FDC/FDD 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.

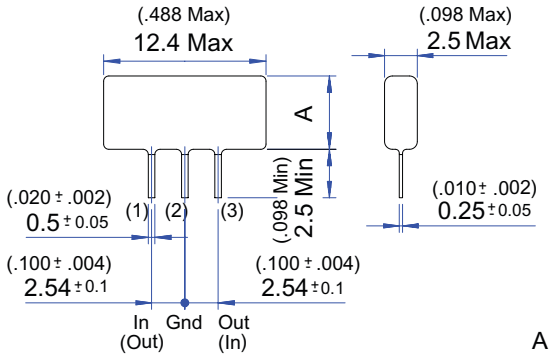
COMMON SPECIFICATIONS

Waveform Distortion:	Overshoot/preshoot under ±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

FDC Type

FDD Type

PACKAGE DIMENSIONS & PIN CONFIGURATION



Unit:mm (inch)

A FDC Type:6MAX(.236)
FDD Type:8MAX(.315)

WN 124009I/12.02

FDC/FDD High-Speed Fixed Delay Lines

SPECIFICATIONS

Part Number	Impedance	Delay Time	Rise Time (20%-80% Max)	-3dB Passband (Minimum)	Temperature Coefficient
*FDC00505	50Ω±10%	50ps±25ps	150ps	5.0GHz	±100ppm/°C
*FDC0105		100ps±25ps	150ps	3.0GHz	
*FDC01505		150ps±25ps	150ps	2.2GHz	
*FDC0205		200ps±25ps	150ps	2.2GHz	
*FDC02505		250ps±25ps	150ps	2.0GHz	
*FDC0305		300ps±25ps	150ps	3.2GHz	
*FDC03505		350ps±25ps	150ps	3.0GHz	
*FDC0405		400ps±25ps	150ps	3.0GHz	
*FDC04505		450ps±25ps	200ps	2.3GHz	
*FDC0505		500ps±25ps	200ps	2.3GHz	
*FDC05505		550ps±25ps	200ps	2.2GHz	
*FDC0605		600ps±50ps	200ps	2.0GHz	
*FDC0705		700ps±50ps	200ps	1.5GHz	
*FDC0805		800ps±50ps	200ps	1.5GHz	
*FDC0905		900ps±50ps	200ps	1.8GHz	
*FDC1005		1.0ns±50ps	200ps	1.5GHz	
*FDC1105		1.1ns±50ps	250ps	1.5GHz	
*FDC1205		1.2ns±50ps	250ps	1.3GHz	
*FDC1305		1.3ns±50ps	250ps	1.3GHz	
*FDC1405		1.4ns±50ps	250ps	1.3GHz	
*FDC1505		1.5ns±50ps	250ps	1.1GHz	
*FDC1605		1.6ns±50ps	300ps	1.1GHz	
*FDC1705		1.7ns±50ps	300ps	1.1GHz	
*FDC1805		1.8ns±50ps	300ps	1.0GHz	
*FDC1905		1.9ns±50ps	300ps	1.0GHz	
*FDC2005		2.0ns±50ps	300ps	1.0GHz	
*FDC2105		2.1ns±50ps	300ps	800MHz	
*FDC2205		2.2ns±50ps	300ps	800MHz	
*FDC2305		2.3ns±50ps	350ps	700MHz	
*FDC2405		2.4ns±50ps	350ps	700MHz	
*FDC2505A		2.5ns±50ps	350ps	700MHz	
*FDC2605		2.6ns±50ps	400ps	600MHz	
*FDC2705		2.7ns±50ps	400ps	600MHz	
*FDC2805		2.8ns±50ps	400ps	600MHz	
*FDC2905		2.9ns±50ps	450ps	550MHz	
*FDC3005A		3.0ns+100ps/-50ps	450ps	550MHz	
FDC3505		3.5ns±0.25ns	600ps	700MHz	
FDC4005		4.0ns±0.3ns	700ps	700MHz	
FDC4505		4.5ns±0.3ns	700ps	600MHz	-400±200 ppm/°C
FDC5005		5.0ns±0.3ns	700ps	600MHz	
*FDC0510	100Ω±10%	0.5ns±0.1ns	300ps	1.5GHz	±100ppm/°C
FDC1010		1.0ns±0.1ns	300ps	1.0GHz	
FDC1510		1.5ns±0.15ns	400ps	900MHz	
FDC2010		2.0ns±0.2ns	400ps	800MHz	
FDC2510		2.5ns±0.2ns	500ps	700MHz	
FDC3010		3.0ns±0.2ns	500ps	700MHz	
FDC3510		3.5ns±0.25ns	600ps	600MHz	
FDC4010		4.0ns±0.3ns	700ps	600MHz	
FDC4510		4.5ns±0.3ns	700ps	600MHz	
FDC5010		5.0ns±0.3ns	700ps	600MHz	

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

FDC/FDD High-Speed Fixed Delay Lines

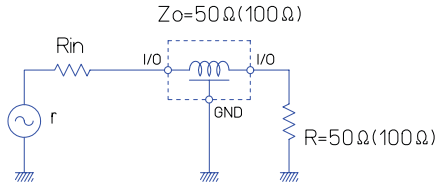
SPECIFICATIONS

Part Number	Impedance	Delay Time	Rise Time (20%-80% Max)	-3dB Passband (Minimum)	Temperature Coefficient
FDD5505	50Ω ±10%	5.5ns±0.3ns	800ps	500MHz	-400±200 ppm/°C
FDD6005		6.0ns±0.3ns	900ps	500MHz	
FDD6505		6.5ns±0.4ns	900ps	450MHz	
FDD7005		7.0ns±0.4ns	1.0ns	430MHz	
FDD7505		7.5ns±0.4ns	1.0ns	400MHz	
FDD8005		8.0ns±0.4ns	1.1ns	400MHz	
FDD8505		8.5ns±0.5ns	1.2ns	350MHz	
FDD9005		9.0ns±0.5ns	1.3ns	330MHz	
FDD9505		9.5ns±0.5ns	1.3ns	290MHz	
FDD10005		10.0ns±0.5ns	1.4ns	290MHz	
FDD10505		10.5ns±0.5ns	1.4ns	200MHz	
FDD11005		11.0ns±0.5ns	1.4ns	200MHz	
FDD11505		11.5ns±0.5ns	1.5ns	170MHz	
FDD12005		12.0ns±0.5ns	1.5ns	170MHz	
FDD12505		12.5ns±0.5ns	1.6ns	150MHz	
FDD13005		13.0ns±0.5ns	1.6ns	150MHz	
FDD13505		13.5ns±0.5ns	1.7ns	150MHz	
FDD14005		14.0ns±0.5ns	1.7ns	150MHz	
FDD14505		14.5ns±0.5ns	1.8ns	150MHz	
FDD15005		15.0ns±0.5ns	1.8ns	150MHz	
FDD5510	100Ω ±10%	5.5ns±0.3ns	800ps	400MHz	
FDD6010		6.0ns±0.3ns	900ps	400MHz	
FDD6510		6.5ns±0.4ns	900ps	350MHz	
FDD7010		7.0ns±0.4ns	1.0ns	350MHz	
FDD7510		7.5ns±0.4ns	1.0ns	330MHz	
FDD8010		8.0ns±0.4ns	1.1ns	330MHz	
FDD8510		8.5ns±0.5ns	1.2ns	300MHz	
FDD9010		9.0ns±0.5ns	1.3ns	300MHz	
FDD9510		9.5ns±0.5ns	1.3ns	250MHz	
FDD10010		10.0ns±0.5ns	1.4ns	250MHz	
FDD10510		10.5ns±0.6ns	1.4ns	200MHz	
FDD11010		11.0ns±0.6ns	1.4ns	200MHz	
FDD11510		11.5ns±0.6ns	1.5ns	170MHz	
FDD12010		12.0ns±0.6ns	1.5ns	170MHz	
FDD12510		12.5ns±0.7ns	1.6ns	150MHz	
FDD13010		13.0ns±0.7ns	1.6ns	150MHz	
FDD13510		13.5ns±0.7ns	1.7ns	150MHz	
FDD14010		14.0ns±0.7ns	1.8ns	140MHz	
FDD14510		14.5ns±0.8ns	1.9ns	130MHz	
FDD15010		15.0ns±0.8ns	2.0ns	130MHz	
FDD16010		16.0ns±0.8ns	2.1ns	120MHz	
FDD17010		17.0ns±0.9ns	2.2ns	115MHz	
FDD18010		18.0ns±0.9ns	2.3ns	110MHz	
FDD19010		19.0ns±1.0ns	2.5ns	105MHz	
FDD20010		20.0ns±1.0ns	2.7ns	100MHz	
FDD21010		21.0ns±1.1ns	2.9ns	95MHz	
FDD22010		22.0ns±1.1ns	3.1ns	90MHz	
FDD23010		23.0ns±1.2ns	3.3ns	85MHz	
FDD24010		24.0ns±1.2ns	3.5ns	83MHz	
FDD25010		25.0ns±1.3ns	3.7ns	80MHz	
FDD27010		27.0ns±1.4ns	4.0ns	74MHz	

FDC/FDD High-Speed Fixed Delay Lines

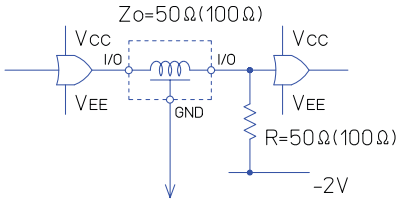
TYPICAL APPLICATIONS AND TERMINATION METHODS

(1) Analog circuit



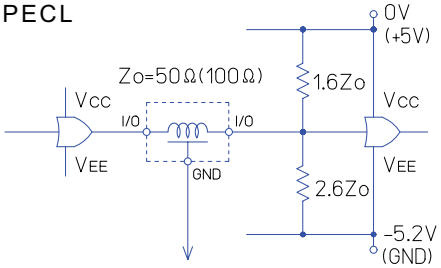
r :Impedance of signal source
Rin:Input adjustment resistance
Zo :Characteristics impedance of internal Elements (=Output impedance)
Ro :Internal adjustment resistance (=Zo)
r+Rin=Zo=R

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



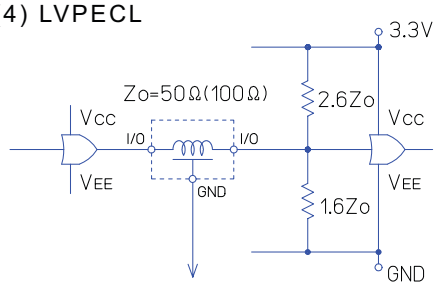
Connect to one of the V_{CC}, V_{EE} or -2V lines

(3) PECL



Connect to either V_{CC} or V_{EE} lines

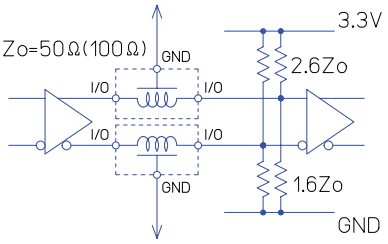
(4) LVPECL



Connect to either 3.3V or GND

(5) LVPECL Differential

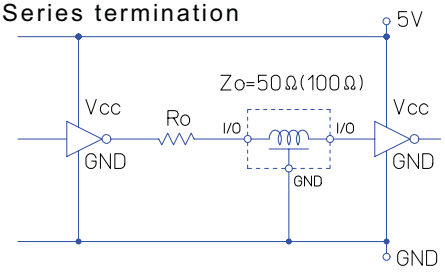
Connect to either 3.3V or GND



Connect to either 3.3V or GND

(6) TTL(FAST), CMOS(FACT)

Series termination



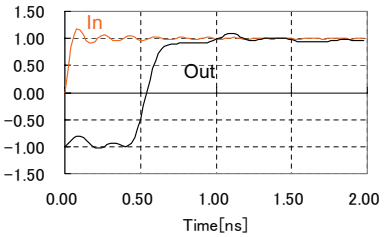
Ro should be adjusted to a value near Zo.

FDC/FDD High-Speed Fixed Delay Lines

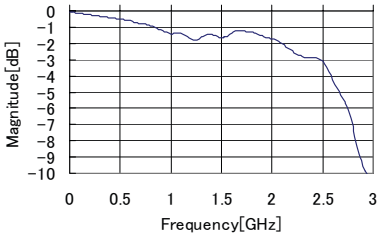
OUTPUT WAVEFORMS (1)

(1) FDC0505

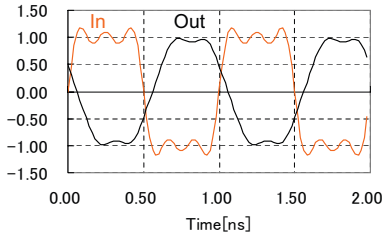
Output waveform (Step function)



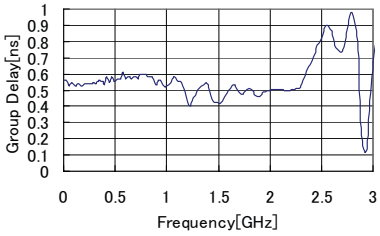
Sdd21 Amplitude / Frequency



Output waveform (1GHz Clock)

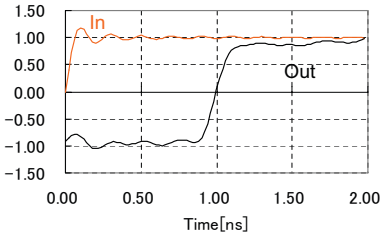


Group Delay

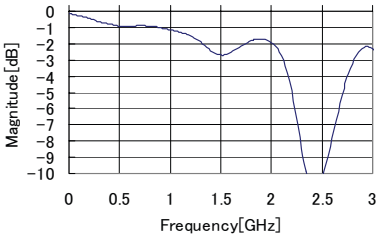


(2) FDC1005

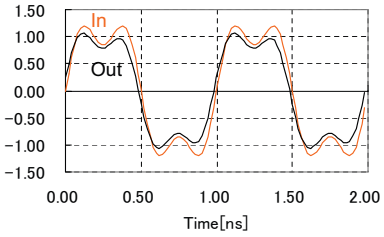
Output waveform (Step function)



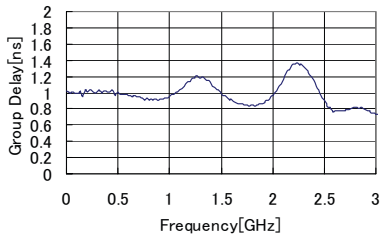
Sdd21 Amplitude / Frequency



Output waveform (1GHz Clock)



Group Delay

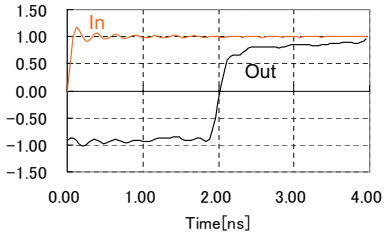


FDC/FDD High-Speed Fixed Delay Lines

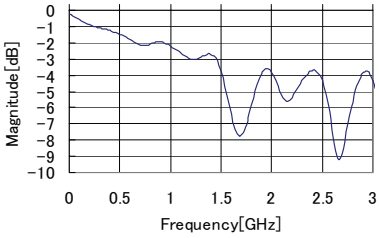
OUTPUT WAVEFORMS (2)

(3) FDC2005

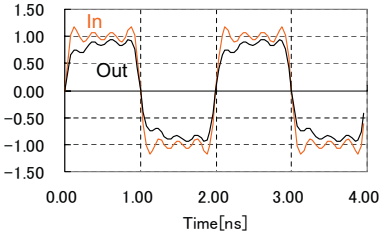
Output waveform (Step function)



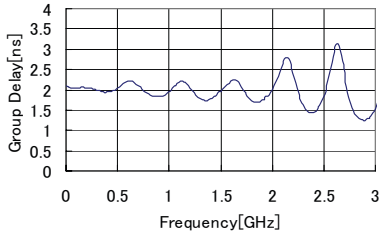
Sdd21 Amplitude / Frequency



Output waveform (500MHz Clock)

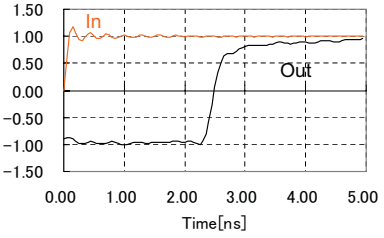


Group Delay

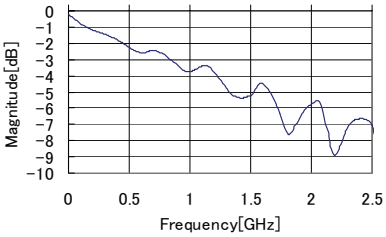


(4) FDC2505A

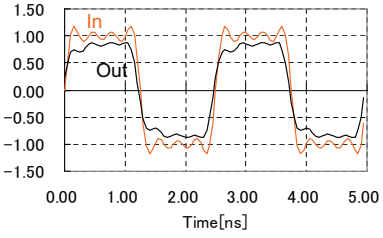
Output waveform (Step function)



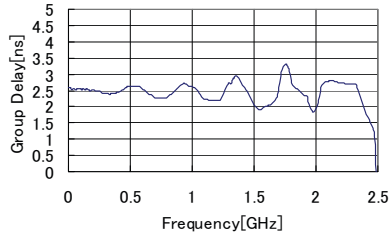
Sdd21 Amplitude / Frequency



Output waveform (400MHz Clock)



Group Delay

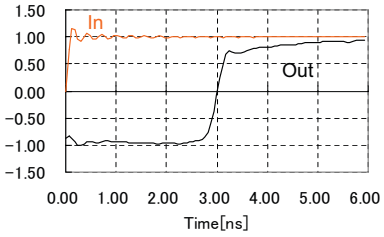


FDC/FDD High-Speed Fixed Delay Lines

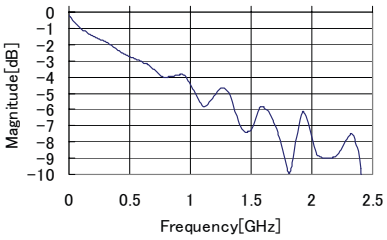
OUTPUT WAVEFORMS (3)

(5) FDC3005A

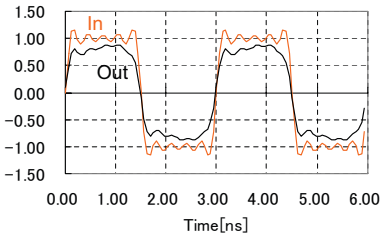
Output waveform (Step function)



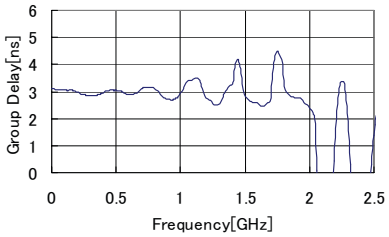
Sdd21 Amplitude / Frequency



Output waveform (333MHz Clock)

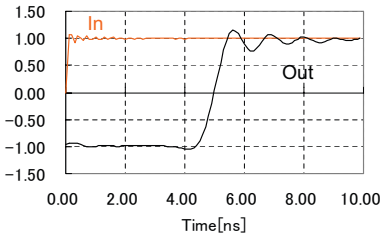


Group Delay

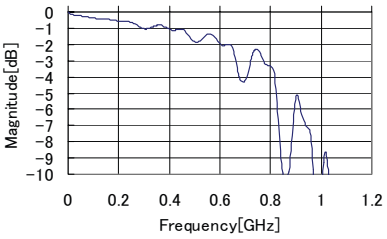


(6) FDC5005

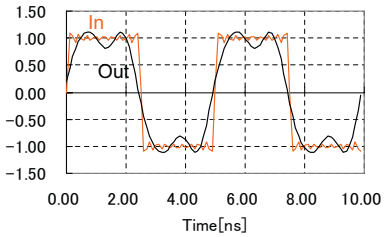
Output waveform (Step function)



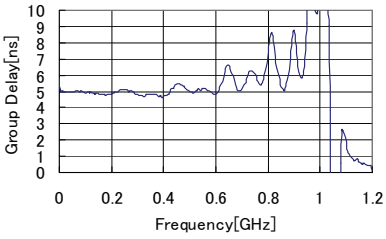
Sdd21 Amplitude / Frequency



Output waveform (200MHz Clock)



Group Delay

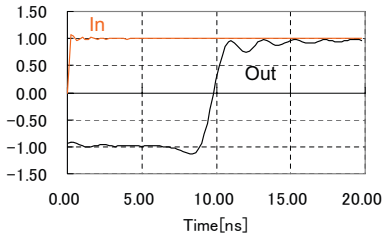


FDC/FDD High-Speed Fixed Delay Lines

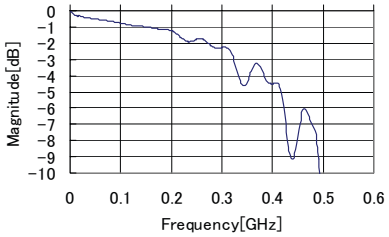
OUTPUT WAVEFORMS (4)

(7) FDD10005

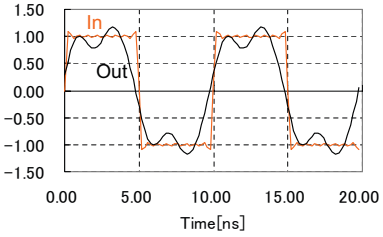
Output waveform (Step function)



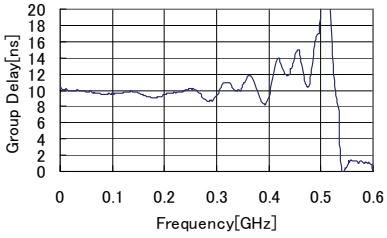
Sdd21 Amplitude / Frequency



Output waveform (100MHz Clock)

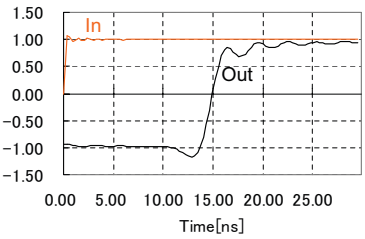


Group Delay

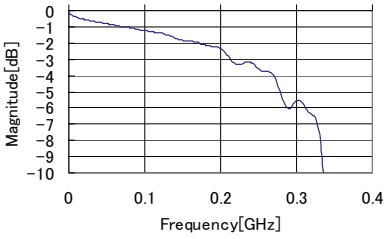


(8) FDD15005

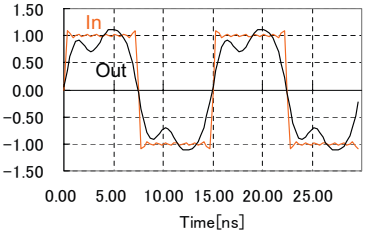
Output waveform (Step function)



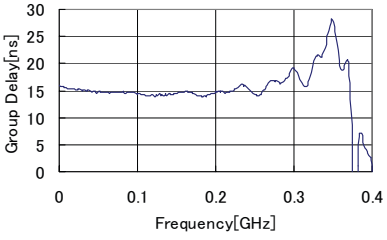
Sdd21 Amplitude / Frequency



Output waveform (66.7MHz Clock)



Group Delay

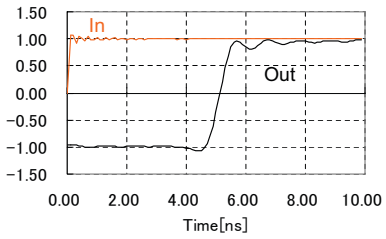


FDC/FDD High-Speed Fixed Delay Lines

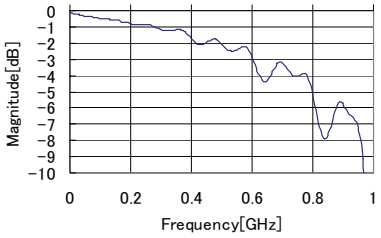
OUTPUT WAVEFORMS (5)

(9) FDC5010

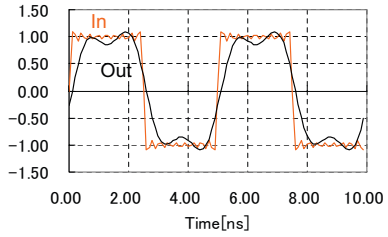
Output waveform (Step function)



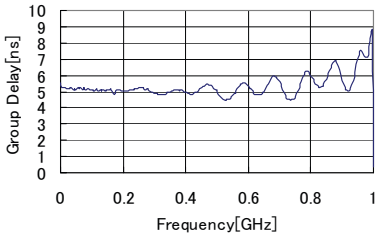
Sdd21 Amplitude / Frequency



Output waveform (200MHz Clock)

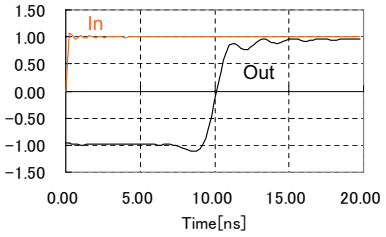


Group Delay

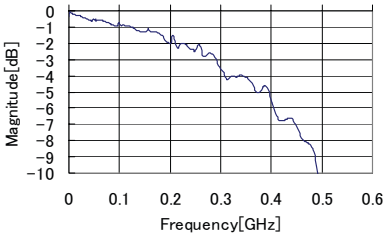


(10) FDD10010

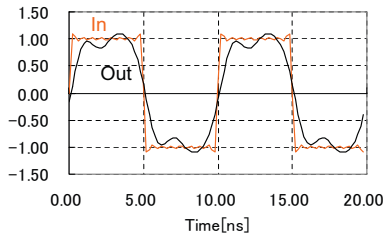
Output waveform (Step function)



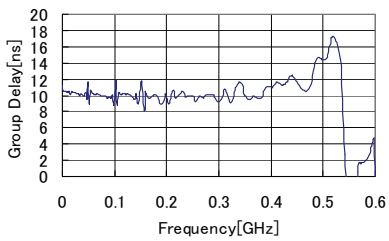
Sdd21 Amplitude / Frequency



Output waveform (100MHz Clock)



Group Delay

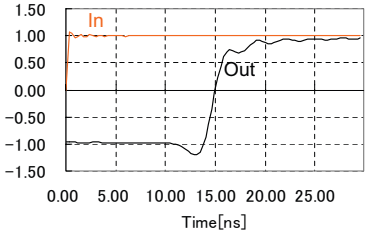


FDC/FDD High-Speed Fixed Delay Lines

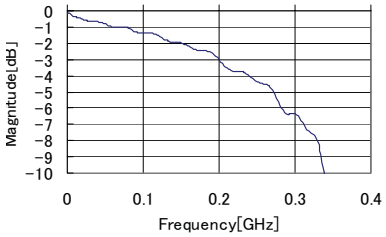
OUTPUT WAVEFORMS (6)

(11) FDD15010

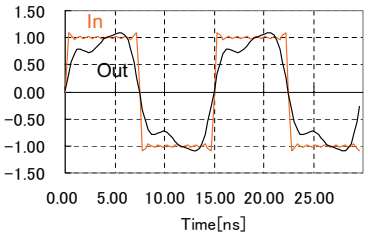
Output waveform (Step function)



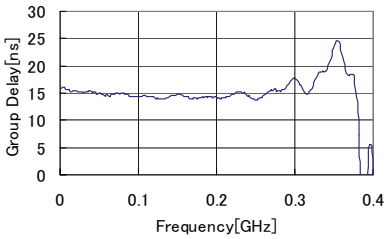
Sdd21 Amplitude / Frequency



Output waveform (66.7MHz Clock)

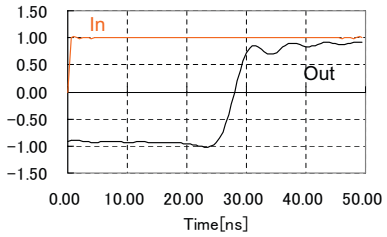


Group Delay

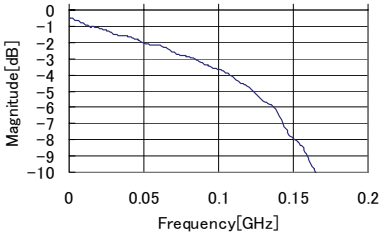


(12) FDD27010

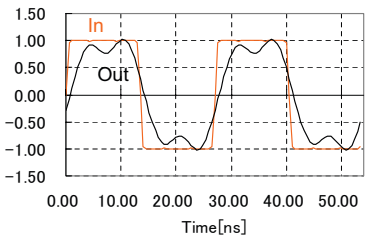
Output waveform (Step function)



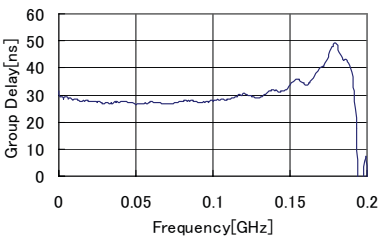
Sdd21 Amplitude / Frequency



Output waveform (37MHz Clock)



Group Delay



FDC/FDD High-Speed Fixed Delay Lines

RoHS Compliance Status

1. Compliance Status

RoHS-compliant components are available. 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, 7µm Min

Compliant Components: Base: 100% Ni, 0.2~0.5µm

External: 100% Sn, 5~10µm