

# 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**

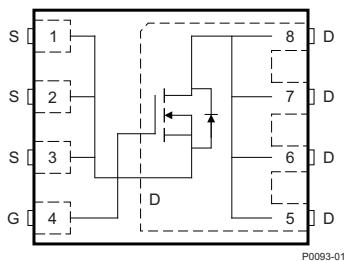
## APPLICATIONS

- **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

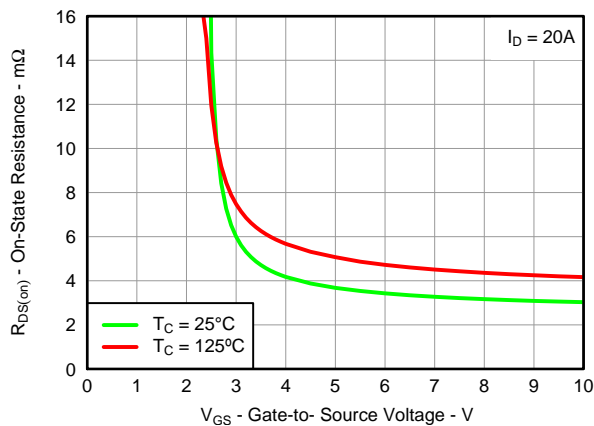
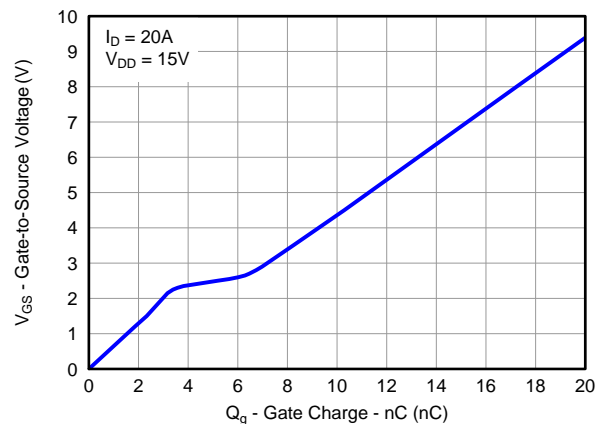
Device	Package	Media	Qty	Ship
CSD17505Q5A	SON 5-mm × 6-mm Plastic Package	13-Inch Reel	2500	Tape and Reel

## 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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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



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)

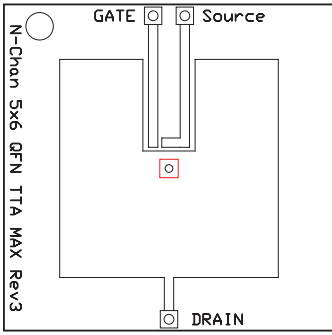
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain to Source Voltage	$V_{GS} = 0V, I_{DS} = 250\mu A$	30			V
$I_{DSS}$	Drain to Source Leakage Current	$V_{GS} = 0V, V_{DS} = 24V$			1	$\mu A$
$I_{GSS}$	Gate to Source Leakage Current	$V_{DS} = 0V, V_{GS} = 20V$			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	$V_{GS} = 0V, V_{DS} = 15V,$ $f = 1MHz$		1560	1980	pF
$C_{oss}$	Output Capacitance			1030	1330	pF
$C_{riss}$	Reverse Transfer Capacitance			65	85	pF
$R_G$	Series Gate Resistance			1	2	$\Omega$
$Q_g$	Gate Charge Total (4.5V)	$V_{DS} = 15V, I_{DS} = 20A$		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)

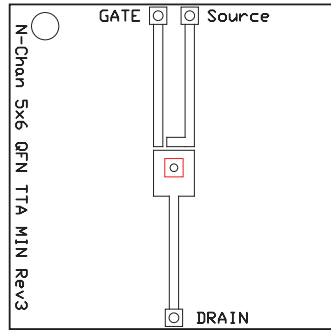
PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal Resistance Junction to Case <sup>(1)</sup>			1.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient <sup>(1)(2)</sup>			50	$^\circ\text{C/W}$

- (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.



M0137-01

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.



M0137-02

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)

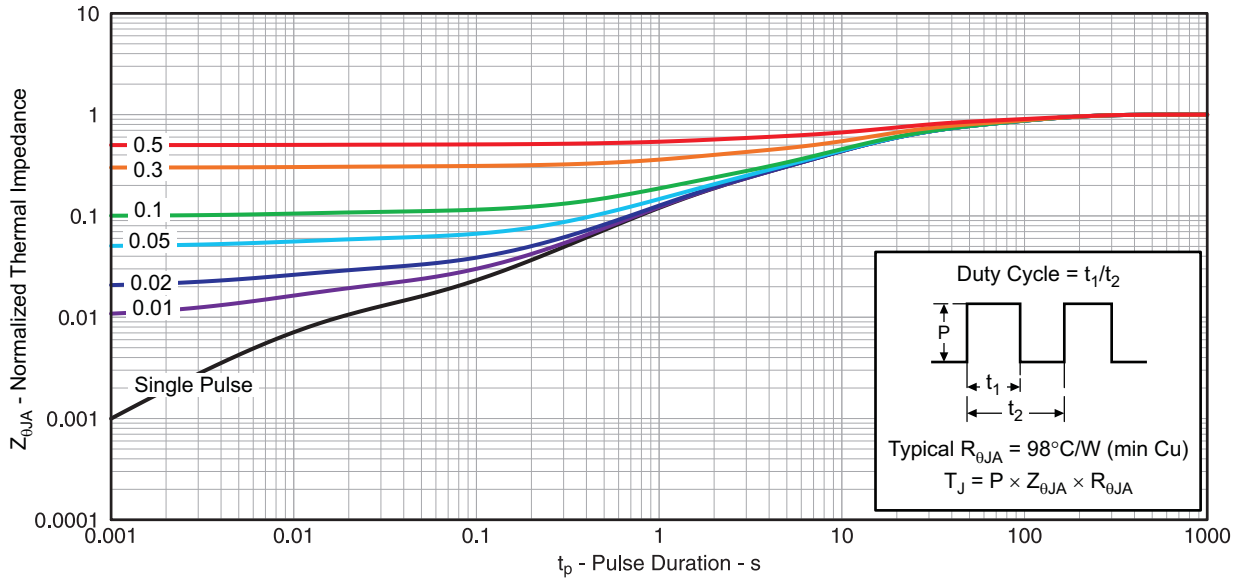
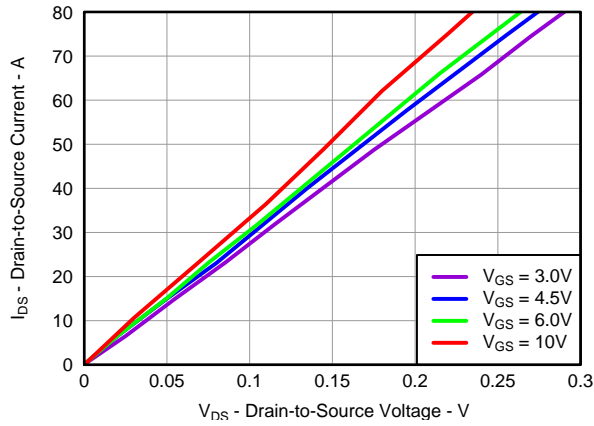


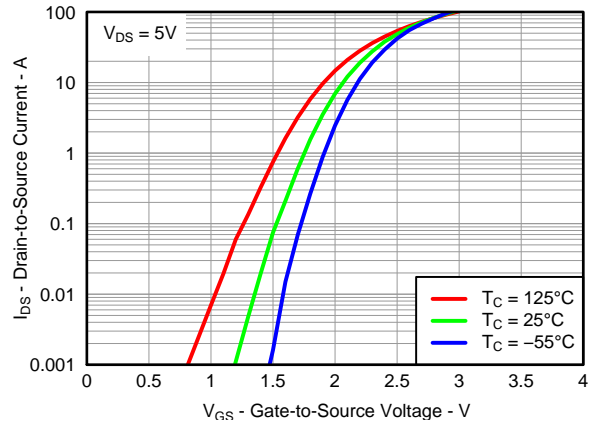
Figure 1. Transient Thermal Impedance

**TYPICAL MOSFET CHARACTERISTICS (continued)**

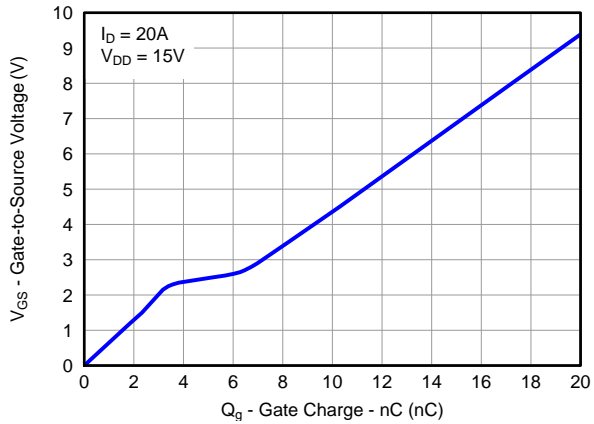
( $T_A = 25^\circ\text{C}$  unless otherwise stated)



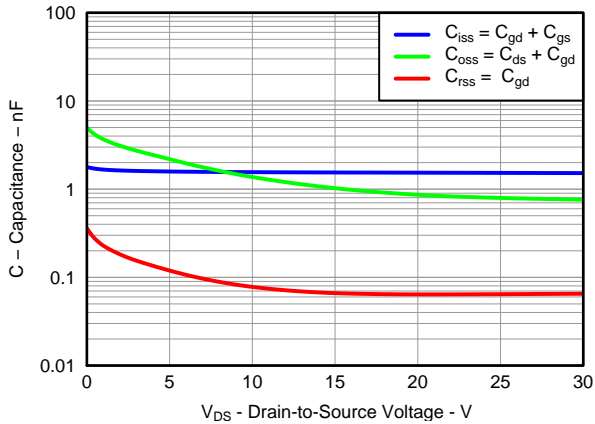
**Figure 2. Saturation Characteristics**



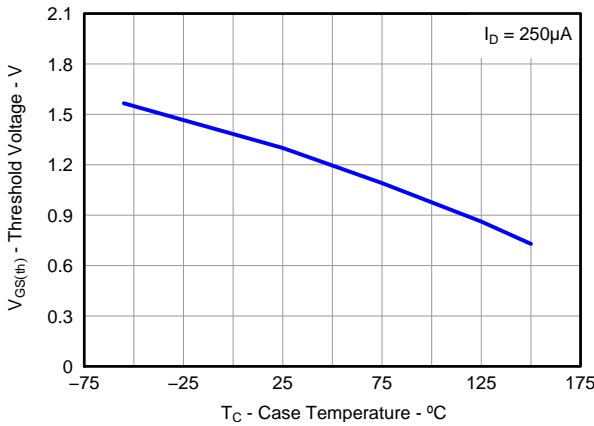
**Figure 3. Transfer Characteristics**



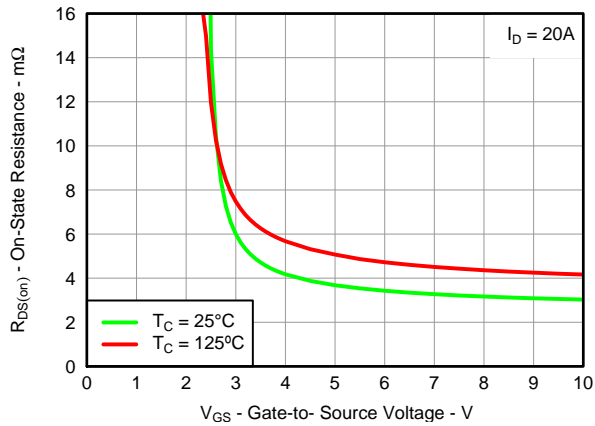
**Figure 4. Gate Charge**



**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)

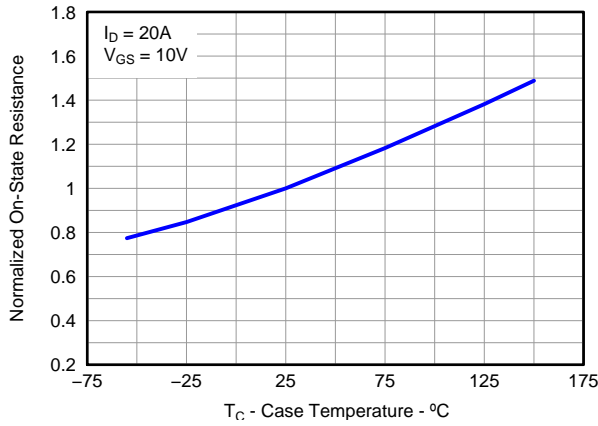


Figure 8. Normalized On-State Resistance vs. Temperature

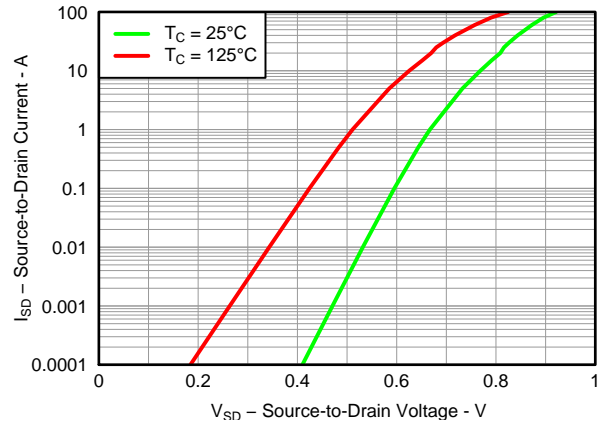


Figure 9. Typical Diode Forward Voltage

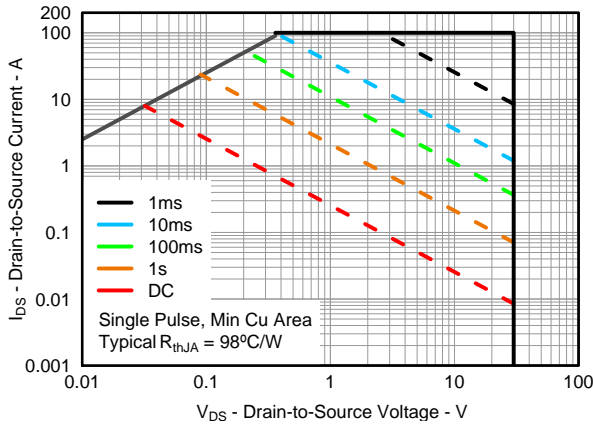


Figure 10. Maximum Safe Operating Area

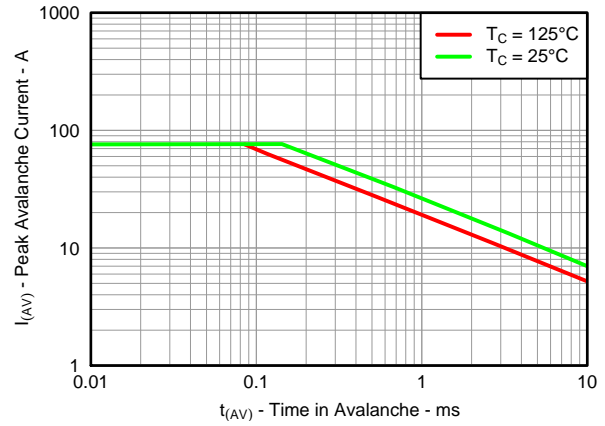


Figure 11. Single Pulse Unclamped Inductive Switching

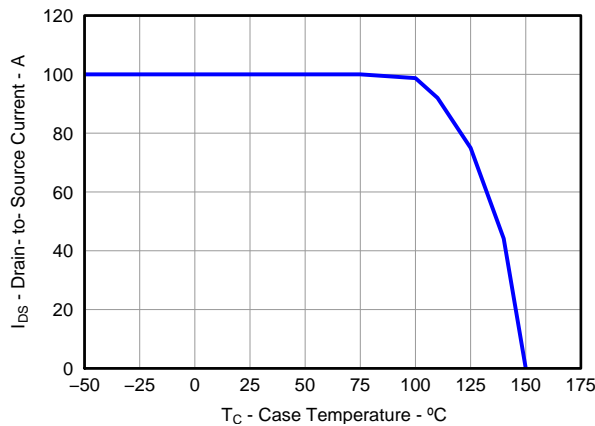
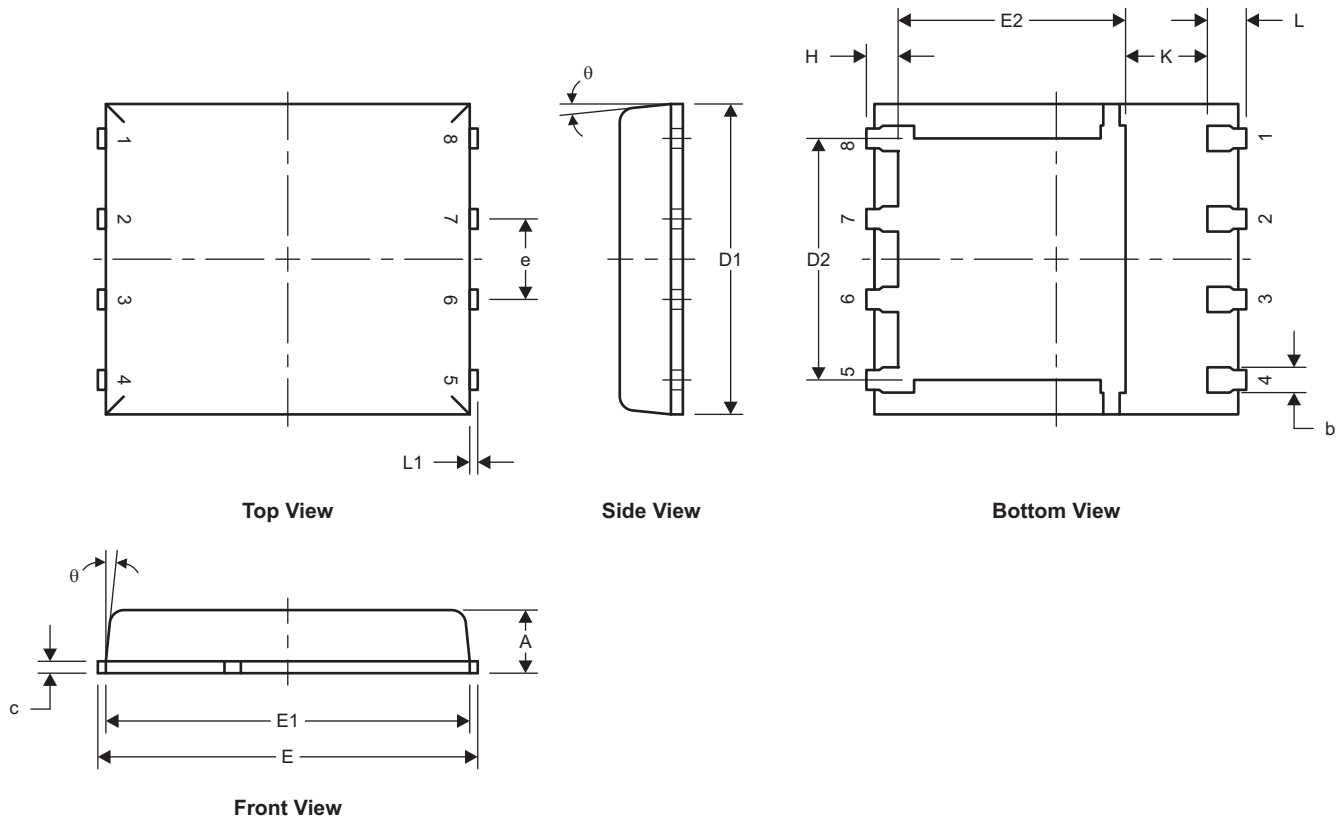


Figure 12. Maximum Drain Current vs. Temperature

**MECHANICAL DATA**

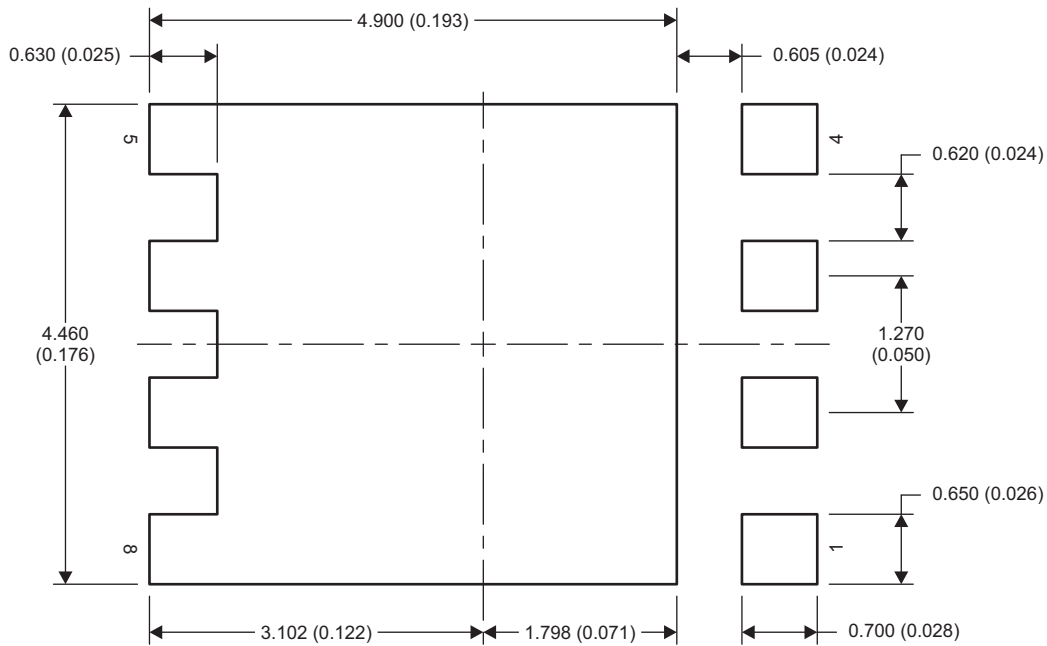
**Q5A Package Dimensions**



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°

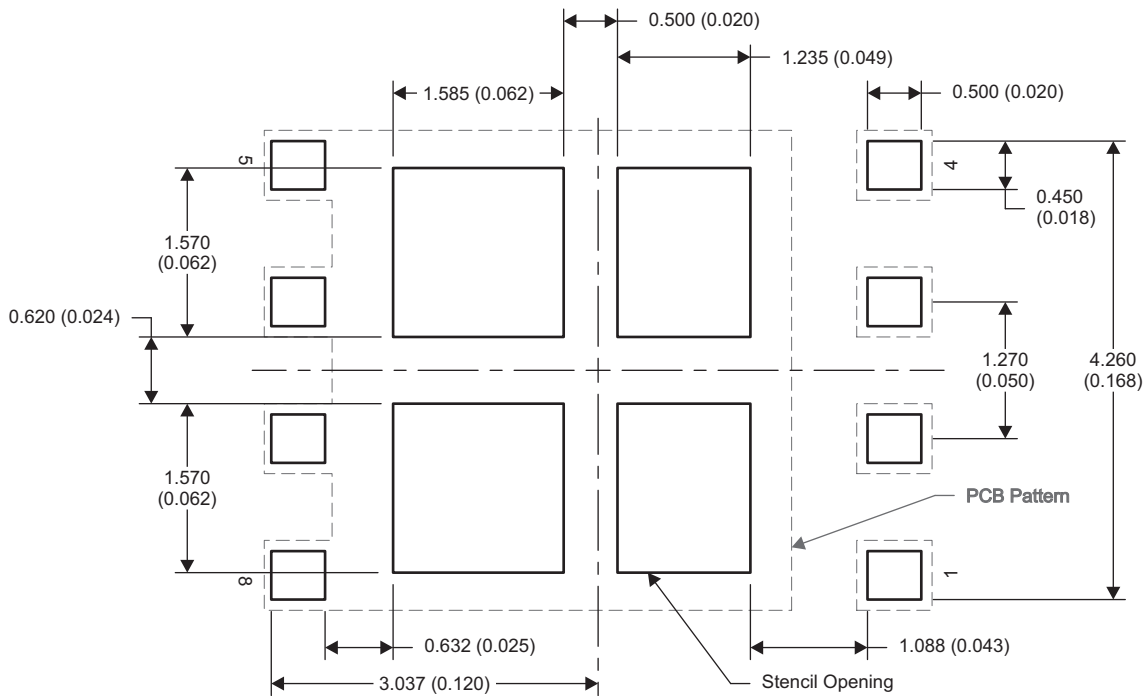
### Recommended PCB Pattern



M0139-01

NOTE: Dimensions are in mm (inches).

### Stencil Recommendation

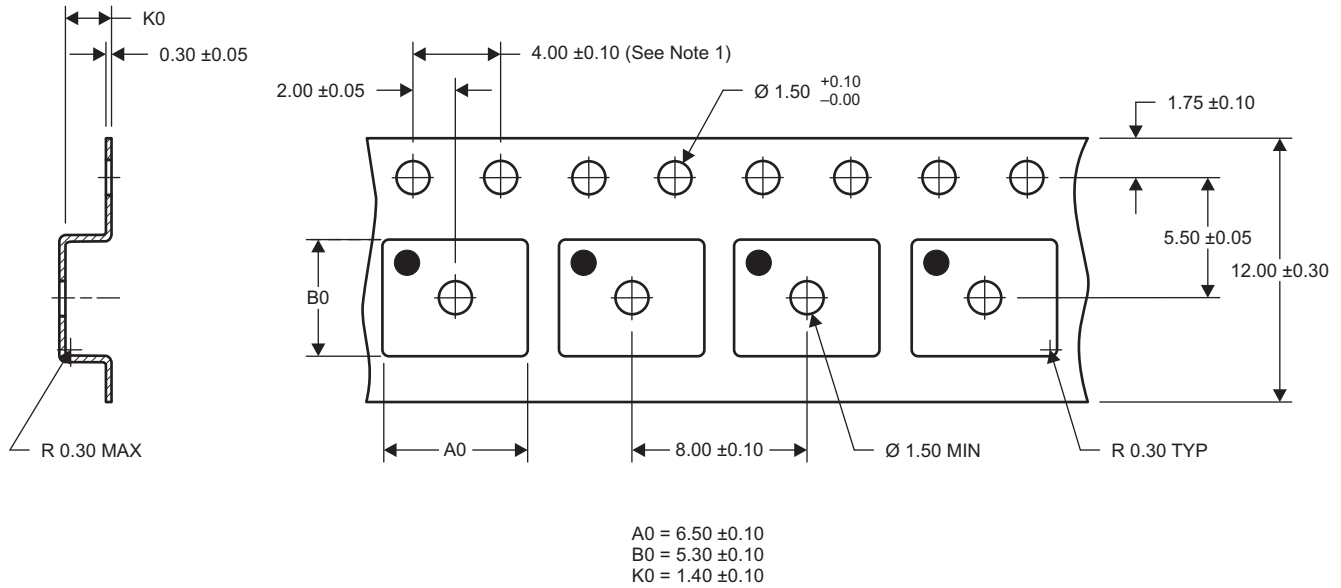


M0209-01

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

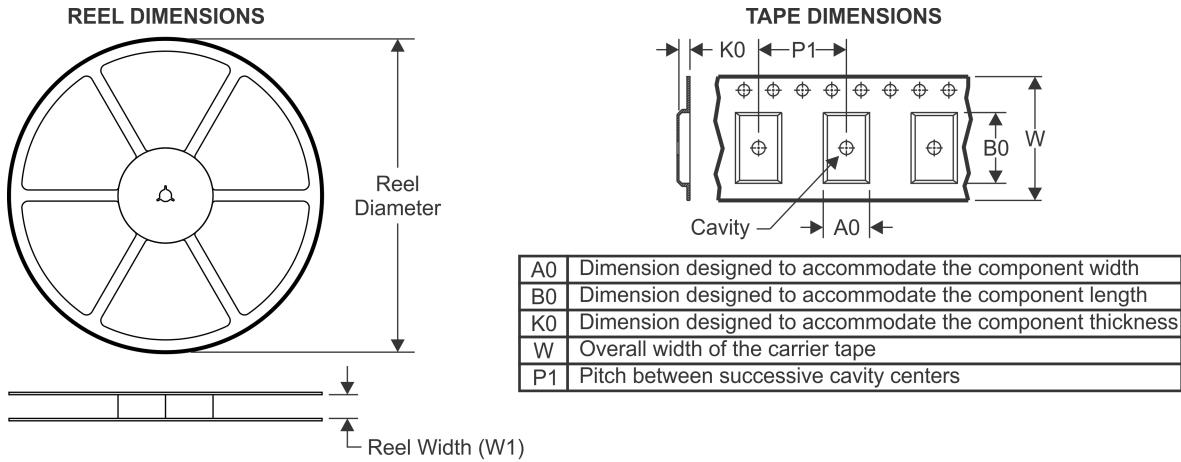
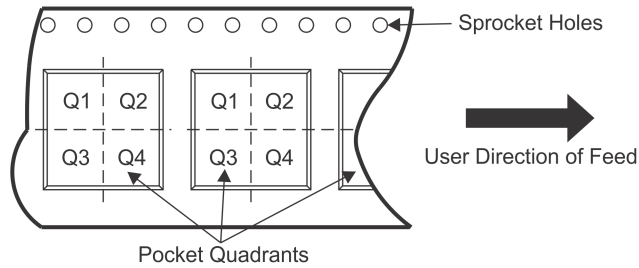


M0138-01

- 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**

**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
CSD17505Q5A	VSONP	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	VSONP	DQJ	8	2500	340.0	340.0	38.0

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Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
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