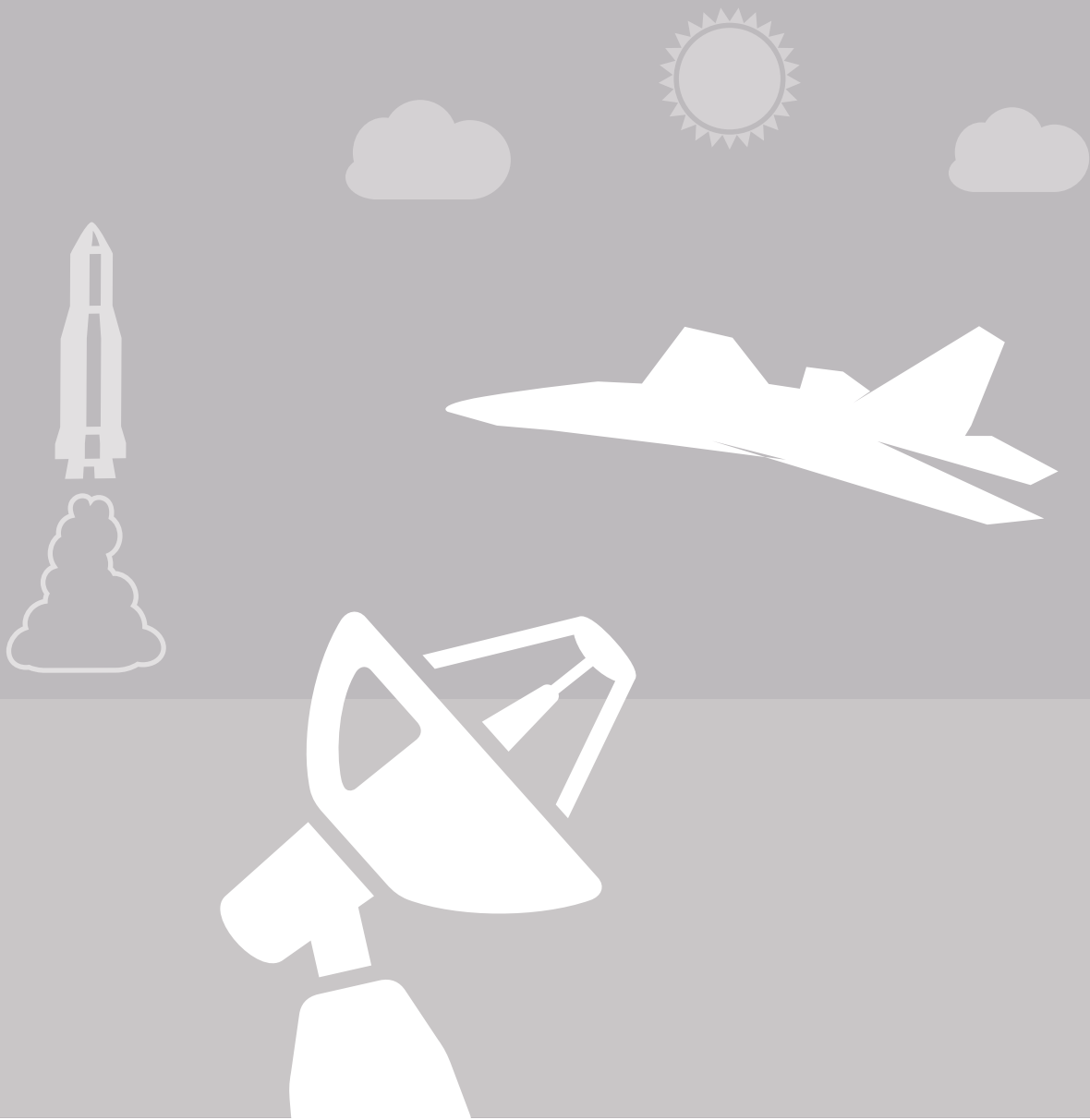

Space, Avionics & Defense

Capacitors



KEMET makes it possible.

Electronic Components
KEMET
CHARGED.®

Tantalum Defense and Aerospace Parts

QPL (Qualified Product Listing)	Style	MIL-PRF/DLA/ ESA/KEMET Specification	KEMET Series	Space Grade	Thermal Shock	Surge Current	Capacitance/DF	DC Leakage	ESR	3 Sigma Screening	Seal Test	Voltage Aging	Weibull Grading	X-Ray	Reflow Conditioning	DPA	Lead Pull Strength	Visual/ Mechanical	Surge Voltage	PDA	Temperature Stability	Solderability	F-Tech	Stimulated Breakdown Screening (SBDS)	Step Stress Surge Test (SSST)	Polymer Reliability Assessment Method	Group C	Group B	LAT
N/A	N/A	GR500	T210/T220/T240	★	●	●	●	●	●		●		●	2															
QPL 39003	CSS13/33	MIL-PRF-39003/10	T216/T256	★	●	●	●	●	●		●		●	2							●								
QPL 39003	CSR13	MIL-PRF-39003/01	T212/T215		●	○	●	●			●		●	1							●	●							
QPL 39003	CSR09	MIL-PRF-39003/02	T222/T225		●	○	●	●			●		●	1							●	●							
QPL 39003	CSR23	MIL-PRF-39003/03	T242/T245		●	○	●	●			●		●	1							●	●							
QPL 39003	CSR91	MIL-PRF-39003/04	T213		●	○	●	●				●		1															
QPL 39003	CSR33	MIL-PRF-39003/06	T252/T255		●	○	●	●			●		●	1							●	●							
QPL 39003	CSR21	MIL-PRF-39003/09	T262		●	●	●	●	●		●		●	1							●	●							
QPL 49137	CX01, CX05	MIL-PRF-49137/1/5	T323		●														●		●	●							
QPL 49137	CX02, CX12	MIL-PRF-49137/2	T363, T369		●														●		●	●							
QPL 49137	CX06	MIL-PRF-49137/6	T378		●														●		●	●							
N/A	N/A	Polymer Hermetic Seal DLA 13030 T Level	T550	★	●	●	●	●	●		●	●		2				●			●	●	●	●				●	
N/A	N/A	Polymer Hermetic Seal DLA 13030 B Level	T550		●	●	●	●	●		●	●		2				●			●	●	●	●					
N/A	N/A	Polymer Hermetic Seal 105 °C	T550		○	●	●	●	●		●	●		2				●			○	○	●	●					
N/A	N/A	Polymer Hermetic Seal 125 °C	T551		○	●	●	●	●		●	●		2				●			○	○	●	●					
N/A	N/A	Polymer Hermetic Seal Modules	M550/M551*		○	●	●	●	●		●	●		2				●			○	○	●	●					
QPL 55365	CWR11	MIL-PRF-55365/8	T492		●	○	●	●	●				●		●			●			●	●							
QPL 55365	CWR09/19/29	MIL-PRF-55365/4/11	T409/T419/T429		●	○	●	●	●				●		●			●			●	●							
QPL 55365†	CWR09/11/19/29	MIL-PRF-55365/4/8/11	T492/T409/T419/T429	★	●	●	●	●	●	●	●	●	●	1	●	●		●	●	●	●	●						●	
N/A	N/A	DLA 04051	T540		●	●	●	●	●	●	●	●		1(2P opt.)	●	○		●	○	○	●	●	○ **	○			○		
N/A	N/A	DLA 04052	T541		●	●	●	●	●	●	●	●		2	●	○		●	○	○	●	●	○ **	○			○		
N/A	N/A	MIL-PRF-XXXX	T580		●	●	●	●	●	●	●	●		1(2P opt.)	●	○		●	●	●	●	●	○ **	●			●		
N/A	N/A	MIL-PRF-XXXX	T580 ^{PT}	★	●	●	●	●	●	●	●	●		1(2P opt.)	●	●		●	●	●	●	●	○ **	●			●	●	
N/A	N/A	MIL-PRF-XXXX	T581		●	●	●	●	●	●	●	●		2	●	○		●	●	●	●	●	○ **	●			●	●	
N/A	N/A	MIL-PRF-XXXX	T580 ^{PT}	★	●	●	●	●	●	●	●	●		2	●	●		●	●	●	●	●	○ **				●	●	
N/A	N/A	KO-CAP (Polymer) COTS	T543			○	●	●	●						●			●					○ **						
ESA	N/A	ESCC3012/005	T583	★	●	●	●	●	●			●		2	●						●	●							●
N/A	N/A	DLA 04053	T496		●	●	●	●	●	○		○	○		●			●		○	●	○						○	
N/A	N/A	DLA 95158	T495		○	○	●	●	●	○		○			●			●		○	○	○						○	
N/A	N/A	DLA 07016	T493		○	●	●	●	●	○		○	●		●			●			○	○	○ **	○				○	
N/A	N/A	MnO2 COTS	T493/T497/T513/T496		●	○	●	●	●	○		○	●		●			●			●	●	○ **	○	○			○	
N/A	N/A	Ta MnO2 Stacks	TSM			◆	◇	◇	◇			◆					●	●											
N/A	N/A	KO (Polymer) Stacks	TSP			◆	◇	◇	◇			◆					●	●											
N/A	N/A	KEMET Space Grade	T493/T496/497/T510	★	●	○	●	●	●	●		○	●	○	●	●		●			●	●	○	○				●	●
N/A	N/A	HVE	T428		●	○	●	●	●				○		●			●		●									

- **C-SAM:** C-Mode Scanning Acoustic Microscopy (ceramic only)
- **DPA:** Destructive Physical Analysis
- **DWV:** Dielectric Withstanding Voltage (ceramic only)
- **ESR:** Equivalent Series Resistance (ESR) is the preferred high-frequency statement of the resistance unavoidably appearing in these capacitors. ESR is not a pure resistance, and it decreases with increasing frequency.
- **F-Tech:** KEMET's optional manufacturing process to eliminate hidden defects in the tantalum dielectric (tantalum only). For more information, please see page 7.
- **PDA:** Percent Defective Allowed
- **Polymer Reliability Assessment Method:** Sample test under accelerated conditions to demonstrate long-term device reliability (polymer only). Please contact KEMET for details.
- **SBDS:** KEMET's patented nondestructive testing technique which simulates the breakdown voltage of a capacitor without damage to its dielectric (tantalum only). For more information, please see page 7.
- **Thermal Shock:** Parts are temperature cycled.
- **Voltage Conditioning:** Parts receive a voltage conditioning at X rated voltage and X°C for a minimum and maximum amount of hours (ceramic only).

Ceramic Defense and Aerospace Parts

QPL (Qualified Product Listing)	Style	MIL-PRF/DLA/ KEMET Specification	KEMET Series	Space Qualified	CSAM	In-Process – 100% Visual Inspection	In-Process DPA	In-Process Lead Pull Strength	Thermal Shock	Voltage Conditioning	Hot IR (+125°C)	PDA	Visual/Mechanical	X-Ray	Solderability (each lot)	Group B (each lot)	Periodic Group B	Group C Lot Test per MIL-PRF-55681	Periodic Group C	Data Pack (standard w/ order)	Pb (lead) Content C of C	Humidity Steady State Low Voltage (LVH)	Final DPA	X-Ray Fluorescence (XRF) Analysis	Additional Thermal Shock Cycles (applies to Group A only)	100% Final Visual Inspection	Hot IR @ +125°C (X7R, C0G), @ +85°C (X5R)	Flex Termination
QPL M123/1, /2, /3	CKS05, CKS06, CKS07	MIL-PRF-123/1, /2, /3 * T Level	C052Z, C062Z, C512Z	★	●	●	●	●	●	●	●	●	●	●		●			●	●	○		●			○	●	
QPL M123/10, /11, /12, /13, /21, /22, /23	CKS51, CKS52, CKS53, CKS54	MIL-PRF-123/10, /11, /12, /13 * T Level	C0805Z, C1210Z, C1808Z, C2225Z	★	●	●	●		●	●	●	●	●			●			●	●	○		●	○		○	●	
QPL M123/21, /22, /23	CKS55, CKS56, CKS57	MIL-PRF-123/21, /22, /23 * T Level	C1206Z, C1812Z, C1825Z	★	●	●	●		●	●	●	●	●			●			●	●	○		●	○		○	●	
M32535/02/03/04/05/06/07/08	N/A	MIL-PRF-32535 M and T Level	K Spec - T Failure Rate	★	●	●	●		●	●	●	●	●			●			●	●	○		●	○		○	●	○
M32535/02/03/04/05/06/07/08	N/A	MIL-PRF-32535 M Level	K Spec - M Failure Rate		●	●	●		●	●	●	●	●			●			●	○	○		●	○		○	●	○
N/A	N/A	GR900	B Spec Through-Hole	★	○	●	●	●	●	●	●	●	●	●		○			●	●	○	○	●			○	●	
N/A	N/A	GR900	A Spec SMD	★	○	●	●		●	●	●	●	●			○			●	●	○	○	●	○		○	●	
N/A	N/A	MIL-PRF-123, In-Process, Group A Tested	Q Spec Through-Hole	★	●	●	●	●	●	●	●	●	●	●		○				●	○	○	●			○		
N/A	N/A	MIL-PRF-123, In-Process, Group A Tested	Q Spec SMD	★	●	●	●		●	●	●	●	●			○				●	○	○	●	○		○		
QPL 49470/1	PS01	MIL-PRF-49470/1 T Level	L1XN, L1RN, L1QN	★	●	●	●		●	●	●	●	●		●	●	●			●	○		●	○		○		
QPL 49470/2	PS02	MIL-PRF-49470/1 B Level	L1XN, L1RN, L1QN			●			●	●	●	●	●		●		●			●	○			○		○		
QPL 49470/2	PS02	MIL-PRF-49470/2 B Level	L1XN, L1RN, L1QN			●			●	●	●	●	●		●		●			●	○			○		○		
QPL 55681/1	CDR01, 02, 03, 04	MIL-PRF-55681/1 M Level	C0805P, C1805P, C1808P, C1812P				●			●	●	●	●		●				●		○	○	○	○	○	○		
QPL 55681/2	CDR05	MIL-PRF-55681/2 M Level	C1825P				●			●	●	●	●		●				●		○	○	○	○	○	○		
QPL 55681/3	CDR06	MIL-PRF-55681/3 M Level	C2225P				●			●	●	●	●		●				●		○	○	○	○	○	○		
QPL 55681/7, 8, 9, 10, 11	CDR31, 32, 33, 34, 35	MIL-PRF-55681/7, 8, 9, 10, 11 M Level	C0805N, C1206N, C1210N, C1812N, C1825N				●			●	●	●	●		●				●		○	○	○	○	○	○		
QPL 20/27, 28, 29, 30, 31	CCR/75, 76, 77, 78, 79	MIL-PRF-20/27, 28, 29, 30, 31	C114G, C124G, C192G, C202G, C222G					●	●	●	●	●	●	■	●		●				○	○	○		○	○		
QPL 20/27, 28, 29, 30, 32	CC/75, 76, 77, 78, 80	MIL-PRF-20/27, 28, 29, 30, 32	C114G, C124G, C192G, C202G, C222G (no FR)					●			●	●	●		●													
QPL 20/35	CCR05	MIL-PRF-20/35	C052G, C056G					●	●	●	●	●	●	■	●		●				○	○	○		○	○		
QPL 20/36	CC05	MIL-PRF-20/36	C052G, C056G (no FR)					●			●	●	●		●													
QPL 20/36	CCR06	MIL-PRF-20/36	C062G, C065G, C066G					●	●	●	●	●	●	■	●		●				○	○	○		○	○		
QPL 20/36	CC06	MIL-PRF-20/36	C062G, C065G, C066G (no FR)					●			●	●	●		●													
QPL 20/37, 28	CCR/07, 08	MIL-PRF-20/37, 38	C512G, C522G					●	●	●	●	●	●	■	●		●				○	○	○		○	○		
QPL 20/37, 38	CC/07, 08	MIL-PRF-20/37, 38	C512G, C522G (no FR)					●			●		●		●													
QPL 39014/1	CKR05	MIL-PRF-39014/1	C052T, C056T					●	●	●	●	●	●	■	●		●				○	○	○		○	○		
QPL 39014/2	CKR06	MIL-PRF-39014/2	C062T, C066T					●	●	●	●	●	●	■	●		●				○	○	○		○	○		
QPL 39014/5	CKR11, 12, 14, 15, 16	MIL-PRF-39014/5	C114T, C124T, C192T, C202T, C222T					●	●	●	●	●	●	■	●		●				○	○	○		○	○		
N/A	N/A	DLA 03028, 05006, 05007	D Spec 0603, 0805, 0402, 1206			●	○			●	●	●	●		●			○	○									
N/A	N/A	DLA 91019	E Spec 2220			●	○			●	●	●	●		●			○	○									
N/A	N/A	N/A	T Spec 0402, 0603, 0805, 1206 ***							●		●			○					○	○	○				○	○	
N/A	N/A	N/A	T Spec 1210, 1812, 1825, 2220, 2225 ***							●		●			○					○	○	○				○	○	
QPL 11015/18, /19, /20	CK05, CK06	MIL-PRF-11015/18, /19, /20	C052K, C062K, C114K, C124K, C192K, C202K, C222K					●					●		●													

Note: All series are tested for capacitance, dielectric withstanding voltage, insulation resistance at room temperature, and dissipation factor.

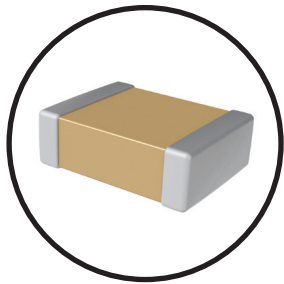
KEY

- Standard
- Optional
- ◐ JAN Branding will be affected
- S Failure Rate
- ★ Space Qualified

Optional tests performed on military specification parts will affect JAN branding.
 * Non-stocking Item *** MIL-PRF-55681 Group A Tested.
 BME Dielectric, PME also available on select part numbers.

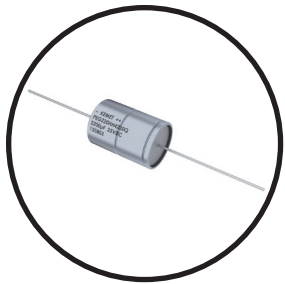
- * Non-stocking Item
- *** MIL-PRF-55681 Group A Tested.
BME Dielectric, PME also available
on select part numbers.

High Reliability Ceramic Capacitors



COTS MLCCS
DLA 05006/7, 03028/9 & 91019
Benefit from advances in commercial grade with tests and screening designed to identify suitable parts for High Reliability Applications

High Reliability Tantalum Capacitors



POLYMER HERMETIC SEAL T550/1
DLA Drawing 13030, T-Level Reliability
High capacitance, low ESR, lightweight alternative to wet tantalum axial capacitors
Based on polymer cathode technology

Ceramic COTS Test Levels

Test Level A	Test Level B	Test Level C
Voltage Conditioning DWV IR @ 25°C CAP DF	Voltage Conditioning DWV IR @ 25°C CAP DF	Voltage Conditioning DWV IR @ 25°C CAP DF
PDA 8%	PDA 8%	PDA 8%
C of C	DPA C of C	DPA 85/85 C of C

F-Tech Advantage

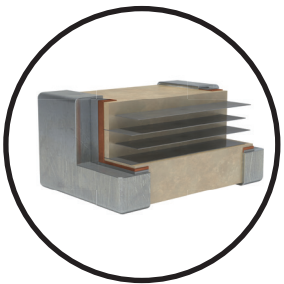
KEMET’s optional F-Tech eliminates hidden defects in the tantalum dielectric. This unique manufacturing process minimizes oxygen and carbon content in the anode, provides a stronger mechanical connection between anode and lead wire and significantly enhances capacitor robustness.

F-Tech is available on select KEMET tantalum capacitor families and can be combined with SBDS.

Simulated Breakdown Screening (SBDS)

Breakdown voltage (BDV) is the ultimate test of a capacitor’s robustness but is a destructive test. To simulate the results of a breakdown screening, KEMET developed a patented Simulated Breakdown Screening (SBDS). This nondestructive testing technique simulates the BDV of a capacitor without damage to its dielectric. This 100% population screening identifies hidden defects in the dielectric, providing the highest level of dielectric testing.

SBDS is available on select KEMET tantalum capacitor families and can be combined with F-Tech.

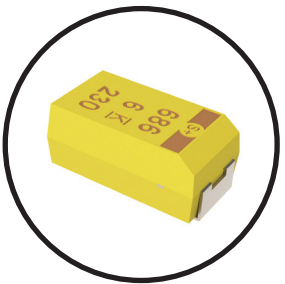
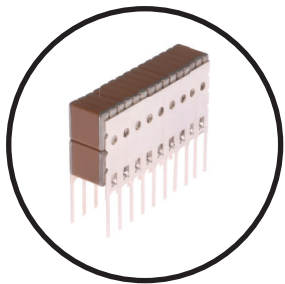


SPACE GRADE MLCCS
MIL-PRF-123
Intensive screening and testing protocols with numerous termination options

GR-900
KEMET’s non-QPL high-reliability capacitors for aerospace applications

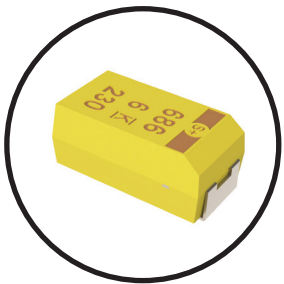
MIL-PRF-32535
Industry’s first BME MLCC qualified for defense and aerospace applications

KPS MIL STACKED CAPACITORS
MIL-PRF-49470, T-Level Reliability available
Higher capacitance in the same footprint
Robust termination system



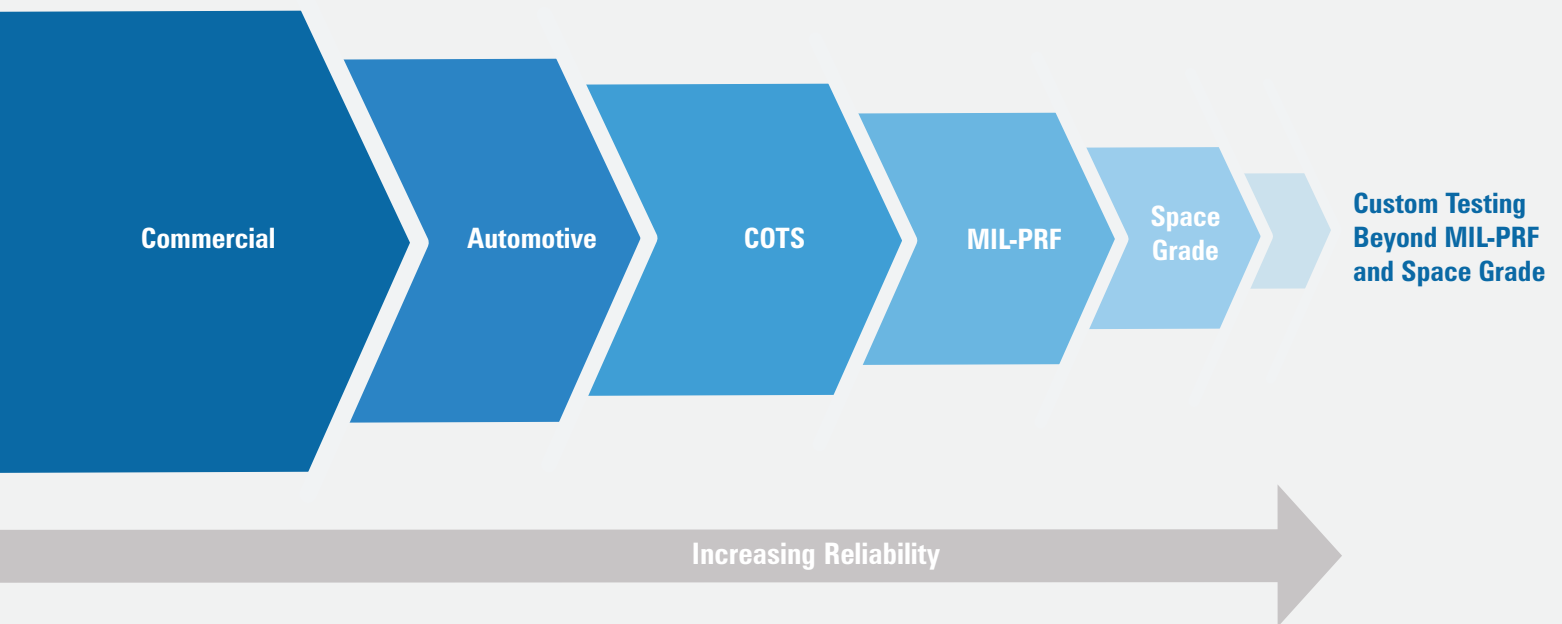
T540 & T541 POLYMER COTS
DLA Drawing 04051/2
Only polymer electrolytic capacitors available today with Reliability Assessment testing criteria

MIL-PRF-55365 MnO₂
MIL & Space Grade
Numerous custom testing/screening options and termination finishes available



Product Grades

KEMET is the undisputed global leader in delivering high-performance ceramic and tantalum capacitors. Our Defense and Space Grade products comply with the most stringent reliability requirements in the industry.



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