DATASHEET

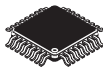
OBSOLETE

The MPC940L 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 150 ps, the MPC940L 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 microprocessor based design. For a similar device at a lower price/performance point, the reader is referred to the MPC9109.

- LVPECL or LVCMOS Clock Input
- 2.5 V LVCMOS Outputs for Pentium II Microprocessor Support
- 150 ps Maximum Output-to-Output Skew
- Maximum Output Frequency of 250 MHz
- 32-Lead LQFP Packaging, Pb-Free
- 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
- For drop in replacement use 83940DYLF

MPC940L

LOW VOLTAGE 1:18 CLOCK DISTRIBUTION CHIP



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

With a low output impedance (≈20 Ω), in both the HIGH and LOW logic states, the output buffers of the MPC940L are ideal for driving series terminated transmission lines. With a 20 Ω output impedance the 940L 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.

The differential LVPECL inputs of the MPC940L 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 MPC940L have internal pullup/pulldown resistors so they can be left open if unused.

The MPC940L 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 LQFP package was chosen to optimize performance, board space and cost of the device. The 32-lead LQFP has a 7x7 mm body size with a conservative 0.8 mm pin spacing.

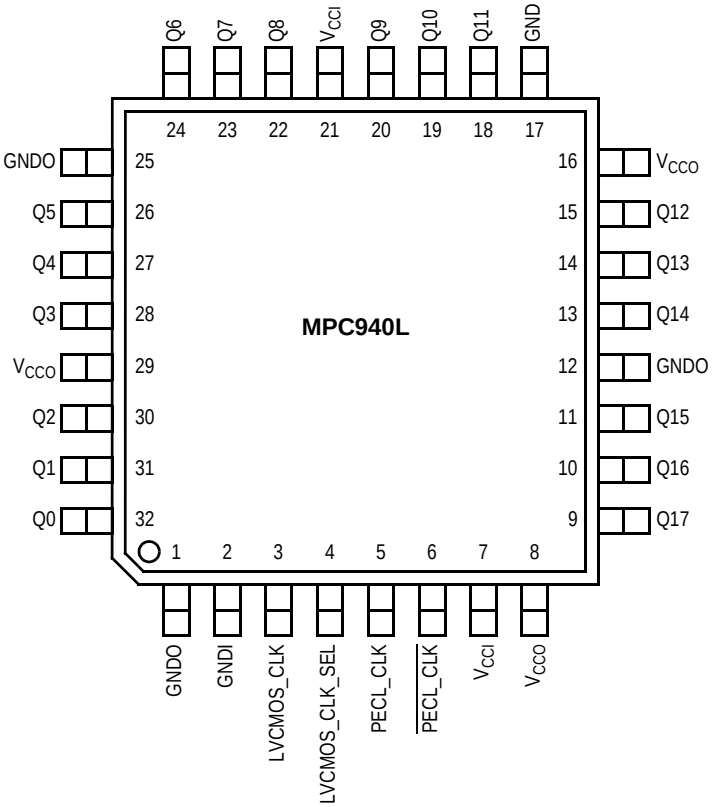
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LOGIC DIAGRAM



Pinout: 32-Lead LQFP (Top View)



FUNCTION TABLE

LVCMOS_CLK_SEL	Input
0	PECL_CLK
1	LVCMOS_CLK

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 1. Pin Configurations

Pin	I/O	Type	Function
PECL_CLK $\overline{\text{PECL_CLK}}$	Input	LVPECL	Reference Clock Input
LVCMOS_CLK	Input	LVCMOS	Alternative Reference Clock Input
LVCMOS_CLK_SEL	Input	LVCMOS	Selects Clock Source
Q0–Q17	Output	LVCMOS	Clock Outputs
V_{CCO}		Supply	Output Positive Power Supply
V_{CCI}		Supply	Core Positive Power Supply
GNDO		Supply	Output Negative Power Supply
GNDI		Supply	Core Negative Power Supply

Table 2. 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_{DD} + 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 3. 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_{CCI} – 1.4		V_{CCI} – 0.6	V	
V_{OH}	Output HIGH Voltage		2.4			V	I_{OH} = –20 mA
V_{OL}	Output LOW Voltage				0.5	V	I_{OL} = 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	1.0	mA	

Table 4. 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 ≤ 150 MHz CMOS_CLK ≤ 150 MHz	2.0 1.8	2.7 2.5	3.4 3.0	ns	
t_{PLH}	Propagation Delay	PECL_CLK > 150 MHz CMOS_CLK > 150 MHz	2.0 1.8	2.9 2.4	3.7 3.2	ns	
$t_{sk(o)}$	Output-to-Output Skew	PECL_CLK CMOS_CLK			150 150	ps	
$t_{sk(pp)}$	Part-to-Part Skew	PECL_CLK ≤ 150 MHz CMOS_CLK ≤ 150 MHz			1.4 1.2	ns	Note (1)
$t_{sk(pp)}$	Part-to-Part Skew	PECL_CLK > 150 MHz CMOS_CLK > 150 MHz			1.7 1.4	ns	Note (1)
$t_{sk(pp)}$	Part-to-Part Skew	PECL_CLK CMOS_CLK			850 750	ps	Note (2)
DC	Output Duty Cycle	f_{CLK} < 134 MHz f_{CLK} ≤ 250 MHz	45 40	50 50	55 60	% %	Input DC = 50% Input DC = 50%
t_r, t_f	Output Rise/Fall Time		0.3		1.1	ns	0.5 – 2.4 V

1. Across temperature and voltage ranges. Includes output skew.
2. For specific temperature and voltage. Includes output skew.

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Table 5. 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_{CCI} – 1.4		V_{CCI} – 0.6	V	
V_{OH}	Output HIGH Voltage	1.8			V	I_{OH} = –12 mA
V_{OL}	Output LOW Voltage			0.5	V	I_{OL} = 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		23		Ω	
I_{CC}	Maximum Quiescent Supply Current		0.5	1.0	mA	

Table 6. 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 ≤ 150 MHz CMOS_CLK ≤ 150 MHz	2.0 1.7	2.8 2.5	3.5 3.0	ns	
t_{PLH}	Propagation Delay PECL_CLK > 150 MHz CMOS_CLK > 150 MHz	2.0 1.8	2.9 2.5	3.8 3.3	ns	
$t_{sk(o)}$	Output-to-Output Skew PECL_CLK CMOS_CLK			150 150	ps	
$t_{sk(pp)}$	Part-to-Part Skew PECL_CLK ≤ 150 MHz CMOS_CLK ≤ 150 MHz			1.5 1.3	ns	Note (1)
$t_{sk(pp)}$	Part-to-Part Skew PECL_CLK > 150 MHz CMOS_CLK > 150 MHz			1.8 1.5	ns	Note (1)
$t_{sk(pp)}$	Part-to-Part Skew PECL_CLK CMOS_CLK			850 750	ps	Note (2)
DC	Output Duty Cycle f_{CLK} < 134 MHz f_{CLK} ≤ 250 MHz	45 40	50 50	55 60	% %	Input DC = 50% Input DC = 50%
t_r, t_f	Output Rise/Fall Time	0.3		1.2	ns	0.5 – 1.8 V

1. Across temperature and voltage ranges. Includes output skew.
2. For specific temperature and voltage. Includes output skew.

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Table 7. 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_{CCI} – 1.0		V_{CCI} – 0.6	V	
V_{OH}	Output HIGH Voltage	1.8			V	I_{OH} = –12 mA
V_{OL}	Output LOW Voltage			0.5	V	I_{OL} = 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	1.0	mA	

Table 8. 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 ≤ 150 MHz CMOS_CLK ≤ 150 MHz	2.6 2.3	4.0 3.1	5.2 4.0	ns	
t_{PLH}	Propagation Delay PECL_CLK > 150 MHz CMOS_CLK > 150 MHz	2.8 2.3	3.8 3.1	5.0 4.0	ns	
$t_{sk(o)}$	Output-to-Output Skew PECL_CLK CMOS_CLK			200 200	ps	
$t_{sk(pp)}$	Part-to-Part Skew PECL_CLK ≤ 150 MHz CMOS_CLK ≤ 150 MHz			2.6 1.7	ns	Note (1)
$t_{sk(pp)}$	Part-to-Part Skew PECL_CLK > 150 MHz CMOS_CLK > 150 MHz			2.2 1.7	ns	Note (1)
$t_{sk(pp)}$	Part-to-Part Skew PECL_CLK CMOS_CLK			1.2 1.0	ns	Note (2)
DC	Output Duty Cycle f_{CLK} < 134 MHz f_{CLK} ≤ 200 MHz	45 40	50 50	55 60	% %	Input DC = 50% Input DC = 50%
t_r, t_f	Output Rise/Fall Time	0.3		1.2	ns	0.5 - 1.8 V

1. Across temperature and voltage ranges. Includes output skew.
2. For specific temperature and voltage. Includes output skew.

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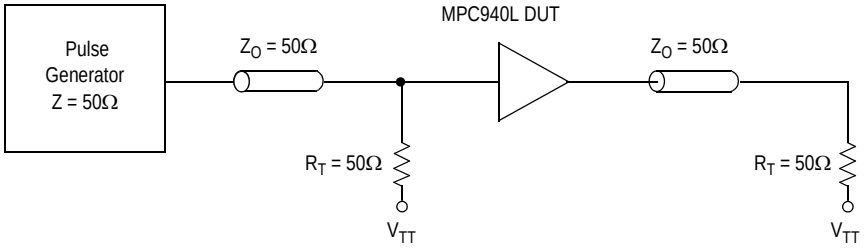


Figure 1. LVCMOS_CLK MPC940L AC Test Reference for V_{CC} = 3.3 V and V_{CC} = 2.5 V

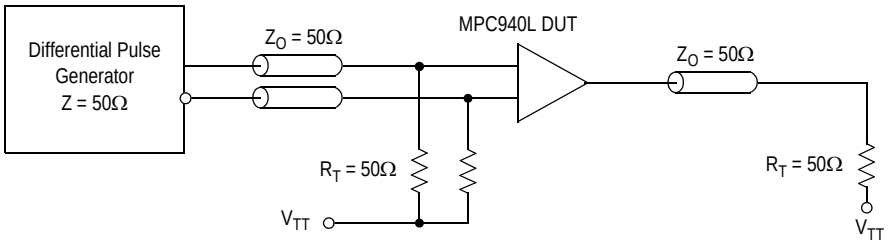


Figure 2. PECL_CLK MPC940L AC Test Reference for V_{CC} = 3.3 V and V_{CC} = 2.5 V

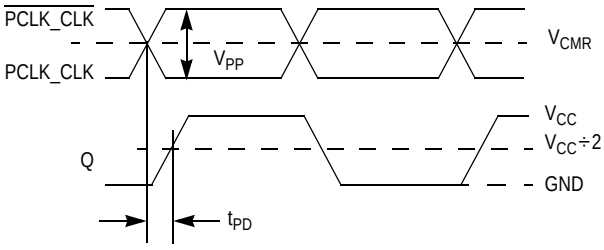


Figure 3. Propagation Delay (t_{PD}) Test Reference

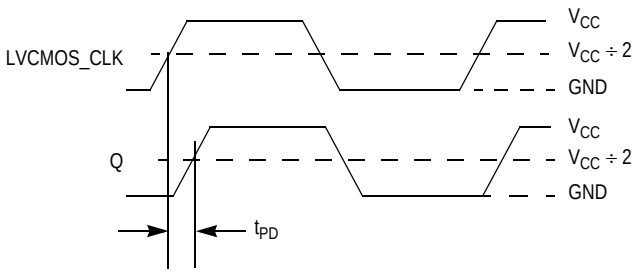
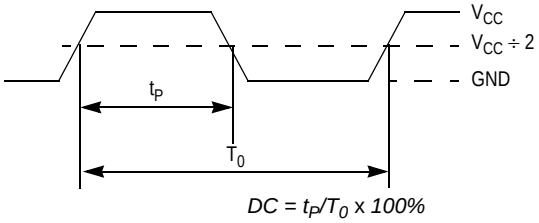
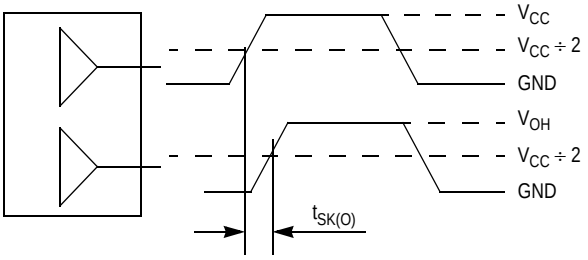


Figure 4. LVCMOS Propagation Delay (t_{PD}) Test Reference



The time from the PLL controlled edge to the non controlled edge, divided by the time between PLL controlled edges, expressed as a percentage.

Figure 5. Output Duty Cycle (DC)



The pin-to-pin skew is defined as the worst case difference in propagation delay between any two similar delay paths within a single device.

Figure 6. Output-to-Output Skew $T_{SK(O)}$

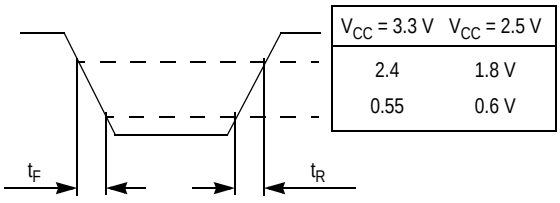


Figure 7. Output Transition Time Test Reference

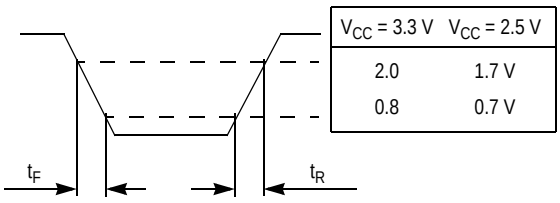
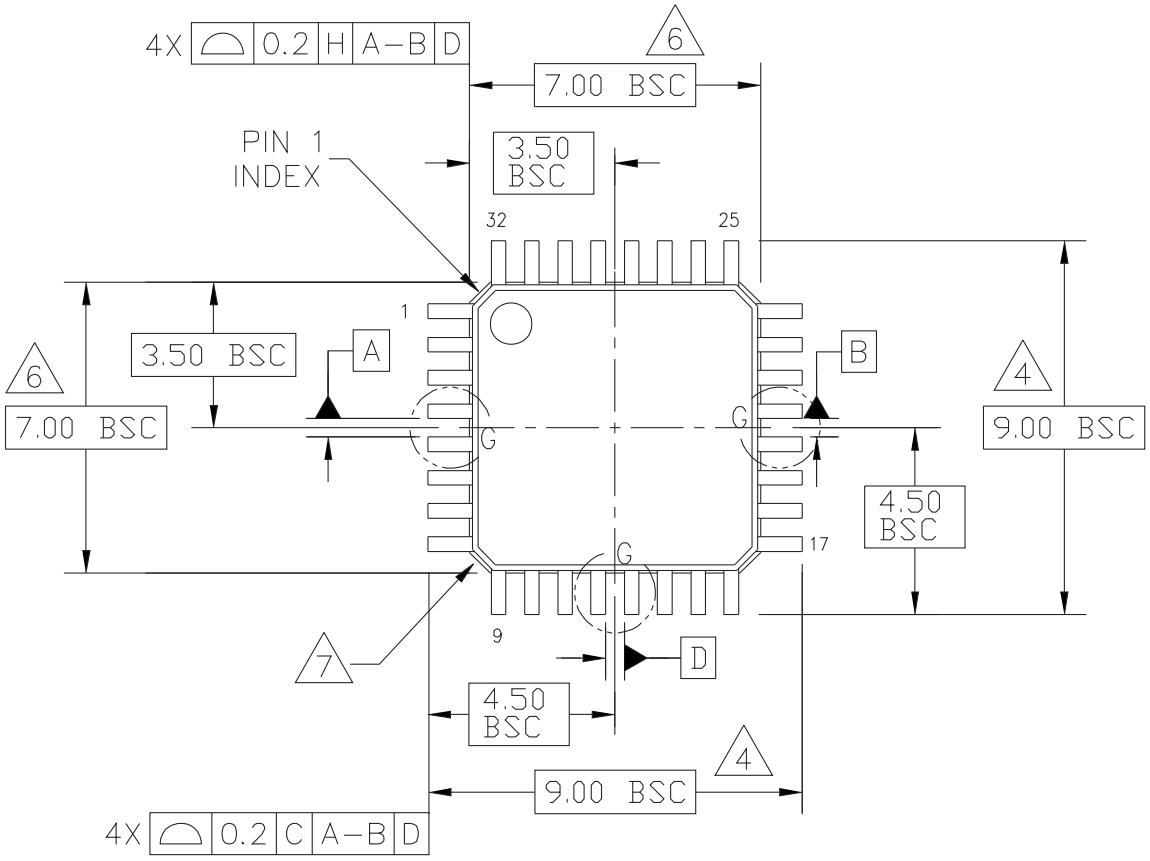
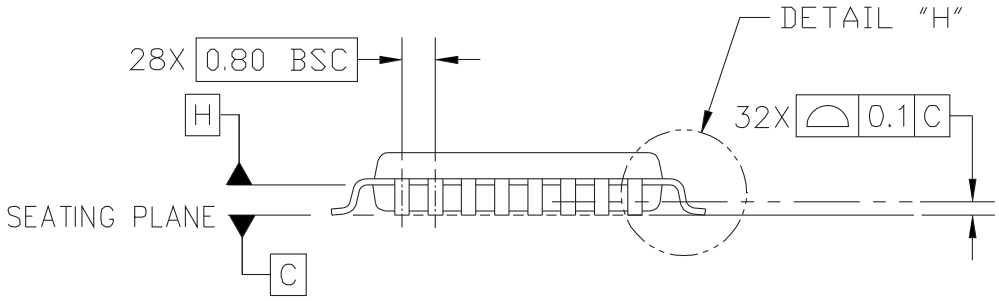


Figure 8. Input Transition Time Test Reference

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PACKAGE DIMENSIONS

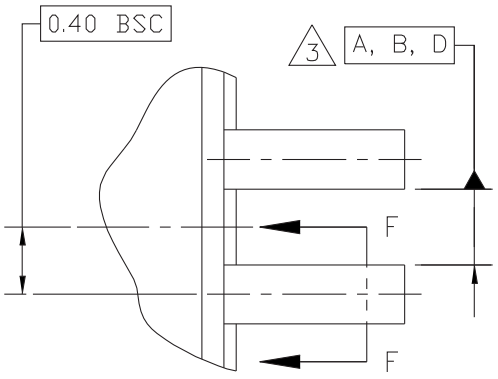




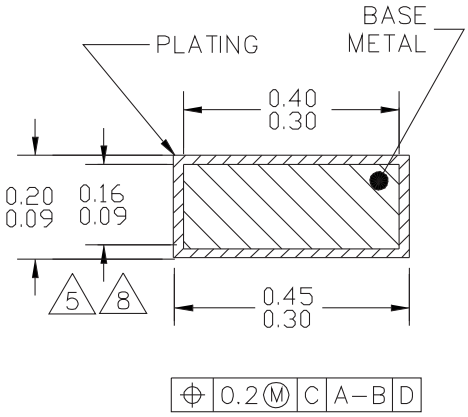
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	CASE NUMBER: 873A-04	01 APR 2005
	STANDARD: JEDEC MS-026 BBA	

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

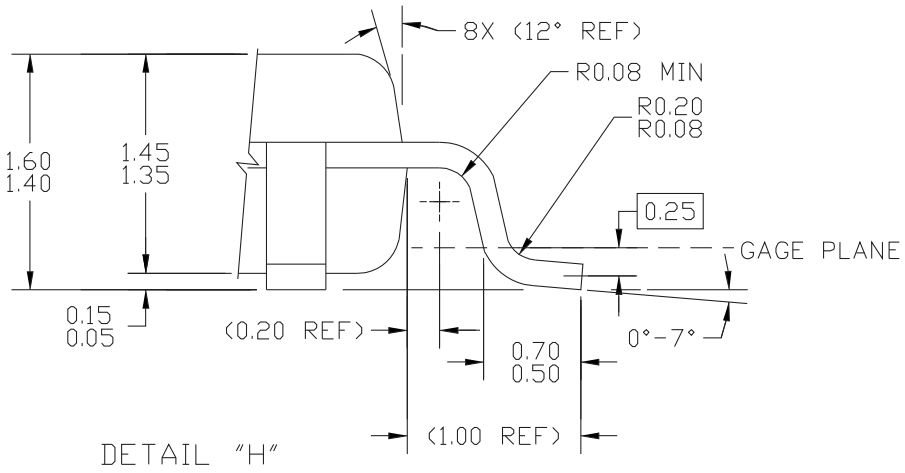
PACKAGE DIMENSIONS



DETAIL G



SECTION F–F
ROTATED 90°CW
32 PLACES



DETAIL "H"

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	STANDARD: JEDEC MS-026 BBA	

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

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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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PAGE 3 OF 3

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

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Ordering Information

Table 9. Ordering Information

Part/Order Number	Marking	Package	Shipping Packaging	Termperature
MPC940LAC	MPC940LAC	Lead-Free, 32 Lead LQFP	Tray	0°C to 70°C
MPC940LACR2	MPC940LAC	Lead-Free, 32 Lead LQFP	2500 Tape & Reel	0°C to 70°C

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Revision History Sheet

Rev	Table	Page	Description of Change	Date
8		1	NRND – Not Recommend for New Designs.	12/20/12
8		1	Product Discontinuation Notice - PDN CQ-15-02.	5/6/15
9		1	Obsolete per Product Discontinuation Notice - PDN CQ-15-02.	10/4/16

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