ENGIN-IC

Miniature Lowpass Filter ENGFC00022

Preliminary

Lowpass Filter; 12.0 GHz
ENGFC00022

Typical Applications

- Miniature clean-up circuit
- Narrow or Wideband Products
- Space Hybrids
- Military Hybrids
- Test and Measurement Systems

Features

- Wideband performance
- Excellent return loss
  - > 20 dB typical
- Small Size
  - 1.5 x 0.72 x 0.1 mm
  - 0.059 x 0.028 x 0.004 inch
- RF Power handling: +32 dBm

Description

The ENGFC00022 is a miniature lowpass filter design with a cutoff frequency above 12 GHz. The device offers low insertion loss of less than 0.3 dB. It provides a minimum of 5 dB attenuation from 24 to 36 GHz. The design optimizes around small size and custom products can incorporate additional rejection as required. The filter has gold backside metallization and is designed to be silver epoxy attached. The RF interconnects are designed to account for wire bonds and external microstrip flares for optimal integrated return loss. No additional ground interconnects are required.

Capabilities

- Low cost custom product development
- 3 to 7 section response
- Capabilities for:
  - Bandpass
  - Highpass
  - Lowpass
- 32 dBm power handling standard
- 40 dBm with custom design

Electrical Specifications, T = 25 ^{o}C, Typical Data, ENGFC00022

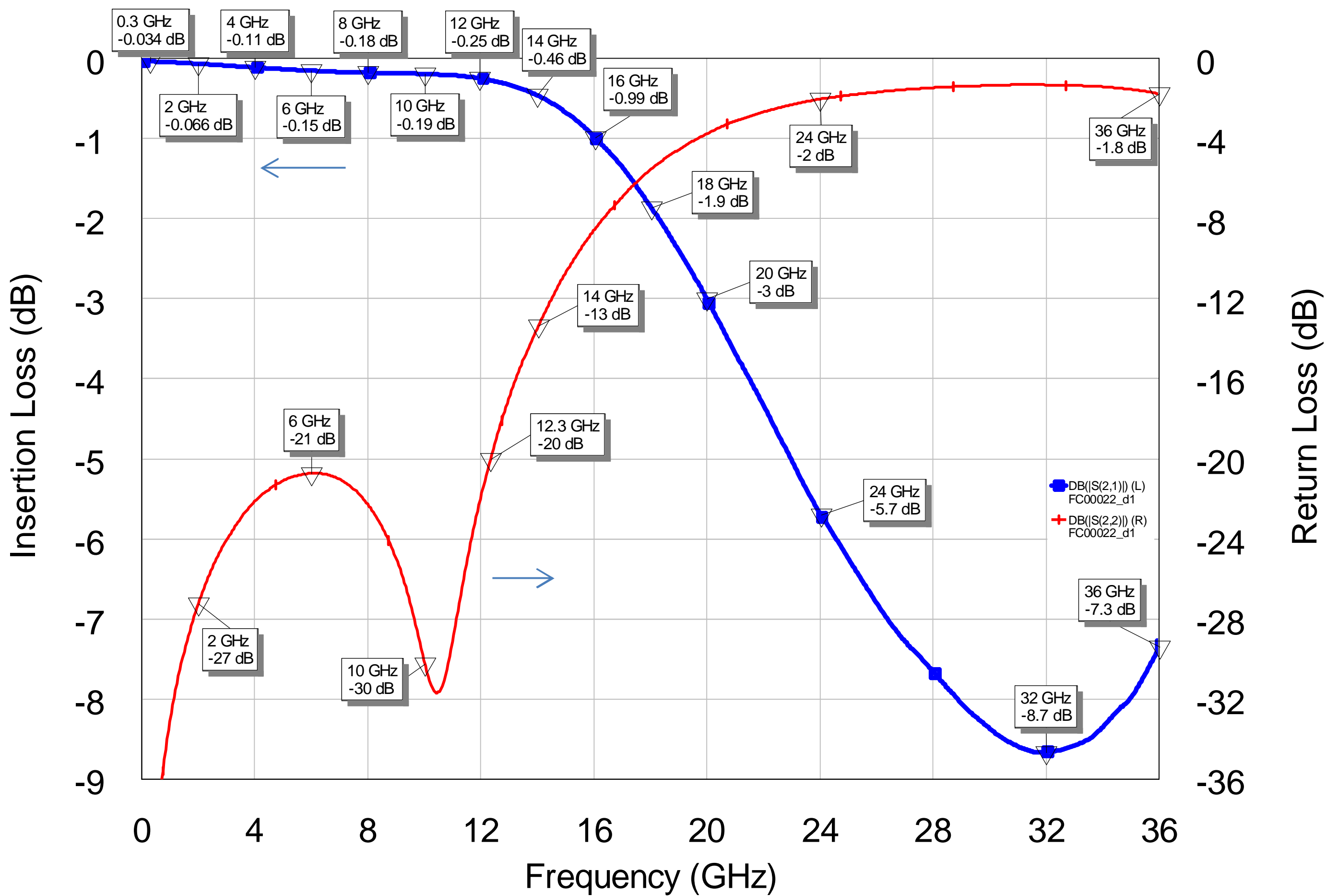
Parameter	Symbol	Minimum	Typical	Maximum	Units
Insertion Loss @ 2 GHz	IL		0.07	0.15	dB
Insertion Loss @ 12 GHz	IL		0.25	0.35	dB
Input Return Loss	S11		20.0		dB
Output Return Loss	S22		20.0		dB
Attenuation @ 24 GHz	Rej	5			dB
Max Operating Power	Phand			32	dBm

Absolute Maximum Ratings

Parameter	Max level
RF Power	+34 dBm
Storage Temperature	-65 ^{o}C to +150 ^{o}C
Operating Temperature	-55 ^{o}C to +125 ^{o}C

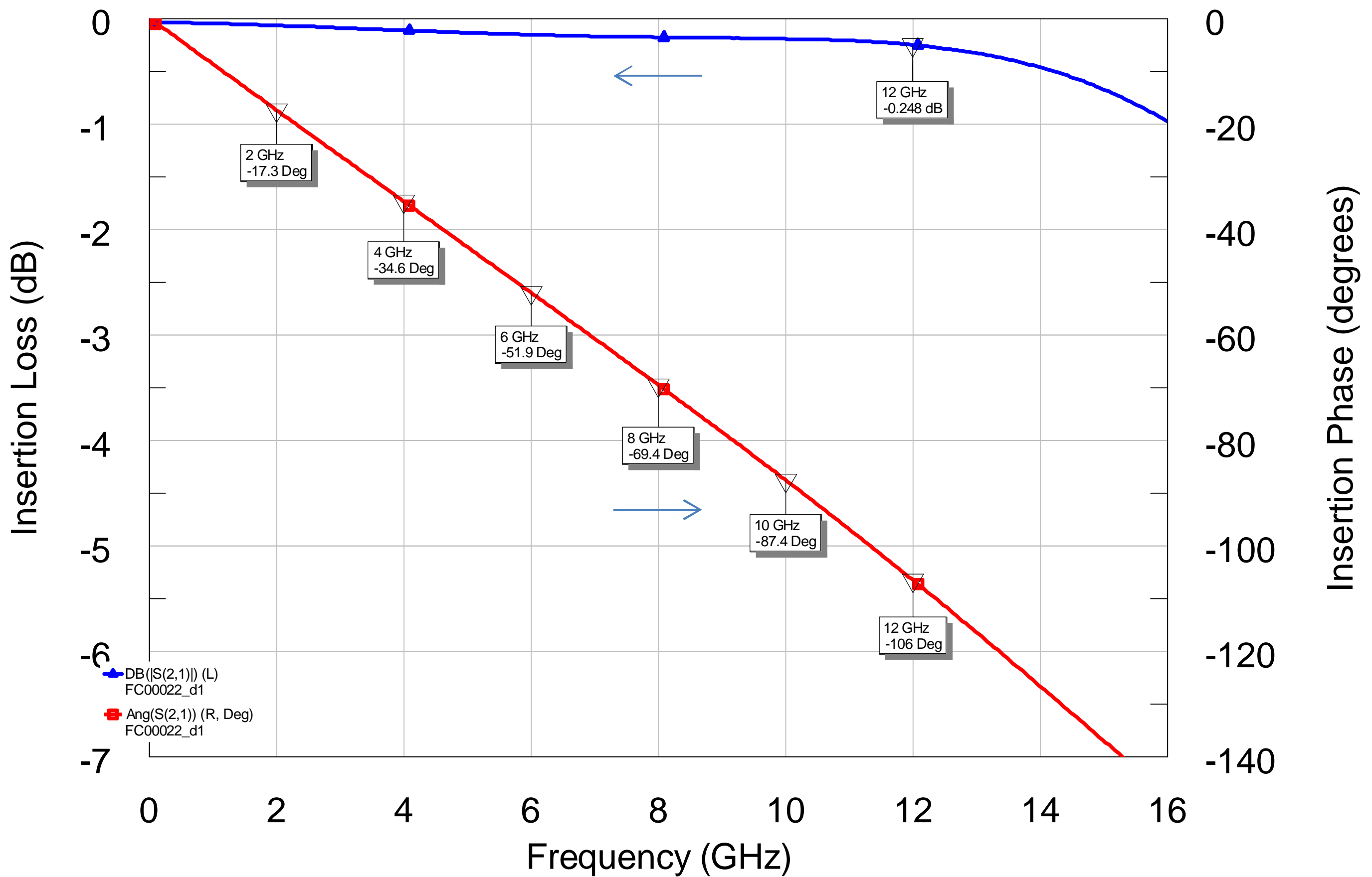
Measured RF Insertion Loss & I/O Return Loss (dB);

assembly includes bond wires and external microstrip flares



ENGIN-IC, Inc
1721 W. PLANO PKWY STE 121 Plano, TX 75075
Phone 972-332-5000
www.engin-ic.com

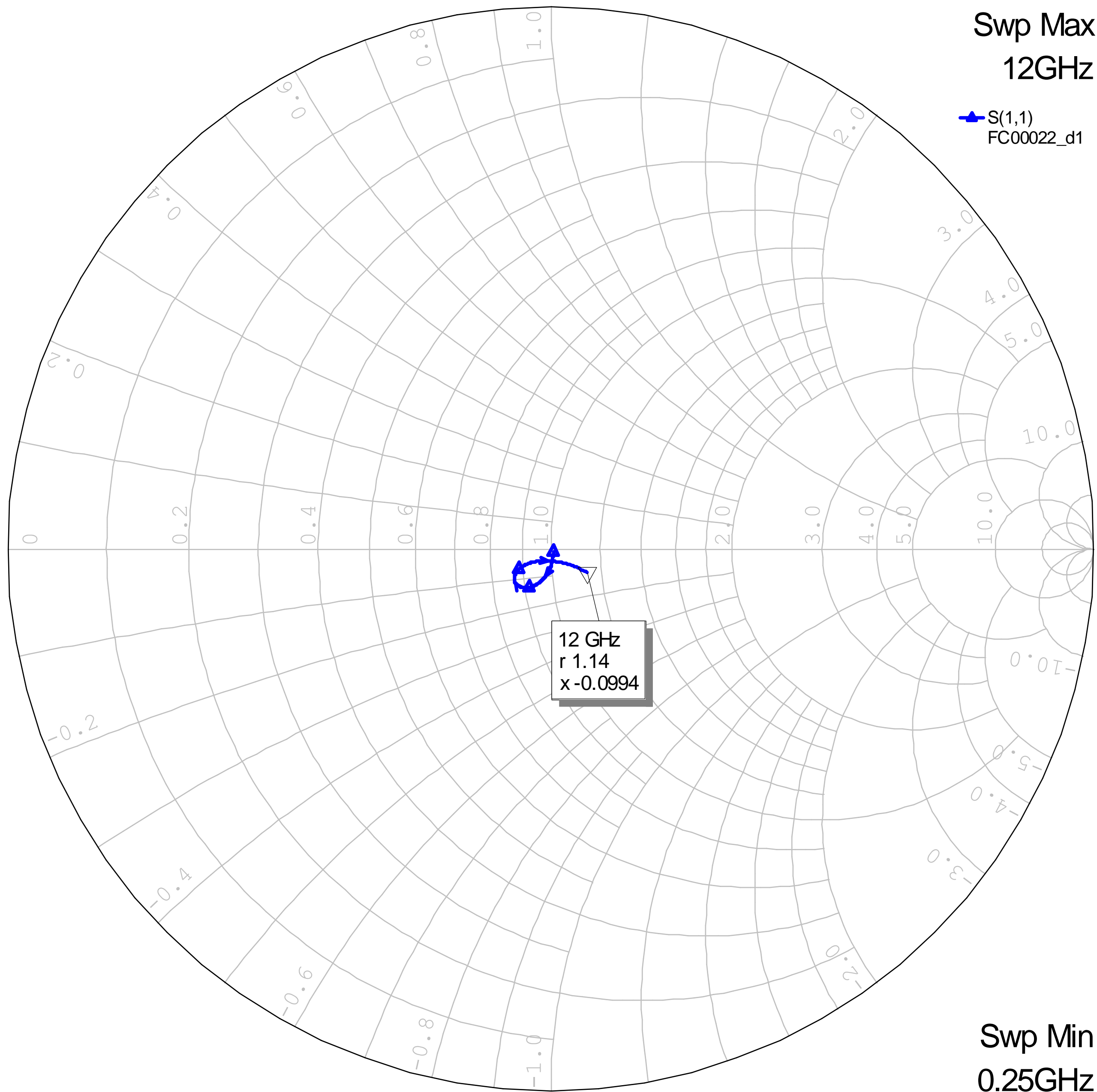
Measured RF Insertion Loss & Insertion Phase (degrees);
assembly includes bond wires and external microstrip flares



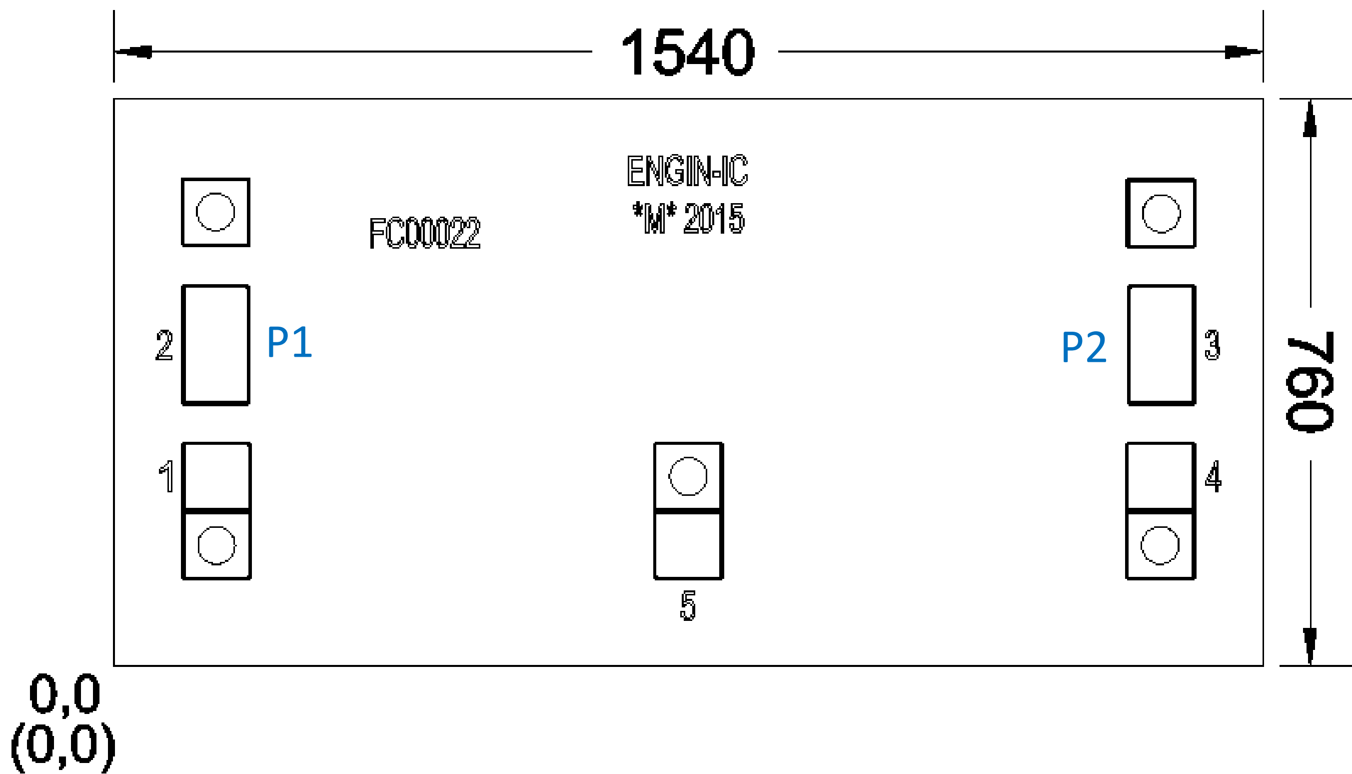
Deviation from Linear Phase:

6 GHz: 0 degrees
10 GHz: 1
12 GHz: 2

Measured Input (& Output) Reflection Coefficients;
assembly includes bond wires and external microstrip flares



Outline Drawing



	Pad Dimensions			
	Length (x-dim, um)	Width (y-dim, um)	Length (x-dim, mils)	Width (y-dim, mils)
Port 1 Pad Dimensions	90	160	3.5	6.3
Port 2 Pad Dimensions	90	160	3.5	6.3

	RF Bond Pad Center Point Locations				
	x-dim, um	y-dim, um	Angle (deg)	x-dim, mils	y-dim, mils
Port 1 Pad Location	137	430	0	5.4	16.9
Port 2 Pad Location	1403	430	0	55.2	16.9

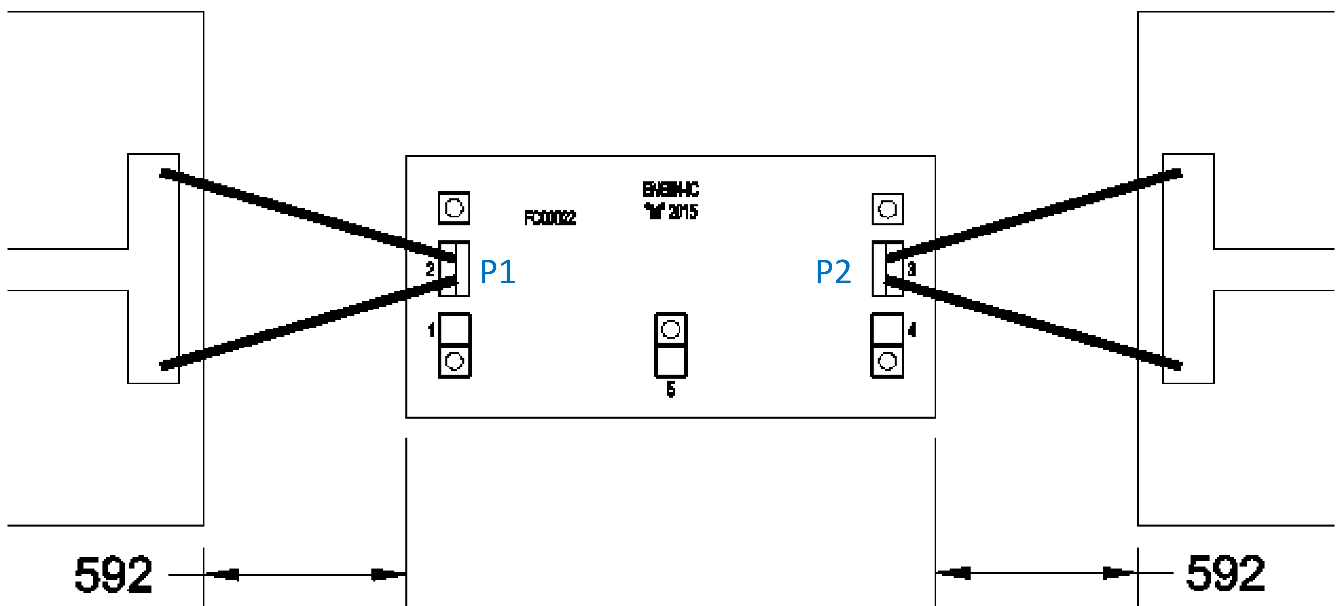
Notes:

1. ***All dimensions are given in both µm and mils. Substrate thickness: 100 µm (0.004").***
2. ***Backside metallization is gold.***
3. ***Bond pad metallization is gold.***
4. ***No DC blocking capacitors.***

External I/O Microstrip Flare Dimensions (on 5-mil alumina) and I/O Bond Wire Inductances for Optimum Insertion and Return Loss Performance

S-parameters can be supplied at DIE level such that optimal flare dimensions can be made for the substrate connection medium used (if different from 5-mil alumina).

	RF I/O port - External Microstrip Flares on 5-mil Alumina				
	Flare Width y-dim, um	Flare Length x-dim, um	Wire Inductance (nH)	Wire Length (um)	Number of Wires
Port 1 Flare Dimensions	668	148	0.42	889	2
Port 2 Flare Dimensions	668	148	0.42	889	2



Notes:

1. ***To achieve bond wire inductance noted, bond the number of wires shown in parallel from each external flare to each associated MMIC RF bond pad as shown above.***
2. ***Gold Wire details:***
   a) ***Diameter: 25.4 µm (1 mil)***
   b) ***Spacing: 4 mils (~ 100 µm) typical***
   c) ***Height above Ground: 8 mils (~ 200 µm) typical (wedge bonds)***
3. ***Wire Length is total length if the wire were made perfectly straight.***
4. ***Ports 1 and 2 can be connected at an angle between 0 and 90 degrees.***

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