

# Wireless Bipolar Power Transistor, 10W

## 1.45 - 1.60 GHz

PH1516-10

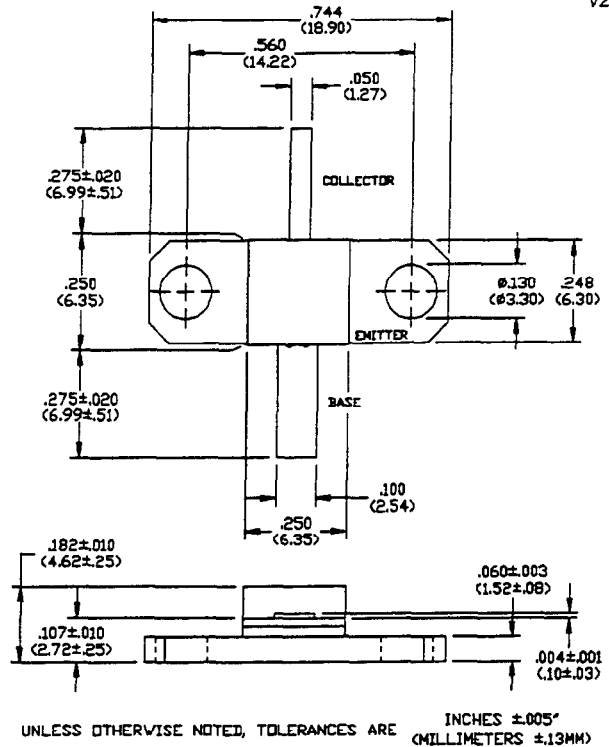
V2.00

### Features

- Designed for Cellular Base Station Applications
- Class AB: -33 dBc Typ 3rd IMD at 10 Watts PEP
- Class A: +49 dBm Typ 3rd Order Intercept Point
- Common Emitter Configuration
- Internal Input Impedance Matching
- Diffused Emitter Ballasting

### Absolute Maximum Ratings at 25°C

| Parameter                 | Symbol        | Rating      | Units |
|---------------------------|---------------|-------------|-------|
| Collector-Base Voltage    | $V_{CBO}$     | 60          | V     |
| Collector-Emitter Voltage | $V_{CES}$     | 60          | V     |
| Emitter-Base Voltage      | $V_{EBO}$     | 3.0         | V     |
| Collector Current         | $I_C$         | 2.0         | A     |
| Total Power Dissipation   | $P_{TOT}$     | 58          | W     |
| Junction Temperature      | $T_J$         | 200         | °C    |
| Storage Temperature       | $T_{STG}$     | -55 to +150 | °C    |
| Thermal Resistance        | $\theta_{JC}$ | 3.0         | °C/W  |

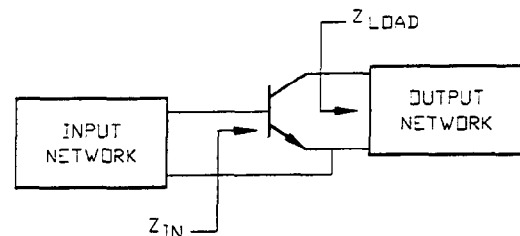


### Electrical Characteristics at 25°C

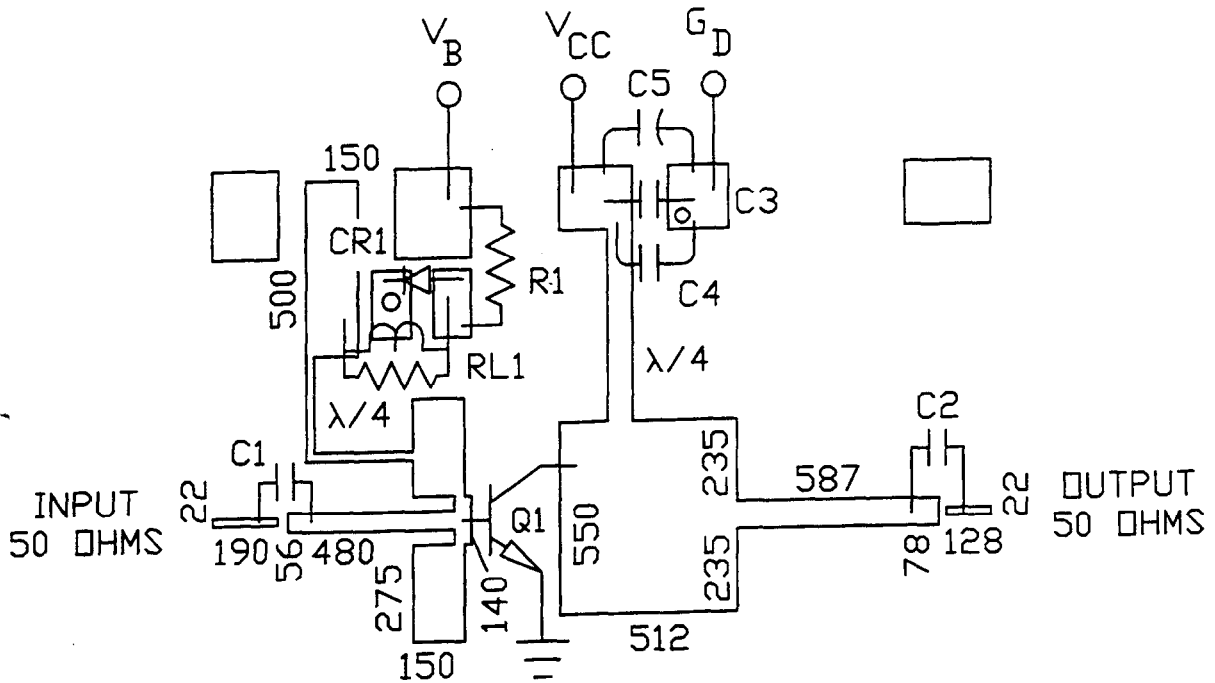
| Parameter                           | Symbol           | Min | Max   | Units | Test Conditions   |
|-------------------------------------|------------------|-----|-------|-------|---|
| Collector-Emitter Breakdown Voltage | $BV_{CES}$       | 60  | -     | V     | $I_C=20$ mA   |
| Collector-Emitter Leakage Current   | $I_{CES}$        | -   | 2.0   | mA    | $V_{CE}=25$ V   |
| Collector-Emitter Breakdown Voltage | $BV_{CEO}$       | 20  | -     | V     | $I_C=20$ mA   |
| Collector-Emitter Breakdown Voltage | $BV_{CER}$       | 30  | -     | V     | $I_C=20$ mA, $R_{BE}=220 \Omega$  |
| Emitter-Base Breakdown Voltage      | $BV_{EBO}$       | 3.0 | -     | V     | $I_B=20$ mA   |
| DC Forward Current Gain             | $h_{FE}$         | 15  | 120   | -     | $V_{CE}=5$ V, $I_C=1$ A   |
| Power Gain                          | $G_p$            | 10  | -     | dB    | $V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W, $F=1.50 - 1.60$ GHz                 |
| Collector Efficiency                | $\eta_C$         | 40  | -     | %     | $V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W, $F=1.50 - 1.60$ GHz                 |
| Input Return Loss                   | RL               | 10  | -     | dB    | $V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W, $F=1.50 - 1.60$ GHz                 |
| Load Mismatch Tolerance             | VSWR             | -   | 3.0:1 | -     | $V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W, $F=1.50 - 1.60$ GHz                 |
| 3rd Order IMD                       | IMD <sub>3</sub> | -   | -30   | dBc   | $V_{CC}=25$ V, $I_{CO}=100$ mA, $P_{OUT}=10$ W PEP $F=1500$ MHz, $\Delta F=100$ kHz |

### Typical Device Impedances

| F(GHz) | $Z_N(\Omega)$ | $Z_{LOAD}(\Omega)$ |
|--------|---------------|--------------------|
| 1.50   | $1.4 + j4.8$  | $2.1 - j0.3$       |
| 1.55   | $2.0 + j5.0$  | $2.0 - j0.4$       |
| 1.60   | $2.5 + j4.9$  | $2.0 - j0.5$       |



RF Test Fixture



ARTWORK DIMENSIONS IN MILS

PARTS LIST

- |             |    |    |  |
|-------------|----|----|--|
| C1          | C2 | C3 | 33 pF ATC SIZE A                                 |
| C4          |    |    | 4.7 μF 35 VOLT CHIP                              |
| C5          |    |    | 50 μF 50 VOLTS                                   |
| CR1         |    |    | 1N4245 DIODE                                     |
| Q1          |    |    | PH1516-10  |
| R1          |    |    | 5 ΩHMS 1/4 WATT                                  |
| RL1         |    |    | 6T/NO. 24 AWG ON 3 OHM 1/4 WATT                  |
| BOARD TYPE: |    |    | ROGERS 6010.5 .025" THICK, E <sub>R</sub> = 10.5 |

Specifications Subject to Change Without Notice.

M/A-COM, Inc.

North America: Tel. (800) 366-2266  
Fax (800) 618-8883

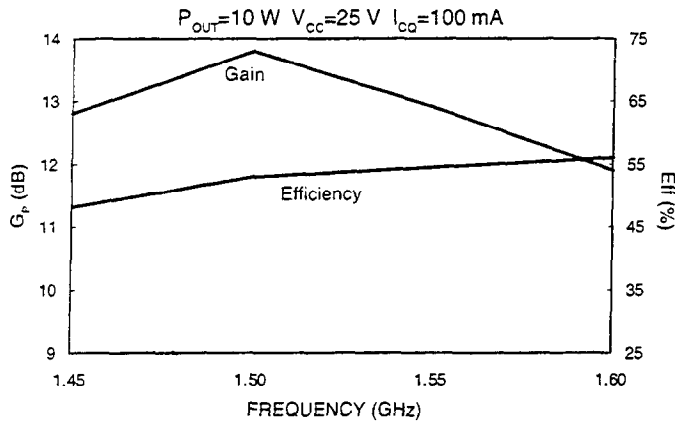
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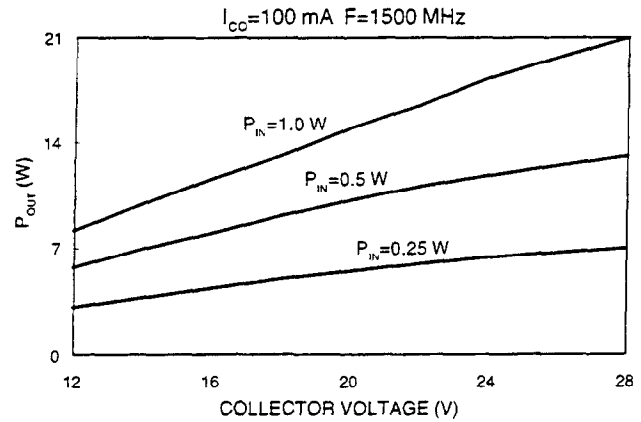
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Typical Broadband Performance Curves

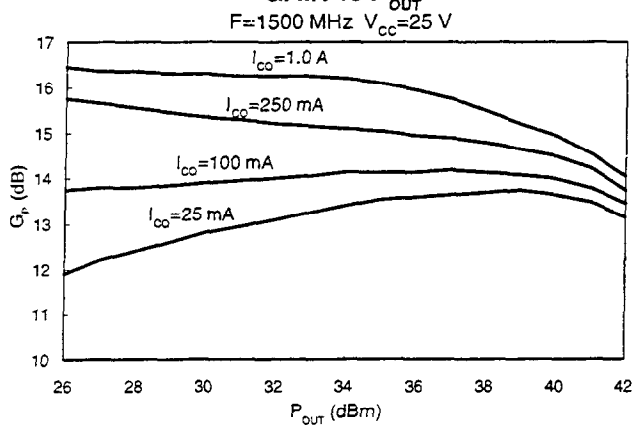
**GAIN-EFFICIENCY vs FREQUENCY**



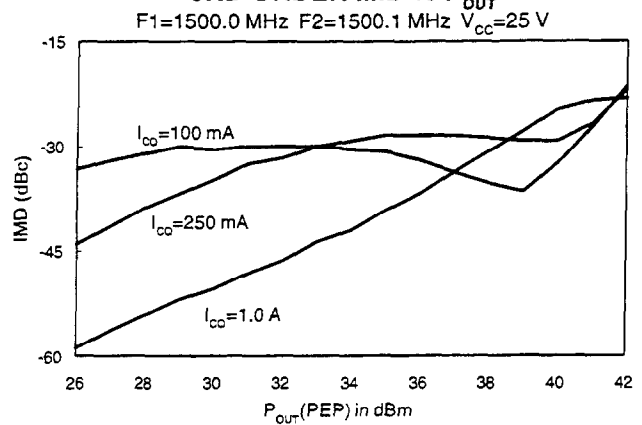
**OUTPUT POWER vs COLLECTOR VOLTAGE**



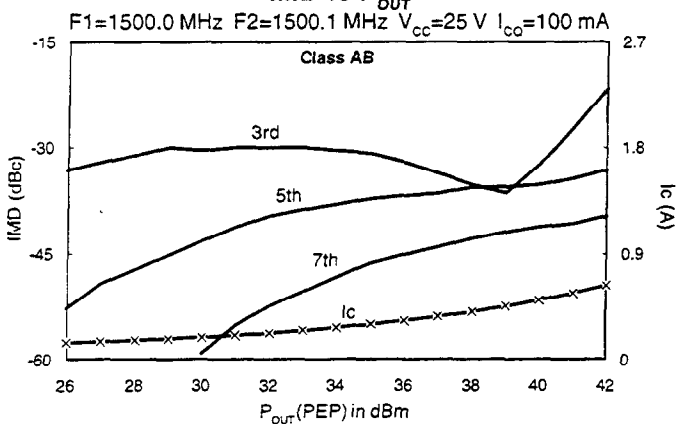
**GAIN vs  $P_{OUT}$**



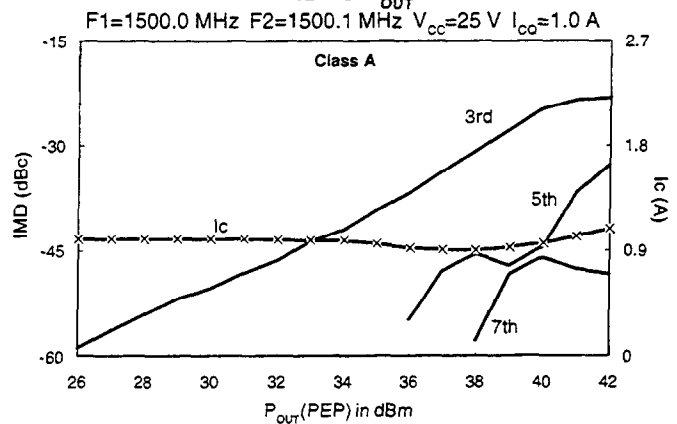
**3RD ORDER IMD vs  $P_{OUT}$**



**IMD vs  $P_{OUT}$**



**IMD vs  $P_{OUT}$**



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## Typical S-Parameters

$V_{CC}=25\text{ V}, I_{CO}=1.0\text{ A}$

| f(MHz) | S11  |        | S21  |        | S12    |        | S22  |        |
|--------|------|--------|------|--------|--------|--------|------|--------|
|        | Mag  | Phase  | Mag  | Phase  | Mag    | Phase  | Mag  | Phase  |
| 100    | 0.85 | 177.3  | 6.57 | 92.2   | 0.0066 | 6.74   | 0.73 | -179.3 |
| 200    | 0.94 | 179.4  | 2.96 | 79.9   | 0.0073 | 4.33   | 0.73 | -179.0 |
| 300    | 0.96 | -179.4 | 1.95 | 75.5   | 0.0075 | 4.04   | 0.72 | -178.8 |
| 400    | 0.97 | -170.0 | 1.51 | 70.6   | 0.0077 | 0.91   | 0.72 | -178.2 |
| 500    | 0.97 | 178.5  | 1.27 | 65.2   | 0.0081 | -0.99  | 0.72 | -177.6 |
| 600    | 0.97 | 178.1  | 1.12 | 59.5   | 0.0085 | -2.6   | 0.73 | -177.1 |
| 700    | 0.96 | 177.7  | 1.09 | 52.7   | 0.0088 | -6.8   | 0.72 | -176.1 |
| 800    | 0.97 | 178.0  | 0.93 | 39.5   | 0.0094 | -12.0  | 0.73 | -174.5 |
| 900    | 0.96 | 177.3  | 0.88 | 34.6   | 0.0093 | -13.3  | 0.75 | -173.4 |
| 1000   | 0.97 | 176.7  | 0.87 | 27.8   | 0.0102 | -17.8  | 0.76 | -172.3 |
| 1100   | 0.95 | 175.9  | 0.96 | 20.7   | 0.0126 | -24.5  | 0.76 | -170.1 |
| 1200   | 0.93 | 176.0  | 0.93 | 4.1    | 0.0118 | -40.0  | 0.81 | -169.0 |
| 1300   | 0.92 | 176.3  | 0.96 | -9.2   | 0.0118 | -51.4  | 0.86 | -168.9 |
| 1400   | 0.91 | 176.9  | 0.98 | -25.3  | 0.0120 | -68.5  | 0.91 | -169.8 |
| 1450   | 0.91 | 177.1  | 0.97 | -34.4  | 0.0118 | -79.3  | 0.94 | -171.1 |
| 1500   | 0.91 | 177.6  | 0.95 | -43.8  | 0.0117 | -91.4  | 0.97 | -172.7 |
| 1550   | 0.91 | 177.9  | 0.91 | -53.8  | 0.0114 | -104.9 | 0.98 | -174.6 |
| 1600   | 0.92 | 178.1  | 0.87 | -63.4  | 0.0107 | -119.8 | 0.99 | -176.7 |
| 1650   | 0.92 | 178.3  | 0.81 | -72.7  | 0.0094 | -135.3 | 0.99 | -178.9 |
| 1700   | 0.93 | 178.1  | 0.74 | -81.2  | 0.0094 | -146.9 | 0.01 | 179.0  |
| 1750   | 0.94 | 178.0  | 0.67 | -89.1  | 0.0084 | -161.9 | 0.99 | 177.4  |
| 1800   | 0.95 | 177.6  | 0.61 | -96.7  | 0.0080 | -174.5 | 0.98 | 175.8  |
| 1850   | 0.95 | 177.1  | 0.55 | -103.2 | 0.0079 | -172.2 | 0.96 | 174.7  |
| 1900   | 0.95 | 176.7  | 0.49 | -108.6 | 0.0077 | -155.4 | 0.95 | 173.8  |
| 1950   | 0.96 | 176.1  | 0.44 | -113.4 | 0.0071 | 145.8  | 0.94 | 173.1  |
| 2000   | 0.96 | 175.6  | 0.40 | -117.3 | 0.0070 | 134.9  | 0.92 | 172.2  |
| 2100   | 0.96 | 174.3  | 0.34 | -125.5 | 0.0081 | 123.6  | 0.91 | 171.0  |
| 2200   | 0.96 | 173.1  | 0.28 | -133.5 | 0.0087 | 104.9  | 0.84 | 169.3  |
| 2300   | 0.96 | 171.7  | 0.23 | -140.0 | 0.0092 | 89.0   | 0.88 | 168.7  |
| 2400   | 0.96 | 170.5  | 0.20 | -144.5 | 0.0075 | 80.1   | 0.86 | 168.0  |

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