

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

1030 and 1090 MHz | 25 W typ | 55% Efficiency typ | 19 dB Gain typ | 50 V | Mode S ELM & Standard Pulse Conditions

IGN1011L20-PB and IGN1011L20-SP are high power GaN-on-SiC RF power transistors that have been designed to suit the needs of IFF/SSR avionics systems. They operate over the full instantaneous bandwidth of 1030-1090MHz. IGN1011L20-PB under ELM Mode S [48x (32µs on, 18µs off), 6.4% Long Term Duty Cycle] pulse conditions and IGN1011L20-SP under standard pulse conditions [128µs, 2% Duty Cycle] both supply a minimum of 20W of peak output power, with typically >19 dB of gain and 55% efficiency. They operate from a 50 V supply voltage. For optimal thermal efficiency, the transistors are housed in a metal-based package with an epoxy-sealed ceramic lid.

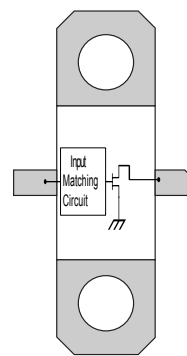


## FEATURES

- GaN on SiC HEMT Technology
- Output Power >20 W
- Pre-matched Input Impedance
- High Efficiency - 55% typical
- 100% RF Tested Under Mode S ELM (IGN1011L20-PB) or standard pulse conditions (IGN1011L20-SP)
- RoHS and REACH Compliant

## APPLICATIONS

- L-band Avionics IFF & SSR Systems - Suitable for both uplink and downlink (Transponder)



**Table 1. RF Electrical Characteristics using Test Fixture on page 3 (Case temperature = 25 °C unless otherwise stated). Performance is similar with Test Fixture on page 4.**

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
RF Output Power	$P_{out}$		25		W	$P_{in} = 0.35W$ $f = 1030, 1090 \text{ MHz}$ $V_{DS} = 50V, I_{DS} = 20mA$ <b>IGN1011L20-PB:</b> Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4% <b>IGN1011L20-SP:</b> 128µs, 2% Duty Cycle
Gain	G		19		dB	
Drain Efficiency	$\eta$		55		%	
Input Return Loss	IRL		13		dB	
Pulse Droop	D		-0.1		dB	
Load Mismatch Stability	VSWR-S	2:1				
VSWR Withstand	VSWR-LMT	5:1				

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

**Table 2. 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	$I_D$	1.8	A	25 °C
DC Gate Current	$I_G$	0.36	mA	25 °C
RF Input Power	$P_{RFIN}$	0.63	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 3. DC Electrical Characteristics (Case temperature = 25 °C unless otherwise stated)**

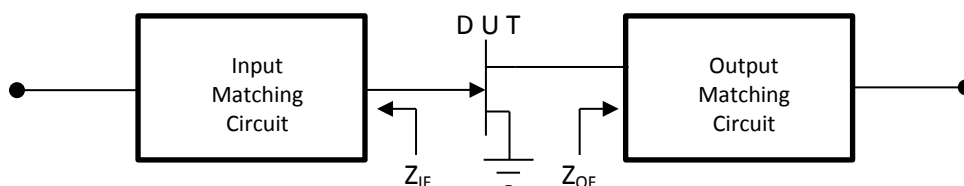
Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Gate Pinch-Off Voltage	$V_P$	-5			V	$V_{DS} = 50V, I_{DS} = 1mA$
Quiescent Gate Voltage	$V_Q$		-2.6		V	$V_{DS} = 50V, I_{DS} = 20mA$

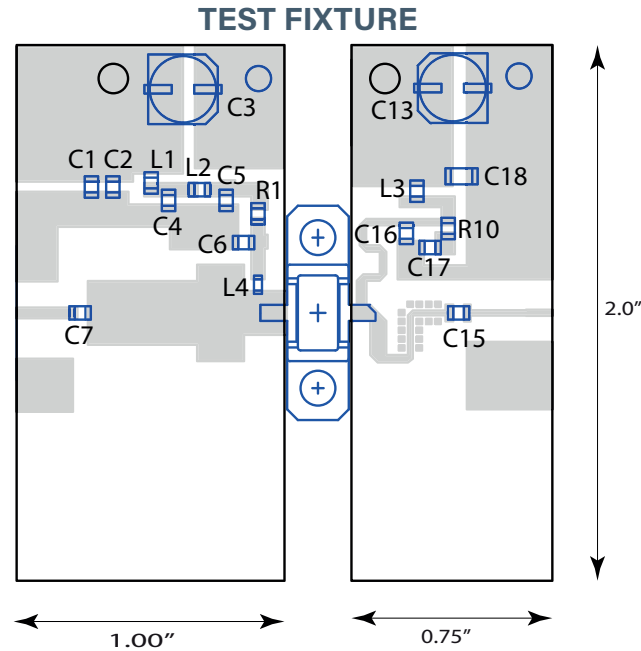
**Table 4. Thermal Resistance (Case temperature = 85 °C unless otherwise stated)**

Parameter	Symbol	Typ	Units	Test Conditions
Peak Thermal Resistance, Channel to Case	$R_{TH}$	7	°C/W	$P_{DISS} = 20.5W$ Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4%. $V_{DS} = 50V$
		5.5		$P_{DISS} = 20.5W$ 128µs, 2% Duty Cycle $V_{DS} = 50V$

**Table 5. Test Fixture Source & Load Impedances for Test Fixture on page 3 (Case temperature = 25 °C unless otherwise stated). Impedances are similar for Test Fixture on page 4.**

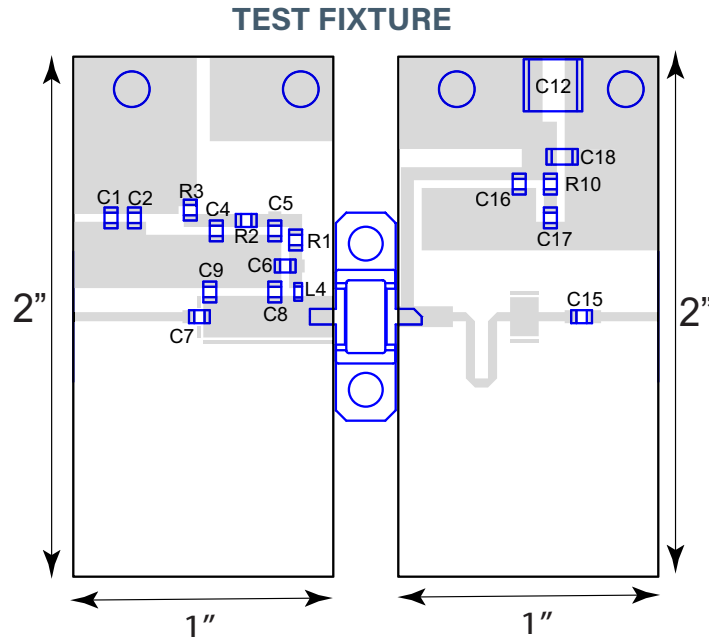
Frequency (MHz)	$Z_{IF}$	$Z_{OF}$	Units	Test Conditions
1030	1.8 - j1.0	24.0 + j13.8	$\Omega$	$P_{IN} = 0.35W$ Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4% $V_{DS} = 50V, I_{DS} = 20mA$
1090	1.8 - j0.4	27.2 + j11.6	$\Omega$	





**Bill of Materials for IGN1011L20 Test Fixture Rogers 6010 Material**

Designator	Description	Quantity	Part Number
C1, C4, C17	CAP 0.1 $\mu$ F, 0805, 50V, X7R	3	C0805C104K5RACTU
C2, C5	CAP 1000PF, 0805, NPO	2	C0805C102M5RACTU
C3	CAP 68 $\mu$ F, 63V Electrolytic	1	UPJ1J680MPD6TD
C6, C15, C16	CAP 18pF, Edge Mount	3	600F180JT250XT
C7	CAP 9.1pF, 0805	1	600F9R1BT250XT
C13	CAP 68 $\mu$ F, 8X10, 63V, Electrolytic	1	EEE-FK1J680P
C18	CAP, 1 $\mu$ F, 1206, 50V	1	C1206C105K5RACTU
L1, L2, L3	IND, FB, 120 OHM, 0805, 5A	3	ILHB0805ER121V
L4	IND, 120nH, 0603	1	0603HP-R12XJE
R1, R10	RES 5.1 OHM, 5%, 1/8W, 0805	2	ERJ-6GEYJ5R1V
PC Board Type	ROGERS 6010, 25mil, 1/1oz Copper	2	



**Bill of Materials for IGN1011L20 Test Fixture Rogers 6006 Material**

Designator	Description	Quantity	Part Number
C1, C4, C17	CAP 0.1 $\mu$ F, 0805, 100V, X7R	3	08051C104K4T2A
C2, C5	CAP 1000PF, 0805, 100V	2	08051A102J4T2A
C6, C7, C15, C16	CAP 33pF	4	ATC600J330
C8	CAP 6.8pF, 0805	1	ATC600F6R8
C9	CAP 4.7pF, 0805	1	ATC600F4R7
C12	CAP 10 $\mu$ F, 2220, 100V, X7R	1	22201C106MAT2A
C18	CAP 1 $\mu$ F, 1206, 100V, X7R	1	12061C105K4T2A
L4	IND, 120nH, 0603	1	0603HP-R12XJB
R1, R2, R10	RES 5.1 OHM, 5%, 1/8W, 0805	3	ERJ-6GEYJ5R1V
R3	RES 200 OHM, 1%, 1/8W, 0805	1	ERJ-6ENF2000V
PC Board Type	ROGERS 6006, 25mil, 1/1oz Copper	2	

TYPICAL PERFORMANCE

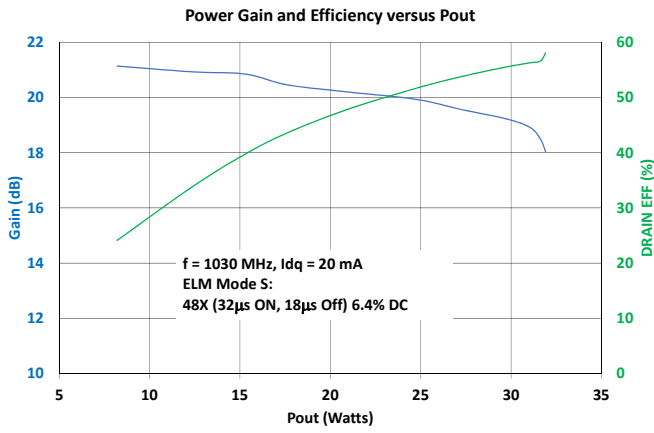


Figure 1

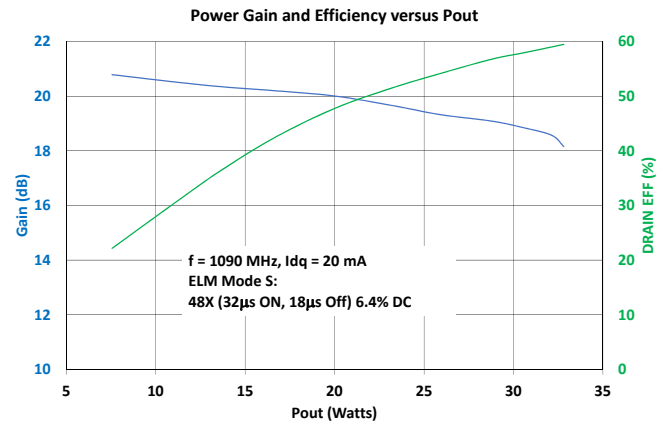


Figure 2

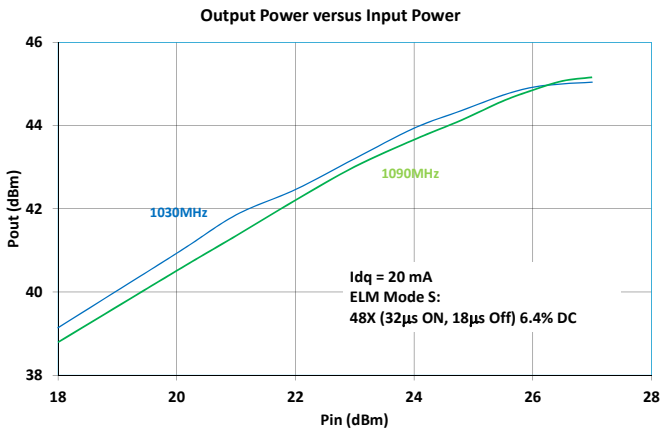


Figure 3

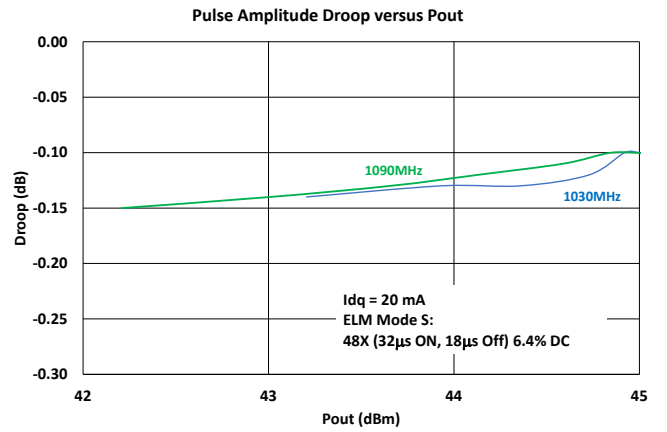
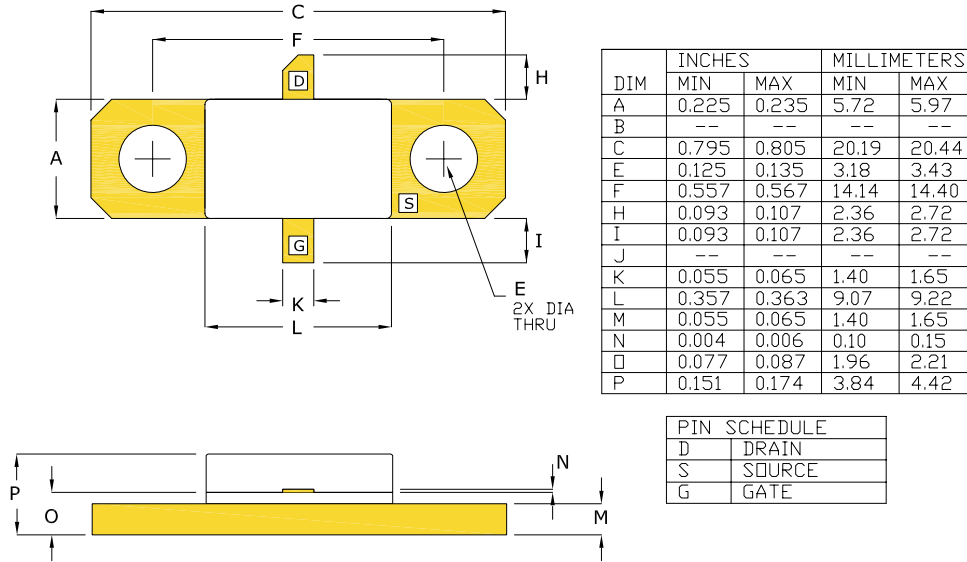
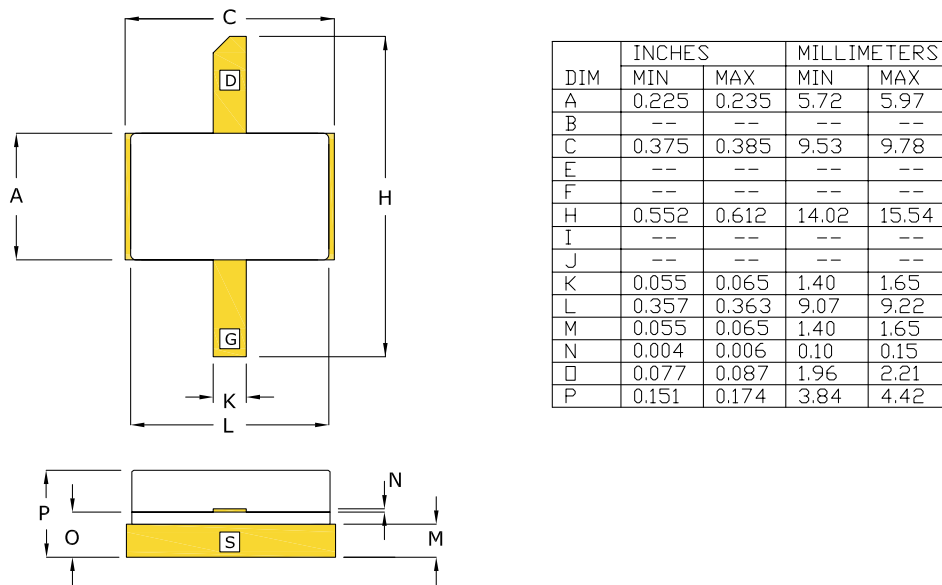


Figure 4

**PACKAGE PL32A2**



**BOLT-DOWN FLANGE OPTION  
IGN1011L20**



**EARLESS FLANGE OPTION  
IGN1011L20S**

### 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 Sensitivity 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.

### Disclaimer

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**DEFINITIONS:**

**DATA SHEET STATUS**

Advanced Specification - This data sheet contains Advanced specifications.

Preliminary Specification - This data sheet contains specifications based on preliminary measurements and data.

Final 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 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.