S3602C Vector Network Analyzer

Datasheet

Saluki Technology Inc.

The document applies to the vector network analyzers of the following models:

- S3602C vector network analyzer (10MHz - 43.5GHz).

Options of the S3602C vector network analyzer in addition to standard accessories:

Part No.	Name	Description
S3602C-201	2-Port ProgrammableStep Attenuator	Set two 60dB programmable step attenuators for the source path, and two 35dB programmable step attenuators for the receiver path
S3602C-400	4-Port Measurement	Two-source stimulus configuration, four-port VNA configuration
S3602C-401	4-Port ProgrammableStep Attenuator	Set four 60dB programmable step attenuators for the source path, and four 35dB programmable step attenuators for the receiver path (Option 400 is needed)
S3602C-402	Active Inter-modulation Measurement	For inter-modulation signal measurement of amplifier (Option 400, S80 is needed)
S3602C-003	Vector Noise Figure Measurement	Frequency range: 10MHz to 43.5GHz; Measurement bandwidth: 800kHz to 24MHz; Noise figure + gain measurement range: 0 to +55dB; Noise source driving voltage: +28V±1V; Noise jitter: <0.15dB;
S3602C-008	Pulse Measurement	For pulse S-parameter measurement
S3602C-480	Four-port Spread Spectrum System Cable	Required connection cable for four-port vector network analyzer when directly building a spread spectrum system.
S3602C-3648	Multi-port Network Parameter Expansion Device	Extended to 16-port network parameter measurement (10MHz-43.5GHz)
S3602C-S05	S-parameter Signal Integrity Analysis	Used to display the frequency domain characteristics and time domain TDR characteristics of the system. Built-in crosstalk evaluation modules such as NEXT, FEXT, PSXT, ILD, ICR and ICN. Built-in standards such as IEEE 802.3, PCIe, SAS and SATA help to quickly evaluate whether S parameters Meet the design requirements. Can automatically convert the software graphic curve into Word or PPT report. Support a variety of Dk/Df extraction methods. Support NRZ, PAM-4 eye diagram drawing function.
S3602C-S06	MiliMeter Extension Port Power Control	Special for Saluki VNA. Suitable for extension modules with power adjustable function such as 3643P S-parameter extension module.
S3602C-S07	AFR Automatic Fixture Removal Option	Used for automatic testing and removal of single-ended and balanced device measurement fixtures.

Part No.	Name	Description
S3602C-S10	Time Domain Measurement	For time-domain test, can locate and analyze the discontinuous positions in devices, fixtures or cables.
S3602C-S11	Advanced Time Domain Analysis	Used for TDR time domain impedance test, eye diagram analysis, etc.. S10 option is included in S11.
S3602C-S80	Frequency Offset Measurement	For frequency offset measurement. millimeter-wave frequency extension main unit needs this option
S3602C-S82	Mixer Scalar Measurement	For the scalar parameter measurement of mixers (Option 400, S80 is needed)
S3602C-S83	Mixer Vector Measurement	For the vector parameter measurement of mixers (Option 400, S80 is needed)
S3602C-S84	Embedded LO Frequency Converter Measurement	For the measurement of embedded LO frequency converters (Option 400, S82 or S83, S80 are needed)
S3602C-S86	Gain Compression Two-Dimension Sweep Measurement	For the gain compression two-dimension sweep test of amplifier
S3602C-S88	Phase Scan Option	Used for phase scan measurement (need option S3602C-400)
31123	2.4mm Calibration Kit	For calibration of the VNA
SCAVNA50FM-(2.4/2.4)	2.4mm Test Cable	For measurement of the analyzer, 2.4mm (female) to 2.4mm (male)
SCAVNA50FF-(2.4/2.4)	2.4mm Test Cable	For measurement of the analyzer, 2.4mm (female) to 2.4mm (female)
20404	E-Cal Kit	For calibration of the analyzer (10MHz-50GHz, 2 ports)
S87233	USB Power Probe	For 402, S82, S86 options in the process of power calibration (50MHz-40GHz)
Top Rack	/	Easy to build the system and use on the cabinet
S3602C-EWT1	Extend 1 year warranty	/

Preface

Thanks for choosing S3602 vector network analyzer produced by Saluki Technology Inc.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with “superior quality and considerate service”, and are committed to offering satisfactory products and service for our clients.

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Saluki Technology

Document Authorization

The information contained in this document is subject to change without notice. The power to interpret the contents of and terms used in this document rests with Saluki.

Product Quality Assurance

The warranty period of the product is 36 months from the date of delivery. The instrument manufacturer will repair or replace damaged parts according to the actual situation within the warranty period.

Product Quality Certificate

The product meets the indicator requirements of the document at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Settings Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

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Content

1. Overview

S3602 Series VNA is a top level VNA with excellent specifications. Its frequency ranges from 10MHz to 67GHz. With Saluki frequency extension modules, S3602 can reach 325GHz. S3602 has a wide dynamic range, low trace noise, flexible interfaces and friendly UI.

S3602 series VNA can be universally implemented in fields including transmission/reception module measurement, dielectric material property measurement, microwave pulse characteristic measurement and photoelectric property measurement; It is a necessary instrument in the scientific research, production process of systems like radar, communication and navigation.

This document will introduce technical specifications of S3602C (10MHz - 43.5GHz).

Definitions

Instrument specifications listed in this datasheet applies to all different configurations S3602 VNA unless options are clearly noted.

Specification (Spec.)

Specifications describe the performance of parameters within the warranty of the instrument. Product specifications applies under the following conditions:

- 90 min warming up
- Environmental temperature of 25℃ (± 5℃) with less than 1℃ deviation from the calibration temperature
- Specifications include measurement uncertainties

Data in this document are Spec. unless otherwise noted.

Typical (typ.)

Typical data is not guaranteed by instrument warranty. It describes additional product performance information that 80 percent of the units exhibit. Typical data only valid at 25℃. Typical performance does not include measurement uncertainty.

Nominal(nom.)

Nominal values indicate expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty.

Calibration Kit and Ecal Modules

Corrected system in this document is calibrated with following calibration kit:

- SAV31123A 2.4mm Mechanical Calibration Kit
- SAV20404 Ecal kit (10MHz - 50GHz, 2 port)

2. Specifications

2. 1. Frequency

Frequency Range	S3602C: 10MHz - 43.5GHz
Frequency Resolution	1Hz
Frequency Accuracy	$\pm 1\times10^{-7}$ (23℃±3℃)

2. 2. Test Port Specification

2. 2. 1. Maximum Output Power

- **2-port configuration (Standard), signal source**
  - Specification

Frequency	Port 1		Port 2 (dBm)
	Filtering mode (dBm)	High-power mode (dBm)	
10MHz - 50MHz	≥-1dBm	≥+13dBm	≥+13dBm
0.05GHz - 4GHz	≥0dBm	≥+7dBm	≥+14dBm
4GHz - 13.5GHz	≥+8dBm		≥+11dBm
13.5GHz - 40GHz	≥+9.5dBm		≥+11dBm
40GHz -43.5GHz	≥+9.5dBm		≥+9dBm

  - Typical

Frequency	Port 1		Port 2 (dBm)
	Filtering mode (dBm)	High-power mode (dBm)	
10MHz - 50MHz	-	≥+14dBm	≥+16dBm
0.05GHz - 4GHz	-	≥+9dBm	≥+15dBm
4GHz - 13.5GHz	≥+10dBm		≥+13dBm
13.5GHz - 40GHz	≥+13dBm		≥+12dBm
40GHz -43.5GHz	≥+10dBm		≥+11dBm

- **2-port configuration (Option 201), signal source**
  - Specification

Frequency	Port 1		Port 2 (dBm)
	Filtering mode (dBm)	High-power mode (dBm)	
10MHz - 50MHz	≥-2dBm	≥+12dBm	≥+13dBm
0.05GHz - 4GHz	≥-1dBm	≥+7dBm	≥+13dBm
4GHz - 13.5GHz	≥+7dBm		≥+10dBm
13.5GHz - 40GHz	≥+7dBm		≥+10.5dBm
40GHz -43.5GHz	≥+7dBm		≥+8dBm

  - Typical

Frequency	Port 1		Port 2 (dBm)
	Filtering mode (dBm)	High-power mode (dBm)	
10MHz - 50MHz	-	≥+13dBm	≥+15dBm
0.05GHz - 4GHz	-	≥+8dBm	≥+14dBm
4GHz - 13.5GHz	≥+9dBm		≥+12dBm
13.5GHz - 40GHz	≥+12dBm		≥+12dBm
40GHz -43.5GHz	≥+9dBm		≥+10dBm

- **4-port configuration(Option 400), 2 sources**
  - Specification

Frequency	Port 1,3		Port 2, 4
	Filtering mode (dBm)	High-power mode (dBm)	(dBm)
10MHz - 50MHz	≥-1dBm	≥+13dBm	≥+13dBm
0.05GHz - 4GHz	≥0dBm	≥+7dBm	≥+14dBm
4GHz - 13.5GHz	≥+8dBm		≥+11dBm
13.5GHz - 40GHz	≥+9.5dBm		≥+11dBm
40GHz -43.5GHz	≥+9.5dBm		≥+9dBm

  - Typical

Frequency	Port 1,3		Port 2, 4 (dBm)
	Filtering mode (dBm)	High-power mode (dBm)	
10MHz - 50MHz	-	≥+14dBm	≥+16dBm
0.05GHz - 4GHz	-	≥+9dBm	≥+15dBm
4GHz - 13.5GHz	≥+10dBm		≥+13dBm
13.5GHz - 40GHz	≥+13dBm		≥+12dBm
40GHz -43.5GHz	≥+10dBm		≥+11dBm

- **4-port configuration(Option 401, Option 402), 2 sources**
  - Specification

Frequency	Port 1,3		Port 2 (dBm)
	Filtering mode (dBm)	High-power mode (dBm)	
10MHz - 50MHz	≥-2dBm	≥+12dBm	≥+13dBm
0.05GHz - 4GHz	≥-1dBm	≥+7dBm	≥+13dBm
4GHz - 13.5GHz	≥+7dBm		≥+10dBm
13.5GHz - 40GHz	≥+7dBm		≥+10.5dBm
40GHz -43.5GHz	≥+7dBm		≥+8dBm

  - Typical

Frequency	Port 1,3		Port 2, 4 (dBm)
	Filtering mode (dBm)	High-power mode (dBm)	
10MHz - 50MHz	-	≥+13dBm	≥+15dBm
0.05GHz - 4GHz	-	≥+8dBm	≥+14dBm
4GHz - 13.5GHz	≥+9dBm		≥+12dBm
13.5GHz - 40GHz	≥+12dBm		≥+12dBm
40GHz -43.5GHz	≥+9dBm		≥+10dBm

2. 2. 2. Output Power Setting Range

Standard/Option 400	-25dBm - +20dBm
With Attenuator (Option 201,401)	-85dBm - +20dBm

2. 2. 3. Minimum Stable Output Power

Standard/Option 400	-25dBm (Typ.)
With Attenuator (Option 201,401)	-85dBm (Typ.)

2. 2. 4. Power Resolution

Power Resolution	0.01dB

2. 2. 5. Temperature Stability

Temperature Stability	0.06dB/℃

2. 2. 6. Power Accuracy

10MHz≤f≤13.5GHz	±1.5dB
13.5GHz<f≤40GHz	±2.0dB
40GHz<f≤43.5GHz	±3.0dB

2. 2. 7. Port Damage Level

Damage Level	+27dBm, 30VDC

2. 2. 8. Power Sweep Range

Frequency	Specification(dB)	Typical
10MHz - 500MHz	≥+35dB	≥+38dB
0.5GHz - 4GHz	≥+30dB	≥+33dB
4GHz - 13.5GHz	≥+31dB	≥+34dB
13.5GHz - 40GHz	≥+33dB	≥+37dB
40GHz - 43.5GHz	≥+30dB	≥+34dB

2. 2. 9. 1dB Compression Point

Frequency range	Figure(dBm)
10MHz - 43.5GHz	≥+10dBm (typ.)

2. 2. 10. Power Linearity

Power Linearity (23℃±3℃)	±2.0dB

2. 2. 11. Port Harmonics Suppression

- **2-port configuration (Standard, Option 201)**

	Frequency	Figure(dBc)
Port 1 Harmonic Suppression	0.01GHz - 4GHz	≤-50dBc
	4GHz - 13.5GHz	≤-60dBc
	13.5GHz - 43.5GHz	≤-60dBc
Port 2 Harmonic Suppression	0.01GHz - 4GHz	≤-13dBc (≤ -15dBc typ.)
	4GHz - 13.5GHz	≤-21dBc
	13.5GHz - 43.5GHz	≤-60dBc

- **4-port configuration (Option 400, Option 401)**

	Frequency	Figure(dBc)
Port 1,3 Harmonic Suppression	0.01GHz - 4GHz	≤-50dBc
	4GHz - 13.5GHz	≤-60dBc
	13.5GHz - 43.5GHz	≤-60dBc
Port 2,4 Harmonic Suppression	0.01GHz - 4GHz	≤-13dBc (≤ -15dBc typ.)
	4GHz - 13.5GHz	≤-21dBc
	13.5GHz - 43.5GHz	≤-60dBc

2. 3. Network Specifications

2. 3. 1. System Dynamic Range

- IF bandwidth = 1Hz
- Averaging factor = 8

	Specification(dB)	Typical(dB)
10MHz ≤ f ≤ 500GHz	≥90dB	≥105dB
500MHz < f ≤ 1GHz	≥110dB	≥117dB
1GHz < f ≤ 13.5GHz	≥122dB	≥133dB
13.5GHz < f ≤ 26.5GHz	≥120dB	≥126dB
26.5GHz < f ≤ 35GHz	≥115dB	≥120dB
35GHz < f ≤ 43.5GHz	≥112dB	≥116dB

2. 3. 2. Phase Noise

- Frequency offset 1kHz

Frequency	Phase Noise		Frequency	Phase Noise
10MHz	-124dBc/Hz		4GHz	-99dBc/Hz
20MHz	-123dBc/Hz		8GHz	-93dBc/Hz
30MHz	-126dBc/Hz		10GHz	-89dBc/Hz
40MHz	-122dBc/Hz		16GHz	-87dBc/Hz
50MHz	-118dBc/Hz		20GHz	-83dBc/Hz
100MHz	-112dBc/Hz		26.5GHz	-81dBc/Hz
500MHz	-117dBc/Hz		32GHz	-81dBc/Hz
1GHz	-111dBc/Hz		40GHz	-77dBc/Hz

Frequency	Phase Noise		Frequency	Phase Noise
2GHz	-105dBc/Hz			

2. 3. 3. Noise Floor

Frequency	Noise Floor
10MHz - 50MHz	≤-78dBm
50MHz – 500MHz	≤-83dBm
500MHz – 1GHz	≤-103dBm
1GHz - 4GHz	≤-115dBm
4GHz - 13.5GHz	≤-115dBm
13.5GHz - 26.5GHz	≤-113dBm
26.5GHz - 35GHz	≤-108dBm
35GHz - 40GHz	≤-105dBm
40GHz - 43.5GHz	≤-103dBm

2. 3. 4. Corrected System Performance

Measurement environmental temperature 23° ±3 °C, with < 1 °C deviation from calibration temperature.

Following test cables are used in this test:

FE0BN0BM025.0	2.4mm Test Cable (Male DUT end)	Applicable for Whole-Machine Measurement
FE0BN0BL025.0	2.4mm Test Cable (Female DUT end)	Applicable for Whole-Machine Measurement

- **Mechanical Calibration Kit SAV 31123A**

	Frequency	Specification
Effective Directivity	0.01GHz - 13.5GHz	≥+50dB
	13.5GHz - 40GHz	≥+45dB
	40GHz - 43.5GHz	≥+42dB
Effective Source Match	10MHz≤f≤2GHz	≥+41dB
	2GHz<f≤13.5GHz	≥+33dB
	13.5GHz<f≤40GHz	≥+30dB
	40GHz<f≤43.5GHz	≥+32dB
Effective Load Match	0.01GHz - 13.5GHz	≥+50dB
	13.5GHz - 40GHz	≥+50dB
	40GHz - 43.5GHz	≥+45dB
Reflection Tracking	0.01GHz - 13.5GHz	±0.01dB
	13.5GHz - 40GHz	±0.01dB
	40GHz - 43.5GHz	±0.015dB
Transmission Tracking	0.01GHz - 13.5GHz	±0.015dB
	13.5GHz - 40GHz	±0.03dB
	40GHz - 43.5GHz	±0.03dB

- **E-Cal Kit SAV 20404 (2-port)**

Spec.	Frequency Range					
	10MHz - 45MHz	45MHz - 2GHz	2GHz - 10GHz	10GHz -20GHz	20GHz - 40GHz	40GHz - 43.5GHz
Effective Directivity	≥45dB	≥45dB	≥43dB	≥40dB	≥37dB	≥33dB
Effective Source Match	≥37dB	≥37dB	≥34dB	≥31dB	≥30dB	≥32dB
Effective Load Match	≥39dB	≥39dB	≥36dB	≥35dB	≥33dB	≥32dB
Reflection Tracking	±0.06dB	±0.06dB	±0.08dB	±0.09dB	±0.12dB	±0.15dB
Transmission Tracking	±0.07dB	±0.07dB	±0.09dB	±0.12dB	±0.16dB	±0.20dB

2. 3. 5. Trace Noise

	Frequency range	Figure(dB rms)
Trace Noise Magnitude 1KHz IF bandwidth	10MHz - 50MHz	≤ 0.006
	50MHz - 500MHz	≤ 0.002
	0.5GHz - 13.5GHz	≤ 0.001
	13.5GHz - 26.5GHz	≤ 0.0009
	26.5GHz - 43.5GHz	≤ 0.004
	Frequency range	**Figure(deg rms)**
Trace Noise Phase 1KHz IF bandwidth	10MHz - 50MHz	≤ 0.04
	50MHz - 500MHz	≤ 0.01
	0.5GHz - 13.5GHz	≤ 0.005
	13.5GHz - 26.5GHz	≤ 0.02
	26.5GHz - 43.5GHz	≤ 0.03

2. 4. Pulse Specifications

Pulse Width Setting Range	20ns - 60s	
Pulse transition time （10% - 90%）	20ns	
Pulse off ratio	**Frequency range**	**Figure(dB)**
	0.01GHz-4GHz	64dB
	4GHz-13.5GHz	80dB
	13.5GHz-43.5GHz	80dB

2. 5. General

IF Bandwidth	1Hz - 5MHz
Max. Sweep Point per Trace	32001
Sweep Type	Linear, Log, Power, CW, Segment, Phase
Trace Display Format	Log magnitude, linear magnitude, SWR , phase , group delay, real and imaginary , smith chart, polar
Magnitude Display Resolution	0.001dB/div
Phase display Resolution	0.01°/div
Reference Level Magnitude	-500 to +500dB
Input Reference Phase Range	-500 to +500°
Port Connector Type	2.4mm (M), 50 Ω impedance
Measurement of Ports	2 port Standard, 4-port with option 400
Peripheral Interface	8 x USB type B, 1 x USB type A: for USB device, printer etc
	GPIB: programming control interface
	VGA: external display interface
	LAN: network interface, programming control interface
Operating System	Windows 7
Storage Capability	160G SSD
Screen	12.1 inch high resolution touch screen
Dimension (LxHxW)	516mm x 280mm x 690mm (W x H x D)
Power	220V±10%, 50Hz - 60Hz
Operating Temperature	0℃ to 50℃
Storage Temperature	-30℃ to 70℃
Maximum Power Consumption	500W
Maximum Weight	47kg

2. 6. Compliant

2. 6. 1. CE

- EMC

Complies with the requirements of the **EC EMC directive 2014/30/EU** with amendments.

Test Standards:

EN 61326-1:2013

EN 61000-3-2:2014

EN 61000-3-3:2013

- Safety

Complies with **EC LVD Directive 2014/35/EU** with amendment.

Test Standard

EN61010-1:2010

2. 6. 2. ISO

- Manufacturing

This instrument is manufactured in an ISO-9001 registered facility

- End of Document -