

FEATURES:

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

APPLICATIONS:

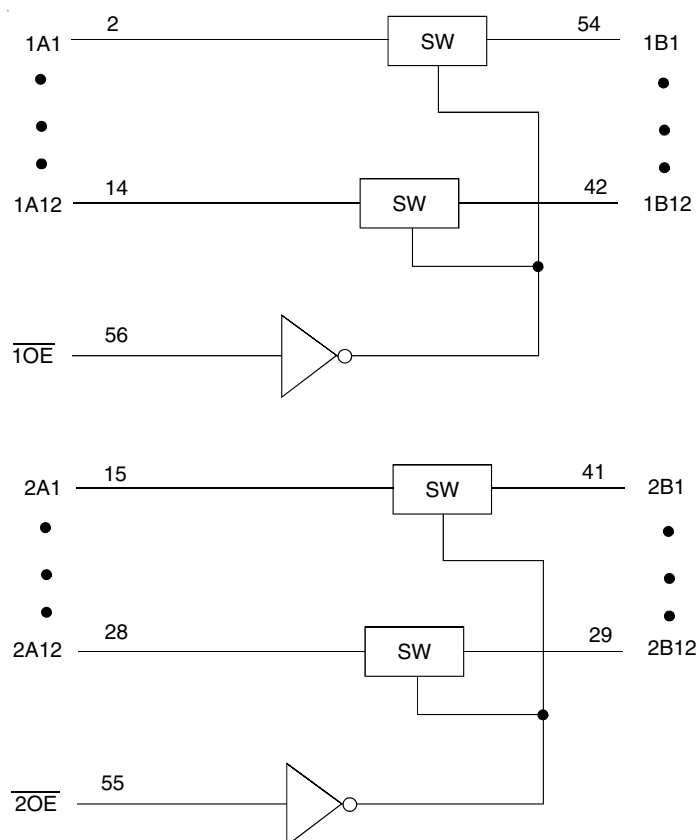
- 3.3V High Speed Bus Switching and Bus Isolation

DESCRIPTION:

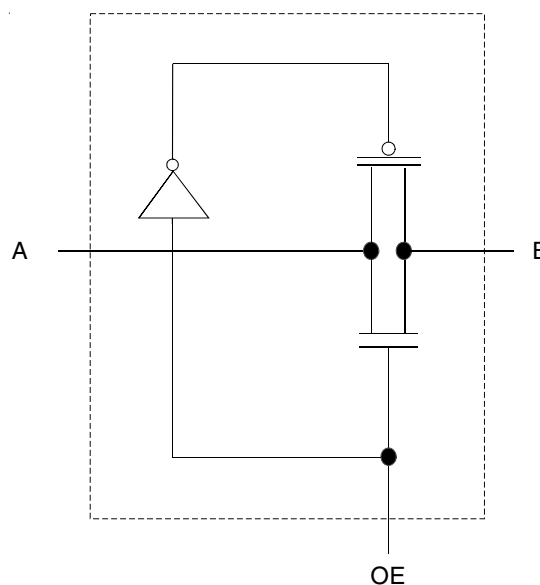
The CBTLV16211 operates as a single 24-bit bus switch or as a dual 12-bit bus switch, which provides high speed switching. This device has very low ON resistance, resulting in under 250ps propagation delay throughout the switch. When Output Enable (\overline{OE}) is low, the corresponding 12-bit bus switch is on and port A is connected to Port B. When \overline{OE} is high, the switch is off and a high impedance exists between Port A and Port B.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor.

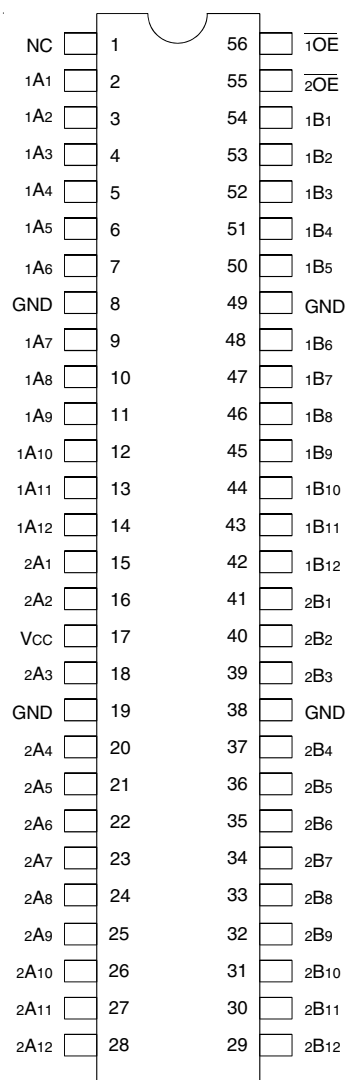
FUNCTIONAL BLOCK DIAGRAM



SIMPLIFIED SCHEMATIC, EACH SWITCH



PIN CONFIGURATION



TOP VIEW

| Package Type | Package Code | Order Code |
|--------------|--------------|------------|
| TSSOP | PAG56 | PAG |

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Description | Max. | Unit |
|------------------|---|-------------|------|
| V _{CC} | Supply Voltage Range | −0.5 to 4.6 | V |
| V _I | Input Voltage Range | −0.5 to 4.6 | V |
| | Continuous Channel Current | 128 | mA |
| I _{IK} | Input Clamp Current, V _{I/O} < 0 | −50 | mA |
| T _{STG} | 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 |
|------------------|----------------------------|
| \overline{xOE} | Output Enable (Active LOW) |
| x A x | Port A Inputs or Outputs |
| x B x | Port B Inputs or Outputs |

FUNCTION TABLE (EACH 12-BIT BUS SWITCH)⁽¹⁾

| Input | Operation |
|-----------------|-----------------|
| \overline{OE} | |
| L | A-Port = B-Port |
| H | Disconnect |

NOTE:

- H = HIGH Voltage Level
L = LOW Voltage Level

OPERATING CHARACTERISTICS⁽¹⁾

| Symbol | Parameter | Test Conditions | Min. | Max. | Unit |
|-----------------|----------------------------------|--------------------------------|------|------|------|
| V _{CC} | Supply Voltage | | 2.3 | 3.6 | V |
| V _{IH} | High-Level Control Input Voltage | V _{CC} = 2.3V to 2.7V | 1.7 | — | V |
| | | V _{CC} = 2.7V to 3.6V | 2 | — | |
| V _{IL} | Low-Level Control Input Voltage | V _{CC} = 2.3V to 2.7V | — | 0.7 | V |
| | | V _{CC} = 2.7V to 3.6V | — | 0.8 | |
| T _A | Operating Free-Air Temperature | | −40 | +85 | °C |

NOTE:

- All unused control inputs of the device must be held at V_{CC} 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. ⁽¹⁾ | Max. | Unit |
|---------------------------------|--|---|-----------------------|------|---------------------|------|------|
| V _{IK} | Control Inputs, Data I/O | V _{CC} = 3V, I _I = -18mA | | — | — | -1.2 | V |
| I _I | Control Inputs | V _{CC} = 3.6V, V _I = V _{CC} or GND | | — | — | ±1 | μA |
| I _{OZ} | Data I/O | V _{CC} = 3.6V, V _O = 0V or 3.6V switch disabled | | — | — | 5 | μA |
| I _{OFF} | | V _{CC} = 0V, V _I or V _O = 0V or 3.6V | | — | — | 10 | μA |
| I _{CC} | | V _{CC} = 3.6V, I _O = 0, V _I = V _{CC} or GND | | — | — | 10 | μA |
| ΔI _{CC} ⁽²⁾ | Control Inputs | V _{CC} = 3.6V, one input at 3V, other inputs at V _{CC} or GND | | — | — | 300 | μA |
| C _I | Control Inputs | V _I = 3V or 0 | | — | 4 | — | pF |
| C _{IO(OFF)} | | V _O = 3V or 0, \overline{OE} = V _{CC} | | — | 6.5 | — | pF |
| R _{ON} ⁽³⁾ | Max. at V _{CC} = 2.3V Typ. at V _{CC} = 2.5V | V _I = 0 | I _O = 64mA | — | 5 | 8 | Ω |
| | | | I _O = 24mA | — | 5 | 8 | |
| | V _{CC} = 3V | V _I = 1.7V | I _O = 15mA | — | 27 | 40 | |
| | | V _I = 0 | I _O = 64mA | — | 5 | 7 | |
| | | | I _O = 24mA | — | 5 | 7 | |
| | | V _I = 2.4V | I _O = 15mA | — | 10 | 15 | |

NOTES:

- Typical values are at 3.3V, +25°C ambient.
- The increase in supply current is attributable to each input that is at the specified voltage level rather than V_{CC} or GND.
- 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 _{CC} = 2.5V ± 0.2V | | V _{CC} = 3.3V ± 0.3V | | Unit |
|--------------------------------|--|-------------------------------|------|-------------------------------|------|------|
| | | Min. | Max. | Min. | Max. | |
| t _{PD} ⁽¹⁾ | Propagation Delay A to B or B to A | — | 0.15 | — | 0.25 | ns |
| t _{EN} | Output Enable Time \overline{OE} to A or B | 1 | 7 | 1 | 6.2 | ns |
| t _{DIS} | Output Disable time \overline{OE} to A or B | 1 | 7.2 | 1 | 7.7 | ns |

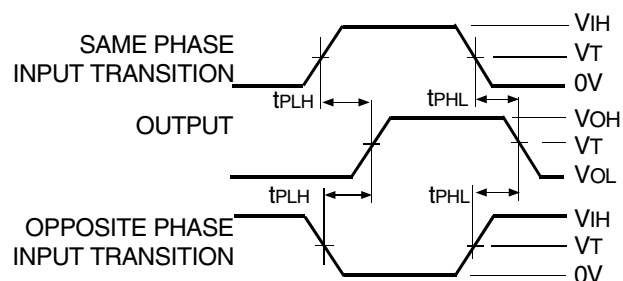
NOTE:

- 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).

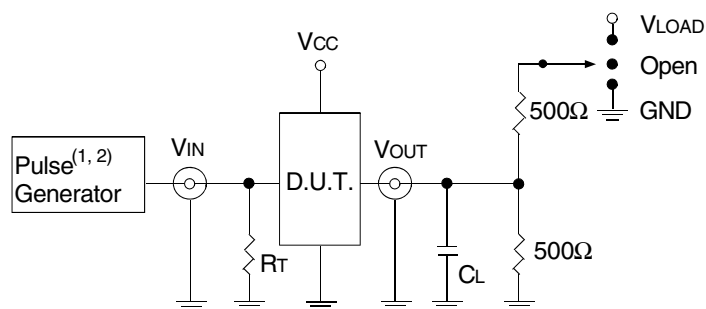
TEST CIRCUITS AND WAVEFORMS

TEST CONDITIONS

| Symbol | $V_{CC}^{(1)} = 3.3V \pm 0.3V$ | $V_{CC}^{(2)} = 2.5V \pm 0.2V$ | Unit |
|------------|--------------------------------|--------------------------------|------|
| V_{LOAD} | 6 | $2 \times V_{CC}$ | V |
| V_{IH} | 3 | V_{CC} | V |
| V_T | 1.5 | $V_{CC} / 2$ | V |
| V_{LZ} | 300 | 150 | mV |
| V_{HZ} | 300 | 150 | mV |
| C_L | 50 | 30 | pF |



Propagation Delay



Test Circuits for All Outputs

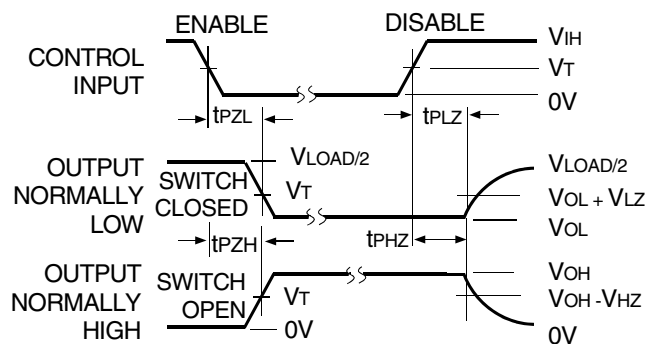
DEFINITIONS:

C_L = Load capacitance: includes jig and probe capacitance.

R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

NOTES:

1. Pulse Generator for All Pulses: Rate $\leq 10\text{MHz}$; $t_r \leq 2.5\text{ns}$; $t_f \leq 2.5\text{ns}$.
2. Pulse Generator for All Pulses: Rate $\leq 10\text{MHz}$; $t_r \leq 2\text{ns}$; $t_f \leq 2\text{ns}$.



NOTE:

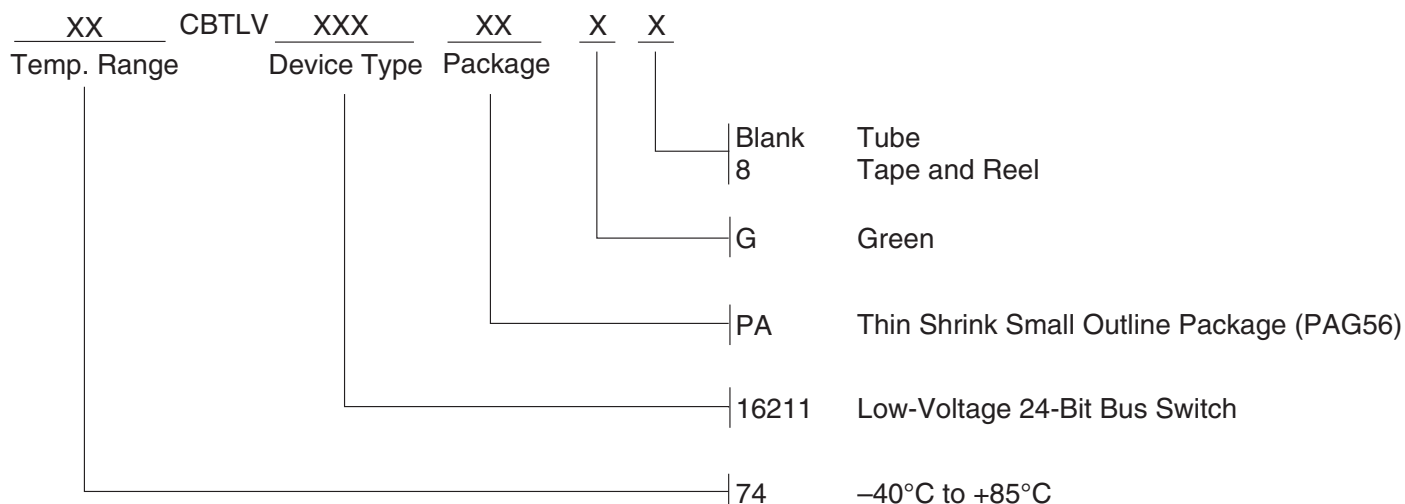
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.

Enable and Disable Times

SWITCH POSITION

| Test | Switch |
|-------------------|------------|
| t_{PLZ}/t_{PZL} | V_{LOAD} |
| t_{PHZ}/t_{PZH} | GND |
| t_{PD} | Open |

ORDERING INFORMATION



Orderable Part Information

| Speed (ns) | Orderable Part ID | Pkg. Code | Pkg. Type | Temp. Grade |
|------------|-------------------|-----------|-----------|-------------|
| | 74CBTLV16211PAG | PAG56 | TSSOP | I |
| | 74CBTLV16211PAG8 | PAG56 | TSSOP | I |

Datasheet Document History

| | | |
|------------|----------|---|
| 12/01/2014 | Pg. 2, 5 | Updated the ordering information by removing the "IDT" notation, obsolete packages "SSOP/TVSOP" and non RoHS part and by adding Tape and Reel information. |
| 06/03/2019 | Pg. 2,5 | Added table under pin configuration diagram with detailed package information and orderable part information table. Updated the ordering information diagram in clearer detail. |

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