

FEATURES:

- Bus switches provide zero delay paths
- 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)
- Hot insertion capability
- Very low power dissipation
- Available in TSSOP package

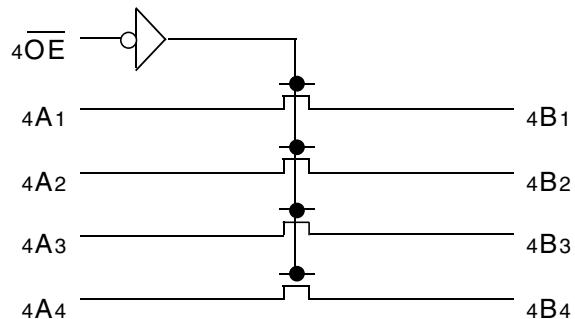
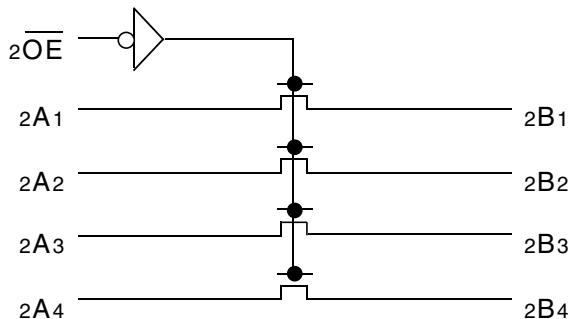
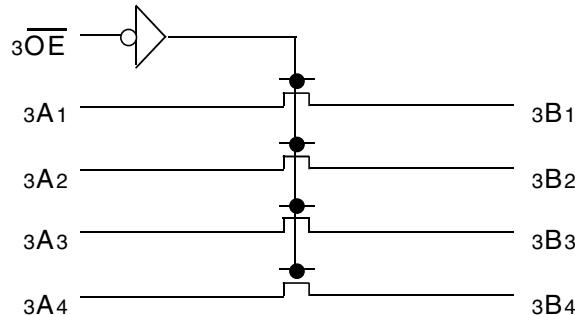
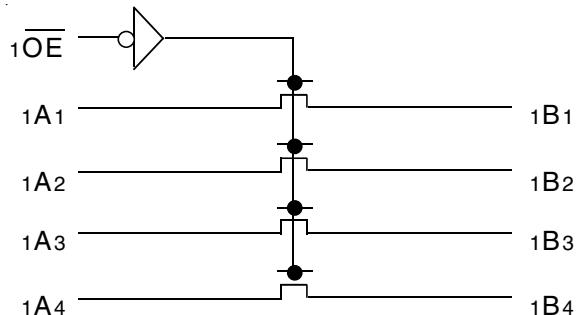
DESCRIPTION:

The FST163244 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. 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 Vcc applied, the device has hot insertion capability.

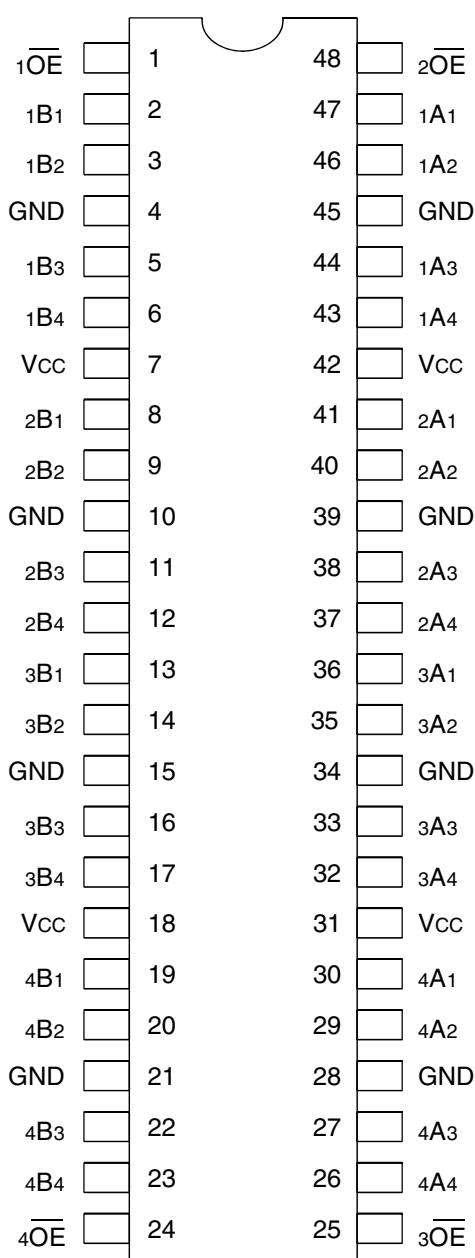
The low on-resistance and simplicity of the connection between input and output ports reduces the delay in this path to close to zero.

The FST163244 is pin-compatible with and functionally similar to the FCT16244T.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Description	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

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. Vcc, Control, and Switch terminals.

CAPACITANCE⁽¹⁾

Symbol	Parameter	Conditions ⁽²⁾	Typ.	Unit
C _{IN}	Control Input Capacitance		6	pF
C _{I/O}	Switch Input/Output Capacitance	Switch Off	12	pF

NOTES:

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

PIN DESCRIPTION

Pin Names	Description
xOE	Output Enable Inputs (Active LOW)
xAx	A Port Bits
xBx	B Port Bits

FUNCTION TABLE⁽¹⁾

Inputs	Outputs	
	xOE	
L		Connect A to B
H		Disconnect A from B

NOTE:

1. H = HIGH Voltage Level
L = LOW Voltage Level

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: TA = -40°C to +85°C, VCC = 5.0V ± 10%

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
VIH	Control Input HIGH Voltage	Guaranteed Logic HIGH for Control Inputs		2	—	—	V
VIL	Control Input LOW Voltage	Guaranteed Logic LOW for Control Inputs		—	—	0.8	V
IIH	Control Input HIGH Current	VCC = Max.	VI = VCC	—	—	±1	µA
IIL	Control Input LOW Current		VI = GND	—	—	±1	
IOZH	Current During Bus Switch Disconnect	VCC = Max., VO = 0 to 5V		—	—	±1	µA
IOZL				—	—	±1	
VIK	Clamp Diode Voltage	VCC = Min., IIN = -18mA		—	-0.7	-1.2	V
IOFF	Switch Power Off Leakage	VCC = 0V, VIN or VO ≤ 5.5V		—	—	±1	µA
ICC	Quiescent Power Supply Current	VCC = Max., VIN = GND or VCC		—	0.1	3	µA

BUS SWITCH IMPEDANCE OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: TA = -40°C to +85°C, VCC = 5.0V ± 10%

Symbol	Parameter	Test Conditions	Min.	Typ. ⁽¹⁾	Max.	Unit
RON	Switch On Resistance, A to B ⁽²⁾	VCC = Min., VIN = 0V, ION = 12mA	—	5	7	Ω
		VCC = Min., VIN = 2.4V, ION = 8mA	—	10	15	
IOS	Short Circuit Current, A to B ⁽³⁾	A(B) = 0V, B(A) = VCC	100	—	—	mA

NOTES:

1. Typical values are at VCC = 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	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	0.5	1.5	mA
I_{CCD}	Dynamic Power Supply Current ^(4,5)	$V_{CC} = \text{Max.}$ One Enable Pin Toggling 50% Duty Cycle		$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	120	160
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.}$ One Enable Pin Toggling $f_i = 10\text{MHz}$ 50% Duty Cycle		$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	1.2	1.6
				$V_{IN} = V_{CC}$ $V_{IN} = 3.4V$	—	1.5	2.4
		$V_{CC} = \text{Max.}$ Four Enable Pins Toggling $f_i = 10\text{MHz}$ 50% Duty Cycle		$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	4.8	6.4
				$V_{IN} = V_{CC}$ $V_{IN} = 3.4V$	—	5.8	9.4

NOTES:

1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type. $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$
2. Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient.
3. Per TTL driven input ($V_{IN} = 3.4V$). All other inputs at V_{CC} or GND . Switch inputs do not contribute to ΔI_{CC} .
4. This parameter represents the current required to switch the internal capacitance of the control inputs at the specified frequency. Switch inputs generate no significant power supply currents as they transition. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.

$$C_{PD} = I_{CCD}/V_{CC}$$

C_{PD} = Power Dissipation Capacitance

$$6. I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$$

$$I_C = I_{CC} + \Delta I_{CC} D_{HNT} + I_{CCD} (f_i N)$$

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 Conditions Apply Unless Otherwise Specified:

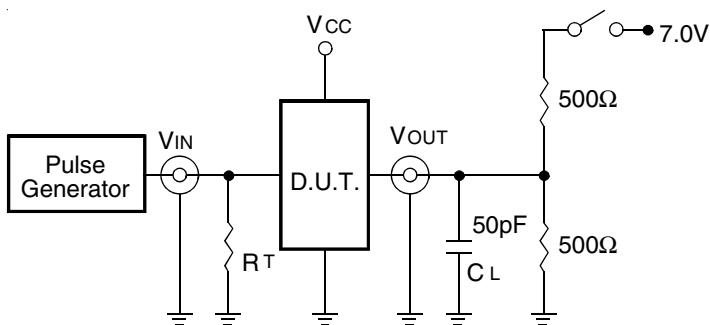
Industrial: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 5.0V \pm 10\%$

Symbol	Description ⁽¹⁾	$V_{CC} = 5V \pm 10\%$			$V_{CC} = 4V$	Unit
		Min.	Typ.	Max.	Max.	
t_{PLH}	Data Propagation Delay A to B, B to A ⁽²⁾	—	—	0.25	0.25	ns
t_{PHL}						
t_{PZH}	Switch CONNECT Delay $x\overline{OE}$ to A or B	1.5	—	5.6	—	ns
t_{PZL}						
t_{PHZ}	Switch DISCONNECT Delay $x\overline{OE}$ to A or B	1.5	—	5.2	—	ns
t_{PLZ}						
$ Q_{ci} $	Charge Injection During Switch DISCONNECT $x\overline{OE}$ to A or B ⁽³⁾	—	1.5	—	—	pC

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.
3. $|Q_{ci}|$ is the charge injection for a single switch DISCONNECT and applies to either single switches or multiplexers. 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

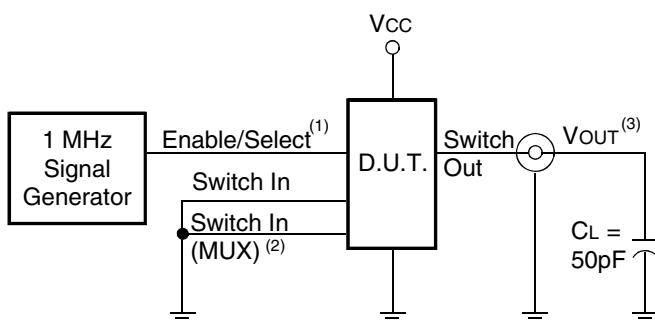
SWITCH POSITION

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

DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.

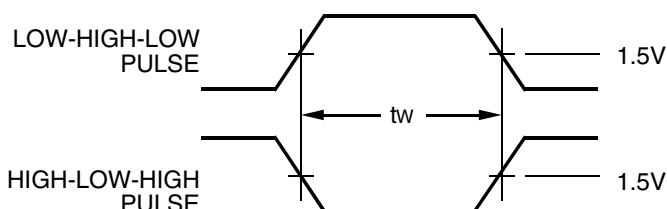
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.



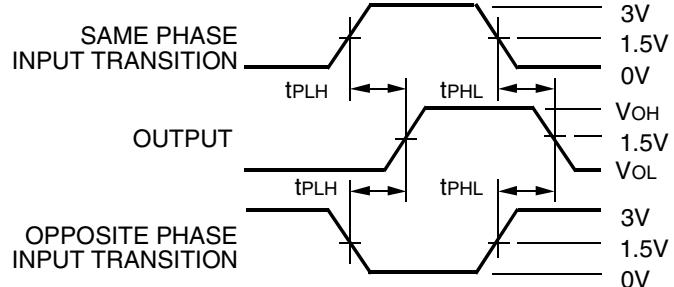
Charge Injection

NOTES:

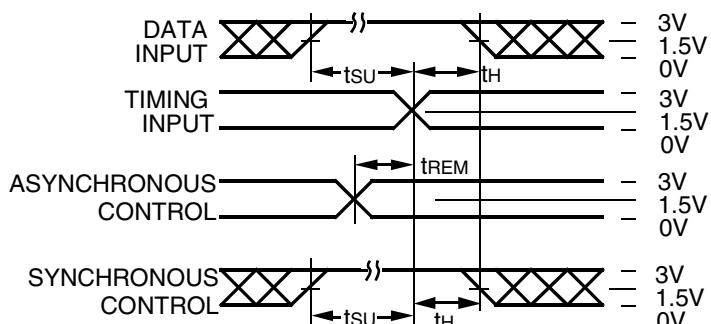
1. Select is used with multiplexers for measuring IQ_{DCIL} during multiplexer select. During all other tests Enable is used.
2. Used with multiplexers to measure IQ_{DCIL} only.
3. Charge Injection = $\Delta V_{OUT} \cdot CL$, with Enable toggling for IQ_{DCIL} or Select toggling for IQ_{DCIL}. ΔV_{OUT}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



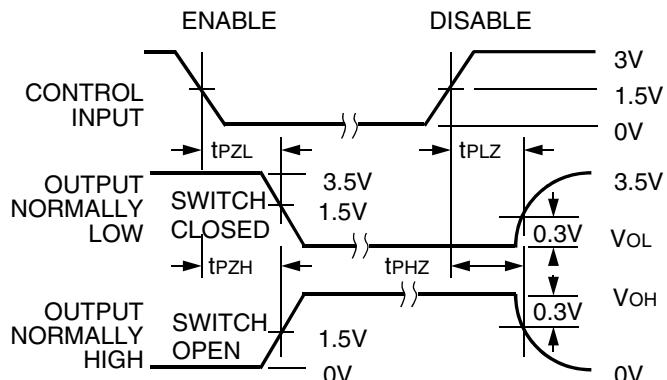
Pulse Width



Propagation Delay



Set-up, Hold, and Release Times



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 $\leq 1.0\text{MHz}$; $t_f \leq 2.5\text{ns}$; $t_r \leq 2.5\text{ns}$.

ORDERING INFORMATION

XX	FST	XXX	XXX	XX	
Temp. Range		Family	Device Type	Package	
				PA	Thin Shrink Small Outline Package
				PAG	TSSOP - Green
			244		16-Bit Flow Through Switch
				163	Double-Density Bus Switch
				74	-40°C to +85°C



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