DC35GN-15-Q4

15 Watts • 50 Volts • Pulsed & CW
GaN on SiC Wideband Transistor
QFN 4x4 mm

GENERAL DESCRIPTION

The DC35GN-15-Q4 is a COMMON SOURCE, class -AB, GaN on SiC HEMT transistor capable of broadband pulsed and CW RF power applications. This transistor utilizes gold metallization, air-cavity Cu-base QFN package with high-thermal conductivity to provide superior electrical and thermal performance with excellent reliability & ruggedness.

FEATURES:

- Wide-band DC-3.5 GHz general purpose driver applications
- Ideal for Pulsed Radar, Avionics, ISM, and CW Communication
- 15 W Pulsed and CW Psat and 18 dB Power Gain @ 1.4 GHz
- Low-cost QFN package with excellent RF & Thermal performance
- 50V Bias Operation with high breakdown voltage

ABSOLUTE MAXIMUM RATINGS

Maximum CW Power Dissipation

Device Dissipation @ 25°C 15 W

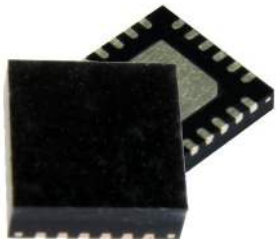
Maximum Voltage and Current

Drain-Source Voltage (V_{DSS}) 125 V
Gate-Source Voltage (V_{GS}) -8 to +0 V
Supply Current (I_{DD}) 700 mA

Maximum Temperatures

Storage Temperature (T_{STG}) -55 to +125° C
Operating Junction Temperature +200 °C

PACKAGE OUTLINE
QFN 4X4 mm



TYPICAL PERFORMANCE SUMMARY [1] @ 25°C

Parameter	Units	0.960 GHz	1.2 GHz	1.4 GHz	2.7 GHz	2.9 GHz	3.1 GHz	3.5 GHz
Output Power Psat	W	20	21	19	20	20	20	16
Power Gain	dB	18.5	18.3	18	13	13	13	12
η_D Drain Efficiency	%	65	72	66	60	63	60	60

[1] Bias Condition: Vdd=+50V, Idq= 40 mA (Vgs= -2.0 ~ -4.5V typical), PW= 1 mS, DC = 10%
RF performance measured on the recommended evaluation board.

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DC FUNCTIONAL CHARACTERISTICS @ 25°C

$I_{D(Off)}$	Drain leakage current	V_{GS} = -8V, V_{DD} = 50V			1	mA
$I_{G(Off)}$	Gate leakage current	V_{GS} = -8V, V_{DD} = 0V			0.2	mA
BV_{DSS}	Drain-Source breakdown voltage	V_{GS} =-8V, I_{DD} = 2mA	125			V
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS} =50V, I_{DD} = 2mA	-4.8	-3.4	-2.5	V

ELECTRICAL CHARACTERISTICS[1] @ 25°C

Symbol	Characteristics	Test Conditions[1]	Min	Typ	Max	Units
Pout	Output Power	Pin=0.32W Freq=1400 MHz	15	19		W
Gp	Power Gain	Pin=0.32W Freq=1400 MHz		18		dB
η_D	Drain Efficiency	Pin=0.32W Freq=1400 MHz	55	66		%
Dr	Droop	Pin=0.32W Freq=1400 MHz		0.1		dB
VSWR-T	Load Mismatch Tolerance	Pin=0.32W Freq=1400 MHz			5:1	
Θjc	Thermal Resistance including PCB, Tbase = 85 °C	Pulse Width=1 mS Duty=10% CW		3.5 8.4		°C/W

[1] Bias Condition: Vdd=+50V, Idq= 40 mA (Vgs= -2.0 ~ -4.5V typical), PW=1 mS, DC = 10%
RF performance measured on the recommended evaluation board.

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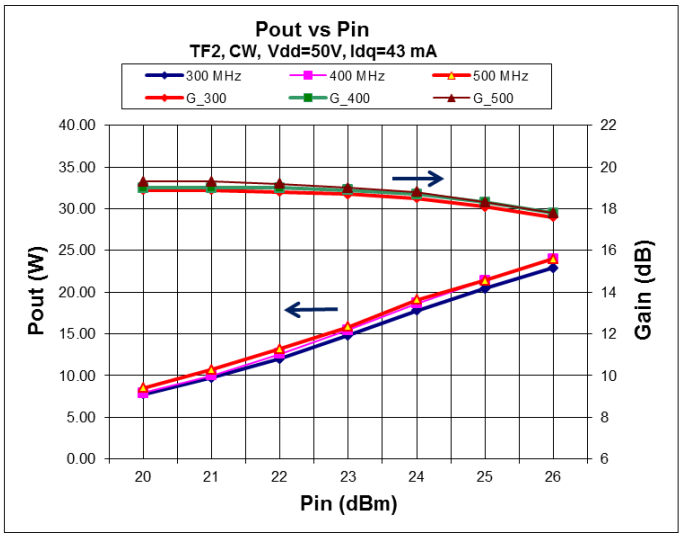
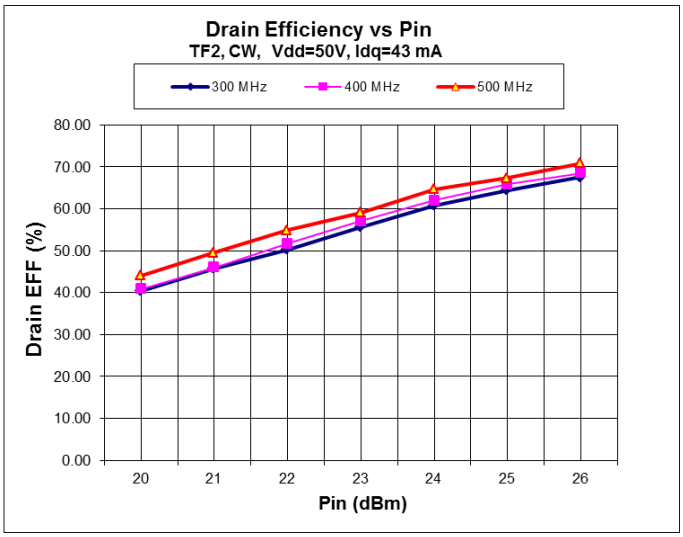
TYPICAL CW PERFORMANCE DATA 300 – 500 MHz Band

Frequency	Pin (W)	Pout (W)	Id (A)	RL (dB)	η_D (%)	Gain (dB)	Droop (dB)
300 MHz	0.32	20.4	.633	-11	64.5	18.1	N/A
400 MHz	0.32	21.4	.649	-12.5	66	18.3	N/A
500 MHz	0.32	21.4	.635	-12.3	67	18.3	N/A

PERFORMANCE PLOTS





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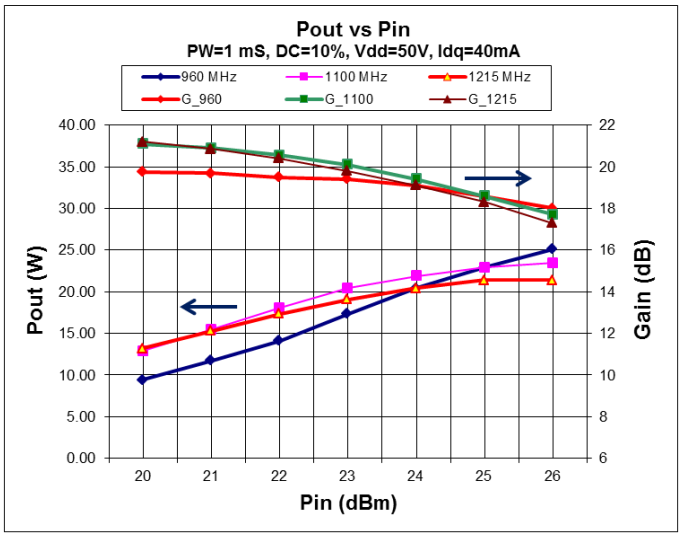
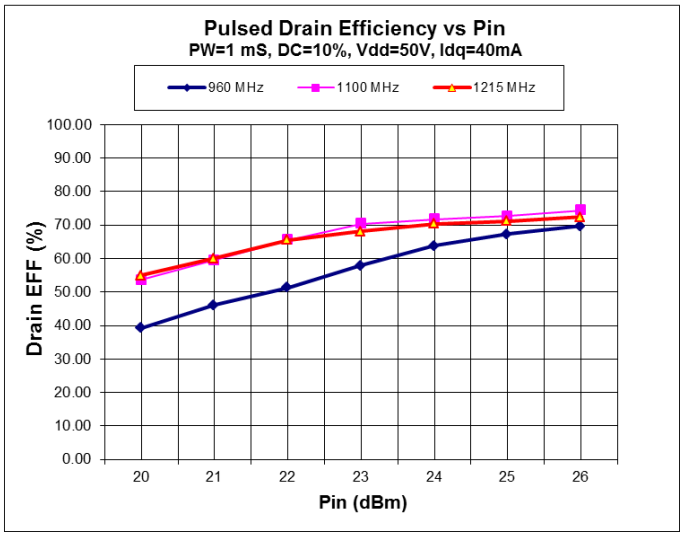
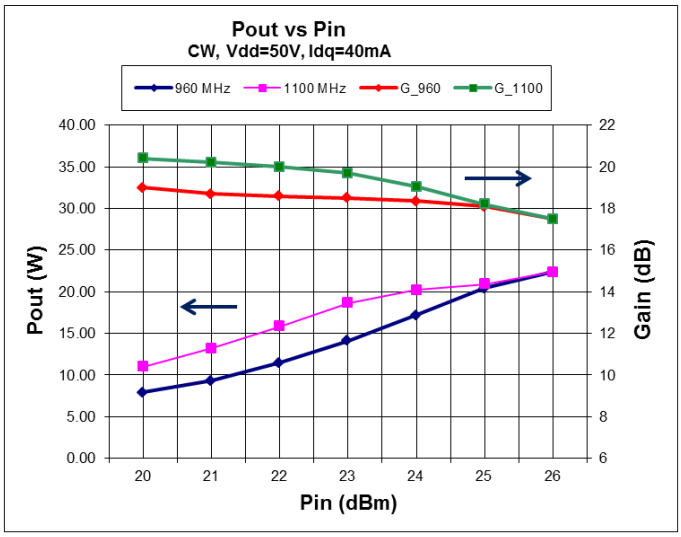
TYPICAL BROAD BAND PULSED PERFORMANCE DATA[1] 0.96 – 1.215 GHz Band

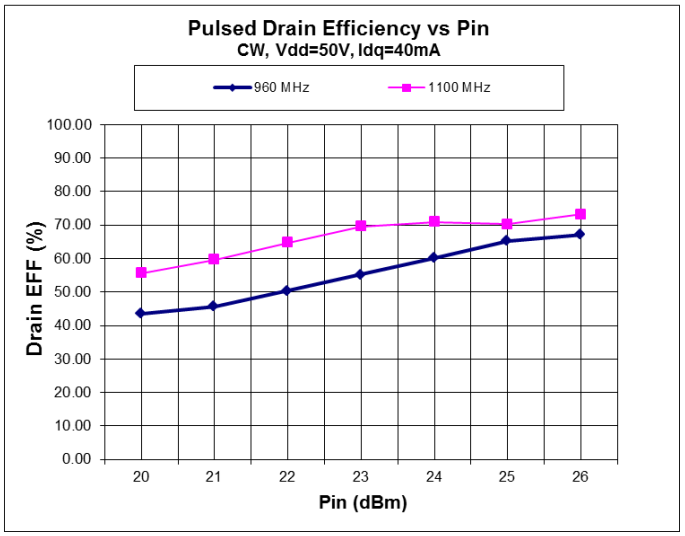
Frequency	Pin (W)	Pout (W)	Id (A)	RL (dB)	η_D (%)	Gain (dB)	Droop (dB)
960 MHz	0.32	22	.680	-12	67	18.6	0.25
1100 MHz	0.32	22	.630	-10.5	72	18.6	0.12
1215 MHz	0.32	21	.600	-14.7	71	18.3	0.10

PERFORMANCE PLOTS









*For the most current data, consult MICROSEMI's website: **www.MICROSEMI.com***
Specifications are subject to change, consult the RFIS factory at (408) 986-8031 for the latest information

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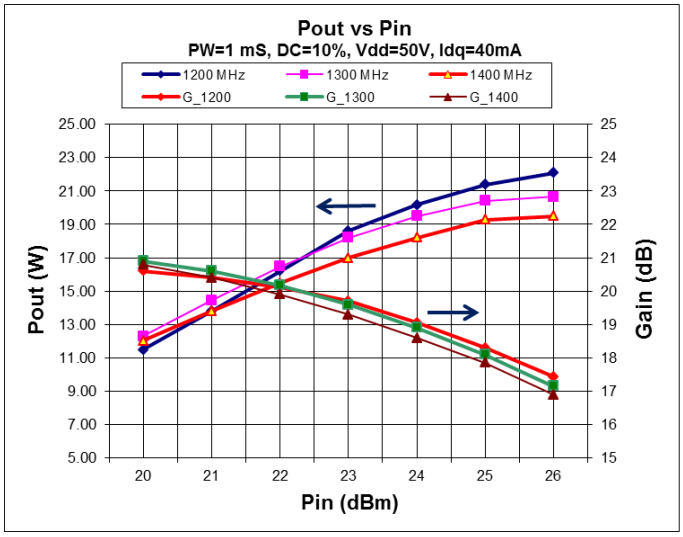
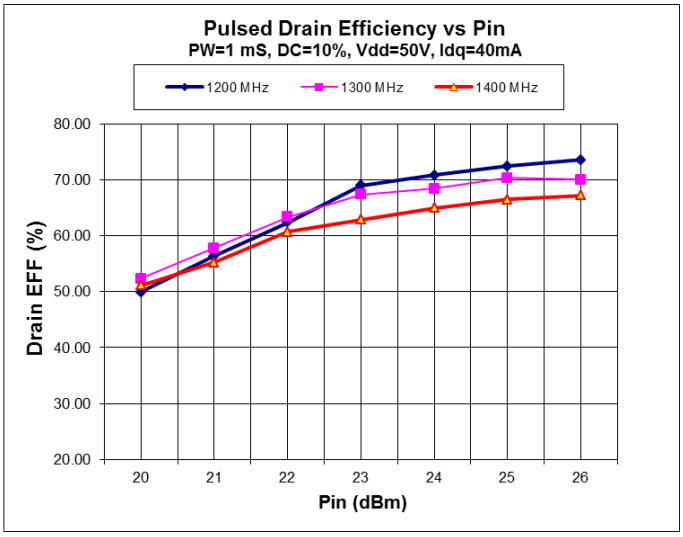
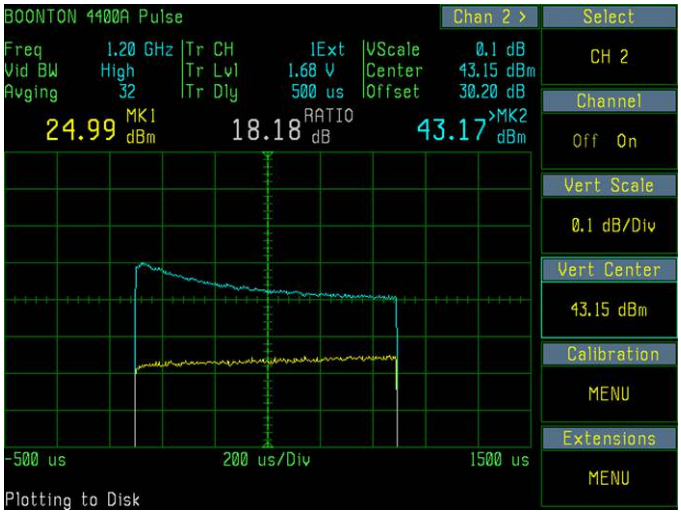
TYPICAL BROAD BAND PULSED PERFORMACE DATA[1] 1.2 – 1.4 GHz Band

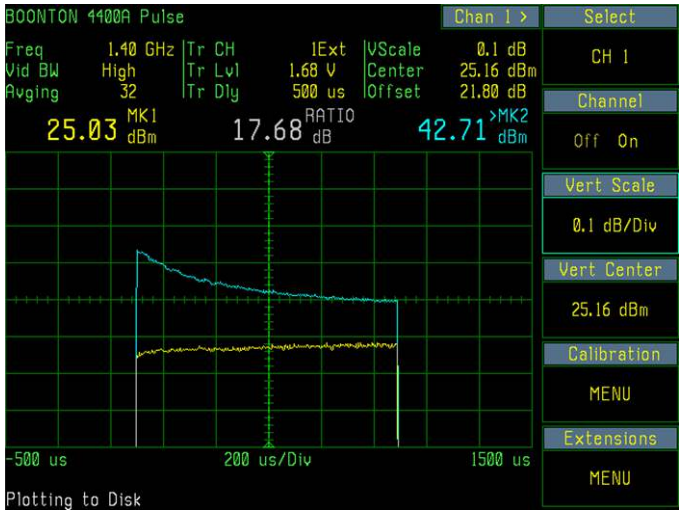
Frequency	Pin (W)	Pout (W)	Id (A)	RL (dB)	η_D (%)	Gain (dB)	Droop (dB)
1200 MHz	0.32	21.4	.590	-10	72.5	18.3	0.1
1300 MHz	0.32	20.4	.580	-17	70.3	18.1	0.1
1400 MHz	0.32	19.3	.580	-12	66.5	17.9	0.12

PERFORMANCE PLOTS









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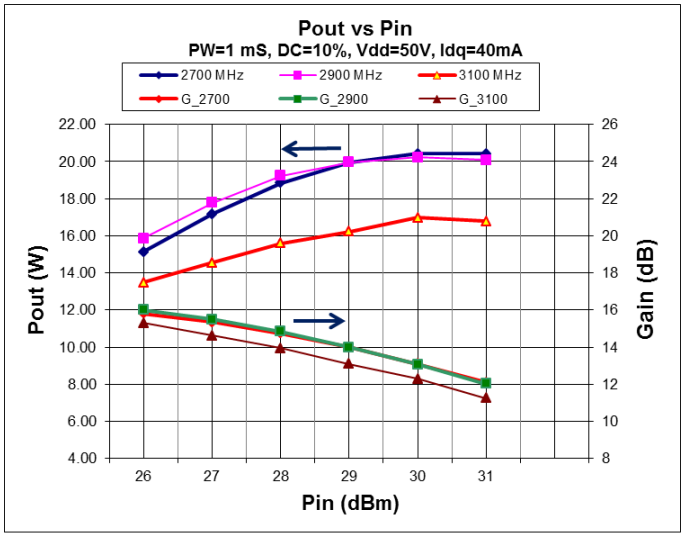
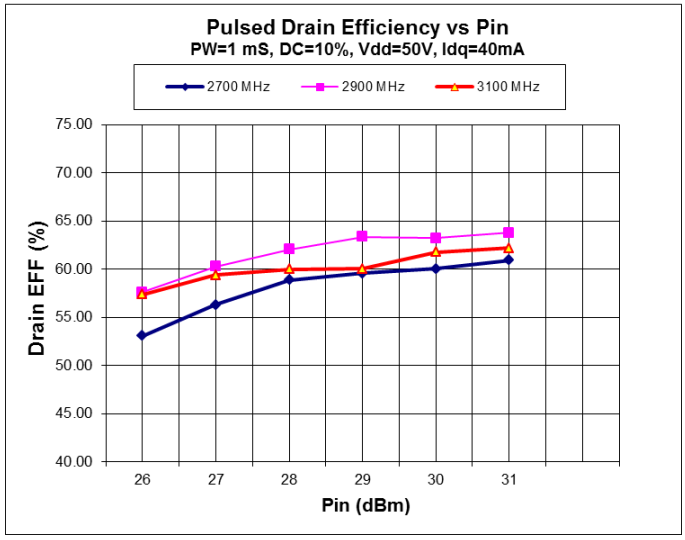
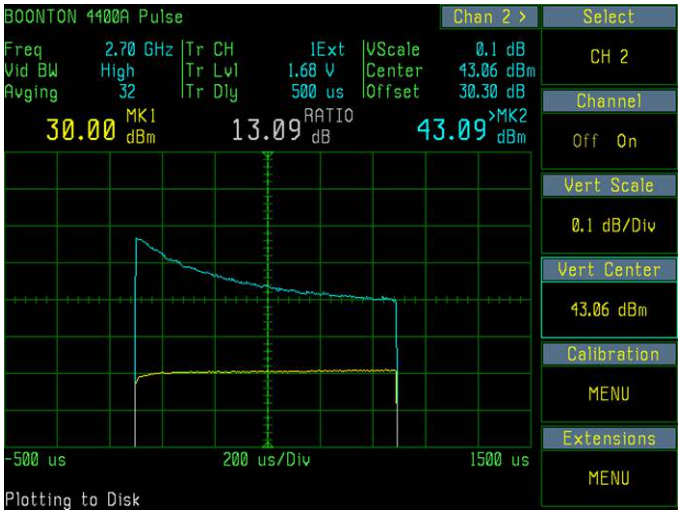
TYPICAL BROAD BAND PULSED PERFORMACE DATA[1] 2.7 – 3.1 GHz Band

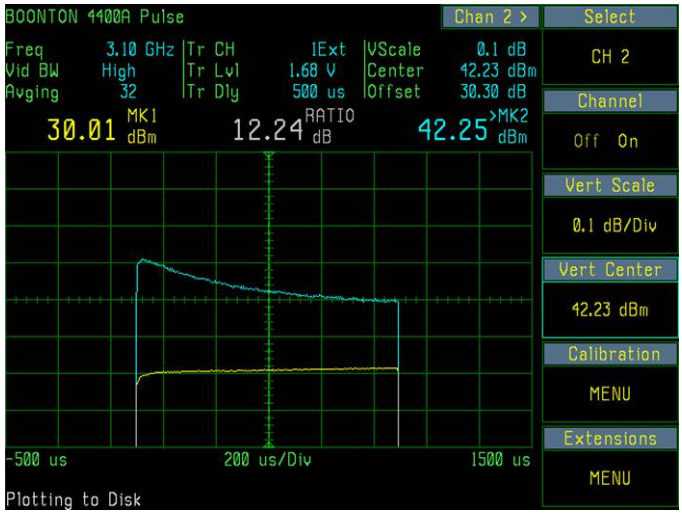
Frequency	Pin (W)	Pout (W)	Id (A)	RL (dB)	η_D (%)	Gain (dB)	Droop (dB)
2700 MHz	1.0	20.4	.680	-6.0	60.0	13.1	0.12
2900 MHz	1.0	20.2	.640	-10.2	63	13.1	0.10
3100 MHz	1.0	17	.550	-9.5	62	12.3	0.09

PERFORMANCE PLOTS









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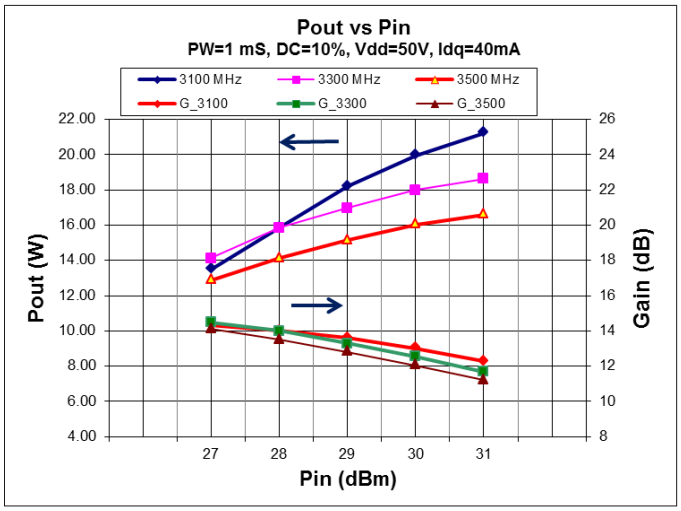
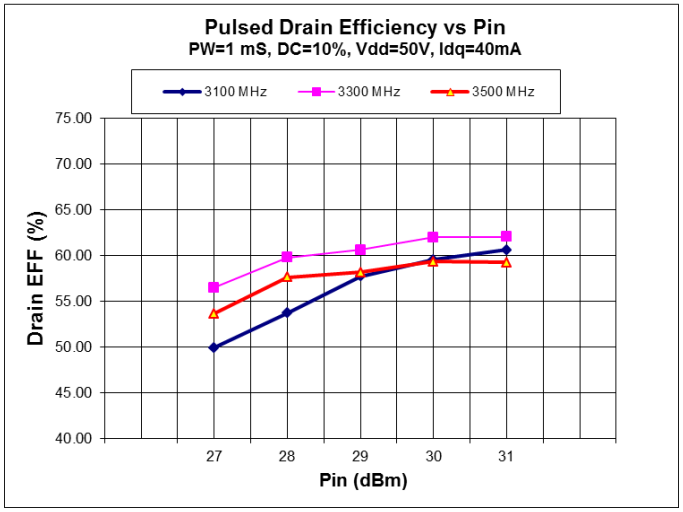
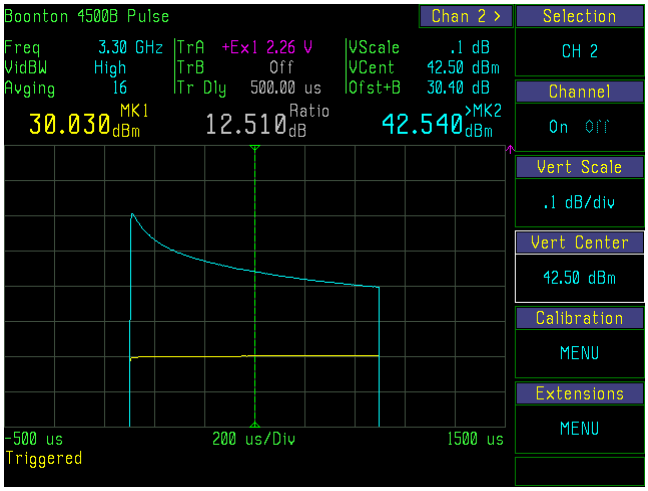
TYPICAL BROAD BAND PULSED PERFORMACE DATA[1] 3.1 – 3.5 GHz Band

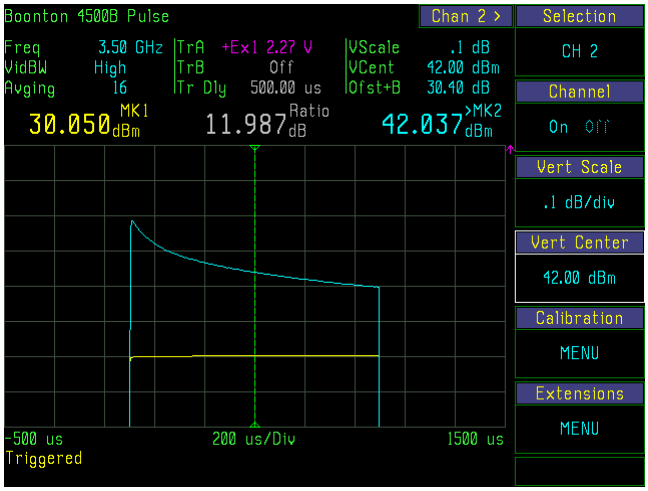
Frequency	Pin (W)	Pout (W)	Id (A)	RL (dB)	η_D (%)	Gain (dB)	Droop (dB)
3100 MHz	1.0	20.0	.670	-6	60	13	0.2
3300 MHz	1.0	18.0	.580	-7.6	62	12.6	0.12
3500 MHz	1.0	16.0	.540	-8.4	60	12	0.11

PERFORMANCE PLOTS









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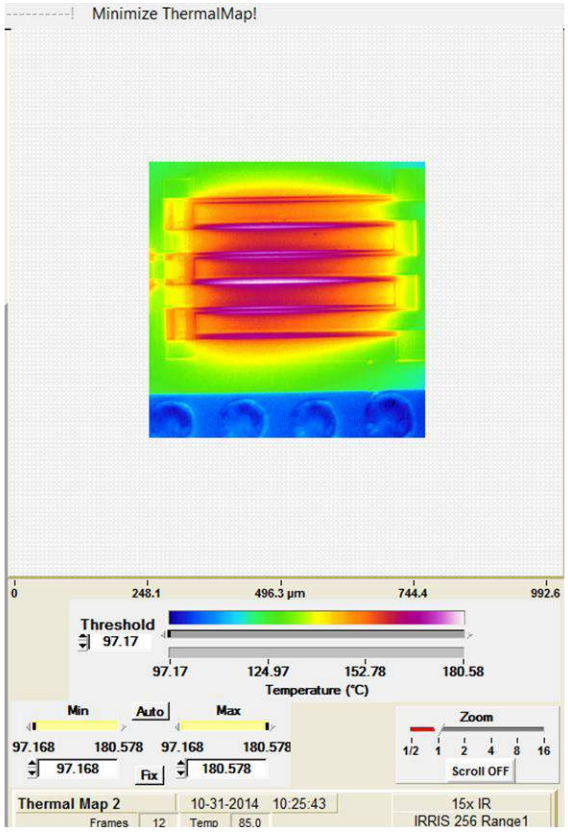
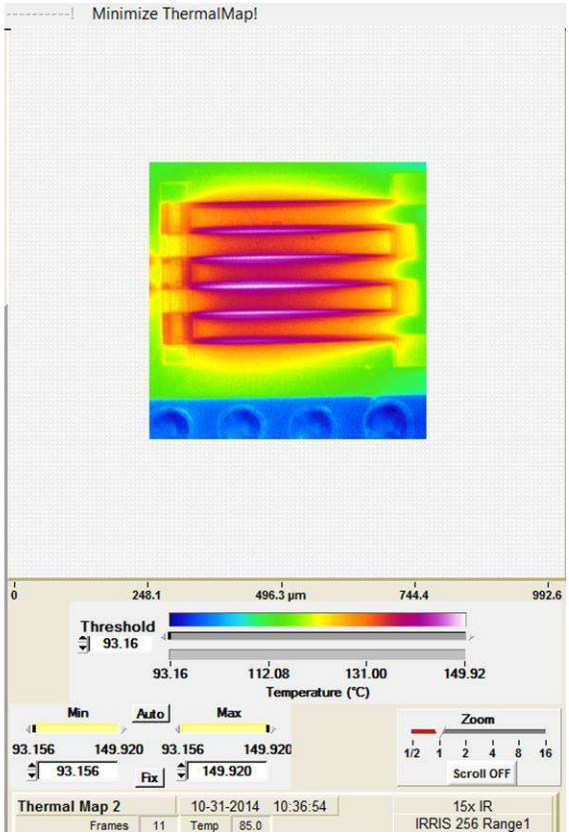
THERMAL IR SCAN DATA (Freq = 1.2 GHz)

DC Pdiss=10.5 W, Tbase =87°C, Tmax=181°C , Rth= 9°C/W



CW Pdiss=8.4 W, Tbase =86°C, Tmax=150°C , Rth= 7.6°C/W



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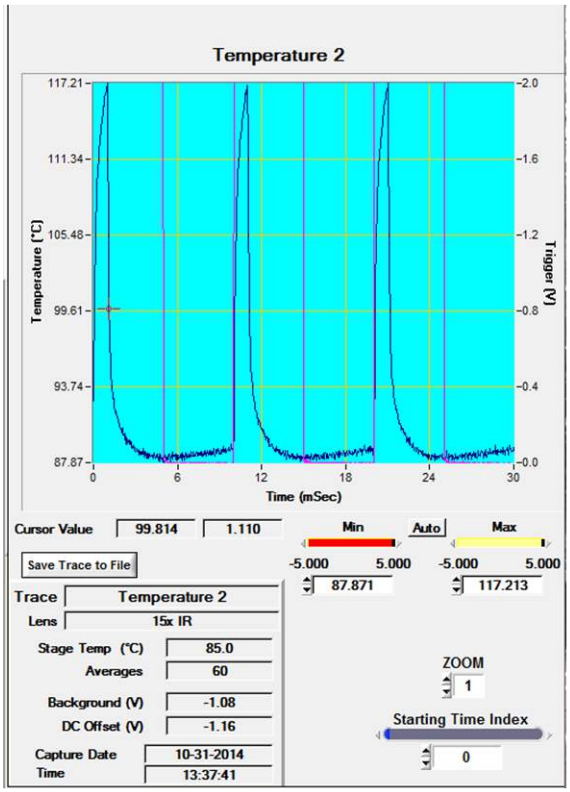
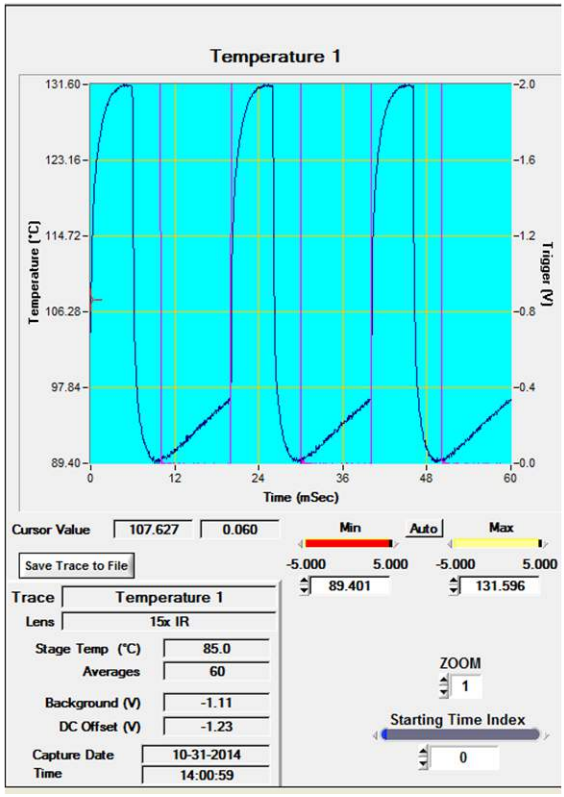
THERMAL IR SCAN DATA (Freq = 1.2 GHz)

1mS,10% Pdiss=9.7W,Tbase =85°C, Tmax=117°C, Rth= 3.3°C/W



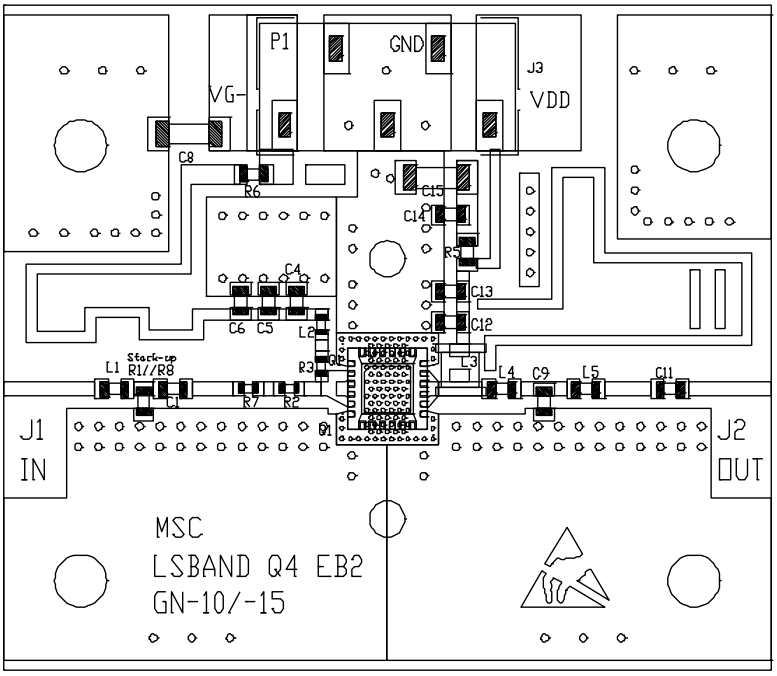
6mS,30% Pdiss=9W,Tbase =85°C, Tmax=131°C, Rth= 5.1°C/W



DC35GN-15-Q4

15 Watts • 50 Volts • Pulsed & CW
GaN on SiC Wideband Transistor
QFN 4x4 mm

EVALUATION BOARD LAYOUT Q4 EB2
ASSEMBLY DIAGRAM AND BOM FOR 300-500 MHz



Board Material: Rogers RO4003C, 12 Mil Thickness, Er = 3.38, 1 OZ Cu
8 Mil Dia Vias below package, Qty: 39, Solid Cu Filled. Board Size: 1.5 x 1.3 inches

Item	Description 300 - 500 MHz
C11,C12	0603, 39 pF, ±5%, 250V, ATC 600S
C1	0603, 10 pF, ±5%, 250V, ATC 600S
C9	0603, 1.8 pF, ±0.25pF, 250V, ATC 600S
C4,C5,C13	0603, 470 pF, ±5%, 100V, AVX, X7R
C6,C14	0603, 10000 pF, ±10%, 100V, AVX, X7R
C8,C15	1206, 4.7 uF, ±10%, 100V, AVX, X7S
R1	0603 300 Ω
R8	0603 360 Ω
R5	0603 5.1 Ω
R2	0402 5.1 Ω
R3	0402 68 Ω
R6	0603 20 Ω
R7	0402 0 Ω JUMPER
L1	0603HP, 15 nH , 5% Coilcraft
L2	0603HP, 56 nH , 5% Coilcraft
L3	1008AF, 0.9 uH , 5% Coilcraft
L4	0603HP, 7.5 nH , 5% Coilcraft
L5	0603HP, 4.7 nH , 5% Coilcraft
J3	TSM-105-01-S-SV-A, SAMTEC
Q1	DC35GN-15-Q4 QFN 4X4, 24L

Note: RF Input is DC short but Gate Input is DC Blocked

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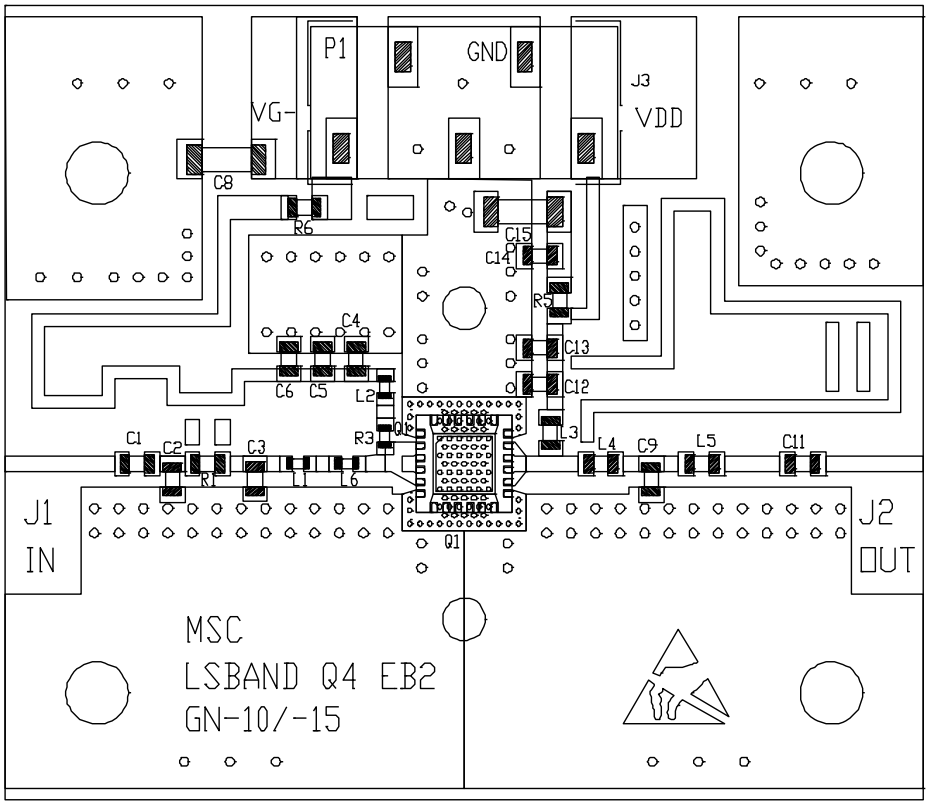
QFN 4x4 mm

EVALUATION BOARD LAYOUT Q4 EB2
ASSEMBLY DIAGRAM AND BOM FOR 960-1215 MHz and 1200-1400 MHz



Board Material: Rogers RO4003C, 12 Mil Thickness, Er = 3.38, 1 OZ Cu
8 Mil Dia Vias below package, Qty: 39, Solid Cu Filled. Board Size: 1.5 x 1.3 inches

Item	Description 0.96 - 1.215 GHz	Description 1.2 - 1.4 GHz
C1,C11,C12	0603, 39 pF, ±5%, 250V, ATC 600S	0603, 39 pF, ±5%, 250V, ATC 600S
C2	0603, 2.4 pF, 250V, ATC 600S	N/A
C3	N/A	0603, 3.9 pF, 250V, ATC 600S
C9	0603, 1.8 pF, ±0.25pF, 250V, ATC 600S	0603, 1.8 pF, ±0.25pF, 250V, ATC 600S
C4,C5,C13	0603, 470 pF, ±5%, 100V, AVX, X7R	0603, 470 pF, ±5%, 100V, AVX, X7R
C6,C14	0603, 10000 pF, ±10%, 100V, AVX, X7R	0603, 10000 pF, ±10%, 100V, AVX, X7R
C8,C15	1206, 4.7 uF, ±10%, 100V, AVX, X7S	1206, 4.7 uF, ±10%, 100V, AVX, X7S
R1	0603 0 Ω JUMPER	0603 6.2 Ω
R5	0603 5.1 Ω	0603 5.1 Ω
R3	0402 12 Ω	0402 12 Ω
R6	0603 20 Ω	0603 20 Ω
L1	0402HP, 2.2 nH , 5% Coilcraft	0402HP, 2.2 nH , 5% Coilcraft
L2	0402PA, 1.9 nH , 5% Coilcraft	0402PA, 1.9 nH , 5% Coilcraft
L3	0603HP, 39 nH , 5% Coilcraft	0603HP, 27 nH , 5% Coilcraft
L4	0603HP, 7.5 nH , 5% Coilcraft	0603HP, 7.5 nH , 5% Coilcraft
L5	0603HP, 4.7 nH , 5% Coilcraft	0603HP, 4.7 nH , 5% Coilcraft
L6	0402HP 1nH, 5% Coilcraft	0402 0 Ω JUMPER
J3	TSM-105-01-S-SV-A, SAMTEC	TSM-105-01-S-SV-A, SAMTEC
Q1	DC35GN-15-Q4 QFN 4X4, 24L	DC35GN-15-Q4 QFN 4X4, 24L

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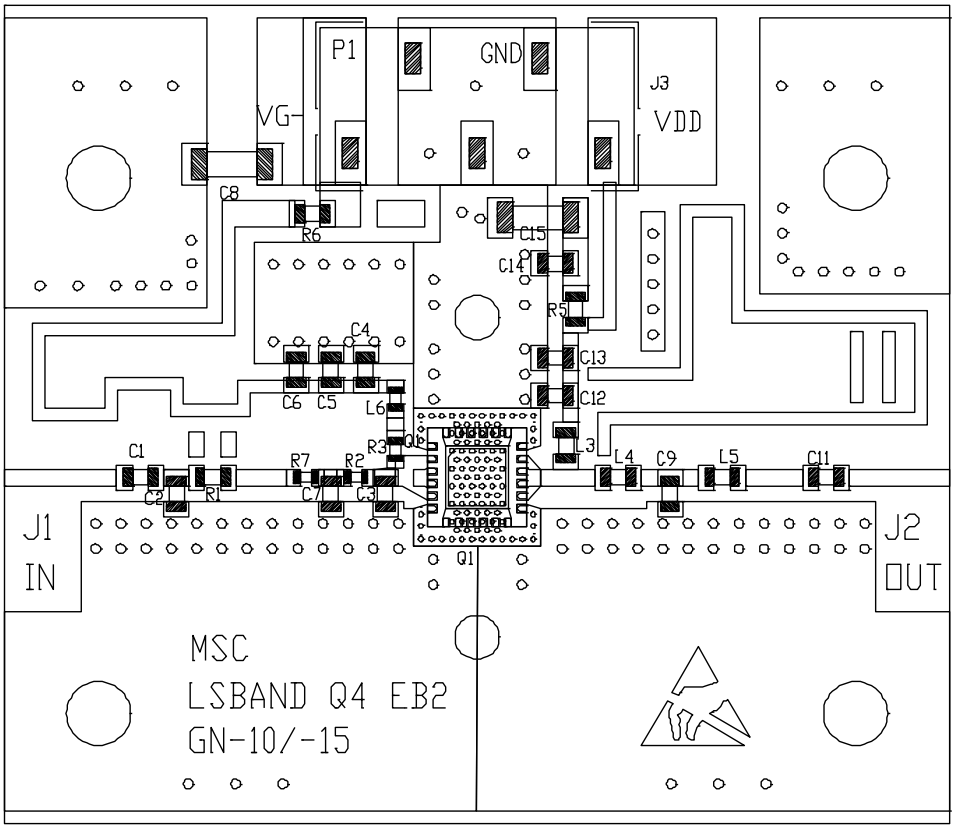
EVALUATION BOARD LAYOUT Q4 EB2
ASSEMBLY DIAGRAM AND BOM FOR 2700-3100 MHz & 3100-3500 MHz



Board Material: Rogers RO4003C, 12 Mil Thickness, Er = 3.38, 1 OZ Cu
8 Mil Dia Vias below package, Qty: 39, Solid Cu Filled. Board Size: 1.5 x 1.3 inches

Item	Description 2.7 - 3.1 GHz	Description 3.1 - 3.5 GHz
C1,C11,C12	0603, 18 pF, ±5%, 250V, ATC 600S	0603, 18 pF, ±5%, 250V, ATC 600S
C2	N/A	N/A
C3	0603, 2.4 pF, 250V, ATC 600S	0603, 1.5 pF, 250V, ATC 600S
		ATTACH AT 1st HOLE
C7	0603, 1 pF, 250V, ATC 600S	0603, 1 pF, 250V, ATC 600S
C9	0603, 1.2 pF, ±0.1pF, 250V, ATC 600S	0603, 1.1 pF, ±0.1pF, 250V, ATC 600S
		AS CLOSE TO L5 AS POSSIBLE
C4,C5,C13	0603, 470 pF, ±5%, 100V, AVX, X7R	0603, 470 pF, ±5%, 100V, AVX, X7R
C6,C14	0603, 10000 pF, ±10%, 100V, AVX, X7R	0603, 10000 pF, ±10%, 100V, AVX, X7R
C8,C15	1206, 4.7 uF, ±10%, 100V, AVX, X7S	1206, 4.7 uF, ±10%, 100V, AVX, X7S
R1	0603 0 Ω JUMPER	0603 0 Ω JUMPER
R5	0603 5.1 Ω	0603 5.1 Ω
R2,R7	0402 0 Ω JUMPER	0402 0 Ω JUMPER
R3	0402 22 Ω	0402 22 Ω
R6	0603 20 Ω	0603 20 Ω
L3	0402HP, 1 nH , 5% Coilcraft	0402HP, 1 nH , 5% Coilcraft
L4	0402HP, 1 nH , 5% Coilcraft	Jumper Copper Foil
L5	0603HP, 1.8 nH , 5% Coilcraft	0402HP, 1 nH , 5% Coilcraft
L6	0402HP, 3.9 nH , 5% Coilcraft	0402HP, 3.9 nH , 5% Coilcraft
J3	TSM-105-01-S-SV-A, SAMTEC	TSM-105-01-S-SV-A, SAMTEC
Q1	DC35GN-15-Q4 QFN 4X4, 24L	DC35GN-15-Q4 QFN 4X4, 24L

DC35GN-15-Q4

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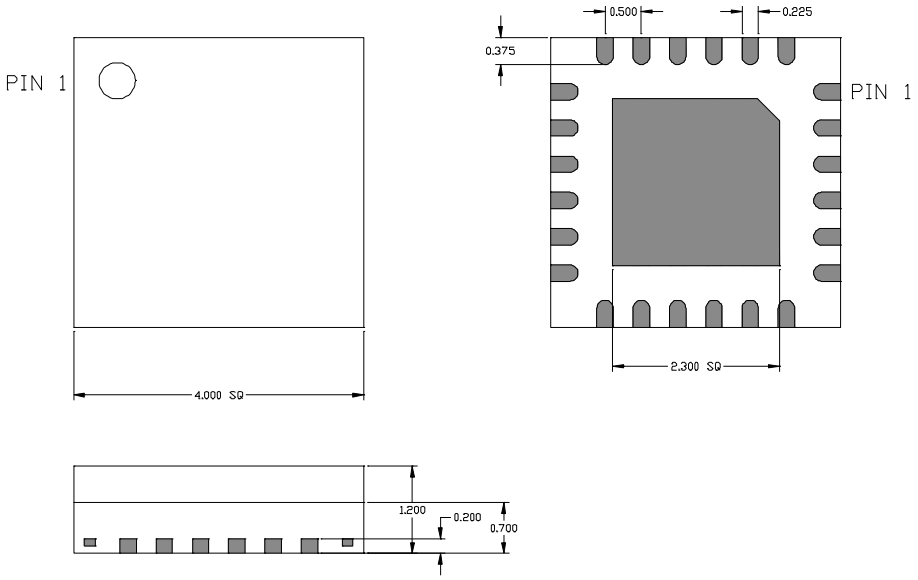
GaN on SiC Wideband Transistor
QFN 4x4 mm

QFN 4X4 mm PACKAGE OUTLINE & DIMENSIONS

All Dimensions are in mm (typ).



PIN	FUNCTION
1,6,13,18	RF GND (Source)
2,3,4,5	RF IN (Gate)
7,8,9,10,11,12	N/C
14,15,16,17	RF OUT (Drain)
19,20,21,22,23,24	N/C
Backside Exposed Pad	RF GND (Source) & Thermal Pad

Notes:

1. **Backside exposed pad must be connected to Solid Cu filled vias for optimum RF & Thermal performance. See recommended evaluation board layout**

DC35GN-15-Q4

15 Watts • 50 Volts • Pulsed & CW
GaN on SiC Wideband Transistor
QFN 4x4 mm

Revision History

Revision	Date	Affected Section(s)	Description
2.0	09-16-14	-	Initial Preliminary Release
3.0	12-04-14	-	Added more Preliminary Data
4.0	2-17-15	-	Added more Data, Updated PCB layout and BOM
5.0	5-1-15	-	Added 3.1-3.5 GHz Data, PCB Layout and BOM