Integrated Device Technology, Inc.

HIGH-SPEED CMOS OCTAL D REGISTER (3-STATE)

IDT54/74AHCT574

FEATURES:

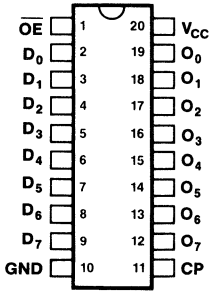
- Equivalent to ALS speeds and output drive over full temperature and voltage supply extremes
- 10ns typical address to output delay
- I_{OL} = 14mA over full military temperature range
- CMOS power levels (5μW typ. static)
- Both CMOS and TTL output compatible
- Substantially lower input current levels than ALS (5μA max.)
- Octal D register (3-state)
- 100% product assurance screening to MIL-STD-833, Class B is available
- JEDEC standard pinout for DIP and LCC

DESCRIPTION:

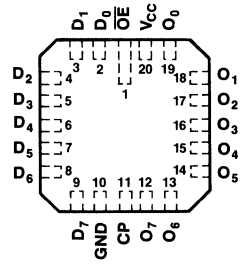
The IDT54/74AHCT574 are 8-bit registers built using advanced CEMOS™, a dual metal CMOS technology. This register consists of eight D-type flip-flops with a buffered common clock and buffered three-state output control. When the output enable ($\overline{OE}$) input is LOW, the eight outputs are enabled. When the $\overline{OE}$ input is HIGH, the outputs are in the three-state conditions.

Input data meeting the set-up and hold time requirements of the D inputs is transferred to the O outputs on the LOW-to-HIGH transition of the clock input.

PIN CONFIGURATIONS

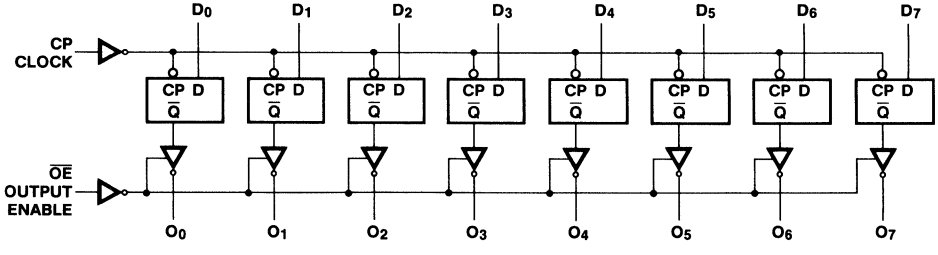


DIP
TOP VIEW



LCC
TOP VIEW

FUNCTIONAL BLOCK DIAGRAM



SSD54/74AHCT374-003

CEMOS is a trademark of Integrated Device Technology, Inc.

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	—	
			I_{OH} = -2.6mA COM'L.	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.

5

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}	Quiescent Power Supply Current 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 $\overline{OE}$ = 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[4] Current	V_{CC} = Max. Outputs Open f_{CP} = 1.0MHz 50% Duty Cycle $\overline{OE}$ = GND 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 $\overline{OE}$ = GND Eight Bits Toggling at 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.

DEFINITION OF FUNCTIONAL TERMS

PIN NAMES	DESCRIPTION
D_I	The D flip-flop data inputs.
CP	Clock Pulse for the register. Enters data on the LOW-to-HIGH transition.
O_I	The register three-state outputs.
$\overline{OE}$	Output Control. An active-LOW three-state control used to enable the outputs. A HIGH level input forces the outputs to the high impedance (off) state.

TRUTH TABLE

FUNCTION	INPUTS			OUTPUTS	INTERNAL
	$\overline{OE}$	CLOCK	D_I	O_I	Q_I
Hi-Z	H	L	X	Z	NC
	H	H	X	Z	NC
LOAD REGISTER	L	↗	L	L	L
	L	↗	H	H	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

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 = 500 Ω	10.0	4.0	14.0	4.0	15.0	ns
t_{ZH} t_{ZL}	Output Enable Time		11.0	4.0	18.0	4.0	21.0	ns
t_{HZ} t_{LZ}	Output Disable Time		9.0	2.0	12.0	2.0	15.0	ns
t_S	Setup Time HIGH or LOW D_N to CP		2.0	15.0	—	15.0	—	ns
t_H	Hold Time HIGH or LOW D_N to CP		0.5	4.0	—	4.0	—	ns
t_W	CP Pulse Width HIGH or LOW		10.0	14.0	—	16.5	—	ns

5