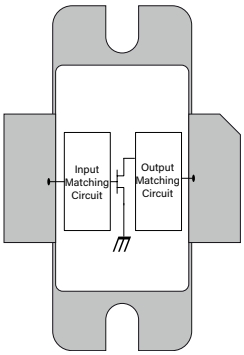
# L-Band, GaN/SiC, RF Power Transistor

**960-1220 MHz | 500 W | 65% Efficiency typ | 16.5 dB Gain typ | 50 V | Link 16**

IGN0912L500 is a high power GaN-on-SiC RF power transistors that has been designed to suit the needs of IFF/SSR avionics systems, military tactical data links, and TACAN/DME systems. It operates over the full instantaneous bandwidth of 960-1220MHz. Under Link 16 [444x (7µs on, 6µs off), 22.7% Long Term Duty Cycle] pulse conditions it supplies a minimum of 500 W of peak output power, with typically 16.5 dB of gain and 65% efficiency. It operates from a 50 V supply voltage. For optimal thermal efficiency, the transistor is housed in a metal-based package with an epoxy-sealed ceramic lid.


## FEATURES

- GaN on SiC HEMT Technology
- Output Power >500 W
- Pre-matched Input and Output Impedance
- High Efficiency - 65% typical
- 100% RF Tested Under Link 16 pulse conditions
- RoHS and REACH Compliant




## APPLICATIONS

- Link 16 applications
- TACAN/DME Systems

### Table 1. Absolute Maximum Ratings (Not Simultaneous)

| Parameter | Symbol | Value | Units | Test Conditions |
|---|---|---|---|---|
| DC Drain-Source Voltage | $V_{DS}$ | 160 | V | 25 °C |
| DC Gate-Source Voltage | $V_{GS}$ | -8 to +1 | V | 25 °C |
| DC Drain Current | $I_D$ | 48 | A | 25 °C |
| DC Gate Current | $I_G$ | 4.8 | mA | 25 °C |
| RF Input Power | $P_{RF,IN}$ | 16 | W | 25 °C |
| Operating Channel Temperature | $T_{CH}$ | -55 to +225 | °C | |
| Storage Temperature | $T_{STG}$ | -55 to +150 | °C | |
| Soldering Temperature | $T_{SOLDER}$ | 260 for 60s | °C | |

**Note: Operation outside the limits given in this table may cause permanent damage to the transistor**

### Table 2.DC Electrical Characteristics (Case temperature = 25 °C unless otherwise stated)

| Parameter | Symbol | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| Gate Pinch-Off Voltage | $V_P$ | -5 | | | V | $V_{DS}$ = 50V, $I_{DS}$ = 1mA |
| Quiescent Gate Voltage | $V_Q$ | | -2.8 | | V | $V_{DS}$ = 50V, $I_{DS}$ = 100mA |

## Table 3. RF Electrical Characteristics (Case temperature = 30 °C unless otherwise stated)

| Parameter | Symbol | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| RF Input Power | $P_{IN, RF}$ | 7.9 | 11.2 | 15.8 | W | $P_{OUT}$ = 500W<br>f = 960, 1090, 1220 MHz<br>$V_{DS}$ = 50V, $I_{DS}$ = 100mA<br>Link 16 pulse conditions (444 x [7µs on, 6µs off], LTDC = 22.7% |
| Gain | G | 15 | 16.5 | 18 | dB | |
| Drain Efficiency | η | 60 | 65 | 75 | % | |
| Input Return Loss | IRL | 7 | 12 | 20 | dB | |
| Pulse Droop | D | -0.5 | -0.2 | +0.2 | dB | |
| Load Mismatch Stability | VSWR-S | 2:1 | | | | |
| VSWR Withstand | VSWR-LMT | 3:1 | | | | |

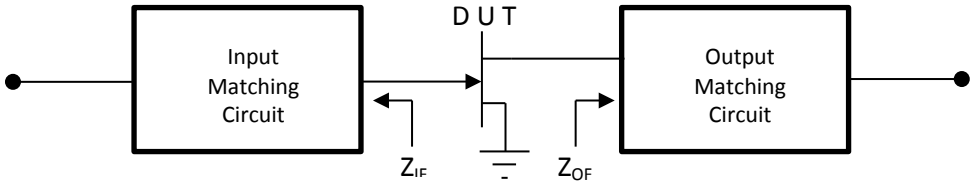
**Note: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured for the ELM and Link 16 pulse trains.**

## Table 4. Thermal Resistance (Case temperature = 85 °C unless otherwise stated)

| Parameter | Symbol | Typ | Units | Test Conditions |
|---|---|---|---|---|
| Peak Thermal Resistance, Channel to Case | $R_{TH}$ | 0.4 | °C/W | $P_{DISS}$ = 269W<br>Link 16 pulse conditions (444 x [7µs on, 6µs off], LTDC = 22.7%<br>$V_{DS}$ = 50V |

## Table 5. Test Fixture Source & Load Impedances (Case temperature = 25 °C unless otherwise stated)

| Frequency (MHz) | $Z_{IF}$ | $Z_{OF}$ | Units | Test Conditions |
|---|---|---|---|---|
| 960 | 1.4 - j 0.4 | 1.9 - j 1.8 | Ω | $P_{OUT}$ = 500W<br>Link 16 pulse conditions (444 x [7µs on, 6µs off], LTDC = 22.7%<br>$V_{DS}$ = 50V, $I_{DS}$ = 100mA |
| 1090 | 1.7 - j 0.0 | 2.0 - j 1.2 | Ω | |
| 1215 | 1.7 + j 0.15 | 2.1 - j 0.6 | Ω | |



## TYPICAL PERFORMANCE

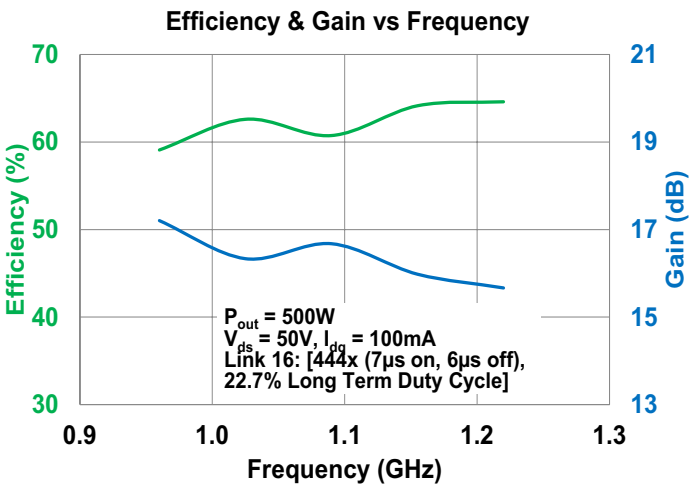



Figure1

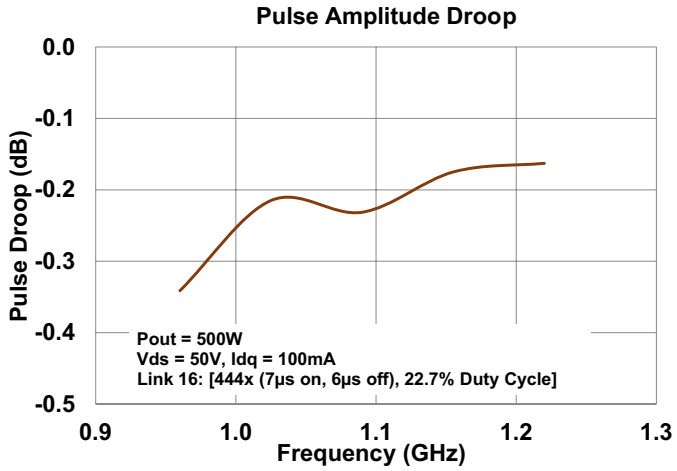



Figure 2

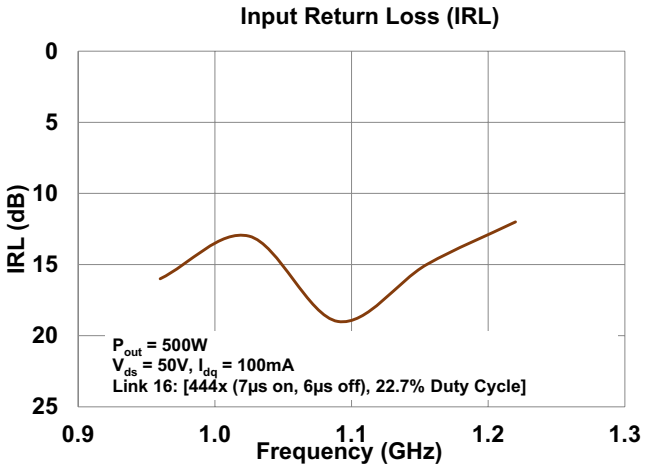
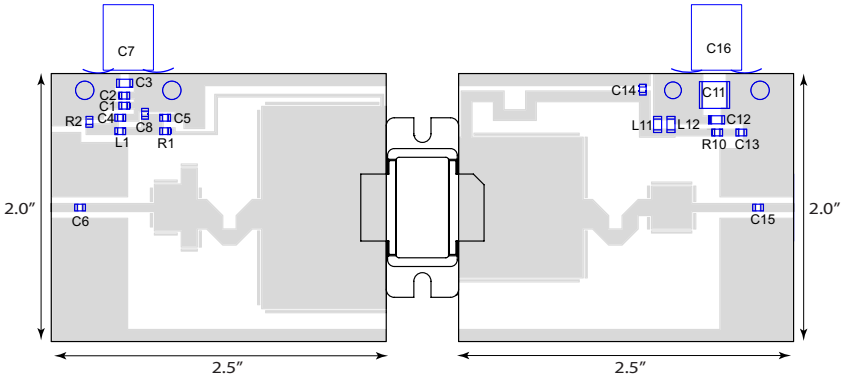



Figure 3

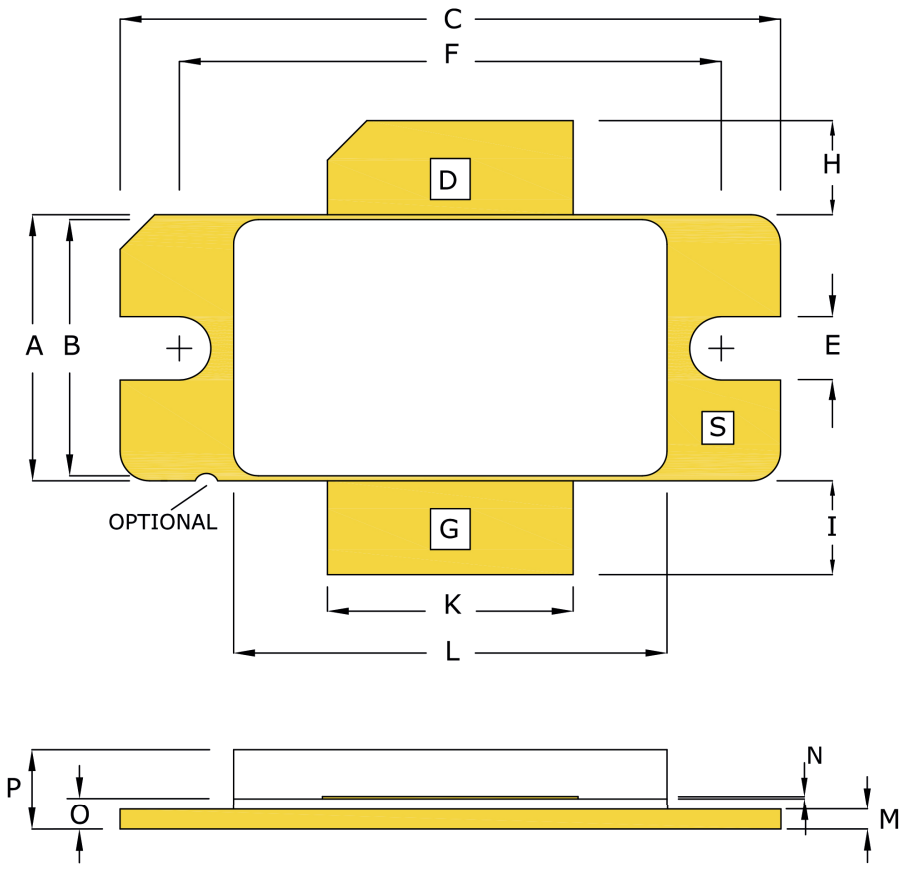
## TEST FIXTURE




### Bill of Materials for IGN0912L500 Test Fixture

| Designator | Description | Part Number |
|---|---|---|
| C1, C4, C13 | CAP 0.1µF, 0805, 100V, X7R | 08051C104K4T2A |
| C2, C5, C6, C14, C15 | CAP 33pF, 0805 | ATC600F330 |
| C3, C12 | CAP 1µF, 1206, 100V, X7R | 12061C105K4T2A |
| C7, C16 | CAP Electrolytic, 68µF, 63V (mounted external to pcb) | UPW1J680MPD |
| C8 | CAP 1000pF, 0805, 100V | 08051A102J4T2A |
| L1 | Zero Ohm Resistor | |
| L11, L12 | IND, FB, 33 OHM, 1206, 6A | BLM31PG330SN1L |
| R1, R10 | RES, 15R0, 0805 | ERJ-6ENF15R0V |
| R2 | RES, 100 OHM, 0805 | ERJ-6ENF1000V |
| PC Board Type | ROGERS RO4350B, 30mil, 1/1oz. Copper | |

## PACKAGE PL95A1




| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.537 | 0.543 | 13.64 | 13.79 |
| B | 0.515 | 0.525 | 13.08 | 13.34 |
| C | 1.337 | 1.343 | 33.96 | 34.11 |
| E | 0.123 | 0.133 | 3.12 | 3.38 |
| F | 1.095 | 1.105 | 27.81 | 28.07 |
| H | 0.175 | 0.205 | 4.45 | 5.21 |
| I | 0.175 | 0.205 | 4.45 | 5.21 |
| J | -- | -- | -- | -- |
| K | 0.495 | 0.505 | 12.57 | 12.83 |
| L | 0.871 | 0.889 | 22.12 | 22.58 |
| M | 0.036 | 0.044 | 0.91 | 1.12 |
| N | 0.003 | 0.006 | 0.08 | 0.15 |
| O | 0.059 | 0.065 | 1.50 | 1.65 |
| P | 0.154 | 0.182 | 3.91 | 4.62 |

| PIN | SCHEDULE |
|---|---|
| D | DRAIN |
| S | SOURCE |
| G | GATE |

## ESD & MSL Rating

| Parameter | Rating | Standard |
|---|---|---|
| **ESD Human Body Model (HBM)** | TBD | ESDA/JEDEC JS-001-2012 |
| **ESD Charged Device Model (CDM)** | TBD | JEDEC JESD22-C101F |
| **Moisture Sensitivty Level (MSL)** | Unlimited Shelf Life | IPC/JEDEC J-STD-020 |

## RoHS Compliance

Integra Technologies, Inc declares that its GaN and LDMOS Transistor Products comply with EU Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS2), as adopted by EU member states on January 2, 2013 and amended on March 31, 2015 by EU Directive 2015/863/EU.

## REACH Compliance

Integra Technologies supports EU Regulation number 1907/2006 concerning the Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) as these apply to Integra semiconductor products, development tools, and shipping packaging.

In support of the REACH regulation, Integra will:

- Inform customers and recipients of Integra product if they contain any substances that are of very high concern (SVHC) per the European Chemical Agency (ECHA) website.
- Notify ECHA if any Integra product that contains any SVHCs which exceed guidelines for REACH chemicals by weight per part number and for total content weight per year for all products produced in or imported to the European market.
- Cease shipments of product containing REACH Annex XIV substances until authorization has been obtained.
- Cease shipment of product containing REACH Annex XVII chemicals when restrictions apply.

Integra has evaluated its materials, BOMs, and product specifications and product and has determined that this transistor conforms to all REACH and SVHC regulations and guidelines. Integra has implemented actions and control programs that will assure continued compliance.

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**MAXIMUM RATINGS** 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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