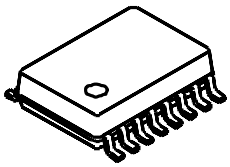
SONY

CXG1121TN

SP4T GSM/GPRS Dual-Band Antenna Switch + Logic

16 pin TSSOP (Plastic)



Description

The CXG1121TN is one of a range of low insertion loss, high power MMIC antenna switches for GSM/GPRS dual-band application. The low insertion loss on transmit means increased talk time as the Tx power amplifier can be operated at a lower output level. On-chip logic reduces component count and simplifies PWB layout by allowing direct connection of the switch to digital base band control lines with CMOS logic levels.

This switch is an SP4T, one antenna can be routed to either of the 2 Tx or 2 Rx ports. It requires 3 CMOS control lines (Tx/Rx, GSM900/1800 and Standby).

The Sony GaAs JFET process is used for low insetion loss. An evaluation PWB is available.

Features

- Insertion loss (Tx) 0.5dB typical at 34dBm (GSM900)
- 3 CMOS compatible control lines
- Low second harmonic, –40dBm typical, at 34dBm (GSM900)
- Small package size: 16-pin TSSOP (3.9mm × 4.1mm × 1.2mm)

Applications

- Dual-band handsets using combinations of GSM900/GSM1800/GSM1900
- GPRS class 12 handsets

Structure

GaAs J-FET MMIC

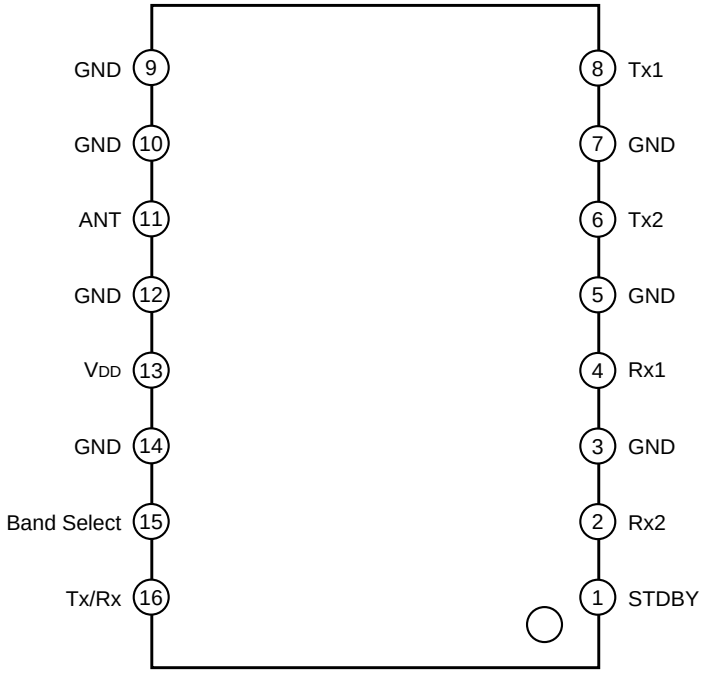
Absolute Maximum Ratings (Ta = 25°C)

• Bias voltage	V_{DD}	7	V
• Control voltage	V_{CTL}	5	V
• Operating temperature	Topr	–20 to +80	°C

GaAs MMICs are ESD sensitive devices. Special handling precautions are required. The IC will be damaged in the range from 100 to 200V @200pF 0Ω and below 1000V @100pF 1500Ω.

E01661-PS

Pin Configuration



Truth Table

On Pass	Band select	Tx (H) / Rx (L)	Standby
ANT – Tx1 DCS1800	H	H	H
ANT – Tx2 GSM900	L	H	H
ANT – Rx1 GSM900/DCS1800	L	L	H
ANT – Rx2 GSM900/DCS1800	H	L	H
OFF	—	—	L

Electrical characteristics (Ta = 25°C)

Item	Symbol	Port	Condition	Min.	Typ.	Max.	Unit
Insertion loss	IL	Tx2 – ANT	*1		0.5	0.7	dB
		Tx1 – ANT	*2		0.6	0.8	dB
		ANT – Rx1	*3		0.55	0.75	dB
		ANT – Rx2	*4		0.7	0.9	dB
Isolation	ISO	ANT – Tx1	*3		20		dB
		ANT – Tx2	*4		17		dB
		Tx2 – Rx1, Rx2	*1		20		dB
		Tx1 – Rx1, Rx2	*2		20		dB
VSWR	VSWR				1.2		
Harmonics*	2fo	GSM Tx – ANT	*1		–40	–36	dBm
	3fo		*1		–34	–30	dBm
	2fo	DCS Tx – ANT	*2		–40	–36	dBm
	3fo		*2		–34	–30	dBm
P_{1dB} compression input power	P_{1dB}	GSM Tx – ANT	*1		36		dBm
		DCS Tx – ANT	*2		36		dBm
Control current	I_{CTL}		V_{CTL} = 3V		80	120	µA
Supply current	I_{DD}		STBY = H		0.5	1.0	mA
Leakage current	I_{IK}		STBY = L		90		µA

Electrical characteristics are measured with all RF ports terminated in 50Ω.

* Harmonics measured with Tx inputs harmonically matched. The use of harmonic matching is recommended to ensure optimum performance.

*1 Power incident on GSM Tx, Pin = 34dBm, 880 to 915MHz, V_{DD} = 5.0V, GSM Tx enabled

*2 Power incident on DCS Tx, Pin = 32dBm, 1710 to 1785MHz, V_{DD} = 5.0V, DCS Tx enabled

*3 Power incident on ANT, Pin = 10dBm, 925 to 960MHz, V_{DD} = 5.0V, GSM Rx enabled

*4 Power incident on ANT, Pin = 10dBm, 1805 to 1880MHz, V_{DD} = 5.0V, DCS Rx enabled

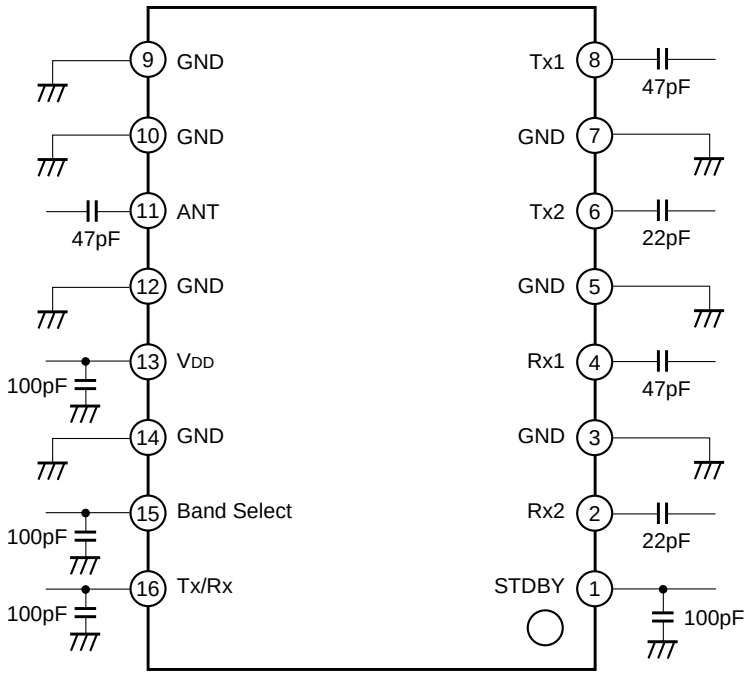
Supply Voltage Value (V_{DD})

Mode	Min.	Typ.	Max.	Unit
GSM/DCS Tx	4.5	5	5.7	V
GSM/DCS Rx	2.7	3	4	V

CMOS Logic Value

Logic	Min.	Typ.	Max.	Unit
High	2.4	2.8	3.2	V
Low	0		0.4	V

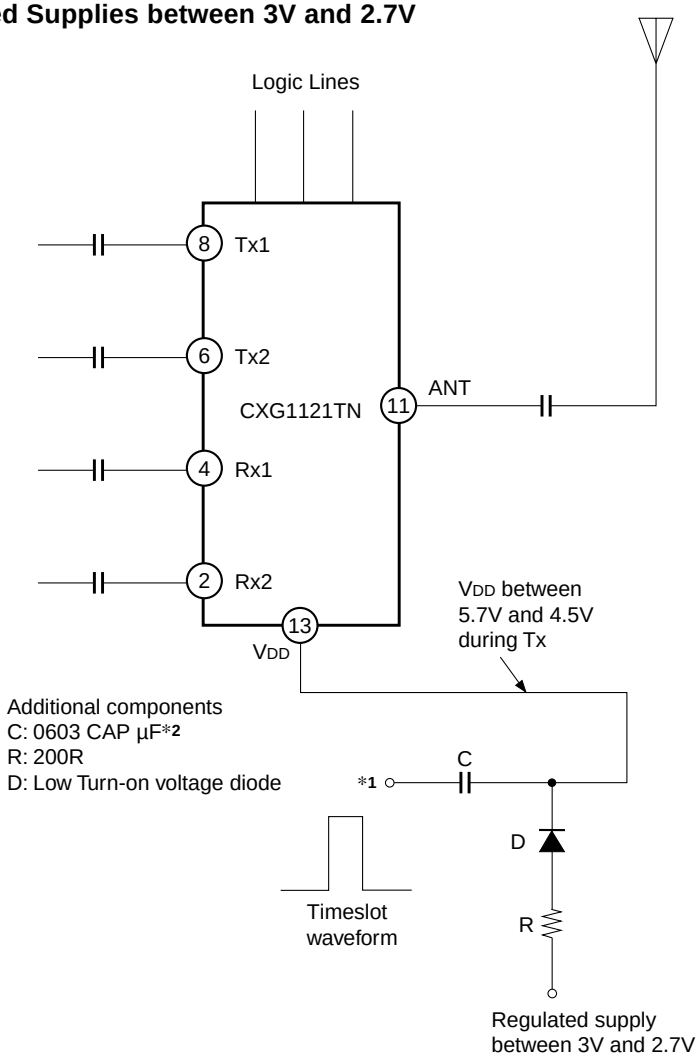
Recommended Circuit



Note) Capacitors are required on all RF ports for DC blocking (22pF – 47pF). Decoupling capacitors are required on V_{DD} and on control lines (100pF).

Application Note (1)

Operating from Regulated Supplies between 3V and 2.7V



Technique

Allows use of CXG1121TN SP4T in handsets with regulated supplies between 3V and 2.7V.

The CXG1121TN is for 5V nominal battery voltage but works well down to a V_{DD} of 4.5V.

This technique is only necessary for Tx modes.

Fundamentally, the timeslot waveform is added to the supply voltage to give a V_{DD} between 5.7V and 4.5V (depending on supply) during Tx modes.

This technique is suitable for up to 4 consecutive Tx timeslots (i.e.GPRS Class 12).

*1 This waveform may be taken from the PA ramping input (or drain supply in case of drain power control) or via the Tx ON/OFF logic.

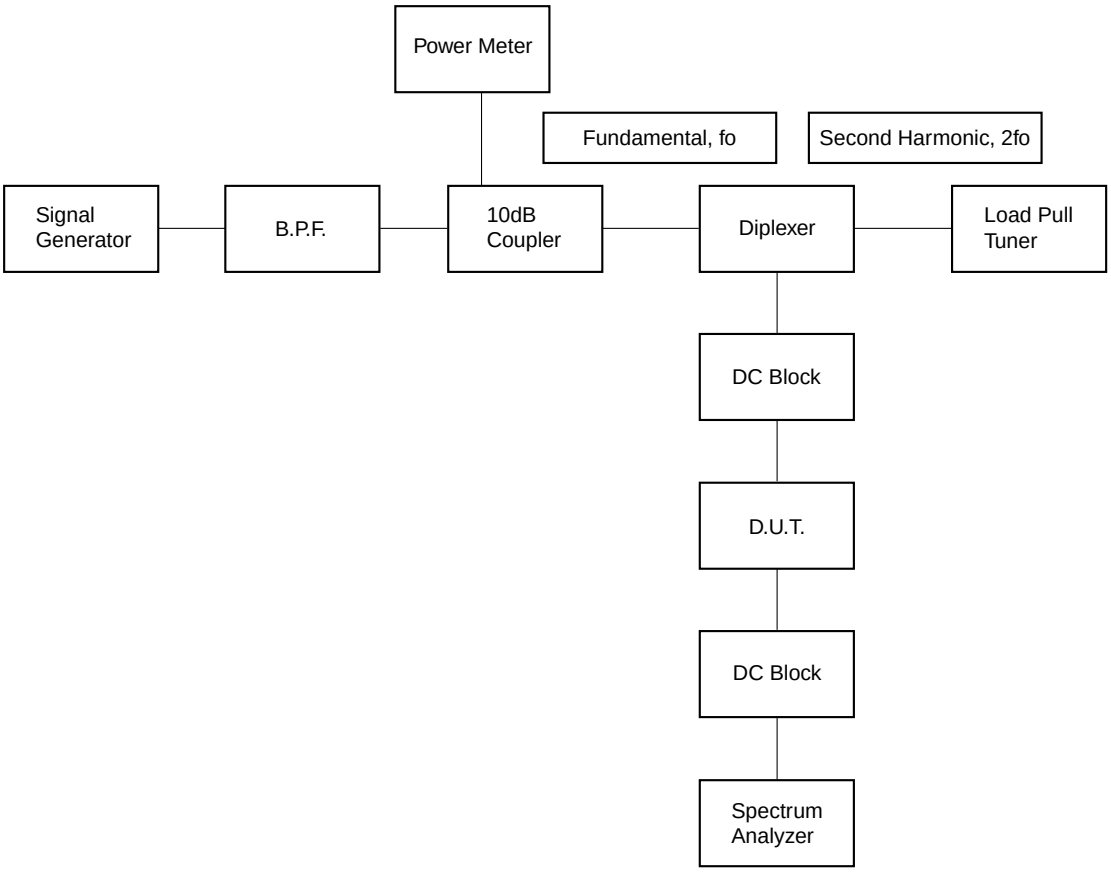
*2 Minimum and recommended value of capacitance C depends on GPRS class and is given by the following table.

Number of consecutive Tx timeslots	Minimum and recommended value of capacitance C (µF)
1	1.0
2	2.0
4	2.0

Application Note (2)

Impedance Matching for Harmonic Minimization

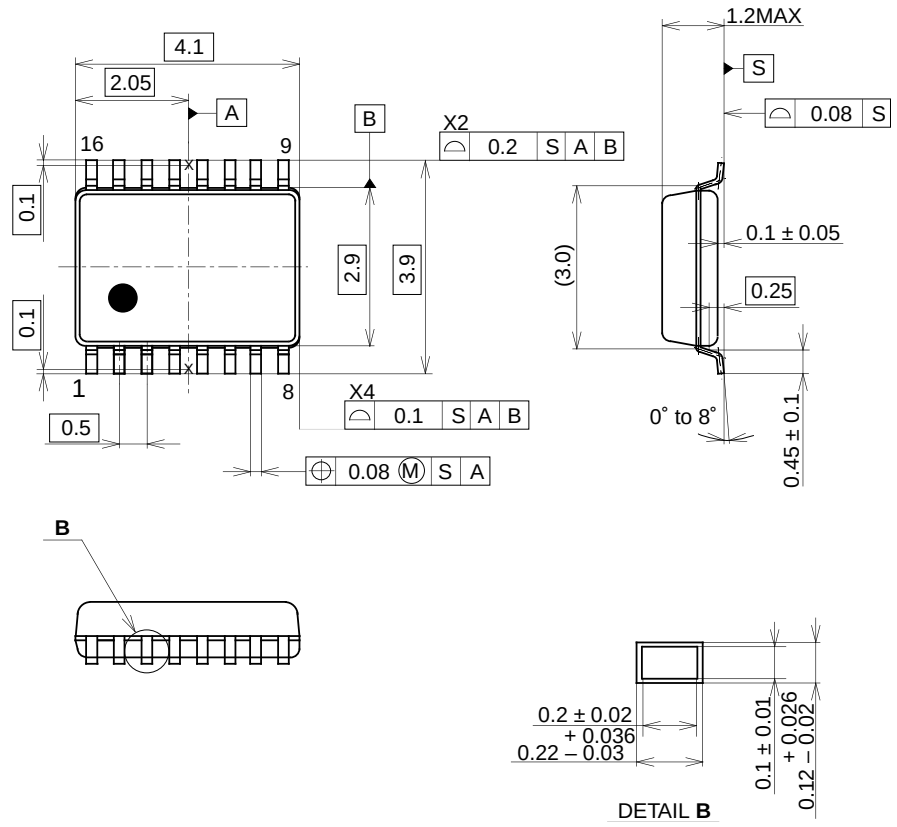
This note outlines the method used to find the source impedance to present to a transmit port at the second harmonic frequency (2fo) to reduce the second harmonic level at the antenna.
This should be carried out for a set of devices that represent the process variants. This way a compromise can be found that suits all variants.
The necessary equipment is shown immediately below.



The device should be mounted on a PWB with 50Ω tracks running from all RF pins to SMA connectors on the PWB edge (DUT). All ports should be externally DC blocked and unused ports should be terminated in 50Ω. All measurements should be performed at the incident powers for which the harmonic levels are specified in this document.
The 2nd harmonic level at the antenna port is measured using the spectrum analyzer and the vertical and horizontal position of the load pull stub adjusted such that this level is minimized.
The device should then be removed from the board and an SMA connector mounted such that the source impedance seen by the transmit port at 2fo can be measured using a VNA.
Measurements should be de-embedded to the end of the SMA center pin.
A network should then be designed to match the impedance of the low pass filter (LPF), which usually comes in front of the device, to the 2fo source impedance that gives sufficiently reduced 2fo levels for all devices measured.
The network should be designed to maintain a good match and insertion loss at the fundamental frequency.

Package Outline Unit: mm

16PIN TSSOP (PLASTIC)



SONY CODE	TSSOP-16P-L01
EIAJ CODE	————
JEDEC CODE	————

PACKAGE STRUCTURE

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	COPPER ALLOY
PACKAGE MASS	0.03g

LEAD PLATING SPECIFICATIONS

ITEM	SPEC.
LEAD MATERIAL	COPPER ALLOY
SOLDER COMPOSITION	Sn-Bi Bi:1-4wt%
PLATING THICKNESS	5-18µm