QUALITY SEMICONDUCTOR, INC.

# High-Speed CMOS Bus Interface 10-Bit Buffers

**QS54/74FCT827T**
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## FEATURES/BENEFITS

- Pin and function compatible to the 74F827/8 74FCT827/8 and 74FCT827T/8T
- Industrial temperature –40°C to 85°C
- CMOS power levels: <7.5mW static
- Available in DIP, SOIC, QSOP, ZIP, HQSOP
- Undershoot clamp diodes on all inputs
- TTL-compatible input and output levels
- Ground bounce controlled outputs
- Reduced output swing of 0-3.5V
- Military product compliant to MIL-STD-883, Class B

**FCT-T 827T, 828T**

- JEDEC-FCT spec compatible
- A, B, and C speed grades with 4.4ns $t_{PD}$ for C
- $I_{OL}$ = 48mA Ind., 32mA Mil.

**FCT-T 2827T, 2828T**

- 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 Ind.

## DESCRIPTION

The QSFCT827T/828T and QSFCT2827T/2828T are 10-bit buffers with three-state outputs that are ideal for driving high-capacitance loads as in memory address and data buses. The 2827/8 are 25Ω resistor output versions useful for driving transmission lines and reducing system noise. The 2827/8 series parts can replace the 827/8 series to reduce noise in an existing design. All inputs have clamp diodes for undershoot noise suppression. All outputs have ground bounce suppression (see QSI Application Note AN-001), and outputs will not load an active bus when $V_{CC}$ is removed from the device.

## Figure 1. Functional Block Diagram

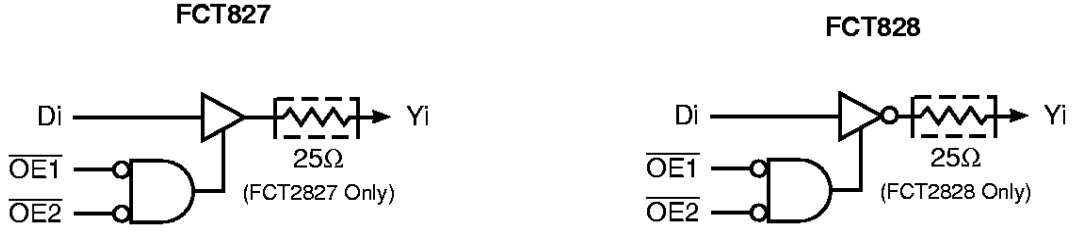
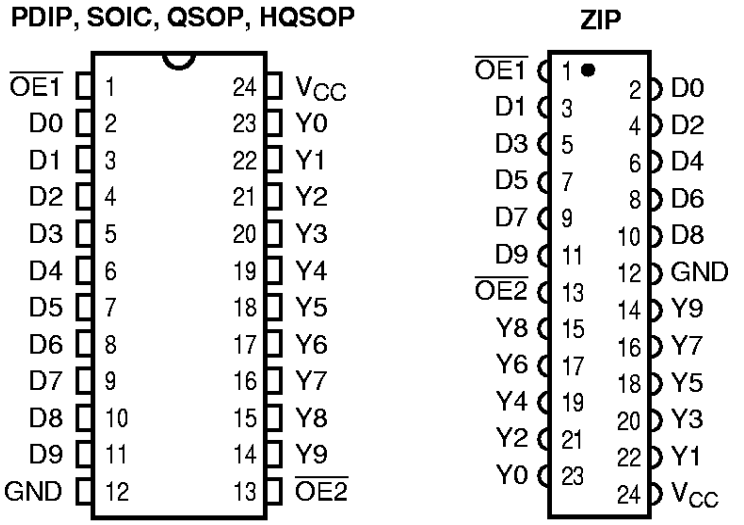


**Figure 2. Pin Configurations** (All Pins Top View)




## Table 1. Pin Description

| Name | I/O | Description |
|---|---|---|
| D9-D0 | I | Data Inputs |
| Y9-Y0 | O | Data Outputs |
| $\overline{OEi}$ | I | Output Enables |

## Table 2. Function Table

| Inputs | | | Outputs | | |
|---|---|---|---|---|---|
| | | | 827, 2827 | 828, 2828 | |
| $\overline{OE1}$ | $\overline{OE2}$ | Di | Yi | $\overline{Yi}$ | Function |
| L | L | L | L | H | Enabled |
| L | L | H | H | L | Enabled |
| H | — | — | Hi-Z | Hi-Z | High Impedance |
| — | H | — | Hi-Z | Hi-Z | High Impedance |

## Table 3. Absolute Maximum Ratings

| | |
|---|---|
| Supply Voltage to Ground | –0.5V to 7.0V |
| DC Output Voltage $V_{OUT}$ | –0.5V to 7.0V |
| DC Input Voltage $V_{IN}$ | –0.5V to 7.0V |
| AC Input Voltage (for a pulse width ≤ 20ns) | –3.0V |
| DC Input Diode Current with $V_{IN} < 0$ | –20mA |
| DC Output Diode Current with $V_{OUT} < 0$ | –50mA |
| DC Output Current Max. Sink Current/Pin | 120mA |
| Maximum Power Dissipation | 0.5 watts |
| $T_{STG}$ Storage Temperature | –65° to 150°C |

**Note:** Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to QSI devices that result in functional or reliability type failures.

## Table 4. Capacitance(1)

$T_A$ = 25°C, f = 1MHz, $V_{IN}$ = 0V, $V_{OUT}$ = 0V

| Pins(2) | SOIC | QSOP | PDIP | ZIP | Unit |
|---|---|---|---|---|---|
| 1-11, 13-23 | 8 | 8 | 9 | 10 | pF |

**Notes:**
1. Capacitance is characterized but not tested.
2. Pin reference for 24-pin package.

## Table 5. Power Supply Characteristics

| Symbol | Parameter | Test Conditions(1) | Min | Max | Unit |
|---|---|---|---|---|---|
| $I_{CC}$ | Quiescent Power Supply Current | $V_{CC}$ = Max., freq = 0<br>0V ≤ $V_{IN}$ ≤ 0.2V or $V_{CC}$-0.2V ≤ $V_{IN}$ ≤ $V_{CC}$ | — | 1.5 | mA |
| $\Delta I_{CC}$ | Supply Current per Input @ TTL HIGH | $V_{CC}$ = Max., $V_{IN}$ = 3.4V, freq = 0(2) | — | 2.0 | mA |
| $Q_{CCD}$ | Supply Current per Input per MHz | $V_{CC}$ = Max., Outputs open and enabled<br>One bit toggling @ 50% duty cycle<br>Other inputs at GND or $V_{CC}$(3,4) | — | 0.25 | mA/ MHz |

**Notes:**
1. For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
2. Per TTL driven input ($V_{IN}$ = 3.4V).
3. For flip-flops, $Q_{CCD}$ 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. This parameter is guaranteed by design but not tested.
4. $I_C$ can be computed using the above parameters as explained in the Technical Overview section.

## Table 6. DC Electrical Characteristics Over Operating Range

Industrial $T_A$ = –40°C to 85°C, $V_{CC}$ = 5.0V ±5% Military $T_A$ = –55°C to 125°C, $V_{CC}$ = 5.0V ±10%

| Symbol | Parameter | Test Conditions | Min | Typ(1) | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{IH}$ | Input HIGH Voltage | Logic HIGH for All Inputs | 2.0 | — | — | V |
| $V_{IL}$ | Input LOW Voltage | Logic LOW for All Inputs | — | — | 0.8 | V |
| $\Delta V_T$ | Input Hysteresis | $V_{TLH} - V_{THL}$ for All Inputs | — | 0.2 | — | V |
| $\lvert I_{IH} \rvert$<br>$\lvert I_{IL} \rvert$ | Input Current<br>Input HIGH or LOW | $V_{CC}$ = Max., $0 \le V_{IN} < V_{CC}$ | — | — | 5 | µA |
| $\lvert I_{OZ} \rvert$ | Off-State Output Current (Hi-Z) | $V_{CC}$ = Max., $0 \le V_{IN} \le V_{CC}$ | — | — | 5 | µA |
| $I_{OS}$ | Short Circuit Current (FCTXXX) | $V_{CC}$ = Max., $V_{OUT}$ = GND(2,3) | –60 | — | — | mA |
| $I_{OR}$ | Current Drive (FCT2XXX) | $V_{CC}$ = Max., $V_{OUT}$ = 2.0V(3) | 50 | — | — | mA |
| $V_{IC}$ | Input Clamp Voltage | $V_{CC}$ = Min., $I_{IN}$ = –18mA, $T_A$ = 25°C(3) | — | –0.7 | –1.2 | V |
| $V_{OH}$ | Output HIGH Voltage | $V_{CC}$ = Min. $I_{OH}$ = –12mA (MIL)<br>$I_{OH}$ = –15mA (IND) | 2.4<br>2.4 | —<br>— | —<br>— | V |
| $V_{OL}$ | Output LOW Voltage (FCTXXX) | $V_{CC}$ = Min. $I_{OL}$ = 32mA (MIL)<br>$I_{OL}$ = 48mA (IND) | —<br>— | —<br>— | 0.50<br>0.50 | V |
| $V_{OL}$ | Output LOW Voltage (FCT2XXX- 25Ω) | $V_{CC}$ = Min. $I_{OL}$ = 12mA (MIL)<br>$I_{OL}$ = 12mA (IND) | —<br>— | —<br>— | 0.50<br>0.50 | V |
| $R_{OUT}$ | Output Resistance (FCT2XXX- 25Ω) | $V_{CC}$ = Min. $I_{OL}$ = 12mA (MIL)<br>$I_{OL}$ = 12mA (IND) | —<br>20 | 25<br>28 | —<br>40 | Ω |

**Notes**:
1. Typical values indicate $V_{CC}$ = 5.0V and $T_A$ = 25°C.
2. Not more than one output should be shorted and the duration is ≤1 second.
3. These parameters are guaranteed by design but not tested.

## Table 7. Switching Characteristics Over Operating Range

Industrial $T_A$ = –40°C to 85°C, $V_{CC}$ = 5.0V ±5% Military $T_A$ = –55°C to 125°C, $V_{CC}$ = 5.0V ±10%
$C_{LOAD}$ = 50pF, $R_{LOAD}$ = 500Ω unless otherwise noted.

| Symbol | Description | | 827A 828A 2827A 2828A | | 827B 828B 2827B 2828B | | 827C 828C 2827C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Max | Min | Max | Min | Max | |
| $t_{PHL}$ | Propagation Delay | Ind | — | 8.0 | — | 5.0 | — | 4.4 | ns |
| $t_{PLH}$ | Di to Yi, 827 | Mil | — | 9.0 | — | 6.5 | — | 5.0 | |
| $t_{PHL}$ | Propagation Delay(1,2) | Ind | — | 15 | — | 13 | — | 10 | ns |
| $t_{PLH}$ | Di to Yi, 827 | Mil | — | 17 | — | 14 | — | 11 | |
| $t_{PHL}$ | Propagation Delay | Ind | — | 8.0 | — | 5.0 | — | 4.4 | ns |
| $t_{PLH}$ | Di to Yi, 2827 | Mil | — | 9.0 | — | 6.5 | — | 5.0 | |
| $t_{PHL}$ | Propagation Delay(1,2) | Ind | — | 17 | — | — | — | — | ns |
| $t_{PLH}$ | Di to Yi, 2827 | Mil | — | 18 | — | — | — | — | |
| $t_{PHL}$ | Propagation Delay | Ind | — | 7.5 | — | 5.0 | — | 4.4 | ns |
| $t_{PLH}$ | Di to Yi, 828 | Mil | — | 9.5 | — | 6.5 | — | 5.0 | |
| $t_{PHL}$ | Propagation Delay(1,2) | Ind | — | 14 | — | 13 | — | 10 | ns |
| $t_{PLH}$ | Di to Yi, 828 | Mil | — | 16 | — | 14 | — | 11 | |
| $t_{PHL}$ | Propagation Delay | Ind | — | 7.5 | — | 5.0 | — | — | ns |
| $t_{PLH}$ | Di to Yi, 2828 | Mil | — | 9.5 | — | 6.5 | — | — | |
| $t_{PHL}$ | Propagation Delay(1,2) | Ind | — | 17 | — | — | — | — | ns |
| $t_{PLH}$ | Di to Yi, 2828 | Mil | — | 18 | — | — | — | — | |
| $t_{PZH}$ | Output Enable Time | Ind | — | 12 | — | 8.0 | — | 7.0 | ns |
| $t_{PZL}$ | $\overline{OE}$ to Yi, 827/8 | Mil | — | 13 | — | 9.0 | — | 8.0 | |
| $t_{PZH}$ | Output Enable Time | Ind | — | 23 | — | 15 | — | 14 | ns |
| $t_{PZL}$ | $\overline{OE}$ to Yi, 827/8(1,2) | Mil | — | 25 | — | 16 | — | 15 | |
| $t_{PZH}$ | Output Enable Time | Ind | — | 12 | — | 8.0 | — | 7.0 | ns |
| $t_{PZL}$ | $\overline{OE}$ to Yi, 2827/8 | Mil | — | 13 | — | 9.0 | — | 8.0 | |
| $t_{PZH}$ | Output Enable Time | Ind | — | 23 | — | — | — | — | ns |
| $t_{PZL}$ | $\overline{OE}$ to Yi, 2827/8(1,2) | Mil | — | 25 | — | — | — | — | |
| $t_{PHZ}$ | Output Disable Time | Ind | — | 9.0 | — | 6.0 | — | 5.7 | ns |
| $t_{PLZ}$ | $\overline{OE}$ to Yi(1,3) | Mil | — | 10 | — | 7.0 | — | 6.7 | |
| $t_{PHZ}$ | Output Disable Time(1) | Ind | — | 10 | — | 7.0 | — | 6.0 | ns |
| $t_{PLZ}$ | $\overline{OE}$ to Yi | Mil | — | 10 | — | 8.0 | — | 7.0 | |

**Notes:**
1. This parameter is guaranteed by design but not tested.
2. $C_{LOAD}$ = 300pF.
3. $C_{LOAD}$ = 5pF.