



**Shin-Etsu Film**

**Polypropylene Capacitor Film  
Shin-Etsu Electric and Electronic Films-R Type**



# Polypropylene Capacitor Film

## Shin-Etsu Electric and Electronic Films-R Type

Shin-Etsu's R Type film was the world's first hazy polypropylene capacitor film successfully developed for commercial purposes. With our unified management system, encompassing all steps from raw material procurement through to production and shipping, we offer stable supply to our customers. We use carefully selected high-purity polypropylene resin and an inflation process in the simultaneous biaxial orientation production method. It has excellent characteristics as a dielectric film, and one major feature is the network of evenly distributed irregularities on the film surface. This structure facilitates oil penetration of the film surface and improves the efficiency of insulating oil impregnation of

the capacitor elements. This network structure was created with proprietary Shin-Etsu technology that makes use of the crystalline transformation behavior of polypropylene, unlike products manufactured using processing additives or secondary surface processing. Our film offers consistent quality and the high reliability required of capacitor materials.

Thanks to its superior oil-impregnability, Shin-Etsu's R Type electric and electronic film enabled the production of today's all-film type capacitors that don't use capacitor paper. Shin-Etsu has also earned high acclaim for our contribution to greater reliability, higher capacity, and miniaturization of power capacitors.



## Features

### 1. Diverse variety

The physical and electrical properties of polypropylene film after impregnation with insulating oil vary according to the type of insulating oil used and the impregnation conditions and other conditions of the capacitor production process. Therefore, the required properties of PP film will differ according to the capacitor production conditions and design concept.

Shin-Etsu Film's product lineup includes the standard R Type, and the LR Type and RH Type, whose properties differ from those of the R Type. We have a system in place to offer the optimum product tailored to diverse customer needs.

### 2. A comprehensive evaluation system

At Shin-Etsu Film, we have the equipment for evaluating the various properties of polypropylene film. For small-capacity capacitors for consumer applications, we have the equipment for manufacturing standard capacitors for evaluation and a range of electrical property evaluation equipment. To maintain the highest standards of quality, we evaluate the films' electrical properties as capacitors and feed this data to the production department.

## Classifications

### ●Product Type

Product Type	Advantage	Application
R	Standard type	For all-PP high-voltage and extra-high-voltage capacitors
RH	Low heat-shrink type	For all-PP high-voltage and microwave oven capacitors
LR	Low *SF type	For all-PP low- and high-voltage capacitors

\* SF: Space Factor

### ●Thickness

Product Type	Standard Thickness (μm)
R	8 9 12 13 14 15 16 18 20 22 25 30
RH	12 13 14 15 16.5 18
LR	10.1 wt* 10.8 wt 12.3 wt 14.8 wt

\* wt: thickness measured using the weight method or by micrometer.

### ●Core dimensions

Item	Dimension
I.D. (inside diameter of core)	76.5 ±1.0 mm
O.D. (outside diameter of roll)	up to 500 mm
Film width	30-1,500 mm

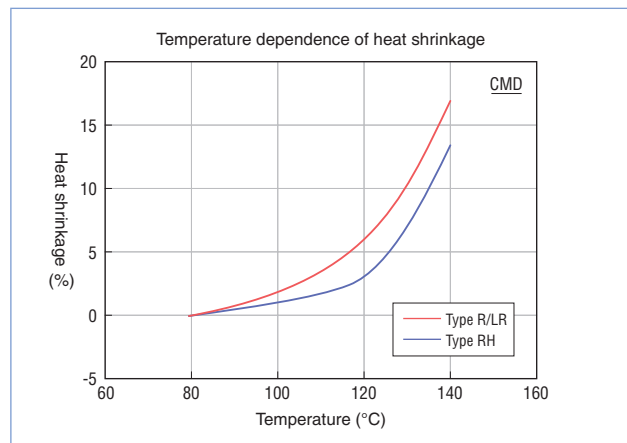
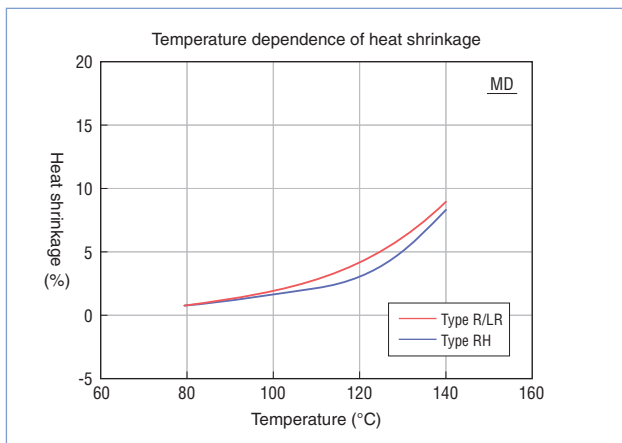
## Properties

### ●General properties

Item	Unit	Characteristic values	Measurement method
Density	g/cm <sup>3</sup>	0.905	JIS K 7112
Softening point	°C	147	JIS K 7121
Melting point	°C	165 - 170	JIS K 7121
Water absorption	%	< 0.05	ASTM D 570

### ●Mechanical properties

Item	Unit	Characteristic values	Measurement method
Tensile strength	MD	MPa	JIS C 2330
	CMD	MPa	
Elongation at break	MD	%	JIS C 2330
	CMD	%	
Heat shrinkage	MD	%	JIS C 2330
	CMD	%	



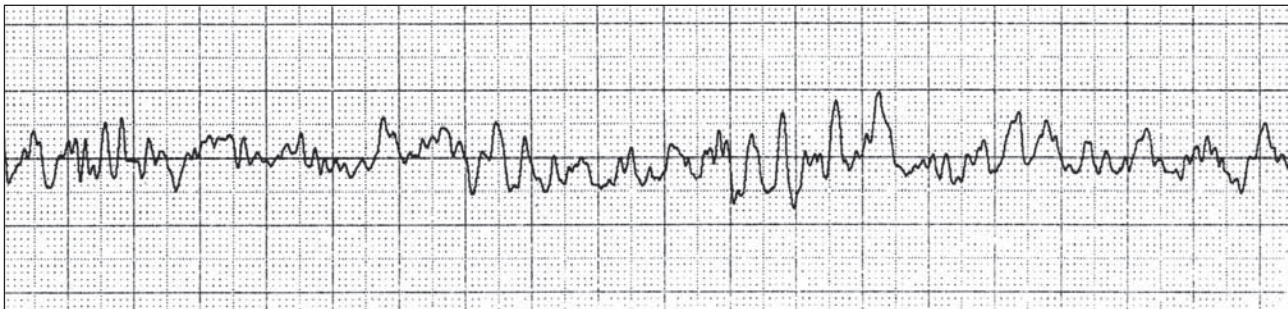
## ●Surface properties

Item		Unit	Characteristic values			Measurement method
			R	RH	LR	
Space factor		%	10	10	5	JIS C 2330
Haze		%	25 - 35	25 - 35	10 - 20	JIS K 6714
Surface roughness Ra	Face	$\mu\text{m}$	0.2 - 0.5	0.2 - 0.5	0.1 - 0.4	JIS B 0601
	Back	$\mu\text{m}$	0.1 - 0.3	0.1 - 0.3	0.1 - 0.3	
Surface roughness Rmax	Face	$\mu\text{m}$	1.5 - 4	1.5 - 4	1 - 2	JIS B 0601
	Back	$\mu\text{m}$	1 - 2	1 - 2	1 - 2	

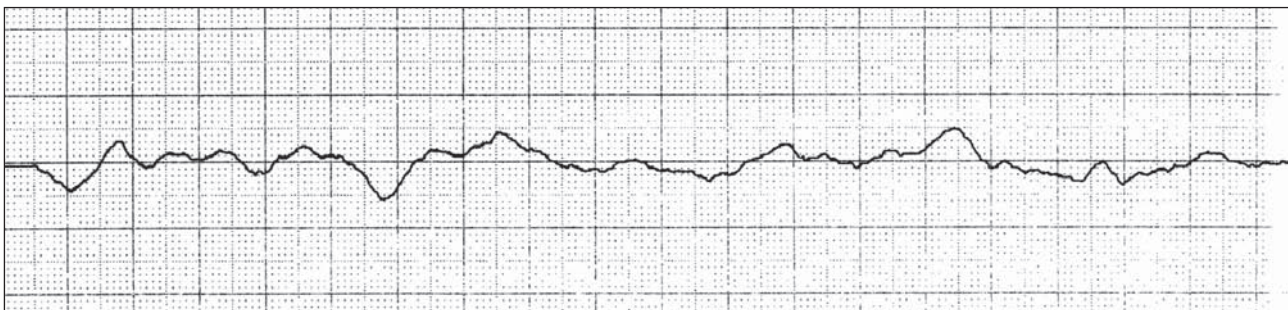
## Surface roughness

Test pieces: 15R, SF 10%

### a. Rough surface (Ra 0.22 $\mu\text{m}$ )

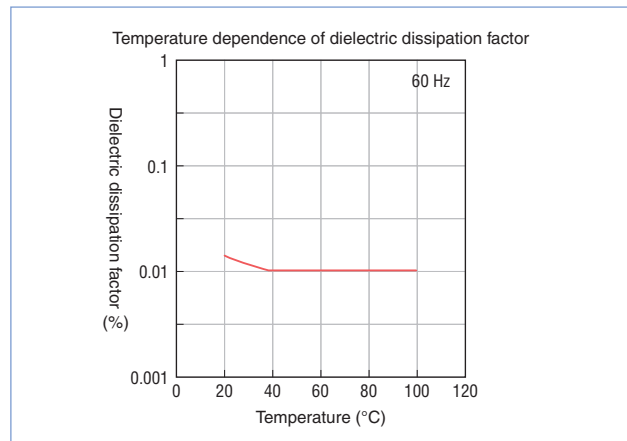
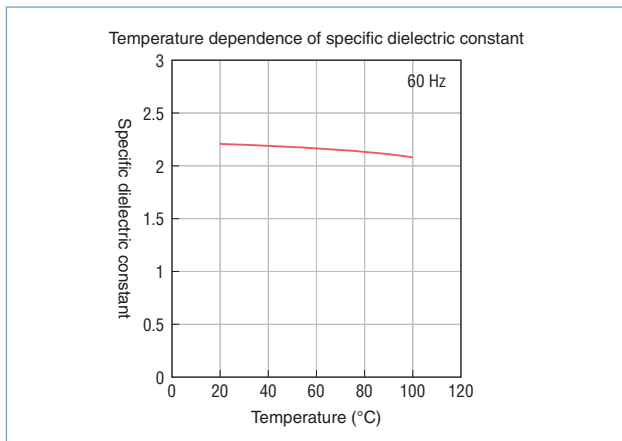
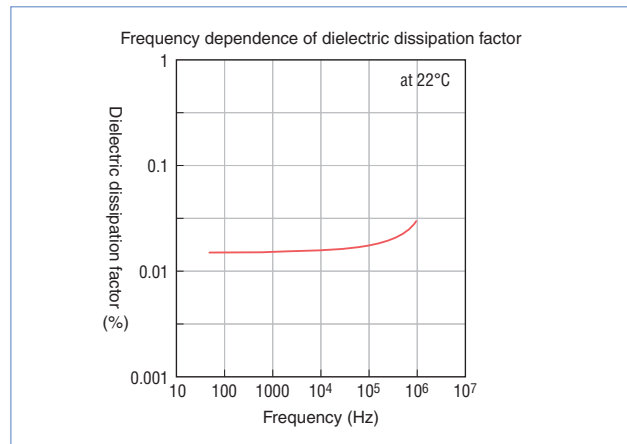
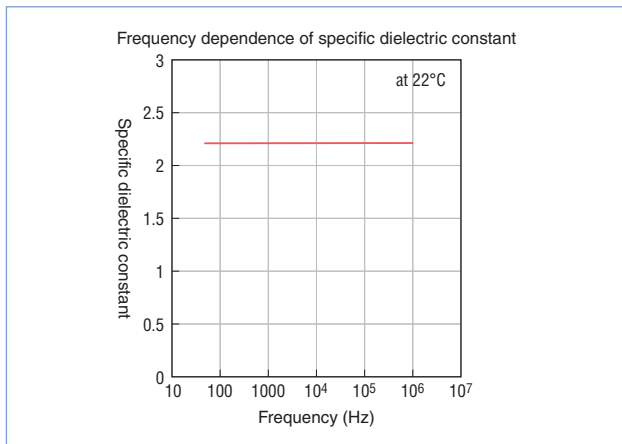
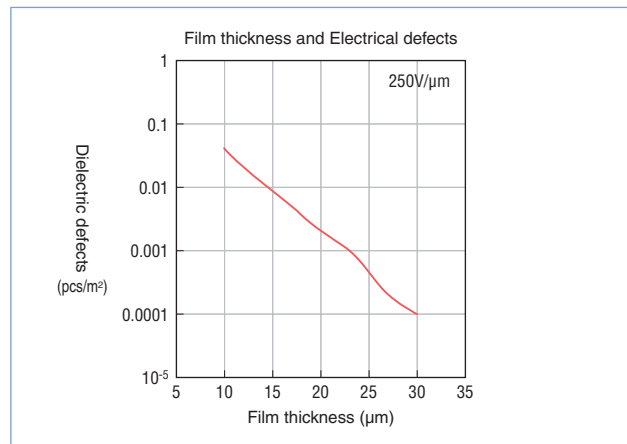
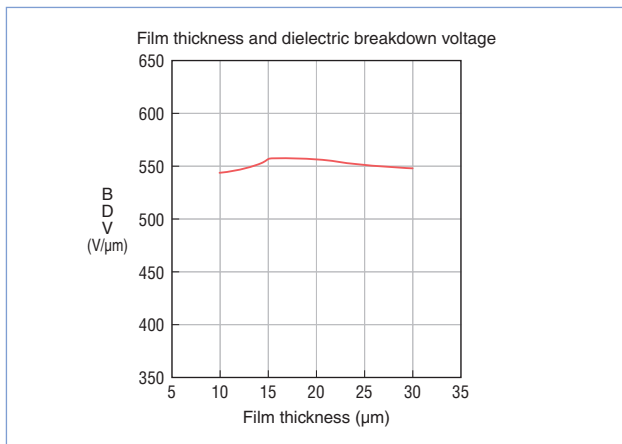


### b. Smooth surface (Ra 0.14 $\mu\text{m}$ )



## ●Electrical properties

Item	Unit	Characteristic values	Measurement method
Specific dielectric constant	—	2.2	JIS C 2330
Dielectric dissipation factor	%	0.02	JIS C 2330
Volume resistivity	$\Omega\cdot\text{cm}$	$10^{17}$	JIS C 2330
Dielectric breakdown voltage	$\text{V}/\mu\text{m}$	550	JIS C 2330
Electrical defects	$\text{pcs}/\text{m}^2$	$< 0.01$	Shin-Etsu method (contact electrode method)



## ●Chemical properties

Item	Unit	Characteristic values	Measurement method
Ash content	ppm	< 30	JIS C 2330
Chlorine content	ppm	< 5	Shin-Etsu method (ion chromatography)

## Packaging


### ●Film lengths and product roll diameters

The standard outer diameters are 180 mm Ø, 200 mm Ø, and 250 mm Ø. The inner diameter of the core is 76 mm Ø.

Thickness (µm)	180 mm Ø	200 mm Ø	250 mm Ø
9	2,000	2,700	4,400
10	—	2,450	4,000
12	1,500	2,050	3,300
13	1,400	1,870	3,000
14	1,300	1,700	2,900
15	1,200	1,600	2,700
16	1,130	1,500	2,500
16.5	—	1,460	2,400
18	1,000	1,300	2,200
19.5	900	1,200	2,000
20	—	1,150	2,000
22	—	1,100	1,800
25	—	960	1,600
30	—	800	1,200

(unit: m)

### ●Slit roll label

		Shin-Etsu Polypropylene Film	
Type	R	Lot No.*1	4510 - 85921
Thickness (µm)*2	13.6 W	Length (m)	1600
Width (µm)	305	Mass (kg)	6.1

\*1 Explanation of Lot no. (digits from left to right)  
 4: Final digit of 2004, the year of production of the Jumbo roll  
 5: Month of production (1-9, 10=X, 11=Y, 12=Z) of Jumbo roll  
 10: Monthly production sequence  
 8: Slitting machine number  
 5921: Slit instruction number

\*2 Explanation of thickness  
 W indicates the weight method (wt)

### Storage and Handling Precautions

- Store out of direct sunlight in a cool place with low humidity.
  - Do not use film more than six months past the delivery date.
- The film may deteriorate, causing problems in use.

Contact Shin-Etsu for more information about film  
for electric and electronic applications.

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- The data presented in this catalog may not be relied upon to represent standard values.  
Shin-Etsu reserves the right to change the data and information in this catalog without notice.
- Shin-Etsu films are produced in plants that are registered in accordance  
with international standards of quality assurance management.