



# 30V, N-Channel NexFET™ Power MOSFETs

 Check for Samples: [CSD17505Q5A](#)

## 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**

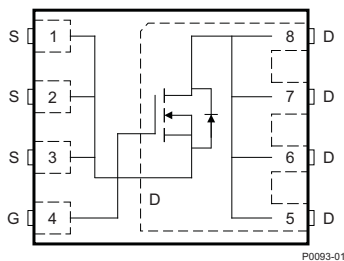
## APPLICATIONS

- **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

## PRODUCT SUMMARY

$T_A = 25^\circ\text{C}$ unless otherwise stated		TYPICAL VALUE		UNIT
$V_{DS}$	Drain to Source Voltage	30		V
$Q_g$	Gate Charge Total (4.5V)	10		nC
$Q_{gd}$	Gate Charge Gate to Drain	2.7		nC
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 4.5\text{V}$	3.7	m $\Omega$
		$V_{GS} = 10\text{V}$	2.9	m $\Omega$
$V_{GS(th)}$	Threshold Voltage	1.3		V

## ORDERING INFORMATION

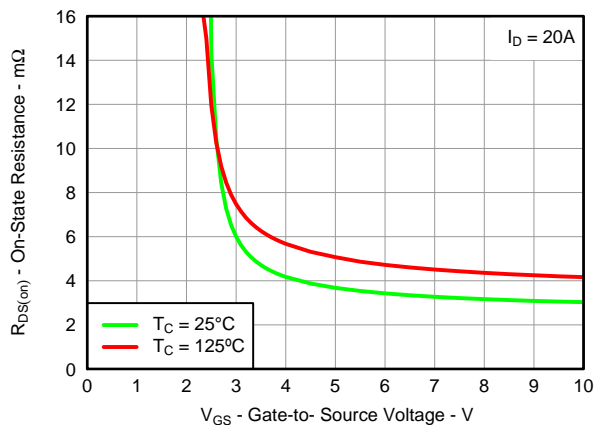
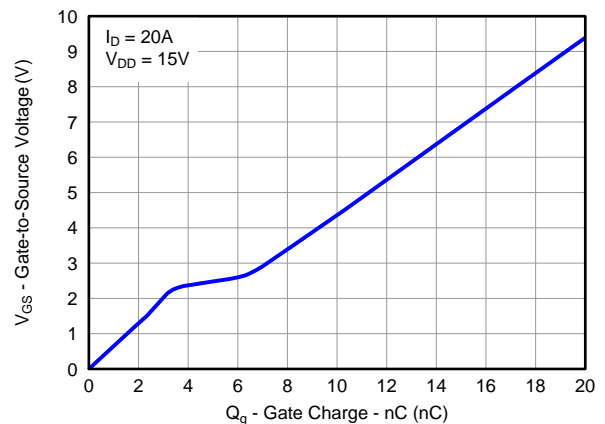
Device	Package	Media	Qty	Ship
CSD17505Q5A	SON 5-mm × 6-mm Plastic Package	13-Inch Reel	2500	Tape and Reel

## 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	$\pm 20$	V
$I_D$	Continuous Drain Current, $T_C = 25^\circ\text{C}$	100	A
	Continuous Drain Current <sup>(1)</sup>	24	A
$I_{DM}$	Pulsed Drain Current, $T_A = 25^\circ\text{C}$ <sup>(2)</sup>	153	A
$P_D$	Power Dissipation <sup>(1)</sup>	3.2	W
$T_J, T_{STG}$	Operating Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$E_{AS}$	Avalanche Energy, single pulse $I_D = 76\text{A}, L = 0.1\text{mH}, R_G = 25\Omega$	290	mJ

(1) Typical  $R_{\theta JA} = 39^\circ\text{C/W}$  on 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  $\leq 2\%$

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

**GATE CHARGE**


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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)

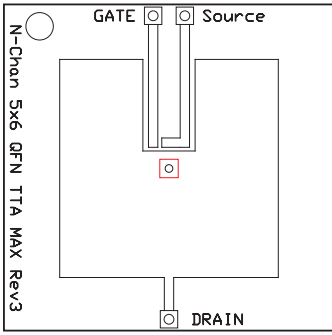
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain to Source Voltage	$V_{GS} = 0V, I_{DS} = 250\mu A$	30			V
$I_{DSS}$	Drain to Source Leakage Current	$V_{GS} = 0V, V_{DS} = 24V$			1	$\mu A$
$I_{GSS}$	Gate to Source Leakage Current	$V_{DS} = 0V, V_{GS} = 20V$			100	nA
$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_{DS} = 250\mu A$	1	1.3	1.8	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 4.5V, I_{DS} = 20A$		3.7	4.6	m $\Omega$
		$V_{GS} = 10V, I_{DS} = 20A$		2.9	3.5	m $\Omega$
$g_{fs}$	Transconductance	$V_{DS} = 15V, I_{DS} = 20A$		82		S
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = 15V,$ $f = 1\text{MHz}$		1560	1980	pF
$C_{oss}$	Output Capacitance			1030	1330	pF
$C_{riss}$	Reverse Transfer Capacitance			65	85	pF
$R_G$	Series Gate Resistance	$V_{DS} = 15V, I_{DS} = 20A$		1	2	$\Omega$
$Q_g$	Gate Charge Total (4.5V)			10	13	nC
$Q_{gd}$	Gate Charge Gate to Drain			2.7		nC
$Q_{gs}$	Gate Charge Gate to Source			3.5		nC
$Q_{g(th)}$	Gate Charge at $V_{th}$			1.9		nC
$Q_{oss}$	Output Charge	$V_{DS} = 13.7V, V_{GS} = 0V$		26		nC
$t_{d(on)}$	Turn On Delay Time	$V_{DS} = 15V, V_{GS} = 4.5V,$ $I_{DS} = 20A, R_G = 2\Omega$		8.3		ns
$t_r$	Rise Time			11.5		ns
$t_{d(off)}$	Turn Off Delay Time			15		ns
$t_f$	Fall Time			6.1		ns
<b>Diode Characteristics</b>						
$V_{SD}$	Diode Forward Voltage	$I_{SD} = 20A, V_{GS} = 0V$		0.8	1	V
$Q_{rr}$	Reverse Recovery Charge	$V_{DD} = 13.7V, I_F = 20A, di/dt = 300A/\mu s$		30		nC
$t_{rr}$	Reverse Recovery Time			28		ns

## THERMAL CHARACTERISTICS

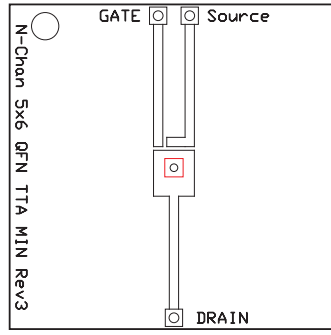
( $T_A = 25^\circ\text{C}$  unless otherwise stated)

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case <sup>(1)</sup>			1.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient <sup>(1)(2)</sup>			50	$^\circ\text{C/W}$

- (1)  $R_{\theta JC}$  is determined with the device mounted on a 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), 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.  $R_{\theta JC}$  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> (6.45-cm<sup>2</sup>), 2-oz. (0.071-mm thick) Cu.



Max  $R_{\theta JA} = 50^{\circ}\text{C/W}$   
when mounted on  
1 inch<sup>2</sup> (6.45 cm<sup>2</sup>) of  
2-oz. (0.071-mm thick)  
Cu.



Max  $R_{\theta JA} = 120^{\circ}\text{C/W}$   
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)

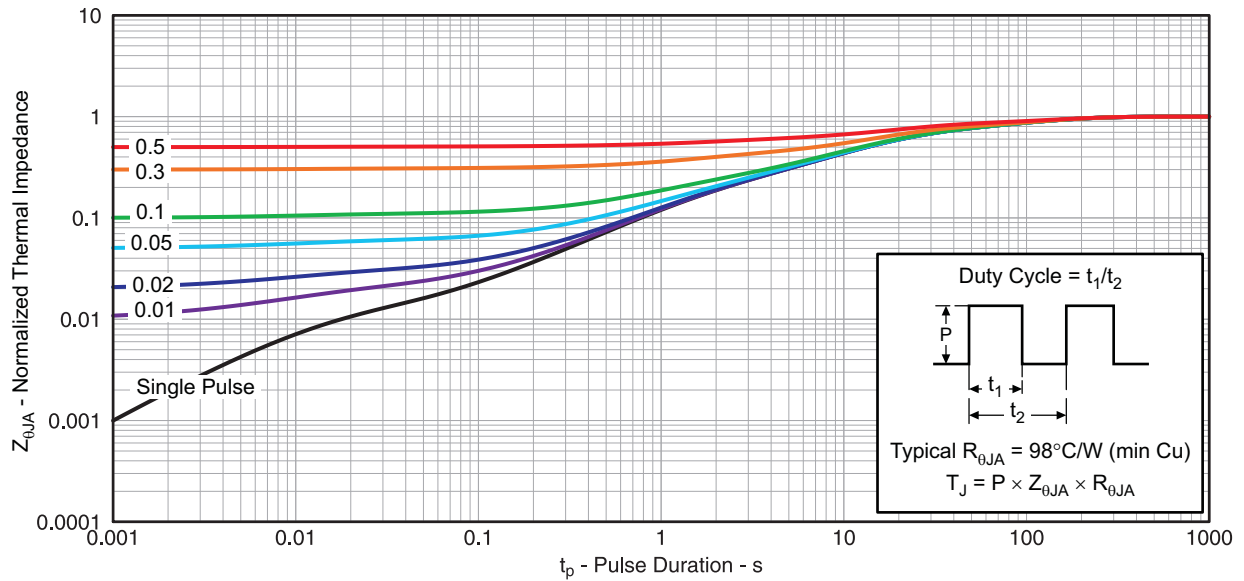
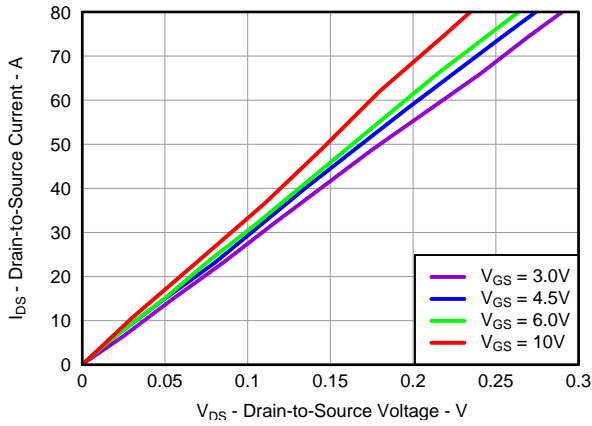


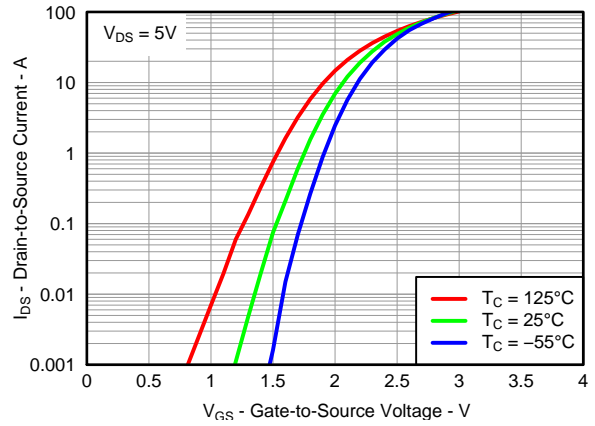
Figure 1. Transient Thermal Impedance

**TYPICAL MOSFET CHARACTERISTICS (continued)**

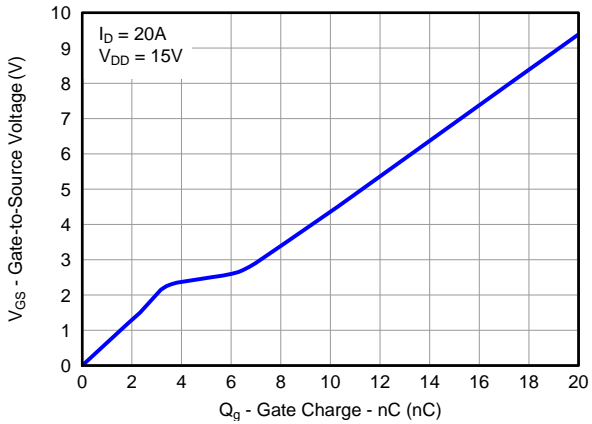
( $T_A = 25^\circ\text{C}$  unless otherwise stated)



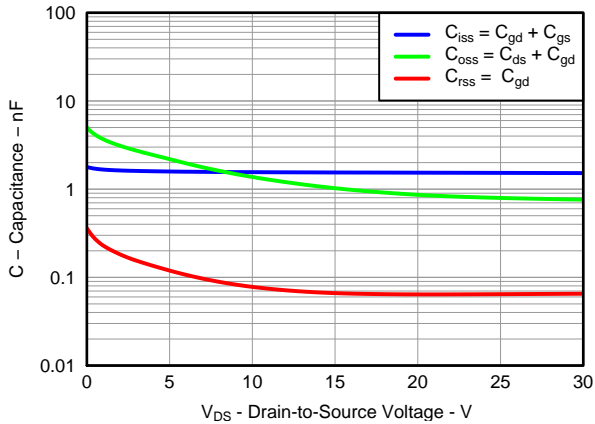
**Figure 2. Saturation Characteristics**



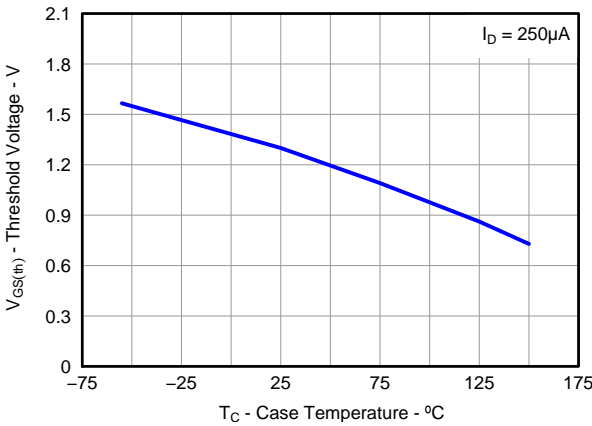
**Figure 3. Transfer Characteristics**



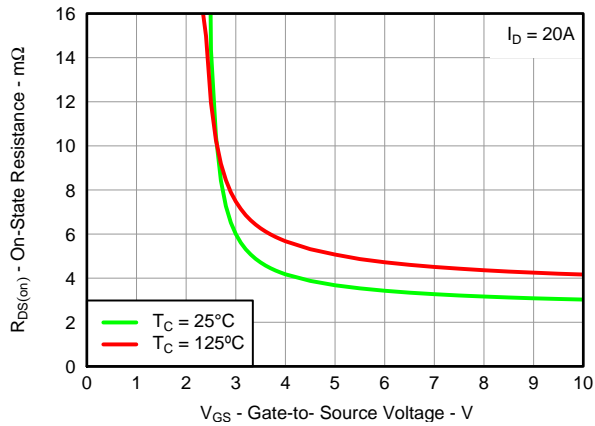
**Figure 4. Gate Charge**



**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)

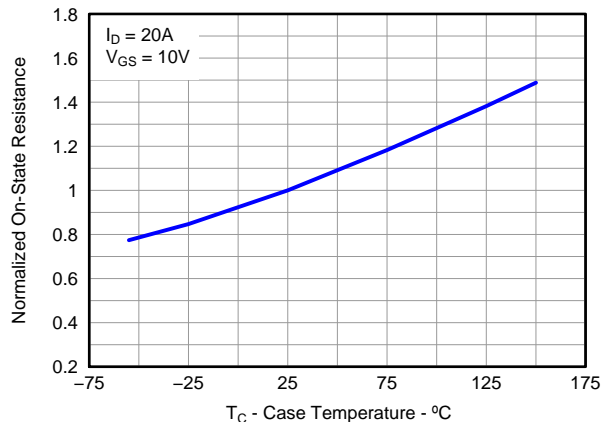


Figure 8. Normalized On-State Resistance vs. Temperature

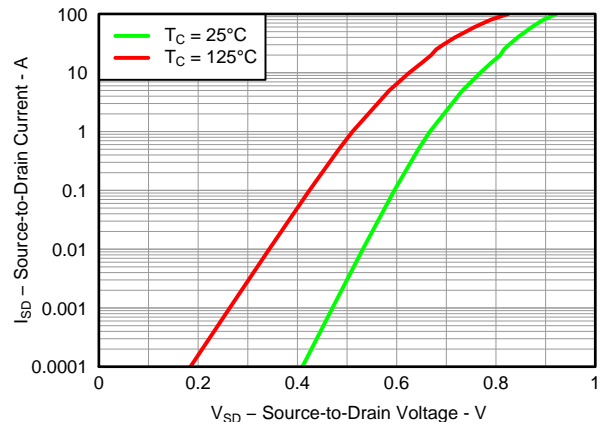


Figure 9. Typical Diode Forward Voltage

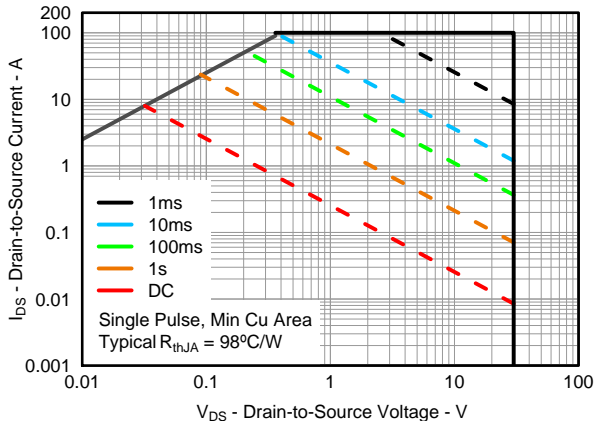


Figure 10. Maximum Safe Operating Area

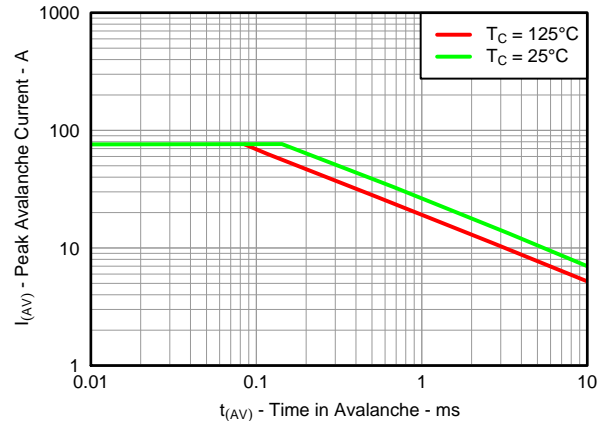


Figure 11. Single Pulse Unclamped Inductive Switching

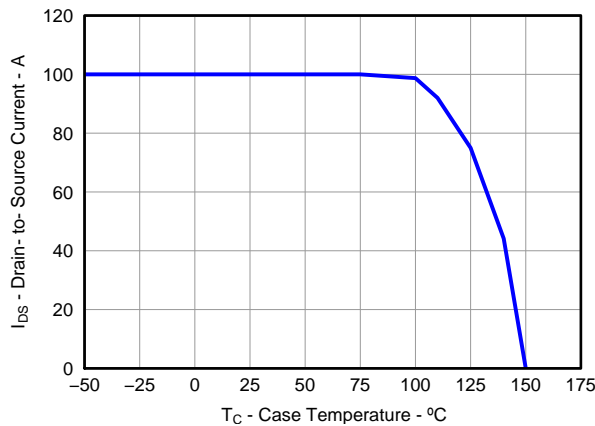
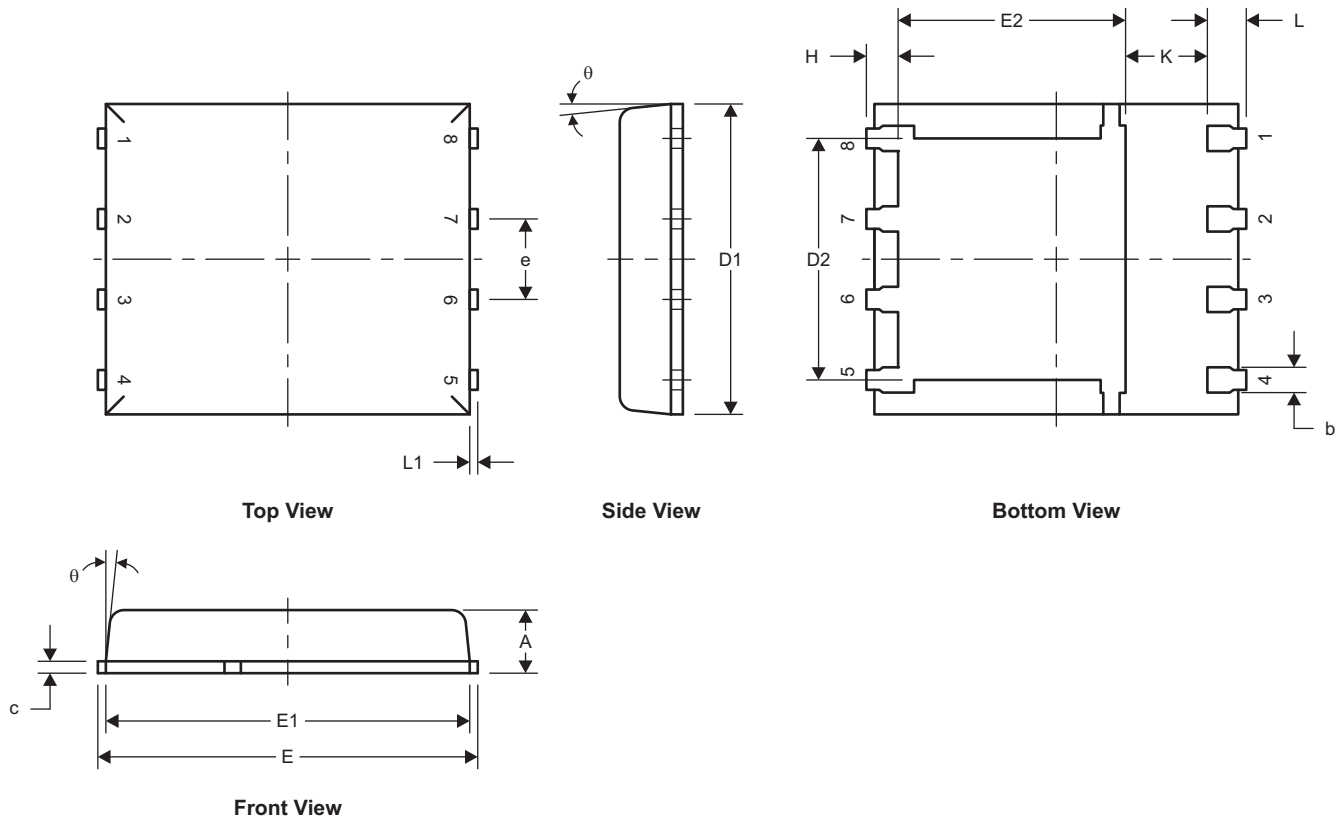


Figure 12. Maximum Drain Current vs. Temperature

**MECHANICAL DATA**

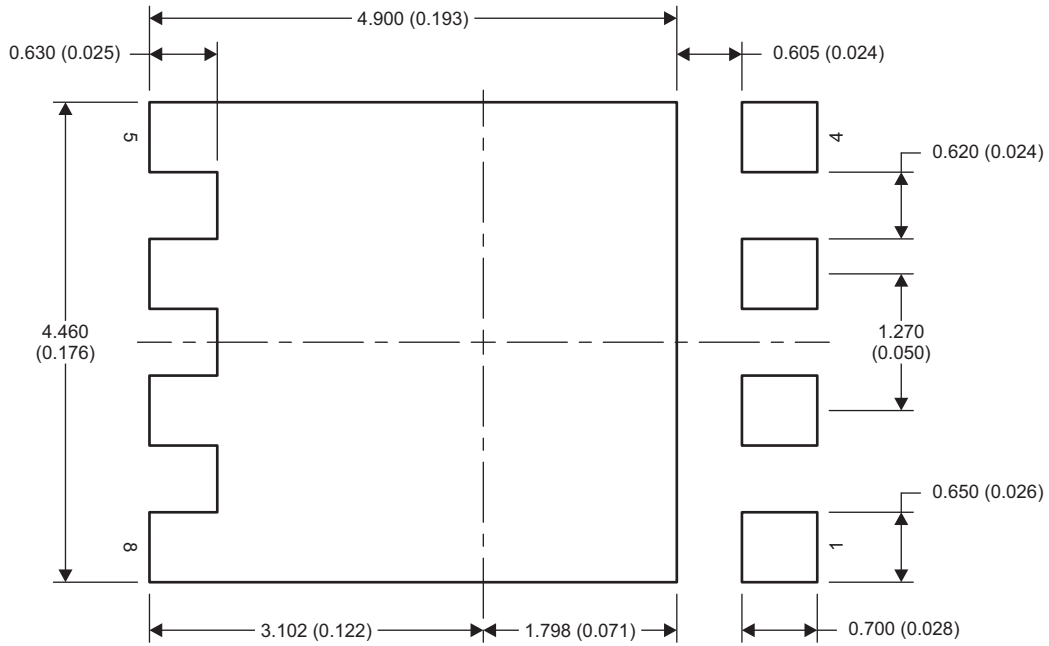
**Q5A Package Dimensions**



M0135-01

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
$\theta$	0°		12°

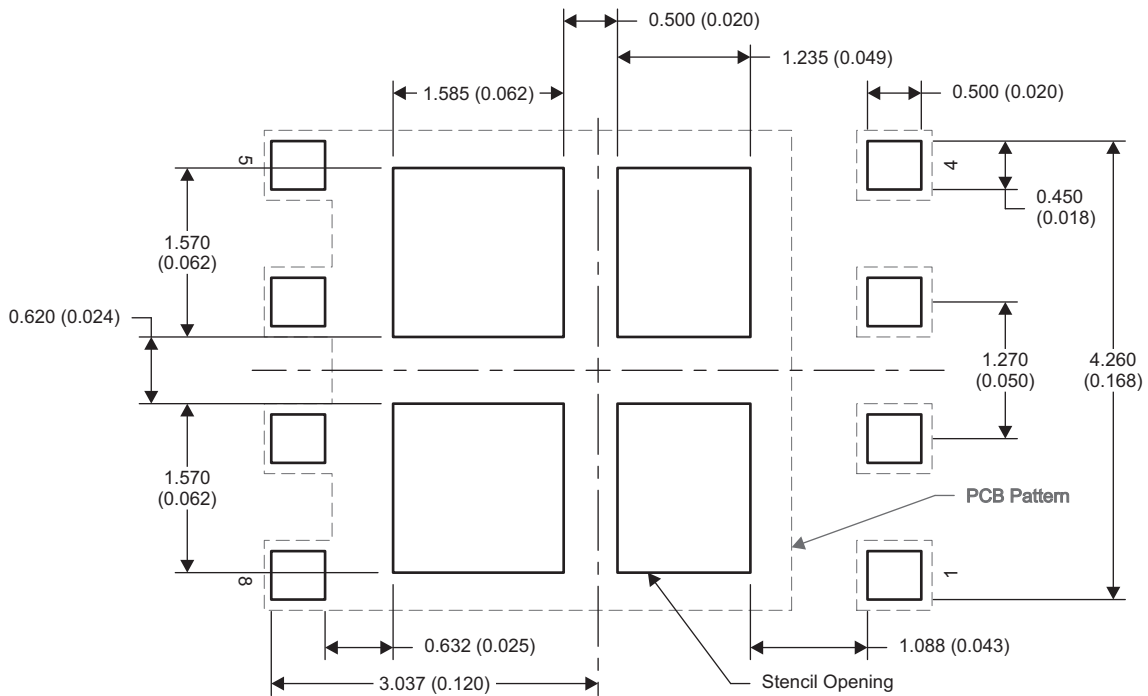
### Recommended PCB Pattern



M0139-01

NOTE: Dimensions are in mm (inches).

### Stencil Recommendation

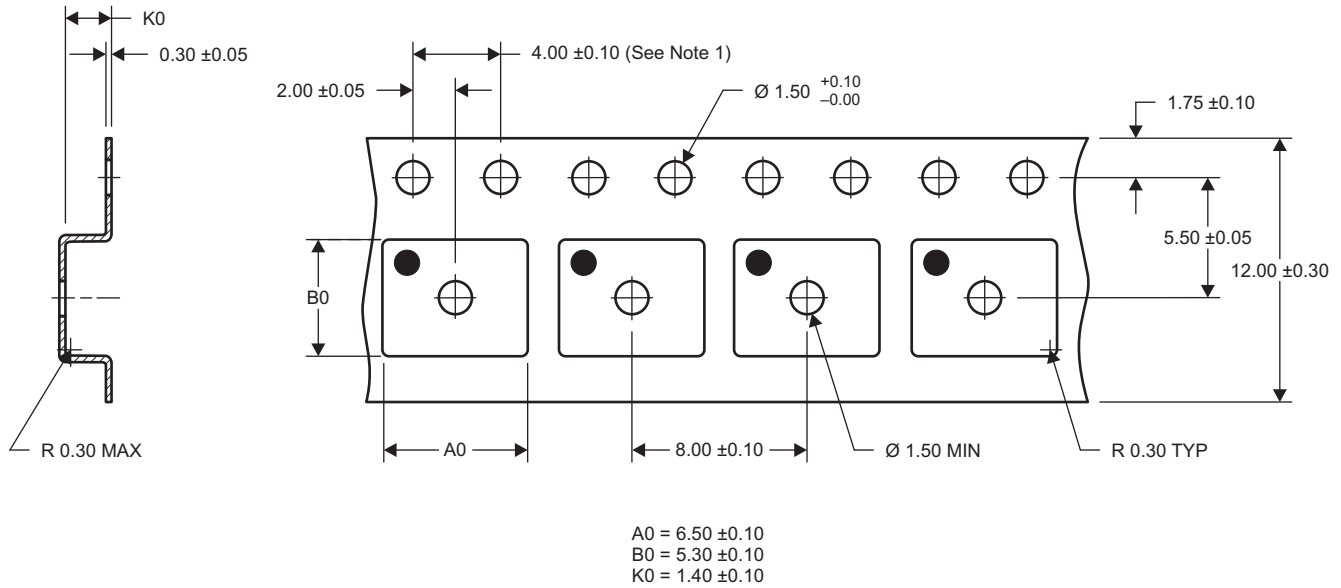


M0209-01

NOTE: Dimensions are in mm (inches).

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

**Q5A Tape and Reel Information**



M0138-01

- 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. A0 and B0 measured on a plane 0.3mm above the bottom of the pocket

**REVISION HISTORY**

Changes from Original (December 2010) to Revision A	Page
• Changed $V_{GS}$ in the Abs Max Ratings table From: +20/-12V To: $\pm 20V$ .....	1
• Changed from +20/-12V to 20V .....	2



**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

**TAPE AND REEL INFORMATION**

\*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
CSD17505Q5A	SON	DQJ	8	2500	330.0	12.4	6.3	5.3	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)
CSD17505Q5A	SON	DQJ	8	2500	340.0	340.0	38.0

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OMAP Mobile Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

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Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
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