

N-Channel 20 V (D-S) MOSFET



RoHS
COMPLIANT

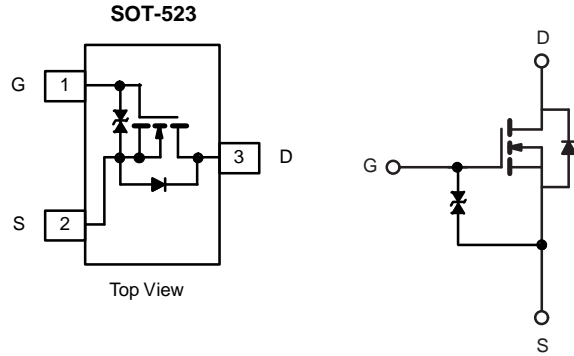
PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω) MAX.	I _D (A) ^c	Q _g (TYP.)
20	0.273 at V _{GS} = 4.5 V	1.6	1.4 nC
	0.399 at V _{GS} = 2.5 V	1.3	

FEATURES

- DT-Trench Power MOSFET
- 100 % R_g tested
- Gate-Source ESD Protected

APPLICATIONS

- Smart phones, tablet PC's
 - DC/DC converters
 - Boost converters
 - Load switch, OVP switch



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)	I _D	T _C = 25 °C	1.8	A
		T _C = 70 °C	1.5	
		T _A = 25 °C	1.5 ^{a, b}	
		T _A = 70 °C	1.2 ^{a, b}	
Pulsed Drain Current (t = 300 μs)	I _{DM}	6		
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	0.4	
		T _A = 25 °C	0.3	
Maximum Power Dissipation	P _D	T _C = 25 °C	0.5	W
		T _C = 70 °C	0.3	
		T _A = 25 °C	0.4 ^{a, b}	
		T _A = 70 °C	0.3 ^{a, b}	
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +150	°C	
Soldering Recommendations (Peak Temperature)		260		

THERMAL RESISTANCE RATINGS					
PARAMETER		SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient ^{a, d}	t ≤ 10 s	R _{thJA}	250	300	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	225	270	

Notes

- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- Based on T_C = 25 °C.
- Maximum under steady state conditions is 360 °C/W.

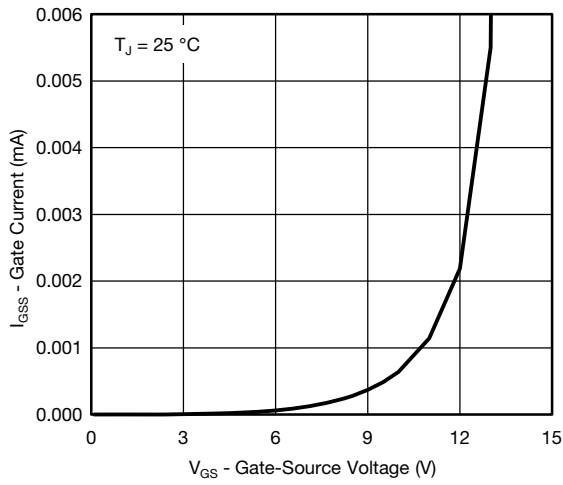
SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted)							
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20	-	-	V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$	-	32	-	mV/ $^\circ\text{C}$	
$V_{GS(th)}$ 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	-	1.0	V	
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 4.5\text{ V}$	-	-	0.1	μA	
		$V_{DS} = 0\text{ V}, V_{GS} = \pm 12\text{ V}$	-	-	± 20		
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	-	-	0.1		
		$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$	-	-	10		
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	2	-	-	A	
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 1\text{ A}$	-	0.273	0.355	Ω	
		$V_{GS} = 2.5\text{ V}, I_D = 0.5\text{ A}$	-	0.399	0.450		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}, I_D = 1.4\text{ A}$	-	5	-	S	
Dynamic ^b							
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	105	-	pF	
Output Capacitance	C_{oss}		-	23	-		
Reverse Transfer Capacitance	C_{rss}		-	11	-		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 1.4\text{ A}$	-	2.7	4.1	nC	
Gate-Source Charge	Q_{gs}	$V_{DS} = 15\text{ V}, V_{GS} = 4.5\text{ V}, I_D = 1.4\text{ A}$	-	1.4	2.1		
Gate-Drain Charge	Q_{gd}		-	0.3	-		
Gate Resistance	R_g		$f = 1\text{ MHz}$	-	0.5		-
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 13.6\text{ }\Omega$ $I_D \cong 1.1\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$	1.4	7	14	ns	
Rise Time	t_r		-	2	4		
Turn-Off Delay Time	$t_{d(off)}$		-	9	18		
Fall Time	t_f		-	8	16		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 13.6\text{ }\Omega$ $I_D \cong 1.1\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$	-	8	16		
Rise Time	t_r		-	8	16		
Turn-Off Delay Time	$t_{d(off)}$		-	13	20		
Fall Time	t_f		-	15	23		
Reverse Recovery Fall Time	t_a	-	6	12			
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	0.4		A
Pulse Diode Forward Current ^a	I_{SM}		-	-	6		
Body Diode Voltage	V_{SD}	$I_F = 1.1\text{ A}$	-	0.8	1.2	V	
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 1.1\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$	-	8	16	ns	
Body Diode Reverse Recovery Charge	Q_{rr}		-	3	6	nC	
Reverse Recovery Fall Time	t_a		-	5	-	ns	
Reverse Recovery Rise Time	t_b		-	3	-		

Notes

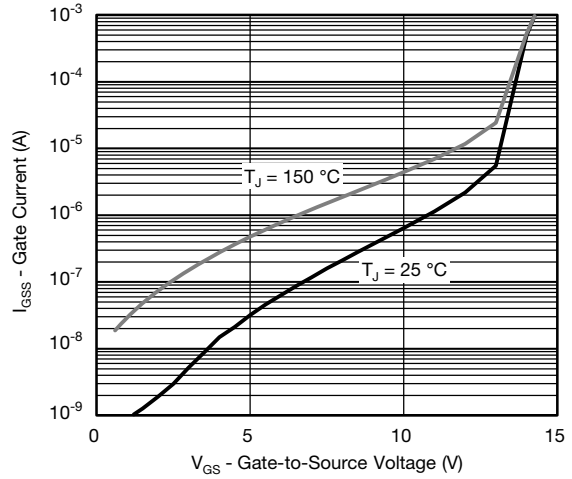
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
 b. Guaranteed by design, not subject to production testing.

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 ratings conditions for extended periods may affect device reliability.

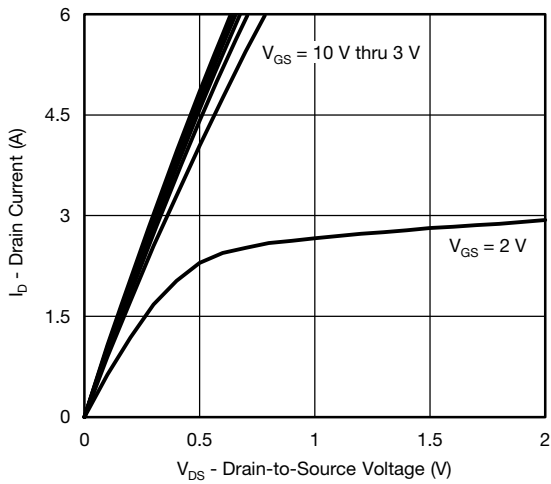
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



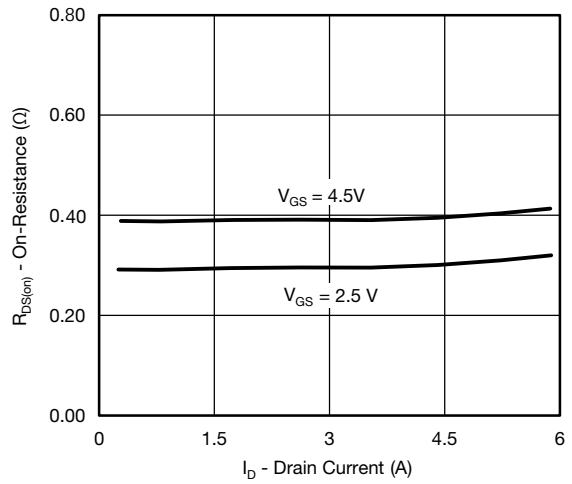
Gate Source Voltage vs. Gate Current



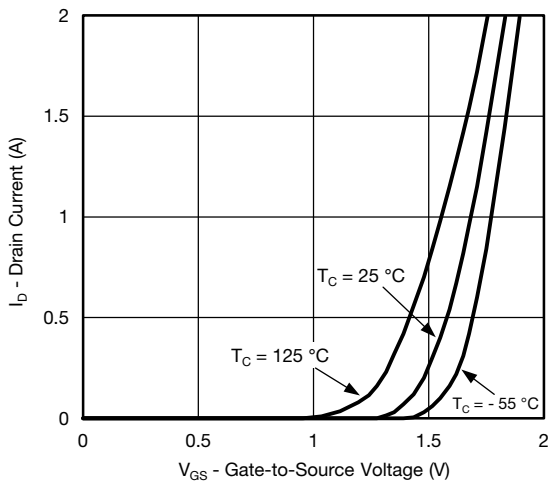
Gate Source Voltage vs. Gate Current



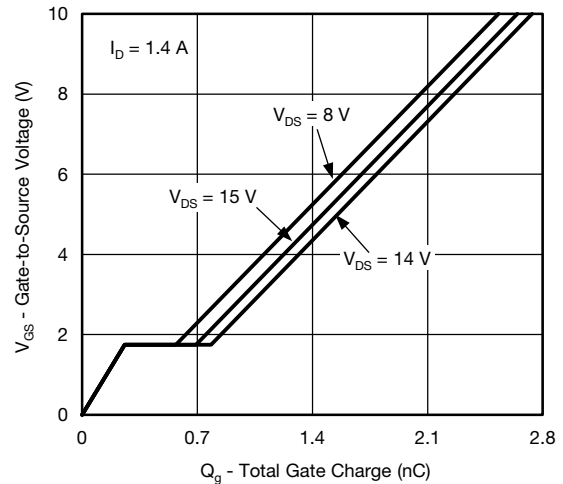
Output Characteristics



On-Resistance vs. Drain Current

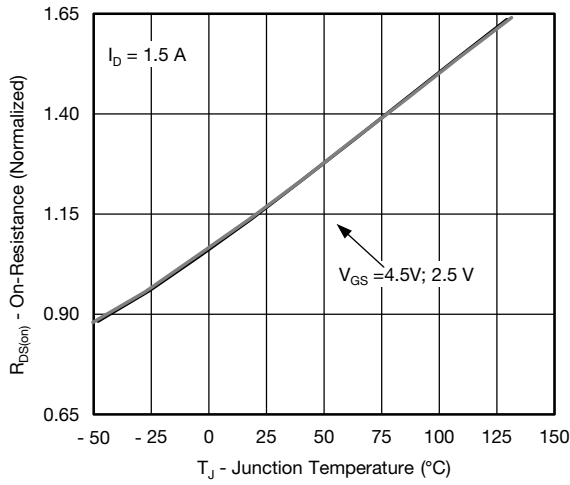


Transfer Characteristics

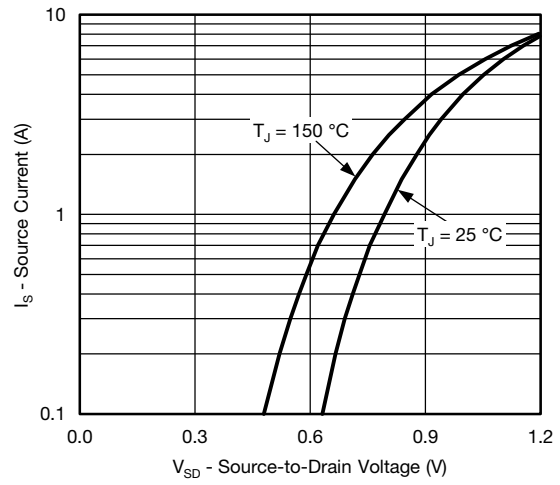


Gate Charge

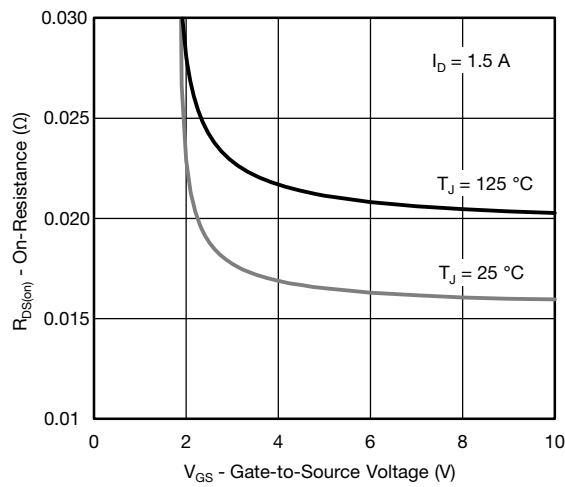
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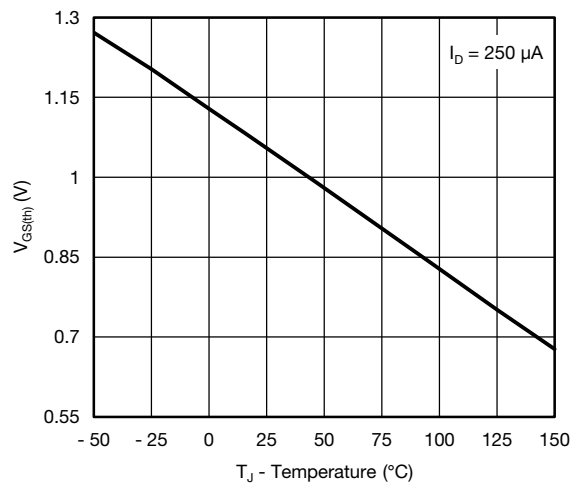
On-Resistance vs. Junction Temperature



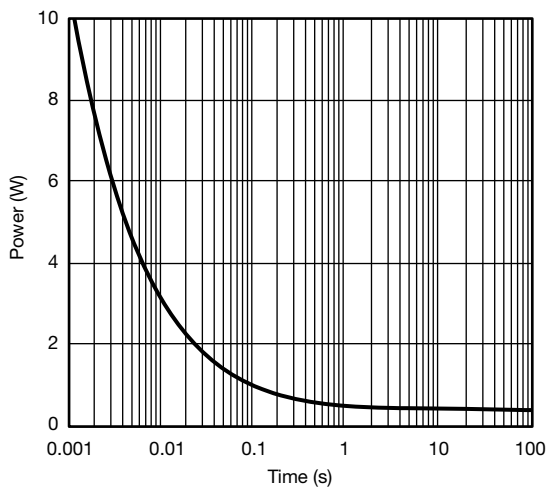
Source-Drain Diode Forward Voltage



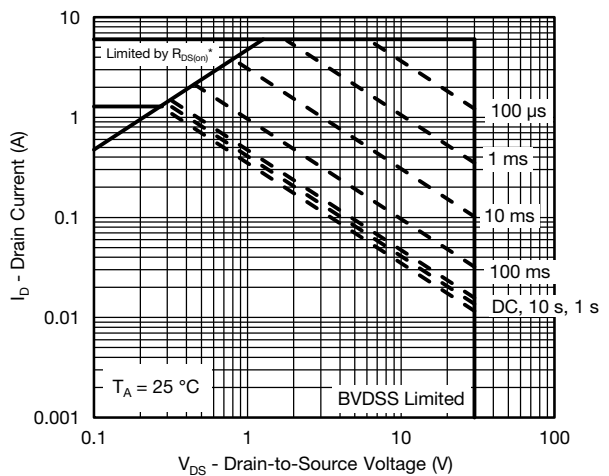
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



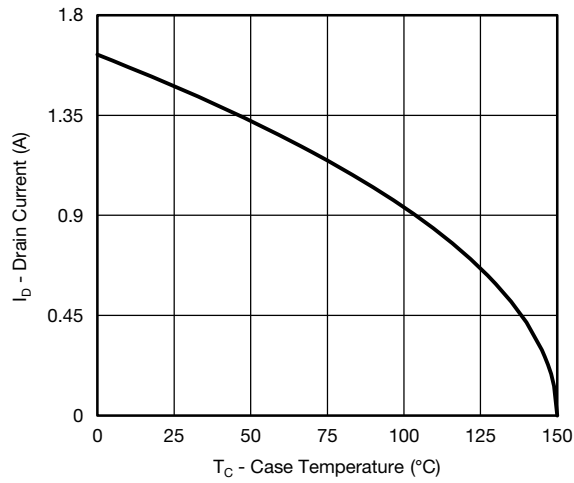
Single Pulse Power, Junction-to-Ambient



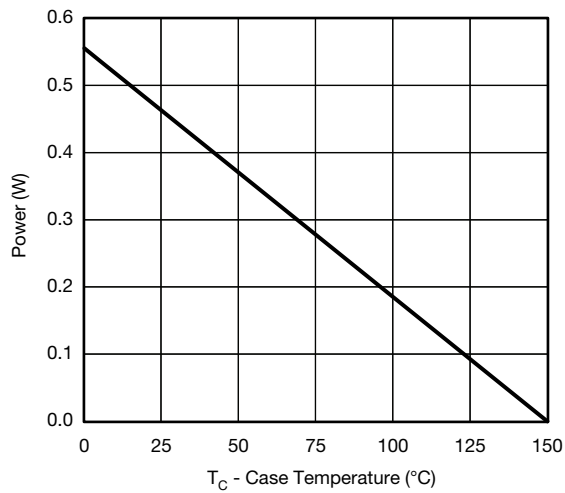
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area, Junction-to-Ambient

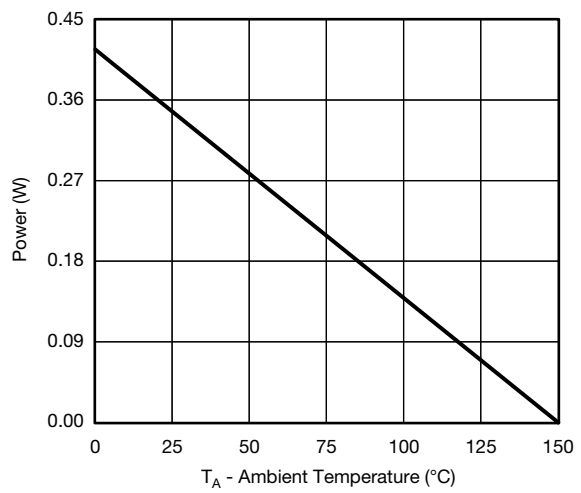
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating*



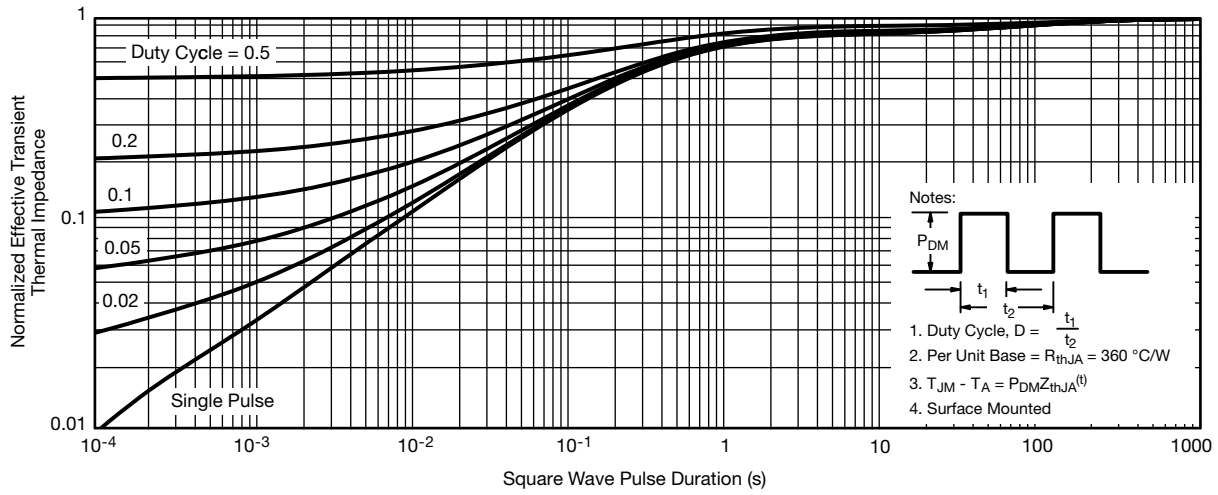
Power, Junction-to-Case



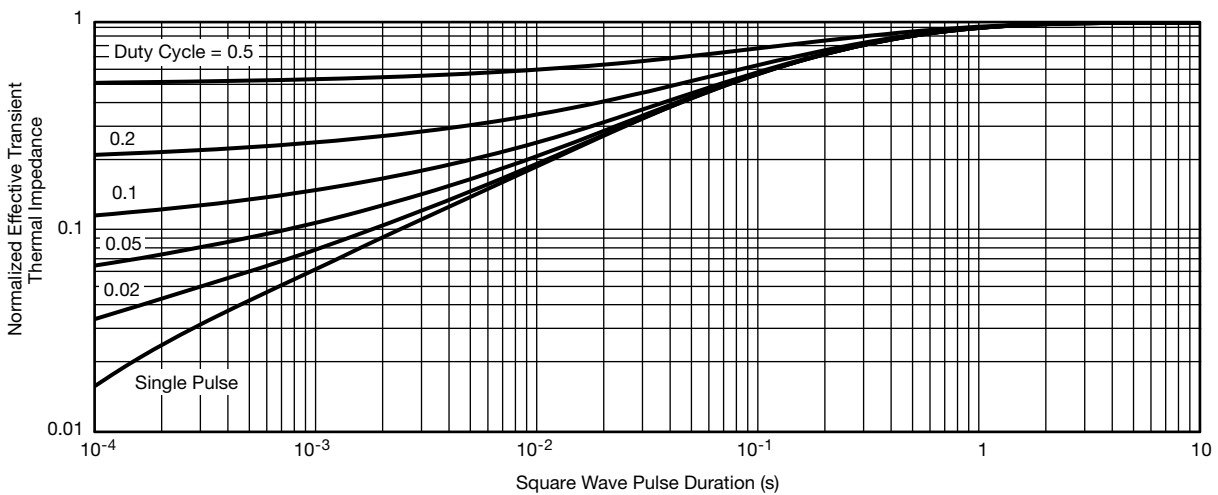
Power, Junction-to-Ambient

* 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)

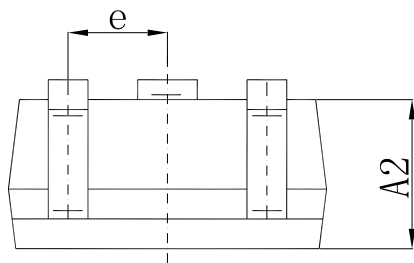
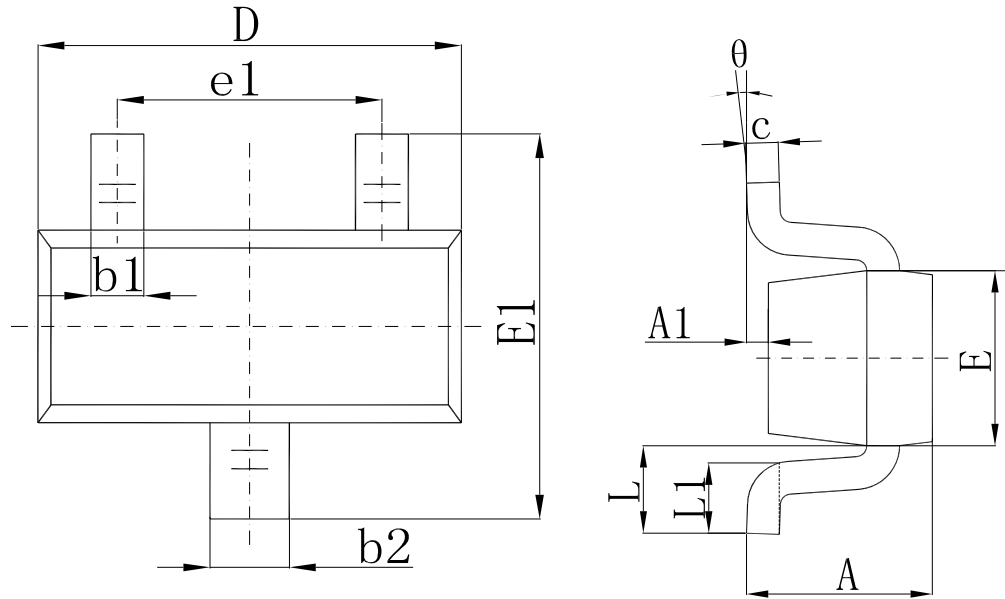


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Foot

SOT-523 PACKAGE OUTLINE



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

Symbol	Dim in mm		
	Min	Nor	Max
A	0.70	0.80	0.90
A1	0.00	0.05	0.10
A2	0.70	0.75	0.80
b1	0.15	0.22	0.29
b2	0.25	0.32	0.39
c	0.10	0.15	0.20
D	1.50	1.60	1.70
E	1.45	1.60	1.75
E1	0.70	0.80	0.90
e	0.500TPY.		
e1	0.90	1.00	1.10
L	0.26	0.36	0.46
L1	0.400REF.		
θ	0°	4°	8°

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