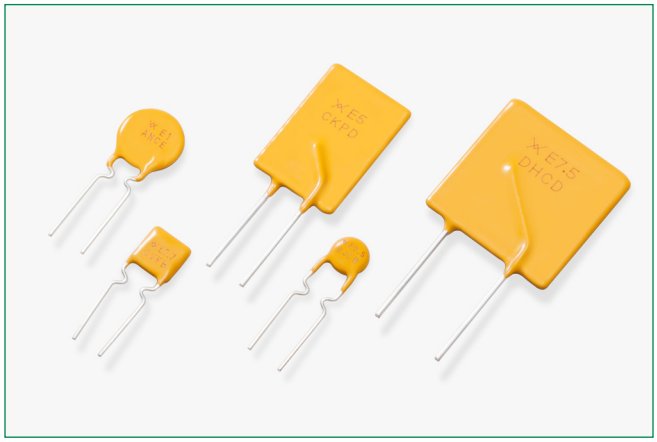
AHEF Series
Radial Leaded



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.

Features & Benefits

- 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

Applications

- Motor and motor circuit protection including power door-locks, mirrors, lumbar umps, 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

Additional Information

Resources | Accessories | Samples

Agency Approvals

Agency	Agency File/Certificate Number
	E74889

Electrical Characteristics

Part Number	Ordering 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)	Max Time-to-trip (s)	R_{MIN} (Ω)	R_{MAX} (Ω)	R_{1MAX} (Ω)	Lead Size (mm^2/AWG)
AHEF (High Temperature) – 32V													
AHEF050	RF3055-000	0.5	0.5	1.0	32	100	0.9	2.5	3.0	0.3500	1.100	1.100	0.205/24
AHEF070	RF3355-000	0.7	0.7	1.4	32	100	1.4	3.5	3.2	0.2300	0.800	0.800	0.205/24
AHEF100	RF3356-000	1.0	1.0	1.9	32	100	1.4	5.0	6.2	0.1500	0.430	0.430	0.205/24
AHEF300	RF3357-000	3.0	3.0	6.0	32	100	3.2	15.0	5.0	0.0350	0.110	0.110	0.52/20
AHEF500	RF3358-000	5.0	5.0	10.0	32	100	5.3	25.0	9.0	0.0150	0.040	0.040	0.52/20
AHEF750	RF3359-000	7.5	7.5	15.0	32	100	6.5	37.5	13.0	0.0074	0.023	0.023	0.52/20
AHEF1000	RF3360-000	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_{aMIN} : 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.

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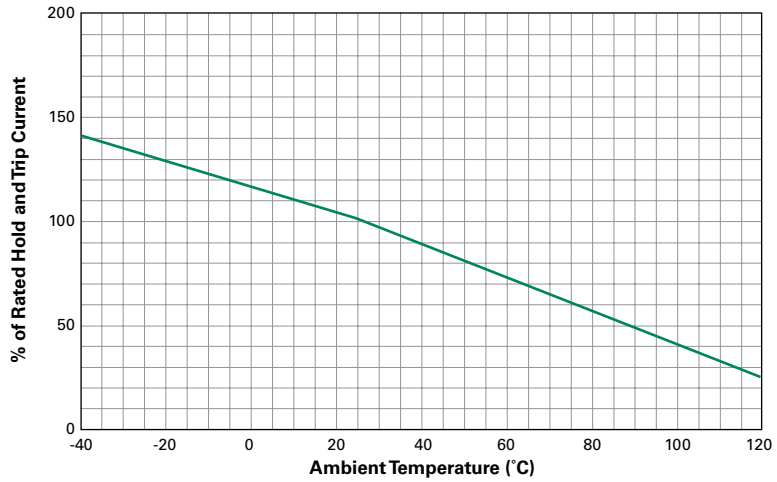
Temperature Rerating

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 Rerating 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

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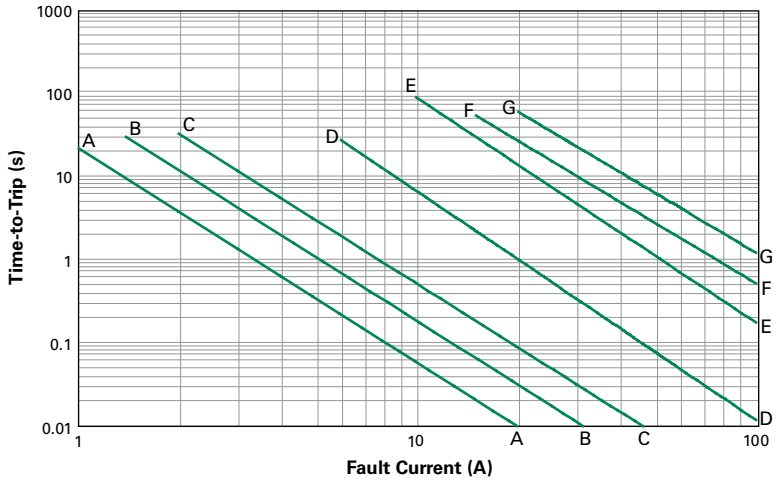
Typical Time-to-Trip Curves at 25°C

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



Physical Specifications

Lead Material	AHEF050 to AHEF100 : Tin-plated Copper-clad Steel, 0.205mm² (24 AWG), ø 0.51mm/0.020in. AHEF300 to AHEF750 : Tin-plated Copper 0.52mm² (20 AWG), ø 0.81mm/0.032in AHEF1000 : Tin-plated Copper 0.82mm² (18 AWG), ø 1.0mm/0.04in
Soldering Characteristics	Solderability per ANSI/J-STD 002 Category 3
Solder Heat Withstand	Per IEC 60068-2-20, Test Tb, Method 1; Can withstand 10s 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 hrs 85°C, 1000 hrs	±5% ±5%
Humidity Aging	85°C, 85% R.H., 1000 hrs	±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.

Moisture Resistance Level	Level 1, J-STD-020
Storage Conditions	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.

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Dimension Figures

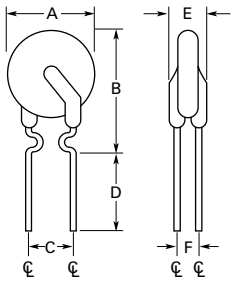

Figure 1

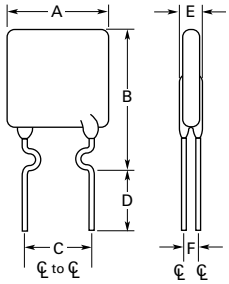

Figure 2

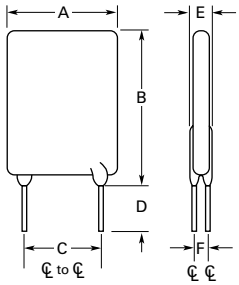

Figure 3

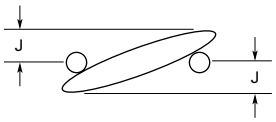

Figure 4

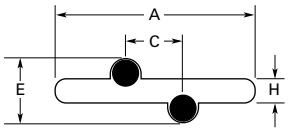

Figure 5

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	
AGRF (High Temperature) – 32V																	
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
AHEF (High Temperature) – 32V						
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	E7.5	*
AHEF1000	250	—	—	5,000	E10	*

*These devices are intended for use in automotive applications.

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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_4	11.0	Minimum
Top Distance between Tape Edges	W_6	3.0	Maximum
Sprocket Hole Position	W_5	9.0	-0.5/+0.75
Sprocket Hole Diameter	D_0	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_0	20.3	±0.5
Abscissa to Top (AHEF050 to AHEF300)	H_1	32.2	Maximum
Abscissa to Top (AHEF500 to AHEF1000)	H_1	45.0	Maximum
Overall Width with Lead Protrusion (AHEF050 to AHEF300)	C_1	43.2	Maximum
Overall Width with Lead Protrusion (AHEF500 to AHEF1000)	C_1	55.0	Maximum
Overall Width without Lead Protrusion (AHEF050 to AHEF300)	C_2	42.5	Maximum
Overall Width without Lead Protrusion (AHEF500 to AHEF1000)	C_2	54.0	Maximum
Lead Protrusion	L_1	1.0	Maximum
Protrusion of Cut-out	L	11.0	Maximum
Protrusion Beyond Hold-Down Tape	l_2	Not specified	—
Sprocket Hole Pitch	P_0	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_1	2.0	Maximum
Overall Tape and Lead Thickness (AHEF1000)	t_1	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_1	3.81	± 0.7
Ordinate to Adjacent Component Lead (AHEF750 to AHEF1000)	P_1	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_2	56.0	Maximum
Reel Width (AHEF500 to AHEF1000)	w_2	63.5	Maximum
Reel Diameter	A	370.0	Maximum
Space between Flanges* (AHEF050 to AHEF300)	w_1	48.0	Maximum
Space between Flanges* (AHEF500 to AHEF1000)	w_1	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.

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Tape and Reel Diagrams

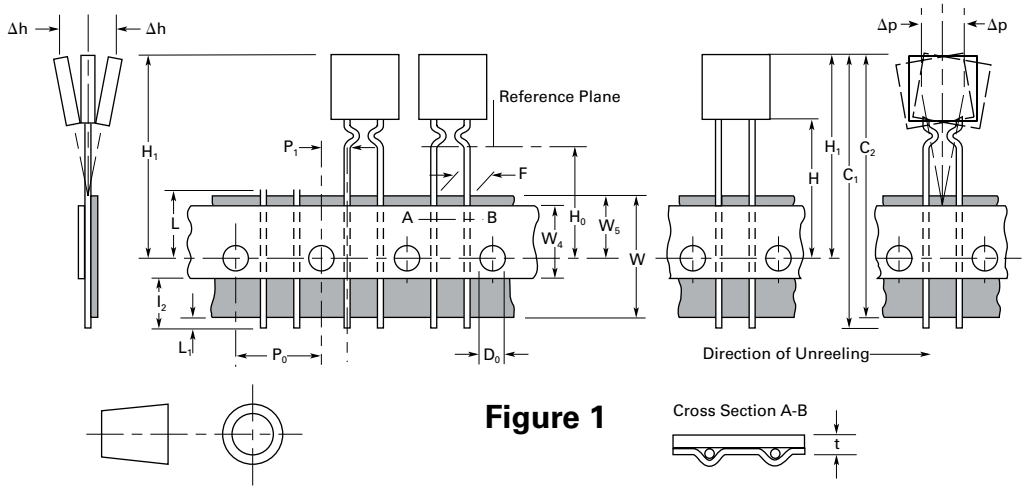

Figure 1

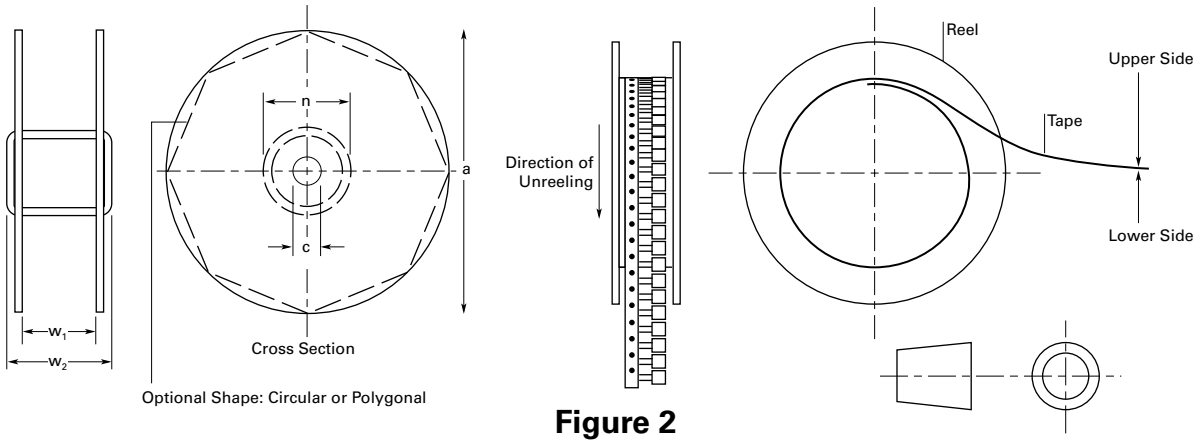

Figure 2

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.

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