



Descriptions

The TS3USB30E 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 device is capable of true isolation. Even when COM+/- overrides VCC, very little current will flow back to the supply.

The TS3USB30E has low bit-to-bit skew and high channel-to-channel noise isolation, and is compatible with various standards, such as high-speed USB 2.0 (480Mbps). Each switch is bidirectional and offers little or no attenuation of the high-speed signals at the outputs. Its bandwidth is wide enough to pass high-speed USB 2.0 differential signals (480 Mb/s) with good signal integrity.

GPIO control of SEL 1.8V logic compatible. The TS3USB30E is available in both QFN 1418 and MSOP-10 with Pb-free and Halogen-free making it a perfect candidate for mobile and space constrained applications.

Features

- Low On-resistance, Ron=1.5Ω when VCC =5V
- 1.8V Logic Compatible Control Pin
- COM+/- Overrides VCC to Achieve True Isolation Even When Supply Is Dead
- High Off-Isolation: -100dB @ 100KHz
- Low Channel-to-Channel Crosstalk: -97dB @ 100KHz
- High Bandwidth (-3dB @800MHz) Suitable for USB2.0 High-Speed Routing
- Low Quiescent Current (<2uA) With Very Wide Supply Range (1.5V ~ 5.5V)

Applications

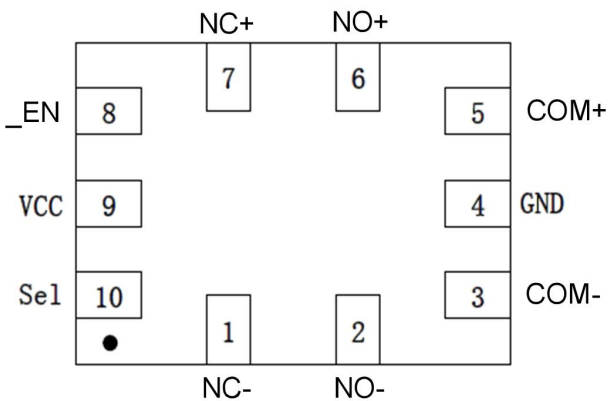
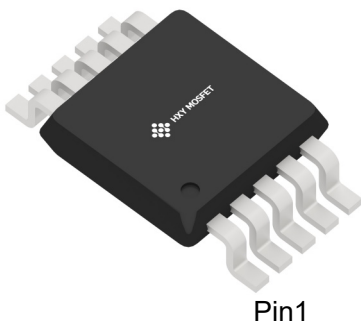
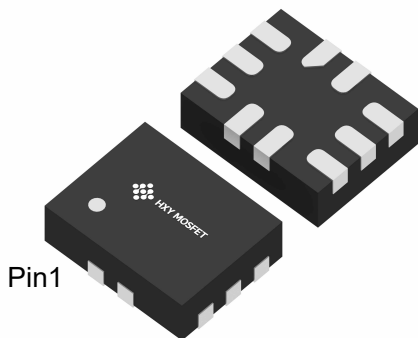
- Anywhere a USB Type-C™ or Micro-B Connector is Used
- Mobile Phones, Tablets and Notebooks

Order Information

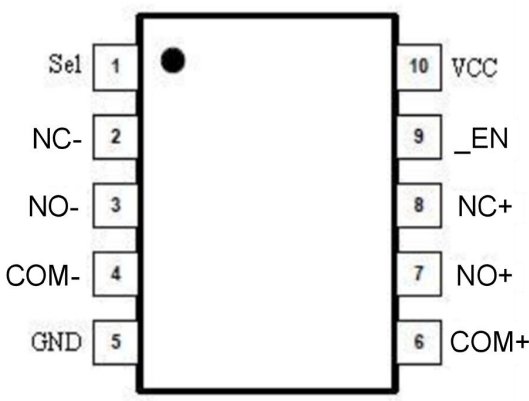
Part Number	Package	
TS3USB30ERSWR	QFN1418	Tape and Reel
TS3USB30EDGSR	MSOP -10	Tape and Reel



Function and Pin Configuration



QFN1418

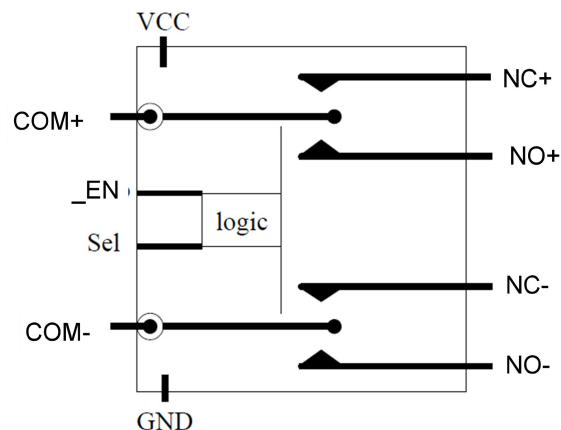


MSOP-10

Pin Number		Symbol	Type	Descriptions
QFN1418	MSOP-10			
1	2	NC-	I/O	Negative Data Port (Normally closed)
2	3	NO-	I/O	Negative Data Port (Normally open)
3	4	COM-	I/O	Common Negative Data Port
4	5	GND	GND	Ground
5	6	COM+	I/O	Common Positive Data Port
6	7	NO+	I/O	Positive Data Port (Normally open)
7	8	NC+	I/O	Positive Data Port (Normally closed)
8	9	_EN	I	Chip Enable, Active Low
9	10	VCC	Supply	Power Supply
10	1	SEL	I	Logic Input Selection



Block Diagram



Truth Table

Input SEL	Function
0	COM+/- = NC+/-
1	COM+/- = NO+/-

Absolute Maximum Ratings ⁽¹⁾

Parameter	Symbol	Value	Unit
Supply Voltage	V _{CC}	-0.3 ~ 6.5	V
Control Input Voltage	V _{IN}	-0.3 ~ 6.5	V
Continuous Current Through NO, NC, COM		±100	mA
Peak Current Through NO, NC, COM (pulsed at 1ms 50% duty cycle)		±200	mA
Storage Temperature Range	T _{STG}	-55 ~ 150	°C
Junction Temperature under Bias	T _J	150	°C
Lead Temperature (Soldering, 10 seconds)	T _L	260	°C
Power Dissipation	P _D	250	mW

Recommend operating ratings ⁽²⁾

Parameter	Symbol	Value	Unit
Supply Voltage Operating	V _{CC}	1.5 ~ 5.5	V
Control Input Voltage	V _{IN}	-0.3 ~ 5.5	V
Input Signal Voltage	V _{COM}	-0.3 ~ 5.5	V
Operating Temperature	T _A	-40 ~ 85	°C
Thermal Resistance	R _{θJA}	360	°C/W

Note:

1. "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.
2. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.



DC Electronics Characteristics (Ta=25°C, VCC=3.3V, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input logic high level	V_{IH}	VCC: 3.3 ~ 5.5V	1.6			V
		VCC: 1.5 ~ 3.3V	1.4			V
Input logic low level	V_{IL}	VCC: 3.3 ~ 5.5V			0.6	V
		VCC: 1.5 ~ 3.3V			0.4	V
Supply quiescent current	I_{CC}	$I_{COM}=0$, $V_{IN}=0$ or $V_{IN}=V_{CC}$			1.0	uA
Increase in I_{CC} per input	I_{CCT}	$I_{COM}=0$, VCC=4.5V $V_{IN}>1.8$ or $V_{IN}<0.5$			1.0	uA
Off state leakage from COM _x to NC _x (or NO _x)	I_{COMx}	$V_{COM}=5.5V$, $V_{NC(or NO)}=0V$			±2.0	uA
On-Resistance	R_{ON1}	$V_{COM}=0 \sim 0.5V$, $I_{COM}=30mA$		3.0	3.5	Ω
	R_{ON2}	$V_{COM}=0.5 \sim 2.0V$, $I_{COM}=30mA$		3.6	3.9	Ω
	R_{ON3}	$V_{COM}=2.0 \sim 4.0V$, $I_{COM}=30mA$		2.5	3.5	Ω
	R_{ON4}	$V_{COM}=4.0 \sim 5.5V$, $I_{COM}=30mA$		1.5	1.8	Ω
On-Resistance Flatness	R_{FLAT1}	$V_{COM}=0 \sim 0.5V$, $I_{COM}=30mA$		0.7		Ω
	R_{FLAT2}	$V_{COM}=0.5 \sim 2.0V$, $I_{COM}=30mA$		0.5		Ω
	R_{FLAT3}	$V_{COM}=2.0 \sim 4.0V$, $I_{COM}=30mA$		1.6		Ω
	R_{FLAT4}	$V_{COM}=4.0 \sim 5.5V$, $I_{COM}=30mA$		0.3		Ω
On-Resistance Matching Between Channels	ΔR_{ON}	$V_{COM}=0 \sim 5.5V$, $I_{COM}=30mA$,		0.1	0.2	Ω

AC Electronics Characteristics (Ta=25°C, VCC=3.3V, unless otherwise noted)

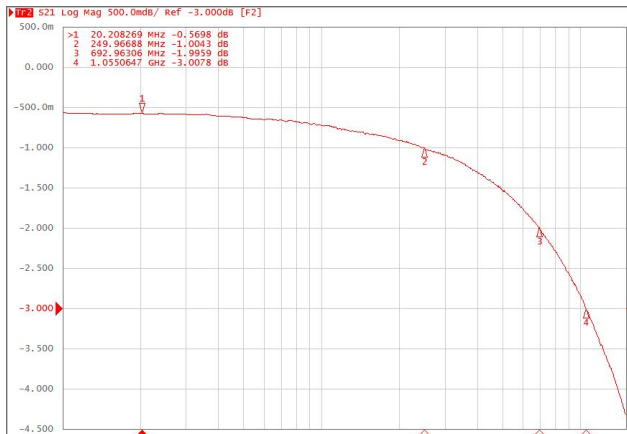
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Time	T_{ON}	$V_{COM}=1.5V$, $C_L=35pF$, $R_L=50\Omega$		200		ns
Turn-Off Time	T_{OFF}	$V_{COM}=1.5V$, $C_L=35pF$, $R_L=50\Omega$		200		ns
Break-Before-Make time	T_{BBM}	$V_{COM}=1.5V$, $C_L=35pF$, $R_L=50\Omega$		500		ns
-3dB Bandwidth	BW	$R_L=50\Omega$, $C_L=0pF$		800		MHz
Off isolation	OIRR	F=1KHz, $R_L=50\Omega$		-81		dB
		F=10KHz, $R_L=50\Omega$		-80		dB
Crosstalk	Xtalk	F=1KHz, $R_L=50\Omega$		-83		dB
		F=10KHz, $R_L=50\Omega$		-82		dB
Total Harmonic Distortion	THD	F=20Hz to 20KHz $V_{COM}=600mVp-p$ @ $R_L=32\Omega$,		-80		dB

Capacitance (Ta=25°C, VCC=3.3V, unless otherwise noted)

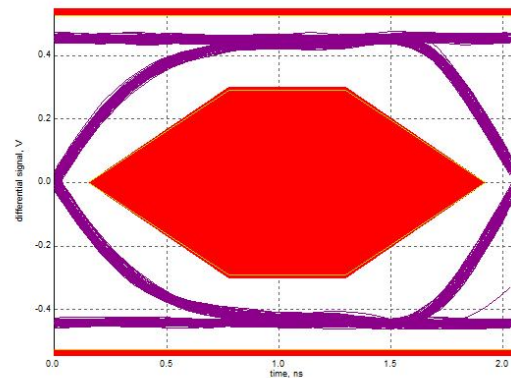
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Off capacitance	C_{OFF}	F=100KHz		5		pF
On capacitance	C_{ON}	F=100KHz		7		pF



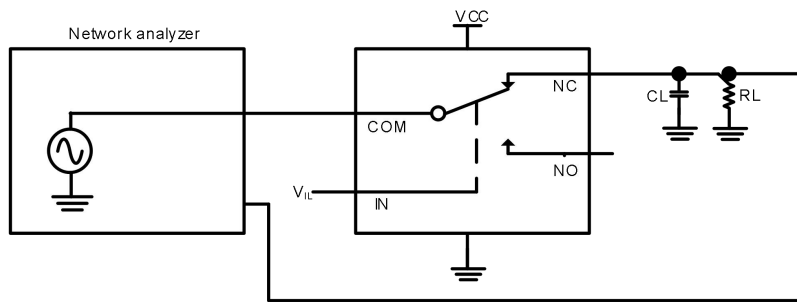
Typical Characteristics (Ta=25°C, VCC=3.3V, unless otherwise noted)



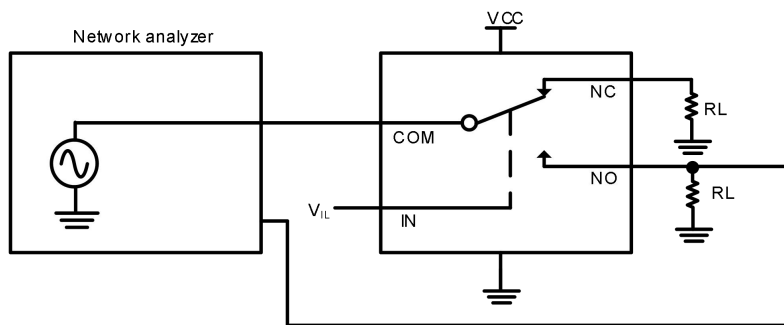
Bandwidth



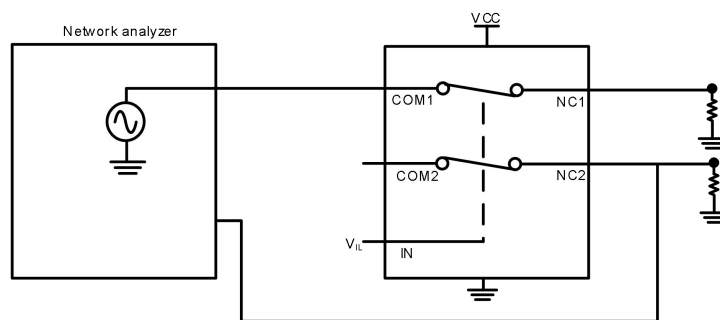
Eye Diagram (480Mbps)



Bandwidth



Off isolation

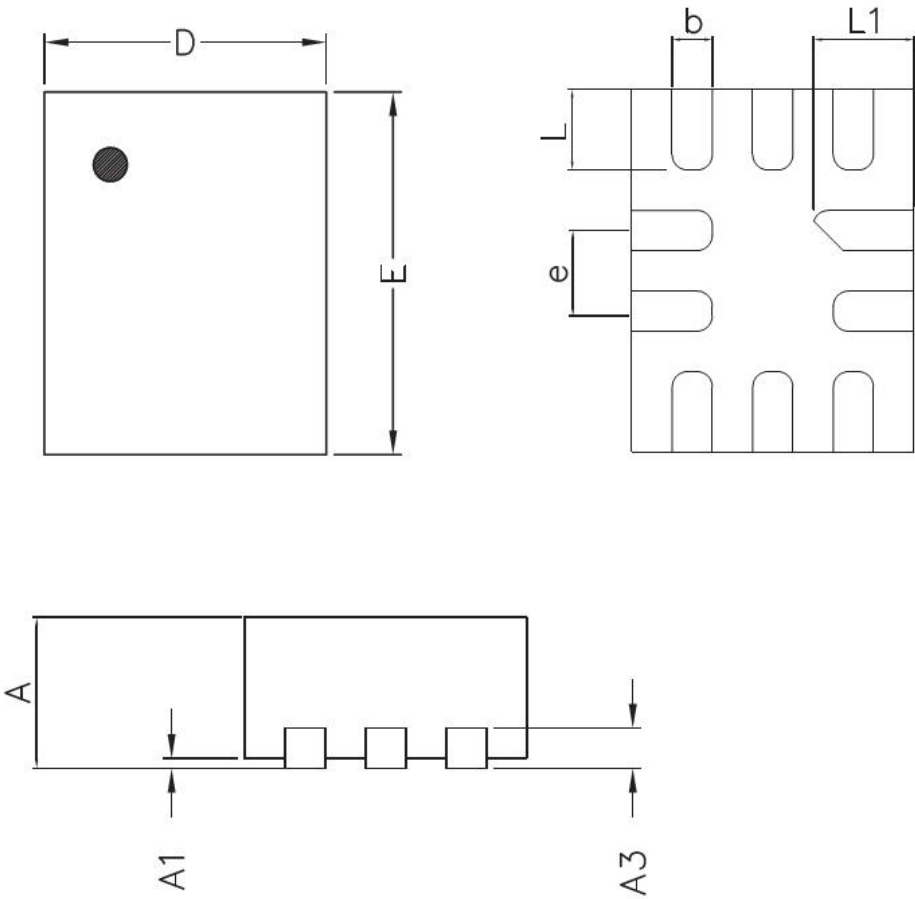


Crosstalk



Package Outline Dimensions

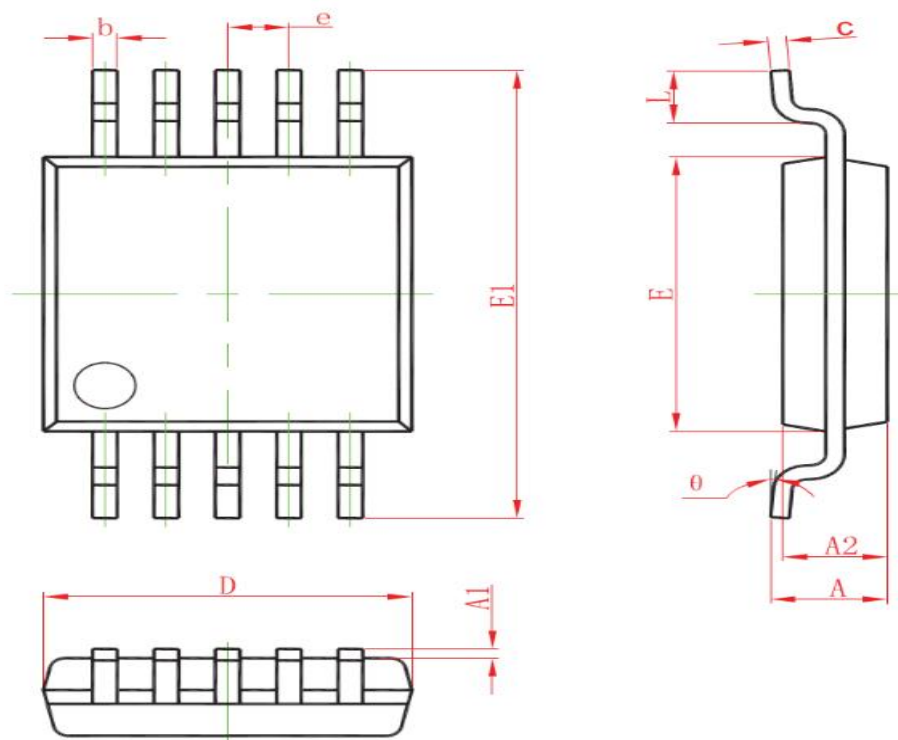
QFN1418



Symbol	Dimension in Millimeters	
	Min.	Max.
A	0.450	0.550
A1	0.000	0.050
A3	0.152 Ref.	
D	1.350	1.450
E	1.750	1.850
b	0.150	0.250
e	0.400 Typ.	
L	0.350	0.450
L1	0.450	0.550



MSOP-10



Symbol	Dimension in Millimeters	
	Min.	Max.
A	0.820	1.100
A1	0.020	0.150
A2	0.750	0.950
b	0.180	0.280
c	0.090	0.230
D	2.900	3.100
e	0.50(BSC)	
E	2.900	3.100
E1	4.750	5.050
L	0.400	0.800
θ	0°	6°



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