Freescale Semiconductor
Technical Data

Document Number: MRF8P18265H
Rev. 1, 2/2012

RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

MRF8P18265HR6
MRF8P18265HSR6

1805-1880 MHz, 72 W AVG., 30 V
SINGLE W-CDMA
LATERAL N-CHANNEL
RF POWER MOSFETs

Designed for CDMA and multicarrier base station applications with frequencies from 1805 to 1880 MHz. Can be used in Class AB and Class C for all typical cellular base station modulation formats.

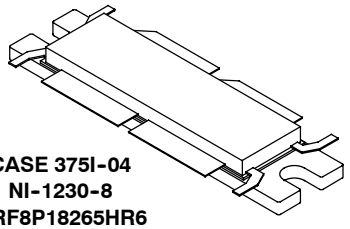
- Typical Doherty Single-Carrier W-CDMA Performance: V_{DD} = 30 Volts, I_{DQA} = 800 mA, V_{GSB} = 1.3 V, P_{out} = 72 Watts Avg., IQ Magnitude Clipping, Channel Bandwidth = 3.84 MHz, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

Frequency	G_{ps} (dB)	η_D (%)	Output PAR (dB)	ACPR (dBc)
1805 MHz	15.9	44.8	6.9	-31.7
1840 MHz	16.1	43.4	7.0	-31.7
1880 MHz	16.0	43.7	6.7	-32.2

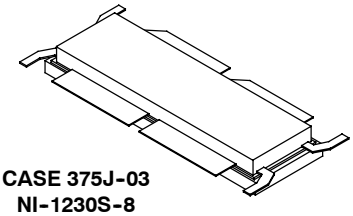
- Capable of Handling 10:1 VSWR, @ 32 Vdc, 1840 MHz, 280 Watts CW Output Power (2 dB Input Overdrive from Rated P_{out})
- Typical P_{out} @ 3 dB Compression Point ≃ 280 Watts CW

Features

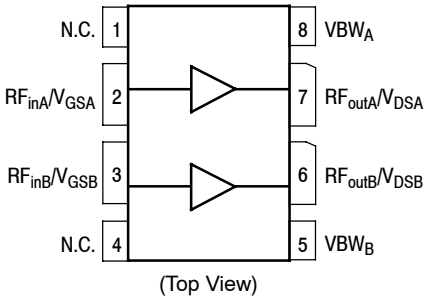
- Production Tested in a Symmetrical Doherty Configuration
- 100% PAR Tested for Guaranteed Output Power Capability
- Characterized with Large-Signal Load-Pull Parameters and Common Source S-Parameters
- Internally Matched for Ease of Use
- Integrated ESD Protection
- Greater Negative Gate-Source Voltage Range for Improved Class C Operation
- Designed for Digital Predistortion Error Correction Systems
- In Tape and Reel. R6 Suffix = 150 Units per 56 mm, 13 inch Reel.



CASE 375I-04
NI-1230-8
MRF8P18265HR6



CASE 375J-03
NI-1230S-8
MRF8P18265HSR6



(Top View)

Figure 1. Pin Connections

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +65	Vdc
Gate-Source Voltage	V_{GS}	-6.0, +10	Vdc
Operating Voltage	V_{DD}	32, +0	Vdc
Storage Temperature Range	T_{stg}	-65 to +150	°C
Case Operating Temperature	T_C	150	°C
Operating Junction Temperature (1,2)	T_J	225	°C
CW Operation @ T_C = 25°C Derate above 25°C	CW	446 4.5	W W/°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (2,3)	Unit
Thermal Resistance, Junction to Case Case Temperature 74°C, 72.5 W CW, 30 Vdc, I_{DQA} = 800 mA, V_{GSB} = 1.3 V, 1880 MHz Case Temperature 90°C, 260 W CW(4), 30 Vdc, I_{DQA} = 800 mA, V_{GSB} = 1.3 V, 1880 MHz	$R_{\theta JC}$	 0.27 0.25	°C/W

1. Continuous use at maximum temperature will affect MTTF.
2. MTTF calculator available at http://www.freescale.com/rf. Select Software & Tools/Development Tools/Calculators to access MTTF calculators by product.
3. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.
4. Exceeds recommended operating conditions. See CW operation data in Maximum Ratings table.

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Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22-A114)	2
Machine Model (per EIA/JESD22-A115)	A
Charge Device Model (per JESD22-C101)	IV

Table 4. Electrical Characteristics (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics (1)					
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} = 30 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 (1)					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 200 μAdc)	$V_{GS(th)}$	1.1	1.9	2.6	Vdc
Gate Quiescent Voltage (V_{DD} = 30 Vdc, I_{DA} = 800 mAdc, Measured in Functional Test)	$V_{GS(Q)}$	1.8	2.6	3.3	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 2 Adc)	$V_{DS(on)}$	0.1	0.15	0.3	Vdc
Functional Tests (2,3) (In Freescale Doherty Test Fixture, 50 ohm system) V_{DD} = 30 Vdc, I_{DQA} = 800 mA, V_{GSB} = 1.3 V, P_{out} = 72 W Avg., f = 1880 MHz, Single-Carrier W-CDMA, IQ Magnitude Clipping, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset.					
Power Gain	G_{ps}	13.8	16.0	17.0	dB
Drain Efficiency	η_D	41.0	43.7	—	%
Output Peak-to-Average Ratio @ 0.01% Probability on CCDF	PAR	6.0	6.7	—	dB
Adjacent Channel Power Ratio	ACPR	—	-32.2	-28.0	dBc

Typical Broadband Performance (3) (In Freescale Doherty Test Fixture, 50 ohm system) V_{DD} = 30 Vdc, I_{DQA} = 800 mA, V_{GSB} = 1.3 V, P_{out} = 72 W Avg., Single-Carrier W-CDMA, IQ Magnitude Clipping, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset.

Frequency	G_{ps} (dB)	η_D (%)	Output PAR (dB)	ACPR (dBc)
1805 MHz	15.9	44.8	6.9	-31.7
1840 MHz	16.1	43.4	7.0	-31.7
1880 MHz	16.0	43.7	6.7	-32.2

1. Each side of device measured separately.
2. Part internally matched both on input and output.
3. Measurement made with device in a symmetrical Doherty configuration.

(continued)

Table 4. Electrical Characteristics (T_A = 25°C unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Typical Performance (1) (In Freescale Doherty Test Fixture, 50 ohm system) V_{DD} = 30 Vdc, I_{DQA} = 800 mA, V_{GSB} = 1.3 V, 1805–1880 MHz Bandwidth					
P_{out} @ 1 dB Compression Point, CW	P1dB	—	224	—	W
P_{out} @ 3 dB Compression Point, CW	P3dB	—	280	—	W
IMD Symmetry @ 17 W PEP, P_{out} where IMD Third Order Intermodulation ≅ 30 dBc (Delta IMD Third Order Intermodulation between Upper and Lower Sidebands > 2 dB)	IMD_{sym}	—	72	—	MHz
VBW Resonance Point (IMD Third Order Intermodulation Inflection Point)	VBW_{res}	—	88	—	MHz
Gain Flatness in 75 MHz Bandwidth @ P_{out} = 72 W Avg.	G_F	—	0.4	—	dB
Gain Variation over Temperature (–30°C to +85°C)	ΔG	—	0.01	—	dB/°C
Output Power Variation over Temperature (–30°C to +85°C) (2)	ΔP1dB	—	0.005	—	dB/°C

1. Measurement made with device in a symmetrical Doherty configuration.
2. Exceeds recommended operating conditions. See CW operation data in Maximum Ratings table.

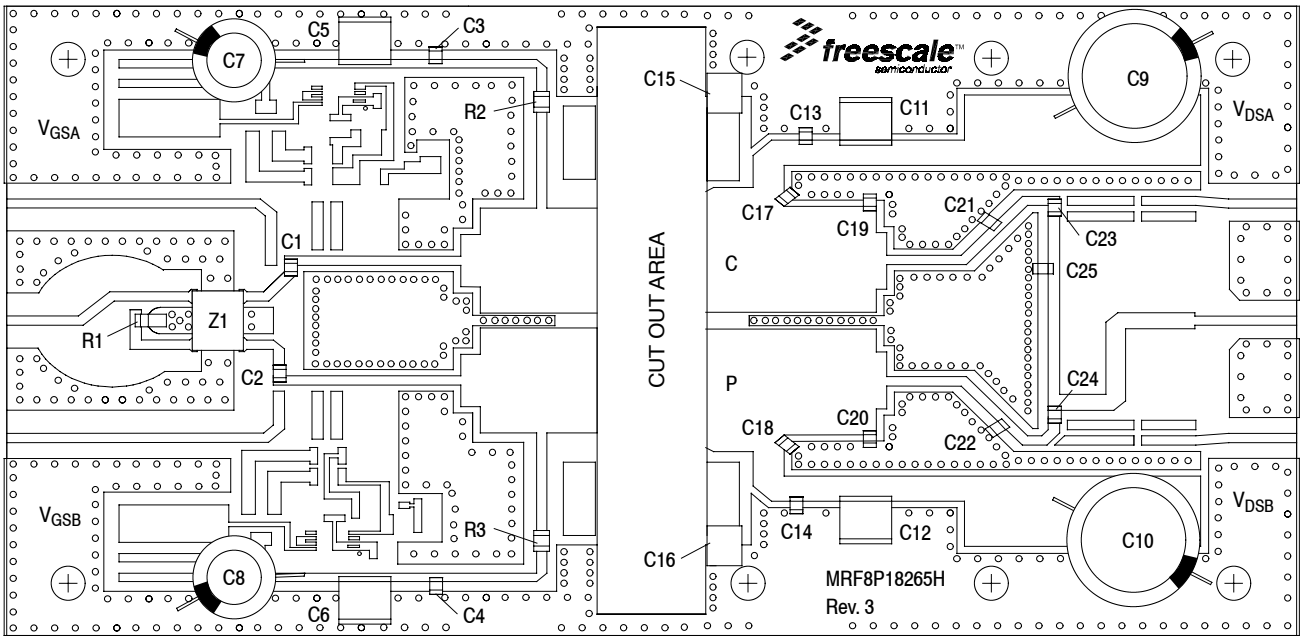


Figure 2. MRF8P18265HR6(HSR6) Test Circuit Component Layout

Table 5. MRF8P18265HR6(HSR6) Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2, C3, C4, C13, C14, C23, C24	15 pF Chip Capacitors	ATC600F150JT250XT	ATC
C5, C6, C11, C12	10 μF, 50 V Chip Capacitors	GRM55DR61H106KA88L	Murata
C7, C8	100 μF, 50 V Chip Capacitors	MCGPR50V107M8X11	Multicomp
C9, C10	470 μF, 63 V Chip Capacitors	MCGPR63V477M13X26-RH	Multicomp
C15, C16	6.8 μF Chip Capacitors	C4532X7RIH685KT	TDK
C17, C18	2.2 pF Chip Capacitors	ATC600F2R2BT250XT	ATC
C19, C20	0.8 pF Chip Capacitors	ATC600F0R8BT250XT	ATC
C21, C22	0.3 pF Chip Capacitors	ATC600F0R3BT250XT	ATC
C25	0.1 pF Chip Capacitor	ATC600F0R1BT250XT	ATC
R1	50 Ω, 4 W Chip Resistor	CW12010T0050GBK	ATC
R2, R3	10 Ω, 1/4 W Chip Resistors	CRCW120610R0FKEA	Vishay
Z1	1900 MHz Band 90°, 3 dB Chip Hybrid Coupler	GCS351-HYB1900	Soshin
PCB	0.020″, ε_r = 3.5	RF-35	Taconic

TYPICAL CHARACTERISTICS

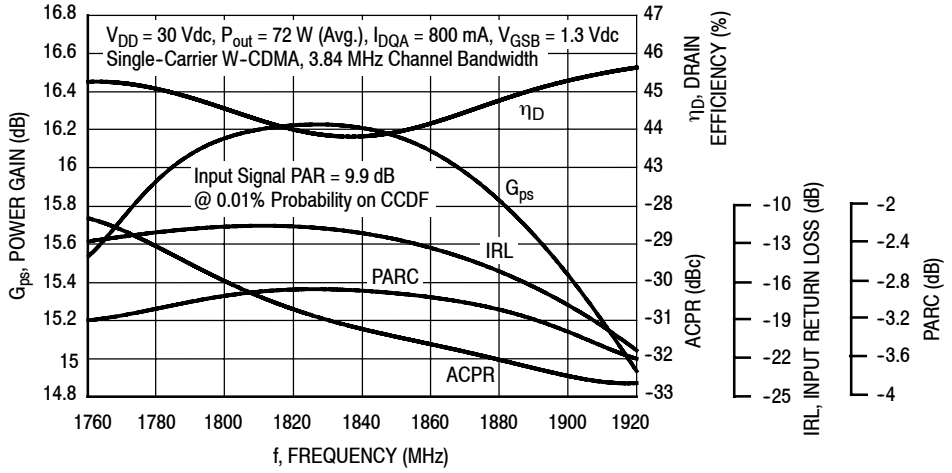


Figure 3. Output Peak-to-Average Ratio Compression (PARC) Broadband Performance @ P_{out} = 72 Watts Avg.

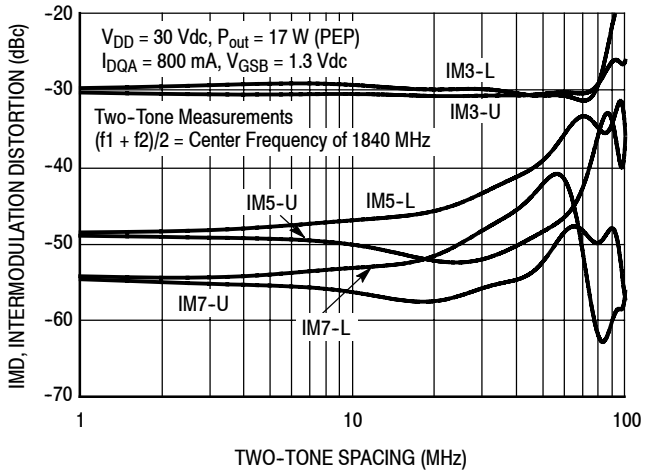


Figure 4. Intermodulation Distortion Products versus Two-Tone Spacing

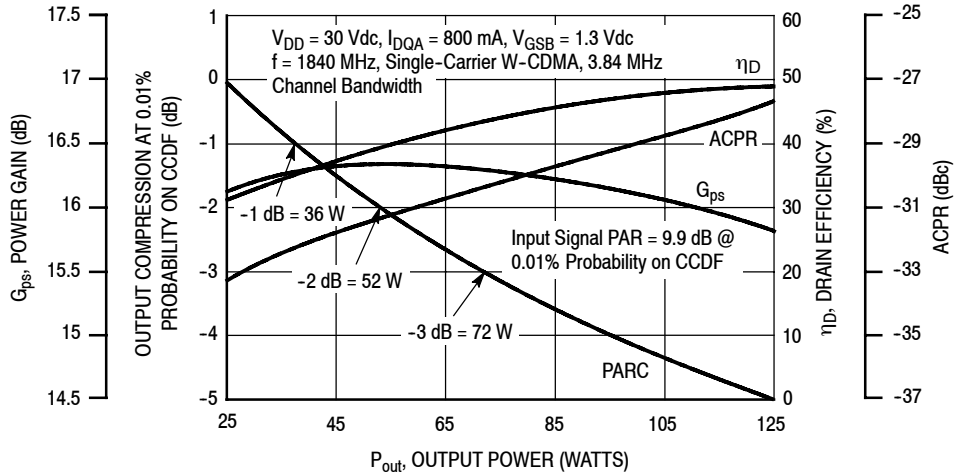


Figure 5. Output Peak-to-Average Ratio Compression (PARC) versus Output Power

TYPICAL CHARACTERISTICS

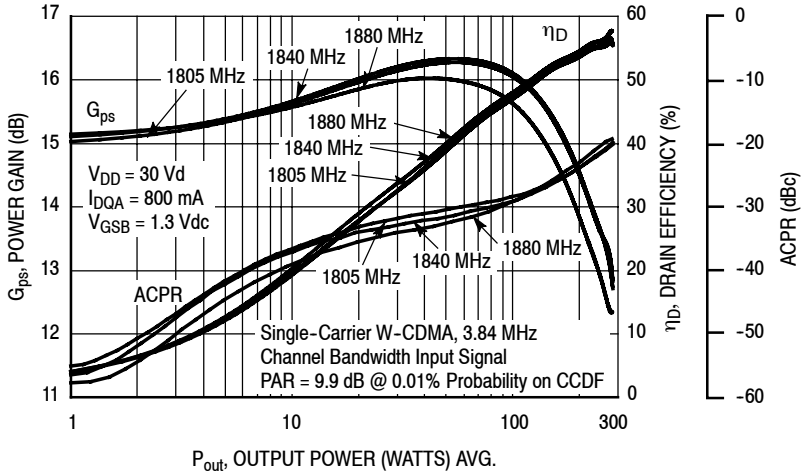


Figure 6. Single-Carrier W-CDMA Power Gain, Drain Efficiency and ACPR versus Output Power

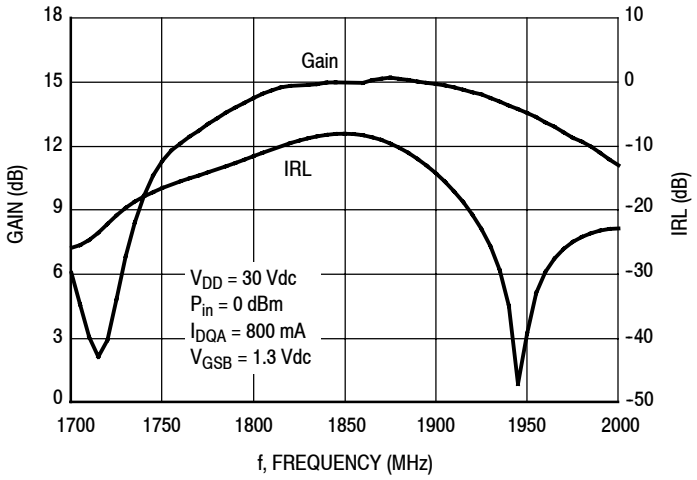


Figure 7. Broadband Frequency Response

W-CDMA TEST SIGNAL

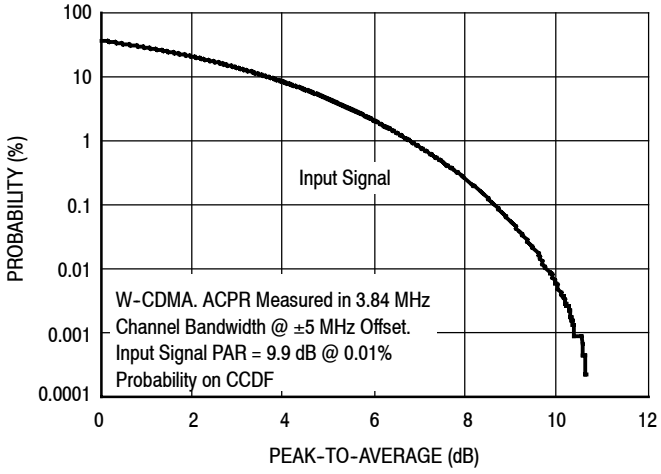


Figure 8. CCDF W-CDMA IQ Magnitude Clipping, Single-Carrier Test Signal

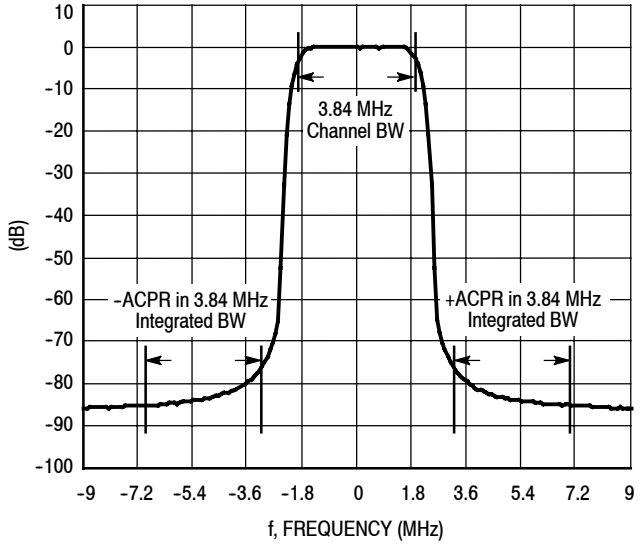


Figure 9. Single-Carrier W-CDMA Spectrum

V_{DD} = 30 Vdc, I_{DQA} = 800 mA

f MHz	Max P_{out} (1) Watts	Max P_{out} (1) dBm	Z_{source} Ω	Z_{load} Ω
1805	195	52.9	2.38 – j6.43	1.31 – j2.51
1840	195	52.9	3.70 – j7.13	1.21 – j2.50
1880	190	52.8	4.23 – j7.74	1.24 – j2.51

(1) Maximum output power measurement reflects pulsed 1 dB gain compression.

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

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

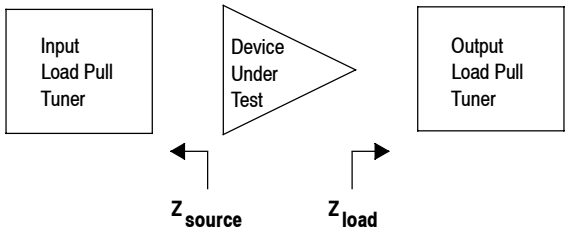


Figure 10. Carrier Side Load Pull Performance — Maximum P1dB Tuning

V_{DD} = 30 Vdc, I_{DQA} = 800 mA

f MHz	Max Eff. (1) %	Z_{source} Ω	Z_{load} Ω
1805	69.3	2.38 – j6.43	3.10 – j1.22
1840	68.9	3.70 – j7.13	2.59 – j1.37
1880	68.3	4.23 – j7.74	2.47 – j1.17

(1) Maximum output power measurement reflects pulsed 1 dB gain compression.

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

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

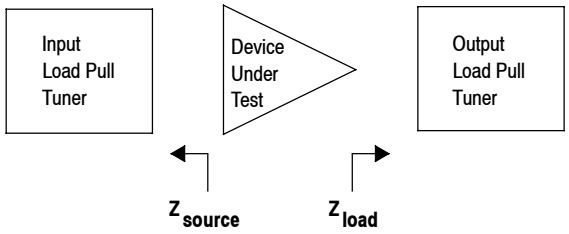
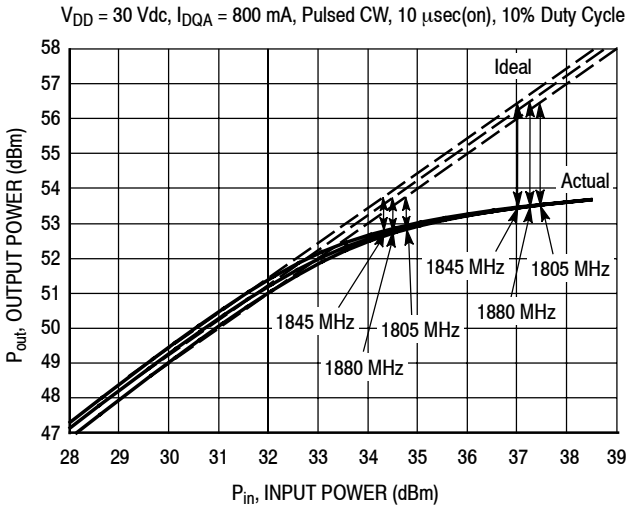


Figure 11. Carrier Side Load Pull Performance — Maximum Efficiency Tuning

ALTERNATIVE PEAK TUNE LOAD PULL CHARACTERISTICS



NOTE: Load Pull Test Fixture Tuned for Peak P1dB Output Power @ 30 V

f (MHz)	P1dB		P3dB	
	Watts	dBm	Watts	dBm
1805	197	52.9	226	53.5
1845	194	52.9	223	53.5
1880	190	52.8	226	53.5

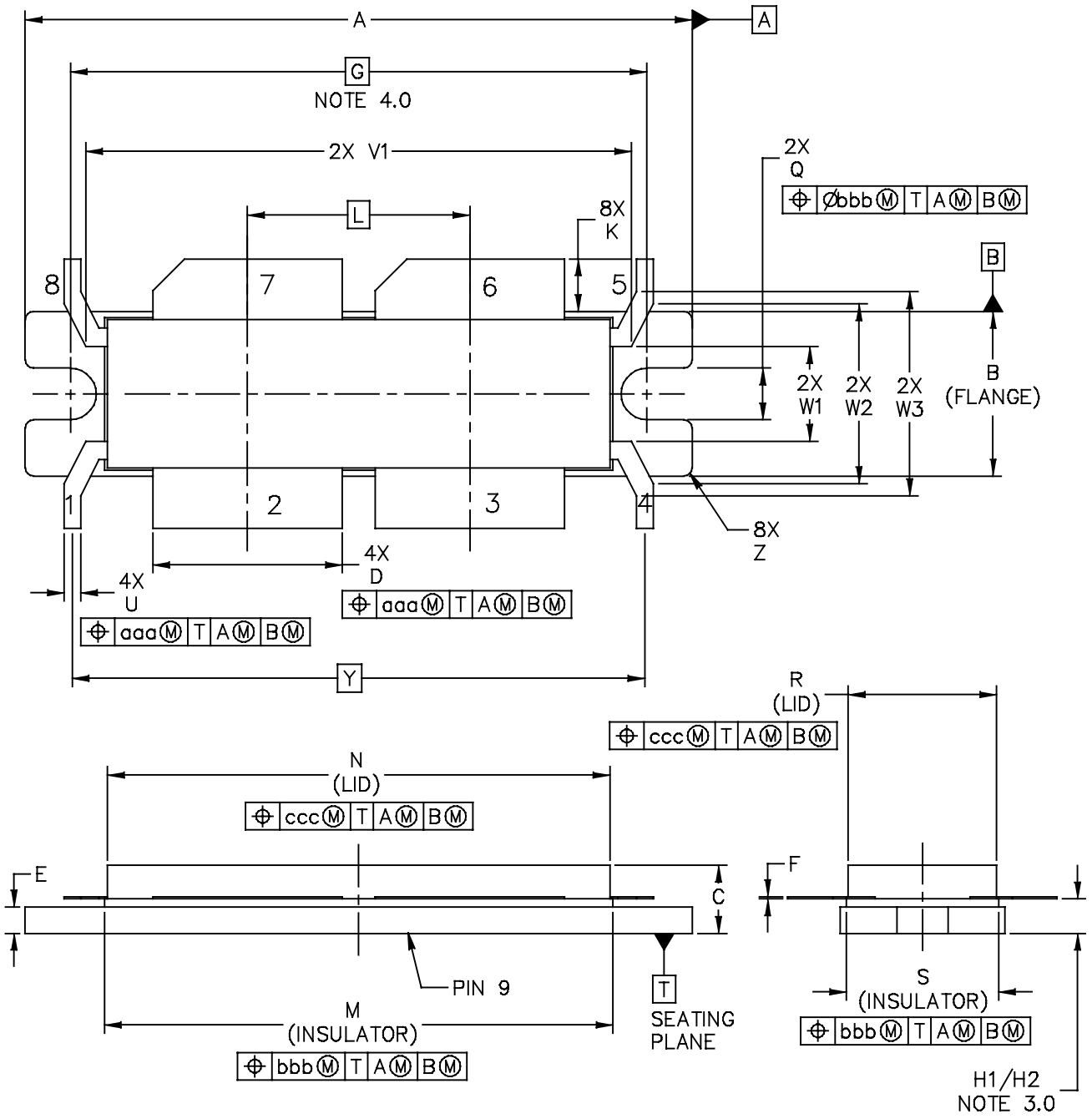
Test Impedances per Compression Level

f (MHz)		Z_{source} Ω	Z_{load} Ω
1805	P1dB	2.38 – j6.43	1.30 – j2.46
1845	P1dB	3.70 – j7.13	1.40 – j2.51
1880	P1dB	4.23 – j7.74	1.27 – j2.55

Figure 12. Pulsed CW Output Power versus Input Power @ 30 V

NOTE: Measurement made on the Class AB, carrier side of the device.

PACKAGE DIMENSIONS



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	CASE NUMBER: 375I−04	18 JUL 2011
	STANDARD: NON−JEDEC	

NOTES:

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

2.0 CONTROLLING DIMENSION: INCH

3.0 DIMENSION H1 AND H2 ARE MEASURED .030 (0.762) AWAY FROM PACKAGE BODY.
H1 APPLIES TO PINS 2,3,6,7. H2 APPLIES TO PINS 1,4,5,8.

4.0 RECOMMENDED BOLT CENTER DIMENSION OF 1.52 (38.61) BASED ON M3 SCREW.

DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX
A	1.615	1.625	41.02	41.28	N	1.218	1.242	30.94	31.55
B	.395	.405	10.03	10.29	Q	.120	.130	3.05	3.3
C	.150	.200	3.81	5.08	R	.365	.375	9.27	9.53
D	.455	.465	11.56	11.81	S	.365	.375	9.27	9.53
E	.062	.066	1.57	1.68	V1	1.320	1.330	33.53	33.78
F	.004	.007	0.10	0.18	U	.035	.045	0.89	1.14
G	1.400 BSC		35.56 BSC		W1	.225	.235	5.72	5.97
H1	.082	.090	2.08	2.29	W2	.431	.441	10.95	11.20
H2	.078	.094	1.98	2.39	W3	.491	.501	12.47	12.73
K	.117	.137	2.97	3.48	Y	1.390 BSC		35.31 BSC	
L	.540 BSC		13.72 BSC		Z	---	R.020	---	R0.51
M	1.219	1.241	30.96	31.52	aaa	.013		0.33	
					bbb	.010		0.25	
					ccc	.020		0.51	

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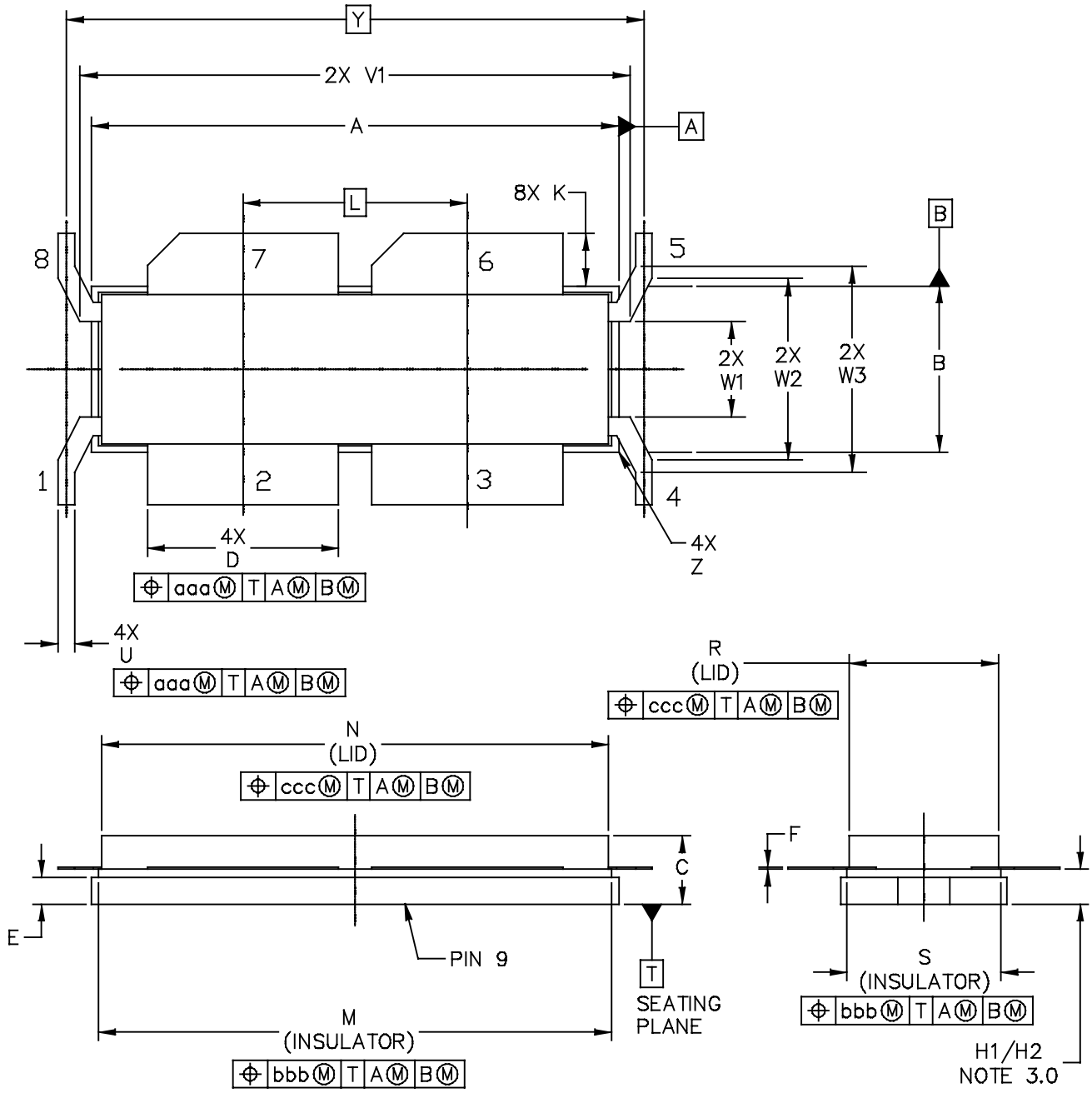

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	STANDARD: NON−JEDEC	

NOTES:

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

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H1 APPLIES TO PINS 2,3,6,7. H2 APPLIES TO PINS 1,4,5,8.

4.0 –DELETED–

DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX
A	1.265	1.275	32.13	32.39	N	1.218	1.242	30.94	31.55
B	.395	.405	10.03	10.29	R	.365	.375	9.27	9.53
C	.150	.200	3.81	5.08	S	.365	.375	9.27	9.53
D	.455	.465	11.56	11.81	U	.035	.045	0.89	1.14
E	.062	.066	1.57	1.68	V1	1.320	1.330	33.53	33.78
F	.004	.007	0.10	0.18	T3	DELETED		DELETED	
H1	.082	.090	2.08	2.29	W1	.225	.235	5.72	5.97
H2	.078	.094	1.98	2.39	W2	.431	.441	10.95	10.20
K	.117	.137	2.97	3.48	W3	.491	.501	12.47	12.73
L	.540 BSC		13.72 BSC		Y	1.390 BSC		35.31 BSC	
M	1.219	1.241	30.96	31.52	Z	---	R.040	---	R1.02
					aaa	.005		0.13	
					bbb	.010		0.25	
					ccc	.020		0.51	

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CASE NUMBER: 375J–03 | 18 JUL 2011

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PRODUCT DOCUMENTATION AND SOFTWARE

Refer to the following documents and software 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

Software

- Electromigration MTTF Calculator
- RF High Power Model
- .s2p File

For Software, do a Part Number search at http://www.freescale.com, and select the “Part Number” link. Go to the Software & Tools tab on the part’s Product Summary page to download the respective tool.

REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
0	Aug. 2010	• Initial Release of Data Sheet
1	Feb. 2012	• Table 3, ESD Protection Characteristics, removed the word “Minimum” after the ESD class rating. ESD ratings are characterized during new product development but are not 100% tested during production. ESD ratings provided in the data sheet are intended to be used as a guideline when handling ESD sensitive devices, p. 2 • Removed Fig. 5, Possible Circuit Topologies, and renumbered all subsequent figures, p. 5–8 • Replaced Case Outline 375I–03, Issue B with 375I–04, Issue C, p. 1, 9, 10. On Sheet 2, changed dimension F in mm from 0.1–0.18 to 0.10–0.18, changed dimension U in mm from 0.89–1.02 to 0.89–1.14, changed dimension W3 in mm from 12.47–12.72 to 12.47–12.73. • Replaced Case Outline 375J–02, Issue A with 375J–03, Issue B, p. 1, 11, 12. On Sheet 2, changed dimension A in mm from 32.13–32.38 to 32.13–32.39, changed dimension F in mm from 0.1–0.18 to 0.10–0.18, changed dimension U in mm from 8.89–11.43 to 0.89–1.14.

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