

PMPB55ENEAX-VB Datasheet

N-Channel 60-V (D-S) MOSFET

PRODUCT SUMMARY			
V _{DS} (V)	R _{DS(on)} (Ω)	I _D (A) ^a	Q _g (Typ.)
60	0.019 at V _{GS} = 10 V	14	7.2 nC
	0.021 at V _{GS} = 4.5 V	11	

FEATURES

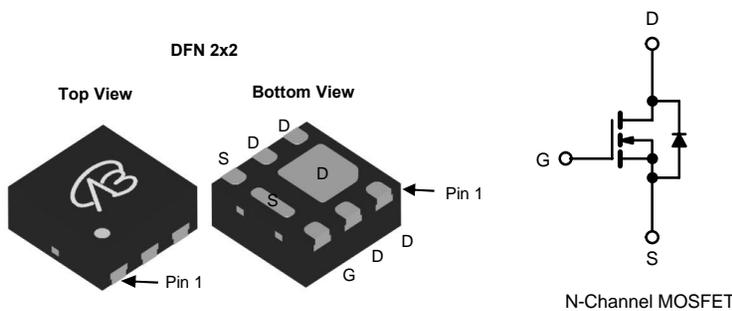
- Halogen-free
- Trench Power MOSFET
- Optimized for High-Side Synchronous Rectifier Operation
- 100 % R_g Tested
- 100 % UIS Tested



RoHS
COMPLIANT

APPLICATIONS

- Notebook CPU Core
- High-Side Switch



ABSOLUTE MAXIMUM RATINGS T _A = 25 °C, unless otherwise noted				
Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V _{DS}	60	V	
Gate-Source Voltage	V _{GS}	± 20		
Continuous Drain Current (T _J = 150 °C)	T _C = 25 °C	14	A	
	T _C = 70 °C	11		
	T _A = 25 °C	5.5 ^{b, c}		
	T _A = 70 °C	2.8 ^{b, c}		
Pulsed Drain Current	I _{DM}	42		
Continuous Source-Drain Diode Current	T _C = 25 °C	4.8		
	T _A = 25 °C	2.0 ^{b, c}		
Single Pulse Avalanche Current	L = 0.1 mH	20		
Avalanche Energy	E _{AS}	21	mJ	
Maximum Power Dissipation	T _C = 25 °C	4.1	W	
	T _C = 70 °C	2.5		
	T _A = 25 °C	2.2 ^{b, c}		
	T _A = 70 °C	1.3 ^{b, c}		
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 ^{b, d}	t ≤ 10 s	R _{thJA}	39	55	°C/W
Maximum Junction-to-Foot (Drain)	Steady State	R _{thJF}	25	29	

Notes:

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

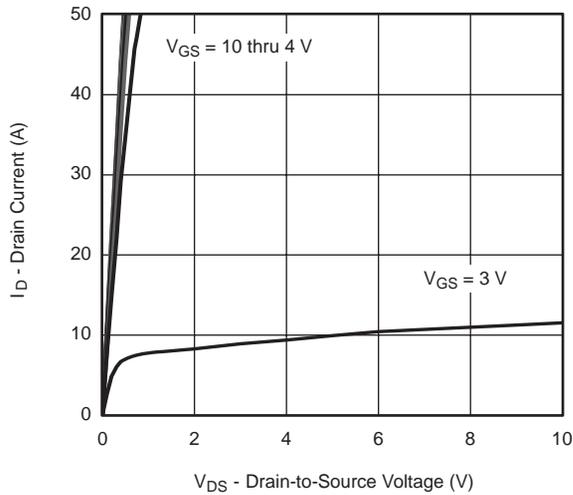
SPECIFICATIONS $T_J = 25\text{ }^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250\text{ }\mu\text{A}$		26		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-6		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		1.5		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}	$V_{DS} = 4.8\text{ V}, V_{GS} = 0\text{ V}$			1	μA
		$V_{DS} = 4.8\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = 10\text{ V}$	20			A
Drain-Source On-State Resistance ^a	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		0.019		Ω
		$V_{GS} = 4.5\text{ V}, I_D = 9\text{ A}$		0.021		
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15\text{ V}, I_D = 10\text{ A}$		50		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		1800		pF
Output Capacitance	C_{oss}			165		
Reverse Transfer Capacitance	C_{rss}			73		
Total Gate Charge	Q_g	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V}, I_D = 10\text{ A}$		15	23	nC
		$V_{DS} = 15\text{ V}, V_{GS} = 5\text{ V}, I_D = 10\text{ A}$		6.8	10.2	
Gate-Source Charge	Q_{gs}			2.5		
Gate-Drain Charge	Q_{gd}		2.3			
Gate Resistance	R_g	$f = 1\text{ MHz}$	0.36	1.8	3.6	Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 1.4\text{ }\Omega$ $I_D \cong 9\text{ A}, V_{GEN} = 4.5\text{ V}, R_g = 1\text{ }\Omega$		16	23	ns
Rise Time	t_r			12	16	
Turn-Off Delay Time	$t_{d(off)}$			16	22	
Fall Time	t_f			10	18	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 15\text{ V}, R_L = 1.4\text{ }\Omega$ $I_D \cong 9\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$		8	16	
Rise Time	t_r			10	20	
Turn-Off Delay Time	$t_{d(off)}$			16	22	
Fall Time	t_f			8	15	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			14	A
Pulse Diode Forward Current ^a	I_{SM}				42	
Body Diode Voltage	V_{SD}	$I_S = 9\text{ A}$		0.8	1.2	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = 9\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		15	30	ns
Body Diode Reverse Recovery Charge	Q_{rr}			6	12	nC
Reverse Recovery Fall Time	t_a			8		ns
Reverse Recovery Rise Time	t_b			7		

Notes:

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

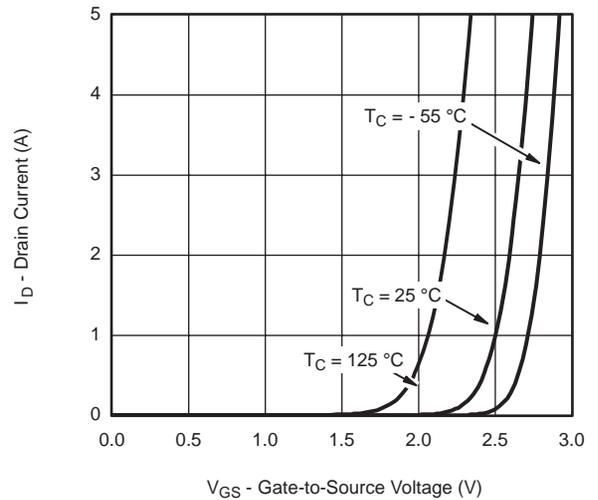


V_{GS} = 10 thru 4 V

V_{GS} = 3 V

V_{DS} - Drain-to-Source Voltage (V)

Output Characteristics



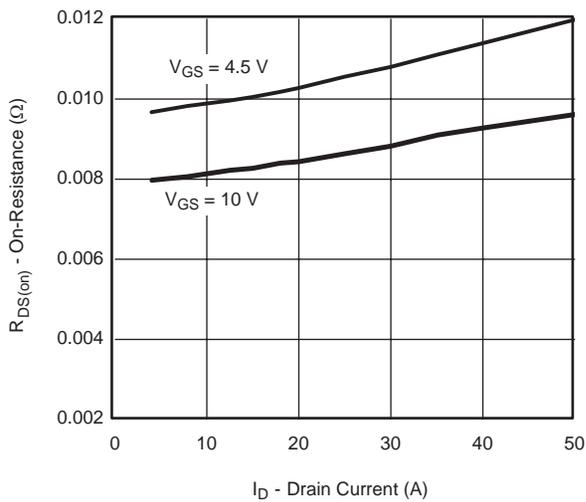
$T_C = -55\text{ }^\circ\text{C}$

$T_C = 25\text{ }^\circ\text{C}$

$T_C = 125\text{ }^\circ\text{C}$

V_{GS} - Gate-to-Source Voltage (V)

Transfer Characteristics

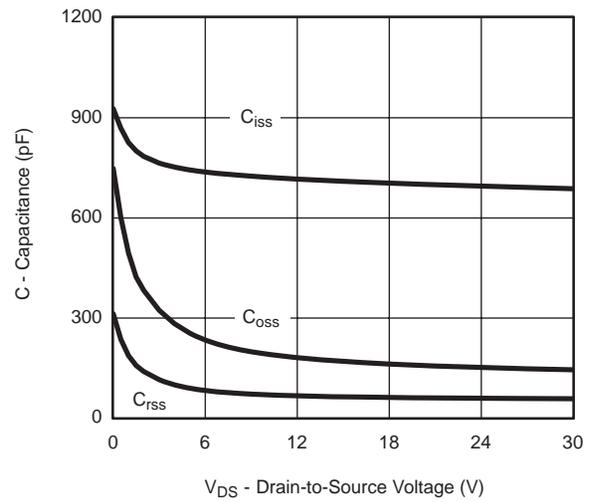


$V_{GS} = 4.5\text{ V}$

$V_{GS} = 10\text{ V}$

I_D - Drain Current (A)

On-Resistance vs. Drain Current and Gate Voltage



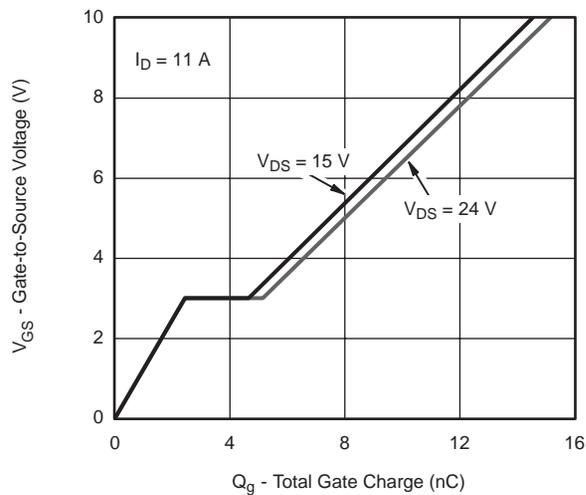
C_{iss}

C_{oss}

C_{rss}

V_{DS} - Drain-to-Source Voltage (V)

Capacitance



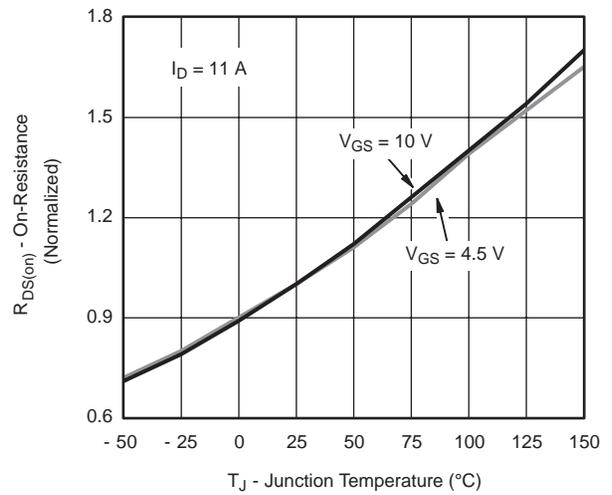
$I_D = 11\text{ A}$

$V_{DS} = 15\text{ V}$

$V_{DS} = 24\text{ V}$

Q_g - Total Gate Charge (nC)

Gate Charge



$I_D = 11\text{ A}$

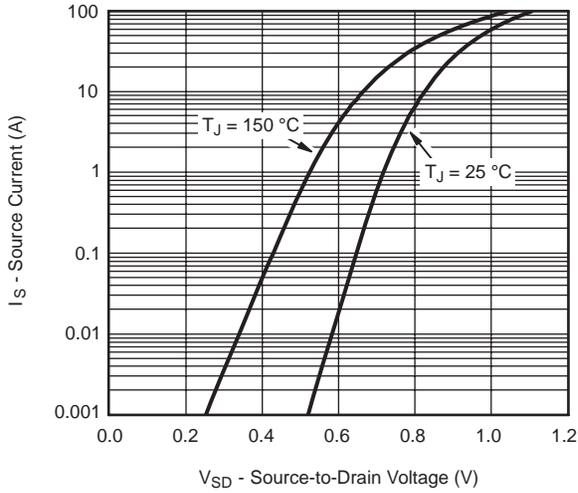
$V_{GS} = 10\text{ V}$

$V_{GS} = 4.5\text{ V}$

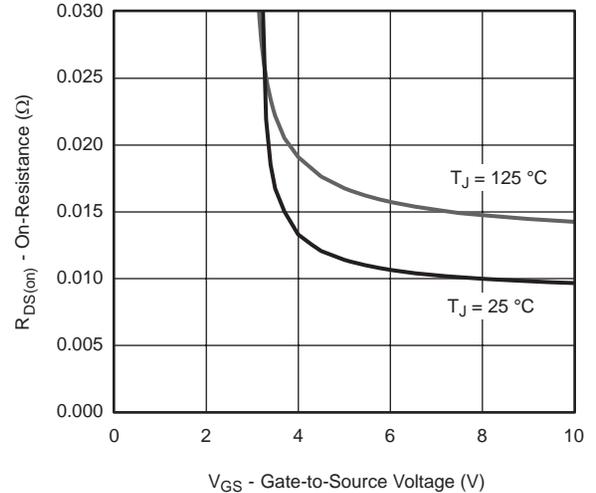
T_J - Junction Temperature ($^\circ\text{C}$)

On-Resistance vs. Junction Temperature

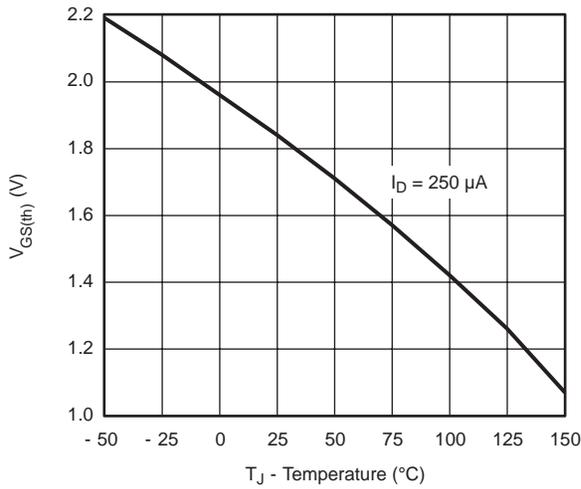
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



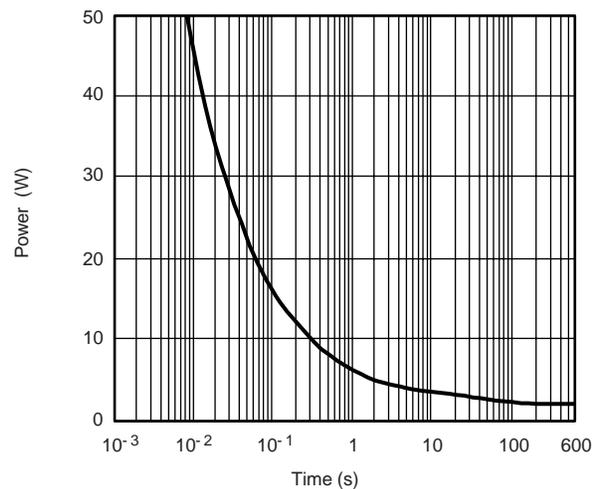
Source-Drain Diode Forward Voltage



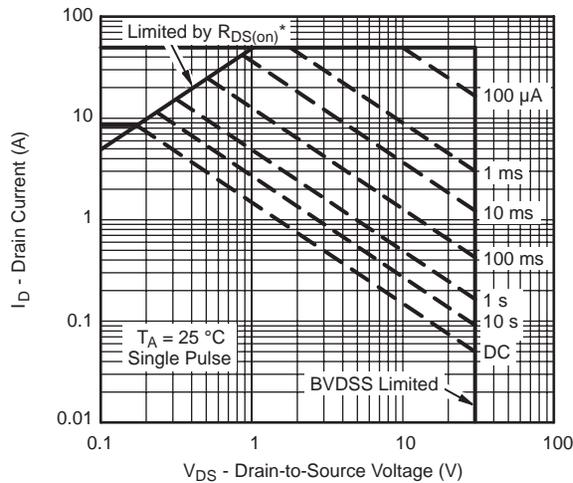
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



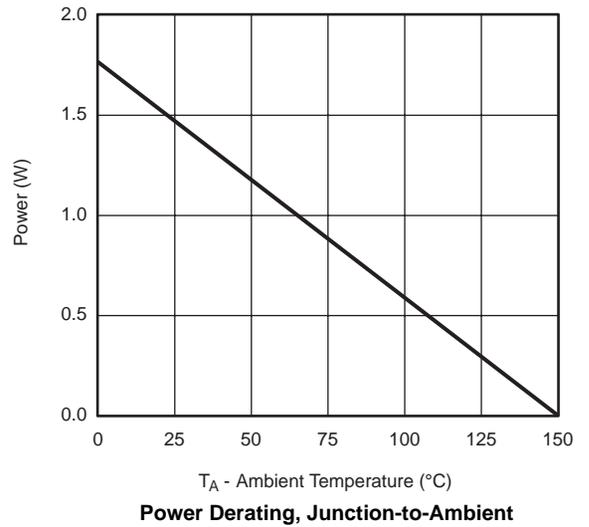
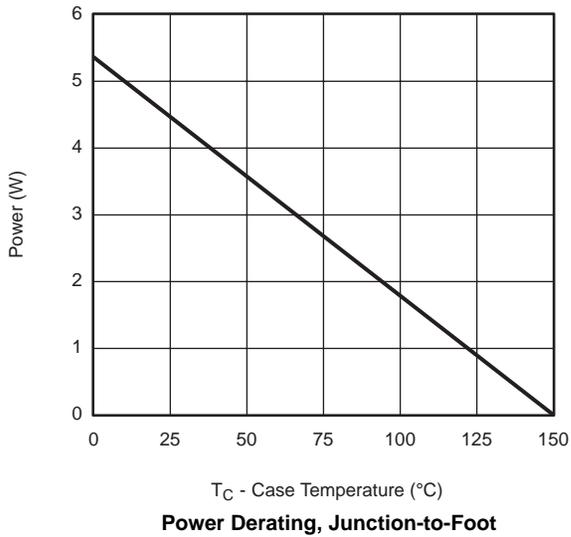
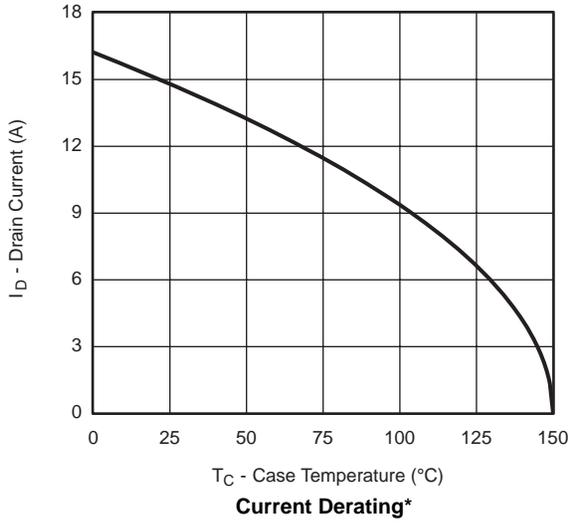
Single Pulse Power, Junction-to-Ambient



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

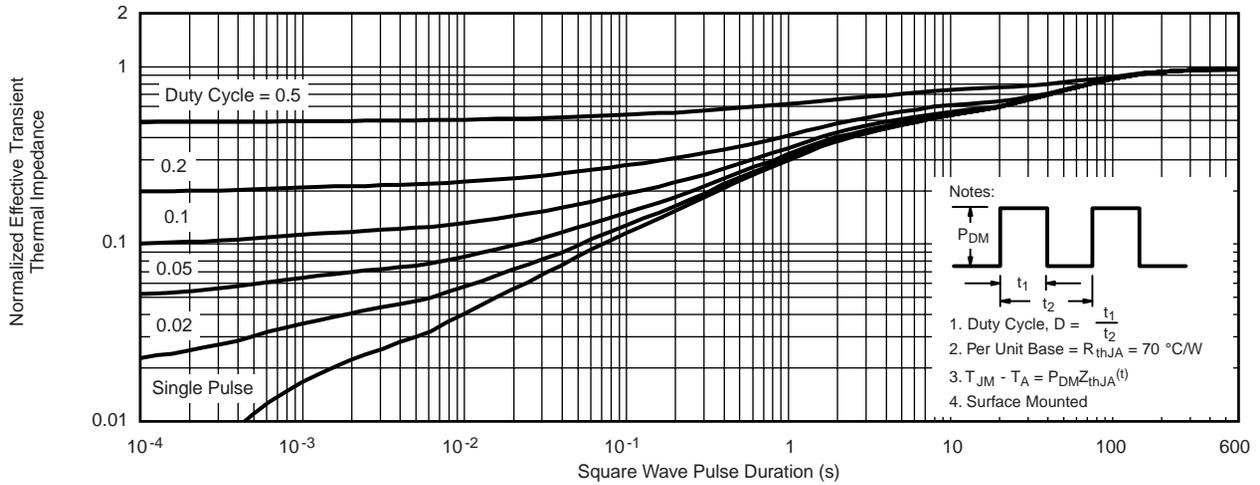
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

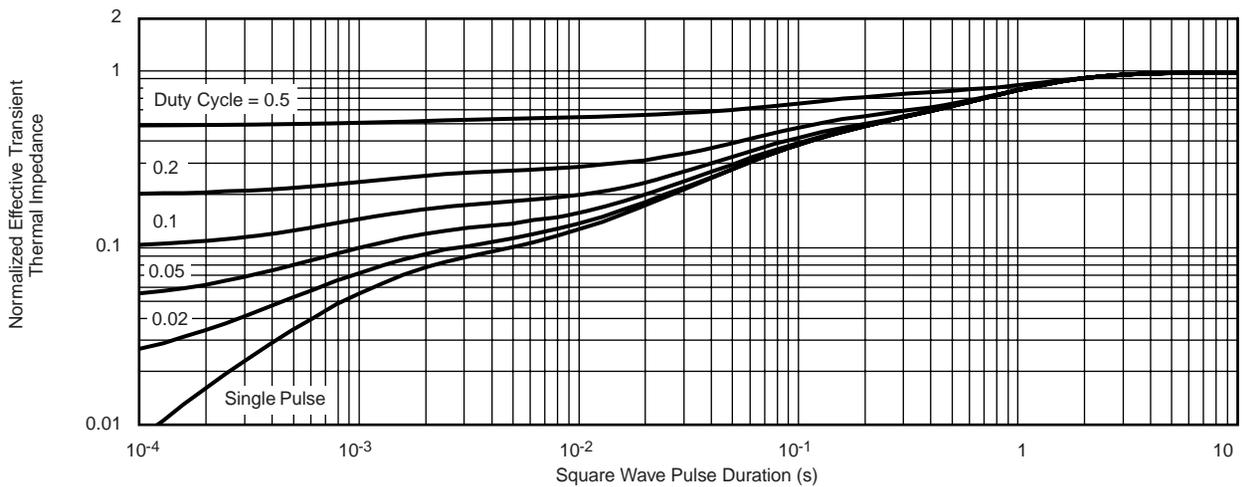


* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

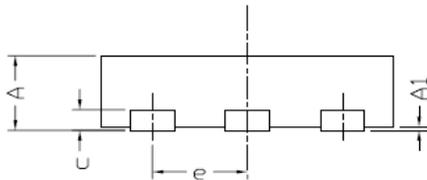
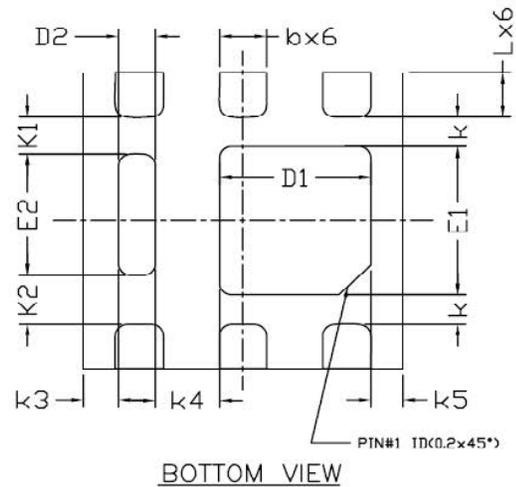
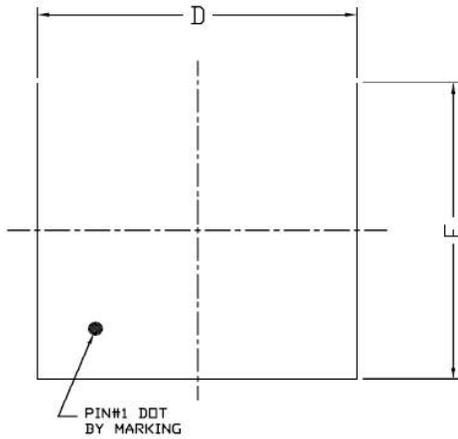


Normalized Thermal Transient Impedance, Junction-to-Ambient

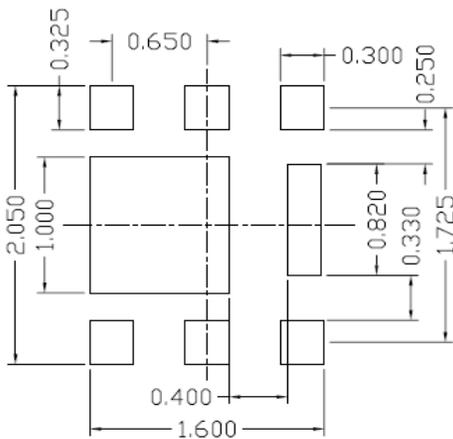


Normalized Thermal Transient Impedance, Junction-to-Foot

DFN2x2 _6L_EP1_S PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



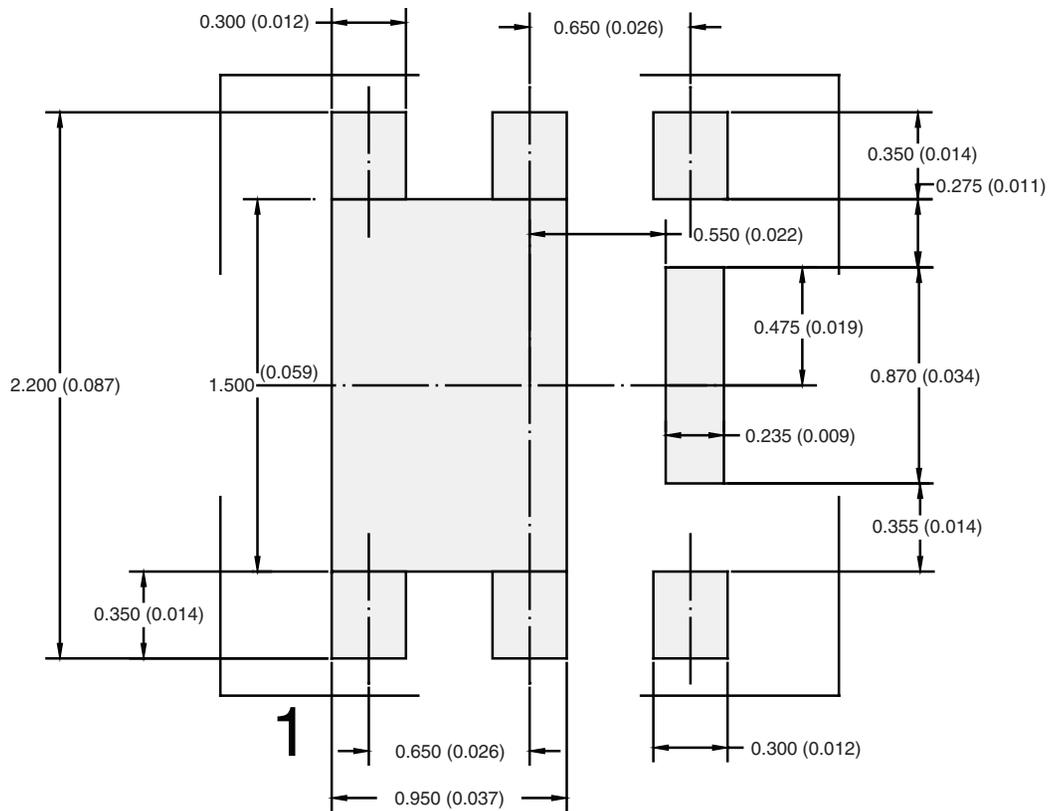
UNIT: mm

NOTE

1. CONTROLLING DIMENSION IS MILLIMETER.
CONVERTED INCH DIMENSIONS ARE NOT NECESSARILY EXACT.

SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.50	0.55	0.60	0.020	0.022	0.024
A1	0.00	—	0.05	0.000	—	0.002
b	0.25	0.30	0.35	0.010	0.012	0.014
c	0.152 REF			0.006 REF		
D	1.90	2.00	2.10	0.075	0.079	0.083
D1	0.85	0.95	1.05	0.033	0.037	0.041
D2	0.13	0.23	0.33	0.005	0.009	0.013
E	1.90	2.00	2.10	0.075	0.079	0.083
E1	0.90	1.00	1.10	0.035	0.039	0.043
E2	0.72	0.82	0.92	0.028	0.032	0.036
e	0.65 BSC			0.026 BSC		
K	0.20 BSC			0.008 BSC		
K1	0.25 BSC			0.010 BSC		
K2	0.33 BSC			0.013 BSC		
K3	0.22 BSC			0.009 BSC		
K4	0.40 BSC			0.016 BSC		
K5	0.20 BSC			0.008 BSC		
L	0.25	0.30	0.35	0.010	0.012	0.014

RECOMMENDED PAD LAYOUT FOR DFN2X2



Dimensions in mm/(Inches)

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