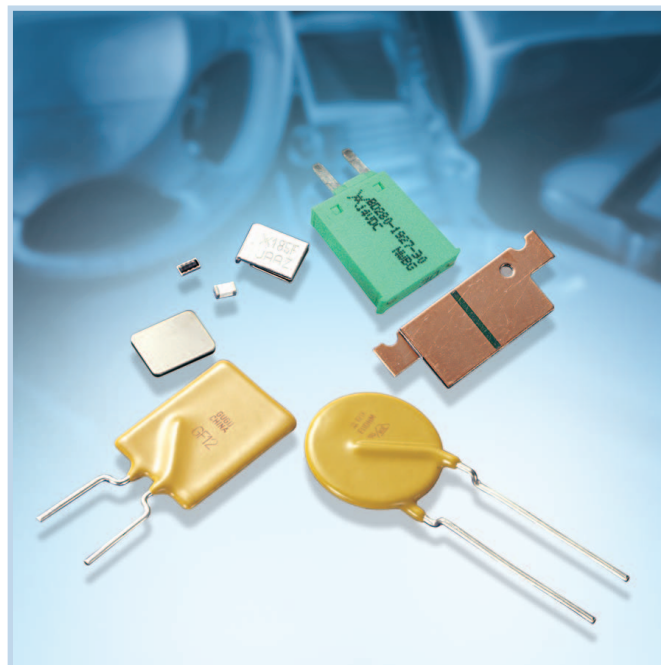




## PolySwitch Resettable Devices Automotive Devices

We have provided PPTC resettable devices for the automotive industry for over 25 years. With the advent of TS16949 and our continued involvement in the automotive industry, we developed automotive specific versions of our PolySwitch PPTC devices (AHS, ASMD, AHRF, AHEF, AGRF and BD). These products are qualified and sold under PS400 specification which is derived from AEC-Q200, the standard for electronic components used in the automotive industry. The key difference between these product families and other protection devices in our circuit protection product portfolio is the qualification process followed according to a series of rigorous tests related to the automotive environment. As a result, they are characterized by specific additional values determined post automotive related testing.



### Benefits

- Expertise from the world's leading resettable overcurrent protection manufacturer
- High quality products from the world's largest passive component manufacturer
- Worldwide team dedicated to support automotive applications
- Wide range of dedicated automotive surface-mount and radial-leaded resettable overcurrent devices
- High performance transient voltage protection devices

### Features

- RoHS compliant
- Overcurrent and overvoltage circuit protection devices
- Resettable and single-use overcurrent devices
- Wide range of form factor and termination methods
- Products meet applicable automotive industry standards
- Devices compatible with high-volume electronics assembly

### Applications

- Motor and motor circuit protection including power door-locks, mirrors, lumbar pumps, seats, sunroofs and windows
- Electronic Control Unit (ECU) I/O protection
- Heating Ventilation and Cooling (HVAC) motor and I/O protection
- Telematics, infotainment and navigations systems
- Liquid Crystal Display (LCD) back-light heaters
- Power and cigarette lighter outlets, plugs and adapter/chargers
- Powered networks and busses
- Air-flow detection and overcurrent protection in HVAC and cooling fan systems
- Stall detection in express window and sunroof circuits
- Power distribution, electrical centers and junction box resettable overcurrent protection
- Wire downsizing
- Motor Electromagnetic Interference (EMI) suppression
- Electrostatic Discharge (ESD) damage protection
- Load dump and other transient voltage protection

**Table A1** Product Series - Current Rating, Voltage Rating / Typical Resistance for Automotive Devices

| Voltage Rating          | AGRF<br>16V | AHRF<br>16V | AHRF<br>30V | AHEF<br>32V | AHS<br>16V | ASMD<br>16V | ASMD<br>30V | ASMD<br>60V | BD<br>14V |
|-------------------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|-------------|-----------|
| <b>Hold Current (A)</b> |             |             |             |             |            |             |             |             |           |
| 0.30                    | —           | —           | —           | —           | —          | —           | —           | 2.90Ω       | —         |
| 0.50                    | —           | —           | 0.565Ω      | 0.5650Ω     | —          | —           | —           | 0.90Ω       | —         |
| 0.70                    | —           | —           | 0.385Ω      | 0.3850Ω     | —          | —           | —           | —           | —         |
| 0.75                    | —           | —           | —           | —           | —          | —           | 0.60Ω       | —           | —         |
| 0.80                    | —           | —           | —           | —           | 0.25Ω      | —           | —           | —           | —         |
| 1.00                    | —           | —           | 0.225Ω      | 0.2250Ω     | —          | —           | 0.30Ω       | —           | —         |
| 1.25                    | —           | —           | —           | —           | —          | 0.16Ω       | —           | —           | —         |
| 1.50                    | —           | —           | —           | —           | —          | 0.14Ω       | —           | —           | —         |
| 1.60                    | —           | —           | —           | —           | 0.10Ω      | —           | —           | —           | —         |
| 2.00                    | —           | 0.0565Ω     | —           | —           | 0.07Ω      | 0.09Ω       | —           | —           | —         |
| 2.50                    | —           | —           | —           | —           | —          | 0.06Ω       | —           | —           | —         |
| 3.00                    | —           | 0.0410Ω     | —           | 0.0520Ω     | 0.05Ω      | —           | —           | —           | —         |
| 4.00                    | 0.0300Ω     | 0.0305Ω     | —           | —           | —          | —           | —           | —           | —         |
| 4.50                    | —           | 0.0290Ω     | —           | —           | —          | —           | —           | —           | —         |
| 5.00                    | 0.0192Ω     | —           | —           | 0.0200Ω     | —          | —           | —           | —           | —         |
| 5.50                    | —           | 0.0190Ω     | —           | —           | —          | —           | —           | —           | —         |
| 6.00                    | 0.0145Ω     | 0.0180Ω     | —           | —           | —          | —           | —           | —           | —         |
| 6.50                    | —           | 0.0140Ω     | —           | —           | —          | —           | —           | —           | —         |
| 7.00                    | 0.0105Ω     | 0.0126Ω     | —           | —           | —          | —           | —           | —           | —         |
| 7.50                    | —           | 0.0120Ω     | —           | 0.0120Ω     | —          | —           | —           | —           | —         |
| 8.00                    | 0.0086Ω     | 0.0104Ω     | —           | —           | —          | —           | —           | —           | 0.0115Ω   |
| 9.00                    | 0.0070Ω     | 0.0100Ω     | —           | —           | —          | —           | —           | —           | —         |
| 10.00                   | 0.0056Ω     | 0.0083Ω     | —           | 0.0083Ω     | —          | —           | —           | —           | —         |
| 11.00                   | 0.0050Ω     | 0.0069Ω     | —           | —           | —          | —           | —           | —           | —         |
| 12.00                   | 0.0046Ω     | —           | —           | —           | —          | —           | —           | —           | 0.0060Ω   |
| 13.00                   | —           | 0.0055Ω     | —           | —           | —          | —           | —           | —           | —         |
| 14.00                   | 0.0040Ω     | 0.0050Ω     | —           | —           | —          | —           | —           | —           | —         |
| 15.00                   | —           | 0.0050Ω     | —           | —           | —          | —           | —           | —           | —         |
| 16.00                   | —           | —           | —           | —           | —          | —           | —           | —           | 0.00365Ω  |
| 20.00                   | —           | —           | —           | —           | —          | —           | —           | —           | 0.00285Ω  |
| 21.00                   | —           | —           | —           | —           | —          | —           | —           | —           | 0.00260Ω  |

**Table A2** Thermal Derating for Automotive Devices  
[Hold Current (A) at Ambient Temperature (°C)]

| Part Number                | Maximum Ambient Temperature |       |      |      |      |      |      |      |      |      |       |
|----------------------------|-----------------------------|-------|------|------|------|------|------|------|------|------|-------|
|                            | -40°C                       | -20°C | 0°C  | 20°C | 25°C | 40°C | 50°C | 60°C | 70°C | 85°C | 125°C |
| <b>AGRF</b>                |                             |       |      |      |      |      |      |      |      |      |       |
| <b>16V — Radial-leaded</b> |                             |       |      |      |      |      |      |      |      |      |       |
| AGRF400                    | 5.9                         | 5.3   | 4.8  | 4.1  | 4.0  | 3.5  | 3.2  | 2.8  | 2.5  | 1.9  | —     |
| AGRF500                    | 7.3                         | 6.6   | 6.0  | 5.2  | 5.0  | 4.4  | 4.0  | 3.6  | 3.1  | 2.4  | —     |
| AGRF600                    | 8.8                         | 8.0   | 7.2  | 6.2  | 6.0  | 5.2  | 4.8  | 4.2  | 3.8  | 2.8  | —     |
| AGRF700                    | 10.3                        | 9.3   | 8.4  | 7.3  | 7.0  | 6.2  | 5.6  | 5.0  | 4.4  | 3.3  | —     |
| AGRF800                    | 11.7                        | 10.7  | 9.6  | 8.3  | 8.0  | 6.9  | 6.4  | 5.6  | 5.1  | 3.7  | —     |
| AGRF900                    | 13.2                        | 11.9  | 10.7 | 9.4  | 9.0  | 7.9  | 7.2  | 6.4  | 5.6  | 4.2  | —     |
| AGRF1000                   | 14.7                        | 13.3  | 12.0 | 10.3 | 10.0 | 8.7  | 8.0  | 7.0  | 6.3  | 4.7  | —     |
| AGRF1100                   | 16.1                        | 14.6  | 13.1 | 11.5 | 11.0 | 9.7  | 8.8  | 7.8  | 6.9  | 5.2  | —     |
| AGRF1200                   | 17.6                        | 16.0  | 14.4 | 12.4 | 12.0 | 10.4 | 9.6  | 8.4  | 7.6  | 5.6  | —     |
| AGRF1400                   | 20.5                        | 18.7  | 16.8 | 14.5 | 14.0 | 12.1 | 11.2 | 9.8  | 8.9  | 6.5  | —     |

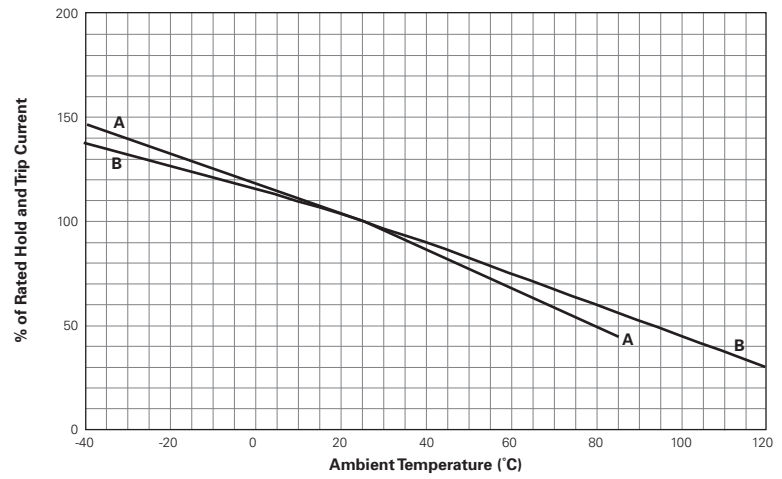
|                 |                                                                                                         |               |
|-----------------|---------------------------------------------------------------------------------------------------------|---------------|
| <b>Table A2</b> | <b>Thermal Derating for Automotive Devices</b><br><b>[Hold Current (A) at Ambient Temperature (°C)]</b> | <b>Cont'd</b> |
|-----------------|---------------------------------------------------------------------------------------------------------|---------------|

| Maximum Ambient Temperature                    |                    |       |       |      |       |      |       |      |      |       |       |   |
|------------------------------------------------|--------------------|-------|-------|------|-------|------|-------|------|------|-------|-------|---|
| Part Number                                    | -40°C              | -20°C | 0°C   | 20°C | 25°C  | 40°C | 50°C  | 60°C | 70°C | 85°C  | 125°C |   |
| AHRF (High Temperature)<br>30V — Radial-leaded |                    |       |       |      |       |      |       |      |      |       |       |   |
| AHRF050                                        | 0.7                | 0.6   | 0.6   | 0.5  | 0.5   | 0.4  | 0.4   | 0.4  | 0.3  | 0.3   | 0.1   |   |
| AHRF070                                        | 1.0                | 0.9   | 0.8   | 0.7  | 0.7   | 0.6  | 0.6   | 0.5  | 0.5  | 0.4   | 0.2   |   |
| AHRF100                                        | 1.4                | 1.2   | 1.1   | 1.0  | 1.0   | 0.9  | 0.8   | 0.7  | 0.7  | 0.6   | 0.2   |   |
| AHRF (High Temperature)<br>16V — Radial-leaded |                    |       |       |      |       |      |       |      |      |       |       |   |
| AHRF200                                        | 2.7                | 2.5   | 2.3   | 2.1  | 2.00  | 1.8  | 1.6   | 1.5  | 1.3  | 1.1   | 0.5   |   |
| AHRF300                                        | 4.1                | 3.7   | 3.4   | 3.1  | 3.00  | 2.7  | 2.4   | 2.2  | 2.0  | 1.7   | 0.7   |   |
| AHRF400                                        | 5.6                | 5.1   | 4.7   | 4.2  | 4.00  | 3.6  | 3.3   | 3.0  | 2.7  | 2.3   | 1.0   |   |
| AHRF450                                        | 6.1                | 5.6   | 5.1   | 4.6  | 4.50  | 4.0  | 3.6   | 3.3  | 3.0  | 2.5   | 1.1   |   |
| AHRF550                                        | 7.5                | 6.9   | 6.2   | 5.7  | 5.50  | 4.9  | 4.4   | 4.0  | 3.7  | 3.1   | 1.4   |   |
| AHRF600                                        | 8.2                | 7.5   | 6.8   | 6.2  | 6.00  | 5.3  | 4.9   | 4.4  | 4.0  | 3.3   | 1.5   |   |
| AHRF650                                        | 8.8                | 8.1   | 7.4   | 6.7  | 6.50  | 5.7  | 5.3   | 4.8  | 4.3  | 3.6   | 1.6   |   |
| AHRF700                                        | 9.5                | 8.7   | 8.0   | 7.2  | 7.00  | 6.2  | 5.6   | 5.2  | 4.7  | 3.9   | 1.7   |   |
| AHRF750                                        | 10.2               | 9.4   | 8.6   | 7.7  | 7.50  | 6.6  | 6.1   | 5.6  | 5.0  | 4.1   | 1.9   |   |
| AHRF800                                        | 10.9               | 10.0  | 9.1   | 8.2  | 8.00  | 7.1  | 6.4   | 5.9  | 5.3  | 4.4   | 2.0   |   |
| AHRF900                                        | 12.2               | 11.2  | 10.2  | 9.3  | 9.00  | 8.0  | 7.2   | 6.6  | 6.0  | 5.0   | 2.2   |   |
| AHRF1000                                       | 13.6               | 12.5  | 11.4  | 10.3 | 10.00 | 8.8  | 8.1   | 7.4  | 6.6  | 5.5   | 2.5   |   |
| AHRF1100                                       | 14.9               | 13.7  | 12.5  | 11.3 | 11.00 | 9.7  | 8.8   | 8.1  | 7.3  | 6.1   | 2.7   |   |
| AHRF1300                                       | 17.7               | 16.3  | 14.8  | 13.4 | 13.00 | 11.4 | 10.5  | 9.6  | 8.6  | 7.2   | 3.3   |   |
| AHRF1400                                       | 19.0               | 17.5  | 15.9  | 14.4 | 14.00 | 12.4 | 11.2  | 10.3 | 9.3  | 7.8   | 3.5   |   |
| AHRF1500                                       | 20.4               | 18.8  | 17.1  | 15.5 | 15.00 | 13.2 | 12.1  | 11.1 | 9.9  | 8.3   | 3.8   |   |
| AHEF (High Temperature)<br>32V — Radial-leaded |                    |       |       |      |       |      |       |      |      |       |       |   |
| AHEF050                                        | 0.7                | 0.6   | 0.60  | 0.5  | 0.5   | 0.4  | 0.400 | 0.40 | 0.30 | 0.300 | 0.1   |   |
| AHEF070                                        | 1.0                | 0.9   | 0.80  | 0.7  | 0.7   | 0.6  | 0.600 | 0.50 | 0.50 | 0.400 | 0.2   |   |
| AHEF100                                        | 1.4                | 1.2   | 1.10  | 1.0  | 1.0   | 0.9  | 0.800 | 0.70 | 0.70 | 0.600 | 0.2   |   |
| AHEF300                                        | 4.1                | 3.8   | 3.42  | 3.1  | 3.0   | 2.7  | 2.430 | 2.22 | 1.98 | 1.650 | 0.6   |   |
| AHEF500                                        | 6.8                | 6.3   | 5.70  | 5.2  | 5.0   | 4.5  | 4.050 | 3.70 | 3.30 | 2.750 | 1.0   |   |
| AHEF750                                        | 10.2               | 9.4   | 8.55  | 7.7  | 7.5   | 6.7  | 6.075 | 5.55 | 4.95 | 4.125 | 1.5   |   |
| AHEF1000                                       | 13.6               | 12.5  | 11.40 | 10.3 | 10.0  | 8.9  | 8.100 | 7.40 | 6.60 | 5.500 | 2.0   |   |
| AHS (High Temperature)<br>16V — Surface-mount  |                    |       |       |      |       |      |       |      |      |       |       |   |
| AHS080-2018                                    | 1.20               | 1.04  | 0.90  | 0.80 | 0.77  | 0.68 | 0.62  | 0.60 | 0.53 | 0.46  | 0.26  |   |
| AHS160                                         | 2.15               | 1.96  | 1.78  | 1.60 | 1.55  | 1.42 | 1.33  | 1.24 | 1.15 | 1.01  | 0.64  |   |
| AHS200                                         | 2.90               | 2.50  | 2.20  | 2.00 | 1.94  | 1.80 | 1.75  | 1.70 | 1.40 | 1.18  | 0.67  |   |
| AHS300                                         | 4.20               | 3.80  | 3.70  | 3.00 | 2.92  | 2.63 | 2.44  | 2.10 | 2.00 | 1.76  | 1.00  |   |
| ASMD<br>16-60V — Surface-mount                 |                    |       |       |      |       |      |       |      |      |       |       |   |
| ASMD030F                                       | 0.35               | 0.31  | 0.27  | 0.23 | 0.22  | 0.19 | 0.17  | 0.15 | 0.13 | 0.11  | —     |   |
| ASMD050F                                       | 0.59               | 0.53  | 0.46  | 0.39 | 0.37  | 0.33 | 0.29  | 0.26 | 0.23 | 0.18  | —     |   |
| ASMD075F                                       | 0.91               | 0.81  | 0.71  | 0.60 | 0.58  | 0.50 | 0.45  | 0.40 | 0.35 | 0.28  | —     |   |
| ASMD100F                                       | 1.37               | 1.22  | 1.06  | 0.90 | 0.86  | 0.76 | 0.68  | 0.60 | 0.52 | 0.41  | —     |   |
| ASMD125F                                       | 1.58               | 1.40  | 1.23  | 1.04 | 1.00  | 0.87 | 0.78  | 0.70 | 0.60 | 0.48  | —     |   |
| ASMD150F                                       | 1.93               | 1.70  | 1.50  | 1.27 | 1.22  | 1.07 | 0.95  | 0.85 | 0.74 | 0.58  | —     |   |
| ASMD200F                                       | 2.63               | 2.34  | 2.04  | 1.73 | 1.66  | 1.45 | 1.30  | 1.16 | 1.00 | 0.80  | —     |   |
| ASMD250F                                       | 3.00               | 2.66  | 2.32  | 1.97 | 1.89  | 1.65 | 1.48  | 1.32 | 1.14 | 0.91  | —     |   |
| BD<br>14V— Bladed Device                       |                    |       |       |      |       |      |       |      |      |       |       |   |
| NEW                                            | BD280-1130-10/16   | 12.4  | 11.0  | 9.7  | 8.3   | 8.0  | 7.0   | 6.3  | 5.6  | 5.0   | 4.0   | — |
| NEW                                            | BD280-1130-15/16   | 17.4  | 15.7  | 14.1 | 12.4  | 12.0 | 10.8  | 9.9  | 9.1  | 8.3   | 7.0   | — |
| NEW                                            | BD280-1130-20/16   | 24.0  | 21.6  | 19.1 | 16.6  | 16.0 | 14.1  | 12.9 | 11.7 | 10.4  | 8.6   | — |
| NEW                                            | BD280-1927-25/16-W | 32.0  | 28.3  | 24.6 | 20.9  | 20.0 | 17.2  | 15.4 | 13.5 | 11.7  | 8.9   | — |
| NEW                                            | BD280-1927-30/16-W | 34.1  | 30.1  | 26.0 | 22.0  | 21.0 | 18.0  | 16.0 | 14.0 | 11.9  | 9.1   | — |

**Figure A1-A4 Thermal Derating Curves for Automotive Devices**

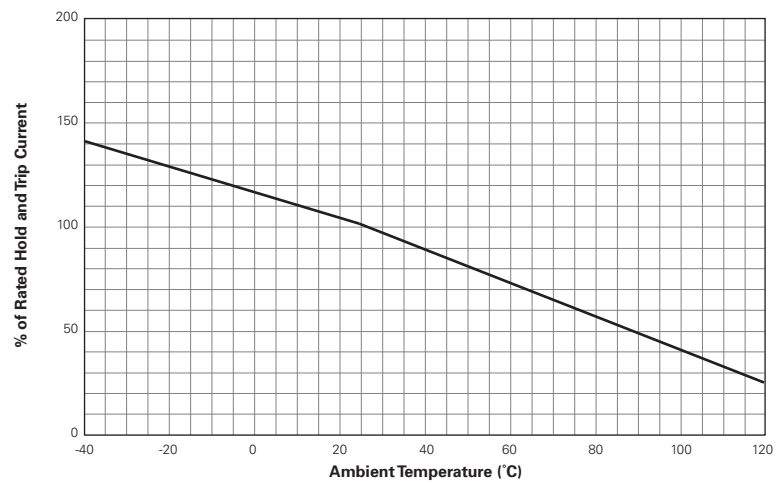
A = AGRF  
B = AHRF

**Figure A1**



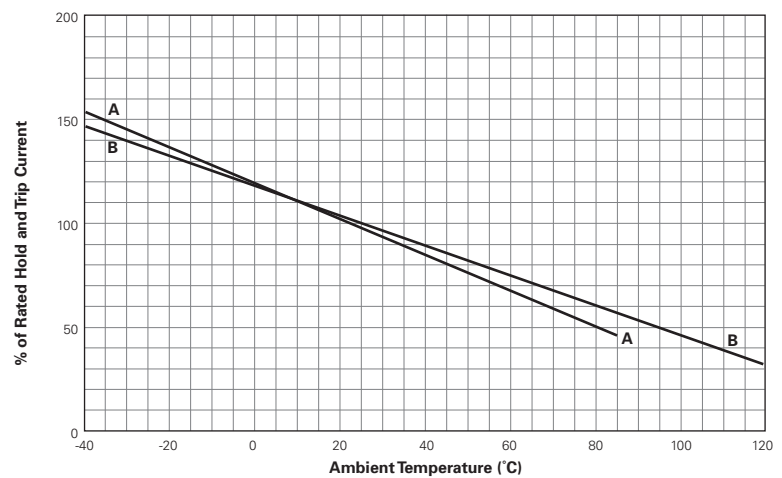
AHEF

**Figure A2**



A = ASMD  
B = AHS

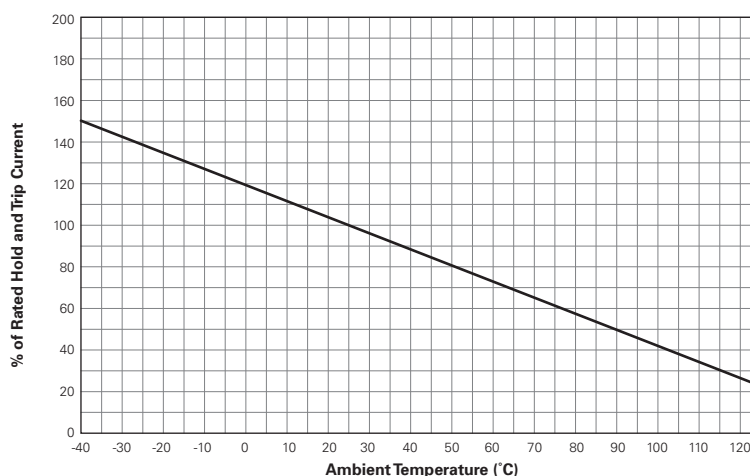
**Figure A3**



**Figure A1-A4 Thermal Derating Curves for Automotive Devices**

Cont'd

BD

**Figure A4**

**Table A3 Electrical Characteristics for Automotive Devices**

| Part Number                    | $I_H(A)@R_{1MAX}$ | $I_H(A)@R_{aMAX}$ | $I_T (A)$ | $V_{MAX} (V_{DC})$ | $I_{MAX} (A)$ | $P_{D Typ} (W)$ | Max. Time-to-trip (A) (s) | $R_{MIN} (\Omega)$ | $R_{1MAX} (\Omega)$ | $R_{aMAX} (\Omega)$ | Figure for Dimensions |
|--------------------------------|-------------------|-------------------|-----------|--------------------|---------------|-----------------|---------------------------|--------------------|---------------------|---------------------|-----------------------|
| <b>AGRF</b>                    |                   |                   |           |                    |               |                 |                           |                    |                     |                     |                       |
| <b>16V — Radial-leaded</b>     |                   |                   |           |                    |               |                 |                           |                    |                     |                     |                       |
| AGRF400                        | 4.0               | 3.0               | 7.6       | 16                 | 100           | 2.5             | 20.0 2.0                  | 0.0186             | 0.0610              | 0.0850              | A5, A8, A9            |
| AGRF500                        | 5.0               | 4.3               | 9.4       | 16                 | 100           | 2.7             | 25.0 2.5                  | 0.0140             | 0.0340              | 0.0480              | A5, A8, A9            |
| AGRF600                        | 6.0               | 5.3               | 10.7      | 16                 | 100           | 2.8             | 30.0 3.5                  | 0.0095             | 0.0280              | 0.0320              | A5, A8, A9            |
| AGRF700                        | 7.0               | 6.5               | 13.2      | 16                 | 100           | 3.0             | 35.0 4.0                  | 0.0066             | 0.0200              | 0.0220              | A5, A8, A9            |
| AGRF800                        | 8.0               | 7.6               | 15.0      | 16                 | 100           | 3.2             | 40.0 5.5                  | 0.0049             | 0.0175              | 0.0181              | A5, A8, A9            |
| AGRF900                        | 9.0               | 8.6               | 16.5      | 16                 | 100           | 3.4             | 45.0 6.0                  | 0.0041             | 0.0135              | 0.0140              | A5, A8, A9            |
| AGRF1000                       | 10.0              | 9.6               | 18.5      | 16                 | 100           | 3.6             | 50.0 7.0                  | 0.0034             | 0.0102              | 0.0106              | A5, A8, A9            |
| AGRF1100                       | 11.0              | 10.5              | 20.3      | 16                 | 100           | 3.7             | 55.0 7.5                  | 0.0033             | 0.0089              | 0.0093              | A5, A8, A9            |
| AGRF1200                       | 12.0              | 11.5              | 22.1      | 16                 | 100           | 4.2             | 60.0 8.0                  | 0.0030             | 0.0086              | 0.0091              | A5, A8, A9            |
| AGRF1400                       | 14.0              | 13.0              | 27.3      | 16                 | 100           | 4.6             | 70.0 9.0                  | 0.0022             | 0.0064              | 0.0067              | A5, A8, A9            |
| <b>AHRF (High Temperature)</b> |                   |                   |           |                    |               |                 |                           |                    |                     |                     |                       |
| <b>30V — Radial-leaded</b>     |                   |                   |           |                    |               |                 |                           |                    |                     |                     |                       |
| AHRF050                        | 0.5               | 0.5               | 1.0       | 30                 | 40            | 0.9             | 2.5 3.0                   | 0.3500             | 1.100               | 1.100               | A8, A9, A10           |
| AHRF070                        | 0.7               | 0.7               | 1.4       | 30                 | 40            | 1.4             | 3.5 3.2                   | 0.2300             | 0.800               | 0.800               | A5, A8, A9            |
| AHRF100                        | 1.0               | 1.0               | 1.9       | 30                 | 40            | 1.4             | 5.0 6.2                   | 0.1500             | 0.430               | 0.430               | A8, A9, A10           |
| <b>AHRF (High Temperature)</b> |                   |                   |           |                    |               |                 |                           |                    |                     |                     |                       |
| <b>16V — Radial-leaded</b>     |                   |                   |           |                    |               |                 |                           |                    |                     |                     |                       |
| AHRF200                        | 2.0               | 2.0               | 3.8       | 16                 | 100           | 1.4             | 10.0 4.8                  | 0.0390             | 0.110               | 0.110               | A8, A9, A10           |
| AHRF300                        | 3.0               | 3.0               | 6.5       | 16                 | 100           | 3.0             | 15.0 5.0                  | 0.0290             | 0.079               | 0.079               | A5, A8, A9            |
| AHRF400                        | 4.0               | 4.0               | 7.4       | 16                 | 100           | 3.3             | 20.0 5.0                  | 0.0210             | 0.060               | 0.060               | A5, A8, A9            |
| AHRF450                        | 4.5               | 4.5               | 8.7       | 16                 | 100           | 3.6             | 22.5 4.0                  | 0.0170             | 0.054               | 0.054               | A5, A8, A9            |
| AHRF550                        | 5.5               | 5.5               | 10.0      | 16                 | 100           | 3.5             | 27.5 6.0                  | 0.0130             | 0.037               | 0.037               | A5, A8, A9            |
| AHRF600                        | 6.0               | 6.0               | 12.0      | 16                 | 100           | 4.1             | 30.0 6.5                  | 0.0100             | 0.032               | 0.032               | A5, A8, A9            |
| AHRF650                        | 6.5               | 6.5               | 13.7      | 16                 | 100           | 4.3             | 32.5 7.0                  | 0.0090             | 0.026               | 0.026               | A5, A8, A9            |
| AHRF700                        | 7.0               | 7.0               | 13.1      | 16                 | 100           | 4.0             | 35.0 7.0                  | 0.0087             | 0.025               | 0.025               | A5, A8, A9            |
| AHRF750                        | 7.5               | 7.5               | 14.8      | 16                 | 100           | 4.5             | 37.5 8.0                  | 0.0074             | 0.022               | 0.022               | A5, A8, A9            |
| AHRF800                        | 8.0               | 8.0               | 15.0      | 16                 | 100           | 4.2             | 40.0 8.0                  | 0.0072             | 0.020               | 0.020               | A5, A8, A9            |
| AHRF900                        | 9.0               | 9.0               | 18.5      | 16                 | 100           | 5.0             | 45.0 11.5                 | 0.0061             | 0.017               | 0.017               | A5, A8, A9            |
| AHRF1000                       | 10.0              | 10.0              | 20.5      | 16                 | 100           | 5.3             | 50.0 10.5                 | 0.0051             | 0.015               | 0.015               | A5, A8, A9            |
| AHRF1100                       | 11.0              | 11.0              | 21.2      | 16                 | 100           | 5.5             | 55.0 11.0                 | 0.0048             | 0.013               | 0.013               | A5, A8, A9            |
| AHRF1300                       | 13.0              | 13.0              | 27.0      | 16                 | 100           | 6.9             | 65.0 15.0                 | 0.0034             | 0.010               | 0.010               | A5, A8, A9            |
| AHRF1400                       | 14.0              | 14.0              | 28.3      | 16                 | 100           | 6.9             | 70.0 15.5                 | 0.0029             | 0.009               | 0.009               | A5, A8, A9            |
| AHRF1500                       | 15.0              | 15.0              | 33.0      | 16                 | 100           | 7.0             | 75.0 20.0                 | 0.0027             | 0.0092              | 0.0092              | A5, A8, A9            |

**Table A3 Electrical Characteristics for Automotive Devices**

Cont'd

| Part Number                                    | I <sub>H</sub> (A)@<br>R <sub>1MAX</sub> | I <sub>H</sub> (A)@<br>R <sub>aMAX</sub> | I <sub>T</sub><br>(A) | V <sub>MAX</sub><br>(V <sub>DC</sub> ) | I <sub>MAX</sub><br>(A) | P <sub>D Typ</sub><br>(W) | Max. Time-to-trip |      | R <sub>MIN</sub><br>(Ω) | R <sub>1MAX</sub><br>(Ω) | R <sub>aMAX</sub><br>(Ω) | Figure for<br>Dimensions |     |
|------------------------------------------------|------------------------------------------|------------------------------------------|-----------------------|----------------------------------------|-------------------------|---------------------------|-------------------|------|-------------------------|--------------------------|--------------------------|--------------------------|-----|
| AHEF (High Temperature)<br>32V — Radial-leaded |                                          |                                          |                       |                                        |                         |                           |                   |      |                         |                          |                          |                          |     |
| AHEF050                                        | 0.5                                      | 0.5                                      | 1.0                   | 32                                     | 100                     | 0.9                       | 2.5               | 3.0  | 0.3500                  | 1.100                    | 1.100                    | A8, A9, A10              |     |
| AHEF070                                        | 0.7                                      | 0.7                                      | 1.4                   | 32                                     | 100                     | 0.9                       | 3.5               | 3.2  | 0.2300                  | 0.800                    | 0.800                    | A8, A9, A11              |     |
| AHEF100                                        | 1.0                                      | 1.0                                      | 1.9                   | 32                                     | 100                     | 1.4                       | 5.0               | 6.2  | 0.1500                  | 0.430                    | 0.430                    | A8, A9, A10              |     |
| AHEF300                                        | 3.0                                      | 3.0                                      | 6.0                   | 32                                     | 100                     | 3.2                       | 15.0              | 5.0  | 0.0350                  | 0.110                    | 0.110                    | A8, A9, A12              |     |
| AHEF500                                        | 5.0                                      | 5.0                                      | 10.0                  | 32                                     | 100                     | 5.3                       | 25.0              | 9.0  | 0.0150                  | 0.040                    | 0.040                    | A8, A9, A12              |     |
| AHEF750                                        | 7.5                                      | 7.5                                      | 15.0                  | 32                                     | 100                     | 6.5                       | 37.5              | 13.0 | 0.0074                  | 0.023                    | 0.023                    | A8, A9, A12              |     |
| AHEF1000                                       | 10.0                                     | 10.0                                     | 20.0                  | 32                                     | 100                     | 7.0                       | 50.0              | 15.0 | 0.0060                  | 0.016                    | 0.016                    | A8, A9, A12              |     |
| AHS (High Temperature)<br>16V — Surface-mount  |                                          |                                          |                       |                                        |                         |                           |                   |      |                         |                          |                          |                          |     |
| AHS080-2018                                    | 0.80                                     | 0.80                                     | 2.00                  | 16                                     | 70                      | 1.5                       | 8.0               | 9.0  | 0.130                   | 0.550                    | 0.550                    | A6                       |     |
| AHS160                                         | 1.60                                     | 1.60                                     | 3.20                  | 16                                     | 70                      | 2.2                       | 8.0               | 15.0 | 0.050                   | 0.150                    | 0.150                    | A7                       |     |
| AHS200                                         | 2.00                                     | 2.00                                     | 4.00                  | 16                                     | 70                      | 2.3                       | 8.0               | 13.4 | 0.050                   | 0.140                    | 0.140                    | A7                       |     |
| AHS300                                         | 3.00                                     | 3.00                                     | 6.00                  | 16                                     | 70                      | 3.0                       | 15.0              | 8.0  | 0.024                   | 0.083                    | 0.083                    | A7                       |     |
| ASMD<br>16-60V — Surface-mount                 |                                          |                                          |                       |                                        |                         |                           |                   |      |                         |                          |                          |                          |     |
| ASMD030F                                       | 0.23                                     | 0.23                                     | 0.59                  | 60                                     | 10                      | 1.1                       | 1.15              | 12.0 | 0.980                   | 4.800                    | 4.800                    | A7                       |     |
| ASMD050F                                       | 0.37                                     | 0.37                                     | 0.98                  | 60                                     | 10                      | 1.7                       | 1.95              | 20.0 | 0.290                   | 1.400                    | 1.400                    | A7                       |     |
| ASMD075F                                       | 0.60                                     | 0.60                                     | 1.48                  | 30                                     | 40                      | 1.1                       | 3.00              | 20.0 | 0.290                   | 1.000                    | 1.000                    | A7                       |     |
| ASMD100F                                       | 0.90                                     | 0.90                                     | 2.16                  | 30                                     | 40                      | 1.1                       | 4.50              | 20.0 | 0.098                   | 0.480                    | 0.480                    | A7                       |     |
| ASMD125F                                       | 1.04                                     | 1.04                                     | 2.46                  | 16                                     | 40                      | 1.1                       | 5.20              | 20.0 | 0.057                   | 0.250                    | 0.250                    | A7                       |     |
| ASMD150F                                       | 1.27                                     | 1.27                                     | 2.95                  | 16                                     | 40                      | 1.2                       | 6.35              | 25.0 | 0.049                   | 0.250                    | 0.250                    | A7                       |     |
| ASMD200F                                       | 1.73                                     | 1.73                                     | 3.93                  | 16                                     | 40                      | 1.2                       | 8.65              | 30.0 | 0.050                   | 0.120                    | 0.120                    | A7                       |     |
| ASMD250F                                       | 1.97                                     | 1.97                                     | 5.00                  | 16                                     | 40                      | 1.2                       | 9.85              | 30.0 | 0.035                   | 0.085                    | 0.085                    | A7                       |     |
| BD<br>14V — Bladed Device                      |                                          |                                          |                       |                                        |                         |                           |                   |      |                         |                          |                          |                          |     |
| NEW                                            | BD280-1130-10/16                         | 8                                        | 8                     | 13                                     | 14                      | 100                       | 4.4               | 40   | 8                       | 0.0095                   | 0.0185                   | 0.0185                   | A13 |
| NEW                                            | BD280-1130-15/16                         | 12                                       | 12                    | 20                                     | 14                      | 100                       | 4.5               | 60   | 8                       | 0.0050                   | 0.0070                   | 0.0070                   | A13 |
| NEW                                            | BD280-1130-20/16                         | 16                                       | 16                    | 26                                     | 14                      | 100                       | 5.2               | 80   | 10                      | 0.0028                   | 0.0064                   | 0.0064                   | A13 |
| NEW                                            | BD280-1927-25/16-W                       | 20                                       | 20                    | 32                                     | 14                      | 100                       | 6.0               | 100  | 13                      | 0.0024                   | 0.0042                   | 0.0042                   | A14 |
| NEW                                            | BD280-1927-30/16-W                       | 21                                       | 21                    | 38                                     | 14                      | 100                       | 6.2               | 120  | 13                      | 0.0021                   | 0.0043                   | 0.0043                   | A14 |

**Notes:**
 $I_H$  : Hold current: maximum current device will pass without interruption in 25°C, unless otherwise specified (20°C for ASMD).

 $I_T$  : Trip current: minimum current that will switch the device from low resistance to high resistance in 25°C still air, unless otherwise specified.

 $V_{MAX}$  : Maximum voltage device can withstand without damage at rated current.

 $I_{MAX}$  : Maximum fault current device can withstand without damage at rated voltage.

 $P_D$  : Power dissipated from device when in the tripped state in 25°C still air, unless otherwise specified.

 $R_{MIN}$  : Minimum resistance of device as supplied at 25°C, unless otherwise specified.

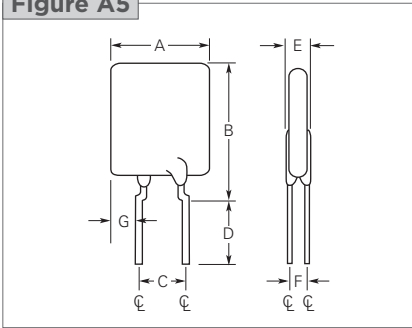
 $R_{1MAX}$  : Maximum resistance of device when measured one hour post reflow (surface-mount device) or one hour post trip (radial-leaded device) at 25°C unless otherwise specified.

 $R_{aMAX}$  : Maximum functional resistance of device after being subjected to the stresses described in PS400 at 25°C, unless otherwise specified.

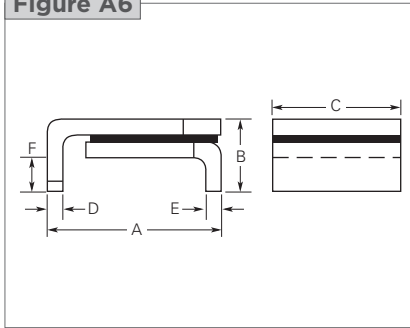
 $R_{aMIN}$  : Minimum functional resistance of device after being subjected to the stresses described in PS400 at 25°C, unless otherwise specified.

**Figure A5-A14 Dimension Figures for Automotive Devices**

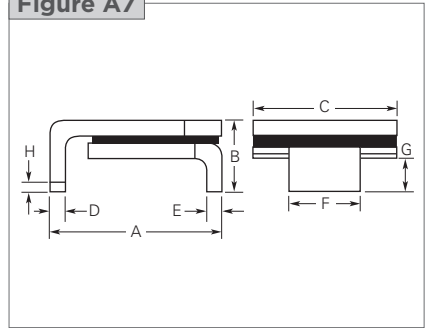
**Figure A5**



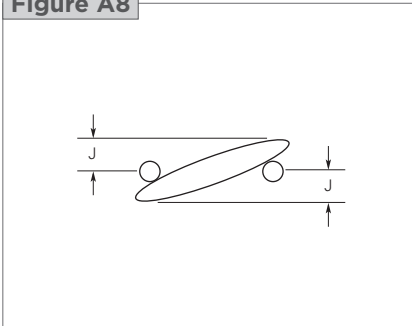
**Figure A6**



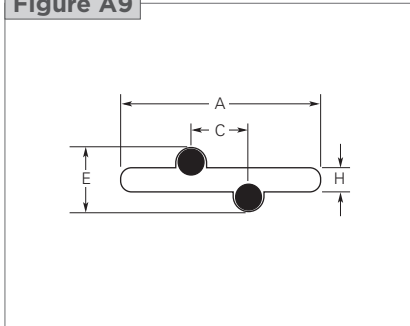
**Figure A7**



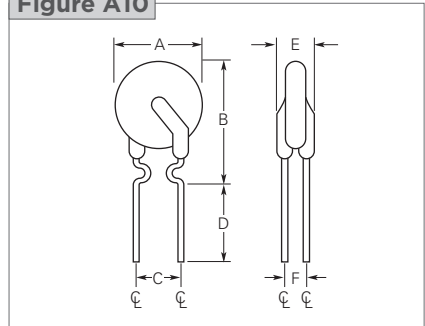
**Figure A8**



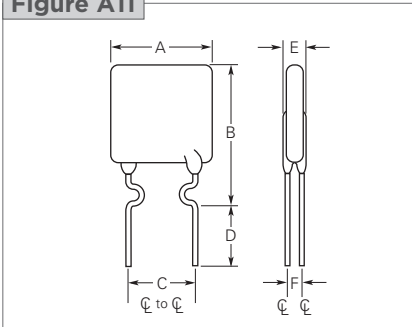
**Figure A9**



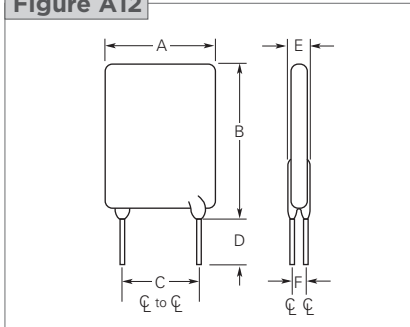
**Figure A10**



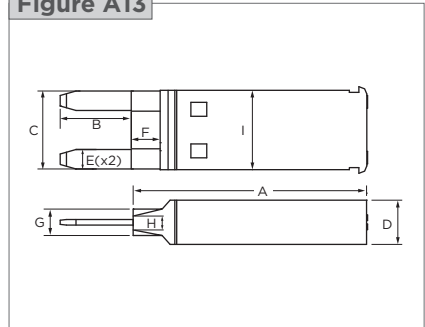
**Figure A11**



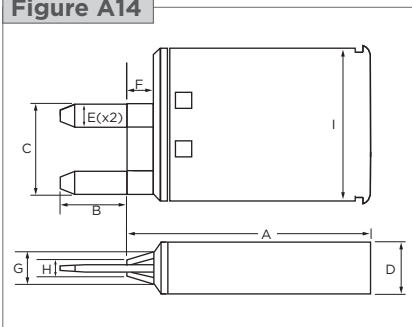
**Figure A12**



**Figure A13**



**Figure A14**



**Table A4 Dimensions for Automotive Devices in Millimeters (Inches)**

| Part Number             | A    |                 | B    |                | C    |               | D             |      | E             |                | F             |      | G    |                 | H               | J             | Figure         |
|-------------------------|------|-----------------|------|----------------|------|---------------|---------------|------|---------------|----------------|---------------|------|------|-----------------|-----------------|---------------|----------------|
|                         | Min. | Max.            | Min. | Max.           | Min. | Max.          | Min.          | Max. | Min.          | Max.           | Min.          | Max. | Min. | Max.            | Typ.            | Max.          |                |
| AGRF                    |      |                 |      |                |      |               |               |      |               |                |               |      |      |                 |                 |               |                |
| 16V — Radial-leaded     |      |                 |      |                |      |               |               |      |               |                |               |      |      |                 |                 |               |                |
| AGRF400                 | —    | 8.9<br>(0.35)   | —    | 14.1<br>(0.56) | —    | 3.0<br>(0.12) | 7.6<br>(0.3)  | —    | 4.3<br>(0.17) | 5.8<br>(0.20)  | 1.2<br>(0.15) | —    | —    | 3.10<br>(0.120) | 1.24<br>(0.049) | 1.4<br>(0.06) | A5, A8,<br>A9  |
| AGRF500                 | —    | 10.4<br>(0.41)  | —    | 15.6<br>(0.61) | —    | 3.0<br>(0.12) | 7.6<br>(0.3)  | —    | 4.3<br>(0.17) | 5.8<br>(0.20)  | 1.2<br>(0.05) | —    | —    | 3.94<br>(0.155) | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AGRF600                 | —    | 10.7<br>(0.42)  | —    | 18.4<br>(0.73) | —    | 3.0<br>(0.12) | 7.6<br>(0.3)  | —    | 4.3<br>(0.17) | 5.8<br>(0.20)  | 1.2<br>(0.05) | —    | —    | 4.07<br>(0.160) | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AGRF700                 | —    | 11.2<br>(0.44)  | —    | 21.0<br>(0.73) | —    | 3.0<br>(0.12) | 7.6<br>(0.3)  | —    | 4.3<br>(0.17) | 5.8<br>(0.20)  | 1.2<br>(0.05) | —    | —    | 4.49<br>(0.177) | 1.24<br>(0.049) | 1.7<br>(0.07) | A5, A8,<br>A9  |
| AGRF800                 | —    | 12.7<br>(0.50)  | —    | 22.2<br>(0.88) | —    | 3.0<br>(0.12) | 7.6<br>(0.3)  | —    | 4.3<br>(0.17) | 5.8<br>(0.20)  | 1.2<br>(0.05) | —    | —    | 5.08<br>(0.200) | 1.24<br>(0.049) | 1.8<br>(0.07) | A5, A8,<br>A9  |
| AGRF900                 | —    | 14.0<br>(0.55)  | —    | 23.0<br>(0.91) | —    | 3.0<br>(0.12) | 7.6<br>(0.3)  | —    | 4.3<br>(0.17) | 5.8<br>(0.20)  | 1.2<br>(0.05) | —    | —    | 5.69<br>(0.224) | 1.24<br>(0.049) | 2.0<br>(0.08) | A5, A8,<br>A9  |
| AGRF1000                | —    | 16.51<br>(0.65) | —    | 25.7<br>(1.01) | —    | 3.0<br>(0.12) | 7.6<br>(0.3)  | —    | 4.3<br>(0.17) | 5.8<br>(0.20)  | 1.2<br>(0.05) | —    | —    | 6.96<br>(0.274) | 1.24<br>(0.049) | 2.0<br>(0.08) | A5, A8,<br>A9  |
| AGRF1100                | —    | 17.5<br>(0.69)  | —    | 26.5<br>(1.04) | —    | 3.0<br>(0.12) | 7.6<br>(0.3)  | —    | 4.3<br>(0.17) | 5.8<br>(0.20)  | 1.2<br>(0.05) | —    | —    | 7.47<br>(0.294) | 1.24<br>(0.049) | 2.4<br>(0.09) | A5, A8,<br>A9  |
| AGRF1200                | —    | 17.5<br>(0.69)  | —    | 28.8<br>(1.14) | —    | 3.5<br>(0.14) | 7.6<br>(0.3)  | —    | 9.4<br>(0.37) | 10.9<br>(0.43) | 1.4<br>(0.06) | —    | —    | 4.83<br>(0.190) | 1.45<br>(0.057) | 1.5<br>(0.06) | A5, A8,<br>A9  |
| AGRF1400                | —    | 23.5<br>(0.925) | —    | 28.7<br>(1.13) | —    | 3.5<br>(0.14) | 7.6<br>(0.3)  | —    | 9.4<br>(0.37) | 10.9<br>(0.43) | 1.4<br>(0.06) | —    | —    | 7.82<br>(0.308) | 1.45<br>(0.057) | 1.9<br>(0.07) | A5, A8,<br>A9  |
| AHRF (High Temperature) |      |                 |      |                |      |               |               |      |               |                |               |      |      |                 |                 |               |                |
| 30V — Radial-leaded     |      |                 |      |                |      |               |               |      |               |                |               |      |      |                 |                 |               |                |
| AHRF050                 | —    | 7.4<br>(0.29)   | —    | 12.7<br>(0.50) | —    | 3.3<br>(0.13) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A8, A9,<br>A10 |
| AHRF070                 | —    | 6.9<br>(0.27)   | —    | 10.8<br>(0.43) | —    | 3.3<br>(0.13) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AHRF100                 | —    | 9.7<br>(0.38)   | —    | 13.6<br>(0.54) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A8, A9,<br>A10 |
| AHRF (High Temperature) |      |                 |      |                |      |               |               |      |               |                |               |      |      |                 |                 |               |                |
| 16V — Radial-leaded     |      |                 |      |                |      |               |               |      |               |                |               |      |      |                 |                 |               |                |
| AHRF200                 | —    | 9.4<br>(0.37)   | —    | 14.4<br>(0.57) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A8, A9,<br>A10 |
| AHRF300                 | —    | 8.8<br>(0.35)   | —    | 13.8<br>(0.55) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AHRF400                 | —    | 10.0<br>(0.39)  | —    | 15.0<br>(0.59) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AHRF450                 | —    | 10.4<br>(0.41)  | —    | 15.6<br>(0.61) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | 3.94<br>(0.155) | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AHRF550                 | —    | 11.2<br>(0.44)  | —    | 18.9<br>(0.74) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AHRF600                 | —    | 11.2<br>(0.44)  | —    | 21.0<br>(0.73) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | 4.49<br>(0.177) | 1.24<br>(0.049) | 1.7<br>(0.07) | A5, A8,<br>A9  |
| AHRF650                 | —    | 12.7<br>(0.50)  | —    | 22.2<br>(0.88) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | 5.08<br>(0.200) | 1.24<br>(0.049) | 1.8<br>(0.07) | A5, A8,<br>A9  |
| AHRF700                 | —    | 14.0<br>(0.55)  | —    | 21.9<br>(0.86) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AHRF750                 | —    | 14.0<br>(0.55)  | —    | 23.5<br>(0.93) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | 5.69<br>(0.224) | 1.24<br>(0.049) | 2.0<br>(0.08) | A5, A8,<br>A9  |
| AHRF800                 | —    | 16.5<br>(0.65)  | —    | 22.5<br>(0.88) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AHRF900                 | —    | 16.5<br>(0.65)  | —    | 25.7<br>(1.01) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 4.3<br>(0.17) | 5.8<br>(0.23)  | 1.2<br>(0.05) | —    | —    | —               | —               | —             | A5, A8,<br>A9  |
| AHRF1000                | —    | 17.5<br>(0.69)  | —    | 26.5<br>(1.04) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 9.4<br>(0.37) | 10.9<br>(0.43) | 1.2<br>(0.05) | —    | —    | 7.47<br>(0.294) | 1.24<br>(0.049) | 1.5<br>(0.06) | A5, A8,<br>A9  |
| AHRF1100                | —    | 21.0<br>(0.83)  | —    | 26.1<br>(1.03) | —    | 3.0<br>(0.12) | 7.6<br>(0.30) | —    | 9.4<br>(0.37) | 10.9<br>(0.43) | 1.2<br>(0.05) | —    | —    | —               | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |



**Table A4 Dimensions for Automotive Devices in Millimeters (Inches)**

Cont'd

| Part Number             | A    |                 | B    |                | C              |                | D              |      | E             |                | F             |      | G    |                 | H               | J             | Figure         |
|-------------------------|------|-----------------|------|----------------|----------------|----------------|----------------|------|---------------|----------------|---------------|------|------|-----------------|-----------------|---------------|----------------|
|                         | Min. | Max.            | Min. | Max.           | Min.           | Max.           | Min.           | Max. | Min.          | Max.           | Min.          | Max. | Min. | Max.            | Typ.            | Max.          |                |
| AHRF (High Temperature) |      |                 |      |                |                |                |                |      |               |                |               |      |      |                 |                 |               |                |
| 16V — Radial-leaded     |      |                 |      |                |                |                |                |      |               |                |               |      |      |                 |                 |               |                |
| AHRF1300                | —    | 23.5<br>(0.925) | —    | 28.7<br>(1.13) | —              | 3.5<br>(0.14)  | 7.6<br>(0.30)  | —    | 9.4<br>(0.37) | 10.9<br>(0.43) | 1.4<br>(0.06) | —    | —    | 7.82<br>(0.308) | 1.45<br>(0.057) | 1.9<br>(0.08) | A5, A8,<br>A9  |
| AHRF1400                | —    | 23.5<br>(0.93)  | —    | 28.7<br>(1.13) | —              | 3.6<br>(0.14)  | 7.6<br>(0.30)  | —    | 9.4<br>(0.37) | 10.9<br>(0.43) | 1.4<br>(0.06) | —    | —    | —<br>(0.049)    | 1.24<br>(0.049) | 1.6<br>(0.06) | A5, A8,<br>A9  |
| AHRF1500                | —    | 23.5<br>(0.93)  | —    | 28.7<br>(1.13) | —              | 3.5<br>(0.14)  | 7.6<br>(0.30)  | —    | 9.4<br>(0.37) | 10.9<br>(0.43) | 1.4<br>(0.06) | —    | —    | 7.82<br>(0.308) | —               | —             | A5, A8,<br>A9  |
| AHEF (High Temperature) |      |                 |      |                |                |                |                |      |               |                |               |      |      |                 |                 |               |                |
| 32V — Radial-leaded     |      |                 |      |                |                |                |                |      |               |                |               |      |      |                 |                 |               |                |
| AHEF050                 | —    | 7.4<br>(0.29)   | —    | 12.7<br>(0.50) | 4.3<br>(0.17)  | 5.8<br>(0.23)  | 7.6<br>(0.30)  | —    | —             | 3.3<br>(0.13)  | —             | —    | —    | —               | —               | —             | A8, A9,<br>A10 |
| AHEF070                 | —    | 6.9<br>(0.27)   | —    | 10.8<br>(0.43) | 4.3<br>(0.17)  | 5.8<br>(0.23)  | 7.6<br>(0.30)  | —    | —             | 3.0<br>(0.12)  | —             | —    | —    | —               | —               | —             | A8, A9,<br>A11 |
| AHEF100                 | —    | 9.7<br>(0.38)   | —    | 13.6<br>(0.54) | 4.3<br>(0.17)  | 5.8<br>(0.23)  | 7.6<br>(0.30)  | —    | —             | 3.0<br>(0.12)  | —             | —    | —    | —               | —               | —             | A8, A9,<br>A10 |
| AHEF300                 | —    | 10.2<br>(0.40)  | —    | 15.5<br>(0.61) | 4.32<br>(0.17) | 5.84<br>(0.23) | 7.6<br>(0.30)  | —    | —             | 3.8<br>(0.15)  | —             | —    | —    | —               | —               | —             | A8, A9,<br>A12 |
| AHEF500                 | —    | 14.0<br>(0.55)  | —    | 24.1<br>(0.95) | 4.3<br>(0.17)  | 5.8<br>(0.23)  | 11.5<br>(0.45) | —    | —             | 3.8<br>(0.15)  | —             | —    | —    | —               | —               | —             | A8, A9,<br>A12 |
| AHEF750                 | —    | 21.1<br>(0.83)  | —    | 24.9<br>(0.98) | 9.4<br>(0.37)  | 10.9<br>(0.43) | 7.6<br>(0.30)  | —    | —             | 3.8<br>(0.15)  | —             | —    | —    | —               | —               | —             | A8, A9,<br>A12 |
| AHEF1000                | —    | 23.5<br>(0.93)  | —    | 27.9<br>(1.10) | 9.4<br>(0.37)  | 10.9<br>(0.43) | 7.6<br>(0.30)  | —    | —             | 4.0<br>(0.16)  | —             | —    | —    | —               | —               | —             | A8, A9,<br>A12 |

| Part Number            | A               |                 | B    |                 | C               |                 | D               |                 | E               |                 | F               |                 | G               |                 | H               |      | Figure |
|------------------------|-----------------|-----------------|------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------|--------|
|                        | Min.            | Max.            | Min. | Max.            | Min.            | Max.            | Min.            | Max.            | Min.            | Max.            | Min.            | Max.            | Min.            | Max.            | Min.            | Max. |        |
| AHS (High Temperature) |                 |                 |      |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |        |
| 16V — Surface-mount    |                 |                 |      |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |        |
| AHS080-2018            | 4.72<br>(0.186) | 5.44<br>(0.214) | —    | 1.52<br>(0.060) | 4.22<br>(0.166) | 4.93<br>(0.194) | 0.25<br>(0.010) | 0.36<br>(0.014) | 0.25<br>(0.010) | 0.36<br>(0.014) | 0.30<br>(0.012) | 0.46<br>(0.018) | —               | —               | —               | —    | A6     |
| AHS160                 | 8.00<br>(0.315) | 9.40<br>(0.370) | —    | 3.00<br>(0.118) | 6.0<br>(0.24)   | 6.71<br>(0.264) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 3.68<br>(0.145) | 3.94<br>(0.155) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| AHS200                 | 8.00<br>(0.315) | 9.40<br>(0.370) | —    | 3.00<br>(0.118) | 6.0<br>(0.240)  | 6.71<br>(0.264) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 3.68<br>(0.145) | 3.94<br>(0.155) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| AHS300                 | 8.00<br>(0.315) | 9.40<br>(0.370) | —    | 3.00<br>(0.118) | 6.0<br>(0.240)  | 6.71<br>(0.264) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 3.68<br>(0.145) | 3.94<br>(0.155) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| ASMD                   |                 |                 |      |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |        |
| 16-60V — Surface-mount |                 |                 |      |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |      |        |
| ASMD030F               | 6.73<br>(0.265) | 7.98<br>(0.314) | —    | 3.18<br>(0.125) | 4.8<br>(0.19)   | 5.44<br>(0.214) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 2.16<br>(0.085) | 2.41<br>(0.095) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| ASMD050F               | 6.73<br>(0.265) | 7.98<br>(0.314) | —    | 3.18<br>(0.125) | 4.8<br>(0.19)   | 5.44<br>(0.214) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 2.16<br>(0.085) | 2.41<br>(0.095) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| ASMD075F               | 6.73<br>(0.265) | 7.98<br>(0.314) | —    | 3.18<br>(0.125) | 4.8<br>(0.19)   | 5.44<br>(0.214) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 2.16<br>(0.085) | 2.41<br>(0.095) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| ASMD100F               | 6.73<br>(0.265) | 7.98<br>(0.314) | —    | 3.00<br>(0.118) | 4.8<br>(0.19)   | 5.44<br>(0.214) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 2.16<br>(0.085) | 2.41<br>(0.095) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| ASMD125F               | 6.73<br>(0.265) | 7.98<br>(0.314) | —    | 3.00<br>(0.118) | 4.8<br>(0.19)   | 5.44<br>(0.214) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 2.16<br>(0.085) | 2.41<br>(0.095) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| ASMD150F               | 8.00<br>(0.315) | 9.40<br>(0.370) | —    | 3.00<br>(0.118) | 6.0<br>(0.24)   | 6.71<br>(0.264) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 3.68<br>(0.145) | 3.94<br>(0.155) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| ASMD200F               | 8.00<br>(0.315) | 9.40<br>(0.370) | —    | 3.00<br>(0.118) | 6.0<br>(0.24)   | 6.71<br>(0.264) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 3.68<br>(0.145) | 3.94<br>(0.155) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |
| ASMD250F               | 8.00<br>(0.315) | 9.40<br>(0.370) | —    | 3.00<br>(0.118) | 6.0<br>(0.24)   | 6.71<br>(0.264) | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.56<br>(0.022) | 0.71<br>(0.028) | 3.68<br>(0.145) | 3.94<br>(0.155) | 0.66<br>(0.026) | 1.37<br>(0.054) | 0.43<br>(0.017) | —    | A7     |

**Table A4 Dimensions for Automotive Devices in Millimeters (Inches)**

Cont'd

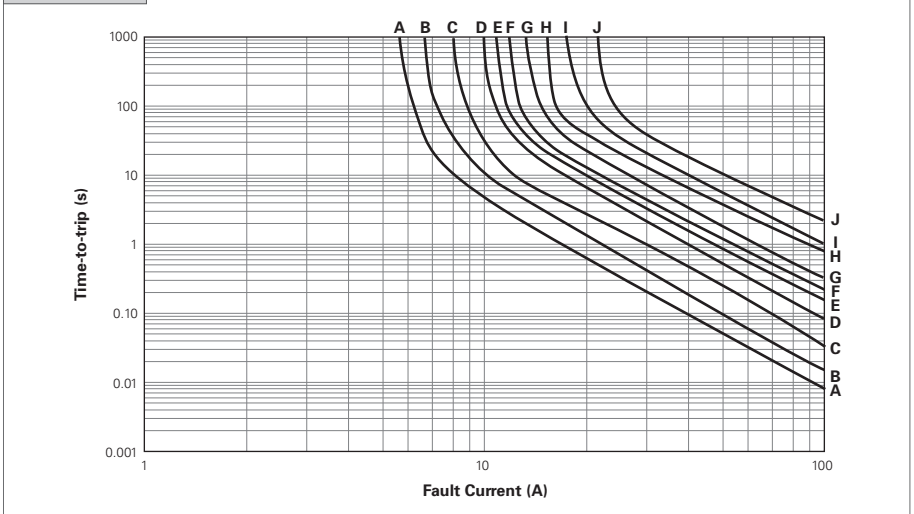
| Part Number         | A                   |                  | B                |                 | C               |                  | D                |                 | E(x2)           |                 | F               |                 | G               |                 | H               |                 | I               |                  | Figure           |     |
|---------------------|---------------------|------------------|------------------|-----------------|-----------------|------------------|------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|------------------|------------------|-----|
|                     | Min.                | Max.             | Min.             | Max.            | Min.            | Max.             | Min.             | Max.            | Min.            | Max.            | Min.            | Max.            | Min.            | Max.            | Min.            | Max.            | Min.            | Max.             |                  |     |
| BD                  |                     |                  |                  |                 |                 |                  |                  |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                  |                  |     |
| 14V — Bladed Device |                     |                  |                  |                 |                 |                  |                  |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |                  |                  |     |
| NEW                 | BD280-1130-10/16    | 29.50<br>(1.173) | 30.10<br>(1.185) | 8.70<br>(0.343) | 9.30<br>(0.366) | 10.75<br>(0.423) | 11.25<br>(0.443) | 6.05<br>(0.238) | 6.65<br>(0.262) | 2.55<br>(0.100) | 3.05<br>(0.120) | 3.30<br>(0.130) | 3.90<br>(0.154) | 3.40<br>(0.134) | 4.00<br>(0.157) | 1.70<br>(0.067) | 2.30<br>(0.091) | 10.90<br>(0.429) | 11.50<br>(0.453) | A13 |
| NEW                 | BD280-1130-15/16    | 29.50<br>(1.173) | 30.10<br>(1.185) | 8.70<br>(0.343) | 9.30<br>(0.366) | 10.75<br>(0.423) | 11.25<br>(0.443) | 6.05<br>(0.238) | 6.65<br>(0.262) | 2.55<br>(0.100) | 3.05<br>(0.120) | 3.30<br>(0.130) | 3.90<br>(0.154) | 3.40<br>(0.134) | 4.00<br>(0.157) | 1.70<br>(0.067) | 2.30<br>(0.091) | 10.90<br>(0.429) | 11.50<br>(0.453) | A13 |
| NEW                 | BD280-1130-20/16    | 29.50<br>(1.173) | 30.10<br>(1.185) | 8.70<br>(0.343) | 9.30<br>(0.366) | 10.75<br>(0.423) | 11.25<br>(0.443) | 6.05<br>(0.238) | 6.65<br>(0.262) | 2.55<br>(0.100) | 3.05<br>(0.120) | 3.30<br>(0.130) | 3.90<br>(0.154) | 3.40<br>(0.134) | 4.00<br>(0.157) | 1.70<br>(0.067) | 2.30<br>(0.091) | 10.90<br>(0.429) | 11.50<br>(0.453) | A13 |
| NEW                 | BD280-1927-25/16-VV | 26.65<br>(1.049) | 27.35<br>(1.077) | 8.60<br>(0.339) | 9.20<br>(0.362) | 10.75<br>(0.423) | 11.25<br>(0.443) | 6.05<br>(0.238) | 6.65<br>(0.262) | 2.55<br>(0.100) | 3.05<br>(0.120) | 1.80<br>(0.071) | 2.20<br>(0.087) | 3.50<br>(0.138) | 3.90<br>(0.154) | 1.70<br>(0.067) | 2.30<br>(0.091) | 19.00<br>(0.748) | 19.40<br>(0.764) | A14 |
| NEW                 | BD280-1927-30/16-VV | 26.65<br>(1.049) | 27.35<br>(1.077) | 8.60<br>(0.339) | 9.20<br>(0.362) | 10.75<br>(0.423) | 11.25<br>(0.443) | 6.05<br>(0.238) | 6.65<br>(0.262) | 2.55<br>(0.100) | 3.05<br>(0.120) | 1.80<br>(0.071) | 2.20<br>(0.087) | 3.50<br>(0.138) | 3.90<br>(0.154) | 1.70<br>(0.067) | 2.30<br>(0.091) | 19.00<br>(0.748) | 19.40<br>(0.764) | A14 |

**Figure A15-A20 Typical Time-to-trip at 25°C for Automotive Devices**

**AGRF**

- A = AGRF400
- B = AGRF500
- C = AGRF600
- D = AGRF700
- E = AGRF800
- F = AGRF900
- G = AGRF1000
- H = AGRF1100
- I = AGRF1200
- J = AGRF1400

**Figure A15**



**AHRF**

- A = AHRF050
- B = AHRF070
- C = AHRF100
- D = AHRF200
- E = AHRF300
- F = AHRF400
- G = AHRF450
- H = AHRF550
- I = AHRF600
- J = AHRF650
- K = AHRF700
- L = AHRF750
- M = AHRF800
- N = AHRF900
- O = AHRF1000
- P = AHRF1100
- Q = AHRF1300
- R = AHRF1400
- S = AHRF1500

**Figure A16**

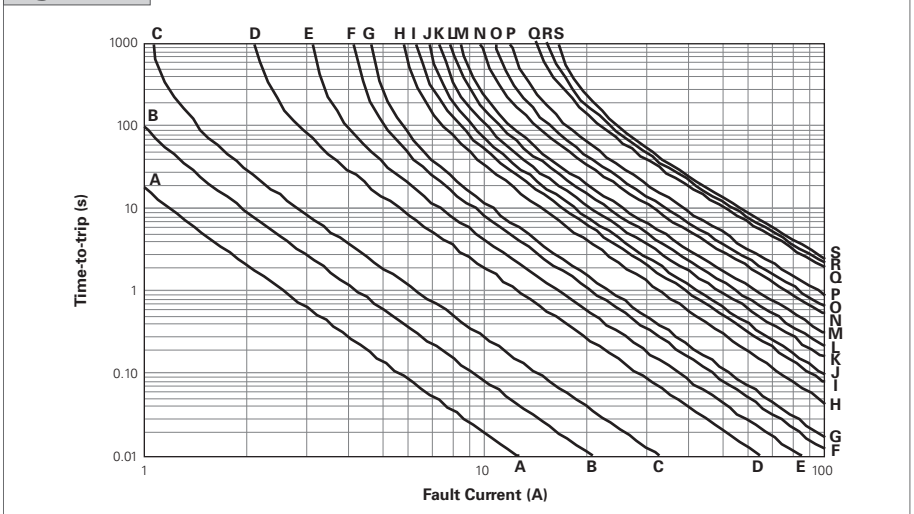


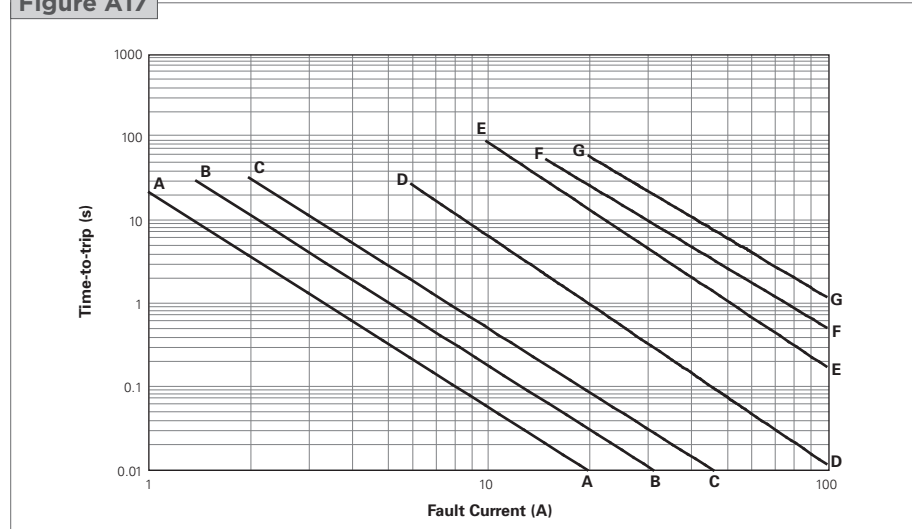
Figure A15-A20 Typical Time-to-trip at 25°C for Automotive Devices

Cont'd

### AHEF

- A = AHEF050
- B = AHEF070
- C = AHEF100
- D = AHEF300
- E = AHEF500
- F = AHEF750
- G = AHEF1000

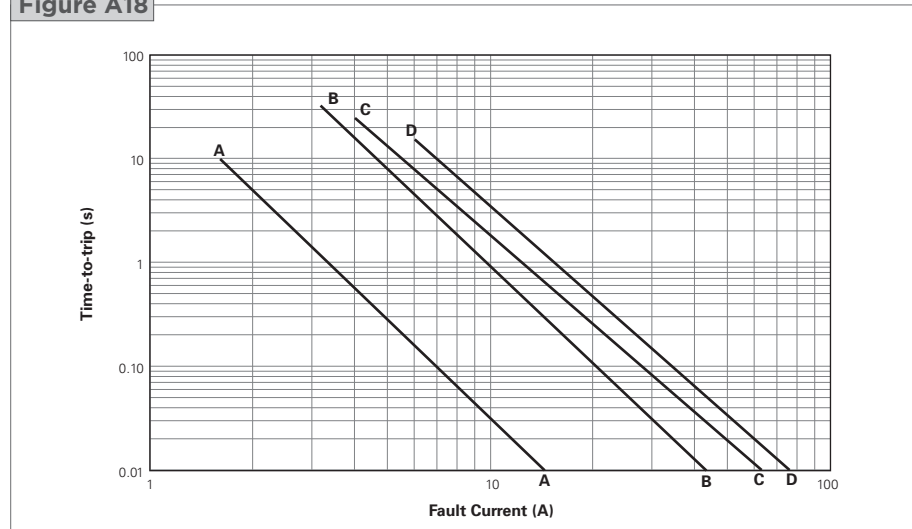
Figure A17



### AHS

- A = AHS080-2018
- B = AHS160
- C = AHS200
- D = AHS300

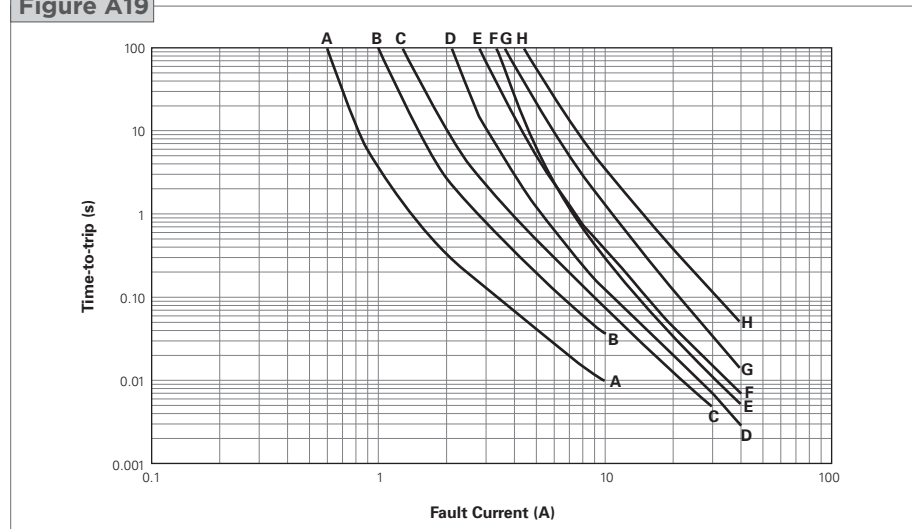
Figure A18



### ASMD

- A = ASMD030F
- B = ASMD050F
- C = ASMD075F
- D = ASMD100F
- E = ASMD125F
- F = ASMD150F
- G = ASMD200F
- H = ASMD250F

Figure A19



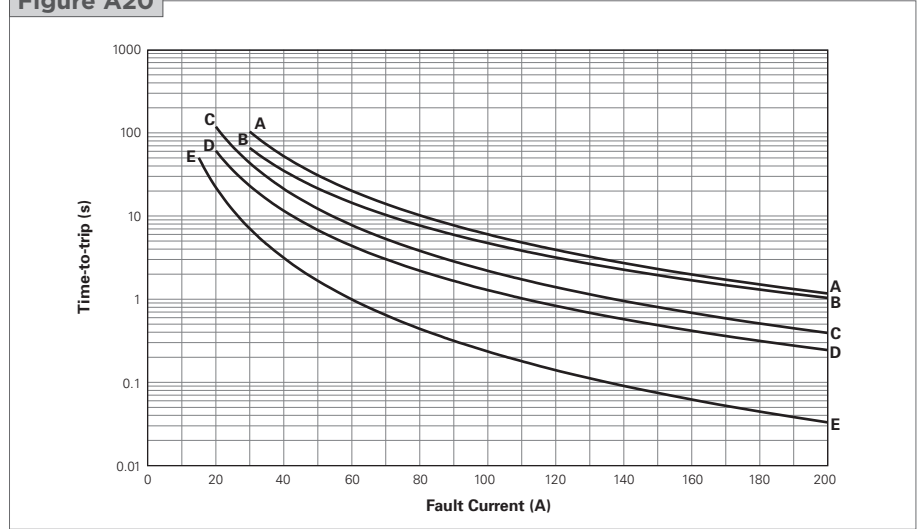
**Figure A15-A20 Typical Time-to-trip at 25°C for Automotive Devices**

Cont'd

**BD**

- A = BD30A
- B = BD25A
- C = BD20A
- D = BD15A
- E = BD10A

**Figure A20**



**Table A5 Physical Characteristics and Environmental Specifications for Automotive Devices**

**AGRF**

**Physical Characteristics**

|                           |                                                                                                                                                                                                              |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lead material             | AGRF400 to AGRF1100 : Tin Plated Copper, 0.52mm <sup>2</sup> (20AWG) ø 0.8 mm/0.032in<br>AGRF1200 to AGRF1400 : Tin Plated Copper, 0.82mm <sup>2</sup> (18AWG) ø 1.0mm/0.040in                               |
| Soldering characteristics | Solderability per ANSI/J-STD-002 Category 3                                                                                                                                                                  |
| Solder heat withstand     | AGRF400: per IEC68-2-20 Test Tb, Method 1A, Condition A: can withstand 5 seconds at 260°C ± 5°C<br>AGRF500-AGRF1400: per IEC68-2-20 Test Tb, Method 1A, Condition B: can withstand 10 seconds at 260°C ± 5°C |
| Insulating material       | Cured, flame-retardant epoxy polymer; meets UL 94V-0                                                                                                                                                         |
| Operation temperature     | -40°C~85°C                                                                                                                                                                                                   |

**Note:** See PS400 for other physical characteristics.  
Devices are not designed to be placed through a reflow process.

**Environmental Specifications**

| Test               | Conditions               | Resistance Change |
|--------------------|--------------------------|-------------------|
| Passive aging      | 70°C, 1000 hours         | ±5%               |
|                    | 85°C, 1000 hours         | ±5%               |
| Humidity aging     | 85°C, 85% RH, 1000 hours | ±5%               |
| Thermal shock      | 85°C, -40°C (10 times)   | ±5%               |
| Solvent resistance | MIL-STD-202, Method 215F | No change         |

**Note:** See PS400 for other environmental specifications.

**Table A5 Physical Characteristics and Environmental Specifications for Automotive Devices**

Cont'd

**AHRF**
**Physical Characteristics**

|                           |                                                                                                                                                                                                                                                                                         |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lead material             | AHRF050 to AHRF200 : Tin-plated Copper Clad Steel, 0.205mm <sup>2</sup> (24 AWG), ø 0.51mm/0.020in<br>AHRF300 to AHRF1100 : Tin-plated copper 0.52mm <sup>2</sup> (20 AWG), ø 0.81mm/0.032 in<br>AHRF1300 to AHRF1500 : Tin-plated copper 0.82mm <sup>2</sup> (18 AWG), ø 1.0mm/0.04 in |
| Soldering characteristics | Solderability per ANSI/J-STD 002 Category 3                                                                                                                                                                                                                                             |
| Solder heat withstand     | per IEC 68-2-20, Test Tb, Method 1A, Condition B; can withstand 10 seconds at 260°C ± 5°C                                                                                                                                                                                               |
| Insulating material       | Cured, flame-retardant epoxy polymer; meets UL 94V-0 requirements                                                                                                                                                                                                                       |
| Operation temperature     | -40°C~125°C                                                                                                                                                                                                                                                                             |

**Note:** See PS400 for other physical characteristics.  
Devices are not designed to be placed through a reflow process.

**Environmental Specifications**

| Test               | Conditions               | Resistance Change |
|--------------------|--------------------------|-------------------|
| Passive aging      | 70°C, 1000 hours         | ±5%               |
|                    | 85°C, 1000 hours         | ±5%               |
| Humidity aging     | 85°C, 85% RH, 1000 hours | ±5%               |
| Thermal shock      | 125°C, -40°C (10 times)  | ±5%               |
| Solvent resistance | MIL-STD-202, Method 215F | No change         |

**Note:** See PS400 for other environmental specifications.

**AHEF**
**Physical Characteristics**

|                           |                                                                                                                                                                                                                                                                            |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lead material             | AHEF050 to AHEF100 : Tin-plated Copper Clad Steel, 0.205mm <sup>2</sup> (24 AWG), ø 0.51mm/0.020in.<br>AHEF300 to AHEF750 : Tin-plated Copper 0.52mm <sup>2</sup> (20 AWG), ø 0.81mm/0.032in<br>AHEF1000 : Tin-plated copper 0.82mm <sup>2</sup> (18 AWG), ø 1.0mm/0.04 in |
| Soldering characteristics | Solderability per ANSI/J-STD 002 Category 3                                                                                                                                                                                                                                |
| Solder heat withstand     | per IEC 68-2-20, Test Tb, Method 1A, Condition B; can withstand 10 seconds at 260°C ± 5°C                                                                                                                                                                                  |
| Insulating material       | Cured, flame-retardant epoxy polymer; meets UL 94V-0 requirements                                                                                                                                                                                                          |
| Operation temperature     | -40°C~125°C                                                                                                                                                                                                                                                                |

**Note:** See PS400 for other physical characteristics.  
Devices are not designed to be placed through a reflow process.

**Environmental Specifications**

| Test               | Conditions               | Resistance Change |
|--------------------|--------------------------|-------------------|
| Passive aging      | 70°C, 1000 hours         | ±5%               |
|                    | 85°C, 1000 hours         | ±5%               |
| Humidity aging     | 85°C, 85% RH, 1000 hours | ±5%               |
| Thermal shock      | 125°C, -40°C (10 times)  | ±5%               |
| Solvent resistance | MIL-STD-202, Method 215F | No change         |

**Note:** See PS400 for other environmental specifications.

**AHS**
**Physical Characteristics**

|                           |                                                    |
|---------------------------|----------------------------------------------------|
| Lead material             | Tin-plated brass to MIL-T-10727B                   |
| Soldering characteristics | Solderability per ANSI-J-STD-002 Category 1        |
| Solder heat withstand     | per IEC-STD 68-2-20, Test Tb, Section 5, Method 1A |
| Flammability              | per IEC 695-2-2 Needle flame test for 20 seconds   |
| Operation temperature     | -40°C~125°C                                        |

**Note:** See PS400 for other physical characteristics.

**Environmental Specifications**

| Test               | Conditions               | Resistance Change |
|--------------------|--------------------------|-------------------|
| Passive aging      | 70°C, 1000 hours         | ±3% Typical       |
|                    | 85°C, 1000 hours         | ±5% Typical       |
| Humidity aging     | 85°C, 85% RH, 1000 hours | ±1.2% Typical     |
| Thermal shock      | 125°C, -40°C (20 times)  | -33% Typical      |
| Solvent resistance | Freon                    | No change         |
|                    | Trichloroethane          | No change         |
|                    | Hydrocarbons             | No change         |

**Note:** See PS400 for other environmental specifications.

**Table A5 Physical Characteristics and Environmental Specifications for Automotive Devices**

Cont'd

**ASMD**
**Physical Characteristics**

|                                |                                                                                                 |
|--------------------------------|-------------------------------------------------------------------------------------------------|
| Terminal pad material          | 98%+ Tin-plated Brass                                                                           |
| Soldering characteristics      | Solderability per ANSI-J-STD-002 Category 1                                                     |
| Solder heat withstand          | per IEC-STD 68-2-20, Test Tb, Section 5, Method 1A                                              |
| Flammability resistance        | per IEC 695-2-2 Needle flame test for 20 seconds                                                |
| Recommended storage conditions | 40°C max, 70% RH max; devices may not meet specified ratings if storage conditions are exceeded |
| Operation temperature          | -40°C~85°C                                                                                      |

**Note:** See PS400 for other physical characteristics.

**Environmental Specifications**

| Test               | Conditions              | Resistance Change |
|--------------------|-------------------------|-------------------|
| Passive aging      | 60°C, 1000 hours        | ±3% typical       |
|                    | 85°C, 1000 hours        | ±5% typical       |
| Humidity aging     | 85°C, 85% RH, 100 hours | ±1.2% typical     |
| Thermal shock      | 85°C, -40°C (20 times)  | -33% typical      |
|                    | 125°C, -55°C (10 times) | -33% typical      |
| Solvent resistance | Freon                   | No change         |
|                    | Trichloroethane         | No change         |
|                    | Hydrocarbons            | No change         |

**Note:** See PS400 for other environmental specifications.

**BD**
**Physical Characteristics**

|                           |                                                          |
|---------------------------|----------------------------------------------------------|
| Lead material             | Brass H65, thickness: 0.8mm , tin plating thickness: 5µm |
| Soldering characteristics | NA                                                       |
| Solder heat withstand     | NA                                                       |
| Insulating material       | Colored PBT, meets UL94V-0 requirements                  |
| Operation temperature     | -40°C~125°C                                              |

**Note:** See PS400 for other physical characteristics.

**Environmental Specifications**

| Test               | Conditions                                            | Resistance Change |
|--------------------|-------------------------------------------------------|-------------------|
| Passive aging      | 85°C, 1000 hours                                      | ±5%               |
| Humidity aging     | 85°C, 85% RH, 1000 hours                              | ±5%               |
|                    | 85°C, 85% RH (with 10% I <sub>HOLD</sub> ), 500 hours | ±5%               |
| Thermal shock      | 85°C to -40°C (5 times)                               | meet SCD          |
| Solvent resistance | MIL-STD-202, Method 215F                              | No change         |

**Note:** See PS400 for other environmental specifications.

**Table A6 Packaging and Marking Information for Automotive Devices**

| Part Number                    | Bag Quantity | Tape & Reel Quantity | Ammo Pack Quantity | Standard Package Quantity | Part Marking | Agency Recognition |
|--------------------------------|--------------|----------------------|--------------------|---------------------------|--------------|--------------------|
| <b>AGRF</b>                    |              |                      |                    |                           |              |                    |
| <b>Radial-leaded</b>           |              |                      |                    |                           |              |                    |
| AGRF400                        | 500          | —                    | —                  | 10,000                    | GF4          | *                  |
| AGRF400-2                      | —            | 2,500                | —                  | 12,500                    | GF4          | *                  |
| AGRF400-AP                     | —            | —                    | 2,000              | 10,000                    | GF4          | *                  |
| AGRF500                        | 500          | —                    | —                  | 10,000                    | GF5          | *                  |
| AGRF500-2                      | —            | 2,000                | —                  | 10,000                    | GF5          | *                  |
| AGRF500-AP                     | —            | —                    | 2,000              | 10,000                    | GF5          | *                  |
| AGRF600                        | 500          | —                    | —                  | 10,000                    | GF6          | *                  |
| AGRF600-2                      | —            | 2,000                | —                  | 10,000                    | GF6          | *                  |
| AGRF600-AP                     | —            | —                    | 2,000              | 10,000                    | GF6          | *                  |
| AGRF700                        | 500          | —                    | —                  | 10,000                    | GF7          | *                  |
| AGRF700-2                      | —            | 1,500                | —                  | 7,500                     | GF7          | *                  |
| AGRF700-AP                     | —            | —                    | 1,500              | 7,500                     | GF7          | *                  |
| AGRF800                        | 500          | —                    | —                  | 10,000                    | GF8          | *                  |
| AGRF800-2                      | —            | 1,000                | —                  | 5,000                     | GF8          | *                  |
| AGRF800-AP                     | —            | —                    | 1,000              | 5,000                     | GF8          | *                  |
| AGRF900                        | 500          | —                    | —                  | 10,000                    | GF9          | *                  |
| AGRF900-2                      | —            | 1,000                | —                  | 5,000                     | GF9          | *                  |
| AGRF900-AP                     | —            | —                    | 1,000              | 5,000                     | GF9          | *                  |
| AGRF1000                       | 250          | —                    | —                  | 5,000                     | GF10         | *                  |
| AGRF1000-2                     | —            | 1,000                | —                  | 5,000                     | GF10         | *                  |
| AGRF1000-AP                    | —            | —                    | 1,000              | 5,000                     | GF10         | *                  |
| AGRF1100                       | 250          | —                    | —                  | 5,000                     | GF11         | *                  |
| AGRF1100-2                     | —            | 1,000                | —                  | 5,000                     | GF11         | *                  |
| AGRF1100-AP                    | —            | —                    | 1,000              | 5,000                     | GF11         | *                  |
| AGRF1200                       | 250          | —                    | —                  | 5,000                     | GF12         | *                  |
| AGRF1200-2                     | —            | 1,000                | —                  | 5,000                     | GF12         | *                  |
| AGRF1200-AP                    | —            | —                    | 1,000              | 5,000                     | GF12         | *                  |
| AGRF1400                       | 250          | —                    | —                  | 5,000                     | GF14         | *                  |
| AGRF1400-2                     | —            | 1,000                | —                  | 5,000                     | GF14         | *                  |
| AGRF1400-AP                    | —            | —                    | 1,000              | 5,000                     | GF14         | *                  |
| <b>AHRF (High Temperature)</b> |              |                      |                    |                           |              |                    |
| <b>Radial-leaded</b>           |              |                      |                    |                           |              |                    |
| AHRF050                        | 500          | —                    | —                  | 10,000                    | HF0.5        | *                  |
| AHRF050-2                      | —            | 2,500                | —                  | 12,500                    | HF0.7        | *                  |
| AHRF050-AP                     | —            | —                    | 2,500              | 12,500                    | HF0.7        | *                  |
| AHRF070                        | 500          | —                    | —                  | 10,000                    | HF0.7        | *                  |
| AHRF070-2                      | —            | 2,500                | —                  | 12,500                    | HF0.7        | *                  |
| AHRF070-AP                     | —            | —                    | 2,500              | 12,500                    | HF0.7        | *                  |
| AHRF100                        | 500          | —                    | —                  | 10,000                    | HF1.0        | *                  |
| AHRF100-2                      | —            | 2,500                | —                  | 12,500                    | HF1.0        | *                  |
| AHRF100-AP                     | —            | —                    | 2,500              | 12,500                    | HF1.0        | *                  |
| AHRF200                        | 500          | —                    | —                  | 10,000                    | HF2          | *                  |
| AHRF200-2                      | —            | 2,500                | —                  | 12,500                    | HF2          | *                  |
| AHRF200-AP                     | —            | —                    | 2,500              | 12,500                    | HF2          | *                  |
| AHRF300                        | 500          | —                    | —                  | 10,000                    | HF3          | *                  |
| AHRF300-2                      | —            | 2,000                | —                  | 10,000                    | HF3          | *                  |
| AHRF300-AP                     | —            | —                    | 2,000              | 10,000                    | HF3          | *                  |
| AHRF400                        | 500          | —                    | —                  | 10,000                    | HF4          | *                  |
| AHRF400-2                      | —            | 1,500                | —                  | 7,500                     | HF4          | *                  |
| AHRF400-AP                     | —            | —                    | 1,500              | 7,500                     | HF4          | *                  |

\* These devices have been designed for use in automotive applications.

For commercial alternatives to these product series please see the radial-leaded devices section or surface-mount devices section.

**Table A6 Packaging and Marking Information for Automotive Devices**

Cont'd

| Part Number                    | Bag Quantity | Tape & Reel Quantity | Ammo Pack Quantity | Standard Package Quantity | Part Marking | Agency Recognition |
|--------------------------------|--------------|----------------------|--------------------|---------------------------|--------------|--------------------|
| <b>AHRF (High Temperature)</b> |              |                      |                    |                           |              |                    |
| <b>Radial-leaded</b>           |              |                      |                    |                           |              |                    |
| AHRF450                        | 500          | —                    | —                  | 10,000                    | HF4.5        | *                  |
| AHRF450-2                      | —            | 1,500                | —                  | 7,500                     | HF4.5        | *                  |
| AHRF450-AP                     | —            | —                    | 1,500              | 7,500                     | HF4.5        | *                  |
| AHRF550                        | 500          | —                    | —                  | 10,000                    | HF5.5        | *                  |
| AHRF550-2                      | —            | 2,000                | —                  | 10,000                    | HF5.5        | *                  |
| AHRF550-AP                     | —            | —                    | 2,000              | 10,000                    | HF5.5        | *                  |
| AHRF600                        | 500          | —                    | —                  | 10,000                    | HF6          | *                  |
| AHRF600-2                      | —            | 2,000                | —                  | 10,000                    | HF6          | *                  |
| AHRF600-AP                     | —            | —                    | 2,000              | 10,000                    | HF6          | *                  |
| AHRF650                        | 500          | —                    | —                  | 10,000                    | HF6.5        | *                  |
| AHRF650-2                      | —            | 1,500                | —                  | 7,500                     | HF6.5        | *                  |
| AHRF650-AP                     | —            | —                    | 1,500              | 7,500                     | HF6.5        | *                  |
| AHRF700                        | 500          | —                    | —                  | 10,000                    | HF7          | *                  |
| AHRF700-2                      | —            | 1,500                | —                  | 7,500                     | HF7          | *                  |
| AHRF700-AP                     | —            | —                    | 1,500              | 7,500                     | HF7          | *                  |
| AHRF750                        | 500          | —                    | —                  | 10,000                    | HF7.5        | *                  |
| AHRF750-2                      | —            | 1,000                | —                  | 5,000                     | HF7.5        | *                  |
| AHRF750-AP                     | —            | —                    | 1,000              | 5,000                     | HF7.5        | *                  |
| AHRF800                        | 500          | —                    | —                  | 10,000                    | HF8          | *                  |
| AHRF800-2                      | —            | 1,000                | —                  | 5,000                     | HF8          | *                  |
| AHRF800-AP                     | —            | —                    | 1,000              | 5,000                     | HF8          | *                  |
| AHRF900                        | 250          | —                    | —                  | 5,000                     | HF9          | *                  |
| AHRF900-2                      | —            | 1,000                | —                  | 5,000                     | HF9          | *                  |
| AHRF900-AP                     | —            | —                    | 1,000              | 5,000                     | HF9          | *                  |
| AHRF1000                       | 250          | —                    | —                  | 5,000                     | HF10         | *                  |
| AHRF1000-2                     | —            | 1,000                | —                  | 5,000                     | HF10         | *                  |
| AHRF1000-AP                    | —            | —                    | 1,000              | 5,000                     | HF10         | *                  |
| AHRF1100                       | 250          | —                    | —                  | 5,000                     | HF11         | *                  |
| AHRF1100-2                     | —            | 1,000                | —                  | 5,000                     | HF11         | *                  |
| AHRF1100-AP                    | —            | —                    | 1,000              | 5,000                     | HF11         | *                  |
| AHRF1300                       | 250          | —                    | —                  | 5,000                     | HF13         | *                  |
| AHRF1300-2                     | —            | 1,000                | —                  | 5,000                     | HF13         | *                  |
| AHRF1300-AP                    | —            | —                    | 1,000              | 5,000                     | HF13         | *                  |
| AHRF1400                       | 250          | —                    | —                  | 5,000                     | HF14         | *                  |
| AHRF1400-2                     | —            | 1,000                | —                  | 5,000                     | HF14         | *                  |
| AHRF1400-AP                    | —            | —                    | 1,000              | 5,000                     | HF14         | *                  |
| AHRF1500                       | 250          | —                    | —                  | 5,000                     | HF15         | *                  |
| AHRF1500-2                     | —            | 1,000                | —                  | 5,000                     | HF15         | *                  |
| AHRF1500-AP                    | —            | —                    | 1,000              | 5,000                     | HF15         | *                  |
| <b>AHEF (High Temperature)</b> |              |                      |                    |                           |              |                    |
| <b>Radial-leaded</b>           |              |                      |                    |                           |              |                    |
| AHEF050                        | 500          | —                    | —                  | 10,000                    | EF0.5        | *                  |
| AHEF070                        | 500          | —                    | —                  | 10,000                    | EF0.7        | *                  |
| AHEF100                        | 500          | —                    | —                  | 10,000                    | EF1.0        | *                  |
| AHEF300                        | 500          | —                    | —                  | 10,000                    | EF3          | *                  |
| AHEF500                        | 250          | —                    | —                  | 5,000                     | EF5          | *                  |
| AHEF750                        | 250          | —                    | —                  | 5,000                     | EF7.5        | *                  |
| AHEF1000                       | 250          | —                    | —                  | 5,000                     | EF10         | *                  |

\* These devices have been designed for use in automotive applications.  
For commercial alternatives to these product series please see the radial-leaded devices section or surface-mount devices section.



**Table A6 Packaging and Marking Information for Automotive Devices**

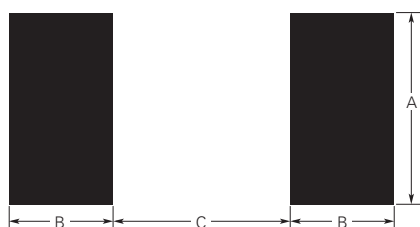
Cont'd

| Part Number            | Tape & Reel Quantity | Standard Package Quantity | Part Marking | Recommended Pad Layouts [mm(in)] See Figure A21] |                    |                    | Agency Recognition |
|------------------------|----------------------|---------------------------|--------------|--------------------------------------------------|--------------------|--------------------|--------------------|
|                        |                      |                           |              | Dimension A (Min. */Nom.)                        | Dimension B (Nom.) | Dimension C (Nom.) |                    |
| AHS (High Temperature) |                      |                           |              |                                                  |                    |                    |                    |
| Surface-mount          |                      |                           |              |                                                  |                    |                    |                    |
| AHS080-2018            | 4,000                | 20,000                    | H08          | 4.6 (0.18)                                       | 1.5 (0.06)         | 3.4 (0.134)        | *                  |
| AHS160                 | 1,500                | 7,500                     | 160          | 4.6 (0.18)                                       | 2.3 (0.09)         | 6.1 (0.240)        | *                  |
| AHS200                 | 1,500                | 7,500                     | H200         | 4.6 (0.18)                                       | 2.3 (0.09)         | 6.1 (0.240)        | *                  |
| AHS300                 | 1,500                | 7,500                     | H300         | 4.6 (0.18)                                       | 2.3 (0.09)         | 6.1 (0.240)        | *                  |
| ASMD                   |                      |                           |              |                                                  |                    |                    |                    |
| Surface-mount          |                      |                           |              |                                                  |                    |                    |                    |
| ASMD030F               | 2,000                | 10,000                    | 030F         | 3.1 (0.12)                                       | 2.3 (0.09)         | 5.1 (0.201)        | *                  |
| ASMD050F               | 2,000                | 10,000                    | 050F         | 3.1 (0.12)                                       | 2.3 (0.09)         | 5.1 (0.201)        | *                  |
| ASMD075F               | 2,000                | 10,000                    | 075F         | 3.1 (0.12)                                       | 2.3 (0.09)         | 5.1 (0.201)        | *                  |
| ASMD100F               | 2,000                | 10,000                    | 100F         | 3.1 (0.12)                                       | 2.3 (0.09)         | 5.1 (0.201)        | *                  |
| ASMD125F               | 2,000                | 10,000                    | 125F         | 3.1 (0.12)                                       | 2.3 (0.09)         | 5.1 (0.201)        | *                  |
| ASMD150F               | 1,500                | 7,500                     | 150F         | 4.6 (0.18)                                       | 2.3 (0.09)         | 6.1 (0.240)        | *                  |
| ASMD200F               | 1,500                | 7,500                     | 200F         | 4.6 (0.18)                                       | 2.3 (0.09)         | 6.1 (0.240)        | *                  |
| ASMD250F               | 1,500                | 7,500                     | 250F         | 4.6 (0.18)                                       | 2.3 (0.09)         | 6.1 (0.240)        | *                  |

\* These devices have been designed for use in automotive applications.  
For commercial alternatives to these product series please see the radial-leaded devices section or surface-mount devices section.

| Part Number                   | Bag Quantity | Standard Package Quantity | Part Marking  | Agency Recognition |
|-------------------------------|--------------|---------------------------|---------------|--------------------|
| <b>BD</b>                     |              |                           |               |                    |
| <b>Bladed Device</b>          |              |                           |               |                    |
| <b>NEW</b> BD280-1130-10/16   | 200          | 1600                      | BD280-1130-10 | *                  |
| <b>NEW</b> BD280-1130-15/16   | 200          | 1600                      | BD280-1130-15 | *                  |
| <b>NEW</b> BD280-1130-20/16   | 200          | 1600                      | BD280-1130-20 | *                  |
| <b>NEW</b> BD280-1927-25/16-W | 200          | 1600                      | BD280-1927-25 | *                  |
| <b>NEW</b> BD280-1927-30/16-W | 200          | 1600                      | BD280-1927-30 | *                  |

\* These devices have been designed for use in automotive applications.  
For commercial alternatives to these product series please see the radial-leaded devices section or surface-mount devices section.

**Figure A21 Recommended Pad Layout for Automotive Devices**


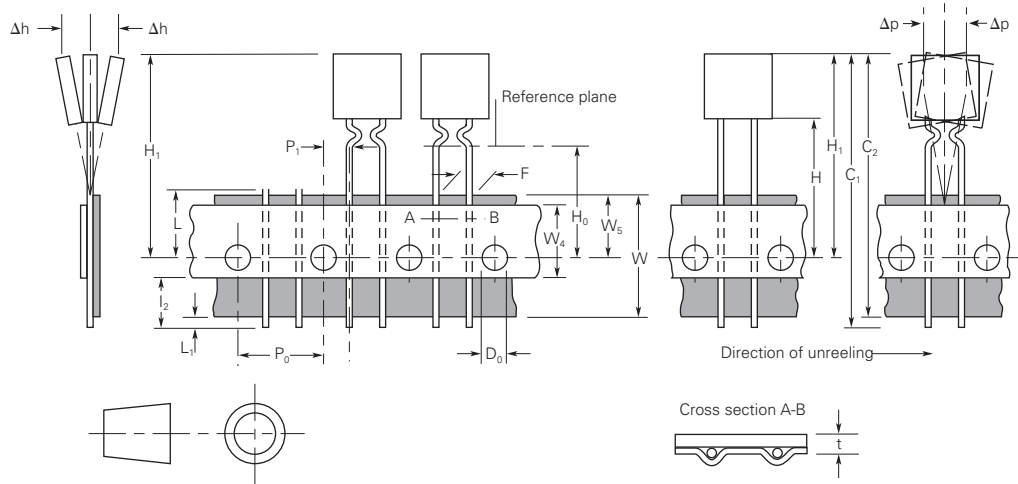
**Table A7 Tape and Reel Specifications for AGRF/AHRF/AHEF Automotive Devices**

AGRF, AHRF and AHEF devices are available in tape and reel packaging per EIA468-B/IEC286-2 and EIA 481-2 standards.  
See Figures A22 and A23 for details.

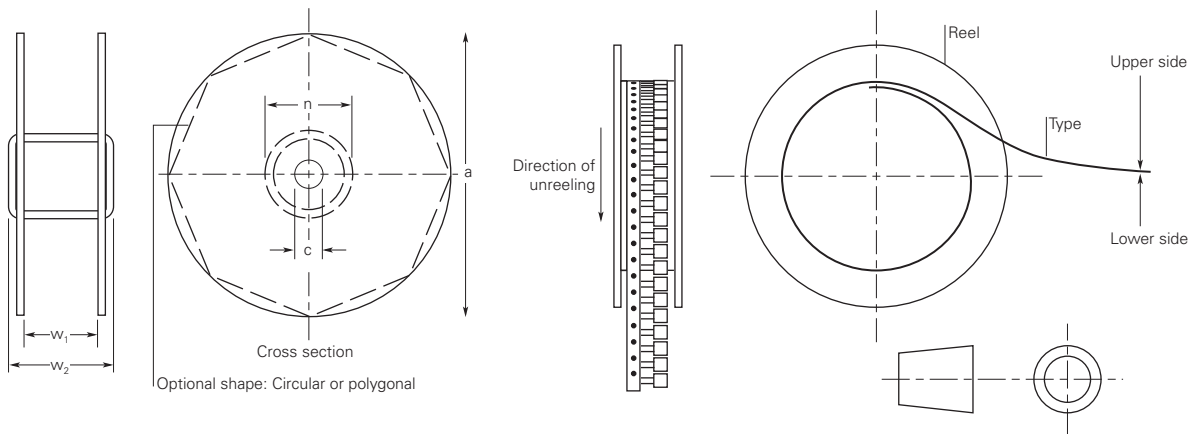
| Description                                                                                              | EIA Mark       | Dimension (mm) | Tolerance  |
|----------------------------------------------------------------------------------------------------------|----------------|----------------|------------|
| Carrier tape width                                                                                       | W              | 18.0           | -0.5/+1.0  |
| Hold down tape width                                                                                     | W <sub>4</sub> | 11.0           | Minimum    |
| Top distance between tape edges                                                                          | W <sub>6</sub> | 3.0            | Maximum    |
| Sprocket hole position                                                                                   | W <sub>5</sub> | 9.0            | -0.5/+0.75 |
| Sprocket hole diameter                                                                                   | D <sub>0</sub> | 4.0            | ±0.2       |
| Abscissa to plane                                                                                        | H <sub>0</sub> | 16.0           | ±0.5       |
| Abscissa to top<br>(AGRF400 to AGRF600, AHRF050 to AHRF450, AHEF050 to AHEF300)                          | H <sub>1</sub> | 32.2           | Maximum    |
| Abscissa to top<br>(AGRF700 to AGRF1400, AHRF550 to AHRF1500*, AHEF500 to AHEF1000)                      | H <sub>1</sub> | 45.0           | Maximum    |
| Overall width with lead protrusion<br>(AGRF400 to AGRF600 & AHRF050 to AHRF450, AHEF050 to AHEF300)      | C <sub>1</sub> | 43.2           | Maximum    |
| Overall width with lead protrusion<br>(AGRF700 to AGRF1400, AHRF550 to AHRF1500, AHEF500 to AHEF1000)    | C <sub>1</sub> | 55.0           | Maximum    |
| Overall width without lead protrusion<br>(AGRF400 to AGRF600, AHRF050 to AHRF450, AHEF050 to AHEF300)    | C <sub>2</sub> | 42.5           | Maximum    |
| Overall width without lead protrusion<br>(AGRF700 to AGRF1400, AHRF550 to AHRF1500, AHEF500 to AHEF1000) | C <sub>2</sub> | 54.0           | Maximum    |
| Lead protrusion                                                                                          | L <sub>1</sub> | 1.0            | Maximum    |
| Protrusion of cut-out                                                                                    | L              | 11.0           | Maximum    |
| Protrusion beyond hold-down tape                                                                         | l <sub>2</sub> | Not specified  | —          |
| Sprocket hole pitch                                                                                      | P <sub>0</sub> | 12.7           | ± 0.3      |
| Device pitch (AGRF400 to AGRF700, AHRF050 to AHRF600, AHEF050 to AHEF300)                                | —              | 12.7           | ± 0.3      |
| Device pitch (AGRF800 to AGRF1400, AHRF650 to AHRF1500, AHEF500 to AHEF1000)                             | —              | 25.4           | ± 0.6      |
| Pitch tolerance                                                                                          | —              | 20 consec.     | ± 0.1      |
| Tape thickness                                                                                           | t              | 0.9            | Maximum    |
| Overall tape and lead thickness<br>(AGRF400 to AGRF1100, AHRF050 to AHRF1100*, AHEF050 to AHEF750)       | t <sub>1</sub> | 2.0            | Maximum    |
| Overall tape and lead thickness<br>(AGRF1200 to AGRF1400, AHRF1300 to AHRF1500*, AHEF1000)               | t <sub>1</sub> | 2.3            | Maximum    |
| Splice sprocket hole alignment                                                                           | —              | 0              | ± 0.3      |
| Body lateral deviation                                                                                   | Δh             | 0              | ± 1.0      |
| Body tape plane deviation                                                                                | Δp             | 0              | ± 1.3      |
| Ordinate to adjacent component lead<br>(AGRF400 to AGRF1100, AHRF050 to AHRF900, AHEF050 to AHEF500)     | P <sub>1</sub> | 3.81           | ± 0.7      |
| Ordinate to adjacent component lead<br>(AGRF1200 to AGRF1400, AHRF1000 to AHRF1500, AHEF750 to AHEF1000) | P <sub>1</sub> | 7.62           | ± 0.7      |
| Lead spacing (AGRF400 to AGRF1100, AHRF050 to AHRF900*, AHEF050 to AHEF500)                              | F              | 5.05           | ± 0.75     |
| Lead spacing (AGRF1200 to AGRF1400, AHRF1000 to AHRF1500*, AHEF750 to AHEF1000)                          | F              | 10.15          | ± 0.75     |
| Reel width (AGRF400 to AGRF600 & AHRF050 to AHRF450, AHEF050 to AHEF300)                                 | w <sub>2</sub> | 56.0           | Maximum    |
| Reel width (AGRF700 to AGRF1400, AHRF550 to AHRF1500*, AHEF500 to AHEF1000)                              | w <sub>2</sub> | 63.5           | Maximum    |
| Reel diameter                                                                                            | a              | 370.0          | Maximum    |
| Space between flanges* (AHEF050 to AHEF300)                                                              | w <sub>1</sub> | 48.0           | Maximum    |
| Space between flanges* (AHEF500 to AHEF1000)                                                             | w <sub>1</sub> | 55.0           | Maximum    |
| Arbor hold diameter                                                                                      | c              | 26.0           | ±12.0      |
| Core diameter*                                                                                           | n              | 91.0           | Maximum    |
| Box                                                                                                      | —              | 64/372/362     | Maximum    |
| Consecutive missing places                                                                               | —              | None           | —          |
| Empty places per reel                                                                                    | —              | 0.1%           | Maximum    |

\*Differs from EIA specification.

**Figure A22 EIA Referenced Taped Component Dimensions for AGRF/AHRF/AHEF Automotive Devices**



**Figure A23 EIA Referenced Reel Dimensions for AGRF/AHRF/AHEF Automotive Devices**



**Table A8 Tape and Reel Specifications for AHS/ASMD Automotive Devices**

AHS and ASMD devices are available in tape and reel packaging per EIA 468-2 standards. See Figures A24 and A25 for details.

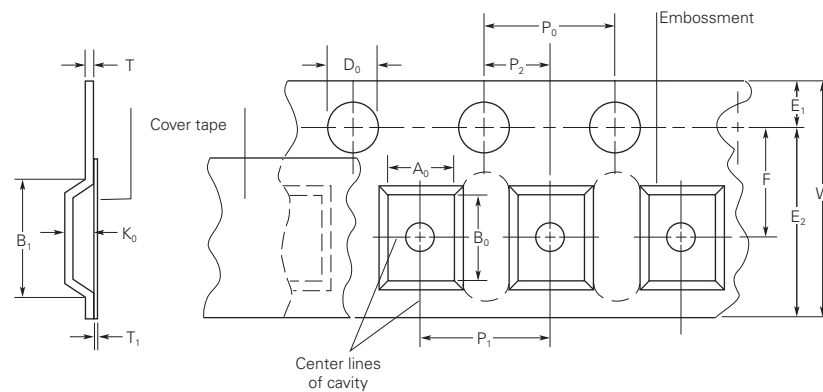
| Description                                                               | EIA Mark            | Dimension (mm) | Tolerance |
|---------------------------------------------------------------------------|---------------------|----------------|-----------|
| Carrier tape width                                                        | W                   | 16.0           | ± 0.3     |
| Sprocket hole pitch                                                       | P <sub>0</sub>      | 4.0            | ± 0.10    |
| Embossed cavity pitch (ASMD030F to ASMD125F & AHS080-2018)                | P <sub>1</sub>      | 8.0            | ± 0.10    |
| Embossed cavity pitch (ASMD150F to ASMD250F & AHS160 to AHS300)           | P <sub>1</sub>      | 12.0           | ± 0.10    |
| Ordinate to embossed cavity center                                        | P <sub>2</sub>      | 2.0            | ± 0.10    |
| Embossed cavity length (inside) (AHS080-2018)                             | A <sub>0</sub>      | 5.11           | ± 0.15    |
| Embossed cavity length (inside) (ASMD030F to ASMD125F)                    | A <sub>0</sub>      | 5.6            | ± 0.23    |
| Embossed cavity length (inside) (ASMD150F to ASMD250F & AHS160 to AHS300) | A <sub>0</sub>      | 6.9            | ± 0.23    |
| Embossed cavity width (inside) (AHS080-2018)                              | B <sub>0</sub>      | 5.6            | ± 0.23    |
| Embossed cavity width (inside) (ASMD030F to ASMD125F)                     | B <sub>0</sub>      | 8.1            | ± 0.15    |
| Embossed cavity width (inside) (ASMD150F to ASMD250F & AHS160 to AHS300)  | B <sub>0</sub>      | 9.6            | ± 0.15    |
| Embossed cavity length (outside)                                          | B <sub>1</sub> max. | 12.1           | —         |
| Sprocket hole diameter                                                    | D <sub>0</sub>      | 1.5            | + 0.1, -0 |
| Abscissa to embossed cavity center                                        | F                   | 7.5            | ± 0.10    |
| Sprocket hole location                                                    | E <sub>1</sub>      | 1.75           | ± 0.10    |
| Sprocket hole location (across embossed cavity)                           | E <sub>2</sub> min. | 14.25          | —         |

**Table A8 Tape and Reel Specifications for AHS/ASMD Automotive Devices**

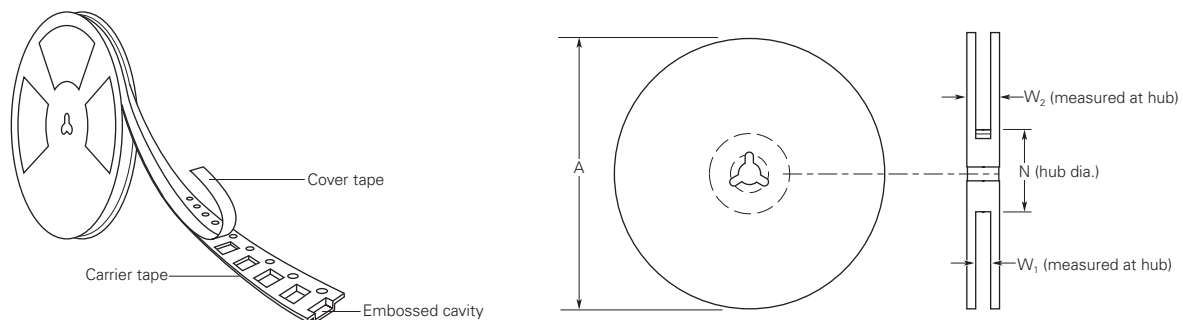
Cont'd

| Description                               | EIA Mark            | Dimension (mm) | Tolerance |
|-------------------------------------------|---------------------|----------------|-----------|
| Carrier tape thickness                    | T max.              | 0.6            | —         |
| Cover tape thickness                      | T <sub>1</sub> max. | 0.1            | —         |
| (AHS080-2018)                             | K <sub>0</sub>      | 1.8            | ± 0.15    |
| (ASMD030F to ASMD125F)                    | K <sub>0</sub>      | 3.2            | ± 0.15    |
| (ASMD150F to ASMD250F & AHS160 to AHS300) | K <sub>0</sub>      | 3.4            | ± 0.15    |
| Embossed cavity depth (inside)            | K <sub>0</sub>      | —              | ± 0.15    |
| Leader min.                               | —                   | 400            | —         |
| Trailer min.                              | —                   | 160            | —         |
| Reel diameter                             | A max.              | 330            | —         |
| Core diameter                             | N min.              | 50             | —         |
| Reel width measured at inside hub         | W <sub>1</sub>      | 16.4           | + 2.0, -0 |
| Reel width measured at outside hub        | W <sub>2</sub> max. | 22.4           | —         |

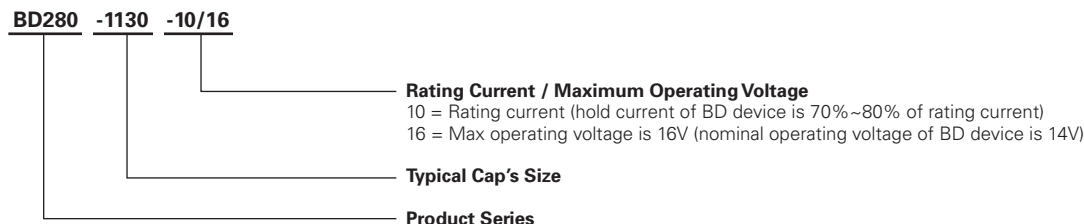
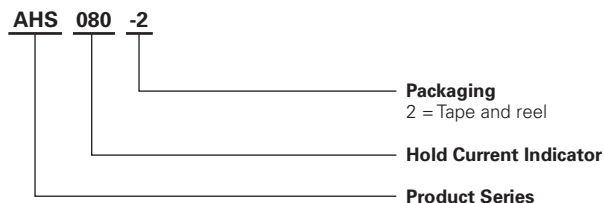
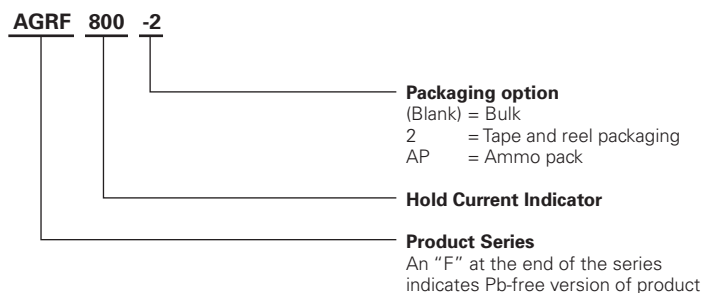
**Figure A24 EIA Referenced Taped Component Dimensions for AHS/ASMD Devices**



**Figure A25 EIA Referenced Reel Dimensions for AHS/ASMD Devices**



## Part Numbering System for Automotive Devices



### Warning :

- Users should independently evaluate the suitability of and test each product selected for their own application.
- Operation beyond the maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- These devices are intended for protection against damage caused by occasional overcurrent or overtemperature fault conditions and should not be used when repeated fault conditions or prolonged trip events are anticipated.
- Contamination of the PPTC material with certain silicone-based oils or some aggressive solvents can adversely impact the performance of the devices.
- Device performance can be impacted negatively if devices are handled in a manner inconsistent with recommended electronic, thermal, and mechanical procedures for electronic components.
- PPTC devices are not recommended for installation in applications where the device is constrained such that its PTC properties are inhibited, for example in rigid potting materials or in rigid housings, which lack adequate clearance to accommodate device expansion.
- Operation in circuits with a large inductance can generate a circuit voltage ( $L di/dt$ ) above the rated voltage of the device.





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