

P2003BEA-VB Datasheet

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

PRODUCT SUMMARY

V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
30	0.021 at $V_{GS} = 10$ V	18	3.8 nC
	0.025 at $V_{GS} = 4.5$ V	17	

FEATURES

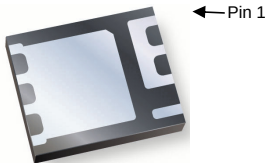
- Halogen-free According to IEC 61249-2-21
- Trench Power MOSFET
- 100 % R_g Tested


RoHS
COMPLIANT

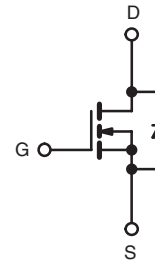
APPLICATIONS

- Notebook PC
 - System Power
 - Load Switch

DFN 3x3 EP



Top View



N-Channel MOSFET

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	30	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J = 150^\circ\text{C}$)	$T_C = 25^\circ\text{C}$	18 ^a	A
	$T_C = 70^\circ\text{C}$	11 ^a	
	$T_A = 25^\circ\text{C}$	9 ^{b, c}	
	$T_A = 70^\circ\text{C}$	7 ^{b, c}	
Pulsed Drain Current	I_{DM}	35	A
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	12 ^a	A
	$T_A = 25^\circ\text{C}$	2.7 ^{b, c}	
Single Pulse Avalanche Current	I_{AS}	5	A
Single Pulse Avalanche Energy	E_{AS}	1.25	mJ
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	15.6	W
	$T_C = 70^\circ\text{C}$	10	
	$T_A = 25^\circ\text{C}$	3.2 ^{b, c}	
	$T_A = 70^\circ\text{C}$	2 ^{b, c}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) ^{e, f}		260	$^\circ\text{C}$

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	32	39	$^\circ\text{C/W}$
Maximum Junction-to-Case (Drain)	R_{thJC}	6.5	8	$^\circ\text{C/W}$

Notes:

a. Package Limited.

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

c. $t = 10$ s.d. Maximum under Steady State conditions is 81 $^\circ\text{C/W}$.

e. The DFN 3x3 is a leadless package. The end of the lead terminal is exposed copper (not plated) as a result of the singulation process in manufacturing. A solder fillet at the exposed copper tip cannot be guaranteed and is not required to ensure adequate bottom side solder interconnection.

f. Rework Conditions: manual soldering with a soldering iron is not recommended for leadless components.

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	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		35		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			- 4.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	1.0		2.5	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}	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$			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	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$, $V_{GS} = 10\text{ V}$	20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$, $I_D = 7.8\text{ A}$		0.021		Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 7.0\text{ A}$		0.025		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 10\text{ V}$, $I_D = 7.8\text{ A}$		17		S
Dynamic ^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		435		pF
Output Capacitance	C_{oss}			95		
Reverse Transfer Capacitance	C_{rss}			42		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 7.8\text{ A}$		8	12	nC
		$V_{DS} = 15\text{ V}$, $V_{GS} = 4.5\text{ V}$, $I_D = 7.8\text{ A}$		3.8	6	
Q_{gs}			1.4			
Q_{gd}			1.1			
Gate Resistance	R_g	$f = 1\text{ MHz}$	1.5	3.2	4.5	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}$, $R_L = 2.4\text{ }\Omega$ $I_D \cong 6.3\text{ A}$, $V_{GEN} = 4.5\text{ V}$, $R_g = 1\text{ }\Omega$		15	25	ns
Rise Time	t_r			12	20	
Turn-Off Delay Time	$t_{d(off)}$			13	20	
Fall Time	t_f			10	15	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}$, $R_L = 2.4\text{ }\Omega$ $I_D \cong 6.3\text{ A}$, $V_{GEN} = 10\text{ V}$, $R_g = 1\text{ }\Omega$		5	10	
Rise Time	t_r			10	15	
Turn-Off Delay Time	$t_{d(off)}$			15	25	
Fall Time	t_f			10	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^{\circ}\text{C}$		12		A
Pulse Diode Forward Current	I_{SM}				35	
Body Diode Voltage	V_{SD}	$I_S = 6.3\text{ A}$, $V_{GS} = 0\text{ V}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 6.3\text{ A}$, $dI/dt = 100\text{ A}/\mu\text{s}$, $T_J = 25\text{ }^{\circ}\text{C}$		15	25	ns
Body Diode Reverse Recovery Charge	Q_{rr}			7	12	nC
Reverse Recovery Fall Time	t_a			9		ns
Reverse Recovery Rise Time	t_b			6		

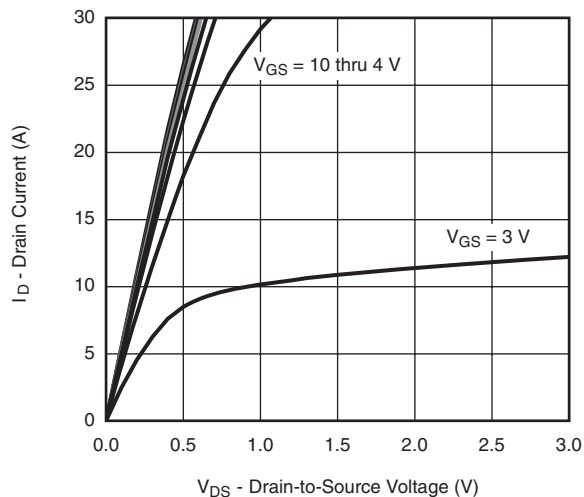
Notes:

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

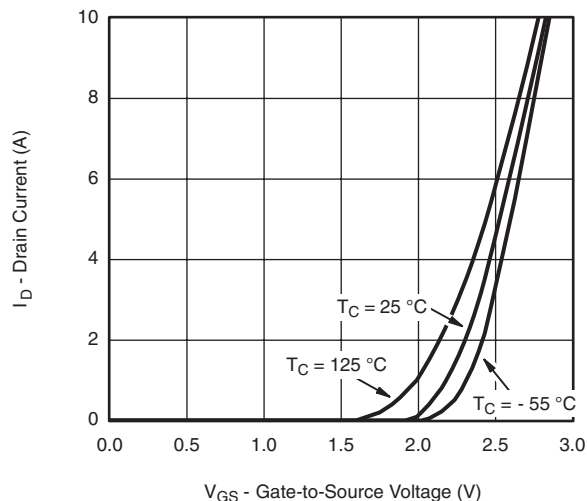
b. Guaranteed by design, not subject to production testing.

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.

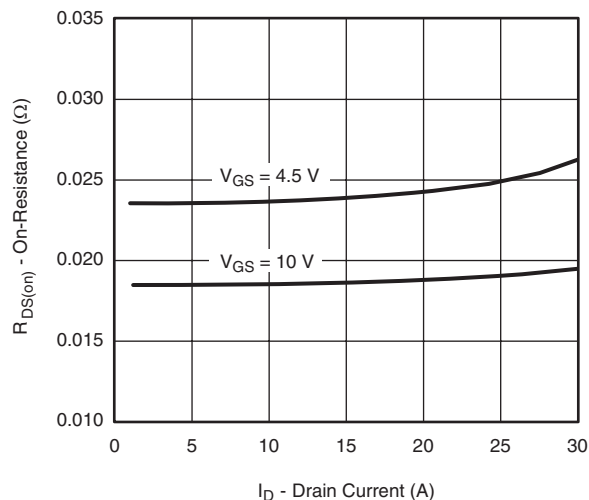
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



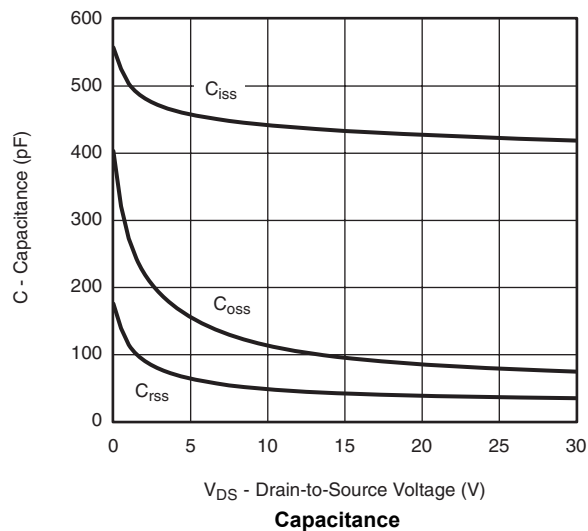
Output Characteristics



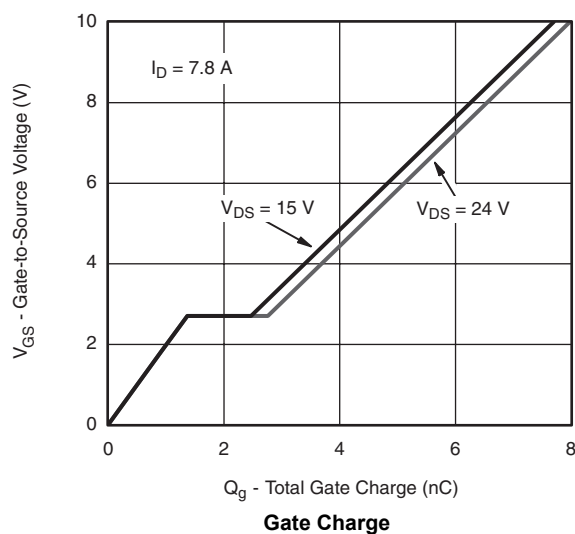
Transfer Characteristics



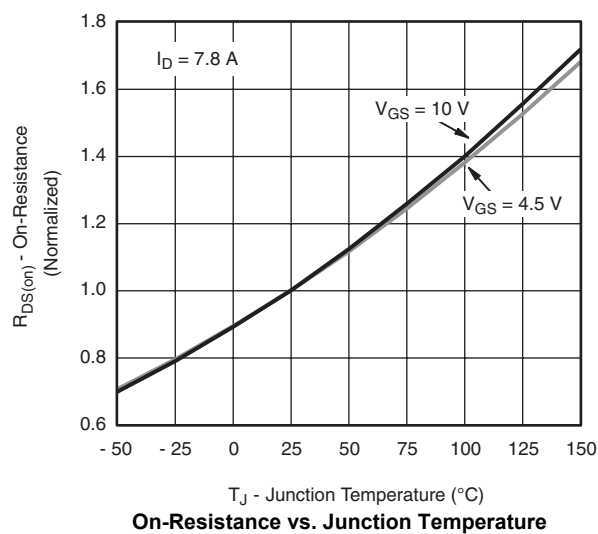
On-Resistance vs. Drain Current



Capacitance

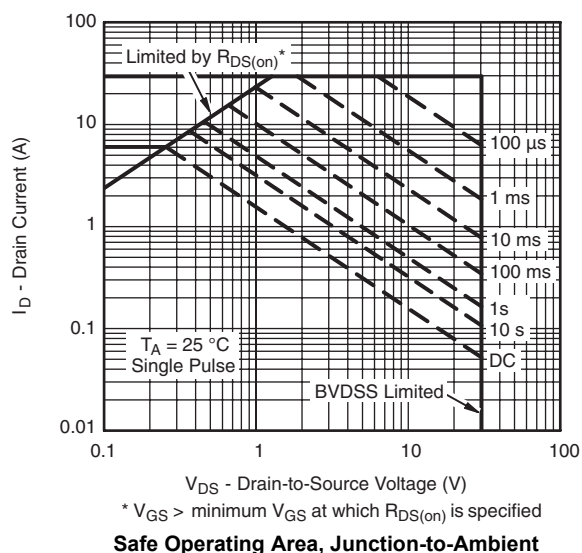
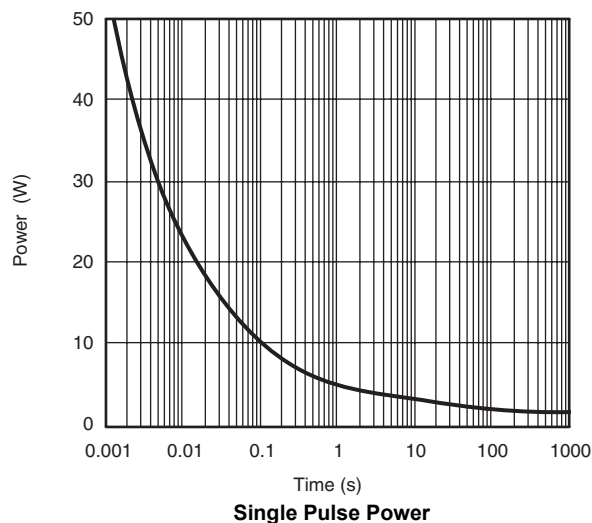
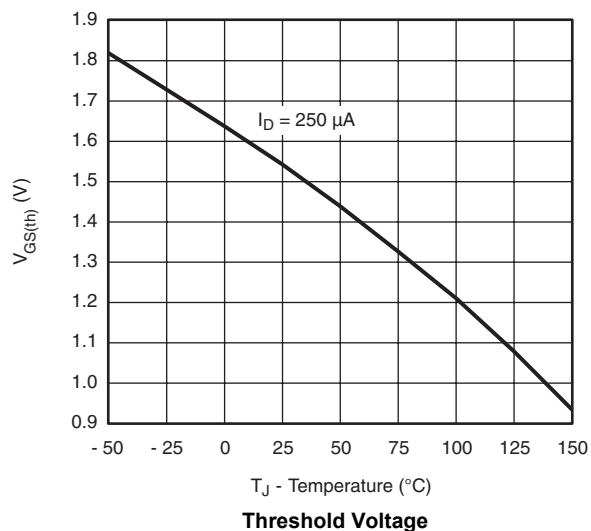
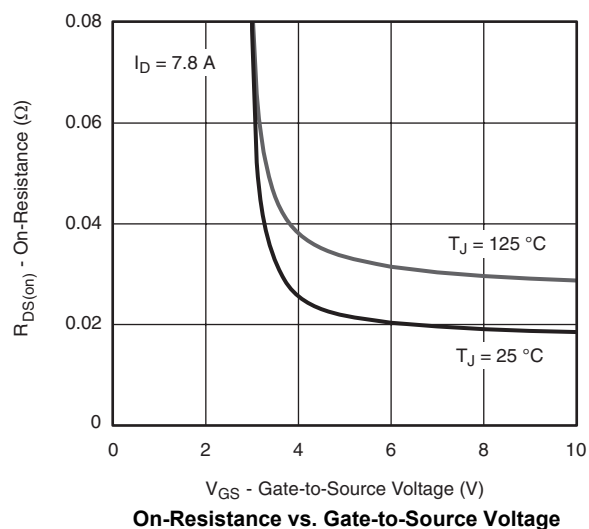
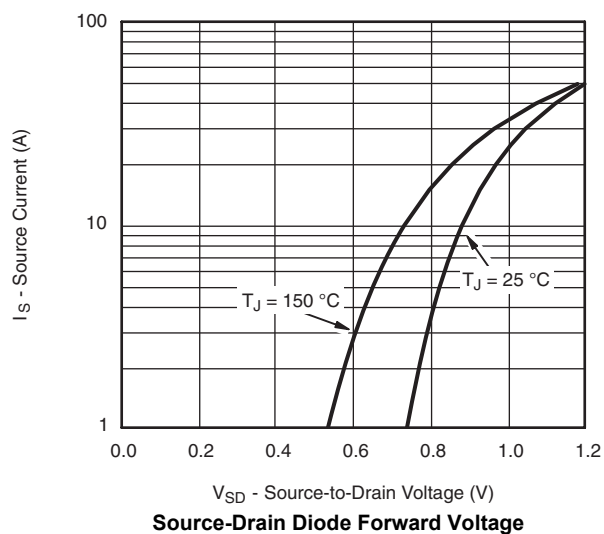


Gate Charge

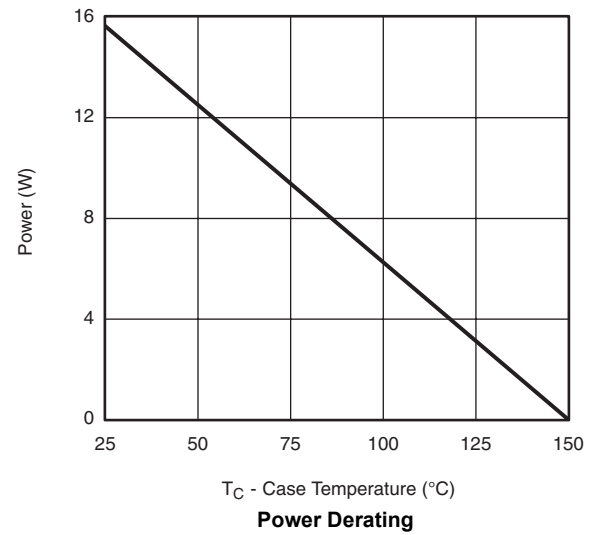
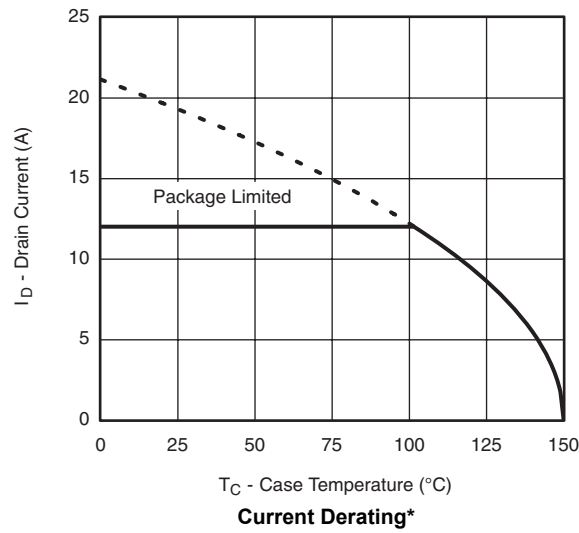


On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

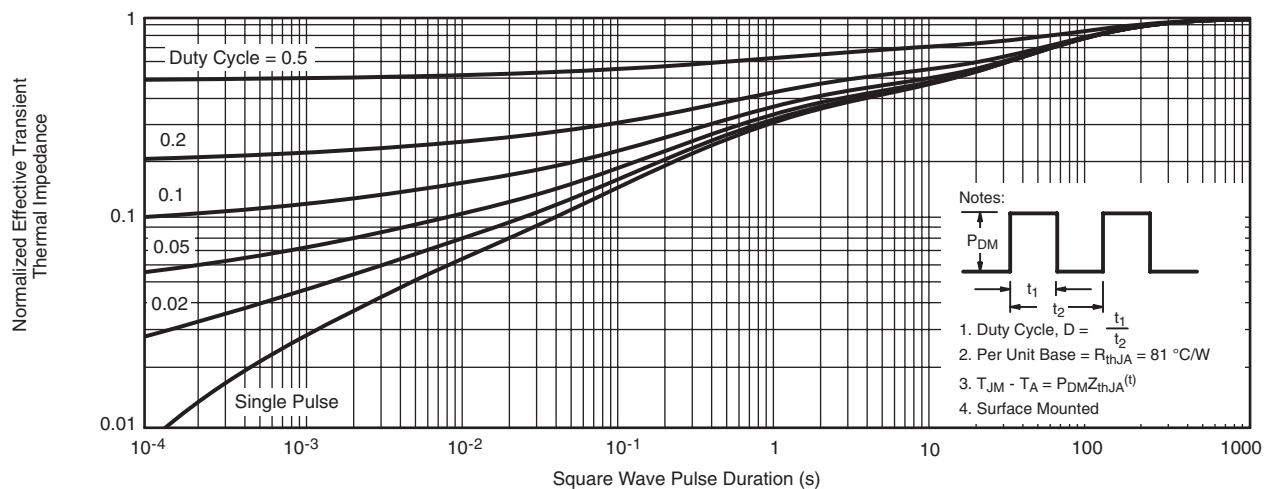


TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

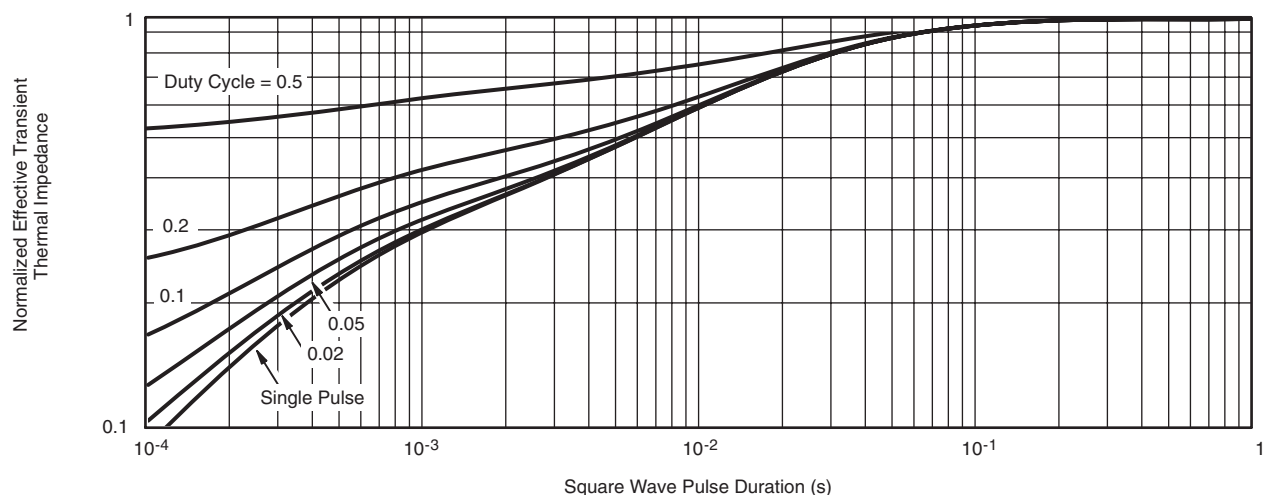


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Normalized Thermal Transient Impedance, Junction-to-Ambient

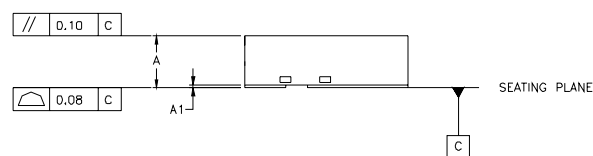


Normalized Thermal Transient Impedance, Junction-to-Case

Figure 1 illustrates the dimensioning and tolerancing of a mechanical part, showing three views: front, side, and top views. The dimensions and tolerances are specified in the table below.

View	Feature	Dimension	Tolerance
Front View	Slot	8x	
		6x	
		8x	
		6x	
	Right Feature	8x	
		6x	
		8x	
		6x	
		8x	
		6x	
Side View	Slot	8x	
		6x	
		8x	
		6x	
	Right Feature	8x	
		6x	
		8x	
		6x	
		8x	
		6x	
Top View	Slot	8x	
		6x	
		8x	
		6x	
	Right Feature	8x	
		6x	
		8x	
		6x	
		8x	
		6x	

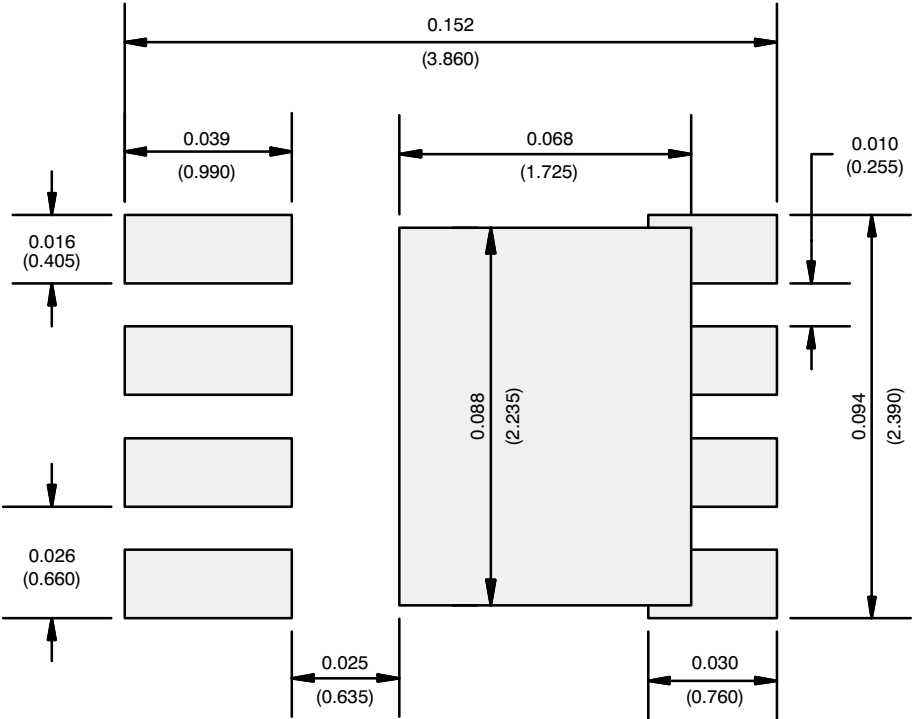
BOTTOM VIEW



FRONT VIEW

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0315	.0394	0.800	1.000
A1	.0000	.0020	0.000	0.050
b	.0098	.0138	0.250	0.350
c	.0080 REF.		0.203 REF.	
D	.1181 BASIC		3.000 BASIC	
E	.1181 BASIC		3.000 BASIC	
e	.0262 BASIC		0.666 BASIC	
e1	.0131 BASIC		0.333 BASIC	

RECOMMENDED MINIMUM PADS



Recommended Minimum Pads
Dimensions in Inches/(mm)

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