

# PMPB15XP,115-VB Datasheet

## P-Channel 20-V (D-S) MOSFET

PRODUCT SUMMARY			
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)	$Q_g$ (Typ.)
- 20	0.020 at $V_{GS} = -10$ V	- 10 <sup>a</sup>	20 nC
	0.028 at $V_{GS} = -4.5$ V	- 8 <sup>a</sup>	
	0.040 at $V_{GS} = -2.5$ V	- 6	

### FEATURES

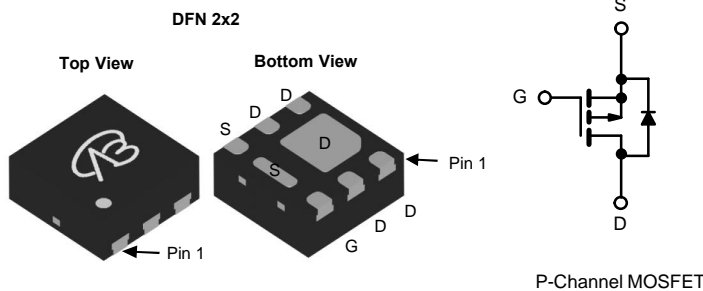
- Halogen-free According to IEC 61249-2-21 Definition
- Trench Power MOSFET
- 100 %  $R_g$  Tested
- Compliant to RoHS Directive 2002/95/EC



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Portable Devices
  - Load Switch
  - Battery Switch
  - Charger Switch



ABSOLUTE MAXIMUM RATINGS $T_A = 25^\circ\text{C}$ , unless otherwise noted				
Parameter		Symbol	Limit	Unit
Drain-Source Voltage		$V_{DS}$	- 20	V
Gate-Source Voltage		$V_{GS}$	$\pm 12$	
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$T_C = 25^\circ\text{C}$	$I_D$	- 10 <sup>a</sup>	A
	$T_C = 70^\circ\text{C}$		- 7 <sup>a</sup>	
	$T_A = 25^\circ\text{C}$		- 8 <sup>b, c</sup>	
	$T_A = 70^\circ\text{C}$		- 7.1 <sup>b, c</sup>	
Pulsed Drain Current		$I_{DM}$	- 30	A
Continuous Source-Drain Diode Current	$T_C = 25^\circ\text{C}$	$I_S$	- 6 <sup>a</sup>	
	$T_A = 25^\circ\text{C}$		- 2.9 <sup>b, c</sup>	
Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	$P_D$	19	W
	$T_C = 70^\circ\text{C}$		12	
	$T_A = 25^\circ\text{C}$		3.5 <sup>b, c</sup>	
	$T_A = 70^\circ\text{C}$		2.2 <sup>b, c</sup>	
Operating Junction and Storage Temperature Range		$T_J, T_{stg}$	- 55 to 150	$^\circ\text{C}$
Soldering Recommendations (Peak Temperature) <sup>d, e</sup>			260	

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>b, e</sup>	$t \leq 5$ s	$R_{thJA}$	28	36	$^\circ\text{C/W}$
	Steady State	$R_{thJC}$	5.3	6.5	

Notes:

a. Package limited.

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

c.  $t = 5$  s.

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

e. Maximum under Steady State conditions is  $80^\circ\text{C/W}$ .

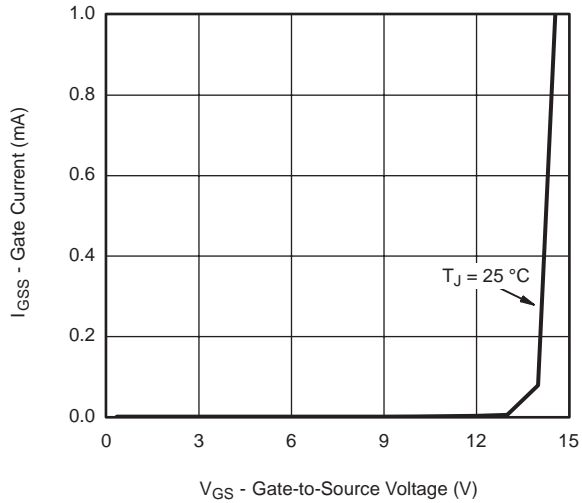
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	- 20			V
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		- 12		mV/ $^{\circ}\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			3		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$		- 0.6		V
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = -20\text{ V}, V_{GS} = \pm 12\text{ V}$			$\pm 20$	$\mu\text{A}$
		$V_{DS} = -20\text{ V}, V_{GS} = \pm 4.5\text{ V}$			$\pm 0.5$	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$			- 1	
		$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^{\circ}\text{C}$			- 10	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \leq -5\text{ V}, V_{GS} = -4.5\text{ V}$	- 20			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -5.6\text{ A}$		0.020		$\Omega$
		$V_{GS} = -4.5\text{ V}, I_D = -5.3\text{ A}$		0.028		
		$V_{GS} = -2.5\text{ V}, I_D = -2.5\text{ A}$		0.040		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -10\text{ V}, I_D = -5.6\text{ A}$		35		S
Dynamic <sup>b</sup>						
Total Gate Charge	$Q_g$	$V_{DS} = -10\text{ V}, V_{GS} = -8\text{ V}, I_D = -5\text{ A}$		50	75	nC
Gate-Source Charge		$V_{DS} = -10\text{ V}, V_{GS} = -4.5\text{ V}, I_D = -5\text{ A}$		20	30	
	$Q_{gs}$			3.3		
Gate-Drain Charge	$Q_{gd}$			8.4		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	0.2	1	2	k $\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		0.71	1.1	us
Rise Time	$t_r$			1.7	2.6	
Turn-Off Delay Time	$t_{d(off)}$			6	9	
Fall Time	$t_f$			3.2	5	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -10\text{ V}, R_L = 1\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		0.3	0.45	
Rise Time	$t_r$			0.6	0.9	
Turn-Off Delay Time	$t_{d(off)}$			10	15	
Fall Time	$t_f$			3.5	5.5	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25\text{ }^{\circ}\text{C}$			- 10	A
Pulse Diode Forward Current	$I_{SM}$				- 30	
Body Diode Voltage	$V_{SD}$	$I_S = -5\text{ A}, V_{GS} = 0\text{ V}$		- 0.85	- 1.2	V
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 6\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^{\circ}\text{C}$		30	60	ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			20	40	nC
Reverse Recovery Fall Time	$t_a$			13		ns
Reverse Recovery Rise Time	$t_b$			17		

Notes:

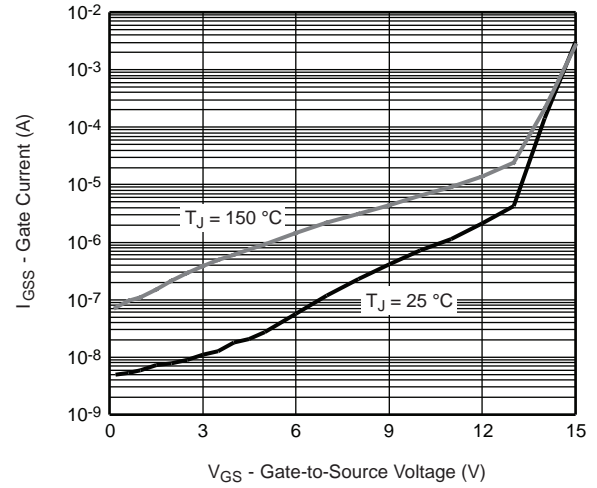
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.

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.

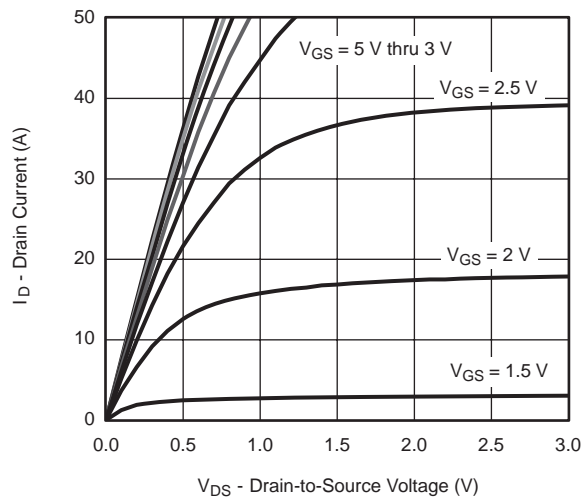
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



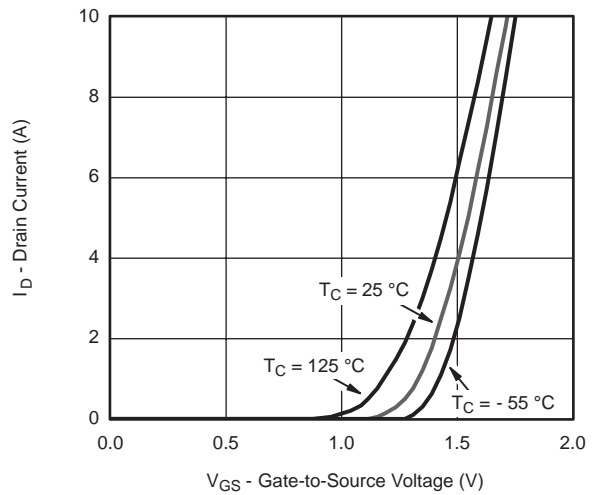
**Gate Current vs. Gate-Source Voltage**



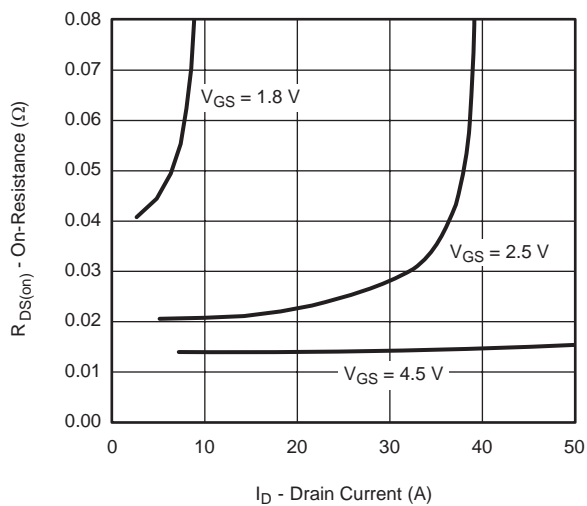
**Gate Current vs. Gate-Source Voltage**



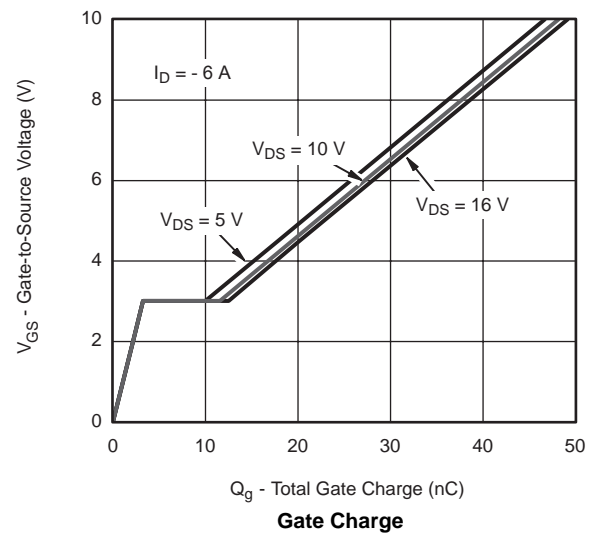
**Output Characteristics**



**Transfer Characteristics**

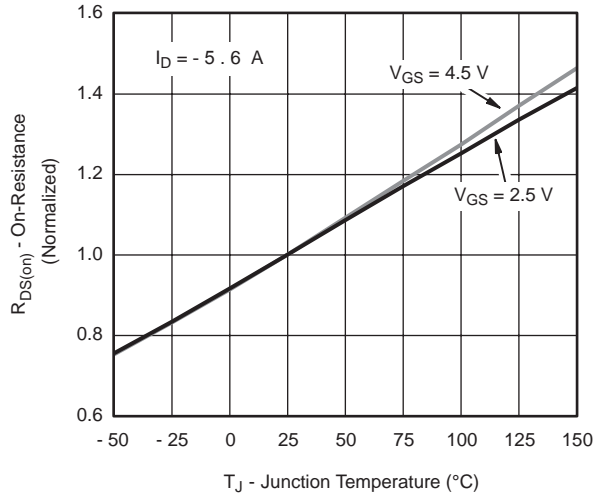


**On-Resistance vs. Drain Current**

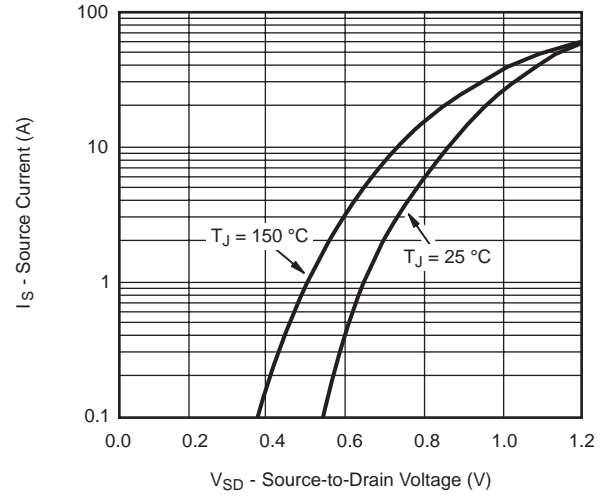


**Gate Charge**

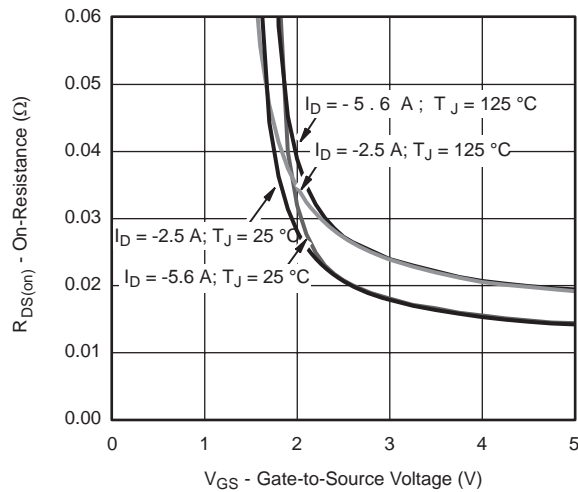
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



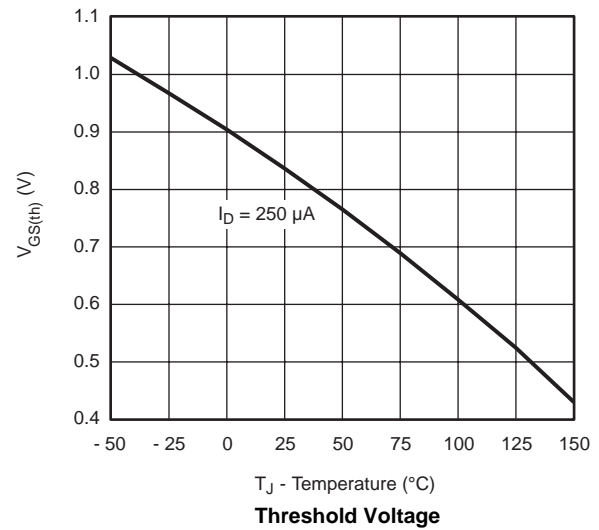
**On-Resistance vs. Junction Temperature**



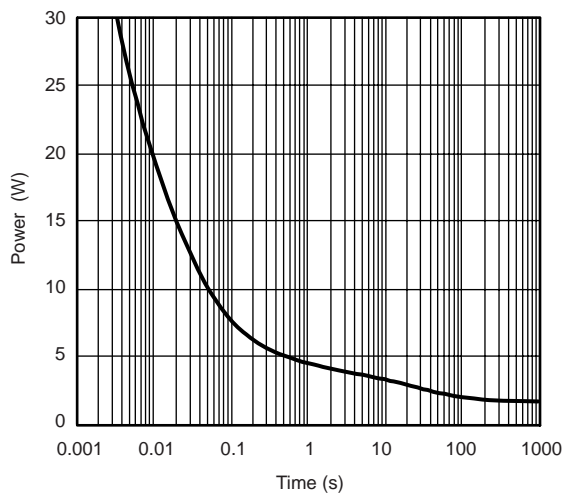
**Source-Drain Diode Forward Voltage**



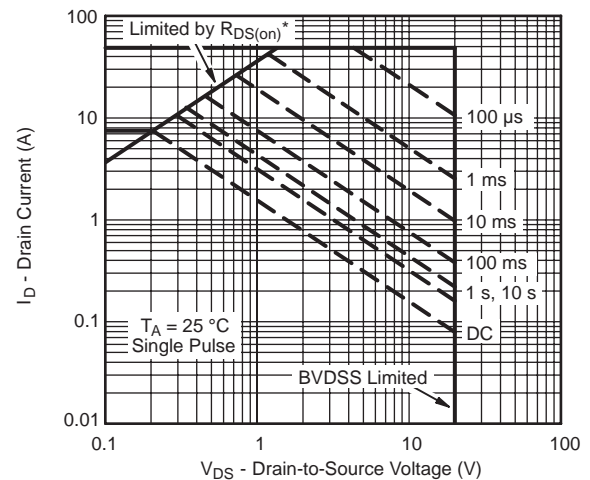
**On-Resistance vs. Gate-to-Source Voltage**



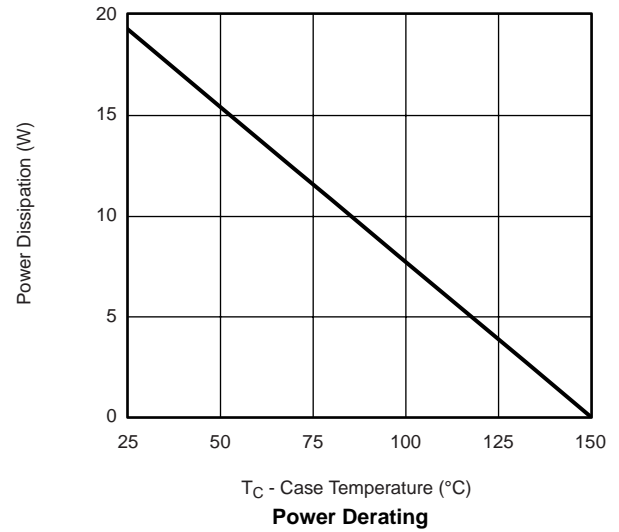
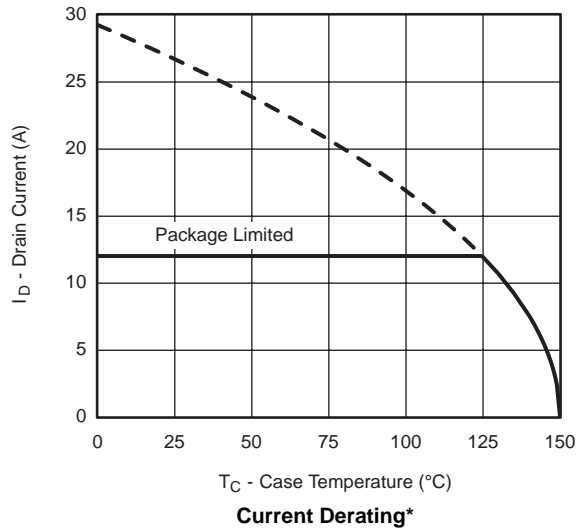
**Threshold Voltage**



**Single Pulse Power, Junction-to-Ambient**

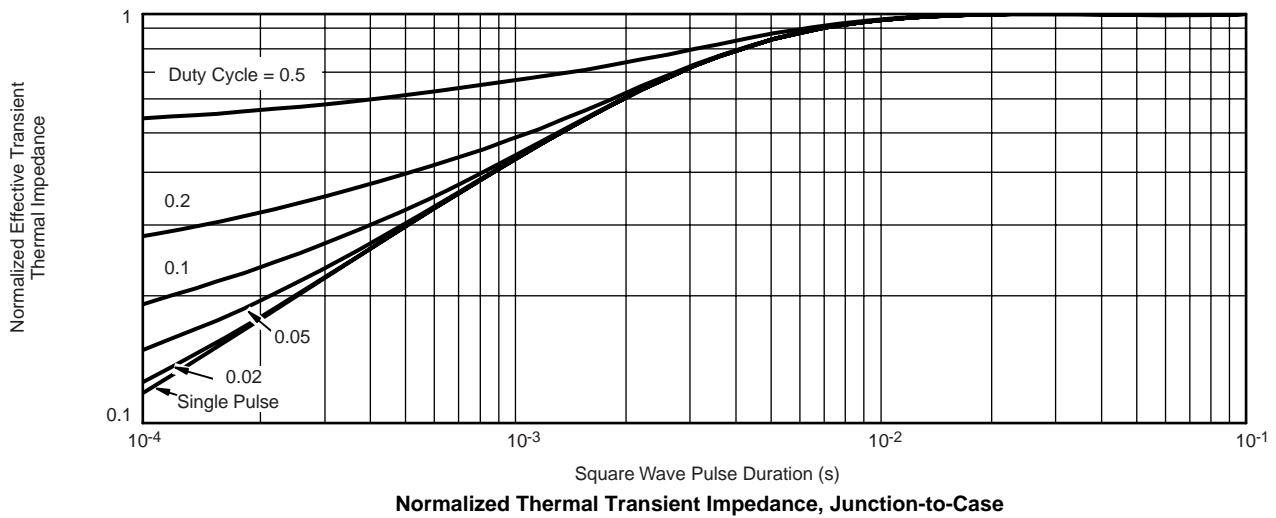
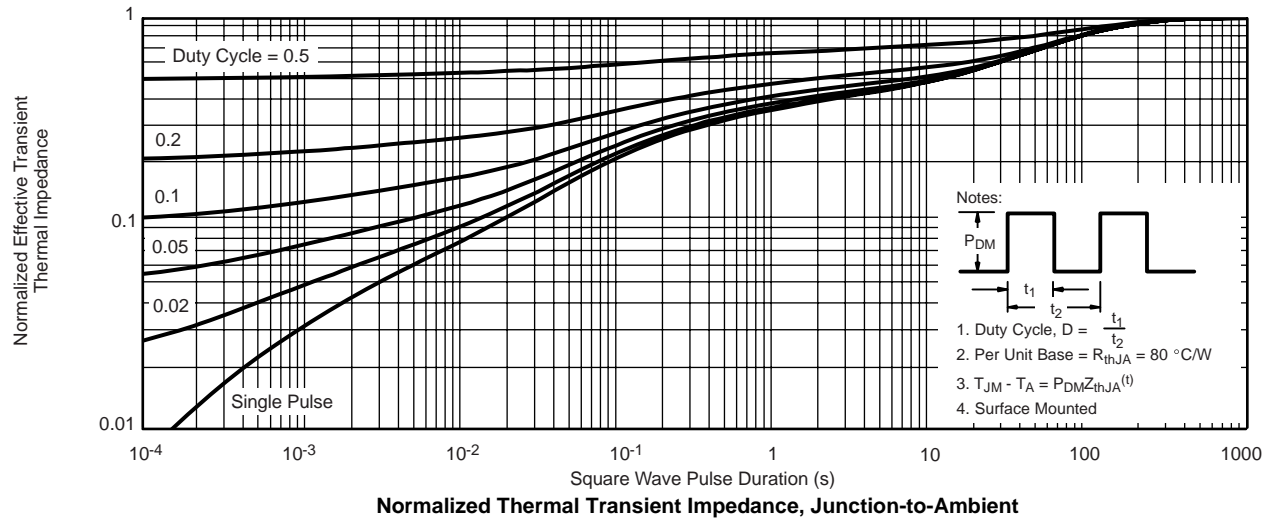


**Safe Operating Area, Junction-to-Ambient**

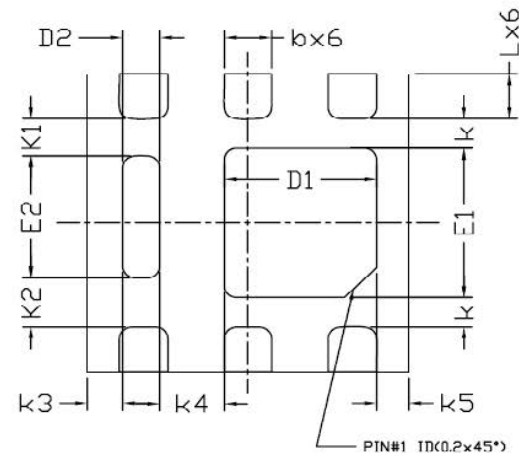
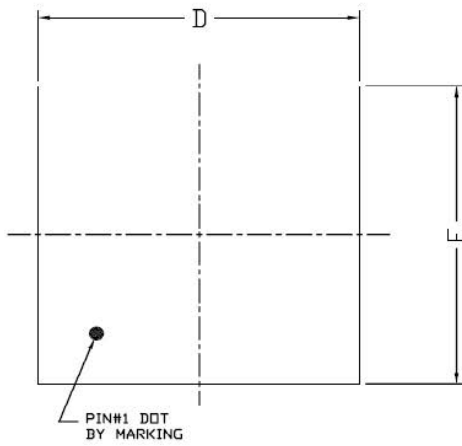
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted

\* 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.

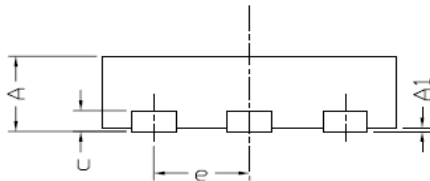
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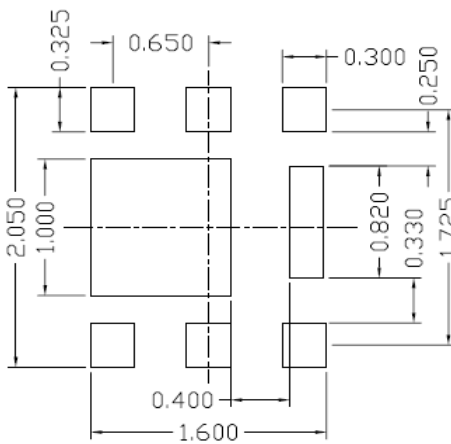
## DFN2x2 \_6L\_EP1\_S PACKAGE OUTLINE



BOTTOM VIEW



## RECOMMENDED LAND PATTERN



UNIT: mm

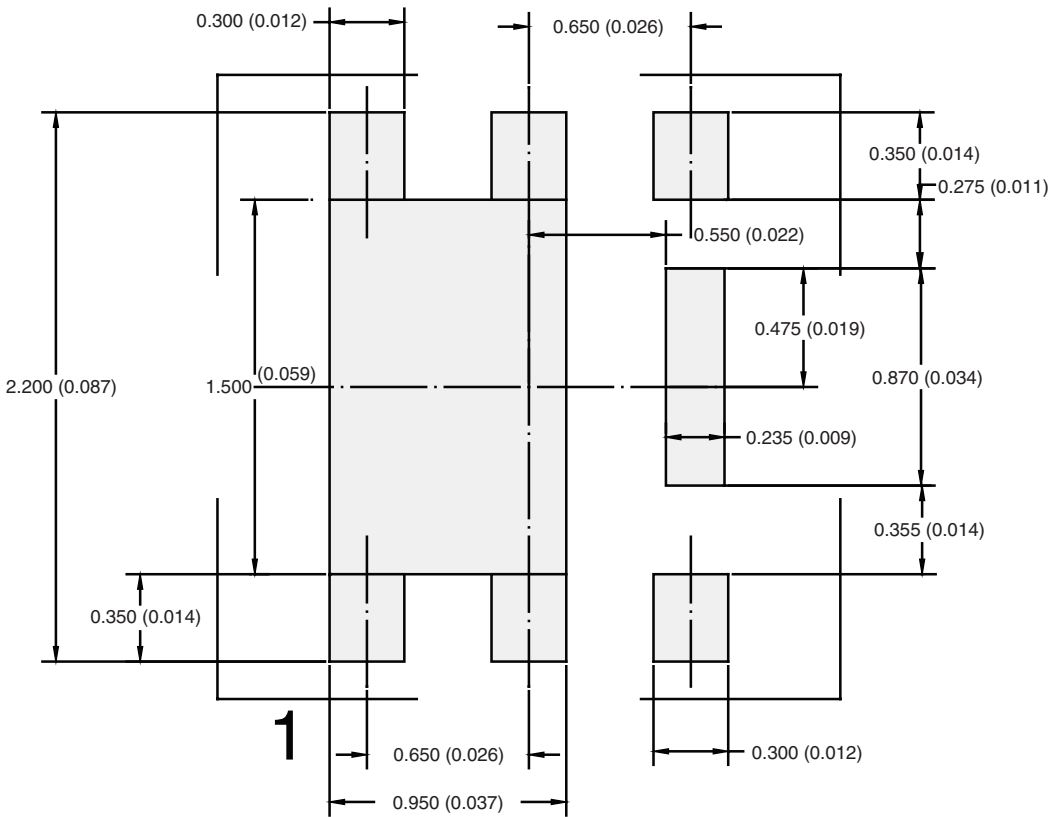
## NOTE

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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