DATA SHEET

SA3604
PCS-band low voltage front-end

Preliminary specification

1999 Dec 14

IC17 Data Handbook

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DESCRIPTION

The SA3604 is an integrated Low-Noise Amplifier (LNA) and mixer designed in a 30 GHz f_T advanced BICMOS process, Qubic3, for high-performance, low power PCS-band communication systems. The LNA has a 1.9 dB noise figure at 1960 MHz with 17.5 dB gain and an IIP3 intercept of –4 dBm. The single-ended input, double balanced mixer has a 9.5 dB noise figure with 8 dB gain and IIP3 of +6.0 dBm at 1960 MHz.

FEATURES

- Integrated LNA output matching
- Excellent gain stability versus temperature and supply voltage
- LNA, mixer and LO buffer power down capability

APPLICATIONS

- IS-136 Standard systems
- Wireless radios

PIN CONFIGURATION

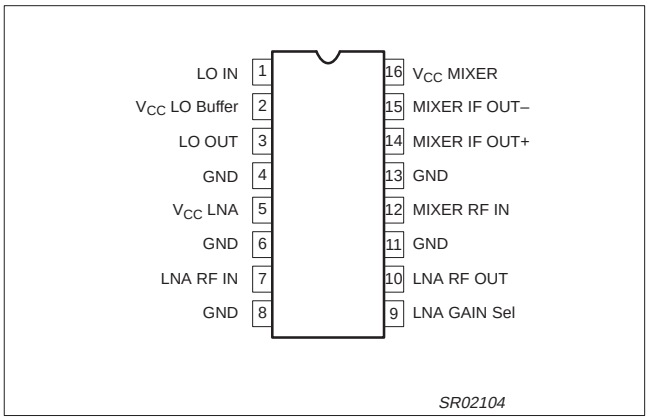


Figure 1. Pin Configuration

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
16-Pin Thin Shrink Small Outline Package (Surface-mount, TSSOP)	–40 to +85°C	SA3604 DH	

PINOUT DEFINITION

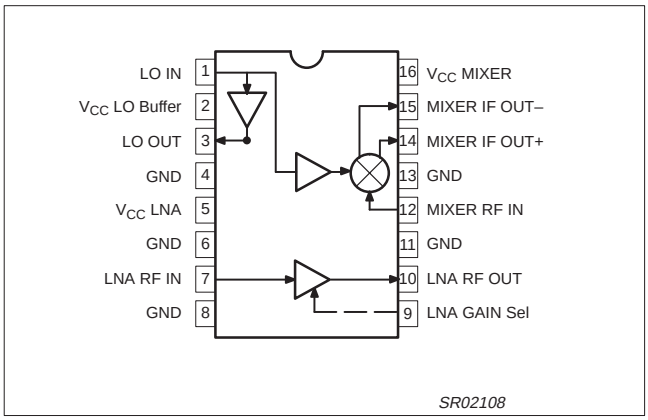


Figure 2. Pinout definition

PIN DESCRIPTION

PIN NUMBER	SYMBOL	FUNCTION
1	LO_IN	VCO input
2	VCC LO BUFFER	LO buffer supply voltage
3	LO OUT	VCO output
4, 6, 8, 11, 13	GND	Ground
5	VCC LNA	LNA supply voltage
7	LNA RF IN	LNA input
9	LNA GAIN SEL	LNA gain select
10	LNA RF OUT	LNA output
12	MIXER RF IN	Mixer input
14	MIXER IF OUT+	Mixer output +
15	MIXER IF OUT–	Mixer output –
16	VCC MIXER	Mixer supply voltage

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNITS
V_{CC}	Supply voltage[1]	–0.3 to +3.5	V
V_{IN}	Voltage applied to any other pin	–0.3 to (V_{CC} + 0.3)	V
P_D	Power dissipation, T_{amb} = 25°C (still air)[2] 16-Pin Plastic TSSOP	TBD	mW
T_{JMAX}	Maximum operating junction temperature	150	°C
P_{MAX}	Maximum power input/output	+20	dBm
T_{STG}	Storage temperature range	–65 to +150	°C

NOTES:
1. Transients exceeding 3.6 V on V_{CC} pin may damage product.
2. Maximum dissipation is determined by the operating ambient temperature and the thermal resistance, θ_{JA}: 16-Pin TSSOP = TBD°C/W
3. Pins 14 and 15 are ESD sensitive (mixer outputs).

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	RATING	UNITS
V_{CC}	Supply voltage	2.7 to 3.3	V
T_{amb}	Operating ambient temperature range	–40 to +85	°C

DC ELECTRICAL CHARACTERISTICS

V_{CC} = +2.8 V, T_{amb} = 25°C; unless otherwise stated.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNITS
			MIN	TYP	MAX	
I_{CC}	Supply current	LO buffer		6		mA
		LNA high gain		6		mA
		Mixer		12		mA
V_{IH}	Logic 1 level		2.0		V_{CC} + 0.3	V
V_{IL}	Logic 0 level		–0.3		0.5	V
I_{BIAS}	Input bias current	Logic 1 or 0	–5		+5	µA

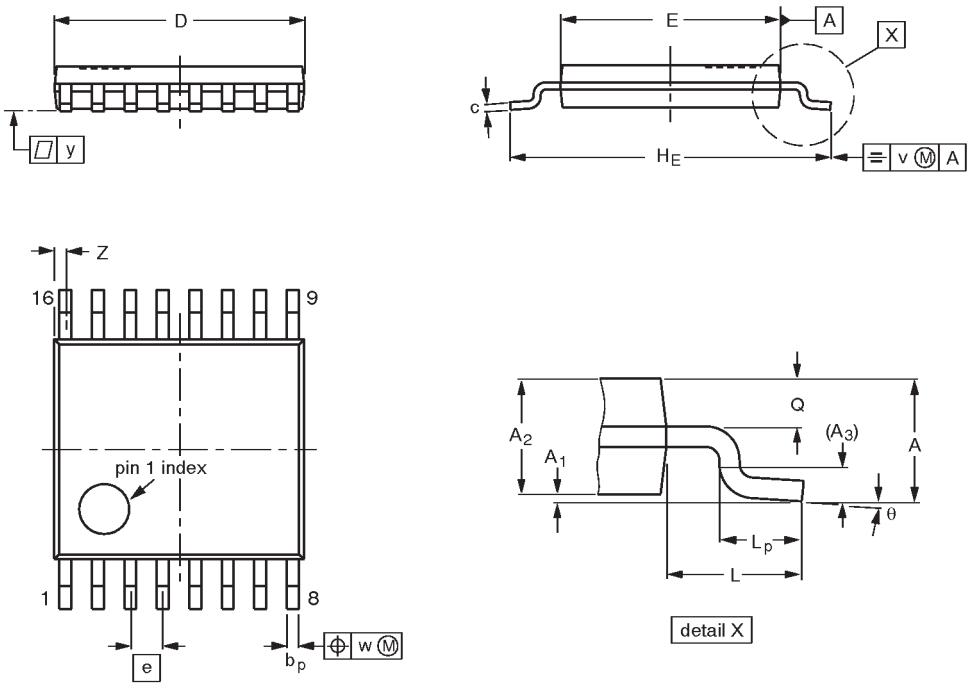
AC ELECTRICAL CHARACTERISTICS

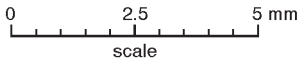
V_{CC} = +2.8 V; f_{RF} = 1960 MHz, f_{VCO} = 2070 MHz; T_{amb} = 25°C; unless otherwise stated.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNITS
			MIN.	–3σ	TYP	+3σ	MAX.	
Overall System								
G_{SYS}	System gain	LNA + Mixer (excluding filter loss)	22					dB
Low Noise Amplifier								
f_{RF}	RF input frequency range		1930				1990	MHz
S_{21}	Gain				17.5			dB
S_{21}	Gain in power-down mode				2			dB
S_{12}	Reverse isolation	@ 1960 MHz			TBD			dB
S_{11}	Input return loss	50 Ω system			10			dB
S_{22}	Output return loss	50 Ω system			10			dB
P_{-1dB}	Input 1 dB gain compression				–19			dBm
IIP3	Input third order intercept	P_{RFin} = –35 dBm, 60 kHz offset			–4			dBm
NF	Noise figure				1.9			dB
$t_{ON/OFF}$	Turn on/off time[1]						100	µs
Mixer								
f_{RF}	RF input frequency range		1930				1990	MHz
f_{IF}	IF input frequency range		70		110		200	MHz
PG_C	Power conversion gain	f_{IF} = 110 MHz			8			dB
S_{11M}	Input match	Ext. impedance matching req.			–10			dB
NF_M	SSB noise figure				9.5			dB
P_{-1dB}	Input 1 dB gain compression				–15			dBm
$IIP3_M$	Input third order intercept	P_{RFin} = –27 dBm, 60 kHz offset			6			dBm
IIP_{2INT}	Input second order intercept				26			dBm
P_{RFM-IF}	RF feedthrough	P_{RFin} = –35 dBm			TBD			dBm
$t_{ON/OFF}$	Turn on/off time[1]						100	µs
LO Buffer								
f_{LO}	Input frequency range		2000				2190	MHz
P_{IN}	Input power		–2		0		+2	dBm
P_{OUT}	Output power				0			dBm
S_{11}	Input return loss	50 Ω system			10			dB
S_{22}	Output return loss	50 Ω system			10			dB
P_{LO-IF}	LO feedthrough to IF				TBD			dBm
P_{LO-RFM}	LO to mixer input feedthrough				TBD			dBm
P_{LO-RF}	LO to LNA input feedthrough				TBD			dBm
	Harmonic content				–20			dB
$t_{ON/OFF}$	Turn on/off time[1]						100	µs

NOTE:
1. External circuit dependent

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm **SOT403-1**





DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.10	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT403-1		MO-153				~~94-07-12~~ 95-04-04

NOTES

Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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