National Semiconductor

54FCT541
Non-Inverting Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

The 'FCT541 is a non-inverting octal buffer and line driver designed to be employed as a memory address driver, clock driver and bus oriented transmitter or receiver which provides improved PC board density.

The FCT541 is functionally equivalent to the FCT 241 with the exception of packaging, inputs and outputs are on the opposite side of the package.

FACT™ FCT utilizes NSC quiet series technology to provide improved quiet output switching and dynamic threshold performance.

FACT FCT features undershoot corrector and split ground bus for superior performance.

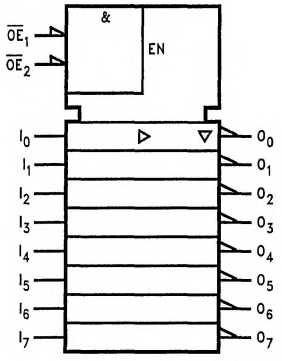
Features

- NSC 54FCT541 is pin and functionally equivalent to IDT 54FCT541
- Input clamp diodes to limit bus reflections
- TTL/CMOS input and output level compatible
- I_{OL} = 48 mA
- CMOS power levels
- 2 kV minimum ESD immunity
- Military product compliant to MIL-STD 883 and standard military drawing #5962-89766

Ordering Code: See Section 8

Logic Symbol

IEEE/IEC



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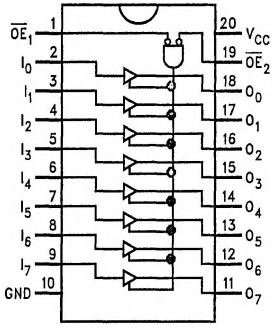
Connection Diagrams

Pin Assignment for DIP, Flatpak and SOIC



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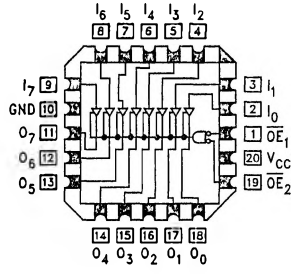
Pin Assignment for LCC



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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 Table

Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I_n	
L	L	H	H
H	X	X	Z
X	H	X	Z
L	L	L	L

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})
54FCT −0.5V to 7.0V

Temperature under Bias (T_{BIAS})
54FCT −65°C to +135°C

Storage Temperature (T_{STG})
54FCT −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. Exposure to absolute maximum rating conditions for extended periods may affect reliability. 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.

Recommended Operating Conditions

Supply Voltage (V_{CC})
54FCT 4.5V to 5.5V

Input Voltage 0V to V_{CC}

Output Voltage 0V to V_{CC}

Operating Temperature (T_A)
54FCT −55°C to +125°C

Junction Temperature (T_J)
CDIP 175°C
PDIP 140°C

DC Characteristics for 'FCT Family Devices

Typical values are at V_{CC} = 5.0V, 25°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 ±5%, Mil: V_{CC} = 5.0V ±10%, T_A = −55°C to +125°C, V_{HC} = V_{CC} − 0.2V.

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

DC Characteristics for 'FCT Family Devices (Continued)

Typical values are at V_{CC} = 5.0V, 25°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 ±5%, T_A = 0°C to +70°C; Mil: V_{CC} = 5.0V ±10%, T_A = −55°C to +125°C, V_{HC} = V_{CC} − 0.2V.

Symbol	Parameter	54FCT			Units	Conditions	
		Min	Typ	Max			
I_{CCD}	Dynamic Power Supply Current (Note 4)		0.35	0.40	mA/MHz	V_{CC} = Max Outputs Open $\overline{OE}_A$ = $\overline{OE}_B$ = 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)			5.5	mA	V_{CC} = Max Outputs Open $\overline{OE}_A$ = $\overline{OE}_B$ = GND f_i = 10 MHz One Bit Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
				6.0			V_{IN} = 3.4V V_{IN} = GND
						(Note 5) V_{CC} = Max $\overline{OE}_A$ = $\overline{OE}_B$ = GND f_i = 2.5 MHz Eight Bits Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq 0.2V$
							V_{IN} = 3.4V

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: $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

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

I_{CC} = Quiescent Current

ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)

D_H = Duty Cycle for TTL Inputs High

N_T = Number of Inputs at D_H

I_{CCD} = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)

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

f_i = Input Frequency

N_i = Number of Inputs at f_i

All currents are milliamps and all frequencies are in megahertz.

AC Electrical Characteristics: See Section 2 for Waveforms

Symbol	Parameter	54FCT/74FCT T_A = +25°C V_{CC} = 5.0V	74FCT T_A, V_{CC} = Com R_L = 500Ω C_L = 50 pF		54FCT T_A, V_{CC} = Mil R_L = 500Ω C_L = 50 pF		Units	Fig. No.
		Typ	Min	Max	Min	Max		
t_{PLH} t_{PHL}	Propagation Delay D_n to O_n	5.0			1.5	9.0	ns	2-8
t_{PZH} t_{PZL}	Output Enable Time	7.0			1.5	12.5	ns	2-11
t_{PHZ} t_{PLZ}	Output Disable Time	6.0			1.5	9.5	ns	2-11

Capacitance T_A = +25°C, f = 1.0 MHz

Symbol	Parameter (Note)	Typ	Max	Units	Conditions
C_{IN}	Input Capacitance	6	8	pF	V_{IN} = 0V

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