SONY

SP3T Antenna Switch for GSM/UMTS/CDMA/LTE Phones

CXM3024XR

Description

The CXM3024XR is a high power SP3T antenna switch for wireless communication system.
This IC has a +1.8 V CMOS compatible decoder.
The Sony GaAs JPHEMT MMIC Process is used for low insertion loss and high linearity.
(Applications: GSM/UMTS/CDMA/LTE handsets)

Features

- ◆ Low insertion Loss : 0.28dB (Typ.) (GSM Low Band, UMTS Band V)
  0.40dB (Typ.) (GSM High Band, UMTS Band I)
- ◆ Low voltage operation: V_{DD} = 2.5 V
- ◆ 1.8 V Control Input
- ◆ No DC Blocking Capacitors required on RF ports.
- ◆ Lead-Free and RoHS Compliant

Package

Small package: 20pin XQFN (2.5 mm × 2.5 mm × 0.35 mm Typ.)

Structure

GaAs JPHEMT MMIC Switch, CMOS Decoder

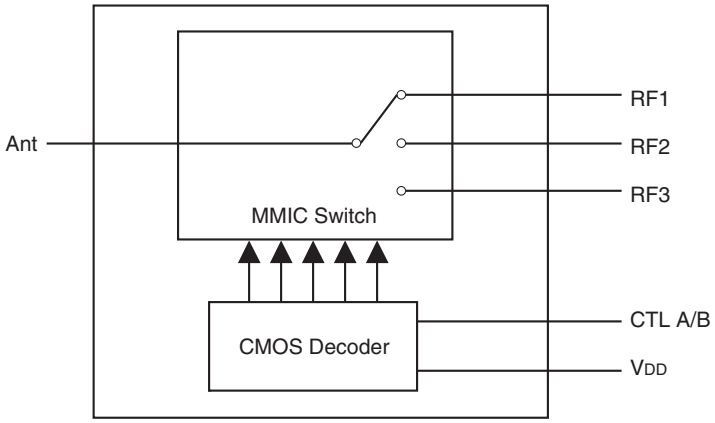
This IC is ESD sensitive device. Special handling precautions are required.

Absolute Maximum Ratings

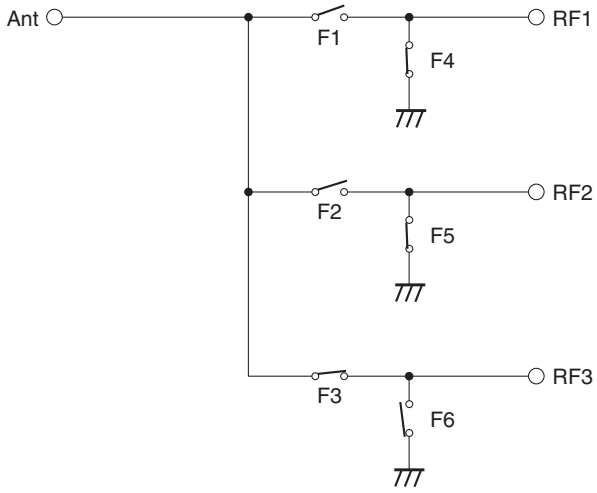
◆ Bias voltage	V_{DD}	4 V (Ta = 25 ℃)
◆ Control voltage	Vctl	4 V (Ta = 25 ℃)
◆ Input power Max.		36 dBm (Duty cycle = 12.5 % to 50 %)
◆ Operating temperature	Topr	–35 to +90 ℃
◆ Storage temperature	Tstg	–65 to +150 ℃

Block Diagram

SP3T Antenna Switch



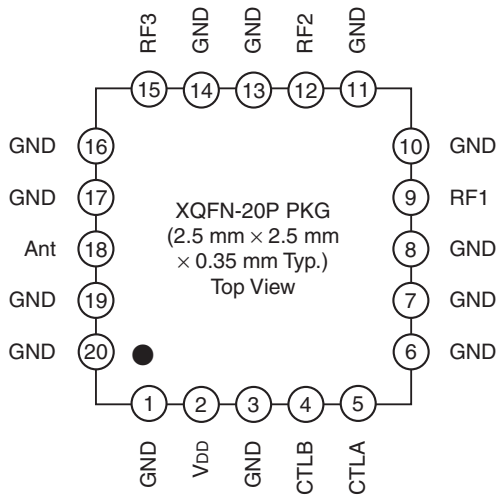
RF Switch



Truth Table

State	Active Path	Vctl state		Switch State					
		A	B	F1	F2	F3	F4	F5	F6
1	ANT-RF1	L/H	L	ON	OFF	OFF	OFF	ON	ON
2	ANT-RF2	L	H	OFF	ON	OFF	ON	OFF	ON
3	ANT-RF3	H	H	OFF	OFF	ON	ON	ON	OFF

Pin Configuration



DC Bias Condition

(Ta = 25 ℃)

Item	Min.	Typ.	Max.	Unit
V_{DD}	2.5	2.8	3.3	V
Vctl (H)	1.35	1.8	3.3	
Vctl (L)	0	—	0.45	

Electrical Characteristics

(Ta = +25 ℃, V_{DD} = 2.5 V, Vctl = 1.8/0 V)

Item	Symbol	Path		Condition	Min.	Typ.	Max.	Unit
Insertion Loss	IL	ANT-RF1, RF2, RF3		*1, *2, *6, *8	—	0.28	0.43	dB
				*3, *4, *7, *9	—	0.40	0.55	
				*5	—	0.45	0.65	
Isolation	ISO1 (vs ANT)	ANT-RF1, RF2, RF3		*1, *2, *6, *8	30	35	—	dB
				*3, *4, *7, *9	25	28	—	
				*5	23	26	—	
	ISO2 (vs each port)	RF1 Active	RF1-RF2, RF3	*1, *2, *6, *8	30	37	—	dB
				*3, *4, *7, *9	26	29	—	
				*5	24	27	—	
		RF2 Active	RF2-RF1, RF3	*1, *2, *6, *8	35	41	—	dB
				*3, *4, *7, *9	29	32	—	
				*5	25	29	—	
		RF3 Active	RF3-RF1, RF2	*1, *2, *6, *8	30	37	—	dB
				*3, *4, *7, *9	26	29	—	
				*5	24	27	—	
VSWR	VSWR	All ports in active paths		600 to 2700 MHz	—	—	1.5	—
Harmonics	2fo	ANT-RF1, RF2, RF3		*1, *2, *6	—	–50	–36	dBm
	3fo				—	–45	–36	
	2fo			*3, *7	—	–55	–40	
	3fo				—	–55	–40	
	2fo			*5	—	–65	–45	
	3fo				—	–65	–45	
Inter modulation product power in Rx band	IMD2	ANT-RF1, RF2, RF3		*10, *11, *12, *15, *16, *19, *20	—	—	–105	dBm
	IMD3			*10, *13, *14, *17, *18, *21, *22	—	—	–105	
Input IP3	IIP3	ANT-RF1, RF2, RF3		*10, *23	65	68	—	dBm
				*10, *24	65	68	—	
Switching time	Ts			50 % CTL to 90 % RF	—	3	5	μs
Control current	Ictl			Vctl = 1.8 V	—	1	5	μA
Supply current	I_{DD}			V_{DD} = 2.8 V	—	0.19	0.30	mA

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

*1 Pin = 26 dBm, 704 to 787 MHz (Band 13, Band 17)
*2 Pin = 26 dBm, 824 to 960 MHz (Band 5, Band 8)
*3 Pin = 26 dBm, 1710 to 1990 MHz (Band 1 Tx, Band 2 Tx, Band 3 Tx, Band 4 Tx)
*4 Pin = 10 dBm, 2110 to 2170 MHz (Band 1 Rx, Band 4 Rx)
*5 Pin = 26 dBm, 2500 to 2690 MHz (Band 7)
*6 Pin = 35 dBm, 824 to 915 MHz (GSM 850/900 Tx)
*7 Pin = 32 dBm, 1710 to 1910 MHz (GSM 1800/1900 Tx)
*8 Pin = 10 dBm, 869 to 960 MHz (GSM 850/900 Rx)
*9 Pin = 10 dBm, 1805 to 1990 MHz (GSM 1800/1900 Rx)
*10 Measured with the recommended circuit

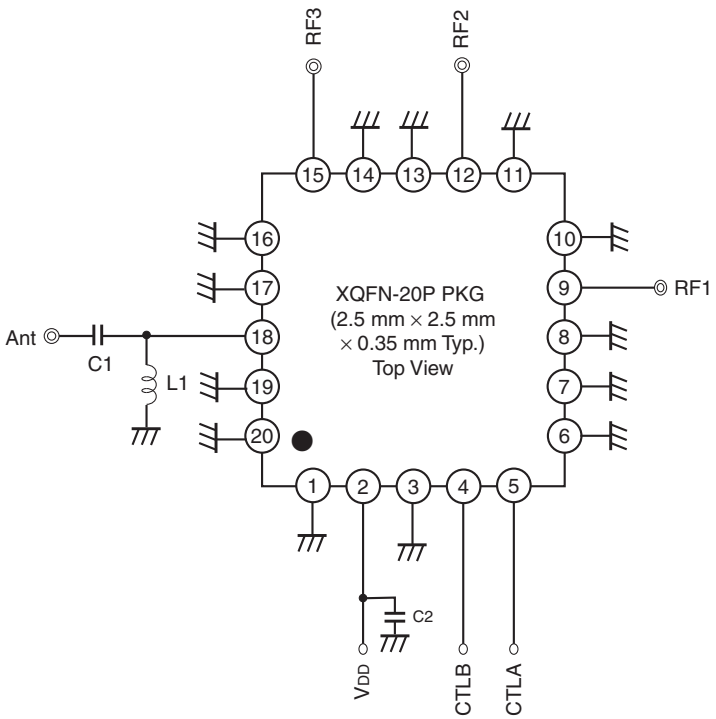
IMD Condition

Band	fRx on TRx	fTx +20 dBm on TRx	fBlocker –15 dBm on Ant		IMD Condition
Band I	2140 MHz	1950 MHz	IMD2 (fRx-fTx)	190 MHz	*11
			IMD2 (fRx+fTx)	4090 MHz	*12
			IMD3 (2fTx-fRx)	1760 MHz	*13
			IMD3 (2fTx+fRx)	6040 MHz	*14
Band II	1960 MHz	1880 MHz	IMD2 (fRx-fTx)	80 MHz	*15
			IMD2 (fRx+fTx)	3840 MHz	*16
			IMD3 (2fTx-fRx)	1800 MHz	*17
			IMD3 (2fTx+fRx)	5720 MHz	*18
Band V	880 MHz	835 MHz	IMD2 (fRx-fTx)	45 MHz	*19
			IMD2 (fRx+fTx)	1715 MHz	*20
			IMD3 (2fTx-fRx)	790 MHz	*21
			IMD3 (2fTx+fRx)	2550 MHz	*22

IIP3 Condition

Band	f1 +27 dBm on TRx	f2 +27 dBm on TRx	IIP3 Condition IIP3 = (3 × Pout – IM3)/2
Band I	1950 MHz	1951 MHz	*23
Band V	835 MHz	836 MHz	*24

Recommended Circuit



Note) 1. No DC blocking capacitors are required on all RF ports.
2. The DC levels of all RF ports are GND.
3. L1 inductor (22 nH) and C1 (12 pF) capacitor are recommended on Ant port for ESD protection.
4. C2 capacitor (100 pF) is recommended.

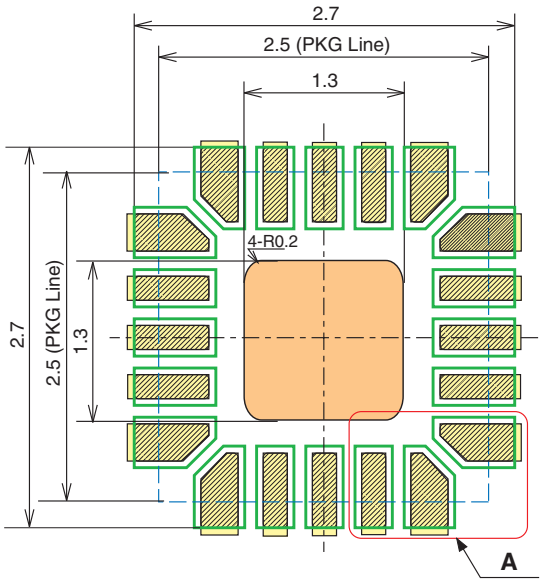
Recommended Land Pattern

XQFN-20P-02 Macro drawing (Reference)

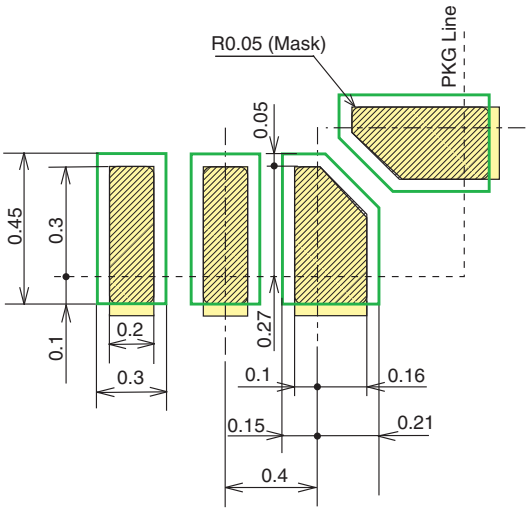
・PKG size : 2.5 mm × 2.5 mm
・Pin pitch : 0.4 mm

* Metal mask thickness : 110 µm

: Metal area in board (*1)
*1 GND plane is recommended
: Land
: Mask (Open area)
: Resist (Open area)

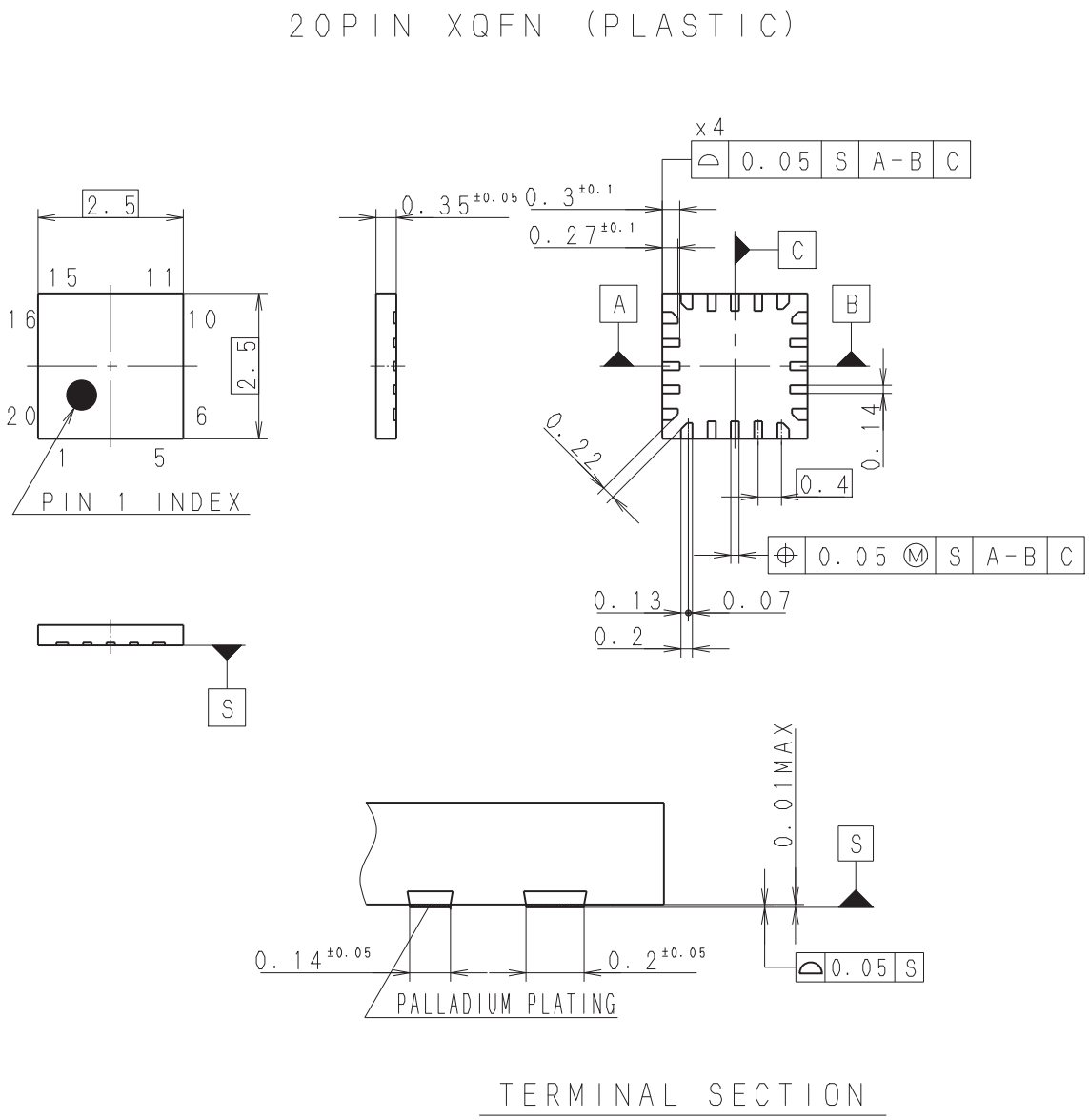


[Detail A]



Package Outline

(Unit: mm)



TERMINAL SECTION

Note: Terminal burr Height 0.05mm MAX.

SONY CODE	XQFN-20P-02
JEITA CODE	————
JEDEC CODE	————

PACKAGE STRUCTURE

PACKAGE MATERIAL	EPOXY RESIN
TERMINAL TREATMENT	PALLADIUM PLATING
TERMINAL MATERIAL	COPPER ALLOY
PACKAGE MASS	0.006g

PART No. AP-4000-20023S	Rev. 0
ISSUED 10.06.30	REVISED
PRODUCTION LINE	COMPILING DIV. SONY SEMICONDUCTOR KYUSHU.
REMARKS PKG CODE: XR-020-C	