

MC10H136

Universal Hexadecimal Counter

Description

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.

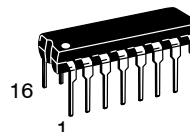
Features

- Counting Frequency, 250 MHz Minimum
- Power Dissipation, 625 mW Typical
- Improved Noise Margin 150 mV
(Over Operating Voltage and Temperature Range)
- Voltage Compensated
- MECL 10K Compatible
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant

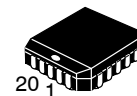


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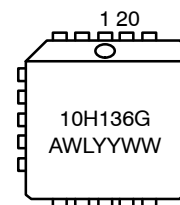
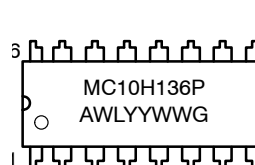


**PDIP-16
P SUFFIX
CASE 648-08**



**PLCC-20
FN SUFFIX
CASE 775-02**

MARKING DIAGRAMS*



- A = Assembly Location
- WL = Wafer Lot
- YY = Year
- WW = Work Week
- G = Pb-Free Package

*For additional marking information, refer to Application Note [AND8002/D](#).

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|----------------------|---------------|
| MC10H136FNG | PLCC-28 (Pb-Free) | 46 Units/Tube |
| MC10H136PG | PDIP-16 (Pb-Free) | 25 Units/Tube |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

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Table 1. FUNCTION SELECT TABLE

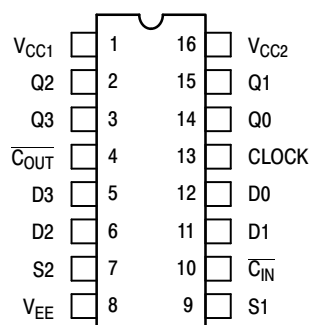
| CIN | S1 | S2 | Operating Mode |
|-----|----|----|------------------------|
| X | L | L | Preset (Program) |
| L | L | H | Increment (Count Up) |
| H | L | H | Hold Count |
| L | H | L | Decrement (Count Down) |
| H | H | L | Hold Count |
| X | H | H | Hold (Stop Count) |

Table 2. SEQUENTIAL TRUTH TABLE*

| INPUTS | | | | | | | | OUTPUTS | | | | |
|--------|----|----|----|----|----|----------|----------|---------|----|----|----|-----------|
| S1 | S2 | D0 | D1 | D2 | D3 | Carry In | Clock ** | Q0 | Q1 | Q2 | Q3 | Carry Out |
| L | L | L | L | H | H | X | H | L | L | H | H | L |
| L | H | X | X | X | X | L | H | H | L | H | H | H |
| L | H | X | X | X | X | L | H | L | H | H | H | H |
| L | H | X | X | X | X | L | H | H | H | H | H | L |
| L | H | X | X | X | X | H | L | H | H | H | H | H |
| L | H | X | X | X | X | H | H | H | H | H | H | H |
| H | H | X | X | X | X | X | H | H | H | H | H | H |
| L | L | H | H | L | L | X | H | H | H | L | L | L |
| H | L | X | X | X | X | L | H | L | H | L | L | H |
| H | L | X | X | X | X | L | H | H | L | L | L | L |
| H | L | X | X | X | X | L | H | L | L | L | L | L |
| H | L | X | X | X | X | L | H | H | H | H | H | H |

* 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.



Pin assignment is for Dual-in-Line Package.

Figure 1. Pin Assignment

Table 3. MAXIMUM RATINGS

| Symbol | Characteristic | Rating | Unit |
|-----------|---|----------------------------|------|
| V_{EE} | Power Supply ($V_{CC} = 0$) | -8.0 to 0 | Vdc |
| V_I | Input Voltage ($V_{CC} = 0$) | 0 to V_{EE} | Vdc |
| I_{out} | Output Current Continuous Surge | 50 100 | mA |
| T_A | Operating Temperature Range | 0 to +75 | °C |
| T_{stg} | Storage Temperature Range Plastic Ceramic | -55 to +150 -55 to +165 | °C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Table 4. ELECTRICAL CHARACTERISTICS ($V_{EE} = -5.2 \text{ V} \pm 5\%$) (Note 1)

| Symbol | Characteristic | 0° | | 25° | | 75° | | Unit |
|-----------|---|-------|-------|-------|-------|-------|--------|---------------|
| | | Min | Max | Min | Max | Min | Max | |
| I_E | Power Supply Current | - | 165 | - | 150 | - | 165 | mA |
| I_{inH} | Input Current High Pins 5, 6, 11, 12, 13 | - | 430 | - | 275 | - | 275 | μA |
| | Pin 9 | - | 670 | - | 420 | - | 420 | |
| | Pin 7 | - | 535 | - | 335 | - | 335 | |
| | Pin 10 | - | 380 | - | 240 | - | 240 | |
| I_{inL} | Input Current Low | 0.5 | - | 0.5 | - | 0.3 | - | μA |
| V_{OH} | High Output Voltage | -1.02 | -0.84 | -0.98 | -0.81 | -0.92 | -0.735 | Vdc |
| V_{OL} | Low Output Voltage | -1.95 | -1.63 | -1.95 | -1.63 | -1.95 | -1.60 | Vdc |
| V_{IH} | High Input Voltage | -1.17 | -0.84 | -1.13 | -0.81 | -1.07 | -0.735 | Vdc |
| V_{IL} | Low Input Voltage | -1.95 | -1.48 | -1.95 | -1.48 | -1.95 | -1.45 | Vdc |

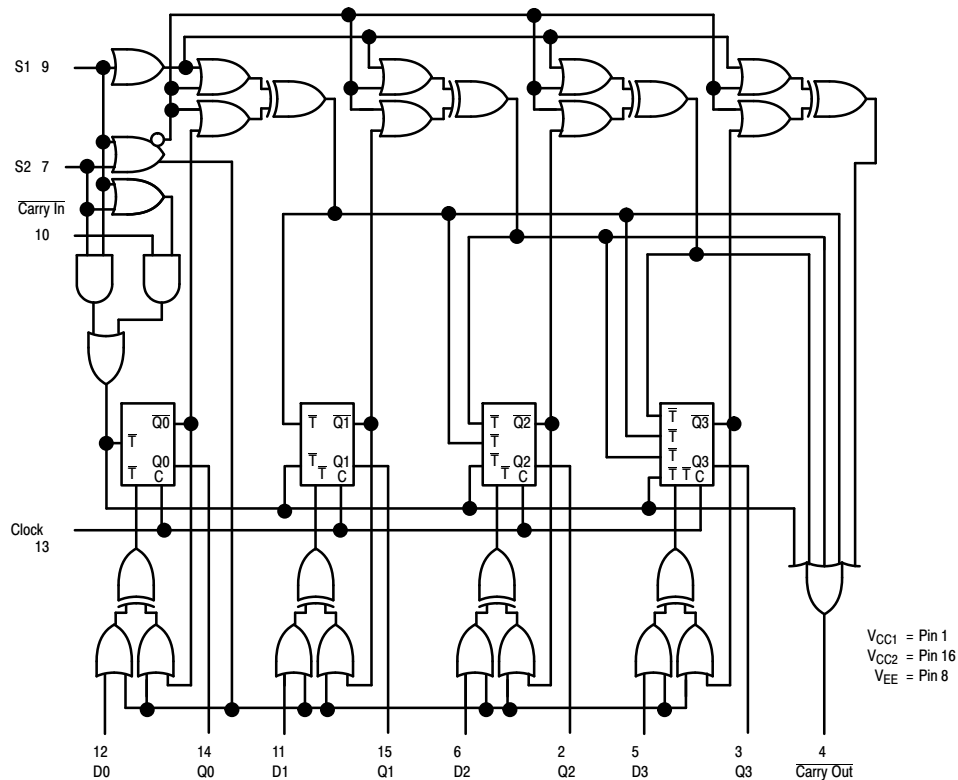
- Each MECL 10H™ series circuit has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 lfpm is maintained. Outputs are terminated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

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Table 5. AC CHARACTERISTICS

| Symbol | Characteristic | 0° | | 25° | | 75° | | Unit |
|-------------|--|------|-----|------|-----|------|-----|------|
| | | Min | Max | Min | Max | Min | Max | |
| t_{pd} | Propagation Delay | 0.7 | 2.3 | 0.7 | 2.4 | 0.7 | 2.5 | ns |
| | Clock to Q | 1.0 | 4.8 | 1.0 | 4.9 | 1.0 | 5.0 | |
| | Clock to Carry Out Carry in to Carry Out | 0.7 | 2.5 | 0.7 | 2.6 | 0.7 | 2.7 | |
| t_{set} | Set-up Time | 2.0 | - | 2.0 | - | 2.0 | - | ns |
| | Data (D0 to C) | 3.5 | - | 3.5 | - | 3.5 | - | |
| | Select (S to C) | 2.0 | - | 2.0 | - | 2.0 | - | |
| | Carry In (C_{in} to C) (C to C_{in}) | 0 | - | 0 | - | 0 | - | |
| t_{hold} | Hold Time | 0 | - | 0 | - | 0 | - | ns |
| | Data (C to D0) | -0.5 | - | -0.5 | - | -0.5 | - | |
| | Select (C to S) | 0 | - | 0 | - | 0 | - | |
| | Carry In (C to C_{in}) (C_{in} to C) | 2.2 | - | 2.2 | - | 2.2 | - | |
| f_{count} | Counting Frequency | 250 | - | 250 | - | 250 | - | MHz |
| t_r | Rise Time | 0.5 | 2.3 | 0.5 | 2.4 | 0.5 | 2.5 | ns |
| t_f | Fall Time | 0.5 | 2.3 | 0.5 | 2.4 | 0.5 | 2.5 | ns |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.



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

Figure 2. Logic Diagram

MC10H136

APPLICATION INFORMATION

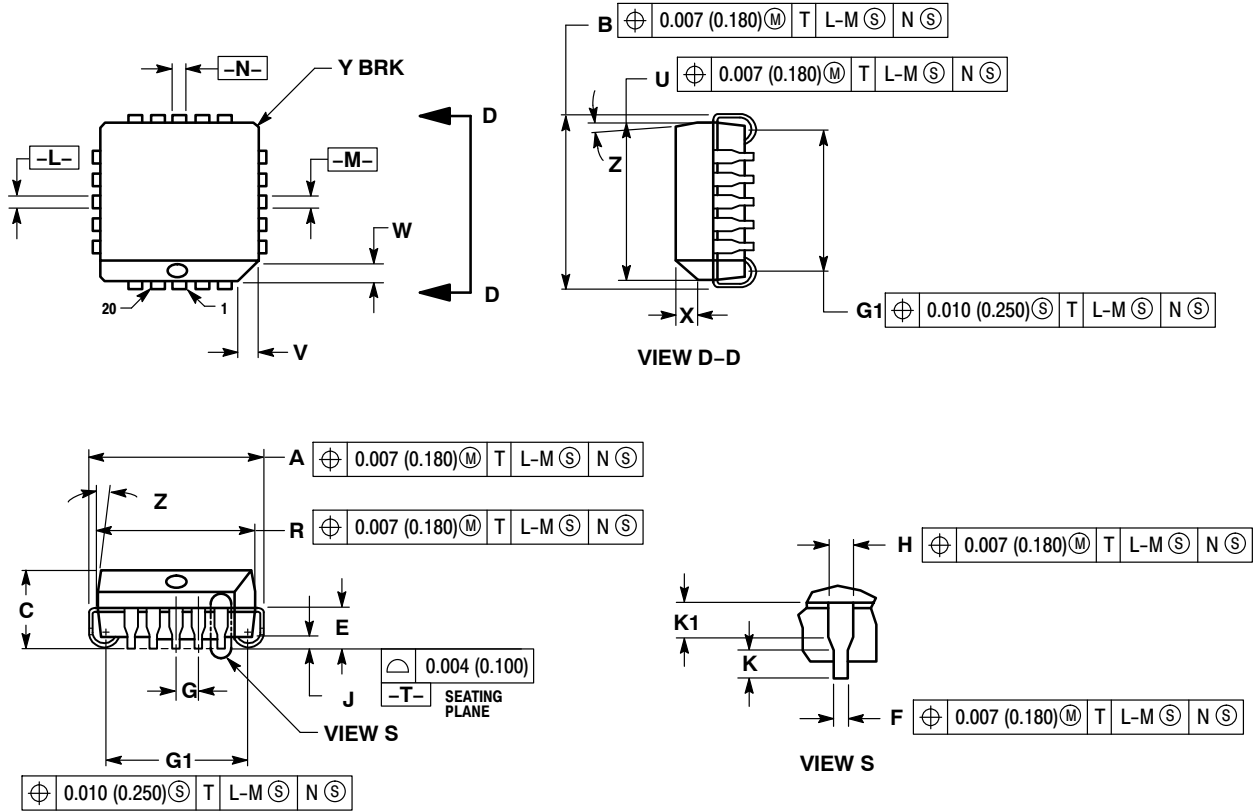
The MC10H136 is a high speed synchronous counter that operates at 250 MHz. Counter operating modes include count up, count down, pre-set and hold count. This device allows the designer to use one basic counter for many applications.

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.

MC10H136

PACKAGE DIMENSIONS

20 LEAD PLLC
CASE 775-02
ISSUE F



NOTES:

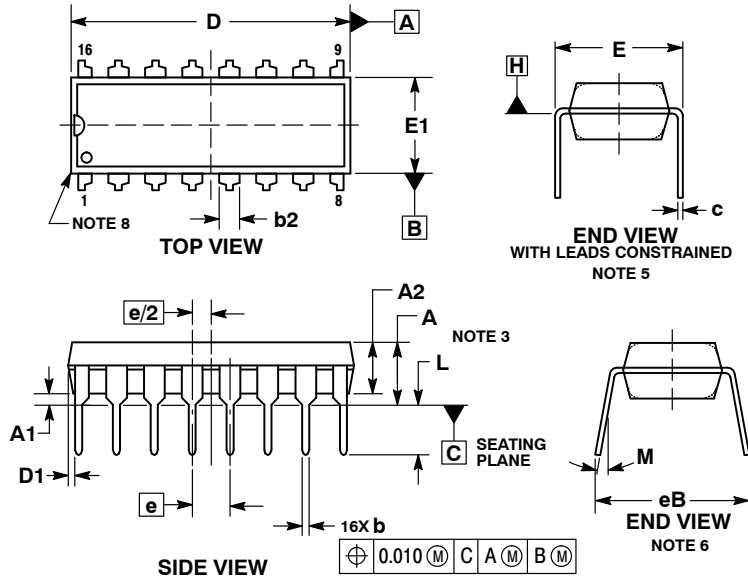
1. DIMENSIONS AND TOLERANCING PER ANSI Y14.5M, 1982.
2. DIMENSIONS IN INCHES.
3. DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
4. DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
5. DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
6. DIMENSIONS IN THE PACKAGE TOP MAY BE SMALLER THAN THE PACKAGE BOTTOM BY UP TO 0.012 (0.300). DIMENSIONS R AND U ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.
7. DIMENSION H DOES NOT INCLUDE DAMBAR PROTRUSION OR INTRUSION. THE DAMBAR PROTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE GREATER THAN 0.037 (0.940). THE DAMBAR INTRUSION(S) SHALL NOT CAUSE THE H DIMENSION TO BE SMALLER THAN 0.025 (0.635).

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.385 | 0.395 | 9.78 | 10.03 |
| B | 0.385 | 0.395 | 9.78 | 10.03 |
| C | 0.165 | 0.180 | 4.20 | 4.57 |
| E | 0.090 | 0.110 | 2.29 | 2.79 |
| F | 0.013 | 0.021 | 0.33 | 0.53 |
| G | 0.050 BSC | | 1.27 BSC | |
| H | 0.026 | 0.032 | 0.66 | 0.81 |
| J | 0.020 | ---- | 0.51 | ---- |
| K | 0.025 | ---- | 0.64 | ---- |
| R | 0.350 | 0.356 | 8.89 | 9.04 |
| U | 0.350 | 0.356 | 8.89 | 9.04 |
| V | 0.042 | 0.048 | 1.07 | 1.21 |
| W | 0.042 | 0.048 | 1.07 | 1.21 |
| X | 0.042 | 0.056 | 1.07 | 1.42 |
| Y | ---- | 0.020 | ---- | 0.50 |
| Z | 2° 10° | | 2° 10° | |
| G1 | 0.310 | 0.330 | 7.88 | 8.38 |
| K1 | 0.040 | ---- | 1.02 | ---- |

MC10H136

PACKAGE DIMENSIONS

PDIP-16
CASE 648-08
ISSUE V



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. DIMENSIONS A, A1 AND L ARE MEASURED WITH THE PACKAGE SEATED IN JEDEC SEATING PLANE GAUGE GS-3.
4. DIMENSIONS D, D1 AND E1 DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS ARE NOT TO EXCEED 0.10 INCH.
5. DIMENSION E IS MEASURED AT A POINT 0.015 BELOW DATUM PLANE H WITH THE LEADS CONSTRAINED PERPENDICULAR TO DATUM C.
6. DIMENSION eB IS MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED.
7. DATUM PLANE H IS COINCIDENT WITH THE BOTTOM OF THE LEADS, WHERE THE LEADS EXIT THE BODY.
8. PACKAGE CONTOUR IS OPTIONAL (ROUNDED OR SQUARE CORNERS).

STYLE 1:

- PIN 1. CATHODE
- CATHODE
- CATHODE
- CATHODE
- CATHODE
- CATHODE
- CATHODE
- CATHODE
- ANODE
- ANODE
- ANODE
- ANODE
- ANODE
- ANODE
- ANODE
- ANODE

STYLE 2:

- PIN 1. COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- COMMON DRAIN
- GATE
- SOURCE
- GATE
- SOURCE
- GATE
- SOURCE
- GATE
- SOURCE

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