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

Descriptions

The RLCS3340 is a high-speed bidirectional passive switch for USB Type-C™ applications, supporting USB 3.1 Gen 1/2 data rates. Controlled by the SEL pin, it switches differential channels between Port L0/L1 and Port C0. It's a generic analog switch for high-speed interfaces with a 0 to 2V common mode range and up to 1.8Vpp differential amplitude. Adaptive tracking maintains channel integrity across the common mode range. Its dynamic performance ensures minimal signal attenuation and jitter. Power consumption is <2mW (operational) and <20μW (shutdown via _EN pin). Available in QFN 2x3-18L and QFN 3x3-16L (Pb-/Halogen-free), it's ideal for mobile and space-constrained designs.

Features

- Wide supply range: 1.5V to 5.5V
- 2:1 / 1:2 differential switch/ Multiplexer
- Supports USB 3.1 SuperSpeed (10Gbps)
- High bandwidth: 5.1GHz (@-3dB)
- Isolation: -24dB @ 1.25GHz
- Crosstalk: -34dB @ 1.25GHz
- Low skew, bidirectional
- ESD tolerance: 2kV HBM
- Powered-off protection (VDD = 0V)
- 1.8V-compatible logic inputs

Applications

- USB Type-C™ ecosystem
- Desktop/notebook PCs
- Server/storage networks
- PCIe backplanes
- Shared I/O ports
- FPD-Link II/III switching

Typical Application

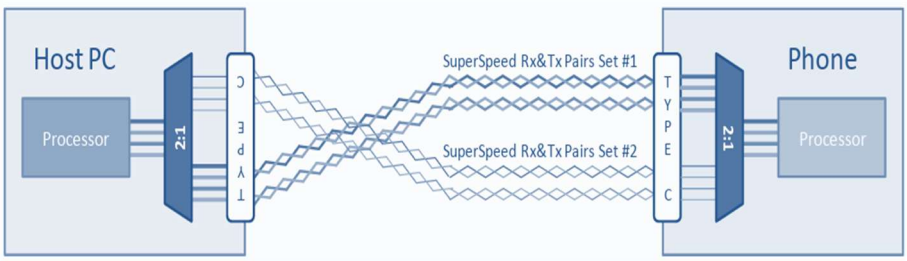


Fig.1 Typical Application

Pin Configuration

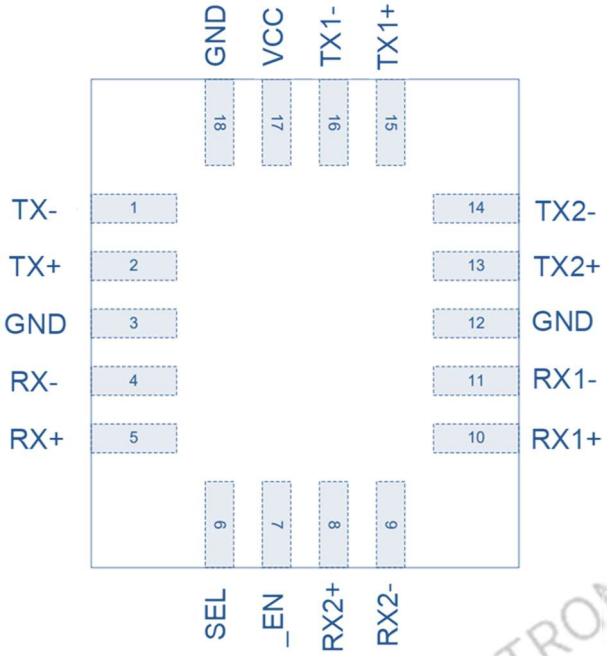


Fig.2 Pin Configuration QFN 2 x 3 -18L

Pin Description (QFN 2 x 3 -18L)

Pin#	Pin Name	Signal Type	Description
1	TX-	I/O	Super Speed TX- Common
2	TX+	I/O	Super Speed TX+ Common
3,12,18	GND	GND	Ground
4	RX-	I/O	Super Speed RX- Common
5	RX+	I/O	Super Speed RX+ Common
6	SEL	I	Switch logic control
7	_EN	I	Chip Enable, Active Low
8	RX2+	I/O	Super Speed RX2+
9	RX2-	I/O	Super Speed RX2-
10	RX1+	I/O	Super Speed RX1+
11	RX1-	I/O	Super Speed RX1-
13	TX2+	I/O	Super Speed TX2+
14	TX2-	I/O	Super Speed TX2-
15	TX1+	I/O	Super Speed TX1+
16	TX1-	I/O	Super Speed TX1-
17	VCC	Power	Supply Voltage

Table-1 Pin Description

Pin Configuration

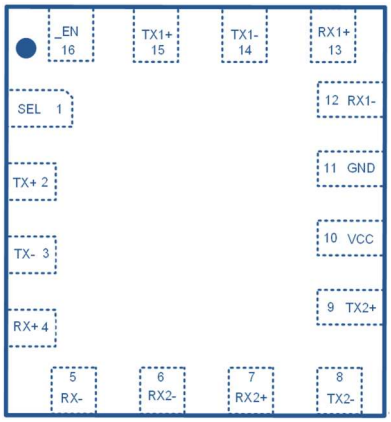


Fig.3 QFN 3 x 3 -16L Pin Configuration

Pin Description (QFN 3 x 3 -16L)

Pin#	Pin Name	Signal Type	Description
1	SEL	I	Switch logic control
2	TX+	I/O	Super Speed TX+ Common
3	TX-	I/O	Super Speed TX- Common
4	RX+	I/O	Super Speed RX+ Common
5	RX-	I/O	Super Speed RX- Common
6	RX2-	I/O	Super Speed RX2-
7	RX2+	I/O	Super Speed RX2+
8	TX2-	I/O	Super Speed TX2-
9	TX2+	I/O	Super Speed TX2+
10	VCC	Power	Supply Voltage
11	GND	GND	Ground
12	RX1-	I/O	Super Speed RX1-
13	RX1+	I/O	Super Speed RX1+
14	TX1-	I/O	Super Speed TX1-
15	TX1+	I/O	Super Speed TX1+
16	_EN	I	Chip Enable, Active Low

Table2 QFN 3x3-16L Pin Description

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-

Table-3 Truth Table

Order Information

Package		Part Number	Quantity per Reel
QFN 2 x 3 -18L	Tape and Reel	RLCS340QN18/R6	
QFN 3 x 3 -16L	Tape and Reel	RLCS340QN16/R6	

Table-4 Order Information

Block Diagram

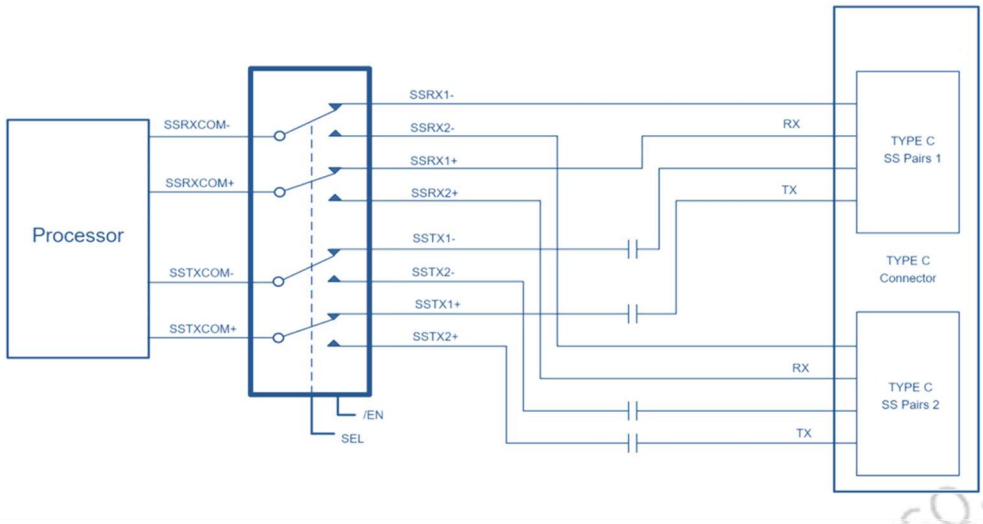


Fig.4 Block Diagram

Maximum Ratings

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

Parameter	Value
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

Table-5 Maximum Description

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.

Electrical Characteristics (Ta=25℃, 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

Table-6 Electrical Characteristics

Note:

(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

Typical Performance Curves (Ta=25°C, VCC=3.0V, CAP=0.1uF, unless otherwise noted)

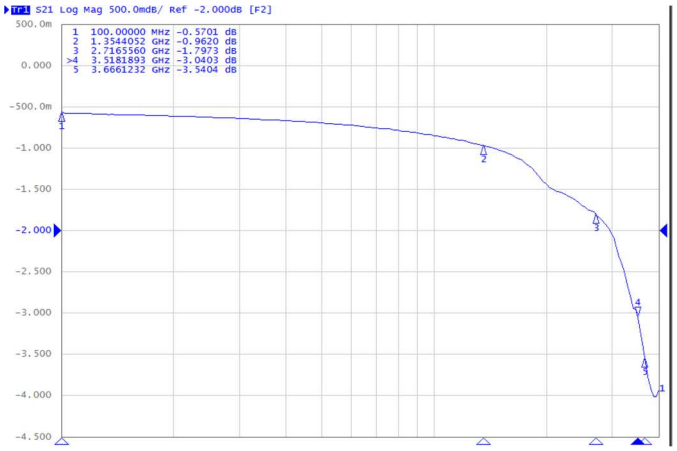


Fig.5 Switch Bandwidth or Insertion Loss

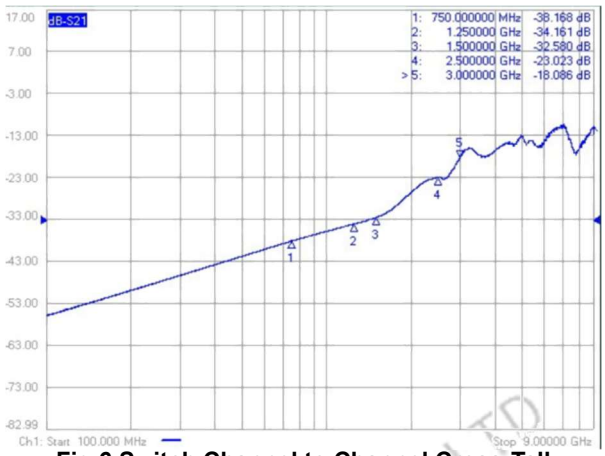


Fig.6 Switch Channel to Channel Cross-Talk

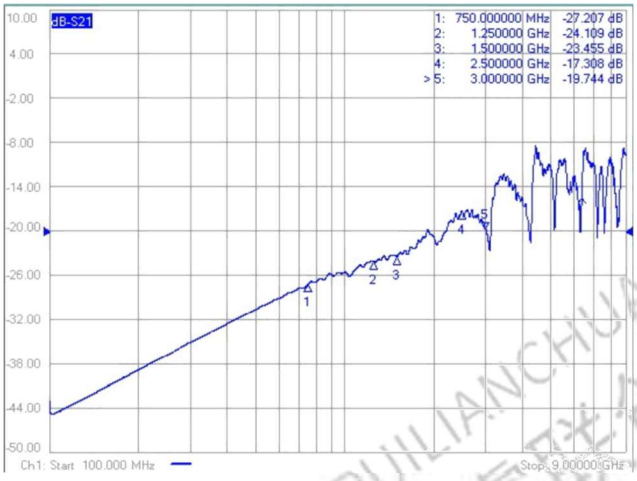
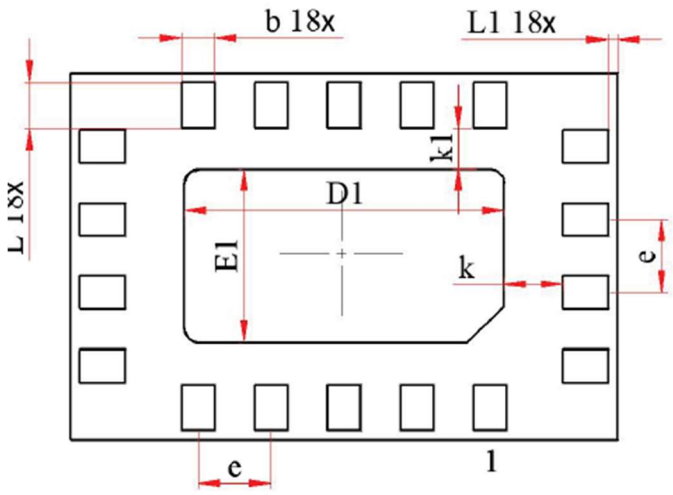


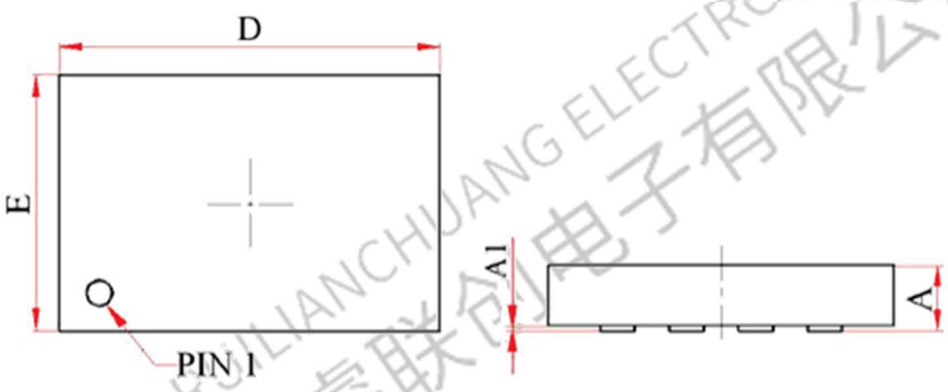
Fig.7 Switch Off Isolation

Package Outline Dimensions

QFN 2 x 3 -18L



Bottom View



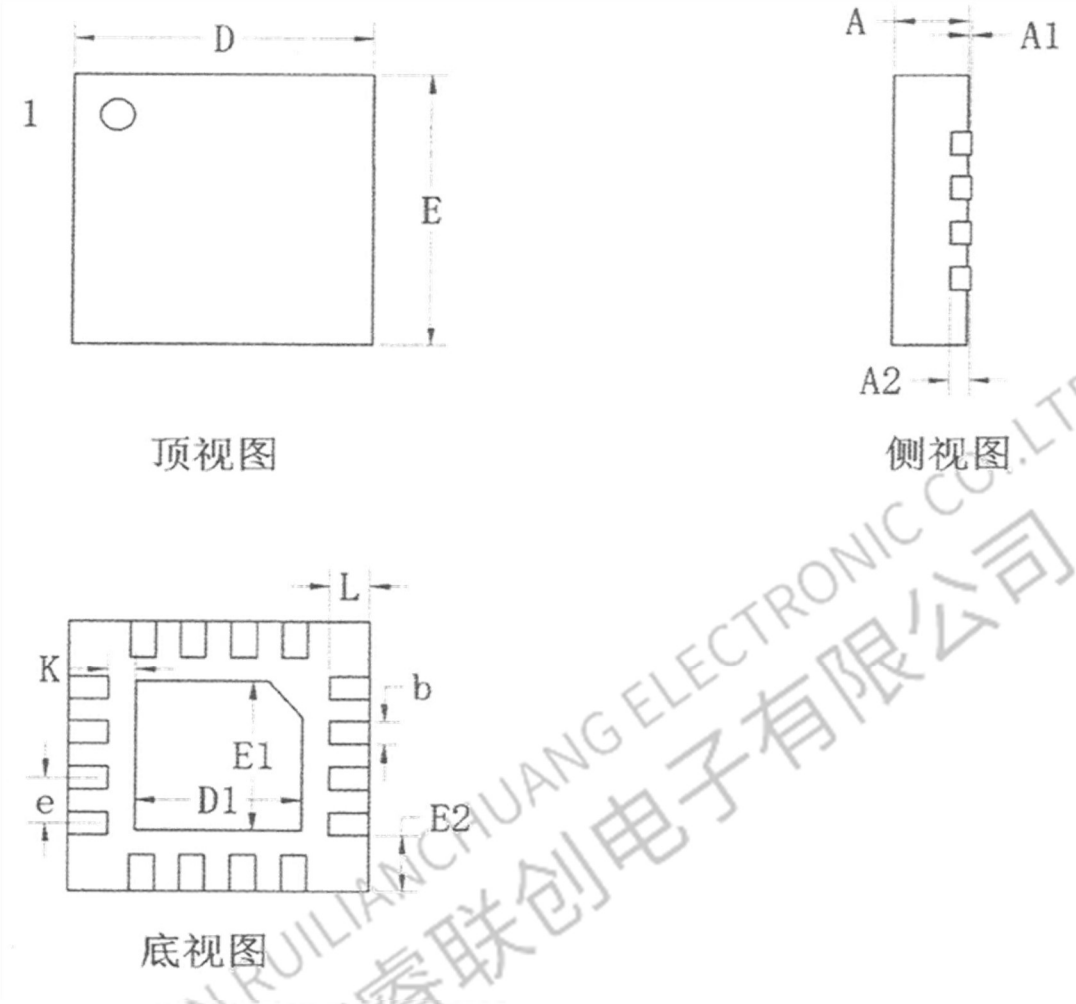
Top View　　Side View

Symbol	Dimension In Millimeters			Dimension In Inches		
	Normal	Min	Max	Normal	Min	Max
A	--	0.340	0.400	--	0.013	0.016
A1	--	0.010	0.050	--	0.000	0.002
D	3.000	2.950	3.050	0.118	0.116	0.120
E	2.000	1.950	2.050	0.079	0.077	0.081
D1	1.750	1.700	1.800	0.069	0.067	0.071
E1	0.950	0.900	1.000	0.037	0.035	0.039
b	0.180	0.150	0.210	0.007	0.006	0.008
L	0.250	0.200	0.300	0.010	0.008	0.012
L1	0.050	0.010	0.090	0.002	0.00	0.004
k	0.325 REF			0.013REF		
k1	0.225 REF			0.009REF		
e	0.400 BSC			0.016 BSC		

Table-6 Package Dimension QFN 2 x 3 -18L

Package outline dimensions

QFN 3x3 -16L



SYMBOL	MILIMETER		
	MIN	NOM	MAX
A	0.7	0.75	0.8
A1	0.00		0.05
A2		0.203 TYP	
b	0.20	0.25	0.30
D	2.95	3.00	3.05
D1	1.55	1.65	1.75
E	2.95	3.00	3.05
E1	1.55	1.65	1.75
E2		0.625 REF	
e		0.50 BSC	
K		0.275 REF	
L	0.35	0.40	0.45

Table-7 Package Dimension QFN 3 x 3 -16L

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