



**THE DATASHEET OF  
QS3384PAG8**



**FEATURES:**

- Enhanced N channel FET with no inherent diode to Vcc
- 5Ω bidirectional switches connect inputs to outputs
- Zero propagation delay, zero added ground bounce
- Undershoot clamp diodes on all switch and control inputs
- Two enables control five bits each
- Available in QSOP and TSSOP packages

**APPLICATIONS:**

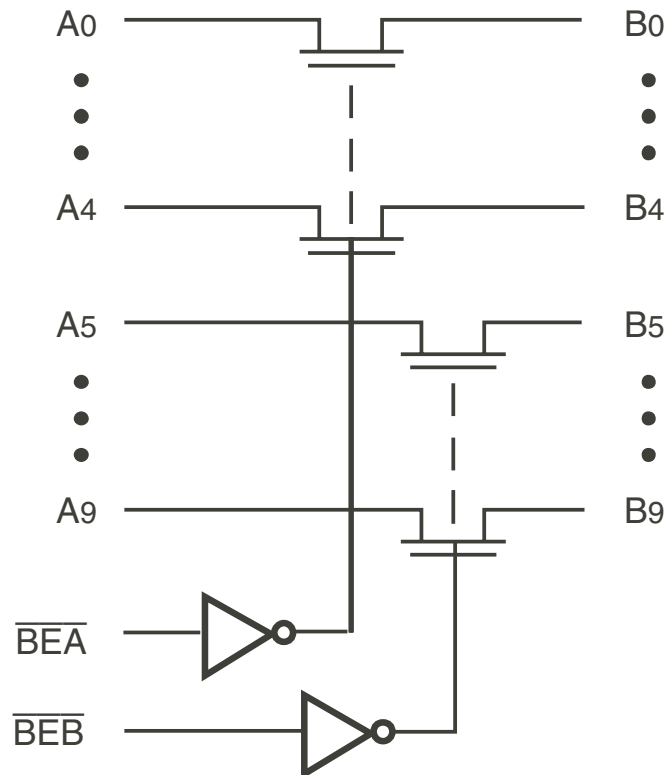
- Hot-swapping, hot-docking
- Voltage translation (5V to 3.3V)
- Power Conservation
- Capacitance reduction and isolation
- Bus Isolation
- Clock Gating

**DESCRIPTION:**

The QS3384 provides a set of ten high-speed CMOS, TTL-compatible bus switches. The low ON resistance of QS3384 allows inputs to be connected to outputs without adding propagation delay and without generating additional ground bounce. Two banks of 5 switches are controlled by independent Bus Enable ( $\overline{BE}$ ) signals.

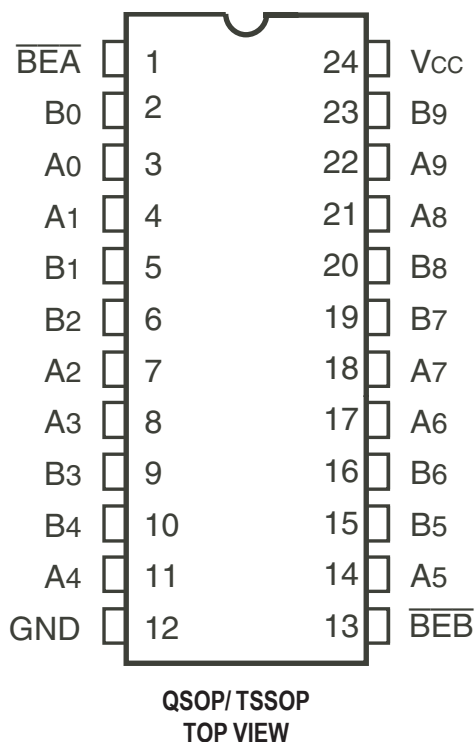
The QS3384 is characterized for operation at -40°C to +85°C.

**FUNCTIONAL BLOCK DIAGRAM**



The IDT logo is a registered trademark of Integrated Device Technology, Inc.

## PIN CONFIGURATION



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

Symbol	Description	Max	Unit
VTERM <sup>(2)</sup>	Supply Voltage to Ground	-0.5 to +7	V
VTERM <sup>(3)</sup>	DC Switch Voltage V <sub>s</sub>	-0.5 to +7	V
VTERM <sup>(3)</sup>	DC Input Voltage V <sub>IN</sub>	-0.5 to +7	V
VAC	AC Input Voltage (pulse width ≤20ns)	-3	V
I <sub>OUT</sub>	DC Output Current	120	mA
P <sub>MAX</sub>	Maximum Power Dissipation (T <sub>A</sub> = 85°C)	0.5	W
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C

### NOTES:

- 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.
- V<sub>CC</sub> terminals.
- All terminals except V<sub>CC</sub>.

## CAPACITANCE (T<sub>A</sub> = +25°C, f = 1MHz, V<sub>IN</sub> = 0V, V<sub>OUT</sub> = 0V)

Pins	Typ.	Max. <sup>(1)</sup>	Unit
Control Inputs	3	5	pF
Quickswitch Channels (Switch OFF)	5	7	pF

### NOTE:

- This parameter is guaranteed but not production tested.

## PIN DESCRIPTION

Pin Names	I/O	Description
A <sub>0</sub> - A <sub>9</sub>	I/O	Bus A
B <sub>0</sub> - B <sub>9</sub>	I/O	Bus B
$\overline{\text{BEA}}$ , $\overline{\text{BEB}}$	I	Bus Switch Enable

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

$\overline{\text{BEA}}$	$\overline{\text{BEB}}$	B <sub>0</sub> - A <sub>4</sub>	B <sub>5</sub> - B <sub>9</sub>	Function
H	H	Hi-Z	Hi-Z	Disconnect
L	H	A <sub>0</sub> - A <sub>4</sub>	Hi-Z	Connect
H	L	Hi-Z	A <sub>5</sub> - A <sub>9</sub>	Connect
L	L	A <sub>0</sub> - A <sub>4</sub>	A <sub>5</sub> - A <sub>9</sub>	Connect

### NOTE:

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

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

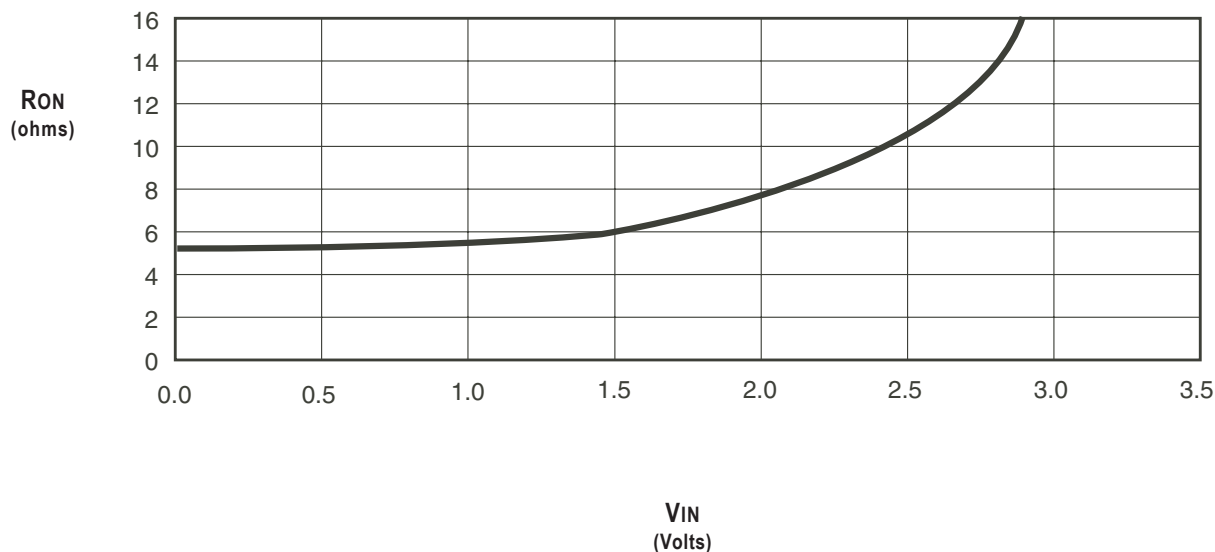
Industrial:  $T_A = -40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ ,  $V_{CC} = 5\text{V} \pm 5\%$

Symbol	Parameter	Test Conditions	Min.	Typ. <sup>(1)</sup>	Max.	Unit
$V_{IH}$	Input HIGH Voltage	Guaranteed Logic HIGH for Control Pins	2	—	—	V
$V_{IL}$	Input LOW Voltage	Guaranteed Logic LOW for Control Pins	—	—	0.8	V
$I_{IN}$	Input Leakage Current (Control Inputs)	$0\text{V} \leq V_{IN} \leq V_{CC}$	—	$\pm 0.01$	$\pm 1$	$\mu\text{A}$
$I_{OZ}$	Off-State Current (Hi-Z)	$0\text{V} \leq V_{OUT} \leq V_{CC}$ , Switches OFF	—	$\pm 0.01$	$\pm 1$	$\mu\text{A}$
RON	Switch ON Resistance	$V_{CC} = \text{Min.}$ , $V_{IN} = 0\text{V}$ , $I_{ON} = 30\text{mA}$	—	5	7	$\Omega$
		$V_{CC} = \text{Min.}$ , $V_{IN} = 2.4\text{V}$ , $I_{ON} = 15\text{mA}$	—	10	15	
VP	Pass Voltage <sup>(2)</sup>	$V_{IN} = V_{CC} = 5\text{V}$ , $I_{OUT} = -5\mu\text{A}$	3.7	4	4.2	V

**NOTES:**

1. Typical values are at  $V_{CC} = 5\text{V}$  and  $T_A = 25^{\circ}\text{C}$ .
2. Pass voltage is guaranteed but not production tested.

### TYPICAL ON RESISTANCE vs VIN AT VCC = 5V



## POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Max.	Unit
I <sub>CCQ</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = Max., V <sub>IN</sub> = GND or V <sub>CC</sub> , f = 0	1.5	mA
ΔI <sub>CC</sub>	Power Supply Current per Input HIGH <sup>(2)</sup>	V <sub>CC</sub> = Max., V <sub>IN</sub> = 3.4V, f = 0	2.5	mA
I <sub>CCD</sub>	Dynamic Power Supply Current per MHz <sup>(3)</sup>	V <sub>CC</sub> = Max., A and B Pins Open, Control Inputs Toggling @ 50% Duty Cycle	0.25	mA/MHz

### NOTES:

- For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
- Per TTL-driven input (V<sub>IN</sub> = 3.4V, control inputs only). A and B pins do not contribute to ΔI<sub>CC</sub>.
- This current applies to the control inputs only and represents the current required to switch internal capacitance at the specified frequency. The A and B inputs generate no significant AC or DC currents as they transition. This parameter is guaranteed but not production tested.

## SWITCHING CHARACTERISTICS OVER OPERATING RANGE

T<sub>A</sub> = -40°C to +85°C, V<sub>CC</sub> = 5V ± 5%

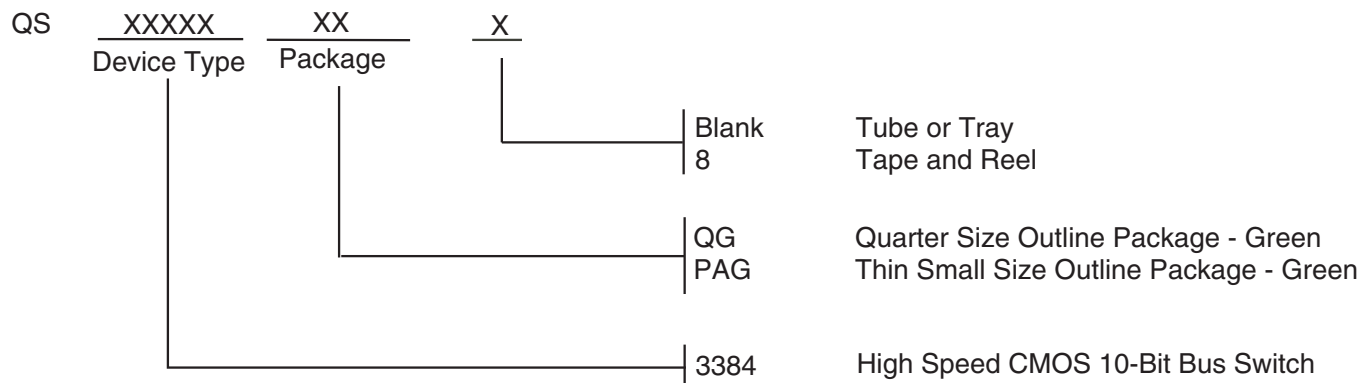
C<sub>LOAD</sub> = 50pF, R<sub>LOAD</sub> = 500Ω unless otherwise noted.

Symbol	Parameter	Min. <sup>(1)</sup>	Typ.	Max.	Unit
t <sub>PLH</sub> t <sub>PHL</sub>	Data Propagation Delay <sup>(2)</sup> A <sub>x</sub> to B <sub>x</sub> , B <sub>x</sub> to A <sub>x</sub>	—	—	0.25 <sup>(3)</sup>	ns
t <sub>PZL</sub> t <sub>PZH</sub>	Switch Turn-On Delay BE <sub>A</sub> , BE <sub>B</sub> to A <sub>x</sub> , B <sub>x</sub>	1.5	—	6.5	ns
t <sub>PLZ</sub> t <sub>PHZ</sub>	Switch Turn-Off Delay <sup>(2)</sup> BE <sub>A</sub> , BE <sub>B</sub> to A <sub>x</sub> , B <sub>x</sub>	1.5	—	5.5	ns

### NOTES:

- Minimums are guaranteed but not production tested.
- This parameter is guaranteed but not production tested.
- The bus switch contributes no propagation 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 of 0.25ns at C<sub>L</sub> = 50pF. Since this time constant is much smaller than the rise and fall times of typical driving signals, it adds very little propagation delay to the system. Propagation 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.

## ORDERING INFORMATION



## Datasheet Document History

10/25/11

Pg. 5

Updated ordering information to include tube or tray and tape & reel. Removed non green package version and updated the ordering information by removing the "IDT" notation.

## 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 Jan 2024)

### 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/).

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- ⊖ [View QS3384PAG8 on WIN SOURCE](#)
- ⊖ [Renesas Electronics America](#) Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

- ✓ Global Sourcing Solution
- ✓ Obsolete Management
- ✓ Cost Control Management
- ✓ Shortage Management
- ✓ Alternative Solution
- ✓ Excess Inventory Management