Low-Pass Filter

PSPL5935 Datasheet

The PSPL5935 Low-Pass Filters are designed for OEM use in high speed digital networks and telecom systems. The devices use a proprietary, absorptive filter design that has attenuation and group delay frequency responses similar to those of the 4th order Bessel-Thomson filter. Traditional Bessel-Thomson designs filter by reflecting stop-band frequency signals and thus can cause increased bit error rates and eye diagram closure due to multiple reflections. By contrast, the PSPL5935 filters by absorption. They have excellent impedance matches and very good return losses, both within and above the filter pass band. This filter is bi-directional, so either port may be used as the input.

Key performance specifications

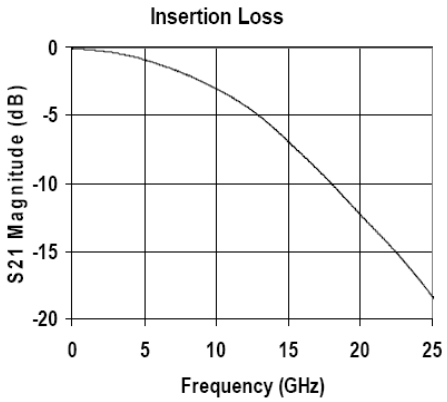
- 12.6 ps Risetime
- 40 GBit/s
- Z-matched
- No Reflection

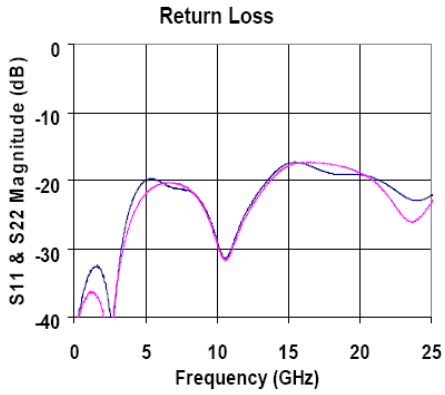
Specifications

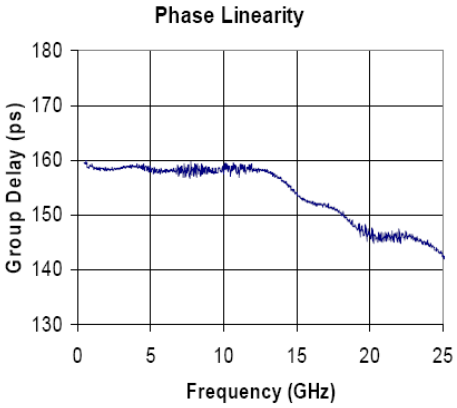
Parameter			Opt. 10GHZ	Opt. 12P5GHZ	Opt. 15GHZ	Opt. 17P5GHZ	Opt. 20GHZ	Opt. 22P5GHZ	Opt. 25GHZ	Opt. 28GHZ	Opt. 20PS
Bandwidth	-3dB with respect to S21 at 100 MHz	Min	9.7 GHz	12.1 GHz	14.5 GHz	16.9 GHz	19.4 GHz	21.5 GHz	24.2 GHz	27.2 GHz	16.8 GHz
		Typ	10.0 GHz	12.5 GHz	15.0 GHz	17.5 GHz	20.0 GHz	22.5 GHz	25.0 GHz	28.0 GHz	17.2 GHz
		Max	10.3 GHz	12.9 GHz	15.5 GHz	18.0 GHz	20.6 GHz	23.2 GHz	25.8 GHz	28.8 GHz	17.6 GHz
Risetime	10% to 90%		33 ps	27 ps	23 ps	19 ps	17 ps	16 ps	14 ps	12.6 ps	20 ps
Group Delay	100 MHz to 40 GHz		158 ps	155 ps	153 ps	151 ps	149 ps	149 ps	148 ps	160 ps	159 ps
Return Loss	see plots		-12 dB 0–25GHz	-12 dB 0–30 GHz	-12 dB 0–30GHz -10 dB 30–35GHz	-12 dB 0–30GHz -10 dB 30–40GHz	-10 dB 0–40GHz	-12 dB 0–30GHz -10 dB 30–40GHz	-10 dB 0–30GHz -8 dB 30–40GHz	-15 dB 0-15GHz -9 dB 15-40GHz	-17 dB 0–20GHz -15 dB 20–40GHz
Max Power, CW			25 dBm								
Storage Temperature	Case		-25° C, minimum +90°C, maximum								
Impedance			50 Ω								
Warranty			One Year								

Note: All parameters listed are typical unless max/min guaranteed limits are provided.

Typical Performance, option 10GHZ





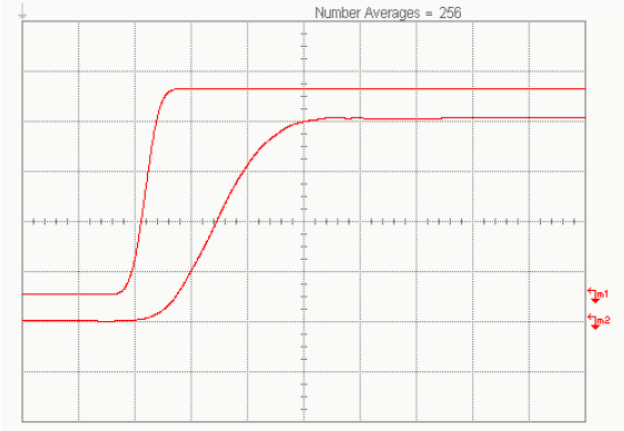


Step Response

The upper trace in the graph at the right shows the input normalized to 10 ps (10% - 90%). The lower trace shows the risetime of the filter output to be 34.9 ps. The risetime (Tr) of the filter can be calculated using the following formula.

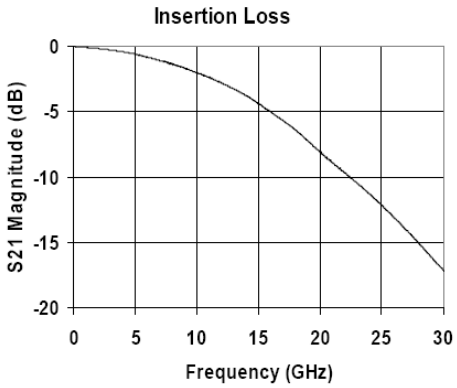
$$Tr(filter) = \sqrt{Tr(Total)^2 - Tr(Source)^2}$$

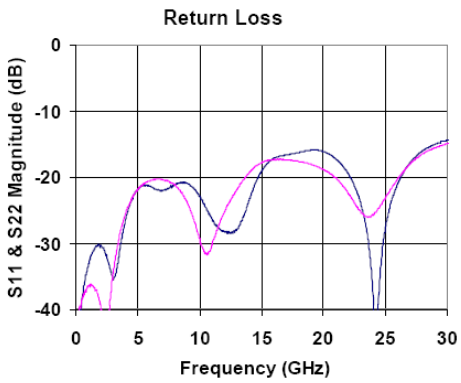
$$Tr(filter) = 33.4\,ps$$

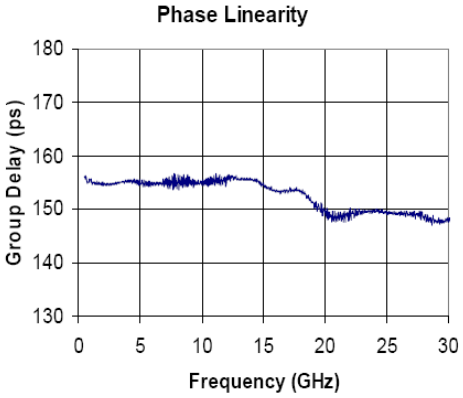


Amplitude scale = 75 mV/div, Time scale = 20 ps/div

Typical Performance, option 12P5GHZ





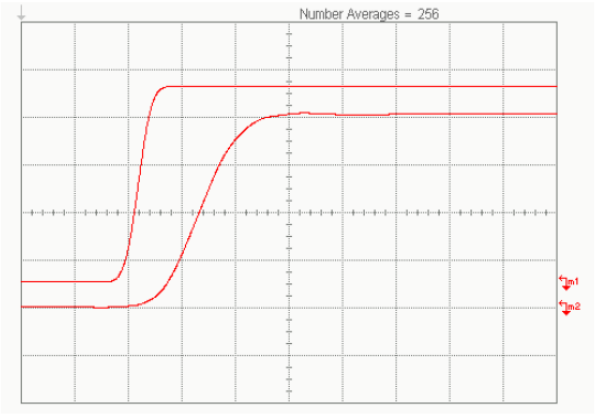


Step Response

The upper trace in the graph at the right shows the input signal normalized to 10 ps (10% - 90%). The lower trace shows the risetime of the filter output to be 28.9 ps. The risetime (Tr) of the filter can be calculated using the following formula.

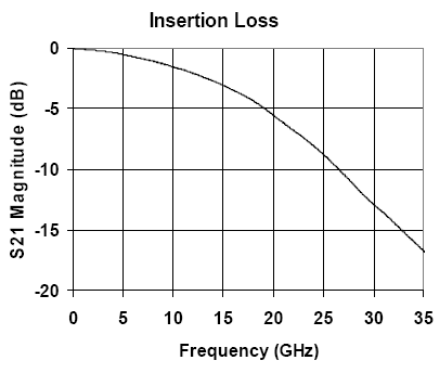
$$Tr(filter) = \sqrt{Tr(Total)^2 - Tr(Source)^2}$$

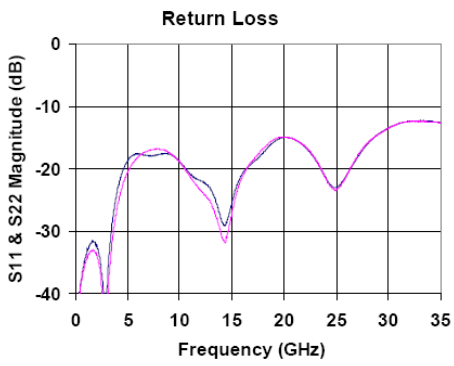
$$Tr(filter) = 27.1ps$$

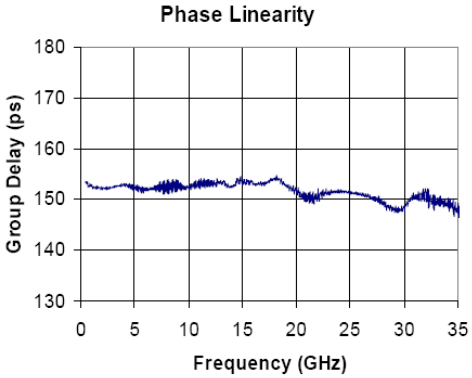


Amplitude scale = 75 mV/div, Time scale = 20 ps/div

Typical Performance, option 15GHZ





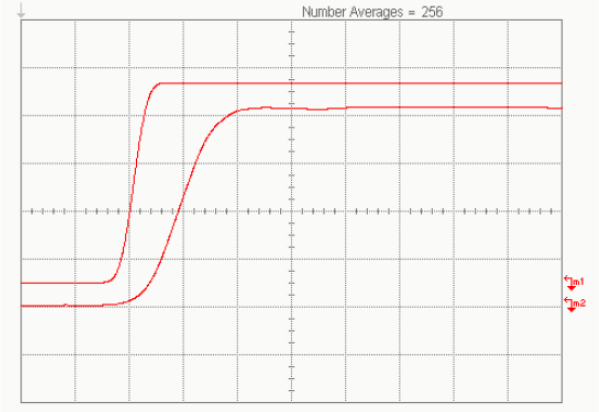


Step Response

The upper trace in the graph at the right shows the input signal normalized to 10 ps (10% - 90%). The lower trace shows the risetime of the filter output to be 24.7 ps. The risetime (Tr) of the filter can be calculated using the following formula.

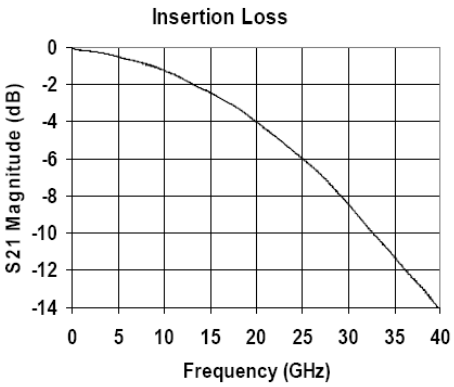
$$Tr(filter) = \sqrt{Tr(Total)^2 - Tr(Source)^2}$$

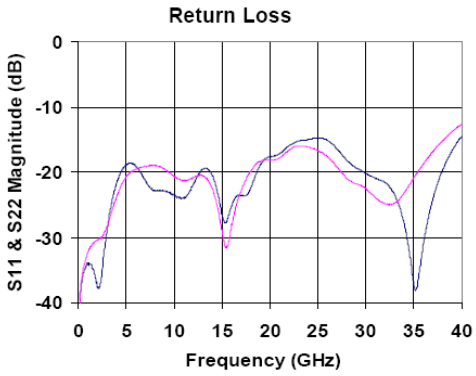
$$Tr(filter) = 22.5\,ps$$

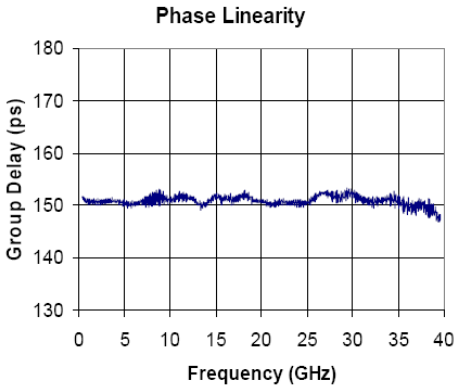


Amplitude scale = 75 mV/div, Time scale = 20 ps/div

Typical Performance, option 17P5GHZ





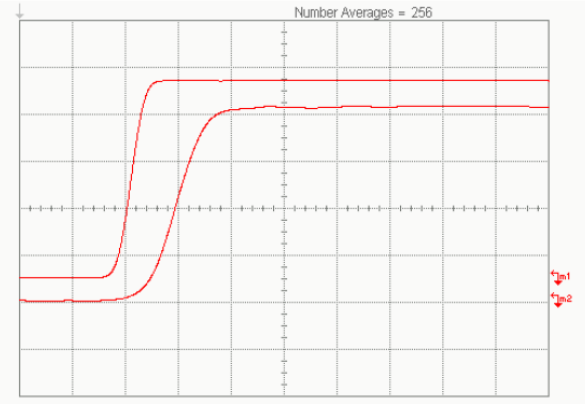


Step Response

The upper trace in the graph at the right shows the input normalized to 10 ps (10% - 90%). The lower trace shows the risetime of the filter output to be 21.5 ps. The risetime (Tr) of the filter can be calculated using the following formula.

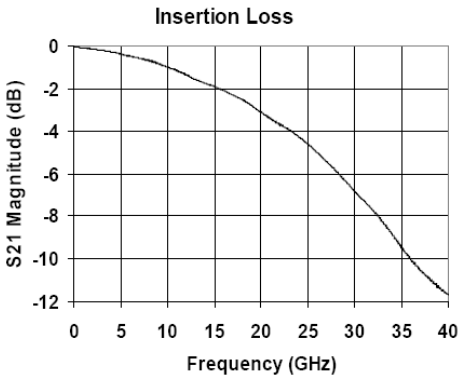
$$Tr(filter) = \sqrt{Tr(Total)^2 - Tr(Source)^2}$$

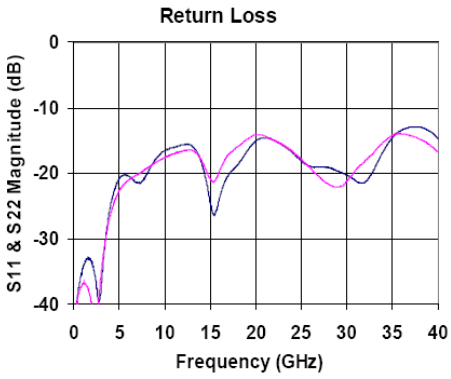
$$Tr(filter) = 18.9\,ps$$

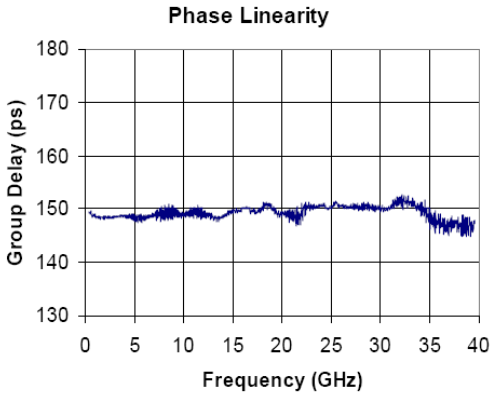


Amplitude scale = 75 mV/div, Time scale = 20 ps/div

Typical Performance, option 20GHZ





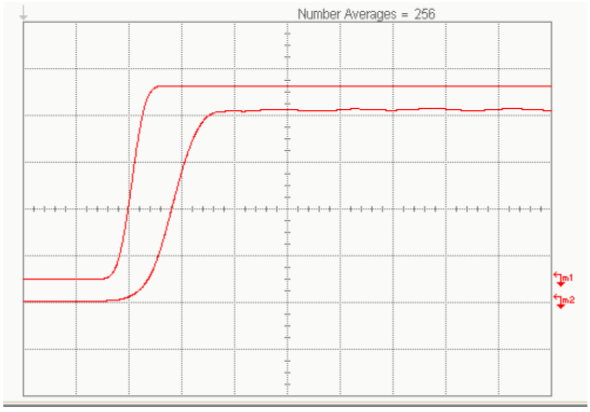


Step Response

The upper trace in the graph at the right shows the input signal normalized to 10 ps (10% - 90%). The lower trace shows the risetime of the filter output to be 19.7 ps. The risetime (Tr) of the filter can be calculated using the following formula.

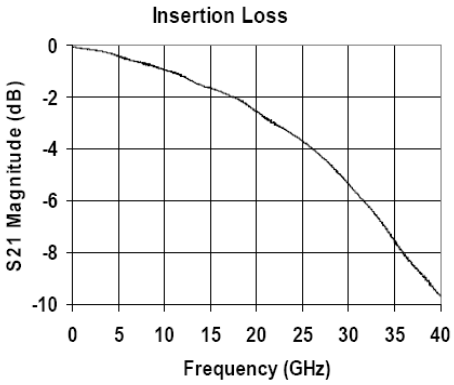
$$Tr(filter) = \sqrt{Tr(Total)^2 - Tr(Source)^2}$$

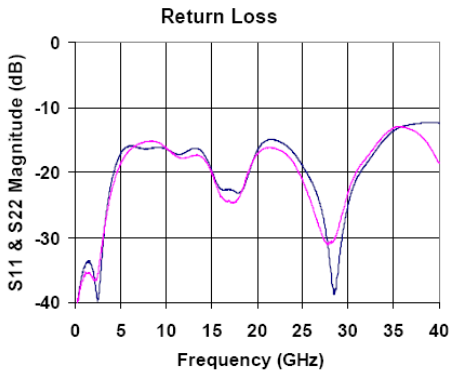
$$Tr(filter) = 16.8\,ps$$

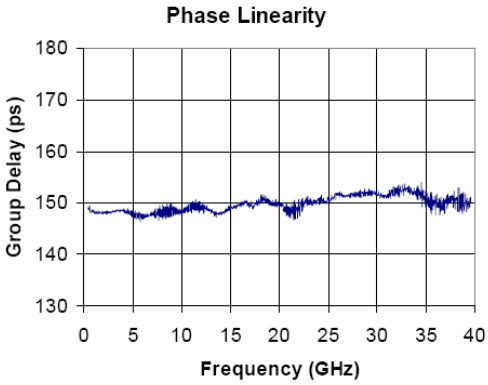


Amplitude scale = 75 mV/div, Time scale = 20 ps/div

Typical Performance, option 22P5GHZ





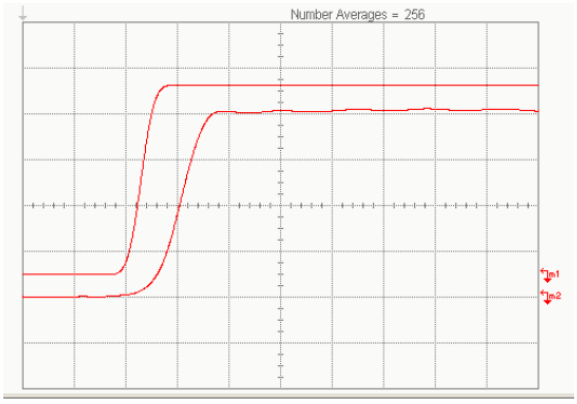


Step Response

The upper trace in the graph at the right shows the input normalized to 10 ps (10% - 90%). The lower trace shows the risetime of the filter output to be 17.3 ps. The risetime (Tr) of the filter can be calculated using the following formula.

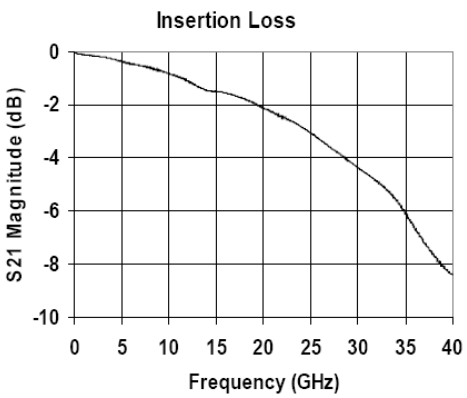
$$Tr(filter) = \sqrt{Tr(Total)^2 - Tr(Source)^2}$$

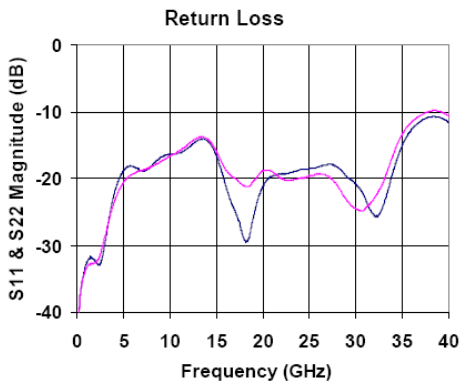
$$Tr(filter) = 15.7\,ps$$

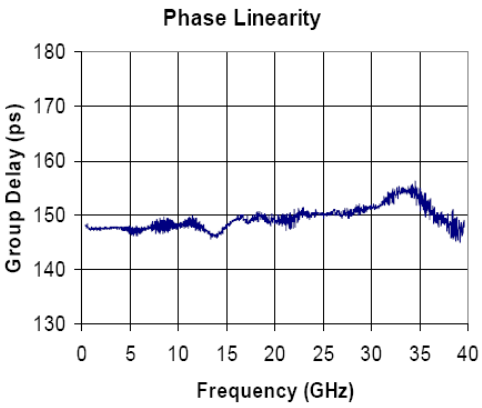


Amplitude scale = 75 mV/div, Time scale = 20 ps/div

Typical Performance, option 25GHZ





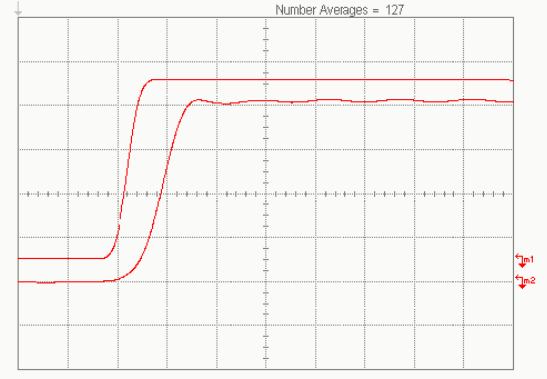


Step Response

The upper trace in the graph at the right shows the input signal normalized to 10 ps (10% - 90%). The lower trace shows the risetime of the filter output to be 17.3 ps. The risetime (Tr) of the filter can be calculated using the following formula.

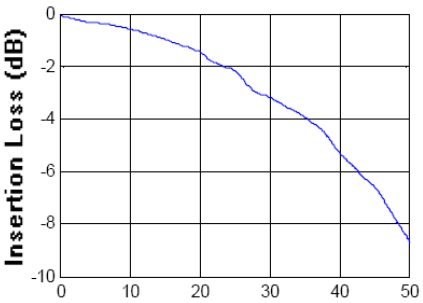
$$Tr(filter) = \sqrt{Tr(Total)^2 - Tr(Source)^2}$$

$$Tr(filter) = 14.2\,ps$$

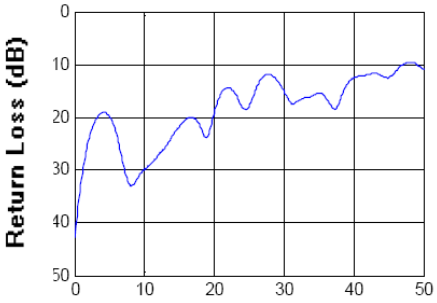


Amplitude scale = 75 mV/div, Time scale = 20 ps/div

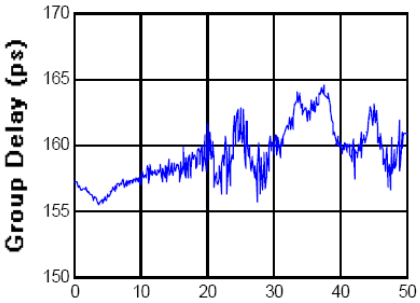
Typical Performance, option 28GHZ



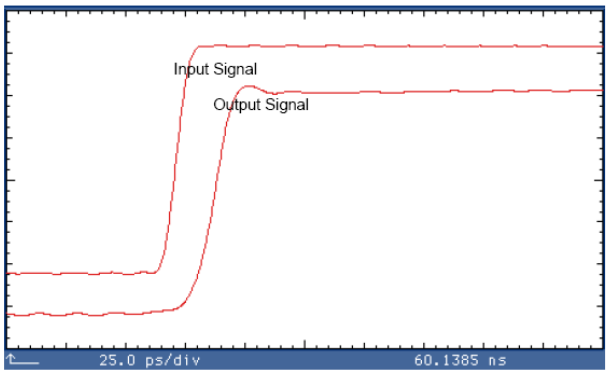
Insertion Loss, 0-50 GHz



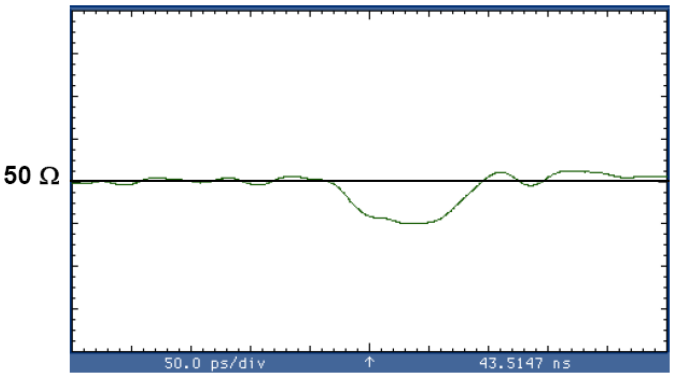
Return Loss, 0-50 GHz



Group Delay (2% Aperture), 0-50 GHz

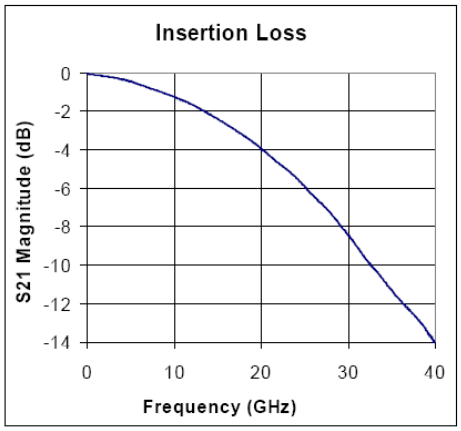


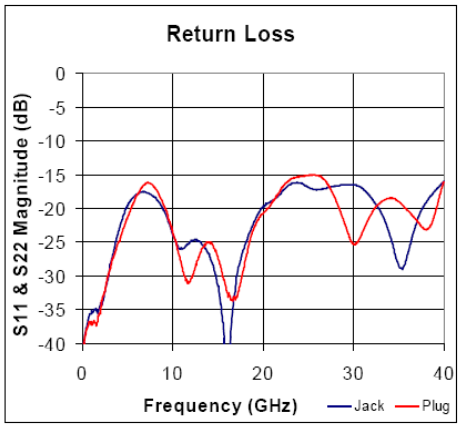
TDT Response to 10 ps step.
Timebase 20 ps/div.

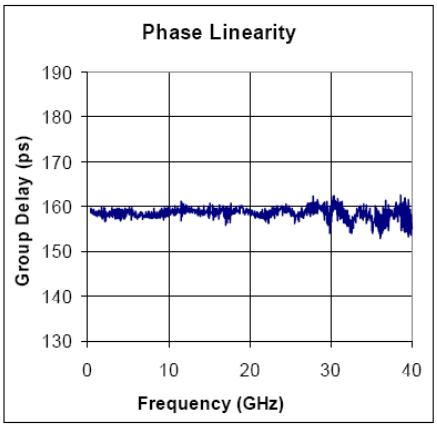


TDR of 5935 Filter using 25 ps step.
Scale 5% ρ/div, 50 ps/div.

Typical Performance, option 20NS





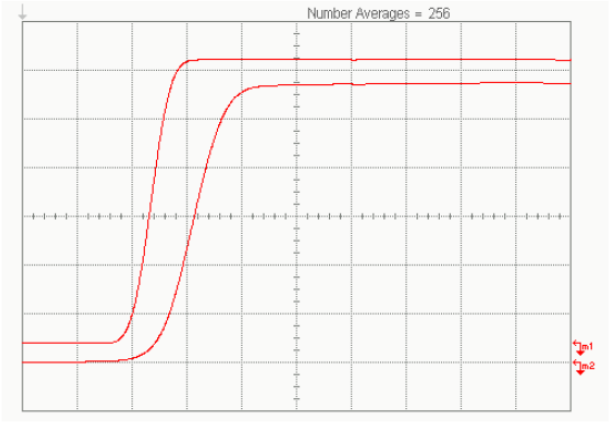


Step Response

The upper trace in the graph at the right shows the input signal normalized to 14 ps (10% - 90%). The lower trace shows the risetime of the filter output to be 23.8 ps. The risetime (Tr) of the filter can be calculated using the following formula.

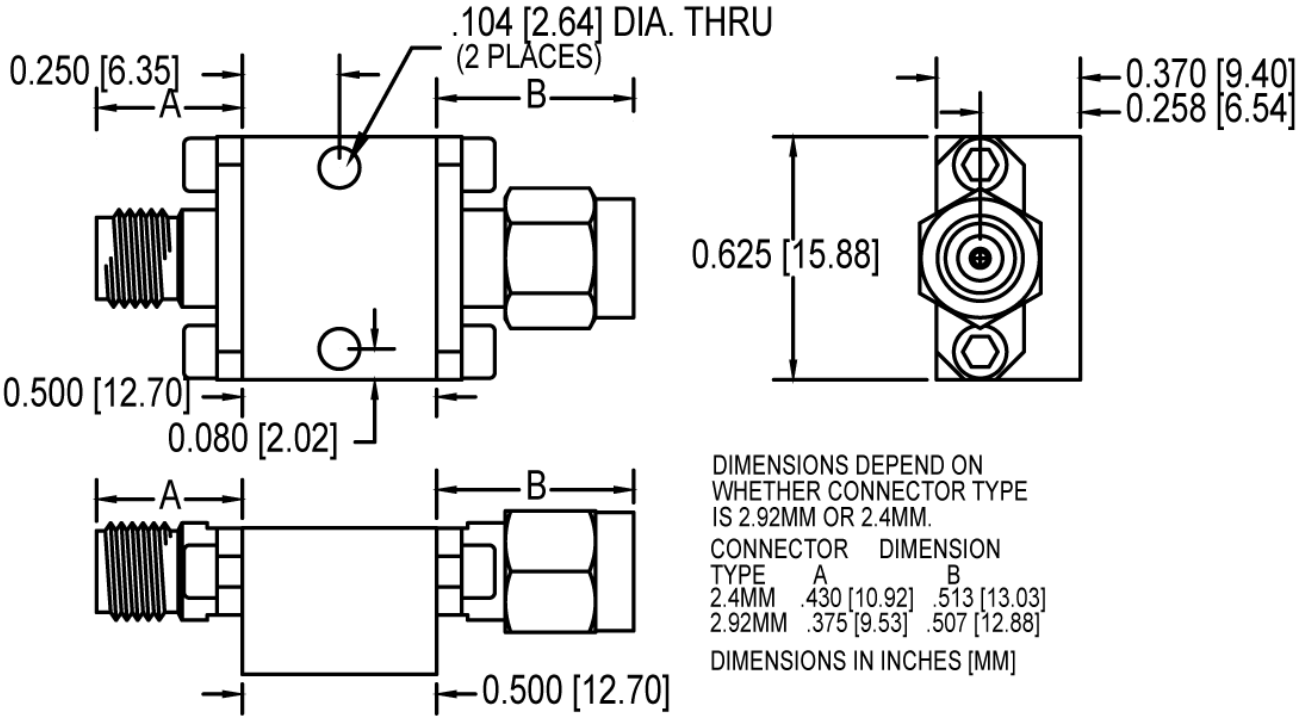
$$Tr(filter) = \sqrt{Tr(Total)^2 - Tr(Source)^2}$$

$$Tr(filter) = \sqrt{23.8^2 - 14^2}\ ,\ Tr(filter) = 19.2\,ps$$



Amplitude scale = 100 mV/div, Time scale = 20 ps/div

PSPL5935 Mechanical dimensions



Ordering information

Model	Description
PSPL5935	Flat Group Delay Low-Pass Filter

Options

- Opt. 240JP J-P 2.4mm connectors
- Opt. 292JP J-P 2.92mm connectors

- Opt. 10GHZ 10 GHz 3dB frequency
- Opt. 12P5GHZ 12.5 GHz 3dB frequency
- Opt. 15GHZ 15 GHz 3dB frequency
- Opt. 17P5GHZ 17.5 GHz 3dB frequency
- Opt. 20GHZ 20 GHz 3dB frequency
- Opt. 22P5GHZ 22.5 GHz 3dB frequency
- Opt. 25GHZ 25 GHz 3dB frequency
- Opt. 28GHZ 28 GHz 3dB frequency
- Opt. 20PS 20 ps risetime

ASEAN / Australasia (65) 6356 3900

Belgium 00800 2255 4835*
Central East Europe and the Baltics +41 52 675 3777
Finland +41 52 675 3777
Hong Kong 400 820 5835
Japan 81 (3) 6714 3010
Middle East, Asia, and North Africa +41 52 675 3777
People's Republic of China 400 820 5835
Republic of Korea 001 800 8255 2835
Spain 00800 2255 4835*
Taiwan 886 (2) 2722 9622
* European toll-free number. If not accessible, call: +41 52 675 3777

Austria 00800 2255 4835*

Brazil +55 (11) 3759 7627
Central Europe & Greece +41 52 675 3777
France 00800 2255 4835*
India 000 800 650 1835
Luxembourg +41 52 675 3777
The Netherlands 00800 2255 4835*
Poland +41 52 675 3777
Russia & CIS +7 (495) 6647564
Sweden 00800 2255 4835*
United Kingdom & Ireland 00800 2255 4835*

Balkans, Israel, South Africa and other ISE Countries +41 52 675 3777

Canada 1 800 833 9200
Denmark +45 80 88 1401
Germany 00800 2255 4835*
Italy 00800 2255 4835*
Mexico, Central/South America & Caribbean 52 (55) 56 04 50 90
Norway 800 16098
Portugal 80 08 12370
South Africa +41 52 675 3777
Switzerland 00800 2255 4835*
USA 1 800 833 9200

Updated 10 April 2013

For Further Information. Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology.

Please visit www.tektronix.com.

29 May 2014

1PW-30589-0

www.tektronix.com