

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

PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
60	0.028 at $V_{GS} = 10$ V	8.5
	0.031 at $V_{GS} = 4.5$ V	7.9

### FEATURES

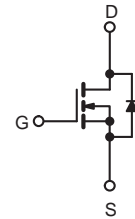
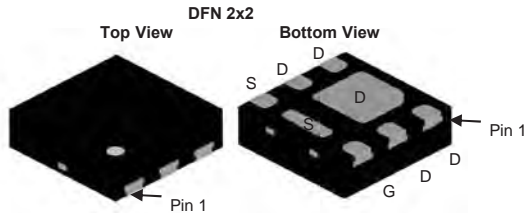
- Halogen-free According to IEC 61249-2-21 Definition
- TrenchFET® Power MOSFET
- 100 %  $R_g$  Tested
- 100 % UIS Tested
- Compliant to RoHS Directive 2002/95/EC



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

### APPLICATIONS

- Primary Side Switch
- Synchronous Rectification



N-Channel MOSFET

ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted					
Parameter	Symbol	10 s	Steady State	Unit	
Drain-Source Voltage	$V_{DS}$	60		V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$			
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	$T_A = 25$ °C	8.5	6.0	A
		$T_A = 70$ °C	7.6	4.8	
Pulsed Drain Current	$I_{DM}$	40			
Continuous Source Current (Diode Conduction) <sup>a</sup>	$I_S$	3.2	1.3		
Single Avalanche Current	$I_{AS}$	L = 0.1 mH	22		mJ
Single Avalanche Energy			$E_{AS}$	24	
Maximum Power Dissipation <sup>a</sup>	$P_D$	$T_A = 25$ °C	3.8	1.5	W
		$T_A = 70$ °C	2.4	1.0	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 150		°C	
Soldering Recommendations (Peak Temperature) <sup>b, c</sup>		260			

THERMAL RESISTANCE RATINGS					
Parameter		Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient <sup>a</sup>	t $\leq$ 10 s	$R_{thJA}$	26	33	°C/W
	Steady State		65	81	
Maximum Junction-to-Case (Drain)	Steady State	$R_{thJC}$	1.9	2.4	

Notes:

- Surface mounted on 1" x 1" FR4 board.
- The DFN2X2 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.
- Rework conditions: manual soldering with a soldering iron is not recommended for leadless components.

<b>SPECIFICATIONS</b> $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1.5	2.5	3.0	V
Gate Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 60\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 55\text{ }^\circ\text{C}$			5	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$	30			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 8.5\text{ A}$		0.028	0.031	$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 6.9\text{ A}$		0.031	0.034	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 8.5\text{ A}$		35		S
Diode Forward Voltage <sup>a</sup>	$V_{SD}$	$I_S = 3.2\text{ A}$ , $V_{GS} = 0\text{ V}$		0.78	1.2	V
<b>Dynamic<sup>b</sup></b>						
Total Gate Charge	$Q_g$	$V_{DS} = 10\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 8.5\text{ A}$		30	45	nC
Gate-Source Charge	$Q_{gs}$			6.9		
Gate-Drain Charge	$Q_{gd}$			5.8		
Gate Resistance	$R_g$		0.65	1.3	1.95	$\Omega$
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ , $R_L = 30\text{ }\Omega$ $I_D \cong 1\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 6\text{ }\Omega$		14	25	ns
Rise Time	$t_r$			12	20	
Turn-Off Delay Time	$t_{d(off)}$			50	80	
Fall Time	$t_f$			12	20	
Source-Drain Reverse Recovery Time	$t_{rr}$	$I_F = 3.2\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		60	100	

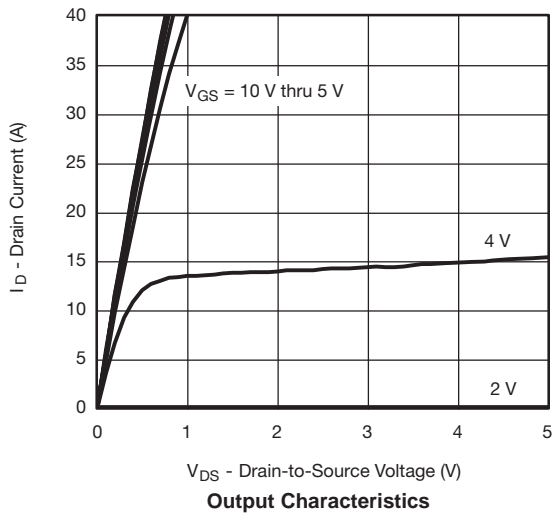
Notes:

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

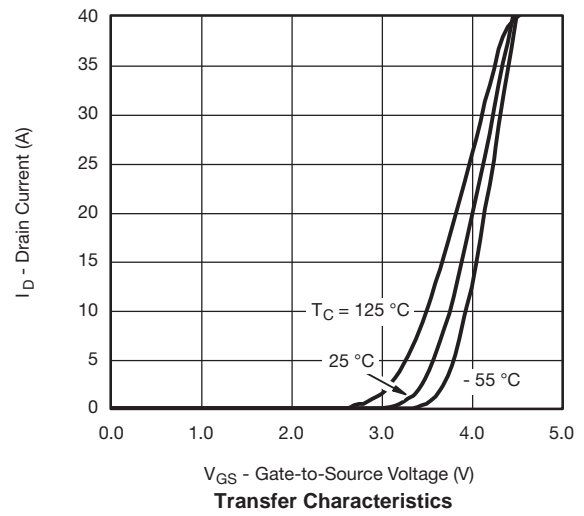
b. Guaranteed by design, not subject to production testing.

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.

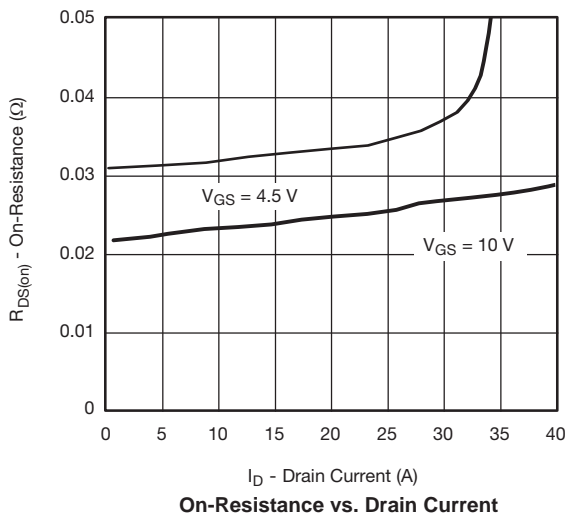
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



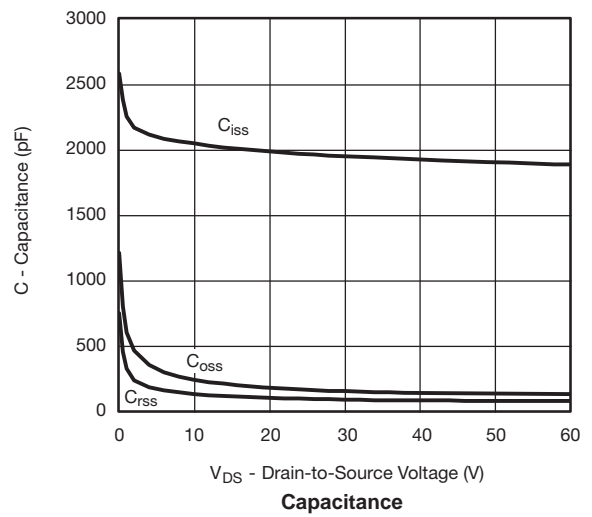
**Output Characteristics**



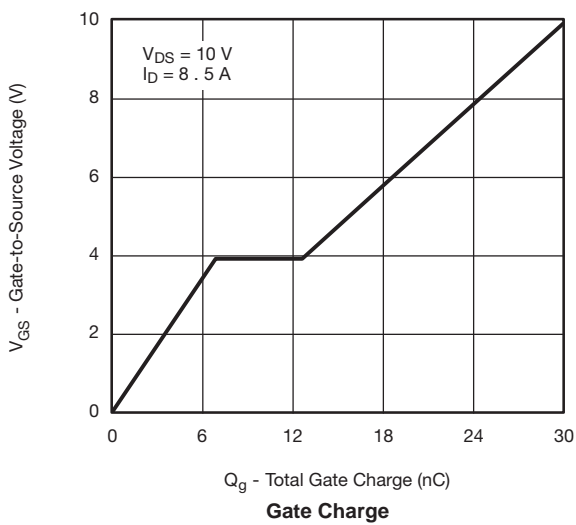
**Transfer Characteristics**



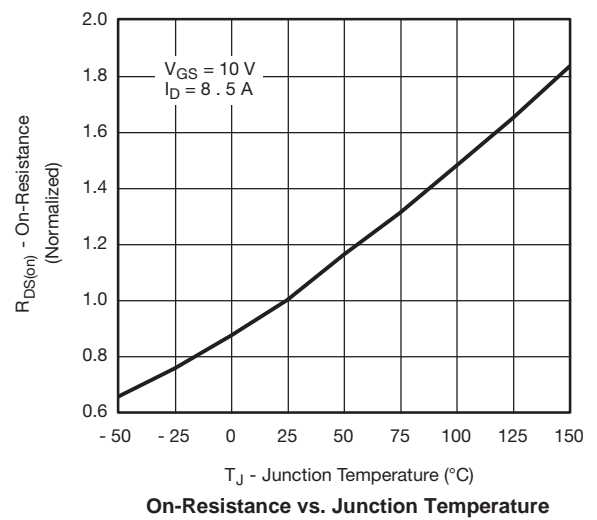
**On-Resistance vs. Drain Current**



**Capacitance**

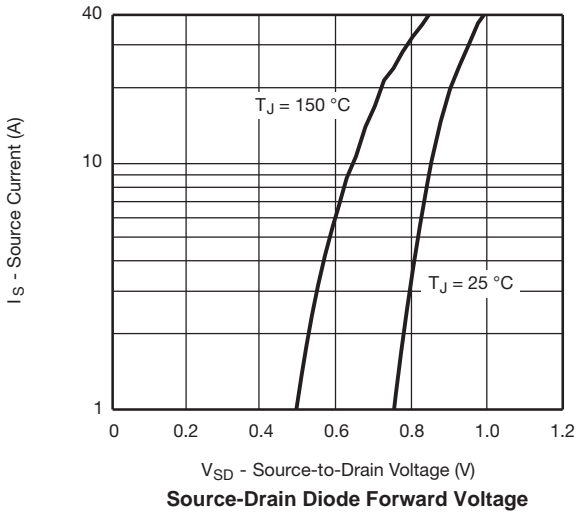


**Gate Charge**

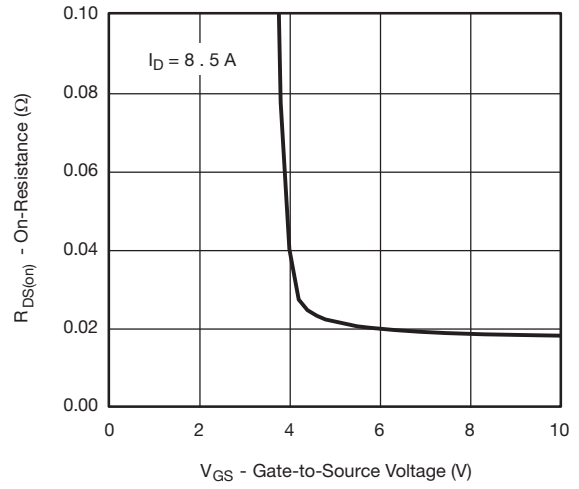


**On-Resistance vs. Junction Temperature**

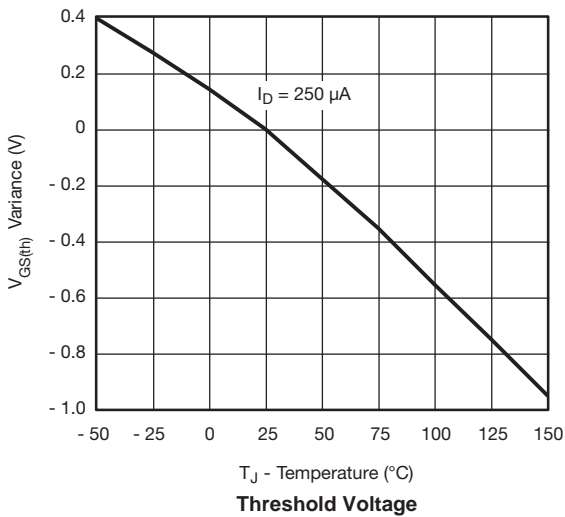
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



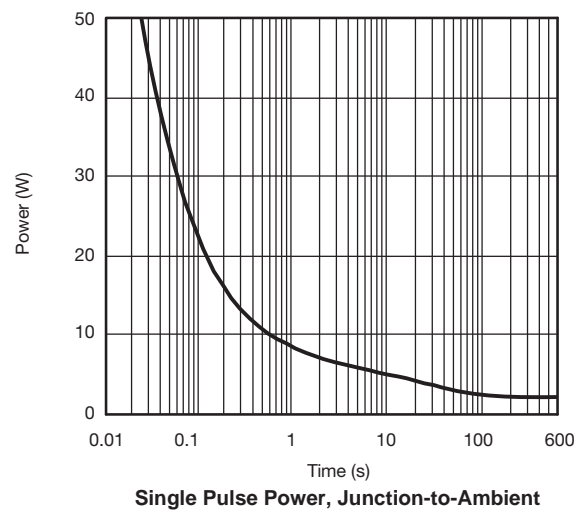
Source-Drain Diode Forward Voltage



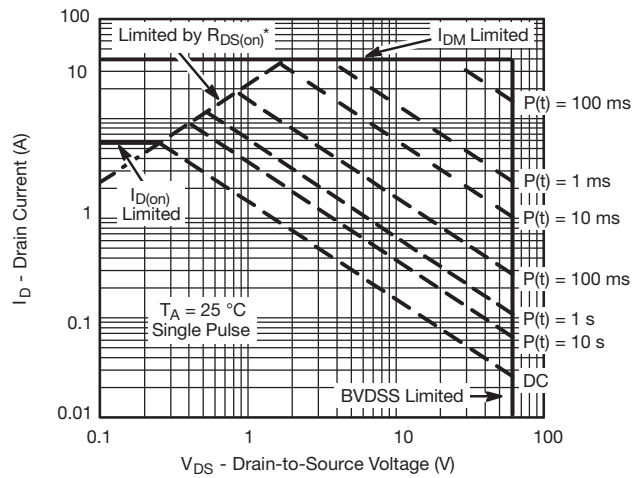
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage

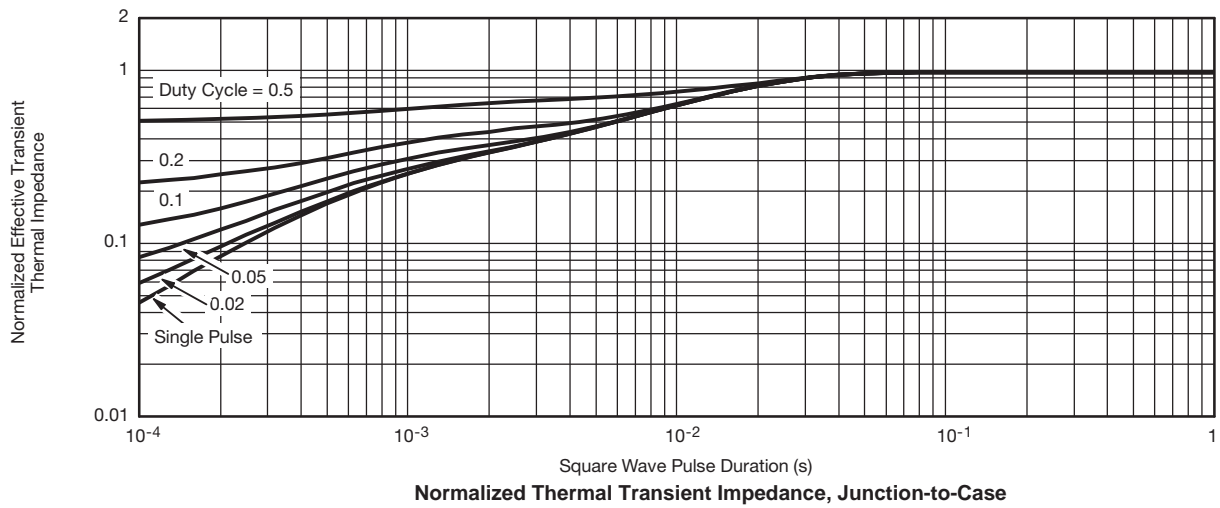
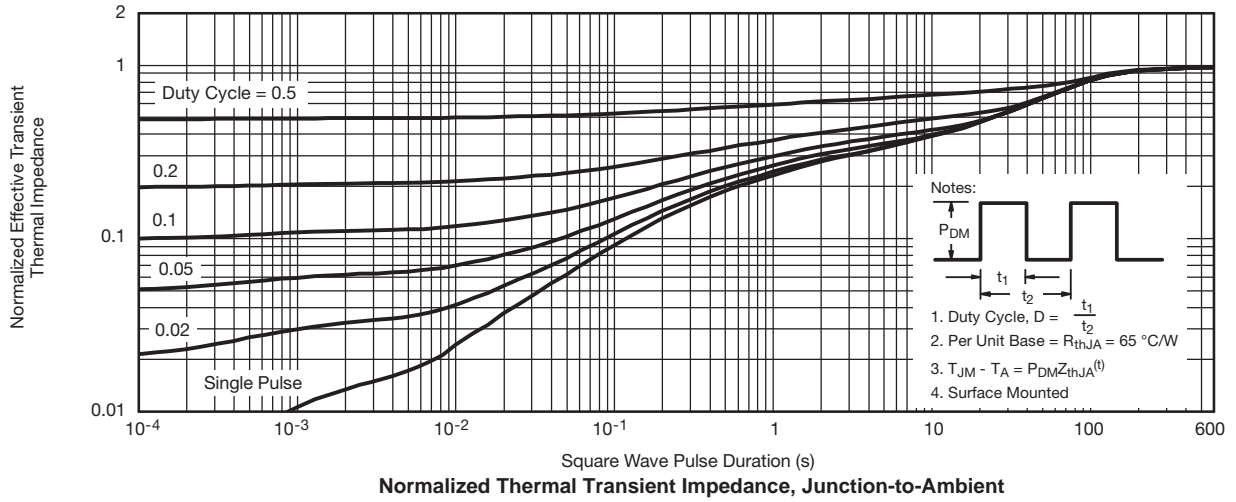


Single Pulse Power, Junction-to-Ambient

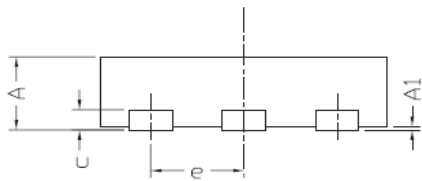
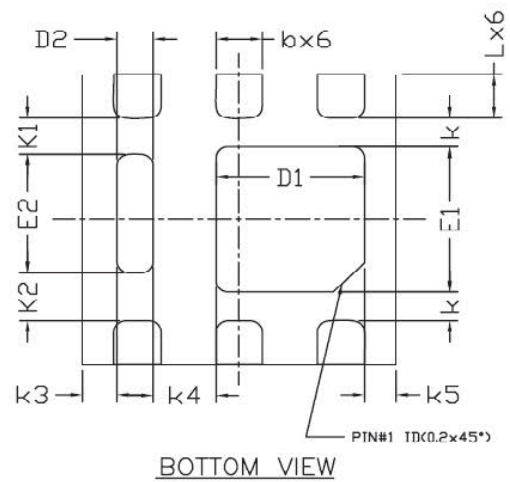
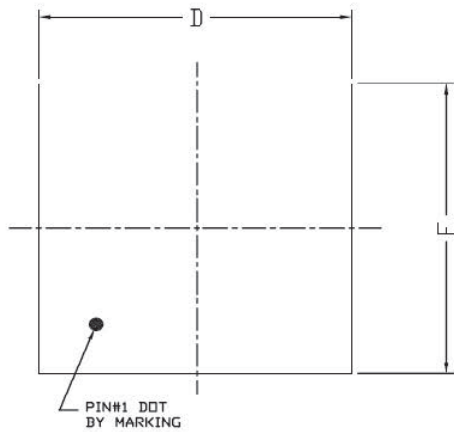


Safe Operating Area

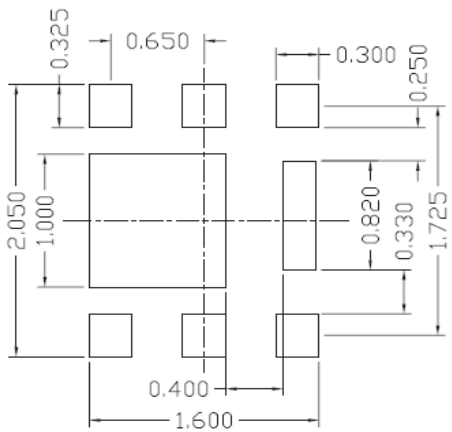
**TYPICAL CHARACTERISTICS** 25 °C, unless otherwise noted



DFN2x2 \_6L\_EP1\_S PACKAGE OUTLINE



RECOMMENDED LAND PATTERN



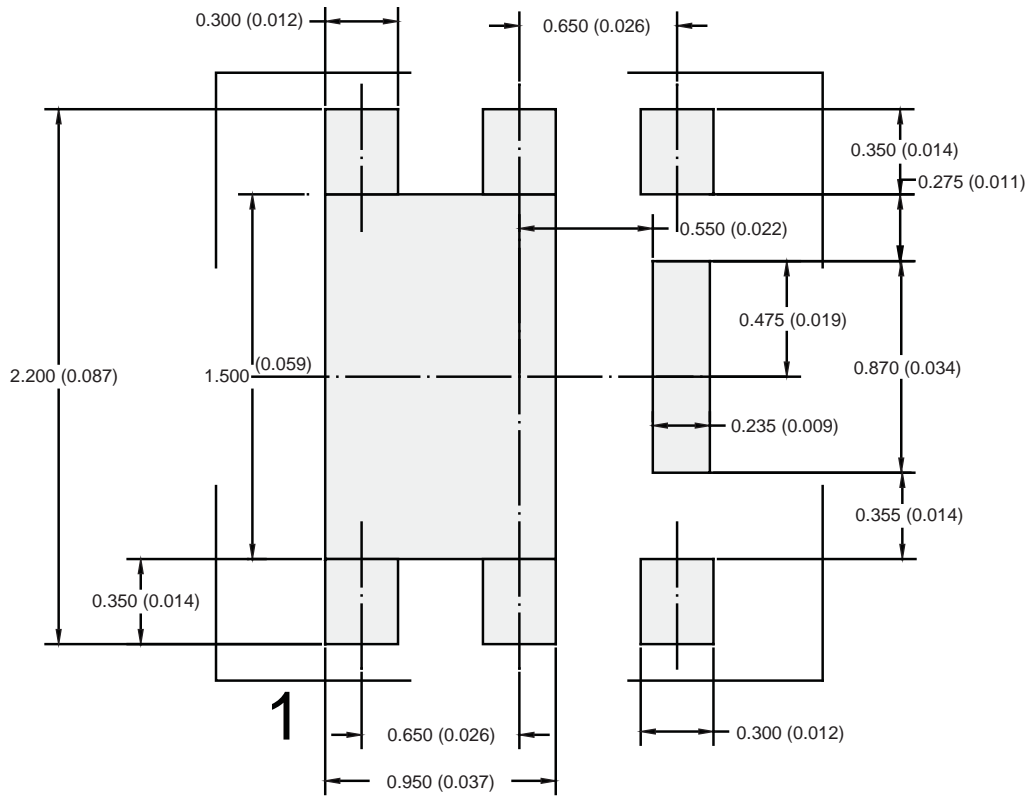
UNIT: mm

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**



Dimensions in mm/(Inches)

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