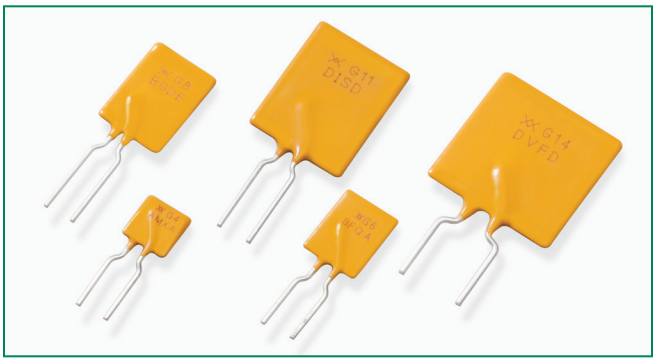
AGRF Series

HF RoHS



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 AGRF Series is a PPTC resettable device designed specifically for the automotive industry. It is a 16V 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 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

Electrical Characteristics

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)
AGRF – 16V												
AGRF400	4.0	3.0	7.6	16	100	2.5	20.0	2.0	0.0186	0.0610	0.0850	0.52/20
AGRF500	5.0	4.3	9.4	16	100	2.7	25.0	2.5	0.0140	0.0340	0.0480	0.52/20
AGRF600	6.0	5.3	10.7	16	100	2.8	30.0	3.5	0.0095	0.0280	0.0320	0.52/20
AGRF700	7.0	6.5	13.2	16	100	3.0	35.0	4.0	0.0066	0.0200	0.0220	0.52/20
AGRF800	8.0	7.6	15.0	16	100	3.2	40.0	5.5	0.0049	0.0175	0.0181	0.52/20
AGRF900	9.0	8.6	16.5	16	100	3.4	45.0	6.0	0.0041	0.0135	0.0140	0.52/20
AGRF1000	10.0	9.6	18.5	16	100	3.6	50.0	7.0	0.0034	0.0102	0.0106	0.52/20
AGRF1100	11.0	10.5	20.3	16	100	3.7	55.0	7.5	0.0033	0.0089	0.0093	0.52/20
AGRF1200	12.0	11.5	22.1	16	100	4.2	60.0	8.0	0.0030	0.0086	0.0091	0.82/18
AGRF1400	14.0	13.0	27.3	16	100	4.6	70.0	9.0	0.0022	0.0064	0.0067	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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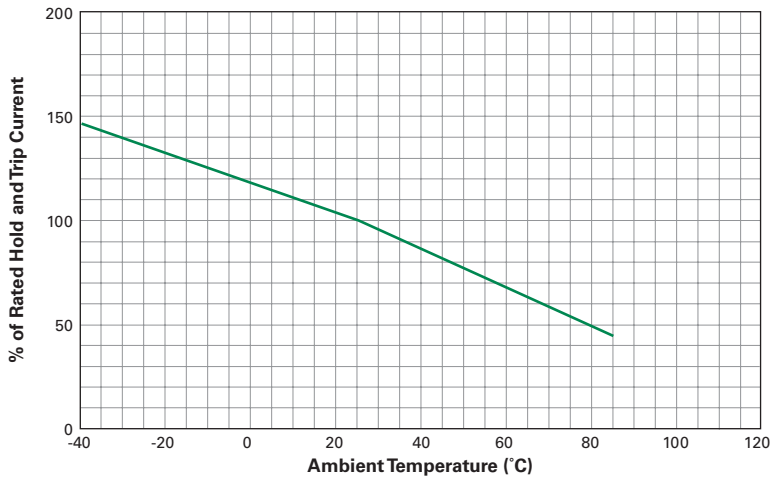
Temperature Rerating

Maximum Ambient Temperature										
	-40°C	-20°C	0°C	20°C	25°C	40°C	50°C	60°C	70°C	85°C
Hold Current (A)										
AGRF – 16V										
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

Temperature Rerating Curve



Part Ordering Number System

AGRF 800 -2

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

Hold Current Indicator

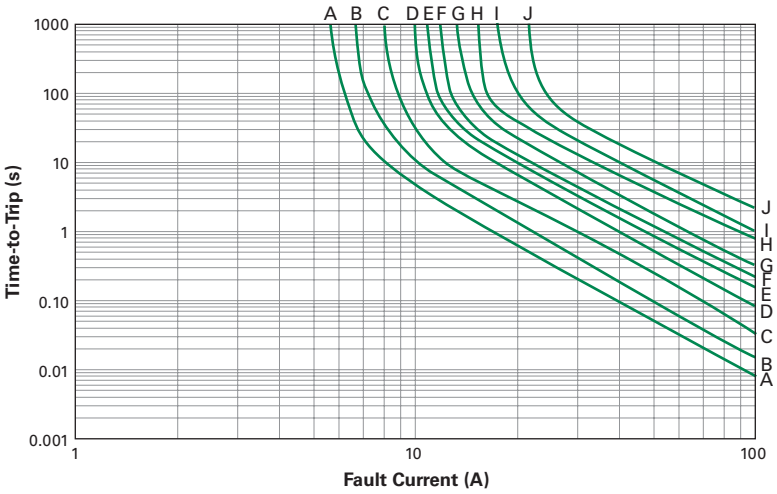
Product Series
An "F" at the End of the Series Indicates Pb-free Version of Product

Revised: 01/31/19

Typical Time-to-Trip Curves at 25°C

AGRF

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



Physical Specifications

Lead Material	AGRF400 to AGRF1100 : Tin-plated Copper, 0.52mm² (20AWG) ø 0.8 mm/0.032in AGRF1200 to AGRF1400 : Tin-plated Copper, 0.82mm² (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 s at 260°C ± 5°C AGRF500-AGRF1400 : per IEC68-2-20 Test Tb, Method 1a, Condition b; Can Withstand 10 s 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 hrs 85°C, 1000 hrs	±5% ±5%
Humidity Aging	85°C, 85% R.H., 1000 hrs	±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.

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

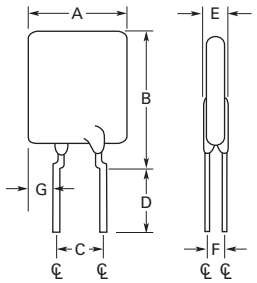

Figure 1

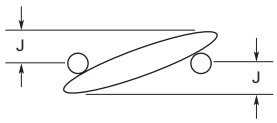

Figure 2

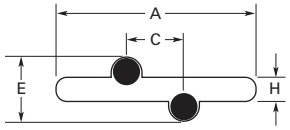

Figure 3

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 – 16V																	
AGRF400	—	8.9 (0.350)	—	14.1 (0.56)	4.3 (0.17)	5.8 (0.20)	7.6 (0.3)	—	—	3.0 (0.12)	1.2 (0.15)	—	—	3.10 (0.120)	1.24 (0.049)	1.4 (0.06)	1,2,3
AGRF500	—	10.4 (0.410)	—	15.6 (0.61)	4.3 (0.17)	5.8 (0.20)	7.6 (0.3)	—	—	3.0 (0.12)	1.2 (0.05)	—	—	3.94 (0.155)	1.24 (0.049)	1.6 (0.06)	1,2,3
AGRF600	—	10.7 (0.420)	—	18.4 (0.73)	4.3 (0.17)	5.8 (0.20)	7.6 (0.3)	—	—	3.0 (0.12)	1.2 (0.05)	—	—	4.07 (0.160)	1.24 (0.049)	1.6 (0.06)	1,2,3
AGRF700	—	11.2 (0.440)	—	21.0 (0.73)	4.3 (0.17)	5.8 (0.20)	7.6 (0.3)	—	—	3.0 (0.12)	1.2 (0.05)	—	—	4.49 (0.177)	1.24 (0.049)	1.7 (0.07)	1,2,3
AGRF800	—	12.7 (0.500)	—	22.2 (0.88)	4.3 (0.17)	5.8 (0.20)	7.6 (0.3)	—	—	3.0 (0.12)	1.2 (0.05)	—	—	5.08 (0.200)	1.24 (0.049)	1.8 (0.07)	1,2,3
AGRF900	—	14.0 (0.550)	—	23.0 (0.91)	4.3 (0.17)	5.8 (0.20)	7.6 (0.3)	—	—	3.0 (0.12)	1.2 (0.05)	—	—	5.69 (0.224)	1.24 (0.049)	2.0 (0.08)	1,2,3
AGRF1000	—	16.51 (0.650)	—	25.7 (1.01)	4.3 (0.17)	5.8 (0.20)	7.6 (0.3)	—	—	3.0 (0.12)	1.2 (0.05)	—	—	6.96 (0.274)	1.24 (0.049)	2.0 (0.08)	1,2,3
AGRF1100	—	17.5 (0.690)	—	26.5 (1.04)	4.3 (0.17)	5.8 (0.20)	7.6 (0.3)	—	—	3.0 (0.12)	1.2 (0.05)	—	—	7.47 (0.294)	1.24 (0.049)	2.4 (0.09)	1,2,3
AGRF1200	—	17.5 (0.690)	—	28.8 (1.14)	9.4 (0.37)	10.9 (0.43)	7.6 (0.3)	—	—	3.5 (0.14)	1.4 (0.06)	—	—	4.83 (0.190)	1.45 (0.057)	1.5 (0.06)	1,2,3
AGRF1400	—	23.5 (0.925)	—	28.7 (1.13)	9.4 (0.37)	10.9 (0.43)	7.6 (0.3)	—	—	3.5 (0.14)	1.4 (0.06)	—	—	7.82 (0.308)	1.45 (0.057)	1.9 (0.07)	1,2,3

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Packaging and Marking Information

Part Number	Bag Quantity	Tape and Reel Quantity	Ammo Pack Quantity	Standard Package Quantity	Part Marking	Agency Recognition
AGRF – 16V						
AGRF400	500	—	—	10,000	G4	*
AGRF400-2	—	2,500	—	12,500	G4	*
AGRF400-AP	—	—	2,000	10,000	G4	*
AGRF500	500	—	—	10,000	G5	*
AGRF500-2	—	2,000	—	10,000	G5	*
AGRF500-AP	—	—	2,000	10,000	G5	*
AGRF600	500	—	—	10,000	G6	*
AGRF600-2	—	2,000	—	10,000	G6	*
AGRF600-AP	—	—	2,000	10,000	G6	*
AGRF700	500	—	—	10,000	G7	*
AGRF700-2	—	1,500	—	7,500	G7	*
AGRF700-AP	—	—	1,500	7,500	G7	*
AGRF800	500	—	—	10,000	G8	*
AGRF800-2	—	1,500	—	7,500	G8	*
AGRF800-AP	—	—	1,500	7,500	G8	*
AGRF900	500	—	—	10,000	G9	*
AGRF900-2	—	1,000	—	5,000	G9	*
AGRF900-AP	—	—	1,000	5,000	G9	*
AGRF1000	250	—	—	5,000	G10	*
AGRF1000-2	—	1,000	—	5,000	G10	*
AGRF1000-AP	—	—	1,000	5,000	G10	*
AGRF1100	250	—	—	5,000	G11	*
AGRF1100-2	—	1,000	—	5,000	G11	*
AGRF1100-AP	—	—	1,000	5,000	G11	*
AGRF1200	250	—	—	5,000	G12	*
AGRF1200-2	—	1,000	—	5,000	G12	*
AGRF1200-AP	—	—	1,000	5,000	G12	*
AGRF1400	250	—	—	5,000	G14	*
AGRF1400-2	—	1,000	—	5,000	G14	*
AGRF1400-AP	—	—	1,000	5,000	G14	*

*These devices are intended for use in automotive applications.

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Tape and Reel Specifications

AGRF 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 (Kinked Lead) (AGRF400 to AGRF1400)	H_0	16.0	±0.5
Abscissa to Top (AGRF400 to AGRF600)	H_1	32.2	Maximum
Abscissa to Top (AGRF700 to AGRF1400)	H_1	45.0	Maximum
Overall Width with Lead Protrusion (AGRF400 to AGRF600)	C_1	43.2	Maximum
Overall Width with Lead Protrusion (AGRF700 to AGRF1400)	C_1	55.0	Maximum
Overall Width without Lead Protrusion (AGRF400 to AGRF600)	C_2	42.5	Maximum
Overall Width without Lead Protrusion (AGRF700 to AGRF1400)	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	I_2	Not specified	—
Sprocket Hole Pitch	P_0	12.7	± 0.3
Device Pitch (AGRF400 to AGRF700)	—	12.7	± 0.3
Device Pitch (AGRF800 to AGRF1400)	—	25.4	± 0.6
Pitch Tolerance	—	20 consec.	± 0.1
Tape Thickness	t	0.9	Maximum
Overall Tape and Lead Thickness (AGRF400 to AGRF1100)	t_1	2.0	Maximum
Overall Tape and Lead Thickness (AGRF1200 to AGRF1400)	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 (AGRF400 to AGRF1100)	P_1	3.81	± 0.7
Ordinate to Adjacent Component Lead (AGRF1200 to AGRF1400)	P_1	7.62	± 0.7
Lead Spacing (AGRF400 to AGRF1100)	F	5.05	± 0.75
Lead Spacing (AGRF1200 to AGRF1400)	F	10.15	± 0.75
Reel Width (AGRF400 to AGRF600)	w_2	56.0	Maximum
Reel Width (AGRF700 to AGRF1400)	w_2	63.5	Maximum
Reel Diameter	A	370.0	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.

Revised: 01/31/19

Tape and Reel Diagrams

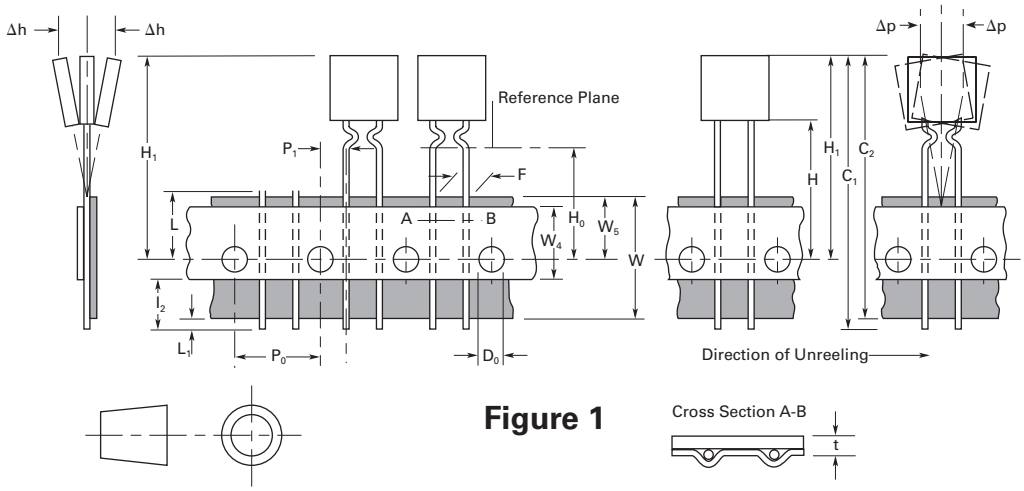

Figure 1

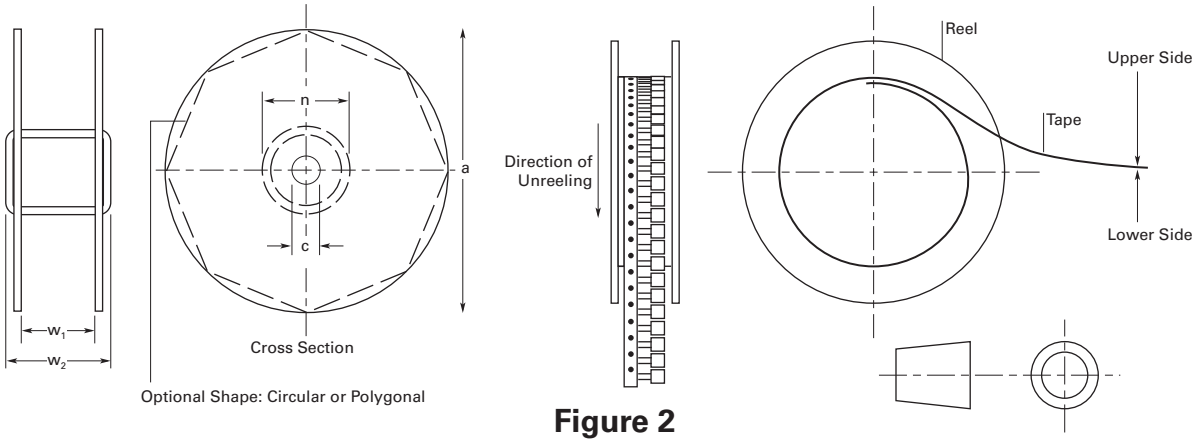

Figure 2

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.