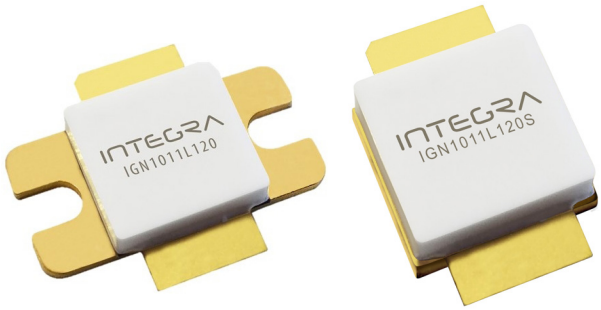
INTEGRA
RF POWER DEVICES

L-Band, GaN/SiC, RF Power Transistor

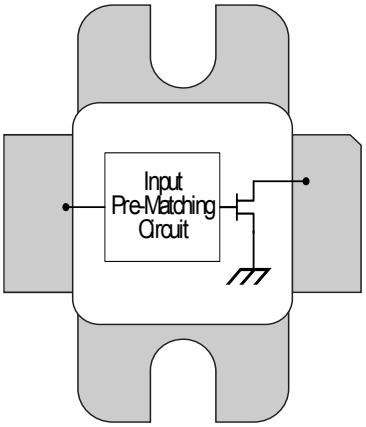
1030 and 1090 MHz | 200 W typ | 70% Efficiency typ | 20 dB Gain typ | 50 V | Mode S ELM

IGN1011L120 and IGN1011L120S are high power GaN-on-SiC RF power transistors that have been designed to suit the unique needs of IFF/SSR avionics systems. They operate at both 1030 and 1090 MHz. Under ELM Mode S [48x (32µs on, 18µs off), 6.4% Long Term Duty Cycle] pulse conditions, they supply a minimum of 120 W of peak output power, with typically >20 dB of gain and 70% 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 >120 W
- Pre-matched Input Impedance
- High Efficiency - up to 70% during the RF pulse
- 30:1 VSWR Withstand Capability
- 100% RF Tested
- RoHS and REACH Compliant



APPLICATIONS

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

Table 1. Absolute Maximum Ratings (Not Simultaneous)

Parameter	Symbol	Value	Units	Test Conditions
DC Drain-Source Voltage	V_{DS}	150	V	25 ºC
DC Gate-Source Voltage	V_{GS}	-8 to +1.0	V	25 ºC
DC Drain Current	I_D	12	A	25 ºC
DC Gate Current	I_G	12	mA	25 ºC
RF Input Power	$P_{RF,IN}$	40	W	25 ºC
Operating Channel Temperature	T_{CH}	-55 to +225	ºC	
Storage Temperature	T_{STG}	-55 to +150	ºC	
Soldering Temperature	T_{SOLDER}	260 for 60s	ºC	

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

Table 2. DC Electrical Characteristics (Case temperature = 25 ºC 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
Quiescent Gate Voltage	V_Q		-2.8		V	V_{DS} = 50V, I_{DS} = 25mA

Table 3. RF Electrical Characteristics 100% Tested in Production (Case temperature = 30 °C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
RF Output Power	$P_{OUT, RF}$	120	170	225	W	P_{IN} = 2W f = 1030, 1090 MHz Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4% V_{DS} = 50V, I_{DS} = 25mA
Gain	G	17.8	19.3	20.5	dB	
Drain Efficiency	η	50	60	75	%	
Pulse Droop	D	-0.4	-0.25	+0.2	dB	
Input Return Loss	IRL	7	12	25	dB	
Load Mismatch Stability	VSWR-S	2:1				

Note 1: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured.
Note 2: Data in Table 3 is obtained in the Reference Test Fixture.

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

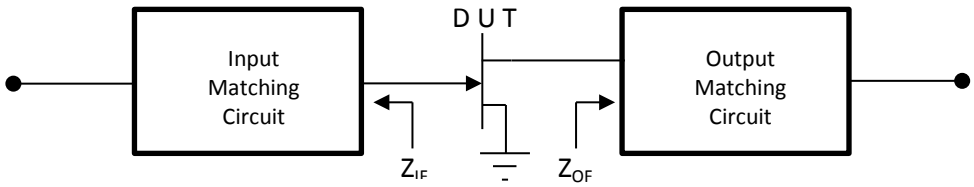
Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Peak Thermal Resistance, Channel to Case	R_{TH}			1.2	°C/W	P_{OUT} = 80W Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4% V_{DS} = 50V

Table 5. VSWR Withstand (Case temperature = 30 °C unless otherwise stated)

Parameter	Min	Typ	Test Conditions
VSWR Withstand	VSWR-LMT	30:1	P_{OUT} = 120W f = 1030, 1090 MHz Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4%. V_{DS} = 50V, I_{DS} = 160mA

Table 5. Optimum Source & Load Impedances (Case temperature = 25 °C unless otherwise stated6

Frequency (MHz)	Z_{IF}	Z_{OF}	Units	Test Conditions
1030	3.1 - j 2.6	5.0 + j 0.9	Ω	P_{OUT} = 120W f = 1030, 1090 MHz Mode S ELM pulse conditions (48 x [32µs on, 18µs off]), LTDC = 6.4% V_{DS} = 50V, I_{DS} = 25mA
1090	3.0 - j 1.9	5.1 + j 0.85	Ω	



TYPICAL PERFORMANCE

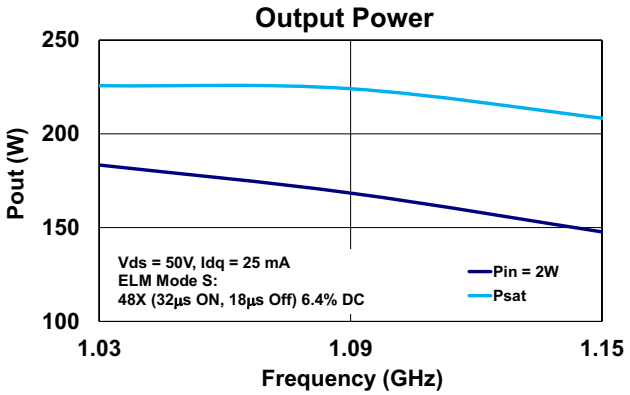


Figure 1

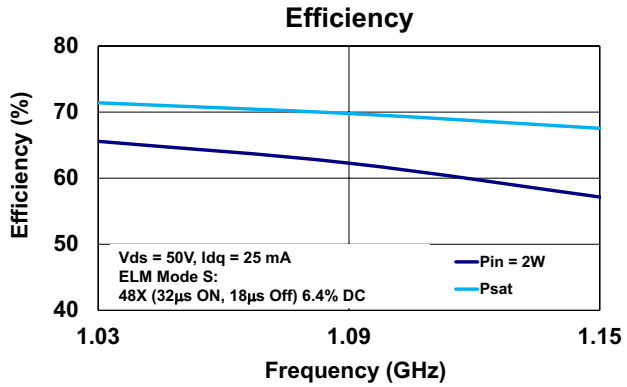


Figure 2

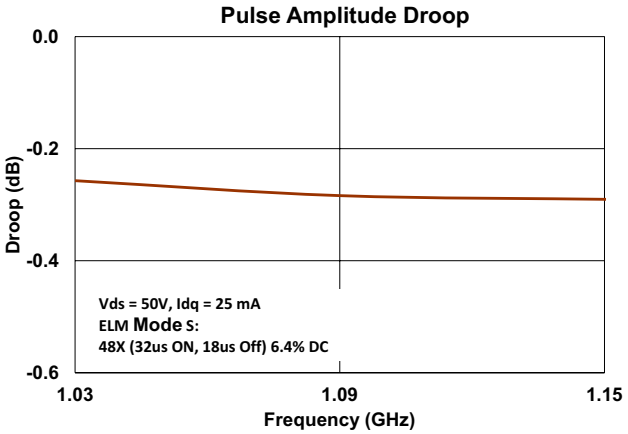


Figure 3

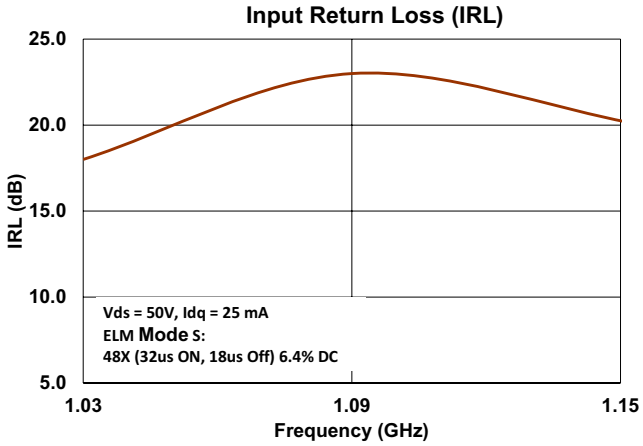
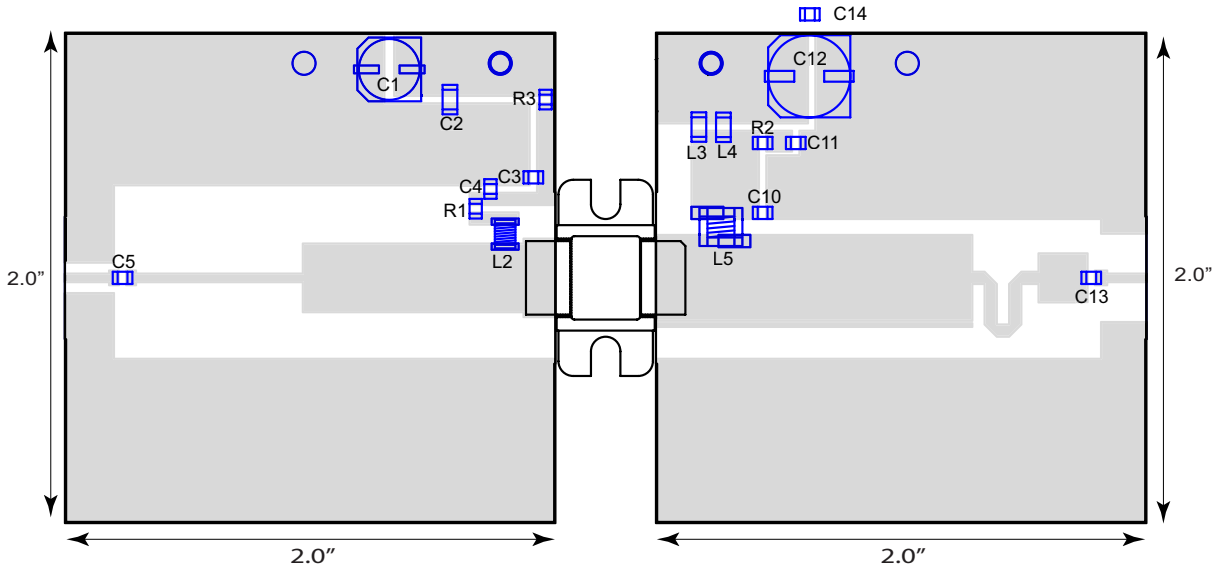


Figure 4

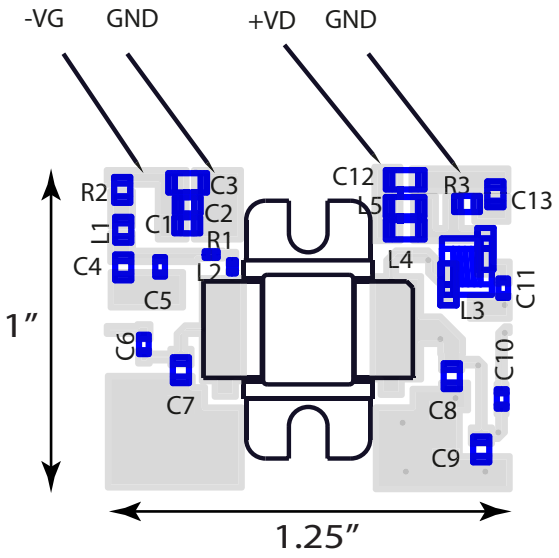
REFERENCE TEST FIXTURE



Bill of Materials for IGN1011L120 Test Fixture

Designator	Description	Part Number
C1	CAP 47µF, 25V, Electrolytic	
C2	CAP 1µF, 100V, 1206	
C3,C11	CAP 0.1µF, 50V, 0805	
C4, C10	CAP 33pF, 0805	ATC600F330
C5, C13	CAP 33pF, 0805, Edge Mount	ATC600F330
C12	CAP 68µF, 63V, Electrolytic	
C14	CAP 4700µF, 63V, Electrolytic	
L2	IND, 27.3nH, 0908	
L3, L4	IND, FB, 33 OHM, 1206, 6A	BLM31PG330SN1L
L5	IND, 18.5nH	
R1, R2	RES, 10 OHM, 0805	
R3	RES, 390 OHM, 0805	
PC Board Type	ROGERS RT6006, 25mil, 1/1oz. Copper	

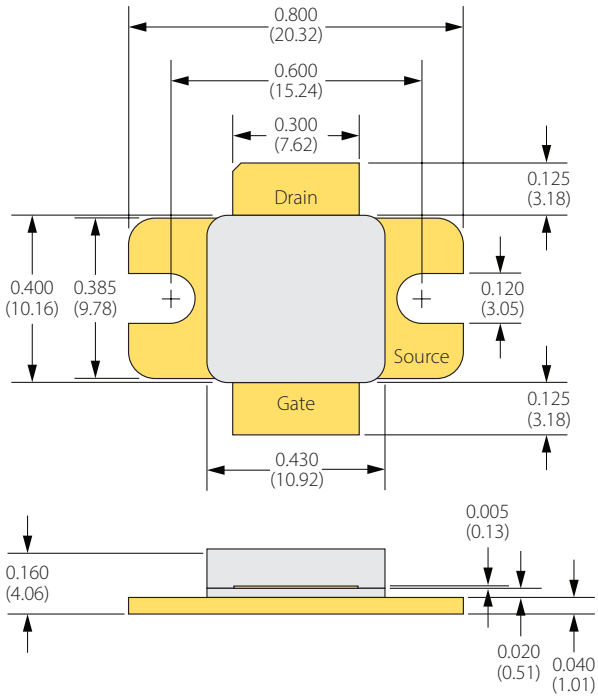
MINIATURIZED TEST FIXTURE



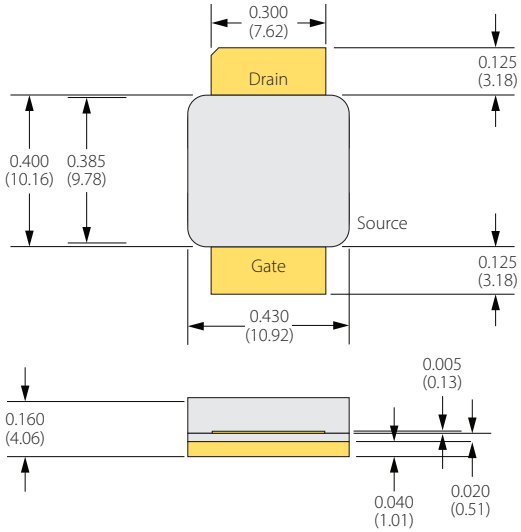
Bill of Materials for IGN1011L120 Miniaturized Test Fixture

Designator	Description
C1, C13	CAP 0.1µF, 100V, 0805
C2	CAP 10pF, 250V, 0805
C3,C12	CAP 1µF, 100V, 1206
C4	CAP 1000pF, 50V, X7R, 0805
C5, C10	CAP 39pF, 250V, 0603, Edge Mount
C6	CAP 18pF, 250V, 0603, Edge Mount
C7	CAP 6.8pF, 250V, 0805, Edge Mount
C8	CAP 7.5pF, 250V, 0805, Edge Mount
C9	CAP 2.7pF, 250V, 0805, Edge Mount
C11	CAP 100pF, 250V, 0603, Edge Mount
C14	CAP 10µF, 100V, X7R, 2220
L1	IND FB, 120 OHM, 5A, 0805
L2	IND 22nH, 0.35A, 0402
L3	IND 18.5nH
L4, L5	IND FB, 33 OHM, 6A, 1206
R1	RES 10 OHM, 0402
R2, R3	RES 10 OHM, 0805
PC Board Type	ROGERS RT3010, 25mil, 1/1oz. Copper

PACKAGE PL44C1



BOLT-DOWN FLANGE OPTION
IGN1011L120



EARLESS FLANGE OPTION
IGN1011L120S

Dimensions: Inches (mm)

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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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.

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