

DM54L93 Decade, Divide-by-12, and Binary Counters

General Description

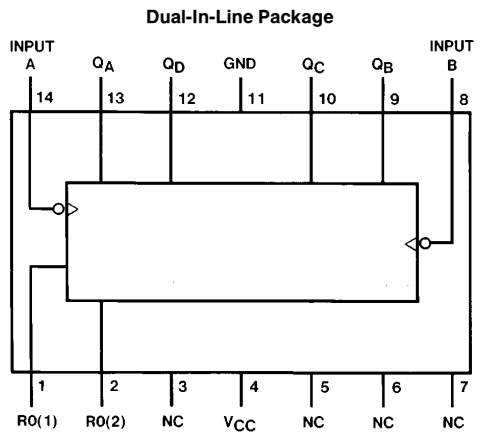
Each of these monolithic counters contains four master-slave flip-flops and additional gating to provide a divide-by-two counter and a three-stage binary counter for which the count cycle length is divide-by-eight.

To use their maximum count length (decade, divide-by-twelve, 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 truth table.

Features

- Typical power dissipation 16 mW
- Count frequency 15 MHz

Connection Diagram



Order Number DM54L93J or DM54L93W
See NS Package Number J14A or W14B

Function Tables

COUNT SEQUENCE
(See Note A)

| Count | Output | | | |
|-------|----------------|----------------|----------------|----------------|
| | Q _D | Q _C | Q _B | Q _A |
| 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 |
| 10 | H | L | H | L |
| 11 | H | L | H | H |
| 12 | H | H | L | L |
| 13 | H | H | L | H |
| 14 | H | H | H | L |
| 15 | H | H | H | H |

RESET/COUNT TRUTH TABLE (Note B)

| Reset Inputs | | Output | | | |
|--------------|-------|----------------|----------------|----------------|----------------|
| R0(1) | R0(2) | Q _D | Q _C | Q _B | Q _A |
| H | H | L | L | L | L |
| L | X | COUNT | | | |
| X | L | COUNT | | | |

Note A: Output Q_A is connected to input B

Note B: H = High Level, L = Low Level, X = Don't Care.

DM54L93 Decade, Divide-by-12, and Binary Counters

Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

| | |
|--------------------------------------|-----------------|
| Supply Voltage | 8V |
| Input Voltage | 5.5V |
| Operating Free Air Temperature Range | |
| DM54L | –55°C to +125°C |
| Storage Temperature Range | –65°C to +150°C |

Note: 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” table 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 | DM54L93 | | | Units |
|------------------|--------------------------------|---------|-----|------|-------|
| | | Min | Nom | Max | |
| V _{CC} | Supply Voltage | 4.5 | 5 | 5.5 | V |
| V _{IH} | High Level Input Voltage | 2 | | | V |
| V _{IL} | Low Level Input Voltage | | | 0.7 | V |
| I _{OH} | High Level Output Current | | | –0.2 | mA |
| I _{OL} | Low Level Output Current | | | 2 | mA |
| f _{CLK} | Clock Frequency (Note 5) | 0 | | 6 | MHz |
| t _w | Pulse Width (Note 5) | A | 90 | | ns |
| | | B | 90 | | |
| | | Reset | 200 | | |
| t _{REL} | Reset Release time (Note 5) | 200 | | | ns |
| T _A | Free Air Operating Temperature | –55 | | 125 | °C |

Electrical Characteristics over recommended operating free air temperature (unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ (Note 1) | Max | Units |
|-----------------|-----------------------------------|--|-------|--------------|-------|-------|
| V _{OH} | High Level Output Voltage | V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min | 2.4 | 3.4 | | V |
| V _{OL} | Low Level Output Voltage | V _{CC} = Min, I _{OL} = Max V _{IL} = Max, V _{IH} = Min (Note 4) | | 0.15 | 0.3 | V |
| I _I | Input Current @ Max Input Voltage | V _{CC} = Max V _I = 5.5V | Reset | | 0.1 | mA |
| | | | A | | 0.2 | |
| | | | B | | 0.2 | |
| I _{IH} | High Level Input Current | V _{CC} = Max V _I = 2.4V | Reset | | 10 | μA |
| | | | A | | 20 | |
| | | | B | | 20 | |
| I _{IL} | Low Level Input Current | V _{CC} = Max V _I = 0.3V | Reset | | –0.18 | mA |
| | | | A | | –0.36 | |
| | | | B | | –0.36 | |
| I _{OS} | Short Circuit Output Current | V _{CC} = Max (Note 2) | –3 | | –15 | mA |
| I _{CC} | Supply Current | V _{CC} = Max (Note 3) | | | 5.5 | mA |

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time.

Note 3: I_{CC} is measured with all outputs open, R0 inputs grounded following momentary connection to 4.5V and all other inputs grounded.

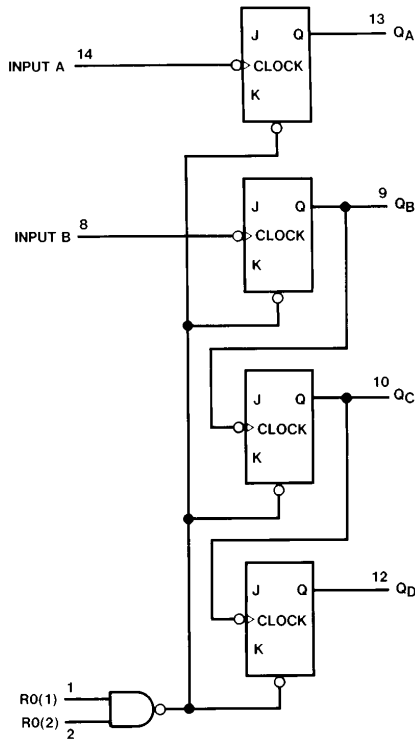
Note 4: Q_A outputs are tested at I_{OL} = max plus the limit value of I_{IL} for the B input. This permits driving the B input while maintaining full fan-out capability.

Note 5: T_A = 25°C and V_{CC} = 5V.

Switching Characteristics at $V_{CC} = 5V$ and $T_A = 25^\circ C$ (See Section 1 for Test Waveforms and Output Load)

| Symbol | Parameter | From (Input) To (Output) | $R_L = 4\text{ k}\Omega, C_L = 50\text{ pF}$ | | Units |
|-----------|--|-----------------------------|--|-----|-------|
| | | | Min | Max | |
| f_{MAX} | Maximum Clock Frequency | A to Q_A | 6 | | MHz |
| t_{PLH} | Propagation Delay Time Low to High Level Output | A to Q_D | | 400 | ns |
| t_{PHL} | Propagation Delay Time High to Low Level Output | A to Q_D | | 400 | ns |

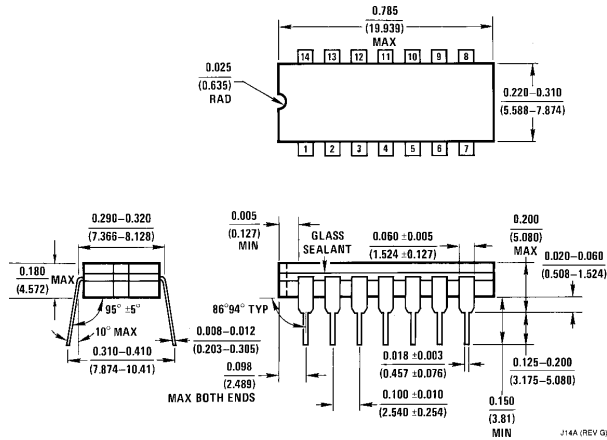
Logic Diagram



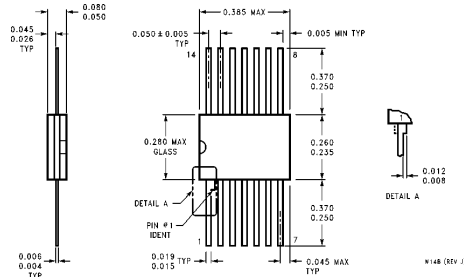
TL/F/6637-2

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

Physical Dimensions inches (millimeters)



14-Lead Ceramic Dual-In-Line Package (J)
Order Number DM54L93J
NS Package Number J14A



14-Lead Ceramic Flat Package (W)
Order Number DM54L93W
NS Package Number W14B

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018

National Semiconductor Europe
 Fax: (+49) 0-180-530 85 86
 Email: cnjwge@tevm2.nsc.com
 Deutsch Tel: (+49) 0-180-530 85 85
 English Tel: (+49) 0-180-532 78 32
 Français Tel: (+49) 0-180-532 93 58
 Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
 19th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
 Tel: 81-043-299-2309
 Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.

This datasheet has been downloaded from:

www.DatasheetCatalog.com

Datasheets for electronic components.

National Semiconductor was acquired by Texas Instruments.

http://www.ti.com/corp/docs/investor_relations/pr_09_23_2011_national_semiconductor.html

This file is the datasheet for the following electronic components:

DM54L93J - <http://www.ti.com/product/dm54l93j?HQS=TI-null-null-dscatalog-df-pf-null-ww>

DM54L93W - <http://www.ti.com/product/dm54l93w?HQS=TI-null-null-dscatalog-df-pf-null-ww>



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

LittleDiode.com

Looking forward to providing you with the best possible service.