

## 1. DESCRIPTION

The XA2214-S14 is a GaAs MMIC for L, S-band SPDT (Single Pole Double Throw) switch which was developed for mobile phone and another L, S-band application.

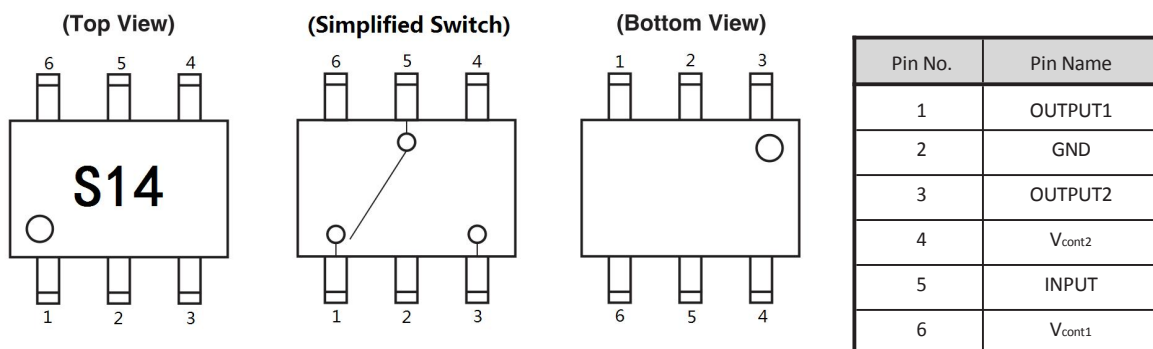
This device can operate 2 control switching by control voltage 1.8 to 5.3 V. This device can operate frequency from 0.05 to 3.0 GHz, having the low insertion loss and high isolation.

This device is housed in a 6-pin SOT363 package. And this package is able to high-density surface mounting.

## 2. FEATURES

- Switch control voltage :  $V_{\text{cont (H)}} = 1.8 \text{ to } 5.3 \text{ V (3.0 V TYP.)}$   
:  $V_{\text{cont (L)}} = -0.2 \text{ to } +0.2 \text{ V (0 V TYP.)}$
- Low insertion loss :  $L_{\text{ins1}} = 0.25 \text{ dB TYP. @ } f = 0.05 \text{ to } 0.5 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{ins2}} = 0.25 \text{ dB TYP. @ } f = 0.5 \text{ to } 1.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{ins3}} = 0.30 \text{ dB TYP. @ } f = 1.0 \text{ to } 2.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{ins4}} = 0.35 \text{ dB TYP. @ } f = 2.0 \text{ to } 2.5 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $L_{\text{ins5}} = 0.35 \text{ dB TYP. @ } f = 2.5 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL1 = 32 \text{ dB TYP. @ } f = 0.05 \text{ to } 0.5 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL2 = 28 \text{ dB TYP. @ } f = 0.5 \text{ to } 1.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL3 = 27 \text{ dB TYP. @ } f = 1.0 \text{ to } 2.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL4 = 26 \text{ dB TYP. @ } f = 2.0 \text{ to } 2.5 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $ISL5 = 24 \text{ dB TYP. @ } f = 2.5 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $P_{\text{in (1 dB)}} = +27.0 \text{ dBm TYP. @ } f = 0.5 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 3.0 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$   
:  $P_{\text{in (1 dB)}} = +20.0 \text{ dBm TYP. @ } f = 0.5 \text{ to } 3.0 \text{ GHz, } V_{\text{cont (H)}} = 1.8 \text{ V, } V_{\text{cont (L)}} = 0 \text{ V}$
- High-density surface mounting : 6-pin super minimold package (SOT363 ,  $2.0 \times 1.25 \times 0.9 \text{ mm}$ )

## 3. PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



#### 4. TRUTH TABLE

| V <sub>cont1</sub> | V <sub>cont2</sub> | INPUT-OUTPUT1 | INPUT-OUTPUT2 |
|--------------------|--------------------|---------------|---------------|
| Low                | High               | ON            | OFF           |
| High               | Low                | OFF           | ON            |

#### 5. ABSOLUTE MAXIMUM RATINGS(TA = +25°C, unless otherwise specified)

| Parameter                     | Symbol            | Ratings              | Unit |
|-------------------------------|-------------------|----------------------|------|
| Switch Control Voltage        | V <sub>cont</sub> | +6.0 <sup>Note</sup> | V    |
| Input Power                   | P <sub>in</sub>   | +30                  | dBm  |
| Operating Ambient Temperature | T <sub>A</sub>    | -40 to +85           | °C   |
| Storage Temperature           | T <sub>stg</sub>  | -50 to +150          | °C   |

**Note** V<sub>cont1</sub> – V<sub>cont2</sub> ≤ 6.0 V

#### 6. RECOMMENDED OPERATING RANGE(TA = +25°C, unless otherwise specified)

| Parameter                  | Symbol                | MIN. | TYP. | MAX. | Unit |
|----------------------------|-----------------------|------|------|------|------|
| Switch Control Voltage (H) | V <sub>cont (H)</sub> | 1.8  | 3.0  | 5.3  | V    |
| Switch Control Voltage (L) | V <sub>cont (L)</sub> | -0.2 | 0    | 0.2  | V    |

## 7. ELECTRICAL CHARACTERISTICS

(TA = +25°C, Vcont (H) = 3.0 V, Vcont (L) = 0 V, DC cut capacitors = 100 pF, unless otherwise specified)

| Parameter                       | Symbol                   | Test Conditions                                                            | MIN.  | TYP.  | MAX. | Unit |
|---------------------------------|--------------------------|----------------------------------------------------------------------------|-------|-------|------|------|
| Insertion Loss 1                | L <sub>ins1</sub>        | f = 0.05 to 0.5 GHz <sup>Note 1</sup>                                      | —     | 0.25  | 0.45 | dB   |
| Insertion Loss 2                | L <sub>ins2</sub>        | f = 0.5 to 1.0 GHz                                                         | —     | 0.25  | 0.45 | dB   |
| Insertion Loss 3                | L <sub>ins3</sub>        | f = 1.0 to 2.0 GHz                                                         | —     | 0.30  | 0.50 | dB   |
| Insertion Loss 4                | L <sub>ins4</sub>        | f = 2.0 to 2.5 GHz                                                         | —     | 0.35  | 0.55 | dB   |
| Insertion Loss 5                | L <sub>ins5</sub>        | f = 2.5 to 3.0 GHz                                                         | —     | 0.35  | 0.60 | dB   |
| Isolation 1                     | ISL1                     | f = 0.05 to 0.5 GHz <sup>Note 1</sup>                                      | 29    | 32    | —    | dB   |
| Isolation 2                     | ISL2                     | f = 0.5 to 1.0 GHz                                                         | 25    | 28    | —    | dB   |
| Isolation 3                     | ISL3                     | f = 1.0 to 2.0 GHz                                                         | 24    | 27    | —    | dB   |
| Isolation 4                     | ISL4                     | f = 2.0 to 2.5 GHz                                                         | 23    | 26    | —    | dB   |
| Isolation 5                     | ISL5                     | f = 2.5 to 3.0 GHz                                                         | 21    | 24    | —    | dB   |
| Input Return Loss 1             | RL <sub>in1</sub>        | f = 0.05 to 0.5 GHz <sup>Note 1</sup>                                      | 15    | 20    | —    | dB   |
| Input Return Loss 2             | RL <sub>in2</sub>        | f = 0.5 to 3.0 GHz                                                         | 15    | 20    | —    | dB   |
| Output Return Loss 1            | RL <sub>out1</sub>       | f = 0.05 to 0.5 GHz <sup>Note 1</sup>                                      | 15    | 20    | —    | dB   |
| Output Return Loss 2            | RL <sub>out2</sub>       | f = 0.5 to 3.0 GHz                                                         | 15    | 20    | —    | dB   |
| 0.1 dB Loss Compression         | P <sub>in (0.1 dB)</sub> | f = 2.0/2.5 GHz                                                            | +21.0 | +23.0 | —    | dBm  |
| Input Power <sup>Note 2</sup>   |                          | f = 0.5 to 3.0 GHz                                                         | —     | +23.0 | —    | dBm  |
| 1 dB Loss Compression           | P <sub>in (1 dB)</sub>   | f = 0.5 to 3.0 GHz                                                         | —     | +27.0 | —    | dBm  |
| Input Power <sup>Note 3</sup>   |                          |                                                                            |       |       |      |      |
| 2nd Harmonics                   | 2f <sub>0</sub>          | f = 2.0 GHz, P <sub>in</sub> = +15 dBm                                     | —     | −55   | −47  | dBc  |
|                                 |                          | f = 2.5 GHz, P <sub>in</sub> = +15 dBm                                     | —     | −55   | −47  | dBc  |
| 3rd Harmonics                   | 3f <sub>0</sub>          | f = 2.0 GHz, P <sub>in</sub> = +15 dBm                                     | —     | −55   | −47  | dBc  |
|                                 |                          | f = 2.5 GHz, P <sub>in</sub> = +15 dBm                                     | —     | −55   | −47  | dBc  |
| Intermodulation Intercept Point | IIP <sub>3</sub>         | f = 0.5 to 3.0 GHz, 2 tone,<br>P <sub>in</sub> = +16 dBm, 5 MHz<br>spicing | —     | +58   | —    | dBm  |
| Switch Control Current          | I <sub>cont</sub>        | —                                                                          | —     | 4     | 25   | μA   |
| Switch Control Speed            | t <sub>sw</sub>          | 50% CTL to 90/10% RF                                                       | —     | 20    | 200  | ns   |

**Notes 1.** DC cut capacitors = 1 000 pF at f = 0.05 to 0.5 GHz

- 2.** P<sub>in (0.1 dB)</sub> is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.
- 3.** P<sub>in (1 dB)</sub> is measured the input power level when the insertion loss increases more 1 dB than that of linear range.

**ELECTRICAL CHARACTERISTICS(continued)**

(TA = +25°C, Vcont (H) = 1.8 V, Vcont (L) = 0 V, DC cut capacitors = 100 pF, unless otherwise specified)

| Parameter                                              | Symbol                   | Test Conditions                       | MIN.  | TYP.  | MAX. | Unit |
|--------------------------------------------------------|--------------------------|---------------------------------------|-------|-------|------|------|
| Insertion Loss 6                                       | L <sub>ins6</sub>        | f = 0.05 to 0.5 GHz <sup>Note 1</sup> | —     | 0.25  | 0.50 | dB   |
| Insertion Loss 7                                       | L <sub>ins7</sub>        | f = 0.5 to 1.0 GHz                    | —     | 0.25  | 0.50 | dB   |
| Insertion Loss 8                                       | L <sub>ins8</sub>        | f = 1.0 to 2.0 GHz                    | —     | 0.30  | 0.55 | dB   |
| Insertion Loss 9                                       | L <sub>ins9</sub>        | f = 2.0 to 2.5 GHz                    | —     | 0.35  | 0.60 | dB   |
| Insertion Loss 10                                      | L <sub>ins10</sub>       | f = 2.5 to 3.0 GHz                    | —     | 0.35  | 0.65 | dB   |
| Isolation 6                                            | ISL6                     | f = 0.05 to 0.5 GHz <sup>Note 1</sup> | 27    | 30    | —    | dB   |
| Isolation 7                                            | ISL7                     | f = 0.5 to 2.0 GHz                    | 23    | 27    | —    | dB   |
| Isolation 8                                            | ISL8                     | f = 2.0 to 2.5 GHz                    | 21    | 25    | —    | dB   |
| Isolation 9                                            | ISL9                     | f = 2.5 to 3.0 GHz                    | 20    | 24    | —    | dB   |
| Input Return Loss 3                                    | RL <sub>in3</sub>        | f = 0.05 to 3.0 GHz <sup>Note 1</sup> | 15    | 20    | —    | dB   |
| Output Return Loss 3                                   | RL <sub>out3</sub>       | f = 0.05 to 3.0 GHz <sup>Note 1</sup> | 15    | 20    | —    | dB   |
| 0.1 dB Loss Compression                                | P <sub>in (0.1 dB)</sub> | f = 2.0/2.5 GHz                       | +14.0 | +17.0 | —    | dBm  |
| Input Power <sup>Note 2</sup>                          |                          | f = 0.5 to 3.0 GHz                    | —     | +17.0 | —    | dBm  |
| 1 dB Loss Compression<br>Input Power <sup>Note 3</sup> | P <sub>in (1 dB)</sub>   | f = 0.5 to 3.0 GHz                    | —     | +20.0 | —    | dBm  |
| Switch Control Current                                 | I <sub>cont</sub>        | —                                     | —     | 4     | 20   | μA   |
| Switch Control Speed                                   | t <sub>sw</sub>          | 50% CTL to 90/10% RF                  | —     | 20    | 200  | ns   |

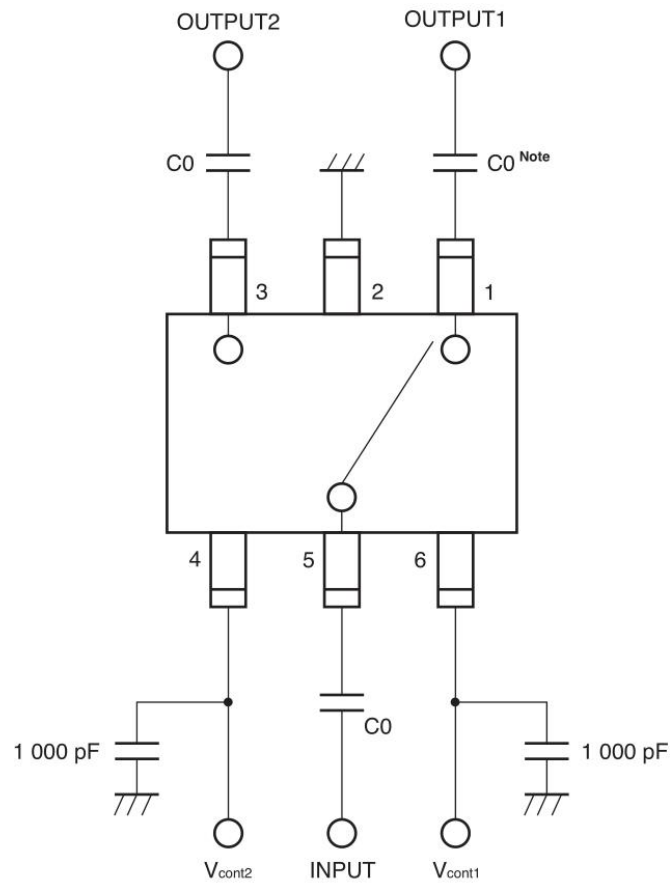
**Notes 1.** DC cut capacitors = 1 000 pF at f = 0.05 to 0.5 GHz

- 2.** P<sub>in (0.1 dB)</sub> is measured the input power level when the insertion loss increases more 0.1 dB than that of linear range.
- 3.** P<sub>in (1 dB)</sub> is measured the input power level when the insertion loss increases more 1 dB than that of linear range.

**Caution** This device is used it is necessary to use DC cut capacitors.

The value of DC cut capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with actual board of your system. The range of recommended DC cut capacitor value is less than 100 pF.

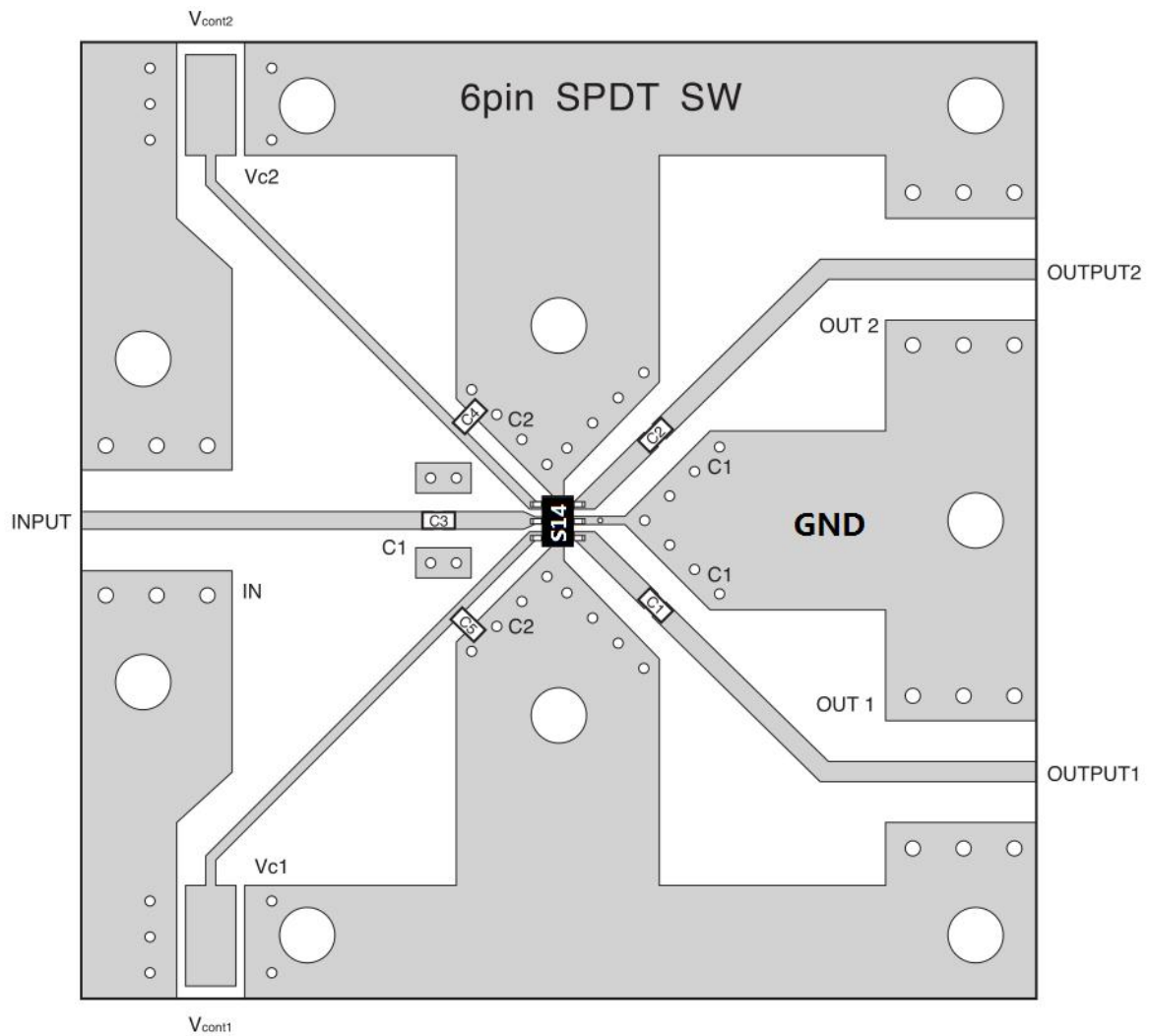
## 8. EVALUATION CIRCUIT



**Note** C0 : 0.05 to 0.5 GHz 1 000 pF  
: 0.5 to 3.0 GHz 100 pF

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

## 9. ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



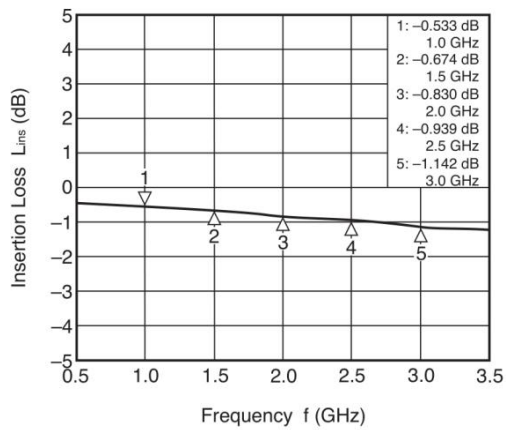
## 10. USING THE NEC EVALUATION BOARD

| Symbol     | Values   |
|------------|----------|
| C1, C2, C3 | 100 pF   |
| C4, C5     | 1 000 pF |

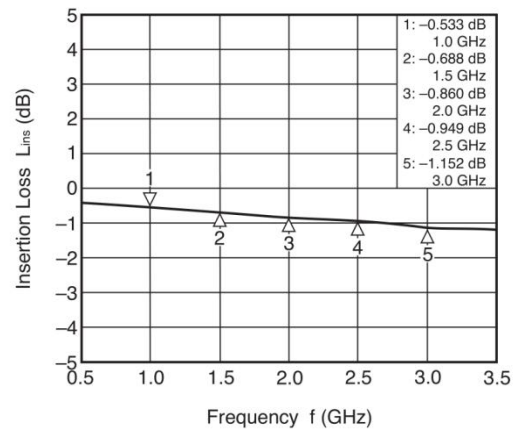
## 11. TYPICAL CHARACTERISTICS

( $T_A = +25^\circ\text{C}$ ,  $V_{\text{cont}}(\text{H}) = 3.0\text{ V}$ ,  $V_{\text{cont}}(\text{L}) = 0\text{ V}$ , DC cut capacitors = 100 pF, unless otherwise specified)

INPUT-OUTPUT1  
INSERTION LOSS vs.FREQUENCY



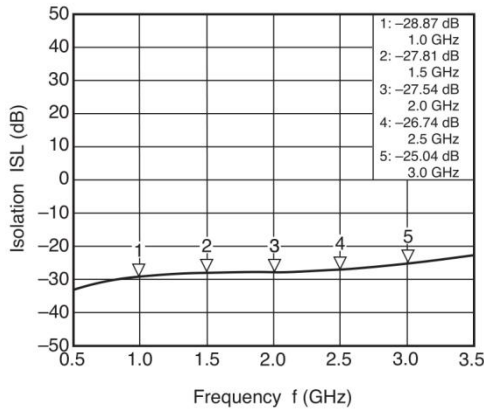
INPUT-OUTPUT2  
INSERTION LOSS vs.FREQUENCY



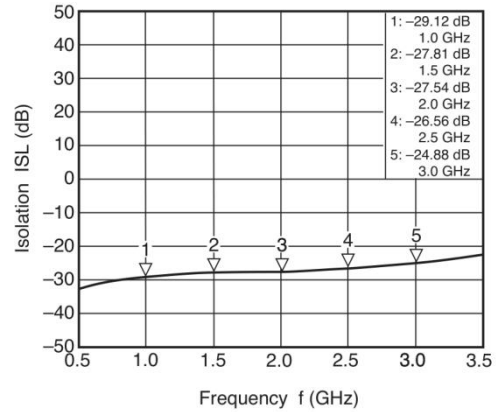
**Remark** The graphs indicate nominal characteristics.

**Caution** These characteristics values include the losses of the NEC evaluation board.

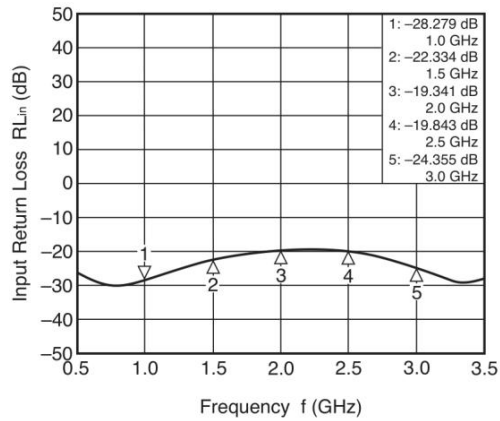
**INPUT-OUTPUT1**  
**ISOLATION vs.FREQUENCY**



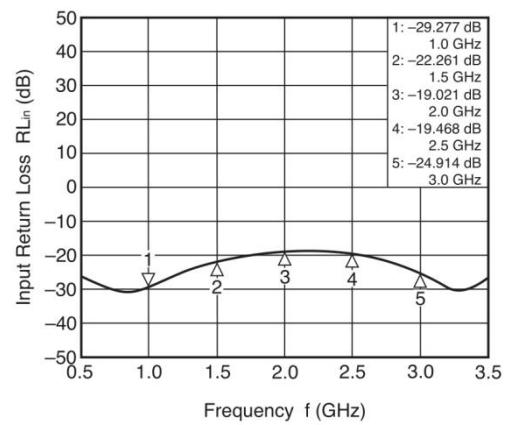
**INPUT-OUTPUT2**  
**ISOLATION vs.FREQUENCY**



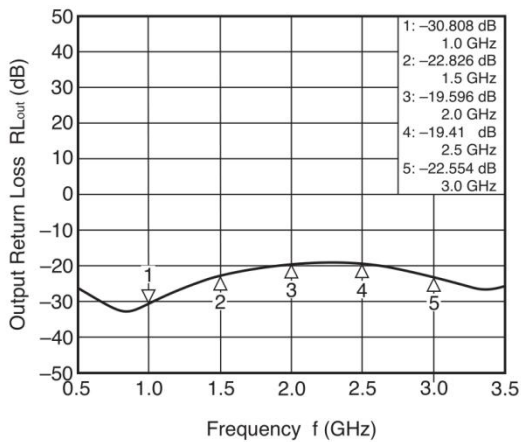
**INPUT-OUTPUT1**  
**INPUT RETURN LOSS vs. FREQUENCY**



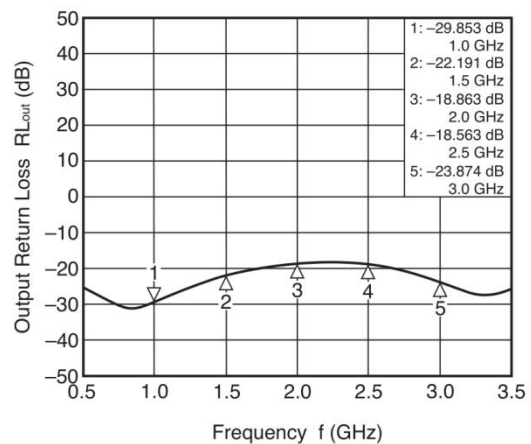
**INPUT-OUTPUT2**  
**INPUT RETURN LOSS vs. FREQUENCY**



**INPUT-OUTPUT1**  
**OUTPUT RETURN LOSS vs. FREQUENCY**

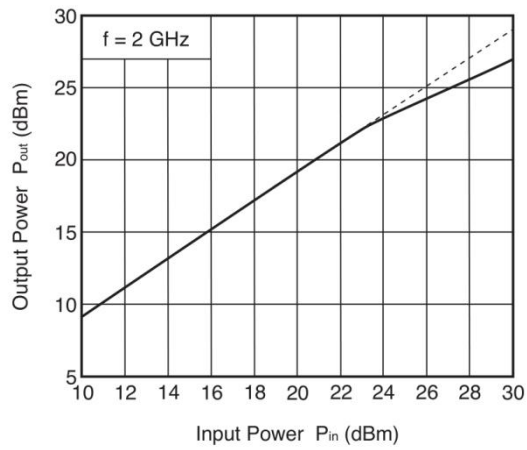


**INPUT-OUTPUT2**  
**OUTPUT RETURN LOSS vs. FREQUENCY**



**Remark** The graphs indicate nominal characteristics.

OUTPUT POWER vs. INPUT POWER



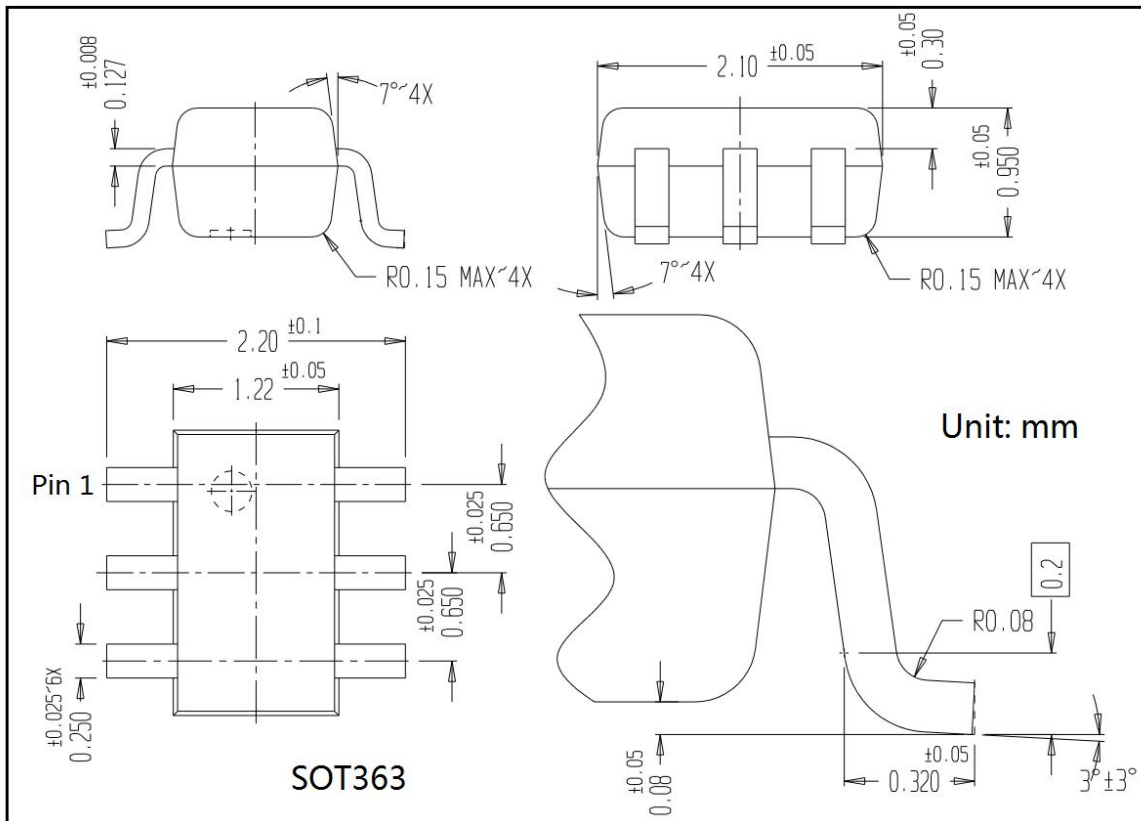
**Remark** The graph indicate nominal characteristics.

## 12. ORDERING INFORMATION

Ordering Information

| Part Number | Device Marking | Package Type | Body size (mm) | Temperature (°C) | MSL  | Transport Media | Package Quantity |
|-------------|----------------|--------------|----------------|------------------|------|-----------------|------------------|
| XA2214-S14  | S14            | SOT363       | 2.10 * 1.22    | - 40 to 85       | MSL3 | T&R             | 3000             |

## 13. DIMENSIONAL DRAWINGS



[ if you need help contact us. Xinluda reserves the right to change the above information without prior notice ]