N *ational Semiconductor*

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54FCT540
Octal Buffer/Line Driver with TRI-STATE® Outputs

General Description

The 'FCT540 is an octal buffer/line drivers designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers.

These devices are similar in function to the 'FCT240 while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes these devices especially useful as output ports for microprocessors, allowing ease of layout and greater PC board density.

Features

- TRI-STATE inverting outputs
- Inputs and outputs opposite side of package, allowing easier interface to microprocessors
- TTL input and output level compatible
- CMOS power consumption
- Output sink capability of 48mA, source capability of 12 mA
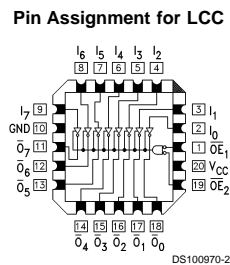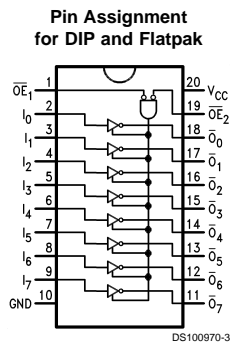- Standard Microcircuit Drawing (SMD) 5962-8976701

Logic Symbol

IEEE/IEC

DS100970-1
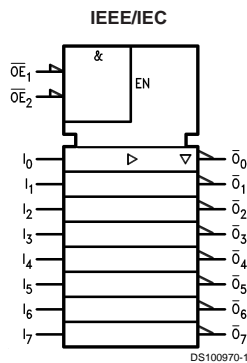
Inputs			Outputs
$\overline{OE}_1$	$\overline{OE}_2$	I	
L	L	H	L
H	X	X	Z
X	H	X	Z
L	L	L	H

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

Connection Diagrams

**Pin Assignment
for DIP and Flatpak**

DS100970-3

Pin Assignment for LCC

DS100970-2

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FACT™ is a trademark of Fairchild Semiconductor Corporation.

Absolute Maximum Ratings (Note 1)

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

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_I = −0.5V	−20 mA
V_I = V_{CC} + 0.5V	+20 mA
DC Input Voltage (V_I)	−0.5V to V_{CC} + 0.5V
DC Output Diode Current (I_{OK})	
V_O = −0.5V	−20 mA
V_O = V_{CC} + 0.5V	+20 mA
DC Output Voltage (V_O)	−0.5V to V_{CC} + 0.5V
DC Output Source	
or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current	
per Output Pin (I_{CC} or I_{GND})	±50 mA

Storage Temperature (T_{STG})	−65°C to +150°C
Junction Temperature (T_J)	
CDIP	175°C

Recommended Operating Conditions

Supply Voltage (V_{CC})	
'FCT	2.0V to 6.0V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	
54FCT	−55°C to +125°C

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® circuits outside databook specifications.

DC Characteristics for 'FCT Family Devices

Symbol	Parameter		FCT540		Units	V_{CC}	Conditions
			Min	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} = 0.0V
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, fl = 10MHz, $\overline{OE}_n$ = GND, One Bit Toggling, 50% Duty Cycle

Note 2: All outputs loaded; thresholds on input associated with output under test.

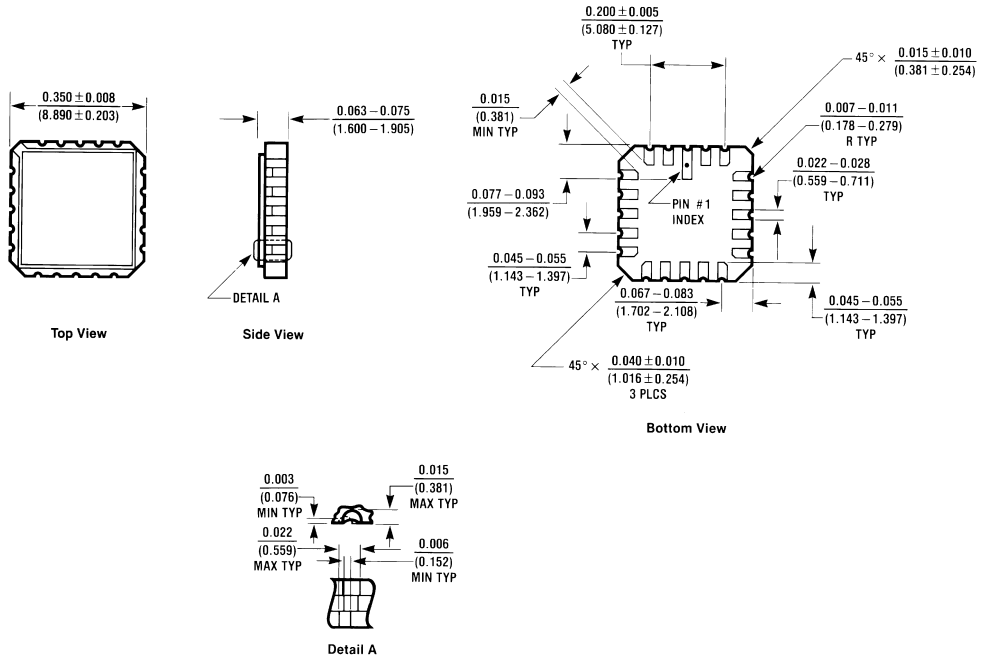**Note 3:** Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics

Symbol	Parameter	54FCT $T_A = -55°C$ to $+125°C$ $V_{CC} = 4.5V-5.5V$ $C_L = 50$ pF		Units
		Min	Max	
t_{PLH}	Propagation Delay	2.0	9.5	ns
t_{PHL}	Data to Outputs	2.0	9.5	
t_{PZH}	Output Enable Time	2.0	12.5	ns
t_{PZL}		2.0	12.5	
t_{PHZ}	Output Disable Time	2.0	12.5	ns
t_{PLZ}		2.0	12.5	

Capacitance

Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance	30.0	pF	V_{CC} = 5.0V

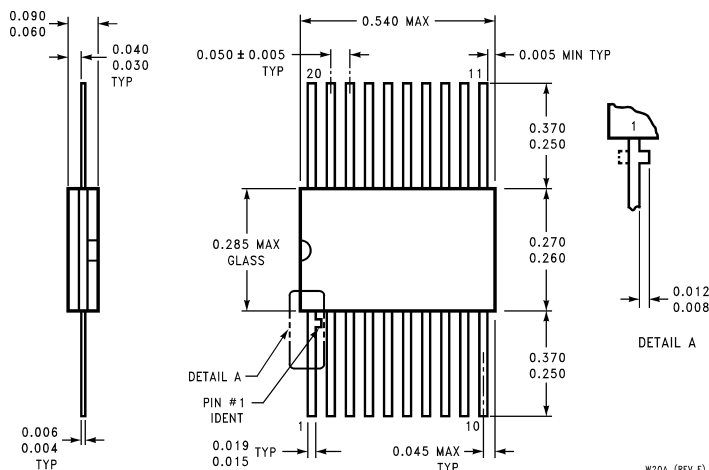## Physical Dimensions inches (millimeters) unless otherwise noted

Top View

$\frac{0.350 \pm 0.008}{(8.890 \pm 0.203)}$

Side View

$\frac{0.063 - 0.075}{(1.600 - 1.905)}$

DETAIL A

Bottom View

$\frac{0.200 \pm 0.005}{(5.080 \pm 0.127)}$ TYP

$45° \times \frac{0.015 \pm 0.010}{(0.381 \pm 0.254)}$

$\frac{0.015}{(0.381)}$ MIN TYP

$\frac{0.007 - 0.011}{(0.178 - 0.279)}$ R TYP

$\frac{0.077 - 0.093}{(1.959 - 2.362)}$

$\frac{0.022 - 0.028}{(0.559 - 0.711)}$ TYP

PIN #1 INDEX

$\frac{0.045 - 0.055}{(1.143 - 1.397)}$ TYP

$\frac{0.067 - 0.083}{(1.702 - 2.108)}$ TYP

$\frac{0.045 - 0.055}{(1.143 - 1.397)}$ TYP

$45° \times \frac{0.040 \pm 0.010}{(1.016 \pm 0.254)}$ 3 PLCS

Detail A

$\frac{0.003}{(0.076)}$ MIN TYP

$\frac{0.015}{(0.381)}$ MAX TYP

$\frac{0.022}{(0.559)}$ MAX TYP

$\frac{0.006}{(0.152)}$ MIN TYP

E20A (REV D)

20-Terminal Ceramic Leadless Chip Carrier (L)
NS Package Number E20A

$\frac{0.985}{(25.019)}$ MAX

$\frac{0.025}{(0.635)}$ RAD

20 19 18 17 16 15 14 13 12 11

$\frac{0.220 - 0.310}{(5.588 - 7.874)}$

1 2 3 4 5 6 7 8 9 10

$\frac{0.005 - 0.020}{(0.127 - 0.508)}$ RAD TYP

$\frac{0.037 \pm 0.005}{(0.940 \pm 0.127)}$

$\frac{0.055 \pm 0.005}{(1.397 \pm 0.127)}$

$\frac{0.020 - 0.060}{(0.508 - 1.524)}$

$\frac{0.180}{(4.572)}$ MAX

$\frac{0.290 - 0.320}{(7.366 - 8.128)}$

GLASS SEALANT

$\frac{0.005}{(0.127)}$ MIN

$\frac{0.200}{(5.080)}$ MAX

$95° \pm 5°$

$86° \quad 94°$

$\frac{0.150}{(3.810)}$ MIN

$\frac{0.125 - 0.200}{(3.175 - 5.080)}$

$\frac{0.008 - 0.012}{(0.203 - 0.305)}$

$\frac{0.310 - 0.410}{(7.874 - 10.41)}$

$\frac{0.060}{(1.524)}$ MAX BOTH ENDS

$\frac{0.100 \pm 0.010}{(2.540 \pm 0.254)}$

$\frac{0.018 \pm 0.003}{(0.457 \pm 0.076)}$

J20A (REV M)

20-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A

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

0.090
0.060

0.040
0.030
TYP

0.540 MAX

0.050 ± 0.005
TYP

20   11

0.005 MIN TYP

0.370
0.250

1

0.285 MAX
GLASS

0.270
0.260

0.012
0.008

DETAIL A

DETAIL A

0.370
0.250

PIN #1
IDENT

1   10

0.006
0.004
TYP

0.019
0.015
TYP

0.045 MAX
TYP

W20A (REV E)

20-Lead Ceramic Flatpak (F)
NS Package Number W20A

LIFE SUPPORT POLICY

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.