

AP20P02J-VB Datasheet

P-Channel 30-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^d	Q _g (Typ.)
- 30	0.056at V _{GS} = - 10 V	- 20	19 nC
	0.072 at V _{GS} = - 4.5 V	- 15	

FEATURES

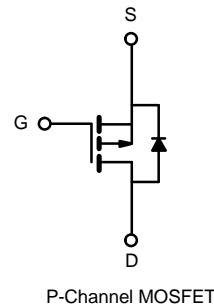
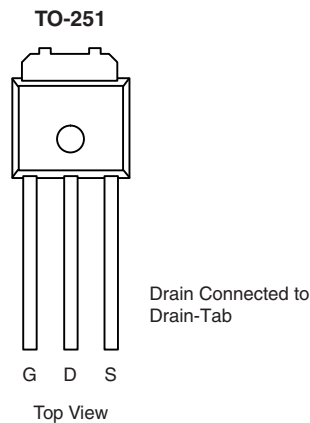
- Halogen-free
- TrenchFET[®] Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested



RoHS
COMPLIANT

APPLICATIONS

- Load Switch
- Notebook Adaptor Switch



ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	- 30	V	
Gate-Source Voltage	V _{GS}	± 20		
Continuous Drain Current (T _J = 150 °C)	I _D	T _C = 25 °C	- 20	A
		T _C = 70 °C	- 15	
		T _A = 25 °C	- 7.9 ^{a, b}	
		T _A = 70 °C	- 5.6 ^{a, b}	
Pulsed Drain Current	I _{DM}	- 60		
Continuous Source-Drain Diode Current	I _S	T _C = 25 °C	- 20	
		T _A = 25 °C	- 7.9 ^{a, b}	
Avalanche Current	I _{AS}	- 20		
Single-Pulse Avalanche Energy	E _{AS}	20	mJ	
Maximum Power Dissipation	P _D	T _C = 25 °C	20	W
		T _C = 70 °C	15	
		T _A = 25 °C	2.7 ^{a, b}	
		T _A = 70 °C	1.7 ^{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}	R _{thJA}	38	46	°C/W	
Maximum Junction-to-Foot	R _{thJF}	20	25		

Notes:

- Surface mounted on 1" x 1" FR4 board.
- t = 10 s.
- Maximum under Steady State conditions is 85 °C/W.
- Based on T_C = 25 °C.

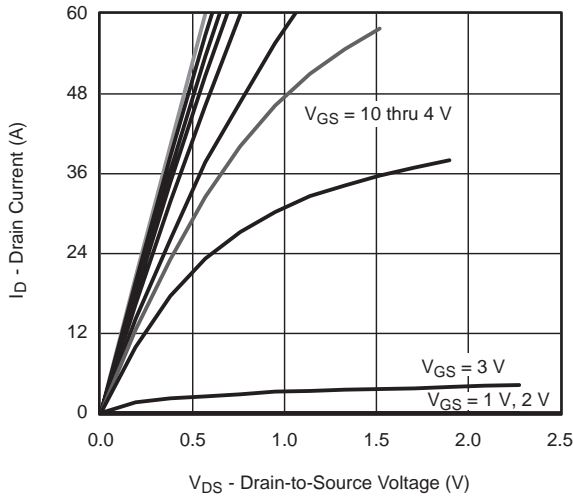
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-30			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-34		mV/ °C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$		5.3			
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-1.4		-2.5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 25\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -30\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-5	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq -10\text{ V}, V_{GS} = -10\text{ V}$	-20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -6\text{ A}$		0.056		Ω
		$V_{GS} = -4.5\text{ V}, I_D = -4\text{ A}$		0.072		
Forward Transconductance ^a	g_{fs}	$V_{DS} = -10\text{ V}, I_D = -6\text{ A}$		28		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1150		pF
Output Capacitance	C_{oss}		205			
Reverse Transfer Capacitance	C_{rss}		140			
Total Gate Charge	Q_g	$V_{DS} = -15\text{ V}, V_{GS} = -10\text{ V}, I_D = -6\text{ A}$	27	43		nC
		$V_{DS} = -15\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -6\text{ A}$	19	25		
Gate-Source Charge	Q_{gs}	$V_{DS} = -15\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -6\text{ A}$	6			
Gate-Drain Charge	Q_{gd}		12			
Gate Resistance	R_g		$f = 1\text{ MHz}$	0.5	2.2	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong -10\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		13	25	ns
Rise Time	t_r		12	24		
Turn-Off Delay Time	$t_{d(off)}$		40	70		
Fall Time	t_f		9	18		
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -15\text{ V}, R_L = 1.5\text{ }\Omega$ $I_D \cong -6\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		48	80	ns
Rise Time	t_r		92	160		
Turn-Off Delay Time	$t_{d(off)}$		34	60		
Fall Time	t_f		19	35		
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-4.1	A
Pulse Diode Forward Current	I_{SM}				-60	
Body Diode Voltage	V_{SD}	$I_S = -3\text{ A}, V_{GS} = 0\text{ V}$		-0.75	-1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -6\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		27	45	ns
Body Diode Reverse Recovery Charge	Q_{rr}		16	27	nC	
Reverse Recovery Fall Time	t_a		12		ns	
Reverse Recovery Rise Time	t_b		15			

Notes:

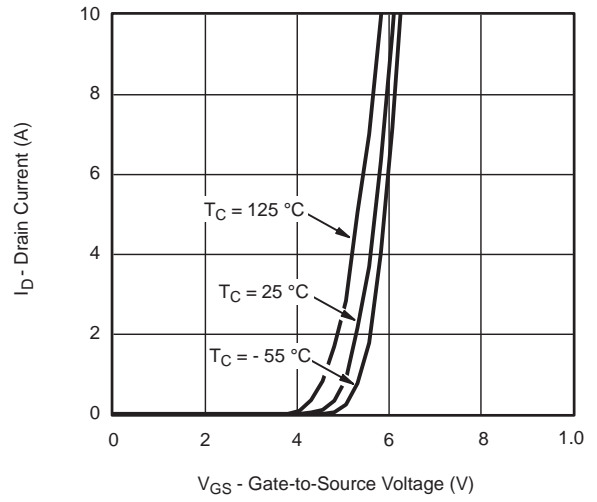
- a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- b. Guaranteed by design, not subject to production testing.

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.

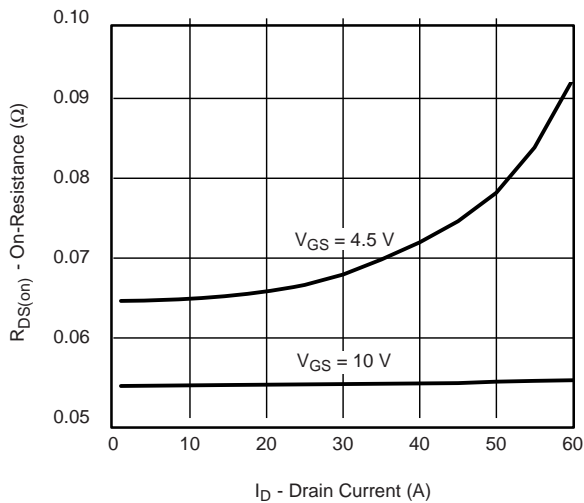
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



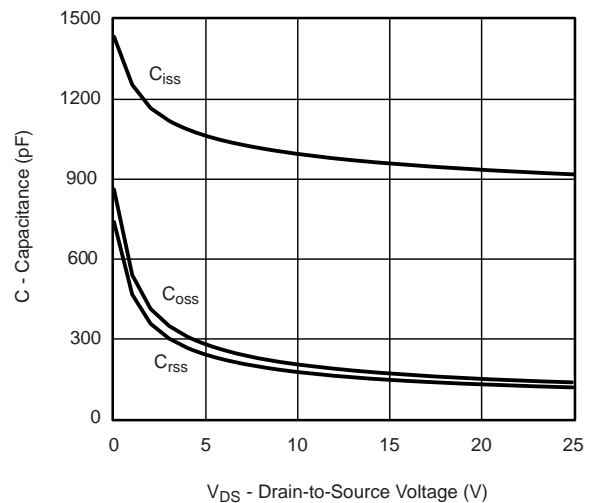
Output Characteristics



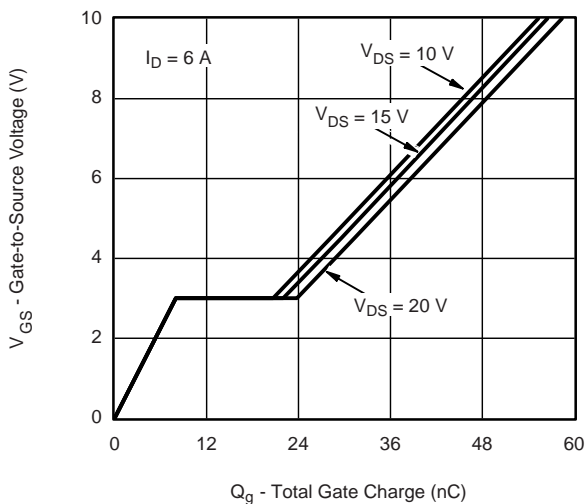
Transfer Characteristics



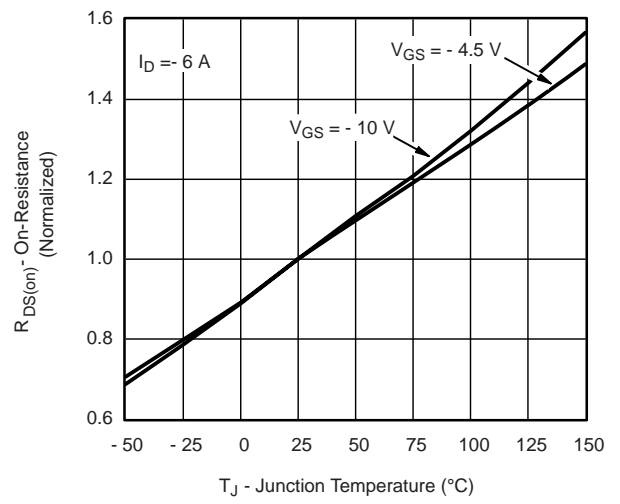
On-Resistance vs. Drain Current



Capacitance

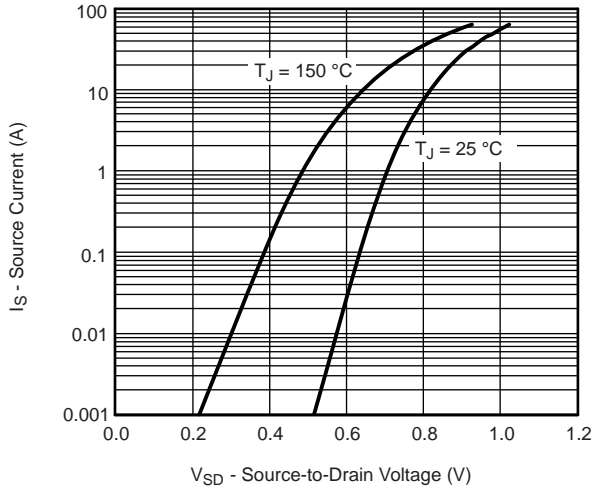


Gate Charge

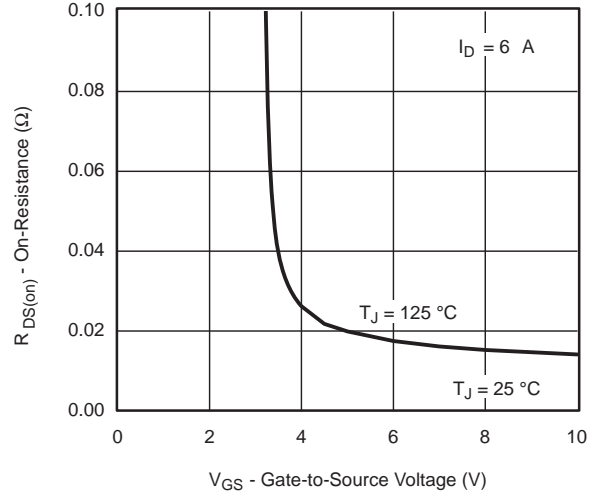


On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



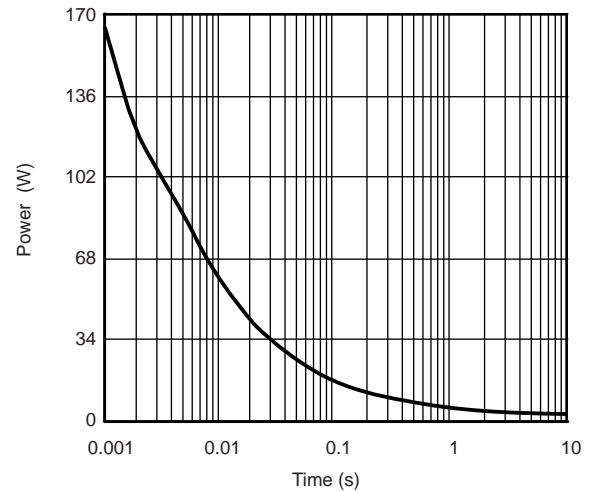
Source-Drain Diode Forward Voltage



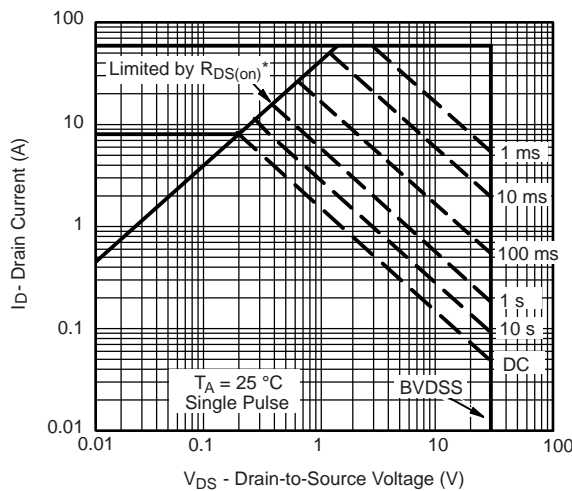
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



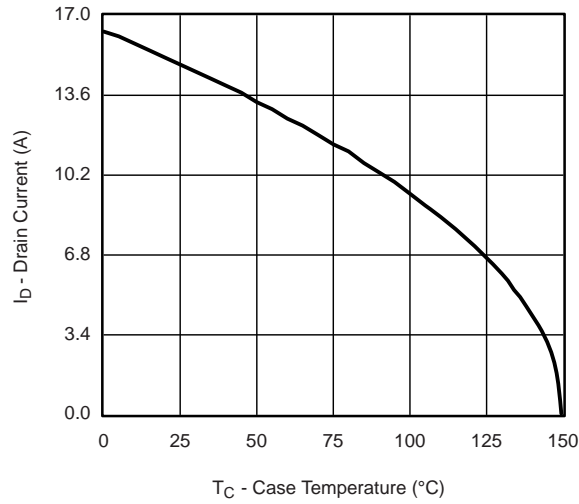
Single Pulse Power, Junction-to-Ambient



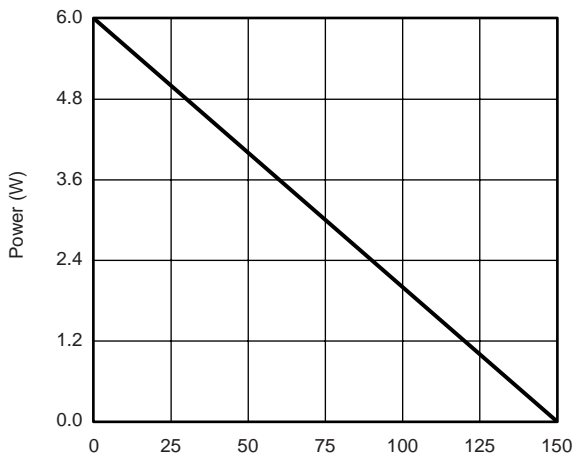
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified

Safe Operating Area

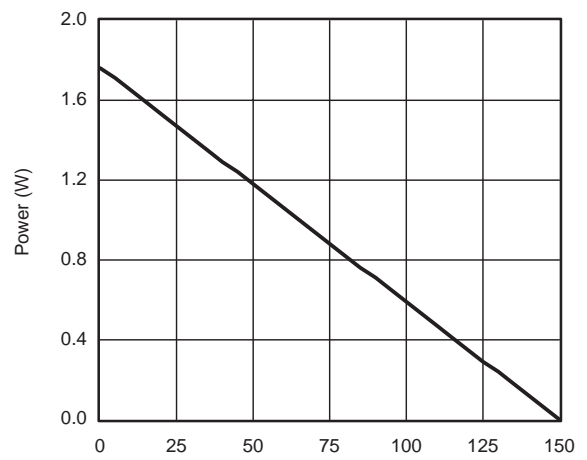
MOSFET TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Current Derating*



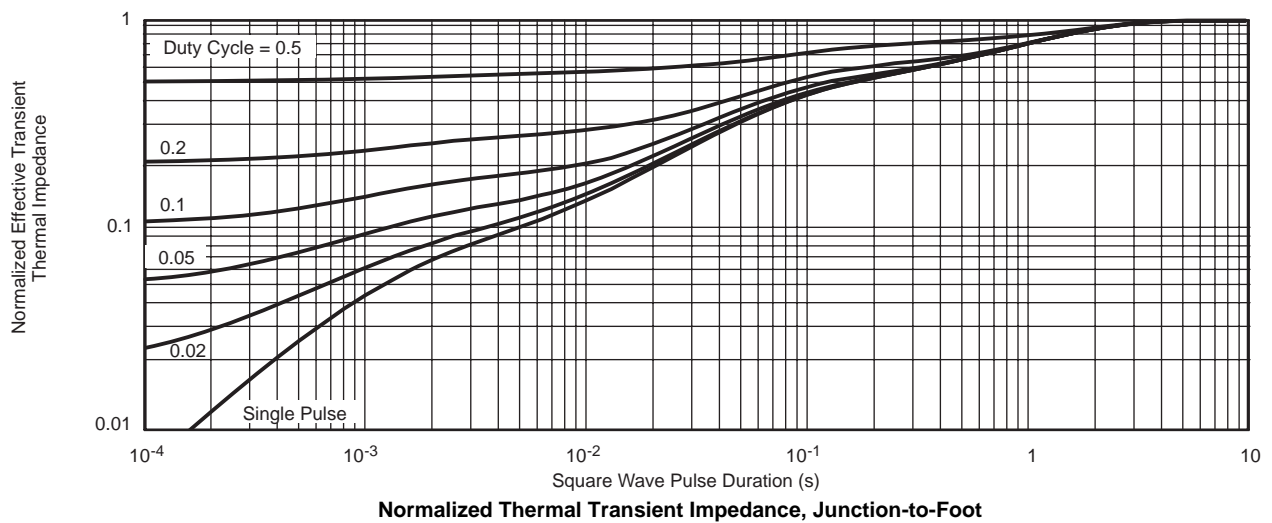
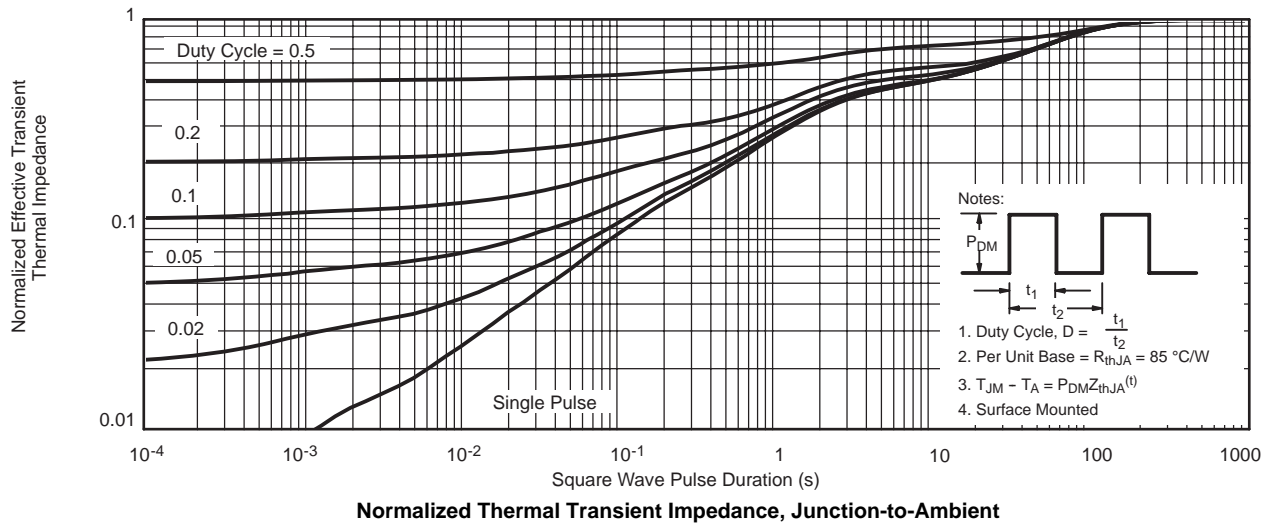
Power, Junction-to-Foot



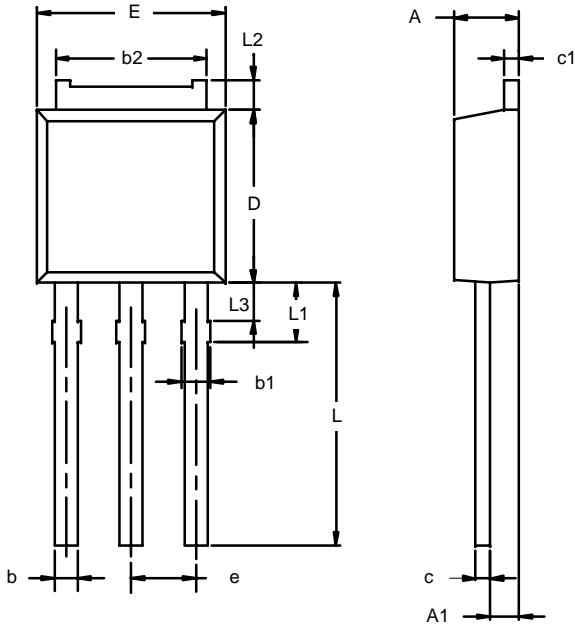
Power Derating, Junction-to-Ambient

* 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



TO-251AA



Note: Dimension L3 is for reference only.

Dim	MILLIMETERS		INCHES	
	Min	Max	Min	Max
A	2.21	2.38	0.087	0.094
A1	0.89	1.14	0.035	0.045
b	0.71	0.89	0.028	0.035
b1	0.76	1.14	0.030	0.045
b2	5.23	5.43	0.206	0.214
c	0.46	0.58	0.018	0.023
c1	0.46	0.58	0.018	0.023
D	5.97	6.22	0.235	0.245
E	6.48	6.73	0.255	0.265
e	2.28 BSC		0.090 BSC	
L	3.89	9.53	0.153	0.375
L1	1.91	2.28	0.075	0.090
L2	0.89	1.27	0.035	0.050
L3	1.15	1.52	0.045	0.060

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