QUICKSWITCH® PRODUCTS HIGH-SPEED CMOS SYNCHRO-SWITCH™ DUAL 4:1 MUX/DEMUX WITH ACTIVE TERMINATORS

IDTQS3ST253

FEATURES:

- Enhanced N channel FET with no inherent diode to Vcc
- Bidirectional signal flow
- Flow-through pinout
- Zero propagation delay, zero ground bounce
- 2 banks of 4:1 Mux/Demux
- Port select synchronous to the clock
- Undershoot clamp diodes on all switch and control pins
- Clock enable and Asynchronous enable
- "Bus-hold" terminators on the Demux side
- Asynchronous SEL option
- Break-before-make feature
- Available in 20-pin QSOP Packages
- Bus-hold eliminates floating bus lines and reduces static power consumption

APPLICATIONS

- Video, audio, graphics switching, muxing

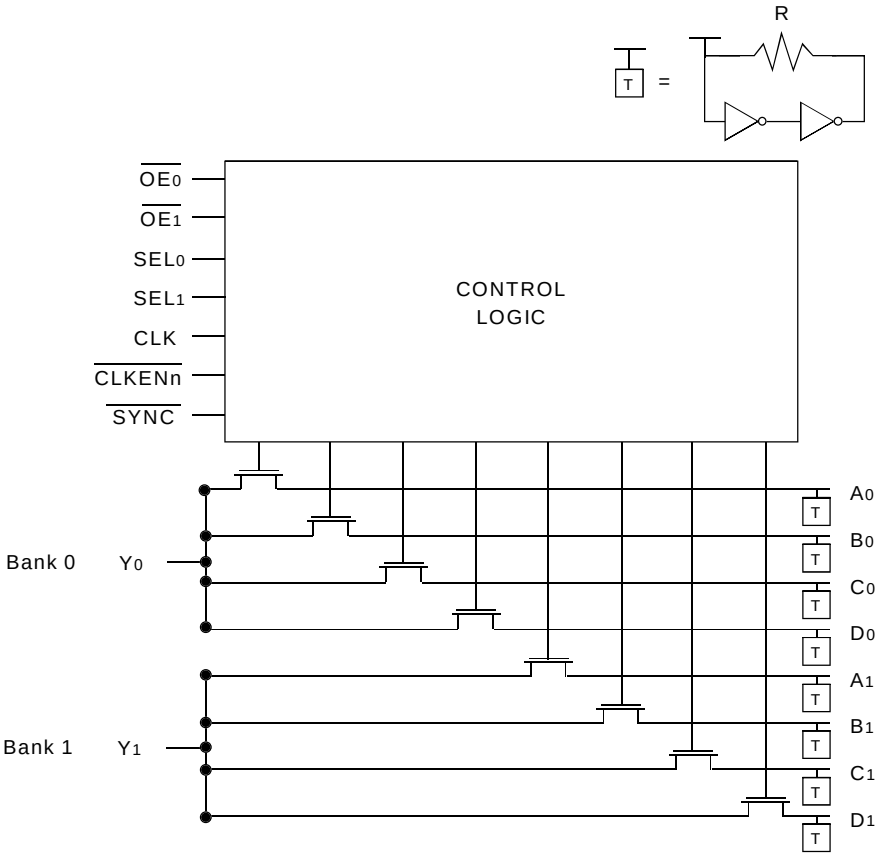
DESCRIPTION:

The QS3ST253 is a high-speed CMOS dual 4:1 multiplexer/demultiplexer with active terminators (bus-hold circuits) on the demux side. Port selection and connection, controlled by SEL signals, can be either asynchronous or synchronous. In the synchronous mode, the A, B, C, or D port to Y port connection is updated on the rising edge of the input clock CLK. Once the port-to-port connection is made, data flow can be bi-directional with a typical 250ps propagation delay through the switch. Clock Enable, overriding Asynchronous Enable, and Asynchronous Select controls provide additional design flexibility.

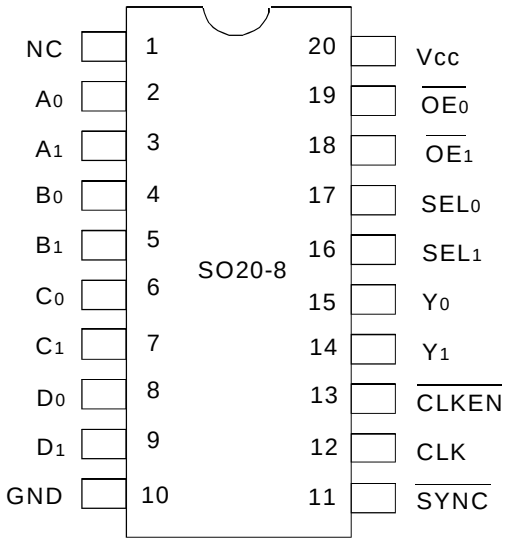
The bus-hold circuits latch the last data driven on the demux side, providing infinite hold time and glitch-free signal transitions. Synchronous controls and bus-hold ease timing constraints in many high speed data mux/demux applications, such as bank interleaving.

The QS3ST253 is characterized for operation at -40°C to +85°C.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



QSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS (1)

Symbol	Description	Max.	Unit
V_{TERM}(2)	Supply Voltage to Ground	– 0.5 to +7	V
V_{TERM}(3)	DC Switch Voltage V_S	– 0.5 to +7	V
V_{TERM}(3)	DC Input Voltage V_{IN}	– 0.5 to +7	V
V_{AC}	AC Input Voltage (pulse width ≤20ns)	-3	V
I_{OUT}	DC Output Current	120	mA
P_{MAX}	Maximum Power Dissipation (T_A = 85°C)	.82	W
T_{STG}	Storage Temperature	– 65 to +150	°C

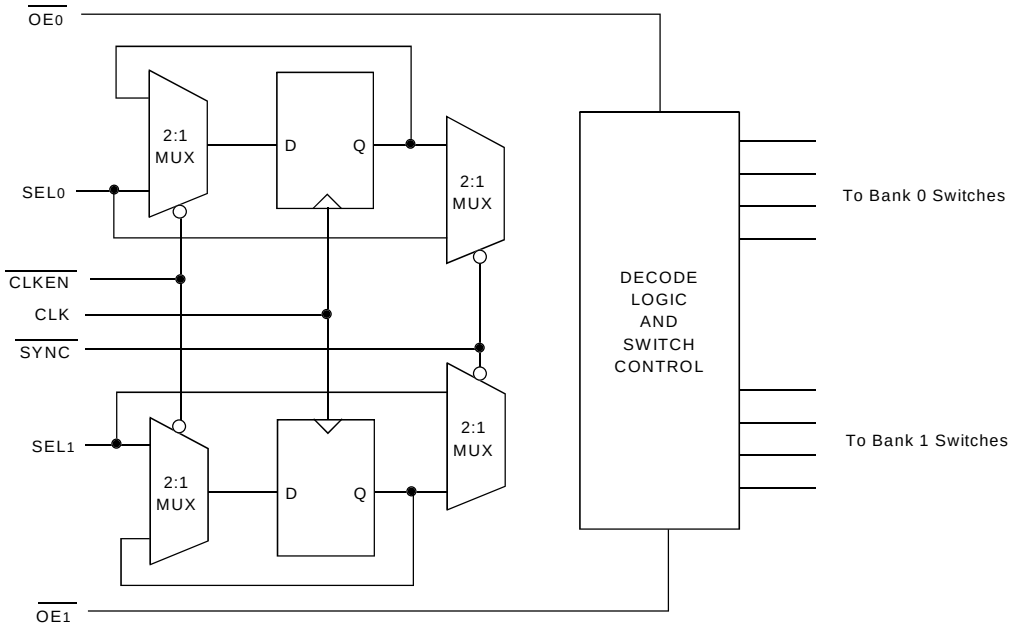
NOTES:

FUNCTION TABLE(1)

Control Inputs							Port Status	
$\overline{SYNC}$	$\overline{OE_0}$	$\overline{OE_1}$	CLK	$\overline{CLKEN}$	SEL_0	SEL_1	Y_0	Y_1
L	L	L	↑	L	L	L	A_0	A_1
L	L	L	↑	L	H	L	B_0	B_1
L	L	L	↑	L	L	H	C_0	C_1
L	L	L	↑	L	H	H	D_0	D_1
L	H	H	↑	L	X	X	Hold Previous Data (2) (Switch OFF)	Hold Previous Data (2) (Switch OFF)
L	L	L	↑	H	X	X	Hold Previous Mux connection (3) (Switch ON)	Hold Previous Mux connection (3) (Switch ON)
L	H	H	↑	H	X	X	Hold Previous Data (4) (Switch OFF)	Hold Previous Data (4) (Switch OFF)
H	L	L	X	X	L	L	A_0	A_1
H	L	L	X	X	H	L	B_0	B_1
H	L	L	X	X	L	H	C_0	C_1
H	L	L	X	X	H	H	D_0	D_1
H	H	H	X	X	X	X	Hold Previous Data (2) (Switch OFF)	Hold Previous Data (2) (Switch OFF)

NOTES:
1. H = HIGH Voltage Level
   L = LOW Voltage Level
   X = Don't Care
   ↑ = Low-to-High Transition
2. Mux switches are turned off and the terminators (last value latches) hold the previous data state. The port connections can be changed by the SEL input.
3. The contents of the "Mux select register" are unchanged and the previous Mux connection is unchanged. The output (Mux port) data state will depend on the present data state of the input (Demux port).
4. The contents of the "Mux select register" are unchanged and the last value latch holds the previous data state.

CONTROL LOGIC

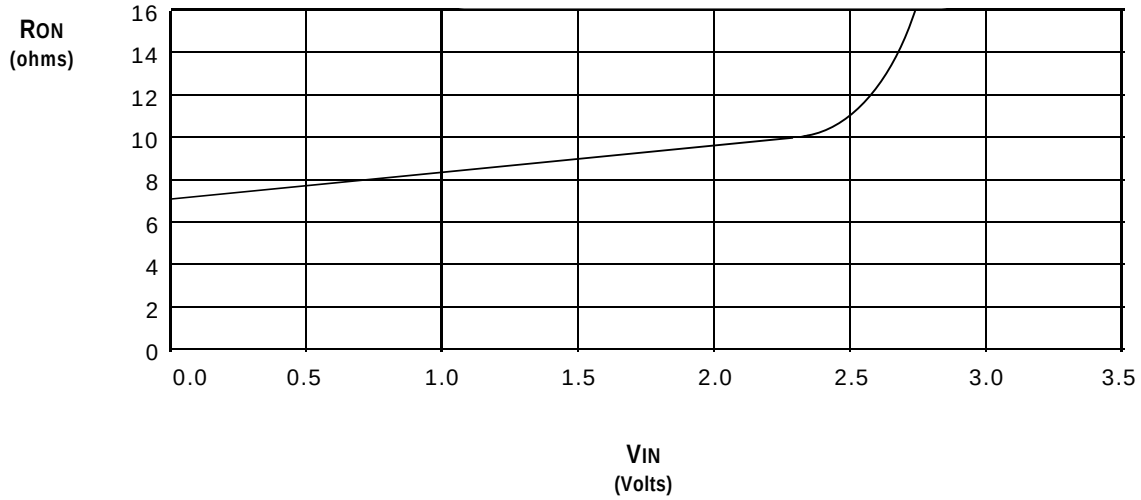


DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Industrial: T_A = -40°C to +85°C, V_{CC} = 5.0V ± 10%

Symbol	Parameter	Test Conditions	Min.	Typ.[1]	Max.	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for Control Pins	2	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Pins	—	—	0.8	V
I						

TYPICAL ON RESISTANCE vs V_{IN} AT V_{CC} = 5V



POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]	Max.	Unit
I_{CCQ}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or Vcc, f = 0	3	µA
ΔI_{CC}	Power Supply Current per Control Input HIGH [2]	V_{CC} = Max., V_{IN} = 3.4V, f = 0	1.5	mA
I_{CCD}	Dynamic Power Supply Current per MHz[3]	V_{CC} = Max., A/B/C/D and Y pins open Control Input Toggling at 50% Duty Cycle	0.25	mA/MHz

NOTES:
1. For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
2. Per TLL driven input (V_{IN} = 3.4V, control inputs only). A/B/C/D and Y pins do not contribute to ΔI_{CC}.
3. This current applies to the control inputs only and represents the current required to switch internal capacitance at the specified frequency. The A/B/C/D and Y inputs generate no significant AC or DC currents as they transition. This parameter is guaranteed but not production tested.

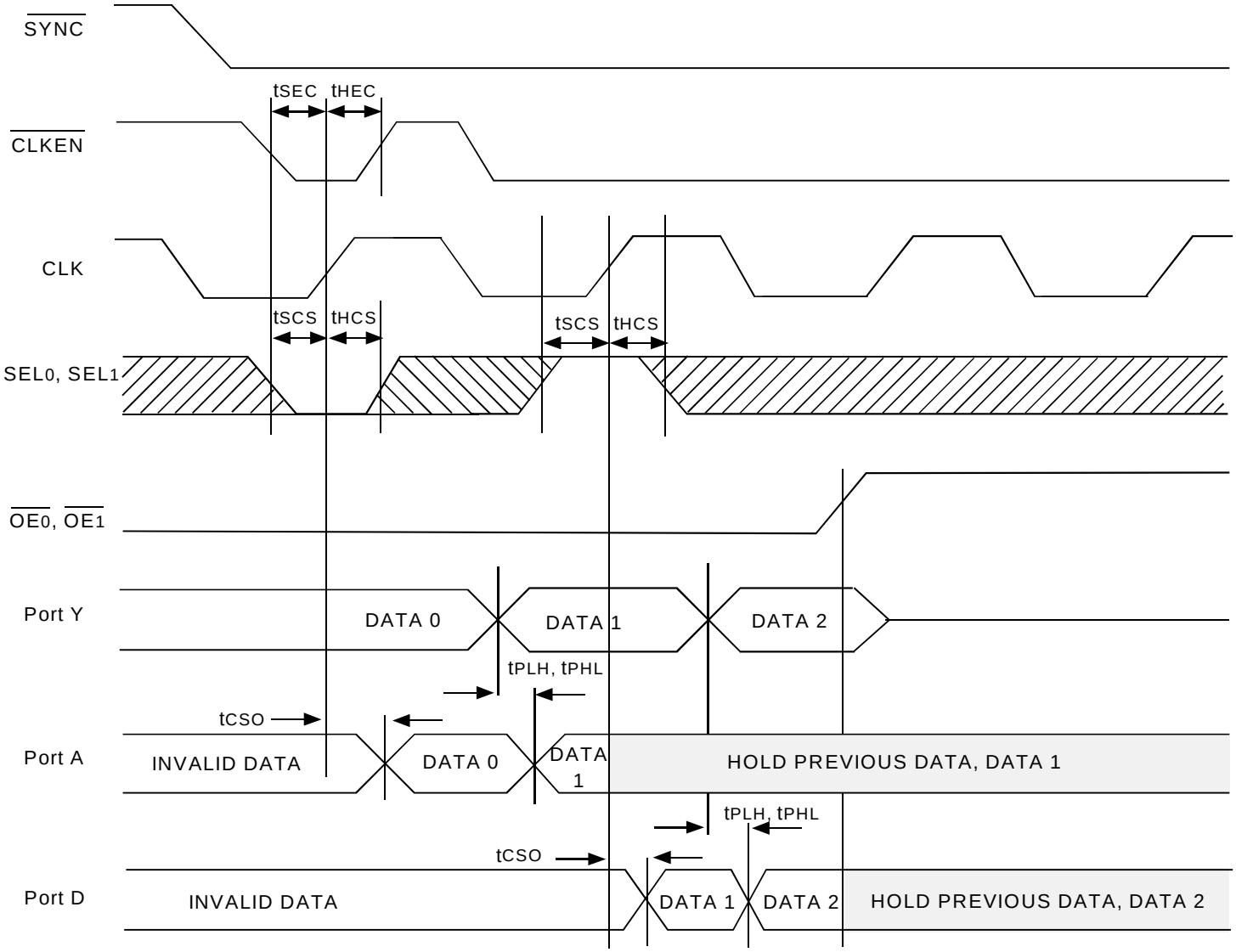
SWITCHING CHARACTERISTICS OVER OPERATING RANGE

T_A = -40°C to +85°C, V_{CC} = 5.0V ± 10%
C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Parameter	Min.	Typ.	Max.	Unit
t_{PLH} t_{PHL}	Data Propagation Delays [1,2] A/B/C/D to Y, Y to A/B/C/D	—	0.25	—	ns
t_{SEC}	Clock Enable to Clock Setup Time	3	—	—	ns
t_{HEC}	Clock Enable to Clock Hold Time	0	—	—	ns
t_{CSO}	Clock to Switch Turn-On Delay [3]	0.5	—	7	ns
t_{ASO}	Asynchronous Select to Switch Turn-On Delay [3]	0.5	—	7	ns
t_W	Clock Pulse Width HIGH	3	—	—	ns
t_{SCS}	SEL to Clock Setup Time	3	—	—	ns
t_{HCS}	SEL to Clock Hold Time	0	—	—	ns
t_{PZL} t_{PZH}	Asynchronous Enable to Switch Turn-On Delay [3]	1.5	—	5.2	ns
t_{PLZ} t_{PHZ}	Asynchronous Enable to Switch Turn-Off Delay [1,3]	1.5	—	4.8	ns

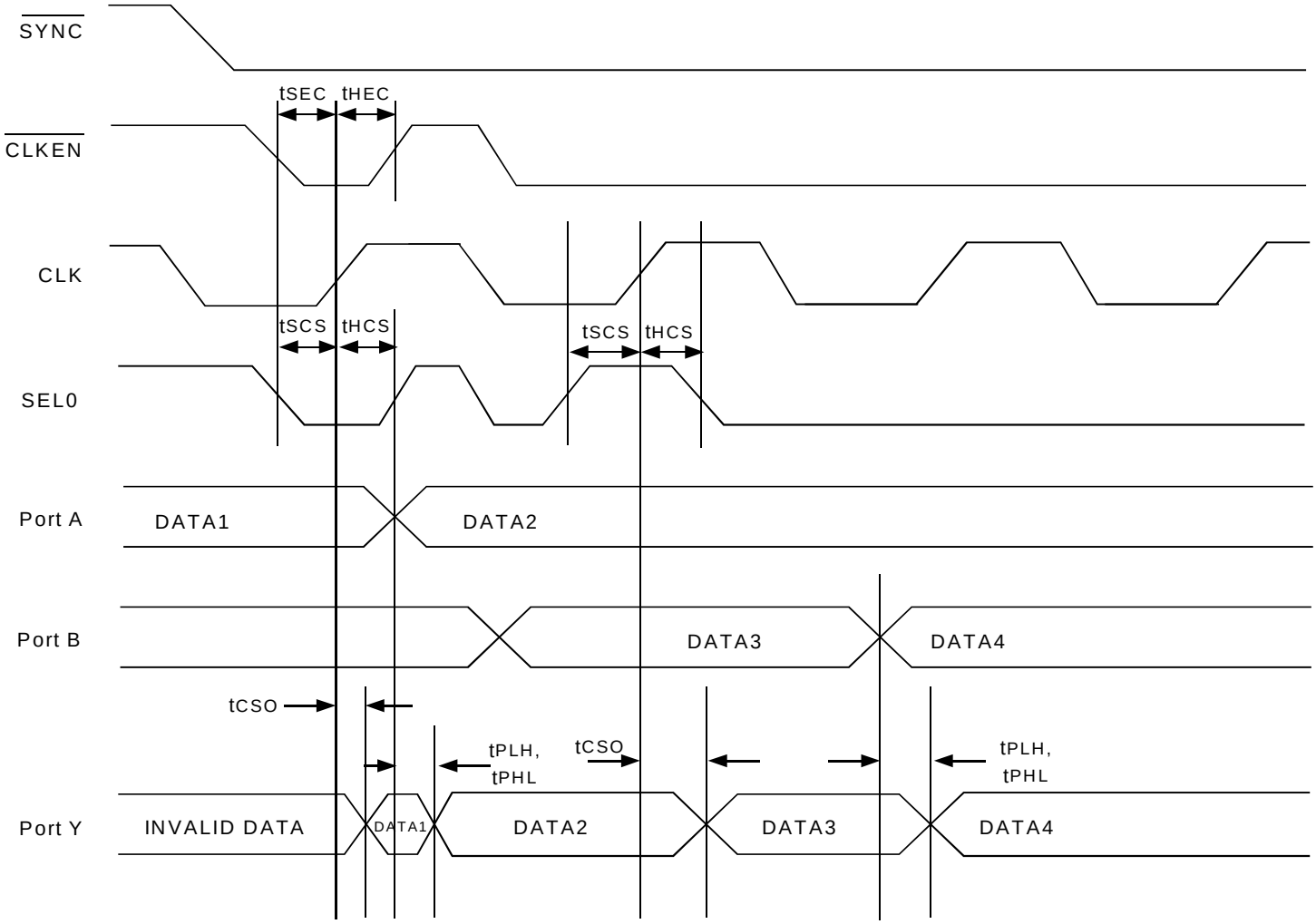
NOTES:
1. This parameter is guaranteed but not production tested.
2. The bus switch contributes no propagation delay other than the RC delay of the ON resistance of the switch and the load capacitance. The time constant for the switch alone is of the order of 0.25ns for 50pF. Since this time constant is much smaller than the rise and fall times of typical driving signals, it adds very little propagation delay to the system. Propagation delay of the bus switch, when used in a system, is determined by the driving circuit on the driving side of the switch and its interaction with the load on the driven side.
3. Minimums guaranteed but not production tested.

TIMING WAVEFORMS - SYNCHRONOUS MODE, DEMUX FUNCTION



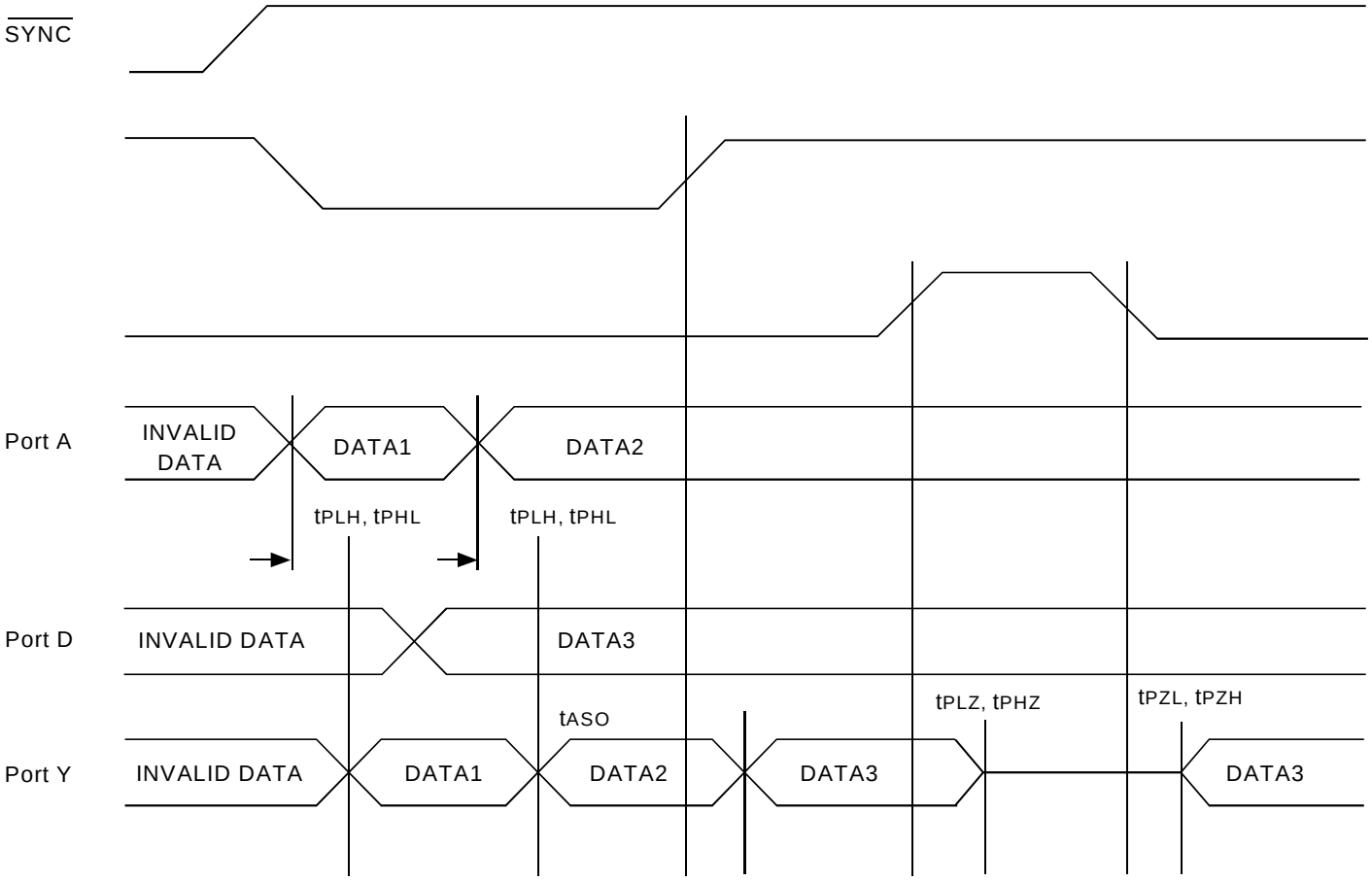
EXAMPLE: PORT A TO PORT D/PORT Y

TIMING WAVEFORMS - SYNCHRONOUS MODE, MUX FUNCTION



EXAMPLE: PORT A/PORT D TO PORT Y

TIMING WAVEFORMS - ASYNCHRONOUS MODE, MUX FUNCTION



I_{BH} +500

Sinking
Current
(+)

I_{BHL} → +60 +60 I_{BHL}

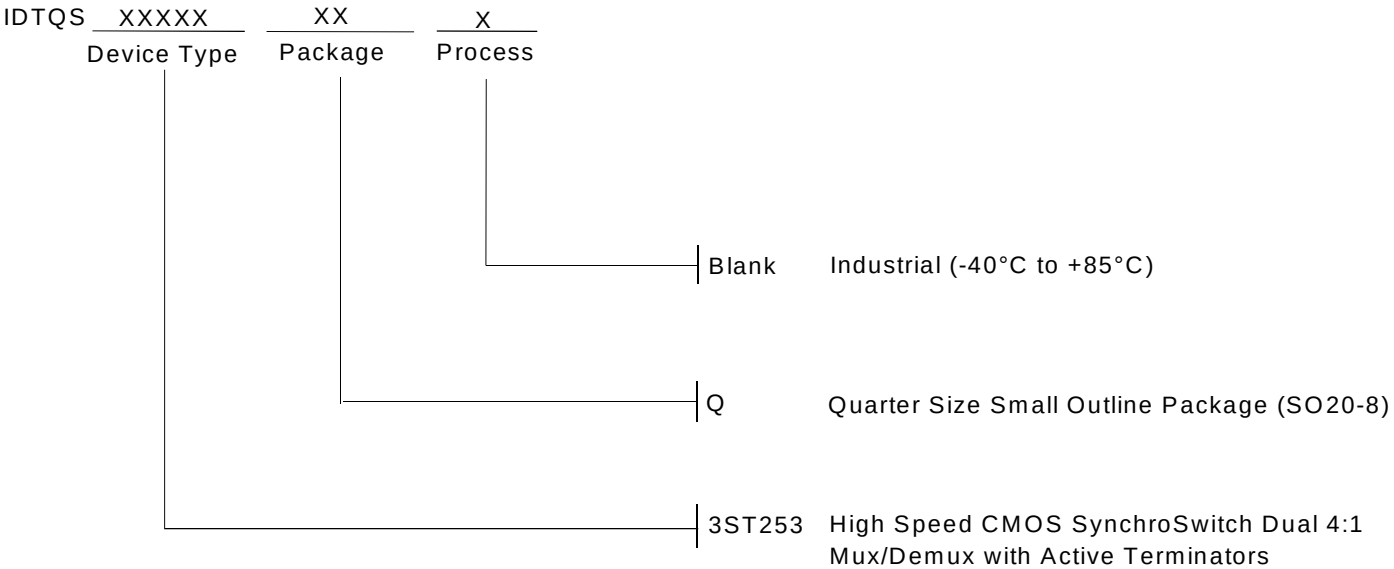
I_{BH} → +20
→ – 20

I_{BHH} → – 60 – 60 I

V_{IH}

0.8V 2V

ORDERING INFORMATION



CORPORATE HEADQUARTERS
2975 Stender Way
Santa Clara, CA 95054

for SALES:
800-345-7015 or 408-727-6116
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