



Descriptions

The TS3USB221ARSER is a bidirectional low-power dual port, high-speed, USB 2.0 analog switch with integrated protection for USB Type-C™ systems. The device is configured as a dual 2:1 or 1:2 switch. It is optimized for use with the USB 2.0 DP/DM lines in a USB Type-C™ system.

The TS3USB221ARSER integrated over-voltage protection on the C0+/- pins can withstand up to DC 30V with automatic shutoff circuitry in order to protect system components behind the switch. GPIO controls of SEL and _EN are 1.8V logic compatible. The TS3USB221ARSER is available in QFN1520(UQFN-10(1.5x2)) with Pb-free and Halogen-free making it a perfect candidate for mobile and space constrained applications.

Order Information

Package		Part Number	Top-Side Marking
QFN1520(UQFN-10(1.5x2))	Tape and Reel	TS3USB221ARSER	A673/UGYW

Features

- Pin-to-Pin FSUSB42UMX, NX3DV42GU, DIO5000, PI3USB4000, SGM7227YU
- Supply Range 2.5 V to 5.5 V
- Differential 2:1 or 1:2 Switch/Multiplexer
- Up to DC 30V Overvoltage Protection (OVP) on C0+/- Ports
- IEC 64000-4-5 Surge Protection w/o External TVS onto C0+/- Ports: ±30V
- System Side Clamp Voltage Pulse Less than 9V, Duration Less than 200nS
- Powered Off Protection When VDD = 0 V
- Low RON of 10 Ω Typical
- Insertion loss: -1dB@200MHz, -2dB@650MHz, -3dB@1GHz
- C_{ON} of 4.8 pF , 1.8-V Compatible Logic Inputs, Standard Temperature Range of 0°C to 85°C

Applications

- Anywhere a USB Type-C™ or Micro-B Connector is Used
- Mobile Phones, Tablets and Notebooks



Functions and Pin Configuration

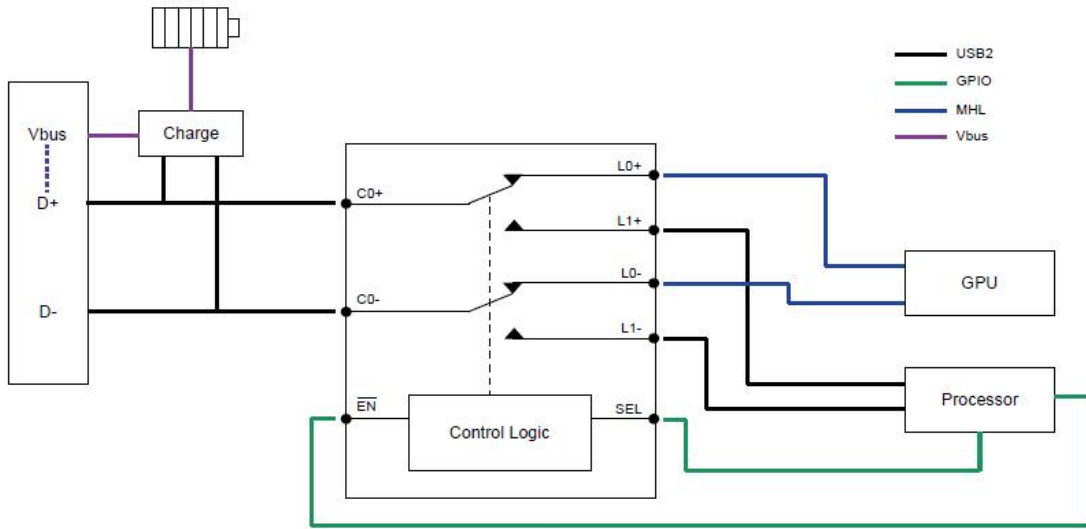


Fig.1 Functional Diagram

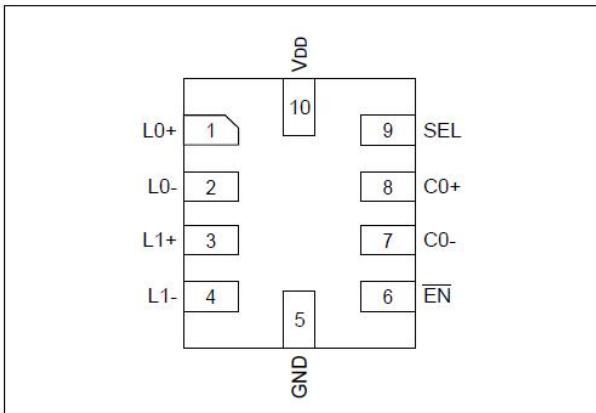


Fig.2 QFN1520(UQFN-10(1.5x2))

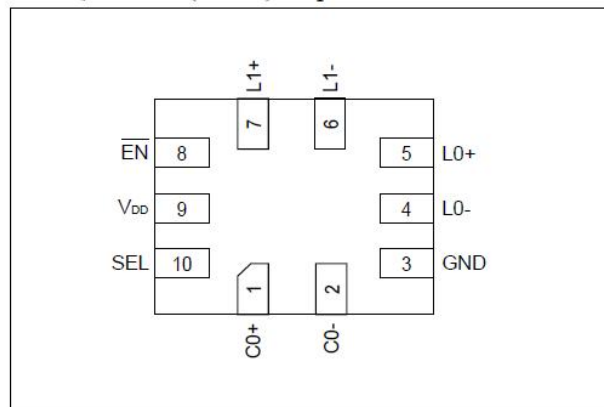


Fig.3 QFN1418



Pin Descriptions

QFN1520 (UQFN-10(1.5x2))	QFN1418	Pin Name	Signal Type	Description
8	1	C0+	I/O	Signal I/O, Common Port
7	2	C0-	I/O	Signal I/O, Common Port
3	7	L1+	I/O	Signal I/O, Channle 1
4	6	L1-	I/O	Signal I/O, Channle 1
1	5	L0+	I/O	Signal I/O, Channle 0
2	4	L0-	I/O	Signal I/O, Channle 0
9	10	SEL	I	Operation Model Select (when SEL=0: C0→L0, when SEL=1: C0→L1)
6	8	_EN	I	_EN=1, Power Down is Enabled.
10	9	VDD	PWR	Positive Supply Voltage
5	3	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	L

Table-2 Truth Table



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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power Supply						
Supply Voltage Range	VDD		2.5	3.3	5.5	V
Supply Current	I _{CC}	<u>EN</u> =1 disconnection		5	13	uA
		<u>EN</u> =0 connection		33	60	uA
SEL/_EN Digital Input Control						
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} = 0V~0.4V I _{OUT} =8mA		10	11	Ω
R _{ON} Flatness ⁽¹⁾	R _{FLAT}	V _{IS} = 0V~0.4V I _{OUT} =8mA		0.3	0.5	Ω
R _{ON} Matching Between Channels ⁽²⁾	ΔR _{ON}	V _{IS} = 0V~0.4V I _{OUT} =8mA		0.1	0.2	Ω
OFF Leakage Current	I _{LEAK}	V _{C0+/-} = 10V V _{L1+/-} = V _{D2+/-} =0V		31	50	uA
Switch Dynamics						
On Capacitance	C _{ON}	V _{C0+/-} = 0.2V, f = 1MHz		4		pF
Off Capacitance	C _{OFF}	V _{C0+/-} = 0.2V, f = 1MHz		3		pF
Off Isolation	Off	f = 250MHz, R _T = 50Ω, C _L = 0pF		-38		dB
Crosstalk ⁽³⁾ (Channel-to-Channel)	X _{TALK}	f = 250MHz, R _T = 50Ω, C _L = 0pF		-41		dB
-3dB Bandwidth	BW	R _T =50Ω, C _L =0pF Signal Power 0dBm	1.0	1.1		GHz
Break-Before-Make	BBM	V _{L1+/-} = V _{D2+/-} = 0.4V, R _L =50Ω		1.5		uS
Turn-on Time	t _{ON}	V _{C0+/-} = 0.4V, R _L =50Ω <u>EN</u> switches from High to Low		20		uS
Turn-off Time	t _{OFF}	V _{C0+/-} = 0.4V, R _L =50Ω <u>EN</u> switches from Low to High		1.2		uS
Propagation Delay	t _{PD}	V _{C0+/-} = 0.4V, R _L =50Ω		200		pS
Over Voltage Protection						
OVP Lockout Threshold	V _{OVP}	V _{C0+/-} Rising Edge	4.6	4.9	5.2	V
OVP Hysteresis	V _{HYS}	V _{C0+/-} Falling Edge		200		mV
Clamp Voltage on L1+/- and D2+/-	V _{CLAMP}	10V shorts to C0+/- with R _L =1KΩ @ L1+/- and D2+/-		6.5	8	V
OVP Response Time	t _{FP}	10V shorts to C0+/- with R _L =1KΩ @ L1+/- and D2+/-		200	300	nS
OVP Recovery Time	t _{FPR}	V _{C0+/-} jumps from 6V to 1V step	30	45	60	uS

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, VDD=3.0V, CAP=0.1uF, unless otherwise noted)

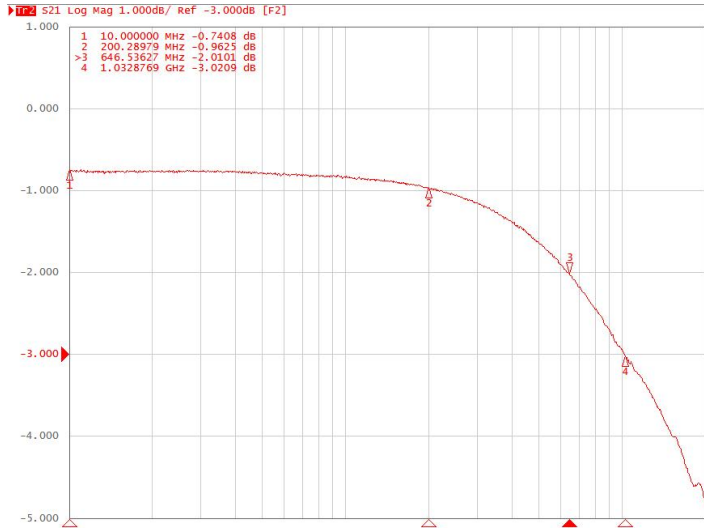


Fig.1 Switch Bandwidth or Insertion Loss

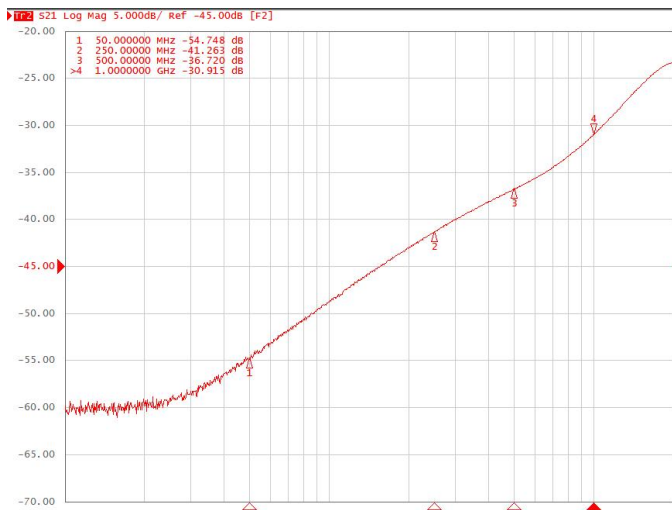


Fig.2 Switch Channel to Channel Cross-Talk

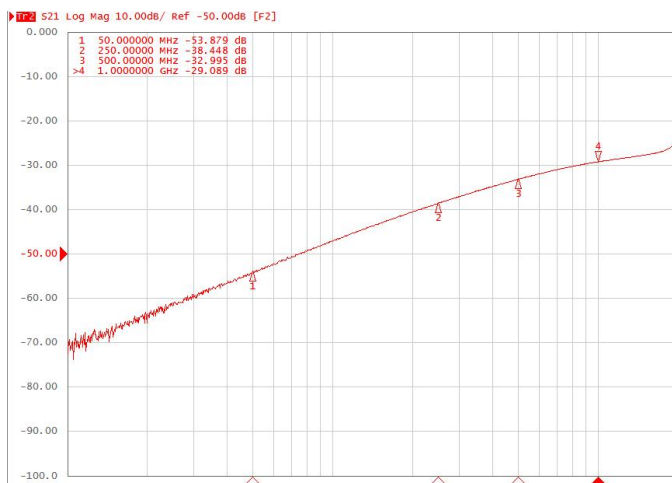
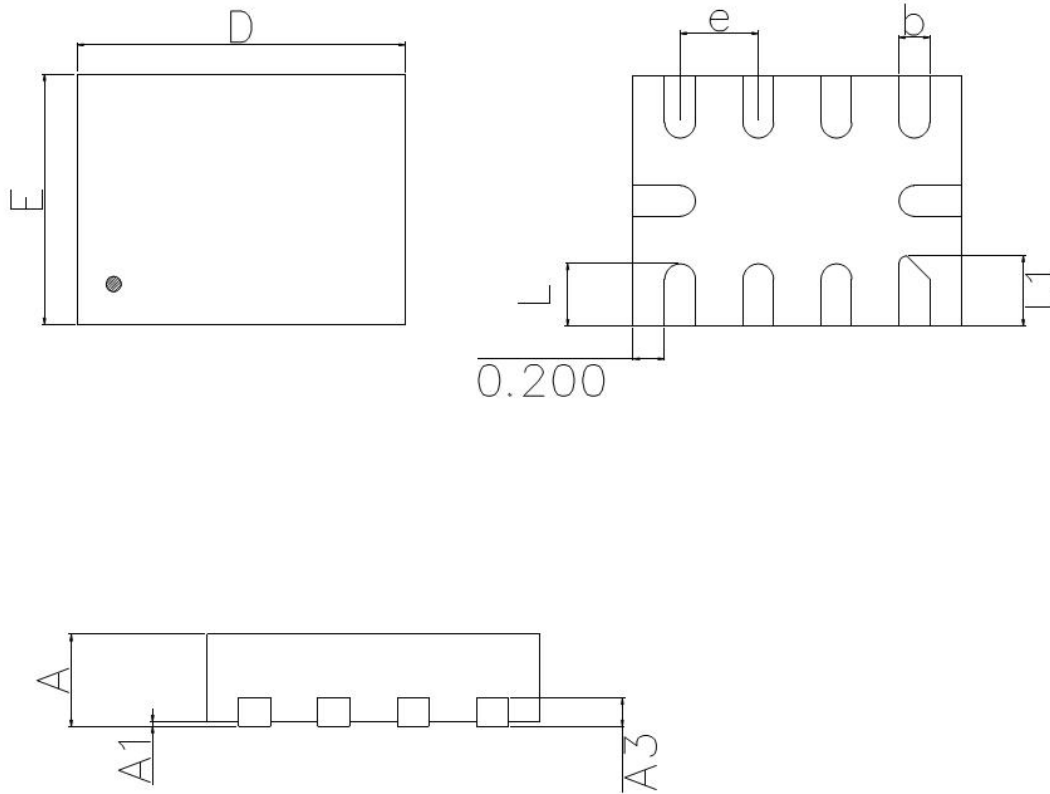


Fig.3 Switch Off Isolation



Package Outline Dimensions

QFN1520(UQFN-10(1.5x2))



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	0.300	0.350	0.400
L1	0.350	0.400	0.450



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