

ERAVANT

NEXT GENERATION MILLIMETERWAVE COMPONENTS

E BAND UPDATES

March 2021

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INTRODUCTION

ERAVANT designs and manufactures total solutions for microwave and millimeterwave applications covering 10 MHz to 220 GHz.

- **This presentation introduces Eravant's selective standard product offerings in the E-Band (60-90 GHz).**
- Our full product offering, including Limited Run models, are listed on our website at www.eravant.com.

Additional products and presentations are available upon customer request:

- Custom models for components and subassemblies can be configured to customers' specifications.
- Presentations about Ka, Q, U, V, W, F and D-Bands are available.
- Presentations for specific applications like 5G/IoT, Space, Test Instrumentation, Communications, and Radar are also available.

ERAVANT PRODUCT COVERAGE

- ERAVANT offers Total Product Solutions to configure any system applications in the Frequency Range of DC to 220 GHz.
- E Band products are mainly used in
 - Last mile communication systems
 - Automotive Radar systems
 - 5G systems
 - Scientific and industrial systems
 - Test equipment and lab set ups
- The intent of this presentation is to present the ERAVANT product offerings in E Band to help the customers having a quick overview of available product families for their project and system planning. The model selected is for illustration purpose. Many models with various performance in the same product family are available on the website.

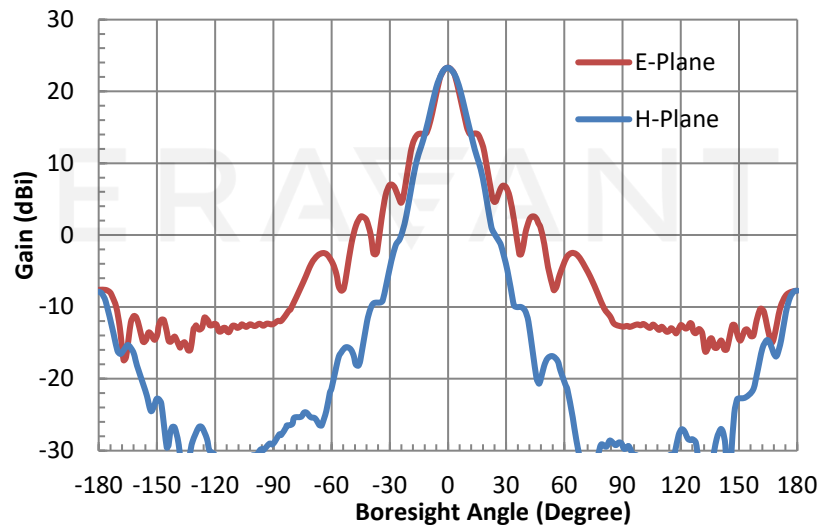
Rectangular Horn Antenna

Model SAR-2309-12-S2

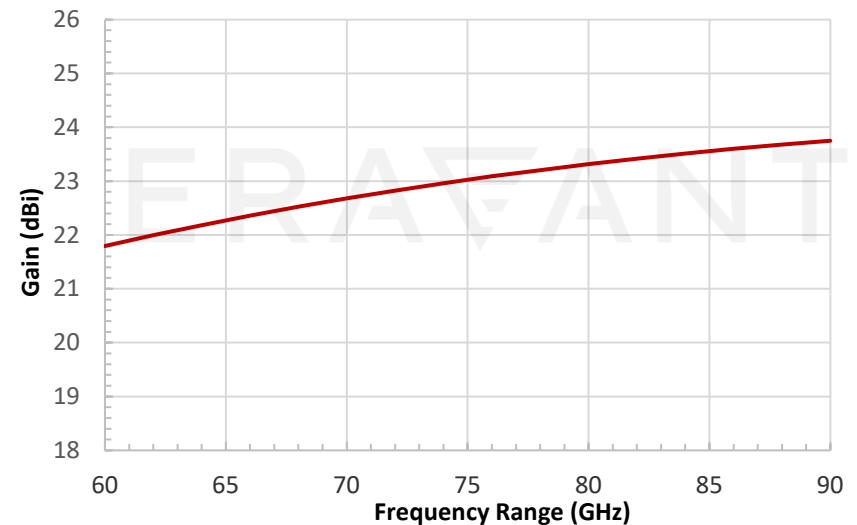
Parameter	Minimum	Typical	Maximum
Frequency	60 GHz		90 GHz
Gain	21.5 dBi	23 dBi	24 dBi
Polarization	Linear		
3 dB Beamwidth, E-Plane		10°	
3 dB Beamwidth, H-Plane		11°	
Side Lobes, E -Plane		14 dB	
Side Lobes, H Plane		30 dB	
VSWR		1.15:1	



Typical Antenna Pattern @ 75 GHz



Typical Gain vs. Frequency



Conical Horn Antenna

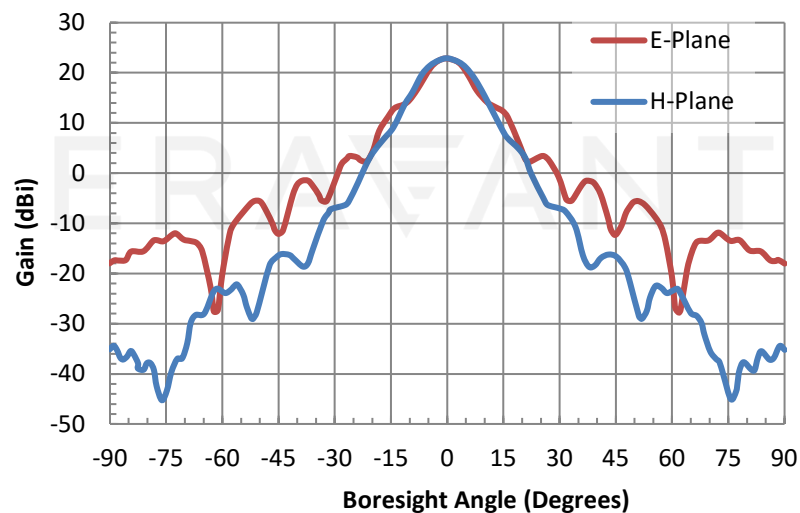
Model SAC-2309-125-S2

Parameter	Minimum	Typical	Maximum
Frequency*	68 GHz		77 GHz
Gain		23 dB	
3 dB Beamwidth, E-plane		11°	
3 dB Beamwidth, H-plane		13°	
Side lobes, E-plane		-20 dB	
Side lobes, H-plane		-28 dB	
VSWR		1.15:1	

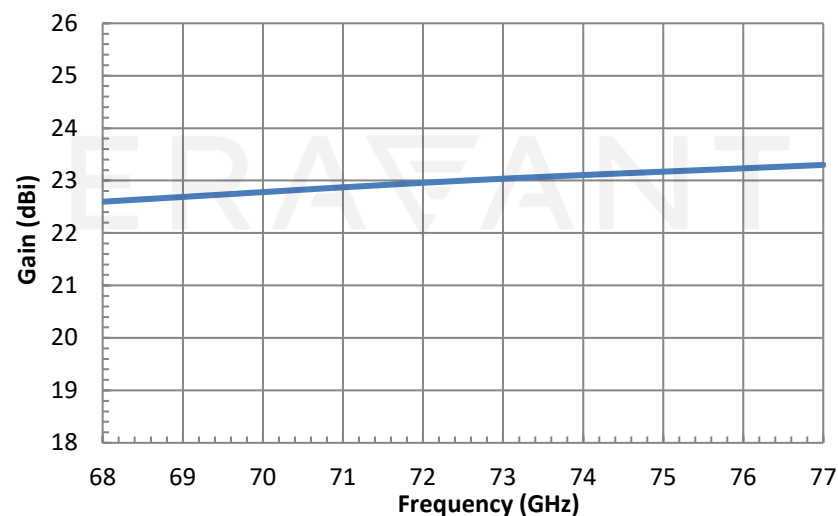


*Note: Can operate from 63 to 90 GHz if the dominant mode is maintained.

Typical Antenna Pattern @ 72.5 GHz



Typical Gain vs. Frequency



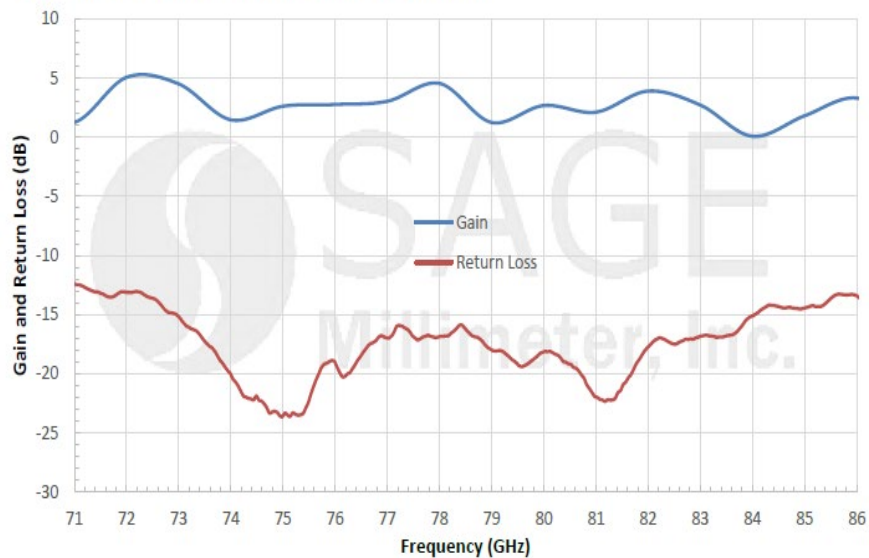
Omni-directional Antenna, 71 to 86 GHz

Model: SAO-7138630230-12-S1

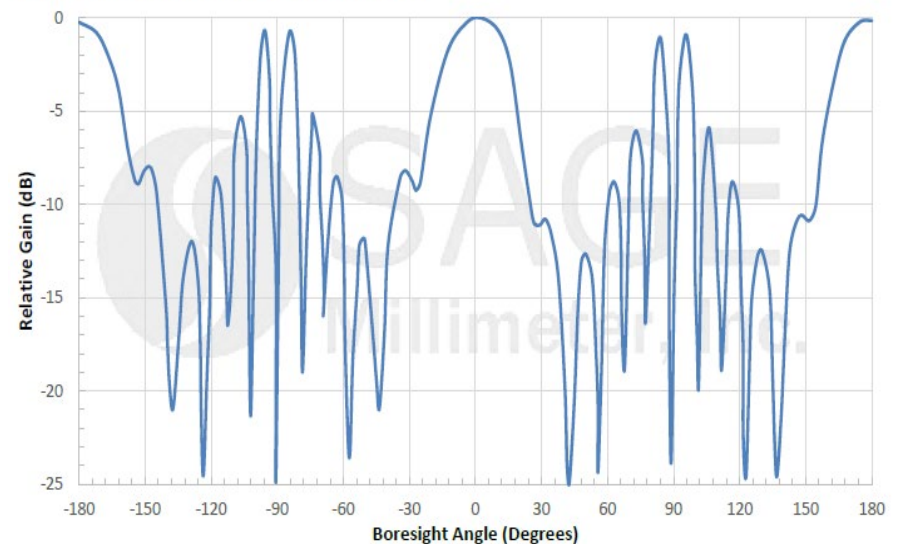
Parameter	Minimum	Typical	Maximum
Frequency*	71 GHz		86 GHz
Gain		2 dB	
Gain Flatness		±3 dB	
3 dB Beam Width, Vertical		30°	
Azimuth Beam Width		360°	
VSWR		2:1	
RF Connector	WR-12 with UG-387/U Flange		
Weight		0.2 Oz	



Typical Gain and Return Loss vs. Frequency



Typical Antenna Pattern @ 78.5 GHz



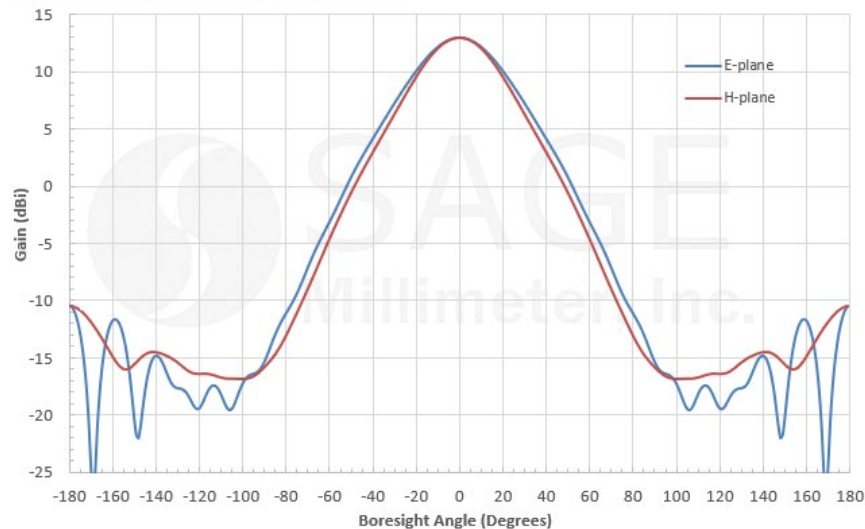
Dual Polarized Antenna, 60 to 90 GHz

Model SAF-6039031340-141-S1-122-DP

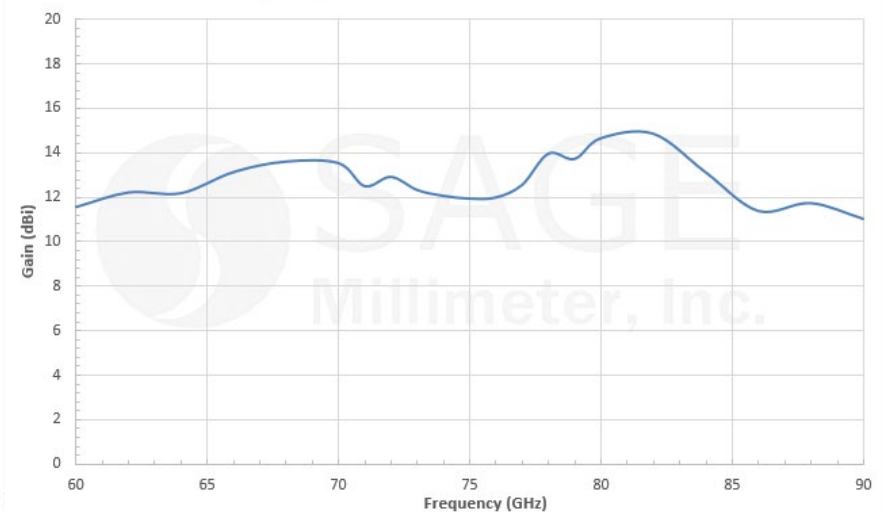
Parameter	Minimum	Typical	Maximum
Frequency*	60 GHz		90 GHz
Gain		13 dBi	
Gain Flatness		±2.5 dB	
3 dB Beam Width, Vertical		40°	
3 dB Beam Width, Horizontal		40°	
Return Loss		15 dB	
RF Connector	WR-12 with UG-387/U Flange		
Weight		1 Oz	



Simulated Antenna Patterns @ 75 GHz



Measured Gain vs. Frequency



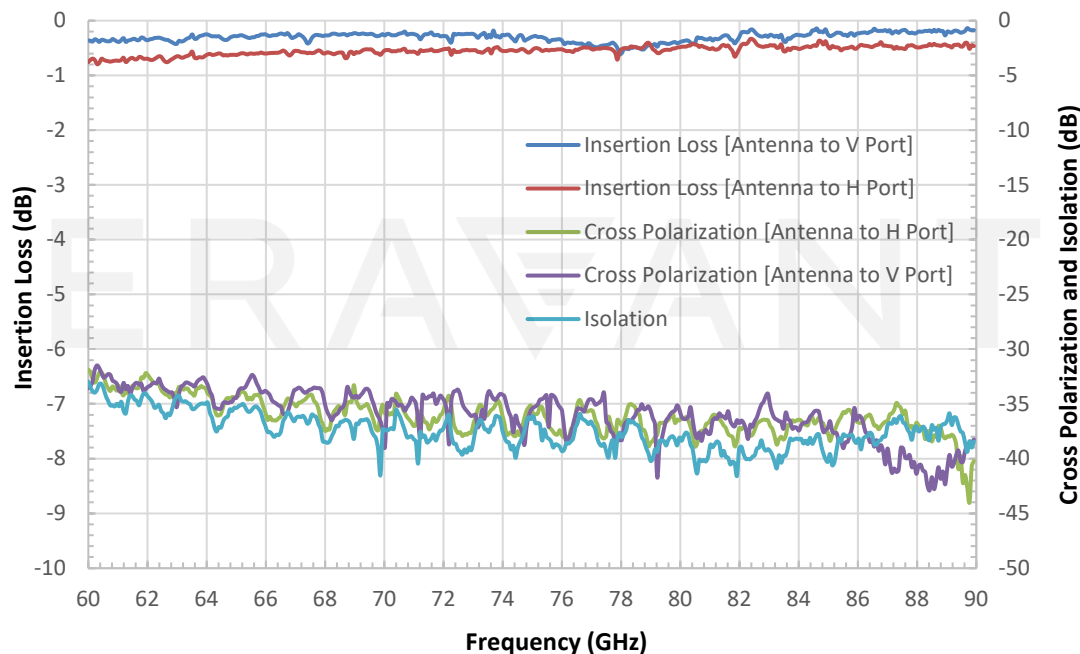
Full Band Orthomode Transducer

Model SAT-FE-12212-S1

Parameter	Minimum	Typical	Maximum
Frequency	60 GHz		90 GHz
Insertion Loss, Vertical		0.8 dB	
Insertion Loss, Horizontal		1.2 dB	
Isolation		40 dB	
Cross Polarization		35 dB	



Typical Performance vs. Frequency



Features

- High Isolation
- Low Insertion Loss
- Full Band Coverage
- Compact Size

Power Amplifier, 67 to 76 GHz, +34 dBm P-1dB

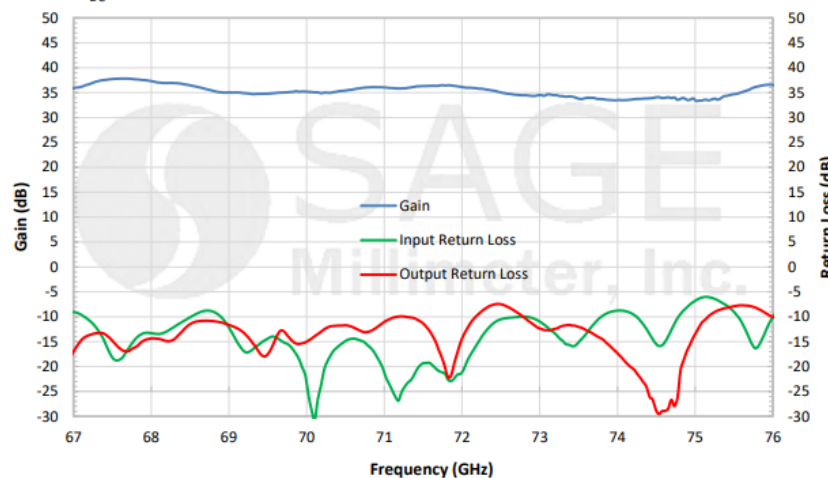
Model SBP-6737633534-1212-E1

Parameter	Minimum	Typical	Maximum
Frequency	67 GHz		76 GHz
Gain		35 dB	
P_{1dB}	+33 dBm	+34 dBm	
P_{sat}	+34 dBm	+35 dBm	
P_{in}			+15 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+15 V _{DC}
DC Supply Current		7 A	



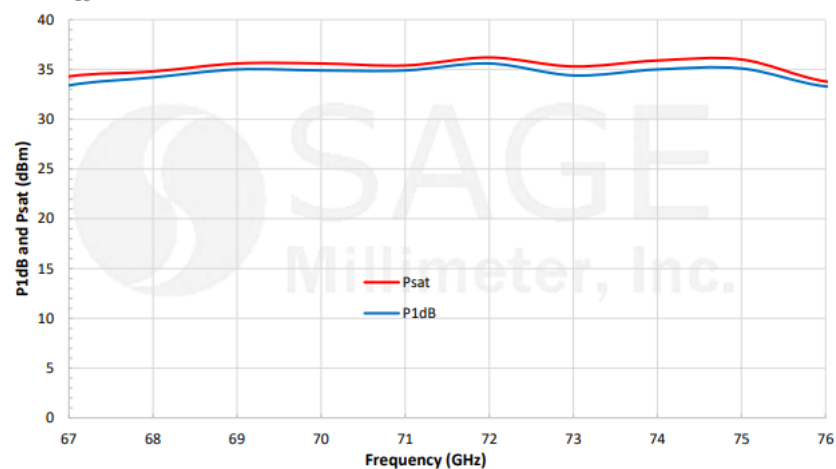
Typical Gain and Return Loss vs. Frequency

Bias = +8 V_{DC}/7 A



Typical P_{1dB} and P_{sat} vs. Frequency

Bias: +8 V_{DC}/9.5 A



Power Amplifier, 60 to 90 GHz, Full Band

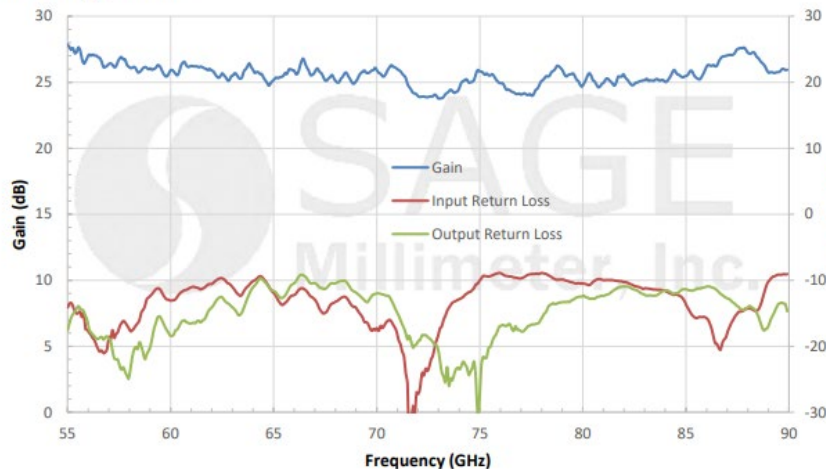
Model SBP-6039032516-1212-E1

Parameter	Minimum	Typical	Maximum
Frequency	60 GHz		90 GHz
Gain		25 dB	
P_{1dB}	+15 dBm	+16 dBm	
P_{sat}	+16 dBm	+20 dBm	
P_{in}			+10 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+15 V _{DC}
DC Supply Current		600 mA	



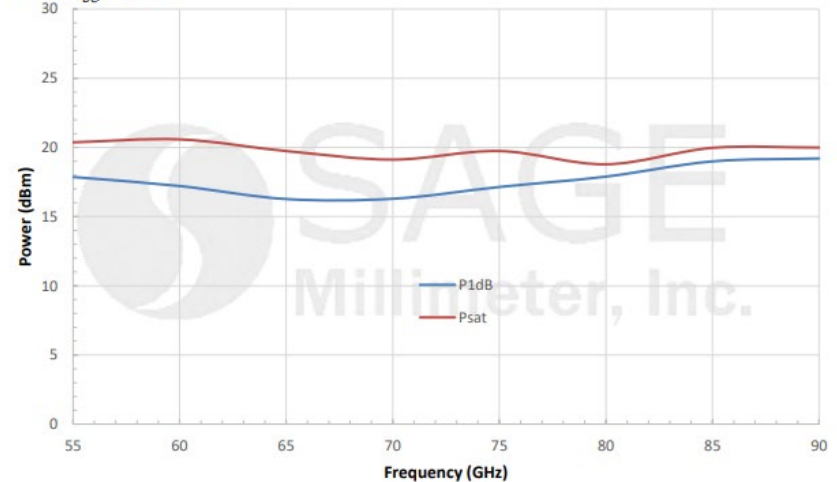
Typical Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/603 mA



Typical Power vs. Frequency

Bias: +8 V_{DC}/750 mA



Power Amplifier, 71 to 76 GHz, +25 dBm P-1

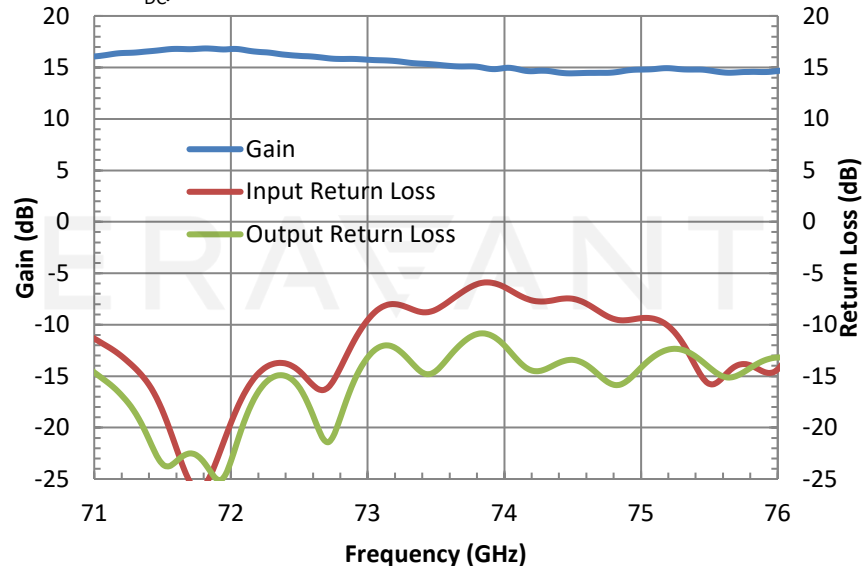
Model SBP-7137631528-1212-E1

Parameter	Minimum	Typical	Maximum
Frequency	71 GHz		76 GHz
Gain		15 dB	
P_{1dB}		+25 dBm	
P_{sat}		+30 dBm	
P_{in}			+0 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage	+13 V _{DC}	+15 V _{DC}	+18 V _{DC}
DC Supply Current		500 mA	



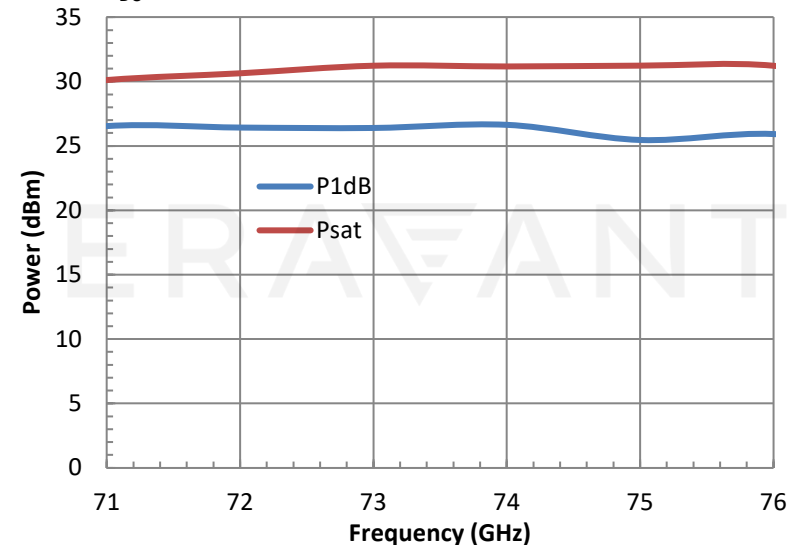
Typical Output Power vs. Frequency

Bias: +15 V_{DC}/500 mA



Typical Output Power vs. Frequency

Bias: +15 V_{DC}/500 mA



Power Amplifier, 71 to 76 GHz, +27 dBm P-1

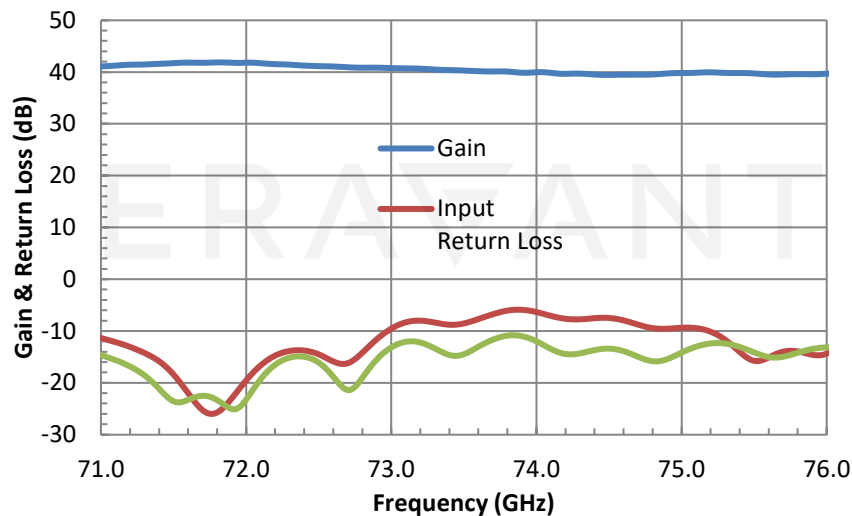
Model SBP-7137634027-1515-E1

Parameter	Minimum	Typical	Maximum
Frequency	71 GHz		76 GHz
Gain		40 dB	
P_{1dB}		+27 dBm	
P_{SAT}		+30 dBm	
P_{in}			+5 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+12 V _{DC}
DC Supply Current		1,100 mA	



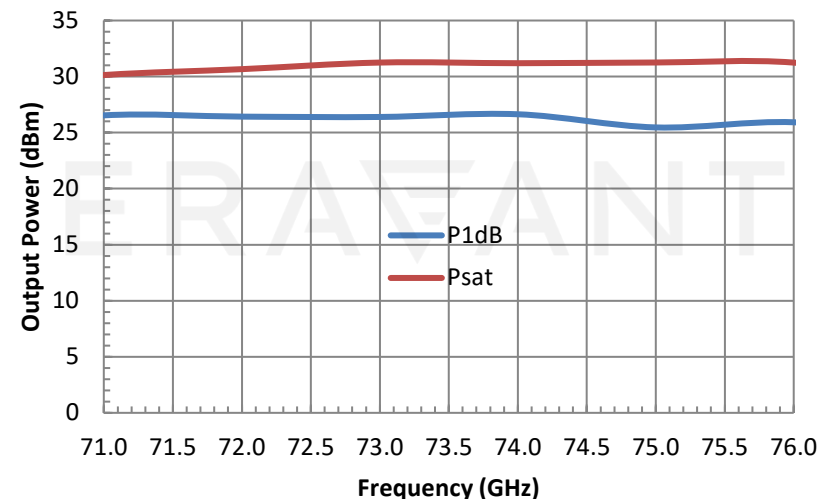
Typical Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/1,100 mA



Typical Output Power vs. Frequency

Bias: +8 V_{DC}/1,350 mA



Power Amplifier, 81 to 86 GHz, +33 dBm P-1dB

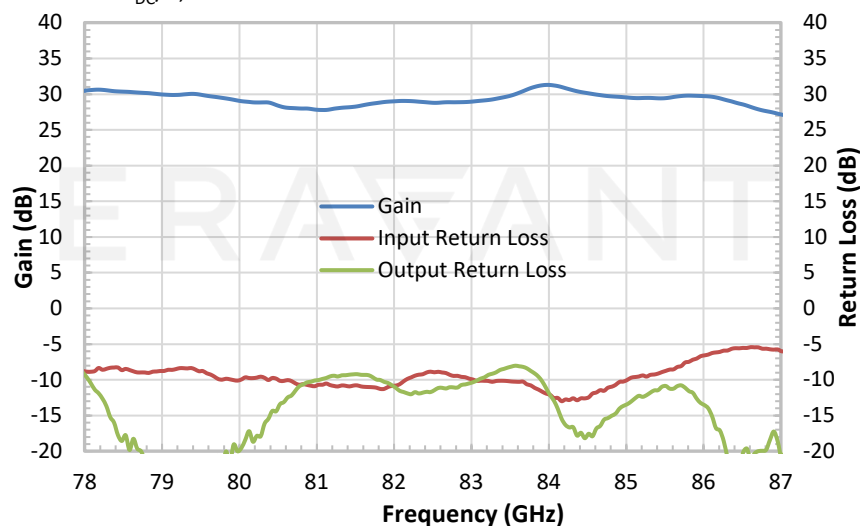
Model SBP-8138632833-1212-E1

Parameter	Minimum	Typical	Maximum
Frequency	81 GHz		86 GHz
Gain		28 dB	
P_{1dB}	+31 dBm	+33 dBm	
P_{sat}	+33 dBm	+34 dBm	
P_{in}			+15 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+15 V _{DC}
DC Supply Current		9 A	



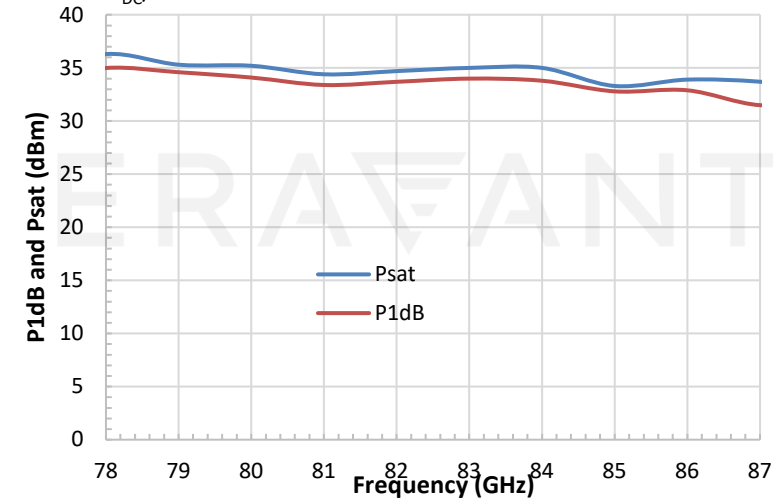
Typical Gain and Return Loss vs. Frequency

Bias = + 8 V_{DC}/8,000 mA



P_{1dB} and P_{sat} vs. Frequency

Bias: +8 V_{DC}/11 A



Power Amplifier, 81 to 86 GHz, +25 dBm P-1

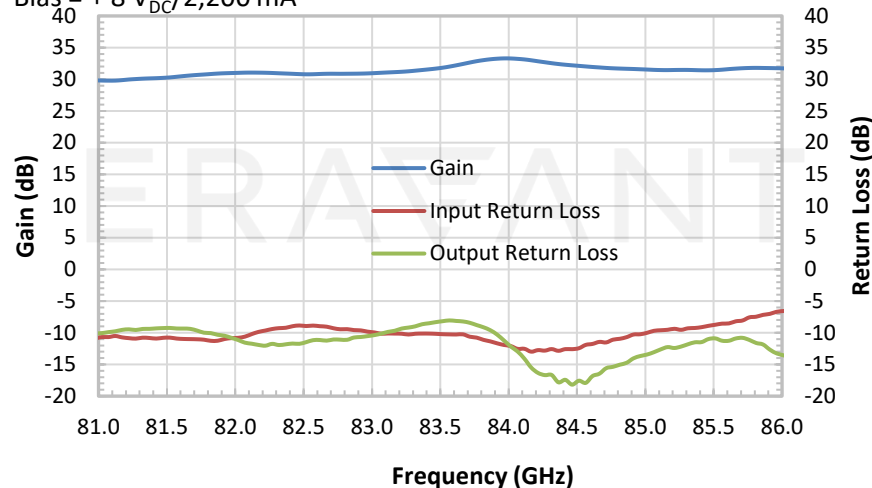
Model SBP-8138633025-1212-E1

Parameter	Minimum	Typical	Maximum
Frequency	81 GHz		86 GHz
Gain		30 dB	
P_{1dB}		+25 dBm	
P_{sat}		+27 dBm	
P_{in}			+16 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+12 V _{DC}
DC Supply Current		1,200 mA	



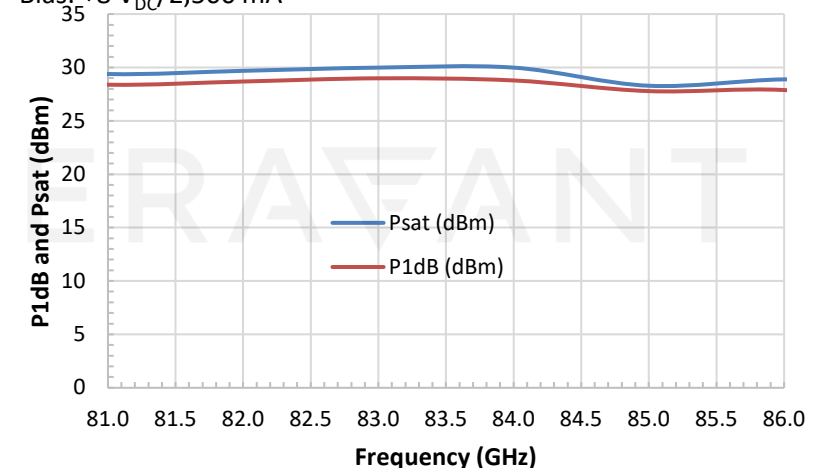
Typical Gain and Return Loss vs. Frequency

Bias = + 8 V_{DC}/2,200 mA



P_{1dB} and P_{sat} vs. Frequency

Bias: +8 V_{DC}/2,500 mA



Power Amplifier, 81 to 86 GHz, +28 dBm P-1

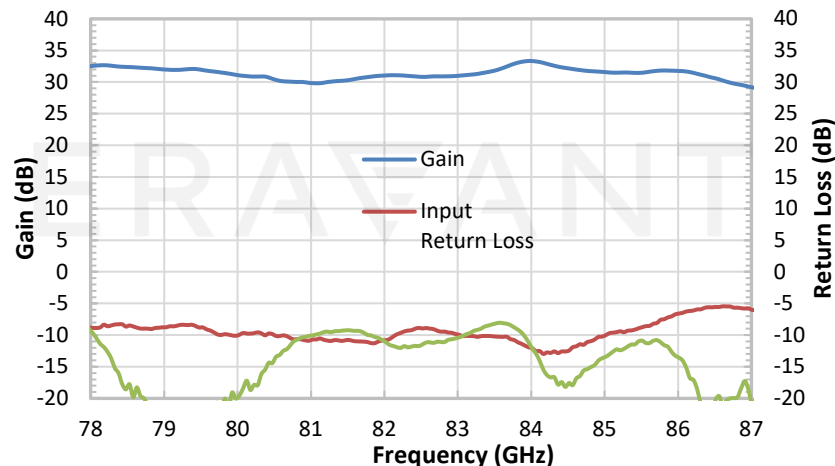
Model SBP-8138633028-1212-E1

Parameter	Minimum	Typical	Maximum
Frequency	81 GHz		86 GHz
Gain		30 dB	
P_{1dB}		+28 dBm	
P_{sat}		+29 dBm	
P_{in}			+16 dBm
Input VSWR		2:1	
Output VSWR		2:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+12 V _{DC}
DC Supply Current		2,000 mA	



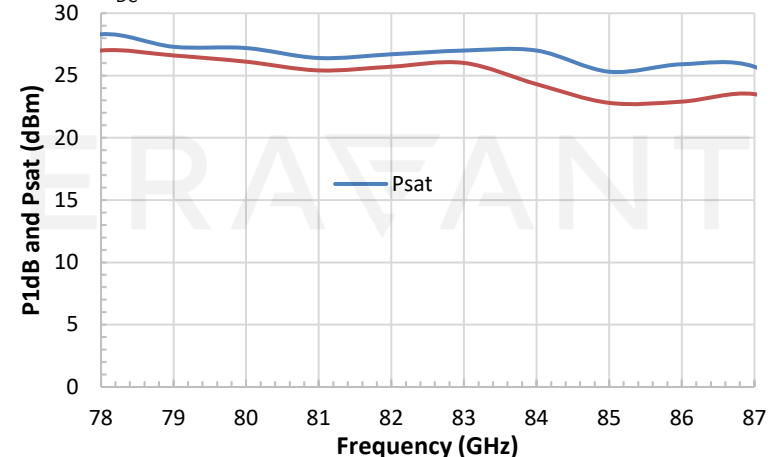
Typical Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/1,210 mA



Typical P_{1dB} and P_{sat} vs. Frequency

Bias: +8 V_{DC}/1,500 mA



Low Noise Amplifier, 60 to 90 GHz

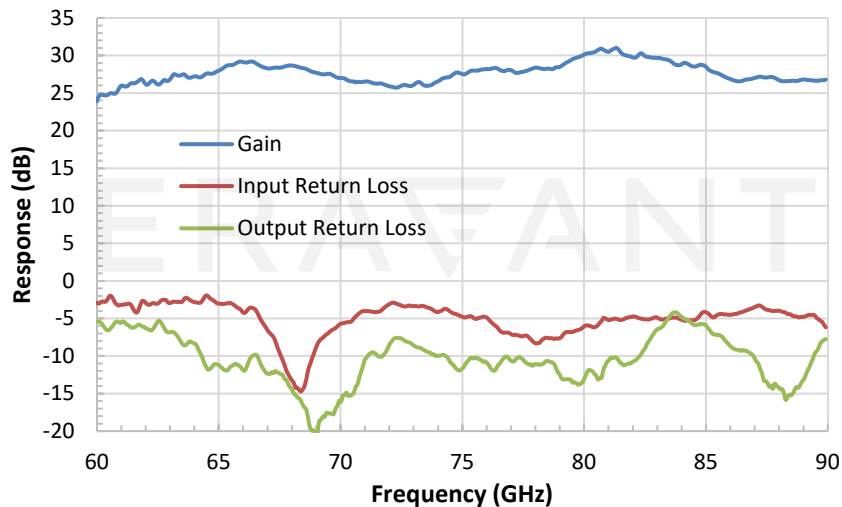
Model SBL-6039032550-1212-S1

Parameter	Minimum	Typical	Maximum
Frequency	60 GHz		90 GHz
Gain		25 dB	
Noise Figure		5 dB	
P_{in}			-24 dBm
Input VSWR		3.5:1	
Output VSWR		3.5:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+12 V _{DC}
DC Supply Current		30 mA	



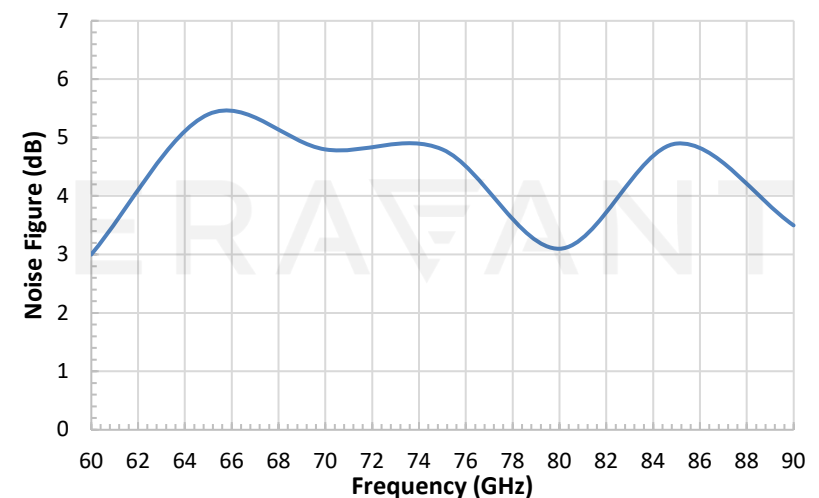
Typical Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/30 mA



Typical Noise Figure vs. Frequency

Bias: +8 V_{DC}/30 mA



Low Noise Amplifier, 60 to 90 GHz

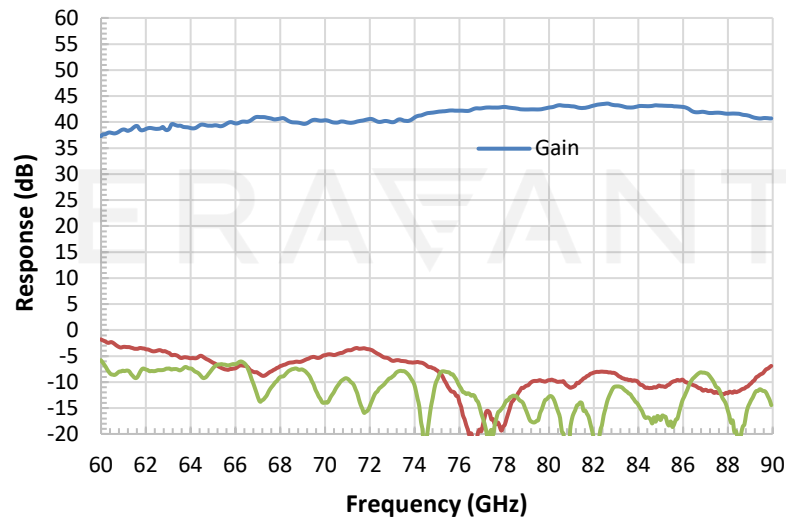
Model SBL-6039034050-1212-E1

Parameter	Minimum	Typical	Maximum
Frequency	60 GHz		90 GHz
Gain		40 dB	
Noise Figure		5 dB	
P_{in}			-24dBm
Input VSWR		2.5:1	
Output VSWR		2.5:1	
DC Voltage	+6 V _{DC}	+8 V _{DC}	+12 V _{DC}
DC Supply Current		150 mA	



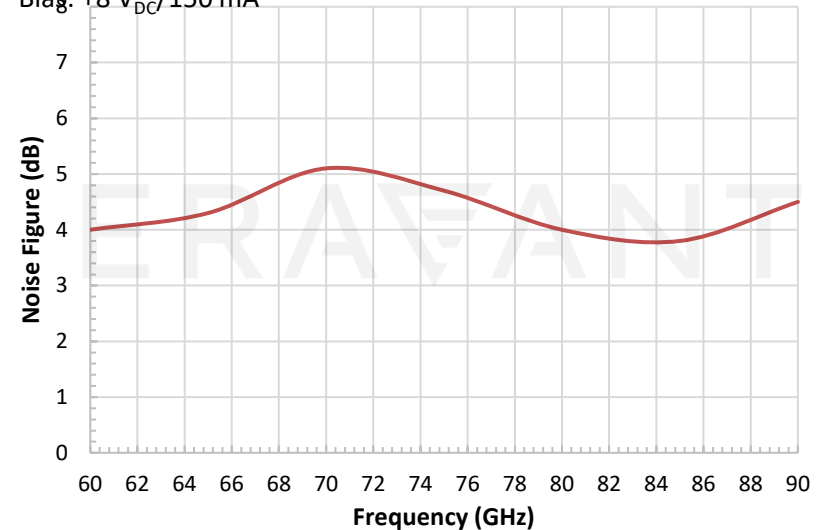
Typical Gain and Return Loss vs. Frequency

Bias: +8 V_{DC}/150 mA



Typical Noise Figure vs. Frequency

Bias: +8 V_{DC}/150 mA



X3 Active Multiplier, +20 dBm Pout

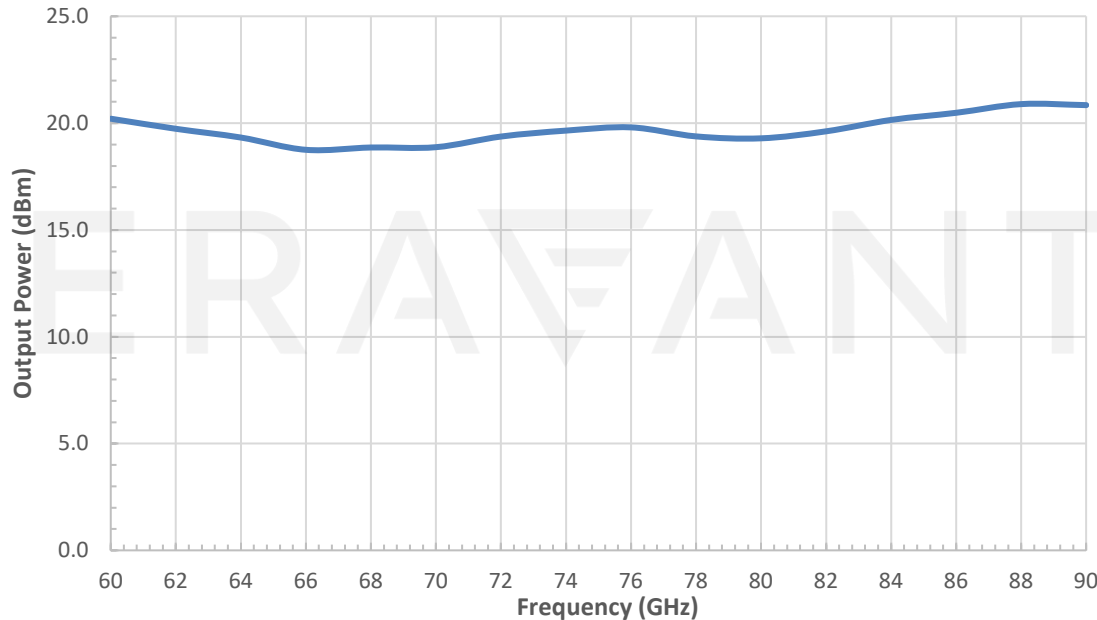
Model SFA-603903320-12KF-E1

Parameter	Minimum	Typical	Maximum
Input Frequency	20 GHz		30 GHz
Input Power		+ 3 dBm	+20 dBm
Output Frequency	60 GHz		90 GHz
Output Power		+20 dBm	
Harmonic Suppression		-20 dBc	
Spurious		-60 dBc	
DC Voltage		+8 V _{DC}	
DC Supply Current		600 mA	



Typical Output Power vs. Frequency

Bias: +8 V_{DC}/800 mA, RF Input Power: +3 dBm



Features

- Full Band Coverage
- High Power Output
- Low Harmonic Emission

X4 Active Multiplier, +20 dBm Pout

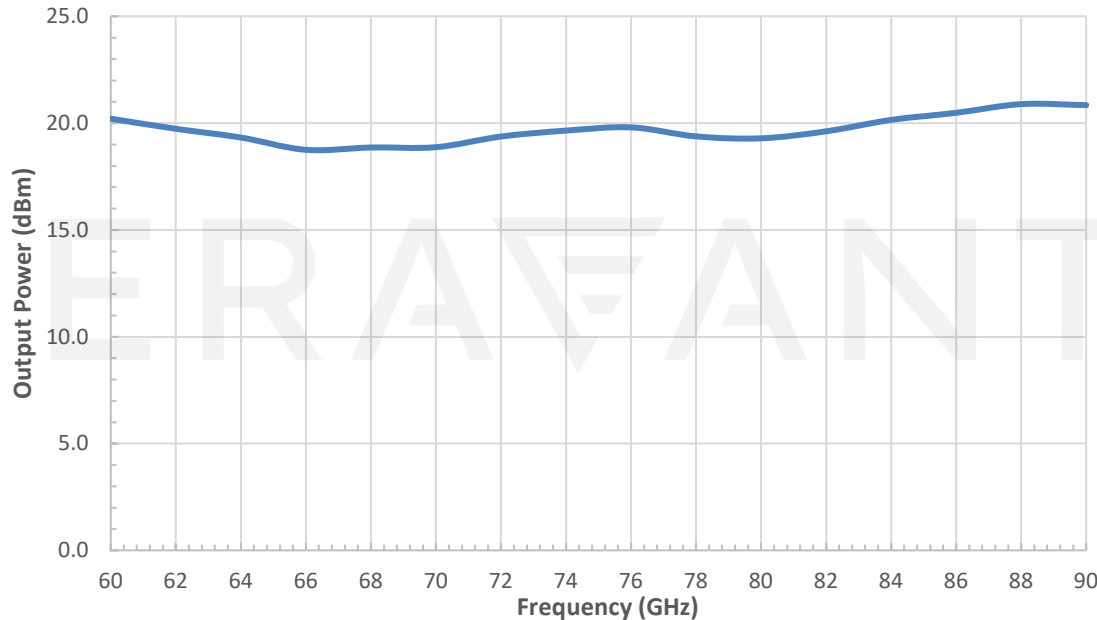
Model SFA-603903420-12KF-E1

Parameter	Minimum	Typical	Maximum
Input Frequency	15 GHz		22.5 GHz
Input Power		+ 3 dBm	+20 dBm
Output Frequency	60 GHz		90 GHz
Output Power		+20 dBm	
Harmonic Suppression		-20 dBc	
Spurious		-60 dBc	
DC Voltage		+8 V _{DC}	
DC Supply Current		800 mA	



Typical Output Power vs. Frequency

Bias: +8 V_{DC}/800 mA, RF Input Power: +3 dBm



Features

- Full Band Coverage
- High Power Output
- Low Harmonic Emission

X6 Active Multiplier, +20 dBm Pout

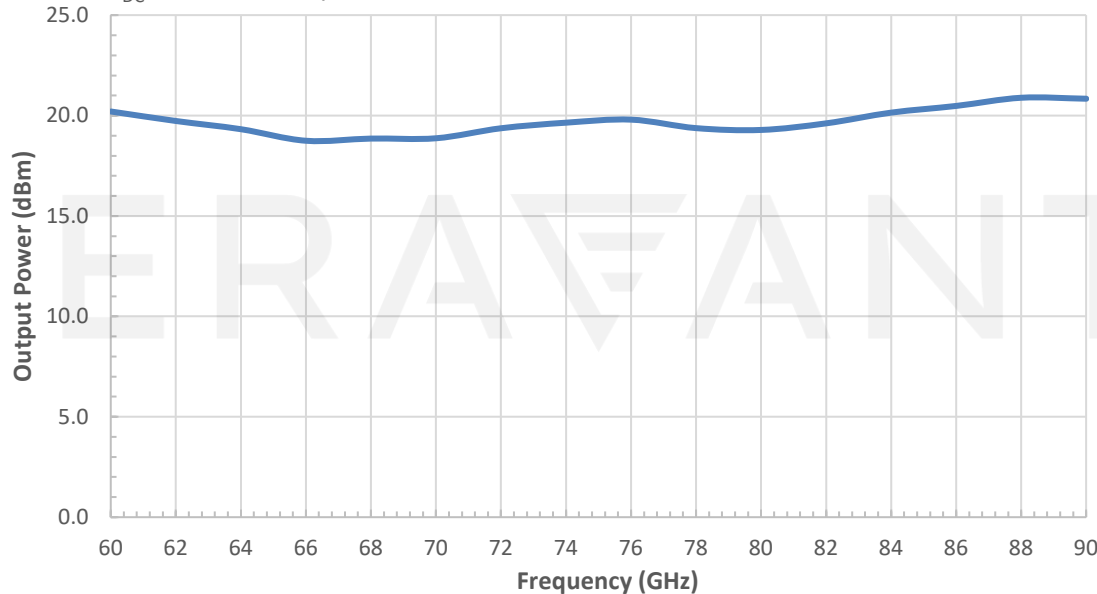
Model SFA-603903620-12SF-E1

Parameter	Minimum	Typical	Maximum
Input Frequency	10 GHz		15 GHz
Input Power		+ 3 dBm	+20 dBm
Output Frequency	60 GHz		90 GHz
Output Power		+20 dBm	
Harmonic Suppression		-20 dBc	
Spurious		-60 dBc	
DC Voltage		+8 V _{DC}	
DC Supply Current		850 mA	



Typical Output Power vs. Frequency

Bias: +8 V_{DC}/850 mA, RF Input Power: +3 dBm



Features

- Full Band Coverage
- High Power Output
- Low Harmonic Emission

X8 Active Multiplier, +20 dBm Pout

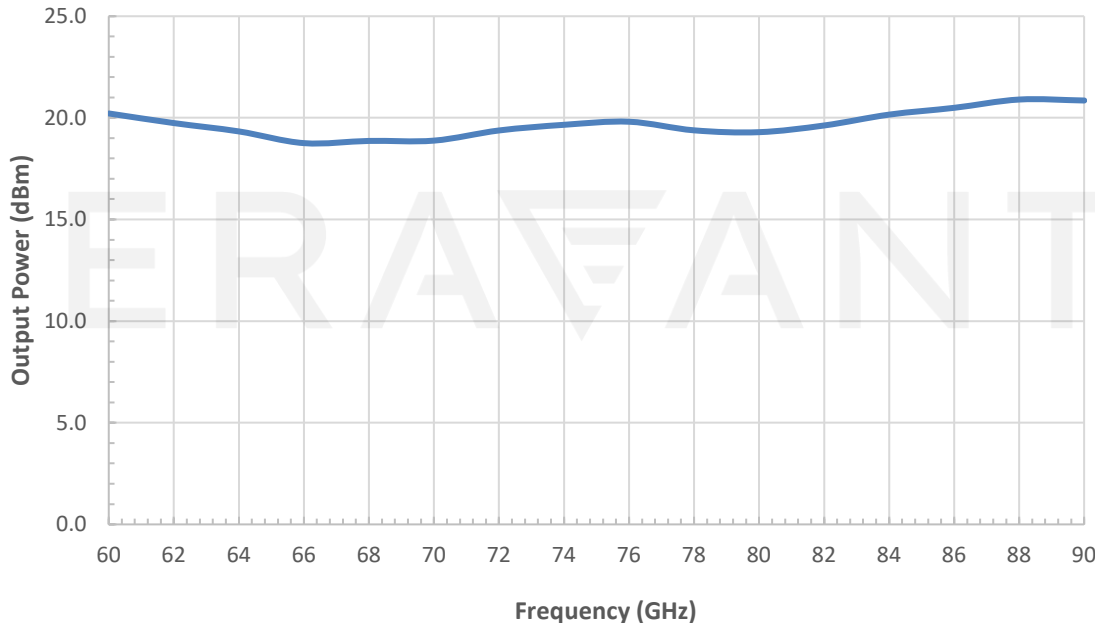
Model SFA-603903620-12SF-E1

Parameter	Minimum	Typical	Maximum
Input Frequency	7.5 GHz		11.25 GHz
Input Power		+ 3 dBm	+20 dBm
Output Frequency	60 GHz		90 GHz
Output Power		+20 dBm	
Harmonic Suppression		-20 dBc	
Spurious		-60 dBc	
DC Voltage		+8 V _{DC}	
DC Supply Current		850 mA	



Typical Output Power vs. Frequency

Bias: +8 V_{DC}/850 mA, RF Input Power: +3 dBm



Features

- Full Band Coverage
- High Power Output
- Low Harmonic Emission

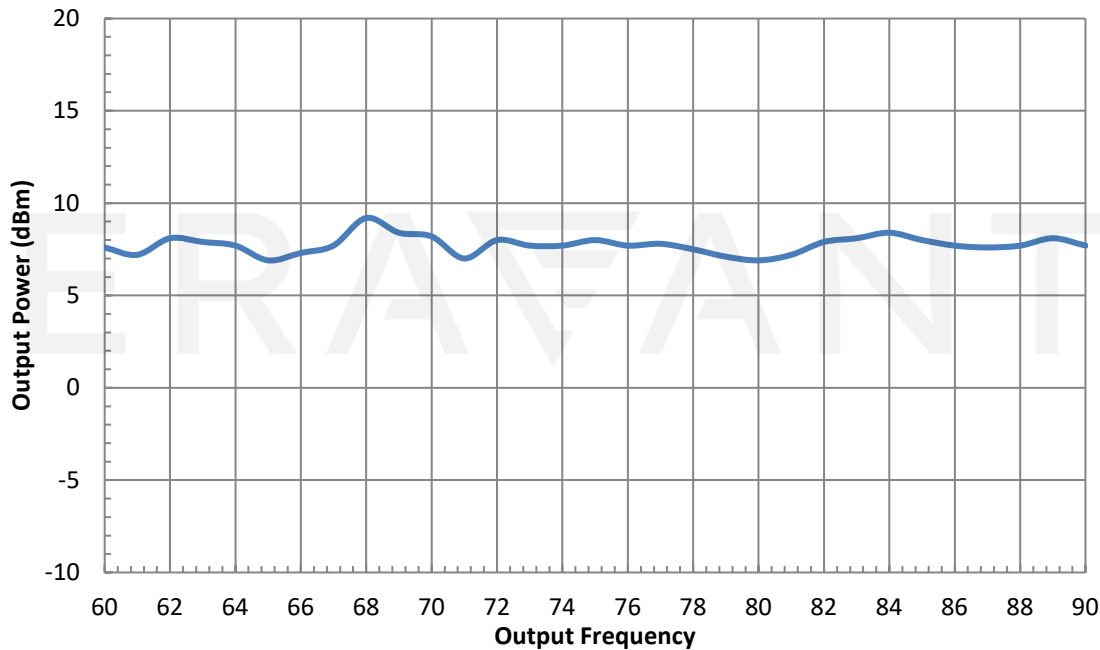
X2 Passive Multiplier

Model SFP-1222F-S1

Parameter	Minimum	Typical	Maximum
Input Frequency	30 GHz		45 GHz
Output Frequency	60 GHz		90 GHz
Input Power		+17 dBm	+19 dBm
Output Power		+6 dBm	
Harmonic Suppression		20 dB	



Output Power vs. Output Frequency



Features

- Minimal Conversion Loss
- No External Bias
- Compact Package

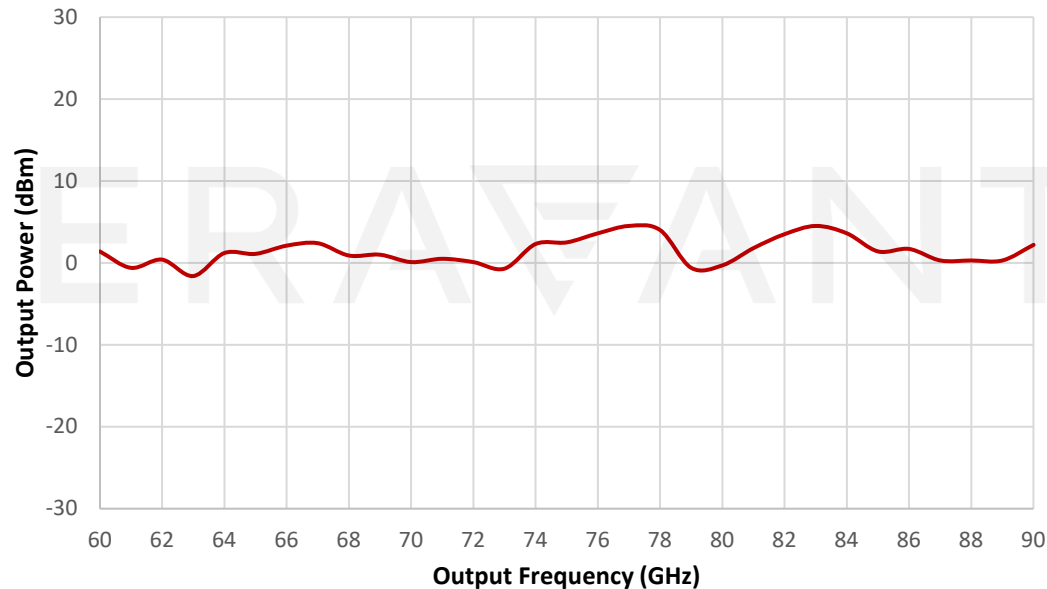
X3 Passive Multiplier

Model SFP-123KF-S1

Parameter	Minimum	Typical	Maximum
Input Frequency	20 GHz		30 GHz
Output Frequency	60 GHz		90 GHz
Input Power		+20 dBm	+22 dBm
Output Power	-3 dBm	+3 dBm	
Harmonic Suppression		20 dB	

Typical Output Power vs. Frequency

$P_{in} = +20$ dBm, F_{in} : 20 to 30 GHz



Features

- Minimal Conversion Loss
- No External Bias
- Compact Package

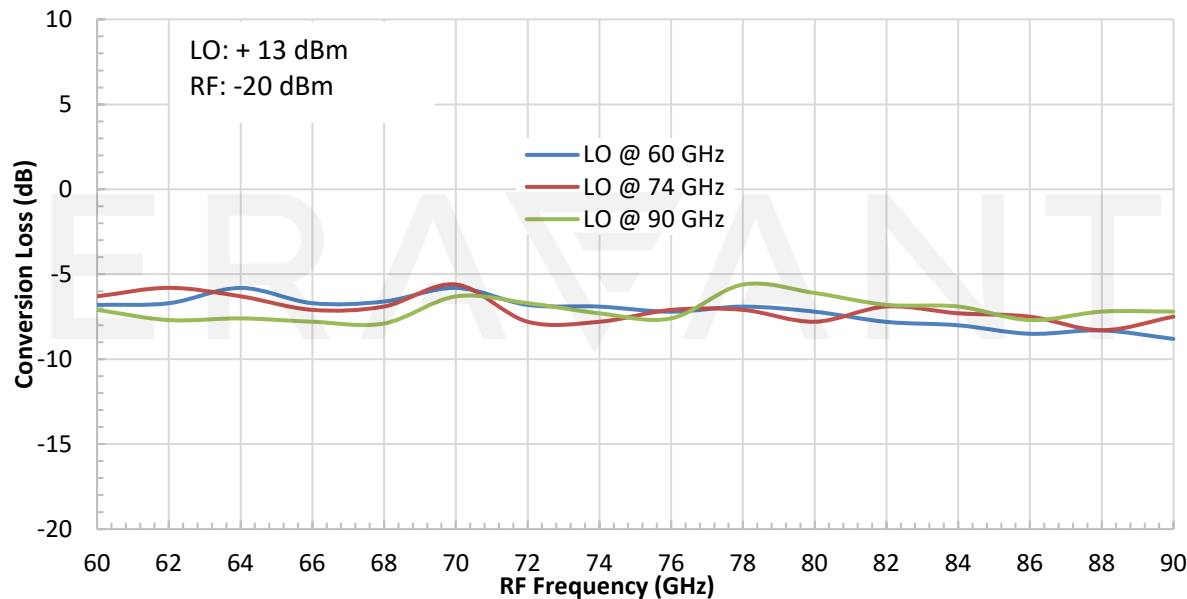
Balanced Mixer

Model SFB-12-N1

Parameter	Minimum	Typical	Maximum
RF Frequency	60 GHz		90 GHz
LO Frequency	60 GHz		90 GHz
IF Frequency	DC		30 GHz
LO Pumping Power	+10 dBm	+13 dBm	+15 dBm
Conversion Loss		9 dB	12 dB
RF to LO Isolation		30 dB	
Combined RF and LO Power			+18 dBm



Typical Conversion Loss vs. Frequency



Features

- Full Waveguide Band Coverage
- Low Conversion Loss
- High IF Frequency up to 30 GHz
- Compact Package

Externally Biased Balanced Mixer

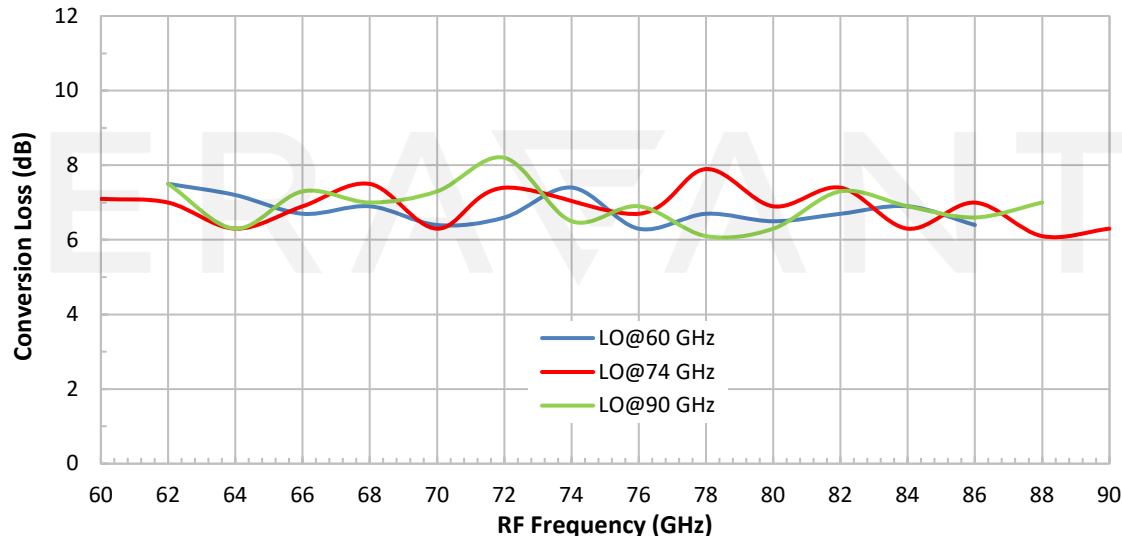
Model SFB-12-E2

Parameter	Minimum	Typical	Maximum
RF Frequency	60 GHz		90 GHz
LO Frequency	60 GHz		90 GHz
IF Frequency	DC		30 GHz
LO Pumping Power	+0 dBm	+3 dBm	+5 dBm
Conversion Loss		9 dB	13 dB
Combined RF and LO Power			+18 dBm
External Bias Voltage		+5 V _{DC}	
Bias Current		1 mA	5 mA



Typical Conversion Loss vs. RF Frequency

LO @ +3 dBm, RF @ -20 dBm, Bias: +5 V_{DC}/0.8 mA



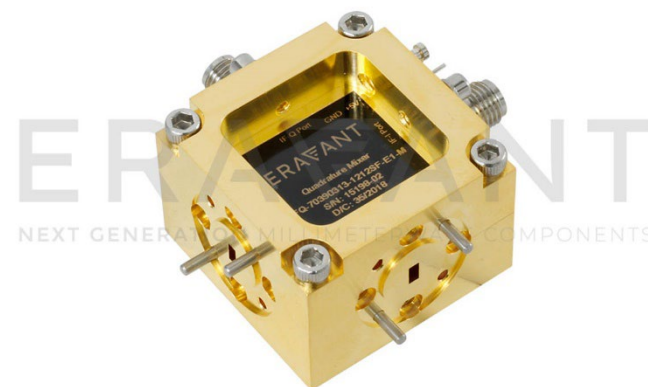
Features

- Full Waveguide Band Coverage
- Low LO Power Requirement
- Low Conversion Loss
- High IF Frequency up to 30 GHz
- Compact Package

I/Q Mixer, Full Band

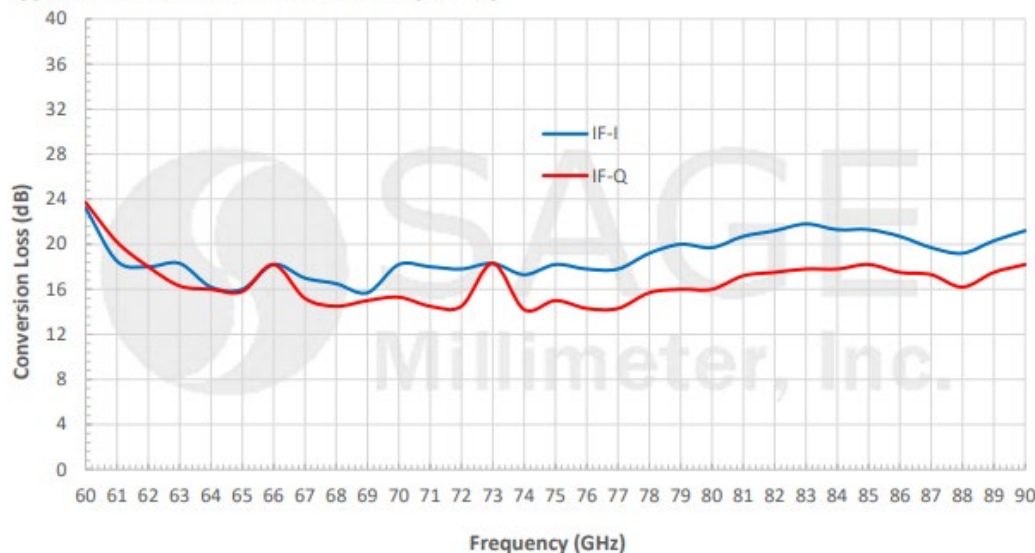
Model SFQ-60390315-1212SF-E1-M

Parameter	Minimum	Typical	Maximum
RF Frequency	60 GHz		90 GHz
LO Frequency	60 GHz		90 GHz
IF Frequency	DC		2 GHz
LO Pumping Power	+0 dBm	+10 dBm	+12 dBm
Conversion Loss		15 dB	20 dB
Combined RF and LO Power			+18 dBm
External Bias Voltage		+5 V _{DC}	
Bias Current		1 mA	5 mA



E-Band Quadrature Mixer or Phase Detector, 60 to 90 GHz

Typical Conversion Loss vs. Frequency



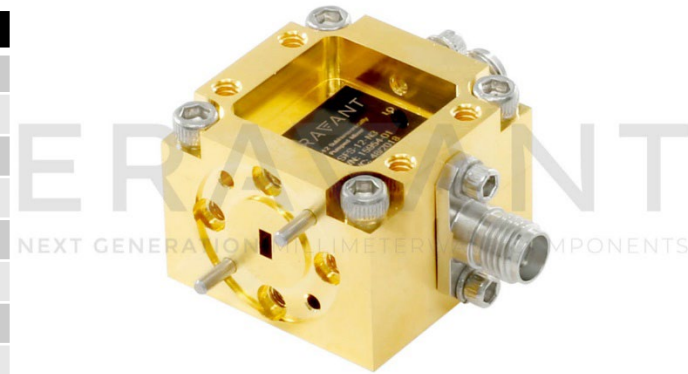
Features

- Full Waveguide Band Coverage
- Low LO Power Requirement
- Low Conversion Loss
- I/Q Operation
- Compact Package

Subharmonically Pumped Mixer, Full Band

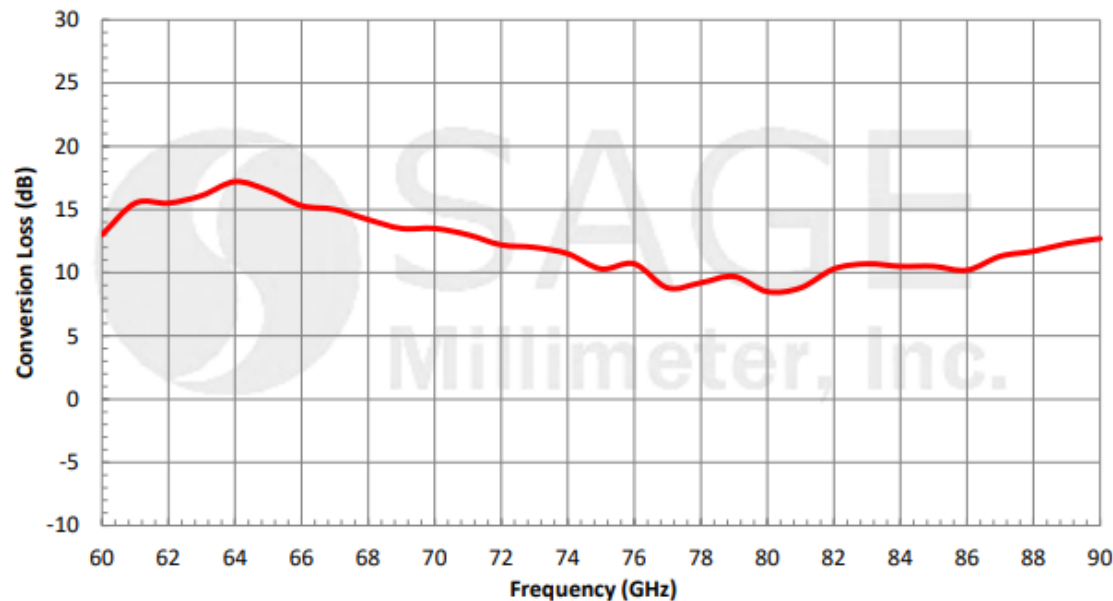
Model SFS-60390314-12KFSF-N1-M

Parameter	Minimum	Typical	Maximum
RF Frequency	60 GHz		90 GHz
LO Frequency	30 GHz		45 GHz
IF Frequency	DC		5 GHz
LO Pumping Power		+9 dBm	+20 dBm
Conversion Loss		14 dB	18 dB
Combined RF and LO Power			+18 dBm
RF to LO Isolation		28 dB	
LO to IF Isolation		20 dB	



Typical Conversion Loss vs. Frequency

LO Power: +9 dBm; IF: 1 GHz



Features

- Full Waveguide Band Coverage
- Low LO Power Requirement
- Low Conversion Loss
- LO = $\frac{1}{2}$ RF
- Compact Package

Third Harmonic Mixer

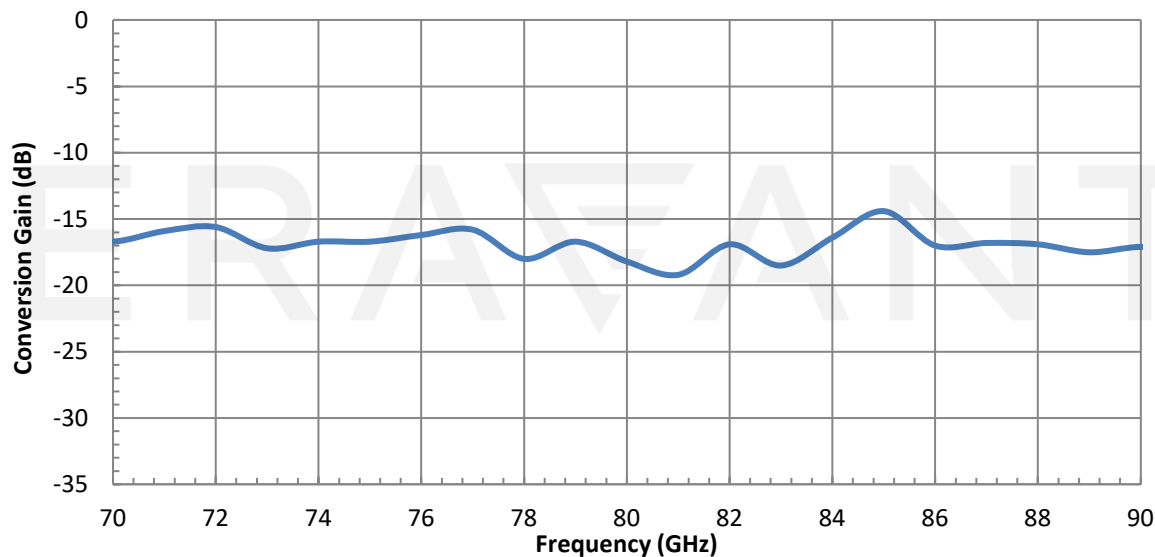
Model SFH-7039030318-12KFSF-S1

Parameter	Minimum	Typical	Maximum
RF Frequency	70 GHz		90 GHz
LO Frequency	23.33 GHz		30.00 GHz
IF Frequency	DC		1.5 GHz
LO Pumping Power	+8 dBm	+13 dBm	+16 dBm
Conversion Loss		17 dB	
LO to IF Isolation		30 dB	
Combined RF and LO Power			+16 dBm



Typical Conversion Loss vs. Frequency

+13 dBm LO, Fixed IF at 1 GHz



Features

- Low LO Power Requirement
- Third Harmonic Mixing
- Compact Package

Amplitude Detector

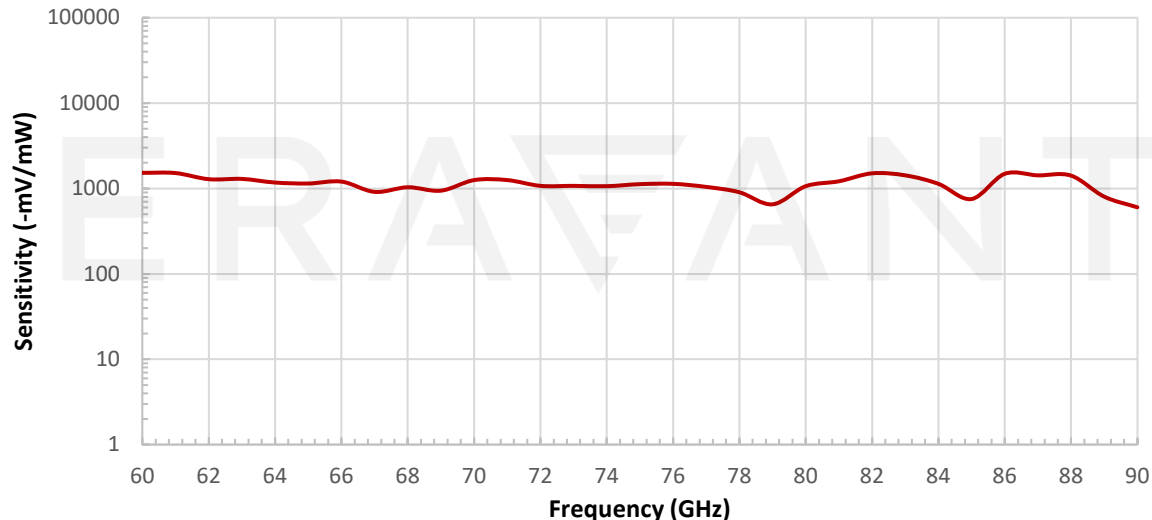
Models SFD-603903-12SF-N1 and SFD-603903-12SF-P1

Parameter	Minimum	Typical	Maximum
Frequency Range	60 GHz		90 GHz
Sensitivity (SFD-603903-12SF-N1)		-900 mV/mV	
Sensitivity (SFD-603903-12SF-P1)		+900 mV/mV	
Sensitivity Flatness		± 2.0 dB	
Linear Detection Range	-45 dBm	-10 dBm	0 dBm
RF Input Power		-20 dBm	+17 dBm
Video Bandwidth		10 MHz	



Typical Performance vs. Frequency

$P_{in} = -20$ dBm



Features

- Broad or Narrow Band Operation
- High Sensitivity Without Tuning
- High Sensitivity Stability Over Broad Temperature Range

Amplitude Detector with Isolator

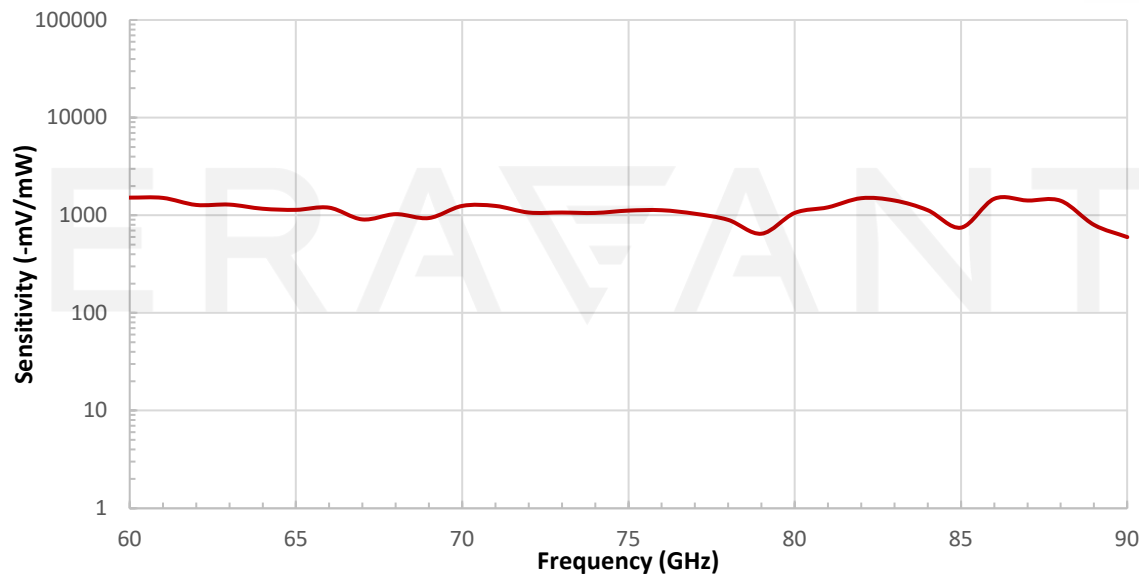
Models STD-12SF-NI and STD-12SF-PI

Parameter	Minimum	Typical	Maximum
Frequency Range	60 GHz		90 GHz
Sensitivity (STD-12SF-NI)		-900 mV/mV	
Sensitivity (STD-12SF-PI)		+900 mV/mV	
Sensitivity Flatness		± 2.0 dB	
Linear Detection Range	-45 dBm	-10 dBm	0 dBm
RF Input Power		-20 dBm	+17 dBm
Video Bandwidth		10 MHz	



Typical Performance vs. Frequency

$P_{in} = -20$ dBm



Features

- Full Waveguide Band Operation
- High Sensitivity Without Tuning
- Faraday Isolator Integrated

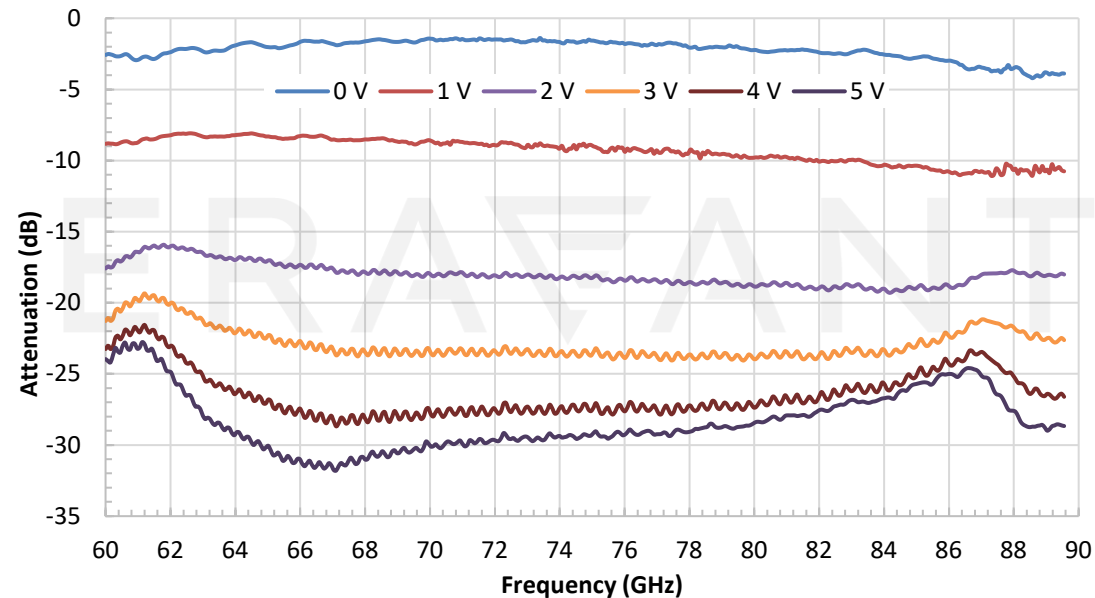
Electrical Attenuator

Model SKA-6039033030-1212-A1

Parameter	Minimum	Typical	Maximum
RF Frequency	60 GHz		90 GHz
Insertion Loss		2.5 dB	4.0 dB
Attenuation	2.5 dB	25 dB	30 dB
Power Handling		+20 dBm	+23 dBm
Control Voltage		0 to -5 V _{DC} / 5 mA	0 to -6 V _{DC} / 8 mA
Control Speed		100 ns	



Typical Attenuation vs. Frequency



Features

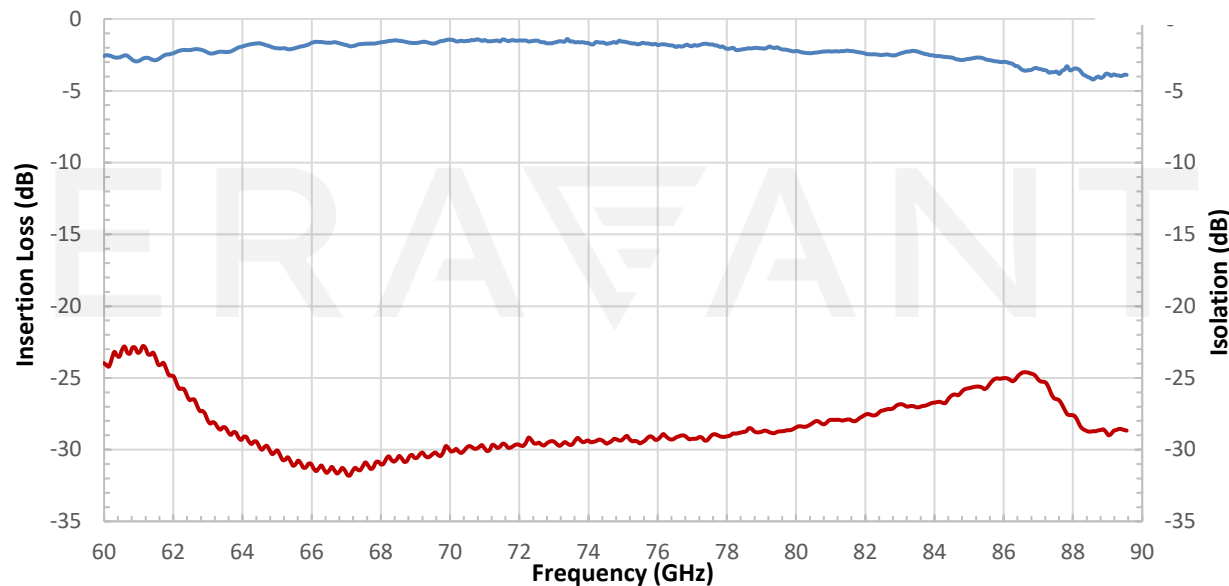
- Low Insertion Loss
- High Dynamic Range
- Fast Control Speed

SPST PIN Diode Switch

Model SKS-6039033030-1212-R1

Parameter	Minimum	Typical	Maximum
RF Frequency	60 GHz		90 GHz
Insertion Loss		3.0 dB	4.0 dB
Isolation	20 dB	25 dB	30 dB
Power Handling		+20 dBm	+23 dBm
Bias Voltage		$\pm 5 V_{DC}$	
Bias Current		10 mA	
Control Signal		TTL	
Switching Speed		100 ns	

Insertion Loss and Isolation vs. Frequency



Features

- Low Insertion Loss
- High Isolation
- Fast Control Speed

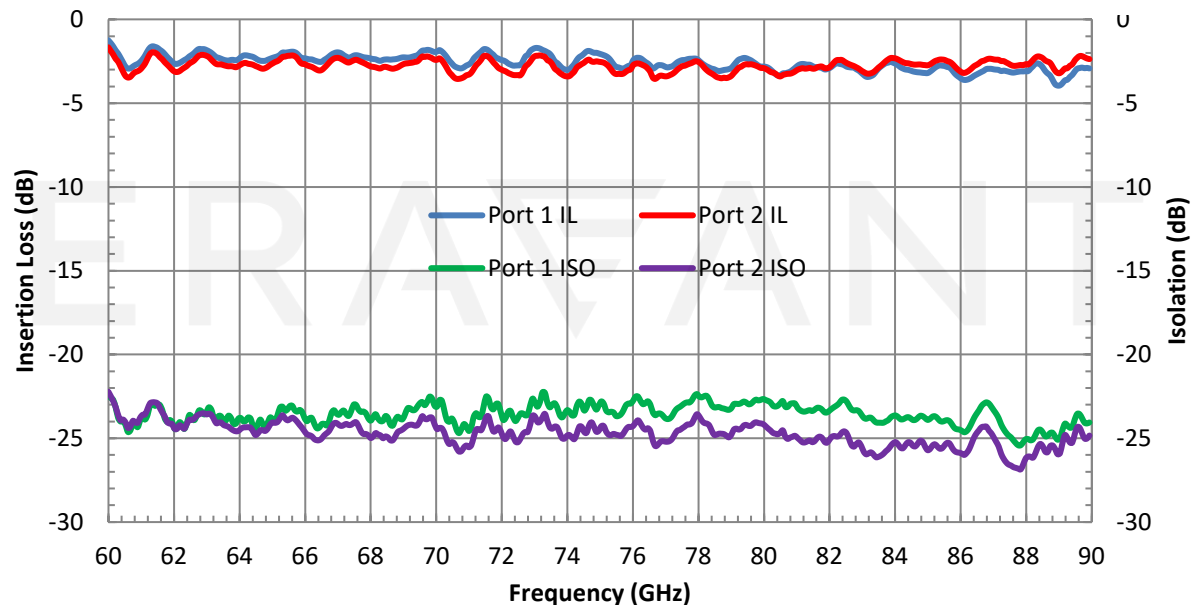
SPDT PIN Diode Switch

Model SKD-6039033025-1212-R1

Parameter	Minimum	Typical	Maximum
RF Frequency	60 GHz		90 GHz
Insertion Loss		3.0 dB	4.0 dB
Isolation	20 dB	25 dB	30 dB
Power Handling		+20 dBm	+23 dBm
Bias Voltage		$\pm 5 V_{DC}$	
Bias Current		10 mA	
Control Signal		TTL	
Switching Speed		100 ns	



Typical Insertion Loss and Isolation vs Frequency



Features

- Low Insertion Loss
- High Isolation
- Fast Control Speed

SP4T PIN Diode Switch

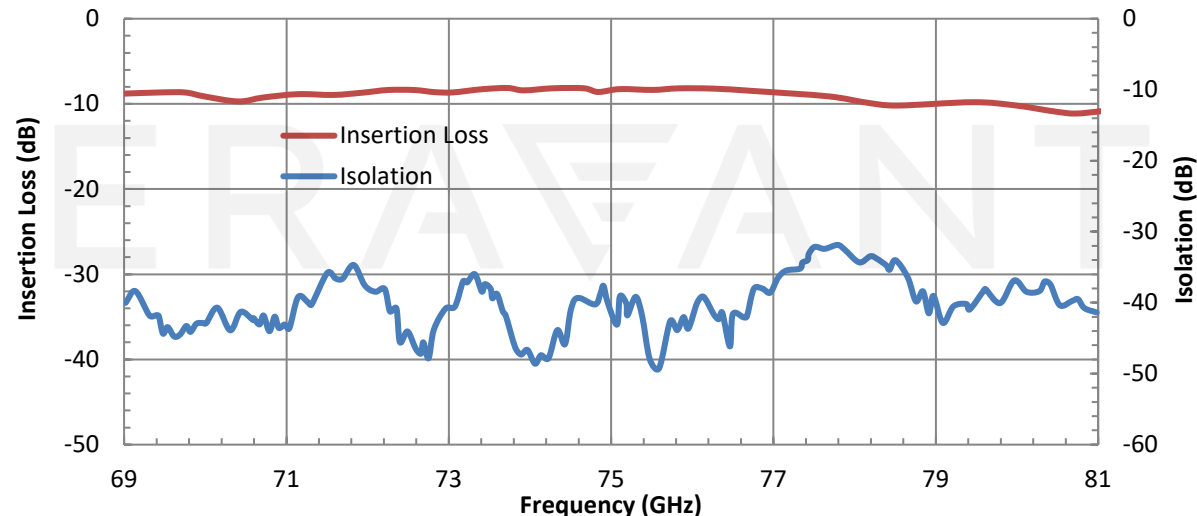
Model SK4-7238138030-1212-R1

Parameter	Minimum	Typical	Maximum
Frequency	72 GHz		81 GHz
Insertion Loss		8.0 dB	
Isolation		30 dB	
VSWR		2.0:1 @ "On" State	
Control Voltage		± 5 V _{DC}	
Control Current		75 mA	
Power Handling			+23 dBm
Switching Speed		100 nS	



Typical Insertion Loss and Isolation vs. Frequency

Bias: ± 5 Vdc/ 75 mA



Features

- Broad Band Coverage
- High Isolation
- Compact Size

Waveguide Motorized Switch

Model SWJ-12-TS

Features

- Low Insertion Loss
- High Isolation
- TTL Control

Applications:

- Test Set
- Communication Systems
- Radar Systems



Parameter	Minimum	Typical	Maximum
Frequency	60 GHz		90 GHz
Insertion Loss		0.4 dB	0.5 dB
Isolation	50 dB	60 dB	
Bias Voltage		$\pm 28 V_{DC}$	
Bias Current		250 mA	
VSWR			1.2:1
Control Signal		TTL	
Switching Speed		125 mS	
Power Handling		100 W (CW)	

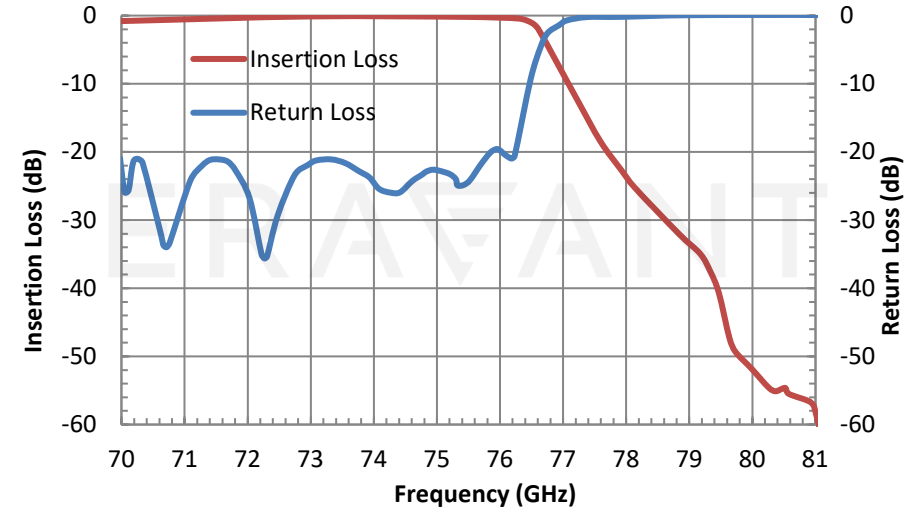
Waveguide Diplexer, 71 to 86 GHz

Model SWY-74384355-12-I1

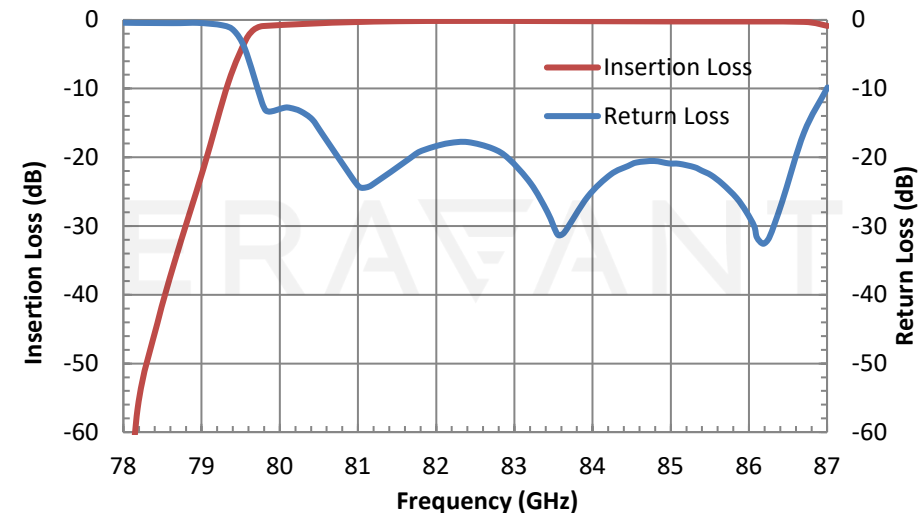


Parameter	Minimum	Typical	Maximum
Low Passband			
Passband Frequency	71 GHz		76 GHz
Passband Insertion Loss		0.5 dB	
Rejection Frequency	81 GHz		86 GHz
Rejection	55 dB		
Return Loss	16 dB		
Group Delay Variation			150 ps
High Passband			
Passband Frequency	81 GHz		86 GHz
Passband Insertion Loss		0.5 dB	
Rejection Frequency	71 GHz		76 GHz
Rejection	55 dB		
Return Loss	16 dB		
Group Delay Variation			150 ps

Typical Lowpass Performance vs. Frequency



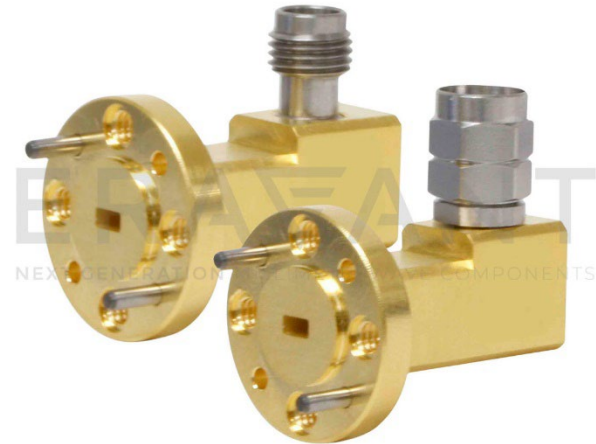
Typical Highpass Performance vs. Frequency



Waveguide to Coax Adapter

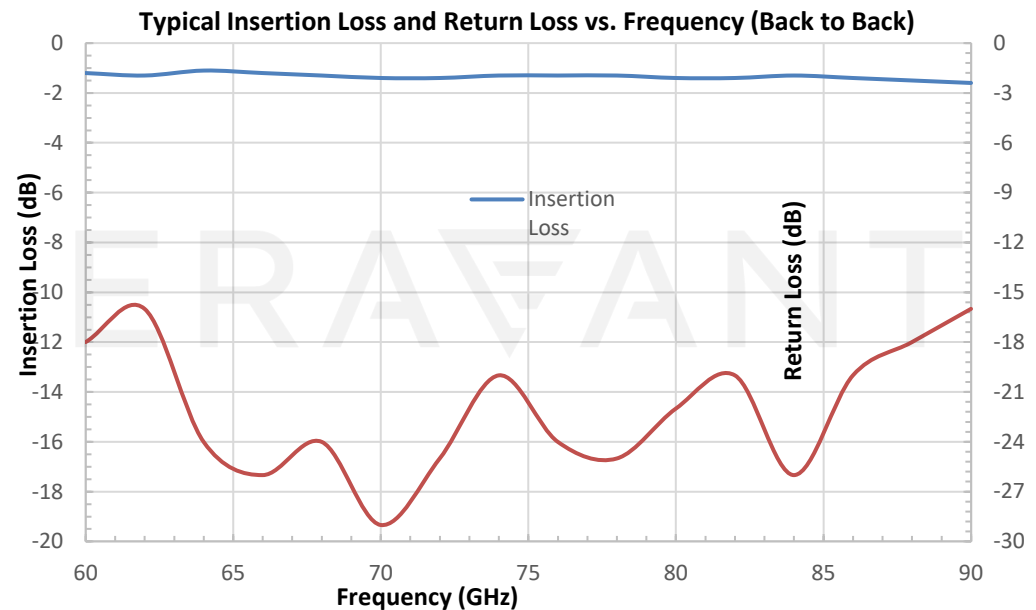
Models SWC-121F-R1 and SWC-121M-R1

Parameter	Minimum	Typical	Maximum
Frequency Range	60 GHz		90 GHz
Insertion Loss		0.6 dB	
Return Loss		14 dB	
Power Handling			10 W (CW)



Features

- Full Waveguide Band Coverage
- Lower Insertion Loss and VSWR
- Instrumentation Grade
- DC Open Circuit



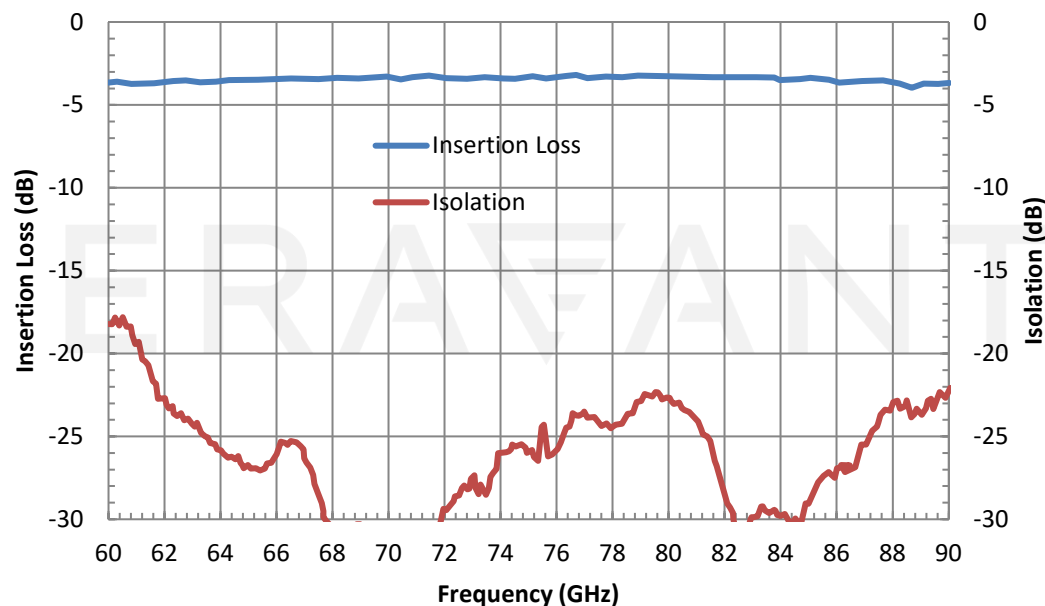
Waveguide 2-Way Power Divider

Model SWP-60390302-12-S1

Parameter	Minimum	Typical	Maximum
Frequency	60 GHz		90 GHz
Power Imbalance		± 0.3 dB	± 0.5 dB
Insertion Loss		0.4 dB	
Isolation		20 dB	
Input / Output VSWR			1.5:1



Typical Insertion Loss and Isolation vs. Frequency



Features

- 2, 4, 8, 16, 32 Ways
- Right Angle and Inline Configuration
- Low Insertion Loss
- High Isolation
- Compact Package

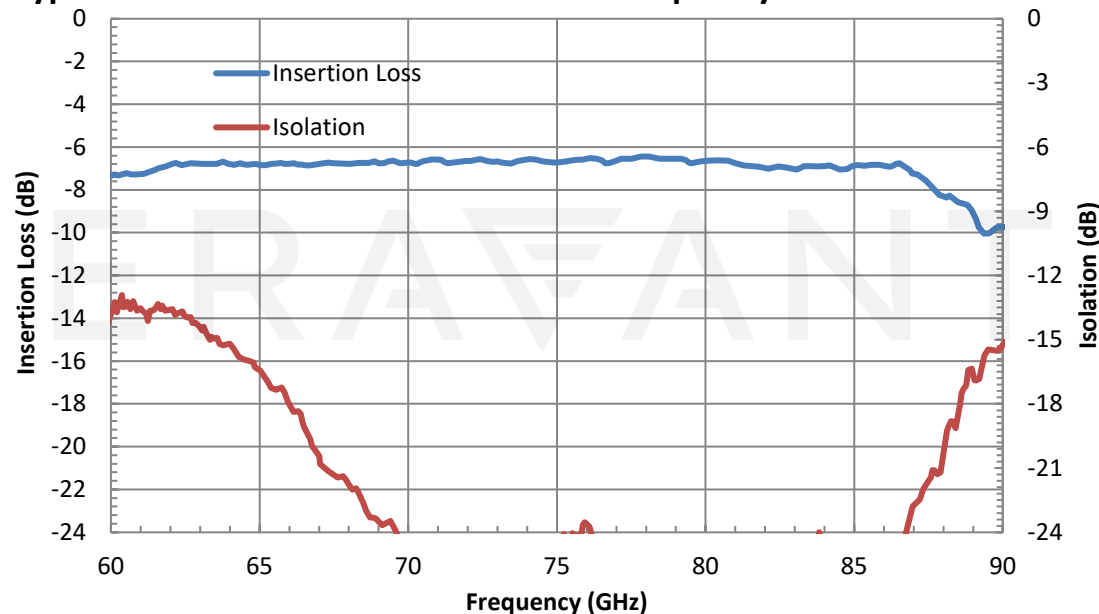
Waveguide 4-Way Power Divider

Model SWP-62386304-12-E1

Parameter	Minimum	Typical	Maximum
Frequency	62 GHz		86 GHz
Insertion Loss		0.8 dB	1.0 dB
Power Imbalance		± 0.4 dB	± 0.5 dB
Port Isolation, Adjacent Port		15 dB	
Port Isolation, Non-adjacent Port		25 dB	
Input / Output VSWR		1.2:1	1.5:1



Typical Insertion Loss and Isolation vs. Frequency



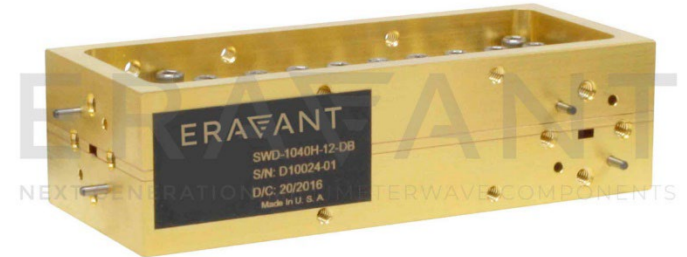
Features

- 2, 4, 8, 16, 32 Ways
- Right Angle and Inline Configuration
- Low Insertion Loss
- High Isolation
- Inline Configuration

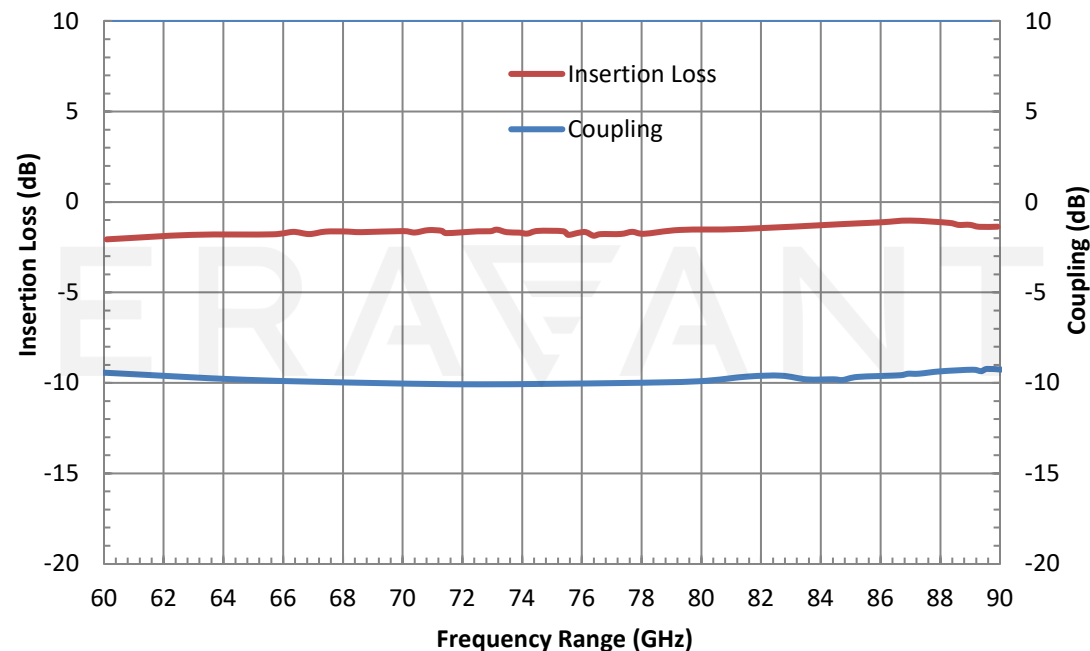
Waveguide Directional Coupler

Model SWD-1040H-12-SB

Parameter	Minimum	Typical	Maximum
Frequency	60 GHz		90 GHz
Insertion Loss*		0.8 dB	
Coupling*		10.0 dB	
Directivity*	30 dB	40 dB	
Main Line VSWR			1.1 : 1



Typical Performance vs. Frequency



Features

- Full Band Operation
- 3, 6, 10, 20, 30, 40 dB
- Dual Directional
- Bi-Directional
- Waveguide Version
- Low Insertion Loss
- High Directivity

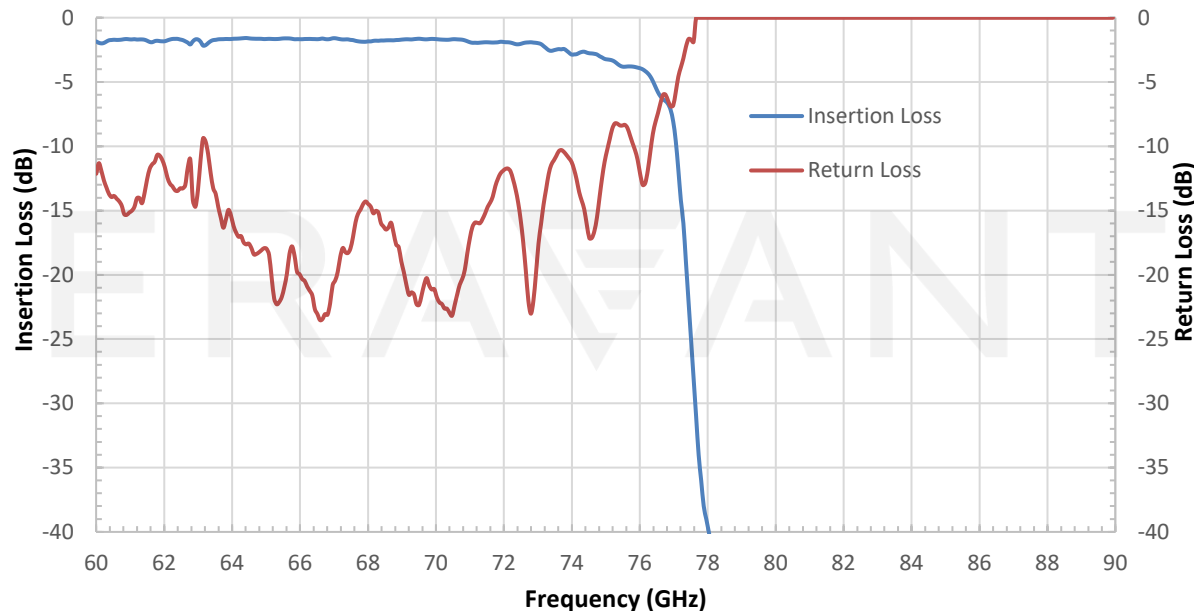
Waveguide Lowpass Filter 50 to 75 GHz

Model SWF-75379340-12-L1

Parameter	Minimum	Typical	Maximum
Passband Frequency	50 GHz		75 GHz
Passband Insertion Loss		2.2 dB	3.0 dB
Passband Ripple		± 0.4 dB	
Rejection Frequency, Low Side	DC		48 GHz
Rejection Frequency, High Side	79 GHz		110 GHz
Rejection		40 dB	
Passband VSWR		1.5:1	



Typical Insertion Loss and Return Loss vs. Frequency



Features

- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

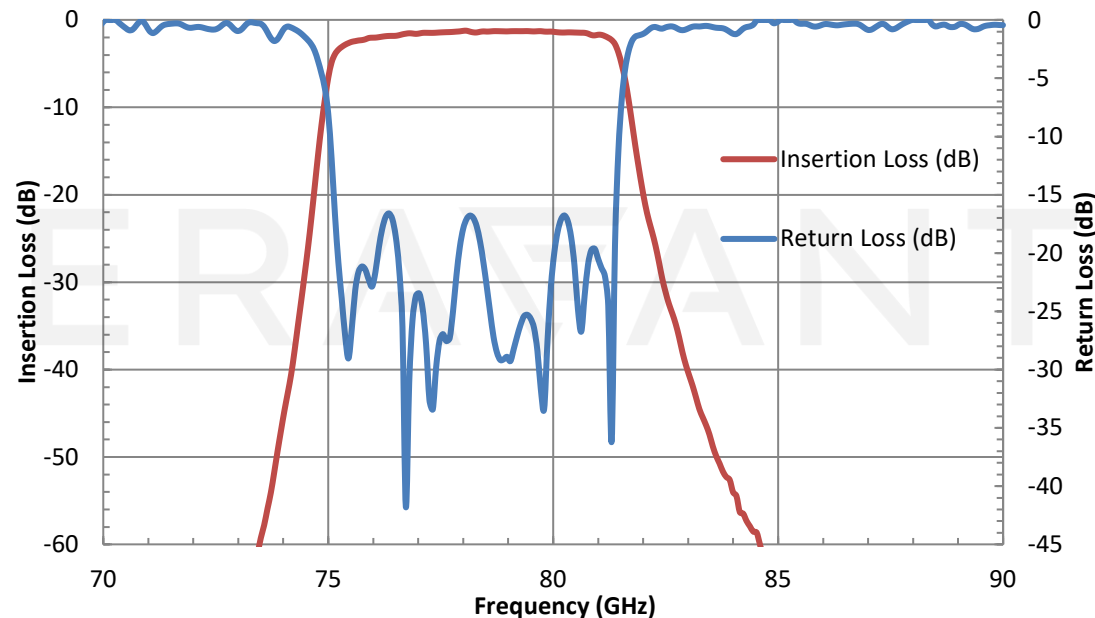
Waveguide Bandpass Filter

Model SWF-79305340-12-B1

Parameter	Minimum	Typical	Maximum
Passband Frequency	76 GHz		81 GHz
Passband Insertion Loss		2.0 dB	3.0 dB
Passband Ripple		± 0.3 dB	
Rejection Frequency, Low Side	DC		73 GHz
Rejection Frequency, High Side	84 GHz		105 GHz
Rejection	40 dB		
Passband VSWR		1.2:1	



Typical Performance vs. Frequency



Features

- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

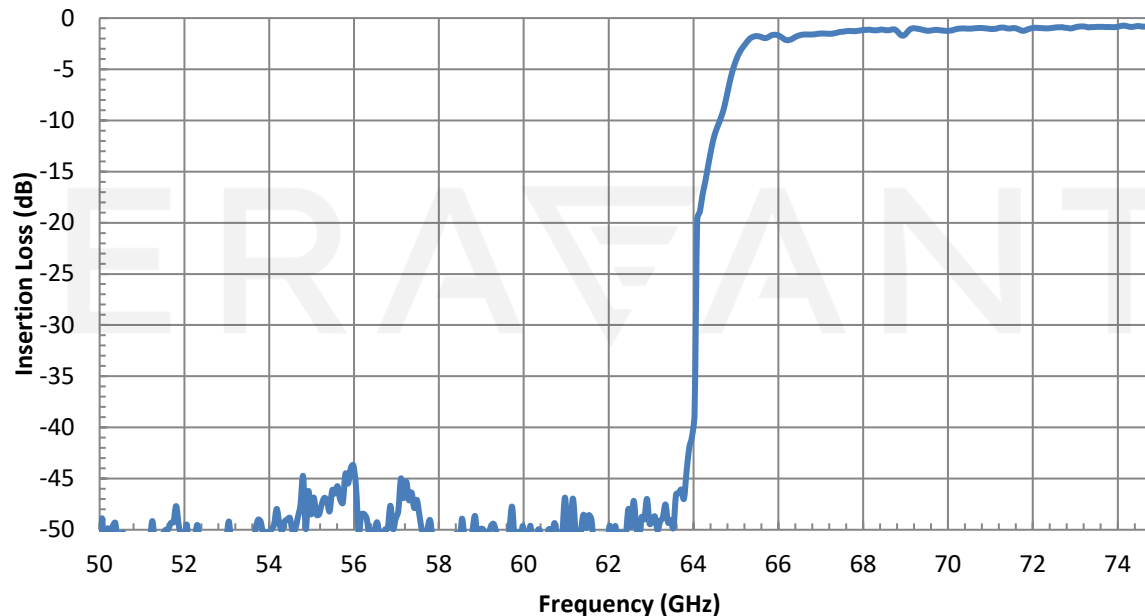
Waveguide Highpass Filter, 67 GHz and Higher

Model SWF-67363340-12-H1

Parameter	Minimum	Typical	Maximum
Passband Frequency	67 GHz		
Passband Insertion Loss		1.0 dB	3.0 dB
Passband Ripple		± 0.3 dB	
Rejection Frequency, Low Side	DC		63 GHz
Rejection		40 dB	
Passband VSWR		1.2:1	
Waveguide	WR-12 with UG-387/U Flange		



Typical Insertion Loss vs. Frequency



Features

- Lowpass, Highpass and Bandpass
- Narrow and Broadband
- Low Cost
- Low Insertion Loss
- High Rejection

Waveguides

- Straights: 1", 2" etc. and Custom Length
- Bends, 45 °, 90° and Custom Angle
- Twists, 45 °, 90° and Custom Angle
- Flexible Waveguides, 1", 2", 3" and 4"



Waveguide E-Bend: 90°



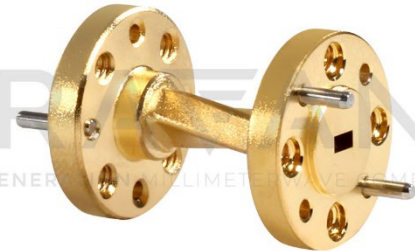
Flexible Waveguide: 2"



Waveguide Straight: 2"



Waveguide H-Bend: 90°



Waveguide Twist: 90°

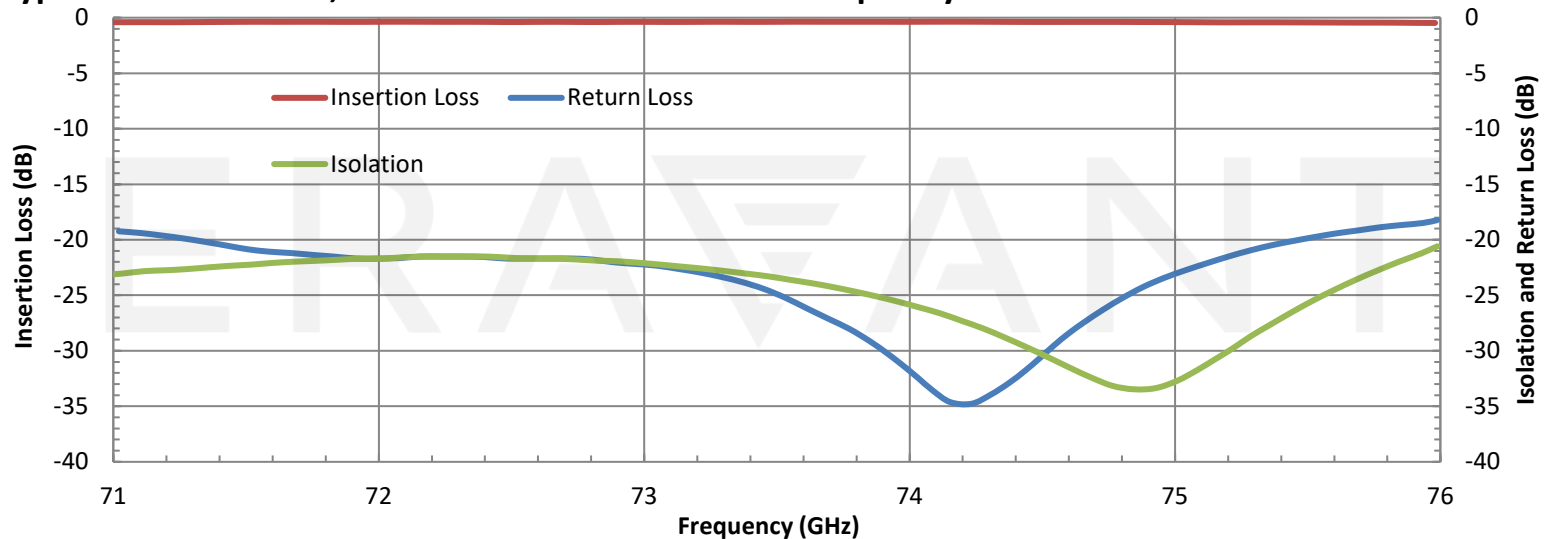
Junction Isolators and Circulators, 71 to 76 GHz

Model SNW-7137630818-12-I1 and SNW-7137630818-12-C1

Parameter	Minimum	Typical	Maximum
RF Frequency Range	71 GHz		76 GHz
Insertion Loss			0.8 dB
Isolation	18 dB		
VSWR			1.4:1
Forward Power Handling			3 W (CW)
Reverse Power Handling			1 W (CW)



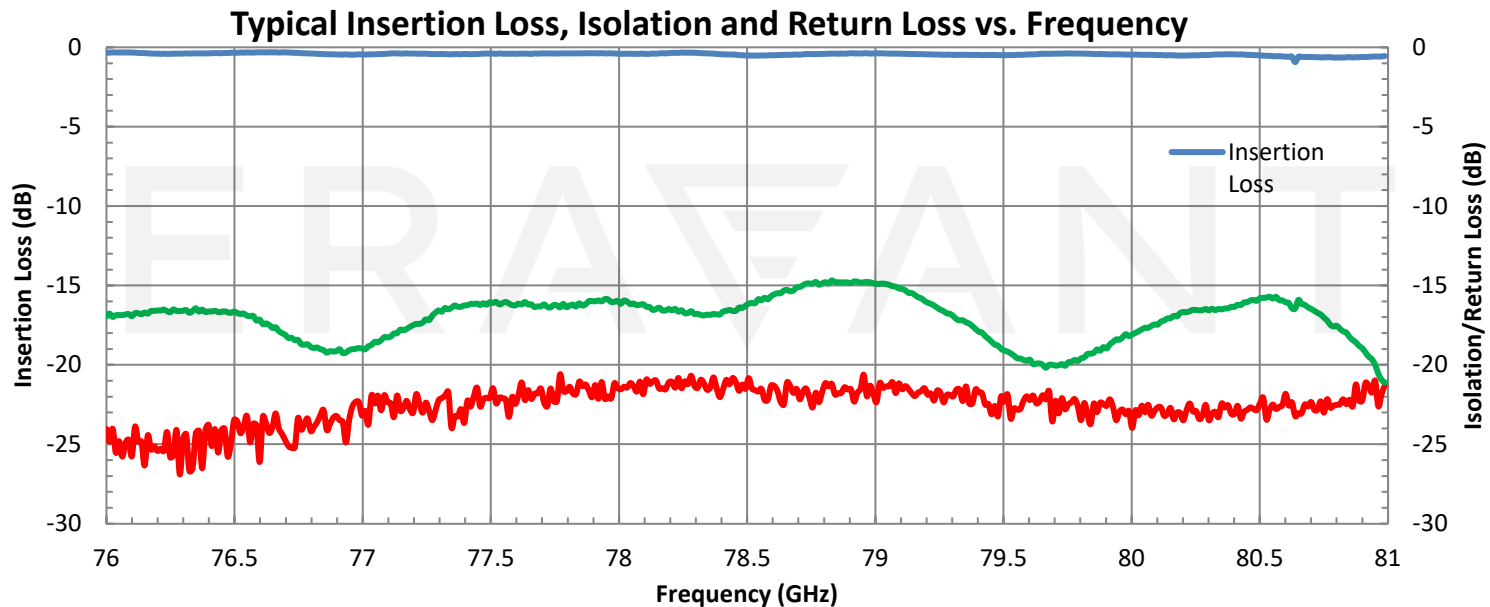
Typical Insertion Loss, Isolation and Return Loss vs. Frequency



Junction Isolators and Circulators, 76 to 81 GHz

Model SNW-7638130818-12-I1 and SNW-7638130818-12-C1

Parameter	Minimum	Typical	Maximum
RF Frequency Range	76 GHz		81 GHz
Insertion Loss			0.8 dB
Isolation	18 dB		
VSWR			1.4:1
Forward Power Handling			3 W (CW)
Reverse Power Handling			1 W (CW)



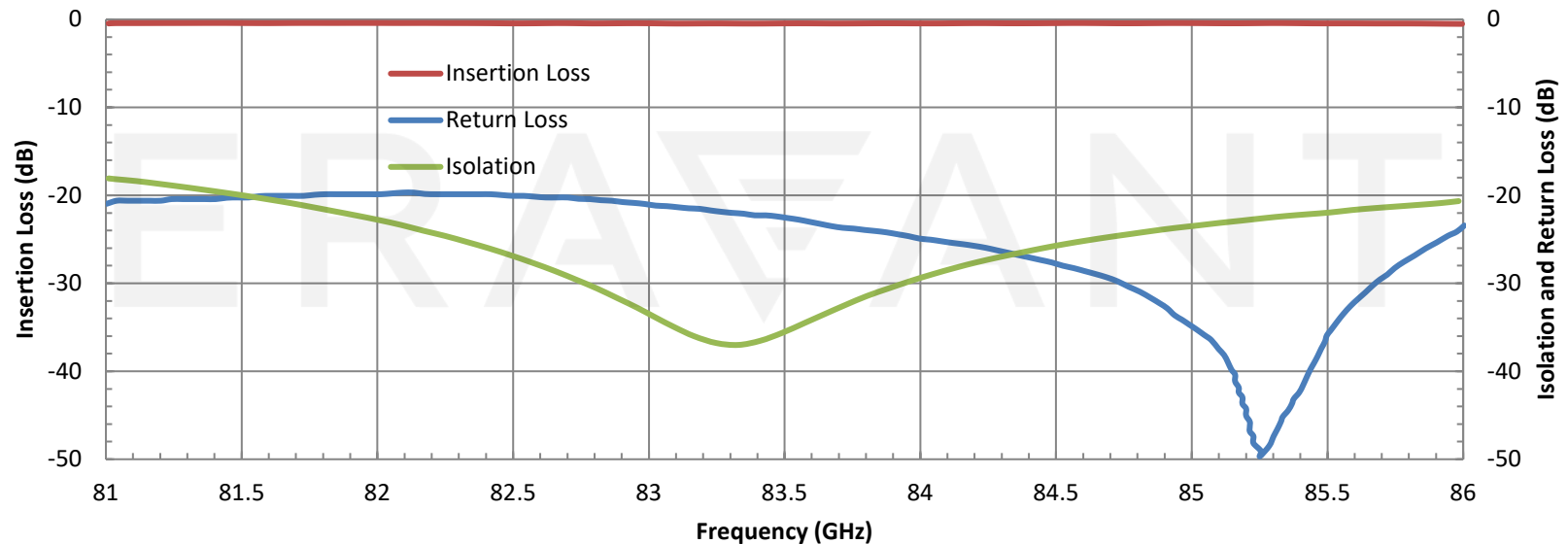
Junction Isolators and Circulators, 81 to 86 GHz

Model SNW-8138630818-12-I1 and SNW-8138630818-12-C1

Parameter	Minimum	Typical	Maximum
RF Frequency Range	81 GHz		86 GHz
Insertion Loss			0.8 dB
Isolation	18 dB		
VSWR			1.4:1
Forward Power Handling			3 W (CW)
Reverse Power Handling			1 W (CW)



Typical Insertion Loss, Isolation and Return Loss vs. Frequency



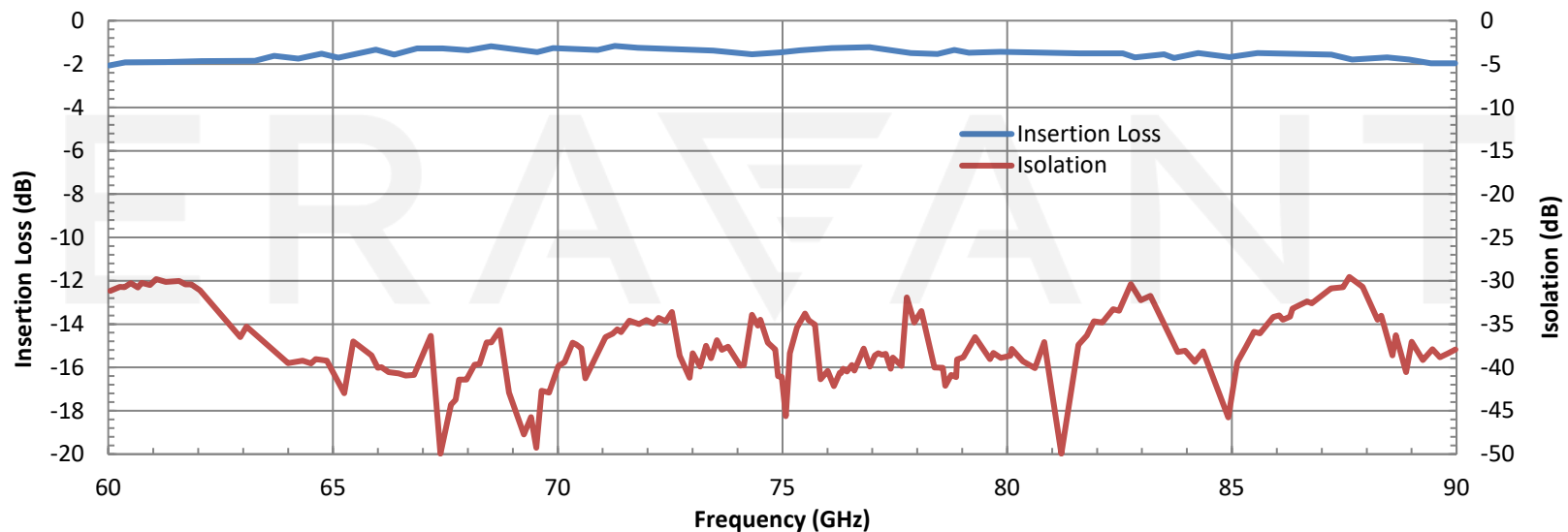
Faraday Isolator, Full Band

Model SNW-8138630818-12-I1 and SNW-8138630818-12-C1

Parameter	Minimum	Typical	Maximum
RF Frequency Range	60 GHz		90 GHz
Insertion Loss		1.5 dB	2.0 dB
Isolation		28 dB	
VSWR			1.4:1
Forward Power Handling		1 W (CW)	1.2 W (CW)
Reverse Power Handling		1 W (CW)	1.2 W (CW)



Typical Performance vs. Frequency



Dual Channel Down Converter, 72 to 84 GHz

Model SSK-SC763863-12-C1

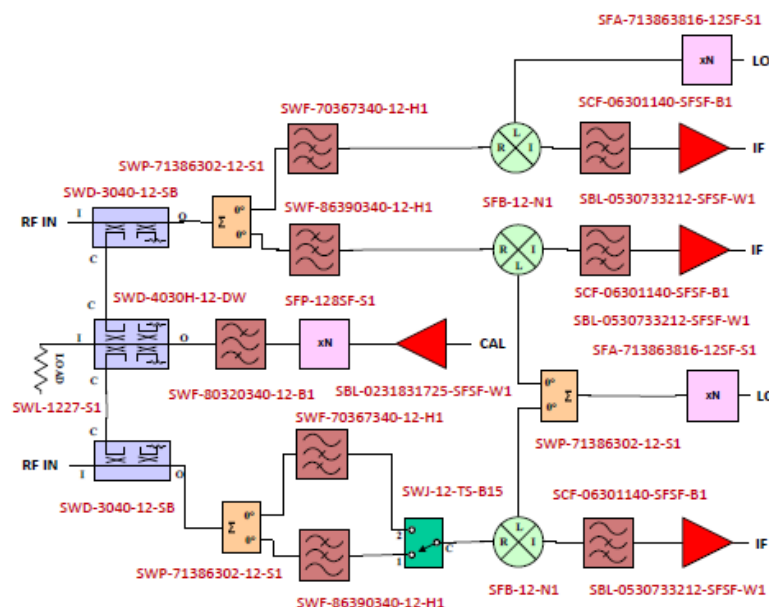
Features

- 72 to 84 GHz Operation
- Broad RF Bandwidth
- 5 dB Noise Figure
- 100 dB RF to IF Gain



Parameter	Minimum	Typical	Maximum
RF Frequency	76 GHz		78 GHz
RF Input Power		-100 dBm	
RF Noise Figure		4.5 dB	
LO Frequency		9.75 GHz	
LO Power		+6 dBm	+ 10 dBm
IF Frequency		6.0 GHz	
IF Power		0 dBm	+ 10 dBm
RX Conversion Gain		100 dB	
VSWR		2:1	
DC Voltage Supply 1		+8 V _{DC}	
DC Current Supply 1		875 mA	
DC Voltage Supply 2		+12 V _{DC}	
DC Current Supply 2		700 mA	
RF Port	WR-12 Waveguide With UG-387/U Flange		
LO Port	SMA (F)		
IF Ports	SMA (F)		

Functional Block Diagram:



FMCW Transceiver, 76 to 86.4 GHz

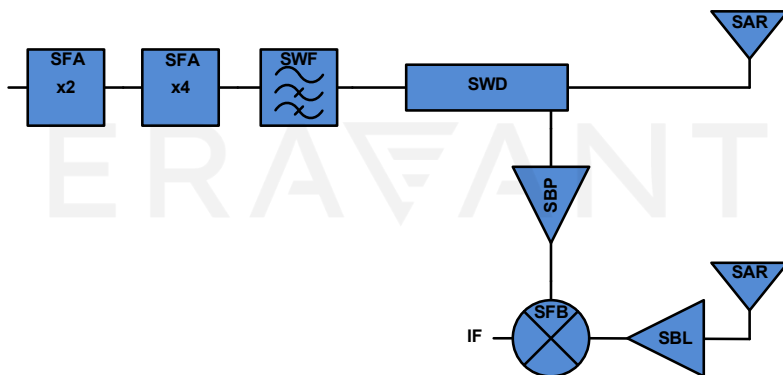
Model SSK-SC763863-12-C1

Features

- 76 to 86.4 GHz Operation
- Broad FM Bandwidth
- High TX/RX Isolation



Functional Block Diagram:



Parameter	Minimum	Typical	Maximum
TX Frequency	76.0 GHz		86.4 GHz
TX Power		+10 dBm	
Input Frequency	9.5 GHz		10.8 GHz
Input Power		+0 dBm	+1 dBm
RX Frequency	76.0 GHz		86.4 GHz
RX Noise Figure		6.0 dB	
RX Conversion Gain		16 dB	
IF Frequency	DC		10 GHz
DC Supply Voltage		+8 V _{DC} /1,000 mA	

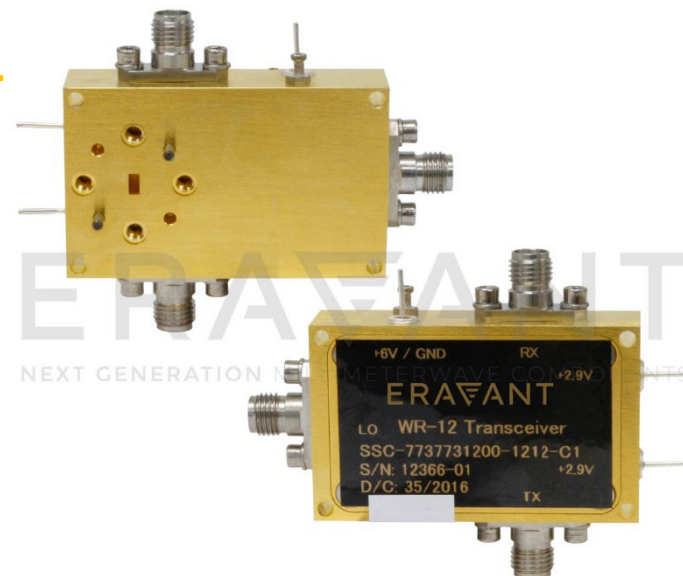
TX/RX Module, 76 to 78 GHz

Model SSC-7737731200-1212-C1

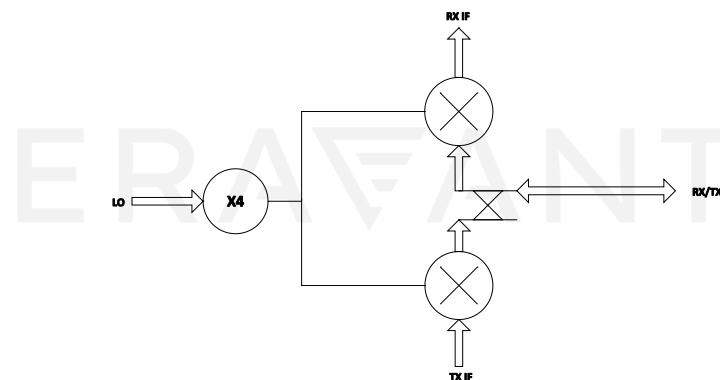
Features

- Compact size
- Built-in X4 Active Multiplier
- Common TX/RX RF port
- Separate TX/RX IF Port

Parameter	Minimum	Typical	Maximum
TX RF Output Frequency	76 GHz		78 GHz
TX RF Output Power	-30 dBm		
TX IF Input Frequency	550 MHz		950 MHz
TX IF Input Power			0 dBm
RX RF Input Frequency	76 GHz		78 GHz
RX RF Input Power		-20 dBm	+3 dBm
RX IF Output Frequency	550 MHz		950 MHz
RX Conversion Loss		-12 dB	
LO Frequency	19.0 GHz		19.5 GHz
LO Input Power		+5 dBm	
TX Mixer DC Voltage Supply		+5V _{DC}	+6 V _{DC}
TX Mixer Current Supply		2.0 mA	2.5 mA
RX Mixer DC Voltage Supply		+5 V _{DC}	+6 V _{DC}
RX Mixer Current Supply		2.0 mA	2.5 mA
LO DC Voltage Supply		+6 V _{DC}	
LO Current Supply		300 mA	



Functional Block Diagram:



Full Band VNA Frequency Extender

Model STO-12203-U6

Features

- Full Band Coverage
- Dynamic Range of 110 dB
- AC Power Input: 100 to 240 VAC

Applications

- Dual Source and 4 Port VNA Extension
- E band S-Parameter Measurement
- Test Lab Instrumentation



Parameter	Minimum	Typical	Maximum
RF Operating Frequency	60 GHz		90 GHz
Test Port Output Power	0 dBm	+5 dBm	
Dynamic Range		110 dB	
Test Port Match		18 dB	
Directivity		40 dB	
RF Source Input Frequency	10 GHz		15 GHz
RF Source Input Power	+0 dBm	+3 dBm	+6 dBm
LO Source Input Frequency	10 GHz	+3 dBm	15 GHz
LO Source Input Power	+0 dBm		+6 dBm
IF Frequency Range	10 MHz		1000 MHz



Full Band Waveguide Calibration Kit

Model STQ-TO-12-S1-CKIT1

Features

- Precisely Machined and Manufactured
- Metrology Grade
- High Electrical Performance
- Ruggedized Packaging



Components Included in the Kit

Item	Eravant M/N	Quantity
Metrology Fixed Short	STQ-WS-VG-F1	1 Piece
Metrology Fixed Waveguide Load	STQ-WL-1223-S1	1 Piece
Metrology $\frac{1}{8}$ Wavelength Offset	STQ-WI-12026-SB	1 Piece
Metrology $\frac{1}{4}$ Wavelength Offset	STQ-WI-12052-SB	1 Piece
Metrology $\frac{3}{8}$ Wavelength Offset	STQ-WI-12077-SB	1 Piece
Waveguide Quick Connect, 0.75" Diameter Flange	SWH-QC-0750C-R2	2 Pieces
Waveguide Screws, 3/32 Hex Head	SWH-332-SS-10	1 Bag (10 Pieces)
Waveguide Screwdriver, 3/32 Hex Head	SWH-332-DS	1 Piece
Calibration Data, USB Drive	STQ-TO-12-S1-U	1 Piece

Full Band Frequency Extender

Model STE-SF612-18-S1

Features

- Full Waveguide Band Operation
- High Output Power
- Low Harmonics and Spurious Emission
- Cost Effective
- Instrumentation Grade
- Adjustable/Removable Legs

Applications

- Network Analyzer Systems
- Frequency Sources
- Test Instrumentations



Parameter	Minimum	Typical	Maximum
Input Frequency Range	10 GHz		15 GHz
Input Power Range		+18 dBm	
Output Frequency Range	60 GHz		90 GHz
Output Power		+5.0 dBm	
Harmonics		-20 dBc	
Spurious		-60 dBc	
DC Voltage	+6 V _{DC}		+15 V _{DC}
DC Current		950 mA	

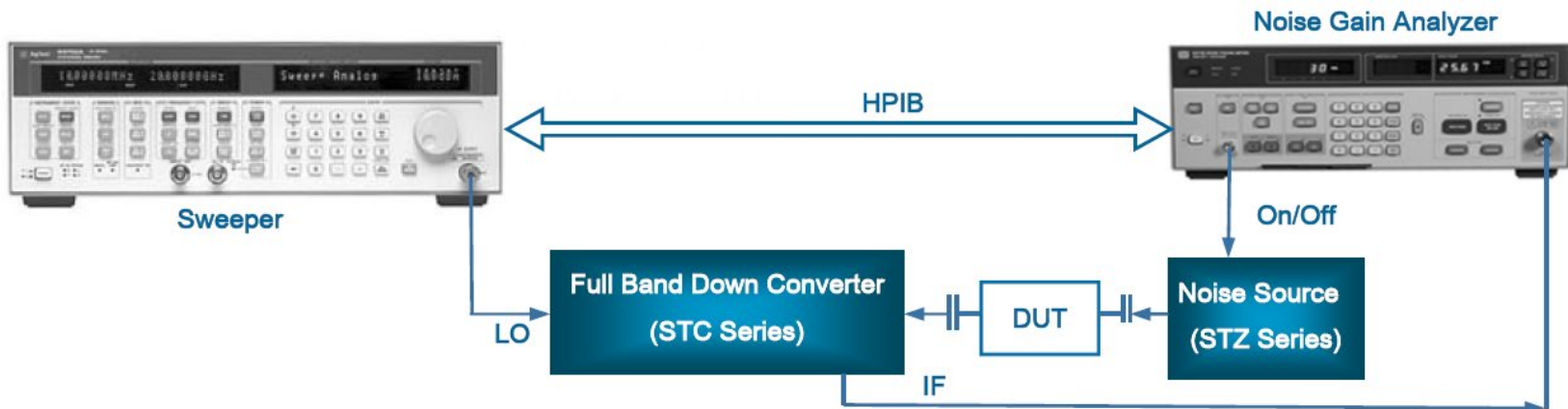
Full Band Noise Figure and Gain Test Extender

Model STG-12-S2

Parameter	Minimum	Typical	Maximum
RF Frequency Range	60 GHz		90 GHz
Noise Source: ENR	11.0 dB	13.0 dB	
Noise Source: Bias	+ 18 V _{DC} /50mA	+28 V _{DC} /60mA	+30 V _{DC} /75mA
IF Frequency Range	10 MHz		1.6 GHz
LO Frequency Range	10 GHz		15 GHz
LO Power		+0 dBm	+3 dBm
N.F. Dynamic Range	0 dB		20 dB
Conversion Gain		20 dB	
Down-Converter: Bias		+12 V _{DC} /450mA	+15 V _{DC} /550mA



Test Set Arrangement:



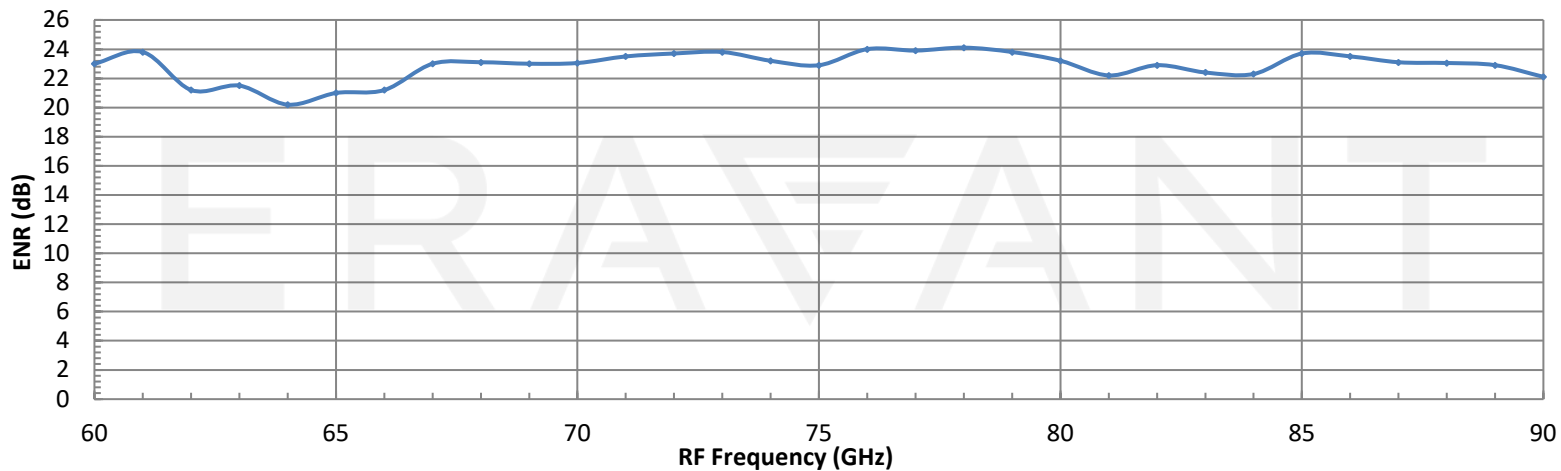
High ENR Noise Source with Isolator

Model STZ-60396320-12-I1

Parameter	Minimum	Typical	Maximum
RF Frequency Range	60.0 GHz		90.0 GHz
ENR	17.0 dB	20.0 dB	
ENR Flatness		± 2.0 dB	
Temperature Stability		0.01 dB/°C	
Long Term Temperature Stability		0.05 dB/day	
AM Modulation Trigger	TTL		
AM Modulation Rate	1.0 KHz		
DC Bias	+18 V _{DC} /45 mA	+28 V _{DC} /75 mA	+30 V _{DC} /100 mA



Typical ENR vs. Frequency Plot:



Direct Reading Attenuator

Model STA-60-12-D1

Features

- Full Band Coverage
- High Attenuation Accuracy
- Large Scaled Dial

Applications:

- Test Lab
- Instrumentations
- Manual Test Set



Parameter	Minimum	Typical	Maximum
RF Frequency Range	60 GHz		90 GHz
Insertion Loss		0.7 dB	
Attenuation Range	0 dB		60 dB
Attenuation Accuracy	0.1 dB or 3% of reading, whichever is larger, up to 40 dB		
VSWR		1.2:1	1.3:1
Power Handling		50 mW	100 mW

Digital Direct Reading Attenuator

Model STA-60-12-D5

Features

- Full Band Coverage
- High Attenuation Accuracy
- Digital Screen with Back Light

Applications:

- Test Lab
- Instrumentations
- Manual Test Set



Parameter	Minimum	Typical	Maximum
RF Frequency Range	60 GHz		90 GHz
Insertion Loss		1.0 dB	
Attenuation Range	0 dB		60 dB
Attenuation Accuracy	0.1 dB or 2% of reading, whichever is larger, up to 40 dB		
VSWR		1.2:1	1.3:1
Power Handling		50 mW	100 mW

Programmable Attenuator

Model STA-60-12-P1

Features

- Full Band Coverage
- High Attenuation Accuracy
- IEEE-488 and USB Control Ports

Applications:

- Test Lab
- Instrumentations
- Auto Test Set



Parameter	Minimum	Typical	Maximum
RF Frequency Range	60 GHz		90GHz
Insertion Loss		1.6 dB	
Attenuation Range	0 dB		60 dB
Attenuation Accuracy	0.1 dB or 3% of reading, whichever is larger, up to 40 dB		
VSWR		1.2:1	1.3:1
Power Handling		400 mW	800 mW

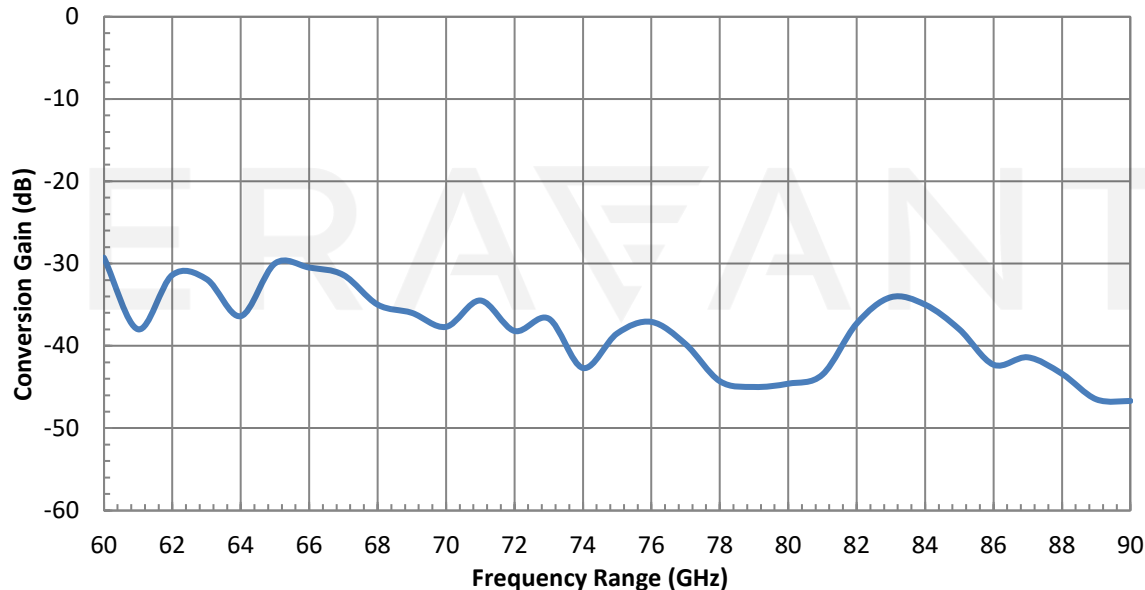
Harmonic Mixer for Keysight Spectrum Analyzer

Model SFH-12SFSF-A1

Parameter	Minimum	Typical	Maximum
RF Range	60 GHz		90 GHz
LO Frequency	3 GHz		6.1 GHz
IF Range	DC		1.3 GHz
Input Power		+16 dBm	+19 dBm
Harmonic Number		16	
Conversion Loss		45 dB	

Typical Conversion Gain vs. Frequency

$P_{RF} = -20$ dBm



Features

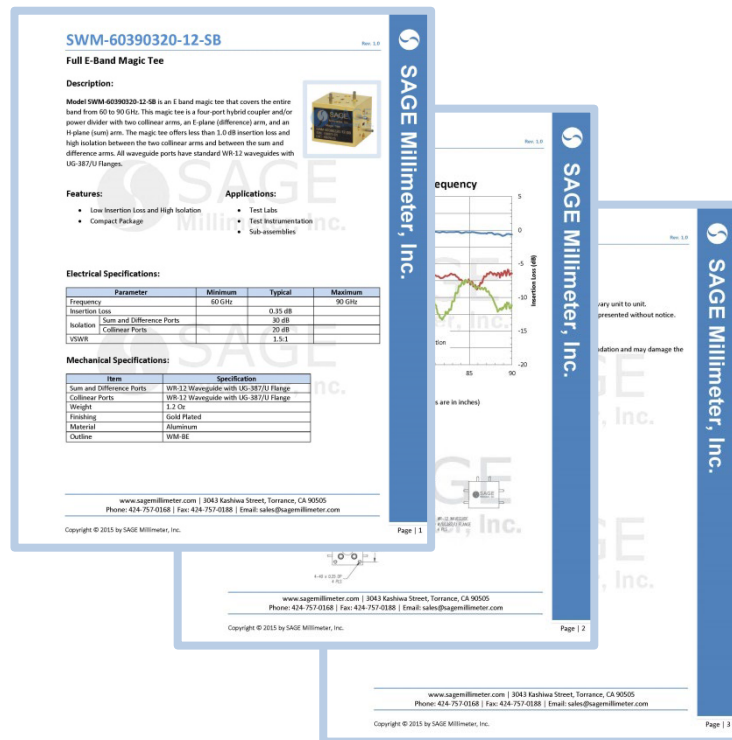
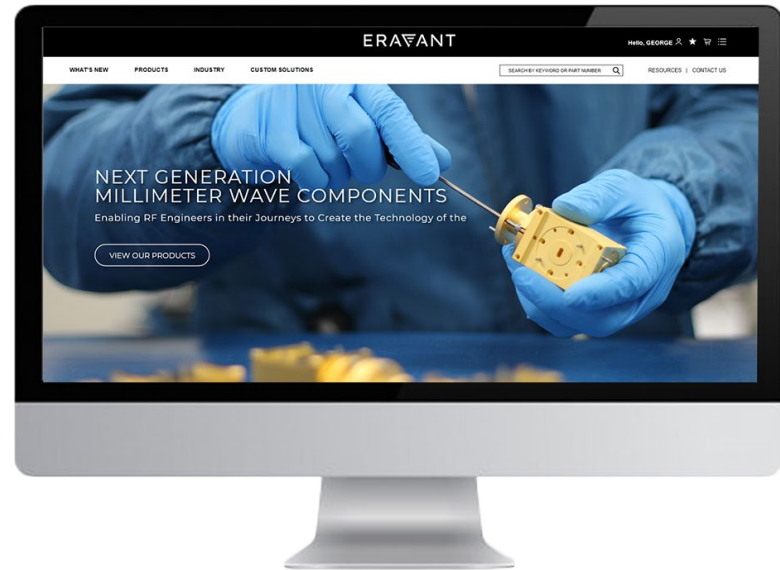
- Full Waveguide Band Operation
- No External Bias Required
- 16th Harmonic Detection

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PASSIVE FREQUENCY MULTIPLIERS

GRID TABLE 28 RESULTS

MODEL	MINIMUM OUTPUT FREQUENCY	MAXIMUM OUTPUT FREQUENCY	OUTPUT POWER	MINIMUM INPUT FREQUENCY	MAXIMUM INPUT FREQUENCY	INPUT POWER	OUTPUT PORT	INPUT PORT	DOWNLOADS	VIEW
SFP-06212-S2	110 GHz	170 GHz	0 dBm	55 GHz	85 GHz	+16 dBm	WR-08 Waveguide	WR-12 Waveguide	Datasheet	View
SFP-06319-U6	110 GHz	170 GHz	-3 dBm	36.67 GHz	56.67 GHz	+20 dBm	WR-06 Waveguide	WR-19 Waveguide	Datasheet	View
SFP-06210-S2	140 GHz	220 GHz	-3 dBm	70 GHz	110 GHz	+17 dBm	WR-05 Waveguide	WR-10 Waveguide	Datasheet	View
SFP-2234033-28SF-S1	22 GHz	40 GHz	+5 dBm	11 GHz	20 GHz	+18 dBm	WR-28 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-243423303-28SF-S1	24 GHz	42 GHz	+3 dBm	8 GHz	14 GHz	+20 dBm	WR-28 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-2835F-U9	26.5 GHz	40.0 GHz	+5 dBm	8.37 GHz	13.33 GHz	+20 dBm	WR-28 Waveguide	SMA (F)	Datasheet	View
SFP-2734033-05-28SF-S1	26.5 GHz	40 GHz	-5 dBm	8.37 GHz	13.33 GHz	+10 dBm	WR-28 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-2235F-S1	33 GHz	50 GHz	+3 dBm	11 GHz	16.67 GHz	+20 dBm	WR-22 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-222KF-S1	33 GHz	50 GHz	+7 dBm	16.5 GHz	25 GHz	+20 dBm	WR-22 Waveguide	2.82 mm (F)	Datasheet STEP File	View
SFP-363673303-19SF-N1	57 GHz	36 GHz	+3 dBm	12 GHz	19 GHz	+20 dBm	WR-19 Waveguide	SMA (F)	Datasheet STEP File	View
SFP-192KF-S1	40 GHz	60 GHz	+6 dBm	20 GHz	30 GHz	+20 dBm	WR-19 Waveguide	2.82 mm (F)	Datasheet STEP File	View