



HIGH-SPEED CMOS QUAD 2-INPUT MULTIPLEXER

IDTQS74FCT158AT/CT

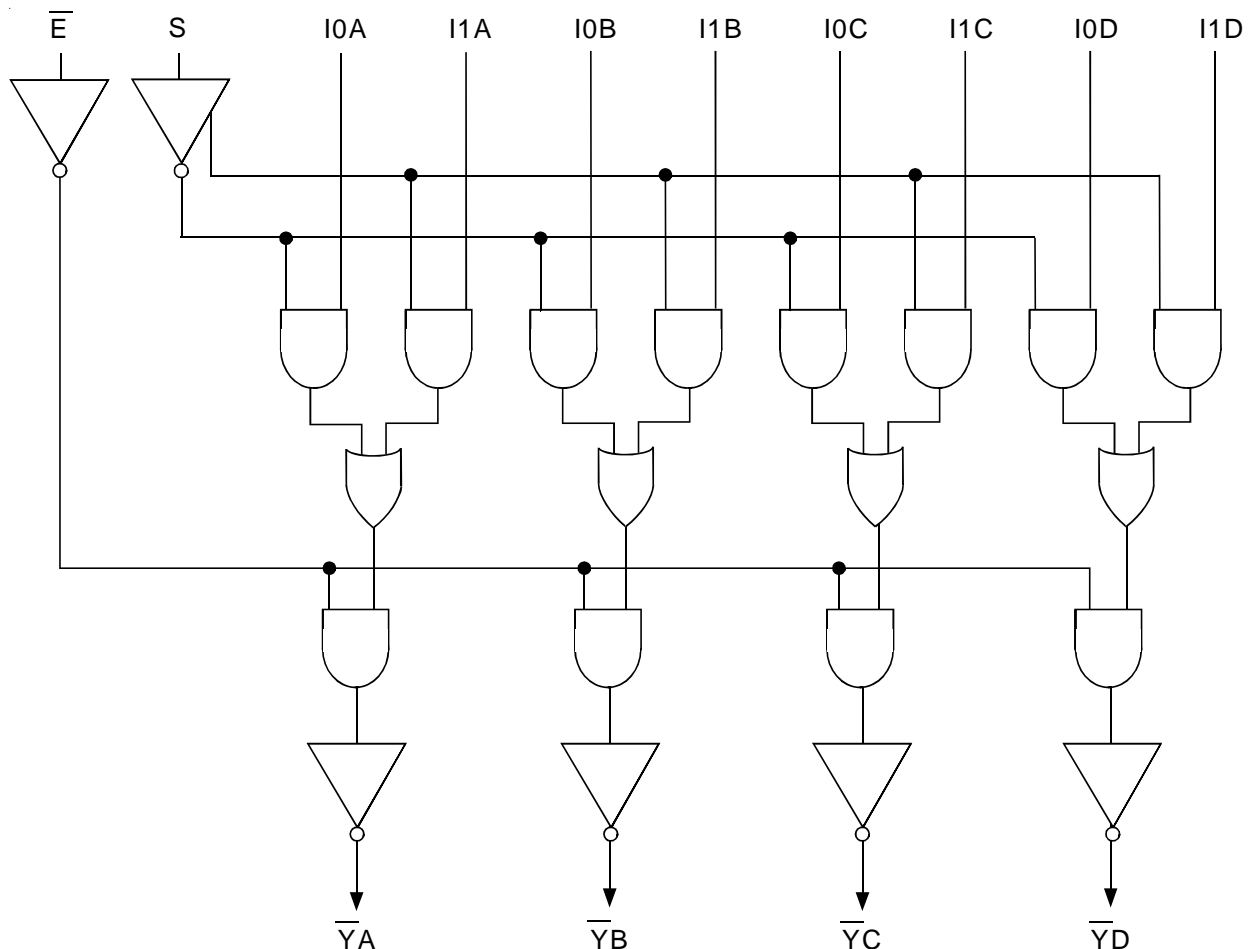
FEATURES:

- CMOS power levels: <7.5mW static
- Undershoot clamp diodes on all inputs
- True TTL input and output compatibility
- Ground bounce controlled outputs
- Reduced output swing of 0 to 3.5V
- A and C grades with 4.3ns for C
- $I_{OL} = 48\text{mA}$
- Available in SOIC and QSOP packages

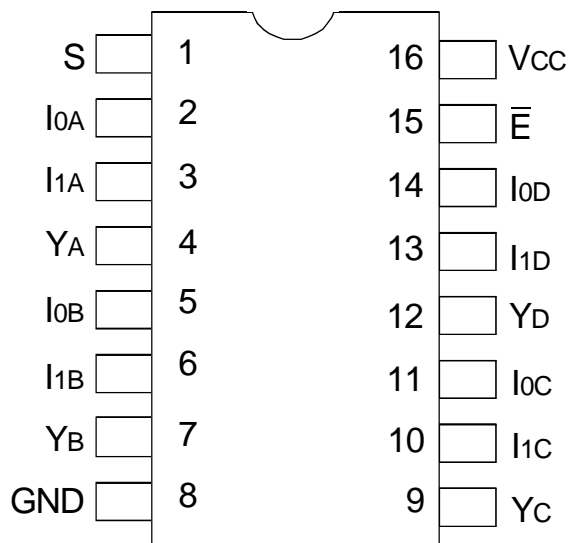
DESCRIPTION:

The IDTQS74FCT158T is a high-speed CMOS TTL-compatible, quad, 2-input multiplexer. All inputs have clamp diodes for undershoot noise suppression. All outputs have ground bounce suppression. Outputs will not load an active bus when V_{CC} is removed from the device.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SOIC/ QSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Description | Max | Unit |
|------------------|------------------------------------------|-------------|------|
| VTERM | Terminal Voltage with Respect to GND | -0.5 to +7 | V |
| TSTG | Storage Temperature | -65 to +150 | °C |
| I _{OUT} | DC Output Current Max Current Sink/Pin | +120 | mA |
| I _{IK} | Input Diode Current, V _{IN} < 0 | -20 | mA |
| I _{OK} | DC Output Current, V _{OUT} < 0 | -50 | mA |

NOTE:

1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

CAPACITANCE (T_A = +25°C, F = 1.0MHz)

| Symbol | Parameter ⁽¹⁾ | Conditions | Typ. | Max. | Unit |
|------------------|--------------------------|-----------------------|------|------|------|
| C _{IN} | Input Capacitance | V _{IN} = 0V | 4 | — | pF |
| C _{OUT} | Output Capacitance | V _{OUT} = 0V | 8 | — | pF |

NOTE:

1. This parameter is measured at characterization but not tested.

PIN DESCRIPTION

| Pin Names | Description |
|---------------------------------|--------------|
| I _{xx} | Data Inputs |
| S | Select Input |
| E-bar | Enable Input |
| Y _A - Y _D | Data Outputs |

FUNCTION TABLE⁽¹⁾

| E-bar | S | Inputs | | | | Y _D | Function |
|-------|---|----------------|----------------|----------------|----------------|----------------|----------|
| | | Y _A | Y _B | Y _C | Y _D | | |
| H | X | H | H | H | H | | Disable |
| L | L | I0A | I0B | I0C | I0D | | Select 0 |
| L | H | I1A | I1B | I1C | I1D | | Select 1 |

NOTE:

1. H = HIGH Voltage Level
X = Don't Care
L = LOW Voltage Level

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 5.0\text{V} \pm 5\%$

| Symbol | Parameter | Test Conditions | Min. | Typ. ⁽¹⁾ | Max. | Unit |
|--------------|-----------------------|-----------------------------------------------------------------------------------|------|---------------------|---------|---------------|
| V_{IH} | Input HIGH Level | Guaranteed Logic HIGH Level | 2 | — | — | V |
| V_{IL} | Input LOW Level | Guaranteed Logic LOW Level | — | — | 0.8 | V |
| ΔV_T | Input Hysteresis | $V_{TLH} - V_{THL}$ for all inputs | — | 0.2 | — | V |
| I_{IH} | Input HIGH Current | $V_{CC} = \text{Max.}$ $0 \leq V_{IN} \leq V_{CC}$ | — | — | ± 5 | μA |
| I_{IL} | Input LOW Current | | | | | |
| I_{OS} | Short Circuit Current | $V_{CC} = \text{Max.}$, $V_{OUT} = \text{GND}^{(2)}$ | -60 | — | — | mA |
| V_{IC} | Input Clamp Voltage | $V_{CC} = \text{Min.}$, $I_{IN} = -18\text{mA}$, $T_A = 25^\circ\text{C}^{(2)}$ | — | -0.7 | -1.2 | V |
| V_{OH} | Output HIGH Voltage | $V_{CC} = \text{Min.}$ $I_{OH} = -15\text{mA}$ | 2.4 | — | — | V |
| V_{OL} | Output LOW Voltage | $V_{CC} = \text{Min.}$ $I_{OL} = 48\text{mA}$ | — | — | 0.5 | V |

NOTES:

1. Typical values are at $V_{CC} = 5.0\text{V}$, $+25^\circ\text{C}$ ambient.
2. This parameter is guaranteed but not tested.

POWER SUPPLY CHARACTERISTICS

| Symbol | Parameter | Test Conditions ⁽¹⁾ | Min. | Max. | Unit |
|-----------------|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------|------|------------|
| I_{CC} | Quiescent Power Supply Current | $V_{CC} = \text{Max.}$ $\text{freq} = 0$ $0\text{V} \leq V_{IN} \leq 0.2\text{V}$ or $V_{CC} - 0.2\text{V} \leq V_{IN} \leq V_{CC}$ | — | 1.5 | mA |
| ΔI_{CC} | Supply Current per Input TTL Inputs HIGH | $V_{CC} = \text{Max.}$ $V_{IN} = 3.4\text{V}^{(2)}$ $\text{freq} = 0$ | — | 2 | mA |
| I_{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 appropriate value specified under DC Electrical Characteristics.
 2. Per TTL driven input ($V_{IN} = 3.4\text{V}$).
 3. For flip-flops, I_{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.
 4. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$
 I_{CC} = Quiescent Current
 ΔI_{CC} = Power Supply Current for a TTL High Input ($V_{IN} = 3.4\text{V}$)
 D_H = Duty Cycle for TTL Inputs High
 N_T = Number of TTL Inputs at D_H
 I_{CCD} = Dynamic Current caused by an Output Transition Pair (HLH or LHL)
 f_{CP} = Clock Frequency for Register Devices (Zero for Non-Register Devices)
 f_i = Output Frequency
 N_i = Number of Outputs at f_i
- All currents are in milliamperes and all frequencies are in megahertz.

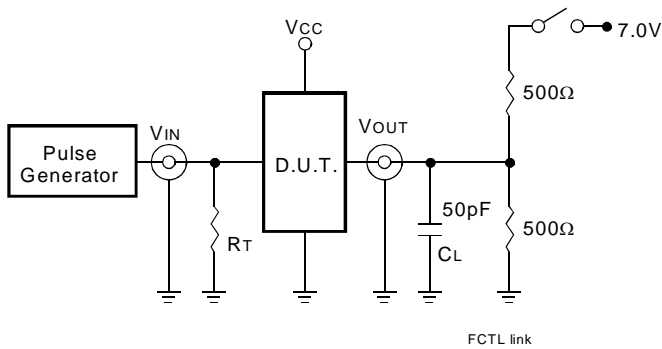
SWITCHING CHARACTERISTICS OVER OPERATING RANGE⁽¹⁾

| Symbol | Parameter | 74FCT158AT | | 74FCT158CT | | Unit |
|--------------------------------------|--------------------------------------------------------|------------|------|------------|------|------|
| | | Min. | Max. | Min. | Max. | |
| t _{PLH} t _{PHL} | Propagation Delay I _{xx} to Y _x | 1.5 | 5 | 1.5 | 4.3 | ns |
| t _{PLH} t _{PHL} | Propagation Delay S to Y _x | 1.5 | 7 | 1.5 | 5.2 | ns |
| t _{PLH} t _{PHL} | Propagation Delay \bar{E} to Y _x | 1.5 | 6 | 1.5 | 4.8 | ns |

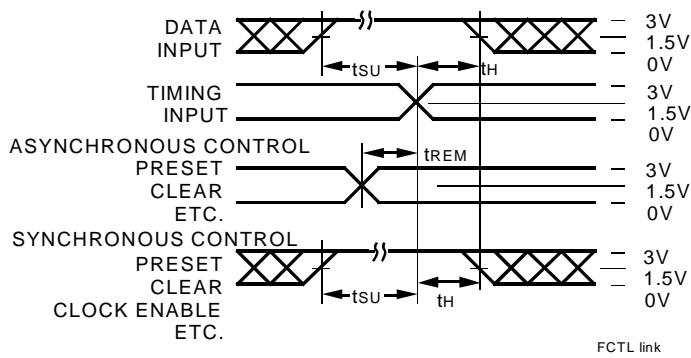
NOTE:

1. C_{LOAD} = 50pF, R_{LOAD} = 500Ω unless otherwise noted.

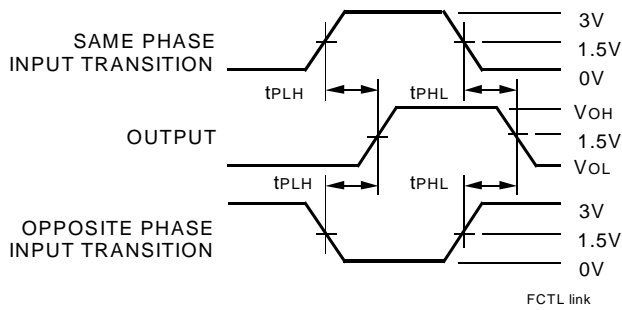
TEST CIRCUITS AND WAVEFORMS



Test Circuits for All Outputs



Set-Up, Hold, and Release Times



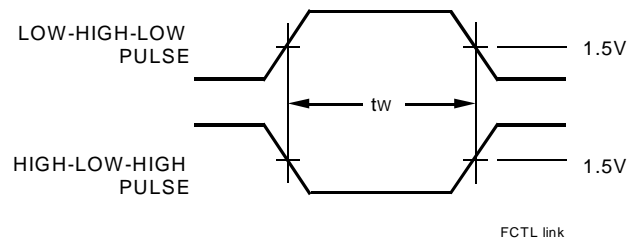
Propagation Delay

SWITCH POSITION

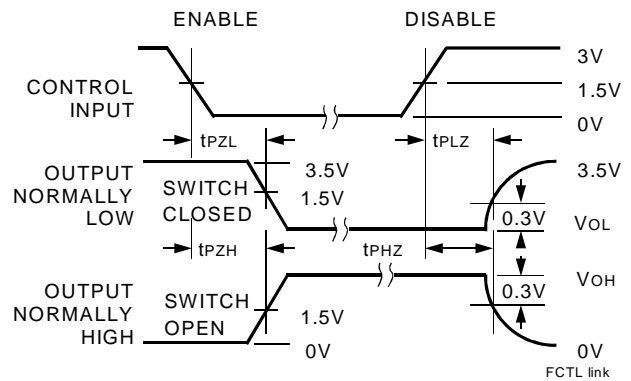
| Test | Switch |
|-----------------------------------------|--------|
| Open Drain Disable Low Enable Low | Closed |
| All Other Tests | Open |

DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.



Pulse Width

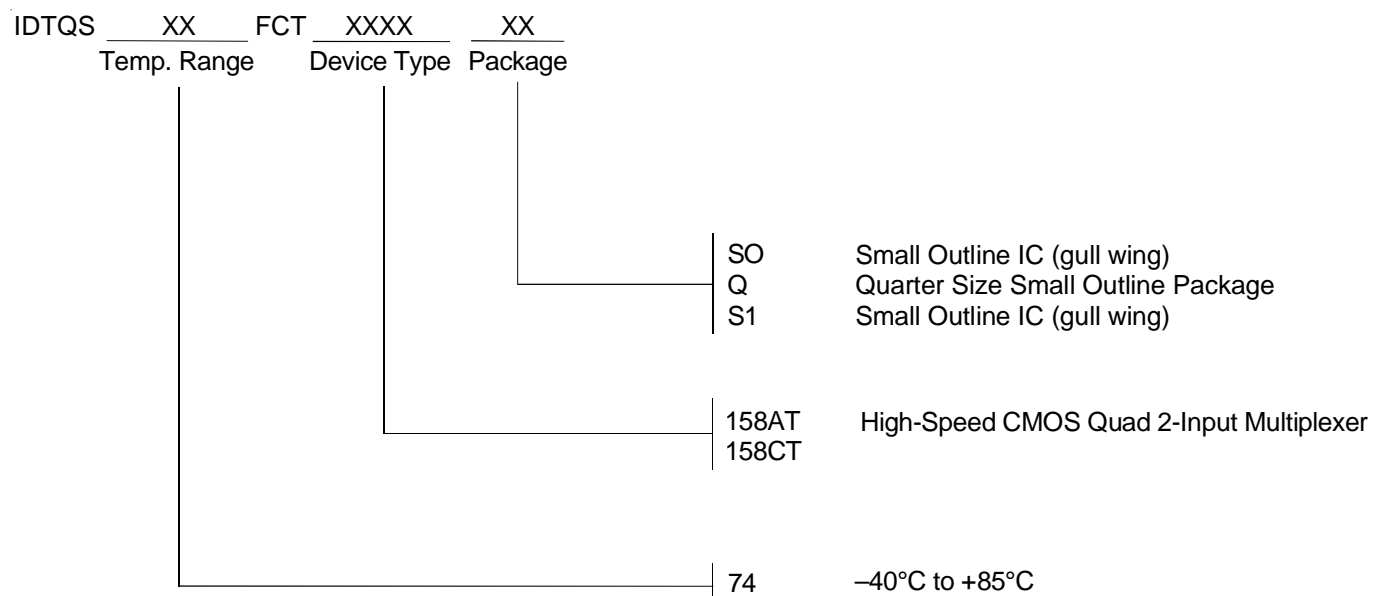


Enable and Disable Times

NOTES:

- Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
- Pulse Generator for All Pulses: Rate $\leq 1.0\text{MHz}$; $t_r \leq 2.5\text{ns}$; $t_f \leq 2.5\text{ns}$.

ORDERING INFORMATION



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