

**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.