MRF841
MRF841F

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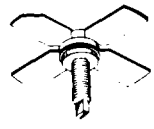
The RF Line

NPN Silicon RF Power Transistors

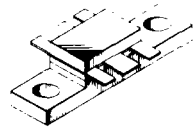
5 W 870 MHz RF POWER TRANSISTORS NPN SILICON

. . . designed primarily for wideband large-signal output and driver stages in the 806-960 MHz frequency range.

- Specified 12.5 Volt, 870 MHz Characteristics — P_{out} = 5 W
  Common Base Gain = 10 dB (Typ)
  Efficiency = 65% (Typ)
- Internally Matched Input for Broadband Operation
- Gold Metallized and Emitter Ballasted for Improved Reliability
- 100% Tested for Load Mismatch at Rated Input Power and 15.5 V



MRF841
CASE 244-04, STYLE 4



MRF841F
CASE 319-06, STYLE 1

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	Vdc
Collector Current — Continuous	I_C	2	Adc
Total Device Dissipation @ T_C = 25°C Derate Above 25°C	P_D	25 143	Watts mW/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C
Operating Junction Temperature	T_J	200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	7	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 25 mAdc, I_B = 0)	$V_{(BR)CEO}$	16	—	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 25 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	36	—	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 5 mAdc, I_C = 0)	$V_{(BR)EBO}$	4	—	—	Vdc
Collector Cutoff Current (V_{CE} = 15 Vdc, V_{BE} = 0)	I_{CES}	—	—	1	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 200 mAdc, V_{CE} = 5 Vdc)	h_{FE}	10	—	150	—
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 15 Vdc, I_E = 0, f = 1 MHz)	C_{ob}	6	9.5	15	pF
FUNCTIONAL TESTS (f = 870 MHz)					
Common-Base Amplifier Power Gain (V_{CC} = 12.5 Vdc, P_{out} = 5 W)	G_{PB}	8.5	10	—	dB
Collector Efficiency (V_{CC} = 12.5 Vdc, P_{out} = 5 W)	η_c	—	65	—	%
Load Mismatch (V_{CC} = 15.5 Vdc, P_{in} = 710 mW, VSWR = 20:1, all Phase Angles)	ψ	No Degradation in Output Power			

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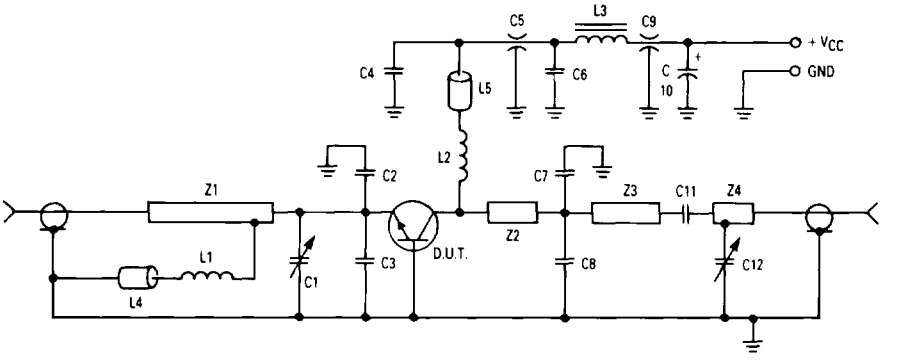

C1, C12 — 0.8–8 pF Johanson 7290 Variable
C2 — 5 pF Mini-Underwood Mica
C3 — 8.2 pF Mini-Underwood Mica
C4 — 91 pF Mini-Underwood Mica
C5, C9 — 680 pF Feedthru
C6 — 0.1 μF Ceramic
C7, C8 — 10 pF Mini-Underwood Mica
C10 — 1 μF Electrolytic
C11 — 43 pF Mini-Underwood

L1, L2 — 4 Turns, #22 AWG Wire, 0.2-inch ID
L3 — VK200 Ferroxcube
L4, L5 — Ferrite Bead, Ferroxcube #56-590-65-3B
Z1 — 2.36" x 0.145" Microstrip 33 Ohm Line
Z2 — 0.5" x 0.175" Microstrip 28 Ohm Line
Z3 — 1.40" x 0.175" Microstrip 28 Ohm Line
Z4 — 0.40" x 0.175" Microstrip 28 Ohm Line
Board = 0.032" Glass Teflon 2 oz. cu clad ϵ_r = 2.55

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Figure 1. 800–960 MHz Broadband Power Gain Test Circuit

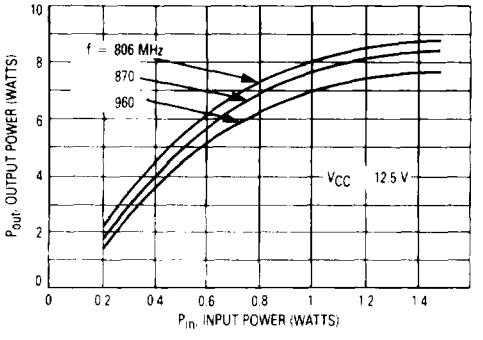

Figure 2. Output Power versus Input Power

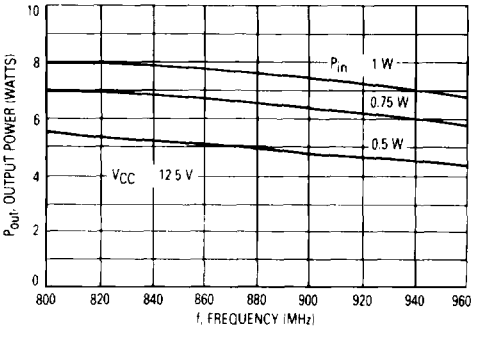

Figure 3. Output Power versus Frequency

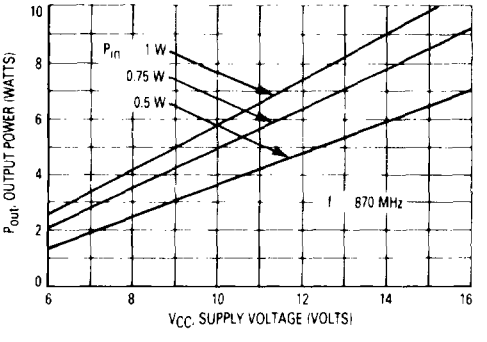

Figure 4. Power Out versus Supply Voltage

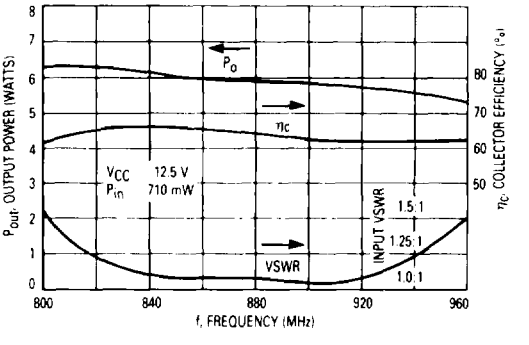

Figure 5. Typical Performance in Broadband Circuit

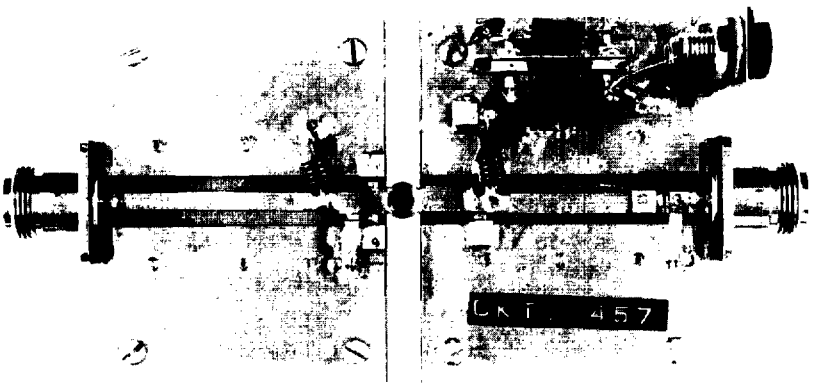

Figure 6. MRF841 Broadband Power Gain Test Circuit

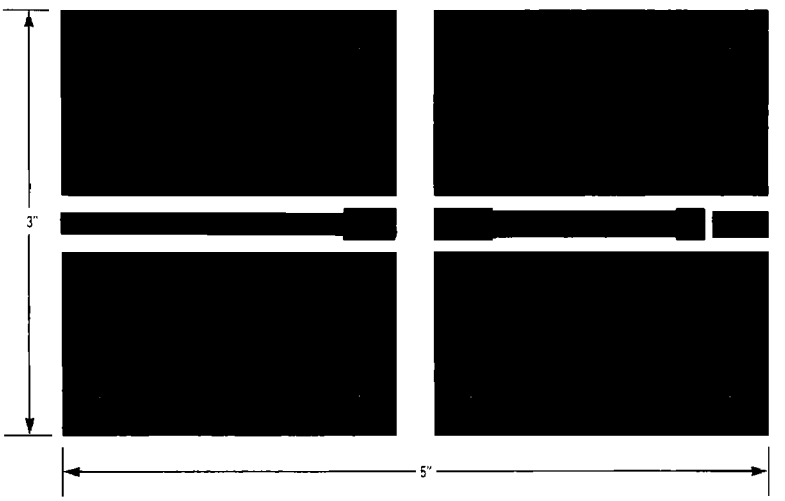

Figure 7. MRF841 Test Circuit Photomaster
NOTE: The Printed Circuit Board shown is 75% of the original.

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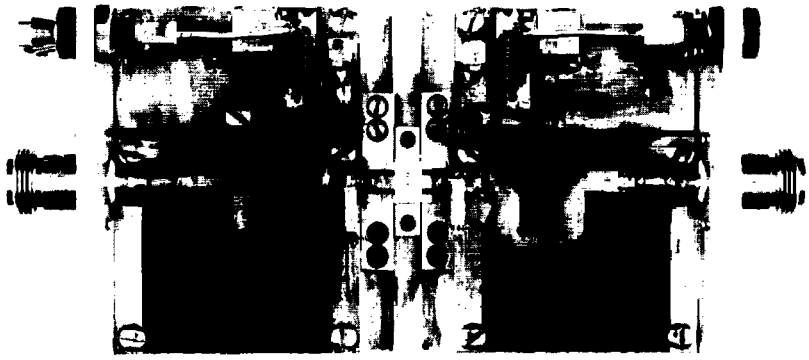


Figure 8. MRF841F Broadband Power Gain Test Circuit

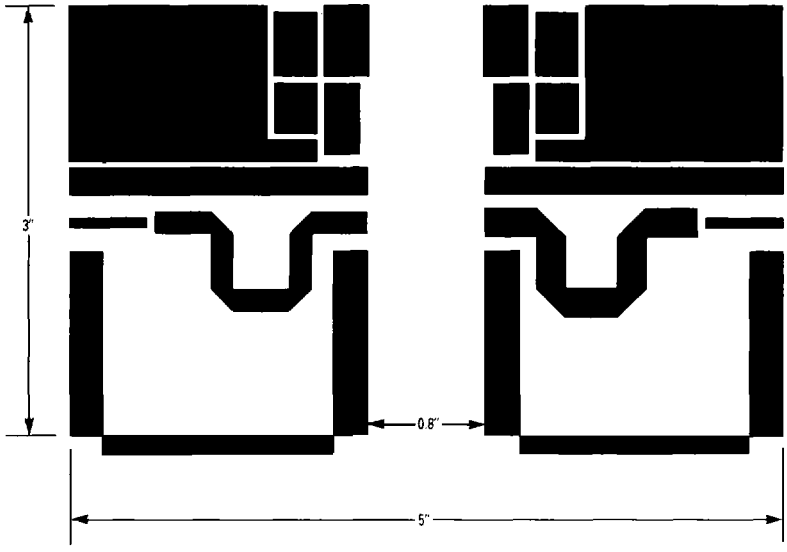
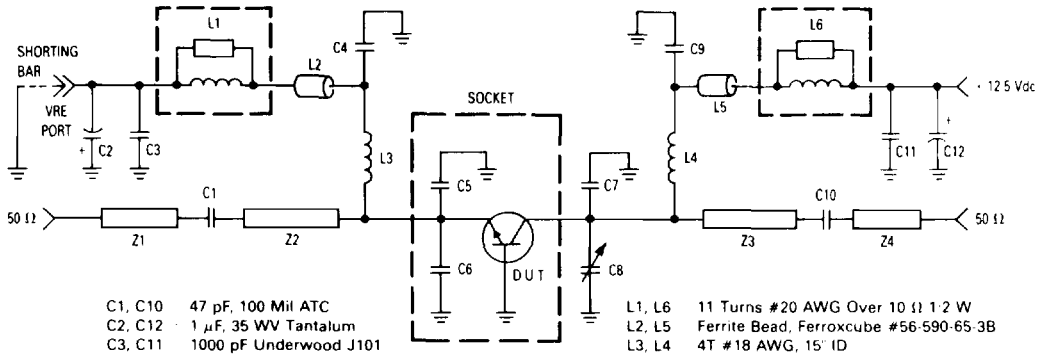


Figure 9. MRF841F Test Circuit Photomaster

NOTE: The Printed Circuit Board shown is 75% of the original.



C1, C10 47 pF, 100 Mil ATC
C2, C12 1 μF, 35 WV Tantalum
C3, C11 1000 pF Underwood J101
C4, C9 91 pF Mini Underwood
C5 12 pF Mini-Underwood
C6 10 pF Mini-Underwood
C7 10 pF Mini-Underwood
C8 Johansen Giga Trim 0.8-8 pF 7290 Variable

L1, L6 11 Turns #20 AWG Over 10 Ω 1-2 W
L2, L5 Ferrite Bead, Ferroxcube #56-590-65-3B
L3, L4 4T #18 AWG, 15' ID
Z1, Z4 50 Ω Printed Line
Z2 30 Ω Printed Line, λ 4 @ 838 MHz
Z3 24 Ω Printed Line, λ 4 @ 838 MHz
Board = 0.032" Glass Teflon 2 oz. cu clad ϵ_r = 2.55

NOTES: C7 and C8 mounted 250 mils down Z3 from collector edge of board

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Figure 10. 800–960 MHz Broadband Power Gain Test Circuit

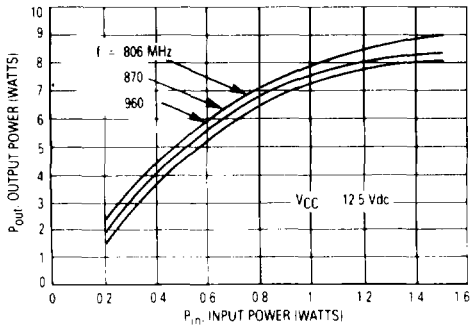

Figure 11. Output Power versus Input Power

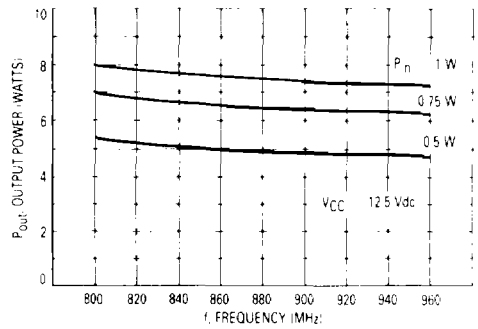

Figure 12. Output Power versus Frequency

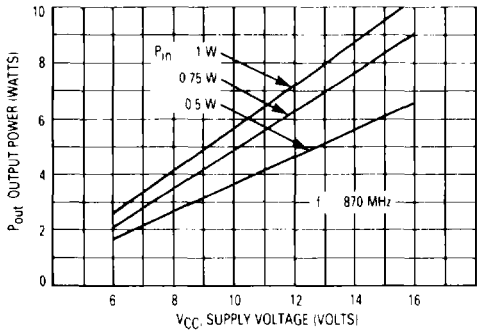

Figure 13. Output Power versus Supply Voltage

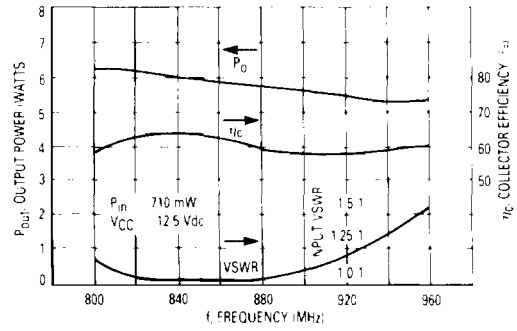

Figure 14. Typical Performance in Broadband Circuit

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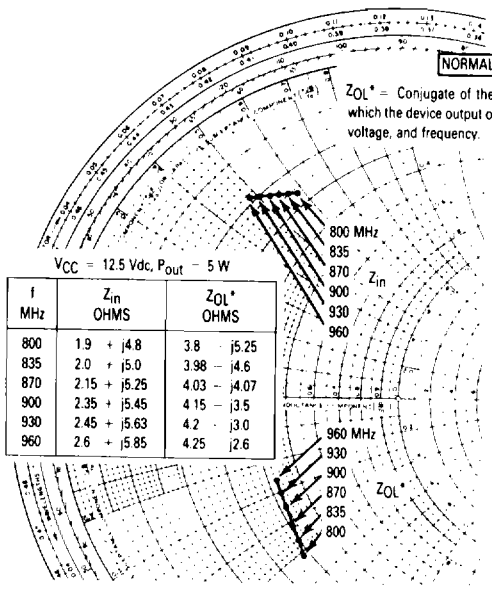

V_{CC} = 12.5 Vdc, P_{out} = 5 W

f MHz	Z_{in} OHMS	Z_{OL}^* OHMS
800	1.9 + j4.8	3.8 − j5.25
835	2.0 + j5.0	3.98 − j4.6
870	2.15 + j5.25	4.03 − j4.07
900	2.35 + j5.45	4.15 − j3.5
930	2.45 + j5.63	4.2 − j3.0
960	2.6 + j5.85	4.25 − j2.6

Figure 15. Series Equivalent Input/Output Impedances

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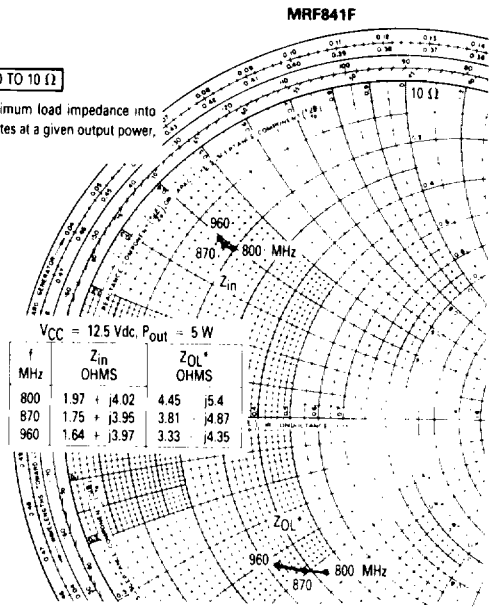

V_{CC} = 12.5 Vdc, P_{out} = 5 W

f MHz	Z_{in} OHMS	Z_{OL}^* OHMS
800	1.97 + j4.02	4.45 − j5.4
870	1.75 + j3.95	3.81 − j4.87
960	1.64 + j3.97	3.33 − j4.35

Figure 16. Series Equivalent Input/Output Impedances