MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

TPV5055B

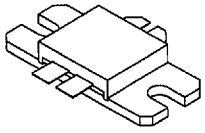
The RF Line
UHF Linear Power Transistor

. . . designed for output stages in Band IV & V TV transmitter amplifiers. Internal matching of both input and output along with use of a push-pull package configuration aids broadband amplifier designs.

Gold metallized dice with diffused emitter ballast resistors enhances reliability, ruggedness and linearity.

- Band IV & V (470–860 MHz)
- 50 W — P_{out}, Class AB
- 28 V — V_{CC}
- Push-Pull Package
- Gold Metallization for Reliability

50 V, 470–860 MHz
UHF LINEAR
POWER TRANSISTOR
NPN SILICON



CASE 398, STYLE 1
(BMA-4)

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MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	30	Vdc
Collector-Base Voltage	V_{CBO}	45	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
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	$R_{\theta JC}$	1.5	°C/W

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 60 mA, I_B = 0)	$V_{(BR)CEO}$	28	—	—	Vdc
Collector-Base Breakdown Voltage (I_C = 20 mA, I_E = 0)	$V_{(BR)CBO}$	45	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 6.0 mA, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CE} = 28 V, V_{BE} = 0)	I_{CES}	—	—	10	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 A, V_{CE} = 10 V)	h_{FE}	10	—	—	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 28 V, I_E = 0, f = 1.0 MHz)	C_{ob}	—	38	—	pF
FUNCTIONAL TESTS					
Common-Emitter Amplifier Power Gain (V_{CE} = 28 V, P_{out} = 50 W, f = 860 MHz, I_{CQ} = 2.0 x 200 mA)	G_{PE}	7.0	—	—	dB
Collector Efficiency (V_{CE} = 28 V, P_{out} = 50 W, f = 860 MHz, I_{CQ} = 2.0 x 200 mA)	η	45	50	—	%
Output Power, 1.0 dB Compression Point (V_{CE} = 28 V, f = 860 MHz, I_{CQ} = 2.0 x 200 mA, P_{ref} = 12.5 W)	$P_{o1\ dB}$	50	—	—	W

TYPICAL BROADBAND RESULTS
V_{CC} = 28 V I_{CQ} = 2 x 200 mA
f = 470–860 MHz

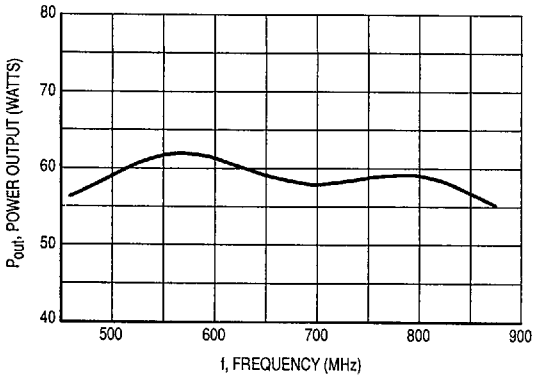


Figure 1. Power Output at 1.0 dB Compression versus Frequency

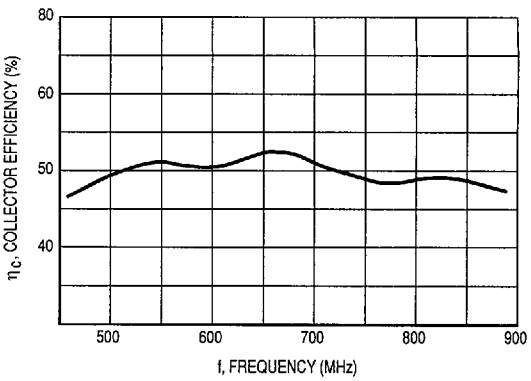


Figure 2. Collector Efficiency versus Frequency

TYPICAL CHARACTERISTICS

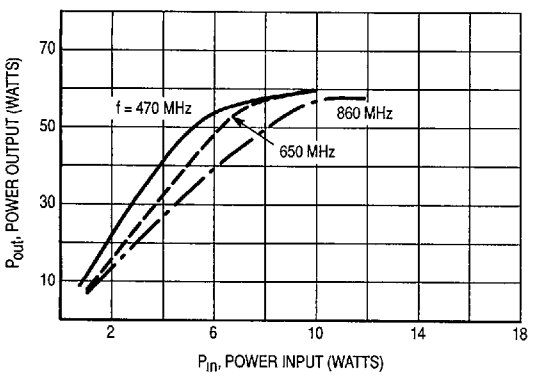
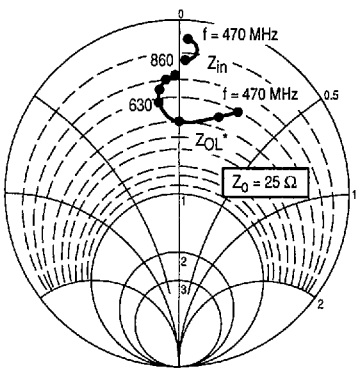


Figure 3. Power Output versus Power Input



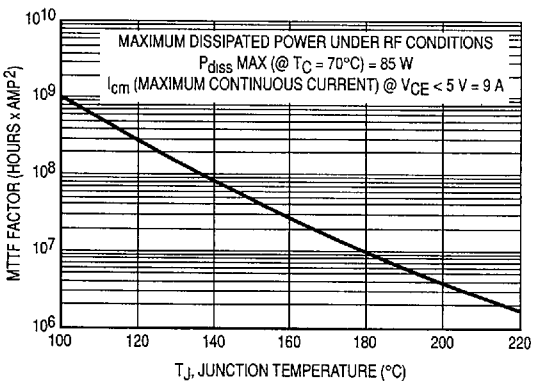


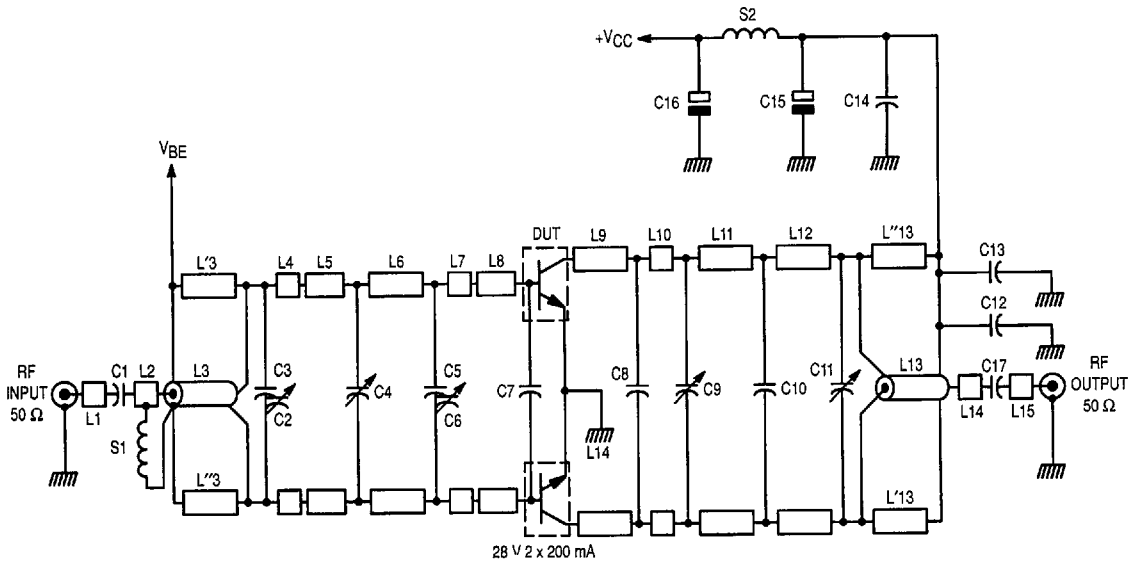
Figure 4. MTTF Factor versus Junction Temperature (MTTF — Hrs. x A^2 — Divide by I_C^2 to obtain MTTF in hours)

f (MHz)	Z_{in} (Ω)	Z_{OL}* (Ω)
470	1.5 + j0.65	7.8 + j5.3
520		9 + j4.5
565	1.9 + j1	10 + j2.5
590		10 + j0
630	2.5 + j1	7.8 – j2
680		6 – j1.7
765	2.9 + j0.8	5 – j1
860	3 + j0.5	4.5 – j0.5

P_{out} = @ 1.0 dB Compression
V_{CC} = 28 V, I_{CQ} = 2.0 x 200 mA

Z_{OL}* = Conjugate of the optimum load impedance into which the device output operates at a given output power, voltage and frequency.

Figure 5. Z_{IN} and Z_{OL}* versus Frequency (Each Side)



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C1 — Chip Capacitor 100 pF ATC 100A101JP50
C2 — Trimmer Capacitor 0.5/4.0 pF Ref. 37275 TEKELEC
C3 — Chip Capacitor 1.3 pF ATC 100A1R3BP50
C4 — Trimmer Capacitor 1.0–4.0 pF GKU 4RO
C5 — Chip Capacitor 5.6 pF ATC 100A5R6CP50
C6 — Trimmer Capacitor 0.5/4.0 pF Ref. 37275 TEKELEC
C7 — Chip Capacitor 18 pF ATC 100A180DP50
C8 — Chip Capacitor 6.8 pF ATC 100A6R8CP50
C9 — Trimmer Capacitor 0.5/4.0 pF Ref. 37275 TEKELEC
C10 — 6 mm Coaxial Line 50 Ω Dia.070
C11 — Trimmer Capacitor 0.5/4.0 pF Ref. 37275 TEKELEC
C12 — Chip Capacitor 100 pF ATC 100A101JP50
C13 — Chip Capacitor 100 pF ATC 100A101JP50
C14 — Chip Capacitor 1.0 nF
C15 — Chip Tantalum Capacitor 6.8 μF 35 V
C16 — Capacitor 100 μF 40 V
C17 — Chip Capacitor 100 pF ATC 100A101JP50

L1 — 50 Ω Printed Line
L2 — 50 Ω Printed Line
L3 — Coaxial Cable 50 Ω 85 mils L = 75 mm
L'3 — 70 Ω Printed Line; Length 75 mm
L4 — 25 Ω Printed Line; Length 2 mm
L5 — 35 Ω Printed Line; Length 22 mm
L6 — 35 Ω Printed Line; Length 12 mm
L7 — 35 Ω Printed Line; Length 2 mm
L8 — 25 Ω Printed Line; Length 8 mm
L9 — 25 Ω Printed Line; Length 16 mm
L10 — 25 Ω Printed Line; Length 7 mm
L11 — 35 Ω Printed Line; Length 15 mm
L12 — 35 Ω Printed Line; Length 15 mm
L13 — Coaxial Cable 50 Ω 85 mils L = 75 mm
L'13 — 70 Ω Printed Line; Length 75 mm
L"13 — 70 Ω Printed Line; Length 75 mm
L14 — 40 Ω Printed Line; Length 7 mm
S1 — 4 Turns Wire 0.8 mm ID 3 mm
S2 — 4 Turns Wire 0.8 mm ID 3 mm
RF Substrate, Teflon Glass 1/50 inch 35 μ
Note: L3 & L13 soldered on 70 W printed line L'3/L'13

Figure 6. 470–860 MHz Test Circuit, Class AB

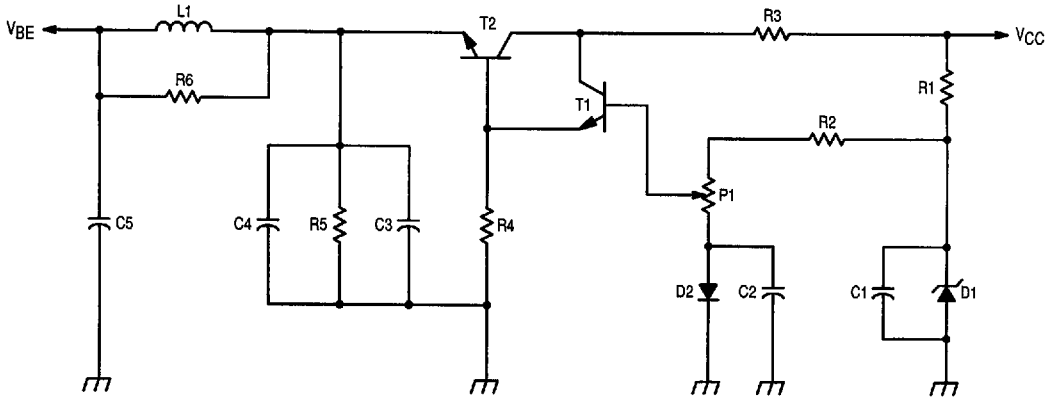
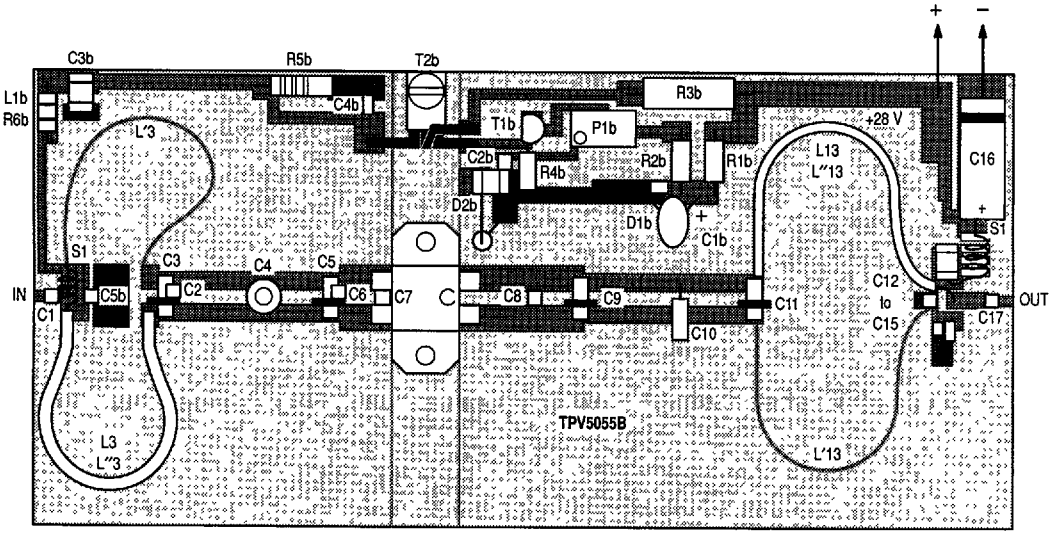


Figure 7. Bias Circuit, Class AB



C1b — 22 µF 35 V Tantalum Capacitor
C2b — 6.8 µF 35 V Tantalum Capacitor + 1.0 nF Chip Capacitor
C3b — 6.8 µF 35 V Tantalum Capacitor
C4b — 1.0 nF Chip Capacitor
C5b — 100 pF ATC 100A101JP50
D1b — Zener Diode 9.1 V
D2b — Diode 1N4007 (fixed in the heatsink next to the RF Transistor Flange)
L1b — 10 Turns Wire Ø 30/100 around R6
P1b — 500 Ω Trimmer
R1b — 2.2 kΩ 1/4 W
R2b — 1.5 kΩ 1/4 W
R3b — 15 Ω 3.0 W SFERNICE
R4b — 1.0 kΩ 1/4 W
R5b — 47 Ω 1/2 W
R6b — 150 Ω 1/4 W
T1b — Transistor BC337
T2b — Transistor BD135 fixed on the heatsink

Figure 8. PC Board Layout