

# MC100LVEP34

## 2.5V / 3.3V ECL ÷2, ÷4, ÷8 Clock Generation Chip

The MC100LVEP34 is a low skew ÷2, ÷4, ÷8 clock generation chip designed explicitly for low skew clock generation applications. The internal dividers are synchronous to each other, therefore, the common output edges are all precisely aligned. The  $V_{BB}$  pin, an internally generated voltage supply, is available to this device only. For single-ended input conditions, the unused differential input is connected to  $V_{BB}$  as a switching reference voltage.  $V_{BB}$  may also rebias AC coupled inputs. When used, decouple  $V_{BB}$  and  $V_{CC}$  via a 0.01  $\mu\text{F}$  capacitor and limit current sourcing or sinking to 0.5 mA. When not used,  $V_{BB}$  should be left open.

The common enable ( $\overline{\text{EN}}$ ) is synchronous so that the internal dividers will only be enabled/disabled when the internal clock is already in the LOW state. This avoids any chance of generating a runt clock pulse on the internal clock when the device is enabled/disabled as can happen with an asynchronous control. An internal runt pulse could lead to losing synchronization between the internal divider stages. The internal enable flip-flop is clocked on the falling edge of the input clock; therefore, all associated specification limits are referenced to the negative edge of the clock input.

Upon start-up, the internal flip-flops will attain a random state; the master reset (MR) input allows for the synchronization of the internal dividers, as well as multiple LVEP34s in a system. Single-ended CLK input operation is limited to a  $V_{CC} \geq 3.0\text{ V}$  in PECL mode, or  $V_{EE} \leq -3.0\text{ V}$  in NECL mode.

### Features

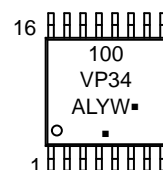
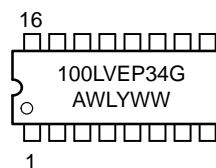
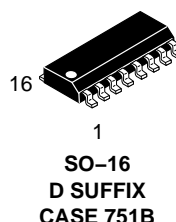
- 35 ps Output-to-Output Skew
- Synchronous Enable/Disable
- Master Reset for Synchronization
- The 100 Series Contains Temperature Compensation.
- PECL Mode Operating Range:  $V_{CC} = 2.375\text{ V}$  to  $3.8\text{ V}$  with  $V_{EE} = 0\text{ V}$
- NECL Mode Operating Range:  $V_{CC} = 0\text{ V}$  with  $V_{EE} = -2.375\text{ V}$  to  $-3.8\text{ V}$
- Open Input Default State
- LVDS Input Compatible
- These are Pb-Free Devices



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### MARKING DIAGRAMS\*



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

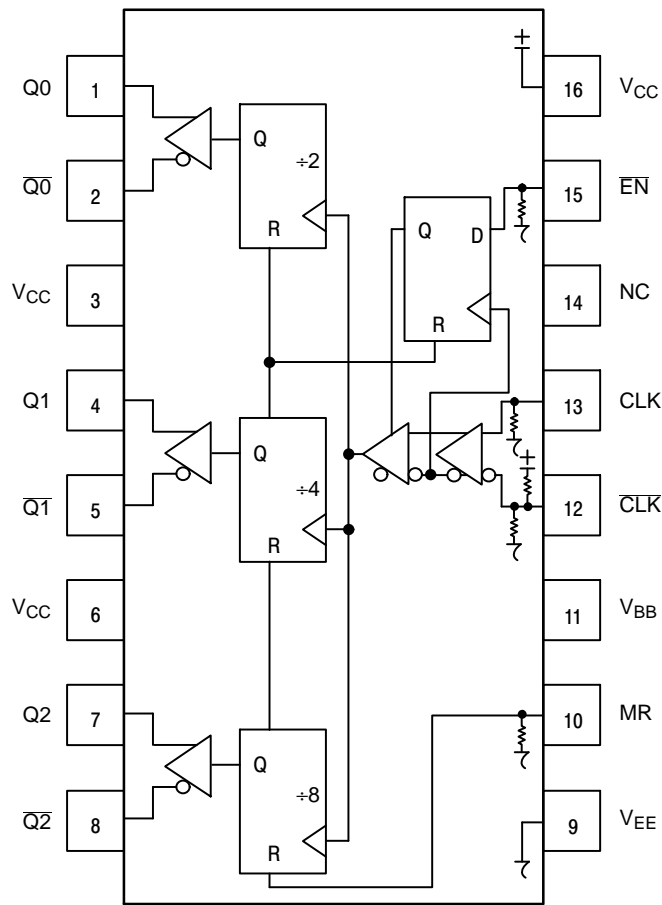
(Note: Microdot may be in either location)

\*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 8 of this data sheet.

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Warning: All  $V_{CC}$  and  $V_{EE}$  pins must be externally connected to Power Supply to guarantee proper operation.

**Figure 1. 16-Lead Pinout (Top View) and Logic Diagram**

**Table 1. PIN DESCRIPTION**

| Pin                              | Function                 |
|----------------------------------|--------------------------|
| CLK*, $\overline{\text{CLK}}$ ** | ECL Diff Clock Inputs    |
| EN*                              | ECL Sync Enable          |
| MR*                              | ECL Master Reset         |
| Q0, $\overline{\text{Q0}}$       | ECL Diff +2 Outputs      |
| Q1, $\overline{\text{Q1}}$       | ECL Diff +4 Outputs      |
| Q2, $\overline{\text{Q2}}$       | ECL Diff +8 Outputs      |
| $V_{BB}$                         | Reference Voltage Output |
| $V_{CC}$                         | Positive Supply          |
| $V_{EE}$                         | Negative Supply          |
| NC                               | No Connect               |

\* Pins will default LOW when left open.

\*\*Pins will default to  $V_{CC}/2$  when left open.

**Table 2. FUNCTION TABLE**

| CLK | EN | MR | FUNCTION        |
|-----|----|----|-----------------|
| Z   | L  | L  | Divide          |
| ZZ  | H  | L  | Hold $Q_{0-3}$  |
| X   | X  | H  | Reset $Q_{0-3}$ |

Z = Low-to-High Transition

ZZ = High-to-Low Transition

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**Table 3. ATTRIBUTES**

| Characteristics   | Value   |
|---|---|
| Internal Input Pulldown Resistor                              | 75 kΩ   |
| Internal Input Pullup Resistor                                | 37.5 kΩ   |
| ESD Protection  | Human Body Model<br>Machine Model<br>Charged Device Model |
|   | > 2 kV<br>> 200 V<br>> 2 kV                               |
| Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1) | Level 1   |
| Flammability Rating   | Oxygen Index: 28 to 34                                    |
|   | UL 94 V-O @ 0.125 in                                      |
| Transistor Count  | 210 Devices   |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test        |   |

1. For additional Moisture Sensitivity information, refer to Application Note AND8003/D.

**Table 4. MAXIMUM RATINGS**

| Symbol           | Parameter  | Condition 1                                    | Condition 2  | Rating      | Unit         |
|------------------|--|--|--|-------------|--------------|
| V <sub>CC</sub>  | PECL Mode Power Supply                             | V <sub>EE</sub> = 0 V                          |  | 6           | V            |
| V <sub>EE</sub>  | NECL Mode Power Supply                             | V <sub>CC</sub> = 0 V                          |  | -6          | V            |
| V <sub>I</sub>   | PECL Mode Input Voltage<br>NECL Mode Input Voltage | V <sub>EE</sub> = 0 V<br>V <sub>CC</sub> = 0 V | V <sub>I</sub> ≤ V <sub>CC</sub><br>V <sub>I</sub> ≥ V <sub>EE</sub> | 6<br>-6     | V<br>V       |
| I <sub>out</sub> | Output Current                                     | Continuous<br>Surge                            |  | 50<br>100   | mA<br>mA     |
| I <sub>BB</sub>  | V <sub>BB</sub> Sink/Source                        |  |  | ± 0.5       | mA           |
| T <sub>A</sub>   | Operating Temperature Range                        |  |  | -40 to +85  | °C           |
| T <sub>stg</sub> | Storage Temperature Range                          |  |  | -65 to +150 | °C           |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient)           | 0 lfpm<br>500 lfpm                             | SOIC-16<br>SOIC-16   | 100<br>60   | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | SOIC-16  | 33 to 36    | °C/W         |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient)           | 0 lfpm<br>500 lfpm                             | TSSOP-16<br>TSSOP-16   | 138<br>108  | °C/W<br>°C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | TSSOP-16   | 33 to 36    | °C/W         |
| T <sub>sol</sub> | Wave Solder  | <2 to 3 sec @ 248°C                            |  | 265         | °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.

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**Table 5. 100EP DC CHARACTERISTICS, PECL**  $V_{CC} = 2.5\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 2)

| Symbol      | Characteristic  | -40°C               |             |      | 25°C        |      |      | 85°C        |      |      | Unit          |
|-------------|---|---------------------|-------------|------|-------------|------|------|-------------|------|------|---------------|
|             |   | Min                 | Typ         | Max  | Min         | Typ  | Max  | Min         | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current  | 40                  | 50          | 60   | 40          | 50   | 60   | 42          | 52   | 62   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 3)  | 1355                | 1480        | 1605 | 1355        | 1480 | 1605 | 1355        | 1480 | 1605 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 3)   | 505                 | 680         | 900  | 505         | 680  | 900  | 505         | 680  | 900  | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)<br>(Note 4)                           | 1335                |             | 1620 | 1335        |      | 1620 | 1275        |      | 1620 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)<br>(Note 4)                            | 505                 |             | 900  | 505         |      | 900  | 505         |      | 900  | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode<br>Range (Differential) (Note 4, Note 5) | 1.2                 |             | 3.3  | 1.2         |      | 3.3  | 1.2         |      | 3.3  | V             |
| $I_{IH}$    | Input HIGH Current  |                     |             | 150  |             |      | 150  |             |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current   | $\frac{D}{\bar{D}}$ | 0.5<br>-150 |      | 0.5<br>-150 |      |      | 0.5<br>-150 |      |      | $\mu\text{A}$ |

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.

- Input and output parameters vary 1:1 with  $V_{CC}$ .
- All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .
- Do not use  $V_{BB}$  at  $V_{CC} < 3.0\text{ V}$ . Single-Ended input CLK pin operation is limited to  $V_{CC} \geq 3.0\text{ V}$  in PECL mode.
- $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ ,  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

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**Table 6. 100EP DC CHARACTERISTICS, PECL**  $V_{CC} = 3.3\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 6)

| Symbol      | Characteristic   | -40°C               |             |      | 25°C        |      |      | 85°C        |      |      | Unit          |
|-------------|--|---------------------|-------------|------|-------------|------|------|-------------|------|------|---------------|
|             |  | Min                 | Typ         | Max  | Min         | Typ  | Max  | Min         | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current   | 40                  | 50          | 60   | 40          | 50   | 60   | 42          | 52   | 62   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 7)                                 | 2155                | 2280        | 2405 | 2155        | 2280 | 2405 | 2155        | 2280 | 2405 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 7)                                  | 1305                | 1570        | 1700 | 1305        | 1570 | 1700 | 1305        | 1570 | 1700 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                            | 2075                |             | 2420 | 2075        |      | 2420 | 2075        |      | 2420 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                             | 1305                |             | 1700 | 1305        |      | 1700 | 1305        |      | 1700 | mV            |
| $V_{BB}$    | Output Voltage Reference (Note 8)                            | 1775                | 1875        | 1975 | 1775        | 1875 | 1975 | 1775        | 1875 | 1975 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 9) | 1.2                 |             | 3.3  | 1.2         |      | 3.3  | 1.2         |      | 3.3  | V             |
| $I_{IH}$    | Input HIGH Current   |                     |             | 150  |             |      | 150  |             |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current  | $\frac{D}{\bar{D}}$ | 0.5<br>-150 |      | 0.5<br>-150 |      |      | 0.5<br>-150 |      |      | $\mu\text{A}$ |

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 lpm. 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.

6. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.925 V to -0.5 V.

7. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .

8. Single-Ended input CLK pin operation is limited to  $V_{CC} \geq 3.0\text{ V}$  in PECL mode.

9.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

**Table 7. 100EP DC CHARACTERISTICS, NECL**  $V_{CC} = 0\text{ V}$ ,  $V_{EE} = -3.8\text{ V}$  to  $-2.375\text{ V}$  (Note 10)

| Symbol      | Characteristic  | -40°C               |             |       | 25°C         |       |       | 85°C         |       |       | Unit          |
|-------------|---|---------------------|-------------|-------|--------------|-------|-------|--------------|-------|-------|---------------|
|             |   | Min                 | Typ         | Max   | Min          | Typ   | Max   | Min          | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current  | 40                  | 50          | 60    | 40           | 50    | 60    | 42           | 52    | 62    | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 11)                                 | -1145               | -1020       | -895  | -1145        | -1020 | -895  | -1145        | -1020 | -895  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 11)                                  | -1995               | -1700       | -1600 | -1995        | -1700 | -1600 | -1995        | -1700 | -1600 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                             | -1225               |             | -880  | -1225        |       | -880  | -1225        |       | -880  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                              | -1995               |             | -1600 | -1995        |       | -1600 | -1995        |       | -1600 | mV            |
| $V_{BB}$    | Output Voltage Reference (Note 12)                            | -1525               | -1425       | -1325 | -1525        | -1425 | -1325 | -1525        | -1425 | -1325 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential) (Note 13) | $V_{EE}+1.2$        |             | 0.0   | $V_{EE}+1.2$ |       | 0.0   | $V_{EE}+1.2$ |       | 0.0   | V             |
| $I_{IH}$    | Input HIGH Current  |                     |             | 150   |              |       | 150   |              |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current   | $\frac{D}{\bar{D}}$ | 0.5<br>-150 |       | 0.5<br>-150  |       |       | 0.5<br>-150  |       |       | $\mu\text{A}$ |

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 lpm. 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.

10. Input and output parameters vary 1:1 with  $V_{CC}$ .

11. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .

12. Single-Ended input CLK pin operation is limited to  $V_{EE} \leq -3.0\text{ V}$  in NECL mode.

13.  $V_{IHCMR}$  min varies 1:1 with  $V_{EE}$ .  $V_{IHCMR}$  max varies 1:1 with  $V_{CC}$ . The  $V_{IHCMR}$  range is referenced to the most positive side of the differential input signal.

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**Table 8. AC CHARACTERISTICS**  $V_{CC}= 0\text{ V}$ ;  $V_{EE}= -3.8\text{ V}$  to  $-2.375\text{ V}$  or  $V_{CC}= 2.375\text{ V}$  to  $3.8\text{ V}$ ;  $V_{EE}= 0\text{ V}$  (Note 14)

| Symbol                 | Characteristic  | -40°C      |            |            | 25°C       |            |            | 85°C       |            |            | Unit |
|------------------------|---|------------|------------|------------|------------|------------|------------|------------|------------|------------|------|
|                        |   | Min        | Typ        | Max        | Min        | Typ        | Max        | Min        | Typ        | Max        |      |
| $f_{max}$              | Maximum Toggle Frequency<br>(See Figure 4. $F_{max}$ )      | 2.8        |            |            | 2.8        |            |            | 2.8        |            |            | GHz  |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay to Output<br>CLK to Q0, Q1, Q2<br>MR to Q | 550<br>500 | 650<br>600 | 750<br>700 | 600<br>550 | 700<br>650 | 800<br>750 | 650<br>600 | 750<br>700 | 850<br>800 | ps   |
| $t_{JITTER}$           | RMS Clock Jitter<br>(See Figure 4. $F_{max}/JITTER$ )       |            |            |            |            |            |            |            |            |            | ps   |
|                        | DIV2 $\leq 2.5\text{ GHz}$                                  |            | 0.36       | 0.4        |            | 0.30       | 0.4        |            | 0.35       | 0.6        |      |
|                        | DIV2 $\leq 3.0\text{ GHz}$                                  |            | 0.34       |            |            | 0.40       |            |            | 0.63       |            |      |
|                        | DIV4 $\leq 2.5\text{ GHz}$                                  |            | 0.26       | 0.4        |            | 0.29       | 0.5        |            | 0.33       | 0.5        |      |
|                        | DIV4 $\leq 3.0\text{ GHz}$                                  |            | 0.32       |            |            | 0.38       |            |            | 0.60       |            |      |
|                        | DIV8 $\leq 2.5\text{ GHz}$                                  |            | 0.27       | 0.4        |            | 0.30       | 0.5        |            | 0.34       | 0.5        |      |
|                        | DIV8 $\leq 3.0\text{ GHz}$                                  |            | 0.32       |            |            | 0.39       |            |            | 1.10       |            |      |
| $t_S$                  | Setup Time $\overline{EN}$                                  | 150        | 50         |            | 150        | 50         |            | 150        | 50         |            | ps   |
| $t_H$                  | Hold Time $\overline{EN}$                                   | 200        | 100        |            | 200        | 100        |            | 200        | 100        |            | ps   |
| $t_{RR}$               | Set/Reset Recovery  | 300        | 200        |            | 300        | 200        |            | 300        | 200        |            | ps   |
| $V_{PP}$               | Input Swing (Note 15)                                       | 150        |            | 1000       | 150        |            | 1000       | 150        |            | 1000       | mV   |
| $t_r$<br>$t_f$         | Output Rise/Fall Times Q<br>(20% – 80%)                     | 90         | 170        | 200        | 100        | 180        | 250        | 120        | 200        | 280        | ps   |

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.

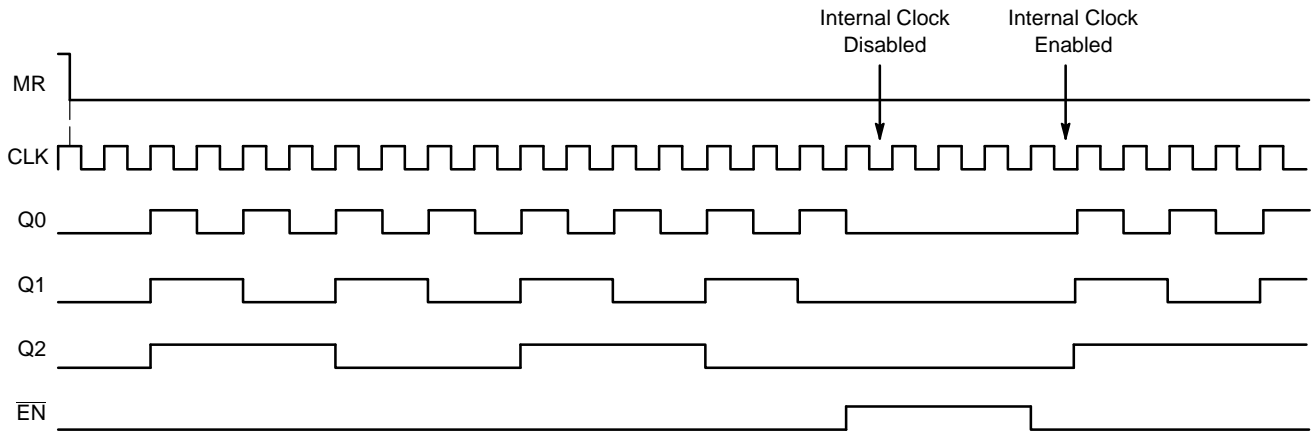
14. Measured using a 750 mV source, 50% duty cycle clock source. All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .

15.  $V_{PP(min)}$  is minimum input swing for which AC parameters guaranteed. The device has a DC gain of  $\approx 40$ .

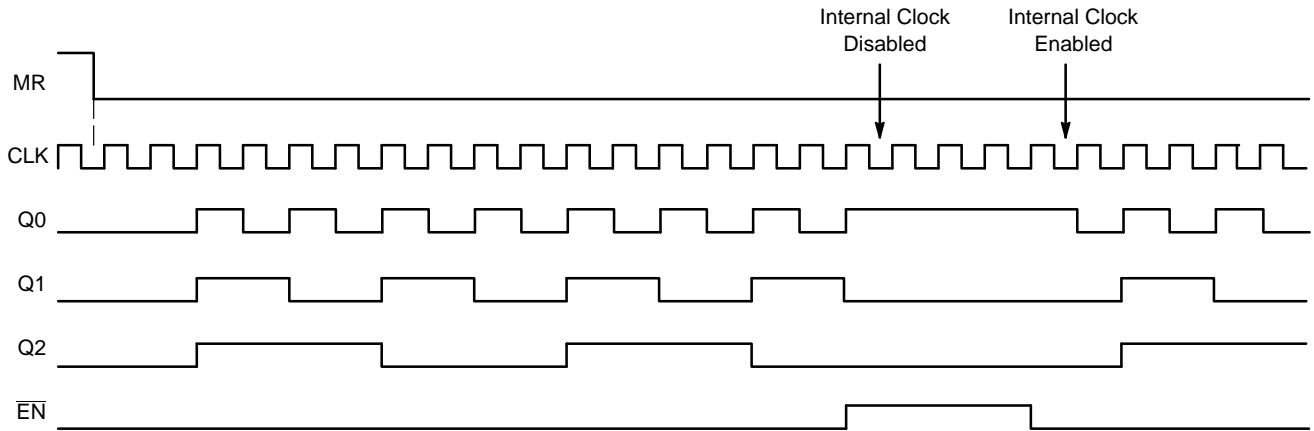
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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There are two distinct functional relationships between the Master Reset and Clock:



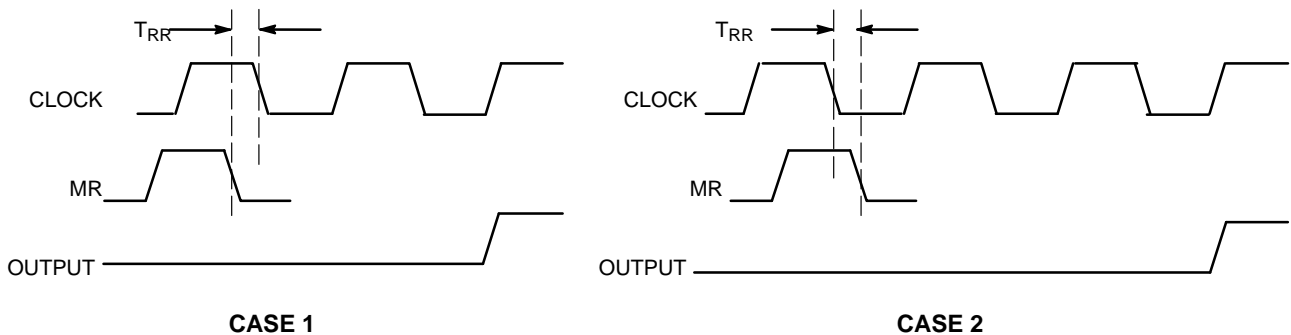
**CASE 1: If the MR is de-asserted (H-L), while the Clock is still high, the outputs will follow the second ensuing clock rising edge.**



**CASE 2: If the MR is de-asserted (H-L), after the Clock has transitioned low, the outputs will follow the third ensuing clock rising edge.**

**Figure 2. Timing Diagrams**

The  $\overline{EN}$  signal will “freeze” the internal divider flip-flops on the first falling edge of CLK after its assertion. The internal divider flip-flops will maintain their state during the freeze. When  $\overline{EN}$  is deasserted (LOW), and after the next falling edge of CLK, then the internal divider flip-flops will “unfreeze” and continue to their next state count with proper phase relationships.



**Figure 3. Reset Recovery Time**

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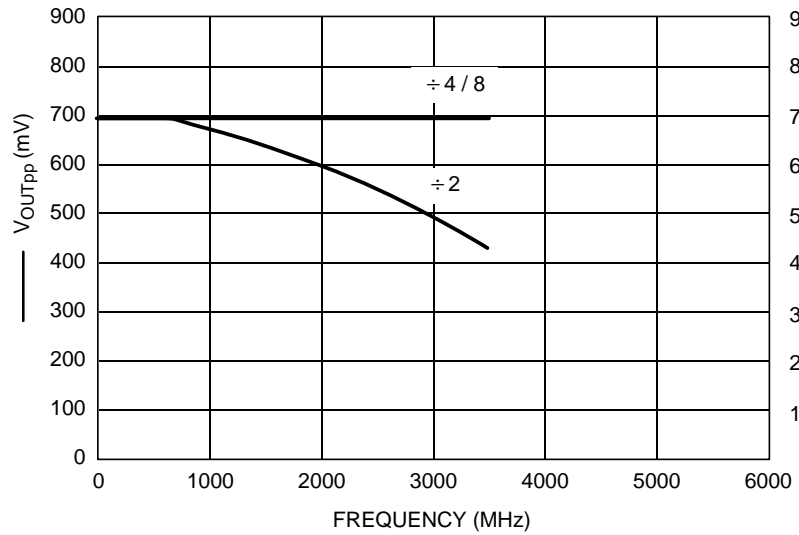


Figure 4. F<sub>max</sub>

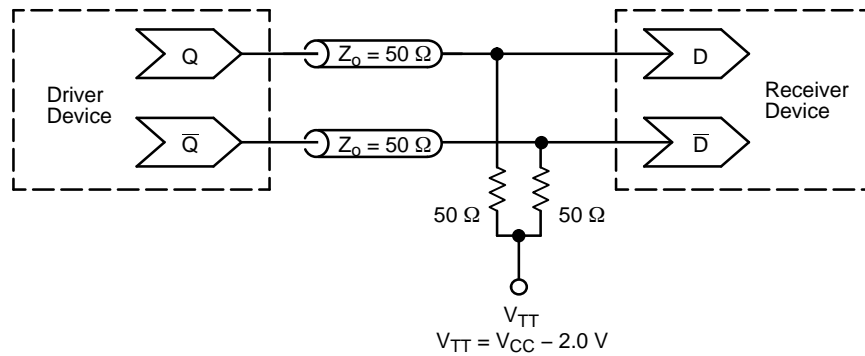


Figure 5. Typical Termination for Output Driver and Device Evaluation  
(See Application Note AND8020/D – Termination of ECL Logic Devices.)

## ORDERING INFORMATION

| Device           | Package              | Shipping <sup>†</sup> |
|------------------|----------------------|-----------------------|
| MC100LVEP34DG    | SOIC-16<br>(Pb-Free) | 48 Units / Rail       |
| MC100LVEP34DR2G  | SOIC-16<br>(Pb-Free) | 2500 / Tape & Reel    |
| MC100LVEP34DTG   | TSSOP-16*            | 96 Units / Rail       |
| MC100LVEP34DTR2G | TSSOP-16*            | 2500 / Tape & Reel    |

<sup>†</sup>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.

\*This package is inherently Pb-Free.



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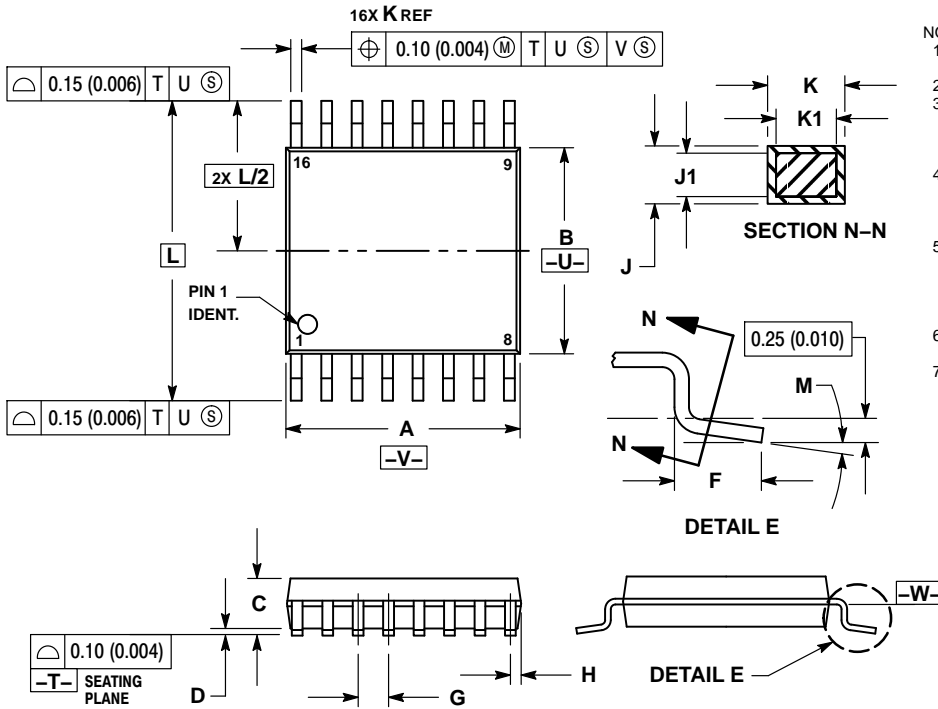
### Resource Reference of Application Notes

- AN1405/D** – ECL Clock Distribution Techniques
- AN1406/D** – Designing with PECL (ECL at +5.0 V)
- AN1503/D** – ECLinPS™ I/O SPiCE Modeling Kit
- AN1504/D** – Metastability and the ECLinPS Family
- AN1568/D** – Interfacing Between LVDS and ECL
- AN1672/D** – The ECL Translator Guide
- AND8001/D** – Odd Number Counters Design
- AND8002/D** – Marking and Date Codes
- AND8020/D** – Termination of ECL Logic Devices
- AND8066/D** – Interfacing with ECLinPS
- AND8090/D** – AC Characteristics of ECL Devices

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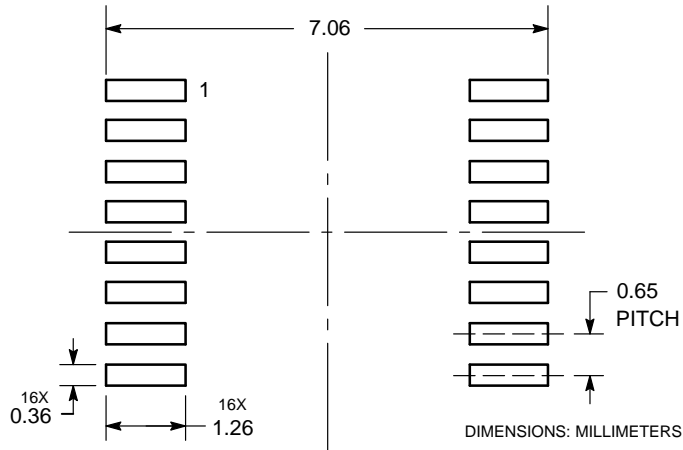
## PACKAGE DIMENSIONS

TSSOP-16  
CASE 948F-01  
ISSUE B



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: MILLIMETER.
  3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
  4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
  5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
  6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
  7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

### SOLDERING FOOTPRINT\*

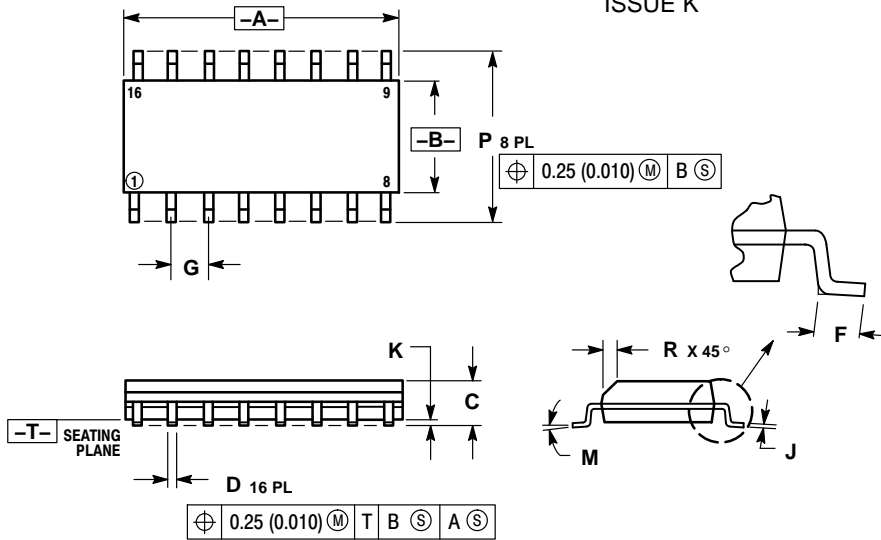


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MC100LVEP34

## PACKAGE DIMENSIONS

SOIC-16  
CASE 751B-05  
ISSUE K

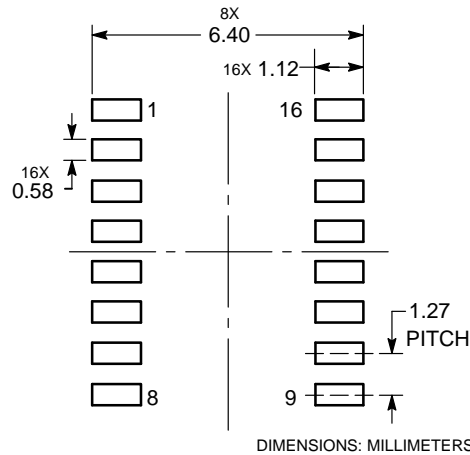


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |       | INCHES    |       |
|-----|-------------|-------|-----------|-------|
|     | MIN         | MAX   | MIN       | MAX   |
| A   | 9.80        | 10.00 | 0.386     | 0.393 |
| B   | 3.80        | 4.00  | 0.150     | 0.157 |
| C   | 1.35        | 1.75  | 0.054     | 0.068 |
| D   | 0.35        | 0.49  | 0.014     | 0.019 |
| F   | 0.40        | 1.25  | 0.016     | 0.049 |
| G   | 1.27 BSC    |       | 0.050 BSC |       |
| J   | 0.19        | 0.25  | 0.008     | 0.009 |
| K   | 0.10        | 0.25  | 0.004     | 0.009 |
| M   | 0°          | 7°    | 0°        | 7°    |
| P   | 5.80        | 6.20  | 0.229     | 0.244 |
| R   | 0.25        | 0.50  | 0.010     | 0.019 |

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