Freescale Semiconductor
Technical Data

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Rev. 4, 12/2006

RoHS

RF Power Field Effect Transistor

N-Channel Enhancement-Mode Lateral MOSFETs

Designed primarily for pulsed wideband large-signal output and driver applications with frequencies up to 450 MHz. Devices are unmatched and are suitable for use in industrial, medical and scientific applications.

- Typical CW Performance at 220 MHz: V_{DD} = 50 Volts, I_{DQ} = 35 mA, P_{out} = 10 Watts
  Power Gain — 25 dB
  Drain Efficiency — 64%
- Capable of Handling 10:1 VSWR, @ 50 Vdc, 220 MHz, 10 Watts CW Output Power

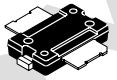
Features

- Integrated ESD Protection
- Excellent Thermal Stability
- Facilitates Manual Gain Control, ALC and Modulation Techniques
- 225°C Capable Plastic Package
- RoHS Compliant

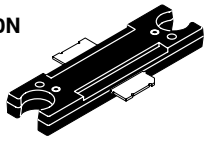
MRF6V2010N
MRF6V2010NB

PREPRODUCTION

10-450 MHz, 10 W, 50 V
LATERAL N-CHANNEL
BROADBAND
RF POWER MOSFETs



CASE 1265-08, STYLE 1
TO-270-2
PLASTIC
MRF6V2010N



CASE 1337-03, STYLE 1
TO-272-2
PLASTIC
MRF6V2010NB

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +110	Vdc
Gate-Source Voltage	V_{GS}	-0.5, +10	Vdc
Storage Temperature Range	T_{stg}	- 65 to +150	°C
Operating Junction Temperature (1,2)	T_J	225	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (3)	Unit
Thermal Resistance, Junction to Case Case Temperature TBD°C, TBD W CW Case Temperature TBD°C, TBD W CW	$R_{\theta JC}$	 TBD TBD	°C/W

Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22-A114)	TBD (Minimum)
Machine Model (per EIA/JESD22-A115)	TBD (Minimum)
Charge Device Model (per JESD22-C101)	TBD (Minimum)

1. Continuous use at maximum temperature will affect MTTF.
2. MTTF calculator available at http://www.freescale.com/rf. Select Tools/Software/Application Software/Calculators to access the MTTF calculators by product. (Calculator available when part is in production.)
3. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.

This document contains information on a preproduction product. Specifications and information herein are subject to change without notice.

freescale semiconductor

Table 4. Moisture Sensitivity Level

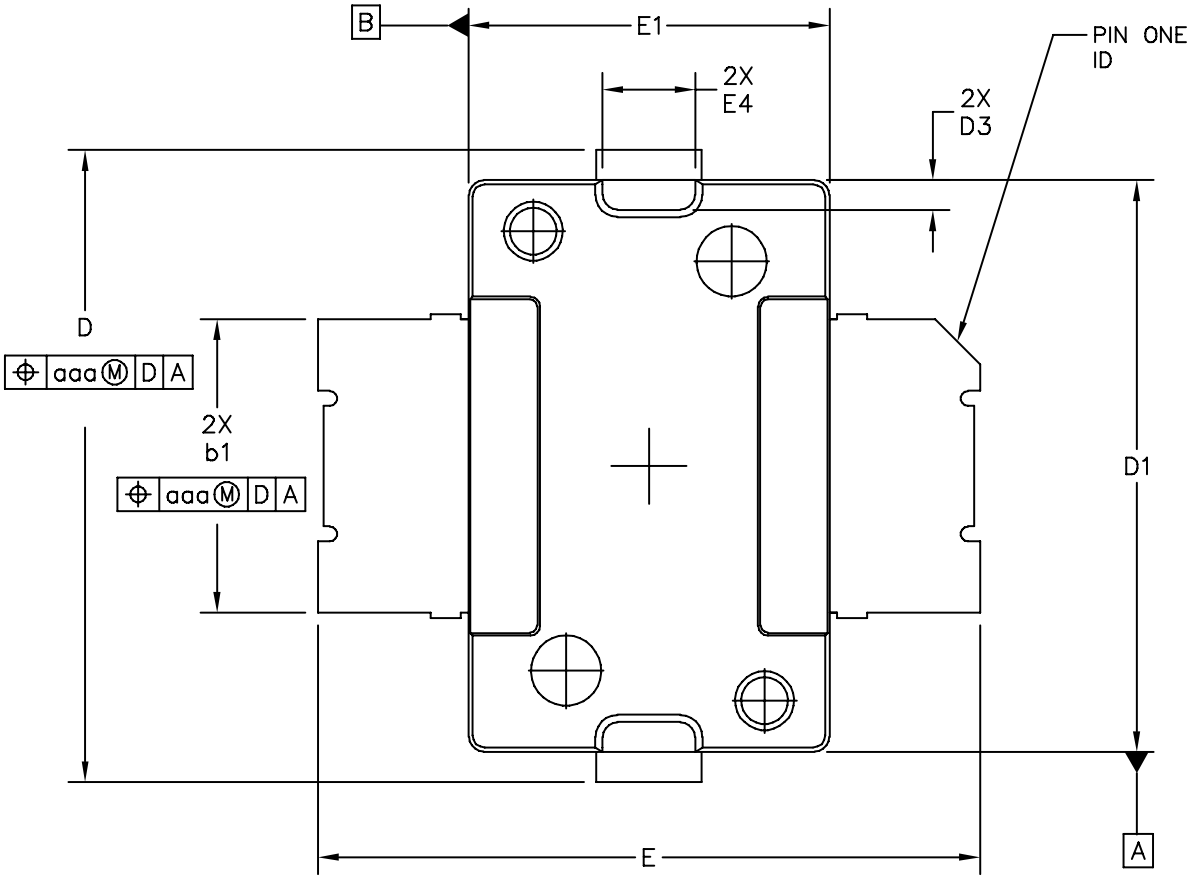
Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	3	260	°C

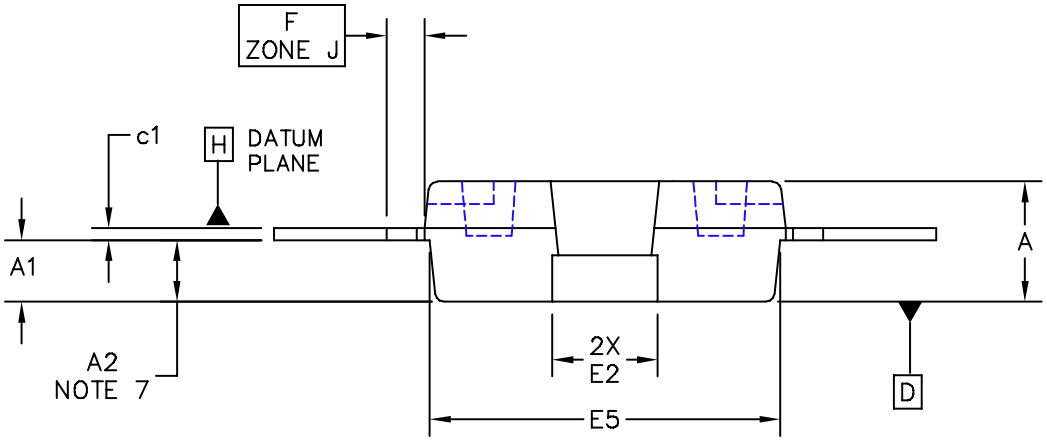
Table 5. Electrical Characteristics (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 100 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	2.5	mA
Zero Gate Voltage Drain Leakage Current (V_{DS} = 50 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	50	μAdc
Drain-Source Breakdown Voltage (I_D = 5 mA, V_{GS} = 0 Vdc)	BV_{DSS}	110	—	—	Vdc
Gate-Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	10	μAdc
On Characteristics					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 28 μAdc)	$V_{GS(th)}$	—	2.4	—	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 70 mAdc)	$V_{DS(on)}$	—	0.3	—	Vdc
Dynamic Characteristics					
Reverse Transfer Capacitance (V_{DS} = 50 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{rss}	—	0.27	—	pF
Output Capacitance (V_{DS} = 50 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{oss}	—	6.6	—	pF
Input Capacitance (V_{DS} = 50 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{iss}	—	15	—	pF
Functional Tests (In Freescale Test Fixture, 50 ohm system) V_{DD} = 50 Vdc, I_{DQ} = 35 mA, P_{out} = 10 W, f = 220 MHz, CW					
Power Gain	G_{ps}	—	25	—	dB
Drain Efficiency	η_D	—	64	—	%
Input Return Loss	IRL	—	-20	—	dB

ATTENTION: The MRF6V2010N and MRF6V2010NB are high power devices and special considerations must be followed in board design and mounting. Incorrect mounting can lead to internal temperatures which exceed the maximum allowable operating junction temperature. Refer to Freescale Application Note AN3263 (for bolt down mounting) or AN1907 (for solder reflow mounting) **PRIOR TO STARTING SYSTEM DESIGN** to ensure proper mounting of these devices.

PACKAGE DIMENSIONS





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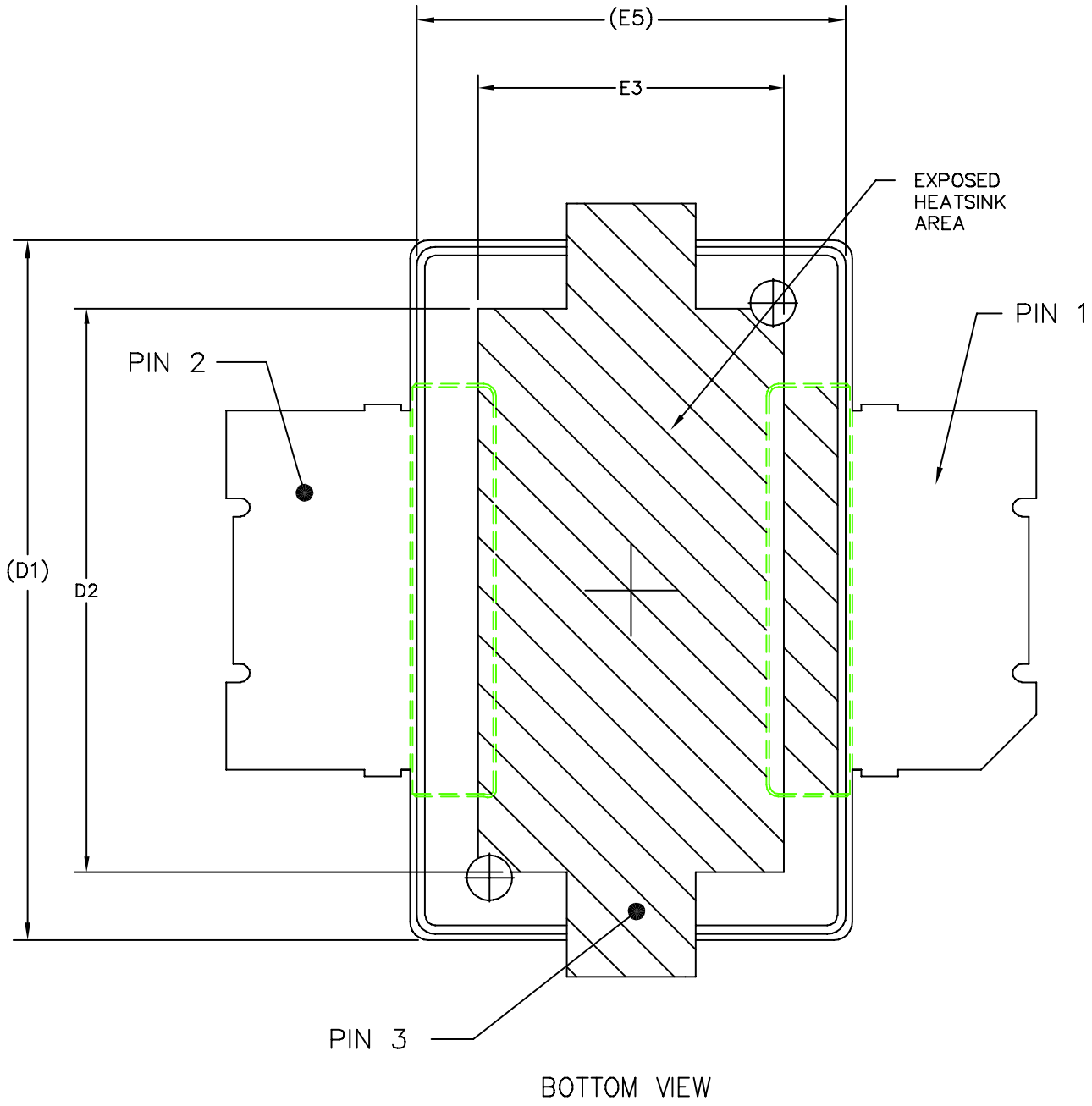
TITLE: TO-270 SURFACE MOUNT	DOCUMENT NO: 98ASH98117A	REV: J
	CASE NUMBER: 1265-08	01 APR 2005
	STANDARD: NON-JEDEC	



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TITLE: TO−270 SURFACE MOUNT	DOCUMENT NO: 98ASH98117A	REV: J
	CASE NUMBER: 1265−08	01 APR 2005
	STANDARD: NON−JEDEC	

NOTES:
1. CONTROLLING DIMENSION: INCH

2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.

3. DATUM PLANE –H– IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.

4. DIMENSIONS "D1" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 PER SIDE. DIMENSIONS "D1 AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –H–.

5. DIMENSION "b1" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 TOTAL IN EXCESS OF THE "b1" DIMENSION AT MAXIMUM MATERIAL CONDITION.

6. DATUMS –A– AND –B– TO BE DETERMINED AT DATUM PLANE –H–.

7. DIMENSION "A2" APPLIES WITHIN ZONE "J" ONLY.

8. DIMENSIONS "D" AND "E2" DO NOT INCLUDE MOLD PROTRUSION. OVERALL LENGTH INCLUDING MOLD PROTRUSION SHOULD NOT EXCEED 0.430 INCH FOR DIMENSION "D" AND 0.080 INCH FOR DIMENSION "E2". DIMENSIONS "D" AND "E2" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE –D–.

STYLE 1:
PIN 1 – DRAIN
PIN 2 – GATE
PIN 3 – SOURCE

DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX
A	.078	.082	1.98	2.08	F	.025 BSC		0.64 BSC	
A1	.039	.043	0.99	1.09	b1	.193	.199	4.90	5.06
A2	.040	.042	1.02	1.07	c1	.007	.011	0.18	0.28
D	.416	.424	10.57	10.77	aaa	.004		0.10	
D1	.378	.382	9.60	9.70					
D2	.290	.320	7.37	8.13					
D3	.016	.024	0.41	0.61					
E	.436	.444	11.07	11.28					
E1	.238	.242	6.04	6.15					
E2	.066	.074	1.68	1.88					
E3	.150	.180	3.81	4.57					
E4	.058	.066	1.47	1.68					
E5	.231	.235	5.87	5.97					

MECHANICAL OUTLINE | PRINT VERSION NOT TO SCALE

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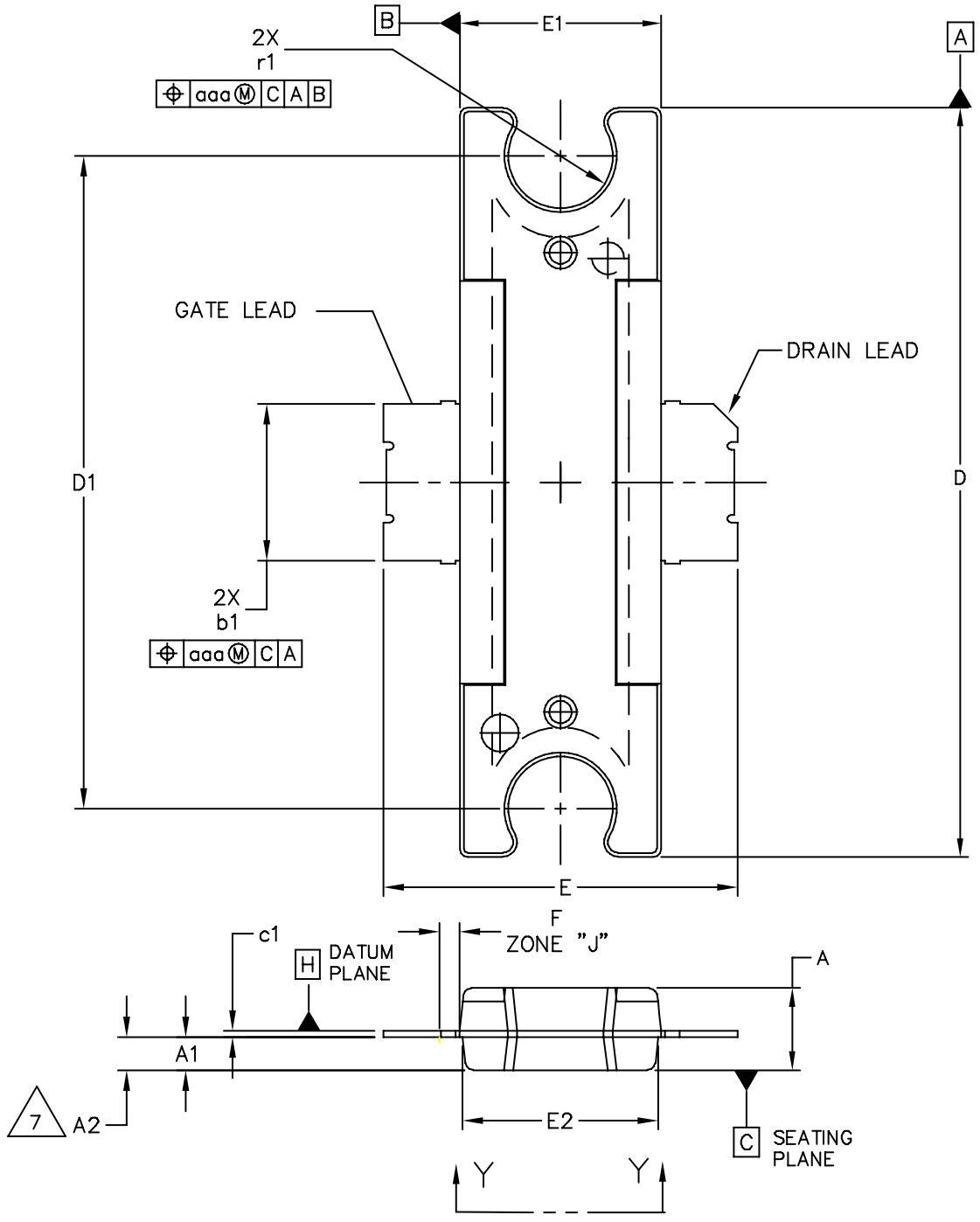

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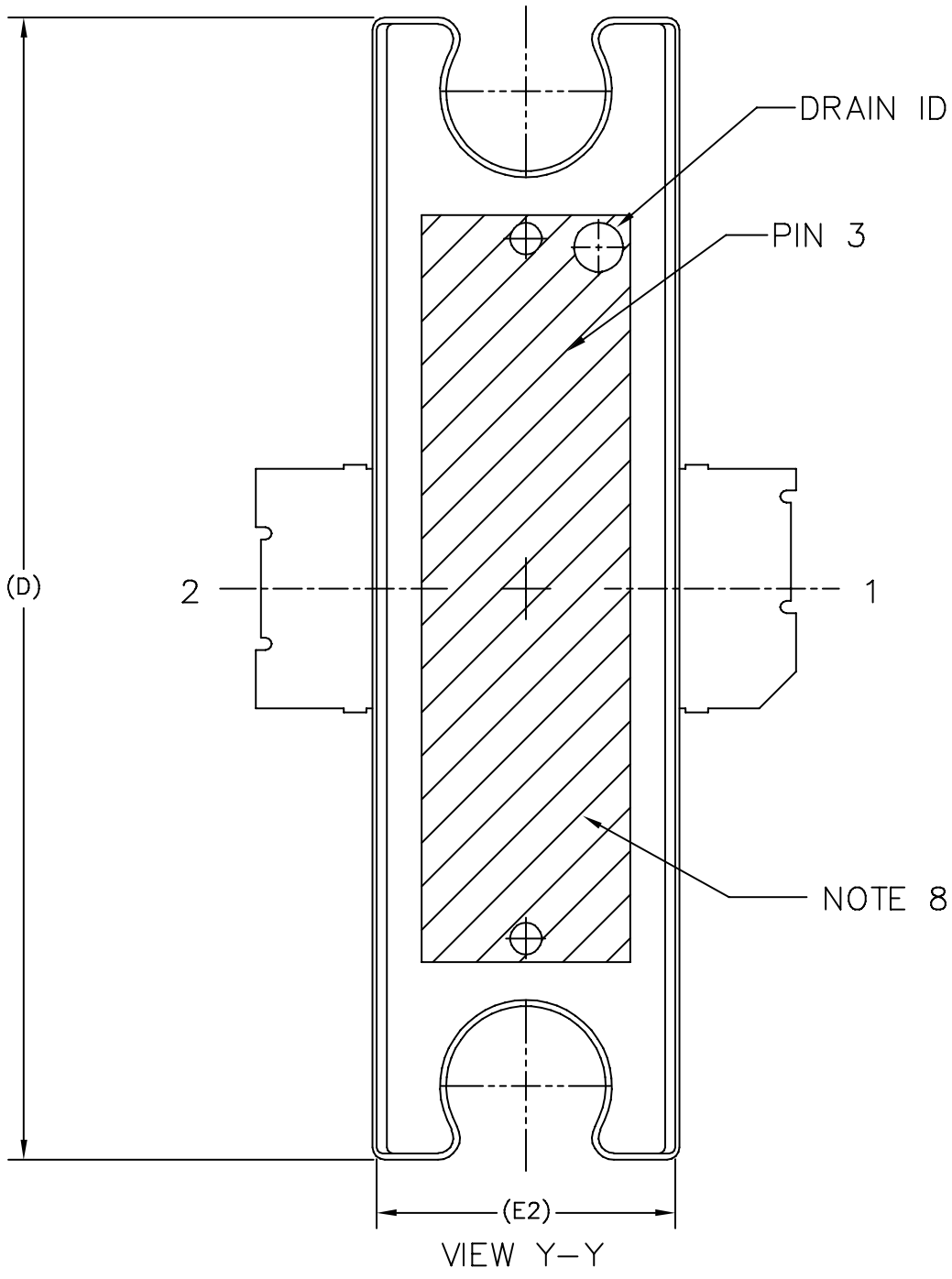
	CASE NUMBER: 1337−03	21 MAR 2005
	STANDARD: NON−JEDEC	



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TITLE: TO–272 2 LEAD	DOCUMENT NO: 98ASA99191D	REV: C
	CASE NUMBER: 1337–03	21 MAR 2005
	STANDARD: NON–JEDEC	

NOTES:

1. CONTROLLING DIMENSION: INCH

2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.

3. DATUM PLANE -H- IS LOCATED AT THE TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.

4. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.

5. DIMENSIONS "b1" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 TOTAL IN EXCESS OF THE "b1" DIMENSION AT MAXIMUM MATERIAL CONDITION.

6. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-.

7. DIMENSION A2 APPLIES WITHIN ZONE "J" ONLY.

8. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.

STYLE 1:
PIN 1 - DRAIN
PIN 2 - GATE
PIN 3 - SOURCE

DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX
A	.100	.104	2.54	2.64	b1	.193	.199	4.90	5.05
A1	.039	.043	0.99	1.09	c1	.007	.011	.18	.28
A2	.040	.042	1.02	1.07	r1	.063	.068	1.60	1.73
D	.928	.932	23.57	23.67	aaa		.004		.10
D1	.810 BSC		20.57 BSC						
E	.438	.442	11.12	11.23					
E1	.248	.252	6.30	6.40					
E2	.241	.245	6.12	6.22					
F	.025 BSC		0.64 BSC						

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TO-272 2 LEAD	CASE NUMBER: 1337-03	21 MAR 2005
	STANDARD: NON-JEDEC	

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