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TPG3USB410YD

Two-Channel Differential 2:1/1:2 USB 3.1 Super Speed 10Gbps Mux/DeMux

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Features

- Wide VCC Operating Range: 1.5V ~ 5.0V
- Low bit-to-bit skew, Bidirectional
- Crosstalk: -31dB @ 2.0 Gbps
- Isolation: -40dB @ 2.0 Gbps
- Supports both AC coupled and DC coupled signals
- High Bandwidth: 5.1GHz @-3dB BW
- USB 3.1 Super Speed 10Gbps Switch
- ESD Tolerance: 2kV HBM

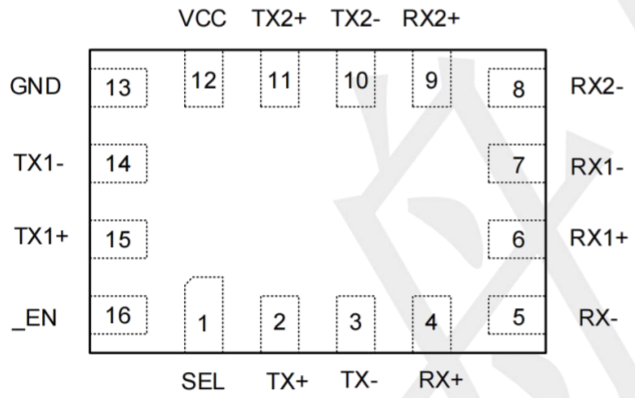
Applications

- USB Type-C Ecosystem
- FPD LinkII and FPD LinkIII Switching
- Server/Storage Area Networks

General Description

The is a high-speed bidirectional passive switch in mux or demux configurations suited for USB Type-C™ application supporting USB 3.1 Gen 1 and Gen 2 data rates. Based on control pin SEL, the device provides switching on differential channels between Port B or Port C to Port A. The is a generic analog differential passive switch that can work for any high- speed interface applications requiring a common mode voltage range of 0 to 2 V and differential signaling with differential amplitude up to 1800mVpp. It employs adaptive tracking that ensures the channel remains unchanged for the entire common mode voltage range. Excellent dynamic characteristics of the device allow high-speed switching with minimum attenuation to the signal eye diagram with very little added jitter. It consumes <2mW of power when operational and has a shutdown mode exercisable by EN pin resulting <20uW

PIN CONFIGURATIONS

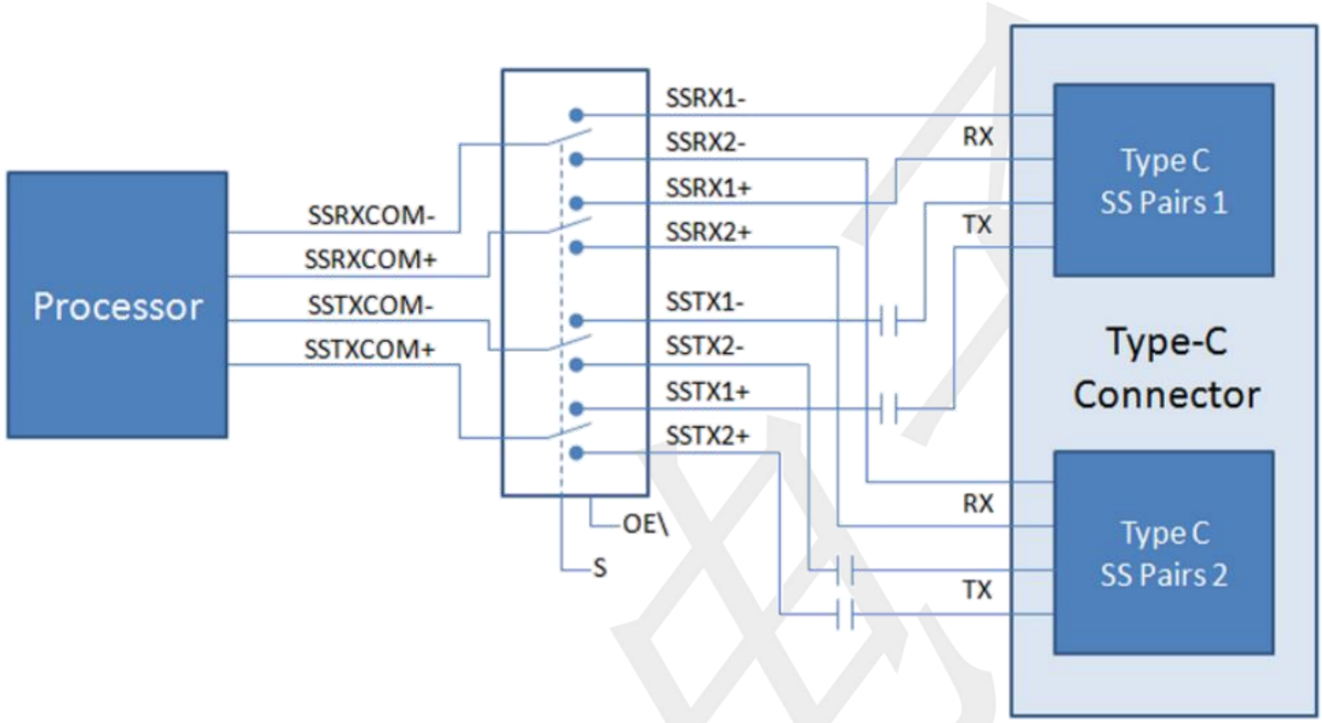


QFN1826-16L (TOP VIEW)

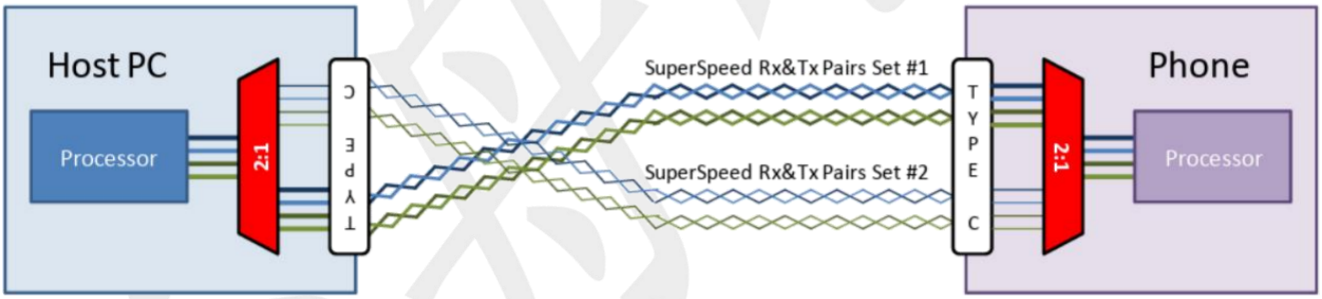
PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION	PIN NO.	PIN NAME	DESCRIPTION
1	SEL	Switch logic control	9	RX2+	Super Speed RX2+
2	TX+	Super Speed TX+ Common	10	TX2-	Super Speed TX2-
3	TX-	Super Speed TX- Common	11	TX2+	Super Speed TX2+
4	RX+	Super Speed RX+ Common	12	VCC	Supply Voltage
5	RX-	Super Speed RX- Common	13	GND	Ground
6	RX1+	Super Speed RX1+	14	TX1-	Super Speed TX1-
7	RX1-	Super Speed RX1-	15	TX1+	Super Speed TX1+
8	RX2-	Super Speed RX2-	16	_EN	Chip Enable, Active Low

BLOCK DIAGRAM



Typical Application



Truth Table

_EN	SEL	TX+	TX-	RX+	RX-
High	X	Hi-Z	Hi-Z	Hi-Z	Hi-Z
Low	Low	TX1+	TX1-	RX1+	RX1-
Low	High	TX2+	TX2-	RX2+	RX2-

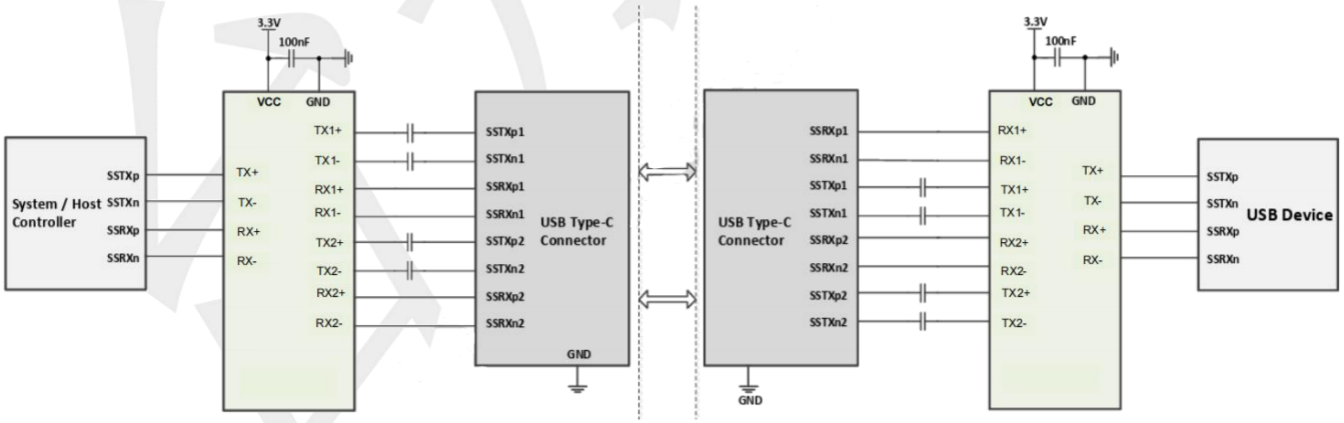
Absolute Maximum Ratings

(Above which useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	-65℃ to +150℃
Junction Temperature	125°C
Supply Voltage to Ground Potential	-0.5V to +5.5V
Supe Speed Data Channel TX / RX	-0.5V to 3.8V
DC Input Voltage	-0.5V to VCC
DC Output Current	50mA
Power Dissipation	300mW

Notes:
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Application Information



AC Coupling Capacitors for USB Type-C

Electronics Characteristics(Ta=25°C, VCC=1.8V, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
POWER SUPPLY						
VCC Quiescent Current	I_Q	SEL=0 or VCC, _EN=0		28		uA
Power-down Current	I_{PD}	SEL=0 or VCC, _EN=VCC			1	uA
DC CHARACTERISTICS						
Input logic high	V_{IH}	VCC=1.8~4.5V	1.6			V
Input logic low	V_{IL}	VCC=1.8~4.5V			0.4	V
_EN Internal pull-up resistor	R_{UP}			2		MΩ
SEL Internal pull-down resistor	R_{DN}			2		MΩ
On-Resistance for TX/RX	R_{ON_HS}	V_{IS}= 0.2V I_{ON}=8mA		6.7	8	Ω
R_{ON} Flatness for TX/RX	R_{FLAT_LP}	V_{IS}= 0 to 1.2V I_{ON}=8mA		0.8	1	Ω
R_{ON} Flatness for TX/RX	R_{FLAT_LP}	V_{IS}= 0 to 0.2V I_{ON}=8mA		0.2	0.3	Ω
R_{ON} Matching Between Channels	R_{MATCH}	V_{IS}= 0 to 1.2V I_{ON}=8mA		0.1		Ω
Switch Off Leakage Current	I_{OFF}	_EN=VCC , Tx, Rx =VCC TX1, TX2, RX1, RX2=0	-0.5		0.5	uA
AC CHARACTERISTICS						
Enable Time _EN to Output	t_{EN}	R_L=50Ω C_L=0pF V_{IS}= 0.6V		80	150	uS
Disable Time _EN to Output	t_{DIS}	R_L=50Ω C_L=0pF V_{IS}= 0.6V		40	250	nS
Turn-On Time SEL to Output	t_{ON}	R_L=50Ω C_L=0pF V_{IS}= 0.6V		400	1200	nS
Turn-Off Time SEL to Output	t_{OFF}	R_L=50Ω C_L=0pF V_{IS}= 0.6V		130	800	nS
Break-Before-Make Time	t_{BBM}	R_L=50Ω C_L=0pF V_{IS}= 0.6V		250	500	nS
Propagation Delay	t_{PD}	R_L=50Ω C_L=0pF V_{IS}= 0.6V		0.25		nS
Off Isolation	Off	R_L= 50Ω f = 1.2GHz V_{IS}= 0.2V_{PP}		-27		dB
Crosstalk	X_{TALK}	R_L= 50Ω f = 1.2GHz V_{IS}= 0.2V_{PP}		-43		dB
-3dB Bandwidth	BW_{-3dB}	R_L=50Ω C_L=0pF Signal 0dBm	4.5	5.1		GHz
CAPACITANCE						
Switch On Capacitance	C_{ON}	V_{Bias} = 0.2V, f = 1.5GHz		1.5		pF
Switch Off Capacitance	C_{OFF}	V_{Bias} = 0.2V, f = 1.5GHz		1.0		pF

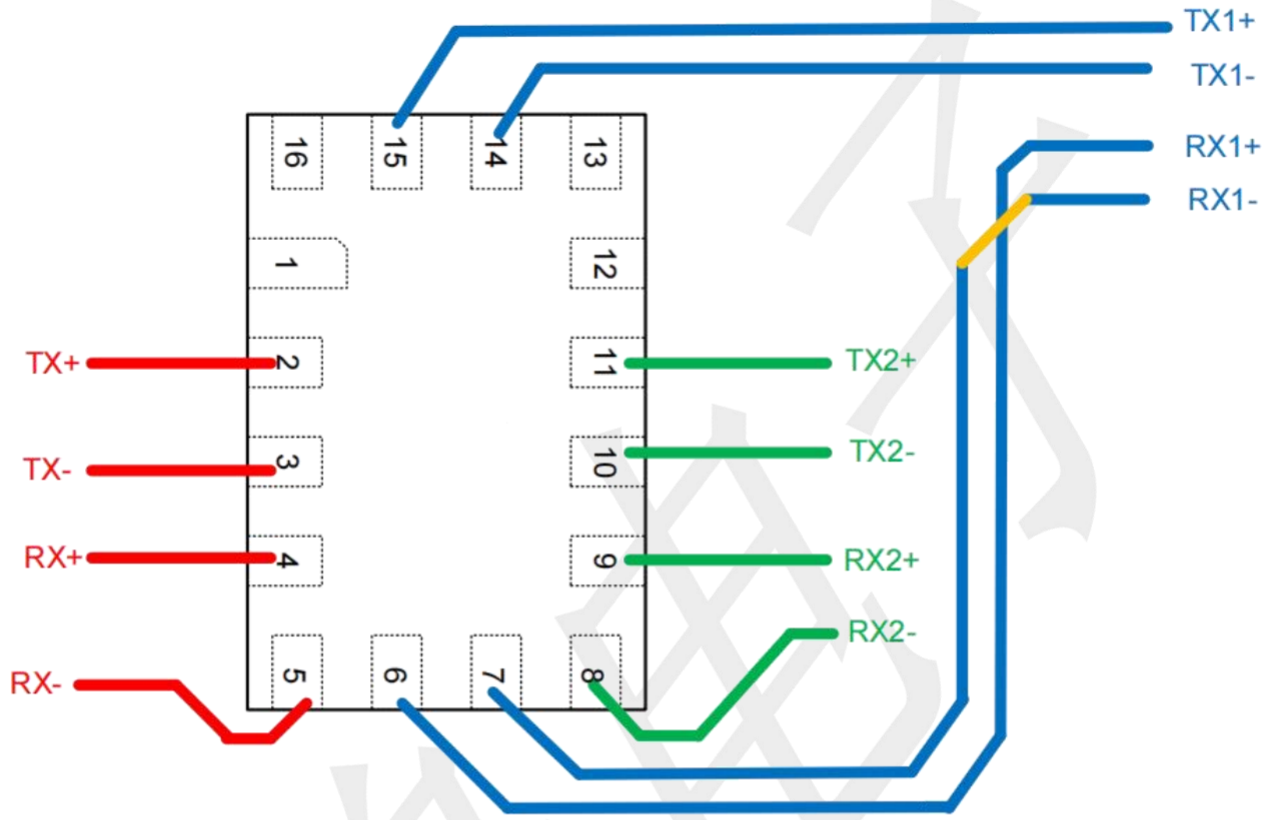
Notes:

(1)Flatness is defined as the difference between maximum and minimum value of ON-resistance at the specified analog signal voltage points.

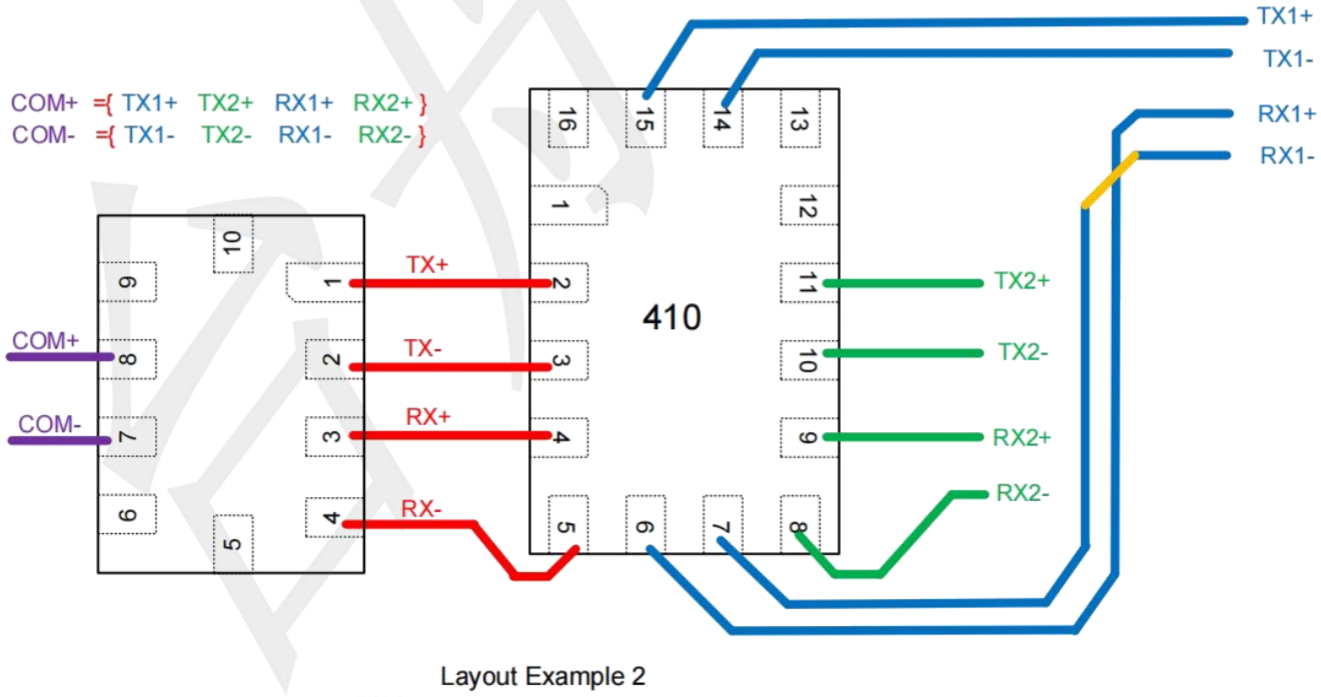
(2)RON matching between channels is calculated by subtracting the channel with the lowest max Ron value from the channel with the highest max Ron value.

(3)Crosstalk is inversely proportional to source impedance

Layout Example



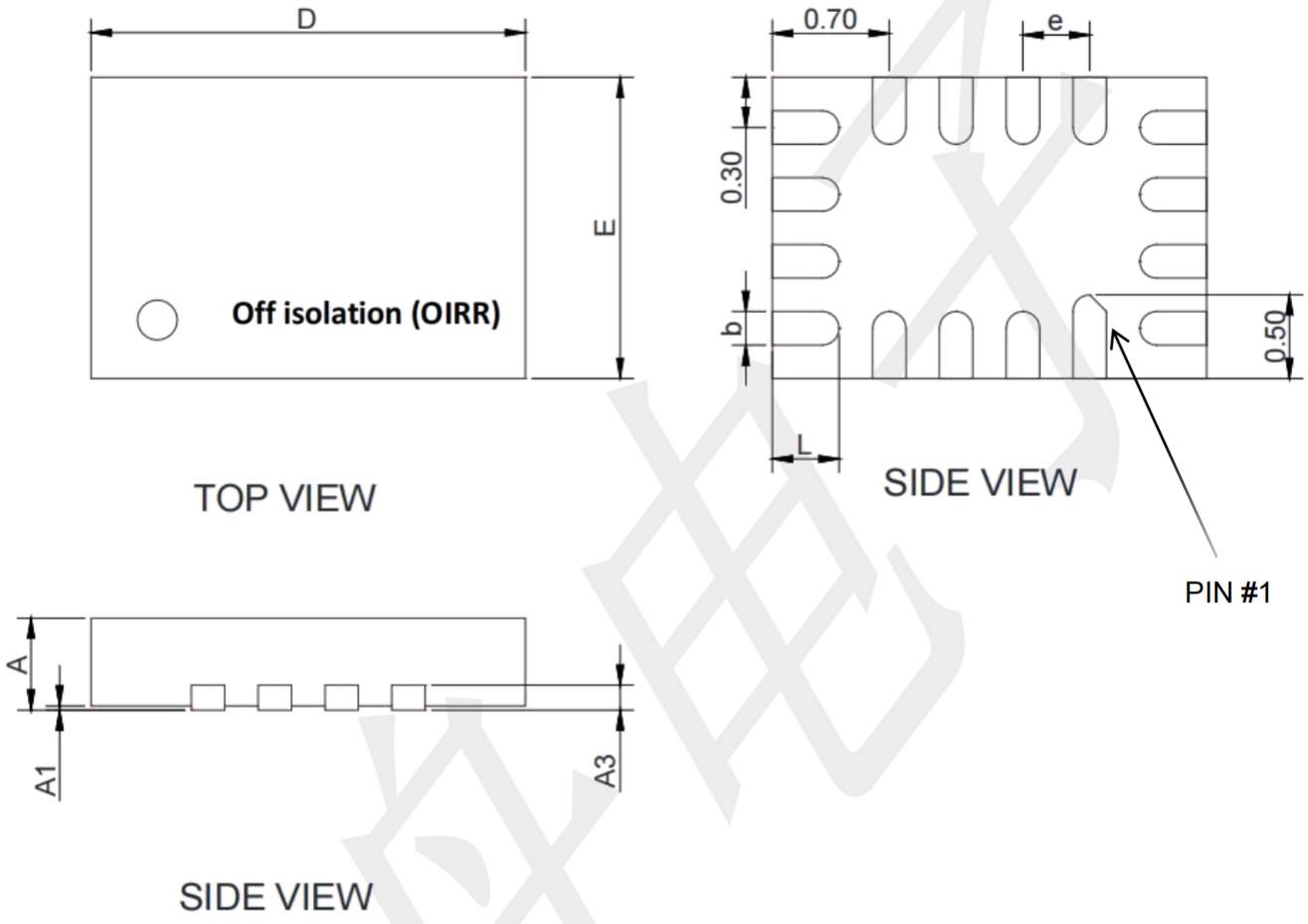
Layout Example 1



Layout Example 2

Package information

QFN1826-16L (Unit: mm)



Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.50	0.55	0.60
A1	0.00	-	0.05
A3	0.15 Ref.		
D	2.55	2.60	2.65
E	1.75	1.80	1.85
L	0.30	0.40	0.50
b	0.15	0.20	0.25
e	0.40 BSC		