SV7102

Low Voltage, High-Speed USB 2.0 Switch

Revision v0.98

SAVITECH Corporation

SV7102
## Low Voltage, High-Speed USB 2.0 Switch

Features

- Wide operating range: +1.65V ~ +5.5V
- USB 2.0 (High Speed), USB2.0 (Full Speed) and legacy USB 1.1 compliant
- Wide bandwidth: 810MHz (typ.)
- 9ns switching transition time
- Cross-talk: -45dB at 480Mbps
- Off isolation: -40dB at 480Mbps
- Low ON-resistance: R_{ON}= 4   (typ.)
- Extreme low signal propagation delay
- Low power consumption

Pin Configuration

10L- WQFN 1.8x1.3x0.6mm

MSOP-10
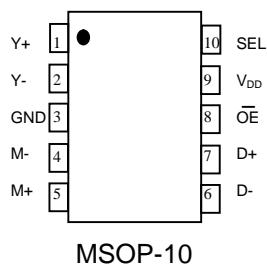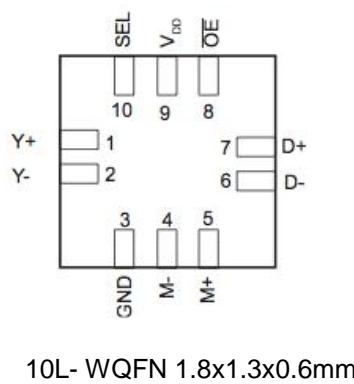
Description

The SV7102 is a high-bandwidth switch specially designed for switching high-speed USB 2.0 signals in handset, portables and digital consumer applications. It offers seamless switching with extreme low attenuation designed for applications requiring low bit-to-bit skew and high channel-to-channel noise isolation, and is fully compliant with industry high-speed USB 2.0 standard.

The SV7102 switch features wide bandwidth that allows minimum edge and phase distortion while signals passing through. The SV7102 is acting as a multiplex that multiplexes twol outputs of a USB host device to one of two corresponding outputs fro connecting to an external USB device. The switch is bidirectional, so it can be used as a demultiplex too.

Block diagram
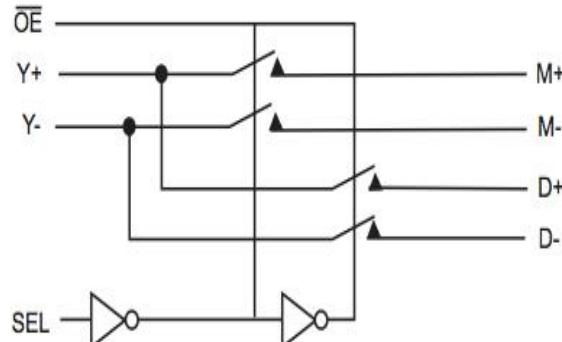
Order codes

Part number	Operation temperature range	Package	Packing
SV7102-10WY-TR3	-40°C, +85°C	WQFN-10	Tape & Reel, 3000pcs
SV7102-10MP-TR3	-40°C, +85°C	MSOP-10	Tape & Reel, 3000pcs

Pin description

NAME	DESCRIPTION
$\overline{OE}$	Active LOW, Output enable
SEL	Select input
Y(+/-)	COM port
M&D(+/-)	I/O for USB data path (port 1 and port 2)

Truth Table

SEL	$\overline{OE}$	Y+	Y-
X	H	Hi-Z	Hi-Z
L	L	M+	M-
H	L	D+	D-

Absolute maximum ratings

Parameter	Value	Unit
Storage Temperature	-60 to +150	°C
Supply Votage to Ground Potential	-0.5 to +7	V
DC Input Voltage	-0.5 to +7	V
DC Output Current	120	mA
Power Dissipation	0.5	W
ESD Susceptibility: HBM	8000	V
ESD Susceptibility: MM	400	V

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions not implied.

DC Electrical Characteristics for USB2.0 Switching over Operation Range

(T_A=-40°C to 85°C, V_{DD}=+3.0~4.4V)

Parameters	Description	Test Conditions[1]	Min.	Typ.[2]	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed HIGH Level	0.4		VDD	V
V_{IL}	Input LOW Voltage	Guaranteed HIGH level	VSS		0.35	V
V_{IK}	Clamp Diode Voltage	V_{DD}=Max., IIK=-18mA		-0.74		V
I_{IH}	Input HIGH Current	V_{DD}=Max., VIH=VDD		0.45	±1	uA
I_{IL}	Input LOW Current	V_{DD}=Max., VIL=GND			±1	uA
R_{ON}	On-Resistance[3]	V_{DD}=Min., -0.4V≤Vin≤1.0V, I_{ON}=-40mA		4		Ω
$R_{FLAT(ON)}$	On-Resistance Flatness[3]	V_{DD}=Min., -0.4V≤Vin≤1.0V, I_{ON}=-40mA		0.6		Ω
$\triangle R_{ON}$	On-Resistance match form center ports to any other port[3]	V_{DD}=Min., -0.4V≤Vin ≤1.0V, I_{ON}=-40mA		1		Ω
I_{OZ}	I/O leakage current when port is off	V_{DD}=+4.3V, V_{in}=0 to +3.6V, switch=off, $\overline{OE}$=HIGH			±1	uA

Notes:
1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. V_{DD}=+3.0~4.4V, T_A = 25°C ambient and maximum loading.
3. Measured by the voltage drop between Y and Dx pin at indicated current through the On-Resistance is determined by the lower of the voltages on the two (Y, Dx) pins.

Power Supply Characteristics (V$_{DD}$=+4.5~5.5V)

Parameters	Description	Test Conditions[1]	Min.	Typ.	Max.	Units
I$_{CC}$	Quiescent Power Supply Current	V$_{DD}$=Max., $\overline{OE}$=1.4V~V$_{DD}$		0.1	1	uA
		V$_{DD}$=Max., V$_{SEL}$=+1.3V~2.1V			1	uA

Power Supply Characteristics (V$_{DD}$=+3.0~4.4V)

Parameters	Description	Test Conditions[1]	Min.	Typ.	Max.	Units
I$_{CC}$	Quiescent Power Supply Current	V$_{DD}$=Max., $\overline{OE}$=1.4V~V$_{DD}$		0.55	1	uA
		V$_{DD}$=Max., V$_{SEL}$=+1.3V~2.1V		110	180	uA

Notes:

1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type

Dynamic Electrical Characteristics Over the Operating Range

Parameters[3]	Description	Test Conditions[1]	Min.	Typ.[2]	Max.	Units
X$_{TALK}$	Crosstalk	R$_L$=50Ω, f=240MHz		-45		dB
O$_{IRR}$	OFF Isolation			-40		dB
BW	-3dB Bandwidth	R$_L$=50Ω		810		MHz
BW	-0.5dB Bandwidth	R$_L$=50Ω		270		MHz

Notes:

1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V$_{DD}$=+3.3V, T$_A$=25°C ambient and maximum loading.
3. This parameter is determined by device characterization but is not production tested.

Switching Characteristics

| Parameters	Description	Test Conditions[1]	Min.	Typ.	Max.	Units
t$_{PD}$	Propagation Delay[2,3]	V$_{DD}$=3.0 ~ 4.4V		0.25		ns
t$_{PZH}$, t$_{PZL}$	Line Enable Time - SEL, $\overline{OE}$ to D(+/-), M(+/-)	V$_{DD}$=3.0 ~ 4.4V		2.5		us
		V$_{DD}$=4.5 ~ 5.5V		30		ns
t$_{PHZ}$, t$_{PLZ}$	Line Disable Time - SEL, $\overline{OE}$ to D(+/-), M(+/-)	V$_{DD}$=3.0 ~ 4.4V		9		ns
t$_{SKc-c}$	Output skew, channel-to-channel[2]	V$_{DD}$=3.0 ~ 4.4V		5		ps
t$_{SKb-b}$	Output skew, bit-to-bit (opposite transition of the same output (t$_{PHL}$-t$_{PLH}$)[2]	V$_{DD}$=3.0 ~ 4.4V		10		ps

Notes:

1. For max. or min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Guaranteed by design.
3. The switch contributes no propagational delay other than the RC delay of the On-Resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.25ns for 10pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagational delay to the system. Propagational delay of the switch when used in a system is determined by the driving circuit on the driving side of the switch and its interactions with the load on the driven side.

Eye Diagrams
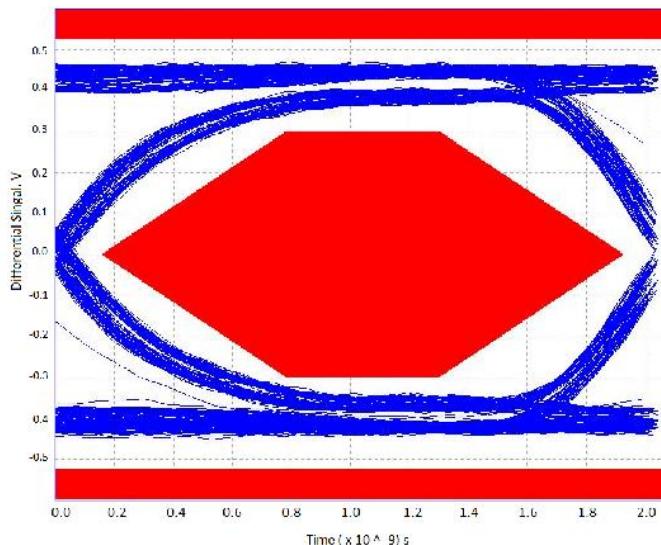

480-Mbps USB signal with NO port (PASS)
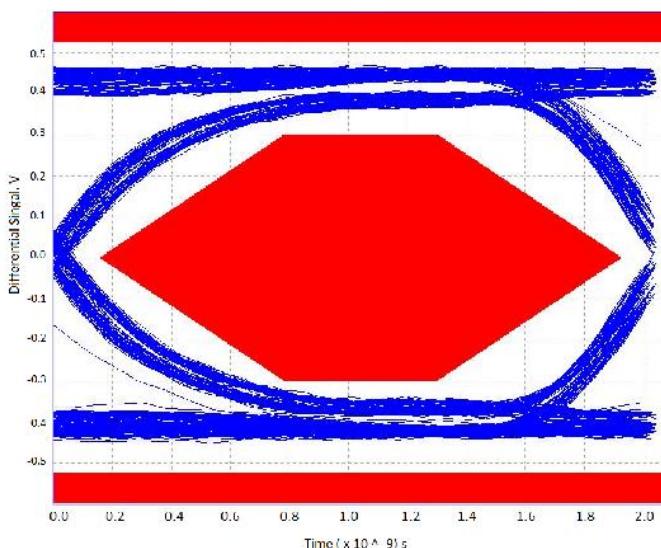
480-Mbps USB signal with NC port (PASS)
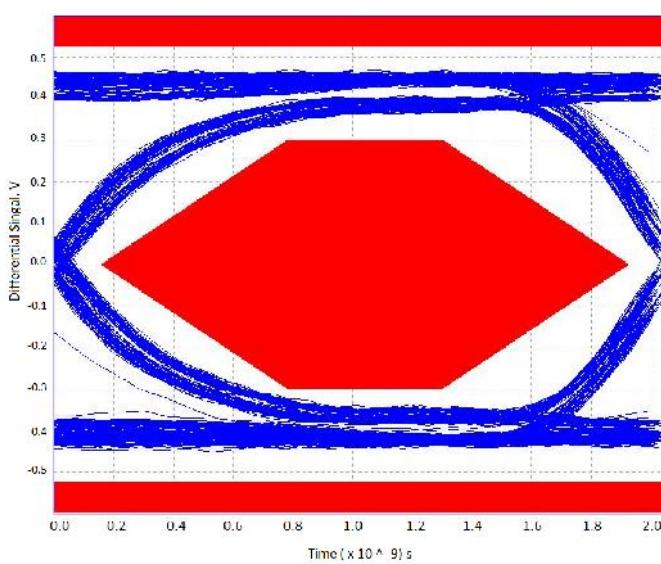
480-Mbps USB signal source (PASS)

盛微先進科技 SAVITECH.COM	**Package Outline Drawing : 10L WQFN 1.8x1.3x0.6mm (10-WY)** Doc No : PE-3-P01 Rev : A1	Date :2011 - 05 - 27
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1. Mechanical Data

Savitech Corp. Confidential
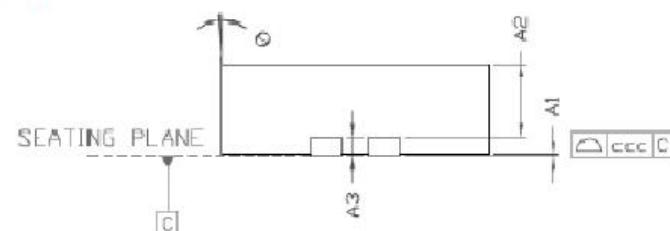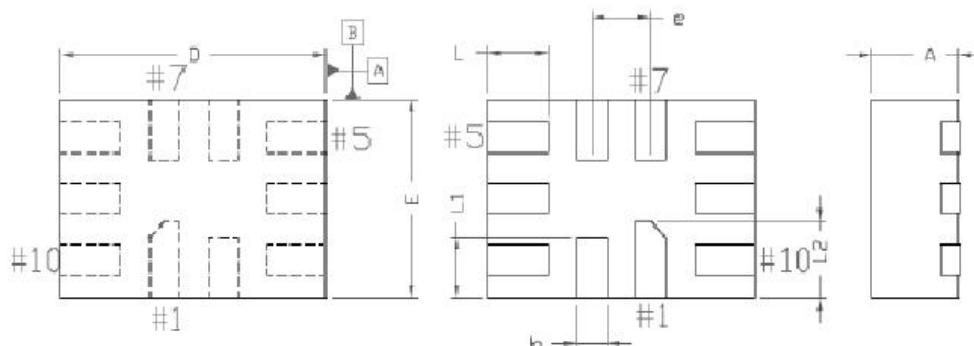
Symbol	Dimension in MM		
	Min.	Mom.	Max.
A	0.55	0.60	0.65
A1	0.00	---	0.05
A2	0.423	---	0.523
A3	---	0.127REF	---
b	0.15	0.25	0.25
D	1.75	1.8	1.85
E	1.25	1.3	1.35
e	---	0.4BSC	
L	0.35	0.40	0.45
L1	0.35	0.40	0.45
L2	0.45	0.50	0.55
Θ	-12	---	0
ccc	---	0.08	---
M	---	---	0.05
Burr	0.00	0.03	0.06

Recommended soldering land pattern for PCB
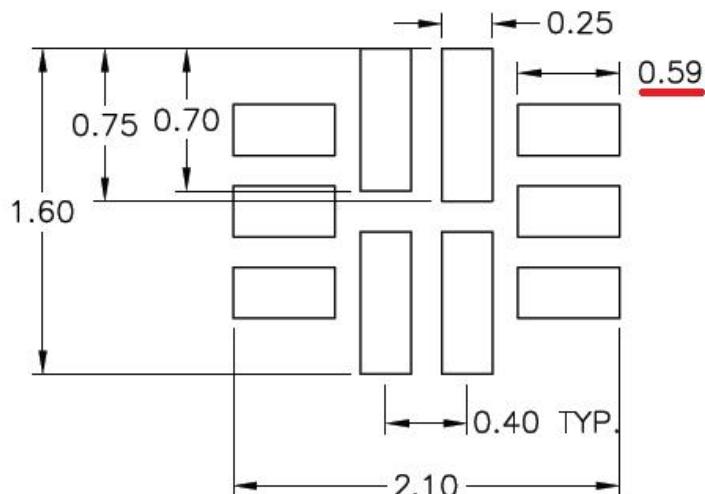
Recommended Land Pattern

MSOP-10 MECHANICAL DATA
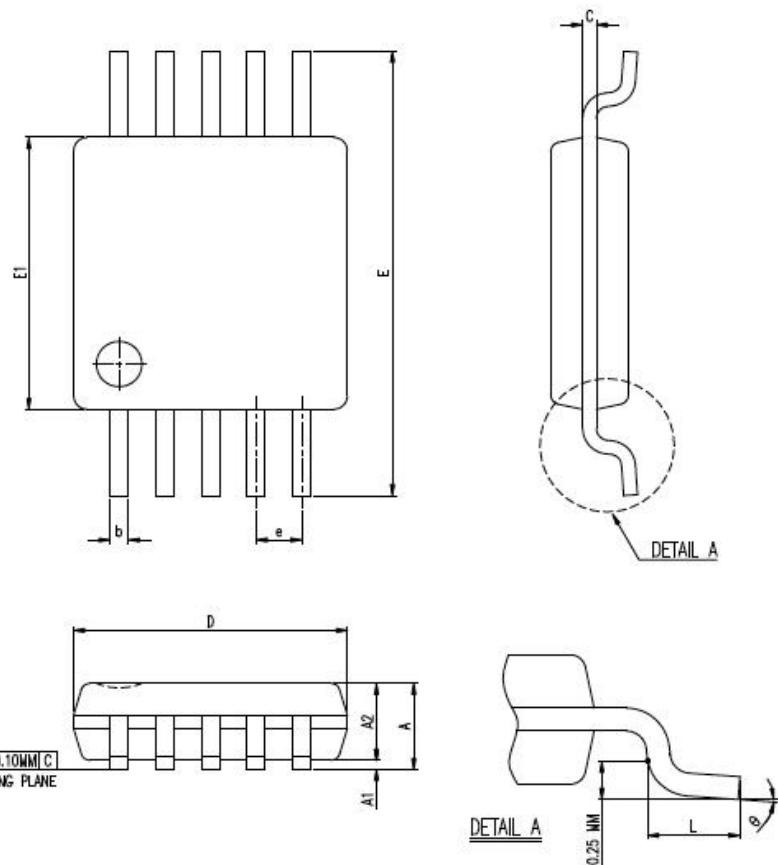
Symbol	Dimension in MM			Dimension in Inch		
	Min.	Mom.	Max.	Min.	Mom.	Max.
A	0.81	1.02	1.10	0.032	0.040	0.043
A1	0.05		0.15	0.002		0.006
A2	0.75	0.86	0.95	0.030	0.034	0.037
b	0.17	0.20	0.27	0.007	0.008	0.011
C	0.13	0.15	0.23	0.005	0.006	0.009
D	2.90	3.00	3.10	0.114	0.118	0.122
E	4.75	4.90	5.05	0.187	0.193	0.199
E1	2.90	3.00	3.10	0.114	0.118	0.122
e	0.50BASIC			0.020 BASIC		
L	0.40	0.55	0.70	0.016	0.022	0.028
Θ	0*	3*	6*	0*	3*	6*
JEDEC						

*Notes:

Dimension "D" does not include mold flash, Protrusions or gate burrs. Mold flash, tie bar burrs and fate burrs shall not exceed 0.12 MM (0.05 Inch) per end dimension "E1" dose not include interlead flash. Interlead flash shall not exceed 0.25MM (0.010 Inch) per side.