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MD7IC2755GNR1

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Freescale Semiconductor
Technical Data

Document Number: MD7IC2755N
Rev. 3, 9/2010

RoHS

RF LDMOS Wideband Integrated Power Amplifiers

MD7IC2755NR1
MD7IC2755GNR1

2500–2700 MHz, 10 W AVG., 28 V
WiMAX
RF LDMOS WIDEBAND
INTEGRATED POWER AMPLIFIERS

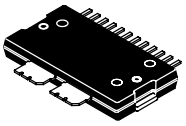
The MD7IC2755N wideband integrated circuit is designed with on–chip matching that makes it usable from 2500–2700 MHz. This multi–stage structure is rated for 26 to 32 Volt operation and covers all typical cellular base station modulations.

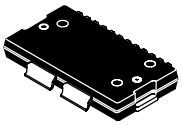
- Typical Doherty WiMAX Performance: V_{DD} = 28 Volts, I_{DQ1A} = I_{DQ1B} = 80 mA, I_{DQ2B} = 275 mA, V_{G2A} = 1.7 Vdc, P_{out} = 10 Watts Avg., f = 2700 MHz, OFDM 802.16d, 64 QAM $^3/_4$, 4 Bursts, 10 MHz Channel Bandwidth, Input Signal PAR = 9.5 dB @ 0.01% Probability on CCDF.
  - Power Gain — 25 dB
  - Power Added Efficiency — 25%
  - Device Output Signal PAR — 8.5 dB @ 0.01% Probability on CCDF
  - ACPR @ 8.5 MHz Offset — –37 dBc in 1 MHz Channel Bandwidth
- Capable of Handling 10:1 VSWR, @ 32 Vdc, 2600 MHz, 90 Watts CW Output Power (3 dB Input Overdrive from Rated P_{out})
- Stable into a 10:1 VSWR. All Spurs Below –60 dBc @ 100 mW to 10 Watts CW P_{out}
- Typical P_{out} @ 1 dB Compression Point ≃ 30 Watts CW

Features

- Production Tested in a Symmetrical Doherty Configuration
- 100% PAR Tested for Guaranteed Output Power Capability
- Characterized with Series Equivalent Large–Signal Impedance Parameters and Common Source S–Parameters
- On–Chip Matching (50 Ohm Input, DC Blocked)
- Integrated Quiescent Current Temperature Compensation with Enable/Disable Function (1)
- Integrated ESD Protection
- 225°C Capable Plastic Package
- RoHS Compliant
- In Tape and Reel. R1 Suffix = 500 Units per 44 mm, 13 inch Reel.

CASE 1618–02
TO–270 WB–14
PLASTIC
MD7IC2755NR1





CASE 1621–02
TO–270 WB–14 GULL
PLASTIC
MD7IC2755GNR1

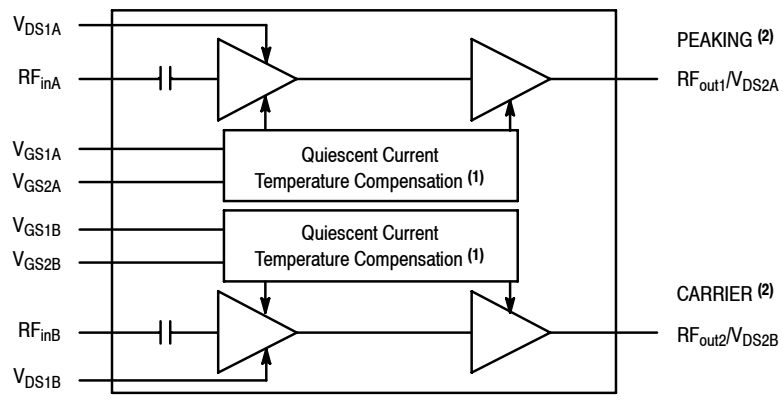
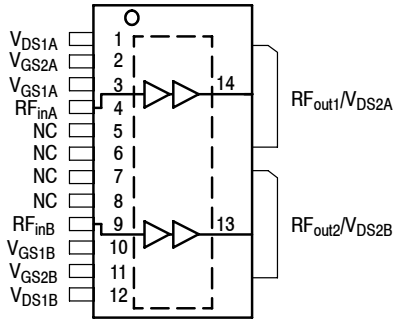


Figure 1. Functional Block Diagram



(Top View)

Note: Exposed backside of the package is the source terminal for the transistors.

Figure 2. Pin Connections

1. Refer to AN1977, *Quiescent Current Thermal Tracking Circuit in the RF Integrated Circuit Family* and to AN1987, *Quiescent Current Control for the RF Integrated Circuit Device Family*. Go to http://www.freescale.com/rf. Select Documentation/Application Notes – AN1977 or AN1987.
2. Peaking and Carrier orientation is determined by the test fixture design.

freescale semiconductor

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	-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 +150	°C
Case Operating Temperature	T_C	150	°C
Operating Junction Temperature (1,2)	T_J	225	°C
Input Power	P_{in}	30	dBm

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (2,3)	Unit
Final Doherty Application			
Thermal Resistance, Junction to Case	$R_{\theta JC}$		°C/W
Case Temperature 72°C, P_{out} = 10 W CW, 2600 MHz			
Stage 1A, 1B, 28 Vdc, I_{DQ1A} = I_{DQ1B} = 80 mA		2.6	
Stage 2A, 2B, 28 Vdc, I_{DQ2B} = 275 mA, V_{G2A} = 1.7 Vdc		1.8	
Case Temperature 90°C, P_{out} = 55 W CW, 2600 MHz			
Stage 1A, 1B, 28 Vdc, I_{DQ1A} = I_{DQ1B} = 80 mA		2.3	
Stage 2A, 2B, 28 Vdc, I_{DQ2B} = 275 mA, V_{G2A} = 1.7 Vdc		1.1	

Table 3. ESD Protection Characteristics

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)	III (Minimum)

Table 4. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD22-A113, IPC/JEDEC J-STD-020	3	260	°C

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.

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

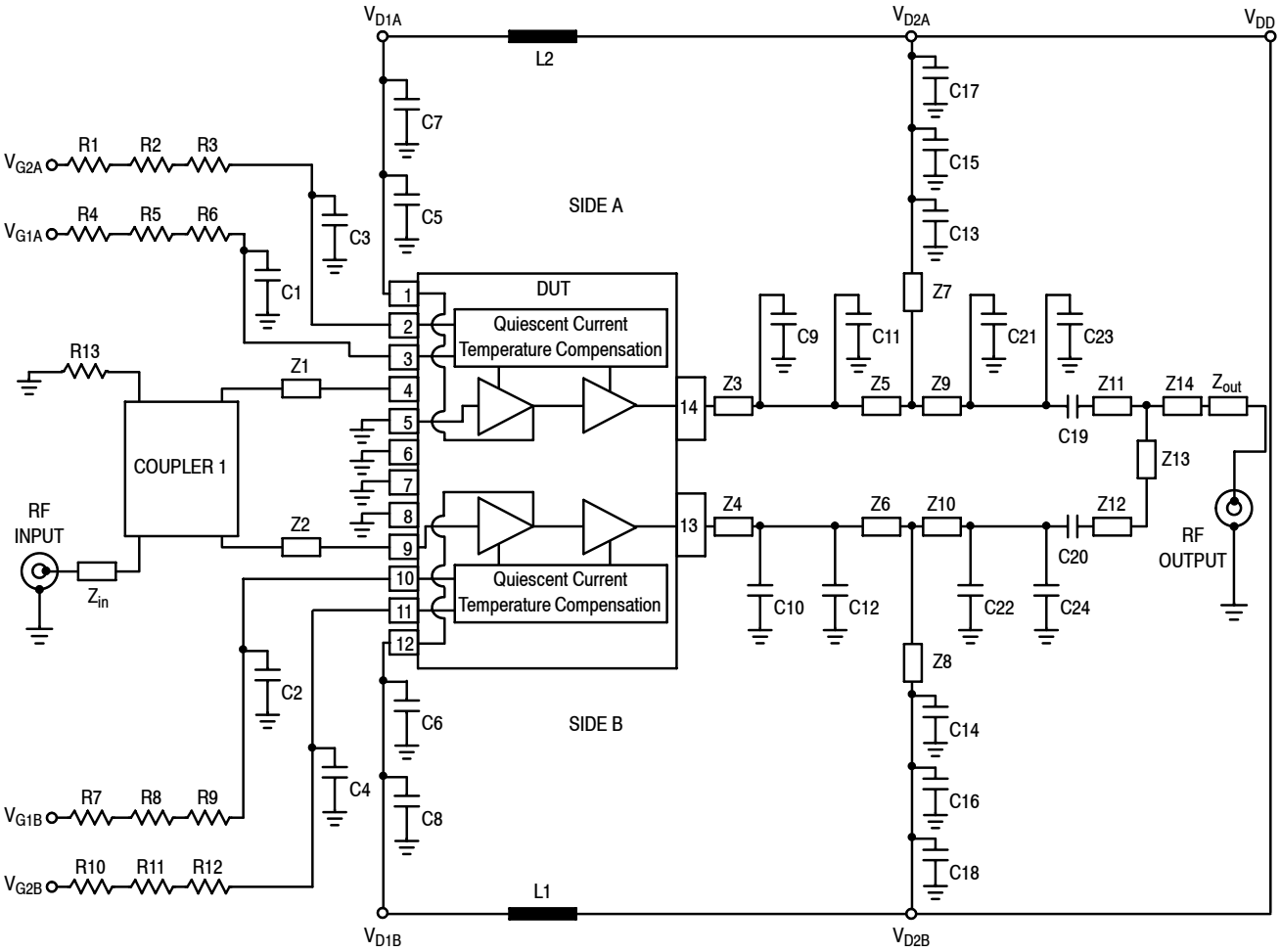
Characteristic	Symbol	Min	Typ	Max	Unit
Stage 1 — Off Characteristics (1)					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 65 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	10	μAdc
Zero Gate Voltage Drain Leakage Current (V_{DS} = 28 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	1	μAdc
Gate-Source Leakage Current (V_{GS} = 1.5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	1	μAdc
Stage 1 — On Characteristics					
Gate Threshold Voltage (1) (V_{DS} = 10 Vdc, I_D = 46 μAdc)	$V_{GS(th)}$	1.2	1.9	2.7	Vdc
Gate Quiescent Voltage (1) (V_{DS} = 28 Vdc, I_{DQ1A} = I_{DQ1B} = 80 mAdc)	$V_{GS(Q)}$	—	2.7	—	Vdc
Fixture Gate Quiescent Voltage (2) (V_{DD} = 28 Vdc, I_{DQ1A} = I_{DQ1B} = 80 mAdc, Measured in Functional Test)	$V_{GG(Q)}$	12	15	18	Vdc
Stage 2 — 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} = 28 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	1	μAdc
Gate-Source Leakage Current (V_{GS} = 1.5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	1	μAdc
Stage 2 — On Characteristics					
Gate Threshold Voltage (1) (V_{DS} = 10 Vdc, I_D = 185 μAdc)	$V_{GS(th)}$	1.2	1.9	2.7	Vdc
Gate Quiescent Voltage (1) (V_{DS} = 28 Vdc, I_{DQ2B} = 275 mAdc)	$V_{GS(Q)}$	—	2.7	—	Vdc
Fixture Gate Quiescent Voltage (2) (V_{DD} = 28 Vdc, I_{DQ2B} = 275 mAdc, Measured in Functional Test)	$V_{GG(Q)}$	12	15	18	Vdc
Drain-Source On-Voltage (1) (V_{GS} = 10 Vdc, I_D = 1 A)	$V_{DS(on)}$	0.2	0.47	1.2	Vdc
Stage 2 - Dynamic Characteristics (2,3)					
Output Capacitance (V_{DS} = 28 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{in} = 0 Vdc)	C_{oss}	—	111	—	pF
Functional Tests (4,5) (In Freescale Doherty Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQ1A} = I_{DQ1B} = 80 mA, I_{DQ2B} = 275 mA, V_{G2A} = 1.7 Vdc, P_{out} = 10 W Avg., f = 2700 MHz, WiMAX, OFDM 802.16d, 64 QAM $^3/_4$, 4 Bursts, 10 MHz Channel Bandwidth, Input Signal PAR = 9.5 dB @ 0.01% Probability on CCDF. ACPR measured in 1 MHz Channel Bandwidth @ ±8.5 MHz Offset.					
Power Gain	G_{ps}	23	25	31	dB
Power Added Efficiency	PAE	23	25	—	%
Output Peak-to-Average Ratio @ 0.01% Probability on CCDF	PAR	8	8.5	—	dB
Adjacent Channel Power Ratio	ACPR	—	-37	-35	dBc

1. Side A and Side B are tied together for this measurement.
2. Each side of device measured separately.
3. Part internally matched both on input and output.
4. Measurement made with device in a Symmetrical Doherty configuration.
5. Measurement made with device in straight lead configuration before any lead forming operation is applied.

(continued)

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

Characteristic	Symbol	Min	Typ	Max	Unit
Typical Performances (In Freescale Doherty Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQ1A} = I_{DQ1B} = 80 mA, I_{DQ2B} = 275 mA, V_{G2A} = 1.7 Vdc, 2500–2700 MHz Bandwidth					
P_{out} @ 1 dB Compression Point, CW	P1dB	—	30	—	W
IMD Symmetry @ 12 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}	—	70	—	MHz
VBW Resonance Point (IMD Third Order Intermodulation Inflection Point)	VBW_{res}	—	85	—	MHz
Gain Flatness in 200 MHz Bandwidth @ P_{out} = 10 W Avg.	G_F	—	1.6	—	dB
Average Deviation from Linear Phase in 200 MHz Bandwidth @ P_{out} = 30 W CW	Φ	—	2	—	°
Average Group Delay @ P_{out} = 30 W CW, f = 2600 MHz	Delay	—	2.7	—	ns
Part–to–Part Insertion Phase Variation @ P_{out} = 30 W CW, f = 2600 MHz, Six Sigma Window	ΔΦ	—	3.6	—	°
Gain Variation over Temperature (–30°C to +85°C)	ΔG	—	0.039	—	dB/°C
Output Power Variation over Temperature (–30°C to +85°C)	ΔP1dB	—	0.03	—	dBm/°C



Z1, Z2	0.0419″ x 0.480″ Microstrip	Z13	0.0419″ x 0.7690′″ Microstrip
Z3, Z4	0.247″ x 0.1504″ Microstrip	Z14	0.0717″ x 0.6750″ Microstrip
Z5, Z6	0.247″ x 0.1704″ Microstrip	Z_{in}	0.0419″ x 1.7230″ Microstrip
Z7, Z8	0.030″ x 0.4400″ Microstrip	Z_{out}	0.0419″ x 1.1400″ Microstrip
Z9, Z10	0.0907″ x 0.075″ Microstrip	PCB	Rogers RO4350B, 0.020″, ε_r = 3.5
Z11, Z12	0.0419″ x 0.4200″ Microstrip		

Figure 3. MD7IC2755NR1(GNR1) Test Circuit Schematic

Table 6. MD7IC2755NR1(GNR1) Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C2, C3, C4, C5, C6, C13, C14, C19, C20	6.8 pF Chip Capacitors	ATC600S6R8BT250XT	ATC
C7, C8, C17, C18	10 μF Chip Capacitors	GRM55DR61H106KA88	Murata
C15, C16	1500 pF Chip Capacitors	GRM1885C2A152JA01	Murata
C9, C10, C11, C12, C21, C22, C23, C24	0.5 pF Chip Capacitors	ATC600S0R5BT250XT	ATC
Coupler 1	2500–2700 Hybrid 3 dB Coupler	GSC356	Soshin
L1, L2	Jumper Wires		
R4, R5, R7, R8	75 Ω, 1/8 W Chip Resistors	RK73B2ATTD750G	KOA Speer
R1, R10	300 Ω, 1/8 W Chip Resistors	RK73B2ATTD301G	KOA Speer
R2, R11	2 k Ω, 1/8 W Chip Resistors	RK73B2ATTD202G	KOA Speer
R3, R6, R9, R12	12 kΩ, 1/8 W Chip Resistors	RK73B2ATTD123G	KOA Speer
R13	51 Ω, 1/8 W Chip Resistor	RK73B2ATTD510G	KOA Speer

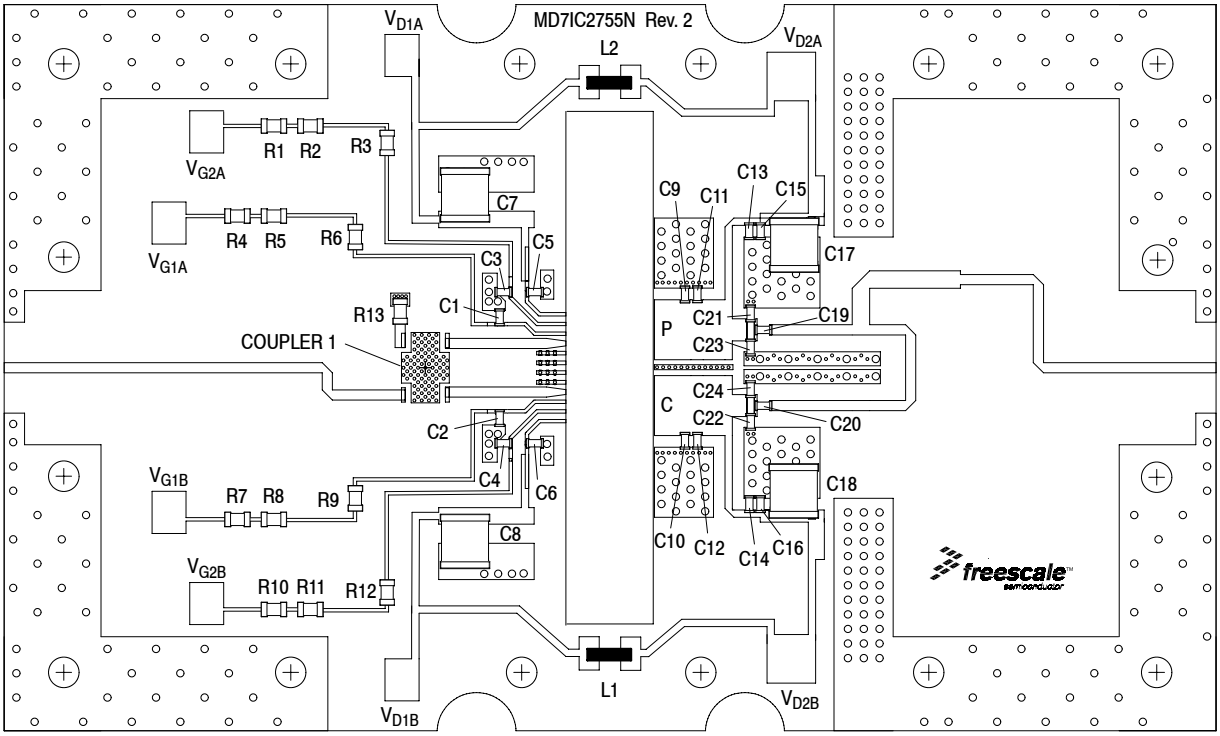


Figure 4. MD7IC2755NR1(GNR1) Test Circuit Component Layout

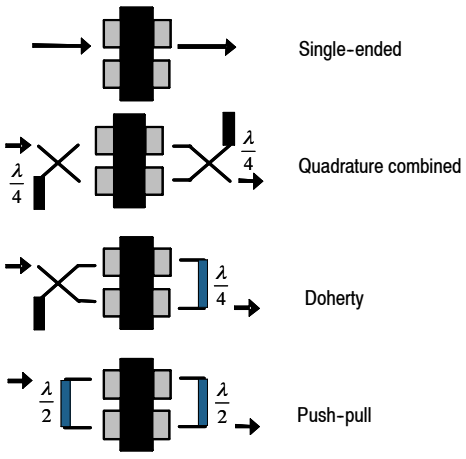


Figure 5. Possible Circuit Topologies

TYPICAL CHARACTERISTICS

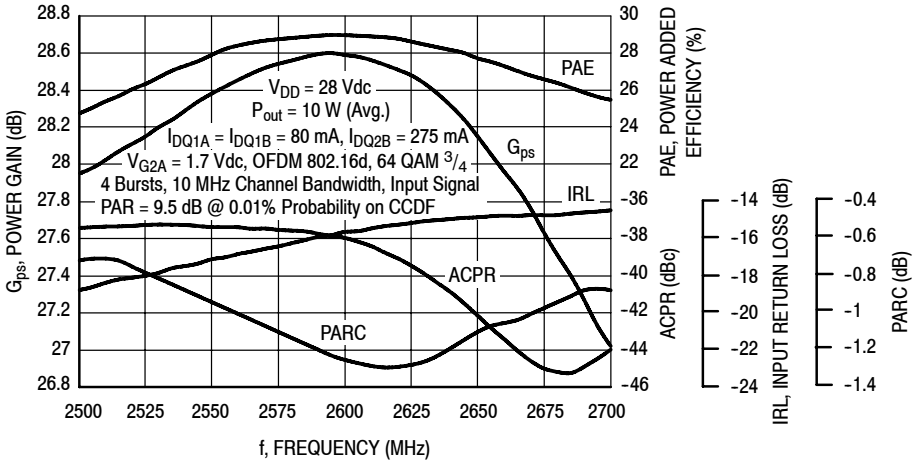


Figure 6. WiMAX Broadband Performance @ P_{out} = 10 Watts Avg.

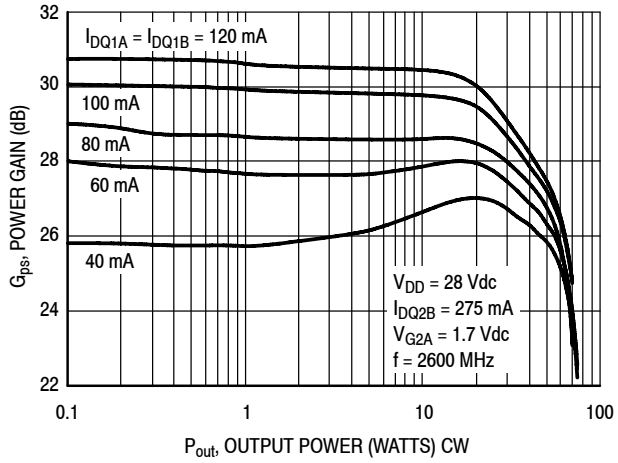


Figure 7. Power Gain versus Output Power — Stage 1, Class AB

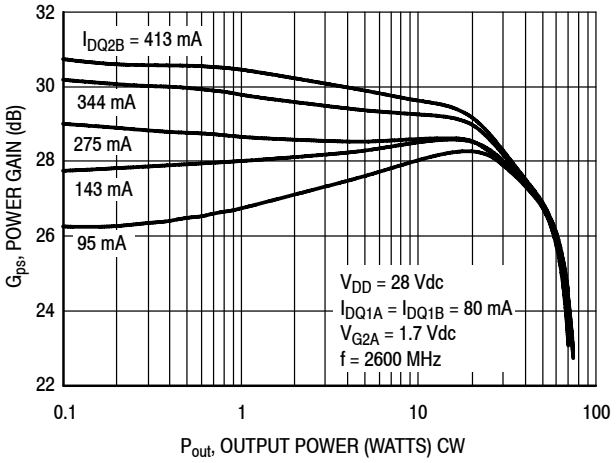


Figure 8. Power Gain versus Output Power — Stage 2, Class AB

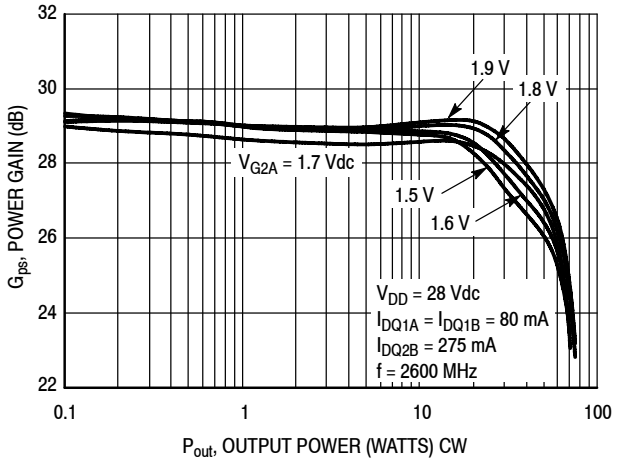


Figure 9. Power Gain versus Output Power — Stage 2, Class C

TYPICAL CHARACTERISTICS

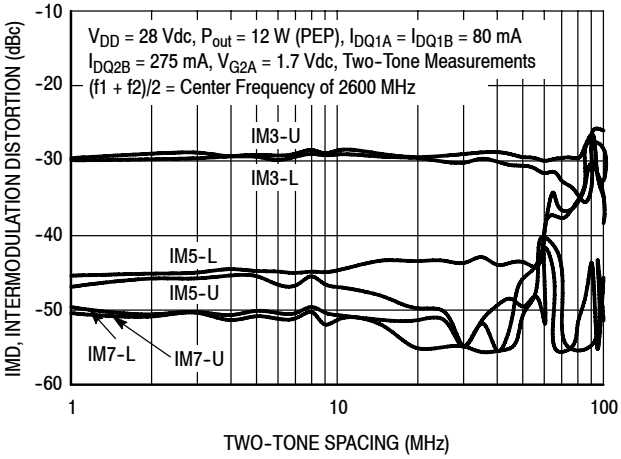


Figure 10. Intermodulation Distortion Products versus Two-Tone Spacing

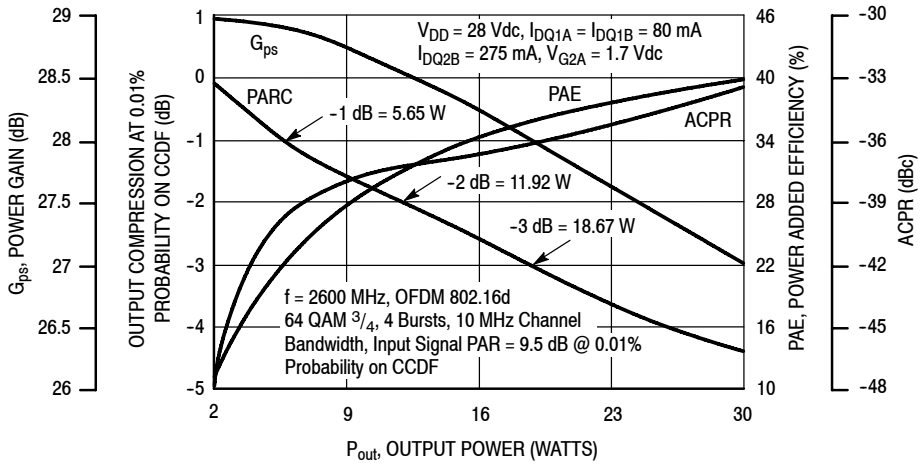


Figure 11. Output Peak-to-Average Ratio Compression (PARC) versus Output Power

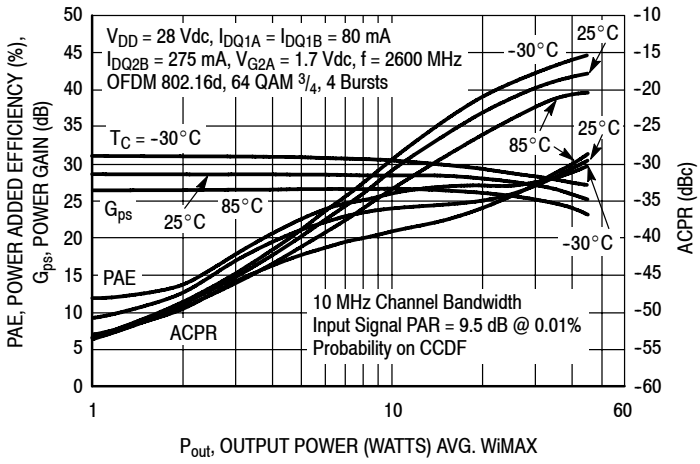


Figure 12. WiMAX, ACPR, Power Gain and Power Added Efficiency versus Output Power

TYPICAL CHARACTERISTICS

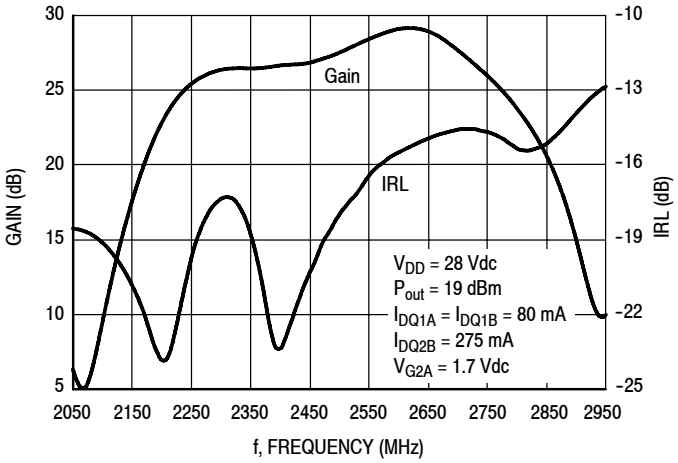
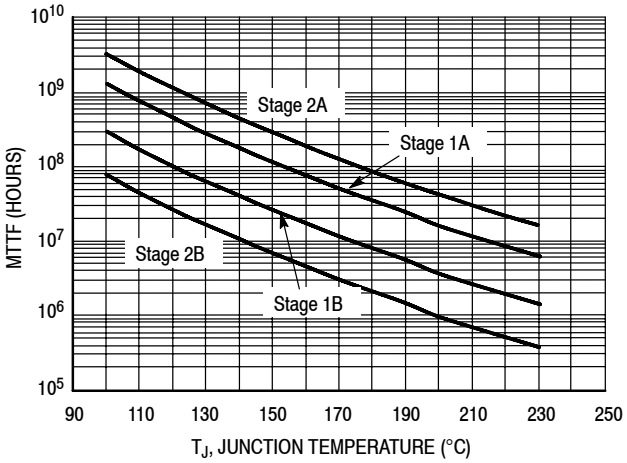


Figure 13. Broadband Frequency Response



This above graph displays calculated MTTF in hours when the device is operated at V_{DD} = 28 Vdc, P_{out} = 10 W Avg., and PAE = 25%.

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

Figure 14. MTTF versus Junction Temperature

WIMAX TEST SIGNAL

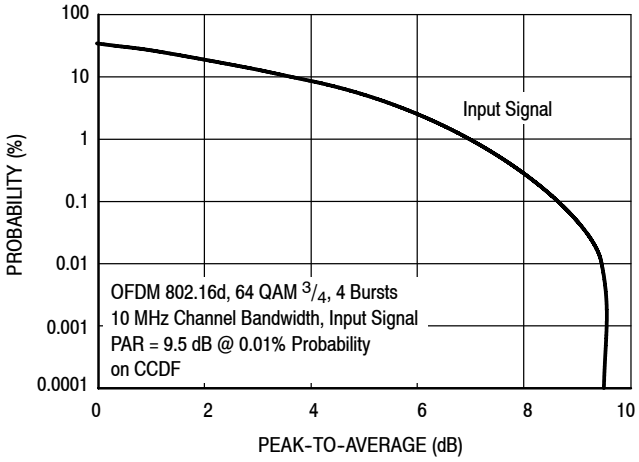


Figure 15. OFDM 802.16d Test Signal

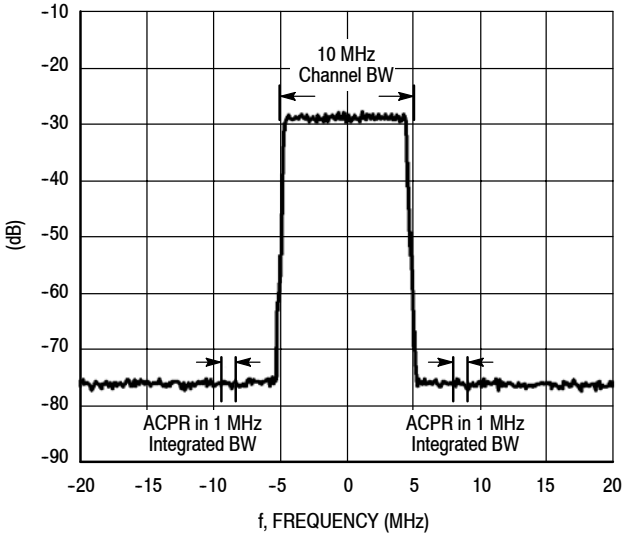
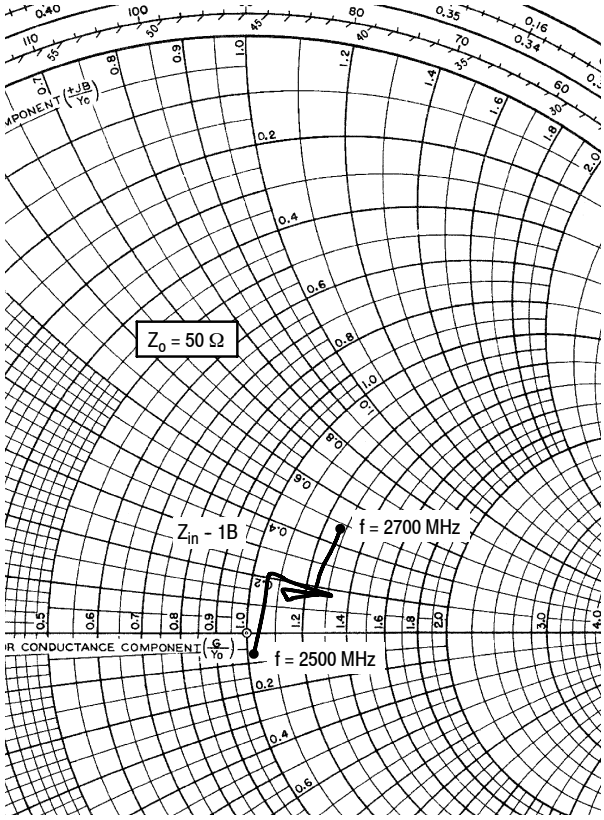


Figure 16. WiMAX Spectrum Mask Specifications



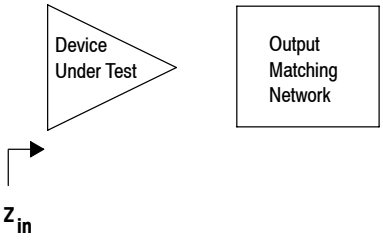
SIDE 1B — Measured Data

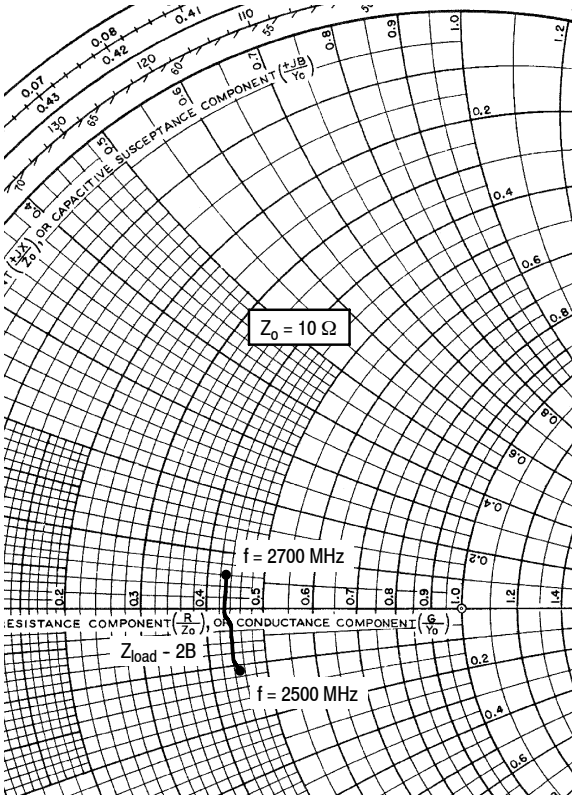
V_{DD} = 28 Vdc, I_{DQ1A} = I_{DQ1B} = 80 mA, I_{DQ2B} = 275 mA, V_{G2A} = 1.7 Vdc, P_{out} = 10 W Avg.

f MHz	Z_{in} Ω
2500	51.13 – j3.65
2525	53.63 + j10.52
2550	65.26 + j9.11
2575	55.46 + j8.51
2600	56.42 + j7.21
2625	64.56 + j9.19
2650	62.22 + j8.40
2675	63.11 + j15.82
2700	63.82 + j23.55

Z_{in} = Device input impedance as measured from gate to ground.

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





SIDE 2B — Simulated Data

V_{DD} = 28 Vdc, I_{DQ1A} = I_{DQ1B} = 80 mA, I_{DQ2B} = 275 mA, V_{G2A} = 1.7 Vdc, P_{out} = 10 W Avg.

f MHz	Z_{load} Ω
2500	4.48 – j1.14
2525	4.44 – j0.93
2550	4.40 – j0.70
2575	4.38 – j0.46
2600	4.36 – j0.25
2625	4.34 – j0.14
2650	4.32 + j0.17
2675	4.31 + j0.33
2700	4.30 + j0.57

Z_{in} = Device input impedance as measured rom gate to ground.

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

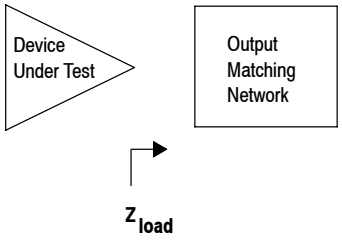
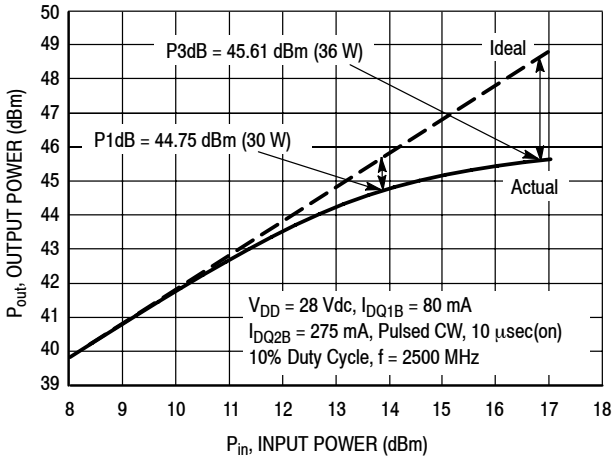


Figure 17. Series Equivalent Input and Load Impedance

ALTERNATIVE PEAK TUNE LOAD PULL CHARACTERISTICS — CLASS AB

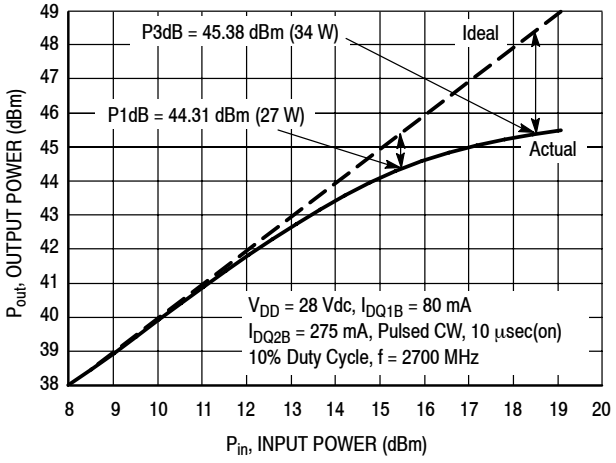


NOTE: Load Pull Test Fixture Tuned for Peak P1dB Output Power @ 28 V

Test Impedances per Compression Level

	Z_{source} Ω	Z_{load} Ω
P1dB	55.22 + j20.17	4.19 – j3.44

Figure 18. Pulsed CW Output Power versus Input Power @ 28 V @ 2500 MHz



NOTE: Load Pull Test Fixture Tuned for Peak P1dB Output Power @ 28 V

Test Impedances per Compression Level

	Z_{source} Ω	Z_{load} Ω
P1dB	48.60 + j5.11	2.47 – j3.66

Figure 19. Pulsed CW Output Power versus Input Power @ 28 V @ 2700 MHz

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

Table 7. Class AB Common Source S-Parameters (V_{DD} = 28 V, I_{DQ1B} = 80 mA, I_{DQ2B} = 275 mA, T_A = 25°C, 50 Ohm System)
Measurement made on the Class AB, carrier side of the device.

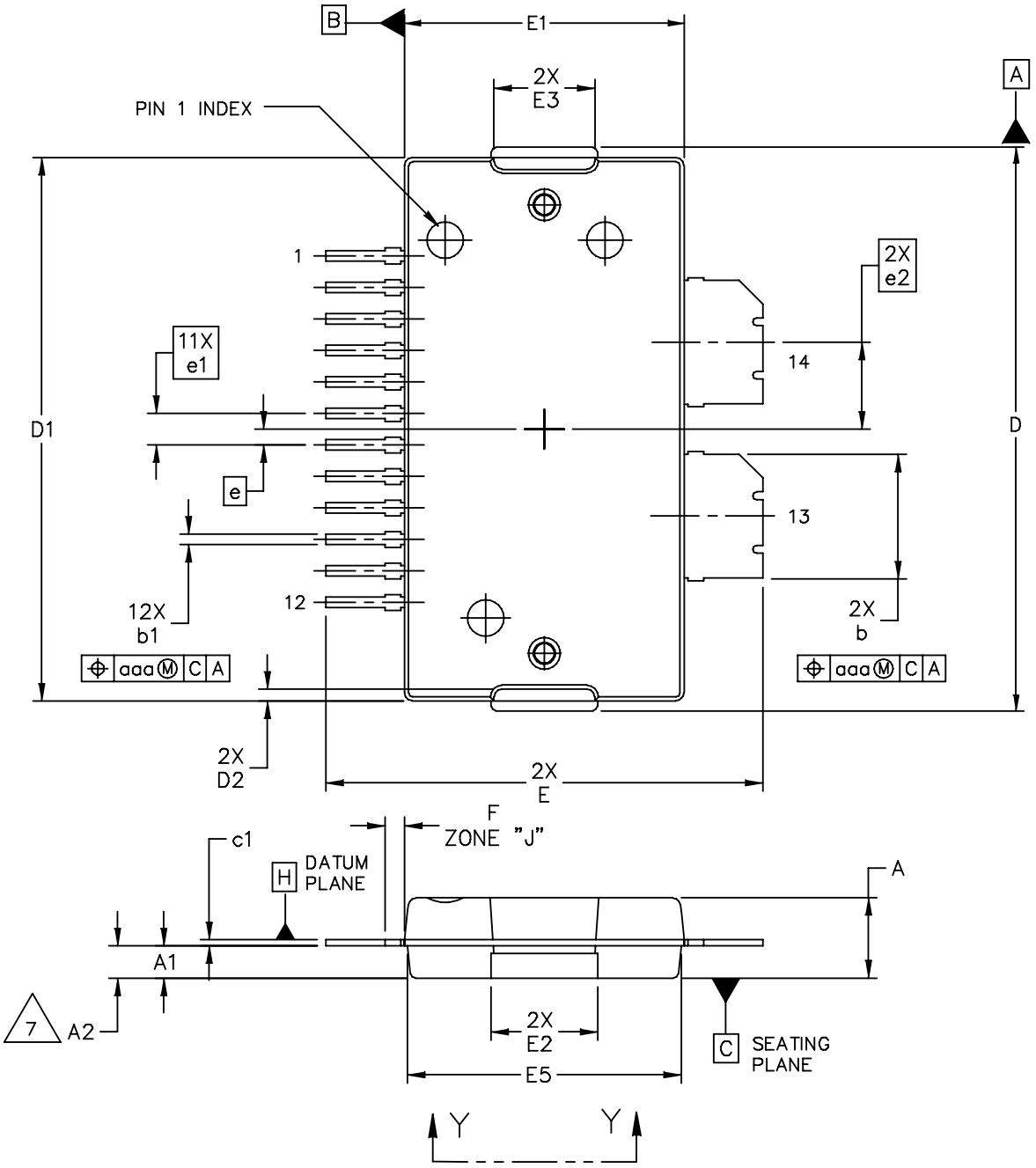
f	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	$\|S_{11}\|$	∠ ϕ	$\|S_{21}\|$	∠ ϕ	$\|S_{12}\|$	∠ ϕ	$\|S_{22}\|$	∠ ϕ
1500	0.569	74.4	0.002	-64.1	0.00228	135.2	0.997	-176.0
1550	0.575	51.5	0.004	-51.1	0.00100	-30.0	0.997	-179.0
1600	0.593	34.0	0.009	-87.0	0.000590	-107.6	0.995	177.4
1650	0.618	21.8	0.032	-84.4	0.00101	-103.4	0.988	172.7
1700	0.623	14.3	0.092	-94.6	0.00168	-49.5	0.974	166.7
1750	0.601	7.6	0.209	-111.8	0.00326	-146.0	0.979	164.9
1800	0.540	1.5	0.452	-140.8	0.00369	-102.1	0.975	162.2
1850	0.426	-6.8	0.885	-175.9	0.00183	-37.4	0.962	159.2
1900	0.275	-12.9	1.539	151.6	0.00427	-46.1	0.954	156.7
1950	0.058	-69.7	2.773	120.2	0.00351	143.7	0.960	153.0
2000	0.154	121.2	4.188	93.2	0.00632	-82.3	0.946	150.8
2050	0.150	79.4	7.347	72.7	0.00857	-34.1	0.935	146.9
2100	0.064	64.0	9.595	43.3	0.0155	-51.9	0.960	144.0
2150	0.607	-131.3	24.560	26.9	0.0482	-102.7	1.296	110.3
2200	0.406	81.7	28.776	-77.6	0.0257	154.9	0.196	-103.8
2250	0.166	-68.2	22.037	-116.7	0.00750	131.6	0.497	-162.5
2300	0.184	-76.9	19.823	-156.5	0.00936	156.1	0.659	-164.7
2350	0.232	-154.0	16.761	-179.7	0.00172	-139.6	0.743	-173.5
2400	0.182	-94.9	16.827	153.2	0.00578	149.5	0.778	-173.7
2450	0.114	-38.6	15.801	128.7	0.00490	163.9	0.814	-173.9
2500	0.277	-52.4	19.305	89.9	0.00825	142.6	0.853	-169.7
2550	0.261	-3.1	11.891	58.7	0.00185	153.7	0.942	-173.7
2600	0.208	10.3	8.941	47.6	0.00411	166.2	0.961	-177.1
2650	0.568	28.8	8.433	40.6	0.00264	-155.7	0.977	-179.4
2700	0.797	25.0	7.430	15.9	0.00536	128.0	0.976	178.8
2750	0.358	26.5	5.138	-5.8	0.00527	168.2	0.973	177.1
2800	0.384	33.8	4.654	-18.4	0.00311	-178.0	0.976	175.3
2850	0.420	40.4	4.257	-28.4	0.000761	173.9	0.977	173.9
2900	0.337	25.5	3.973	-41.8	0.00233	-134.7	0.977	172.6
2950	0.166	27.4	3.240	-53.3	0.00414	-133.7	0.969	171.4
3000	0.194	23.2	2.641	-52.2	0.00578	-153.5	0.980	170.4
3050	0.186	-9.6	2.337	-61.6	0.00456	158.2	0.979	169.1
3100	0.241	-59.0	2.189	-74.9	0.00204	-78.5	0.982	168.5
3150	0.344	-81.9	2.394	-90.8	0.00281	-98.4	0.974	162.9
3200	0.392	-95.8	2.636	-105.7	0.00468	-122.1	0.966	154.9
3250	0.363	-95.2	3.397	-117.6	0.00661	-106.5	0.949	139.2
3300	0.312	-84.4	5.196	-146.4	0.0170	-126.5	0.819	93.6
3350	0.430	-65.7	5.347	144.0	0.0291	119.3	0.707	-65.7

(continued)

Table 7. Class AB Common Source S-Parameters (V_{DD} = 28 V, I_{DQ1B} = 80 mA, I_{DQ2B} = 275 mA, T_A = 25°C, 50 Ohm System) Measurement made on the Class AB, carrier side of the device. **(continued)**

f	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	$\|S_{11}\|$	∠ ϕ	$\|S_{21}\|$	∠ ϕ	$\|S_{12}\|$	∠ ϕ	$\|S_{22}\|$	∠ ϕ
3400	0.434	-56.5	2.527	100.7	0.00568	100.1	0.930	-139.3
3450	0.499	-50.1	1.448	92.0	0.00828	25.3	0.865	-161.1
3500	0.546	-52.3	1.394	68.4	0.000298	-87.1	0.944	-163.3
3550	0.518	-56.8	1.073	52.6	0.00543	7.1	0.965	-171.1
3600	0.492	-68.4	0.834	39.8	0.00150	-30.4	0.958	-177.1

PACKAGE DIMENSIONS



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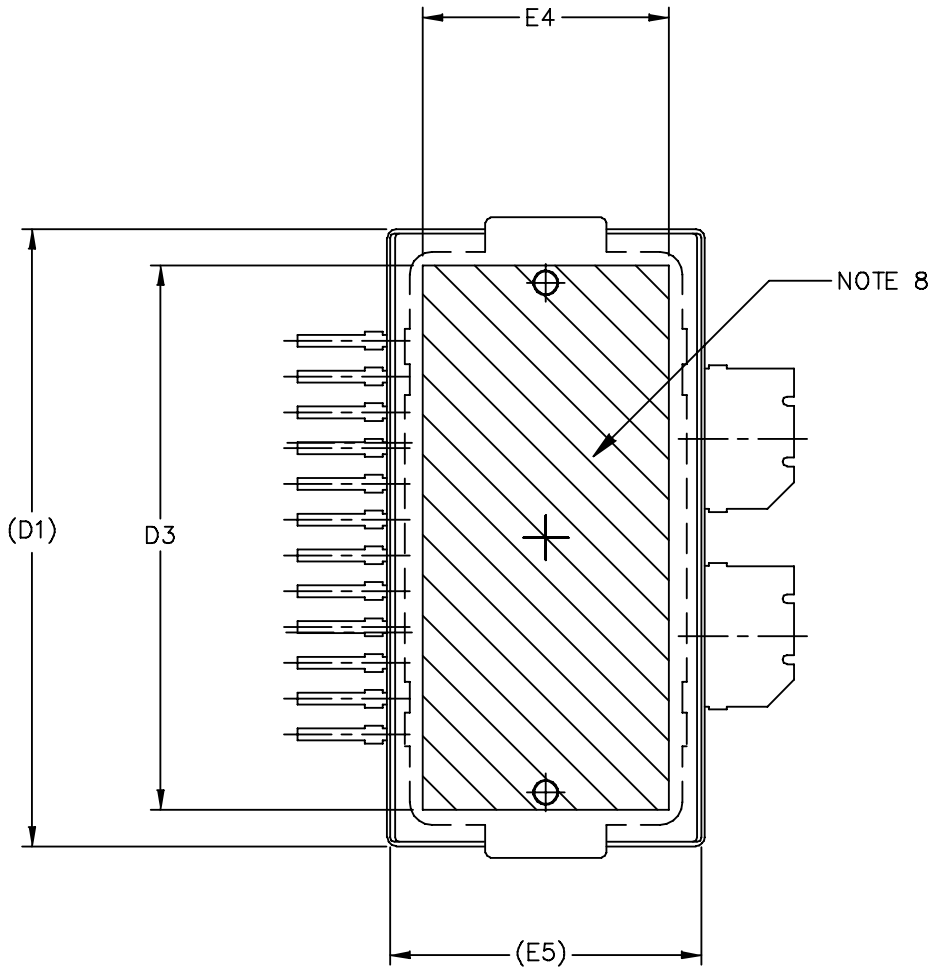

VIEW Y–Y

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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. DIMENSIONS "b" AND "b1" DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 TOTAL IN EXCESS OF THE "b" AND "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	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX
A	.100	.104	2.54	2.64	F	.025 BSC		0.64 BSC	
A1	.039	.043	0.99	1.09	b	.154	.160	3.91	4.06
A2	.040	.042	1.02	1.07	b1	.010	.016	0.25	0.41
D	.712	.720	18.08	18.29	c1	.007	.011	.18	.28
D1	.688	.692	17.48	17.58	e	.020 BSC		0.51 BSC	
D2	.011	.019	0.28	0.48	e1	.040 BSC		1.02 BSC	
D3	.600	---	15.24	---	e2	.1105 BSC		2.807 BSC	
E	.551	.559	14	14.2					
E1	.353	.357	8.97	9.07	aaa	.004		.10	
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					

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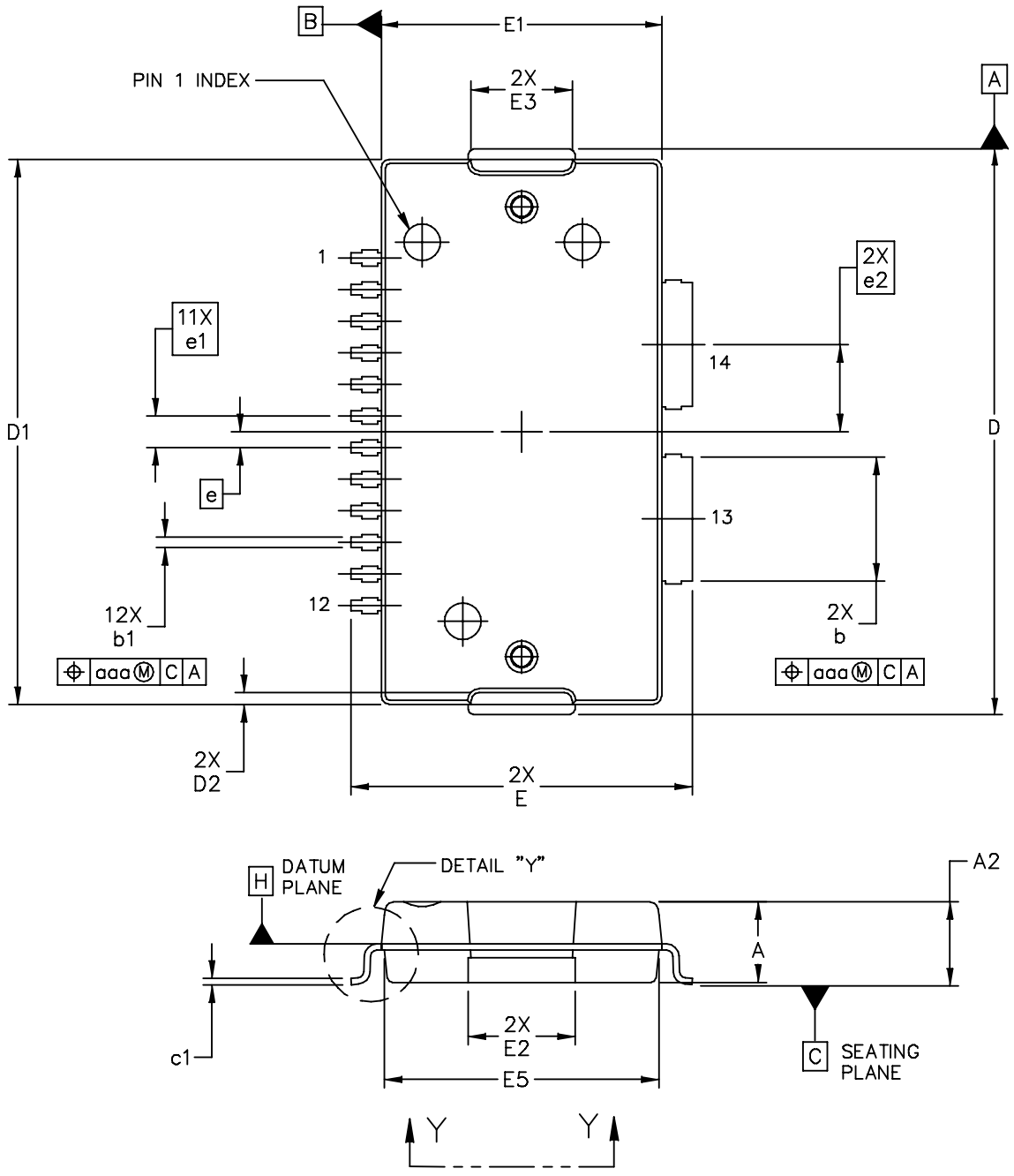

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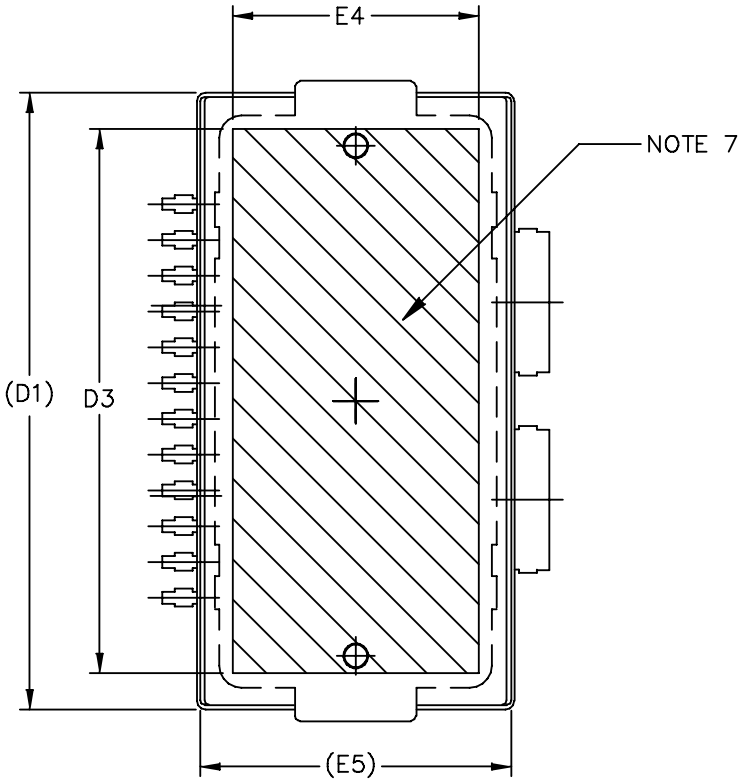

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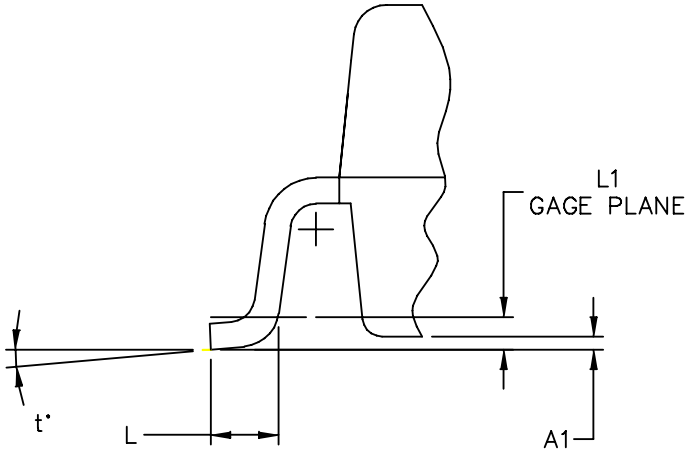

DETAIL "Y"

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

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

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	L	.018	.024	0.46	0.61
A1	.001	.004	0.02	0.10	L1	.010 BSC		0.25 BSC	
A2	.099	.110	2.51	2.79	b	.154	.160	3.91	4.06
D	.712	.720	18.08	18.29	b1	.010	.016	0.25	0.41
D1	.688	.692	17.48	17.58	c1	.007	.011	.18	.28
D2	.011	.019	0.28	0.48	e	.020 BSC		0.51 BSC	
D3	.600	---	15.24	---	e1	.040 BSC		1.02 BSC	
E	.429	.437	10.9	11.1	e2	.1105 BSC		2.807 BSC	
E1	.353	.357	8.97	9.07	t	2°	8°	2°	8°
E2	.132	.140	3.35	3.56					
E3	.124	.132	3.15	3.35	aaa	.004		.10	
E4	.270	---	6.86	---					
E5	.346	.350	8.79	8.89					

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PRODUCT DOCUMENTATION, TOOLS AND SOFTWARE

Refer to the following documents to aid your design process.

Application Notes

- AN1907: Solder Reflow Attach Method for High Power RF Devices in Plastic Packages
- AN1955: Thermal Measurement Methodology of RF Power Amplifiers
- AN1977: Quiescent Current Thermal Tracking Circuit in the RF Integrated Circuit Family
- AN1987: Quiescent Current Control for the RF Integrated Circuit Device Family
- AN3263: Bolt Down Mounting Method for High Power RF Transistors and RFICs in Over-Molded Plastic Packages
- AN3789: Clamping of High Power RF Transistors and RFICs in Over-Molded Plastic Packages

Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices

Software

- Electromigration MTTF Calculator

For Software and Tools, 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	Jan. 2009	• Initial Release of Data Sheet
1	July 2009	• Test Conditions clarified for Fig. 18, Pulsed CW Output Power versus Input Power @ 28 V @ 2500 MHz, and Fig. 19, Pulsed CW Output Power versus Input Power @ 28 V @ 2700 MHz, p. 12 • Added Electromigration MTTF Calculator availability to Product Software, p. 21
2	Sept. 2010	• For P_{out} = 10 W CW, changed Stage 1A, Stage 1B thermal resistance values from 4.0 (Stage 1A), 5.0 (Stage 1B) to 2.6°C/W and Stage 2A, Stage 2B thermal resistance values from 0.9 (Stage 2A), 2.1 (Stage 2B) to 1.8 in Thermal Characteristics table. For P_{out} = 55 W CW, changed Stage 1A, Stage 1B thermal resistance values from 4.6 (Stage 1A), 4.2 (Stage 1B) to 2.3°C/W and Stage 2A, Stage 2B thermal resistance values from 1.2 (Stage 2A), 2.0 (Stage 2B) to 1.1 in Thermal Characteristics table. Thermal value now reflects the use of the combined dissipated power from the carrier amplifier and peaking amplifier, p. 2. • Fig. 4, Test Circuit Component Layout, added labels to distinguish Carrier and Peaking side of amplifier, p. 6
3	Sept. 2010	• Fig. 3, Test Circuit Schematic, corrected labeling of C9 and C11 0.5 pF Chip Capacitors, p. 5

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