

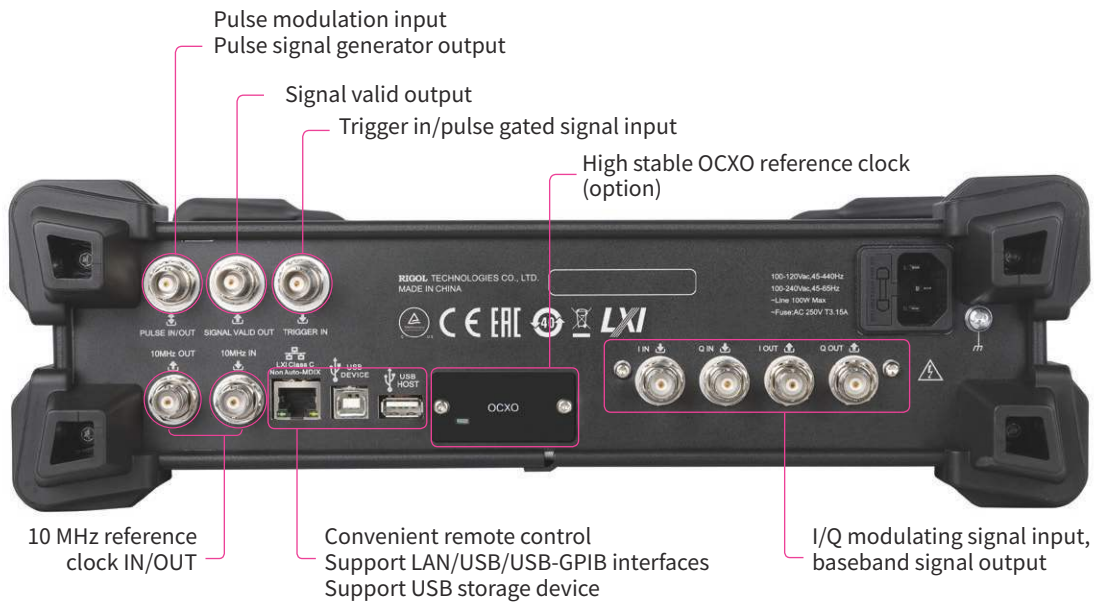
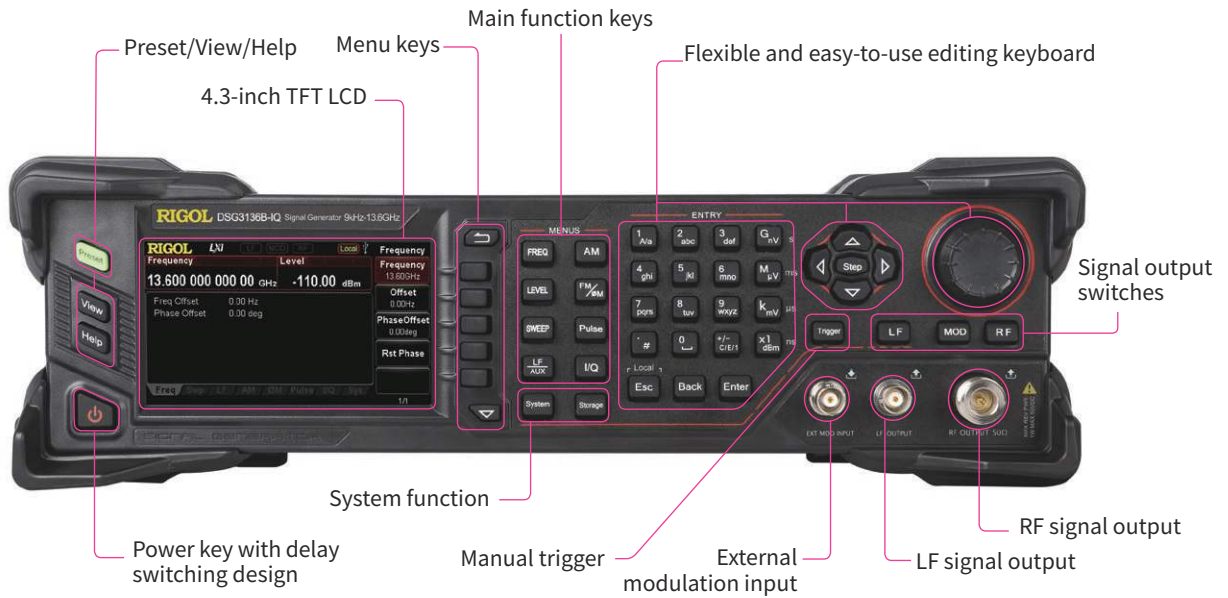
# RIGOL



## DSG3000B Series RF Signal Generator

- Highest frequency: 6.5 GHz/13.6 GHz
- Amplitude accuracy: <math><0.5\text{ dB}</math> (typical)
- Output amplitude range: -130 dBm to +27 dBm (setting range)
- High signal purity, phase noise: <math><-116\text{ dBc/Hz@20 kHz}</math> (typical)
- Standard 1 ppm internal clock; optional 5 ppb high stable clock
- Standard AM/FM/ $\Phi$ M analog modulation
- Support pulse modulation; on/off ratio up to 70 dB; user-defined pulse train generator
- I/Q modulation and I/Q baseband output
- All modulations support internal and external modulation modes
- Standard 2U height design to save rack space; rack mount kit is available
- Support USB/LAN/GPIB remote control; SCPI command set
- Wear-free electronic attenuator design

# ► DSG3000B Series RF Signal Generator



# Specifications

The technical specifications are valid when the instrument is within the calibration period, is stored for at least two hours at the temperature ranging from 0°C to 50°C and is warmed up for 40 minutes. Unless otherwise noted, the specifications in this manual include the measurement uncertainty.

**Typical Value (typ.):** the typical performance that 80 percent of the measurement results can meet at room temperature (approximately 25°C ). The data are not warranted and do not include the measurement uncertainty.

**Nominal Value (nom.):** the expected average performance or the designed performance attribute, such as the 50 Ω connector. The data are not warranted and are measured at room temperature (approximately 25°C ).

**Measured Value (meas.):** the performance attribute measured during the design phase used to be compared with the expected performance, such as the variation of the amplitude drift with time. The data are not warranted and are measured at room temperature (approximately 25°C ).

Note: Unless otherwise noted, all the values in this manual are the measurement results of multiple instruments at room temperature.

## Frequency

Frequency Range	
DSG3065B	9 kHz to 6.5 GHz
DSG3065B-IQ	9 kHz to 6.5 GHz (IQ: 50 MHz to 6.5 GHz)
DSG3136B	9 kHz to 13.6 GHz
DSG3136B-IQ	9 kHz to 13.6 GHz (IQ: 50 MHz to 6.5 GHz)

Frequency	
Frequency resolution	0.01 Hz
Setting time <sup>[1]</sup>	< 10 ms (typ.)

Frequency Band		
Band	Frequency range	N <sup>[2]</sup>
1	$f < 227.5 \text{ MHz}$	0.25
2	$227.5 \text{ MHz} \leq f < 455 \text{ MHz}$	0.125
3	$455 \text{ MHz} \leq f < 910 \text{ MHz}$	0.25
4	$910 \text{ MHz} \leq f < 1820 \text{ MHz}$	0.5
5	$1820 \text{ MHz} \leq f \leq 3600 \text{ MHz}$	1
6	$3600 \text{ MHz} < f \leq 6500 \text{ MHz}$	2
7	$6500 \text{ MHz} < f \leq 13600 \text{ MHz}$	4

Internal Reference Frequency		
Reference frequency	10 MHz	
Initial calibration accuracy		$\leq 0.1 \text{ ppm}$
	With option OCXO-B08	$\leq 10 \text{ ppb}$
Temperature stability	Temperature range: 0°C to 50°C , reference to 25°C	< 1 ppm
	With option OCXO-B08	< 5 ppb
Aging rate		< 1 ppm/year
	With option OCXO-B08	< 30 ppb/year
Internal reference frequency output	Frequency	10 MHz
	Level	+5 dBm to +10 dBm
External reference frequency input	Frequency	10 MHz
	Level	0 dBm to +10 dBm
	Maximum deviation	$\pm 5 \text{ ppm}$

Note:

[1] Time from receipt of SCPI command to within 0.1 ppm of final frequency (final frequency  $\geq 227.5 \text{ MHz}$ ) or within 100 Hz (final frequency < 227.5 MHz).

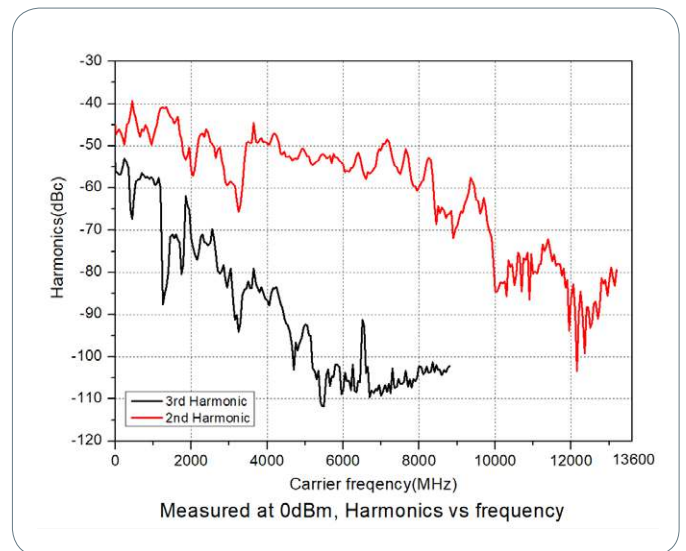
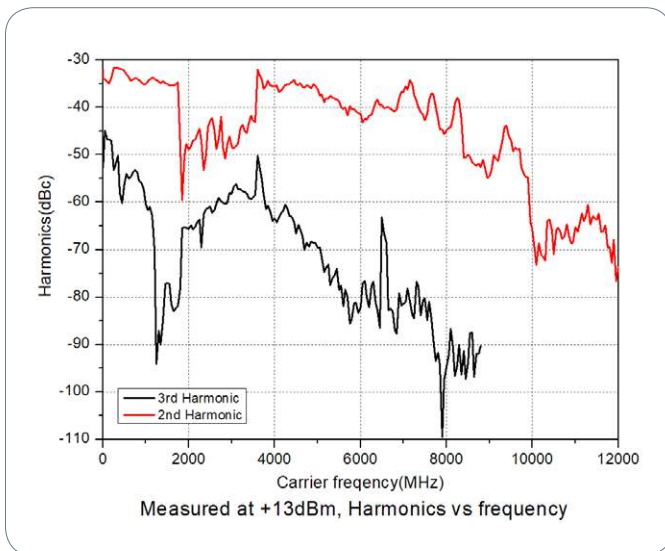
[2] N is a factor used to help define certain specifications in this manual.

## Frequency Sweep

Sweep type	Step sweep (equally or logarithmically spaced frequency steps) List sweep (list with arbitrary frequency steps)	
Sweep mode	Single, continuous	
Sweep range	Full frequency range	
Sweep shape	Triangle, ramp	
Step change	Linear or logarithmic	
Number of points	Step sweep	2 to 65535
	List sweep	1 to 6001
Dwell time	20 ms to 100 s	
Trigger mode	Auto, key, external, bus (USB and LAN)	

## Spectral Purity<sup>[1]</sup>

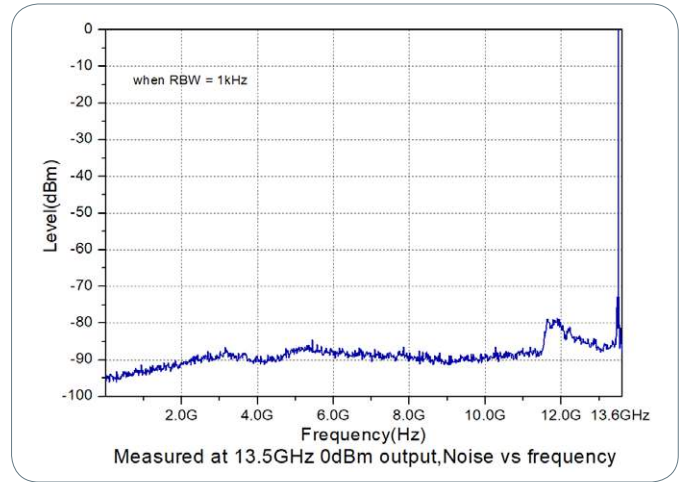
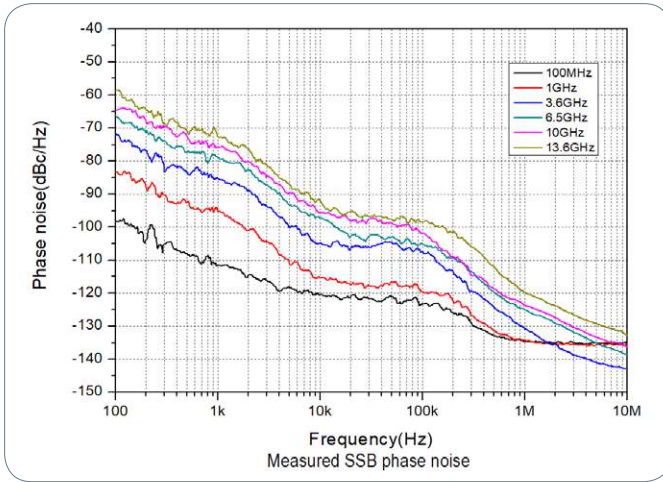
Harmonic	CW mode	
	2 MHz < f ≤ 6.5GHz, level ≤ +13 dBm	< -30 dBc
	6.5 GHz < f ≤ 12 GHz, level ≤ +10 dBm	< -30 dBc
	12 GHz < f ≤ 13.6 GHz, level ≤ 2 dBm	< -30 dBc
Sub-harmonic <sup>[2]</sup>	CW mode	
	3.6 GHz < f ≤ 13.6 GHz	< -60 dBc, < -70 dBc (typ.)
Non-harmonic	CW mode, level > -10 dBm, carrier offset > 10 kHz	
	100 kHz ≤ f ≤ 1.5 GHz	< -60 dBc, < -70 dBc (typ.)
	1.5 GHz < f ≤ 3.6 GHz	< -54 dBc, < -64 dBc (typ.)
	3.6 GHz < f ≤ 6.5 GHz	< -48 dBc, < -58 dBc (typ.)
	6.5 GHz < f ≤ 13.6 GHz	< -42 dBc, < -52 dBc (typ.)
SSB phase noise	CW mode, carrier offset = 20 kHz, 1 Hz measurement bandwidth	
	f=1 GHz	< -110 dBc/Hz, < -116 dBc/Hz (typ.)
	f=6.5 GHz	< -98 dBc/Hz, < -102 dBc/Hz (typ.)
	f=13.6 GHz	< -92 dBc/Hz, < -96 dBc/Hz (typ.)
Residual FM	CW mode, RMS value at f = 1 GHz	
	0.3 kHz to 3 kHz	< 10 Hz rms, < 5 Hz rms (typ.)
	0.03 kHz to 20 kHz	< 50 Hz rms, < 10 Hz rms (typ.)



Note:

[1] Applicable to instrument without IQ function.

[2] When level ≥ -50 dBm.



## Amplitude

Setting Range		Specification level range	Setting range
Maximum output level <sup>[1]</sup>	9 kHz ≤ f < 100 kHz		+5 dBm
	100 kHz ≤ f ≤ 1MHz	+10 dBm	+15 dBm
	1 MHz < f ≤ 200 MHz	+13 dBm	+20 dBm
	200 MHz < f ≤ 3.6 GHz	+13 dBm	+27 dBm
	3.6 GHz < f ≤ 6.5 GHz	+13 dBm	+20 dBm
	6.5 GHz < f ≤ 12 GHz	+10 dBm	+15 dBm
	12 GHz < f ≤ 13.6 GHz	+2 dBm	+10 dBm
Minimum output level	9 kHz ≤ f < 100 kHz		-130 dBm
	100 kHz ≤ f ≤ 3.6 GHz	-110 dBm	-130 dBm
	3.6 GHz < f ≤ 6.5 GHz	-110 dBm	-130 dBm
	6.5 GHz < f ≤ 9 GHz	-110 dBm	-130 dBm
	9 GHz < f ≤ 13.6 GHz	-90 dBm	-110 dBm
Setting Resolution	0.01 dB		

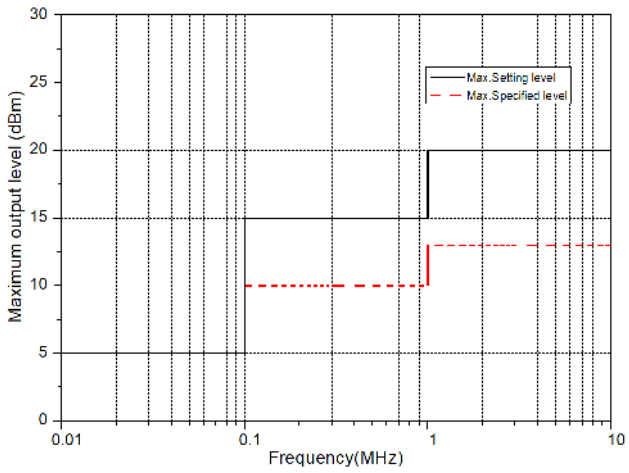
## Absolute Level Uncertainty

Temperature range: 20°C to 30°C

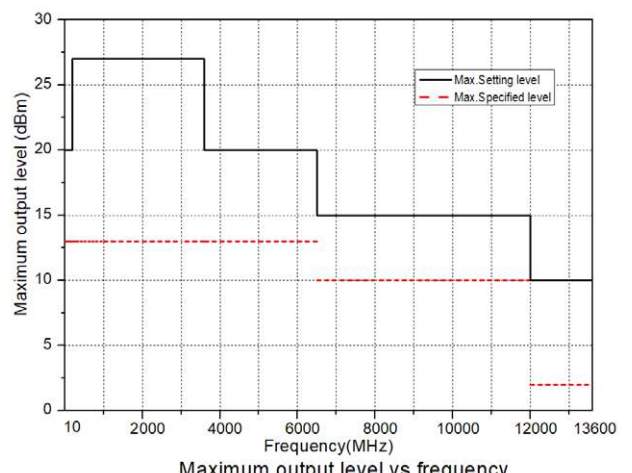
	-60 dBm to max. specification level	-90 dBm to -60 dBm	-110 dBm to -90 dBm
9 kHz ≤ f < 100 kHz	≤ 0.7 (typ.)	≤ 0.7 (typ.)	≤ 0.7 (typ.)
100 kHz ≤ f ≤ 200 MHz	≤ 0.7 dB, ≤ 0.5 (typ.)	≤ 0.9 dB, ≤ 0.5 (typ.)	≤ 1.1 dB, ≤ 0.5 (typ.)
200 MHz < f ≤ 3.6 GHz	≤ 0.7 dB, ≤ 0.5 (typ.)	≤ 0.9 dB, ≤ 0.5 (typ.)	≤ 1.1 dB, ≤ 0.5 (typ.)
3.6 GHz < f ≤ 6.5 GHz	≤ 0.9 dB, ≤ 0.5 (typ.)	≤ 1.1 dB, ≤ 0.5 (typ.)	≤ 1.3 dB, ≤ 0.5 (typ.)
6.5 GHz < f ≤ 9 GHz	≤ 1.1 dB, ≤ 0.5 (typ.)	≤ 1.3 dB, ≤ 0.5 (typ.)	≤ 1.5 dB, ≤ 0.7 (typ.)
9 GHz < f ≤ 12 GHz	≤ 1.3 dB, ≤ 0.5 (typ.)	≤ 1.5 dB, ≤ 0.5 (typ.)	
12 GHz < f ≤ 13.6 GHz	≤ 1.5 dB, ≤ 0.7 (typ.)	≤ 1.8 dB, ≤ 0.7 (typ.)	

VSWR	
1 MHz ≤ f ≤ 13.6 GHz	< 1.8 (typ.)

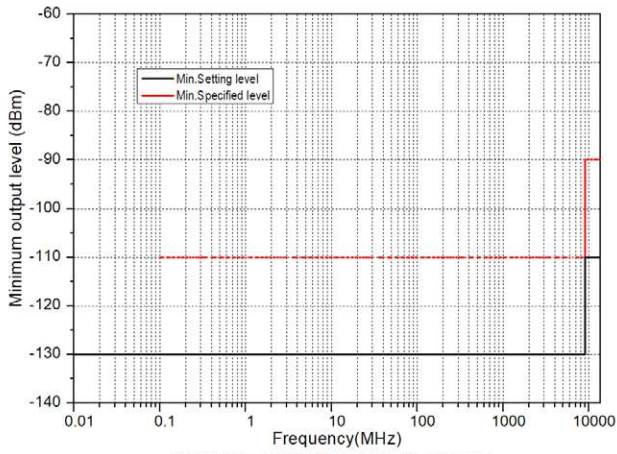
Note:  
[1] Typical maximum output level up to +25 dBm when output frequency ≥ 10 MHz.



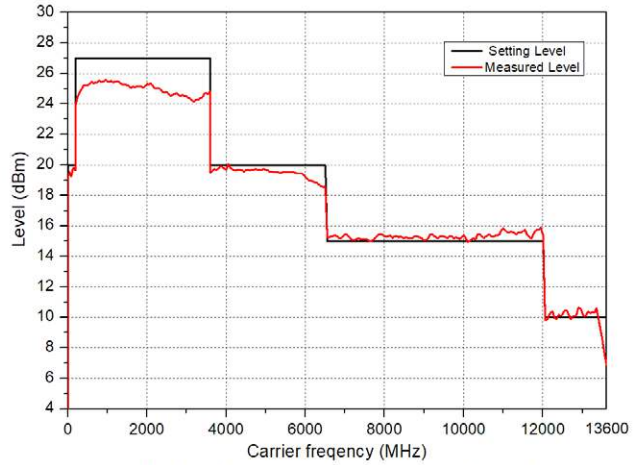
Maximum output level vs frequency



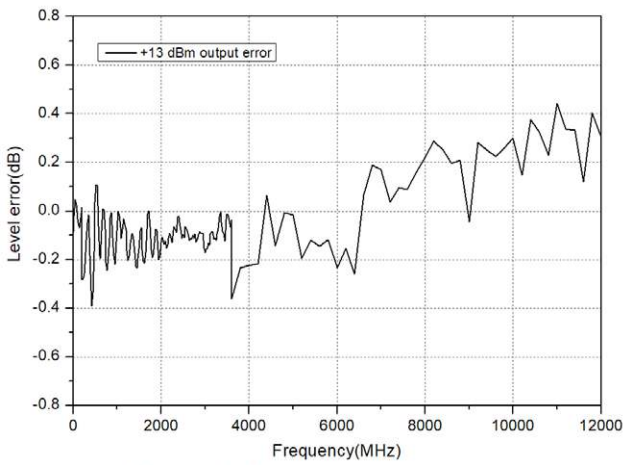
Maximum output level vs frequency



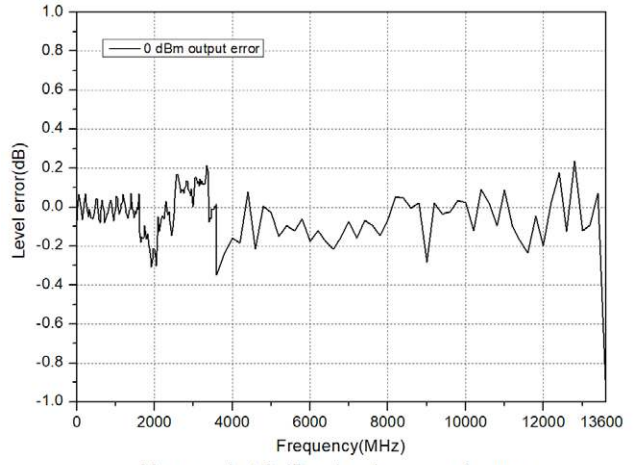
Minimum output level vs frequency



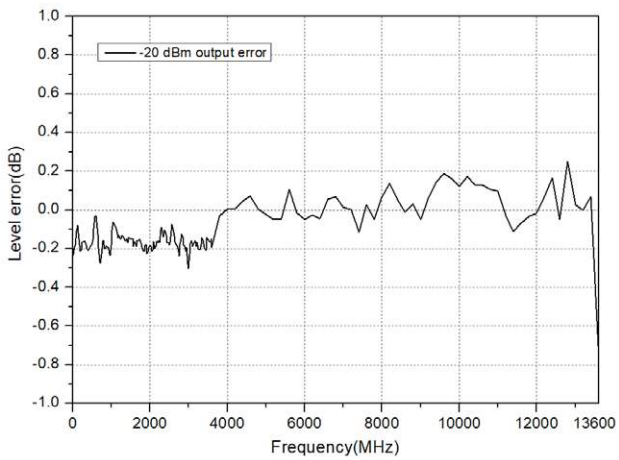
Measured maximum level, Level vs frequency



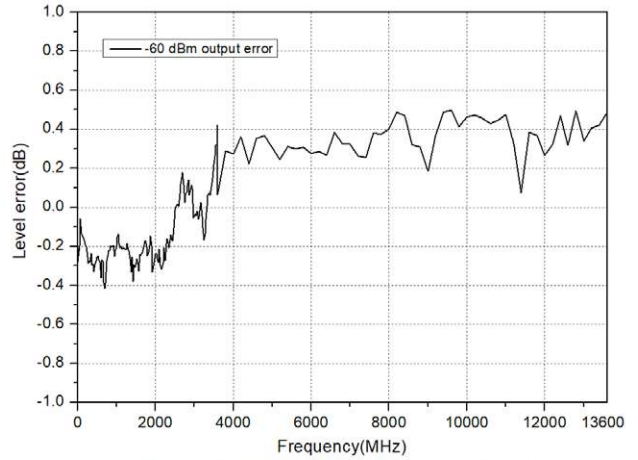
Measured at +13 dBm, level error vs frequency



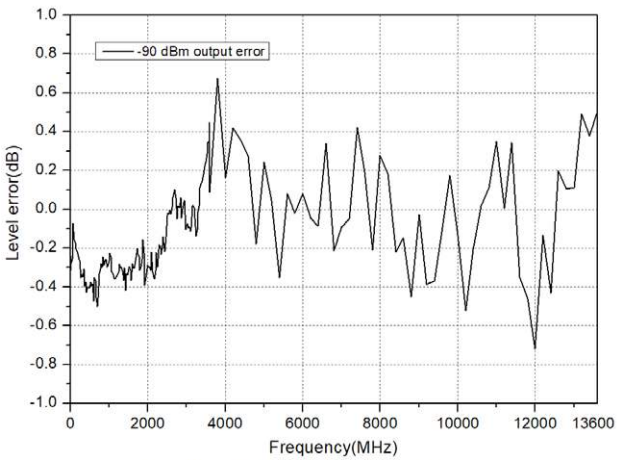
Measured at 0 dBm, level error vs frequency



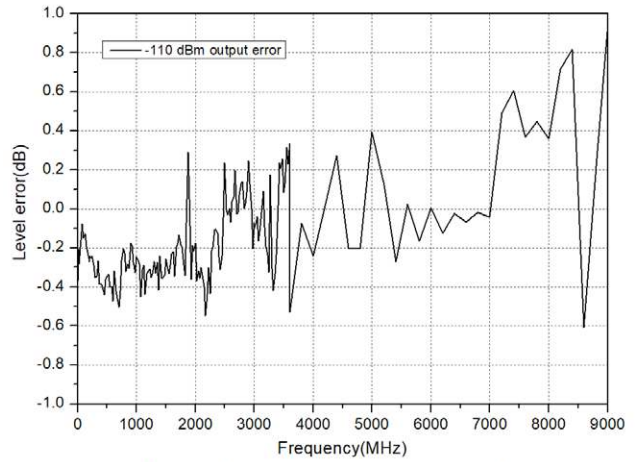
Measured at -20 dBm, level error vs frequency



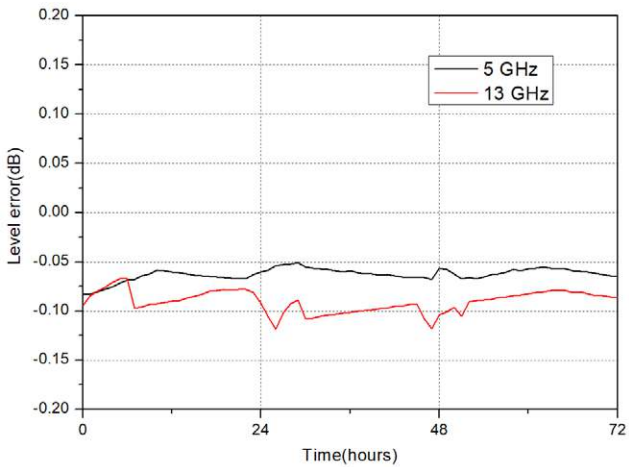
Measured at -60 dBm, level error vs frequency



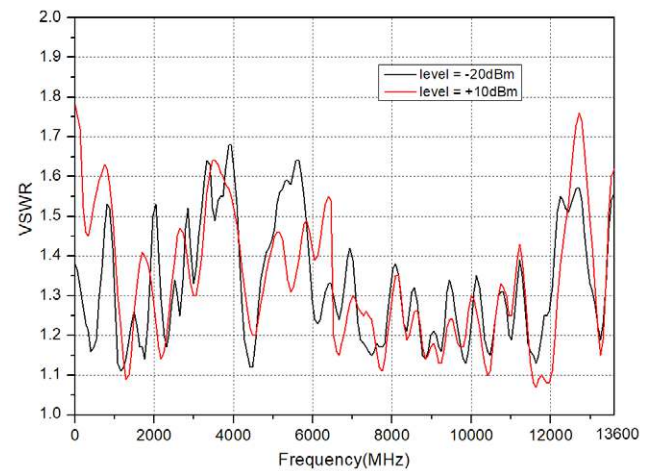
Measured at -90 dBm, level error vs frequency



Measured at -110 dBm, level error vs frequency



Measured level repeatability at 0dBm, ALC ON, 25°C



Measured VSWR, VSWR vs frequency

Level Setting		
Setting time <sup>[1]</sup>	Fixed frequency, temperature range: 20°C to 30°C	≤ 5 ms (typ.)

Max. Reverse Power		
Max. reverse power	Max. DC voltage	50 V
	1 MHz < f ≤ 13.6 GHz	1 W

Level Sweep		
Sweep type	Step sweep (equally spaced level steps) List sweep (list with arbitrary level steps)	
Sweep mode	Single, continuous	
Sweep range	Full level range	
Sweep shape	Triangle, ramp	
Step change	Linear	
Number of points	Step sweep	2 to 65535
	List sweep	1 to 6001
Dwell time	20 ms to 100 s	
Trigger mode	Auto, key, external, bus (USB and LAN)	

## Internal Modulation Generator (LF)

Internal Modulation Generator (LF)		
Waveform	Sine, square	
Frequency range	Sine	DC to 200 kHz
	Square	DC to 20 kHz
Resolution	0.01 Hz	
Frequency error	Same as that of the RF reference source	
Voltage range	AC	0 to 3 V <sub>p</sub>
	DC	-3 V to 3 V
Voltage resolution	2 mV	

## Modulation<sup>[2]</sup>

Simultaneous Modulation					
	AM	FM	ØM	Pulse mod.	I/Q mod.
AM	—	○	○	△	×
FM	○	—	×	○	○
ØM	○	×	—	○	○
Pulse mod.	△	○	○	—	○
I/Q mod.	×	○	○	○	—

Note: ○ : compatible; × : not compatible; △ : compatible, but the AM performance will be undermined when pulse modulation is enabled.

Amplitude Modulation	
Carrier frequency range	≤ 3.6 GHz
Modulation source	Internal, external
Modulation depth <sup>[3]</sup>	0% to 100%
Resolution	0.1%

Note:

[1] Time from receipt of SCPI command to within 0.1 dB of final level.

[2] Unless otherwise noted, the modulation source is sine. The temperature range is from 20°C to 30°C, with the carrier frequency ≥ 1 MHz.

[3] The envelop peak power is no greater than the maximum value of the specification output range.



Setting uncertainty	$f_{\text{mod}} = 1 \text{ kHz}$	$< \text{setting value} \times 4\% + 1\%$
Distortion	$f_{\text{mod}} = 1 \text{ kHz}, m < 30\%, \text{level} = 0 \text{ dBm}$	$< 3\% \text{ (typ.)}$
Modulation frequency response	$m < 80\%, \text{DC}/10 \text{ Hz to } 100 \text{ kHz}$	$< 3 \text{ dB (nom.)}$

#### Frequency Modulation

Carrier frequency range	$\leq 3.6 \text{ GHz}$	
Modulation source	Internal, external	
Max. deviation	$N \times 1 \text{ MHz (nom.)}$	
Resolution	$< 0.1\%$ of the deviation or 1 Hz, whichever is greater (nom.)	
Setting uncertainty	$f_{\text{mod}} = 1 \text{ kHz}, \text{internal modulation}$	$< \text{setting value} \times 2\% + 20 \text{ Hz}$
Distortion	$f_{\text{mod}} = 1 \text{ kHz}, \text{deviation} = N \times 50 \text{ kHz}$	$< 2\% \text{ (typ.)}$
Modulation frequency response <sup>[1]</sup>	DC/10 Hz to 100 kHz	$< 3 \text{ dB (nom.)}$

#### Phase Modulation

Carrier frequency range	$\leq 3.6 \text{ GHz}$	
Modulation source	Internal, external	
Max. deviation	$N \times 5 \text{ rad (nom.)}$	
Resolution	$< 0.1\%$ of the deviation or 0.01 rad, whichever is greater (nom.)	
Setting uncertainty	$f_{\text{mod}} = 1 \text{ kHz}, \text{internal modulation}$	$< \text{setting value} \times 1\% + 0.1 \text{ rad}$
Distortion	$f_{\text{mod}} = 1 \text{ kHz}, \text{deviation} = N \times 5 \text{ rad}$	$< 1\% \text{ (typ.)}$
Modulation frequency response <sup>[2]</sup>	DC/10 Hz to 100 kHz	$< 3 \text{ dB (nom.)}$

#### Pulse Modulation (Option DSG3000B-PUG)

Carrier frequency range	$\leq 3.6 \text{ GHz}$	
Modulation source	External, internal	
On/off ratio	$100 \text{ kHz} \leq f \leq 3.6 \text{ GHz}$	$> 70 \text{ dB}$
Rise/fall time (10%/90%)	$< 50 \text{ ns}$	
Pulse repetition frequency	DC to 1 MHz	

#### Pulse Generator (Option DSG3000B-PUG)

Pulse mode	Single pulse	
Pulse period	Setting range	40 ns to 170 s
	Resolution	10 ns
Pulse width	Setting range	10 ns to (170 s - 10 ns)
	Resolution	10 ns
Trigger delay	Setting range	10 ns to 170 s
	Resolution	10 ns
Trigger mode	Auto, external trigger, external gate, key, bus (USB and LAN)	

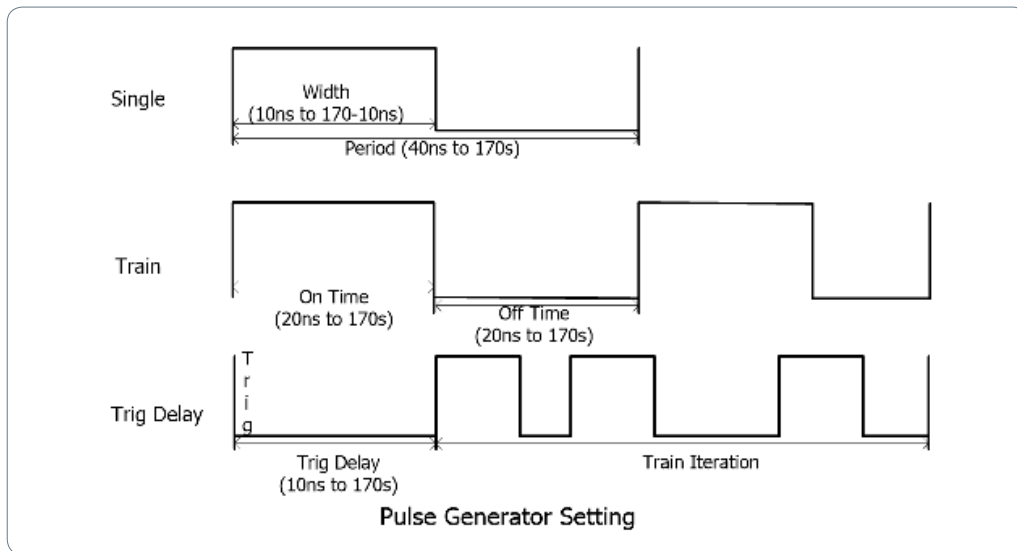
#### Pulse Train Generator (Option DSG3000B-PUG)

Pulse train generator	Number of pulse patterns	1 to 2047
	On/off time range	20 ns to 170 s
	Number of repetitions per pattern	1 to 256

Note:

[1] External modulation, measured at 100 kHz deviation.

[2] External modulation, measured at 5 rad deviation.



#### I/Q Modulation (Only Available for DSG3065B-IQ and DSG3136B-IQ)

Carrier frequency range	50 MHz ≤ f ≤ 6.5 GHz	
Modulation source	External, internal	
Bandwidth (RF)	External modulation	
	Baseband (I or Q)	≤ 60 MHz (nom.)
	RF (I + Q)	≤ 120 MHz (nom.)
	Internal modulation	
	Baseband (I or Q)	≤ 30 MHz (nom.)
	RF (I + Q)	≤ 60 MHz (nom.)
Carrier suppression <sup>[1]</sup>	50 MHz ≤ f ≤ 6 GHz	≥ 40 dBc (typ.)
Image sideband suppression <sup>[1,2]</sup>	50 MHz ≤ f ≤ 6 GHz	≥ 40 dBc (typ.)
External I/Q input	VSWR	< 1.5
	Full range input	$\sqrt{I^2 + Q^2} = 0.5V_{rms}$
Internal modulation		
EVM <sup>[1]</sup>	16 QAM, root cosine filter (α = 0.22), 4 MSps, output level ≤ +4 dBm	≤ 2%rms (typ.)
	QPSK, root cosine filter (α = 0.22), 4 MSps, output level ≤ +4 dBm	≤ 2%rms (typ.)
External modulation		
EVM <sup>[1]</sup>	CDMA2000/1xEV-DO, 1.2288 Mcps, frequency: 800 to 900 MHz, 1800 to 1900 MHz, output level ≤ +4 dBm	≤ 2%rms (typ.)
ACPR		≥ 70 dB

#### I/Q Baseband Generator (Only Available for DSG3065B-IQ and DSG3136B-IQ)

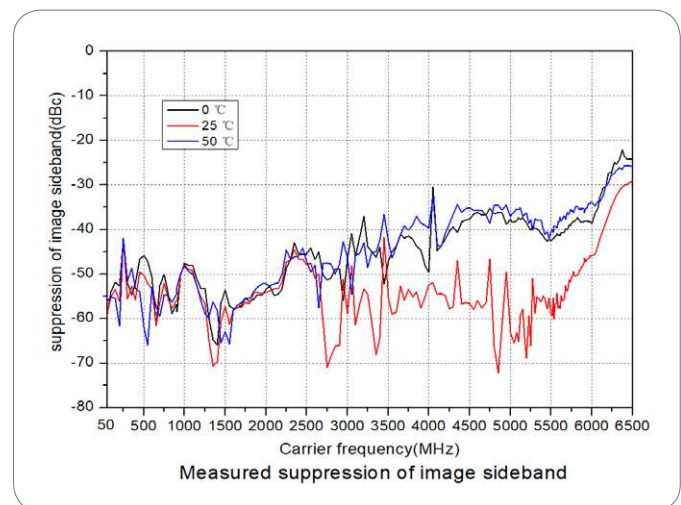
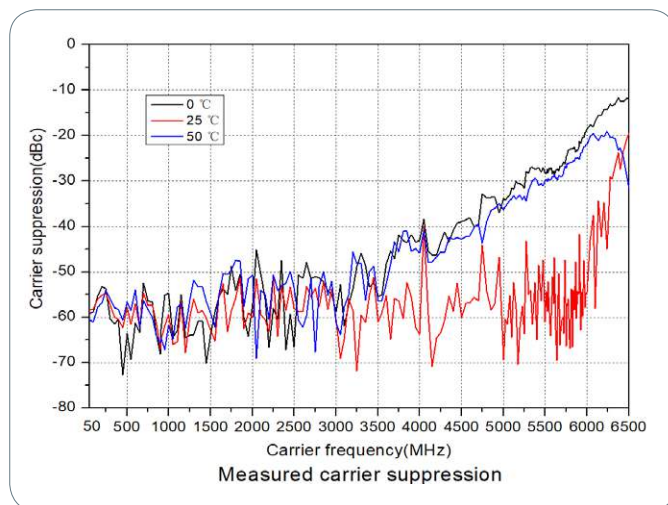
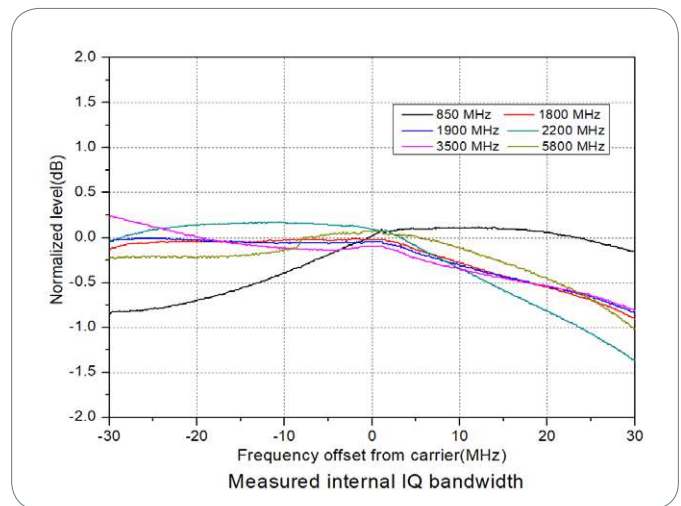
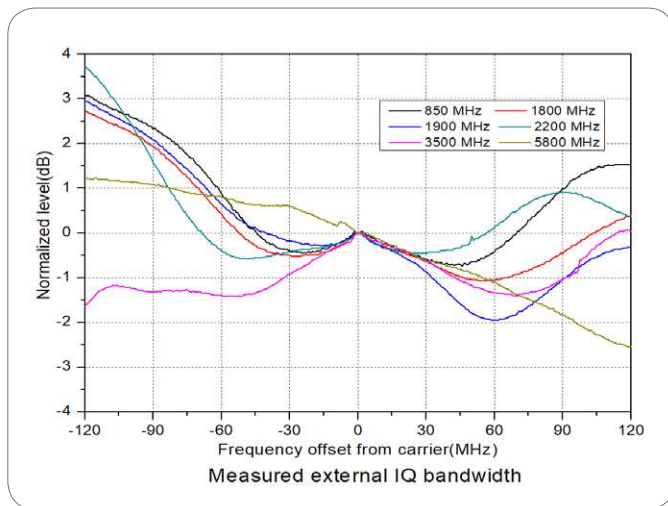
Output impedance	50 Ω (nom.)	
Output voltage	Setting range	0.02 V <sub>p</sub> to 1.5 V <sub>p</sub>
	Resolution	1 mV
Frequency response	Reference: 1 MHz	≤ 10 MHz
		≤ 30 MHz
		< 0.5 dB (nom.)
		< 1 dB (nom.)

Note:

[1] The parameter is measured at room temperature. When the temperature is different from the room temperature, the specification will deteriorate.

[2] Baseband frequency ≤ 10 MHz.

I/Q imbalance	Amplitude	≤ 10 MHz	< 0.1 dB (nom.)
		≤ 30 MHz	< 0.2 dB (nom.)
	Nonlinear phase	≤ 10 MHz	200 ps (nom.)
		≤ 30 MHz	500 ps (nom.)
SFDR	Sine	≤ 30 MHz	> 50 dB (nom.)
Waveform memory	Waveform length		1 sample to 16 Msample in one-sample steps
	Resolution		14 bits
	Loading time (1 Msample)		< 10 s <sup>[1]</sup> (nom.)
	Non-volatile memory		96 MB (nom.)
Sample rate	Setting range		1 kHz to 50 MHz
	Resolution		0.01 Hz
Trigger	Trigger mode		Auto, key, external, bus (USB and LAN)
	Operation mode		Retrig, arm auto, arm retrigger, single
	External trigger delay		
	Setting range		0 to (2 <sup>16</sup> - 1)
	Resolution		1
	External trigger inhibit		
	Setting range		0 to (2 <sup>16</sup> - 1)
	Resolution		1
External trigger pulse width		> 20 ns (nom.)	



Note:  
[1] Load from internal non-volatile Flash memory.

## Input and Output

Front Panel Connectors		
RF output	Impedance	50 $\Omega$ (nom.)
	Connector	N female
External modulating signal input	Impedance	100 k $\Omega$ /600 $\Omega$ /50 $\Omega$ (nom.)
	Coupling	AC/DC
	Sensitivity	1 V <sub>pp</sub> for indicated modulation depth or deviation (nom.)
	Connector	BNC female
Internal modulation generator (LF) output	Impedance	50 $\Omega$ (nom.)
	Connector	BNC female

Rear Panel Connectors		
External trigger input	Impedance	1 k $\Omega$ (nom.)
	Connector	BNC female
	Trigger voltage	3.3 V TTL level
Signal valid output	Connector	BNC female
	Output voltage	0 V/3.3 V (nom.)
Pulse input or output	Impedance	50 $\Omega$ (nom.)
	Input/output voltage	0 V/3.3 V (nom.)
10MHz input (external frequency reference input)	Impedance	50 $\Omega$ (nom.)
	Connector	BNC female
10MHz output (external frequency reference output)	Impedance	50 $\Omega$ (nom.)
	Connector	BNC female
I/Q baseband input/output signal (only available for DSG3065B-IQ/DSG3136B-IQ)	Impedance	50 $\Omega$ (nom.)
	Connector	BNC female

Rear Panel Communication Interfaces		
USB host	Connector	A plug
	Protocol	Version 2.0
USB device	Connector	B plug
	Protocol	Version 2.0
LAN	LXI Core 2011 Device	10/100Base, RJ-45

# General Specifications

Display	
Type	TFT LCD
Resolution	480 × 272
Size	4.3-inch

Mass Storage	
Mass storage	Non-volatile Flash memory (internal); USB storage device (not supplied)
Data storage space	Non-volatile Flash memory (internal) 96 MB (nom.)

Power Supply	
Input voltage range, AC	100 V to 120 V; 100 V to 240 V
AC frequency range	100 V to 120 V: 45 Hz to 440 Hz 100 V to 240 V: 45 Hz to 65 Hz
Power consumption	With all the options 70 W (typ.), max. 100 W

Electromagnetic Compatibility and Safety		
Certificate of conformity	CE	
	cTUVus	
	EAC	
EMC	Conform to EMC Directive 2014/30/EU, Conform to or above IEC61326-1: 2013/EN61326-1: 2013 Group 1 Class A standard	
	CISPR 11/EN 55011	
	IEC 61000-4-2:2008/EN 61000-4-2	±4.0 kV (contact discharge), ±8.0 kV (air discharge)
	IEC 61000-4-3:2002/EN 61000-4-3	3 V/m (80 MHz to 1 GHz) 3 V/m (1.4 GHz to 2 GHz) 1 V/m (2.0 GHz to 2.7 GHz)
	IEC 61000-4-4:2004/EN 61000-4-4	1 kV power cable
	IEC 61000-4-5:2001/EN 61000-4-5	0.5 kV (Phase to Neutral) 1 kV (Phase to PE) 1 kV (Neutral to PE)
	IEC 61000-4-6:2003/EN 61000-4-6	3 V, 0.15-80 MHz
	IEC 61000-4-8:2009	3 A/m (50 Hz, 60 Hz)
	IEC 61000-4-11:2004/EN 61000-4-11	Voltage dip: 0% UT during half cycle 0% UT during 1 cycle 70% UT during 25 cycles Short interruption: 0% UT during 250 cycles
Safety regulation	Conform to: IEC 61010-1:2010 (Third Edition)/EN 61010-1:2010, UL 61010-1:2012 R4.16 and CAN/CSA-C22.2 NO. 61010-1-12+ GI1+ GI2	

Environmental		
Temperature	Operating temperature range	0°C to 50°C
	Storage temperature range	-20°C to +70°C
Humidity	0°C to 30°C	≤ 95% rel. humidity
	30°C to 40°C	≤ 75% rel. humidity
	40°C to 50°C	≤ 45% rel. humidity
Altitude	Operating height	Below 3,000m

Dimensions	
(W × H × D)	364 mm × 112 mm × 420 mm (14.33 inch × 4.41 inch × 16.54 inch)

Weight	
DSG3065B/DSG3136B	7.61 kg (16.8 lb)
DSG3065B-IQ/DSG3136B-IQ	8.03 kg (17.7 lb)

Calibration Interval	
Recommended calibration interval	18 months

## Order Information

	Description	Order Number
Model	Signal Generator, 9 kHz to 6.5 GHz	DSG3065B
	Signal Generator, 9 kHz to 6.5 GHz, I/Q Modulation (Std.)	DSG3065B-IQ
	Signal Generator, 9 kHz to 13.6 GHz	DSG3136B
	Signal Generator, 9 kHz to 13.6 GHz, I/Q Modulation (Std.)	DSG3136B-IQ
Standard Accessories	Power Cable	-
Options	Pulse Modulation, Pulse Generator, and Pulse Train Generator	DSG3000B-PUG
	High Stable OCXO Reference Clock	OCXO-B08
	Rack Mount Kit	RM-DSG3000
Optional Accessories	include: N(F)-N(F) adaptor (1pcs), N(M)-N(M) adaptor (1pcs), N(M)-SMA(F) adaptor (2pcs), N(M)-BNC(F) adaptor (2pcs), SMA(F)-SMA(F) adaptor (1pcs), SMA(M)-SMA(M) adaptor (1pcs), BNC T type adaptor (1pcs), 50 Ω SMA load (1pcs), 50 Ω BNC impedance adaptor (1pcs)	RF Adaptor Kit
	include: 50 Ω to 75 Ω adaptor (2pcs)	RF CATV Kit
	include: 6dB attenuator (1pcs), 10dB attenuator (2pcs)	RF Attenuator Kit
	N(M)-N(M) RF cable	CB-NM-NM-75-L-12G
	N(M)-SMA(M) RF cable	CB-NM-SMAM-75-L-12G
	USB-GPIB interface converter	USB-GPIB

## Warranty Period

Three years for the mainframe

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