Preliminary

GaN Power Transistors

RSEC15I33CN

Product Features

- 1 to 2GHz Wideband Operation
- 320W Pulse Power @ Fixed Input Power
- 60% Drain Efficiency @ Pulse Power
- Internal Matched Transistor
- 50V Operation

Applications

- Broadband Amplifier
- Test Instrumentation
- Multi-Band, Multi-Mode
- Multi-Carrier
- Pulse Amplifier



Package Type : RF12002KR3

Description

The RSEC15I33CN is a 320 W GaN-on-SiC HEMT power transistor operating from 1GHz to 2GHz, housed in RFHIC's RF12002KR3 flanged package. Operating at 50 V, the device delivers 320 W typical saturated output power with 60% drain efficiency, including broadband amplifiers, test instrumentation, multi-band/multi-mode/multi-carrier systems, and pulse amplifier designs.

Typical Pulsed Signal Performance

(V_{DS}= +50V, T_C=25℃, 50Ω)

Frequency [MHz]	Peak Power				
	Input Power [W]	Output Power [W]	Gain [dB]	Drain Efficiency [%]	Signal Type
1000	12.6	307.6	13.9	63.4	Pulse width 100µsec, Duty Cycle 10%.
1200	12.6	338.8	14.3	50.6	
1400	12.6	383.7	14.8	59.0	
1600	12.6	408.3	15.1	71.8	
1800	12.6	335.0	14.3	71.6	
2000	12.6	291.7	13.7	52.6	

Note

*1 Measured in the RSEC15I33CN test board amplifier circuit, under pulse width 100usec, Duty Cycle 10%.

Absolute Maximum Ratings

Rating	Symbol	Value	Unit	Condition
Drain to Source Voltage	V_{DSS}	150	V	Tc=25℃
Gate to Source Voltage	V_{GS}	-10, +2	V	Tc=25℃
Operating Voltage	V_{DD}	52	V_{DC}	
Maximum Forward Gate Current	I_{GMAX}	41.8	mA	Tc=25℃
Maximum Drain Current[*1]	I_{DMAX}	18	A	Tc=25℃
Power Dissipation	P_{DISS}	178	W	Tc=85℃
Storage Temperature	T_{STG}	-65, +150	℃	
Case Operating Temperature	T_C	-40, +150	℃	30 seconds
Operating Junction Temperature[*2]	T_J	225	℃	
Soldering Temperature[*3]	T_S	245	℃	

Note

*1 Current Limit for long term, reliable operation.

*2 Continuous use at maximum temperature will affect MTTF.

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

Thermal Characteristics

Rating	Symbol	Value	Unit	Condition
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.65 *1	℃/W	Tc=85℃

Note

*1 Measured for the RSEC15I33CN at dissipation power is 177.7W.

Electrical Characteristics (T_C=25℃ unless otherwise noted)

Characteristics	Conditions	Symbol	Min	Typ	Max	Unit
DC Characteristics[*1]						
Gate Threshold Voltage	**V_{DS} = 10V** **I_D = 28.8mA**	$V_{GS(TH)}$	-3.8	-3.0	-2.3	V_{DC}
Gate Quiescent Voltage	**V_{DS} = 50V** **I_D = 20mA**	$V_{GS(Q)}$	-	-2.9	-	V_{DC}
Saturated Drain Current[*2]	**V_{DS} = 6V** **V_{GS} = 2V**	I_{DS}	34.8	41.8	-	A
Drain-Source Breakdown Voltage	**V_{GS} = -8V** **I_D = 3.6mA**	V_{BR}	150	-	-	V
Gate Leakage Current	**V_{GS} = -8V** **V_{DS} = 150V**	I_{GLKG}	-9.2	-	-	mA
Drain Leakage Current	**V_{GS} = -8V** **V_{DS}= 150V**	I_{DLKG}	-	-	16.7	mA
RF Characteristics (Fc=1500MHz unless otherwise noted)						
Saturated Output Power[*3,6]	**V_{DS} = 50V** **I_{DQ} = 20mA**	P_{SAT}	200	320	-	W
Pulsed Drain Efficiency[*3]	**V_{DS} = 50V** **I_{DQ} = 20mA** **P_{in} = 48dBm**	η	40.0	60.0		%
Saturated Output Gain[*7]	**V_{DS} = 50V** **I_{DQ} = 20mA** **P_{in} = 48dBm**	G_S	13.0	14.5	16.0	dB
Small Signal Gain[*7]	**V_{DS} = 50V** **I_{DQ} = 20mA** **P_{in} = -10dBm**	G_P	13.0	14.5	16.0	dB
Output Mismatch Stress[*3, 5]	**V_{DS} = 50V** **I_{DQ} = 20mA** **P_{OUT} = P_{SAT} Pulsed**	VSWR	-	-	10:1	ψ

Note

*1 Measured on wafer prior to packaging.

*2 Scaled from PCM data.

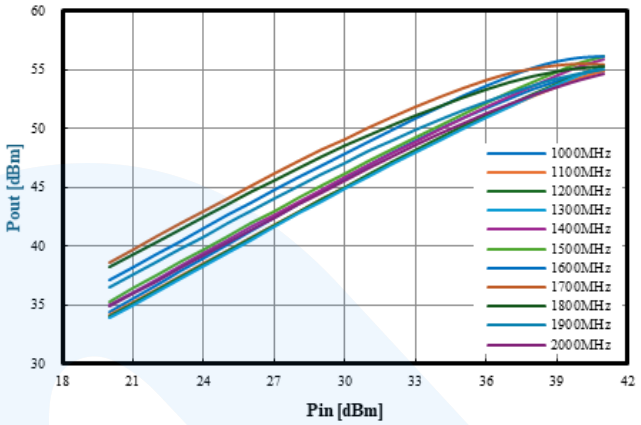
*3 Pulse width 100μsec, Duty Cycle 10%.

*4 Psat is defined as ΔPout/ΔPin<0.1, where ΔPin is increased input power, ΔPout is increased output power.

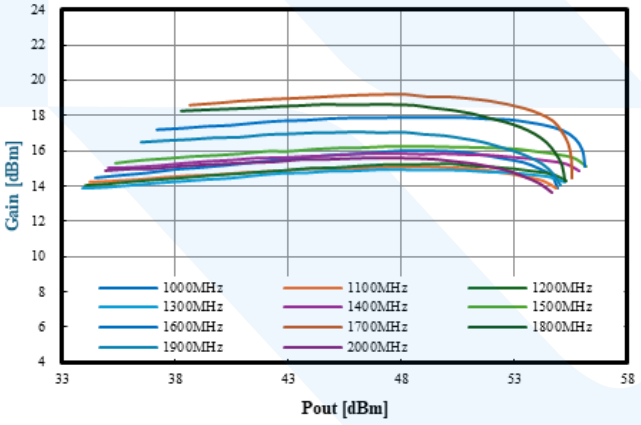
*5 Measured in the RSEC15I33CN test board amplifier circuit. No damage at all phase angles.

Typical Pulsed Signal Performance (Tc=25°C, Measured in the RSEC15I33CN test board amplifier circuit)

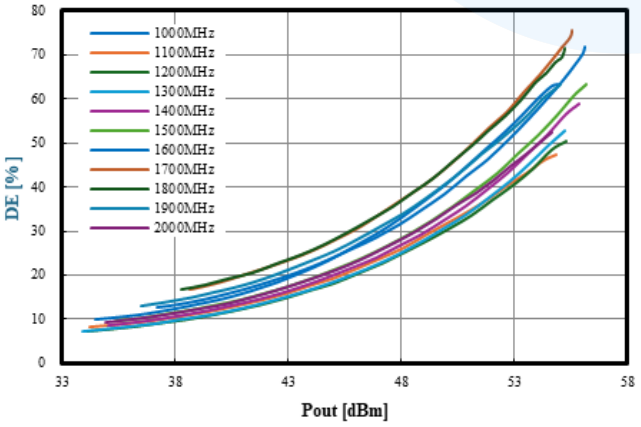
Input Power vs. Output Power



Output Power vs. Power Gain



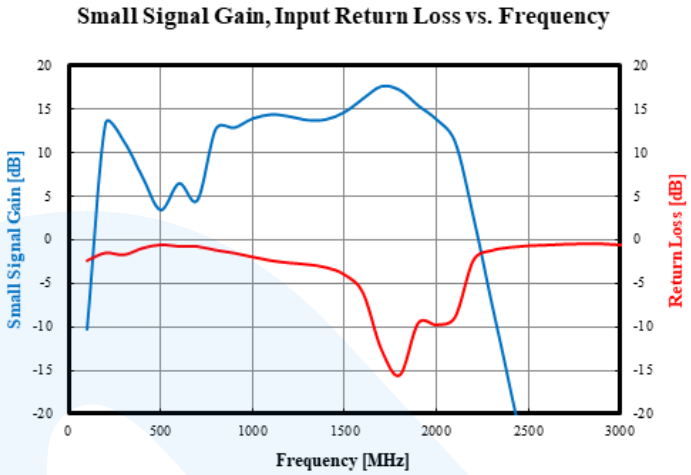
Output Power vs. Drain Efficiency

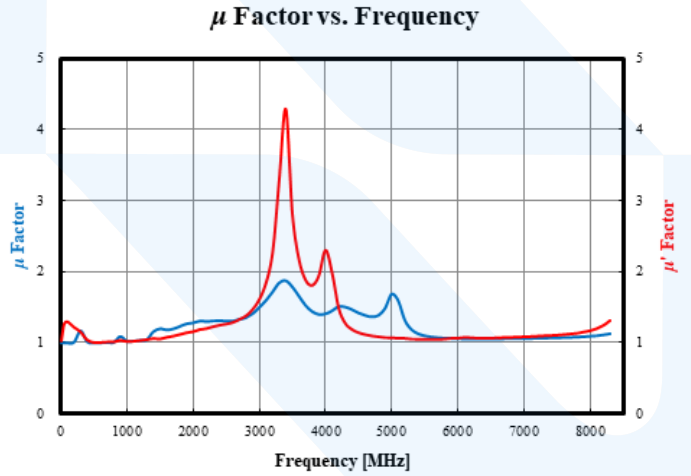


V_{DS} = 50V, I_{DQ} = 200mA Pulse Width = 100µsec, Duty Cycle = 10%

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Typical Small Signal Performance (Tc=25℃, Measured in the test board amplifier circuit)

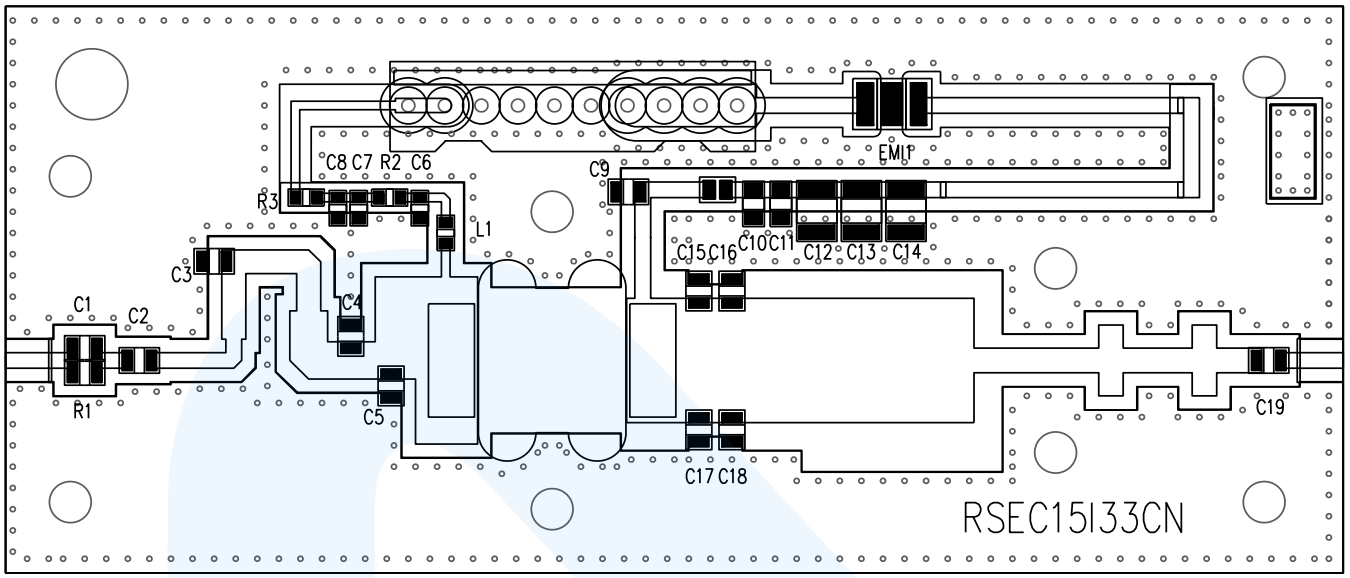




P_{IN} = -10dBm, V_{DS} = 28V, I_{DQ} = 200mA

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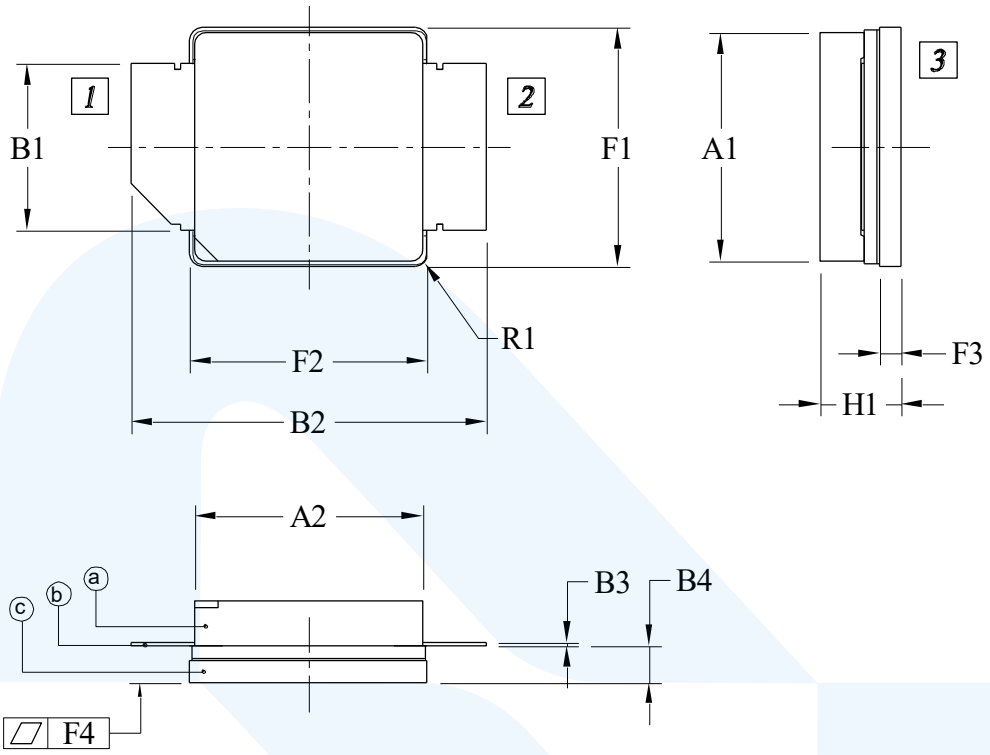
Test Board Component Layout



Part	Description	Part Number	Manufacturer
R1	50 ohm Chip Resistor	MCR03 EZPJ510	ROHM
R2	10 ohm Chip Resistor	MCR03 EZPJ100	ROHM
R3	91 ohm Chip Resistor	MCR03 EZPJ910	ROHM
C1	56pF High Q Capacitor	201 CHA 560 JSLE	TEMEX
C2	39pF High Q Capacitor	201 CHA 390 JSLE	TEMEX
C3	2.7pF High Q Capacitor	201 CHA 2R7 CSLE	TEMEX
C4	3.9pF High Q Capacitor	201 CHA 3R9 CSLE	TEMEX
C5	2.0pF High Q Capacitor	201 CHA 2R0 CSLE	TEMEX
C6, C11	100pF High Q Capacitor	201 CHA 101 JSLE	TEMEX
C7	1μF Chip Capacitor	GRM188R71C105KA12D	MURATA
C8, C10, C17, C18	N.C	-	-
C9	24pF High Q Capacitor	201 CHA 240 JSLE	TEMEX
C12, C13, C14	10uF MLCC	GRM32EC72A106KE05L	MURATA
C15	3.6pF High Q Capacitor	201 CHA 3R6 CSLE	TEMEX
C16	0.7pF High Q Capacitor	201 CHA 0R7 BSLE	TEMEX
C19	6.8pF High Q Capacitor	201 CHA 6R8 CSLE	TEMEX
L1	4.3nH, ±2%, 1608,2100mA	LQW18AN4N3B80	MURATA
EMI1	EMI FILTER	CTH32R102S20A-TM	MARUWA
CON1	DC Connector	5045-10	NESEL
AMP1	GaN Transistor	RSEC15I33CN	RFHIC
PCB	εr=3.66 ± 0.05, 0.020” (0.508mm)	RO4350B	ROGERS Corp.

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Package Dimensions (Type: RF12002KR3)



Pin Description	
Pin No	Function
1	Gate
2	Drain
3	Source

ⓐ- Lid
ⓑ- Lead Frame
ⓒ- Flange

Dim.	INCH			MILLIMETER		
	MIN	TYP	MAX	MIN	TYP	MAX
A1	.379	.384	.389	9.63	9.76	9.89
A2	.379	.384	.389	9.63	9.76	9.89
B1	.274	.280	.285	6.97	7.10	7.23
B2	.579	.598	.618	14.70	15.20	15.70
B3	.003	.005	.007	0.08	0.13	0.18
B4	.057	.062	.067	1.45	1.57	1.70
F1	.395	.400	.405	10.03	10.16	10.29
F2	.395	.400	.405	10.03	10.16	10.29
F3	.031	.036	.041	0.79	0.92	1.05
F4	-	.001	-	-	0.03	-
H1	.115	.137	.158	2.92	3.47	4.02
R1 (Radius)	.016	.020	.024	0.40	0.50	0.60

Revision History

Part Number	Release Date	Version	Description	Data Sheet Status
RSEC15I33CN	Oct, 2026	0.1	Initial Release of datasheet	Preliminary

KS Q 9100:2018
AS9100 D

Certification

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

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