

# LCDA12C-8 and LCDA15C-8 Low Capacitance TVS Diode Array For Multi-mode Transceiver Protection

### **PROTECTION PRODUCTS**

### Description

The LCDAxxC-8 has been specifically designed to protect sensitive components which are connected to data and transmission lines from over voltages caused by electrostatic discharge **(ESD)**, electrical fast transients **(EFT)**, and **lightning**.

The low capacitance array configuration of the LCDAxxC-8 allows the user to protect eight high-speed data or I/O lines. They may be used on systems operating from 5 to 15 Volts. The high surge capability (500W, tp=8/20µs) makes the LCDAxxC-8 suitable for telecommunications systems operating in harsh transient environments. The low inductance construction minimizes voltage overshoot during high current surges.

The features of the LCDAxxC-8 are ideal for protecting multi-protocol transceivers in WAN applications such as Frame Relay systems, routers, and switches.

### Features

- Transient protection for high-speed data lines to IEC 61000-4-2 (ESD) ±15kV (air), ±8kV (contact) IEC 61000-4-4 (EFT) 40A (5/50ns) IEC 61000-4-5 (Lightning) 0.5kV, 12A (8/20µs)
- Protects eight I/O lines
- Low capacitance for high-speed interfaces
- High surge capability
- Low clamping voltage
- Solid-state silicon avalanche technology

### **Mechanical Characteristics**

- ◆ JEDEC SO-16 package
- Molding compound flammability rating: UL 94V-0
- Marking : Part number, date code, logo
- Packaging : Tape and Reel per EIA 481

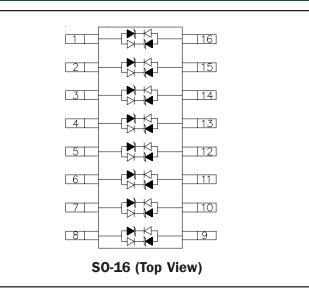
### Applications

- ◆ Multi-Mode Transceiver Protection
- WAN Equipment: CSU/DSU Multiplexers Routers ISP Equipment Customer Premise Equipment
  Protection for any of the following interfaces:
  - RS-232 (V.28) RS-422 (V.11, X.21)

RS-449 (V.11/V.10)

# Circuit Diagram

### Schematic & PIN Configuration



Revision 02/18/05



### **PROTECTION PRODUCTS**

Absolute Maximum Rating

| Rating                                 | Symbol           | Value         | Units |
|--|------------------|---------------|-------|
| Peak Pulse Power ( $t_p = 8/20\mu s$ ) | P <sub>pk</sub>  | 500           | Watts |
| Lead Soldering Temperature             | T                | 260 (10 sec.) | °C    |
| Operating Temperature                  | Tj               | -55 to +125   | °C    |
| Storage Temperature                    | Т <sub>sтg</sub> | -55 to +150   | °C    |

### **Electrical Characteristics**

| LCDA12C-8                 |                  |   |         |         |         |       |
|---------------------------|------------------|---|---------|---------|---------|-------|
| Parameter                 | Symbol           | Conditions  | Minimum | Typical | Maximum | Units |
| Reverse Stand-Off Voltage | V <sub>RWM</sub> |   |         |         | 12      | V     |
| Reverse Breakdown Voltage | V <sub>BR</sub>  | I <sub>t</sub> = 1mA  | 13.3    |         |         | V     |
| Reverse Leakage Current   | I <sub>R</sub>   | V <sub>RWM</sub> = 12V, T=25°C                                  |         |         | 5       | μA    |
| Clamping Voltage          | V <sub>c</sub>   | $I_{pp} = 5A, t_p = 8/20 \mu s$                                 |         |         | 19      | V     |
| Clamping Voltage          | V <sub>c</sub>   | $I_{pp} = 20A, t_p = 8/20\mu s$                                 |         |         | 26.6    | V     |
| Peak Pulse Current        | I <sub>pp</sub>  | t <sub>p</sub> = 8/20μs   |         |         | 20      | А     |
| Junction Capacitance      | C <sub>j</sub>   | Between I/O pins and<br>Ground<br>V <sub>R</sub> = OV, f = 1MHz |         | 8       | 15      | pF    |

| LCDA15C-8                 |                  |   |         |         |         |       |
|---------------------------|------------------|---|---------|---------|---------|-------|
| Parameter                 | Symbol           | Conditions  | Minimum | Typical | Maximum | Units |
| Reverse Stand-Off Voltage | V <sub>RWM</sub> |   |         |         | 15      | V     |
| Reverse Breakdown Voltage | V <sub>BR</sub>  | I <sub>t</sub> = 1mA  | 16.7    |         |         | V     |
| Reverse Leakage Current   | I <sub>R</sub>   | V <sub>RWM</sub> = 15V, T=25°C                                  |         |         | 5       | μA    |
| Clamping Voltage          | V <sub>c</sub>   | I <sub>PP</sub> = 1A, t <sub>p</sub> = 8/20μs                   |         |         | 24      | V     |
| Clamping Voltage          | V <sub>c</sub>   | I <sub>pp</sub> = 15Α, t <sub>p</sub> = 8/20μs                  |         |         | 33      | V     |
| Peak Pulse Current        | I <sub>PP</sub>  | t <sub>p</sub> = 8/20μs   |         |         | 15      | А     |
| Junction Capacitance      | C <sub>j</sub>   | Between I/O pins and<br>Ground<br>V <sub>R</sub> = OV, f = 1MHz |         | 8       | 15      | pF    |

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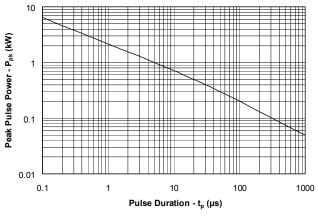
**Power Derating Curve** 



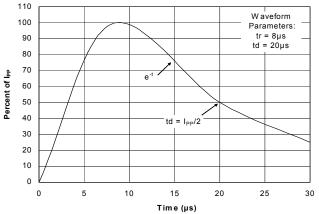
# **PROTECTION PRODUCTS**

### **Typical Characteristics**

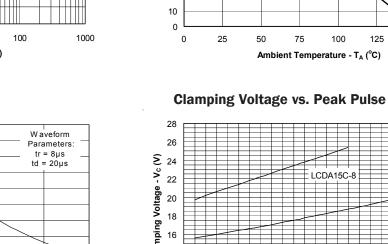
### Non-Repetitive Peak Pulse Power vs. Pulse Time



### **Pulse Waveform**



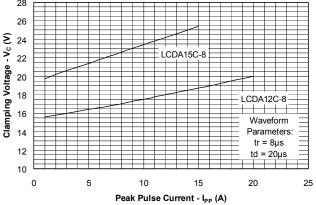
LCDA12C-8 Capacitance vs. Reverse Voltage



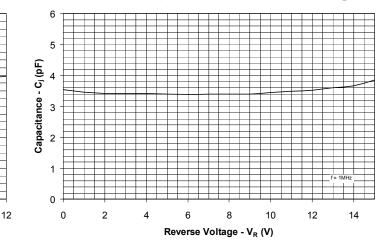
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% of Rated Power or

**Clamping Voltage vs. Peak Pulse Current** 



LCDA15C-8 Capacitance vs. Reverse Voltage



f = 1MHz Reverse Voltage - V<sub>R</sub> (V)

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Capacitance - C<sub>i</sub> (pF)



# PROTECTION PRODUCTS

### Applications Information

### Device Connection Options for Protection of Eight High-Speed Data Lines

The LCDAxxC-8 may be configured to protect up to eight I/O lines operating between 5 and 15V. It may be used to protect the most popular serial data interface standard lines making it ideal for use in equipment utilizing multi-mode transceivers. The LCDAxxC-8 is symmetrical so the data lines may be connected at pins 1-8 or 9-16. Pins 9-16 or 1-8 are connected to ground as shown. For best results, these pins should be connected directly to a ground plane on the board. The path length should be kept as short as possible to minimize parasitic inductance.

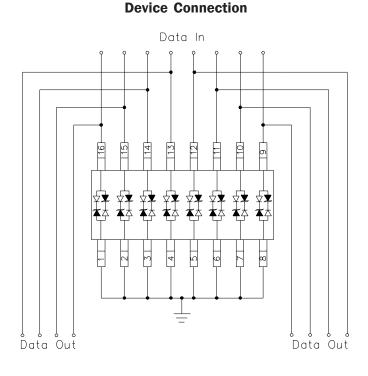
### **Multi-Mode Transceiver Protection**

The LCDAxxC-8 may be used to protect multi-mode transceiver I/O lines with external connections. The LCDAxxC-8 adds a maximum loading capacitance of 15pF with a working voltage of 12V or 15V. This allows the transceiver to safely operate in all modes without clipping or degradation of the signal. With proper design and layout, the transceiver port can be protected to >15kV (HBM per IEC 61000-4-2).

# **Circuit Board Layout Recommendations for Suppression of ESD.**

Good circuit board layout is critical for the suppression of fast rise-time transients such as ESD. The following guidelines are recommended:

- Place the LCDAxxC-8 near the input terminals or connectors to restrict transient coupling.
- Minimize the path length between the LCDAxxC-8 and the protected line.
- Minimize all conductive loops including power and ground loops.
- The ESD transient return path to ground should be kept as short as possible.
- Never run critical signals near board edges.
- Use ground planes whenever possible.



### Matte Tin Lead Finish

Matte tin has become the industry standard lead-free replacement for SnPb lead finishes. A matte tin finish is composed of 100% tin solder with large grains. Since the solder volume on the leads is small compared to the solder paste volume that is placed on the land pattern of the PCB, the reflow profile will be determined by the requirements of the solder paste. Therefore, these devices are compatible with both lead-free and SnPb assembly techniques. In addition, unlike other lead-free compositions, matte tin does not have any added alloys that can cause degradation of the solder joint.

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1.75

0.25

1.65

0.51

0.25

8°

(1.04)

16

0.10

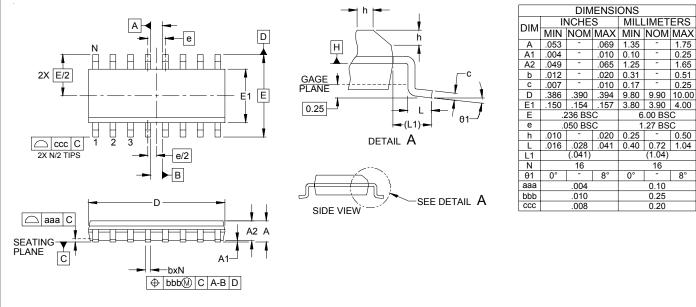
0.25

0.20



# **PROTECTION PRODUCTS**

Outline Drawing - SO-16

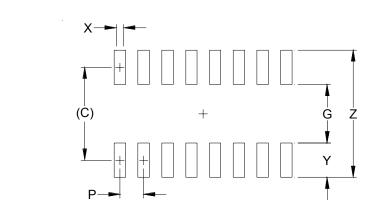


### NOTES:

1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).

- 2. DATUMS -A- AND -B- TO BE DETERMINED AT DATUM PLANE -H-
- DIMENSIONS "E1" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. 3.
- 4. REFERENCE JEDEC STD MS-012, VARIATION AC.

### Land Pattern - SO-16



| DIMENSIONS |        |             |  |  |
|------------|--------|-------------|--|--|
| DIM        | INCHES | MILLIMETERS |  |  |
| С          | (.205) | (5.20)      |  |  |
| G          | .118   | 3.00        |  |  |
| Р          | .050   | 1.27        |  |  |
| X          | .024   | 0.60        |  |  |
| Y          | .087   | 2.20        |  |  |
| Z          | .291   | 7.40        |  |  |

### NOTES:

- 1. THIS LAND PATTERN IS FOR REFERENCE PURPOSES ONLY. CONSULT YOUR MANUFACTURING GROUP TO ENSURE YOUR COMPANY'S MANUFACTURING GUIDELINES ARE MET.
- 2. REFERENCE IPC-SM-782A, RLP NO. 304A.

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# SEMTECH

# LCDA12C-8 and LCDA15C-8

### **PROTECTION PRODUCTS**

# Ordering Information

| Part Number   | Lead Finish | Qty per<br>Reel | Reel Size |
|---------------|-------------|-----------------|-----------|
| LCDA12C-8.TB  | SnPb        | 500             | 7 Inch    |
| LCDA15C-8.TB  | SnPb        | 500             | 7 Inch    |
| LCDA12C-8.TBT | Pb Free     | 500             | 7 Inch    |
| LCDA15C-8.TBT | Pb Free     | 500             | 7 Inch    |
| LCDA12C-8     | SnPb        | 48/Tube         | N/A       |
| LCDA15C-8     | SnPb        | 48/Tube         | N/A       |
| LCDA12C-8.T   | Pb Free     | 48/Tube         | N/A       |
| LCDA15C-8.T   | Pb Free     | 48/Tube         | N/A       |

### **Contact Information**

Semtech Corporation Protection Products Division 200 Flynn Road, Camarillo, CA 93012 Phone: (805)498-2111 FAX (805)498-3804