

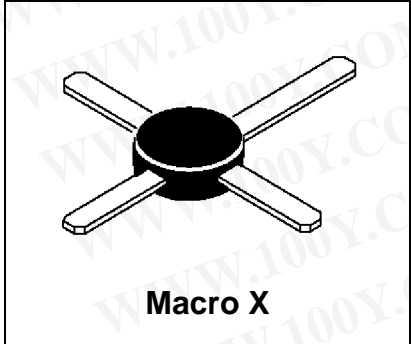
MRF559
MRF559G

* G Denotes RoHS Complaint, Pb Free Terminal Finish

RF & MICROWAVE DISCRETE
LOW POWER TRANSISTORS

Features

- Specified @ 12.5 V, 870 MHz Characteristics
- Output Power = .5 W
- Minimum Gain = 8.0 dB
- Efficiency 50%
- Cost Effective Macro X Package
- Electroless Tin Plated Leads for Improved Solderability



DESCRIPTION: Designed primarily for wideband large signal stages in the UHF frequency range.

ABSOLUTE MAXIMUM RATINGS (T_{case} = 25°C)

| Symbol | Parameter | Value | Unit |
|------------------|---------------------------|-------|------|
| V _{CEO} | Collector-Emitter Voltage | 16 | Vdc |
| V _{CBO} | Collector-Base Voltage | 30 | Vdc |
| V _{EBO} | Emitter-Base Voltage | 3.0 | Vdc |
| I _C | Collector Current | 150 | mA |

Thermal Data

| | | | |
|------------------|---|-------------|----------------|
| P _D | Total Device Dissipation @ TC = 75°C Derate above 75°C | 2.0 20 | Watts mW/°C |
| T _{stg} | Storage Temperature Range | -65 to +150 | °C |

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ELECTRICAL SPECIFICATIONS (Tcase = 25°C)

**STATIC
(off)**

| Symbol | Test Conditions | Value | | | Unit |
|--------|---|-------|------|------|-----------------|
| | | Min. | Typ. | Max. | |
| BVCEO | Collector-Emitter Breakdown Voltage (IC = 5.0 mA _{dc} , IB = 0) | 16 | - | - | V _{dc} |
| BVCBO | Collector-Base Breakdown Voltage (IC = 0.1 mA _{dc} , IB = 0) | 30 | - | - | V _{dc} |
| BVEBO | Emitter-Base Breakdown Voltage (IE = 0.1 mA _{dc} , IC = 0) | 3.0 | - | - | V _{dc} |
| ICES | Collector Cutoff Current (VCE = 15 V _{dc} , VBE = 0 V _{dc}) | - | - | 1.0 | mA |

(on)

| | | | | | |
|-----|---|----|---|-----|---|
| HFE | DC Current Gain (IC = 50 mA _{dc} , VCE = 10 V _{dc}) | 30 | - | 200 | - |
|-----|---|----|---|-----|---|

DYNAMIC

| Symbol | Test Conditions | Value | | | Unit |
|--------|--|-------|------|------|------|
| | | Min. | Typ. | Max. | |
| COB | Output Capacitance (V _{CB} = 12.5 V _{dc} , IE = 0, f = 1.0 MHz) | - | 2.5 | 3.0 | pF |

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FUNCTIONAL

| Symbol | Test Conditions | Value | | | Unit |
|----------|--|----------|-----------|------|------|
| | | Min. | Typ. | Max. | |
| G_{PE} | Power Gain Test Circuit-Figure 1 $P_{out} = 0.5\text{ W}$, $V_{CE} = 12.5\text{Vdc}$ $f = 870$ MHz $f = 512$ MHz | 8.0 - | 9.5 13 | - | dB |
| η | Collector Efficiency Test Circuit-Figure 1 $P_{out} = 0.5\text{ W}$, $V_{CE} = 12.5\text{Vdc}$ $f = 870$ MHz $f = 512$ MHz | 50 - | 65 60 | - | % |

Typical Performance @ $V_{CC} = 7.5\text{V}$

| | | | | | |
|----------|--|--------|-----------|--------|----|
| G_{PE} | Power Gain Test Circuit-Figure 1 $P_{out} = 0.5\text{ W}$, $V_{CE} = 7.5\text{Vdc}$ $f = 870$ MHz $f = 512$ MHz | - - | 6.5 10 | - - | dB |
| η | Collector Efficiency Test Circuit-Figure 1 $P_{out} = 0.5\text{ W}$, $V_{CE} = 7.5\text{Vdc}$ $f = 870$ MHz $f = 512$ MHz | - - | 70 65 | - - | % |

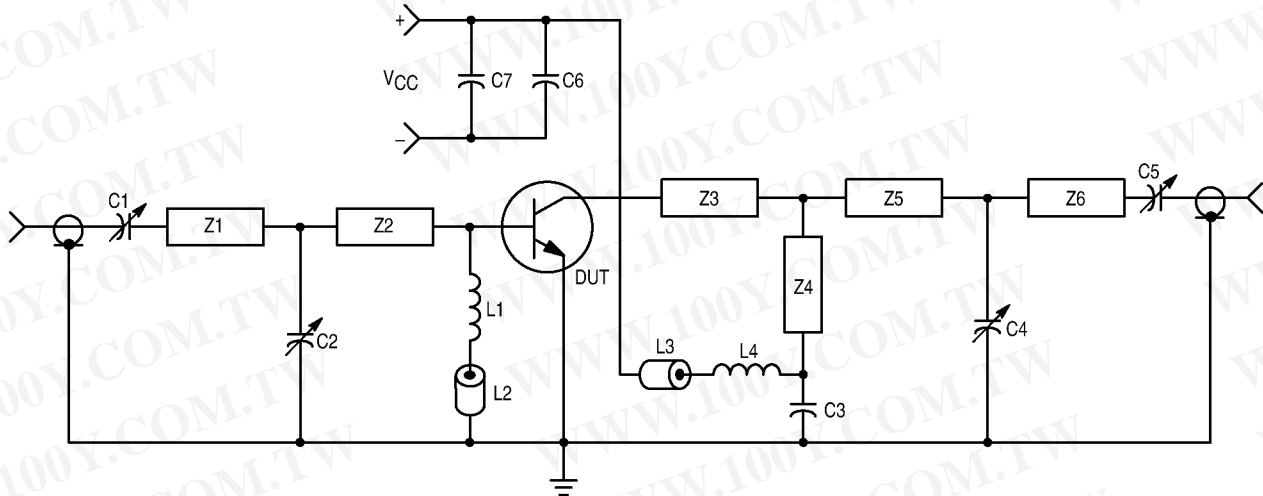


Figure 2. 870 MHz Test Fixture

C1, C2, C4, C5 — 1.0–10 pF Johanson
 C7 — 1.0 μF Tantalum
 L2, L3 — Ferrite Bead
 Z2 — 30 Ω 2.5 cm
 Z4 — 50 Ω 1.2 cm
 Microstrip Elements — $\epsilon_r = 2.55$

C3, C6 — 0.001 μF Chip Capacitor
 L1, L4 — 4 Turns #26 AWG, 0.3 cm ID, 0.4 cm Long
 Z1 — 50 Ω 1.5 cm
 Z3 — 50 Ω 2.0 cm
 Z5, Z6 — 50 Ω 1.25 cm

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RF Low Power PA, LNA, and General Purpose Discrete Selector Guide

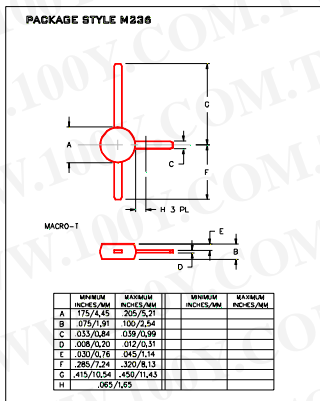
| Package | Device | Type | GPE Freq (MHz) | Pout | GPE (dB) | Efficiency (%) | GPE VCC | BVCEO | IC max |
|-------------|-----------------|------|----------------|------|----------|----------------|---------|-------|--------|
| SO-8 | MRF4427, R2 | NPN | 175 | 0.15 | 18 | 60 | 12 | 20 | 400 |
| TO-39 | 2N4427 | NPN | 175 | 1 | 10 | 50 | 12 | 20 | 400 |
| POWER MACRO | MRF553 | NPN | 175 | 1.5 | 11.5 | 60 | 12.5 | 16 | 500 |
| POWER MACRO | MRF553T | NPN | 175 | 1.5 | 11.5 | 50 | 12.5 | 16 | 500 |
| TO-39 | MRF607 | NPN | 175 | 1.75 | 11.5 | 50 | 12.5 | 16 | 330 |
| TO-39 | 2N6255 | NPN | 175 | 3 | 7.8 | 50 | 12.5 | 18 | 1000 |
| TO-72 | 2N5179 | NPN | 200 | | 20 | | 6 | 12 | 50 |
| MACRO X | MRF559 | NPN | 512 | 0.5 | 10 | 65 | 7.5 | 16 | 150 |
| MACRO X | MRF559 | NPN | 512 | 0.5 | 13 | 60 | 12.5 | 16 | 150 |
| TO-39 | 2N3866A | NPN | 400 | 1 | 10 | 45 | 28 | 30 | 400 |
| SO-8 | MRF3866, R1, R2 | NPN | 400 | 1 | 10 | 45 | 28 | 30 | 400 |
| POWER MACRO | MRF555 | NPN | 470 | 1.5 | 11 | 50 | 12.5 | 16 | 400 |
| POWER MACRO | MRF555T | NPN | 470 | 1.5 | 11 | 50 | 12.5 | 16 | 400 |
| MACRO X | MRF559 | NPN | 870 | 0.5 | 6.5 | 70 | 7.5 | 16 | 150 |
| MACRO X | MRF559 | NPN | 870 | 0.5 | 9.5 | 65 | 12.5 | 16 | 150 |
| SO-8 | MRF8372, R1, R2 | NPN | 870 | 0.75 | 8 | 55 | 12.5 | 16 | 200 |
| POWER MACRO | MRF557 | NPN | 870 | 1.5 | 8 | 55 | 12.5 | 16 | 400 |
| POWER MACRO | MRF557T | NPN | 870 | 1.5 | 8 | 55 | 12.5 | 16 | 400 |

| Package | Device | Type | Freq (MHz) | NF (dB) | NF IC (mA) | NF VCE | GN (dB) | Gu Max (dB) | Ftau (MHz) | Cob(pF) | BVCE | IC max (mA) |
|---------|-----------------|------|------------|---------|------------|--------|---------|-------------|------------|---------|------|-------------|
| TO-39 | 2N5109 | NPN | 200 | 3 | 10 | 15 | | 12 | 1200 | 3.5 | 20 | 400 |
| TO-39 | MRF5943C | NPN | 200 | 3.4 | 30 | 15 | | 11.4 | 1000 | | 30 | 400 |
| SO-8 | MRF5943, R1, R2 | NPN | 200 | 3.4 | 30 | 15 | | 17 | 1300 | 1 | 12 | 500 |
| TO-72 | 2N5179 | NPN | 200 | 4.5 | 1.5 | 6 | | 15 | 900 | 1 | 12 | 50 |
| TO-72 | 2N2857 | NPN | 300 | 5.5 | 50 | 6 | | 13 | 1600 | 1 | 15 | 40 |
| TO-39 | MRF517 | NPN | 300 | 7.5 | 50 | 15 | | 5.5 | 4600 | 3 | 25 | 150 |
| TO-72 | MRF904 | NPN | 450 | 1.5 | 5 | 6 | | 11 | 4000 | 1 | 15 | 30 |
| TO-72 | 2N6304 | NPN | 450 | 5 | 2 | 5 | | 14 | 1400 | 1 | 15 | 50 |
| MACRO T | BFR91 | NPN | 500 | 1.9 | 2 | 5 | 11 | 16.5 | 5000 | 1 | 12 | 35 |
| MACRO T | BFR96 | NPN | 500 | 2 | 10 | 10 | | 14.5 | 500 | 2.6 | 15 | 100 |
| SO-8 | MRF5812, R1, R2 | NPN | 500 | 2 | 50 | 10 | 15.5 | 17.8 | 5000 | | 15 | 200 |
| MACRO X | MRF581A | NPN | 500 | 2 | 50 | 10 | 14 | 15 | 5000 | | 15 | 200 |
| Macro | BFR90 | NPN | 500 | 2.4 | 2 | 10 | 15 | 18 | 5000 | 1 | 15 | 30 |
| TO-72 | BFY90 | NPN | 500 | 2.5 | 2 | 5 | | 20 | 1300 | | 15 | 50 |
| TO-72 | MRF914 | NPN | 500 | 2.5 | 5 | 10 | | 15 | 4500 | | 12 | 40 |
| MACRO X | MRF581 | NPN | 500 | 2.5 | 50 | 10 | 15 | 17.8 | 5000 | | 16 | 200 |
| TO-39 | MRF586 | NPN | 500 | 3 | 90 | 15 | 11 | 14.5 | 4500 | 2.2 | 17 | 200 |
| MACRO X | MRF951 | NPN | 1000 | 1.3 | 5 | 6 | 14 | 17 | 8000 | 0.45 | 10 | 100 |
| MACRO X | MRF571 | NPN | 1000 | 1.5 | 10 | 6 | 10 | | 8000 | 1 | 10 | 75 |
| MACRO T | BFR91 | NPN | 1000 | 2.5 | 2 | 5 | 8 | 11 | 5000 | 1 | 12 | 35 |
| MACRO T | BFR90 | NPN | 1000 | 3 | 2 | 10 | 10 | 12.5 | 5000 | 1 | 15 | 30 |
| TO-39 | MRF545 | PNP | | | | | | 14 | 1400 | 2 | 70 | 400 |
| TO-39 | MRF544 | NPN | | | | | | 13.5 | 1500 | | 70 | 400 |

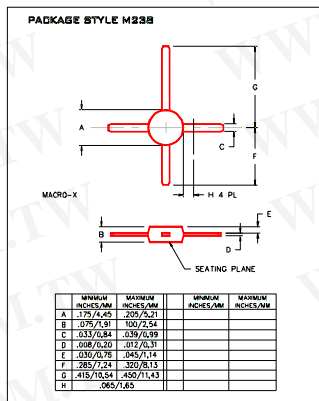
RF (Low Power PA / General Purpose) Selection

RF (LNA / General Purpose) Selection Guide

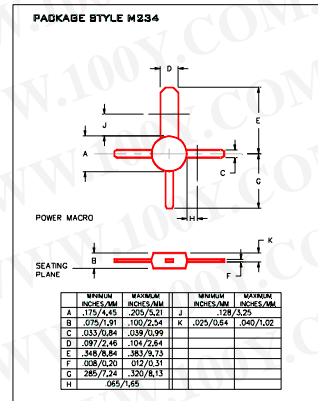
Low Cost RF Plastic Package Options



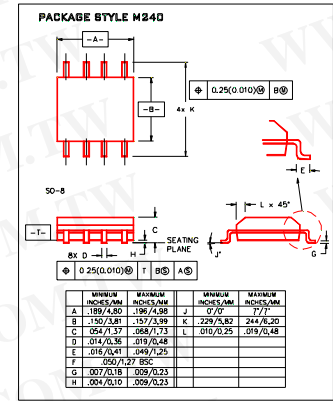
Macro T



Macro X



Power Macro



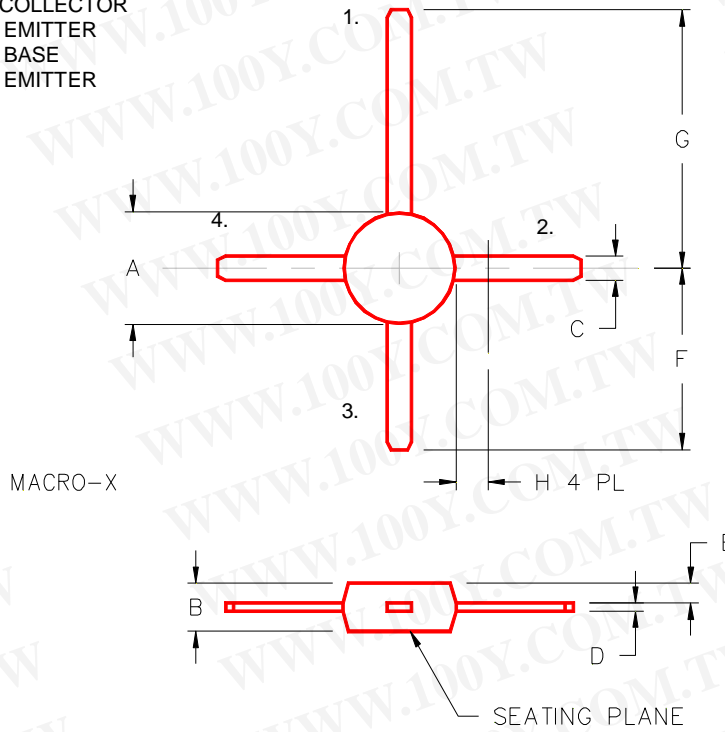
SO-8

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PACKAGE STYLE M238

- PIN 1. COLLECTOR
- 2. EMITTER
- 3. BASE
- 4. EMITTER



| | MINIMUM INCHES/MM | MAXIMUM INCHES/MM | | MINIMUM INCHES/MM | MAXIMUM INCHES/MM |
|---|----------------------|----------------------|--|----------------------|----------------------|
| A | .175/4,45 | .205/5,21 | | | |
| B | .075/1,91 | .100/2,54 | | | |
| C | .033/0,84 | .039/0,99 | | | |
| D | .008/0,20 | .012/0,31 | | | |
| E | .030/0,76 | .045/1,14 | | | |
| F | .285/7,24 | .320/8,13 | | | |
| G | .415/10,54 | .450/11,43 | | | |
| H | .065/1,65 | | | | |