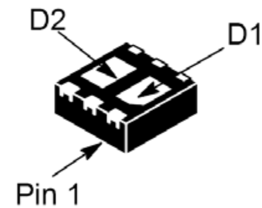
Dual P-Channel, -20 V, -4.1A, Power MOSFET

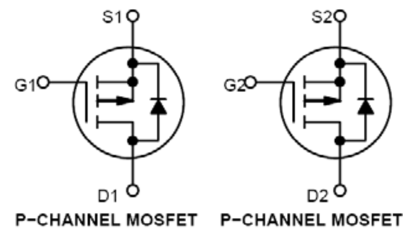


Description

The WPMD2008 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in DC-DC conversion applications. Standard Product WPMD2008 is Pb-free.

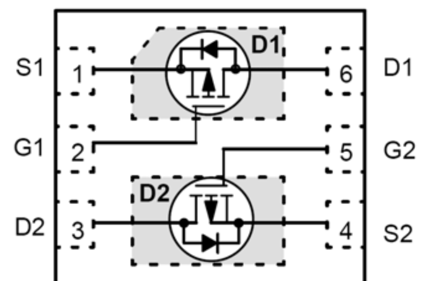
Features

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX
−20 V	110mΩ @ −4.5V
	138mΩ @ −2.5V



- Lowest RDS(on) Solution in 2x2 mm Package
- 1.8 V RDS(on) Rating for Operation at Low Voltage Gate Drive Logic Level
- Low Profile (< 0.8 mm) for Easy Fit in Thin Environments
- Bidirectional Current Flow with Common Source Configuration
- DFN6 Package Provides Exposed Drain Pad for Excellent Thermal Conduction

PIN CONNECTIONS



Application

- Optimized for Battery and Load Management Applications in Portable Equipment
- Li−Ion Battery Charging and Protection Circuits
- High Power Management in Portable, Battery Powered Products
- High Side Load Switch

MARKING DIAGRAM

E = Specific Device Code
YWW = Date Code

Order information

Part Number	Part Number	Shipping
WPMD2008-6/TR	DFN 6	3000Tape&Reel

WPMD2008

Absolute Maximum Ratings (T_A=25°C unless otherwise specified)

Parameter	Symbol			Value	Units
V_{DS}	Drain-Source voltage			-20	V
V_{GS}	Gate-Source Voltage			±8	V
I_D	Continuous Drain Current[A]	Steady-State	T_A=25℃	-3	A
		Steady-State	T_A=85℃	-2.3	
		t ≤ 5s	T_A=25℃	-4.1	
P_D	Steady-State		T_A=25℃	1.45	W
	t ≤ 5 s			2.3	
I_D	Continuous Drain Current[B]	Steady-State	T_A=25℃	-2.0	A
			T_A=85℃	-1.5	
P_D	Power Dissipation [B]		T_A=25℃	0.7	W
I_{DM}	Pulse Drain Current [B]		tp=10us	-20	A
T_J	Operating Junction Temperature Range			-55~150	℃
Tstg	Storage Temperature Range				

A: Surface Mounted on FR4 Board using 1 in sq pad size, 2 oz Cu.
B: Surface Mounted on FR4 Board using the minimum pad size, 2oz Cu.

Thermal Resistance Ratings

Parameter	Symbol	Max	Unit
Junction to Ambient-Steady State[C]	$R_{\theta JA}$	86	℃/W
Junction to Ambient - t≤5[C]	$R_{\theta JA}$	54	℃/W
Junction to Ambient-Steady State Min Pad[D]	$R_{\theta JA}$	175	℃/W

C: Surface Mounted on FR4 Board using 1 in sq pad size, 2 oz Cu.
D: Surface Mounted on FR4 Board using the minimum pad size, 2oz Cu.

Electrical Characteristics

MOSFET ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0 V, I_D = −250 uA		−20			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = −16 V, V_{GS} = 0 V	T_J = 25°C			−1	uA
			T_J = 85°C			−10	
Gate−to−source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±8.0 V				±100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 uA		−0.4	−0.6	−1	V
Drain−to−source On−resistance	$R_{DS(on)}$	V_{GS} = −4.5V, I_D = −2.0A			90	110	mΩ
		V_{GS} = −2.5, I_D = −2.0A			115	138	
Forward Transconductance	g_{FS}	V_{DS} = −10 V, I_D = −2.7A			7.0		S
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = −15 V			480		pF
Output Capacitance	C_{OSS}				46		
Reverse Transfer Capacitance	C_{RSS}				10		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −4.5 V, V_{DS} = −6 V, I_D = −2.8 A			7.2		nC
Threshold Gate Charge	$Q_{G(TH)}$				2.2		
Gate−to−Source Charge	Q_{GS}				2.2		
Gate−to−Drain Charge	Q_{GD}				1.2		
Gate Resistance	R_G				8.8		Ω
SWITCHING CHARACTERISTICS							
Turn−On Delay Time	td(ON)	V_{GS} = −4.5 V, V_{DS} = −6.0 V, I_D=-2.8A, R_G=6 Ω			38		ns
Rise Time	tr				25		
Turn−Off Delay Time	td(OFF)				43		
Fall Time	tf				5		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Recovery Voltage	V_{SD}	V_{GS} = 0 V, I_S = −1.0 A	T_J = 25°C		−0.7		V

Typical Performance Characteristics

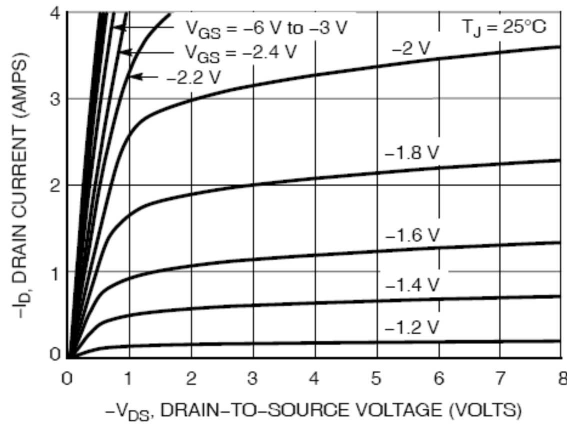


Figure 1. On−Region Characteristics

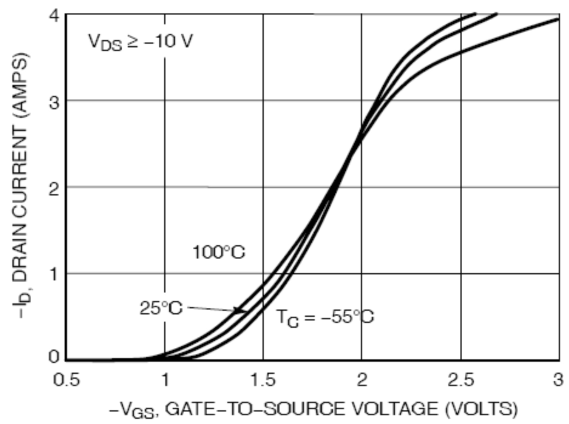


Figure 2. Transfer Characteristics

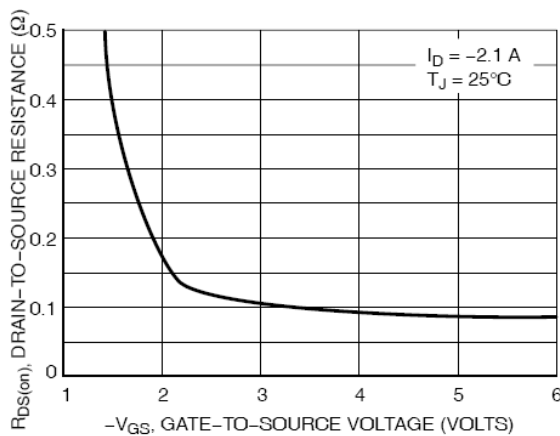


Figure 3. On−Resistance vs. Gate−to−Source Voltage

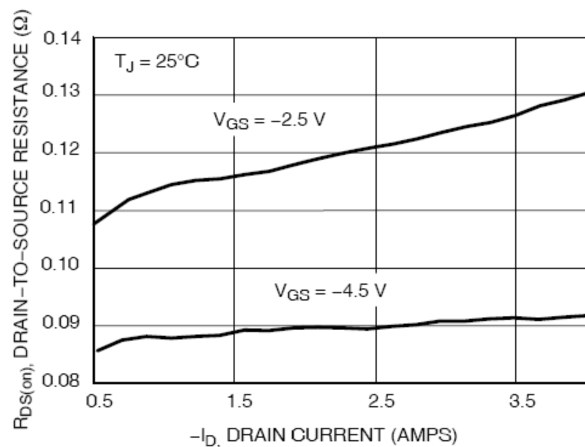


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

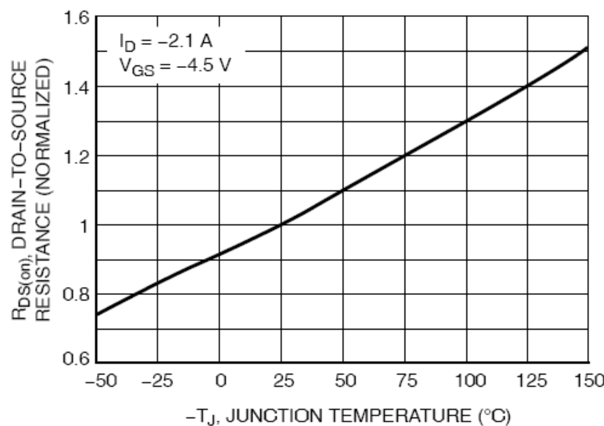


Figure 5. On−Resistance Variation with Temperature

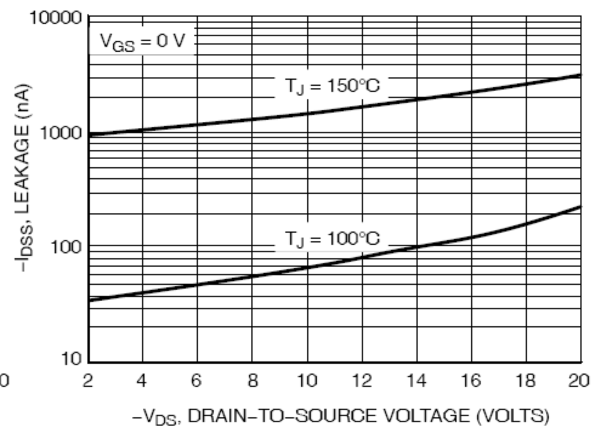


Figure 6. Drain−to−Source Leakage Current vs. Voltage

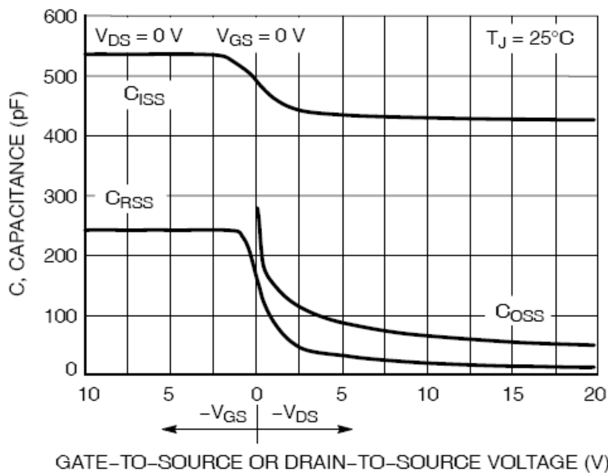


Figure 7. Capacitance Variation

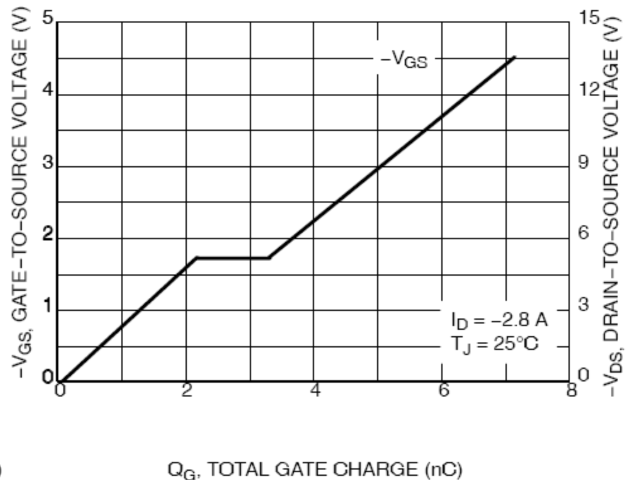


Figure 8. Gate–to–Source and Drain–to–Source Voltage vs. Total Charge

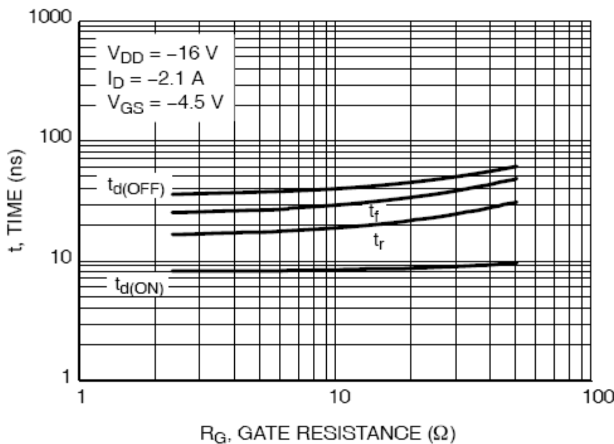


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

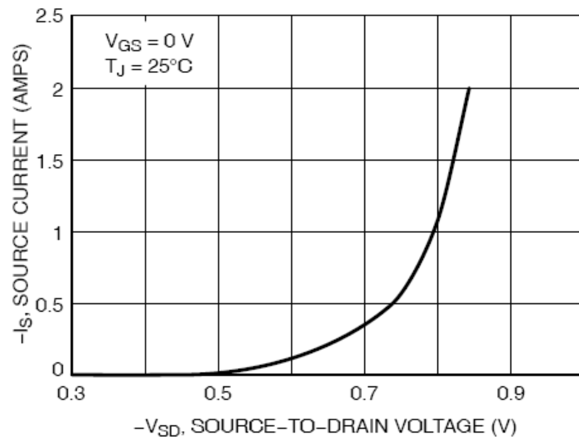


Figure 10. Diode Forward Voltage vs. Current

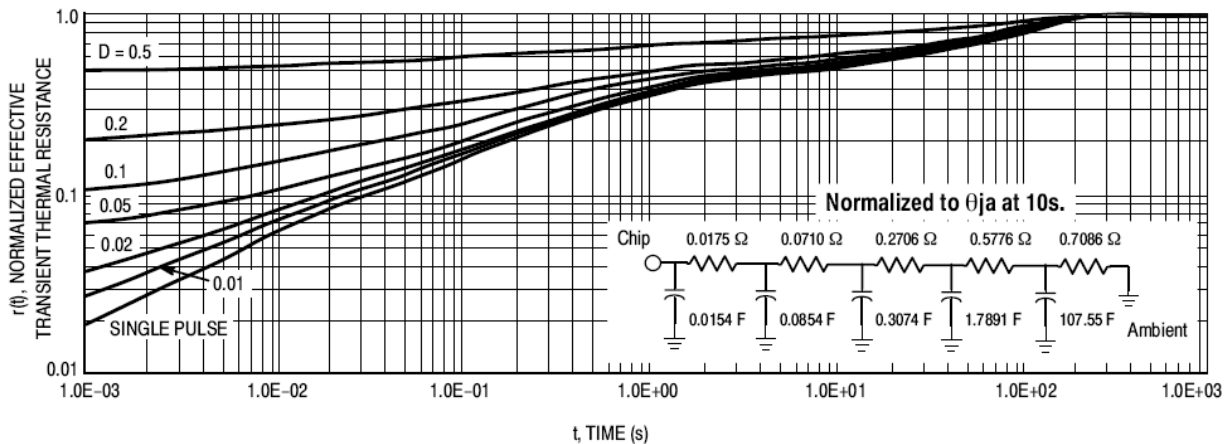
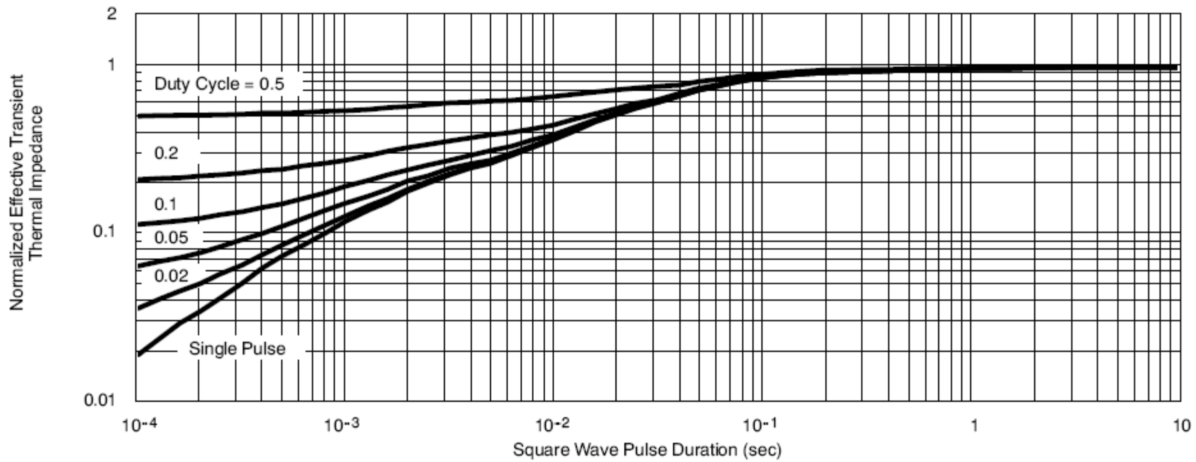
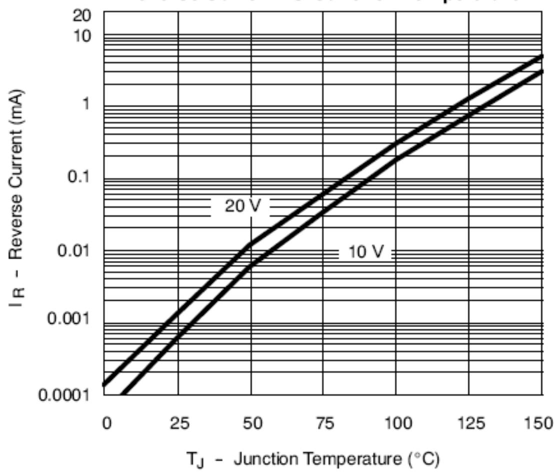


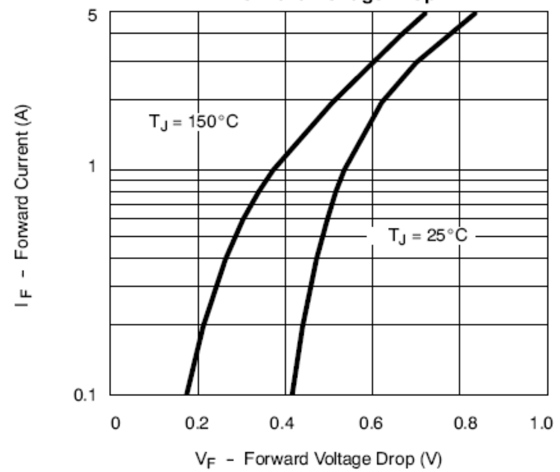
Figure 11. Thermal Response



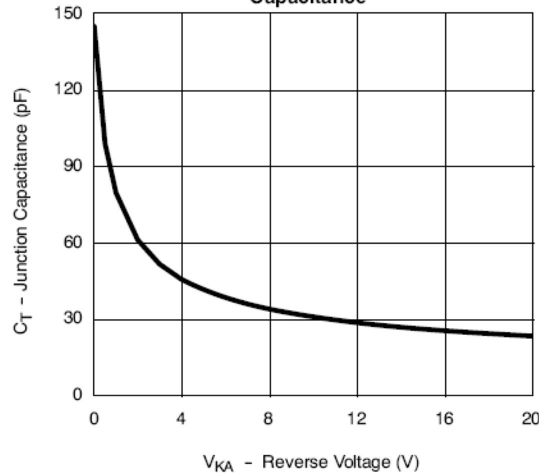
Normalized Thermal Transient Impedance, Junction-to-Foot
Normalized Effective Transient Thermal Impedance
Duty Cycle = 0.5
0.2
0.1
0.05
0.02
Single Pulse
2
1
0.1
0.01
10-4
10-3
10-2
10-1
1
10
Square Wave Pulse Duration (sec)



Reverse Current vs. Junction Temperature
I R - Reverse Current (mA)
20
10
1
0.1
0.01
0.001
0.0001
20 V
10 V
0
25
50
75
100
125
150
TJ - Junction Temperature (°C)



Forward Voltage Drop
I F - Forward Current (A)
5
1
0.1
TJ = 150°C
TJ = 25°C
0
0.2
0.4
0.6
0.8
1.0
VF - Forward Voltage Drop (V)



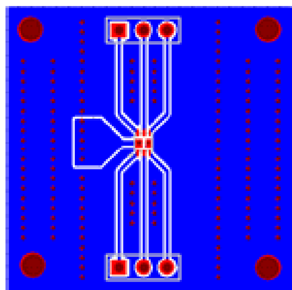
Capacitance
CT - Junction Capacitance (pF)
150
120
90
60
30
0
0
4
8
12
16
20
VKA - Reverse Voltage (V)

Power Dissipation Characteristics

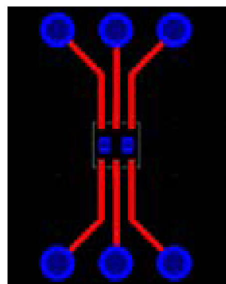
1. The package of WPMD2008 is DFN2x2-6L, surface mounted on FR4 Board using 1 in sq pad size, 2 oz Cu, R θJA is 84 ℃/W, surface mounted on FR4 Board using minimum pad size, 2 oz Cu, R θJA is 175℃ /W.

2. The power dissipation PD is based on TJ(MAX)=150°C, and the relation between TJ and Pd is TJ = Ta + R θJA* PD , the maximum power dissipation is determined by R θJA .

3. The R θJA is the thermal impedance from junction to ambient, using larger PCB pad size can get smaller R θJA and result in larger maximum power dissipation.



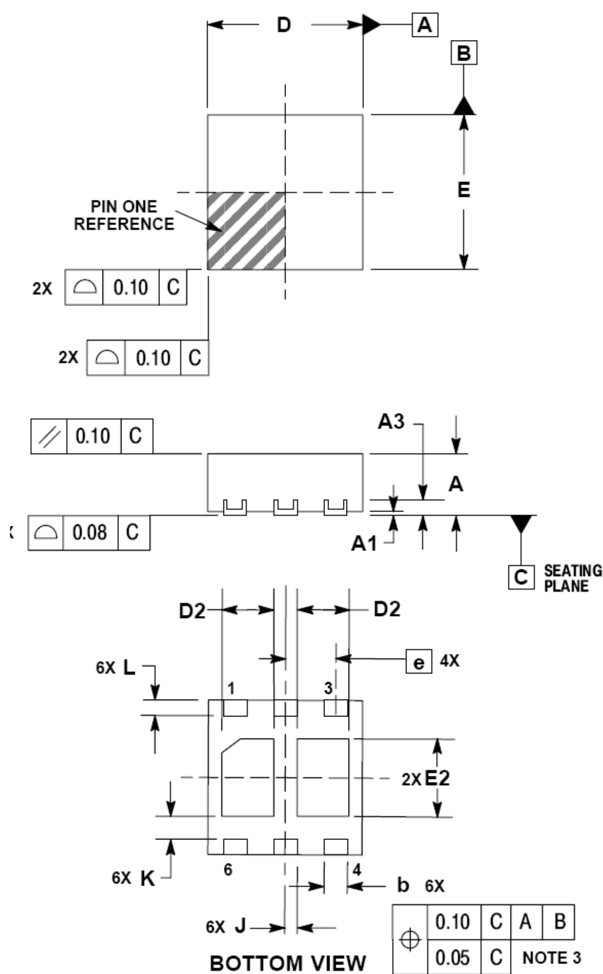
84 ℃/W when mounted on a 1 in^2 pad of 2 oz copper



175 ℃/W when mounted on a minimum pad of 2 oz copper

Packaging Information

DFN 6 Package Outline Dimension

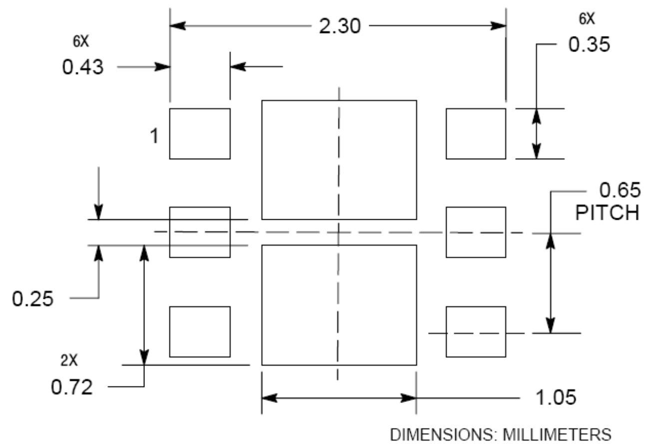


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

STYLE 1:
PIN 1. SOURCE1
2. GATE1
3. DRAIN2
4. SOURCE2
5. GATE2
6. DRAIN1

DIM	MILLIMETERS MIN	MILLIMETERS MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.25	0.35
D	2.00 BSC	
D2	0.57	0.77
E	2.00 BSC	
E2	0.90	1.10
e	0.65 BSC	
K	0.25 REF	
L	0.20	0.30
J	0.15 REF	

SOLDERMASK DEFINED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS