

N-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY

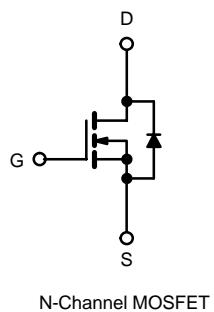
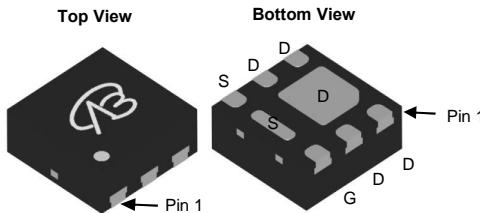
V_{DS} (V)	$R_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
40	0.010 at $V_{GS} = 10$ V	12	7.2 nC
	0.012 at $V_{GS} = 4.5$ V	9	

FEATURES

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



DFN 2x2



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}	40	
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_J = 150$ °C)	I_D	12	A
		9.6	
		9 ^{b, c}	
		6.3 ^{b, c}	
Pulsed Drain Current	I_{DM}	36	
Continuous Source-Drain Diode Current	I_S	4.8	
		2.0 ^{b, c}	
Single Pulse Avalanche Current	I_{AS}	20	
Avalanche Energy	E_{AS}	21	mJ
Maximum Power Dissipation	P_D	4.1	W
		2.5	
		2.2 ^{b, 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}	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

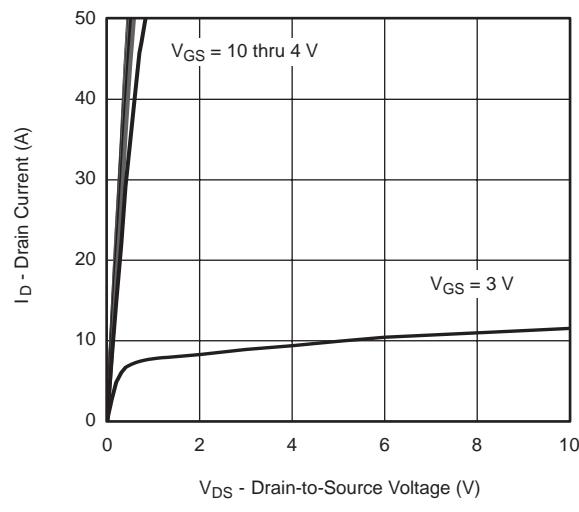
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit	
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$	40			V	
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = 250 \mu\text{A}$		26		$\text{mV}/^\circ\text{C}$	
$V_{GS(\text{th})}$ Temperature Coefficient	$\Delta V_{GS(\text{th})}/T_J$			- 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}	$V_{DS} = 0 \text{ V}, V_{GS} = \pm 20 \text{ V}$			± 100	nA	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}$			1	μA	
		$V_{DS} = 32 \text{ V}, V_{GS} = 0 \text{ V}, T_J = 55^\circ\text{C}$			10		
On-State Drain Current ^a	$I_{D(\text{on})}$	$V_{DS} \geq 5 \text{ V}, V_{GS} = 10 \text{ V}$	20			A	
Drain-Source On-State Resistance ^a	$R_{DS(\text{on})}$	$V_{GS} = 10 \text{ V}, I_D = 10 \text{ A}$		0.010		Ω	
		$V_{GS} = 4.5 \text{ V}, I_D = 9 \text{ A}$		0.012			
Forward Transconductance ^a	g_{fs}	$V_{DS} = 15 \text{ V}, I_D = 10 \text{ A}$		50		S	
Dynamic^b							
Input Capacitance	C_{iss}	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		900		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	Ω
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		
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	$T_C = 25^\circ\text{C}$			12	A	
Pulse Diode Forward Current ^a	I_{SM}				36		
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:

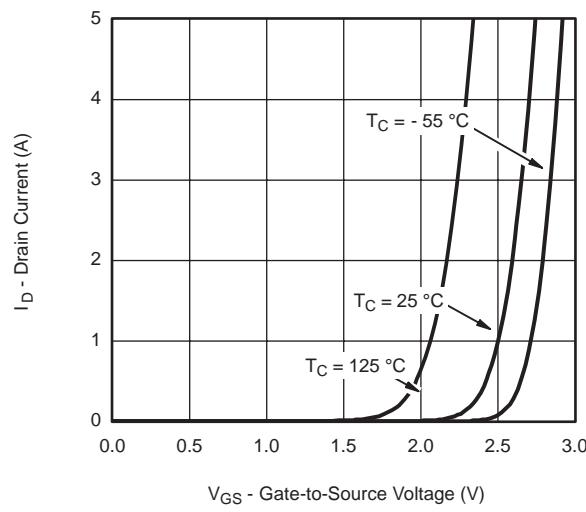
a. Pulse test; pulse width $\leq 300 \mu\text{s}$, duty cycle $\leq 2\%$.

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

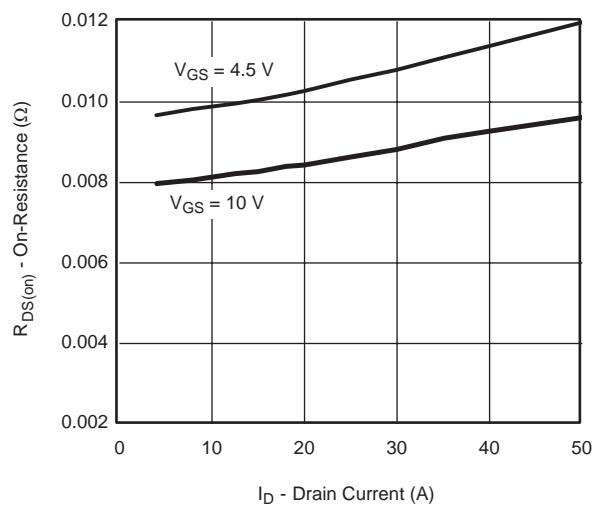
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


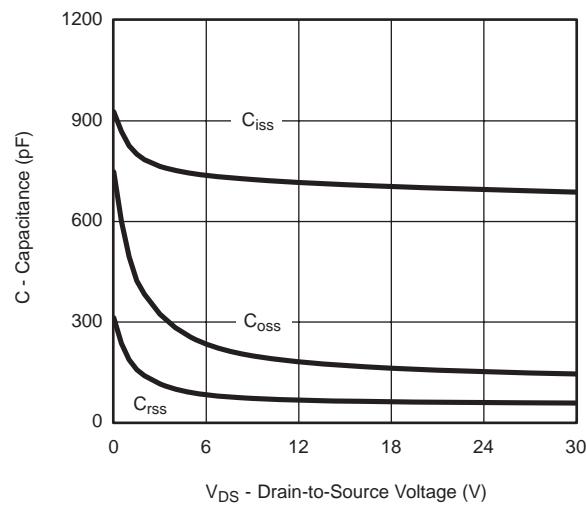
Output Characteristics



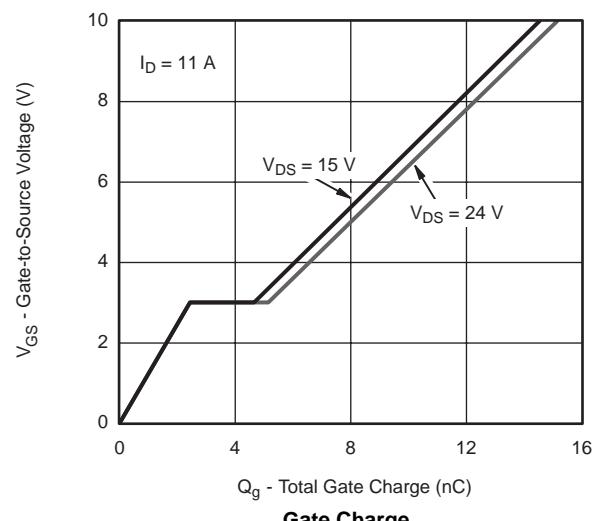
Transfer Characteristics



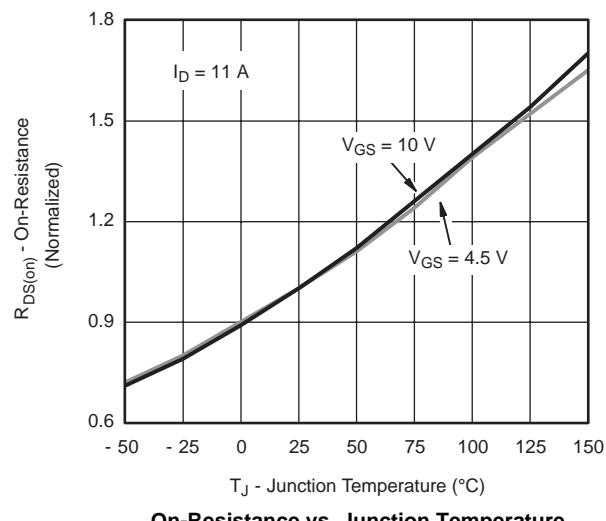
On-Resistance vs. Drain Current and Gate Voltage



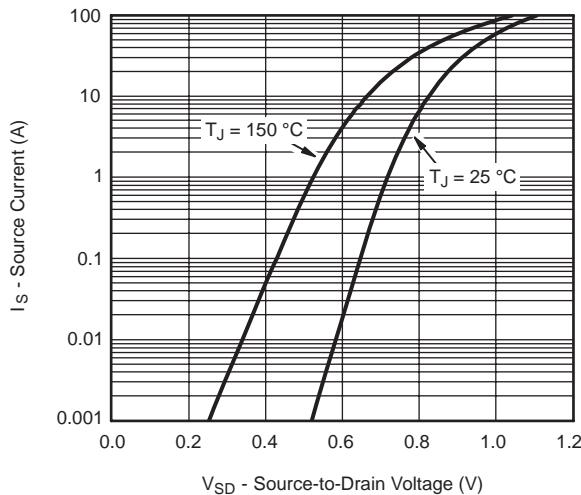
Capacitance



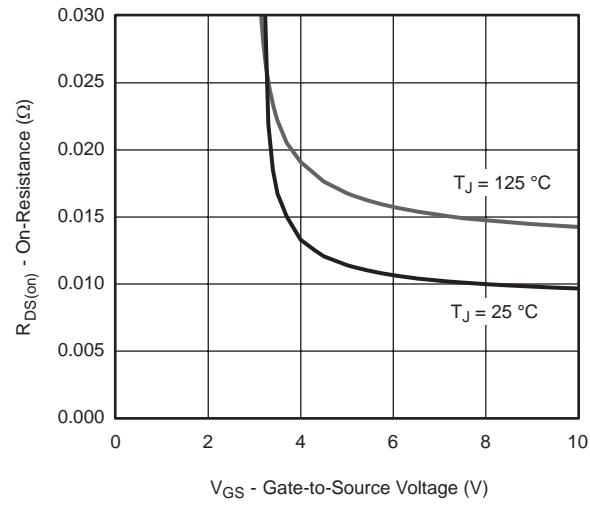
Gate Charge



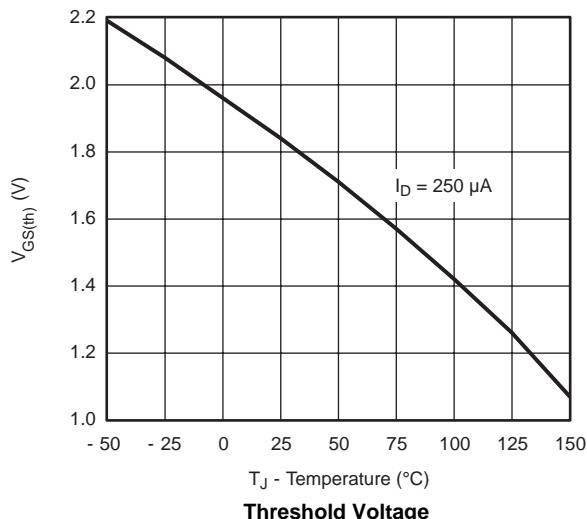
On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


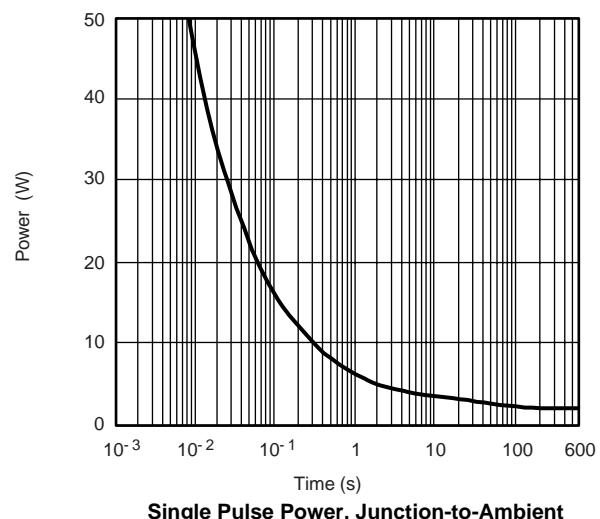
Source-Drain Diode Forward Voltage



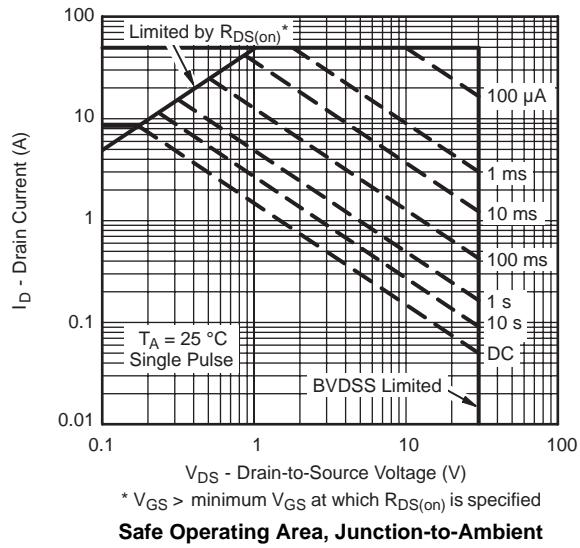
On-Resistance vs. Gate-to-Source Voltage



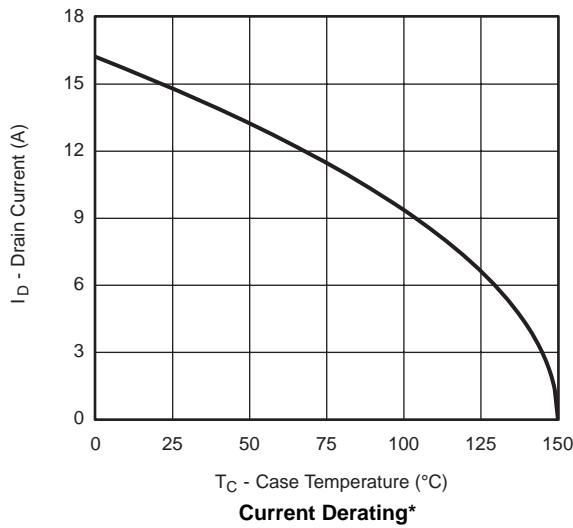
Threshold Voltage



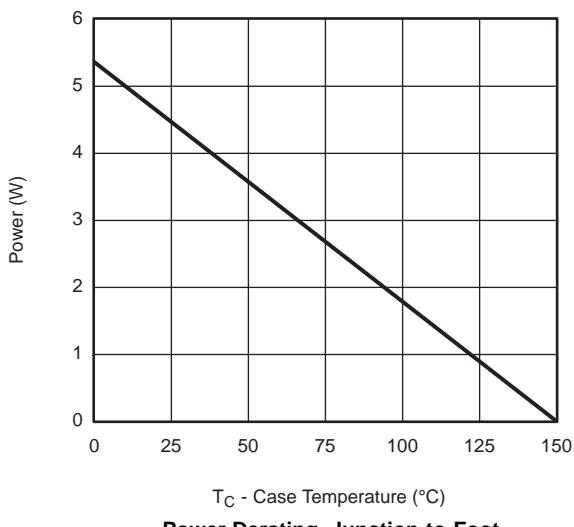
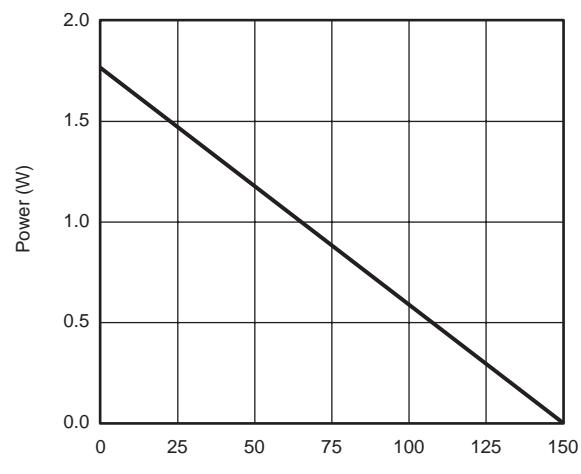
Single Pulse Power, Junction-to-Ambient



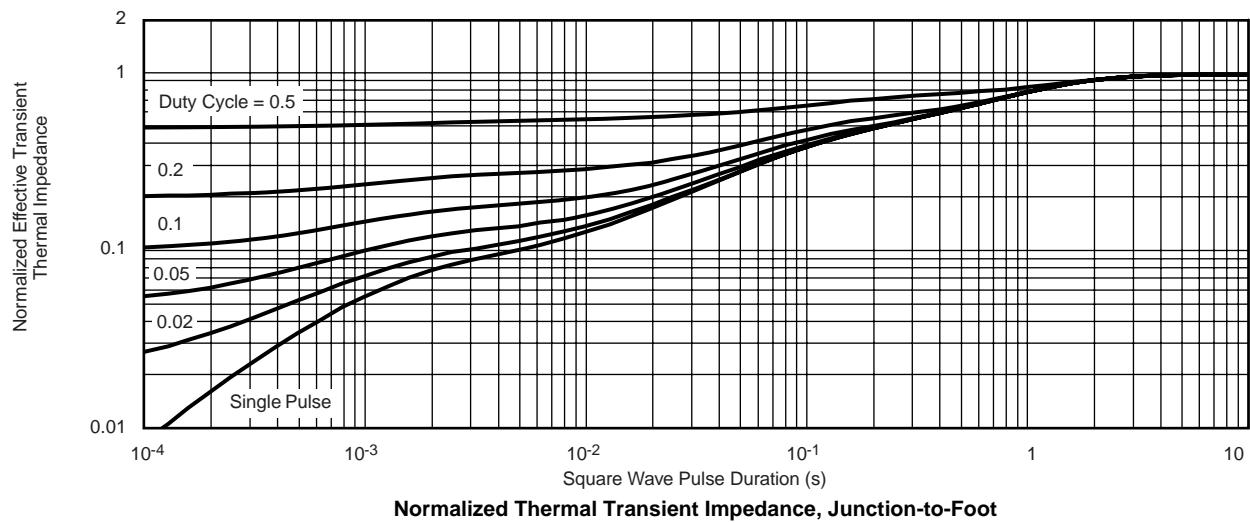
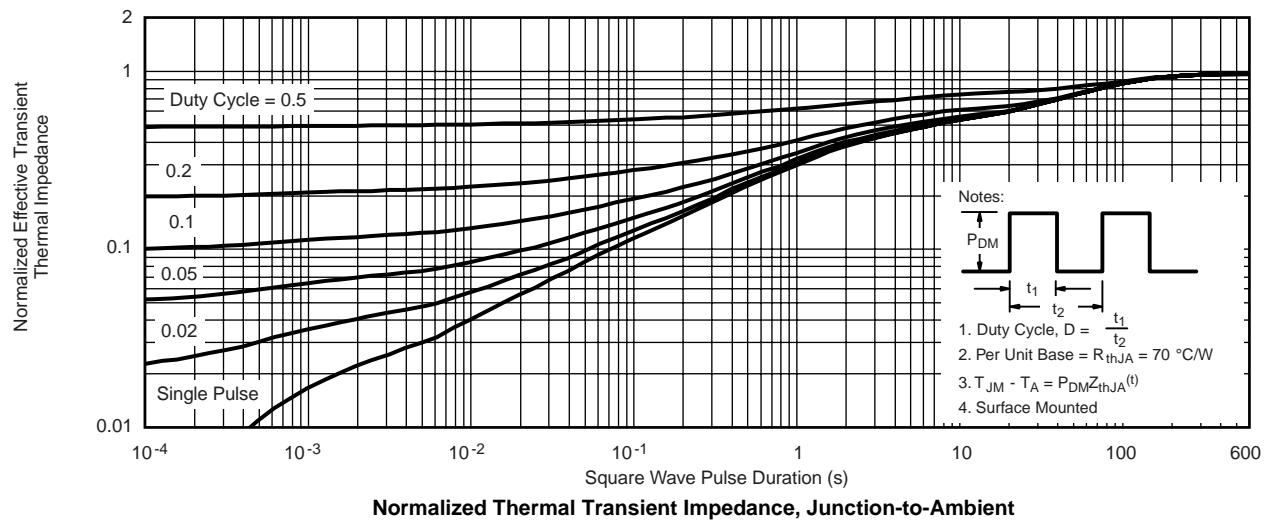
Safe Operating Area, Junction-to-Ambient

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


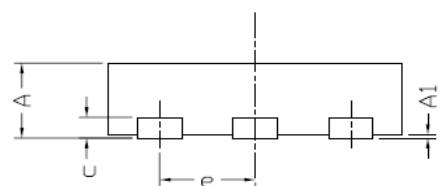
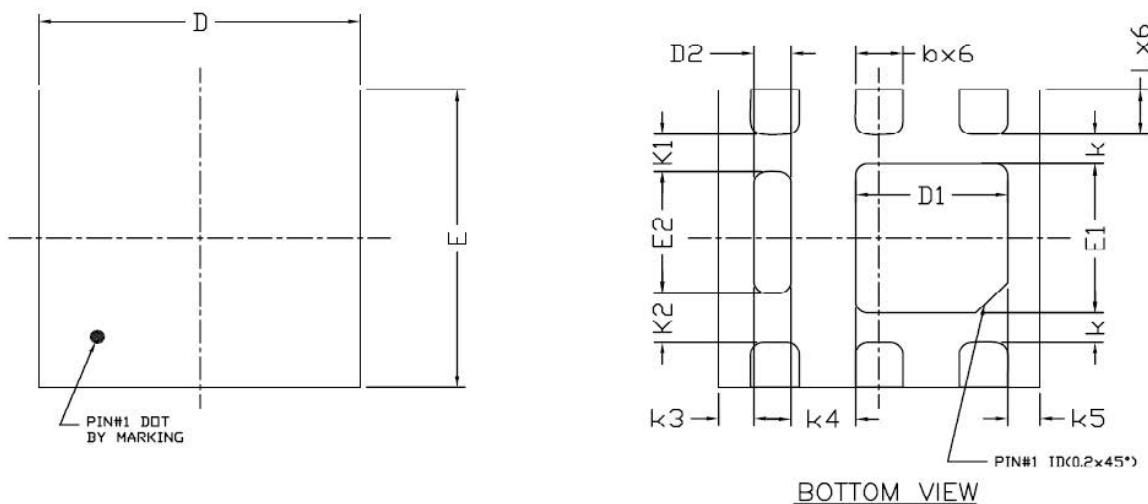
Current Derating*


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

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

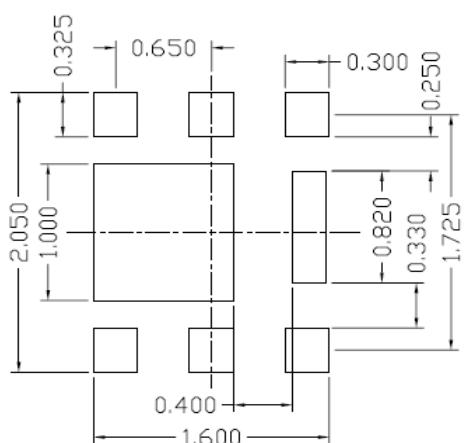
* The power dissipation P_D is based on $T_{J(max)} = 150$ °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


DFN2x2 _6L_EP1_S PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



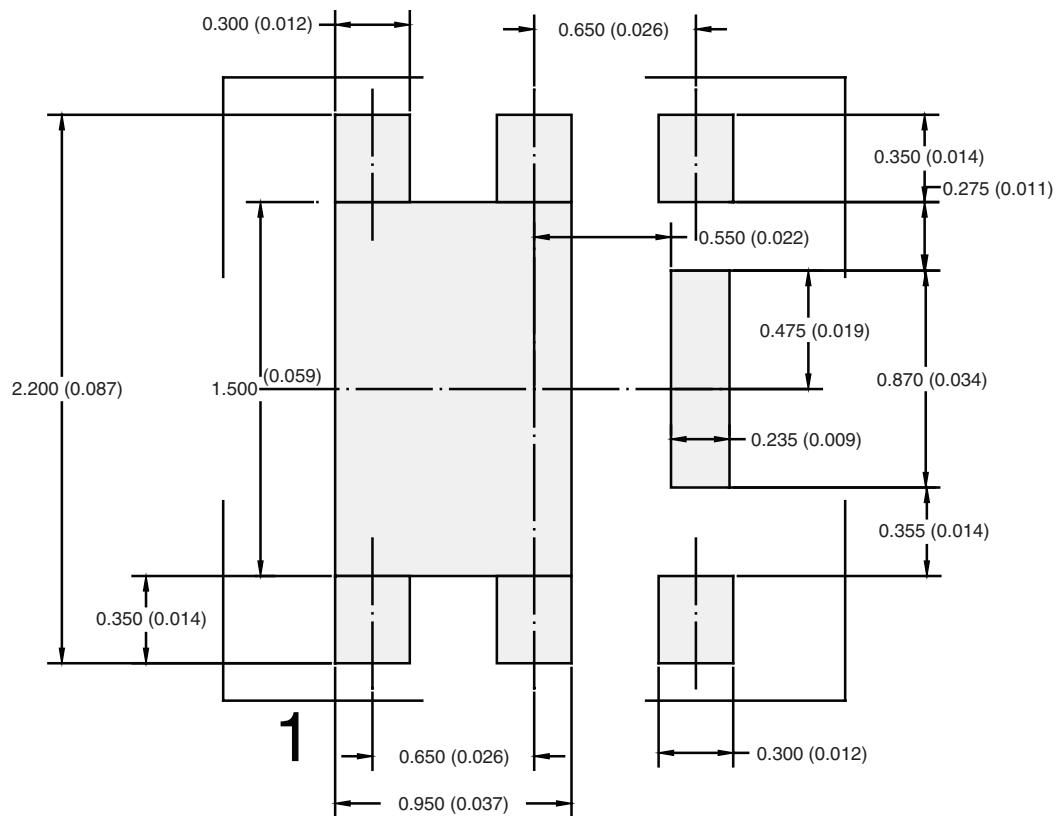
UNIT: mm

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

NOTE

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

RECOMMENDED PAD LAYOUT FOR DFN2X2



Dimensions in mm/(Inches)

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