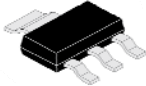


# NPN Switching Transistor

# MPSA44U



SOT-89

**SOT-89**  
**Surface mount**  
**Plastic Package**  
**RoHS compliant**

## FEATURES:

1. Collector-Emitter voltage:  $V_{CEO}=400V$
  2. Collector current up to 300mA
  3. Complement to MPSA94
  4. This product is available in AEC-Q101 Compliant and PPAP Capable also.
- Note:** For AEC-Q101 compliant products, please use suffix -AQ in the part number while ordering.

## APPLICATIONS:

1. Telephone switching
2. High voltage switch

## ABSOLUTE MAXIMUM RATINGS ( $T_a = 25 \text{ }^\circ\text{C}$ )

| Parameter                   | Symbol    | Value                    | Unit             |    |
|-----------------------------|-----------|--------------------------|------------------|----|
| Collector Base Voltage      | $V_{CBO}$ | 500                      | V                |    |
| Collector Emitter Voltage   | $V_{CEO}$ | 400                      |                  |    |
| Emitter Base Voltage        | $V_{EBO}$ | 6                        |                  |    |
| Collector Current           | $I_C$     | 300                      | mA               |    |
| Collector Power Dissipation | $P_C$     | $T_a = 25^\circ\text{C}$ | 625              | mW |
|                             |           | $T_C = 25^\circ\text{C}$ | 1.5              | W  |
| Junction Temperature        | $T_j$     | +150                     | $^\circ\text{C}$ |    |
| Storage Temperature         | $T_{stg}$ | -55 ~ +150               | $^\circ\text{C}$ |    |



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### ELECTRICAL CHARACTERISTICS at $T_a = 25 \text{ }^\circ\text{C}$

| Parameter                            | Symbol        | Test Conditions                           | Value |      |      | UNIT |
|--------------------------------------|---------------|---|-------|------|------|------|
|                                      |               |   | Min.  | Typ. | Max. |      |
| Collector-base breakdown voltage     | $V_{(BR)CBO}$ | $I_C=100\mu\text{A}, I_E=0$               | 500   | --   | --   | V    |
| Collector-emitter breakdown voltage  | $V_{(BR)CEO}$ | $I_C=1\text{mA}, I_B=0$                   | 400   | --   | --   |      |
| Emitter-base breakdown voltage       | $V_{(BR)EBO}$ | $I_E = 100\mu\text{A}, I_C = 0$           | 6     | --   | --   |      |
| Collector cut-off current            | $I_{CBO}$     | $V_{CB} = 400\text{V}, I_E = 0$           | --    | --   | 100  | nA   |
| Collector cut-off current            | $I_{CES}$     | $V_{CB} = 400\text{V}, I_E = 0$           | --    | --   | 500  |      |
| Emitter cut-off current              | $I_{EBO}$     | $V_{CB} = 400\text{V}, I_C = 0$           | --    | --   | 100  |      |
| DC current gain                      | $h_{FE(1)}$   | $V_{CE} = 10\text{V}, I_C = 1\text{mA}$   | 40    | --   | --   |      |
|                                      | $h_{FE(2)}$   | $V_{CE} = 10\text{V}, I_C = 10\text{mA}$  | 50    | --   | 240  |      |
|                                      | $h_{FE(3)}$   | $V_{CE} = 10\text{V}, I_C = 50\text{mA}$  | 45    | --   | --   |      |
|                                      | $h_{FE(4)}$   | $V_{CE} = 10\text{V}, I_C=100\text{mA}$   | 40    | --   | --   |      |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C = 1\text{mA}, I_B= 0.1\text{mA}$     | --    | --   | 0.4  | V    |
|                                      |               | $I_C = 1\text{mA}, I_B= 0.1\text{mA}$     | --    | --   | 0.5  |      |
|                                      |               | $I_C = 50\text{mA}, I_B= 5\text{mA}$      | --    | --   | 0.75 |      |
| Base-emitter saturation voltage      | $V_{BE(sat)}$ | $I_C = 10\text{mA}, I_B=1\text{mA}$       | --    | --   | 0.75 |      |
| Transition frequency                 | $f_T$         | $V_{CE} = 20\text{V}, I_C = 10\text{mA},$ | 50    | --   | --   | MHz  |
| Output capacitance                   | $C_{ob}$      | $V_{CB} = 20\text{V}, I_E = 0,$           | --    | --   | 7    | pF   |

### THERMAL RESISTANCE

| Description         | Symbol        | Value | Unit               |
|---------------------|---------------|-------|--------------------|
| Junction to Case    | $R_{th(J-C)}$ | 83.33 | $^\circ\text{C/W}$ |
| Junction to Ambient | $R_{th(J-A)}$ | 200   | $^\circ\text{C/W}$ |

### Notes:

1. Pulse test:  $PW < 300\mu\text{s}$ , Duty Cycle  $< 2\%$

### Recommended Reflow Solder Profiles

The recommended reflow solder profiles for Pb and Pb-free devices are shown below.

Figure 1 shows the recommended solder profile for devices that have Pb-free terminal plating, and where a Pb-free solder is used.

Figure 2 shows the recommended solder profile for devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with a leaded solder.

Figure 1

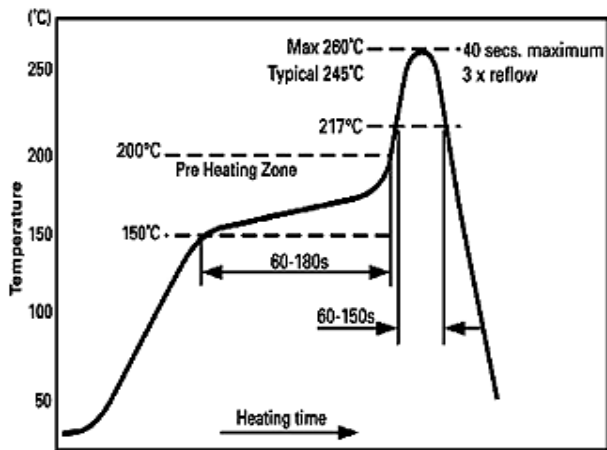
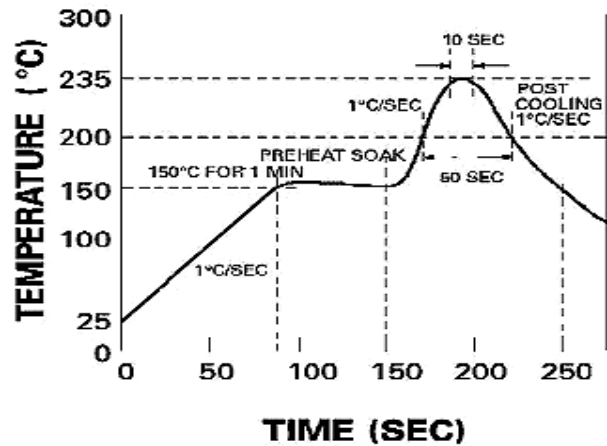


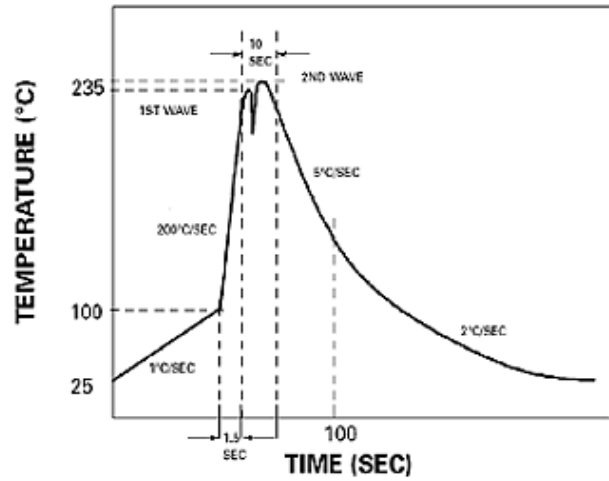
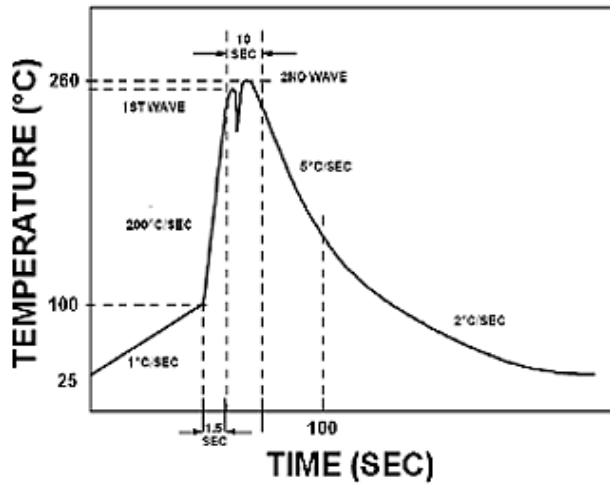
Figure 2



| Reflow profiles in tabular form    |                 |                 |
|------------------------------------|-----------------|-----------------|
| Profile Feature                    | Sn-Pb System    | Pb-Free System  |
| Average Ramp-Up Rate               | ~3°C/second     | ~3°C/second     |
| <b>Preheat</b>                     |                 |                 |
| – Temperature Range                | 150-170°C       | 150-200°C       |
| – Time                             | 60-180 seconds  | 60-180 seconds  |
| Time maintained above:             |                 |                 |
| – Temperature                      | 200°C           | 217°C           |
| – Time                             | 30-50 seconds   | 60-150 seconds  |
| Peak Temperature                   | 235°C           | 260°C max.      |
| Time within +0 -5°C of actual Peak | 10 seconds      | 40 seconds      |
| Ramp-Down Rate                     | 3°C/second max. | 6°C/second max. |

**Recommended Wave Solder Profiles**

|  |  |
|--|--|
| <p>The Recommended solder Profile For Devices with Pb-free terminal plating where a Pb-free solder is used</p> | <p>The Recommended solder Profile For Devices with Pb-free terminal plating used with leaded solder, or for devices with leaded terminal plating used with leaded solder</p> |
|--|--|



| Wave Profiles in Tabular Form      |                             |                             |
|------------------------------------|-----------------------------|-----------------------------|
| Profile Feature                    | Sn-Pb System                | Pb-Free System              |
| Average Ramp-Up Rate               | ~200°C/second               | ~200°C/second               |
| Heating rate during preheat        | Typical 1-2, Max 4°C/sec    | Typical 1-2, Max 4°C/Sec    |
| Final preheat Temperature          | Within 125°C of Solder Temp | Within 125°C of Solder Temp |
| Peak Temperature                   | 235°C                       | 260°C max.                  |
| Time within +0 -5°C of actual Peak | 10 seconds                  | 10 seconds                  |
| Ramp-Down Rate                     | 5°C/second max.             | 5°C/second max              |

### Typical Characteristic curves

Fig. 1. DC Current Gain

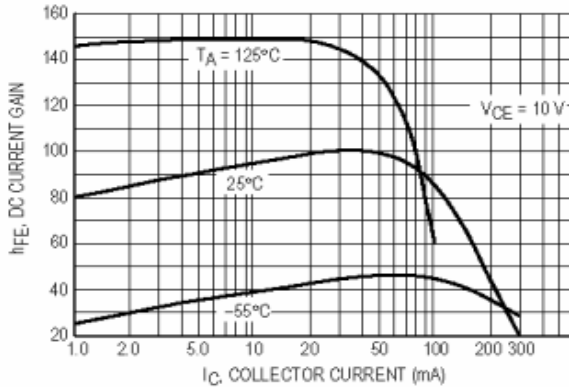


Fig. 4. Active region, Safe Operating Area

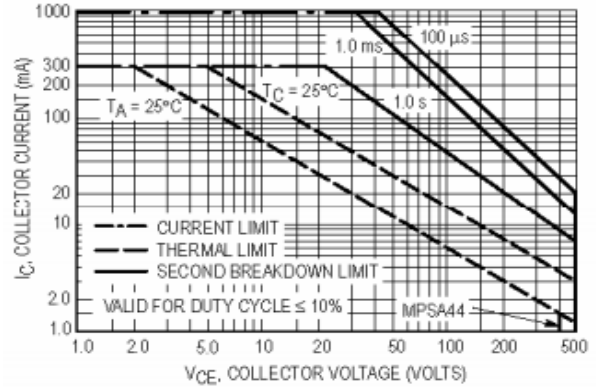


Fig. 2. Collector Saturation Region

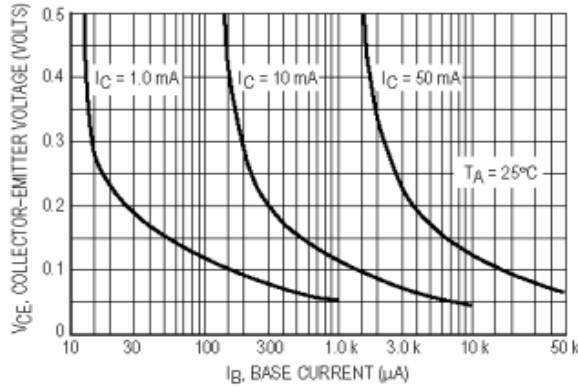


Fig. 5. Capacitance

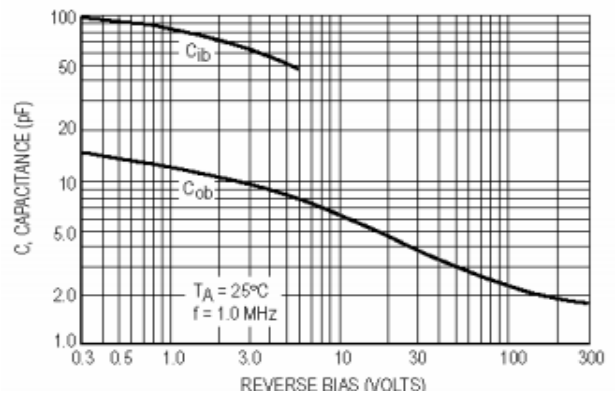


Fig. 3. "On" Voltage

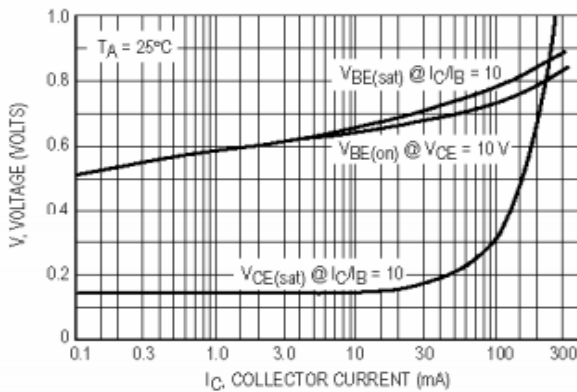
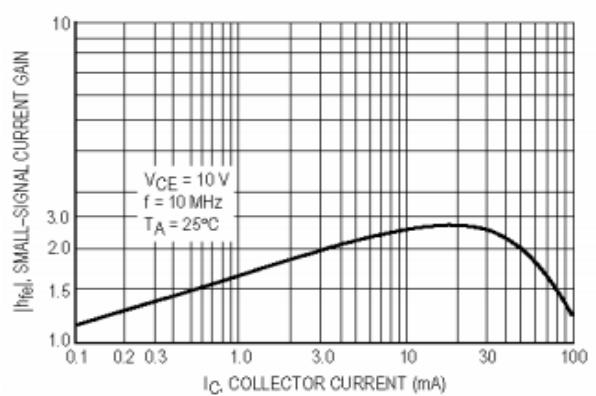
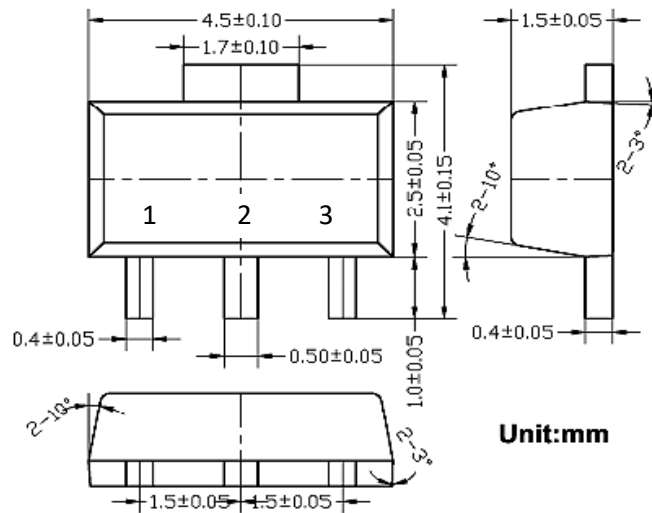


Fig. 6. High frequency Current Gain



### Package Details

SOT-89 Plastic Package

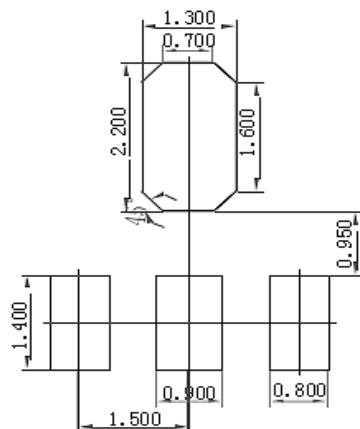


Unit:mm

### Pin Configuration

1. Base
2. Collector
3. Emitter

### SOT-89 Suggested Pad Layout



#### Note:

1. Controlling Dimension:in millimeters.
2. General tolerance: $\pm 0.05$ mm
3. The pad Layout is for reference purposes only.



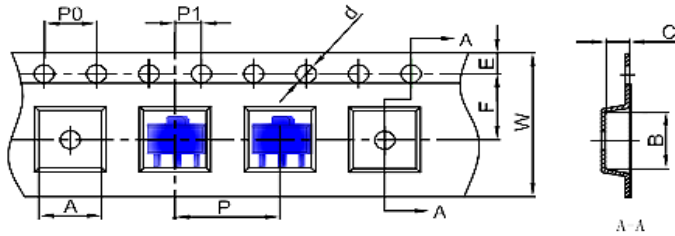
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## SOT-89 Tape and Reel

### SOT-89 Embossed Carrier Tape

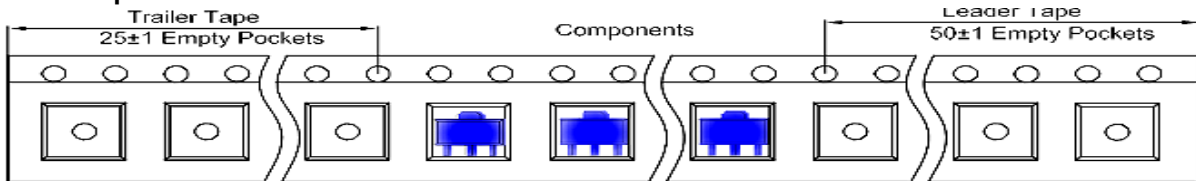


#### Packaging Description:

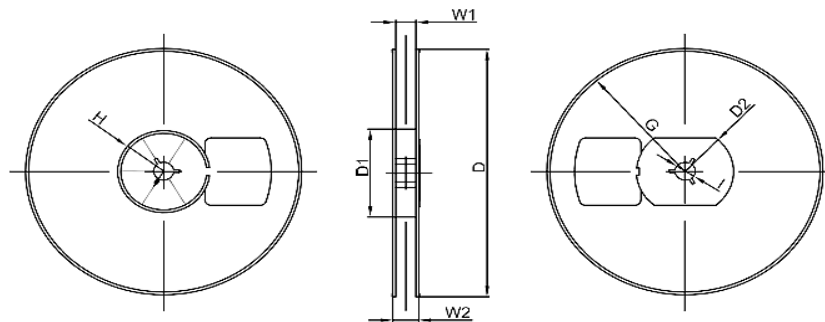
SOT-89 Parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-Static sprayed agent. these reeled parts in standard option are shipped with 3000 units per 7" or 17.8cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

| Dimensions are in millimeter |      |      |      |       |      |      |      |      |      |       |
|------------------------------|------|------|------|-------|------|------|------|------|------|-------|
| Pkg type                     | A    | B    | C    | d     | E    | F    | P0   | P    | P1   | W     |
| SOT-89-3L                    | 4.85 | 4.45 | 1.60 | Ø1.50 | 1.75 | 5.50 | 4.00 | 8.00 | 2.00 | 12.00 |

### SOT-89 Tape Leader and Trailer



### SOT - 89 Reel



| Dimensions are in millimeter |           |            |              |            |                 |          |       |       |
|------------------------------|-----------|------------|--------------|------------|-----------------|----------|-------|-------|
| Reel Option                  | D         | D1         | D2           | G          | H               | I        | W1    | W2    |
| 7"Dia                        | Ø180.00   | 60.00      | R32.00       | R86.50     | R30.00          | Ø13.00   | 13.20 | 16.50 |
| REEL                         | Reel Size | Box        | Box Size(mm) | Carton     | Carton Size(mm) | G.W.(kg) |       |       |
| 1000 pcs                     | 7 inch    | 10,000 pcs | 203×203×195  | 40,000 pcs | 438×438×220     |          |       |       |

MPSA44U

Rev5 02072022EJS



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## Recommended Product Storage Environment for Discrete Semiconductor Devices

This storage environment assumes that the Diodes and transistors are packed properly inside the original packing supplied by CDIL.

- Temperature 5 °C to 30 °C
- Humidity between 40 to 70 %RH
- Air should be clean.
- Avoid harmful gas or dust.
- Avoid outdoor exposure or storage in areas subject to rain or water spraying .
- Avoid storage in areas subject to corrosive gas or dust. Product shall not be stored in areas exposed to direct sunlight.
- Avoid rapid change of temperature.
- Avoid condensation.
- Mechanical stress such as vibration and impact shall be avoided.
- The product shall not be placed directly on the floor.
- The product shall be stored on a plane area. They should not be turned upside down. They should not be placed against the wall.

### **Shelf Life of CDIL Products**

The shelf life of products is the period from product manufacture to shipment to customers. The product can be unconditionally shipped within this period. The period is defined as 2 years.

If products are stored longer than the shelf life of 2 years the products shall be subjected to quality check as per CDIL quality procedure.

The products are further warranted for another one year after the date of shipment subject to the above conditions in CDIL original packing.

### **Floor Life of CDIL Products and MSL Level**

When the products are opened from the original packing, the floor life will start.

For this, the following JEDEC table may be referred:

| JEDEC MSL Level |                    |                 |
|-----------------|--------------------|-----------------|
| Level           | Time               | Condition       |
| 1               | Unlimited          | ≤30 °C / 85% RH |
| 2               | 1 Year             | ≤30 °C / 60% RH |
| 2a              | 4 Weeks            | ≤30 °C / 60% RH |
| 3               | 168 Hours          | ≤30 °C / 60% RH |
| 4               | 72 Hours           | ≤30 °C / 60% RH |
| 5               | 48 Hours           | ≤30 °C / 60% RH |
| 5a              | 24 Hours           | ≤30 °C / 60% RH |
| 6               | Time on Label(TOL) | ≤30 °C / 60% RH |





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## Customer Notes

### Component Disposal Instructions

1. CDIL Semiconductor Devices are RoHS compliant, customers are requested to please dispose as per prevailing Environmental Legislation of their Country.
2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

## Disclaimer

The product information and the selection guides facilitate selection of the CDIL's Semiconductor Device(s) best suited for application in your product(s) as per your requirement. It is recommended that you completely review our Data Sheet(s) so as to confirm that the Device(s) meet functionality parameters for your application. The information furnished in the Data Sheet and on the CDIL Web Site/CD are believed to be accurate and reliable. CDIL however, does not assume responsibility for inaccuracies or incomplete information. Furthermore, CDIL does not assume liability whatsoever, arising out of the application or use of any CDIL product; neither does it convey any license under its patent rights nor rights of others. These products are not designed for use in life saving/support appliances or systems. CDIL customers selling these products (either as individual Semiconductor Devices or incorporated in their end products), in any life saving/support appliances or systems or applications do so at their own risk and CDIL will not be responsible for any damages resulting from such sale(s). CDIL strives for continuous improvement and reserves the right to change the specifications of its products without prior notice.



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**Continental Device India Pvt. Limited**

C-120 Naraina Industrial Area, New Delhi 110 028, India.

Telephone +91-11-2579 6150, 4141 1112 Fax +91-11-2579 5290, 4141 1119

email@cdil.com www.cdil.com

CIN No. U32109DL1964PTC004291