JUN 1 1992

P54/74FCT3240C/D–P54/74FCT3241C/D–P54/74FCT3244C/D
3.3 VOLT OCTAL BUFFERS/LINE DRIVERS WITH 3-STATE OUTPUTS

FEATURES

- Function and Drive Compatible with the Fastest TTL Logic
- Inputs and Outputs Interface with TTL Logic Levels
- 3.3V ± 0.2V Power Supply and CMOS for Lowest Power Dissipation
- FCT3-D speed at 3.5ns max. (Com'l)
  FCT3-C speed at 4.1ns max. (Com'l)
- Edge-rate Control Circuitry for Significantly Improved Noise Characteristics
- ESD protection exceeds 2000V
- 64 mA Sink Current (Com'l), 48 mA (Mil)
  15mA Source Current (Com'l), 12 mA (Mil)
- Multiple Center Power and Ground Pins
- Manufactured in 0.4 micron PACE Technology™

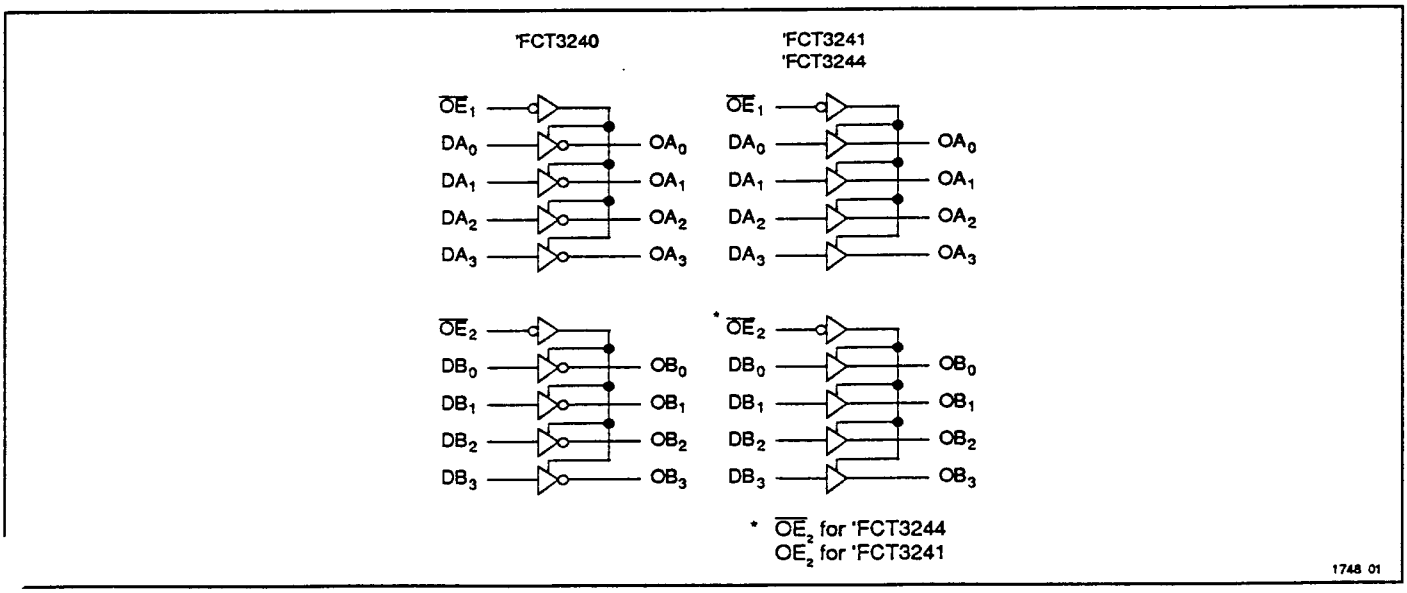
DESCRIPTION

The 'FCT3240, 'FCT3241 and 'FCT3244 are octal buffers and line drivers designed to be employed as memory address drivers, clock drivers and bus-oriented transmitters/receivers. The devices provide speed and drive capabalities equivalent to their fastest bilpolar logic counterparts while significantly reducing power dissipation. The input and output voltage levels allow direct interface with TTL devices without external components.

The 'FCT3240, 'FCT3241 and 'FCT3244 are manufactured with PACE III Technology™ which is Performance Advanced CMOS Engineered with two-level metal and epitaxial substrates to use 0.4 micron effective channel lengths giving 250 picosecond loaded* internal gate delays. The nominal supply voltage is reduced from the conventional 5.0V to 3.3V, thus reducing output swings dramatically. This, together with the (lower inductance) center power and ground pins, significantly improve noise that would otherwise occur in very high speed circuitry.

*For a fan-in/fan-out of 4 at 85°C junction temperature and 3.3V supply.

LOGIC DIAGRAMS



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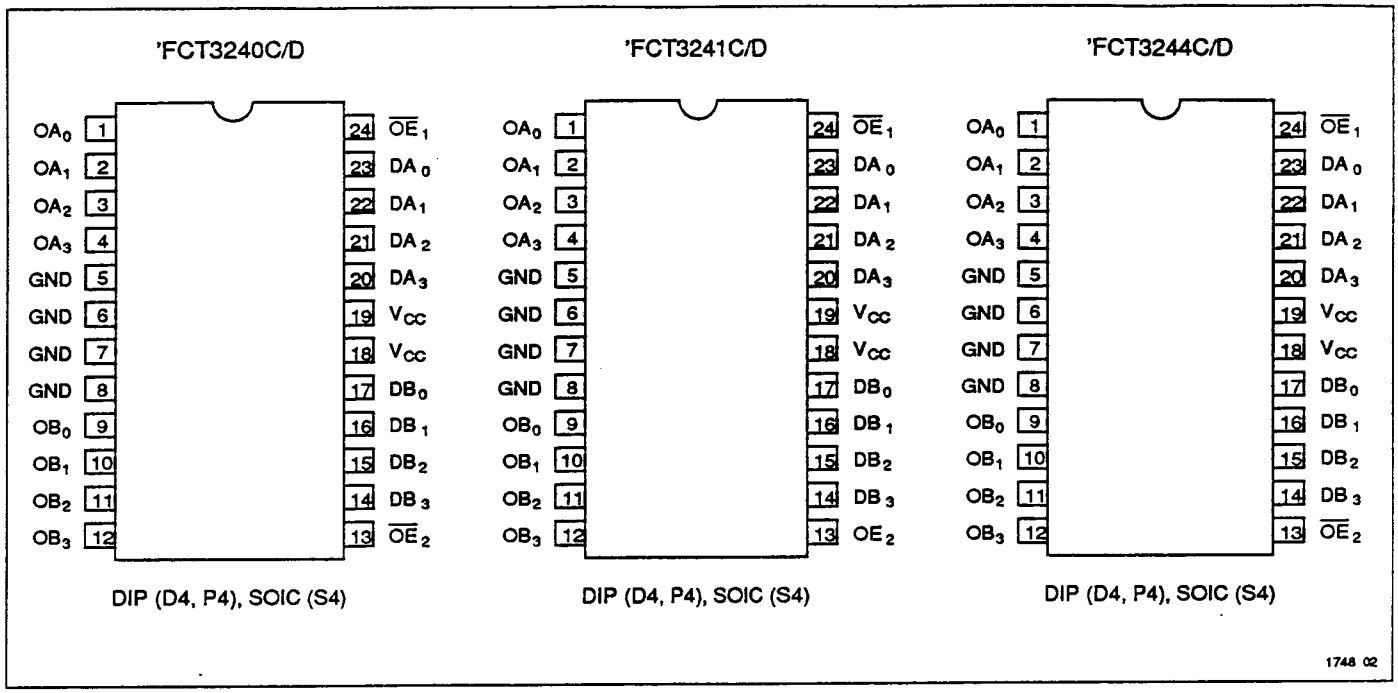
PIN CONFIGURATION



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ABSOLUTE MAXIMUM RATINGS[1,2]

Symbol	Parameter	Value	Unit
T_{STG}	Storage Temperature	–65 to +150	°C
T_A	Ambient Temperature Under Bias	–65 to +135	°C
V_{CC}	V_{CC} Potential to Ground	–0.5 to +5.0	V
I_{IN}	Input Current	–30 to +5.0	mA

1748 Tbl 01

Symbol	Parameter	Value	Unit
I_{OUTPUT}	Current Applied to Output	120	mA
V_{IN}	Input Voltage	–0.5 to V_{CC} + 0.5	V
V_{OUT}	Voltage Applied to Output	–0.5 to V_{CC} + 0.5	V

1748 Tbl 02

Notes:

1. Operation beyond the limits set forth in the above table may impair the useful life of the device. Unless otherwise noted, these limits are over the operating free-air temperature range.
2. Unused inputs must always be connected to an appropriate logic voltage level, preferably either V_{CC} or ground.

RECOMMENDED OPERATING CONDITIONS

Free Air Ambient Temperature	Min	Max
Military	–55°C	+125°C
Commercial	0°C	+70°C

1748 Tbl 03

Supply Voltage (V_{CC})	Min	Max
Military	+3.1V	+3.5V
Commercial		

1748 Tbl 04

DC ELECTRICAL CHARACTERISTICS (Over recommended operating conditions)

Symbol	Parameter		Min	Typ[1]	Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0		V_{CC} + 0.5	V		
V_{IL}	Input LOW Voltage		–0.5		0.8	V		
V_H	Hysteresis			0.35		V		All inputs
V_{IK}	Input Clamp Diode Voltage			–0.7	–1.2	V	MIN	I_{IN} = –18mA
V_{OH}	Output HIGH Voltage	Military/Commercial (CMOS)	V_{CC} – 0.2	V_{CC}		V	MIN	I_{OH} = –300µA
		Military (TTL)	2.4			V	MIN	I_{OH} = –12mA
		Commercial (TTL)	2.4			V	MIN	I_{OH} = –15mA
V_{OL}	Output LOW Voltage	Military/Commercial (CMOS)		GND	0.2	V	MIN	I_{OL} = 300µA
		Military (TTL)		0.3	0.55	V	MIN	I_{OL} = 48mA
		Commercial (TTL)		0.3	0.55	V	MIN	I_{OL} = 64mA
I_{IH}	Input HIGH Current				5	µA	MAX	V_{IN} = V_{CC}
I_{IL}	Input LOW Current				–5	µA	MAX	V_{IN} = GND
I_{IH}	Input HIGH Current				5	µA	MAX	V_{IN} = 2.7V
I_{IL}	Input LOW Current				–5	µA	MAX	V_{IN} = 0.5V
I_{OZH}	OFF state I_{OUT} HIGH-level Output Current				10	µA	MAX	V_{OUT} = V_{CC}
I_{OZL}	OFF state I_{OUT} LOW-level Output Current				–10	µA	MAX	V_{OUT} = GND
I_{OZH}	OFF state I_{OUT} HIGH-level Output Current				10	µA	MAX	V_{OUT} = 2.7V
I_{OZL}	OFF state I_{OUT} HIGH-level Output Current				–10	µA	MAX	V_{OUT} = 0.5V
I_{OS}	Output Short Circuit Current[2]		–60	–120	–225	mA	MAX	V_{OUT} = 0.0V
C_{IN}	Input Capacitance[3]			5	10	pF		All inputs
C_{OUT}	Output Capacitance[3]			9	12	pF		All outputs

1748 Tbl 05

otes:

.. Typical limits are at V_{CC} = 3.3V, T_A = +25°C ambient.

2. Not more than one output should be shorted at a time. Duration of short should not exceed one second. The use of high speed test apparatus and/or sample and hold techniques are preferable in order to minimize internal chip heating and more accurately reflect operational values. Otherwise prolonged shorting of a high output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{os} tests should be performed last.
3. This parameter is guaranteed but not tested.

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DC CHARACTERISTICS (Over recommended operating conditions unless otherwise specified.)

Symbol	Parameter	Typ[1]	Max	Units	Conditions
I_{CC}	Quiescent Power Supply Current (CMOS inputs)	0.003	0.5	mA	V_{CC} = MAX, f_1 = 0, Outputs Open, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC} - 0.2V$
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs)	0.5	2.0	mA	V_{CC} = MAX, $V_{IN} = V_{CC} - 0.6V$[2], f_1 = 0, Outputs Open
I_{CCD}	Dynamic Power Supply Current[3]	0.15	0.25	mA/ mHz	V_{CC} = MAX, One Input Toggling, 50% Duty Cycle, Outputs Open, $\overline{OE}_1 = \overline{OE}_2$ = GND, $OE_2 = V_{CC}$, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC} - 0.2V$
I_C	Total Power Supply Current[5]	1.7	4.0	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, One Bit Toggling at f_1 = 10MHz, $\overline{OE}_1 = \overline{OE}_2$ = GND, $OE_2 = V_{CC}$, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC} - 0.2V$
		2.0	5.0	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, One Bit Toggling at f_1 = 10MHz, $\overline{OE}_1 = \overline{OE}_2$ = GND, $OE_2 = V_{CC}$, $V_{IN} = V_{CC} - 0.6V$ or V_{IN} = GND
		3.2	6.5[4]	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f_1 = 2.5MHz, $\overline{OE}_1 = \overline{OE}_2$ = GND, $OE_2 = V_{CC}$, $V_{IN} \le 0.2V$ or $V_{IN} \ge V_{CC} - 0.2V$
		5.2	14.5[4]	mA	V_{CC} = MAX, 50% Duty Cycle, Outputs Open, Eight Bits Toggling at f_1 = 2.5MHz, $\overline{OE}_1 = \overline{OE}_2$ = GND, $OE_2 = V_{CC}$, $V_{IN} = V_{CC} - 0.6V$ or V_{IN} = GND

1748 Tbl 06

Notes:

1. Typical values are at V_{CC} = 3.3V, +25°C ambient and maximum loading.
2. Per TTL driven input ($V_{IN} = V_{CC} - 0.6V$); all other inputs at V_{CC} or GND.
3. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
4. Values for these conditions are examples of the I_{CC} formula. These limits are guaranteed but not tested.
5. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CCQC} + \Delta I_{CC} D_H N_T + I_{CCD}(f_0/2 + f_1 N_1)$
   I_{CC} = Quiescent Current with CMOS input levels
   ΔI_{CC} = Power Supply Current for a TTL High Input ($V_{IN} = V_{CC} - 0.6V$)
   D_H = Duty Cycle for TTL Inputs High
   N_T = Number of TTL Inputs at D_H
   I_{CCD} = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
   f_0 = Clock Frequency for Register Devices (Zero for Non-Register Devices)
   f_1 = Input Frequency
   N_1 = Number of Inputs at f_1
   All currents are in milliamps and all frequencies are in megahertz.

TRUTH TABLES

'FCT3240

Inputs			Output
$\overline{OE}_1$	$\overline{OE}_2$	D	
L	L	L	H
L	L	H	L
H	H	X	Z

1748 Tbl 07

'FCT3241

Inputs			Output
$\overline{OE}_1$	OE_2	D	
L	H	L	L
L	H	H	H
H	L	X	Z

1748 Tbl 08

'FCT3244

Inputs			Output
$\overline{OE}_1$	$\overline{OE}_2$	D	
L	L	L	L
L	L	H	H
H	H	X	Z

1748 Tbl 09

H = HIGH Voltage Level, L = LOW Voltage Level, X = Don't Care, Z = High Impedance

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AC CHARACTERISTICS

Symbol	Parameter	'FCT3240C				'FCT3240D				Units	Fig. No.
		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	1.0	4.7	1.5	4.8	1.0	4.3	1.0	3.7	ns	1, 2
t_{PZH} t_{PZL}	Output Enable Time	1.0	5.7	1.5	5.0	1.0	5.0	1.0	4.3	ns	1 7 8
t_{PHZ} t_{PLZ}	Output Disable Time	1.0	4.6	1.5	4.5	1.0	4.5	1.0	4.0	ns	

1748 Tbl 10

AC CHARACTERISTICS

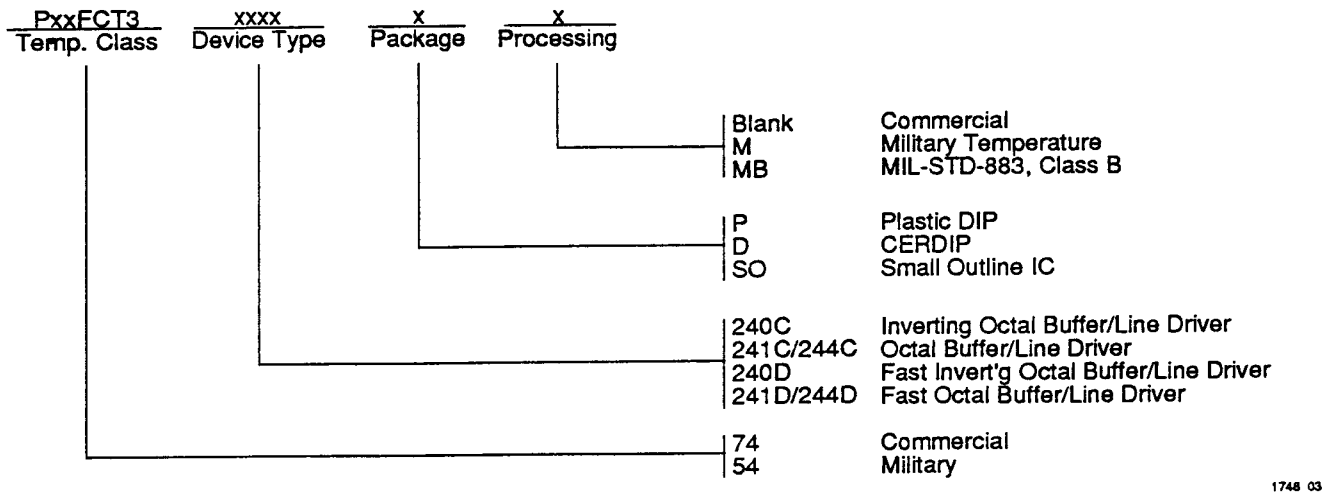
Symbol	Parameter	'FCT3241C 'FCT3244C				'FCT3241D 'FCT3244D				Units	Fig. No.
		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	1.0	4.6	1.5	4.1	1.0	4.1	1.0	3.5	ns	1, 3
t_{PZH} t_{PZL}	Output Enable Time	1.0	6.5	1.5	5.8	1.0	5.9	1.0	5.0	ns	1 7 8
t_{PHZ} t_{PLZ}	Output Disable Time	1.0	5.7	1.5	5.2	1.0	5.2	1.0	4.4	ns	

1748 Tbl 11

Note:

1. Minimum limits are guaranteed but not tested on Propagation Delays.
   AC Characteristics guaranteed with C_L = 50pF as shown in Figure 1.

ORDERING INFORMATION



1748 03

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