

Q

# High Speed CMOS 8-Bit Identity Comparator

QS54/74FCT521T

QS54/74FCT2521T

## FEATURES/BENEFITS

- Pin and function compatible to the 74F521, 74FCT521, and 74ALS521
- 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 521T

- JEDEC-FCT spec compatible
- Fastest CMOS logic family available
- Standard thru D speed grades; 3.9 ns t<sub>PD</sub> for D
- I<sub>OL</sub> = 48 mA Com., 32 mA Mil.

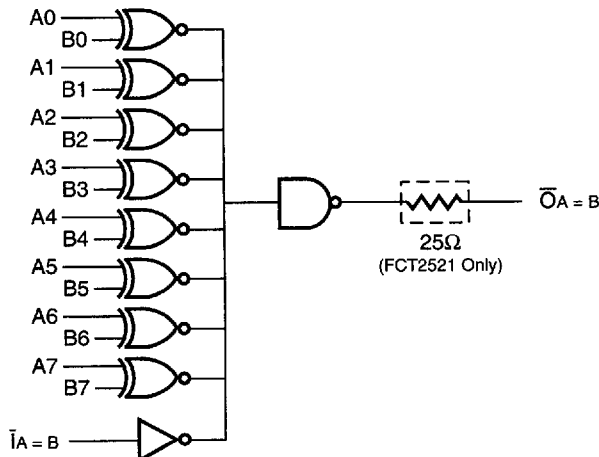
### FCT-T 2521T

- Built-in 25Ω series resistor outputs reduce reflection and other system noise
- Standard thru D speed grades; 3.9 ns t<sub>PD</sub> for D
- I<sub>OL</sub> = 12 mA Com.

## DESCRIPTION

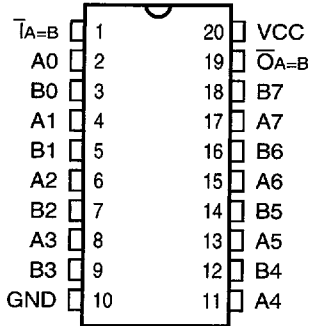
The QSFCT521 and QSFCT2521 are high-speed CMOS TTL-compatible 8-bit identity comparators. Two words of up to eight bits are compared and a low output is provided when the words match. An expansion input allows the comparison to be extended over multiple words. All inputs have clamp diodes for undershoot noise suppression. All outputs have ground bounce suppression (see QSI Application Note AN-001).

## FUNCTIONAL BLOCK DIAGRAM

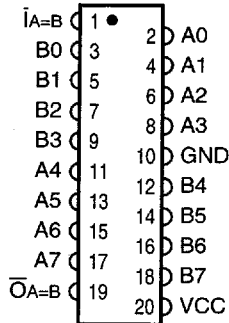


# PIN CONFIGURATIONS (All Pins Top View)

PDIP, SOIC, QSOP, HQSOP



ZIP



## PIN DESCRIPTION

| Name            | I/O | Description               |
|-----------------|-----|---------------------------|
| A7-A0           | I   | Word A                    |
| B7-B0           | I   | Word B                    |
| $\bar{I}_A = B$ | I   | Expansion or Enable Input |
| $\bar{O}_A = B$ | O   | Compare Output            |

## FUNCTION TABLE

| Inputs             |                 | Outputs         | Function               |
|--------------------|-----------------|-----------------|------------------------|
| A7-A0, B7-B0       | $\bar{I}_A = B$ | $\bar{O}_A = B$ |                        |
| A7-A0 = B7-B0      | L               | L               | Compare Equal          |
| A7-A0 $\neq$ B7-B0 | L               | H               | Compare Not Equal      |
| X                  | H               | H               | Expand Input Not Valid |

## 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 |
|------------|------|------|------|-----|------|
| 1-9, 11-18 | 4    | 4    | 5    | 7   | pF   |
| 19         | 6    | 6    | 7    | 9   | pF   |
| —          | 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      | $V_{CC} = \text{Max.}$ , $\text{freq} = 0$<br>$0\text{V} \leq V_{IN} \leq 0.2\text{V}$ 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<br>One bit toggling @ 50% duty cycle<br>Other inputs at GND or $V_{CC}$ <sup>(3,4)</sup> | —   | 0.25 | mA/MHz |

### Notes:

- For conditions shown as Min. or Max., use the appropriate values specified under DC specifications.
- Per TTL driven input ( $V_{IN} = 3.4\text{V}$ ).
- 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.
- $I_C$  can be computed using the above parameters as explained in the Technical Overview section.

**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             |
| $I_{IH}$<br>$I_{IL}$ | Input Current<br>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                         | $V_{CC} = \text{Min.}$<br>$I_{OH} = -12 \text{ mA (MIL)}$<br>$I_{OH} = -15 \text{ mA (COM)}$ | 2.4<br>2.4 | —<br>—             | —<br>—       | V             |
| $V_{OL}$             | Output LOW Voltage (FCTXXX)                 | $V_{CC} = \text{Min.}$<br>$I_{OL} = 32 \text{ mA (MIL)}$<br>$I_{OL} = 48 \text{ mA (COM)}$   | —<br>—     | —<br>—             | 0.50<br>0.50 | V             |
| $V_{OL}$             | Output LOW Voltage (FCT2XXX - 25 $\Omega$ ) | $V_{CC} = \text{Min.}$<br>$I_{OL} = 12 \text{ mA (MIL)}$<br>$I_{OL} = 12 \text{ mA (COM)}$   | —<br>—     | —<br>—             | 0.50<br>0.50 | V             |
| $R_{OUT}$            | Output Resistance (FCT2XXX - 25 $\Omega$ )  | $V_{CC} = \text{Min.}$<br>$I_{OL} = 12 \text{ mA (MIL)}$<br>$I_{OL} = 12 \text{ mA (COM)}$   | —<br>20    | 25<br>28           | —<br>40      | $\Omega$      |

**Notes:**

- Typical values indicate  $V_{CC} = 5.0\text{V}$  and  $T_A = 25^\circ\text{C}$ .
- Not more than one output should be shorted and the duration is  $\leq 1$  second.
- These parameters are guaranteed by design but not tested.

**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>                   |     | 521T<br>2521T |     | 521AT<br>2521AT |     | 521BT<br>2521BT |     | 521CT<br>2521CT |     | 521DT<br>2521DT |     | Unit |
|------------|----------------------------------------------|-----|---------------|-----|-----------------|-----|-----------------|-----|-----------------|-----|-----------------|-----|------|
|            |                                              |     | Min           | Max | Min             | Max | Min             | Max | Min             | Max | Min             | Max |      |
| $t_{PHL}$  | Propagation Delay                            | COM | 1.5           | 11  | 1.5             | 7.2 | 1.5             | 5.5 | 1.5             | 4.5 | 1.5             | 4.1 | ns   |
| $t_{PLH}$  | $A_i = B_i$ to $\overline{O}_A = B$          | MIL | 1.5           | 15  | 1.5             | 9.5 | 1.5             | 7.3 | 1.5             | 5.1 |                 |     | ns   |
| $t_{PHLX}$ | Propagation Delay                            | COM | 1.5           | 10  | 1.5             | 6   | 1.5             | 4.6 | 1.5             | 4.1 | 1.5             | 3.9 | ns   |
| $t_{PLHX}$ | $\overline{I}_A = B$ to $\overline{O}_A = B$ | MIL | 1.5           | 9   | 1.5             | 7.8 | 1.5             | 6.0 | 1.5             | 4.5 |                 |     | ns   |

**Notes:**

- Minimum guaranteed but not tested.