

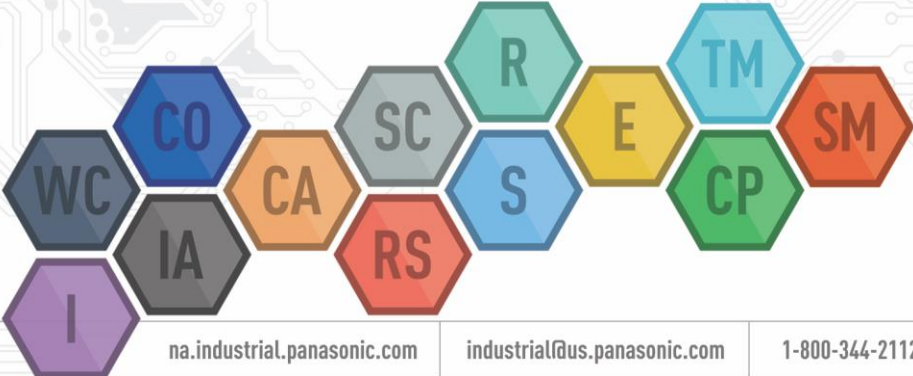
## Not Recommended for New Design: EEF-HX, CS, CT and CX Series High Voltage SP-Cap® Capacitors (10V Or Above)

NRFND.PG92.06.28.2019

06.28.2019

<b>About This Notice:</b>	High voltage SP-Cap Capacitors 10V or above in the EEF-HX, CS, CT and CX Series are now designated Not Recommended For New Design by Panasonic.
<b>Features:</b>	
<b>Effective Date:</b>	Immediate
<b>Affected Parts and/or Replacements:</b>	See Attached. Panasonic POSCAP or OS-CON Brand Capacitors can be considered design in alternatives. Please consult your local Panasonic representative for design alternative assistance.
<b>Datasheet(s):</b>	See Attached.
<b>Notes:</b>	

# Panasonic



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# Panasonic NRFND.PG92.06.28.2019 Affected Parts

## SP-CAP High Voltage

Series	Part Number	Rated Voltage	Capacitance (μF)
CS	EEF-CS1A470R	10	47
CS	EEF-CS1C150R	16	15
CS	EEF-CS1C220R	16	22
CS	EEF-CS1C330R	16	33
CS	EEF-CS1D100R	20	10
CS	EEF-CS1D150R	20	15
CS	EEF-CS1D220R	20	22
CS	EEF-CS1E100R	25	10
CS	EEF-CS1E150R	25	15
CS	EEF-CS1V100R	35	10
CT	EEF-CT1A680R	10	68
CT	EEF-CT1C470R	16	47
CT	EEF-CT1D330R	20	33
CT	EEF-CT1D470R	20	47
CT	EEF-CT1E220R	25	22
CT	EEF-CT1V150R	35	15
CX	EEF-CX1A470R	10	47
CX	EEF-CX1A680R	10	68
CX	EEF-CX1A101R	10	100
CX	EEF-CX1C150R	16	15
CX	EEF-CX1C220R	16	22
CX	EEF-CX1C330R	16	33
CX	EEF-CX1C470R	16	47
CX	EEF-CX1C680R	16	68
CX	EEF-CX1D220R	20	22
CX	EEF-CX1D330R	20	33
CX	EEF-CX1D470R	20	47
CX	EEF-CX1D560R	20	56
CX	EEF-CX1E150R	25	15
CX	EEF-CX1E220R	25	22
CX	EEF-CX1E330R	25	33
CX	EEF-CX1V150R	35	15
CX	EEF-CX1V220R	35	22
HX	EEF-HX1A470R	10	47
HX	EEF-HX1A680R	10	68
HX	EEF-HX1A101R	10	100
HX	EEF-HX1C150R	16	15

HX	EEF-HX1C220R	16	22
HX	EEF-HX1C330R	16	33
HX	EEF-HX1C470R	16	47
HX	EEF-HX1C680R	16	68
HX	EEF-HX1D220R	20	22
HX	EEF-HX1D330R	20	33
HX	EEF-HX1D470R	20	47
HX	EEF-HX1D560R	20	56
HX	EEF-HX1E150R	25	15
HX	EEF-HX1E220R	25	22
HX	EEF-HX1E330R	25	33
CT	EEF-CT1C470BR	16	47
CT	EEF-CT1V150TR	35	15
CX	EEF-CX1A101DR	10	100
CX	EEF-CX1A470DR	10	47
CX	EEF-CX1C100BR	16	10
CX	EEF-CX1C470BR	16	47
CX	EEF-CX1D680QR	20	68
CX	EEF-CX1E150KR	25	15
CX	EEF-CX1E330JR	25	33

### Surface Mount Type

Series: **CS,CT,CX**



CS, CT and CX series part numbers rated 10 V.DC or above are Not Recommended For New Design.

### SP-Cap



### Features

- High voltage (35 V.DC max.)
- Low profile (Height 1.0 mm max.)
- High ripple current (5600 mAr.m.s. max.)
- RoHS compliance, Halogen free

### Specifications

Series	CS	CT	CX	
Category temp. range	-55 °C to +105 °C			
Rated voltage range	4 V.DC to 35 V.DC		2 V.DC to 35 V.DC	
Nominal cap. range	10 µF to 120 µF	15 µF to 180 µF	15 µF to 560 µF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)			
DC leakage current	I ≤ 0.1 CV(µA) [2 V.DC to 6.3 V.DC, 2 min], I ≤ 0.3 CV(µA) [10 V.DC to 35 V.DC, 2 min]			
Dissipation factor (tan δ)	≤ 0.06 (120 Hz / + 20 °C)			
Surge voltage (V.DC)	Rated voltage × 1.25 [2 V.DC to 16 V.DC], × 1.15 [20 V.DC to 35 V.DC] (15 °C to 35 °C)			
Endurance	+105 °C ± 2 °C, 2000 h, rated voltage applied			
	Capacitance change	Within ±20 % of the initial value		
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	≤ 3 times of the initial limit : 2 V.DC to 6.3 V.DC Within the initial limit : 10 V.DC to 35 V.DC		
Damp heat (Steady state)	+60 °C, 90 %, 500 h, No-applied voltage			
	Capacitance change of initial measured value	2 V.DC to 2.5 V.DC +70 %, -20 %	4 V.DC, 10 V.DC to 35 V.DC +60 %, -20 %	6.3 V.DC +50 %, -20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit		
	DC leakage current	Within the initial limit : 2 V.DC to 6.3 V.DC ≤ 3 times of the initial limit : 10 V.DC to 35 V.DC		

### Marking

Capacitance      Polarity bar (Positive)

Lot No.      R. voltage code

R. voltage code		Unit : V.DC	
d	2	C	16
e	2.5	D	20
g	4	E	25
j	6.3	V	35
A	10		

### Dimensions (not to scale)

Series	L±0.2	W1±0.2	W2±0.1	H±0.1	P±0.3
CS	7.3	4.3	2.4	1.1	1.3
CT	7.3	4.3	2.4	1.4	1.3
CX	7.3	4.3	2.4	1.9	1.3

Unit : mm

\* Externals of figure are the reference.

### Characteristics list

#### ■ 2 V.DC to 6.3 V.DC

Reflow<sup>\*3</sup> <Standard>

Series	Rated volt. (V.DC)	Cap. (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty <sup>*4</sup> (pcs)
			L	W	H	Ripple current <sup>*1</sup> (mAr.m.s.)	ESR <sup>*2</sup> (mΩ max.)		
CS	4	120	7.3	4.3	1.1	5100	15	EEFCS0G121R	3500
	6.3	68	7.3	4.3	1.1	5100	15	EEFCS0J680R	3500
CT	4	180	7.3	4.3	1.4	5100	15	EEFCT0G181R	3500
	6.3	100	7.3	4.3	1.4	5100	15	EEFCT0J101R	3500
CX	2	220	7.3	4.3	1.9	5100	15	EEFCX0D221R	3500
		270	7.3	4.3	1.9	5600	12	EEFCX0D271XR	3500
		330	7.3	4.3	1.9	5100	15	EEFCX0D331R	3500
			7.3	4.3	1.9	5600	12	EEFCX0D331XR	3500
		390	7.3	4.3	1.9	5100	15	EEFCX0D391R	3500
		470	7.3	4.3	1.9	5100	15	EEFCX0D471R	3500
		560	7.3	4.3	1.9	5100	15	EEFCX0D561R	3500
	2.5	220	7.3	4.3	1.9	5100	15	EEFCX0E221R	3500
		330	7.3	4.3	1.9	5100	15	EEFCX0E331R	3500
		390	7.3	4.3	1.9	5100	15	EEFCX0E391R	3500
		470	7.3	4.3	1.9	5100	15	EEFCX0E471R	3500
	4	150	7.3	4.3	1.9	5100	15	EEFCX0G151R	3500
		180	7.3	4.3	1.9	5100	15	EEFCX0G181R	3500
			7.3	4.3	1.9	5600	12	EEFCX0G181XR	3500
		220	7.3	4.3	1.9	5100	15	EEFCX0G221R	3500
			7.3	4.3	1.9	5600	12	EEFCX0G221XR	3500
		270	7.3	4.3	1.9	5100	15	EEFCX0G271R	3500
		330	7.3	4.3	1.9	5100	15	EEFCX0G331R	3500
	6.3	100	7.3	4.3	1.9	5100	15	EEFCX0J101R	3500
		120	7.3	4.3	1.9	5100	15	EEFCX0J121R	3500
		150	7.3	4.3	1.9	5100	15	EEFCX0J151R	3500
			7.3	4.3	1.9	5600	12	EEFCX0J151XR	3500
		180	7.3	4.3	1.9	5100	15	EEFCX0J181R	3500
		220	7.3	4.3	1.9	5100	15	EEFCX0J221R	3500

\*1: Ripple current (100 kHz / +45 °C)

\*2: ESR (100 kHz / +20 °C)

\*3: Please refer to the page of "Mounting Specifications".

\*4: Please contact us when 500 pcs packing is necessary.

◆ Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

### Temperature compensation multipliers for ripple current

Temperature	T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
2 V.DC to 6.3 V.DC	1.0	0.7	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

### Characteristics list

■ 10 V.DC to 35 V.DC

**Not Recommended for New Design**

Reflow\*<sup>3</sup> <Standard>

Series	Rated volt. (V.DC)	Cap. (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty* <sup>4</sup> (pcs)
			L	W	H	Ripple current* <sup>1</sup> (mAr.m.s.)	ESR* <sup>2</sup> (mΩ max.)		
CS	10	47	7.3	4.3	1.1	3200	40	EEFCS1A470R	3500
		15	7.3	4.3	1.1	3200	40	EEFCS1C150R	3500
	16	22	7.3	4.3	1.1	3200	40	EEFCS1C220R	3500
		33	7.3	4.3	1.1	3200	40	EEFCS1C330R	3500
	20	10	7.3	4.3	1.1	3200	40	EEFCS1D100R	3500
		15	7.3	4.3	1.1	3200	40	EEFCS1D150R	3500
		22	7.3	4.3	1.1	3200	40	EEFCS1D220R	3500
	25	10	7.3	4.3	1.1	3200	40	EEFCS1E100R	3500
		15	7.3	4.3	1.1	3200	40	EEFCS1E150R	3500
	35	10	7.3	4.3	1.1	3200	40	EEFCS1V100R	3500
CT	10	68	7.3	4.3	1.4	3200	40	EEFCT1A680R	3500
	16	47	7.3	4.3	1.4	3200	40	EEFCT1C470R	3500
	20	33	7.3	4.3	1.4	3200	40	EEFCT1D330R	3500
		47	7.3	4.3	1.4	3200	40	EEFCT1D470R	3500
	25	22	7.3	4.3	1.4	3200	40	EEFCT1E220R	3500
	35	15	7.3	4.3	1.4	3200	40	EEFCT1V150R	3500
CX	10	47	7.3	4.3	1.9	3200	40	EEFCX1A470R	3500
		68	7.3	4.3	1.9	3200	40	EEFCX1A680R	3500
		100	7.3	4.3	1.9	3200	40	EEFCX1A101R	3500
	16	15	7.3	4.3	1.9	3200	40	EEFCX1C150R	3500
		22	7.3	4.3	1.9	3200	40	EEFCX1C220R	3500
		33	7.3	4.3	1.9	3200	40	EEFCX1C330R	3500
		47	7.3	4.3	1.9	3200	40	EEFCX1C470R	3500
		68	7.3	4.3	1.9	3200	40	EEFCX1C680R	3500
	20	22	7.3	4.3	1.9	3200	40	EEFCX1D220R	3500
		33	7.3	4.3	1.9	3200	40	EEFCX1D330R	3500
		47	7.3	4.3	1.9	3200	40	EEFCX1D470R	3500
		56	7.3	4.3	1.9	3200	40	EEFCX1D560R	3500
	25	15	7.3	4.3	1.9	3200	40	EEFCX1E150R	3500
		22	7.3	4.3	1.9	3200	40	EEFCX1E220R	3500
		33	7.3	4.3	1.9	3200	40	EEFCX1E330R	3500
	35	15	7.3	4.3	1.9	3200	40	EEFCX1V150R	3500
		22	7.3	4.3	1.9	3200	40	EEFCX1V220R	3500

\*1: Ripple current (100 kHz / +45 °C)

\*2: ESR (100 kHz / +20 °C)

\*3: Please refer to the page of "Mounting Specifications".

\*4: Please contact us when 500 pcs packing is necessary.

◆ Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

### Temperature compensation multipliers for ripple current

Temperature	T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
10 V.DC to 35 V.DC	1.0	0.8	0.5

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

## Guidelines and precautions regarding the technical information and use of our products described in this online catalog.

- If you want to use our products described in this online catalog for applications requiring special qualities or reliability, or for applications where the failure or malfunction of the products may directly jeopardize human life or potentially cause personal injury (e.g. aircraft and aerospace equipment, traffic and transportation equipment, combustion equipment, medical equipment, accident prevention, anti-crime equipment, and/or safety equipment), it is necessary to verify whether the specifications of our products fit to such applications. Please ensure that you will ask and check with our inquiry desk as to whether the specifications of our products fit to such applications use before you use our products.
- The quality and performance of our products as described in this online catalog only apply to our products when used in isolation. Therefore, please ensure you evaluate and verify our products under the specific circumstances in which our products are assembled in your own products and in which our products will actually be used.
- If you use our products in equipment that requires a high degree of reliability, regardless of the application, it is recommended that you set up protection circuits and redundancy circuits in order to ensure safety of your equipment.
- The products and product specifications described in this online catalog are subject to change for improvement without prior notice. Therefore, please be sure to request and confirm the latest product specifications which explain the specifications of our products in detail, before you finalize the design of your applications, purchase, or use our products.
- The technical information in this online catalog provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.
- If any of our products, product specifications and/or technical information in this online catalog is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially with regard to security and export control, shall be observed.

## <Regarding the Certificate of Compliance with the EU RoHS Directive/REACH Regulations>

- The switchover date for compliance with the RoHS Directive/REACH Regulations varies depending on the part number or series of our products.
- When you use the inventory of our products for which it is unclear whether those products are compliant with the RoHS Directive/REACH Regulation, please select "Sales Inquiry" in the website inquiry form and contact us.

**We do not take any responsibility for the use of our products outside the scope of the specifications, descriptions, guidelines and precautions described in this online catalog.**

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### Surface Mount Type

Series: **HX (Guaranteed at 125 °C)**

**!** HX series part numbers rated 10 V.DC or above are Not Recommended For New Design.



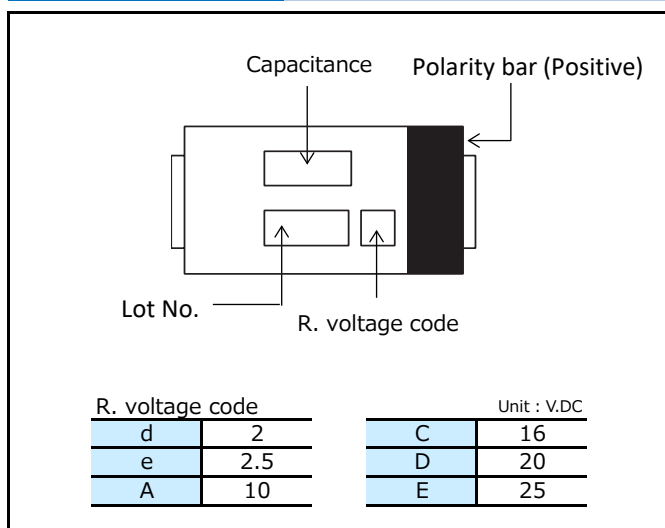
#### Features

- Endurance 125 °C 1000 h
- High voltage & Large capacitance (2 V.DC 560 μF to 25 V.DC 33 μF)
- Low ESR (4.5 mΩ max.)
- RoHS compliance, Halogen free

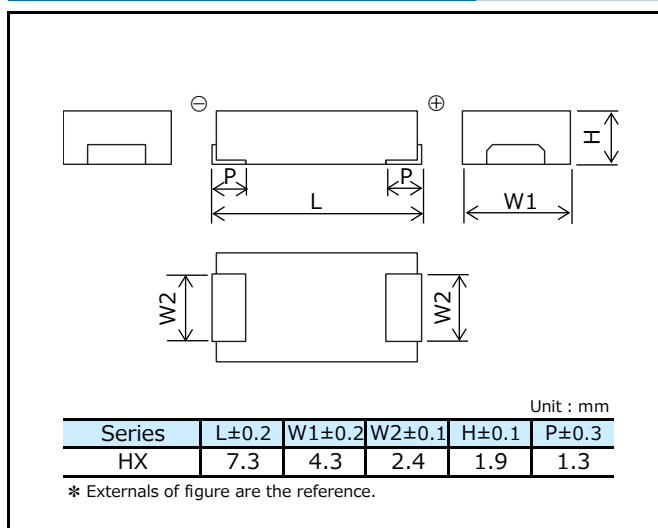
#### Specifications

Series	HX	
Category temp. range	-55 °C to +125 °C	
Rated voltage range	2 V.DC to 2.5 V.DC, 10 V.DC to 25 V.DC	
Category voltage range	1.6 V.DC to 2 V.DC, 8 V.DC to 20 V.DC	
Nominal cap. range	15 μF to 560 μF	
Capacitance tolerance	±20 % (120 Hz / +20 °C)	
DC leakage current	I ≤ 0.1 CV(μA) [2 V.DC to 2.5 V.DC, 2 min], I ≤ 0.3 CV(μA) [10 V.DC to 25 V.DC, 2 min]	
Dissipation factor (tan δ)	≤ 0.1 (120 Hz / +20 °C)	
Surge voltage (V.DC)	Rated voltage × 1.25 [2 V.DC to 16 V.DC], × 1.15 [20 V.DC to 25 V.DC] (15 °C to 35 °C)	
Endurance	+125 °C ± 2 °C, 1000 h, category voltage applied	
	Capacitance change	Within ±20 % of the initial value
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	Within the initial limit
Damp heat (Steady state)	After storing for 500 hours at +60 °C, 90 %	
	Capacitance change of initial measurd value	2 V.DC to 2.5 V.DC: +70 %, -20 % 10 V.DC to 25 V.DC: +60 %, -20 %
	Dissipation factor (tan δ)	≤ 2 times of the initial limit
	DC leakage current	Within the initial limit : 2 V.DC to 2.5 V.DC ≤ 3 times of the initial limit : 10 V.DC to 25 V.DC

#### Marking



#### Dimensions (not to scale)



### Characteristics list

#### ■ 2 V.DC to 2.5 V.DC

Reflow\*<sup>3</sup> <Standard>

Series	Rated volt. [105 °C] (V.DC)	Category volt. [125 °C] (V.DC)	Cap. (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty* <sup>4</sup> (pcs)
				L	W	H	Ripple current* <sup>1</sup> (mAr.m.s.)	ESR* <sup>2</sup> (mΩ max.)		
HX	2	1.6	470	7.3	4.3	1.9	5100	15	EEFHX0D471R	3500
				7.3	4.3	1.9	6300	9	EEFHX0D471R9	3500
				7.3	4.3	1.9	7500	6	EEFHX0D471R6	3500
				7.3	4.3	1.9	8500	4.5	EEFHX0D471R4	3500
			560	7.3	4.3	1.9	5100	15	EEFHX0D561R	3500
				7.3	4.3	1.9	8500	4.5	EEFHX0D561R4	3500
	2.5	2	330	7.3	4.3	1.9	5100	15	EEFHX0E331R	3500
				7.3	4.3	1.9	6300	9	EEFHX0E331R9	3500
				7.3	4.3	1.9	7500	6	EEFHX0E331R6	3500
				7.3	4.3	1.9	8500	4.5	EEFHX0E331R4	3500
			470	7.3	4.3	1.9	5100	15	EEFHX0E471R	3500
				7.3	4.3	1.9	6300	9	EEFHX0E471R9	3500
				7.3	4.3	1.9	7500	6	EEFHX0E471R6	3500
				7.3	4.3	1.9	8500	4.5	EEFHX0E471R4	3500

#### ■ 10 V.DC to 25 V.DC

**Not Recommended for New Design**

Reflow\*<sup>3</sup> <Standard>

Series	Rated volt. [105 °C] (V.DC)	Category volt. [125 °C] (V.DC)	Cap. (μF)	Case size (mm)			Specification		Part number	Min. Packaging Q'ty* <sup>4</sup> (pcs)
				L	W	H	Ripple current* <sup>1</sup> (mAr.m.s.)	ESR* <sup>2</sup> (mΩ max.)		
HX	10	8	47	7.3	4.3	1.9	3200	40	EEFHX1A470R	3500
			68	7.3	4.3	1.9	3200	40	EEFHX1A680R	3500
			100	7.3	4.3	1.9	3200	40	EEFHX1A101R	3500
	16	12.8	15	7.3	4.3	1.9	3200	40	EEFHX1C150R	3500
			22	7.3	4.3	1.9	3200	40	EEFHX1C220R	3500
			33	7.3	4.3	1.9	3200	40	EEFHX1C330R	3500
			47	7.3	4.3	1.9	3200	40	EEFHX1C470R	3500
			68	7.3	4.3	1.9	3200	40	EEFHX1C680R	3500
			20	7.3	4.3	1.9	3200	40	EEFHX1D220R	3500
	20	16	33	7.3	4.3	1.9	3200	40	EEFHX1D330R	3500
			47	7.3	4.3	1.9	3200	40	EEFHX1D470R	3500
			56	7.3	4.3	1.9	3200	40	EEFHX1D560R	3500
			15	7.3	4.3	1.9	3200	40	EEFHX1E150R	3500
	25	20	22	7.3	4.3	1.9	3200	40	EEFHX1E220R	3500
			33	7.3	4.3	1.9	3200	40	EEFHX1E330R	3500

\*1: Ripple current (100 kHz / +45 °C)

\*2: ESR (100 kHz / +20 °C)

\*3: Please refer to the page of "Mounting Specifications".

\*4: Please contact us when 500 pcs packing is necessary.

◆ Please refer to each page in this catalog for "Reflow conditions" and "Taping specifications".

### Temperature compensation multipliers for ripple current

Temperature	T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C	105 °C < T ≤ 125 °C
2 V.DC to 2.5 V.DC	1.0	0.7	0.25	0.25
10 V.DC to 25 V.DC	1.0	0.8	0.5	0.25

◆ Ripple current should be controlled so that surface temperature of capacitor does not exceed the category temperature.

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- The technical information in this online catalog provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.
- If any of our products, product specifications and/or technical information in this online catalog is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially with regard to security and export control, shall be observed.

## <Regarding the Certificate of Compliance with the EU RoHS Directive/REACH Regulations>

- The switchover date for compliance with the RoHS Directive/REACH Regulations varies depending on the part number or series of our products.
- When you use the inventory of our products for which it is unclear whether those products are compliant with the RoHS Directive/REACH Regulation, please select "Sales Inquiry" in the website inquiry form and contact us.

**We do not take any responsibility for the use of our products outside the scope of the specifications, descriptions, guidelines and precautions described in this online catalog.**

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