54FCT541

54FCT541 Octal Buffer/Line Driver with -TRISTATE Outputs

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National Semiconductor

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**
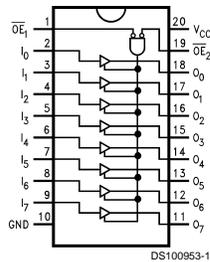
DS100953-1

**Pin Assignment
LCC**
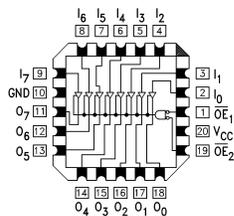
DS100953-30

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	($\Delta V/\Delta t$)
Data Input	50 mV/ns
Enable Input	20 mV/ns

DC Electrical Characteristics

Symbol	Parameter		FCT541			Units	V_{CC}	Conditions
			Min	Typ	Max			
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	$V_{IN} = 0.0$V
I_{OZH}	Output Leakage Current				10	μA	Max	$V_{OUT} = 5.5$V; $\overline{OE}_n = 2.0$V
I_{OZL}	Output Leakage Current				−10	μA	Max	$V_{OUT} = 0.0$V; $\overline{OE}_n = 2.0$V
I_{OS}	Output Short-Circuit Current				-60	mA	Max	$V_{OUT} = 0.0$V
I_{CCQ}	Quiescent Power Supply Current				1.5	mA	Max	$V_{IN} < 0.2$V or V_{IN} 5.3V, V_{CC} = 5.5V
ΔI_{CC}	Quiescent Power Supply Current				2.0	mA	Max	$V_I = V_{CC} - 2.1$V
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, fl = 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 $T_A = -55°C$ to $+125°C$ $V_{CC} = 4.5V–5.5V$ $C_L = 50$ 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 $T_A = 25°C$
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
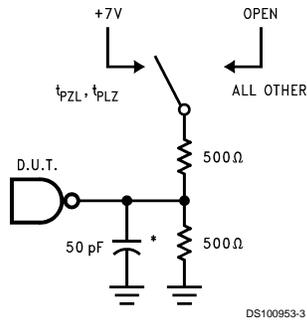
*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

$V_M = 1.5V$
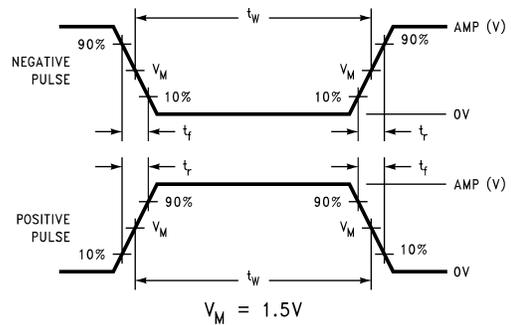
FIGURE 2. Test Input Signal Levels

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
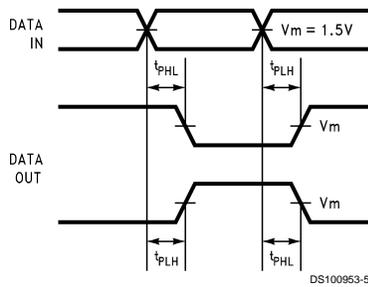
FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions
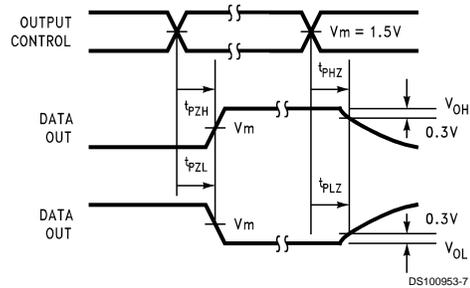
FIGURE 5. TRI-STATE Output HIGH and LOW Enable and Disable Time

Physical Dimensions inches (millimeters) unless otherwise noted

0.350 ± 0.008
(8.890 ± 0.203)

0.063 − 0.075
(1.600 − 1.905)

DETAIL A

Top View

Side View

0.200 ± 0.005
(5.080 ± 0.127)
TYP

45° × 0.015 ± 0.010
(0.381 ± 0.254)

0.015
(0.381)
MIN TYP

0.007 − 0.011
(0.178 − 0.279)
R TYP

0.077 − 0.093
(1.959 − 2.362)

0.022 − 0.028
(0.559 − 0.711)
TYP

PIN #1
INDEX

0.045 − 0.055
(1.143 − 1.397)
TYP

0.067 − 0.083
(1.702 − 2.108)
TYP

0.045 − 0.055
(1.143 − 1.397)
TYP

45° × 0.040 ± 0.010
(1.016 ± 0.254)
3 PLCS

Bottom View

0.003
(0.076)
MIN TYP

0.015
(0.381)
MAX TYP

0.022
(0.559)
MAX TYP

0.006
(0.152)
MIN TYP

Detail A
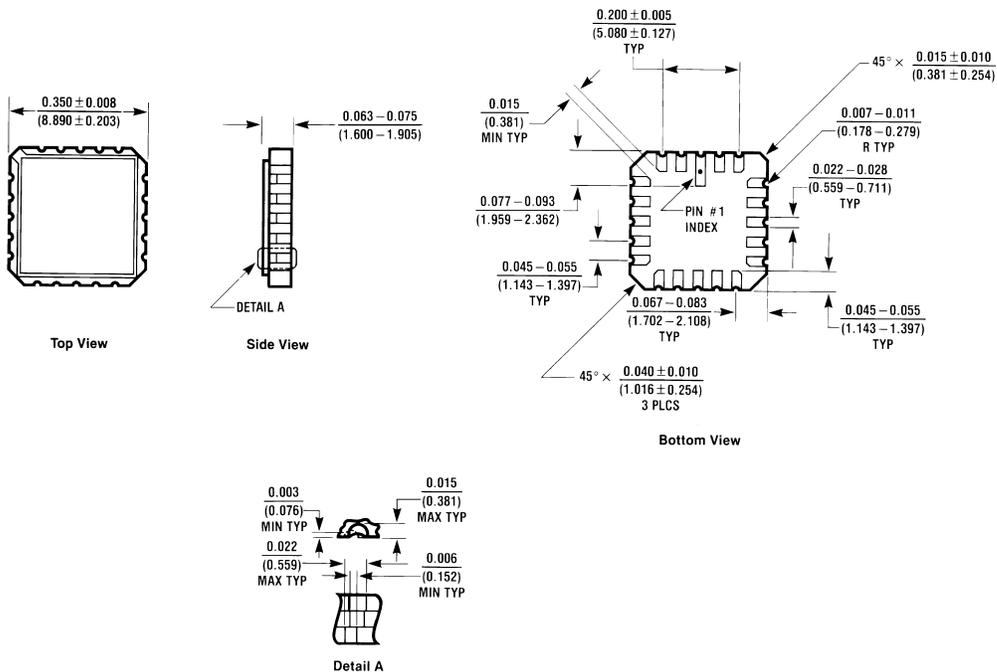
E20A (REV D)

20-Terminal Ceramic Chip Carrier
NS Package Number E20A

0.025
(0.635)
RAD

0.985
(25.019)
MAX

20 19 18 17 16 15 14 13 12 11

0.220 − 0.310
(5.588 − 7.874)

1 2 3 4 5 6 7 8 9 10

0.005 − 0.020
(0.127 − 0.508)
RAD TYP

0.037 ± 0.005
(0.940 ± 0.127)

0.005
(0.127)
MIN

0.055 ± 0.005
(1.397 ± 0.127)

0.020 − 0.060
(0.508 − 1.524)

0.180
(4.572)
MAX

0.290 − 0.320
(7.366 − 8.128)

GLASS SEALANT

0.200
(5.080)
MAX

95° ± 5°

0.008 − 0.012
(0.203 − 0.305)

86° 94°

0.150
(3.810)
MIN

0.125 − 0.200
(3.175 − 5.080)

0.310 − 0.410
(7.874 − 10.41)

0.060
(1.524)
MAX
BOTH ENDS

0.018 ± 0.003
(0.457 ± 0.076)

0.100 ± 0.010
(2.540 ± 0.254)

J20A (REV M)

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

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

0.090
0.060

0.040
0.030
TYP

0.006
0.004
TYP

0.540 MAX

0.050 ± 0.005
TYP

20   11

0.005 MIN TYP

0.370
0.250

0.270
0.260

0.370
0.250

0.285 MAX
GLASS

DETAIL A

PIN #1
IDENT

1   10

0.019
0.015
TYP

0.045 MAX
TYP

1

0.012
0.008

DETAIL A

W20A (REV E)
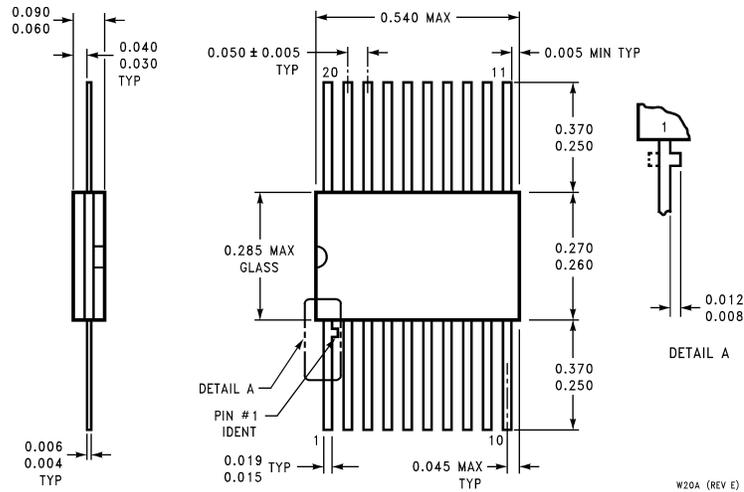
**20-Lead Ceramic Flatpack
NS Package Number W20A**

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