

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

Q

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 and 74FCT 240/1/4 and 74FCT240T/1T/4T
- CMOS power levels: <7.5 mW static
- Available in DIP, ZIP, SOIC, QSOP, LCC
- 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., A, C, & D speed grades with 3.8 ns tPD for D
- I_{OL} = 64 mA Com., 48 mA Mil.

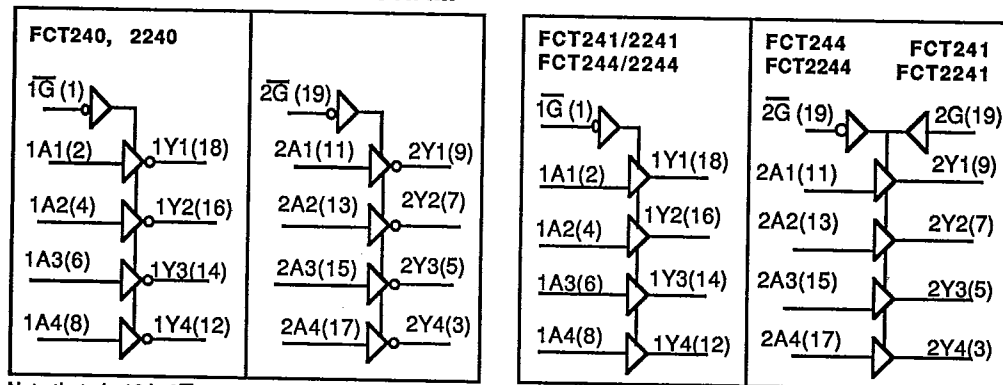
FCT-T 2240T, 2241T, 2244T

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

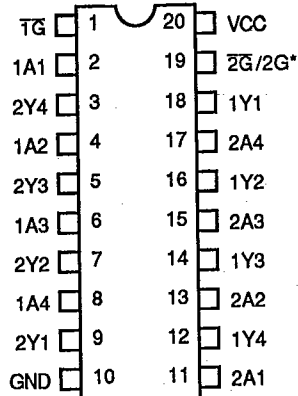


Note that pin 19 is 1G on the FCT244 and 2G for the FCT241

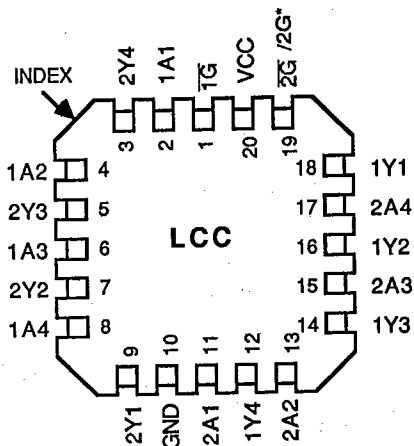
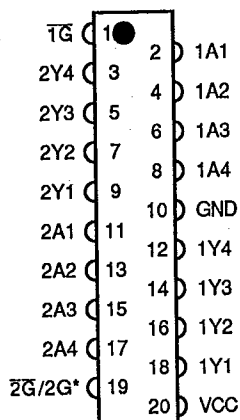
PINOUTS

FCT240/241/244 FCT2240/2241/2244

PDIP, SOIC, QSOP



ZIP



ALL PINS TOP VIEW

*Note: Pin 19 is 2G for the 240/244 and is 2G for the 241

FUNCTION TABLES

FCT240/FCT2240

TG/2G	Input A	Output Y
H	X	Z
L	L	H
L	H	L

FCT244/FCT2244

TG/2G	Input A	Output Y
H	X	Z
L	L	L
L	H	H

H=High, L=Low, Z=High Impedance

FCT241/FCT2241

TG	2G	Input A	Output Y
H	L	X	Z
L	H	L	L
L	H	H	H

ABSOLUTE MAXIMUM RATINGS

Supply Voltage to Ground.....	-0.5V to +7.0V
DC Output Voltage V_O	-0.5V to 7.0V
DC Input Voltage V_I	-0.5V to 7.0V
AC Input Voltage (for a pulse width ≤ 20 ns).....	-3.0V
DC Input Diode Current with $V_I < 0$	-20 mA
DC Output Diode Current with $V_O < 0$	-50 mA
DC Output Current Max. sink current/pin.....	120 mA
Maximum Power Dissipation.....	0.5 watts
T_{STG} Storage Temperature.....	-65° to +165°C

CAPACITANCE

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

Pins	SOIC	QSOP	PDIP,LCC	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

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

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Commercial $T_A=0^{\circ}\text{C}$ to 70°C , $V_{CC}=5.0\text{V}\pm 5\%$ Military $T_A=-55^{\circ}\text{C}$ to 125°C , $V_{CC}=5.0\text{V}\pm 10\%$

Symbol	Parameter	Test Conditions		Min	Typ (1)	Max	Unit
V_{ih}	Input High Voltage	Logic HIGH for All Inputs		2.0	-	-	Volts
V_{il}	Input LOW Voltage	Logic LOW for All Inputs		-	-	0.8	
ΔV_t	Input Hysteresis	$V_{th} - V_{tl}$ for All Inputs		-	0.2	-	
$ I_{ih} $ $ I_{il} $	Input Current Input HIGH or LOW	$V_{CC} = \text{MAX}$	$0 \leq V_{in} < V_{CC}$	-	-	5	μA
$ I_{oz} $	Off State Output Current (Hi-Z)	$V_{CC} = \text{MAX}$, $0 \leq V_{in} \leq V_{CC}$		-	-	5	
I_{os}	Short Circuit Current FCTXXX	$V_{CC} = \text{MAX}$, $V_o = \text{GND}$ (2,3)		-60	-	-225	mA
I_{or}	Current Drive FCT2XXX (25 Ω)	$V_{CC} = \text{MIN}$, $V_o = 2.0\text{V}$ (3)		50	-	-	mA
V_{ic}	Input Clamp Voltage	$V_{CC} = \text{MIN}$, $I_{in} = 18\text{ mA}$ (3)		-	-0.7	-1.2	Volts
V_{oh}	Output HIGH Voltage FCTXXX & FCT2XXX	$V_{CC} = \text{MIN}$	$I_{oh} = 12\text{ mA}$ (MIL)	2.4	-	-	Volts
			$I_{oh} = 15\text{ mA}$ (COM)	2.4	-	-	
V_{ol}	Output LOW Voltage FCTXXX	$V_{CC} = \text{MIN}$	$I_{ol} = 48\text{ mA}$ (MIL)	-	-	0.55	
			$I_{ol} = 64\text{ mA}$ (COM)	-	-	0.55	
	Output LOW Voltage FCT2XXX (25 Ω)	$V_{CC} = \text{MIN}$	$I_{ol} = 12\text{ mA}$ (MIL)	-	-	0.50	
			$I_{ol} = 12\text{ mA}$ (COM)	-	-	0.50	
R_{out}	Output Resistance FCT2XXX (25 Ω)	$V_{CC} = \text{MIN}$	$I_{ol} = 12\text{ mA}$ (MIL)	-	25	-	Ω
			$I_{ol} = 12\text{ mA}$ (COM)	20	28	40	

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 ≤ 1 second.
3. These parameters are guaranteed by design but not tested.

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} = 3.4 V, freq = 0 (2)	-	2.0	
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

1. For conditions shown as MIN or MAX use the appropriate values specified under DC specifications.
2. Per TTL driven input (V_i = 3.4V)
3. For flipflops 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.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Commercial $T_A = 0^\circ\text{C}$ to 70°C , $V_{CC} = 5.0\text{V} \pm 5\%$ Military $T_A = -55^\circ\text{C}$ to 125°C , $V_{CC} = 5.0\text{V} \pm 10\%$
 Cload = 50 pF, Rload = 500 Ω unless otherwise noted

FCT240, FCT2240

Symbol	Description	Notes (1)	240, 2240		240A, 2240A		240C, 2240C		240D		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
tPHL tPLH	Propagation Delay Ai to Yi, FCT240	Com	1.5	8	1.5	4.8	1.5	4.1	1.5	3.8	ns
		MII	1.5	9	1.5	5.1					
	Propagation Delay Ai to Yi, FCT2240	Com	1.5	8	1.5	4.8	1.5	4.1			
		MII	1.5	9	1.5	5.1					
tPZH tPZL	Output Enable Time OE to Yi, FCT240	Com	1.5	10	1.5	6.2	1.5	5.8	1.5	5.6	
		MII	1.5	10.5	1.5	6.5					
	Output Enable Time OE to Yi, FCT2240	Com	1.5	10	1.5	6.2	1.5	5.8			
		MII	1.5	10.5	1.5	6.5					
tPHZ tPLZ	Output Disable Time OE to Yi	Com	2	1.5	9.5	1.5	5.6	1.5	5.2	1.5	5.2
		MII	2	1.5	10.0	1.5	5.9				

FCT241, FCT244, FCT2241, FCT2244

Symbol	Description	Notes (1)	241/4, 2241/4		241/4A, 2241/4A		241/4C, 2241/4C		241/4D, 2244D		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
tPHL tPLH	Propagation Delay Ai to Yi, FCT241/4	COM	1.5	6.5	1.5	4.8	1.5	4.1	1.5	3.8	ns
		MIL	1.5	7.5	1.5	5.1					
	Propagation Delay Ai to Yi, FCT2244	COM	1.5	6.5	1.5	4.8	1.5	4.1	1.5	3.8	
		MIL	1.5	7.5	1.5	5.1					
tPZH tPZL	Output Enable Time OE to Yi, FCT241/4	COM	1.5	8	1.5	6.2	1.5	5.8	1.5	5.6	
		MIL	1.5	8.5	1.5	6.5					
	Output Enable Time OE to Yi, FCT2244	COM	1.5	8	1.5	6.2	1.5	5.8	1.5	5.6	
		MIL	1.5	8.5	1.5	6.5					
tPHZ tPLZ	Output Disable Time OE to Yi	COM	2	1.5	7	1.5	5.6	1.5	5.2	1.5	5.2
		MIL	2	1.5	7.5	1.5	5.9				

Notes:

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