

FEATURES/BENEFITS

- Pin and function compatible to the 74F151/251 74FCT151/251 and 74FCT151T/251T
- Industrial temperature -40°C to 85°C
- CMOS power levels: $<7.5\text{mW}$ static
- Available in DIP, SOIC, QSOP, 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 151T, 251T

- JEDEC-FCT spec compatible
- A and C speed grades with 4.5ns t_{PD} for C
- $I_{OL} = 48\text{mA}$ Ind., 32mA Mil.

FCT-T 2151T

- Built-in 25Ω series resistor outputs reduce reflection and other system noise
- Std., A, and C speed grades with 4.5ns t_{PD} for C
- $I_{OL} = 12\text{mA}$ Ind.

DESCRIPTION

The QSFCT151T and QSFCT251T are high-speed CMOS TTL-compatible 8-input multiplexers. The 151 has TTL outputs; the 251 has 3-state outputs. The QSFCT2151T is a 25Ω 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). Outputs will not load an active bus when V_{CC} is removed from the device.

Figure 1. Functional Block Diagram

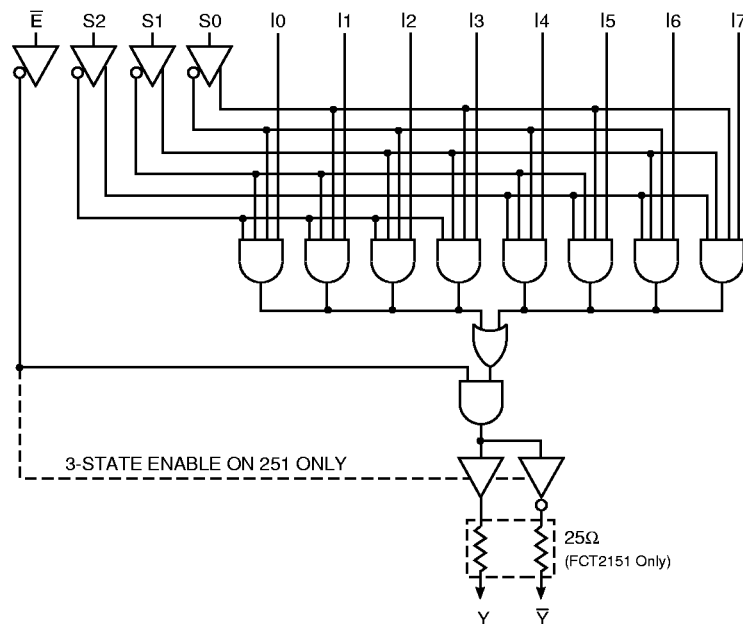
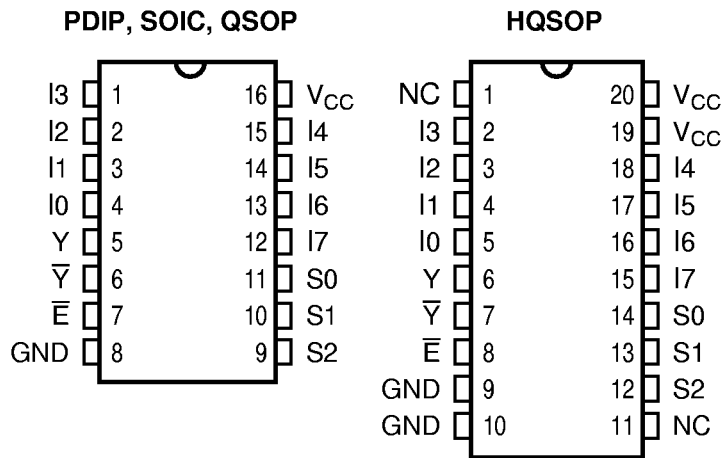


Figure 2. Pin Configurations (All Pins Top View)



Note:
Available in both 150 mil wide SOIC (package code S1) and 300 mil SOIC (package code SO).

Table 1. Pin Description

| Name | I/O | Description |
|--------------|-----|-------------|
| I7-I0 | I | Data In |
| S2-S0 | I | Select |
| \bar{E} | I | Enable |
| Y, \bar{Y} | O | Data Out |

Table 2. Function Table

| \bar{E} | Select | | | 151, 2151 | | 251 | | Function |
|-----------|--------|----|----|-----------|------------|------|------------|----------|
| | S2 | S1 | S0 | Y | \bar{Y} | Y | \bar{Y} | |
| H | X | X | X | L | H | HI-Z | HI-Z | Disable |
| L | L | L | L | I0 | $\bar{I0}$ | I0 | $\bar{I0}$ | S2-0 = 0 |
| L | L | L | H | I1 | $\bar{I1}$ | I1 | $\bar{I1}$ | S2-0 = 1 |
| L | L | H | L | I2 | $\bar{I2}$ | I2 | $\bar{I2}$ | S2-0 = 2 |
| L | L | H | H | I3 | $\bar{I3}$ | I3 | $\bar{I3}$ | S2-0 = 3 |
| L | H | L | L | I4 | $\bar{I4}$ | I4 | $\bar{I4}$ | S2-0 = 4 |
| L | H | L | H | I5 | $\bar{I5}$ | I5 | $\bar{I5}$ | S2-0 = 5 |
| L | H | H | L | I6 | $\bar{I6}$ | I6 | $\bar{I6}$ | S2-0 = 6 |
| L | H | H | H | I7 | $\bar{I7}$ | I7 | $\bar{I7}$ | S2-0 = 7 |

Table 3. 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 $V_{IN} < 0$ | -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 this device resulting in functional or reliability type failures.

Table 4. Capacitance⁽¹⁾

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

| Pins ⁽²⁾ | SOIC | QSOP | PDIP | Unit |
|---------------------|------|------|------|------|
| 1-3, 10, 11, 13-15 | 4 | 4 | 5 | pF |
| 4-7, 9, 12 | 8 | 8 | 9 | pF |

Notes:

1. Capacitance is characterized but not tested.
2. Pin reference for 16-pin package.

Table 5. Power Supply Characteristics

| Symbol | Parameter | Test Conditions ⁽¹⁾ | Min | Max | Unit |
|-----------------|-------------------------------------|--|-----|------|--------|
| I_{CC} | Quiescent Power Supply Current | $V_{CC} = \text{Max.}$, 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 |
| ΔI_{CC} | Supply Current per Input @ TTL HIGH | $V_{CC} = \text{Max.}$, $V_{IN} = 3.4\text{V}$, 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 ($V_{IN} = 3.4\text{V}$).
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.

QS54/74FCT151T, 251T, 2151T

Table 6. DC Electrical Characteristics Over Operating Range

Industrial $T_A = -40^{\circ}\text{C}$ to 85°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)(FCT251) | $V_{CC} = \text{Max.}, 0 \leq V_{IN} \leq V_{CC}$ | — | — | 5 | μA |
| I_{OS} | Short Circuit Current (FCTXXX) | $V_{CC} = \text{Max.}, V_{OUT} = \text{GND}^{(2,3)}$ | -60 | — | — | mA |
| I_{OR} | Current Drive (FCT2151) | $V_{CC} = \text{Max.}, V_{OUT} = 2.0\text{V}^{(3)}$ | 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) $I_{OH} = -15\text{mA}$ (IND) | 2.4 2.4 | — — | — — | V |
| V_{OL} | Output LOW Voltage (FCTXXX) | $V_{CC} = \text{Min.}, I_{OL} = 32\text{mA}$ (MIL) $I_{OL} = 48\text{mA}$ (IND) | — — | — — | 0.50 0.50 | V |
| V_{OL} | Output LOW Voltage (FCT2151- 25 Ω) | $V_{CC} = \text{Min.}, I_{OL} = 12\text{mA}$ (MIL) $I_{OL} = 12\text{mA}$ (IND) | — — | — — | 0.50 0.50 | V |
| R_{OUT} | Output Resistance (FCT2151- 25 Ω) | $V_{CC} = \text{Min.}, I_{OL} = 12\text{mA}$ (MIL) $I_{OL} = 12\text{mA}$ (IND) | — 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.

QS54/74FCT151T, 251T, 2151T

Table 7. Switching Characteristics Over Operating Range

Industrial $T_A = -40^\circ\text{C}$ to 85°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.

| Symbol | Description ⁽¹⁾ | | 2151 | | 151A 251A 2151A | | 151C 2151C | | Unit |
|------------------------------------|--|-----|------|-----|-----------------------|-----|---------------|-----|------|
| | | | Min | Max | Min | Max | Min | Max | |
| t_{iY} | Propagation Delay In to Y or \bar{Y} , 151/251 | Ind | 1.5 | 7 | 1.5 | 5.2 | 1.5 | 4.5 | ns |
| | | Mil | 1.5 | 8 | 1.5 | 5.8 | 1.5 | 5.2 | |
| t_{iY} | Propagation Delay In to Y or \bar{Y} , 2151 | Ind | 1.5 | 7 | 1.5 | 5.2 | 1.5 | 4.5 | ns |
| | | Mil | 1.5 | 8 | 1.5 | 5.8 | 1.5 | 5.2 | |
| t_{sY} | Propagation Delay Sn to Y or \bar{Y} , 151/251 | Ind | 1.5 | 9 | 1.5 | 6.6 | 1.5 | 5.9 | ns |
| | | Mil | 1.5 | 9.5 | 1.5 | 7.4 | 1.5 | 6.5 | |
| t_{sY} | Propagation Delay In to Y or \bar{Y} , 2151 | Ind | 1.5 | 9 | 1.5 | 6.6 | 1.5 | 5.9 | ns |
| | | Mil | 1.5 | 9.5 | 1.5 | 7.4 | 1.5 | 6.5 | |
| $t_{OE\bar{H}}$ $t_{OE\bar{L}}$ | Output Enable Time \bar{E} to Y_i , 151 | Ind | 1.5 | 7 | 1.5 | 5.2 | 1.5 | 4.5 | ns |
| | | Mil | 1.5 | 8 | 1.5 | 5.8 | 1.5 | 5.2 | |
| $t_{OE\bar{H}}$ $t_{OE\bar{L}}$ | Output Enable Time \bar{E} to Y_i , 2151 | Ind | 1.5 | 7 | 1.5 | 5.2 | 1.5 | 4.5 | ns |
| | | Mil | 1.5 | 8 | 1.5 | 5.8 | 1.5 | 5.2 | |
| t_{PZH} t_{PZL} | Output Enable Time \bar{E} to Y_i , 251 | Ind | 1.5 | 9 | 1.5 | 6.0 | 1.5 | 5.0 | ns |
| | | Mil | 1.5 | 10 | 1.5 | 6.4 | 1.5 | 5.5 | |
| t_{PHZ} t_{PLZ} | Output Disable Time ⁽²⁾ \bar{E} to Y_i , 251 | Ind | 1.5 | 7 | 1.5 | 6 | 1.5 | 5.0 | ns |
| | | Mil | 1.5 | 7 | 1.5 | 6.3 | 1.5 | 5.5 | |

Notes:

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