MOTOROLA SEMICONDUCTOR TECHNICAL DATA

MRF838
MRF838A

The RF Line

1 W – 870 MHz

RF POWER TRANSISTORS

NPN SILICON

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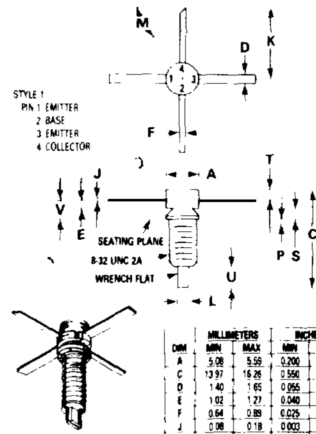
NPN SILICON RF POWER TRANSISTORS

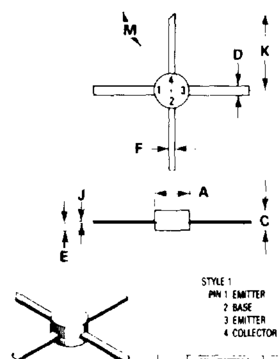
. . . designed for 12.5 volt UHF large-signal, common-emitter amplifier applications in industrial and commercial FM equipment operating in the range of 806–960 MHz.

- Specified 12.5 Volt, 870 MHz Characteristics:
  - Output Power = 1.0 Watt
  - Minimum Gain = 6.5 dB
  - Efficiency = 60% Typ
- Series Equivalent Large-Signal Characterization



MRF838A
CASE 305-01

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	5.08	5.59	0.200	0.220
C	13.97	16.26	0.550	0.640
D	1.40	1.65	0.055	0.065
E	1.02	1.27	0.040	0.050
F	0.64	0.89	0.025	0.035
J	0.08	0.18	0.003	0.007
K	11.05	—	0.435	—
L	1.40	1.65	0.055	0.065
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
S	1.40	1.65	0.055	0.065
T	1.40	1.78	0.055	0.070
U	2.79	3.81	0.110	0.150
V	2.41	2.92	0.095	0.115



MRF838
CASE 305A-01

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	5.08	5.59	0.200	0.220
C	2.41	3.30	0.095	0.130
D	1.40	1.65	0.056	0.065
E	1.02	1.27	0.040	0.050
F	0.64	0.89	0.025	0.035
J	0.08	0.18	0.003	0.007
K	11.05	—	0.435	—
M	45° NOM		45° NOM	

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	0.3	Adc
Total Device Dissipation @ $T_C = 25°C$ (1) Derate Above 25°C	P_D	2.5 0.014	Watts W/°C
Storage Temperature Range	T_{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case (2)	$R_{\theta JC}$	70	°C/W

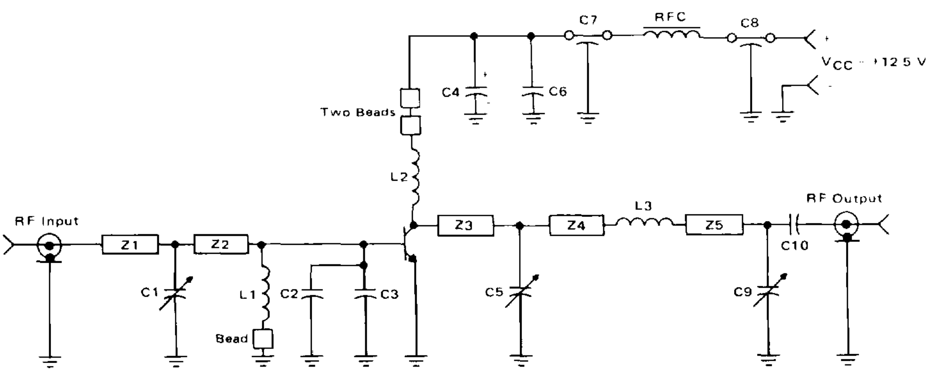
(1) These devices are designed for RF operation. The total device dissipation rating applies only when the devices are operated as RF amplifiers.

(2) Thermal Resistance is determined under specified RF operating conditions by infrared measurement techniques.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	$V_{(BR)CEO}$	16	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 10 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}	–	–	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 100 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	10	80	150	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 12.5 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	5.0	7.0	pF
FUNCTIONAL TEST					
Common-Emitter Amplifier Power Gain (P_{out} = 1.0 W, V_{CC} = 12.5 Vdc, f = 870 MHz)	G_{PE}	6.5	7.5	–	dB
Collector Efficiency (P_{out} = 1.0 W, V_{CC} = 12.5 Vdc, f = 870 MHz)	η	50	60	–	%

FIGURE 1 – 870 MHz TEST CIRCUIT



C1, C5, C9 – 0.8-8.0 pF Johanson Gigatrim #7291
C2, C3 – 10 pF ATC Chip Capacitor (Case A)
C4 – 1.0 μF 30 V Tantalum Capacitor
C6 – 0.1 μF Erie Redcap 100 V
C7, C8 – 680 pF Feedthru
C10 – 100 pF Chip Capacitor (100 mil)
L1, L2 – 1 Turn #18 AWG 1/8" Diameter
L3 – #14 AWG 1/2 Turn 0.250" Diameter

RFC – Ferroxcube VK200 20/4B
Bead – Ferroxcube #56 590 65/3B
Z1, Z2 – 1.2" X 0.155" Microstrip
Z3 – 1.05" X 0.155" Microstrip
Z4 – 0.5" X 0.155" Microstrip
Z5 – 1.5" X 0.155" Microstrip
Board Material – 0.0625" Thick Glass-Teflon, ϵ_r = 2.5

FIGURE 2 – OUTPUT POWER versus INPUT POWER

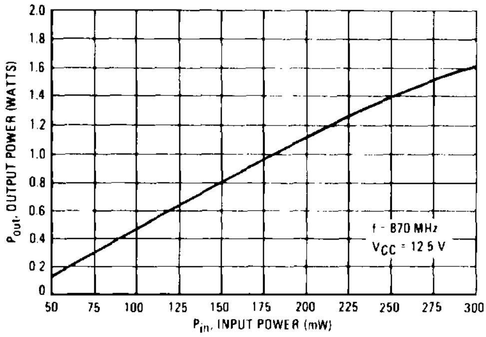


FIGURE 3 – OUTPUT POWER versus FREQUENCY

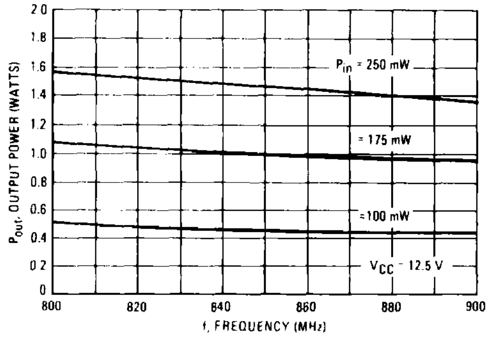


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE

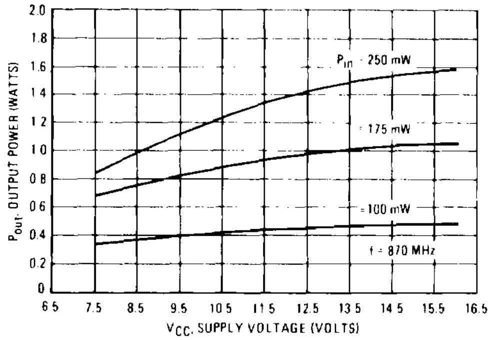
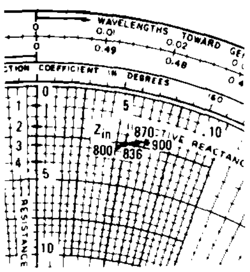


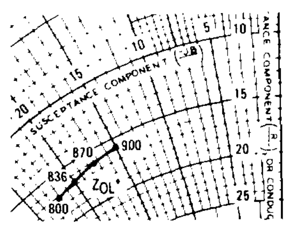
FIGURE 5 – SERIES EQUIVALENT INPUT IMPEDANCE



P_{out} = 1.0 W, V_{CC} = 12.5 Vdc

f MHz	Z_{in} Ohms
800	2.8 + j4.6
836	2.6 + j5.0
870	2.4 + j5.6
900	2.3 + j6.2

FIGURE 6 – SERIES EQUIVALENT OUTPUT IMPEDANCE

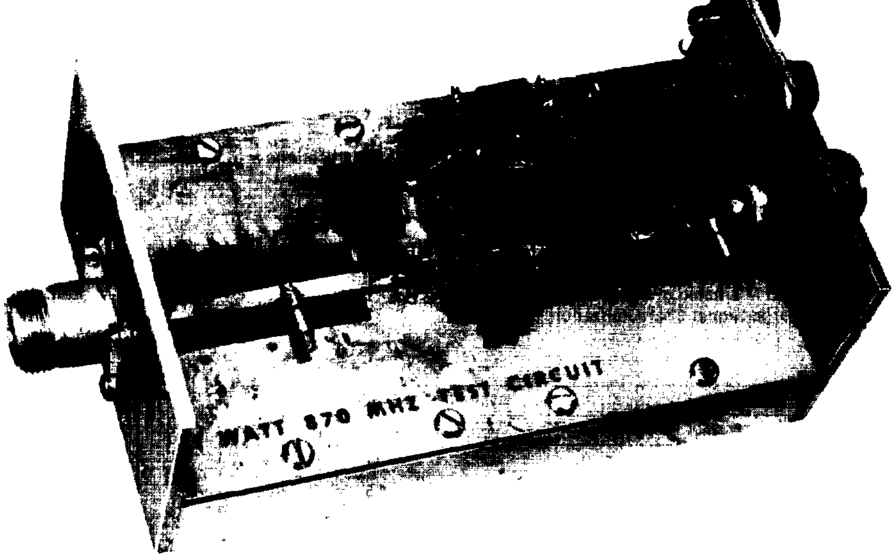


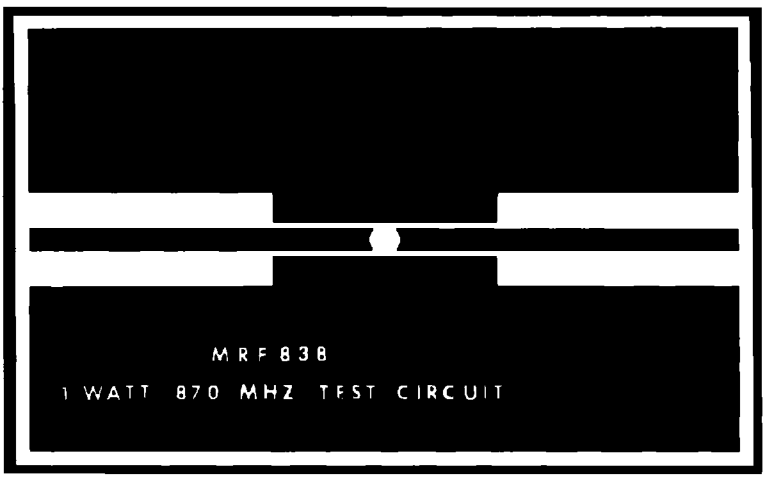
P_{out} = 1.0 W, V_{CC} = 12.5 Vdc

f MHz	Z_{OL}* Ohms
800	17.1 - j22.2
836	16.6 - j20.0
870	16.1 - j17.4
900	15.9 - j15.0

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

FIGURE 7 – 870 MHz TEST CIRCUIT





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