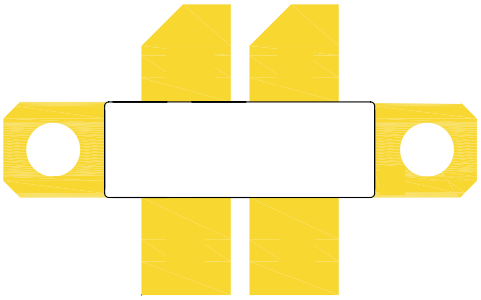
# VHF/UHF-Band, GaN/SiC, RF Power Transistor

**30 - 512 MHz | 500W typ | 60% Efficiency typ | 20 dB Gain typ | 50 V | 1ms Pulse Length, 10% Duty Cycle**

IGN131 is a high power GaN-on-SiC RF power transistor that has been designed to suit the unique needs of VHF/UHF systems. It operates over the full 30 - 512 MHz frequency range. Under 1ms, 10% duty cycle pulse conditions, it supplies typically > 400 W of peak output power. 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 >400W
- High Efficiency - up to 60%
- 100% RF Tested Under 1ms, 10% duty cycle pulse conditions
- RoHS and REACH Compliant

## APPLICATIONS

- VHF/UHF Applications

### Table 1. RF Electrical Characteristics in Standard Test Fixture (Case temperature = 30 °C unless otherwise stated)

| Parameter | Symbol | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| **Gain** | G | | 21 | | dB | $P_{OUT}$ = 400W |
| **Drain Efficiency** | η | | 52 | | % | f = 250 MHz |
| **Pulse Droop** | D | | -0.25 | | dB | 1ms pulse length, 10% duty cycle |
| **Load Mismatch Stability** | VSWR-S | | 2:1 | | | |
| **VSWR Withstand** | VSWR-LMT | | 5:1 | | | $V_{DS}$ = 50V, $I_{DS}$ = 50mA per side |

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

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

| Parameter | Symbol | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| **Gate Pinch-Off Voltage** | $V_P$ | -5.0 | | | V | $V_{DS}$ = 50V, $I_{DS}$ = 1mA per side |
| **Quiescent Gate Voltage** | $V_Q$ | | -2.8 | | V | $V_{DS}$ = 50V, $I_{DS}$ = 50mA per side |

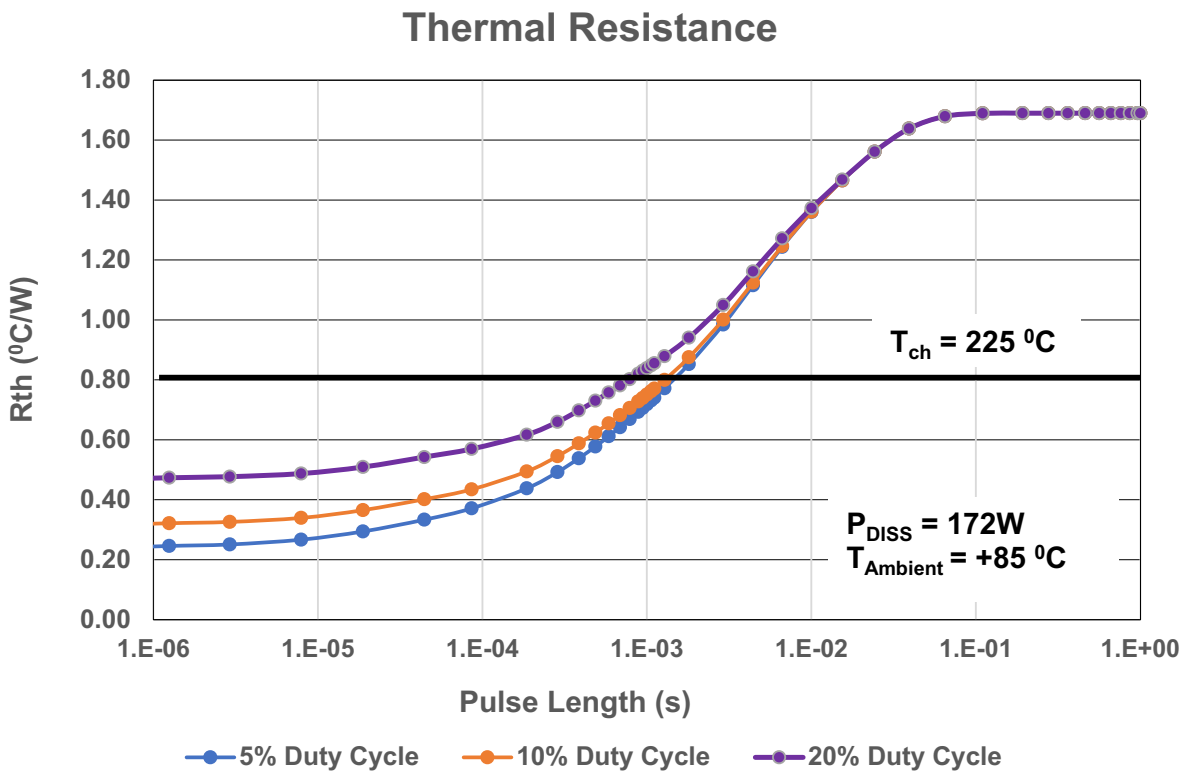
### Table 3. Absolute Maximum Ratings (Not Simultaneous)

| Parameter | Symbol | Value | Units | Test Conditions |
|---|---|---|---|---|
| DC Drain-Source Voltage | $V_{DS}$ | 150 | V | 25 °C |
| DC Gate-Source Voltage | $V_{GS}$ | -8 to +1.0 | V | 25 °C |
| DC Drain Current per side | $I_D$ | 24 | A | 25 °C |
| DC Gate Current per side | $I_G$ | 2.4 | mA | 25 °C |
| RF Input Power | $P_{RF,IN}$ | 12 | W | 25 °C |
| Operating Channel Temperature | $T_{CH}$ | -55 to +225 | °C | |
| Storage Temperature | $T_{STG}$ | -62 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 4. Thermal Resistance (Case temperature = 85 °C unless otherwise stated)

| Parameter | Symbol | Typ | Test Conditions |
|---|---|---|---|
| Peak Thermal Resistance per side, Channel to Case | $R_{TH}$ | 0.7 | $P_{DISS}$ = 184W per side<br>1ms pulse length, 10% duty cycle<br>$V_{DS}$ = 50V |
| | | 1.7 | $P_{DISS}$ = 106W per side<br>CW<br>$V_{DS}$ = 38V<br>Case temperature 30 °C |



## TYPICAL PERFORMANCE IN A BROADBAND TEST FIXTURE

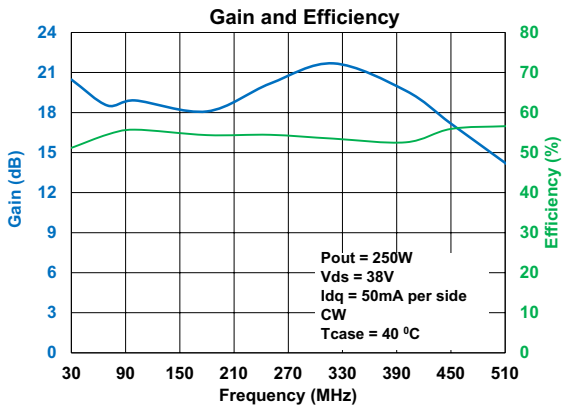



Figure 1

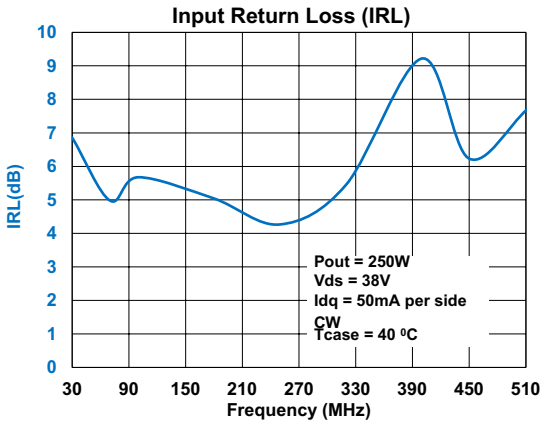



Figure 2

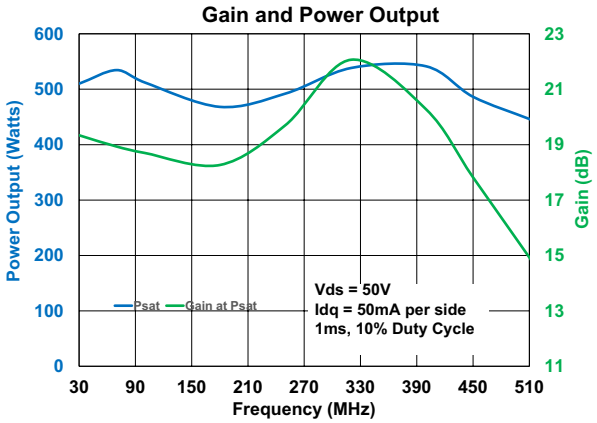



Figure 3

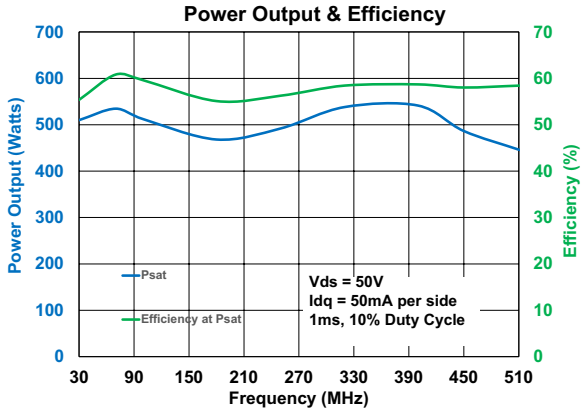



Figure 4

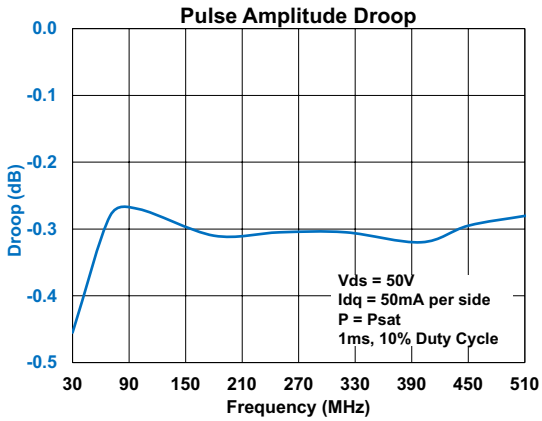



Figure 5

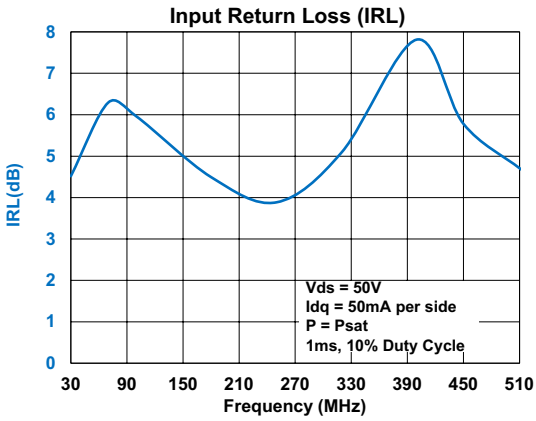



Figure 6

## TYPICAL PERFORMANCE IN A BROADBAND TEST FIXTURE

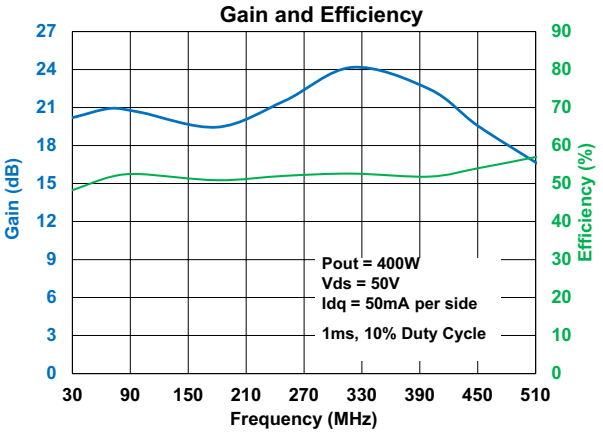



Figure 7

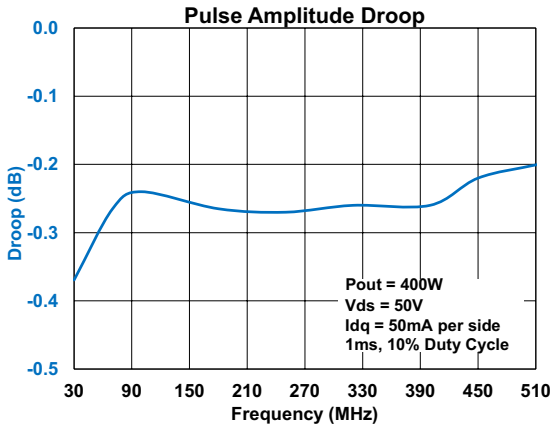



Figure 8

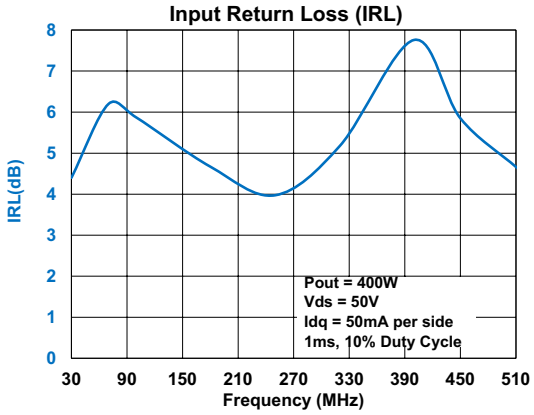
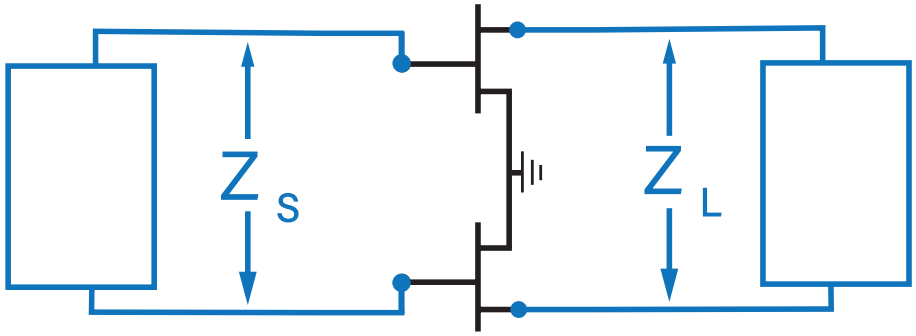



Figure 9

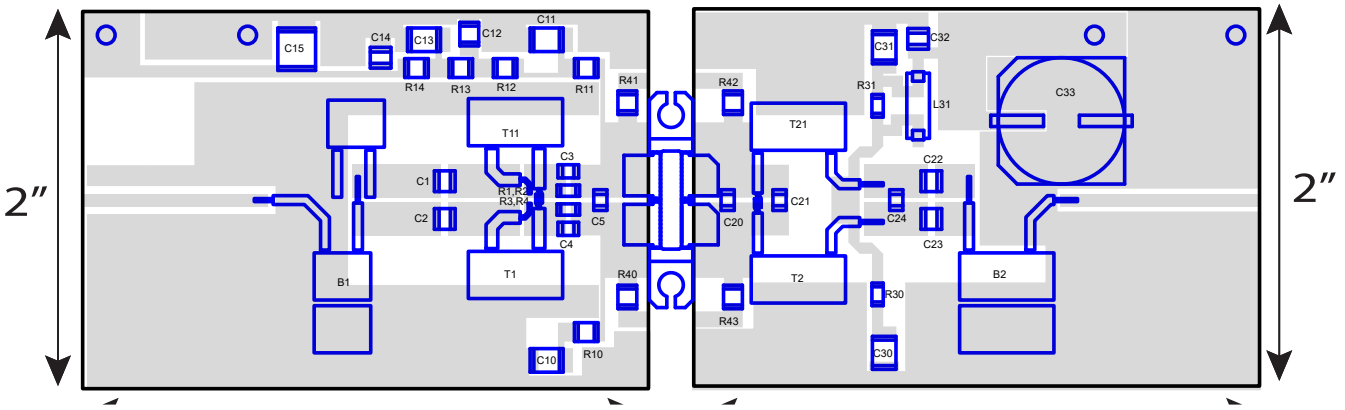
### Table 5. Test Fixture Impedances (Case temperature = 25 °C unless otherwise stated)

| Frequency (MHz) | $Z_S$ | $Z_L$ | Units | Test Conditions |
|---|---|---|---|---|
| **30** | 16.8 - j 3.1 | 14.2 + j 2.0 | Ω | $P_{OUT} = P_{sat}$<br>$V_{DS}$ = 50V, $I_{DS}$ = 50mA per side |
| **70** | 13.9 - j 4.7 | 14.7 + j 0.6 | Ω | |
| **100** | 11.7 - j 4.8 | 14.6 - j0.1 | Ω | |
| **180** | 7.7 - j 2.4 | 13.6 - j 1.0 | Ω | |
| **250** | 6.4 + j 0.6 | 12.5 - j 0.9 | Ω | |
| **320** | 6.3 + j 3.8 | 11.5 - j 0.1 | Ω | |
| **400** | 7.5 + j 7.2 | 10.8 + j 1.3 | Ω | |
| **450** | 8.9 + j 9.2 | 10.6 + j 2.2 | Ω | |
| **512** | 11.6 + j 11.5 | 10.7 + j 3.6 | Ω | |

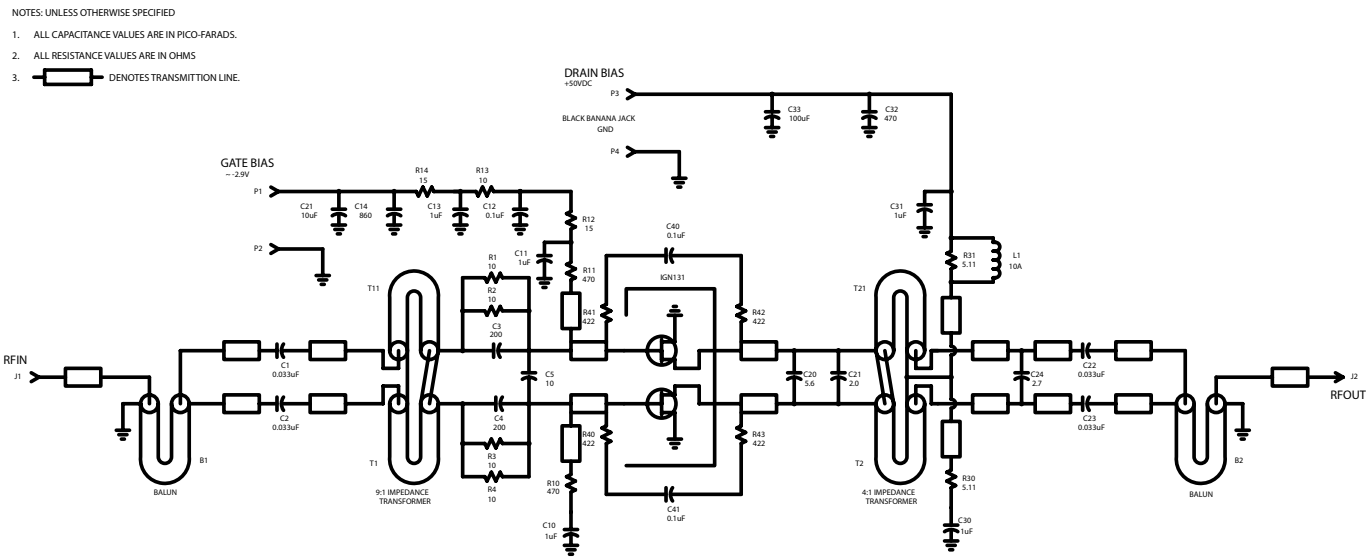
**Note: Source and load impedances are terminal to terminal.**



## TEST FIXTURE



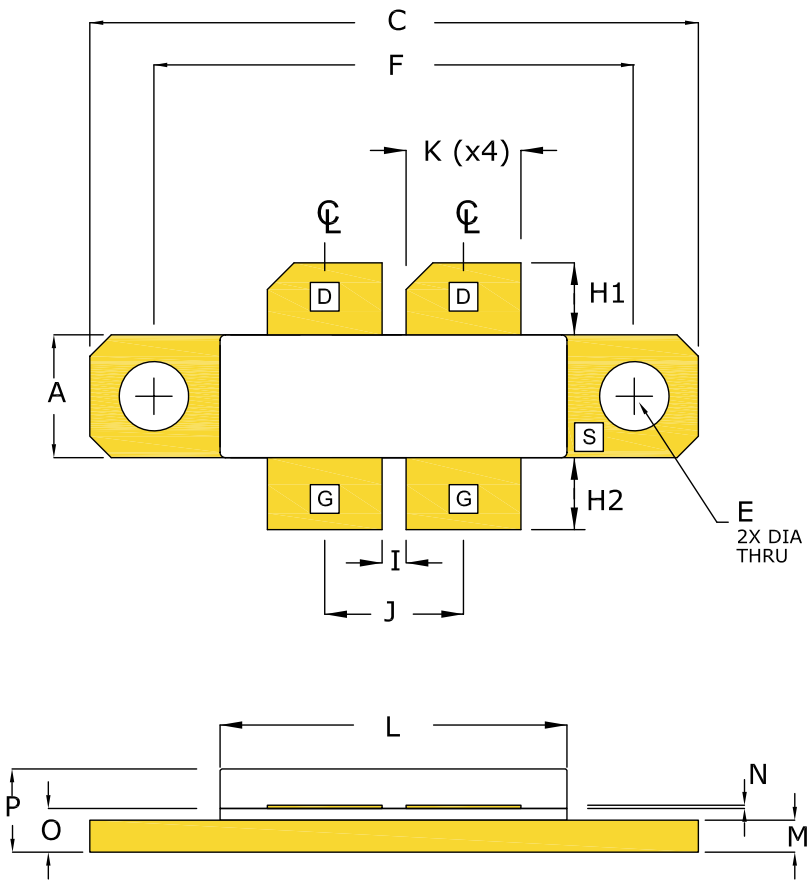

## SCHEMATIC



## Bill of Materials for IGN131 Test Fixture

| | |
|---|---|
| C1, C2, C22, C23: | CAP, C1812C333KCRACTU, 0.033µF, 500V, X7R, 1812 |
| C3, C4: | CAP, ATC800B201CT500X, 200PF, 250V, ATC800B |
| C5: | CAP, ATC800B100JT500XT1K, 10PF, 250V, ATC800B |
| C10, C11, C13, C30, C31 | CAP, C1812X105K1RACTU, 1uF, X7R, 100V, 1812 |
| C12: | CAP, C1210C104K1RACTU, 0.1uF, X7R, 100V, 1210 |
| C14: | CAP, ATC800B861JT200X, 860pF, ATC800B |
| C15: | CAP, C2220X106K5RACTU, 10uF 50V X7R, 2220 |
| C20: | CAP, ATC800B5R6CT500X, 5.6pF, ATC800B |
| C21: | CAP, ATC800B2R0CT500X, 2.0pF, ATC800B |
| C24: | CAP, ATC800B2R7CT500X, 2.7pF, ATC800B |
| C32: | CAP, ATC800B471JT200X, 470pF, ATC800B |
| C33: | CAP, EEV-FK2A101M, ALUM, 100uF, 100V |
| | |
| L31: | FERR, 28F0181-1SR-10, 115 OHM, 10 AMP, SMT, 1LN |
| R1, R2, R3, R4: | RES, ERJ-6GEYJ100V, 10 OHM, 1/8W, 0805 |
| | |
| R10, R11: | RES, ERJ-6GEYJ471V, 470 OHM, 1/8W, 0805 |
| R12, R14: | RES, CRCW121015R0JNEA, 15 OHM, 1/2W, 1210 |
| R13: | RES, CRCW121010R0FKEA, 10 OHM, 1/2W, 1210 |
| R30, R31: | RES, RC1206FR-075R11L, 5.11 OHM, 1/4W, 1206 |
| R40, R41, R42, R43: | RES, CRCW1210422RFKEA, 422 OHM, 1/2W, 1210 |
| | |
| PC Board | RO4350-03011, 30mil, 1/1oz. Copper |

## PACKAGE PL22D1




| DIM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 0.225 | 0.235 | 5.72 | 5.97 |
| B | -- | -- | -- | -- |
| C | 1.135 | 1.145 | 28.83 | 29.08 |
| E | 0.125 | 0.135 | 3.18 | 3.43 |
| F | 0.895 | 0.905 | 22.73 | 22.99 |
| H1 | 0.115 | 0.155 | 2.92 | 3.94 |
| H2 | 0.115 | 0.155 | 2.92 | 3.94 |
| I | 0.040 | 0.050 | 1.02 | 1.27 |
| J | 0.225 | 0.235 | 5.72 | 5.97 |
| K | 0.210 | 0.220 | 5.33 | 5.59 |
| L | 0.638 | 0.650 | 16.21 | 16.51 |
| M | 0.055 | 0.065 | 1.40 | 1.65 |
| N | 0.003 | 0.006 | 0.10 | 0.18 |
| O | 0.077 | 0.087 | 1.96 | 2.21 |
| P | 0.149 | 0.178 | 3.78 | 4.52 |

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

## DIMENSIONS

## 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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