CTP21

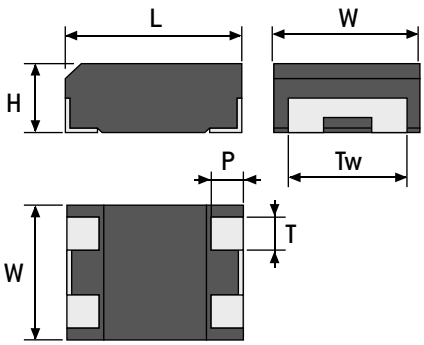
Polymer tantalum capacitors
Very low ESR
SMD
Polarized

ELECTRICAL AND CLIMATIC CHARACTERISTICS

	CTP21
Operating temperature	–55°C +105°C
Damp heat	56 days
Capacitance range	47µF ⇨ 560µF
Tolerance	±10% - ±20%
Voltage range	16V ⇨ 75V
Max. capacitance change –55°C	–25%
Max. capacitance change +85°C	+15%
Max. capacitance change +105°C	+25%
Maximum DF at +20°C	see table
Maximum DF at –55°C	see table
Maximum DF at +85°C	1,2 x lim. 20°C
Maximum DF at +105°C	1,2 x lim. 20°C
Max. leakage current at +20°C	see table
Max. leakage current at +85°C	10 x lim. 20°C
Max. leakage current at +105°C	10 x lim. 20°C / U_C
Max. ESR at 100kHz +20°C	see table

DIMENSIONS (mm)

Case code	Dimensions					
	$L^{-0,1}_{+0,5}$	$W^{-0,1}_{+0,5}$	$H^{-0,1}_{+0,5}$	$T_W{}^{-0,1}_{+0,5}$	P	T
D	11	12,5	5,5	10,5	1,5	3



MARKING, PACKAGING, CONSTRUCTION:
see general characteristics

HOW TO ORDER

Commercial description	Model	Case	Capacitance in µF	Tolerance in %	DC Voltage	Termination	Packaging
	CTP21	**D**	**150µF**	**20%**	**40V**	**T**	**R**
EXXELIA PN	**Model code**	**Case**	**Capacitance code**	**Tolerance code**	**DC Voltage code**	**Termination**	**Packaging**
	CTP21	**D**	**157**	**M**	**040**	**T**	**R**
			Expressed in pF with 3 digits: 2 digits for the value and the third for the multiplier	**K** = 10% **M** = 20%	Expressed in volt with 3 digits	**Commercial description / EXXELIA PN** **T** = SnPb (non RoHS) **F** = Sn100% (RoHS)	**-** = Bulk **R** = Tape & Reel

CTP21

STANDARD RATINGS - ELECTRICAL CHARACTERISTICS

Capacitance 100Hz +20°C (µF)	Case (code)	Type	Max. I leak			Max. DF 100Hz +20°C (%)	Max. DF 100Hz −55°C (%)	Max. DF 100Hz +85°C (%)	Max. DF 100Hz +105°C (%)	Max. ESR 100kHz +20°C (mΩ)	Irms Max. 100kHz +20°C (A)
			+20°C (µA)	+85°C (µA)	+105°C (µA)						
Rated voltage (+85°C) 16 V - Category voltage (+105°C) 12 V											
390	D	CTP21	62,4	624	624	16	16	19,2	19,2	30	3,4
470	D	CTP21	75,2	752	752	16	16	19,2	19,2	30	3,5
560	D	CTP21	89,6	896	896	16	16	19,2	19,2	30	3,7
Rated voltage (+85°C) 25 V - Category voltage (+105°C) 20 V											
180	D	CTP21	45	450	450	12	12	14,4	14,4	40	2,5
270	D	CTP21	67,5	675	675	12	12	14,4	14,4	35	2,7
330	D	CTP21	82,5	825	825	12	12	14,4	14,4	35	2,9
Rated voltage (+85°C) 40 V - Category voltage (+105°C) 30 V											
68	D	CTP21	27,2	272	272	10	10	12	12	40	2,4
82	D	CTP21	32,8	328	328	10	10	12	12	40	2,5
100	D	CTP21	40	400	400	10	10	12	12	40	2,6
120	D	CTP21	48	480	480	10	10	12	12	35	2,7
150	D	CTP21	60,0	600	600	10	10	12	12	35	2,8
Rated voltage (+85°C) 50 V - Category voltage (+105°C) 40 V											
68	D	CTP21	34,0	340	340	10	10	12	12	50	2,3
Rated voltage (+85°C) 63 V - Category voltage (+105°C) 50 V											
33	D	CTP21	29,6	296	296	9	9	10	10	60	1,7
47	D	CTP21	29,6	296	296	9	9	10	10	60	1,9
56	D	CTP21	35,2	352	352	9	9	10	10	55	2,1
Rated voltage (+85°C) 75 V - Category voltage (+105°C) 60 V											
33	D	CTP21	24,7	247	247	9	9	10	10	60	1,8
47	D	CTP21	35,2	352	352	9	9	10	10	60	1,9

STANDARD TERMINATIONS:

T tinning electrolytic SnPb (non RoHS)
F tinning electrolytic 100% Sn (RoHS)

PACKAGING:

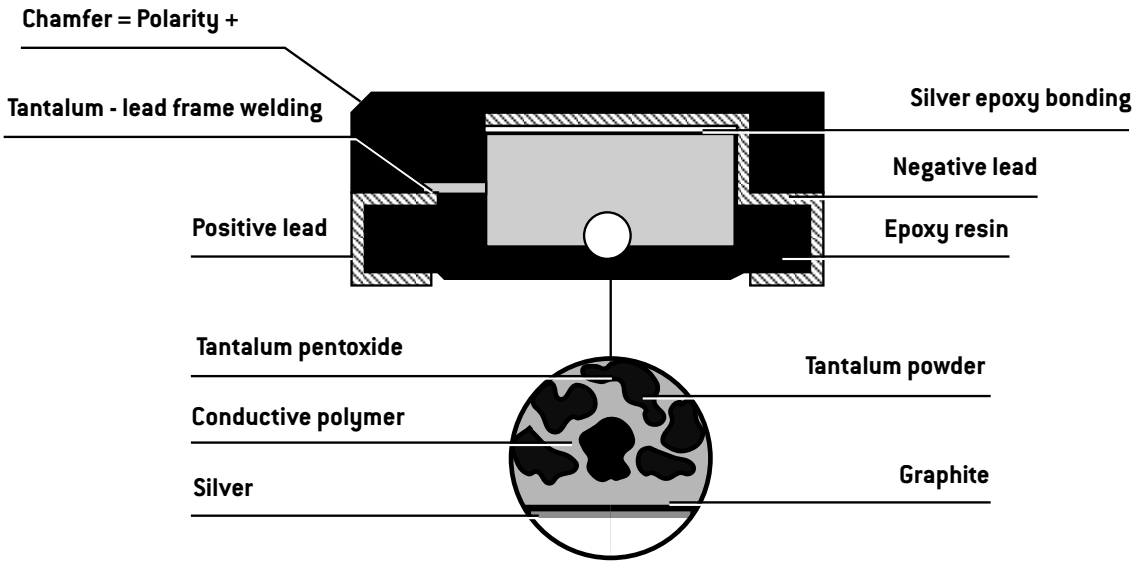
Standard: Bulk
Optional: Tape & Reel
When ordering add the suffix «R» just after the termination code.

General Information

OVERVIEW

The construction of solid tantalum polymer capacitors is similar to the one of solid tantalum MnO_2 capacitors: the anode is made of tantalum and its oxide constitutes the dielectric, the cathode is made of a conductive polymer to replace MnO_2.

CONSTRUCTION

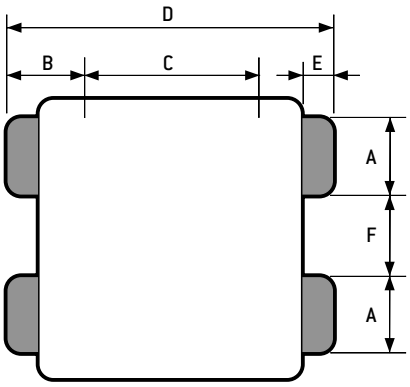


Benefits of conductive polymer used as a cathode are a better conductivity and a higher retention frequency which enable to reach a very low ESR.

The second advantage of conductive polymer as compare to manganese oxide is a self-healing mechanism which is less exothermic avoiding ignition failures.

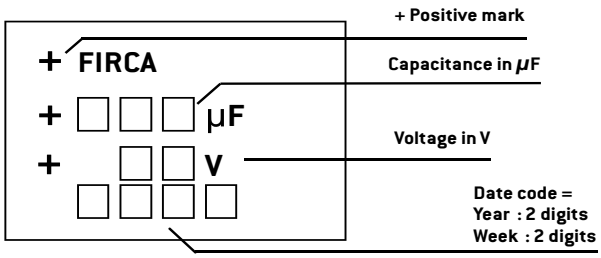
RECOMMENDED MOUNTING PAD GEOMETRY

Vapor phase or infrared soldering (in mm)



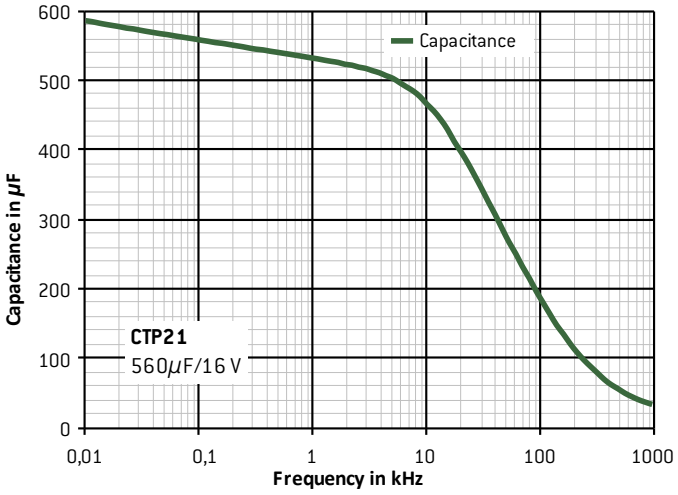
Case code	Dimensions (mm)					
	A min.	B nom.	C nom.	D nom.	E nom.	F nom.
D	3,6	3,3	7,6	14,2	1,35	3,8

MARKING

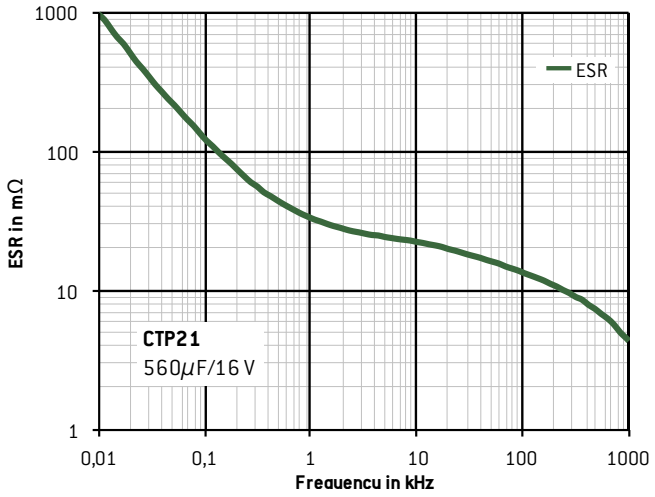


General Information

CAPACITANCE CHANGE VS FREQUENCY (TYPICAL)



ESR CHANGE VS FREQUENCY (TYPICAL)



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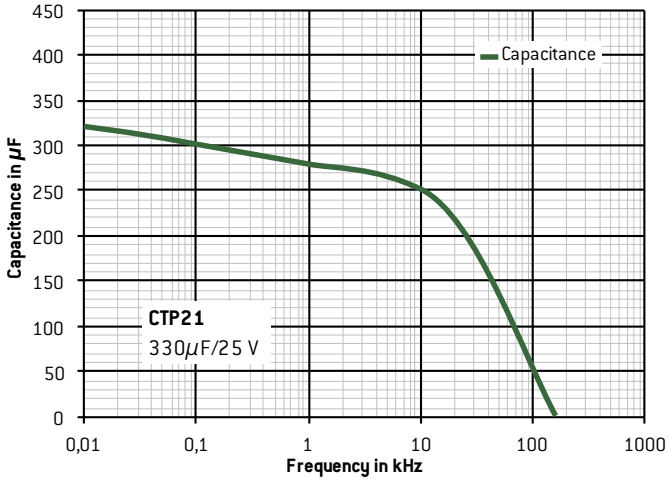

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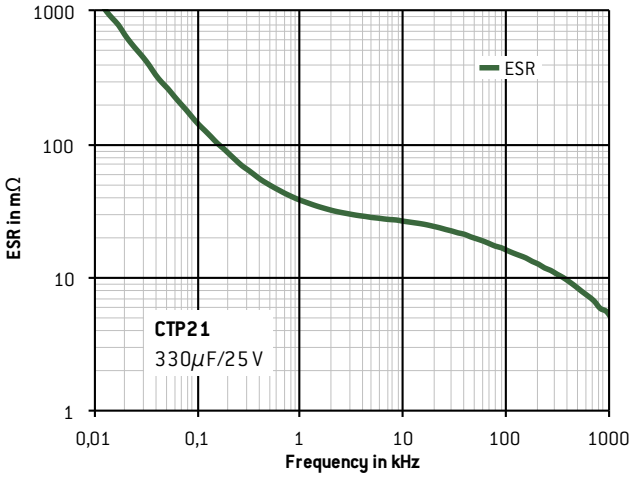

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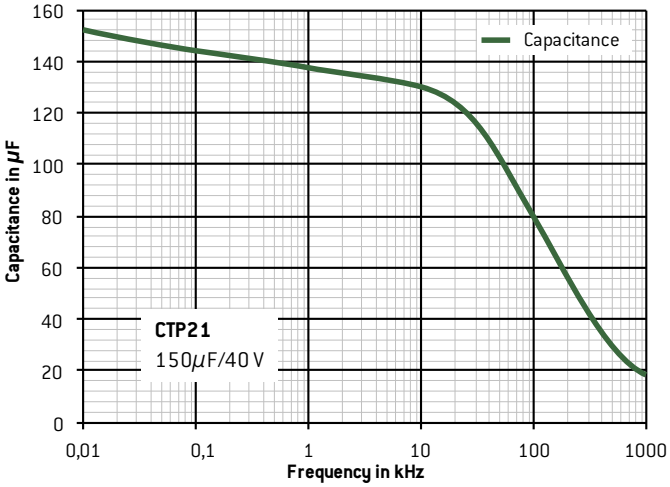
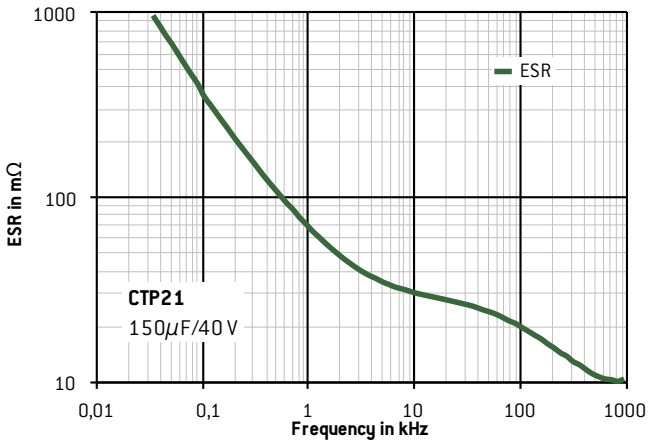
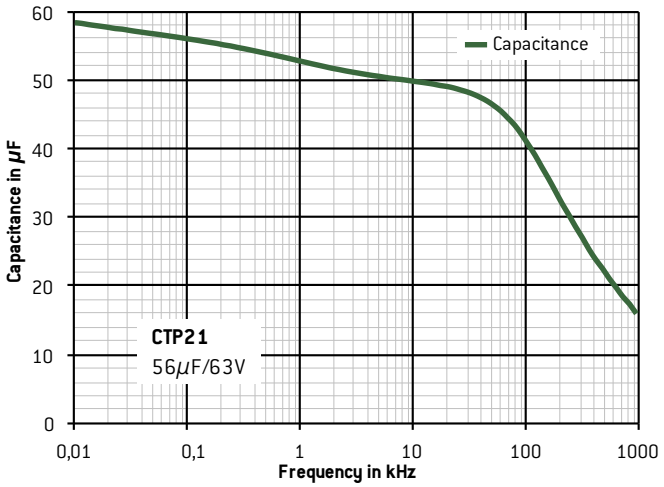


ESR CHANGE VS FREQUENCY (TYPICAL)

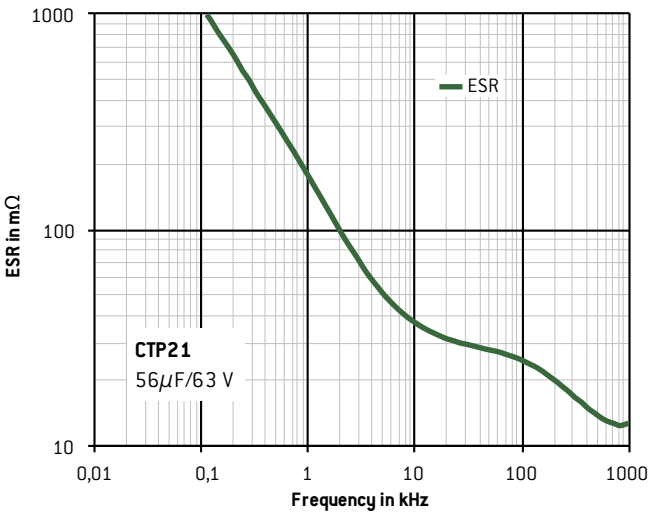


General Information

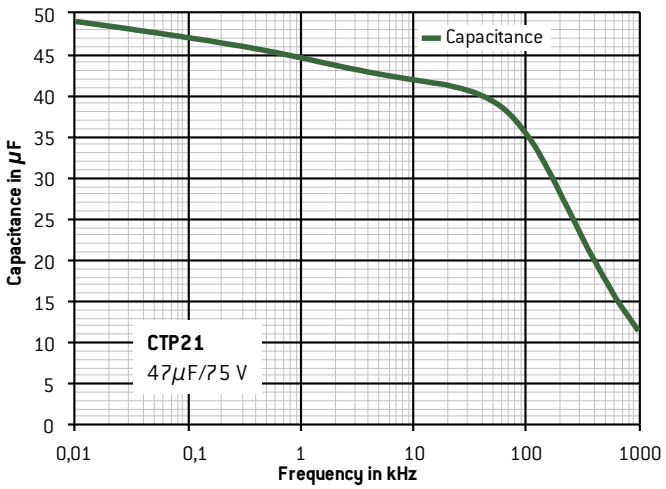
CAPACITANCE CHANGE VS FREQUENCY (TYPICAL)



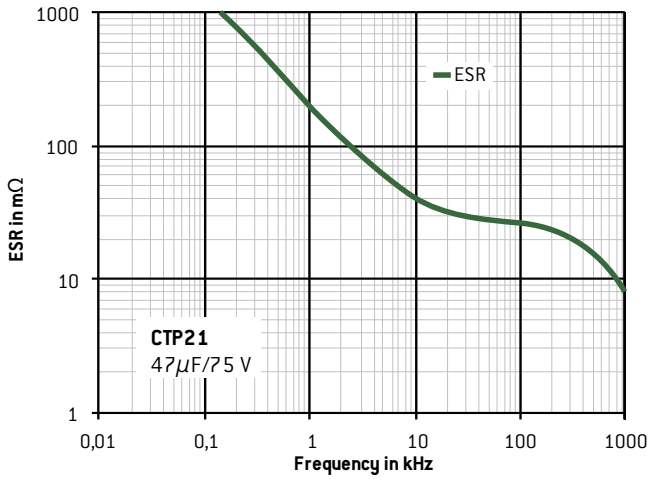
ESR CHANGE VS FREQUENCY (TYPICAL)



CAPACITANCE CHANGE VS FREQUENCY (TYPICAL)

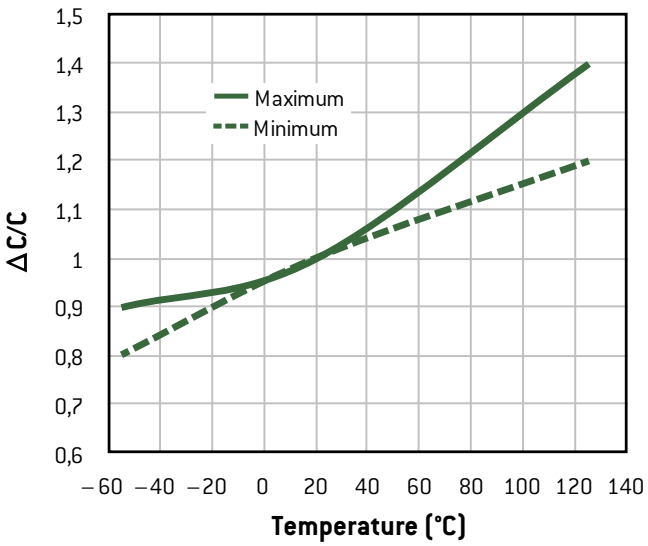


ESR CHANGE VS FREQUENCY (TYPICAL)

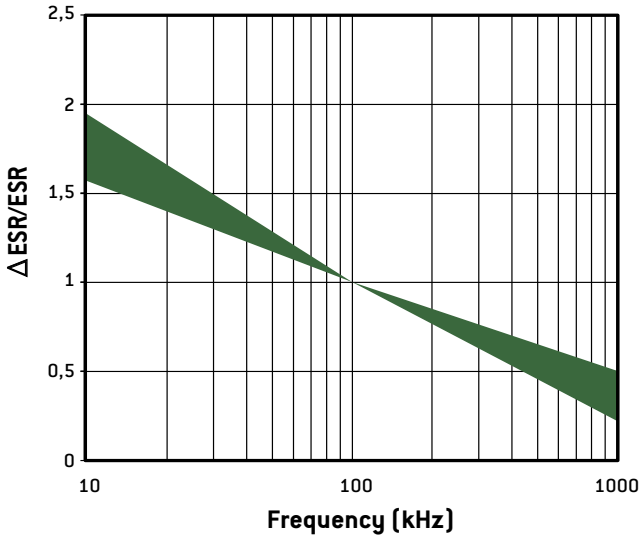


General Information

CAPACITANCE CHANGE VS TEMPERATURE



ESR CHANGE VS FREQUENCY



General information

Tantalum capacitors are, with ceramic, aluminum and film capacitors, one of the most used family.

The manufacturing technology and the constant improvements in tantalum powders allow it to be the capacitor with the highest CV (product capacitance x voltage) per volume, very long life and high reliability.

It has also the following advantages:

- Wide range of capacitance (less than 1µF to more than 10 000µF)
- Wide operating temperature range (–55°C to +200°C)
- Electrical characteristics stable with temperature
- Low leakage current
- Very low ESR for some types
- Stability after long periods of storage , without any reforming

All these characteristics allow tantalum capacitors to be commonly used either in large volume markets like mobile phones or computers, or in specific High-Rel applications such as space, aerospace and military.

Its main uses are found in the following functions:

- Filtering
- Bypass
- Coupling
- RC time constant
- Energy storage

Tantalum capacitors can be divided into two main families and several subfamilies:

Solid tantalum capacitors:

- Solid MnO_2
  - Metal cases
  - Molded cases
  - SMD
- Solid Polymer
  - SMD

Wet tantalum capacitors:

- Silver cases
- Tantalum cases

HOW TO USE THE SELECTION GUIDE

1 - The **Technical Selection Guide** can be used to select a product according to the main technical requirements.

2 - The **Classification according to specification** makes the link between all major standard specifications and the products.

3 - The **Selection Guide** by family has the same classification as in the catalogue. You will find for each type the main features, the approvals and the page number of the technical data sheet.

MANUFACTURING

ANODE AND INSULATOR

Tantalum capacitors are the capacitors which have the highest ratio of capacitance per volume. This is mainly due to the high dielectric coefficient of its insulator and to its large cross-section.

The basic raw material is a high purity (greater than 99,99%) tantalum powder with a very fine granulation, compressed to form a cylinder or a parallelipiped constituting the anode of the capacitor (positive plate).

The pellet is then sintered at high temperature (1200°C to 2200°C), under high vacuum (10^{-6} Torr), firstly to purify the powder and secondly to obtain a strong mechanical structure by a welding of the particles.

The insulating part is obtained by anodization to a depth of the tantalum surface which forms a tantalum pentoxide film (Ta_2O_5) with a thickness of about 16 angstroms per anodization volt. The dielectric coefficient is between 21 and 27 depending upon the anodization conditions.

WET ELECTROLYTE: CATHODE AND ENCAPSULATION

In this case, the cathode is formed by a sulphuric acid solution. The anodized tantalum pellet is impregnated with this solution and then placed in a silver or tantalum case, into which some equivalent gelled solution have been previously deposited.

The case is then crimped on the internal PTFE gasket to make the sealing. The final steps are welding (CT79), soldering (CT9) or elastomer seal (CT4) depending on the capacitors.

SOLID ELECTROLYTE: CATHODE AND ENCAPSULATION

In this case, the cathode is formed either by managanous dioxide which is a grey semi conductor or by polymer solution.

Solid MnO_2 cathode is obtained by dipping the pellets into a manganous nitrate water solution which impregnates the internal structure; this solution is then decomposed in a high temperature oven to obtain manganous dioxide. This operation is repeated several times. The nature and quality of this semiconductor are important to some of the electrical parameters (especially the serial resistance).

To finish the negative plate, a graphite coating and then a silver coating are deposited on the outside surface of the manganous dioxide or conducting polymer.

The positive nickel lead is welded on the tantalum wire and the negative lead is either soldered for the products with axial leads or glued with a silver epoxy for the SMD range.

BURN-IN - SORTING - INSPECTION

All the products are submitted to a final burn-in, with differing severities depending upon the characteristics of each type (temperature, voltage, duration).

Then follows the sorting, marking and inspection operations. It can be noted that the procedures for these operations are the same for approved and non approved parts (except the periodical tests).

General information

TYPE IDENTIFICATION - ORDERING INFORMATION

THE COMPLETE IDENTIFICATION OF A PRODUCT IS MADE OF

- The type (or model)
- The case size
- The rated capacitance
- The tolerance
- The rated voltage
- If applicable the CECC specification number

THE TYPE

It can be expressed with the commercial description (CTC21E C 33μF 10% 40V) or the **EXXELIA** part number (TS22EC336K040F).
When applicable the CECC specification number should be indicated.

THE CASE SIZE

It is indicated on the technical data sheets in front of each capacitance-voltage value and is generally identified by a letter code . It is important to give this information because there can be, for the same type, a standard range and an extended range in which the same value will be available in two different sizes.

THE RATED CAPACITANCE

It can be expressed:

- Directly in μF (eg: 47μF)
- Coded according to MIL specification, with:
  - 2 digits number for the value
  - A multiplying factor to obtain the capacitance in pF (power of 10)

Eg: 567 = 56.10^7 pF = 560μF

THE TOLERANCE

It can be expressed directly in % or identified by a code letter:

M = ±20%
K = ±10%
J = ±5%

N.B.: the standard tolerance for tantalum capacitors is 20%; if no tolerance is specified, it would be considered as 20%.

A 20% tolerance means in fact –20% to +20%.

THE RATED VOLTAGE

It is expressed directly in volts (V)

N.B.: 6,3V rated voltage can be coded as 6V.

CECC SPECIFICATIONS

Some of the products which are described in this catalogue are made to a CECC specification; these documents give in detail the following information for each type:

- The climatic, electrical and mechanical characteristics
- The test and inspection procedures
- The sampling methods and levels
- The tests periods

The reference specifications concerning the tantalum capacitors are the following:

CECC 30 000 (NFC 83-100)

Generic specification: fixed capacitors

- Terminology
- Quality Assessment Procedures
- Test and inspection methods

CECC 30 200 (NFC 83-112)

Sectional specification: tantalum capacitors

- Prefered characteristics
- Quality Assessment Procedures
- Test and inspection methods

CECC 30 201 XXX

Detail specifications solid tantalum capacitors

- Detailed characteristics for each type

CECC 30 202 XXX

Detail specifications wet tantalum capacitors

- Detailed characteristics for each type

CECC 30 800 (NFC 83-113)

Sectional specification: tantalum chip capacitors

- Prefered characteristics
- Quality Assessment Procedures
- Test and inspection methods

CECC 30 801 XXX

Detail specifications tantalum chip capacitors

- Detailed characteristics for each type
- The list of all the detail specifications is given in the selection guide, with the corresponding type.

NB: Some of the products refer to specifications which are no longer published.

OTHER SPECIFICATIONS

In addition to CECC approvals, some of the products are qualified to MIL standard M39006/22, M39006/25, DSCC DWG No. 93026 and some others are listed in ESA (European Space Agency) Preferred Parts Lists ESCC EPPL I or II.