

## DM74LS193 Synchronous 4-Bit Binary Counter with Dual Clock

### General Description

The DM74LS193 circuit is a synchronous up/down 4-bit binary counter. Synchronous operation is provided by having all flip-flops clocked simultaneously, so that the outputs change together when so instructed by the steering logic. This mode of operation eliminates the output counting spikes normally associated with asynchronous (ripple-clock) counters.

The outputs of the four master-slave flip-flops are triggered by a LOW-to-HIGH level transition of either count (clock) input. The direction of counting is determined by which count input is pulsed while the other count input is held HIGH.

The counter is fully programmable; that is, each output may be preset to either level by entering the desired data at the inputs while the load input is LOW. The output will change independently of the count pulses. This feature allows the counters to be used as modulo-N dividers by simply modifying the count length with the preset inputs.

A clear input has been provided which, when taken to a high level, forces all outputs to the low level; independent

of the count and load inputs. The clear, count, and load inputs are buffered to lower the drive requirements of clock drivers, etc., required for long words.

These counters were designed to be cascaded without the need for external circuitry. Both borrow and carry outputs are available to cascade both the up and down counting functions. The borrow output produces a pulse equal in width to the count down input when the counter underflows.

Similarly, the carry output produces a pulse equal in width to the count down input when an overflow condition exists. The counters can then be easily cascaded by feeding the borrow and carry outputs to the count down and count up inputs respectively of the succeeding counter.

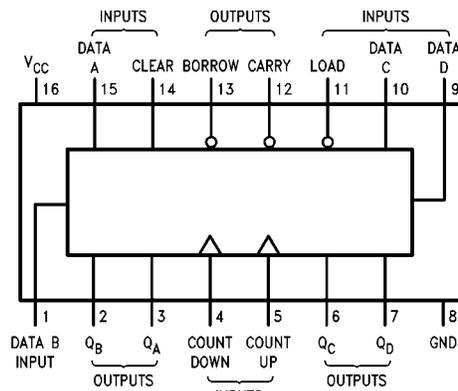
### Features

- Fully independent clear input
- Synchronous operation
- Cascading circuitry provided internally
- Individual preset each flip-flop

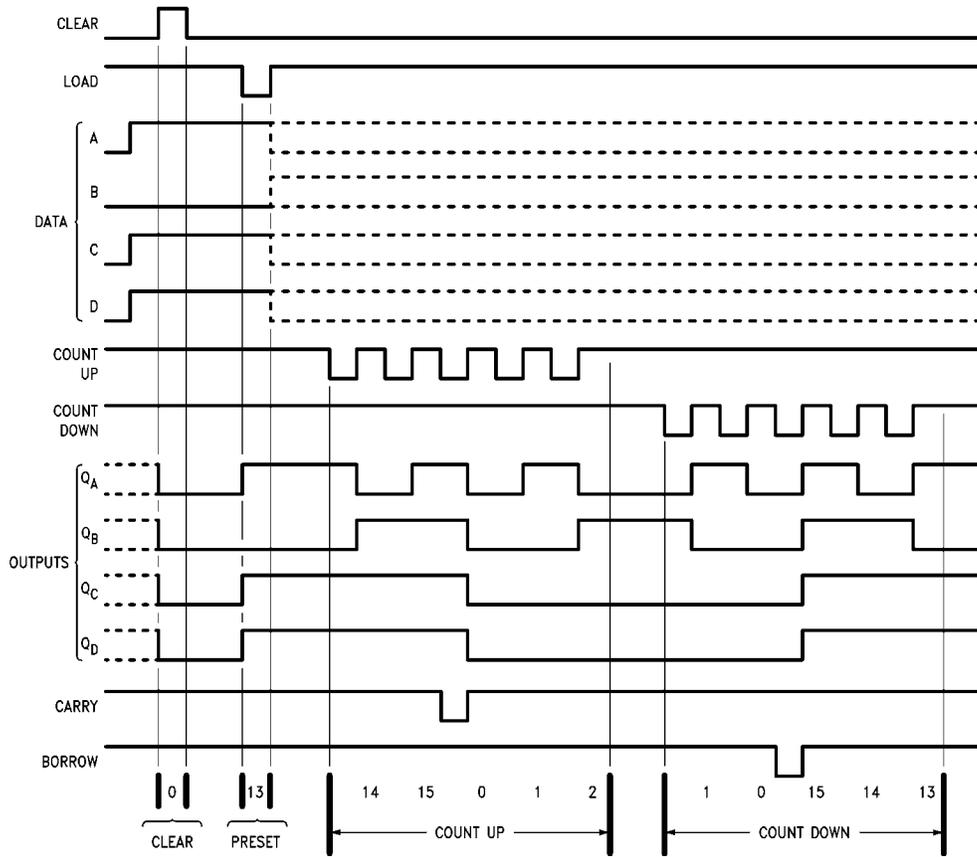
### Ordering Code:

Order Number	Package Number	Package Description
DM74LS193M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow Body
DM74LS193N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

### Connection Diagram



### Timing Diagram



Note A: Clear overrides load, data, and count inputs

Note B: When counting up, count-down input must be HIGH; when counting down, count-up input must be HIGH.