P54/74FCT543T/AT/CT
P54/74FCT544T/AT/CT
OCTAL REGISTERED TRANSCEIVER

FEATURES

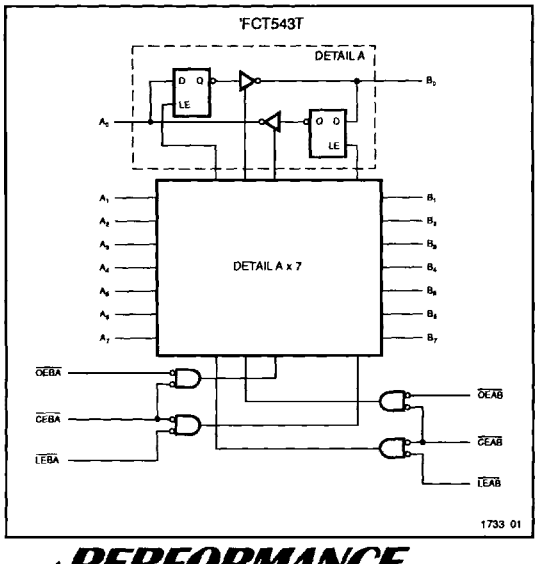
- **Function, Pinout and Drive Compatible with the FCT and F Logic**
- **FCT-C speed at 5.3ns max. (Com'l) FCT-A speed at 6.5ns max. (Com'l)**
- **Reduced V_{OH} (typically = 3.3V) versions of Equivalent FCT functions**
- **Edge-rate Control Circuitry for Significantly Improved Noise Characteristics**
- **ESD protection exceeds 2000V**
- **Power-off disable feature**
- **Matched Rise and Fall times**
- **Fully Compatible with TTL Input and Output Logic Levels**
- **64 mA Sink Current (Com'l), 48 mA (Mil) 15 mA Source Current (Com'l), 12 mA (Mil)**
- **Separate Controls for Data Flow in Each Direction**
- **Back to Back Latches for Storage**
- **Manufactured in 0.7 micron PACE Technology™**

DESCRIPTION

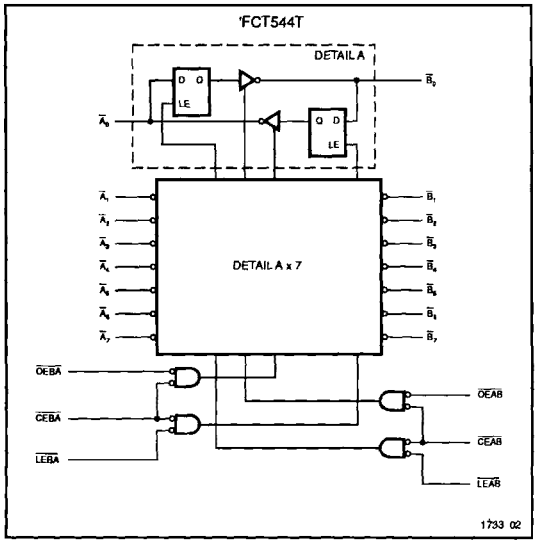
The 'FCT543T and 'FCT544T Octal Registered Transceivers contain two sets of eight D-type latches. Separate Latch Enable ($\overline{LEAB}$, $\overline{LEBA}$) and Output Enable ($\overline{OEAB}$, $\overline{OEBA}$) controls permit each latch set to have independent control of inputting and outputting in either direction of data flow. For data flow from A to B, for example, the A-to-B Enable ($\overline{CEAB}$) input must be LOW in order to enter data from A0–A7 or to take data from B0–B7, as indicated in the truth table. With $\overline{CEAB}$ LOW, a LOW signal on the A-to-B Latch Enable ($\overline{LEAB}$) input makes the A-to-B latches transparent; a subsequent LOW-to-HIGH transition of the $\overline{LEAB}$ signal puts the A latches in the storage mode and their output no longer change with the A inputs. With $\overline{CEAB}$ and $\overline{OEAB}$ both LOW, the 3-state B output buffers are active and reflect the data present at the output of the A latches. Control of data from B to A is similar, but uses $\overline{CEAB}$, $\overline{LEAB}$ and $\overline{OEAB}$ inputs.

7

FUNCTIONAL BLOCK DIAGRAM

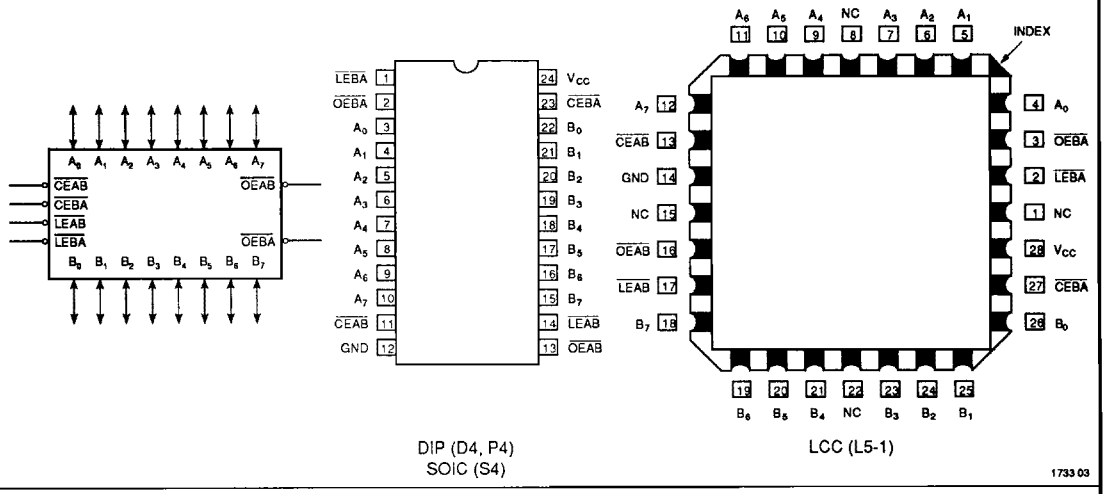


FUNCTIONAL BLOCK DIAGRAM



LOGIC SYMBOL AND PIN CONFIGURATIONS

'FCT543T

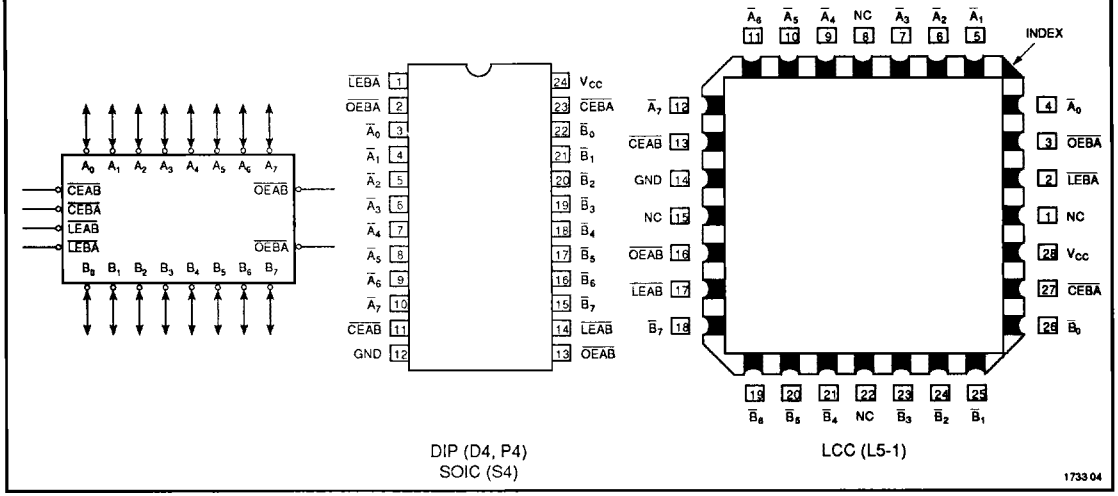


DIP (D4, P4)
SOIC (S4)

LCC (L5-1)

1733 03

'FCT544T



DIP (D4, P4)
SOIC (S4)

LCC (L5-1)

1733 04

PIN DESCRIPTIONS

Pin Name	Description
$\overline{OEAB}$	A-to-B Output Enable Input (Active LOW)
$\overline{OEBA}$	B-to-A Output Enable Input (Active LOW)
$\overline{CEAB}$	A-to-B Enable Input (Active LOW)
$\overline{CEBA}$	B-to-A Enable Input (Active LOW)
$\overline{LEAB}$	A-to-B Latch Enable Input (Active LOW)
$\overline{LEBA}$	B-to-A Latch Enable Input (Active LOW)
A_0–A_7	A-to-B Data Inputs or B-to-A 3-State Outputs
B_0–B_7	B-to-A Data Inputs or A-to-B 3-State Outputs

1733 Tbl 01

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 +7.0	V
P_T	Power Dissipation	0.5	W

1733 Tbl 02

Symbol	Parameter	Value	Unit
I_{OUTPUT}	Current Applied to Output	120	mA
V_{IN}	Input Voltage	–0.5 to +7.0	V
V_{OUT}	Voltage Applied to Output	–0.5 to +7.0	V

1733 Tbl 03

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

1733 Tbl 04

Supply Voltage (V_{CC})	Min	Max
Military	+4.5V	+5.5V
Commercial	+4.75V	+5.25V

1733 Tbl 05

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		
V_{IL}	Input LOW Voltage				0.8	V		
V_H	Hysteresis[3]			0.2		V		All inputs
V_{IK}	Input Clamp Diode Voltage			–0.7	–1.2	V	MIN	I_{IN} = –18mA
V_{OH}	Output HIGH Voltage	Military	2.4	3.3		V	MIN	I_{OH} = –12mA
		Commercial	2.4	3.3		V	MIN	I_{OH} = –15mA
V_{OL}	Output LOW Voltage	Military		0.3	0.5	V	MIN	I_{OL} = 48mA
		Commercial		0.3	0.5	V	MIN	I_{OL} = 64mA
I_{IH}	Input HIGH Current				20	µA	MAX	$V_{IN} = V_{CC}$
I_{IH}	Input HIGH Current	Except I/O Pins			5	µA	MAX	V_{IN} = 2.7V
		I/O Pins			15	µA	MAX	V_{IN} = 2.7V
I_{IL}	Input LOW Current	Except I/O Pins			–5	µA	MAX	V_{IN} = 0.5V
		I/O Pins			–15	µA	MAX	V_{IN} = 0.5V
I_{OZH}	Off State I_{OUT} HIGH-Level Output Current				15	µA	MAX	V_{OUT} = 2.7V
I_{OZL}	Off State I_{OUT} LOW-Level Output Current				–15	µA	MAX	V_{OUT} = 0.5V
I_{OS}	Output Short Circuit Current[2]		–60	–120	–225	mA	MAX	V_{OUT} = 0.0V
I_{OFF}	Power-off Disable				100	µA	0V	V_{OUT} = 4.5V
C_{IN}	Input Capacitance[3]			5	10	pF	MAX	All inputs
$C_{I/O}$	I/O Capacitance[3]			9	12	pF	MAX	All outputs
I_{CC}	Quiescent Power Supply Current			0.2	1.5	mA	MAX	$V_{IN} \leq 0.2V$, $V_{IN} \geq V_{CC}-0.2V$

1733 Tbl 06

Notes:

1. Typical limits are at V_{CC} = 5.0V, 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.

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

Symbol	Parameter	Typ.[1]	Max.	Units	Conditions
ΔI_{CC}	Quiescent Power Supply Current (TTL inputs)	0.5	2.0	mA	V_{CC} = MAX, V_{IN} = 3.4V[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, $\overline{CEAB}$ + $\overline{OEAB}$ = Low, Outputs Open, $\overline{CEAB}$ = High, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
I_C	Total Power Supply Current[5]	1.7	4.0	mA	V_{CC} = MAX, f_0 = 10MHz, $\overline{CEAB}$ + $\overline{OEAB}$ = Low 50% Duty Cycle, Outputs Open, $\overline{CEBA}$ = High One Bit Toggling at f_1 = 5MHz, f_0 = $\overline{LEAB}$ = 10MHz, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		2.2	6.0	mA	V_{CC} = MAX, f_0 = 10MHz, $\overline{CEAB}$ + $\overline{OEAB}$ = Low 50% Duty Cycle, Outputs Open, $\overline{CEBA}$ = High One Bit Toggling at f_1 = 5MHz, f_0 = $\overline{LEAB}$ = 10MHz, V_{IN} = 3.4V or V_{IN} = GND
		7.0	12.8[4]	mA	V_{CC} = MAX, f_0 = 10MHz, $\overline{CEAB}$ + $\overline{OEAB}$ = Low 50% Duty Cycle, Outputs Open, $\overline{CEBA}$ = High Eight Bits Toggling at f_1 = 5MHz, f_0 = $\overline{LEAB}$ = 10MHz, $V_{IN} \leq 0.2V$ or $V_{IN} \geq V_{CC} - 0.2V$
		9.2	21.8[4]	mA	V_{CC} = MAX, f_0 = 10MHz, $\overline{CEAB}$ + $\overline{OEAB}$ = Low 50% Duty Cycle, Outputs Open, $\overline{CEBA}$ = High Eight Bits Toggling at f_1 = 5MHz, f_0 = $\overline{LEAB}$ = 10MHz, V_{IN} = 3.4V or V_{IN} = GND

1733 Tbl 07

Notes:
1. Typical values are at V_{CC} = 5.0V, +25°C ambient.
2. Per TTL driven input (V_{IN} = 3.4V); 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. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD}(f_0/2 + f_1 N_1)$
   I_{CC} = Quiescent Current with CMOS input levels

ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)
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 TABLE FOR A-TO-B (Symmetric with B-to-A)

Inputs			Latch Status	Outputs 'FCT543T	Outputs 'FCT544T
$\overline{CEAB}$	$\overline{LEAB}$	$\overline{OEAB}$	A-TO-B	B0–B7	B0–B7
H	–	–	Storing	High Z	High Z
–	H	–	Storing	–	–
–	–	H	–	High Z	High Z
L	L	L	Transparent	Current A Inputs	Previous A Inputs
L	H	L	Storing	Previous A Inputs	Current A Inputs

1733 Tbl 08

* = Before $\overline{LEAB}$ LOW-to-HIGH Transition
H = HIGH Voltage Level
L = LOW Voltage Level
– = Don't Care or Irrelevant
A-to-B data flow shown: B-to-A flow control is the same, except using $\overline{CEBA}$, $\overline{LEBA}$, and $\overline{OEBA}$

AC CHARACTERISTICS

Sym.	Parameter	'FCT543T 'FCT544T				'FCT543AT 'FCT544AT				'FCT543CT 'FCT544CT				Units	Fig. No.
		MIL		COM'L		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
t_{PLH} t_{PHL}	Propagation Delay Transparent Mode A_n to B_n or B_n to A_n	2.0	10.0	2.5	8.5	2.5	7.5	2.5	6.5	2.5	6.1	2.5	5.3	ns	1, 5
t_{PLH} t_{PHL}	Propagation Delay $\overline{LEBA}$ to A_n $\overline{LEAB}$ to B_n	2.5	14.0	2.5	12.5	2.5	9.0	2.5	8.0	2.5	8.0	2.5	7.0	ns	1, 5
t_{PZH} t_{PZL}	Output Enable Time $\overline{OEBA}$ or $\overline{OEAB}$ to A_n or B_n $\overline{CEBA}$ or $\overline{CEAB}$ to A_n or B_n	2.0	14.0	2.0	12.0	2.0	10.0	2.0	9.0	2.0	9.0	2.0	8.0	ns	1,7,8
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OEBA}$ or $\overline{OEAB}$ to A_n or B_n $\overline{CEBA}$ or $\overline{CEAB}$ to A_n or B_n	2.0	13.0	2.0	9.0	2.0	8.5	2.0	7.5	2.0	7.5	2.0	6.5	ns	1,7,8

1733 Tbl 09

Note: Minimum limits are guaranteed on Propagation Delays.

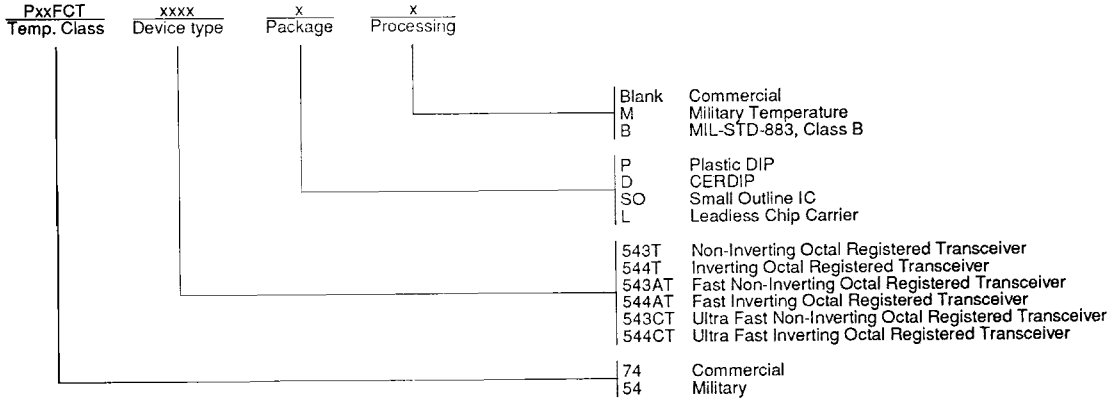
AC OPERATING REQUIREMENTS

Sym.	Parameter	'FCT543T 'FCT544T				'FCT543AT 'FCT544AT				'FCT543CT 'FCT544CT				Units	Fig. No.
		MIL		COM'L		MIL		COM'L		MIL		COM'L			
		Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.	Min.[1]	Max.		
t_s (H) t_s (L)	Set-up Time HIGH or LOW A_n or B_n to $\overline{LEBA}$ or $\overline{LEAB}$	3.0	—	3.0	—	2.0	—	2.0	—	2.0	—	2.0	—	ns	9
t_h (H) t_h (L)	Hold Time HIGH or LOW A_n or B_n to $\overline{LEBA}$ or $\overline{LEAB}$	2.0	—	2.0	—	2.0	—	2.0	—	2.0	—	2.0	—	ns	9
t_w	$\overline{LEBA}$ or $\overline{LEAB}$ Pulse Width LOW	5.0	—	5.0	—	5.0	—	5.0	—	5.0	—	5.0	—	ns	6

1733 Tbl 10

7

ORDERING INFORMATION



1733 05