

## Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All recreations are done with the approval of the OCM.

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceed the OCM data sheet.

## Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-35835
  - Class Q Military
  - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
  - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OEM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.



# High Speed CMOS 8-Bit Buffers/Line Drivers

QS54/74FCT240T  
QS54/74FCT241T  
QS54/74FCT244T

QS54/74FCT2240T  
QS54/74FCT2241T  
QS54/74FCT2244T

## FEATURES/BENEFITS

- Pin and function compatible to the 74F240/1/4, 74FCT240/1/4 and 74ABT240/1/4
- CMOS power levels: <7.5 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

### FCT-T 240T, 241T, 244T

- JEDEC-FCT spec compatible
- Fastest CMOS logic family available
- Std. thru D speed grades with 3.8 ns  $t_{PD}$  for D
- $I_{OL} = 64$  mA Com., 48 mA Mil.

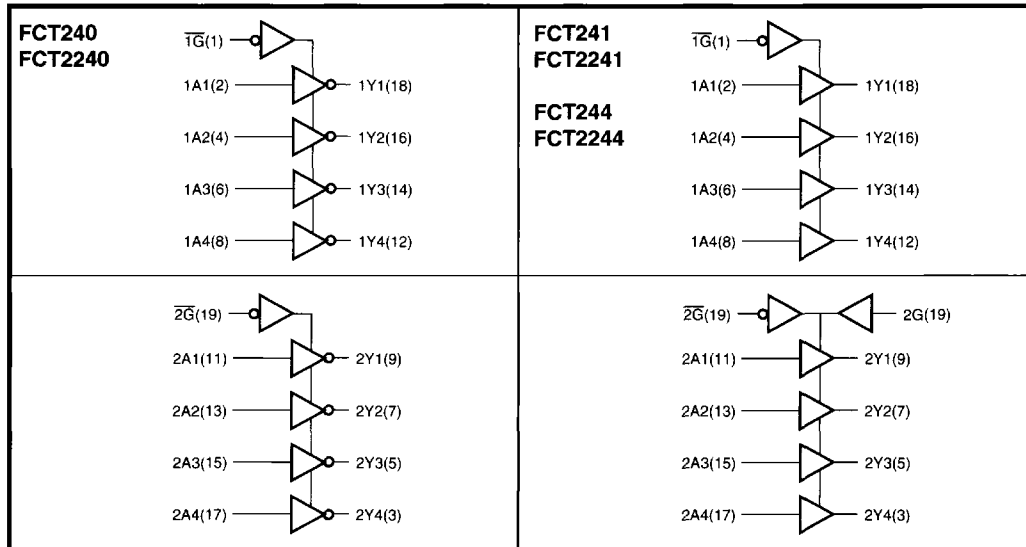
### FCT-T 2240T, 2241T, 2244T

- Built-in 25Ω series resistor outputs reduce reflection and other system noise
- Std. thru D speed grades with 3.8 ns  $t_{PD}$  for D
- $I_{OL} = 12$  mA Com

## DESCRIPTION

The FCT240T, FCT241T and FCT244T are 8-bit buffers/line drivers with three-state outputs that are ideal for driving high-capacitance loads as in memory address and data buses. The FCT2240T, FCT2241T, and FCT2244T are 25Ω resistor output versions useful for driving transmission lines and reducing system noise. The 2240, 2241, 2244 series parts can replace the 240 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.

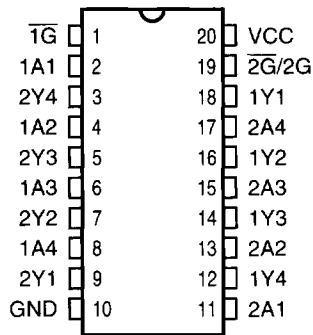
## FUNCTIONAL BLOCK DIAGRAM



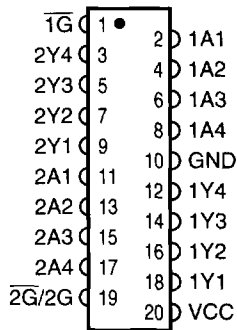
Note that pin 19 is  $\overline{2G}$  on the FCT244 and 2G for the FCT241

**PIN CONFIGURATIONS (All Pins Top View)**

**PDIP, SOIC, QSOP, HQSOP**



**ZIP**



**Note:**

Pin 19 is 2G-bar for the FCT240/244 and is 2G for the FCT241.

**PIN DESCRIPTION**

Name	I/O	Description
xA4-xA0	I	Data Inputs
xY4-xY0	O	Data Outputs - Three State
1G-bar	I	Output Enable
2G	I	Output Enable (FCT241 Only)
2G-bar	I	Output Enable (FCT240/244 Only)

**FUNCTION TABLES**

**FCT240/FCT2240**

1G-bar/2G-bar	Input A	Output Y
H	X	Z
L	L	H
L	H	L

**FCT241/FCT2241**

1G-bar	2G	Input A	Output Y
H	L	X	Z
L	H	L	L
L	H	H	H

**FCT244/FCT2244**

1G-bar/2G-bar	Input A	Output Y
H	X	Z
L	L	L
L	H	H



**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 .....	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.

**CAPACITANCE**

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

Pins	SOIC	QSOP	PDIP	ZIP	Unit
1, 19	4	4	5	7	pF
—	6	6	7	9	pF
2-9,11-18	8	8	9	10	pF

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

**POWER SUPPLY CHARACTERISTICS**

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Min	Max	Unit
$I_{CC}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ , $\text{freq} = 0$ $0\text{V} \leq V_{IN} \leq 0.2\text{V}$ 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	$V_{CC} = \text{Max.}$ , $V_{IN} = 3.4\text{V}$ , $\text{freq} = 0$ <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.

**QSFCT240T, 241T, 244T, 2240T, 2241T, 2244T**

**DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE**

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

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 - 25 $\Omega$ )	$V_{CC} = \text{Min.}, V_{OUT} = 2.0\text{V}^{(3)}$	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	$V_{CC} = \text{Min.}$ $I_{OH} = -12 \text{ mA (MIL)}$ $I_{OH} = -15 \text{ mA (COM)}$	2.4 2.4	— —	— —	V
$V_{OL}$	Output LOW Voltage (FCTXXX)	$V_{CC} = \text{Min.}$ $I_{OL} = 48 \text{ mA (MIL)}$ $I_{OL} = 64 \text{ mA (COM)}$	— —	— —	0.55 0.55	V
$V_{OL}$	Output LOW Voltage (FCT2XXX - 25 $\Omega$ )	$V_{CC} = \text{Min.}$ $I_{OL} = 12 \text{ mA (MIL)}$ $I_{OL} = 12 \text{ mA (COM)}$	— —	— —	0.50 0.50	V
$R_{OUT}$	Output Resistance (FCT2XXX - 25 $\Omega$ )	$V_{CC} = \text{Min.}$ $I_{OL} = 12 \text{ mA (MIL)}$ $I_{OL} = 12 \text{ mA (COM)}$	— 20	25 28	— 40	$\Omega$

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**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.

## QSFACT240T, 241T, 244T, 2240T, 2241T, 2244T

### FCT240T, FCT2240 SWITCHING CHARACTERISTICS OVER OPERATING RANGE

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

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 <sup>(1)</sup>		240 2240		240A 2240A		240C 2240C		240D 2240D		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>PHL</sub>	Propagation Delay	COM	1.5	8	1.5	4.8	1.5	4.1	1.5	3.8	ns
t <sub>PLH</sub>	A <sub>i</sub> to Y <sub>i</sub> (FCT240)	MIL	1.5	9	1.5	5.1	1.5	4.7	—	—	
t <sub>PHL</sub>	Propagation Delay	COM	1.5	8	1.5	4.8	1.5	4.1	—	—	ns
t <sub>PLH</sub>	A <sub>ito</sub> Y <sub>i</sub> (FCT2240)	MIL	1.5	9	1.5	5.1	1.5	4.7	—	—	
t <sub>PZH</sub>	Output Enable Time	COM	1.5	10	1.5	6.2	1.5	5.8	1.5	5.6	ns
t <sub>PZL</sub>	$\bar{G}$ to Y <sub>i</sub> (FCT240)	MIL	1.5	10.5	1.5	6.5	1.5	6.5	—	—	
t <sub>PZH</sub>	Output Enable Time	COM	1.5	10	1.5	6.2	1.5	5.8	—	—	ns
t <sub>PZL</sub>	$\bar{G}$ to Y <sub>i</sub> (FCT2240)	MIL	1.5	10.5	1.5	6.5	1.5	6.5	—	—	
t <sub>PHZ</sub>	Output Disable Time	COM <sup>(2)</sup>	1.5	9.5	1.5	5.6	1.5	5.2	1.5	5.2	ns
t <sub>PLZ</sub>	$\bar{G}$ to Y <sub>i</sub>	MIL <sup>(2)</sup>	1.5	10	1.5	5.9	1.5	5.7	—	—	

### FCT241T, FCT244T, FCT2241T, FCT2244T SWITCHING CHARACTERISTICS OVER OPERATING RANGE

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

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 <sup>(1)</sup>		241/244 2241/2244		241/244A 2241/4A		241/244C 2241/4C		241/244D 2244D		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t <sub>PHL</sub>	Propagation Delay	COM	1.5	6.5	1.5	4.8	1.5	4.1	1.5	3.8	ns
t <sub>PLH</sub>	A <sub>i</sub> to Y <sub>i</sub> (FCT241/4)	MIL	1.5	7.5	1.5	5.1	1.5	4.6	—	—	
t <sub>PHL</sub>	Propagation Delay	COM	1.5	6.5	1.5	4.8	1.5	4.1	1.5	3.8	ns
t <sub>PLH</sub>	A <sub>i</sub> to Y <sub>i</sub> (FCT2241/4)	MIL	1.5	7.5	1.5	5.1	1.5	4.6	—	—	
t <sub>PZH</sub>	Output Enable Time	COM	1.5	8	1.5	6.2	1.5	5.8	1.5	5.6	ns
t <sub>PZL</sub>	$\bar{G}$ to Y <sub>i</sub> (FCT241/4)	MIL	1.5	8.5	1.5	6.5	1.5	6.5	—	—	
t <sub>PZH</sub>	Output Enable Time	COM	1.5	8	1.5	6.2	1.5	5.8	1.5	5.6	ns
t <sub>PZL</sub>	$\bar{G}$ to Y <sub>i</sub> (FCT2241/4)	MIL	1.5	8.5	1.5	6.5	1.5	6.5	—	—	
t <sub>PHZ</sub>	Output Disable Time	COM <sup>(2)</sup>	1.5	7	1.5	5.6	1.5	5.2	1.5	5.2	ns
t <sub>PLZ</sub>	$\bar{G}$ to Y <sub>i</sub>	MIL <sup>(2)</sup>	1.5	7.5	1.5	5.9	1.5	5.7	—	—	

**Notes:**

1. Minimums guaranteed but not tested.
2. This parameter is guaranteed by design but not tested.
3. See Test Circuit and Waveforms.