P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A)[d]	Q_g (Typ.)
- 20	0.066 at V_{GS} = - 4.5 V	- 3.8	9 nC
	0.086 at V_{GS} = - 2.5 V	- 3.3	

FEATURES

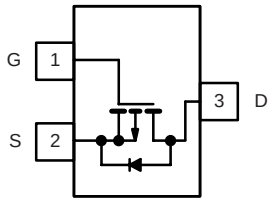
- **Halogen-free According to IEC 61249-2-21 Definition**
- TrenchFET® Power MOSFET
- 100 % R_g Tested
- Compliant to RoHS Directive 2002/95/EC

Pb-free
RoHS COMPLIANT
HALOGEN FREE

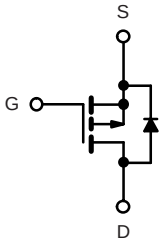
APPLICATIONS

- Load Switch for Portable Devices
- DC/DC Converter

SOT-523



Top View



P-Channel MOSFET

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)	T_C = 25 °C	I_D	- 3.8	A
	T_C = 70 °C		- 3.0	
	T_A = 25 °C		- 2.8[a, b]	
	T_A = 70 °C		- 2.2[a, b]	
Pulsed Drain Current (10 µs Pulse Width)		I_{DM}	- 15	
Continuous Source-Drain Diode Current	T_C = 25 °C	I_S	- 1.4	
	T_A = 25 °C		- 0.8[a, b]	
Maximum Power Dissipation	T_C = 25 °C	P_D	1.7	W
	T_C = 70 °C		1.1	
	T_A = 25 °C		0.96[a, b]	
	T_A = 70 °C		0.62[a, b]	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	- 55 to 150	°C

THERMAL RESISTANCE RATINGS					
Parameter		**Symbol**	**Typical**	**Maximum**	**Unit**
Maximum Junction-to-Ambient[a, c]	t ≤ 5 s	R_{thJA}	100	130	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R_{thJF}	60	75	

Notes:
a. Surface Mounted on 1" x 1" FR4 board.
b. t = 5 s.
c. Maximum under Steady State conditions is 175 °C/W.
d. T_C = 25 °C.

SPECIFICATIONS T_J = 25 °C, unless otherwise noted						
Parameter	**Symbol**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = - 250 µA	- 20			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	I_D = - 250 µA		- 20		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 µA	- 0.5		- 2.5	V
Gate-Source Leakage	I_{GSS}	V_{DS} = 0 V, V_{GS} = ± 8 V			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = - 20 V, V_{GS} = 0 V			- 1	µA
		V_{DS} = - 20 V, V_{GS} = 0 V, T_J = 55 °C			- 10	
On-State Drain Current[a]	$I_{D(on)}$	$V_{DS} \leq$ - 5 V, V_{GS} = - 4.5 V	- 5			A
Drain-Source On-State Resistance[a]	$R_{DS(on)}$	V_{GS} = - 4.5 V, I_D = - 2.5 A		0.066	0.072	Ω
		V_{GS} = - 2.5 V, I_D = - 2.0 A		0.086	0.092	
		V_{GS} = - 1.8 V, I_D = - 1.5 A		0.095	0.105	
Forward Transconductance[a]	g_{fs}	V_{DS} = - 10 V, I_D = - 2.5 A		7.5		S
Dynamic[b]						
Input Capacitance	C_{iss}	V_{DS} = - 10 V, V_{GS} = 0 V, f = 1 MHz		66		pF
Output Capacitance	C_{oss}			112		
Reverse Transfer Capacitance	C_{rss}			89		
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 8 V, I_D = - 2.5 A		15	23	nC
Total Gate Charge	Q_g	V_{DS} = - 10 V, V_{GS} = - 4.5 V, I_D = - 2.5 A		9	13.5	
Gate-Source Charge	Q_{gs}			1.0		
Gate-Drain Charge	Q_{gd}			2.5		
Gate Resistance	R_g	f = 1 MHz	2	10	20	Ω
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 5 Ω $I_D \cong$ - 2 A, V_{GEN} = - 4.5 V, R_g = 1 Ω		20	40	ns
Rise Time	t_r			20	40	
Turn-Off Delay Time	$t_{d(off)}$			40	70	
Fall Time	t_f			10	20	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = - 10 V, R_L = 5 Ω $I_D \cong$ - 2 A, V_{GEN} = - 8 V, R_g = 1 Ω		8	16	
Rise Time	t_r			9	18	
Turn-Off Delay Time	$t_{d(off)}$			35	65	
Fall Time	t_f			9	18	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	T_C = 25 °C			- 3.8	A
Pulse Diode Forward Current	I_{SM}				- 15	
Body Diode Voltage	V_{SD}	I_S = - 2 A, V_{GS} = 0 V		- 0.79	- 1.2	V
Body Diode Reverse Recovery Time	t_{rr}	I_F = - 2 A, dI/dt = 100 A/µs, T_J = 25 °C		21	35	ns
Body Diode Reverse Recovery Charge	Q_{rr}			15	25	nC
Reverse Recovery Fall Time	t_a			9		ns
Reverse Recovery Rise Time	t_b			12		

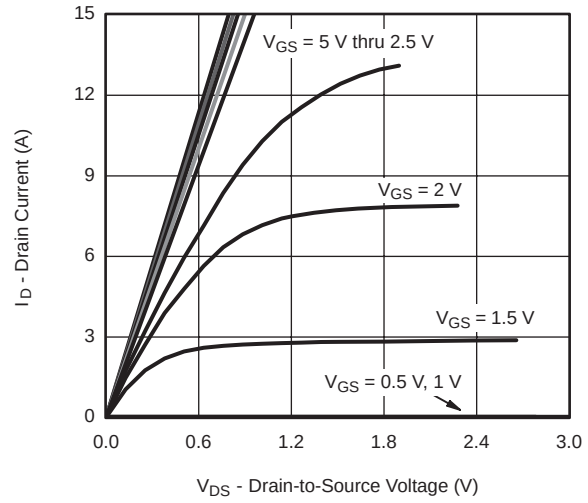
Notes:

a. Pulse test; pulse width ≤ 300 µs, duty cycle ≤ 2 %.

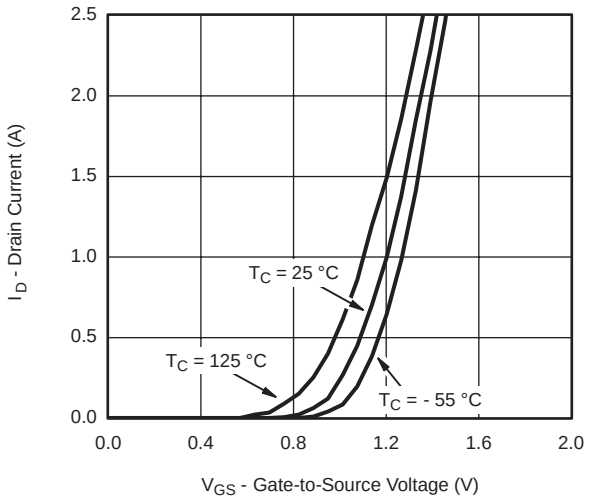
b. Guaranteed by design, not subject to production testing.

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.

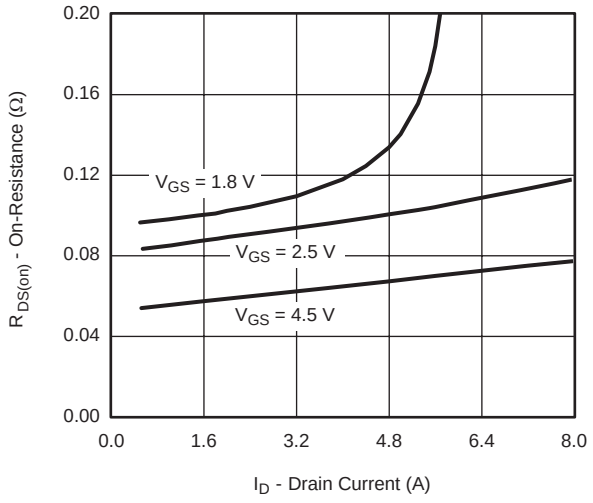
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



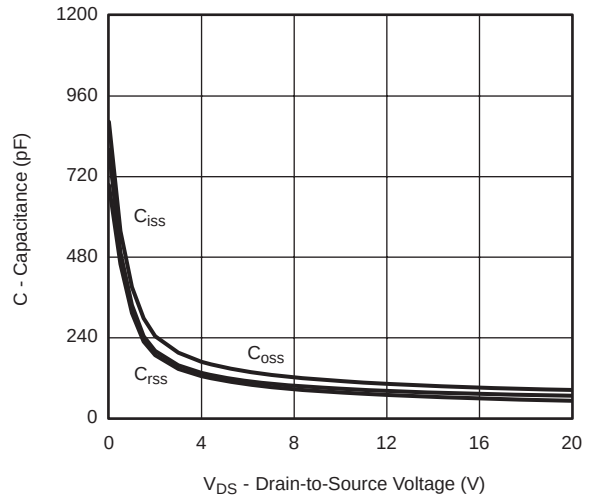
Output Characteristics



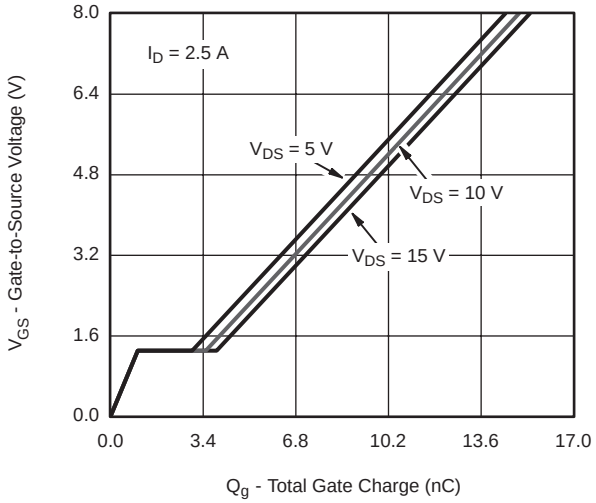
Transfer Characteristics



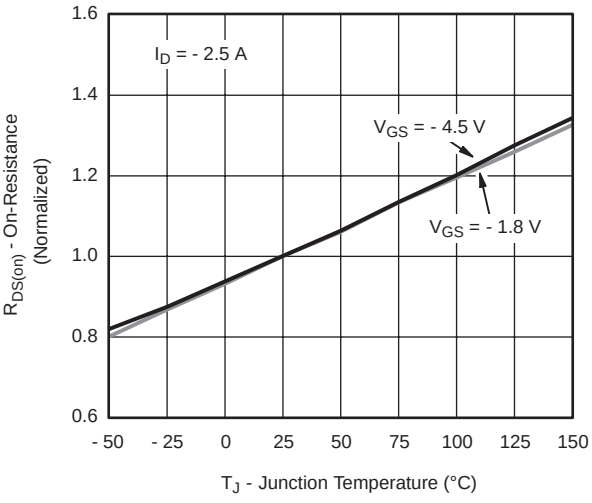
On-Resistance vs. Drain Current and Gate Voltage



Capacitance

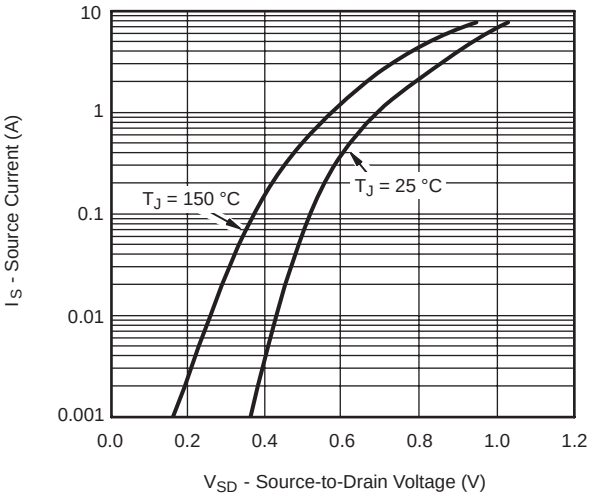


Gate Charge

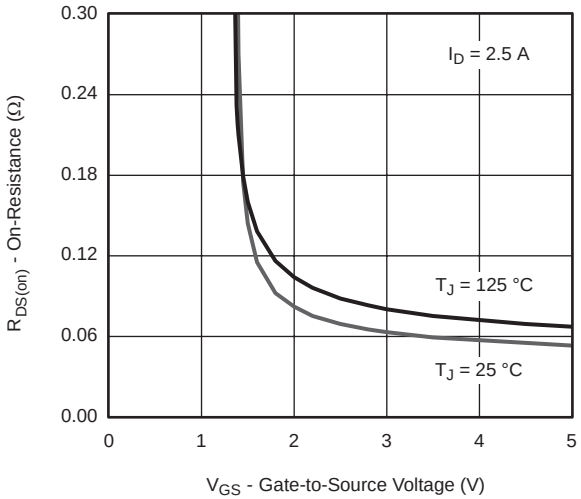


On-Resistance vs. Junction Temperature

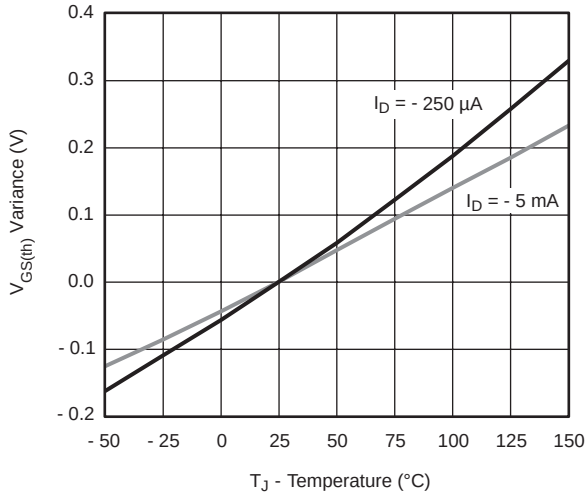
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



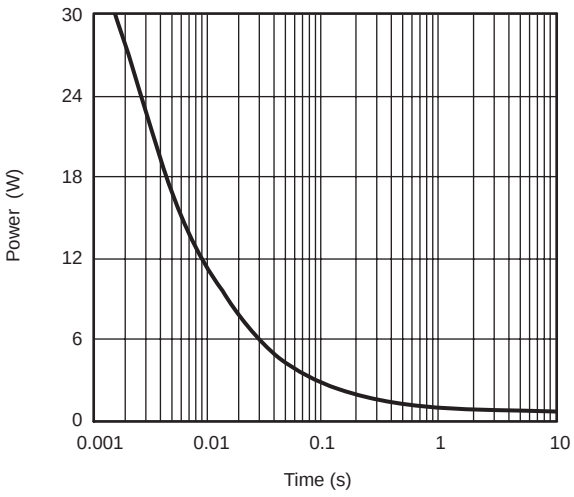
Source-Drain Diode Forward Voltage



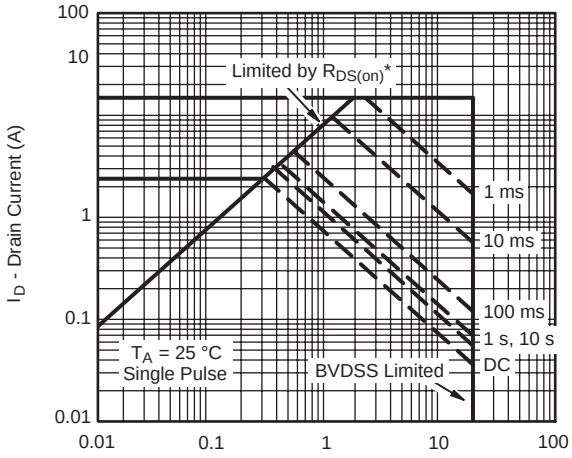
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



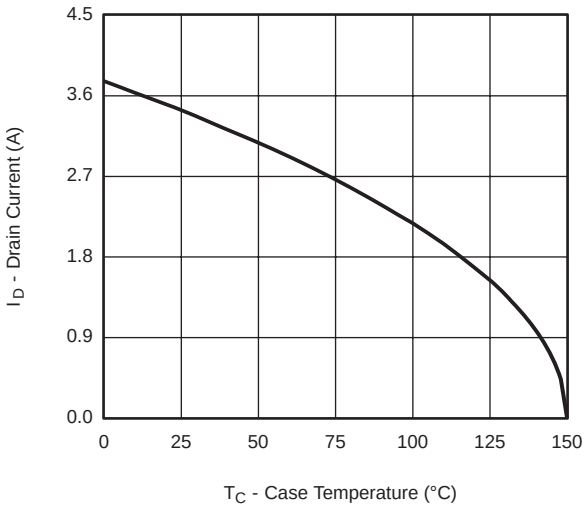
Single Pulse Power, Junction-to-Ambient



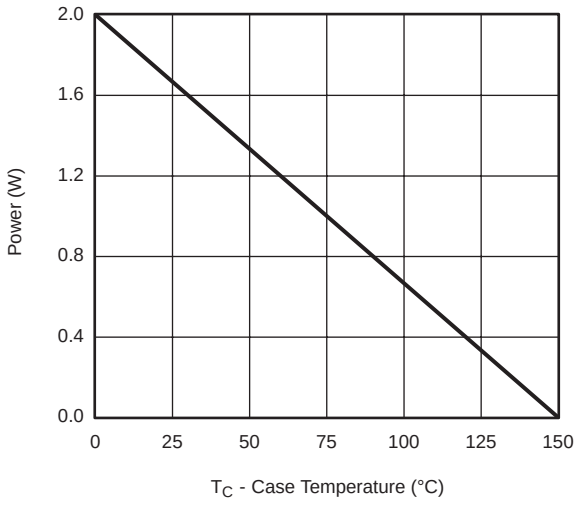
* V_{GS} > minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

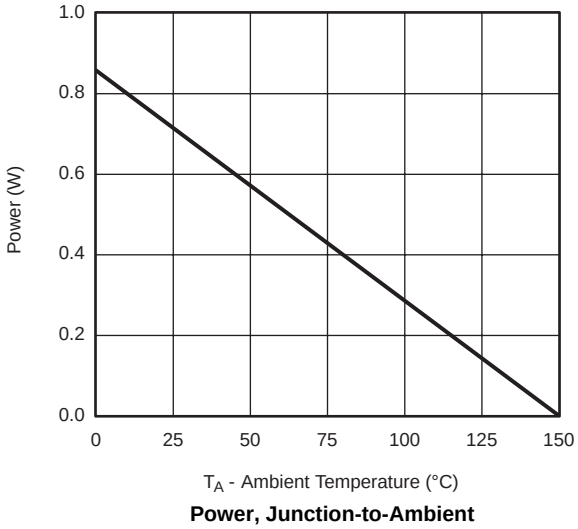
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



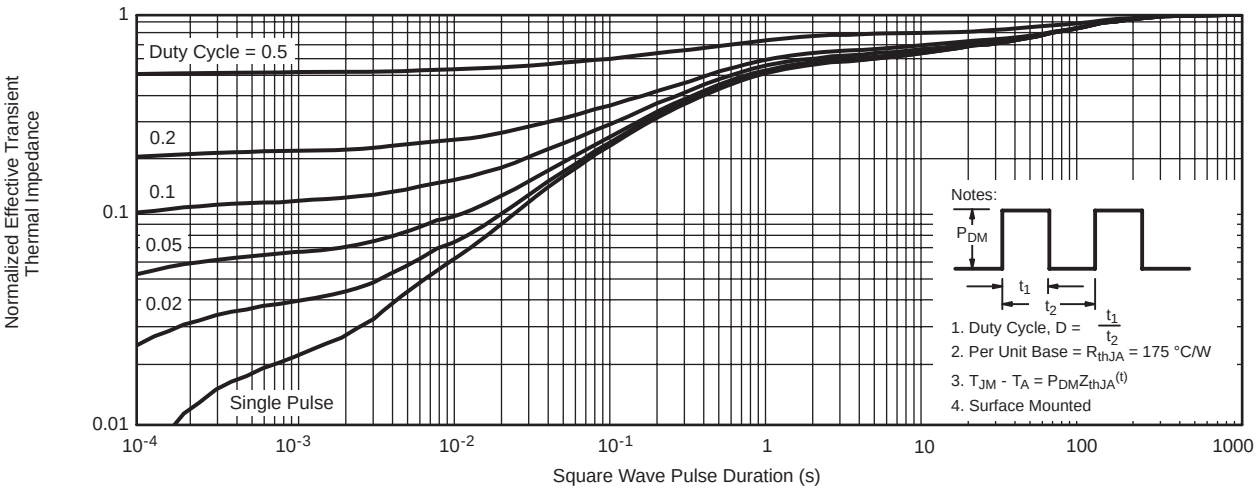
Power Derating, Junction-to-Foot



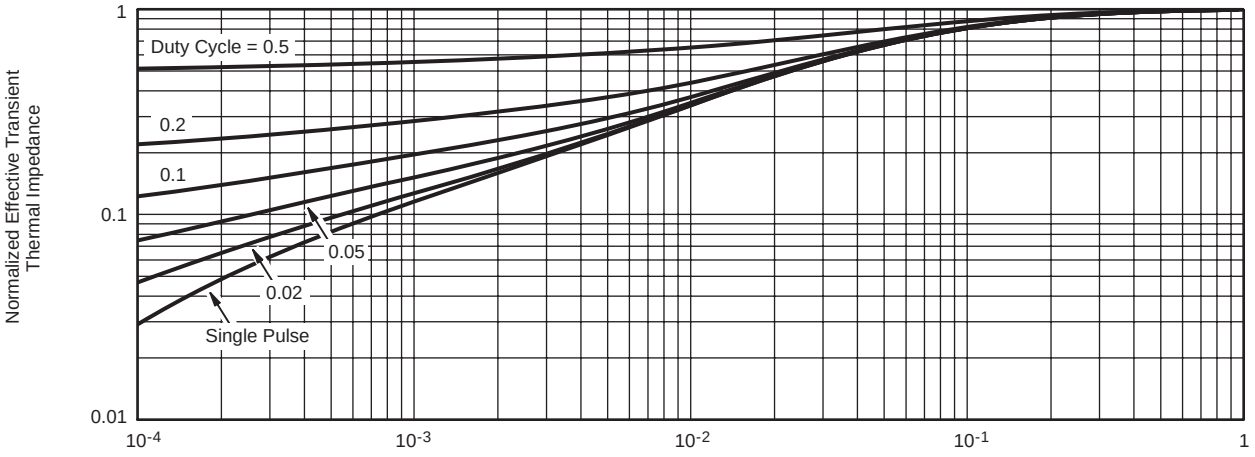
Power, Junction-to-Ambient

* 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

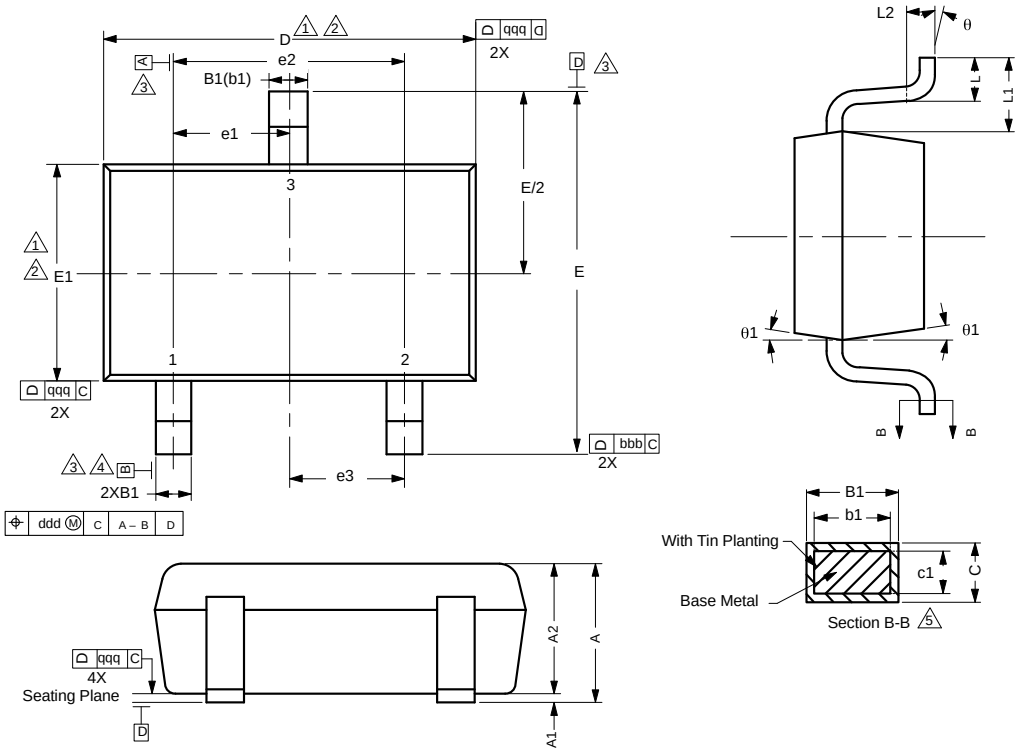


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

SOT-523: 3 Leads



Notes

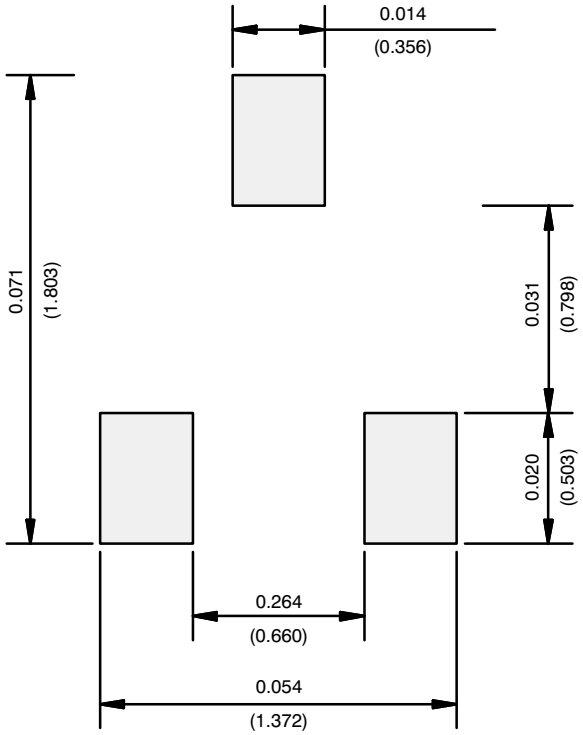
Dimensions in millimeters will govern.

1. Dimension D does not include mold flash, protrusions or gate burrs. Mold flash protrusions or gate burrs shall not exceed 0.10 mm per end. Dimension E1 does not include Interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.10 mm per side.
2. Dimensions D and E1 are determined at the outmost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interelead flash, but including any mismatch between the top and bottom of the plastic body.
3. Datums A, B and D to be determined 0.10 mm from the lead tip.
4. Terminal positions are shown for reference only.
5. These dimensions apply to the flat section of the lead between 0.08 mm and 0.15 mm from the lead tip.

DIMENSIONS	TOLERANCES
aaa	0.10
bbb	0.10
ccc	0.10
ddd	0.10

DIM.	MILLIMETERS			NOTE
	MIN.	NOM.	MAX.	
A	-	-	0.80	
A_1	0.00	-	0.10	
A_2	0.65	0.70	0.80	
B_1	0.19	-	0.24	5
b_1	0.17	-	0.21	
c	0.13	-	0.15	5
c_1	0.10	-	0.12	5
D	1.48	1.575	1.68	1, 2
E	1.50	1.60	1.70	
E_1	0.66	0.76	0.86	1, 2
e_1	0.50 BSC			
e_2	1.00 BSC			
e_3	0.50 BSC			
L	0.15	0.205	0.30	
L_1	0.40 ref.			
L_2	0.15 BSC			
θ	0°	-	8°	
$θ_1$	4°	-	10°	

RECOMMENDED MINIMUM PADS FOR SOT523: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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