Bus Switch 16-to-8 Multiplexer

Product Features

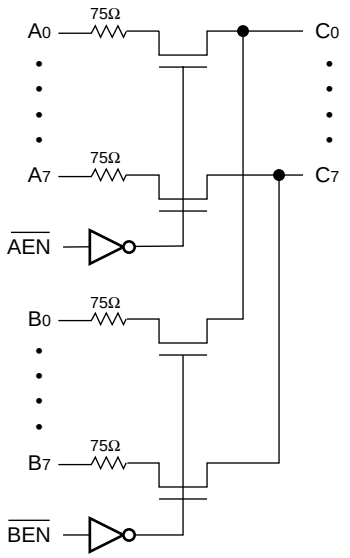
- Near-zero propagation delay
- 75 Ohm series input resistor.
- Direct bus connection when switches are ON
- Ultra-low quiescent power (0.2µA typical) – Ideally suited for notebook applications
- Packages available:
  – 28-pin 150-mil wide plastic QSOP (Q28)
  – 28-pin 300-mil wide plastic SOIC (S28)

Product Description

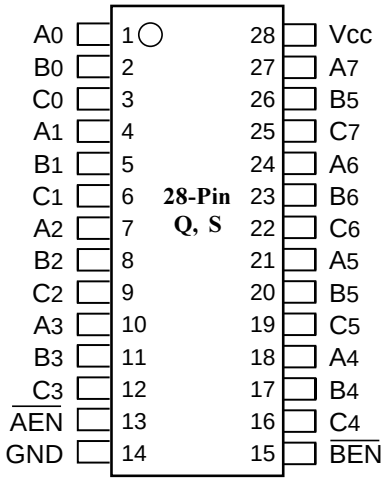
Pericom Semiconductor's PI5C series of logic circuits are produced using the Company's advanced 0.8 micron CMOS technology, achieving industry leading performance.

The PI5C3990 is a 16-to-8 multiplexer switches with a low ON resistance allowing inputs to be connected directly to outputs. The two enable inputs connect each of eight I/O to the common I/O pin. This multiplexer function can be used to select and route logic signals to form crossbar switches, isolate bus capacitance, or provide a zero delay switch connection. The bus switch creates no additional ground bounce noise or additional propagation delay. The device has a 75-ohm series resistor to eliminate input glitch.

Logic Block Diagram



Pin Configuration



Truth Table[1]

$\overline{AEN}$	$\overline{BEN}$	A Sw	B Sw	Function
H	H	Off	Off	Disconnect
L	H	On	Off	A to C
H	L	Off	On	B to C
L	L	On	On	A, B to C

Note: 1. H = High Voltage Level
L = Low Voltage Level

Product Pin Description

Pin Name	I/O	Description
$\overline{AEN}$, $\overline{BEN}$	I	Bus Output Enable (Active LOW)
A0-A7	I/O	Bus A
B0-B7	I/O	Bus B
C0-C7	I/O	Bus C

Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	–65°C to +150°C
Ambient Temperature with Power Applied	–40°C to +85°C
Supply Voltage to Ground Potential (Inputs & Vcc Only)	–0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only)	–0.5V to +7.0V
DC Input Voltage	–0.5V to +7.0V
DC Output Current	120mA
Power Dissipation	0.5W

Note:
Stresses greater than those listed under 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.

DC Electrical Characteristics (Over the Operating Range, $T_A = –40°C$ to $+85°C$, $V_{CC} = 5V \pm 5\%$)

Parameters	Description	Test Conditions[1]	Min.	Typ[2]	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level	2.0	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level	–0.5	—	0.8	V
I_{IH}	Input HIGH Current	V_{CC} = Max., $V_{IN} = V_{CC}$	—	—	±1	µA
I_{IL}	Input LOW Current	V_{CC} = Max., V_{IN} = GND	—	—	±1	µA
I_{OZH}	High Impedance Output Current	0 - A, B, C - V_{CC}	—	—	±1	µA
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., $I_{IN} = –18mA$	—	–0.7	–1.2	V
I_{OS}	Short Circuit Current[3]	A, B (C) = 0V, C (A, B) = V_{CC}	100	—	—	mA
V_H	Input Hysteresis at Control Pins		—	150	—	mV
R_{ON}	Switch On Resistance[4]	V_{CC} = Min., V_{IN} (C) = 0.0V I_{ON} = 30mA	60	80	96	ohm
		V_{CC} = Min., V_{IN} (C) = 2.4V I_{ON} = 10mA	60	90	105	ohm

Capacitance ($T_A = 25°C$, f = 1 MHz)

Parameters[5]	Description	Test Conditions	Typ	Units
C_{IN}	Input Capacitance	V_{IN} = 0V	8	pF
C_{OFF}	A/B Capacitance, Switch Off	V_{IN} = 0V	9	pF
C_{ON}	A/B Capacitance, Switch On	V_{IN} = 0V	18	pF

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 Vcc = 5.0V, $T_A = 25°C$ ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. Measured by the voltage drop between A, B, and C pins at indicated current through the switch. ON resistance is determined by the lower of the voltages on the two (A,B,C) pins.
5. This parameter is determined by device characterization but is not production tested.

Power Supply Characteristics

Parameters	Description	Test Conditions[1]		Min.	Typ[2]	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max.	V_{IN} = GND or V_{CC}	—	0.2	30	µA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	V_{CC} = Max.	V_{IN} = 3.4V[3]	—	—	3.5	mA
I_{CCD}	Supply Current per Input per MHz[4]	V_{CC} = Max., A, B, and C Pins Open $\overline{BE}$ = GND Control Input Toggling 50% Duty Cycle		—	—	0.25	mA/ MHz

Notes:
1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at Vcc = 5.0V, +25°C ambient.
3. Per TTL driven input (V_{IN} = 3.4V, control inputs only); A, B, and C pins do not contribute to Icc.
4. This current applies to the control inputs only and represent the current required to switch internal capacitance at the specified frequency. The A, B, and C inputs generate no significant AC or DC currents as they transition. This parameter is not tested, but is guaranteed by design.
5. Values for these conditions are examples of the Icc formula. These limits are guaranteed but not tested.

PI5C3990 Switching Characteristics over Operating Range

Parameter	Description	Condition[1]	Com			Units
			Min.	Typ.	Max.	
t_{PLH} t_{PHL}	Propagation Delay[2,3] A, B to/from C	C_L = 50pF R_L = 500ohm	—	6.5	—	ns
t_{PZH} t_{PZL}	Bus Enable Time, $\overline{AEN/BEN}$ to A,B,C		1.5	—	10	
t_{PHZ} t_{PLZ}	Bus Disable Time, $\overline{AEN/BEN}$ to A,B,C		1.5	—	5.5	

Notes:
1. See test circuit and waveforms.
2. This parameter is guaranteed but not tested on Propagation Delays.
3. The bus switch contributes no propagational 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 6.5ns for 50pF load. Since this time constant is much smaller than the rise/fall times of typical driving signals, it adds very little propagational delay to the system. Propagational 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.