

## FEATURES:

- Functionally equivalent to QS3251
- 5Ω bi-directional switch connection between two ports
- 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 QSOP and TSSOP packages

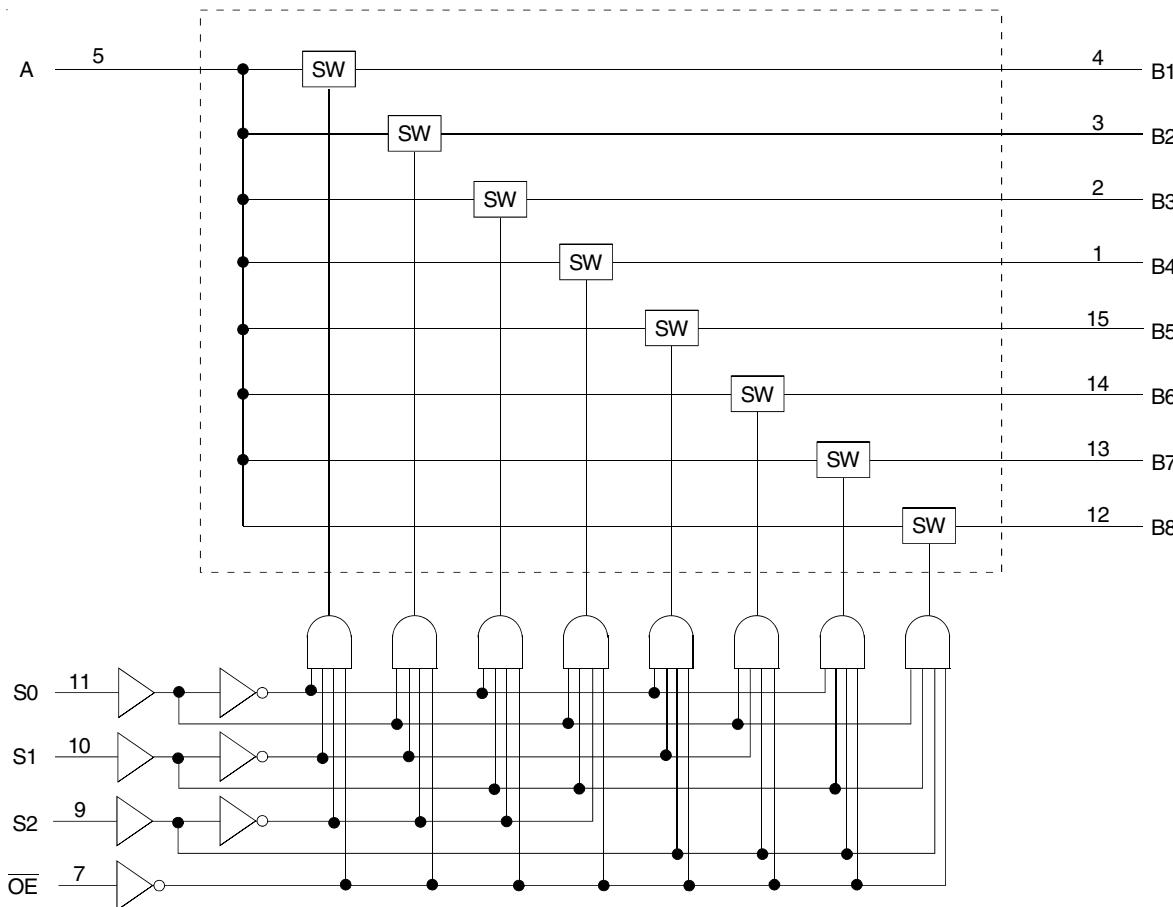
## DESCRIPTION:

The CBTLV3251 is a 1-of-8 high-speed multiplexer/demultiplexer. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

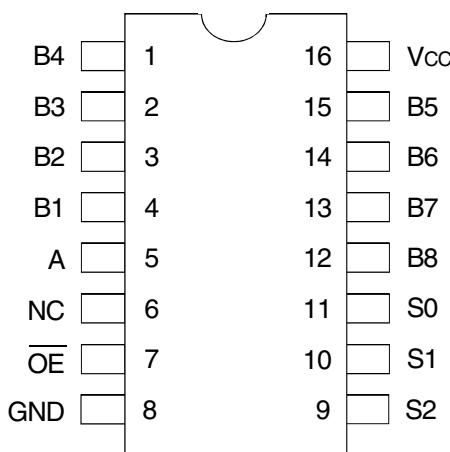
The select input (S0, S1, S2) controls the data flow. The multiplexer/demultiplexer switches are disabled when the output-enable ( $\overline{OE}$ ) input is high.

To ensure that the device is in high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{cc}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

## FUNCTIONAL BLOCK DIAGRAM



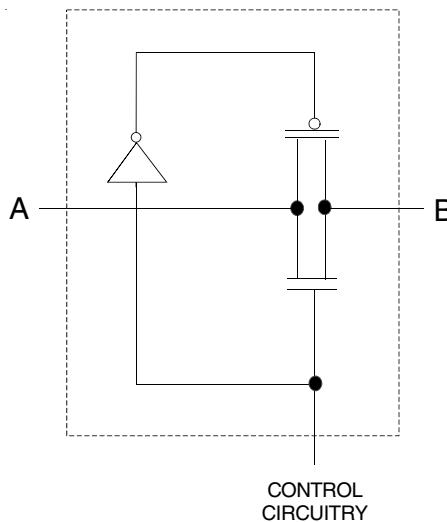
## PIN CONFIGURATION



TOP VIEW

Package Type	Package Code	Order Code
TSSOP	PGG16	PGG
QSOP	PCG16	QG

## SIMPLIFIED SCHEMATIC, EACH SWITCH

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

Symbol	Description	Max	Unit
Vcc	Supply Voltage Range	-0.5 to +4.6	V
VI	Input Voltage Range	-0.5 to +4.6	V
	Continuous Channel Current	128	mA
IIK	Input Clamp Current, VI<0	-50	mA
TSTG	Storage Temperature	-65 to +150	°C

## NOTE:

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.

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

Inputs				Function
$\overline{OE}$	S2	S1	S0	
L	L	L	L	A Port = B1 Port
L	L	L	H	A Port = B2 Port
L	L	H	L	A Port = B3 Port
L	L	H	H	A Port = B4 Port
L	H	L	L	A Port = B5 Port
L	H	L	H	A Port = B6 Port
L	H	H	L	A Port = B7 Port
L	H	H	H	A Port = B8 Port
H	X	X	X	Disconnect

## NOTE:

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

OPERATING CHARACTERISTICS, TA = 25°C<sup>(1)</sup>

Symbol	Parameter	Test Conditions	Min.	Max.	Unit
Vcc	Supply Voltage		2.3	3.6	V
VIH	High-Level Control Input Voltage	Vcc = 2.3V to 2.7V	1.7	—	V
		Vcc = 2.7V to 3.6V	2	—	
VIL	Low-Level Control Input Voltage	Vcc = 2.3V to 2.7V	—	0.7	V
		Vcc = 2.7V to 3.6V	—	0.8	
TA	Operating Free-Air Temperature		-40	85	°C

## NOTE:

1. All unused control inputs of the device must be held at Vcc or GND to ensure proper device operation.

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

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

Symbol	Parameter	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
VIK	Control Inputs, Data Inputs	VCC = 3V, I <sub>I</sub> = -18mA	—	—	-1.2	V
I <sub>I</sub>	Control Inputs	VCC = 3.6V, VI = VCC or GND	—	—	±1	µA
I <sub>OZ</sub>	Data I/O	VCC = 3.6V, VO = 0 or 3.6V, switch disabled	—	—	5	µA
I <sub>OFF</sub>		VCC = 0, VI or VO = 0 to 3.6V	—	—	50	µA
I <sub>CC</sub>		VCC = 3.6V, IO = 0, VI = VCC or GND	—	—	10	µA
ΔI <sub>CC</sub> <sup>(2)</sup>	Control Inputs	VCC = 3.6V, one input at 3V, other inputs at VCC or GND	—	—	300	µA
C <sub>I</sub>	Control Inputs	VI = 3V or 0	—	4	—	pF
C <sub>IO(OFF)</sub>	A Port	VO = 3V or 0, OĒ = VCC = 3.3V	—	40.5	—	pF
	B Port		—	6	—	
R <sub>ON</sub> <sup>(3)</sup>	VCC = 2.3V Typ. at VCC = 2.5V	VI = 0	I <sub>O</sub> = 64mA	—	5	8
			I <sub>O</sub> = 24mA	—	5	8
		VI = 1.7V	I <sub>O</sub> = 15mA	—	27	40
	VCC = 3V	VI = 0	I <sub>O</sub> = 64mA	—	5	7
			I <sub>O</sub> = 24mA	—	5	7
		VI = 2.4V	I <sub>O</sub> = 15mA	—	10	15

## NOTES:

1. Typical values are at VCC = 3.3V, +25°C ambient.
2. The increase in supply current is attributable to each current that is at the specified voltage level rather than VCC or GND.
3. This is measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

## SWITCHING CHARACTERISTICS

Symbol	Parameter	VCC = 2.5V ± 0.2V		VCC = 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>SEL</sub>	Select Time S to A or B	1	4.8	1	4.5	ns
t <sub>EN</sub>	Enable Time S to B	1	4.8	1	4.5	ns
t <sub>DIS</sub>	Disable Time S to B	1	5.1	1	5.3	ns
t <sub>EN</sub>	Output Enable Time OĒ to A or B	1	5	1	4.8	ns
t <sub>DIS</sub>	Output Disable Time OĒ to A or B	1	5.5	1	6	ns

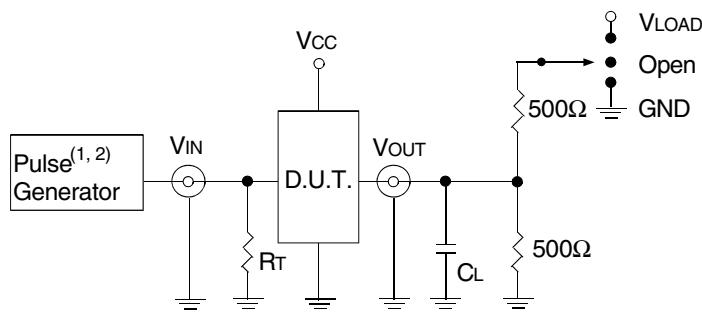
## NOTE:

1. The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance 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



Test Circuits for All Outputs

## DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.

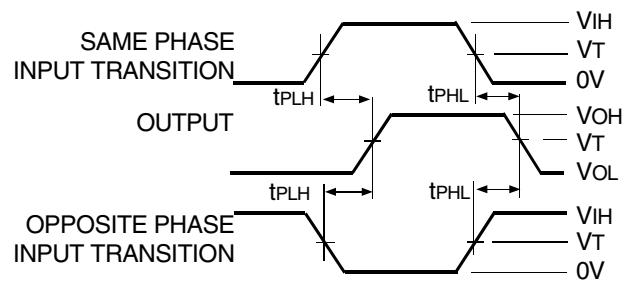
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.

## NOTES:

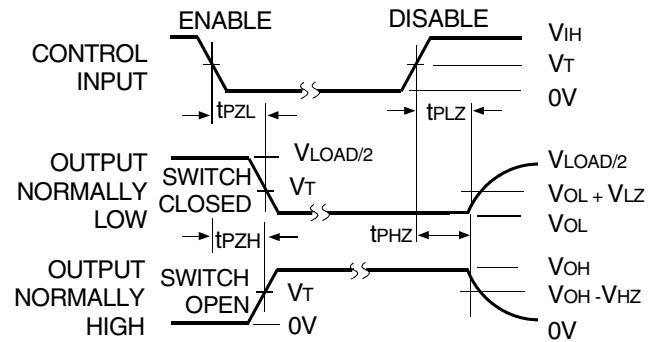
1. Pulse Generator for All Pulses: Rate  $\leq 10MHz$ ;  $t_f \leq 2.5ns$ ;  $t_r \leq 2.5ns$ .
2. Pulse Generator for All Pulses: Rate  $\leq 10MHz$ ;  $t_f \leq 2ns$ ;  $t_r \leq 2.5ns$ .

## SWITCH POSITION

Test	Switch
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND
$t_{SEL}$	Open
$t_{PD}$	Open

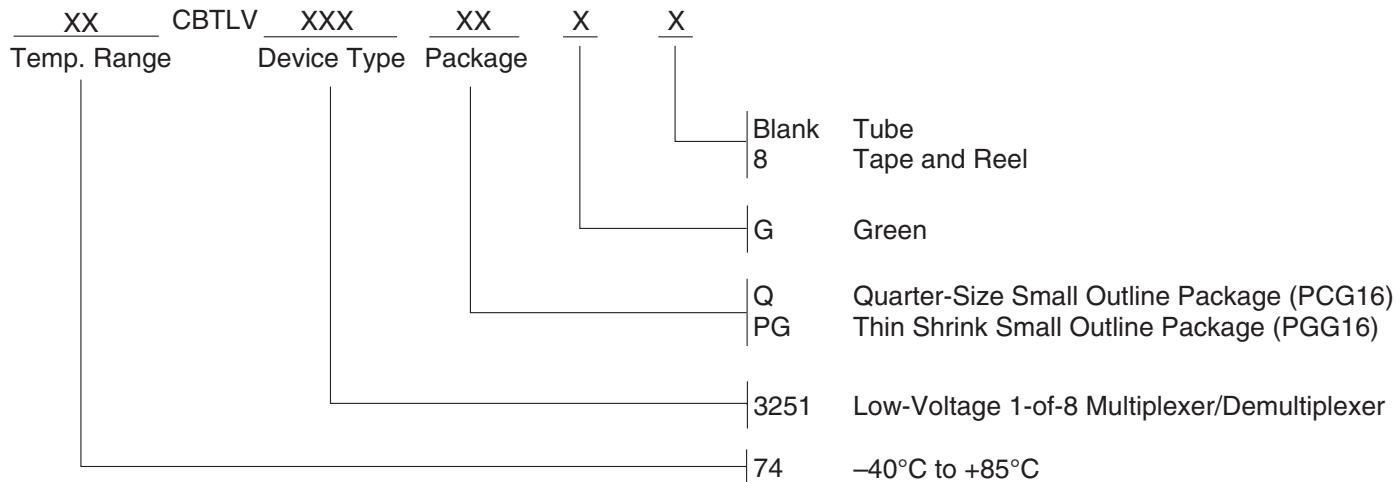


Propagation Delay



Enable and Disable Times

## ORDERING INFORMATION



## Orderable Part Information

Speed (ns)	Orderable Part ID	Pkg. Code	Pkg. Type	Temp. Grade
	74CBTLV3251PGG	PGG16	TSSOP	I
	74CBTLV3251PGG8	PGG16	TSSOP	I
	74CBTLV3251QG	PCG16	QSOP	I
	74CBTLV3251QG8	PCG16	QSOP	I

## Datasheet Document History

12/18/2014	Pg. 5	Updated the ordering information by removing non RoHS part and adding Tape and Reel information.
05/10/2019	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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