

MNMM54C193-X REV 1A0

 Original Creation Date: 10/18/95
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SYNCHRONOUS 4-BIT UP/DOWN BINARY COUNTER
General Description

These up/down counters are monolithic complementary MOS (CMOS) integrated circuits. The MM54C193 is a binary counter.

Counting up and counting down is performed by two count inputs, one being held high while the other is clocked. The outputs change on the positive-going transition of this clock.

These counters feature preset inputs that are set when load is a logical "0" and a clear which forces all outputs to "0" when it is at a logical "1". The counters also have carry and borrow outputs so that they can be cascaded using no external circuitry.

Industry Part Number

MM54C193

NS Part Numbers

 MM54C193J/883
 MM54C193W/883

Prime Die

MM54C193

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp Description
Temp (°C)

| | | |
|----|---------------------|------|
| 1 | Static tests at | +25 |
| 2 | Static tests at | +125 |
| 3 | Static tests at | -55 |
| 4 | Dynamic tests at | +25 |
| 5 | Dynamic tests at | +125 |
| 6 | Dynamic tests at | -55 |
| 7 | Functional tests at | +25 |
| 8A | Functional tests at | +125 |
| 8B | Functional tests at | -55 |
| 9 | Switching tests at | +25 |
| 10 | Switching tests at | +125 |
| 11 | Switching tests at | -55 |

Features

- High noise margin
 - Tenth power TTL compatible
 - Wide supply range
 - Carry and borrow outputs for N-bit cascading
 - Asynchronous clear
 - High noise immunity
- 1V guaranteed
Drive 2 LPTTL loads
3 V to 15V
0.45 Vcc (typ.)

(Absolute Maximum Ratings)

(Note 1)

| | |
|----------------------------------|--------------------|
| Voltage at Any Pin | -0.3V to Vcc +0.3V |
| Operating Temperature Range (TA) | -55 C to +125 C |
| Storage Temperature Range (Ts) | -65 C to +150 C |
| Maximum Vcc Voltage | 18V |
| Power Dissipation (Pd) | |
| Dual-In-Line | 700mW |
| Small Outline | 500mW |
| Operating Vcc Range | 3V to 15V |
| Lead Temperature (TA) | |
| (Soldering, 10 seconds) | 260 C |

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Electrical Characteristics

DC PARAMETERS:

| SYMBOL | PARAMETER | CONDITIONS | NOTES | PIN-NAME | MIN | MAX | UNIT | SUB-GROUPS |
|---------|----------------------------|--|-------|----------|-------|-----|------|------------|
| Voh | Logical "1" Output Voltage | Vcc = 5V, Iout = -10uA, Vld = Vclr = 1.5V, other inputs at 3.5V | | | 4.5 | | V | 1, 2, 3 |
| | | Vcc = 10V, Iout = -10uA, Vld = Vclr = 2V, other inputs at 8V | | | 9 | | V | 1, 2, 3 |
| | | Vcc = 4.5V, Iout = -360uA, Vld = Vclr = 0.8V, other inputs at 3V | | | 2.4 | | V | 1, 2, 3 |
| Vol | Logical "0" Output Voltage | Vcc = 5V, Iout = 10uA, Vih = 3V, Vil = 1.5V | | | | 0.5 | V | 1, 2, 3 |
| | | Vcc = 10V, Iout = 10uA, Vih = 8V, Vil = 2V | | | | 1 | V | 1, 2, 3 |
| | | Vcc = 4.5V, Iout = 360uA, Vih = 3V, Vil = 0.8V | | | | 0.4 | V | 1, 2, 3 |
| Iih | Logical "1" Input Current | Vcc = 15V, Vin = 15V, other inputs at 0 | | | 1 | | uA | 1, 2, 3 |
| Iil | Logical "0" Input Current | Vcc = 15V, Vin = 0V, other inputs at 15V | | | -1 | | uA | 1, 2, 3 |
| Icc | Quiescent Device Current | Vcc = 15V, Vih = 15V, Vil = 0V | | | | 300 | uA | 1, 2, 3 |
| Isource | Output Source Current | Vcc = 5V, Vout = 0V, Vld = Vclr = 0, other inputs at 5V | | | -1.75 | | mA | 1 |
| | | Vcc = 10V, Vout = 0V, Vld = Vclr = 0, other inputs at 10V | | | -8 | | mA | 1 |
| Isink | Output Sink Current | Vcc = 5V, Vout = 5V, Vih = 5V, Vil = 0V | | | 1.75 | | mA | 1 |
| | | Vcc = 10V, Vout = 10V, Vih = 10V, Vil = 0V | | | 8 | | mA | 1 |
| Vih | Logical "1" Input Voltage | Vcc = 5V | 1 | | 3.5 | | V | 1, 2, 3 |
| | | Vcc = 10V | 1 | | 8 | | V | 1, 3 |
| | | | 1 | | 5.6 | | V | 2 |
| | | Vcc = 4.5V, (CMOS to LP) | 1 | | 3 | | V | 1, 2, 3 |
| Vil | Logical "0" Input Voltage | Vcc = 5V | 1 | | | 1.5 | V | 1, 2, 3 |
| | | Vcc = 10V | 1 | | | 2 | V | 1, 2, 3 |
| | | Vcc = 4.5V, (CMOS to LP) | 1 | | | 0.8 | V | 1, 2, 3 |

Electrical Characteristics

AC PARAMETERS: PROPAGATION DELAY TIME:

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: $C_l = 50\text{pF}$ or equivalent impedance provided by diode load.

| SYMBOL | PARAMETER | CONDITIONS | NOTES | PIN-NAME | MIN | MAX | UNIT | SUB-GROUPS |
|--------|-----------------------|------------|-------|----------|-----|-----|------|------------|
| tPLH | Count Up or Down to Q | Vcc = 5V | 2 | | | 400 | nS | 9 |
| | | | 2 | | | 500 | nS | 10, 11 |
| | | Vcc = 10V | 2 | | | 160 | nS | 9 |
| | | | 2 | | | 200 | nS | 10, 11 |
| tPHL | Count Up or Down to Q | Vcc = 5V | 2 | | | 400 | nS | 9 |
| | | | 2 | | | 500 | nS | 10, 11 |
| | | Vcc = 10V | 2 | | | 160 | nS | 9 |
| | | | 2 | | | 200 | nS | 10, 11 |
| tPHL | Count Up to Carry | Vcc = 5V | 2 | | | 200 | nS | 9 |
| | | | 2 | | | 250 | nS | 10, 11 |
| | | Vcc = 10V | 2 | | | 80 | nS | 9 |
| | | | 2 | | | 100 | nS | 10, 11 |
| tPHL | Count Down to Borrow | Vcc = 5V | 2 | | | 200 | nS | 9 |
| | | | 2 | | | 250 | nS | 10, 11 |
| | | Vcc = 10V | 2 | | | 80 | nS | 9 |
| | | | 2 | | | 100 | nS | 10, 11 |
| tPLH | Load to Q | Vcc = 5V | 2 | | | 480 | nS | 9 |
| | | | 2 | | | 600 | nS | 10, 11 |
| | | Vcc = 10V | 2 | | | 190 | nS | 9 |
| | | | 2 | | | 237 | nS | 10, 11 |
| tPHL | Load to Q | Vcc = 5V | 2 | | | 480 | nS | 9 |
| | | | 2 | | | 600 | nS | 10, 11 |
| | | Vcc = 10V | 2 | | | 190 | nS | 9 |
| | | | 2 | | | 237 | nS | 10, 11 |

Electrical Characteristics

AC PARAMETERS:

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: $C_l = 50\text{pF}$ or equivalent impedance provided by diode load.

| SYMBOL | PARAMETER | CONDITIONS | NOTES | PIN-NAME | MIN | MAX | UNIT | SUB-GROUPS |
|--------|--|------------|-------|----------|-----|-----|------|------------|
| ts | Time Prior to Load that Data must be present | Vcc = 5V | 1 | | | 160 | nS | 9 |
| | | Vcc = 10V | 1 | | | 50 | nS | 9 |
| tW | Minimum Clear Pulse Width | Vcc = 5V | 1 | | | 480 | nS | 9 |
| | | Vcc = 10V | 1 | | | 190 | nS | 9 |
| tW | Minimum Load Pulse Width | Vcc = 5V | 1 | | | 160 | nS | 9 |
| | | Vcc = 10V | 1 | | | 65 | nS | 9 |
| tW | Minimum Count Pulse Width | Vcc = 5V | 1 | | | 200 | nS | 9 |
| | | Vcc = 10V | 1 | | | 80 | nS | 9 |
| fMAX | | Vcc = 5V | 1 | | 2.5 | | MHz | 9 |
| | | Vcc = 10V | 1 | | 6 | | MHz | 9 |
| tr,tf | Clock Rise and Fall Time | Vcc = 5V | 1 | | | 15 | uS | 9 |
| | | Vcc = 10V | 1 | | | 5 | uS | 9 |

Note 1: Parameter tested go-no-go only.

Note 2: Tested at 25 C; guaranteed, but not tested at +125 C and -55 C.