

Product Features

- 2110~2200MHz
- 79.4W Saturated Power @ 48V
- 16% Drain Efficiency @ 37dBm
- Internally 50ohm Matched
- 2-Stage Amplifier Module
- GaN on SiC Technology

Applications

- Massive MIMO
- 4G System
- Multi-Band, Multi-Mode
- Multi-Carrier
- RRH Drive Amplifier



Package Type : PP-3G

Description

The SDM21009-30H is a fully integrated micro-strip GaN Hybrid power amplifier module designed for applications in 4G LTE MIMO systems, small cells and low power remote radio heads. SDM Series is an integrated 2-stage power amplifier module, 50ohm input and output impedance matched device can deliver up to 79.4W of saturation power and operating drain voltage 48V. This device is size 8x14x2.6mm and is packaged in a ceramic surface mount package.

Typical Performance

(V_{DS}= +48V, T_C=25 °C, 50Ω)

Frequency [MHz]	Peak Power	Average Power ^{*1}			
	Power [W]	Power [W]	Gain [dB]	Drain Efficiency [%]	ACLR [dBc]
2120	129.1	5.0	39.1	16.1	-39.2
2155	125.9	5.0	39.3	16.3	-39.5
2190	126.8	5.0	39.1	16.4	-39.8

Note

*1 Measured in the SDM21009-30H test board amplifier circuit, under LTE 20MHz 1carrier, PAR 7.5dB @0.01% probability on CCDF.

Absolute Maximum Ratings

Rating	Symbol	Value	Unit	Condition
Drain to Source Voltage	V _{DSS}	100	V	T _c =25 °C
Gate to Source Voltage	V _{GS}	-10, +2	V	T _c =25 °C
Operating Voltage	V _{DD}	52	V _{DC}	
Storage Temperature	T _{STG}	-40, +125	°C	
Case Operating Temperature	T _C	-30, +125	°C	
Operating Junction Temperature ^{*1}	T _J	225	°C	
Soldering Temperature ^{*2}	T _S	250	°C	

Note

*1 Continuous use at maximum temperature will affect MTTF.

*2 Refer to the Application Note(AN-002) on soldering - "Solder Condition for RFHIC's GaN Device"

Electrical Characteristics^{*1} (T_C=25°C unless otherwise noted)

Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
DC Characteristics (Main)						
Maximum Forward Gate Current	T _c = 25°C	I _{GMAX}	-	-	16	mA
Maximum Drain Current ^{*2}	T _c = 25°C	I _{DMAX}	-	-	6.00	A
Power Dissipation	T _c = 85°C	P _{DMAX}	-	-	80	W
Gate Threshold Voltage	V _{DS} = 10V	V _{GS(TH)}	-3.8	-3.0	-2.3	V _{DC}
	I _D = 14.4mA					
Gate Quiescent Voltage	V _{DS} = 48V	V _{GS(Q)}	-3.7	-2.9	-2.2	V _{DC}
	I _D = 200mA					
Drain-Source Breakdown Voltage	V _{GS} = -8V	V _{BR}	150	-	-	V
	I _D = 14.4mA					
Saturated Drain Current ^{*3}	V _{DS} = 6V	I _{DS}	12.0	14.4	-	A
	V _{GS} = 2V					
Gate Leakage Current	V _{GS} = -8V	I _{GLKG150}	-4.5	-	-	mA
	V _{DS} = 150V					
Drain Leakage Current	V _{GS} = -8V	I _{DLKG150}	-	-	5.8	mA
	V _{DS} = 150V					
DC Characteristics (Drive)						
Maximum Forward Gate Current	T _c = 25°C	I _{GMAX}	-	-	2	mA
Maximum Drain Current ^{*2}	T _c = 25°C	I _{DMAX}	-	-	0.8	A
Power Dissipation	T _c = 85°C	P _{DMAX}	-	-	21.2	W
Gate Threshold Voltage	V _{DS} = 10V	V _{GS(TH)}	-3.8	-3.0	-2.3	V _{DC}
	I _D = 2.16mA					
Gate Quiescent Voltage	V _{DS} = 48V	V _{GS(Q)}	-3.7	-2.9	-2.2	V _{DC}
	I _D = 40mA					
Drain-Source Breakdown Voltage	V _{GS} = -8V	V _{BR}	150	-	-	V
	I _D = 2.16mA					
Saturated Drain Current ^{*3}	V _{DS} = 6V	I _{DS}	1.7	2.1	-	A
	V _{GS} = 2V					
Gate Leakage Current	V _{GS} = -8V	I _{GLKG150}	-0.7	-	-	mA
	V _{DS} = 150V					
Drain Leakage Current	V _{GS} = -8V	I _{DLKG150}	-	-	0.9	mA
	V _{DS} = 150V					

Note

*1 Measured on wafer prior to packaging.

*2 Current Limit for long term, reliable operation

*3 Scaled from PCM data.

Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
RF Characteristics (F=2155MHz unless otherwise noted)						
Saturated Output Power ^{*1,4}	V_{DS} = 48V	P _{SAT}	100	79.4	126	W
Modulated Gain ^{*2}	V_{DS} = 48V	G _P	38	40	45	dB
	P_{OUT} = 37dBm					
Linearity ^{*2}	V_{DS} = 48V	ACLR	-45	-38	-35	dBc
	P_{OUT} = 37dBm					
Modulated Drain Efficiency ^{*2}	V_{DS} = 48V	η	12	16	20	%
	P_{OUT} = 37dBm					
Output Mismatch Stress ^{*1,3}	V_{DS} = 48V	VSWR	-	-	10:1	ψ
	P_{OUT} = P_{SAT} Pulsed					

Note

*1 Pulse width 10μsec, Pulse period 100μsec.

*2 Measured in the SDM21009-30H test board amplifier circuit, under LTE 20MHz 1carrier, PAR 7.5dB @0.01% probability on CCDF.

Drive Idq=40mA, Main Idq=200mA

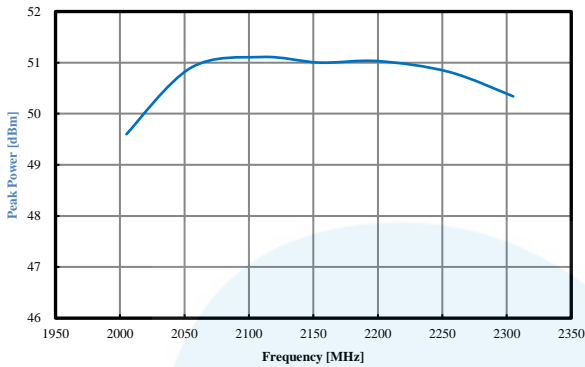
*3 Measured in the SDM21009-30H test board amplifier circuit. No damage at all phase angles.

*4 Psat is defined as $\Delta P_{out}/\Delta P_{in} < 0.1$, where ΔP_{in} is increased input power, ΔP_{out} is increased output power.

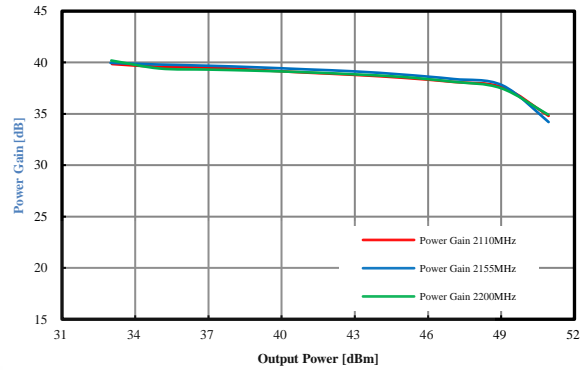
Typical Pulsed Signal Performance

(Tc=25°C, Measured in the SDM21009-30H test board amplifier circuit)

Peak Power vs. Frequency



Pulsed Power Gain vs. Output Power



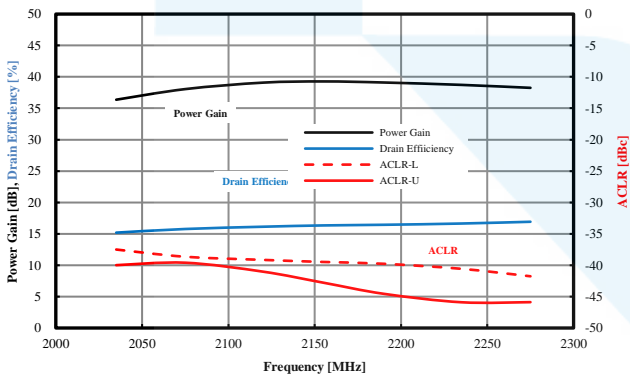
V_{DS} = 48V, Drive Idq=40mA, Main Idq=200mA

Pulse width 100µsec, Pulse period 1ms

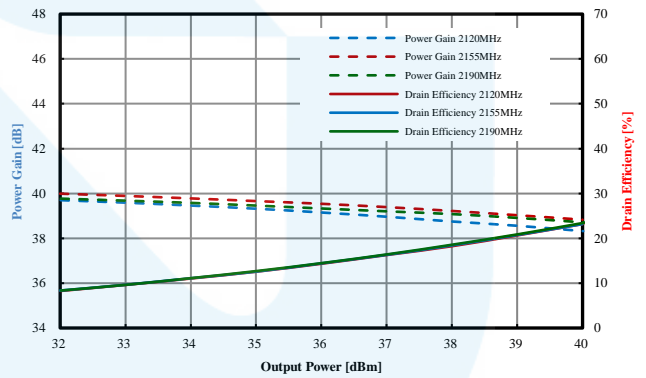
Typical Modulated Signal Performance

(Tc=25°C, Measured in the SDM21009-30H test board amplifier circuit)

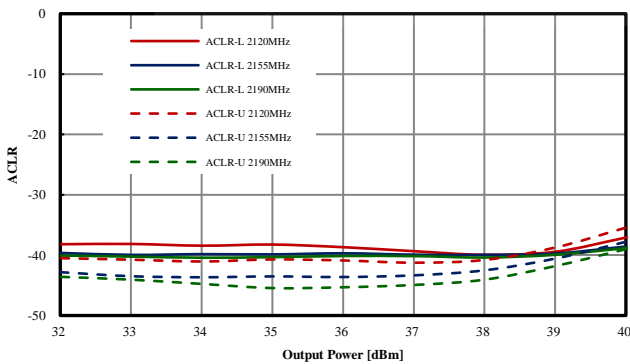
Power Gain, Drain Efficiency, ACLR vs. Frequency



Power Gain, Drain Efficiency vs. Output Power



ACLR vs. Output Power

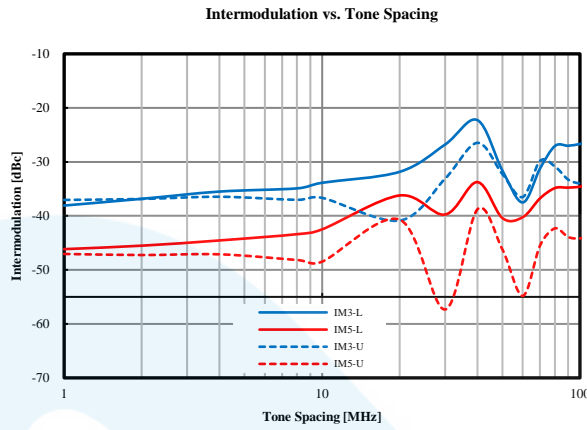


V_{DS} = 48V, Drive Idq=40mA, Main Idq=200mA

LTE 20MHz 1carrier, PAR 7.5dB @0.01% probability on CCDF.

Typical 2-tone Intermodulation Imbalance Performance

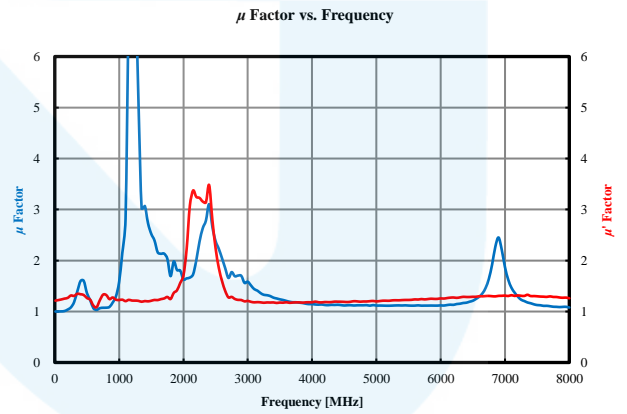
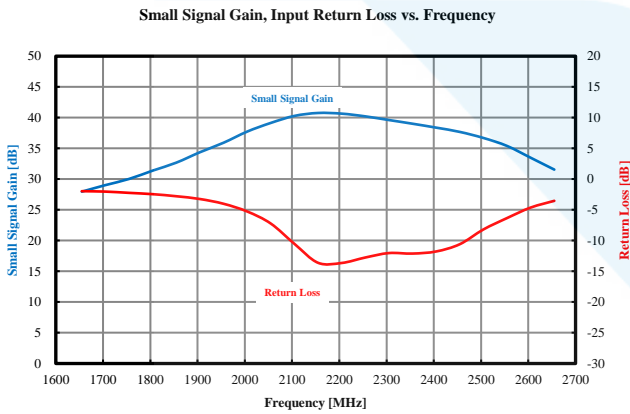
(Tc=25°C, Measured in the SDM21009-30H test board amplifier circuit)



2-tone Power = 37dBm, $V_{DS} = 48V$, Drive Idq=40mA, Main Idq=200mA

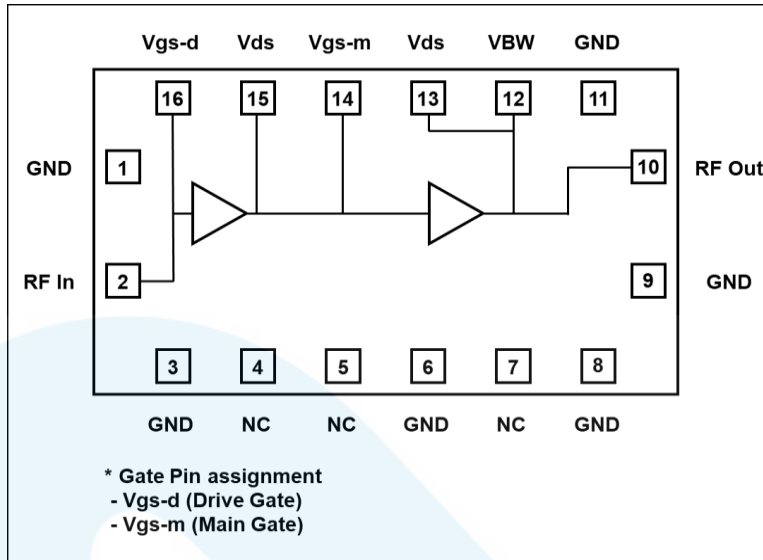
Typical Small Signal Performance

(Tc=25°C, Measured in the SDM21009-30H test board amplifier circuit)

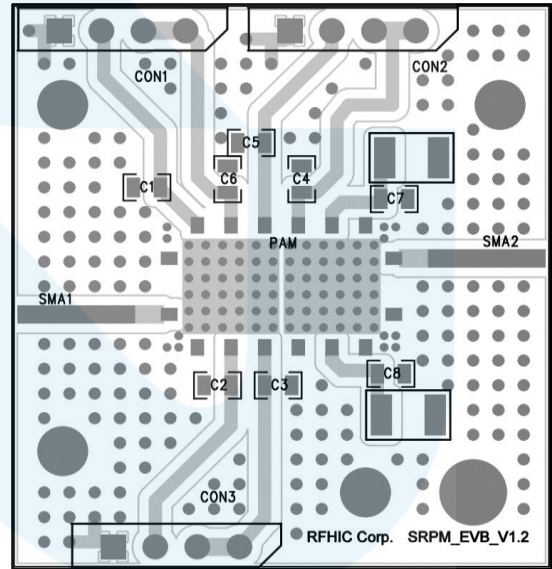
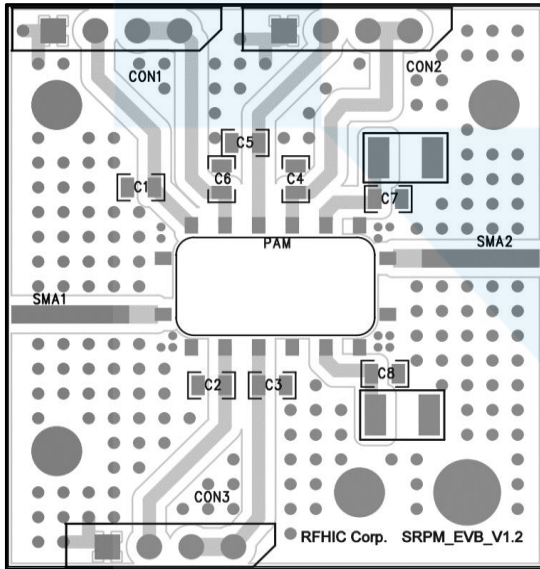


Input Power= -20dBm, $V_{DS} = 48V$, Drive Idq=40mA, Main Idq=200mA

Block Diagram



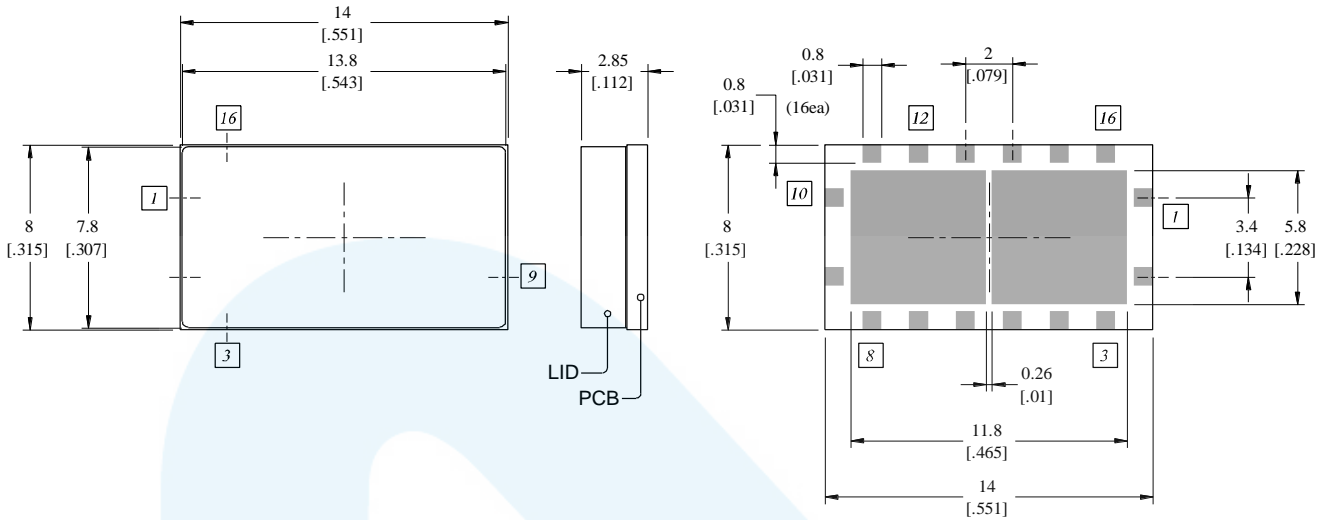
Test Board Component Layout with Coin Embedded and Thermal Via Type



Part	Description	Part Number	Manufacturer
C4, C6, C7	1.0uF / 100V	GRM21BC72A105KE01	MURATA
C1, C5	4.7uF / 16V	TAJA475M016RNJ	AVX
PCB	2Layer, 20mil, 1oz	RO4350B	ROGERS
CON1~2	2.54mm Male Connector	5267-04A	MOLEX
SMA1~2	Female Connector	-	-
PAM	GaN Hybrid PAM	SDM21009-30H	RFHIC

Package Dimensions (Type:PP-3G)

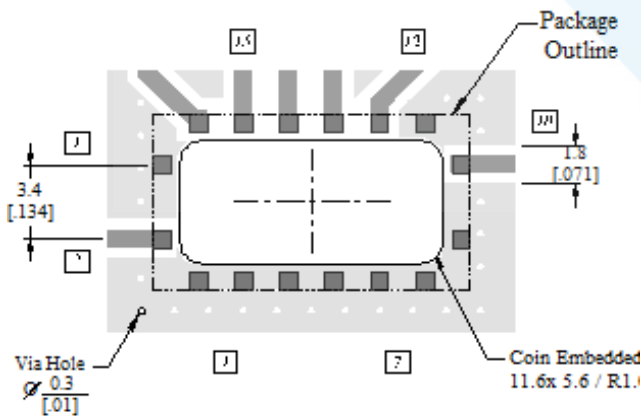
* Unit: mm[inch] | Tolerance: ±0.15[.006]



Pin Description								
[2]	[4]	[5]	[10]	[13]	[14]	[15]	[16]	[12]
RF In	-	-	RF Out	V _{DS}	V _{GS-m}	V _{DS}	V _{GS-d}	VBW
-	-	-	-	Main	Main	Drive	Drive	

* Other Pins are GND.

Recommended Footprint & Coin Embedded



Revision History

Part Number	Release Date	Version	Description	Data Sheet Status
SDM21009-30H	May, 2024	0.1	Initial version	Preliminary



Certification

This product is manufactured by a company that is certified for the AS9100D quality management system.

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