



20-BIT BUS SWITCH

IDT74FST32XL2384

FEATURES:

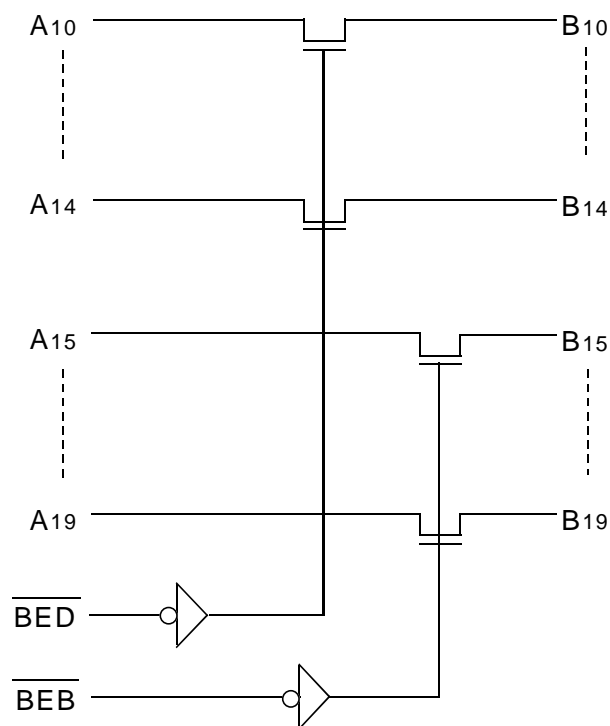
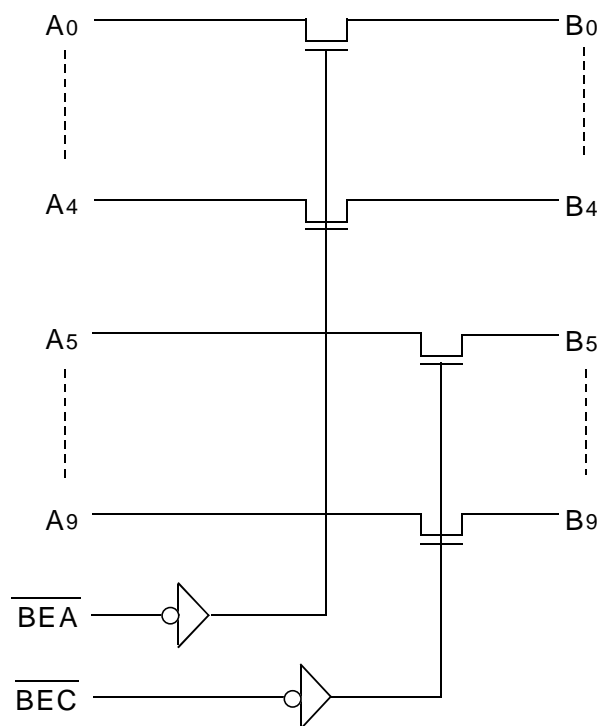
- Bus switches provide zero delay paths
- Extended commercial range of -40°C to $+85^{\circ}\text{C}$
- Low switch on-resistance: FST32XL2384 – 28Ω
- TTL-compatible input and output levels
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- Available in SSOP, TSSOP, and TVSOP Packages

DESCRIPTION:

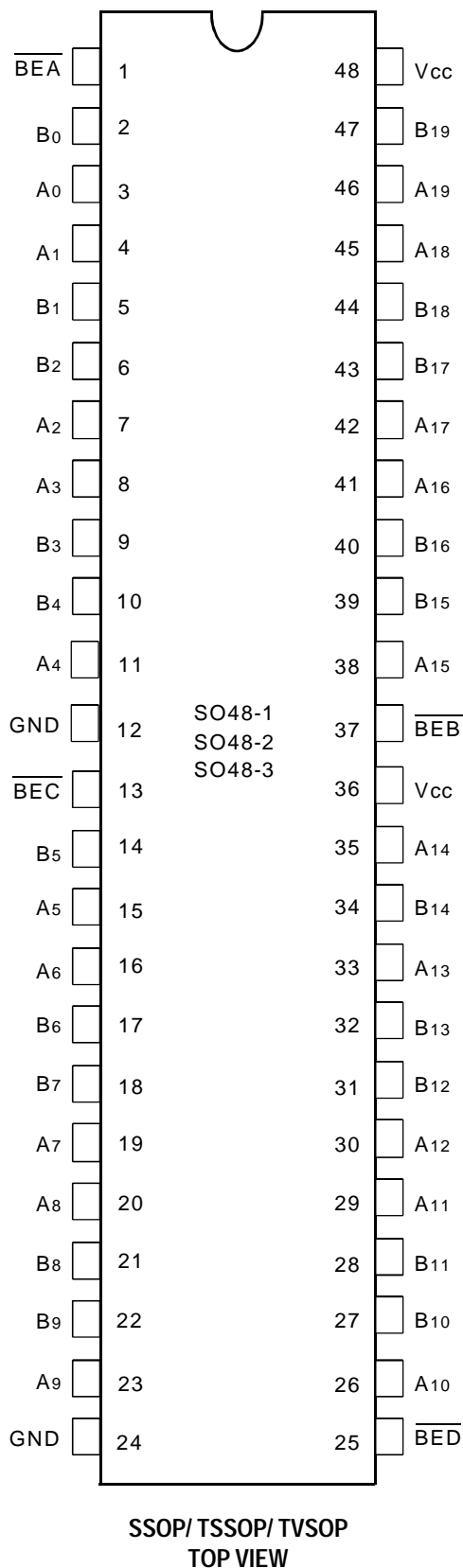
The FST32XL2384 belongs to IDT's family of Bus switches. Bus switch devices perform the function of connecting or isolating two ports without providing any inherent current sink or source capability. Thus they generate little or no noise of their own while providing a low resistance path for an external driver. These devices connect input and output ports through an n-channel FET. When the gate-to-source junction of this FET is adequately forward-biased the device conducts and the resistance between input and output ports is small. Without adequate bias on the gate-to-source junction of the FET, the FET is turned off, therefore with no V_{CC} applied, the device has hot insertion capability.

The low on-resistance and simplicity of the connection between input and output ports reduces the delay in this path to close to zero.

The FST32XL2384 is a 20-bit TTL-compatible bus switch. The BEX pins provide enable control.

FUNCTIONAL BLOCK DIAGRAM

PIN CONFIGURATION



ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating	Max.	Unit
VTERM(2)	Terminal Voltage with Respect to GND	-0.5 to +7	V
TSTG	Storage Temperature	-65 to +150	°C
IOUT	Maximum Continuous Channel Current	128	mA

FST LINK

NOTES:

- Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
- Vcc, Control, and Switch terminals.

CAPACITANCE (1)

Symbol	Parameter	Conditions(2)	Typ.	Unit
CIN	Control Input Capacitance		4	pF
CIO	Switch Input/Output Capacitance	Switch Off	8	pF

NOTES:

- Capacitance is characterized but not tested.
- TA = 25°C, f = 1MHz, VIN = 0V, VOUT = 0V

PIN DESCRIPTION

Pin Names	I/O	Description
A19-A0	I/O	Bus A
B19-B0	I/O	Bus B
BEA	I	Enable, 0-4
BEB	I	Enable, 15-19
BEC	I	Enable, 5-9
BED	I	Enable, 10-14

FUNCTION TABLE(1)

BEA	BEB	B0-B4	B15-B19	Description
H	H	Hi-Z	Hi-Z	Disconnect
L	H	A0-A4	Hi-Z	Connect
H	L	Hi-Z	A15-A19	Connect
L	L	A0-A4	A15-A19	Connect
BEC	BED	B5-B9	B10-B14	Description
H	H	Hi-Z	Hi-Z	Disconnect
L	H	A5-A9	Hi-Z	Connect
H	L	Hi-Z	A10-A14	Connect
L	L	A5-A9	A10-A14	Connect

NOTE:

- H = HIGH
L = LOW
Z = High-Impedance

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Conditions: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Unit
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs	2	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW for Control Inputs	—	—	0.8	V
I_{IH}	Input HIGH Current	$V_{CC} = \text{Max.}$ $V_I = V_{CC}$	—	—	± 1	μA
I_{IL}	Input LOW Current		$V_I = \text{GND}$	—	—	
I_{OZH}	High Impedance Output Current (3-State Output pins)	$V_{CC} = \text{Max.}$ $V_O = V_{CC}$	—	—	± 1	μA
I_{OZL}			$V_O = \text{GND}$	—	—	
I_{OS}	Short Circuit Current	$V_{CC} = \text{Max.}, V_O = \text{GND}^{(3)}$	—	300	—	mA
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$	—	-0.7	-1.2	V
R_{ON}	Switch On Resistance ⁽⁴⁾	$V_{CC} = \text{Min.}, V_{IN} = 0.0\text{V}$ $I_{ON} = 30\text{mA}$	20	28	40	Ω
		$V_{CC} = \text{Min.}, V_{IN} = 2.4\text{V}$ $I_{ON} = 15\text{mA}$	20	35	48	Ω
I_{OFF}	Input/Output Power Off Leakage	$V_{CC} = 0\text{V}, V_{IN}$ or $V_O \leq 4.5\text{V}$	—	—	1	μA
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}, V_{IN} = \text{GND}$ or V_{CC}	—	0.1	3	μA

NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0\text{V}$, $+25^\circ\text{C}$ ambient.
- Not more than one output should be tested at one time. Duration of the test should not exceed one second.
- Measured by voltage drop between ports at indicated current through the switch.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Unit	
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4\text{V}^{(3)}$	—	0.5	1.5	mA	
I_{CCD}	Dynamic Power Supply Current ⁽⁴⁾	$V_{CC} = \text{Max.}$ Outputs Open Enable Pin Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	30	40	$\mu\text{A}/$ MHz/ Switch
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.}$ Outputs Open Enable Pins Toggling (20 Switches Toggling) $f_i = 10\text{MHz}$ 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	6	8	mA
			$V_{IN} = 3.4$ $V_{IN} = \text{GND}$	—	7	11	

NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0\text{V}$, $+25^\circ\text{C}$ ambient.
- Per TTL driven input ($V_{IN} = 3.4\text{V}$). All other inputs at V_{CC} or GND .
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
- $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

$$I_C = I_{CC} + \Delta I_{CC} \cdot D_H \cdot N_T + I_{CCD} \cdot (f_i \cdot N)$$

I_{CC} = Quiescent Current

ΔI_{CC} = Power Supply Current for a TTL High Input ($V_{IN} = 3.4\text{V}$)

D_H = Duty Cycle for TTL Inputs High

N_T = Number of TTL Inputs at D_H

I_{CCD} = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)

f_i = Input Frequency

N = Number of Switches Toggling at f_i

All currents are in milliamps and all frequencies are in megahertz.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Conditions: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 5.0\text{V} \pm 10\%$

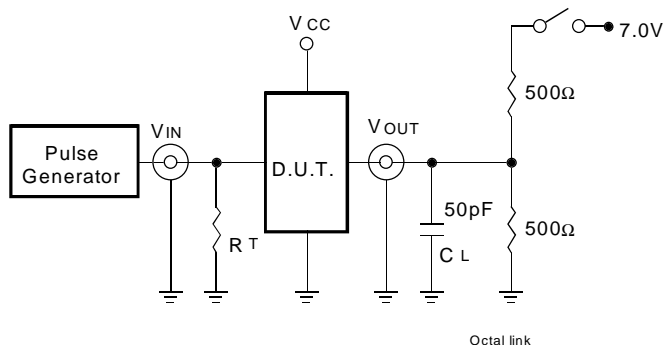
Symbol	Description	Condition ⁽¹⁾	Min. ⁽²⁾	Typ.	Max.	Unit
t _{PLH} t _{PHL}	Data Propagation Delay Ai to Bi, Bi to Aj ^(3,4)	C _L = 50pF R _L = 500Ω	—	—	1.25	ns
t _{PZH} t _{PZL}	Switch Turn on Delay BEx to Ai, Bi		1.5	—	7.5	ns
t _{PHZ} t _{PLZ}	Switch Turn off Delay BEx to Ai, Bi ⁽³⁾		1.5	—	5.5	ns
Q _{ci}	Charge Injection ^(5,6)		—	1.5	—	pC

NOTES:

1. See test circuit and waveforms.
2. Minimum limits guaranteed but not tested.
3. This parameter is guaranteed by design but not tested.
4. 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 2.5ns for 50pF load. Since this time is constant and much smaller than the rise/fall times of typical driving signals, it adds very little propagation delay to the system. Propagation delay on 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.
5. Measured at switch turn off, load = 50pF in parallel with 10MΩ scope probe, $V_{IN} = 0.0$ volts.
6. Characterized parameter. Not 100% tested.

TEST CIRCUITS AND WAVEFORMS

TEST CIRCUITS FOR ALL OUTPUTS



SWITCH POSITION

Test	Switch
Open Drain	Closed
Disable Low	
Enable Low	
All Other Tests	Open

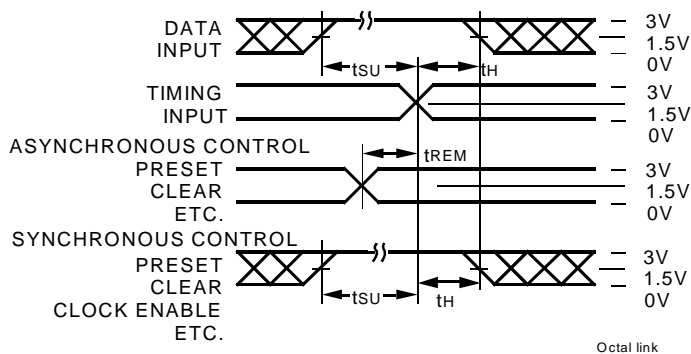
FCT LINK

DEFINITIONS:

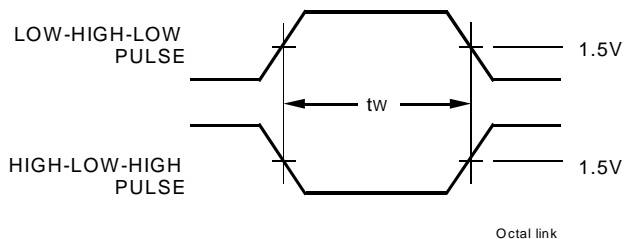
CL = Load capacitance: includes jig and probe capacitance.

RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.

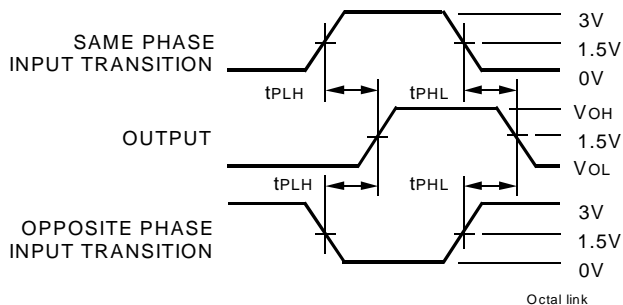
SET-UP, HOLD, AND RELEASE TIMES



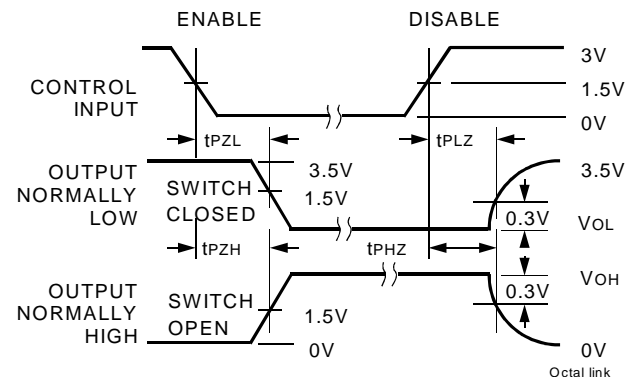
PULSE WIDTH



PROPAGATION DELAY



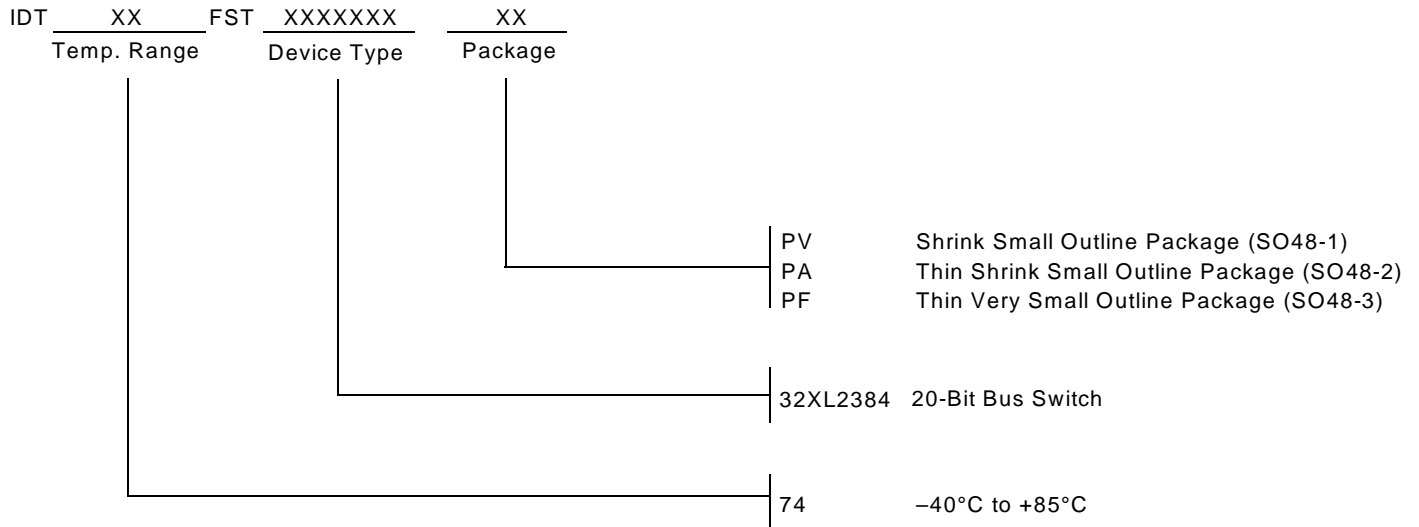
ENABLE AND DISABLE TIMES



NOTES:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH
2. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns

ORDERING INFORMATION



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