MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

J01006

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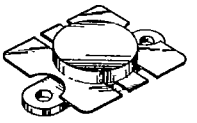
The RF Line
VHF Power Transistor

. . . designed primarily for wideband large-signal output amplifier stages in 30–200 MHz frequency range.

- Guaranteed Performance at 175 MHz and 28 Vdc
  Output Power = 100 W
  Minimum Gain = 7 dB
- Built-In Matching Network for Broadband Operation
- 100% Tested for Load Mismatch at All Phase Angles with 3:1 VSWR
- Gold Metallization System for High Reliability
- High Output Saturation Power — P_{sat} = 125 W (Min)
- Diffused Ballast Resistors

28 VOLTS
30–200 MHz
VHF POWER
TRANSISTOR



.500 J ZERO
CASE 316A-01, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	35	Vdc
Collector-Base Voltage	V_{CES}	60	Vdc
Emitter-Base Voltage	V_{EBO}	4	Vdc
Collector Current — Continuous	I_C	12	Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	150 1.14	Watts W/°C
Operating Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{stg}	−65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.88	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 50 mA, I_B = 0)	$V_{(BR)CEO}$	35	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 100 mA, V_{BE} = 0)	$V_{(BR)CES}$	60	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 5 mA, I_C = 0)	$V_{(BR)EBO}$	4	—	—	Vdc
Collector Cutoff Current (V_{CE} = 25 V, V_{BE} = 0)	I_{CES}	—	—	10	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 1 A, V_{CE} = 10 V)	h_{FE}	20	—	150	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 28 V, I_E = 0, f = 1 MHz)	C_{ob}	—	—	200	pF

(continued)

ELECTRICAL CHARACTERISTICS — continued

Characteristic	Symbol	Min	Typ	Max	Unit
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CE} = 28 V, P_{out} = 100 W, f = 175 MHz)	G_{PE}	7	—	—	dB
Collector Efficiency (V_{CE} = 28 V, P_{out} = 100 W, f = 175 MHz)	η_C	—	60	—	%
Load Mismatch (V_{CE} = 28 V, P_{out} = 100 W, f = 175 MHz, Load VSWR = 3:1, All Phase Angles)	ψ	No Degradation in Output Power			
Saturated Output Power (V_{CE} = 28 V, f = 175 MHz)	P_{sat}	125	—	—	W

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TYPICAL CHARACTERISTICS

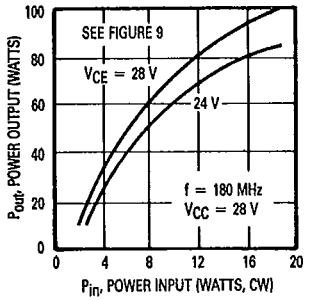


Figure 1. Power Input versus Power Output (Class C Narrowband)

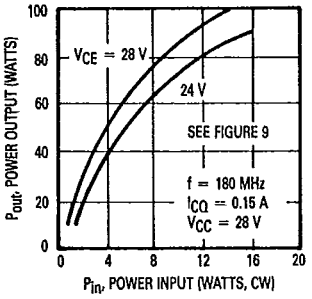


Figure 2. Power Input versus Power Output (Class B Narrowband)

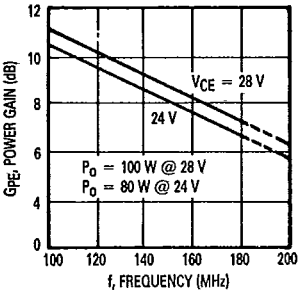


Figure 3. Power Gain versus Frequency (Class C Narrowband)

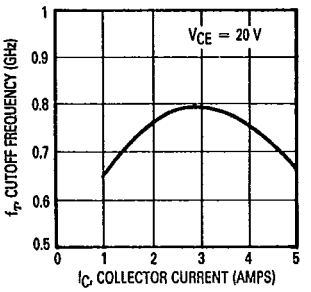


Figure 4. Cutoff Frequency versus Current

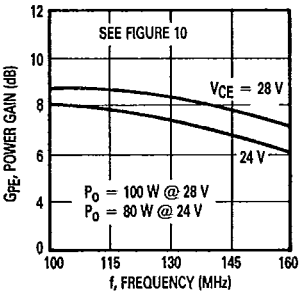


Figure 5. Power Gain versus Frequency (Broadband)

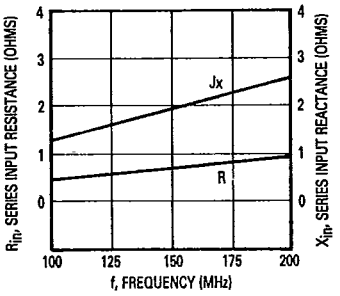


Figure 6. Series Input Impedance versus Frequency

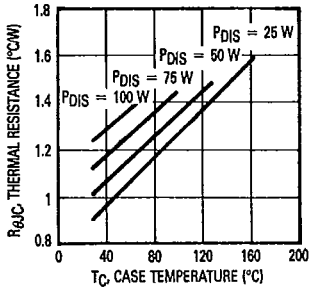


Figure 7. Thermal Resistance versus Case Temperature

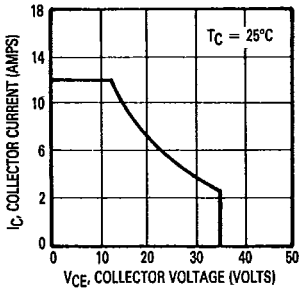
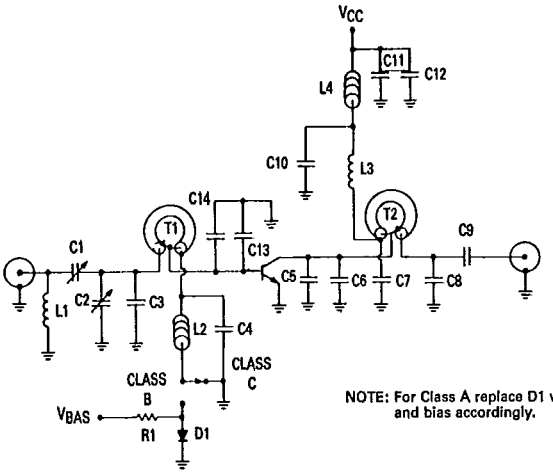


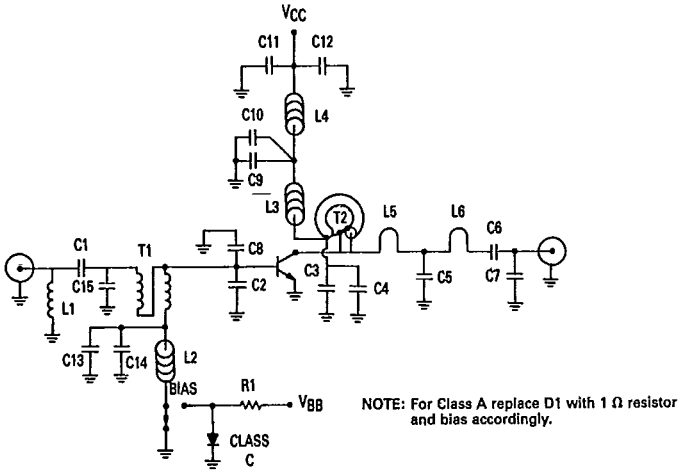
Figure 8. DC Safe Operating Area



NOTE: For Class A replace D1 with 1 Ω resistor and bias accordingly.

C1 — 8–60 pF ARCO
C2 — 3–35 pF ARCO
C3 — 30 pF UNELCO
C4, C7, C9, C10, C11 — 1000 pF UNELCO
C5 — 110 pF UNELCO
C6 — 120 pF UNELCO
C8 — 40 pF UNELCO
C12 — 25 μF Electrolytic
C13 — 350 pF UNELCO
C14 — 300 pF UNELCO
D1 — DSR 5050
L1 — 5 turns, 0.125" diameter #22 AWG
L2, L4 — 3 Ferrite beads
R1 — 12 Ω
T1 — 0.075" diameter semiridged 10 Ω co-ax
T2 — 0.075" diameter semiridged 25 Ω co-ax

Figure 9. Narrowband Test Circuit (100–180 MHz)



NOTE: For Class A replace D1 with 1 Ω resistor and bias accordingly.

C1 — 50 pF UNELCO
C2 — 350 pF UNELCO
C3, C6, C9, C12, C14 — 1000 pF UNELCO
C4, C10, C13 — 0.1 μF disc
C5, C15 — 30 pF UNELCO
C7 — 0–18 pF #402 ARCO
C8 — 300 pF UNELCO
C11 — 100 μF Electrolytic
D1 — DSR 5050
L1 — 4 turns, 0.125" diameter #22 AWG
L2, L3, L4 — 3 Ferrite Beads on #22 AWG
L5 — 0.08" wide ribbon, 0.25" long
L6 — 0.08" wide ribbon, 0.125" long
R1 — 50 Ω
T1 — 1" long twisted pair #22 AWG
T2 — 0.075" diameter semiridged 25 Ω co-ax, 2" long (Balun transformer)

Figure 10. Broadband Test Circuit (100–160 MHz)

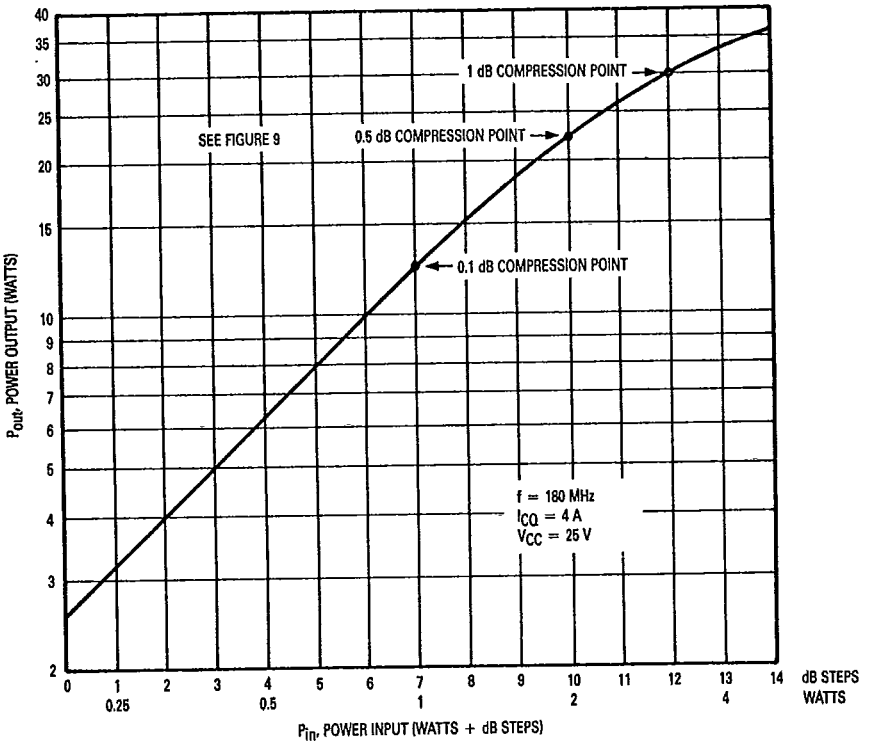
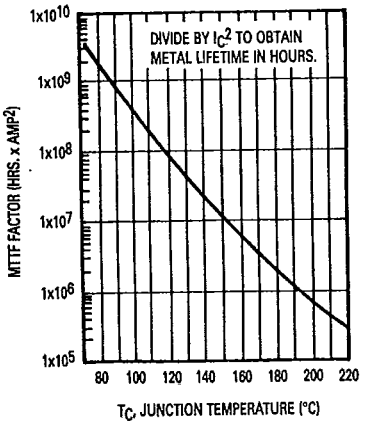


Figure 11. Power Input versus Power Output (Class A Narrowband)



Conditions:

P_O = 100 W
η_C = 60%
G_T = 7 dB
T_C = 45°C
θ_{JC} = 1.25
V_{CE} = 28 V
P_{DIS} = 87 W
T_J = 150°C

MTTF Factor = (1 x 10^7 hrs.) (amp^2)

$$\text{MTTF (hr)} = \frac{(1 \times 10^7 \text{ hrs})\ (\text{amp}^2)}{(5.95 \text{ amp})^2}$$

= 2.8 x 10^5 hrs
= 32 yrs

Figure 12. MTTF Factor versus Junction Temperature