



SGM7302

6GHz, 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 6GHz 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_{ON}: 5Ω (TYP)**
- **High Bandwidth: 6GHz**
- **Ultra Low Crosstalk: -40dB**
- **Low Power Disable Mode**
- **1.2V Logic Compatible**
- **Bidirectional Signal Path**
- **Available in a Green FOCSP-2.43×2.43-36B Package**

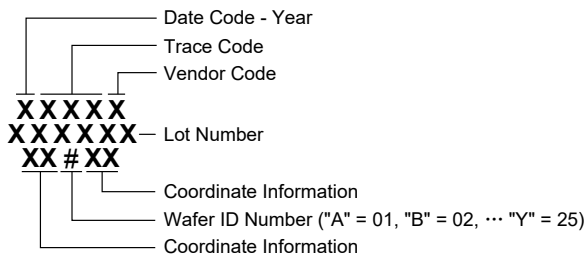
APPLICATIONS

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	SGM 7302 XXXXX XXXXXX XX#XX	Tape and Reel, 3000

MARKING INFORMATION



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.

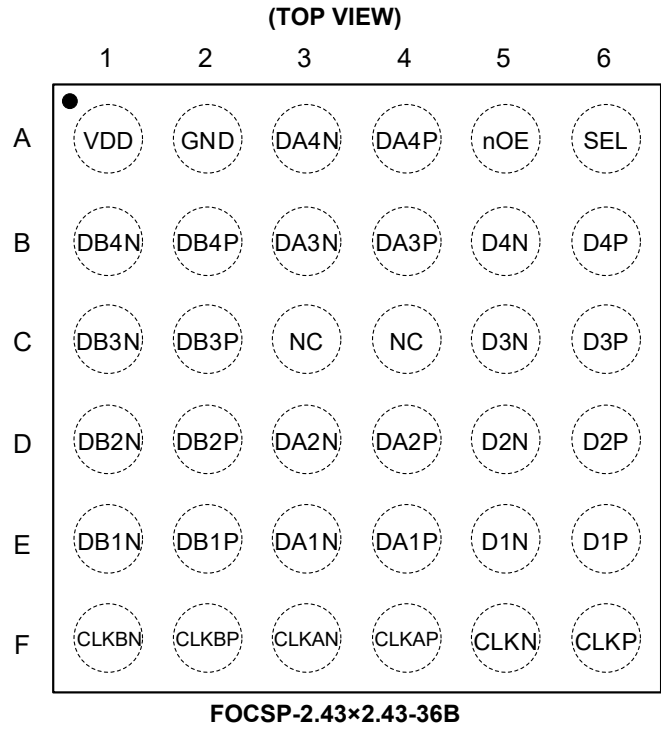
ESD SENSITIVITY CAUTION

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

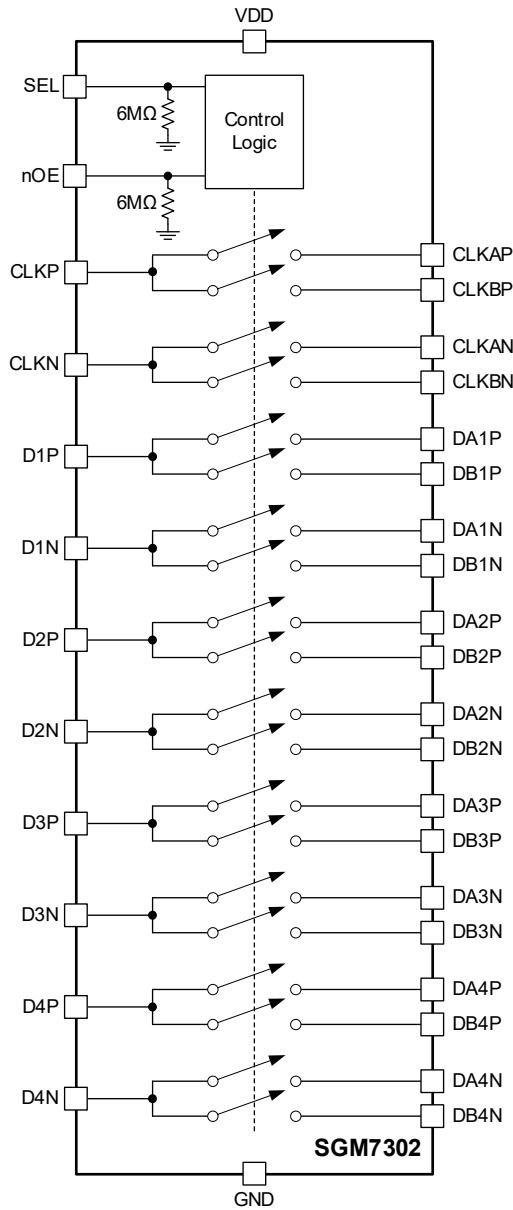


Figure 1. Block Diagram

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

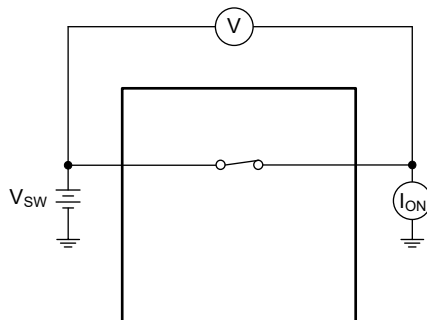
(T_A = +25°C, V_{DD} = 1.5V to 5.5V, typical values are at V_{DD} = 1.8V, unless otherwise noted.)

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

ELECTRICAL CHARACTERISTICS (continued)(T_A = +25°C, V_{DD} = 1.5V to 5.5V, typical values are at V_{DD} = 1.8V, unless otherwise noted.)

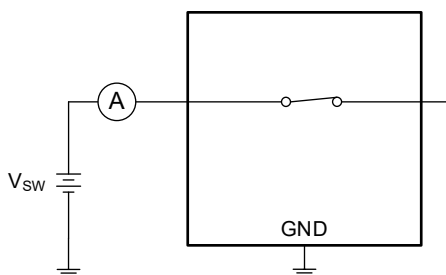
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Dynamic Characteristics						
Switching Time (SEL to Output)	t _{SW}	V _{DD} = 1.5V to 5.5V, V _{NOE} = 0V Differential port input = 1.2V Differential port output: R _L = 50Ω, C _L = 15pF			1.5	μs
Turn-On Time (nOE to Output)	t _{ON_nOE}	V _{DD} = 1.5V to 5.5V Differential port input = 1.2V Differential port output: R _L = 50Ω, C _L = 15pF			20	μs
Turn-Off Time (nOE to Output)	t _{OFF_nOE}	V _{DD} = 1.5V to 5.5V Differential port input = 1.2V Differential port output: R _L = 50Ω, C _L = 15pF		0.5	1	μs
Maximum Toggling Frequency (SEL Line)	f _{SEL_MAX}	V _{DD} = 1.5V to 5.5V Differential port input = 1.2V Differential port output: R _L = 50Ω, C _L = 2pF			100	kHz
Turn-On Time (VDD to Output)	t _{ON_VDD}	V _{DD} from 0V to 5.5V, V _{DD} ramp rate = 2μs Differential port input = 1.2V Differential port output: R _L = 50Ω, C _L = 15pF			20	μs
Turn-Off Time (VDD to Output)	t _{OFF_VDD}	V _{DD} from 5.5V to 0V Differential port input = 1.2V Differential port output: R _L = 50Ω, C _L = 15pF			4.0	ms
Minimum Pulse Width (nOE)	t _{MIN_nOE}	V _{DD} = 1.5V to 5.5V Differential port input = 1.2V Differential port output: R _L = 50Ω, C _L = 2pF	500			ns
Break-Before-Make Time Delay	t _{BBM}	V _{DD} = 1.5V to 5.5V, V _{NOE} = 0V Differential port: R _L = 50Ω, C _L = 15pF, V _{SW} = 0.6V	50			ns
Intra-Pair Output Skew (Bit to Bit)	t _{SKEW_INTRA}	V _{DD} = 1.5V to 5.5V, V _{NOE} = 0V Differential port input = 0.3V Differential port output: R _L = 50Ω, C _L = 5pF		1		ps
Inter-Pair Output Skew (CH to CH)	t _{SKEW_INTER}	V _{DD} = 1.5V to 5.5V, V _{NOE} = 0V Differential port input = 0.3V Differential port output: R _L = 50Ω, C _L = 5pF		4		ps
Switch Propagation Delay	t _{PD}	V _{DD} = 1.5V to 5.5V, V _{NOE} = 0V Differential port input = 1.2V Differential port output: R _L = 50Ω, C _L = 5pF, t _{RISE} = 100ps		40		ps
Differential Isolation	ISO	V _{DD} = 1.5V to 5.5V, V _{NOE} and V _{SEL} = 0V or V _{DD} Differential port: R _S = 50Ω, R _L = 50Ω, C _L = 5pF V _{SW} = 200mVpp (differential), f = 1250MHz		-20		dB
Differential Crosstalk (CH to CH)	X _{TALK}	V _{DD} = 1.5V to 5.5V, V _{NOE} and V _{SEL} = 0V or V _{DD} Differential port: R _S = 50Ω, R _L = 50Ω, C _L = 5pF V _{SW} = 200mVpp (differential), f = 1250MHz		-40		dB
Differential Bandwidth	BW	V _{DD} = 1.5V to 5.5V, V _{NOE} = 0V, V _{SEL} = 0V or V _{DD} Differential port: V _{SW} = 200mVpp (differential)		6		GHz
Insertion Loss	IL	V _{DD} = 1.5V to 5.5V, V _{NOE} = 0V, V _{SEL} = 0V or V _{DD} Differential port: R _S = 50Ω, R _L = 50Ω, C _L = 5pF V _{SW} = 200mVpp (differential), f = 100MHz		-0.5		dB
Capacitance-Off	C _{OFF}	V _{DD} = 1.5V to 5.5V, V _{NOE} and V _{SEL} = 0V or V _{DD} Differential port: 0V, 0.2V, f = 1250MHz		1.5		pF
Capacitance-On	C _{ON}	V _{DD} = 1.5V to 5.5V, V _{NOE} = 0V, V _{SEL} = 0V or V _{DD} Differential port: 0V, 0.2V, f = 1250MHz		1.5		pF

TEST CIRCUITS

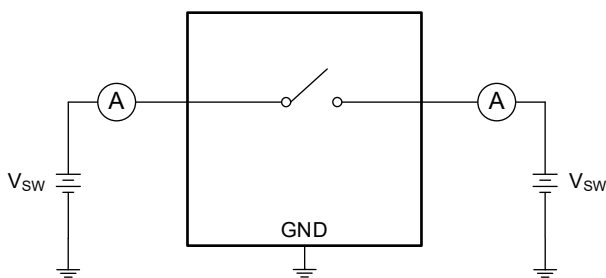


$$R_{ON} = V1/I_{ON}$$

Test Circuit 1. On-Resistance

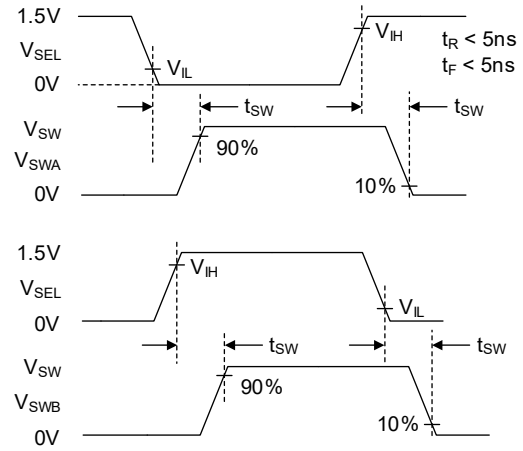
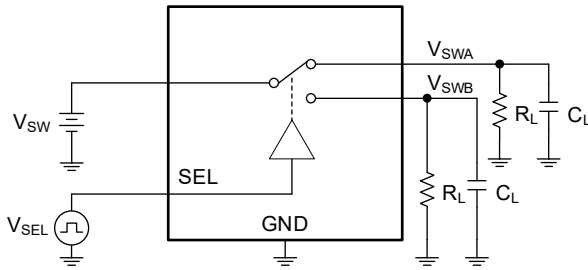


Test Circuit 2. On Leakage

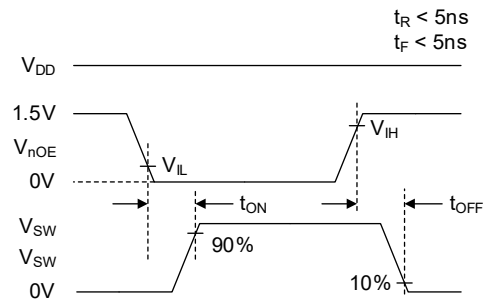
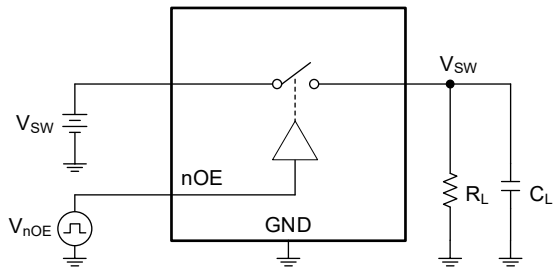


Test Circuit 3. Off Leakage

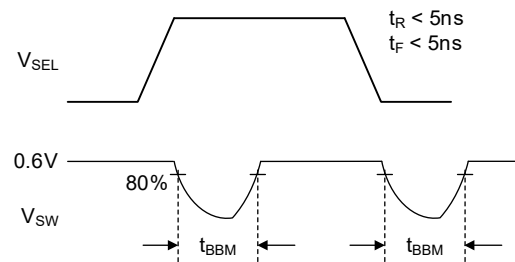
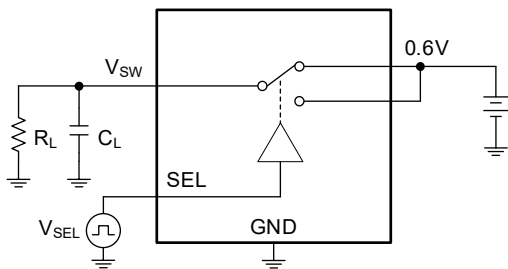
TEST CIRCUITS (continued)



Test Circuit 4. t_{sw} Timing

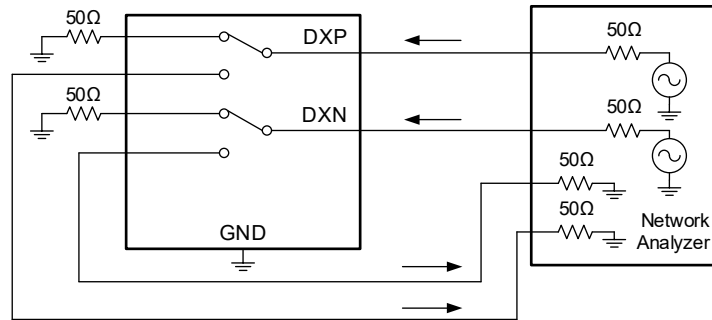


Test Circuit 5. Switching Times (t_{ON} , t_{OFF})

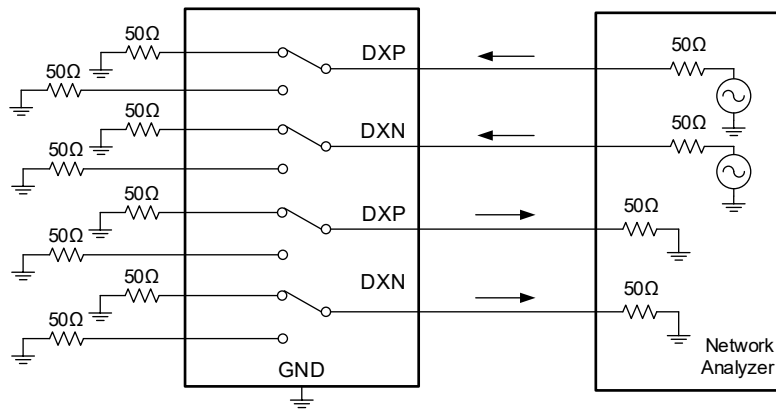


Test Circuit 6. Break-Before-Make Time Delay (t_{BBM})

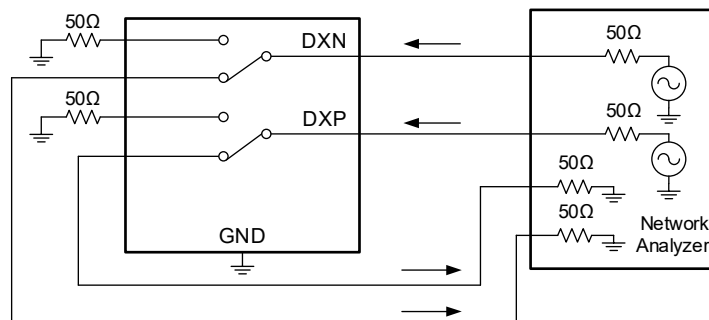
TEST CIRCUITS (continued)



Test Circuit 7. Off Isolation

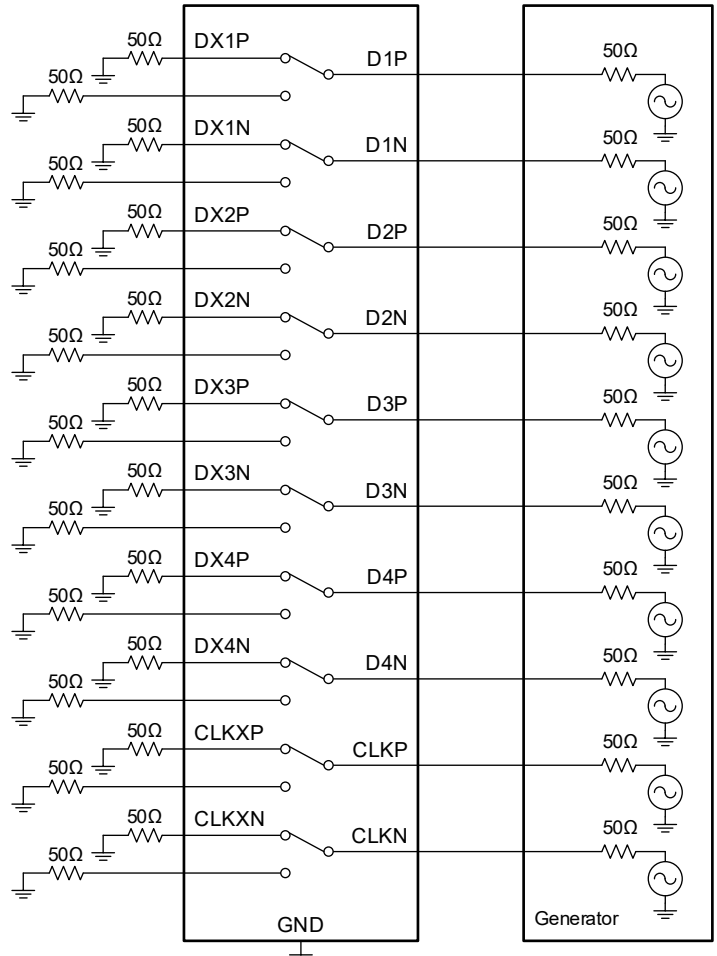


Test Circuit 8. Channel-to-Channel Crosstalk



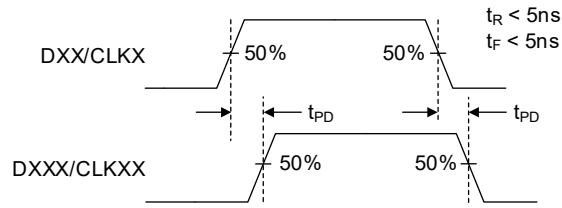
Test Circuit 9. -3dB Bandwidth and Insertion Loss

TEST CIRCUITS (continued)

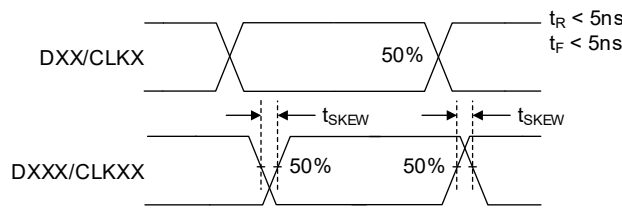


Test Circuit 10. t_{PD} , t_{SKEW_INTRA} and t_{SKEW_INTER} Setup

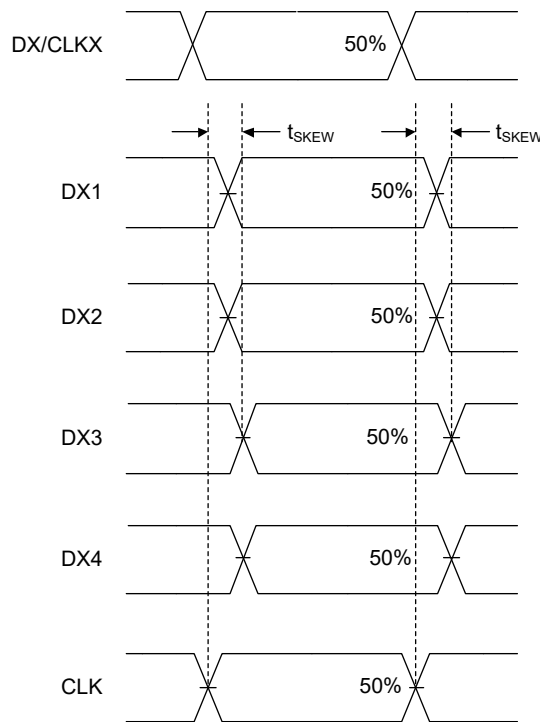
TEST CIRCUITS (continued)



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.

AUGUST 2023 – REV.A.1 to REV.A.2	Page
Update Electrical Characteristics	5

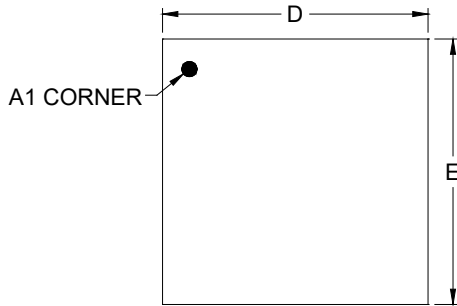
AUGUST 2023 – REV.A to REV.A.1	Page
Update Package Outline Dimensions.....	13

Changes from Original (AUGUST 2023) to REV.A	Page
Changed from product preview to production data.....	All

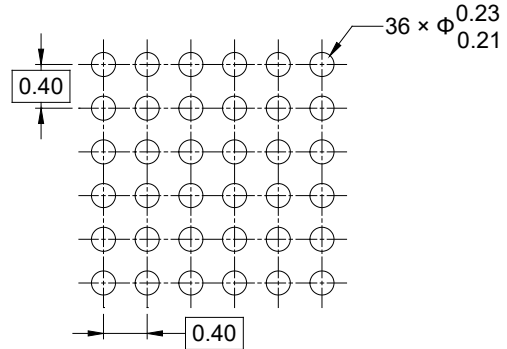
PACKAGE INFORMATION

PACKAGE OUTLINE DIMENSIONS

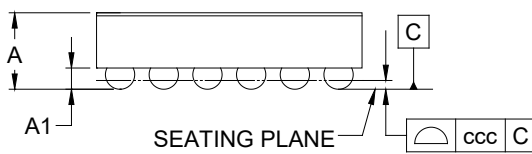
FOCSP-2.43×2.43-36B



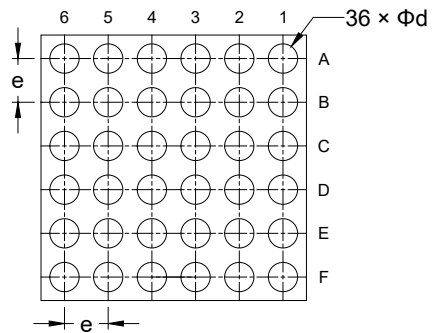
TOP VIEW



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

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
FOCSP-2.43×2.43-36B	7"	9.5	2.75	2.75	0.81	4.0	4.0	2.0	8.0	Q1

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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