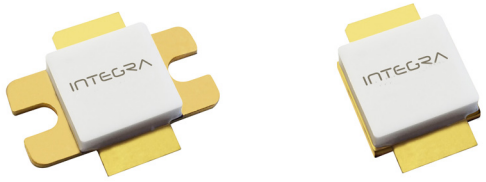
L-Band, GaN/SiC, RF Power Transistor

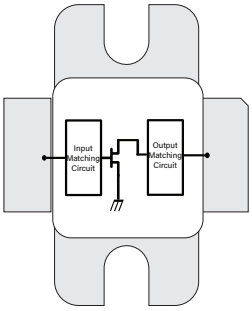
1.20 - 1.40 GHz | 350W typ | 72% Efficiency typ | 17.5dB Gain typ | 50V | 300µs Pulse Length, 10% Duty Cycle

IGN1214M300R3 and IGN1214M300R3S are high power GaN-on-SiC RF power transistors that have been designed specifically for use in L band radar systems. They operate over the full bandwidth of 1.2 - 1.4 GHz. They supply a minimum of 300W of peak output power, with typically >17.5 dB of associated gain and 70% typical efficiency. They operate from a 50V supply voltage.



FEATURES

- GaN on SiC HEMT Technology
- Output Power >350 W
- Pre-matched Input & Output Impedance
- High Efficiency - up to 72%
- Capable of withstanding 5:1 VSWR mismatch
- 100% RF Tested
- RoHS and REACH Compliant
- IGN1214M300R3 has a bolt-down flange, IGN1214M300R3S is the earless flange option



APPLICATIONS

- L-band Radar Systems

Table 1. RF Electrical Characteristics (Case temperature = 25+/-5 ºC unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Input Power	P_{IN}	3.8	5.3	7.5	W	P_{OUT}= 300W f = 1.2, 1.3, 1.4 GHz 300µs pulse length, 10% duty cycle V_{DS} = 50V, I_{DS} = 100mA
Gain	G	16	17.5	19	dB	
Drain Efficiency	η	60	70	80	%	
Pulse Droop	D	-0.4	-0.05	0.1	dB	
Input Return Loss	IRL	8	12	20	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.

Table 2. Absolute Maximum Ratings (Not Simultaneous)

Parameter	Symbol	Value	Units	Test Conditions
DC Drain-Source Supply Voltage	V_{DS}	135		25 °C
DC Gate-Source Voltage	V_{GS}	-8 to +1	V	25 °C
DC Drain Current	I_D	26.4	A	25 °C
DC Gate Current	I_G	26.4	mA	25 °C
RF Input Power	$P_{RF,IN}$	20	W	25 °C
Operating Channel Temperature	T_{CH}	-55 to +225	°C	
Storage Temperature	T_{STG}	-55 to +150	°C	
Soldering Temperature	T_{SOLDER}	250	°C	<50 sec at >200 °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+/-5 °C unless otherwise stated)

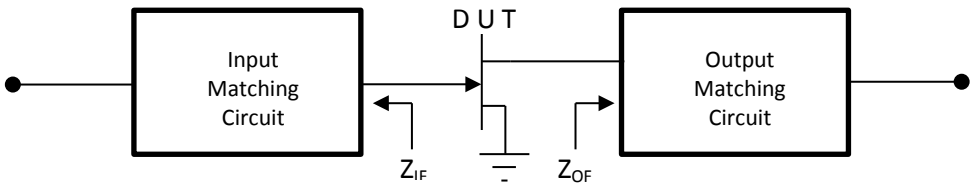
Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Gate Pinch-Off Voltage	V_P	-4.0	-3.0	-2.5	V	V_{DS} = 50V, I_{DS} = 4mA
Quiescent Gate Voltage	V_Q		-2.6		V	V_{DS} = 50V, I_{DS} = 100mA

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

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Peak Thermal Resistance, Channel to underneath side of flange	R_{TH}		0.55		°C/W	P_{diss} = 128.6W 300µs pulse length, 10% duty cycle V_{DS} = 50V

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

Frequency (GHz)	Z_{IF}	Z_{OF}	Units	Test Conditions
1.2	2.8 - j1.9	1.6 + j 1.2	Ω	P_{OUT} = 300W 300µs Pulse length, 10% Duty Cycle V_{DS} = 50V, I_{DS} = 100mA
1.3	3.0 - j 1.0	1.9 + j 1.0	Ω	
1.4	3.3 - j 0.2	1.7 + j 0.8	Ω	



TYPICAL PERFORMANCE

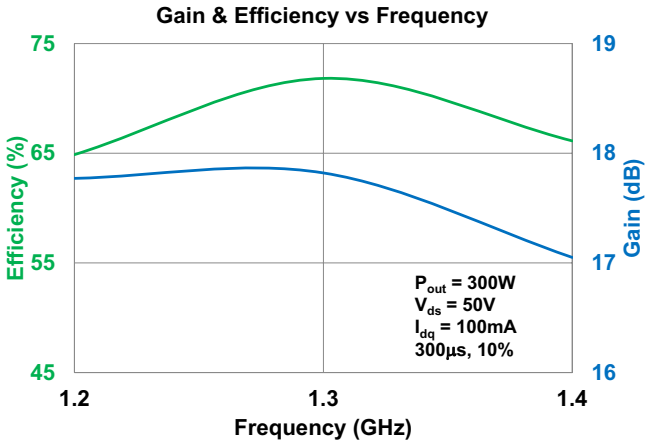


Figure 1

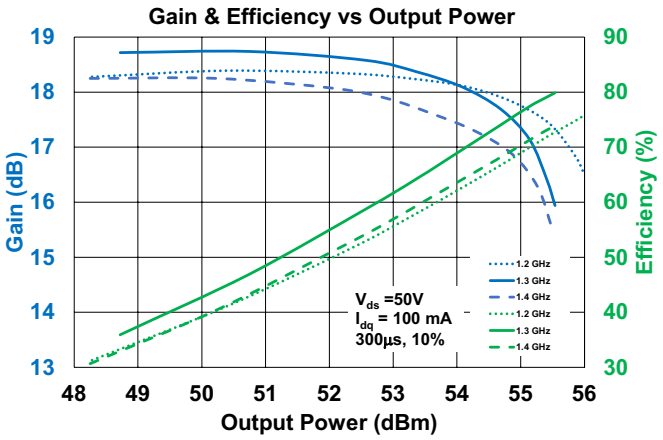


Figure 2

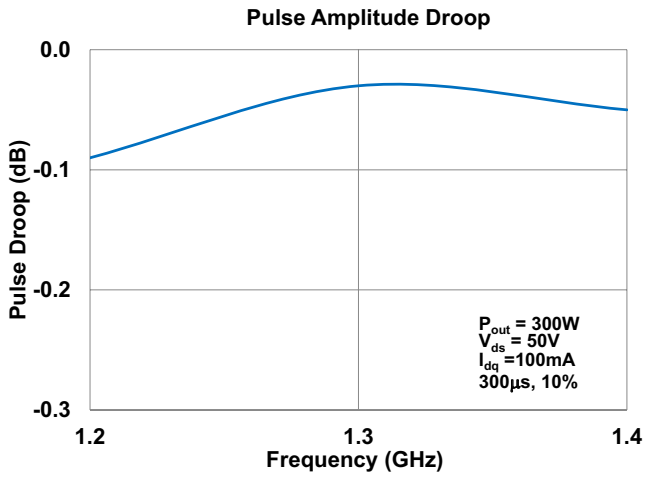


Figure 3

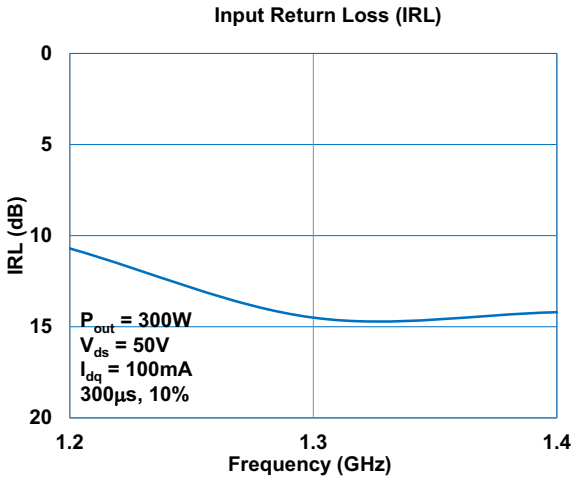
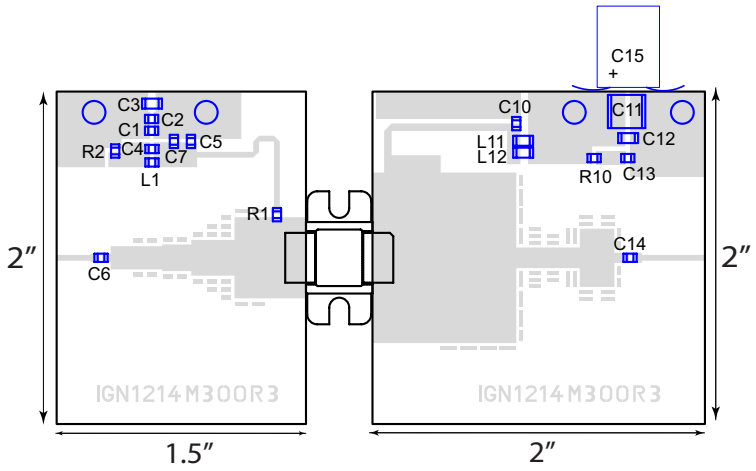


Figure 4

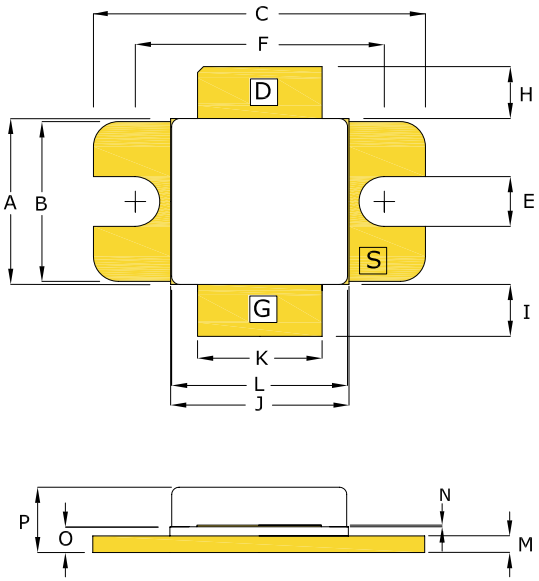
TEST FIXTURE



Bill of Materials for IGN1214M300R3 Test Fixture

Designator	Description	Quantity	Part Number
C1, C4, C13	CAP 0.1µF, 0805, 50V	3	08051C104K4T2A
C2, C5, C6, C14	CAP 18pF, 0805	4	ATC600F180
C3, C12	CAP 1µF, 1206	2	12061C105K4T2A
C7	CAP 1000pF, 0805, 50V, X7R	1	UPW1J680MPD
C10	CAP 100pF, 0805	1	ATC600F102
C11	CAP 10µF, 2220, 100V, X7R	1	22201C106MAT2A
C1	CAP 68µF, 63V Electrolytic	1	EEE-FK1J680P
L1	IND FB, 120 OHM, 0805, 5A	1	ILHB0805ER121V
L11, L12	IND FB, 33 OHM, 1206, 6A	2	BLM31PG330SN1L
R1, R10	RES 10 OHM, 0805	2	ERJ-6ENF150V
R2	RES, 100 OHM, 0805	1	ERJ-6ENF1000V
PC Board Type	ROGERS RT6006, 25mil, 1/1oz. Copper	2	

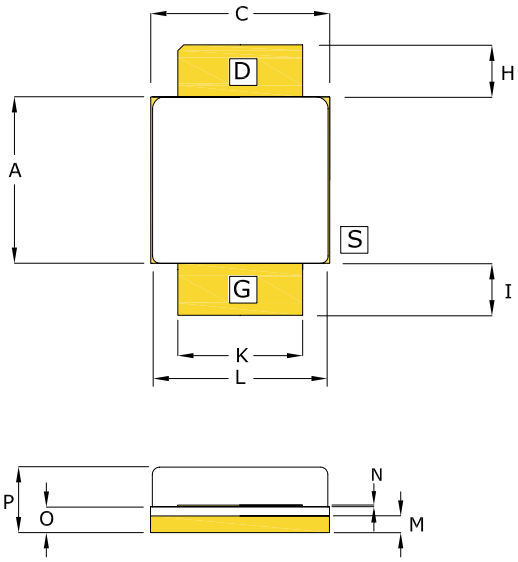
PACKAGE PL44C1



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.395	0.405	10.03	10.29
B	0.380	0.390	9.65	9.91
C	0.795	0.805	20.19	20.45
E	0.115	0.125	2.92	3.18
F	0.595	0.605	15.11	15.37
H	0.110	0.140	2.79	3.56
I	0.110	0.140	2.79	3.56
J	0.425	0.435	10.80	11.05
K	0.295	0.305	7.49	7.75
L	0.420	0.428	10.67	10.87
M	0.035	0.045	0.89	1.14
N	0.004	0.007	0.10	0.18
□	0.053	0.067	1.35	1.70
P	0.143	0.179	3.63	4.55

PIN SCHEDULE	
D	DRAIN
S	SOURCE
G	GATE

BOLT-DOWN FLANGE OPTION
IGN1214M300R3



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.393	0.408	9.97	10.35
B	--	--	--	--
C	0.423	0.438	10.73	11.11
E	--	--	--	--
F	--	--	--	--
H	0.110	0.140	2.79	3.56
I	0.110	0.140	2.79	3.56
J	--	--	--	--
K	0.295	0.305	7.49	7.75
L	0.420	0.428	10.67	10.87
M	0.035	0.045	0.89	1.14
N	0.004	0.007	0.10	0.18
□	0.053	0.067	1.35	1.70
P	0.143	0.179	3.63	4.55

PIN SCHEDULE	
D	DRAIN
S	SOURCE
G	GATE

EARLESS FLANGE OPTION
IGN1214M300R3S

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.

Disclaimer

Integra Technologies Inc. reserves the right to make changes without further notice to any products herein. Integra Technologies Inc. makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Integra Technologies Inc. assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. Integra Technologies Inc. products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Integra Technologies Inc. customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Integra Technologies Inc. for any damages resulting from such improper use or sale.

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.

Integra Technologies, 321 Coral Circle, El Segundo, CA 90245-4620 | Phone: 310-606-0855 | Fax: 310-606-0865