



High Speed CMOS 8-Bit Buffer/Line Drivers

QS54/74FCT540T
QS54/74FCT541T

QS54/74FCT2540T
QS54/74FCT2541T

FEATURES/BENEFITS

- Pin and function compatible to the 74F540/541 74FCT540/541 and 74ABT540/541
- CMOS power levels: <7.5 mW static
- Available in DIP, SOIC, QSOP, ZIP, HQSOPW
- 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 540T, 541T

- 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 2540T, 2541T

- 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.

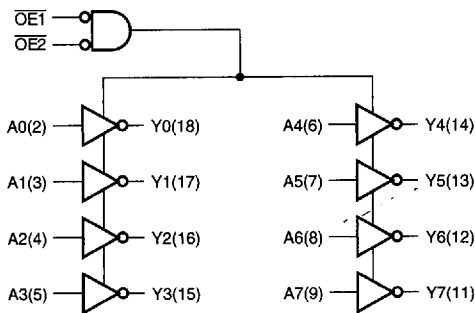
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DESCRIPTION

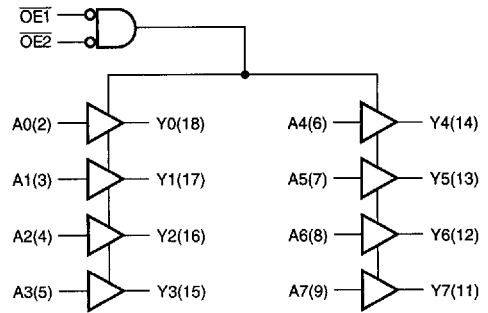
The QSFC540T and QSFC541T are 8-bit buffer/line drivers with three-state outputs that are ideal for driving high-capacitance loads as in memory address and data buses. The FCT2540 and FCT2541 are 25Ω resistor output versions useful for driving transmission lines and reducing system noise. The 2540 series parts can replace the 540 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

FCT540/2540

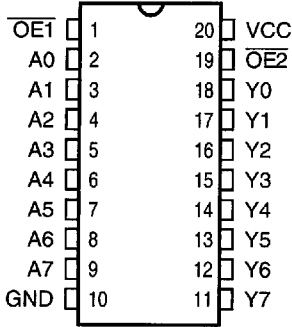


FCT541/2541

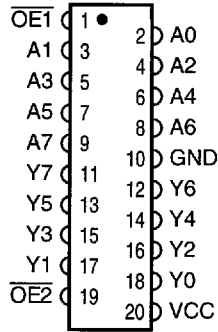


PIN CONFIGURATIONS (All Pins Top View)

PDIP, SOIC, QSOP, HQSOP



ZIP



PIN DESCRIPTION

Name	I/O	Description
A7-A0	I	Data Inputs
Y7-Y0	O	Data Outputs
$\overline{OE1}$, $\overline{OE2}$	I	Output Enable

FUNCTION TABLE

$\overline{OE1}$	$\overline{OE2}$	Input A	540	541	Function
			Output Y	Output Y	
H	X	X	Hi-Z	Hi-Z	Disable Outputs
X	H	X	Hi-Z	Hi-Z	
L	L	L	H	L	Enable Outputs
L	L	H	L	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 ≤ 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, $V_{IN} = 0V$, $V_{OUT} = 0V$

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 ⁽¹⁾	Min	Max	Unit
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$, $\text{freq} = 0$ $0V \leq V_{IN} \leq 0.2V$ or $V_{CC} - 0.2V \leq V_{IN} \leq V_{CC}$	—	1.5	mA
ΔI_{CC}	Supply Current per Input @ TTL HIGH	$V_{CC} = \text{Max.}$, $V_{IN} = 3.4V$, $\text{freq} = 0$ ⁽²⁾	—	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} ^(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.

QSFCT540T, 541T, 2540T, 2541T

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	—	—	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
$ 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	μA
I_{OS}	Short Circuit Current (FCTXXX)	$V_{CC} = \text{Max.}, V_{OUT} = \text{GND}^{(2,3)}$	-60	—	—	mA
I_{OR}	Current Drive (FCT2XXX - 25Ω)	$V_{CC} = \text{Min.}, V_{OUT} = 2.0\text{V}^{(3)}$	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 - 25Ω)	$V_{CC} = \text{Min.}$ $I_{OL} = 12 \text{ mA (MIL)}$ $I_{OL} = 12 \text{ mA (COM)}$	— —	— —	0.50 0.50	V
R_{OUT}	Output Resistance (FCT2XXX - 25Ω)	$V_{CC} = \text{Min.}$ $I_{OL} = 12 \text{ mA (MIL)}$ $I_{OL} = 12 \text{ mA (COM)}$	— 20	25 28	— 40	Ω

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.

QSFCT540T, 541T, 2540T, 2541T

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 , $V_{CC} = 5.0\text{V} \pm 10\%$

$C_{LOAD} = 50\text{ pF}$, $R_{LOAD} = 500\Omega$ unless otherwise noted.

QSFCT540/2540

Symbol	Description ⁽¹⁾		540T 2540T		540AT 2540AT		540CT 2540CT		540DT 2540DT		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay Ai to Yi	COM	1.5	8.5	1.5	4.8	1.5	4.1	1.5	3.8	ns
t _{PHL}		MIL	1.5	9.5	1.5	5.1	1.5	4.6	1.5	4.4	
t _{PZH}	Output Enable $\overline{\text{OE}}$ to Yi	COM	1.5	10	1.5	6.2	1.5	5.8	1.5	5.2	ns
t _{PZL}		MIL	1.5	10.5	1.5	6.5	1.5	6.5	1.5	6.5	
t _{PLZ}	Disable Time	COM ⁽²⁾	1.5	9.5	1.5	5.6	1.5	5.2	1.5	5.2	ns
t _{PHZ}		MIL ⁽²⁾	1.5	12.5	1.5	5.9	1.5	5.7	1.5	5.7	

Notes:

1. Minimum propagation delay values are guaranteed but not tested.
2. This parameter is guaranteed but not tested.

QSFCT541/2541

Symbol	Description ⁽¹⁾		541T 2541T		541AT 2541AT		541CT 2541CT		541DT 2541DT		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay Ai to Yi	COM	1.5	8	1.5	4.8	1.5	4.1	1.5	3.8	ns
t _{PHL}		MIL	1.5	9	1.5	5.1	1.5	4.6	1.5	4.4	
t _{PZH}	Output Enable $\overline{\text{OE}}$ to Yi	COM	1.5	10	1.5	6.2	1.5	5.8	1.5	5.2	ns
t _{PZL}		MIL	1.5	10.5	1.5	6.5	1.5	6.5	1.5	6.5	
t _{PLZ}	Disable Time	COM ⁽²⁾	1.5	9.5	1.5	5.6	1.5	5.2	1.5	5.2	ns
t _{PHZ}		MIL ⁽²⁾	1.5	12.5	1.5	5.9	1.5	5.7	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.

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