



# High-Speed CMOS Bus Interface 10-Bit Buffers

QS54/74FCT827T  
QS54/74FCT828T  
QS54/74FCT2827T  
QS54/74FCT2828T

## FEATURES/BENEFITS

- Pin and function compatible to the 74F827/8 74FCT827/8 and 74FCT827T/8T
- Industrial temperature  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$
- CMOS power levels:  $<7.5\text{mW}$  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
- $I_{OL} = 48\text{mA}$  Ind., 32mA Mil.

### FCT-T 2827T, 2828T

- Built-in  $25\Omega$  series resistor outputs reduce reflection and other system noise
- A, B, and C speed grades with 4.4ns  $t_{PD}$  for C
- $I_{OL} = 12\text{mA}$  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  $25\Omega$  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

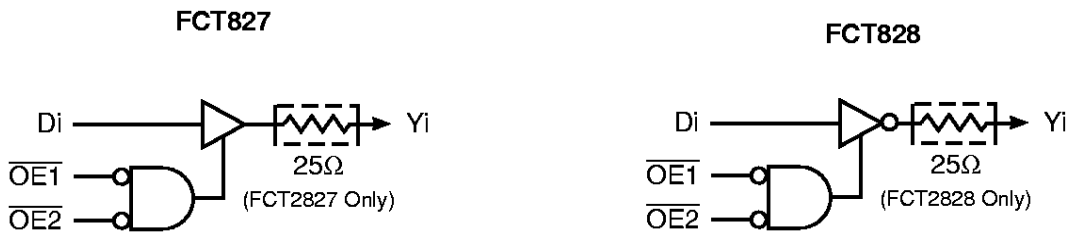


Figure 2. Pin Configurations (All Pins Top View)

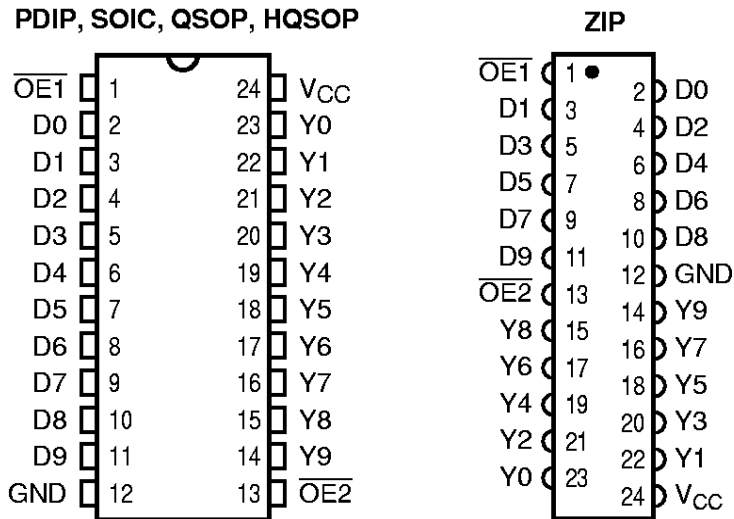


Table 1. Pin Description

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		Function
			827, 2827	828, 2828	
$\overline{OE1}$	$\overline{OE2}$	$D_i$	$Y_i$	$\overline{Y}_i$	
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 $\leq 20$ ns).....	-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<sup>(1)</sup>**

$T_A = 25^\circ\text{C}$ ,  $f = 1\text{MHz}$ ,  $V_{IN} = 0\text{V}$ ,  $V_{OUT} = 0\text{V}$

Pins <sup>(2)</sup>	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 <sup>(1)</sup>	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
$\Delta I_{CC}$	Supply Current per Input @ TTL HIGH	$V_{CC} = \text{Max.}$ , $V_{IN} = 3.4\text{V}$ , freq = 0 <sup>(2)</sup>	—	2.0	mA
$Q_{CCD}$	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 $V_{CC}$ <sup>(3,4)</sup>	—	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 ( $V_{IN} = 3.4\text{V}$ ).
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.

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**Table 6. DC Electrical Characteristics Over Operating Range**

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

Military  $T_A = -55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions	Min	Typ <sup>(1)</sup>	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
$ I_{IH} $ $ I_{IL} $	Input Current Input HIGH or LOW	$V_{CC} = \text{Max.}, 0 \leq V_{IN} < V_{CC}$	—	—	5	$\mu\text{A}$
$ I_{OZ} $	Off-State Output Current (Hi-Z)	$V_{CC} = \text{Max.}, 0 \leq V_{IN} \leq V_{CC}$	—	—	5	$\mu\text{A}$
$I_{OS}$	Short Circuit Current (FCTXXX)	$V_{CC} = \text{Max.}, V_{OUT} = \text{GND}^{(2,3)}$	-60	—	—	mA
$I_{OR}$	Current Drive (FCT2XXX)	$V_{CC} = \text{Max.}, V_{OUT} = 2.0\text{V}^{(3)}$	50	—	—	mA
$V_{IC}$	Input Clamp Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}, T_A = 25^{\circ}\text{C}^{(3)}$	—	-0.7	-1.2	V
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}$ $I_{OH} = -12\text{mA}$ (MIL) $I_{OH} = -15\text{mA}$ (IND)	2.4 2.4	— —	— —	V
$V_{OL}$	Output LOW Voltage (FCTXXX)	$V_{CC} = \text{Min.}$ $I_{OL} = 32\text{mA}$ (MIL) $I_{OL} = 48\text{mA}$ (IND)	— —	— —	0.50 0.50	V
$V_{OL}$	Output LOW Voltage (FCT2XXX- 25 $\Omega$ )	$V_{CC} = \text{Min.}$ $I_{OL} = 12\text{mA}$ (MIL) $I_{OL} = 12\text{mA}$ (IND)	— —	— —	0.50 0.50	V
$R_{OUT}$	Output Resistance (FCT2XXX- 25 $\Omega$ )	$V_{CC} = \text{Min.}$ $I_{OL} = 12\text{mA}$ (MIL) $I_{OL} = 12\text{mA}$ (IND)	— 20	25 28	— 40	$\Omega$

**Notes:**

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

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**Table 7. Switching Characteristics Over Operating Range**

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

Military  $T_A = -55^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$

$C_{LOAD} = 50\text{pF}$ ,  $R_{LOAD} = 500\Omega$  unless otherwise noted.

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

**Notes:**

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