Freescale Semiconductor
Technical Data

Document Number: MRF7S19100N
Rev. 2, 8/2006

查询"MRF7S19100NBR1"供应商

RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

MRF7S19100NR1
MRF7S19100NBR1

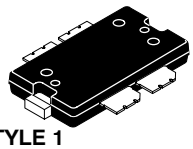
1930-1990 MHz, 29 W AVG., 28 V
SINGLE W-CDMA
LATERAL N-CHANNEL
RF POWER MOSFETs

Designed for CDMA base station applications with frequencies from 1930 to 1990 MHz. Suitable for CDMA and multicarrier amplifier applications. To be used in Class AB and Class C for PCN-PCS/cellular radio and WLL applications.

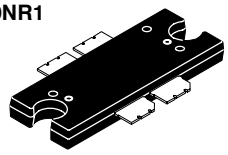
- Typical Single-Carrier W-CDMA Performance: V_{DD} = 28 Volts, I_{DQ} = 1000 mA, P_{out} = 29 Watts Avg., Full Frequency Band, 3GPP Test Model 1, 64 DPCH with 50% Clipping, Channel Bandwidth = 3.84 MHz, Input Signal PAR = 7.5 dB @ 0.01% Probability on CCDF.
  Power Gain — 17.5 dB
  Drain Efficiency — 30%
  Device Output Signal PAR — 6.1 dB @ 0.01% Probability on CCDF
  ACPR @ 5 MHz Offset — -38 dBc in 3.84 MHz Channel Bandwidth
- Capable of Handling 5:1 VSWR, @ 32 Vdc, 1960 MHz, 100 Watts CW Peak Tuned Output Power
- P_{out} @ 1 dB Compression Point ≥ 100 W CW

Features

- 100% PAR Tested for Guaranteed Output Power Capability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Internally Matched for Ease of Use
- Integrated ESD Protection
- Designed for Digital Predistortion Error Correction Systems
- 200°C Capable Plastic Package
- RoHS Compliant
- In Tape and Reel. R1 Suffix = 500 Units per 44 mm, 13 inch Reel.



CASE 1486-03, STYLE 1
TO-270 WB-4
PLASTIC
MRF7S19100NR1



CASE 1484-04, STYLE 1
TO-272 WB-4
PLASTIC
MRF7S19100NBR1

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +65	Vdc
Gate-Source Voltage	V_{GS}	-0.5, +10	Vdc
Operating Voltage	V_{DD}	32, +0	Vdc
Storage Temperature Range	T_{stg}	- 65 to +200	°C
Operating Junction Temperature	T_J	200	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (1,2)	Unit
Thermal Resistance, Junction to Case Case Temperature 82°C, 100 W CW Case Temperature 79°C, 29 W CW	$R_{\theta JC}$	 0.57 0.68	°C/W

1. MTTF calculator available at http://www.freescale.com/rf. Select Tools/Software/Application Software/Calculators to access the MTTF calculators by product.
2. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.

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Table 3. ESD Protection Characteristics

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Test Methodology	Class
Human Body Model (per JESD22-A114)	1C (Minimum)
Machine Model (per EIA/JESD22-A115)	A (Minimum)
Charge Device Model (per JESD22-C101)	IV (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°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 65 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	10	μAdc
Zero Gate Voltage Drain Leakage Current (V_{DS} = 28 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	1	μAdc
Gate-Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	500	nAdc
On Characteristics					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 320 μAdc)	$V_{GS(th)}$	1	2	3	Vdc
Gate Quiescent Voltage (1) (V_{DS} = 28 Vdc, I_D = 1000 mAdc, Measured in Functional Test)	$V_{GS(Q)}$	2	2.8	4	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 3.2 Adc)	$V_{DS(on)}$	0.2	0.24	0.4	Vdc
Dynamic Characteristics (2)					
Reverse Transfer Capacitance (V_{DS} = 28 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{rss}	—	1.54	—	pF
Output Capacitance (V_{DS} = 28 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{oss}	—	553.5	—	pF

Functional Tests (In Freescale Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQ} = 1000 mA, P_{out} = 29 W Avg., f1 = 1930 MHz, f2 = 1990 MHz, Single-Carrier W-CDMA, 3GPP Test Model 1, 64 DPCH, 50% Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset.

Power Gain	G_{ps}	16.5	17.5	19.5	dB
Drain Efficiency	η_D	28.5	30	—	%
Output Peak-to-Average Ratio @ 0.01% Probability on CCDF	PAR	5.7	6.1	—	dB
Adjacent Channel Power Ratio	ACPR	—	-38	-36	dBc
Input Return Loss	IRL	—	-12	-10	dB

1. V_{GG} = 11/10 x $V_{GS(Q)}$. Parameter measured on Freescale Test Fixture, due to resistive divider network on the board. Refer to Test Circuit schematic.
2. Part internally matched both on input and output.

(continued)

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

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Characteristic	Symbol	Min	Typ	Max	Unit
Typical Performances (In Freescale Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQ} = 1000 mA, 1930 - 1990 MHz Bandwidth					
Video Bandwidth (Tone Spacing from 100 kHz to VBW) ΔIMD3 = IMD3 @ VBW frequency - IMD3 @ 100 kHz <1 dBc (both sidebands)	VBW	—	30	—	MHz
Gain Flatness in 60 MHz Bandwidth @ P_{out} = 100 W CW	G_F	—	1	—	dB
Group Delay @ P_{out} = 100 W CW, f = 1960 MHz	Delay	—	2.15	—	ns
Part - to - Part Insertion Phase Variation @ P_{out} = 100 W CW	ΔΦ	—	28.8	—	°
Gain Variation over Temperature	ΔG	—	0.019	—	dB/°C
Output Power Variation over Temperature	ΔP1dB	—	0.015	—	dBm/°C

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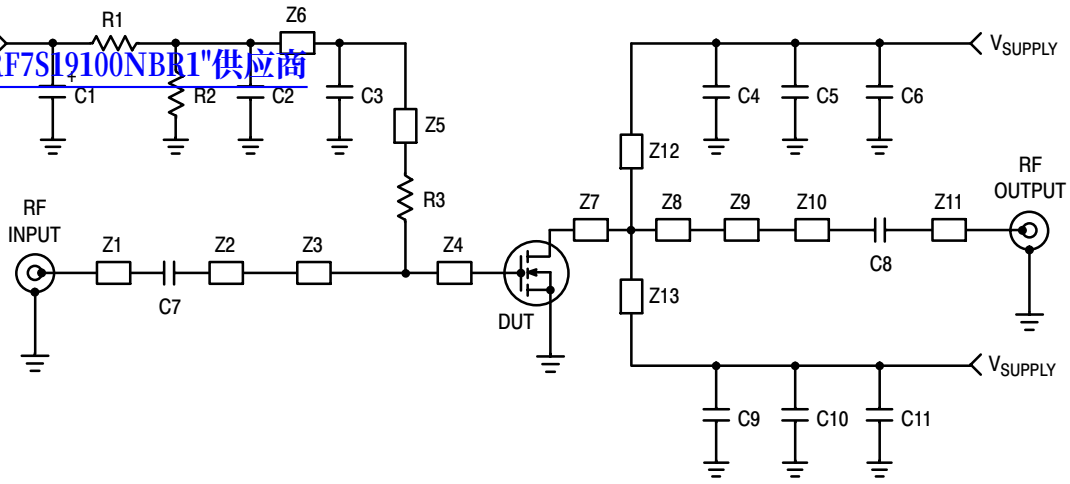

Z1	0.744″ x 0.084″ Microstrip	Z8	0.319″ x 0.880″ Microstrip
Z2	0.383″ x 0.084″ Microstrip	Z9	0.390″ x 0.215″ Microstrip
Z3	0.600″ x 0.230″ Microstrip	Z10	0.627″ x 0.084″ Microstrip
Z4	0.505″ x 0.800″ Microstrip	Z11	0.743″ x 0.084″ Microstrip
Z5	1.086″ x 0.080″ Microstrip	Z12, Z13	1.326″ x 0.121″ Microstrip
Z6	0.452″ x 0.080″ Microstrip	PCB	Arlon AD250, 0.030″, ε_r = 2.5
Z7	0.161″ x 0.880″ Microstrip		

Figure 1. MRF7S19100NR1(NBR1) Test Circuit Schematic

Table 6. MRF7S19100NR1(NBR1) Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	10 µF, 35 V Tantalum Capacitor	T491D106K035AT	Kemet
C2, C5, C6, C10, C11	10 µF, 50 V Chip Capacitors	GRM55DR61H106KA88L	Murata
C3, C7	5.1 pF Chip Capacitors	600B5R1BT250XT	ATC
C4, C9	8.2 pF Chip Capacitors	600B8R2BT250XT	ATC
C8	10 pF Chip Capacitor	600B100BT250XT	ATC
R1	1 KΩ, 1/4 W Chip Resistor	CRCW12061001F100	Vishay
R2	10 KΩ, 1/4 W Chip Resistor	CRCW12061002F100	Vishay
R3	10 Ω, 1/4 W Chip Resistor	CRCW120610R0F100	Vishay

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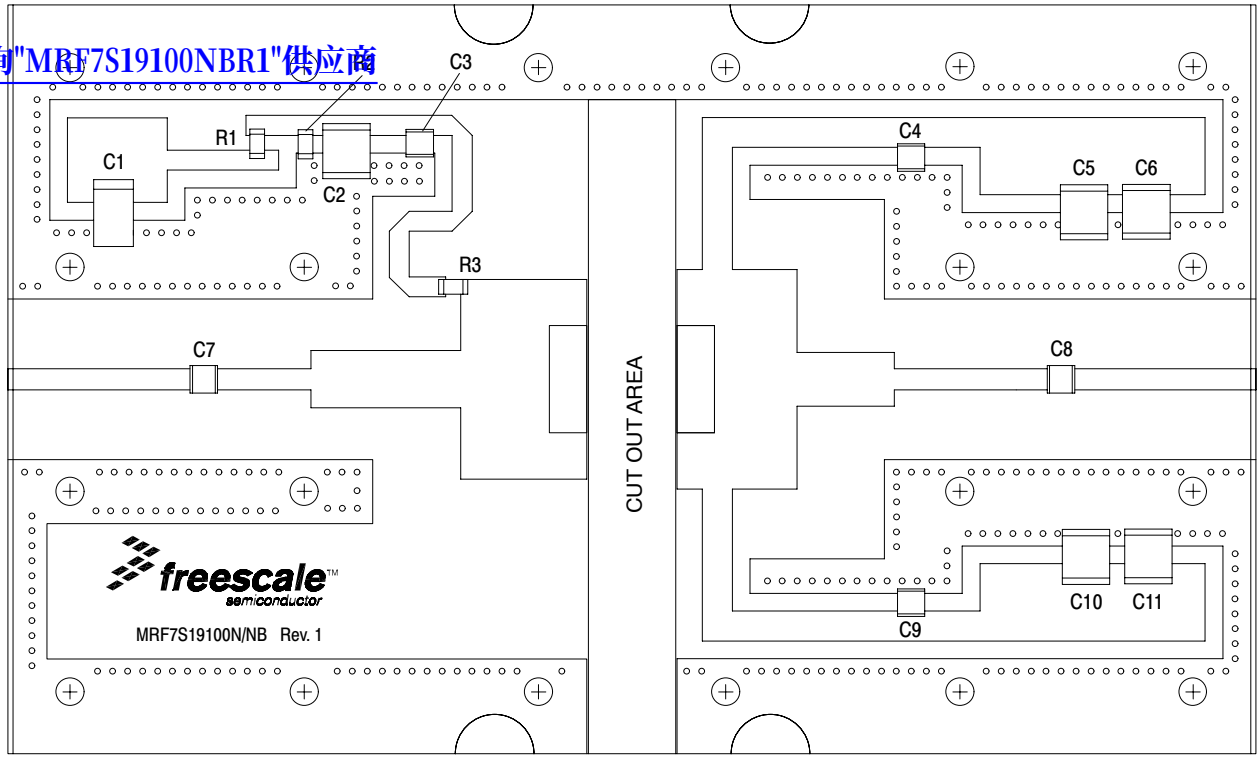

Figure 2. MRF7S19100NR1(NBR1) Test Circuit Component Layout

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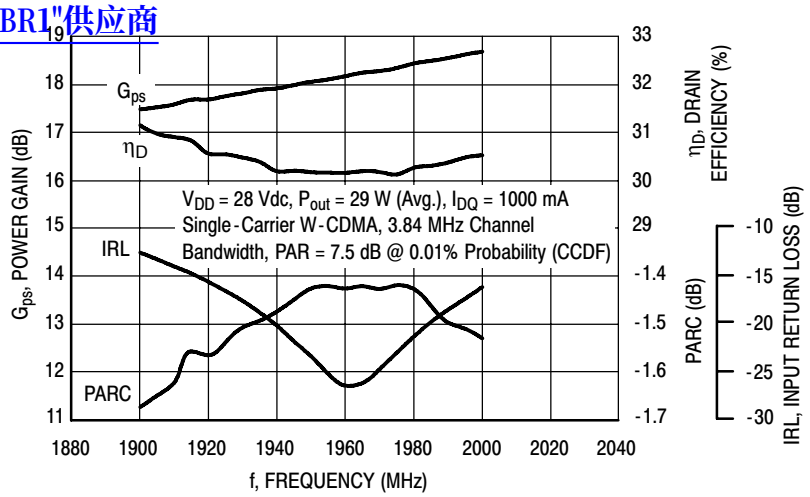

Figure 3. Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @ P_{out} = 29 Watts Avg.

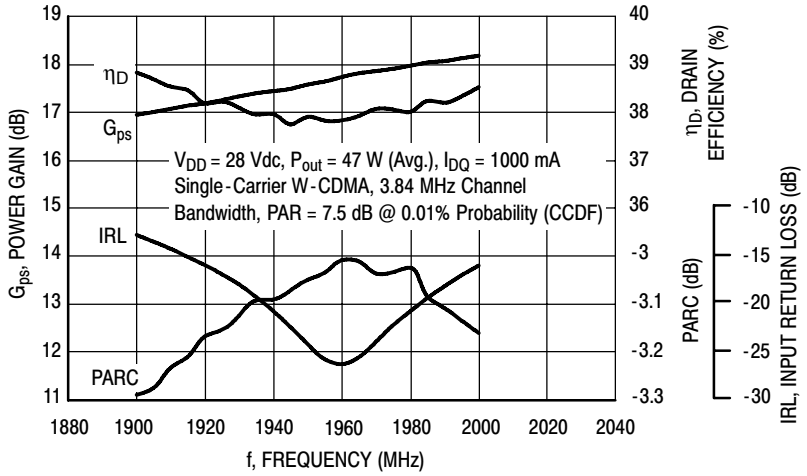

Figure 4. Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @ P_{out} = 47 Watts Avg.

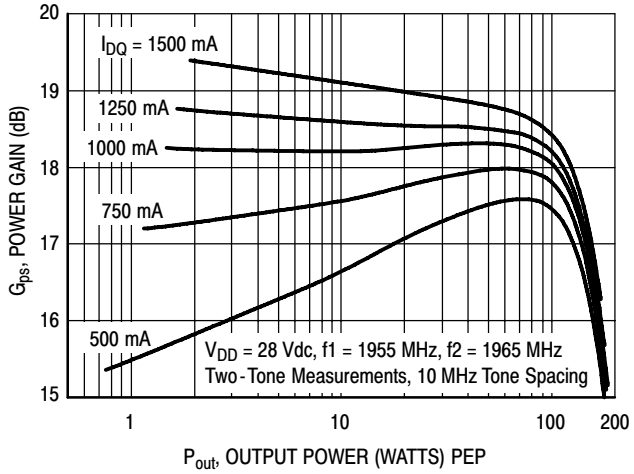

Figure 5. Two-Tone Power Gain versus Output Power

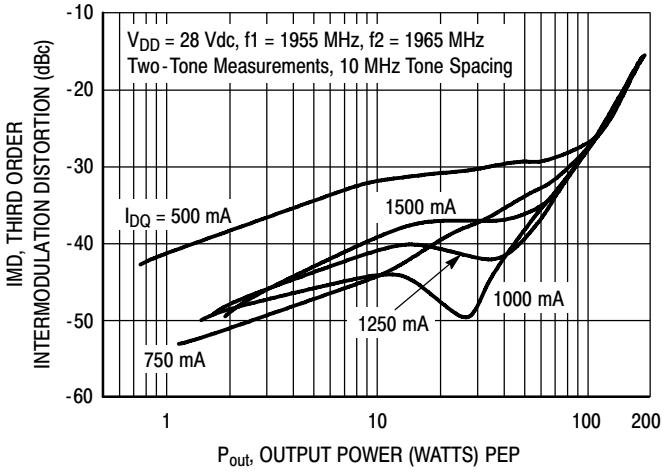

Figure 6. Third Order Intermodulation Distortion versus Output Power

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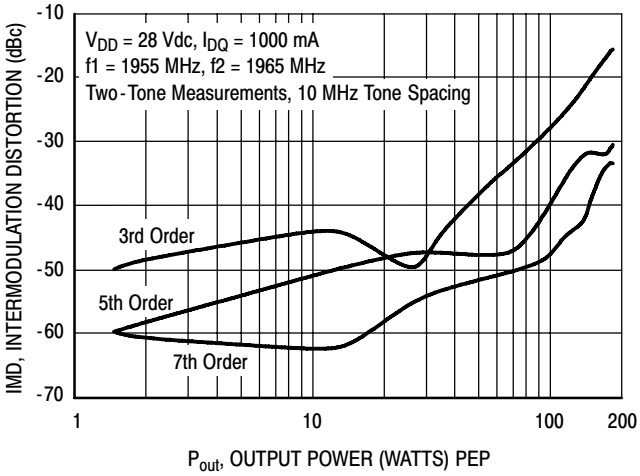

Figure 7. Intermodulation Distortion Products versus Output Power

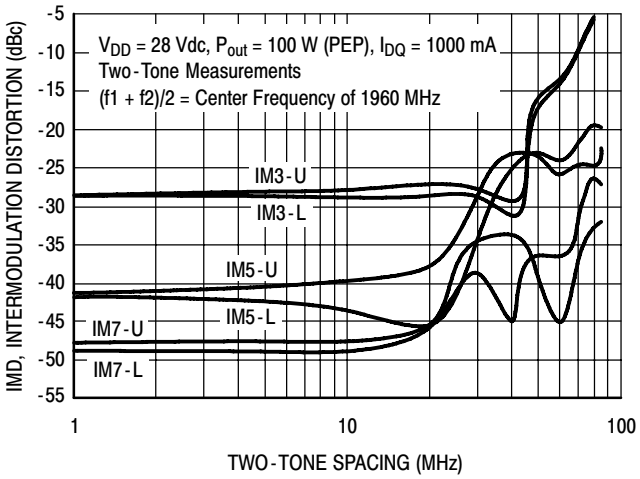

Figure 8. Intermodulation Distortion Products versus Tone Spacing

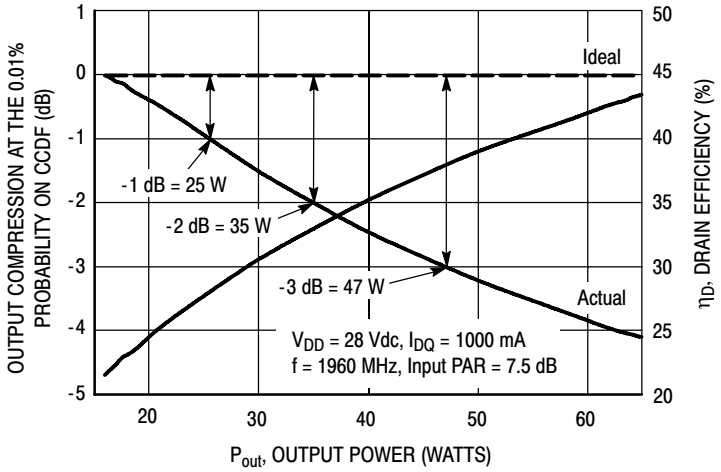

Figure 9. Output Peak-to-Average Ratio Compression (PARC) versus Output Power

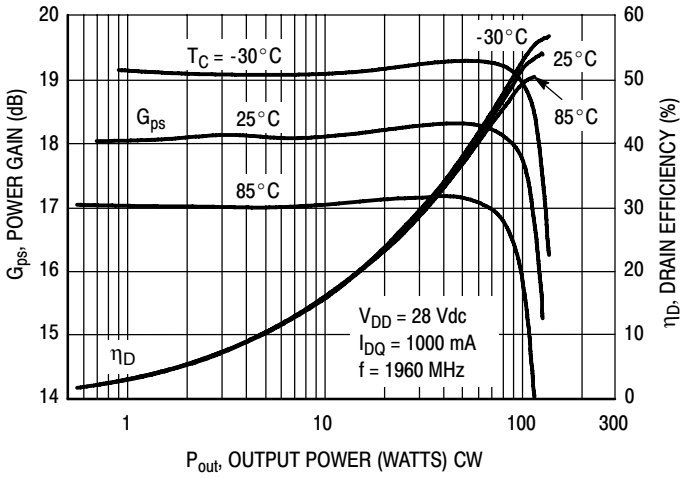

Figure 10. Power Gain and Drain Efficiency versus CW Output Power

TYPICAL CHARACTERISTICS

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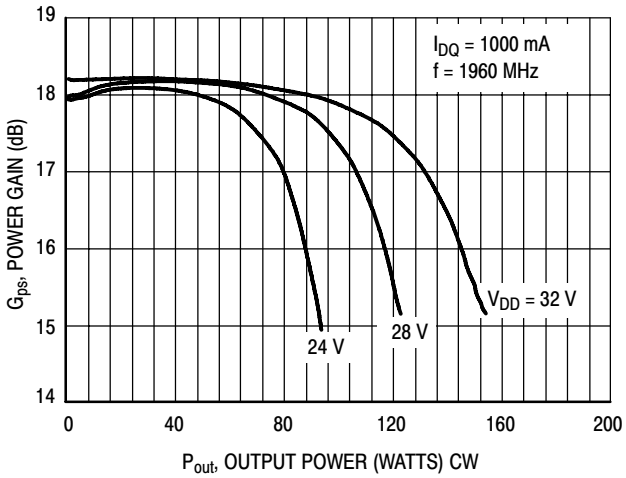
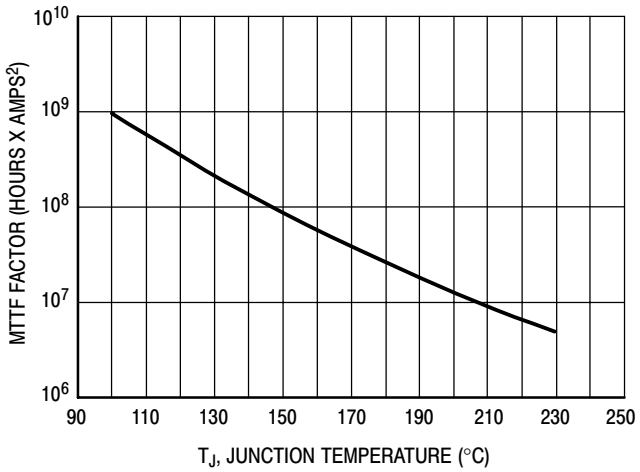


Figure 11. Power Gain versus Output Power



This above graph displays calculated MTTF in hours x ampere^2 drain current. Life tests at elevated temperatures have correlated to better than ±10% of the theoretical prediction for metal failure. Divide MTTF factor by I_D^2 for MTTF in a particular application.

Figure 12. MTTF Factor versus Junction Temperature

W-CDMA TEST SIGNAL

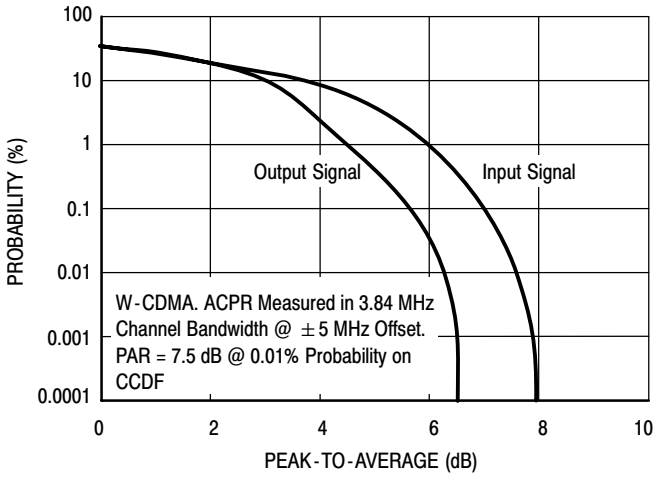


Figure 13. CCDF W-CDMA 3GPP, Test Model 1, 64 DPCH, 50% Clipping, Single-Carrier Test Signal

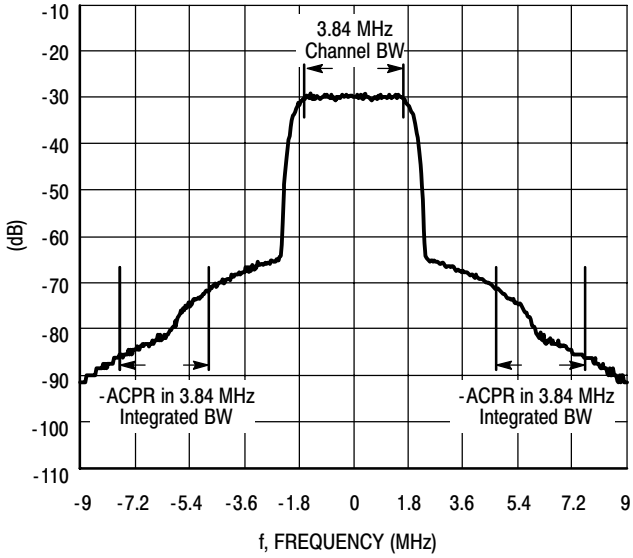


Figure 14. Single-Carrier W-CDMA Spectrum

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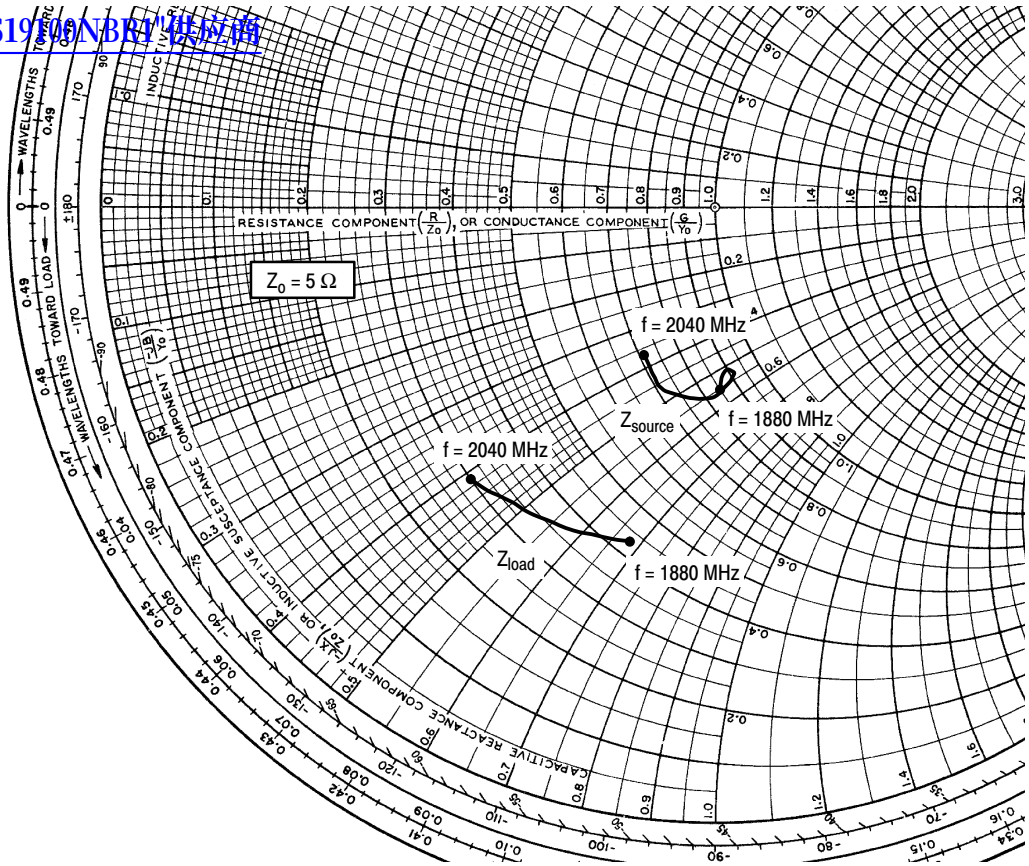

V_{DD} = 28 Vdc, I_{DQ} = 1000 mA, P_{out} = 29 W Avg.

f MHz	Z_{source} Ω	Z_{load} Ω
1880	4.257 - j2.758	2.143 - j3.408
1900	4.388 - j2.617	2.038 - j3.236
1920	4.521 - j2.560	1.944 - j3.066
1940	4.568 - j2.630	1.858 - j2.898
1960	4.424 - j2.758	1.775 - j2.725
1980	4.124 - j2.800	1.708 - j2.550
2000	3.819 - j2.611	1.643 - j2.387
2020	3.567 - j2.292	1.572 - j2.223
2040	3.525 - j1.844	1.487 - j2.029

Z_{source} = Test circuit impedance as measured from gate to ground.

Z_{load} = Test circuit impedance as measured from drain to ground.

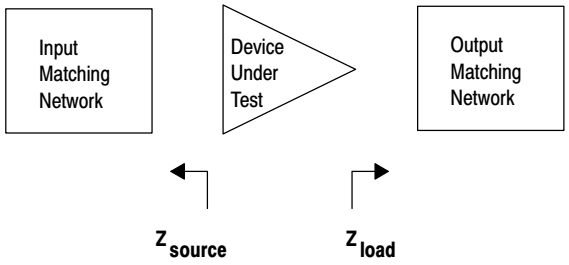

Figure 15. Series Equivalent Source and Load Impedance

ALTERNATIVE PEAK TUNE LOAD PULL CHARACTERISTICS

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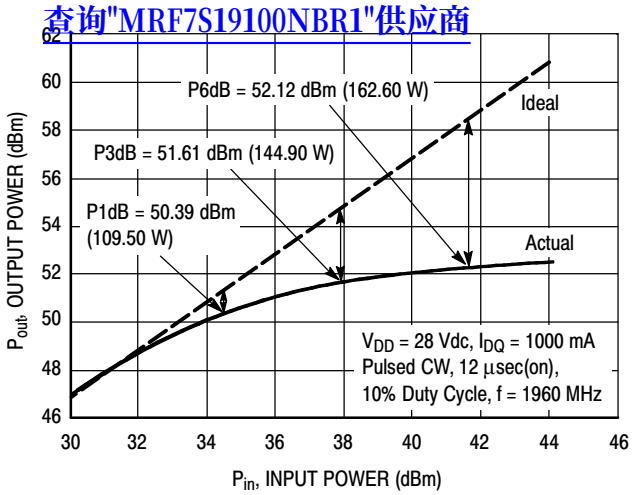
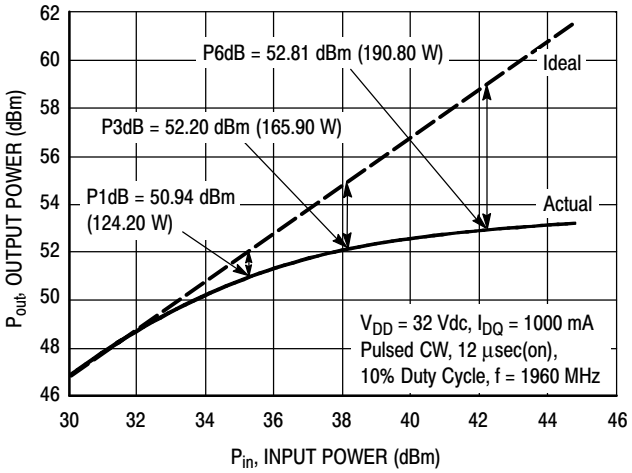


NOTE: Measured in a Peak Tuned Load Pull Fixture

Test Impedances per Compression Level

	Z_{source} Ω	Z_{load} Ω
P3dB	4.39 - j5.66	1.81 - j3.27

Figure 16. Pulsed CW Output Power versus Input Power



NOTE: Measured in a Peak Tuned Load Pull Fixture

Test Impedances per Compression Level

	Z_{source} Ω	Z_{load} Ω
P3dB	4.39 - j5.66	1.81 - j3.27

Figure 17. Pulsed CW Output Power versus Input Power

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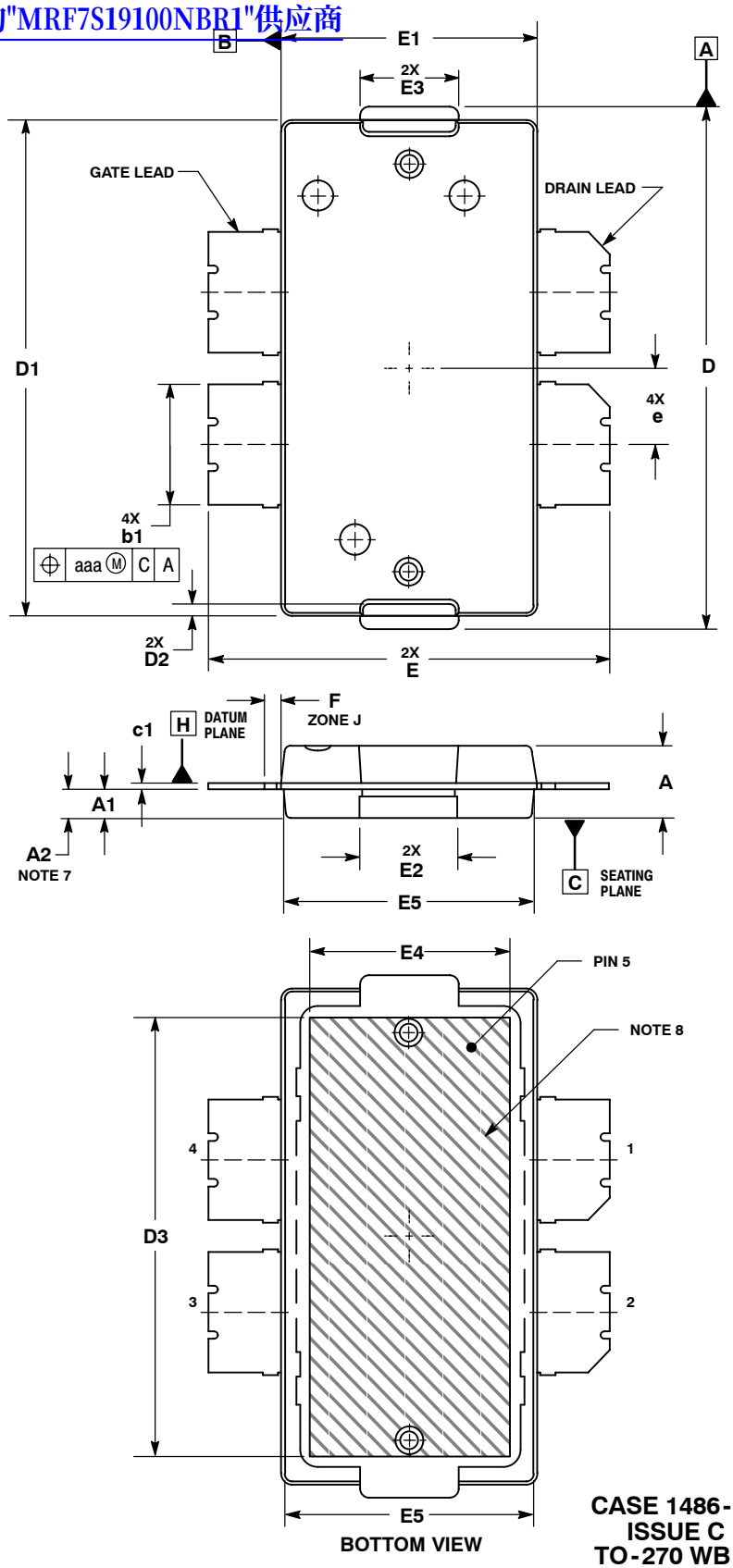
PACKAGE DIMENSIONS



CASE 1486-03
ISSUE C
TO-270 WB-4
PLASTIC
MRF7S19100N

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.

	INCHES		MILLIMETERS	
DIM	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

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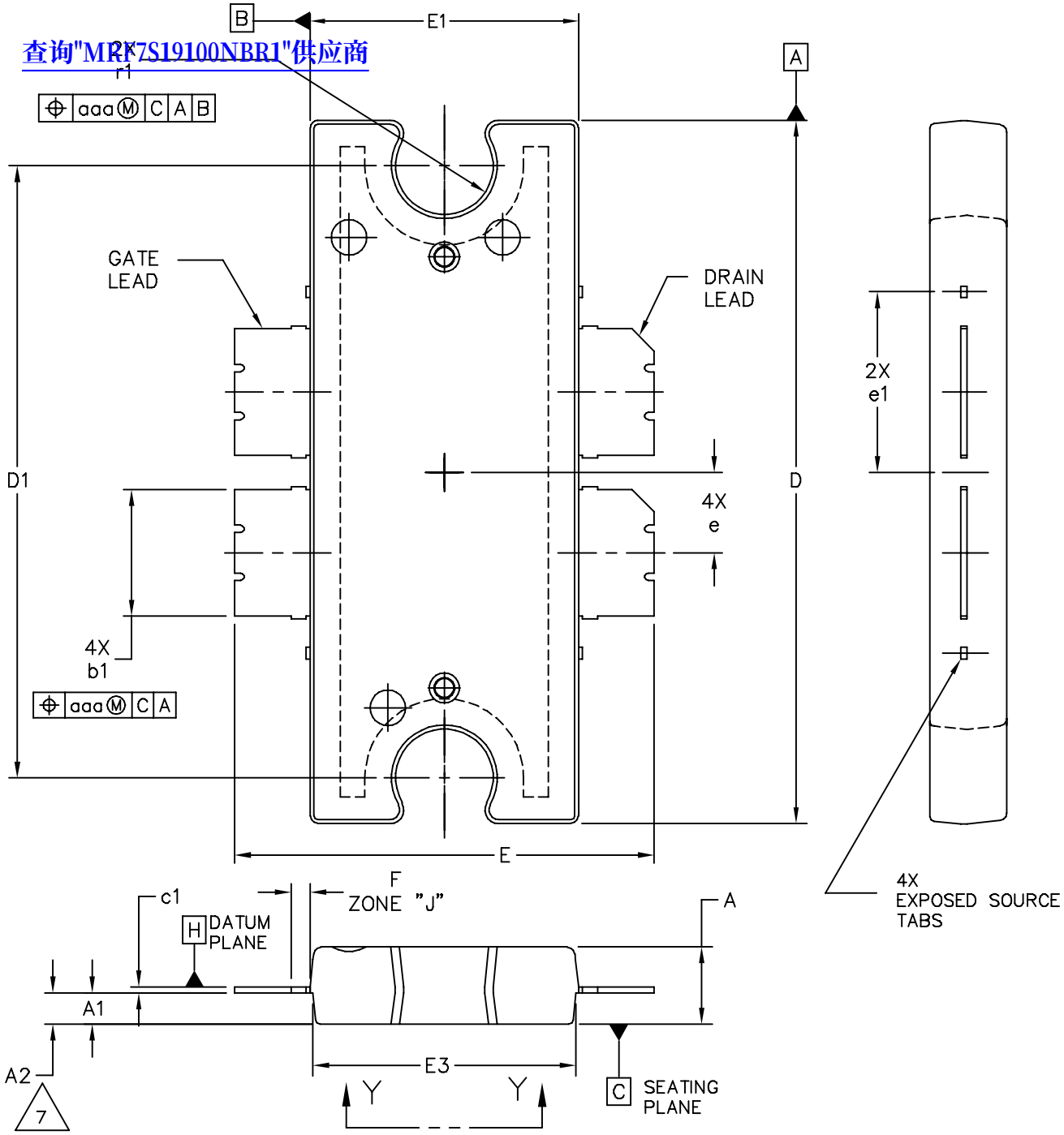

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TITLE: TO-272 4 LEAD, WIDE BODY	DOCUMENT NO: 98ASA10575D	REV: D
	CASE NUMBER: 1484-04	05 APR 2006
	STANDARD: NON-JEDEC	

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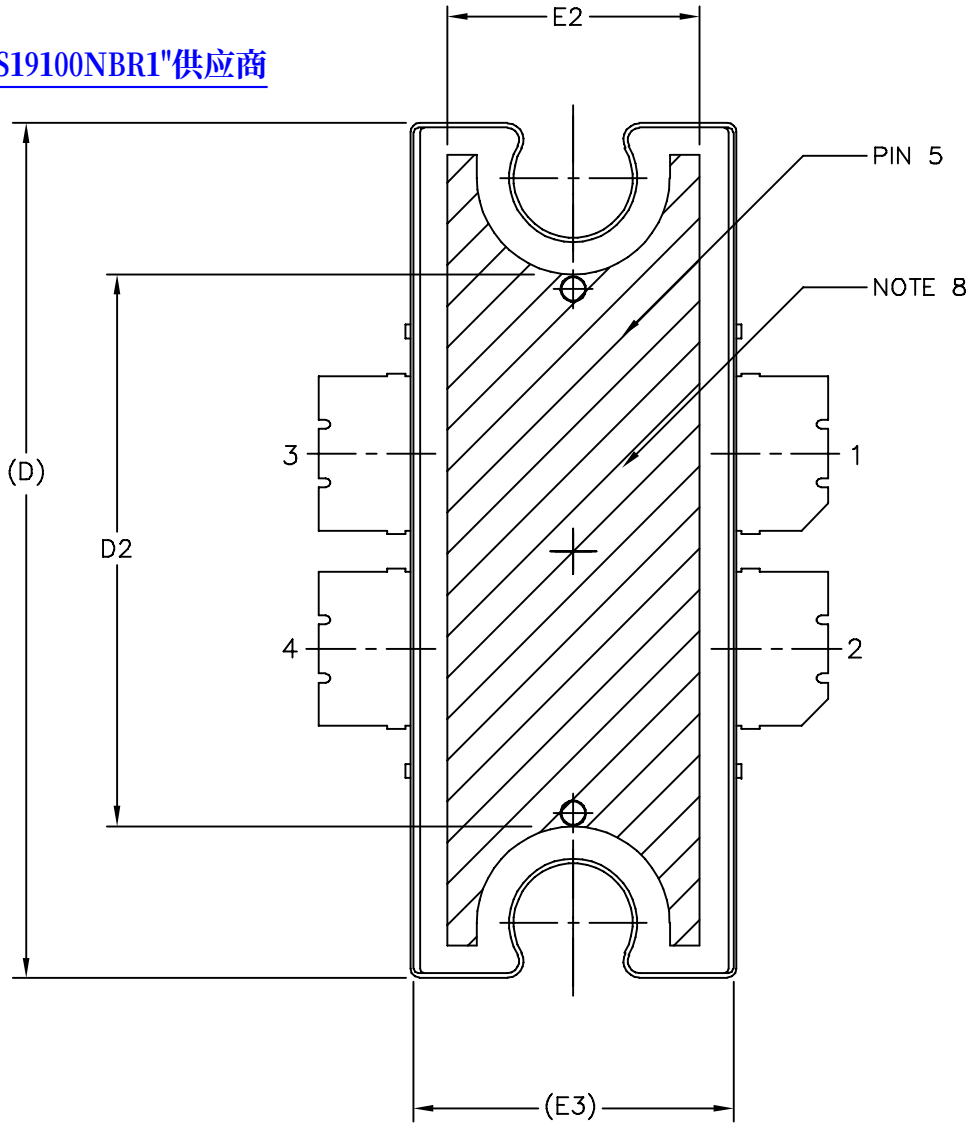

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TITLE: TO-272 4 LEAD, WIDE BODY	DOCUMENT NO: 98ASA10575D	REV: D
	CASE NUMBER: 1484-04	05 APR 2006
	STANDARD: NON-JEDEC	

NOTES:

1. CONTROLLING DIMENSION: INCH

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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. 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 MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER 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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