

# The RF Line

## NPN Silicon

### RF Power Transistor

... designed for power amplifier applications in industrial, commercial and amateur radio equipment to 30 MHz.

- Specified 12.5 Volt, 30 MHz Characteristics —
  - Output Power = 60 Watts
  - Minimum Gain = 13 dB
  - Efficiency = 55%

#### MATCHING PROCEDURE

In the push-pull circuit configuration it is preferred that the transistors are used as matched pairs to obtain optimum performance.

The matching procedure used by Motorola consists of measuring  $h_{FE}$  at the data sheet conditions and color coding the device to predetermined  $h_{FE}$  ranges within the normal  $h_{FE}$  limits. A color dot is added to the marking on top of the cap. Any two devices with the same color dot can be paired together to form a matched set of units.

#### MAXIMUM RATINGS

| Rating   | Symbol    | Value       | Unit                         |
|--|-----------|-------------|------------------------------|
| Collector-Emitter Voltage  | $V_{CEO}$ | 18          | Vdc                          |
| Collector-Emitter Voltage  | $V_{CES}$ | 36          | Vdc                          |
| Emitter-Base Voltage   | $V_{EBO}$ | 4.0         | Vdc                          |
| Collector Current — Continuous   | $I_C$     | 15          | Adc                          |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$     | 175<br>1.0  | Watts<br>W/ $^\circ\text{C}$ |
| Storage Temperature Range  | $T_{stg}$ | -65 to +150 | $^\circ\text{C}$             |

#### THERMAL CHARACTERISTICS

| Characteristic                       | Symbol          | Max | Unit                      |
|--------------------------------------|-----------------|-----|---------------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 1.0 | $^\circ\text{C}/\text{W}$ |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

#### OFF CHARACTERISTICS

|   |               |     |   |   |     |
|---|---------------|-----|---|---|-----|
| Collector-Emitter Breakdown Voltage<br>( $I_C = 100 \text{ mAdc}$ , $I_B = 0$ )   | $V_{(BR)CEO}$ | 18  | — | — | Vdc |
| Collector-Emitter Breakdown Voltage<br>( $I_C = 50 \text{ mAdc}$ , $V_{BE} = 0$ ) | $V_{(BR)CES}$ | 36  | — | — | Vdc |
| Emitter-Base Breakdown Voltage<br>( $I_E = 10 \text{ mAdc}$ , $I_C = 0$ )         | $V_{(BR)EBO}$ | 4.0 | — | — | Vdc |

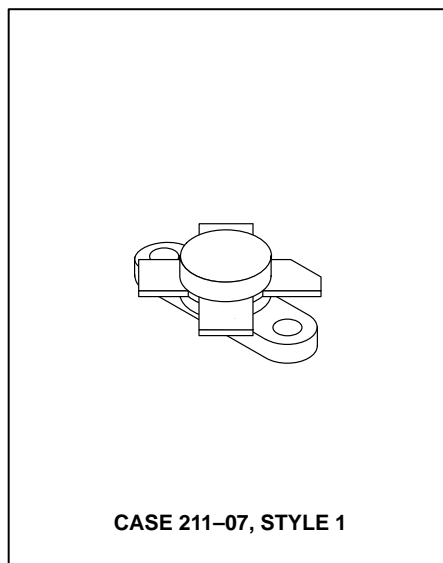
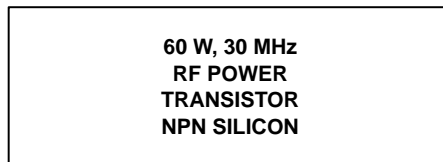
#### ON CHARACTERISTICS

|   |          |    |   |     |   |
|---|----------|----|---|-----|---|
| DC Current Gain<br>( $I_C = 5.0 \text{ Adc}$ , $V_{CE} = 5.0 \text{ Vdc}$ ) | $h_{FE}$ | 10 | — | 150 | — |
|---|----------|----|---|-----|---|

#### DYNAMIC CHARACTERISTICS

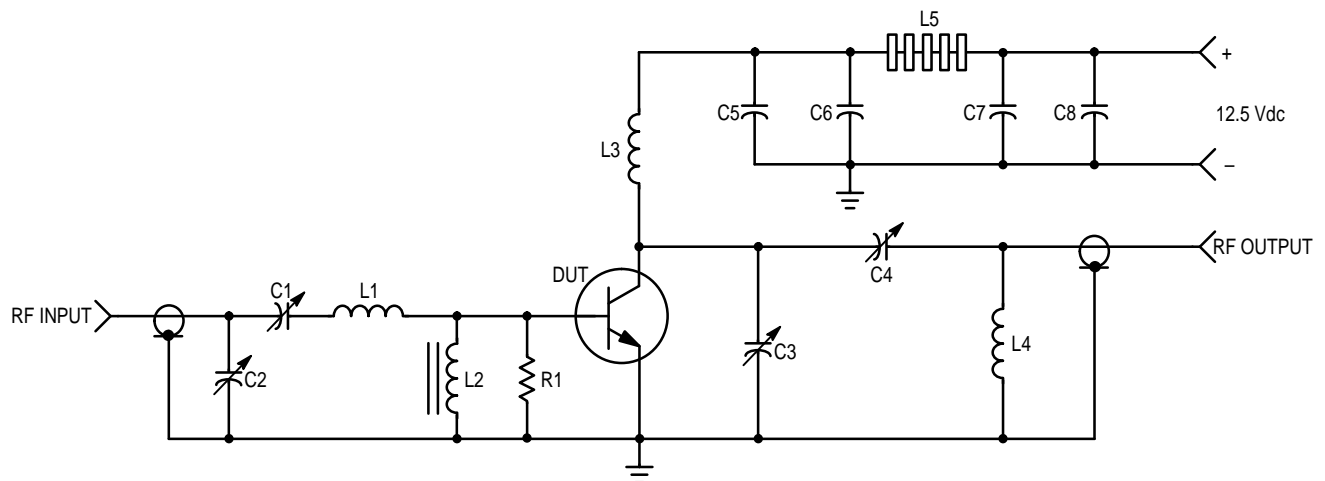
|   |          |   |   |     |    |
|---|----------|---|---|-----|----|
| Output Capacitance<br>( $V_{CB} = 12.5 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$ ) | $C_{ob}$ | — | — | 250 | pF |
|---|----------|---|---|-----|----|

(continued)



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

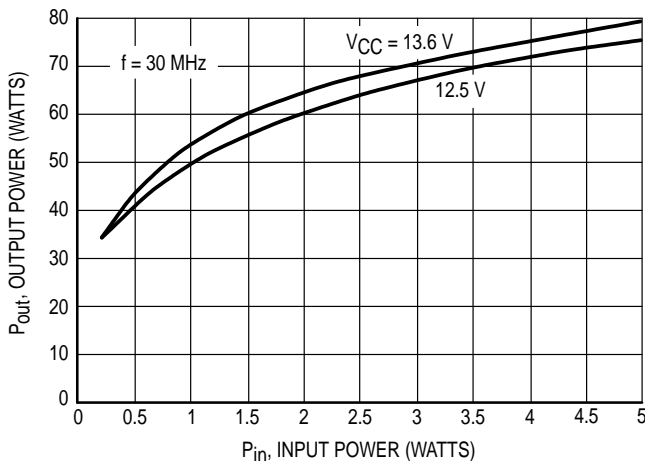
| Characteristic   | Symbol    | Min | Typ          | Max | Unit        |
|--|-----------|-----|--------------|-----|-------------|
| <b>FUNCTIONAL TESTS</b> (Figure 1)   |           |     |              |     |             |
| Common-Emitter Amplifier Power Gain<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{Out} = 60\text{ W}$ , $f = 30\text{ MHz}$ )  | $G_{pe}$  | 13  | —            | —   | dB          |
| Collector Efficiency<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{Out} = 60\text{ W}$ , $f = 30\text{ MHz}$ )                 | $\eta$    | 55  | —            | —   | %           |
| Series Equivalent Input Impedance<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{Out} = 60\text{ W}$ , $f = 30\text{ MHz}$ )    | $Z_{in}$  | —   | $1.66-j.844$ | —   | Ohms        |
| Series Equivalent Output Impedance<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{Out} = 60\text{ W}$ , $f = 30\text{ MHz}$ )   | $Z_{out}$ | —   | $1.73-j.188$ | —   | Ohms        |
| Parallel Equivalent Input Impedance<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{Out} = 60\text{ W}$ , $f = 30\text{ MHz}$ )  | $Z_{in}$  | —   | $2.09/1030$  | —   | $\Omega/pF$ |
| Parallel Equivalent Output Impedance<br>( $V_{CC} = 12.5\text{ Vdc}$ , $P_{Out} = 60\text{ W}$ , $f = 30\text{ MHz}$ ) | $Z_{out}$ | —   | $1.75/330$   | —   | $\Omega/pF$ |



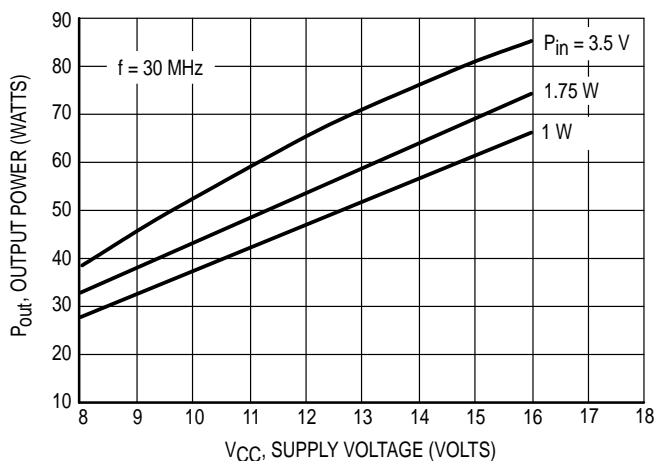
- C1, C2, C4 — ARCO 469
- C3 — ARCO 466
- C5 — 1000 pF, UNELCO
- C6, C7 — 0.1  $\mu\text{F}$  Disc Ceramic
- C8 — 1000  $\mu\text{F}/15\text{ V}$  Electrolytic
- R1 — 10 Ohm/1.0 Watt, Carbon

- L1 — 3 Turns, #18 AWG, 5/16" I.D., 5/16" Long
- L2 — VK200-20/4B, FERROXCUBE
- L3 — 12 Turns, #18 AWG Enameled Wire, 1/4" I.D., Close Wound
- L4 — 3 Turns 1/8" O.D. Copper Tubing, 3/8" I.D., 3/4" Long
- L5 — 7 FERRITE Beads, FERROXCUBE #56-590-65/3B

**Figure 1. 30 MHz Test Circuit Schematic**

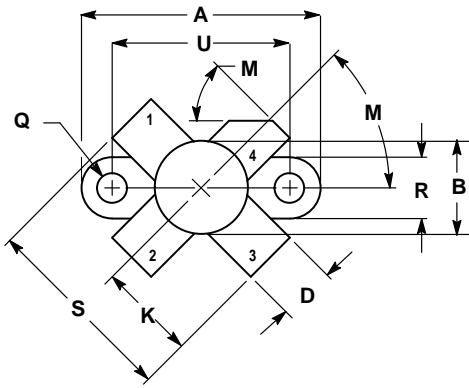


**Figure 2. Output Power versus Input Power**



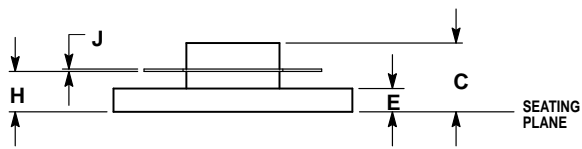
**Figure 3. Output Power versus Supply Voltage**

# PACKAGE DIMENSIONS




- NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.960  | 0.990 | 24.39       | 25.14 |
| B   | 0.370  | 0.390 | 9.40        | 9.90  |
| C   | 0.229  | 0.281 | 5.82        | 7.13  |
| D   | 0.215  | 0.235 | 5.47        | 5.96  |
| E   | 0.085  | 0.105 | 2.16        | 2.66  |
| H   | 0.150  | 0.108 | 3.81        | 4.57  |
| J   | 0.004  | 0.006 | 0.11        | 0.15  |
| K   | 0.395  | 0.405 | 10.04       | 10.28 |
| M   | 40°    | 50°   | 40°         | 50°   |
| Q   | 0.113  | 0.130 | 2.88        | 3.30  |
| R   | 0.245  | 0.255 | 6.23        | 6.47  |
| S   | 0.790  | 0.810 | 20.07       | 20.57 |
| U   | 0.720  | 0.730 | 18.29       | 18.54 |



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

**CASE 211-07  
 ISSUE N**

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