

P-Channel 20 V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω) Max.	I _D (A) ^a	Q _g (Typ.)
- 20	0.0320 at V _{GS} = - 4.5 V	- 5.9	13.8 nC
	0.0410 at V _{GS} = - 2.5 V	- 5.2	
	0.0675 at V _{GS} = - 1.8 V	- 4.3	

FEATURES

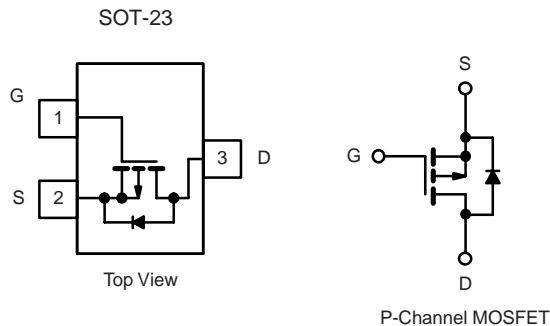
- DT-Trench Power MOSFET
- 100 % R_g Tested
- Built-in ESD Protection
- Typical ESD Performance 3000 V



RoHS
COMPLIANT

APPLICATIONS

- Power Management for Portable and Consumer
- Load Switches
- DC/DC Converters



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}	± 8	
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	I _D	- 5.9	A
	T _C = 70 °C		- 4.7	
	T _A = 25 °C		- 4.5 ^{b, c}	
	T _A = 70 °C		- 3.6 ^{b, c}	
Pulsed Drain Current (t = 300 μs)		I _{DM}	- 20	
Continuous Source-Drain Diode Current	T _C = 25 °C	I _S	- 1.4	
	T _A = 25 °C		- 1 ^{b, c}	
Maximum Power Dissipation	T _C = 25 °C	P _D	1.7	W
	T _C = 70 °C		1.1	
	T _A = 25 °C		1 ^{b, c}	
	T _A = 70 °C		0.6 ^{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, d}	t ≤ 5 s	R _{thJA}	100	130	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	60	75	

Notes:

- T_C = 25 °C.
- Surface mounted on 1" x 1" FR4 board.
- t = 5 s.
- Maximum under steady state conditions is 175 °C/W.

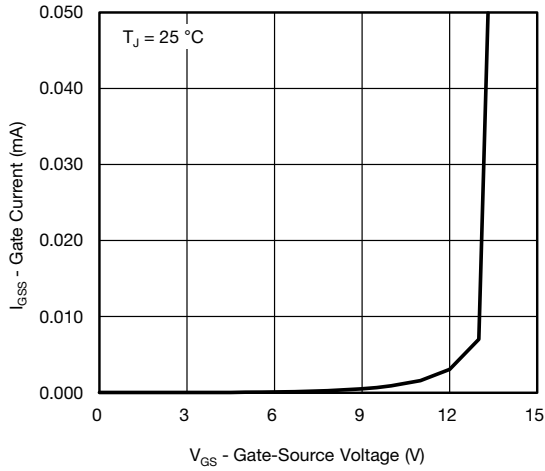
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-14		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			2.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.4		-1	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 8\text{ V}$			± 10	μA
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$			± 1	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			-1	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	-15			A
		$V_{GS} = -4.5\text{ V}, I_D = -4\text{ A}$		0.0265	0.0320	Ω
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -2.5\text{ V}, I_D = -4\text{ A}$		0.0340	0.0410	
		$V_{GS} = -1.8\text{ V}, I_D = -2\text{ A}$		0.0465	0.0675	
		Dynamic^b				
Total Gate Charge	Q_g	$V_{DS} = -10\text{ V}, V_{GS} = -8\text{ V}, I_D = -4.5\text{ A}$		23.8	36	nC
				13.8	21	
Gate-Source Charge	Q_{gs}	$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -4.5\text{ A}$		1.9		
Gate-Drain Charge	Q_{gd}			3		
Gate Resistance	R_g	$f = 1\text{ MHz}$	2.2	11	22	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 2.8\text{ }\Omega$ $I_D \cong -3.6\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		22	33	ns
Rise Time	t_r			21	32	
Turn-Off Delay Time	$t_{d(off)}$			62	93	
Fall Time	t_f			14	21	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 2.8\text{ }\Omega$ $I_D \cong -3.6\text{ A}, V_{GEN} = -8\text{ V}, R_g = 1\text{ }\Omega$		9	18	
Rise Time	t_r			6	12	
Turn-Off Delay Time	$t_{d(off)}$			65	98	
Fall Time	t_f			15	23	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-1.4	A
Pulse Diode Forward Current	I_{SM}				-20	
Body Diode Voltage	V_{SD}	$I_S = -3.6\text{ A}, V_{GS} = 0\text{ V}$		-0.8	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -3.6\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		13	20	ns
Body Diode Reverse Recovery Charge	Q_{rr}			5	10	nC
Reverse Recovery Fall Time	t_a			8		ns
Reverse Recovery Rise Time	t_b			5		

Notes:

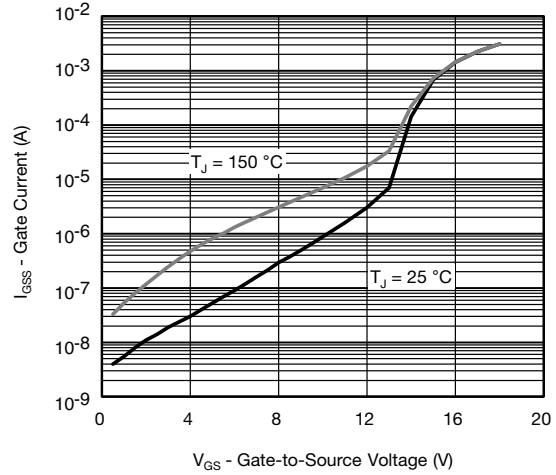
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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.

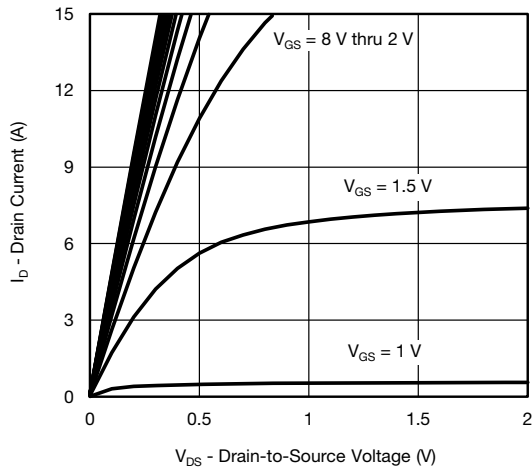
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



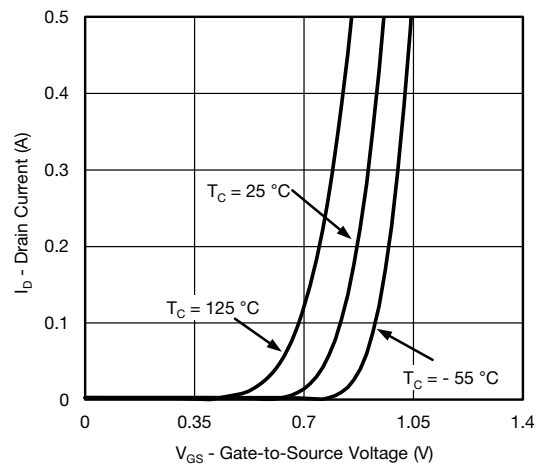
Gate Current vs. Gate-Source Voltage



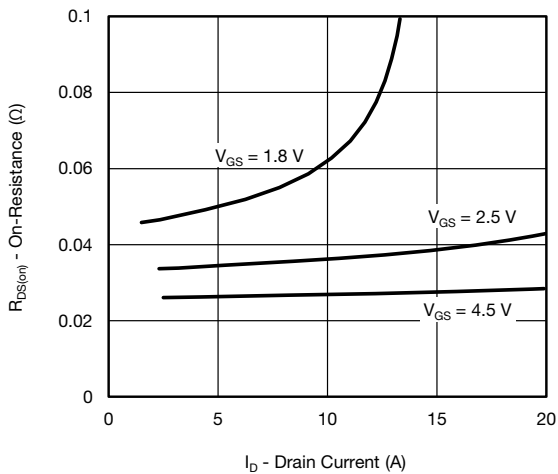
Gate Current vs. Gate-Source Voltage



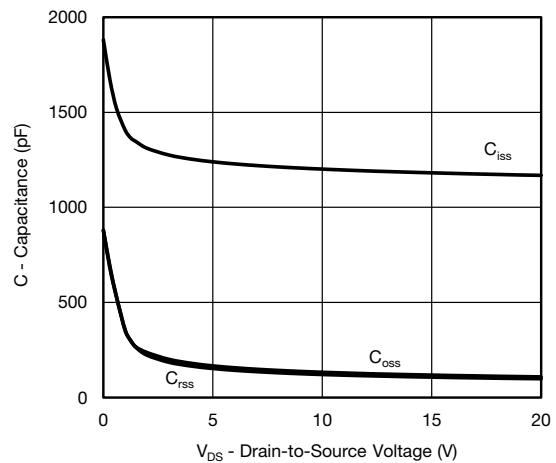
Output Characteristics



Transfer Characteristics

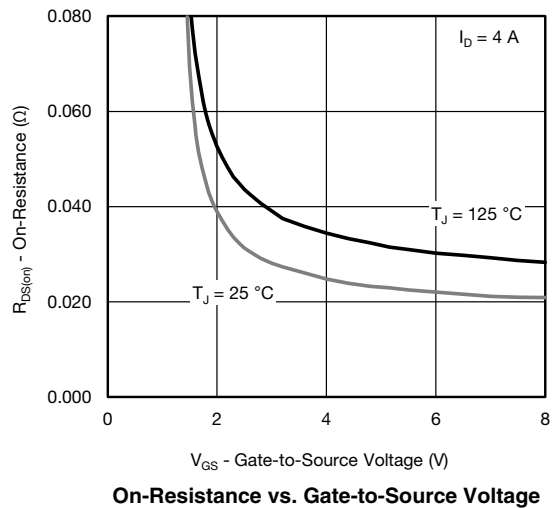
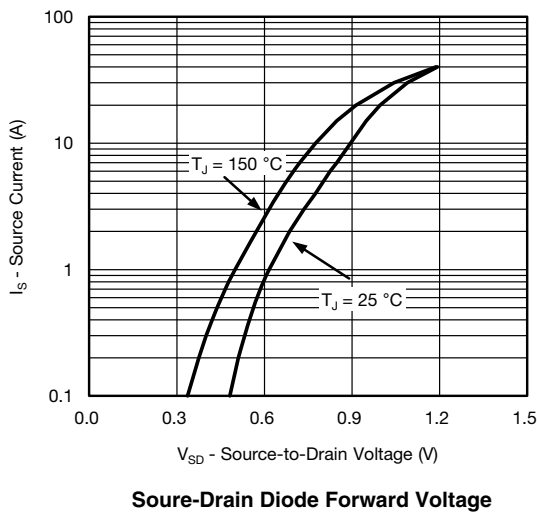
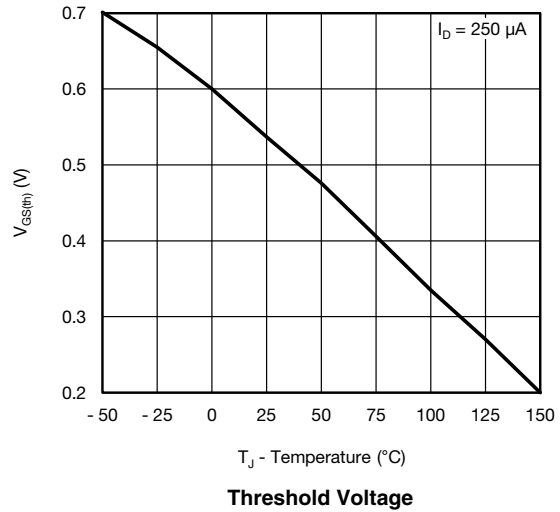
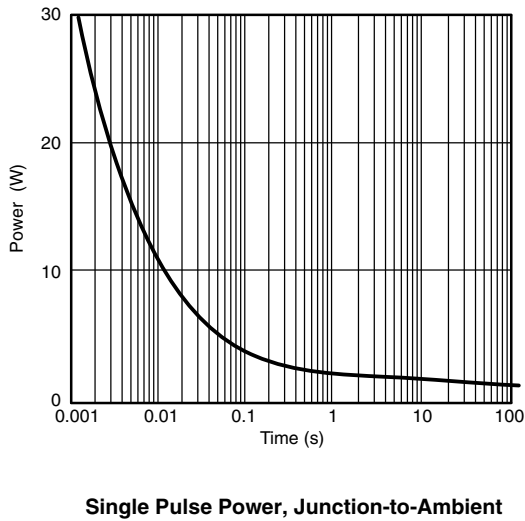
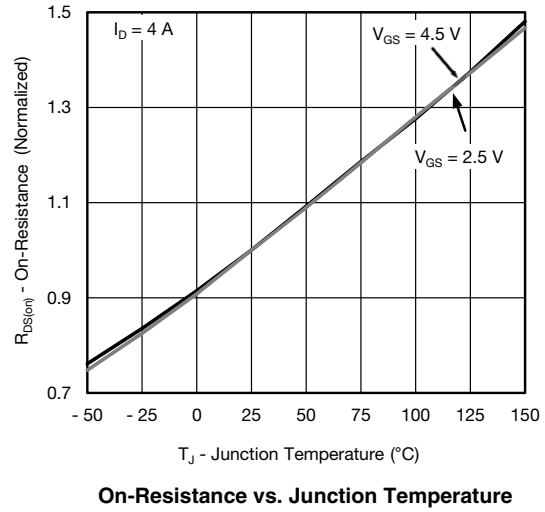
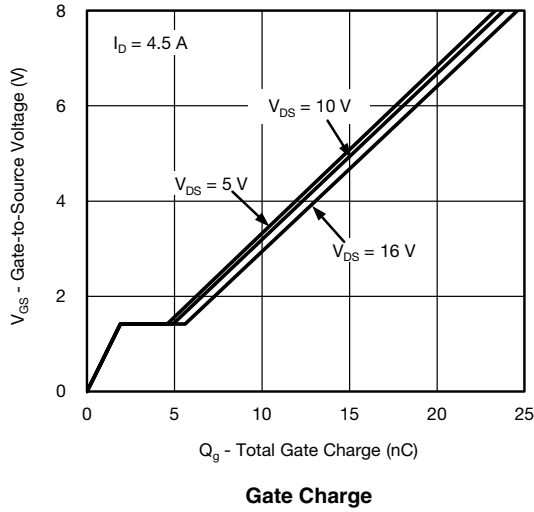


On-Resistance vs. Drain Current

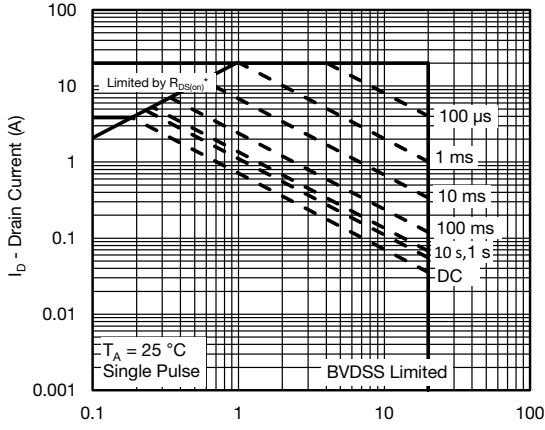


Capacitance

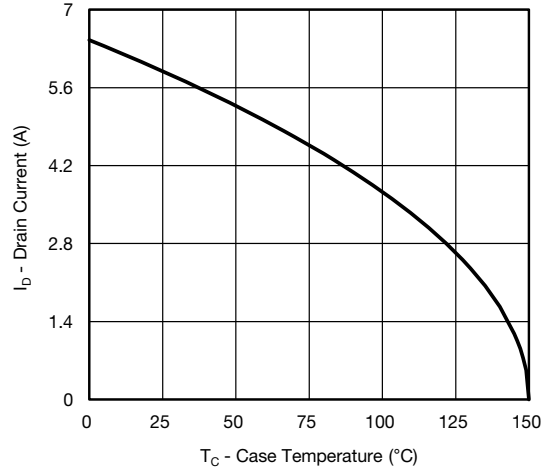
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



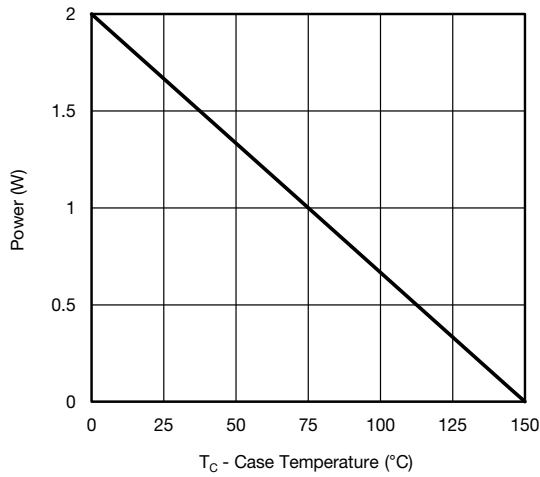
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



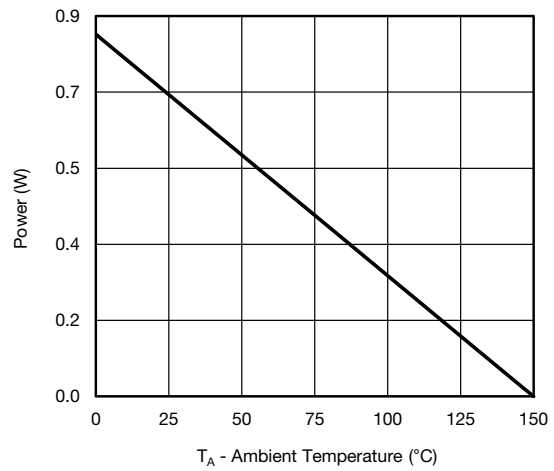
V_{DS} - Drain-to-Source Voltage (V)
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient



Current Derating*



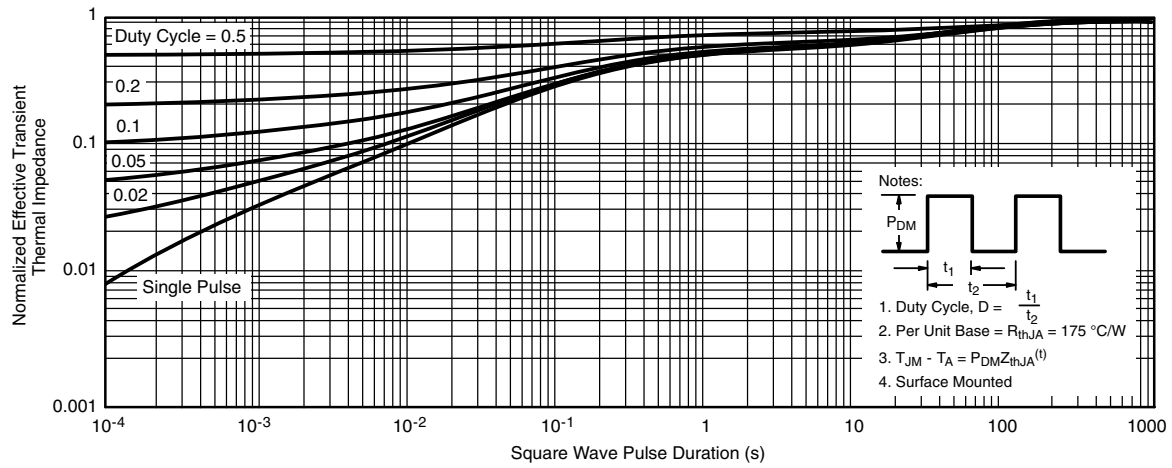
Power Junction-to-Case



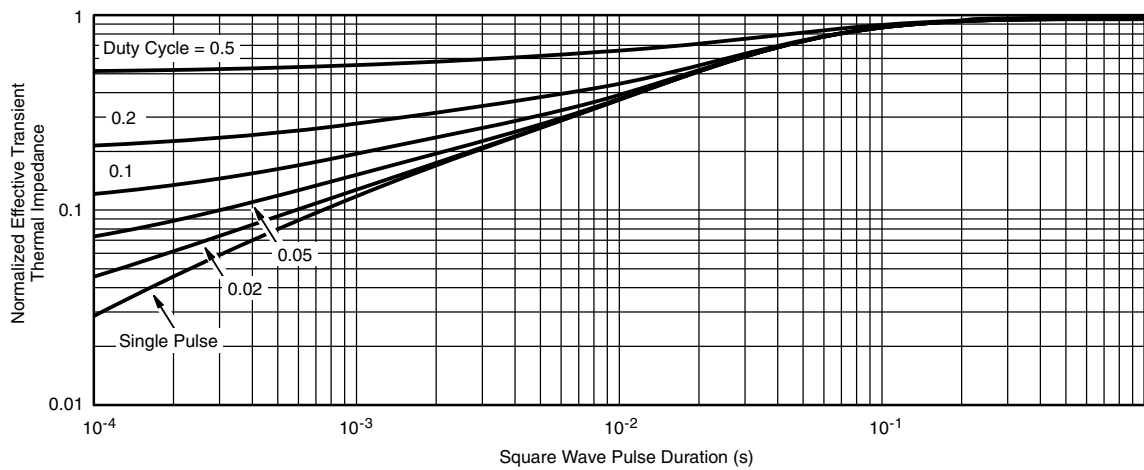
Power Junction-to-Ambient

* The power dissipation P_D is based on $T_{J(max.)} = 150^\circ\text{C}$, 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)



Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

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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