

**features**

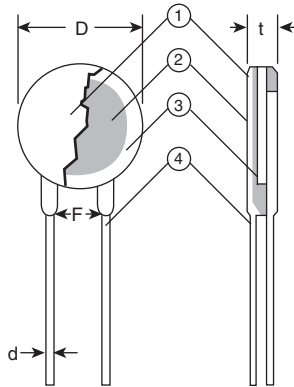
- Flame retardant coating (UL94V0)
- Excellent transient voltage suppression characteristics
- Higher surge current
- Wide varistor voltage
- V-I characteristics are the same in both polarity
- Products with lead-free terminations meet EU RoHS requirements

**Approval Awarded and Varistor Vol..rang**

| Type  | UL1449 (File No. E328032) (Units (V)) |            |
|-------|---------------------------------------|------------|
|       | S Series                              | U Series   |
| NVD05 | 82 - 470                              | 100 - 470  |
| NVD07 | 82 - 470                              | 100 - 470  |
| NVD10 | 82 - 1100                             | 100 - 1100 |
| NVD14 | 82 - 910                              | 120 - 910  |
| NVD20 | —                                     | 200 - 910  |

S Series: does not apply to 330 and 510. The VDE acquisition products apply individually. c-UL acquisition products apply individually.

**dimensions and construction**



Contact KOA Speer for detailed dimensions.

| Type | Dimensions inches (mm)       |               |                        |                           |
|------|------------------------------|---------------|------------------------|---------------------------|
|      | øD (max.)*                   | ød            | F                      | t (max.)*                 |
| 05U  | .276 - .295<br>(7.0 - 7.5)   | .024<br>(0.6) | .197±.039<br>(5.0±1.0) | .169±.232<br>(4.3 - 5.9)  |
| 07U  | .276 - .374<br>(9.0 - 9.5)   |               |                        |                           |
| 10U  | .472 - .531<br>(12.0 - 13.5) | .031<br>(0.8) | .295±.039<br>(7.5±1.0) | .169±.567<br>(4.3 - 14.4) |
| 10UB | .472<br>(12.0)               | .024<br>(0.6) | .197±.039<br>(5.0±1.0) | .169±.209<br>(4.3 - 5.3)  |
| 14U  | .630 - .669<br>(16.0 - 17.0) | .031<br>(0.8) | .295±.039<br>(7.5±1.0) | .169±.567<br>(4.3 - 14.4) |
| 20U  | .91 - .94<br>(23.0 - 24.0)   | .039<br>(1.0) | .394±.039<br>(10±1.0)  | .205±.354<br>(5.2 - 9.0)  |

\* D max. and t ma. vary according to the varistor voltage

**ordering information**

|           |          |                            |   |                      |                               |   |           |                                   |
|-----------|----------|----------------------------|---|----------------------|-------------------------------|---|-----------|-----------------------------------|
| <b>NV</b> | <b>D</b> | <b>05</b>                  | <b>U</b>  | <b>C</b>             | <b>D</b>                      | <b>MHT</b>  | <b>A</b>  | <b>220</b>                        |
| Type      | Style    | Diameter                   | Series  | Termination Material | Inner Connect Solder Material | Taping  | Packaging | Varistor Voltage                  |
|           | Disc     | 05<br>07<br>10<br>14<br>20 | S: S series<br>U: U series<br>UB: U series<br>5mm pitch<br>(D10 only) | C: Sn-Cu             | D: SnAgCu<br>Blank: SnPb      | MT:5mm straight taping<br>MHT:5mm inside kink taping<br>10UB: GHT: 7.5mm straight taping<br>GJT: 7.5mm outside kink taping<br>MJT:5mm outside kink taping<br>10UC: MJT: 7.5mm outside kink taping | A: Ammo   | 22V 022<br>220V 220<br>1800V 1800 |

For further information on packaging, please refer to Appendix C.

**applications and ratings**

| Type       | Varistor Voltage<br>Vc Ic = 0.1mA (V) | Maximum Allowable Voltage |          | NVD05UC              |                              |                  |     | NVD07UC              |                              |                  |      |
|------------|---------------------------------------|---------------------------|----------|----------------------|------------------------------|------------------|-----|----------------------|------------------------------|------------------|------|
|            |                                       | a.c. r.m.s. (v)           | d.c. (v) | Maximum (2ms) Energy | Max. Peak Current (2 pulses) | Clamping Voltage |     | Maximum (2ms) Energy | Max. Peak Current (2 pulses) | Clamping Voltage |      |
|            |                                       |                           |          | E (J)                | Ip (A)                       | V1A              | V5A | E (J)                | Ip (A)                       | V2.5A            | V10A |
| NVD□SCD018 | 16 - 22                               | 11                        | 14       | 0.3                  | 50                           | 40               | —   | —                    | —                            | —                | —    |
| NVD□UCD022 | 20 - 27                               | 14                        | 18       | 0.5                  | 125                          | 48               | —   | 1.1                  | 250                          | 43               | —    |
| NVD□UCD027 | 25 - 32                               | 17                        | 22       | 0.7                  |                              | 60               | —   | 1.3                  |                              | 53               | —    |
| NVD□UCD033 | 30 - 39                               | 20                        | 26       | 0.8                  |                              | 73               | —   | 1.6                  |                              | 65               | —    |
| NVD□UCD039 | 37 - 47                               | 25                        | 31       | 0.9                  |                              | 86               | —   | 1.9                  |                              | 77               | —    |
| NVD□UCD047 | 45 - 54                               | 30                        | 38       | 1.1                  |                              | 104              | —   | 2.3                  |                              | 93               | —    |
| NVD□UCD056 | 52 - 62                               | 35                        | 45       | 1.3                  |                              | 123              | —   | 2.7                  |                              | 110              | —    |
| NVD□UCD068 | 60 - 76                               | 40                        | 56       | 1.6                  |                              | 150              | —   | 3.3                  |                              | 135              | —    |
| NVD□SCD082 | 74 - 90                               | 50                        | 65       | 1.7                  |                              | 200              | —   | 145                  |                              | 3.5              | 600  |
| NVD□UCD100 | 90 - 110                              | 60                        | 85       | 3.0                  | 600                          | —                | 175 | 6.0                  | 1250                         | —                | 165  |
| NVD□UCD120 | 108 - 132                             | 75                        | 100      | 3.5                  |                              | —                | 210 | 7.0                  |                              | —                | 200  |
| NVD□UCD150 | 135 - 165                             | 95                        | 125      | 4.5                  |                              | —                | 260 | 9.0                  |                              | —                | 250  |
| NVD□UCD200 | 185 - 225                             | 130                       | 170      | 6.0                  |                              | —                | 355 | 12.5                 |                              | —                | 340  |
| NVD□UCD220 | 198 - 242                             | 140                       | 180      | 6.5                  |                              | —                | 380 | 13.5                 |                              | —                | 360  |
| NVD□UCD240 | 216 - 264                             | 150                       | 200      | 7.5                  |                              | —                | 415 | 15.0                 |                              | —                | 395  |
| NVD□UCD270 | 247 - 303                             | 175                       | 225      | 8.0                  |                              | —                | 475 | 17.0                 |                              | —                | 455  |
| NVD□UCD330 | 297 - 363                             | 210                       | 270      | 9.5                  |                              | —                | 570 | 20.0                 |                              | —                | 545  |
| NVD□UCD360 | 342 - 396                             | 230                       | 300      | 11.0                 |                              | —                | 620 | 23.0                 |                              | —                | 595  |
| NVD□UCD390 | 367 - 429                             | 250                       | 320      | 12.0                 |                              | —                | 675 | 25.0                 |                              | —                | 650  |
| NVD□UCD430 | 407 - 473                             | 275                       | 350      | 13.5                 |                              | —                | 745 | 27.5                 |                              | —                | 710  |
| NVD□UCD470 | 437 - 517                             | 300                       | 385      | 15.0                 |                              | —                | 810 | 30.0                 |                              | —                | 775  |

□ Add disk diameter

| Type        | Varistor Voltage<br>Vc Ic = 0.1mA (V) | Maximum Allowable Voltage |          | NVD10UC - NVD10UBC* |                              |                  |      | NVD14UC           |                              |                  |      | NVD20UC           |                              |                  |     |   |
|-------------|---------------------------------------|---------------------------|----------|---------------------|------------------------------|------------------|------|-------------------|------------------------------|------------------|------|-------------------|------------------------------|------------------|-----|---|
|             |                                       | a.c. r.m.s. (v)           | d.c. (v) | Max. (2ms) Energy   | Max. Peak Current (2 pulses) | Clamping Voltage |      | Max. (2ms) Energy | Max. Peak Current (2 pulses) | Clamping Voltage |      | Max. (2ms) Energy | Max. Peak Current (2 pulses) | Clamping Voltage |     |   |
|             |                                       |                           |          | E (J)               | Ip (A)                       | V5A              | V25A | E (J)             | Ip (A)                       | V10A             | V50A | E (J)             | Ip (A)                       | V100A            |     |   |
| NVD□SCD018  | 16 - 22                               | 11                        | 14       | —                   | —                            | —                | —    | —                 | —                            | —                | —    | —                 | —                            | —                |     |   |
| NVD□UCD022  | 20 - 27                               | 14                        | 18       | 2.6                 | 500                          | 43               | —    | 5.3               | 1000                         | 43               | —    | —                 | —                            | —                |     |   |
| NVD□UCD027  | 25 - 32                               | 17                        | 22       | 3.2                 |                              | 53               | —    | 6.5               |                              | 53               | —    | —                 | —                            | —                | —   |   |
| NVD□UCD033  | 30 - 39                               | 20                        | 26       | 4.0                 |                              | 65               | —    | 7.9               |                              | 65               | —    | —                 | —                            | —                | —   |   |
| NVD□UCD039  | 37 - 47                               | 25                        | 31       | 4.4                 |                              | 77               | —    | 9.4               |                              | 77               | —    | —                 | —                            | —                | —   |   |
| NVD□UCD047  | 45 - 54                               | 30                        | 38       | 5.7                 |                              | 93               | —    | 11.0              |                              | 93               | —    | —                 | —                            | —                | —   |   |
| NVD□UCD056  | 52 - 62                               | 35                        | 45       | 6.7                 |                              | 110              | —    | 13.0              |                              | 110              | —    | —                 | —                            | —                | —   |   |
| NVD□UCD068  | 60 - 76                               | 40                        | 56       | 8.2                 |                              | 135              | —    | 16.0              |                              | 135              | —    | —                 | —                            | —                | —   |   |
| NVD□SCD082  | 74 - 90                               | 50                        | 65       | 8.0                 |                              | 1250             | —    | 135               |                              | 14.0             | 2500 | —                 | 135                          | —                | —   | — |
| NVD□UCD100  | 90 - 110                              | 60                        | 85       | 12.0                | 2500                         | —                | 165  | —                 | —                            | —                | —    | —                 | —                            | —                |     |   |
| NVD14SCD100 | 90 - 110                              | —                         | —        | —                   | —                            | —                | —    | 18.0              | 2500                         | —                | 165  | —                 | —                            | —                |     |   |
| NVD□UCD120  | 108 - 132                             | 75                        | 100      | 14.5                | 2500                         | —                | 200  | 30.0              | 5000                         | —                | 200  | —                 | —                            | —                |     |   |
| NVD□UCD150  | 135 - 165                             | 95                        | 125      | 18.0                |                              | —                | 250  | 37.5              |                              | —                | 250  | —                 | —                            | —                | —   | — |
| NVD□UCD200  | 185 - 225                             | 130                       | 170      | 25.0                |                              | —                | 340  | 50.0              |                              | —                | 340  | 100               | —                            | —                | 340 | — |
| NVD□UCD220  | 198 - 242                             | 140                       | 180      | 27.5                |                              | —                | 360  | 55.0              |                              | —                | 360  | 110               | —                            | —                | 360 | — |
| NVD□UCD240  | 216 - 264                             | 150                       | 200      | 30.0                |                              | —                | 395  | 60.0              |                              | —                | 395  | 120               | —                            | 7000             | 395 | — |
| NVD□UCD270  | 247 - 303                             | 175                       | 225      | 35.0                |                              | —                | 455  | 70.0              |                              | —                | 455  | 135               | —                            | —                | 455 | — |
| NVD□UCD330  | 297 - 363                             | 210                       | 270      | 42.0                |                              | —                | 545  | 80.0              |                              | —                | 545  | —                 | —                            | —                | —   | — |
| NVD□UCD360  | 342 - 396                             | 230                       | 300      | 45.0                |                              | —                | 595  | 90.0              |                              | —                | 595  | 180               | —                            | —                | 595 | — |
| NVD□UCD390  | 367 - 429                             | 250                       | 320      | 50.0                |                              | —                | 650  | 100.0             |                              | —                | 650  | 195               | —                            | 6500             | 650 | — |
| NVD□UCD430  | 407 - 473                             | 275                       | 350      | 55.0                |                              | —                | 710  | 110.0             |                              | —                | 710  | 215               | —                            | —                | 710 | — |
| NVD□UCD470  | 437 - 517                             | 300                       | 385      | 60.0                |                              | —                | 775  | 125.0             |                              | —                | 775  | 250               | —                            | —                | 775 | — |

□ Add disk diameter

\* Manufacturing range of NVD10UBC is varistor voltages 22 - 270

Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use.

12/20/17

**applications and ratings (continued)**

| Type        | Varistor Voltage<br>Vc Ic = 0.1mA (V) | Maximum Allowable Voltage |             | NVD10UC - NVD10UCB*  |                                    |                     | NVD14UC**            |                                    |                     |                      | NVD20UC                            |                     |        |       |
|-------------|---------------------------------------|---------------------------|-------------|----------------------|------------------------------------|---------------------|----------------------|------------------------------------|---------------------|----------------------|------------------------------------|---------------------|--------|-------|
|             |                                       | a.c. r.m.s.<br>(v)        | d.c.<br>(v) | Max. (2ms)<br>Energy | Max. Peak<br>Current<br>(2 pulses) | Clamping<br>Voltage | Max. (2ms)<br>Energy | Max. Peak<br>Current<br>(2 pulses) | Clamping<br>Voltage | Max. (2ms)<br>Energy | Max. Peak<br>Current<br>(2 pulses) | Clamping<br>Voltage |        |       |
|             |                                       |                           |             | E (J)                | Ip (A)                             | V5A                 | V25A                 | E (J)                              | Ip (A)              | V10A                 | V50A                               | E (J)               | Ip (A) | V100A |
| NVD□UCD510  | 474 - 561                             | 320                       | 410         | 67.0                 | 2500                               | —                   | 845                  | 136.0                              | 4500                | —                    | 845                                | —                   | 6500   | —     |
| NVD□UCD620  | 577 - 682                             | 385                       | 505         | 67.0                 |                                    | —                   | 1025                 | 136.0                              |                     | —                    | 1025                               | 273                 |        | 1025  |
| NVD□UCD680  | 637 - 748                             | 420                       | 560         | 67.0                 |                                    | —                   | 1120                 | 136.0                              |                     | —                    | 1120                               | 273                 |        | 1120  |
| NVD□UCD750  | 697 - 825                             | 460                       | 615         | 70.0                 |                                    | —                   | 1240                 | 150.0                              |                     | —                    | 1240                               | 300                 |        | 1240  |
| NVD□UCD780  | 737 - 858                             | 485                       | 640         | 70.0                 |                                    | —                   | 1290                 | 150.0                              |                     | —                    | 1290                               | 300                 |        | 1290  |
| NVD□UCD820  | 767 - 902                             | 510                       | 670         | 80.0                 |                                    | —                   | 1355                 | 165.0                              |                     | —                    | 1355                               | 325                 |        | 1355  |
| NVD□UCD910  | 857 - 1000                            | 550                       | 745         | 90.0                 |                                    | —                   | 1500                 | 180.0                              |                     | —                    | 1500                               | 360                 |        | 1500  |
| NVD□UCD1100 | 1070 - 1210                           | 680                       | 895         | 110.0                |                                    | —                   | 1815                 | —                                  |                     | —                    | 1815                               | —                   |        | —     |
| NVD□UCD1800 | 1700 - 1980                           | 1000                      | 1465        | 183.0                |                                    | —                   | 2970                 | 360.0                              |                     | —                    | 2970                               | —                   |        | —     |

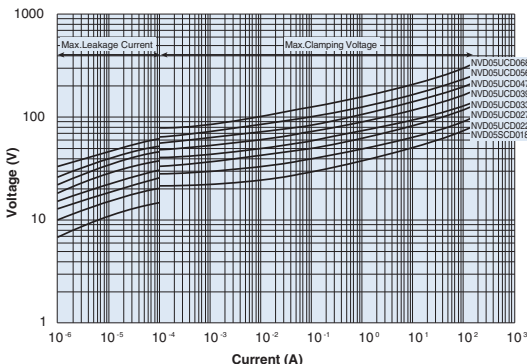
□ Add disk diameter \* Manufacturing range of NVD10UCB is varistor voltages 22 - 270 \*\* NVD14SCD100 is applied

**environmental applications**  
**Performance Characteristics**

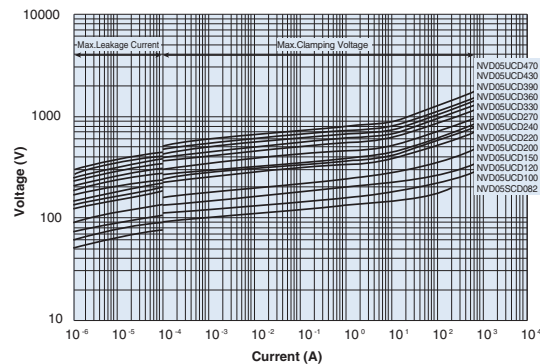
| Parameter                                       | Requirement Δ V±%                 | Test Method   |    |      |       |          |     |                     |
|---|-----------------------------------|---|----|------|-------|----------|-----|---------------------|
| Varistor Voltage                                | Within specified tolerance        | Voltage between terminals when the specified current is flowed<br><table border="1"> <tr> <th>Ic</th> <th>Type</th> </tr> <tr> <td>0.1mA</td> <td>NVD05UCD</td> </tr> <tr> <td>1mA</td> <td>NVD07UCD - NVD20UCD</td> </tr> </table> | Ic | Type | 0.1mA | NVD05UCD | 1mA | NVD07UCD - NVD20UCD |
| Ic  | Type                              |   |    |      |       |          |     |                     |
| 0.1mA   | NVD05UCD                          |   |    |      |       |          |     |                     |
| 1mA   | NVD07UCD - NVD20UCD               |   |    |      |       |          |     |                     |
| Solderability                                   | 95% coverage minimum              | 230°C ± 5°C, 5 seconds ± 0.5 second / 250°C ± 5°C, 5 seconds ± 0.5 second (Pb free)   |    |      |       |          |     |                     |
| Resistance to Solder Heat                       | ±5% no abnormality in appearance  | 260°C ± 5°C, 10 seconds ± 1 second  |    |      |       |          |     |                     |
| Rapid Change of Temperature                     | ±5% no abnormality in appearance  | -40°C (30 minutes)/ +125°C (30 minutes), 5 cycles, except NVD20UCD<br>-40°C (30 minutes)/ +85°C (30 minutes), 5 cycles: NVD20UCD  |    |      |       |          |     |                     |
| Maximum Peak Current                            | ±10% no abnormality in appearance | Rated impulse current of (T=8/20μs), positive/negative applied once each  |    |      |       |          |     |                     |
| Maximum Energy                                  | ±10% no abnormality in appearance | A single standard impulse of 2ms, once  |    |      |       |          |     |                     |
| High Temperature Life with d.c. Bias            | ±10% no abnormality in appearance | 85°C ± 5°C, Vc=(Vd.c.) 1000h<br>Load: maximum allowable circuit voltage (d.c.)  |    |      |       |          |     |                     |
| High Temperature Life with a.c. Bias            | ±10% no abnormality in appearance | 85°C ± 5°C, Vc=(Va.c.r.m.s.) 1000h<br>Load: maximum allowable circuit voltage (d.c.)  |    |      |       |          |     |                     |
| High Temperature & High Humidity Life with Bias | ±5% no abnormality in appearance  | 80°C ± 5°C, 95% RH, 1000h   |    |      |       |          |     |                     |
| High Temperature Storage Life                   | ±5% no abnormality in appearance  | 125°C ± 5°C, 1000h  |    |      |       |          |     |                     |
| Low Temperature Storage Life                    | ±5% no abnormality in appearance  | -40°C ± 5°C, 1000h  |    |      |       |          |     |                     |

**Voltage Current Curves (Ta = +25°C)**

**NVD05SCD018 - NVD05UCD068**



**NVD05SCD082 - NVD05UCD470**



For Typical Characteristics Graphs see Environmental Applications. Additional environmental applications can also be found at [www.koaspeer.com](http://www.koaspeer.com)  
Specifications given herein may be changed at any time without prior notice. Please confirm technical specifications before you order and/or use. 12/20/17

circuit protection