

Q

# High Speed CMOS

## 16-Bit Register

### in QVSOP™

QS74FCT2X374T  
QS74FCT2X2374T

## FEATURES/BENEFITS

- 16-bit Function compatible to the 74F374 74ABT374 and 74FCT374T
- CMOS power levels: <15 mW static
- Available in 40-pin QVSOP™ (Q2)
- 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 2X374T

- JEDEC-FCT spec compatible
- Fastest CMOS logic family available
- A and C speed grades; 5.2 ns  $t_{PD}$  for C
- $I_{OL} = 48$  mA

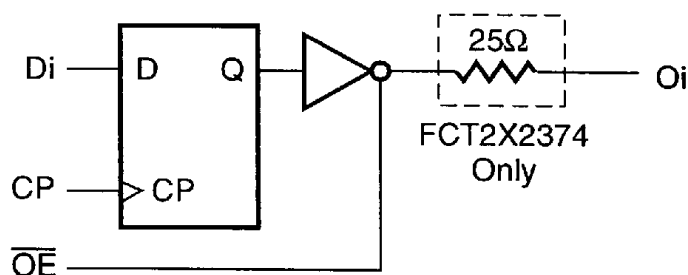
### FCT-T 2X2374T (Advance Information)

- Built-in  $25\Omega$  series resistor outputs reduce reflection and other system noise
- A and C speed grades; 5.2 ns  $t_{PD}$  for C
- $I_{OL} = 12$  mA

## DESCRIPTION

The FCT2X374T and FCT2X2374T are 16-bit registers with three-state outputs that are useful for bus-oriented applications. Output Enable ( $\overline{OE}$ ) inputs enable the selected port for output. The FCT2X2374T is a  $25\Omega$  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



# QS74FCT2X374T, QS74FCT2X2374T PRELIMINARY

## PINOUT

$\overline{OE0}$	1	40	Vcc
D0	2	39	O0
D1	3	38	O1
D2	4	37	O2
D3	5	36	O3
D4	6	35	O4
D5	7	34	O5
D6	8	33	O6
D7	9	32	O7
GND	10	31	CP0
$\overline{OE1}$	11	30	Vcc
D8	12	29	O8
D9	13	28	O9
D10	14	27	O10
D11	15	26	O11
D12	16	25	O12
D13	17	24	O13
D14	18	23	O14
D15	19	22	O15
GND	20	21	CP1

## PIN DESCRIPTION

Name	I/O	Description
Di	I	Data Inputs
Oi	O	Data Outputs
CP0	I/O	Clock Inputs O7-O0
CP1	I/O	Clock Inputs O15-O8
$\overline{OE0}$	I/O	Output Enables O7-O0
$\overline{OE1}$	I/O	Output Enables O15-O8

## FUNCTION TABLE

$\overline{OE_n}$	CPn	Di	Internal Q Value	Outputs	Function
H	X	X	X	Hi-Z	Disable Outputs
L	↑	L	L	L	Load Input Data, Enable Outputs
L	↑	H	H	H	
H	↑	L	L	Hi-Z	Load Input Data, Disable Outputs
H	↑	H	H	Hi-Z	

# QS74FCT2X374T, QS74FCT2X2374T PRELIMINARY

## 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 FCT2X374	$V_{CC} = \text{Max.}$ , $V_{OUT} = \text{GND}^{(2,3)}$	-60	—	-225	mA
$I_{OR}$	Current Drive FCT2X2374 (25 $\Omega$ )	$V_{CC} = \text{Max.}$ , $V_{OUT} = 2.0\text{V}$	50	—	—	mA
$V_{IC}$	Input Clamp Voltage	$V_{CC} = \text{Min.}$ , $I_{IN} = -18$ mA <sup>(3)</sup>	—	-0.7	-1.2	V
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}$ , $I_{OH} = -15$ mA	2.4	—	—	V
$V_{OL}$	Output LOW Voltage FCT2X374	$V_{CC} = \text{Min.}$ , $I_{OL} = 48$ mA	—	—	0.55	V
$V_{OL}$	Output LOW Voltage FCT2X2374 (25 $\Omega$ )	$V_{CC} = \text{Min.}$ , $I_{OL} = 12$ mA	—	—	0.50	V
$R_{OUT}$	Output Resistance FCT2X2374 (25 $\Omega$ )	$V_{CC} = \text{Min.}$ , $I_{OL} = 12$ 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.

# QS74FCT2X374T, QS74FCT2X2374T PRELIMINARY

## 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:

- For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
- Per TTL driven input (V<sub>IN</sub> = 3.4V).
- 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.
- 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.

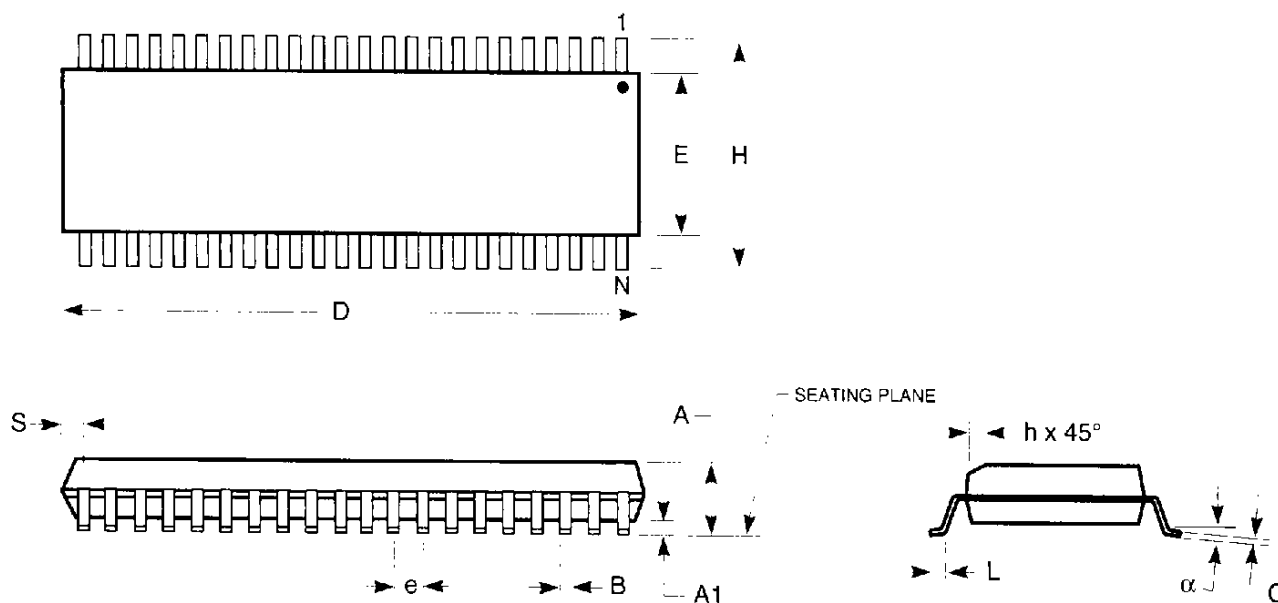
Symbol	Description	2X374A 2X2374A		2X374C 2X2374C		Unit
		Min	Max	Min	Max	
t <sub>PHL</sub> t <sub>PLH</sub>	Propagation Delay <sup>(1)</sup> CP to O <sub>i</sub>	2.0	6.5	2.0	5.2	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time <sup>(1)</sup> FCT2X374	1.5	6.5	1.5	5.5	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time <sup>(1)</sup> FCT2X2374	1.5	6.5	1.5	6.2	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time <sup>(2)</sup>	1.5	5.5	1.5	5.0	ns
t <sub>S</sub>	Data Setup Time	2.0	—	1.5	—	ns
t <sub>H</sub>	Data Hold Time	1.5	—	1.0	—	ns
t <sub>w</sub>	Clock Pulse Width <sup>(2)</sup> HIGH or LOW	5.0	—	4.0	—	ns

### Notes:

- Minimums guaranteed but not tested. See Test Circuit and Waveforms.
- This parameter is guaranteed but not tested.

# PACKAGING INFORMATION

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



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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.