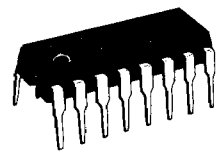
DN74LS191 N74LS191

Synchronous 4-bit Binary Up / Down Counters (with Up / Down Mode Control)

■ Description

DN74LS191 is a synchronous 4-bit binary (hexadecimal) couter with up/down control inputs and set input.

P-2



16-pin plastic DIL package

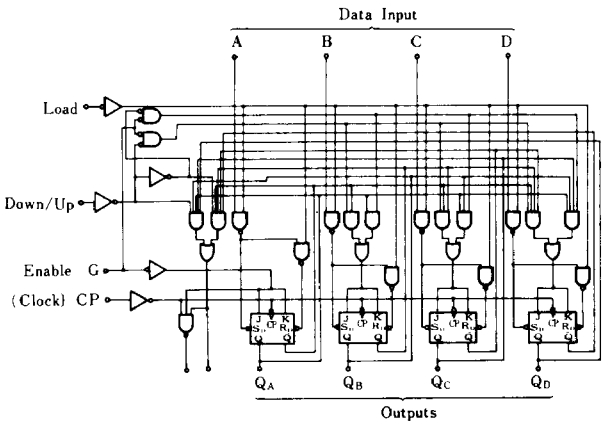
P-5

16-pin Panaflat package (SO-16D)

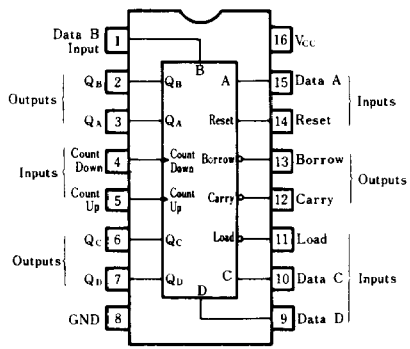
■ Features

- Up/down switching according to up/down control input
- Asynchronous set input
- Enable input
- Easy cascade connection
- High-speed counting (f_{max} = 25MHz typical)
- Wide operating temperature range (Ta = −20 to +75°C)

■ Logic diagram



Pin configuration (top view)



■ Recommended operating conditions

Parameter	Sym	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.75	5.00	5.25	V
Output current	I_{OH}			−400	μA
	I_{OL}			8	mA
Operating temperature range	Topr	−20	25	75	℃
Clock frequency	fclock	0		20	MHz
Clock pulse width	$t_{W(CP)}$	25			ns
Load pulse width	$t_{W(Load)}$	35			ns
Set-up time	tsu	20			ns
Hold time	th	5			ns
Enable time	tenable	40			ns

■ DC characteristics (Ta = −20 ~ +75℃)

Parameter		Sym	Test conditions		Min	Typ*	Max	Unit
Input voltage		V_{IH}			2.0			V
		V_{IL}					0.8	V
Output voltage		V_{OH}	V_{CC} = 4.75V, I_{OH} = −400μA V_{IH} = 2V, V_{IL} = 0.8V		2.7	3.4		V
		V_{OL}	V_{CC} = 4.75V V_{IH} = 2V V_{IL} = 0.8V	I_{OL} = 4mA		0.25	0.4	V
				I_{OL} = 8mA		0.35	0.5	V
Input current	Enable	I_{IH}	V_{CC} = 5.25V V_I = 2.7V				60	μA
	Others						20	μA
	Enable	I_{IL}	V_{CC} = 5.25V V_I = 0.4V				−1.2	mA
	Others						−0.4	mA
	Enable	I_I	V_{CC} = 5.25V V_I = 7V				0.3	mA
	Others						0.1	mA
Output short circuit current**		I_{OS}	V_{CC} = 5.25V V_O = 0V		−15		−100	mA
Input clamp voltage		V_{IK}	V_{CC} = 4.75V I_I = −18mA				−1.5	V
Supply current***		I_{CC}	V_{CC} = 5.25V			20	35	mA

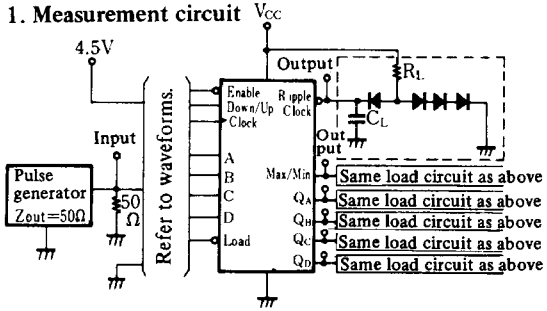
* When constant at V_{CC} = 5V, Ta = 25°C.
** Only one output at a time short circuited to GND. Also, short circuit time to GND within 1 second.
*** Measured with all outputs open and all inputs grounded.

■ Switching characteristics (V_{CC} = 5V, Ta = 25℃ constant)

Parameter	Sym	Inputs	Outputs	Test conditions	Min	Typ	Max	Unit
Maximum clock frequency	f_{max}			C_L = 15pF R_L = 2kΩ	20	25		MHz
Propagation delay time	t_{PLH}	Load	Q_A, Q_B Q_C, Q_D			22	33	ns
	t_{PHL}					23	50	ns
	t_{PLH}	Data A, B, C, D	Q_A, Q_B Q_C, Q_D			20	32	ns
	t_{PHL}					33	40	ns
	t_{PLH}	Clock	Ripple Clock			13	20	ns
	t_{PHL}					16	24	ns
	t_{PLH}	Clock	Q_A, Q_B Q_C, Q_D			16	24	ns
	t_{PHL}					24	36	ns
	t_{PLH}	Clock	Max/Min			28	42	ns
	t_{PHL}					37	52	ns
	t_{PLH}	Down / Up	Ripple Clock			30	45	ns
	t_{PHL}					30	45	ns
	t_{PLH}	Down / Up	Max/Min			21	33	ns
	t_{PHL}					22	33	ns
	t_{PLH}	Enable	Ripple Clock			21	33	ns
	t_{PHL}					22	33	ns

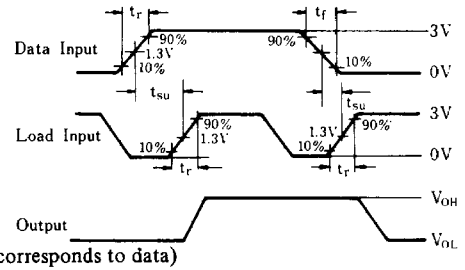
※ Switching parameter measurement information

1. Measurement circuit V_{CC}



1. Number of pulse generators increased as needed.
2. C_L includes probe and tool floating capacitance.
3. Diodes are all MA161.

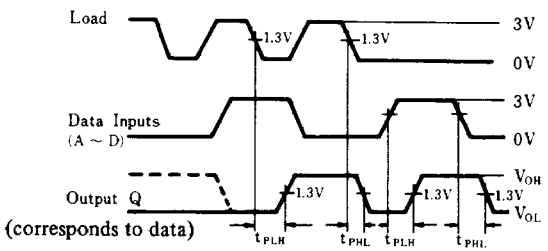
2. Waveforms



Notes

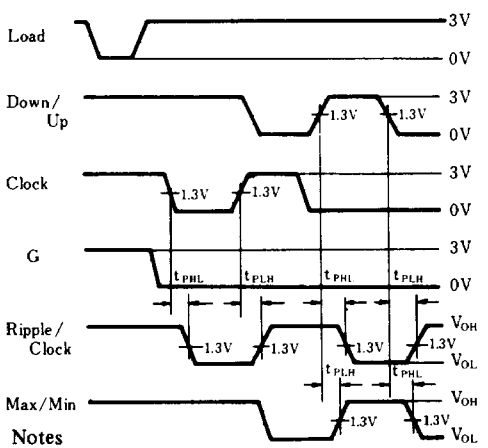
1. Input waveform: $t_r \leqq 15ns$, $t_f \leqq 6ns$, PRR = 1MHz, duty cycle = 50%.

Waveforms-1 Load → Q, Data → Q



Note: All other inputs are 4.5V.

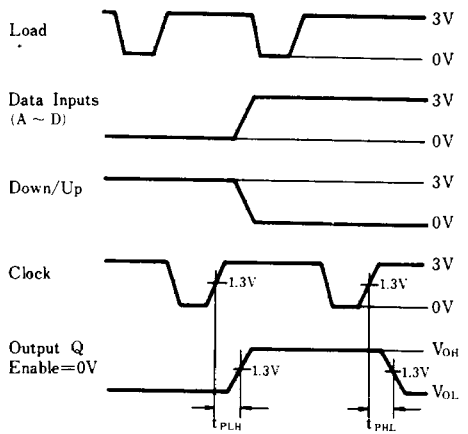
Waveforms-2 G → Ripple CP, CP → Ripple CP, Down/Up → Ripple CP, Down/UP → Max/Min



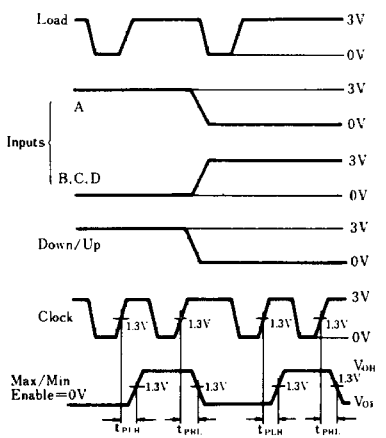
Notes

1. All data inputs are 0V.

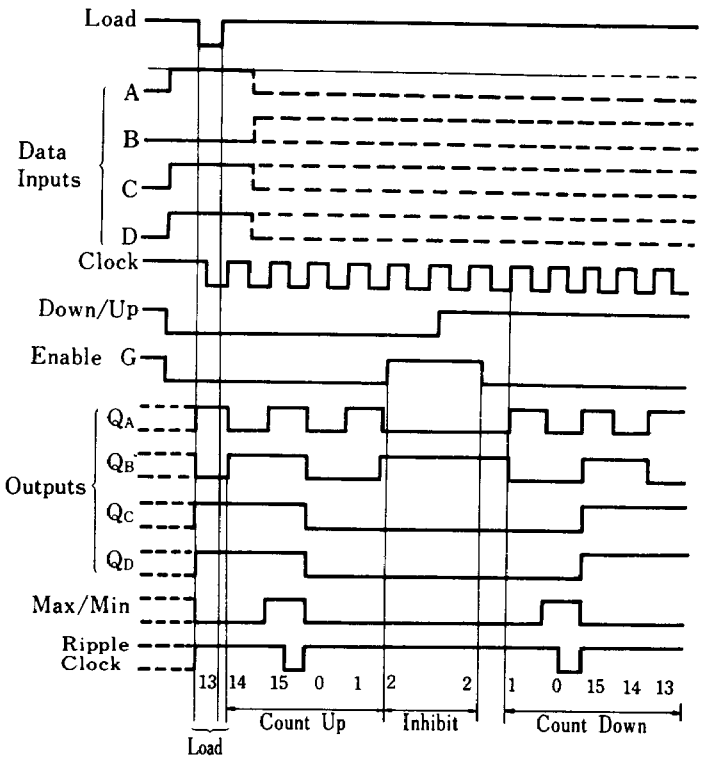
Waveforms-3 Clock → Q



Waveforms-4 Clock → Max/Min



■ Timing chart



Count order
1. Load (set) at binary 13.
2. Count up at 14, 15 (max), 0, 1, 2.
3. Inhibit.
4. Count down at 2, 1, 0 (min), 15, 14, 13.