

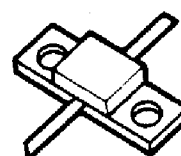
**MRA0610**  
**Series**

**The RF Line**  
**UHF Power Transistors**

... designed primarily for wideband, large-signal output and driver amplifier stages in the 600 to 1000 MHz frequency range.

- Designed for Class C, Common Base Power Amplifiers
- Specified 28 Volt, 1000 MHz Characteristics:
  - Output Power — 3 to 40 Watts
  - Power Gain — 7 to 7.8 dB Min, Common Base
  - Collector Efficiency — 50 to 55%
- Built-In Matching Network for Broadband Operation
- Gold Metallization for Improved Reliability
- Diffused Ballast Resistors

**7 to 7.8 dB**  
**600-1000 MHz**  
**3 TO 40 WATTS**  
**BROADBAND**  
**UHF POWER**  
**TRANSISTORS**



**CASE 394-01, STYLE 1**  
**(MRA .25)**

**MAXIMUM RATINGS**

| Rating                         | Symbol           | -3          | -9  | -18A | -40A | Unit            |
|--------------------------------|------------------|-------------|-----|------|------|-----------------|
| Collector-Base Voltage         | V <sub>CES</sub> | 50          |     |      |      | V <sub>dc</sub> |
| Emitter-Base Voltage           | V <sub>EBO</sub> | 3.5         |     |      |      | V <sub>dc</sub> |
| Collector Current — Continuous | I <sub>C</sub>   | 0.5         | 1.5 | 2.5  | 5    | A <sub>dc</sub> |
| Operating Junction Temperature | T <sub>J</sub>   | 200         |     |      |      | °C              |
| Storage Temperature Range      | T <sub>stg</sub> | -65 to +150 |     |      |      | °C              |

**THERMAL CHARACTERISTICS**

| Characteristic                           | Symbol           | Max |   |   |     | Unit |
|------------------------------------------|------------------|-----|---|---|-----|------|
| Thermal Resistance, RF, Junction to Case | R <sub>θJC</sub> | 15  | 6 | 4 | 2.5 | °C/W |

**ELECTRICAL CHARACTERISTICS**

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

**OFF CHARACTERISTICS**

|                                                                                      |           |                      |     |   |     |                  |
|--------------------------------------------------------------------------------------|-----------|----------------------|-----|---|-----|------------------|
| Collector-Emitter Breakdown Voltage<br>(I <sub>C</sub> = 20 mA, V <sub>BE</sub> = 0) | MRA0610-3 | V <sub>(BR)CES</sub> | 50  | — | —   | V <sub>dc</sub>  |
| (I <sub>C</sub> = 60 mA, V <sub>BE</sub> = 0)                                        | -9        |                      | 50  | — | —   |                  |
| (I <sub>C</sub> = 100 mA, V <sub>BE</sub> = 0)                                       | -18A      |                      | 50  | — | —   |                  |
| (I <sub>C</sub> = 200 mA, V <sub>BE</sub> = 0)                                       | -40A      |                      | 50  | — | —   |                  |
| Emitter-Base Breakdown Voltage<br>(I <sub>E</sub> = 0.25 mA, I <sub>C</sub> = 0)     | MRA0610-3 | V <sub>(BR)EBO</sub> | 3.5 | — | —   | V <sub>dc</sub>  |
| (I <sub>E</sub> = 0.75 mA, I <sub>C</sub> = 0)                                       | -9        |                      | 3.5 | — | —   |                  |
| (I <sub>E</sub> = 1.25 mA, I <sub>C</sub> = 0)                                       | -18A      |                      | 3.5 | — | —   |                  |
| (I <sub>E</sub> = 2.5 mA, I <sub>C</sub> = 0)                                        | -40A      |                      | 3.5 | — | —   |                  |
| Collector Cutoff Current<br>(V <sub>CB</sub> = 28 V, I <sub>E</sub> = 0)             | MRA0610-3 | I <sub>CBO</sub>     | —   | — | 0.5 | mA <sub>dc</sub> |
|                                                                                      | -9        |                      | —   | — | 1.5 |                  |
|                                                                                      | -18A      |                      | —   | — | 2.5 |                  |
|                                                                                      | -40A      |                      | —   | — | 5   |                  |

(continued)

# ELECTRICAL CHARACTERISTICS — continued

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

## ON CHARACTERISTICS

|                                  |           |     |    |   |     |
|----------------------------------|-----------|-----|----|---|-----|
| DC Current Gain                  | MRA0610-3 | hFE |    |   |     |
| ( $I_C = 0.1$ A, $V_{CE} = 5$ V) |           |     | 10 | — | 100 |
| ( $I_C = 0.3$ A, $V_{CE} = 5$ V) |           |     | 10 | — | 100 |
| ( $I_C = 0.5$ A, $V_{CE} = 5$ V) |           |     | 10 | — | 100 |
| ( $I_C = 1$ A, $V_{CE} = 5$ V)   |           |     | 10 | — | 100 |

## DYNAMIC CHARACTERISTICS

|                                             |           |                 |   |   |     |    |
|---------------------------------------------|-----------|-----------------|---|---|-----|----|
| Output Capacitance                          | MRA0610-3 | C <sub>ob</sub> |   |   | 4.5 | pF |
| ( $V_{CB} = 28$ V, $I_E = 0$ , $f = 1$ MHz) |           |                 | — | — | 10  |    |
|                                             |           |                 | — | — | 14  |    |
|                                             |           |                 | — | — | 28  |    |
|                                             |           |                 | — | — | —   |    |

## FUNCTIONAL TESTS

|                                                         |           |                 |     |   |   |    |
|---------------------------------------------------------|-----------|-----------------|-----|---|---|----|
| Common-Base Amplifier Power Gain                        | MRA0610-3 | G <sub>pb</sub> |     |   |   | dB |
| ( $V_{CE} = 28$ V, $P_{out} = 3$ W, $f = 0.6$ & 1 GHz)  |           |                 | 7.8 | — | — |    |
| ( $V_{CE} = 28$ V, $P_{out} = 9$ W, $f = 0.6$ & 1 GHz)  |           |                 | 7.8 | — | — |    |
| ( $V_{CE} = 28$ V, $P_{out} = 18$ W, $f = 0.6$ & 1 GHz) |           |                 | 7.8 | — | — |    |
| ( $V_{CE} = 28$ V, $P_{out} = 40$ W, $f = 0.6$ & 1 GHz) |           |                 | 7   | — | — |    |
| Collector Efficiency                                    | MRA0610-3 | $\eta_c$        |     |   |   | %  |
| ( $V_{CE} = 28$ V, $P_{out} = 3$ W, $f = 0.6$ & 1 GHz)  |           |                 | 50  | — | — |    |
| ( $V_{CE} = 28$ V, $P_{out} = 9$ W, $f = 0.6$ & 1 GHz)  |           |                 | 55  | — | — |    |
| ( $V_{CE} = 28$ V, $P_{out} = 18$ W, $f = 0.6$ & 1 GHz) |           |                 | 50  | — | — |    |
| ( $V_{CE} = 28$ V, $P_{out} = 40$ W, $f = 0.6$ & 1 GHz) |           |                 | 50  | — | — |    |

## TYPICAL CHARACTERISTICS

### MRA0610-3 — 3 WATTS BROADBAND

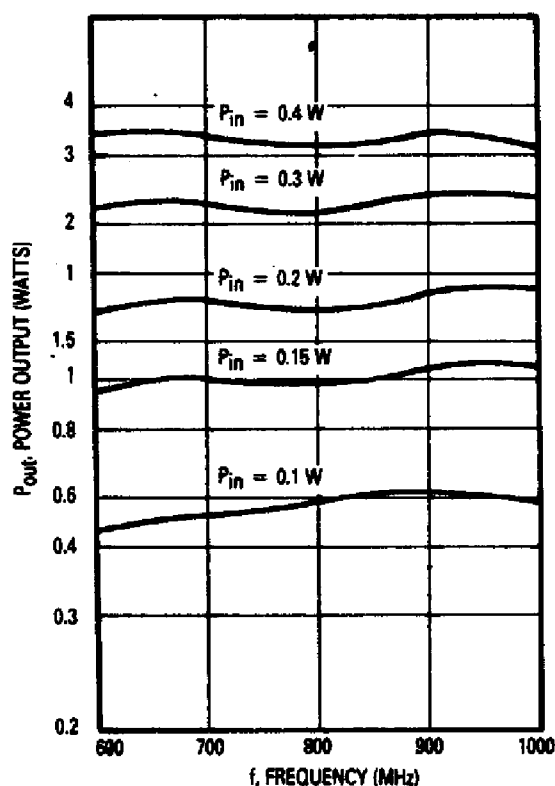


Figure 1. Power Output versus Frequency

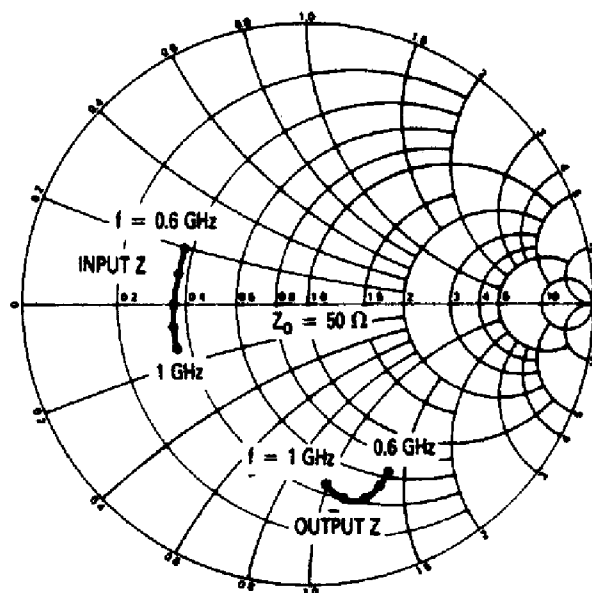


Figure 2. Series Equivalent Input/Output Impedance  
 $V_{CC} = 28$  V

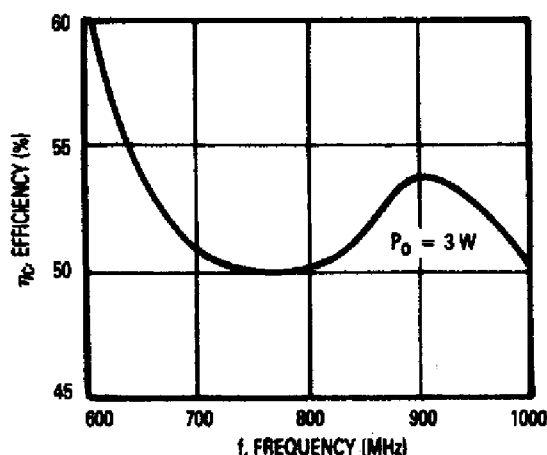


Figure 3. Efficiency versus Frequency

# MRA0610 Series

## TYPICAL CHARACTERISTICS

T-3

### MRA0610-9 — 9 WATTS BROADBAND

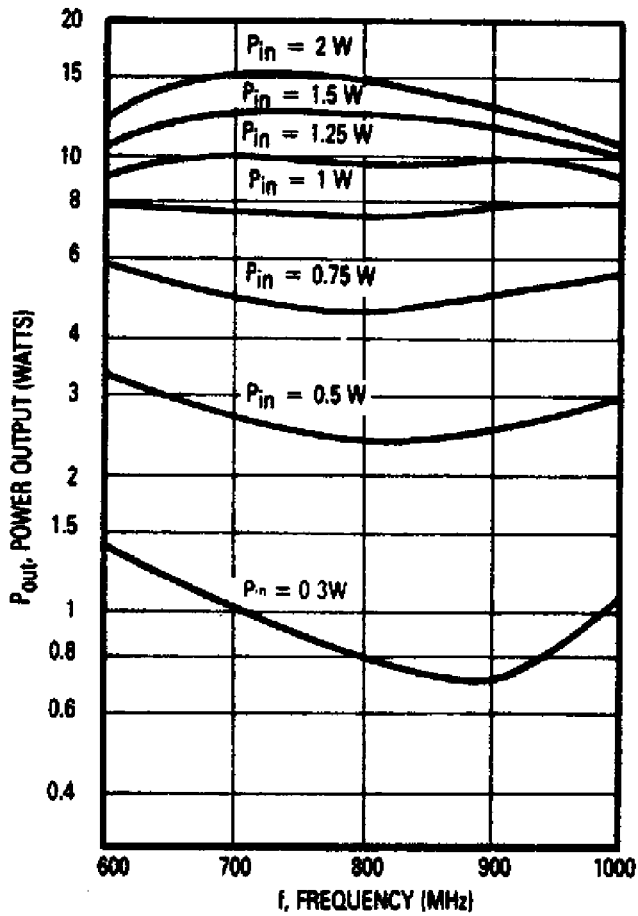


Figure 4. Power Output versus Frequency

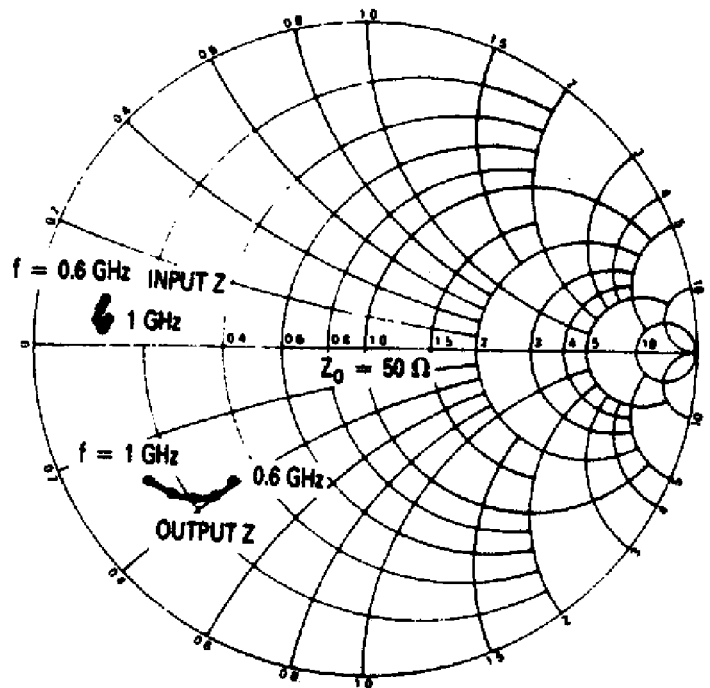


Figure 5. Series Equivalent Input/Output Impedance  
 $V_{CC} = 28\text{ V}$

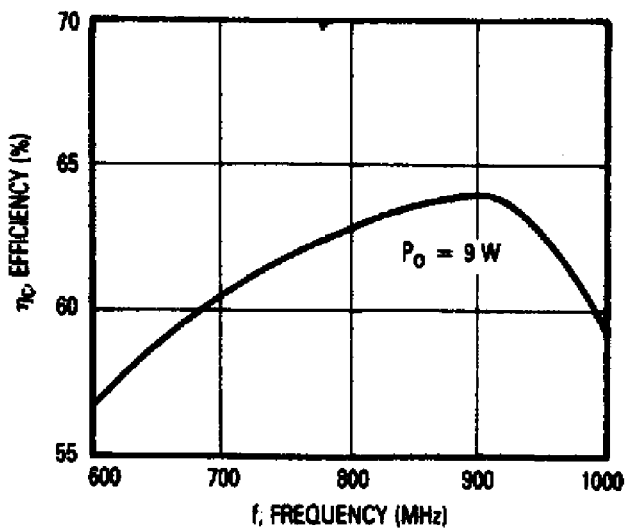


Figure 6. Efficiency versus Frequency

# MRA0610 Series

## TYPICAL CHARACTERISTICS

### MRA0610-18A — 18 WATTS BROADBAND

T.

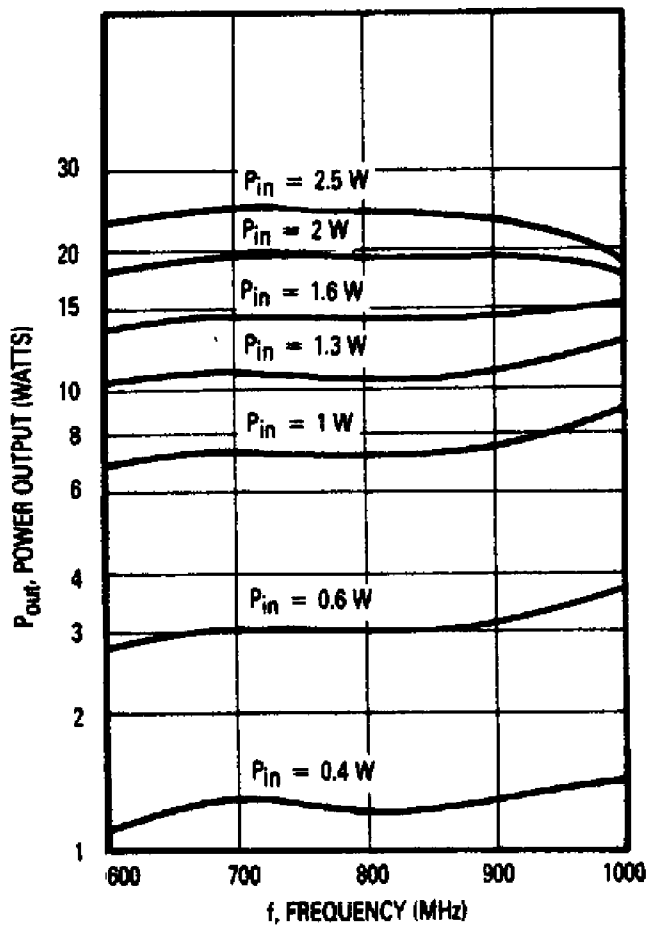


Figure 7. Power Output versus Frequency

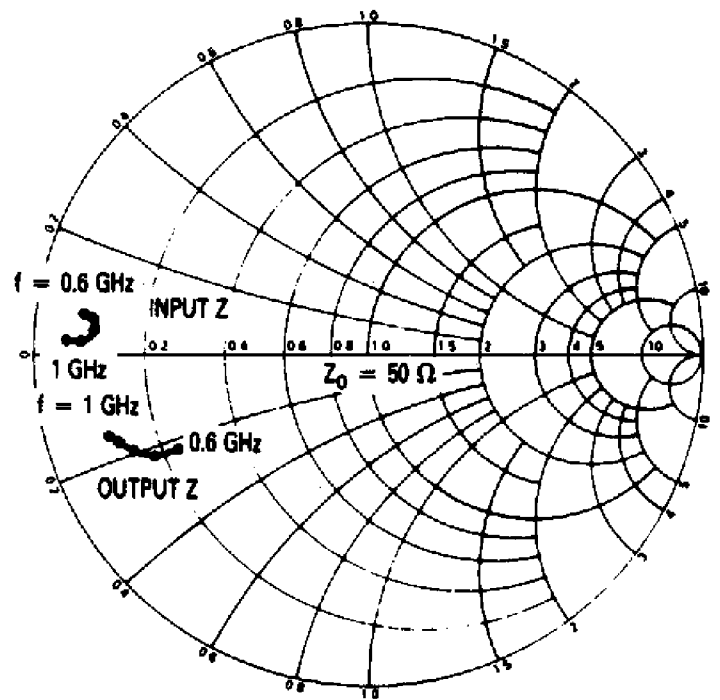


Figure 8. Series Equivalent Input/Output Impedance  
 $V_{CC} = 28 \text{ V}$

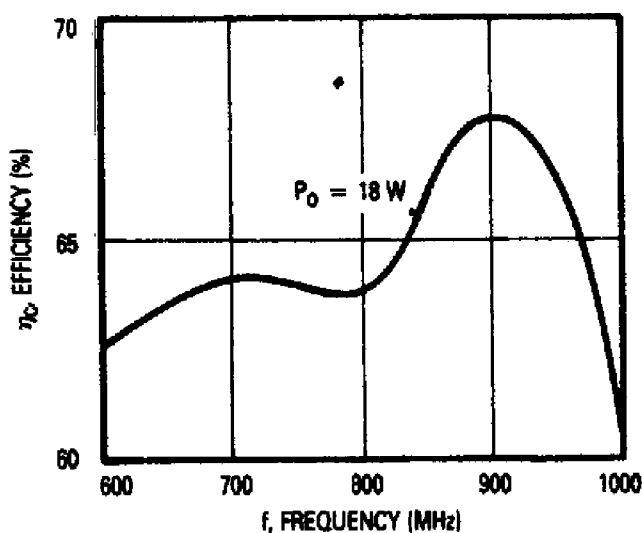


Figure 9. Efficiency versus Frequency

## TYPICAL CHARACTERISTICS

## MRA0610-40A — 40 WATTS BROADBAND

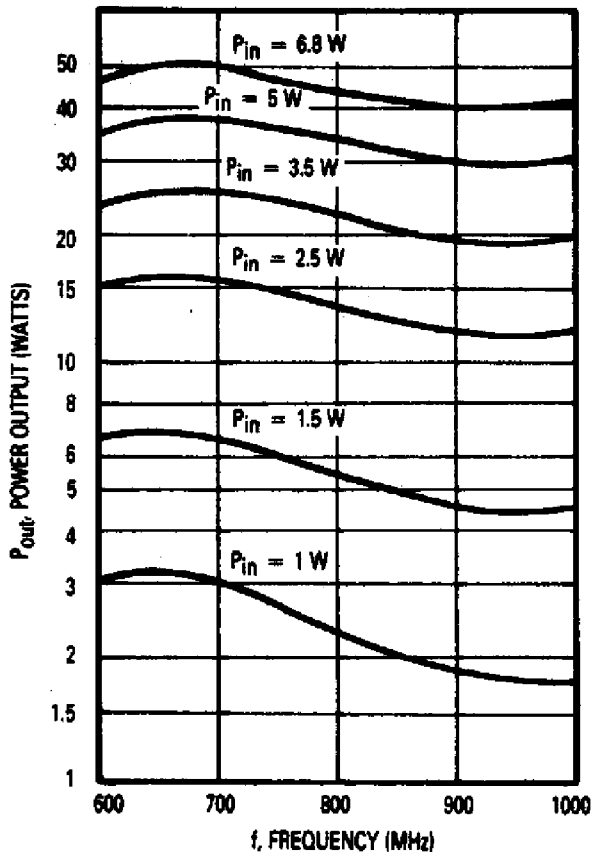


Figure 10. Power Output versus Frequency

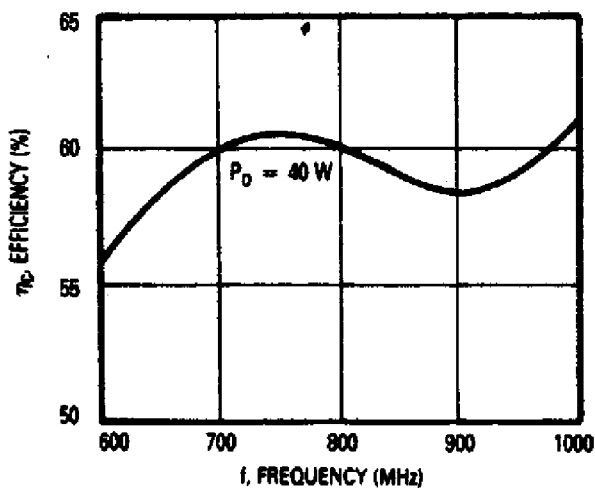


Figure 12. Efficiency versus Frequency

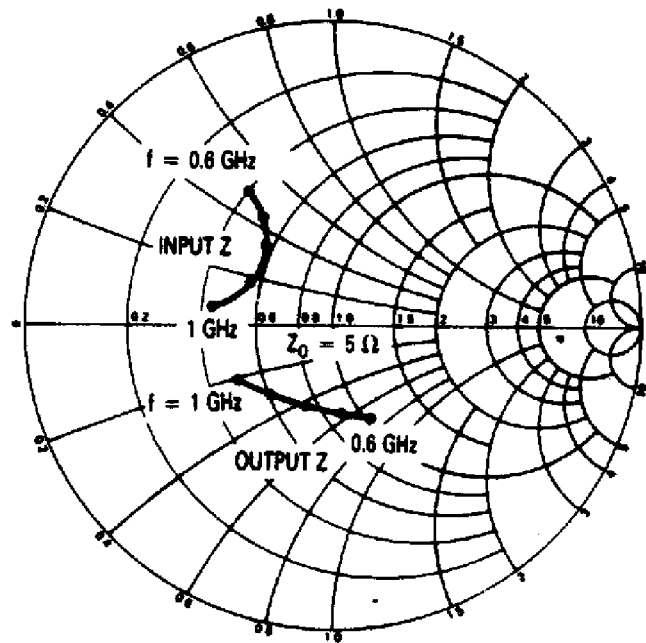
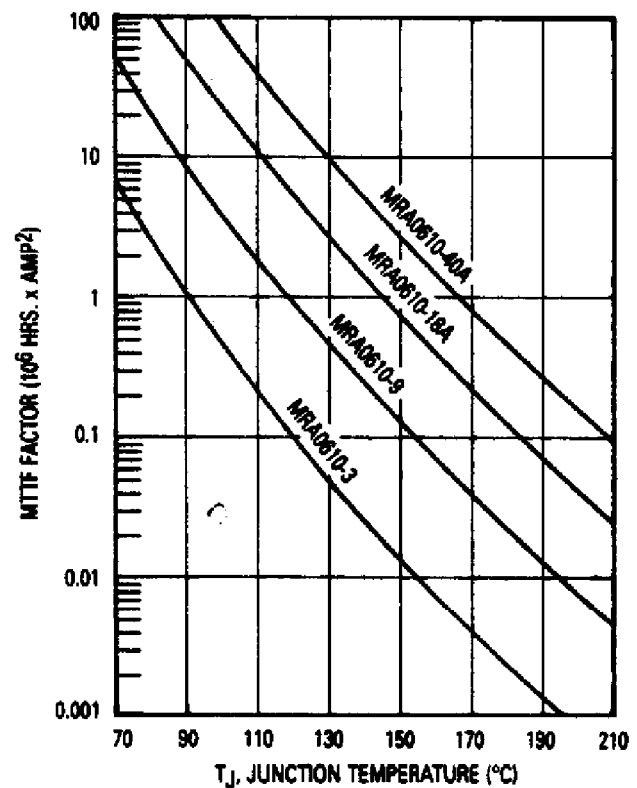
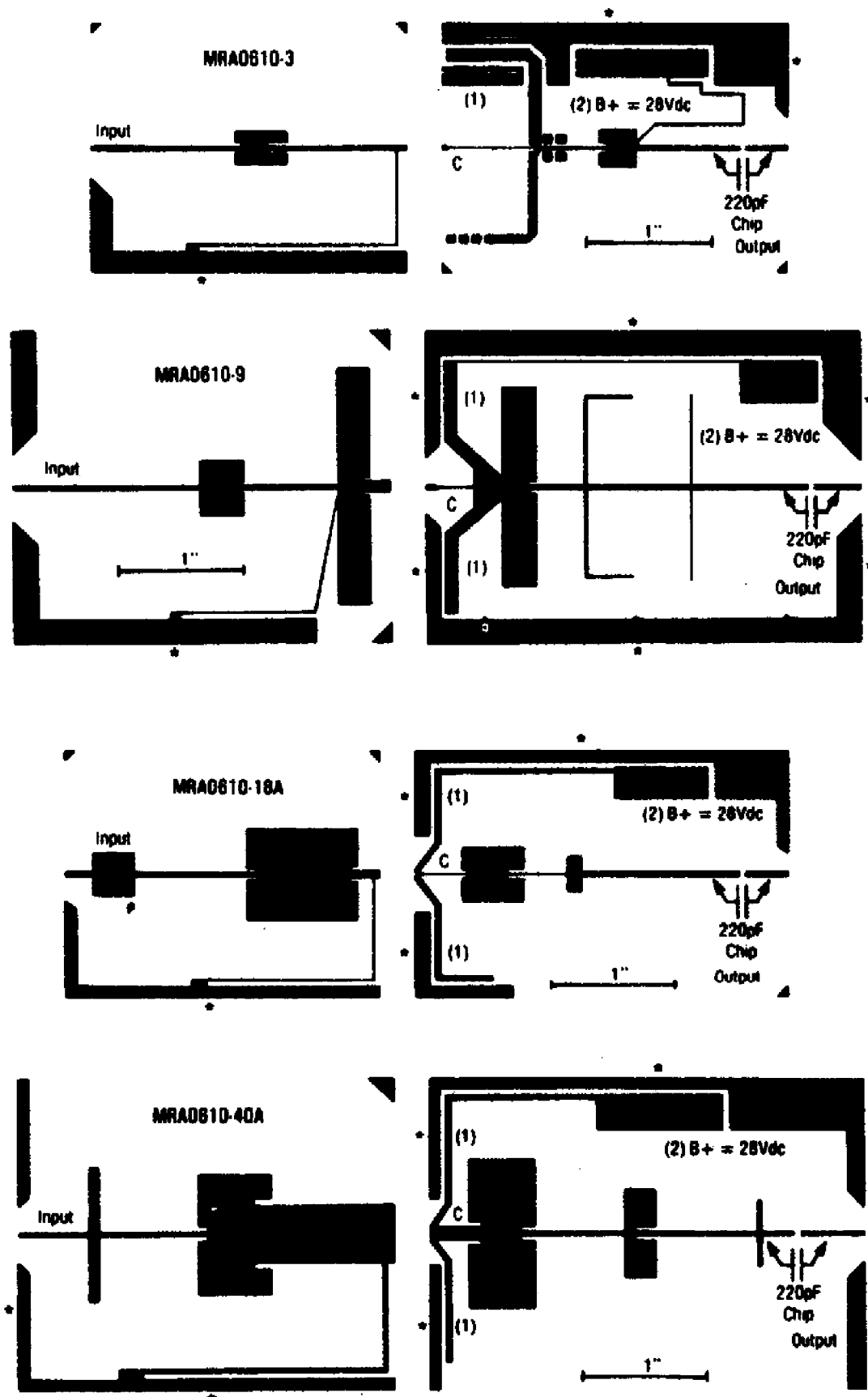
Figure 11. Series Equivalent Input/Output Impedance  
 $V_{CC} = 28$  V

Figure 13. MTTF Factor versus Junction Temperature

Note: Divide by  $I_C^2$  to obtain metal lifetime in hours



\*Foil wrap or plate around to ground plane. Board material 0.020 inch glass-terfon  $\epsilon_r = 2.55$ .  
 (1) Bypass capacitor to ground for shunt inductor (220pF chip).  
 (2) Use B+ bypass of 0.01 and 1  $\mu$ F capacitors at this point.

**Figure 14. Test Circuit Boards for MRA0610 Series**

(Not to Scale)