

## DM7490A Decade and Binary Counters

### General Description

The DM7490A monolithic counter contains four master-slave flip-flops and additional gating to provide a divide-by-two counter and a three-stage binary counter for which the count cycle length is divide-by-five.

The counter has a gated zero reset and also has gated set-to-nine inputs for use in BCD nine's complement applications.

To use the maximum count length (decade or four-bit binary), the B input is connected to the  $Q_A$  output. The input count pulses are applied to input A and the outputs are as described in the appropriate Function Table. A symmetrical divide-by-ten count can be obtained from the counters by connecting the  $Q_D$  output to the A input and applying the input count to the B input which gives a divide-by-ten square wave at output  $Q_A$ .

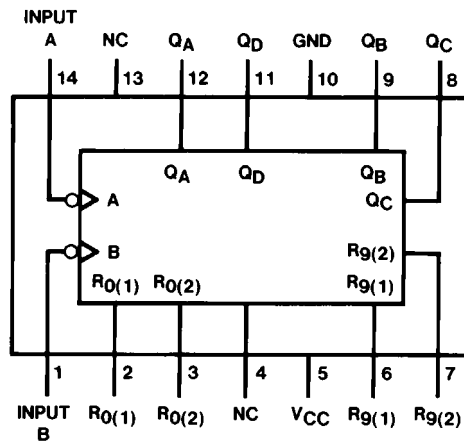
### Features

- Typical power dissipation 145 mW
- Count frequency 42 MHz

### Ordering Code:

Order Number	Package Number	Package Description
DM7490AN	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

### Connection Diagram



## Function Tables

BCD Count Sequence (Note 1)

Count	Outputs			
	Q <sub>D</sub>	Q <sub>C</sub>	Q <sub>B</sub>	Q <sub>A</sub>
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	L	H	L	H
6	L	H	H	L
7	L	H	H	H
8	H	L	L	L
9	H	L	L	H

BCD Bi-Quinary (5-2) (Note 2)

Count	Outputs			
	Q <sub>A</sub>	Q <sub>D</sub>	Q <sub>C</sub>	Q <sub>B</sub>
0	L	L	L	L
1	L	L	L	H
2	L	L	H	L
3	L	L	H	H
4	L	H	L	L
5	H	L	L	L
6	H	L	L	H
7	H	L	H	L
8	H	L	H	H
9	H	H	L	L

Reset/Count Function Table

Reset Inputs				Outputs			
R0(1)	R0(2)	R9(1)	R9(2)	Q <sub>D</sub>	Q <sub>C</sub>	Q <sub>B</sub>	Q <sub>A</sub>
H	H	L	X	L	L	L	L
H	H	X	L	L	L	L	L
X	X	H	H	H	L	L	H
X	L	X	L	COUNT			
L	X	L	X	COUNT			
L	X	X	L	COUNT			
X	L	L	X	COUNT			

H = HIGH Level

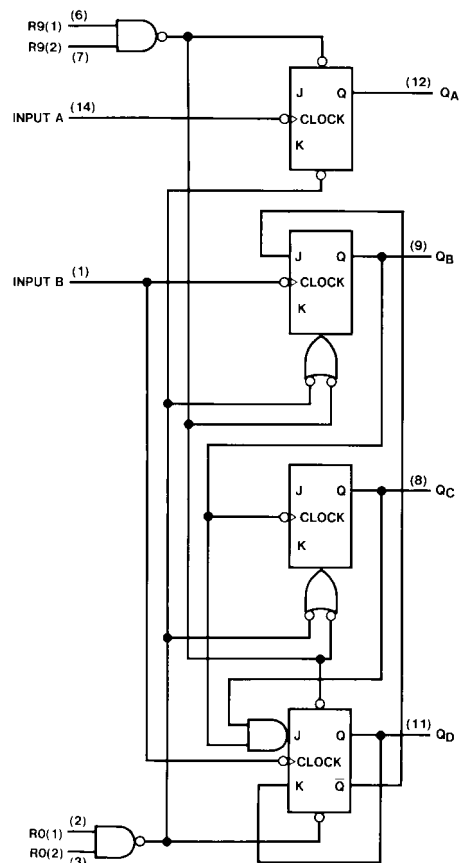
L = LOW Level

X = Don't Care

**Note 1:** Output QA is connected to input B for BCD count.

**Note 2:** Output QD is connected to input A for bi-quinary count

## Logic Diagram



The J and K inputs shown without connection are for reference only and are functionally at a HIGH level.

**Absolute Maximum Ratings**(Note 3)

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	-65°C to +150°C

**Note 3:** The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

**Recommended Operating Conditions**

Symbol	Parameter	Min	Nom	Max	Units
$V_{CC}$	Supply Voltage	4.75	5	5.25	V
$V_{IH}$	HIGH Level Input Voltage	2			V
$V_{IL}$	LOW Level Input Voltage			0.8	V
$I_{OH}$	HIGH Level Output Current			-0.8	mA
$I_{OL}$	LOW Level Output Current			16	mA
$f_{CLK}$	Clock Frequency (Note 4)	A	0	32	MHz
		B	0	16	
$t_W$	Pulse Width (Note 4)	A	15		ns
		B	30		
		Reset	15		
$t_{REL}$	Reset Release Time (Note 4)	25			ns
$T_A$	Free Air Operating Temperature	0		70	°C

**Note 4:**  $T_A = 25^\circ\text{C}$  and  $V_{CC} = 5V$ .

**DC Electrical Characteristics**

over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 5)	Max	Units
$V_I$	Input Clamp Voltage	$V_{CC} = \text{Min}$ , $I_I = -12 \text{ mA}$			-1.5	V
$V_{OH}$	HIGH Level Output Voltage	$V_{CC} = \text{Min}$ , $I_{OH} = \text{Max}$ $V_{IL} = \text{Max}$ , $V_{IH} = \text{Min}$	2.4	3.4		V
$V_{OL}$	LOW Level Output Voltage	$V_{CC} = \text{Min}$ , $I_{OL} = \text{Max}$ $V_{IH} = \text{Min}$ , $V_{IL} = \text{Max}$ (Note 6)		0.2	0.4	V
$I_I$	Input Current @ Max Input Voltage	$V_{CC} = \text{Max}$ , $V_I = 5.5V$			1	mA
$I_{IH}$	HIGH Level Input Current	$V_{CC} = \text{Max}$ $V_I = 2.7V$	A		80	$\mu\text{A}$
			Reset		40	
			B		120	
$I_{IL}$	LOW Level Input Current	$V_{CC} = \text{Max}$ $V_I = 0.4V$	A		-3.2	mA
			Reset		-1.6	
			B		-4.8	
$I_{OS}$	Short Circuit Output Current	$V_{CC} = \text{Max}$ (Note 7)	-18		-57	mA
$I_{CC}$	Supply Current	$V_{CC} = \text{Max}$ (Note 8)		29	42	mA

**Note 5:** All typicals are at  $V_{CC} = 5V$ ,  $T_A = 25^\circ\text{C}$ .

**Note 6:**  $Q_A$  outputs are tested at  $I_{OL} = \text{Max}$  plus the limit value of  $I_{IL}$  for the B input. This permits driving the B input while maintaining full fan-out capability.

**Note 7:** Not more than one output should be shorted at a time.

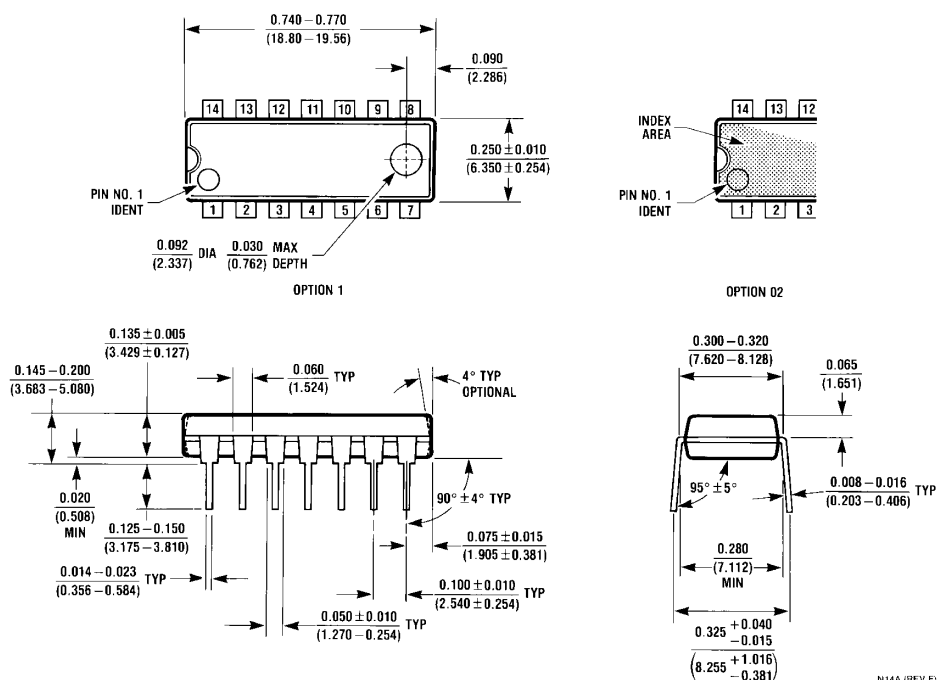
**Note 8:**  $I_{CC}$  is measured with all outputs open, both RO inputs grounded following momentary connection to 4.5V, and all other inputs grounded.

## AC Switching Characteristics

at  $V_{CC} = 5V$  and  $T_A = 25^\circ C$

Symbol	Parameter	From (Input) To (Output)	$R_L = 400\Omega, C_L = 15\text{ pF}$		Units
			Min	Max	
$f_{MAX}$	Maximum Clock Frequency	A to $Q_A$	32		MHz
		B to $Q_B$	16		
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output	A to $Q_A$		16	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	A to $Q_A$		18	ns
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output	A to $Q_D$		48	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	A to $Q_D$		50	ns
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output	B to $Q_B$		16	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	B to $Q_B$		21	ns
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output	B to $Q_C$		32	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	B to $Q_C$		35	ns
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output	B to $Q_D$		32	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	B to $Q_D$		35	ns
$t_{PLH}$	Propagation Delay Time LOW-to-HIGH Level Output	SET-9 to $Q_A, Q_D$		30	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	SET-9 to $Q_B, Q_C$		40	ns
$t_{PHL}$	Propagation Delay Time HIGH-to-LOW Level Output	SET-0 Any Q		40	ns

# Physical Dimensions inches (millimeters) unless otherwise noted



**14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide  
Package Number N14A**

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