DATA SHEET

SA3603
Cellular-band low voltage front-end

Preliminary specification

1999 Dec 17

IC17 Data Handbook

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Cellular-band low voltage front-end

SA3603

DESCRIPTION

The SA3603 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 Cellular-band communication systems. The LNA has a 1.6 dB noise figure at 881 MHz with 17.5 dB gain and an IIP3 intercept of –4 dBm. The single-ended input, single balanced mixer has a 9.5 dB noise figure with 7.5 dB gain and IIP3 of +6.0 dBm at 881 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

Pin		Pin	
LO IN	1	16	V_{CC} MIXER
V_{CC} LO Buffer	2	15	MIXER IF OUT–
LO OUT	3	14	MIXER IF OUT+
GND	4	13	GND
V_{CC} LNA	5	12	MIXER RF IN
GND	6	11	GND
LNA RF IN	7	10	LNA RF OUT
GND	8	9	LNA GAIN Sel

SR02104

Figure 1. Pin Configuration

ORDERING INFORMATION

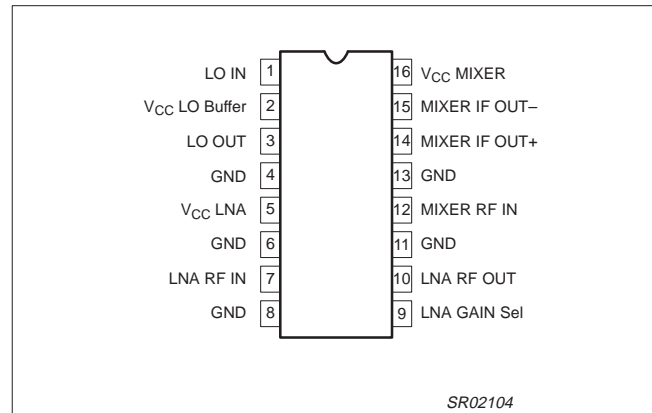| DESCRIPTION	TEMPERATURE RANGE	ORDER CODE	DWG #
16-Pin Thin Shrink Small Outline Package (Surface-mount, TSSOP)	–40 to +85°C	SA3603 DH	
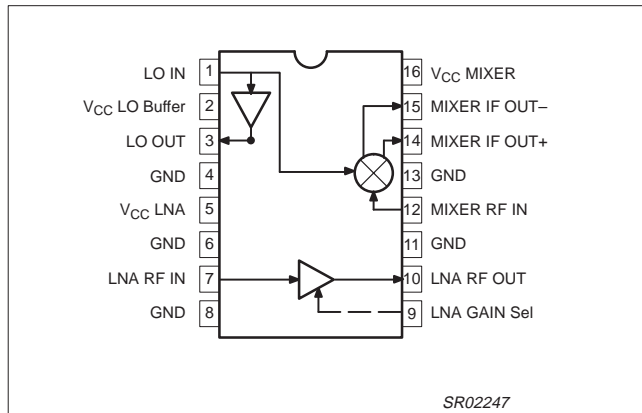
PINOUT DEFINITION

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	MIN	TYP	MAX	UNITS
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

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AC ELECTRICAL CHARACTERISTICS

V_{CC} = +2.8 V; f_{RF} = 881 MHz, f_{VCO} = 991 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		869				894	MHz
S_{21}	Gain				17.5			dB
S_{21}	Gain in power-down mode				2			dB
S_{12}	Reverse isolation	@ 881 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				1.6			dB
$t_{ON/OFF}$	Turn on/off time[1]						100	μs
Mixer								
f_{RF}	RF input frequency range		869				894	MHz
f_{IF}	IF input frequency range		70		110		200	MHz
PG_C	Power conversion gain	f_{IF} = 110 MHz			7.5			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
$IIP2_{INT}$	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		939				1094	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

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TSSOP16:   plastic thin shrink small outline package; 16 leads; body width 4.4 mm   **SOT403-1**
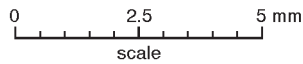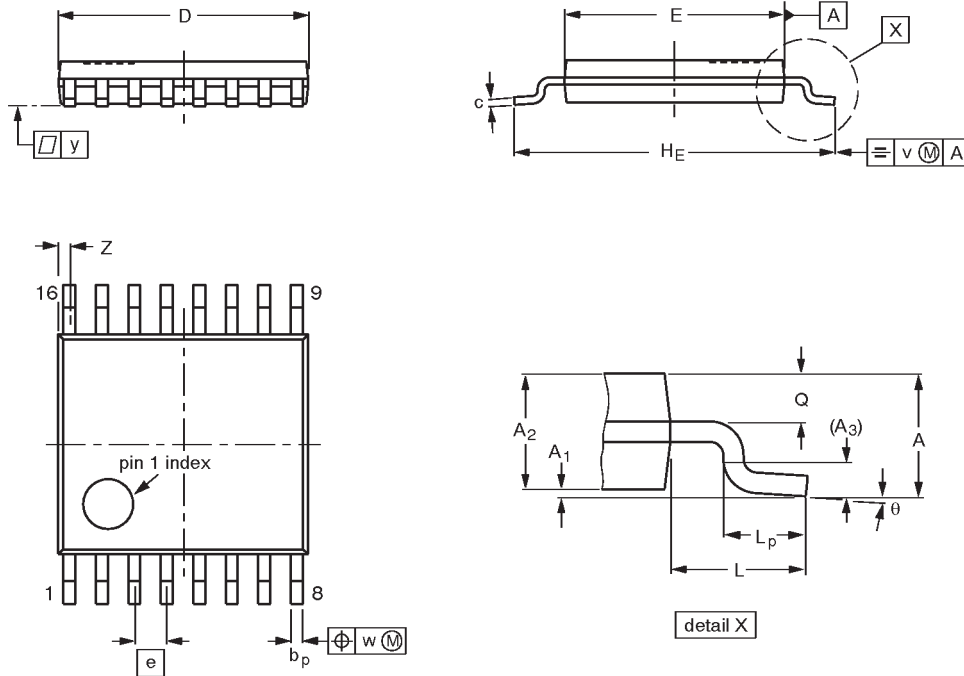
DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A₁	A₂	A₃	bp	c	D [1]	E [2]	e	HE	L	Lp	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

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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.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

[1] Please consult the most recently issued datasheet before initiating or completing a design.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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Date of release: 04-00

Document order number: 9397 750 07035

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