T-33-01

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

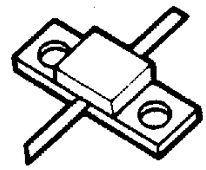
MRA0610 Series

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

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



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

MAXIMUM RATINGS

Rating	Symbol	-3	-9	-18A	-40A	Unit
Collector-Base Voltage	V_{CES}	50				Vdc
Emitter-Base Voltage	V_{EBO}	3.5				Vdc
Collector Current — Continuous	I_C	0.5	1.5	2.5	5	Adc
Operating Junction Temperature	T_J	200				°C
Storage Temperature Range	T_{stg}	−65 to +150				°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max				Unit
Thermal Resistance, RF, Junction to Case	$R_{\theta JC}$	15	6	4	2.5	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Collector-Emitter Breakdown Voltage		$V_{(BR)CES}$				Vdc
(I_C = 20 mA, V_{BE} = 0)	MRA0610-3		50	—	—	
(I_C = 60 mA, V_{BE} = 0)	-9		50	—	—	
(I_C = 100 mA, V_{BE} = 0)	-18A		50	—	—	
(I_C = 200 mA, V_{BE} = 0)	-40A		50	—	—	
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$				Vdc
(I_E = 0.25 mA, I_C = 0)	MRA0610-3		3.5	—	—	
(I_E = 0.75 mA, I_C = 0)	-9		3.5	—	—	
(I_E = 1.25 mA, I_C = 0)	-18A		3.5	—	—	
(I_E = 2.5 mA, I_C = 0)	-40A		3.5	—	—	
Collector Cutoff Current	MRA0610-3	I_{CBO}	—	—	0.5	mAdc
(V_{CB} = 28 V, I_E = 0)	-9		—	—	1.5	
	-18A		—	—	2.5	
	-40A		—	—	5	

(continued)

ELECTRICAL CHARACTERISTICS — continued

Characteristic		Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS						
DC Current Gain		h_{FE}				—
(I_C = 0.1 A, V_{CE} = 5 V)	MRA0610-3		10	—	100	
(I_C = 0.3 A, V_{CE} = 5 V)	-9		10	—	100	
(I_C = 0.5 A, V_{CE} = 5 V)	-18A		10	—	100	
(I_C = 1 A, V_{CE} = 5 V)	-40A		10	—	100	
DYNAMIC CHARACTERISTICS						
Output Capacitance	MRA0610-3	C_{ob}	—	—	4.5	pF
(V_{CB} = 28 V, I_E = 0, f = 1 MHz)	- 9		—	—	10	
	-18A		—	—	14	
	-40A		—	—	28	
FUNCTIONAL TESTS						
Common-Base Amplifier Power Gain		G_{PB}				dB
(V_{CE} = 28 V, P_{out} = 3 W, f = 0.6 & 1 GHz)	MRAL0610-3		7.8	—	—	
(V_{CE} = 28 V, P_{out} = 9 W, f = 0.6 & 1 GHz)	-9		7.8	—	—	
(V_{CE} = 28 V, P_{out} = 18 W, f = 0.6 & 1 GHz)	-18A		7.8	—	—	
(V_{CE} = 28 V, P_{out} = 40 W, f = 0.6 & 1 GHz)	-40A		7	—	—	
Collector Efficiency		η_c				%
(V_{CE} = 28 V, P_{out} = 3 W, f = 0.6 & 1 GHz)	MRA0610-3		50	—	—	
(V_{CE} = 28 V, P_{out} = 9 W, f = 0.6 & 1 GHz)	-9		55	—	—	
(V_{CE} = 28 V, P_{out} = 18 W, f = 0.6 & 1 GHz)	-18A		50	—	—	
(V_{CE} = 28 V, P_{out} = 40 W, f = 0.6 & 1 GHz)	-40A		50	—	—	

TYPICAL CHARACTERISTICS
MRA0610-3 — 3 WATTS BROADBAND

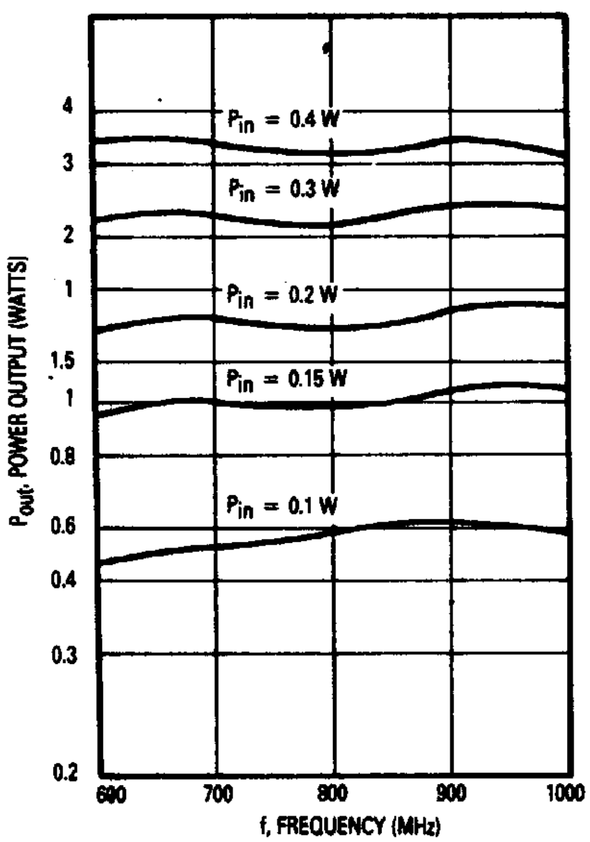


Figure 1. Power Output versus Frequency

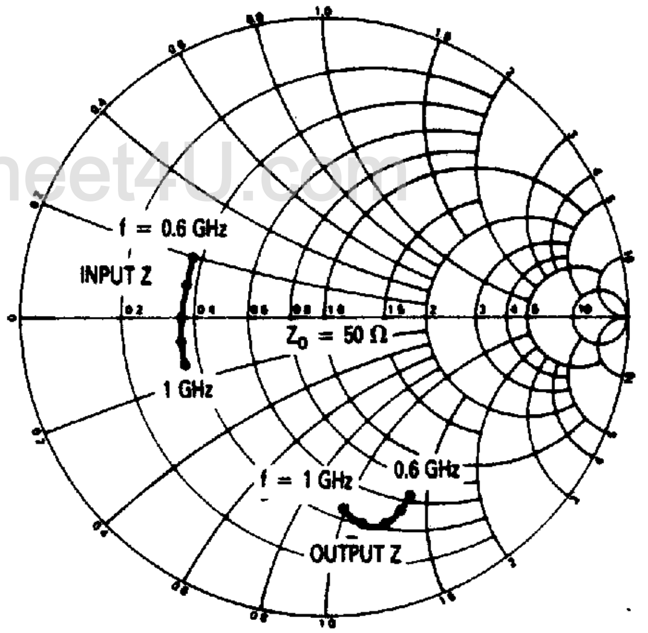


Figure 2. Series Equivalent Input/Output Impedance
V_{CC} = 28 V

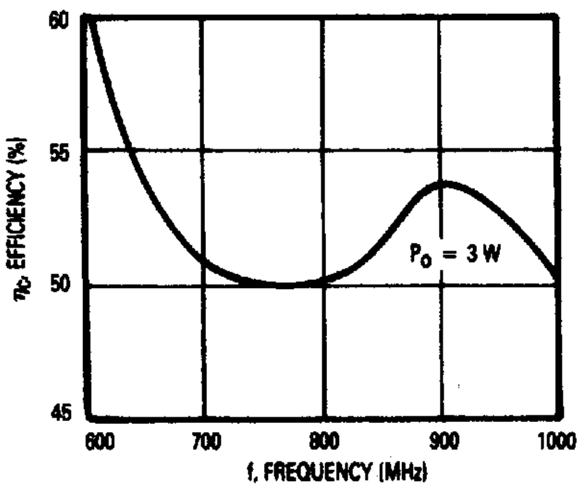


Figure 3. Efficiency versus Frequency

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TYPICAL CHARACTERISTICS

MRA0610-9 — 9 WATTS BROADBAND

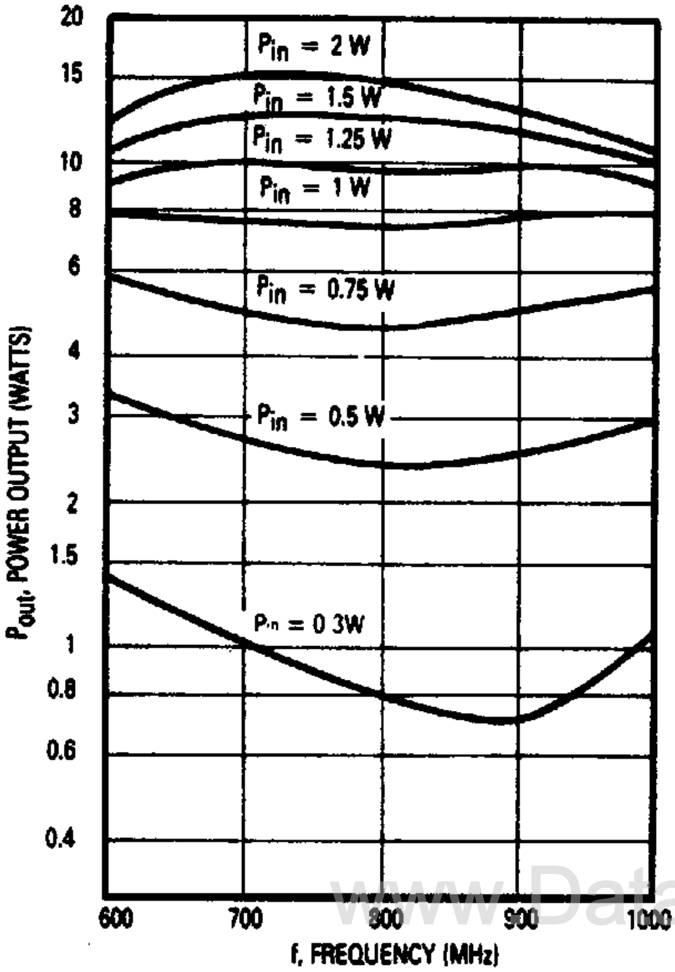

Figure 4. Power Output versus Frequency

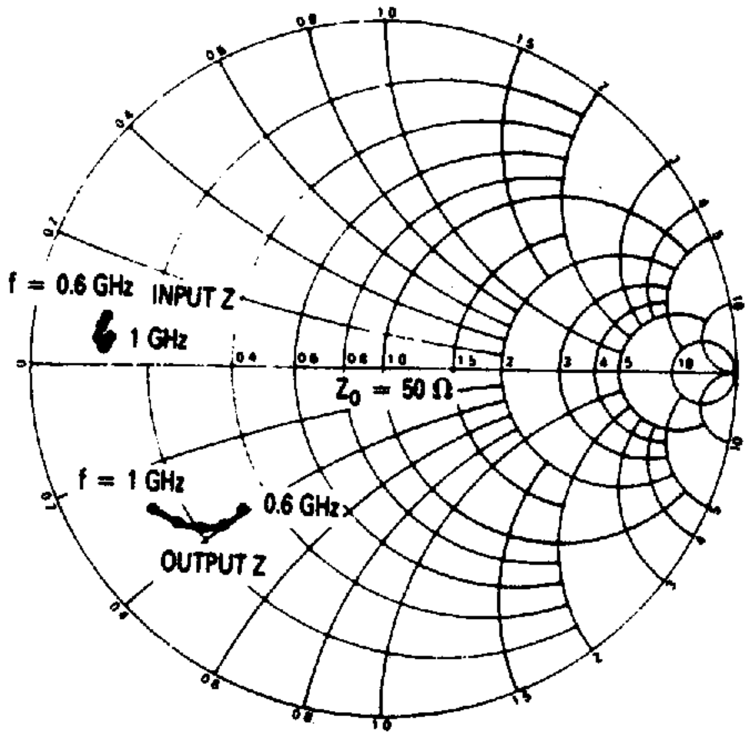

Figure 5. Series Equivalent Input/Output Impedance
V_{CC} = 28 V

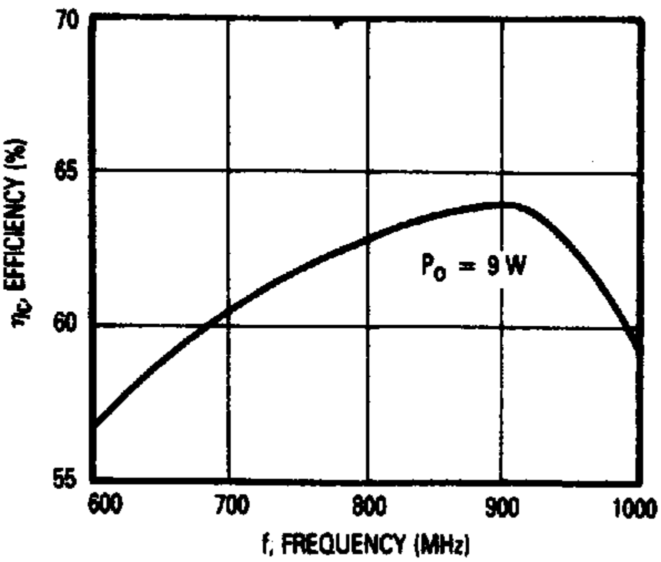

Figure 6. Efficiency versus Frequency

TYPICAL CHARACTERISTICS

MRA0610-18A — 18 WATTS BROADBAND

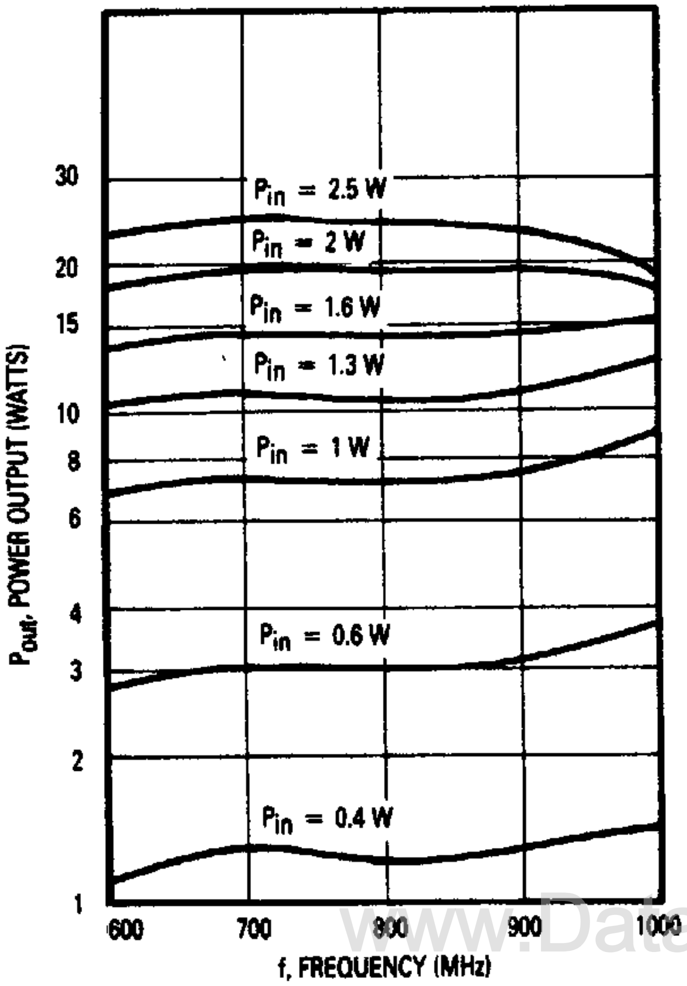

Figure 7. Power Output versus Frequency

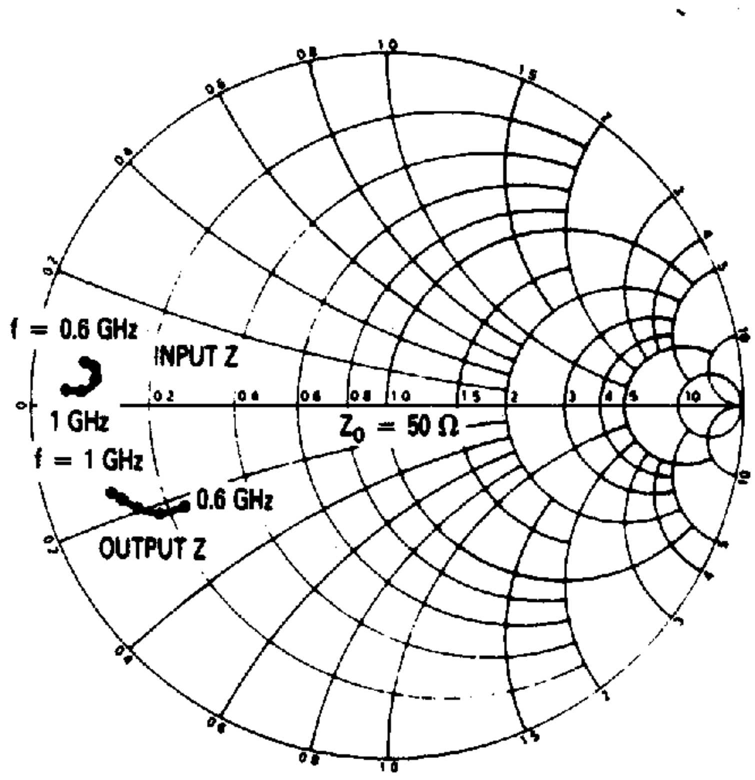

Figure 8. Series Equivalent Input/Output Impedance
V_{CC} = 28 V

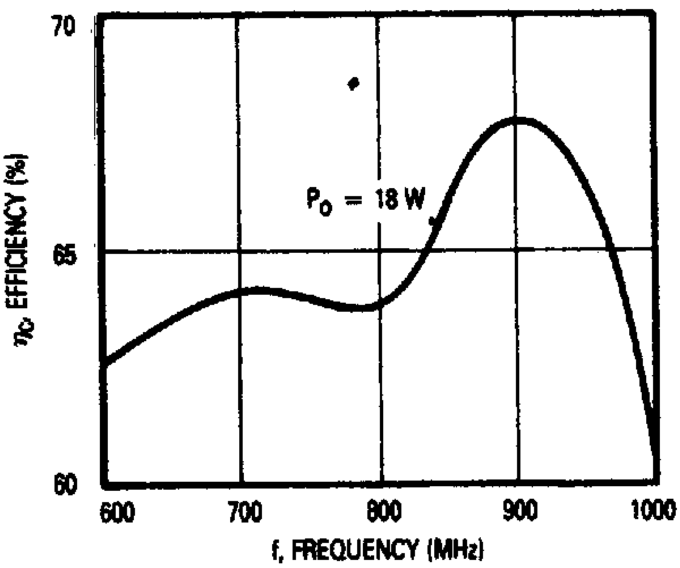

Figure 9. Efficiency versus Frequency

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TYPICAL CHARACTERISTICS

MRA0610-40A — 40 WATTS BROADBAND

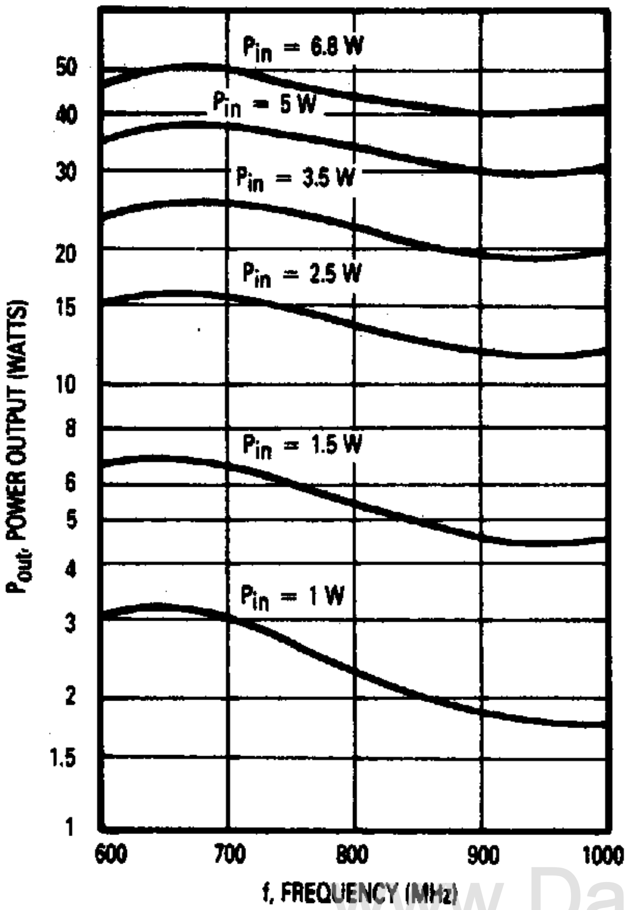


Figure 10. Power Output versus Frequency

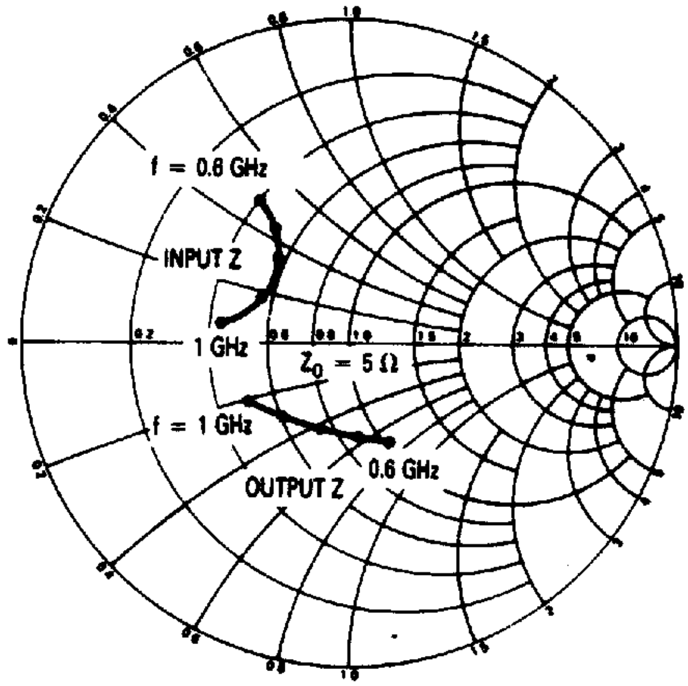


Figure 11. Series Equivalent Input/Output Impedance
V_{CC} = 28 V

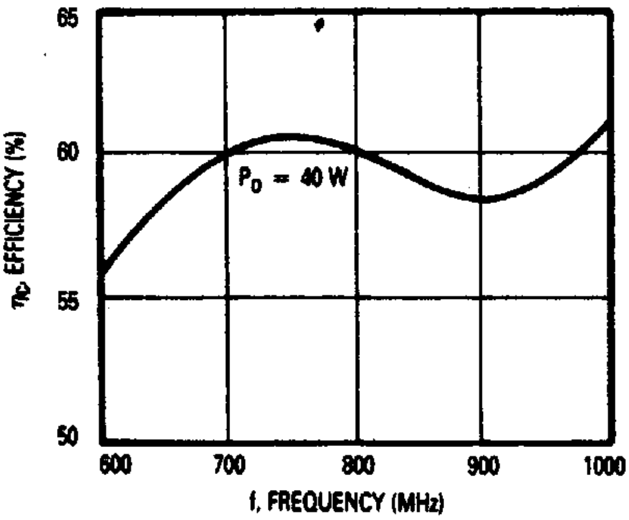


Figure 12. Efficiency versus Frequency

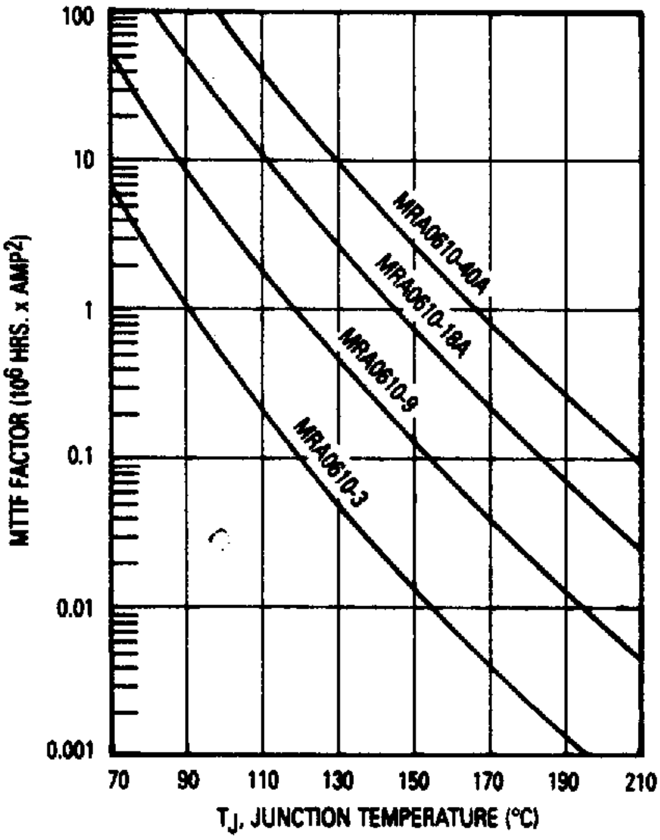
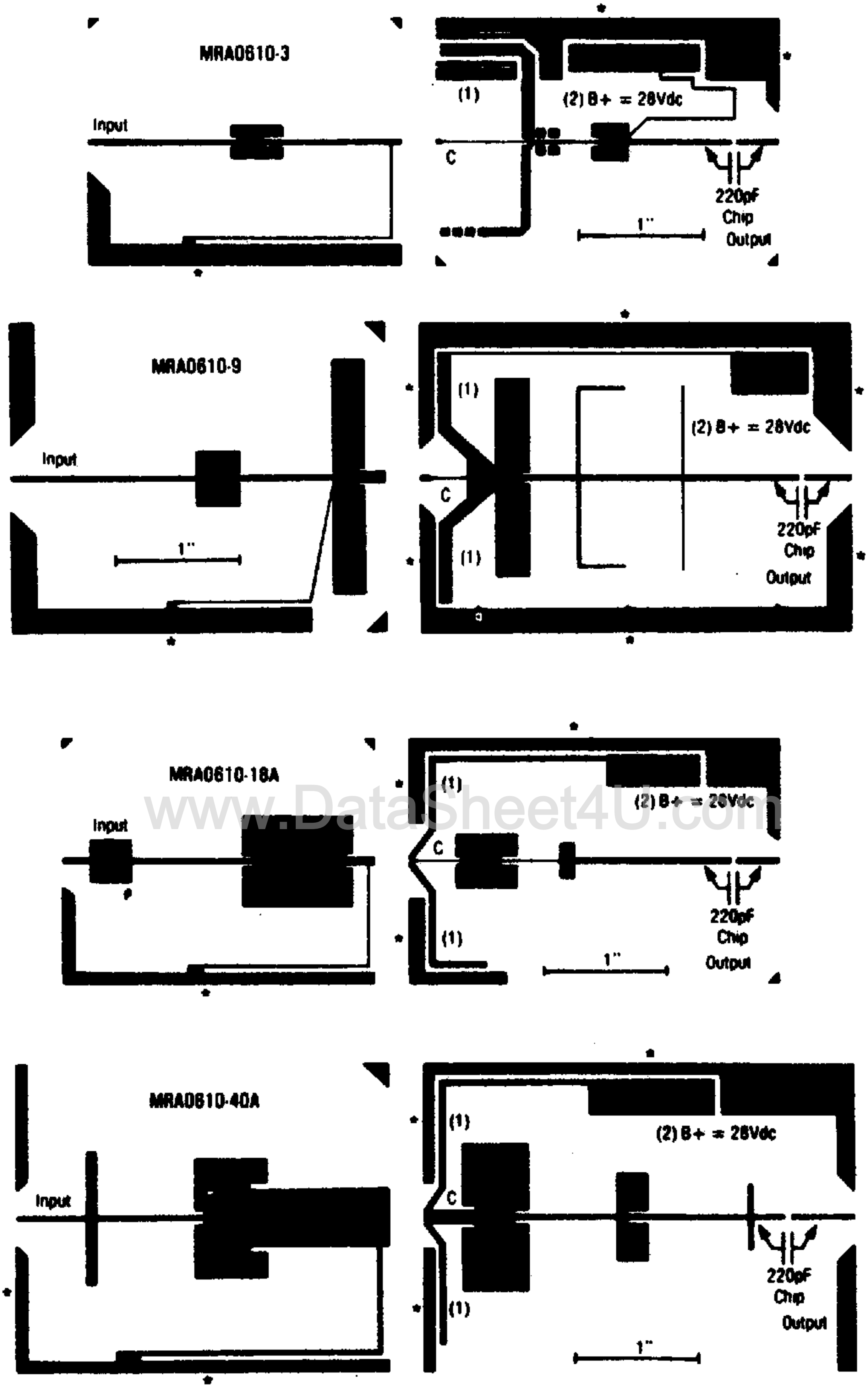


Figure 13. MTTF Factor versus Junction Temperature

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-teflon ϵ_r = 2.55.

(1) Bypass capacitor to ground for shunt inductor (220pF chip).

(2) Use B+ bypass of 0.01 and 1μF capacitors at this point.

Figure 14. Test Circuit Boards for MRA0610 Series

(Not to Scale)