

**Features**

- 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
- RoHS compliant, Lead-Free and Halogen-Free

**Additional Information**



Datasheet



Resources



Samples

**Description**

The AHEF Series is a PPTC resettable device designed specifically for the automotive industry. It is a 32V high-temperature, lead-free, radial leaded resettable device that meets Littelfuse's Automotive qualification. This qualification is based on AEC-Q200: Stress Test Qualification for Passive Components.

**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 buses
- Air-flow detection and overcurrent protection in HVAC and cooling fan systems
- Stall detection in express window and sunroof circuits
- Resettable overcurrent protection for power distribution, electrical centers and junction boxes
- Wire downsizing
- Motor electromagnetic interference (EMI) suppression
- Electrostatic discharge (ESD) damage protection
- Load dump and other transient voltage protection

**Electrical Characteristics**

Part Number	$I_H(A)@$	$I_T(A)@$	$I_T$ (A)	$V_{MAX}$	$I_{MAX}$ (A)	$P_{D,Typ}$ (W)	Max Time-to-trip		$R_{MIN}$ ( $\Omega$ )	$R_{MAX}$ ( $\Omega$ )	$R_{1MAX}$ ( $\Omega$ )	Lead Size (mm <sup>2</sup> /AWG)
	( $R_{1MAX}$ )	( $R_{aMAX}$ )		( $V_{DC}$ )			(A)	(s)				
<b>AHEF (High Temperature) – 32V</b>												
AHEF050	0.5	0.5	1.0	32	100	0.9	2.5	3.0	0.3500	1.100	1.100	0.205/24
AHEF070	0.7	0.7	1.4	32	100	1.4	3.5	3.2	0.2300	0.800	0.800	0.205/24
AHEF100	1.0	1.0	1.9	32	100	1.4	5.0	6.2	0.1500	0.430	0.430	0.205/24
AHEF300	3.0	3.0	6.0	32	100	3.2	15.0	5.0	0.0350	0.110	0.110	0.52/20
AHEF500	5.0	5.0	10.0	32	100	5.3	25.0	9.0	0.0150	0.040	0.040	0.52/20
AHEF750	7.5	7.5	15.0	32	100	6.5	37.5	13.0	0.0074	0.023	0.023	0.52/20
AHEF1000	10.0	10.0	20.0	32	100	7.0	50.0	15.0	0.0060	0.016	0.016	0.82/18

**Notes:**

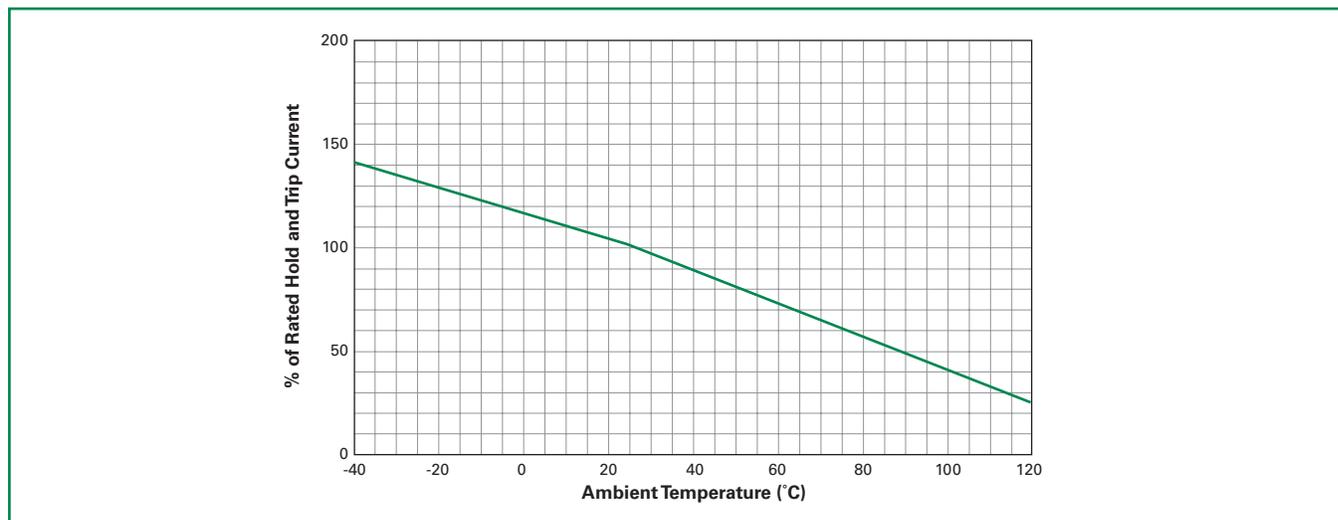
- $I_H$  : Hold current: maximum current device will pass without interruption in 25°C, unless otherwise specified.
- $I_T$  : Trip current: minimum current that will switch the device from low-resistance to high-resistance in 25°C still air, unless otherwise specified.
- $V_{MAX}$  : Maximum voltage 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 trip 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.
- $R_{bMIN}$  : Minimum functional resistance of device after being subjected to the stresses described in PS400 at 25°C, unless otherwise specified.
- \* Electrical characteristics determined at 25°C.

### Temperature Derating

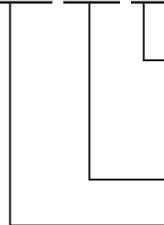
	Maximum Ambient Temperature										
	-40°C	-20°C	0°C	20°C	25°C	40°C	50°C	60°C	70°C	85°C	125°C
Hold Current (A)											
AHEF (High Temperature) – 32V											
AHEF050	0.7	0.6	0.60	0.5	0.5	0.4	0.400	0.40	0.30	0.300	0.1
AHEF070	1.0	0.9	0.80	0.7	0.7	0.6	0.600	0.50	0.50	0.400	0.2
AHEF100	1.4	1.2	1.10	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

### Temperature Derating Curve



### Part Ordering Number System

**AHEF 300 -2**



**Packaging Option**

- (Blank) = Bulk
- 2 = Tape and Reel Packaging
- AP = Ammo Pack

**Hold Current Indicator**

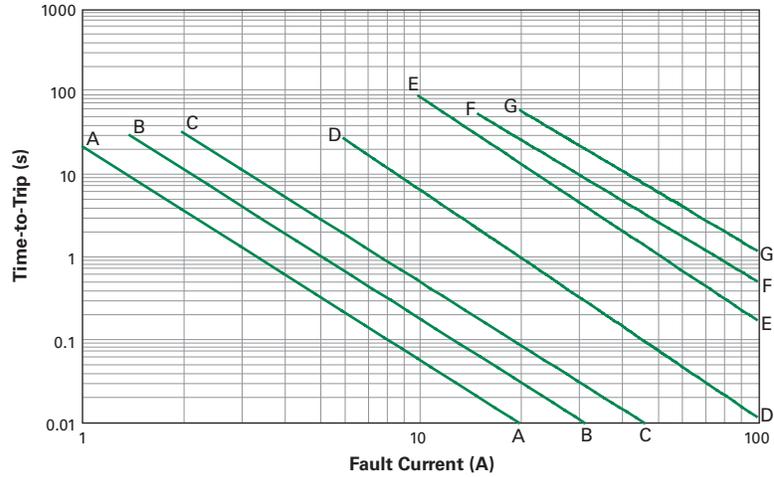
**Product Series**

An "F" at the End of the Series Indicates Pb-free Version of Product

**Typical Time-to-Trip Curves at 25°C**

**AHEF**

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



**Physical Specifications**

<b>Lead Material</b>	AHEF050 to AHEF100 : Tin-plated Copper-clad Steel, 0.205mm <sup>2</sup> (24 AWG), ø 0.51mm/0.020in. AHEF300 to AHEF750 : Tin-plated Copper 0.52mm <sup>2</sup> (20 AWG), ø 0.81mm/0.032in AHEF1000 : Tin-plated Copper 0.82mm <sup>2</sup> (18 AWG), ø 1.0mm/0.04in
<b>Soldering Characteristics</b>	Solderability per ANSI/J-STD 002 Category 3
<b>Solder Heat Withstand</b>	Per IEC 68-2-20, Test Tb, Method 1a, Condition b; Can Withstand 10 s at 260°C ± 5°C
<b>Insulating Material</b>	Cured, Flame-retardant Epoxy Polymer; Meets UL 94V-0 Requirements
<b>Operation Temperature</b>	-40°C~125°C

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

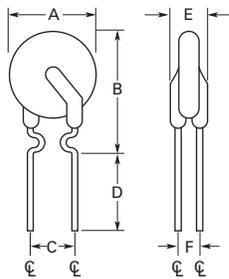
**Environmental Specifications**

Test	Conditions	Resistance Change
<b>Passive Aging</b>	70°C, 1000 hrs	±5%
	85°C, 1000 hrs	±5%
<b>Humidity Aging</b>	85°C, 85% R.H., 1000 hrs	±5%
<b>Thermal Shock</b>	125°C, -40°C 10 times	±5%
<b>Solvent Resistance</b>	MIL-STD-202, Method 215F	No change

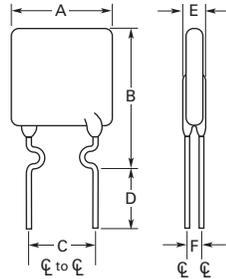
**Note:** See PS400 for other environmental specifications.

<b>Moisture Resistance Level</b>	Level 1, J-STD-020
<b>Storage Conditions</b>	40°C max, 70% RH max; devices should remain in original sealed bags prior to use. Devices may not meet specified values if these storage conditions are exceeded.

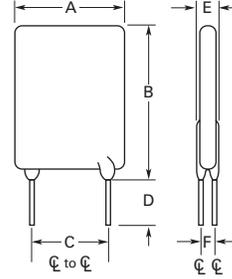
**Dimension Figures**



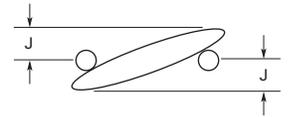
**Figure 1**



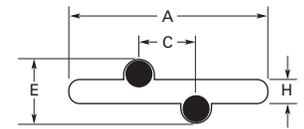
**Figure 2**



**Figure 3**



**Figure 4**



**Figure 5**

**Dimensions**

Part Number	Dimensions in Millimeters (Inches)																Figure
	A		B		C		D		E		F		G		H	J	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Typ	Typ	
<b>AGRF (High Temperature) – 32V</b>																	
AHEF050	—	7.4 (0.29)	—	12.7 (0.50)	4.3 (0.17)	5.8 (0.23)	7.6 (0.30)	—	—	3.3 (0.13)	—	—	—	—	—	—	1,4,5
AHEF070	—	6.9 (0.27)	—	10.8 (0.43)	4.3 (0.17)	5.8 (0.23)	7.6 (0.30)	—	—	3.0 (0.12)	—	—	—	—	—	—	2,4,5
AHEF100	—	9.7 (0.38)	—	13.6 (0.54)	4.3 (0.17)	5.8 (0.23)	7.6 (0.30)	—	—	3.0 (0.12)	—	—	—	—	—	—	1,4,5
AHEF300	—	10.2 (0.40)	—	15.5 (0.61)	4.32 (0.17)	5.84 (0.23)	7.6 (0.30)	—	—	3.8 (0.15)	—	—	—	—	—	—	3,4,5
AHEF500	—	14.0 (0.55)	—	24.1 (0.95)	4.3 (0.17)	5.8 (0.23)	11.5 (0.45)	—	—	3.8 (0.15)	—	—	—	—	—	—	3,4,5
AHEF750	—	21.1 (0.83)	—	24.9 (0.98)	9.4 (0.37)	10.9 (0.43)	7.6 (0.30)	—	—	3.8 (0.15)	—	—	—	—	—	—	3,4,5
AHEF1000	—	23.5 (0.93)	—	27.9 (1.10)	9.4 (0.37)	10.9 (0.43)	7.6 (0.30)	—	—	4.0 (0.16)	—	—	—	—	—	—	3,4,5

**Packaging and Marking Information**

Part Number	Bag Quantity	Tape and Reel Quantity	Ammo Pack Quantity	Standard Package Quantity	Part Marking	Agency Recognition
<b>AHEF (High Temperature) – 32V</b>						
AHEF050	500	—	—	10,000	E0.5	*
AHEF070	500	—	—	10,000	E0.7	*
AHEF100	500	—	—	10,000	E1	*
AHEF300	500	—	—	10,000	E3	*
AHEF500	250	—	—	5,000	E5	*
AHEF750	250	—	—	5,000	E75	*
AHEF1000	250	—	—	5,000	E10	*

\*These devices are intended for use in automotive applications.

### Tape and Reel Specifications

AHEF devices are available in tape and reel packaging per EIA468-B/IEC286-2 and EIA 481-2 standards. See Figures 1 and 2 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 (Straight Lead) (AHEF300 to AHEF1000)	H	20.3	±0.5
Abscissa to Plane (Kinked Lead) (AHEF050 to AHEF100)	H <sub>0</sub>	20.3	±0.5
Abscissa to Top (AHEF050 to AHEF300)	H <sub>1</sub>	32.2	Maximum
Abscissa to Top (AHEF500 to AHEF1000)	H <sub>1</sub>	45.0	Maximum
Overall Width with Lead Protrusion (AHEF050 to AHEF300)	C <sub>1</sub>	43.2	Maximum
Overall Width with Lead Protrusion (AHEF500 to AHEF1000)	C <sub>1</sub>	55.0	Maximum
Overall Width without Lead Protrusion (AHEF050 to AHEF300)	C <sub>2</sub>	42.5	Maximum
Overall Width without Lead Protrusion (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 (AHEF050 to AHEF300)	—	12.7	± 0.3
Device Pitch (AHEF500 to AHEF1000)	—	25.4	± 0.6
Pitch Tolerance	—	20 consec.	± 0.1
Tape Thickness	t	0.9	Maximum
Overall Tape and Lead Thickness (AHEF050 to AHEF750)	t <sub>1</sub>	2.0	Maximum
Overall Tape and Lead Thickness (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 (AHEF050 to AHEF500)	P <sub>1</sub>	3.81	± 0.7
Ordinate to Adjacent Component Lead (AHEF750 to AHEF1000)	P <sub>1</sub>	7.62	± 0.7
Lead Spacing (AHEF050 to AHEF500)	F	5.05	± 0.75
Lead Spacing (AHEF750 to AHEF1000)	F	10.15	± 0.75
Reel Width (AHEF050 to AHEF300)	w <sub>2</sub>	56.0	Maximum
Reel Width (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.

Tape and Reel Diagrams

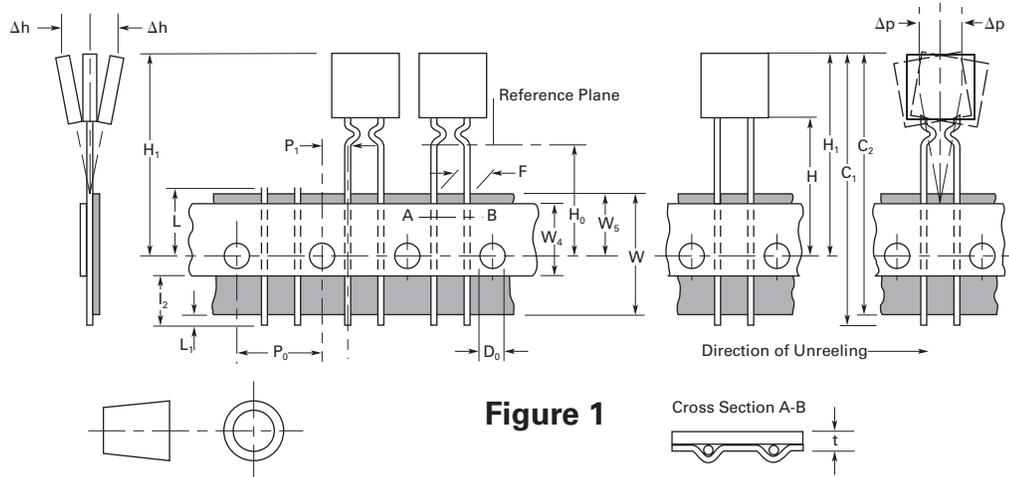


Figure 1

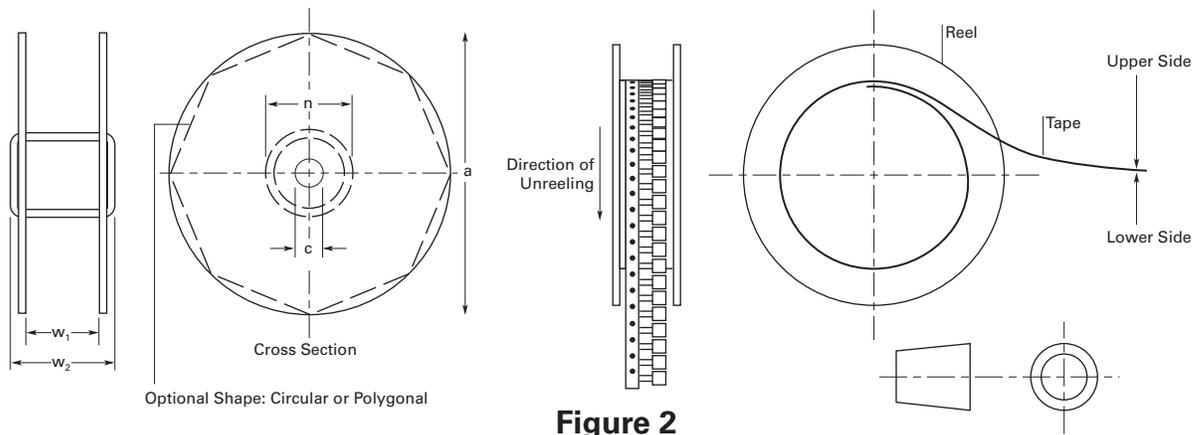


Figure 2

**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 ( $Ldi/dt$ ) above the rated voltage of the device.

**Disclaimer Notice** - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).