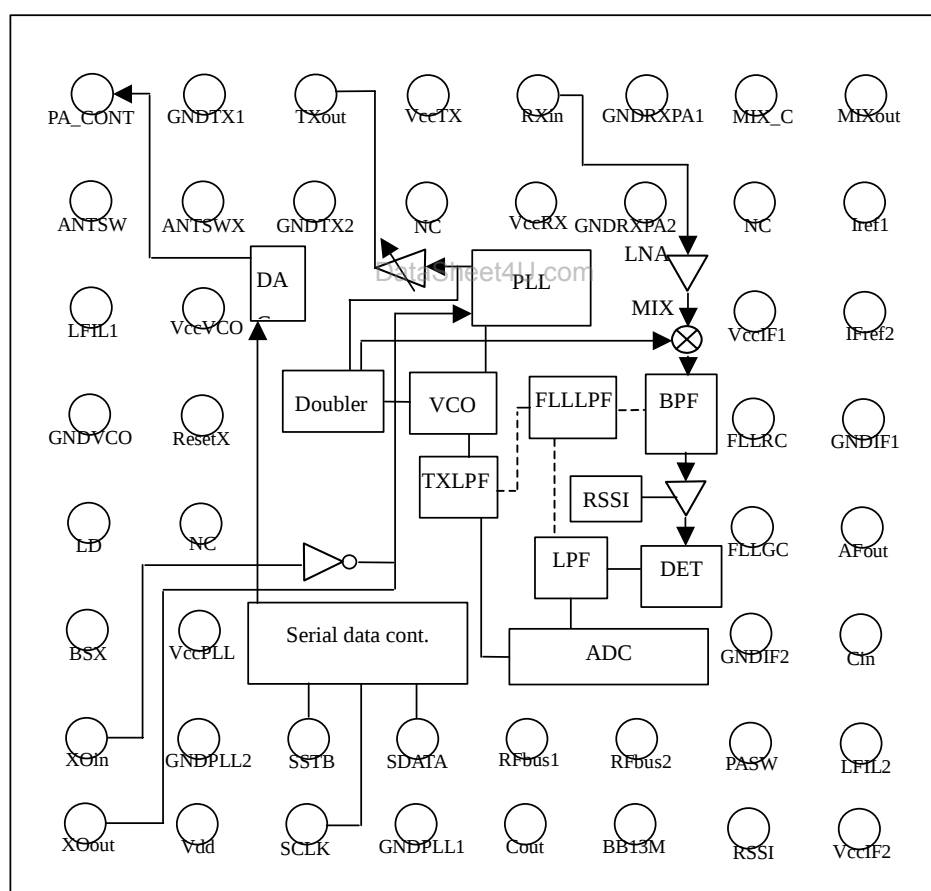


TOSHIBA SiGe-BiCMOS LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TB31296FT**Bluetooth RF IC****FEATURES**

- BlueRF RXMODE1
- Power Consumption : TX mode 27.0mA (Typ.)
RX mode 42.0mA (Typ.)
- Operating Voltage Range : 2.7V ~ 3.5 V
- Small Package : FBGA 48in
- Build-in LNA
- Build-in VCO
- Build-in PA : 0dBm output (typ. controllable)
- External PA control voltage supply for Class1
- Very slight current consumption in Deep Sleep mode

BLOCK DIAGRAM

(Top View)

The information contained herein is subject to change without notice.

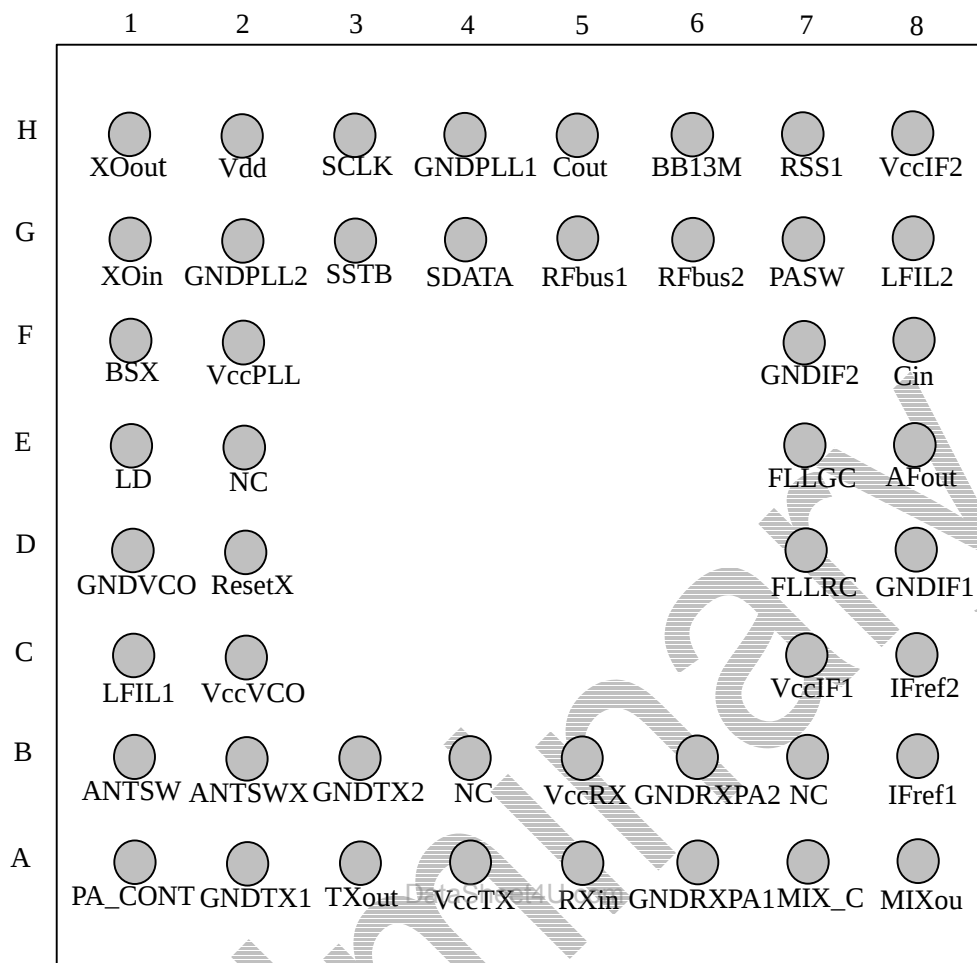
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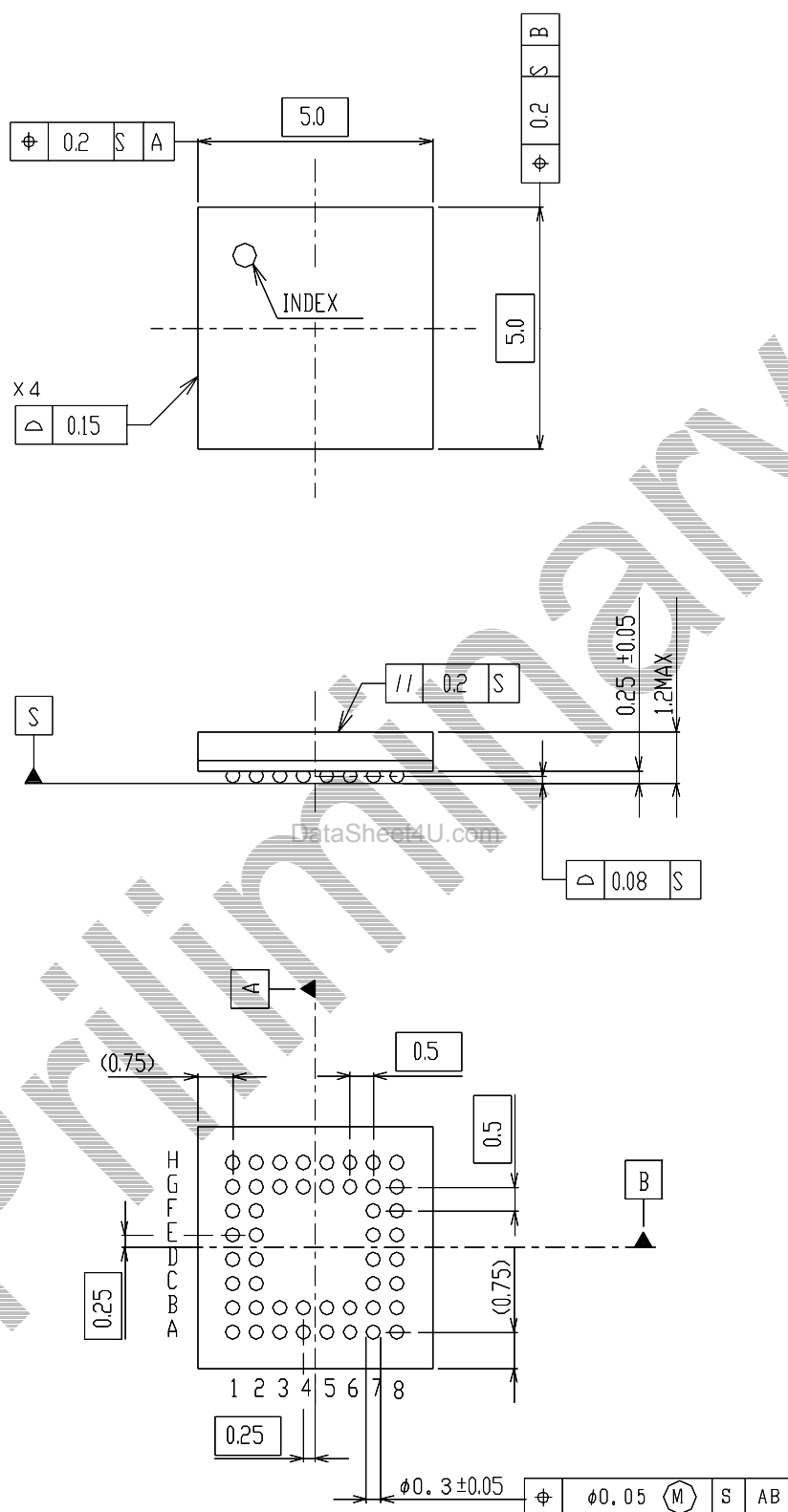
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1 Pinning



2 Package Dimensions (FBGA48[5.0mm x 5.0mm x 1.2mm])



3 Pin description

PIN NO.	PIN NAME	FUNCTION
1	Moni1	Internal signal monitor terminal
2	VccIF1	Power supply terminal
3	IFref	IF decoupling terminal for DC bias
4	FLLRC	FLL decoupling terminal for DC bias
5	FLLGC	FLL decoupling terminal for DC bias
6	Moni2	Internal signal monitor terminal
7	NC1	Non connection
8	LFIL2	13MHz CLK PLL loop filter terminal
9	VccIF2	Power supply terminal
10	VrefC	decoupling terminal for DC bias
11	RSSI	RSSI
12	BB13M	13MHz clock output for BB
13	RFbus2	RX data signal in or TX PA control signal out
14	RFbus1	RX or TX Data signal in/out
15	NC2	Non connection
16	DATA	Data input terminal for serial data
17	CLK	Clock input terminal for serial data
18	STB	Strobe input terminal for serial data
19	Vdd	Power supply terminal
20	XOout	Crystal output terminal
21	XOin	Crystal input terminal or External Clock input terminal
22	BSX	External BS signal input terminal
23	LD	Lock detect output
24	VccPLL	Power supply terminal
25	ResetX	External reset signal input terminal
26	LFIL1	Main PLL loop filter terminal
27	VccVCO	Power supply terminal
28	ANTSW	Antenna control signal
29	ANTSWX	Antenna control signal (inverted ANTSW)
30	PACONT	External PA voltage control signal for gain
31	TXout	PA output terminal
32	VccTX	Power supply terminal
33	VccRX	Power supply terminal
34	RXin	LNA input terminal
35	MIXC	MIX decoupling terminal for DC bias
36	Moni3	Internal signal monitor terminal
37	GND1	GND terminal
38	GND2	GND terminal
39	PASW	External PA on/off control signal
40	GND3	GND terminal
41	GND4	GND terminal
42	GND5	GND terminal
43	GND6	GND terminal
44	GND7	GND terminal

4 MAXIMUM RATINGS (Ta=25)

CHARACTERISTICS	SYMBOL	RATING	UNIT
Power Supply Voltage	VCC	3.6	V
Power Dissipation	PD	530	mW
Input terminal Voltage	CLK, DATA, STB, BS, LD	3.4	V
Storage Temperature Range	Tstg	-50 ~ 150	

Maximum ratings indicate the limits, which the device must not be beyond

5 OPERATING RANGES

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Analog supply voltage	Vcc*		2.7	3.3	3.4	V
Digital interface I/O supply voltage	Vdd		1.8	3.3	3.4	V
Operating temperature	Topr		-35		85	

Operating ranges indicate the conditions for which the device is intended to be functional even with the electrical changes

6 ELECTRICAL CHARACTERISTICS (Unless otherwise specified, Ta=25 , VCC=3.3V , f=2450MHz)

This spec is IC design target value and in mass production these may be updated.

POWER SUPPLY

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Current Consumption Rx (*2)	ICCRX	RX mode, BS=H	-	42.0	60.0	mA
Current Consumption Tx	ICCTX	TX mode, BS=H, PAout=0[dBm]	-	26.9	40.0	mA
Current Consumption tune	ICCwait2	During synthesizer tuning	-	15.5	-	mA
Current Consumption BS	ICC BS	Battery save mode, BS=L	-	0.01	10	uA
" H " level input/output level	VIH	CLK, DATA, STB, BS, RFbus1, RFbus2, BB13M	Vdd × 0.8	Vdd	Vdd+ 0.2	V
" L " level input/output level	VIL	CLK, DATA, STB, BS, RFbus1, RFbus2, BB13M	-0.2	0	Vdd × 0.2	V

INPUT SIGNAL REGURATION

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Reference Clock frequency	Fclk	200[kHz] step	4	13	50	MHz
Reference Clock level	Vclk		TBD	110	TBD	dBuV
Serial data bus input frequency	Dbus-freq.		-	13	20	MHz

PLL CHARACTERISTICS

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Operating frequency range			2380		2500	MHz
Lock Up Time	t-lock	Phase comparison ref: 500kHz CP current= 2mA	-	85	-	us
VCO phase noise	Pn1	@500kHz		107		dBc/Hz
	Pn2	@1MHz		113		dBc/Hz
	Pn3	@2MHz		119		dBc/Hz

RX CHARACTERISTICS

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
Sensitivity	Sense	BER=0.1%, RXin	-	-83	TBD	dBm
Maximum input range	maxRange		-10	TBD	-	dBm
RSSI output level 1 (*6)	V (RSSI-1)	Vin(LNA)=-60dBm, no mod.	TBD	1.28	TBD	V
RSSI output level 2 (*6)	V (RSSI-2)	Vin(LNA)=-40dBm, no mod.	TBD	2.04	TBD	V
C/I performance	InterCo	(*1)		8.8	14	dB
	Inter+1MHz	(*1)		2.0	4	dB
	Inter-1MHz	(*1)		0.1	4	dB
	Inter+2MHz	(*2)		-24	TBD	dB
	Inter-2MHz			-31	-30	dB
	Inter+3MHz	(*2)		-31	TBD	dB
	Inter-3MHz			-41	-40	dB
	Inter+4MHz			-41	-40	dB
	Inter<-3MHz			-42	-40	dB
	Inter+5MHz	Image -1MHz frequency		-30	-20	dB
	Inter+6MHz	Image frequency		-20	-9	dB
	Inter+7MHz	Image +1MHz frequency		-30	-20	dB
	Inter>7MHz			-42	-40	dB
Intermodulation		From Bluetooth spec.	-39	TBD		dBm
Receiver spurious emission		30MHz to 1GHz		TBD		dBm
		1GHz to 12.75GHz		TBD		dBm
Out of band blocking	OBB1			TBD		dBm
	OBB2			TBD		dBm
	OBB3			TBD		dBm
	OBB4			TBD		dBm

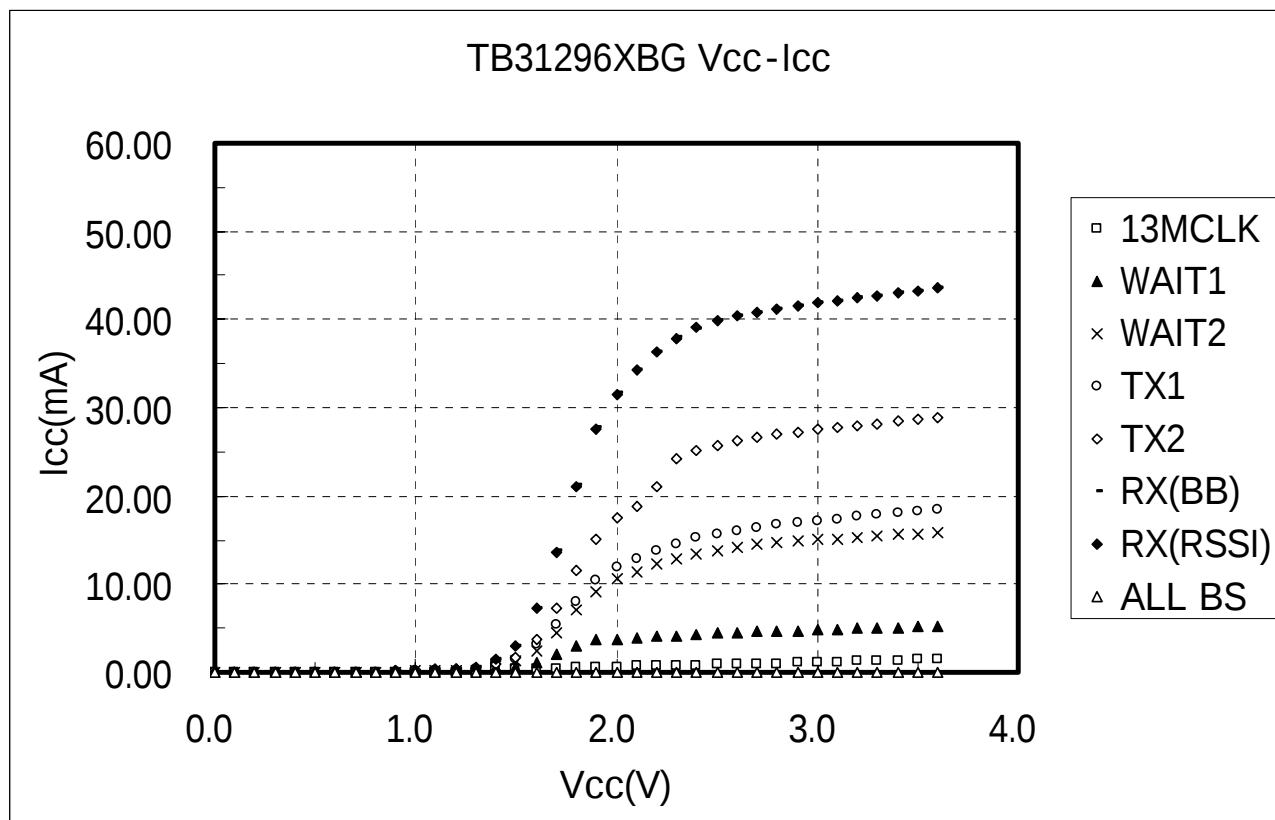
(*1) use relaxed regulation

(*2) use relaxed regulation from spurious response

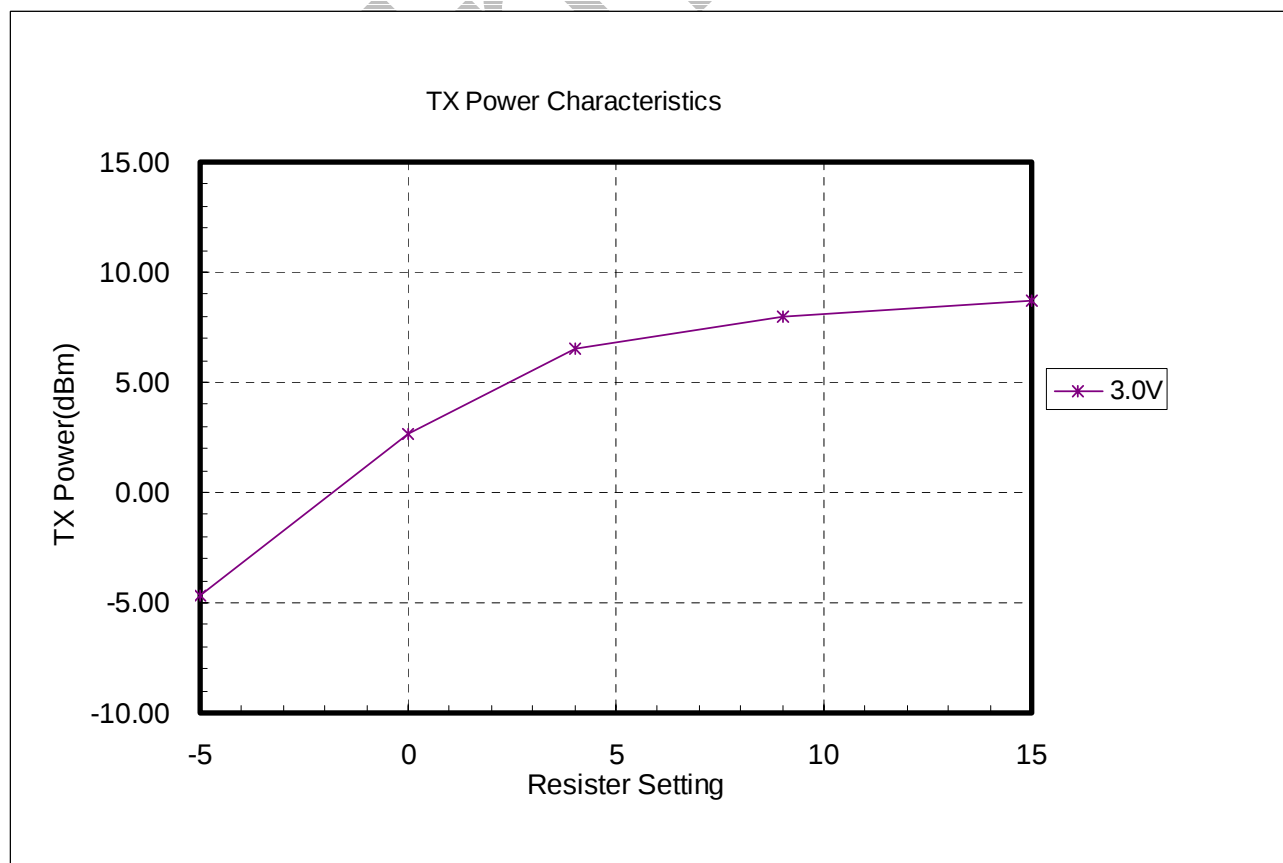
TX CHARACTERISTICS

CHARACTERISTICS	SYMBOL	TEST CONDITION	MIN	TYP.	MAX	UNIT
TX output signal level	PAOUT(max)	Nominal setting	TBD	0	TBD	dBm
TX Output Signal control range	PArange	17 step controlled	-13		5	dBm
TX max output	PAmix		TBD	5	TBD	dBm
TX minimum output	PAmix		TBD	-13	TBD	dBm
20dB bandwidth				807	1000	MHz
Frequency deviation	Dev(Tx)	(*9)	140	160	175	kHz
Frequency Drift	Fdrift	DH1 packet		1.6	25	kHz
In-band spurious emission		2MHz offset			-20	dBm
		>= 3MHz offset			-40	dBm
Out of band spurious	OBS1	30MHz to 1GHz with operating				dBm
	OBS2	30MHz to 1GHz with BS				dBm
	OBS3	1 to 12.75GHz with op.				dBm
	OBS4	1GHz to 12.75GHz with BS				dBm
	OBS5	1.8GHz to 1.9GHz				dBm
	OBS6	5.15GHz to 5.3GHz				dBm
External PA control voltage	EPA1			0		V
	EPA2			N/30 x Vcc		V
	EPA3			Vcc		V
	N	Cont. steps		30		step

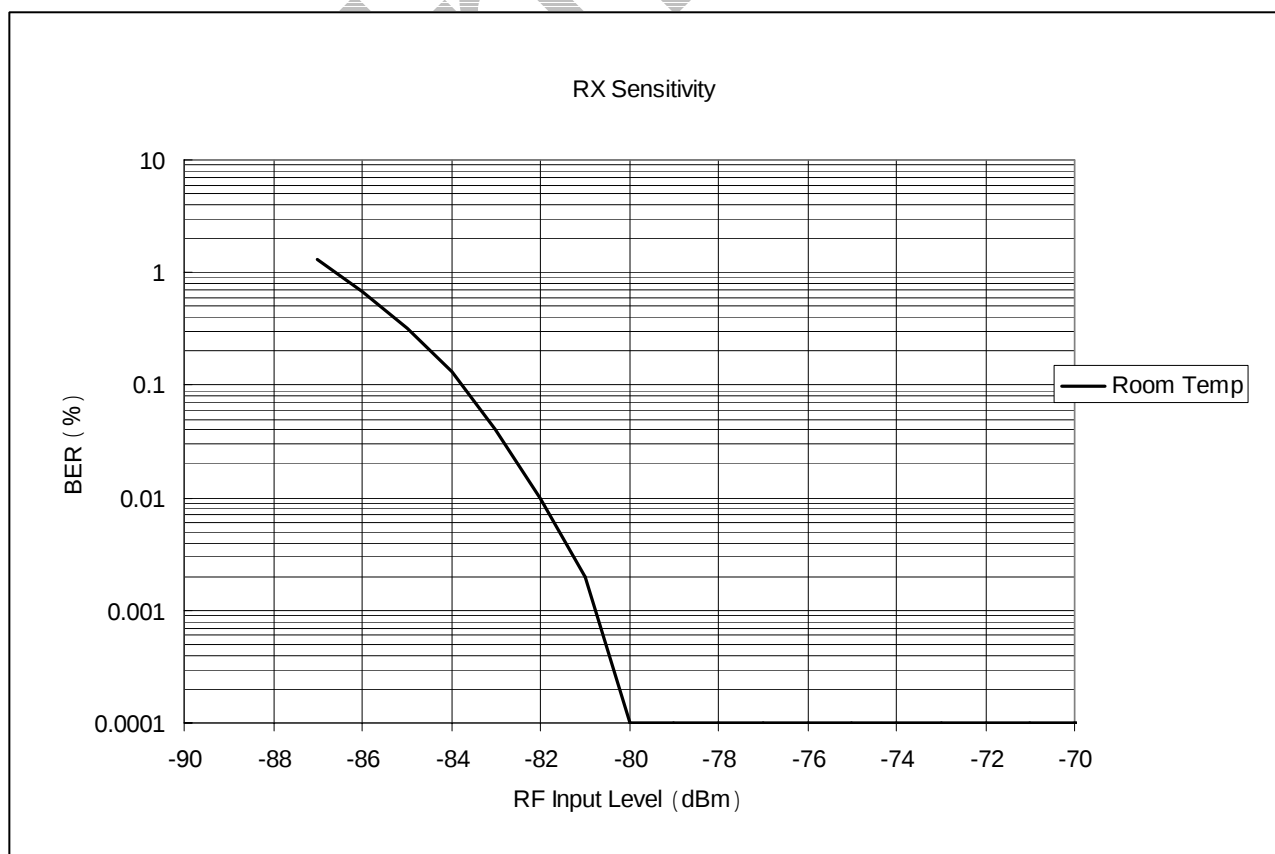
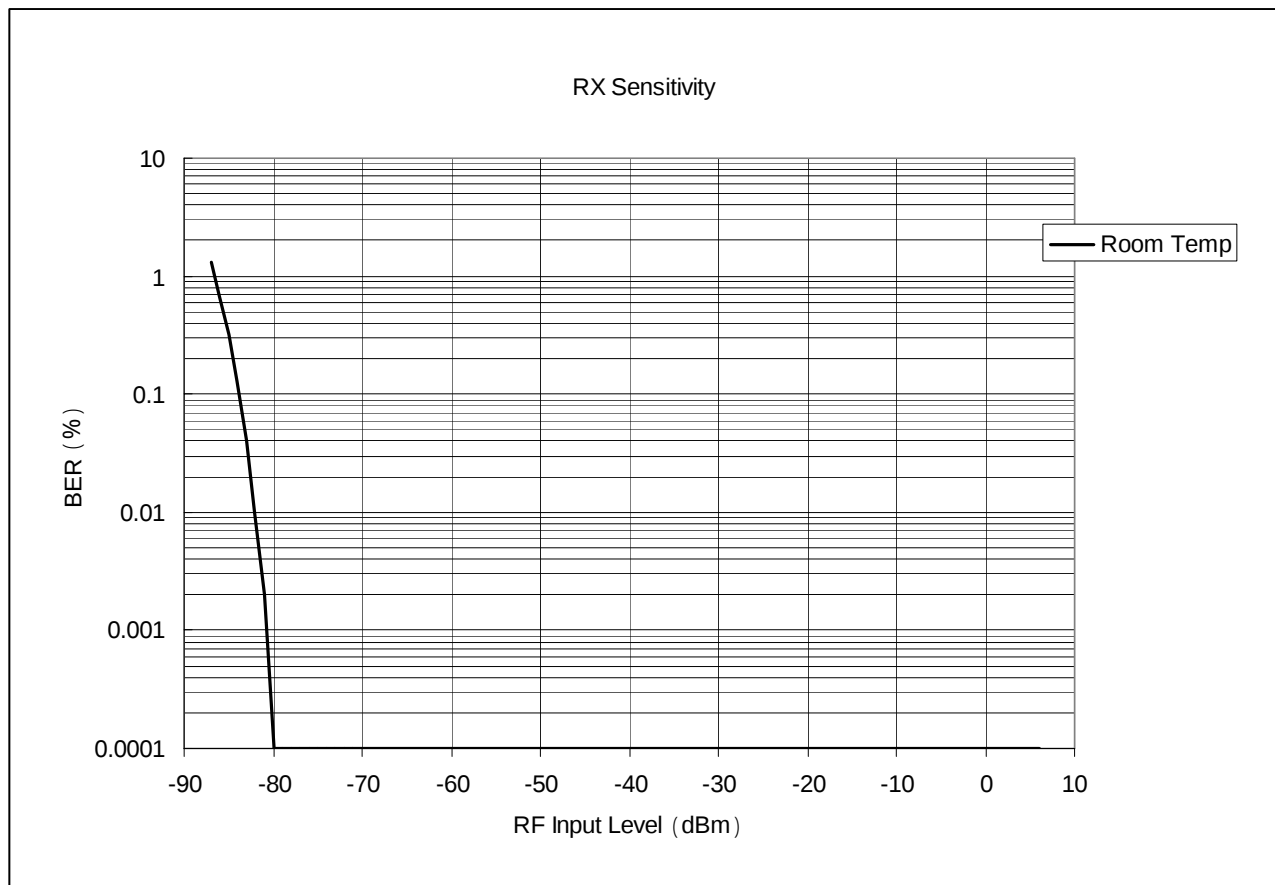
7 Nominal DATA

7.1 $V_{CC} - I_{CC}$ 

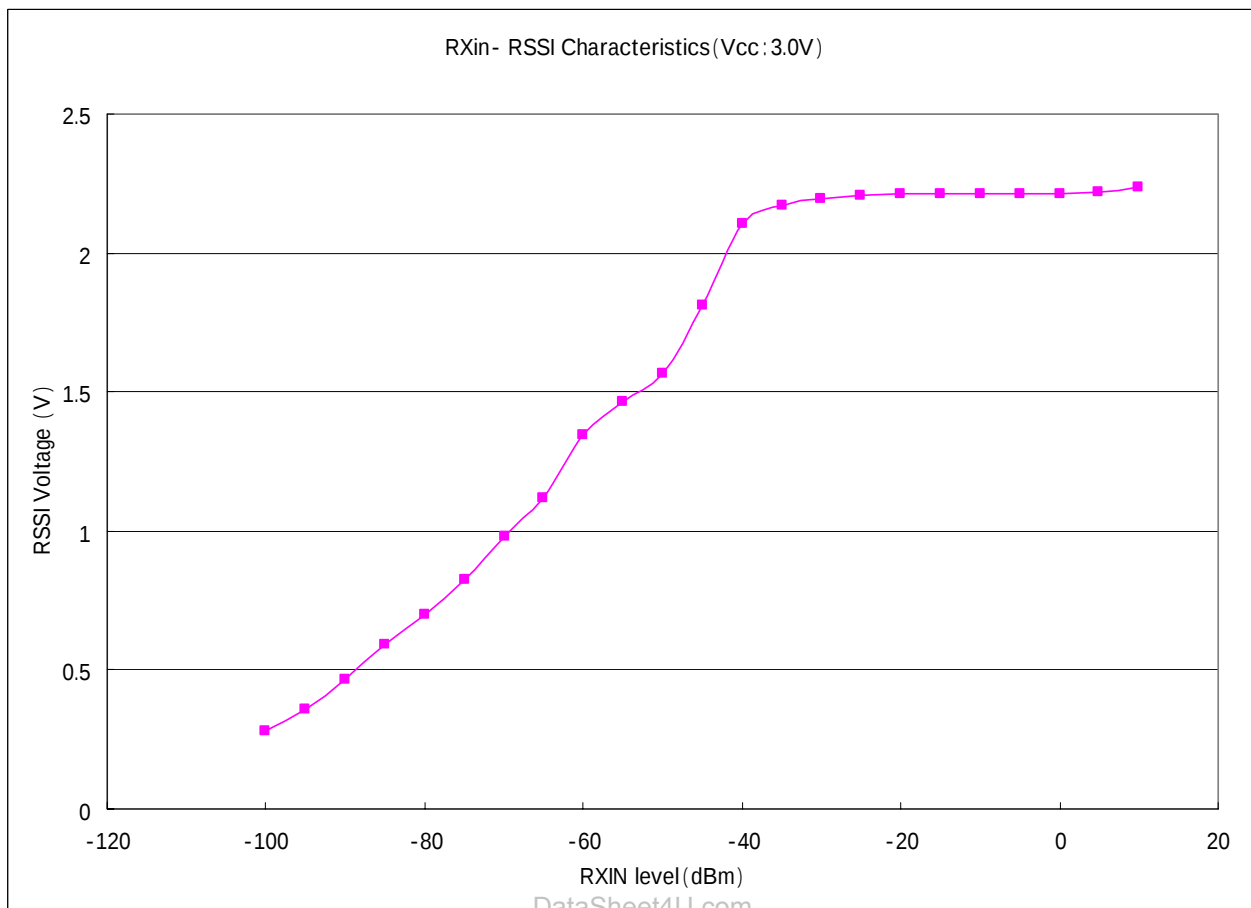
7.2 PA output Power



7.3 RX Sensitivity



7.4 RSSI



7.5 X'tal Turning Circuit Characteristics

