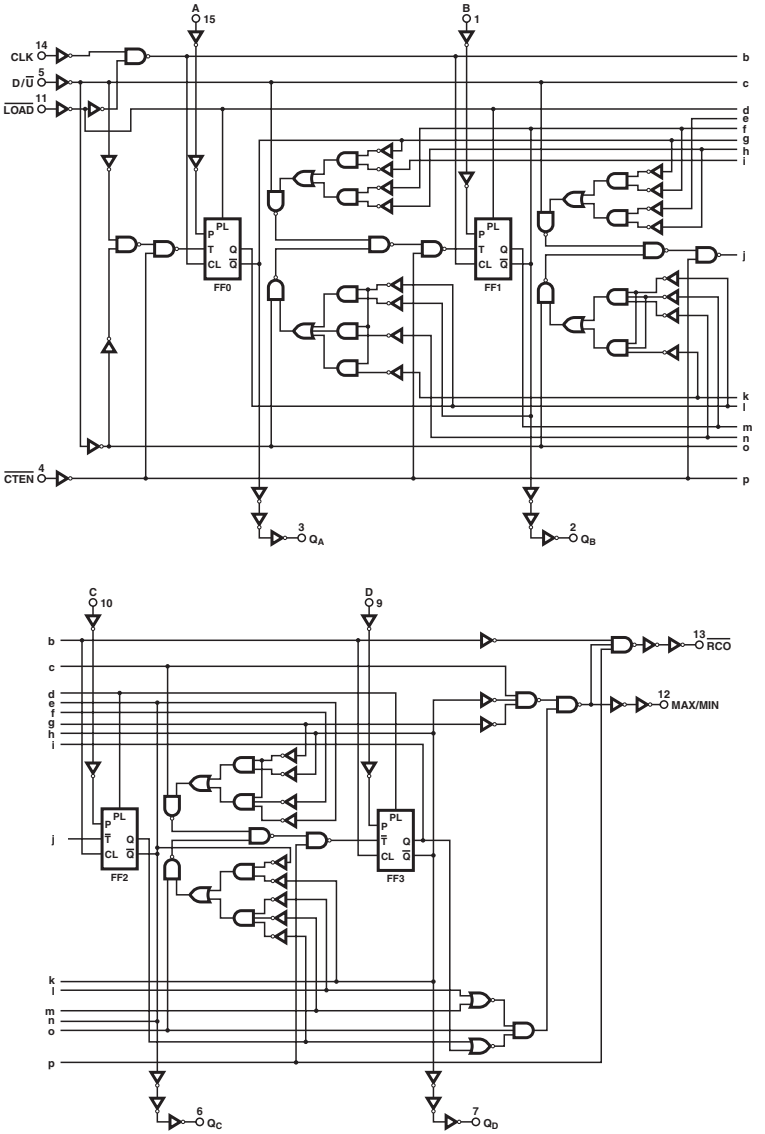
## SYNCHRONOUS 4-BIT UP/DOWN DECADE AND BINARY COUNTERS

### Logic Diagram






: OBSOLETED or NOT RECOMMENDED NEW DESIGNS

**FUNCTION TABLE**

| INPUTS | | | | FUNCTION |
|---|---|---|---|---|
| $\overline{LOAD}$ | $\overline{CTEN}$ | D/$\overline{U}$ | CLK | |
| H | L | L | ⌐‾ | Count up |
| H | L | H | ⌐‾ | Count down |
| L | X | X | X | Asynchronous preset |
| H | H | X | X | No change |

D/$\overline{U}$ or $\overline{CTEN}$ should be changed only when clock is high.
X = Don't care
⌐‾ Low-to-high clock transition

ELECTRICAL CHARACTERISTICS AND RECOMMENDED OPERATING CONDITIONS

| PARAMETER | MAX or MIN | TTL | LS | ALS | SN74 HC | CD74 HC | UNIT |
|---|---|---|---|---|---|---|---|
| $I_{CC}$ | MAX | 105 | 35 | 22 | 0.08 | 0.16 | mA |
| $I_{OH}$ | MAX | -0.8 | -0.4 | -0.4 | -4 | -4 | mA |
| $I_{OL}$ | MAX | 16 | 8 | 8 | 4 | 4 | mA |

TIMING REQUREMENTS AND SWITCHING CHARACTERISTICS

| PARAMETER | INPUT | OUTPUT | MAX or MIN | TTL | LS | ALS | SN74 HC | CD74 HC |
|---|---|---|---|---|---|---|---|---|
| fmax | | | MIN | 20 | 20 | 25 | 17 | 20 |
| tw | CLK | | MIN | 25 | 25 | 20 | 30 | 30 |
| | $\overline{LOAD}$ | | | 35 | 35 | 20 | 30 | 24 |
| tsu | Data , high or low | | MIN | 20 | 20 | 20 | 38 | 18 |
| th | Data hold time | | MIN | 0 | 5 | 5 | 5 | 2 |
| $t_{PLH}$ | $\overline{LOAD}$ | Q | MAX | 33 | 33 | 30 | 66 | 59 |
| $t_{PHL}$ | | | | 50 | 50 | 30 | 66 | 59 |
| $t_{PLH}$ | DATA | Q | MAX | 22 | 32 | 21 | 60 | 53 |
| $t_{PHL}$ | | | | 50 | 40 | 21 | 60 | 53 |
| $t_{PLH}$ | CLK | $\overline{RCO}$ | MAX | 20 | 20 | 20 | 30 | 38 |
| $t_{PHL}$ | | | | 24 | 24 | 20 | 30 | 38 |
| $t_{PLH}$ | CLK | Q | MAX | 24 | 24 | 18 | 48 | 51 |
| $t_{PHL}$ | | | | 36 | 36 | 18 | 48 | 51 |
| $t_{PLH}$ | CLK | MAX/MIN | MAX | 42 | 42 | 31 | 63 | 63 |
| $t_{PHL}$ | | | | 52 | 52 | 31 | 63 | 63 |
| $t_{PLH}$ | D/$\overline{U}$ | $\overline{RCO}$ | MAX | 45 | 45 | 37 | 57 | 45 |
| $t_{PHL}$ | | | | 45 | 45 | 28 | 57 | 45 |
| $t_{PLH}$ | D/$\overline{U}$ | MAX/ MIN | MAX | 33 | 33 | 25 | 48 | 50 |
| $t_{PHL}$ | | | | 33 | 33 | 25 | 48 | 50 |

UNIT fmax : MHz other : ns