Universal Hexadecimal Counter

The MC10H136 is a high speed synchronous hexadecimal counter. This 10H part is a functional/pinout duplication of the standard MECL 10K family part, with 100% improvement in counting frequency and no increase in power-supply current.

- Counting Frequency, 250 MHz Minimum
- Voltage Compensated
- Power Dissipation, 625 mW Typical
- MECL 10K-Compatible
- Improved Noise Margin 150 mV

 (Over Operating Voltage and Text

 (Over
 - (Over Operating Voltage and Temperature Range)

MC10H136



L SUFFIX CERAMIC PACKAGE CASE 620–10



P SUFFIX PLASTIC PACKAGE CASE 648–08



FN SUFFIX PLCC CASE 775–02

MAXIMUM RATINGS

| Characteristic | Symbol | Rating | Unit |
|---|------------------|----------------------------|------|
| Power Supply (V _{CC} = 0) | V _{EE} | -8.0 to 0 | Vdc |
| Input Voltage (V _{CC} = 0) | VI | 0 to VEE | Vdc |
| Output Current — Continuous — Surge | lout | 50 100 | mA |
| Operating Temperature Range | TA | 0 to +75 | °C |
| Storage Temperature Range — Plastic — Ceramic | T _{stg} | -55 to +150 -55 to +165 | °C |

ELECTRICAL CHARACTERISTICS (VFF = -5.2 V ±5%) (See Note)

| e-//(/p | | 0° | | 25° | | 75 ° | | |
|---|-------------------|--------------------|--------------------------|-------|--------------------------|-------------|--------------------------|------|
| Characteristic | Symbol | Min | Max | Min | Max | Min | Max | Unit |
| Power Supply Current | ΙΕ | _ | 165 | _ | 150 | _ | 165 | mA |
| Input Current High Pins 5, 6, 11, 12, 13 Pin 9 Pin 7 Pin 10 | l _{in} H | - - - | 430 670 535 380 | | 275 420 335 240 | = (| 275 420 335 240 | μА |
| Input Current Low | l _{inL} | 0.5 | | 0.5 | 1 | 0.3 | | μΑ |
| High Output Voltage | Vон | -1.02 | -0.84 | -0.98 | -0.81 | -0.92 | -0.735 | Vdc |
| Low Output Voltage | V _{OL} | -1.95 | -1.63 | -1.95 | -1.63 | -1.95 | -1.60 | Vdc |
| High Input Voltage | V _{IH} | -1.17 | -0.84 | -1.13 | -0.81 | -1.07 | -0.735 | Vdc |
| Low Input Voltage | VIL | -1.95 | -1.48 | -1.95 | -1.48 | -1.95 | -1.45 | Vdc |

AC PARAMETERS

| Propagation Delay Clock to Q Clock to Carry Out Carry in to Carry Out | ^t pd | 0.7 1.0 0.7 | 2.3 4.8 2.5 | 0.7 1.0 0.7 | 2.4 4.9 2.6 | 0.7 1.0 0.7 | 2.5 5.0 2.7 | ns |
|--|------------------|------------------------|-------------------|------------------------|-------------------|------------------------|-------------------|-----|
| Set-up Time Data (D0 to C) Select (S to C) Carry In (C _{in} to C) (C to C _{in}) | t _{set} | 2.0 3.5 2.0 0 | | 2.0 3.5 2.0 0 | C O | 2.0 3.5 2.0 0 | | ns |
| Hold Time Data (C to D0) Select (C to S) Carry In (C to C _{in}) (C _{in} to C) | thold | 0 -0.5 0 2.2 | = | 0 -0.5 0 2.2 | | 0 -0.5 0 2.2 | | ns |
| Counting Frequency | fcount | 250 | - | 250 | _ | 250 | - | MHz |
| Rise Time | t _r | 0.5 | 2.3 | 0.5 | 2.4 | 0.5 | 2.5 | ns |
| Fall Time | t _f | 0.5 | 2.3 | 0.5 | 2.4 | 0.5 | 2.5 | ns |

FUNCTION SELECT TABLE

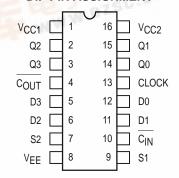
| CIN | S1 | S2 | Operating Mode | |
|-----|----|----|------------------------|--|
| X | L | L | Preset (Program) | |
| L | L | Ή | Increment (Count Up) | |
| Н | L | Ι | Hold Count | |
| L | Н | L | Decrement (Count Down) | |
| Н | Н | L | Hold Count | |
| Х | Н | Н | Hold (Stop Count) | |

SEQUENTIAL TRUTH TABLE *

| INPUTS | | | | | | | OUTPUTS | | | | | |
|--------|----|----|----|----|----|-------------|--------------|----|----|----|----|--------------|
| S1 | S2 | D0 | D1 | D2 | D3 | Carry In | Clock * * | Q0 | Q1 | Q2 | Q3 | Carry Out |
| L | L | L | L | Н | Н | Χ | Н | L | L | Н | Н | L |
| L | Н | Х | Х | Х | Х | L | Н | H | L | Н | Н | Н |
| L | Н | Χ | Х | Х | Х | L | Н | L | Н | Н | Н | Н |
| L | Н | Х | Х | Χ | Х | L | Н | Н | Н | Н | Н | L |
| L | Н | Χ | Х | Χ | Χ | Н | L | Н | Н | Н | Н | Н |
| L | Н | Х | Х | Х | Х | Н | Н | Н | Н | Н | Н | Н |
| Н | Н | Χ | Х | Х | Х | Х | Н | Н | Н | Н | Н | Н |
| L | L | Н | Н | L | L | Χ | Н | Ι | Η | L | L | L |
| Н | L | Х | Х | Х | Х | L | Н | L | Н | L | L | Н |
| Н | L | Х | Х | Х | Х | L | Н | Н | L | L | L | Н |
| Н | L | Χ | Х | Х | Х | L | Н | L | L | L | L | L |
| Н | L | Х | Х | Χ | Χ | L | Н | Н | Н | Н | Н | Н |
| | | | | | | | | | | | | |

- * Truth table shows logic states assuming inputs vary in sequence shown from top to bottom.
- * A clock H is defined as a clock input transition from a low to a high logic level.

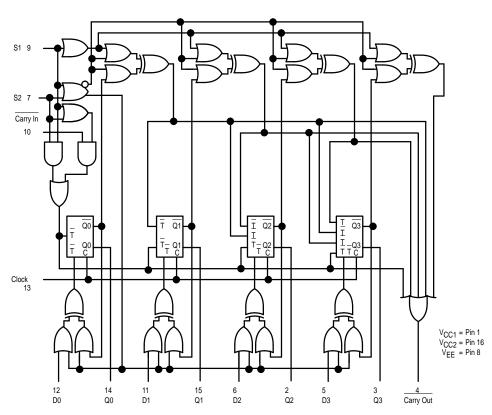
DIP PIN ASSIGNMENT



Pin assignment is for Dual-in-Line Package.
For PLCC pin assignment, see the Pin Conversion
Tables on page 6–11 of the Motorola MECL Data
Book (DL122/D).

Each MECL 10H series circuit has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear fpm is maintained. Outputs are terminated through a 50-ohm resistor to –2.0 volts.

LOGIC DIAGRAM



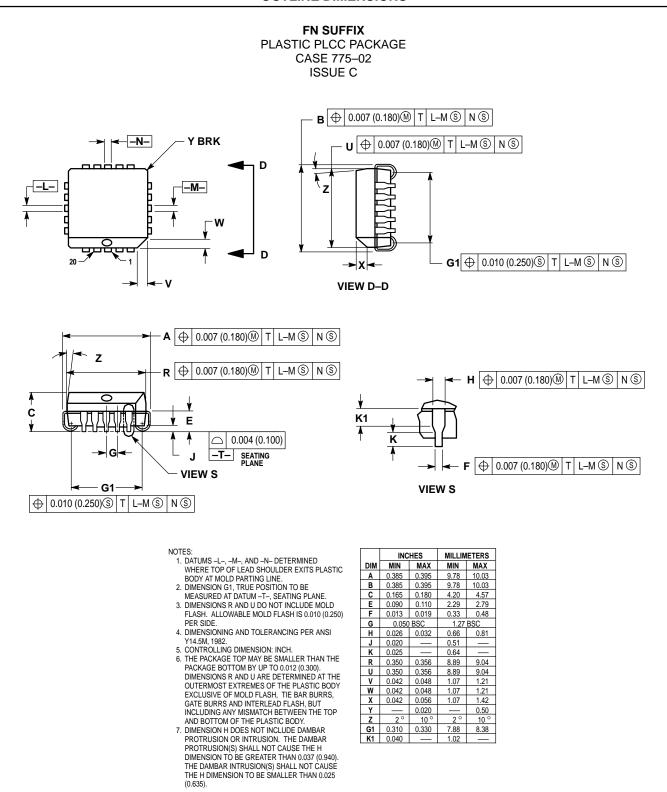
NOTE: FLIP-FLOPS WILL TOGGLE WHEN ALL T INPUTS ARE LOW.

APPLICATION INFORMATION

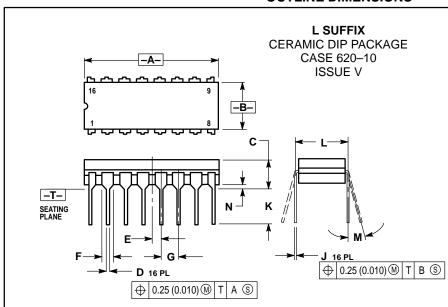
The MC10H136 is a high speed synchronous counter that operates at 250 MHz. Counter operating modes include count up, count down, pre-set and hold count. This device allows the designer to use one basic counter for many applications.

The S1, S2, control lines determine the operating modes of the counter. In the pre-set mode, a clock pulse is necessary to load the counter with the information present on the data inputs (D0, D1, D2, and D3). Carry out goes low on the terminal count or when the counter is being pre-set.

OUTLINE DIMENSIONS



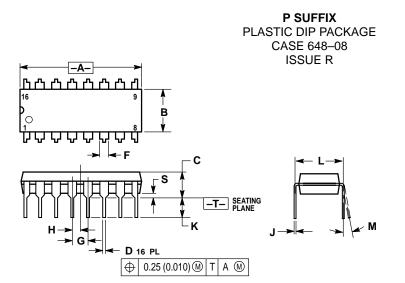
OUTLINE DIMENSIONS



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
- DIMENSION F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC

| | INC | HES | MILLIN | IETERS | |
|-----|-------|-------|----------|--------|--|
| DIM | MIN | MAX | MIN | MAX | |
| Α | 0.750 | 0.785 | 19.05 | 19.93 | |
| В | 0.240 | 0.295 | 6.10 | 7.49 | |
| С | | 0.200 | | 5.08 | |
| D | 0.015 | 0.020 | 0.39 | 0.50 | |
| Е | 0.050 | BSC | 1.27 BSC | | |
| F | 0.055 | 0.065 | 1.40 | 1.65 | |
| G | 0.100 | BSC | 2.54 BSC | | |
| Н | 0.008 | 0.015 | 0.21 | 0.38 | |
| K | 0.125 | 0.170 | 3.18 | 4.31 | |
| L | 0.300 | BSC | 7.62 | BSC | |
| M | 0° | 15° | 0 ° | 15° | |
| N | 0.020 | 0.040 | 0.51 | 1.01 | |



- DIMENSIONING AND TOLERANCING PER ANSI
- Y14.5M, 1982. CONTROLLING DIMENSION: INCH. DIMENSION L TO CENTER OF LEADS WHEN
- FORMED PARALLEL.
 DIMENSION B DOES NOT INCLUDE MOLD FLASH.
- ROUNDED CORNERS OPTIONAL

| | INC | HES | MILLIN | IETERS | |
|-----|-------|-------|----------|--------|--|
| DIM | MIN | MAX | MIN | MAX | |
| Α | 0.740 | 0.770 | 18.80 | 19.55 | |
| В | 0.250 | 0.270 | 6.35 | 6.85 | |
| С | 0.145 | 0.175 | 3.69 | 4.44 | |
| D | 0.015 | 0.021 | 0.39 | 0.53 | |
| F | 0.040 | 0.70 | 1.02 | 1.77 | |
| G | 0.100 | BSC | 2.54 BSC | | |
| Н | 0.050 | BSC | 1.27 BSC | | |
| J | 0.008 | 0.015 | 0.21 | 0.38 | |
| K | 0.110 | 0.130 | 2.80 | 3.30 | |
| L | 0.295 | 0.305 | 7.50 | 7.74 | |
| M | 0° | 10° | 0° | 10 ° | |
| S | 0.020 | 0.040 | 0.51 | 1.01 | |

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