

VBFB1101N Datasheet

N-Channel 100-V (D-S), 175 °C MOSFET

PRODUCT SUMMARY

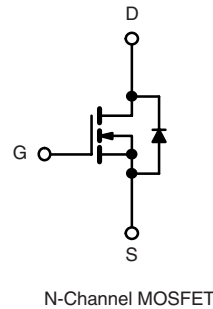
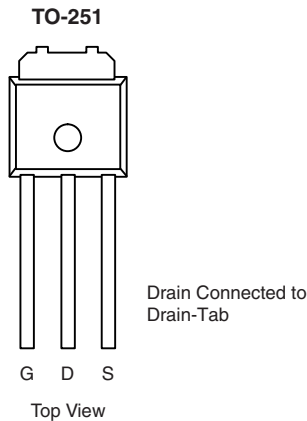
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
100	0.0125 at $V_{GS} = 10$ V	65	48 nC

FEATURES

- Trench Power MOSFET
- 100 % R_g Tested
- 100 % UIS Tested

**APPLICATIONS**

- Primary Side Switch
- Isolated DC/DC Converter

**ABSOLUTE MAXIMUM RATINGS** $T_A = 25\text{ }^{\circ}\text{C}$, unless otherwise noted

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J = 150\text{ }^{\circ}\text{C}$)	I_D	$T_C = 25\text{ }^{\circ}\text{C}$	65 ^a
		$T_C = 100\text{ }^{\circ}\text{C}$	52
		$T_A = 25\text{ }^{\circ}\text{C}$	8.2 ^b
		$T_A = 100\text{ }^{\circ}\text{C}$	5.8 ^b
Pulsed Drain Current	I_{DM}	200	A
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$	65 ^a
		$T_A = 25\text{ }^{\circ}\text{C}$	2.0 ^b
Single Pulse Avalanche Current	I_{AS}	48	A
Avalanche Energy	E_{AS}	121	mJ
Maximum Power Dissipation	P_D	$T_C = 25\text{ }^{\circ}\text{C}$	156.4
		$T_C = 100\text{ }^{\circ}\text{C}$	78.2
		$T_A = 25\text{ }^{\circ}\text{C}$	3.0 ^b
		$T_A = 100\text{ }^{\circ}\text{C}$	1.5 ^b
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	$^{\circ}\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^b	R_{thJA}	40	50	$^{\circ}\text{C/W}$
Maximum Junction-to-Case	R_{thJC}	0.85	1.1	$^{\circ}\text{C/W}$

Notes:

a. Package limited.

b. Surface mounted on 1" x 1" FR4 board.

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}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	100			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		110		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 12.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2.5		5	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 100\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 100\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$			50	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = 10\text{ V}$	50			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 15\text{ A}$		0.0125		Ω
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}$, $I_D = 15\text{ A}$		33		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		2800		pF
Output Capacitance	C_{oss}			260		
Reverse Transfer Capacitance	C_{rss}			100		
Total Gate Charge	Q_g	$V_{DS} = 50\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 50\text{ A}$		48	75	nC
Gate-Source Charge	Q_{gs}			16		
Gate-Drain Charge	Q_{gd}			13		
Gate Resistance	R_g	$f = 1\text{ MHz}$		1.6	2.5	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 50\text{ V}$, $R_L = 1.0\text{ }\Omega$ $I_D \equiv 50\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$		12	20	ns
Rise Time	t_r			10	20	
Turn-Off Delay Time	$t_{d(off)}$			18	35	
Fall Time	t_f			8	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$			50	A
Pulse Diode Forward Current ^a	I_{SM}				100	
Body Diode Voltage	V_{SD}	$I_S = 15\text{ A}$		0.85	1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 50\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^{\circ}\text{C}$		80	120	ns
Body Diode Reverse Recovery Charge	Q_{rr}			160	240	nC
Reverse Recovery Fall Time	t_a			57		ns
Reverse Recovery Rise Time	t_b			23		

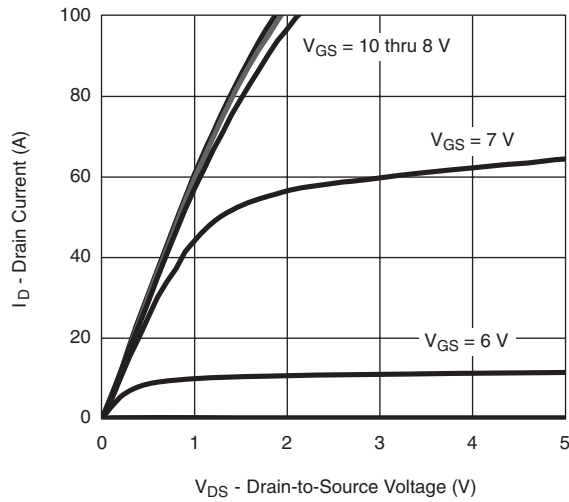
Notes:

a. Pulse test; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

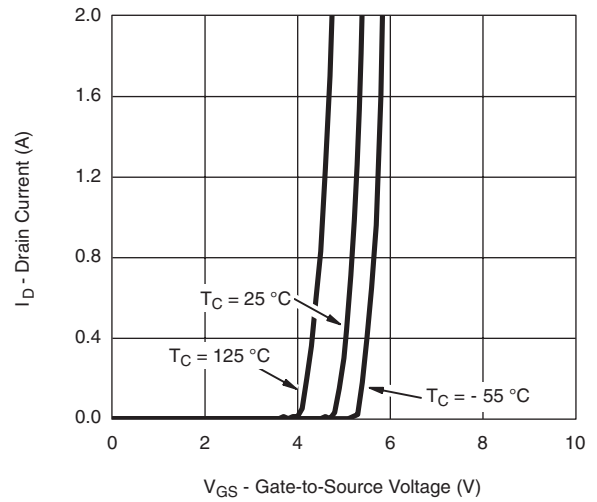
b. Guaranteed by design, not subject to production testing.

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.

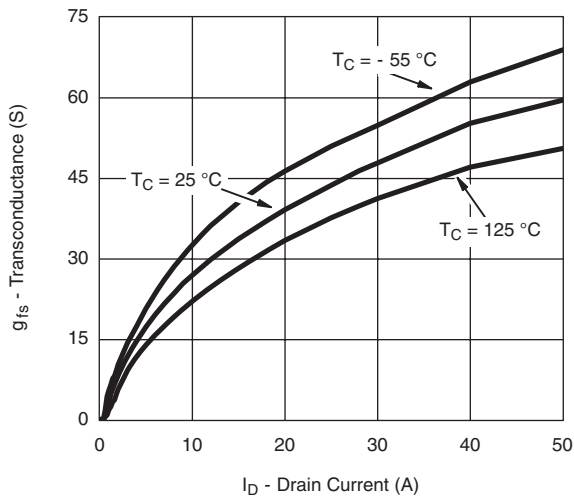
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



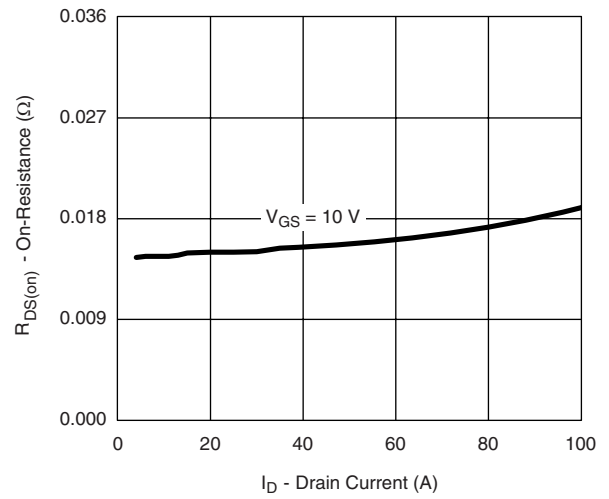
Output Characteristics



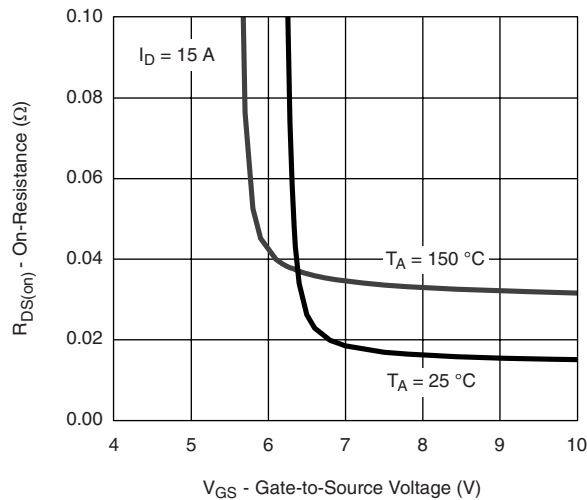
Transfer Characteristics



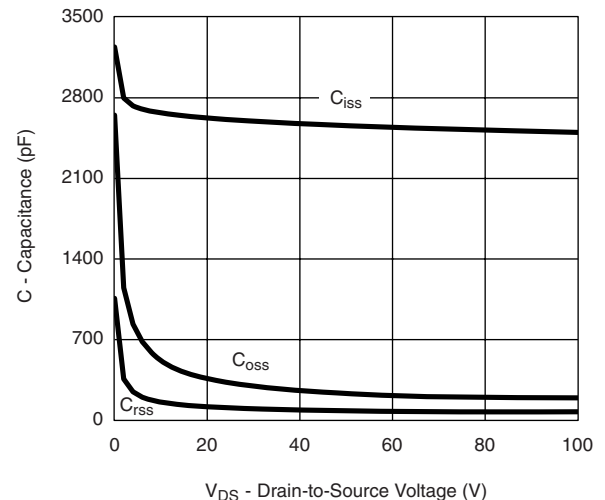
Transconductance



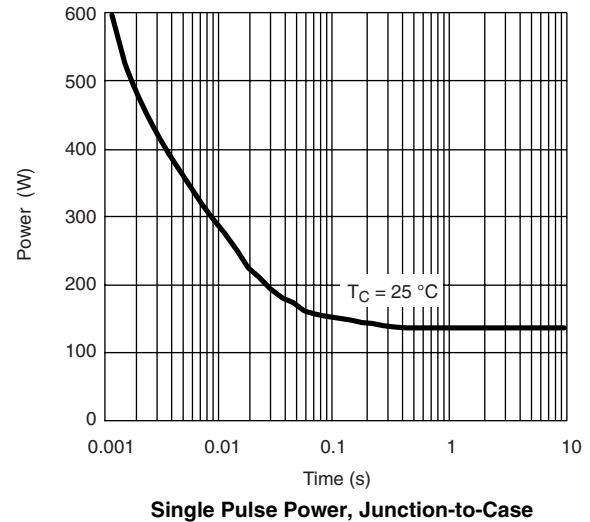
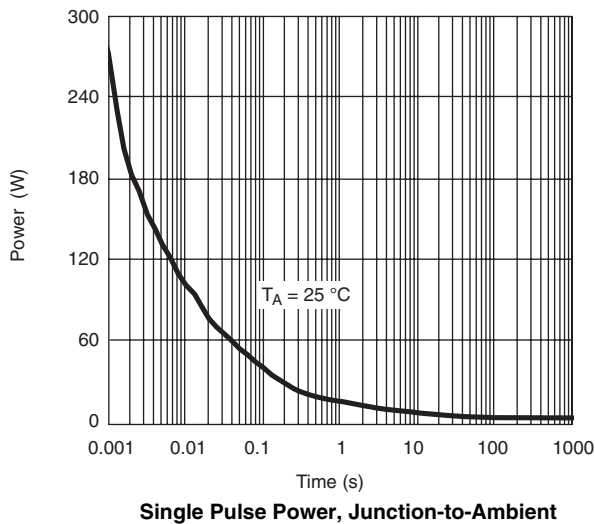
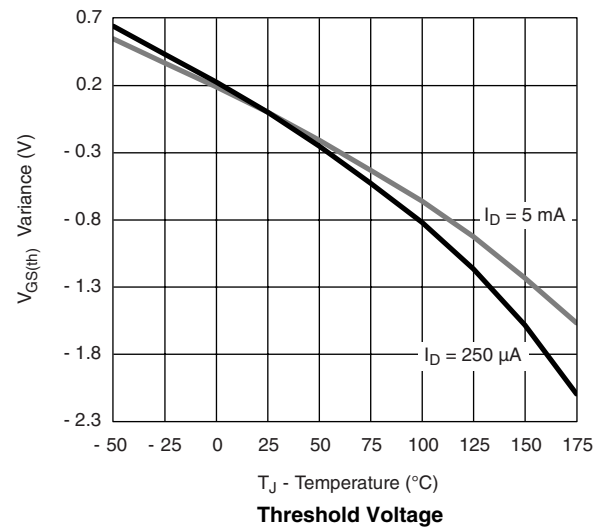
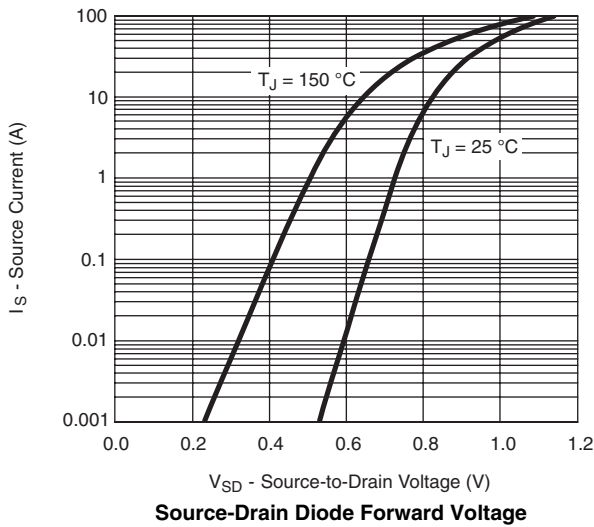
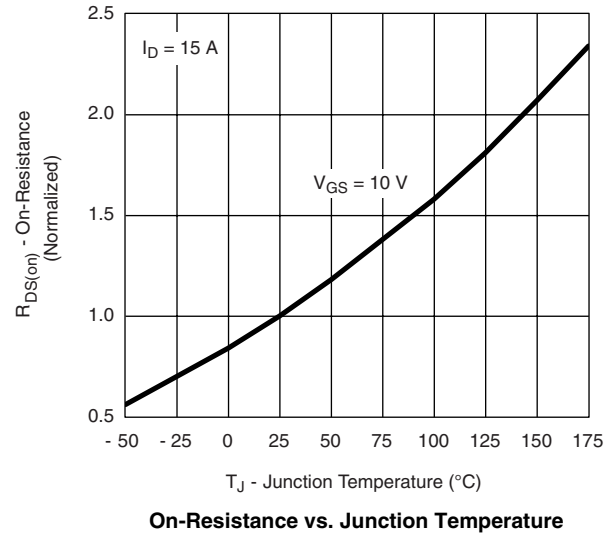
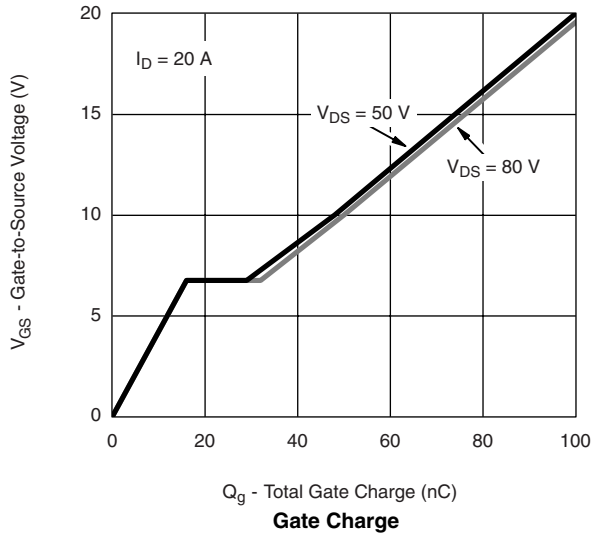
On-Resistance vs. Drain Current



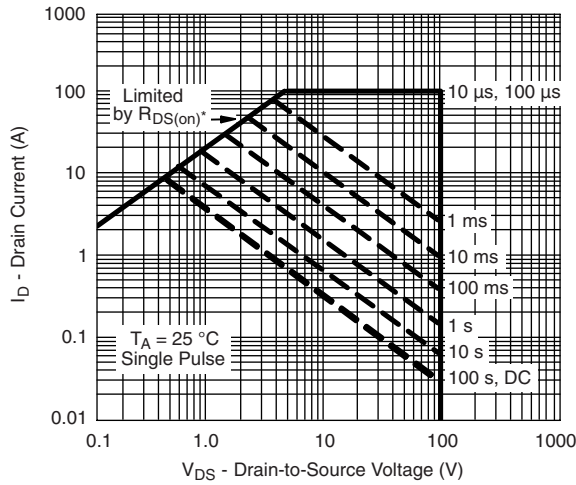
On-Resistance vs. Gate-to-Source Voltage



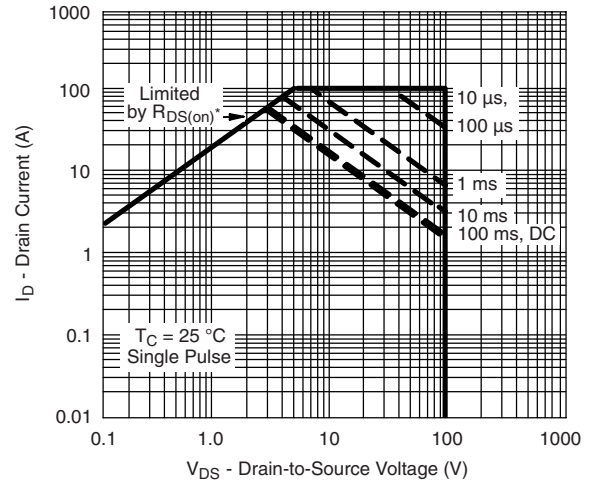
Capacitance

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


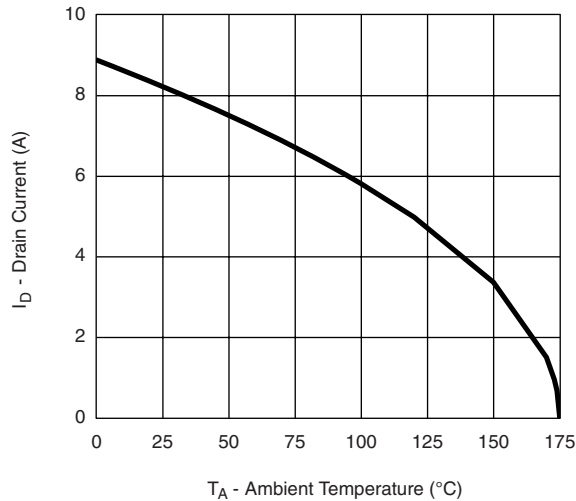
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



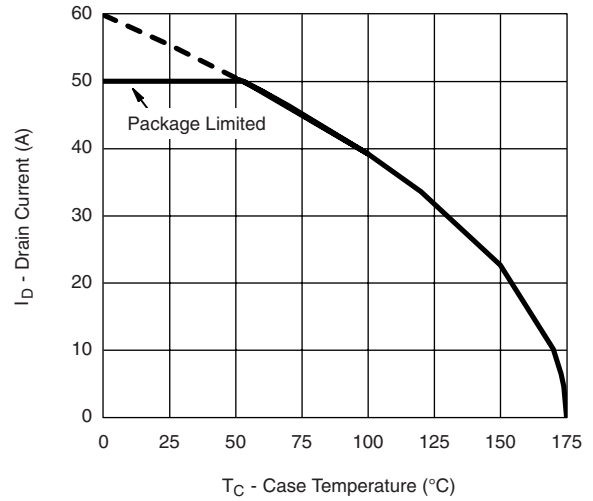
* $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified
Safe Operating Area, Junction-to-Ambient



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

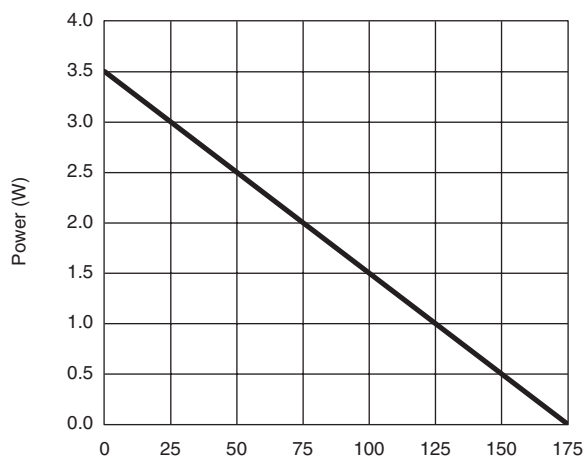


Current Derating, Junction-to-Ambient**

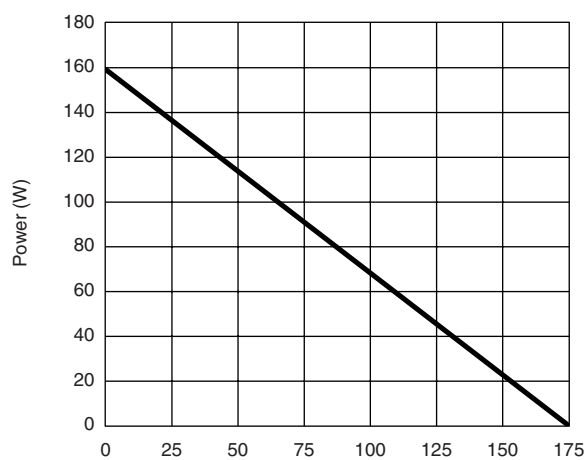


Current Derating, Junction-to-Case**

** The power dissipation P_D is based on $T_{J(max)} = 175^\circ\text{C}$, 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

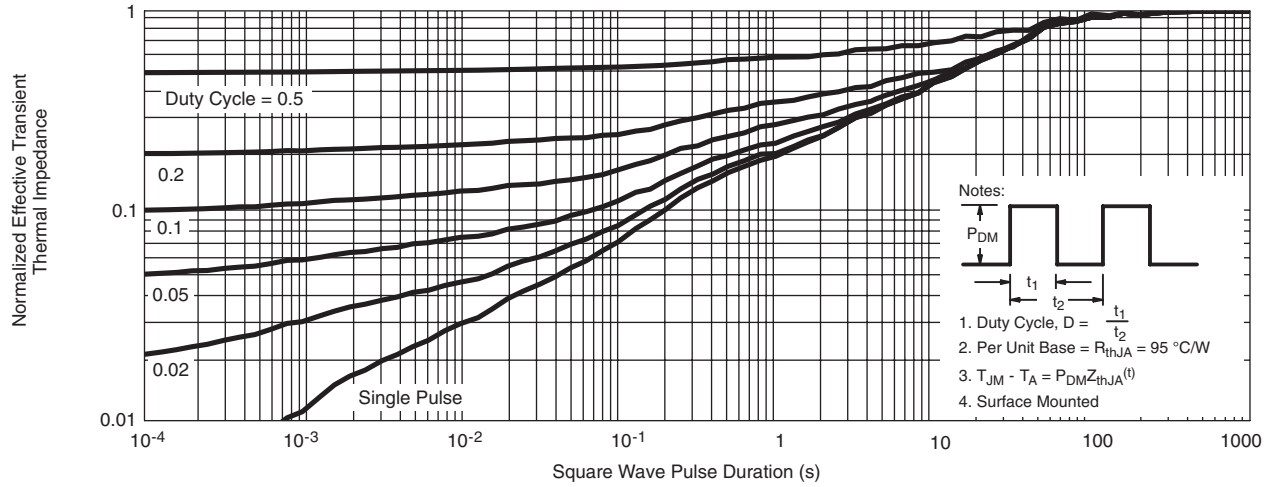
T_A - Ambient Temperature (°C)
Power Derating*, Junction-to-Ambient



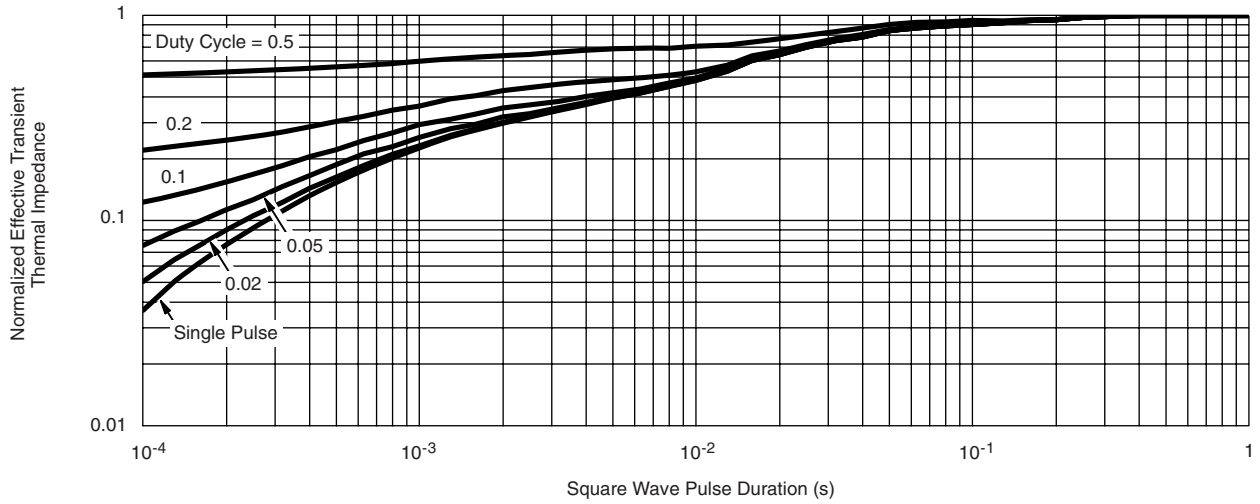
T_C - Case Temperature (°C)
Power Derating*, Junction-to-Case

* The power dissipation P_D is based on $T_{J(max)} = 175\text{ °C}$, 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.

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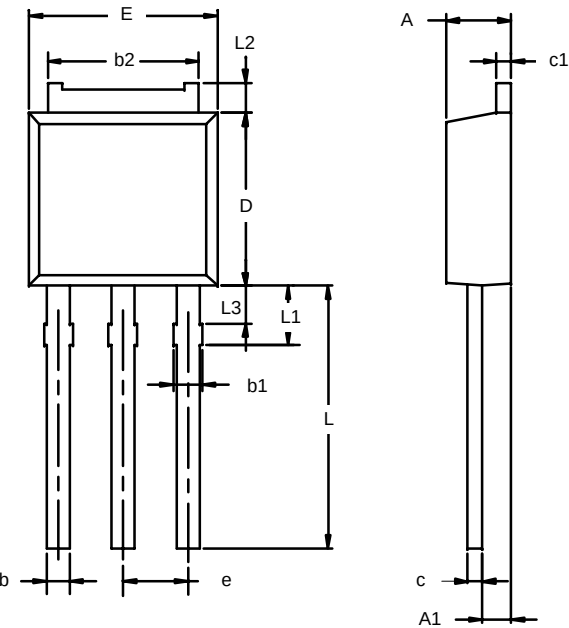


Normalized Thermal Transient Impedance, Junction-to-Ambient



Normalized Thermal Transient Impedance, Junction-to-Case

TO-251AA (DPAK)



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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