

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 @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 175 1.0 | Watts 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 ($I_C = 100 \text{ mAdc}$, $I_B = 0$) | $V_{(BR)CEO}$ | 18 | — | — | Vdc |
| Collector-Emitter Breakdown Voltage ($I_C = 50 \text{ mAdc}$, $V_{BE} = 0$) | $V_{(BR)CES}$ | 36 | — | — | Vdc |
| Emitter-Base Breakdown Voltage ($I_E = 10 \text{ mAdc}$, $I_C = 0$) | $V_{(BR)EBO}$ | 4.0 | — | — | Vdc |

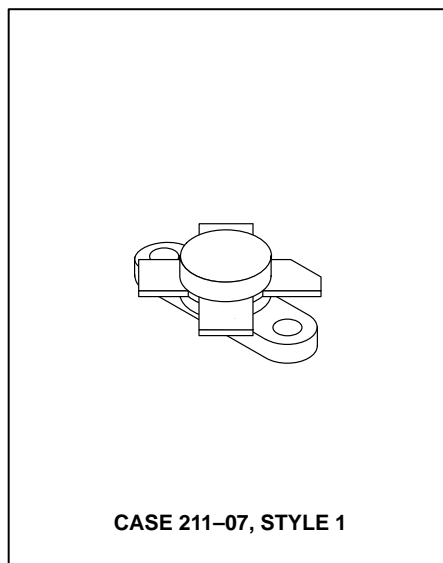
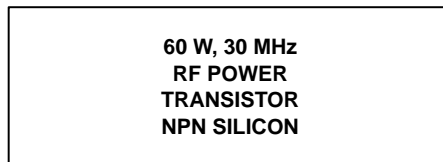
ON CHARACTERISTICS

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

DYNAMIC CHARACTERISTICS

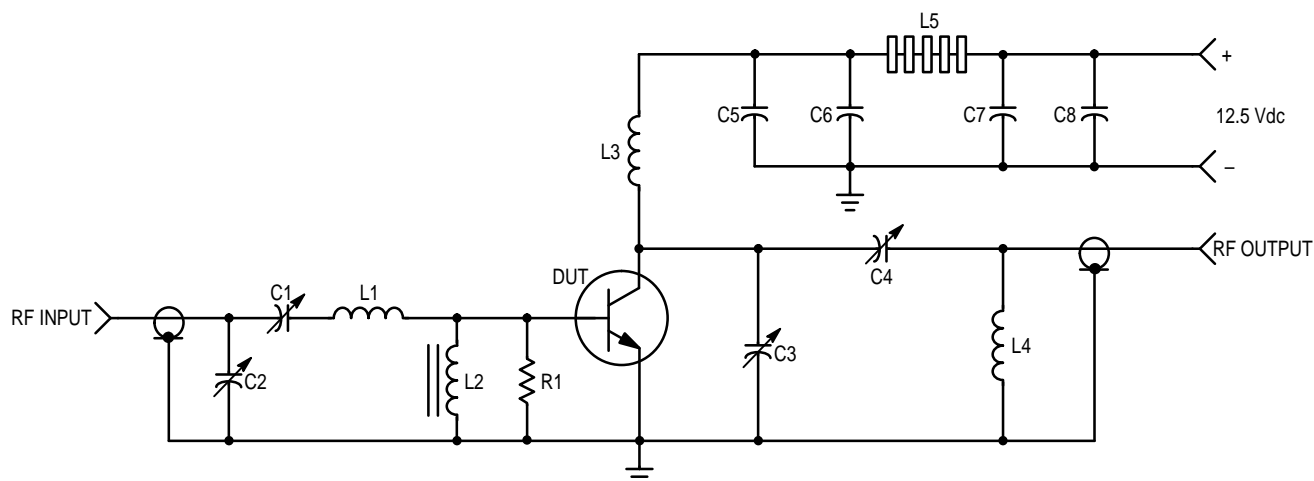
| | | | | | |
|---|----------|---|---|-----|----|
| Output Capacitance ($V_{CB} = 12.5 \text{ Vdc}$, $I_E = 0$, $f = 1.0 \text{ MHz}$) | C_{ob} | — | — | 250 | pF |
|---|----------|---|---|-----|----|

(continued)



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

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



- C1, C2, C4 — ARCO 469
- C3 — ARCO 466
- C5 — 1000 pF, UNELCO
- C6, C7 — 0.1 μF 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

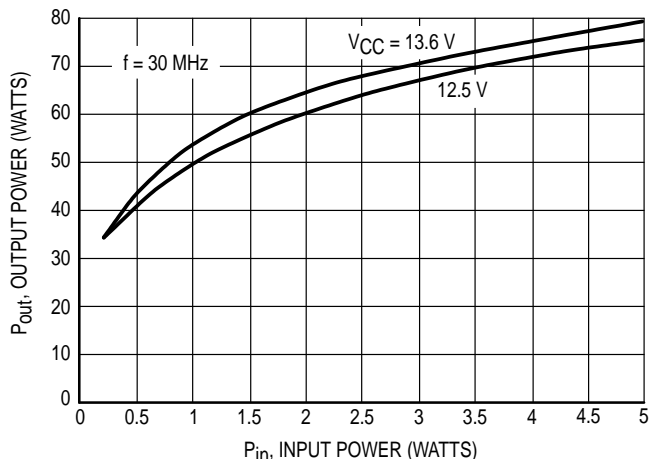


Figure 2. Output Power versus Input Power

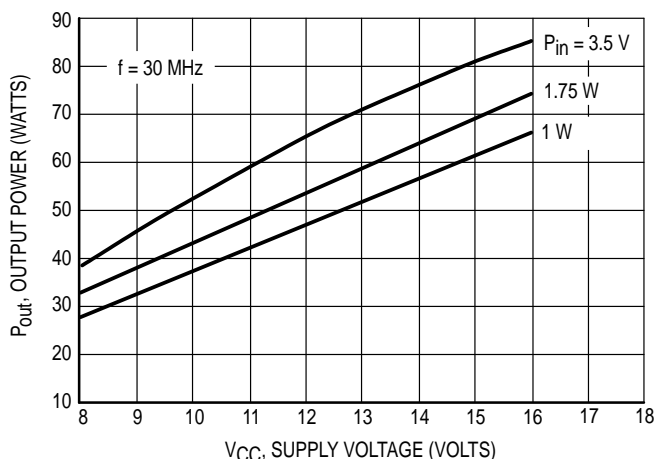
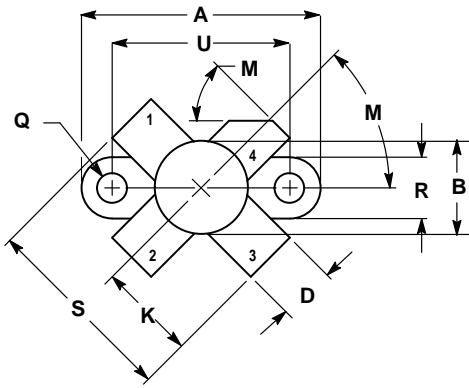


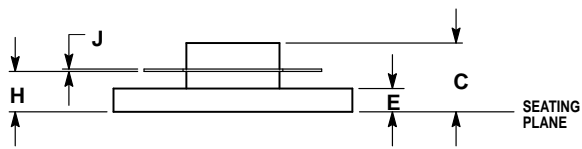
Figure 3. Output Power versus Supply Voltage

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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