Integrated Device Technology, Inc.

HIGH-SPEED CMOS OCTAL D FLIP-FLOP WITH CLEAR

IDT54/74AHCT273

FEATURES:

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

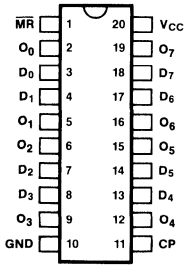
DESCRIPTION:

The IDT54/74AHCT273 are octal D flip-flops built using advanced CEMOS™, a dual metal CMOS technology. The IDT54/74AHCT273 has eight edge-triggered D-type flip-flops with individual D inputs and O outputs. The common buffered Clock (CP) and Master Reset ($\overline{MR}$) inputs load and reset (clear) all flip-flops simultaneously.

The register is fully edge-triggered. The state of each D input, one setup time before the LOW-to-HIGH clock transition, is transferred to the corresponding flip-flop's O output.

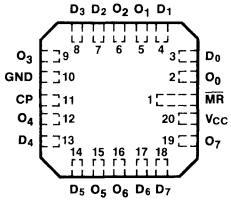
All outputs will be forced LOW independently of Clock or Data inputs by a LOW voltage level on the $\overline{MR}$ input. The device is useful for applications where the true output only is required and the Clock and Master Reset are common to all storage elements.

PIN CONFIGURATIONS



SSD54/74AHCT273-001

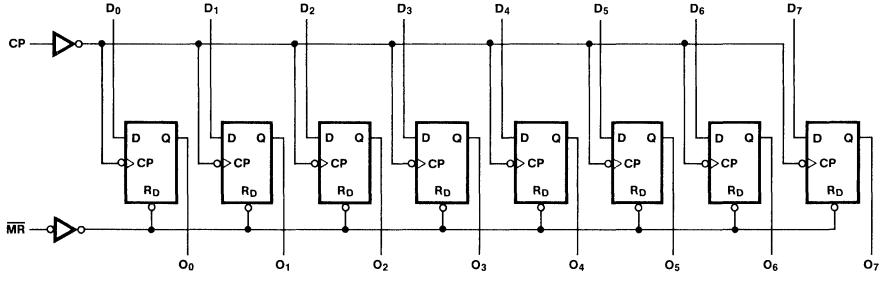
DIP
TOP VIEW



SSD54/74AHCT273-002

LCC
TOP VIEW

FUNCTIONAL BLOCK DIAGRAM



SSD54/74AHCT273-003

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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	-100	—	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	—	
			I_{OH} = -2.6mA COM	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	—	—	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} = 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 Per TTL Inputs HIGH	V_{CC} = Max. V_{IN} = 3.4V[3]		—	0.5	1.6	mA
I_{CCD}	Dynamic Power Supply Current	V_{CC} = Max. Outputs Open $\overline{MR} = V_{CC}$ 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} = Max. Outputs Open f_{CP} = 1.0MHz 50% Duty Cycle $\overline{MR} = V_{CC}$ One Bit Toggling at f_i = 500kHz 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} = GND	—	0.65	3.4	
		V_{CC} = Max. Outputs Open f_{CP} = 1.0MHz 50% Duty Cycle $\overline{MR} = V_{CC}$ Eight Bits Toggling f_i = 250kHz 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} = GND	—	2.88	9.4	

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. Per TTL driven input (V_{IN} = 3.4V); all other inputs at V_{CC} or GND.
4. $I_{CC} = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_{CC} = I_{CCQ} + I_{CCT}D_HN_T + I_{CCD}(f_{CP}/2 + f_iN_i)$
   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.

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DEFINITION OF FUNCTIONAL TERMS

PIN NAMES	DESCRIPTION
D_0-D_7	Data Inputs
$\overline{MR}$	Master Reset (Active LOW)
CP	Clock Pulse Input (Active Rising Edge)
O_0-O_7	Data Outputs

TRUTH TABLE

OPERATING MODE	INPUTS			OUTPUT
	$\overline{MR}$	CP	D_N	O_N
Reset (Clear)	L	X	X	L
Load '1'	H	↑	h	H
Load '0'	H	↑	l	L

H = HIGH Voltage steady state
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH clock transition
L = LOW Voltage Level steady state
l = LOW Voltage Level one setup time prior to the LOW-to-HIGH clock transition
X = Don't Care
↑ = LOW-to-HIGH clock transition

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

SYMBOL	PARAMETER	CONDITION	TYPICAL	COMMERCIAL		MILITARY		UNITS
				MIN.	MAX.	MIN.	MAX.	
t_{PLH} t_{PHL}	Propagation Delay CP to O_N	C_L = 50 pf R_L = 500Ω	10.0	3.0	15.0	3.0	17.0	ns
t_{PLH} t_{PHL}	Propagation Delay $\overline{MR}$ to Output		12.0	4.0	18.0	4.0	21.0	ns
t_S	Set Up Time High or Low Data to CP		3.0	10.0	—	10.0	—	ns
t_H	Hold Time High or Low Data to CP		0.6	1.0	—	1.0	—	ns
t_W	Clock Pulse Width High or Low		10.0	16.0	—	16.0	—	ns
t_{REC}	Recovery Time $\overline{MR}$ to CP		5.0	15.0	—	15.0	—	ns