

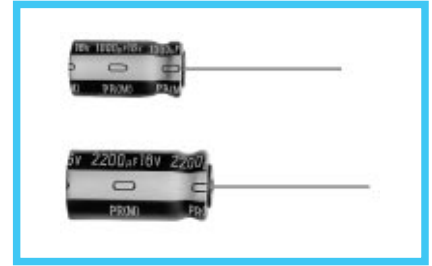
**PR** series Standard, For Switching Power Supplies



- Same case sizes as VX series, but operating at higher temperature range up to + 105°C.
- Designed specifically for use in switching power supplies.

This series will be discontinued in 2002, and combine with PS series.

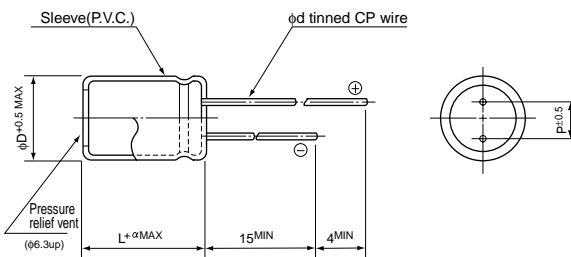
**PR**

High Ripple Current  
High Reliability
**PF,PJ,PS**


## Specifications

Item	Performance Characteristics																																	
Category Temperature Range	— 55 ~ + 105°C(6.3 ~ 100V), — 40 ~ + 105°C(160 ~ 400V),— 25 ~ + 105°C(450V)																																	
Rated Voltage Range	6.3 ~ 450V																																	
Rated Capacitance Range	0.47 ~ 22000µF																																	
Capacitance Tolerance	±20% at 120Hz,20°C																																	
Leakage Current	Rated voltage(V)	6.3 ~ 100 <span style="float: right;">160 ~ 450</span>																																
	Leakage current	After 1 minute's application of rated voltage, leakage current is not more than 0.03CV or 4(µA), whichever is greater. After 2 minutes' application of rated voltage, leakage current is not more than 0.01CV or 3(µA), whichever is greater. <span style="float: right;">CV ≤ 1000:I=0.1CV + 40(µA)max. (1 minute's) CV &gt; 1000:I=0.04CV + 100(µA)max. (1 minute's)</span>																																
tan δ	For capacitance of more than 1000µF, add 0.02 for every increase of 1000µF. Measurement frequency : 120Hz, Temperature : 20°C																																	
	Rated voltage(V)	<table border="1" style="width: 100%; text-align: center; font-size: x-small;"> <tr> <td>6.3</td><td>10</td><td>16</td><td>25</td><td>35</td><td>50</td><td>63</td><td>100</td><td>160 ~ 250</td><td>315 • 350</td><td>400 • 450</td> </tr> <tr> <td colspan="11">tan δ (MAX.)</td> </tr> <tr> <td>0.26</td><td>0.22</td><td>0.18</td><td>0.16</td><td>0.13</td><td>0.10</td><td>0.09</td><td>0.08</td><td>0.15</td><td>0.20</td><td>0.25</td> </tr> </table>	6.3	10	16	25	35	50	63	100	160 ~ 250	315 • 350	400 • 450	tan δ (MAX.)											0.26	0.22	0.18	0.16	0.13	0.10	0.09	0.08	0.15	0.20
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0.26	0.22	0.18	0.16	0.13	0.10	0.09	0.08	0.15	0.20	0.25																								
Stability at Low Temperature	Measurement frequency : 120Hz																																	
	<table border="1" style="width: 100%; text-align: center; font-size: x-small;"> <tr> <td colspan="2">Rated voltage(V)</td> <td>6.3</td><td>10</td><td>16</td><td>25 ~</td><td>160 • 200</td><td>250</td><td>315 • 350</td><td>400</td><td>450</td> </tr> <tr> <td rowspan="2">Impedance ratio ZT/Z20(MAX.)</td> <td>Z— 25°C/Z + 20°C</td> <td>4</td><td>3</td><td>2</td><td>100</td><td>3</td><td>3</td><td>4</td><td>6</td><td>15</td> </tr> <tr> <td>Z— 40°C/Z + 20°C</td> <td>8</td><td>6</td><td>4</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>—</td> </tr> </table>	Rated voltage(V)		6.3	10	16	25 ~	160 • 200	250	315 • 350	400	450	Impedance ratio ZT/Z20(MAX.)	Z— 25°C/Z + 20°C	4	3	2	100	3	3	4	6	15	Z— 40°C/Z + 20°C	8	6	4	2	4	6	8	10	—	
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Endurance	After an application of D.C. bias voltage plus the rated ripple current for 2000 hours(1000 hours for D=8 or less)at 105°C the peak voltage shall not exceed the rated D.C. voltage, capacitors meet the characteristics requirements listed at right.																																	
		<table border="1" style="width: 100%; text-align: center; font-size: x-small;"> <tr> <td>Capacitance change</td><td>Within ±20% of initial value</td> </tr> <tr> <td>tan δ</td><td>200% or less of initial specified value</td> </tr> <tr> <td>Leakage current</td><td>Initial specified value or less</td> </tr> </table>	Capacitance change	Within ±20% of initial value	tan δ	200% or less of initial specified value	Leakage current	Initial specified value or less																										
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Leakage current	Initial specified value or less																																	
Shelf Life	After leaving capacitors under no load at 105°C for 1000 hours, they meet the specified value for endurance characteristics listed above.																																	
Marking	Printed with white color letter on dark brown sleeve.																																	

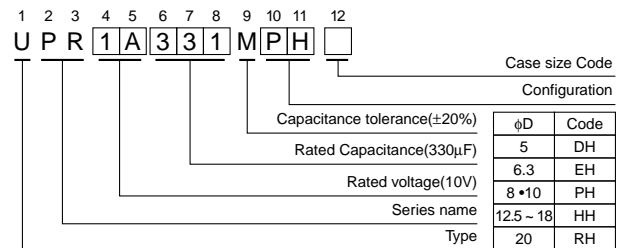
## Radial Lead Type



φD	5	6.3	8	10	12.5	16	18	20
P	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0
φd	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0

α	(L < 20)	1.5
	(L ≥ 20)	2.0

## Type numbering system (Example : 10V 330µF)



Please refer to page 18, 19, 20 about the formed or taped product spec.  
 Please refer to page 3 for the minimum order quantity.

■ Dimension table in next page.

## Standard ratings

V(Code)		6.3(0J)			10(1A)			16(1C)			25(1E)		
Cap.(μF)	Item	Case size	Impedance	Rated ripple	Case size	Impedance	Rated ripple	Case size	Impedance	Rated ripple	Case size	Impedance	Rated ripple
	Code												
4.7	4R7										5×11	5.00	24
10	100							5×11	2.80	35	5×11	2.80	39
22	220	5×11	2.40	34	5×11	2.40	45	5×11	2.40	55	5×11	2.40	60
33	330	5×11	2.30	50	5×11	2.30	60	5×11	2.30	70	5×11	2.20	75
47	470	5×11	2.10	65	5×11	2.10	75	5×11	1.80	85	5×11	1.60	90
100	101	5×11	1.90	100	5×11	1.80	110	6.3×11	0.80	135	6.3×11	0.62	145
220	221	6.3×11	0.67	165	6.3×11	0.58	180	8×11.5	0.36	235	8×11.5	0.35	250
330	331	6.3×11	0.48	200	8×11.5	0.36	255	8×11.5	0.32	285	10×12.5	0.22	355
470	471	8×11.5	0.31	280	8×11.5	0.26	305	10×12.5	0.20	395	10×16	0.16	470
1000	102	10×12.5	0.22	470	10×16	0.14	570	10×20	0.12	700	12.5×20	0.10	855
2200	222	12.5×20	0.096	930	12.5×20	0.090	1010	12.5×25	0.067	1150	16×25	0.053	1230
3300	332	12.5×20	0.090	1100	12.5×25	0.074	1220	16×25	0.052	1350	16×31.5	0.045	1450
4700	472	16×25	0.061	1320	16×25	0.054	1410	16×31.5	0.045	1560	●18×35.5	0.040	1660
6800	682	16×25	0.056	1490	16×31.5	0.046	1610	●18×35.5	0.040	1750	20×40	0.030	2070
10000	103	16×31.5	0.051	1830	●18×35.5	0.038	1980	△18×40	0.035	2170			
15000	153	●18×35.5	0.039	2280	△18×40	0.033	2470						
22000	223	20×40	0.030	2860									

V(Code)		35(1V)			50(1H)			63(1J)			100(2A)		
Cap.(μF)	Item	Case size	Impedance	Rated ripple	Case size	Impedance	Rated ripple	Case size	Impedance	Rated ripple	Case size	Impedance	Rated ripple
	Code												
0.47	R47				5×11	47.0	7				5×11	43.0	10
1	010				5×11	22.0	12				5×11	20.0	15
2.2	2R2				5×11	10.0	18				5×11	9.80	22
3.3	3R3				5×11	6.70	25				5×11	6.60	29
4.7	4R7	5×11	5.00	27	5×11	4.70	30	5×11	4.70	34	5×11	4.60	37
10	100	5×11	2.80	44	5×11	2.20	50	5×11	2.10	55	6.3×11	1.80	65
22	220	5×11	2.30	65	5×11	1.90	75	6.3×11	0.98	90	8×11.5	0.68	115
33	330	5×11	1.90	85	6.3×11	0.84	105	6.3×11	0.71	110	10×12.5	0.46	160
47	470	6.3×11	1.00	115	6.3×11	0.80	125	8×11.5	0.65	155	10×16	0.37	210
100	101	8×11.5	0.50	190	8×11.5	0.45	210	10×12.5	0.31	260	12.5×20	0.18	385
220	221	10×12.5	0.24	325	10×16	0.21	400	10×20	0.20	465	16×25	0.10	590
330	331	10×16	0.20	440	10×20	0.19	535	12.5×20	0.12	650	16×25	0.090	720
470	471	10×20	0.12	580	12.5×20	0.10	730	12.5×25	0.081	800	16×31.5	0.076	875
1000	102	12.5×25	0.067	995	16×25	0.053	1110	16×31.5	0.049	1200	△18×40	0.047	1320
2200	222	16×31.5	0.044	1450	●18×35.5	0.037	1530	△18×40	0.032	1840			
3300	332	●18×35.5	0.038	1660	20×40	0.028	1950						
4700	472	△18×40	0.033	2030									

Case size : D × L(mm) MAX. Impedance : (Ω) at 20°C 100kHz Rated ripple : (mA) at 105°C 120Hz

V		160		200		250		315		350		400		450	
Cap.(μF)	Code	2 C		2 D		2 E		2 F		2 V		2 G		2 W	
	0.47	R47	6.3×11	12	6.3×11	12	6.3×11	12	8×11.5	11	8×11.5	11			
1	010	6.3×11	17	6.3×11	17	6.3×11	17	8×11.5	16	10×12.5	17	10×12.5	16	10×12.5	18
2.2	2R2	6.3×11	25	6.3×11	25	8×11.5	29	10×12.5	28	10×16	31	10×16	27	10×20	29
3.3	3R3	8×11.5	36	8×11.5	36	10×12.5	42	10×12.5	34	10×16	38	10×20	36	12.5×20	41
4.7	4R7	8×11.5	43	10×12.5	50	10×12.5	50	10×16	45	10×20	49	10×20	43	12.5×20	49
10	100	10×12.5	70	10×16	80	10×20	88	10×20	72	12.5×20	82	12.5×25	72	16×25	75
22	220	10×20	130	10×20	140	12.5×25	155	12.5×25	120	16×25	130	16×25	110	16×31.5	115
33	330	12.5×20	180	12.5×25	190	12.5×25	190	16×25	155	16×31.5	160	16×31.5	140	●18×35.5	145
47	470	12.5×25	220	12.5×25	220	16×25	230	16×35.5	190	●18×35.5	200	●18×35.5	170	20×40	175
100	101	16×25	330	16×31.5	335	●18×35.5	340	△18×40	285	20×40	290				
220	221	●18×35.5	500	△18×40	515	20×40	525							Case size	Rated ripple

Rated Ripple(mA rms) at 105°C 120Hz

Size 20 × 31 is available for capacitors marked. "●"  
 Size 20 × 35 is available for capacitors marked. "△"  
 In this case, [6] will be put at 12th digit of type numbering system.

## Frequency coefficient of rated ripple current

V	Cap.(μF)	Frequency	50Hz	120Hz	300Hz	1kHz	10kHz ~
6.3 ~ 100	~ 47		0.75	1.00	1.35	1.57	2.00
	100 ~ 470		0.80	1.00	1.23	1.34	1.50
	1000 ~ 22000		0.85	1.00	1.10	1.13	1.15
160 ~ 450	0.47 ~ 220		0.80	1.00	1.25	1.40	1.60