

# Part Number: IGN4450M90 (Preliminary)

# Integra

TECHNOLOGIES, INC.

## C-Band Radar Transistor

IGN4450M90 is an internally pre-matched, gallium nitride (GaN) high electron mobility transistor (HEMT). This part is designed for C-Band radar applications operating over the 4.4 – 5.0 GHz instantaneous frequency band. Under 300us / 10% pulse conditions it supplies a minimum of 90 watts of peak output power with 13dB gain typically. Specified operation is with Class AB bias. When appropriately rated, it is operable under a wide range of pulse widths and duty factors. It operates with spectral purity into all phases of 3:1 output VSWR. All devices are 100% screened for large signal RF parameters in a fixed tuned broadband matching circuit / test fixture. The use of external tuners is not allowed during screening.



### GaN on Silicon Carbide FET

- High Power Gain
- Excellent Thermal Stability
- Gold Metal

### Gold Metal System

- Complete Gold System
- Gold Bond Wires
- Gold Package Metal
- Maximum Reliability

### Class AB

- Specified with AB bias

### Internal Impedance Matching

- Ease of Use
- Input and Output
- Ultra Low Loss Design

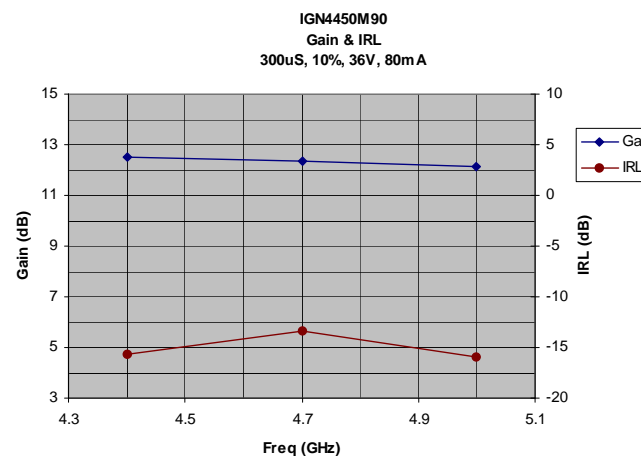
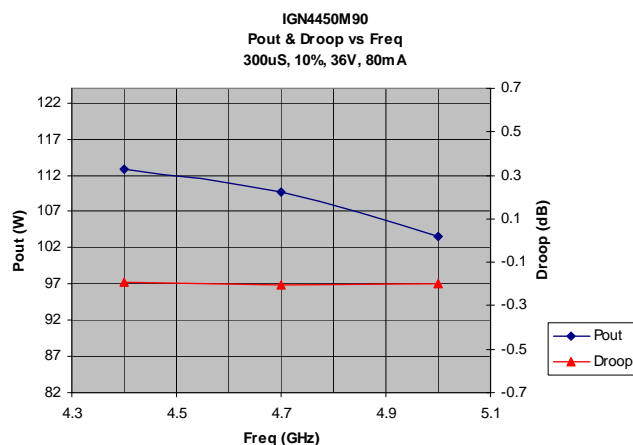
### Metal - Ceramic

- Metal Based
- Epoxy Seal

### High Power RF Test / Fixture

- Broadband
- Matched to 50  $\Omega$  (ohms)
- Long-term Correlation
- 100% Device RF Screening
- No External Tuning required

## TYPICAL RF DATA



**MAXIMUM RATINGS**

| Screen | Parameter                                    | Symbol    | Min | Max  | Units | Test Conditions |
|--------|--|-----------|-----|------|-------|-----------------|
| BD     | Drain-Source Voltage                         | $V_{DS}$  | --  | 40   | V     | --              |
| BD     | Gate-Source Voltage                          | $V_{GS}$  | -10 | 0    | 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                           | $R_{TH(JC)}$ | --  | 0.26 | °C/W  | $V_{DD}=V1, I_{DQ}=I_{DQ1}, PW=PW1, DF=DF1, T_F=25\pm5^\circ C, P_{OUT}=90W, N_D=50\%$ |
| 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%   | Drain-Source Breakdown Voltage | $BV_{DSS}$ | 80   | --   | V     | $I_{DS} = 20mA, V_{GS} = -8V, T_F = 25\pm5^\circ C$ |
| BD     | Drain Leakage Current          | $I_{DSS}$  | --   | 5.0  | mA    | $V_{DS} = 36V, V_{GS} = -8V, T_F = 25\pm5^\circ C$  |
| 100%   | Operating Gate Voltage         | $V_{GS}$   | -5.0 | -3.0 | V     | $V_{DS} = 36V, I_D = 0.500A, T_F = 25\pm5^\circ C$  |
| BD     | Gate Leakage Current           | $I_{GSS}$  | --   | 5.0  | mA    | $V_{GS} = -5V, V_{DS} = 40V, T_F = 25\pm5^\circ C$  |

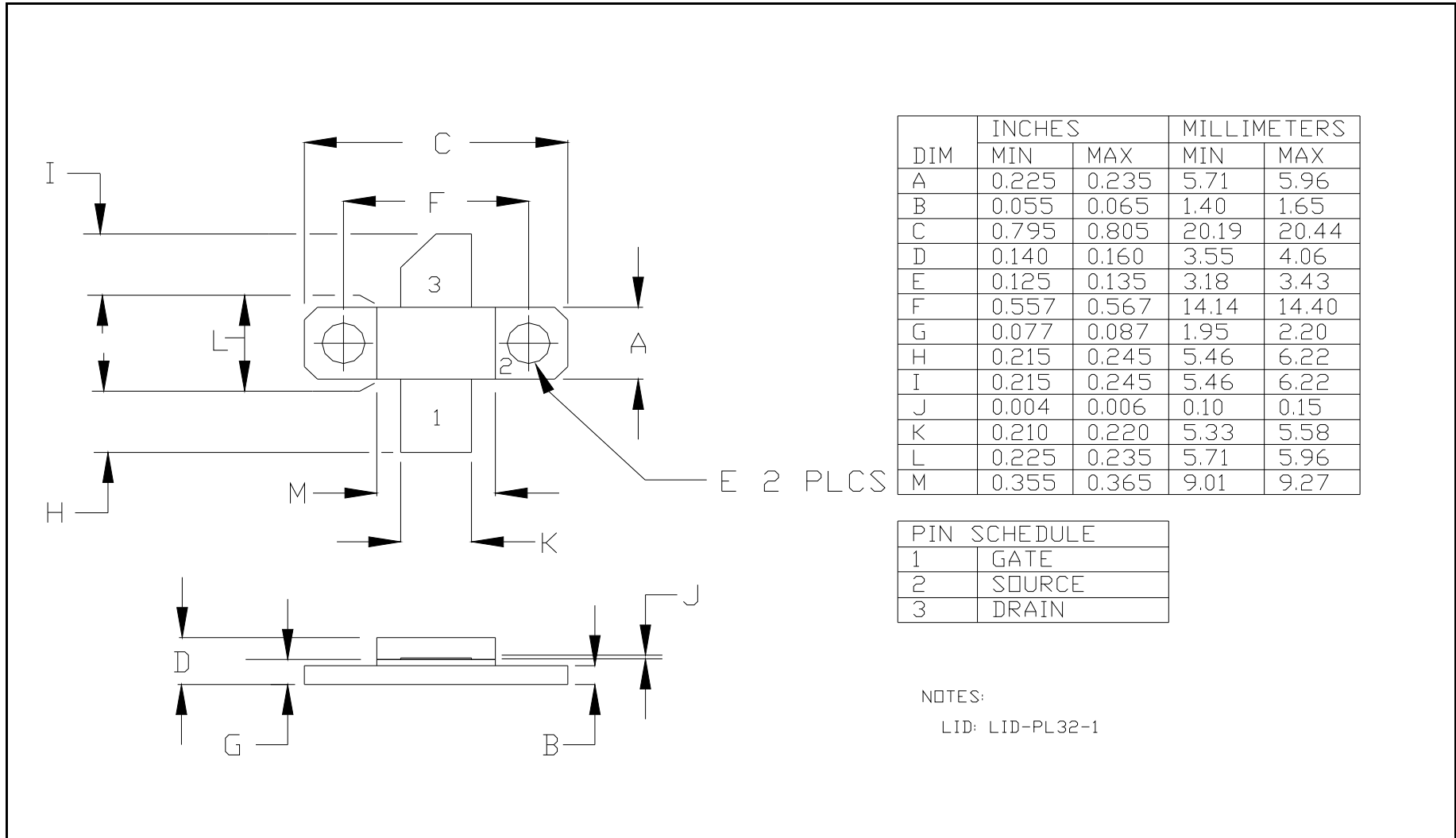
**RF ELECTRICAL CHARACTERISTICS**

| Screen | Parameter   | Symbol   | Min   | Max   | Units | Test Conditions   |
|--------|---|----------|-------|-------|-------|---|
| 100%   | Input Return Loss   | RL       | -20   | -8    | dB    | $V_{DD}=V1, I_{DQ}=I_{DQ1}, PW=PW1, DF=DF1, T_F=T_{F1}, P_{IN}=P_{IN1}, F=F1, F2, F3.$  |
| 100%   | Output Power  | $P_o$    | 90    | 143   | W     | $V_{DD}=V1, I_{DQ}=I_{DQ1}, PW=PW1, DF=DF1, T_F=T_{F1}, P_{IN}=P_{IN1}, F=F1, F2, F3.$  |
| 100%   | Drain Efficiency  | $\eta_d$ | 50    | 75    | %     | $V_{DD}=V1, I_{DQ}=I_{DQ1}, PW=PW1, DF=DF1, T_F=T_{F1}, P_{IN}=P_{IN1}, F=F1, F2, F3.$  |
| 100%   | Pulse Amplitude Droop   | Droop    | 0.5   | -0.5  | dB    | $V_{DD}=V1, I_{DQ}=I_{DQ1}, PW=PW1, DF=DF1, T_F=T_{F1}, P_{IN}=P_{IN1}, F=F1, F2, F3.$  |
| 100%   | Power Gain  | $G_p$    | 12.55 | 14.55 | dB    | $V_{DD}=V1, I_{DQ}=I_{DQ1}, PW=PW1, DF=DF1, T_F=T_{F1}, P_{IN}=P_{IN1}, F=F1, F2, F3.$  |
| 100%   | 3:1 Load Mismatch Stability                                   | VSWR-S   | S     | --    | --    | $V_{DD}=V1, I_{DQ}=I_{DQ1}, PW=PW1, DF=DF1, T_F=T_{F1}, P_{OUT}=P_{OUT1}, F=F1, F2, F3.$<br>Rotate 3:1 output VSWR through 360° phase.<br>No oscillatory or pulse break-up characteristics allowed on detected output pulse. All non-harmonically related signals must be at least -65 dBc. |
| Note 1 | $V1 = 36V; I_{DQ1} = 80mA; PW1 = 300us; DF1 = 10%$            |          |       |       |       |   |
| Note 2 | Input Power Test Levels: $P_{IN1} = 5W$                       |          |       |       |       |   |
| Note 3 | Output Power Test Levels: $P_{OUT1} = 90W$                    |          |       |       |       |   |
| Note 4 | Test Frequencies: $F1 = 4.4 GHz, F2 = 4.7 GHz, F3 = 5.0 GHz.$ |          |       |       |       |   |
| Note 5 | $T_{F1} = 25\pm5^\circ C =$ Device flange temperature.        |          |       |       |       |   |
| Note 6 | Screen 'BD' = parameter qualified By Design.                  |          |       |       |       |   |

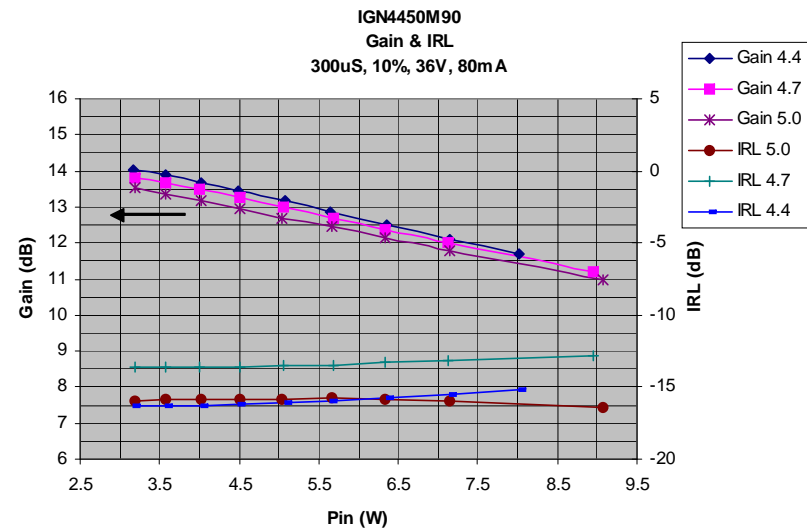
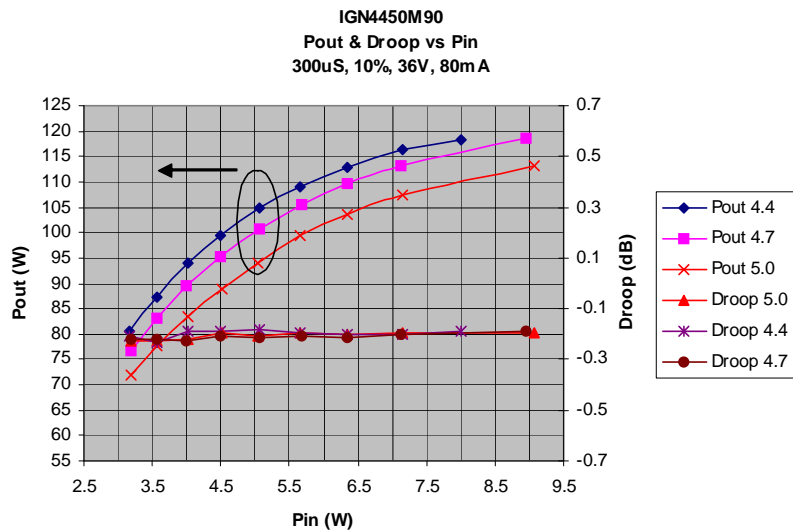
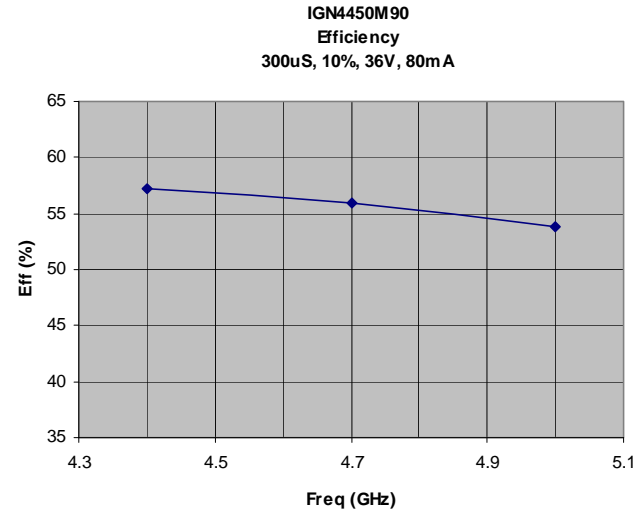
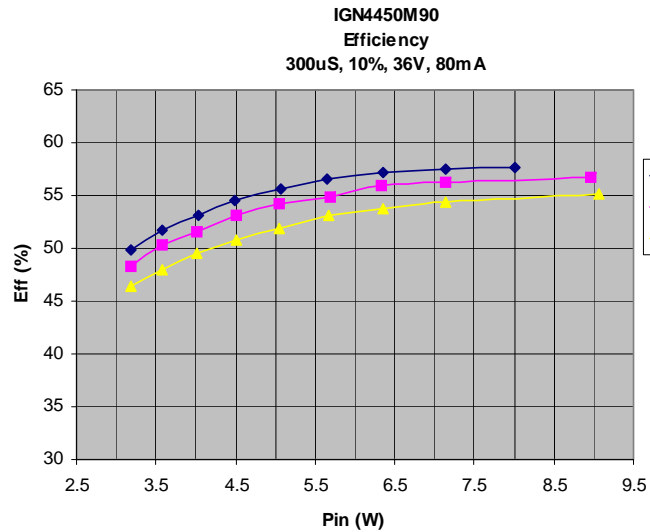
**RF TEST FIXTURE IMPEDANCE CHARACTERISTICS**

| Frequency (GHz)      | $Z_{IF} (\Omega)$  | $Z_{OF} (\Omega)$   |
|----------------------|--|---|
| 4.4                  | $4.4 - j8.6$   | $5.6 - j5.7$  |
| 4.7                  | $4.4 - j6.8$   | $5.6 - j4.5$  |
| 5.0                  | $4.4 - j5.2$   | $5.6 - j3.2$  |
| Impedance Definition |  |  |

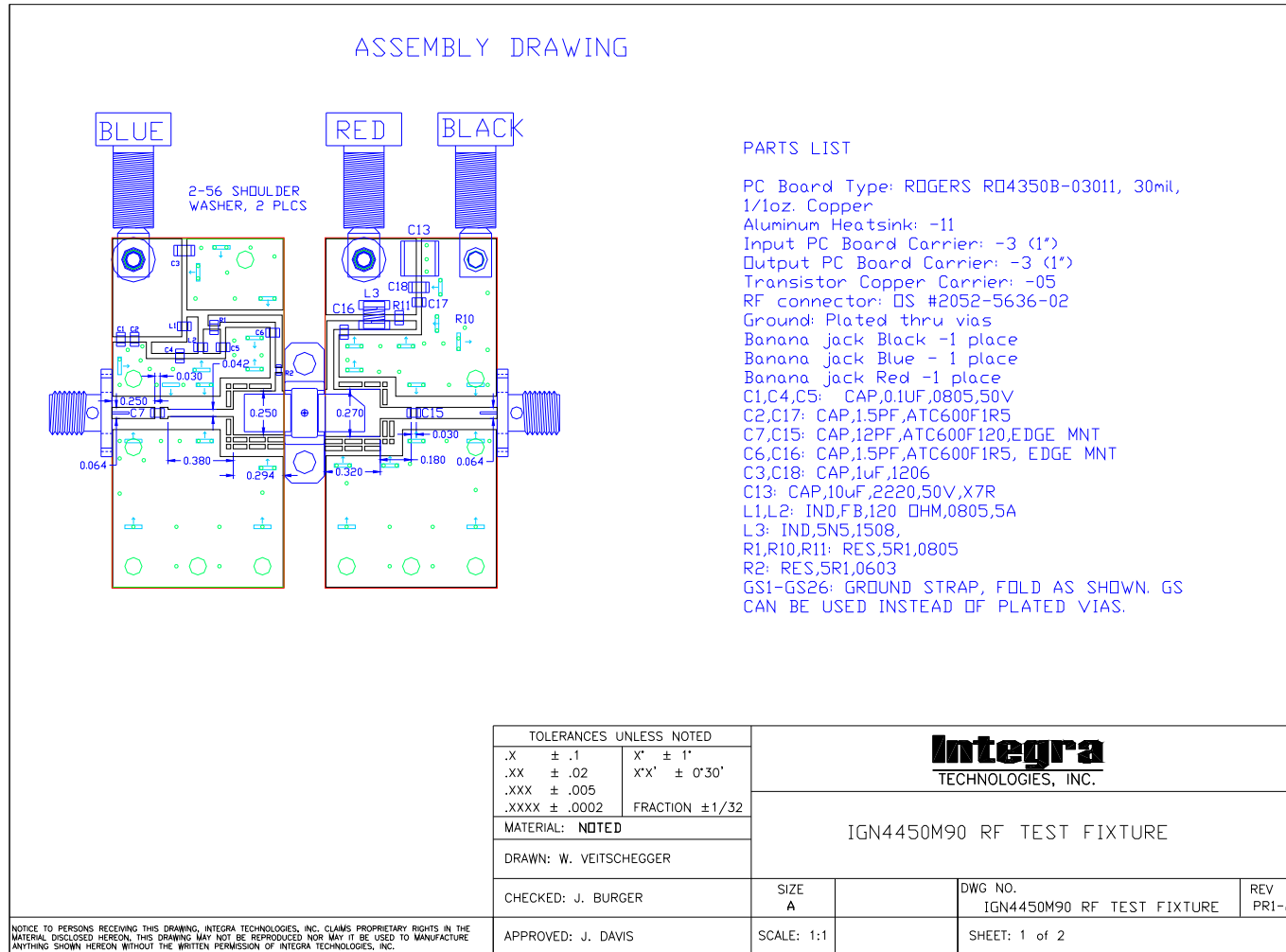
**PACKAGE DIMENSIONAL OUTLINE DRAWING**



**RF PERFORMANCE GRAPHS**



**RF TEST FIXTURE**



**CONTACT FACTORY FOR RF TEST FIXTURE CAD DRAWING WITH CIRCUIT DIMENSIONS**

<L:\Public\Controlled Documents\Controlled Drawings\RF Test Fixture Drawings\IGN4450M90 REV PR1-A.dwg>

**DEFINITIONS**

| <b>Data Sheet Status</b>   |   |
|--|---|
| 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.                              |
| <b>Maximum Ratings</b>   |   |
| Stress above one or more of the maximum ratings may cause permanent damage to the device. These are maximum ratings only 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. |   |

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