

NLTL-6273S

GaAs MMIC Non-Linear Transmission Line

DEVICE OVERVIEW

General Description

NLTL-6273 is a MMIC non-linear transmission line (NLTL) based comb generator. This NLTL offers excellent phase noise performance over a low 0.7 to 5 GHz input frequency range with output tones beyond 40 GHz. NLTL-6273 is fabricated with GaAs Schottky diode based varactors on a 2.28 mm x 3.13 mm substrate. Both wire bondable die and connectorized modules are available.



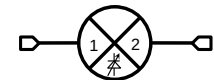
Features

- Low Phase Noise
- Broadband Input Frequencies
- No External DC Bias Required

Applications

- Comb Line Generation
- High Efficiency Multiplication

Functional Block Diagram



Part Ordering Options

Part Number	Description	Package	Packing Size	Green Status	Product Lifecycle	Export Classification
NLTL-6273S	GaAs MMIC Non-Linear Transmission Line	S	-	RoHS REACH	Released	EAR99

Table Of Contents

- **Device Overview**
 - General Description
 - Features
 - Applications
 - Functional Block Diagram
- **Port Configuration and Functions**
 - Port Diagram
 - Port Functions
- **Revision History**
- **Specifications**
 - Absolute Maximum Ratings
 - Package Information
 - Recommended Operating Conditions
 - Sequencing Requirements
 - Electrical Specifications
 - Typical Performance Plots
- **Mechanical Data**
 - Outline Drawing
- **Operation**
 - Application Information

Revision History

Revision Code	Revision Date	Comment
-	2017-08-01	Datasheet Initial Release
A	2017-09-01	Minor Clarification/Text Changes
B	2017-10-01	Corrected typos
C	2019-08-01	Added DC Current Plot

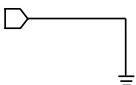
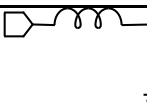
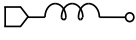
Port Configuration and Functions

Port Diagram

A top-down view of the NLTL-6273's CH package outline drawing is shown below. The NLTL should only be used in the forward direction, with the input and output ports given in Port Functions.



Port Functions

Port	Function	Description	Equivalent Circuit for Package
GND	Ground	S package ground provided through metal housing and outer coax conductor.	
Port 1	Input	Port 1 is diode connected for the CH package and DC short for the S package.	
Port 2	Output	Port 2 is diode connected for the CH and DC open for the S package.	

Specifications

Absolute Maximum Ratings

The Absolute Maximum Ratings indicate limits beyond which damage may occur to the device. If these limits are exceeded, the device may be inoperable or have a reduced lifetime.

Parameter	Maximum Rating	Unit
Maximum Operating Temperature	100	°C
Maximum Storage Temperature	125	°C
Minimum Operating Temperature	-55	°C
Minimum Storage Temperature	-65	°C

Package Information

Parameter	Details	Rating
Weight	Package name: S	10g
Dimensions	-	13.21 x 14.22 mm

Recommended Operating Conditions

The Recommended Operating Conditions indicate the limits, inside which the device should be operated, to guarantee the performance given in Electrical Specifications. Operating outside these limits may not necessarily cause damage to the device, but the performance may degrade outside the limits of the electrical specifications. For limits, above which damage may occur, see Absolute Maximum Ratings.

Parameter	Min	Nominal	Max	Unit
Input Power	16	-	26	dBm
Ambient Temperature	-55	25	100	°C

Sequencing Requirements

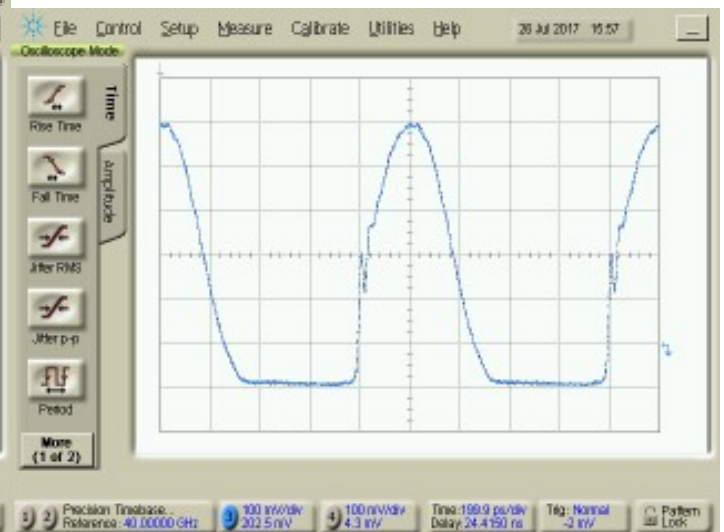
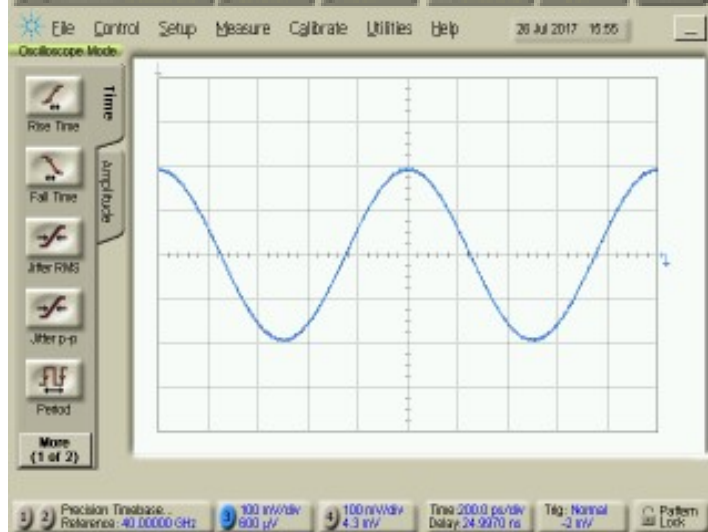
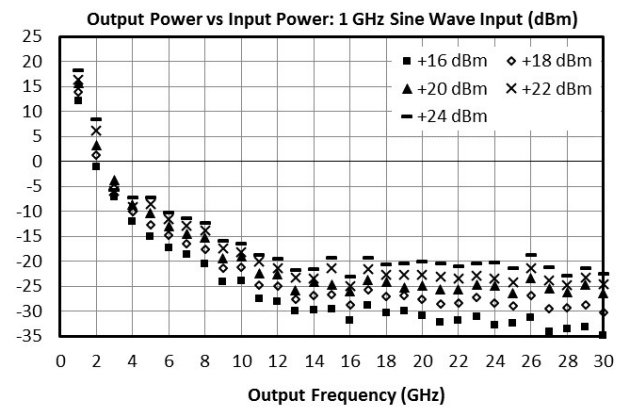
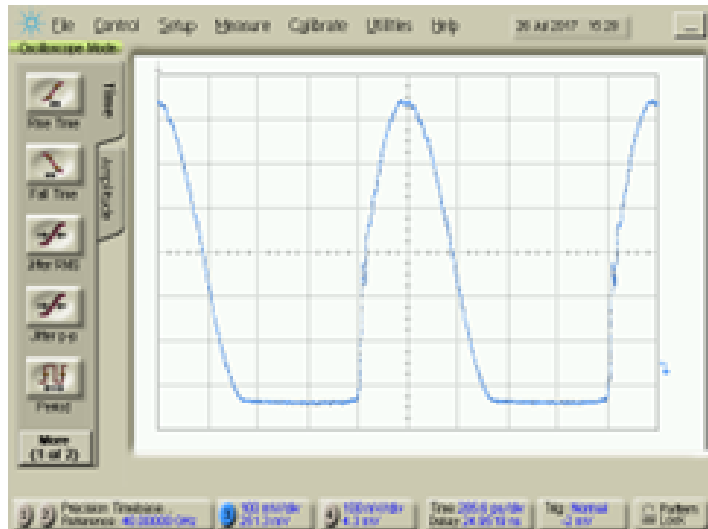
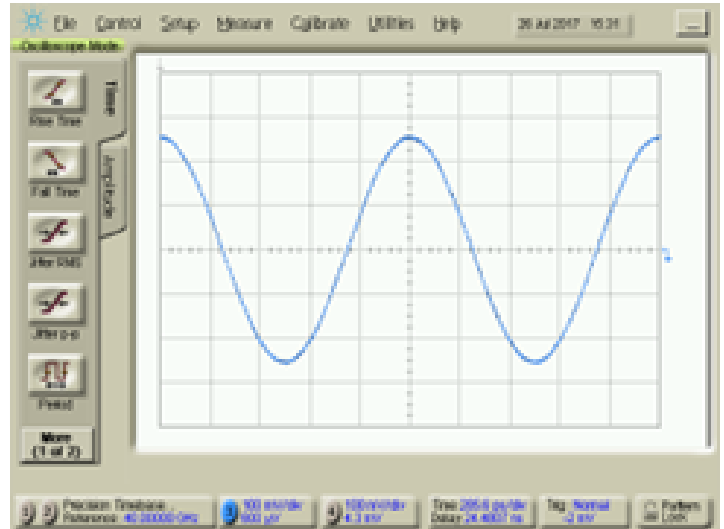
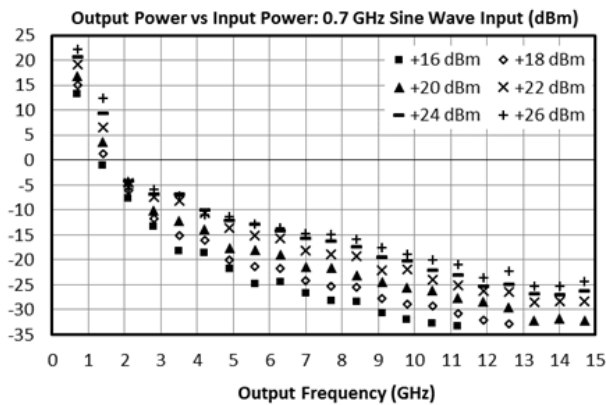
This is a passive NLTL that requires no external DC bias. Self-bias of the diodes is sufficient for operation. It is not required, but is recommended to provide a 50Ω termination to each port before applying RF power.

Electrical Specifications

The electrical specifications apply at TA=+25°C in a 50Ω system. Typical data shown is for the NLTL used in the forward direction with a +20 dBm sine wave input. Min and Max limits apply only to our connectorized units and are guaranteed at Tau=+25°C. All bare die are 100% DC tested and visually inspected.

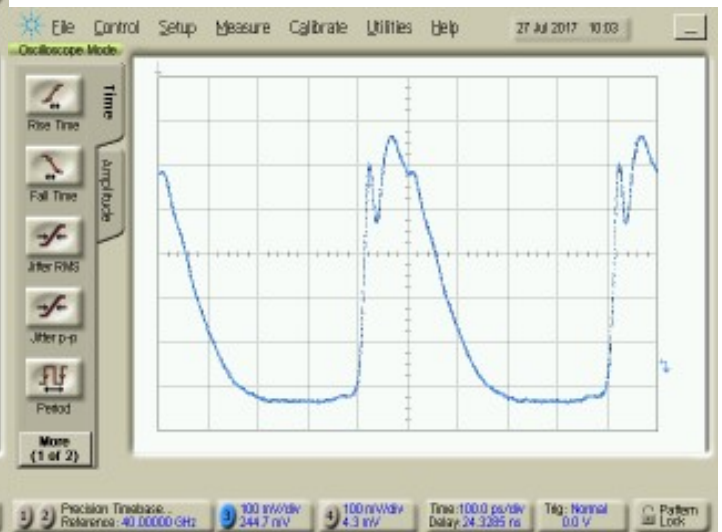
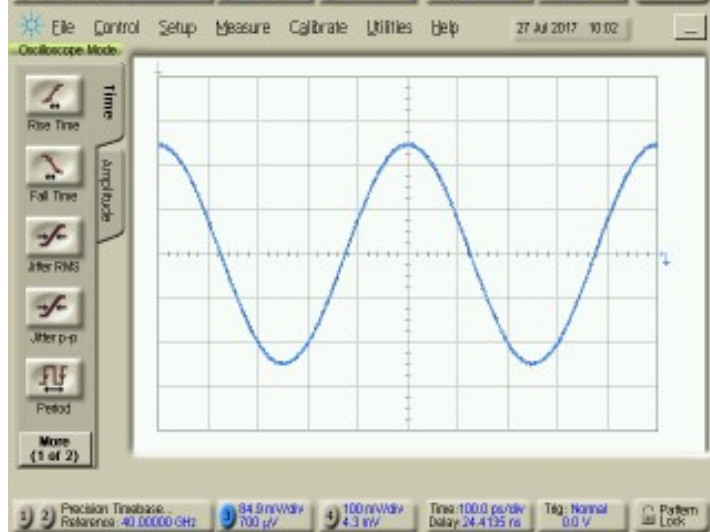
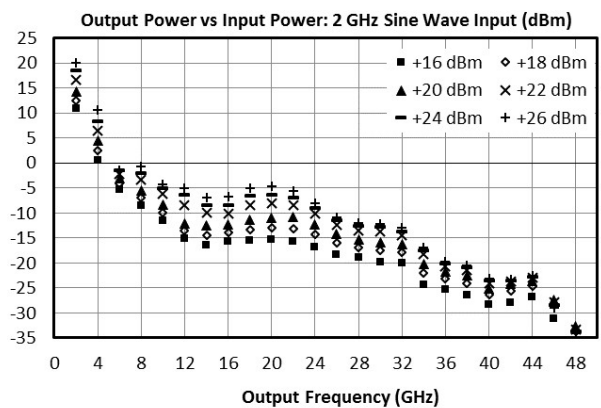
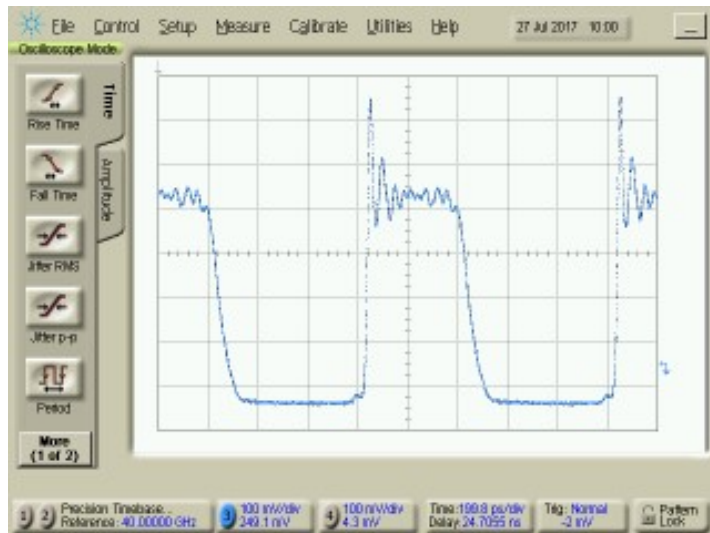
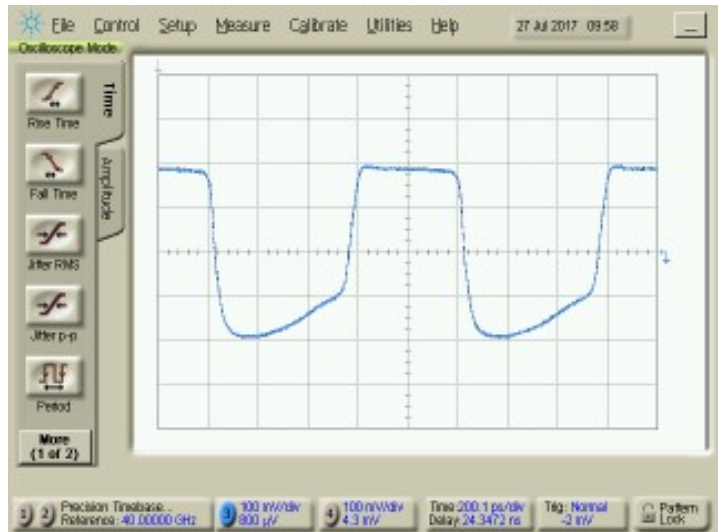
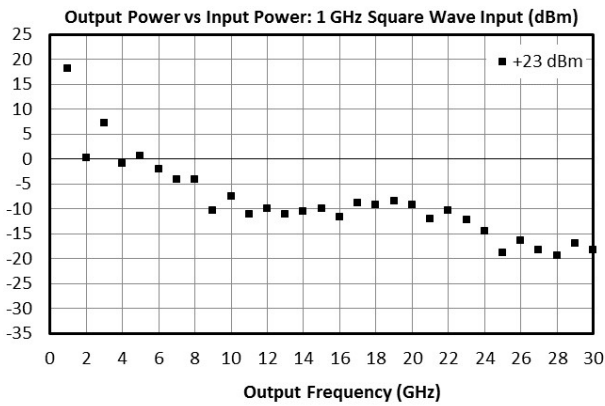
Parameter	Test Conditions	Minimum Frequency (GHz)	Maximum Frequency (GHz)	Min	Typ	Max	Unit
Input Frequency Range	-	-	-	0.7	-	5	GHz
Output Frequency Range	-	-	-	0.7	-	40	GHz
Input Power	-	-	-	16	-	26	dBm
Maximum Output Harmonic for given Input	1 GHz Input	-	-	-	-	30	-
Maximum Output Harmonic for given Input	2 GHz Input	-	-	-	-	17	-
Maximum Output Harmonic for given Input	4 GHz Input	-	-	-	-	10	-
Maximum Output Harmonic for given Input	5 GHz Input	-	-	-	-	8	-
Maximum Output Harmonic for given Input	Input=0.7 GHz	-	-	-	-	10	-

Typical Performance Plots



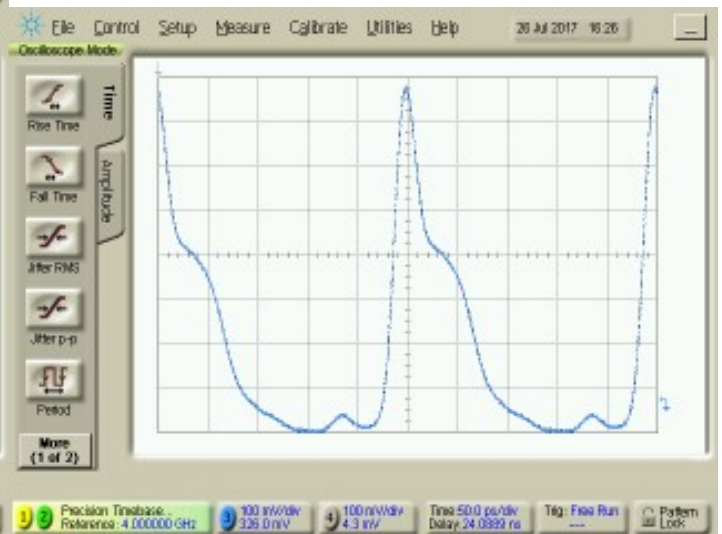
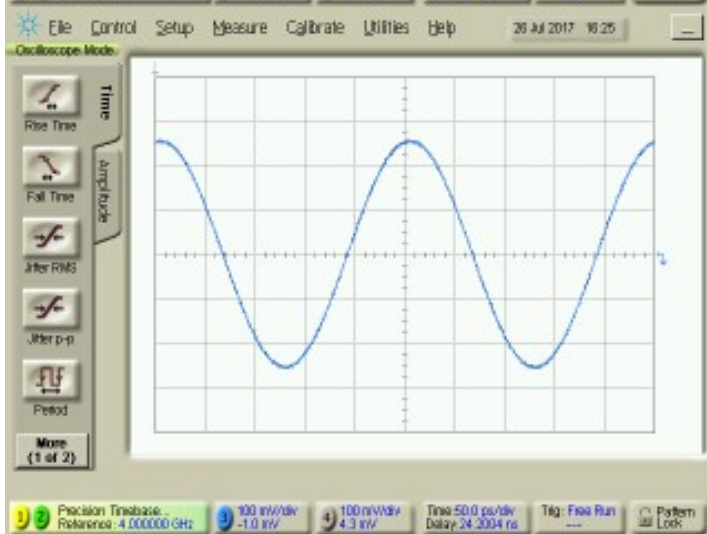
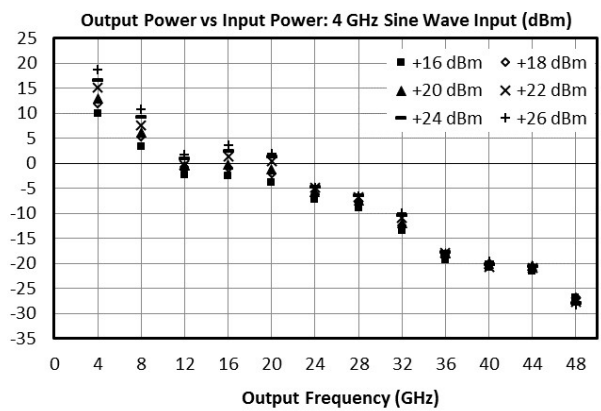
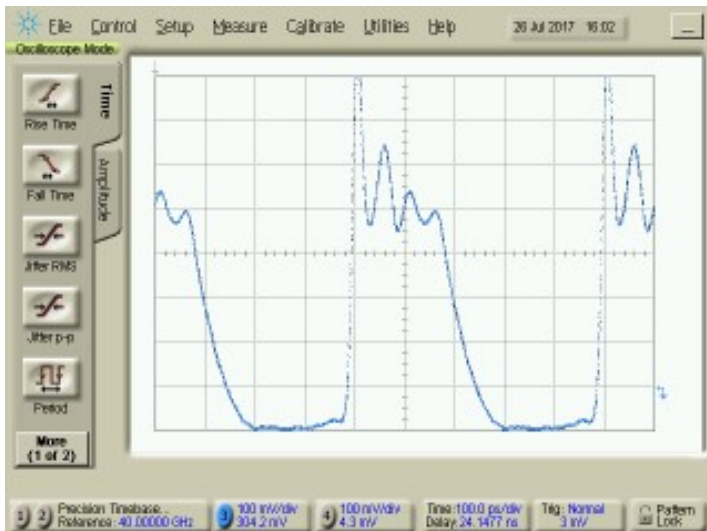
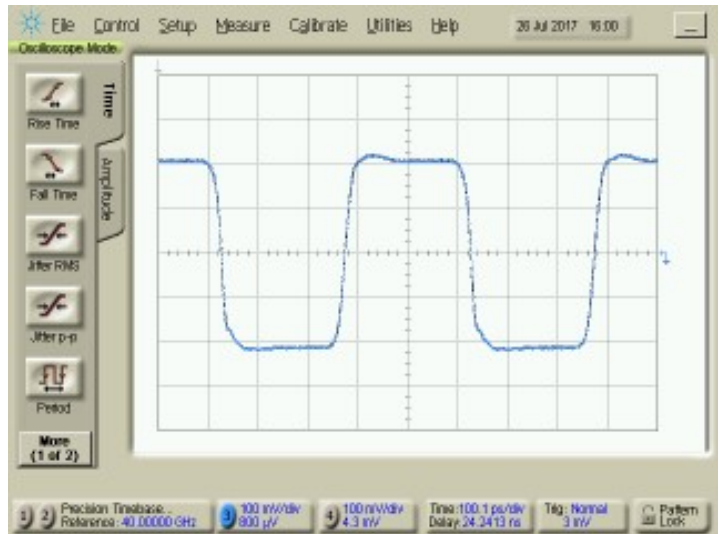
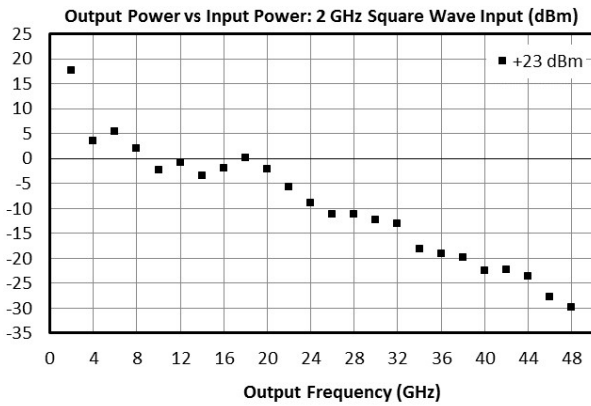
NLTL-6273S

GaAs MMIC Non-Linear Transmission Line



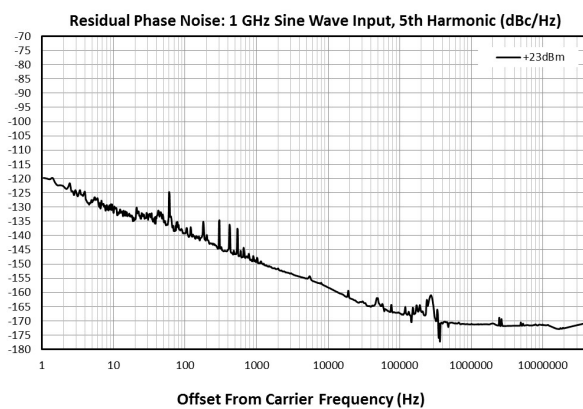
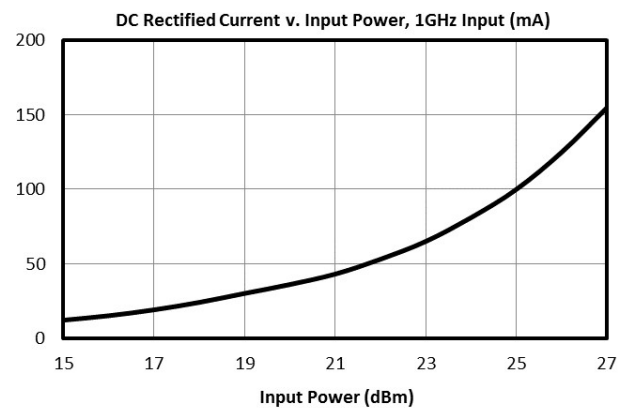
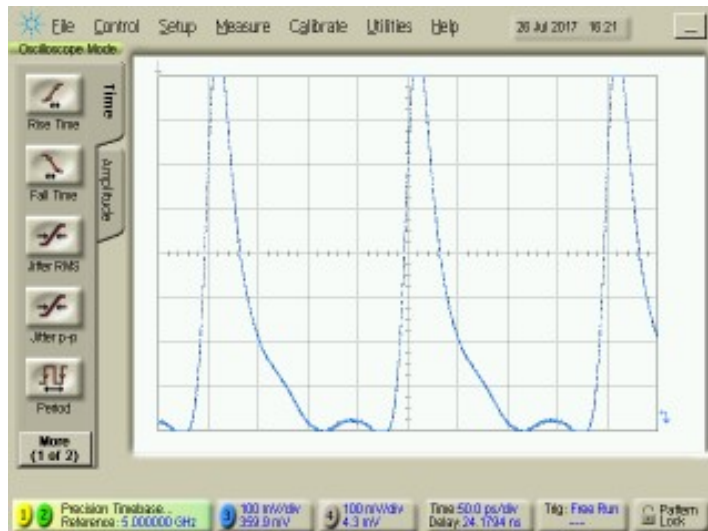
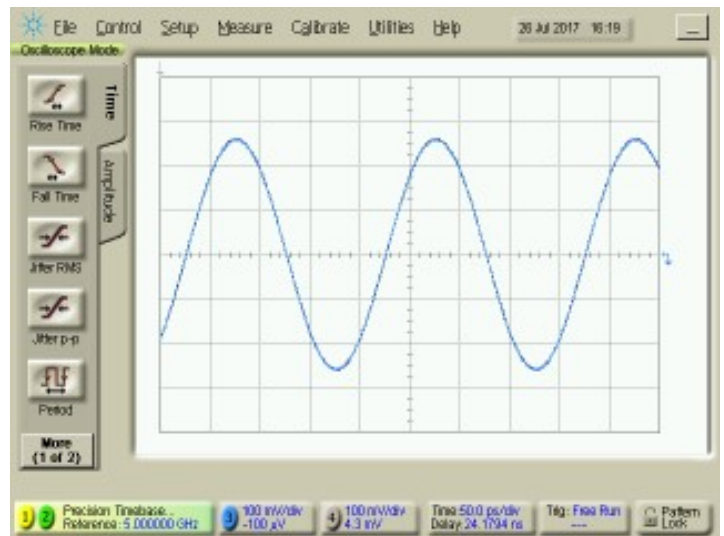
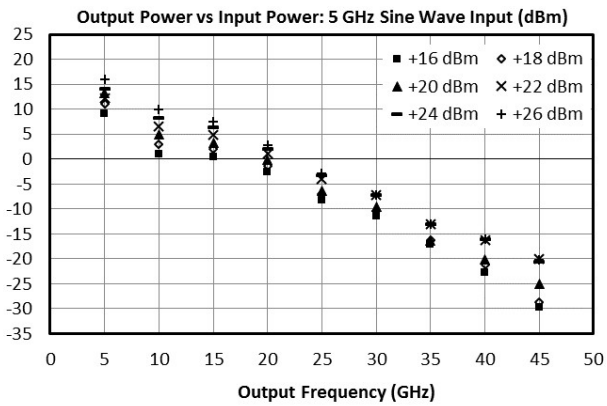
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1 GHz, +23 dBm Sine Wave Input		Parameter	Min	Typical	Max
5 th Output Harmonic		1 Hz Offset		-120	
		10 Hz Offset		-130	
		100 Hz Offset		-140	
		1 kHz Offset		-150	
		10 kHz Offset		-160	
		100 kHz Offset		-170	
		1 MHz Offset		Thermal Floor	

Application Information

NLTL-6273 belongs to Marki Microwave's NLTL family of multipliers and non-linear transmission lines. The NLTL product line consists of passive GaAs MMIC non-linear transmission lines designed and fabricated with GaAs Schottky diode based varactors. NLTLs take an input signal and create an impulse train of harmonics. Harmonic outputs up to and beyond 40 GHz are generated by the NLTL. The NLTL-6273SM is the packaged 5 mm QFN version of the NLTL-6273CH.

Port 1 supports L and S band input signals. Port 2 will output integer multiples of the input signal (i.e., x2, x3, x4, ..., x30) up to the 30th output harmonic or a maximum of 40 GHz. Higher harmonics can be generated but will be at a lower efficiency.

The operating conditions of the NLTL are extremely important to optimize performance. High power inputs will increase the output power observed; however, the conversion efficiency will decrease. This is increasingly true for higher input frequencies and at input powers above the recommended limit. Optimal conversion efficiency of the NLTL is achieved using a square wave input with a fast rise time. Doing so causes a degradation in the 2nd output harmonic but otherwise improves the conversion efficiency at all other harmonics.

NLTL-6273 requires no external DC bias. The self-bias of the diodes caused by the rectified RF input signal is sufficient for operation. For the best performance, optimization of the DC return path is recommended for each specific application to optimize the harmonic output power distribution.

The phase noise of a non-linear transmission line is outstanding. If verification of performance is necessary, the application circuit used and input conditions are extremely important. NLTLs are AM sensitive. If there is excessive AM noise on the input of the NLTL, observing the output of the NLTL will show excessive PM/phase noise because of the high AM to PM conversion property of NLTLs.

NLTL-6273S

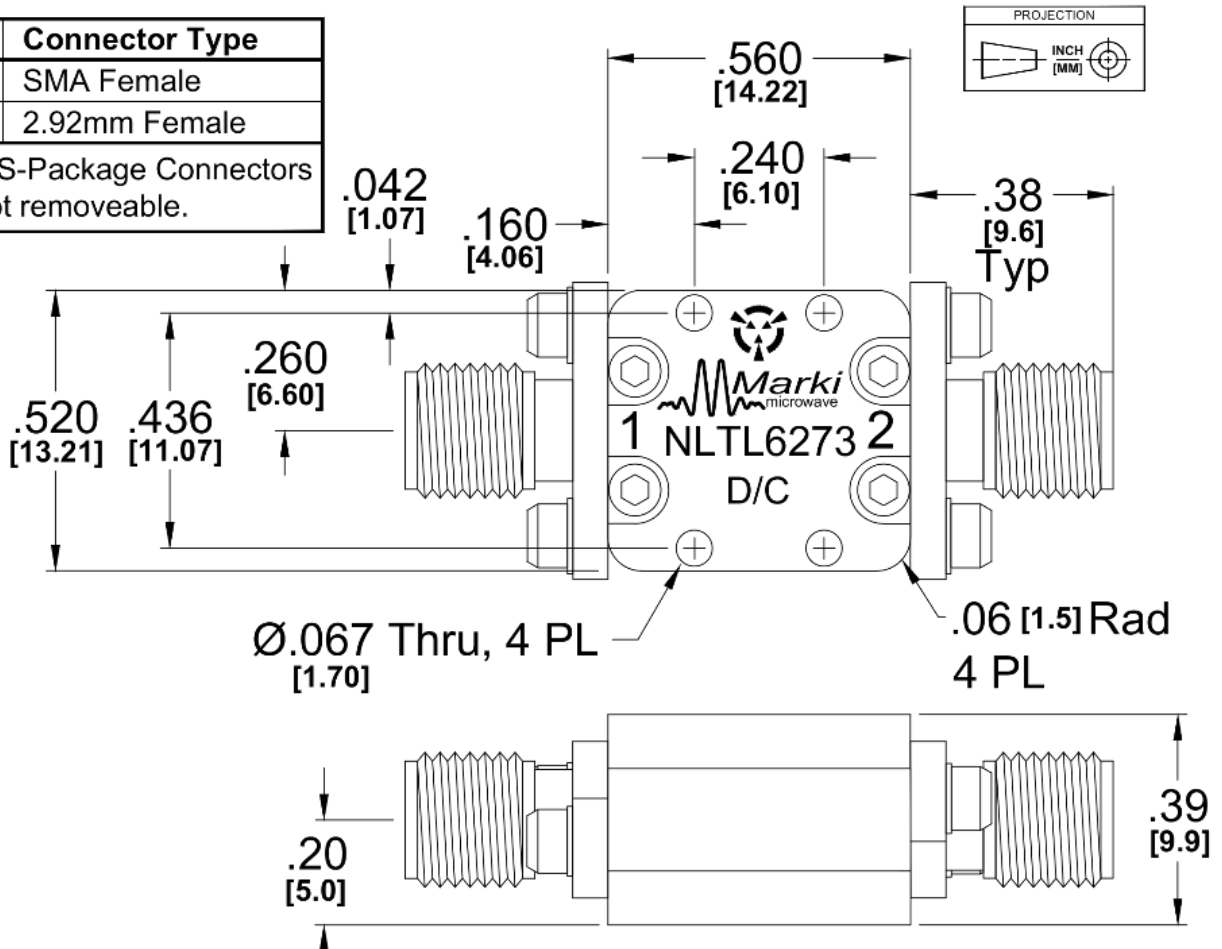
GaAs MMIC Non-Linear Transmission Line

Mechanical Data

Outline Drawing

Port	Connector Type
1	SMA Female
2	2.92mm Female

Note: S-Package Connectors are not removeable.



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