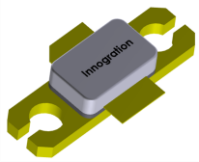
Gallium Nitride 28V 15W, RF Power Transistor

Description

The GTAH58015GX is a 15W,internally matched GaN HEMT,designed for multiple applications, especially sub-6GHz LTE/LTE-A/LTE-U from 4500-5900MHz.

There is no guarantee of performance when this part is used in applications designed Outside of these frequencies.

GTAH58015GX



•Typical performance (on wide band fixture with device soldered)

V_{DD}=28V I_{DQ}=110mA, Pulse CW, Pulse width=20uS, Duty cycle=20%.

Freq(MHz)	P3dB(dBm)	P3dB(W)	Eff(%)@P3dB	Small Signal Gain (dB)
5150	42	16	57.3	14.4
5250	42.5	17.7	60.1	15.2
5350	42.7	18.5	62	15.3
5450	42.7	18.6	59.4	15.1
5550	42.9	19.5	59.9	14.7
5650	42.9	19.4	61.7	14.4
5750	42.9	19.5	64.1	14.5
5850	42.6	18.2	63.6	14.9
5950	42.1	16.3	64.4	15.0

•Typical performance (on narrow band fixture with device soldered)

V_{DD}=28V I_{DQ}=100mA, Pulse CW, Pulse width=20uS, Duty cycle=10%.

Freq(MHz)	P1(dBm)	P1dB Gain(dB)	P3(dBm)	P3(W)	EFF(%)@P3
5700	41.59	13.89	43.35	21.61	66.13
5800	41.30	13.83	43.17	20.77	65.69
5900	41.21	13.60	43.01	20.01	65.17

Applications and Features

- Suitable for wireless communication infrastructure, wideband amplifier, EMC testing, ISM etc.
- High Efficiency and Linear Gain Operations
- Thermally Enhanced Industry Standard Package
- High Reliability Metallization Process
- Excellent thermal Stability and Excellent Ruggedness
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

Important Note: Proper Biasing Sequence for GaN HEMT Transistors

Turning the device ON

1. Set VGS to the pinch--off (VP) voltage, typically –5 V
2. Turn on VDS to nominal supply voltage (28V)
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

Turning the device OFF

1. Turn RF power off
2. Reduce VGS down to VP, typically –5 V
3. Reduce VDS down to 0 V
4. Turn off VGS

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain--Source Voltage	V_{DSS}	150	Vdc
Gate--Source Voltage	V_{GS}	-10,+2	Vdc
Operating Voltage	V_{DD}	40	Vdc
Maximum Forward Gate Current @ TC = 25°C	Igmax	4	mA
Storage Temperature Range	Tstg	-65 to +150	°C
Case Operating Temperature	T_C	+150	°C
Operating Junction Temperature(See note 1)	T_J	+200	°C
Total Device Power Dissipation (Derated above 25°C, see note 2)	Pdiss	31	W

Note: 1. Continuous operation at maximum junction temperature will affect MTTF
2.Bias Conditions should also satisfy the following expression: Pdiss < (Tj – Tc) / RJC and Tc = Tcase

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case T_C= 85°C, T_J=200°C, RF CW operation	$R_{\theta JC}$	5.67	C/W

Table 3. Electrical Characteristics (T_C = 25℃ unless otherwise noted)

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS}=-8V; I_{DS}=4mA	V_{DSS}	150			V
Gate Threshold Voltage	V_{DS} = 28V, I_D = 4mA	V_{GS}(th)		-2.7		V
Gate Quiescent Voltage	V_{DS} =28V, I_{DS}=110mA, Measured in Functional Test	$V_{GS(Q)}$		-2.4		V

Functional Tests (In 5.1-5.9GHz Production Test Fixture, 50 ohm system) :V_{DD} = 28 Vdc, I_{DQ} = 110 mA, f = 5800 MHz, WCDMA signal, Pout=2W

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain	Gp		14		dB
Drain Efficiency @ P_{SAT}	Eff		26		%
Saturated Power by CCDF test	P_{SAT}	15			W
Input Return Loss	IRL		-10		dB
Mismatch stress at all phases (Device no damage)	VSWR		10:1		Ψ

Loadpull data

Test condition: (100us, 20%)

GTAH58015GX 5p15GHz	Freq (MHz)	VDD (V)	Idq (mA)	Zsource (ohms)	Zload (ohms)	Pout (dBm)	Gain (dB)	Eff (%)
MXP	5150	28	100	37.2-j*5.1	20.4+j*0.7	43.81	13.66	65.60
MXE	5150	28	100	37.2-j*5.1	9.4-j*5.8	42.30	14.71	72.46
Trade Off	5150	28	100	37.2-j*5.1	15.0-j*1.0	43.61	14.44	68.18
GTAH58015GX 5p35GHz	**Freq (MHz)**	**VDD (V)**	**Idq (mA)**	**Zsource (ohms)**	**Zload (ohms)**	**Pout (dBm)**	**Gain (dB)**	**Eff (%)**
MXP	5350	28	100	37.9+j*6.7	22.7-j*2.3	43.80	12.31	64.43
MXE	5350	28	100	37.9+j*6.7	12.5-j*7.5	42.82	13.38	69.58
Trade Off	5350	28	100	37.9+j*6.7	17.1-j*5.5	43.6	12.96	66.46
GTAH58015GX 5p55GHz	**Freq (MHz)**	**VDD (V)**	**Idq (mA)**	**Zsource (ohms)**	**Zload (ohms)**	**Pout (dBm)**	**Gain (dB)**	**Eff (%)**
MXP	5550	28	100	29.7+j*13.4	24.3-j*1.6	43.68	12.23	62.71
MXE	5550	28	100	29.7+j*13.4	9.9-j*10.3	41.83	13.87	70.07
Trade Off	5550	28	100	29.7+j*13.4	19.2-j*8.0	43.48	12.98	64.91

GTAH58015GX 5p75GHz	Freq (MHz)	VDD (V)	Idq (mA)	Zsource (ohms)	Zload (ohms)	Pout (dBm)	Gain (dB)	Eff (%)
MXP	5750	28	100	25.3+j*18.9	26.4+j*1.5	43.65	12.48	60.55
MXE	5750	28	100	25.3+j*18.9	10.4-j*13.2	41.75	14.06	71.39
Trade Off	5750	28	100	25.3+j*18.9	19.6-j*4.9	43.39	13.59	66.20
GTAH58015GX 5p95GHz	**Freq (MHz)**	**VDD (V)**	**Idq (mA)**	**Zsource (ohms)**	**Zload (ohms)**	**Pout (dBm)**	**Gain (dB)**	**Eff (%)**
MXP	5950	28	100	14.3+j*17.8	20.8+j*16.1	43.63	12.57	60.56
MXE	5950	28	100	14.3+j*17.8	19.7-j*16.2	41.61	14.66	70.51
Trade Off	5950	28	100	14.3+j*17.8	33.5+j*4.0	43.5	13.35	61.00

Figure 2. Power Gain and Drain Efficiency as Function of Pulse Output Power

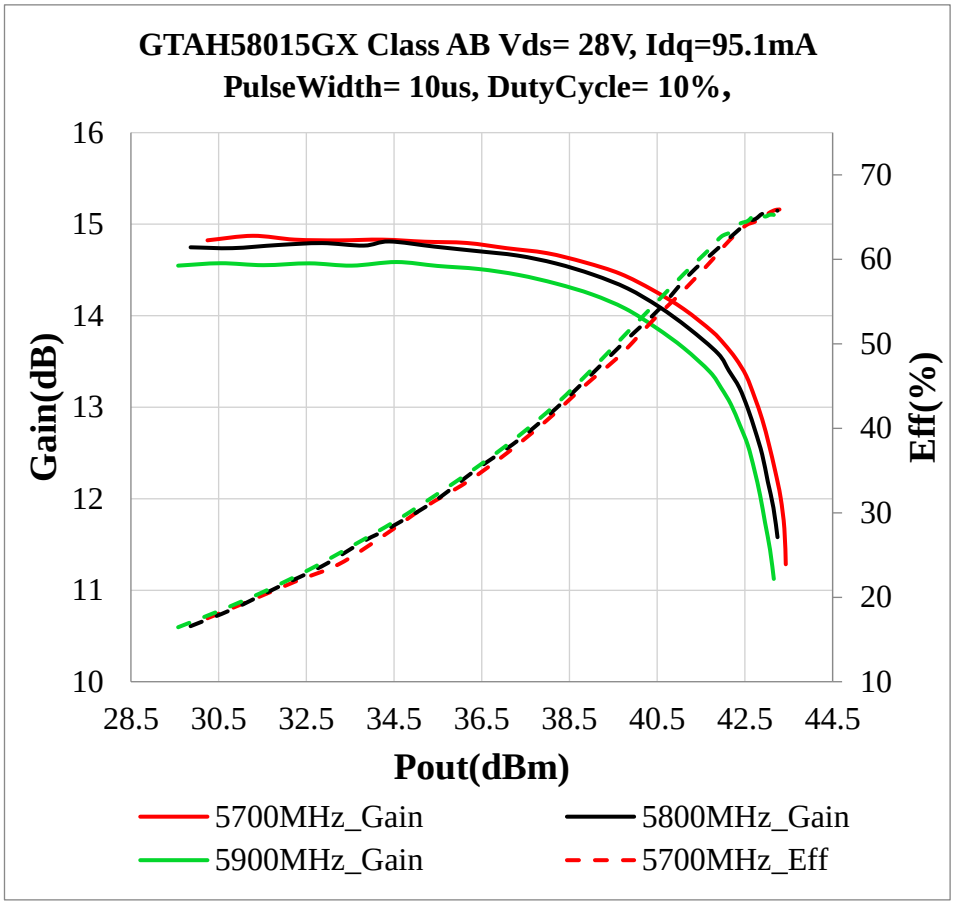


Figure 3. Network analyzer output S11/S21

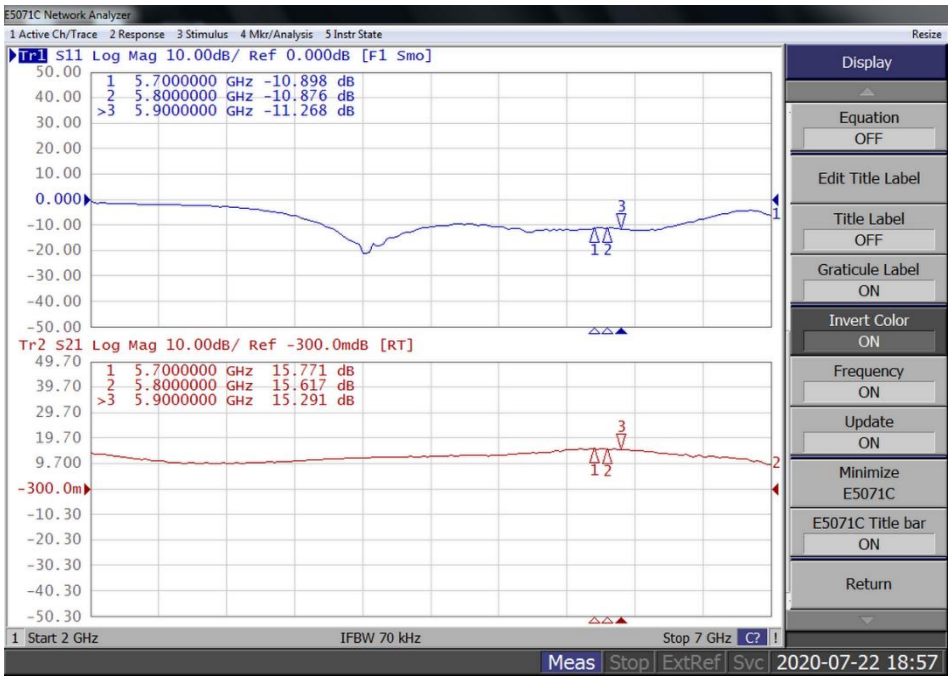
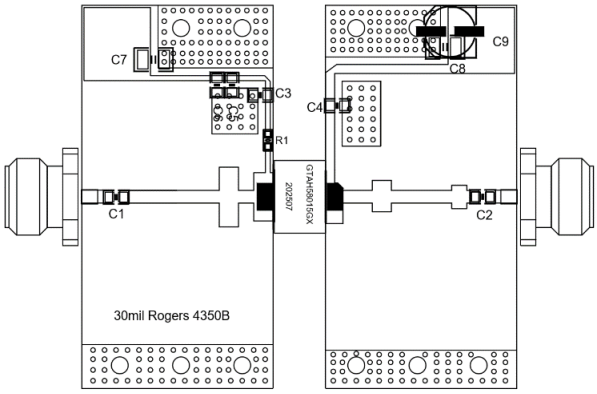


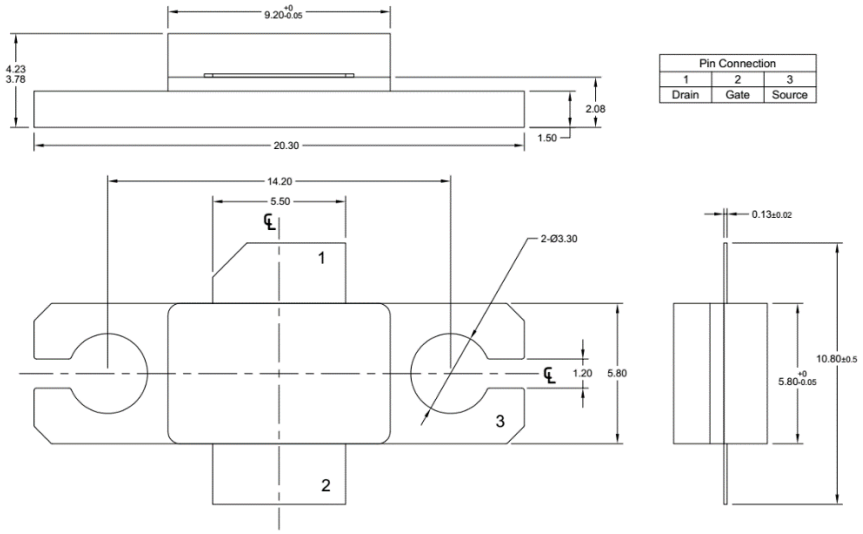
Figure 4. PCB layout and bill of materials



BOM		
C1,C2	3.6pF	ATC600F
C3,C4	2.7pF	ATC600F
C5	1nF	C0805
C6	100nF	C0805
C7,C8	10uF/50V	C1210
C9	470 uF /63V	
R1	10 ohm	R0603

Package Outline

Flanged ceramic package; 2 leads



OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-GXB					10/10/2017

Figure 1. Package Outline PKG-G2E

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2017/4/27	V1.0	Preliminary Datasheet Creation
2017/5/25	V1.1	Preliminary Datasheet
2017/6/20	V1.2	Modification on maximum rating
2018/1/31	V1.3	Add loadpull data and modify RF test data
2020/7/23	V1.4	Modification based on latest application result

Application data based on ZBB-20-19

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