



Integrated Device Technology, Inc.

FAST CMOS 8-INPUT MULTIPLEXER

IDT54/74FCT151T/AT/CT

FEATURES:

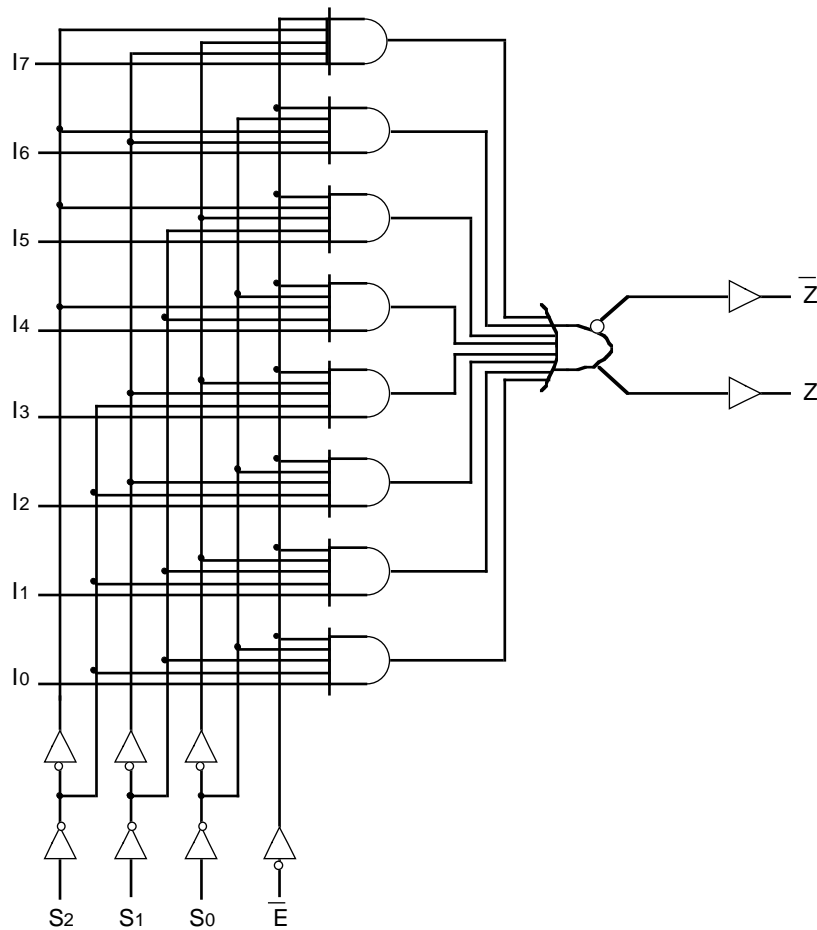
- Std., A, and C speed grades
- Low input and output leakage $\leq 1\mu\text{A}$ (max.)
- CMOS power levels
- True TTL input and output compatibility
 - $V_{OH} = 3.3\text{V}$ (typ.)
 - $V_{OL} = 0.3\text{V}$ (typ.)
- High drive outputs (-15mA I_{OH} , 48mA I_{OL})
- Power off disable outputs permit "live insertion"
- Meets or exceeds JEDEC standard 18 specifications
- Product available in Radiation Tolerant and Radiation Enhanced versions
- Military product compliant to MIL-STD-883, Class B and DESC listed (dual marked)
- Available in DIP, SOIC, CERPACK and LCC packages

DESCRIPTION:

The IDT54/74FCT151T/AT/CT are high-speed 8-input multiplexers built using an advanced dual metal CMOS technology. They select one bit of data from up to eight sources under the control of three select inputs. Both assertion and negation outputs are provided.

The IDT54/74FCT151T/AT/CT has a common Active-LOW enable (\bar{E}) input. When \bar{E} is LOW, data from one of eight inputs is routed to the complementary outputs according to the 3-bit code applied to the Select (S_0 - S_2) inputs. A common application of the 'FCT151 is data routing from one of eight sources.

FUNCTIONAL BLOCK DIAGRAM



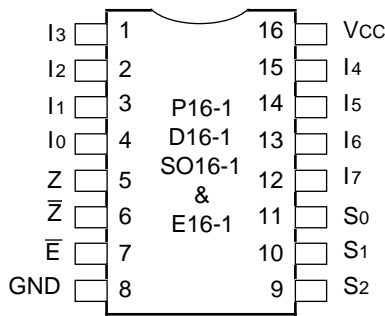
2635 drw 01

The IDT logo is a registered trademark of Integrated Device Technology, Inc.

MILITARY AND COMMERCIAL TEMPERATURE RANGES

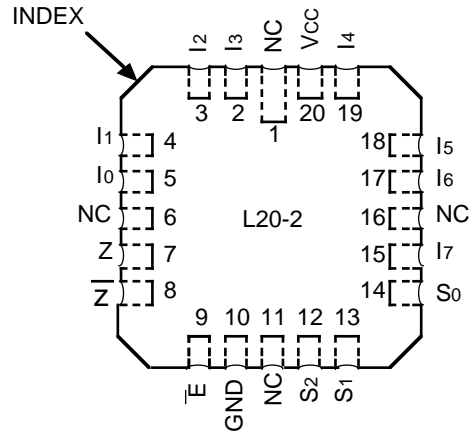
APRIL 1994

PIN CONFIGURATIONS



DIP/SOIC/CERPACK
TOP VIEW

2635 drw 02



LCC
TOP VIEW

2635 drw 03

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

| Symbol | Rating | Commercial | Military | Unit |
|----------------------------------|--------------------------------------|-------------------------------|-------------------------------|------|
| V _{TERM} ⁽²⁾ | Terminal Voltage with Respect to GND | -0.5 to +7.0 | -0.5 to +7.0 | V |
| V _{TERM} ⁽³⁾ | Terminal Voltage with Respect to GND | -0.5 to V _{CC} + 0.5 | -0.5 to V _{CC} + 0.5 | V |
| T _A | Operating Temperature | 0 to +70 | -55 to +125 | °C |
| T _{BIAS} | Temperature Under Bias | -55 to +125 | -65 to +135 | °C |
| T _{STG} | Storage Temperature | -55 to +125 | -65 to +150 | °C |
| P _T | Power Dissipation | 0.5 | 0.5 | W |
| I _{OUT} | DC Output Current | -60 to +120 | -60 to +120 | mA |

NOTES:

2635 Ink 01

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. No terminal voltage may exceed V_{CC} by +0.5V unless otherwise noted.

2. Input and V_{CC} terminals only.
3. Outputs and I/O terminals only.

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

| Symbol | Parameter ⁽¹⁾ | Conditions | Typ. | Max. | Unit |
|------------------|--------------------------|-----------------------|------|------|------|
| C _{IN} | Input Capacitance | V _{IN} = 0V | 6 | 10 | pF |
| C _{OUT} | Output Capacitance | V _{OUT} = 0V | 8 | 12 | pF |

NOTE:

2635 Ink 02

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

PIN DESCRIPTION

| Pin Names | Description |
|---------------------------------|---------------------------|
| I ₀ - I ₇ | Data Inputs |
| S ₀ - S ₂ | Selects Inputs |
| \bar{E} | Enable Input (Active LOW) |
| Z | Data Output |
| \bar{Z} | Inverted Data Output |

2635 tbl 03

FUNCTION TABLE⁽¹⁾

| Inputs | | | | Outputs | |
|----------------|----------------|----------------|-----------|----------------|-------------|
| S ₂ | S ₁ | S ₀ | \bar{E} | Z | \bar{Z} |
| X | X | X | H | L | H |
| L | L | L | L | I ₀ | \bar{I}_0 |
| L | L | H | L | I ₁ | \bar{I}_1 |
| L | H | L | L | I ₂ | \bar{I}_2 |
| L | H | H | L | I ₃ | \bar{I}_3 |
| H | L | L | L | I ₄ | \bar{I}_4 |
| H | L | H | L | I ₅ | \bar{I}_5 |
| H | H | L | L | I ₆ | \bar{I}_6 |
| H | H | H | L | I ₇ | \bar{I}_7 |

NOTE:

2635 tbl 04

1. H = HIGH Voltage Level, L = LOW Voltage Level, X = Don't care, Z = High Impedance.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

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 ⁽¹⁾ | | Min. | Typ. ⁽²⁾ | Max. | Unit |
|-----------|--|---|--|------|---------------------|---------|---------------|
| V_{IH} | Input HIGH Level | Guaranteed Logic HIGH Level | | 2.0 | — | — | V |
| V_{IL} | Input LOW Level | Guaranteed Logic LOW Level | | — | — | 0.8 | V |
| I_{IH} | Input HIGH Current ⁽⁴⁾ | $V_{CC} = \text{Max.}$ | $V_I = 2.7\text{V}$ | — | — | ± 1 | μA |
| I_{IL} | Input LOW Current ⁽⁴⁾ | $V_{CC} = \text{Max.}$ | $V_I = 0.5\text{V}$ | — | — | ± 1 | μA |
| I_{OZH} | High Impedance Output Current ⁽⁴⁾ | $V_{CC} = \text{Max.}$ | $V_O = 2.7\text{V}$ | — | — | ± 1 | μA |
| I_{OZL} | | | $V_O = 0.5\text{V}$ | — | — | ± 1 | μA |
| I_I | Input HIGH Current ⁽⁴⁾ | $V_{CC} = \text{Max.}, V_I = V_{CC} (\text{Max.})$ | | — | — | 20 | μA |
| V_{IK} | Clamp Diode Voltage | $V_{CC} = \text{Min.}, I_N = -18\text{mA}$ | | — | -0.7 | -1.2 | V |
| I_{OS} | Short Circuit Current | $V_{CC} = \text{Max.}^{(3)}, V_O = \text{GND}$ | | -60 | -120 | -225 | mA |
| V_{OH} | Output HIGH Voltage | $V_{CC} = \text{Min.}$ $V_{IN} = V_{IH}$ or V_{IL} | $I_{OH} = -6\text{mA MIL.}$ $I_{OH} = -8\text{mA COM'L.}$ | 2.4 | 3.3 | — | V |
| | | | $I_{OH} = -12\text{mA MIL.}$ $I_{OH} = -15\text{mA COM'L.}$ | 2.0 | 3.0 | — | V |
| V_{OL} | Output LOW Voltage | $V_{CC} = \text{Min.}$ $V_{IN} = V_{IH}$ or V_{IL} | $I_{OL} = 32\text{mA MIL.}$ $I_{OL} = 48\text{mA COM'L.}$ | — | 0.3 | 0.5 | V |
| | | | | | | | |
| V_H | Input Hysteresis | — | | — | 200 | — | mV |
| I_{CC} | Quiescent Power Supply Current | $V_{CC} = \text{Max.}$ $V_{IN} = \text{GND}$ or V_{CC} | | — | 0.01 | 1 | mA |

NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0\text{V}$, $+25^\circ\text{C}$ ambient and maximum loading.
- Not more than one output should be shorted at one time. Duration of the short circuit test should not exceed one second.
- The test limit for this parameter is $\pm 5\mu\text{A}$ at $T_A = -55^\circ\text{C}$.

2635 tbl 05

POWER SUPPLY CHARACTERISTICS

| Symbol | Parameter | Test Conditions ⁽¹⁾ | | Min. | Typ. ⁽²⁾ | Max. | Unit |
|-----------------|---|--|--|------|---------------------|------|------------|
| ΔI_{CC} | Quiescent Power Supply Current TTL Inputs HIGH | $V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$ | | — | 0.5 | 2.0 | mA |
| I_{CCD} | Dynamic Power Supply Current ⁽⁴⁾ | $V_{CC} = \text{Max.}$ Outputs Open \bar{E} or $\bar{OE} = \text{GND}$ One Bit Toggling 50% Duty Cycle | $V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$ | — | 0.15 | 0.25 | mA/ MHz |
| I_C | Total Power Supply Current ⁽⁵⁾ | $V_{CC} = \text{Max.}$ Outputs Open $f_i = 10\text{MHz}$ 50% Duty Cycle \bar{E} or $\bar{OE} = \text{GND}$ One Input Toggling | $V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$ | — | 3.2 | 6.5 | mA |
| | | | $V_{IN} = 3.4V$ $V_{IN} = \text{GND}$ | — | 3.5 | 7.5 | |

NOTES:

2635 tbl 06

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient.
- Per TTL driven input ($V_{IN} = 3.4V$). All other inputs at V_{CC} or GND .
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_o)$
 $I_{CC} = \text{Quiescent Current}$
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$
 $D_H = \text{Duty Cycle for TTL Inputs High}$
 $N_T = \text{Number of TTL Inputs at } D_H$
 $I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$
 $f_{CP} = \text{Clock Frequency for Register Devices (Zero for Non-Register Devices)}$
 $f_i = \text{Input Frequency}$
 $N_o = \text{Number of Inputs at } f_i$
 All currents are in milliamps and all frequencies are in megahertz.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

| Symbol | Parameter | Condition ⁽¹⁾ | IDT54/74FCT151T | | IDT54/74FCT151AT | | IDT54/74FCT151CT | | Unit | | | | | | |
|------------------------|---|--|---------------------|------|---------------------|------|---------------------|------|------|---------------------|------|-----|-----|-----|----|
| | | | Com'l. | | Mil. | | Com'l. | | | Mil. | | | | | |
| | | | Min. ⁽²⁾ | Max. | Min. ⁽²⁾ | Max. | Min. ⁽²⁾ | Max. | | Min. ⁽²⁾ | Max. | | | | |
| t_{PLH} t_{PHL} | Propagation Delay S_N to \bar{Z} | $C_L = 50\text{pF}$ $R_L = 500\Omega$ | 1.5 | 9.0 | 1.5 | 10.0 | 1.5 | 6.6 | 1.5 | 7.4 | 1.5 | 5.6 | 1.5 | 6.2 | ns |
| t_{PLH} t_{PHL} | Propagation Delay S_N to Z | | 1.5 | 10.5 | 1.5 | 11.5 | 1.5 | 6.8 | 1.5 | 7.6 | 1.5 | 5.8 | 1.5 | 6.5 | ns |
| t_{PLH} t_{PHL} | Propagation Delay \bar{E} to \bar{Z} | | 1.5 | 7.0 | 1.5 | 7.5 | 1.5 | 5.6 | 1.5 | 6.3 | 1.5 | 4.8 | 1.5 | 5.4 | ns |
| t_{PLH} t_{PHL} | Propagation Delay \bar{E} to Z | | 1.5 | 9.5 | 1.5 | 11.0 | 1.5 | 5.8 | 1.5 | 6.6 | 1.5 | 5.0 | 1.5 | 5.7 | ns |
| t_{PLH} t_{PHL} | Propagation Delay I_N to \bar{Z} | | 1.5 | 6.5 | 1.5 | 7.5 | 1.5 | 5.2 | 1.5 | 5.8 | 1.5 | 4.4 | 1.5 | 4.9 | ns |
| t_{PLH} t_{PHL} | Propagation Delay I_N to Z | | 1.5 | 7.5 | 1.5 | 9.0 | 1.5 | 5.5 | 1.5 | 6.1 | 1.5 | 4.7 | 1.5 | 5.2 | ns |

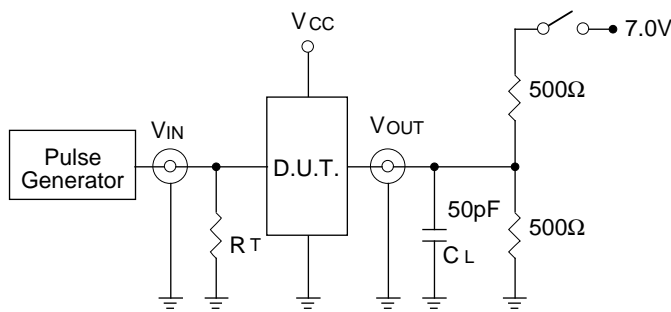
NOTES:

2635 tbl 07

- See test circuit and waveforms.
- Minimum limits are guaranteed but not tested on Propagation Delays.

TEST CIRCUITS AND WAVEFORMS

TEST CIRCUITS FOR ALL OUTPUTS



2635 drw 04

SWITCH POSITION

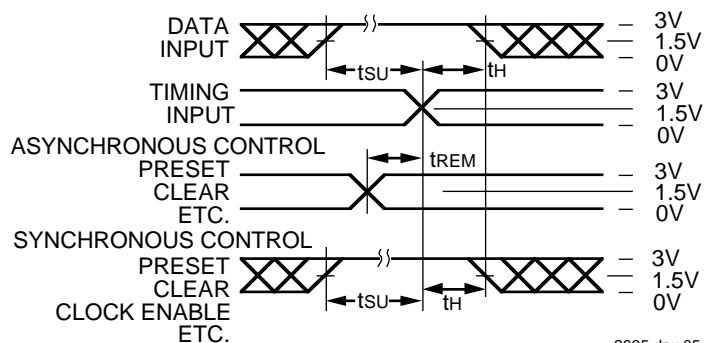
| Test | Switch |
|---|--------|
| Open Drain Disable Low Enable Low | Closed |
| All Other Tests | Open |

DEFINITIONS:

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

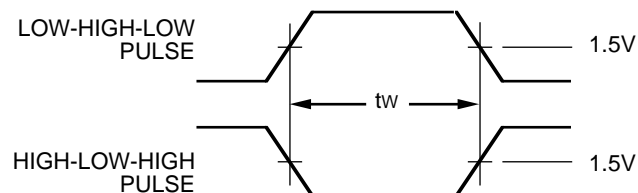
2635 Ink 08

SET-UP, HOLD AND RELEASE TIMES



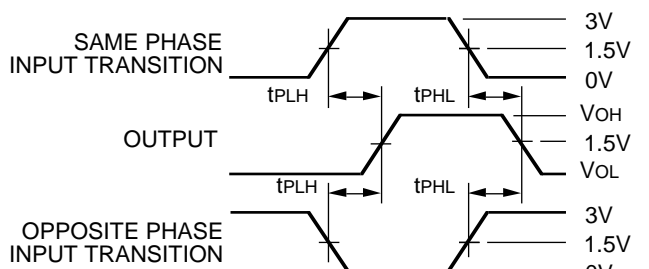
2635 drw 05

PULSE WIDTH



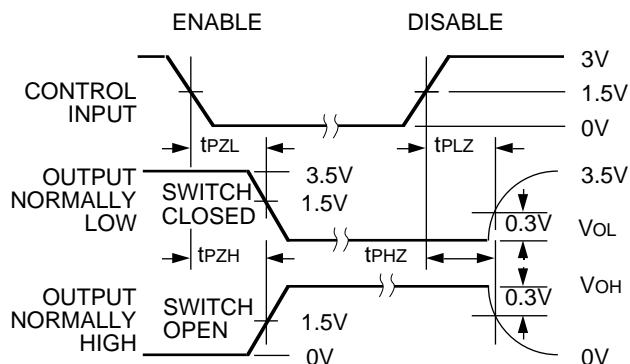
2635 drw 06

PROPAGATION DELAY



2635 drw 07

ENABLE AND DISABLE TIMES

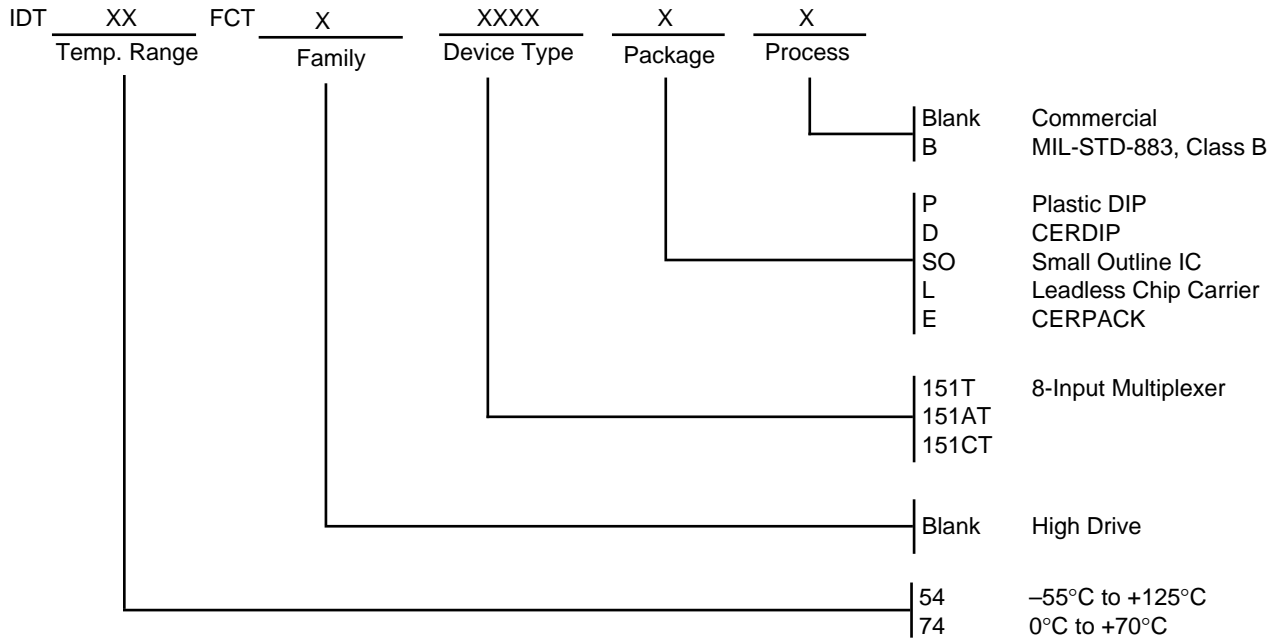


2635 drw 08

NOTES:

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

ORDERING INFORMATION



2635 drw 09