

# ANTREX Electronics

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## Product Reference Information

**Part Number:** MPC9109AC  
**Manufacturer:** NXP USA Inc.  
**Package:** 32-LQFP  
**Availability:** Please confirm with sales

### Product Page:

<https://antrexco.com/product/details/nxp-usa-inc/mpc9109ac.html>

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### Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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## Low Voltage 1:18 Clock Distribution Chip

The MPC9109 is a 1:18 low voltage clock distribution chip with 2.5 V or 3.3 V LVCMOS output capabilities. The device features the capability to select either a differential LVPECL or an LVCMOS compatible input. The 18 outputs are 2.5 V or 3.3 V LVCMOS compatible and feature the drive strength to drive 50  $\Omega$  series or parallel terminated transmission lines. With output-to-output skews of 200 ps, the MPC9109 is ideal as a clock distribution chip for the most demanding of synchronous systems. The 2.5 V outputs also make the device ideal for supplying clocks for a high performance Pentium II™ microprocessor based design. For a higher performance version of the 9109 refer to the MPC940L data sheet.

### Features

- LVPECL or LVCMOS clock input
- 2.5 V LVCMOS outputs for Pentium II microprocessor support
- 200 ps maximum output-to-output skew @ 3.3 V output
- Maximum output frequency of 250 MHz @ 3.3 V core
- 32-lead QFP packaging
- Dual or single supply device:
  - Dual  $V_{CC}$  supply voltage, 3.3 V core and 2.5 V output
  - Single 3.3 V  $V_{CC}$  supply voltage for 3.3 V outputs
  - Single 2.5 V  $V_{CC}$  supply voltage for 2.5 V I/O

### Functional Description

With a low output impedance ( $\approx 20 \Omega$ ), in both the HIGH and LOW logic states, the output buffers of the MPC9109 are ideal for driving series terminated transmission lines. With a 20  $\Omega$  output impedance the 9109 has the capability of driving two series terminated lines from each output. This gives the device an effective fanout of 1:36. If a lower output impedance is desired please see the MPC942 data sheet. If better performance is desired please see the MPC940L data sheet.

The differential LVPECL inputs of the MPC9109 allow the device to interface directly with a LVPECL fanout buffer like the MC100EP111 to build very wide clock fanout trees or to couple to a high frequency clock source. The LVCMOS input provides a more standard interface for applications requiring only a single clock distribution chip at relatively low frequencies. In addition, the two clock sources can be used to provide for a test clock interface as well as the primary system clock. A logic HIGH on the LVCMOS\_CLK\_Sel pin will select the LVCMOS level clock input. All inputs of the MPC9109 have internal pullup/pulldown resistor so they can be left open if unused.

The MPC9109 is a single or dual supply device. The device power supply offers a high degree of flexibility. The device can operate with a 3.3 V core and 3.3 V output, a 3.3 V core and 2.5 V outputs as well as a 2.5 V core and 2.5 V outputs. The 32-lead QFP package was chosen to optimize performance, board space and cost of the device. The 32-lead TQFP has a 7x7mm body size with a conservative 0.8 mm pin spacing.

**MPC9109**

**LOW VOLTAGE  
1:18 CLOCK  
DISTRIBUTION CHIP**



**FA SUFFIX  
32-LEAD LQFP PACKAGE  
CASE 873A-04**

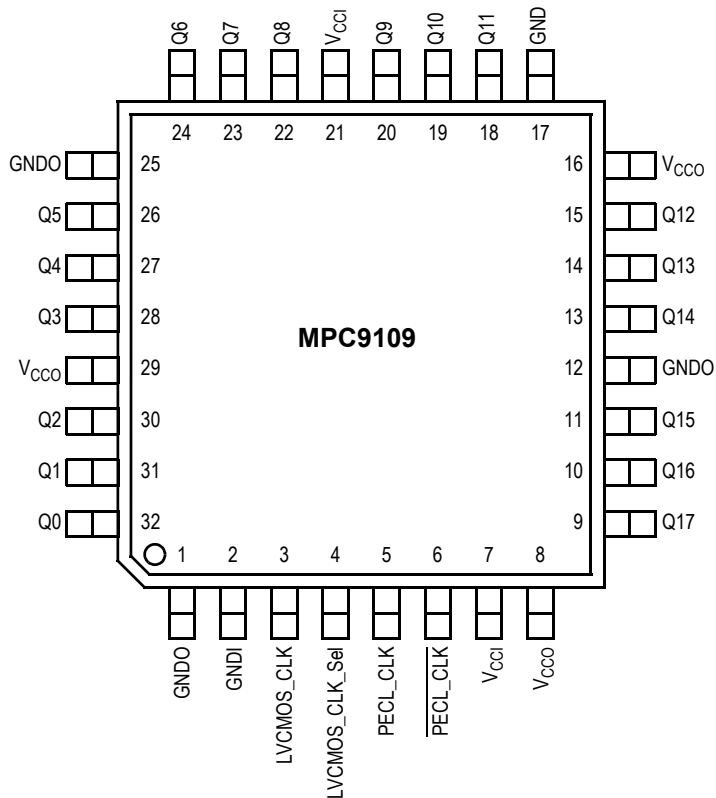


**AC SUFFIX  
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**Figure 1. Logic Diagram**



**Figure 2. Pinout: 32-Lead TQFP (Top View)**

**Table 1. Function Table**

| LVC MOS CLK_Sel | Input       |
|-----------------|-------------|
| 0               | PECL_CLK    |
| 1               | LVC MOS_CLK |

**Table 2. Power Supply Voltages**

| Supply Pin       | Voltage Level       |
|------------------|---------------------|
| V <sub>CCI</sub> | 2.5 V or 3.3 V ± 5% |
| V <sub>CCO</sub> | 2.5 V or 3.3 V ± 5% |

**Table 3. Absolute Maximum Ratings<sup>(1)</sup>**

| Symbol            | Parameter                 | Min  | Max                   | Unit |
|-------------------|---------------------------|------|-----------------------|------|
| V <sub>CC</sub>   | Supply Voltage            | −0.3 | 3.6                   | V    |
| V <sub>I</sub>    | Input Voltage             | −0.3 | V <sub>CC</sub> + 0.3 | V    |
| I <sub>IN</sub>   | Input Current             |      | ±20                   | mA   |
| T <sub>Stor</sub> | Storage Temperature Range | −40  | 125                   | °C   |

1. Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied.

**Table 4. DC Characteristics** (T<sub>A</sub> = 0° to 70°C, V<sub>CCI</sub> = 3.3 V ± 5%; V<sub>CCO</sub> = 3.3 V ± 5%)

| Symbol           | Characteristic                      | Min                  | Typ | Max                  | Unit | Condition                |
|------------------|-------------------------------------|----------------------|-----|----------------------|------|--------------------------|
| V <sub>IH</sub>  | Input HIGH Voltage CMOS_CLK         | 2.4                  |     | V <sub>CCI</sub>     | V    |                          |
| V <sub>IL</sub>  | Input LOW Voltage CMOS_CLK          |                      |     | 0.8                  | V    |                          |
| V <sub>PP</sub>  | Peak-to-Peak Input Voltage PECL_CLK | 500                  |     | 1000                 | mV   |                          |
| V <sub>CMR</sub> | Common Mode Range PECL_CLK          | V <sub>CC</sub> −1.4 |     | V <sub>CC</sub> −0.6 | V    |                          |
| V <sub>OH</sub>  | Output HIGH Voltage                 | 2.4                  |     |                      | V    | I <sub>OH</sub> = −20 mA |
| V <sub>OL</sub>  | Output LOW Voltage                  |                      |     | 0.5                  | V    | I <sub>OH</sub> = 20 mA  |
| I <sub>IN</sub>  | Input Current                       |                      |     | ±200                 | μA   |                          |
| C <sub>IN</sub>  | Input Capacitance                   |                      | 4.0 |                      | pF   |                          |
| C <sub>pd</sub>  | Power Dissipation Capacitance       |                      | 10  |                      | pF   | Per output               |
| Z <sub>OUT</sub> | Output Impedance                    | 18                   | 23  | 28                   | Ω    |                          |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current    |                      | 0.5 |                      | mA   |                          |

**Table 5. AC Characteristics** (T<sub>A</sub> = 0° to 70°C, V<sub>CCI</sub> = 3.3 V ± 5%; V<sub>CCO</sub> = 3.3 V ± 5%)

| Symbol                          | Characteristic                             | Min        | Typ        | Max        | Unit | Condition           |
|---------------------------------|--------------------------------------------|------------|------------|------------|------|---------------------|
| F <sub>max</sub>                | Maximum Input Frequency                    |            |            | 250        | MHz  |                     |
| t <sub>PLH</sub>                | Propagation Delay PECL_CLK<br>CMOS_CLK     | 1.8<br>1.6 | 2.8<br>2.5 | 3.8<br>3.3 | ns   | Note <sup>(1)</sup> |
| t <sub>sk(o)</sub>              | Output-to-Output Skew PECL_CLK<br>CMOS_CLK |            |            | 200<br>200 | ps   | Note <sup>(1)</sup> |
| t <sub>sk(pr)</sub>             | Part-to-Part Skew PECL_CLK<br>CMOS_CLK     |            |            | 2.0<br>1.7 | ns   | Note <sup>(1)</sup> |
| d <sub>t</sub>                  | Duty Cycle                                 | 45         |            | 55         | %    | Note <sup>(1)</sup> |
| t <sub>r</sub> , t <sub>f</sub> | Output Rise/Fall Time                      | 0.1        |            | 1.3        | ns   | Note <sup>(1)</sup> |

1. Guaranteed by statistical analysis, not 100% tested in production.

**Table 6. Absolute Maximum Ratings<sup>(1)</sup>**

| Symbol            | Parameter                 | Min  | Max                   | Unit |
|-------------------|---------------------------|------|-----------------------|------|
| V <sub>CC</sub>   | Supply Voltage            | −0.3 | 3.6                   | V    |
| V <sub>I</sub>    | Input Voltage             | −0.3 | V <sub>CC</sub> + 0.3 | V    |
| I <sub>IN</sub>   | Input Current             |      | ±20                   | mA   |
| T <sub>Stor</sub> | Storage Temperature Range | −40  | 125                   | °C   |

1. Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied.

**Table 7. DC Characteristics** (T<sub>A</sub> = 0° to 70°C, V<sub>CCI</sub> = 3.3 V ± 5%; V<sub>CCO</sub> = 2.5 V ± 5%)

| Symbol           | Characteristic                      | Min                  | Typ | Max                  | Unit | Condition                |
|------------------|-------------------------------------|----------------------|-----|----------------------|------|--------------------------|
| V <sub>IH</sub>  | Input HIGH Voltage CMOS_CLK         | 2.4                  |     | V <sub>CCI</sub>     | V    |                          |
| V <sub>IL</sub>  | Input LOW Voltage CMOS_CLK          |                      |     | 0.8                  | V    |                          |
| V <sub>PP</sub>  | Peak-to-Peak Input Voltage PECL_CLK | 500                  |     | 1000                 | mV   |                          |
| V <sub>CMR</sub> | Common Mode Range PECL_CLK          | V <sub>CC</sub> −1.4 |     | V <sub>CC</sub> −0.6 | V    |                          |
| V <sub>OH</sub>  | Output HIGH Voltage                 | 1.8                  |     |                      | V    | I <sub>OH</sub> = −20 mA |
| V <sub>OL</sub>  | Output LOW Voltage                  |                      |     | 0.5                  | V    | I <sub>OH</sub> = 20 mA  |
| I <sub>IN</sub>  | Input Current                       |                      |     | ±200                 | μA   |                          |
| C <sub>IN</sub>  | Input Capacitance                   |                      | 4.0 |                      | pF   |                          |
| C <sub>pd</sub>  | Power Dissipation Capacitance       |                      | 10  |                      | pF   | Per output               |
| Z <sub>OUT</sub> | Output Impedance                    |                      | 23  |                      | Ω    |                          |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current    |                      | 0.5 |                      | mA   |                          |

**Table 8. AC Characteristics** (T<sub>A</sub> = 0° to 70°C, V<sub>CCI</sub> = 3.3 V ± 5%; V<sub>CCO</sub> = 2.5 V ± 5%)

| Symbol                          | Characteristic                             | Min        | Typ        | Max        | Unit | Condition           |
|---------------------------------|--------------------------------------------|------------|------------|------------|------|---------------------|
| F <sub>max</sub>                | Maximum Input Frequency                    |            |            | 250        | MHz  |                     |
| t <sub>PLH</sub>                | Propagation Delay PECL_CLK<br>CMOS_CLK     | 1.8<br>1.6 | 2.8<br>2.5 | 3.9<br>3.4 | ns   | Note <sup>(1)</sup> |
| t <sub>sk(o)</sub>              | Output-to-Output Skew PECL_CLK<br>CMOS_CLK |            |            | 250<br>250 | ps   | Note <sup>(1)</sup> |
| t <sub>sk(pr)</sub>             | Part-to-Part Skew PECL_CLK<br>CMOS_CLK     |            |            | 2.1<br>1.8 | ns   | Note <sup>(1)</sup> |
| d <sub>t</sub>                  | Duty Cycle                                 | 45         |            | 55         | %    | Note <sup>(1)</sup> |
| t <sub>r</sub> , t <sub>f</sub> | Output Rise/Fall Time                      | 0.1        |            | 1.3        | ns   | Note <sup>(1)</sup> |

1. Guaranteed by statistical analysis, not 100% tested in production.

**Table 9. Absolute Maximum Ratings<sup>(1)</sup>**

| Symbol            | Parameter                 | Min  | Max                   | Unit |
|-------------------|---------------------------|------|-----------------------|------|
| V <sub>CC</sub>   | Supply Voltage            | −0.3 | 3.6                   | V    |
| V <sub>I</sub>    | Input Voltage             | −0.3 | V <sub>CC</sub> + 0.3 | V    |
| I <sub>IN</sub>   | Input Current             |      | ±20                   | mA   |
| T <sub>Stor</sub> | Storage Temperature Range | −40  | 125                   | °C   |

1. Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute-maximum-rated conditions is not implied.

**Table 10. DC Characteristics** (T<sub>A</sub> = 0° to 70°C, V<sub>CCI</sub> = 2.5 V ± 5%; V<sub>CCO</sub> = 2.5 V ± 5%)

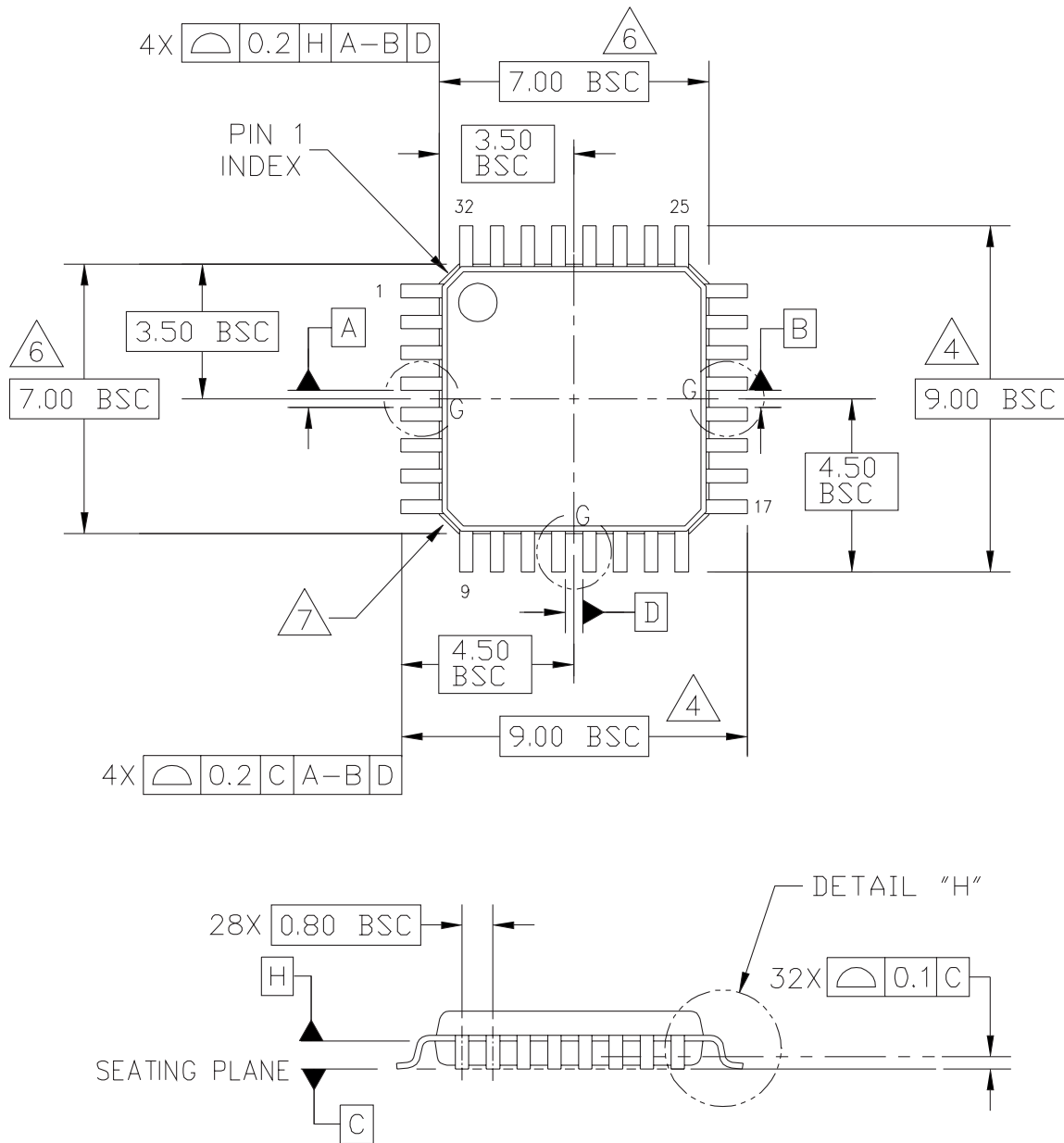
| Symbol           | Characteristic                      | Min                  | Typ | Max                  | Unit | Condition                |
|------------------|-------------------------------------|----------------------|-----|----------------------|------|--------------------------|
| V <sub>IH</sub>  | Input HIGH Voltage CMOS_CLK         | 2.0                  |     | V <sub>CCI</sub>     | V    |                          |
| V <sub>IL</sub>  | Input LOW Voltage CMOS_CLK          |                      |     | 0.8                  | V    |                          |
| V <sub>PP</sub>  | Peak-to-Peak Input Voltage PECL_CLK | 500                  |     | 1000                 | mV   |                          |
| V <sub>CMR</sub> | Common Mode Range PECL_CLK          | V <sub>CC</sub> −1.0 |     | V <sub>CC</sub> −0.6 | V    |                          |
| V <sub>OH</sub>  | Output HIGH Voltage                 | 1.8                  |     |                      | V    | I <sub>OH</sub> = −12 mA |
| V <sub>OL</sub>  | Output LOW Voltage                  |                      |     | 0.5                  | V    | I <sub>OH</sub> = 12 mA  |
| I <sub>IN</sub>  | Input Current                       |                      |     | ±200                 | μA   |                          |
| C <sub>IN</sub>  | Input Capacitance                   |                      | 4.0 |                      | pF   |                          |
| C <sub>pd</sub>  | Power Dissipation Capacitance       |                      | 10  |                      | pF   | Per output               |
| Z <sub>OUT</sub> | Output Impedance                    | 18                   | 23  | 28                   | Ω    |                          |
| I <sub>CC</sub>  | Maximum Quiescent Supply Current    |                      | 0.5 |                      | mA   |                          |

**Table 11. AC Characteristics** (T<sub>A</sub> = 0° to 70°C, V<sub>CCI</sub> = 2.5 V ± 5%; V<sub>CCO</sub> = 2.5 V ± 5%)

| Symbol                          | Characteristic                             | Min        | Typ        | Max        | Unit | Condition           |
|---------------------------------|--------------------------------------------|------------|------------|------------|------|---------------------|
| F <sub>max</sub>                | Maximum Input Frequency                    |            |            | 200        | MHz  |                     |
| t <sub>PLH</sub>                | Propagation Delay PECL_CLK<br>CMOS_CLK     | 2.2<br>2.0 | 2.8<br>2.5 | 4.9<br>4.2 | ns   | Note <sup>(1)</sup> |
| t <sub>sk(o)</sub>              | Output-to-Output Skew PECL_CLK<br>CMOS_CLK |            |            | 250<br>250 | ps   | Note <sup>(1)</sup> |
| t <sub>sk(pr)</sub>             | Part-to-Part Skew PECL_CLK<br>CMOS_CLK     |            |            | 2.7<br>2.2 | ns   | Note <sup>(1)</sup> |
| d <sub>t</sub>                  | Duty Cycle                                 | 45         |            | 55         | %    | Note <sup>(1)</sup> |
| t <sub>r</sub> , t <sub>f</sub> | Output Rise/Fall Time                      | 0.1        |            | 1.3        | ns   | Note <sup>(1)</sup> |

1. Guaranteed by statistical analysis, not 100% tested in production.

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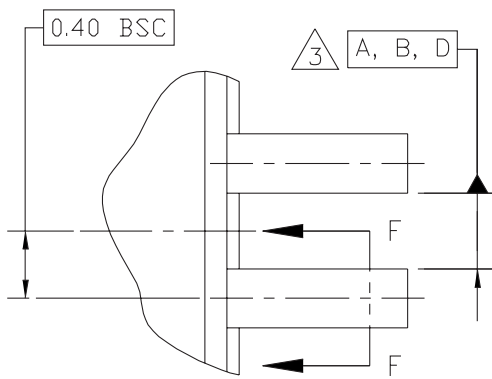


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|                                                                                 | CASE NUMBER: 873A-04       | 01 APR 2005                |
|                                                                                 | STANDARD: JEDEC MS-026 BBA |                            |

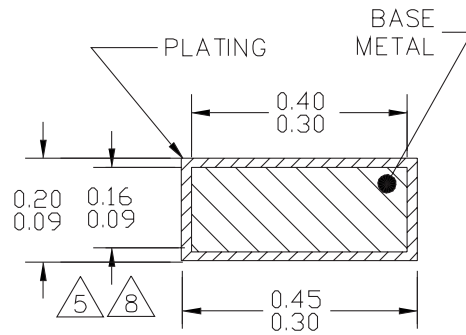
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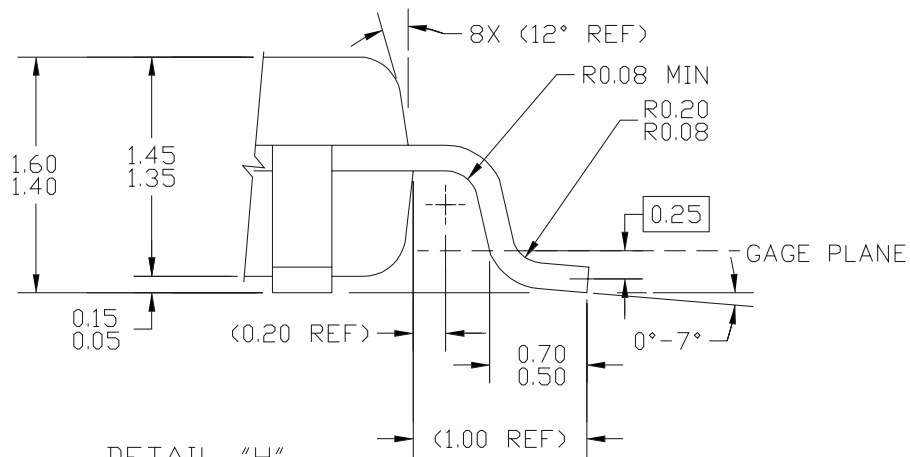


DETAIL G



$\oplus 0.2 \text{ M C A-B D}$

SECTION F-F  
ROTATED 90°CW  
32 PLACES



DETAIL "H"

|                                                                                 |                            |                            |             |
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**CASE 873A-04  
ISSUE C  
32-LEAD LQFP PACKAGE**

**MPC9109**

## PACKAGE DIMENSIONS

### NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5-1994.
3. DATUMS A, B, AND D TO BE DETERMINED AT DATUM PLANE H.
4. DIMENSIONS TO BE DETERMINED AT SEATING PLANE DATUM C.
5. DIMENSION DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED THE MAXIMUM DIMENSION BY MORE THAN 0.08 MM. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSION AND ADJACENT LEAD OR PROTRUSION: 0.07 MM.
6. DIMENSIONS DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25 MM PER SIDE. DIMENSIONS ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS INCLUDING MOLD MISMATCH.
7. EXACT SHAPE OF EACH CORNER IS OPTIONAL.
8. THESE DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.1 MM AND 0.25 MM FROM THE LEAD TIP.

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