



HIGH-SPEED CMOS BUS INTERFACE 10-BIT BUFFER

IDTQS74FCT2827AT/BT/CT

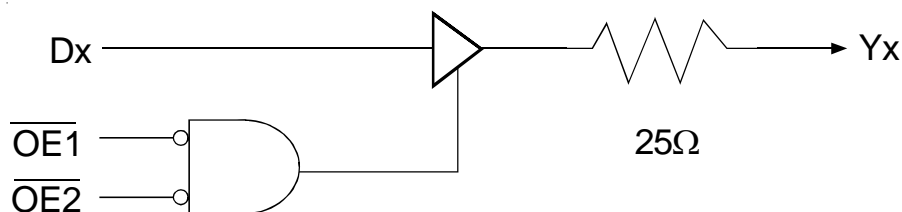
FEATURES:

- CMOS power levels: <7.5mW static
- Undershoot clamp diodes on all outputs
- True TTL input and output compatibility
- Ground bounce controlled outputs
- Reduced output swing of 0 to 3.5V
- Built-in 25Ω series resistor outputs reduce reflection and other system noise
- A,B, and C speed grades with 4.4ns t_{PD} for C
- I_{OL} = 12mA
- Available in SOIC and QSOP packages

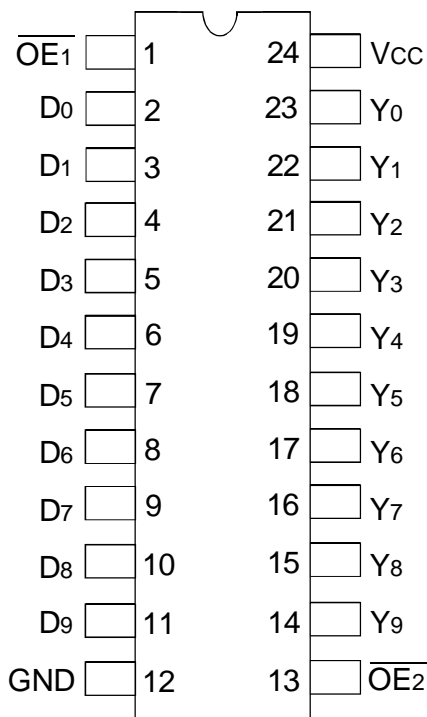
DESCRIPTION:

The IDTQS74FCT2827T is a 10-bit buffer with 3-state outputs and a 25Ω resistor, useful for driving transmission lines and reducing system noise. The 2827T series parts can replace the 827T series to reduce noise in an existing design. All inputs have clamp diodes for undershoot noise suppression. All outputs have ground bounce suppression. Outputs will not load an active bus when V_{CC} is removed from the device.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SOIC/ QSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Description | Max | Unit |
|-----------------|--|-------------|------|
| VTERM | Terminal Voltage with Respect to GND | -0.5 to +7 | V |
| TSTG | Storage Temperature | -65 to +150 | °C |
| IOUT | DC Output Current Max Sink Current/Pin | 120 | mA |
| I _{IK} | Input Diode Current, V _{IN} < 0 | -20 | mA |
| I _{OK} | Output Diode Current, V _{OUT} < 0 | -50 | mA |

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.

CAPACITANCE (T_A = +25°C, F = 1.0MHz)

| Symbol | Parameter ⁽¹⁾ | Conditions | Typ. | Max. | Unit |
|------------------|--------------------------|-----------------------|------|------|------|
| C _{IN} | Input Capacitance | V _{IN} = 0V | 8 | — | pF |
| C _{OUT} | Output Capacitance | V _{OUT} = 0V | 8 | — | pF |

NOTE:

1. This parameter is measured at characterization but not tested.

PIN DESCRIPTION

| Pin Names | I/O | Description |
|-------------------|-----|---|
| \overline{OE}_x | I | When both are LOW, the outputs are enabled. When either one or both are HIGH, the outputs are HIGH Z. |
| D _x | I | 10-Bit Data Inputs |
| \overline{Y}_x | O | 10-Bit Data Outputs |

FUNCTION TABLE⁽¹⁾

| Inputs | | | Outputs | Function |
|-------------------|-------------------|----------------|----------------|-------------|
| \overline{OE}_1 | \overline{OE}_2 | D _x | Y _x | |
| L | L | L | L | Transparent |
| L | L | H | H | Transparent |
| H | X | X | Z | High-Z |
| X | H | X | Z | High-Z |

NOTE:

1. H = HIGH
L = LOW
X = Don't Care
Z = High-Impedance

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 5.0\text{V} \pm 5\%$

| Symbol | Parameter | Test Conditions | | Min. | Typ. ⁽¹⁾ | Max. | Unit |
|-----------------|---------------------------------|---|-----------------------------|------|---------------------|---------|---------------|
| V_{IH} | Input HIGH Level | Guaranteed Logic HIGH Level | | 2 | — | — | V |
| V_{IL} | Input LOW Level | Guaranteed Logic LOW Level | | — | — | 0.8 | V |
| ΔV_T | Input Hysteresis | $V_{TLH} - V_{THL}$ for all inputs | | — | 0.2 | — | V |
| I_{IH} | Input HIGH Current | $V_{CC} = \text{Max.}$ | $0 \leq V_{IN} \leq V_{CC}$ | — | — | ± 5 | μA |
| I_{IL} | Input LOW Current | | | | | | |
| I_{OZ} | Off-State Output Current (Hi-Z) | $V_{CC} = \text{Max}$ | $0 \leq V_{IN} \leq V_{CC}$ | — | — | ± 5 | μA |
| I_{OR} | Current Drive | $V_{CC} = \text{Max.}, V_{OUT} = 2.0\text{V}^{(2)}$ | | 50 | — | — | mA |
| V_{IC} | Input Clamp Voltage | $V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}, T_A = 25^\circ\text{C}^{(2)}$ | | — | -0.7 | -1.2 | V |
| V_{OH} | Output HIGH Voltage | $V_{CC} = \text{Min.}$ | $I_{OH} = -15\text{mA}$ | 2.4 | — | — | V |
| V_{OL} | Output LOW Voltage | $V_{CC} = \text{Min.}$ | $I_{OL} = 12\text{mA}$ | — | — | 0.5 | V |
| $R_{OUT}^{(3)}$ | Output Resistance | $V_{CC} = \text{Min.}$ | $I_{OH} = 12\text{mA}$ | 18 | 25 | 40 | Ω |

NOTES:

- Typical values are at $V_{CC} = 5.0\text{V}$, $T_A = 25^\circ\text{C}$.
- This parameter is measured at characterization but not tested.
- R_{OUT} changed on March 8, 2002. See rear page for more information.

POWER SUPPLY CHARACTERISTICS

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 5.0\text{V} \pm 5\%$

| Symbol | Parameter | Test Conditions ⁽¹⁾ | Min. | Max. | Unit |
|-----------------|--|---|------|------|--------|
| I_{CC} | Quiescent Power Supply Current | $V_{CC} = \text{Max.}$ freq = 0 $0\text{V} \leq V_{IN} \leq 0.2\text{V}$ or $V_{CC} - 0.2\text{V} \leq V_{IN} \leq V_{CC}$ | — | 1.5 | mA |
| ΔI_{CC} | Supply Current per Input TTL Inputs HIGH | $V_{CC} = \text{Max.}$ $V_{IN} = 3.4\text{V}^{(2)}$ freq = 0 | — | 2 | mA |
| I_{CCD} | Supply Current per Input per MHz | $V_{CC} = \text{Max.}$ Outputs Open and Enabled One Bit Toggling 50% Duty Cycle Other inputs at GND or $V_{CC}^{(3,4)}$ | — | 0.25 | mA/MHz |

NOTES:

- For conditions shown as Min. or Max., use the appropriate values specified under DC Electrical Characteristics.
- Per TLL driven input ($V_{IN} = 3.4\text{V}$).
- For flip-flops, I_{CCD} is measured by switching one of the data input pins so that the output changes every clock cycle. This is a measurement of device power consumption only and does not include power to drive load capacitance or tester capacitance.
- $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$
 I_{CC} = Quiescent Current
 ΔI_{CC} = Power Supply Current for a TTL High Input ($V_{IN} = 3.4\text{V}$)
 D_H = Duty Cycle for TTL Inputs High
 N_T = Number of TTL Inputs at D_H
 I_{CCD} = Dynamic Current Caused by an Output Transition Pair (HLH or LHL)
 f_{CP} = Clock Frequency for Register Devices (Zero for Non-Register Devices)
 f_i = Input Frequency
 N_i = Number of Inputs at f_i
 All currents are in milliamperes and all frequencies are in megahertz.

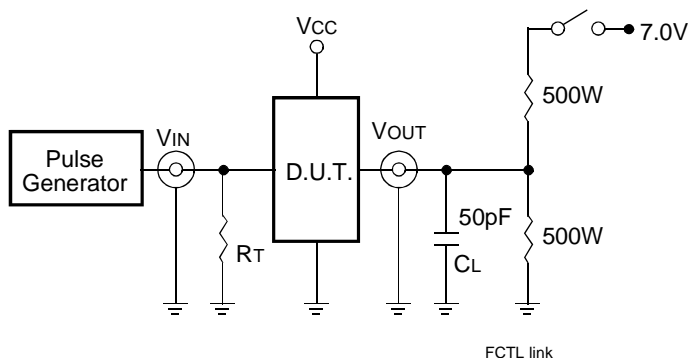
SWITCHING CHARACTERISTICS OVER OPERATING RANGE⁽¹⁾

| Symbol | Parameter ⁽²⁾ | FCT2827AT | | FCT2827BT | | FCT2827CT | | Unit |
|--------------|---|-----------|------|-----------|------|-----------|------|------|
| | | Min. | Max. | Min. | Max. | Min. | Max. | |
| tPLH tPHL | Propagation Delay Dx to \bar{Y}_x | — | 8 | — | 5 | — | 4.4 | ns |
| tPLH tPHL | Propagation Delay Dx to \bar{Y}_x ^(2,3) | — | 17 | — | — | — | — | ns |
| tPZH tPZL | Output Enable Time $\bar{O}\bar{E}_x$ to \bar{Y}_x | — | 12 | — | 8 | — | 7 | ns |
| tPZH tPZL | Output Enable Time $\bar{O}\bar{E}_x$ to \bar{Y}_x ^(2,3) | — | 23 | — | — | — | — | ns |
| tPHZ tPLZ | Output Disable Time $\bar{O}\bar{E}_x$ to \bar{Y}_x ^(2,4) | — | 9 | — | 6 | — | 5.7 | ns |
| tPHZ tPLZ | Output Disable Time $\bar{O}\bar{E}_x$ to \bar{Y}_x ⁽²⁾ | — | 10 | — | 7 | — | 6 | ns |

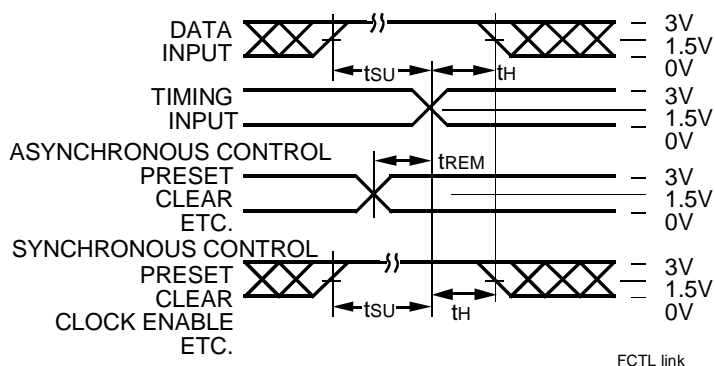
NOTES:

1. C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.
2. This parameter is guaranteed by design but not tested.
3. C_{LOAD} = 300pF.
4. C_{LOAD} = 5pF.

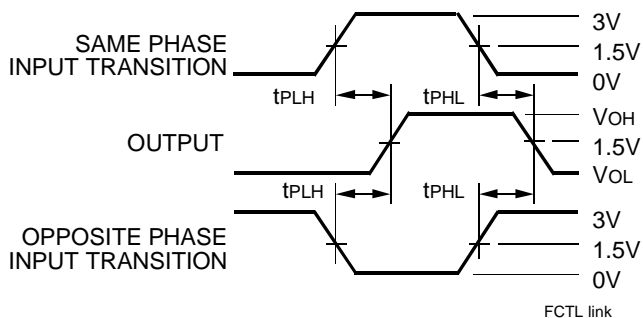
TEST CIRCUITS AND WAVEFORMS



Test Circuits for All Outputs



Set-Up, Hold, and Release Times



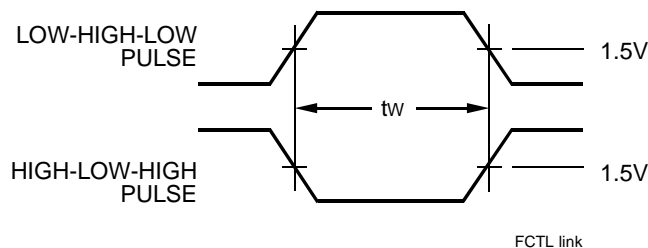
Propagation Delay

SWITCH POSITION

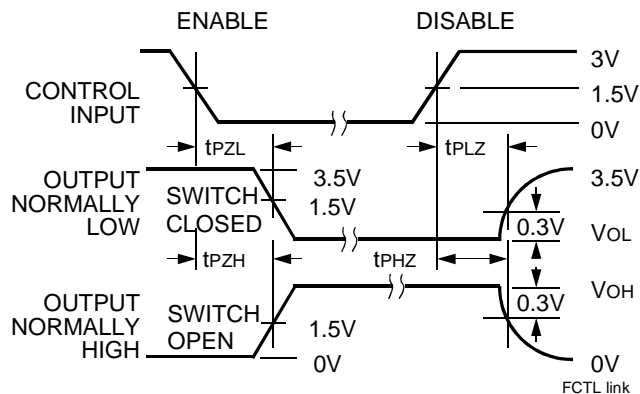
| Test | Switch |
|---|--------|
| Open Drain Disable Low Enable Low | Closed |
| All Other Tests | Open |

DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.
RT = Termination resistance: should be equal to Zout of the Pulse Generator.



Pulse Width

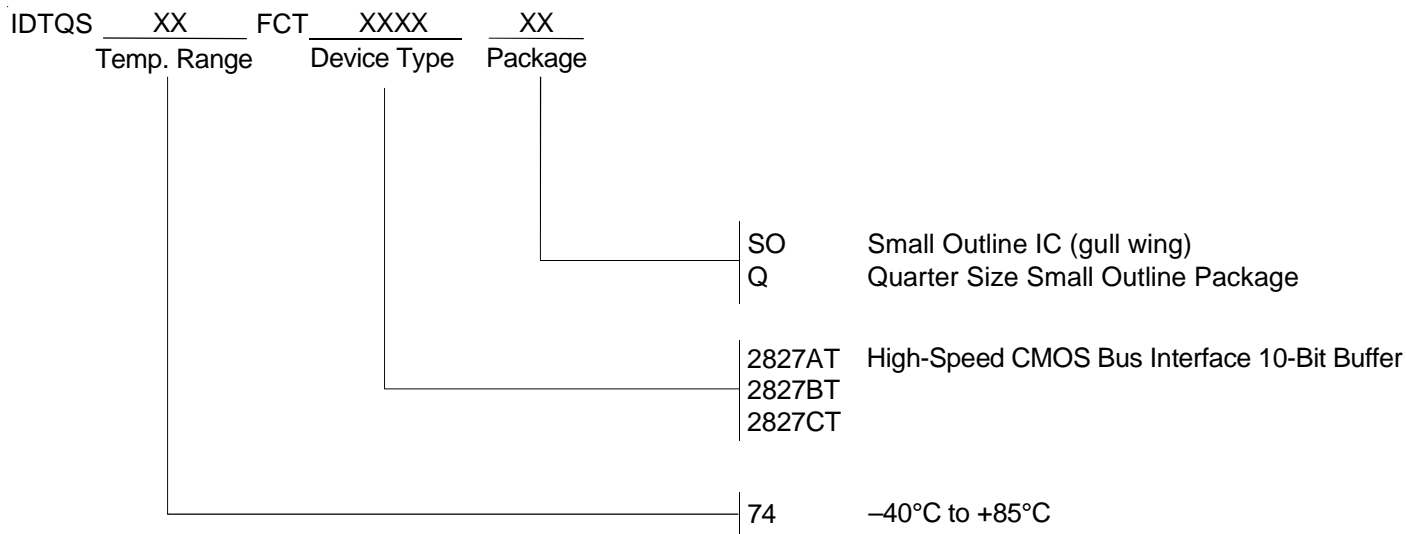


Enable and Disable Times

NOTES:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
2. Pulse Generator for All Pulses: Rate \leq 1.0MHz; $t_f \leq$ 2.5ns; $t_r \leq$ 2.5ns.

ORDERING INFORMATION



As per PCN L0201-02, the Output Resistance (R_{OUT}) specifications have changed as of March 8, 2002. The original specifications were:

| Parameter | Description | Min. | Typ. | Max. | Unit |
|------------------|--|------|------|------|------|
| R _{OUT} | V _{CC} = Min, I _{OL} = -15mA | 20 | 28 | 40 | Ω |



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