MOTOROLA
SEMICONDUCTOR TECHNICAL DATA

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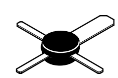
The RF Line
NPN Silicon
RF Low Power Transistor

MRF557

**1.5 W, 870 MHz
RF LOW POWER
TRANSISTOR
NPN SILICON**

Designed primarily for wideband large signal predriver stages in the 800 MHz frequency range.

- Specified @ 12.5 V, 870 MHz Characteristics
  Output Power = 1.5 W
  Minimum Gain = 8.0 dB
  Efficiency 60% (Typ)
- Cost Effective PowerMacro Package
- Electroless Tin Plated Leads for Improved Solderability
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.



CASE 317D–02, STYLE 2

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	16	Vdc
Collector–Base Voltage	V_{CBO}	36	Vdc
Emitter–Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	400	mAdc
Total Device Dissipation @ T_C = 75°C (1, 2) Derate above 75°C	P_D	3.0 40	Watts mW/°C
Storage Temperature Range	T_{stg}	–55 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	25	°C/W

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector–Emitter Breakdown Voltage (I_C = 5.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector–Emitter Breakdown Voltage (I_C = 5.0 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	—	—	Vdc
Emitter–Base Breakdown Voltage (I_E = 0.1 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0, T_C = 25°C)	I_{CES}	—	—	0.1	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 100 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	50	90	200	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	—	3.5	5.0	pF

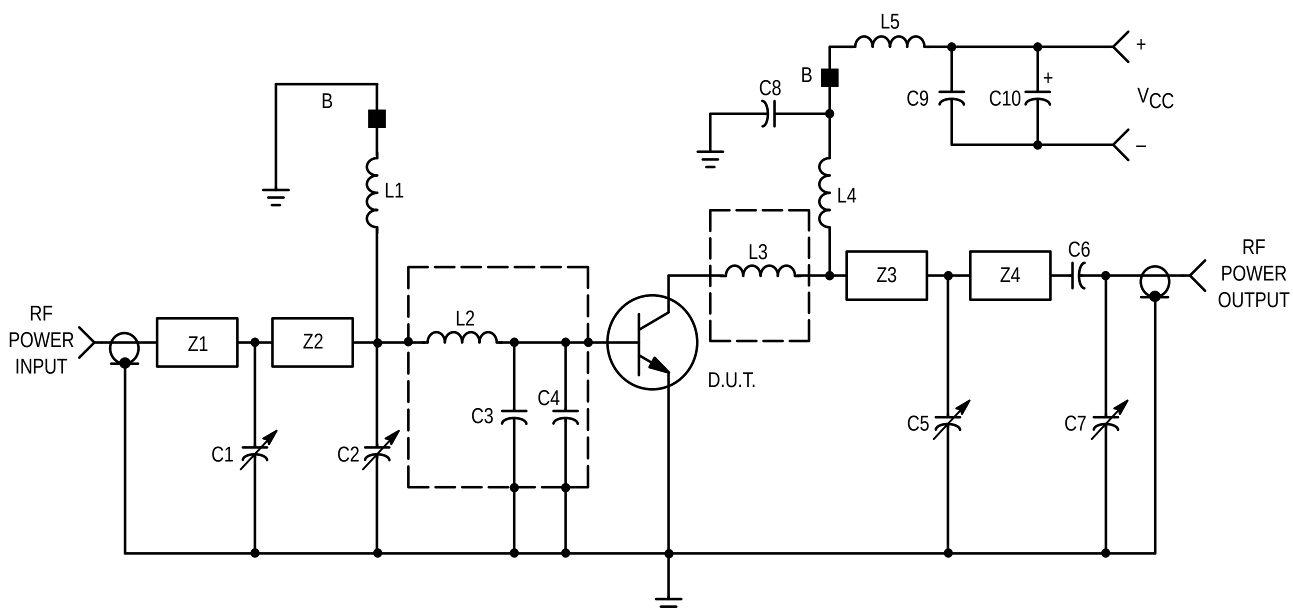
NOTES:
1. T_C, Case temperature measured on collector lead immediately adjacent to body of package.
2. The MRF557 PowerMacro must be properly mounted for reliable operation. AN938, “Mounting Techniques in PowerMacro Transistor,” discusses methods of mounting and heatsinking.

(continued)

MOTOROLA

ELECTRICAL CHARACTERISTICS — continued (T_A = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
FUNCTIONAL TESTS						
Common–Emitter Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 1.5 W, f = 870 MHz)	Figures 1, 2	G_{pe}	8.0	9.0	—	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 1.5 W, f = 870 MHz)	Figures 1, 2	η_c	55	60	—	%
Load Mismatch Stress (V_{CC} = 15.5 Vdc, P_{in} = 225 mW, f = 870 MHz, VSWR ≥ 10:1 all phase angles)	Figures 1, 2	ψ	No Degradation in Output Power			



C1, C2, C5, C7 — 0.8–8.0 pF Johanson Gigatrim*
C3, C4 — 15 pF Clamped Mica, Mini–Underwood
C6 — 27 pF Clamped Mica, Mini–Underwood
C8 — 91 pF Clamped Mica, Mini–Underwood
C9 — 68 pF Clamped Mica, Mini–Underwood
C10 — 1.0 µF, 25 V Tantalum
B — Bead, Ferroxcube 56–590–65/3B
PCB — 1/16″ Glass Teflon, ε_r = 2.56

L1, L4 — 5 Turns #21 AWG, 5/32″ ID
L2, L3 — 60 x 125 x 250 Mils Copper Tab on 27 Mil Thick Alumina Substrate
L5 — 7 Turns #21 AWG, 5/32″ ID
Z1 — 1.65 x 0.163″ Microstrip, Z_o = 50 Ω
Z2 — 0.85 x 0.163″ Microstrip, Z_o = 50 Ω
Z3 — 0.625 x 0.163″ Microstrip, Z_o = 50 Ω
Z4 — 1.35 x 0.163″ Microstrip, Z_o = 50 Ω

*Fixed tuned for broadband response.

Figure 1. 800–880 MHz Broadband Circuit

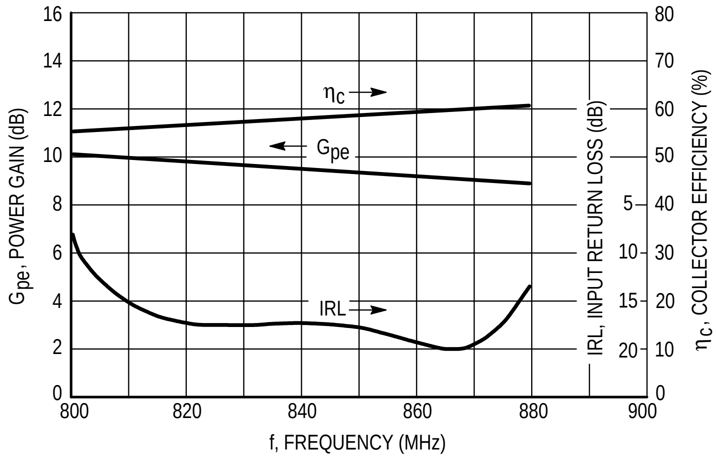


Figure 2. Performance in Broadband Circuit

f Frequency MHz	Z_{in} Ohms		Z_{OL}* Ohms	
	V_{CC} = 7.5 V	V_{CC} = 12.5 V	V_{CC} = 7.5 V	V_{CC} = 12.5 V
	P_{in} = 300 mW	P_{in} = 200 mW	P_{out} 806 MHz = 1.7 W P_{out} 870 MHz = 1.4 W P_{out} 960 MHz = 1.0 W	P_{out} 806 MHz = 2.1 W P_{out} 870 MHz = 1.8 W P_{out} 960 MHz = 1.1 W
806	2.4 + j3.9	2.4 + j3.1	14.7 – j4.4	13.6 – j12.8
870	2.5 + j4.6	2.7 + j3.7	17.2 – j8.6	16 – j13.2
960	6.1 + j7.4	6.8 + j8.3	40 – j8.3	38 – j10.5

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

Table 1. Z_{in} and Z_{OL} versus Collector Voltage, Input Power and Output Power

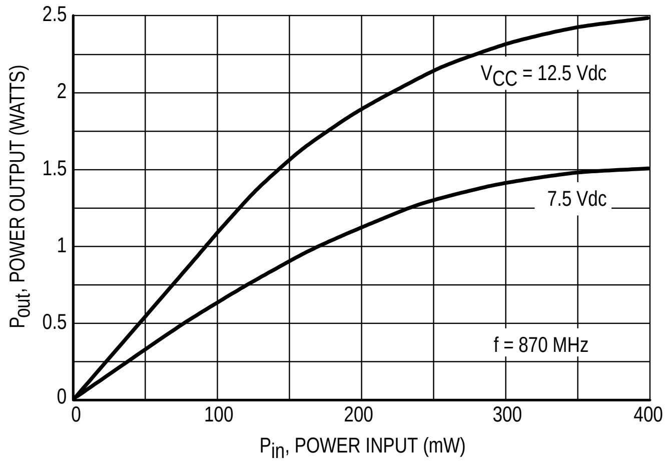


Figure 3. Power Output versus Power Input

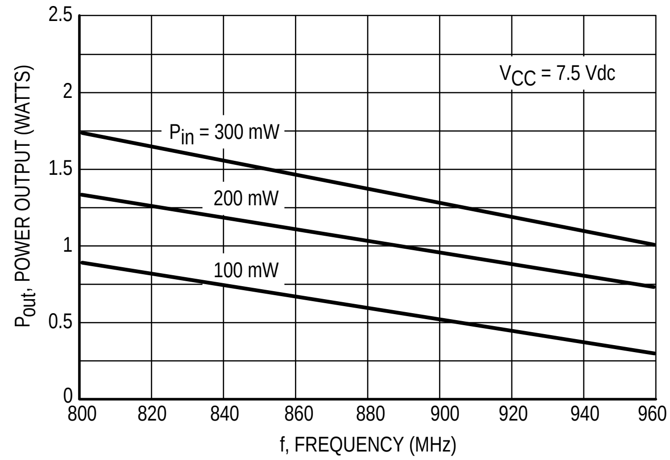


Figure 4. Power Output versus Frequency

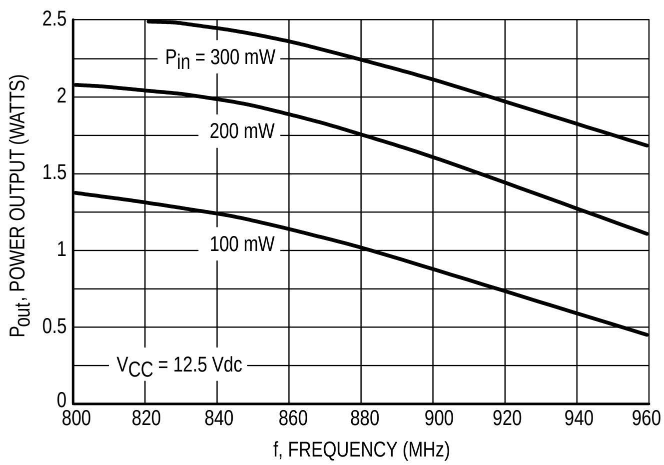


Figure 5. Power Output versus Frequency

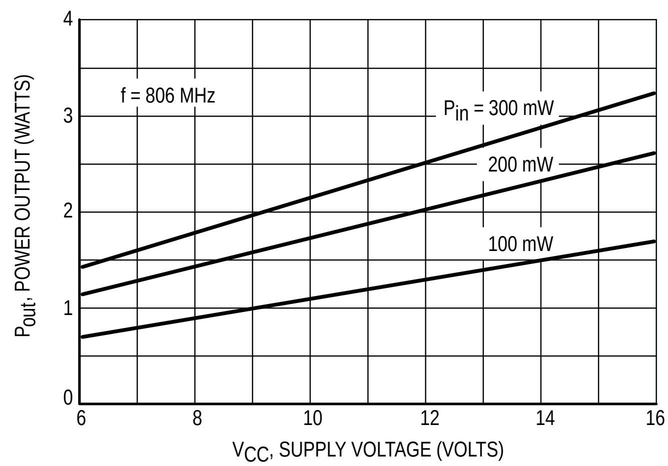


Figure 6. Power Output versus Supply Voltage

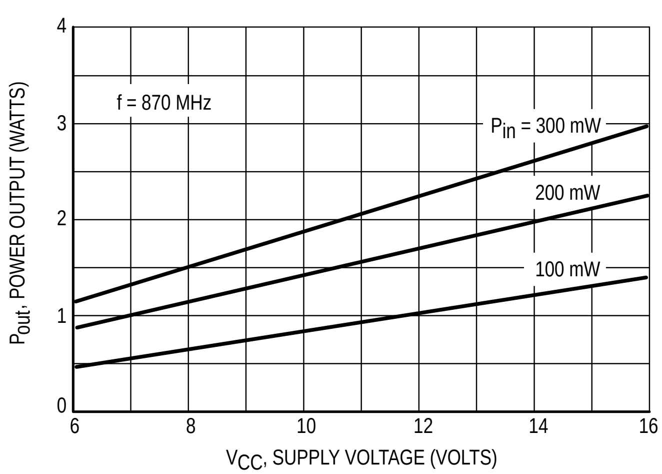


Figure 7. Power Output versus Supply Voltage

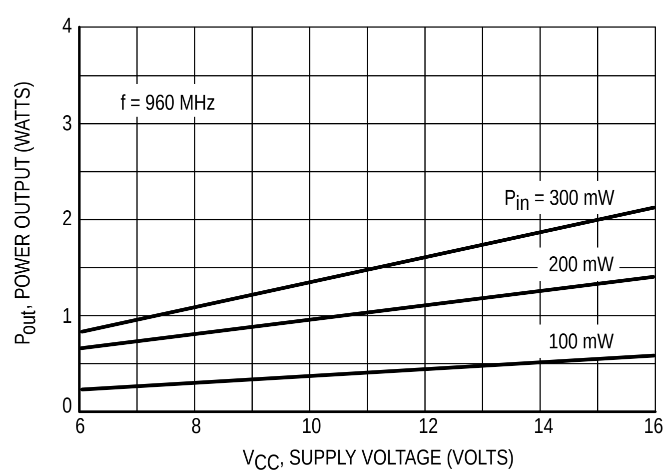
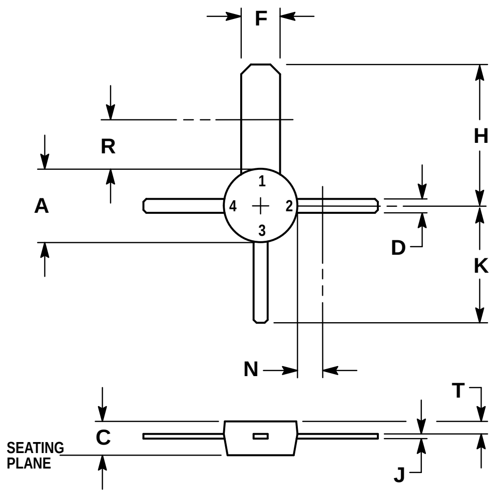


Figure 8. Power Output versus Supply Voltage

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. LEAD DIMENSIONS UNCONTROLLED WITHIN DIMENSION N AND R.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
C	0.075	0.100	1.91	2.54
D	0.033	0.039	0.84	0.99
F	0.097	0.104	2.46	2.64
H	0.348	0.383	8.84	9.72
J	0.008	0.012	0.24	0.30
K	0.285	0.320	7.24	8.12
N	—	0.065	—	1.65
R	—	0.128	—	3.25
T	0.025	0.040	0.64	1.01

STYLE 2:
PIN 1. COLLECTOR
2. EMITTER
3. BASE
4. EMITTER

CASE 317D–02
ISSUE C

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