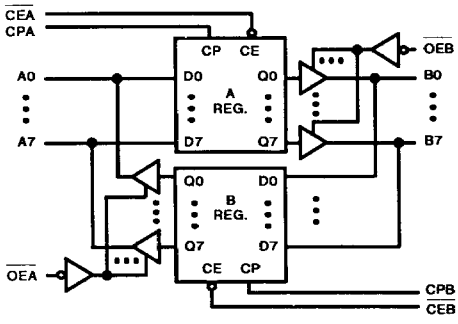
CD54/74FCT2952A, CD54/74FCT2952BT
CD54/74FCT2953A, CD54/74FCT2953BT

July 1990



FCT2952A FUNCTIONAL DIAGRAM

Octal Register-Transceivers, 3-State

CD54/74FCT2952A, CD54/74FCT2952BT - Non-Inverting
CD54/74FCT2953A, CD54/74FCT2953BT - Inverting

Type Features:

- *Buffered inputs*
- *Typical propagation delay: 5.6ns @ VCC = 5V, TA = 25°C, CL = 50pF (FCT2952A, FCT2953A)*

The CD54/74FCT2952A, 2952BT, 2953A and 2953BT octal register-transceivers use a small-geometry BiCMOS technology. The output stage is a combination of bipolar and CMOS transistors that limits the output-HIGH level to two diode drops below VCC. This resultant lowering of output swing (0V to 3.7V) reduces power bus ringing (a source of EMI) and minimizes VCC bounce and ground bounce and their effects during simultaneous output switching. The output configuration also enhances switching speed and is capable of sinking 48 to 64 milliamperes.

These devices contain two 8-bit back-to-back registers that store data flowing in both directions between two bidirectional buses. Each register has separate clock, clock enable, and 3-state output enable signals associated with it.

The CD54/74FCT2952A, 2952BT, 2953A and 2953BT are supplied in 24-lead dual-in-line narrow-body plastic packages (EN suffix) and in 24-lead dual-in-line small-outline plastic packages (M suffix). Both package types are operable over two temperature ranges: Commercial (0°C to +70°C) and Extended Industrial (-55°C to +125°C).

Family Features:

- *SCR-latchup-resistant BiCMOS process and circuit design*
- *FCTXXXXA - Speed of bipolar FAST*/AS/S; FCTXXXXBT - 30% faster than FAST/AS/S with significantly reduced power consumption*
- *64/48-mA output sink current (commercial/extended industrial)*
- *Output voltage swing limited to 3.7V @ VCC = 5V*
- *Controlled output-edge rates*
- *Input/output isolation to VCC*
- *BiCMOS technology with low quiescent power*

* FAST is a registered trademark of Fairchild Semiconductor Corp.

The CD54FCT2952A and 2953A are also available in chip form (H suffix). These unpackaged devices are operable over the -55°C to +125°C temperature range.

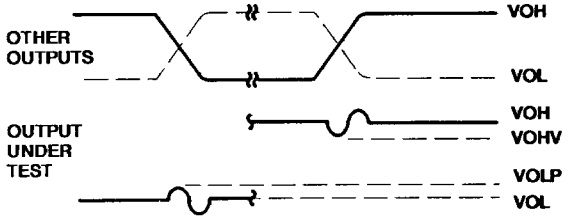
REGISTER FUNCTION TABLE (APPLIES TO A OR B REGISTER)

INPUTS			INTERNAL	
D	CP	$\overline{CE}$	Q	FUNCTION
X	X	H	NC	Hold Data
L	↓	L	L	Load Data
H	↓	L	H	

OUTPUT CONTROL

	INTERNAL	OUTPUTS		
$\overline{OE}$	Q	FCT2952A,BT	FCT2953A,BT	FUNCTION
H	X	Z	Z	Disable Outputs
L	L	L	H	Enable Outputs
L	H	H	L	

PARAMETER MEASUREMENT INFORMATION



NOTES:
1. VOLP is measured with respect to a ground reference near the output under test. VOHV is measured with respect to VOH.
2. Input pulses have the following characteristics: PRR ≤ 1MHz, tr = 2.5ns, tf = 2.5ns, skew 1ns.
3. R.F. fixture with 700-MHz design rules required. IC should be soldered into test board and bypassed with 0.1μF capacitor. Scope and probes require 700-MHz bandwidth.

Figure 1 - Simultaneous switching transient waveforms.

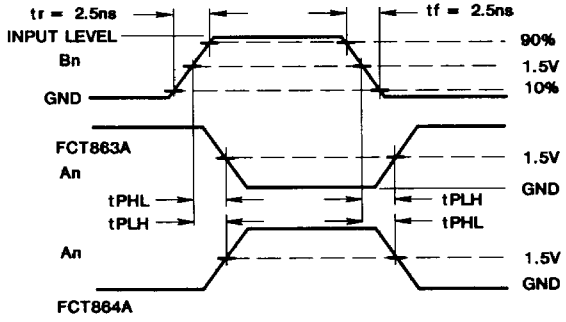
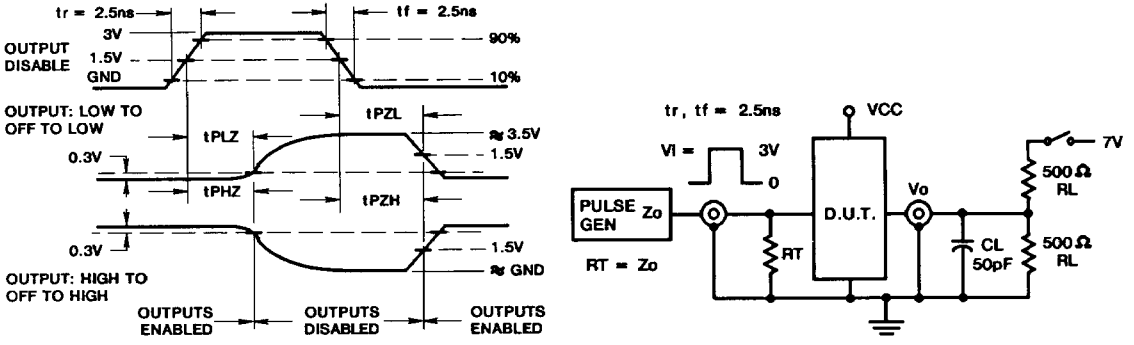


Figure 2 - Propagation delay times.



TEST	SWITCH POSITION
tPLZ, tPZL, OPEN DRAIN	CLOSED
tPHZ, tPZH, tPLH, tPHL	OPEN

Figure 3 - Three-state propagation delay times and test circuit.

STATIC ELECTRICAL CHARACTERISTICS

FCT Series: 74FCT Commercial Temperature Range, 0°C to +70°C; VCC max = 5.25V, VCC min = 4.75V
54FCT Extended Industrial Temperature Range, −55°C to +125°C; VCC max = 5.5V, VCC min = 4.5V

CHARACTERISTICS		TEST CONDITIONS VI (V)	TEST CONDITIONS IO (mA)	VCC (V)	AMBIENT TEMPERATURE (TA) +25°C MIN	+25°C MAX	0°C to +70°C MIN	0°C to +70°C MAX	−55°C to +125°C MIN	−55°C to +125°C MAX	UNITS
High-Level Input Voltage	VIH			4.5 to 5.5	2	–	2	–	2	–	V
Low-Level Input Voltage	VIL			4.5 to 5.5	–	0.8	–	0.8	–	0.8	V
High-Level Output Voltage	VOH	VIH or	−15	MIN	2.4	–	2.4	–	–	–	V
		VIL	−12	MIN	2.4	–	–	–	2.4	–	V
Low-Level Output Voltage	VOL	VIH or	64	MIN	–	0.55	–	0.55	–	–	V
		VIL	48	MIN	–	0.55	–	–	–	0.55	V
High-Level Input Current	IIH	VCC		MAX	–	0.1	–	1	–	1	µA
Low-Level Input Current	IIL	GND		MAX	–	−0.1	–	−1	–	−1	µA
3-State Leakage Current	IOZH	VCC		MAX	–	0.5	–	10	–	10	µA
	IOZL	GND		MAX	–	−0.5	–	−10	–	−10	µA
Short-Circuit Output Current *	IOS	VCC or GND VO = 0		MAX	−60	–	−60	–	−60	–	mA
Input Clamp Voltage	VIK	VCC or GND	−18	MIN	–	−1.2	–	−1.2	–	−1.2	V
Quiescent Supply Current, MSI	ICC	VCC or GND	0	MAX	–	8	–	80	–	500	µA
Additional Quiescent Supply Current per Input Pin TTL Inputs High, 1 Unit Load	ΔICC	3.4V†		MAX	–	1.6	–	1.6	–	2	mA

* Not more than one output should be shorted at one time. Test duration should not exceed 100ms.
† Inputs that are not measured are at VCC or GND.

FCT Input Loading: All inputs are 1 unit load. Unit load is ΔICC limit specified in Static Characteristics Chart, e.g., 1.6mA max. @ +70°C.

PREREQUISITE FOR SWITCHING

CHARACTERISTICS		SYMBOL	V_{CC} (V)	CD54/74FCT2952A, 2953A					CD54/74FCT2952BT, 2953BT					UNITS
				AMBIENT TEMPERATURE (T_A)										
				+25°C	0°C to +70°C		-55°C to +125°C		+25°C	0°C to +70°C		-55°C to +125°C		
				TYP	MIN	MAX	MIN	MAX	TYP	MIN	MAX	MIN	MAX	
Clock Pulse Width	CPA, CPB	tW	5†		3	-	3	-					-	ns
Setup Time	An, Bn to CPA, CPB	tSU	5		2	-	2.5	-					-	ns
	$\overline{CEA}$, $\overline{CEB}$ to CPA, CPB	tSU	5		3	-	3	-					-	ns
Hold Time	An, Bn to CPA, CPB	tH	5		2	-	2	-					-	ns
	$\overline{CEA}$, $\overline{CEB}$ to CPA, CPB	tH	5		2	-	2	-					-	ns

†5V: min. is @ 4.5V
5V: min. is @ 4.75V for 0°C to +70°C
typ. is @ 5V

SWITCHING CHARACTERISTICS

FCT Series: tr, tf = 2.5ns, CL = 50pF, RL - See Figure 4

CHARACTERISTICS		SYMBOL	V_{CC} (V)	CD54/74FCT2952A, 2953A					CD54/74FCT2952BT, 2953BT					UNITS
				AMBIENT TEMPERATURE (T_A)										
				+25°C	0°C to +70°C		-55°C to +125°C		+25°C	0°C to +70°C		-55°C to +125°C		
				TYP	MIN	MAX	MIN	MAX	TYP	MIN	MAX	MIN	MAX	
Propagation Delays:	CPA, CPB to Bn, An	tPLH, tPHL	5†	5.5	2	10	2	11						ns
Output Enable Time	$\overline{OEA}$ or $\overline{OEB}$ to An or Bn	tPZL, tPZH	5	5.5	1.5	10.5	1.5	13						ns
Output Disable Time	$\overline{OEA}$ or $\overline{OEB}$ to An or Bn	tPLZ, tPHZ	5	5.5	1.5	10	1.5	10						ns
Power Dissipation Capacitance		CPD§	-	56 Typical					56 Typical					pF
Min. (Valley) VOHV During Switching of Other Outputs (Output Under Test Not Switching)		VOHV See Figure 1	5	0.5 Typical @ +25°C										V
Max. (Peak) VOLP During Switching of Other Outputs (Output Under Test Not Switching)		VOLP See Figure 1	5	1 Typical @ +25°C										V
Input Capacitance		CI	-	-	-	10	-	10	-	-	10	-	10	pF
Input/Output Capacitance		$C_{I/O}$	-	-	-	15	-	15	-	-	15	-	15	pF

†5V: min. is @ 5.5V
max. is @ 4.5V
5V: min. is @ 5.25V for 0°C to +70°C
max. is @ 4.75V for 0°C to +70°C
typ. is @ 5V

§CPD, measured per function, is used to determine the dynamic power consumption.
PD (per package) = VCC ICC + Σ (VCC² fi CPD + VO² fo CL + VCC ΔICC D) where:
VCC = supply voltage
ΔICC = flow through current x unit load
CL = output load capacitance
D = duty cycle of input high
fo = output frequency
fi = input frequency

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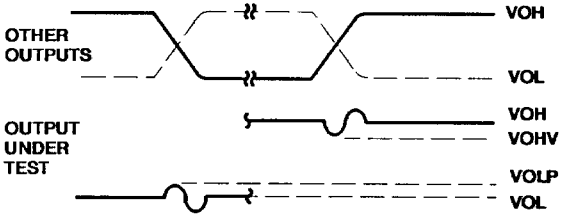

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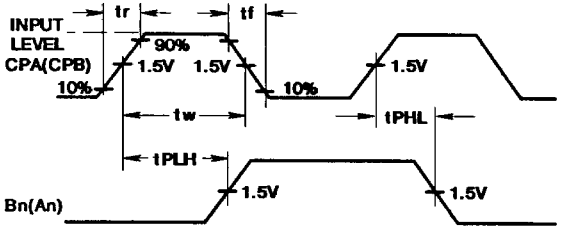


Figure 2 - CD54/74FCT2952A, 2952BT propagation delay times.

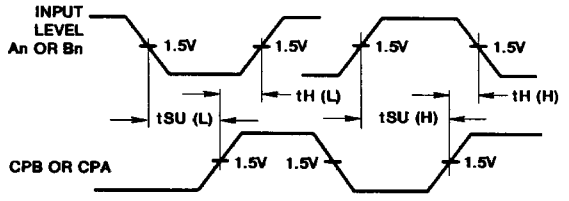
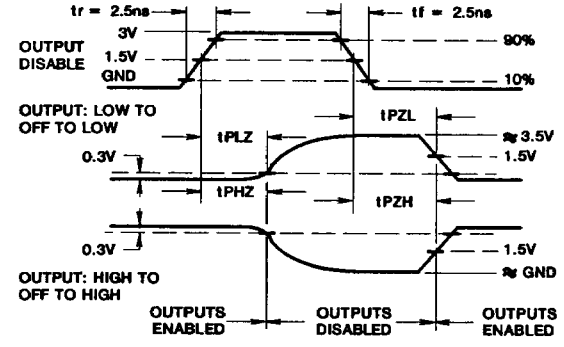
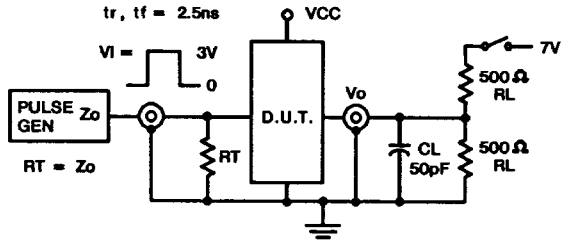


Figure 3 - Setup and hold times.





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tPHZ, tPZH, tPLH, tPHL	OPEN

Figure 4 - Three-state propagation delay times and test circuit.