

Freescale Semiconductor
Technical Data

MHVIC910HR2
Rev. 5, 1/2005

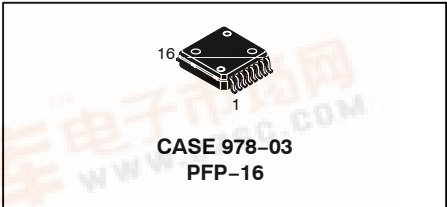
Will be replaced by MHVIC910HNR2 end of Q205. N suffix indicates 260°C reflow capable. The PFP-16 package has had lead-free terminations from its initial release.

MHVIC910HR2

**921 MHz – 960 MHz SiFET
RF Integrated Power Amplifier**

**960 MHz, 10 W, 26 V
GSM CELLULAR
RF LDMOS INTEGRATED CIRCUIT**

The MHVIC910HR2 integrated circuit is designed for GSM base stations, uses Freescale's newest High Voltage (26 Volts) LDMOS IC technology, and contains a three-stage amplifier. Target applications include macrocell (driver function) and microcell base stations (final stage). The device is in a PFP-16 Power Flat Pack package which gives excellent thermal performances through a solderable backside contact.



- Typical GSM Performance @ Full Frequency Band (921–960 MHz), 26 Volts
 Output Power — 40 dBm (CW) @ P1dB
 Power Gain — 39 dB @ P1dB
 Efficiency — 48% @ P1dB
- On-Chip Matching (50 Ohm Input, DC Blocked, >5 Ohm Output)
- Integrated ESD Protection
- Usable Frequency Range — 921 to 960 MHz
- In Tape and Reel. R2 Suffix = 1,500 Units per 16 mm, 13 inch Reel.

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain Supply Voltage	V _{DD}	28	Vdc
Gate Supply Voltage	V _{GS}	6	Vdc
RF Input Power	P _{in}	5	dBm
Case Operating Temperature	T _C	- 30 to + 85	°C
Storage Temperature Range	T _{stg}	- 65 to + 150	°C
Operating Channel Temperature	T _{ch}	150	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	R _{θJC}	2.9	°C/W

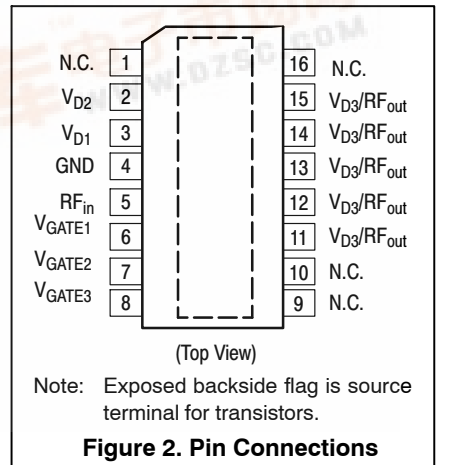
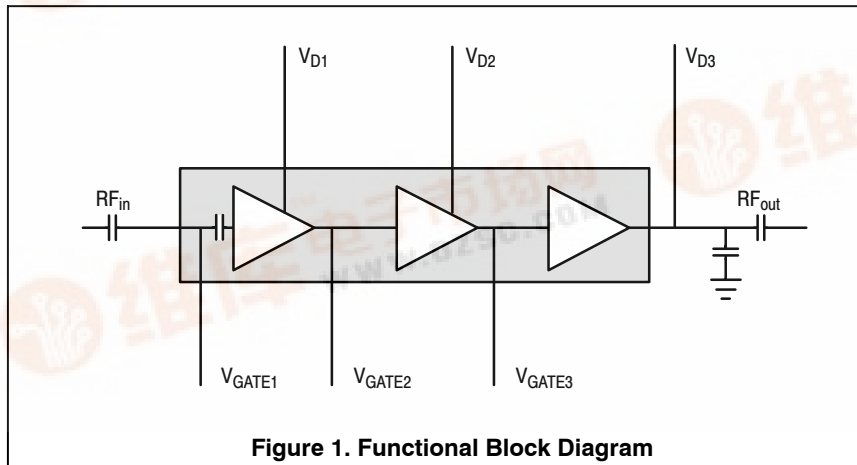


Table 3. ESD Protection Characteristics

Test Conditions	Class
Human Body Model	0 (Minimum)
Machine Model	M2 (Minimum)

Table 4. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD 22-A113, IPC/JEDEC J-STD-020	3	240	°C

Table 5. Recommended Operating Ranges

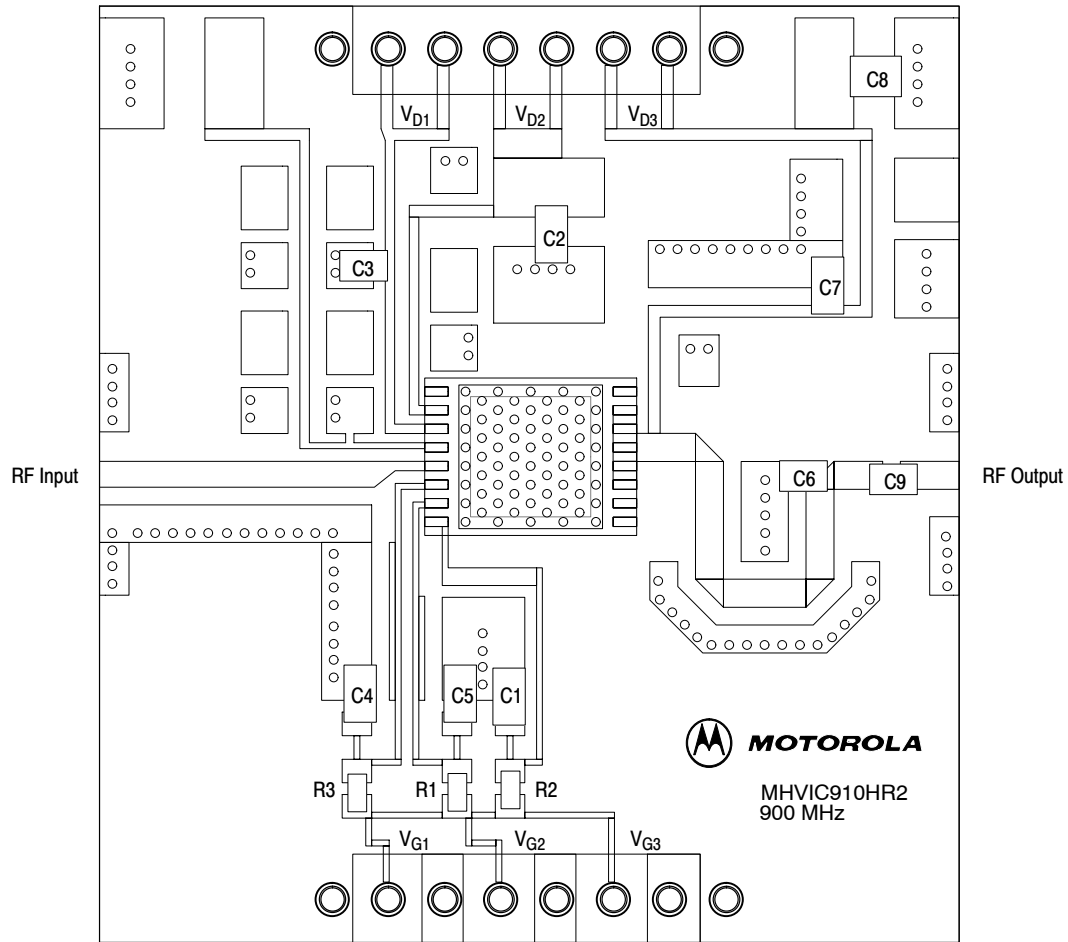
Parameter	Symbol	Value	Unit
Drain Supply Voltage	V_{DD}	26	Vdc
3rd Stage Quiescent Current	I_{DQ3}	150	mA
2nd Stage Quiescent Current	I_{DQ2}	50	mA
1st Stage Quiescent Current	I_{DQ1}	25	mA

Table 6. Electrical Characteristics ($T_A = 25^\circ\text{C}$ matched to a $50\ \Omega$ system, unless otherwise noted)

$V_{DD} = 26\ \text{V}$, V_{GS} set for $I_{DQ3} = 150\ \text{mA}$, frequency range 921–960 MHz

Characteristic	Symbol	Min	Typ	Max	Unit
Frequency Range	f_{RF}	921	—	960	MHz
Output Power @ 1 dB Compression Point	$P @ 1\text{dB}$	39	40	—	dBm
Power Gain @ P1dB	$G @ 1\text{dB}$	38	39	—	dB
Power Added Efficiency @ 1 dB Compression Point	PAE @ 1dB	43	48	—	%
Input Return Loss @ P1dB	IRL @ 1dB	—	-15	-10	dB
Gain Flatness @ 40 dBm Variation ($T_C = -30$ to $+85^\circ\text{C}$ @ 40 dBm)	G_F G_V	— —	.5 5	— —	dB dB
Load Stability ($V_{DS} = 24\ \text{V}$ to $28\ \text{V}$, $P_{out} = \text{P1dB}$ Down to 0 dBm, All Phase Angles)	VSWR	10:1	—	—	—
Ruggedness ($V_{DS} = 26\ \text{V}$, $P_{out} = 42\ \text{dBm}$, Load VSWR = 10:1, All Phase Angles)	Ψ	No Damage After Test			

NOTE – **CAUTION** – MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.



Freescall has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescall Semiconductor signature/logo. PCBs may have either Motorola or Freescall markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 4. 921–960 MHz Demo Board Component Layout

TYPICAL CHARACTERISTICS

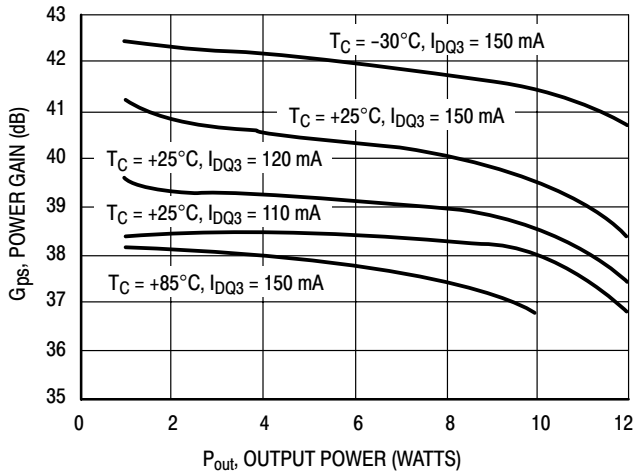


Figure 5. Power Gain versus Output Power

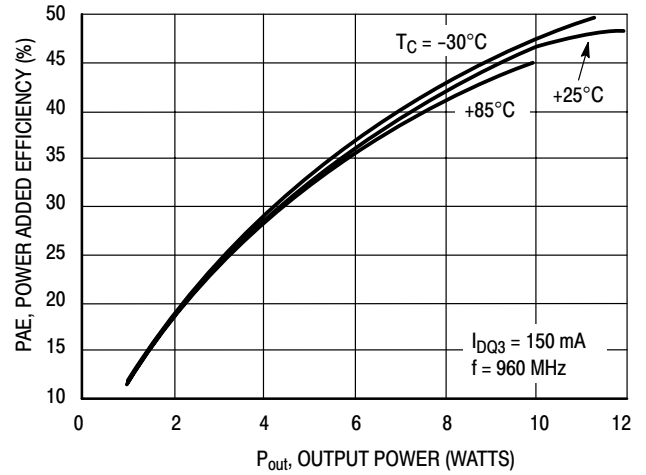


Figure 6. Power Added Efficiency versus Output Power

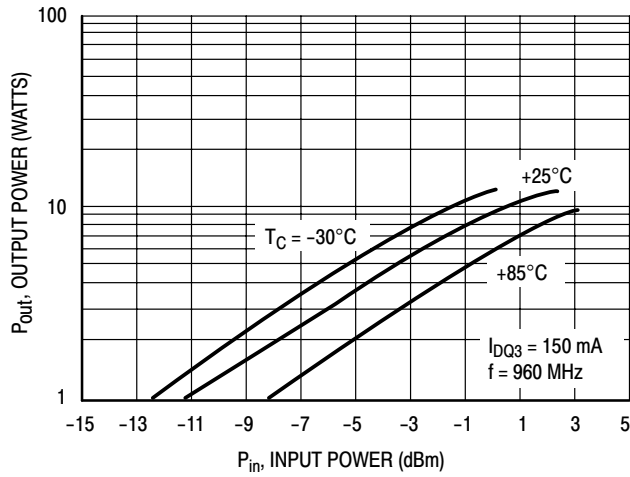
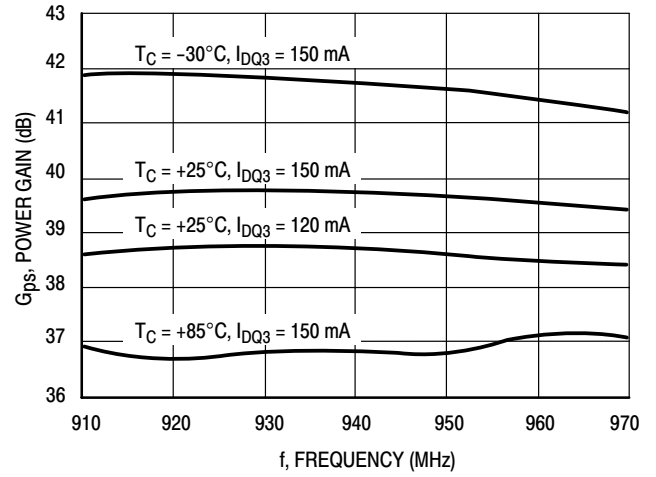
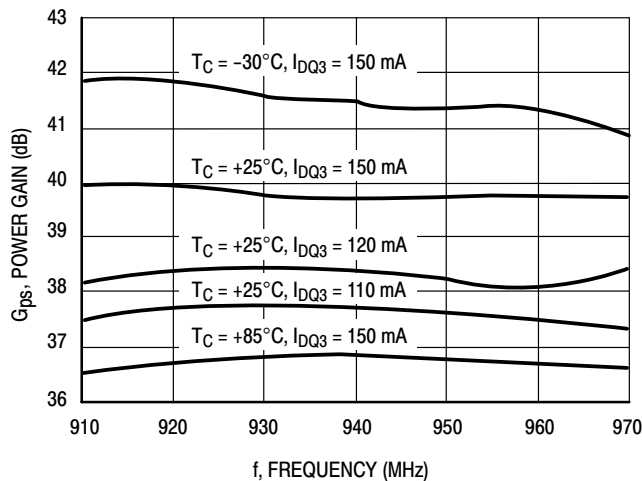


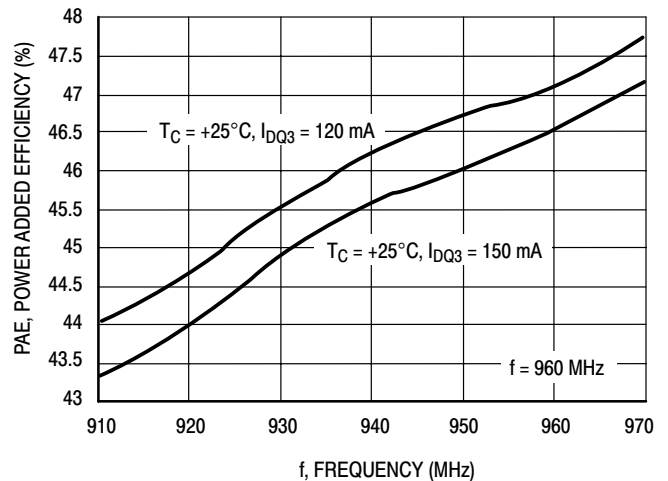
Figure 7. Output Power versus Input Power



**Figure 8. Power Gain versus Frequency
P_{out} = 10 W**



**Figure 9. Power Gain versus Frequency
P_{out} = P1dB**



**Figure 10. Power Added Efficiency versus Frequency
P_{out} = 10 W**

TYPICAL CHARACTERISTICS

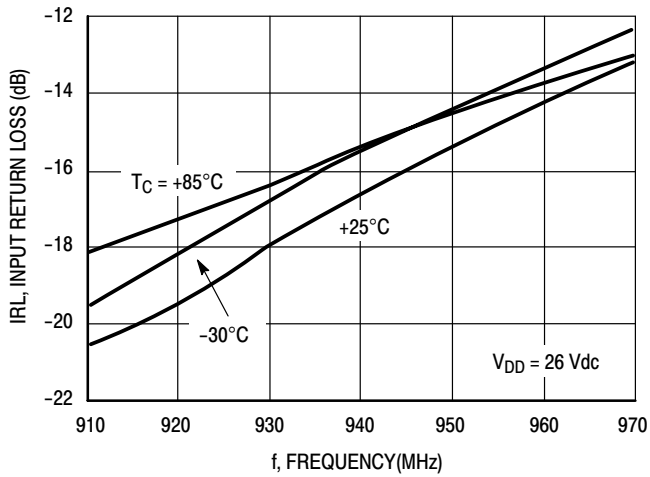


Figure 11. Input Return Loss versus Frequency
 $P_{out} = 10\text{ W}$

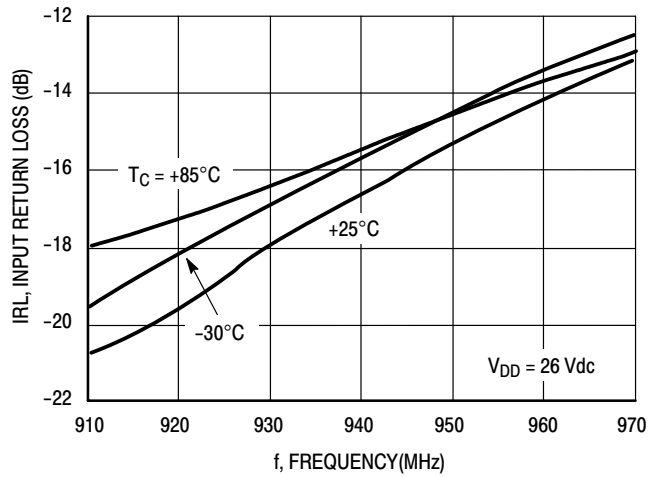


Figure 12. Input Return Loss versus Frequency
 $P_{out} = P1dB$

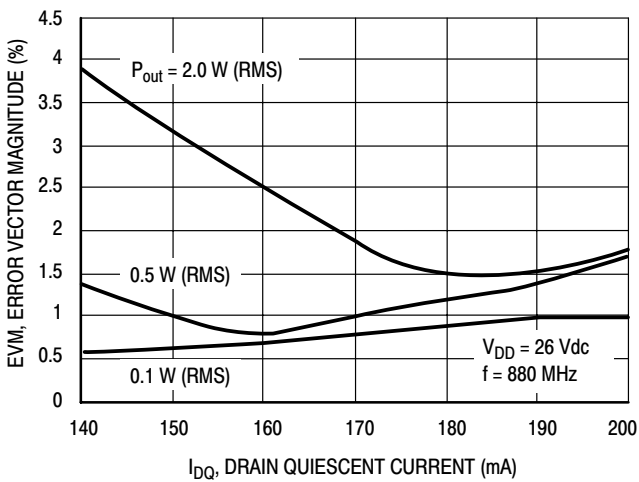


Figure 13. Error Vector Magnitude versus I_{DQ} Total

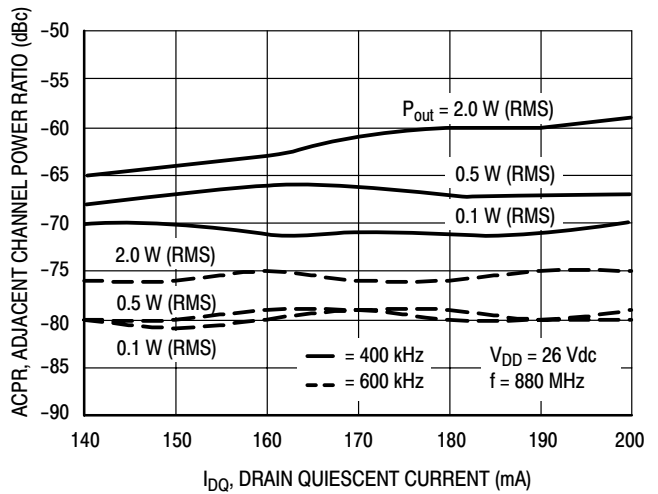


Figure 14. Adjacent Channel Power Ratio versus I_{DQ} Total

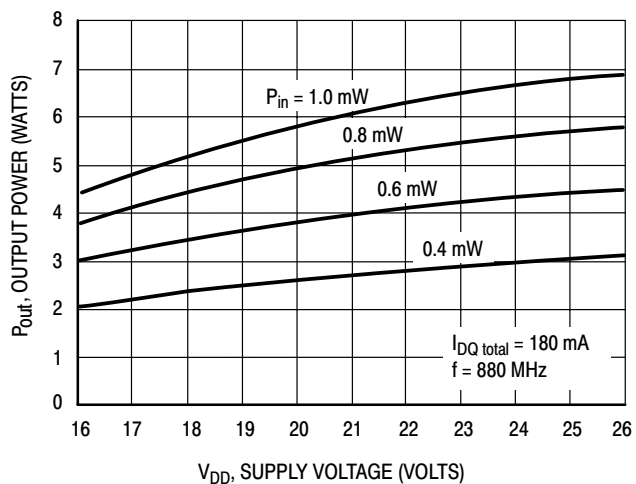


Figure 15. Output Power versus Supply Voltage

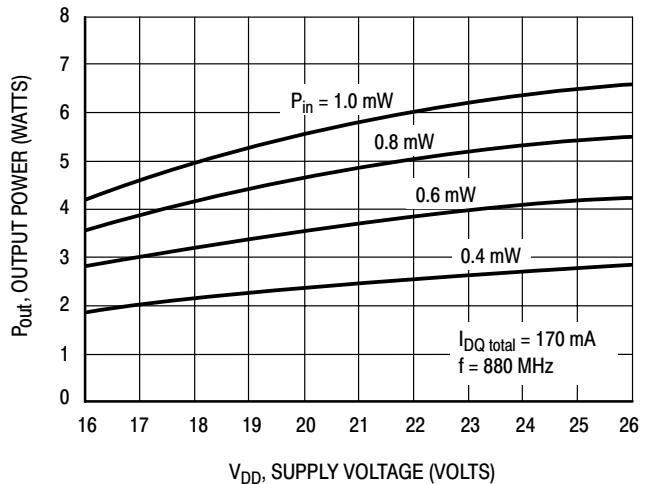


Figure 16. Output Power versus Supply Voltage

TYPICAL CHARACTERISTICS

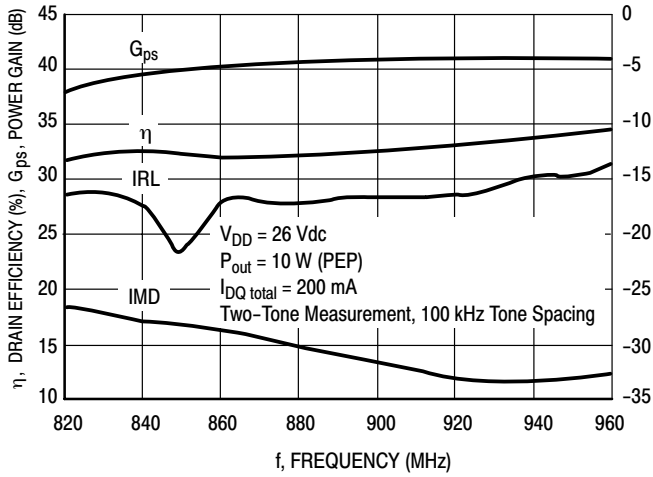


Figure 17. Two-Tone Broadband Performance

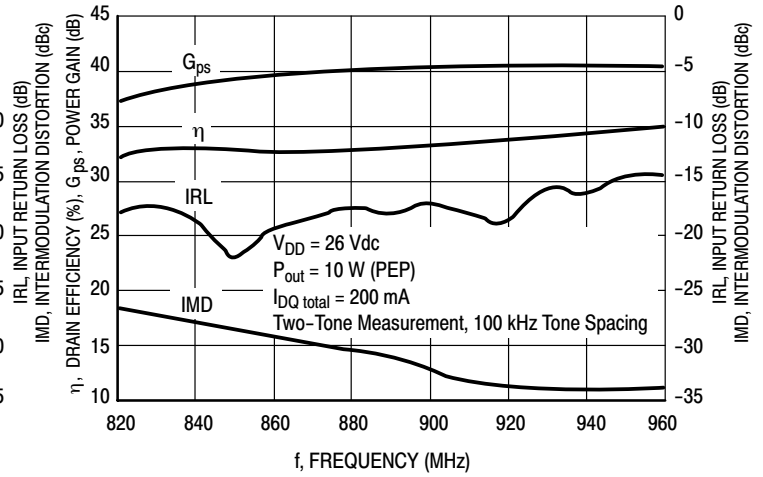


Figure 18. Two-Tone Broadband Performance

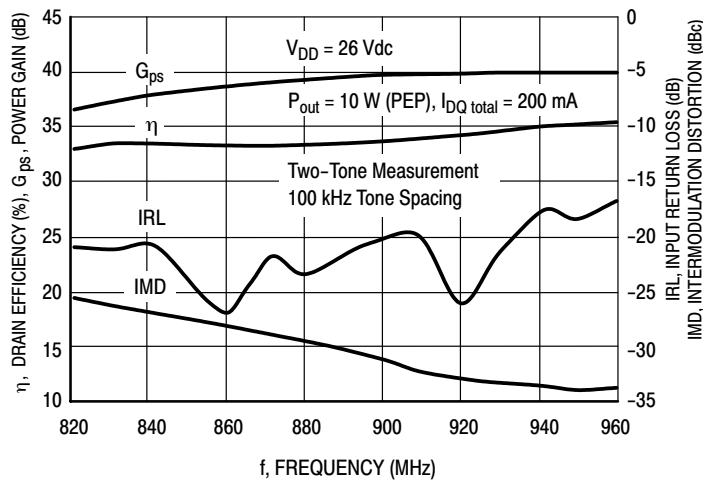


Figure 19. Two-Tone Broadband Performance

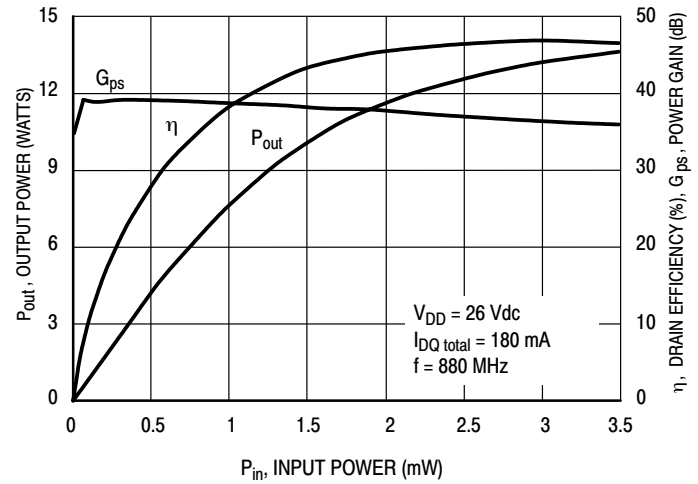


Figure 20. CW Performance @ 880 MHz

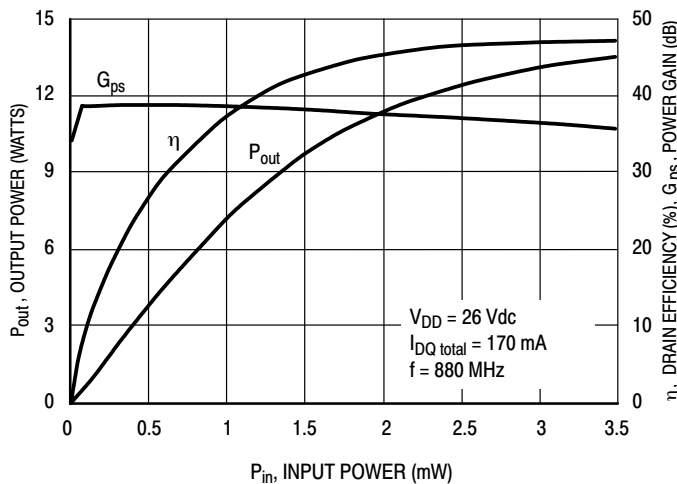


Figure 21. CW Performance @ 880 MHz

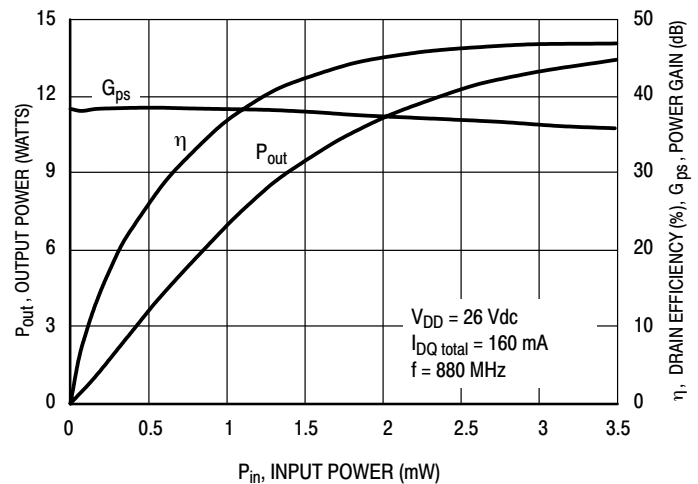


Figure 22. CW Performance @ 880 MHz

TYPICAL CHARACTERISTICS

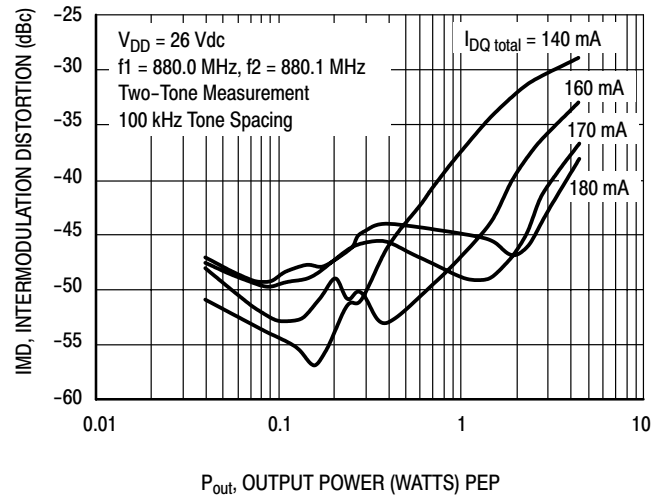


Figure 23. Intermodulation Distortion versus Output Power

$V_{DD} = 26 \text{ V}$, $I_{DQ} = 225 \text{ mA}$, $P_{out} = 40 \text{ dBm}$

f MHz	Z_{load} Ω
900	$7.81 + j4.61$
920	$7.27 + j4.90$
940	$6.77 + j5.23$
960	$6.31 + j5.59$
980	$5.90 + j5.96$
1000	$5.53 + j6.36$

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

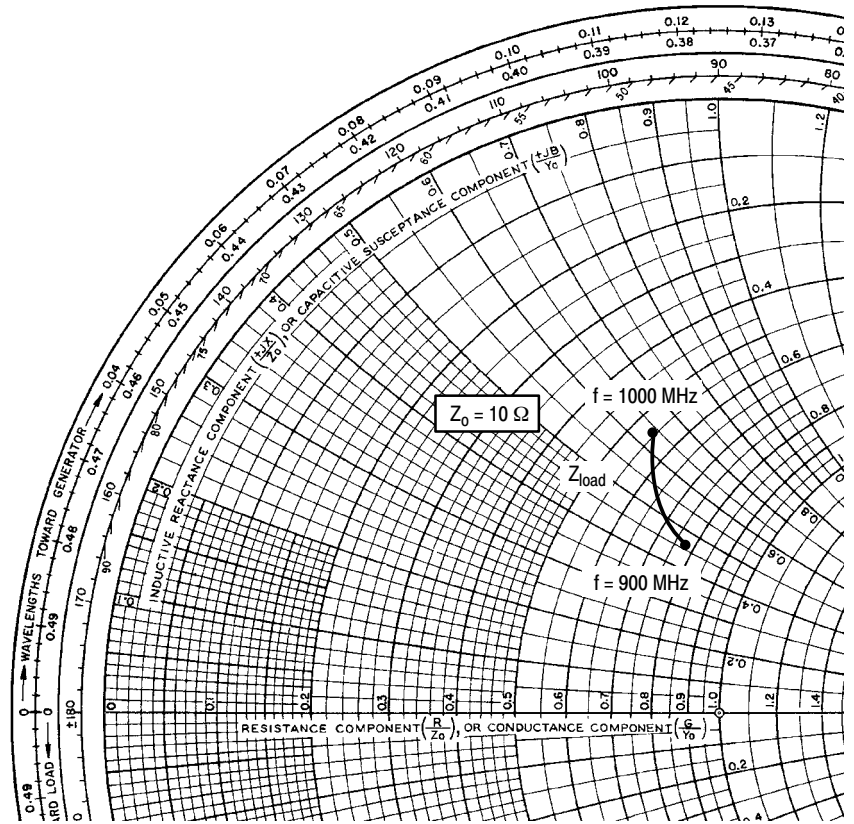
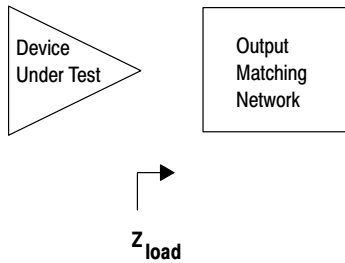
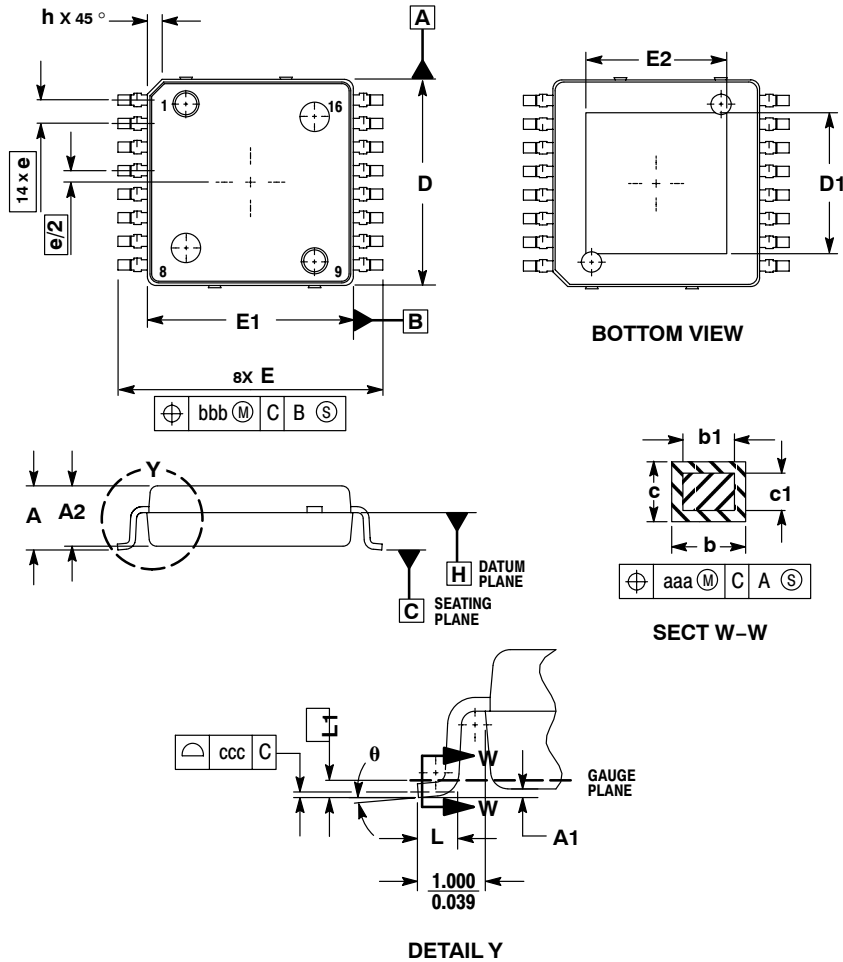


Figure 24. Series Equivalent Load Impedance



NOTES

PACKAGE DIMENSIONS



NOTES:

1. CONTROLLING DIMENSION: MILLIMETER.
2. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DATUM PLANE -H- IS LOCATED AT BOTTOM OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE BOTTOM OF THE PARTING LINE.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD PROTRUSION, ALLOWABLE PROTRUSION IS 0.250 PER SIDE. DIMENSIONS D AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE -H-.
5. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION IS 0.127 TOTAL IN EXCESS OF THE b DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-.

DIM	MILLIMETERS	
	MIN	MAX
A	2.000	2.300
A1	0.025	0.100
A2	1.950	2.100
D	6.950	7.100
D1	4.372	5.180
E	8.850	9.150
E1	6.950	7.100
E2	4.372	5.180
L	0.466	0.720
L1	0.250 BSC	
b	0.300	0.432
b1	0.300	0.375
c	0.180	0.279
c1	0.180	0.230
e	0.800 BSC	
h	---	0.600
θ	0°	7°
aaa	0.200	
bbb	0.200	
ccc	0.100	

CASE 978-03
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 PFP-16

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