

T-33-09

**MOTOROLA SEMICONDUCTOR TECHNICAL DATA**

**MRF5176**

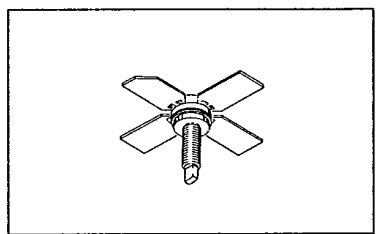
**The RF Line**

**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

15 W – 400 MHz  
RF POWER TRANSISTOR  
NPN SILICON



**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	33	Vdc
Collector-Base Voltage	V <sub>CBO</sub>	60	Vdc
Emitter-Base Voltage	V <sub>EBO</sub>	4.0	Vdc
Collector Current – Continuous	I <sub>C</sub>	2.0	A <sub>dc</sub>
Total Device Dissipation @ T <sub>A</sub> = 25°C (1) Derate above 25°C	P <sub>D</sub>	30 170	Watts mW/°C
Storage Temperature Range	T <sub>stg</sub>	-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 <sub>θJC</sub>	6.0	°C/W

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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	7.06	7.26	0.278	0.286
B	0.20	0.50	0.008	0.020
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	11.06	—	0.435	—
M	45° NOM		45° NOM	
P	—	1.27	—	0.050
S	3.00	3.25	0.118	0.128
T	1.40	1.72	0.055	0.070
U	2.92	3.68	0.115	0.145

CASE 244-04

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**6367254 MOTOROLA SC (XSTRS/R F)  
MRF5176**

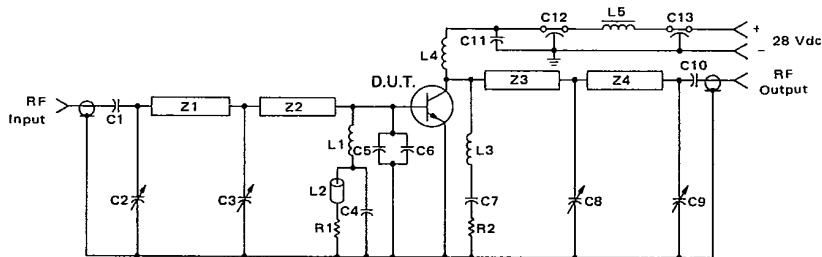
89D 79432 D T-33-09

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Breakdown Voltage ( $I_C = 50 \text{ mA dc}, I_B = 0$ )	$V_{(BR)CEO}$	33	—	—	Vdc
Collector-Emitter Breakdown Voltage ( $I_C = 50 \text{ mA dc}, V_{BE} = 0$ )	$V_{(BR)CES}$	60	—	—	Vdc
Emitter-Base Breakdown Voltage ( $I_E = 2.0 \text{ mA dc}, I_C = 0$ )	$V_{(BR)EBO}$	4.0	—	—	Vdc
Collector Cutoff Current ( $V_{CB} = 30 \text{ Vdc}, I_E = 0$ )	$I_{CBO}$	—	—	1.0	mA dc
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 500 \text{ mA dc}, V_{CE} = 5.0 \text{ Vdc}$ )	$h_{FE}$	10	—	100	—
<b>DYNAMIC CHARACTERISTICS</b>					
Output Capacitance ( $V_{CB} = 30 \text{ Vdc}, I_E = 0, f = 1.0 \text{ MHz}$ )	$C_{ob}$	—	—	25	pF
<b>FUNCTIONAL TESTS (Figure 1)</b>					
Common-Emitter Amplifier Power Gain ( $V_{CC} = 28 \text{ Vdc}, P_{out} = 15 \text{ W}, f = 400 \text{ MHz}$ )	$G_{PE}$	10	—	—	dB
Collector Efficiency ( $V_{CC} = 28 \text{ Vdc}, P_{out} = 15 \text{ W}, f = 400 \text{ MHz}$ )	$\eta$	50	—	—	%

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FIGURE 1 - 400 MHz TEST CIRCUIT SCHEMATIC



- |   |   |  |
|---|---|--|
| C1, C10 0.018 $\mu\text{F}$ VITRAMON Chip | L1 3.9 $\mu\text{H}$ Molded Choke         | R1 207 $\Omega$ , 1/8 W, 10%                             |
| C2, C3, C8 1.0-20 pF JOHANSON Type 3906   | L2 Ferrite Bead, FERROXCUBE, 56 590 65-3B | R2 5.1 $\Omega$ , 1/8 W, 10%                             |
| C4 100 pF UNDERWOOD (UNELCO)              | L3 3 Turns, #20 AWG, 0.1" ID              | Z1 Microstrip Line, 0.1" W x 1.2" L                      |
| C5, C6 56 pF ATC Chip                     | L4 6 Turns, #20 AWG, 1/4" ID              | Z2 Microstrip Line, 0.25" W x 0.7" L                     |
| C7 0.1 $\mu\text{F}$ ERIE Disc Ceramic    | L5 Ferrite Choke, FERROXCUBE, VK200-20-4B | Z3, Z4 Microstrip Line, 0.075" W x 1.25" L               |
| C9 1.0-20 pF JOHANSON Type 3906           |   | Board - Glass Teflon, $\epsilon_R = 2.56$ , $t = 0.062"$ |
| C11 1.0 $\mu\text{F}$ , 35 V TANTALUM     |   | Input/Output Connectors - Type N                         |
| C12, C13 680 pF ALLEN BRADLEY Feedthru    |   |  |

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FIGURE 2 -- OUTPUT POWER versus FREQUENCY

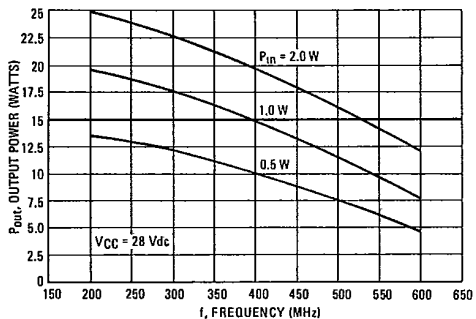


FIGURE 3 -- OUTPUT POWER versus INPUT POWER

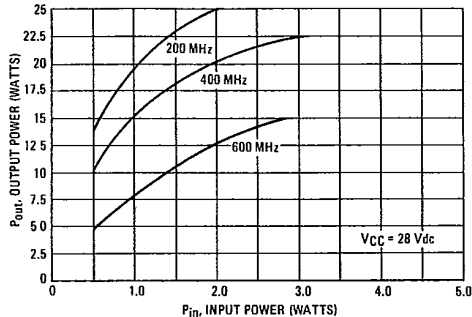


FIGURE 4 -- OUTPUT POWER versus SUPPLY VOLTAGE

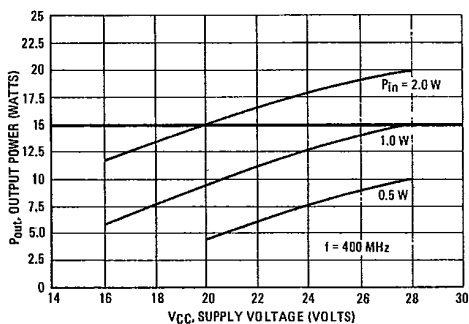
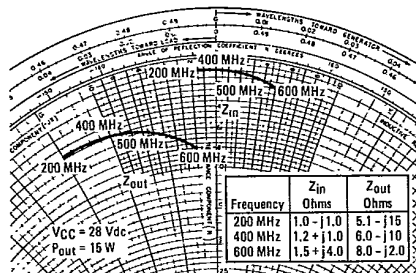


FIGURE 5 -- SERIES EQUIVALENT IMPEDANCE



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FIGURE 6 -- 400 MHz TEST CIRCUIT

