

L-Band Radar Transistor

The high power pulsed radar transistor device part number IB1214M130 is designed for L-Band radar systems operating over the instantaneous bandwidth of 1.210-1.400 GHz. While operating in class C mode this common base device supplies a minimum of 130 watts of peak pulse power under the conditions of 330µs pulse width and 10% duty cycle, at Pin= 20W. All devices are 100% screened for large signal RF parameters.



- Silicon Bipolar
 - Ultra-high f_T
- Class C Operation
 - High Efficiency
- Common Base Configuration
 - Single Power Supply
- Gold Metal
 - Maximum Reliability
- Emitter Ballasting
 - Optimum Thermal Distribution
- Internal Impedance Matching
 - Ease of Use
 - Ultra-low Loss Design
- BeO Package
 - Unmatched Thermal Reliability
- RF Test Fixture
 - Broadband
 - Matched to 50Ω
 - Long-term Correlation
 - 100% Device RF Screening
 - No External Tuning Allowed

TYPICAL DATA TYPICAL DATA TYPICAL DATA TYPICAL DATA

Vcc=50V
Pulse: 330us/10%
S = Stable
P = Pass

| Lot/SN | F(MHZ) | Po pk | Pin pk | Ic pk | RL | Nc | G | deltaG | VSWR | |
|---------|--------|-------|--------|-------|----|------|------|--------|------|-----|
| | | | | | | | | | 2 1 | 3 1 |
| D2494-1 | 1210 | 161 | 20.0 | 5.17 | 15 | 62.3 | 9.07 | | S | P |
| | 1300 | 162 | 20.0 | 5.80 | 15 | 55.9 | 9.08 | 0.28 | S | P |
| | 1400 | 152 | 20.0 | 5.66 | 21 | 53.8 | 8.81 | | S | P |

MAXIMUM RATINGS

| Screen | Parameter | Symbol | Min | Max | Units | Test Conditions |
|--------|--|-----------|-----|------|-------|-----------------|
| BD | Collector-Emitter Voltage | V_{CES} | -- | 75 | V | $V_{BE}=0V$. |
| BD | Emitter-Base Voltage | V_{EBO} | -- | 2 | V | -- |
| BD | Storage Temperature Range | T_{STG} | -55 | +150 | °C | -- |
| BD | Operating Junction Temperature Range | T_J | -55 | +200 | °C | -- |
| Note | Screen 'BD' = parameter qualified By Design. | | | | | |

THERMAL CHARACTERISTICS

| Screen | Parameter | Symbol | Min | Max | Units | Test Conditions |
|--------|--|--------------|-----|------|-------|--|
| BD | Thermal Resistance | $R_{TH(JC)}$ | -- | 0.43 | °C/W | $V_{CC}=50V$, Pulse Format=330us, 10%, $T_F=25\pm 5^\circ C$, $P_{in}=20W$, $P_{out}=130W$, $N_C=50\%$ |
| Note | Screen 'BD' = parameter qualified By Design. | | | | | |

PROCESSING SPECIFICATIONS

| Screen | Parameter | Symbol | Min | Max | Units | Test Conditions |
|--------|--|--------|-----|-----|-------|--|
| 100% | DC Wafer Probe | -- | -- | -- | -- | Per Integra specification. |
| Q1 | Wafer DC and RF Qualification | -- | -- | -- | -- | Per Integra specification. |
| LM | Wire Bond Strength | -- | -- | -- | -- | Line monitor per Integra specification. |
| 100% | Pre-cap visual inspection | -- | -- | -- | -- | Per Integra specification. |
| 100% | Gross leak test | -- | -- | -- | -- | MIL-STD-750D, Method 1071.6, Test Condition C. |
| Note | Screen 'Q1' = parameter is qualified by assembly and test of 3 pieces minimum per wafer. | | | | | |
| Note | Screen 'LM' = parameter is qualified by assembly line monitor. | | | | | |

DC ELECTRICAL CHARACTERISTICS

| Screen | Parameter | Symbol | Min | Max | Units | Test Conditions |
|--------|---|------------|-----|-----|-------|--|
| 100% | Collector-Emitter Breakdown Voltage | BV_{CES} | 75 | -- | V | $I_C=20mA$, $V_{BE}=0V$, $T_F=25\pm 5^\circ C$. |
| 100% | Zero Base Voltage Collector Leakage Current | I_{CES} | -- | 7.5 | mA | $V_{CE}=50V$, $V_{BE}=0V$, $T_F=25\pm 5^\circ C$. |
| 100% | DC Current Gain | H_{FE} | 20 | 150 | -- | $V_{CE}=5V$, $I_C=0.2A$, $T_F=25\pm 5^\circ C$. |

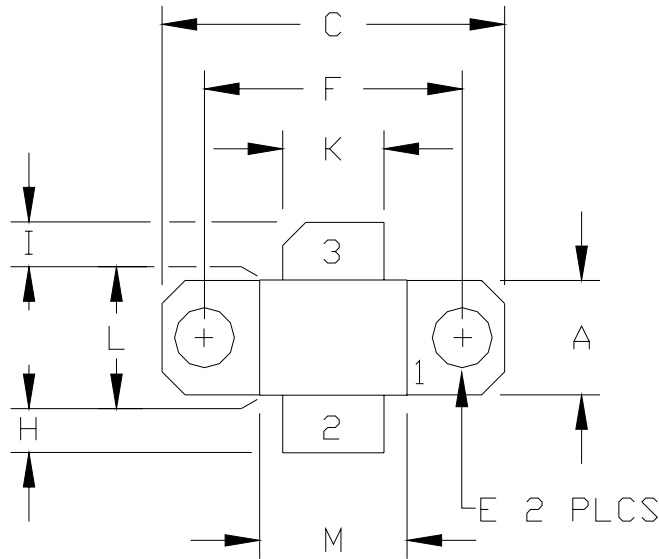
RF ELECTRICAL CHARACTERISTICS

| Screen | Parameter | Symbol | Min | Max | Units | Test Conditions |
|--------|--|-----------|------|-----|-------|---|
| 100% | Input Return Loss | IRL | 10 | -- | dB | $V_{CC}=V1, PW=PW1, DF=DF1, T_F=25\pm5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ |
| 100% | Output Power | P_{OUT} | 130 | -- | W | $V_{CC}=V1, PW=PW1, DF=DF1, T_F=25\pm5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ |
| 100% | Power Gain | Gp | 8.15 | -- | dB | $V_{CC}=V1, PW=PW1, DF=DF1, T_F=25\pm5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ |
| 100% | Collector Efficiency ($P_O/I_C/V_{CC}$) | N_C | 50 | -- | % | $V_{CC}=V1, PW=PW1, DF=DF1, T_F=25\pm5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ |
| 100% | Pulse Amplitude Droop | D | -- | 0.5 | dB | $V_{CC}=V1, PW=PW1, DF=DF1, T_F=25\pm5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ |
| 100% | Gain Flatness | GF | -- | 1 | dB | Calculate from Gain at each frequency F. |
| 100% | Stability into 2:1 VSWR | VSWR-S | -- | -- | -- | 2:1 output VSWR through 360° phase. No oscillatory or pulse break-up characteristics allowed on detected output pulse. |
| 100% | 3:1 Load Mismatch Tolerance | LMT | -- | -- | -- | $V_{CC}=V1, PW=PW1, DF=DF1, T_F=25\pm5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ Rotate 3:1 output VSWR through 360° phase. Post test $P_O =$ Pre test $P_O \pm 10W.$ |
| BD | Pulse Risetime | RT | -- | 80 | ns | $V_{CC}=V1, PW=PW1, DF=DF1, T_F=25\pm5^\circ C, P_{IN}=P_{IN1}, P_{IN2}, P_{IN3}, F=F1, F2, F3.$ |
| Note | $V1 = 50V; PW1 = 330\mu s; DF1 = 10%; P_{IN1} = P_{IN2} = P_{IN3} = 20W; F1 = 1.210\text{ GHz}, F2 = 1.300\text{ GHz}, F3 = 1.400\text{ GHz}.$ | | | | | |
| Note | $T_F =$ Device flange temperature. | | | | | |
| Note | Screen 'BD' = parameter qualified By Design. | | | | | |

BROADBAND RF TEST FIXTURE IMPEDANCE CHARACTERISTICS

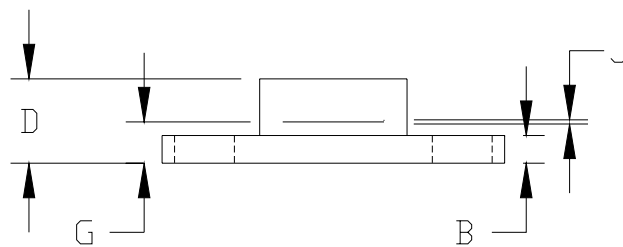
| Frequency (GHz) | $Z_{IF} (\Omega)$ | $Z_{OF} (\Omega)$ |
|----------------------|-------------------|-------------------|
| 1.210 | 2.19-j1.74 | 5.12-j3.07 |
| 1.300 | 2.29-j1.04 | 4.84-j2 |
| 1.400 | 2.59-j0.37 | 4.79-j0.92 |
| Impedance Definition | | |

PACKAGE DIMENSIONAL OUTLINE DRAWING



| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.243 | 0.253 | 6.17 | 6.43 |
| B | 0.055 | 0.065 | 1.40 | 1.65 |
| C | 0.739 | 0.749 | 18.77 | 19.02 |
| D | 0.165 | 0.185 | 4.19 | 4.70 |
| E | 0.125 | 0.135 | 3.18 | 3.43 |
| F | 0.555 | 0.565 | 14.10 | 14.35 |
| G | 0.082 | 0.092 | 2.08 | 2.34 |
| H | 0.070 | 0.125 | 1.78 | 3.18 |
| I | 0.070 | 0.125 | 1.78 | 3.18 |
| J | 0.004 | 0.006 | 0.10 | 0.15 |
| K | 0.215 | 0.225 | 5.46 | 5.72 |
| L | 0.245 | 0.255 | 6.22 | 6.48 |
| M | 0.315 | 0.325 | 8.00 | 8.26 |

| PIN SCHEDULE | |
|--------------|-----------|
| 1 | BASE |
| 2 | EMITTER |
| 3 | COLLECTOR |



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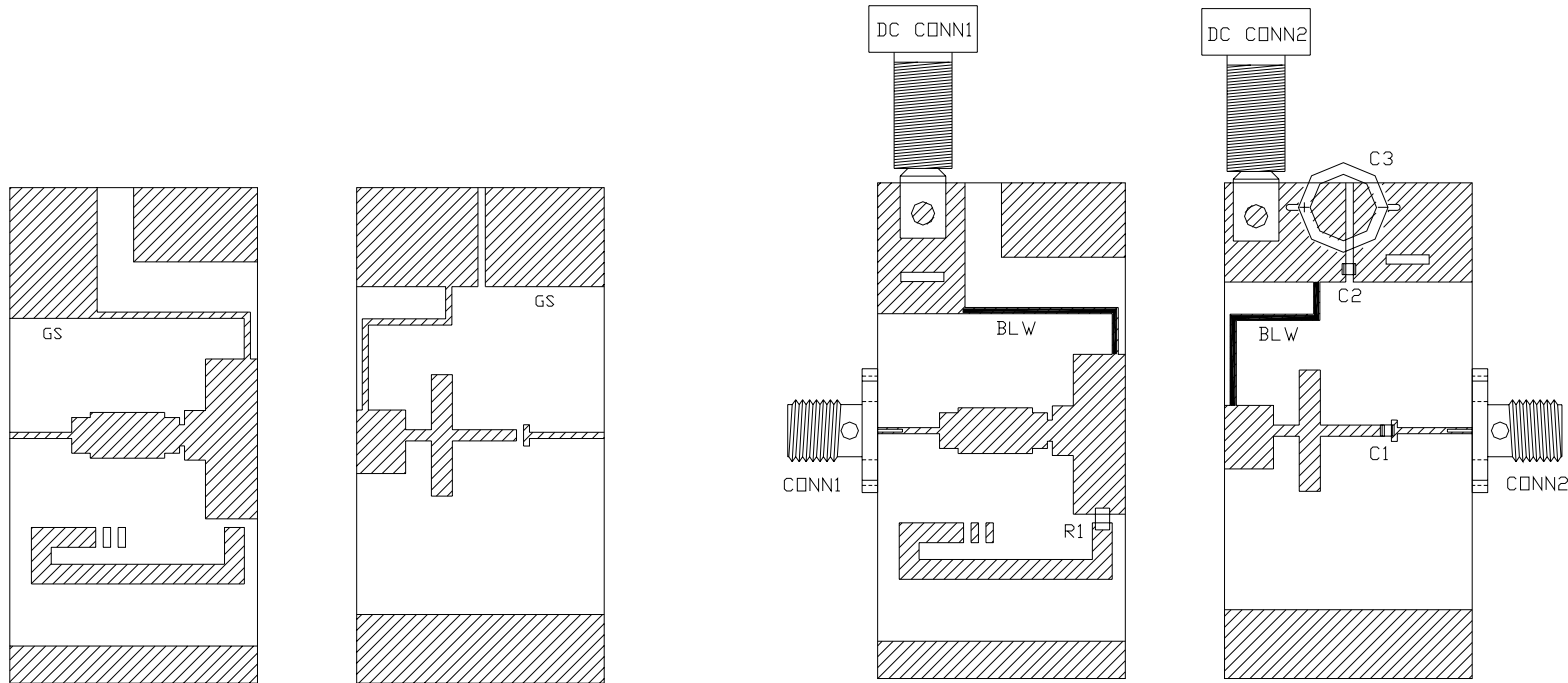
DOCUMENT NUMBER:
IB1130

REV:
PR1

SHEET NAME:
06-OUTLINE

REV:
NC

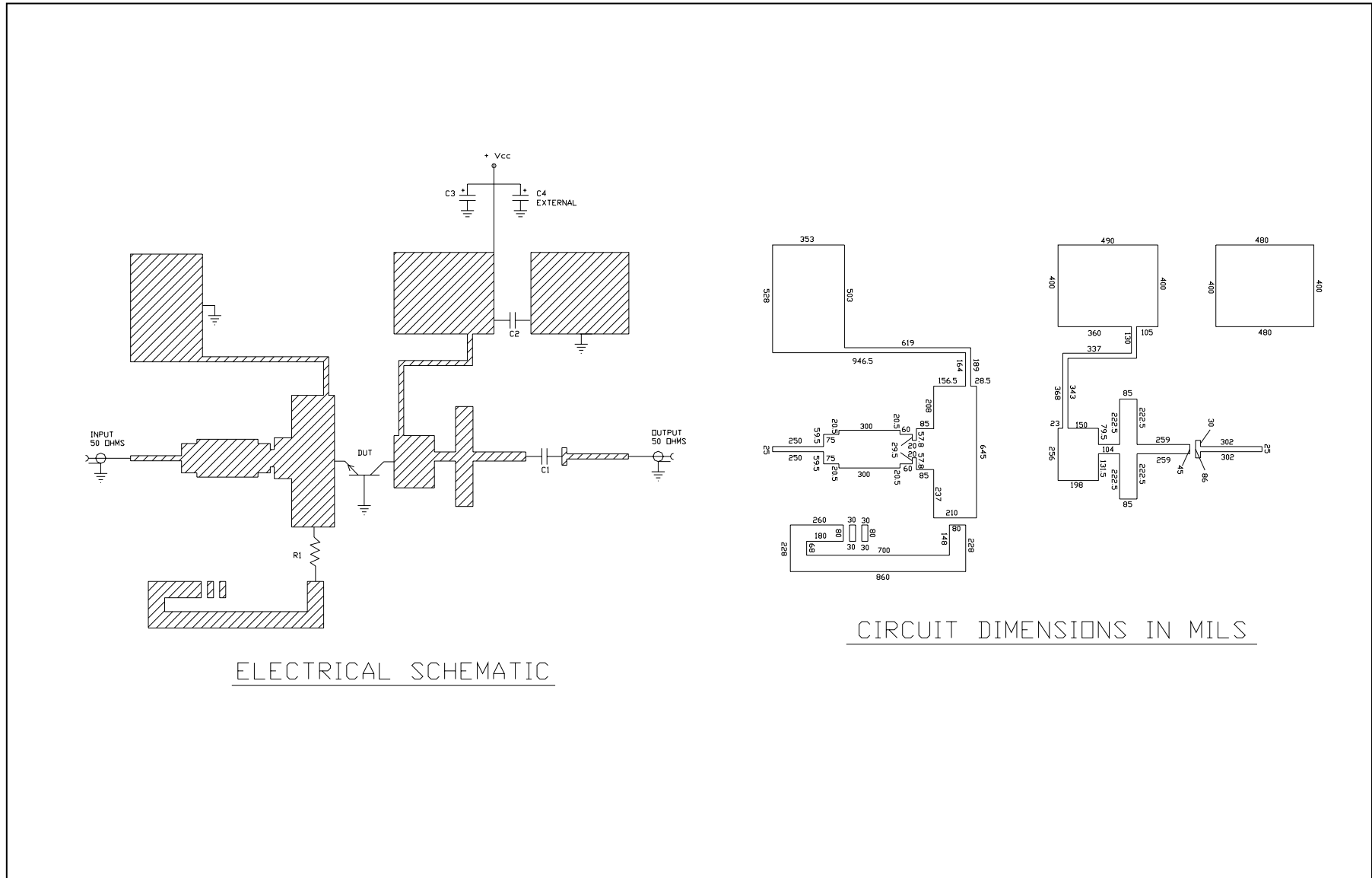
RF TEST FIXTURE



| COMPONENT | DESCRIPTION |
|-------------------------|---|
| DUT | TRANSISTOR #IB1214M130, MOUNT HARD TO THE RIGHT |
| PC BOARD | ROGERS #R03010, TH=0.025" 1oz. Cu |
| C1, C2 | CHIP CAPACITOR, TYPE ATC100A, 100 pF |
| C3 | ELECTROLYTIC CAPACITOR, 68uF / 63V |
| R1 | RESISTOR 50 OHMS - 1206 |
| GS | GROUND SHIM, COPPER, TH=0.001" |
| CONN1, CONN2 | SMA CONNECTOR, TYPE QS #2052-5636-02 |
| INPUT PC BOARD CARRIER | 2 INCH BRASS - 03 (1.00") |
| OUTPUT PC BOARD CARRIER | 2 INCH BRASS - 03 (1.00") |
| TRANSISTOR CARRIER | 2 INCH COPPER - 03 |
| TRANSISTOR CLAMP | NORYL CLAMP - 04 |
| HEATSINK | 2 INCH HEATSINK - 11 |
| DC CONN1 | BANANA JACK, BLACK |
| DC CONN2 | BANANA JACK, RED |
| NOTE | FIXTURE HARDWARE DRAWINGS AVAILABLE ON REQUEST |

ASSEMBLY AND PARTS LIST

RF TEST FIXTURE



DEFINITIONS

| Data Sheet Status | |
|--|---|
| Proposed Specification | This data sheet contains proposed specifications. |
| Preliminary Specification | This data sheet contains specifications based on preliminary measurements and data. |
| Product Specification | This data sheet contains final product specifications. |
| Maximum Ratings | |
| Stress above one or more of the maximum ratings may cause permanent damage to the device. These are maximum ratings only and operation of the device at these or at any other conditions above those given in the characteristics sections of the specification is not implied. Exposure to maximum values for extended periods of time may affect device reliability. | |

WARNING

| Product and environmental safety - toxic materials |
|--|
| This product contains beryllium oxide. The product is entirely safe provided that the BeO base is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with general or domestic waste. |

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