## DESCRIPTION

The LX5250/52 is a multimode SCSI terminator that is compatible with the SCSI SPI-2 (Ultra2 SCSI), SCSI SPI-3 (Ultra3 SCSI or Ultra160 SCSI), and SCSI SPI-4 (Ultra320) specifications developed by the T10 standards committee for low voltage differential (LVD) termination, while providing backwards compatibility to the SCSI, SCSI-2, and SPI single-ended specifications. Multimode compatibility permits the use of legacy devices on the bus without hardware alterations. Automatic mode selection is achieved through voltage detection on the Diffsense line.

The LX5250/52 utilizes an industry standard LVD architecture. The individual high bandwidth drivers maximize channel separation, reduce channel-to-channel noise and cross talk to insure Ultra320 performance.

When the LX5250/52 is enabled, the differential sense (DIFFSENSE) pin supplies a voltage between 1.2V and 1.4V. In application this pin is tied to the DIFFSENSE input of the corresponding LVD transceivers. This action enables the LVD transceiver function. DIFFSENSE is capable of supplying a maximum of 10mA.

Tying the DIFFSENSE pin high places the LX5250/52 in a HI Z state indicating the presence of an HVD device. Tying the pin low places the part in a single-ended mode while also signaling the multimode transceiver to operate in a single-ended mode.
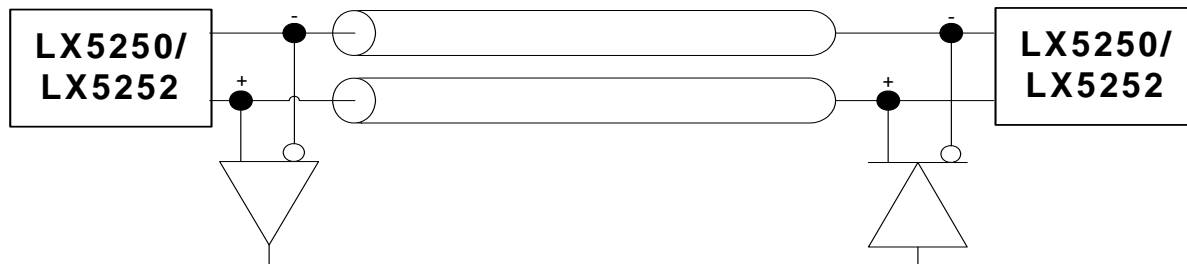
Recognizing the needs of portable and configurable peripherals, the LX5250/52 has a TTL compatible sleep/disable mode. During this sleep/disable mode, power dissipation is reduced to a meager 15uA while also placing all outputs in a HI Z state. Also during sleep/disable mode, the DIFFSENSE function is disabled and is placed in a HI Z state.

The LX5250/52 also provides a master / slave function. Driving this pin high or floating the pin enables the 1.3V DIFFSENSE reference. Driving the pin low disables the on board DIFFSENSE reference and enables use of an external master reference device.

**IMPORTANT:** For the most current data, consult *MICROSEMI*'s website: **http://www.microsemi.com**

## KEY FEATURES

- Compliant with SCSI SPI-2 (Ultra2), SPI-3 (Ultra160), and SPI-4 (Ultra320)
- Auto-Selectable LVD or Single-Ended Termination
- Fast Response, No Output Capacitors Required
- Compatible with Active Negation Drivers
- 15µA Supply Current in Disconnect Mode
- Logic Command Disconnects All Termination Lines
- Diffsense Line Driver
- Ground Driver Integrated for Single-Ended Operation
- Current Limit and Thermal Protection
- Hot-Swap Compatible (Single-Ended)
- Available in 36-pin QSOP and 28-pin TSSOP package
- LX5250, 36-pin QSOP: Pin Compatible With DS2118, UCC5630A and UCC5672
- LX5250 28-pin TSSOP: Pin Compatible with DS2119, and UCC5672

## PRODUCT HIGHLIGHT



## PACKAGE ORDER INFO

| T_A (°C) | **DB** QSOP 36-Pin RoHS Compliant / Pb-free Transition DC: 0535 | **PW** TSSOP 28-Pin RoHS Compliant / Pb-free Transition DC: 0518 |
|---|---|---|
| 0 to 70 | **LX5250CDB** **LX5252CDB** | **LX5250CPW** - |

Note: Available in Tape & Reel.
Append the letters "TR" to the part number. (i.e. LX5250CDB-TR)

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## ABSOLUTE MAXIMUM RATINGS

Term Power ($V_{TERM}$) ............................................................................................-0.3V to 7V
Operating Junction Temperature ................................................................................150°C
Storage Temperature Range………………………………………………..-65°C to 150°C
RoHS / Pb-free Peak Package Solder Reflow Temperature
(40 second maximum exposure).................................................................... 260°C (+0, -5)

Note:    Exceeding these ratings could cause damage to the device.  All voltages are with respect to
         Ground.  Currents are positive into, negative out of specified terminal.

## THERMAL DATA

| DB | 36 Pin QSOP | |
|----|-------------|---|
| THERMAL RESISTANCE-JUNCTION TO AMBIENT, $\theta_{JA}$ | | 53.9°C/W |

| PW | 28 Pin TSSOP | |
|----|--------------|---|
| THERMAL RESISTANCE-JUNCTION TO AMBIENT, $\theta_{JA}$ | | 100°C/W |

Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$.
The $\theta_{JA}$ numbers are guidelines for the thermal performance of the device/pc-board
system.  All of the above assume no ambient airflow.  $\theta_{JA}$ can vary significantly
depending on mounting technique.  (See Application Notes Section: Thermal
considerations)

## MASTER/SLAVE FUNCTION TABLE

| Master/Slave | DIFFSENSE Status | |
|--------------|------------------|---|
| L* | HI Z | 0mA |
| H | 1.3V | 10mA Source |
| Open (Pull-Up) | 1.3V | 10mA Source |

* When in Low state, terminator will sense state of DIFFSENSE line.

## PACKAGE PIN OUT



**LX5250/5252**

**DB PACKAGE**
(Top View)

N/C = Not internally connected



**LX5250 ONLY**

**PW PACKAGE**
(Top View)

N/C = Not internally connected

RoHS / Pb-free 100% Matte Tin Lead Finish

## DIFFSENSE/POWER UP/POWER DOWN FUNCTION TABLE

| LX5250 DISCONNECT | LX5252 DISCONNECT | DIFFSENSE | Outputs | | Quiescent Current |
|---|---|---|---|---|---|
| | | | Status | Type | |
| L | H | < 0.5V | Enable | SE | 55mA |
| L | H | 0.7V – 1.9V | Enable | LVD | 35mA |
| L | H | > 2.4V | Disable | HI-Z | 8mA |
| H or Open | L or Open | X | Disable | HI-Z | 10µA |

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PACKAGE DATA

## RECOMMENDED MAX OPERATING CONDITIONS

| Parameter | | Symbol | LX5250/52 | | | Units |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| VTerm | LVD | $V_{TERM}$ | 2.9 | | 5.25 | V |
| | SE | | 3.5 | | 5.25 | |
| Signal Line Voltage | | | 0 | | 5.0 | V |
| Disconnect Input Voltage | | | 0 | | $V_{TERM}$ | V |
| Operating Junction Temperature | | $T_J$ | 0 | | 125 | °C |

## ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the operating ambient temperature $0°C \le T_A \le 70°C$, VTerm = 4.75V. For the LX5250, DISCONNECT = L; for the LX5252, DISCONNECT = H.

| Parameter | Symbol | Test Conditions | LX5250/52 | | | Units |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| **LVD Terminator Section** | | | | | | |
| VTerm Supply Current | $LVD_{ICC}$ | All term lines open | | 35 | 45 | mA |
| | | LX5250: DISCONNECT > 2.0V; LX5252: $\overline{DISCONNECT}$ < 0.8V | | 15 | 35 | µA |
| Common Mode Voltage | $V_{CM}$ | | 1.125 | 1.25 | 1.375 | V |
| Offset Voltage | $V_{OS}$ | Open circuit between (-) and (+) terminals | 100 | 112 | 125 | mV |
| Differential Terminator Impedance | $Z_O$ | $V_{OUT}$ Differential = -1V to +1V | 100 | 105 | 110 | Ω |
| Common Mode Impedance | $Z_{CM}$ | 0.5V to 2V | 110 | 150 | 195 | Ω |
| Output Capacitance (Note 1) | $C_O$ | LX5250: DISCONNECT > 2.0V; LX5252: $\overline{DISCONNECT}$ < 0.8V | | | 3 | pF |
| Mode Change Delay | $t_{DF}$ | Diffsense = 1.4V to 0V | 100 | 115 | 300 | ms |
| **Diffsense Section** | | | | | | |
| Diffsense Output Voltage | $V_{DIFF}$ | | 1.2 | 1.3 | 1.4 | V |
| Diffsense Output Source Current | $I_{DIFF}$ | $V_{DIFF}$ = 0V | 5 | | 15 | mA |
| Diffsense Sink Current | $I_{SINK(DIFF)}$ | $V_{DIFF}$ = 2.75V | 20 | | 200 | µA |
| **Single Ended Section** | | | | | | |
| VTerm Supply Current | $SE_{ICC}$ | All tem lines = Open, Master/Slave = 0V | | 55 | 75 | mA |
| | | All tem lines = 0.2V, Master/Slave = 0V | | 250 | 290 | mA |
| | | LX5250: DISCONNECT > 2.0V; LX5252: $\overline{DISCONNECT}$ < 0.8V | | 15 | 35 | µA |
| Termination Output High Voltage | $V_O$ | | 2.5 | 2.85 | 3.1 | V |
| Output Current | $I_O$ | $V_{OUT}$ = 0.2V | 18.5 | 22.5 | 24 | mA |
| Sink Current | $I_{SINK}$ | $V_{OUT}$ = 4V, All lines | 40 | 65 | | mA |
| Output Capacitance (Note 1) | $C_O$ | DISC > 2.0V | | | 3 | pF |
| Output Leakage | $I_{DDQ}$ | LX5250: DISCONNECT > 2.0V; LX5252: $\overline{DISCONNECT}$ < 0.8V, $V_{LINE}$ = 0 to 4V, $T_A$ = 25° | | | 2 | µA |
| | $I_{HP}$ | LX5250: DISCONNECT > 2.0V; LX5252: $\overline{DISCONNECT}$ < 0.8V, $V_{TERM}$ = Open, $V_{LINE}$ = 2.7V, $T_A$ = 25° | | 1 | | µA |
| Ground Driver Impedance | $Z_G$ | I = 1mA | | | 100 | Ω |

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**ELECTRICALS**

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## ELECTRICAL CHARACTERISTICS

Unless otherwise specified, the following specifications apply over the operating ambient temperature $0°C \leq T_A \leq 70°C$, VTerm = 4.75V. For the LX5250, DISCONNECT = L; for the LX5252, DISCONNECT = H.

| Parameter | Symbol | Test Conditions | LX5250/52 Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **DISCONNECT Section** | | | | | | |
| Disconnect Thresholds | $V_{TH}$ | | 0.8 | | 2.0 | V |
| Input Current | $I_{IL}$ | LX5250: DISCONNECT = 0V; LX5252: $\overline{\text{DISCONNECT}}$ = 2.4V | | | 10 | µA |
| | $I_{IH}$ | LX5250: DISCONNECT = 2.4V; LX5252: $\overline{\text{DISCONNECT}}$ = 0V | | 100 | | nA |
| **MASTER/SLAVE Section** | | | | | | |
| Master/Slave Thresholds | $V_{TH(MS)}$ | | 0.8 | | 2.0 | V |
| Input Current | $I_{IL(MS)}$ | Master/Slave = 0V | | | 10 | µA |
| | $I_{IH(MS)}$ | Master/Slave = 2.4V | | 100 | | nA |

Note 1:  Guaranteed by design.

## BLOCK DIAGRAM
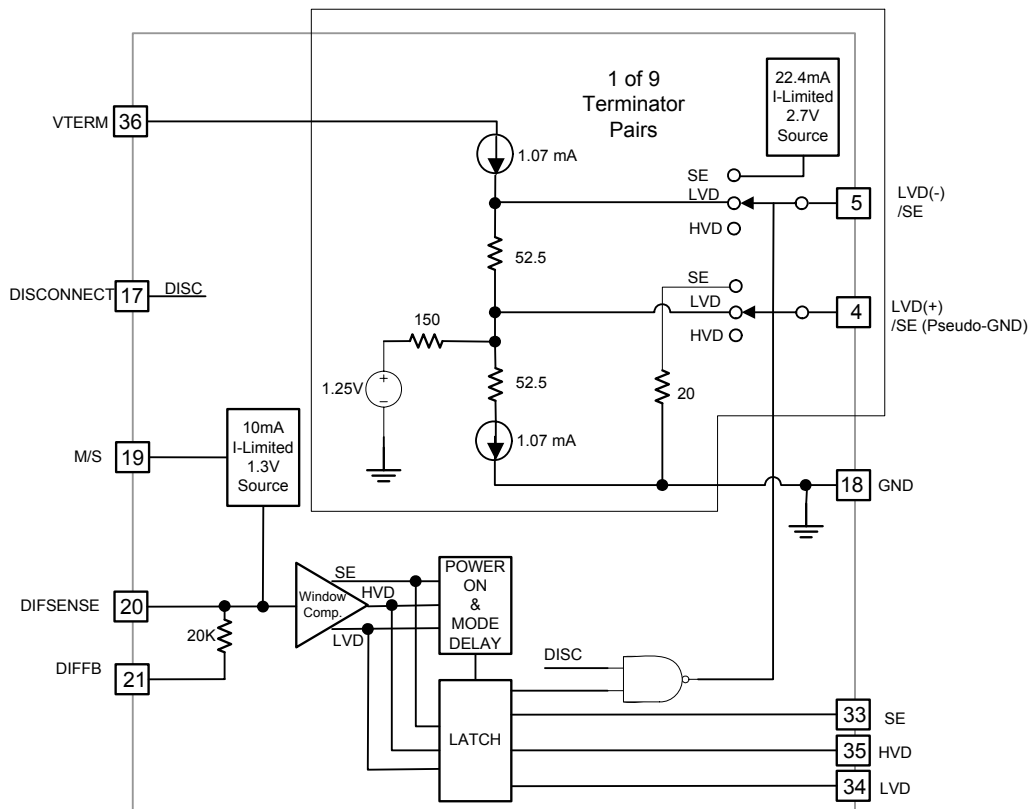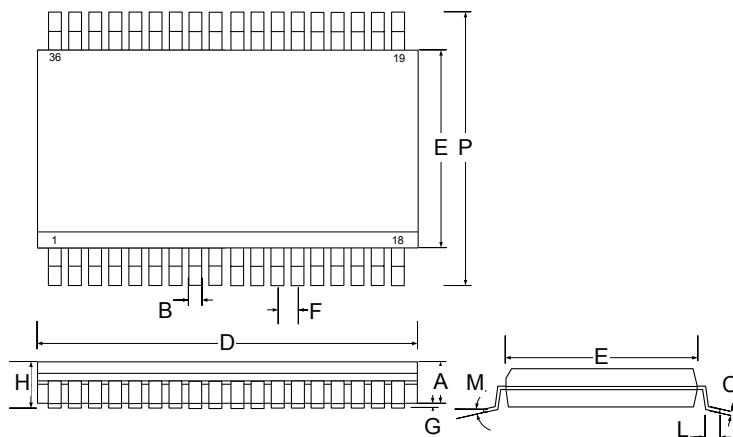


**Figure 1 –** LX5250/52 Block Diagram; 36-pin version shown

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## FUNCTIONAL PIN DESCRIPTION

| PIN NAME | DESCRIPTION |
|---|---|
| 1-, 2-, 3-, 4-, 5-, 6-, 7-, 8-, 9- | Negative signal termination lines for LVD mode. Signal termination lines for SE mode. |
| 1+, 2+, 3+, 4+, 5+, 6+, 7+, 8+, 9+ | Positive signal termination lines for LVD mode. Psuedo-ground lines for SE mode. |
| V$_{TERM}$ | Power supply pin for terminator. Connect to SCSI bus VTERM. Must be decoupled by one 4.7μF low-ESR capacitor for every three terminator devices. It is absolutely necessary to connect this pin to the decoupling capacitor through a very low impedance (big traces to PCB). Keeping distances very short from the decoupling capacitors is somewhat layout dependent and some applications may benefit from high frequency decoupling with 0.1μF capacitors at V$_{TERM}$ pin. |
| DISCONNECT | Enables/Disables terminator. See Power Down Function Table for logic levels for LX5250 and LX5252. |
| GND | Terminator ground pin. Connect to ground. |
| MASTER/SLAVE | Sometimes referred to as M/S pin in this datasheet. Used to select which terminator is the controlling device. M/S pin High or Open enables the DIFFSENSE output drive. Please see MASTER/SLAVE Function Table. |
| DIFFSENSE | This is a dual function pin. It drives the SCSI bus DIFFSENS line. It is also the sense pin to detect the SCSI bus mode (LVD, SE, or HVD). DIFFSENSE output drive can be disabled with low level on the M/S pin. Please see DIFFSENSE and MASTER/SLAVE Function Tables. Internally connected to DIFFB pin through a 20K Ω resistor. |
| DIFFB | Internally connected to DIFFSENSE pin through a 20K Ω resistor. It can be used as a mode sense pin when the device is non-controlling terminator (M/S is low). An RC filter (50K Ω resistor & 4.7μF) is not required on the LX5250 as it has an internal timer. |
| SE | Single-Ended output; when High, terminator is operating in SE mode. |
| LVD | Low Voltage Differential output; when High, terminator is operating in LVD mode. |
| HVD | High Voltage Differential output; when High, terminator is operating in HVD mode. |
| HEATSINK | Attached to die mounting pad, but not bonded to GND pin. Pins should be considered a heat sink only, and not a true ground connection. It is recommended that these pins be connected to ground, but can be left floating. |

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APPLICATION SCHEMATIC
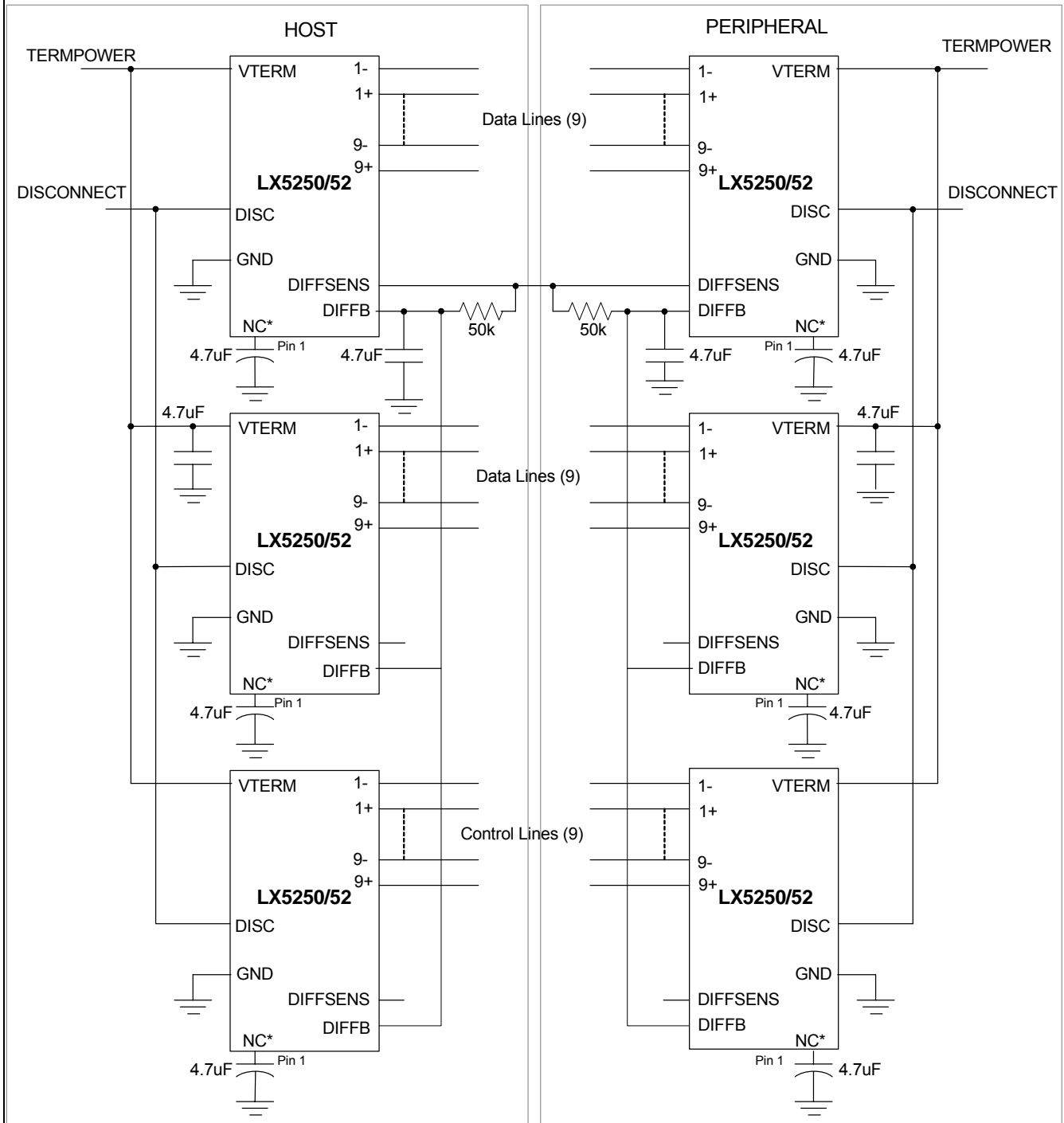


*The capacitor on pin 1 can be placed on the LX5250CDB, LX5250CPW, or LX5252CDB to be pin-compatible with other devices, but is not required.

**Figure 2 –** Application Diagram

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## MECHANICAL DRAWINGS

### DB — 36-Pin Quarter Size Outline Package (QSOP)



| Dim | MILLIMETERS | | INCHES | |
|-----|-----|-----|-----|-----|
| | **MIN** | **MAX** | **MIN** | **MAX** |
| A | 2.14 | 2.54 | 0.084 | 0.100 |
| B | 0.29 | 0.51 | 0.011 | 0.020 |
| C | 0.23 | 0.32 | 0.009 | 0.0125 |
| D | 15.20 | 15.40 | 0.598 | 0.606 |
| E | 7.40 | 7.60 | 0.291 | 0.299 |
| F | 0.80 BSC | | 0.031 BSC | |
| G | 0.10 | 0.30 | 0.004 | 0.012 |
| H | 2.44 | 2.64 | 0.096 | 0.104 |
| L | 0.51 | 1.01 | 0.020 | 0.040 |
| M | 0° | 8° | 0° | 8° |
| P | 10.11 | 10.51 | 0.398 | 0.004 |
| *LC | – | 0.10 | – | 0.004 |

*Lead Coplanarity

### PW — 28-Pin Thin Small Shrink Outline (TSSOP)
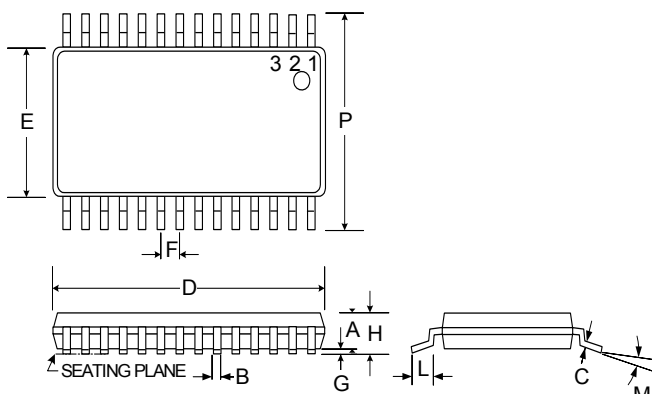


| Dim | MILLIMETERS | | INCHES | |
|-----|-----|-----|-----|-----|
| | **MIN** | **MAX** | **MIN** | **MAX** |
| A | 0.85 | 0.95 | 0.033 | 0.037 |
| B | 0.19 | 0.30 | 0.007 | 0.012 |
| C | 0.09 | 0.20 | 0.003 | 0.008 |
| D | 9.60 | 9.80 | 0.378 | 0.390 |
| E | 4.30 | 4.50 | 0.169 | .176 |
| F | 0.65 BSC | | 0.025 BSC | |
| G | 0.05 | 0.15 | 0.002 | 0.005 |
| H | – | 1.10 | – | 0.043 |
| L | 0.50 | 0.75 | 0.020 | 0.030 |
| M | 0° | 8° | 0° | 8° |
| P | 6.25 | 6.50 | 0.246 | 0.256 |
| *LC | – | 0.10 | – | 0.004 |

**Note:**
1. Dimensions do not include mold flash or protrusions; these shall not exceed 0.155mm(.006") on any side. Lead dimension shall not include solder coverage.

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