



54FCT/74FCT244A

Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

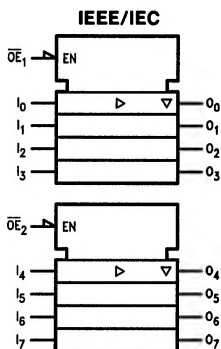
The 'FCT244A is an octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus-oriented transmitter/receiver which provides improved PC board density.

Features

- NSC 54/74FCT244A is pin and functionally equivalent to IDT 54/74FCT244A
- TRI-STATE outputs drive lines or buffer memory address registers
- TTL input and output level compatible
- TTL inputs accept CMOS levels
- High current latch up immunity
- $I_{OL} = 64$ mA (commercial) and 48 mA (military)
- Electrostatic discharge protection ≥ 2 kV
- Military product compliant to MIL-STD 883C
- Inherently radiation tolerant

Ordering Code: See Section 8

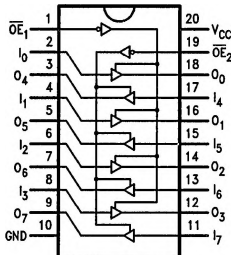
Logic Symbol



TL/F/10270-1

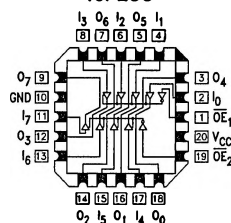
Connection Diagrams

Pin Assignment
for DIP, Flatpak and SOIC



TL/F/10270-2

Pin Assignment
for LCC



TL/F/10270-3

Pin Names	Description
$\overline{OE}_1, \overline{OE}_2$	TRI-STATE Output Enable Inputs
I_0-I_7	Inputs
O_0-O_7	Outputs

Truth Tables

Inputs		Outputs (Pins 12, 14, 16, 18)
\overline{OE}_1	D	
L	L	L
L	H	H
H	X	Z

Inputs		Outputs (Pins 3, 5, 7, 9)
\overline{OE}_2	D	
L	L	L
L	H	H
H	X	Z

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
Z = High Impedance

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Terminal Voltage with Respect to GND (V_{TERM})	
54FCTA	-0.5V to 7.0V
74FCTA	-0.5V to 7.0V
Temperature under Bias (T_{BIAS})	
74FCTA	-55°C to +125°C
54FCTA	-65°C to +135°C
Storage Temperature (T_{STG})	
74FCTA	-55°C to +125°C
54FCTA	-65°C to +150°C
Power Dissipation (P_T)	0.5W
DC Output Current (I_{OUT})	120 mA

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT FCT circuits outside databook specifications.

Recommended Operating Conditions

Supply Voltage (V_{CC})	
54FCTA	4.5V to 5.5V
74FCTA	4.75V to 5.25V
Input Voltage	0V to V_{CC}
Output Voltage	0V to V_{CC}
Operating Temperature (T_A)	
54FCTA	-55°C to +125°C
74FCTA	-0°C to +70°C
Junction Temperature (T_J)	
CDIP	175°C
PDIP	140°C

DC Characteristics for 'FCTA Family Devices

Typical values are at $V_{CC} = 5.0V$, 25°C ambient and maximum loading. For test conditons shown as Max, use the value specified for the appropriate device type: Com: $V_{CC} = 5.0V \pm 5\%$, $T_A = 0^\circ C$ to $+70^\circ C$; Mil: $V_{CC} = 5.0V \pm 10\%$, $T_A = -55^\circ C$ to $+125^\circ C$, $V_{HC} = V_{CC} - 0.2V$

Symbol	Parameter	54FCTA/74FCTA			Units	Conditions	
		Min	Typ	Max			
V_{IH}	Minimum High Level Input Voltage	2.0			V		
V_{IL}	Maximum Low Level Input Voltage			0.8	V		
I_{IH}	Input High Current			5.0 5.0	μA	$V_{CC} = \text{Max}$	$V_I = V_{CC}$ $V_I = 2.7V$ (Note 2)
I_{IL}	Input Low Current			-5.0 -5.0	μA	$V_{CC} = \text{Max}$	$V_I = 0.5V$ (Note 2) $V_I = \text{GND}$
I_{OZ}	Maximum TRI-STATE Current			10.0 10.0 -10.0 -10.0	μA	$V_{CC} = \text{Max}$	$V_I = V_{CC}$ $V_I = 2.7V$ (Note 2) $V_I = 0.5V$ (Note 2) $V_I = \text{GND}$
V_{IK}	Clamp Diode Voltage		-0.7	-1.2	V	$V_{CC} = \text{Min}$; $I_N = -18 \text{ mA}$	
I_{OS}	Short Circuit Current	-60	-120		mA	$V_{CC} = \text{Max}$ (Note 1); $V_O = \text{GND}$	
V_{OH}	Minimum High Level Output Voltage	2.8 V_{HC} 2.4 2.4	3.0 V_{CC} 4.3 4.3		V	$V_{CC} = 3V$; $V_{IN} = 0.2V$ or V_{HC} ; $I_{OH} = -32 \mu A$	$I_{OH} = -300 \mu A$ $I_{OH} = -12 \text{ mA}$ (Mil) $I_{OH} = -15 \text{ mA}$ (Com)
V_{OL}	Maximum Low Level Output Voltage		GND GND 0.3 0.3	0.2 0.2 0.55 0.55	V	$V_{CC} = 3V$; $V_{IN} = 0.2V$ or V_{HC} ; $I_{OL} = 300 \mu A$	$I_{OL} = 300 \mu A$ $I_{OL} = 48 \text{ mA}$ (Mil) $I_{OL} = 64 \text{ mA}$ (Com)
I_{CC}	Maximum Quiescent Supply Current		0.001	1.5	mA	$V_{CC} = \text{Max}$ $V_{IN} \geq V_{HC}$, $V_{IN} \leq 0.2V$ $I_I = 0$	
ΔI_{CC}	Quiescent Supply Current; TTL Inputs HIGH		0.5	2.0	mA	$V_{CC} = \text{Max}$ $V_{IN} = 3.4V$ (Note 3)	

DC Characteristics for 'FCTA Family Devices (Continued)

Typical values are at $V_{CC} = 5.0V$, $25^{\circ}C$ ambient and maximum loading. For test conditions shown as Max, use the value specified for the appropriate device type: Com: $V_{CC} = 5.0V \pm 5\%$, $T_A = 0^{\circ}C$ to $+70^{\circ}C$; Mil: $V_{CC} = 5.0V \pm 10\%$, $T_A = -55^{\circ}C$ to $+125^{\circ}C$, $V_{HC} = V_{CC} - 0.2V$

Symbol	Parameter	54FCTA/74FCTA			Units	Conditions	
		Min	Typ	Max			
I_{CCD}	Dynamic Power Supply Current (Note 4)		0.25	0.40	mA/MHz	$V_{CC} = \text{Max}$ Outputs Open $\overline{OE}_A = \overline{OE}_B = \text{GND}$ One Input Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
I_C	Total Power Supply Current (Note 6)		1.5	4.5	mA	$V_{CC} = \text{Max}$ Outputs Open $\overline{OE}_A = \overline{OE}_B = \text{GND}$ $f_1 = 10 \text{ MHz}$ One Bit Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
			1.8	5.0		$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	
			3.0	8.0		(Note 5) $V_{CC} = \text{Max}$ Outputs Open $\overline{OE}_A = \overline{OE}_B = \text{GND}$	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
			5.0	14.5		$f_1 = 2.5 \text{ MHz}$ Eight Bits Toggling 50% Duty Cycle	$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$
V_H	Input Hysteresis on Clock Only		200		mV		

Note 1: Maximum test duration not to exceed one second, not more than one output shorted at one time.

Note 2: This parameter guaranteed but not tested.

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

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

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

Note 6: $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_1 N_I)$
 $I_{CC} = \text{Quiescent Current}$
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$
 $D_H = \text{Duty Cycle for TTL Inputs High}$
 $N_T = \text{Number of Inputs at } D_H$
 $I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$
 $f_{CP} = \text{Clock Frequency for Register Devices (Zero for Non-Register Devices)}$
 $f_1 = \text{Input Frequency}$
 $N_I = \text{Number of Inputs at } f_1$
 All currents are in milliamperes and all frequencies are in megahertz.

AC Electrical Characteristics: See Section 2 for Waveforms

Symbol	Parameter	54FCTA/74FCTA	74FCTA		54FCTA		Units	Fig. No.
		$T_A = +25^\circ\text{C}$ $V_{CC} = 5.0\text{V}$	$T_A, V_{CC} = \text{Com}$ $R_L = 500\Omega$ $C_L = 50\text{pF}$		$T_A, V_{CC} = \text{Mil}$ $R_L = 500\Omega$ $C_L = 50\text{pF}$			
		Typ	Min (Note 1)	Max	Min (Note 1)	Max		
t_{PLH} t_{PHL}	Propagation Delay D_n to O_n	3.1	1.5	4.8			ns	2-8
t_{PZH} t_{PZL}	Output Enable Time	3.8	1.5	6.2			ns	2-11
t_{PHZ} t_{PLZ}	Output Disable Time	3.3	1.5	5.6			ns	2-11

Note 1: Minimum limits are guaranteed but not tested on propagation delays.

Capacitance ($T_A = +25^\circ\text{C}$, $f = 1.0\text{ MHz}$)

Symbol	Parameter (Note)	Typ	Max	Units	Conditions
C_{IN}	Input Capacitance	6	10	pF	$V_{IN} = 0\text{V}$
C_{OUT}	Output Capacitance	8	12	pF	$V_{OUT} = 0\text{V}$

Note: This parameter is measured at characterization but not tested.