

## 3.3 V/5 V ECL ÷ 2 Divider

### MC10EP32, MC100EP32

#### Description

The MC10/100EP32 is an integrated ÷2 divider with differential CLK inputs.

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  $\mu$ F capacitor and limit current sourcing or sinking to 0.5 mA. When not used,  $V_{BB}$  should be left open.

The reset pin is asynchronous and is asserted on the rising edge. Upon power-up, the internal flip-flops will attain a random state; the reset allows for the synchronization of multiple EP32's in a system.

The 100 Series contains temperature compensation.

#### Features

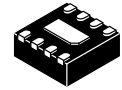
- 350 ps Typical Propagation Delay
- Maximum Frequency > 4 GHz Typical (Figure 3)
- PECL Mode Operating Range:
  - ♦  $V_{CC} = 3.0$  V to 5.5 V with  $V_{EE} = 0$  V
- NECL Mode Operating Range:
  - ♦  $V_{CC} = 0$  V with  $V_{EE} = -3.0$  V to  $-5.5$  V
- Open Input Default State
- Safety Clamp on Inputs
- Q Output Will Default LOW with Inputs Open or at  $V_{EE}$
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant



SOIC-8 NB  
D SUFFIX  
CASE 751-07

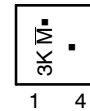
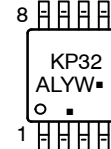
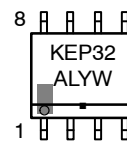
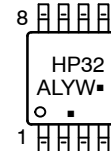
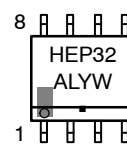


TSSOP-8  
DT SUFFIX  
CASE 948R-02



DFN-8  
MN SUFFIX  
CASE 506AA

#### MARKING DIAGRAMS\*



|    |             |   |                     |
|----|-------------|---|---------------------|
| H  | = MC10      | A | = Assembly Location |
| K  | = MC100     | L | = Wafer Lot         |
| 3K | = MC100     | Y | = Year              |
| M  | = Date Code | W | = Work Week         |
|    |             | ■ | = Pb-Free Package   |

(Note: Microdot may be in either location)

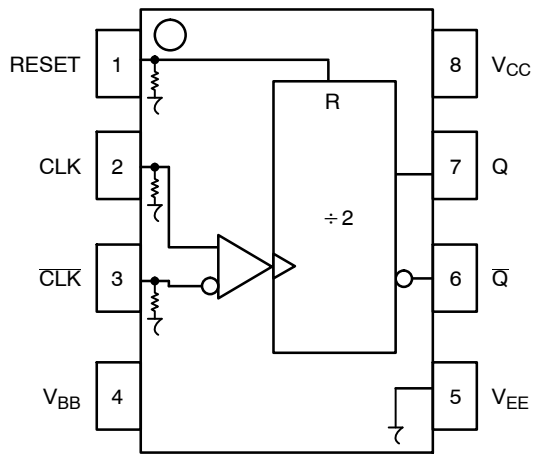
\*For additional marking information, refer to Application Note [AND8002/D](#).

#### ORDERING INFORMATION

See detailed ordering and shipping information on page 8 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 8.

# MC10EP32, MC100EP32



**Figure 1. 8-Lead Pinout (Top View) and Logic Diagram**

**Table 1. PIN DESCRIPTION**

| Pin                            | Function                                                                                                                                                                        |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CLK, $\overline{\text{CLK}}^*$ | ECL Clock Inputs                                                                                                                                                                |
| Reset*                         | ECL Asynchronous Reset                                                                                                                                                          |
| $V_{BB}$                       | Reference Voltage Output                                                                                                                                                        |
| Q, $\overline{Q}$              | ECL Data Outputs                                                                                                                                                                |
| $V_{CC}$                       | Positive Supply                                                                                                                                                                 |
| $V_{EE}$                       | Negative Supply                                                                                                                                                                 |
| EP                             | (DFN-8 only) Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open. |

\*Pins will default LOW when left open.

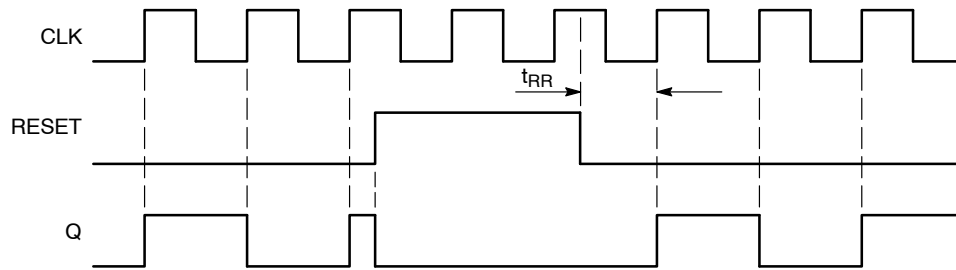
**Table 2. TRUTH TABLE**

| CLK | $\overline{\text{CLK}}$ | RESET | Q | $\overline{Q}$ |
|-----|-------------------------|-------|---|----------------|
| X   | X                       | Z     | L | H              |
| Z   | Z                       | L     | F | F              |

Z = LOW to HIGH Transition

$\overline{Z}$  = HIGH to LOW Transition

F = Divide by 2 Function



**Figure 2. Timing Diagram**

**Table 3. ATTRIBUTES**

| Characteristics                                                             | Value                         |
|-----------------------------------------------------------------------------|-------------------------------|
| Internal Input Pulldown Resistor                                            | 75 k $\Omega$                 |
| Internal Input Pullup Resistor                                              | N/A                           |
| ESD Protection<br>Human Body Model<br>Machine Model<br>Charged Device Model | > 4 kV<br>> 200 V<br>> 2 kV   |
| Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)               | Pb-Free Pkg                   |
| SOIC-8 NB<br>TSSOP-8<br>DFN-8                                               | Level 1<br>Level 3<br>Level 1 |
| Flammability Rating<br>Oxygen Index: 28 to 34                               | UL 94 V-0 @ 0.125 in          |
| Transistor Count                                                            | 78 Devices                    |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test                      |                               |

1. For additional information, see Application Note [AND8003/D](#).

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**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    |
| I <sub>out</sub> | Output Current                                     | Continuous<br>Surge                            |                                                                      | 50<br>100   | 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–8 NB                                                            | 190<br>130  | °C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | SOIC–8 NB                                                            | 41 to 44    | °C/W |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient)           | 0 lfpm<br>500 lfpm                             | TSSOP–8                                                              | 185<br>140  | °C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | Standard Board                                 | TSSOP–8                                                              | 41 to 44    | °C/W |
| θ <sub>JA</sub>  | Thermal Resistance (Junction-to-Ambient)           | 0 lfpm<br>500 lfpm                             | DFN8                                                                 | 129<br>84   | °C/W |
| θ <sub>JC</sub>  | Thermal Resistance (Junction-to-Case)              | (Note 1)                                       | DFN8                                                                 | 35 to 40    | °C/W |
| T <sub>sol</sub> | Wave Solder (Pb-Free)                              | <2 to 3 sec @ 260°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.

1. JEDEC standard multilayer board – 2S2P (2 signal, 2 power)

**Table 5. 10EP DC CHARACTERISTICS, PECL (V<sub>CC</sub> = 3.3 V, V<sub>EE</sub> = 0 V (Note 1))**

| Symbol             | Characteristic                                                             | –40°C |      |      | 25°C |      |      | 85°C |      |      | Unit |
|--------------------|----------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|------|
|                    |                                                                            | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |      |
| I <sub>EE</sub>    | Power Supply Current                                                       | 23    | 30   | 40   | 23   | 30   | 40   | 23   | 30   | 40   | mA   |
| V <sub>OH</sub>    | Output HIGH Voltage (Note 2)                                               | 2165  | 2290 | 2415 | 2230 | 2355 | 2480 | 2290 | 2415 | 2540 | mV   |
| V <sub>OL</sub>    | Output LOW Voltage (Note 2)                                                | 1365  | 1490 | 1615 | 1430 | 1555 | 1680 | 1490 | 1615 | 1740 | mV   |
| V <sub>IH</sub>    | Input HIGH Voltage (Single-Ended)                                          | 2090  |      | 2415 | 2155 |      | 2480 | 2215 |      | 2540 | mV   |
| V <sub>IL</sub>    | Input LOW Voltage (Single-Ended)                                           | 1365  |      | 1690 | 1430 |      | 1755 | 1490 |      | 1815 | mV   |
| V <sub>BB</sub>    | Output Voltage Reference                                                   | 1790  | 1890 | 1990 | 1855 | 1955 | 2055 | 1915 | 2015 | 2115 | mV   |
| V <sub>IHCMR</sub> | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3) | 2.0   |      | 3.3  | 2.0  |      | 3.3  | 2.0  |      | 3.3  | V    |
| I <sub>IH</sub>    | Input HIGH Current                                                         |       |      | 150  |      |      | 150  |      |      | 150  | μA   |
| I <sub>IL</sub>    | Input LOW Current                                                          | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | μA   |

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.

1. Input and output parameters vary 1:1 with V<sub>CC</sub>. V<sub>EE</sub> can vary +0.3 V to –2.2 V.

2. All loading with 50 Ω to V<sub>CC</sub> – 2.0 V.

3. V<sub>IHCMR</sub> min varies 1:1 with V<sub>EE</sub>. V<sub>IHCMR</sub> max varies 1:1 with V<sub>CC</sub>. The V<sub>IHCMR</sub> range is referenced to the most positive side of the differential input signal.

# MC10EP32, MC100EP32

**Table 6. 10EP DC CHARACTERISTICS, PECL** ( $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 1))

| Symbol      | Characteristic                                                             | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|----------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|---------------|
|             |                                                                            | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current                                                       | 23    | 30   | 40   | 23   | 30   | 40   | 23   | 30   | 40   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 2)                                               | 3865  | 3990 | 4115 | 3930 | 4055 | 4180 | 3990 | 4115 | 4240 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 2)                                                | 3065  | 3190 | 3315 | 3130 | 3255 | 3380 | 3190 | 3315 | 3440 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | 3790  |      | 4115 | 3855 |      | 4180 | 3915 |      | 4240 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | 3065  |      | 3390 | 3130 |      | 3455 | 3190 |      | 3515 | mV            |
| $V_{BB}$    | Output Voltage Reference                                                   | 3490  | 3590 | 3690 | 3555 | 3655 | 3755 | 3615 | 3715 | 3815 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3) | 2.0   |      | 5.0  | 2.0  |      | 5.0  | 2.0  |      | 5.0  | V             |
| $I_{IH}$    | Input HIGH Current                                                         |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

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.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +2.0 V to -0.5 V.
2. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  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. 10EP DC CHARACTERISTICS, NECL** ( $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -5.5\text{ V}$  to  $-3.0\text{ V}$  (Note 1))

| Symbol      | Characteristic                                                             | -40°C        |       |       | 25°C         |       |       | 85°C         |       |       | Unit          |
|-------------|----------------------------------------------------------------------------|--------------|-------|-------|--------------|-------|-------|--------------|-------|-------|---------------|
|             |                                                                            | Min          | Typ   | Max   | Min          | Typ   | Max   | Min          | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current                                                       | 23           | 30    | 40    | 23           | 30    | 40    | 23           | 30    | 40    | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 2)                                               | -1135        | -1010 | -885  | -1070        | -945  | -820  | -1010        | -885  | -760  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 2)                                                | -1935        | -1810 | -1685 | -1870        | -1745 | -1620 | -1810        | -1685 | -1560 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | -1210        |       | -885  | -1145        |       | -820  | -1085        |       | -760  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | -1935        |       | -1610 | -1870        |       | -1545 | -1810        |       | -1485 | mV            |
| $V_{BB}$    | Output Voltage Reference                                                   | -1510        | -1410 | -1310 | -1445        | -1345 | -1245 | -1385        | -1285 | -1185 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3) | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | V             |
| $I_{IH}$    | Input HIGH Current                                                         |              |       | 150   |              |       | 150   |              |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5          |       |       | 0.5          |       |       | 0.5          |       |       | $\mu\text{A}$ |

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.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .
2. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  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.

# MC10EP32, MC100EP32

**Table 8. 100EP DC CHARACTERISTICS, PECL** ( $V_{CC} = 3.3\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 1))

| Symbol      | Characteristic                                                             | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|----------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|---------------|
|             |                                                                            | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current                                                       | 23    | 30   | 37   | 26   | 34   | 40   | 28   | 36   | 42   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 2)                                               | 2155  | 2280 | 2405 | 2155 | 2280 | 2405 | 2155 | 2280 | 2405 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 2)                                                | 1355  | 1480 | 1605 | 1355 | 1480 | 1605 | 1355 | 1480 | 1605 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | 2075  |      | 2420 | 2075 |      | 2420 | 2075 |      | 2420 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | 1355  |      | 1675 | 1355 |      | 1675 | 1355 |      | 1675 | mV            |
| $V_{BB}$    | Output Voltage Reference                                                   | 1775  | 1875 | 1975 | 1775 | 1875 | 1975 | 1775 | 1875 | 1975 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3) | 2.0   |      | 3.3  | 2.0  |      | 3.3  | 2.0  |      | 3.3  | V             |
| $I_{IH}$    | Input HIGH Current                                                         |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

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.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +0.3 V to -2.2 V.
2. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  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 9. 100EP DC CHARACTERISTICS, PECL** ( $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$  (Note 1))

| Symbol      | Characteristic                                                             | -40°C |      |      | 25°C |      |      | 85°C |      |      | Unit          |
|-------------|----------------------------------------------------------------------------|-------|------|------|------|------|------|------|------|------|---------------|
|             |                                                                            | Min   | Typ  | Max  | Min  | Typ  | Max  | Min  | Typ  | Max  |               |
| $I_{EE}$    | Power Supply Current                                                       | 23    | 30   | 37   | 26   | 34   | 40   | 28   | 36   | 42   | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 2)                                               | 3855  | 3980 | 4105 | 3855 | 3980 | 4105 | 3855 | 3980 | 4105 | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 2)                                                | 3055  | 3180 | 3305 | 3055 | 3180 | 3305 | 3055 | 3180 | 3305 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | 3775  |      | 4120 | 3775 |      | 4120 | 3775 |      | 4120 | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | 3055  |      | 3375 | 3055 |      | 3375 | 3055 |      | 3375 | mV            |
| $V_{BB}$    | Output Voltage Reference                                                   | 3475  | 3575 | 3675 | 3475 | 3575 | 3675 | 3475 | 3575 | 3675 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3) | 2.0   |      | 5.0  | 2.0  |      | 5.0  | 2.0  |      | 5.0  | V             |
| $I_{IH}$    | Input HIGH Current                                                         |       |      | 150  |      |      | 150  |      |      | 150  | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5   |      |      | 0.5  |      |      | 0.5  |      |      | $\mu\text{A}$ |

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.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .  $V_{EE}$  can vary +2.0 V to -0.5 V.
2. All loading with 50  $\Omega$  to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  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.

# MC10EP32, MC100EP32

**Table 10. 100EP DC CHARACTERISTICS, NECL** ( $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -5.5\text{ V}$  to  $-3.0\text{ V}$  (Note 1))

| Symbol      | Characteristic                                                             | -40°C        |       |       | 25°C         |       |       | 85°C         |       |       | Unit          |
|-------------|----------------------------------------------------------------------------|--------------|-------|-------|--------------|-------|-------|--------------|-------|-------|---------------|
|             |                                                                            | Min          | Typ   | Max   | Min          | Typ   | Max   | Min          | Typ   | Max   |               |
| $I_{EE}$    | Power Supply Current                                                       | 23           | 30    | 37    | 26           | 34    | 40    | 28           | 36    | 42    | mA            |
| $V_{OH}$    | Output HIGH Voltage (Note 2)                                               | -1145        | -1020 | -895  | -1145        | -1020 | -895  | -1145        | -1020 | -895  | mV            |
| $V_{OL}$    | Output LOW Voltage (Note 2)                                                | -1945        | -1820 | -1695 | -1945        | -1820 | -1695 | -1945        | -1820 | -1695 | mV            |
| $V_{IH}$    | Input HIGH Voltage (Single-Ended)                                          | -1225        |       | -880  | -1225        |       | -880  | -1225        |       | -880  | mV            |
| $V_{IL}$    | Input LOW Voltage (Single-Ended)                                           | -1945        |       | -1625 | -1945        |       | -1625 | -1945        |       | -1625 | mV            |
| $V_{BB}$    | Output Voltage Reference                                                   | -1525        | -1425 | -1325 | -1525        | -1425 | -1325 | -1525        | -1425 | -1325 | mV            |
| $V_{IHCMR}$ | Input HIGH Voltage Common Mode Range (Differential Configuration) (Note 3) | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | $V_{EE}+2.0$ |       | 0.0   | V             |
| $I_{IH}$    | Input HIGH Current                                                         |              |       | 150   |              |       | 150   |              |       | 150   | $\mu\text{A}$ |
| $I_{IL}$    | Input LOW Current                                                          | 0.5          |       |       | 0.5          |       |       | 0.5          |       |       | $\mu\text{A}$ |

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.

1. Input and output parameters vary 1:1 with  $V_{CC}$ .
2. All loading with  $50\ \Omega$  to  $V_{CC} - 2.0\text{ V}$ .
3.  $V_{IHCMR}$  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.

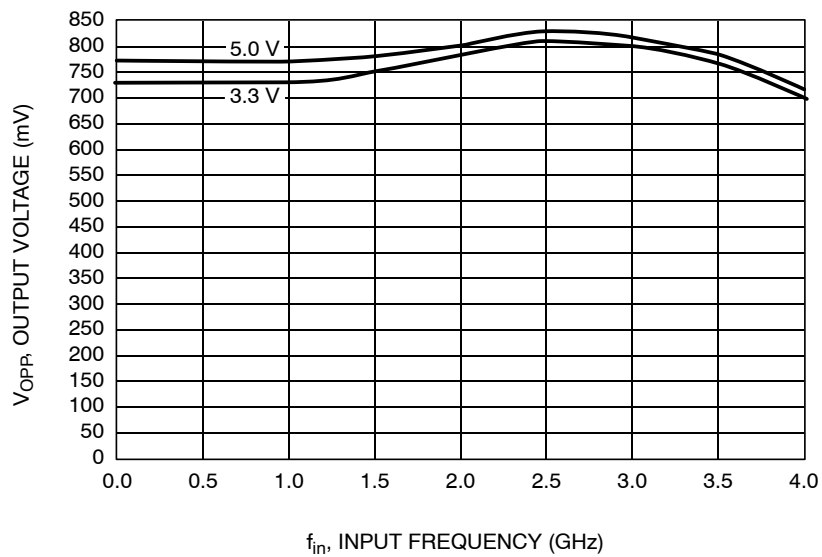
**Table 11. AC CHARACTERISTICS** ( $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -3.0\text{ V}$  to  $-5.5\text{ V}$  or  $V_{CC} = 3.0\text{ V}$  to  $5.5\text{ V}$ ;  $V_{EE} = 0\text{ V}$  (Note 1))

| Symbol                   | Characteristic                                                                                                                               | -40°C             |                   |                   | 25°C              |                   |                   | 85°C              |                   |                   | Unit |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
|                          |                                                                                                                                              | Min               | Typ               | Max               | Min               | Typ               | Max               | Min               | Typ               | Max               |      |
| $V_{OPP}$                | Output Voltage Amplitude (See Figure 3)<br>$f_{in} < 3.5\text{ GHz}$<br>$f_{in} @ 4.0\text{ GHz}$                                            | 640               | 700<br>740        |                   | 630               | 700<br>710        |                   | 500               | 700<br>600        |                   | mV   |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Propagation Delay to Output Differential<br>CLK to Q, $\bar{Q}$<br>10 Series<br>RESET to Q, $\bar{Q}$<br>100 Series<br>RESET to Q, $\bar{Q}$ | 250<br>220<br>320 | 330<br>290<br>400 | 420<br>390<br>480 | 270<br>250<br>320 | 350<br>300<br>400 | 450<br>390<br>480 | 320<br>320<br>375 | 400<br>380<br>450 | 480<br>460<br>525 | ps   |
| $t_{RR}$                 | Set/Reset Recovery                                                                                                                           | 200               | 175               |                   | 200               | 175               |                   | 200               | 175               |                   | ps   |
| $t_{PW}$                 | Minimum Pulse width<br>RESET                                                                                                                 | 550               | 475               |                   | 550               | 475               |                   | 550               | 475               |                   | ps   |
| $t_{JITTER}$             | CLOCK Random Jitter (RMS)<br>$f_{in} < 3.5\text{ GHz}$<br>$f_{in} @ \leq 4.0\text{ GHz}$                                                     |                   | 0.5<br>0.5        | 1.5               |                   | 0.5<br>0.5        | 1.5               |                   | 0.5<br>0.5        | 1.5               | ps   |
| $V_{PP}$                 | Input Voltage Swing<br>(Differential Configuration)                                                                                          | 150               | 800               | 1200              | 150               | 800               | 1200              | 150               | 800               | 1200              | mV   |
| $t_r$ ,<br>$t_f$         | Output Rise/Fall Times<br>Q, $\bar{Q}$ (20% – 80%)                                                                                           | 50                | 100               | 150               | 70                | 120               | 170               | 70                | 130               | 200               | ps   |

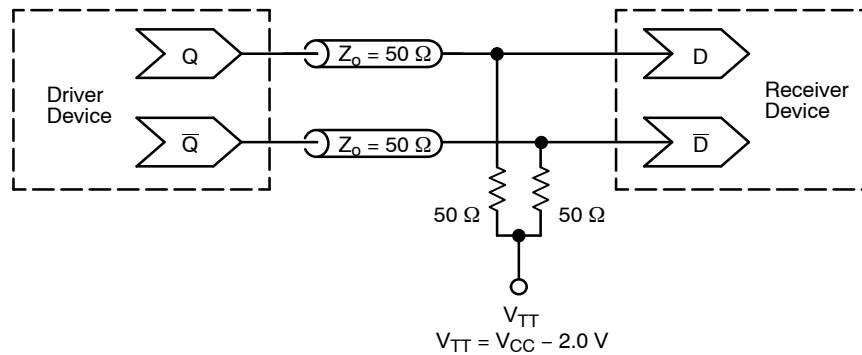
NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm.

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

## MC10EP32, MC100EP32



**Figure 3. Input Frequency ( $f_{in}$ ) Versus Typical Output Voltage ( $V_{OPP}$ )**



**Figure 4. Typical Termination for Output Driver and Device Evaluation**  
(See Application Note [AND8020/D](#) – Termination of ECL Logic Devices.)

# MC10EP32, MC100EP32

## ORDERING INFORMATION

| Device         | Package                | Shipping <sup>†</sup> |
|----------------|------------------------|-----------------------|
| MC10EP32DR2G   | SOIC-8 NB<br>(Pb-Free) | 2500 / Tape & Reel    |
| MC10EP32DTG    | TSSOP-8<br>(Pb-Free)   | 100 Units / Tube      |
| MC10EP32DTR2G  | TSSOP-8<br>(Pb-Free)   | 2500 / Tape & Reel    |
| MC100EP32DG    | SOIC-8 NB<br>(Pb-Free) | 98 Units / Tube       |
| MC100EP32DR2G  | SOIC-8 NB<br>(Pb-Free) | 2500 / Tape & Reel    |
| MC100EP32DTG   | TSSOP-8<br>(Pb-Free)   | 100 Units / Tube      |
| MC100EP32DTR2G | TSSOP-8<br>(Pb-Free)   | 2500 / Tape & Reel    |
| MC100EP32MNR4G | DFN-8<br>(Pb-Free)     | 1000 / Tape & Reel    |

## DISCONTINUED (Note 2)

|            |                        |                 |
|------------|------------------------|-----------------|
| MC10EP32DG | SOIC-8 NB<br>(Pb-Free) | 98 Units / Tube |
|------------|------------------------|-----------------|

<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](#).

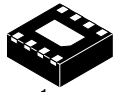
2. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).

## 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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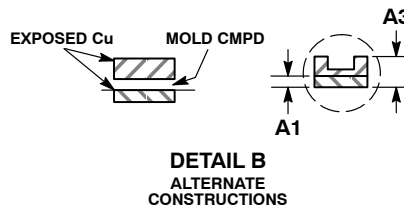
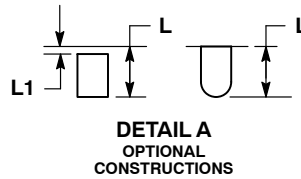
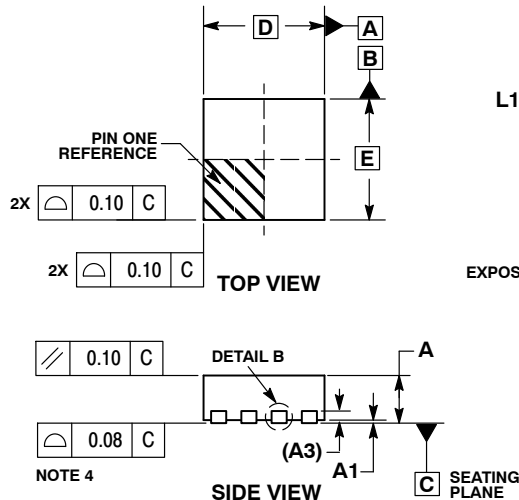




SCALE 4:1

### DFN8 2x2, 0.5P CASE 506AA ISSUE F

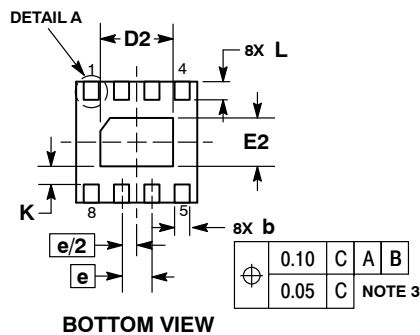
DATE 04 MAY 2016



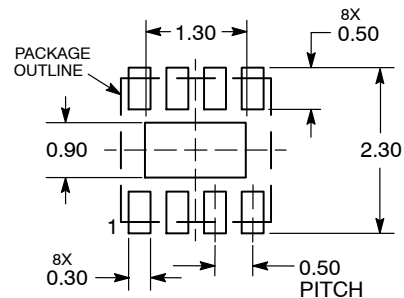
#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 MM FROM TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| MILLIMETERS |      |      |
|-------------|------|------|
| DIM         | MIN  | MAX  |
| A           | 0.80 | 1.00 |
| A1          | 0.00 | 0.05 |
| A3          | 0.20 | REF  |
| b           | 0.20 | 0.30 |
| D           | 2.00 | BSC  |
| D2          | 1.10 | 1.30 |
| E           | 2.00 | BSC  |
| E2          | 0.70 | 0.90 |
| e           | 0.50 | BSC  |
| K           | 0.30 | REF  |
| L           | 0.25 | 0.35 |
| L1          |      | 0.10 |



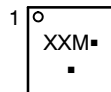
### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

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

### GENERIC MARKING DIAGRAM\*

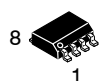


XX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Device

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                         |                                   |                                                                                                                                                                                  |
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| <b>DESCRIPTION:</b>     | <b>DFN8, 2.0X2.0, 0.5MM PITCH</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

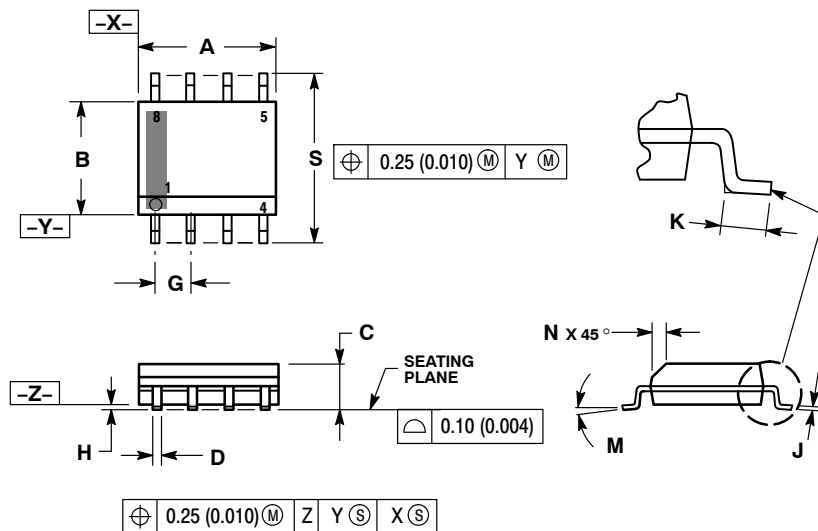
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SCALE 1:1

SOIC-8 NB  
CASE 751-07  
ISSUE AK

DATE 16 FEB 2011

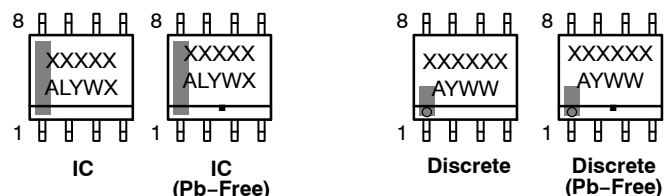
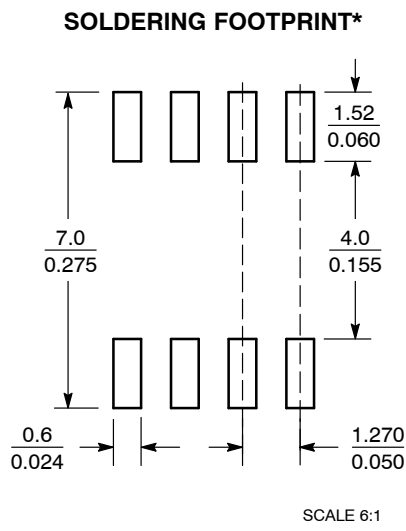


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION 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.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.197 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.053     | 0.069 |
| D   | 0.33        | 0.51 | 0.013     | 0.020 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 0.10        | 0.25 | 0.004     | 0.010 |
| J   | 0.19        | 0.25 | 0.007     | 0.010 |
| K   | 0.40        | 1.27 | 0.016     | 0.050 |
| M   | 0°          | 8°   | 0°        | 8°    |
| N   | 0.25        | 0.50 | 0.010     | 0.020 |
| S   | 5.80        | 6.20 | 0.228     | 0.244 |

GENERIC  
MARKING DIAGRAM\*



XXXXXX = Specific Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
▪ = Pb-Free Package

XXXXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

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

STYLES ON PAGE 2

|                  |             |                                                                                                                                                                                     |
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| DESCRIPTION:     | SOIC-8 NB   | PAGE 1 OF 2                                                                                                                                                                         |

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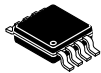
**SOIC-8 NB**  
**CASE 751-07**  
**ISSUE AK**

DATE 16 FEB 2011

|                                                                                                                                                                                                   |                                                                                                                                                                                          |                                                                                                                                                                                    |                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STYLE 1:</b><br>PIN 1. EMITTER<br>2. COLLECTOR<br>3. COLLECTOR<br>4. EMITTER<br>5. EMITTER<br>6. BASE<br>7. BASE<br>8. EMITTER                                                                 | <b>STYLE 2:</b><br>PIN 1. COLLECTOR, DIE, #1<br>2. COLLECTOR, #1<br>3. COLLECTOR, #2<br>4. COLLECTOR, #2<br>5. BASE, #2<br>6. EMITTER, #2<br>7. BASE, #1<br>8. EMITTER, #1               | <b>STYLE 3:</b><br>PIN 1. DRAIN, DIE #1<br>2. DRAIN, #1<br>3. DRAIN, #2<br>4. DRAIN, #2<br>5. GATE, #2<br>6. SOURCE, #2<br>7. GATE, #1<br>8. SOURCE, #1                            | <b>STYLE 4:</b><br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE<br>4. ANODE<br>5. ANODE<br>6. ANODE<br>7. ANODE<br>8. COMMON CATHODE                                                                           |
| <b>STYLE 5:</b><br>PIN 1. DRAIN<br>2. DRAIN<br>3. DRAIN<br>4. DRAIN<br>5. GATE<br>6. GATE<br>7. SOURCE<br>8. SOURCE                                                                               | <b>STYLE 6:</b><br>PIN 1. SOURCE<br>2. DRAIN<br>3. DRAIN<br>4. SOURCE<br>5. SOURCE<br>6. GATE<br>7. GATE<br>8. SOURCE                                                                    | <b>STYLE 7:</b><br>PIN 1. INPUT<br>2. EXTERNAL BYPASS<br>3. THIRD STAGE SOURCE<br>4. GROUND<br>5. DRAIN<br>6. GATE 3<br>7. SECOND STAGE Vd<br>8. FIRST STAGE Vd                    | <b>STYLE 8:</b><br>PIN 1. COLLECTOR, DIE #1<br>2. BASE, #1<br>3. BASE, #2<br>4. COLLECTOR, #2<br>5. COLLECTOR, #2<br>6. EMITTER, #2<br>7. EMITTER, #1<br>8. COLLECTOR, #1                              |
| <b>STYLE 9:</b><br>PIN 1. EMITTER, COMMON<br>2. COLLECTOR, DIE #1<br>3. COLLECTOR, DIE #2<br>4. EMITTER, COMMON<br>5. EMITTER, COMMON<br>6. BASE, DIE #2<br>7. BASE, DIE #1<br>8. EMITTER, COMMON | <b>STYLE 10:</b><br>PIN 1. GROUND<br>2. BIAS 1<br>3. OUTPUT<br>4. GROUND<br>5. GROUND<br>6. BIAS 2<br>7. INPUT<br>8. GROUND                                                              | <b>STYLE 11:</b><br>PIN 1. SOURCE 1<br>2. GATE 1<br>3. SOURCE 2<br>4. GATE 2<br>5. DRAIN 2<br>6. DRAIN 2<br>7. DRAIN 1<br>8. DRAIN 1                                               | <b>STYLE 12:</b><br>PIN 1. SOURCE<br>2. SOURCE<br>3. SOURCE<br>4. GATE<br>5. DRAIN<br>6. DRAIN<br>7. DRAIN<br>8. DRAIN                                                                                 |
| <b>STYLE 13:</b><br>PIN 1. N.C.<br>2. SOURCE<br>3. SOURCE<br>4. GATE<br>5. DRAIN<br>6. DRAIN<br>7. DRAIN<br>8. DRAIN                                                                              | <b>STYLE 14:</b><br>PIN 1. N-SOURCE<br>2. N-GATE<br>3. P-SOURCE<br>4. P-GATE<br>5. P-DRAIN<br>6. P-DRAIN<br>7. N-DRAIN<br>8. N-DRAIN                                                     | <b>STYLE 15:</b><br>PIN 1. ANODE 1<br>2. ANODE 1<br>3. ANODE 1<br>4. ANODE 1<br>5. CATHODE, COMMON<br>6. CATHODE, COMMON<br>7. CATHODE, COMMON<br>8. CATHODE, COMMON               | <b>STYLE 16:</b><br>PIN 1. EMITTER, DIE #1<br>2. BASE, DIE #1<br>3. EMITTER, DIE #2<br>4. BASE, DIE #2<br>5. COLLECTOR, DIE #2<br>6. COLLECTOR, DIE #2<br>7. COLLECTOR, DIE #1<br>8. COLLECTOR, DIE #1 |
| <b>STYLE 17:</b><br>PIN 1. VCC<br>2. V2OUT<br>3. V1OUT<br>4. TXE<br>5. RXE<br>6. VEE<br>7. GND<br>8. ACC                                                                                          | <b>STYLE 18:</b><br>PIN 1. ANODE<br>2. ANODE<br>3. SOURCE<br>4. GATE<br>5. DRAIN<br>6. DRAIN<br>7. CATHODE<br>8. CATHODE                                                                 | <b>STYLE 19:</b><br>PIN 1. SOURCE 1<br>2. GATE 1<br>3. SOURCE 2<br>4. GATE 2<br>5. DRAIN 2<br>6. MIRROR 2<br>7. DRAIN 1<br>8. MIRROR 1                                             | <b>STYLE 20:</b><br>PIN 1. SOURCE (N)<br>2. GATE (N)<br>3. SOURCE (P)<br>4. GATE (P)<br>5. DRAIN<br>6. DRAIN<br>7. DRAIN<br>8. DRAIN                                                                   |
| <b>STYLE 21:</b><br>PIN 1. CATHODE 1<br>2. CATHODE 2<br>3. CATHODE 3<br>4. CATHODE 4<br>5. CATHODE 5<br>6. COMMON ANODE<br>7. COMMON ANODE<br>8. CATHODE 6                                        | <b>STYLE 22:</b><br>PIN 1. I/O LINE 1<br>2. COMMON CATHODE/VCC<br>3. COMMON CATHODE/VCC<br>4. I/O LINE 3<br>5. COMMON ANODE/GND<br>6. I/O LINE 4<br>7. I/O LINE 5<br>8. COMMON ANODE/GND | <b>STYLE 23:</b><br>PIN 1. LINE 1 IN<br>2. COMMON ANODE/GND<br>3. COMMON ANODE/GND<br>4. LINE 2 IN<br>5. LINE 2 OUT<br>6. COMMON ANODE/GND<br>7. COMMON ANODE/GND<br>8. LINE 1 OUT | <b>STYLE 24:</b><br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR/ANODE<br>4. COLLECTOR/ANODE<br>5. CATHODE<br>6. CATHODE<br>7. COLLECTOR/ANODE<br>8. COLLECTOR/ANODE                                      |
| <b>STYLE 25:</b><br>PIN 1. VIN<br>2. N/C<br>3. REXT<br>4. GND<br>5. IOUT<br>6. IOUT<br>7. IOUT<br>8. IOUT                                                                                         | <b>STYLE 26:</b><br>PIN 1. GND<br>2. dv/dt<br>3. ENABLE<br>4. ILIMIT<br>5. SOURCE<br>6. SOURCE<br>7. SOURCE<br>8. VCC                                                                    | <b>STYLE 27:</b><br>PIN 1. ILIMIT<br>2. OVLO<br>3. UVLO<br>4. INPUT+<br>5. SOURCE<br>6. SOURCE<br>7. SOURCE<br>8. DRAIN                                                            | <b>STYLE 28:</b><br>PIN 1. SW_TO_GND<br>2. DASIC_OFF<br>3. DASIC_SW_DET<br>4. GND<br>5. V_MON<br>6. VBULK<br>7. VBULK<br>8. VIN                                                                        |
| <b>STYLE 29:</b><br>PIN 1. BASE, DIE #1<br>2. EMITTER, #1<br>3. BASE, #2<br>4. EMITTER, #2<br>5. COLLECTOR, #2<br>6. COLLECTOR, #2<br>7. COLLECTOR, #1<br>8. COLLECTOR, #1                        | <b>STYLE 30:</b><br>PIN 1. DRAIN 1<br>2. DRAIN 1<br>3. GATE 2<br>4. SOURCE 2<br>5. SOURCE 1/DRAIN 2<br>6. SOURCE 1/DRAIN 2<br>7. SOURCE 1/DRAIN 2<br>8. GATE 1                           |                                                                                                                                                                                    |                                                                                                                                                                                                        |

|                         |                    |                                                                                                                                                                                     |
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| <b>DESCRIPTION:</b>     | <b>SOIC-8 NB</b>   | <b>PAGE 2 OF 2</b>                                                                                                                                                                  |

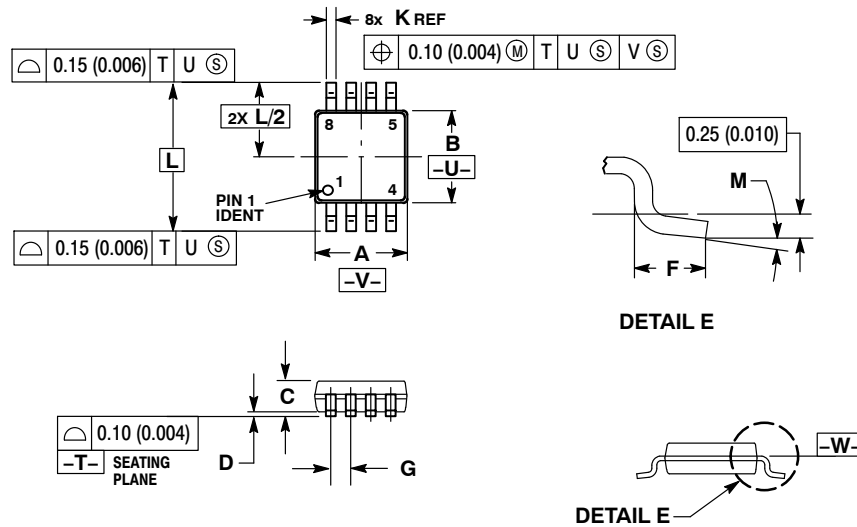
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SCALE 2:1

**TSSOP-8 3.00x3.00x0.95**  
CASE 948R-02  
ISSUE A

DATE 07 APR 2000



## 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. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 2.90        | 3.10 | 0.114     | 0.122 |
| B   | 2.90        | 3.10 | 0.114     | 0.122 |
| C   | 0.80        | 1.10 | 0.031     | 0.043 |
| D   | 0.05        | 0.15 | 0.002     | 0.006 |
| F   | 0.40        | 0.70 | 0.016     | 0.028 |
| G   | 0.65 BSC    |      | 0.026 BSC |       |
| K   | 0.25        | 0.40 | 0.010     | 0.016 |
| L   | 4.90 BSC    |      | 0.193 BSC |       |
| M   | 0°          | 6°   | 0°        | 6°    |

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