Low Voltage 1:18 Clock Distribution Chip

MPC9109

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

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

**AC SUFFIX
32-LEAD LQFP PACKAGE
Pb-FREE PACKAGE
CASE 873A-04**

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 Ω 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 (≈20 Ω), 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 Ω 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.

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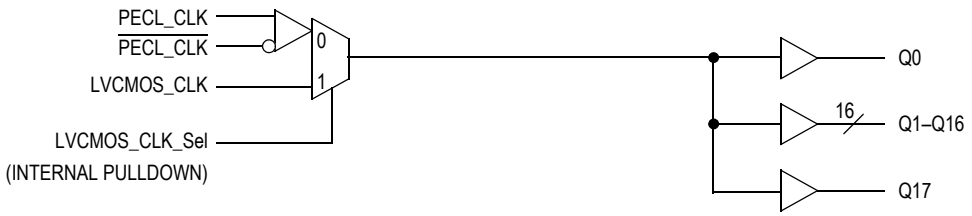

Figure 1. Logic Diagram

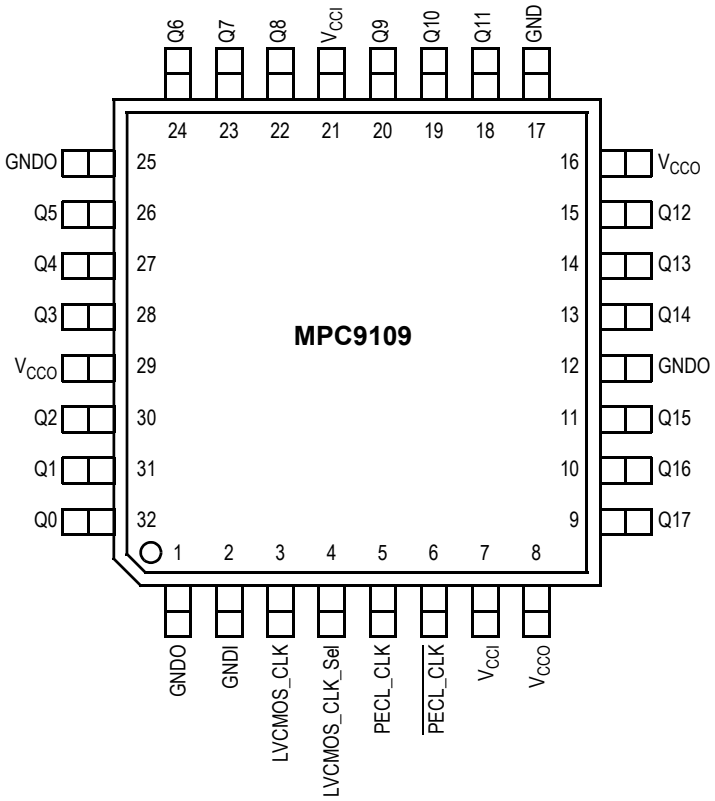

Figure 2. Pinout: 32-Lead TQFP (Top View)

Table 1. Function Table

LVCMOS CLK_Sel	Input
0	PECL_CLK
1	LVCMOS_CLK

Table 2. Power Supply Voltages

Supply Pin	Voltage Level
V_{CCI}	2.5 V or 3.3 V ± 5%
V_{CCO}	2.5 V or 3.3 V ± 5%

Table 3. Absolute Maximum Ratings[1]

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	–0.3	3.6	V
V_I	Input Voltage	–0.3	V_{CC} + 0.3	V
I_{IN}	Input Current		±20	mA
T_{Stor}	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_A = 0° to 70°C, V_{CCI} = 3.3 V ± 5%; V_{CCO} = 3.3 V ± 5%)

Symbol	Characteristic		Min	Typ	Max	Unit	Condition
V_{IH}	Input HIGH Voltage	CMOS_CLK	2.4		V_{CCI}	V	
V_{IL}	Input LOW Voltage	CMOS_CLK			0.8	V	
V_{PP}	Peak-to-Peak Input Voltage	PECL_CLK	500		1000	mV	
V_{CMR}	Common Mode Range	PECL_CLK	V_{CC}–1.4		V_{CC}–0.6	V	
V_{OH}	Output HIGH Voltage		2.4			V	I_{OH} = –20 mA
V_{OL}	Output LOW Voltage				0.5	V	I_{OH} = 20 mA
I_{IN}	Input Current				±200	µA	
C_{IN}	Input Capacitance			4.0		pF	
C_{pd}	Power Dissipation Capacitance			10		pF	Per output
Z_{OUT}	Output Impedance		18	23	28	Ω	
I_{CC}	Maximum Quiescent Supply Current			0.5		mA	

Table 5. AC Characteristics (T_A = 0° to 70°C, V_{CCI} = 3.3 V ± 5%; V_{CCO} = 3.3 V ± 5%)

Symbol	Characteristic		Min	Typ	Max	Unit	Condition
F_{max}	Maximum Input Frequency				250	MHz	
t_{PLH}	Propagation Delay	PECL_CLK CMOS_CLK	1.8 1.6	2.8 2.5	3.8 3.3	ns	Note[1]
$t_{sk(o)}$	Output-to-Output Skew	PECL_CLK CMOS_CLK			200 200	ps	Note[1]
$t_{sk(pr)}$	Part-to-Part Skew	PECL_CLK CMOS_CLK			2.0 1.7	ns	Note[1]
d_t	Duty Cycle		45		55	%	Note[1]
t_r, t_f	Output Rise/Fall Time		0.1		1.3	ns	Note[1]

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

Table 6. Absolute Maximum Ratings(1)

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	–0.3	3.6	V
V_I	Input Voltage	–0.3	V_{CC} + 0.3	V
I_{IN}	Input Current		±20	mA
T_{Stor}	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_A = 0° to 70°C, V_{CCI} = 3.3 V ± 5%; V_{CCO} = 2.5 V ± 5%)

Symbol	Characteristic		Min	Typ	Max	Unit	Condition
V_{IH}	Input HIGH Voltage	CMOS_CLK	2.4		V_{CCI}	V	
V_{IL}	Input LOW Voltage	CMOS_CLK			0.8	V	
V_{PP}	Peak-to-Peak Input Voltage	PECL_CLK	500		1000	mV	
V_{CMR}	Common Mode Range	PECL_CLK	V_{CC}–1.4		V_{CC}–0.6	V	
V_{OH}	Output HIGH Voltage		1.8			V	I_{OH} = –20 mA
V_{OL}	Output LOW Voltage				0.5	V	I_{OH} = 20 mA
I_{IN}	Input Current				±200	µA	
C_{IN}	Input Capacitance			4.0		pF	
C_{pd}	Power Dissipation Capacitance			10		pF	Per output
Z_{OUT}	Output Impedance			23		Ω	
I_{CC}	Maximum Quiescent Supply Current			0.5		mA	

Table 8. AC Characteristics (T_A = 0° to 70°C, V_{CCI} = 3.3 V ± 5%; V_{CCO} = 2.5 V ± 5%)

Symbol	Characteristic		Min	Typ	Max	Unit	Condition
F_{max}	Maximum Input Frequency				250	MHz	
t_{PLH}	Propagation Delay	PECL_CLK CMOS_CLK	1.8 1.6	2.8 2.5	3.9 3.4	ns	Note(1)
$t_{sk(o)}$	Output-to-Output Skew	PECL_CLK CMOS_CLK			250 250	ps	Note(1)
$t_{sk(pr)}$	Part-to-Part Skew	PECL_CLK CMOS_CLK			2.1 1.8	ns	Note(1)
d_t	Duty Cycle		45		55	%	Note(1)
t_r, t_f	Output Rise/Fall Time		0.1		1.3	ns	Note(1)

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

Table 9. Absolute Maximum Ratings[1]

Symbol	Parameter	Min	Max	Unit
V_{CC}	Supply Voltage	–0.3	3.6	V
V_I	Input Voltage	–0.3	V_{CC} + 0.3	V
I_{IN}	Input Current		±20	mA
T_{Stor}	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_A = 0° to 70°C, V_{CCI} = 2.5 V ± 5%; V_{CCO} = 2.5 V ± 5%)

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

Table 11. AC Characteristics (T_A = 0° to 70°C, V_{CCI} = 2.5 V ± 5%; V_{CCO} = 2.5 V ± 5%)

Symbol	Characteristic		Min	Typ	Max	Unit	Condition
F_{max}	Maximum Input Frequency				200	MHz	
t_{PLH}	Propagation Delay	PECL_CLK CMOS_CLK	2.2 2.0	2.8 2.5	4.9 4.2	ns	Note[1]
$t_{sk(o)}$	Output-to-Output Skew	PECL_CLK CMOS_CLK			250 250	ps	Note[1]
$t_{sk(pr)}$	Part-to-Part Skew	PECL_CLK CMOS_CLK			2.7 2.2	ns	Note[1]
d_t	Duty Cycle		45		55	%	Note[1]
t_r, t_f	Output Rise/Fall Time		0.1		1.3	ns	Note[1]

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

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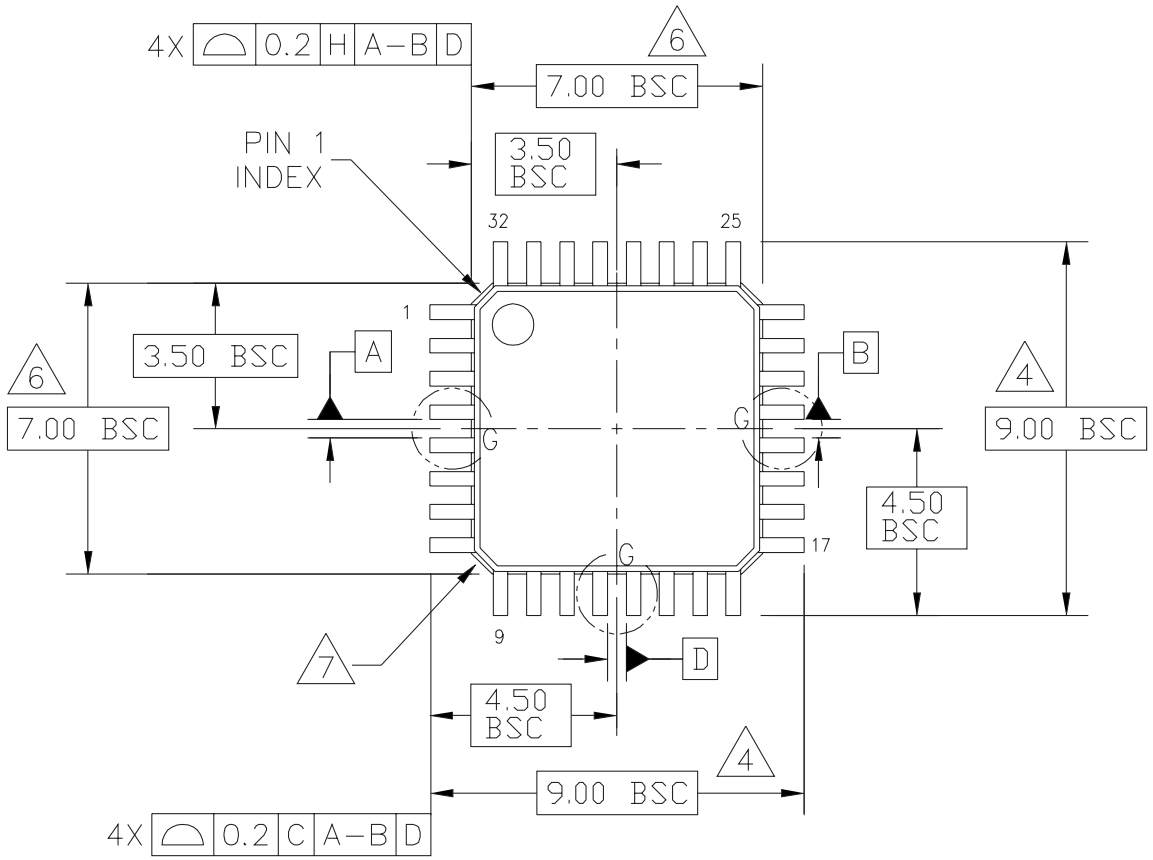

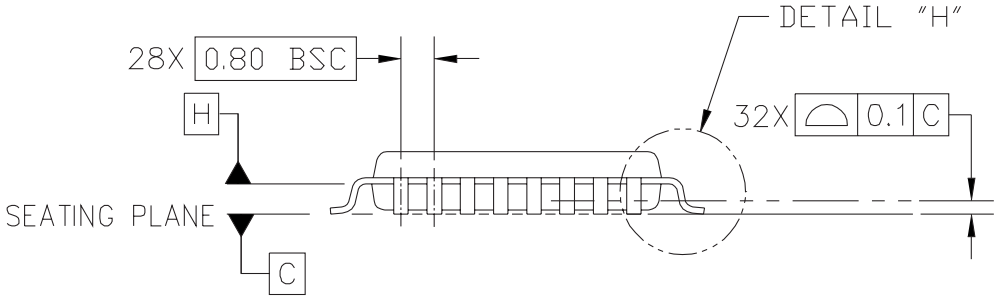

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CASE 873A-04
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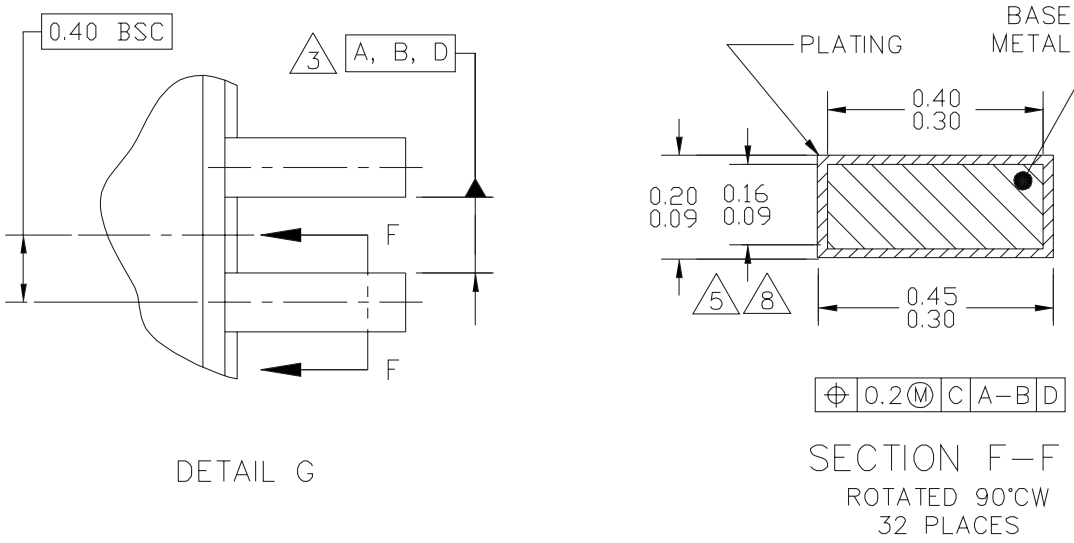

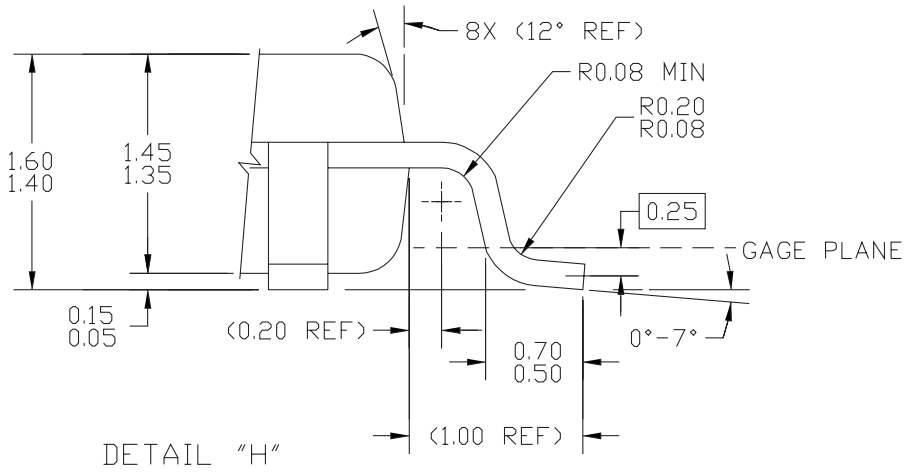

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1. DIMENSIONS ARE IN MILLIMETERS.

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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