



# LOW-VOLTAGE 12-BIT 3:1 MUX / DEMUX BUS SWITCH

**IDT74CBTLV16214**

## FEATURES:

- 5Ω A/B bi-directional switch
- Isolation Under Power-Off Conditions
- Over-voltage tolerant
- Latch-up performance exceeds 100mA
- VCC = 2.3V - 3.6V, normal range
- ESD >2000V per MIL-STD-883, Method 3015; >200V using machine model (C = 200pF, R = 0)
- Available in SSOP, TSSOP, and TVSOP packages

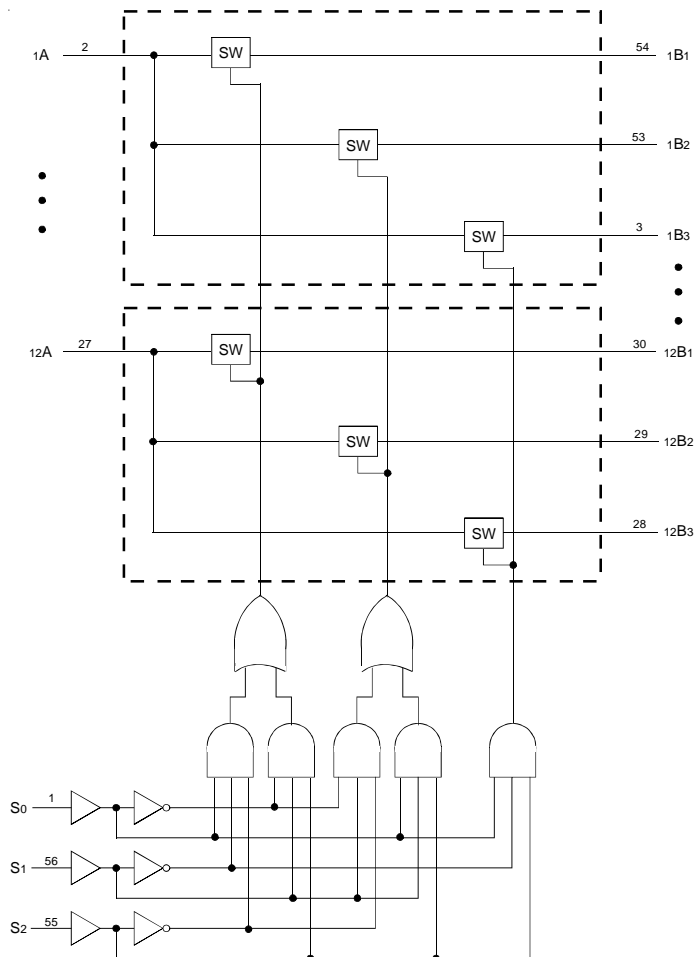
## APPLICATIONS:

- Muxing and demuxing
- 3.3V High Speed Bus Switching and Bus Isolation
- Hot-swapping, hot-docking

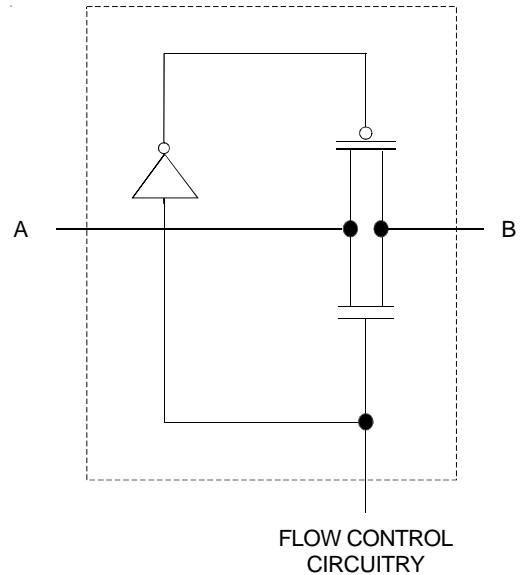
## DESCRIPTION:

The CBTLV16214 provides a set of 12 high-speed buses switching between three separate ports. The low ON resistance allows inputs to be connected to outputs without adding propagation delay. The CBTLV16214 operates as a 12-bit bus select through the data select (S0-S2) terminals.

## FUNCTIONAL BLOCK DIAGRAM



## SIMPLIFIED SCHEMATIC, EACH SWITCH

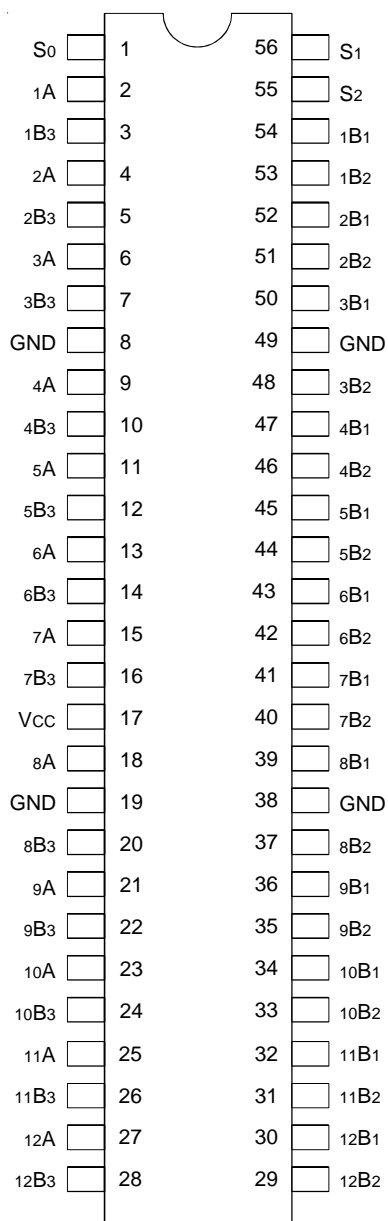


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**INDUSTRIAL TEMPERATURE RANGE**

**AUGUST 2002**

## PIN CONFIGURATION



SSOP / TSSOP / TVSOP  
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Description	Max.	Unit
V <sub>CC</sub>	Supply Voltage Range	-0.5 to 4.6	V
V <sub>I</sub>	Input Voltage Range	-0.5 to 4.6	V
I <sub>CC</sub>	Continuous Channel Current	128	mA
I <sub>IK</sub>	Input Clamp Current, V <sub>I/O</sub> < 0	-50	mA
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C

### NOTE:

- 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.

## PIN DESCRIPTION

Pin Names	Description
S <sub>x</sub>	Data Select Inputs
x A	Port A Inputs or Outputs
x B <sub>x</sub>	Port B Inputs or Outputs

## FUNCTION TABLE<sup>(1)</sup>

Inputs			Inputs/Outputs	Operation
S <sub>2</sub>	S <sub>1</sub>	S <sub>0</sub>	A	
L	L	L	Z	Disconnect
L	L	H	B <sub>1</sub>	A Port = B <sub>1</sub> Port
L	H	L	B <sub>2</sub>	A Port = B <sub>2</sub> Port
L	H	H	Z	Disconnect
H	L	L	Z	Disconnect
H	L	H	B <sub>3</sub>	A Port = B <sub>3</sub> Port
H	H	L	B <sub>1</sub>	A Port = B <sub>1</sub> Port
H	H	H	B <sub>2</sub>	A Port = B <sub>2</sub> Port

### NOTE:

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

## OPERATING CHARACTERISTICS<sup>(1)</sup>

Symbol	Parameter	Test Conditions	Min.	Max.	Unit
V <sub>CC</sub>	Supply Voltage		2.3	3.6	V
V <sub>IH</sub>	High-Level Control Input Voltage	V <sub>CC</sub> = 2.3V to 2.7V	1.7	—	V
		V <sub>CC</sub> = 2.7V to 3.6V	2	—	
V <sub>IL</sub>	Low-Level Control Input Voltage	V <sub>CC</sub> = 2.3V to 2.7V	—	0.7	V
		V <sub>CC</sub> = 2.7V to 3.6V	—	0.8	
T <sub>A</sub>	Operating Free-Air Temperature		-40	+85	°C

### NOTE:

- All unused control inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation.

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Operating Condition: TA = -40°C to +85°C

Symbol	Parameter	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit	
V <sub>IK</sub>	Control Inputs, Data I/O	V <sub>CC</sub> = 3V, I <sub>I</sub> = -18mA	—	—	-1.2	V	
I <sub>I</sub>	Control Inputs	V <sub>CC</sub> = 3.6V, V <sub>I</sub> = V <sub>CC</sub> or GND	—	—	±1	μA	
I <sub>OZ</sub>	Data I/O	V <sub>CC</sub> = 3.6V, V <sub>O</sub> = 0V or 3.6V switch disabled	—	—	5	μA	
I <sub>OFF</sub>		V <sub>CC</sub> = 0V, V <sub>I</sub> or V <sub>O</sub> = 0V or 3.6V	—	—	10	μA	
I <sub>CC</sub>		V <sub>CC</sub> = 3.6V, I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND	—	—	10	μA	
ΔI <sub>CC</sub> <sup>(2)</sup>	Control Inputs	V <sub>CC</sub> = 3.6V, one input at 3V, other inputs at V <sub>CC</sub> or GND	—	—	300	μA	
C <sub>I</sub>	Control Inputs	V <sub>I</sub> = 3V or 0	—	4	—	pF	
C <sub>I(OFF)</sub>	A	V <sub>O</sub> = 3V or 0 (switch off)	—	20	—	pF	
	B		—	7.5	—		
R <sub>ON</sub> <sup>(3)</sup>	Max. at V <sub>CC</sub> = 2.3V Typ. at V <sub>CC</sub> = 2.5V	V <sub>I</sub> = 0	I <sub>O</sub> = 64mA	—	5	8	Ω
			I <sub>O</sub> = 24mA	—	5	8	
	V <sub>I</sub> = 1.7V	I <sub>O</sub> = 15mA	—	27	40		
		V <sub>I</sub> = 0	I <sub>O</sub> = 64mA	—	5	7	
	V <sub>CC</sub> = 3V		V <sub>I</sub> = 0	I <sub>O</sub> = 24mA	—	5	
		V <sub>I</sub> = 2.4V		I <sub>O</sub> = 15mA	—	10	

### NOTES:

1. Typical values are at 3.3V, +25°C ambient.
2. The increase in supply current is attributable to each input that is at the specified voltage level rather than V<sub>CC</sub> or GND.
3. This is measured by the voltage drop between the A and B terminals at the indicated current through the switch.

## SWITCHING CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> = 2.5V ± 0.2V		V <sub>CC</sub> = 3.3V ± 0.3V		Unit
		Min.	Max.	Min.	Max.	
t <sub>PD</sub> <sup>(1)</sup>	Propagation Delay A to B or B to A	—	0.15	—	0.25	ns
t <sub>PD</sub>	Propagation Delay S to A or B	1	6.5	1	6	ns
t <sub>EN</sub>	Output Enable Time S to A or B	1	6.5	1	6	ns
t <sub>DIS</sub>	Output Disable time S to A or B	1	7	1	6.5	ns

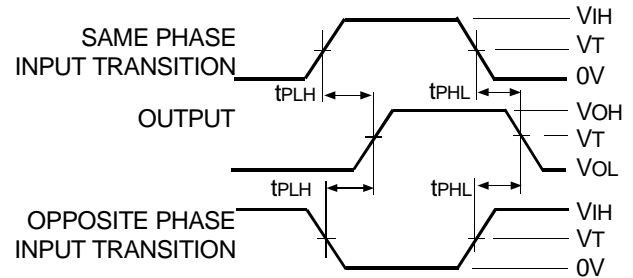
### NOTE:

1. The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance when driven by an ideal voltage source (zero output impedance).

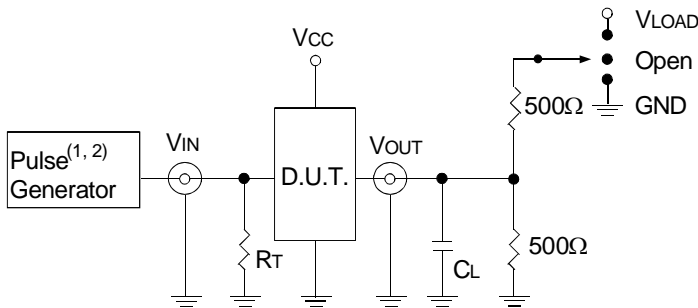
## TEST CIRCUITS AND WAVEFORMS

### TEST CONDITIONS

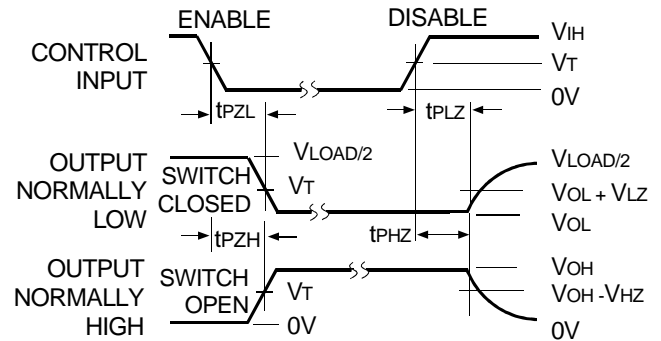
Symbol	V <sub>CC</sub> <sup>(1)</sup> = 3.3V ± 0.3V	V <sub>CC</sub> <sup>(2)</sup> = 2.5V ± 0.2V	Unit
V <sub>LOAD</sub>	6	2 x V <sub>CC</sub>	V
V <sub>IH</sub>	3	V <sub>CC</sub>	V
V <sub>T</sub>	1.5	V <sub>CC</sub> / 2	V
V <sub>LZ</sub>	300	150	mV
V <sub>HZ</sub>	300	150	mV
C <sub>L</sub>	50	30	pF



*Propagation Delay*



*Test Circuits for All Outputs*



NOTE:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

*Enable and Disable Times*

#### DEFINITIONS:

C<sub>L</sub> = Load capacitance: includes jig and probe capacitance.

R<sub>T</sub> = Termination resistance: should be equal to Z<sub>out</sub> of the Pulse Generator.

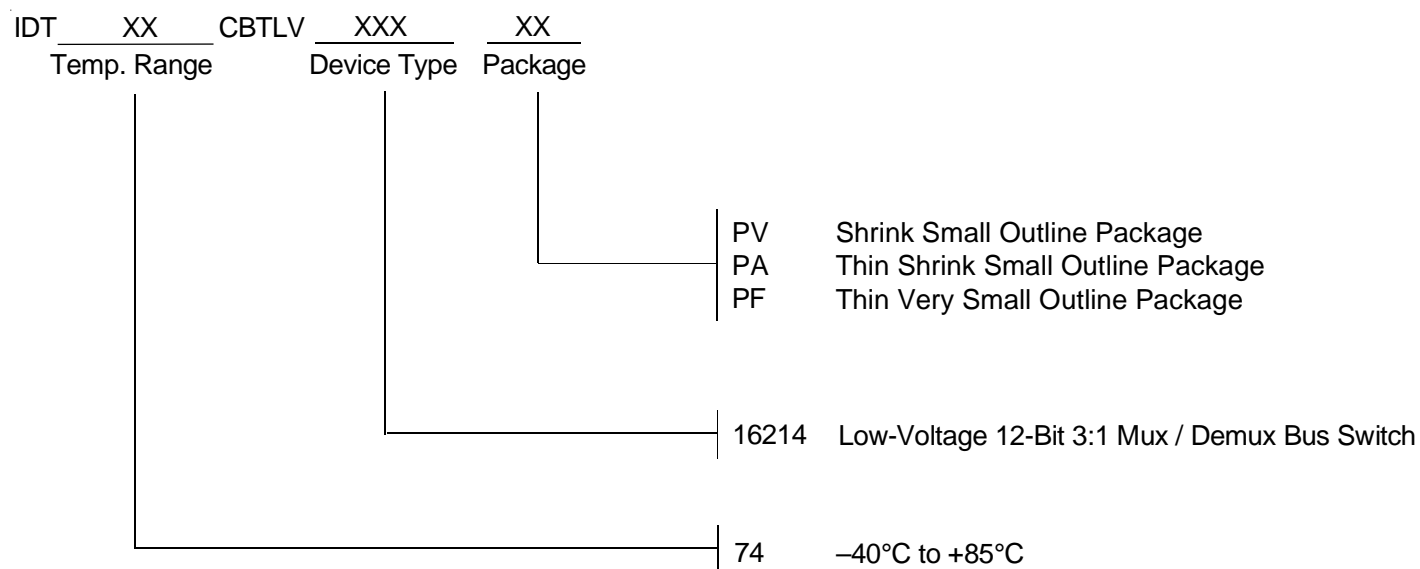
#### NOTES:

1. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>r</sub> ≤ 2.5ns; t<sub>r</sub> ≤ 2.5ns.
2. Pulse Generator for All Pulses: Rate ≤ 10MHz; t<sub>r</sub> ≤ 2ns; t<sub>r</sub> ≤ 2ns.

### SWITCH POSITION

Test	Switch
t <sub>PLZ</sub> /t <sub>PZL</sub>	V <sub>LOAD</sub>
t <sub>PHZ</sub> /t <sub>PZH</sub>	GND
t <sub>PD</sub>	Open

### ORDERING INFORMATION



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