Document Number: MRF374A
Rev. 5, 5/2006

RoHS

RF Power Field-Effect Transistor

N-Channel Enhancement-Mode Lateral MOSFET

Designed for broadband commercial and industrial applications with frequencies from 470 to 860 MHz. The high gain and broadband performance of this device make it ideal for large-signal, common source amplifier applications in 28/32 volt transmitter equipment.

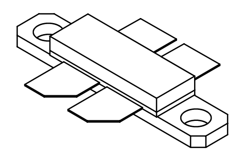
- Typical Two-Tone Performance @ 860 MHz, 32 Volts, Narrowband Fixture
  Output Power — 130 Watts PEP
  Power Gain — 17.3 dB
  Efficiency — 41%
  IMD — -32.5 dBc
- Capable of Handling 10:1 VSWR @ 32 Vdc, 857 MHz, 130 Watts CW Output Power

Features

- Integrated ESD Protection
- Excellent Thermal Stability
- Characterized with Differential Large-Signal Impedance Parameters
- RoHS Compliant

MRF374A

**470-860 MHz, 130 W, 32 V
LATERAL N-CHANNEL
BROADBAND
RF POWER MOSFET**



**CASE 375F-04, STYLE 1
NI-650**

ARCHIVE INFORMATION

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +70	Vdc
Gate-Source Voltage	V_{GS}	-0.5, +15	Vdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	302 1.72	W W/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C
Case Operating Temperature	T_C	150	°C
Operating Junction Temperature	T_J	200	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.58	°C/W

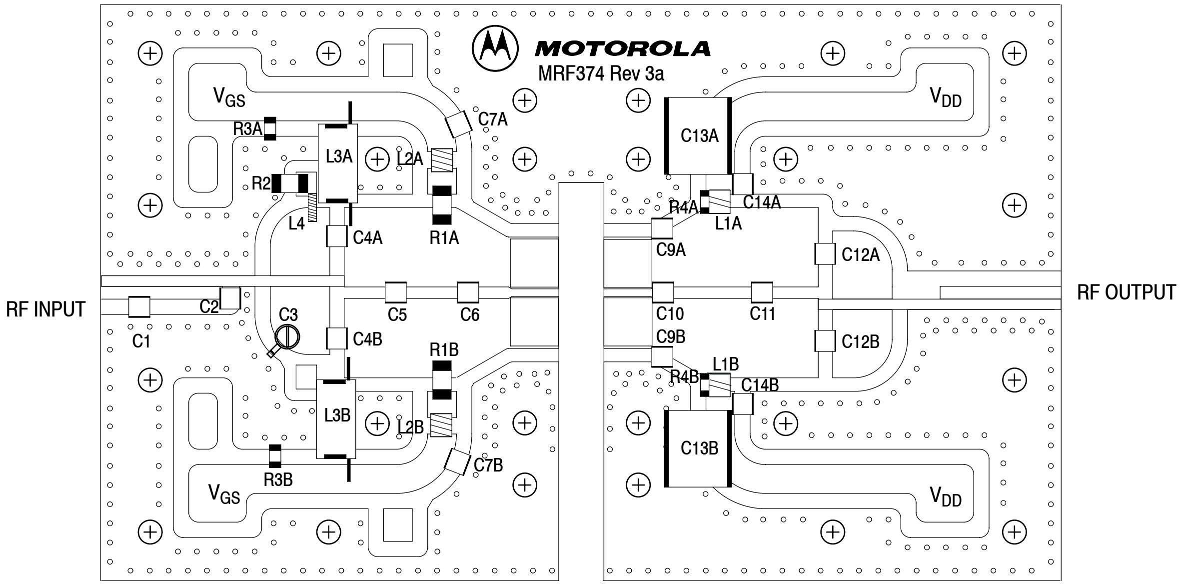
Table 3. ESD Protection Characteristics

Test Conditions	Class
Human Body Model	1 (Minimum)
Machine Model	M2 (Minimum)

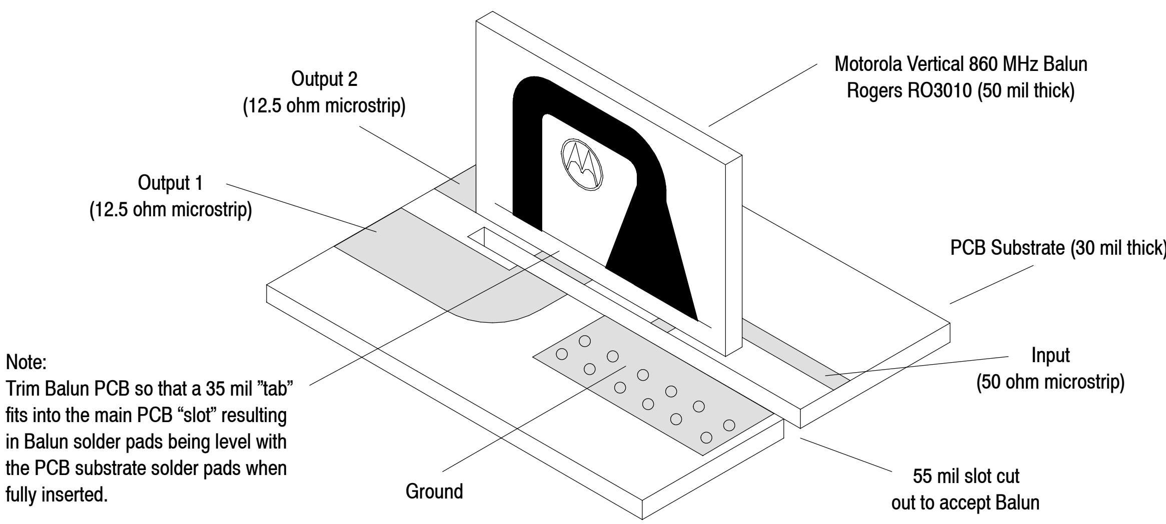
Table 4. Electrical Characteristics (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics [1]					
Drain-Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D =10 μA)	$V_{(BR)DSS}$	70	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 32 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 [1] (V_{DS} = 10 V, I_D = 200 μA)	$V_{GS(th)}$	2	2.9	4	Vdc
Gate Quiescent Voltage [2] (V_{DS} = 32 V, I_D = 100 mA)	$V_{GS(Q)}$	2.5	3.3	4.5	Vdc
Drain-Source On-Voltage [1] (V_{GS} = 10 V, I_D = 3 A)	$V_{DS(on)}$	—	0.41	0.45	Vdc
Dynamic Characteristics [1]					
Input Capacitance (V_{DS} = 32 V, V_{GS} = 0 V, f = 1 MHz)	C_{iss}	—	97.3	—	pF
Output Capacitance (V_{DS} = 32 V, V_{GS} = 0 V, f = 1 MHz)	C_{oss}	—	49	—	pF
Reverse Transfer Capacitance (V_{DS} = 32 V, V_{GS} = 0 V, f = 1 MHz)	C_{rss}	—	1.91	—	pF
Functional Characteristics, Narrowband Operation [2] (In Freescale MRF374A Narrowband Circuit, 50 ohm system)					
Common Source Power Gain (V_{DD} = 32 Vdc, P_{out} = 130 W PEP, I_{DQ} = 400 mA, f1 = 857 MHz, f2 = 863 MHz)	G_{ps}	16	17.3	—	dB
Drain Efficiency (V_{DD} = 32 Vdc, P_{out} = 130 W PEP, I_{DQ} = 400 mA, f1 = 857 MHz, f2 = 863 MHz)	η	36	41.2	—	%
Intermodulation Distortion (V_{DD} = 32 Vdc, P_{out} = 130 W PEP, I_{DQ} = 400 mA, f1 = 857 MHz, f2 = 863 MHz)	IMD	—	-32.5	-28	dB

1. Each side of device measured separately.
2. Measurement made with device in push-pull configuration.



Vertical Balun Mounting Detail



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

Figure 1. MRF374A Narrowband Test Circuit Component Layout

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Table 5. MRF374A Narrowband Test Circuit Component Layout Designations and Values

Designation	Description
C1	0.8 pF Chip Capacitor, ATC
C2	2.2 pF Chip Capacitor, ATC
C3	0.5 - 5.0 pF Variable Capacitor, Johanson Gigatrim
C4A, B, C12A, B	47 pF Chip Capacitors, ATC
C5	1.0 pF Chip Capacitor, ATC
C6	10 pF Chip Capacitor, ATC
C7A, B, C14A, B	100,000 pF Chip Capacitors, ATC
C9A, B	15 pF Chip Capacitors, ATC
C10	3.9 pF Chip Capacitor, ATC
C11	5.1 pF Chip Capacitor, ATC
C13A, B	2.2 μF, 100 V Chip Capacitors, Vishay #VJ3640Y225KXBAT
L1A, B	5.0 nH, Coilcraft #A02T
L2A, B	8.0 nH, Coilcraft #A03T
L3A, B	130.0 nH, Coilcraft #132-11SMJ
L4	8.8 nH, Coilcraft #1606-8
R1A, B	51 Ω, 1/4 W Chip Resistors, Vishay Dale (1210)
R2	10 Ω, 1/2 W Chip Resistor, Vishay Dale (2010)
R3A, B	3.3 kΩ, 1/8 W Chip Resistors, Vishay Dale (1206)
R4A, B	180 Ω, 1/4 W Chip Resistors, Vishay Dale (1210)
PCB	MRF374 Printed Circuit Board Rev 03, Rogers RO4350, Height 30 mils, ε_r = 3.48
Balun B1A, B	Vertical 860 MHz Narrowband Balun, Printed Circuit Board Rev 01, Rogers RO3010, Height 50 mils, ε_r = 10.2

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TYPICAL CHARACTERISTICS

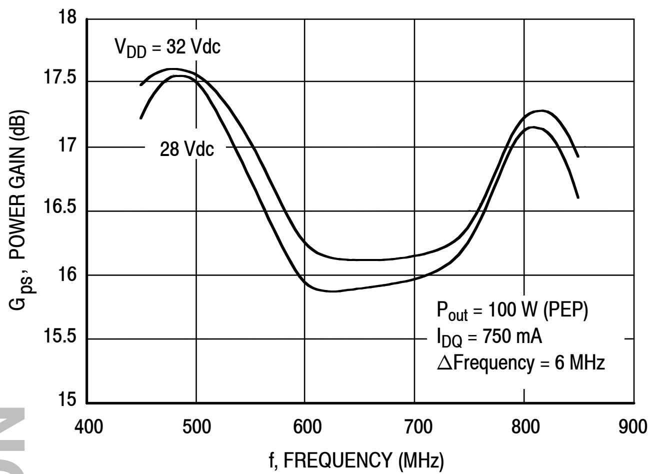

Figure 2. Gain versus Frequency in Broadband Circuit

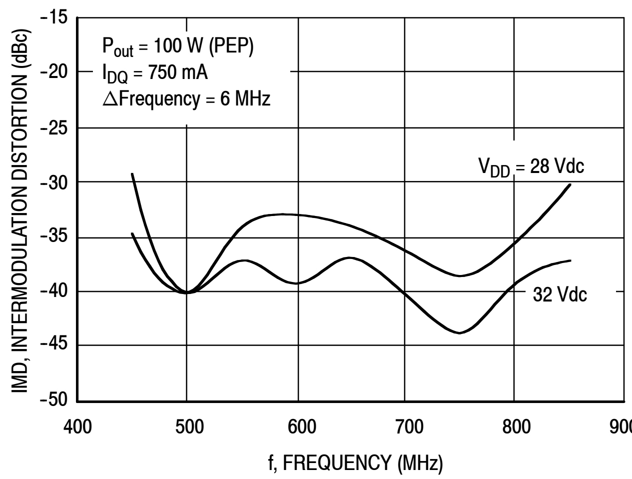

Figure 3. Intermodulation Distortion versus Frequency in Broadband Circuit

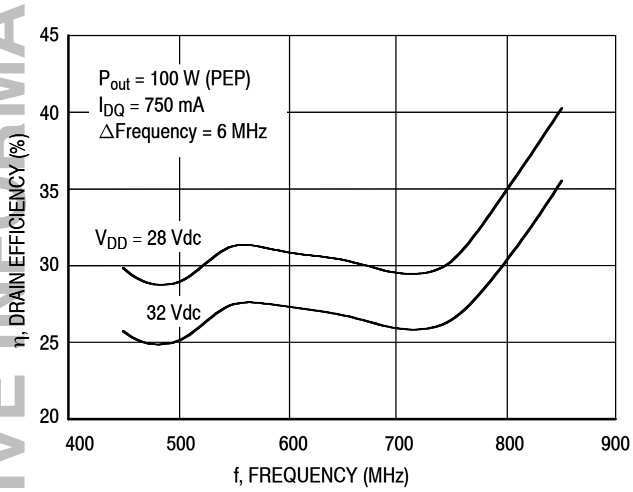

Figure 4. Drain Efficiency versus Frequency in Broadband Circuit

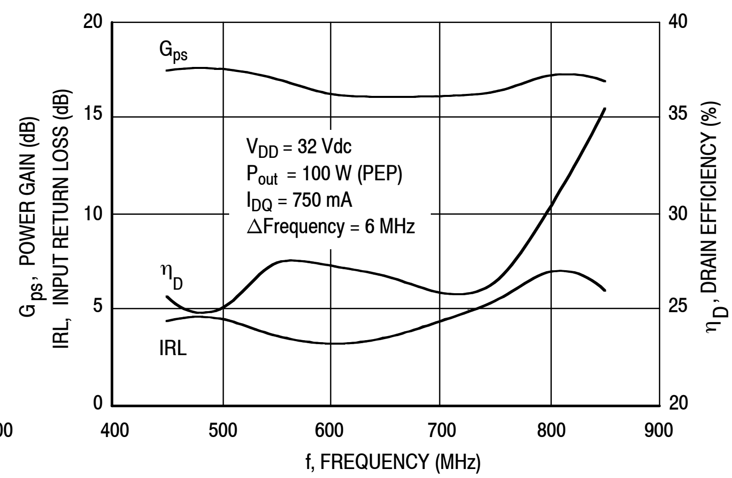

Figure 5. Performance in Broadband Circuit

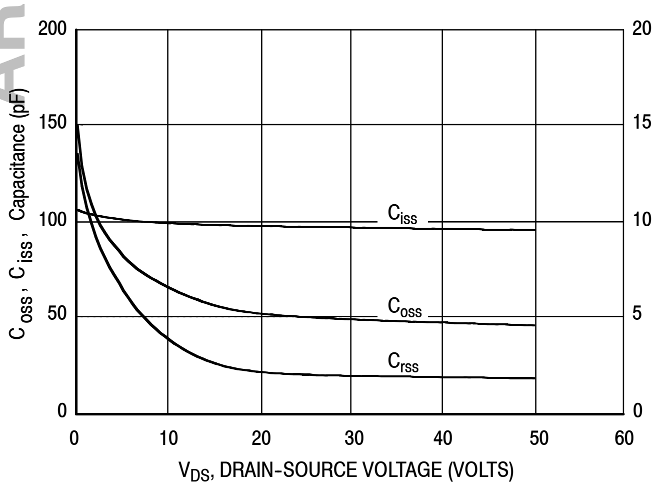

Figure 6. Capacitance versus Voltage

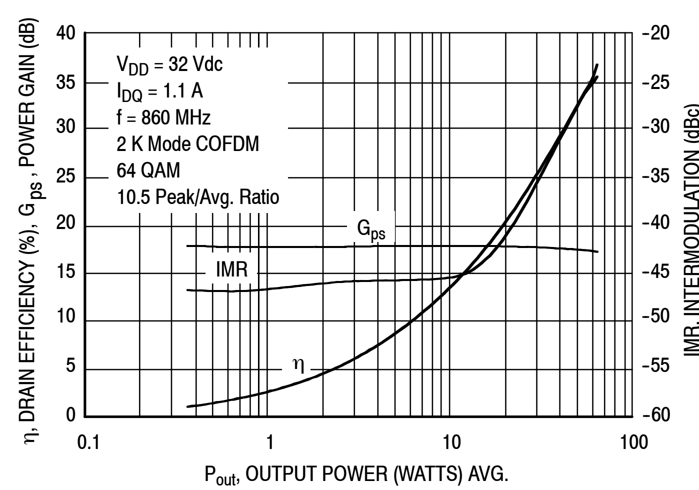

Figure 7. COFDM Intermodulation, Gain and Efficiency versus Output Power in Broadband Circuit

TYPICAL CHARACTERISTICS

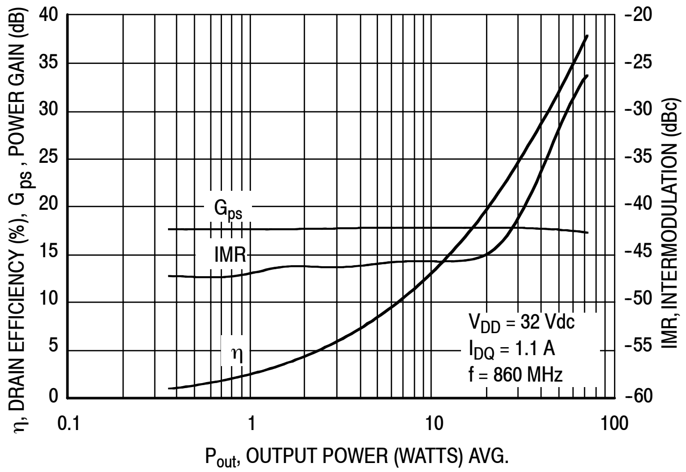

Figure 8. 8-VSB Intermodulation, Gain and Efficiency versus Output Power in Broadband Circuit

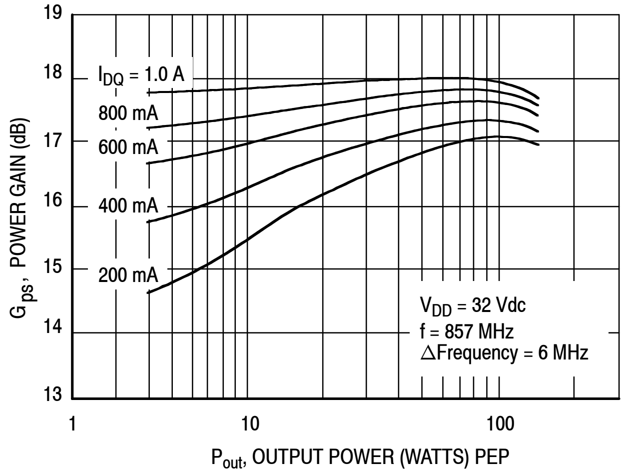

Figure 9. Power Gain versus Peak Output Power in Narrowband Circuit

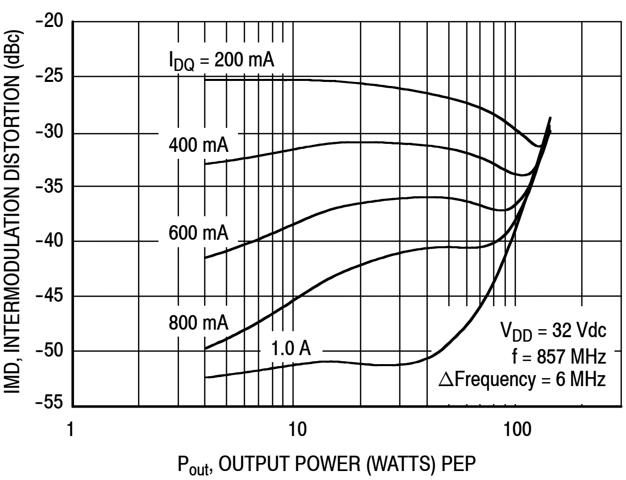

Figure 10. Intermodulation Distortion versus Peak Output Power in Narrowband Circuit

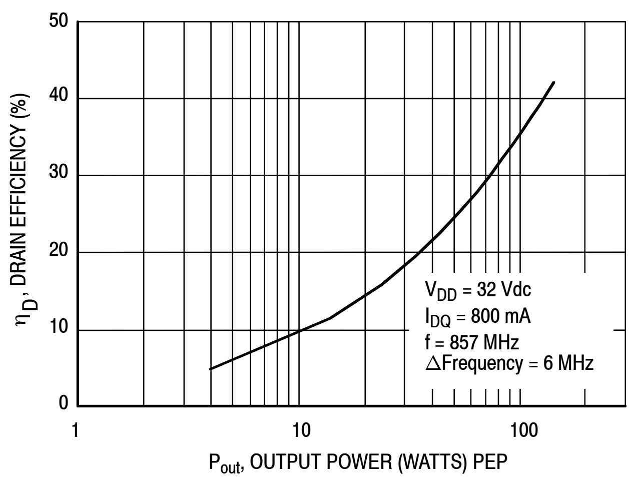

Figure 11. Drain Efficiency versus Peak Output Power in Narrowband Circuit

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TYPICAL CHARACTERISTICS

V_{DD} = 28 Vdc

V_{DD} = 32 Vdc

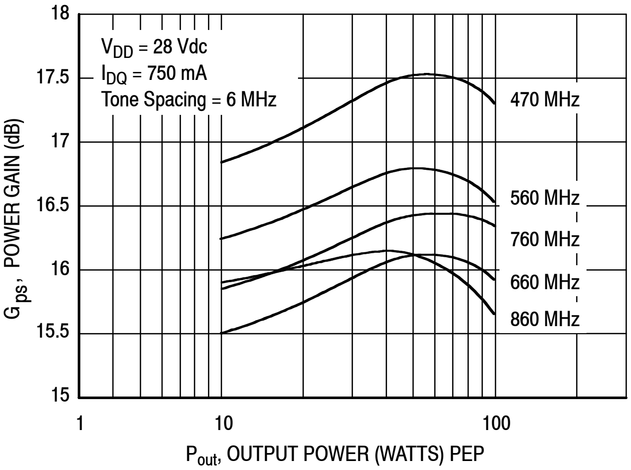


Figure 12. Power Gain versus Peak Output Power in Broadband Circuit

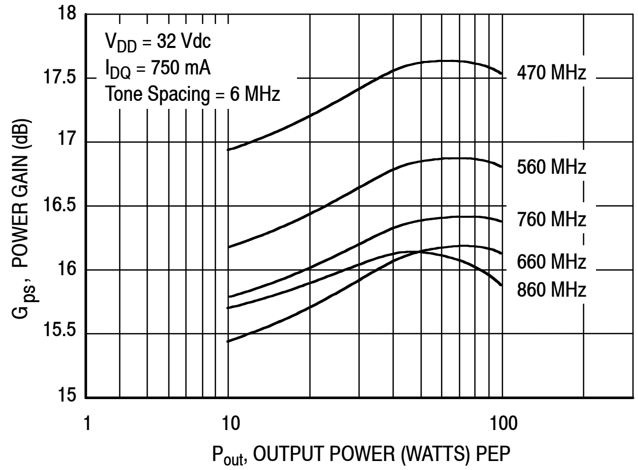


Figure 13. Power Gain versus Peak Output Power in Broadband Circuit

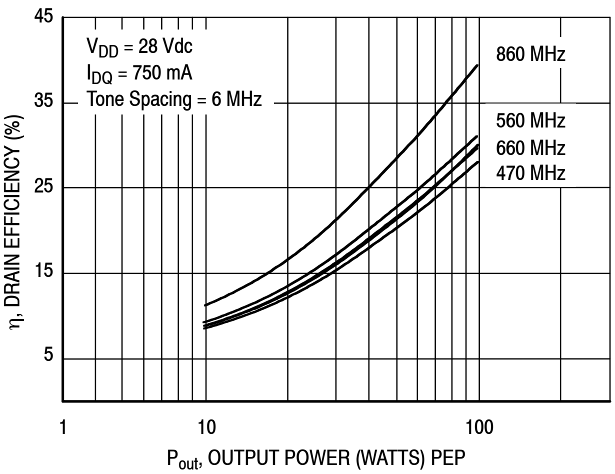


Figure 14. Drain Efficiency versus Peak Output Power in Broadband Circuit

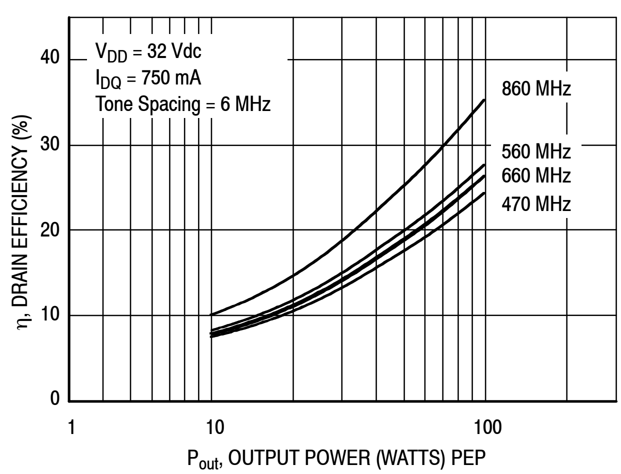


Figure 15. Drain Efficiency versus Peak Output Power in Broadband Circuit

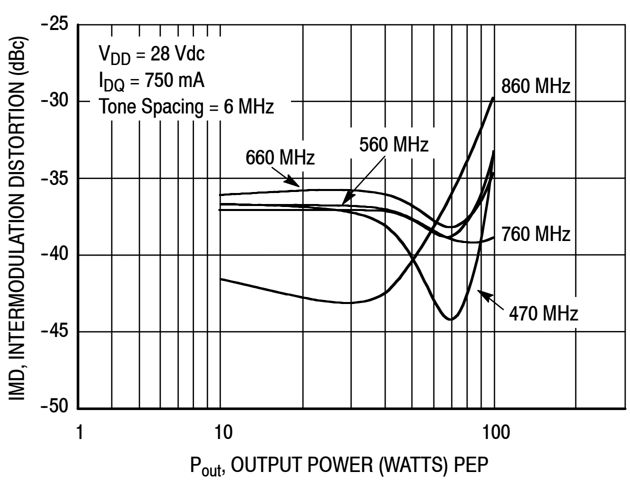


Figure 16. Intermodulation Distortion versus Peak Output Power in Broadband Circuit

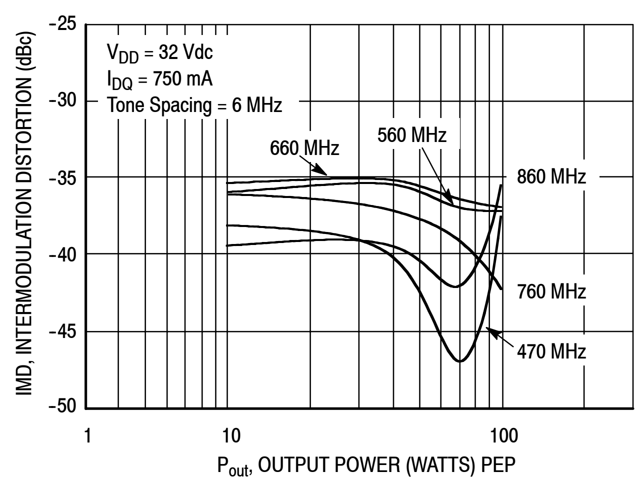
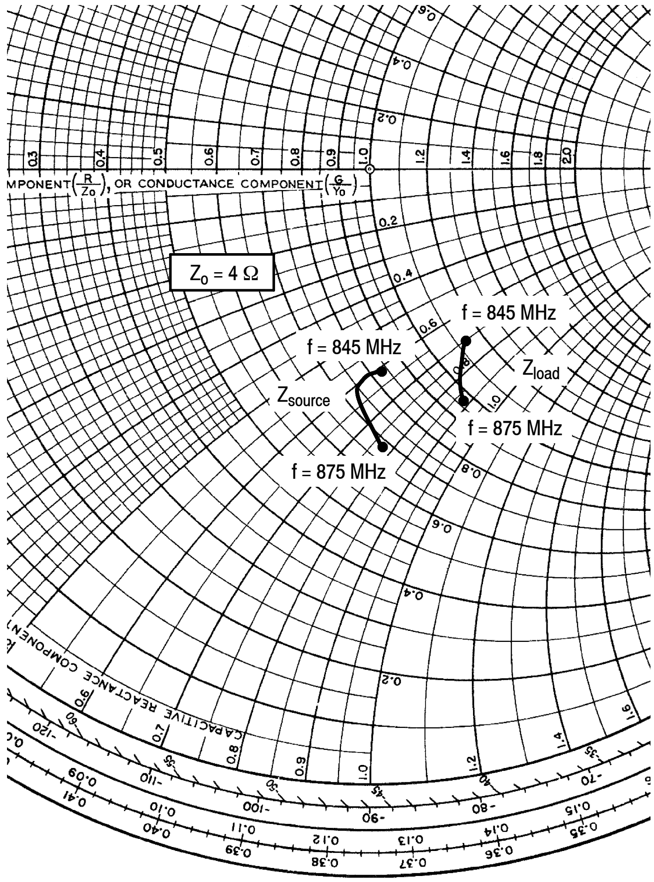


Figure 17. Intermodulation Distortion versus Peak Output Power in Broadband Circuit



V_{DD} = 32 V, I_{DQ} = 400 mA, P_{out} = 130 W PEP

f MHz	Z_{source} Ω	Z_{load} Ω
845	3.33 - j2.42	4.56 - j2.86
860	3.03 - j2.39	4.22 - j3.16
875	2.73 - j3.10	3.87 - j3.52

Z_{source} = Test circuit impedance as measured from gate to gate, balanced configuration.

Z_{load} = Test circuit impedance as measured from drain to drain, balanced configuration.

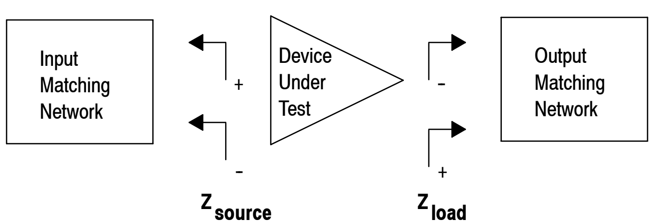
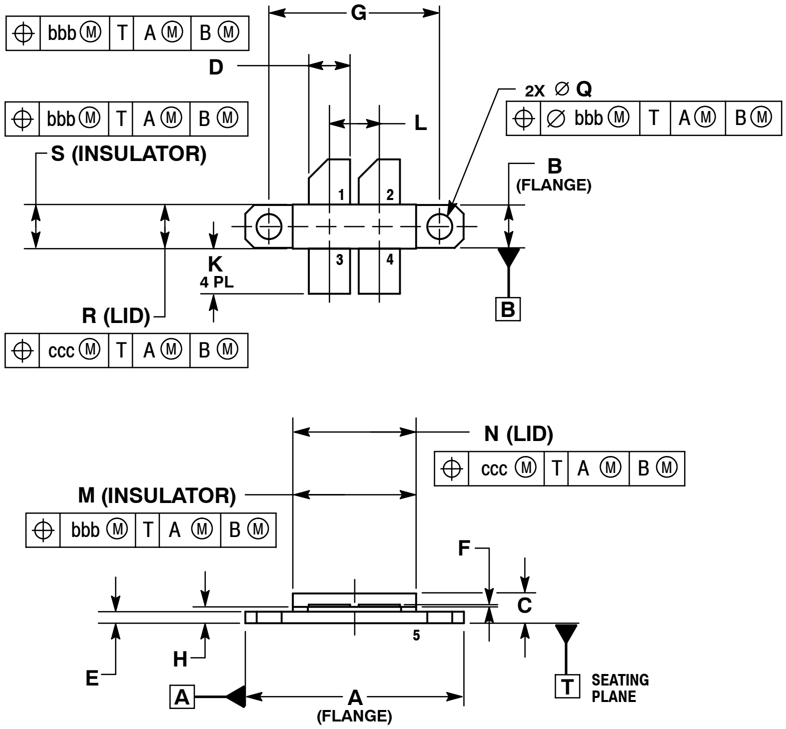


Figure 18. Series Equivalent Source and Load Impedance

NOTES

NOTES

PACKAGE DIMENSIONS



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

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	1.135	1.145	28.80	29.10
B	0.225	0.235	5.72	5.97
C	0.135	0.178	3.43	4.52
D	0.210	0.220	5.33	5.59
E	0.055	0.065	1.40	1.65
F	0.004	0.006	0.11	0.15
G	0.900 BSC		22.86 BSC	
H	0.077	0.087	1.96	2.21
K	0.220	0.250	5.59	6.35
L	0.260 BSC		6.60 BSC	
M	0.643	0.657	16.33	16.69
N	0.638	0.650	16.20	16.50
Q	∅.125	∅.135	∅3.175	∅3.43
R	0.227	0.233	5.77	5.92
S	0.225	0.235	5.715	5.97
bbb	0.010 BSC		0.254 BSC	
ccc	0.015 BSC		0.381 BSC	

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

CASE 375F-04
ISSUE E
NI-650

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How to Reach Us:

Home Page:
www.freescale.com

E-mail:
support@freescale.com

USA/Europe or Locations Not Listed:
Freescale Semiconductor
Technical Information Center, CH370
1300 N. Alma School Road
Chandler, Arizona 85224
+1-800-521-6274 or +1-480-768-2130
support@freescale.com

Europe, Middle East, and Africa:
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
support@freescale.com

Japan:
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1-8-1, Shimo-Meguro, Meguro-ku,
Tokyo 153-0064
Japan
0120 191014 or +81 3 5437 9125
support.japan@freescale.com

Asia/Pacific:
Freescale Semiconductor Hong Kong Ltd.
Technical Information Center
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Tai Po Industrial Estate
Tai Po, N.T., Hong Kong
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