

# MC10H131

## Dual D Type Master-Slave Flip-Flop

### Description

The MC10H131 is a MECL 10H™ part which is a functional/pinout duplication of the standard MECL 10K™ family part, with 100% improvement in clock speed and propagation delay and no increase in power-supply current.

### Features

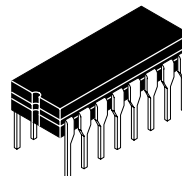
- Propagation Delay, 1.0 ns Typical
- Power Dissipation, 235 mW Typical
- Improved Noise Margin 150 mV (Over Operating Voltage and Temperature Range)
- Voltage Compensated
- MECL 10K Compatible
- Pb-Free Packages are Available\*



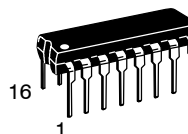
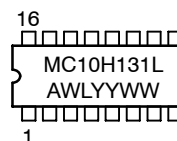
**ON Semiconductor®**

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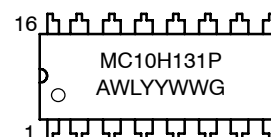
### MARKING DIAGRAMS\*



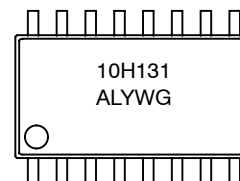
**CDIP-16  
L SUFFIX  
CASE 620A**



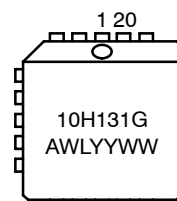
**PDIP-16  
P SUFFIX  
CASE 648**



**SOEIAJ-16  
CASE 966**



**PLLC-20  
FN SUFFIX  
CASE 775**



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

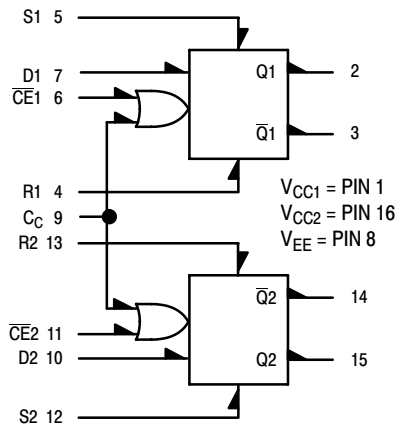
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

\*For additional marking information, refer to Application Note AND8002/D.

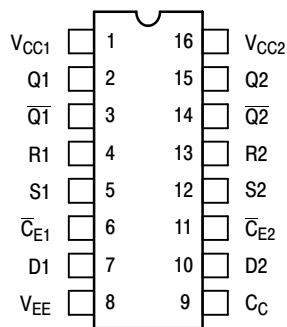
### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

# MC10H131



**Figure 1. Logic Diagram**



Pin assignment is for Dual-in-Line Package.

**Figure 2. Pin Assignment**

**Table 1. RS TRUTH TABLE**

| R | S | $Q_{n+1}$ |
|---|---|-----------|
| L | L | $Q_n$     |
| L | H | H         |
| H | L | L         |
| H | H | ND        |

ND = Not Defined

**Table 2. CLOCKED TRUTH TABLE**

| C | D | $Q_{n+1}$ |
|---|---|-----------|
| L | X | $Q_n$     |
| H | L | L         |
| H | H | H         |

$$C = \overline{CE} + C_C$$

A clock H is a clock transition from a low to a high state.

**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<br>- Continuous<br>- Surge           | 50<br>100                  | mA       |
| $T_A$     | Operating Temperature Range                         | 0 to +75                   | °C       |
| $T_{stg}$ | Storage Temperature Range<br>- Plastic<br>- Ceramic | -55 to +150<br>-55 to +165 | °C<br>°C |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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**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 | –     | 62    | –     | 56    | –     | 62     | mA            |
| $I_{inH}$ | Input Current High   |       |       |       |       |       |        | $\mu\text{A}$ |
|           | Pins 6, 11           | –     | 530   | –     | 310   | –     | 310    |               |
|           | Pin 9                | –     | 660   | –     | 390   | –     | 390    |               |
|           | Pins 7, 10           | –     | 485   | –     | 285   | –     | 285    |               |
|           | Pins 4, 5, 12, 13    | –     | 790   | –     | 465   | –     | 465    |               |
| $I_{inL}$ | Input Current Low    | 0.5   | –     | 0.5   | –     | 0.3   | –      | $\mu\text{A}$ |
| $V_{OH}$  | 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           |

1. 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  $\Omega$  resistor to  $-2.0\text{ V}$ .

**Table 5. AC CHARACTERISTICS**

| Symbol     | Characteristic         | 0°  |     | 25° |     | 75° |     | Unit |
|------------|------------------------|-----|-----|-----|-----|-----|-----|------|
|            |                        | Min | Max | Min | Max | Min | Max |      |
| $t_{pd}$   | Propagation Delay      |     |     |     |     |     |     | ns   |
|            | Clock, $\overline{CE}$ | 0.8 | 1.6 | 0.8 | 1.7 | 0.8 | 1.8 |      |
|            | Set, Reset             | 0.6 | 1.6 | 0.7 | 1.7 | 0.7 | 1.8 |      |
| $t_r$      | Rise Time              | 0.6 | 2.0 | 0.6 | 2.0 | 0.6 | 2.2 | ns   |
| $t_f$      | Fall Time              | 0.6 | 2.0 | 0.6 | 2.0 | 0.6 | 2.2 | ns   |
| $t_{set}$  | Set-up Time            | 0.7 | –   | 0.7 | –   | 0.7 | –   | ns   |
| $t_{hold}$ | Hold Time              | 0.8 | –   | 0.8 | –   | 0.8 | –   | ns   |
| $f_{tog}$  | Toggle Frequency       | 250 | –   | 250 | –   | 250 | –   | MHz  |

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 lfpm. 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.

## APPLICATION INFORMATION

The MC10H131 is a dual master–slave type D flip–flop. Asynchronous Set (S) and Reset (R) override Clock ( $C_C$ ) and Clock Enable ( $\overline{CE}$ ) inputs. Each flip–flop may be clocked separately by holding the common clock in the new low state and using the enable inputs for the clocking function. If the common clock is to be used to clock the flip–flop, the Clock Enable inputs must be in the low state.

In this case, the enable inputs perform the function of controlling the common clock.

The output states of the flip–flop change on the positive transition of the clock. A change in the information present at the data (D) input will not affect the output information at any other time due to master slave construction.

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## ORDERING INFORMATION

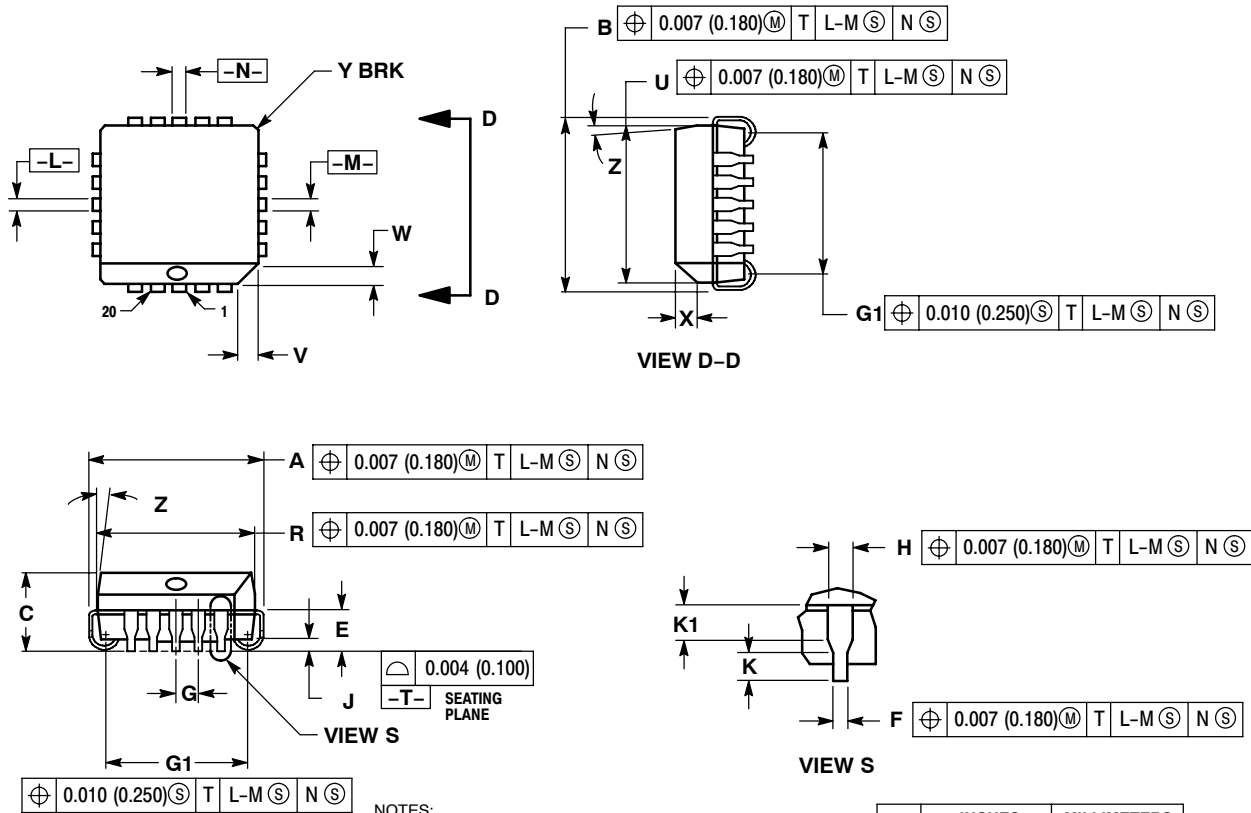
| Device        | Package                | Shipping†          |
|---------------|------------------------|--------------------|
| MC10H131FN    | PLLC-20                | 46 Units / Rail    |
| MC10H131FNG   | PLLC-20<br>(Pb-Free)   | 46 Units / Rail    |
| MC10H131FNR2  | PLLC-20                | 500 / Tape & Reel  |
| MC10H131FNR2G | PLLC-20<br>(Pb-Free)   | 500 / Tape & Reel  |
| MC10H131L     | CDIP-16                | 25 Unit / Rail     |
| MC10H131M     | SOEIAJ-16              | 50 Unit / Rail     |
| MC10H131MG    | SOEIAJ-16<br>(Pb-Free) | 50 Unit / Rail     |
| MC10H131MEL   | SOEIAJ-16              | 2000 / Tape & Reel |
| MC10H131MELG  | SOEIAJ-16<br>(Pb-Free) | 2000 / Tape & Reel |
| MC10H131P     | PDIP-16                | 25 Unit / Rail     |
| MC10H131PG    | PDIP-16<br>(Pb-Free)   | 25 Unit / Rail     |

†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.

# MC10H131

## PACKAGE DIMENSIONS

20 LEAD PLLC  
CASE 775-02  
ISSUE E



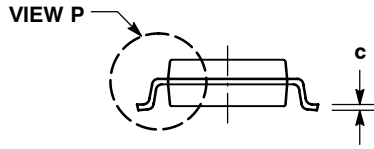
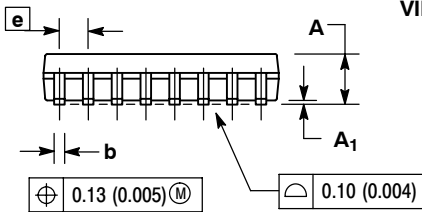
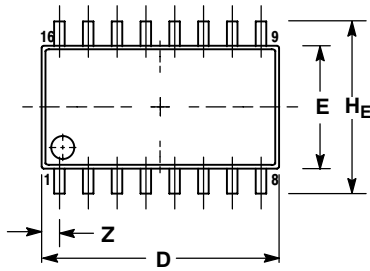
- NOTES:
- DIMENSIONS AND TOLERANCING PER ANSI Y14.5M, 1982.
  - DIMENSIONS IN INCHES.
  - DATUMS -L-, -M-, AND -N- DETERMINED WHERE TOP OF LEAD SHOULDER EXITS PLASTIC BODY AT MOLD PARTING LINE.
  - DIMENSION G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
  - DIMENSIONS R AND U DO NOT INCLUDE MOLD FLASH. ALLOWABLE MOLD FLASH IS 0.010 (0.250) PER SIDE.
  - 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.
  - 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     | 0.019 | 0.33        | 0.48  |
| 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        | ----  |

# MC10H131

## PACKAGE DIMENSIONS

### SOEIAJ-16 CASE 966-01 ISSUE A

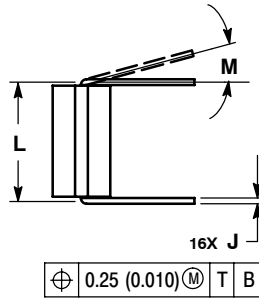


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

| DIM            | MILLIMETERS |       | INCHES |       |
|----------------|-------------|-------|--------|-------|
|                | MIN         | MAX   | MIN    | MAX   |
| A              | ---         | 2.05  | ---    | 0.081 |
| A <sub>1</sub> | 0.05        | 0.20  | 0.002  | 0.008 |
| b              | 0.35        | 0.50  | 0.014  | 0.020 |
| c              | 0.10        | 0.20  | 0.007  | 0.011 |
| D              | 9.90        | 10.50 | 0.390  | 0.413 |
| E              | 5.10        | 5.45  | 0.201  | 0.215 |
| e              | 1.27 BSC    |       |        |       |
| HE             | 7.40        | 8.20  | 0.291  | 0.323 |
| L              | 0.50        | 0.85  | 0.020  | 0.033 |
| LE             | 1.10        | 1.50  | 0.043  | 0.059 |
| M              | 0°          | 10°   | 0°     | 10°   |
| Q <sub>1</sub> | 0.70        | 0.90  | 0.028  | 0.035 |
| Z              | ---         | 0.78  | ---    | 0.031 |

### CDIP-16 L SUFFIX CERAMIC DIP PACKAGE CASE 620A-01 ISSUE O



NOTES:

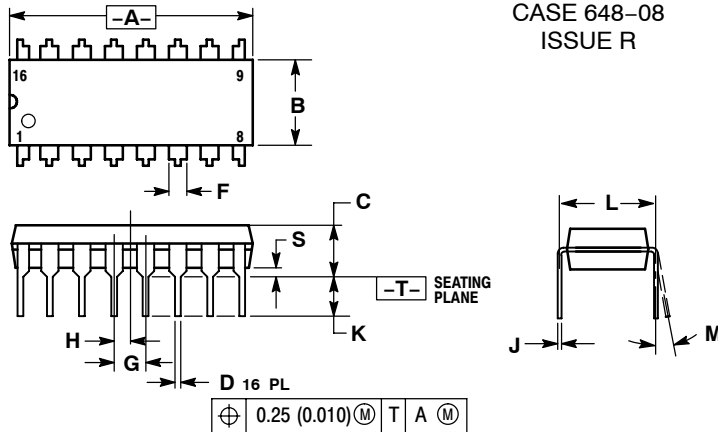
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
4. DIMENSION F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.
5. THIS DRAWING REPLACES OBSOLETE CASE OUTLINE 620-10.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.750     | 0.785 | 19.05       | 19.93 |
| B   | 0.240     | 0.295 | 6.10        | 7.49  |
| C   | ---       | 0.200 | ---         | 5.08  |
| D   | 0.015     | 0.020 | 0.39        | 0.50  |
| E   | 0.050 BSC |       |             |       |
| F   | 0.055     | 0.065 | 1.40        | 1.65  |
| G   | 0.100 BSC |       |             |       |
| H   | 0.008     | 0.015 | 0.21        | 0.38  |
| K   | 0.125     | 0.170 | 3.18        | 4.31  |
| L   | 0.300 BSC |       |             |       |
| M   | 0°        | 15°   | 0°          | 15°   |
| N   | 0.020     | 0.040 | 0.51        | 1.01  |

# MC10H131

## PACKAGE DIMENSIONS

### PDIP-16 P SUFFIX PLASTIC DIP PACKAGE CASE 648-08 ISSUE R



#### NOTES:

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

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.740     | 0.770 | 18.80       | 19.55 |
| B   | 0.250     | 0.270 | 6.35        | 6.85  |
| C   | 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    |       |
| H   | 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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