

# PMPB40SNA115-VB Datasheet

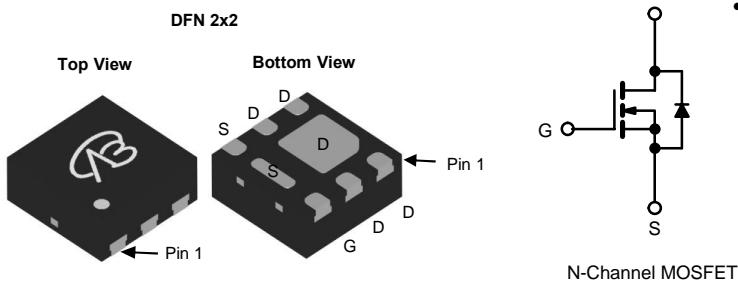
## N-Channel 60-V (D-S) MOSFET

### PRODUCT SUMMARY

$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A) <sup>a</sup>	$Q_g$ (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



### 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	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	14	A
		11	
		5.5 <sup>b, c</sup>	
		2.8 <sup>b, c</sup>	
Pulsed Drain Current	$I_{DM}$	42	
Continuous Source-Drain Diode Current	$I_S$	4.8	
		2.0 <sup>b, c</sup>	
Single Pulse Avalanche Current	$I_{AS}$	20	mJ
Avalanche Energy	$E_{AS}$	21	
Maximum Power Dissipation	$P_D$	4.1	W
		2.5	
		2.2 <sup>b, c</sup>	
		1.3 <sup>b, c</sup>	
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 <sup>b, d</sup>	$R_{thJA}$	39	55	°C/W
Maximum Junction-to-Foot (Drain)	$R_{thJF}$	25	29	

Notes:

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

**SPECIFICATIONS**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

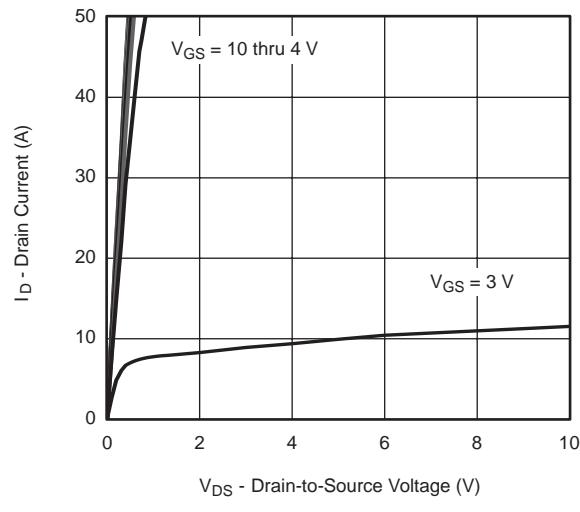
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
<b>Static</b>							
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	60			V	
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$		26		$\text{mV}/^\circ\text{C}$	
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			- 6			
Gate-Source Threshold Voltage	$V_{GS(\text{th})}$	$V_{DS} = V_{GS}, I_D = 250 \mu\text{A}$		1.5		V	
Gate-Source Leakage	$I_{GSS}$	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			$\pm 100$	nA	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 4.8 \text{ V}, V_{GS} = 0 \text{ V}$			1	$\mu\text{A}$	
		$V_{DS} = 4.8 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$			10		
On-State Drain Current <sup>a</sup>	$I_{D(\text{on})}$	$V_{DS} \geq 5 \text{ V}, V_{GS} = 10 \text{ V}$	20			A	
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}, I_D = 10 \text{ A}$		0.019		$\Omega$	
		$V_{GS} = 4.5 \text{ V}, I_D = 9 \text{ A}$		0.021			
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15 \text{ V}, I_D = 10 \text{ A}$		50		S	
<b>Dynamic<sup>b</sup></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	
Gate-Source Charge	$Q_{gs}$	$V_{DS} = 15 \text{ V}, V_{GS} = 5 \text{ V}, I_D = 10 \text{ A}$		6.8	10.2		
Gate-Drain Charge	$Q_{gd}$			2.5			
Gate Resistance	$R_g$		$f = 1 \text{ MHz}$	0.36	1.8	3.6	$\Omega$
Turn-On Delay Time	$t_{d(\text{on})}$			16	23		
Rise Time	$t_r$	$V_{DD} = 15 \text{ V}, R_L = 1.4 \Omega$ $I_D \geq 9 \text{ A}, V_{GEN} = 4.5 \text{ V}, R_g = 1 \Omega$		12	16	ns	
Turn-Off Delay Time	$t_{d(\text{off})}$			16	22		
Fall Time	$t_f$			10	18		
Turn-On Delay Time	$t_{d(\text{on})}$			8	16		
Rise Time	$t_r$	$V_{DD} = 15 \text{ V}, R_L = 1.4 \Omega$ $I_D \geq 9 \text{ A}, V_{GEN} = 10 \text{ V}, R_g = 1 \Omega$		10	20	ns	
Turn-Off Delay Time	$t_{d(\text{off})}$			16	22		
Fall Time	$t_f$			8	15		
<b>Drain-Source Body Diode Characteristics</b>							
Continuous Source-Drain Diode Current	$I_S$	$T_C = 25^\circ\text{C}$			14	A	
Pulse Diode Forward Current <sup>a</sup>	$I_{SM}$				42		
Body Diode Voltage	$V_{SD}$	$I_S = 9 \text{ A}$		0.8	1.2	V	
Body Diode Reverse Recovery Time	$t_{rr}$	$I_F = 9 \text{ A}, dI/dt = 100 \text{ A}/\mu\text{s}, T_J = 25^\circ\text{C}$		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:

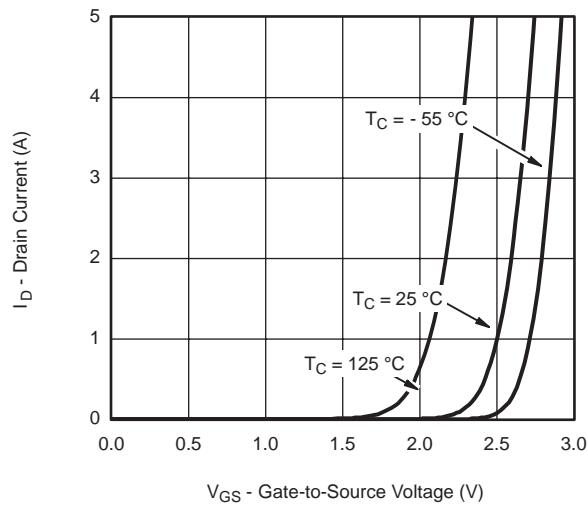
a. Pulse test; pulse width  $\leq 300 \mu\text{s}$ , duty cycle  $\leq 2\%$ .

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

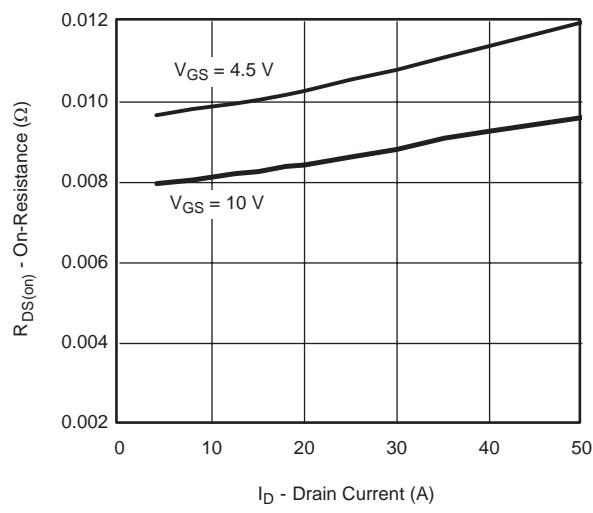
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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


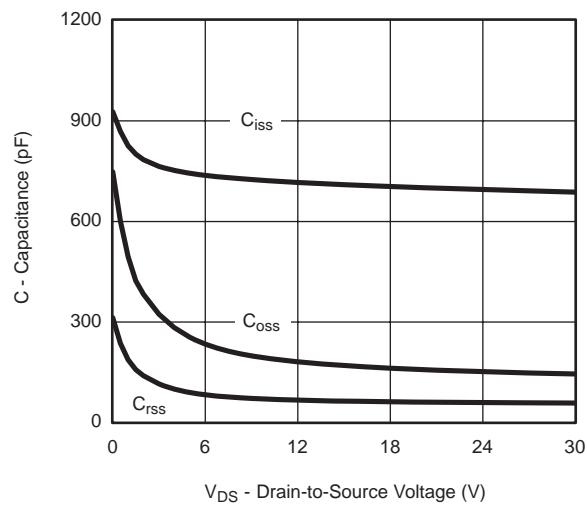
Output Characteristics



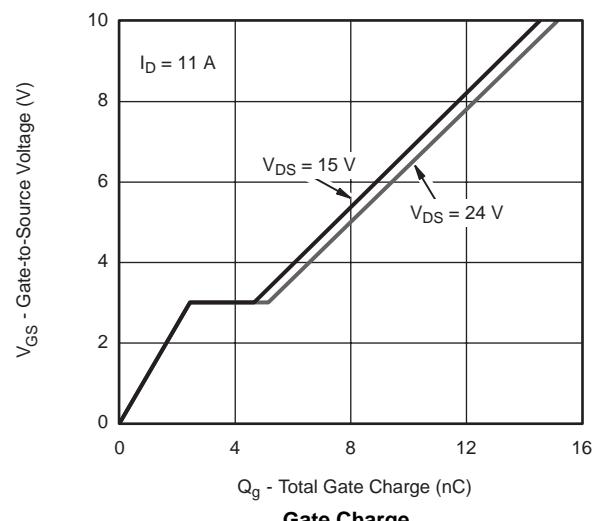
Transfer Characteristics



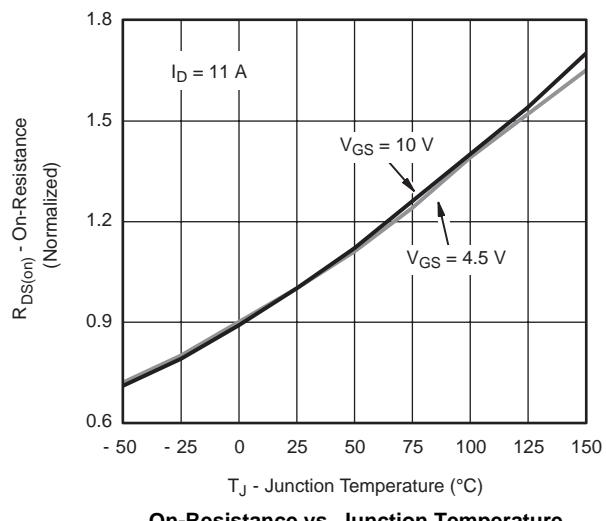
On-Resistance vs. Drain Current and Gate Voltage



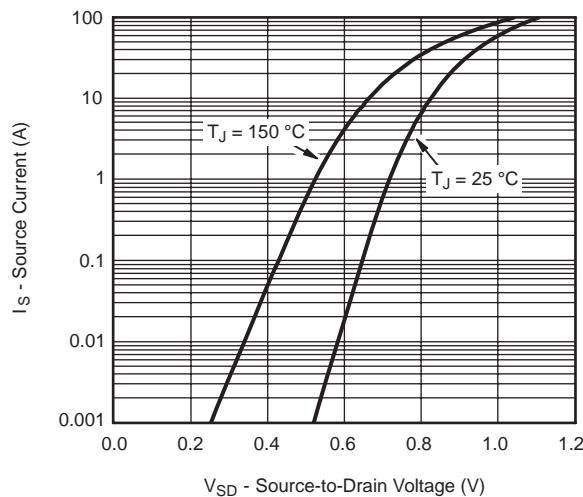
Capacitance



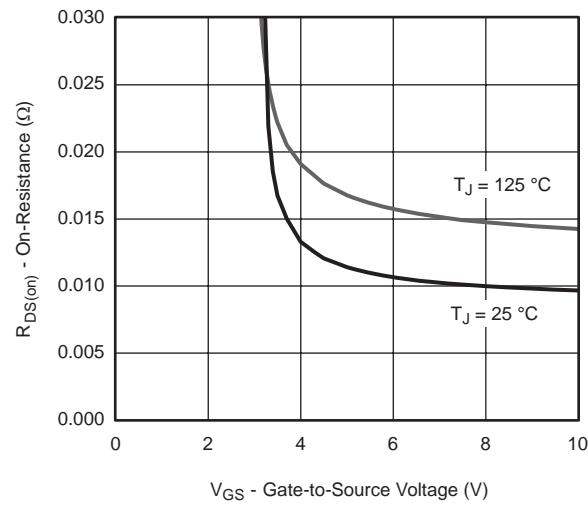
Gate Charge



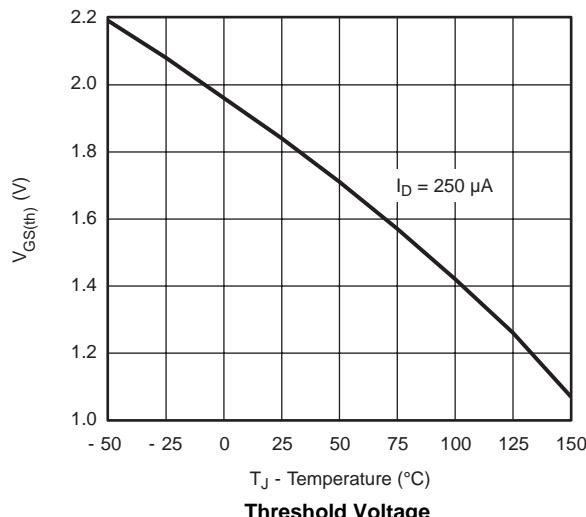
On-Resistance vs. Junction Temperature

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


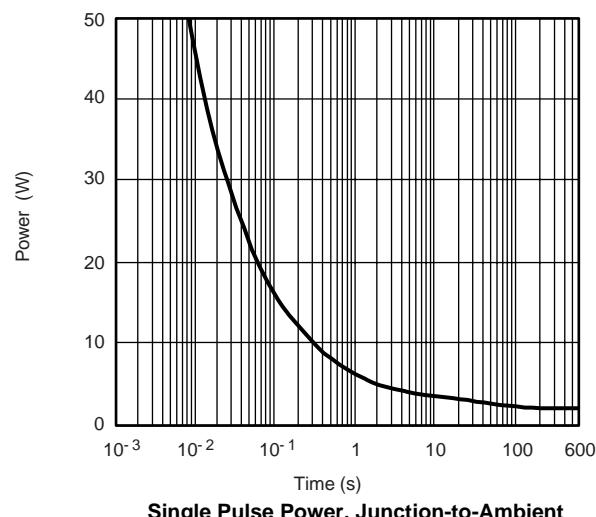
Source-Drain Diode Forward Voltage



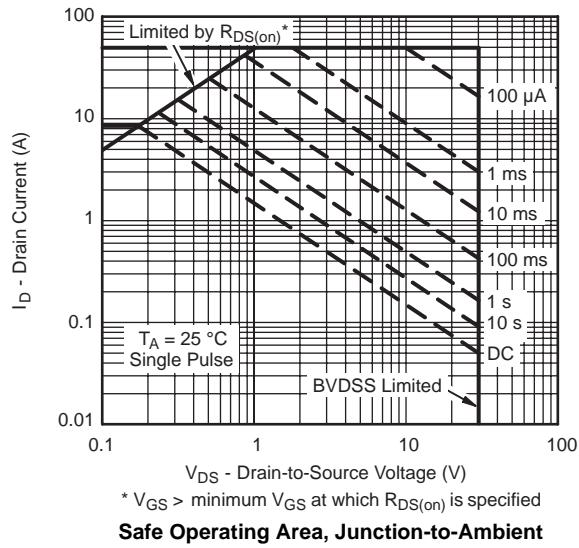
On-Resistance vs. Gate-to-Source Voltage



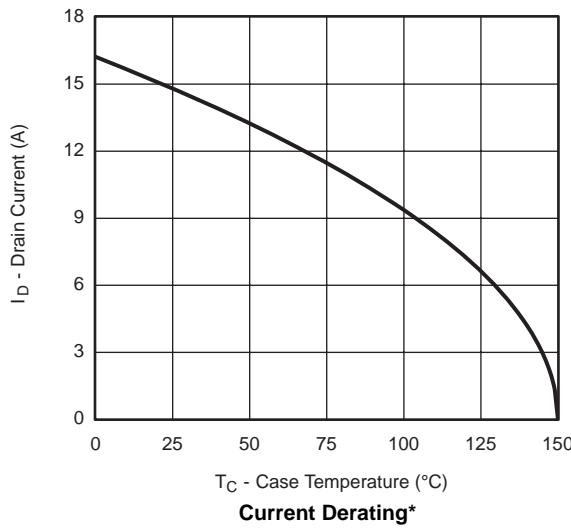
Threshold Voltage



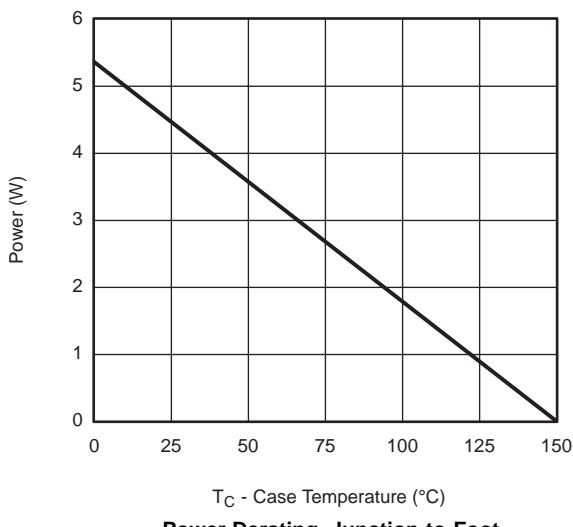
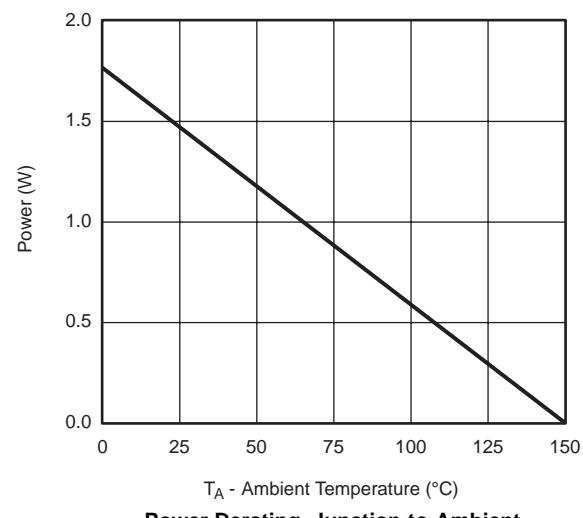
Single Pulse Power, Junction-to-Ambient



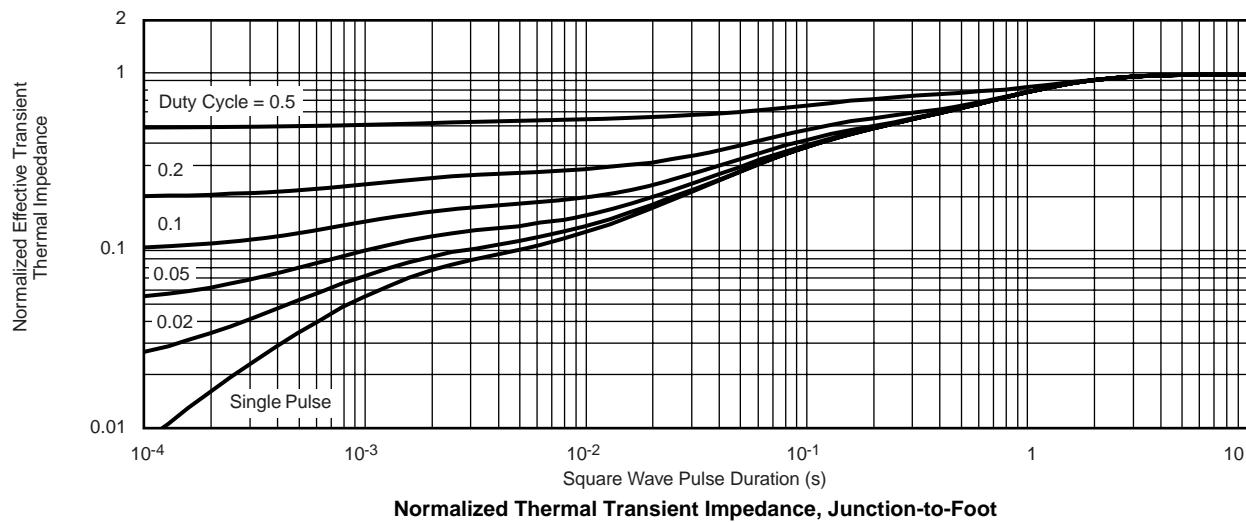
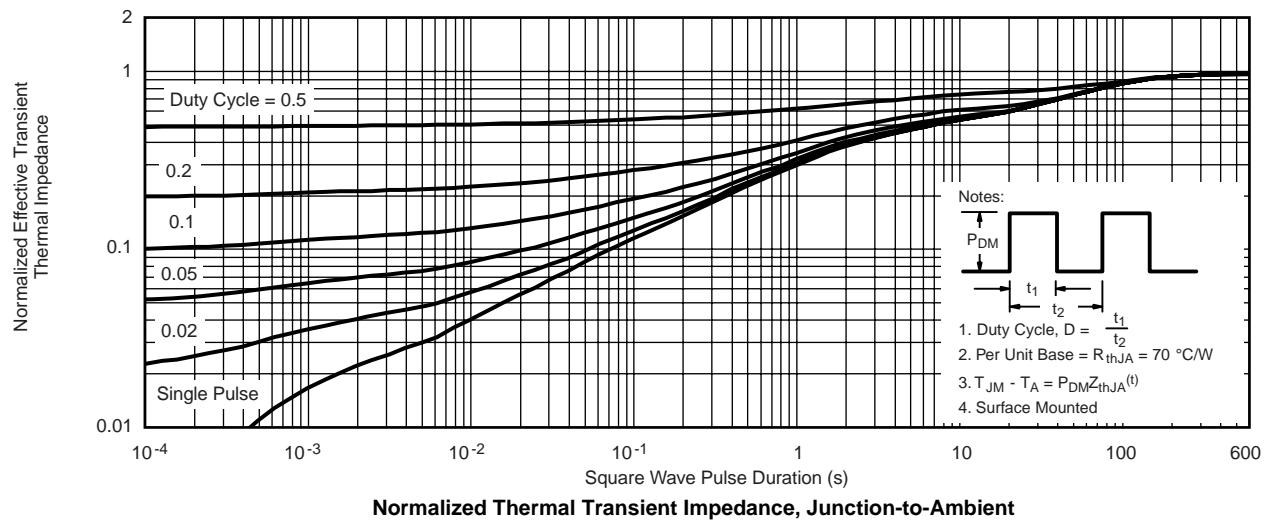
Safe Operating Area, Junction-to-Ambient

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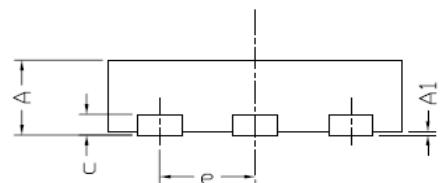
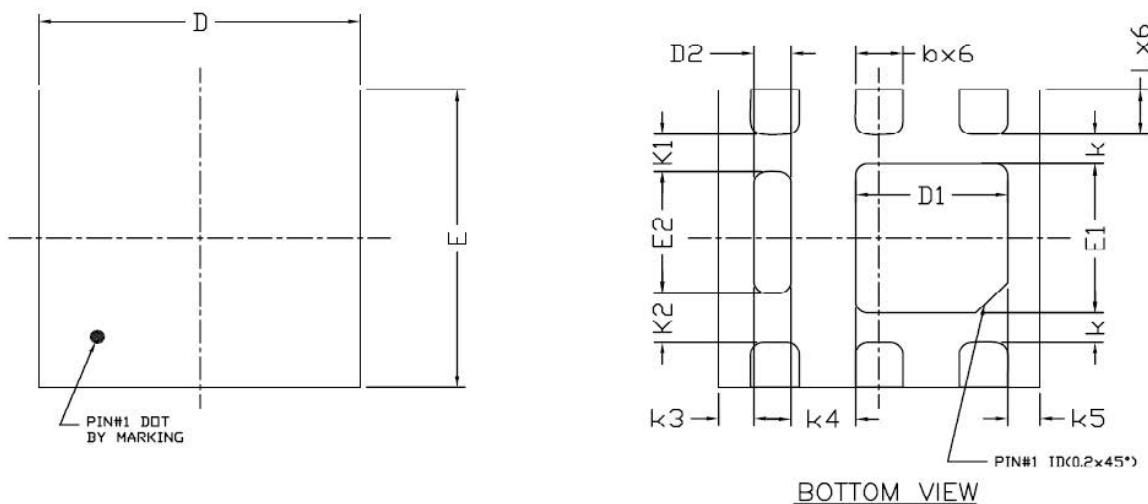
Current Derating\*


 Power Derating, Junction-to-Foot  
 Current Derating, Junction-to-Foot

 Power Derating, Junction-to-Ambient  
 Current Derating, Junction-to-Ambient

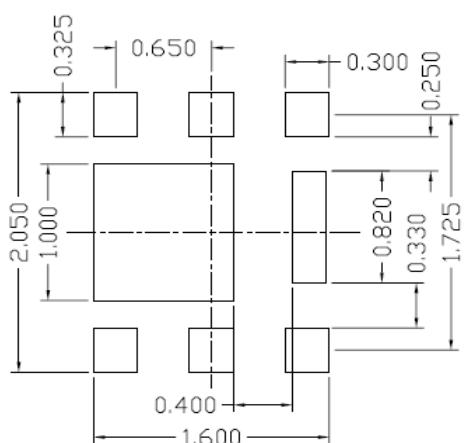
\* The power dissipation  $P_D$  is based on  $T_{J(max)} = 150$  °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package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

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


## DFN2x2 \_6L\_EP1\_S PACKAGE OUTLINE



## RECOMMENDED LAND PATTERN



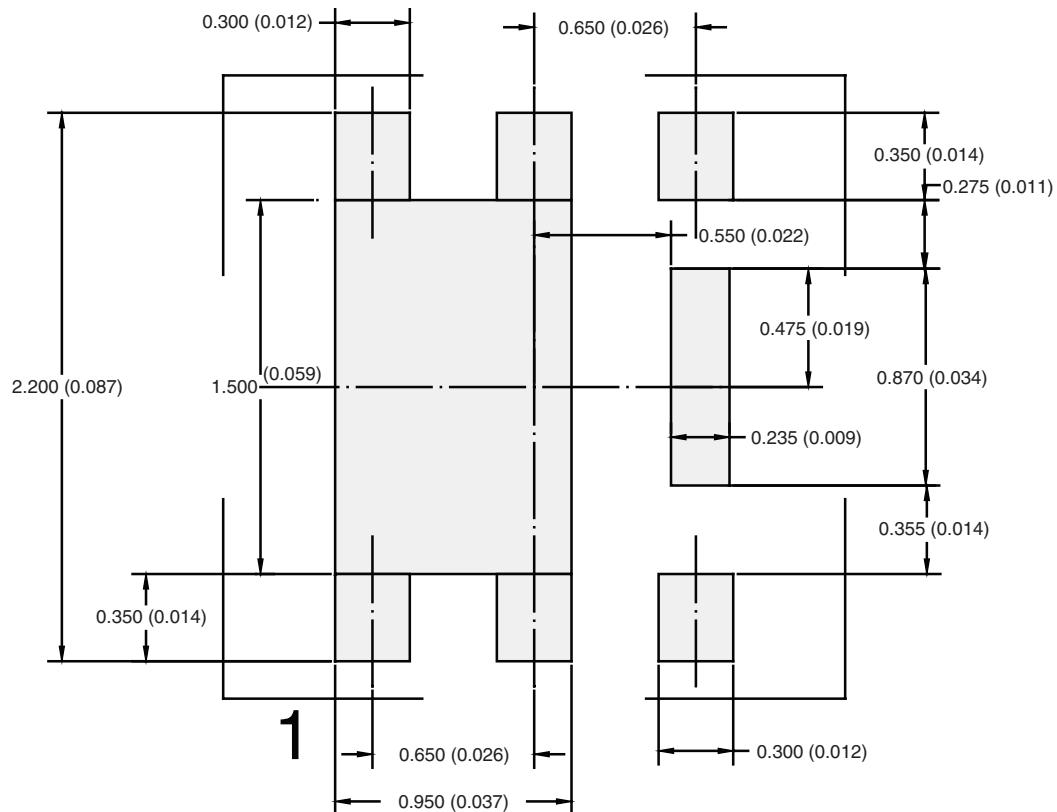
UNIT: mm

## 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



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