MOTOROLA
SEMICONDUCTOR
TECHNICAL DATA

MRF5176

The RF Line

15 W – 400 MHz

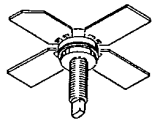
RF POWER
TRANSISTOR

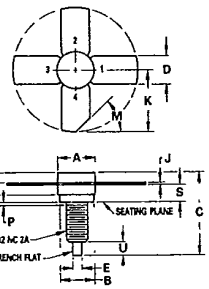
NPN SILICON

NPN SILICON RF POWER TRANSISTOR

. . . designed primarily for wideband large-signal driver and predriver amplifier stages in the 200-600 MHz frequency range.

- Specified 28 Volt, 400 MHz Characteristics –
  Output Power = 15 Watts
  Minimum Gain = 10 dB
  Efficiency = 50%
- Characterized from 200 to 600 MHz
- Includes Series Equivalent Impedances





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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	7.06	7.26	0.278	0.286
B	6.20	6.50	0.244	0.256
C	14.99	16.51	0.590	0.650
D	5.46	5.96	0.215	0.235
E	1.40	1.65	0.055	0.065
F	1.52	—	0.060	—
J	0.08	0.17	0.003	0.007
K	11.05	—	0.435	—
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
S	3.00	3.25	0.118	0.128
T	1.40	1.77	0.055	0.070
U	2.92	3.68	0.115	0.145

CASE 244-04

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	33	Vdc
Collector-Base Voltage	V_{CBO}	60	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	Vdc
Collector Current — Continuous	I_C	2.0	Adc
Total Device Dissipation @ T_A = 25°C (1) Derate above 25°C	P_D	30 170	Watts mW/°C
Storage Temperature Range	T_{stg}	-65 to +200	°C

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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	6.0	°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 = 50 mAdc, I_B = 0)	$V_{(BR)CEO}$	33	–	–	Vdc
Collector-Emitter Breakdown Voltage (I_C = 50 mAdc, V_{BE} = 0)	$V_{(BR)CES}$	60	–	–	Vdc
Emitter-Base Breakdown Voltage (I_E = 2.0 mAdc, I_C = 0)	$V_{(BR)EBO}$	4.0	–	–	Vdc
Collector Cutoff Current (V_{CB} = 30 Vdc, I_E = 0)	I_{CBO}	–	–	1.0	mAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 500 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	10	–	100	–
DYNAMIC CHARACTERISTICS					
Output Capacitance (V_{CB} = 30 Vdc, I_E = 0, f = 1.0 MHz)	C_{ob}	–	–	25	pF
FUNCTIONAL TESTS (Figure 1)					
Common-Emitter Amplifier Power Gain (V_{CC} = 28 Vdc, P_{out} = 15 W, f = 400 MHz)	G_{PE}	10	–	–	dB
Collector Efficiency (V_{CC} = 28 Vdc, P_{out} = 15 W, f = 400 MHz)	η	50	–	–	%

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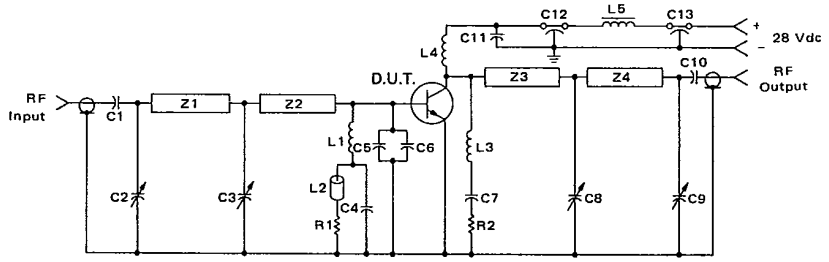
FIGURE 1 – 400 MHz TEST CIRCUIT SCHEMATIC



C1,C10 0.018 µF VITRAMON Chip
C2,C3,C8 1.0-20 pF JOHANSON Type 3906
C4 100 pF UNDERWOOD (UNELCO)
C5,C6 56 pF ATC Chip
C7 0.1 µF ERIE Disc Ceramic
C9 1.0-20 pF JOHANSON Type 3906
C11 1.0 µF, 35 V TANTALUM
C12,C13 680 pF ALLEN BRADLEY Feedthru

L1 3.9 µH Molded Choke
L2 Ferrite Bead, FERROXCUBE, 56 590 65-3B
L3 3 Turns, #20 AWG, 0.1" ID
L4 6 Turns, #20 AWG, 1/4" ID
L5 Ferrite Choke, FERROXCUBE, VK200-20-4B

R1 207 Ω, 1/8 W, 10%
R2 5.1 Ω, 1/8 W, 10%

Z1 Microstrip Line, 0.1" W x 1.2" L
Z2 Microstrip Line, 0.25" W x 0.7" L
Z3,Z4 Microstrip Line, 0.075" W x 1.25" L

Board – Glass Teflon, ϵ_R = 2.56, t = 0.062"
Input/Output Connectors – Type N

FIGURE 2 – OUTPUT POWER versus FREQUENCY

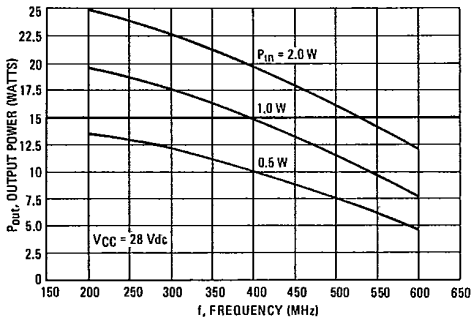


FIGURE 3 – OUTPUT POWER versus INPUT POWER

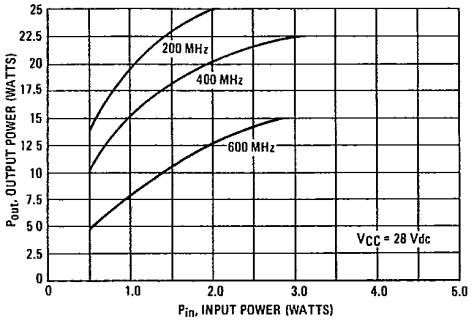


FIGURE 4 – OUTPUT POWER versus SUPPLY VOLTAGE

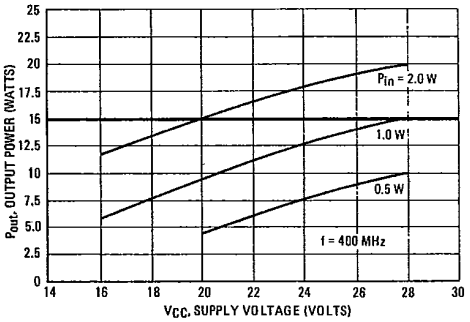
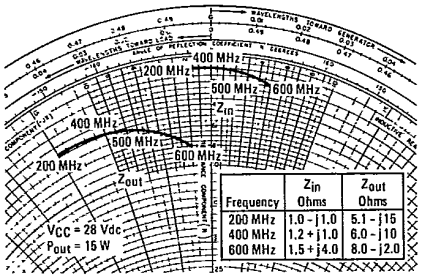


FIGURE 5 – SERIES EQUIVALENT IMPEDANCE



Frequency	Zin Ohms	Zout Ohms
200 MHz	1.0 - j1.0	5.1 - j15
400 MHz	1.2 + j1.0	6.0 - j10
600 MHz	1.5 + j4.0	8.0 - j2.0

FIGURE 6 – 400 MHz TEST CIRCUIT