

# SAC3602



S-band Multifunction Chip integrated with Serial Driver, Phase Shifter and Attenuator Chip  
1.98GHz~2.3GHz Rev 2.1

## Features

- Frequency: 1.98GHz~2.3GHz
- RMS of Attenuation Accuracy: 0.5dB
- RMS of Phase Accuracy: 1.5°
- Gain: 16.5dB
- Die Size: 3.2mm×3.2mm×0.1 mm

## Typical Applications

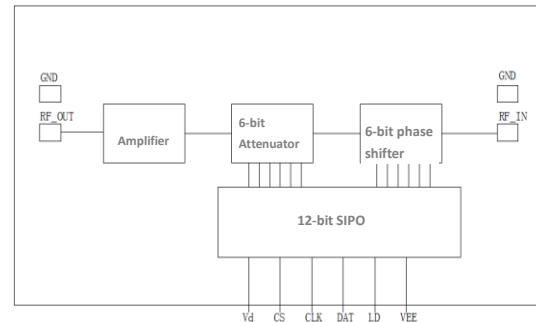
- EW
- Military Radar and Weather Radar
- SATCOM
- Beamforming
- Phase Shift

## General Description

SAC3602 is a high-performance GaAs MMIC Core Chip which operates in S-band. It integrated 12-bit serial to parallel chip, amplifier, 6-bit phase shifter, 6-bit attenuator.

The die is fabricated by using 0.5um gate length PHEMT Technology. The MMIC uses gold bonding pads and backside metallization. It is fully protected with BCB passivation to achieve the highest level of reliability.

## Functional Diagram



## Electrical Performance (T<sub>A</sub>=+25°C, V<sub>D</sub>=-5V, Control Voltage=0/+5V, Z<sub>0</sub>=50Ω)

| Parameter                          | Min.     | Typ.  | Max.    | Units |
|------------------------------------|----------|-------|---------|-------|
| Frequency Range                    | 1.98~2.3 |       |         | GHz   |
| Gain                               | —        | 16.5  | —       | dB    |
| Gain Flatness                      | —        | 0.1   | —       | dB    |
| Output P <sub>-1dB</sub>           | 18       | —     | —       | dBm   |
| Attenuation Range                  | 0.5      | —     | 31.5    | dB    |
| ⊠RMS of Attenuation Accuracy       | —        | 0.5   | —       | dB    |
| A <sub>TT</sub> - Phase Error      | —        | —     | 2       | °     |
| Phase Range                        | 5.625    | —     | 354.375 | °     |
| RMS of Phase Accuracy              | —        | 1.5   | —       | °     |
| P <sub>HASE</sub> -Amplitude Error | —        | ±0.5  | —       | dB    |
| Input VSWR                         | —        | 1.4   | —       | : 1   |
| Output VSWR                        | —        | 1.3   | —       | : 1   |
| TTL Control Voltage                | —        | 0(0V) | 1(+5V)  | V     |
| Positive Power Supply(+5V)         | —        | 90    | 100     | mA    |
| Negative Power Supply (-5V)        | —        | 10    | 20      | mA    |
| Storage Temperature                | -55      | —     | 75      | °C    |

### SuperApex, LLC

1580 S. Milwaukee Ave. Suite 405, Libertyville, IL 60048, USA  
Tel: 1-847-505-8319, 1-847-573-9866,  
E-mail: sales@superapexco.com  
Website: www.superapexco.com

## Port Definition

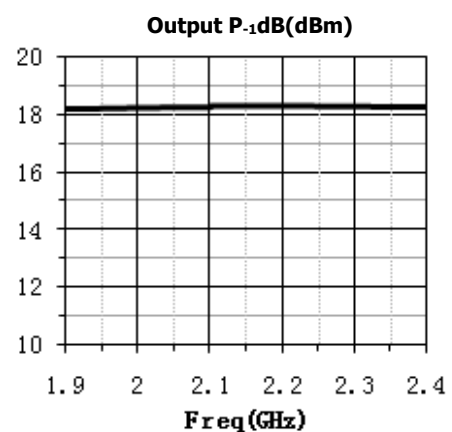
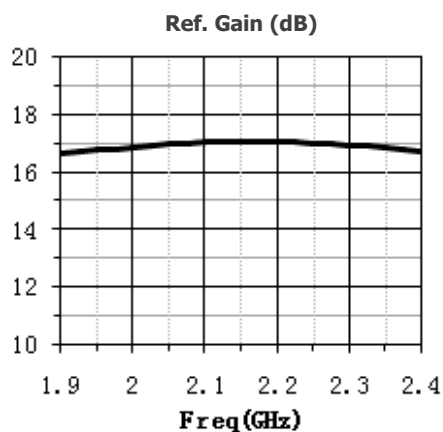
| Num. | Symbol | Function Definition           | Notes                           |
|------|--------|-------------------------------|---------------------------------|
| 1    | CLK    | CLOCK                         | falling edge trigger            |
| 2    | DAT    | D1-D6 Phase Shift             | data is latched on falling edge |
|      |        | D7-D12 Attenuation            |                                 |
| 3    | EN     | —                             | low level effective             |
| 4    | Vs     | Driver bias power supply, -5V | Add 0.1uF bypass capacitor      |
| 5    | Vd     | Amplifier bias voltage, +5V   | Add 0.1uF bypass capacitor      |

## Serial Data Timing (0: 0V, 1: +5V)

| BITS   | Attenuator bits |     |     |     |     |       | Phase shifter bits |        |       |     |     |      |
|--------|-----------------|-----|-----|-----|-----|-------|--------------------|--------|-------|-----|-----|------|
|        | D12             | D11 | D10 | D9  | D8  | D7    | D6                 | D5     | D4    | D3  | D2  | D1   |
| Func.  | 16dB            | 8dB | 4dB | 2dB | 1dB | 0.5dB | 5.625°             | 11.25° | 22.5° | 45° | 90° | 180° |
| Ref.   | 0               | 0   | 0   | 0   | 0   | 0     | 0                  | 0      | 0     | 0   | 0   | 0    |
| All on | 1               | 1   | 1   | 1   | 1   | 1     | 1                  | 1      | 1     | 1   | 1   | 1    |

Notes: D12 first in.

## ON WAFER MEASUREMENTS

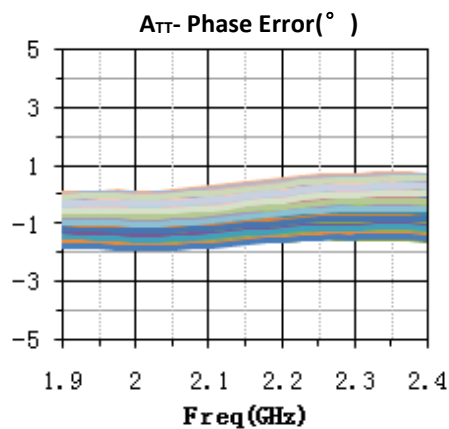
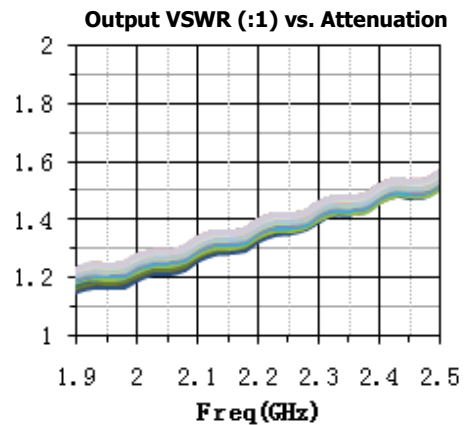
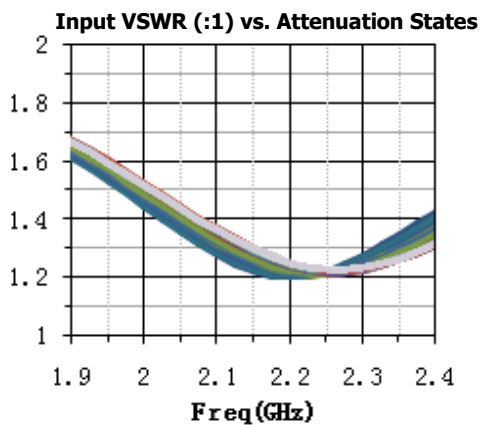
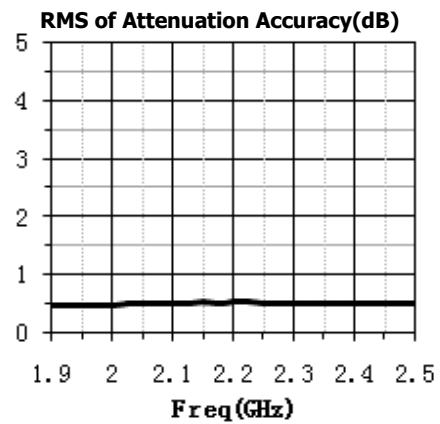
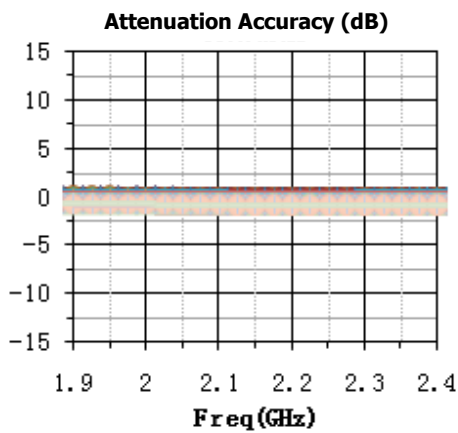


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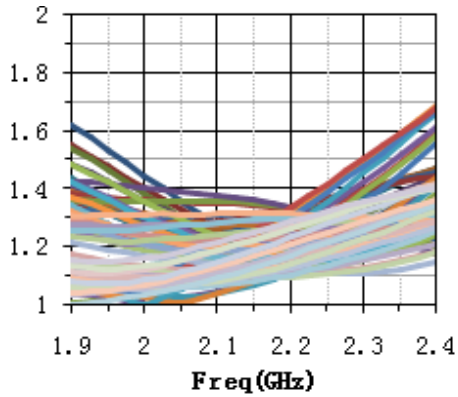
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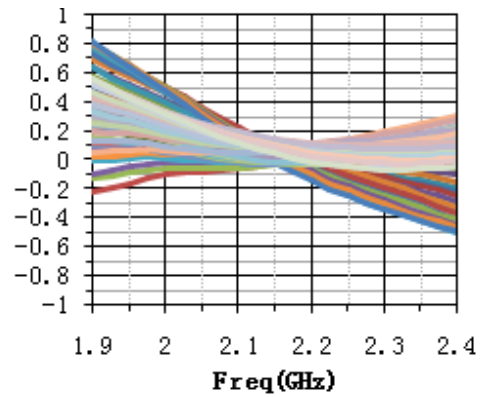


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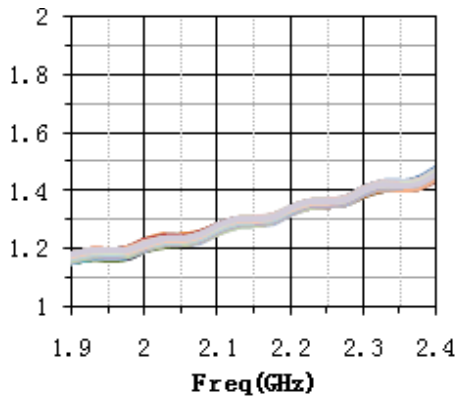
**Input VSWR (:1) vs. Phase Shift States**



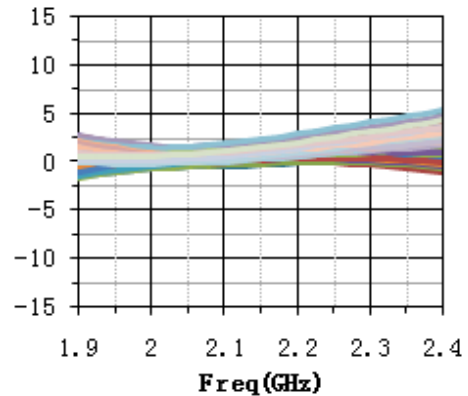
**PHASE-Amplitude Error(dB)**



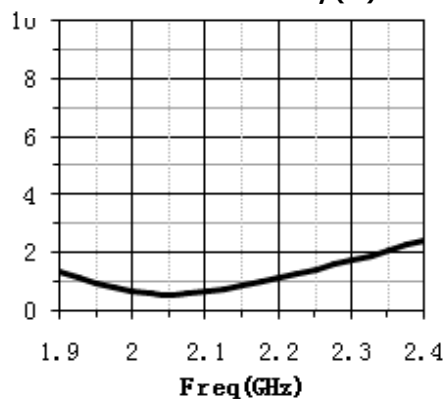
**Output VSWR (:1) vs. Phase Shift States**



**Phase Accuracy (° )**



**RMS of Phase Accuracy (° )**



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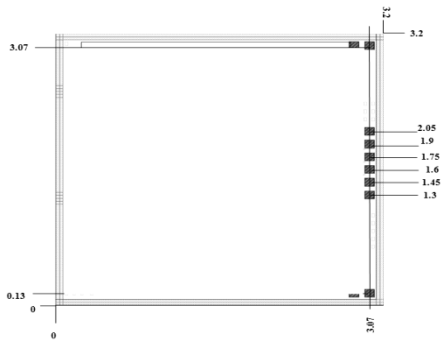
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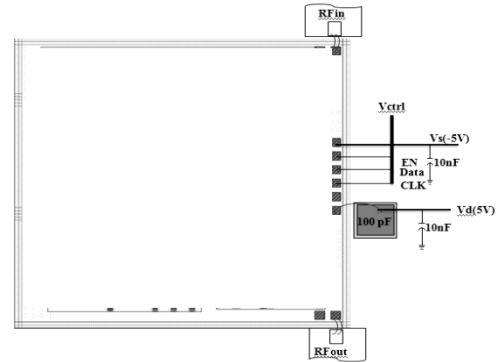
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**Die Outline**  
(All dimensions in mm)



**Assembly Diagram**



**Attention:**

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.