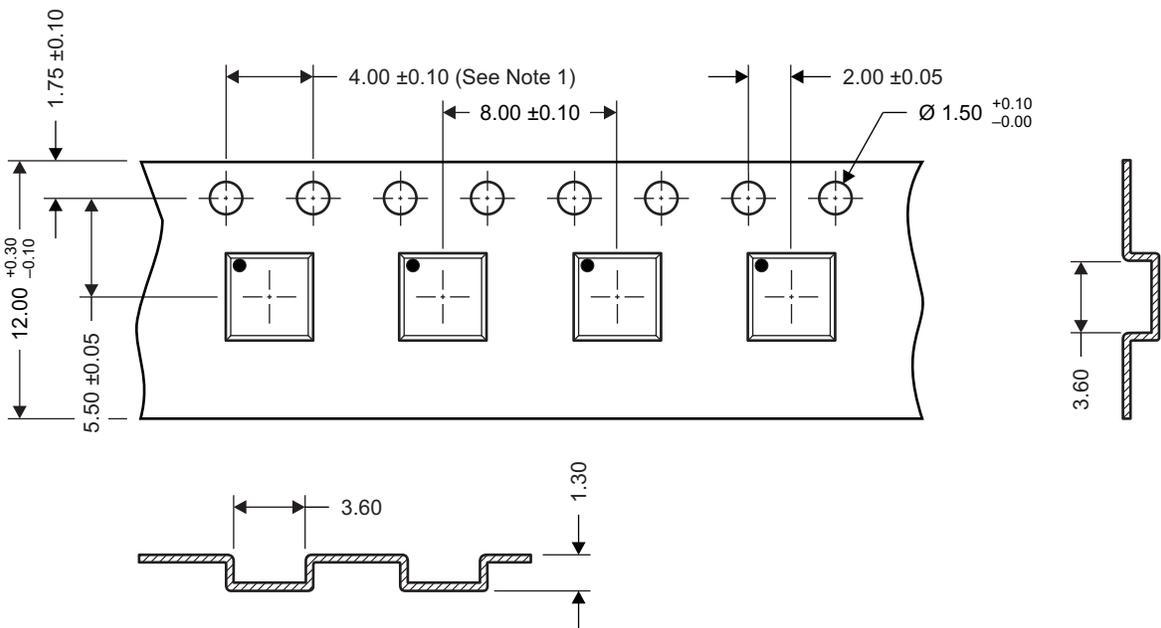
M0144-01

Notes: 1. 10-sprocket hole-pitch cumulative tolerance ±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 ±0.05mm

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 7

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