QUALITY SEMICONDUCTOR, INC.

High-Speed CMOS 8-Bit Buffers/Line Drivers

QS54/74FCT240T
QS54/74FCT244T
QS54/74FCT2240T
QS54/74FCT2244T

FEATURES/BENEFITS

- Pin and function compatible to the 74F240/4 74FCT240/4 and 74ABT240/4
- Industrial temperature –40°C to 85°C
- CMOS power levels: <7.5mW 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 240T, 244T

- JEDEC-FCT spec compatible
- Std. thru D speed grades with 3.8ns t_{PD} for D
- I_{OL} = 64mA Ind., 48mA Mil.

FCT-T 2240T, 2244T

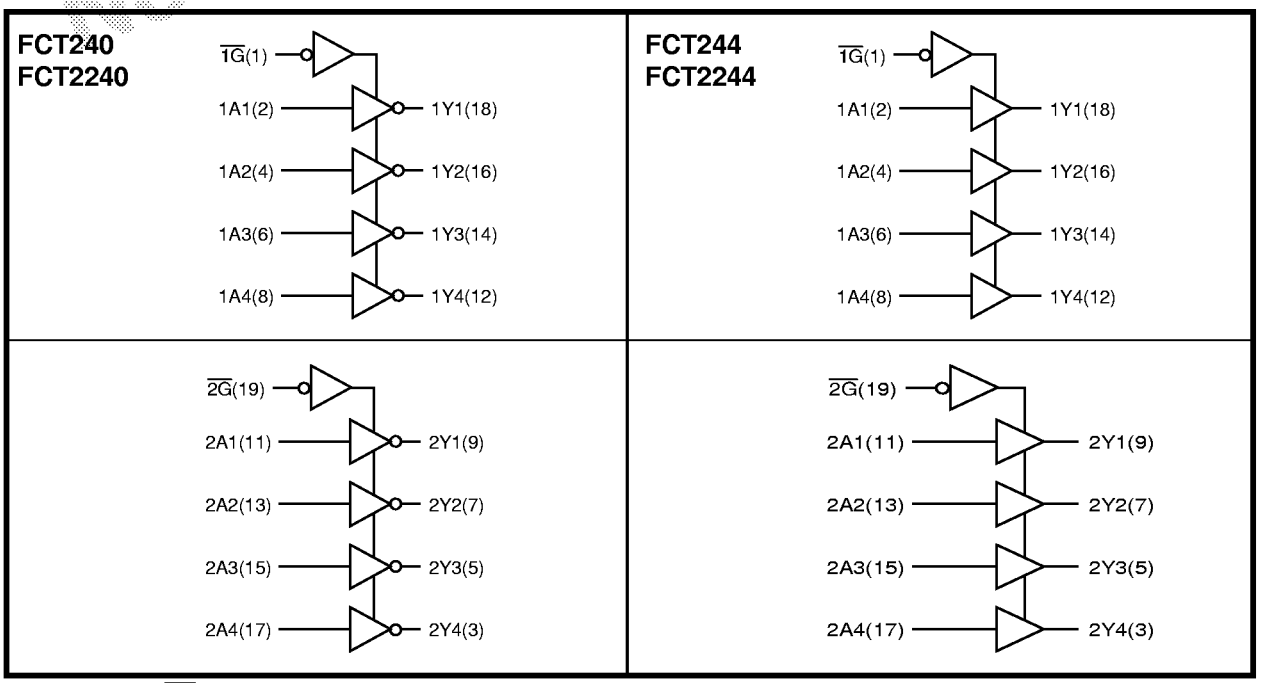
- Built-in 25Ω series resistor outputs reduce reflection and other system noise
- Std. thru C speed grades with 4.1ns t_{PD} for C
- I_{OL} = 12mA Ind.

DESCRIPTION

The FCT240T 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 and FCT2244T are 25Ω resistor output versions useful for driving transmission lines and reducing system noise. The 2240 and 2244 series parts can replace the 240/244 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.

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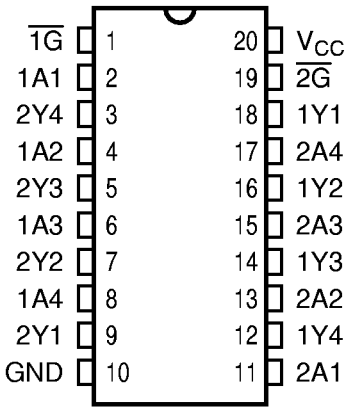
Figure 1. Functional Block Diagram



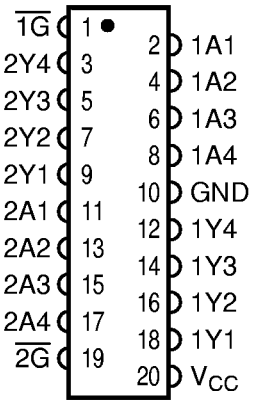
Note: Pin 19 is $\overline{2G}$ on the FCT244.

Figure 2. Pin Configurations (All Pins Top View)

PDIP, SOIC, QSOP, HQSOP



ZIP



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Table 1. Pin Description

Name	I/O	Description
xA4-xA0	I	Data Inputs
xY4-xY0	O	Data Outputs - Three State
$\overline{1G}/\overline{2G}$	I	Output Enables

Table 2. Function Tables

FCT240/FCT2240

$\overline{1G}/\overline{2G}$	Input A	Output Y
H	X	Z
L	L	H
L	H	L

FCT244/FCT2244

$\overline{1G}/\overline{2G}$	Input A	Output Y
H	X	Z
L	L	L
L	H	H

Table 3. Absolute Maxuimum 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	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(1)

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

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

Notes:
1. Capacitance is characterized but not tested.
2. Pin reference for 20-pin package.

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Table 5. 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}	—	1.5	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 BitToggling @ 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.

Table 6. DC Electrical Characteristics Over Operating Range

Industrial T_A = –40°C to 85°C, V_{CC} = 5.0V ±5% Military T_A = –55°C to 125°C, V_{CC} = 5.0V ±10%

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	—	0.2	—	V
$\lvert I_{IH} \rvert$ $\lvert I_{IL} \rvert$	Input Current Input HIGH or LOW	V_{CC} = Max., $0 \le V_{IN} < V_{CC}$	—	—	5	µA
$\lvert I_{OZ} \rvert$	Off-State Output Current (Hi-Z)	V_{CC} = Max., $0 \le V_{IN} \le V_{CC}$	—	—	5	µA
I_{OS}	Short Circuit Current (FCTXXX)	V_{CC} = Max., V_{OUT} = GND(2,3)	–60	—	—	mA
I_{OR}	Current Drive (FCT2XXX – 25Ω)	V_{CC} = Min., V_{OUT} = 2.0V(3)	50	—	—	mA
V_{IC}	Input Clamp Voltage	V_{CC} = Min., I_{IN} = –18mA, T_A = 25°C(3)	—	–0.7	–1.2	V
V_{OH}	Output HIGH Voltage	V_{CC} = Min. I_{OH} = –12mA (MIL) I_{OH} = –15mA (IND)	2.4 2.4	— —	— —	V
V_{OL}	Output LOW Voltage (FCTXXX)	V_{CC} = Min. I_{OL} = 48mA (MIL) I_{OL} = 64mA (IND)	— —	— —	0.55 0.55	V
V_{OL}	Output LOW Voltage (FCT2XXX – 25Ω)	V_{CC} = Min. I_{OL} = 12mA (MIL) I_{OL} = 12mA (IND)	— —	— —	0.50 0.50	V
R_{OUT}	Output Resistance (FCT2XXX – 25Ω)	V_{CC} = Min. I_{OL} = 12mA (MIL) I_{OL} = 12mA (IND)	— 20	25 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 7. FCT240T, FCT2240T Switching Characteristics Over Operating Range

Industrial T_A = –40°C to 85°C, V_{CC} = 5.0V ±5% Military T_A = –55°C to 125°C, V_{CC} = 5.0V ±10%
C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Description[1]		2240		240A 2240A		240C 2240C		240D		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{PHL}	Propagation Delay	IND	1.5	8	1.5	4.8	1.5	4.1	1.5	3.8	ns
t_{PLH}	Ai to Yi (FCT240)	MIL	1.5	9	1.5	5.1	1.5	4.7	—	—	
t_{PHL}	Propagation Delay	IND	1.5	8	1.5	4.8	1.5	4.1	—	—	ns
t_{PLH}	Ai to Yi (FCT2240)	MIL	1.5	9	1.5	5.1	1.5	4.7	—	—	
t_{PZH}	Output Enable Time	IND	1.5	10	1.5	6.2	1.5	5.8	1.5	5.6	ns
t_{PZL}	$\overline{G}$ to Yi (FCT240)	MIL	1.5	10.5	1.5	6.5	1.5	6.5	—	—	
t_{PZH}	Output Enable Time	IND	1.5	10	1.5	6.2	1.5	5.8	—	—	ns
t_{PZL}	$\overline{G}$ to Yi (FCT2240)	MIL	1.5	10.5	1.5	6.5	1.5	6.5	—	—	
t_{PHZ}	Output Disable Time	IND[2]	1.5	9.5	1.5	5.6	1.5	5.2	1.5	5.2	ns
t_{PLZ}	$\overline{G}$ to Yi	MIL[2]	1.5	10	1.5	5.9	1.5	5.7	—	—	

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Table 8. FCT244T, FCT2244T Switching Characteristics Over Operating Range

Industrial T_A = –40°C to 85°C, V_{CC} = 5.0V ±5% Military T_A = –55°C to 125°C, V_{CC} = 5.0V ±10%
C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

Symbol	Description[1]		244 2244		244A 2244A		244C 2244C		244D		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{PHL}	Propagation Delay	IND	1.5	6.5	1.5	4.8	1.5	4.1	1.5	3.8	ns
t_{PLH}	Ai to Yi (FCT244)	MIL	1.5	7.5	1.5	5.1	1.5	4.6	—	—	
t_{PHL}	Propagation Delay	IND	1.5	6.5	1.5	4.8	1.5	4.1	1.5	3.8	ns
t_{PLH}	Ai to Yi (FCT2244)	MIL	1.5	7.5	1.5	5.1	1.5	4.6	—	—	
t_{PZH}	Output Enable Time	IND	1.5	8	1.5	6.2	1.5	5.8	1.5	5.6	ns
t_{PZL}	$\overline{G}$ to Yi (FCT244)	MIL	1.5	8.5	1.5	6.5	1.5	6.5	—	—	
t_{PZH}	Output Enable Time	IND	1.5	8	1.5	6.2	1.5	5.8	1.5	5.6	ns
t_{PZL}	$\overline{G}$ to Yi (FCT2244)	MIL	1.5	8.5	1.5	6.5	1.5	6.5	—	—	
t_{PHZ}	Output Disable Time	IND[2]	1.5	7	1.5	5.6	1.5	5.2	1.5	5.2	ns
t_{PLZ}	$\overline{G}$ to Yi	MIL[2]	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.