

MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

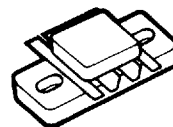
T-33-27

The RF Line**VHF Linear Power Transistor**

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... 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

TPV3100
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	A dc
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 ($T_C = 70^\circ\text{C}$)	$R_{\theta JC}$	0.8	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
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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, $R_{BE} = 15 \Omega$)	$V_{(BR)CER}$	60	—	—	Vdc

ON CHARACTERISTICS

DC Current Gain ($I_C = 0.5$ A, $V_{CE} = 28$ V)	h_{FE}	20	—	150	—
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DYNAMIC CHARACTERISTICS

Output Capacitance ($V_{CB} = 28$ V, $I_E = 0$, $f = 1$ MHz)	C_{ob}	—	60	—	pF
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(continued)

ELECTRICAL CHARACTERISTICS — continued

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

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CLASS A TYPICAL VALUES

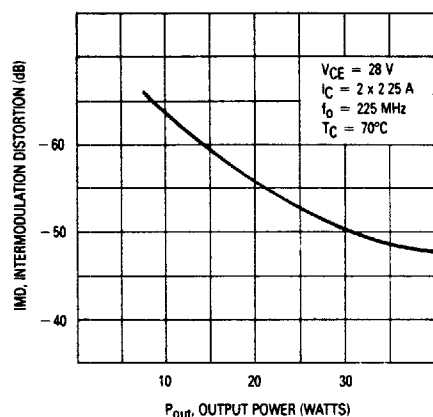


Figure 1. IMD versus Output Power

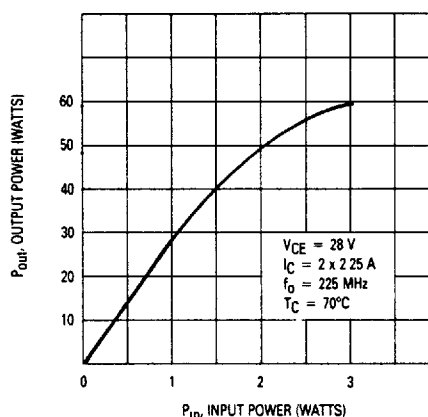


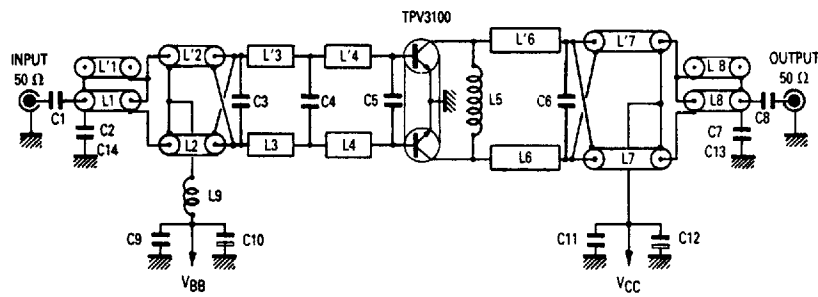
Figure 2. Output Power versus Input Power (CW)

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: $V_{CE} = 28 \text{ V}$, $I_C = 2 \times 2.25 \text{ A}$
 Z_{in} : Values for optimum input return loss
 Z_{Load} : Values for best IMD at 28 W ref

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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 μ F chip capacitor
 C10 — 1000 μ F 5 V
 C12 — 1000 μ F 6 V
 C13, C14 — 0.1 μ F chip capacitor substrate teflon-glass 1/50 inch.

Figure 3. 225 MHz Test Fixture

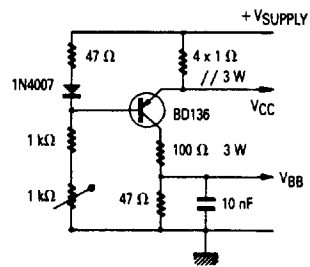


Figure 4. Biasing Circuit

CLASS AB TYPICAL VALUES

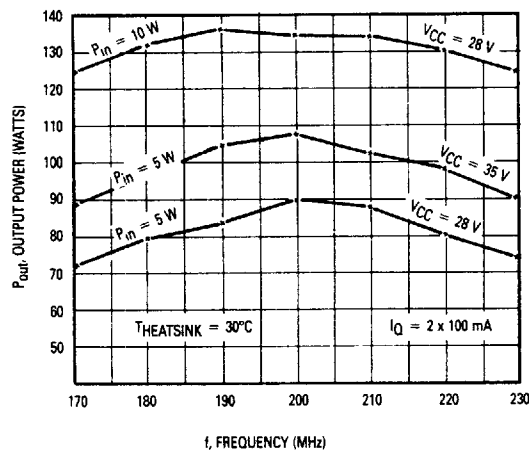


Figure 5. Output Power versus Frequency

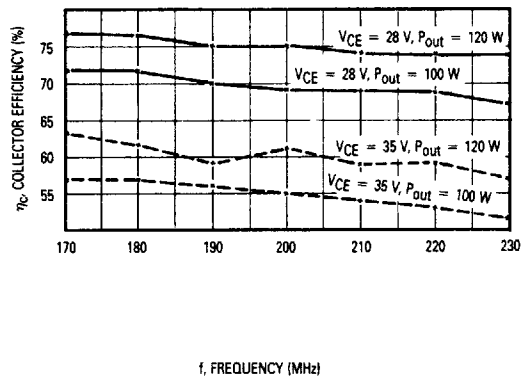


Figure 6. Collector Efficiency versus Frequency

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 $I_Q = 2 \times 100$ mA $P_{out} = 100$ W
 Z_{in} values to get optimum input return loss
 Z_{Load} values to get optimum output power and efficiency

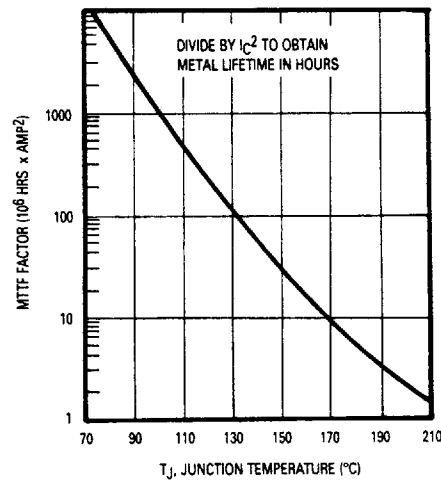
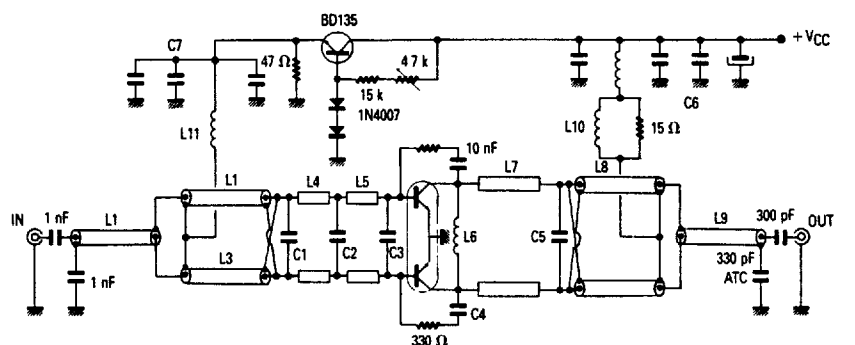


Figure 7. MTTF versus Junction Temperature

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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 λ_g 225 MHz or 1 = 23 mm sub 1/50 inch teflon glass
 L5 — 40 ohms line 65% λ_g 225 MHz or 1 = 6 mm
 L6 — 3 turns ID 4 mm wire 1 mm ϕ leads 5 mm long
 L7 — 40 line 3.5% λ_g 225 MHz or 1 = 32 mm 1/50 teflon glass
 L10 — 11 turns ID 4 mm wire 1 mm ϕ
 L11 — 0.22 μ H 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 μ F + 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

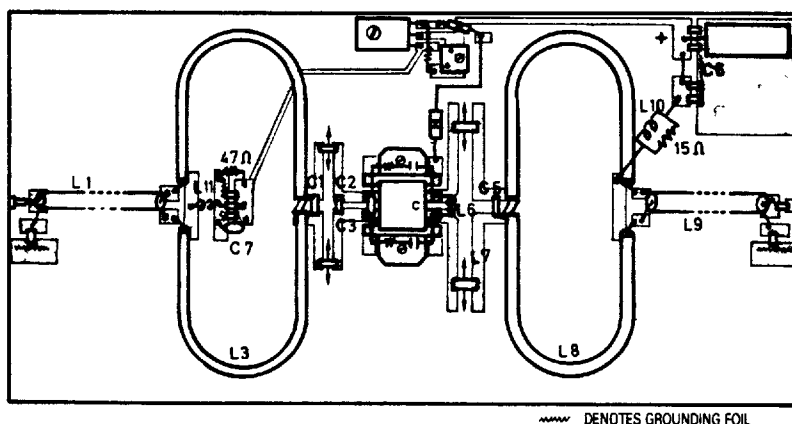


Figure 9. Components Layout