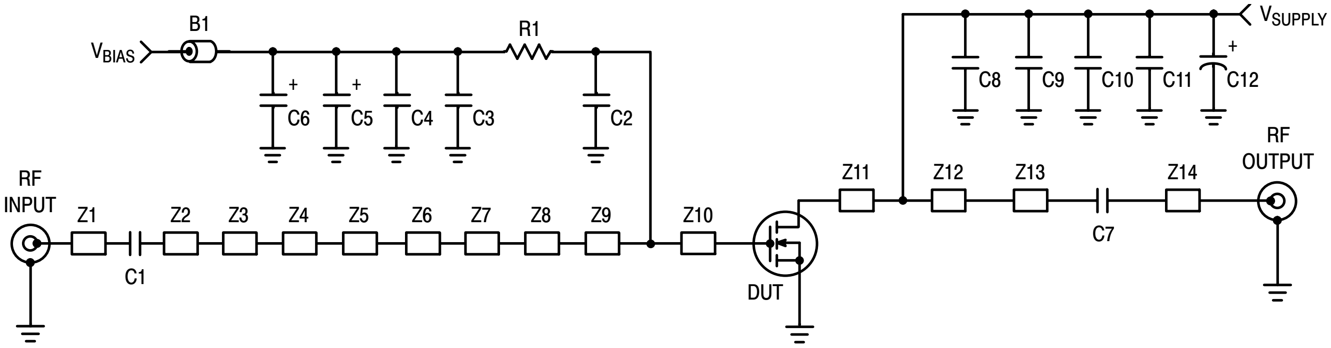
Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22-A114)	3A (Minimum)
Machine Model (per EIA/JESD22-A115)	A (Minimum)
Charge Device Model (per JESD22-C101)	IV (Minimum)

Table 4. Electrical Characteristics (T$_A$ = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 68 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}	—	—	1	μAdc
On Characteristics					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 250 μAdc)	$V_{GS(th)}$	1	2	3	Vdc
Gate Quiescent Voltage (V_{DD} = 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 = 2.2 Adc)	$V_{DS(on)}$	0.1	0.21	0.3	Vdc
Dynamic Characteristics [1]					
Reverse Transfer Capacitance (V_{DS} = 28 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{rss}	—	1.5	—	pF
Functional Tests (In Freescale Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQ} = 1000 mA, P_{out} = 20 W Avg., f1 = 2390 MHz, f2 = 2400 MHz, 2- Carrier W- CDMA, 3.84 MHz Channel Bandwidth Carriers. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset. IM3 measured in 3.84 MHz Bandwidth @ ±10 MHz Offset. PAR = 8.5 dB @ 0.01% Probability on CCDF.					
Power Gain	G_{ps}	14	15.4	17	dB
Drain Efficiency	η_D	22.5	23.5	—	%
Intermodulation Distortion	IM3	-35	-37	—	dBc
Adjacent Channel Power Ratio	ACPR	-38	-40.5	—	dBc
Input Return Loss	IRL	—	-10	—	dB

1. Part is internally matched both on input and output.



Z1	0.725″ x 0.080″ Microstrip	Z9	0.329″ x 0.756″ Microstrip
Z2	0.240″ x 0.080″ Microstrip	Z10	0.083″ x 0.756″ Microstrip
Z3	0.110″ x 0.240″ Microstrip	Z11	0.092″ x 0.800″ Microstrip
Z4	0.140″ x 0.080″ Microstrip	Z12	0.436″ x 0.800″ Microstrip
Z5	0.167″ x 0.500″ Microstrip	Z13	0.974″ x 0.080″ Microstrip
Z6	0.130″ x 0.080″ Microstrip	Z14	0.727″ x 0.080″ Microstrip
Z7	0.250″ x 0.611″ Microstrip	PCB	Arlon CuClad 250GX-0300-55-22, 0.030″, ε_r = 2.55
Z8	0.060″ x 0.080″ Microstrip		

Figure 1. MRF6S23100HR3(HSR3) Test Circuit Schematic

Table 5. MRF6S23100HR3(HSR3) Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
B1	Ferrite Bead, Surface Mount	2743019447	Fair-Rite
C1, C2, C7, C8	5.6 pF Chip Capacitors, B Case	ATC100B5R6CT500XT	ATC
C3	0.01 μF Chip Capacitor	C1825C103J1RAC	Kemet
C4, C9	2.2 μF, 50 V Chip Capacitors	C1825C225J5RAC	Kemet
C5	22 μF, 25 V Tantalum Capacitor	T491D226K025AT	Kemet
C6	47 μF, 16 V Tantalum Capacitor	T491D476K016AT	Kemet
C10, C11	10 μF, 50 V Chip Capacitors	GRM55DR61H106KA88B	Murata
C12	330 μF, 63 V Electrolytic Capacitor	EMVY630GTR331MMH0S	Nippon Chemi-Con
R1	10 Ω, 1/4 W Chip Resistor	CRC120610R0FKEA	Vishay

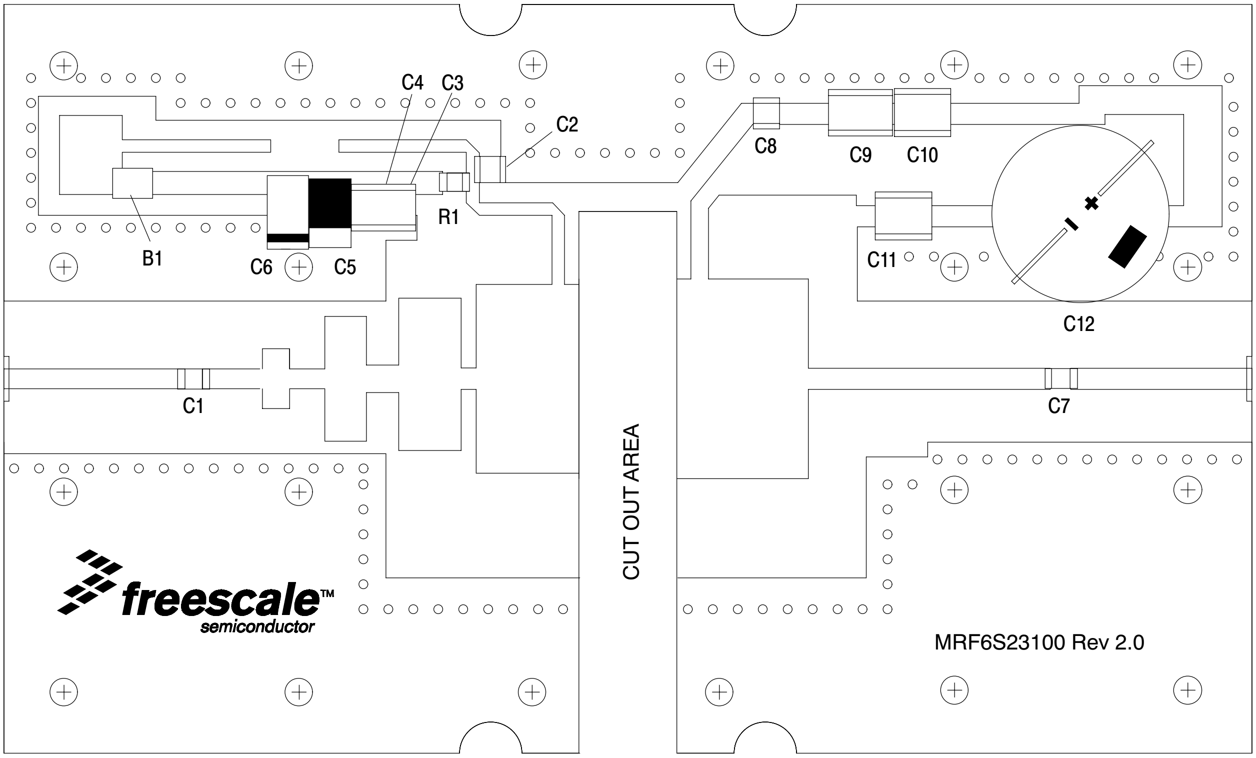


Figure 2. MRF6S23100HR3(HSR3) Test Circuit Component Layout

TYPICAL CHARACTERISTICS

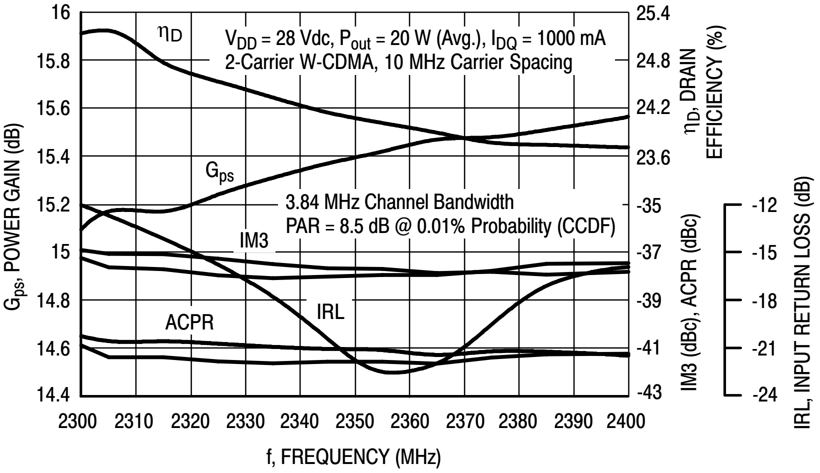


Figure 3. 2-Carrier W-CDMA Broadband Performance @ P_{out} = 20 Watts Avg.

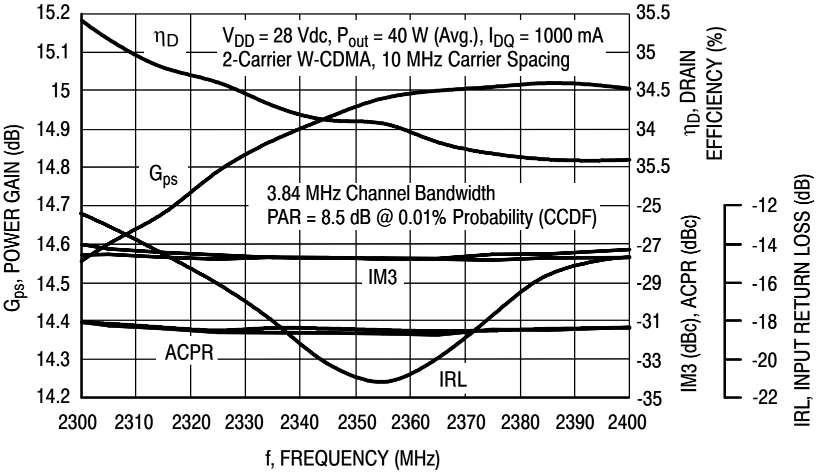


Figure 4. 2-Carrier W-CDMA Broadband Performance @ P_{out} = 40 Watts Avg.

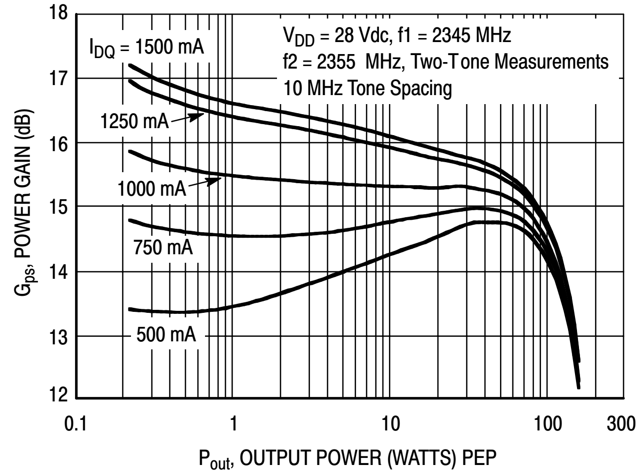


Figure 5. Two-Tone Power Gain versus Output Power

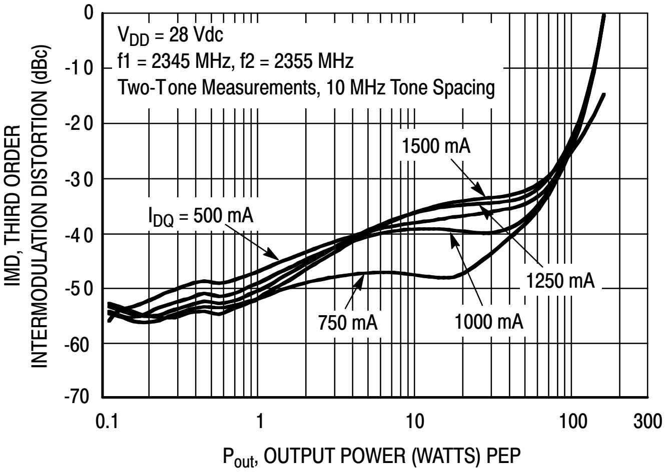


Figure 6. Third Order Intermodulation Distortion versus Output Power

TYPICAL CHARACTERISTICS

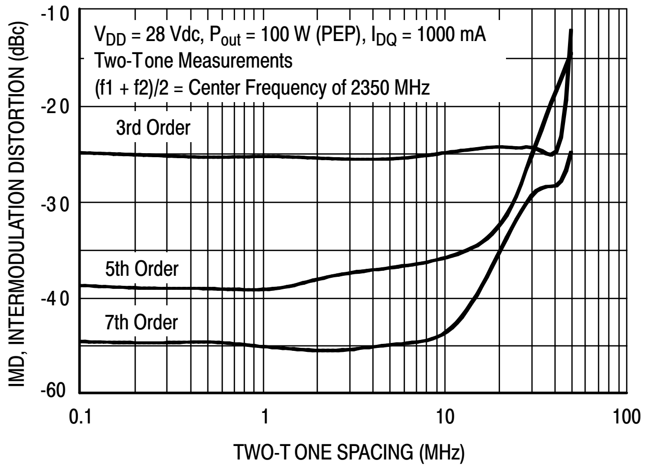


Figure 7. Intermodulation Distortion Products versus Tone Spacing

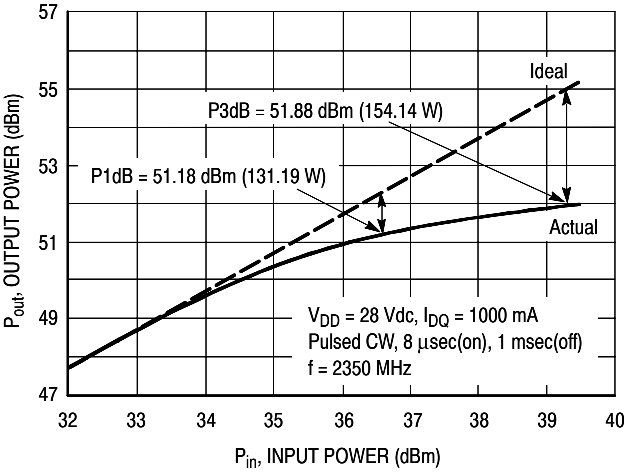


Figure 8. Pulsed CW Output Power versus Input Power

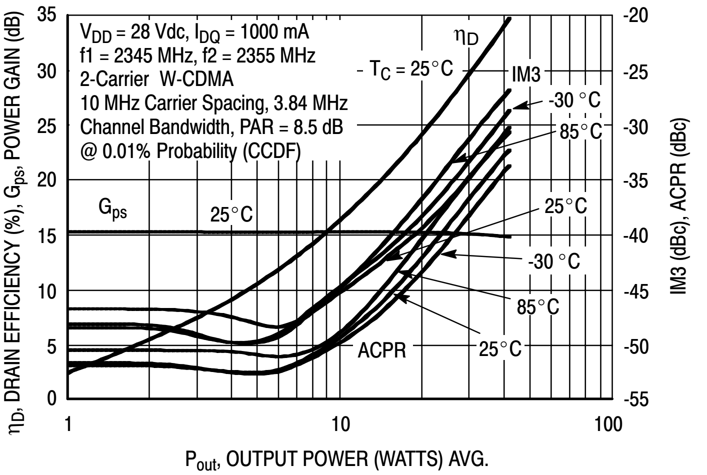


Figure 9. 2-Carrier W-CDMA ACPR, IM3, Power Gain and Drain Efficiency versus Output Power

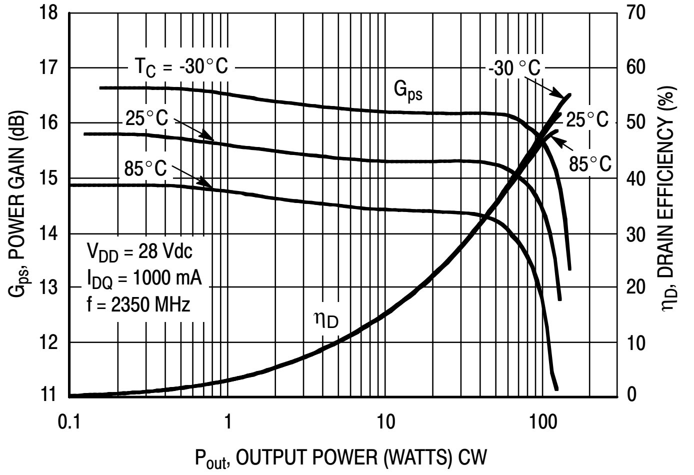


Figure 10. Power Gain and Drain Efficiency versus CW Output Power

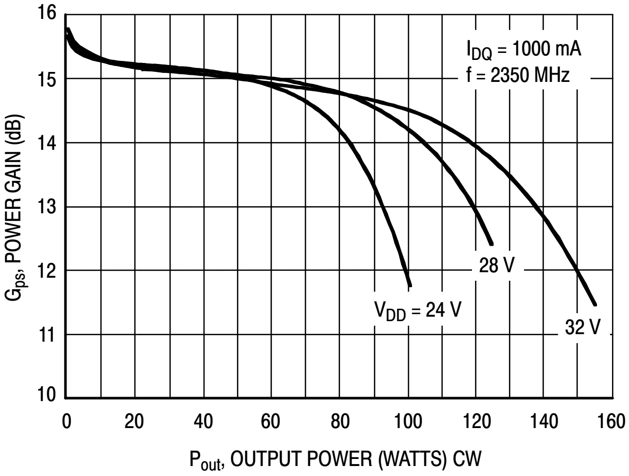
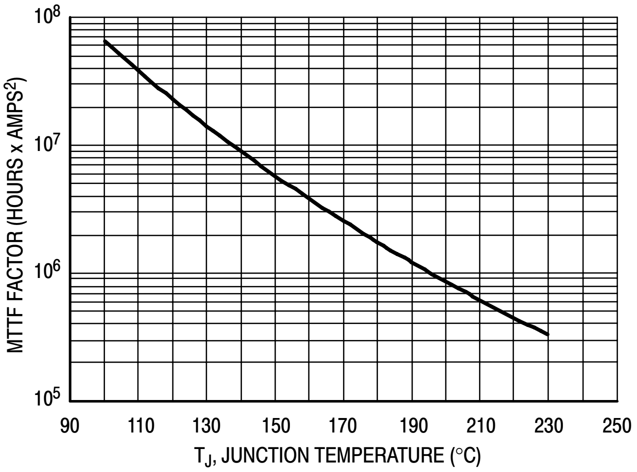


Figure 11. Power Gain versus Output Power

TYPICAL CHARACTERISTICS

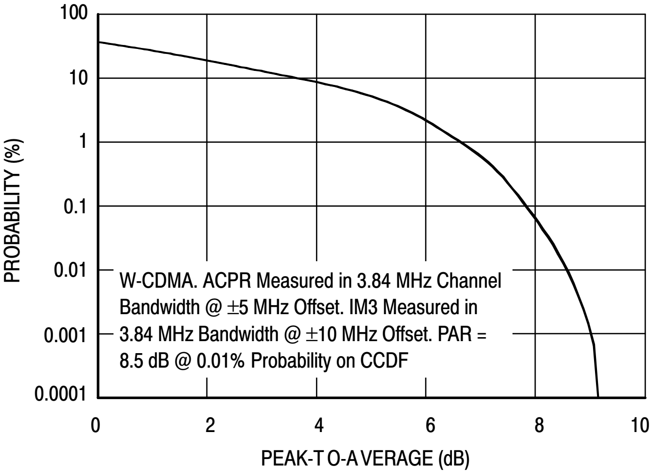


This above graph displays calculated MTTF in hours when the device is operated at V_{DD} = 28 Vdc, P_{out} = 20 W Avg., and η_D = 23.5%.

MTTF calculator available at http://www.freescale.com/rf. Select Software & Tools/Development Tools/Calculators to access MTTF calculators by product.

Figure 12. MTTF Factor versus Junction Temperature

W-CDMA TEST SIGNAL



W-CDMA. ACPR Measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset. IM3 Measured in 3.84 MHz Bandwidth @ ±10 MHz Offset. PAR = 8.5 dB @ 0.01% Probability on CCDF

Figure 13. CCDF W-CDMA 3GPP, Test Model 1, 64 DPCH, 67% Clipping, Single-Carrier Test Signal

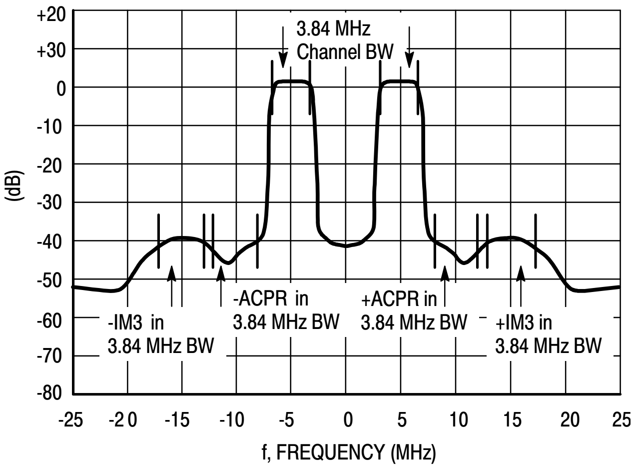
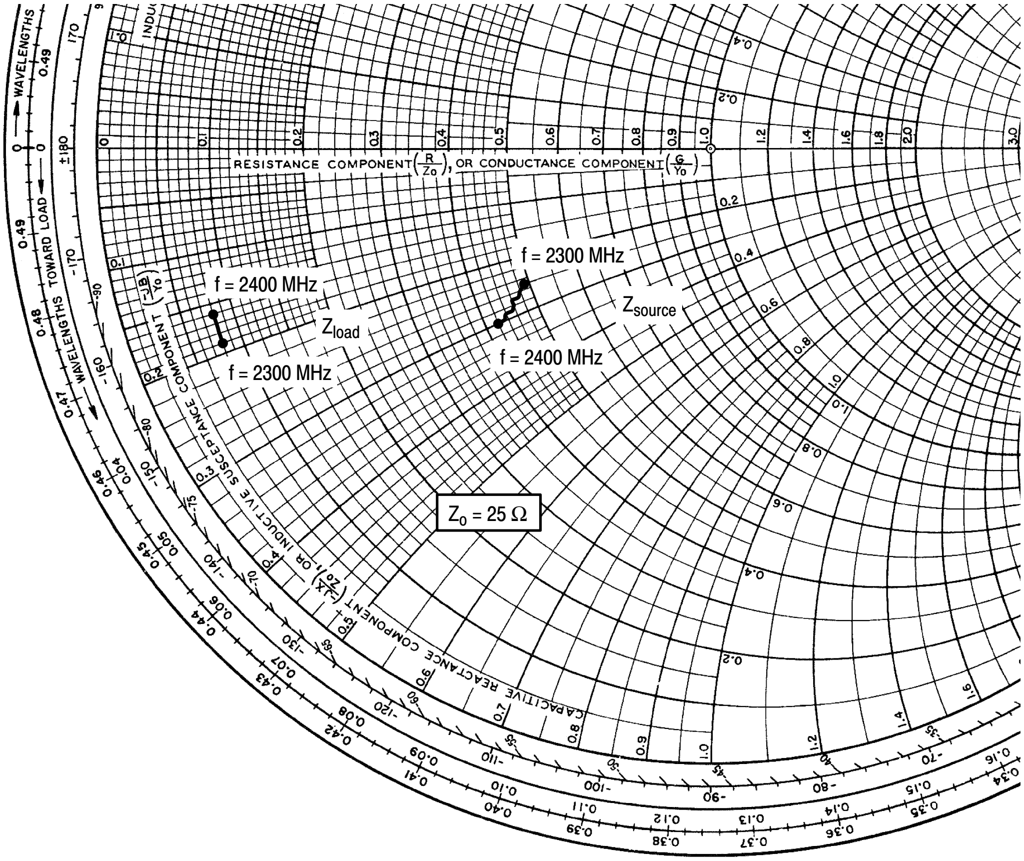


Figure 14. 2-Carrier W-CDMA Spectrum



V_{DD} = 28 Vdc, I_{DQ} = 1000 mA, P_{out} = 20 W Avg.

f MHz	Z_{source} Ω	Z_{load} Ω
2300	12.20 - j6.20	2.06 - j4.69
2310	12.06 - j6.40	2.04 - j4.62
2320	11.91 - j6.56	2.02 - j4.55
2330	11.76 - j6.71	2.01 - j4.48
2340	11.60 - j6.86	1.99 - j4.42
2350	11.44 - j7.00	1.97 - j4.35
2360	11.27 - j7.13	1.96 - j4.28
2370	11.10 - j7.22	1.94 - j4.22
2380	10.92 - j7.34	1.93 - j4.15
2390	10.73 - j7.46	1.91 - j4.09
2400	10.55 - j7.53	1.90 - j4.02

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

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

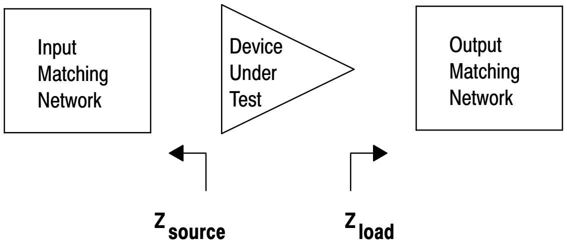
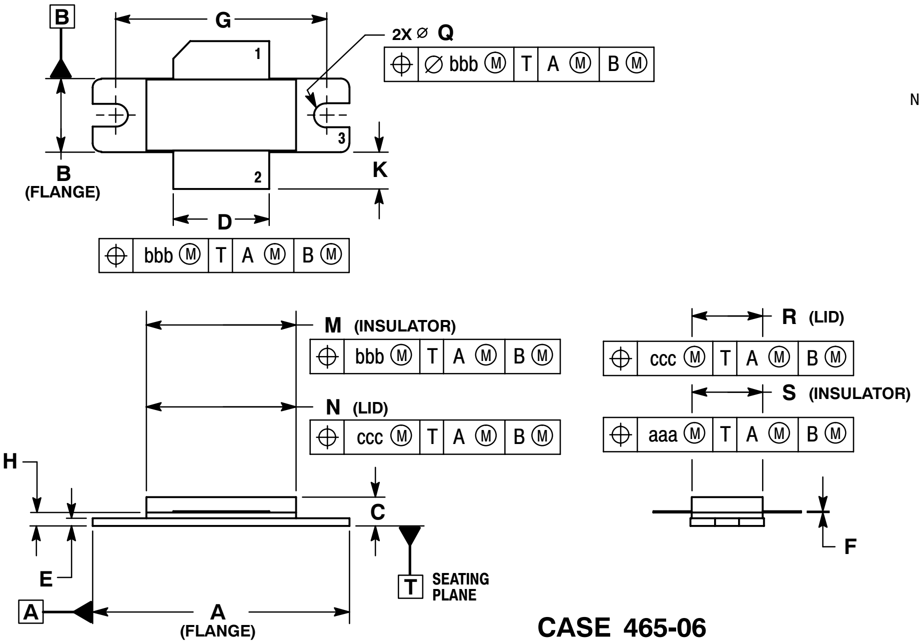


Figure 15. Series Equivalent Source and Load Impedance

PACKAGE DIMENSIONS

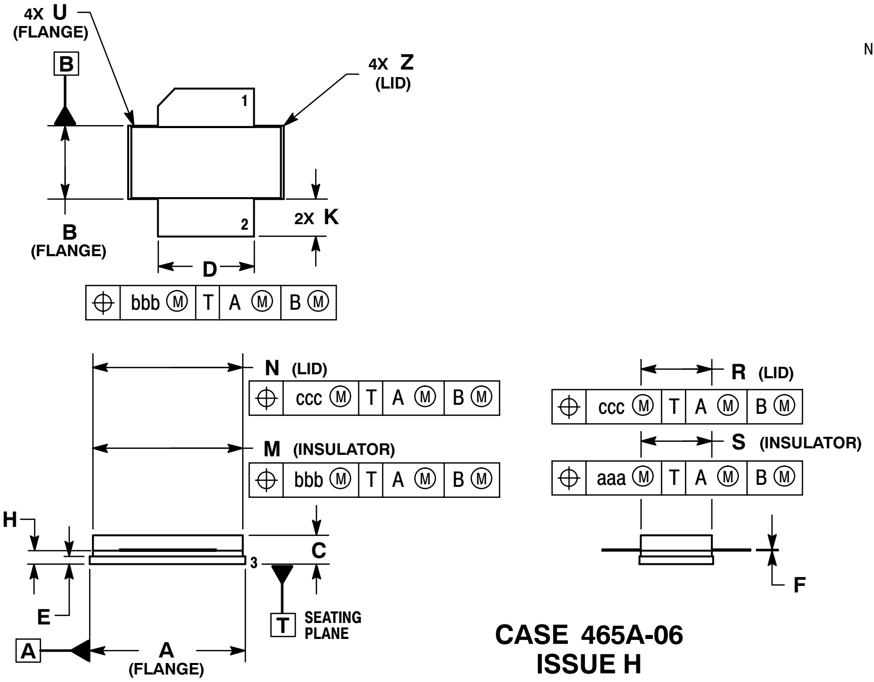


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	1.335	1.345	33.91	34.16
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
G	1.100 BSC		27.94 BSC	
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.774	0.786	19.66	19.96
N	0.772	0.788	19.60	20.00
Q	∅.118	∅.138	∅3.00	∅3.51
R	0.365	0.375	9.27	9.53
S	0.365	0.375	9.27	9.52
aaa	0.005 REF		0.127 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

CASE 465-06
ISSUE G
NI-780
MRF6S23100HR3



NOTES:
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2. CONTROLLING DIMENSION: INCH.
3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	0.805	0.815	20.45	20.70
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.774	0.786	19.61	20.02
N	0.772	0.788	19.61	20.02
R	0.365	0.375	9.27	9.53
S	0.365	0.375	9.27	9.52
U	---	0.040	---	1.02
Z	---	0.030	---	0.76
aaa	0.005 REF		0.127 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

STYLE 1:
PIN 1. DRAIN
2. GATE
5. SOURCE

CASE 465A-06
ISSUE H
NI-780S
MRF6S23100HSR3

PRODUCT DOCUMENTATION

Refer to the following documents to aid your design process.

Application Notes

- AN1955: Thermal Measurement Methodology of RF Power Amplifiers

Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices

REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
2	Dec. 2008	• Modified data sheet to reflect RF Test Reduction described in Product and Process Change Notification number, PCN13232, p. 1, 2 • Removed Lower Thermal Resistance and Low Gold Plating bullets from Features section as functionality is standard, p. 1 • Removed Total Device Dissipation from Max Ratings table as data was redundant (information already provided in Thermal Characteristics table), p. 1 • Operating Junction Temperature increased from 200°C to 225°C in Maximum Ratings table and related "Continuous use at maximum temperature will affect MTTF" footnote added, p. 1 • Corrected V_{DS} to V_{DD} in the RF test condition voltage callout for $V_{GS(Q)}$, On Characteristics table, p. 2 • Removed Forward Transconductance from On Characteristics table as it no longer provided usable information, p. 2 • Updated PCB information to show more specific material details, Fig. 1, Test Circuit Schematic, p. 3 • Updated Part Numbers in Table 5, Component Designations and Values, to latest RoHS compliant part numbers, p. 3 • Adjusted scale for Fig. 7, Intermodulation Distortion Products versus Tone Spacing, to show wider dynamic range, p. 6 • Removed lower voltage tests from Fig. 11, Power Gain versus Output Power, due to fixed tuned fixture limitations, p. 6 • Replaced Fig. 12, MTTF versus Junction Temperature with updated graph. Removed $Amps^2$ and listed operating characteristics and location of MTTF calculator for device, p. 7 • Added Product Documentation and Revision History, p. 10

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