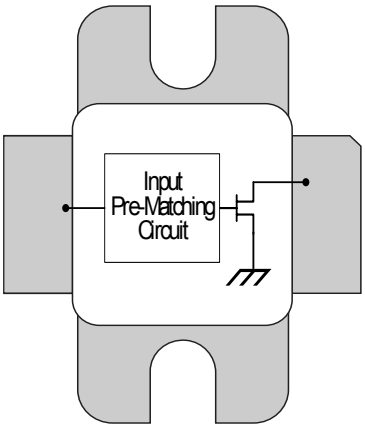
L-Band, GaN/SiC, RF Power Transistor

1.2 - 1.4 GHz | 400 W typ | 54% Efficiency typ | 20 dB Gain typ | 50 V | 150µs Pulse Length, 10% Duty Cycle

IGN1214M380 is a high power GaN-on-SiC RF power transistor that has been designed to suit the unique needs of modern radar systems. It supplies a minimum of 380 W of peak output power, with typically >19.5 dB of associated gain and 50% efficiency. 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 >380 W
- Pre-matched Input Impedance
- 100% RF Tested Under 150µs, 10% 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
RF Output Power	$P_{OUT, RF}$	380	400		W	P_{IN} = 4.25W f = 1.2, 1.3, 1.4 GHz 150µs pulse length 10% duty cycle pulse conditions V_{DS} = 50V, I_{DS} = 10mA
Gain	G	19.5	20		dB	
Drain Efficiency	η	50	54		%	
Pulse Droop	D	-0.5	-0.2	+0.2	dB	
Input Return Loss	IRL	10	14	18	dB	
Load Mismatch Stability	VSWR-S	2:1				
VSWR Withstand	VSWR-LMT	3:1				

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 Voltage	V_{DS}	140	V	25 °C
DC Gate-Source Voltage	V_{GS}	-8 to +1	V	25 °C
DC Drain Current	I_D	36	A	25 °C
DC Gate Current	I_G	36	mA	25 °C
RF Input Power	$P_{RF,IN}$	5	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	-5.0			V	V_{DS} = 50V, I_{DS} = 1mA
Quiescent Gate Voltage	V_Q		-2.8		V	V_{DS} = 50V, I_{DS} = 10mA

Table 4. Test Fixture Source & Load Impedances (Case temperature = 25 °C unless otherwise stated)

Frequency (GHz)	Z_{IF}	Z_{OF}	Units	Test Conditions
1.2	1.94 - j 2.31	2.15 - j 0.28	Ω	P_{OUT} = 380W 150µs pulse length, 10% duty cycle V_{DS} = 50V, I_{DS} = 10mA
1.3	1.7 - j 2.01	2.14 - j 0.24	Ω	
1.4	1.74 - j 1.71	2.16 - j 0.29	Ω	

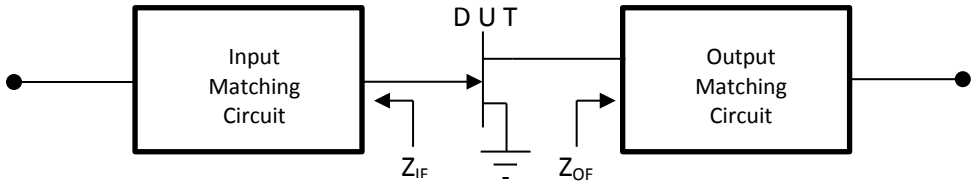
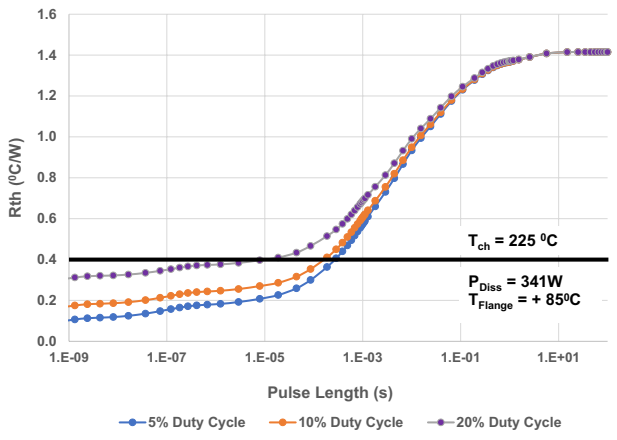
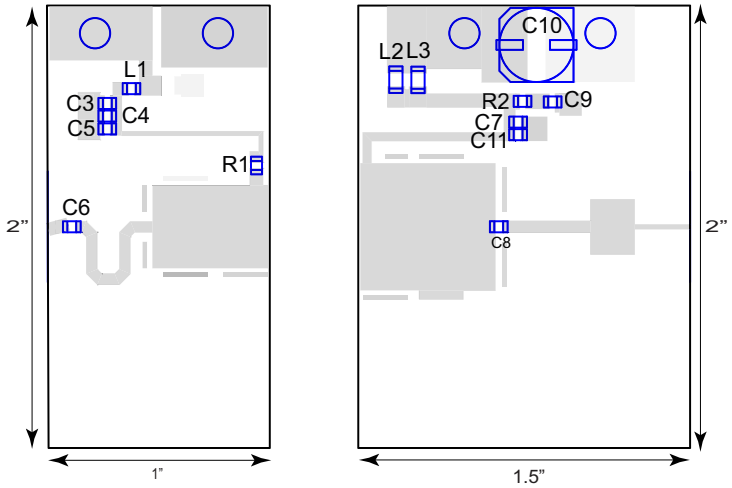


Table 5. Thermal Resistance (Case temperature = 85 °C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Peak Thermal Resistance, Channel to Case	R_{TH}		0.4		°C/W	P_{DISS} = 340.7W 150µs pulse length, 10% duty cycle V_{DS} = 50V



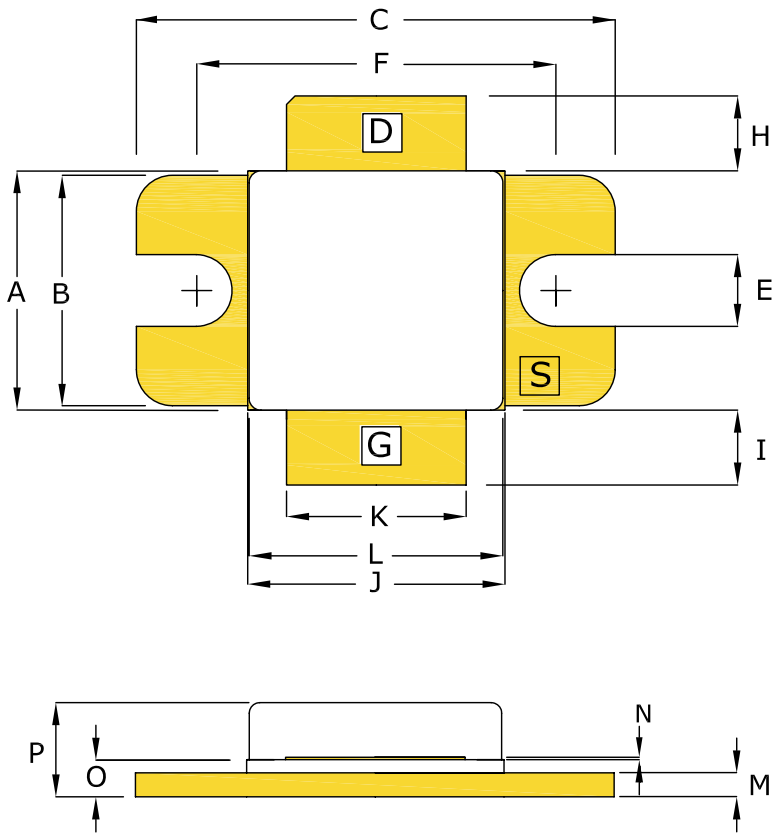
TEST FIXTURE



Bill of Materials for IGN1214M380 Test Fixture

Designator	Description	Quantity
C3, C9	CAP 0.1µF, 0805, 50V	2
C4, C11	CAP 100pF, 0805, 50V	2
C5, C6	CAP 18pF, 0805, 50V, Edge Mount	2
C7	CAP 18pF, 0805, 50V	1
C8	CAP 20pF, Edge Mount	1
C10	CAP 68µF, 63V, Electrolytic	1
C11	CAP 4700µF, 63V, Electrolytic	1
L1	IND FB 120 OHM, 5A, 0805	1
L2, L3	IND FB 33 OHM, 1206, 6A	2
R1, R2	RES 10 OHM, 0805	2
PC Board Type	ROGERS RT6010.2, 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

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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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.