L-Band, GaN/SiC, RF Power Transistor

1.2 - 1.4 GHz | 550 W typ | 70% Efficiency typ | 17 dB Gain typ | 50 V | 100µs Pulse Length, 10% Duty Cycle

IGN1214M500R2 and IGN1214M500R2S are high power GaN-on-SiC RF power transistors that have been designed to suit the unique needs of modern long-pulse, long-range radar systems. They supply a minimum of 500 W of peak output power, with typically >17 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 >500 W
- Pre-matched Input Impedance
- High Efficiency - up to 75%
- 100% RF Tested under 100µs, 10% duty cycle pulse conditions
- RoHS and REACH Compliant

APPLICATIONS

- L-band Radar Systems

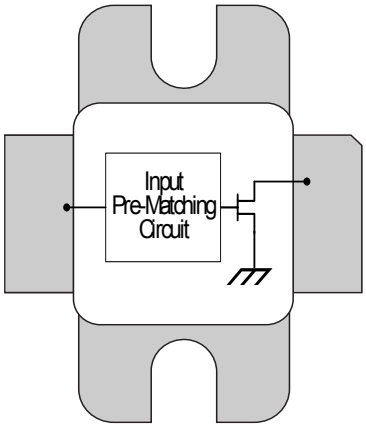


Table 1. Absolute Maximum Ratings (Not Simultaneous)

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	36	A	25 °C
DC Gate Current	I_G	36	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}	260 for 60s	°C	

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

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} = 50V, I_{DS} = 1mA
Quiescent Gate Voltage	V_Q		-2.8		V	V_{DS} = 50V, I_{DS} = 75mA

Table 3. RF Electrical Characteristics (Case temperature = 30 °C unless otherwise stated)

Parameter	Symbol	Min	Typ	Max	Units	Test Conditions
Input Return Loss	IRL	10	12	22	dB	P_{IN} = 11W f = 1.2, 1.3, 1.4 GHz 100µs pulse length 10% duty cycle pulse conditions V_{DS} = 50V, I_{DS} = 75mA
RF Output Power	$P_{OUT, RF}$	500	550	700	W	
Gain	G	16.6	17	18	dB	
Drain Efficiency	η	62	70	75	%	
Pulse Droop	D	-0.4	-0.2	+0.2	dB	
Load Mismatch Stability	VSWR-S	2:1				
VSWR Withstand	VSWR-LMT	3:1				

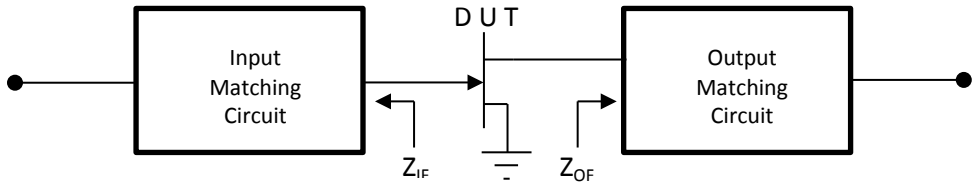
Note: Consult Integra Technologies Application Note 001 for information on how RF output power and pulse droop are measured.

Table 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}		0.32		°C/W	P_{DISS} = 235.7W 100µs pulse length 10% duty cycle V_{DS} = 50V

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

Frequency (GHz)	Z_{IF}	Z_{OF}	Units	Test Conditions
1.2	7.3 - j 2.4	1.9 - j 0.4	Ω	P_{OUT} = 500W 100µs pulse length 10% duty cycle V_{DS} = 50V, I_{DS} = 75mA
1.3	7.1 - j 1.2	1.8 - j 0.5	Ω	
1.4	7.4 + j 0	1.4 - j 0.5	Ω	



TYPICAL PERFORMANCE

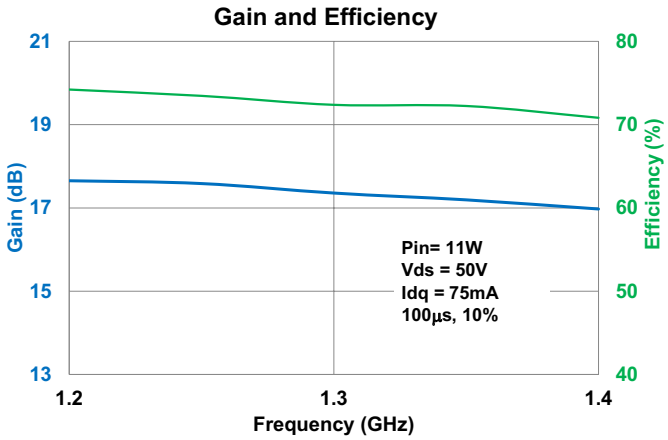


Figure 1

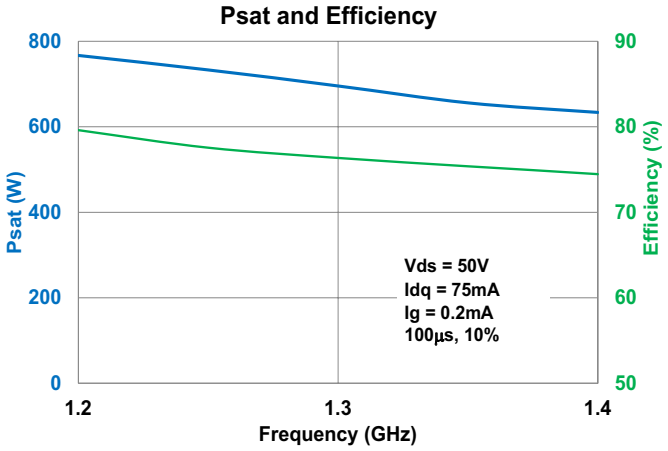


Figure 2

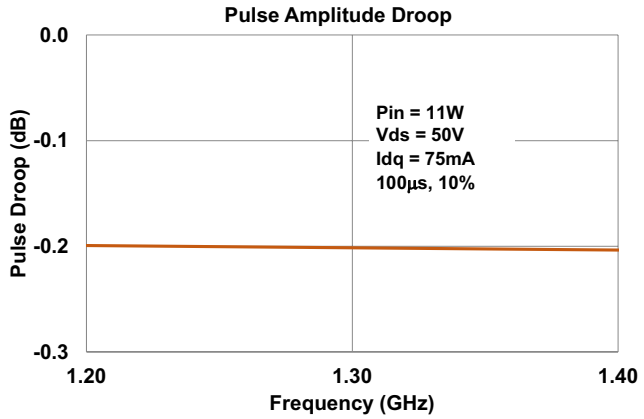


Figure 3

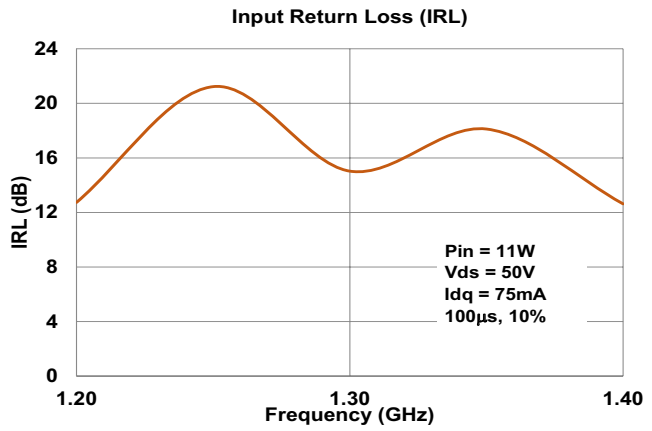
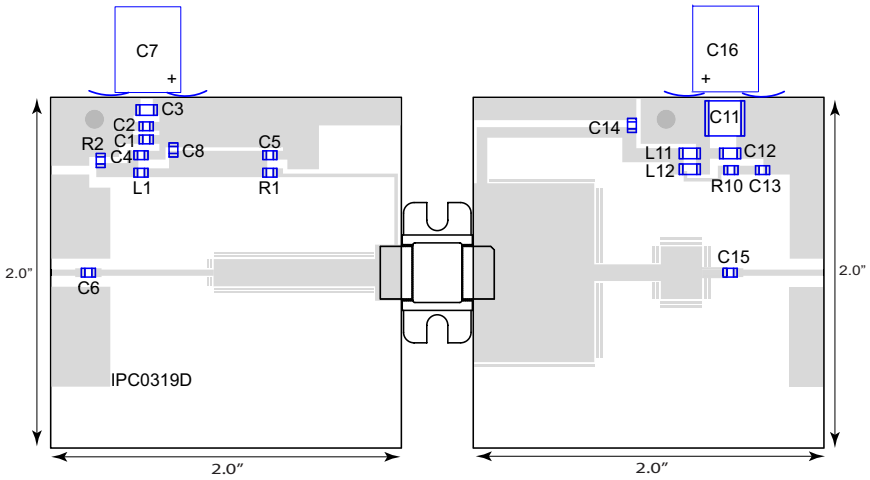


Figure 4

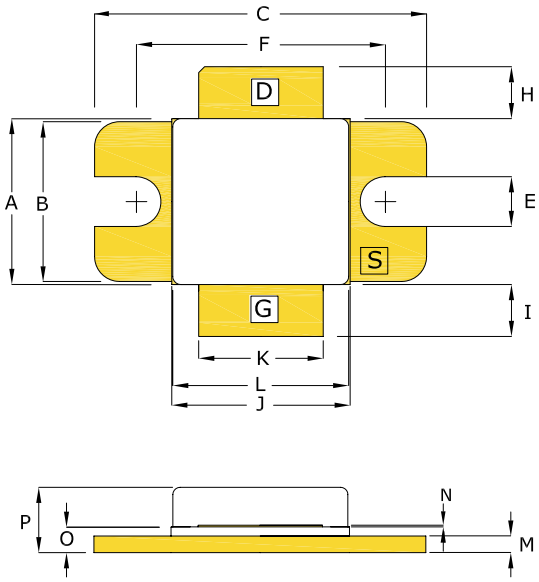
TEST FIXTURE



Bill of Materials for IGN1214M500R2 Test Fixture

Designator	Description	Quantity	Part Number
C1, C4, C13	CAP 0.1µF, 0805, 100V, X7R	3	08051C104K4T2A
C2, C5, C6, C14, C15	CAP 18pF, 0805	5	600F180JT250XT
C3, C12	CAP 1µF, 1206, 100V, X7R	2	12061C105K4T2A
C7, C16	CAP 68µF, 63V, Electrolytic	2	UPW1J680MPD
C8	CAP 1000pF, 0805, 100V	1	08051A102J4T2A
C11	CAP 10µF, 2220, 100V, X7R	1	22201C106MAT2A
L1	IND 120 OHM, 0805, 5A	1	ILHB0805ER121V
L11, L12	IND 33OHM, 1206, 6A	2	BLM31PG330SN1L
R1, R10	RES, 15 OHM, 0805	2	BLM31PG330SN1L
R2	RES, 100OHM, 0805	1	ERJ-6ENF1000V
PC Board Type	ROGERS RT6006, 25mil, 1/1oz. Copper	2	

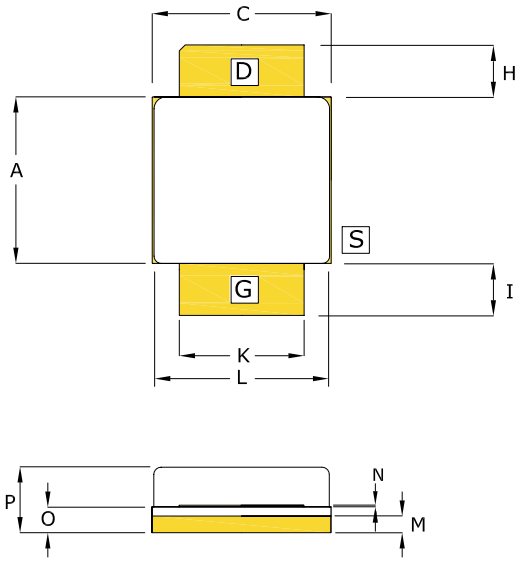
PACKAGE PL44C1



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
IGN1214M500R2



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
IGN1214M500R2S

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.

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