




**THE DATASHEET OF  
MF-SM185/33-2**





## Features

- Compliant with AEC-Q200 Rev-C- Stress Test Qualification for Passive Components in Automotive Applications
- Surface mount devices
- Fully compatible with current industry standards
- Packaged per EIA 481-2 standard
- RoHS compliant\* and halogen free\*\*
- Agency recognition: 
- Patents pending

## MF-SM Series - PTC Resettable Fuses

### Electrical Characteristics

Model	V max. Volts	I max Amps	I <sub>hold</sub>	I <sub>trip</sub>	Resistance		Max. Time To Trip		Tripped Power Dissipation
			Amperes at 23 °C		Ohms at 23 °C		Amperes at 23 °C	Seconds at 23 °C	Watts at 23 °C
			Hold	Trip	R Min.	R1 Max.		Max.	Typ.
MF-SM030	60	40	0.30	0.60	0.90	4.80	1.5	3.0	1.7
MF-SM050	60	40	0.50	1.00	0.35	1.40	2.5	4.0	1.7
MF-SM075	30	80	0.75	1.50	0.23	1.00	8.0	0.3	1.7
MF-SM075/60	60	10	0.75	1.50	0.23	1.00	8.0	0.3	1.7
MF-SM100	30	80	1.10	2.20	0.12	0.48	8.0	0.5	1.7
MF-SM100/33	33	40	1.10	2.20	0.12	0.41	8.0	0.5	1.7
MF-SM125	15	100	1.25	2.50	0.07	0.25	8.0	2.0	1.7
MF-SM150	15	100	1.50	3.00	0.06	0.25	8.0	5.0	1.9
MF-SM150/33	33	40	1.50	3.00	0.06	0.23	8.0	5.0	1.9
MF-SM185/33	33	40	1.80	3.60	0.04	0.15	8.0	5.0	1.9
MF-SM200	15	100	2.00	4.00	0.045	0.125	8.0	12.0	1.9
MF-SM250	15	100	2.50	5.00	0.024	0.085	8.0	25.0	1.9
MF-SM260	6	100	2.60	5.20	0.025	0.075	8.0	20.0	1.7
MF-SM300	6	100	3.00	6.00	0.015	0.048	8.0	35.0	1.5

### Environmental Characteristics

Operating Temperature.....	-40 °C to +85 °C
Maximum Device Surface Temperature in Tripped State .....	125 °C
Passive Aging .....	+85 °C, 1000 hours..... ±5 % typical resistance change
Humidity Aging.....	+85 °C, 85 % R.H. 7 days..... ±5 % typical resistance change
Thermal Shock .....	MIL-STD-202F, Method 107G..... ±10 % typical resistance change
Vibration .....	-40 °C to +85 °C, 20 cycles ..... -20 % typical resistance change
	MIL-STD-883C, Method 2007.1,..... R <sub>min</sub> ≤ R ≤ R <sub>1max</sub>
	Condition A
Moisture Sensitivity Level (MSL) .....	Level 1
ESD Classification - HBM.....	Class 6

### Test Procedures And Requirements For Model MF-SM Series

Test	Test Conditions	Accept/Reject Criteria
Visual/Mech.....	Verify dimensions and materials.....	Per MF physical description
Resistance.....	In still air @ 23 °C.....	R <sub>min</sub> ≤ R ≤ R <sub>1max</sub>
Time to Trip.....	At specified current, V <sub>max</sub> , 23 °C .....	T ≤ max. time to trip (seconds)
Hold Current .....	30 min. at I <sub>hold</sub> .....	No trip
Trip Cycle Life.....	V <sub>max</sub> , I <sub>max</sub> , 100 cycles .....	No arcing or burning
Trip Endurance .....	V <sub>max</sub> , 48 hours .....	No arcing or burning
Solderability.....	MIL-STD-202F, Method 208F.....	95 % min. coverage
UL File Number .....	E174545 <a href="http://www.ul.com/">http://www.ul.com/</a> Follow link to Online Certificates Directory, then enter UL File No. E174545, or <a href="#">click here</a>	
TÜV Certificate .....	Certificate Number Available on Request, or <a href="#">click here</a>	

\* RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

\*\* Bourns considers a product to be "halogen free" if (a) the Bromine (Br) content is 900 ppm or less; (b) the Chlorine (Cl) content is 900 ppm or less; and (c) the total Bromine (Br) and Chlorine (Cl) content is 1500 ppm or less.

Specifications are subject to change without notice.

Users should verify actual device performance in their specific applications.

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## Applications

Almost anywhere there is a low voltage power supply and a load to be protected, including:

- Computers & peripherals
- General electronics
- Automotive applications

## MF-SM Series - PTC Resettable Fuses

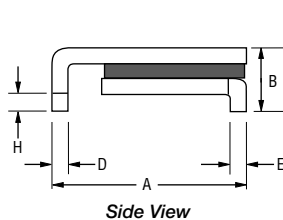
**BOURNS®**

### Product Dimensions

Model	A		B	C	D		E		F		G		H
	Min.	Max.	Max.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
MF-SM030	6.73 (0.265)	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM050	6.73 (0.265)	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM075	6.73 (0.265)	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM075/60	6.73 (0.265)	7.98 (0.314)	3.18 (0.125)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM100	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM100/33	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM125	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM150	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM150/33	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM185/33	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM200	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM250	8.00 (0.315)	9.50 (0.374)	3.0 (0.118)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM260	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)
MF-SM300	6.73 (0.265)	7.98 (0.314)	3.0 (0.118)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)

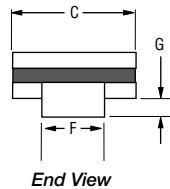
Packaging:

TAPE & REEL: MF-SM030, 050, 075, 075/60, 100, 100/33, 125, 260, 300 = 2000 pcs. per reel;  
MF-SM150, 150/33, 185/33, 200, 250 = 1500 pcs. per reel.



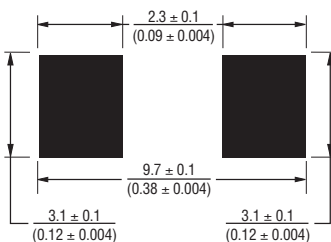
DIMENSIONS: MM  
(INCHES)

Terminal material:  
Tin-plated brass



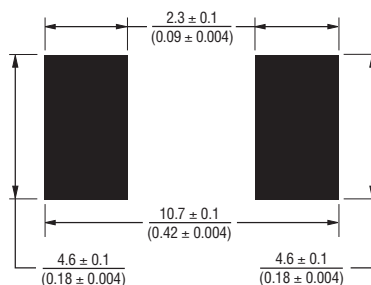
#### Recommended Pad Layout

MF-SM030, 050, 075, 075/60, 100, 100/33, 125, 260, 300



#### Recommended Pad Layout

MF-SM150, 150/33, 185/33, 200, 250



### How to Order

**MF - SM 100/33 - 2 - 99**

Multifuse® Product Designator \_\_\_\_\_  
Series \_\_\_\_\_  
SM = Surface Mount Component  
Hold Current,  $I_{hold}/V_{max}^*$  \_\_\_\_\_  
030 - 300 (0.3 - 3.0 Amps)  
Packaging Options \_\_\_\_\_  
- 2 = Tape and Reel\*\*  
Part Number Suffix Option \_\_\_\_\_  
- 99 = RoHS Compliance

As of date code April 1, 2005 all MF-SM models are RoHS compliant. The suffix "-99" can be used if a new part number is required to reference the RoHS compliance, **but including the "-99" suffix option is not recommended for new designs.**

\*  $V_{max}$  entry applies only to models MF-SM075/60, MF-SM100/33, MF-SM150/33 & MF-SM185/33.

\*\* Packaged per EIA-481-2

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# MF-SM Series - PTC Resettable Fuses

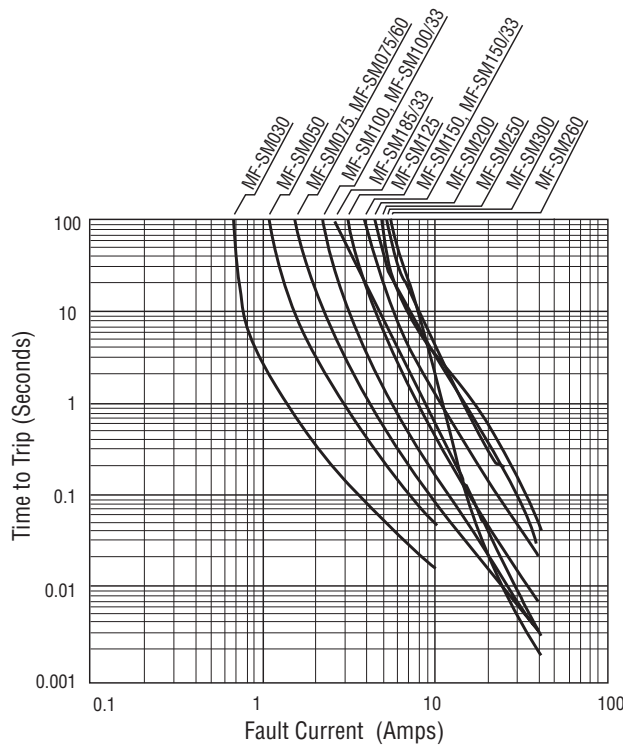


Thermal Derating Chart -  $I_{hold}$  (Amps)

Model	Ambient Operating Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
MF-SM030	0.45	0.40	0.35	0.30	0.25	0.23	0.20	0.17	0.14
MF-SM050	0.76	0.67	0.59	0.50	0.42	0.38	0.33	0.29	0.23
MF-SM075	1.11	0.99	0.84	0.75	0.63	0.57	0.49	0.45	0.36
MF-SM075/60	1.11	0.99	0.84	0.75	0.63	0.57	0.49	0.45	0.36
MF-SM100	1.66	1.47	1.29	1.10	0.91	0.83	0.73	0.64	0.50
MF-SM100/33	1.66	1.47	1.29	1.10	0.91	0.83	0.73	0.64	0.50
MF-SM125	1.89	1.68	1.46	1.25	1.04	0.94	0.83	0.73	0.56
MF-SM150	2.27	2.01	1.76	1.50	1.25	1.13	0.99	0.87	0.68
MF-SM150/33	2.27	2.01	1.76	1.50	1.25	1.13	0.99	0.87	0.68
MF-SM185/33	2.56	2.32	2.08	1.85	1.60	1.44	1.28	1.12	0.88
MF-SM200	3.02	2.68	2.34	2.00	1.66	1.50	1.32	1.16	0.90
MF-SM250	3.78	3.35	2.93	2.50	2.08	1.88	1.65	1.45	1.13
MF-SM260	3.64	3.25	2.91	2.60	2.26	2.08	1.95	1.74	1.48
MF-SM300	4.13	3.75	3.30	2.87	2.62	2.43	2.25	2.00	1.78

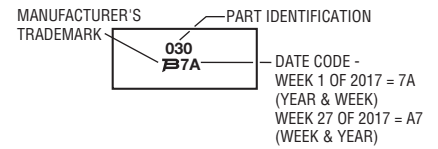
$I_{trip}$  is approximately two times  $I_{hold}$ .

Typical Time to Trip at 23 °C



Typical Part Marking

Represents total content. Layout may vary.

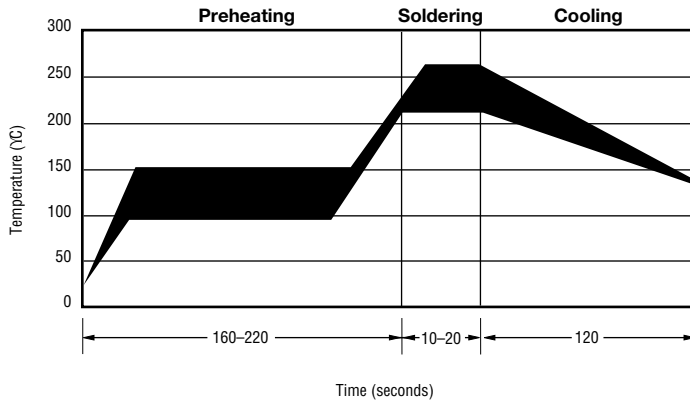


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## Solder Reflow Recommendations



### Solder reflow

- Recommended reflow methods: IR, vapor phase oven, hot air oven.
- Devices are not designed to be wave soldered to the bottom side of the board.
- Gluing the devices is not recommended.
- Recommended maximum paste thickness is 0.25 mm (.010 inch).
- Devices can be cleaned using standard industry methods and solvents.

### Note:

- If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

### Rework

- A device should not be reworked.

## Storage Recommendations

The recommended long term storage conditions for Multifuse® Polymer PTC devices are 40 °C maximum and 70 % RH maximum. All devices should remain in the original sealed packaging prior to use. Devices may not conform with data sheet specifications if these storage recommendations are exceeded. Devices stored in this manner have an indefinite shelf life.

MF-SM, MF-SM/33, MF-SM/60 & MF-SM/250 Series Tape and Reel Specifications

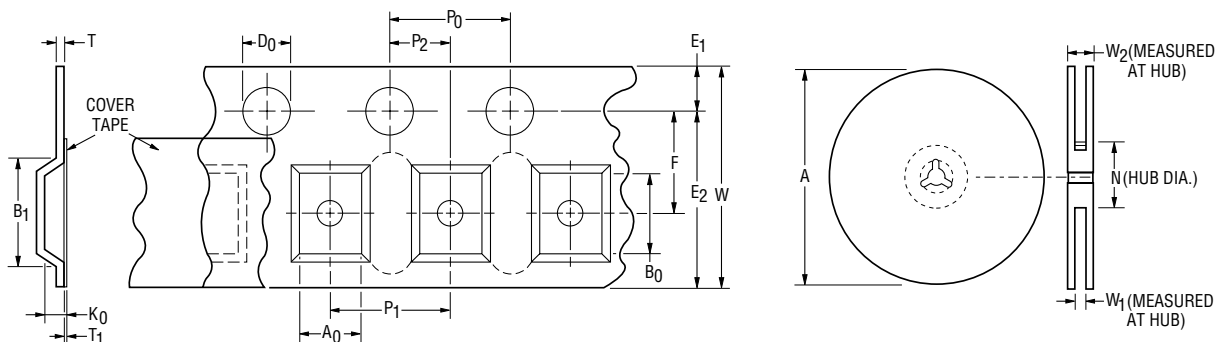


NOTE: Effective December 1, 2010 (product date code V0), the cover tape was changed to the new 3M™ Universal Cover Tape (UCT).

Tape Dimensions	MF-SM030, 050, 075, 100, 125, 260, 300; MF-SM075/60; MF-SM-100/33; MF-SM008/250 per EIA-481-2	MF-SM150, 200, 250; MF-SM-150/33, MF-SM-185/33; MF-SM013/250 per EIA 481-2
	W max.	16.3 (0.642)
P <sub>0</sub>	4.0 ± 0.1 (0.157 ± 0.004)	4.0 ± 0.1 (0.157 ± 0.004)
P <sub>1</sub>	8.0 ± 0.1 (0.315 ± 0.004)	12.0 ± 0.1 (0.472 ± 0.004)
P <sub>2</sub>	2.0 ± 0.1 (0.079 ± 0.004)	2.0 ± 0.1 (0.079 ± 0.004)
A <sub>0</sub>	5.7 ± 0.1 (0.224 ± 0.004)	6.9 ± 0.1 (0.272 ± 0.004)
B <sub>0</sub>	8.1 ± 0.1 (0.319 ± 0.004)	9.6 ± 0.1 (0.378 ± 0.004)
B <sub>1</sub> max.	12.1 (0.476)	12.1 (0.476)
D <sub>0</sub>	1.5 + 0.1/-0.0 (0.059 + 0.004/-0)	1.5 + 0.1/-0.0 (0.059 + 0.004/-0)
F	7.5 ± 0.1 (0.295 ± 0.004)	7.5 ± 0.1 (0.295 ± 0.004)
E <sub>1</sub>	1.75 ± 0.1 (0.069 ± 0.004)	1.75 ± 0.1 (0.069 ± 0.004)
E <sub>2</sub> min.	14.25 (0.561)	14.25 (0.561)
T max.	0.6 (0.024)	0.6 (0.024)
T <sub>1</sub> max.	0.1 (0.004)	0.1 (0.004)
K <sub>0</sub>	3.4 ± 0.1 (0.134 ± 0.004)	3.4 ± 0.1* (0.134 ± 0.004)*
Leader min.	390 (15.35)	390 (15.35)
Trailer min.	160 (6.30)	160 (6.30)
<b>Reel Dimensions</b>		
A max.	360 (14.17)	360 (14.17)
N min.	50 (1.97)	50 (1.97)
W <sub>1</sub>	16.4 + 2.0/-0.0 (0.646 + 0.079/-0)	16.4 + 2.0/-0.0 (0.646 + 0.079/-0)
W <sub>2</sub> max.	22.4 (0.882)	22.4 (0.882)

\* Model MF-SM013/250 =  $\frac{3.8 \pm 0.1}{(0.150 \pm 0.004)}$

DIMENSIONS:  $\frac{\text{MM}}{\text{(INCHES)}}$



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**Application Notice**

- Users are responsible for independent and adequate evaluation of Bourns® Multifuse® Polymer PTC devices in the user's application, including the PPTC device characteristics stated in the applicable data sheet.
- Polymer PTC devices must not be allowed to operate beyond their stated maximum ratings. Operation in excess of such maximum ratings could result in damage to the PTC device and possibly lead to electrical arcing and/or fire. Circuits with inductance may generate a voltage above the rated voltage of the polymer PTC device and should be thoroughly evaluated within the user's application during the PTC selection and qualification process.
- Polymer PTC devices are intended to protect against adverse effects of temporary overcurrent or overtemperature conditions up to rated limits and are not intended to serve as protective devices where overcurrent or overvoltage conditions are expected to be repetitive or prolonged.
- In normal operation, polymer PTC devices experience thermal expansion under fault conditions. Thus, a polymer PTC device must be protected against mechanical stress, and must be given adequate clearance within the user's application to accommodate such thermal expansion. Rigid potting materials or fixed housings or coverings that do not provide adequate clearance should be thoroughly examined and tested by the user, as they may result in the malfunction of polymer PTC devices if the thermal expansion is inhibited.
- Exposure to lubricants, silicon-based oils, solvents, gels, electrolytes, acids, and other related or similar materials may adversely affect the performance of polymer PTC devices.
- Aggressive solvents may adversely affect the performance of polymer PTC devices. Conformal coating, encapsulating, potting, molding, and sealing materials may contain aggressive solvents including but not limited to xylene and toluene, which are known to cause adverse effects on the performance of polymer PTCs. Such aggressive solvents must be thoroughly cured or baked to ensure their complete removal from polymer PTCs to minimize the possible adverse effect on the device.
- Recommended storage conditions should be followed at all times. Such conditions can be found on the applicable data sheet and on the Multifuse® Polymer PTC Moisture/Reflow Sensitivity Classification (MSL) note:  
[https://www.bourns.com/docs/RoHS-MSL/msl\\_mf.pdf](https://www.bourns.com/docs/RoHS-MSL/msl_mf.pdf)

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Bourns expressly identifies those Bourns® standard products that are suitable for use in automotive applications on such products’ data sheets in the section entitled “Applications.” Unless expressly and specifically approved in writing by two authorized Bourns representatives on a case-by-case basis, use of any other Bourns® standard products in an automotive application might not be safe and thus is not recommended, authorized or intended and is at the user’s sole risk. If Bourns expressly identifies a sub-category of automotive application in the data sheet for its standard products (such as infotainment or lighting), such identification means that Bourns has reviewed its standard product and has determined that if such Bourns® standard product is considered for potential use in automotive applications, it should only be used in such sub-category of automotive applications. Any reference to Bourns® standard product in the data sheet as compliant with the AEC-Q standard or “automotive grade” does not by itself mean that Bourns has approved such product for use in an automotive application.

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