Electronic Components

KEMET

CHARGED.®

Detailed Specification ESCC 3012/005 Revision

(ESA contract 4000119701/17/NL/LvH/zk)

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1 – Handling (HBM, CDM and MM, moisture....)

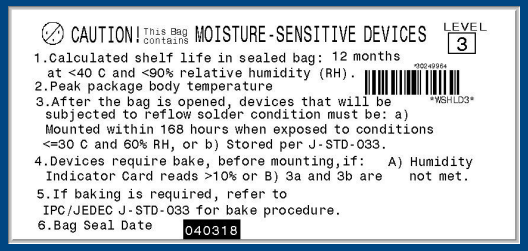
ACTUAL/ QUESTIONS

- Parts not critical regardind ESD. Confirm if is ESD sensitivity is included at primary packaging or packaging Label as required in ESCC specs;
- No picture provided of typical ESD on parts delivered;
- No “Handling precaution paragraph”, but moisture sensitivity of Ta cap treated in Note 3 of ESCC 3012/005 – page 8

3. These components are classified as Moisture Sensitivity Level 3 in accordance with J-STD-020. Components shall be delivered in moisture barrier bags with a desiccant and moisture indicator card. Components should be stored still contained within the moisture barrier bags in a non-condensating atmospheric environment of $T_{amb} \leq +40°C$ and relative humidity RH ≤ 90%.
These components have a floor life of 168 hours at $T_{amb} \leq +30°C$ and RH ≤ 60%.

PROPOSAL/ RESPONSE

- Information about handling is on Catalog Datasheet for T583 series page 7
- Primary packaging have ESD sensitivity (tape, waffles or bulk packaging).
- Label:



- **Storage**

All KO-Cap series are shipped in moisture barrier bags (MBBs) with desiccant and humidity indicator card (HIC). These parts are classified as MSL3 (Moisture Sensitivity Level 3) per IPC/JEDEC J-STD-020 and packaged per IPC/JEDEC J-STD-033 MSL3 specifies a floor time of 168H at 30°C maximum temperature and 60% relative humidity. Unused capacitors should be sealed in a MBB with fresh desiccant.

Calculated shelf life in sealed bag:
- 12 months from bag seal date in a storage environment of < 40°C and humidity < 90% RH
- 24 months from bag seal date in a storage environment of < 30°C and humidity < 70% RH

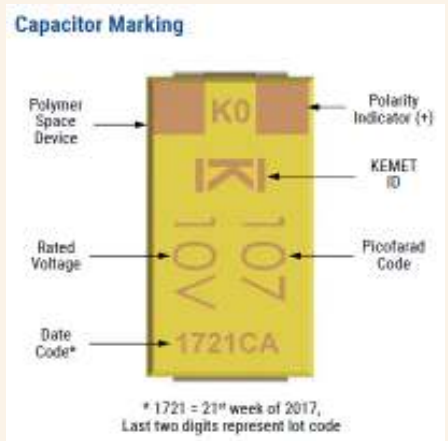
If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure.

2 – Picture

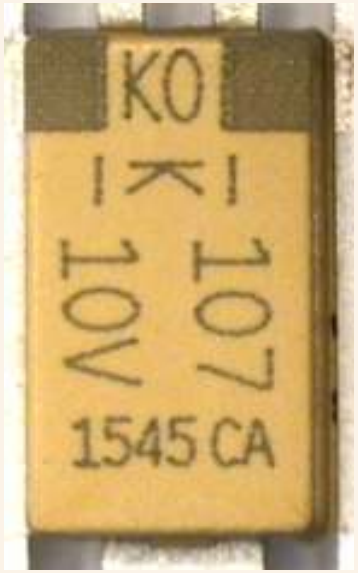
ACTUAL/ QUESTIONS

- No Real Picture of the part marking included

PROPOSAL/ RESPONSE



Date Code*	
1st and 2nd digit = Year	15 = 2015 16 = 2016 17 = 2017 18 = 2018
3rd and 4th digit = Week of the Year	01 = 1st week of the year to 52 = 52nd week of the year
Last two digits represent lot code.	



3 – Counterfeit detection

ACTUAL/ QUESTIONS

- Do we have information at packaging, marking or any other level to inscrease confidence parts are coming from the right source and is not a counterfeit?

PROPOSAL/ RESPONSE

- Is part of our Quality Manual & Documents
  - Procedures to prevent the use of conterfeit product (raw material) and the delivery of conterfeit product to a customer include:
    - Raw Material Perspective: Finished product is 100% tested to ensure conformance to specifications.
    - Semi-Finished Product: Product dispositioned as scarp is positively controlled
    - Finished Product Inventory: apllication of an obsolescence program
  - Product returned to KEMET that is to be placed back into inventory shall be validated as authentic KEMET product. If product is identified as counterfeit it must be quarantined and report to management as appropriate.

4 – Radiation Susceptibility

ACTUAL/ QUESTIONS

- Could you provide radiation reports or generic data that could be considered interesting to be included at ESCC detailed specification level, even related to generic information and/or technology?

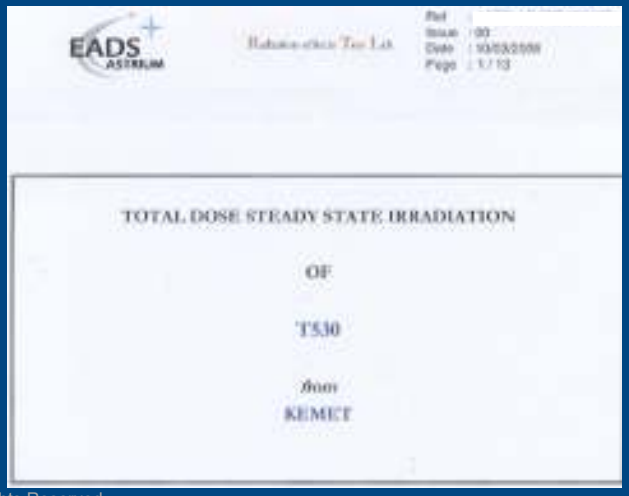
PROPOSAL/ RESPONSE

- Published Paper:

Radiation Characterisation for New Tantalum Polymer Capacitors

P. Martin, I. Lopez-Calle, E. Muñoz, M. Domínguez, M. Morales, D. Núñez, D. Lacombe, Y. Morilla, C. Mota, J. Pedroso.

- Confidential Astrium Report:



5 – Package, materials and soldering recomendations

ACTUAL/ QUESTIONS

- Recomendations in terms of assembly, soldering thechnique, soldering profile, etc recommended;
- Agreement to reproduce partially or mention those thechnical notes, assembly recomendations in the ESCC detailed spec?
- RoHs & Reach compliant? Agrrement to include note on ESCC detailed Spec?

PROPOSAL/ RESPONSE

- Recomendations for soldering Process and soldering Profile are avalilable on Catalog Datasheet for T583 series page 7
- We agree.
- Compliance letters are available at: http://www.kemet.com/Green-Product-Roadmap
- For T583 series acc ESCC3012/005 we are not compliant wit RoHs and Reach due to the termination finish with Pb.
  - What is expected from ESA?

6 – Reliability Data

ACTUAL/ QUESTIONS

- Reliability data in terms of Activation Energy, MTBF figures tha could be interesting to be included in ESCC detailed Spec?

PROPOSAL/ RESPONSE

- For Leakge is defined:
  - KO-CAP capacitors have an average failure rate of 0.5 %/1,000 hours at category voltage, U_C, and category temperature, T_C. These capacitors are qualified using industry test standards at U_C and T_C.

    (Ex catalog of T598 page 4)
  - For capacitance and ESR, data exist, but is still incomplete and tehrefore not yet available to customers .
  - To be discussed.....

6 – Reliability Data

Reliability

KO-CAP capacitors have an average failure rate of 0.5 %/1,000 hours at category voltage, U_C, and category temperature, T_C. These capacitors are qualified using industry test standards at U_C and T_C. The minimum test time (1,000 hours or 2,000 hours) is dependent on the product.

The actual life expectancy of KO-CAP capacitors increases when application voltage, U_A, and application temperature, T_A, are lower than U_C and T_C. As a general guideline, when $U_A < 0.9 * U_C$ and $T_A < 85°C$, the life expectancy will typically exceed the useful lifetime of most hardware (> 10 years).

The lifetime of a KO-CAP capacitor at a specific application voltage and temperature can be modeled using the equations below. A failure is defined as passing enough current to blow a 1-amp fuse. The calculation is an estimation based on empirical results and is not a guarantee.

$$VAF = \left(\frac{U_C}{U_A}\right)^n$$

where:
VAF = acceleration factor due to voltage, unitless
U_C = category voltage, volt
U_A = application voltage, volt
n = exponent, 16

$$TAF = e^{\left[\frac{E_a}{k}\left(\frac{1}{273+T_A} - \frac{1}{273+T_C}\right)\right]}$$

where:
TAF = acceleration factor due to temperature, unitless
E_a = activation energy, 1.4 eV
k = Boltzmann's constant, 8.617E-5 eV/K
T_A = application temperature, °C
T_C = category temperature, °C

$$AF = VAF * TAF$$

where:
AF = acceleration factor, unitless
TAF = accerlation factor due to temperature, unitless
VAF = acceleration factor due to voltage, unitless

$$Life_{U_A,T_A} = Life_{U_C,T_C} * AF$$

where:
$Life_{UA, TA}$ = guaranteed life application voltage and temperature, years
$Life_{UC, TC}$ = guaranteed life category voltage and temperature, years
AF = acceleration factor, unitless

Reliability Table 1 – Common Temperature Range Classifications

85°C (T_A)/ 85°C (T_C)	Rated voltage (U_R)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0
	Category voltage (U_C)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0
105°C (T_A)/ 105°C (T_C)	Rated voltage (U_R)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0
	Category voltage (U_C)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0
105°C (T_A)/ 125°C (T_C)	Rated voltage (U_R)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0
	Category voltage (U_C)	1.7	2.7	4.2	5.4	6.7	8.4	10.7	13.4	16.8	23.5	33.5	42.2	50.3
105°C (T_A)/ 150°C (T_C)	Rated voltage (U_R)	2.5	4.0	6.3	8.0	10.0	12.5	16.0	20.0	25.0	35.0	50.0	63.0	75.0
	Category voltage (U_C)	1.7	2.7	4.2	5.4	6.7	8.4	10.7	13.4	16.8	23.5	33.5	42.2	50.3

Terms:
Category voltage, U_C: Maximum recommended peak DC operating voltage for continuous operation at the category temperature, T_C
Rated voltage, U_R: Maximum recommended peak DC operating voltage for continuous operation up to the rated temperature, T_R
Category temperature, T_C: Maximum recommended operating temperature. Voltage derating may be required at T_C
Rated temperature, T_R: Maximum recommended operating temperature without voltage derating. T_R is equal to or lower than T_C

7 – Derating

ACTUAL/ QUESTIONS

- Do we agree with derating rules applied in ESCC-Q-ST-30-11?

PROPOSAL/ RESPONSE

- We do agree with the derating rules applied in ESCC-Q-ST-30-11.
- We need to include a clarification on the next update to the derating provided page 9 of ESCC 3012/005, since it refers only to temperature.