**FEATURES:**
- Bus switches provide zero delay paths
- Low switch on-resistance: 7Ω
- TTL-compatible input and output levels
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- Available in QSOP and TSSOP packages

**DESCRIPTION:**
The FST6800 belongs to IDT’s family of Bus switches. Bus switch devices perform the function of connecting or isolating two ports without providing any inherent current sink or source capability. Thus they generate little or no noise of their own while providing a low resistance path for an external driver. These devices connect input and output ports through an n-channel FET. When the gate-to-source junction of this FET is adequately forward-biased, the device conducts and the resistance between input and output ports is small. Without adequate bias on the gate-to-source junction of the FET, the FET is turned off, therefore with no Vcc applied, the device has hot insertion capability.

The low on-resistance and simplicity of the connection between input and output ports reduces the delay in this path to close to zero.

The FST6800 provides a 10-Bit TTL-compatible interface. The ON pin serves as the enable pin. When ON is high, A and B ports are isolated and B outputs are precharged to the BIASV voltage, through the equivalent of a 10KΩ resistor.
## Absolute Maximum Ratings (1)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTERM(2)</td>
<td>Terminal Voltage with Respect to GND</td>
<td>–0.5 to +7</td>
<td>V</td>
</tr>
<tr>
<td>TSTG</td>
<td>Storage Temperature</td>
<td>–65 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>IOUT</td>
<td>Maximum Continuous Channel Current</td>
<td>128</td>
<td>mA</td>
</tr>
</tbody>
</table>

### Notes:
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.
2. Vcc, Control, and Switch terminals.

## Capacitance (1)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions(2)</th>
<th>Typ.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIN</td>
<td>Control Input Capacitance</td>
<td>Switch Off</td>
<td>4 pF</td>
<td></td>
</tr>
<tr>
<td>CIO</td>
<td>Switch Input/Output Capacitance</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
1. Capacitance is characterized but not tested.
2. \( T_a = 25°C, f = 1\text{MHz}, V_{\text{IN}} = 0\text{V}, V_{\text{OUT}} = 0\text{V}. \)

## DC Electrical Characteristics over Operating Range

Following Conditions Apply Unless Otherwise Specified:
Industrial: \( T_a = -40°C \) to +85°C, \( V_{\text{CC}} = 5.0V \pm 5\% \), BIASV = 0 to VCC

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions(1)</th>
<th>Min.</th>
<th>Typ.(2)</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIH</td>
<td>Input HIGH Voltage</td>
<td>Guaranteed Logic HIGH for Control Inputs</td>
<td>2</td>
<td>—</td>
<td>—</td>
<td>V</td>
</tr>
<tr>
<td>VIL</td>
<td>Input LOW Voltage</td>
<td>Guaranteed Logic LOW for Control Inputs</td>
<td>—</td>
<td>—</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td>IIL</td>
<td>Input HIGH Current</td>
<td>( V_{\text{CC}} = \text{Max.} )</td>
<td>—</td>
<td>—</td>
<td>( \pm 1 )</td>
<td>( \mu\text{A} )</td>
</tr>
<tr>
<td>IO</td>
<td>Input LOW Current</td>
<td>( V_{\text{IL}} = \text{GND} )</td>
<td>—</td>
<td>—</td>
<td>( \pm 1 )</td>
<td>( \mu\text{A} )</td>
</tr>
<tr>
<td>I0</td>
<td>Precharge Output Current</td>
<td>( V_{\text{CC}} = \text{Min., BIASV = 2.4V, VO = 0V} )</td>
<td>0.15</td>
<td>—</td>
<td>—</td>
<td>mA</td>
</tr>
<tr>
<td>IOZH</td>
<td>High Impedance Output Current</td>
<td>( V_{\text{CC}} = \text{Max.} )</td>
<td>—</td>
<td>—</td>
<td>( \pm 1 )</td>
<td>( \mu\text{A} )</td>
</tr>
<tr>
<td>IOZL</td>
<td>(3-State Output Pins)</td>
<td>( V_{\text{O}} = \text{GND} )</td>
<td>—</td>
<td>—</td>
<td>( \pm 1 )</td>
<td>( \mu\text{A} )</td>
</tr>
<tr>
<td>IOS</td>
<td>Short Circuit Current</td>
<td>( V_{\text{CC}} = \text{Min., VO = GND(3)} )</td>
<td>—</td>
<td>300</td>
<td>—</td>
<td>mA</td>
</tr>
<tr>
<td>VIK</td>
<td>Clamp Diode Voltage</td>
<td>( V_{\text{CC}} = \text{Min., IIN = –1.8mA} )</td>
<td>—</td>
<td>—</td>
<td>–0.7</td>
<td>–1.2</td>
</tr>
<tr>
<td>RON</td>
<td>Switch On Resistance(4)</td>
<td>( V_{\text{CC}} = 4.75V, V_{\text{IN}} = 0.0V I_{\text{ON}} = 64mA )</td>
<td>—</td>
<td>—</td>
<td>7</td>
<td>( \Omega )</td>
</tr>
<tr>
<td>Ioff</td>
<td>Input/Output Power Off Leakage</td>
<td>( V_{\text{CC}} = 0V, V_{\text{IN}} ) or ( V_{\text{O}} \leq 4.5V )</td>
<td>—</td>
<td>—</td>
<td>1</td>
<td>( \mu\text{A} )</td>
</tr>
<tr>
<td>ICC</td>
<td>Quiescent Power Supply Current</td>
<td>( V_{\text{CC}} = \text{Max., VI = GND or VCC} )</td>
<td>—</td>
<td>0.1</td>
<td>3</td>
<td>( \mu\text{A} )</td>
</tr>
</tbody>
</table>

### Notes:
1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at \( V_{\text{CC}} = 5.0V \), \( +25°C \) ambient.
3. Not more than one output should be tested at one time. Duration of the test should not exceed one second.
4. Measured by voltage drop between ports at indicated current through the switch.
### POWER SUPPLY CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter Description</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ΔICC</td>
<td>Quiescent Power Supply Current TTL Inputs HIGH</td>
<td>VCC = Max., VIN = 3.4V</td>
<td>—</td>
<td>0.5</td>
<td>1.5</td>
<td>mA</td>
</tr>
<tr>
<td>ICCD</td>
<td>Dynamic Power Supply Current</td>
<td>VCC = Max., Outputs Open, Enable Pin Toggling 50% Duty Cycle</td>
<td>VIN = VCC</td>
<td>30</td>
<td>40</td>
<td>μA/ MHz</td>
</tr>
<tr>
<td>IC</td>
<td>Total Power Supply Current</td>
<td>VCC = Max., Outputs Open, Enable Pin Toggling (Ten Switches Toggling) fi = 10MHz 50% Duty Cycle</td>
<td>VIN = 3.4V</td>
<td>3</td>
<td>4</td>
<td>mA</td>
</tr>
</tbody>
</table>

**NOTES:**
1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at VCC = 5.0V, +25°C ambient.
3. Per TTL driven input (VIN = 3.4V). All other inputs at VCC or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. Values for these conditions are examples of ICC formula. These limits are guaranteed but not tested.
6. IC = IQUESCENT + INPUTS + IDYNAMIC
   - IC = ICC + ΔICC DHNT + ICCD (N)
   - ICC = Quiescent Current
   - ΔICC = Power Supply Current for a TTL High Input (VIN = 3.4V)
   - DH = Duty Cycle for TTL Inputs High
   - NT = Number of TTL Inputs at DH
   - ICCD = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
   - fCP = Clock Frequency for Register Devices (zero for non-register devices)
   - fI = Input Frequency
   - N = Number of Switches Toggling at fI
   All currents are in milliamps and all frequencies are in megahertz

### SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Industrial: TA = -40°C to +85°C, VCC = 5.0V ± 5%

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Condition</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPLH</td>
<td>Data Propagation Delay</td>
<td>Cl = 50pF RL = 500Ω</td>
<td>—</td>
<td>—</td>
<td>0.25</td>
<td>ns</td>
</tr>
<tr>
<td>tPHL</td>
<td>Ax, Bx to Ax, Bx</td>
<td></td>
<td></td>
<td>—</td>
<td>6.5</td>
<td>ns</td>
</tr>
<tr>
<td>tPHZ</td>
<td>Switch Turn On Delay</td>
<td></td>
<td>1.5</td>
<td>—</td>
<td>6.5</td>
<td>ns</td>
</tr>
<tr>
<td>tPLZ</td>
<td>Switch Turn Off Delay</td>
<td></td>
<td>1.5</td>
<td>—</td>
<td>5.5</td>
<td>ns</td>
</tr>
</tbody>
</table>

**NOTES:**
1. See test circuit and waveforms.
2. Minimum limits guaranteed but not tested.
3. This parameter is guaranteed by design but not tested.
4. 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 0.25 ns for 50 pF load. Since this time is constant and much smaller than the rise/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.
**TEST CIRCUITS AND WAVEFORMS**

**SWITCH POSITION**

<table>
<thead>
<tr>
<th>Test</th>
<th>Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Drain</td>
<td>Closed</td>
</tr>
<tr>
<td>Disable Low</td>
<td></td>
</tr>
<tr>
<td>Enable Low</td>
<td></td>
</tr>
<tr>
<td>All Other Tests</td>
<td>Open</td>
</tr>
</tbody>
</table>

**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. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
2. Pulse Generator for All Pulses: Rate \(\leq 1.0\)MHz; \(t_F \leq 2.5\)ns; \(t_R \leq 2.5\)ns.

**TEST CIRCUITS FOR ALL OUTPUTS**

- **Same Phase Input Transition**
  - Data Input: 3V, 1.5V, 0V
  - Output: 3V, 1.5V, 0V

- **Opposite Phase Input Transition**
  - Data Input: 3V, 1.5V, 0V
  - Output: 3V, 1.5V, 0V

**PROPAGATION DELAY**

- **Enable and Disable Times**
  - Control Input: 3V, 1.5V, 0V
  - Output Normally LOW: 3.5V, 1.5V
  - Output Normally HIGH: 1.5V, 0V

- **Enable and Disable Times**
  - Control Input: 3V, 1.5V, 0V
  - Output Normally LOW: 3.5V, 1.5V
  - Output Normally HIGH: 1.5V, 0V
ORDERING INFORMATION

<table>
<thead>
<tr>
<th>XX</th>
<th>FST</th>
<th>XX</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp. Range</td>
<td>Device Type</td>
<td>Package</td>
<td>Blank</td>
<td>Tube or Tray</td>
</tr>
<tr>
<td>QG</td>
<td>PGG</td>
<td>8</td>
<td>Quarter-size Small Outline Package - Green</td>
<td></td>
</tr>
<tr>
<td>6800</td>
<td>10-Bit Bus Switch with Precharged Outputs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td></td>
<td>–40°C to +85°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Blank 8

Tape or Reel

Tube or Tray

Quarter-size Small Outline Package - Green

Thin Shrink Small Outline Package - Green

10-Bit Bus Switch with Precharged Outputs

–40°C to +85°C
Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.

2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.

3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.

4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.

5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.

   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

   Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user’s manual or other Renesas Electronics document.

6. When using Renesas Electronics products, refer to the latest product information (data sheets, user’s manuals, application notes, "General Notes for Handling and Using Semiconductor Devices* in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.

7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.

8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.

9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations and shall administer them as required or administered by the governments of any countries asserting jurisdiction over the parties or transactions.

10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.

11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.

12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

Corporate Headquarters

TOYOSU FORESIA, 3-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

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/

Trademarks

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

© 2020 Renesas Electronics Corporation. All rights reserved.