No.P-281-E006/1
DATE 2025-11

PRODUCTS DATA SHEET

TANTALUM SOLID ELECTROLYTIC CAPACITOR

Type 281

RoHS COMPLIANT
LEAD FREE

MATSUO ELECTRIC CO., LTD.

Type 281

Type 281 is Ultra Low ESR series based on Type 267.

FEATURES

1. Suitable for surface mounting.
2. Dimensional accuracy and symmetrical terminal structure suitable for high-density mounting ensures excellent "Self-Alignment".
3. Soldering: 260℃ for 10 seconds by reflow or flow soldering.
4. This type is suitable for medium to high frequency circuit as High Speed CPU, Switching Regulators, DC/DC Convertor for High Quality Voltage Source, etc.

APPLICATION CLASSIFICATION BY USE

The application classification by use which divided the market and use into four is set up supposing our products being used for a broad use.
Please confirm the application classification by use of each product that you intend to use.
Moreover, please be sure to inform to our Sales Department in advance in examination of the use of those other than the indicated use.

RATING

Item	Rating
Category temperature range (Operating temperature)	-55 ~ +125°C
Rated Temperature (Maximum operating temperature for DC rated Voltage)	+85°C (1)
DC rated voltage range［U_R］	See CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS and EXTENDED PRODUCTS.
Normal capacitance range［C_R］	
Capacitance tolerance	
Failure rate level	1%/1000 h

Note(1): For operation 125℃,derate voltage linearly to 67% of 85℃ voltage rating.

ORDERING INFORMATION

（ex.） 281 E 6301 227 M R 734

TYPE / SERIES / RATED VOLTAGE / CAPACITANCE / CAPACITANCE TOLERANCE / STYLE OF REELED PACKAGE（Taping specification） / SPECIAL CODE

Marking	Series
M	Standard
E	Extended

Marking	Rated Voltage
6301	6.3VDC
1002	10VDC
1602	16VDC
2002	20VDC
2502	25VDC
3502	35VDC
5002	50VDC

Marking	Capacitance	Marking	Capacitance
475	4.7 μF	686	68 μF
685	6.8 μF	107	100 μF
106	10 μF	157	150 μF
156	15 μF	227	220 μF
226	22 μF	337	330 μF
336	33 μF	477	470 μF
476	47 μF		

Marking	Capacitance Tolerance
K	±10%
M	±20%

Code	Reel Size	Anode Notation
R	φ180 Reel	Feed hole: -
L	φ180 Reel	Feed hole: +
N	φ330 Reel	Feed hole: -
P	φ330 Reel	Feed hole: +

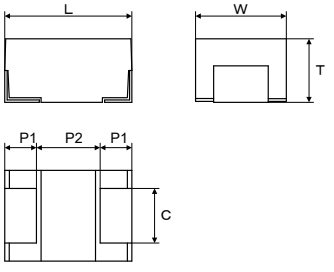
Series	Special Code	Case Code
M	Blanks	D3, H
E	Blanks, 734	D3
	Blanks	H

When selecting a model, please refer to the Catalog Number on pages 3 to 4. Special products will have standard numbers other than those listed above.

DIMENSIONS

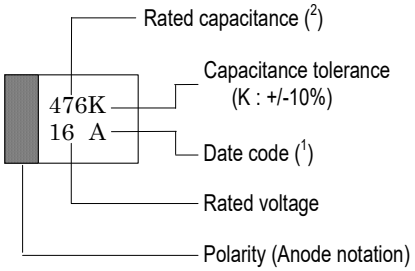
（mm）

Case Code	Case Size	L ±0.2	W ±0.2	T ±0.2	P_1 ±0.2	P_2 min.	C ±0.1
D3	7343	7.3	4.4	2.8	1.3	4.0	2.4
H	7343H	7.3	4.4	4.1	1.3	4.0	2.4



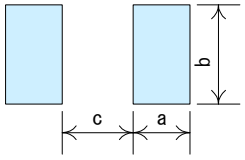
MARKING

［D3, H case］



Note(1) Date codes are based on the Annex 1 Table 13 of JIS C 5101-1.
Note(2) First two digits are significant figures of capacitance value(pF).
Third digit is the number of zeros following.

RECOMMENDED SOLDER PAD LAYOUT



（mm）

Case Code	Case Size	a		b	c
		Flow	Reflow		
D3	7343	5.2	2.4	2.7	4.6
H	7343H	5.2	2.4	2.7	4.6

In order to expect the self alignment effect, it is recommended that land width is almost the same size as terminal of capacitor,and space between lands (c) nearly equal to the space between terminals for appropriate soldering.

STANDARD RATING

＜Series M : Standard products＞

R.V.(VDC) / Cap.(μF)	6.3	10	16	20	25	35	50
4.7						D3	
6.8						D3	
10						D3	H
15							
22						H	
33			D3		H		
47			H				
68			H				
100							
150							
220							

＜Series E : Extended products＞

R.V.(VDC) / Cap.(μF)	6.3	10	16	20	25
22					D3
33					
47			D3		
68				H	
100	D3		H		
150		D3			
220	D3	H			
330	H				
470		H			

CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS

July, 2024

< 281 M series >

Catalog Number (1)(2)(3)	U_R VDC	U_S VDC		C_R μF	Case code	Leakage current(DCL) μA			Dissipation factor				ESR(Ω) 25℃ 100kHz	Permissible ripple current 100kHz(mArms)		
		85℃	125℃			20℃	85℃	125℃	-55℃	20℃	85℃	125℃		25℃	85℃	125℃
281M 1602 336 _1 _2 _3	16	20	13	33	D3	5.3	53	66	0.08	0.06	0.06	0.06	0.225	816	730	516
281M 1602 476 _1 _2 _3	↓	↓	↓	47	H	7.5	75	94	0.08	0.06	0.06	0.06	0.150	1049	938	663
281M 1602 686 _1 _2 _3	↓	↓	↓	68	H	11	110	136	0.08	0.06	0.06	0.06	0.150	1049	938	663
281M 2502 336 _1 _2 _3	25	32	20	33	H	8.3	83	103	0.08	0.06	0.06	0.06	0.225	856	766	542
281M 3502 475 _1 _2 _3	35	44	28	4.7	D3	1.6	16	21	0.08	0.06	0.06	0.06	0.400	612	548	387
281M 3502 685 _1 _2 _3	↓	↓	↓	6.8	D3	2.4	24	30	0.08	0.06	0.06	0.06	0.350	655	586	414
281M 3502 106 _1 _2 _3	↓	↓	↓	10	D3	3.5	35	44	0.08	0.06	0.06	0.06	0.300	707	632	447
281M 3502 226 _1 _2 _3	↓	↓	↓	22	H	7.7	77	96	0.08	0.06	0.06	0.06	0.250	812	727	514
281M 5002 106 _1 _2 _3	50	65	40	10	H	5.0	50	63	0.10	0.08	0.08	0.08	0.400	642	574	406

< 281 E series >

Catalog Number (1)(2)(3)	U_R VDC	U_S VDC		C_R μF	Case code	Leakage current(DCL) μA			Dissipation factor				ESR(Ω) 25℃ 100kHz	Permissible ripple current 100kHz(mArms)		
		85℃	125℃			20℃	85℃	125℃	-55℃	20℃	85℃	125℃		25℃	85℃	125℃
281E 4001 157 _1 _2 _3	4	5	3.2	150	D_3	6.0	60	75	0.10	0.08	0.08	0.08	0.100	1225	1095	775
281E 4001 227 _1 _2 _3	↓	↓	↓	220	D_3	8.8	88	110	0.15	0.08	0.08	0.10	0.100	1225	1095	775
281E 4001 337 _1 _2 734 _3	↓	↓	↓	330	D_3	13	132	165	0.18	0.10	0.10	0.12	0.100	1225	1095	775
281E 4001 337 _1 _2 _3	↓	↓	↓	330	H	13	132	165	0.15	0.08	0.08	0.10	0.100	1285	1149	812
281E 6301 107 _1 _2 _3	6.3	8	5	100	D_3	6.3	63	79	0.10	0.08	0.08	0.08	0.100	1225	1095	775
281E 6301 227 _1 _2 734 _3	↓	↓	↓	220	D_3	14	139	173	0.15	0.08	0.08	0.10	0.100	1225	1095	775
281E 6301 337 _1 _2 _3	↓	↓	↓	330	H	21	208	260	0.15	0.08	0.08	0.10	0.100	1285	1149	812
281E 1002 157 _1 _2 734 _3	10	13	8	150	D_3	15	150	188	0.15	0.08	0.08	0.10	0.100	1225	1095	775
281E 1002 227 _1 _2 _3	↓	↓	↓	220	H	22	220	275	0.15	0.08	0.08	0.10	0.100	1285	1149	812
281E 1002 477 _1 _2 _3	↓	↓	↓	470	H	47	470	588	0.15	0.10	0.10	0.12	0.100	1285	1149	812
281E 1602 476 _1 _2 _3	16	20	13	47	D_3	7.5	75	94	0.08	0.06	0.06	0.08	0.150	1000	894	632
281E 1602 107 _1 _2 _3	↓	↓	↓	100	H	16	160	200	0.15	0.08	0.08	0.10	0.100	1285	1149	812
281E 2002 686 _1 _2 _3	20	26	16	68	H	14	136	170	0.08	0.06	0.06	0.08	0.150	1049	938	663
281E 2502 226 _1 _2 _3	25	32	20	22	D_3	5.5	55	69	0.08	0.06	0.06	0.08	0.200	866	775	548

※ U_R = Rated Voltage U_S = Surge Voltage C_R = Capacitance

Note1 : For Capacitance Tolerance, insert "K" or "M" into _1

Note2 : For Reeled Package, insert "R", "L", "N" or "P" into _2

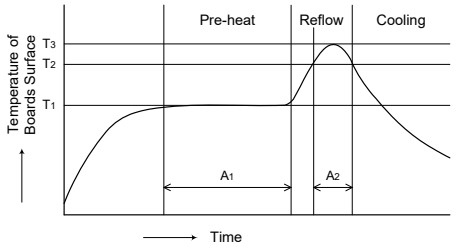
Note3 : Insert mark for stratification into _3. Example: "7' indicates halogen-free products.

PERFORMANCE

No.	Item			Performance	Test method
1	Leakage Current (μA)			Shall not exceed 0.01 CV or 0.5 whichever is greater.	JIS C 5101-1, 4.9 Applied Voltage : Rated Voltage for 5 min. Temperature : 20°C
2	Capacitance (μF)			Shall be within tolerance of the nominal value specified.	JIS C 5101-1, 4.7 Frequency : 120 Hz± 20% Voltage : 0.5Vrms+1.5 ~2VDC Temperature : 20°C
3	Dissipation Factor			Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS or EXTENDED PRODUCTS.	JIS C 5101-1, 4.8 Frequency : 120 Hz± 20% Voltage : 0.5Vrms+1.5 ~2VDC Temperature : 20°C
4	ESR(Equivalent series resistance)			Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS or EXTENDED PRODUCTS.	Frequency : 100 kHz Temperature : 20°C
5	Characteristics at High and LowTemperature				JIS C 5101-1, 4.29
		Step 1	Leakage Current Capacitance Dissipation Factor	Shall not exceed the value in No.1. Shall be within the specified tolerance. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS or EXTENDED PRODUCTS.	Measuring temperature : 20±2°C
		Step 2	Capacitance Change Dissipation Factor	Shall be within ± 10% of the value at Step 1. For 10V-470μF (H) only within ±15% of initial value. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS or EXTENDED PRODUCTS.	Measuring temperature : -55±3°C
		Step 3	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed the value in No.1. Shall be within ± 2% of the value at Step 1. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS or EXTENDED PRODUCTS.	Measuring temperature : 20±2°C
		Step 4	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed 0.1 CV or 5 whichever is greater. Shall be within ± 10% of the value at Step 1. For 10V-470μF (H) only within ±12% of initial value. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS or EXTENDED PRODUCTS.	Measuring temperature : 85±2°C
		Step 5	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed 0.125 CV or 6.3 whichever is greater. Shall be within ± 15% of the value at Step 1. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS or EXTENDED PRODUCTS.	Measuring temperature : 125±2°C Measuring voltage : Derated voltage at 125°C
		Step 6	Leakage Current Capacitance Change Dissipation Factor	Shall not exceed the value in No.1. Shall be within ± 2% of the value at Step 1. Shall not exceed the values shown in CATALOG NUMBERS AND RATING OF STANDARD PRODUCTS or EXTENDED PRODUCTS.	Measuring temperature : 20±2°C
6	Surge		Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of initial value. For 10V-470μF (H) only within ±10% of initial value. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.26 Test temperature and applied voltage : To each half of specimens · 85 ± 2°C, · 125 ± 2°C Applied Voltage :DC surge voltage Series protective resistance : 1000 Ω Discharge resistance : 1000 Ω
7	Shear Test			No exfoliation between lead terminal and board.	JIS C 5101-1, 4.34 Capacitors mounted under conditions JIS C 5101-1, 4.33 are used as specimens. Pressure : 5N Duration : 10 ± 1 s
8	Substrate Bending Test		Capacitance Appearance	Initial value to remain steady during measurement. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.35 Bending : 3 mm Duration:5s
9	Vibration		Capacitance Appearance	Initial value to remain steady during measurement. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.17 Frequency range : 10 ~ 55 Hz Swing width : 1.5 mm Vibration direction : 3 directions with mutually right-angled Duration : 2 hours in each of these mutually perpendicular directions (total 6 hours) Mounting : Solder terminal to the printed board
10	Shock			There shall be no intermittent contact of 0.5 ms or greater, short, or open. Nor shall there be any spark discharge, insulation breakdown, or evidence of mechanical damage.	JIS C 5101-1, 4.19 Peak acceleration : 490 m/s^2 Duration : 11 ms Wave form : Half-sine
11	Solderability			Shall be covered to over 3/4 of terminal surface by new soldering.	JIS C 5101-1, 4.15 Solder temperature : 230 ± 5°C Dipping time : 3 to 5 s Dipping depth : Terminal shall be dipped into melted solder.

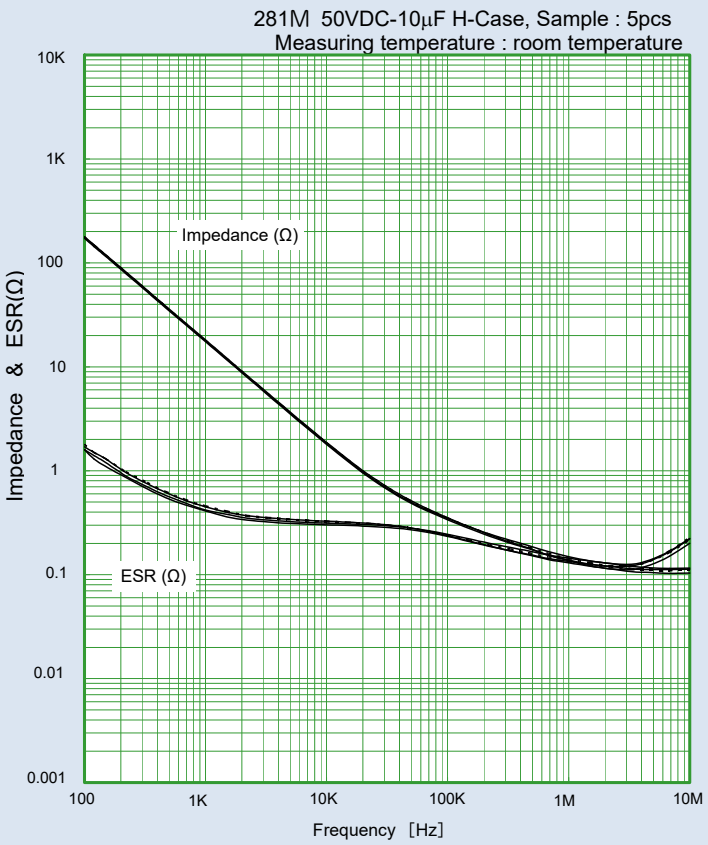
No.	Item		Performance	Test method
12	Resistance to Soldering Heat	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. ・Series M : Shall be within ± 3% of initial value. ・Series E : Shall be within ± 5% of initial value. For 10V-470μF (H) only within ±10% of initial value. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.14 One of the following methods (a) Complete dipping method Solder temperature: 260 ± 5°C Dipping time: 10 ± 1 s (b) Terminal dipping method Solder temperature: 260 ± 5°C Dipping time: 10 ± 1 s [Exception: 10V470μF(H) is tested by condition Chart 1.]
13	Component solvent resistance	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 3% of initial value. For 10V-470μF (H) only within ±10% of initial value. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.31 Temperature : 23 ± 5°C Dipping time : 5 ± 0.5 min. Conditioning : JIS C 0052 method 2 Solvent : 2-propanol (Isopropyl alcohol)
14	Solvent resistance of marking	Visual examination	After the test the marking shall be legible.	JIS C 5101-1, 4.32 Temperature : 23 ± 5°C Dipping time : 5 ± 0.5 min. Conditioning : JIS C 0052 method 1 Solvent : 2-propanol (Isopropyl alcohol) Rubbing material : cotton wool
15	Rapid Change of Temperature	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of initial value. For 10V-470μF (H) only within ±10% of initial value. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.16 Step 1 : -55 ± 3°C, 30 ± 3 min. Step 2 : 25 +10/-5°C, 3 min. max. Step 3 : 125 ± 2°C, 30 ± 3 min. Step 4 : 25 +10/-5°C, 3 min. max. Number of cycles : 5
16	Damp heat, Steady state	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed the value in No.1. Shall be within ± 5% of initial value. For 10V-470μF (H) only within ±10% of initial value. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.22 Temperature : 40 ± 2°C Moisture : 90 ~ 95%RH Duration : 500 +24/0h
16	Endurance	Leakage Current Capacitance Change Dissipation Factor Appearance	Shall not exceed 1.25 times of the value in No.1. Shall be within ± 10% of initial value. Shall not exceed the value in No.3. There shall be no evidence of mechanical damage.	JIS C 5101-1, 4.23 Test temperature and applied voltage : 85 ± 2°C and rated voltage or 125 ± 3°C and 2/3 × rated voltage Duration : 2000 +72/0h Power supply impedance : 3 Ω or less

Chart 1: [10V470μF(H) only]

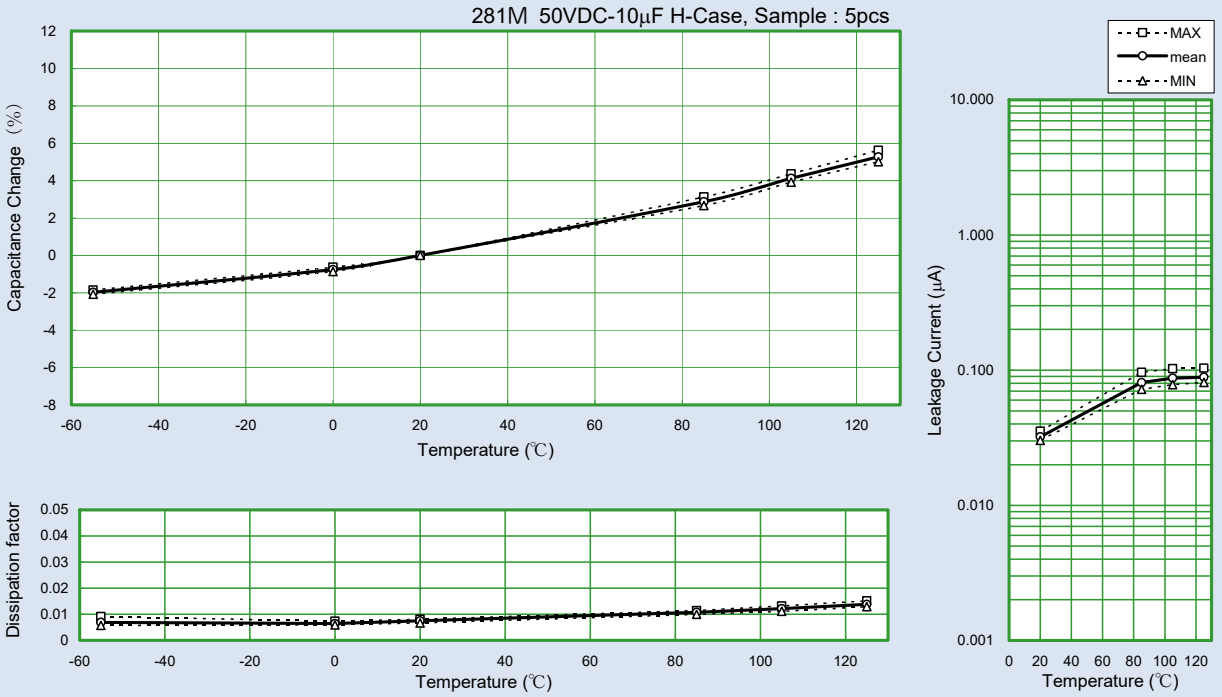


Temperature	Time
T1=135±10℃	A1=30-60sec.
T2=200℃	A2≦40sec.
T3=220℃ max.	

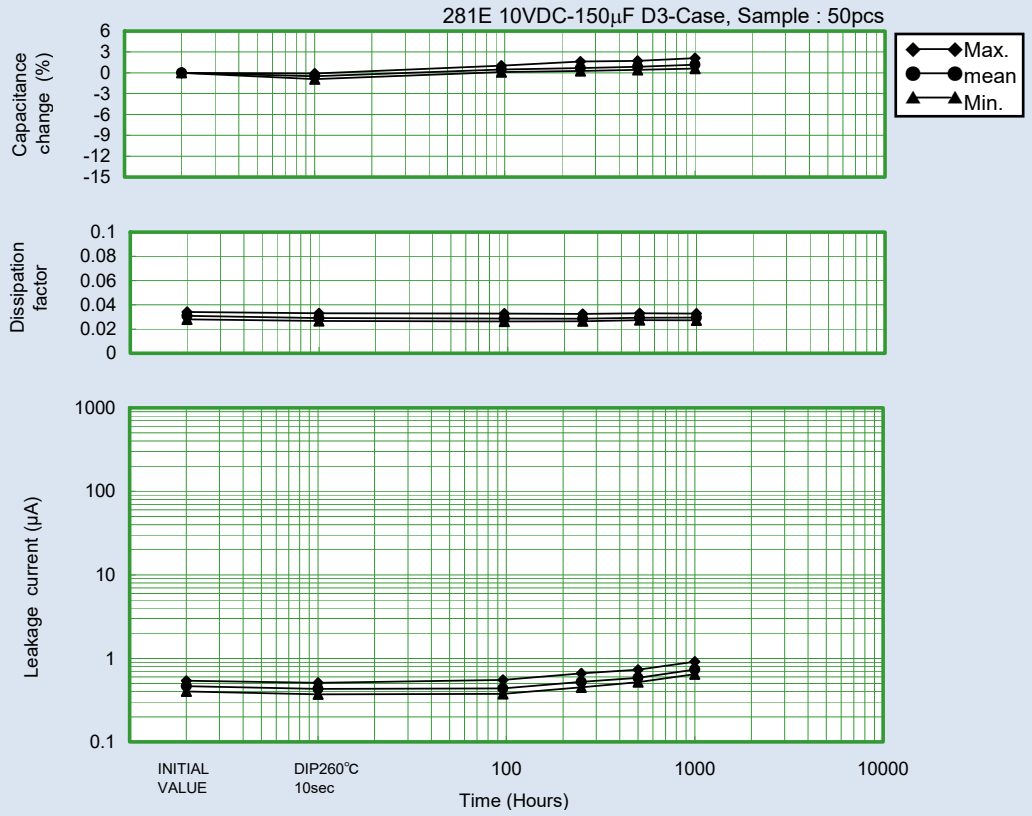
FREQUENCY CHARACTERISTICS



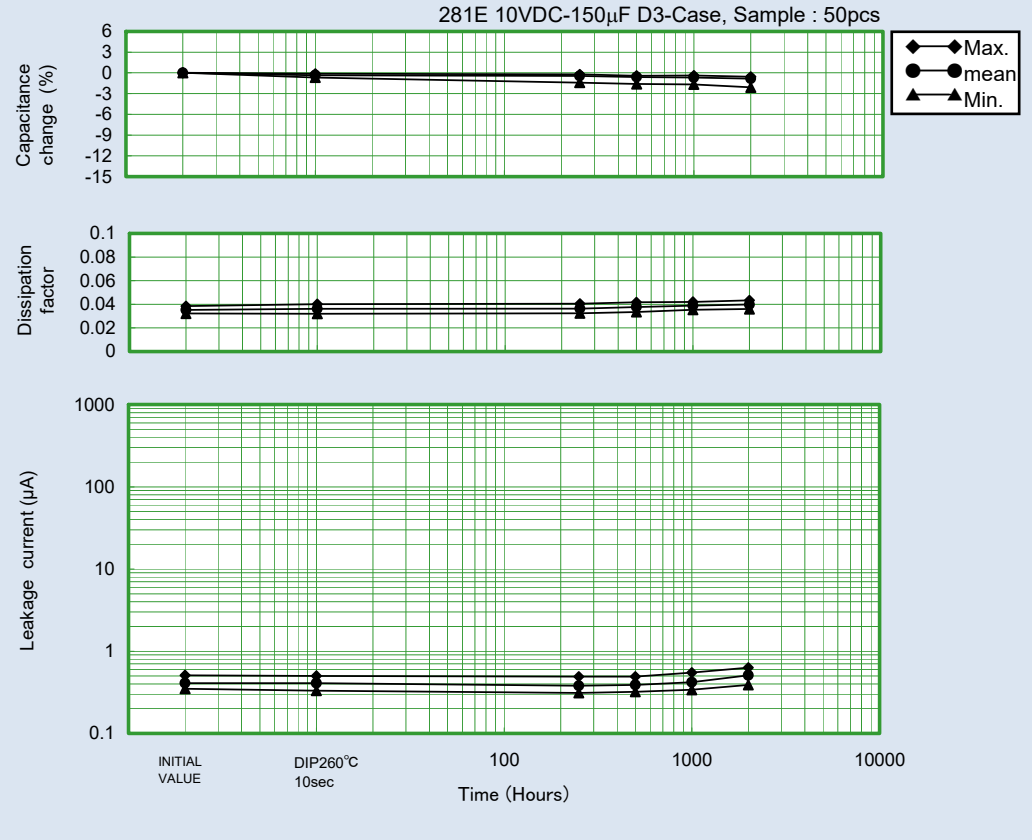
TEMPERATURE CHARACTERISTICS



DAMP HEAT, STEADY STATE 40℃, 95%RH



ENDURANCE 85℃, RATED VOLTAGE



Application Notes for Tantalum Solid Electrolytic Capacitor

1. Operating Voltage

Tantalum Solid Electrolytic Capacitor shall be operated at the rated voltage or lower.

Rated voltage: The "rated voltage" refers to the maximum DC voltage that is allowed to be continuously applied between the capacitor terminals at the rated temperature.

Surge voltage: The "surge voltage" refers to the voltage that is allowed to be instantaneously applied to the capacitor at the rated temperature or the maximum working temperature. The capacitor shall withstand the voltage when a 30-second cycle of application of the voltage through a 1000 Ω series resistance is repeated 1000 times in 6-minute periods.

When designing the circuit, the equipment's required reliability must be considered and appropriate voltage derating must be performed.

2. Application that contain AC Voltage

Special attention to the following 3 items.

(1) The sum of the DC bias voltage and the positive peak value of the AC voltage should not exceed the rated voltage.

(2) Reverse voltage should not exceed the allowable values of the negative peak AC voltage.

(3) Ripple current should not exceed the allowable values.

3. Reverse Voltage

Tantalum solid electrolytic capacitor is polarity. Please do not impress reverse voltage. As well, please confirm the potential of the tester beforehand when both ends of the capacitor are checked with the tester etc.

4. Permissible Ripple Current

The permissible ripple current and voltage at about 100 kHz or higher can be determined by the following formula from the permissible power loss (Pmax value)shown in Table 1 and the specified ESR value. However, when the expected operating temperature is higher than room temperature, determine the permissible values multiplying the Pmax value by the specified multiplier (Table 2). For the permissible values at different frequencies, consult our Sales Department.

$P=I^2 \times ESR$ or $P=\dfrac{E^2 \times ESR}{Z^2}$

Permissible ripple current Imax= $\sqrt{\dfrac{P\max}{ESR}}$ (Arms)

Permissible ripple voltage Emax= $\sqrt{\dfrac{P\,max}{ESR}}$ × Z

= *Imax× Z (Vrms)*

Imax : Permissible ripple current at regulated frequency (Arms : RMS value)
Emax : Permissible ripple voltage at regulated frequency (Vrms : RMS value)
Pmax : Permissible power loss (W)
ESR : Specified ESR value at regulated frequency (Ω)
Z : Impedance at regulated frequency (Ω)

Table 1 Permissible power loss

Case Code	Pmax（W）
A	0.045
B	0.050
C_3	0.065
D_3	0.085
H	0.100
E	0.105

Note: Above values are measured at 0.8t glass epoxy board mounting in free air and may be changed depending on the kind of board, packing density, and air convection condition. Please consult us if calculated power loss value is different from above list of P max value.

Table 2 Pmax multiplier at each operating temperature

Operating temperature（℃）	Multiplier
25	1.0
55	0.9
85	0.8
125	0.4

5. Application on low-impedance circuit

The failure rate of low impedance circuit at 0.1Ω/V is about five times greater than that of a 1Ω/V circuit. To curtail this higher failure rate, tantalum capacitors used in low impedance circuits, such as filters for power supplies, particularly switching power supplies, or for noise by-passing, require that operating voltage be derated to less than half of the rated voltage. Actually, less than 1/3 of the rated voltage is recommended.

6. Non Polar Application(BACK TO BACK)

The capacitor cannot be used as a non-polar unit.

7. Soldering

7.1. Preheating

To obtain optimal reliability and solderability conditions, capacitors should be pre-heated at 130 to 200 °C for approximately 60 to 120 seconds.

7.2. Soldering

The body of the capacitor shall not exceed 260 °C during soldering.

(1) Reflow Soldering

Reflow soldering is a process in which the capacitors are mounted on a printed board with solder paste. There are two methods of Reflow Soldering: Direct and Atmospheric Heat.

· Direct Heat (Hot plate)

During the Direct Heat method, the capacitor has been positioned on a printed board, which is then placed upon a hot plate. The capacitor maintains a lower temperature than the substrate, which in turn stays at a lower temperature than the hot plate.

· Atmospheric Heat

a) VPS (Vapor Phase Soldering)

During VPS,the substrate is heated by an inert liquid with a high boiling point. The temperature of the capacitor's body and the temperature of the substrate are about the same as the atmosphere. This temperature should be below 240°C.

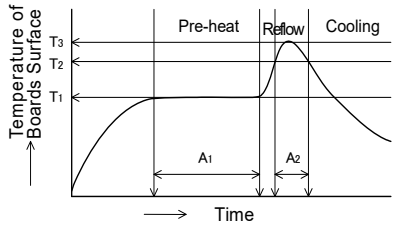
b) Near and Far IR Ray

Due to the heat absorption of the capacitor's body, the internal temperature of the capacitors may be 20 ~ 30°C higher than the setting temperature and may exceed 260°C.

Temperature control is crucial in maintaining a temperature of 260 °C or lower.

c) Convention Oven

An infrared ray is the main source of heat in this process. The temperature of the substrate and the capacitors can be maintained at a similar level by the circulation of heated air, or an inert gas.



Temperature	Time
T1=130℃～200℃	A1=60～120sec.
T2=220℃～230℃	A2<60秒以下
T3=～260℃	10sec. or less than 10

Number of times:2times max.

(2) Soldering with a Soldering Iron

Soldering with a soldering iron cannot be recommended due to the lack of consistency in maintaining temperatures and process times. If this method should be necessary, the iron should never touch the capacitor's terminals, and the temperature of the soldering iron should never exceed 350°C. The application of the iron should not exceed 5 seconds.

(3) Please consult us for other methods.

8. Cleaning

Cleaning by organic solvent may damage capacitor's appearance and performance.However, our capacitors are not effected even when soaked at 20 ~ 30°C 2-propanol for 5 minutes. When introducing new cleaning methods or changing the cleaning term, please consult us.

9. Protective Resin Coating

After components are assembled to substrate, a protective resin coating is sometimes applied. As this resin coating cures, it gives mechanical and thermal stress to Tantalum capacitors. This stress can cause damage to the capacitors, which affects their reliability.
Before using a resin coating, proper research must be done in regards to the material and process to insure that excessive stress will not be applied to capacitors and other components.

10. Vibration

Approximately 300 G shall be applied to a capacitor, when dropped from 1 meter to a concrete floor.
Although capacitors are made to withstand this drop test, stress from shock due to falling or striking does cause damage to the capacitors and increases failure rates. Do not subject capacitors to this type of mechanical stress.

11. Ultrasonic cleaning

Matsuo does not recommend Ultrasonic cleaning. This may cause damage to the capacitors, and may even cause broken terminals. If the Ultrasonic cleaning process will be used, please note the following:
(1)The solvent should not be boiled. (Lower the ultrasonic wave output or use solvent with The high boiling point.)
(2)The recommended wattage is less than 0.5 watts per cm^2.
(3)The cleaning time should be kept to a minimum. Also, samples must be swang in the solvlent. Please consult us.

12. Additional Notes

· When more than one capacitor is connected in series, a resistor that can distribute the voltage equally to the capacitors shall beconnected in parallel.
· The capacitor cases shall not be cut even if the mounting space is insufficient.
· During a customers aging process, voltage should remain under the rated voltage at all times.
· Capacitors should never be touched or manipulated while operating.
· Capacitors are not meant to be dismantled.
· When testing capacitors, please examine the power source before conducting test to insure the tester's polarity and applied voltage.
· In the event of a capacitor burning, smoking, or emitting an offensive smell during operation, please turn the circuit "off" and keep hands and face away from the burning capacitor.
· If a capacitor be electrical shorted, it becomes hot, and the capacitor element may ignite. In this case, the printed board may be burnt out.
· Capacitors should be stored at room temperature under low humidity. Capacitors should never be stored under direct sunlight, and should be stored in an environment containing dust.
· If the capacitors will be operated in a humid environment, they should be sealed with a compound under proper conditions.
· Capacitors should not be stored or operated in environments containing acids, alkalis or active gasses.
· When capacitors are disposed of as "scrap" or waste, they should be treated as Industria Waste since they contain various metals and polymers.
· Capacitors submitted as samples should not be used for production purposes.
· The plastic reel (made of PS) used for packaging the product is intended for use in ambient temperatures (5-35℃). To prevent issues during automated insertion due to reel deformation or other factors, please keep the reel away from direct sunlight and heat sources, and ensure it does not reach high temperatures (above 60℃), including during transportation.

These application notes are prepared based on "Guideline of notabilia for fixed tantalum electrolytic capacitors with solid electrolyte for use in electronic equipment" (RCR-2368) issued by Japan Electronics and Information Technology Industries Association (JEITA).
For the details of the instructions (explanation, reasons and concrete examples), please refer to this guideline, or consult our Sales Department.

MATSUO ELECTRIC CO., LTD.

Please feel free to ask our Sales Department for more information on Tantalum Solid Electrolytic Capacitor.

Overseas Sales 5-3,3-Chome,Sennari-cho,Toyonaka-shi,Osaka 561-8558,Japan Tel:06-6332-0883 Fax:06-6332-0920
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URL https://www.ncc-matsuo.co.jp/

適用用途分類 / APPLICATION CLASSIFICATION BY USE

Rev.7 (2025.10.03)

市場	適用用途分類	用途		推奨品種	推奨品種
		概要	代表的なアプリケーション例	チップタンタルコンデンサ	回路保護素子
高信頼度機器	1	・高度な安全性や信頼性が要求される機器 ・製品の保守交換が不可能な機器、製品の故障が人命に直接かかわる、または、致命的なシステムダウンを引　き起こす可能性がある機器	・宇宙開発機器関連(衛星、ロケット、人工衛星) ・航空・防衛システム ・原子力・火力・水力発電システム	267型Pシリーズ	該当なし
車載・産業機器	2	・信頼性が重視される機器 ・製品の保守交換が極めて困難な機器や、製品の故障が人命に影響する、あるいは故障の範囲が広範囲である機器	・自動車および鉄道・船舶等の輸送機器の車両制御(エンジン制御,駆動制御,ブレーキ制御) ・新幹線・主要幹線の運行制御システム	267型Nシリーズ 271型Nシリーズ	JAG型Nシリーズ JAJ型Nシリーズ JAK型Nシリーズ JHC型Nシリーズ KAB型Nシリーズ KVA型Nシリーズ
	3-A	・車載用だが一般電装機器で車室内環境において使用される機器	・エアコン,カーナビ等の車室内搭載部品、　車載用通信機器		KAB型Mシリーズ
	3-B	・製品の保守交換が可能な機器や、製品の故障が人命に影響しないが故障によるシステムダウンの損失が大きく保全管理が要求される機器	・家庭用/ビル用等のセキュリティ管理システム ・工業用ロボットや工作機械等の制御機器	267型M,Eシリーズ 279型 281型M,Eシリーズ TCA型 TCD型	JHC型
汎用機器	4	・最先端技術を積極的に適用する小型・薄型品 ・製品の保守交換が可能な機器や、製品の故障によるシステムダウンが部分的な機器向けの市場で広く使用されることを想定した製品	・スマートフォン、携帯電話、モバイルPC(タブレット)、電子辞書 ・デスクトップPC、ノートPC、ホームネットワーク ・アミューズメント機器(パチンコ、ゲーム機)	251型Mシリーズ 267型Cシリーズ TCB型	JAE型、JAG型 JAJ型、JAK型 KAB型 KAB型Tシリーズ KVA型

Market	Application classification by use	Use		Recommendation Type	Recommendation Type
		Outline	Typical example of application	Chip Tantalum Capacitors	Circuit Protection Components
High reliability apparatus	1	- Apparatus in which advanced safety and reliability are demanded. - Whether failure of the apparatus which cannot maintenance exchange products, and a product is direct for a human life, apparatus which changes or may cause a fatal system failure.	- Space development apparatus relation (Satellite, Rocket, Artificial Satellite) - Aviation and a defensive system - Atomic power, fire power, and a water-power generation system	Type 267 P Sereis	With no relevance
In-vehicle - Industrial apparatus	2	- Apparatus in which reliability is important. - The apparatus in which maintenance exchange of a product is very difficult, and failure of a product influence a human life, or the range of failure is wide range.	- Vehicles control of transport machines, such as a car, and a railroad, a vessel (Engine control, drive control, brake control) - The operation control system of the Shinkansen and a main artery	Type 267 N Sereis Type 271 N Sereis	Type JAG N series Type JAJ N series Type JAK N series Type JHC N series Type KAB N series Type KVA N series
	3-A	- General electrical equipment designed for use in vehicles but used in the interior environment	- Vehicle indoor loading parts, such as an air-conditioner and car navigation, and in-vehicle communication facility		Type KAB M series
	3-B	-Apparatus which can maintenance exchange products, and apparatus in which the loss of the system failure is large although failure of a product does not influence a human life, and maintenance engineering is demanded	- Security management system for home/buildings etc. - Control apparatus, such as Industrial use robots and a machine tool etc.	Type 267 M,E Sereis Type 279 Type 281 M,E Sereis Type TCA Type TCD	Type JHC
Apparatus in general	4	- The small size and the thin article which applies leading-edge technology positively - The product supposing being used widely in the market for the apparatus which can maintenance exchange products, and apparatus with a partial system failure by failure of product.	-Smart phone, Mobile phone, Mobile PC (tablet), Electronic dictionary - Desktop PC, Notebook PC, Home network - Amusement apparatus (Pachinko,Game machine)	Type 251 M Series Type 267 C Series Type TCB	Type JAE, Type JAG Type JAJ, Type JAK Type KAB Type KAB T series Type KVA

テーピング数量・リール寸法
Taping Quantity And Carrier Tape Dimensions

チップタンタルコンデンサ
Chip Tantalum Capacitors

定格：251型Mシリーズ, TCB型
Type：251 M Series, TCB

ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P_1 (mm)	P_2 (mm)	P_0 (mm)	ϕD_0 (mm)	包装数/リール(個) Quantity/Reel (pcs)
									ϕ180
U	1.0×0.5	8.0±0.3	3.5±0.05	1.75±0.1	2.0±0.05	2.0±0.05	4.0±0.1	1.55±0.03	10,000
M	1.6×0.8				4.0±0.1			$1.5^{+0.1}_{0}$	3,000
S	2.0×1.25								
A	3.2×1.6								

定格：267型Mシリーズ, 267型Eシリーズ, 267型Pシリーズ, 271Nシリーズ
279型Mシリーズ, 281型Mシリーズ, 281型Eシリーズ
Type：267 M Series, 267 E Series, 267 P Series, 271 N Series
279 M Series, 281 M Series, 281 E Series

ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P_1 (mm)	P_2 (mm)	P_0 (mm)	D_0 (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									ϕ180	ϕ330
A	3.2×1.6	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	$\phi 1.5^{+0.1}_{0}$	2,000	9,000
B	3.5×2.8									8,000
C3	6.0×3.2	12.0±0.3	5.5±0.05		8.0±0.1				500	3,000
D3	7.3×4.4		5.7±0.05	1.5±0.1						2,500
H	7.3×4.4		5.7±0.1							1,500
E	7.3×5.8		5.5±0.05	1.75±0.05						2,000

定格：267型Nシリーズ、TCA型
Type：267 N Series, TCA

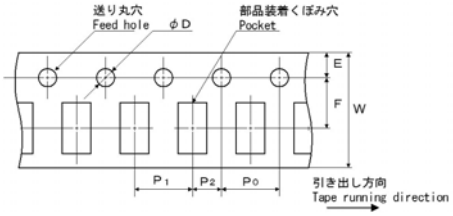
ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P_1 (mm)	P_2 (mm)	P_0 (mm)	D_0 (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									ϕ180	ϕ330
A	3.2×1.6	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	$\phi 1.5^{+0.1}_{0}$	2,000	9,000
B	3.5×2.8									8,000
C	6.0×3.2	12.0±0.3	5.5±0.05		8.0±0.1				500	3,000
D	7.3×4.4		5.7±0.05	1.5±0.1						2,500

回路保護素子
Circuit Protection Components

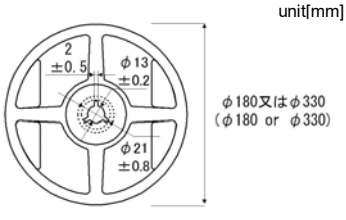
定格：JAE型、JAG型、JAG型Nシリーズ、JAJ型、JAJ型Nシリーズ、JAK型、JAK型Nシリーズ、JHC型、JHC型Nシリーズ
KAB型、KAB型Nシリーズ、KAB型Mシリーズ、KAB型Tシリーズ、KVA型、KVA型Nシリーズ
Type：JAE, JAG, JAG N Series, JAJ, JAJ N Series, JAK, JAK N Series, JHC, JHC N Series
KAB, KAB N Series, KAB M Series, KAB T Series, KVA, KVA N Series

ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P_1 (mm)	P_2 (mm)	P_0 (mm)	D_0 (mm)	包装数/リール(個) Quantity/Reel (pcs)	
									ϕ180	ϕ330
29	1.6×0.8	8.0±0.3	3.5±0.05	1.75±0.05	4.0±0.1	2.0±0.05	4.0±0.1	ϕ1.55±0.03	5,000	-
31	2.0×1.25									-
52	3.2×1.6			1.75±0.1				ϕ1.5±0.1	2,000	-
44E	7.3×5.8	12±0.3	5.5±005		8.0±0.1			$\phi 1.5^{+0.1}_{0}$	500	1,500
59F	11.0×7.3	24±0.3	11.5±005		12.0±0.1				-	500

テーピング寸法/Tape dimensions



リール寸法/Reel dimensions　単位[mm]
unit[mm]



チップタンタルコンデンサ テーピング形状記号
Chip Tantalum Capacitors Tape code

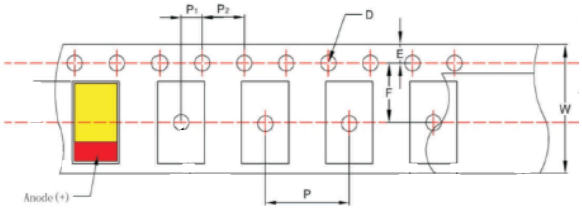
φ180リール φ180Reel	φ330リール φ330Reel	極性 Anode notation
L	P	送り穴側 ＋ Feed hole ＋
R	N	送り穴側 － Feed hole －

チップタンタルコンデンサ
Chip Tantalum Capacitors

定格：TCD型
Type：TCD

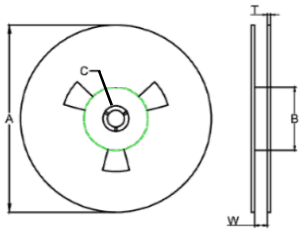
ケース記号 Case Code	ケースサイズ Case size	W (mm)	F (mm)	E (mm)	P (mm)	P_1 (mm)	P_2 (mm)	φD (mm)	包装数/リール(個) Quantity/Reel (pcs)
									φ180
D	7.3×4.3×2.8	12±0.30	5.5±0.05	1.75±0.10	4±0.10	8±0.10	2±0.10	1.55±0.20	500

テーピング寸法/Tape dimensions



単位[mm]
unit[mm]

リール寸法/Reel dimensions



リール Reel	テープ幅 Tape width	A	B	C	W	T
φ180	12	178±2.00	50 min	13.0±0.50	12.4+1.5/-0	1.50±0.50