High-Speed Switch and Redriver Guide

Best-in-Class Performance, Reliability and Robustness

TEXAS INSTRUMENTS

Overview

In today's high performance systems, designers are constantly pushing for faster data throughput and greater design flexibility. This push often leads to signal integrity issues in transmission. Texas Instruments' broad portfolio of switches and redrivers for high-speed signaling help solve these issues by delivering high signal integrity, low output jitter, and the lowest power consumption. These products support many standards. This guide helps navigate through the extensive TI portfolio to find the best product for your designs.

Key Applications

- Smartphones and Tablets
- Docking Stations
- Printers
- Cameras
- Personal Computers
- Single-Board Computers
- Televisions
- Servers
- Automotive Infotainment

High-Speed Switch Comparison

TI switches provide a critical and unique combination of low signal attenuation and power consumption in a wide variety of packages for all applications. This winning combination delivers high signal quality routing that saves costs by reducing board space and design complexity.

Standard	PCIe/USB3.0	USB2.0/USB3.0	Thunderbolt™	DisplayPort	DisplayPort/HDMI
Part #	HD3SS3415/HD3SS3412	HD3SS6126	HD3SS0001	HD3SS213	HD3SS215
Standards	USB3.0/PCIe	USB3.0/USB2.0/PCIe	DP1.2a/Thunderbolt	DP1.2a/eDP1.4	PCIe2/DP1.2a/eDP1.4/HDMI2.0
Package	WQFN	WQFN	VQFN	BGA	BGA/QFN
# of Pins/Balls	42	42	24	50	50/56
Package Size	3.5mm x 9mm	3.5mm x 9mm	3mm x 3mm	5mm x 5mm	5mm x 5mm, 8mm x 8mm
Pitch	0.5mm	0.5mm	0.4mm	0.5mm	0.5mm
-3dB bandwidth	8GHz	10GHz	10GHz	5.4GHz	5.4 GHz
Dynamic Char Freq*	4GHz	2.5GHz	5GHz	2.7GHz	3GHz
Cross Talk (dB)	-35	-35	-35	-42	-42
Isolation (dB)	-19	-23	-24	-22	-22
Insertion Loss (dB)	-1.5	-1.1	-1.5	-1.5	-1.7
Return Loss (dB)	-11	-11	-20	-13	-11
Power (Active)	15.5mW	8mW	3.3mW	< 2mW typ	<9mW typ
Power (Low)	33uW	–	80uW	< 30uW typ	< 30uW typ
VCC	3.3V	3.3V	3.3V	3.3V	3.3V
ESD (HBM)	4kV	2kV	1.5kV	2kV	2kV
Temp Range (˚C)	-40 – 85	0 – 70	-40 – 85	-40 – 105	-40 – 105
Configuration	4ch 2:1/1:2	2:1/1:2	Thunderbolt Source/DP/DP++	Full DP config 2:1/1:2	Full DP/HDMI config 2:1/1:2

* Cross Talk, Isolation, Insertion Loss, and Return Loss tested at characteristic frequency

Redriver Comparison

TI redrivers deliver reliable communication by compensating for signal path losses. Compensation comes from equalizing the inputs to recover ISI losses and boosting the amplitude to overcome transmission path losses. TI's methods help systems pass standard compliance from the start.

Feature	USB3.0 (5Gbps)				PCIE GEN2 (5Gbps)	
	TUSB551RWB	SN65LVPE502ARLL/RGE	SN65LVPE512RMQ	TUSB501DRF	SN65LVPE504RUA	SN65LVPE501RGE
Package	12 Pin X2QFN	24 Pin VQFN	24 Pin WQFN	8 Pin WSON	42 Pin WQFN	24 Pin VQFN
Package Size	1.6mm x 1.6mm	3mm x 3mm, 4mm x 4mm	3mm x 3mm	2mm x 2mm	9mm x 3.5mm	4mm x 4mm
Package Pitch	0.4mm	0.4mm, 0.5mm	0.4mm	0.5mm	0.5mm	0.5mm
Channels	1	2	2	1	4	2
Active Power (Typical)	< 130mW	330mW	330mW	126mW	574mW	330mW
U2/U3(USB3)/ Auto LP (PCIE)	< 22mW	70mW	70mW	20mW	89mW	70mW
Low Power	< 8mW (NC)	3.6uW (Sleep)	3.6uW (Sleep)	3mW (NC)	<1mW (Shutdown)	5mW (NC)
EQ Settings (dB)	3, 6, 9	0, 7, 15	0, 7, 15	3, 6, 9	0, 7, 15	0, 7, 15
ESD Protection	2kV HBM	5kV HBM	5kV HBM	5kV HBM	6 kV HBM	3kV HBM
Power Supply	1.8 VDC	3.3 VDC	3.3 VDC	3.3 VDC	3.3 VDC	3.3 VDC
Output Swing = NC	1100 mVpp	1042 mVpp	1241 mVpp	No Default	929 mVpp	1000 mVpp
DE Settings OS = NC	0, -3.5, -6	0, -3.5, -6	0, -3, -5	No Default	-3.4, -6.2, -10.3	-3.7, -6.4, -9.4

Feature	DisplayPort1.2a (5.4Gbps)	SATA/SAS (6Gbps)		
	SN75DP130SS/DS(RGZ)	SN75LVCP600DRF	SN75LVCP600SDSK	SN75LVCP601RTJ
Package	48 Pin VQFN	8 Pin WSON	10 Pin SON	20 Pin QFN
Package Size	7mm x 7mm	2mm x 2mm	2.5mm x 2.5mm	4mm x 4mm
Package Pitch	0.5mm	0.5mm	0.5mm	0.5mm
# Lanes	4	1	1	2
Active Power (Typical)	SS(468mW), DS(174 mW)	< 100mW	106mW	215mW
Low Power	SS(14.4mW), DS(7.2mW)	<11mW	<11mW (Partial/Slumber state)	<50Mw
EQ Settings (dB)	0, 3.5, 6, 8, 10, 13, 15, 18	7, 14	7, 14	0, 7, 14
ESD Protection	2kV HBM	6 kV HBM	9kV HBM	10kv HBM
Power Supply	SS(3.3V), DS(3.3V&1.1V)	3.3 VDC	3.3 VDC	3.3 VDC
Output Swing	DP Standard	650 mVpp	850 mVpp (DE=1), 600 mVpp (DE=0)	630 mVpp
DE/PRE Settings	DP Standard	0, -1.2	0, -1.3	-4, 0, -2

NC = No Connect

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