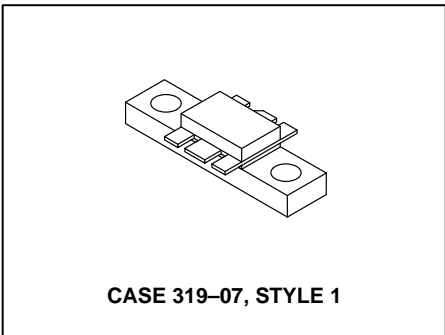


The RF Line

NPN Silicon

RF Power Transistor



... designed for 12.5 volt UHF large-signal, common-base amplifier applications in industrial and commercial FM equipment operating in the range of 806-960 MHz.

- Specified 12.5 Volt, 870 MHz Characteristics
 - Output Power = 10 Watts
 - Power Gain = 6.0 dB Min
 - Efficiency = 50% Min
- Series Equivalent Large-Signal Characterization
- Internally Matched Input for Broadband Operation
- Tested for Load Mismatch Stress at All Phase Angles with 20:1 VSWR @ 15.5 Volt Supply and 50% RF Overdrive
- Gold Metallized, Emitter Ballasted for Long Life and Resistance to Metal Migration
- Silicon Nitride Passivated

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|------------------|-------------|---------------|
| Collector-Emitter Voltage | V _{CEO} | 16 | Vdc |
| Collector-Base Voltage | V _{CB0} | 36 | Vdc |
| Emitter-Base Voltage | V _{EBO} | 4.0 | Vdc |
| Collector Current — Continuous | I _C | 3.8 | Adc |
| Total Device Dissipation @ T _C = 25°C (1) Derate above 25°C | P _D | 40 0.32 | Watts W/°C |
| Storage Temperature Range | T _{stg} | -65 to +150 | °C |

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|--|------------------|-----|------|
| Thermal Resistance, Junction to Case (2) | R _{θJC} | 3.1 | °C/W |

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|--|----------------------|-----|---|-----|-----|
| Collector-Emitter Breakdown Voltage (I _C = 50 mA, I _B = 0) | V _{(BR)CEO} | 16 | — | — | Vdc |
| Collector-Emitter Breakdown Voltage (I _C = 50 mA, V _{BE} = 0) | V _{(BR)CES} | 36 | — | — | Vdc |
| Emitter-Base Breakdown Voltage (I _E = 5.0 mA, I _C = 0) | V _{(BR)EBO} | 4.0 | — | — | Vdc |
| Collector Cutoff Current (V _{CB} = 15 Vdc, I _E = 0) | I _{CBO} | — | — | 2.0 | mA |

NOTES:

(continued)

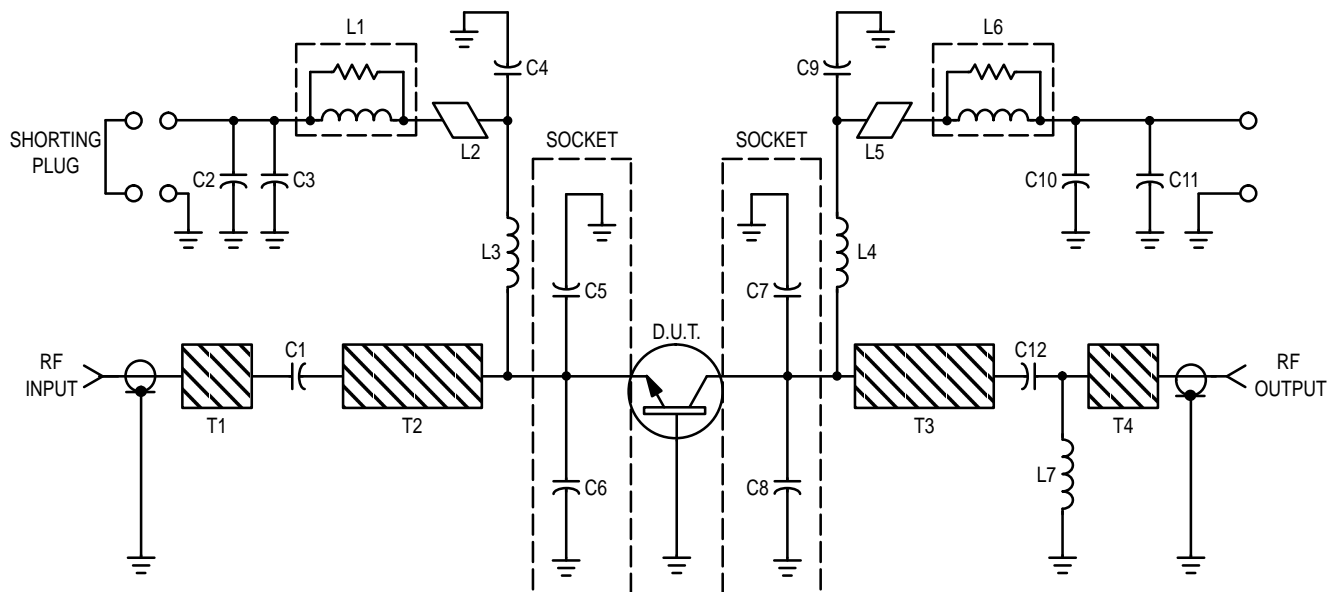
- This device is designed for RF operation. The total device dissipation rating applies only when the device is operated as an RF amplifier.
- Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|----------|--------------------------------|-----|-----|------|
| ON CHARACTERISTICS | | | | | |
| DC Current Gain ($I_C = 1.0 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$) | h_{FE} | 10 | — | — | — |
| DYNAMIC CHARACTERISTICS | | | | | |
| Output Capacitance ($V_{CB} = 12.5 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$) | C_{ob} | — | 24 | 35 | pF |
| FUNCTIONAL TESTS | | | | | |
| Common-Base Amplifier Power Gain ($P_{out} = 10 \text{ W}$, $V_{CC} = 12.5 \text{ Vdc}$, $f = 870 \text{ MHz}$) | G_{PE} | 6.0 | 7.0 | — | dB |
| Collector Efficiency ($P_{out} = 10 \text{ W}$, $V_{CC} = 12.5 \text{ Vdc}$, $f = 870 \text{ MHz}$) | η | 50 | 55 | — | % |
| Load Mismatch Stress ($V_{CC} = 15.5 \text{ Vdc}$, $P_{in} = 3.0 \text{ W}$, (3) $f = 870 \text{ MHz}$, $VSWR = 20:1$, all phase angles) | — | No Degradation in Output Power | | | |

NOTE:

3. $P_{in} = 150\%$ of the typical input power requirement for 10 W output power @ 12.5 Vdc.



C1, C12 — 50 pF, 100 Mil Chip Capacitor
 C2, C11 — 15 μF , 20 V Tantalum
 C3, C10 — 1000 pF, 350 V UNELCO
 C4, C9 — 91 pF Mini-Underwood
 C5 — 15 pF
 C6 — 15 pF
 C7 — 15 pF
 C8 — 15 pF

L1, L6 — 11 Turns 20 AWG Around 10 Ω 1/2 W Resistor
 L2, L5 — Ferrite Bead
 L3, L4 — 4 Turn 20 AWG 0.2" I.D.
 T1, T4 — $Z_0 = 50 \Omega$
 T2 — $Z_0 = 30 \Omega$ $\ell = \lambda/4$ @ 838 MHz
 T3 — $Z_0 = 13.5 \Omega$ $\ell = \lambda/4$ @ 838 MHz

L7 — 18 AWG Wire Loop

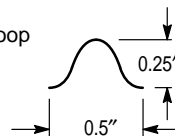


Figure 1. 870 MHz Test Circuit

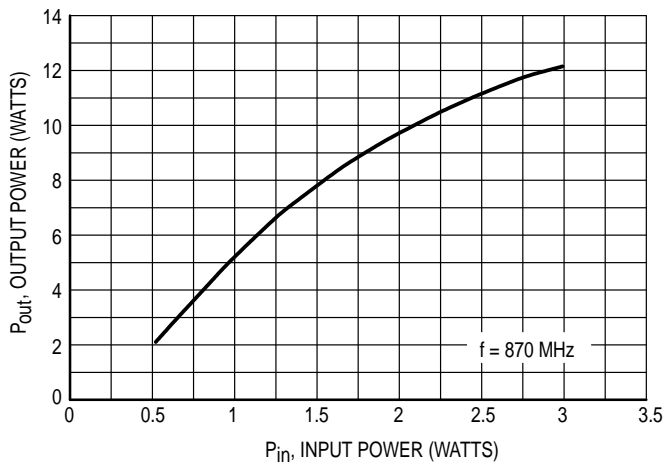


Figure 2. Output Power versus Input Power

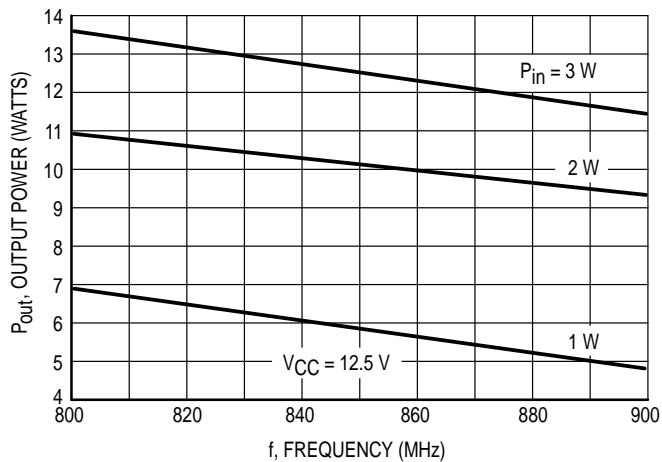


Figure 3. Output Power versus Frequency

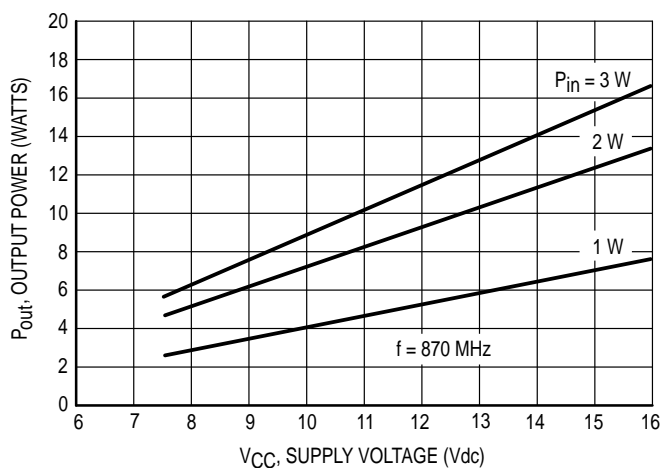
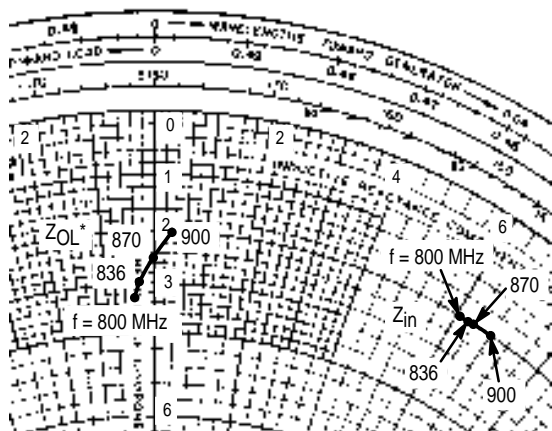


Figure 4. Output Power versus Supply Voltage



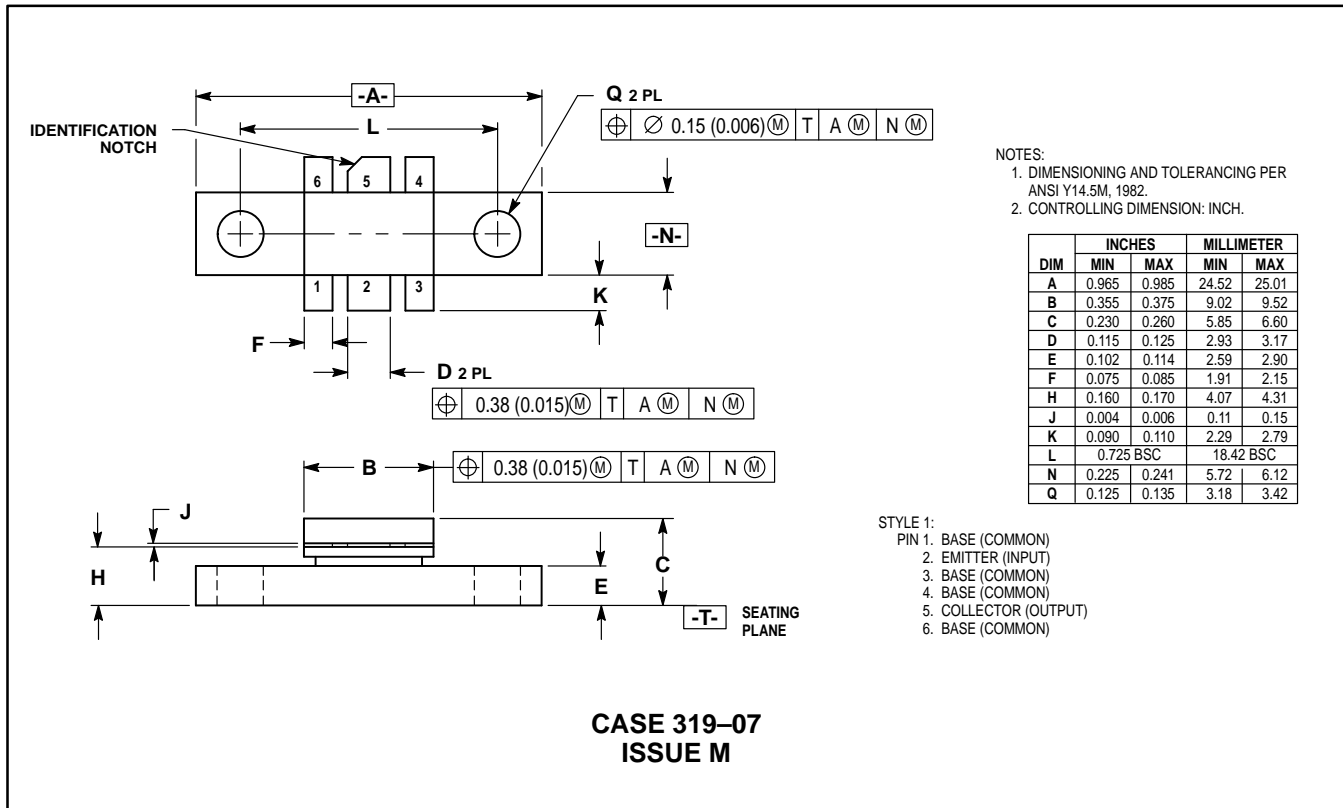
$P_{out} = 10 \text{ W}, V_{CC} = 12.5 \text{ Vdc}$

| f MHz | Z_{in} Ohms | Z_{OL}^* Ohms |
|----------|------------------|--------------------|
| 800 | $2.0 + j6.1$ | $3.3 - j0.4$ |
| 836 | $2.0 + j6.2$ | $3.0 - j0.3$ |
| 870 | $2.0 + j6.4$ | $2.5 + j0.0$ |
| 900 | $2.0 + j6.8$ | $2.0 + j0.3$ |

Z_{OL}^* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

Figure 5. Series Equivalent Input/Output Impedance

PACKAGE DIMENSIONS



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 can and do vary in different applications. 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.

Literature Distribution Centers:

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.
 EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.
 JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.
 ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



MRF840/D



This datasheet has been download from:

www.datasheetcatalog.com

Datasheets for electronics components.