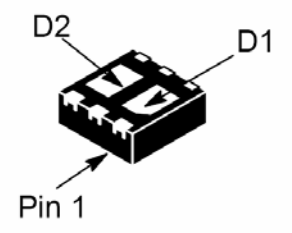
WPMD2010

Dual P-Channel, -20 V, -3.6A, Power MOSFET

Http://www.willsemi.com

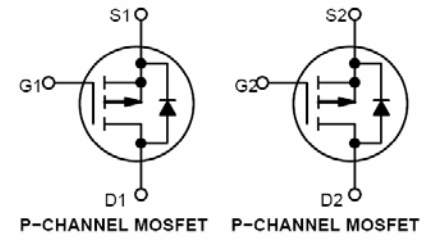


Description

The WPMD2010 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 WPMD2010 is Pb-free.

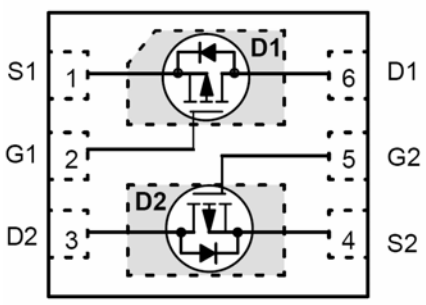
Features

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ
−20 V	75mΩ@ −4.5V
	101mΩ@ −2.5V



- Lower 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

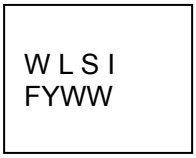
PIN CONNECTIONS



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



F = Specific Device Code
YWW = Date Code

Order information

Part Number	Package	Shipping
WPMD2010-6/TR	DFN 6	3000Tape&Reel

ABSOLUTE MAXIMUM RATINGS T_A = 25 °C, unless otherwise noted					
Parameter		Symbol	10 S	Steady State	Unit
Drain-Source Voltage		V_{DS}	-20		V
Gate-Source Voltage		V_{GS}	±12		
Continuous Drain Current (T_J = 150 °C)[a]	T_A=25°C	I_D	−3.6	−3.1	A
	T_A=70°C		−2.9	−2.7	
Maximum Power Dissipation [a]	T_A=25°C	P_D	2.0	1.5	W
	T_A=70°C		1.3	1.0	
Continuous Drain Current (T_J = 150 °C)[b]	T_A=25°C	I_D	−2.3	−2.1	A
	T_A=70°C		−1.8	−1.7	
Maximum Power Dissipation [b]	T_A=25°C	P_D	0.8	0.7	W
	T_A=70°C		0.5	0.4	
Pulsed Drain Current [c]		I_{DM}	-18		A
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 150		°C

THERMAL RESISTANCE RATINGS					
Single Operation					
Parameter		Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance [a]	t ≤ 10 s	$R_{\theta JA}$	50	62	°C/W
	Steady State		65	82	
Junction-to-Ambient Thermal Resistance [b]	t ≤ 10 s	$R_{\theta JA}$	125	150	
	Steady State		145	175	
Junction-to-Case Thermal Resistance	Steady State	$R_{\theta JC}$	30	38	
Dual operation					
Junction-to-Ambient Thermal Resistance [a]	t ≤ 10 s	$R_{\theta JA}$	40	50	°C/W
	Steady State		52	65	
Junction-to-Ambient Thermal Resistance [b]	t ≤ 10 s	$R_{\theta JA}$	100	120	
	Steady State		116	140	
Junction-to-Case Thermal Resistance	Steady State	$R_{\theta JC}$	25	30	

a. Surface mounted on FR4 Board using 1 in sq pad size, 1oz Cu.
b. Surface mounted on FR4 board using the minimum recommended pad size, 1oz Cu.
c. Repetitive rating, pulse width limited by junction temperature, t_p=10μs, Duty Cycle=1%

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			−0.1	uA
			T_J = 85°C			−1	
Gate−to−source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = ±12 V				±100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = −250 uA		−0.4	−0.6	−1.0	V
Drain−to−source On−resistance	$R_{DS(on)}$	V_{GS} = −4.5V, I_D = −3.1 A			75	120	mΩ
		V_{GS} = −2.5, I_D = −2.5 A			101	150	
Forward Transconductance	g_{FS}	V_{DS} = −5 V, I_D = −3.1A			12		S
CHARGES, CAPACITANCES AND GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz,V_{DS} = −10 V		400	470	550	pF
Output Capacitance	C_{OSS}			45	55	65	
Reverse Transfer Capacitance	C_{RSS}			40	50	60	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −4.5 V, V_{DS} = −10 V, I_D = −2.7 A		4	6	8	nC
Threshold Gate Charge	$Q_{G(TH)}$			0.3	0.34	0.4	
Gate−to−Source Charge	Q_{GS}			0.5	0.75	1	
Gate−to−Drain Charge	Q_{GD}			1.0	1.2	1.5	
Gate Resistance	R_G				8.8		Ω
SWITCHING CHARACTERISTICS							
Turn−On Delay Time	td(ON)	V_{GS} = −4.5 V, V_{DS} = −10 V, R_L=3 Ω, R_G=6 Ω		6	9	12	ns
Rise Time	tr			5	7	10	
Turn−Off Delay Time	td(OFF)			30	40	60	
Fall Time	tf			5	7	10	
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Recovery Voltage	VSD	VGS = 0 V, IS = −1.6 A	T_J = 25°C	-0.7	-0.85	-1.5	V

Typical Performance Characteristis

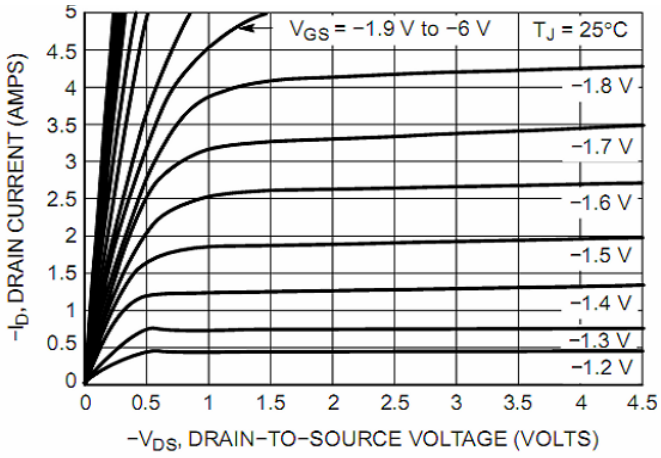


Figure 1. On−Region Characteristics

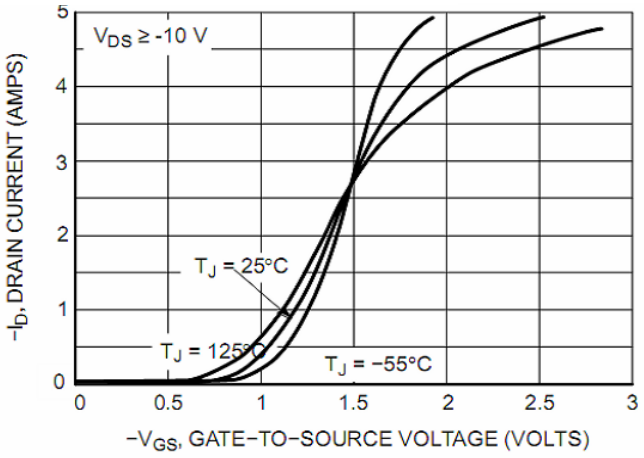


Figure 2. Transfer Characteristics

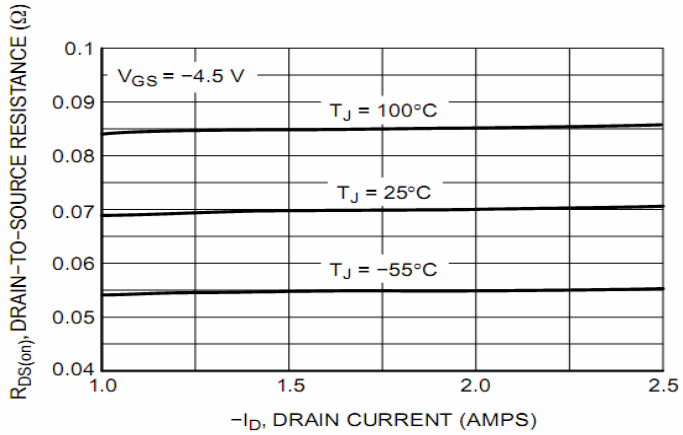


Figure 3. On−Resistance versus Drain Current

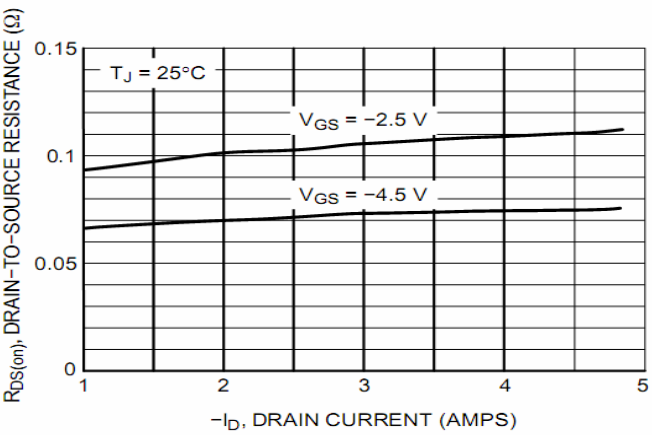


Figure 4. On−Resistance versus Drain Current and Gate Voltage

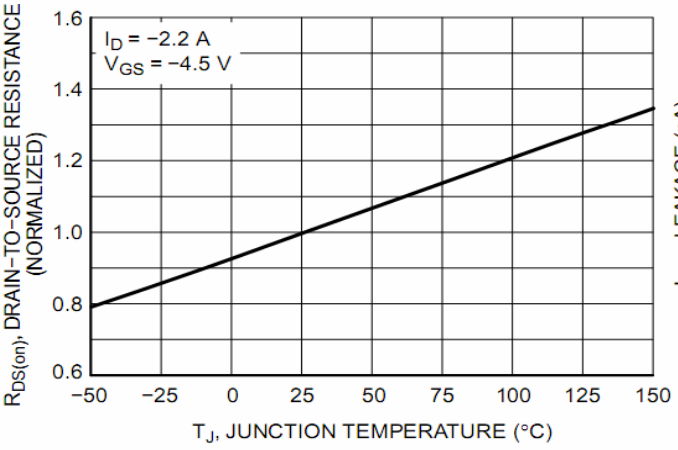


Figure 5. On−Resistance Variation with Temperature

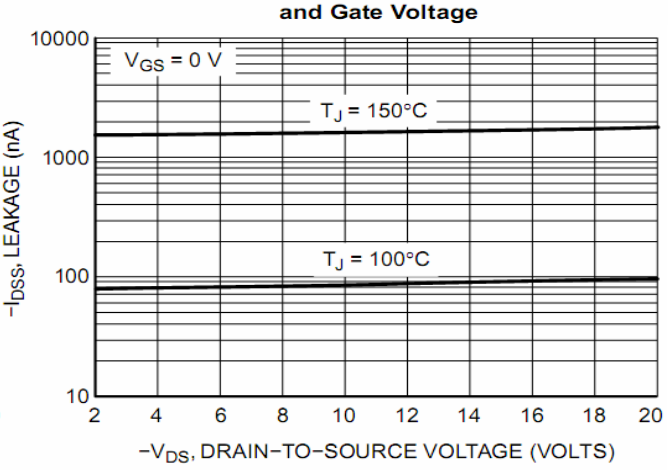


Figure 6. Drain−to−Source Leakage Current versus Voltage

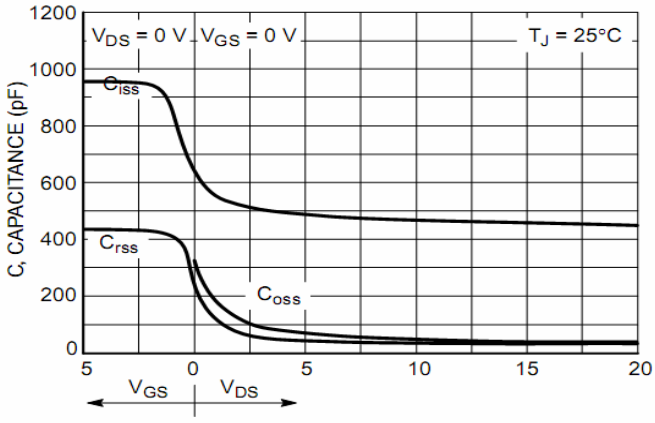


Figure 7. Capacitance Variation

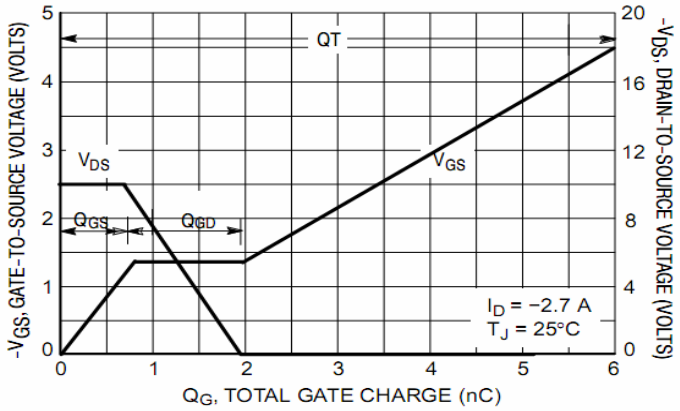


Figure 8. Gate−To−Source and Drain−To−Source Voltage versus Total Charge

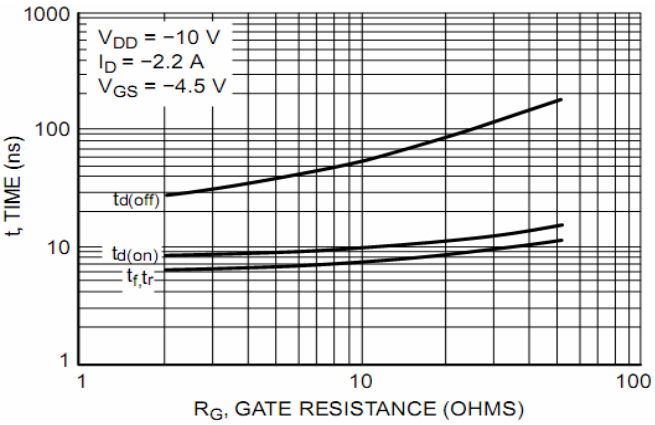


Figure 9. Resistive Switching Time Variation versus Gate Resistance

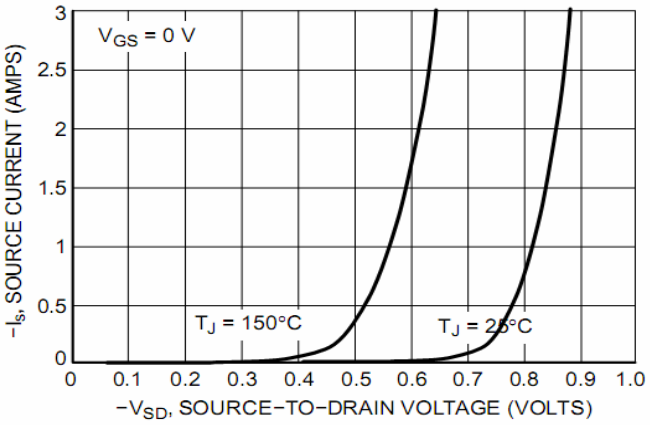


Figure 10. Diode Forward Voltage versus Current

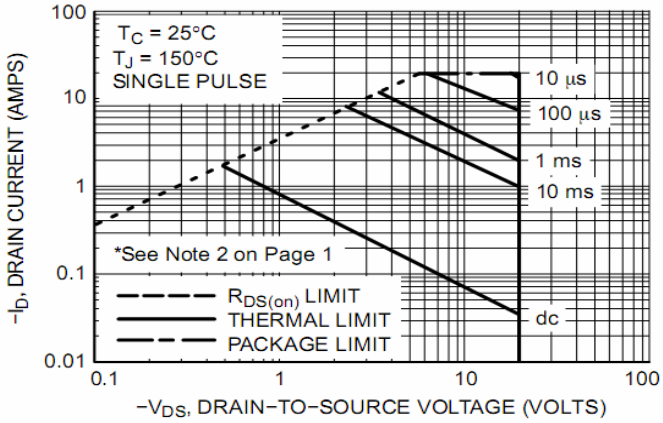


Figure 11. Maximum Rated Forward Biased Safe Operating Area

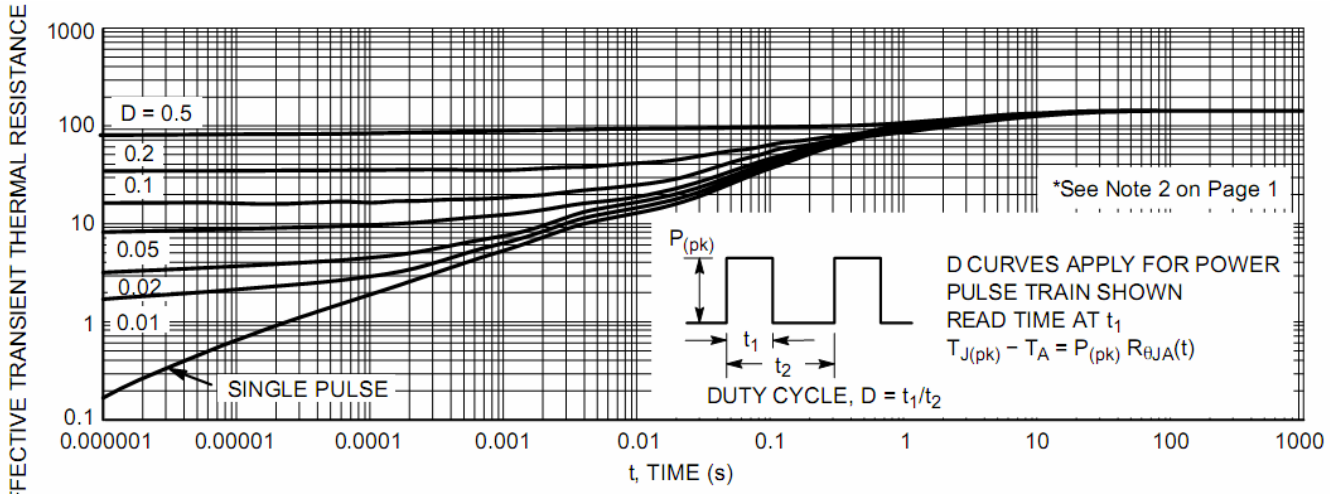


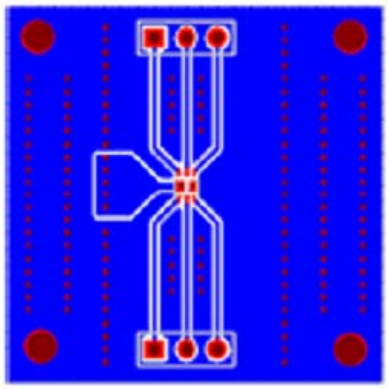
Figure 12. Thermal Response

Power Dissipation Characteristics

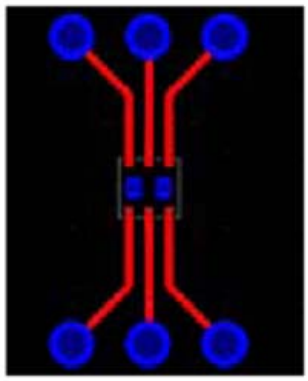
1. The package of WPMD2010 is DFN2x2-6L, surface mounted on FR4 Board using 1 in sq pad size，2 oz Cu，R θJA is 82 ℃/W, surface mounted on FR4 Board using minimum pad size，2 oz Cu，R θJA is 175℃ /W.

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.



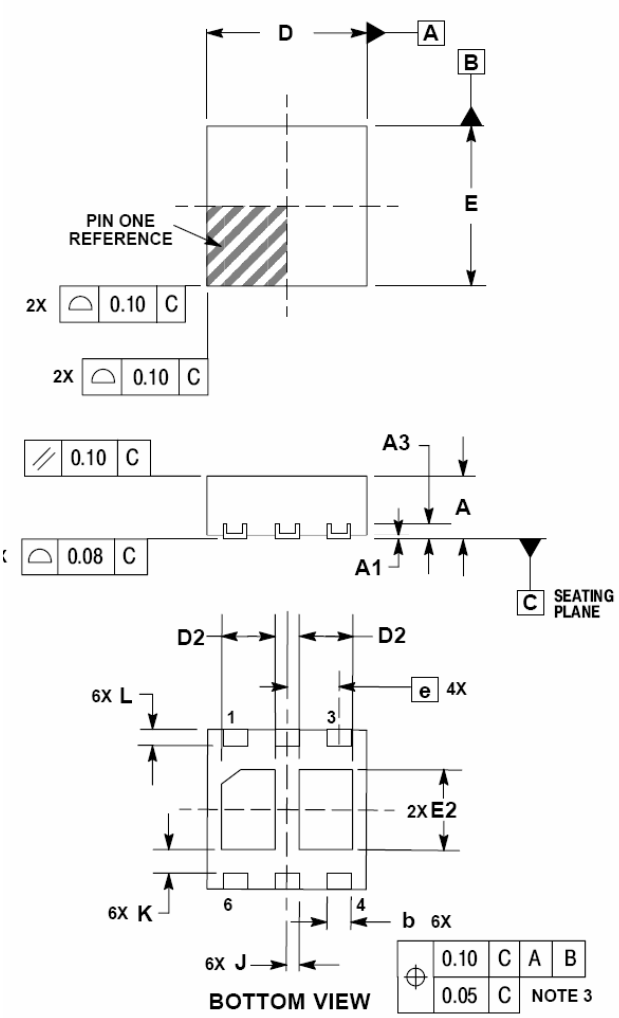
82 ℃/W when mounted on a 1 in^2 pad of 2 oz copper



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

Packaging Information

DFN 6 Package Outline Dimension

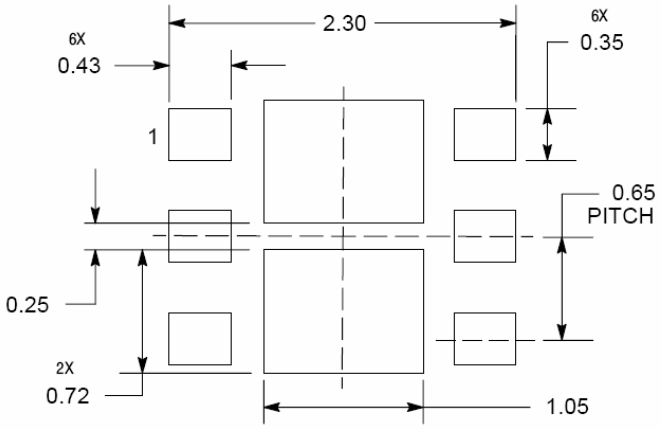


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20mm FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	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	

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

SOLDERMASK DEFINED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS