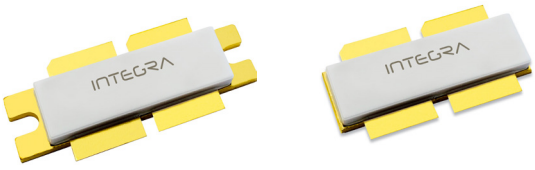
L-Band, GaN/SiC, RF Power Transistor

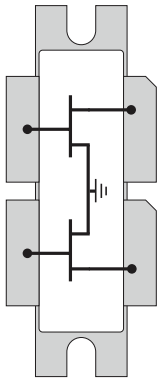
1.2 - 1.4 GHz | 3700 W typ | 75% Efficiency typ | 18 dB Gain typ | 100 V | 100µs Pulse Length, 4% Duty Cycle

IGN1214M3200 and IGN1214M3200S are high power GaN-on-SiC RF power transistors that have been designed to suit the unique needs of modern long-range radar systems. They supply a minimum of 3200 W of peak output power, with typically >18 dB of associated gain and 68% efficiency. They operate from a 100 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 >3200 W
- Pre-matched Input Impedance
- High Efficiency - up to 75%
- 100% RF Tested Under 100µs, 4% duty cycle pulse conditions
- RoHS and REACH Compliant



APPLICATIONS

- L-band Radar Systems

Table 1. RF Electrical Characteristics (Case temperature = 30 °C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Gain	G	17	18	20	dB	P_{OUT} = 3200W f = 1.2, 1.3, 1.4 GHz 100µs pulse length 4% duty cycle pulse conditions V_{DS} = 100V, I_{DS} = 75mA per side
Drain Efficiency	η	60	68	75	%	
Pulse Droop	D	-0.8	-0.4	+0.2	dB	
Input Return Loss	IRL	10	13	20	dB	
Load Mismatch Stability	VSWR-S	2:1				
VSWR Withstand	VSWR-LMT	5:1				
Second Harmonic			-31		dBc	
Third Harmonic			-49		dBc	

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} = 100V, I_{DS} = 1mA
Quiescent Gate Voltage	V_Q		-2.8		V	V_{DS} = 100V, I_{DS} = 75mA per side

Table 3. Absolute Maximum Ratings (Not Simultaneous)

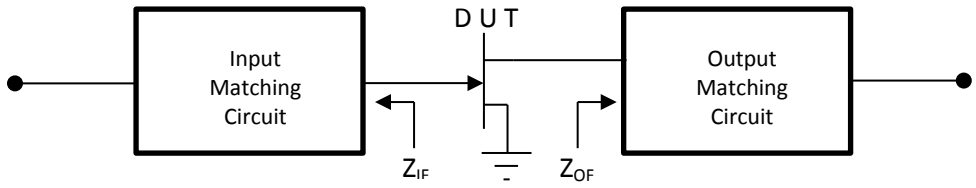
Parameter	Symbol	Value	Units	Test Conditions
DC Drain-Source Voltage	V_{DS}	400	V	25 °C
DC Gate-Source Voltage	V_{GS}	-8 to +1	V	25 °C
DC Drain Current	I_D	144	A	25 °C
DC Gate Current	I_G	144	mA	25 °C
RF Input Power	$P_{RF,IN}$	115	W	25 °C
Operating Channel Temperature	T_{CH}	-55 to +225	°C	
Storage 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 4. Matching Circuit Impedances (Case temperature = 25 °C unless otherwise stated)

Frequency (GHz)	Z_{IF}	Z_{OF} Fundamental	Z_{OF} Second Harmonic	Units	Test Conditions
1.2	1.08 - j 1.67	2.01 - j 2.90	0.58 + j 1.93	Ω	P_{OUT} = 3200W 100µs pulse length 4% duty cycle V_{DS} = 100V, I_{DS} = 75mA per side
1.3	0.93 - j 0.84	1.92 - j 2.24	0.52 + j 3.06	Ω	
1.4	0.86 - j 0.05	1.92 - j 1.72	0.62 + j 4.20	Ω	

Note: Source and load impedances are terminal to ground and are measured looking into the test fixture with an identical signal simultaneously applied to both terminals i.e. even mode excitation.



TYPICAL PERFORMANCE

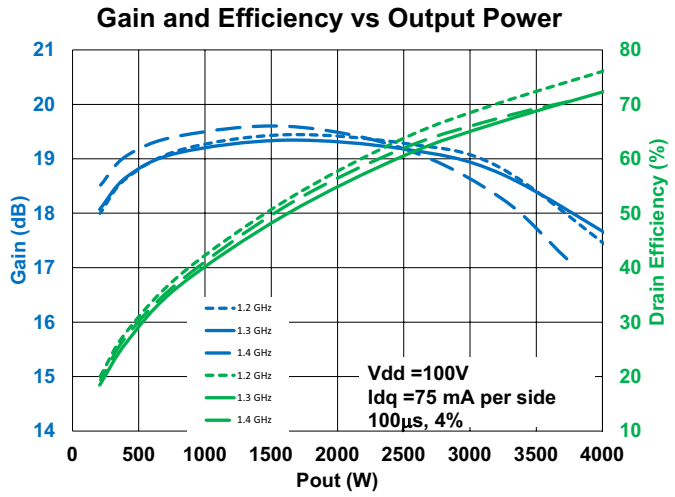


Figure 1

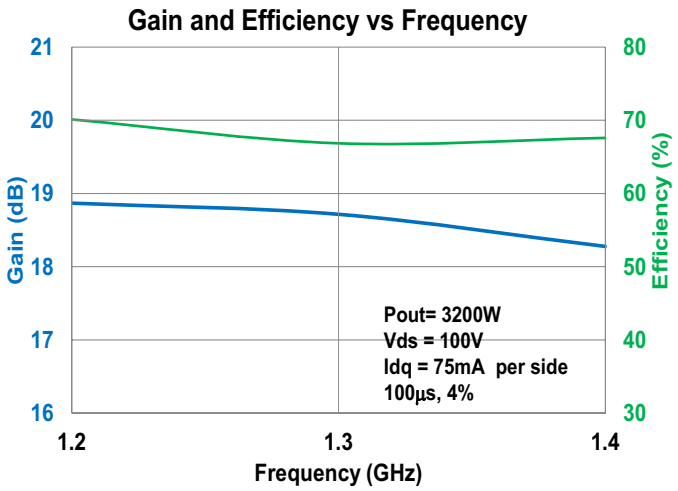


Figure 2

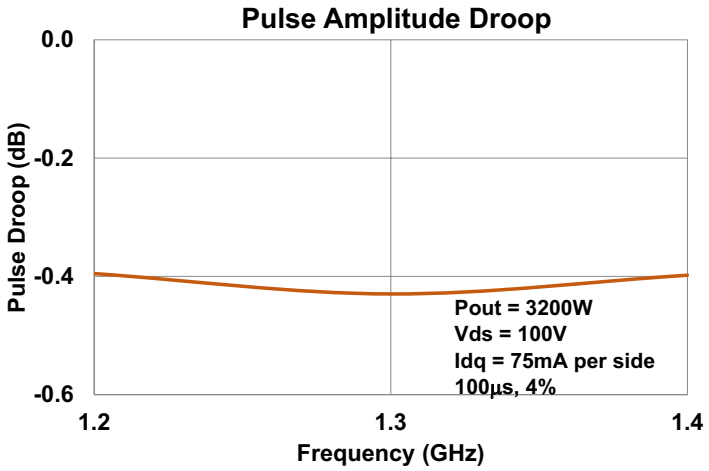


Figure 3

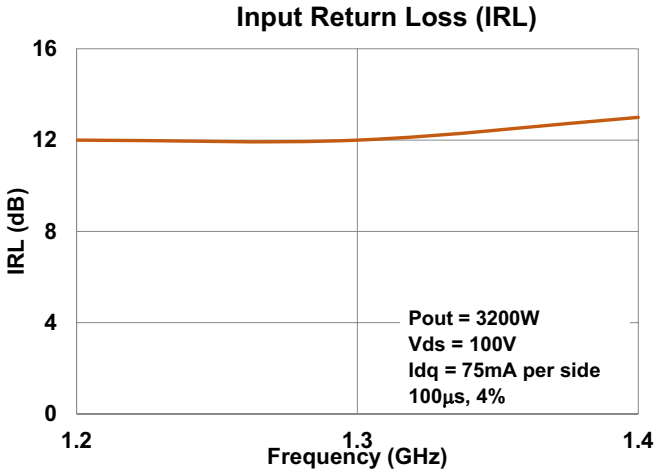


Figure 4

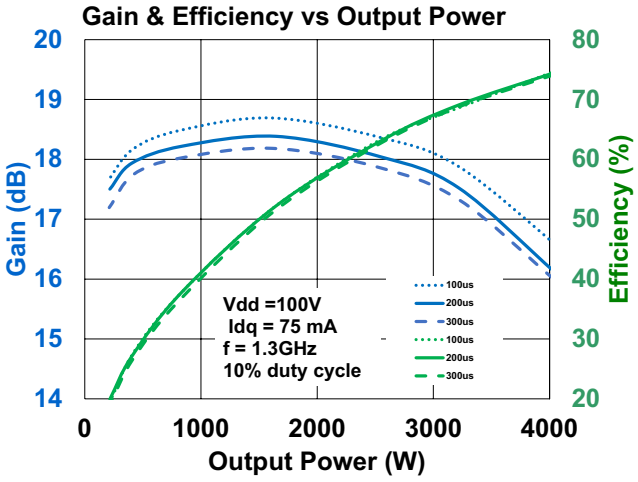


Figure 5

TYPICAL PERFORMANCE

Table 5. Thermal Resistance (Case temperature = 85 ^{0}C unless otherwise stated)

Parameter	Symbol	Typ	Units	Test Conditions
Peak Thermal Resistance, Channel to Case, per side	R_{TH}	0.14	^{0}C/W	P_{DISS} = 750W per side 100µs pulse length 4% duty cycle V_{DS} = 100V

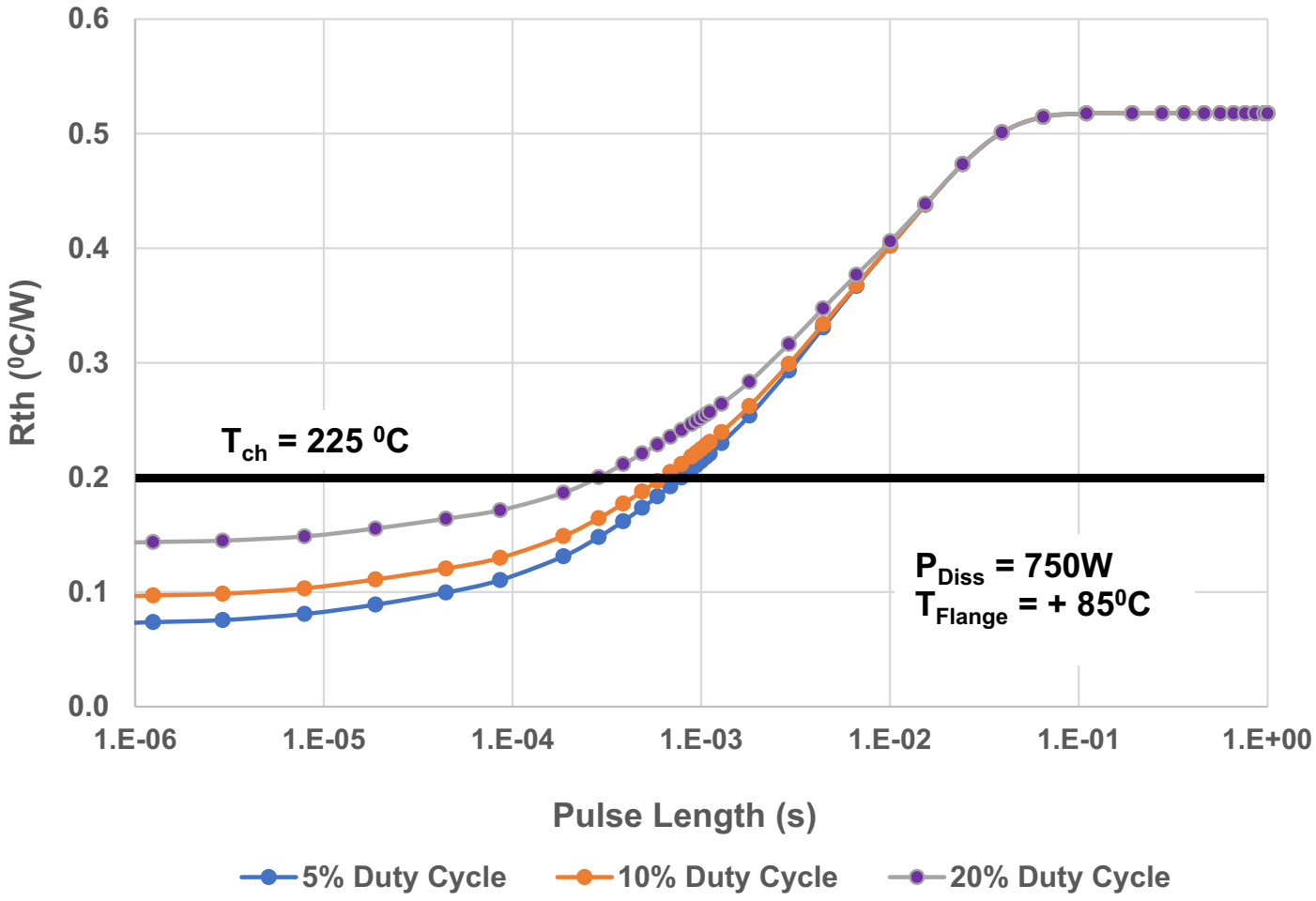
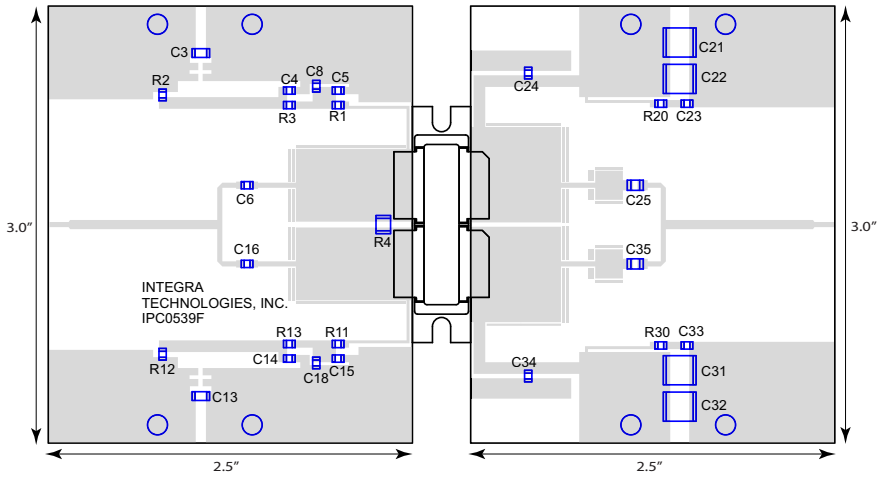


Figure 6

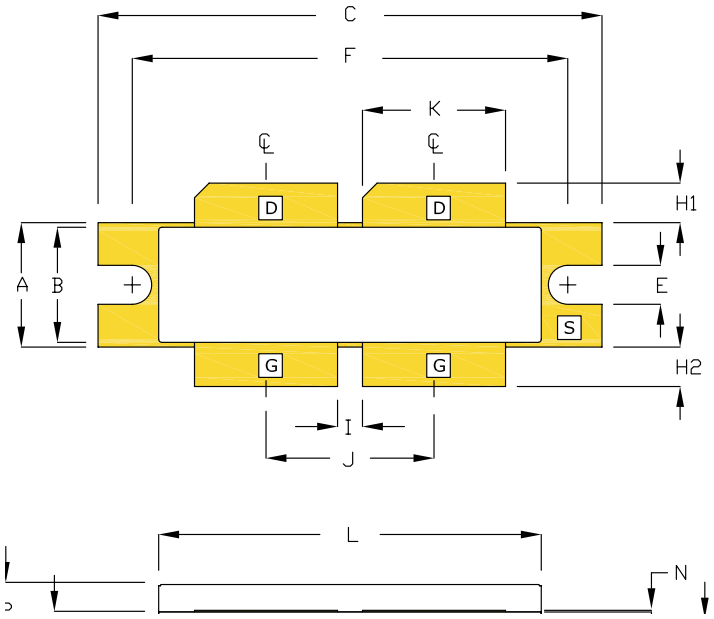
TEST FIXTURE



Bill of Materials for IGN1214M3200 Test Fixture

Designator	Description	Quantity	Part Number
C3, C13	CAP 1μF, 1206, 100V, X7R	2	12061C105K4T2A
C4, C14, C23, C33	CAP 0.068μF, 250V, 0805, X7R	4	C0805C683KARAC#A
C5, C6, C15, C16, C24, C34	CAP 33pF, 0805	6	ATC600F330
C8, C18	CAP 1000pF, 0805, 100V	2	08051A102J4T2A
C21, C22, C31, C32	CAP 2.2μF, 2220, 250V, X7R	4	C5750X7T2E225K250KA
C25, C35	CAP 150pF, 1111	2	800B151JT300XT
R1, R11, R20, R30	RES, 15 OHM, 0805	4	CRCW080515R0JNEA
R2, R12	RES, 100OHM, 0805	2	CRCW0805100RFKTA
R3, R13	RES, 0 OHM, 0805	1	CRCW08050000ZSTA
R4	RES, 5.1 OHM, 1210	1	CRCW12105R10JNEA
PC Board Type	ROGERS RO3006, 25mil, 2/2oz. Copper	2	

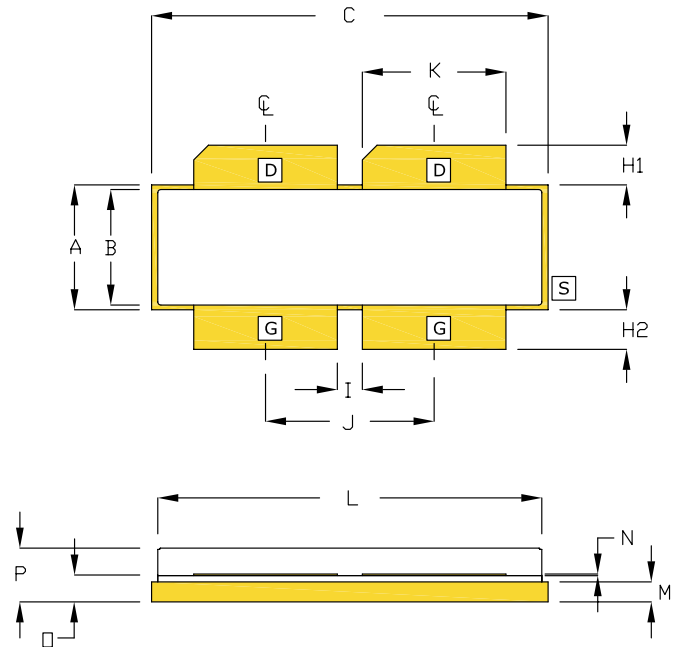
PACKAGE PL124A1



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.395	0.405	10.03	10.29
B	0.366	0.374	9.29	9.49
C	1.615	1.625	41.02	41.27
E	0.120	0.130	3.05	3.30
F	1.395	1.405	35.43	35.69
H1	0.120	0.130	3.05	3.30
H2	0.120	0.130	3.05	3.30
I	0.075	0.085	1.90	2.16
J	0.535	0.545	13.59	13.84
K	0.455	0.465	11.55	11.81
L	1.218	1.242	30.93	31.54
M	0.059	0.069	1.499	1.752
N	0.004	0.007	0.10	0.18
□	0.079	0.089	2.00	2.26
P	0.165	0.188	4.19	4.77

PIN SCHEDULE	
D	DRAIN
S	SOURCE
G	GATE

BOLT-DOWN FLANGE OPTION
IGN1214M3200



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.395	0.405	10.03	10.29
B	0.366	0.374	9.29	9.49
C	1.265	1.275	32.13	32.38
E	--	--	--	--
F	--	--	--	--
H1	0.120	0.130	3.05	3.30
H2	0.120	0.130	3.05	3.30
I	0.075	0.085	1.90	2.16
J	0.535	0.545	13.59	13.84
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P	0.165	0.188	4.19	4.77

PIN SCHEDULE	
D	DRAIN
S	SOURCE
G	GATE

EARLESS FLANGE OPTION
IGN1214M3200S

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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