

4825771 INTEGRATED DEVICE

97D 02339

DT-46-07-05



**FAST CMOS  
OCTAL D FLIP-FLOP  
(3-STATE)**

**IDT54/74FCT534  
IDT54/74FCT534A**

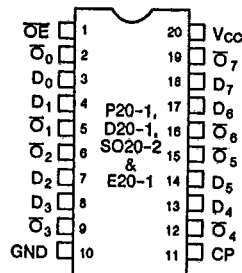
**FEATURES:**

- IDT54/74FCT534 10.0ns max. clock to output;  
IDT54/74FCT534A 6.5ns max. clock to output
- Equivalent to FAST™ output drive over full temperature and voltage supply extremes
- $I_{OL} = 48\text{mA}$  (commercial) and 32mA (military)
- CMOS power levels (5μW typ. static)
- TTL input and output level compatible
- CMOS output level compatible
- Substantially lower input current levels than FAST™ (5μA max.)
- Octal D flip-flop with 3-state output
- JEDEC standard pinout for DIP and LCC
- Product available in Radiation Tolerant and Enhanced versions
- Military product compliant to MIL-STD-883, Class B

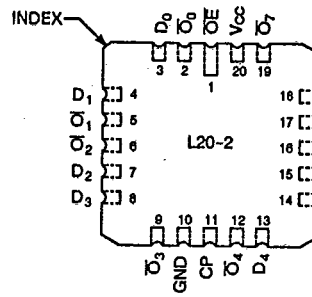
**DESCRIPTION:**

The IDT54/74FCT534 and IDT54/74FCT534A are octal D-type flip-flops built using IDT's advanced CEMOS™, a dual metal CMOS technology. The IDT54/74FCT534 and IDT54/74FCT534A are high-speed, low-power octal D-type flip-flops featuring separate D-type inputs for each flip-flop and 3-state outputs for bus-oriented applications. A buffered Clock (CP) and Output Enable ( $\overline{OE}$ ) are common to all flip-flops.

**PIN CONFIGURATIONS**



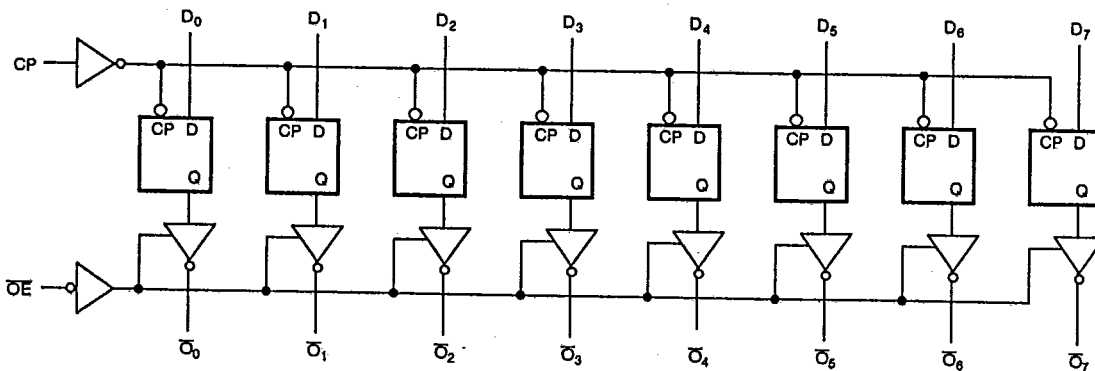
DIP/SOIC/CERPACK  
TOP VIEW



LCC  
TOP VIEW

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**FUNCTIONAL BLOCK DIAGRAM**



CEMOS is a trademark of Integrated Device Technology, Inc.  
FAST is a trademark of Fairchild Semiconductor Co.

**MILITARY AND COMMERCIAL TEMPERATURE RANGES**

**DECEMBER 1987**

4825771 INTEGRATED DEVICE

97D 02340 D

T-46-07-05

IDT54/74FCT534/A FAST CMOS OCTAL D FLIP-FLOP (3-STATE)

MILITARY AND COMMERCIAL TEMPERATURE RANGES

**ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>**

SYMBOL	RATING	COMMERCIAL	MILITARY	UNIT
V <sub>TERM</sub>	Terminal Voltage with Respect to GND	-0.5 to +7.0	-0.5 to +7.0	V
T <sub>A</sub>	Operating Temperature	0 to +70	-55 to +125	°C
T <sub>BIAS</sub>	Temperature Under Bias	-55 to +125	-65 to +135	°C
T <sub>STG</sub>	Storage Temperature	-55 to +125	-65 to +150	°C
P <sub>T</sub>	Power Dissipation	0.5	0.5	W
I <sub>OUT</sub>	DC Output Current	120	120	mA

**NOTE:**

1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

**CAPACITANCE (T<sub>A</sub> = +25°C, f = 1.0MHz)**

SYMBOL	PARAMETER <sup>(1)</sup>	CONDITIONS	TYP.	MAX.	UNIT
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V	6	10	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	8	12	pF

**NOTE:**

1. This parameter is measured at characterization but not tested.

**DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE**

Following Conditions Apply Unless Otherwise Specified:

V<sub>LO</sub> = 0.2V; V<sub>HC</sub> = V<sub>CC</sub> - 0.2V

Commercial: T<sub>A</sub> = 0°C to +70°C; V<sub>CC</sub> = 5.0V ± 5%

Military: T<sub>A</sub> = -55°C to +125°C; V<sub>CC</sub> = 5.0V ± 10%

SYMBOL	PARAMETER	TEST CONDITIONS <sup>(1)</sup>	MIN.	TYP. <sup>(2)</sup>	MAX.	UNIT
V <sub>IH</sub>	Input HIGH Level	Guaranteed Logio High Level	2.0	-	-	V
V <sub>IL</sub>	Input LOW Level	Guaranteed Logio Low Level	-	-	0.8	V
I <sub>IH</sub>	Input HIGH Current	V <sub>CC</sub> = Max.	V <sub>I</sub> = V <sub>CC</sub>	-	5	μA
			V <sub>I</sub> = 2.7V	-	5 <sup>(4)</sup>	
I <sub>IL</sub>	Input LOW Current	V <sub>CC</sub> = Max.	V <sub>I</sub> = 0.5V	-	-5 <sup>(4)</sup>	μA
			V <sub>I</sub> = GND	-	-5	
I <sub>OZ</sub>	Off State (High Impedance) Output Current	V <sub>CC</sub> = Max.	V <sub>O</sub> = V <sub>CC</sub>	-	10	μA
			V <sub>O</sub> = 2.7V	-	10 <sup>(4)</sup>	
			V <sub>O</sub> = 0.5V	-	-10 <sup>(4)</sup>	
			V <sub>O</sub> = GND	-	-10	
V <sub>IK</sub>	Clamp Diode Voltage	V <sub>CC</sub> = Min., I <sub>N</sub> = -18mA	-	-0.7	-1.2	V
I <sub>OS</sub>	Short Circuit Current	V <sub>CC</sub> = Max. <sup>(3)</sup> , V <sub>O</sub> = GND	-60	-120	-	mA
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min. V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	V <sub>CC</sub> = 3V, V <sub>IN</sub> = V <sub>LO</sub> or V <sub>HO</sub> , I <sub>OH</sub> = -32μA	V <sub>HC</sub>	V <sub>CC</sub>	-
			I <sub>OH</sub> = -300μA	V <sub>HC</sub>	V <sub>CC</sub>	-
			I <sub>OH</sub> = -12mA MIL. I <sub>OH</sub> = -15mA COM'L.	2.4	4.3	-
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min. V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>	V <sub>CC</sub> = 3V, V <sub>IN</sub> = V <sub>LO</sub> or V <sub>HO</sub> , I <sub>OL</sub> = 300μA	-	GND	V <sub>LO</sub>
			I <sub>OL</sub> = 300μA	-	GND	V <sub>LO</sub>
			I <sub>OL</sub> = 32mA MIL. I <sub>OL</sub> = 48mA COM'L.	-	0.3	0.5
V <sub>H</sub>	Input Hysteresis on Clock Only	-	-	200	-	mV

**NOTES:**

- For conditions shown as max. or min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at V<sub>CC</sub> = 5.0V, +25°C ambient and maximum loading.
- Not more than one output should be shorted at one time. Duration of the short circuit test should not exceed one second.
- This parameter is guaranteed but not tested.

4825771 INTEGRATED DEVICE

97D 02341 D

T.46-07-05

IDT54/74FCT534/A FAST  
CMOS OCTAL D FLIP-FLOP (3-STATE)

MILITARY AND COMMERCIAL TEMPERATURE RANGES

**POWER SUPPLY CHARACTERISTICS**

$V_{LC} = 0.2V; V_{HC} = V_{CC} - 0.2V$

SYMBOL	PARAMETER	TEST CONDITIONS <sup>(1)</sup>	MIN.	TYP. <sup>(2)</sup>	MAX.	UNIT
$I_{CC}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ $V_{IN} \geq V_{HC}; V_{IN} \leq V_{LC}$ $t_{CP} = f_i = 0$	-	0.001	1.5	mA
$\Delta I_{CC}$	Power Supply Current Per TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$	-	0.5	2.0	mA
$I_{CCD}$	Dynamic Power Supply Current <sup>(4)</sup>	$V_{CC} = \text{Max.}$ Outputs Open $\overline{OE} = \text{GND}$ One Bit Toggling 50% Duty Cycle	-	0.15	0.25	mA/MHz
$I_C$	Total Power Supply Current <sup>(6)</sup>	$V_{CC} = \text{Max.}$ Outputs Open $t_{CP} = 10\text{MHz}$ , 50% Duty Cycle $\overline{OE} = \text{GND}$ One Bit Toggling at $f_i = 5\text{MHz}$ 50% Duty Cycle	-	1.5	4.0	mA
		$V_{IN} \geq V_{HC}$ $V_{IN} \leq V_{LC}$ (FCT)	-	2.0	6.0	
		$V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$	-	3.75	7.8 <sup>(5)</sup>	
		$V_{IN} \geq V_{HC}$ $V_{IN} \leq V_{LC}$ (FCT)	-	6.0	16.8 <sup>(5)</sup>	

**NOTES:**

- For conditions shown as max. or min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0V, +25^\circ\text{C}$  ambient and maximum loading.
- Per TTL driven Input ( $V_{IN} = 3.4V$ ); all other inputs at  $V_{CC}$  or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
- Values for these conditions are examples of the  $I_{CC}$  formula. These limits are guaranteed but not tested.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$   
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$   
 $I_{CC}$  = Quiescent Current  
 $\Delta I_{CC}$  = 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)  
 $f_{CP}$  = Clock Frequency for Register Devices (Zero for Non-Register Devices)  
 $f_i$  = Input Frequency  
 $N_i$  = Number of Inputs at  $f_i$   
 All currents are in milliamperes and all frequencies are in megahertz.

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**DEFINITION OF FUNCTIONAL TERMS**

PIN NAMES	DESCRIPTION
$D_0 - D_7$	Data Inputs
CP	Clock Pulse Input (Active Rising Edge)
$\overline{OE}$	3-State Output Enable Input (Active LOW)
$\overline{O}_0 - \overline{O}_7$	Complementary 3-State Outputs

**TRUTH TABLE**

FUNCTION	INPUTS			OUTPUTS	INTERNAL
	$\overline{OE}$	CP	$D_i$	$\overline{O}_i$	$Q_i$
Hi-Z	H	L	X	Z	NC
	H	H	X	Z	NC
LOAD REGISTER	L		L	H	L
	L		H	L	H
	H		L	Z	L
	H		H	Z	H

- H = HIGH
- L = LOW
- X = Don't Care
- Z = High Impedance
- = LOW-to-HIGH transition
- NC = No Change

4825771 INTEGRATED DEVICE

97D 02342 D

T.46.07.05

IDT54/74FCT534/A FAST  
CMOS OCTAL D FLIP-FLOP (3-STATE)

MILITARY AND COMMERCIAL TEMPERATURE RANGES

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

SYMBOL	PARAMETER	CONDITION <sup>(1)</sup>	IDT54/74FCT534					IDT54/74FCT534A					UNIT
			TYP. <sup>(3)</sup>	COM'L		MIL.		TYP. <sup>(3)</sup>	COM'L		MIL.		
				MIN. <sup>(2)</sup>	MAX.	MIN. <sup>(2)</sup>	MAX.		MIN. <sup>(2)</sup>	MAX.	MIN. <sup>(2)</sup>	MAX.	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay CP to Q <sub>n</sub>	C <sub>L</sub> = 50pF R <sub>L</sub> = 500Ω	6.5	1.5	10.0	1.5	11.0	4.5	1.5	6.5	1.5	7.2	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time		9.0	1.5	12.5	1.5	14.0	5.5	1.5	6.5	1.5	7.5	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time		6.0	1.5	8.0	1.5	8.0	4.0	1.5	5.5	1.5	6.5	ns
t <sub>SU</sub>	Set-up Time HIGH or LOW D <sub>n</sub> to CP		1.0	2.0	-	2.5	-	1.0	2.0	-	2.0	-	ns
t <sub>H</sub>	Hold Time HIGH or LOW D <sub>n</sub> to CP		0.5	1.5	-	1.5	-	1.0	1.5	-	1.5	-	ns
t <sub>w</sub>	CP Pulse Width HIGH or LOW		4.0	7.0	-	7.0	-	4.0	5.0	-	6.0	-	ns

NOTES:

- See test circuit and waveforms.
- Minimum limits are guaranteed but not tested on Propagation Delays.
- Typical values are at V<sub>CC</sub> = 5.0V, +25°C ambient and maximum loading.

ORDERING INFORMATION

