

## DHB34 Varistor Series



### Agency Approvals

| Agency | Agency Approval | Agency File Number |
|--------|-----------------|--------------------|
|        | UL1449          | E320116            |
|        | 22.2-1          | 91788              |

### Additional Information



Datasheet



Resources



Samples

### Description

The DHB34 Series of transient surge suppressors is comprised of two industrial high-energy Metal-Oxide Varistors (MOVs) discs placed in parallel as a single device. They are designed to provide surge suppression in the AC mains outdoor and service entrance environment (distribution panels) of buildings. DHB34 applications also include industrial heavy motors, controls, and power supplies such as used in the oil-drilling, mining, and transportation fields, including HVAC and motor/generator applications.

The DHB34 Series provides rigid terminals for through-hole solder mounting on printed circuit boards, thereby eliminating the need for screw mounting.

### Features

- Lead-Free, Halogen-Free and RoHS Compliant
- Wide operating voltage range  
 $V_{M(AC)RMS}$  110V to 750V
- High-energy absorption capability  
 $W_{TM} = 220J$  to 1050J
- High peak pulse current (Each of two discs placed in parallel) capability  
 $I_{TM} = 40,000A$
- Rigid terminals for secure through-hole solder mounting
- No derating up to 85°C ambient
- Dual Disc Device - two 34mm varistor discs in parallel in a single package.

### Absolute Maximum Ratings

• For ratings of individual members of a series, see Device Ratings and Specifications chart

| Continuous                                                                                   | DHB34 Series | Units      |
|----------------------------------------------------------------------------------------------|--------------|------------|
| Steady State Applied Voltage:                                                                |              |            |
| AC Voltage Range ( $V_{M(AC)RMS}$ )                                                          | 110 to 750   | V          |
| DC Voltage Range ( $V_{M(DC)}$ )                                                             | 148 to 970   | V          |
| Transients:                                                                                  |              |            |
| Peak Pulse Current ( $I_{TM}$ )                                                              |              |            |
| For 8/20 $\mu$ s Current Wave (See Figure 2)                                                 | 40000        | A          |
| Single Pulse Energy Range                                                                    |              |            |
| For 2ms Current Wave ( $W_{TM}$ )                                                            | 220 to 1050  | J          |
| Operating Ambient Temperature Range ( $T_A$ )                                                | -55 to + 85  | °C         |
| Storage Temperature Range ( $T_{STG}$ )                                                      | -55 to + 125 | °C         |
| Temperature Coefficient ( $\alpha$ ) of Clamping Voltage ( $V_C$ ) at Specified Test Current | <0.01        | %/°C       |
| Hi-Pot Encapsulation (COATING Isolation Voltage Capability)                                  | 2500         | V          |
| COATING Insulation Resistance                                                                | 1000         | M $\Omega$ |

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### DHB34 Series Ratings & Specifications

| Lead-free<br>and RoHS<br>Compliant Models | Model<br>Size<br>Disc<br>Dia.<br>(mm) | Maximum Rating (85°C) |             |                 |                                   | Specifications (25°C)                      |             |       |                                                                        |                             |
|-------------------------------------------|---------------------------------------|-----------------------|-------------|-----------------|-----------------------------------|--------------------------------------------|-------------|-------|------------------------------------------------------------------------|-----------------------------|
|                                           |                                       | Continuous            |             | Transient       |                                   | Varistor Voltage at 1mA<br>DC Test Current |             |       | Maximum<br>Clamping Voltage<br>$V_C$ at 200A<br>Current (8/20 $\mu$ s) | Typical<br>Capaci-<br>tance |
|                                           |                                       | $V_{RMS}$             | $V_{DC}$    | Energy<br>(2ms) | Peak<br>Current<br>8 x 20 $\mu$ s |                                            |             |       |                                                                        |                             |
|                                           |                                       | $V_{M(AC)}$           | $V_{M(DC)}$ | $W_{TM}$        | $I_{TM}$                          | Min                                        | $V_{N(DC)}$ | Max   | $V_C$                                                                  | $f = 1\text{MHz}$           |
| Part Number                               |                                       | (V)                   | (V)         | (J)             | (A)                               | (V)                                        | (V)         | (V)   | (V)                                                                    | (pF)                        |
| V111DHB34                                 | 34                                    | 110                   | 148         | 220             | 40,000 <sup>1</sup>               | 156                                        | 173         | 190   | 288                                                                    | 11,600                      |
| V131DHB34                                 | 34                                    | 130                   | 175         | 270             | 40,000 <sup>2</sup>               | 184.5                                      | 205         | 225.5 | 345                                                                    | 10,000                      |
| V141DHB34                                 | 34                                    | 140                   | 188         | 291             | 40,000 <sup>3</sup>               | 198                                        | 220         | 242   | 375                                                                    | 9,000                       |
| V151DHB34                                 | 34                                    | 150                   | 200         | 300             | 40,000 <sup>4</sup>               | 216                                        | 240         | 264   | 405                                                                    | 8,000                       |
| V181DHB34                                 | 34                                    | 180                   | 240         | 330             | 40,000                            | 254                                        | 282         | 310   | 468                                                                    | 6,800                       |
| V201DHB34                                 | 34                                    | 200                   | 265         | 350             | 40,000                            | 283                                        | 314         | 345   | 533                                                                    | 6,350                       |
| V251DHB34                                 | 34                                    | 250                   | 330         | 370             | 40,000                            | 351                                        | 390         | 429   | 650                                                                    | 5,000                       |
| V271DHB34                                 | 34                                    | 275                   | 369         | 400             | 40,000                            | 387                                        | 430         | 473   | 730                                                                    | 4,500                       |
| V301DHB34                                 | 34                                    | 300                   | 410         | 430             | 40,000                            | 423                                        | 470         | 517   | 780                                                                    | 4,100                       |
| V321DHB34                                 | 34                                    | 320                   | 420         | 460             | 40,000                            | 459                                        | 510         | 561   | 830                                                                    | 3,800                       |
| V331DHB34                                 | 34                                    | 330                   | 435         | 475             | 40,000                            | 467                                        | 518.5       | 570   | 843                                                                    | 3,750                       |
| V351DHB34                                 | 34                                    | 350                   | 460         | 500             | 40,000                            | 495                                        | 549.5       | 604   | 894                                                                    | 3,600                       |
| V391DHB34                                 | 34                                    | 385                   | 510         | 550             | 40,000                            | 545                                        | 604         | 663   | 1,000                                                                  | 3,500                       |
| V421DHB34                                 | 34                                    | 420                   | 560         | 600             | 40,000                            | 612                                        | 680         | 748   | 1,130                                                                  | 3,000                       |
| V441DHB34                                 | 34                                    | 440                   | 585         | 630             | 40,000                            | 622                                        | 690         | 758   | 1,147                                                                  | 2,900                       |
| V481DHB34                                 | 34                                    | 480                   | 640         | 650             | 40,000                            | 675                                        | 750         | 825   | 1,240                                                                  | 2,700                       |
| V511DHB34                                 | 34                                    | 510                   | 675         | 700             | 40,000                            | 738                                        | 820         | 902   | 1,350                                                                  | 2,500                       |
| V551DHB34                                 | 34                                    | 550                   | 710         | 755             | 40,000                            | 778                                        | 863.5       | 949   | 1,404                                                                  | 2,390                       |
| V571DHB34                                 | 34                                    | 575                   | 730         | 770             | 40,000                            | 819                                        | 910         | 1001  | 1,480                                                                  | 2,200                       |
| V661DHB34                                 | 34                                    | 660                   | 850         | 900             | 40,000                            | 945                                        | 1050        | 1155  | 1,720                                                                  | 2,000                       |
| V681DHB34                                 | 34                                    | 680                   | 875         | 925             | 40,000                            | 962                                        | 1067.5      | 1173  | 1,777                                                                  | 1,900                       |
| V751DHB34                                 | 34                                    | 750                   | 970         | 1050            | 40,000                            | 1080                                       | 1200        | 1320  | 2,000                                                                  | 1,800                       |

Note:

1. 40kA capability depends on applications rated up to 97V<sub>RMS</sub>. 30kA applies if > 97V<sub>RMS</sub>.
2. 40kA capability depends on applications rated up to 115V<sub>RMS</sub>. 30kA applies if > 115V<sub>RMS</sub>.
3. 40kA capability depends on applications rated up to 123V<sub>RMS</sub>. 30kA applies if > 123V<sub>RMS</sub>.
4. 40kA capability depends on applications rated up to 132V<sub>RMS</sub>. 30kA applies if > 132V<sub>RMS</sub>.

### Power Dissipation Ratings



Figure 1

Should transients occur in rapid succession, the average power 100 dissipation result is simply the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be within the specifications shown on the Device Ratings and Specifications table for the specific device. The operating values must be derated as shown in above.

### Peak Pulse Current Test Waveform

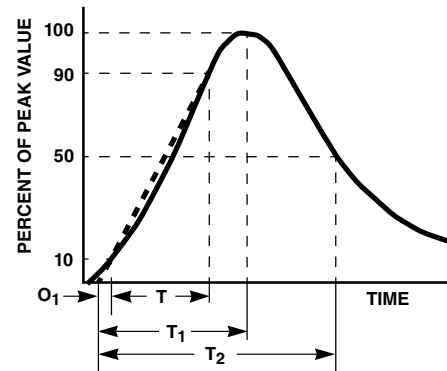


Figure 2

$O_1$  = Virtual Origin of Wave

$T$  = Time from 10% to 90% of Peak

$T_1$  = Rise Time =  $1.25 \times T$

$T_2$  = Decay Time

**Example** - For an  $8/20 \mu s$  Current Waveform:

$8 \mu s = T_1$  = Rise Time

$20 \mu s = T_2$  = Decay Time

### Maximum Clamping Voltage

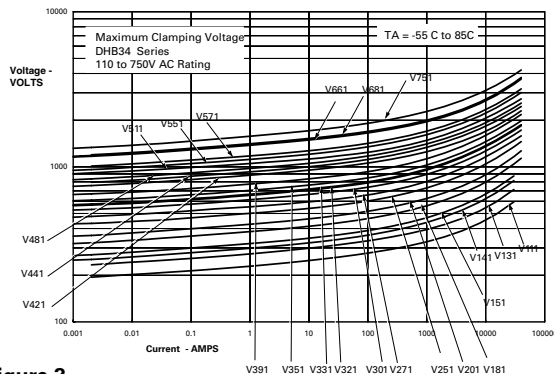


Figure 3

### Repetitive Surge Capability

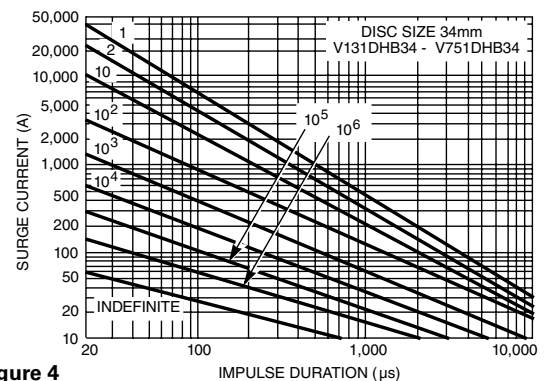


Figure 4

NOTE: If pulse ratings are exceeded, a shift of  $V_{NIDC}$  (at specified current) of more than  $\pm 10\%$  could result. This type of shift, which normally results in a decrease of  $V_{NIDC}$ , may result in the device not meeting the original published specifications, but it does not prevent the device from continuing to function, and to provide ample protection.

## Soldering Parameters

### Non Lead-free Profile



Figure 5

### Lead-free Profile

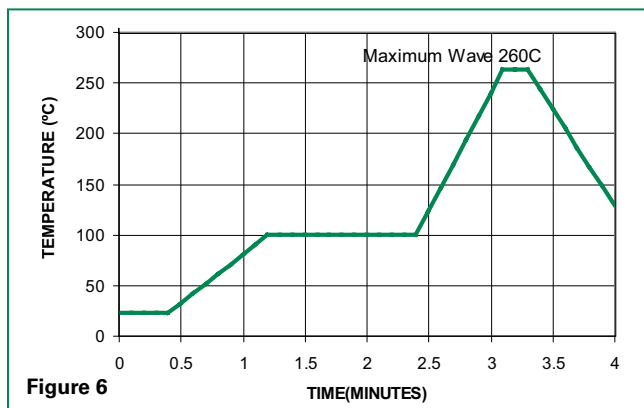


Figure 6

|                                                   |                               |                         |
|---------------------------------------------------|-------------------------------|-------------------------|
| Reflow Condition                                  |                               | Pb – Free assembly      |
| Pre Heat                                          | - Temperature Min (Ts(min))   | 150°C                   |
|                                                   | - Temperature Max (Ts(max))   | 200°C                   |
|                                                   | - Time (min to max) (ts)      | 60 – 180 secs           |
| Average ramp up-rate (Liquidus Temp (TL) to peak) |                               | 5°C/second max          |
| TS(max) to TL - Ramp-up Rate                      |                               | 5°C/second max          |
| Reflow                                            | - Temperature (TL) (Liquidus) | 217°C                   |
|                                                   | - Temperature (tL)            | 60 – 150 seconds        |
| Peak Temperature (TP)                             |                               | 250 <sup>+0/-5</sup> °C |
| Time within 5°C of actual peak Temperature (tp)   |                               | 20 – 40 seconds         |
| Ramp-down Rate                                    |                               | 5°C/second max          |
| Time 25°C to peak Temperature (TP)                |                               | 8 minutes Max.          |
| Do not exceed                                     |                               | 260°C                   |

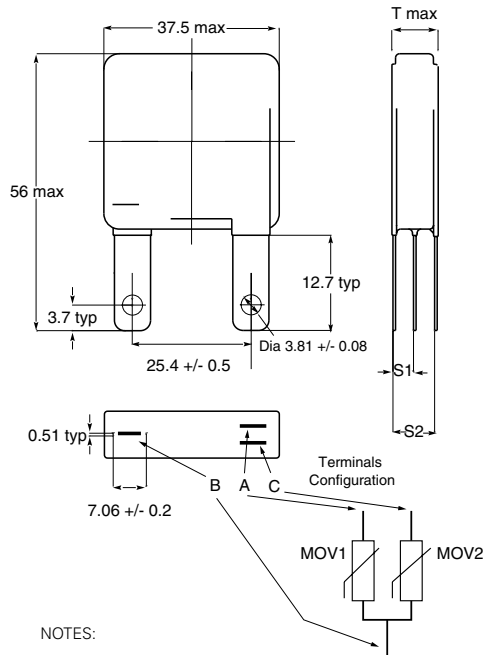
### Physical Specifications

|                                  |                                                                  |
|----------------------------------|------------------------------------------------------------------|
| <b>Lead Material</b>             | Tin-coated Copper                                                |
| <b>Soldering Characteristics</b> | Solderability per MIL-STD-202, Method 208                        |
| <b>Insulating Material</b>       | Cured, flame retardant epoxy polymer meets UL94V-0 requirements. |
| <b>Device Labeling</b>           | Marked with LF, voltage, amperage rating, and date code.         |

### Environmental Specifications

|                                      |                                                    |
|--------------------------------------|----------------------------------------------------|
| <b>Operating/Storage Temperature</b> | -55°C to +85°C/-55°C to +125°C                     |
| <b>Humidity Aging</b>                | +85°C, 85% RH, 1000 hours<br>+/-10% Voltage change |
| <b>Thermal Shock</b>                 | +85°C to -40°C 5 times<br>+/-10% Voltage change    |
| <b>Solvent Resistance</b>            | MIL-STD-202, Method 215                            |
| <b>Moisture Sensitivity</b>          | Level 1, J-STD-020                                 |

### Dimensions (mm)



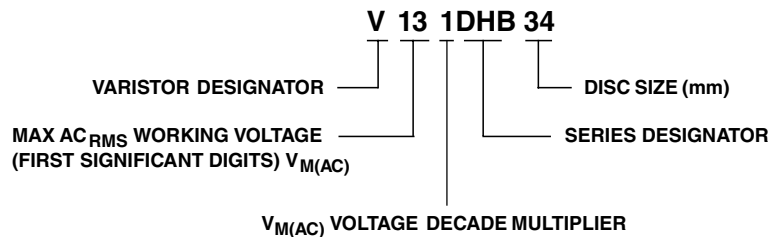
#### NOTES:

- **Terminals Configuration:**  
Terminals A & B are connected to one varistor element.  
Terminals B & C connected to second varistor element.
- **Dimensions:**  
Measures are in mm is typical, unless otherwise specified.

### Table of Dimensions - Thickness and Terminal Offsets

| Part Type | T Max | S1 +/- 1.15 mm | S2 +/- 2.30mm |
|-----------|-------|----------------|---------------|
| V111DHB34 | 7.6   | 2.65           | 5.50          |
| V131DHB34 | 7.8   | 2.85           | 5.70          |
| V141DHB34 | 8.2   | 3.00           | 6.00          |
| V151DHB34 | 8.8   | 3.15           | 6.30          |
| V181DHB34 | 9.0   | 3.25           | 6.50          |
| V201DHB34 | 9.2   | 3.35           | 6.70          |
| V251DHB34 | 9.10  | 3.00           | 6.00          |
| V271DHB34 | 9.55  | 3.25           | 6.50          |
| V301DHB34 | 10.20 | 3.50           | 7.00          |
| V321DHB34 | 10.60 | 3.66           | 7.24          |
| V331DHB34 | 10.65 | 3.70           | 7.40          |
| V351DHB34 | 10.5  | 4.10           | 8.20          |
| V391DHB34 | 11.2  | 4.45           | 8.90          |
| V421DHB34 | 12.65 | 4.50           | 9.00          |
| V441DHB34 | 12.80 | 4.55           | 9.10          |
| V481DHB34 | 13.55 | 4.80           | 9.60          |
| V511DHB34 | 13.4  | 5.25           | 10.50         |
| V551DHB34 | 14.6  | 5.70           | 11.40         |
| V571DHB34 | 14.8  | 5.80           | 11.60         |
| V661DHB34 | 17.20 | 6.65           | 13.30         |
| V681DHB34 | 17.5  | 7.00           | 14.00         |
| V751DHB34 | 18.20 | 7.35           | 14.70         |

### Part Numbering System



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