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

Descriptions

The RLCS3000 is a high-speed bidirectional passive switch for mux/demux configurations in 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. This generic analog switch suits any high-speed interface with a 0~2V common mode range and up to 1800mVpp differential signaling. Adaptive tracking maintains channel integrity across the common mode range. Its dynamic performance ensures minimal signal attenuation and jitter, preserving eye diagrams. Power consumption is <2mW (operational) and <20μW (shutdown via _EN pin).The RLCS3000 comes in a compact UQFN 1.5x2-10L package.

Features

- Wide Supply Range 1.5 V to 5.5 V
- Differential 2:1 or 1:2 Switch/Multiplexer
- USB 3.1 Super Speed 10Gbps Switch
- High Bandwidth: 5.1GHz @-3dB Bandwidth
- Isolation: -24dB @ 1.25 GHz
- Crosstalk: -34dB @ 1.25 GHz
- Low bit-to-bit skew, Bidirectional
- ESD Tolerance: 2kV HBM
- Powered Off Protection When VDD = 0 V
- 1.8-V Compatible Logic Inputs

Applications

- Anywhere a USB Type-C™ Ecosystem
- Mobile Phones,
- Tablets and Notebooks
- PCI Express Backplanes

Functions and Pin Configuration

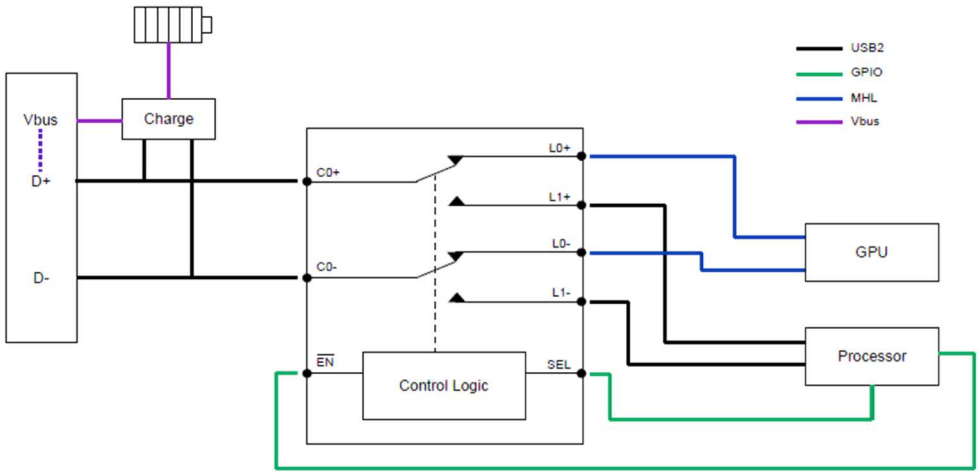


Fig.1 Functional Diagram

Pin Configuration

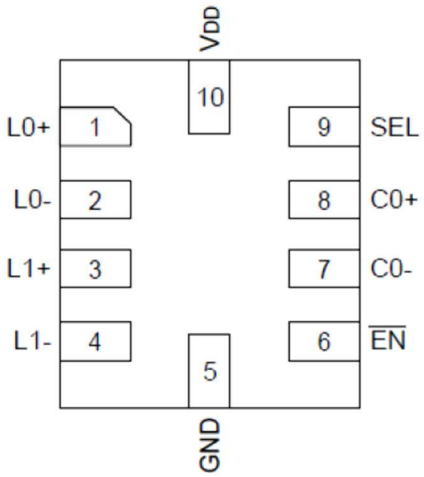


Fig.2 UQFN 1.5x2-10L

Pin Descriptions

UQFN1.5x2-10L	Pin Name	Signal Type	Description
8	C0+	I/O	Signal I/O, Common Port
7	C0-	I/O	Signal I/O, Common Port
3	L1+	I/O	Signal I/O, Channle 1
4	L1-	I/O	Signal I/O, Channle 1
1	L0+	I/O	Signal I/O, Channle 0
2	L0-	I/O	Signal I/O, Channle 0
9	SEL	I	Operation Model Select (when SEL=0: C0→L0, when SEL=1: C0→L1)
6	_EN	I	_EN=1, Power Down is Enabled.
10	VDD	PWR	Positive Supply Voltage
5	GND	GND	Power Ground

Table-1 Pin Descriptions

Truth Table

Function	SEL	_EN
C0+/- to L0+/-	L	L
C0+/- to L1+/-	H	L
All Switches Hi-Z	X	H

Table-2 Truth Table

Order Information

Package		Part Number	Quantity per Reel
UQFN 1.5x2-10L	Tape and Reel	RLCS3000QN10/R6	3000PCS

Table-3 Order Information

Electrical Characteristics (Ta=25°C, VCC=3.3V, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
POWER SUPPLY						
Supply Voltage Range	VDD		1.5	3.3	5.5	V
Supply Current	I_{CC}	_EN =1 disconnection		0.6	1	uA
		_EN =0 connection		28		uA
SEL/_EN DIGITAL INPUT CONTOL						
control input logic high	V_{IH}		1.6		5.5	V
control input logic low	V_{IL}		-0.1		0.5	V
Internal pull-down resistor	R_{PD}			2		MΩ
SWITCH ON RESISTANCE AND OFF LEAKAGE						
On-Resistance	R_{ON}	V_{IS}= 0~0.4V I_{ON}=8mA		6.7	8	Ω
R_{ON} Flatness	R_{FLAT}	V_{IS}= 0 to 1.2V I_{ON}=8mA		0.8	1	Ω
		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
OFF Leakage Current	I_{LEAK}	$V_{C0+/-}$= VCC $V_{L1+/-}$= $V_{L0+/-}$ =0V	-0.5		0.5	uA
SWITCH DYNAMICS						
On Capacitance	C_{ON}	$V_{C0+/-}$ = 0.2V, f = 1.5GHz		1.5		pF
Off Capacitance	C_{OFF}	$V_{C0+/-}$ = 0.2V, f = 1.5GHz		1.0		pF
Off Isolation	Off	R_L = 50Ω f = 1.25GHz V_{IS}= 0.2V_{PP}		-24		dB
Crosstalk	X_{TALK}	R_L = 50Ω f = 1.25GHz V_{IS}= 0.2V_{PP}		-34		dB
-3dB Bandwidth	BW_{-3dB}	R_L=50Ω C_L=0pF Signal 0dBm	3.6	5.1		GHz
Break-Before-Make	BBM	$V_{L1+/-}$ = $V_{L0+/-}$ = 0.4V, R_L=50Ω		1.5		uS
Turn-on Time	t_{OFF}	$V_{C0+/-}$ = 0.4V, R_L=50Ω _EN switches from High to Low		40		uS
Turn-off Time	t_{OFF}	$V_{C0+/-}$ = 0.4V, R_L=50Ω _EN switches from Low to High		1.2		uS
Propagation Delay	t_{PD}	$V_{C0+/-}$ = 0.4V, R_L=50Ω		200		pS

Table-4 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) R_{ON} 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)

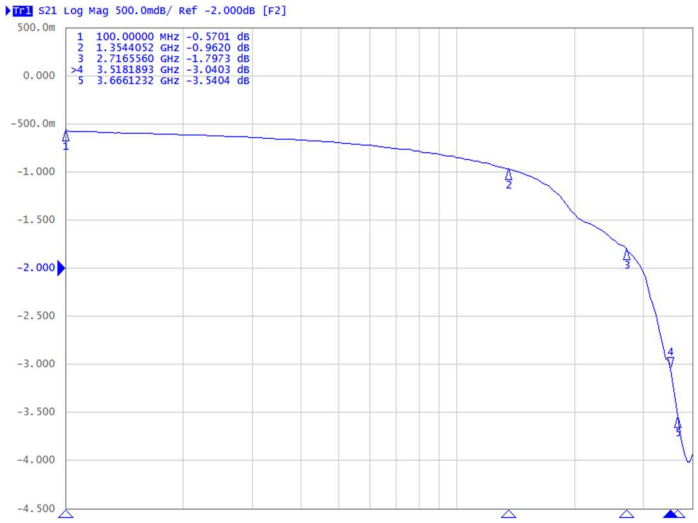


Fig.4 Switch Bandwidth or Insertion Loss

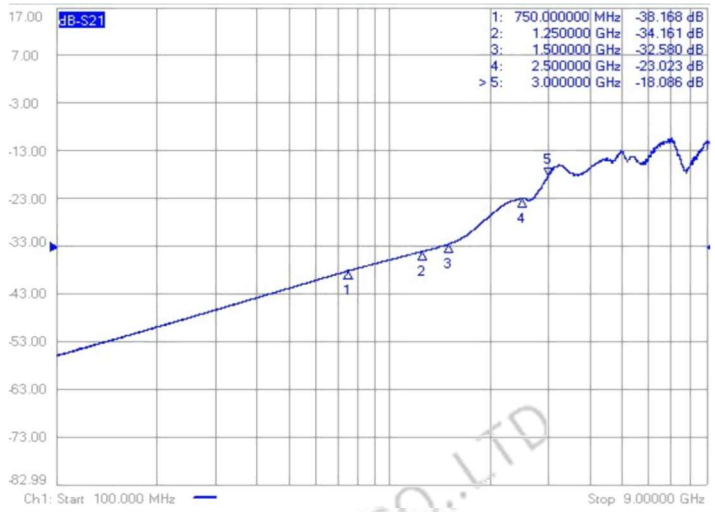


Fig.5 Switch Channel to Channel Cross-Talk

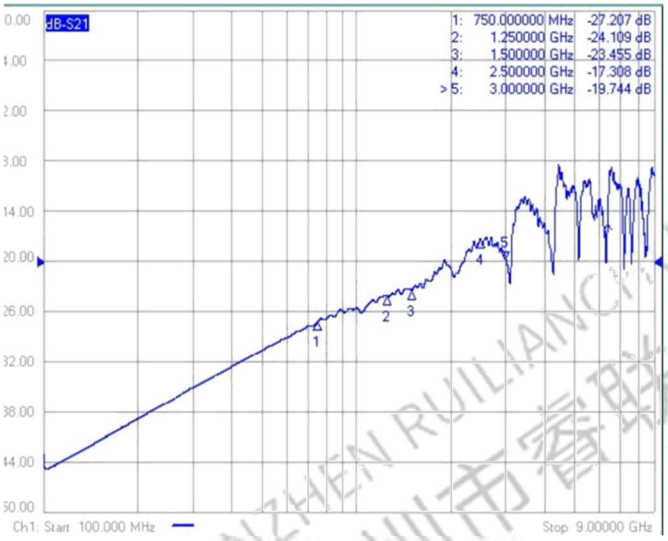
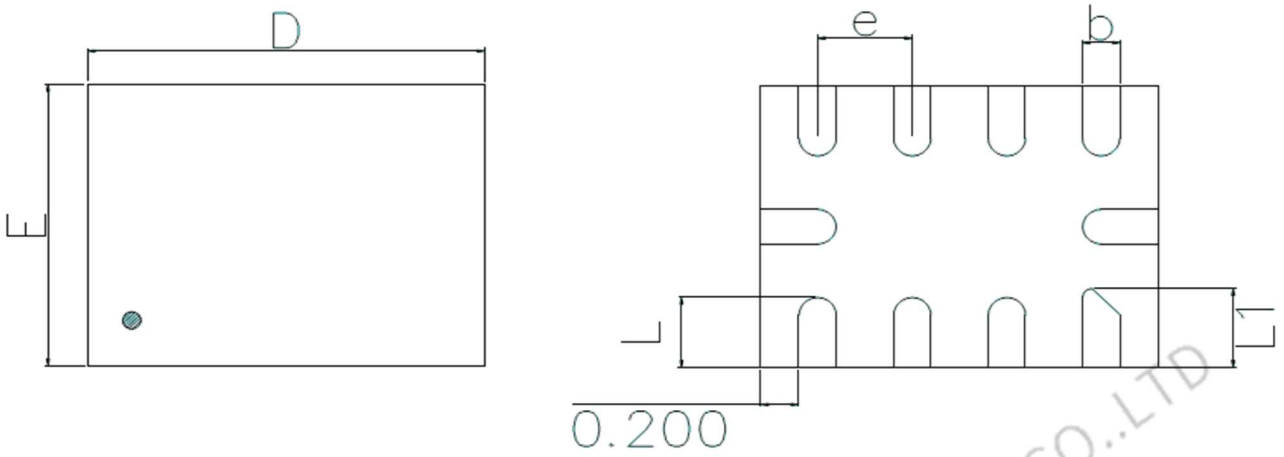
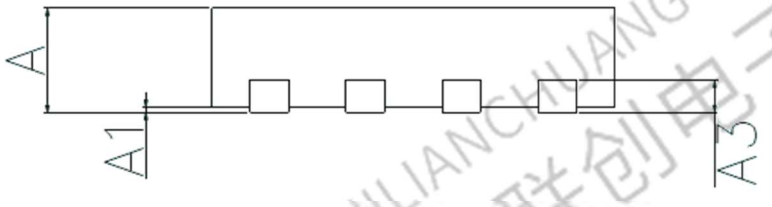


Fig.6 Switch Off Isolation

Package Outline Dimensions

UQFN 1.5x2 -10L





Symbol	Dimension in Millimeters		
	Min.	Typ.	Max.
A	0.500	0.550	0.600
A1	0.000		0.050
A3	0.150 Ref.		
D	1.950	2.000	2.050
E	1.450	1.500	1.550
b	0.150	0.200	0.250
e	0.500 (BSC)		
L	0.350	0.400	0.450
L1	0.450	0.450	0.550

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