

RF Power Field-Effect Transistor

N-Channel Enhancement-Mode Lateral MOSFETs

Designed primarily for 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, $I_{DQ} = 450$ mA, $P_{out} = 150$ Watts
 Power Gain — 25.5 dB
 Drain Efficiency — 69%
- Capable of Handling 10:1 VSWR, @ 50 Vdc, 210 MHz, 150 Watts Output Power
- Integrated ESD Protection
- Excellent Thermal Stability
- Facilitates Manual Gain Control, ALC and Modulation Techniques
- 225°C Capable Plastic Package
- RoHS Compliant

MRF6V2150N
MRF6V2150NB
 PREPRODUCTION

10-450 MHz, 150 W, 50 V
LATERAL N-CHANNEL
SINGLE-ENDED
BROADBAND
RF POWER MOSFETs

CASE 1486-03, STYLE 1
 TO-270 WB-4
 PLASTIC
 MRF6V2300N

CASE 1484-04, STYLE 1
 TO-272 WB-4
 PLASTIC
 MRF6V2300NB

PARTS ARE SINGLE-ENDED

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	- 0.5 +110	Vdc
Gate-Source Voltage	V_{GS}	- 0.5 +12	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

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.

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)

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 ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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Off Characteristics

Zero Gate Voltage Drain Leakage Current ($V_{DS} = 110\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$)	I_{DSS}	—	—	10	μA
Zero Gate Voltage Drain Leakage Current ($V_{DS} = 50\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$)	I_{DSS}	—	—	10	μA
Drain-Source Breakdown Voltage ($I_D = 75\text{ mA}$, $V_{GS} = 0\text{ Vdc}$)	BV_{DSS}	110	—	—	Vdc
Gate-Source Leakage Current ($V_{GS} = 5\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	—	—	10	μA

On Characteristics

Gate Threshold Voltage ($V_{DS} = 10\text{ Vdc}$, $I_D = 400\ \mu\text{A}$)	$V_{GS(th)}$	—	2.4	—	Vdc
Drain-Source On-Voltage ($V_{GS} = 10\text{ Vdc}$, $I_D = 1\text{ A}$)	$V_{DS(on)}$	—	0.3	—	Vdc

Dynamic Characteristics

Reverse Transfer Capacitance ($V_{DS} = 50\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{rss}	—	1.54	—	pF
Output Capacitance ($V_{DS} = 50\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{oss}	—	94	—	pF
Input Capacitance ($V_{DS} = 50\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{iss}	—	163	—	pF

Functional Tests (In Freescale Test Fixture, 50 ohm system) $V_{DD} = 50\text{ Vdc}$, $I_{DQ} = 450\text{ mA}$, $P_{out} = 150\text{ W}$, $f = 220\text{ MHz}$, CW

Power Gain	G_{ps}	—	25.5	—	dB
Drain Efficiency	η_D	—	69	—	%
Input Return Loss	IRL	—	-17	—	dB
P_{out} @ 1 dB Compression Point, CW ($f = 220\text{ MHz}$)	P1dB	—	165	—	W



ATTENTION: The MRF6V2150N and MRF6V2150NB 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.

TYPICAL CHARACTERISTICS

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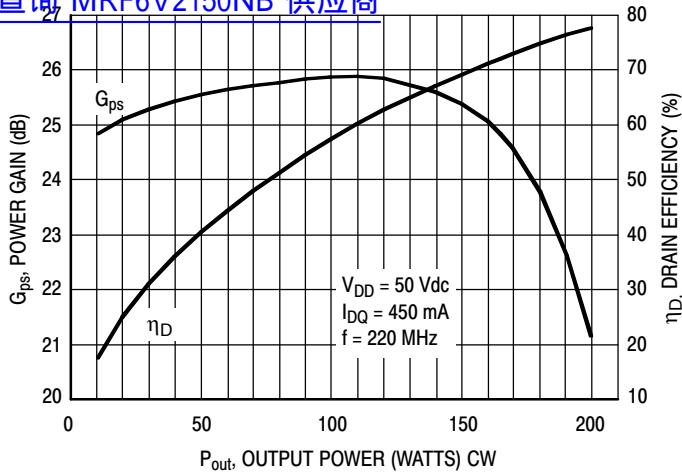


Figure 1. Power Gain and Drain Efficiency versus CW Output Power

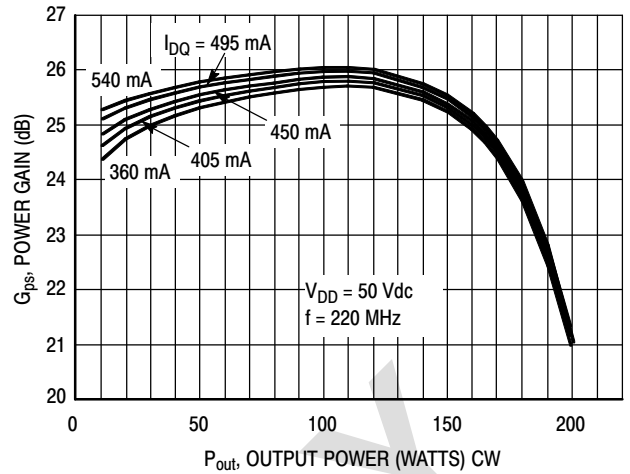


Figure 2. Power Gain versus Output Power

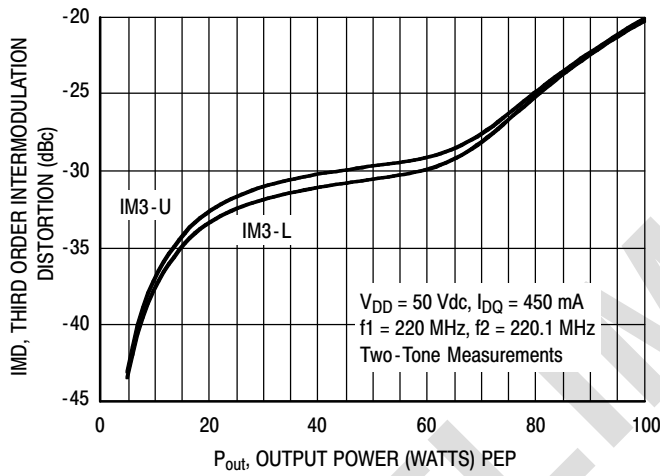


Figure 3. Third Order Intermodulation Distortion versus Output Power

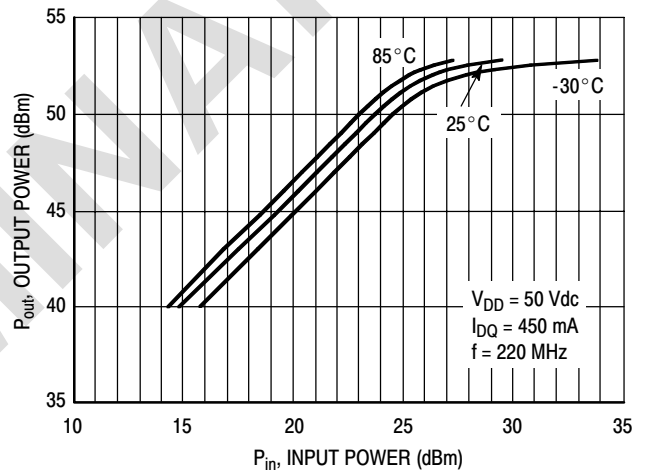
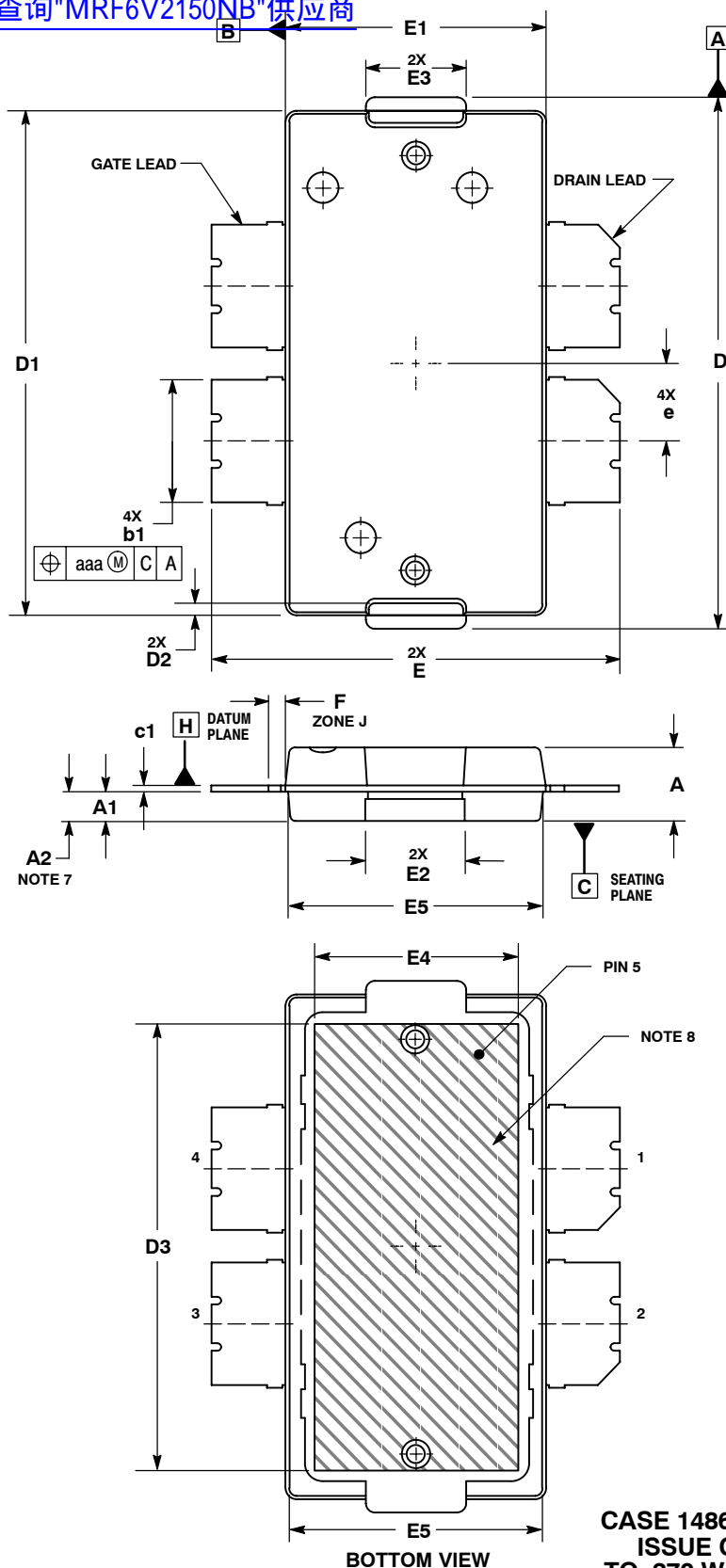


Figure 4. Output Power versus Input Power over Temperature

PACKAGE DIMENSIONS

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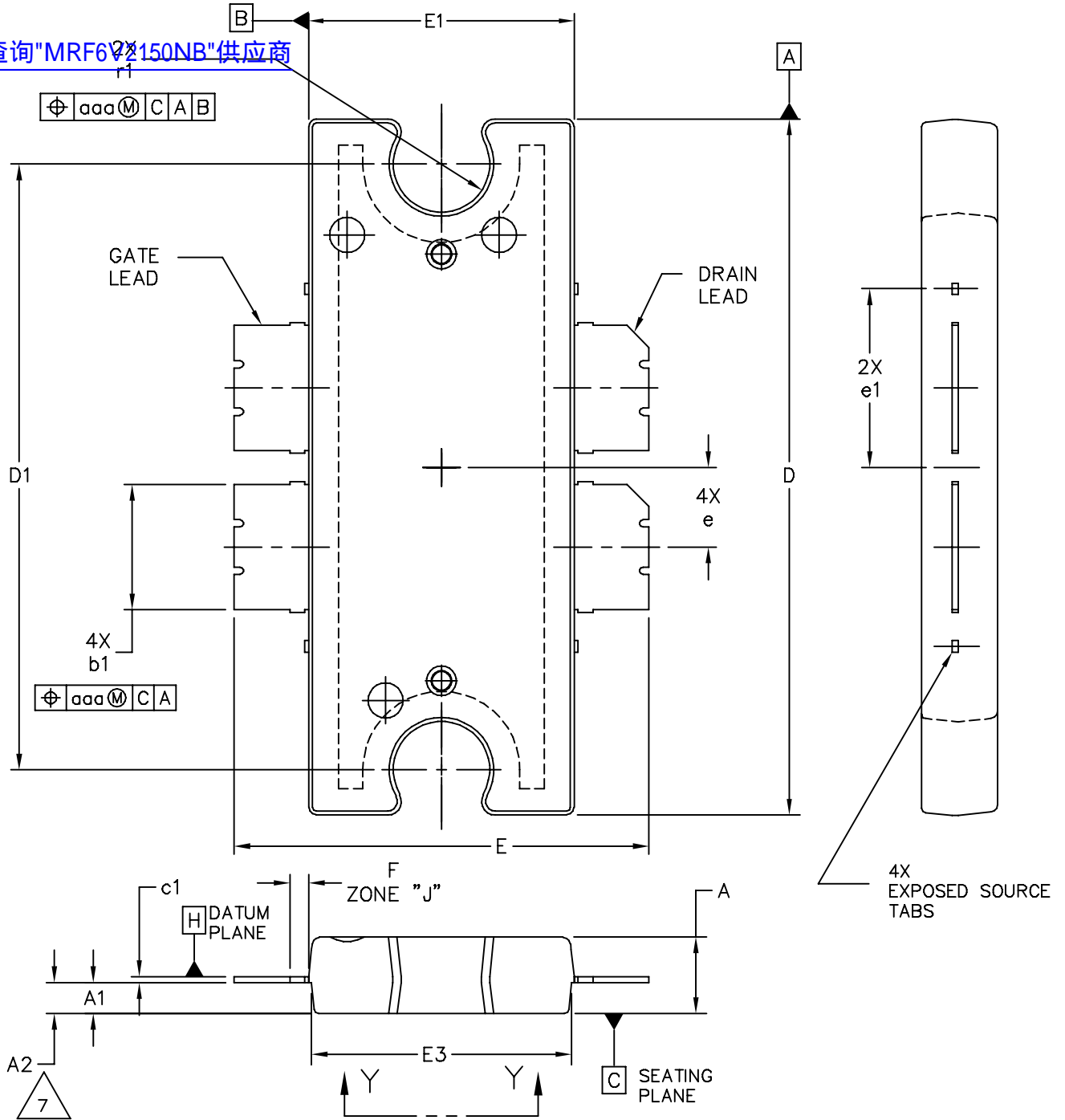
- NOTES:
1. CONTROLLING DIMENSION: INCH.
 2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
 3. DATUM PLANE -H- IS LOCATED AT THE TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.
 4. DIMENSIONS "D" AND "E1" DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 PER SIDE. DIMENSIONS "D" AND "E1" DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
 5. 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. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.100	.104	2.54	2.64
A1	.039	.043	0.99	1.09
A2	.040	.042	1.02	1.07
D	.712	.720	18.08	18.29
D1	.688	.692	17.48	17.58
D2	.011	.019	0.28	0.48
D3	.600	---	15.24	---
E	.551	.559	14	14.2
E1	.353	.357	8.97	9.07
E2	.132	.140	3.35	3.56
E3	.124	.132	3.15	3.35
E4	.270	---	6.86	---
E5	.346	.350	8.79	8.89
F	.025 BSC		0.64 BSC	
b1	.164	.170	4.17	4.32
c1	.007	.011	0.18	0.28
e	.106 BSC		2.69 BSC	
aaa	.004		0.10	

- STYLE 1:
 PIN 1. DRAIN
 2. DRAIN
 3. GATE
 4. GATE
 5. SOURCE

**CASE 1486-03
 ISSUE C
 TO-270 WB-4
 PLASTIC
 MRF6V2150N**

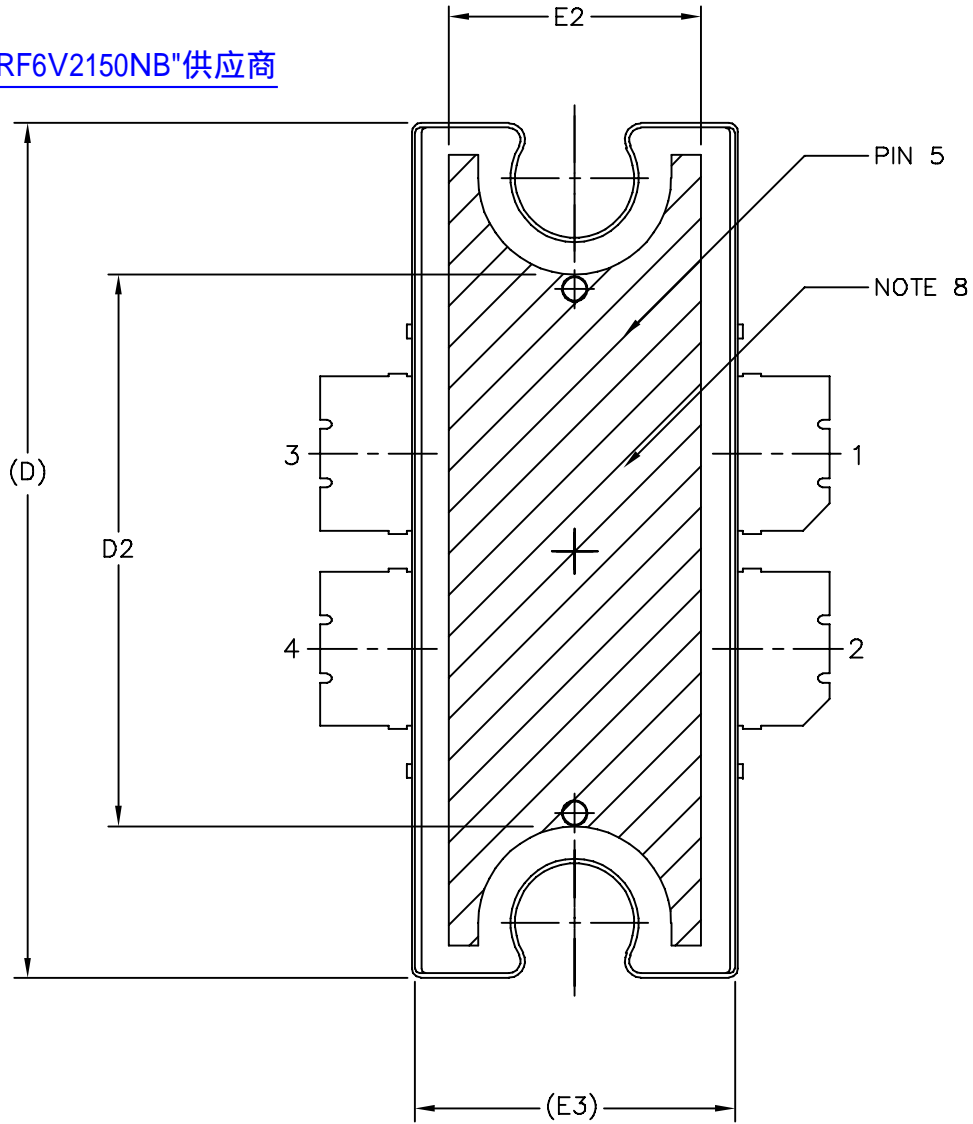
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TITLE: TO-272 4 LEAD, WIDE BODY			DOCUMENT NO: 98ASA10575D		REV: D
			CASE NUMBER: 1484-04		05 APR 2006
			STANDARD: NON-JEDEC		

MRF6V2150N MRF6V2150NB

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NOTES:

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2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
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6. DATUM A AND B TO BE DETERMINED AT DATUM PLANE H.
7. DIMENSION A2 APPLIES WITHIN ZONE "J" ONLY.
8. HATCHING REPRESENTS EXPOSED AREA OF THE HEAT SLUG. HATCHED AREA SHOWN IS ON THE SAME PLANE.

STYLE 1:

PIN 1 - DRAIN PIN 2 - DRAIN
 PIN 3 - GATE PIN 4 - GATE
 PIN 5 - SOURCE

DIM	INCH		MILLIMETER		DIM	INCH		MILLIMETER	
	MIN	MAX	MIN	MAX		MIN	MAX	MIN	MAX
A	.100	.104	2.54	2.64	b1	.164	.170	4.17	4.32
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	e	.106 BSC		2.69 BSC	
D1	.810 BSC		20.57 BSC		e1	.239 INFO ONLY		6.07 INFO ONLY	
D2	.600	---	15.24	---	aaa	.004		.10	
E	.551	.559	14	14.2					
E1	.353	.357	8.97	9.07					
E2	.270	---	6.86	---					
E3	.346	.350	8.79	8.89					
F	.025 BSC		0.64 BSC						

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MECHANICAL OUTLINE

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TO-272
 4 LEAD WIDE BODY

DOCUMENT NO: 98ASA10575D

REV: D

CASE NUMBER: 1484-04

05 APR 2006

STANDARD: NON-JEDEC

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