DIO3350
USB 3.1/3.0 Super-Speed 11Gbps Switch

Features

- Wide V_{DD} Input Voltage Range: 1.5V to 5.0V
- Up to 11 Gbps for applications including USB3.0, USB3.1, 10GE, Thunderbolt, and SAS3.0
- Bi-directional operation
- Bandwidth: 11GHz (Typical)
- -0.9dB Typical Insertion Loss at 2.5GHz
- Low Active Power of 15μA Typ. @ 3.6V V_{IN}
- Low Shutdown Power of < 0.5μA Max.
- Low Crosstalk: -55dB @ 2.5GHz
- Low Off Isolation: -27dB @ 2.5GHz
- Operation Temperature Range: -40°C to 85 °C
- 2.5KV HBM ESD Protection
- Packaged in QFN2.6*1.8-16, QFN2.5*4.5-20 and QFN2*2-18

Descriptions

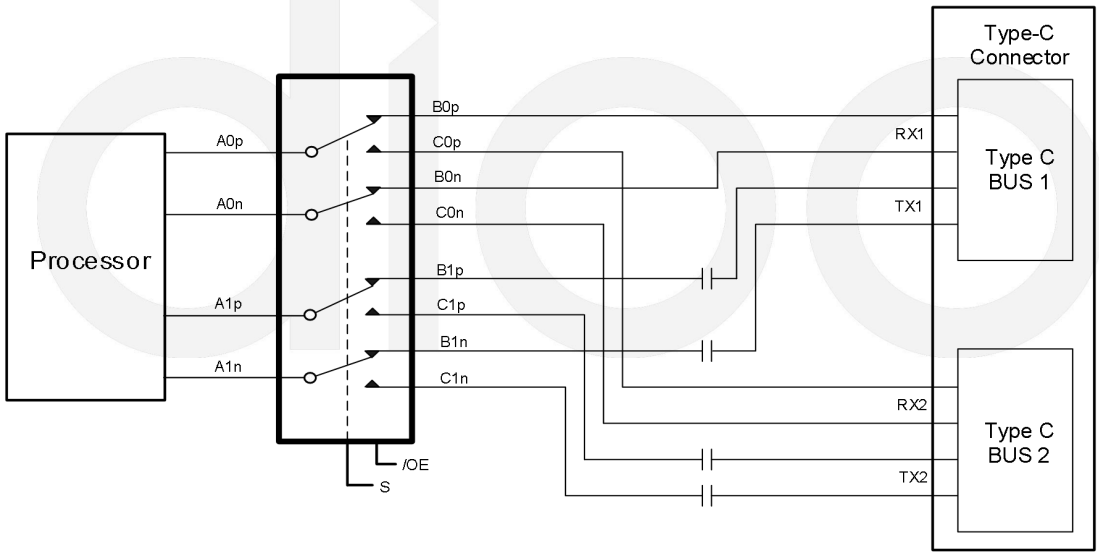
The DIO3350 is a two pairs 2:1 data switch for USB Super Speed Gen1 and Gen2, 5 Gbps and 10 Gbps data. The DIO3350 focus on the mobile device market, for the use in Type-C applications as a reversible cable switch. It can minimize the switch channel to channel skew and channel to channel crosstalk of the super speed signals.

The DIO3350 data switches offer superior performance, support various high speed data transmission protocols, such as USB3.0, USB3.1, 10GE, Thunderbolt, and SAS3.0.

Applications

- Smartphones
- Tablets
- Notebooks

Block Diagram



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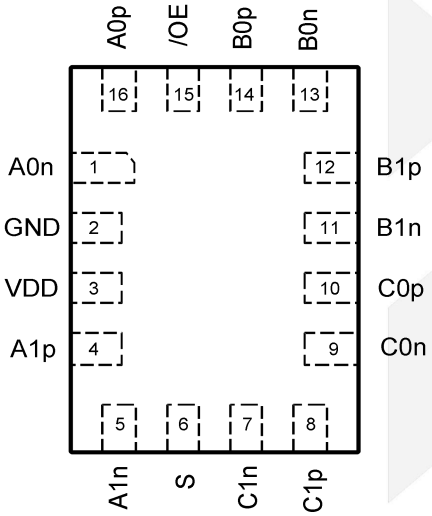
Ordering Information

Order Part Number	Top Marking		T_A	Package	
DIO3350LN16	D3EV	Green	-40 to 85°C	QFN2.6*1.8-16	Tape & Reel, 3000
DIO3350CN18	D3EV	Green	-40 to 85°C	QFN2*2-18	Tape & Reel, 3000
DIO3350AEN20	D3EA	Green	-40 to 85°C	QFN2.5*4.5-20	Tape & Reel, 5000
DIO3350BEN20	D3EB	Green	-40 to 85°C	QFN2.5*4.5-20	Tape & Reel, 5000

Pin Assignment

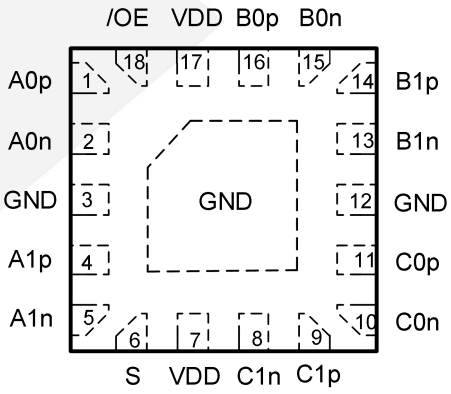
QFN2.6*1.8-16

DIO3350LN16



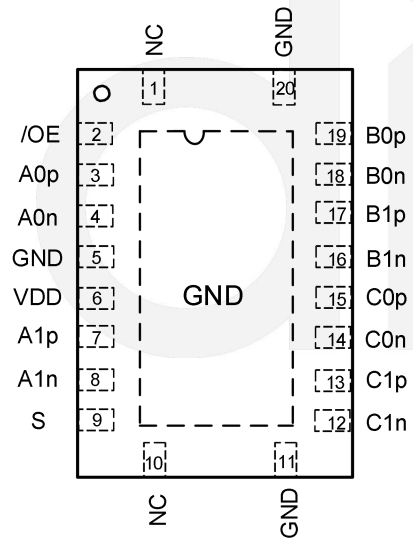
QFN2*2-18

DIO3350CN18



QFN2.5*4.5-20

DIO3350AEN20



QFN2.5*4.5-20

DIO3350BEN20

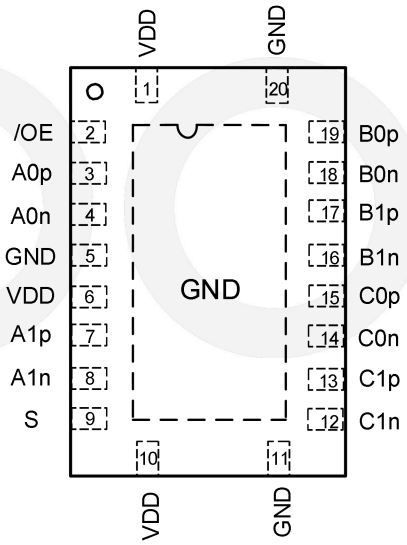


Figure 1 Top View

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Pin Descriptions

Pin Name	Type	Description
A0n	I/O	Port A, channel 0, high-speed negative signal
A1p	I/O	Port A, channel 1, high-speed positive signal
A1n	I/O	Port A, channel 1, high-speed negative signal
S	I	Switch Select (L: Port A to Port B; H: Port A to Port C)
C1n	I/O	Port C, channel 1, high-speed negative signal (connector side)
C1p	I/O	Port C, channel 1, high-speed positive signal (connector side)
C0n	I/O	Port C, channel 0, high-speed negative signal (connector side)
C0p	I/O	Port C, channel 0, high-speed positive signal (connector side)
B1n	I/O	Port B, channel 1, high-speed negative signal (connector side)
B1p	I/O	Port B, channel 1, high-speed positive signal (connector side)
B0n	I/O	Port B, channel 0, high-speed negative signal (connector side)
B0p	I/O	Port B, channel 0, high-speed positive signal (connector side)
A0p	I/O	Port A, channel 0, high-speed positive signal
/OE	I	Output Enable (0=Switches Enabled, 1=Switches Disabled)
VDD	VDD	Device Power
GND	GND	Ground
NC	NC	No connected

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Absolute Maximum Ratings

Stresses beyond those listed under the Absolute Maximum Rating table may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Parameter		Rating	Unit
V_{DD}	Supply Voltage		-0.5 to 6.0	V
V_{CNTRL}	DC Input Voltage (S, /OE)(1)		-0.5 to V_{DD}	V
V_{SW}	DC Switch I/O Voltage(1,2)		-0.3 to 2.1	V
I_{IK}	DC Input Diode Current		-50	mA
I_{SW}	DC Switch Current		25	mA
T_{STG}	Storage Temperature		-65 to 150	°C
ESD	Human Body Model, JEDEC: JESD22-A114		4	kV
θ_{JA}	Package Thermal Resistance	QFN2.6*1.8-16	117.3	°C/W
		QFN2*2-18	120	
		QFN2.5*4.5-20	46.6	

Note:

1. The input and output negative ratings may be exceeded if the input and output diode current ratings are observed.
2. V_{SW} refers to analog data switch paths.

Recommend Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. DIOO does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter	Rating	Unit
V_{DD}	Supply Voltage	1.5 to 5.0	V
V_{CNTRL}	Control Input Voltage (S, /OE)(3)	0 to 5.0	V
V_{SW}	Switch I/O Voltage (Both SSUSB Switch Paths)	0 to 2.0	V
T_A	Operating Temperature Range	-40 to 85	°C

Note:

3. The control inputs must be held HIGH or LOW; they must not float.

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DC and Transient Characteristics

All typical values are at T_A=25°C unless otherwise specified.

Symbol	Parameter	Conditions	V_{DD}(V)	Min.	Typ.	Max.	Unit
V_{IH}	Control Input Voltage High	S, /OE	1.5	1.3			V
		S, /OE	3.6	1.4			
		S, /OE	5.0	1.5			
V_{IL}	Control Input Voltage Low	S, /OE	1.5			0.4	V
		S, /OE	3.6			0.4	
		S, /OE	5.0			0.4	
I_{IN}	Control Input Leakage	V_{SW} = -0.6 to 2.0V V_{CNTRL} = 0 to V_{DD}	5.0	-500		500	nA
I_{OZ}	Off-State Leakage for Open Data Paths	V_{SW} = 0.0≤DATA≤2.0V	5.0	-0.5		0.5	uA
I_{CL}	On-State Leakage for Closed Data Paths(4)	V_{SW} = 0.0≤DATA≤2.0V	5.0	-0.5		0.5	uA
I_{OFF}	Power-Off Leakage Current (All I/O Ports)	V_{SW} = 0 V or 2.0V	0	-500		500	nA
R_{ON}	Switch On Resistance	V_{SW} = 0.2V, I_{ON} = -8mA	1.5		6	8	Ω
ΔR_{ON}	Difference in R_{ON} Between Positive-Negative	V_{SW} = 0.2V, I_{ON} = -8mA	1.5		0.1		Ω
R_{ONF}	Flatness for R_{ON}	V_{SW} = 0.0≤DATA≤2.0V, I_{ON} = -8mA	1.5			0.5	Ω
I_{CC}	Quiescent Supply Current	$V_{/OE}$ = 0, V_{SEL} = 0 or V_{DD}, I_{OUT} = 0	5.0		21	30	μA
I_{CCZ}	Quiescent Supply Current (High Impedance)	V_{SEL}= X, $V_{/OE}$ = V_{DD}, I_{OUT} = 0	5.0			0.5	μA
I_{CCT}	Increase in Quiescent Supply Current per V_{CNTRL}	V_{SEL} or $V_{/OE}$ = 1.5V	5.0		7	15	μA

Note:

4. For this test, the data switch is closed with the respective switch pin floating.

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AC Electrical Characteristics

All typical values are at V_{DD}=3.6V, T_A=25°C unless otherwise specified.

Symbol	Parameter	Conditions	V_{DD}(V)	Min.	Typ.	Max.	Unit
t_{ON}	Turn-On Time, S to Output	R_L=50Ω, C_L=0pF, V_{SW}=0V, V_{SW}=0.6V	1.5 to 5.0V		420	700	ns
t_{OFF}	Turn-Off Time, S to Output	R_L=50Ω, C_L=0pF, V_{SW}=0V, V_{SW}=3.3V	1.5 to 5.0V		100	300	ns
$t_{ZHM,ZL}$	Enable Time,/OE to Output	R_L=50Ω, C_L=0pF, V_{SW}=0.6V	1.5 to 5.0V		53	150	μs
$t_{LZM,HZ}$	Disable Time,/OE to Output	R_L=50Ω, C_L=0pF, V_{SW}=0.6V	1.5 to 5.0V		100	300	ns
t_{PD}	Propagation Delay(5)	C_L=0pF, R_L=50Ω	1.5 to 5.0V		60		ps
t_{BBM}	Break-Before-Make(5)	R_L=50Ω, C_L=0pF, V_{SW}=0.6V	1.5 to 5.0V	120		600	ns
DO_{IRR}	Differential Off Isolation(5)	V_S=0dBm, R_L=50Ω, f=2.5GHz	3.6V		-27		dB
		V_S=0dBm, R_L=50Ω, f=5.0GHz			-20		dB
SDDNEXT	Differential Channel Crosstalk(5)	V_S=0dBm, R_L=50Ω, f=2.5GHz	3.6V		-55		dB
		V_S=0dBm, R_L=50Ω, f=5.0GHz			-47		dB
DIL	Differential Insertion Loss(All Data Paths)(5)	V_{IN}=0dBm, f=2.5GHz, R_L=50Ω, C_L=0pF	3.6V		-0.9		dB
		V_{IN}=0dBm, f=5.0GHz, R_L=50Ω, C_L=0pF			-1.4		
BW	Differential -3dB Bandwidth(5)	V_{IN}=1 Vpk-pk, R_L=50Ω, C_L=0pF, (Both Data Paths)	3.6V		11		GHz
Tsk(P)	Skew of Opposite Transitions of the Same Output(5)	R_{PU}=50Ω to V_{DD}, C_L=0pF	3.6V		6		ps
C_{IN}	Control Pin Input Capacitance(5)	V_{DD}=0V, f=1MHz			2.7		pF
C_{ON}	On Capacitance(5)	V_{DD}=3.3V, f=2.5GHz			0.45		pF
C_{OFF}	Off Capacitance(5)	V_{DD}=3.3V, f=2.5GHz			0.36		pF

Note:

5. Guaranteed by characterization.

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Typical Performance Characteristics

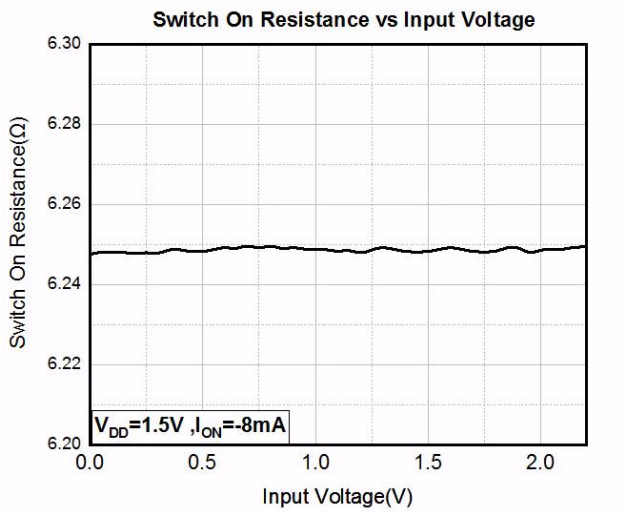


Figure 2 R_{ON} VS. V_{IN}

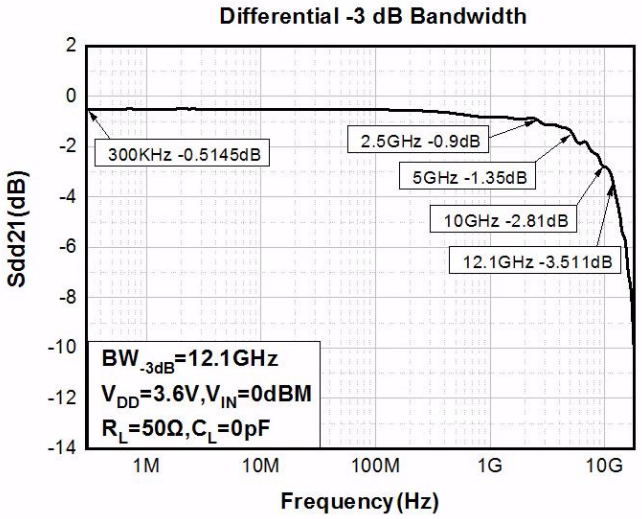


Figure 3 Different -3dB Bandwidth

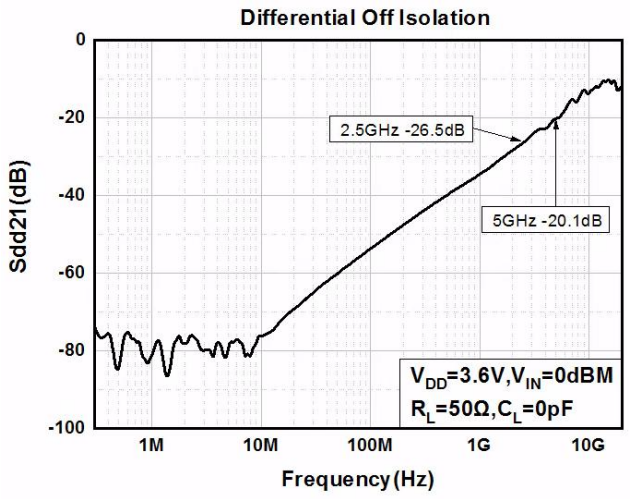


Figure 4 Different Off Isolation

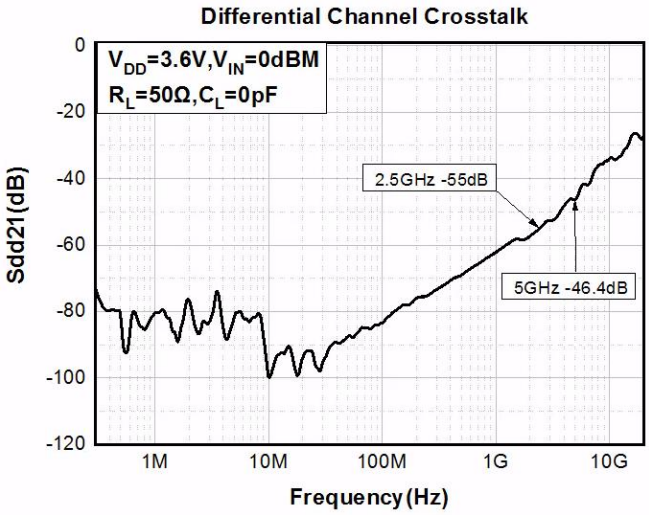


Figure 5 Differential Channel Crosstalk

Before Switch

After Switch

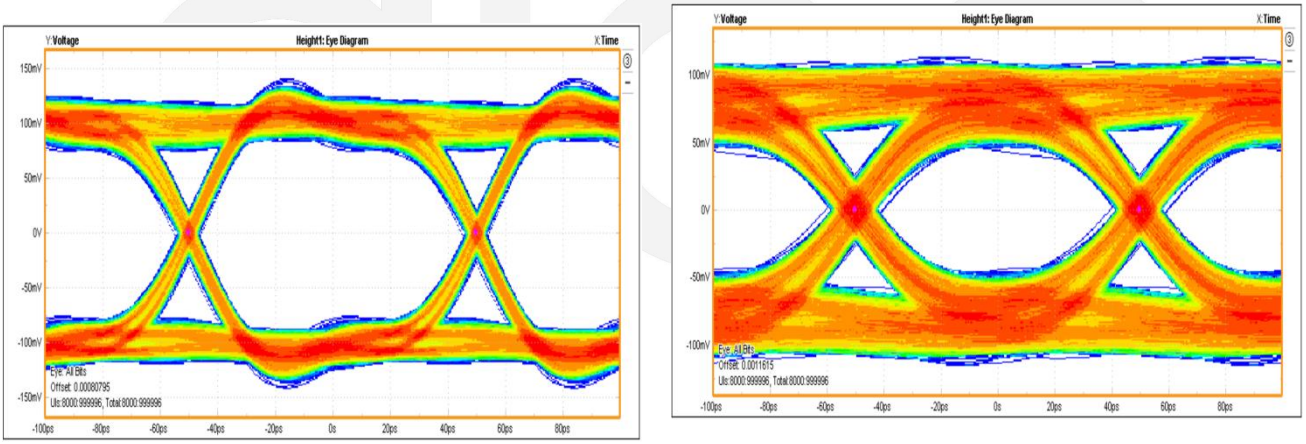


Figure 6 Eye Opening at 10Gb/s using PRBS15 pattern

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Typical Applications

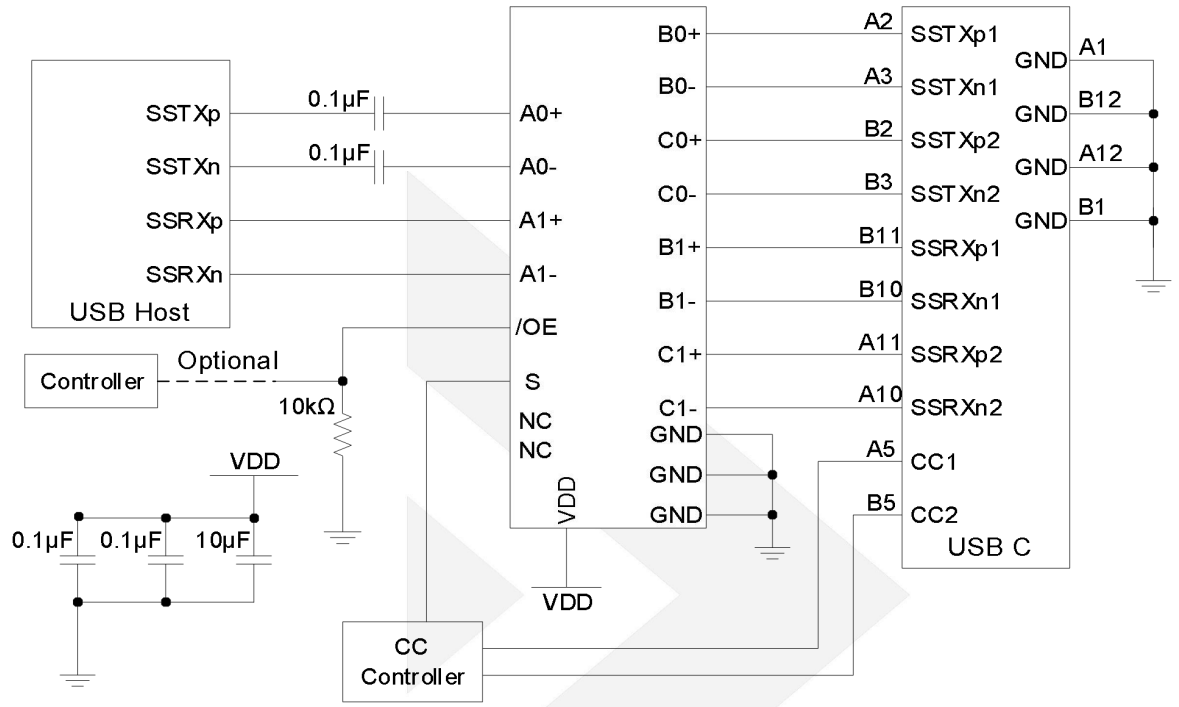


Figure 7. Down Facing Port for USB3.1 Type C Connector

Systems Examples

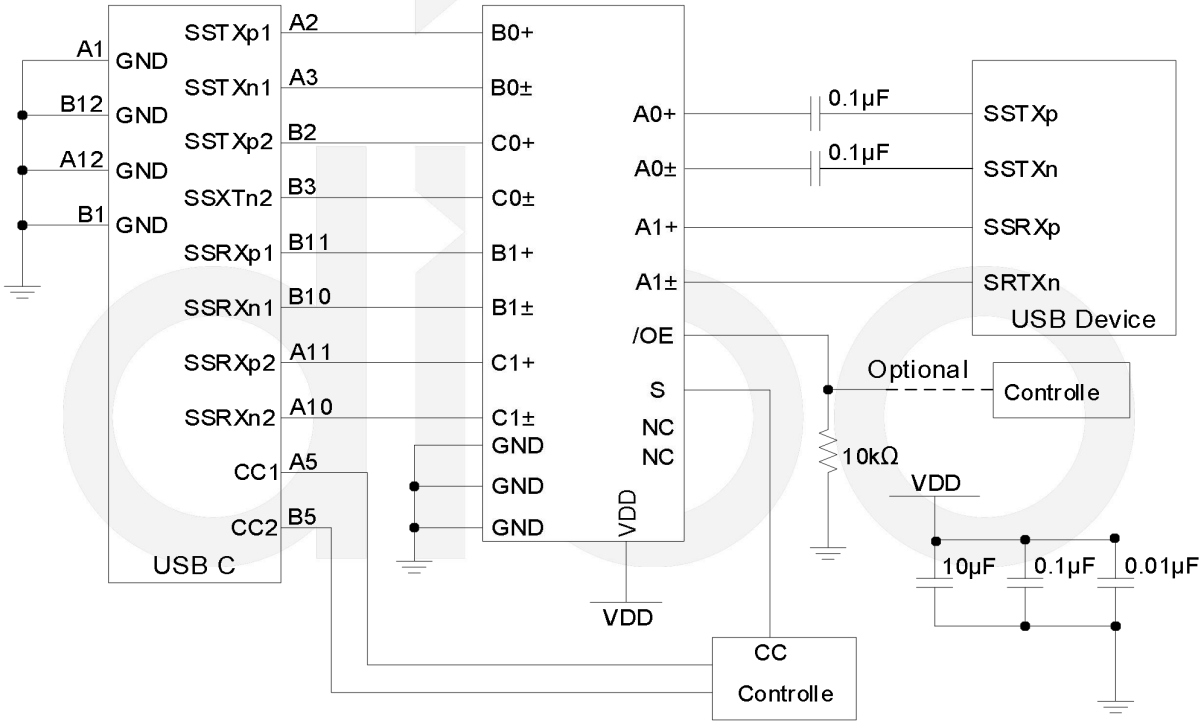


Figure 8. Up Facing Port for USB3.1 USB Type-C Connector

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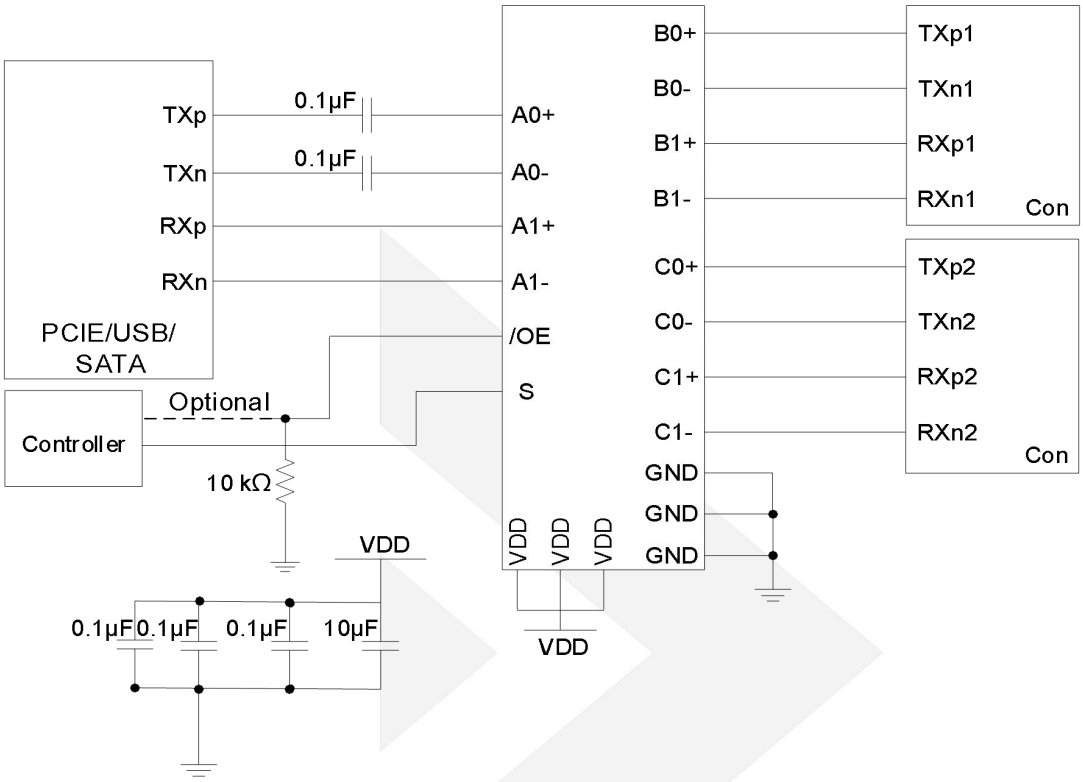


Figure 9. PCIE Motherboard

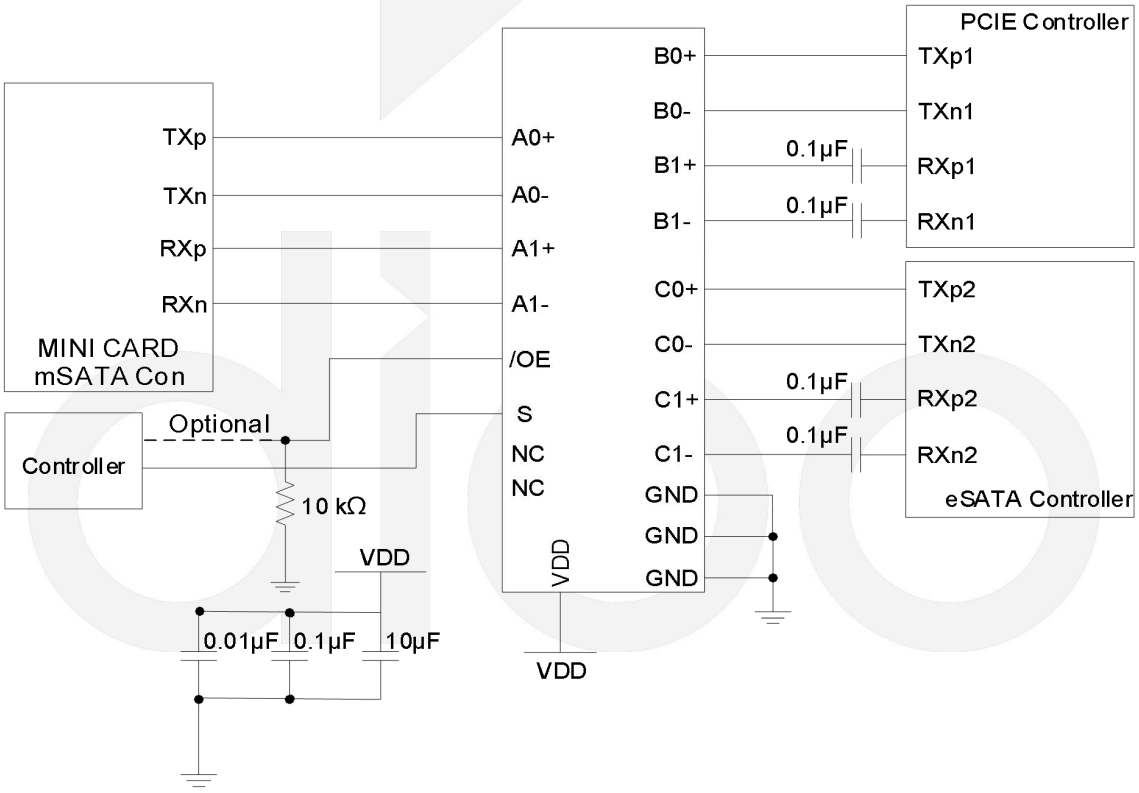


Figure10. PCIE and eSATA Combo

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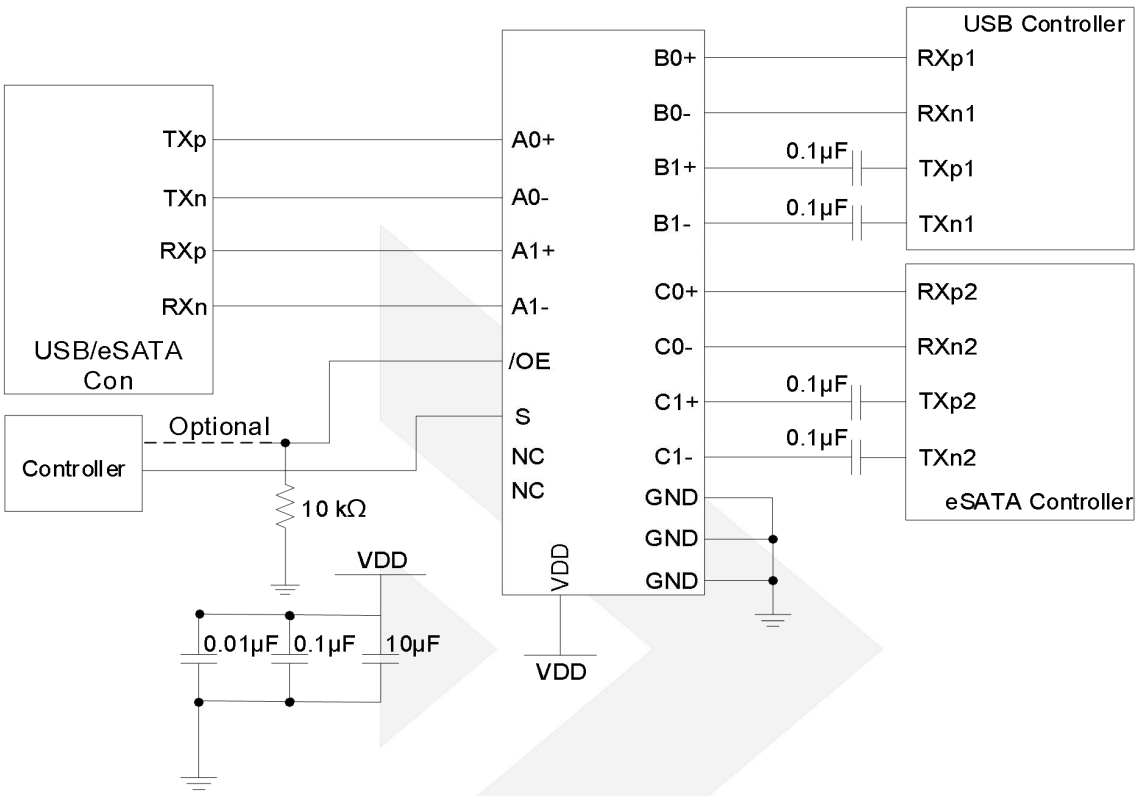


Figure 11. eSATA and USB 3.0 Combo Connector

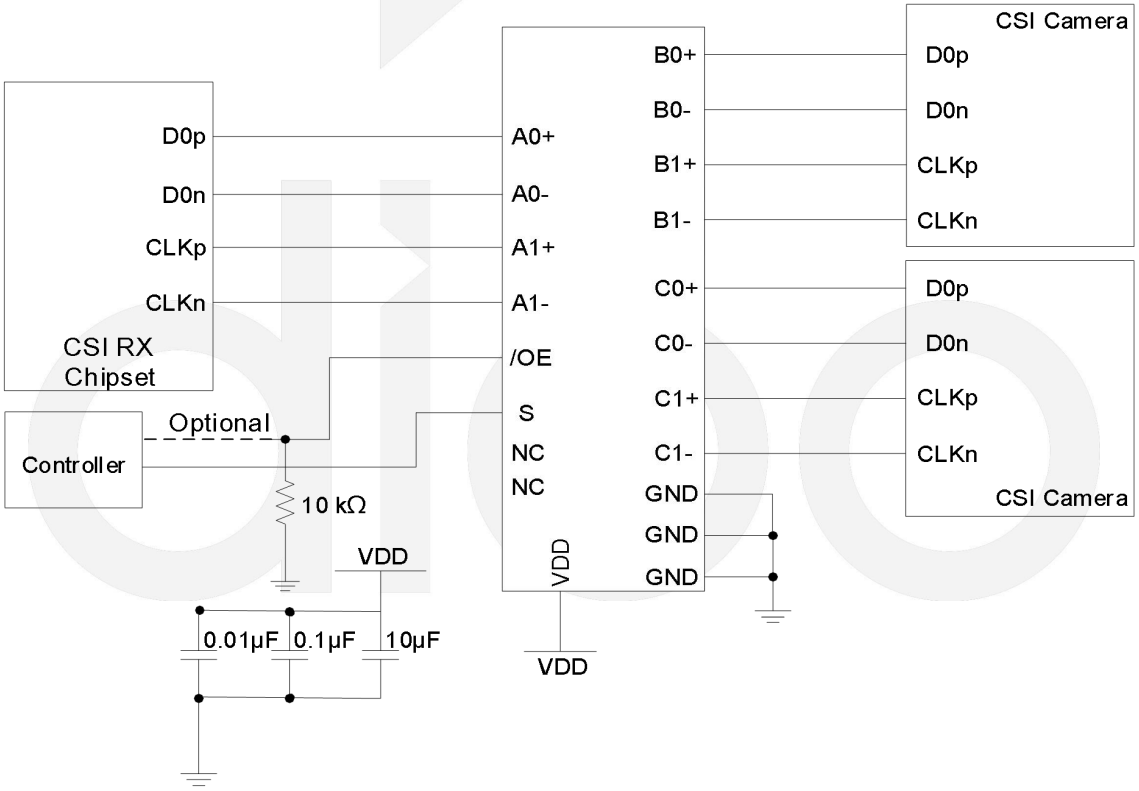


Figure 12. CSI Camera Array

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CONTACT US

Dioo is a professional design and sales corporation for high-quality performance analog semiconductors. The company focuses on industry markets, such as cell phones, handheld products, laptops, medical equipment, and so on. Dioo's product families include analog signal processing and amplifying, LED drivers, and charger ICs. Go to http://www.dioo.com for a complete list of Dioo product families.

For additional product information or full datasheet, please contact our sales department or representatives.

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