

3.3 V LVTTTL/LVCMOS to LVPECL Translator

MC100EPT622

Description

The MC100EPT622 is a 10-Bit LVTTTL/LVCMOS to LVPECL translator. Because LVPECL (Positive ECL) levels are used only +3.3 V and ground are required. The device has an OR-ed enable input which can accept either LVPECL (ENPECL) or TTL/LVCMOS inputs (ENTTL). If the inputs are left open, they will default to the enable state. The device design has been optimized for low channel-to-channel skew.

Features

- 450 ps Typical Propagation Delay
- Maximum Frequency > 1.5 GHz Typical
- PECL Mode
- Operating Range: $V_{CC} = 3.0\text{ V to }3.8\text{ V}$ with $V_{EE} = 0\text{ V}$
- PNP LVTTTL Inputs for Minimal Loading
- Q Output Will Default HIGH with Inputs Open
- The 100 Series Contains Temperature Compensation
- These Devices are Pb-Free, Halogen Free and are RoHS Compliant



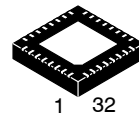
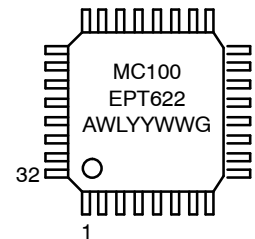
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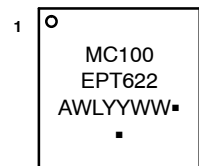
MARKING DIAGRAMS*



LQFP-32
FA SUFFIX
CASE 561AB



QFN32
MN SUFFIX
CASE 488AM



- A = Assembly Location
- WL = Wafer Lot
- YY = Year
- WW = Work Week
- G or ■ = Pb-Free Package

(Note: Microdot may be in either location)

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

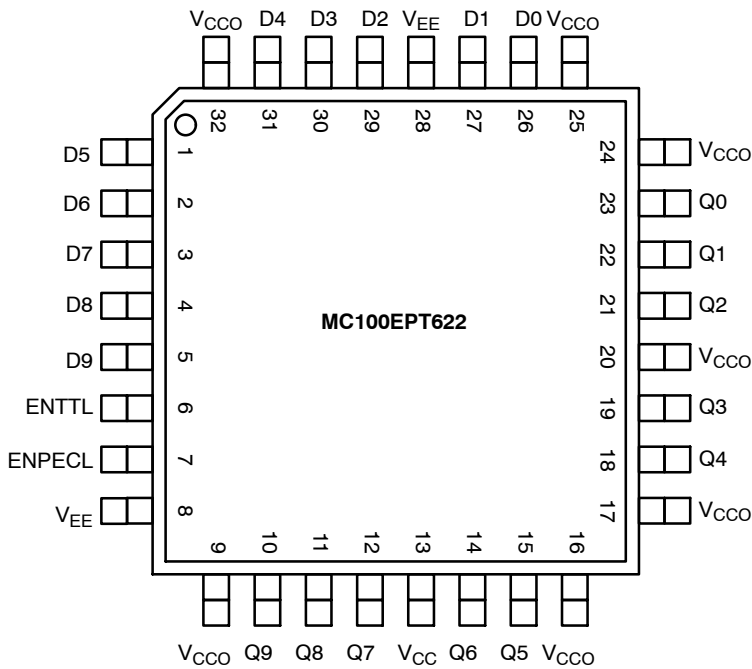
Table 1. TRUTH TABLE

| ENPECL | ENTTL | D | Q |
|--------|-------|---|---|
| H | X | H | H |
| H | X | L | L |
| X | H | H | H |
| X | H | L | L |
| L | L | X | L |

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

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

Figure 1. 32-Lead LQFP Pinout (Top View)

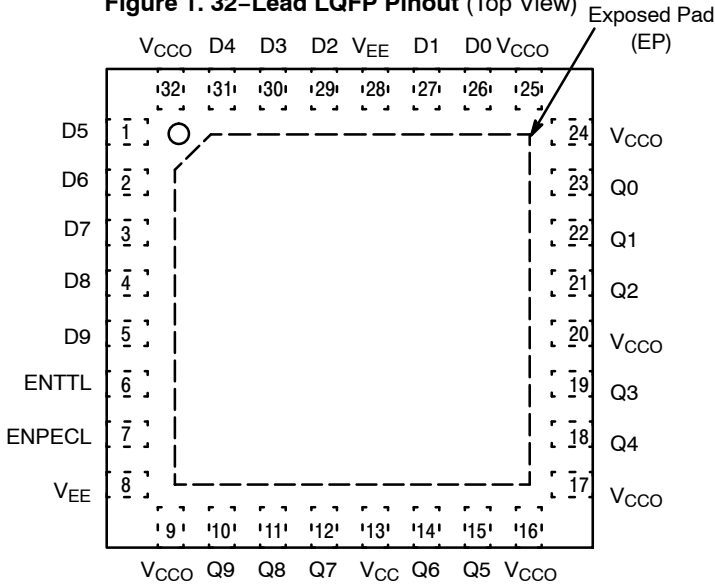


Figure 3. 32-Lead QFN Pinout (Top View)

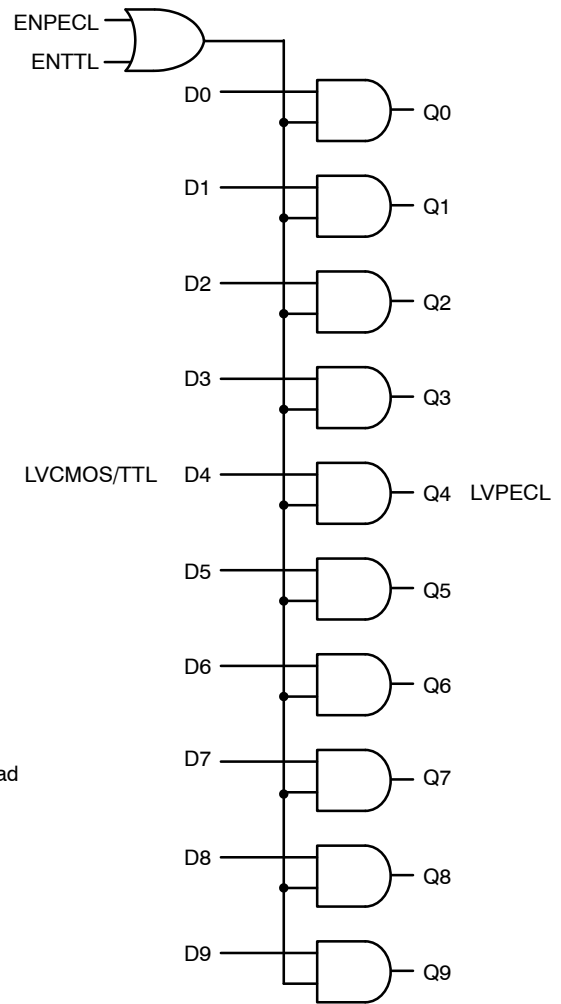


Figure 2. Logic Symbol

Table 1. PIN DESCRIPTION

| Pin | Function |
|----------------------|--|
| D0:9 | Data Input (TTL) |
| Q0:9 | Data Outputs (PECL) |
| ENTTL | Enable Control (TTL) |
| ENPECL | Enable Control (PECL) |
| V_{CC} , V_{CCO} | Positive Supply |
| V_{EE} | Ground |
| EP | The exposed pad (EP) on the QFN-32 package bottom is thermally connected to the die for improved heat transfer out of the package. The exposed pad must be attached to a heat-sinking conduit. The pad is electrically connected to V_{EE} . |

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Table 2. ATTRIBUTES

| Characteristics | Value |
|---|-----------------------------|
| Internal Input Pulldown Resistor | N/A |
| Internal Input Pullup Resistor | N/A |
| ESD Protection Human Body Model Machine Model Charged Device Model | > 2 kV > 150 V > 2 kV |
| Moisture Sensitivity, Indefinite Time Out of Drypack | Pb-Free Pkg |
| LQFP-32 QFN-32 | Level 2 Level 1 |
| Flammability Rating Oxygen Index: 28 to 34 | UL 94 V-0 @ 0.125 in |
| Transistor Count | 596 Devices |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test | |

Table 3. MAXIMUM RATINGS

| Symbol | Parameter | Condition 1 | Condition 2 | Rating | Unit |
|---------------|--|-----------------------|--------------------|-------------|--------------|
| V_{CC} | Power Supply | $V_{EE} = 0\text{ V}$ | | 5 | V |
| V_I | Input Voltage | $V_{EE} = 0\text{ V}$ | $V_I \leq V_{CC}$ | 5 to 0 | V |
| I_{out} | Output Current | Continuous Surge | | 50 100 | mA mA |
| T_A | Operating Temperature Range | | | -40 to +85 | °C |
| T_{stg} | Storage Temperature Range | | | -65 to +150 | °C |
| θ_{JA} | Thermal Resistance (Junction-to-Ambient) | 0 lfp 500 lfp | 32 LQFP 32 LQFP | 80 55 | °C/W °C/W |
| θ_{JC} | Thermal Resistance (Junction-to-Case) | Standard Board | 32 LQFP | 12 to 17 | °C/W |
| θ_{JA} | Thermal Resistance (Junction-to-Ambient) | 0 lfp 500 lfp | QFN-32 QFN-32 | 31 27 | °C/W °C/W |
| θ_{JC} | Thermal Resistance (Junction-to-Case) | 2S2P | QFN-32 | 12 | °C/W |
| T_{sol} | Wave Solder | | | 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.

Table 4. TTL INPUT DC CHARACTERISTICS ($V_{CC} = 3.3\text{ V}$, $GND = 0.0\text{ V}$, $T_A = -40^\circ\text{C}$ to 85°C)

| Symbol | Characteristic | Condition | Min | Typ | Max | Unit |
|-----------|------------------------|--------------------------|------|------|------|---------------|
| I_{IH} | Input HIGH Current | $V_{IN} = 2.7\text{ V}$ | | | 25 | μA |
| I_{IHH} | Input HIGH Current MAX | $V_{IN} = V_{CC}$ | | | 100 | μA |
| I_{IL} | Input LOW Current | $V_{IN} = 0.5\text{ V}$ | | | -0.6 | mA |
| V_{IK} | Input Clamp Voltage | $I_{IN} = -18\text{ mA}$ | -1.2 | -0.9 | | V |
| V_{IH} | Input HIGH Voltage | | 2.0 | | | V |
| V_{IL} | Input LOW Voltage | | | | 0.8 | V |

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 lfp.

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Table 5. PECL INPUT DC CHARACTERISTICS $V_{CC} = 3.3\text{ V}$, $GND = 0.0\text{ V}$, $T_A = -40^\circ\text{C}$ to 85°C

| Symbol | Characteristic | Condition | Min | Typ | Max | Unit |
|----------|--------------------|---------------------------|------|-----|------|---------------|
| I_{IH} | Input HIGH Current | $V_{IN} = 2420\text{ mV}$ | | | 150 | μA |
| I_{IL} | Input LOW Current | $V_{IN} = 1490\text{ mV}$ | | | 200 | μA |
| V_{IH} | Input HIGH Voltage | | 2075 | | 2420 | mV |
| V_{IL} | Input LOW Voltage | | 1490 | | 1675 | mV |

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

Table 6. PECL OUTPUT DC CHARACTERISTICS $V_{CC} = 3.3\text{ V}$, $GND = 0.0\text{ V}$ (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 | 85 | 115 | 145 | 90 | 120 | 155 | 95 | 130 | 155 | 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 | 1520 | 1700 | 1355 | 1520 | 1700 | 1355 | 1520 | 1700 | mV |

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

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

Table 7. AC CHARACTERISTICS $V_{CC} = 3.0\text{ V}$ to 3.8 V (Note 3)

| Symbol | Characteristic | -40°C | | | 25°C | | | 85°C | | | Unit |
|--------------------------|---|---------------------|--------------------------|--------------------------|--------------------|--------------------------|--------------------------|--------------------|--------------------------|--------------------------|------|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| f_{\max} | Maximum Frequency (See Figure 4) | 1.0 | 1.5 | | 1.0 | 1.5 | | 1.0 | 1.5 | | GHz |
| t_{PLH} , t_{PHL} | Propagation Delay to Output (Figure 5, Note 4) D to Q ENPECL to Q ENTTL to Q | 100 150 300 | 450 500 450 | 800 875 800 | 100 150 300 | 500 500 500 | 875 875 800 | 100 200 300 | 500 550 500 | 800 925 800 | ps |
| t_{JITTER} | Random Clock Jitter (RMS) (See Figure 4) | | 0.7 | 3.0 | | 0.7 | 3.0 | | 0.7 | 3.0 | ps |
| t_r / t_f | Output Rise/Fall Times (20% – 80%) | 100 | 200 | 450 | 100 | 200 | 250 | 100 | 200 | 300 | ps |
| T_{SKEW} | Duty Cycle Skew (Note 5) D to Q Channel 0–7 Channel 8–9 ENPECL to Q ENTTL to Q | | 120 200 120 100 | 375 775 400 275 | | 120 200 120 100 | 375 775 400 275 | | 120 200 120 100 | 375 775 400 275 | 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 lpm.

3. Measured using a 2.4 V source, 50% duty cycle clock source. All loading with $50\ \Omega$ to $V_{CC}-2.0\text{ V}$.
4. 1.5 V to 50% point of the output.
5. Duty cycle skew $|t_{PLH} - t_{PHL}|$ on the specific path.

MC100EPT622

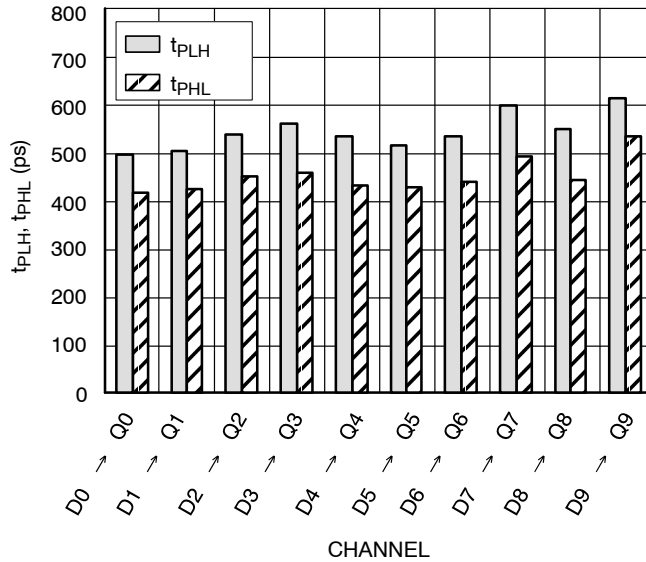
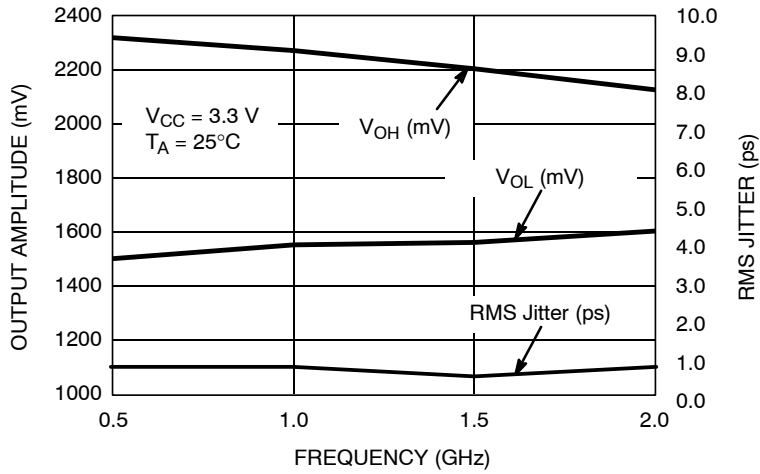


Figure 5. Average Propagation Delay (3.3 V, 25°C)

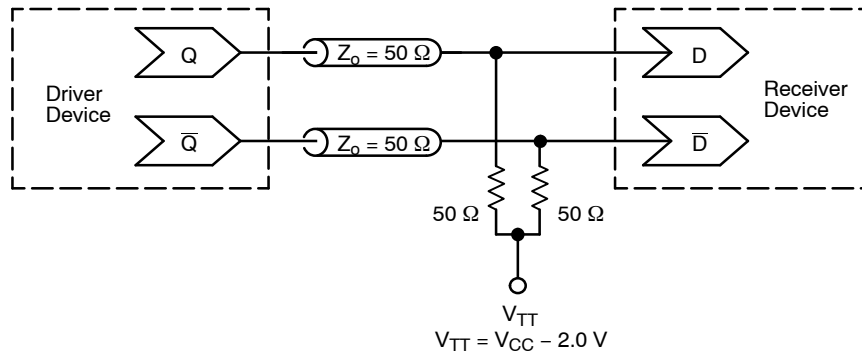


Figure 6. Typical Termination for Output Driver and Device Evaluation (See Application Note [AND8020/D](#) – Termination of ECL Logic Devices.)

MC100EPT622

ORDERING INFORMATION

| Device | Package | Shipping |
|----------------|----------------------|------------------|
| MC100EPT622FAG | LQFP-32 (Pb-Free) | 250 Units / Tray |
| MC100EPT622MNG | QFN32 (Pb-Free) | 74 Units / Rail |

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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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

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1 32

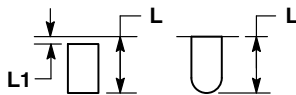
SCALE 2:1

QFN32 5x5, 0.5P
CASE 488AM
ISSUE A

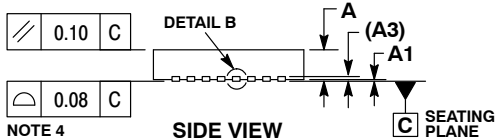
DATE 23 OCT 2013



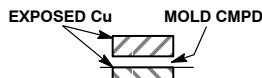
TOP VIEW



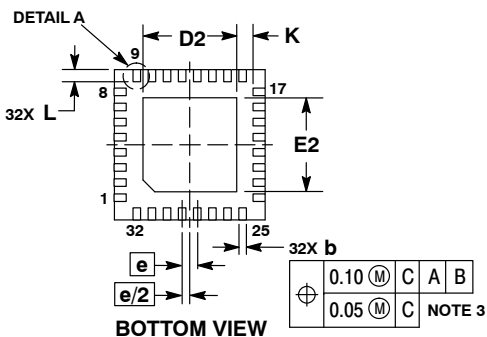
DETAIL A
ALTERNATE TERMINAL
CONSTRUCTIONS



SIDE VIEW



DETAIL B
ALTERNATE
CONSTRUCTION



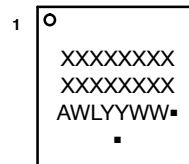
BOTTOM VIEW

NOTES:

1. DIMENSIONS 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 0.30MM FROM THE TERMINAL TIP. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

| MILLIMETERS | | |
|-------------|------|------|
| DIM | MIN | MAX |
| A | 0.80 | 1.00 |
| A1 | --- | 0.05 |
| A3 | 0.20 | REF |
| b | 0.18 | 0.30 |
| D | 5.00 | BSC |
| D2 | 2.95 | 3.25 |
| E | 5.00 | BSC |
| E2 | 2.95 | 3.25 |
| e | 0.50 | BSC |
| K | 0.20 | --- |
| L | 0.30 | 0.50 |
| L1 | --- | 0.15 |

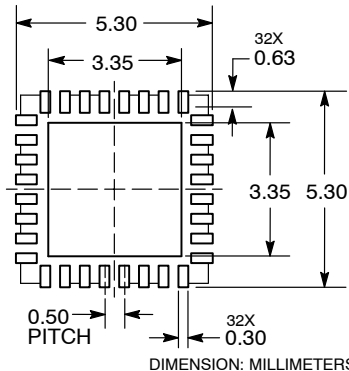
GENERIC MARKING DIAGRAM*



- XXXXXX = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- YY = Year
- WW = Work Week
- = Pb-Free Package

(Note: Microdot may be in either location)
*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.

RECOMMENDED SOLDERING FOOTPRINT*



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

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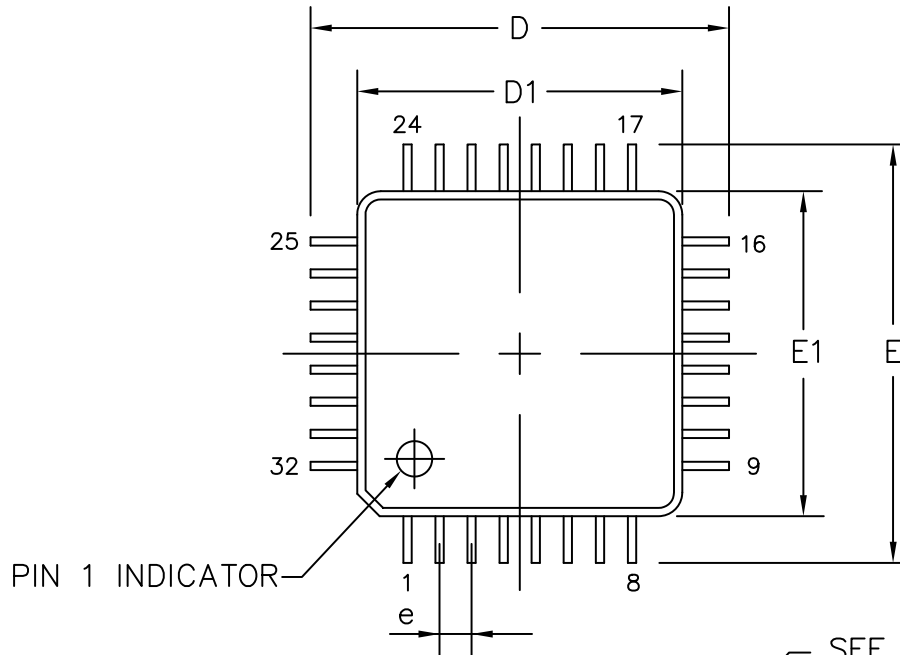
MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

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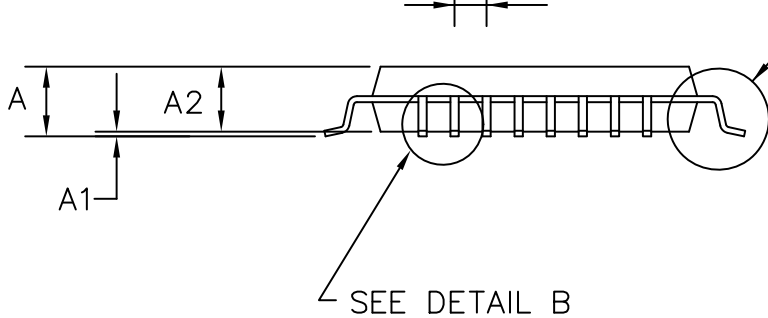


LQFP-32, 7x7
CASE 561AB-01
ISSUE O

DATE 19 JUN 2008



| SYMBOL | MIN | NOM | MAX |
|----------------|----------|------|------|
| A | — | — | 1.60 |
| A1 | 0.05 | — | 0.15 |
| A2 | 1.35 | 1.40 | 1.45 |
| B | 0.30 | 0.37 | 0.45 |
| B1 | 0.30 | 0.35 | 0.40 |
| C | 0.09 | — | 0.20 |
| C1 | 0.09 | — | 0.16 |
| D | 9.00 BSC | | |
| D1 | 7.00 BSC | | |
| E | 9.00 BSC | | |
| E1 | 7.00 BSC | | |
| e | 0.80 BSC | | |
| L | 0.45 | 0.60 | 0.75 |
| L1 | 1.00 | | |
| R1 | 0.08 | — | 0.20 |
| α° | 11 | — | 13 |
| β° | 0 | — | 7 |
| γ° | 0 | — | — |



ALL DIMENSIONS IN MM

| | | |
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