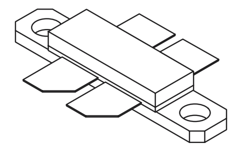
The RF MOSFET Line
RF Power Field-Effect Transistor
N–Channel Enhancement–Mode Lateral MOSFET

MRF374

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

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

- Typical Two–Tone Performance @ 860 MHz, 28 Volts, Narrowband 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–04, STYLE 1
NI–650**

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°C Derate above 25°C	P_D	270 1.25	W W/°C
Storage Temperature Range	T_{stg}	– 65 to +150	°C
Operating Junction Temperature	T_J	200	°C

THERMAL CHARACTERISTICS

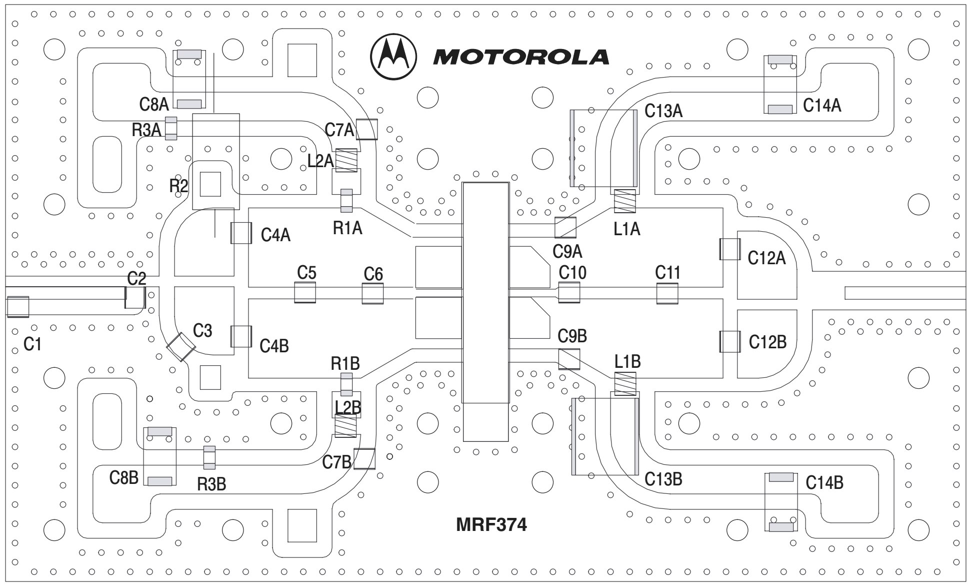
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.65	°C/W

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°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain–Source Breakdown Voltage (per Side) (V_{GS} = 0 Vdc, I_D =1 μA per Side)	$V_{(BR)DSS}$	65	–	–	Vdc
Zero Gate Voltage Drain Current (per Side) (V_{DS} = 28 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	–	–	1	μAdc
Gate–Source Leakage Current (per Side) (V_{GS} = 20 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	–	–	1	μAdc
ON CHARACTERISTICS					
Gate Threshold Voltage (per Side) (V_{DS} = 10 V, I_D = 200 μA per Side)	$V_{GS(th)}$	2	3.5	4	Vdc
Gate Quiescent Voltage (per Side) (V_{DS} = 28 V, I_D = 100 mA per Side)	$V_{GS(Q)}$	3	4.2	5	Vdc
Drain–Source On–Voltage (per Side) (V_{GS} = 10 V, I_D = 3 A per Side)	$V_{DS(on)}$	–	0.56	0.8	Vdc
Forward Transconductance (per Side) (V_{DS} = 10 V, I_D = 3 A per Side)	g_{fs}	2.2	2.8	–	S
DYNAMIC CHARACTERISTICS (1)					
Input Capacitance (per Side) (V_{DS} = 28 V, V_{GS} = 0 V, f = 1 MHz)	C_{iss}	–	80	–	pF
Output Capacitance (per Side) (V_{DS} = 28 V, V_{GS} = 0 V, f = 1 MHz)	C_{oss}	–	45	–	pF
Reverse Transfer Capacitance (per Side) (V_{DS} = 28 V, V_{GS} = 0 V, f = 1 MHz)	C_{rss}	–	3.5	–	pF
FUNCTIONAL CHARACTERISTICS, TWO–TONE TESTING (2)					
Common Source Power Gain (V_{DD} = 28 Vdc, P_{out} = 100 W PEP, I_{DQ} = 400 mA, f1 = 857 MHz, f2 = 863 MHz)	G_{ps}	12.5	13.5	–	dB
Drain Efficiency (V_{DD} = 28 Vdc, P_{out} = 100 W PEP, I_{DQ} = 400 mA, f1 = 857 MHz, f2 = 863 MHz)	η	30	36	–	%
Intermodulation Distortion (V_{DD} = 28 Vdc, P_{out} = 100 W PEP, I_{DQ} = 400 mA, f1 = 857 MHz, f2 = 863 MHz)	IMD	–28	–31	–	dB
Load Mismatch (V_{DD} = 28 Vdc, P_{out} = 100 W CW, I_{DQ} = 400 mA, f = 860 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 Vdc, P_{out} = 100 W PEP, I_{DQ} = 500 mA, f1 = 857 MHz, f2 = 863 MHz)	G_{ps}	–	12	–	dB
Drain Efficiency (V_{DD} = 28 Vdc, P_{out} = 100 W PEP, I_{DQ} = 500 mA, f1 = 857 MHz, f2 = 863 MHz)	η	–	36	–	%
Intermodulation Distortion (V_{DD} = 28 Vdc, P_{out} = 100 W PEP, I_{DQ} = 500 mA, f1 = 857 MHz, f2 = 863 MHz)	IMD	–	– 34	–	dB

(1) Each side of device measured separately.
(2) Measured in push–pull configuration.



Vertical Balun Mounting Detail

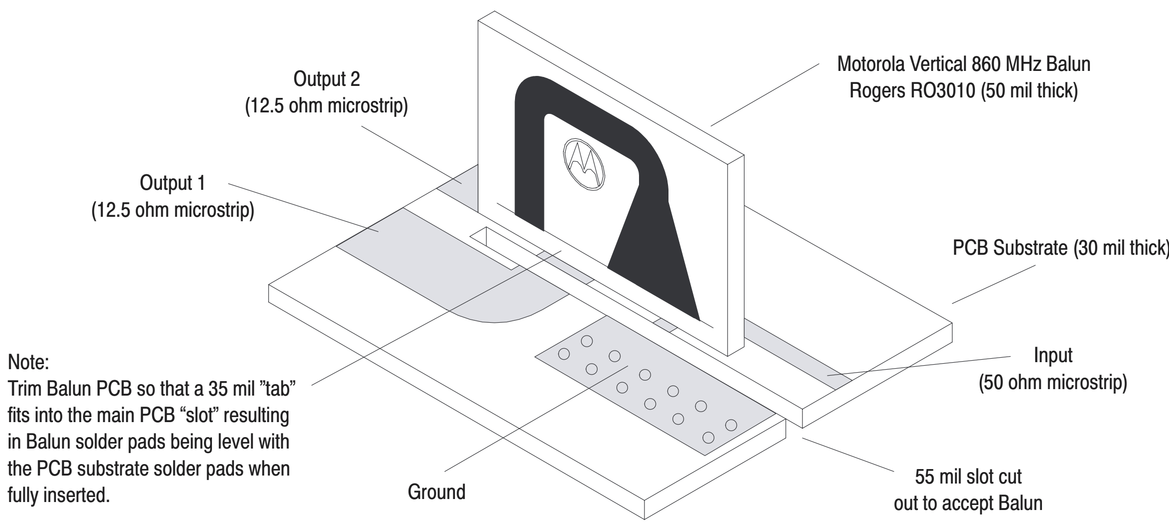


Figure 1. Narrowband Component Layout

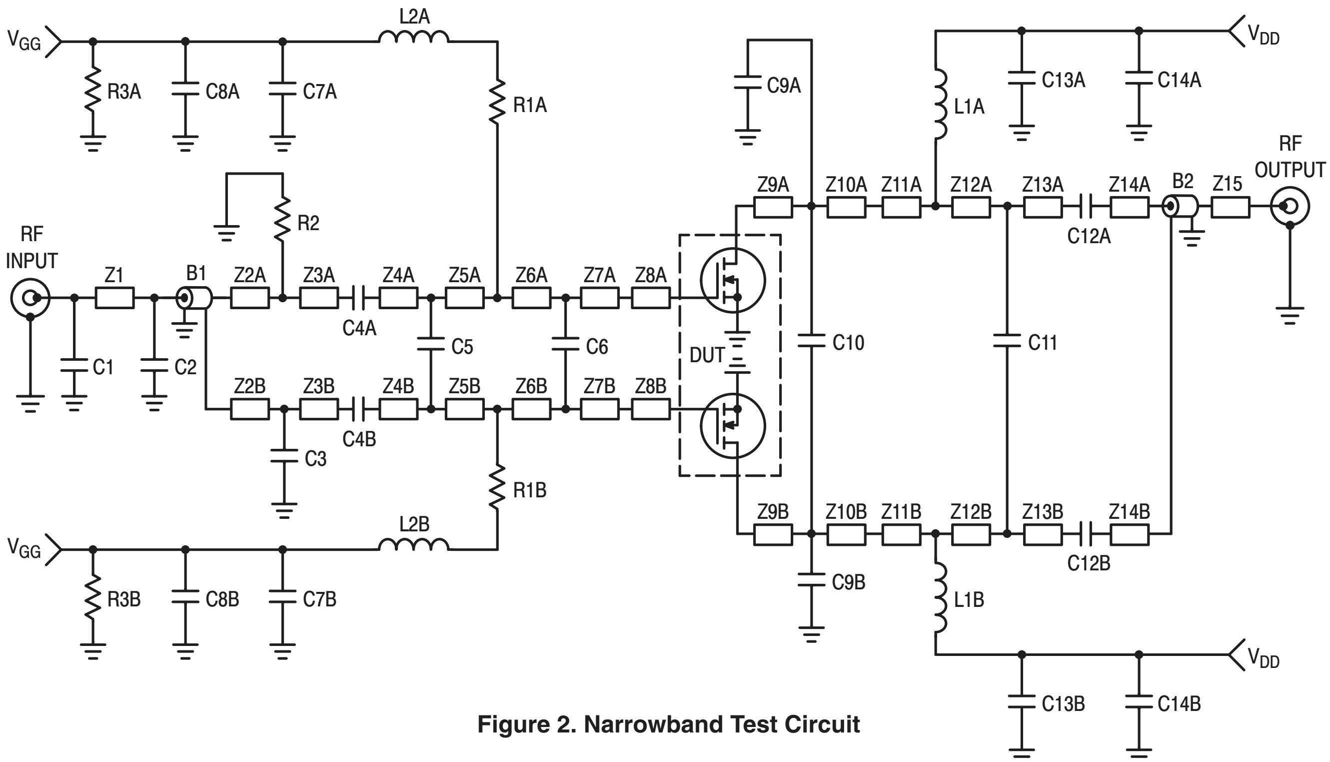


Figure 2. Narrowband Test Circuit

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 μF, 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 μF, 100 V, Vishay P/N VJ3640Y225KXBAT
C14A, B	22 μF, 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 kΩ, Vishay Dale Chip Resistor (1206)
PCB	MRF374 Printed Circuit Board Rev 03, Rogers RO4350, Height 30 mils, ε_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, ε_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 μ650 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

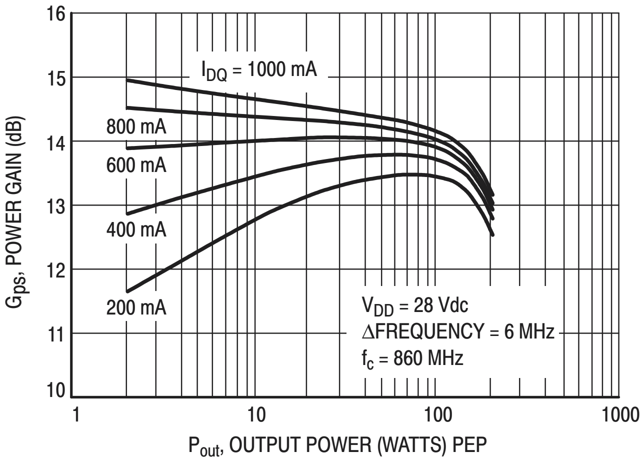


Figure 3. Power Gain versus Peak Output Power

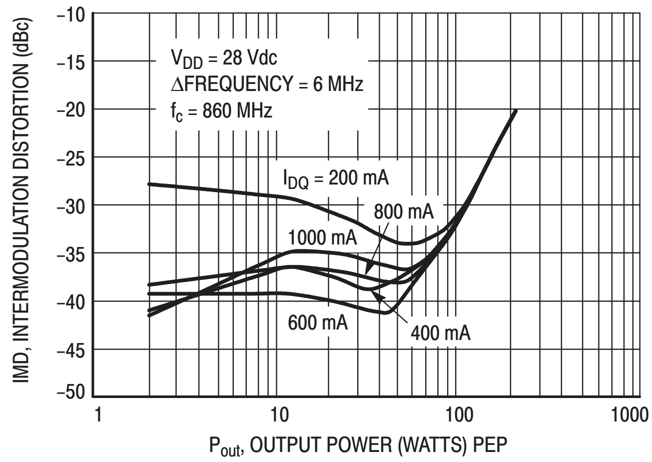


Figure 4. Intermodulation Distortion versus Peak Output Power

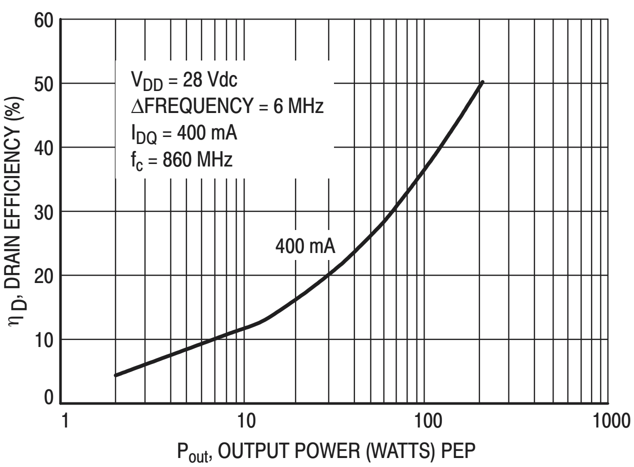


Figure 5. Drain Efficiency versus Peak Output Power

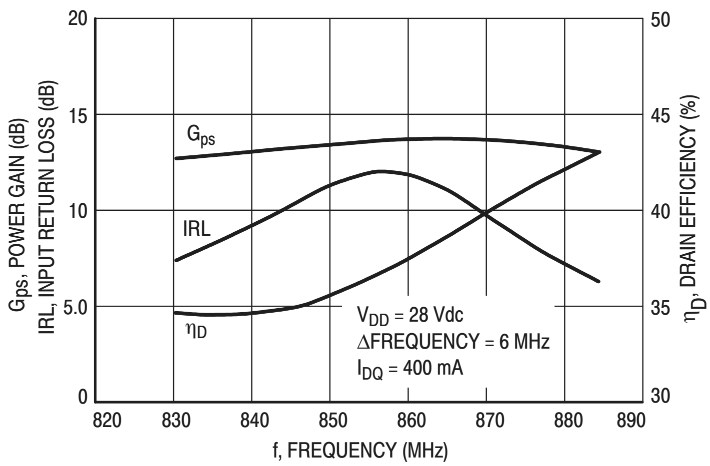


Figure 6. Performance in Narrowband Test Circuit

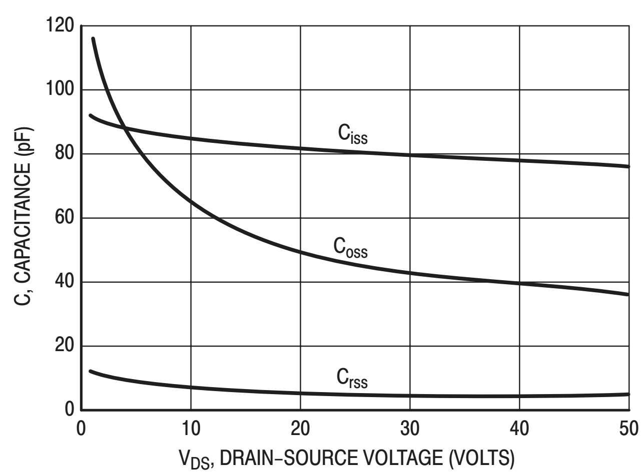
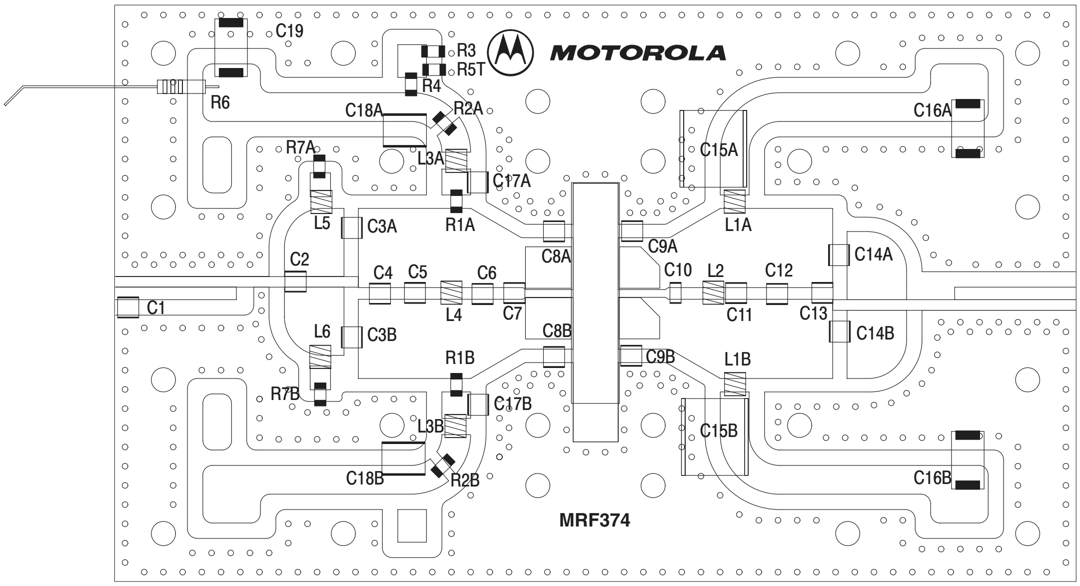


Figure 7. Capacitance versus Voltage



Vertical Balun Mounting Detail

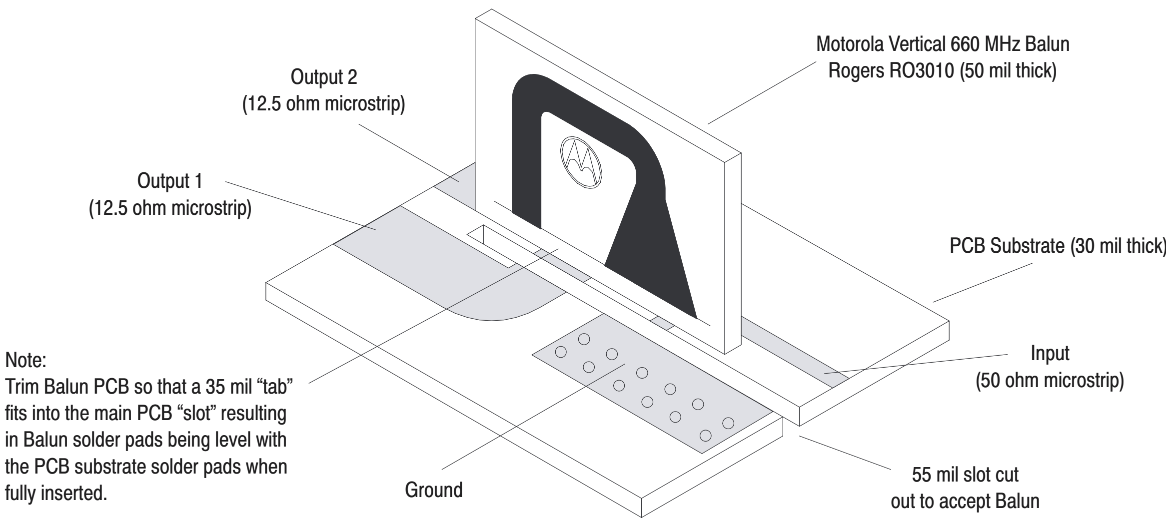


Figure 8. Broadband Component Layout

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 μF, 100 V, Vitramon P/N VJ3640Y335KXBAT
C16A, B	22 μF, 35 V, Kemet P/N T491D226K035AS
C17A, B	3.9 pF, ATC, Case B
C18A, B	2.2 μF, 50 V, Vitramon P/N VJ2225Y225KXAAT
C19	10 μF, 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 kΩ, Vishay Dale Chip Resistor (1206)
R5T	470 Ω Thermistor, KOA SPEER MOT P/N 0680149M01
R6	6.8 kΩ, Vishay Dale Resistor, 1/2 W (Axial Lead)
PCB	MRF374 Printed Circuit Board Rev 03, Rogers RO4350, Height 30 mils, ε_r = 3.48
Balun B1, B2	Vertical 660 MHz Broadband Balun, Printed Circuit Board Rev 01, Rogers RO3010, Height 50 mils, ε_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

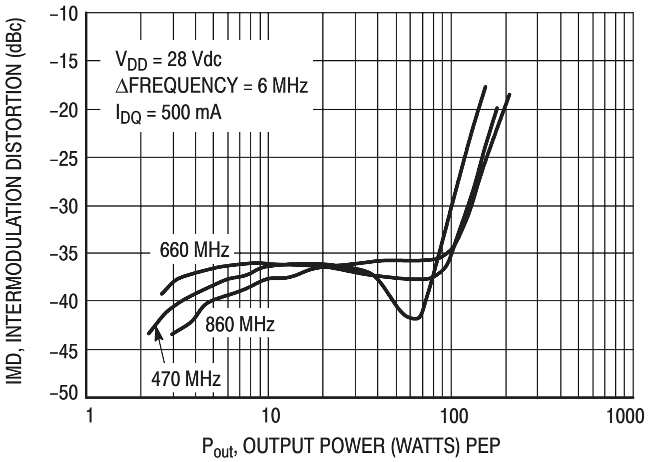


Figure 9. Broadband Intermodulation Distortion versus Output Power

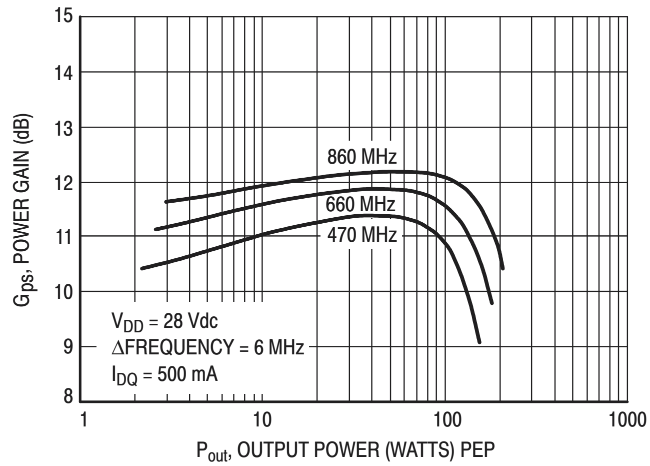


Figure 10. Broadband Power Gain versus Output Power

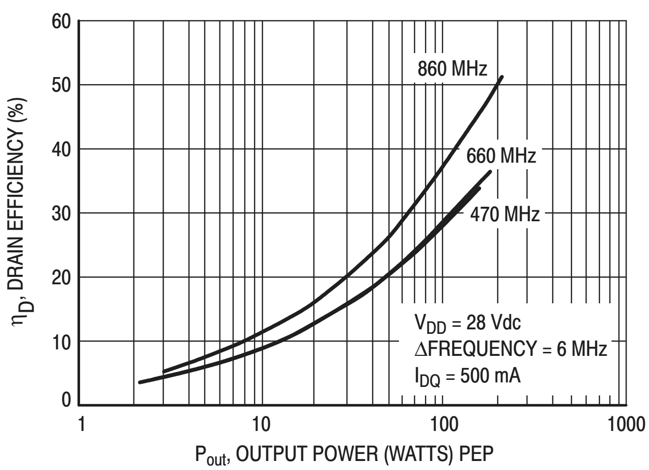


Figure 11. Broadband Efficiency versus Output Power

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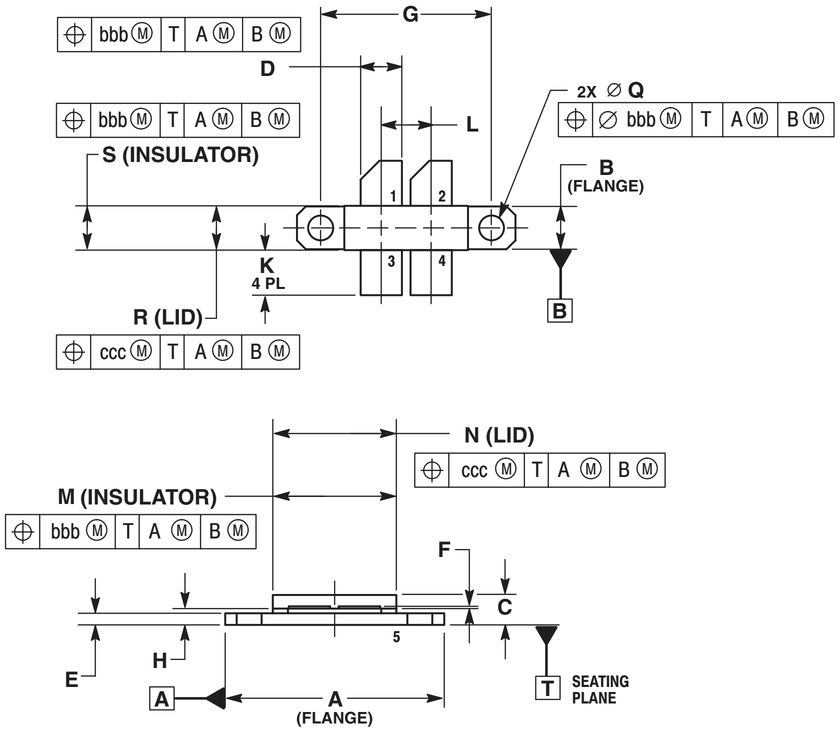
PACKAGE DIMENSIONS



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.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	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 D
NI–650

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