NASA-STD-8739.11 Tutorial
Section M1, Magnetics

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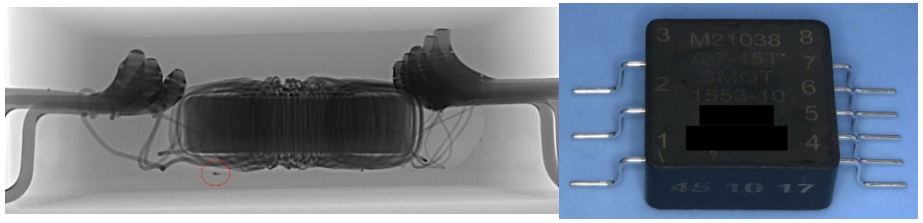
Acronyms

AEC	Automotive Electronics Council
COTS	Commercial-Off-The-Shelf
Cpk	Process Capability Index
CM	Common Mode (Choke)
DLA	Defense Logistics Agency
DoD	Department of Defense
DPPM	Defective Parts Per Million
EEEE	Electrical, Electronic, Electromechanical, Electro-Optical
EOL	End-Of-Line
ETW	Electronics Technology Workshop
FIT	Failure-In-Time
FMEA	Failure Mode and Effects Analysis
GSFC	Goddard Space Flight Center
IL	In-Line
ILPM	Industry Leading Parts Manufacturer
JEDEC	Joint Electron Device Engineering Council

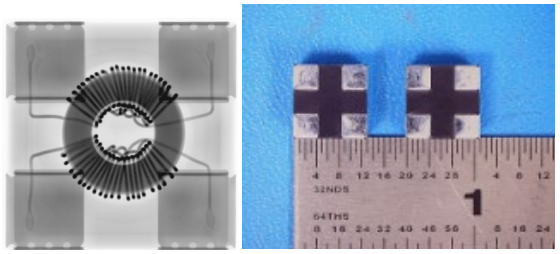
MEAL	Mission Environment, Application, and Lifetime
MIL-SPEC	Military Specification
NASA	National Aeronautics and Space Administration
NEPP	NASA Electronic Parts & Packaging (Program)
NESC	NASA Engineering & Safety Center
PCB	Printed Circuit Board
PPAP	Production Part Approval Process
PSW	Part Submission Warrant
QML	Qualified Manufacturers List
QPL	Qualified Product List
RF	Radio Frequency
RHA	Radiation Hardness Assurance
SMA	Safety and Mission Assurance
SMD	Standard Microcircuit Drawing
SME	Subject Matter Expert
SPC	Statistical Process Control

Covered Part Types

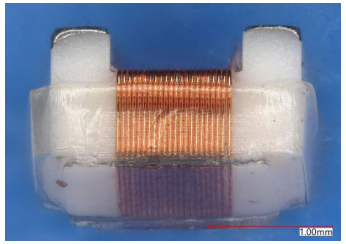
- Magnetics includes simple or RF inductors & transformers including small power transformers, common mode chokes, signal transformers



MIL-PRF-21038 low power pulse, often used for 1553 bus



Surface mount common mode choke



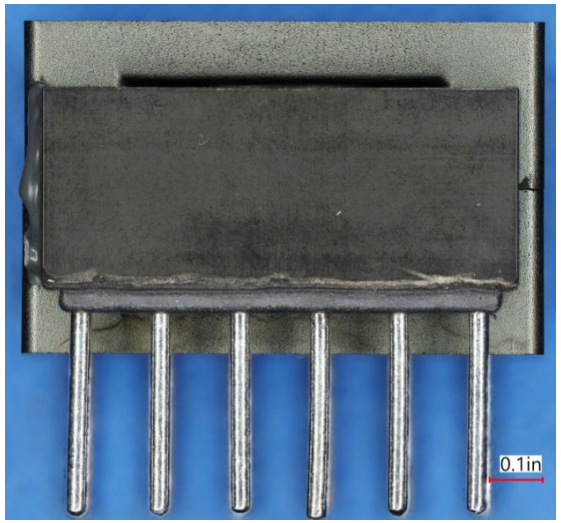
RF (Radio Frequency) Surface Mount Inductor

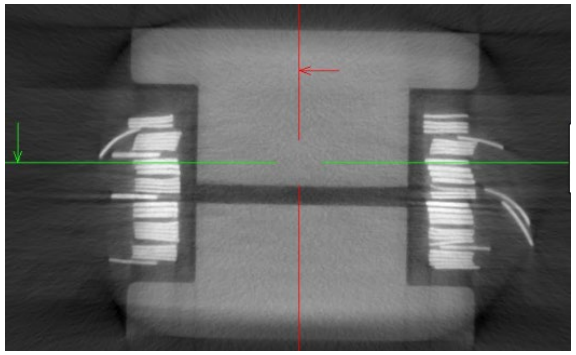
Classic toroid power inductor, for Space

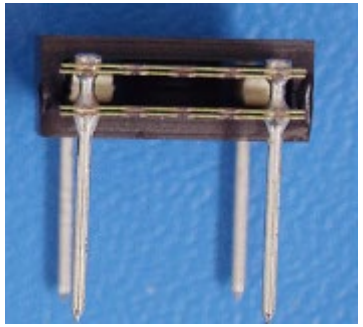
All photos by the Goddard Space Flight Center Physical Analysis Lab

NOT Covered: Planar Inductors & Transformers

Inductors & transformers that have windings which are conducting layers **in** a Printed Circuit Board (PCB) or stacks of PCBs, as opposed to the wire used in standard transformer construction.







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Key Considerations

- Wire insulation, for leakage, temperature and space tolerance
- Device properties are affected by wire insulation (“heavy” is preferred for reliability, but affects device size and closeness to “ideal” parts)
- Derating is by temperature: environment temperature + device temperature rise, given the electrical usage. Call your Thermal Engineer!
- Many magnetics are still of standard construction and made with machine-assist, or are simply hand-made, so older referenced documents still apply (e.g. MIL-PRF-27 & MIL-STD-981)

Major Changes from EEE-INST-002

Organization of the requirements and testing tables:

WAS, in INST-002: Part Types are on the Left margin, each part type shows the Assurance Level for that part type in the same row.

Part Type	Procurement Specification	Level 1	Level 2	Level 3
Custom Magnetic Devices 2/	MIL-STD-981	Class S	Class S, B	Class S, B
Inductors/Coils				
RF Fixed Coils	MIL-PRF-39010 9/	R 3/	R, P	R, P
RF Fixed and Variable Coils	MIL-PRF-15305 9/	4/	5/	X
RF Fixed and Variable Chip Coils	MIL-PRF-83446 9/	4/	X	X
Inductors, Power, Audio, Charging, and Saturable	MIL-PRF-27 8/ 9/		T, M 7/	T, M 7/
All Coil and Inductor Types	SCD 9/	4/	4/	4/
All Coils and Inductor Types	Commercial 9/		4/	4/
Transformers				
RF Fixed and Variable	6/ 9/	4/	4/	4/
Lower Power Pulse	MIL-PRF-21038 8/ 9/	T 4/	T, M	T, M
Transformers Power, Audio, Charging, and Saturable	MIL-PRF-27 8/ 9/	T 7/	T, M 7/	T, M 7/
All Transformer Types	SCD 9/	4/	4/	4/
All Transformer Types	Commercial 9/		4/	4/

Major Changes from EEE-INST-002

Organization of the requirements and testing tables:

NOW, in 8739.11 :

All the part types requirements are listed for *each* assurance level.

Here, only Level 1 requirements are listed for all the covered part types on a single 'page'.

Levels 2 & 3 are similarly on their own 'page'.

Assurance Level	Part Type and Description	Specification	Use As Is Class	Product Level	Screening	LAT	DPA
Level 1	Inductors/Coils						
	RF Fixed Molded Coils	MIL-PRF-39010	B, F	S			X
	RF Fixed Coil Surface Mount	MIL-PRF-39010	B, F	S			X
	RF Fixed Molded Coils	MIL-PRF-15305	B, C	K			X
	RF Variable Molded Coils	MIL-PRF-15305	B, C	V			X
	RF Fixed and Variable Chip Coils	MIL-PRF-83446	M	T, with F,G tolerance			X
	Audio, Power, and High-Power Pulse	MIL-PRF-27	S, V, T, U	T			X
	All Other Inductor Types	Automotive, Commercial, SCD			X	X	X
	Transformer						
	RF Fixed Intermediate Frequency and Discriminator	MIL-T-55631	B, C	Grade 1			X
	Low Power Pulse	MIL-PRF-21038	M	T			X
	Audio, Power, and High-Power Pulse	MIL-PRF-27	S, V, T, U	T			X
	All Other Transformer Types	Automotive, Commercial, SCD			X	X	X
Level 2	Inductors/Coils						
	RF Fixed Molded Coils	MIL-PRF-39010	A, B, F	R, S			X
	RF Fixed Coil Surface Mount	MIL-PRF-39010	A, B, F	R, S			X
	RF Fixed Molded Coils	MIL-PRF-15305	A, B, C	K			X
	RF Variable Molded Coils	MIL-PRF-15305	A, B, C	V			X
	RF Fixed and Variable Chip Coils	MIL-PRF-83446	M	T, with K, J, H, F, G tolerance			X
	Audio, Power, and High-Power Pulse	MIL-PRF-27	R, S, V, T, U	M, T			X

DRAFT

Send email to address below for questions

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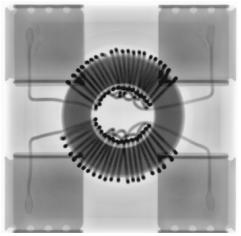
Backup

Report J23322EVAL

Part Number:	SGTPL-2516-0001E
Date Code:	2151-1

Planar Transformer



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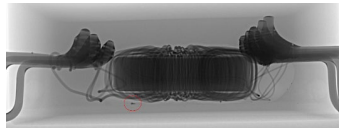
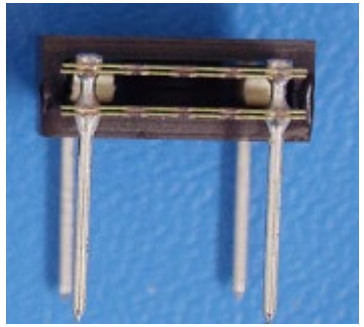


J21302 M21038



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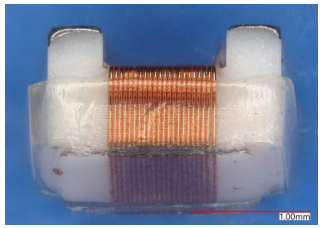

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