



Integrated Device Technology, Inc.

FAST CMOS OCTAL BUS TRANSCEIVER (OPEN DRAIN)

IDT54/74FCT621T/AT
IDT54/74FCT622T/AT

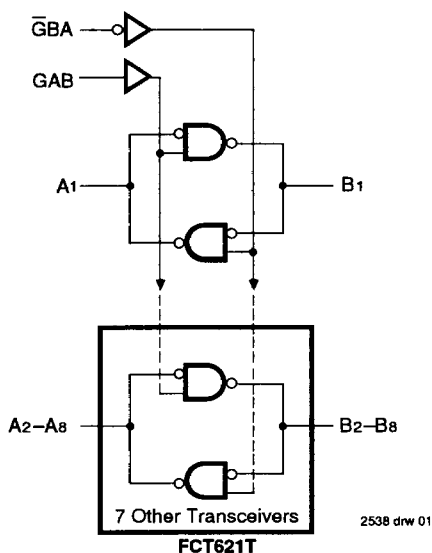
FEATURES:

- IDT54/74FCT621T/622T equivalent to FAST™ speed
- **IDT54/74FCT621AT/622AT 25% faster than FAST speed**
- Equivalent to FAST output drive over full temperature and voltage supply extremes
- $I_{OL} = 64\text{mA}$ (commercial) and 48mA (military)
- CMOS power levels (1mW typ. static)
- TTL input and output level compatible
- Substantially lower input current levels than FAST ($5\mu\text{A max.}$)
- **Power Down Disable feature**
- JEDEC standard pinout for DIP and LCC
- Product available in Radiation Tolerant and Radiation Enhanced versions
- Military product compliant to MIL-STD-883, Class B

DESCRIPTION:

The IDT54/74FCT621T/AT 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. The IDT54/74FCT622T/AT is the inverting option of the '621.

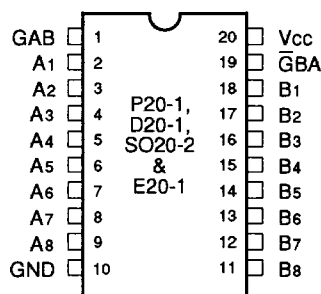
FUNCTIONAL BLOCK DIAGRAM ⁽¹⁾



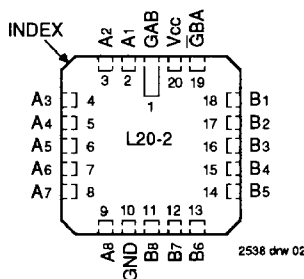
NOTE:

1. The FCT622T is the inverting option of FCT621T.

PIN CONFIGURATIONS



DIP/SOIC/CERPACK
TOP VIEW



LCC
TOP VIEW

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FAST is a trademark of National Semiconductor Co.

MILITARY AND COMMERCIAL TEMPERATURE RANGES

MAY 1992

PIN DESCRIPTION

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

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FUNCTION TABLE⁽¹⁾

Enable Inputs		Function	
GBA	GAB	'FCT621T	'FCT622T
L	L	B data to A bus	$\overline{\text{B}}$ data to A bus
H	H	A data to B bus	$\overline{\text{A}}$ data to B bus
H	L	OFF	OFF
L	H	B data to A bus A data to B bus	$\overline{\text{B}}$ data to A bus $\overline{\text{A}}$ data to B bus

NOTE:

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

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 to V _{CC}	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	120	120	mA

NOTES:

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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. Inputs and V_{CC} terminals.
3. Outputs and I/O terminals.

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 _{I/O}	I/O Capacitance	V _{OUT} = 0V	8	12	pF

NOTE:

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

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following conditions Apply Unless Otherwise Specified:

Commercial: TA = 0°C to +70°C, VCC = 5.0V ± 5%; Military: TA = -55°C to +125°C, VCC = 5.0V ± 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	V _{CC} = Max V _I = 2.7V	Except I/O Pins I/O Pins	—	—	5 15	μA
I _{IL}	Input LOW Current	V _{CC} = Max V _I = 0.5V	Except I/O Pins I/O Pins	—	—	-5 -15	μA
I _I	Input HIGH Current	V _{CC} = Max., V _I = V _{CC} (Max.)		—	—	20	μA
V _{IK}	Clamp Diode Voltage	V _{CC} = Min., I _{IN} = -18mA		—	-0.7	-1.2	V
I _{OFF}	Power Down Disable	V _{CC} = GND V _O = 4.5V		—	—	100	μA
I _{OH}	Output HIGH Current	V _{CC} = Max. V _{IN} = V _{IH} or V _{IL}	V _{OH} = V _{CC} (Max.)	—	—	20	μA
V _{OL}	Output LOW Voltage (B Bus)	V _{CC} = Min. V _{IN} = V _{IH} or V _{IL}	I _{OL} = 48mA MIL. ⁽⁴⁾ I _{OL} = 64mA COM'L.	—	0.3	0.55	V
V _{OL}	Output LOW Voltage (A Bus)	V _{CC} = Min. V _{IN} = V _{IH} or V _{IL}	I _{OL} = 32mA MIL. ⁽⁴⁾ I _{OL} = 48mA COM'L.	—	0.3	0.5	V
V _H	Input Hysteresis	—		—	200	—	mV
I _{CC}	Quiescent Power Supply Current ⁽³⁾	V _{CC} = max., V _{IN} = GND or V _{CC}		—	0.2	1.5	mA

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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} = 5.0V, +25°C ambient and maximum loading.
- This test is performed with outputs preconditioned to the LOW state. I_{CC} with outputs preconditioned to the HIGH state is guaranteed when the outputs are forced to V_{CC} or GND.
- 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.

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 $\overline{G}BA = GAB = GND$ or V_{CC} One Input Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = GND$	—	0.15	0.25	mA/MHz
I_C	Total Power Supply Current ^(6,7)	$V_{CC} = \text{Max.}$ Outputs Open $\overline{G}BA = GAB = GND$ or V_{CC} One Bit Toggling at $f_i = 10\text{MHz}$ 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = GND$	—	1.7	4.0	mA
			$V_{IN} = 3.4V$ $V_{IN} = GND$	—	2.0	5.0	
		$V_{CC} = \text{Max.}$ Outputs Open $\overline{G}BA = GAB = GND$ or V_{CC} Eight Bits Toggling at $f_i = 2.5\text{MHz}$ 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = GND$	—	3.2	6.5 ⁽⁵⁾	
			$V_{IN} = 3.4V$ $V_{IN} = GND$	—	5.2	14.5 ⁽⁵⁾	

NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ 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.
- $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

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

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

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

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

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

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

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

$f_i = \text{Input Frequency}$

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

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

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

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SWITCHING CHARACTERISTICS OVER OPERATING RANGE – IDT54/74FCT621T/AT

Symbol	Parameter	Condition ⁽¹⁾	IDT54/74FCT621T				IDT54/74FCT621AT				Unit
			Com'l.		Mil.		Com'l.		Mil.		
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
tPLH	Propagation Delay A to B	CL = 50pF RL = 500Ω	5.5	13.0	5.5	13.5	5.5	12.0	5.5	12.5	ns
tPHL			1.5	8.5	1.5	9.5	1.5	6.8	1.5	7.6	
tPLH	Propagation Delay B to A		5.5	12.5	5.5	13.0	5.5	12.0	5.5	12.5	ns
tPHL			1.5	8.0	1.5	9.0	1.5	6.4	1.5	7.2	
tPLH	Propagation Delay $\overline{\text{GBA}}$ to A		5.5	14.0	5.5	14.5	5.5	13.0	5.5	13.5	ns
tPHL			1.5	8.5	1.5	9.5	1.5	6.8	1.5	7.6	
tPLH	Propagation Delay GAB to B		5.5	14.0	5.5	14.5	5.5	13.0	5.5	13.5	ns
tPHL			1.5	8.0	1.5	9.0	1.5	6.4	1.5	7.2	

SWITCHING CHARACTERISTICS OVER OPERATING RANGE – IDT54/74FCT622T/AT

Symbol	Parameter	Condition ⁽¹⁾	IDT54/74FCT622T				IDT54/74FCT622AT				Unit
			Com'l.		Mil.		Com'l.		Mil.		
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
tPLH	Propagation Delay $\overline{\text{A}}$ to B	CL = 50pF RL = 500Ω	5.5	13.5	5.5	14.0	5.5	12.0	5.5	12.5	ns
tPHL			1.5	8.0	1.5	9.5	1.5	6.0	1.5	7.0	
tPLH	Propagation Delay $\overline{\text{B}}$ to A		5.5	12.5	5.5	13.0	5.5	12.0	5.5	12.5	ns
tPHL			1.5	8.0	1.5	9.5	1.5	5.5	1.5	6.5	
tPLH	Propagation Delay $\overline{\text{GBA}}$ to A		5.5	12.5	5.5	13.0	5.5	11.5	5.5	12.0	ns
tPHL			1.5	10.0	1.5	11.5	1.5	7.0	1.5	8.5	
tPLH	Propagation Delay GAB to B		6.0	12.5	6.0	13.0	6.0	11.5	6.0	12.0	ns
tPHL			1.5	9.5	1.5	11.0	1.5	6.5	1.5	7.5	

NOTES:

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

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