

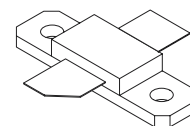
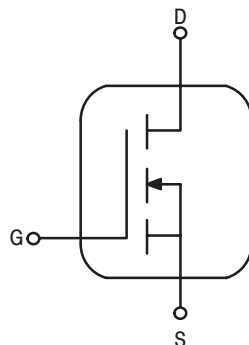
The RF MOSFET Line
RF Power Field Effect Transistors
N-Channel Enhancement-Mode Lateral MOSFETs

MRF373R1
MRF373SR1

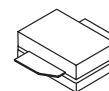
Designed for broadband commercial and industrial applications with frequencies from 470 – 860 MHz. The high gain and broadband performance of these devices make them ideal for large-signal, common source amplifier applications in 28 volt transmitter equipment.

470 – 860 MHz, 60 W, 28 V
LATERAL N-CHANNEL
BROADBAND
RF POWER MOSFETS

- Guaranteed CW Performance at 860 MHz, 28 Volts, Narrowband Fixture
Output Power – 60 Watts
Power Gain – 13 dB
Efficiency – 50%
- Typical Performance at 860 MHz, 28 Volts, Broadband Push-Pull Fixture
Output Power – 100 Watts (PEP)
Power Gain – 11.2 dB
Efficiency – 40%
IMD – -30 dBc
- Excellent Thermal Stability
- 100% Tested for Load Mismatch Stress at All Phase Angles with 5:1 VSWR @ 28 Vdc, 860 MHz, 60 Watts CW
- In Tape and Reel. R1 = 500 units per 32 mm, 13 inch Reel.



CASE 360B-05, STYLE 1
NI-360
MRF373R1



CASE 360C-05, STYLE 1
NI-360S
MRF373SR1

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|-----------------------------------------------------------------------|------------------|--------------|-----------|
| Drain-Source Voltage | V _{DSS} | 65 | Vdc |
| Gate-Source Voltage | V _{GS} | ±20 | Vdc |
| Drain Current – Continuous | I _D | 7 | Adc |
| Total Device Dissipation @ T _C = 25°C Derate above 25°C | P _D | 173 1.33 | W W/°C |
| Storage Temperature Range | T _{stg} | - 65 to +150 | °C |
| Operating Junction Temperature | T _J | 200 | °C |

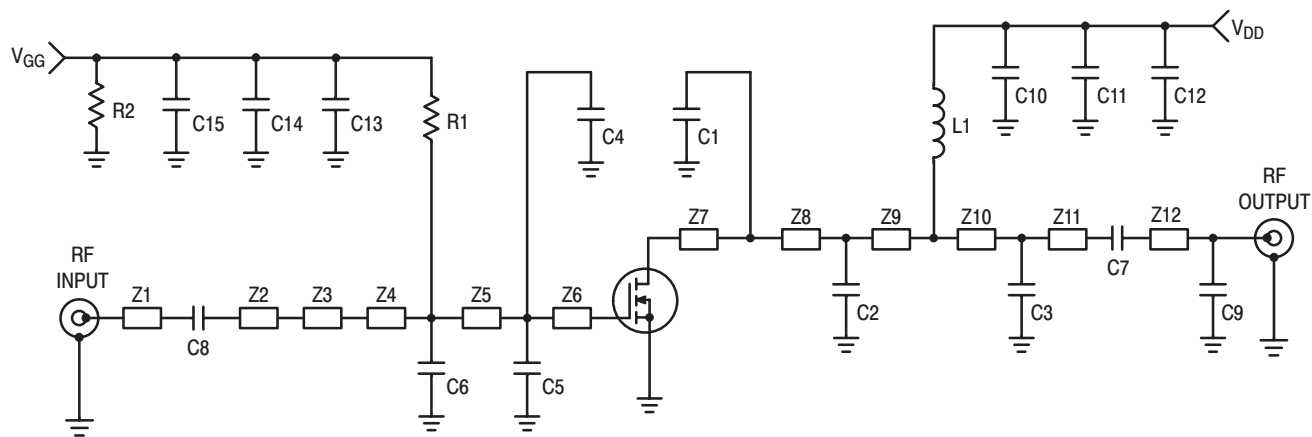
THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--------------------------------------|------------------|------|------|
| Thermal Resistance, Junction to Case | R _{θJC} | 0.75 | °C/W |
| Thermal Resistance, Junction to Case | R _{θJC} | 1 | °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 ($V_{GS} = 0 \text{ Vdc}$, $I_D = 1 \mu\text{A}$) | $V_{(BR)DSS}$ | 65 | – | – | Vdc |
| Zero Gate Voltage Drain Current ($V_{DS} = 28 \text{ Vdc}$, $V_{GS} = 0 \text{ Vdc}$) | I_{DSS} | – | – | 1 | μAdc |
| Gate–Source Leakage Current ($V_{GS} = 20 \text{ Vdc}$, $V_{DS} = 0 \text{ Vdc}$) | I_{GSS} | – | – | 1 | μAdc |
| ON CHARACTERISTICS | | | | | |
| Gate Threshold Voltage ($V_{DS} = 10 \text{ V}$, $I_D = 200 \mu\text{A}$) | $V_{GS(th)}$ | 2 | 3 | 4 | Vdc |
| Gate Quiescent Voltage ($V_{DS} = 28 \text{ V}$, $I_D = 100 \text{ mA}$) | $V_{GS(Q)}$ | 3 | 4 | 5 | Vdc |
| Drain–Source On–Voltage ($V_{GS} = 10 \text{ V}$, $I_D = 3 \text{ A}$) | $V_{DS(on)}$ | – | 0.6 | 0.8 | Vdc |
| Forward Transconductance ($V_{DS} = 10 \text{ V}$, $I_D = 3 \text{ A}$) | g_{fs} | 2.2 | 2.9 | – | S |
| DYNAMIC CHARACTERISTICS | | | | | |
| Input Capacitance ($V_{DS} = 28 \text{ V}$, $V_{GS} = 0$, $f = 1 \text{ MHz}$) | C_{iss} | – | 79 | – | pF |
| Output Capacitance ($V_{DS} = 28 \text{ V}$, $V_{GS} = 0$, $f = 1 \text{ MHz}$) | C_{oss} | – | 46 | – | pF |
| Reverse Transfer Capacitance ($V_{DS} = 28 \text{ V}$, $V_{GS} = 0$, $f = 1 \text{ MHz}$) | C_{rss} | – | 4 | – | pF |
| FUNCTIONAL CHARACTERISTICS, CW Operation | | | | | |
| Common Source Power Gain ($V_{DD} = 28 \text{ V}$, $P_{out} = 60 \text{ W}$, $I_{DQ} = 200 \text{ mA}$, $f = 860 \text{ MHz}$) | G_{ps} | 13 | 14.7 | – | dB |
| Drain Efficiency ($V_{DD} = 28 \text{ V}$, $P_{out} = 60 \text{ W}$, $I_{DQ} = 200 \text{ mA}$, $f = 860 \text{ MHz}$) | η | 50 | 54 | – | % |
| Load Mismatch ($V_{DD} = 28 \text{ V}$, $P_{out} = 60 \text{ W}$, $I_{DQ} = 200 \text{ mA}$, $f = 860 \text{ MHz}$, Load VSWR at 5:1 at All Phase Angles) | ψ | No Degradation in Output Power | | | |
| TYPICAL CHARACTERISTICS, 2 Tone Operation, Push Pull Configuration (MRF373SR1), Broadband Fixture | | | | | |
| Common Source Power Gain ($V_{DD} = 28 \text{ Vdc}$, $P_{out} = 100 \text{ W PEP}$, $I_{DQ} = 400 \text{ mA}$, $f_1 = 860.0 \text{ MHz}$, $f_2 = 866 \text{ MHz}$) | G_{ps} | – | 11.2 | – | dB |
| Drain Efficiency ($V_{DD} = 28 \text{ Vdc}$, $P_{out} = 100 \text{ W PEP}$, $I_{DQ} = 400 \text{ mA}$, $f_1 = 860.0 \text{ MHz}$, $f_2 = 866 \text{ MHz}$) | η | – | 40 | – | % |
| Third Order Intermodulation Distortion ($V_{DD} = 28 \text{ Vdc}$, $P_{out} = 100 \text{ W PEP}$, $I_{DQ} = 400 \text{ mA}$, $f_1 = 860.0 \text{ MHz}$, $f_2 = 866 \text{ MHz}$) | IMD | – | –30 | – | dBc |



- | | | | |
|------------|---------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------|
| C1 | 4.7 pF, B Case Chip Capacitor, ATC | Connectors | N-Type (female), M/A Com P/N 3052-1648-10 |
| C2 | 15 pF, B Case Chip Capacitor, ATC | PCB | MRF373 Printed Circuit Board Rev 01, CuClad 250 (GX-0300-55), height 30 mils, $\epsilon_r = 2.55$ |
| C3 | 6.8 pF, B Case Chip Capacitor, ATC | Heatsink | Motorola P/N 95-11LDMOSKPS-1 |
| C4, C5, C6 | 10 pF, B Case Chip Capacitor, ATC | LDMOS | $\mu 250$ 3" x 5" Bedstead |
| C7, C8 | 47 pF, B Case Chip Capacitor, ATC | Insert | Motorola P/N 95-11LDMOSKPS-2 |
| C9 | 0.2 pF, B Case Chip Capacitor, ATC | Insert for LDMOS | $\mu 250$ 3" x 5" Bedstead |
| C10, C13 | 300 pF, B Case Chip Capacitor, ATC, Side Mounted | End Plates | 2) Motorola P/N 93-3MB-9, End Plate for Type-N Connector |
| C11 | 2) 2.2 μ F, 50 V, Kemet P/N C1825C225 | Banana Jack and Nut | |
| C12 | 22 μ F, 50 V, Kemet P/N T491D226K50AS | | |
| C14 | 2) 1.0 μ F, 50 V, Kemet P/N C1825C105 | | |
| C15 | 10 μ F, 35 V, Kemet P/N T491D106K35AS | | |
| L1 | 22 nH, Coilcraft P/N B07T | Brass Banana Jack | |
| R1 | 1.2 k Ω , Vishay Dale Chip Resistor (1206) | | |
| R2 | 12 k Ω , Vishay Dale Chip Resistor (1206) | | |

Figure 1. Single-Ended Narrowband Test Circuit Schematic (MRF373R1)

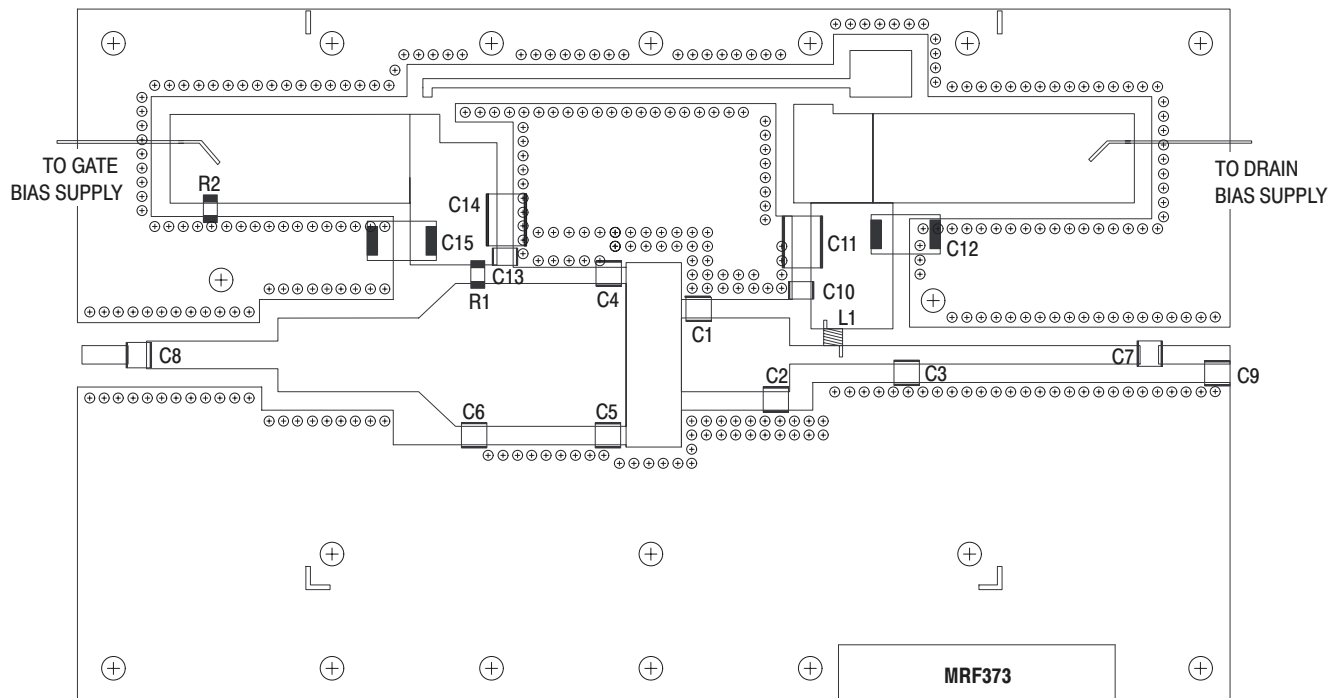


Figure 2. Single-Ended Narrowband Test Circuit Layout (Suitable for Use with MRF373R1)

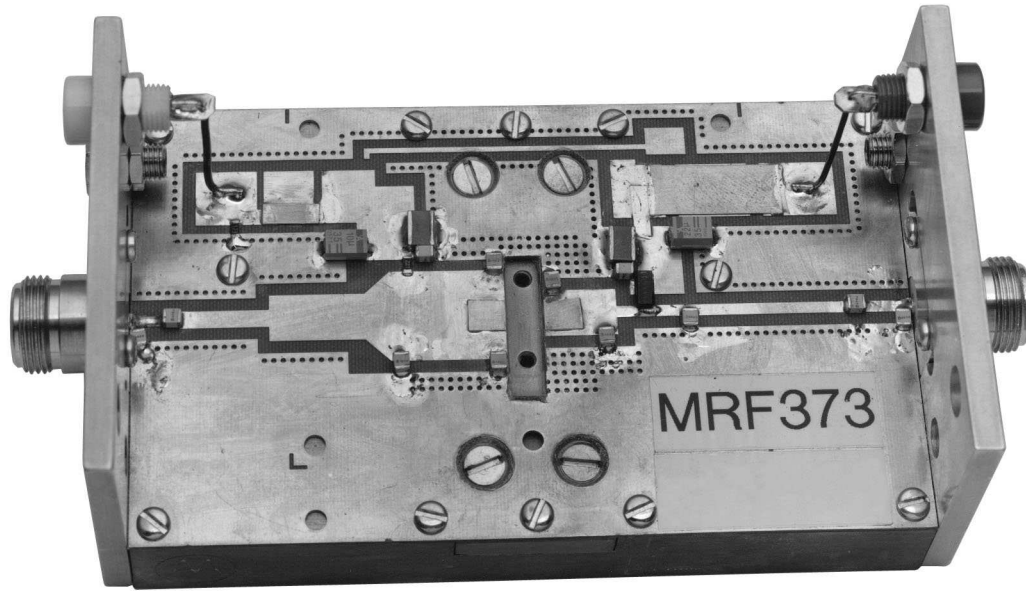
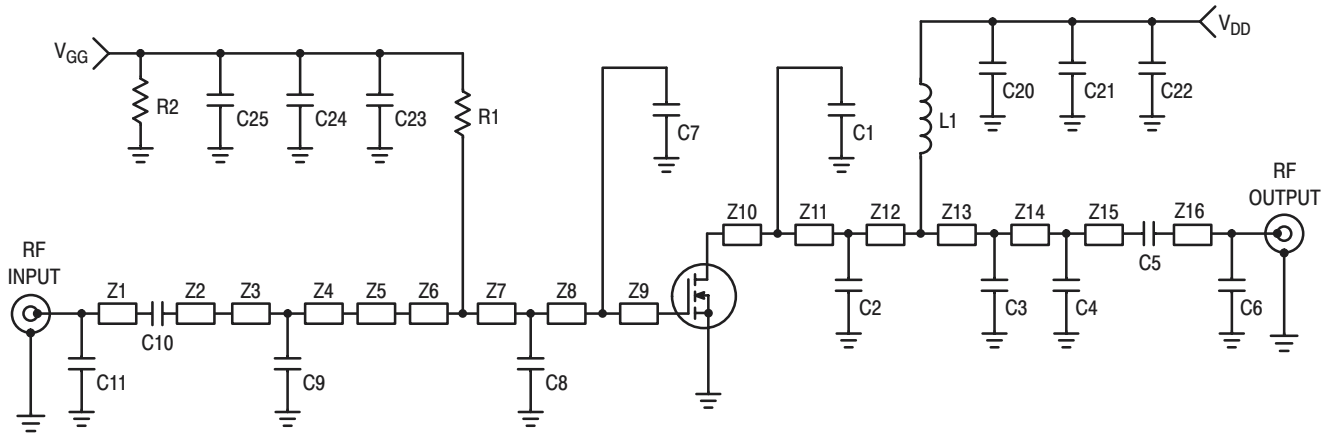


Figure 3. MRF373R1 Narrowband Test Fixture Photo



- C1, C2 18 pF, B Case Chip Capacitor, ATC
- C3 12 pF, B Case Chip Capacitor, ATC
- C4, C11 0.8 pF, B Case Chip Capacitor, ATC
- C5, C10 68 pF, B Case Chip Capacitor, ATC
- C6 0.3 pF, B Case Chip Capacitor, ATC
- C7 15 pF, B Case Chip Capacitor, ATC
- C8 10 pF, B Case Chip Capacitor, ATC
- C9 1.8 pF, B Case Chip Capacitor, ATC
- C20, C23 300 pF, B Case Chip Capacitor, ATC, Side Mounted
- C21 2) 2.2 μ F, 100 V, Vishay P/N VJ3640Y225KXBAT
- C24 2) 1.0 μ F, 50 V, Kemet P/N C1825C105
- C22 22 μ F, 35 V, Kemet P/N T491D226K35AS
- C25 10 μ F, 35 V, Kemet P/N T491D106K35AS
- L1 22 nH, Coilcraft P/N B07T
- R1 1.2 k Ω , Vishay Dale Chip Resistor (1206)
- R2 12 k Ω , Vishay Dale Chip Resistor (1206)

- Connectors N-Type (female), M/A Com P/N 3052-1648-10
- PCB MRF373 Printed Circuit Board Rev 01, CuClad 250 (GX-0300-55), height 30 mils, $\epsilon_r = 2.55$ (new PCB's available from CMR)
- Heatsink Motorola P/N 95-11LDMOSKPS-1 LDMOS μ 250 3" x 5" Bedstead
- Insert Motorola P/N 95-11LDMOSKPS-2S Insert for LDMOS μ 250S 3" x 5" Bedstead
- End Plates 2) Motorola P/N 93-3MB-9, 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

Figure 4. Single-Ended Narrowband Test Circuit Schematic (MRF373SR1)

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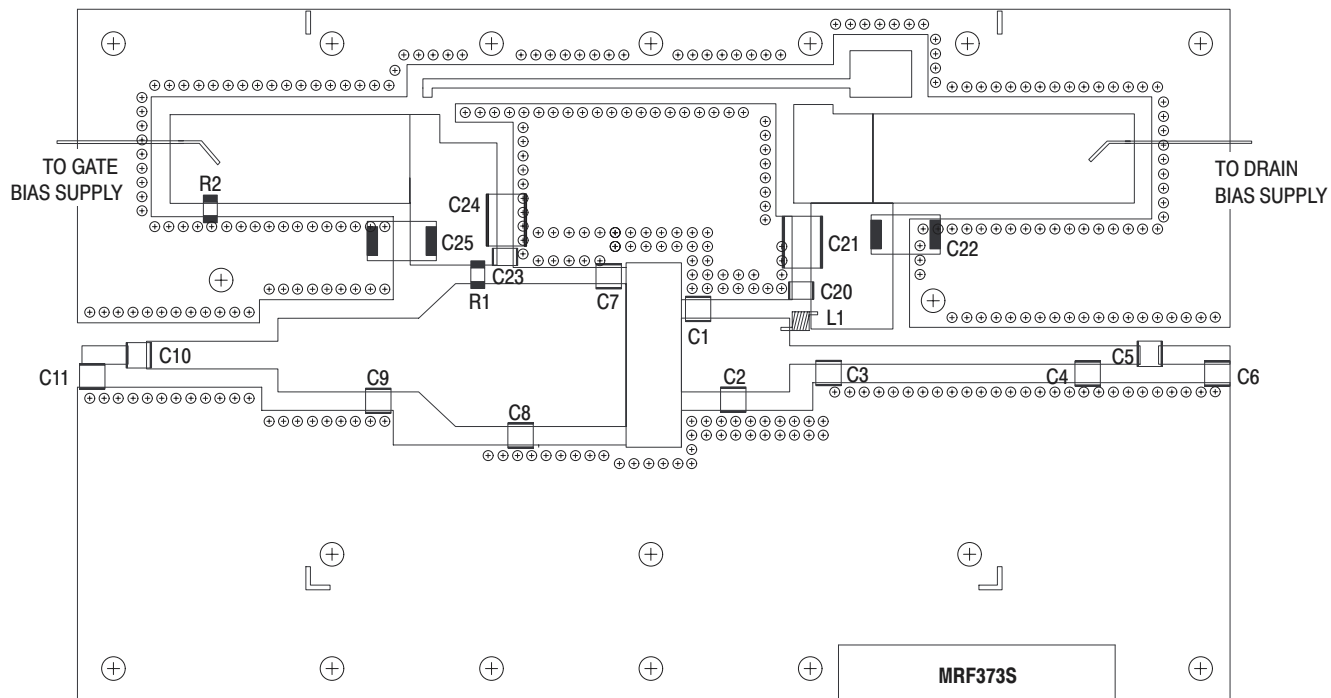


Figure 5. Single-Ended Narrowband Test Circuit Layout (Suitable for Use with MRF373SR1)

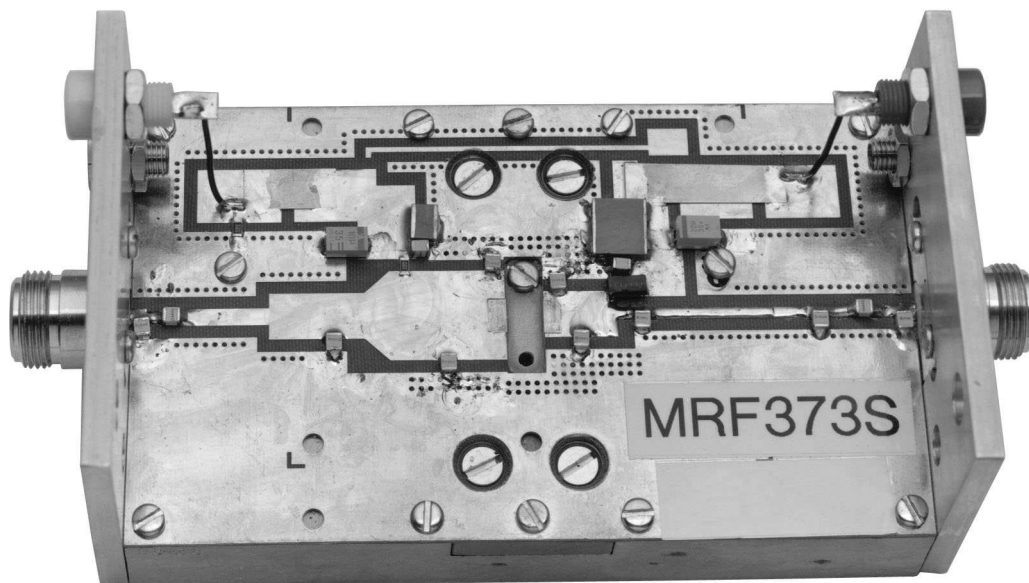


Figure 6. MRF373SR1 Narrowband Test Circuit Photo

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TYPICAL CHARACTERISTICS FOR MRF373R1 IN SINGLE-ENDED FIXTURE

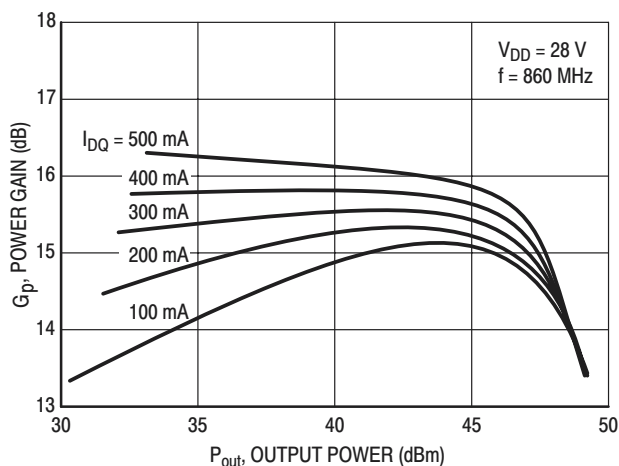


Figure 7. Power Gain versus Output Power

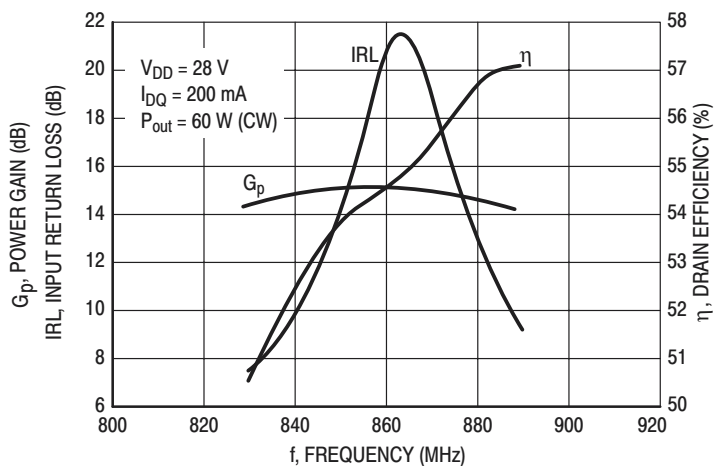


Figure 8. Performance in Narrowband Circuit

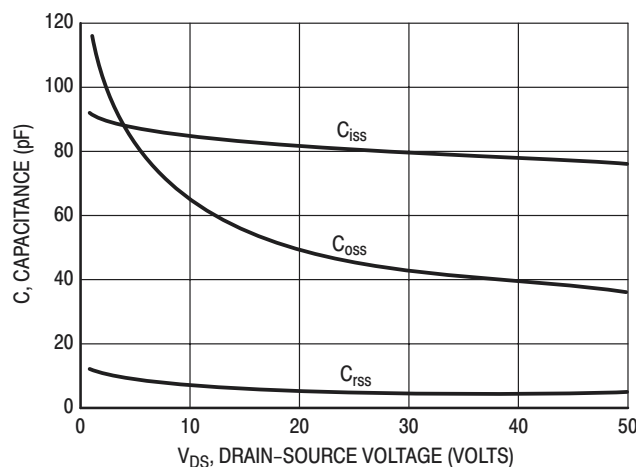
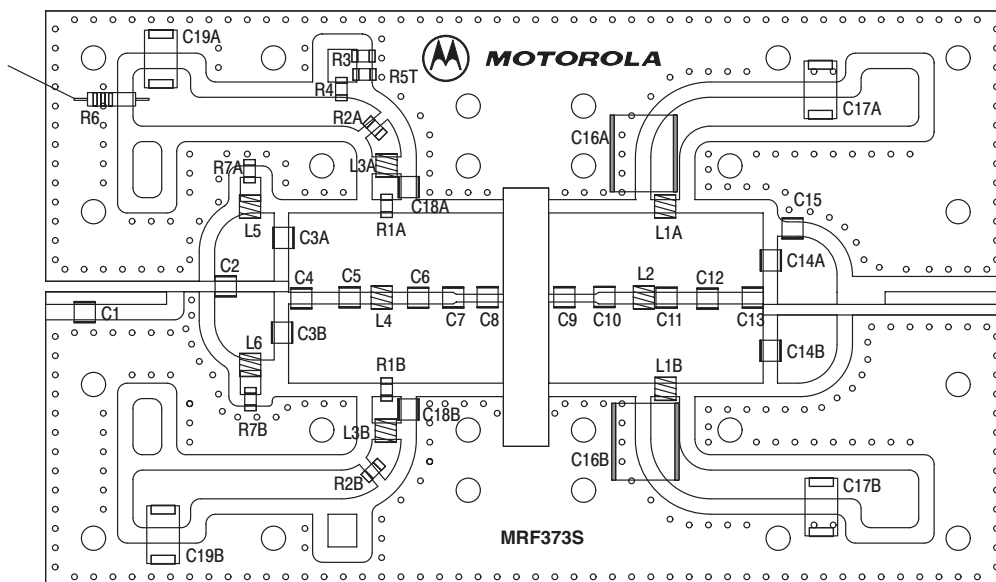


Figure 9. Capacitance versus Voltage

Table 1. Common Source S-Parameters ($V_{DS} = 28\text{ V}$, $I_D = 2.0\text{ A}$)

| f MHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|----------|-----------------|-----|-----------------|----|-----------------|----|-----------------|-----|
| | S ₁₁ | ∠φ | S ₂₁ | ∠φ | S ₁₂ | ∠φ | S ₂₂ | ∠φ |
| 400 | 0.921 | 182 | 2.23 | 52 | 0.009 | 39 | 0.824 | 184 |
| 450 | 0.922 | 181 | 1.95 | 49 | 0.009 | 53 | 0.832 | 184 |
| 500 | 0.924 | 180 | 1.70 | 46 | 0.010 | 64 | 0.841 | 184 |
| 550 | 0.926 | 179 | 1.49 | 42 | 0.011 | 72 | 0.851 | 183 |
| 600 | 0.929 | 178 | 1.31 | 38 | 0.013 | 78 | 0.860 | 183 |
| 650 | 0.932 | 177 | 1.16 | 35 | 0.015 | 81 | 0.870 | 182 |
| 700 | 0.936 | 176 | 1.03 | 31 | 0.017 | 82 | 0.881 | 182 |
| 750 | 0.940 | 176 | 0.93 | 28 | 0.019 | 82 | 0.892 | 181 |
| 800 | 0.945 | 175 | 0.84 | 26 | 0.021 | 82 | 0.904 | 180 |
| 850 | 0.951 | 174 | 0.78 | 24 | 0.023 | 80 | 0.917 | 180 |
| 900 | 0.957 | 173 | 0.72 | 24 | 0.025 | 78 | 0.929 | 179 |



Vertical Balun Mounting Detail

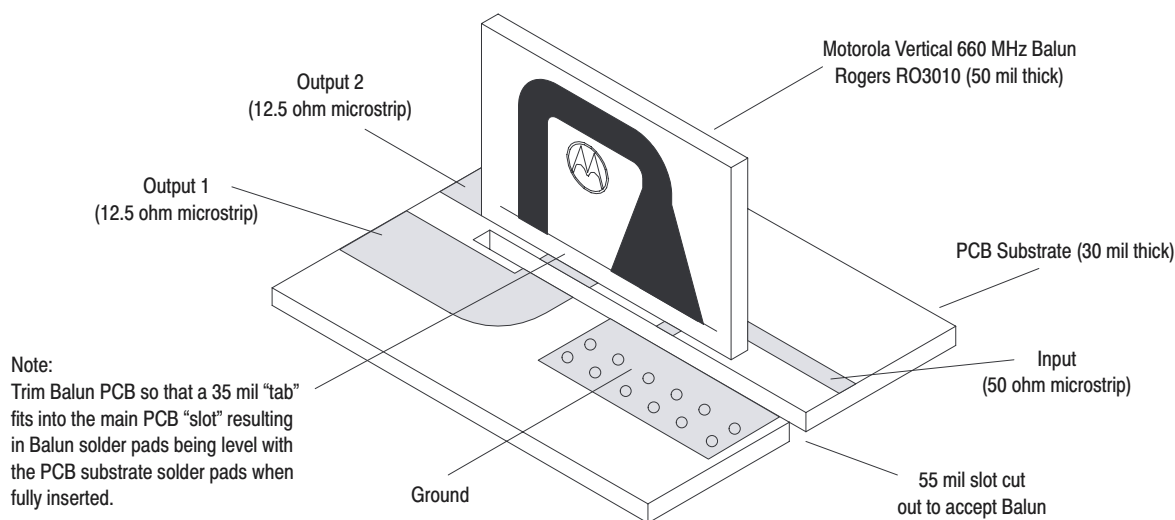


Figure 10. MRF373SR1 Broadband Push-Pull Component Layout

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Table 2. MRF373SR1 Broadband Push–Pull Application Parts List

| Designation | Description |
|------------------------|-----------------------------------------------------------------------------------------------------------------------|
| C1 | 1.0 pF, AVX, P12101J1R0BBT |
| C2, C4, C10 | 10 pF, AVX, P12101J100GBT |
| C3A, B | 120 pF, 300 V, AVX, AQ149M121JAJBE |
| C5, C6, C9 | 12 pF, AVX, P12101J120GBT |
| C7, C8 | 18 pF, AVX, P12101J180GBT |
| C11 | 6.8 pF, AVX, P12101J6R8BBT |
| C12 | 4.7 pF, AVX, P12101J4R7BBT |
| C13, C18A, B | 3.3 pF, AVX, P12101J3R3BBT |
| C14A, B | 100 pF, 500 V, AVX, AQ147M101JAJBE |
| C15 | 2.7 pF, AVX, P12101J2R7BBT |
| C16A, B | 3.3 μ F, 100 V, Vitramon P/N VJ3640Y335KXBAT |
| C17A, B, C19A, B | 22 μ F, 35 V, Kemet P/N T491D226K35AS |
| 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 | 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 |
| PCB | MRF373 PP Printed Circuit Board Rev 2C, Rogers RO4350, Height 30 mils, $\epsilon_r = 3.48$ |
| Balun A, B | Vertical 660 MHz Broadband Balun, Printed Circuit Board Rev 01, Rogers RO3010, Height 50 mils, $\epsilon_r = 10.2$ |

TYPICAL TWO-TONE BROADBAND CHARACTERISTICS

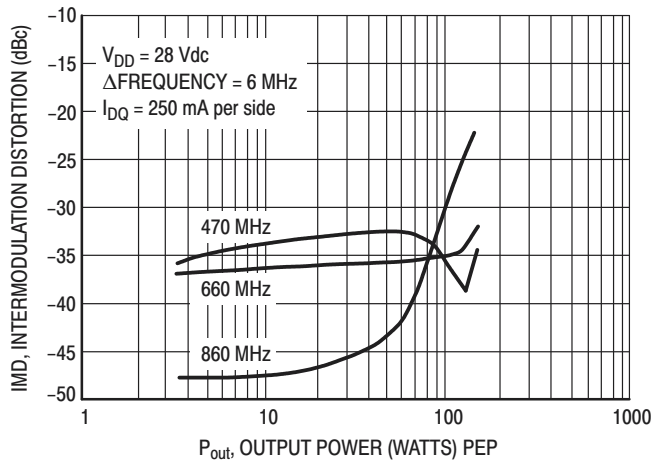


Figure 11. Intermodulation Distortion versus Output Power (MRF373S Broadband Push-Pull Fixture)

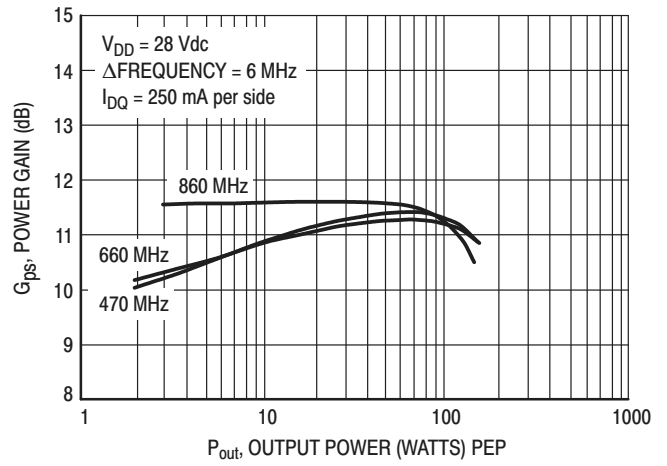


Figure 12. Broadband Power Gain versus Output Power (MRF373S Broadband Push-Pull Fixture)

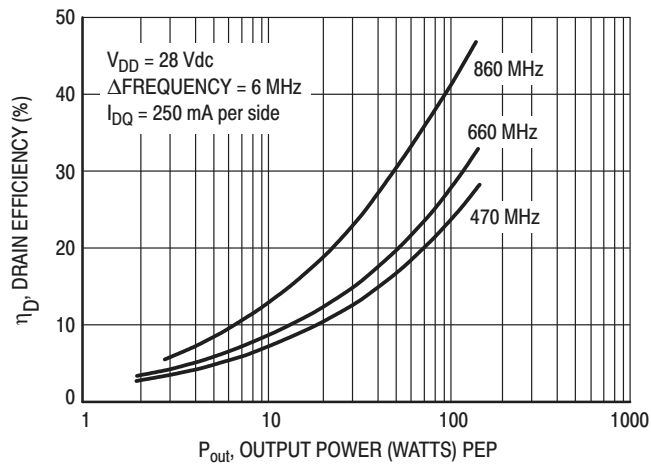


Figure 13. Efficiency versus Output Power (MRF373S Broadband Push-Pull Fixture)

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NOTES

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PACKAGE DIMENSIONS

NOTES:

1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.795 | 0.805 | 20.19 | 20.45 |
| B | 0.225 | 0.235 | 5.72 | 5.97 |
| C | 0.125 | 0.175 | 3.18 | 4.45 |
| D | 0.210 | 0.220 | 5.33 | 5.59 |
| E | 0.055 | 0.065 | 1.40 | 1.65 |
| F | 0.004 | 0.006 | 0.10 | 0.15 |
| G | 0.562 BSC | | 14.28 BSC | |
| H | 0.077 | 0.087 | 1.96 | 2.21 |
| K | 0.220 | 0.250 | 5.59 | 6.35 |
| M | 0.355 | 0.365 | 9.02 | 9.27 |
| N | 0.357 | 0.363 | 9.07 | 9.22 |
| Q | 0.125 | 0.135 | 3.18 | 3.43 |
| R | 0.227 | 0.233 | 5.77 | 5.92 |
| S | 0.225 | 0.235 | 5.72 | 5.97 |
| aaa | 0.005 REF | | 0.13 REF | |
| bbb | 0.010 REF | | 0.25 REF | |
| ccc | 0.015 REF | | 0.38 REF | |

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

**CASE 360B-05
 ISSUE F
 NI-360
 MRF373R1**

NOTES:

1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| A | 0.375 | 0.385 | 9.53 | 9.78 |
| B | 0.225 | 0.235 | 5.72 | 5.97 |
| C | 0.105 | 0.155 | 2.67 | 3.94 |
| D | 0.210 | 0.220 | 5.33 | 5.59 |
| E | 0.035 | 0.045 | 0.89 | 1.14 |
| F | 0.004 | 0.006 | 0.10 | 0.15 |
| H | 0.057 | 0.067 | 1.45 | 1.70 |
| K | 0.085 | 0.115 | 2.16 | 2.92 |
| M | 0.355 | 0.365 | 9.02 | 9.27 |
| N | 0.357 | 0.363 | 9.07 | 9.22 |
| R | 0.227 | 0.23 | 5.77 | 5.92 |
| S | 0.225 | 0.235 | 5.72 | 5.97 |
| aaa | 0.005 REF | | 0.13 REF | |
| bbb | 0.010 REF | | 0.25 REF | |
| ccc | 0.015 REF | | 0.38 REF | |

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

**CASE 360C-05
 ISSUE D
 NI-360S
 MRF373SR1**

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