Integrated Device Technology, Inc.

OCTAL BUS SWITCH

IDT74FST3244
IDT74FST32244

FEATURES:

- Bus switches provide zero delay paths
- Extended commercial range of –40°C to +85°C
- Low switch on-resistance
- TTL-compatible input and output levels
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- Available in QSOP, TSSOP, SOIC, SSOP, and PDIP
- Hot insertion capability
- Very low power dissipation

DESCRIPTION:

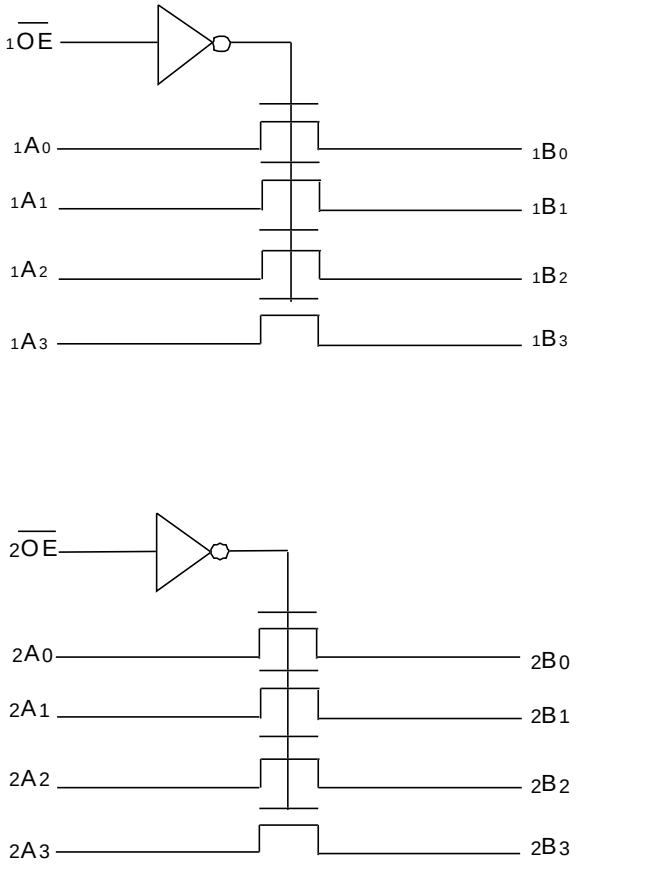
The FST3244/32244 belong to IDT's family of Bus switches. Bus switch devices perform the function of connecting or isolating two ports without providing any inherent current sink or source capability. Thus they generate little or no noise of their own while providing a low resistance path for an external 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 not 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 FST32244 integrates terminating resistors in the device, thus eliminating the need for external 25Ω series resistors.

The FST3244 and FST32244 are octal TTL-compatible bus switches. The $\overline{OE}$ pins provide output enable control for all 8 bits. These devices are pin-compatible with and functionally similar to the FCT244T.

FUNCTIONAL BLOCK DIAGRAM



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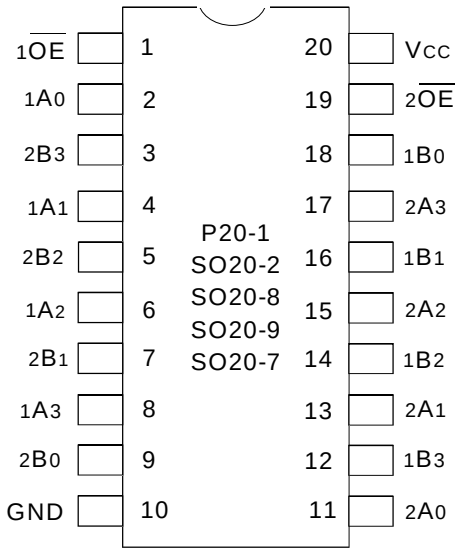
PIN CONFIGURATION



DIP/SOIC/SSOP
QSOP/TSSOP
TOP VIEW

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PIN DESCRIPTION

Pin Names	Description
x$\overline{OE}$	Output Enable Inputs (Active LOW)
xAx	A Port Bits
xBx	B Port Bits

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FUNCTION TABLE[1]

$_1\overline{OE}$	$_2\overline{OE}$	Description
H	H	DISCONNECT
L	H	CONNECT $_1$A to $_1$B
H	L	CONNECT $_2$A to $_2$B
L	L	CONNECT $_1$A to $_1$B and $_2$A to $_2$B

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NOTE:
1. H = HIGH Voltage Level
   L = LOW Voltage Level
   X = Don't Care

CAPACITANCE[1]

Symbol	Parameter	Conditions[2]	Typ.	Unit
C_{IN}	Control Input Capacitance		8	pF
$C_{I/O}$	Switch Input/Output Capacitance	Switch Off	13	pF

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NOTES:
1. Capacitance is characterized but not tested.
2. T_A = 25°C, f = 1MHz, V_{IN} = 0V, V_{OUT} = 0V

ABSOLUTE MAXIMUM RATINGS[1]

Symbol	Description	Max.	Unit
V_{TERM}[2]	Terminal Voltage with Respect to GND	–0.5 to +7.0	V
T_{STG}	Storage Temperature	–65 to +150	°C
I_{OUT}	Maximum Continuous Channel Current	128	mA

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NOTES:
1. 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.
2. V_{CC}, Control and Switch terminals.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Condition Apply Unless Otherwise Specified:
Operating Conditions: T_A = –40°C to +85°C, V_{CC} = 5.0V ±5%

Symbol	Parameter	Test Conditions		Min.	Typ.[1]	Max.	Unit
V_{IH}	Control Input HIGH Voltage	Guaranteed Logic HIGH Level		2.0	—	—	V
V_{IL}	Control Input LOW Voltage	Guaranteed Logic LOW Level		—	—	0.8	V
I_{IH}	Control Input HIGH Current	V_{CC} = Max.	V_I = V_{CC}	—	—	±1	µA
I_{IL}	Control Input LOW Current		V_I = GND	—	—	±1	
I_{OZH}	Current During	V_{CC} = Max., V_O = 0 to 5V		—	—	±1	µA
I_{OZL}	Bus Switch DISCONNECT			—	—	±1	
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.7	–1.2	V
I_{OFF}	Switch Power Off Leakage	V_{CC} = 0V, V_{IN} or $V_O \leq$ 5.5V		—	—	±1	µA
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}		—	0.1	3	µA

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BUS SWITCH IMPEDANCE OVER OPERATING RANGE

Following Condition Apply Unless Otherwise Specified:
Operating Conditions: T_A = –40°C to +85°C, V_{CC} = 5.0V ±5%

Symbol	Parameter	Test Conditions		Min.	Typ.[1]	Max.	Unit
R_{ON}	Switch CONNECT Resistance A to B[2]	V_{CC} = Min., V_{IN} = 0.0V	3xxx	—	5	7	Ω
		I_{ON} = 30mA	32xxx	17	28	40	
		V_{CC} = Min., V_{IN} = 2.4V	3xxx	—	10	15	
		I_{ON} = 15mA	32xxx	20	35	48	
I_{OS}	Short Circuit Current, A to B[3]	A(B) = 0V, B(A) = V_{CC}		100	—	—	mA

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NOTES:
1. Typical values are at V_{CC} = 5.0V, +25°C ambient.
2. The voltage drop between the indicated ports divided by the current through the switch.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	V_{CC} = Max. V_{IN} = 3.4V[3]		—	0.5	1.5	mA
I_{CCD}	Dynamic Power Supply Current[4,5]	V_{CC} = Max. Outputs Open 1 Enable Pin Toggling 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND	—	120	160	µA/ MHz/ Enable
I_C	Total Power Supply Current[6]	V_{CC} = Max. Outputs Open 2 Enable Pins Toggling fi = 10MHz 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND	—	2.4	3.2	mA
			V_{IN} = 3.4 V_{IN} = GND	—	2.9	4.7	

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NOTES:
1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 3.3V, +25¡C ambient.
3. Per TTL driven input (V_{IN} = 3.4V). All other inputs at V_{CC} or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. $C_{PD} = I_{CCD}/V_{CC}$
   C_{PD} = Power Dissipation Capacitance
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_i N)$
   I_{CC} = Quiescent Current
   ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)
   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 = Control Input Frequency
   N = Number of Control Inputs Toggling at f_i

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Following Condition Apply Unless Otherwise Specified:
Operating Conditions: T_A = –40°C to +85°C, V_{CC} = 5.0V ±5%

Symbol	Description[1]	Min.	Typ.	32244 Max.	32244 Max.	Unit
t_{PLH} t_{PHL}	Data Propagation Delay A to B, B to A[2]	—	—	0.25	1.25	ns
t_{PZH} t_{PZL}	Switch CONNECT Delay x$\overline{OE}$ to A or B	1.5	—	6.5	5.6	ns
t_{PHZ} t_{PLZ}	Switch DISCONNECT Delay x$\overline{OE}$ to A or B	1.5	—	5.5	5.2	ns
$\|Q_{CI}\|$	Charge Injection During Switch DISCONNECT, x$\overline{OE}$ to A or B[3]	—	1.5	—	—	pC

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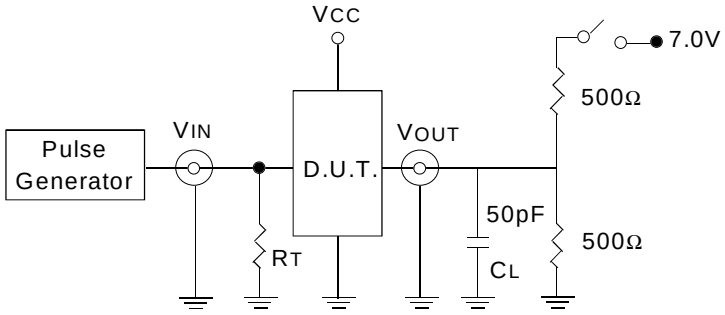
NOTES:
1. See test circuits and waveforms.
2. The bus switch contributes no Propagation Delay other than the RC Delay of the load interacting with the RC of the switch.
5. $|Q_{CI}|$ is the charge injection for a single switch DISCONNECT and applies to either single switches or multiplexers.
   $|Q_{DCI}|$ is the charge injection for a multiplexer as the multiplexed port switches from one path to another. Charge injection is reduced because the injection from the DISCONNECT of the first path is compensated by the CONNECT of the second path.

TEST CIRCUITS AND WAVEFORMS

TEST CIRCUITS FOR ALL OUTPUTS



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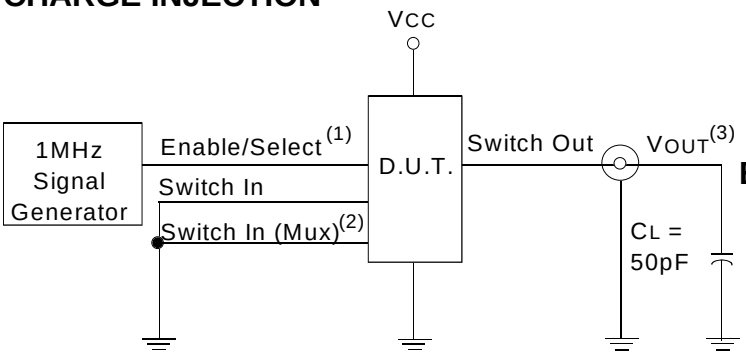
SWITCH POSITION

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

DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator

CHARGE INJECTION



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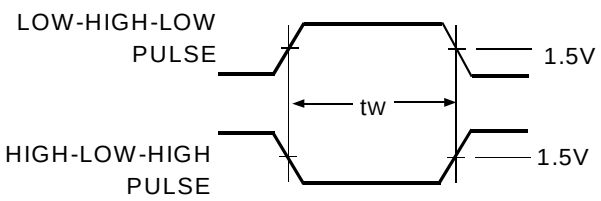
NOTES:

1. Select is used with multiplexers for measuring $|Q_{DCI}|$ during multiplexer select. During all other tests Enable is used.
2. Used with multiplexers to measure $|Q_{DCI}|$ only.
3. Charge Injection = $\Delta V_{OUT} C_L$, with Enable toggling for $|Q_{CI}|$ or Select toggling for $|Q_{DCI}|$. ΔV_{OUT} is the change in V_{OUT} and is measured with a 10MΩ probe.

PULSE WIDTH



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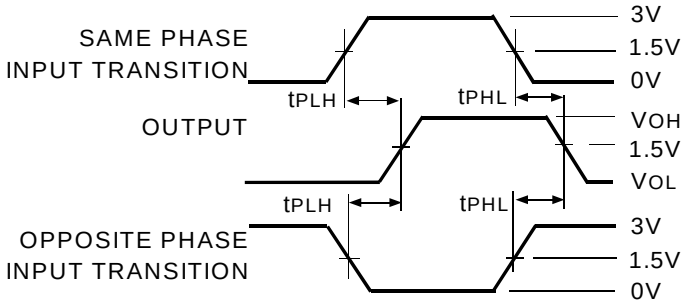
PROPAGATION DELAY



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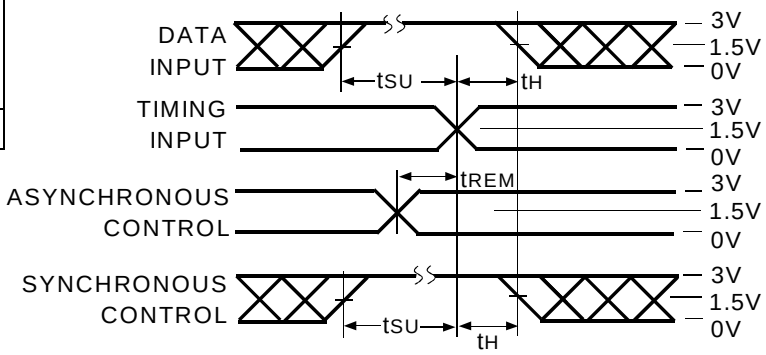
SET-UP, HOLD AND RELEASE TIMES



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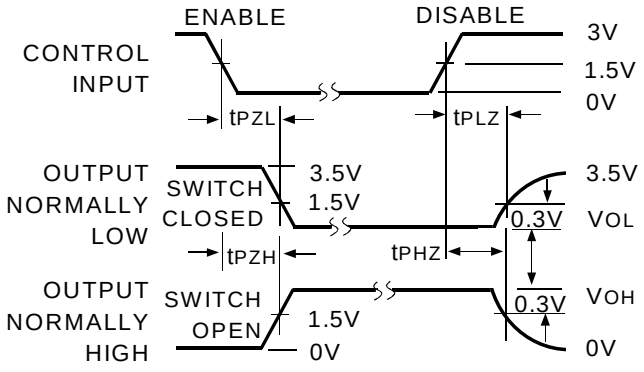
ENABLE AND DISABLE TIMES



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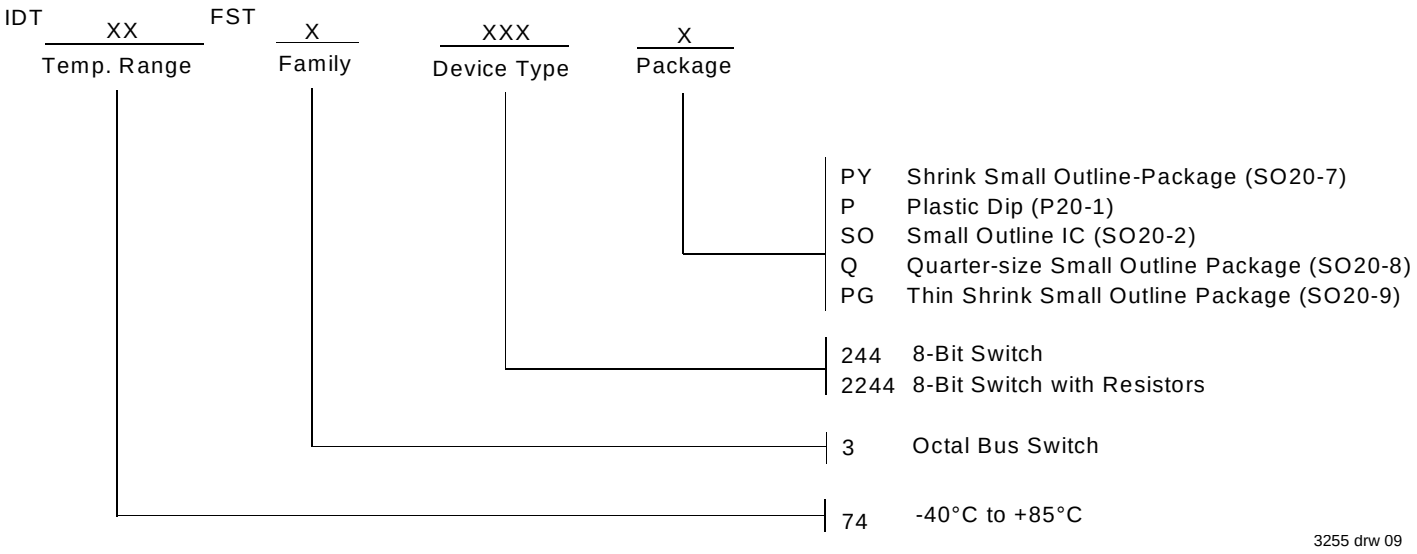
NOTES:

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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