National Semiconductor

October 1999

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

General Description

The 'FCT541 is an octal buffer and line driver with TRI-STATE outputs designed to be employed as a memory and address driver, clock driver, or bus-oriented transmitter/receiver. The 'FCT541 is similar to the 'FCT244 with broadside pinout.

Features

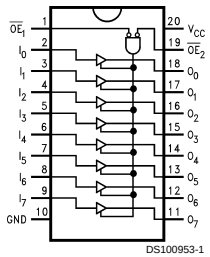
- Non-inverting buffers
- TTL input and output level compatible
- CMOS power consumption
- Output sink capability of 48 mA, source capability of 12 mA
- Flow-through pinout for ease of PC board layout
- Standard Microcircuit Drawing (SMD) 5962-8976601

Ordering Code

Military	Package Number	Package Description
54FCT541DMQB	J20A	20-Lead Ceramic Dual-In-Line
54FCT541FMQB	W20A	20-Lead Cerpack
54FCT541LMQB	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

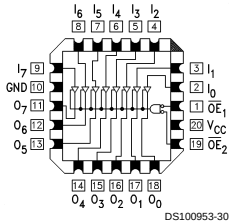
Connection Diagram

Pin Assignment
DIP and Cerpack



DS100953-1

Pin Assignment
LCC



DS100953-30

Pin Names	Description
$\overline{OE}_1$, $\overline{OE}_2$	Output Enable Input (Active Low)
I_0–I_7	Inputs
O_0–O_7	Outputs

Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I	FCT541
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

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Absolute Maximum Ratings (Note 1)

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

Storage Temperature	−65˚C to +150˚C
Ambient Temperature under Bias	−55˚C to +125˚C
Junction Temperature under Bias	
Ceramic	−55˚C to +175˚C
V_{CC} Pin Potential to Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Any Output in the Disabled or Power-Off State	−0.5V to 5.5V
in the HIGH State	−0.5V to V_{CC}
Current Applied to Output in LOW State (Max)	twice the rated I_{OL} (mA)
DC Latchup Source Current	−500 mA

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	−55˚C to +125˚C
Supply Voltage	
Military	+4.5V to +5.5V
Minimum Input Edge Rate	(ΔV/Δt)
Data Input	50 mV/ns
Enable Input	20 mV/ns

DC Electrical Characteristics

Symbol	Parameter		FCT541 Min	FCT541 Typ	FCT541 Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0			V		Recognized HIGH Signal
V_{IL}	Input LOW Voltage				0.8	V		Recognized LOW Signal
V_{CD}	Input Clamp Diode Voltage				−1.2	V	Min	I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	54FCT	4.3			V	Min	I_{OH} = −300 µA
		54FCT	2.4			V	Min	I_{OH} = −12 mA
V_{OL}	Output LOW Voltage	54FCT			0.2	V	Min	I_{OL} = 300 µA
		54FCT			0.55	V	Min	I_{OL} = 48 mA
I_{IH}	Input HIGH Current				5	µA	Max	V_{IN} = V_{CC}
I_{IL}	Input LOW Current				−5	µA	Max	V_{IN} = 0.0V
I_{OZH}	Output Leakage Current				10	µA	Max	V_{OUT} = 5.5V; $\overline{OE}_n$ = 2.0V
I_{OZL}	Output Leakage Current				−10	µA	Max	V_{OUT} = 0.0V; $\overline{OE}_n$ = 2.0V
I_{OS}	Output Short-Circuit Current				-60	mA	Max	V_{OUT} = 0.0V
I_{CCQ}	Quiescent Power Supply Current				1.5	mA	Max	V_{IN} < 0.2V or V_{IN} 5.3V, V_{CC} = 5.5V
ΔI_{CC}	Quiescent Power Supply Current				2.0	mA	Max	V_I = V_{CC} − 2.1V
I_{CCD}	Dynamic I_{CC}				0.4	mA/ MHz	Max	V_{CC} = 5.5V, Outputs Open, One Bit Toggling, 50% Duty Cycle, $\overline{OE}_n$ = GND
I_{CC}	Total Power Supply Current				6.0	mA	Max	V_{CC} = 5.5V, Outputs Open, fI = 10MHz, $\overline{OE}_n$ = GND, One Bit Toggling, 50% Duty Cycle, $\overline{OE}_n$ = GND

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

AC Electrical Characteristics

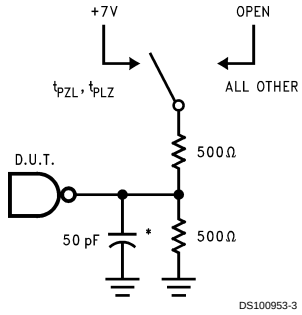
Symbol	Parameter	54FCT $T_A = -55^\circ C$ to $+125^\circ C$, $V_{CC} = 4.5V-5.5V$, $C_L = 50$ pF		Units	Fig. No.
		Min	Max		
t_{PLH}	Propagation Delay	2.0	9.0	ns	*Figure 4*
t_{PHL}	Data to Outputs	2.0	9.0		
t_{PZH}	Output Enable Time	2.0	12.5	ns	*Figure 5*
t_{PZL}		2.0	12.5		
t_{PHZ}	Output Disable Time	2.0	12.5	ns	*Figure 5*
t_{PLZ}		2.0	12.5		

Capacitance

Symbol	Parameter	Max	Units	Conditions $T_A = 25^\circ C$
C_{IN}	Input Capacitance	10.0	pF	V_{CC} = 0.0V
C_{OUT} (Note 3)	Output Capacitance	12.0	pF	V_{CC} = 5.0V

Note 3: C_{OUT} is measured at frequency of f = 1 MHz, per MIL-STD-883B, Method 3012.

AC Loading



*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

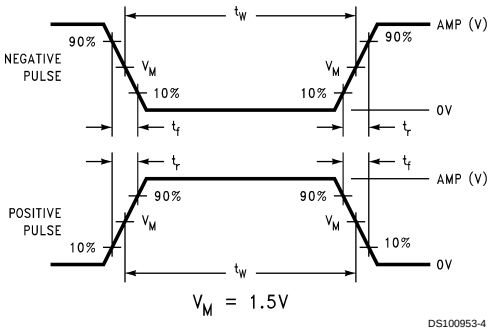


FIGURE 2. Test Input Signal Levels

Amplitude	Rep. Rate	t_w	t_r	t_f
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

FIGURE 3. Test Input Signal Requirements

AC Waveforms

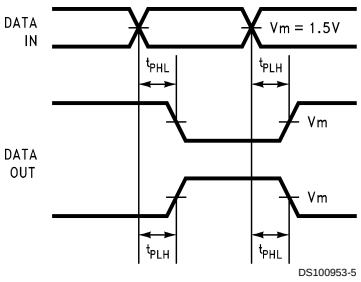


FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

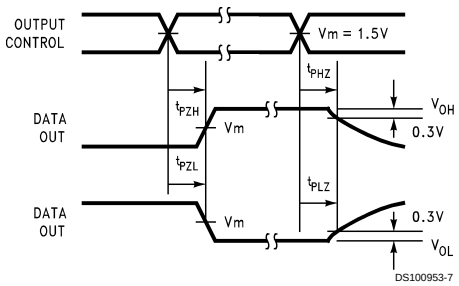
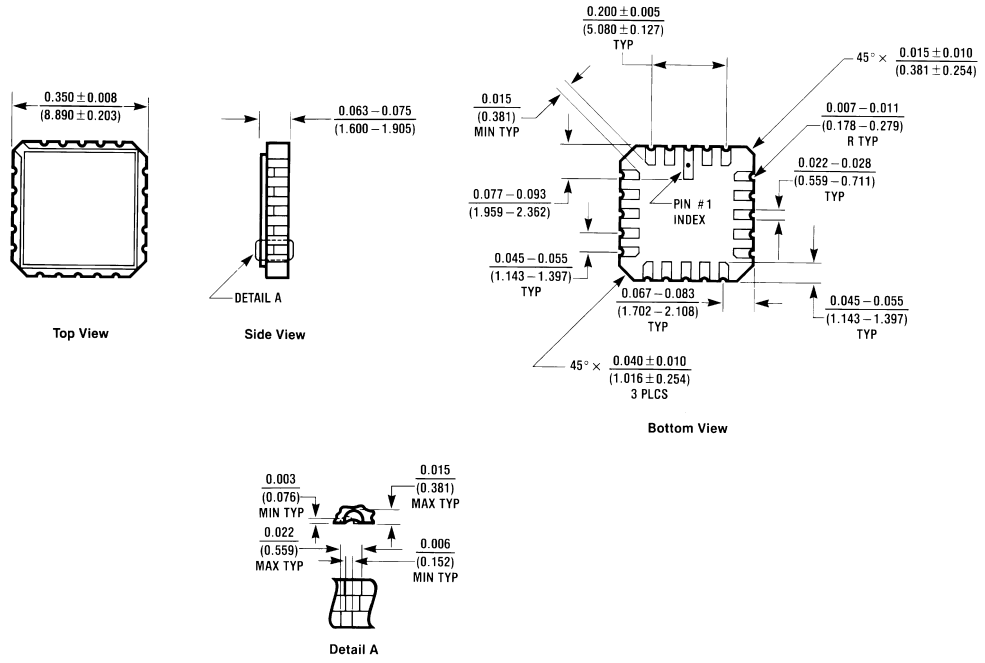
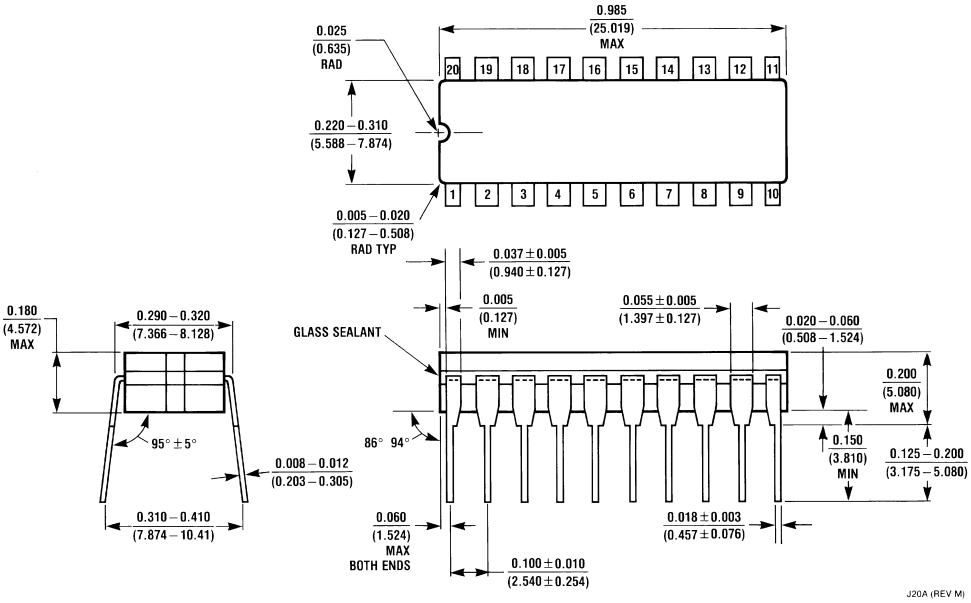


FIGURE 5. TRI-STATE Output HIGH and LOW Enable and Disable Time

Physical Dimensions inches (millimeters) unless otherwise noted

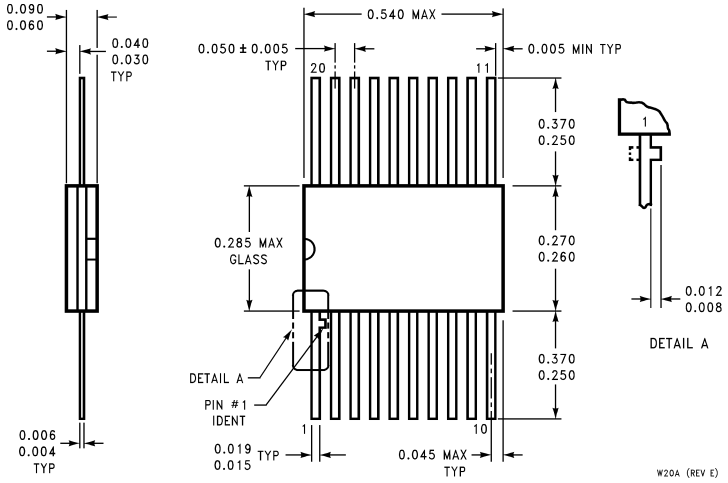


20-Terminal Ceramic Chip Carrier
NS Package Number E20A



20-Lead Ceramic Dual-In-Line Package
NS Package Number J20A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Ceramic Flatpack
NS Package Number W20A

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