

P-Channel 12-V (D-S) MOSFET

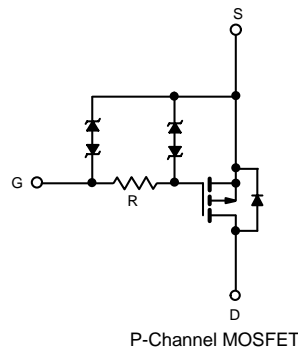
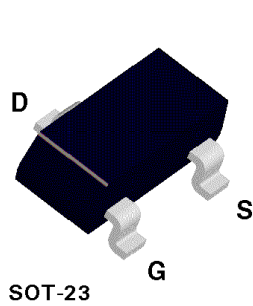
PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A)	Q _g (Typ.)
- 12	0.018 at V _{GS} = - 4.5 V	- 6 ^a	20 nC
	0.021 at V _{GS} = - 2.5 V	- 6 ^a	
	0.040 at V _{GS} = - 1.8 V	- 4	

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

- Portable Devices
 - Load Switch
 - Battery Switch
 - Charger Switch

ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V _{DS}	- 12	V
Gate-Source Voltage	V _{GS}	± 12	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	- 6 ^a	A
	T _C = 70 °C	- 6 ^a	
	T _A = 25 °C	- 5 ^{b, c}	
	T _A = 70 °C	- 4.1 ^{b, c}	
Pulsed Drain Current	I _{DM}	- 50	
Continuous Source-Drain Diode Current	T _C = 25 °C	- 6 ^a	
	T _A = 25 °C	- 2.9 ^{b, c}	
Maximum Power Dissipation	T _C = 25 °C	19	W
	T _C = 70 °C	12	
	T _A = 25 °C	3.5 ^{b, c}	
	T _A = 70 °C	2.2 ^{b, c}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	- 55 to 150	°C
Soldering Recommendations (Peak Temperature) ^{d, e}		260	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, e}	t ≤ 5 s	R _{thJA}	28	36	°C/W
Maximum Junction-to-Case (Drain)	Steady State	R _{thJC}	5.3	6.5	

Notes:

- Package limited.
- Surface Mounted on 1" x 1" FR4 board.
- t = 5 s.
- Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.
- Maximum under Steady State conditions is 80 °C/W.

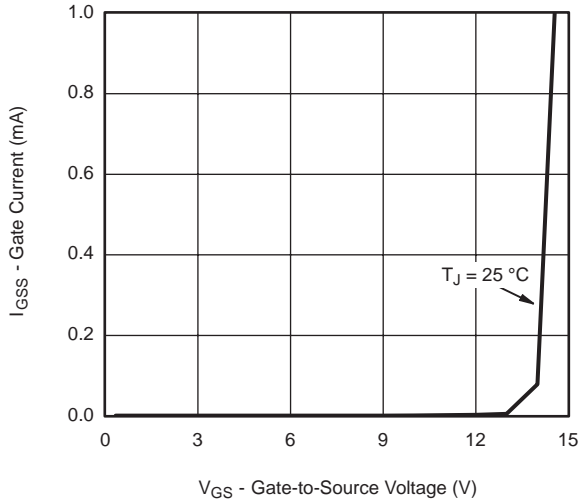
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted							
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-12			V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-12		mV/°C	
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.5		-1.2	V	
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$			± 20	μA	
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			± 0.5		
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1		
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10		
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	-20			A	
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -4.5\text{ V}, I_D = -5.6\text{ A}$		0.018		Ω	
		$V_{GS} = -2.5\text{ V}, I_D = -5.3\text{ A}$		0.021			
		$V_{GS} = -1.8\text{ V}, I_D = -2.5\text{ A}$		0.040			
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -5.6\text{ A}$		35		S	
Dynamic^b							
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -8\text{ V}, I_D = -5\text{ A}$		50	75	nC	
Gate-Source Charge			Q_{gs}	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -5\text{ A}$	20		30
Gate-Drain Charge					Q_{gd}		3.3
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.2	1	2	k Ω	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		0.71	1.1	us	
Rise Time	t_r			1.7	2.6		
Turn-Off Delay Time	$t_{d(off)}$			6	9		
Fall Time	t_f			3.2	5		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		0.3	0.45		
Rise Time	t_r			0.6	0.9		
Turn-Off Delay Time	$t_{d(off)}$			10	15		
Fall Time	t_f			3.5	5.5		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-6	A	
Pulse Diode Forward Current	I_{SM}				-50		
Body Diode Voltage	V_{SD}	$I_S = -5\text{ A}, V_{GS} = 0\text{ V}$		-0.85	-1.2	V	
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 6\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		30	60	ns	
Body Diode Reverse Recovery Charge	Q_{rr}			20	40	nC	
Reverse Recovery Fall Time	t_a			13		ns	
Reverse Recovery Rise Time	t_b			17			

Notes:

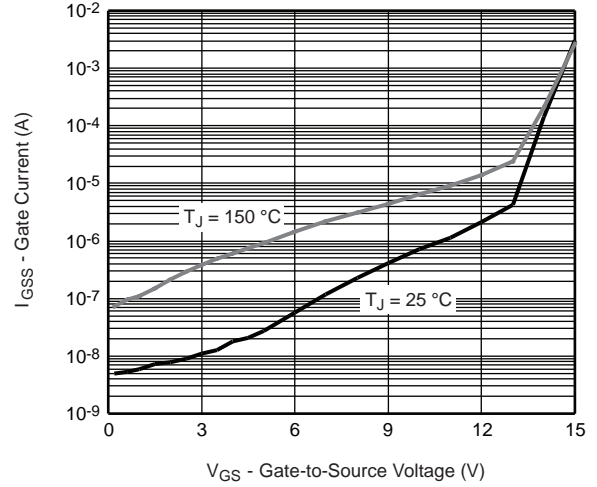
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

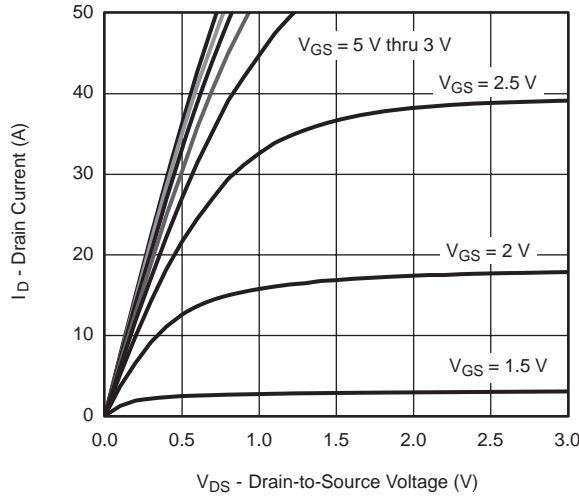
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



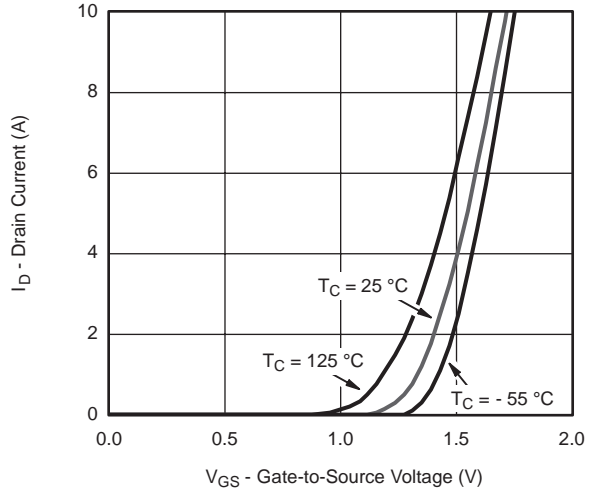
Gate Current vs. Gate-Source Voltage



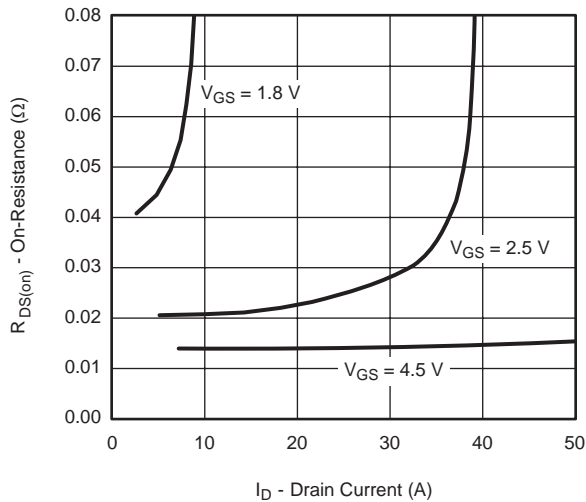
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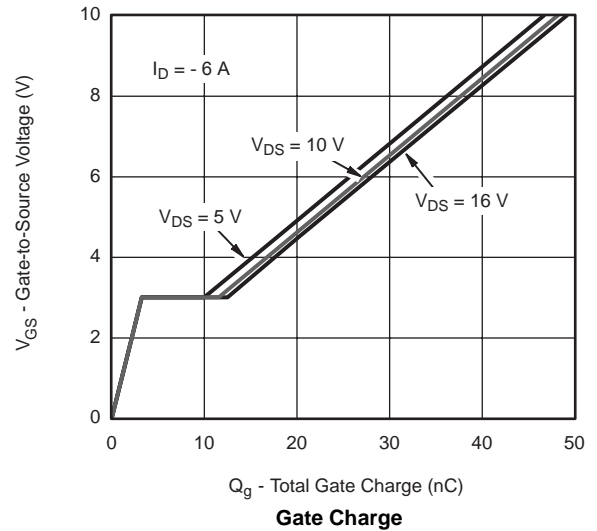
Output Characteristics



Transfer Characteristics

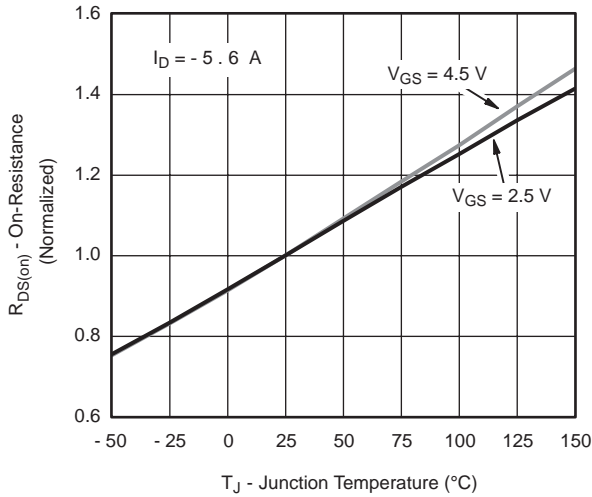


On-Resistance vs. Drain Current

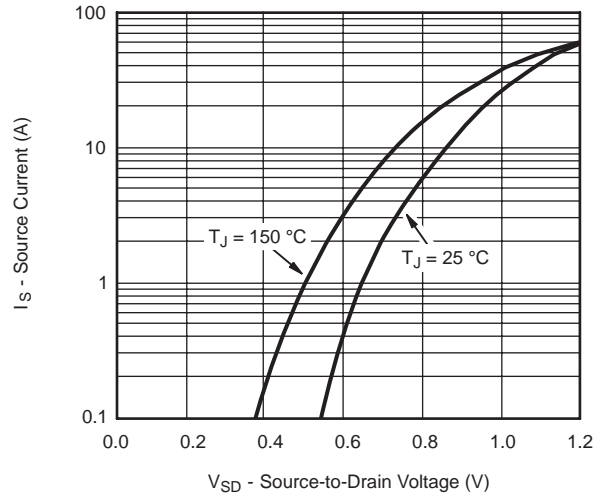


Gate Charge

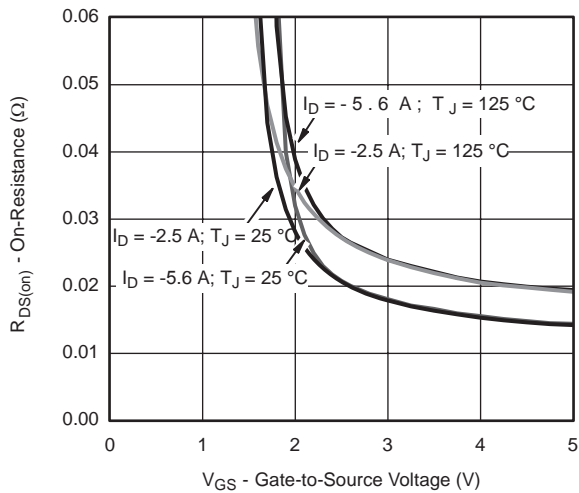
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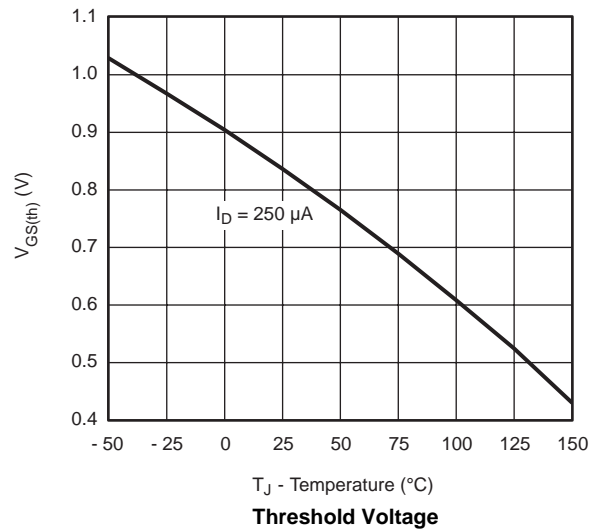
On-Resistance vs. Junction Temperature



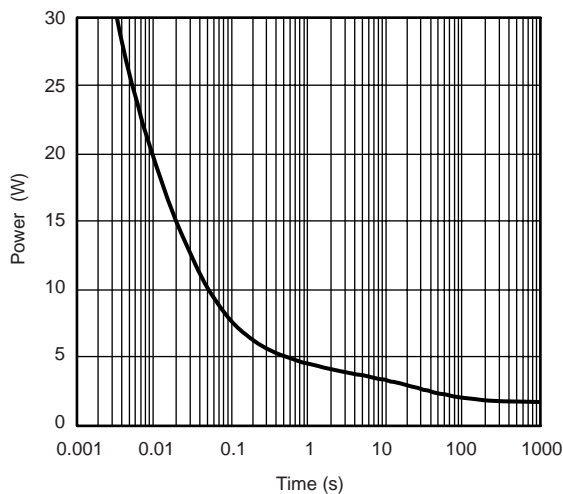
Source-Drain Diode Forward Voltage



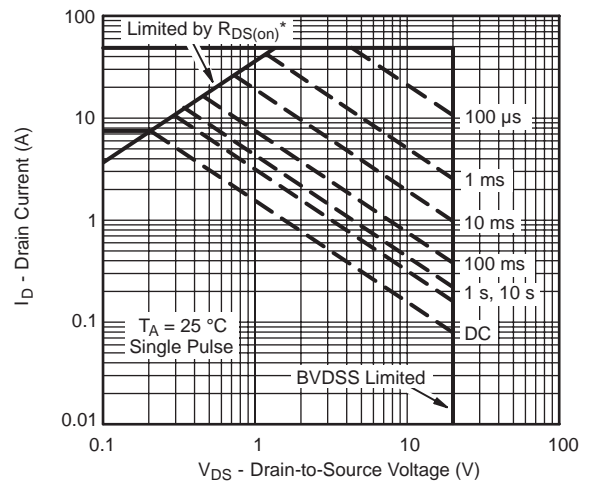
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

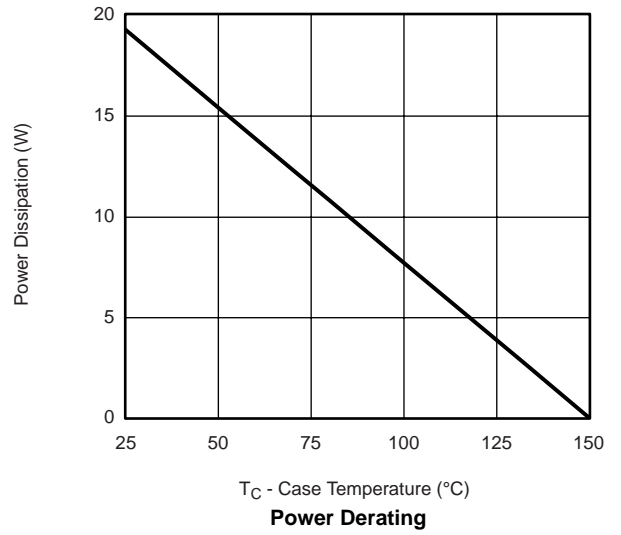
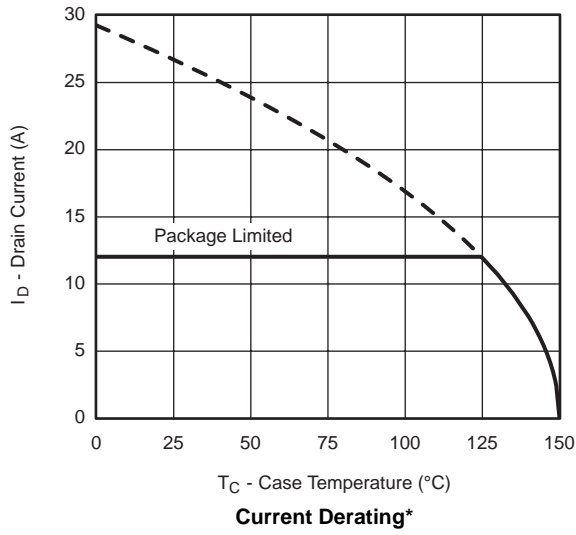


Single Pulse Power, Junction-to-Ambient



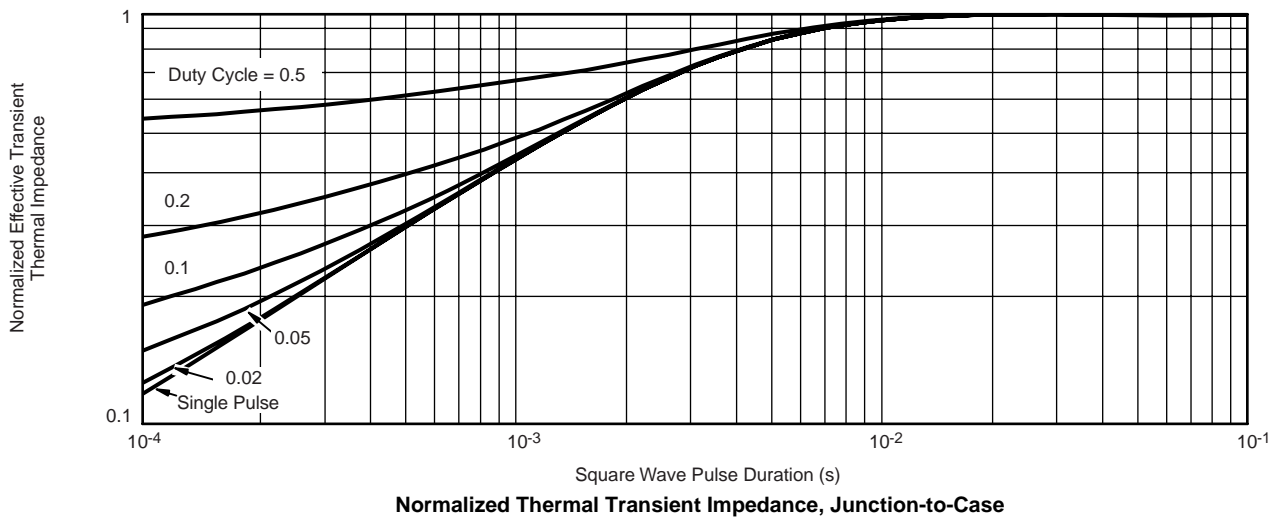
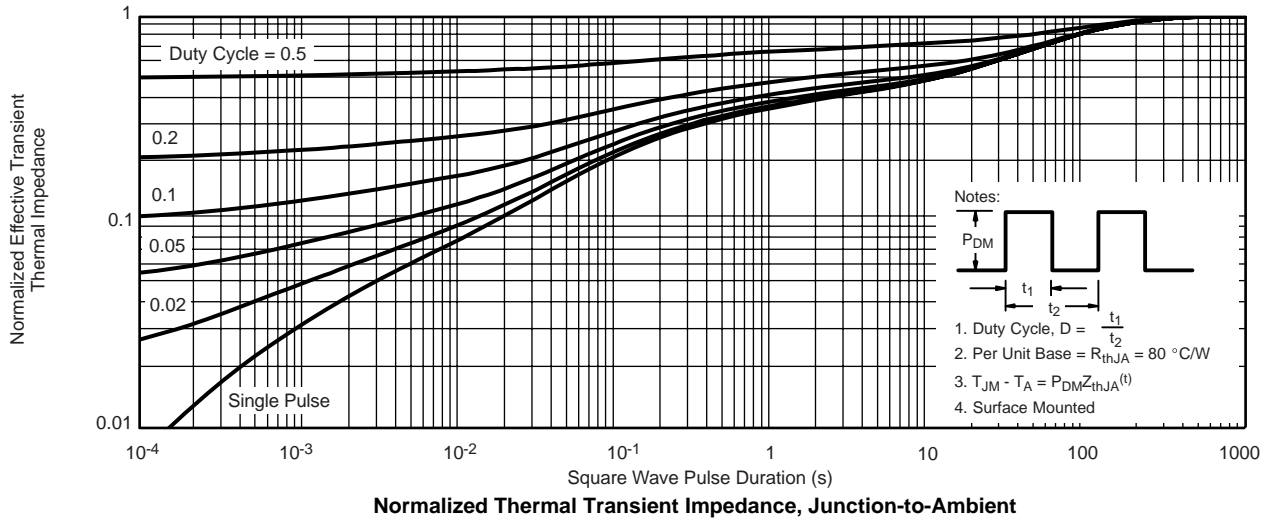
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

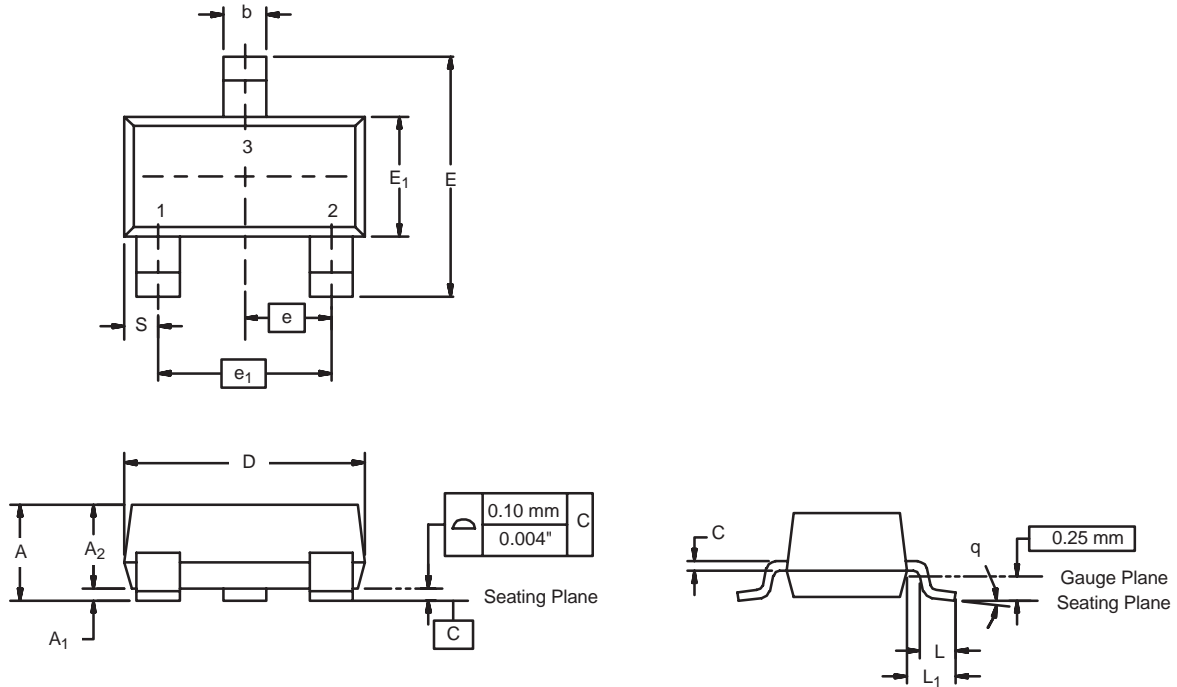


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



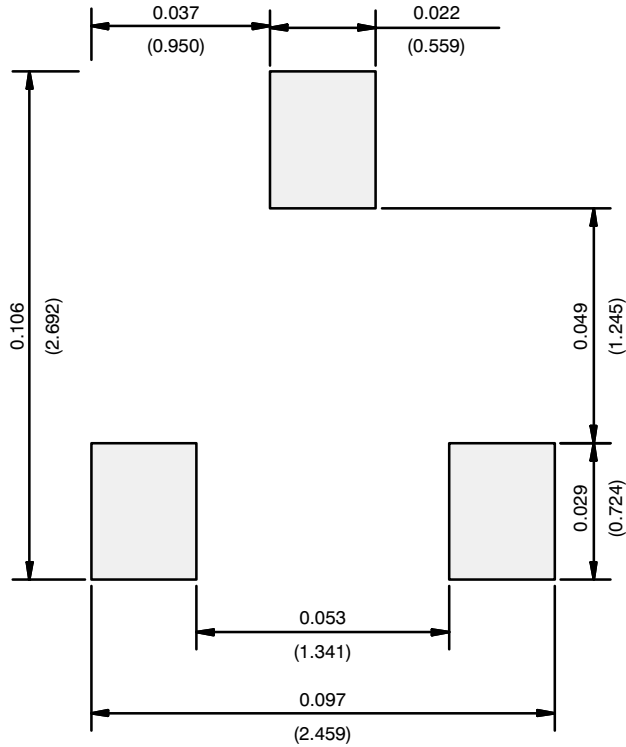
SOT-23 (TO-236): 3-LEAD



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



Recommended Minimum Pads
Dimensions in Inches/(mm)

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