NASA-STD-8739.11 Tutorial
Section F3. Fuses

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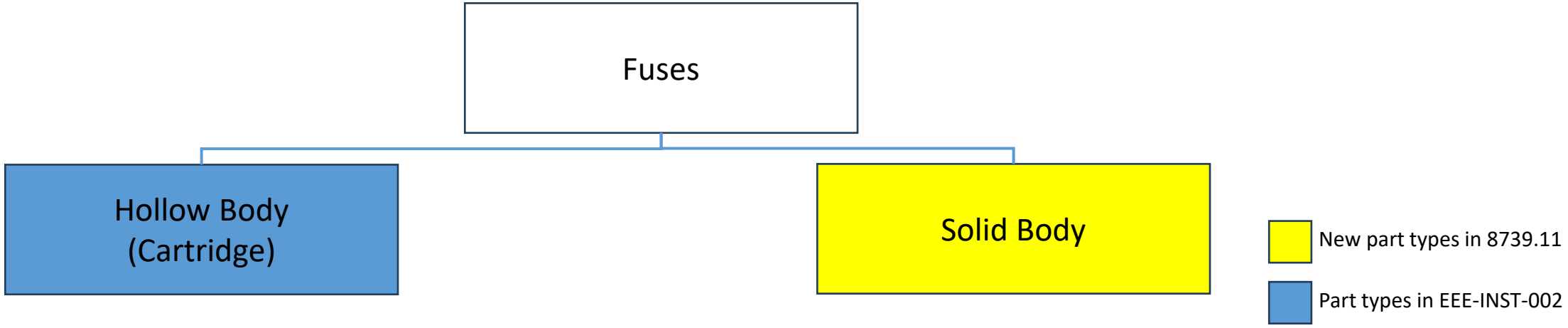
Acronyms

A	Ampere
C	degrees Celsius
DPA	Destructive Physical Analysis
GSFC	Goddard Space Flight Center
LAT	Lot Acceptance Testing
NASA	National Aeronautics and Space Administration
NEPP	NASA Electronic Parts & Packaging (Program)
V	Volt

Covered Part Type

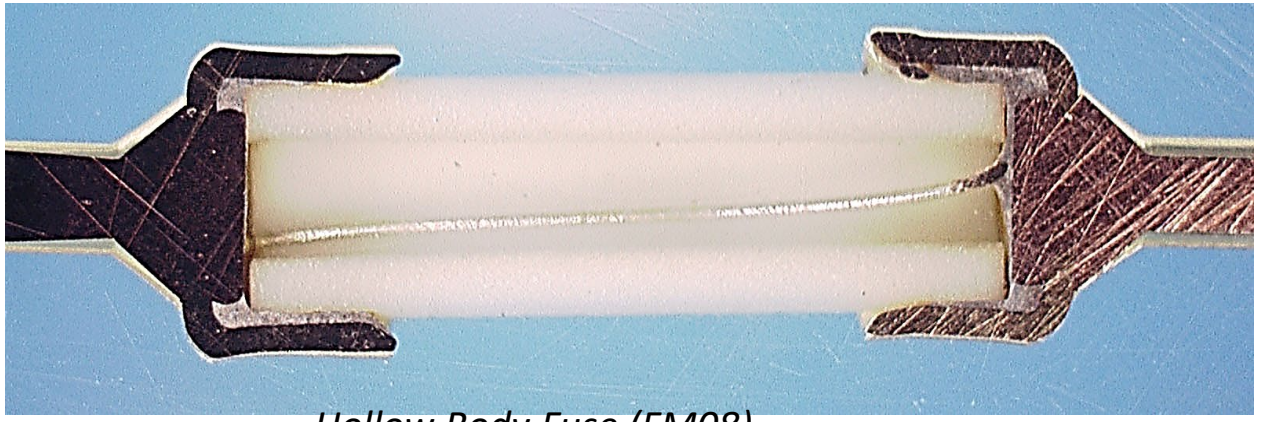
- Fuses – devices that provide overcurrent protection in an electrical circuit.
- NASA-STD-8739.11 fuse requirements based heavily on MIL-PRF-23419 requirements and primary slash sheets.
- Resettable fuses are not covered. Resettable fuses are generally not recommended for flight applications. For special applications of these types of fuses, consult the project parts engineer.



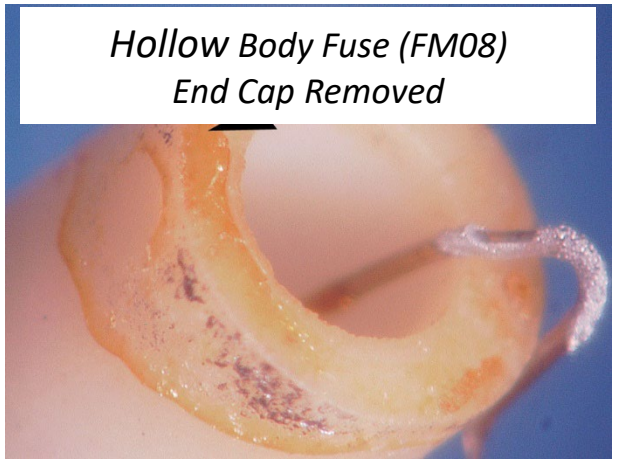
Covered Part Type: Hollow Body Fuse

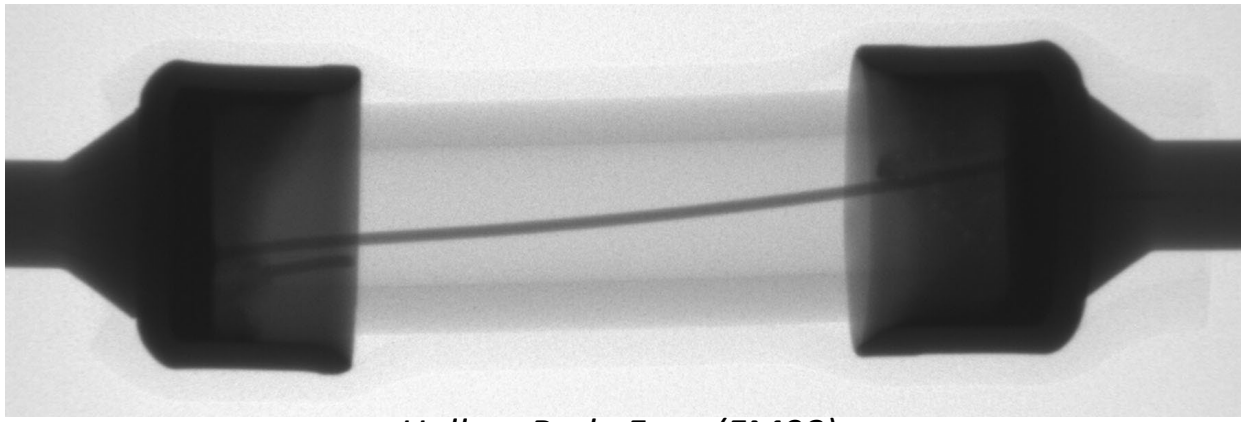


Hollow Body Fuse (FM08)
External view



Hollow Body Fuse (FM08)
Cross-section view



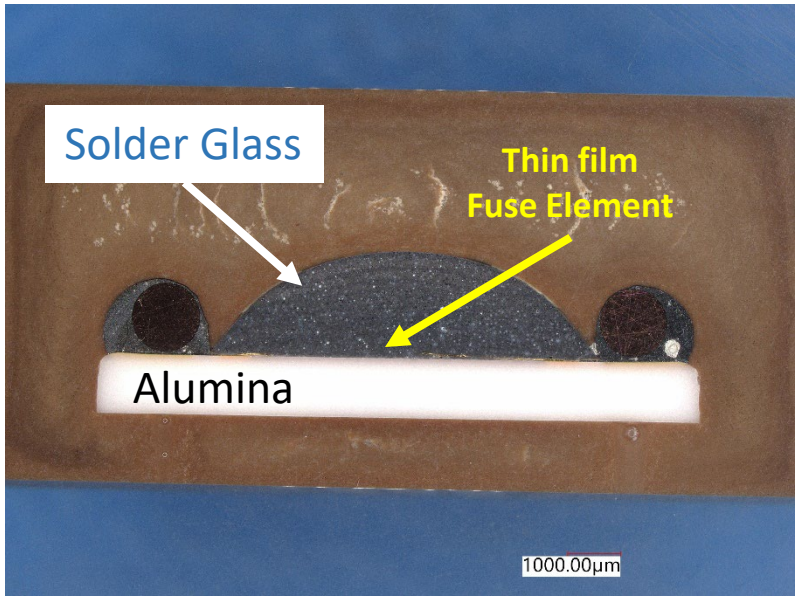


Hollow Body Fuse (FM08)
Xray

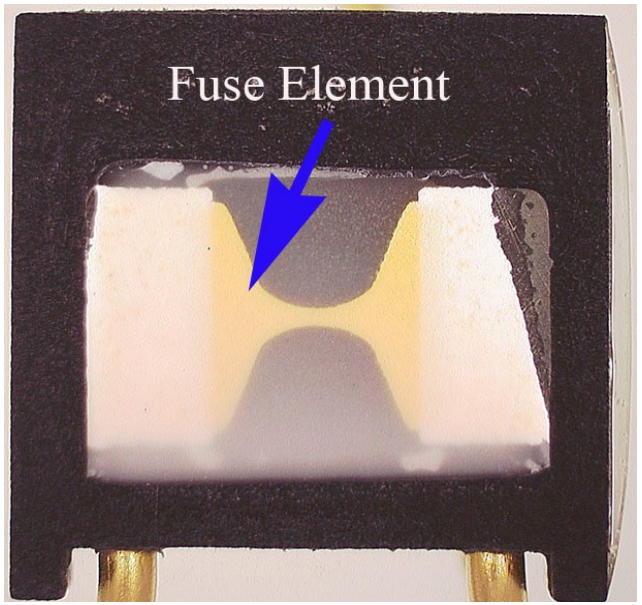
Covered Part Type: Solid Body Fuse



Solid Body Fuse (FM12)
External view



Solid Body Fuse (FM12-like)
Cross-section view



Solid Body Fuse (FM12-like)
Cross-section view

Key Considerations

- New in NASA-STD-8739.11, Key Considerations have been added for certain sections. This information is intended to provide technical guidance in part selection and applications, beyond the traditional tables provided for screening and lot acceptance.
  - Maximum rated voltage and current
  - Overload interrupt time
  - Short Circuit Interrupt – breaking capacity; the maximum current that can be safely interrupted
  - Speed at which the fuse blows
  - Let-through energy (estimate of the energy let through as the fuse is blowing)
  - Temperature derating
  - Dimensions (can the fuse be interchanged with a fuse of a different rating?)

Major Changes from EEE-INST-002

EEE-INST-002 F3. Fuses Requirements

Table 1 FUSE REQUIREMENTS 1/, 4/, 5/

Procurement Specification	Fuse Style and Type	Military Reference Specification	Level 1	Level 2	Level 3
Mil Specification SCD Commercial	FM Fuse, Cartridge, Instrument Type	MIL-PRF-23419	2/ 3/	2/ 3/ 3/	2/ 3/ 3/

NASA-STD-8739.11 F3. Fuses Requirements

Table 1. FUSE REQUIREMENTS 1/

Assurance Level	Fuse Style and Type	Specification	Use as Is	Screening 1/	LAT 2/	DPA
Level 1	Hollow Body	MIL-PRF-23419		X		X
	Solid Body	MIL-PRF-23419	X			
	Hollow and Solid Body	SCD		X	X	X
Level 2	Hollow Body	MIL-PRF-23419		X		X
	Solid Body	MIL-PRF-23419	X			
	Hollow and Solid Body	Automotive, Commercial, SCD		X	X	X
Level 3	Hollow Body	MIL-PRF-23419		X		X
	Solid Body	MIL-PRF-23419	X			
	Hollow Body	Automotive, Commercial, SCD		X		X
	Solid Body	Automotive, Commercial, SCD		X		X

- NASA-STD-8739.11 distinguishes solid vs hollow body fuses, to include screening, lot acceptance testing (LAT) and derating requirements
- Solid body fuses per MIL-PRF-23419 are Use-As-Is in all applications
- Hollow body fuses and solid body fuses not per MIL-PRF-23419 have varying levels screening, LAT and destructive physical analysis (DPA)
- Screening requirements for Level 3 have been reduced. LAT for Level 3 has been eliminated

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Major Changes from EEE-INST-002

EEE-INST-002 F3. Fuses Derating

Table 4 FUSE DERATING REQUIREMENTS FOR CARTRIDGE STYLE (Notes 1-6)

Fuses are derated by multiplying the rated amperes by the appropriate derating factor listed below.

Fuse Current Rating (Amperes) @ 25 °C	Current Derating Factor	Temperature Derating Factor	Remarks
2, 2-1/2, 3, 4, 5, 7, 10, 15	50%	There is an additional derating of 0.2%/°C for an increase in the temperature of fuse body above 25 °C.	
1, 1-1/2	45%		
3/4	40%		
1/2	40%		The flight use of fuses rated 1/2 ampere or less requires application approval by the project office.
3/8	35%		
1/4	30%		
1/8	25%		

- Derating table for hollow-body fuses did not change
- Derating table for solid body fuses is simplified

NASA-STD-8739.11 F3. Fuses Derating

Table 4A. HOLLOW BODY FUSE DERATING REQUIREMENTS 1/ 2/ 3/ 4/ 5/ 6/

Derating of fuses is accomplished by multiplying the stress parameter by the appropriate derating factor specified below.

Stress Parameter	Derating Factor
Current Rating @ 25 °C: ≥ 2 A	• 50% minus 0.2%/ °C for an increase in fuse body temperature above 25 °C
Current Rating @ 25 °C: ≥ 1A and < 2 A	• 45% minus 0.2%/ °C for an increase in fuse body temperature above 25 °C
Current Rating @ 25 °C: ≥ 0.5A and < 1 A 7/	• 40% minus 0.2%/ °C for an increase in fuse body temperature above 25 °C
Current Rating @ 25 °C: ≥ 0.375A and < 0.5 A 7/	• 35% minus 0.2%/ °C for an increase in fuse body temperature above 25 °C
Current Rating @ 25 °C: ≥ 0.25A and < 0.375 A 7/	30% minus 0.2%/ °C for an increase in fuse body temperature above 25 °C
Current Rating @ 25 °C: < 0.25 A 7/	25% minus 0.2%/ °C for an increase in fuse body temperature above 25 °C
Operating Temperature	110 °C
Voltage Rating	50V Maximum

Table 4B. SOLID BODY FUSE DERATING REQUIREMENTS

Derating of fuses is accomplished by multiplying the stress parameter by the appropriate derating factor specified below.

Stress Parameter	Derating Factor
Current	80% of manufacturer's rating
Operating Temperature	110 °C

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Send email to address below for questions

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