



Integrated Device Technology, Inc.

HIGH-SPEED CMOS OCTAL D FLIP-FLOP (3-STATE)

IDT54/74AHCT534

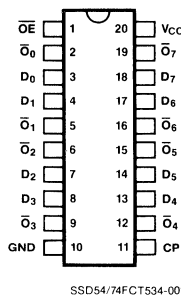
FEATURES:

- Equivalent to ALS speeds and output drive over full temperature and voltage supply extremes
- 10ns typical clock to output
- $I_{OL} = 14\text{mA}$ over full military temperature range
- CMOS power levels ($5\mu\text{W}$ typ. static)
- Both CMOS and TTL output compatible
- Substantially lower input current levels than ALS ($5\mu\text{A}$ max.)
- Octal D flip-flop with 3-state output
- 100% product assurance screening to MIL-STD-883, Class B is available
- JEDEC standard pinout for DIP and LCC

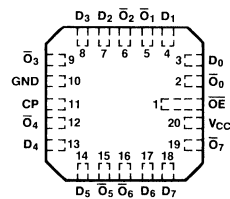
DESCRIPTION:

The IDT54/74AHCT534 are octal D flip-flops built using advanced CEMOS™, a dual metal CMOS technology. The IDT54/74FCT534 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

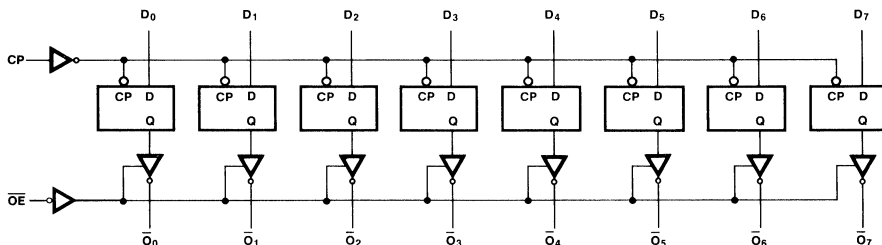


DIP
TOP VIEW



LCC
TOP VIEW

FUNCTIONAL BLOCK DIAGRAM



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MILITARY AND COMMERCIAL TEMPERATURE RANGES

JULY 1986

ABSOLUTE MAXIMUM RATING⁽¹⁾

SYMBOL	RATING	COMMERCIAL	MILITARY	UNIT
V _{TERM}	Terminal Voltage with Respect to GND	-0.5 to +7.0	-0.5 to +7.0	V
T _A	Operating Temperature	0 to +70	-55 to +125	°C
T _{BIAS}	Temperature Under Bias	-55 to +125	-65 to +135	°C
T _{STG}	Storage Temperature	-55 to +125	-65 to +155	°C
I _{OUT}	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.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

T_A = 0°C to +70°C V_{CC} = 5.0V ± 5% Min. = 4.75V Max. = 5.25V (Commercial)
 T_A = -55°C to +125°C V_{CC} = 5.0V ± 10% Min. = 4.50V Max. = 5.50V (Military)
 V_{LC} = 0.2V
 V_{HC} = V_{CC} - 0.2V

SYMBOL	PARAMETER	TEST CONDITIONS ⁽¹⁾	MIN.	TYP. ⁽²⁾	MAX.	UNIT	
V _{IH}	Input HIGH Level	Guaranteed Logic High Level	2.0	—	—	V	
V _{IL}	Input LOW Level	Guaranteed Logic Low Level	—	—	0.8	V	
I _{IH}	Input HIGH Current	V _{CC} = Max., V _{IN} = V _{CC}	—	—	5	μA	
I _{IL}	Input LOW Current	V _{CC} = Max., V _{IN} = GND	—	—	-5	μA	
I _{SC}	Short Circuit Current	V _{CC} = Max. ⁽³⁾	-60	-120	—	mA	
V _{OH}	Output HIGH Voltage	V _{CC} = 3V, V _{IN} = V _{LC} or V _{HC} , I _{OH} = -32μA	V _{HC}	V _{CC}	—	V	
		V _{CC} = Min. V _{IN} = V _{IH} or V _{IL}	I _{OH} = -150μA	V _{HC}	V _{CC}		—
			I _{OH} = -1.0mA MIL.	2.4	4.3		—
V _{OL}	Output LOW Voltage	V _{CC} = 3V, V _{IN} = V _{LC} or V _{HC} , I _{OL} = 300μA	—	GND	V _{LC}	V	
		V _{CC} = Min. V _{IN} = V _{IH} or V _{IL}	I _{OL} = 300μA	—	GND		V _{LC}
			I _{OL} = 14mA MIL.	—	—		0.4
			I _{OL} = 24mA COM'L.	—	—		0.5

NOTES:

1. For conditions shown as max. or min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at V_{CC} = 5.0V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the short circuit test should not exceed one second.



POWER SUPPLY CHARACTERISTICS

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

SYMBOL	PARAMETER	TEST CONDITIONS ⁽¹⁾		MIN.	TYP. ⁽²⁾	MAX.	UNIT
I_{CCQ}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ $V_{IN} \geq V_{HC}$; $V_{IN} \leq V_{LC}$ $f_{CP} = f_i = 0$		—	0.001	1.5	mA
I_{CCT}	Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(4)}$		—	0.5	1.6	mA
I_{CCD}	Dynamic Power Supply Current	$V_{CC} = \text{Max.}$ Outputs Open OE = GND One Bit Toggling 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq V_{LC}$	—	0.15	0.25	mA/ MHz
I_{CC}	Total Power Supply Current ⁽⁴⁾	$V_{CC} = \text{Max.}$ Outputs Open $f_{CP} = 1.0\text{MHz}$ 50% Duty Cycle OE = GND One Bit Toggling at $f_i = 500\text{KHz}$ 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq V_{LC}$ (AHCT)	—	0.15	1.8	mA
			$V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$	—	0.65	3.4	
		$V_{CC} = \text{Max.}$ Outputs Open $f_{CP} = 1.0\text{MHz}$ 50% Duty Cycle OE = GND Eight Bits Toggling at $f_i = 250\text{KHz}$ 50% Duty Cycle	$V_{IN} \geq V_{HC}$ $V_{IN} \leq V_{LC}$ (AHCT)	—	0.63	2.2	
			$V_{IN} = 3.4V$ or $V_{IN} = \text{GND}$	—	2.88	9.4	





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.
 - $I_{CC} = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_{CC} = I_{CCQ} + I_{CCT}D_HN_T + I_{CCD}(f_{CP}/2 + f_iN_i)$
 I_{CCQ} = Quiescent Current
 I_{CCT} = 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 milliamps and all frequencies are in megahertz.

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	$\overline{O_N}$	Q _I
Hi-Z	H	L	X	Z	NC
	H	H	X	Z	NC
LOAD REGISTER	L		L	H	H
	L		H	L	L
	H		L	Z	H
	H		H	Z	L

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

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

SYMBOL	PARAMETER	CONDITION	TYPICAL	COMMERCIAL		MILITARY		UNITS
				MIN.	MAX.	MIN.	MAX.	
t _{PLH} t _{PHL}	Propagation Delay CP to $\overline{O_N}$	C _L = 50 pf R _L = 500Ω	10.0	3.0	16.0	3.0	18.0	ns
t _{ZH} t _{ZL}	Output Enable Time		11.0	5.0	18.0	5.0	20.0	ns
t _{HZ} t _{LZ}	Output Disable Time		11.0	2.0	14.0	2.0	16.0	ns
t _S	Set Up Time HIGH or LOW D _N to CP		2.0	10.0	—	10.0	—	ns
t _H	Hold Time HIGH or LOW D _N to CP		0.5	3.0	—	4.0	—	ns
t _W	CP Pulse Width HIGH or LOW		7.0	14.0	—	16.0	—	ns