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## Description

The CXM3549XR is a DP5T antenna switch for UMTS/LTE dual-mode handsets. The CXM3549XR has a CMOS SPI interface decoder. The Sony GaAs junction gate pHEMT (JPHEMT) MMIC process is used for low insertion loss and high linearity. (Application: UMTS/LTE dual-mode handsets SPI interface)

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## Features

- ◆ Low insertion loss: 0.5 dB (Typ.) TRx (Band 1/7)  
\* including recommended circuit
- ◆ Low voltage operation:  $V_{DD} = 2.5\text{ V}$
- ◆ SPI interface
- ◆ No DC blocking capacitors
- ◆ Small package size: XQFN-22P (3.3 mm × 2.4 mm × 0.35 mm Max.)
- ◆ Lead-free and RoHS compliant

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## Structure

- ◆ GaAs junction-gate PHEMT (JPHEMT) MMIC switch, CMOS decoder

### Note on Handling

GaAs MMIC's are ESD sensitive devices. Special handling precautions are required.

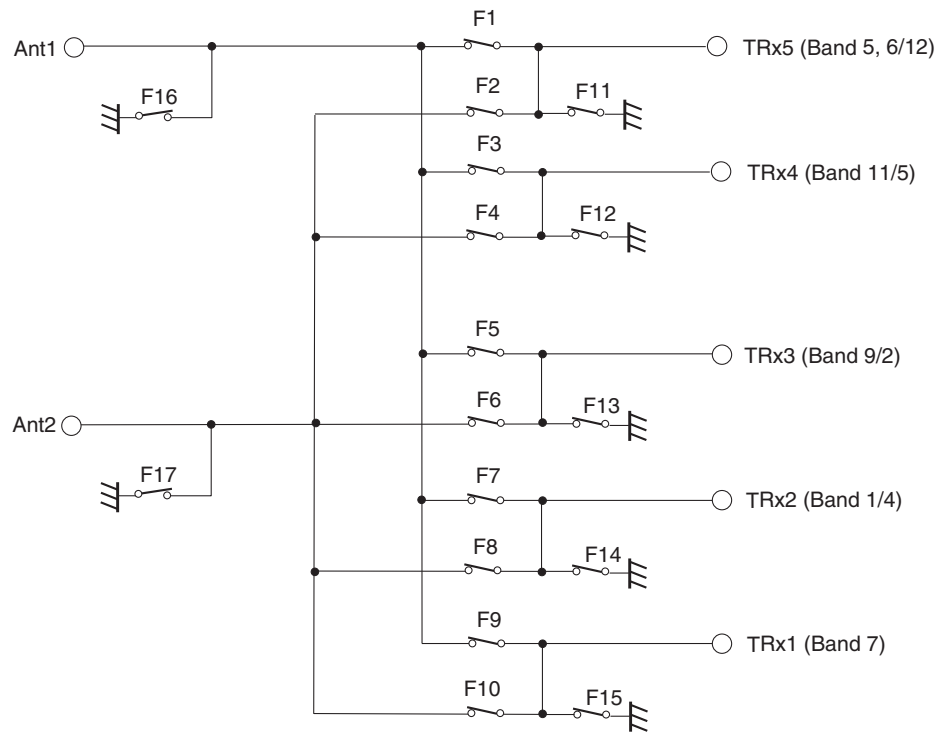
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**Absolute Maximum Ratings**

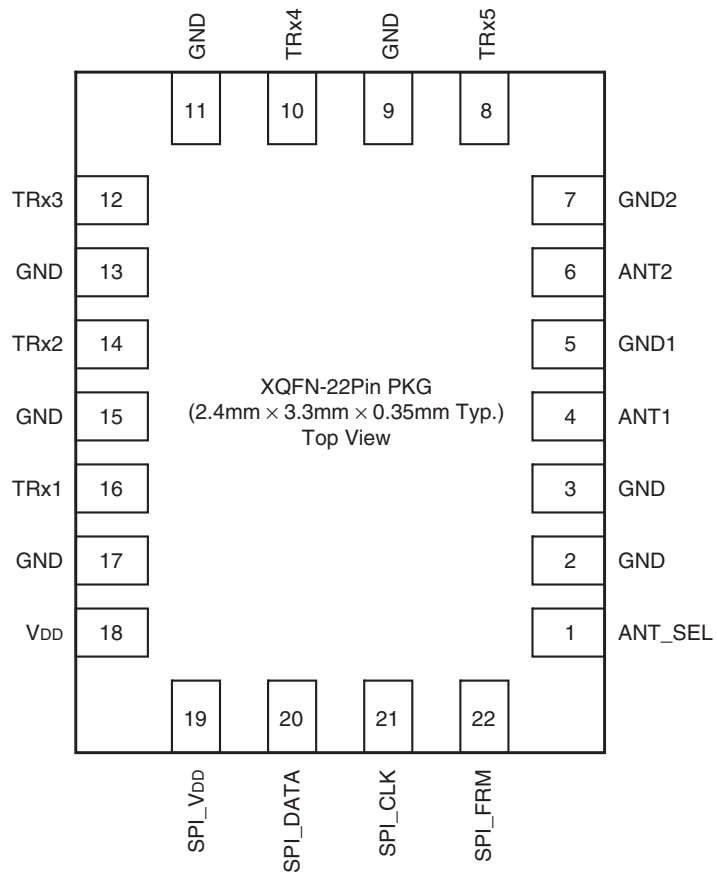
(Ta = 25 °C)

Bias voltage	V <sub>DD</sub>	4	V
SPI bias voltage	SPI_V <sub>DD</sub>	3.5	V
Input power max. (TRx1, 2, 3, 4, 5)		32	dBm
Operating temperature		-35 to +90	°C
Storage temperature		-65 to +150	°C

Block Diagram



Pin Configuration

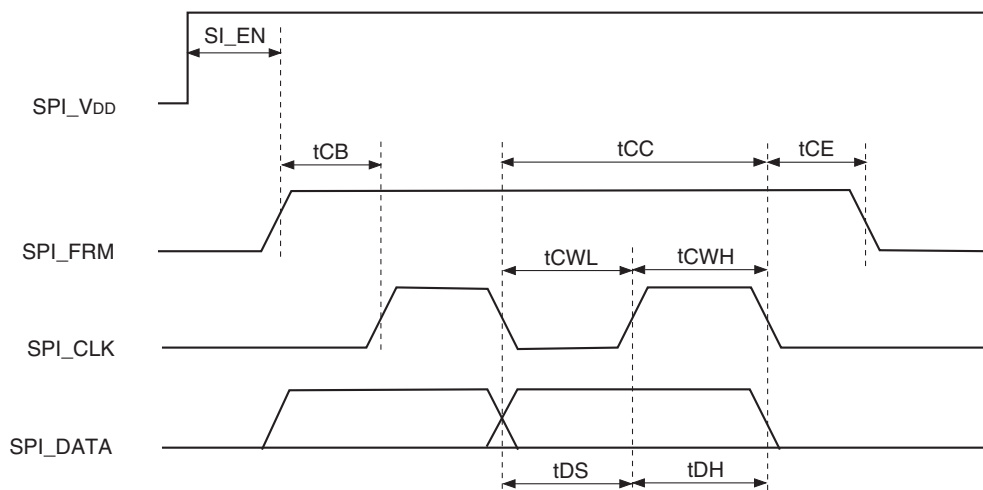


DC Bias Condition

Item	Min.	Typ.	Max.	Unit
V <sub>DD</sub>	2.5	2.9	3.3	V
V <sub>ctl</sub> (ANT SEL) (H)	1.35	2.9	3.3	V
V <sub>ctl</sub> (ANT SEL) (L)	-0.3	—	0.45	V
SPI_V <sub>DD</sub>	1.62	1.8	1.98	V
SPI_V <sub>ctl</sub> (H)	SPI_V <sub>DD</sub> × 0.7	—	SPI_V <sub>DD</sub> + 0.3	V
SPI_V <sub>ctl</sub> (L)	-0.3	—	SPI_V <sub>DD</sub> × 0.3	V

SPI Timing Characteristic

Item	Symbol	Condition	SPEC			Unit
			Min.	Min.	Min.	
SPI bias current	SPI_I <sub>DD</sub>	SPI_V <sub>DD</sub> = 1.8 V	—	200	400	μA
SPI Ctrl current	SPI_I <sub>ctl</sub>	SPI_V <sub>DD</sub> = 1.8 V	—	—	10	μA
SPI_Enable	SPI_EN	SPI_V <sub>DD</sub> ↑ (90 %) to SPI_FRM ↑	10	—	—	μs
Clock frequency	CLK_Freq	SPI_V <sub>DD</sub> Enable	—	26	—	MHz
Clock cycle	t <sub>CC</sub>	CLK_Freq = 26 MHz	34	38.4	42	ns
Clock begin time	t <sub>CB</sub>		t <sub>CC</sub> /2	—	—	ns
Clock end time	t <sub>CE</sub>		t <sub>CC</sub> /2	—	—	ns
Clock width High	t <sub>CWH</sub>		t <sub>CC</sub> × 0.4	—	—	ns
Clock width Low	t <sub>CWL</sub>		t <sub>CC</sub> × 0.4	—	—	ns
Data setup time	t <sub>DS</sub>		5	—	—	ns
Data hold time	t <sub>DH</sub>		5	—	—	ns



SPI Control Specification

Item	Specification
Address bits	14 bits
Data bits	16 bits
Total bits	30 bits total
Clock edge (data sampling)	Rising edge

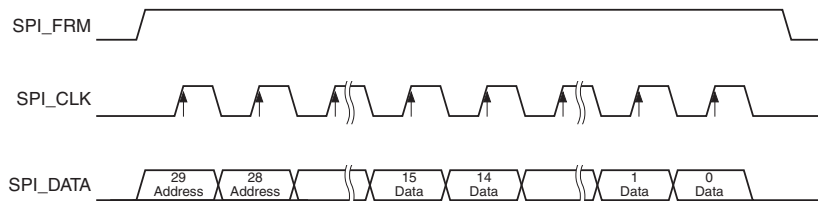
Address		Control Data	
29	16	15	0

MSB LSB

29	28	27	26	25	24	23	22	21	20	19	18	17	16
R/W		Address1			Address2				Address3				
0	0	0	1	0	1	0	1	0	0	0	0	0	0

Port symbol	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	GSM/UMTS	GSM_ANT	GSM_BS1	GSM_BS2	UMTS_BS1	UMTS_BS2	UMTS_BS3	Reserve	Not Used							
TRx5	0	X	X	0	0	1	0	X	X	X	X	X	X	X	X	X
TRx4	0	X	X	0	1	0	0	X	X	X	X	X	X	X	X	X
TRx3	0	X	X	0	1	1	0	X	X	X	X	X	X	X	X	X
TRx2	0	X	X	0	0	0	0	X	X	X	X	X	X	X	X	X
TRx1	0	X	X	0	0	0	1	X	X	X	X	X	X	X	X	X
Term	X	X	X	1	X	X	X	X	X	X	X	X	X	X	X	X

Port symbol	1 Pin	Active port
ANT_SEL	H	ANT1
	L	ANT2



**Electrical Characteristics 1 (Ta = 25 °C)**

**DC characteristic**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, Ta = 25 °C)

Item	Condition	Min.	Typ.	Max.	Unit
Bias current	V <sub>DD</sub> = 2.9 V, SPI_V <sub>DD</sub> = 1.8 V	—	240	500	μA
SPI bias current	SPI_V <sub>DD</sub> = 1.8 V, signal input	—	200	400	μA
	SPI_V <sub>DD</sub> = 1.8 V, No signal	—	3.0	10	μA
Ctrl current	V <sub>DD</sub> = 2.9 V, SPI_V <sub>DD</sub> = 1.8 V, Vctrl = H	—	0.01	10	μA
Wake-up time		—	—	100	μs
Switching time		—	3	5	μs

**TRx1 (Band 7)**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, Ta = 25 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx1	Band 7	2500-2570	—	0.56	0.76	—	0.56	0.76	dB
			2620-2690	—	0.62	0.82	—	0.58	0.78	
VSWR	ANT-TRx1	RF Port	2500-2690	—	1.2	1.5	—	1.2	1.5	—
		ANT Port	2500-2690	—	1.2	1.5	—	1.2	1.5	
SW isolation	ANT-TRx1	Path: Non Active ANT-TRx1	2500-2690	20	25	—	20	25	—	dB
Rx band spurious	ANT-TRx1		2620-2690	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx1	Band 7	5000-5140 (2Tx)	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			7500-7710 (3Tx)	—	—	-44	—	—	-44	
			10000-10280 (4Tx)	—	—	-44	—	—	-44	
ACLR	ANT-TRx1	±5 MHz	2500-2570	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	2500-2570	—	—	-55	—	—	-55	
IMD2	ANT-TRx1	Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 120	—	-113	-105	—	-113	-105	dBm
			Pjam = 5190	—	-110	-105	—	-110	-105	
IMD3	ANT-TRx1	Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 2415	—	-110	-105	—	-110	-105	dBm
			Pjam = 7725	—	-115	-105	—	-115	-105	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.

**TRx2 (Band 1, 4)**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, Ta = 25 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx2	Band 1	1920-1980	—	0.48	0.63	—	0.46	0.61	dB
			2110-2170	—	0.51	0.66	—	0.48	0.63	
		Band 4	1710-1755	—	0.46	0.61	—	0.44	0.59	dB
			2110-2155	—	0.51	0.66	—	0.48	0.63	
VSWR	ANT-TRx2	RF Port	1710-2170	—	1.1	1.5	—	1.1	1.5	—
		ANT Port	1710-2170	—	1.1	1.5	—	1.1	1.5	
SW isolation	ANT-TRx2	Path: Non Active ANT-TRx2	1710-2170	25	30	—	25	30	—	dB
Isolation	ANT-TRx2	Meas. Port: TRx2-TRx3	1920-1980	21	25	—	21	25	—	dB
Rx band spurious	ANT-TRx2		2110-2170	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx2	Band 1, Band 4	2Tx	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			3Tx	—	—	-44	—	—	-44	
			4Tx	—	—	-44	—	—	-44	
ACLR	ANT-TRx2	±5 MHz	1920-1980	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	1920-1980	—	—	-55	—	—	-55	
IMD2	ANT-TRx2	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 190	—	-111	-105	—	-109	-104	dBm
			P <sub>jam</sub> = 4090	—	-116	-105	—	-105	-100	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 400	—	-111	-105	—	-105	-100	dBm
			P <sub>jam</sub> = 3865	—	-118	-105	—	-104	-99	
IMD3	ANT-TRx2	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 1760	—	-111	-105	—	-111	-105	dBm
			P <sub>jam</sub> = 6040	—	-115	-105	—	-115	-105	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 1330	—	-108	-103	—	-108	-103	dBm
			P <sub>jam</sub> = 5590	—	-115	-105	—	-114	-105	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.



**TRx3 (Band 9, 2)**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, Ta = 25 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx3	Band 9	1750-1785	—	0.49	0.64	—	0.47	0.62	dB
			1845-1880	—	0.51	0.66	—	0.48	0.63	
		Band 2	1850-1910	—	0.51	0.66	—	0.48	0.63	dB
			1930-1990	—	0.52	0.67	—	0.49	0.64	
VSWR	ANT-TRx3	RF Port	1750-1990	—	1.1	1.5	—	1.1	1.5	—
		ANT Port	1750-1990	—	1.1	1.5	—	1.1	1.5	
SW isolation	ANT-TRx3	Path: Non Active ANT-TRx3	1750-1990	25	31	—	25	31	—	dB
Rx band spurious	ANT-TRx3		1845-1880, 1930-1990	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx3	Band 2, Band 9	2Tx	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			3Tx	—	—	-44	—	—	-44	
			4Tx	—	—	-44	—	—	-44	
ACLR	ANT-TRx3	±5 MHz	1750-1910	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	1750-1910	—	—	-55	—	—	-55	
IMD2	ANT-TRx3	Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 95	—	-114	-105	—	-114	-106	dBm
			Pjam = 3625	—	-115	-105	—	-110	-105	
		Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 80	—	-115	-105	—	-115	-105	dBm
			Pjam = 3840	—	-115	-105	—	-115	-105	
IMD3	ANT-TRx3	Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 1670	—	-108	-103	—	-108	-103	dBm
			Pjam = 5390	—	-111	-105	—	-110	-105	
		Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 1800	—	-108	-103	—	-108	-103	dBm
			Pjam = 5720	—	-110	-105	—	-110	-105	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.

**TRx4 (Band 11, 5/6)**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, Ta = 25 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx4	Band 11	1428-1463	—	0.48	0.63	—	0.45	0.60	dB
			1476-1511	—	0.49	0.64	—	0.45	0.60	
		Band 5/6	824-849	—	0.50	0.65	—	0.45	0.60	dB
			869-894	—	0.50	0.65	—	0.45	0.60	
VSWR	ANT-TRx4	RF Port	824-1511	—	1.1	1.5	—	1.1	1.5	—
		ANT Port	824-1511	—	1.1	1.5	—	1.1	1.5	
SW isolation	ANT-TRx4	Path: Non Active ANT-TRx4	824-894, 1428-1511	25	35	—	25	35	—	dB
Rx band spurious	ANT-TRx4		869-894, 1476-1511	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx4	Band 11, Band 5/6	2Tx	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			3Tx	—	—	-44	—	—	-44	
			4Tx	—	—	-44	—	—	-44	
ACLR	ANT-TRx4	±5 MHz	824-849, 1428-1463	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	824-869, 1428-1463	—	—	-55	—	—	-55	
IMD2	ANT-TRx4	Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 48	—	-120	-105	—	-120	-105	dBm
			Pjam = 2924	—	-120	-105	—	-111	-105	
		Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 45	—	-120	-105	—	-120	-105	dBm
			Pjam = 1715	—	-120	-105	—	-111	-105	
IMD3	ANT-TRx4	Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 1390	—	-113	-105	—	-113	-105	dBm
			Pjam = 4362	—	-114	-105	—	-114	-105	
		Ptx = 21.5 dBm, Pjam = -15 dBm Meas. = Rx_Band	Pjam = 790	—	-110	-105	—	-110	-105	dBm
			Pjam = 2550	—	-115	-105	—	-115	-105	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.

**TRx5 (Band 5/6, 12)**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, T<sub>a</sub> = 25 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx5	Band 5/6	824-849	—	0.50	0.65	—	0.45	0.60	dB
			869-894	—	0.50	0.65	—	0.45	0.60	
		Band 12	698-716	—	0.57	0.72	—	0.50	0.65	dB
			728-746	—	0.57	0.72	—	0.50	0.65	
VSWR	ANT-TRx5	RF Port	698-894	—	1.2	1.5	—	1.2	1.5	—
		ANT Port	698-894	—	1.2	1.5	—	1.2	1.5	
SW isolation	ANT-TRx5	Path: Non Active ANT-TRx5	698-894	25	42	—	25	42	—	dB
Rx band spurious	ANT-TRx5		726-746, 869-894	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx5	Band 5/6, Band 12	2Tx	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			3Tx	—	—	-44	—	—	-44	
			4Tx	—	—	-44	—	—	-44	
ACLR	ANT-TRx5	±5 MHz	698-716, 824-849	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	698-716, 824-849	—	—	-55	—	—	-55	
IMD2	ANT-TRx5	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 45	—	-125	-105	—	-125	-105	dBm
			P <sub>jam</sub> = 1715	—	-125	-105	—	-125	-105	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 30	—	-125	-105	—	-125	-105	dBm
			P <sub>jam</sub> = 1444	—	-112	-105	—	-112	-105	
IMD3	ANT-TRx5	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 790	—	-120	-105	—	-120	-105	dBm
			P <sub>jam</sub> = 2550	—	-116	-105	—	-116	-105	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 677	—	-113	-105	—	-113	-105	dBm
			P <sub>jam</sub> = 2151	—	-110	-105	—	-110	-105	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.

## Electrical Characteristics 2 (Ta = -30 to +85 °C)

### DC characteristic

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, Ta = -30 to +85 °C)

Item	Condition	Min.	Typ.	Max.	Unit
Bias current	V <sub>DD</sub> = 2.9 V, SPI_V <sub>DD</sub> = 1.8 V	—	270	600	μA
SPI bias current	SPI_V <sub>DD</sub> = 1.8 V, signal input	—	220	450	μA
	SPI_V <sub>DD</sub> = 1.8 V, No signal	—	3.0	10	μA
Ctrl current	V <sub>DD</sub> = 2.9 V, SPI_V <sub>DD</sub> = 1.8 V, V <sub>ctrl</sub> = H	—	0.01	10	μA
Wake-up time		—	—	100	μs
Switching time		—	—	5	μs

### TRx1 (Band 7)

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, Ta = -30 to +85 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx1	Band 7	2500-2570	—	—	0.86	—	—	0.86	dB
			2620-2690	—	—	0.92	—	—	0.88	
VSWR	ANT-TRx1	RF Port	2500-2690	—	—	1.5	—	—	1.5	—
		ANT Port	2500-2690	—	—	1.5	—	—	1.5	
SW isolation	ANT-TRx1	Path: Non Active ANT-TRx1	2500-2690	20	—	—	20	—	—	dB
Rx band spurious	ANT-TRx1		2620-2690	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx1	Band 7	5000-5140 (2Tx)	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			7500-7710 (3Tx)	—	—	-44	—	—	-44	
			10000-10280 (4Tx)	—	—	-44	—	—	-44	
ACLR	ANT-TRx1	±5 MHz	2500-2570	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	2500-2570	—	—	-55	—	—	-55	
IMD2	ANT-TRx1	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 120	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 5190	—	—	-102	—	—	-102	
IMD3	ANT-TRx1	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 2415	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 7725	—	—	-102	—	—	-102	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.

**TRx2 (Band 1, 4)**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, T<sub>a</sub> = -30 to +85 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx2	Band 1	1920-1980	—	—	0.73	—	—	0.71	dB
			2110-2170	—	—	0.76	—	—	0.73	
		Band 4	1710-1755	—	—	0.71	—	—	0.69	dB
			2110-2155	—	—	0.76	—	—	0.73	
VSWR	ANT-TRx2	RF Port	1710-2170	—	—	1.5	—	—	1.5	—
		ANT Port	1710-2170	—	—	1.5	—	—	1.5	
SW isolation	ANT-TRx2	Path: Non Active ANT-TRx2	1710-2170	25	—	—	25	—	—	dB
Isolation	ANT-TRx2	Meas. Port: TRx2-TRx3	1920-1980	21	—	—	21	—	—	dB
Rx band spurious	ANT-TRx2		2110-2170	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx2	Band 1, Band 4	2Tx	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			3Tx	—	—	-44	—	—	-44	
			4Tx	—	—	-44	—	—	-44	
ACLR	ANT-TRx2	±5 MHz	1920-1980	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	1920-1980	—	—	-55	—	—	-55	
IMD2	ANT-TRx2	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 190	—	—	-102	—	—	-101	dBm
			P <sub>jam</sub> = 4090	—	—	-102	—	—	-97	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 400	—	—	-102	—	—	-97	dBm
			P <sub>jam</sub> = 3865	—	—	-102	—	—	-96	
IMD3	ANT-TRx2	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 1760	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 6040	—	—	-102	—	—	-102	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 1330	—	—	-102	—	—	-100	dBm
			P <sub>jam</sub> = 5590	—	—	-102	—	—	-102	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.

**TRx3 (Band 9, 2)**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, T<sub>a</sub> = -30 to +85 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx3	Band 9	1750-1785	—	—	0.74	—	—	0.72	dB
			1845-1880	—	—	0.76	—	—	0.73	
		Band 2	1850-1910	—	—	0.76	—	—	0.73	dB
			1930-1990	—	—	0.77	—	—	0.74	
VSWR	ANT-TRx3	RF Port	1750-1990	—	—	1.5	—	—	1.5	—
		ANT Port	1750-1990	—	—	1.5	—	—	1.5	
SW isolation	ANT-TRx3	Path: Non Active ANT-TRx3	1750-1990	25	—	—	25	—	—	dB
Rx band spurious	ANT-TRx3		1845-1880, 1930-1990	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx3	Band 2, Band 9	2Tx	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			3Tx	—	—	-44	—	—	-44	
			4Tx	—	—	-44	—	—	-44	
ACLR	ANT-TRx3	±5 MHz	1750-1910	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	1750-1910	—	—	-55	—	—	-55	
IMD2	ANT-TRx3	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 95	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 3625	—	—	-102	—	—	-102	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 80	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 3840	—	—	-102	—	—	-102	
IMD3	ANT-TRx3	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 1670	—	—	-100	—	—	-100	dBm
			P <sub>jam</sub> = 5390	—	—	-102	—	—	-102	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 1800	—	—	-100	—	—	-100	dBm
			P <sub>jam</sub> = 5720	—	—	-102	—	—	-102	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.

**TRx4 (Band 11, 5/6)**

(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, T<sub>a</sub> = -30 to +85 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx4	Band 11	1428-1463	—	—	0.73	—	—	0.70	dB
			1476-1511	—	—	0.74	—	—	0.70	
		Band 5/6	824-849	—	—	0.75	—	—	0.70	dB
			869-894	—	—	0.75	—	—	0.70	
VSWR	ANT-TRx4	RF Port	824-1511	—	—	1.5	—	—	1.5	—
		ANT Port	824-1511	—	—	1.5	—	—	1.5	
SW isolation	ANT-TRx4	Path: Non Active ANT-TRx4	824-894, 1428-1511	25	—	—	25	—	—	dB
Rx band spurious	ANT-TRx4		869-894, 1476-1511	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx4	Band 11, Band 5/6	2Tx	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			3Tx	—	—	-44	—	—	-44	
			4Tx	—	—	-44	—	—	-44	
ACLR	ANT-TRx4	±5 MHz	824-849, 1428-1463	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	824-869, 1428-1463	—	—	-55	—	—	-55	
IMD2	ANT-TRx4	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 48	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 2924	—	—	-102	—	—	-102	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 45	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 1715	—	—	-102	—	—	-102	
IMD3	ANT-TRx4	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 1390	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 4362	—	—	-102	—	—	-102	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 790	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 2550	—	—	-102	—	—	-102	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.

**TRx5 (Band 5/6, 12)**

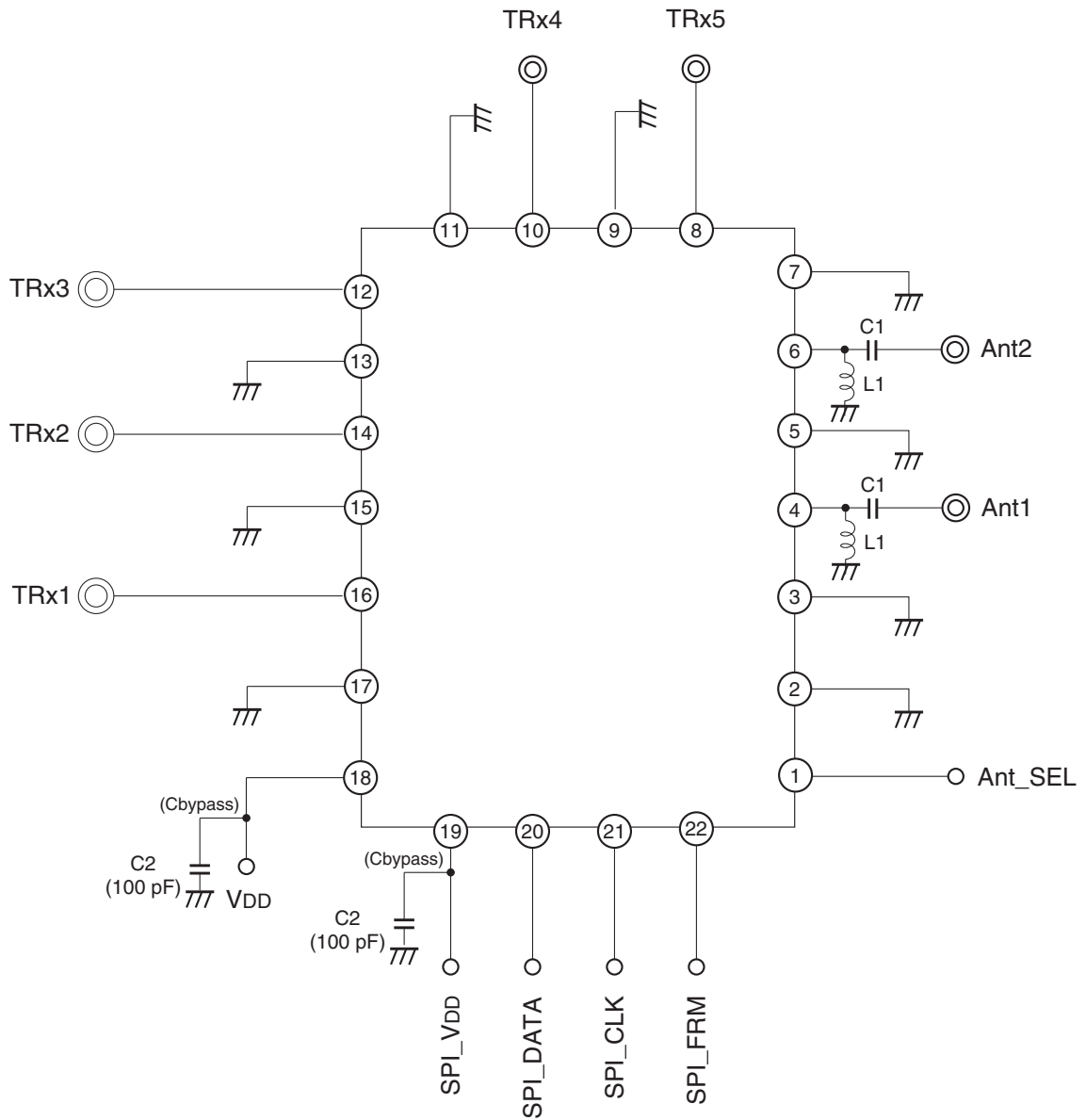
(V<sub>DD</sub> = 2.9 V, SPI\_V<sub>DD</sub> = 1.8 V, T<sub>a</sub> = -30 to +85 °C, Pin = 26 dBm)

Item	State	Condition	Frequency [MHz]	ANT1			ANT2			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Insertion loss	ANT-TRx5	Band 5/6	824-849	—	—	0.75	—	—	0.70	dB
			869-894	—	—	0.75	—	—	0.70	
		Band 12	698-716	—	—	0.82	—	—	0.75	dB
			728-746	—	—	0.82	—	—	0.75	
VSWR	ANT-TRx5	RF Port	698-894	—	—	1.5	—	—	1.5	—
		ANT Port	698-894	—	—	1.5	—	—	1.5	
SW isolation	ANT-TRx5	Path: Non Active ANT-TRx5	698-894	25	—	—	25	—	—	dB
Rx band spurious	ANT-TRx5		726-746, 869-894	—	—	-125	—	—	-125	dBm
Harmonics	ANT-TRx5	Band 5/6, Band 12	2Tx	—	—	-44	—	—	-44	dBm/ 3.84 MHz
			3Tx	—	—	-44	—	—	-44	
			4Tx	—	—	-44	—	—	-44	
ACLR	ANT-TRx5	±5 MHz	698-716, 824-849	—	—	-50	—	—	-50	dBc/ 3.84 MHz
		±10 MHz	698-716, 824-849	—	—	-55	—	—	-55	
IMD2	ANT-TRx5	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 45	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 1715	—	—	-102	—	—	-102	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 30	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 1444	—	—	-102	—	—	-102	
IMD3	ANT-TRx5	P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 790	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 2550	—	—	-102	—	—	-102	
		P <sub>tx</sub> = 21.5 dBm, P <sub>jam</sub> = -15 dBm Meas. = Rx_Band	P <sub>jam</sub> = 677	—	—	-102	—	—	-102	dBm
			P <sub>jam</sub> = 2151	—	—	-102	—	—	-102	

Electrical Characteristics are measured with recommended circuit and RF ports terminated in 50 Ω.








Recommended Circuit



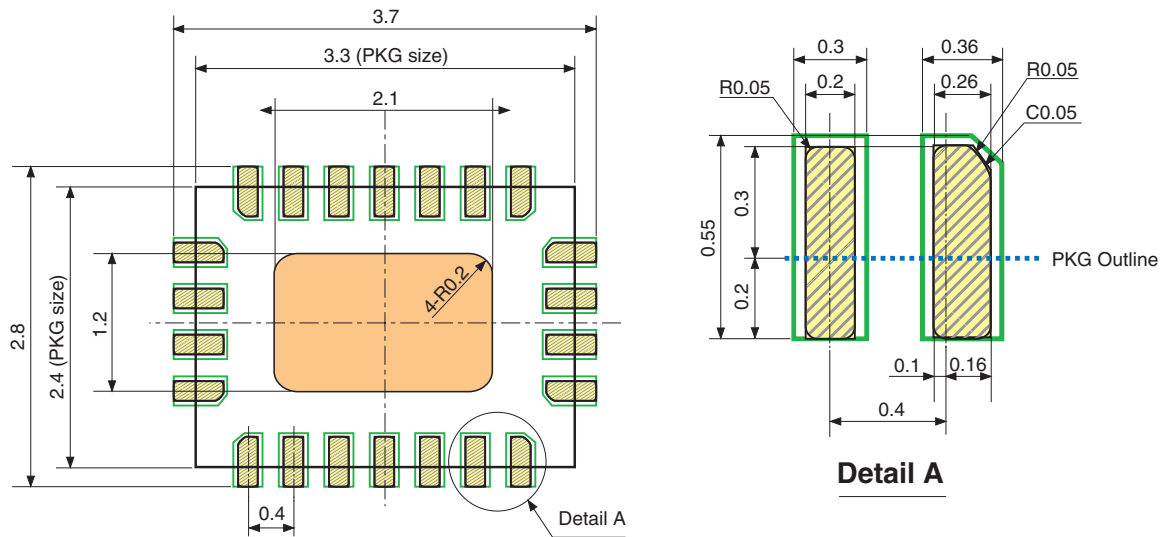
- Note) 1. No DC blocking capacitors are required on all RF ports.  
 2. DC levels of all RF ports are GND.  
 3. L1 inductor (18 nH) and C1 capacitor (10 pF) are recommended on Ant port for ESD protection.  
 4. C2 capacitor (100 pF) is recommended.

Recommended Land Pattern

-  : Land area
-  : Board resist open area
-  : PKG outline
-  : Mask open area (Solder printing area)
-  : Metal area in board (\*1)
- (\*1) : GND plane is recommended

**Specification**

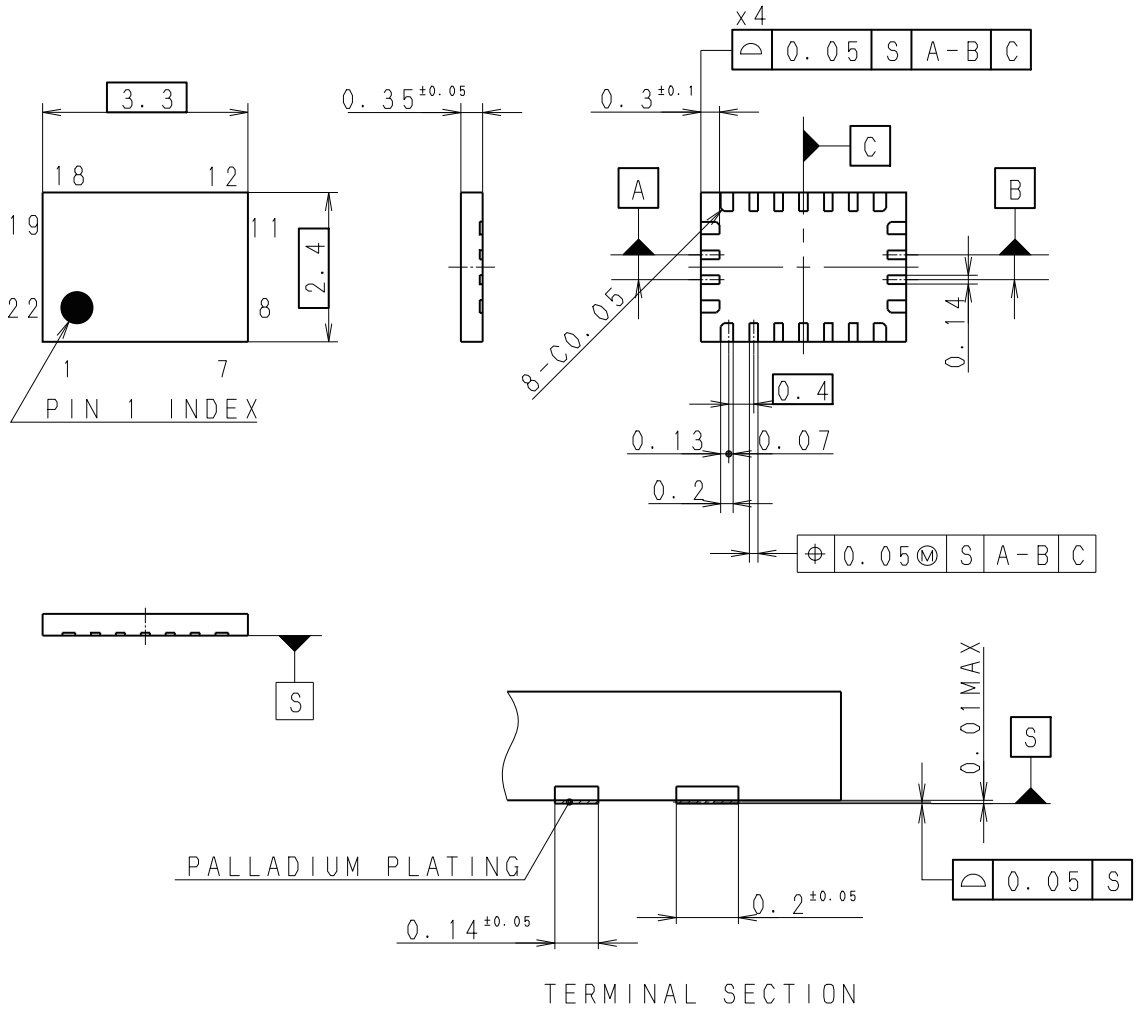
- PKG size: 3.3 mm × 2.4 mm t0.35 mm
- Terminal pitch: 0.4 mm
- Terminal length: 0.3 mm
- Mask thickness: 0.11 mm



Package Outline

(Unit: mm)

22PIN XQFN (PLASTIC)



Note:Cutting burr of lead are 0.05mm MAX.

PACKAGE STRUCTURE

SONY CODE	XQFN-22P-01
JEITA CODE	_____
JEDEC CODE	_____

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	PALLADIUM PLATING
LEAD MATERIAL	COPPER ALLOY
PACKAGE MASS	0.01g

PART No.	AP-4000-22009S	Rev. 0
ISSUED	10.05.12	REVISED
PRODUCTION LINE	COMPILING DIV. SDT ENGINEERING DIVISION	
REMARKS	PKG CODE: XR-022-S	