

# PHEMT GaAs IC High Linearity 3 V T/R SP3T Switch 0.1–2.5 GHz



**AS219-000**

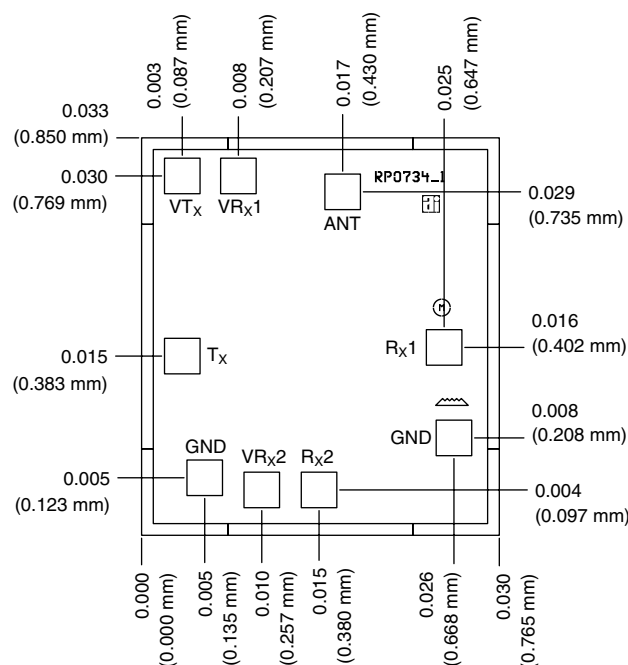
## Features

- +2.6 to +5 V Linear Operation
- Harmonics  $H_2, H_3 > 70$  dBc @  
 $P_{IN} = 34.5$  dBm @ 900 MHz,  
 $P_{IN} = 32$  dBm @ 1800 MHz
- Low  $T_X$  Insertion Loss (0.35 dB @ 0.9 GHz)
- High  $R_X$  Isolation (25 dB @ 0.9 GHz)
- 100% RF Tested in Die Form
- PHEMT Process

## Description

The AS219-000 is a PHEMT GaAs IC SP3T antenna switch operating in the 900 MHz and 1800 MHz frequency bands. Switching between the antenna and  $T_X/R_X$  ports is accomplished with 3 control inputs. When the control inputs are driven with the appropriate voltages, a low insertion loss path is provided from an antenna port to a  $T_X$  port, while the other  $R_X$  ports have high attenuation.

## Chip Outline



Dimensions in inches (mm).  
 Thickness: 0.008 (0.200 mm)  $\pm$  0.001 (0.025 mm).

## Electrical Specifications at 25°C (0, +3 V)

| Parameter <sup>1</sup>      | Condition  | Frequency   | Min. | Typ.  | Max. | Unit |
|-----------------------------|------------|-------------|------|-------|------|------|
| Insertion Loss <sup>2</sup> | Ant- $R_X$ | 0.1–1.0 GHz |      | 0.50  | 0.75 | dB   |
|                             |            | 1.0–2.0 GHz |      | 0.70  | 0.80 | dB   |
|                             |            | 2.0–2.5 GHz |      | 0.80  | 1.10 | dB   |
|                             | Ant- $T_X$ | 0.1–1.0 GHz |      | 0.35  | 0.40 | dB   |
|                             |            | 1.0–2.0 GHz |      | 0.50  | 0.55 | dB   |
|                             |            | 2.0–2.5 GHz |      | 0.65  | 0.70 | dB   |
| Isolation                   | Ant- $R_X$ | 0.1–1.0 GHz | 24   | 26    |      | dB   |
|                             |            | 1.0–2.0 GHz | 20   | 25    |      | dB   |
|                             |            | 2.0–2.5 GHz | 20   | 24    |      | dB   |
|                             | Ant- $T_X$ | 0.1–1.0 GHz | 20   | 23    |      | dB   |
|                             |            | 1.0–2.0 GHz | 14   | 16    |      | dB   |
|                             |            | 2.0–2.5 GHz | 10   | 14    |      | dB   |
| VSWR <sup>3</sup>           |            | 0.1–2.5 GHz |      | 1.1:1 |      | dB   |

1. All measurements made in a 50  $\Omega$  system, unless otherwise specified.

2. Insertion loss changes by 0.003 dB/°C.

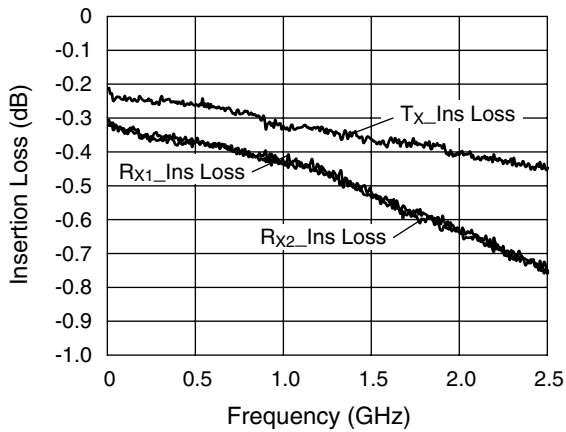
3. Insertion loss state.

## Operating Characteristics at 25°C (0, +3 V)

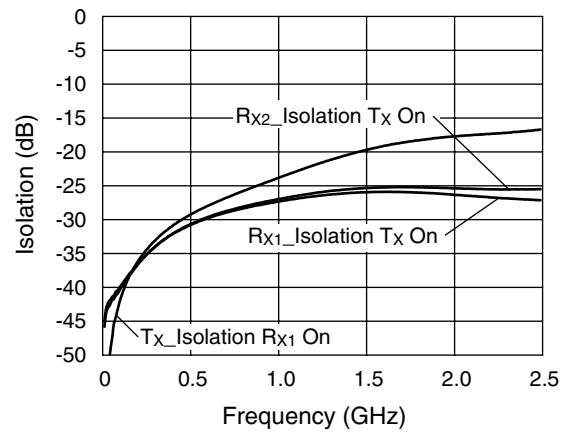
| Parameter                                                  | Condition                                                                                                                   | Frequency          | Min. | Typ.            | Max. | Unit           |
|------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------|------|-----------------|------|----------------|
| Switching Characteristics <sup>1</sup>                     | Rise, Fall (10/90% or 90/10% RF)<br>On, Off (50% CTL to 90/10% RF)<br>Video Feedthru                                        |                    |      | 60<br>100<br>50 |      | ns<br>ns<br>mV |
| Input Power for -0.1 dB Compression                        | 0/+3 V                                                                                                                      | 0.9 GHz            |      | +35             |      | dBm            |
| Harmonics H <sub>2</sub> , H <sub>3</sub> (Transmit State) | P <sub>IN</sub> = 34.5 dBm<br>P <sub>IN</sub> = 32 dBm                                                                      | 0.9 GHz<br>1.8 GHz |      | +70<br>+70      |      | dBc<br>dBc     |
| Control Voltages                                           | V <sub>Low</sub> = 0 to 0.2 V @ 20 $\mu$ A Max.<br>V <sub>High</sub> = +2.7 V @ 100 $\mu$ A Max. to +5 V @ 200 $\mu$ A Max. |                    |      |                 |      |                |

1. Video feedthru measured with 1 ns risetime pulse and 500 MHz bandwidth.

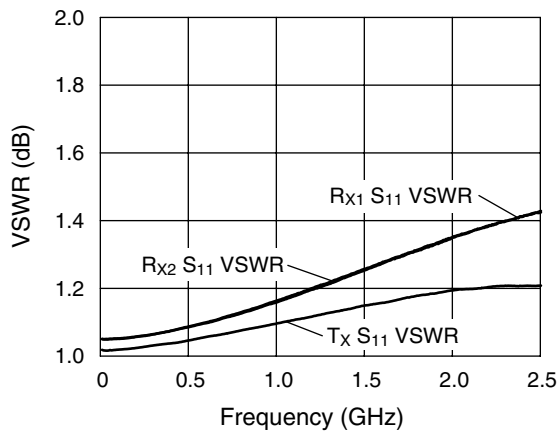
## Typical Performance Data



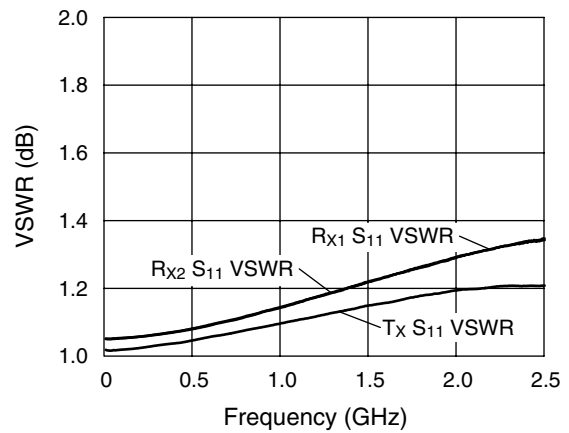
Insertion Loss vs. Frequency



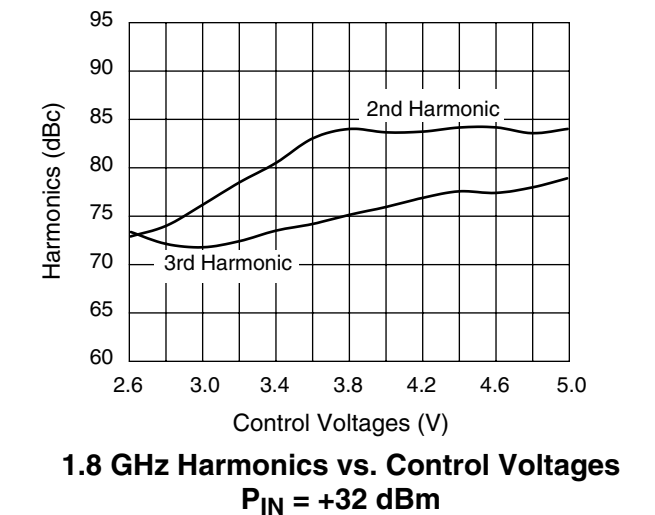
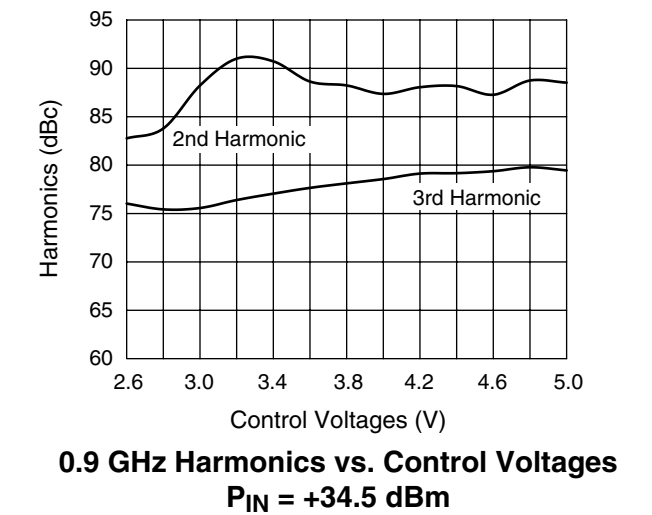
Isolation vs. Frequency



VSWR S<sub>11</sub> vs. Frequency



VSWR S<sub>22</sub> vs. Frequency



Absolute Maximum Ratings

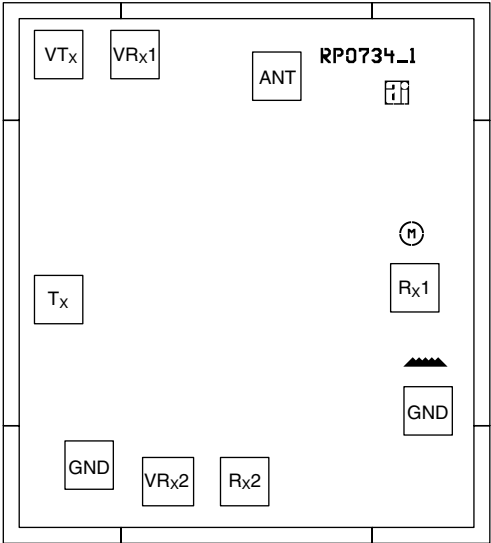
| Characteristic        | Value                           |
|-----------------------|---------------------------------|
| RF Input Power        | 6 W > 500 MHz<br>0/+7 V Control |
| Control Voltage       | -0.2 V, +8 V                    |
| Operating Temperature | -40°C to +85°C                  |
| Storage Temperature   | -65°C to +150°C                 |

Truth Table

| V <sub>1</sub>    | V <sub>2</sub>    | V <sub>3</sub>    | Ant-T <sub>x</sub> | Ant-R <sub>x1</sub> | Ant-R <sub>x2</sub> |
|-------------------|-------------------|-------------------|--------------------|---------------------|---------------------|
| V <sub>High</sub> | V <sub>Low</sub>  | V <sub>Low</sub>  | Ins. Loss          | Isolation           | Isolation           |
| V <sub>Low</sub>  | V <sub>High</sub> | V <sub>Low</sub>  | Isolation          | Ins. Loss           | Isolation           |
| V <sub>Low</sub>  | V <sub>Low</sub>  | V <sub>High</sub> | Isolation          | Isolation           | Ins. Loss           |

V<sub>Low</sub> = 0–0.2 V.  
 V<sub>High</sub> = 2.7–5 V.

Pin Out



Bond pad metalization: gold.  
 Bond pad dimensions 0.003 (0.075 mm) x 0.003 (0.075 mm).  
 Back side metalization: none.  
 See application note, Handling GaAs MMIC Die.