1.0 SCOPE

This document contains specific electrical, mechanical, and environmental requirements and specifications for double-sealed, axial-leaded hybrid capacitors rated for operation at 200°C and in environments of extreme shock and vibration.

2.0 CONSTRUCTION

2.1 General

The capacitors shall be comprised of sintered tantalum anodes and ruthenium oxide coated cathodes operating in aqueous electrolyte. The components shall be confined within a tantalum case, first by a compressed gasket, followed by a hermetically welded glass to metal seal.

2.2 Package

The configuration and dimensions shall be as per Figure I.

2.2.1 Insulation

For Kapton tape insulation, add the suffix "S" to the P/N when ordering (e.g., HC2DxxxxxxHTXS).

2.3 Mass

Family >>>	HCD	HC2D	HC3D
Max mass	18g	15g	15.5g

2.4 Hermetic Seal

The capacitor shall be hermetically sealed such that the package does not leak electrolyte or vent any gas when exposed to a vacuum, per MIL-STD-202, Method 112, Condition C, Procedure IIIa.

2.5 Part Marking

The capacitor shall be permanently and legibly marked on the case circumference with the following information, at a minimum:

i. Manufacturer's name and/or cage code
ii. Manufacturer's part number
iii. Date/lot code
iv. Individual unit serial number

The marking shall be resistant to solvents per MIL-STD-202, Method 215J.

2.6 Terminations

2.6.1 Solderability

The terminations shall be solderable per ANSI J-STD-002.

2.6.2 Finish

Standard leads Sn/Pb per N32 of MIL-STD-1276. For RoHS compliant leads add "-LF" at the end of the complete part number (e.g., HC2DxxxxxxHTXS-LF)

2.7 Resistance to Soldering Heat

The capacitor shall be able to withstand solder dipping of the terminations at 260°C for 10 seconds per MIL-STD-202, Method 210, Condition B. The capacitor shall not be visibly damaged, and the electrical characteristics shall not be affected.

2.8 Terminal Strength

The terminations shall be able to withstand a 5-lb, 30-second pull test per MIL-STD-202, Method 211, Condition A. The capacitor shall not be visibly damaged, and the electrical characteristics shall not be affected.

2.9 Fungus Resistance

The capacitor materials shall not support fungus growth, nor shall they be a nutrient to fungus.

3.0 ENVIRONMENTAL REQUIREMENTS

3.1 Operating Temperature

-55°C to +200°C (with voltage de-rating)

3.2 Storage Temperature

-62°C to +130°C

3.3 Mechanical Environmental Testing

3.3.1 Random Vibration at Temperature

Capacitors of this product style have been designed and qualified to withstand 20 minutes of 75Grms random vibration, 10Hz to 10000Hz, at 200°C.

Capacitor parameters remained stable during exposure, and within specification after exposure.

3.3.2 Shock at Temperature

Test results defining the shock capabilities of this product style are pending.

3.3.3 Additional Mechanical Capabilities

Capacitors shall also be designed to withstand MIL-STD-202 mechanical environmental tests in accordance with Table I below.

TABLE I. Mechanical Environmental Tests

TEST	REFERENCE	CONDITION	COMMENTS
Shock	MIL-STD-202, Method 213	D	1mS, 500g peak
Vibration, high freq	MIL-STD-202, Method 204	H	12 sweeps/axis, 80g peak
Random Vibration	MIL-STD-202, Method 214	II-K	1.5 hr/axis, 53.8g rms
Thermal Shock	MIL-STD-202, Method 107	A	30 cycles, step 3 at +125C
Moisture Resistance	MIL-STD-202, Method 106		6V bias
Altitude	MIL-STD-202, Method 105	D	100,000-ft test

NOTE: Environmental survivability has been demonstrated for units subjected to rigorous proprietary testing in down-hole applications. These actual environmental test conditions exceed those specified in Table I.

4.0 ELECTRICAL REQUIREMENTS

4.1 Capacitance

25°C, 120Hz capacitance is specified (±20%) in Table II.

NOTE: For ordering ±10% cap tolerance, add the suffix "K" to the P/N, e.g., HC2DxxxxxxHTXKS.

4.2 Equivalent Series Resistance

Maximum 25°C, 120Hz ESR is specified in Table II.

4.3 DC Leakage

Maximum 25°C, 5-min rated voltage DCL is specified in Table II.

4.4 Rated Voltage

Maximum rated voltages up to 85°C are specified in Table II. Voltage de-rating at temperatures above 85°C, up to 200°C, is specified in Table II. Between specified temperatures, voltage requires linear de-rating.

4.5 Surge Voltage

Capacitors shall be able to withstand 1000 charge/discharge cycles at 110% of rated voltage at 85C through a 1K-Ω resistor. Each cycle shall consist of a 30-second surge voltage application, followed by a 330-second discharge period. Capacitors shall not be visibly damaged, and the electrical characteristics shall not be affected.

4.6 Ripple Current

Capacitors are capable of dissipating up to 2.0W in free air at 85°C, allowing for a 50°C temperature rise (due to I^2R) of the capacitor, which necessitates voltage de-rating. The specific application conditions, both electrical and physical, must be assigned such that internal capacitor heating does not exceed the maximum rated temperature; based on the ultimate temperature of the capacitors, voltage may require de-rating.

4.7 Life Test

Capacitors shall be able to withstand either 175°C or 200°C life test (with appropriate voltage de-rating per Table II) for durations as follows:

FAMILY	*50-75V P/N*	*100-125V P/N*
HCD-HTX	1000 hrs	2000 hrs
HC2D-HTX	500 hrs	1000 hrs

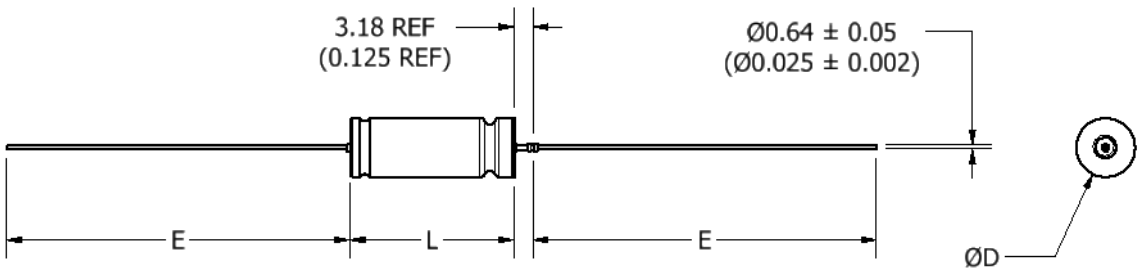
FAMILY	*60V P/N*	*75V P/N*
HC3-HTX	500 hrs	1000 hrs

Upon completion, capacitors shall not be visibly damaged, and:

Capacitance shall be within +10%, -20% of the initial value.

ESR shall not exceed 200% of the applicable value from Table II.

FIGURE I. MECHANICAL DIMENSIONS



Case Size	Dimensions, mm (in)			
	Basic Case		Insulated Case	E ±6.35 (0.250)
	L +0.79 (0.031) -0.41 (0.016)	D ±0.41 (0.016)	D MAX	
D	26.97 (1.062)	9.52 (0.375)	10.31 (0.406)	57.15 (2.250)
D-LF	26.97 (1.062)	9.52 (0.375)	10.31 (0.406)	25.40 (1.000)

TABLE II. ELECTRICAL SPECIFICATIONS

Part Number	Case Size	Max WVDC ≤ 85°C	25°C AC/DC			WVDC @175°C	WVDC @200°C
			Nominal Cap (µF)	Max ESR (Ω)	Max DCL (µA)		
HCD050681HTX	D	50	680	0.7	5	35	30
HC2D050152HTX	D	50	1500	0.5	15	30	25
HCD060561HTX	D	60	560	0.8	5	42	36
HC2D060122HTX	D	60	1200	0.5	20	36	30
HC3D060182HTX	D	60	1800	0.6	30	36	30
HCD075471HTX	D	75	470	0.9	5	50	45
HC2D075941HTX	D	75	940	0.6	20	45	37
HC3D075122HTX	D	75	1200	0.9	30	45	37
HCD100221HTX	D	100	220	1.2	5	70	60
HC2D100471HTX	D	100	470	0.7	25	60	50
HCD125151HTX	D	125	150	1.6	5	85	75
HC2D125331HTX	D	125	330	0.8	25	75	62

Note: Based on component availability, lead times may vary by P/N.