



# FAST CMOS OCTAL BUS TRANSCEIVER (OPEN DRAIN)

**IDT74FCT621T/AT**

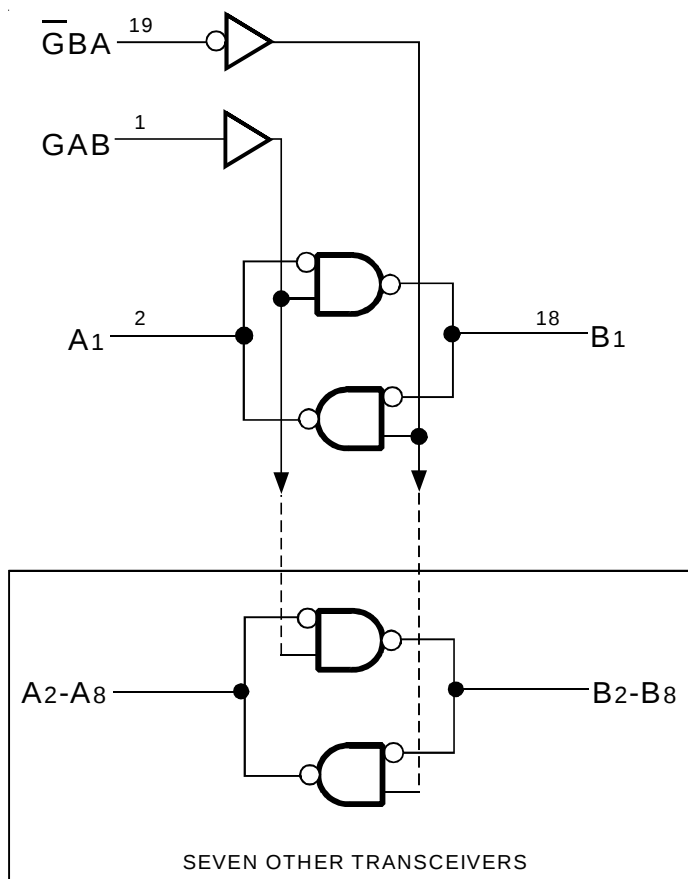
## FEATURES:

- Std. and A grades
- Low input and output leakage  $\leq 1\mu\text{A}$  (max.)
- CMOS power levels
- True TTL input and output compatibility:
  - $V_{OH} = 3.3V$  (typ.)
  - $V_{OL} = 0.3V$  (typ.)
- Meets or exceeds JEDEC standard 18 specifications
- Power off disable outputs permit "live insertion"
- Available in SOIC package

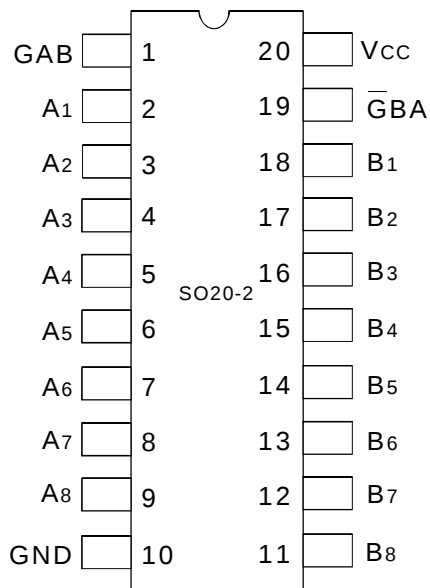
## DESCRIPTION:

The IDT74FCT621T is an octal transceiver with non-inverting Open-Drain bus compatible outputs in both send and receive directions. The B bus outputs are capable of sinking 64mA providing very good capacitive drive characteristics. These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control function implementation allows for maximum flexibility in timing.

## FUNCTIONAL BLOCK DIAGRAM



## PIN CONFIGURATION



SOIC  
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

| Symbol                           | Description                          | Max                          | Unit |
|----------------------------------|--------------------------------------|------------------------------|------|
| V <sub>TERM</sub> <sup>(2)</sup> | Terminal Voltage with Respect to GND | −0.5 to +7                   | V    |
| V <sub>TERM</sub> <sup>(3)</sup> | Terminal Voltage with Respect to GND | −0.5 to V <sub>CC</sub> +0.5 | V    |
| T <sub>STG</sub>                 | Storage Temperature                  | −65 to +150                  | °C   |
| I <sub>OUT</sub>                 | DC Output Current                    | −60 to +120                  | mA   |

### NOTES:

- 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<sub>CC</sub> by +0.5V unless otherwise noted.
- Inputs and V<sub>CC</sub> terminals only.
- Output and I/O terminals only.

## CAPACITANCE (T<sub>A</sub> = +25°C, F = 1.0MHz)

| Symbol           | Parameter <sup>(1)</sup> | Conditions            | Typ. | Max. | Unit |
|------------------|--------------------------|-----------------------|------|------|------|
| C <sub>IN</sub>  | Input Capacitance        | V <sub>IN</sub> = 0V  | 6    | 10   | pF   |
| C <sub>OUT</sub> | Output Capacitance       | V <sub>OUT</sub> = 0V | 8    | 12   | pF   |

### NOTE:

- This parameter is measured at characterization but not tested.

## PIN DESCRIPTION

| Pin Names                       | Description                    |
|---------------------------------|--------------------------------|
| $\overline{\text{GBA}}$ , GAB   | Enable Inputs                  |
| A <sub>1</sub> – A <sub>8</sub> | A Inputs or Open-drain Outputs |
| B <sub>1</sub> – B <sub>8</sub> | B Inputs or Open-drain Outputs |

## FUNCTION TABLE<sup>(1)</sup>

| Enable Inputs           |     | Function                           |
|-------------------------|-----|------------------------------------|
| $\overline{\text{GBA}}$ | GAB |                                    |
| L                       | L   | B data to A bus                    |
| H                       | H   | A data to B bus                    |
| H                       | L   | OFF                                |
| L                       | H   | B data to A bus<br>A data to B bus |

### NOTE:

- H = HIGH Voltage Level.  
L = LOW Voltage Level.  
OFF = HIGH if pull-up resistor is connected to Open-Drain output.

## 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 <sup>(1)</sup>                             |                                       | Min. | Typ. <sup>(2)</sup> | 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             |
| $I_{IH}$  | Input HIGH Current <sup>(4)</sup>                | $V_{CC} = \text{Max.}$ , $V_I = 2.7\text{V}$               |                                       | —    | —                   | $\pm 1$ | $\mu\text{A}$ |
| $I_{IL}$  | Input LOW Current <sup>(4)</sup>                 | $V_{CC} = \text{Max.}$ , $V_I = 0.5\text{V}$               |                                       | —    | —                   | $\pm 1$ | $\mu\text{A}$ |
| $I_I$     | Input HIGH Current <sup>(4)</sup>                | $V_{CC} = \text{Max.}$ , $V_I = V_{CC} (\text{Max.})$      |                                       | —    | —                   | $\pm 1$ | $\mu\text{A}$ |
| $V_{IK}$  | Clamp Diode Voltage                              | $V_{CC} = \text{Min.}$ , $I_{IN} = -18\text{mA}$           |                                       | —    | -0.7                | -1.2    | V             |
| $I_{OH}$  | Output HIGH Current                              | $V_{CC} = \text{Max.}$<br>$V_{IN} = V_{IH}$ or $V_{IL}$    | $V_{OH} = V_{CC} (\text{Max.})$       | —    | —                   | 20      | $\mu\text{A}$ |
| $V_{OL}$  | Output LOW Voltage<br>(B Bus)                    | $V_{CC} = \text{Min.}$<br>$V_{IN} = V_{IH}$ or $V_{IL}$    | $I_{OL} = 64\text{mA}$ <sup>(3)</sup> | —    | 0.3                 | 0.55    | V             |
| $V_{OL}$  | Output LOW Voltage<br>(A Bus)                    | $V_{CC} = \text{Min.}$<br>$V_{IN} = V_{IH}$ or $V_{IL}$    | $I_{OL} = 48\text{mA}$ <sup>(3)</sup> | —    | 0.3                 | 0.5     | V             |
| $I_{OFF}$ | Input/Output Power Off<br>Leakage <sup>(4)</sup> | $V_{CC} = 0\text{V}$ , $V_{IN}$ or $V_O = 4.5\text{V}$     |                                       | —    | —                   | $\pm 1$ | $\mu\text{A}$ |
| $V_H$     | Input Hysteresis                                 | —                                                          |                                       | —    | 200                 | —       | mV            |
| $I_{CC}$  | Quiescent Power Supply<br>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.
- These are maximum  $I_{OL}$  values per output, for 8 outputs turned on simultaneously. Total maximum  $I_{OL}$  (all outputs) is 512mA for commercial and 384mA for military. Derate  $I_{OL}$  for number of outputs exceeding 8 turned on simultaneously.
- The test limit for this parameter is  $\pm 5\mu\text{A}$  at  $T_A = -55^{\circ}\text{C}$ .

## POWER SUPPLY CHARACTERISTICS

| Symbol          | Parameter                                         | Test Conditions <sup>(1)</sup>                                                                                                                                |                                            | Min. | Typ. <sup>(2)</sup> | Max.              | Unit   |
|-----------------|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------|---------------------|-------------------|--------|
| $\Delta I_{CC}$ | Quiescent Power Supply Current<br>TTL Inputs HIGH | $V_{CC} = \text{Max.}$<br>$V_{IN} = 3.4V^{(3)}$                                                                                                               |                                            | —    | 0.5                 | 2                 | mA     |
| $I_{CCD}$       | Dynamic Power Supply Current <sup>(4)</sup>       | $V_{CC} = \text{Max.}$<br>Outputs Open<br>$\overline{G}BA = GAB = \text{GND or } V_{CC}$<br>One Input Toggling<br>50% Duty Cycle                              | $V_{IN} = V_{CC}$<br>$V_{IN} = \text{GND}$ | —    | 0.15                | 0.25              | mA/MHz |
| $I_C$           | Total Power Supply Current <sup>(6,7)</sup>       | $V_{CC} = \text{Max.}$<br>Outputs Open<br>$\overline{G}BA = GAB = \text{GND or } V_{CC}$<br>One Bit Toggling<br>at $f_i = 10\text{MHz}$<br>50% Duty Cycle     | $V_{IN} = V_{CC}$<br>$V_{IN} = \text{GND}$ | —    | 1.5                 | 3.5               | mA     |
|                 |                                                   |                                                                                                                                                               | $V_{IN} = 3.4V$<br>$V_{IN} = \text{GND}$   | —    | 1.8                 | 4.5               |        |
|                 |                                                   | $V_{CC} = \text{Max.}$<br>Outputs Open<br>$\overline{G}BA = GAB = \text{GND or } V_{CC}$<br>Eight Bits Toggling<br>at $f_i = 2.5\text{MHz}$<br>50% Duty Cycle | $V_{IN} = V_{CC}$<br>$V_{IN} = \text{GND}$ | —    | 3                   | 6 <sup>(5)</sup>  |        |
|                 |                                                   |                                                                                                                                                               | $V_{IN} = 3.4V$<br>$V_{IN} = \text{GND}$   | —    | 5                   | 14 <sup>(5)</sup> |        |

### NOTES:

1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical values are at  $V_{CC} = 5.0V$ ,  $+25^\circ\text{C}$  ambient.

3. Per TTL driven input ( $V_{IN} = 3.4V$ ); all other inputs at  $V_{CC}$  or GND.

4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.

5. Values for these conditions are examples of the  $I_{CC}$  formula. These limits are guaranteed but not tested.

6.  $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$

$I_{CC} = \text{Quiescent Current}$

$\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$

$D_H = \text{Duty Cycle for TTL Inputs High}$

$N_T = \text{Number of TTL Inputs at } D_H$

$I_{CCD} = \text{Dynamic Current Caused by an Output Transition Pair (HLH or LHL)}$

$f_{CP} = \text{Clock Frequency for Register Devices (Zero for Non-Register Devices)}$

$f_i = \text{Input Frequency}$

$N_i = \text{Number of Inputs at } f_i$

All currents are in milliamps and all frequencies are in megahertz.

7. This test is performed with outputs tied to GND through a pull-down resistor.

## SWITCHING CHARACTERISTICS OVER OPERATING RANGE

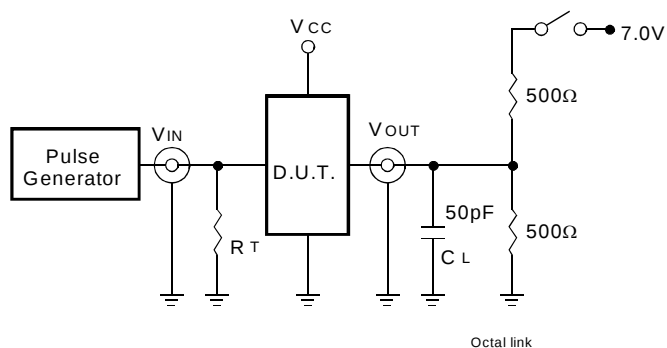
| Symbol           | Parameter                                 | Condition <sup>(1)</sup> | IDT74FCT621T        |      | IDT74FCT621AT       |      | Unit |
|------------------|-------------------------------------------|--------------------------|---------------------|------|---------------------|------|------|
|                  |                                           |                          | Min. <sup>(2)</sup> | Max. | Min. <sup>(2)</sup> | Max. |      |
| t <sub>PLH</sub> | Propagation Delay, A to B                 | CL = 50pF<br>RL = 500Ω   | 5.5                 | 13   | 5.5                 | 12   | ns   |
| t <sub>PHL</sub> |                                           |                          | 1.5                 | 8.5  | 1.5                 | 6.8  |      |
| t <sub>PLH</sub> | Propagation Delay, B to A                 |                          | 5.5                 | 12.5 | 5.5                 | 12   | ns   |
| t <sub>PHL</sub> |                                           |                          | 1.5                 | 8    | 1.5                 | 6.4  |      |
| t <sub>PLH</sub> | Propagation Delay, $\overline{G}$ BA to A |                          | 5.5                 | 14   | 5.5                 | 13   | ns   |
| t <sub>PHL</sub> |                                           |                          | 1.5                 | 8.5  | 1.5                 | 6.8  |      |
| t <sub>PLH</sub> | Propagation Delay, $\overline{G}$ AB to B |                          | 5.5                 | 14   | 5.5                 | 13   | ns   |
| t <sub>PHL</sub> |                                           |                          | 1.5                 | 8    | 1.5                 | 6.4  |      |

### NOTES:

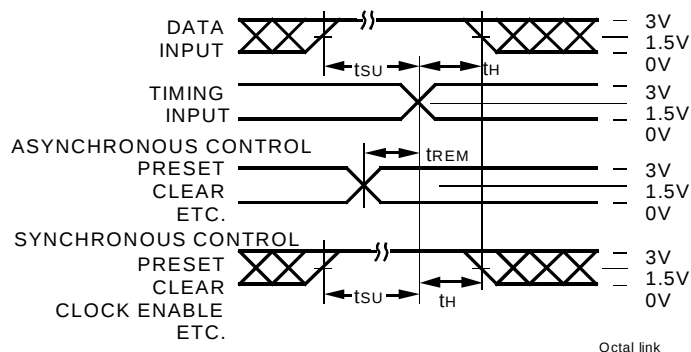
1. See test circuit and waveforms.

2. Minimum limits are guaranteed but not tested on Propagation Delays.

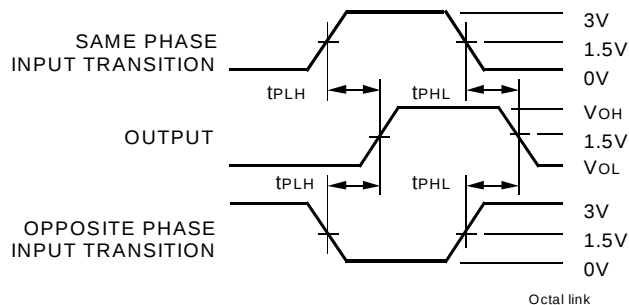
## TEST CIRCUITS AND WAVEFORMS



**Test Circuits for All Outputs**



**Set-Up, Hold, and Release Times**



**Propagation Delay**

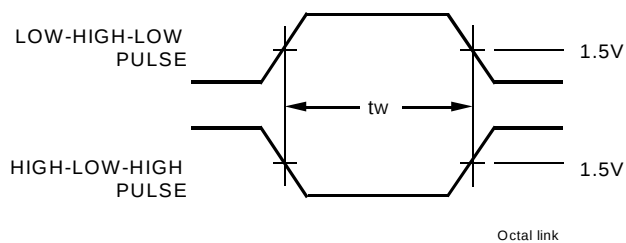
## SWITCH POSITION

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

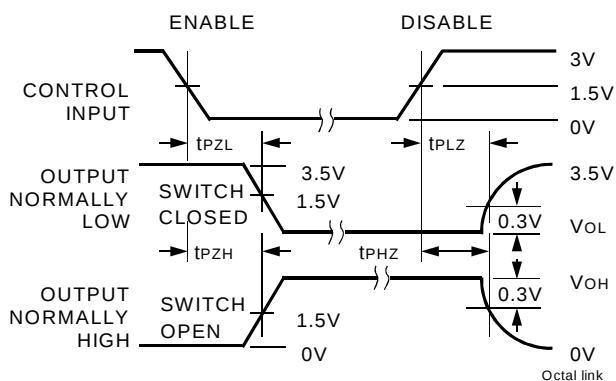
### DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.

RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.



**Pulse Width**

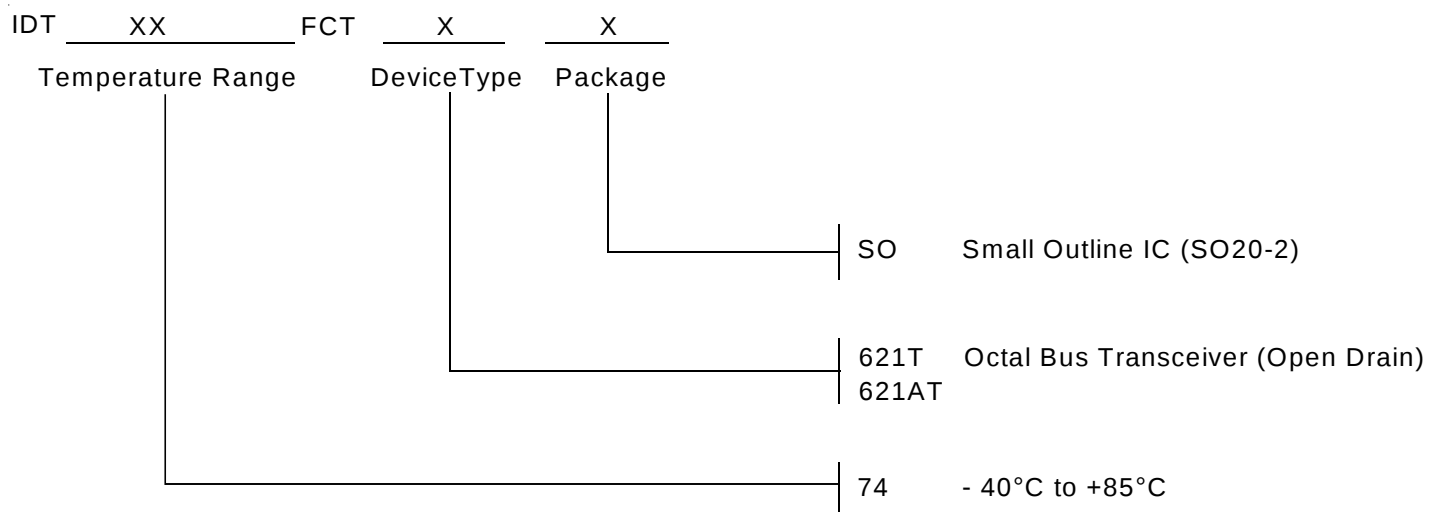


**Enable and Disable Times**

### 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



**CORPORATE HEADQUARTERS**  
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