

**DESCRIPTION**

The LX5251 is a multimode SCSI terminator that is compatible with the SCSI SPI-2 (Ultra2), SCSI SPI-3 (Ultra3 or Ultra160), 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 LX5251 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 LX5251 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 15mA.

Tying the DIFFSENSE pin high places the LX5251 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.

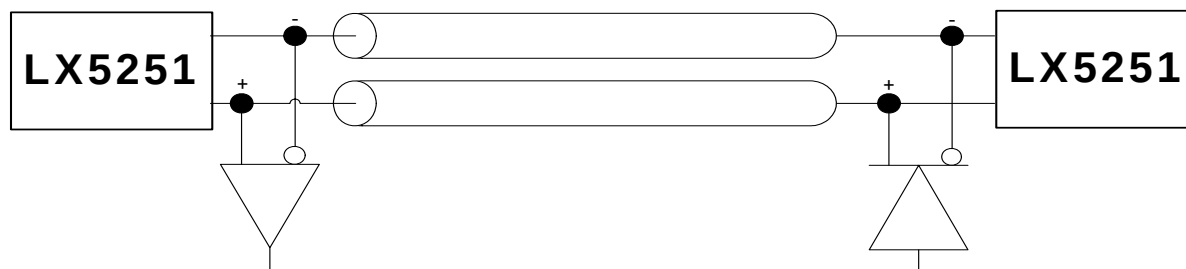
Recognizing the needs of portable and configurable peripherals, the LX5251 has a TTL compatible sleep/disable mode. During this sleep/disable mode, power dissipation is reduced to a meager 15uA while also placing all outputs in a HI-Z state. Also during sleep/disable mode, the DIFFSENSE function is disabled and is placed in a HI-Z state.

The LX5251 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.

**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 24-pin TSSOP Package

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

**PRODUCT HIGHLIGHT**

**PACKAGE ORDER INFO**

|                           |           |                          |
|---------------------------|-----------|--------------------------|
| <b>T<sub>A</sub> (°C)</b> | <b>PW</b> | <b>Plastic TSSOP</b>     |
|                           |           | <b>24-Pin</b>            |
|                           |           | RoHS Compliant / Pb-free |
|                           |           | Transition DC: 0442      |
| <b>0 to 70</b>            |           | <b>LX5251CPW</b>         |

Note: Available in Tape & Reel. Append the letters "TR" to the part number. (i.e. LX5251CPW-TR)

**ABSOLUTE MAXIMUM RATINGS**

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

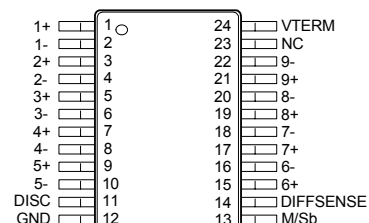
Note: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of specified terminal.

**THERMAL DATA**
**PW 24 Pin Plastic 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.

**PACKAGE PIN OUT**


**PW PACKAGE**  
(Top View)

N/C = Not internally connected

RoHS / Pb-free 100% Matte Tin Lead Finish

**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 DIFFSENS line.

**DIFFSENSE/POWER UP/POWER DOWN FUNCTION TABLE**

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

**RECOMMENDED MAX OPERATING CONDITIONS**

| Parameter                      | Symbol         | LX5251 |     |                   | Units |
|--------------------------------|----------------|--------|-----|-------------------|-------|
|                                |                | Min    | Typ | Max               |       |
| VTerm                          | LVD            | 2.9    |     | 5.25              | V     |
|                                | SE             | 3.5    |     | 5.25              | V     |
| Signal Line Voltage            |                | 0      |     | 5.0               | V     |
| Disconnect Input Voltage       |                | 0      |     | V <sub>TERM</sub> | V     |
| Operating Junction Temperature | T <sub>J</sub> | 0      |     | 125               | °C    |

**ELECTRICAL CHARACTERISTICS**

Unless otherwise specified, the following specifications apply over the operating ambient temperature  $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$ , VTerm = 4.75V, and DISC = L.

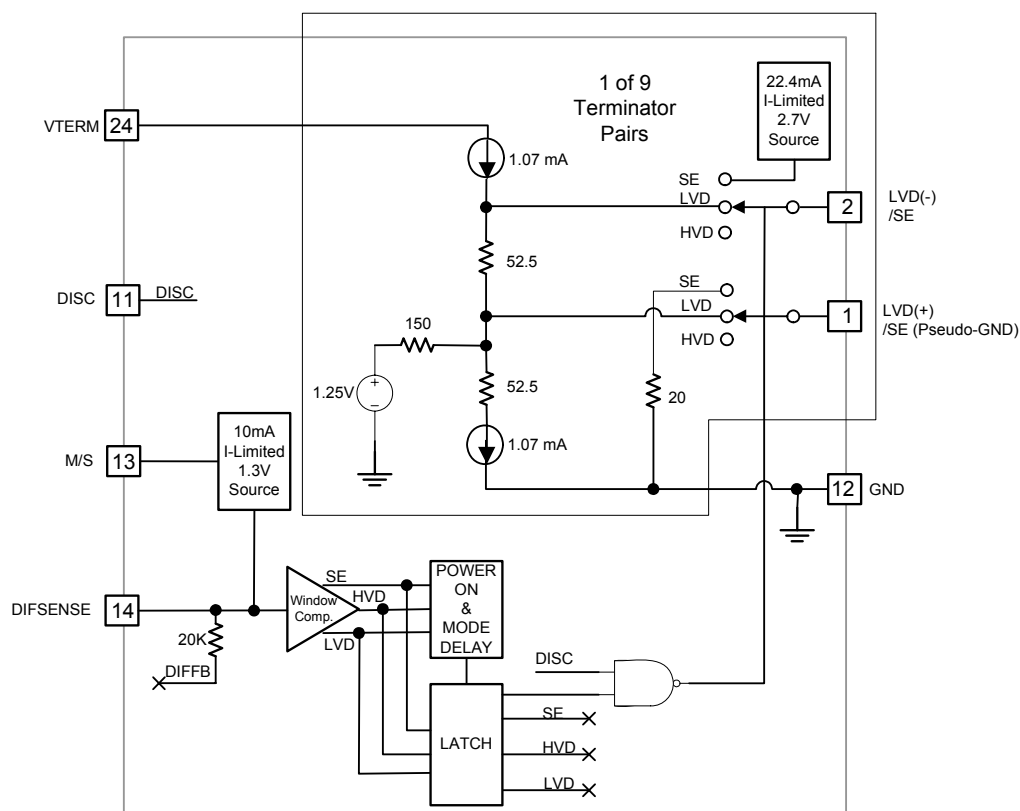
| Parameter                         | Symbol                  | Test Conditions                                                                                                         | LX5251 |                 |                 | Units          |
|-----------------------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------|--------|-----------------|-----------------|----------------|
|                                   |                         |                                                                                                                         | Min    | Typ             | Max             |                |
| ▶ LVD Terminator Section          |                         |                                                                                                                         |        |                 |                 |                |
| VTerm Supply Current              | LVD <sub>ICC</sub>      | All term lines open<br>DISC > 2.0V                                                                                      |        | 35<br>15        | 45<br>35        | mA<br>μA       |
| Common Mode Voltage               | V <sub>CM</sub>         |                                                                                                                         | 1.125  | 1.25            | 1.375           | V              |
| Offset Voltage                    | V <sub>OS</sub>         | Open circuit between (-) and (+) terminals                                                                              | 100    | 112             | 125             | mV             |
| Differential Terminator Impedance | Z <sub>O</sub>          | V <sub>OUT</sub> Differential = -1V to +1V                                                                              | 100    | 105             | 110             | Ω              |
| Common Mode Impedance             | Z <sub>CM</sub>         | 0.5V to 2V                                                                                                              | 110    | 150             | 195             | Ω              |
| Output Capacitance (Note 1)       | C <sub>O</sub>          | DISC > 2.0V                                                                                                             |        |                 | 3               | pF             |
| Mode Change Delay                 | t <sub>DF</sub>         | Diffsense = 1.4V to 0V                                                                                                  | 100    | 115             | 300             | ms             |
| ▶ Diffsense Section               |                         |                                                                                                                         |        |                 |                 |                |
| Diffsense Output Voltage          | V <sub>DIFF</sub>       |                                                                                                                         | 1.2    | 1.3             | 1.4             | V              |
| Diffsense Output Source Current   | I <sub>DIFF</sub>       | V <sub>DIFF</sub> = 0V                                                                                                  | 5      |                 | 15              | mA             |
| Diffsense Sink Current            | I <sub>SINK(DIFF)</sub> | V <sub>DIFF</sub> = 2.75V                                                                                               | 20     |                 | 200             | μA             |
| ▶ Single Ended Section            |                         |                                                                                                                         |        |                 |                 |                |
| VTerm Supply Current              | SE <sub>ICC</sub>       | All tem lines = Open, Master/Slave = 0V<br>All tem lines = 0.2V, Master/Slave = 0V<br>DISC > 2.0V; T <sub>A</sub> = 25° |        | 55<br>250<br>15 | 75<br>290<br>35 | mA<br>mA<br>μA |
| Termination Output High Voltage   | V <sub>O</sub>          |                                                                                                                         | 2.5    | 2.7             | 3.1             | V              |
| Output Current                    | I <sub>O</sub>          | V <sub>OUT</sub> = 0.2V                                                                                                 | 18.5   | 22.5            | 24              | mA             |
| Sink Current                      | I <sub>SINK</sub>       | V <sub>OUT</sub> = 4V, All lines                                                                                        | 40     | 65              |                 | mA             |
| Output Capacitance (Note 1)       | C <sub>O</sub>          | DISC > 2.0V                                                                                                             |        |                 | 3               | pF             |
| Output Leakage                    | I <sub>DDQ</sub>        | DISC > 2.0V ; V <sub>LINE</sub> = 0 to 4V, T <sub>A</sub> = 25°                                                         |        |                 | 2               | μA             |
|                                   | I <sub>HP</sub>         | DISC > 2.0V ;V <sub>TERM</sub> = Open, V <sub>LINE</sub> = 2.7V, T <sub>A</sub> = 25°                                   |        | 1               |                 | μA             |
| Ground Driver Impedance           | Z <sub>G</sub>          | I = 1mA                                                                                                                 |        |                 | 100             | Ω              |

**ELECTRICAL CHARACTERISTICS (CONTINUED)**

Unless otherwise specified, the following specifications apply over the operating ambient temperature  $0^{\circ}\text{C} \leq T_A \leq 125^{\circ}\text{C}$ ,  $V_{\text{Term}} = 4.75\text{V}$ , and DISCONNECT = L.

| Parameter               | Symbol              | Test Conditions     | LX5251 |     |     | Units |
|-------------------------|---------------------|---------------------|--------|-----|-----|-------|
|                         |                     |                     | Min    | Typ | Max |       |
| ► DISCONNECT Section    |                     |                     |        |     |     |       |
| Disconnect Thresholds   | V <sub>TH</sub>     |                     | 0.8    |     | 2.0 | V     |
| Input Current           | I <sub>IL</sub>     | DISC = 0V           |        | 100 |     | nA    |
|                         | I <sub>IH</sub>     | DISC = 2.4V         |        |     | 10  | µA    |
| ► MASTER/SLAVE Section  |                     |                     |        |     |     |       |
| Master/Slave Thresholds | V <sub>TH(MS)</sub> |                     | 0.8    |     | 2.0 | V     |
| Input Current           | I <sub>IL(MS)</sub> | Master/Slave = 0V   |        |     | 10  | µA    |
|                         | I <sub>IH(MS)</sub> | Master/Slave = 2.4V |        | 100 |     | nA    |

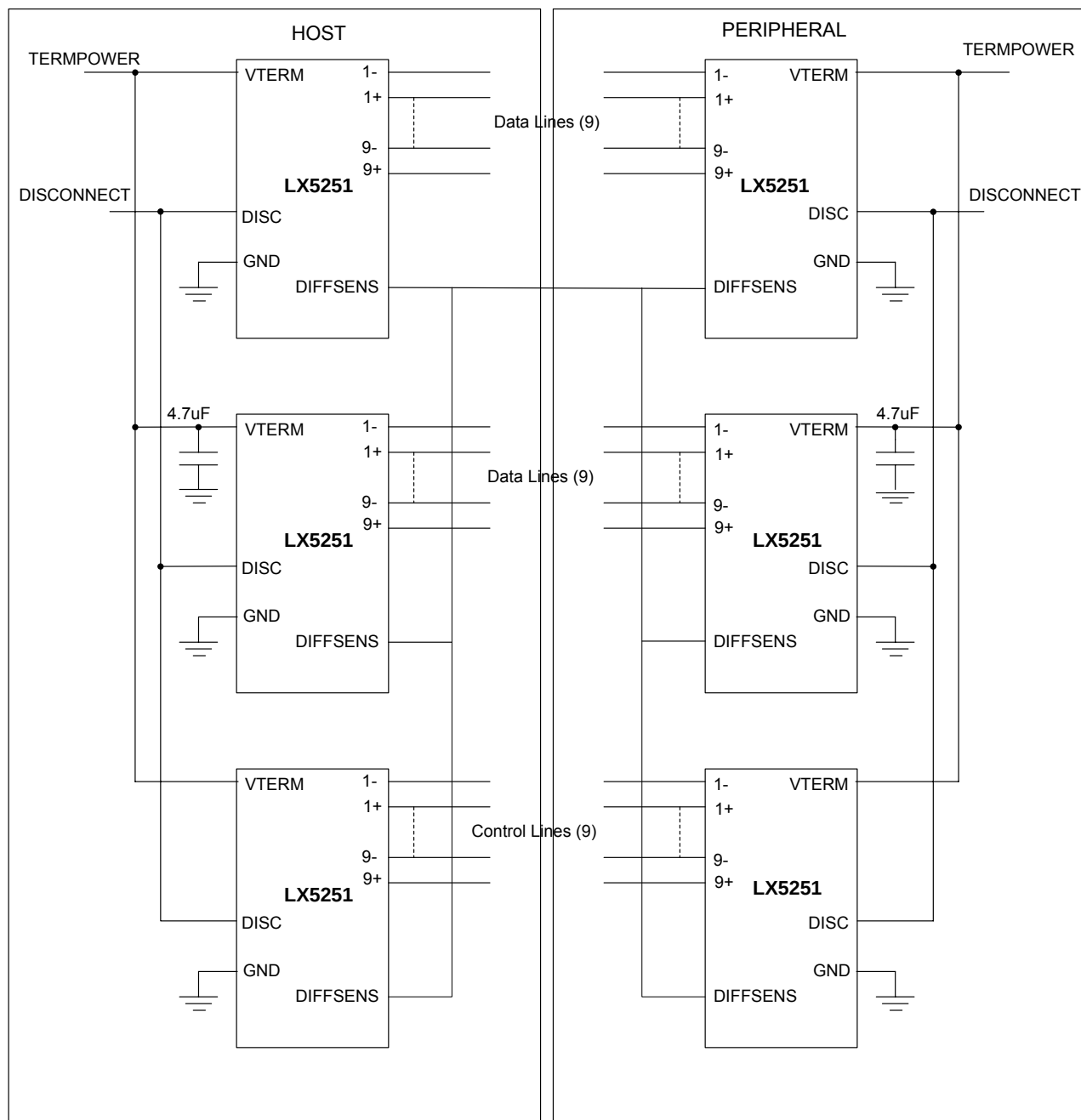
Note 1: Guaranteed by design.

**BLOCK DIAGRAM**


**Figure 1 – LX5251 Block Diagram**

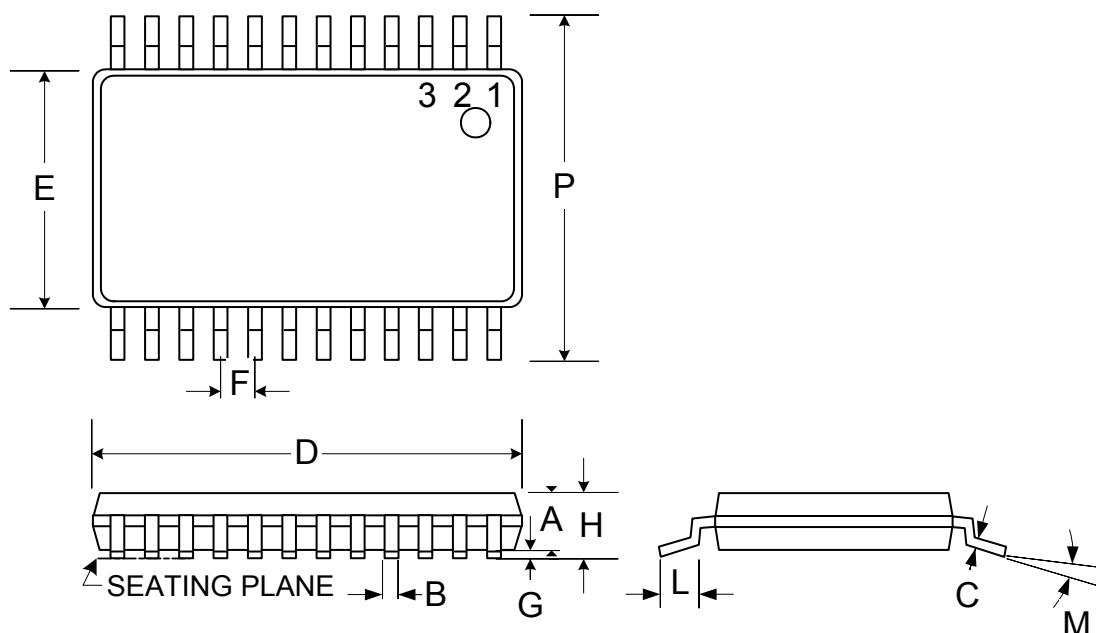
**FUNCTIONAL PIN DESCRIPTION**

| 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 <sub>TERM</sub>                  | Power supply pin for terminator. Connect to SCSI bus VTERM. Musts be decoupled by one 4.7 $\mu$ F 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 0.1 $\mu$ F capacitors at V <sub>TERM</sub> pin. |
| DISCONNECT                         | Enables/Disables terminator. See Power Down Function Table for logic levels.                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 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. Note: Must connect Diffsense signal to Diffsense pin of LX5251.                                                                                                                                                              |

**APPLICATION SCHEMATIC**


\* DIFFB pin not present on the LX5251CPW. Must connect DiffSense signal to DiffSens pin of each terminator.

**Figure 2 – Microsemi Application Schematic**

**MECHANICAL DRAWINGS**
**PW 24-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 | 0.0035    | 0.008 |
| D   | 7.70        | 7.90 | 0.303     | 0.311 |
| E   | 4.30        | 4.50 | 0.169     | 0.177 |
| F   | 0.65 BSC    |      | 0.025 BSC |       |
| G   | 0.05        | 0.15 | 0.002     | 0.005 |
| H   | —           | 1.10 | —         | .0433 |
| L   | 0.50        | 0.75 | 0.020     | 0.030 |
| M   | 0°          | 8°   | 0°        | 8°    |
| P   | 6.25        | 6.55 | 0.246     | 0.256 |
| *LC | —           | 0.10 | —         | 0.004 |

\* Lead Coplanarity

**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.



LX5251

9-Line Multimode SCSI Terminator

PRODUCTION DATA SHEET

NOTES

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