

Product Is Not Recommended for New Design.
The next generation of higher performance products are in development. Visit our online Selector Guides (<http://mot-sps.com/rf/sg/html>) for scheduled introduction dates.

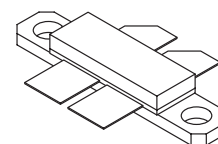
MRF374

The RF MOSFET Line RF Power Field-Effect Transistor N-Channel Enhancement-Mode Lateral MOSFET

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

**100 W, 470 – 860 MHz, 28 V
LATERAL N-CHANNEL
BROADBAND
RF POWER MOSFET**

- Typical Two-Tone Performance @ 860 MHz, 28 Volts, Narrow-band Fixture
 - Output Power – 100 Watts PEP
 - Power Gain – 13.5 dB
 - Efficiency – 36%
 - IMD – –31 dBc
- Typical Performance at 860 MHz, 28 Volts, Broadband Fixture
 - Output Power – 100 Watts PEP
 - Power Gain – 12 dB
 - Efficiency – 36%
 - IMD – –34 dBc
- 100% Tested for Load Mismatch Stress at All Phase Angles with
5:1 VSWR @ 28 Vdc, 860 MHz, 100 Watts CW
- Excellent Thermal Stability
- Characterized with Differential Large-Signal Impedance Parameters



CASE 375F-02, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	Vdc
Gate-Source Voltage	V_{GS}	± 20	Vdc
Drain Current – Continuous (per Side)	I_D	7	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	350 1.25	W W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 65 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.65	$^\circ\text{C/W}$

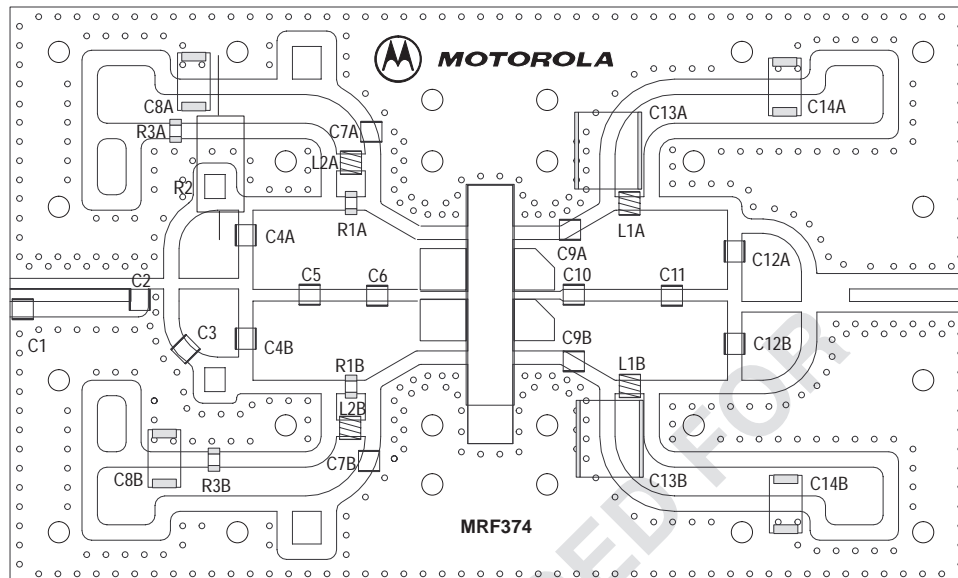
NOTE – **CAUTION** – MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain–Source Breakdown Voltage (per Side) ($V_{GS} = 0\text{ V}$, $I_D = 1\ \mu\text{A}$ per Side)	$V_{(BR)DSS}$	65	–	–	Vdc
Zero Gate Voltage Drain Current (per Side) ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$)	I_{DSS}	–	–	1	μAdc
Gate–Source Leakage Current (per Side) ($V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$)	I_{GSS}	–	–	1	μAdc
ON CHARACTERISTICS					
Gate Threshold Voltage (per Side) ($V_{DS} = 10\text{ V}$, $I_D = 200\ \mu\text{A}$ per Side)	$V_{GS(th)}$	2	3.5	4	Vdc
Gate Quiescent Voltage (per Side) ($V_{DS} = 28\text{ V}$, $I_D = 100\text{ mA}$ per Side)	$V_{GS(Q)}$	3	4.2	5	Vdc
Drain–Source On–Voltage (per Side) ($V_{GS} = 10\text{ V}$, $I_D = 3\text{ A}$ per Side)	$V_{DS(on)}$	–	0.56	0.8	Vdc
Forward Transconductance (per Side) ($V_{DS} = 10\text{ V}$, $I_D = 3\text{ A}$ per Side)	g_{fs}	2.2	2.8	–	S
DYNAMIC CHARACTERISTICS (1)					
Input Capacitance (per Side) ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$)	C_{iss}	–	80	–	pF
Output Capacitance (per Side) ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$)	C_{oss}	–	45	–	pF
Reverse Transfer Capacitance (per Side) ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$)	C_{rss}	–	3.5	–	pF
FUNCTIONAL CHARACTERISTICS, TWO–TONE TESTING (2)					
Common Source Power Gain ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 100\text{ W PEP}$, $I_{DQ} = 400\text{ mA}$, $f_1 = 857\text{ MHz}$, $f_2 = 863\text{ MHz}$)	G_{ps}	12.5	13.5	–	dB
Drain Efficiency ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 100\text{ W PEP}$, $I_{DQ} = 400\text{ mA}$, $f_1 = 857\text{ MHz}$, $f_2 = 863\text{ MHz}$)	η	30	36	–	%
Intermodulation Distortion ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 100\text{ W PEP}$, $I_{DQ} = 400\text{ mA}$, $f_1 = 857\text{ MHz}$, $f_2 = 863\text{ MHz}$)	IMD	–28	–31	–	dB
Load Mismatch ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 100\text{ W CW}$, $I_{DQ} = 400\text{ mA}$, $f = 860\text{ MHz}$, VSWR 5:1 at All Phase Angles of Test)		No Degradation in Output Power			
TYPICAL TWO–TONE BROADBAND					
Common Source Power Gain ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 100\text{ W PEP}$, $I_{DQ} = 500\text{ mA}$, $f_1 = 857\text{ MHz}$, $f_2 = 863\text{ MHz}$)	G_{ps}	–	12	–	dB
Drain Efficiency ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 100\text{ W PEP}$, $I_{DQ} = 500\text{ mA}$, $f_1 = 857\text{ MHz}$, $f_2 = 863\text{ MHz}$)	η	–	36	–	%
Intermodulation Distortion ($V_{DD} = 28\text{ Vdc}$, $P_{out} = 100\text{ W PEP}$, $I_{DQ} = 500\text{ mA}$, $f_1 = 857\text{ MHz}$, $f_2 = 863\text{ MHz}$)	IMD	–	–34	–	dB

(1) Each side of device measured separately.

(2) Measured in push–pull configuration.



Vertical Balun Mounting Detail

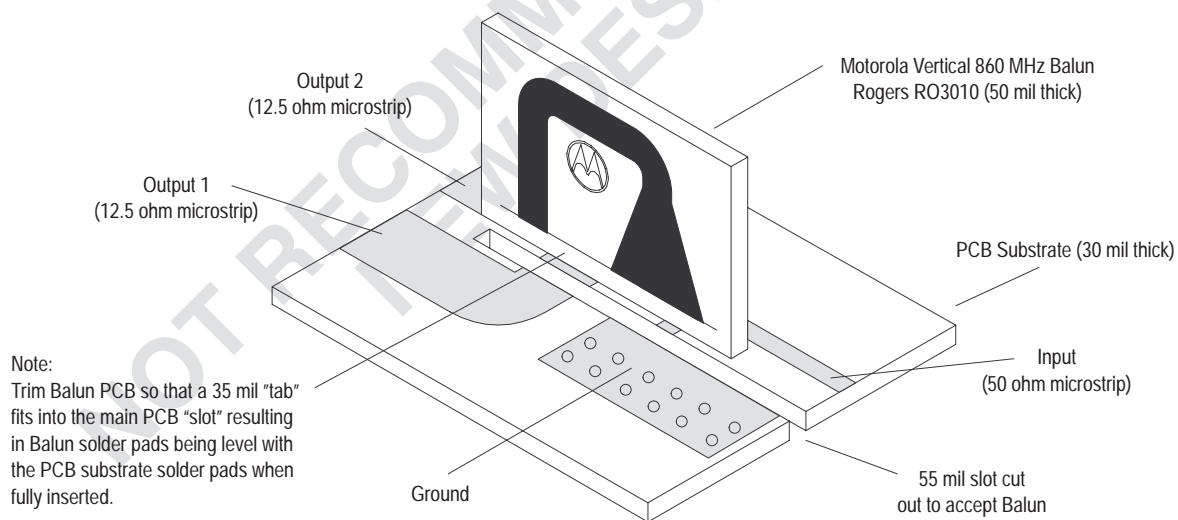


Figure 1. Narrowband Component Layout

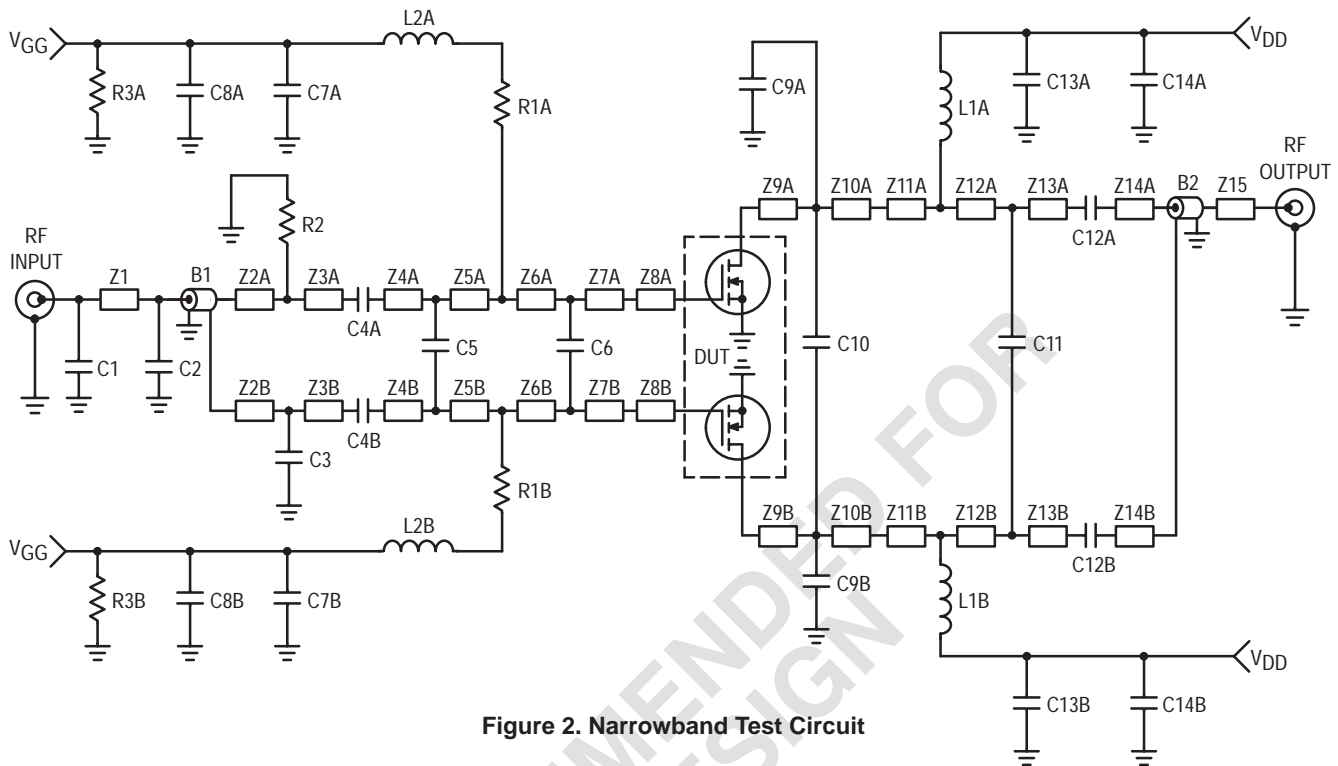


Figure 2. Narrowband Test Circuit

Table 1. Narrowband Component Designations and Values

Designation	Description
C1	0.3 pF, ATC, Case B
C2	3.0 pF, ATC, Case B
C3, C5	1.8 pF, ATC, Case B
C4A, B, C12A, B	47 pF, ATC, Case B
C6	10 pF, ATC, Case B
C7A, B	68 pF, ATC, Case B
C8A, B	10 μ F, 35 V Kemet P/N T491D106K35AS
C9A, B	15 pF, ATC, Case B
C10	5.6 pF, ATC, Case B
C11	5.1 pF, ATC, Case B
C12	3.0 pF, ATC, Case B
C13A, B	2.2 μ F, 100 V, Vishay P/N VJ3640Y225KXBAT
C14A, B	22 μ F, 35 V Kemet P/N T491D226K35AS
L1A, B	5.0 nH, Coilcraft P/N A02T
L2A, B	8.0 nH, Coilcraft P/N A03T
R1A, B	180 Ω , Vishay Dale Chip Resistor, 1/4 W (1210)
R2	10 Ω , Dale Axial Carbon Resistor, 1 W
R3A, B	3.3 k Ω , Vishay Dale Chip Resistor (1206)
PCB	MRF374 Printed Circuit Board Rev 03, Rogers RO4350, Height 30 mils, $\epsilon_r = 3.48$
Balun B1A, B	860 MHz Vertical Balun, 4:1 Impedance Translation (i.e., 12.5 Ω : 50 Ω), Printed Circuit Board Rev 01, Rogers RO3010, Height 50 mils, $\epsilon_r = 10.2$
Connectors	N-Type (female), M/A-Com P/N 3052-1648-10
Heatsink	Motorola P/N 99-1RH-2C 3" X 5" Bedstead
Insert	Motorola P/N 99-7RI-1D Insert for LDMOS μ 650 in 3" X 5" Bedstead
Protective Cover	Motorola P/N 99-2PC-2B
End Plates	2) Motorola P/N 94-7GB-1EPL, End Plate for Type-N Connector
Banana Jack and Nut	2) Johnson P/N 108-0904-001
Brass Banana Jack	2) H.H. Smith P/N SM-101

TYPICAL TWO-TONE NARROWBAND CHARACTERISTICS

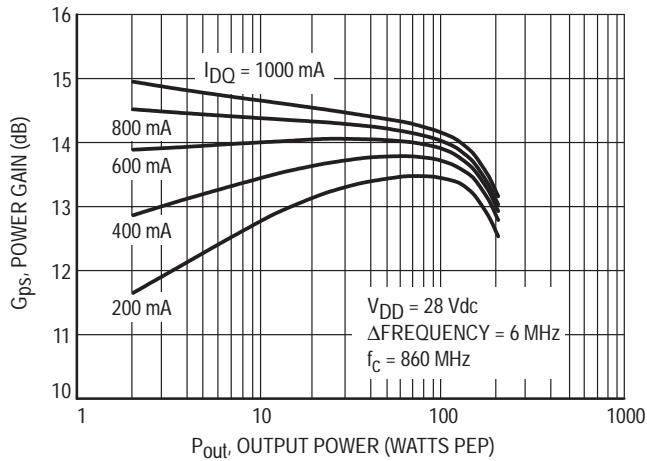


Figure 3. Power Gain versus Peak Output Power

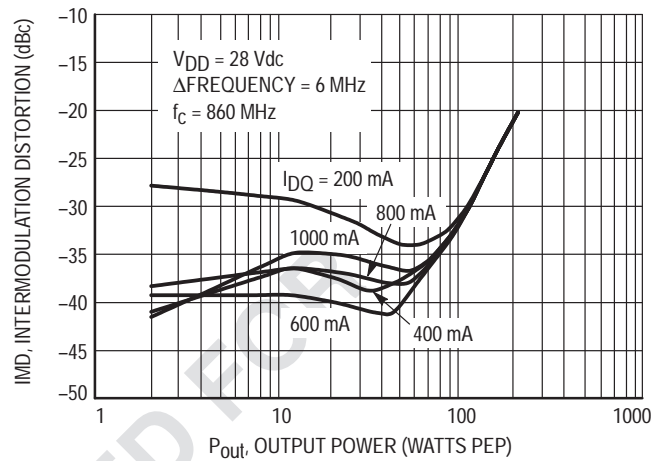


Figure 4. Intermodulation Distortion versus Peak Output Power

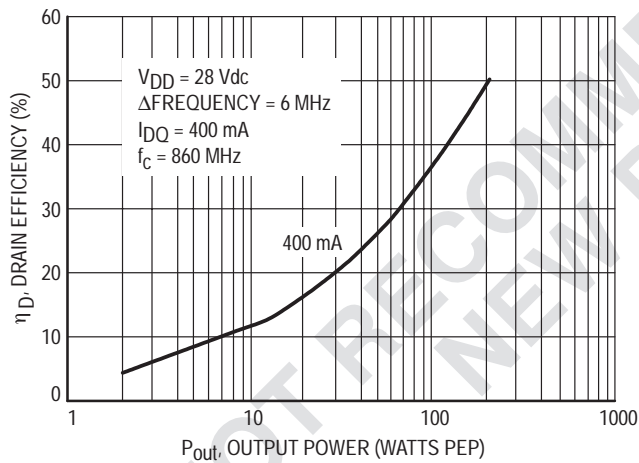


Figure 5. Drain Efficiency versus Peak Output Power

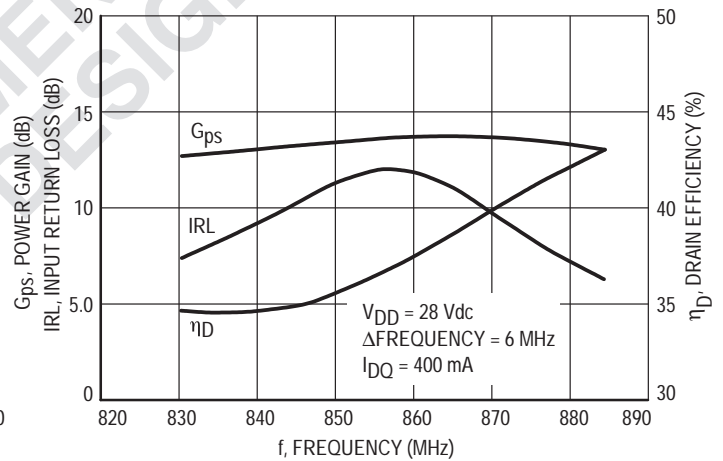


Figure 6. Performance in Narrowband Test Circuit

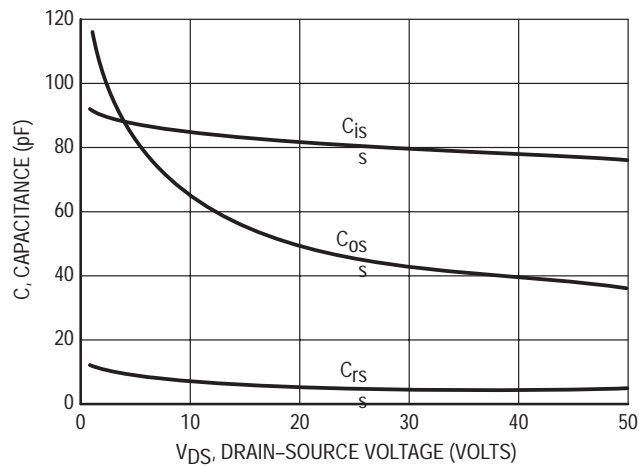
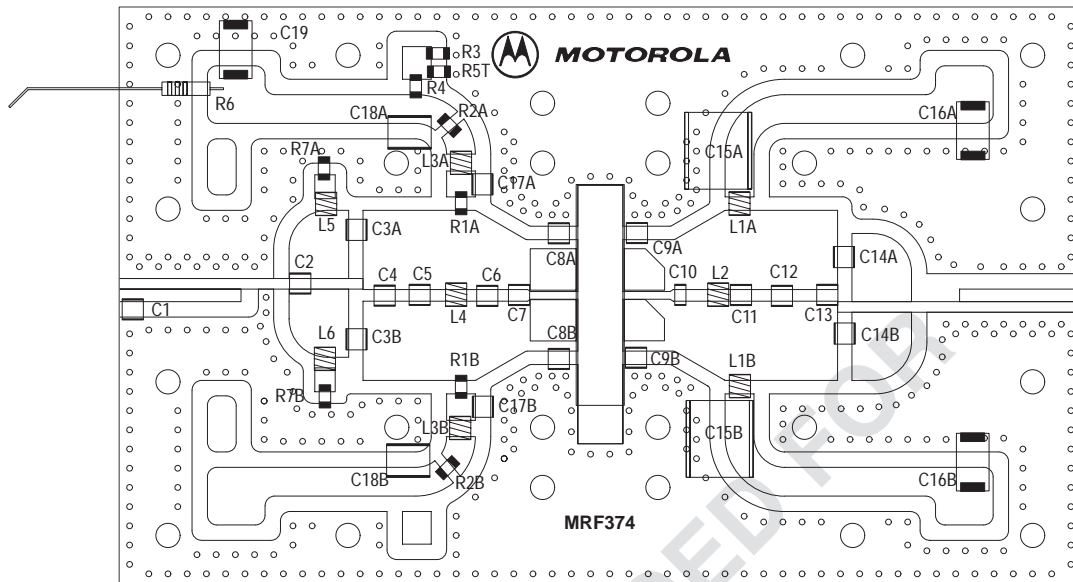


Figure 7. Capacitance versus Voltage



Vertical Balun Mounting Detail

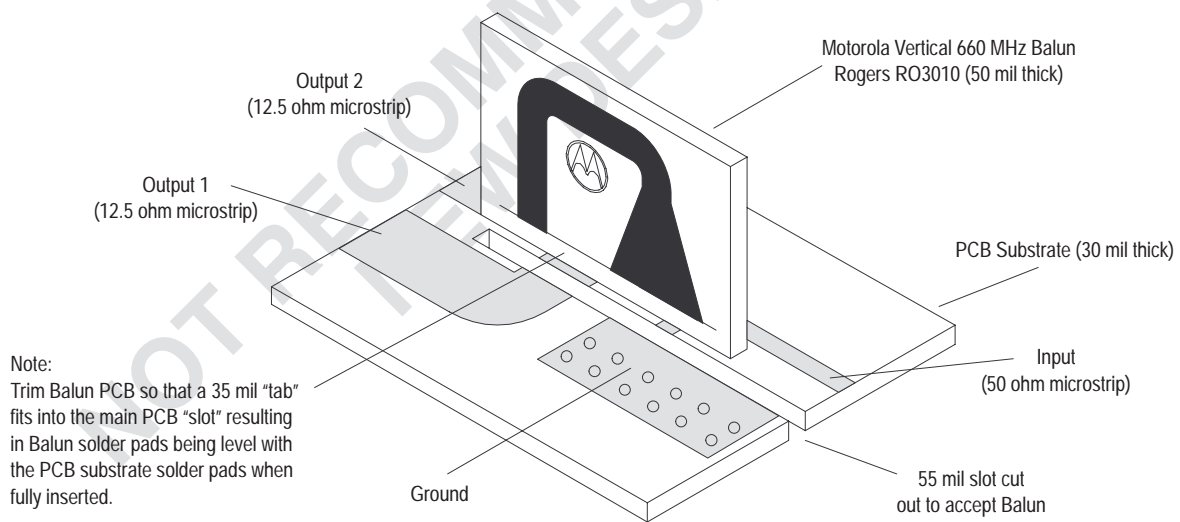


Figure 8. Broadband Component Layout

Table 2. Broadband Component Designations and Values

Designation	Description
C1	0.8 pF, ATC, Case B
C2	8.2 pF, ATC, Case B
C3A, B, C14A, B	100 pF, ATC, Case B
C4	7.5 pF, ATC, Case B
C5	3.0 pF, ATC, Case B
C6	9.1 pF, ATC, Case B
C7	15 pF, ATC, Case B
C8A, B	12 pF, ATC, Case B
C9A, B	4.7 pF, ATC, Case B
C10	10 pF, ATC, Case B
C11	3.6 pF, ATC, Case B
C12	3.0 pF, ATC, Case B
C13	2.7 pF, ATC, Case B
C15A, B	3.3 μ F, 100 V, Vitramon P/N VJ3640Y335KXBAT
C16A, B	22 μ F, 35 V, Kemet P/N T491D226K035AS
C17A, B	3.9 pF, ATC, Case B
C18A, B	2.2 μ F, 50 V, Vitramon P/N VJ2225Y225KXAAT
C19	10 μ F, 35 V, Kemet P/N T491D106K035AS
L1A, B, L3A, B, L4, L5	8.0 nH, Coilcraft P/N A03T
L2, L6	12.5 nH, Coilcraft P/N A04T
R1A, B	22 Ω , Vishay Dale Chip Resistor, 1/4 W (1206)
R2A, B, R7A, B	10 Ω , Vishay Dale Chip Resistor, 1/4 W (1206)
R3	390 Ω , Vishay Dale Chip Resistor (1206)
R4	2.4 k Ω , Vishay Dale Chip Resistor (1206)
R5T	470 Ω Thermistor, KOA SPEER MOT P/N 0680149M01
R6	6.8 k Ω , Vishay Dale Resistor, 1/2 W (Axial Lead)
PCB	MRF374 Printed Circuit Board Rev 03, Rogers RO4350, Height 30 mils, $\epsilon_r = 3.48$
Balun B1, B2	Vertical 660 MHz Broadband Balun, Printed Circuit Board Rev 01, Rogers RO3010, Height 50 mils, $\epsilon_r = 10.2$

f MHz	Z_{in} Ω	Z_{OL}^* Ω
470	5.79 – j0.97	4.54 + j2.82
660	4.52 + j0.50	4.21 + j3.04
860	3.16 + j3.73	3.86 + j3.44

Z_{in} = Input impedance from the transistor.

Z_{OL}^* = Complex conjugate of the optimum load at a given voltage, P1dB, gain, efficiency, bias current and frequency.

Note: Z_{in} and Z_{OL} are measured impedances taken from gate-to-gate and drain-to-drain, respectively.

Table 3. Broadband Push-Pull Balanced Fixture Impedances

TYPICAL TWO-TONE BROADBAND CHARACTERISTICS

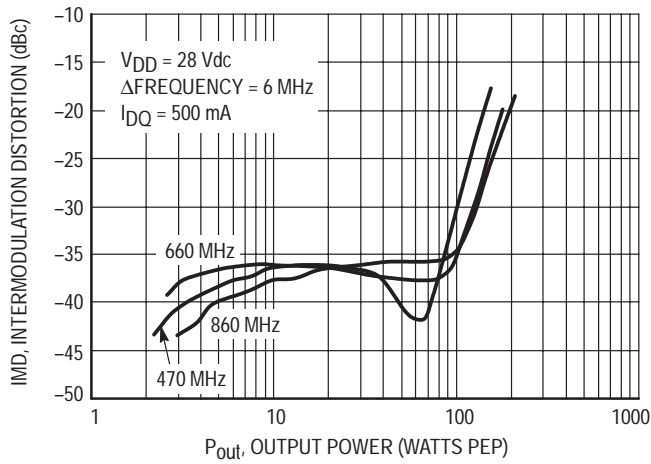


Figure 9. Broadband Intermodulation Distortion versus Output Power

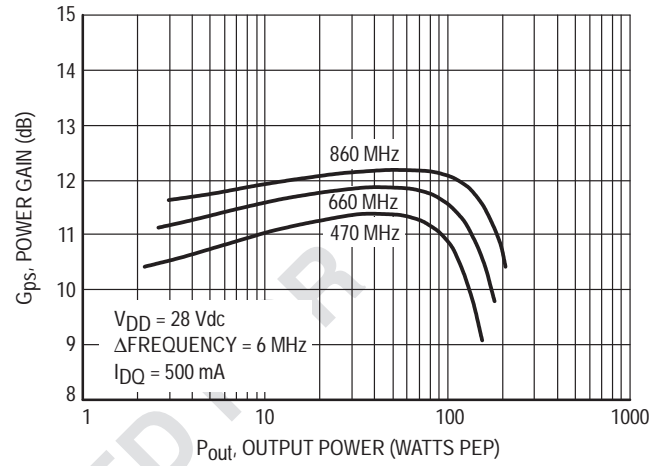


Figure 10. Broadband Power Gain versus Output Power

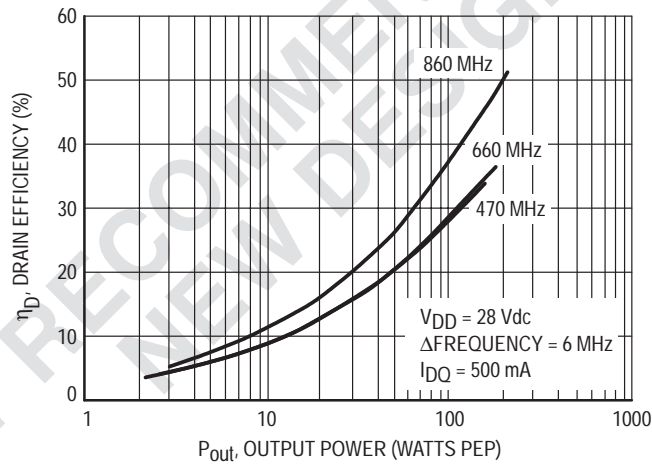


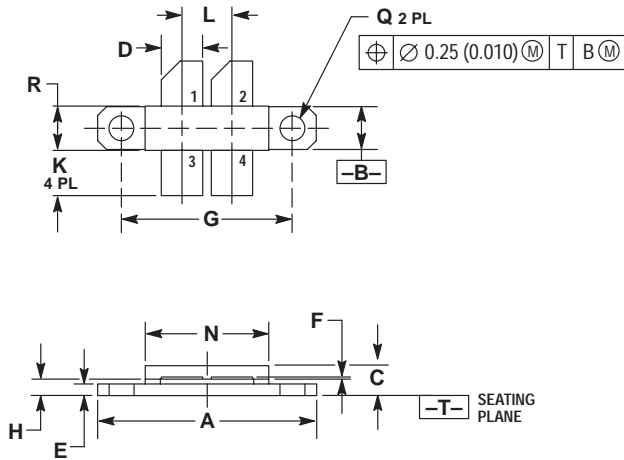
Figure 11. Broadband Efficiency versus Output Power

NOTES

NOTES

NOTES

PACKAGE DIMENSIONS




- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION H IS MEASURED 0.030" AWAY FROM FLANGE.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.135	1.145	28.80	29.10
B	0.225	0.235	5.72	5.97
C	0.148	0.178	3.76	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	0.110	0.150
G	0.900 BSC		22.86 BSC	
H	0.076	0.086	1.93	2.18
K	0.215	0.255	5.46	6.28
L	0.260 BSC		6.60 BSC	
N	0.638	0.650	16.20	16.50
Q	∅ 0.130 BSC		∅ 3.30 BSC	
R	0.225	0.235	5.72	5.97

- STYLE 1:
1. COLLECTOR
 2. COLLECTOR
 3. BASE
 4. BASE
 5. EMITTER

CASE 375F-02 ISSUE A

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

JAPAN: Motorola Japan Ltd.; SPS, Technical Information Center, 3-20-1,
Minami-Azabu, Minato-ku, Tokyo 106-8573 Japan. 81-3-3440-3569

Customer Focus Center: 1-800-521-6274

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 1-602-244-6609
Motorola Fax Back System – US & Canada ONLY 1-800-774-1848
– http://sps.motorola.com/mfax/

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre,
2, Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.
852-26668334

HOME PAGE: <http://motorola.com/sps/>

