QUALITY SEMICONDUCTOR, INC.

High-Speed CMOS 16-Bit Register with Clock Enable in QVSOP™

QS74FCT2X377T

FEATURES/BENEFITS

- Function compatible to the 74F377, 74FCT377 and 74ABT377
- CMOS power levels: <15mW static
- Undershoot clamp diodes on all inputs
- Fastest CMOS logic family available
- JEDEC-FCT spec compatible
- TTL-compatible input and output levels
- Ground bounce controlled outputs
- Reduced output swing of 0-3.5V
- Available in 40-pin 0.4mm pitch QVSOP (Q2)
- A and C speed grades with 5.2ns t_{PD} for C
- I_{OL} = 48mA Ind.

DESCRIPTION

The QS74FCT2X377 is a high-speed 16-bit CMOS TTL-compatible register. It includes a buffered clock, a buffered output drive, and a synchronous clock enable. Data is stored in the register on the rising edge of the clock if the clock enable input is active. The high-output current I_{OL} and I_{OH} drive high capacitance loads. 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.

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Figure 1. Functional Block Diagram

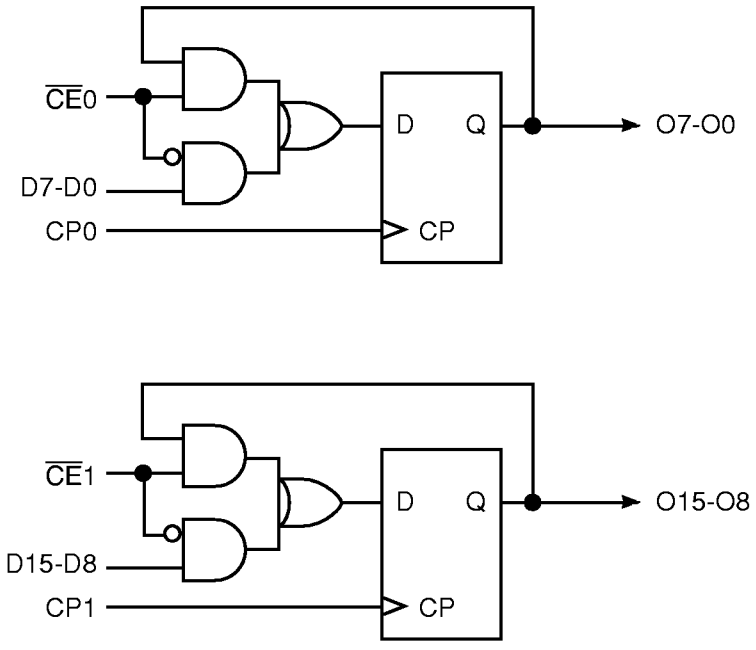
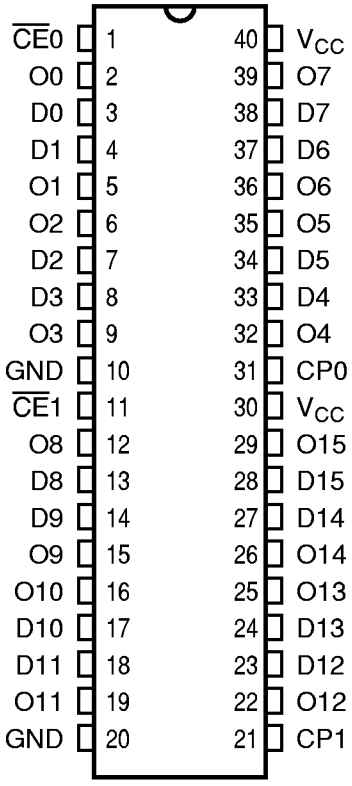


Figure 2. Pin Configuration (All Pins Top View)

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Table 1. Pin Description

Name	I/O	Description
Di	I	Data Inputs
Oi	O	Data Outputs
CPi	I	Clock Input
$\overline{CE}i$	I	Clock Enable

Table 2. Function Table

Inputs $\overline{CE}i$	Inputs CPi	Inputs Di	Internal Q Value	Outputs Oi	Function
H	X	X	NC	NC	Hold Value
L	↑	L	L	L	Load Input Data
L	↑	H	H	H	

Note:
$\overline{CE}0$, CP0 control bits 7-0
$\overline{CE}1$, CP1 control bits 15-8

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	1.2 watts
T_{STG} Storage Temperature	–65° to +150°C

Note: Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to this device resulting in functional or reliability type failures.

Table 4. Capacitance

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

Pins	Typ	Unit
1-9, 11-19, 21, 31	4	pF
22-29, 32-39	6	pF

Note: Capacitance is characterized but not tested.

Table 5. DC Electrical Characteristics Over Operating Range

Industrial: T_A = –40°C to 85°C, V_{CC} = 5.0V ±5%

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
ΔV_T	Input Hysteresis	$V_{TLH} - V_{THL}$ for All Inputs(3)	—	0.2	—	V
$\lvert I_{IH} \rvert$ $\lvert I_{IL} \rvert$	Input Current Input HIGH or LOW	V_{CC} = Max., 0 ≤ V_{IN} < V_{CC}	—	—	5	µA
$\lvert I_{OZ} \rvert$	Off-State Output Current (Hi-Z)	V_{CC} = Max., 0 ≤ V_{IN} ≤ V_{CC}	—	—	5	µA
I_{OS}	Short Circuit Current FCT2X374	V_{CC} = Max., V_{OUT} = GND(2,3)	–60	—	–225	mA
I_{OR}	Current Drive FCT2X2374 (25Ω)	V_{CC} = Max., V_{OUT} = 2.0V	50	—	—	mA
V_{IC}	Input Clamp Voltage	V_{CC} = Min., I_{IN} = –18mA(3)	—	–0.7	–1.2	V
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = –15mA	2.4	—	—	V
V_{OL}	Output LOW Voltage FCT2X374	V_{CC} = Min., I_{OL} = 64mA	—	—	0.55	V
V_{OL}	Output LOW Voltage FCT2X2374 (25Ω)	V_{CC} = Min., I_{OL} = 12mA	—	—	0.50	V
R_{OUT}	Output Resistance FCT2X2374 (25Ω)	V_{CC} = Min., I_{OL} = 12mA	20	28	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.

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Table 6. Power Supply Characteristics

Symbol	Parameter	Test Conditions[1]	Min	Max	Unit
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max., Freq = 0 0V ≤ V_{IN} ≤ 0.2V or V_{CC}-0.2V ≤ V_{IN} ≤ V_{CC}	—	3.0	mA
ΔI_{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 One Bit Toggling @ 50% Duty Cycle 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.

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Table 7. Switching Characteristics Over Operating Range

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

Symbol	Description	2X374A 2X2374A		2X374C 2X2374C		Unit
		Min	Max	Min	Max	
t_{PHL} t_{PLH}	Propagation Delay[1] CP to Oi	2.0	6.5	2.0	5.2	ns
t_{PZH} t_{PZL}	Output Enable Time[1] FCT2X374	1.5	6.5	1.5	5.5	ns
t_{PZH} t_{PZL}	Output Enable Time[1] FCT2X2374	1.5	6.5	1.5	6.2	ns
t_{PHZ} t_{PLZ}	Output Disable Time[2]	1.5	5.5	1.5	5.0	ns
t_S	Data Setup Time	2.0	—	1.5	—	ns
t_H	Data Hold Time	1.5	—	1.0	—	ns
t_W	Clock Pulse Width[2] HIGH or LOW	5.0	—	4.0	—	ns

Notes:
1. Minimums guaranteed but not tested. See Test Circuit and Waveforms.
2. This parameter is guaranteed but not tested.