



# SGM7302

## 6.8GHz, 2:1 (SPDT) 10-Channel MIPI Switch with 1.2V Logic Support

---

### GENERAL DESCRIPTION

The SGM7302 is an optimized differential 5-channel (single-ended 10-channel) single-pole, double-throw (SPDT) dual directional high-speed switch. The product attribute determines that it is suitable for multiple MIPI compliant devices to connect to a single CSI/DSI, C-PHY/D-PHY module. The device also supports SATA, SAS, MIPI DSI/CSI, LVDS, RGMII, DDR and Ethernet interfaces.

The main features of product are 6.8GHz bandwidth, low skew between channels with little signal degradation, and great layout loss compensation. Its low current consumption meets the needs of low power applications, including mobile phones and other personal electronics.

The SGM7302 is available in a Green FOCSP-2.43×2.43-36B package.

### FEATURES

- **Supply Voltage Range: 1.5V to 5.5V**
- **Low R<sub>ON</sub>: 5Ω (TYP)**
- **High Bandwidth: 6.8GHz**
- **Ultra Low Crosstalk: -55dB**
- **Low Power Disable Mode**
- **1.2V Logic Compatible**
- **Bidirectional Signal Path**
- **Available in a Green FOCSP-2.43×2.43-36B Package**

### APPLICATIONS

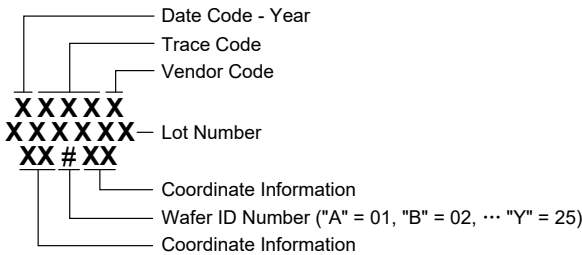
Smart Phone  
Tablet PC  
Notebook PC  
AI Equipment  
Medical Equipment

**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM7302	FOCSP-2.43x2.43-36B	-40°C to +85°C	SGM7302YG/TR	0GR XXXXX XXXXXX XX#XX	Tape and Reel, 3000

**MARKING INFORMATION**

NOTE: XXXXX = Date Code, Trace Code and Vendor Code. XXXXXX = Lot Number. XX#XX = Coordinate Information and Wafer ID Number.



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

**ABSOLUTE MAXIMUM RATINGS**

- Supply Voltage Range,  $V_{DD}$  ..... -0.5V to 5.8V
- Switch Signal Voltage (Differential Input/Output),  $V_{SW}$  .....  
..... -0.5V to 3.3V
- $V_{SEL}$ ,  $V_{IOE}$ ..... -0.5V to 5.8V
- Junction Temperature ..... +150°C
- Storage Temperature Range ..... -65°C to +150°C
- Lead Temperature (Soldering, 10s) ..... +260°C
- ESD Susceptibility
- HBM ..... 3500V
- CDM ..... 2000V

**RECOMMENDED OPERATING CONDITIONS**

- Operating Temperature Range,  $T_A$  ..... -40°C to +85°C
- Supply Voltage Range,  $V_{DD}$  ..... 1.5V to 5.5V
- Switch Signal Voltage (Differential Input/Output),  $V_{SW}$  .....  
..... 0V to 1.3V
- $V_{SEL}$ ,  $V_{IOE}$  ..... 0V to 5.5V

**OVERSTRESS CAUTION**

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

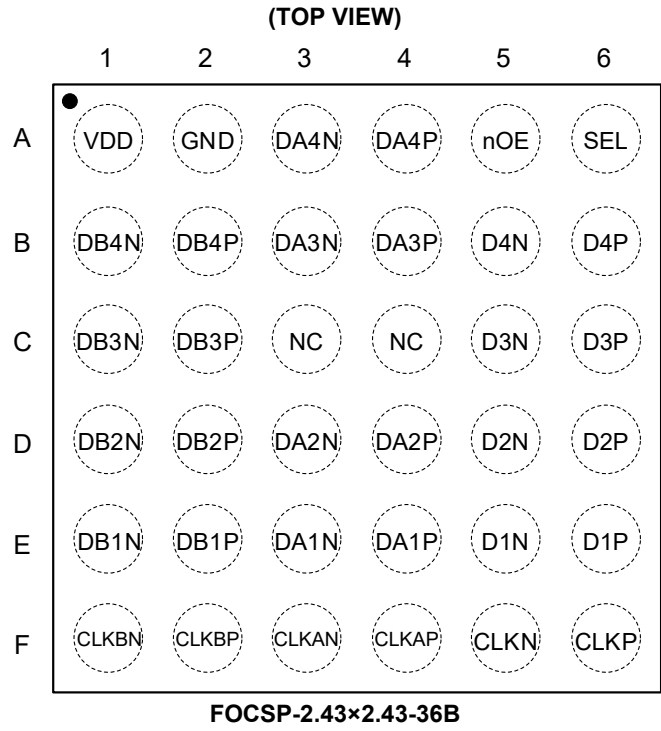
**ESD SENSITIVITY CAUTION**

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

**PIN CONFIGURATION**



**PIN DESCRIPTION**

PIN	NAME	I/O	FUNCTION	PIN	NAME	I/O	FUNCTION
F3	CLKAN	I/O	Differential Input/Output.	B3	DA3N	I/O	Differential Input/Output.
F4	CLKAP	I/O	Differential Input/Output.	B4	DA3P	I/O	Differential Input/Output.
F1	CLKBN	I/O	Differential Input/Output.	A3	DA4N	I/O	Differential Input/Output.
F2	CLKBP	I/O	Differential Input/Output.	A4	DA4P	I/O	Differential Input/Output.
F5	CLKN	I/O	Differential Input/Output.	E1	DB1N	I/O	Differential Input/Output.
F6	CLKP	I/O	Differential Input/Output.	E2	DB1P	I/O	Differential Input/Output.
E5	D1N	I/O	Differential Input/Output.	D1	DB2N	I/O	Differential Input/Output.
E6	D1P	I/O	Differential Input/Output.	D2	DB2P	I/O	Differential Input/Output.
D5	D2N	I/O	Differential Input/Output.	C1	DB3N	I/O	Differential Input/Output.
D6	D2P	I/O	Differential Input/Output.	C2	DB3P	I/O	Differential Input/Output.
C5	D3N	I/O	Differential Input/Output.	B1	DB4N	I/O	Differential Input/Output.
C6	D3P	I/O	Differential Input/Output.	B2	DB4P	I/O	Differential Input/Output.
B5	D4N	I/O	Differential Input/Output.	A2	GND	G	Ground.
B6	D4P	I/O	Differential Input/Output.	C3, C4	NC	-	No Connection.
E3	DA1N	I/O	Differential Input/Output.	A5	nOE	I	Output Enable (Active Low), Has Internal Pull-Down Resistor.
E4	DA1P	I/O	Differential Input/Output.	A6	SEL	I	Channel Select.
D3	DA2N	I/O	Differential Input/Output.	A1	VDD	P	Power Supply Voltage.
D4	DA2P	I/O	Differential Input/Output.				

NOTE: I = input, O = output, G = ground, P = power.

FUNCTIONAL BLOCK DIAGRAM

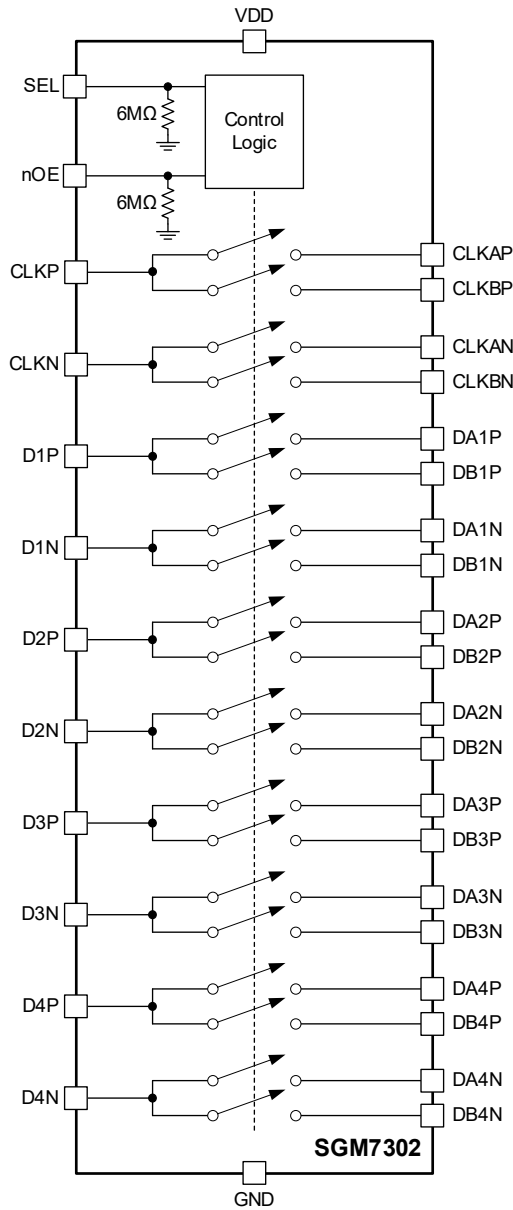


Figure 1. Block Diagram

FUNCTION TABLE

nOE	SEL	FUNCTION
H	X	Input/Output Pins High-Impedance
L	L	Differential Input CLK = Differential Output CLKA
		Differential Input Dn = Differential Output DAN
L	H	Differential Input CLK = Differential Output CLKB
		Differential Input Dn = Differential Output DBn

NOTE: X = Don't care.

## ELECTRICAL CHARACTERISTICS

(T<sub>A</sub> = +25°C, V<sub>DD</sub> = 1.5V to 5.5V, typical values are at V<sub>DD</sub> = 1.8V, unless otherwise noted.)

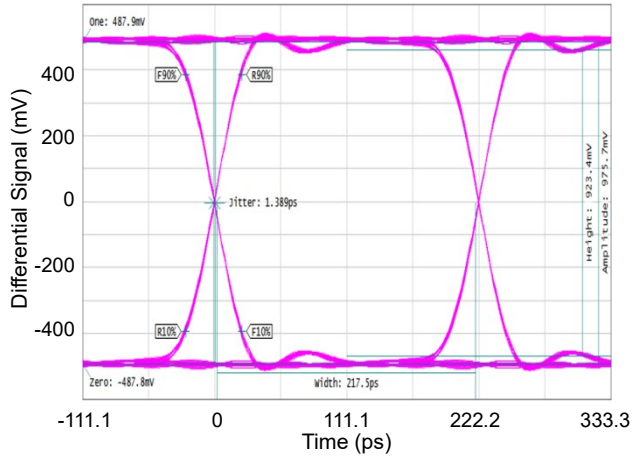
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	
<b>Device Parameters</b>							
Input Voltage (High)	V <sub>IH</sub>	SEL, nOE	1		5.5	V	
Input Voltage (Low)	V <sub>IL</sub>	SEL, nOE	0		0.4	V	
Input Leakage Current (High)	I <sub>LK,H</sub>	SEL, nOE	-1		5	μA	
Input Leakage Current (Low)	I <sub>LK,L</sub>	SEL, nOE	-1		5	μA	
Pull-Down Resistance	R <sub>PD</sub>	SEL, nOE		6		MΩ	
Digital Input Capacitance	C <sub>I</sub>	V <sub>SEL</sub> = 0V, 1.8V or V <sub>DD</sub> , f = 1MHz		5		pF	
<b>Power Supply</b>							
Supply Current (Normal)	I <sub>VDD</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>nOE</sub> = 0V, V <sub>SEL</sub> = 0V or 5.5V Differential port input = 0V		50	85	μA	
Supply Current (Power-Down)	I <sub>DD_PD</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>nOE</sub> = V <sub>DD</sub> , V <sub>SEL</sub> = 0V or 5.5V Differential port input = 0V			3	μA	
<b>DC Characteristics</b>							
Resistance-On (High Speed)	R <sub>ON</sub>	V <sub>nOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port input = 0.2V Differential port output = -8mA	V <sub>DD</sub> = 1.8V to 5.5V		3.5	4.5	Ω
			V <sub>DD</sub> = 1.5V		3.8	5.0	
Resistance-On (Low Power)	R <sub>ON</sub>	V <sub>nOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port input = 1.3V Differential port output = -8mA	V <sub>DD</sub> = 1.8V to 5.5V		4.2	5.0	Ω
			V <sub>DD</sub> = 1.5V		5.2	6.5	
Resistance-On Flatness (High Speed)	R <sub>FLAT_ON</sub>	V <sub>nOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port input = 0V to 0.2V Differential port output = -8mA	V <sub>DD</sub> = 1.8V to 5.5V		0.1		Ω
			V <sub>DD</sub> = 1.5V		0.2		
Resistance-On Flatness (Low Power)	R <sub>FLAT_ON</sub>	V <sub>nOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port input = 0V to 1.3V Differential port output = -8mA	V <sub>DD</sub> = 1.8V to 5.5V		0.8		Ω
			V <sub>DD</sub> = 1.5V		1.6		
Resistance-On Match between Pairs of the Same Channel (High Speed)	ΔR <sub>ON</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>nOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port input = 0.2V Differential port output = -8mA		0.1		Ω	
Resistance-On Match between Pairs of the Same Channel (Low Power)	ΔR <sub>ON</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>nOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port input = 1.3V Differential port output = -8mA		0.1		Ω	
Leakage Current (Switch Off)	I <sub>OFF</sub>	V <sub>DD</sub> = 0V to 5.5V, V <sub>nOE</sub> and V <sub>SEL</sub> = 0V or 5.5V Differential port input = 0V to 3.0V Differential port output = 0V to 3.0V	-1		1	μA	
Leakage Current (Switch On)	I <sub>ON</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>nOE</sub> = 0V, V <sub>SEL</sub> = 0V or 5.5V Differential port input = 0V to 3.0V Differential port output = NC	-2		2	μA	

**ELECTRICAL CHARACTERISTICS (continued)**(T<sub>A</sub> = +25°C, V<sub>DD</sub> = 1.5V to 5.5V, typical values are at V<sub>DD</sub> = 1.8V, unless otherwise noted.)

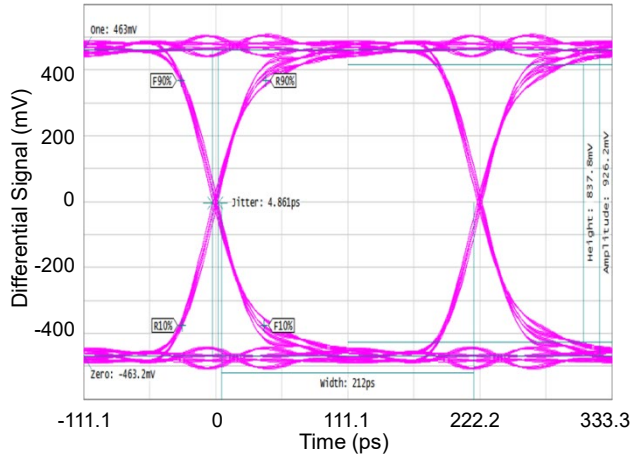
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Dynamic Characteristics</b>						
Switching Time (SEL to Output)	t <sub>SW</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> = 0V Differential port input = 1.2V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 15pF			1.5	μs
Turn-On Time (nOE to Output)	t <sub>ON_nOE</sub>	V <sub>DD</sub> = 1.5V to 5.5V Differential port input = 1.2V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 15pF			20	μs
Turn-Off Time (nOE to Output)	t <sub>OFF_nOE</sub>	V <sub>DD</sub> = 1.5V to 5.5V Differential port input = 1.2V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 15pF		0.5	1	μs
Maximum Toggling Frequency (SEL Line)	f <sub>SEL_MAX</sub>	V <sub>DD</sub> = 1.5V to 5.5V Differential port input = 1.2V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 2pF			100	kHz
Turn-On Time (VDD to Output)	t <sub>ON_VDD</sub>	V <sub>DD</sub> from 0V to 5.5V, V <sub>DD</sub> ramp rate = 2μs Differential port input = 1.2V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 15pF			20	μs
Turn-Off Time (VDD to Output)	t <sub>OFF_VDD</sub>	V <sub>DD</sub> from 5.5V to 0V Differential port input = 1.2V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 15pF			4.0	ms
Minimum Pulse Width (nOE)	t <sub>MIN_nOE</sub>	V <sub>DD</sub> = 1.5V to 5.5V Differential port input = 1.2V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 2pF	500			ns
Break-Before-Make Time Delay	t <sub>BBM</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> = 0V Differential port: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 15pF, V <sub>SW</sub> = 0.6V	50			ns
Intra-Pair Output Skew (Bit to Bit)	t <sub>SKEW_INTRA</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> = 0V Differential port input = 0.3V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF		1		ps
Inter-Pair Output Skew (CH to CH)	t <sub>SKEW_INTER</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> = 0V Differential port input = 0.3V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF		4		ps
Switch Propagation Delay	t <sub>PD</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> = 0V Differential port input = 1.2V Differential port output: R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF, t <sub>RISE</sub> = 100ps		40		ps
Differential Isolation	ISO	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> and V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port: R <sub>S</sub> = 50Ω, R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF V <sub>SW</sub> = 200mVpp (differential), f = 1250MHz		-35		dB
Differential Crosstalk (CH to CH)	X <sub>TALK</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> and V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port: R <sub>S</sub> = 50Ω, R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF V <sub>SW</sub> = 200mVpp (differential), f = 1250MHz		-55		dB
Differential Bandwidth	BW	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port: V <sub>SW</sub> = 200mVpp (differential)		6.8		GHz
Insertion Loss	IL	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port: R <sub>S</sub> = 50Ω, R <sub>L</sub> = 50Ω, C <sub>L</sub> = 5pF V <sub>SW</sub> = 200mVpp (differential), f = 100MHz		-0.35		dB
Capacitance-Off	C <sub>OFF</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> and V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port: 0V, 0.2V, f = 1250MHz		1.5		pF
Capacitance-On	C <sub>ON</sub>	V <sub>DD</sub> = 1.5V to 5.5V, V <sub>NOE</sub> = 0V, V <sub>SEL</sub> = 0V or V <sub>DD</sub> Differential port: 0V, 0.2V, f = 1250MHz		1.5		pF

TYPICAL PERFORMANCE CHARACTERISTICS

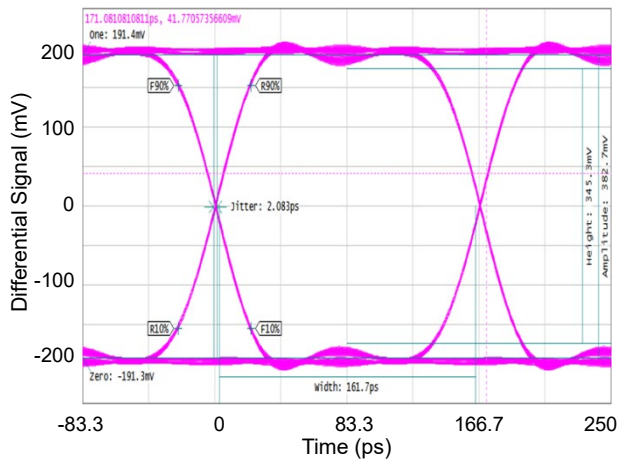
4.5Gbps (500mV<sub>PP</sub>), Before Switch



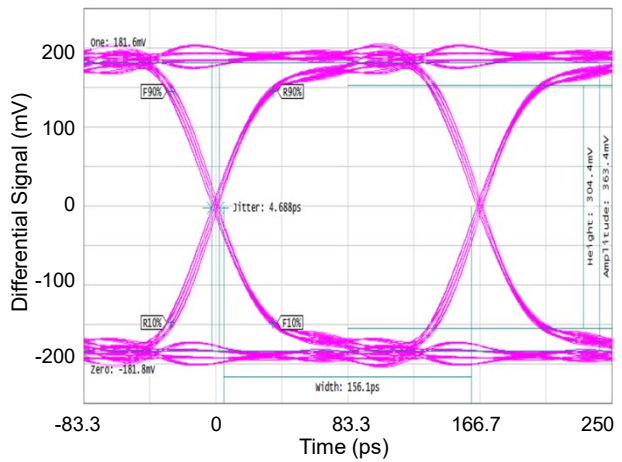
4.5Gbps (500mV<sub>PP</sub>), After Switch



6Gbps (200mV<sub>PP</sub>), Before Switch

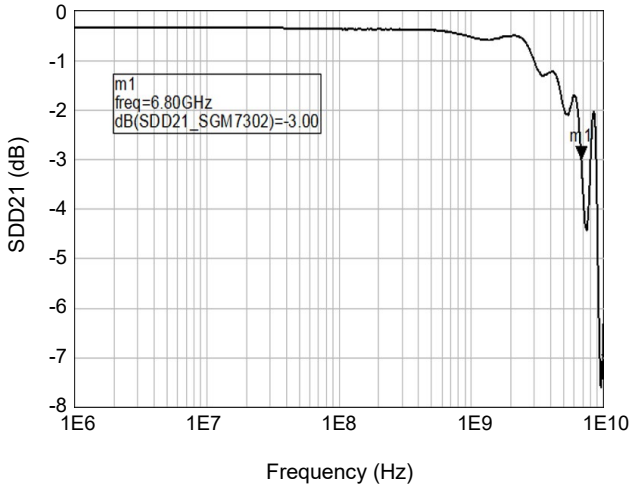


6Gbps (200mV<sub>PP</sub>), After Switch

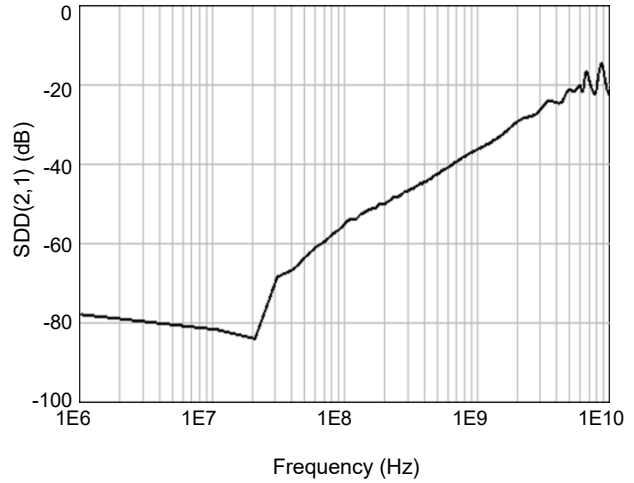


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

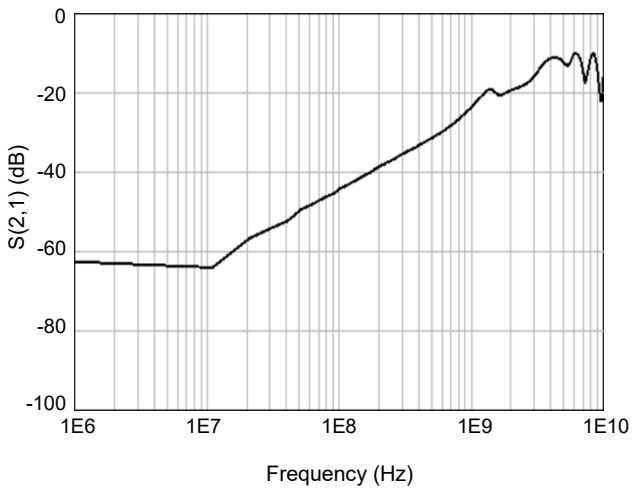
Differential Insertion Loss



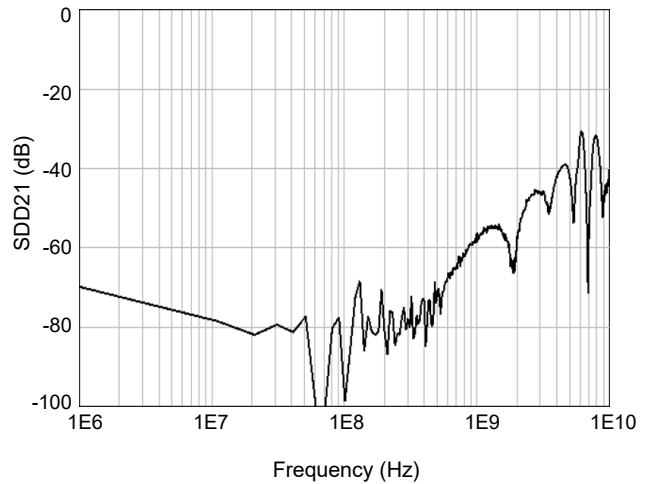
Off Isolation



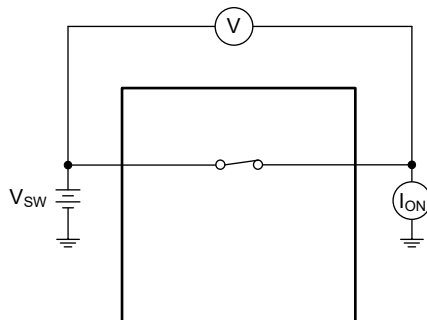
Intra-Pair Crosstalk



Inter-Pair Crosstalk

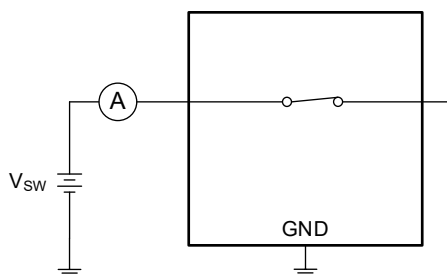


TEST CIRCUITS

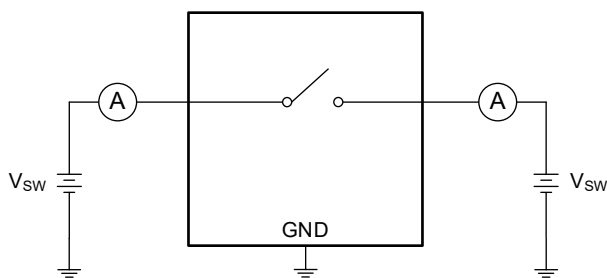


$$R_{ON} = V1/I_{ON}$$

Test Circuit 1. On-Resistance

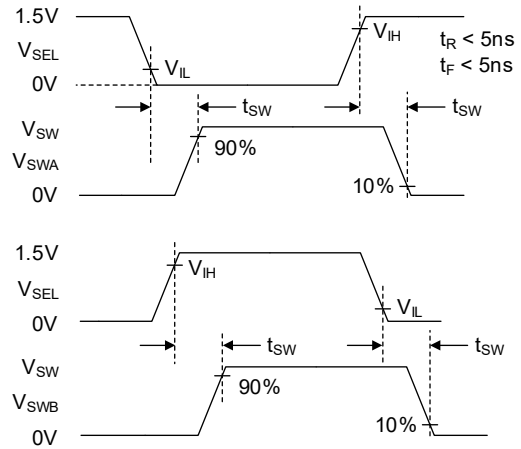
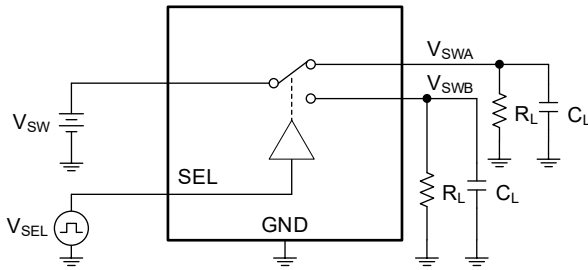


Test Circuit 2. On Leakage

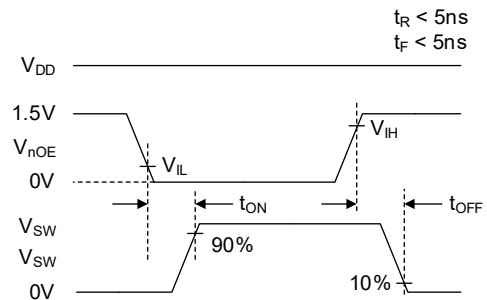
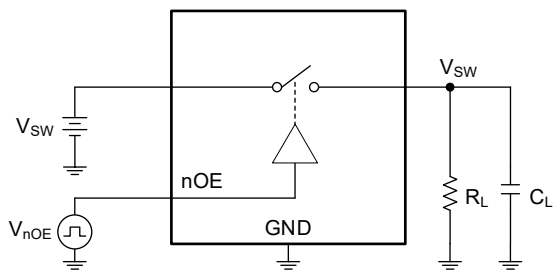


Test Circuit 3. Off Leakage

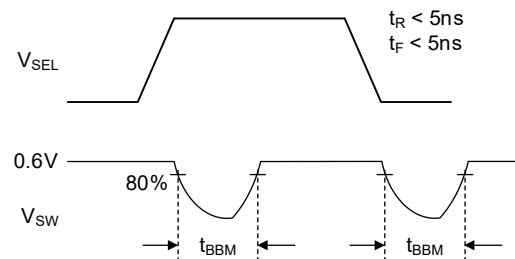
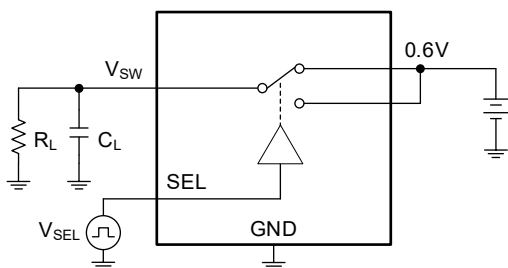
TEST CIRCUITS (continued)



Test Circuit 4.  $t_{sw}$  Timing

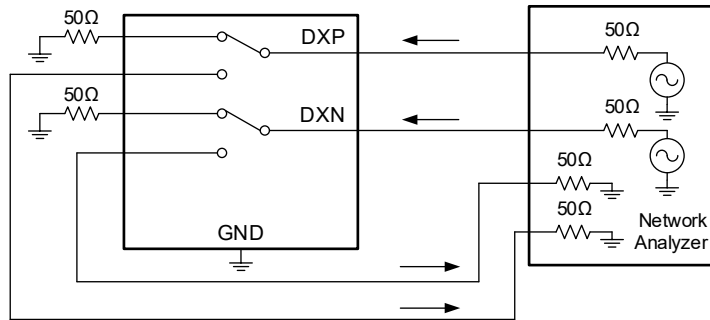


Test Circuit 5. Switching Times ( $t_{ON}$ ,  $t_{OFF}$ )

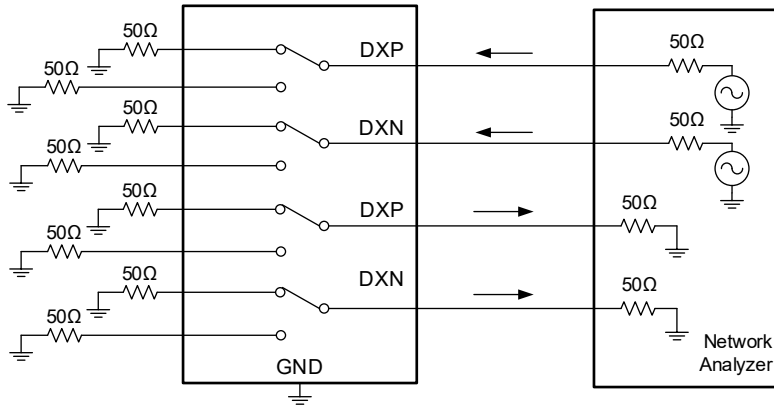


Test Circuit 6. Break-Before-Make Time Delay ( $t_{BBM}$ )

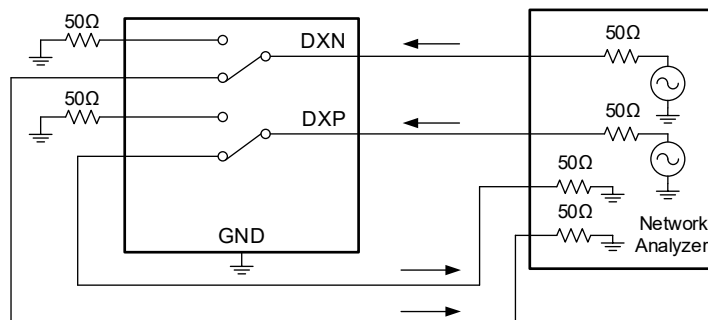
TEST CIRCUITS (continued)



Test Circuit 7. Off Isolation

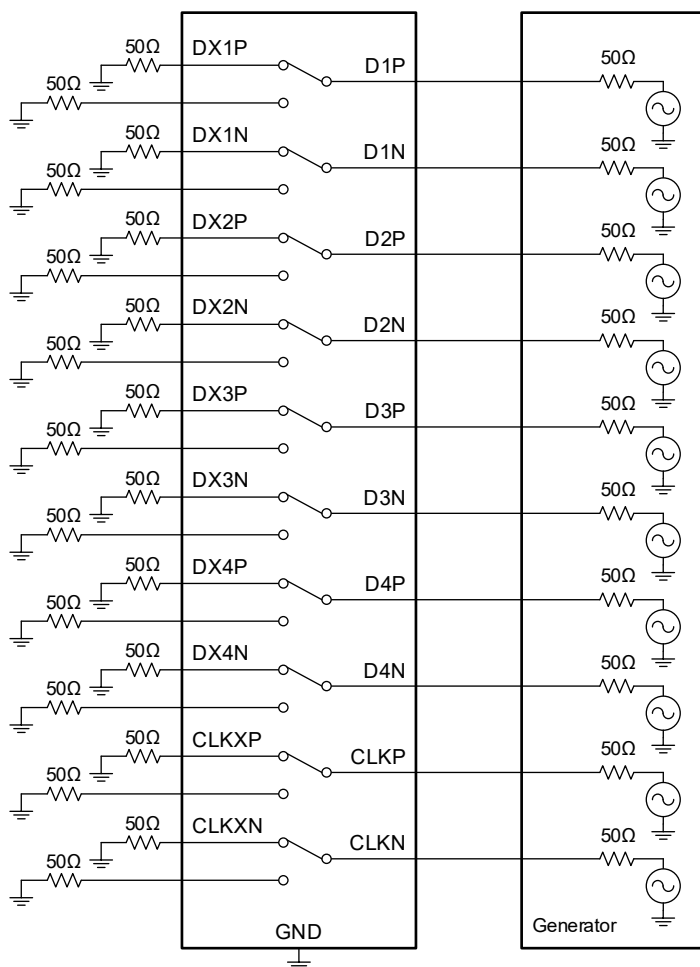


Test Circuit 8. Channel-to-Channel Crosstalk



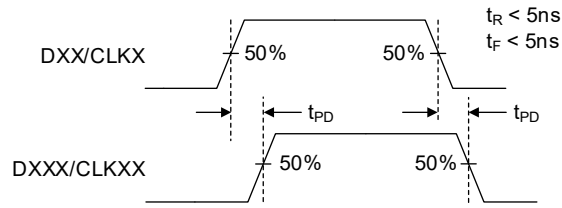
Test Circuit 9. -3dB Bandwidth and Insertion Loss

TEST CIRCUITS (continued)

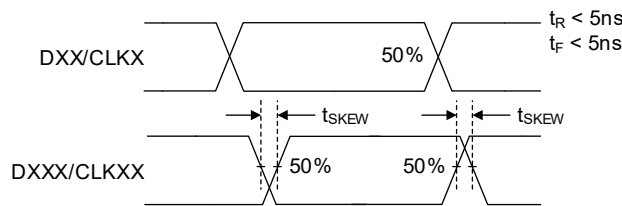


Test Circuit 10.  $t_{PD}$ ,  $t_{SKEW\_INTRA}$  and  $t_{SKEW\_INTER}$  Setup

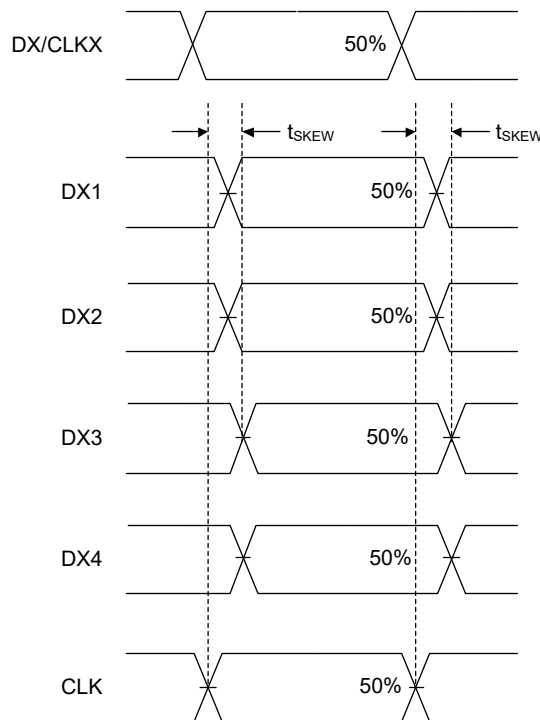
TEST CIRCUITS (continued)



Test Circuit 11. Propagation Delay Time ( $t_{PD}$ )



Test Circuit 12. Opposite Transitions of Same Output ( $t_{SKEW\_INTRA}$ )



Test Circuit 13. Channel-to-Channel Skew ( $t_{SKEW\_INTER}$ )

**REVISION HISTORY**

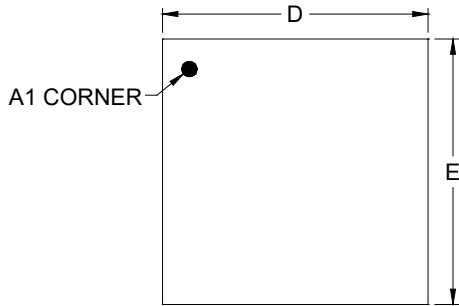
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<b>DECEMBER 2023 – REV.A.4 to REV.B</b>	<b>Page</b>
Update Electrical Characteristics and Typical Performance Characteristics .....	5, 7, 8
<b>NOVEMBER 2023 – REV.A.3 to REV.A.4</b>	<b>Page</b>
Update Package Marking .....	2
<b>NOVEMBER 2023 – REV.A.2 to REV.A.3</b>	<b>Page</b>
Update Electrical Characteristics, added Typical Performance Characteristics .....	5, 7, 8
<b>AUGUST 2023 – REV.A.1 to REV.A.2</b>	<b>Page</b>
Update Electrical Characteristics .....	5
<b>AUGUST 2023 – REV.A to REV.A.1</b>	<b>Page</b>
Update Package Outline Dimensions.....	13
<b>Changes from Original (AUGUST 2023) to REV.A</b>	<b>Page</b>
Changed from product preview to production data.....	All

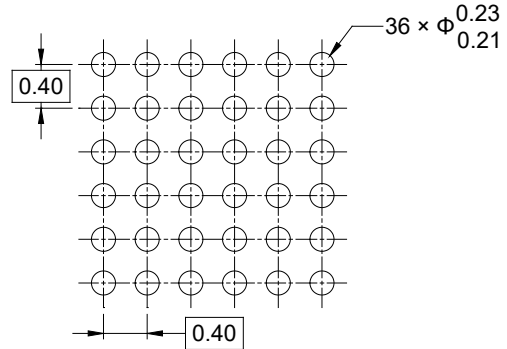
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

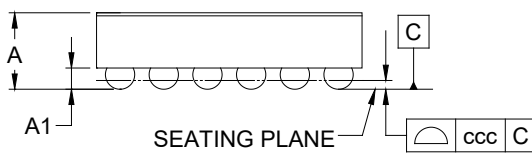
### FOCSP-2.43×2.43-36B



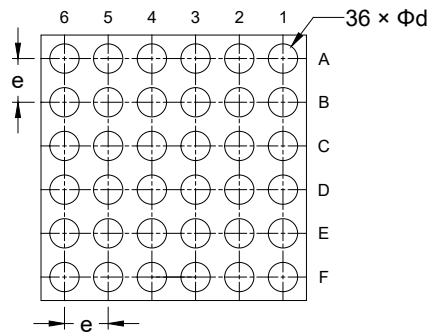
TOP VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



SIDE VIEW



BOTTOM VIEW

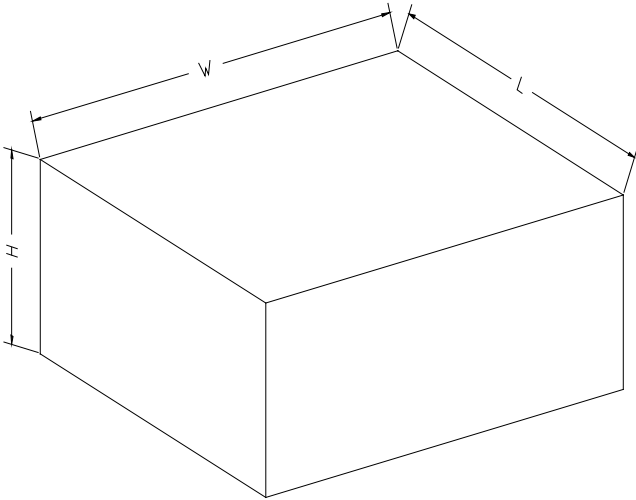
Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	0.700
A1	0.169	-	0.219
D	2.400	-	2.460
E	2.400	-	2.460
d	0.238	-	0.298
e	0.400 BSC		
ccc	0.050		

NOTE: This drawing is subject to change without notice.



# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7" (Option)	368	227	224	8
7"	442	410	224	18

DD0002