

MNDM54LS193-X REV 1A0

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UP/DOWN BINARY COUNTER (with Separate Up/Down Clocks)

General Description

The '193 is an up/down modulo-16 binary counter. Separate Count Up and Count Down Clocks are used and in either counting mode the circuits operate synchronously. The outputs change state synchronous with the LOW-to-HIGH transitions on the clock inputs. Separate Terminal Count Up and Terminal Count Down outputs are provided which are used as the clocks for subsequent stages without extra logic, thus simplifying multistage counter design. Individual preset inputs allow the circuits to be used as programmable counters. Both the Parallel Load (/PL) and the Master Reset (MR) inputs asynchronously override the clocks.

Industry Part Number

54LS193

NS Part Numbers

DM54LS193E/883

DM54LS193J/883

DM54LS193W/883

Prime Die

L193

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

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(Absolute Maximum Ratings)

(Note 1)

Storage Temperature	-65 C to +150 C
Ambient Temperature under Bias	-55 C to +125 C
Junction Temperature under Bias	-55C to +175C
Vcc Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage	-0.5V to +10.0V
Voltage Applied to Output in HIGH State (with Vcc=0V)	
Standard Output	-0.5V to Vcc
TRI-STATE Output	-0.5V to +5.5V
Current Applied to Output in LOW State (Max)	twice the rated Iol(mA)

Note 1: Absolute Maximum ratings are those values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	-55 C to +125 C
Supply Voltage	
Military	+4.5V to +5.5V

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: VCC 4.5V to 5.5V, Temp range: -55C to 125C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	Input High Current	VCC=5.5V, VM=2.7V, VINH=4.5V	1, 3	INPUTS		20.0	uA	1, 2, 3
IBVI	Input High Current	VCC=5.5V, VM=10.0V, VINH=4.5V	1, 3	INPUTS		100	uA	1, 2, 3
IIL	Input LOW Current	VCC=5.5V, VM=0.4V, VINL=0.0V	1, 3	INPUTS	-30	-400	uA	1, 2, 3
VOL	Output LOW Voltage	VCC=4.5V, VIL=0.7V, IOL=4.0mA, VINL=0.0V, VINH=4.5V, VIH=2.0mA	1, 3	OUTPUTS		0.4	V	1, 2, 3
VOH	Output HIGH Voltage	VCC= 4.5V, VIH=2.0V, IOH=-0.4mA, VIL=0.7V, VINL=0.0V	1, 3	OUTPUTS	2.5		V	1, 2, 3
IOS	Short Circuit Current	VCC=5.5V, VINL=0.0V, VOUT=0.0V	1, 3	OUTPUTS	-20	-100	mA	1, 2, 3
VCD	Input Clamp Diode Voltage	VCC=4.5V, IM=-18mA, VOUT=0.0V	1, 3	INPUTS		-1.5	V	1, 2, 3
ICC	Supply Current	VCC=5.5V, VINH=4.5V, VINL=0.0V	1, 3	VCC		34.0	mA	1, 2, 3

Electrical Characteristics

AC PARAMETERS - 15pF

(The following conditions apply to all the following parameters, unless otherwise specified.)

AC: CL=15pF, RL=2k ohms

Temp range: +25C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpHL	Propagation Delay	VCC=5.0V	5	MR to Qn		25.0	ns	9
tpLH 1	Propagation Delay	VCC=5.0V	5	PL to Qn		32.0	ns	9
tpHL 1	Propagation Delay	VCC=5.0V	5	PL to Qn		30.0	ns	9
tpLH 2	Propagation Delay	VCC=5.0V	5	Pn to Qn		20.0	ns	9
tpHL 2	Propagation Delay	VCC=5.0V	5	Pn to Qn		30.0	ns	9
tpLH 3	Propagation Delay	VCC=5.0V	5	CPU/CPD to Qn		31.0	ns	9
tpHL 3	Propagation Delay	VCC=5.0V	5	CPU/CPD to Qn		28.0	ns	9
tpLH 4	Propagation Delay	VCC=5.0V	5	CPU to TCU		16.0	ns	9
tpHL 4	Propagation Delay	VCC=5.0V	5	CPU to TCU		21.0	ns	9
tpLH 5	Propagation Delay	VCC=5.0V	5	CPU to TCD		16.0	ns	9
tpHL 5	Propagation Delay	VCC=5.0V	5	CPU to TCD		24.0	ns	9
ts(H/L)	Setup Time	VCC=5.0V	5	Pn to PL	20.0		ns	9
th(H/L)	Hold Time	VCC=5.0V	5	Pn to PL	3.0		ns	9
tw(H)	Pulse Width	VCC=5.0V	5	MR	20.0		ns	9
tw(L) 1	Pulse Width	VCC=5.0V	5	PL	20.0		ns	9
tw(L) 2	Pulse Width	VCC=5.0V	5	CP	17.0		ns	9
tREC	Recovery Time	VCC=5.0V	5	PL to Clock	10.0		ns	9
tREC 2	Recovery Time	VCC=5.0V	5	MR to CP	3.0		ns	9
fMAX	Maximum Clock Frequency	VCC=5.0V	5	CP	30.0		MHZ	9

Electrical Characteristics

AC PARAMETERS - 50pF

(The following conditions apply to all the following parameters, unless otherwise specified.)

AC: CL=50pF, RL=2k ohms

Temp range: -55C to +125C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpHL	Propagation Delay	VCC=5.0V	2, 4	MR to Qn	2.0	40.0	ns	9
			2, 4	MR to Qn	2.0	56.0	ns	10, 11
tpHL/LH 1	Propagation Delay	VCC=5.0V	2, 4	PL to Qn	2.0	45.0	ns	9
			2, 4	PL to Qn	2.0	63.0	ns	10, 11
tpLH 2	Propagation Delay	VCC=5.0V	2, 4	Pn to Qn	2.0	25.0	ns	9
			2, 4	Pn to Qn	2.0	33.0	ns	10, 11
tpHL 2	Propagation Delay	VCC=5.0V	2, 4	Pn to Qn	2.0	35.0	ns	9
			2, 4	Pn to Qn	2.0	46.0	ns	10, 11
tpLH 3	Propagation Delay	VCC=5.0V	2, 4	CPU/CPD to Qn	2.0	43.0	ns	9
			2, 4	CPU/CPD to Qn	2.0	60.0	ns	10, 11
tpHL 3	Propagation Delay	VCC=5.0V	2, 4	CPU/CPD to Qn	2.0	52.0	ns	9
			2, 4	CPU/CPD to Qn	2.0	73.0	ns	10, 11
tpLH 4	Propagation Delay	VCC=5.0V	2, 4	CPU to TCU	2.0	21.0	ns	9
			2, 4	CPU to TCU	2.0	27.0	ns	10, 11
tpHL 4	Propagation Delay	VCC=5.0V	2, 4	CPU to TCU	2.0	26.0	ns	9
			2, 4	CPU to TCU	2.0	34.0	ns	10, 11
tpLH 5	Propagation Delay	VCC=5.0V	2, 4	CPD to TCD	2.0	21.0	ns	9
			2, 4	CPD to TCD	2.0	27.0	ns	10, 11
tpHL 5	Propagation Delay	VCC=5.0V	2, 4	CPD to TCD	2.0	29.0	ns	9
			2, 4	CPD to TCD	2.0	38.0	ns	10, 11

Electrical Characteristics

AC PARAMETERS - 50pF(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)

AC: CL=50pF, RL=2k ohms

Temp range: -55C to +125C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Ts (H/L)	Set-up time	VCC=5.0V	2, 4	Pn to PL	30.0		ns	9, 10, 11
Th (H/L)	Hold time	VCC=5.0V	2, 4	Pn to PL	10.0		ns	9, 10, 11
tw (H)	Pulse Width	VCC=5.0V	2, 4	MR	20.0		ns	9, 10, 11
tw (L)	Pulse Width	VCC=5.0V	2, 4	PL	20.0		ns	9, 10, 11
tw (L) 2	Pulse Width	VCC=5.0V	2, 4	CP	20.0		ns	9, 10, 11
tREC	Recovery Time	VCC=5.0V	2, 4	PL to Clock	10.0		ns	9
			2, 4	PL to Clock	15.0		ns	10, 11
tREC 2	Recovery Time	VCC=5.0V	2, 4	MR to CP	3.0		ns	9
			2, 4	MR to CP	8.0		ns	10, 11
Fmax	Maximum clock frequency	VCC=5.0V	2, 4	CP	22.0		MHZ	9, 10, 11

Note 1: Screen tested 100% on each device at +25C, +125C & -55C temperature, subgroups A1, 2, 3, 7 & 8.

Note 2: Screen tested 100% on each device at +25C temperature only, subgroup A9.

Note 3: Sample tested (Method 5005, Table 1) on each MFG. lot at +25C, +125C & -55C temperature, subgroups A1, 2, 3, 7 & 8.

Note 4: Sample tested (Method 5005, Table 1) on each MFG. lot at +25C, subgroup A9. Subgroups 10 & 11 are guaranteed, not tested.

Note 5: GUARANTEED, NOT TESTED. (Design characterization data)

Revision History

Rev	ECN #	Rel Date	Originator	Changes
1A0	M0001740	07/17/98	Linda Collins	Initial MDS release: MNDM54LS193-X Rev. 1A0. Reworded the phrase in note 4 from 'and periodically at +125C & -55C, subgroups 10 & 11' to 'Subgroups 10 & 11 are guaranteed, not tested'.