

## FEATURES:

- Functionally equivalent to QS3253
- 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

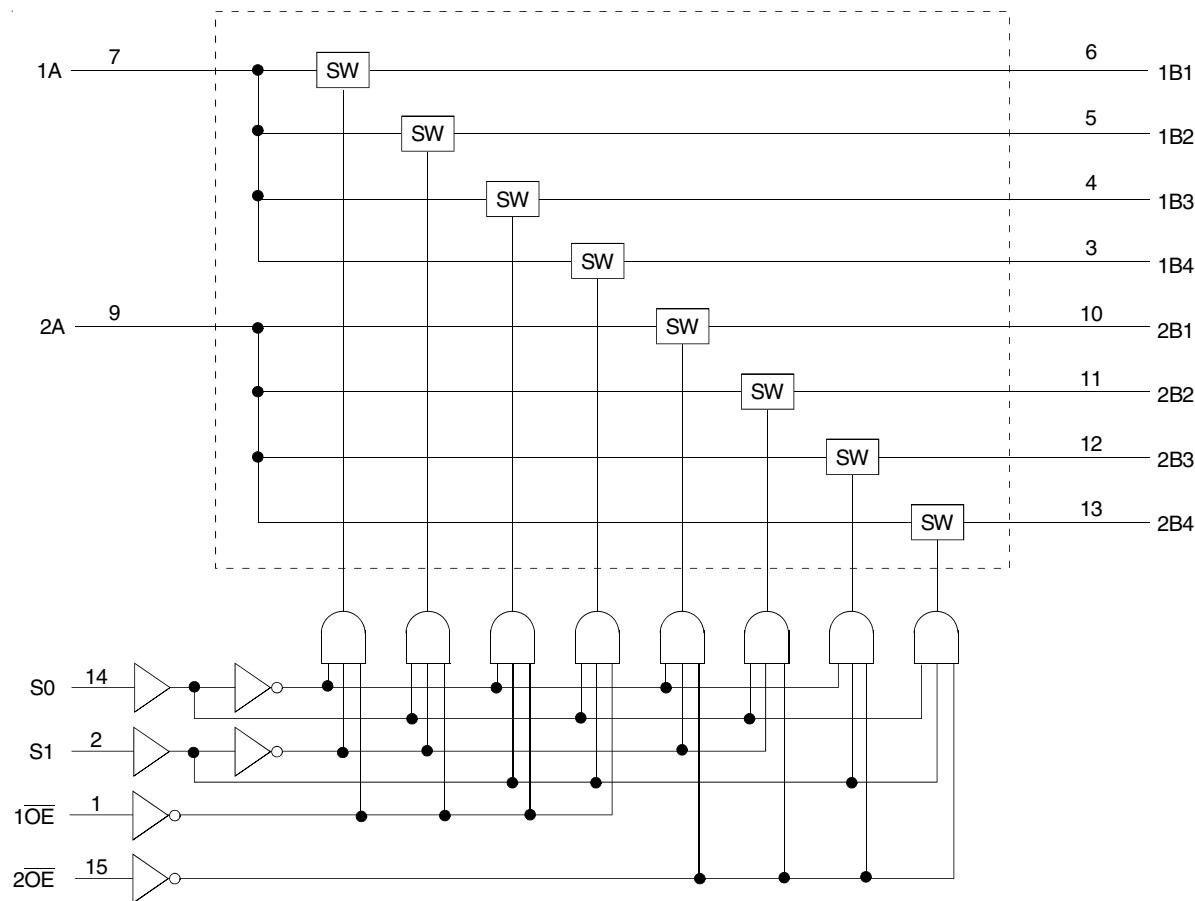
## DESCRIPTION:

The CBTLV3253 is a dual 1-of-4 high-speed multiplexer/demultiplexer. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

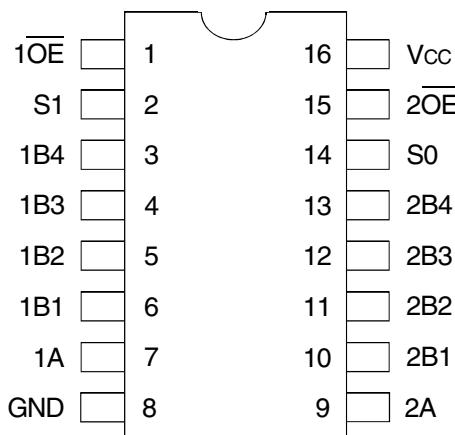
The select (S0, S1) input controls the data flow. The multiplexer/demultiplexer switches are disabled when the output-enable ( $\overline{OE}$ ) input is high.

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



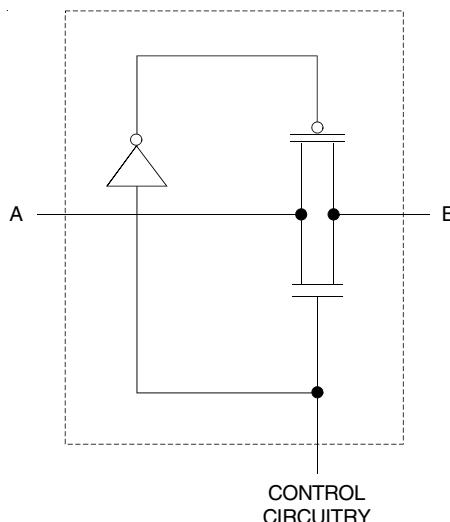
## PIN CONFIGURATION



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>

ONE OF TWO 1:4 MUX/DEMUX BANKS

Inputs			Function
OE	S1	S0	
L	L	L	A Port = B1 Port
L	L	H	A Port = B2 Port
L	H	L	A Port = B3 Port
L	H	H	A Port = B4 Port
H	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
V <sub>IK</sub>	Control Inputs, Data Inputs	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> = 0 or 3.6V, switch disabled	—	—	5	µA
I <sub>OFF</sub>		V <sub>CC</sub> = 0, V <sub>I</sub> or V <sub>O</sub> = 0 to 3.6V	—	—	50	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>IO(OFF)</sub>	A Port	V <sub>O</sub> = 3V or 0, $\overline{OE}$ = V <sub>CC</sub> = 3.3V	—	20	—	pF
	B Port		—	6	—	
R <sub>ON</sub> <sup>(3)</sup>	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
			I <sub>O</sub> = 24mA	—	5	8
		V <sub>I</sub> = 1.7V	I <sub>O</sub> = 15mA	—	27	40
	V <sub>CC</sub> = 3V	V <sub>I</sub> = 0	I <sub>O</sub> = 64mA	—	5	7
			I <sub>O</sub> = 24mA	—	5	7
		V <sub>I</sub> = 2.4V	I <sub>O</sub> = 15mA	—	10	15

## NOTES:

1. Typical values are at V<sub>CC</sub> = 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 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. On-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

## 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>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 $\overline{OE}$ to A or B	1	5	1	4.8	ns
t <sub>DIS</sub>	Output Disable Time $\overline{OE}$ to A or B	1	5.5	1	5.4	ns

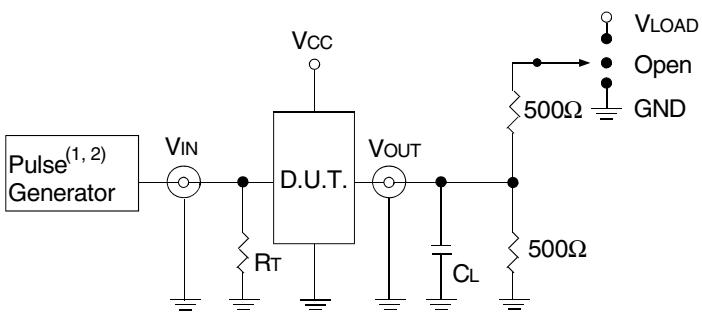
## NOTE:

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.

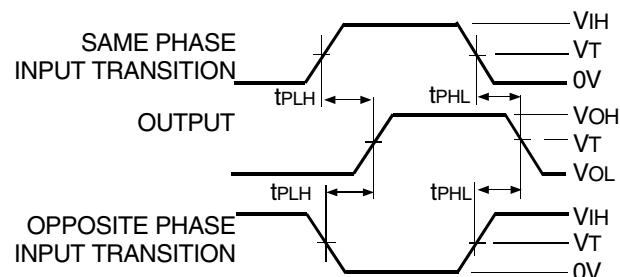
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.

## NOTES:

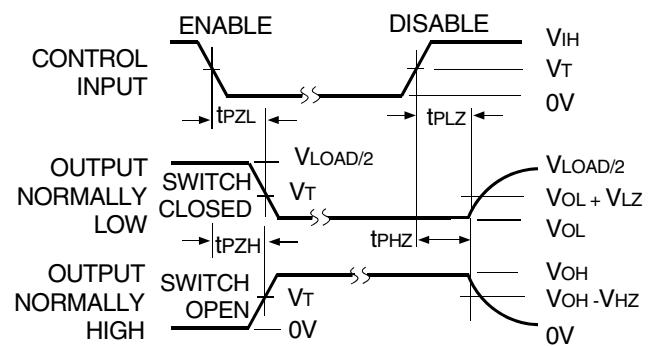
1. Pulse Generator for All Pulses: Rate  $\leq 10\text{MHz}$ ;  $t_f \leq 2.5\text{ns}$ ;  $t_r \leq 2.5\text{ns}$ .
2. Pulse Generator for All Pulses: Rate  $\leq 10\text{MHz}$ ;  $t_f \leq 2\text{ns}$ ;  $t_r \leq 2.5\text{ns}$ .

## SWITCH POSITION

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

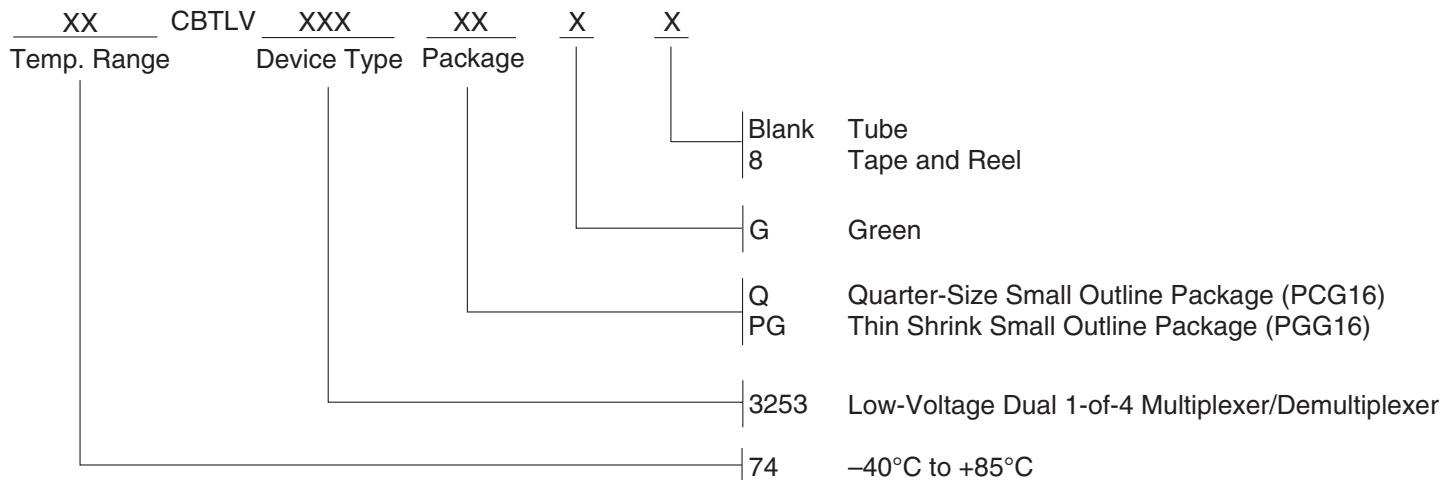


Propagation Delay



Enable and Disable Times

## ORDERING INFORMATION



## Orderable Part Information

Speed (ns)	Orderable Part ID	Pkg. Code	Pkg. Type	Temp. Grade
	74CBTLV3253PGG	PGG16	TSSOP	I
	74CBTLV3253PGG8	PGG16	TSSOP	I
	74CBTLV3253QG	PCG16	QSOP	I
	74CBTLV3253QG8	PCG16	QSOP	I

## Datasheet Document History

12/18/2014	Pg. 5	Updated the ordering information by removing the "IDT" notation, non RoHS part and by 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.

## IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES ("RENESAS") PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD-PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers who are designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only to develop an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third-party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising from your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Disclaimer Rev.1.01)

### Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

### Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit [www.renesas.com/contact-us/](http://www.renesas.com/contact-us/).