

## Not Recommended for New Design: EEF-SX Series SP-Cap Specialty Polymer Aluminum Capacitors

NRFND.PG92.01.24.2019

01.24.2019

<b>About This Notice:</b>	Due to the market requirement of Pb free soldering, Panasonic has developed parts that can be used at high reflow temperature (260°C). As Panasonic has compatible replacements and is working towards the standardization of the SP-Cap Series line-ups, the EEF-SX Series SP-Caps at 240°C are now Not Recommended for New Design.
<b>Features:</b>	
<b>Effective Date:</b>	Immediate
<b>Affected Parts and/or Replacements:</b>	See attached.
<b>Datasheet(s):</b>	See attached.
<b>Notes:</b>	

# Panasonic NRFND.PG92.01.24.2019 Affected Parts

EEF-SX0D181R  
 EEF-SX0D221R  
 EEF-SX0D271R  
 EEF-SX0D271XR  
 EEF-SX0D331R  
 EEF-SX0D331XR  
 EEF-SX0D391R  
 EEF-SX0D391XR  
 EEF-SX0D471R  
 EEF-SX0D471XR  
 EEF-SX0E151R  
 EEF-SX0E181R  
 EEF-SX0E221R  
 EEF-SX0E331R  
 EEF-SX0E331XR  
 EEF-SX0E391R  
 EEF-SX0E391XR  
 EEF-SX0G820R  
 EEF-SX0G101R

## Recommended Replacement Parts

Rated Rated Voltage (V)	Cap. ( $\mu$ F) $\pm 20\%$ at 120Hz	Reflow: 240degC peak					Ripple Current (A[rms]) max. at 100kHz	Part number
		Part number	$\tan\delta$ max. at 120Hz	L.C. ( $\mu$ A) max. at R.V. 2min	ESR (m $\Omega$ ) max. at 100kHz	Part number		
2	180	EEF-SX0D181R	0.06	21.6	9	3.0	EEF-SX0D181ER	
	220	EEF-SX0D221R	0.06	26.4	9	3.0	EEF-SX0D221ER	
	270	EEF-SX0D271R	0.06	32.4	9	3.0	EEF-SX0D271ER	
	270	EEF-SX0D271XR	0.06	32.4	6	3.5	EEF-SX0D271XE	
	330	EEF-SX0D331R	0.06	39.6	9	3.0	EEF-SX0D331ER	
	330	EEF-SX0D331XR	0.06	39.6	6	3.5	EEF-SX0D331XE	
	390	EEF-SX0D391R	0.06	46.8	9	3.0	EEF-SX0D391ER	
	390	EEF-SX0D391XR	0.06	46.8	6	3.5	EEF-SX0D391XE	
	470	EEF-SX0D471R	0.06	56.4	9	3.0	EEF-SX0D471ER	
	470	EEF-SX0D471XR	0.06	56.4	6	3.5	EEF-SX0D471XE	
2.5	150	EEF-SX0E151R	0.06	22.5	9	3.0	EEF-SX0E151ER	
	180	EEF-SX0E181R	0.06	27.0	9	3.0	EEF-SX0E181ER	
	220	EEF-SX0E221R	0.06	33.0	9	3.0	EEF-SX0E221ER	
	330	EEF-SX0E331R	0.06	49.5	9	3.0	EEF-SX0E331ER	
	330	EEF-SX0E331XR	0.06	49.5	6	3.5	EEF-SX0E331XE	
	390	EEF-SX0E391R	0.06	58.5	9	3.0	EEF-SX0E391ER	
	390	EEF-SX0E391XR	0.06	58.5	6	3.5	EEF-SX0E391XE	
4	82	EEF-SX0G820R	0.06	19.7	9	3.0	EEF-SX0G820ER	
	100	EEF-SX0G101R	0.06	24.0	9	3.0	EEF-SX0G101ER	

Flow: 260degC peak

tanδ max. at 120Hz	L.C. (μA) max. at R.V. 2min	ESR (mΩ) max. at 100kHz	Ripple Current (A[rms]) max. at 100kHz
0.06	36.0	9	3.0
0.06	44.0	9	3.0
0.06	54.0	9	3.0
0.06	54.0	6	3.5
0.06	66.0	9	3.0
0.06	66.0	6	3.5
0.06	78.0	9	3.0
0.06	78.0	6	3.5
0.06	94.0	9	3.0
0.06	94.0	6	3.5
0.06	37.5	9	3.0
0.06	45.0	9	3.0
0.06	55.0	9	3.0
0.06	82.5	9	3.0
0.06	82.5	6	3.5
0.06	97.5	9	3.0
0.06	97.5	6	3.5
0.06	32.8	9	3.0
0.06	40.0	9	3.0

Surface Mount Type

## SP-Cap

Series: **S**

**Large Cap**



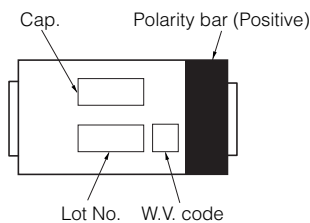
### ■ Features

- Super Low-ESR (4.5 mΩ to 9 mΩ)
- Lower ESR and Higher Capacitance at the same case size as conventional products.
- Excellent Noise-absorbent Characteristics
- High Ripple Current
- RoHS directive compliant

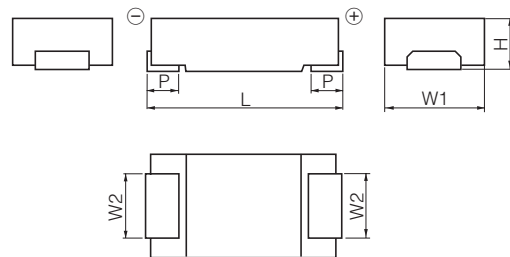
### ■ Specifications

Series & Size Code	SL		SX	
Category Temp. Range	-40 °C to +105 °C			
Rated W.V.Range	2 V.DC to 6.3 V.DC			
Nominal Cap.Range	56 μF to 220 μF		82 μF to 560 μF	
Capacitance Tolerance	±20 %			
DC Leakage Current	Reflow 240 °C : $I \leq 0.06 CV (\mu A)$ 2 minutes (2 V.DC to 4 V.DC) $I \leq 0.04 CV (\mu A)$ 2 minutes (6.3 V.DC)  Reflow 260 °C : $I \leq 0.1 CV (\mu A)$ 2 minutes			
tan δ	≤ 0.06 (120 Hz/+20 °C)			
Surge Voltage	Rated Working Voltage × 1.25 (15 °C to 35 °C)			
Endurance	After applying rated working voltage for 1000 hours at 105 °C±2 °C, and then being stabilized at +20 °C, capacitor shall meet the following limits.			
	Capacitance change	±10% of initial measured value		
	tan δ	≤ Initial specified value		
	DC leakage current	≤ Initial specified value		
Moisture resistance	After storing for 500 hours at 60 °C, 90 %			
	Capacitance change of initial measured value	2, 2.5 V.DC	4 V.DC	6.3 V.DC
		+70, -20 %	+60, -20 %	+50, -20 %
	tan δ	≤ 200 % of initial specified value		
	DC leakage current	≤ Initial specified value		

### ■ Marking



### ■ Dimensions in mm(not to scale)



Series & Size Code	(mm)				
	L±0.2	W1±0.2	W2±0.1	H	P±0.3
SL	7.3	4.3	2.4	1.8±0.1	1.3
SX	7.3	4.3	2.4	1.9±0.2	1.3

\* Externals of figure are the reference.

■ Low ESR Products

Series & Size Code	Rated W.V. (V.DC)	Capacitance (±20%) (μF)	Case Size			Specification		Part number		Min. Packaging Q'ty (pcs)	
			L (mm)	W (mm)	H (mm)	Ripple current*1 (Ar.m.s.)	ESR*2 (mΩ max.)	Reflow condition : 240 °C	Reflow condition : 260 °C [Proposal]		
SL	2	100	7.3	4.3	1.8	3.0	9	EEFSL0D101R	EEFSL0D101ER	3500	
		120	7.3	4.3	1.8	3.0	9	EEFSL0D121R	EEFSL0D121ER	3500	
		150	7.3	4.3	1.8	3.0	9	EEFSL0D151R	EEFSL0D151ER	3500	
		180	7.3	4.3	1.8	3.0	9	EEFSL0D181R	EEFSL0D181ER	3500	
		220	7.3	4.3	1.8	3.0	9	EEFSL0D221R	EEFSL0D221ER	3500	
	2.5	100	7.3	4.3	1.8	3.0	9	EEFSL0E101R	EEFSL0E101ER	3500	
		120	7.3	4.3	1.8	3.0	9	EEFSL0E121R	EEFSL0E121ER	3500	
		150	7.3	4.3	1.8	3.0	9	EEFSL0E151R	EEFSL0E151ER	3500	
	4	82	7.3	4.3	1.8	3.0	9	EEFSL0G820R	EEFSL0G820ER	3500	
	6.3	56	7.3	4.3	1.8	3.0	9	EEFSL0J560R	—	3500	
SX	2	180	7.3	4.3	1.9	3.0	9	EEFSX0D181R	EEFSX0D181ER	3500	
		220	7.3	4.3	1.9	3.0	9	EEFSX0D221R	EEFSX0D221ER	3500	
		270	7.3	4.3	1.9	3.0	9	EEFSX0D271R	EEFSX0D271ER	3500	
			7.3	4.3	1.9	3.5	6	EEFSX0D271XR	EEFSX0D271XE	3500	
		330	7.3	4.3	1.9	3.8	4.5	—	EEFSX0D271E4	3500	
			7.3	4.3	1.9	3.0	9	EEFSX0D331R	EEFSX0D331ER	3500	
			7.3	4.3	1.9	3.5	6	EEFSX0D331XR	EEFSX0D331XE	3500	
		390	7.3	4.3	1.9	3.8	4.5	—	EEFSX0D331E4	3500	
			7.3	4.3	1.9	3.0	9	EEFSX0D391R	EEFSX0D391ER	3500	
			7.3	4.3	1.9	3.5	6	EEFSX0D391XR	EEFSX0D391XE	3500	
		470	7.3	4.3	1.9	3.8	4.5	—	EEFSX0D391E4	3500	
			7.3	4.3	1.9	3.0	9	EEFSX0D471R	EEFSX0D471ER	3500	
			7.3	4.3	1.9	3.5	6	EEFSX0D471XR	EEFSX0D471XE	3500	
		2.5	560	7.3	4.3	1.9	3.8	4.5	—	EEFSX0D471E4	3500
			150	7.3	4.3	1.9	3.0	9	EEFSX0E151R	EEFSX0E151ER	3500
	180		7.3	4.3	1.9	3.0	9	EEFSX0E181R	EEFSX0E181ER	3500	
	220		7.3	4.3	1.9	3.0	9	EEFSX0E221R	EEFSX0E221ER	3500	
			7.3	4.3	1.9	3.5	7	—	EEFSX0E221E7	3500	
	330		270	7.3	4.3	1.9	3.5	7	—	EEFSX0E271E7	3500
			7.3	4.3	1.9	3.0	9	EEFSX0E331R	EEFSX0E331ER	3500	
			7.3	4.3	1.9	3.5	6	EEFSX0E331XR	EEFSX0E331XE	3500	
	390		7.3	4.3	1.9	3.8	4.5	—	EEFSX0E331E4	3500	
			7.3	4.3	1.9	3.0	9	EEFSX0E391R	EEFSX0E391ER	3500	
			7.3	4.3	1.9	3.5	6	EEFSX0E391XR	EEFSX0E391XE	3500	
	470		7.3	4.3	1.9	3.8	4.5	—	EEFSX0E391E4	3500	
			7.3	4.3	1.9	3.0	9	—	EEFSX0E471ER	3500	
			7.3	4.3	1.9	3.5	6	—	EEFSX0E471XE	3500	
	4		7.3	4.3	1.9	3.8	4.5	—	EEFSX0E471E4	3500	
		82	7.3	4.3	1.9	3.0	9	EEFSX0G820R	EEFSX0G820ER	3500	
			7.3	4.3	1.9	3.0	9	EEFSX0G101R	EEFSX0G101ER	3500	
		150	7.3	4.3	1.9	3.0	9	—	EEFSX0G151ER	3500	
			7.3	4.3	1.9	3.5	7	—	EEFSX0G151E7	3500	
		180	7.3	4.3	1.9	3.0	9	—	EEFSX0G181ER	3500	
		220	7.3	4.3	1.9	3.0	9	—	EEFSX0G221ER	3500	
		6.3	120	7.3	4.3	1.9	3.5	7	—	EEFSX0J121E7	3500
			150	7.3	4.3	1.9	3.0	9	—	EEFSX0J151ER	3500

\*1: Ripple current (100 kHz/ +20 to +105 °C), \*2: ESR (100 kHz/+20 °C)

\*3: Please confirm EE25 in detail of the Mounting Specifications.

## Surface Mount Type **SP-Cap**

Series : **SX (Low ESR Products)**



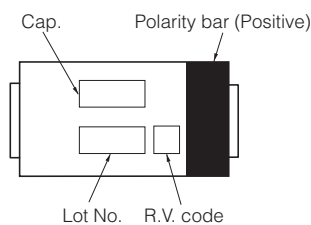
### Features

- Large capacitance (560  $\mu\text{F}$  max.)
- Low ESR (4.5  $\text{m}\Omega$  to 9  $\text{m}\Omega$ )
- High ripple current (8500  $\text{mAr.m.s.}$  max.)
- RoHS compliance, Halogen free

### Specifications

Series	SX			
Category temp. range	-55 °C to +105 °C			
Rated voltage range	2 V.DC to 6.3 V.DC			
Nominal cap.range	82 $\mu\text{F}$ to 560 $\mu\text{F}$			
Capacitance tolerance	$\pm 20\%$ (120 Hz/+20 °C)			
DC leakage current	$I \leq 0.1 \text{ CV}$ ( $\mu\text{A}$ ) 2 minutes			
Dissipation factor ( $\tan \delta$ )	$\leq 0.06$ (120 Hz/+20 °C)			
Surge voltage (V.DC)	Rated voltage $\times 1.25$ (15 °C to 35 °C)			
Endurance	+105 °C, 2000 h, rated voltage applied			
	Capacitance change	Within $\pm 20\%$ of the initial value		
	$\tan \delta$	$\leq 2$ times of the initial limit		
	DC leakage current	$\leq 3$ times of the initial limit		
Damp heat (Steady state)	+60 °C, 90 %, 500 h, No-applied voltage			
	Capacitance change of initial measurd value	2 to 2.5 V.DC	4 V.DC	6.3 V.DC
		+70 %, -20 %	+60 %, -20 %	+50 %, -20 %
	$\tan \delta$	$\leq 2$ times of the initial limit		
DC leakage current	Within the initial limit			

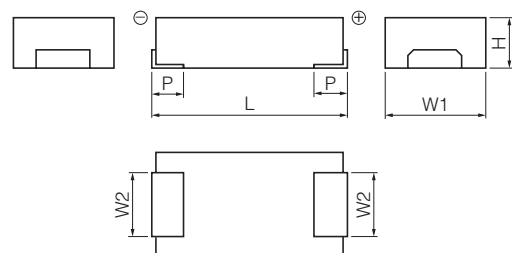
### Marking



Rated voltage mark

d	2 V.DC
e	2.5 V.DC
g	4 V.DC
j	6.3 V.DC

### Dimensions (not to scale)



Unit : mm

Series	$L \pm 0.2$	$W1 \pm 0.2$	$W2 \pm 0.1$	$H \pm 0.1$	$P \pm 0.3$
SX	7.3	4.3	2.4	1.9	1.3

\* Externals of figure are the reference.

## Characteristics list

								Reflow *3	<Standard>	
Series	Rated voltage (V.DC)	Capacitance (±20%) (μF)	Case size (mm)			Specification		Part number	Min.*4 Packaging Q'ty (pcs)	
			L	W	H	*1 Ripple current (mA r.m.s.)	*2 ESR (mΩ max.)			
SX	2	180	7.3	4.3	1.9	6300	9	EEFSX0D181ER	3500	
		220	7.3	4.3	1.9	6300	9	EEFSX0D221ER	3500	
		270	7.3	4.3	1.9	6300	9	EEFSX0D271ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0D271XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0D271E4	3500	
		330	7.3	4.3	1.9	6300	9	EEFSX0D331ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0D331XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0D331E4	3500	
		390	7.3	4.3	1.9	6300	9	EEFSX0D391ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0D391XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0D391E4	3500	
		470	7.3	4.3	1.9	6300	9	EEFSX0D471ER	3500	
	7.3		4.3	1.9	7500	6	EEFSX0D471XE	3500		
	7.3		4.3	1.9	8500	4.5	EEFSX0D471E4	3500		
	560	7.3	4.3	1.9	8500	4.5	EEFSX0D561E4	3500		
	2.5	150	7.3	4.3	1.9	6300	9	EEFSX0E151ER	3500	
		180	7.3	4.3	1.9	6300	9	EEFSX0E181ER	3500	
		220	7.3	4.3	1.9	6300	9	EEFSX0E221ER	3500	
			7.3	4.3	1.9	7000	7	EEFSX0E221E7	3500	
		270	7.3	4.3	1.9	7000	7	EEFSX0E271E7	3500	
		330	7.3	4.3	1.9	6300	9	EEFSX0E331ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0E331XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0E331E4	3500	
		390	7.3	4.3	1.9	6300	9	EEFSX0E391ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0E391XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0E391E4	3500	
		470	7.3	4.3	1.9	6300	9	EEFSX0E471ER	3500	
			7.3	4.3	1.9	7500	6	EEFSX0E471XE	3500	
			7.3	4.3	1.9	8500	4.5	EEFSX0E471E4	3500	
		4	82	7.3	4.3	1.9	6300	9	EEFSX0G820ER	3500
			100	7.3	4.3	1.9	6300	9	EEFSX0G101ER	3500
			150	7.3	4.3	1.9	6300	9	EEFSX0G151ER	3500
				7.3	4.3	1.9	7000	7	EEFSX0G151E7	3500
	180		7.3	4.3	1.9	6300	9	EEFSX0G181ER	3500	
	220		7.3	4.3	1.9	6300	9	EEFSX0G221ER	3500	
	270		7.3	4.3	1.9	6300	9	EEFSX0G271ER	3500	
330	7.3		4.3	1.9	6300	9	EEFSX0G331ER	3500		
	7.3		4.3	1.9	7500	6	EEFSX0G331XE	3500		
6.3	120		7.3	4.3	1.9	7000	7	EEFSX0J121E7	3500	
	150	7.3	4.3	1.9	6300	9	EEFSX0J151ER	3500		
	180	7.3	4.3	1.9	6300	9	EEFSX0J181ER	3500		
	220	7.3	4.3	1.9	6300	9	EEFSX0J221ER	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.

## Temperature compensation multipliers for ripple current

Temp.	T ≤ 45 °C	45 °C < T ≤ 85 °C	85 °C < T ≤ 105 °C
Coefficient	1.0	0.7	0.25