



# High Speed CMOS 16-Bit Latch in QVSOP™

QS74FCT2X373T  
QS74FCT2X2373T

## FEATURES/BENEFITS

- 16-bit Function compatible to the 74F373 74ABT373 and 74FCT373T
- CMOS power levels: <15 mW static
- Available in 40-pin QVSOP
- TTL-compatible input and output levels
- Ground bounce controlled outputs
- Reduced output swing of 0-3.5V
- Undershoot clamp diodes on all inputs

### FCT-T 2X373T

- JEDEC-FCT spec compatible
- Fastest CMOS logic family available
- A and C speed grades; 4.2 ns  $t_{PD}$  for C
- $I_{OL} = 64$  mA

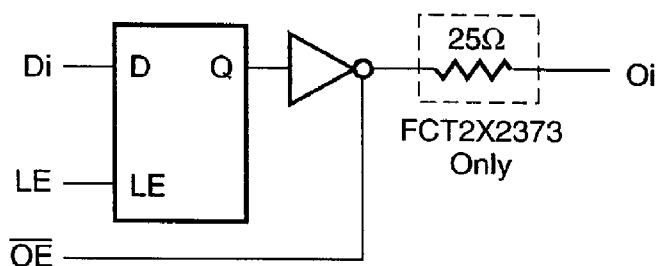
### FCT-T 2X2373T (Advance Information)

- Built-in 25Ω series resistor outputs reduce reflection and other system noise
- A and C speed grades; 4.2 ns  $t_{PD}$  for C
- $I_{OL} = 12$  mA

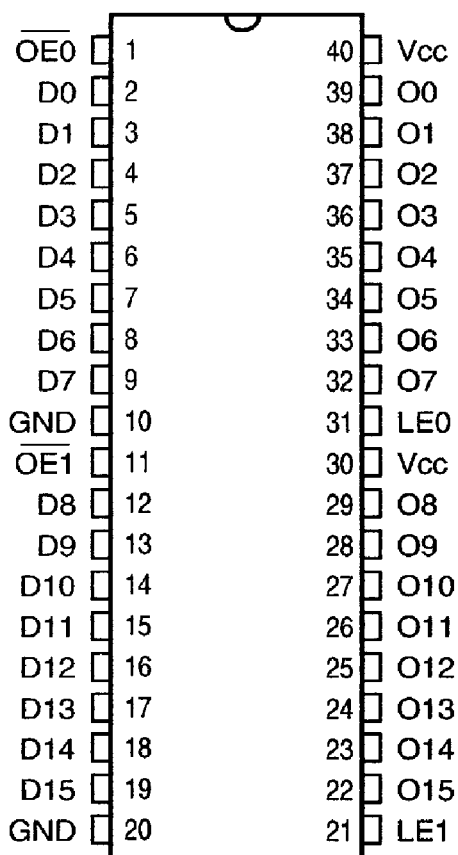
## DESCRIPTION

The FCT2X373T and FCT2X2373T are 16-bit transparent latches with three-state outputs that are useful for bus-oriented applications. The Output Enable ( $\overline{OE}$ ) and Latch Enable (LE) inputs are designed to operate as two 8-bit latches or one 16-bit latch. The FCT2X2373T is a 25Ω resistor output version useful for driving transmission lines and reducing system noise. 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.

## FUNCTIONAL BLOCK DIAGRAM



**PINOUT**



**PIN DESCRIPTION**

Name	I/O	Description
Di	I	Data Inputs
Oi	O	Data Outputs
LE0	I	Latch Enable, O7-O0
LE1	I	Latch Enable, O15-O8
$\overline{OE0}$	I	Output Enable, O7-O0
$\overline{OE1}$	I	Output Enable, O15-O8

**FUNCTION TABLE**

$\overline{OE_n}$	LEn	Di	Internal Q Value	Outputs Oi	Function
H	X	X	X	Hi-Z	Disable Outputs
L	X	X	H	H	Enable Outputs
L	X	X	L	L	
X	H	L	L	X	Pass Input Data
X	H	H	H	X	
X	L	X	Q	X	Hold Prior Data

**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 $V_{IN} < 0$ .....	-20 mA
DC Output Diode Current with $V_{OUT} < 0$ .....	-50 mA
DC Output Current Max. Sink Current/Pin .....	120 mA
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.

**CAPACITANCE**

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

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

**Note:** Capacitance is characterized but not tested.

**DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE**

Commercial  $T_A = 0^\circ\text{C}$  to  $70^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 5\%$

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 <sup>(3)</sup>	—	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 FCT2X373	$V_{CC} = \text{Max.}, V_{OUT} = \text{GND}^{(2,3)}$	-60	—	-225	mA
$I_{OR}$	Current Drive FCT2X2373 (25 $\Omega$ )	$V_{CC} = \text{Max.}, V_{OUT} = 2.0\text{V}$	50	—	—	mA
$V_{IC}$	Input Clamp Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18 \text{ mA}^{(3)}$	—	-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 FCT2X373	$V_{CC} = \text{Min.}, I_{OL} = 64 \text{ mA}$	—	—	0.55	V
$V_{OL}$	Output LOW Voltage FCT2X2373 (25 $\Omega$ )	$V_{CC} = \text{Min.}, I_{OL} = 12 \text{ mA}$	—	—	0.50	V
$R_{OUT}$	Output Resistance FCT2X2373 (25 $\Omega$ )	$V_{CC} = \text{Min.}, I_{OL} = 12 \text{ mA}$	20	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.

**POWER SUPPLY CHARACTERISTICS**

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Min	Max	Unit
I <sub>CC</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = Max., freq = 0 0V ≤ V <sub>IN</sub> ≤ 0.2V or V <sub>CC</sub> -0.2V ≤ V <sub>IN</sub> ≤ V <sub>CC</sub>	—	3.0	mA
ΔI <sub>CC</sub>	Supply Current per Input @ TTL HIGH	V <sub>CC</sub> = Max., V <sub>IN</sub> = 3.4V, freq = 0 <sup>(2)</sup>	—	2.0	mA
Q <sub>CCD</sub>	Supply Current per Input per MHz	V <sub>CC</sub> = Max., Outputs Open and Enabled One Bit Toggling @ 50% Duty Cycle Other Inputs at GND or V <sub>CC</sub> <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<sub>IN</sub> = 3.4V).
3. For flip-flops, Q<sub>CCD</sub> 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 teste capacitance. This parameter is guaranteed by design but not tested.
4. I<sub>C</sub> can be computed using the above parameters as explained in the Technical Overview section.

**SWITCHING CHARACTERISTICS OVER OPERATING RANGE**

Commercial T<sub>A</sub> = 0°C to 70°C, V<sub>CC</sub> = 5.0V ± 5%

C<sub>LOAD</sub> = 50 pF, R<sub>LOAD</sub> = 500Ω unless otherwise noted.

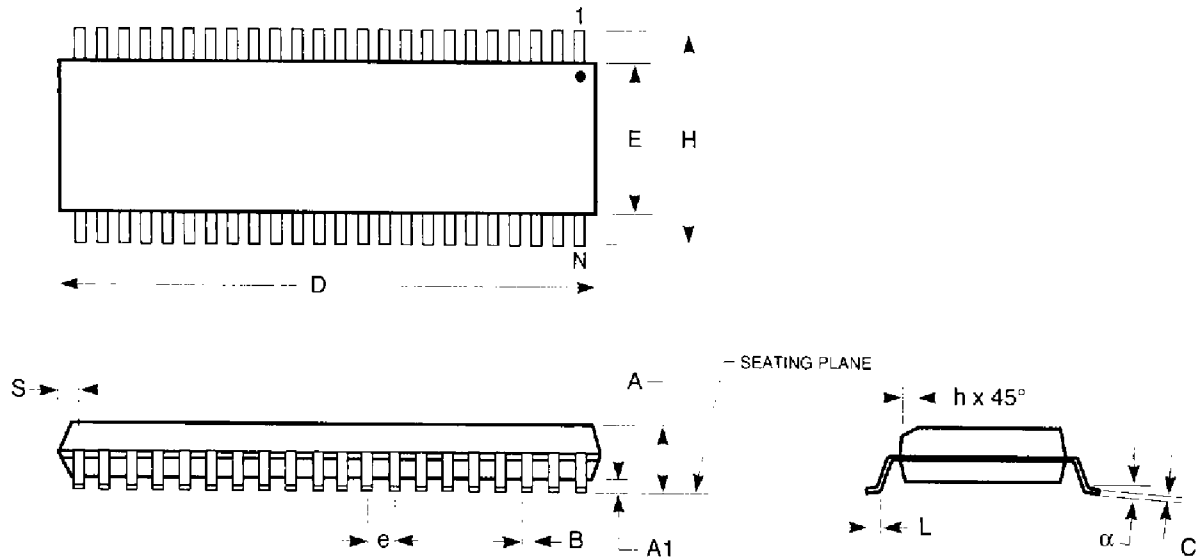
Symbol	Description	2X373A 2X2373A		2X373C 2X2373C		Unit
		Min	Max	Min	Max	
t <sub>PHL</sub> t <sub>PLH</sub>	Propagation Delay <sup>(1)</sup> Di to Oi	1.5	5.2	1.5	4.2	ns
t <sub>PHLE</sub> t <sub>PLHE</sub>	Propagation Delay <sup>(1)</sup> LE HIGH to Oi	2.0	8.5	2.0	5.5	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time <sup>(1)</sup> $\overline{OE}$ to Oi, FCT2X373	1.5	6.5	1.5	5.5	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time <sup>(1)</sup> $\overline{OE}$ to Oi, FCT2X2373	1.5	6.5	1.5	6.2	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time <sup>(2)</sup> $\overline{OE}$ to Oi	1.5	5.5	1.5	5.0	ns
t <sub>s</sub>	Data Setup Time Di to LE, HIGH or LOW	2.0	—	2.0	—	ns
t <sub>h</sub>	Data Hold Time Di to LE, HIGH or LOW	1.5	—	1.5	—	ns
t <sub>w</sub>	Clock Pulse Width <sup>(2)</sup> 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.

## PACKAGING INFORMATION

### 150-MIL QVSOP™ - Package Code Q1/Q2 150-Mil Wide Plastic Small Outline Gull-Wing



JEDEC#	MO-154BB			MO-154AB		
DWG#	PSS-40A (Q2)			PSS-48A (Q1)		
Symbol	Min	Nom	Max	Min	Nom	Max
A	0.059	0.065	0.069	0.059	0.065	0.069
A1	0.004	0.006	0.008	0.004	0.006	0.008
B	0.0067	0.008	0.009	0.0051	0.0063	0.008
C	0.0075	0.008	0.0098	0.0075	0.008	0.0098
D	0.386	0.390	0.394	0.386	0.390	0.394
E	0.150	0.154	0.157	0.150	0.154	0.157
e	0.0197 BSC, 0.5mm			0.0157 BSC, 0.4mm		
H	0.228	0.236	0.244	0.228	0.236	0.244
h	0.010	0.013	0.016	0.010	0.013	0.016
L	0.020	0.024	0.030	0.020	0.024	0.030
N	40			48		
$\alpha$	0°	5°	8°	0°	5°	8°
S	0.006	0.008	0.010	0.012	0.014	0.016

**Notes:**

1. Refer to applicable symbol list.
2. All dimensions are in inches.
3. N is the number of lead positions.
4. Dimensions D and E are to be measured at maximum material condition but do not include mold flash. Allowable mold flash is 0.006 in. per side.
5. Lead coplanarity is 0.003 in. maximum.