T-33-27

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

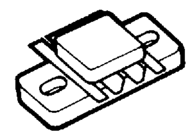
TPV3100

The RF Line
VHF Linear Power Transistor

. . . designed for linear, push-pull amplifiers in VHF Band III. The TPV3100 utilizes gold metallization, diffused emitter ballast resistors and a low thermal resistance header to ensure long term reliability.

- Band III (170–230 MHz)
- 28 W — P_{ref} @ −51 dB IMD
- 28 V — V_{CC}
- High Gain — 14 dB, Class A @ f = 225 MHz
- Push-Pull Package
- Gold Metallization for Reliability

28 V — 170–230 MHz
VHF LINEAR
POWER TRANSISTOR



MRP 7
CASE 827-01/1, STYLE 1

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	35	Vdc
Collector-Base Voltage	V_{CBO}	65	Vdc
Emitter-Base Voltage	V_{EBO}	3.5	Vdc
Collector Current — Continuous	I_C	8	Adc
Operating Junction Temperature	T_J	200	°C
Storage Temperature Range	T_{stg}	−65 to +200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (T_C = 70°C)	$R_{\theta JC}$	0.8	°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-Base Breakdown Voltage (I_C = 50 mA, I_E = 0)	$V_{(BR)CBO}$	65	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 5 mA, I_C = 0)	$V_{(BR)EBO}$	3.5	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 50 mA, R_{BE} = 15 Ω)	$V_{(BR)CER}$	60	—	—	Vdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.5 A, V_{CE} = 28 V)	h_{FE}	20	—	150	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 28 V, I_E = 0, f = 1 MHz)	C_{ob}	—	60	—	pF

(continued)

ELECTRICAL CHARACTERISTICS — continued

Characteristic	Symbol	Min	Typ	Max	Unit
FUNCTIONAL TESTS					
Common-Emitter Amplifier Small-Signal Gain (V_{CE} = 28 V, P_{out} = 28 W, f = 225 MHz, I_C = 2 x 2.25 A)	G_{PE}	14	—	—	dB
Load Mismatch (V_{CE} = 28 V, P_{out} = 28 W, f = 225 MHz, Load VSWR = ∞:1, All Phase Angles)	ψ	No Degradation in Output Power			
Intermodulation Distortion, 3 Tone (f = 225 MHz, V_{CE} = 28 V, I_E = 2 x 2.25 A, P_{ref} = 28 W, Vision Carrier = −8 dB, Sound Carrier = −7 dB, Sideband Signal = −16 dB, Specification TV05001)	IMD_1	—	—	−51	dB
Output Power, 1 dB Compression Point (V_{CE} = 28 V, f = 225 MHz, I_Q = 2 x 100 mA, P_{ref} = 28 W)	$P_{o1\ dB}$	100	—	—	W

CLASS A TYPICAL VALUES

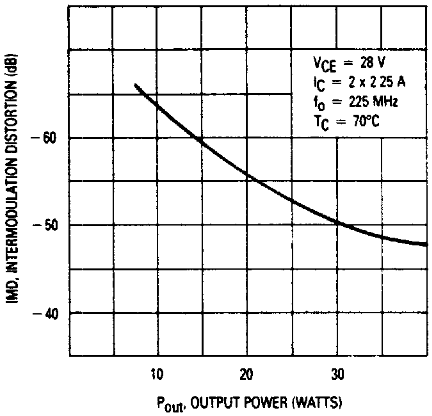


Figure 1. IMD versus Output Power

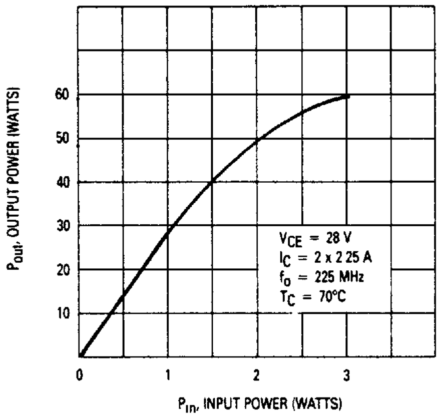
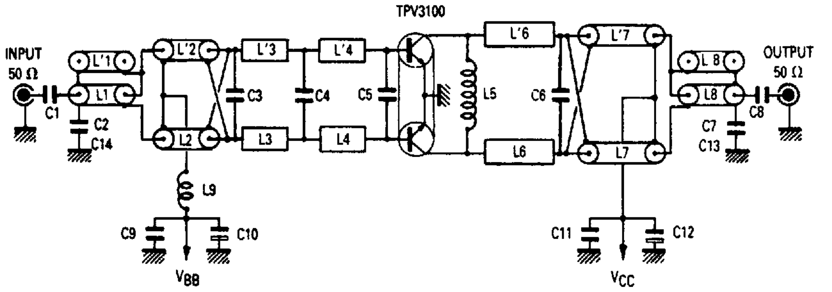


Figure 2. Output Power versus Input Power (CW)

Class A Large Signal Impedances

f_o (MHz)	Z_{in} (Ohms)	Z_{Load} (Ohms)
170	1 + j0.6	14.5 + j10
200	0.9 + j1	12.5 + j7
230	1.2 + j2	10.5 + j8.2

NOTES: V_{CE} = 28 V I_C = 2 x 2.25 A
Z_{in}: Values for optimum input return loss
Z_{Load}: Values for best IMD at 28 W ref



L1, L8 — 80 mm teflon coaxial cable 50 ohms
L2, L7 — 80 mm teflon coaxial cable 25 ohms
L3 — 25 mm line W = 1.5 mm on substrate
L4 — 5 mm line W = 1.5 mm on substrate
L5 — 5 turns dia 5 mm, 0 8 mm wire, L = 5 mm
L6 — 33 mm line W = 2 mm on substrate
L9 — 10 turns dia 3 mm, 0 5 mm wire

C1, C2 — 4700 pF chip capacitor
C7, C8 — 4700 pF chip capacitor
C3 — 68 pF chip capacitor
C4 — 100 pF chip capacitor
C5 — 220 pF + 22 pF chip capacitor
C6 — 33 pF chip capacitor
C9, C11 — 1000 pF + 10 nF + 0.1 μF chip capacitor
C10 — 1000 μF 5 V
C12 — 1000 μF 6 V
C13, C14 — 0.1 μF chip capacitor substrate teflon-glass 1/50 inch.

Figure 3. 225 MHz Test Fixture

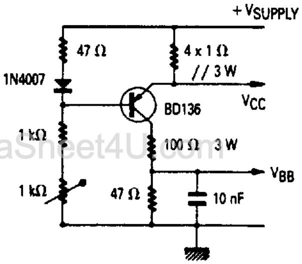


Figure 4. Biasing Circuit

CLASS AB TYPICAL VALUES

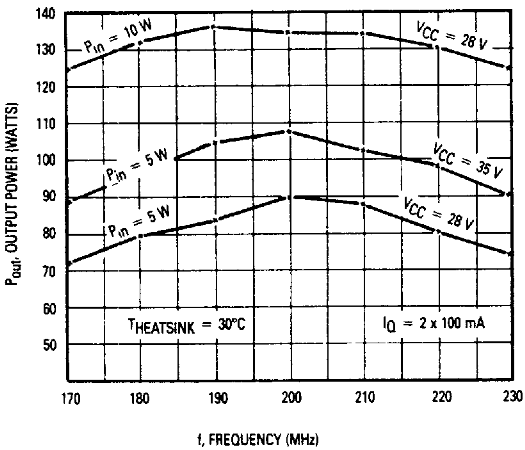


Figure 5. Output Power versus Frequency

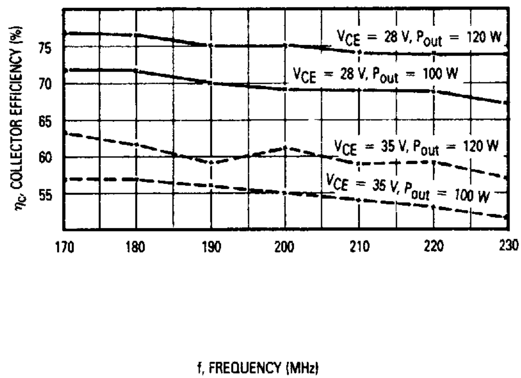


Figure 6. Collector Efficiency versus Frequency

Class AB Large Signal Impedances

Frequency (MHz)	Z_{in} (Ω)	Z_{Load} (Ω)
170	1 25 + j0.5	10 + j10
200	0.9 + j0.9	9.5 + j7
230	1 + j2	6.5 + j6.5

NOTES: V_{CE} = 28 Volts I_Q = 2 x 100 mA P_{out} = 100 W
— Z_{in} values to get optimum input return loss
— Z_{Load} values to get optimum output power and efficiency

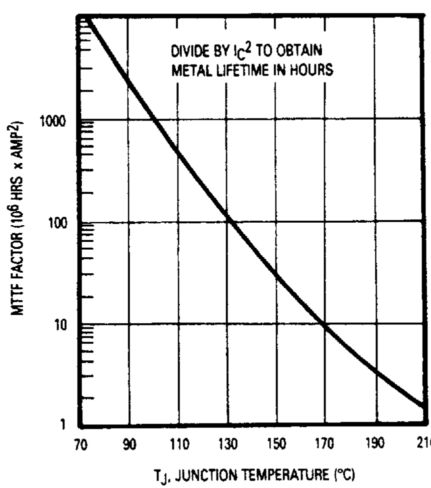
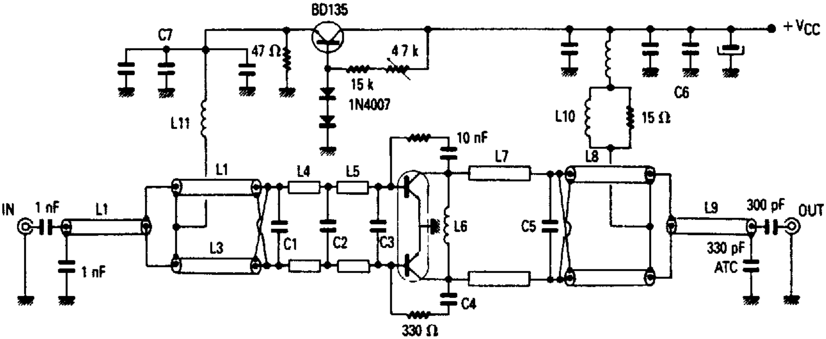


Figure 7. MTTF versus Junction Temperature



L1, L9 — 50 ohms coaxial 1 = 80 mm
L2, L3, L8 — 25 ohms coaxial cable or semi-rigid 1 = 80 mm
L4 — 40 ohms line 2.5% of λg 225 MHz or 1 = 23 mm sub 1/50 inch teflon glass
L5 — 40 ohms line 65% λg 225 MHz or 1 = 6 mm
L6 — 3 turns ID 4 mm wire 1 mm ø leads 5 mm long
L7 — 40 line 3.5% λg 225 MHz or 1 = 32 mm 1/50 teflon glass
L10 — 11 turns ID 4 mm wire 1 mm ø
L11 — 0 22 μH molded inductor

C1 — 68 pF ATC 100B
C2 — 100 pF ATC 100B
C3 — 220 pF ATC 100B
C5 — 27 pF + 33 pF ATC 100A
C6, C7 — 1 nF + 10 nF + 0.1 μF + electrolytic

L4 has to be adjusted for Gain
L6 and L7 have to be adjusted for the best lead

Figure 8. 170–230 MHz Broadband Amplifier, Class AB

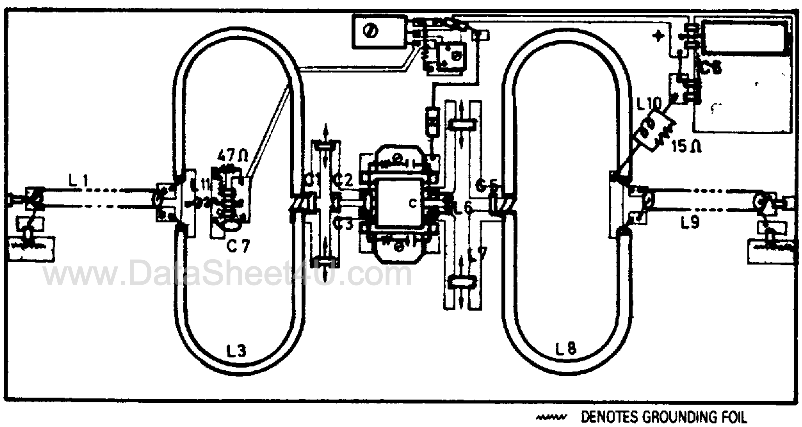


Figure 9. Components Layout