

N-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^e	Q_g (Typ.)
20	0.028 at $V_{GS} = 4.5$ V	6 ^a	8.8 nC
	0.042 at $V_{GS} = 2.5$ V	6 ^a	
	0.050 at $V_{GS} = 1.8$ V	5.6	

FEATURES

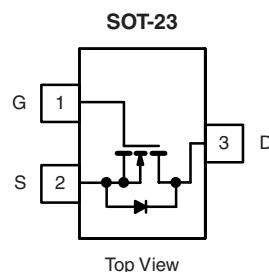
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- DC/DC Converters
- Load Switch for Portable Applications



ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V_{DS}	20	V	
Gate-Source Voltage	V_{GS}	± 12		
Continuous Drain Current ($T_J = 150$ °C)	I_D	6 ^a	A	
		5.1		
		5 ^{b, c}		
		4 ^{b, c}		
Pulsed Drain Current	I_{DM}	20		
Continuous Source-Drain Diode Current	I_S	1.75		
		1.04 ^{b, c}		
Maximum Power Dissipation	P_D	2.1	W	
		1.3		
		1.25 ^{b, c}		
		0.8 ^{b, c}		
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	°C	
Soldering Recommendations (Peak Temperature)		260		

THERMAL RESISTANCE RATINGS				
Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	80	100	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	40	

Notes:

- Package limited
- Surface Mounted on 1" x 1" FR4 board.
- $t = 5$ s.
- Maximum under steady state conditions is 125 °C/W.
- Based on $T_C = 25$ °C.

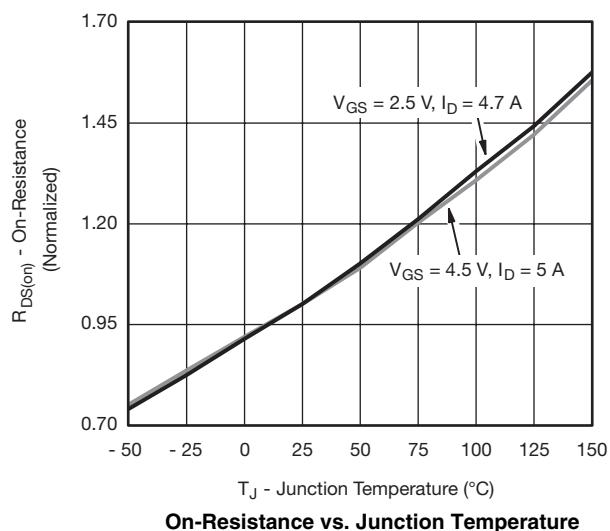
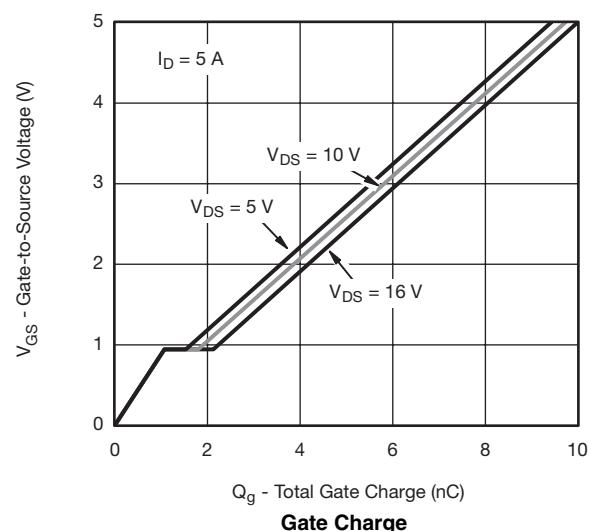
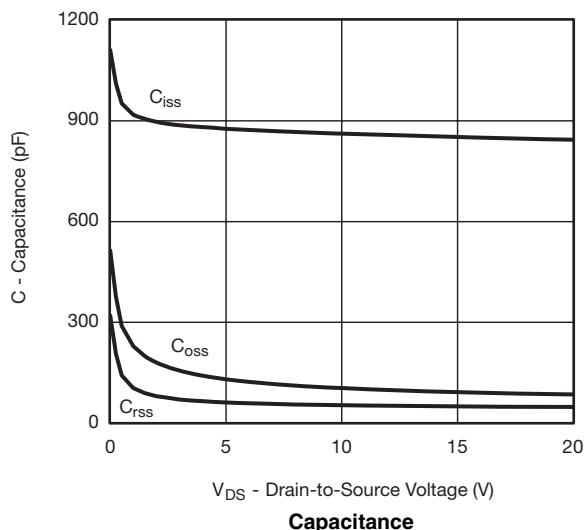
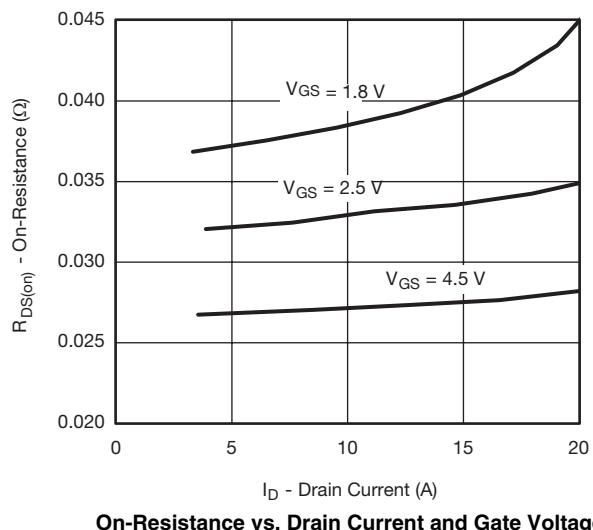
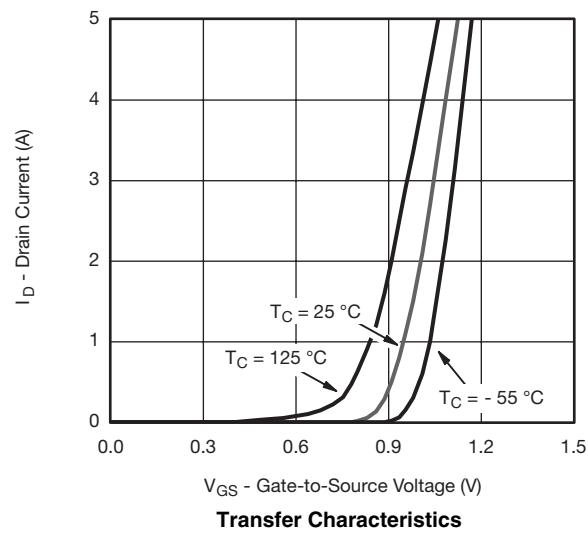
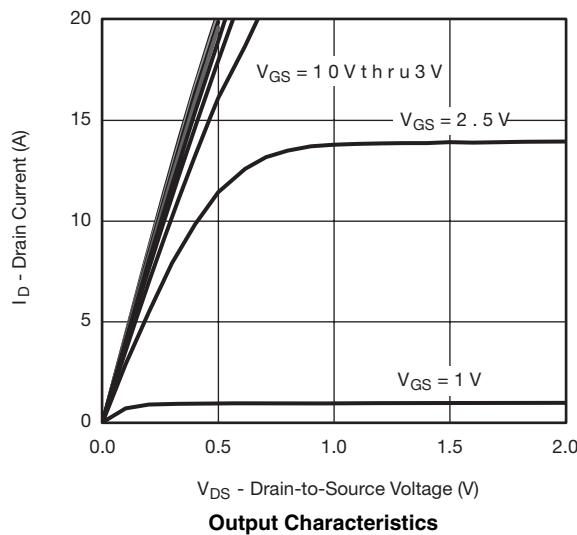
SPECIFICATIONS $T_J = 25^\circ\text{C}$, unless otherwise noted

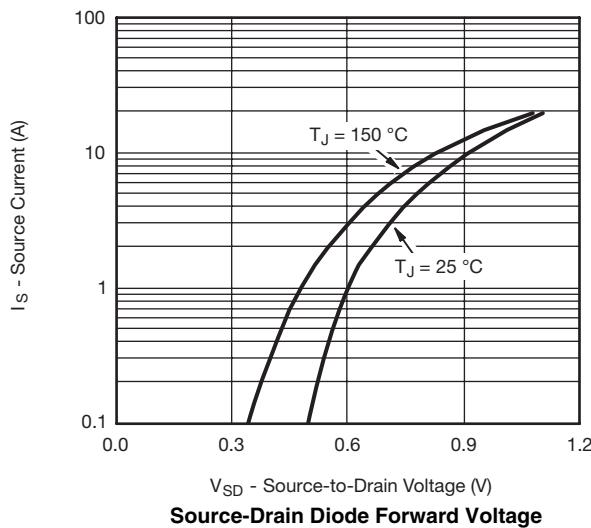
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}$, $I_D = 250 \mu\text{A}$	20			V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$		25		mV/°C	
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			- 2.6			
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	0.45		1.0	V	
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0 \text{ V}$, $V_{GS} = \pm 8 \text{ V}$			± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20 \text{ V}$, $V_{GS} = 0 \text{ V}$		1		μA	
		$V_{DS} = 20 \text{ V}$, $V_{GS} = 0 \text{ V}$, $T_J = 70^\circ\text{C}$			10		
On-State Drain Current ^a	$I_{D(\text{on})}$	$V_{DS} \leq 5 \text{ V}$, $V_{GS} = 4.5 \text{ V}$	20			A	
Drain-Source On-State Resistance ^a	$R_{DS(\text{on})}$	$V_{GS} = 4.5 \text{ V}$, $I_D = 5.0 \text{ A}$		0.028		Ω	
		$V_{GS} = 2.5 \text{ V}$, $I_D = 4.7 \text{ A}$		0.042			
		$V_{GS} = 1.8 \text{ V}$, $I_D = 4.3 \text{ A}$		0.050			
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10 \text{ V}$, $I_D = 5.0 \text{ A}$		24		S	
Dynamic^b							
Input Capacitance	C_{iss}	$V_{DS} = 10 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$		865		pF	
Output Capacitance	C_{oss}			105			
Reverse Transfer Capacitance	C_{rss}			55			
Total Gate Charge	Q_g	$V_{DS} = 10 \text{ V}$, $V_{GS} = 5 \text{ V}$, $I_D = 5.0 \text{ A}$		12	18	nC	
				8.8	14		
Gate-Source Charge	Q_{gs}	$V_{DS} = 10 \text{ V}$, $V_{GS} = 4.5 \text{ V}$, $I_D = 5.0 \text{ A}$		1.1			
Gate-Drain Charge	Q_{gd}			0.7			
Gate Resistance	R_g	$f = 1 \text{ MHz}$		0.5	2.4	4.8	Ω
Turn-On Delay Time	$t_{d(\text{on})}$		8	16	ns		
Rise Time	t_r	$V_{DD} = 10 \text{ V}$, $R_L = 2.2 \Omega$ $I_D \geq 4 \text{ A}$, $V_{GEN} = 4.5 \text{ V}$, $R_g = 1 \Omega$		17		26	
Turn-Off Delay Time	$t_{d(\text{off})}$			31		47	
Fall Time	t_f			8		16	
Turn-On Delay Time	$t_{d(\text{on})}$			5		10	
Rise Time	t_r	$V_{DD} = 10 \text{ V}$, $R_L = 2.2 \Omega$ $I_D \geq 4 \text{ A}$, $V_{GEN} = 5 \text{ V}$, $R_g = 1 \Omega$		13	20		
Turn-Off Delay Time	$t_{d(\text{off})}$			21	32		
Fall Time	t_f			6	12		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$			1.75	A	
Pulse Diode Forward Current	I_{SM}				20		
Body Diode Voltage	V_{SD}	$I_S = 4 \text{ A}$, $V_{GS} = 0 \text{ V}$		0.75	1.2	V	
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 4 \text{ A}$, $dl/dt = 100 \text{ A}/\mu\text{s}$, $T_J = 25^\circ\text{C}$		12	20	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			5	10		
Reverse Recovery Fall Time	t_a			7			
Reverse Recovery Rise Time	t_b			5			

Notes:

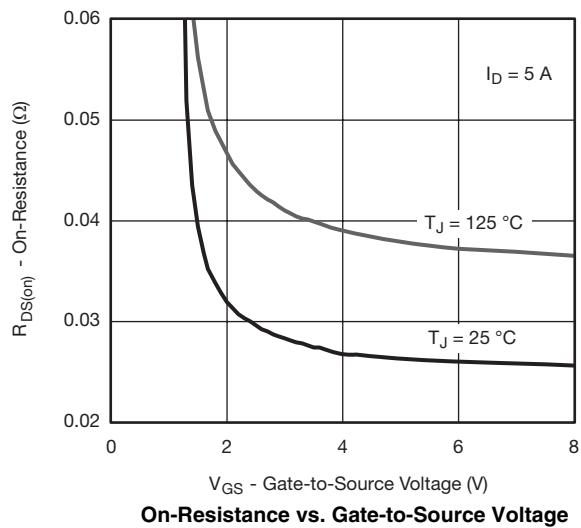
a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$
 b. Guaranteed by design, not subject to production testing.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

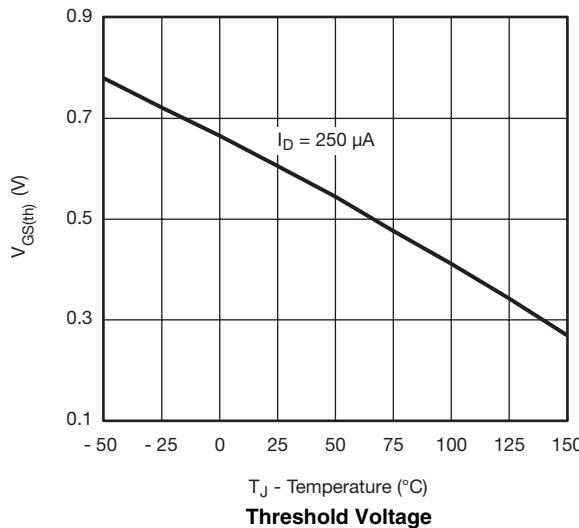
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


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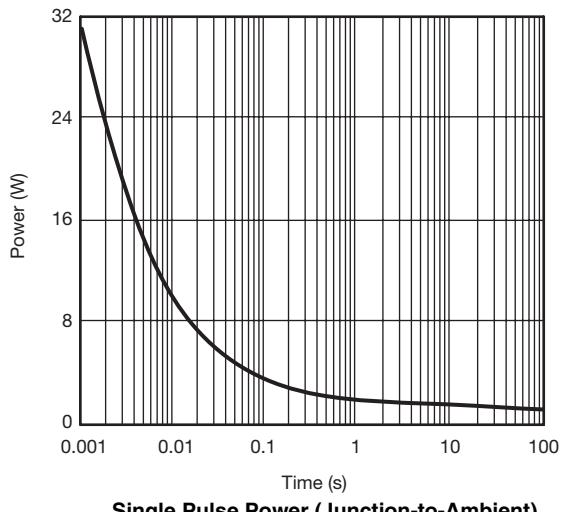
Source-Drain Diode Forward Voltage



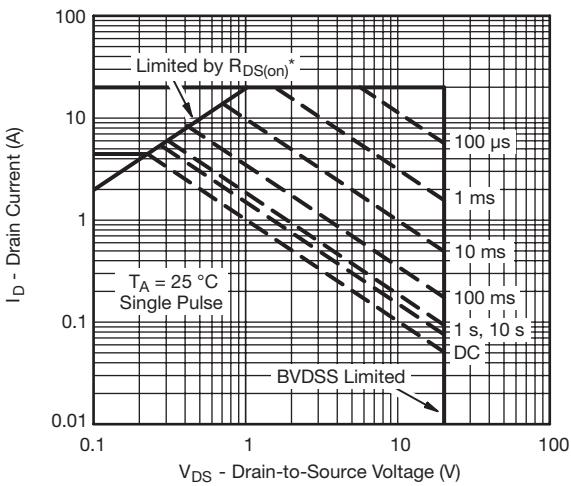
On-Resistance vs. Gate-to-Source Voltage



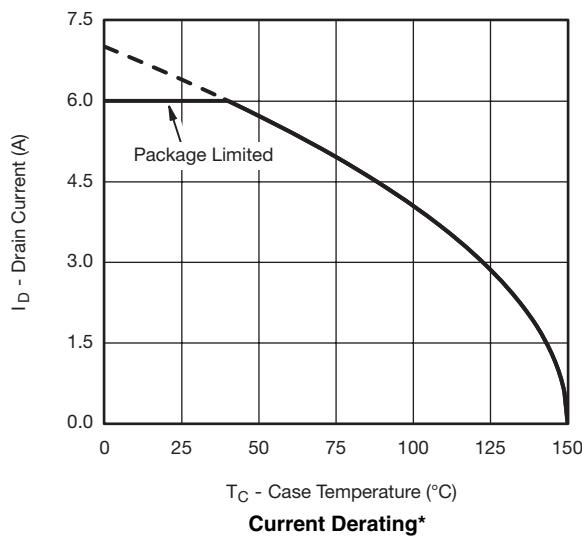
Threshold Voltage



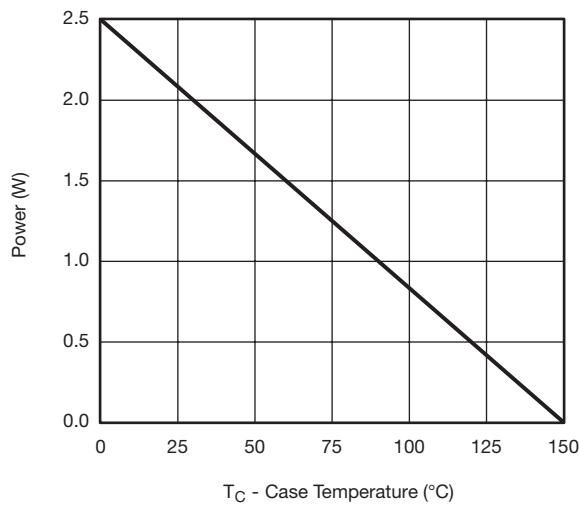
Single Pulse Power (Junction-to-Ambient)



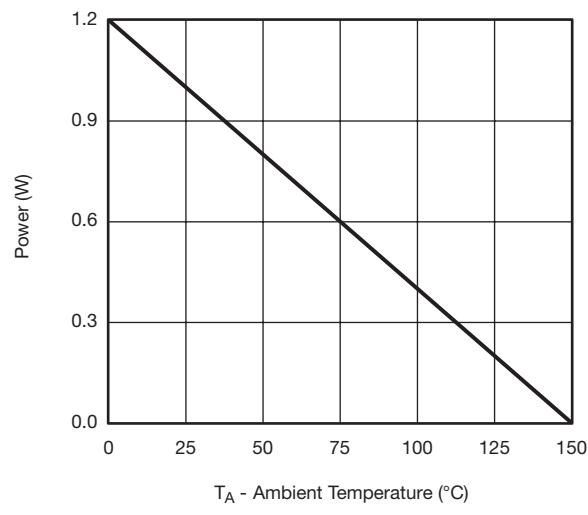
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted
T_C - Case Temperature (°C)

Current Derating*

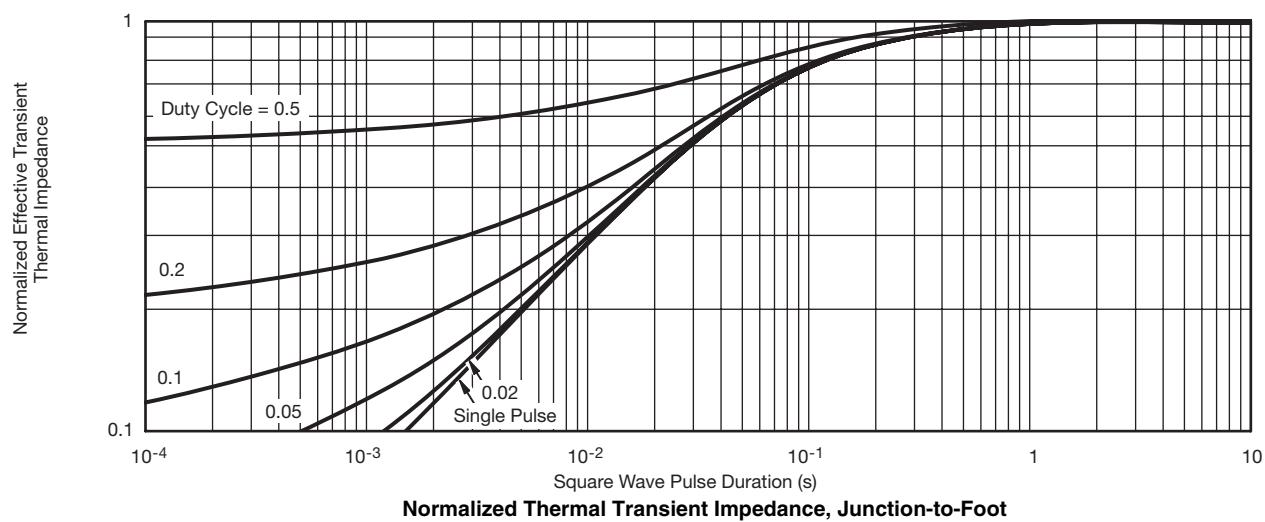
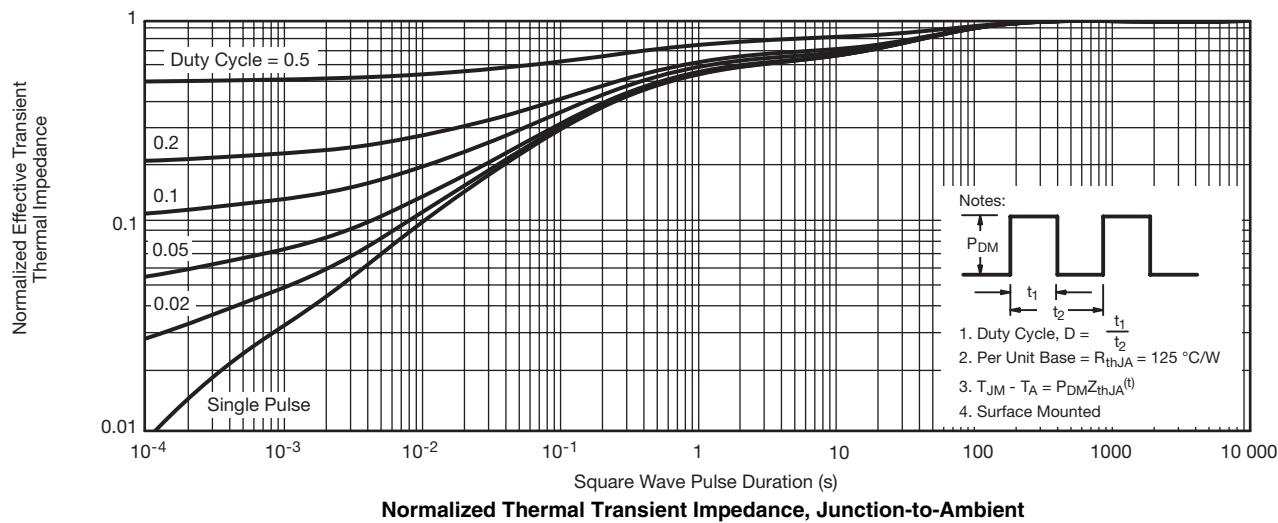
T_C - Case Temperature (°C)

Power Derating, Junction-to-Foot

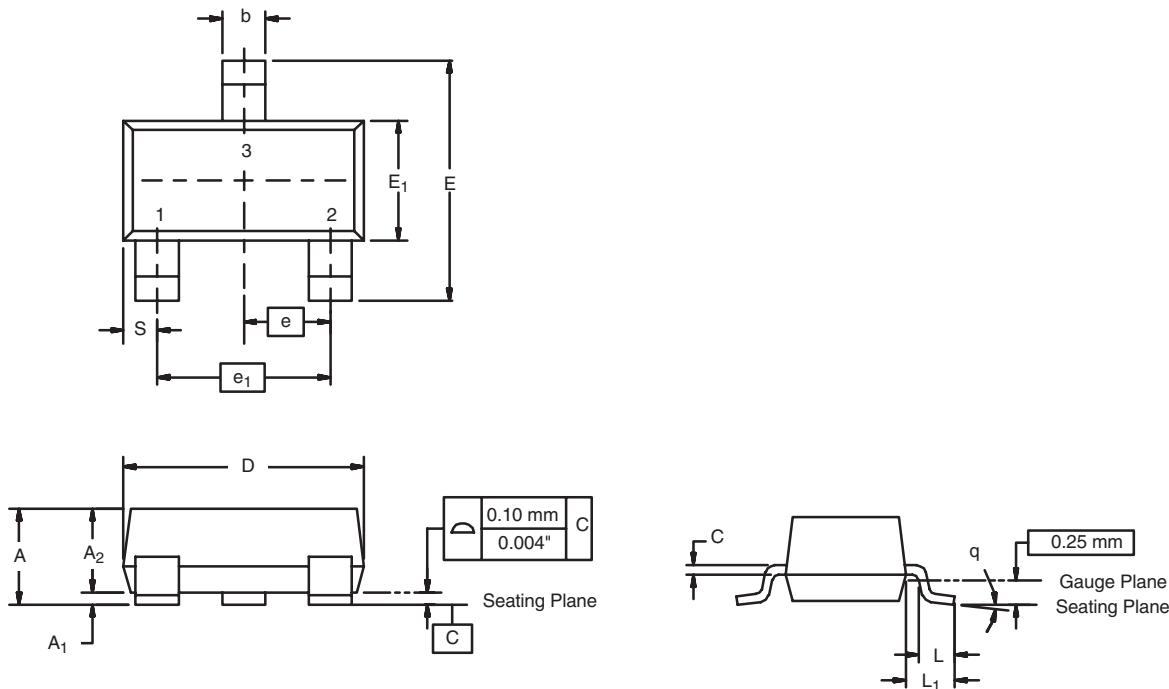
T_A - Ambient Temperature (°C)

Power Derating, Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(\max.)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


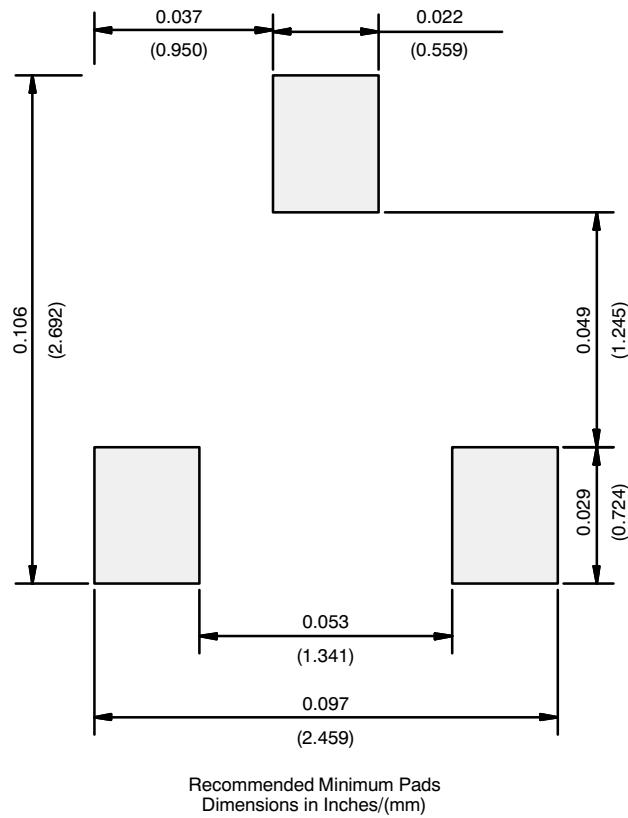
SOT-23 (TO-236): 3-LEAD



Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	0.89	1.12	0.035	0.044
A ₁	0.01	0.10	0.0004	0.004
A ₂	0.88	1.02	0.0346	0.040
b	0.35	0.50	0.014	0.020
c	0.085	0.18	0.003	0.007
D	2.80	3.04	0.110	0.120
E	2.10	2.64	0.083	0.104
E ₁	1.20	1.40	0.047	0.055
e	0.95 BSC		0.0374 Ref	
e ₁	1.90 BSC		0.0748 Ref	
L	0.40	0.60	0.016	0.024
L ₁	0.64 Ref		0.025 Ref	
S	0.50 Ref		0.020 Ref	
q	3°	8°	3°	8°

ECN: S-03946-Rev. K, 09-Jul-01
 DWG: 5479

RECOMMENDED MINIMUM PADS FOR SOT-23



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