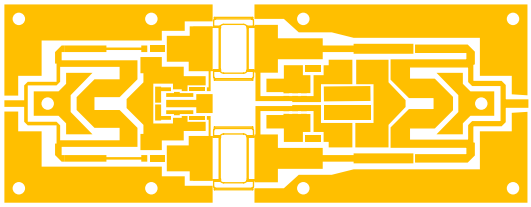
S-Band GaN/SiC, RF Power Amplifier Pallet

2.9-3.1 GHz | 4 kW | 63% Efficiency typ | 14 dB Gain typ | 100 V | 60µs Pulse Length, 4% Duty Cycle

IGNP2931M4000 is a high power GaN-on-SiC RF power amplifier pallet that has been designed to suit the unique needs of S-Band Radar systems. It operates over the full 2.9-3.1 GHz frequency range. Under 60µs, 4% duty cycle pulse conditions it supplies 4kW of peak output power, with typically 14dB of associated gain and 63% efficiency. It operates from a 100 V supply voltage.



FEATURES

- GaN on SiC HEMT Technology
- Output Power >4kW
- Fully matched to 50Ω
- High Efficiency
- 100% RF Tested Under 60µs, 4% duty cycle pulse conditions
- System Power in a component pallet form factor
- Unparallelled System Power Density
- Enables Disruptive Radar System Re-architecture
- SWaP-C^2
- Size = Reduce radar system size by a 66% over competing systems
- Weight = Reduce radar system weight a factor of 55%
- System Power Density = 408W / in^2
- Cost = Reduce system cost by >40%
- Complexity = Eliminate multiple combining layers

APPLICATIONS

- S-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	10	14	16	dB	P_{OUT} = 4kW
Drain Efficiency	η	50	63	70	%	f = 2.9, 3.0, 3.1 GHz
Pulse Droop	D	0	-0.25	-0.6	dB	60µs pulse length, 4% duty cycle
Load Mismatch Stability	VSWR-S	3:1				V_{DS} = 100V, I_{DS} = 300 mA
Input Return Loss	IRL	5	20	30	dB	

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}	300	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	10	mA	25 °C
RF Input Power	$P_{RF,IN}$	400	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} = 100V, I_{DS} = 1mA
Quiescent Gate Voltage	V_Q		-4		V	V_{DS} = 100V, I_{DS} = 300mA

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

Parameter	Symbol	Typ	Units	Test Conditions
Peak Thermal Resistance, Channel to Case	R_{TH}	0.055	°C/W	P_{DISS} = 2349W 60µs pulse length, 4% duty cycle V_{DS} = 100V

TYPICAL PERFORMANCE

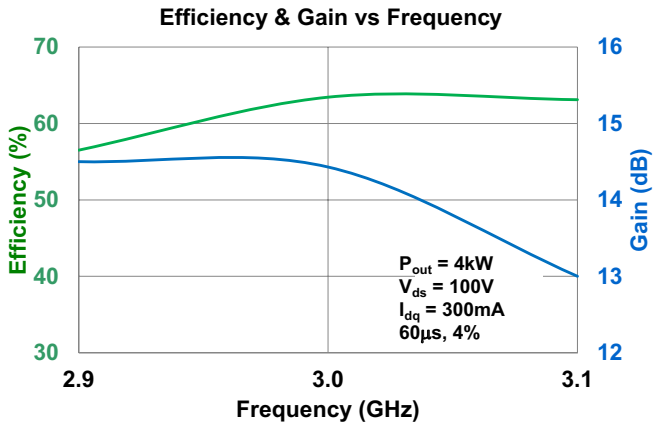


Figure 1.

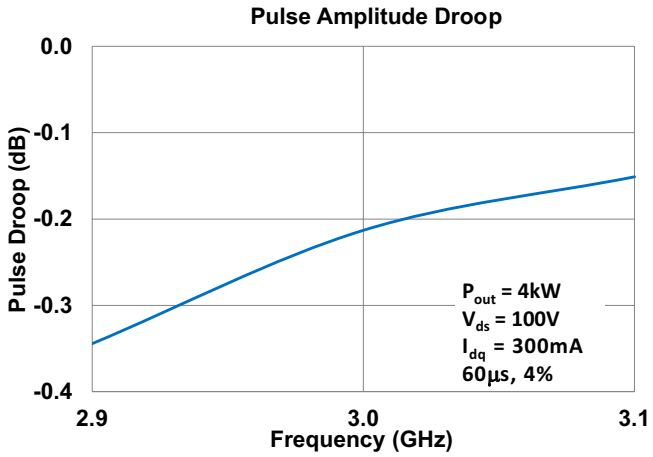


Figure 2.

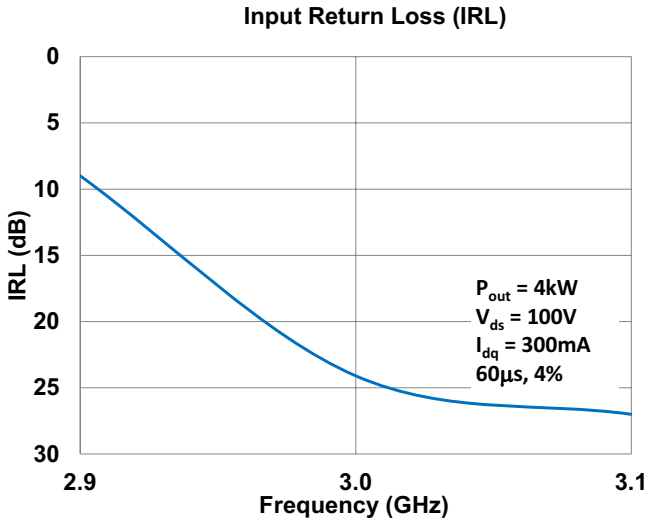
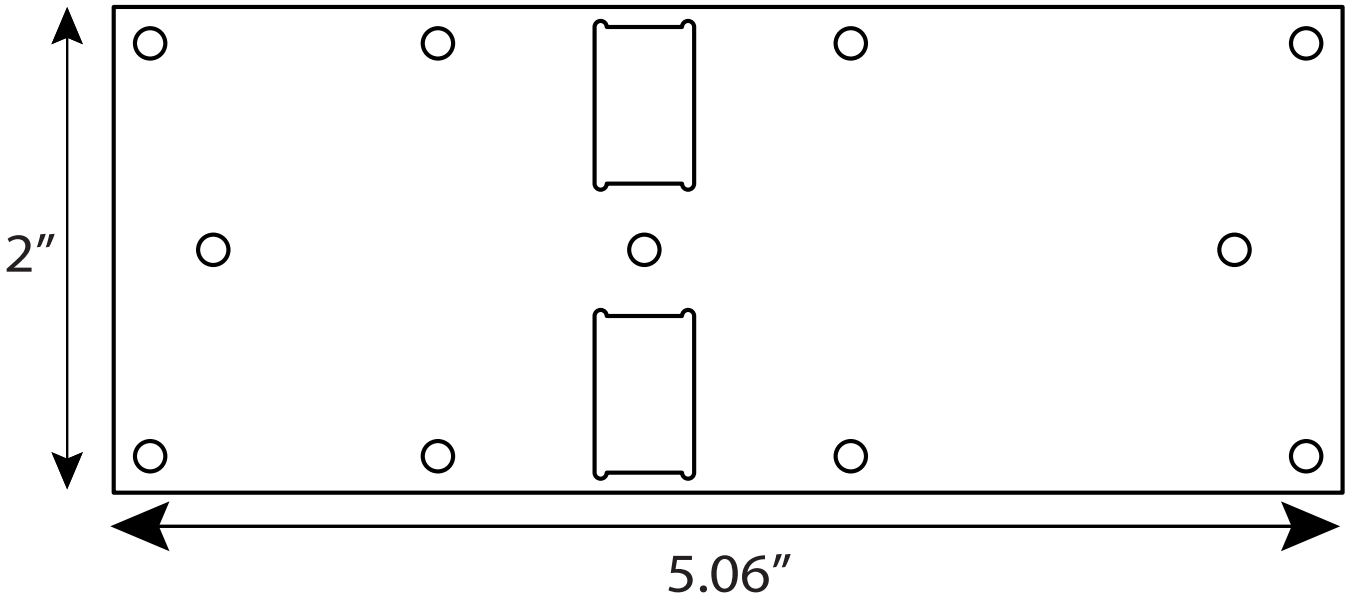


Figure 3.

DIMENSIONS



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

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