



3 Pin Fixed High-Speed Fixed Delay Lines

The FDC and FDD family of fixed single in-line package (SIP) delay line products are available in a variety of types in either standard or custom specifications. SPICE Model is available.

Features

- Miniaturized high-speed fixed delay lines that combine ELMEC's high-density delay line elements in a single in-line package.
- Suitable for use with a variety of logic elements including the ECLinPS, ECL 100KH, 10K series as well as TTL FAST, CMOS FACT and analog circuits.
- Since the FDC and FDD feature the same package size (except for height) and pin configuration, with both types combined a delay time range of 0-27ns (0-15ns in our 50Ω version) can be adjusted in varying increments of 50ps, 100ps, and 500ps. See the following pages for detailed specifications.

Common Specifications

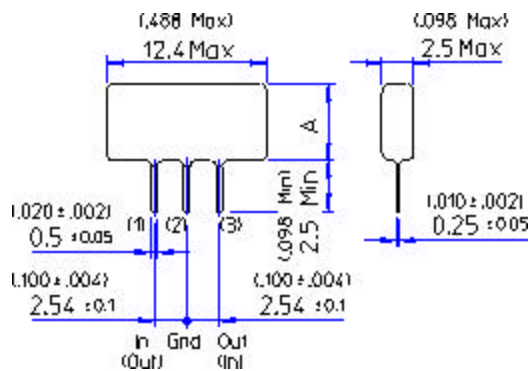
Waveform Distortion:	Overshoot/preshoot under $\pm 20\%$
Insulation Resistance:	DC50V, over 100MΩ
Durable Voltage:	DC50V, 1 minute
Operating Temperature Range:	-40°C to +85°C
Storage Temperature Range:	-40°C to +120°C

Package Dimensions & Pin Configuration

Unit:mm(inch)

A:FDC Type 6MAX(.236)

FDD Type 8MAX(.315)



FDC Product Specifications

Part Number	Impedance	Delay Time	Rise Time (20-80% Max)	-3 dB Passband (Minimum)	Temperature Coefficient	Simulation Model and Data
*FDC00505	50Ω ± 10%	50ps ± 25ps	150ps	2.5GHz	± 100ppm/°C	E, T
*FDC0105		100ps ± 25ps	150ps	2.5GHz		E, T
*FDC01505		150ps ± 25ps	150ps	2.0GHz		E, T
*FDC0205		200ps ± 25ps	150ps	2.0GHz		E, T
*FDC02505		250ps ± 25ps	150ps	2.0GHz		E, T
*FDC0305		300ps ± 25ps	150ps	2.0GHz		E, T
*FDC03505		350ps ± 25ps	150ps	2.0GHz		E, T
*FDC0405		400ps ± 25ps	150ps	2.0GHz		E, T
*FDC04505		450ps ± 25ps	200ps	1.5GHz		E, T
*FDC0505		500ps ± 25ps	200ps	1.5GHz		E, T
*FDC05505		550ps ± 25ps	200ps	1.5GHz		E, T
*FDC0605		600ps ± 50ps	200ps	1.5GHz		E, S, T
*FDC0705		700ps ± 50ps	200ps	1.5GHz		E, T
*FDC0805		800ps ± 50ps	200ps	1.0GHz		E, S, T
*FDC0905		900ps ± 50ps	200ps	1.0GHz		E, S, T
*FDC1005		1.0ns ± 50ps	200ps	1.0GHz		E, S, T
*FDC1105		1.1ns ± 50ps	250ps	900MHz		E, S, T
*FDC1205		1.2ns ± 50ps	250ps	900MHz		E, S, T
*FDC1305		1.3ns ± 50ps	250ps	900MHz		E, S, T
*FDC1405		1.4ns ± 50ps	250ps	900MHz		E, S, T
*FDC1505		1.5ns ± 50ps	250ps	900MHz		E, S, T
*FDC1605		1.6ns ± 50ps	300ps	800MHz		E, S, T
*FDC1705		1.7ns ± 50ps	300ps	800MHz		E, S, T
*FDC1805		1.8ns ± 50ps	300ps	800MHz		E, S, T
*FDC1905		1.9ns ± 50ps	300ps	800MHz		E, S, T
*FDC2005		2.0ns ± 50ps	300ps	800MHz		E, S, T
*FDC2105		2.1ns ± 50ps	300ps	800MHz		E, S, T
*FDC2205		2.2ns ± 50ps	300ps	800MHz		E, S, T
*FDC2305		2.3ns ± 50ps	350ps	650MHz		E, S, T
*FDC2405		2.4ns ± 50ps	350ps	650MHz		E, S, T
*FDC2505A		2.5ns ± 50ps	350ps	650MHz		E, T
*FDC2605		2.6ns ± 50ps	400ps	600MHz		E, T
*FDC2705		2.7ns ± 50ps	400ps	600MHz		E, T
*FDC2805	2.8ns ± 50ps	400ps	600MHz	E, T		
*FDC2905	2.9ns ± 50ps	450ps	550MHz	E, T		
*FDC3005A	3.0ns + 100ps / -50ps	450ps	550MHz	E, T		
FDC3505	3.5ns ± 0.25ns	600ps	600MHz	E, S, T		
FDC4005	4.0ns ± 0.3ns	700ps	600MHz	E, S, T		
FDC4505	4.5ns ± 0.3ns	700ps	600MHz	E, S, T		
FDC5005	5.0ns ± 0.3ns	700ps	600MHz	E, S, T		
*FDC0510	100Ω ± 10%	0.5ns ± 0.1ns	300ps	1.5GHz	± 100ppm/°C	E, T
FDC1010		1.0ns ± 0.1ns	300ps	1.0GHz		E, S, T
FDC1510		1.5ns ± 0.15ns	400ps	900MHz		E, S, T
FDC2010		2.0ns ± 0.2ns	400ps	800MHz		E, S, T
FDC2510		2.5ns ± 0.2ns	500ps	700MHz		E, S, T
FDC3010		3.0ns ± 0.2ns	500ps	700MHz		E, S, T
FDC3510		3.5ns ± 0.25ns	600ps	600MHz		E, S, T
FDC4010		4.0ns ± 0.3ns	700ps	600MHz		E, S, T
FDC4510		4.5ns ± 0.3ns	700ps	600MHz		E, S, T
FDC5010		5.0ns ± 0.3ns	700ps	600MHz		E, S, T

Note: Product numbers with an asterisk (*) are distributed constant type delay lines.

E - Uses Excel macro to indicate S-parameter, Group Delay characteristics, Pulse Response Wave.
 S - SPICE Model
 T - Touchstone format (S2P file)

For additional data, please inquire by email to. sales@elmectech.com

FDD Product Specifications

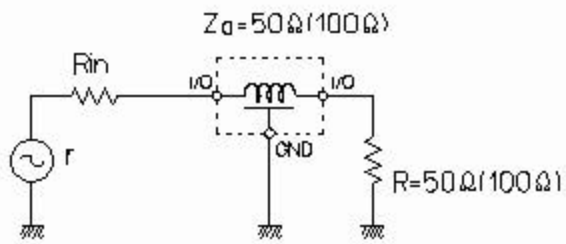
Part Number	Impedance	Delay Time	Rise Time (20-80% Max)	-3 dB Passband (Minimum)	Temperature Coefficient	Simulation Model and Data
FDD5505	50Ω ± 10%	5.5ns ± 0.3ns	800ps	400MHz	-400± 200ppm/°C	E,S,T
FDD6005		6.0ns ± 0.3ns	900ps	400MHz		E,S,T
FDD6505		6.5ns ± 0.4ns	900ps	350MHz		E,S,T
FDD7005		7.0ns ± 0.4ns	1.0ns	350MHz		E,S,T
FDD7505		7.5ns ± 0.4ns	1.0ns	330MHz		E,S,T
FDD8005		8.0ns ± 0.4ns	1.1ns	330MHz		E,S,T
FDD8505		8.5ns ± 0.5ns	1.2ns	300MHz		E,S,T
FDD9005		9.0ns ± 0.5ns	1.3ns	300MHz		E,S,T
FDD9505		9.5ns ± 0.5ns	1.3ns	250MHz		E,S,T
FDD10005		10.0ns ± 0.5ns	1.4ns	250MHz		E,S,T
FDD10505		10.5ns ± 0.5ns	1.4ns	200MHz		E,S,T
FDD11005		11.0ns ± 0.5ns	1.4ns	200MHz		E,S,T
FDD11505		11.5ns ± 0.5ns	1.5ns	170MHz		E,S,T
FDD12005		12.0ns ± 0.5ns	1.5ns	170MHz		E,S,T
FDD12505		12.5ns ± 0.5ns	1.6ns	150MHz		E,S,T
FDD13005		13.0ns ± 0.5ns	1.6ns	150MHz		E,S,T
FDD13505		13.5ns ± 0.5ns	1.7ns	150MHz		E,T
FDD14005		14.0ns ± 0.5ns	1.7ns	150MHz		E,S,T
FDD14505		14.5ns ± 0.5ns	1.8ns	150MHz		E,S,T
FDD15005		15.0ns ± 0.5ns	1.8ns	150MHz		E,S,T
FDD5510	100Ω ± 10%	5.5ns ± 0.3ns	800ps	400MHz		E,S,T
FDD6010		6.0ns ± 0.3ns	900ps	400MHz		E,S,T
FDD6510		6.5ns ± 0.4ns	900ps	350MHz		E,S,T
FDD7010		7.0ns ± 0.4ns	1.0ns	350MHz		E,S,T
FDD7510		7.5ns ± 0.4ns	1.0ns	330MHz		E,S,T
FDD8010		8.0ns ± 0.4ns	1.1ns	330MHz		E,S,T
FDD8510		8.5ns ± 0.5ns	1.2ns	300MHz		E,S,T
FDD9010		9.0ns ± 0.5ns	1.3ns	300MHz		E,S,T
FDD9510		9.5ns ± 0.5ns	1.3ns	250MHz		E,S,T
FDD10010		10.0ns ± 0.5ns	1.4ns	250MHz		E,S,T
FDD10510		10.5ns ± 0.6ns	1.4ns	200MHz		S
FDD11010		11.0ns ± 0.6ns	1.4ns	200MHz		E,S,T
FDD11510		11.5ns ± 0.6ns	1.5ns	170MHz		E,S,T
FDD12010		12.0ns ± 0.6ns	1.5ns	170MHz		E,S,T
FDD12510		12.5ns ± 0.7ns	1.6ns	150MHz		E,S,T
FDD13010		13.0ns ± 0.7ns	1.6ns	150MHz		E,S,T
FDD13510		13.5ns ± 0.7ns	1.7ns	150MHz		E,S,T
FDD14010		14.0ns ± 0.7ns	1.8ns	140MHz		E,S,T
FDD14510		14.5ns ± 0.8ns	1.9ns	130MHz		E,S,T
FDD15010		15.0ns ± 0.8ns	2.0ns	130MHz		E,S,T
FDD16010		16.0ns ± 0.8ns	2.1ns	120MHz	E,S,T	
FDD17010		17.0ns ± 0.9ns	2.2ns	115MHz	E,S,T	
FDD18010		18.0ns ± 0.9ns	2.3ns	110MHz	E,S,T	
FDD19010		19.0ns ± 1.0ns	2.5ns	105MHz	E,S,T	
FDD20010		20.0ns ± 1.0ns	2.7ns	100MHz	E,S,T	
FDD21010		21.0ns ± 1.1ns	2.9ns	95MHz	E,S,T	
FDD22010		22.0ns ± 1.1ns	3.1ns	90MHz	E,S,T	
FDD23010		23.0ns ± 1.2ns	3.3ns	85MHz	E,S,T	
FDD24010		24.0ns ± 1.2ns	3.5ns	83MHz	E,S,T	
FDD25010		25.0ns ± 1.3ns	3.7ns	80MHz	E,S,T	
FDD27010	27.0ns ± 1.4ns	4.0ns	74MHz	E,S,T		

Note: E - Uses Excel macro to indicate S-parameter, Group Delay characteristics, Pulse Response Wave.
S - SPICE Model
T - Touchstone format (S2P file)

For additional data, please inquire by email to. sales@elmectech.com

Typical Applications

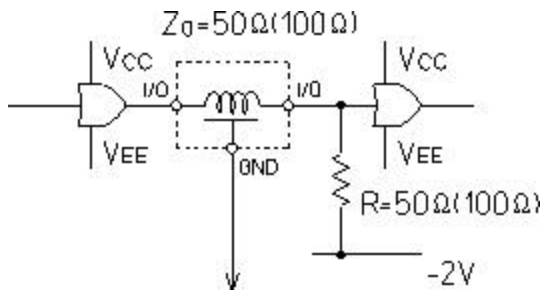
(1) Analog circuit



r : Signal Source Impedance
 R_{in} : Input Adjustment Resistance
 Z_0 : Characteristic Impedance
 $r + R_{in} = Z = R$

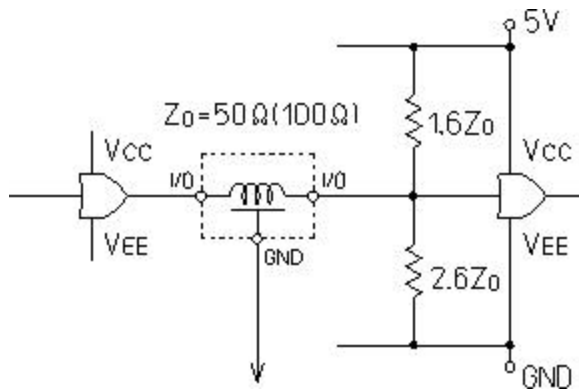
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(2) ECL (-2V termination line used)



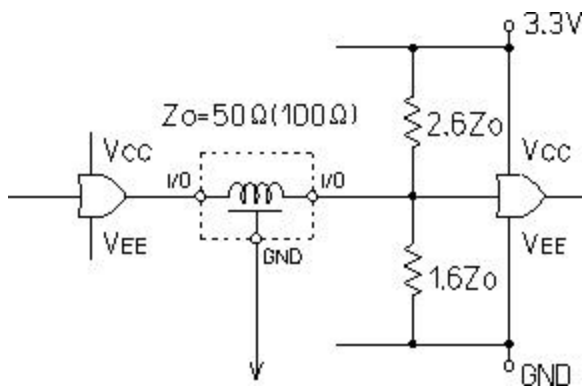
Connect to one of the V_{CC} , V_{EE} or $-2V$ lines
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(3) ECL (-2V termination line not used)(PECL)



Connect to either V_{CC} or V_{EE} lines
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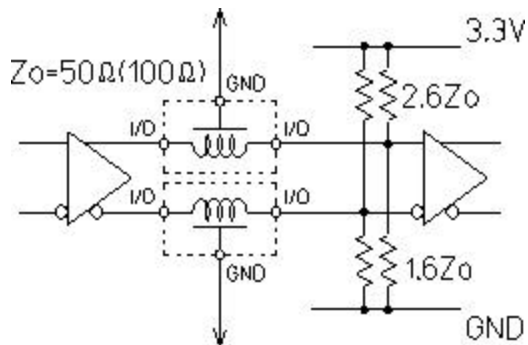
(4) LVPECL



Connect to either 3.3V or GND
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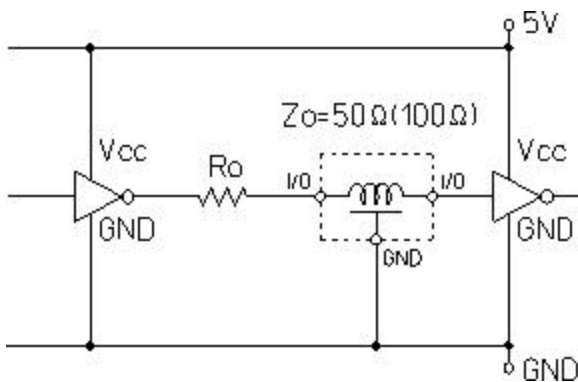
(5) LVPECL Differential

Connect to either 3.3V or GND



Connect to either 3.3V or GND
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(6) TTL (FAST), CMOS (FACT)



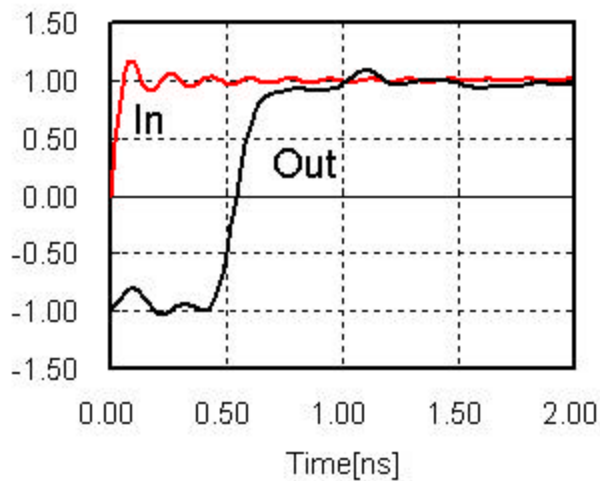
R_o should be adjusted to a value near Z_o .
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Output Waveforms

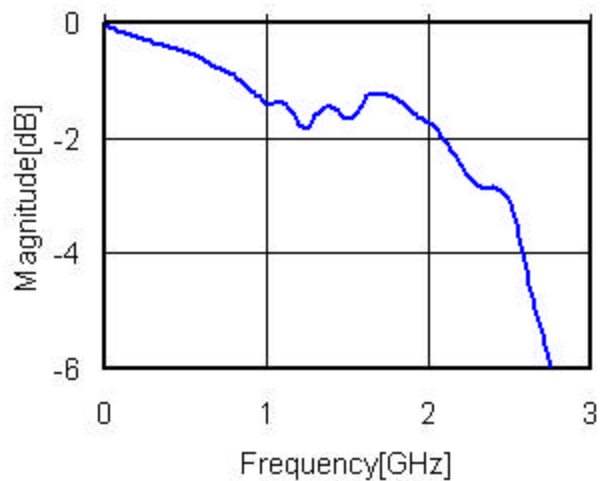
FDC0505

Output waveform
 (Step function)

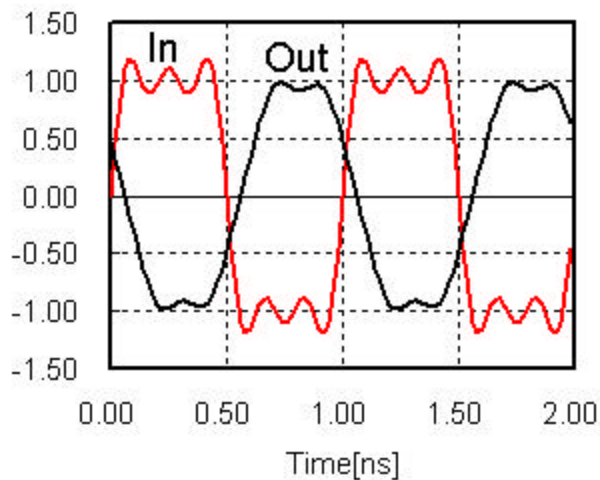
Amplitude / Frequency



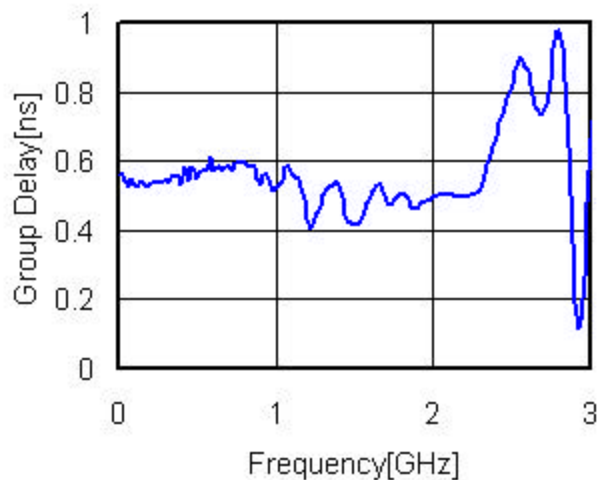
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Output waveform
 (1GHz Clock)



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Group Delay



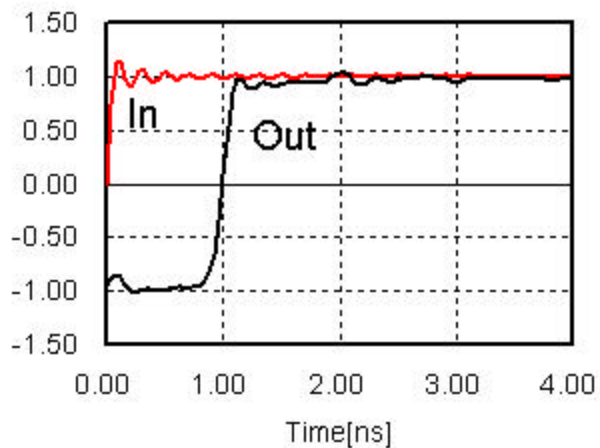
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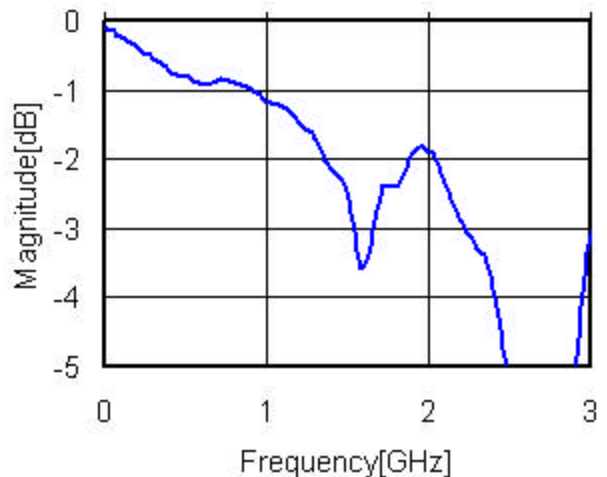
FDC1005

Output waveform
 (Step function)



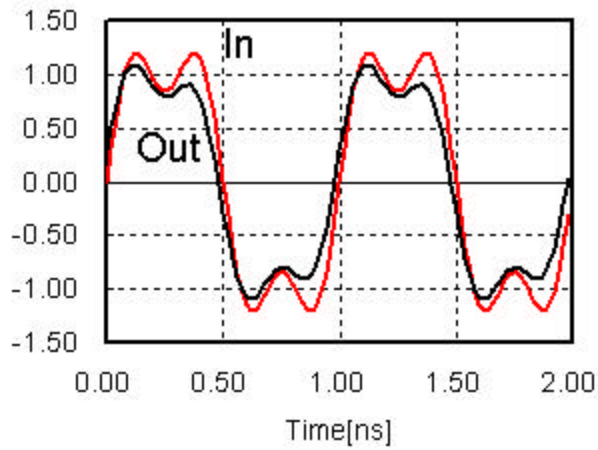
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Amplitude / Frequency



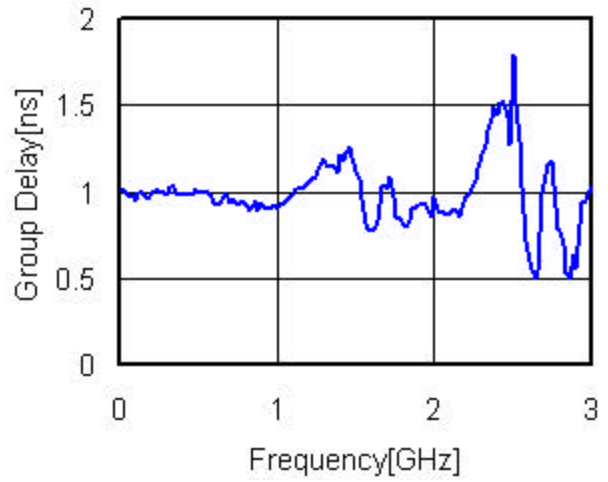
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**Output waveform
(1GHz Clock)**



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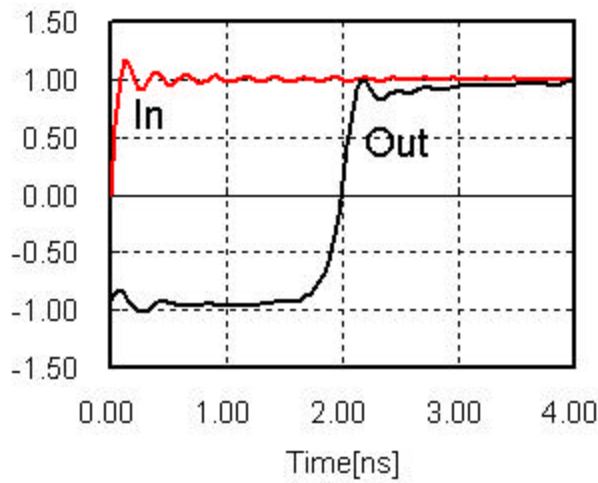
Group Delay



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FDC2005

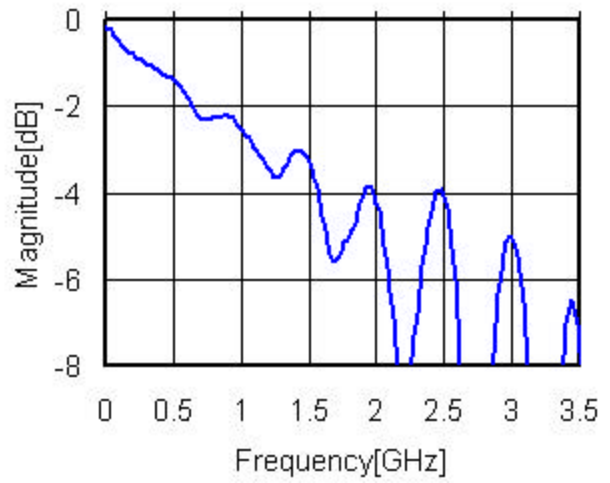
**Output waveform
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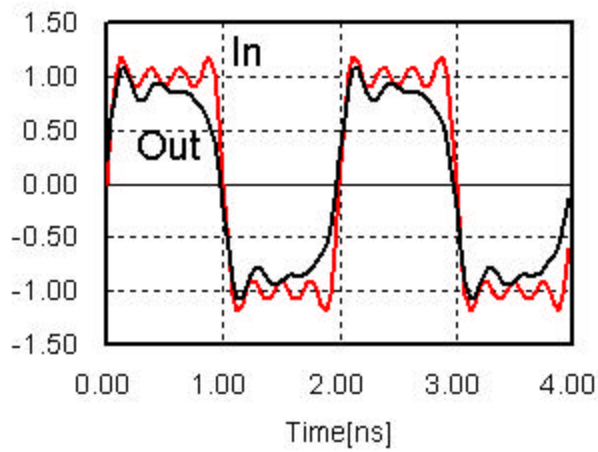
**Output waveform
(500MHz Clock)**

Amplitude / Frequency

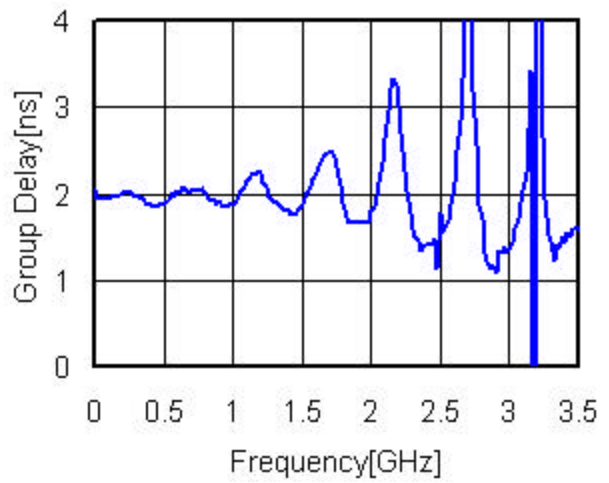


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Group Delay



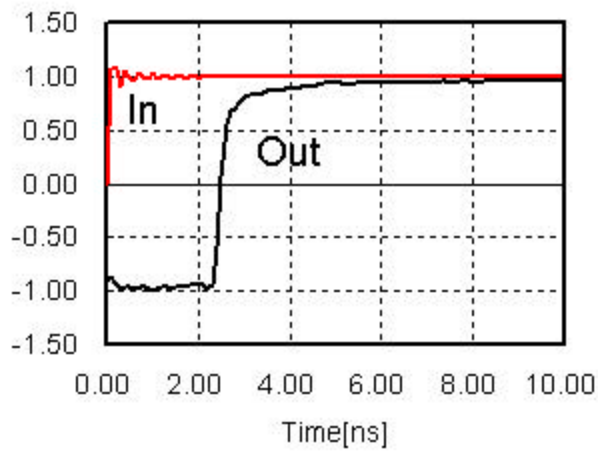
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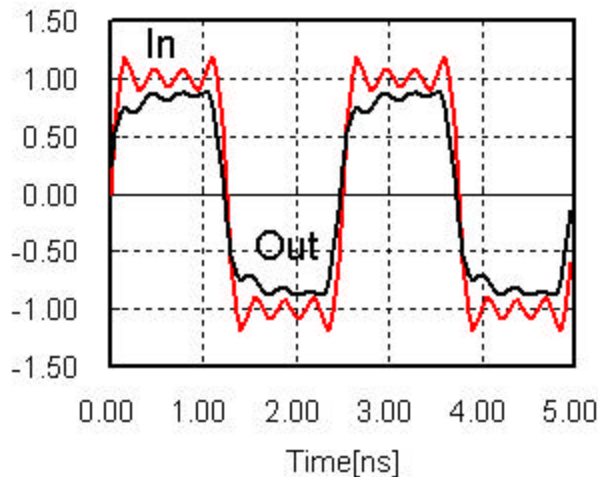
FDC2505A

Output waveform (Step function)



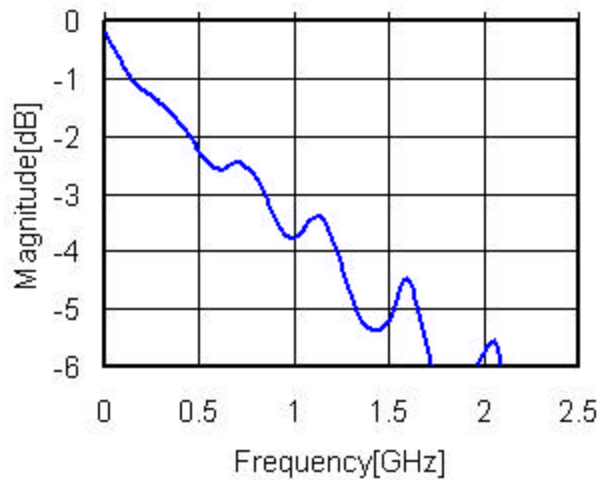
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Output waveform (400MHz Clock)



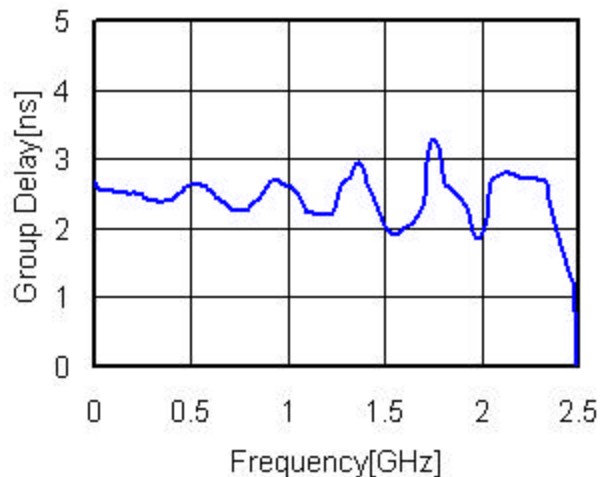
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Amplitude / Frequency



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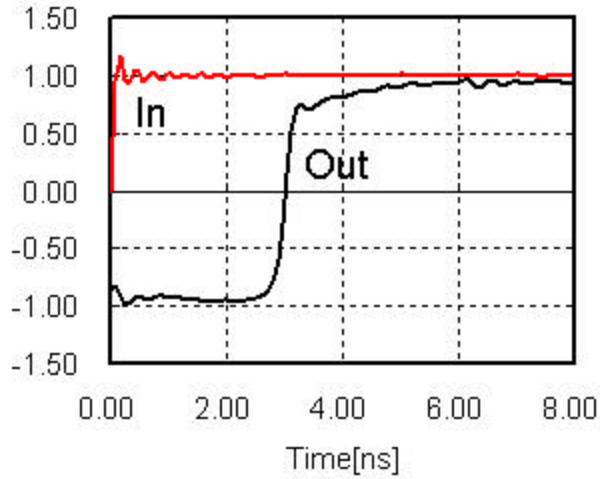
Group Delay



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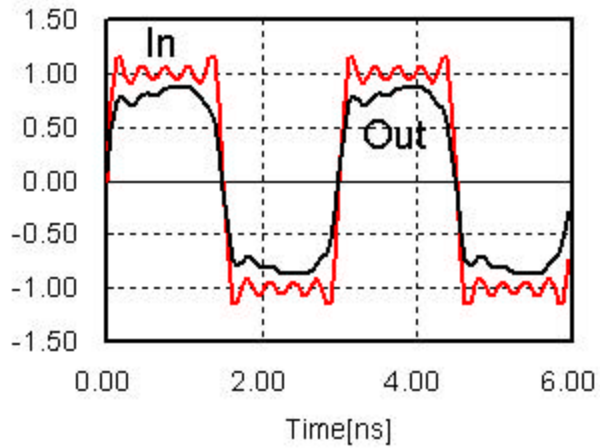
FDC3005A

Output waveform
(Step function)



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Output waveform
(333MHz Clock)

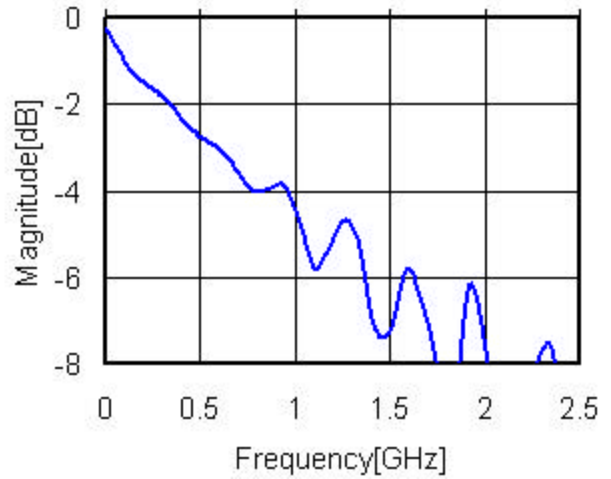


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FDC5005

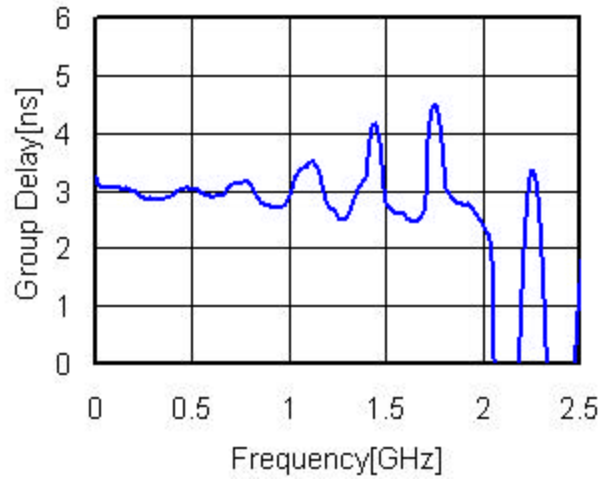
Output waveform
(Step function)

Amplitude / Frequency



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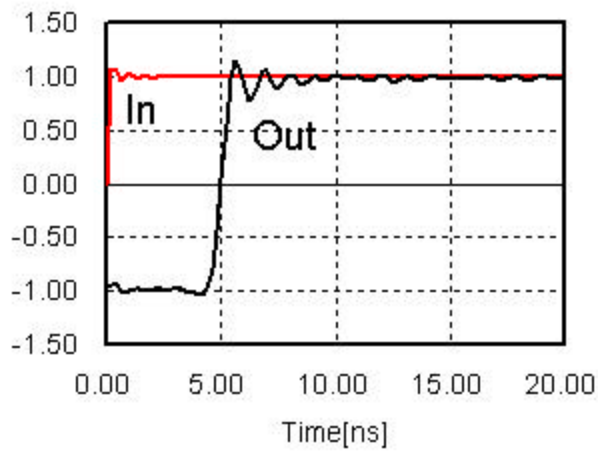
Group Delay



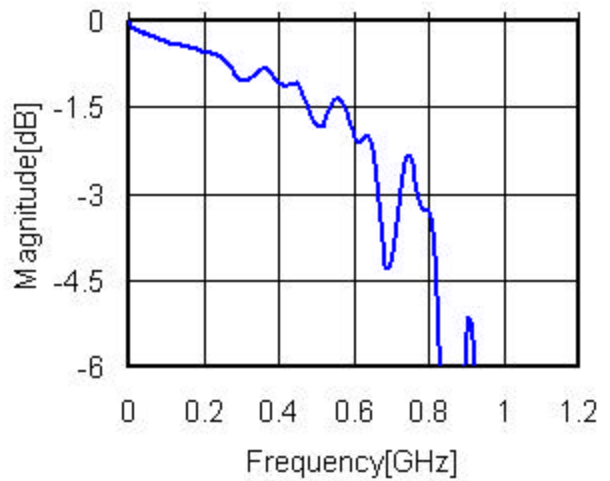
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Output waveform
(Step function)

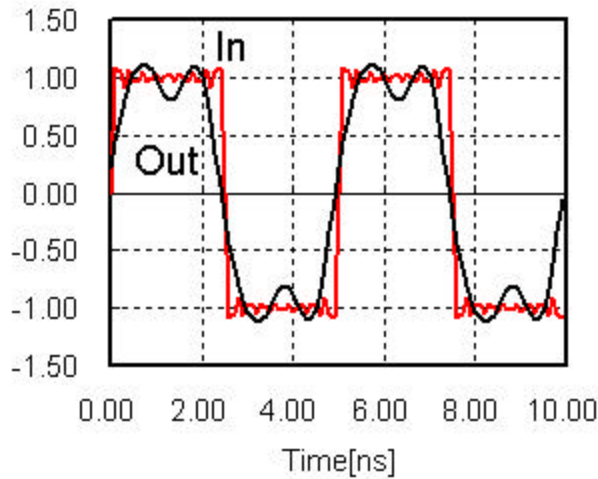
Amplitude / Frequency



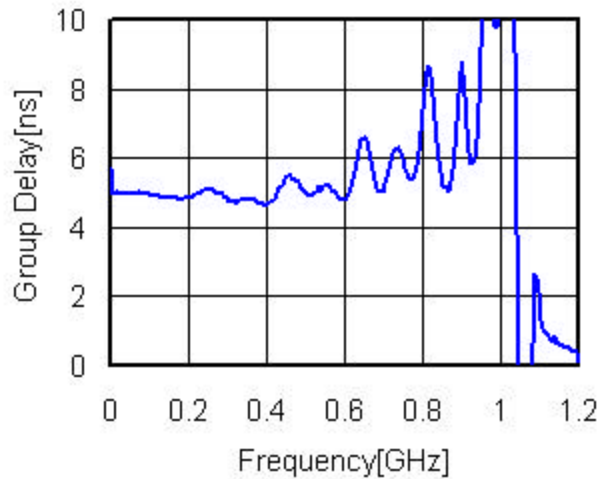
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Output waveform
 (200MHz Clock)



Printable Version - High Resolution PDF
Group Delay



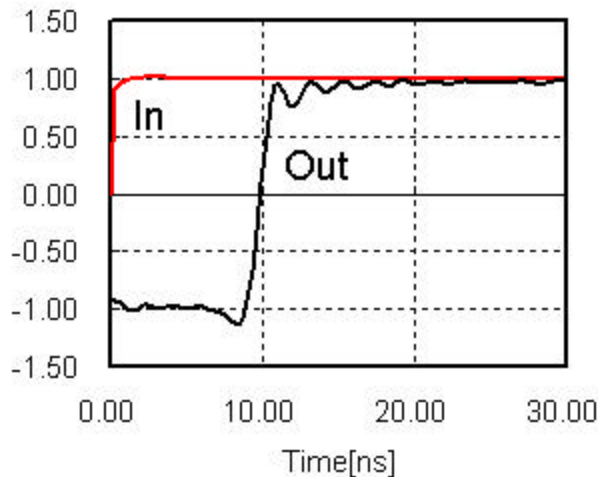
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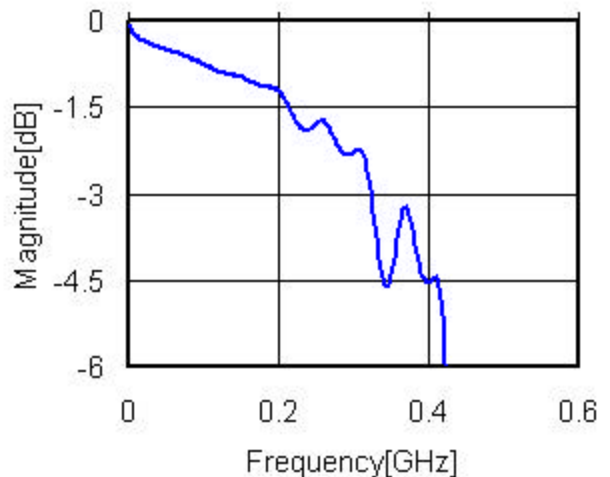
FDD10005

Output waveform
 (Step function)



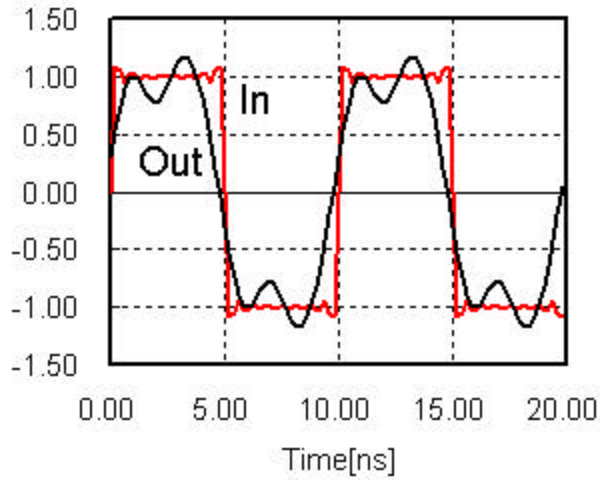
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Amplitude / Frequency



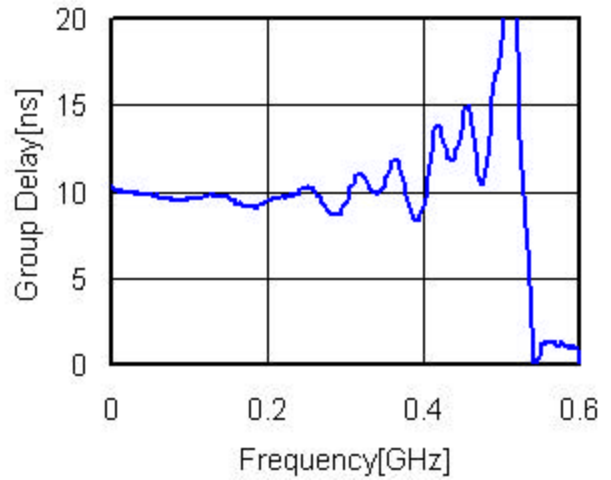
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**Output waveform
(100]MHz Clock)**



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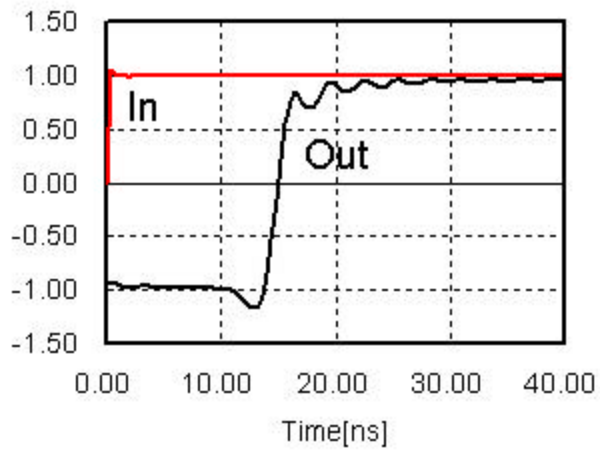
Group Delay



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FDD15005

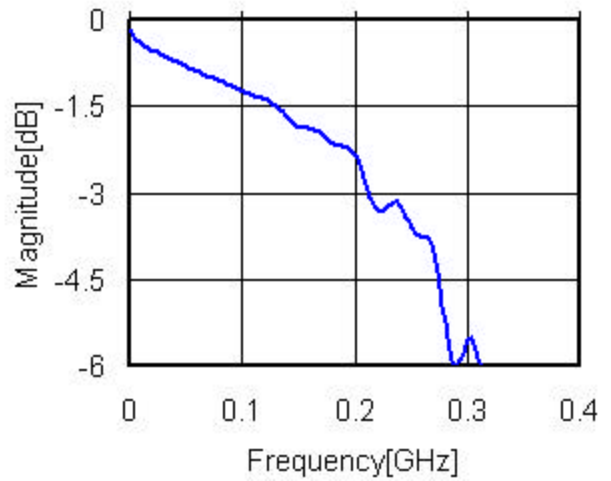
**Output waveform
(Step function)**



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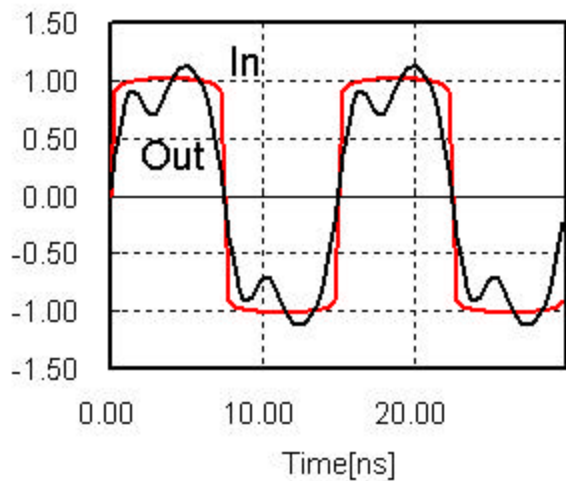
**Output waveform
(66.7MHz Clock)**

Amplitude / Frequency

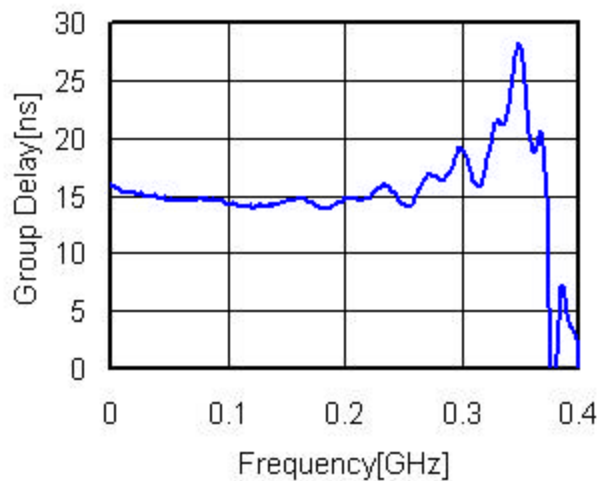


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Group Delay



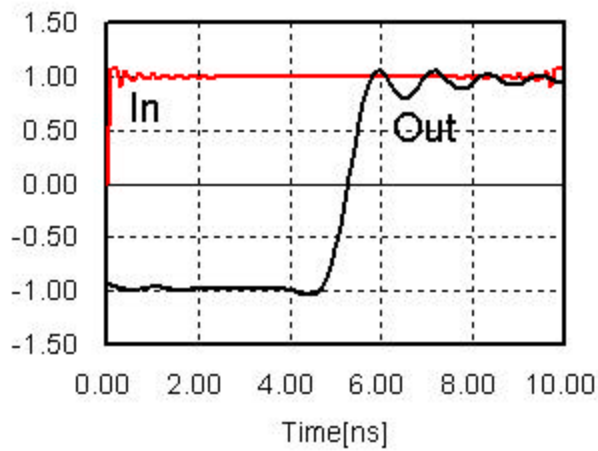
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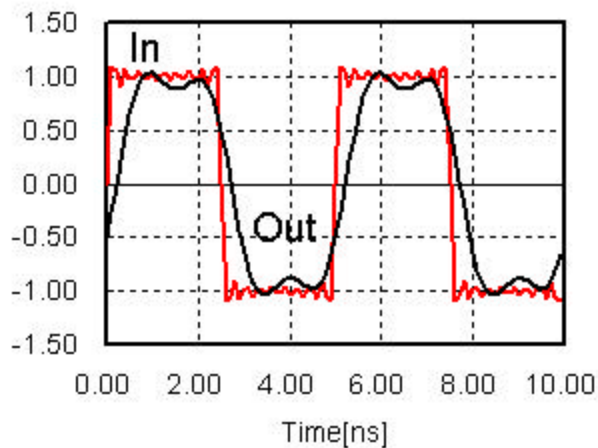
FDC5010

Output waveform (Step function)



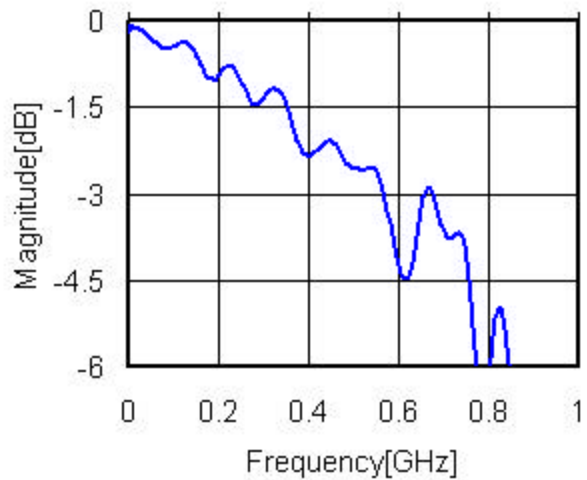
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Output waveform (200MHz Clock)



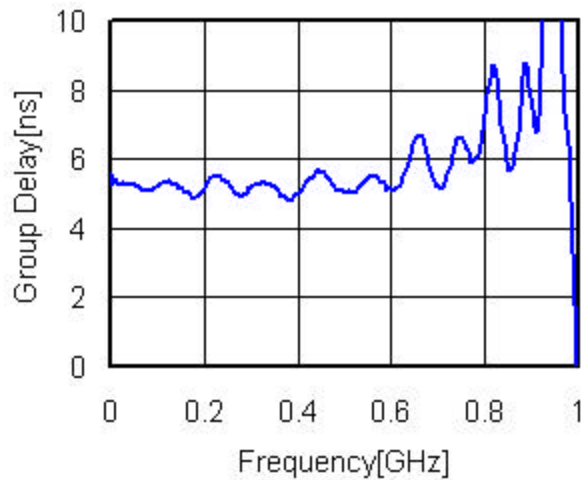
[Printable Version - High Resolution PDF](#)

Amplitude / Frequency



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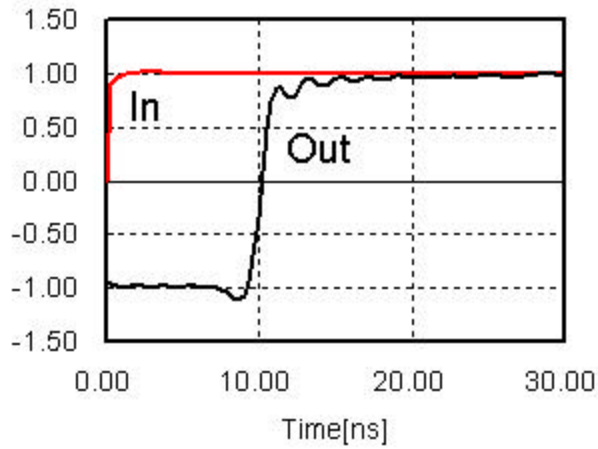
Group Delay



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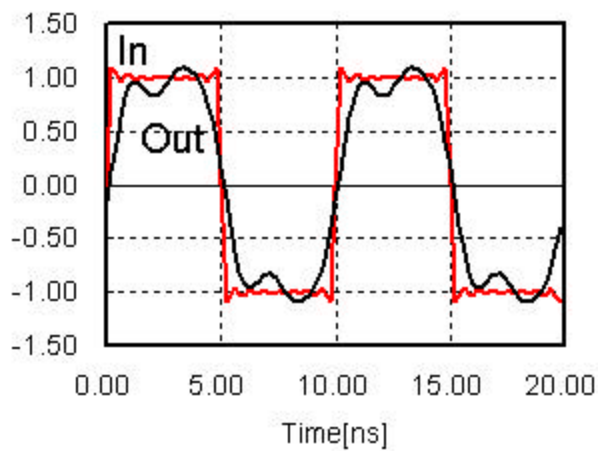
FDD10010

Output waveform
(Step function)



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Output waveform
(100MHz Clock)

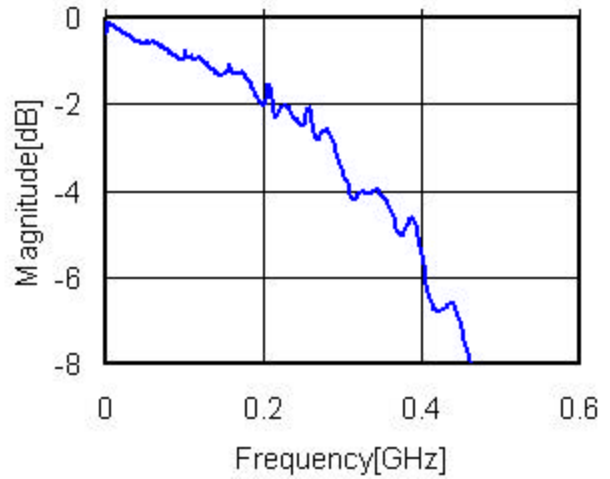


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FDD15010

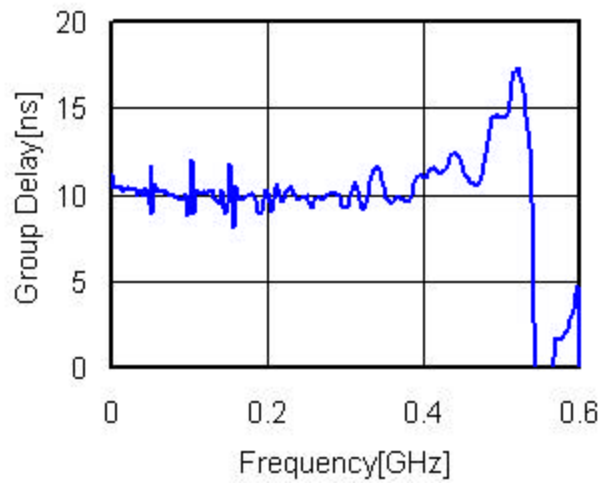
Output waveform
(Step function)

Amplitude / Frequency



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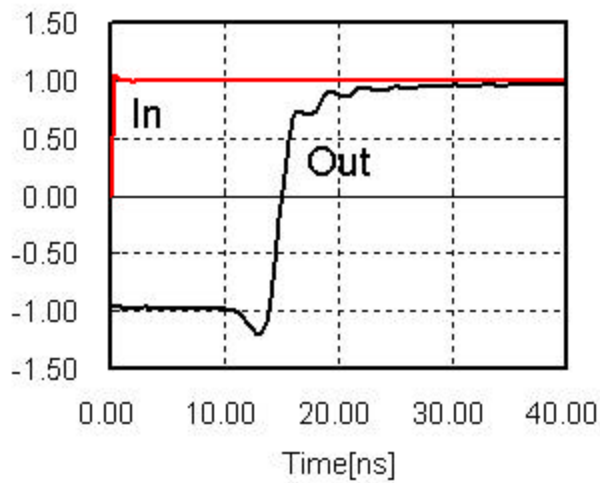
Group Delay



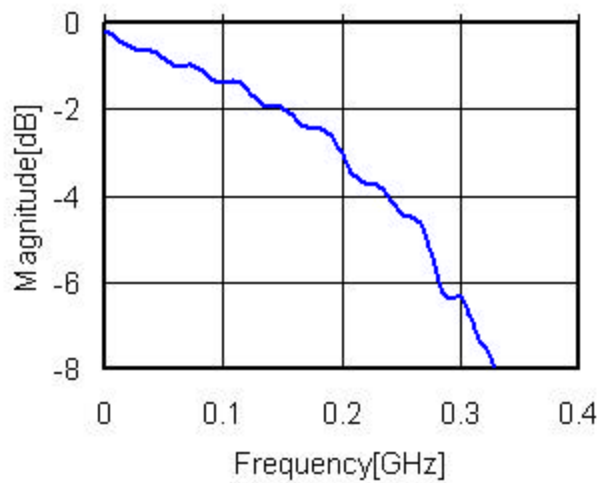
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Output waveform
(Step function)

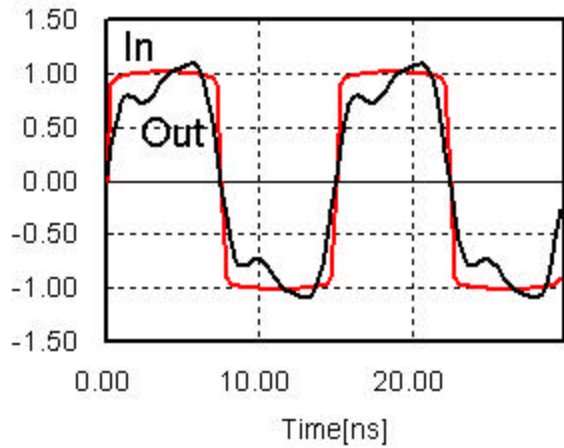
Amplitude / Frequency



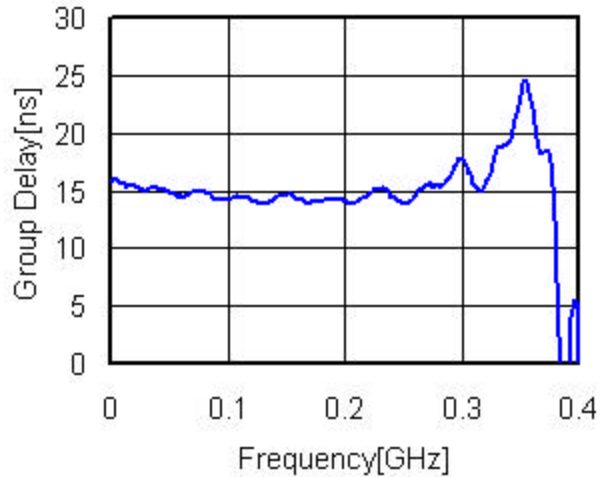
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Output waveform
 (66.7MHz Clock)



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Group Delay



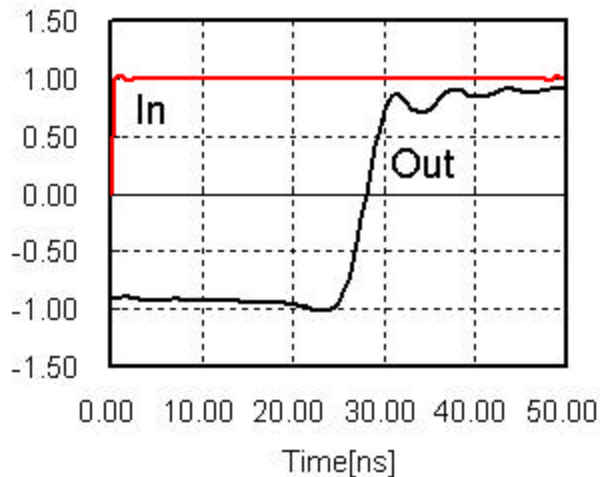
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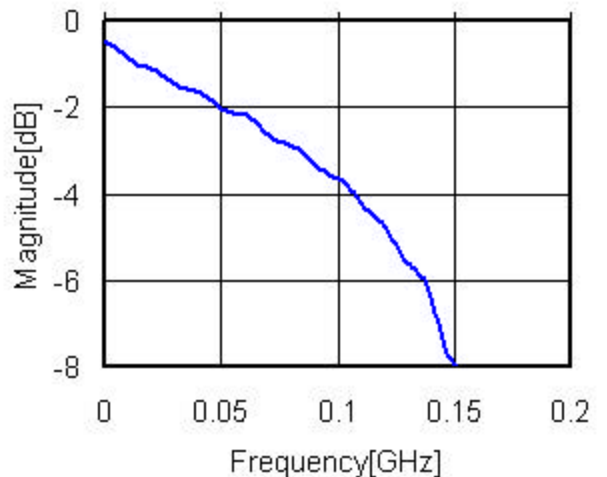
FDD27010

Output waveform
 (Step function)



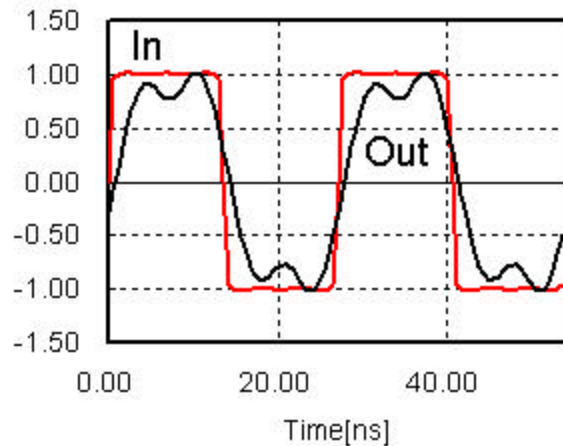
[Printable Version - High Resolution PDF](#)

Amplitude / Frequency



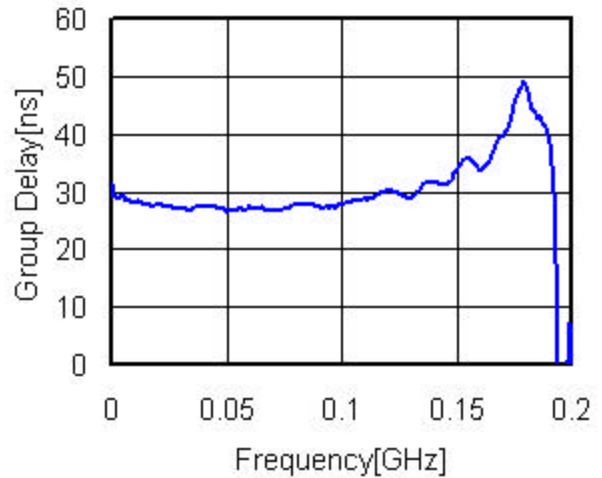
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Output waveform (37MHz Clock)



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Group Delay



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RoHS Compliance Status

1. Compliance Status

Completed. However, if RoHS-compliant components are not specified at the time of order, non-compliant stock items may be supplied until depleted.

2. Differentiating Compliant and Non-compliant Components

Compliant and Non-compliant Components will be differentiated by Lot Numbers.

Non-compliant Components: 2-digit year/month code

Compliant Components: S+2-digit year/month code (3-digit code)

3. Terminal Plating

Non-compliant Components: 90% Sn/10% Pb, 7 μ m Min

Compliant Components: Base: 100% Ni, 0.2~0.5 μ m

External: 100% Sn, 5~10 μ m

1875 South Grant Street, Suite 570 ~ San Mateo, CA 94402 USA
(650) 212-4744 ~ sales@elmectech.com

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