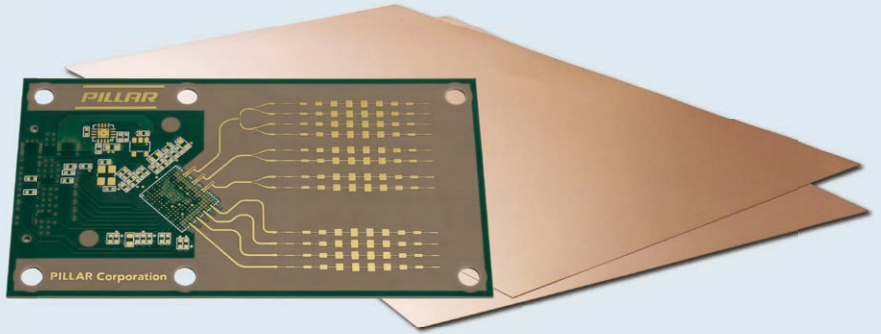


## Substrate with extremely low losses in millimeter-wave bands Best suited for multi-layer PCBs for high-frequency applications



### Substrates for high frequency

NPC-F220A, NPC-H220A, NPC-F260A,  
NPC-F300ALK, NPC-H300ALK

These substrates are made of fluorocarbon polymers with the smallest dielectric constant and dissipation factor among all organic resins. They provide excellent antenna and circuit characteristics in high-frequency bands. This resin has little degradation in characteristics due to moisture absorption and remains stable even in high temperature environments and in the presence of strong and harmful chemicals. Therefore, this product can be used even in harsh environment.

### Main applications

Automotive industry: Collision avoidance and surrounding obstacle detection radar

Wireless infrastructure: Antenna, 5G small cell, and wireless backhaul

Wired infrastructure: High-speed optoelectronic converter

Others: Various millimeter-wave and microwave applications

### Newly developed materials for multi-layer PCBs

NPC-F260AS, NPC-F300AS

This product is a fluorocarbon resin substrate that can keep the coefficient of thermal expansion low and satisfy through-hole connection reliability. Moreover, this substrate causes little in-plane variation in dielectric constant even in millimeter-wave bands and maintains low losses. This product can be used for hybrid multi-layer PCBs and build-up multi-layer PCBs for high-frequency applications.

### Features of our fluorocarbon resin multi-layer PCBs

Our fluorocarbon resin multi-layer PCBs can contribute to emerging millimeter-wave integrated application that is assumed to happen in the future, and provide automotive-grade reliability to achieve stable operation even in high-temperature environments.

### Applications



5G/6G base station



High-speed data center

■ Main specifications of high-frequency substrates

NPC-F220A								
Nominal dielectric thickness [mm]	Dielectric thickness [mm]	Dielectric constant (10GHz)	Dissipation factor (10GHz)	Coefficients of linear thermal expansion @ -40°C to 150°C [ppm/°C]			Copper foil thickness [μm]	Product size [mm]
				X	Y	Z		
0.127(C)	0.127	2.19	0.0007	28	26	202	18	340×510
0.254(C)	0.254	2.20	0.0007				35	

NPC-H220A								
Nominal dielectric thickness [mm]	Dielectric thickness [mm]	Dielectric constant (10GHz)	Dissipation factor (10GHz)	Coefficients of linear thermal expansion @ -40°C to 150°C [ppm/°C]			Copper foil thickness [μm]	Product size [mm]
				X	Y	Z		
0.4	0.37	2.16	0.0004	—	—	—	18 35	300×500
0.5	0.46	2.19	0.0006					340×510
0.6	0.56	2.18	0.0006					600×500
0.8	0.80	2.16	0.0005					300×500 600×500
1.0	0.98	2.17	0.0005					
1.2	1.21	2.18	0.0005					
1.6	1.59	2.17	0.0005					
3.2	3.19	2.16	0.0009					

NPC-F260A								
Nominal dielectric thickness [mm]	Dielectric thickness [mm]	Dielectric constant (10GHz)	Dissipation factor (10GHz)	Coefficients of linear thermal expansion @ -40°C to 150°C [ppm/°C]			Copper foil thickness [μm]	Product size [mm]
				X	Y	Z		
0.1	0.08	2.59	0.0018	17	12	175	18 35	340×510 680×510
0.2	0.155	2.59	0.0017					
0.4	0.40	2.55	0.0015					
0.5	0.49	2.58	0.0015					
0.6	0.55	2.60	0.0017					
0.8	0.74	2.53	0.0018					
1.0	0.96	2.58	0.0014					
1.2	1.15	2.61	0.0014					
1.6	1.53	2.56	0.0015					
3.2	3.12	2.59	0.0028					

■ Main specifications of newly developed materials for multi-layer PCBs

NPC-F260AS								
Nominal dielectric thickness [mm]*1	Dielectric thickness [mm]	Dielectric constant (10GHz)	Dissipation factor (10GHz)	Coefficients of linear thermal expansion @ -40°C to 150°C [ppm/°C]			Copper foil thickness [μm]	Product size [mm]
				X	Y	Z		
0.075(C)	0.075	2.85	0.0017	10	13	90	12 18	340×510
0.1(C)	0.100	2.82	0.0016	15	15	93		533×610
0.127(C)	0.127	2.79	0.0011	18	17	95		(21×24 inches)

\*1) Please contact us for thickness that is not in the lineup (0.050 mm to 1.6 mm).

NPC-F300AS								
Nominal dielectric thickness [mm]*1	Dielectric thickness [mm]	Dielectric constant (10GHz)	Dissipation factor (10GHz)	Coefficients of linear thermal expansion @ -40°C to 150°C [ppm/°C]			Copper foil thickness [μm]	Product size [mm]
				X	Y	Z		
0.075(C)	0.075	3.02	0.0015	8	11	75	12 18	340×510
0.1(C)	0.100	3.02	0.0013	10	11	48		533×610
0.127(C)	0.127	3.00	0.0012	13	12	41		(21×24 inches)

\*1) Please contact us for thickness that is not in the lineup (0.050 mm to 1.6 mm).

Note: The nominal dielectric thickness followed by (C) indicates the dielectric thickness.  
Note: The measurement method of dielectric properties complies with the balanced-type circular disk resonator method (JPCA-FCL01-2006).  
Note: The values shown in the table above are typical values, not guaranteed values.

F260AS and F300AS are fluorocarbon resin substrates with a low coefficient of thermal expansion (CTE), suitable for multi-layer PCBs to assure automotive-grade reliability.

## Reliability

### ☆ Through-hole (TH) connection reliability

Temperature: -40°C (30 min) ⇔ 125°C (30 min)

Number of cycles: 3,000

Drill bit size:  $\phi 0.15$  mm to  $\phi 0.4$  mm

Copper foil thickness: 18  $\mu$ m

Plating thickness: 20  $\mu$ m



### ☆ Insulation reliability

Pretreatment: Reflow at 260°C x 2

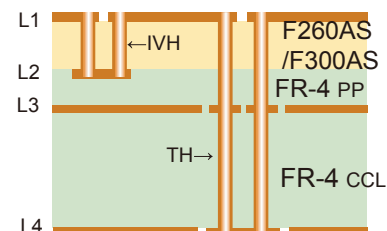
Temperature/Humidity: 85°C/85%RH

Applied voltage: 16 VDC

Testing time: 1,000 hours

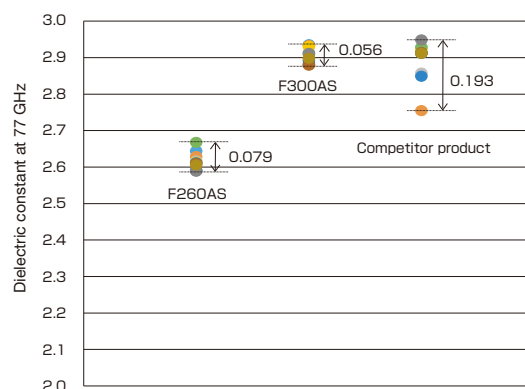
Copper foil thickness: 18  $\mu$ m

Plating thickness: 20  $\mu$ m

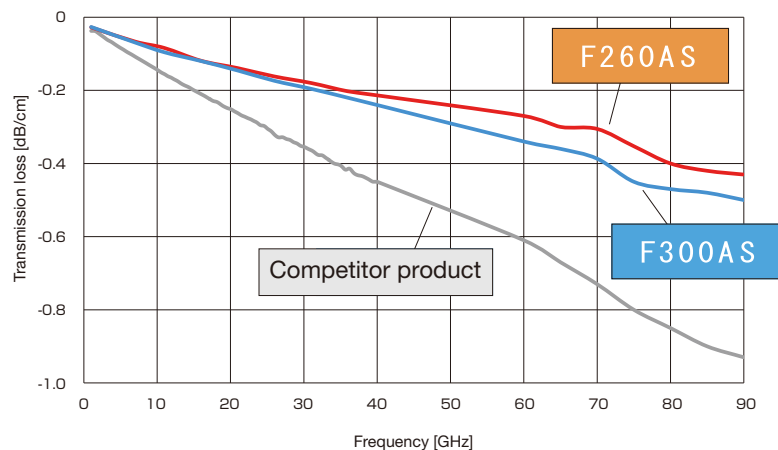


F260AS and F300AS are low-CTE, low-variation, low-loss substrates suitable for multi-layer PCBs.

## Electrical characteristics (Evaluation results when dielectric thickness is 0.127 mm)



Dielectric constant variations within the substrate  
(Values calculated from the resonance frequency of 77-GHz resonator)



Frequency characteristics of transmission loss  
(Values measured on microstrip lines)

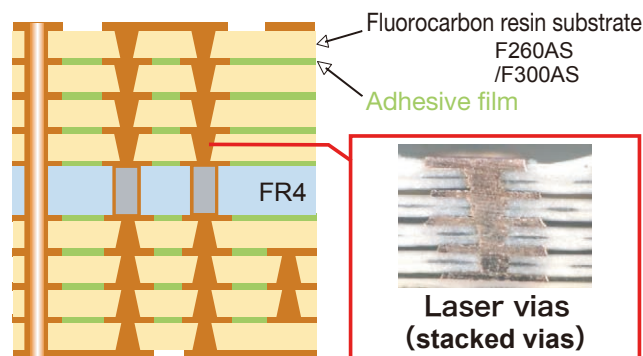
## Prototype example of fluorocarbon resin build-up PCBs

We have developed fluorocarbon resin build-up multi-layer PCBs, which were formerly difficult to produce, by applying thin thermosetting adhesive films with a low dielectric constant and low dissipation factor.

## Features

- Can use popular press equipment (200°C)
- Hybrid multi-layer PCBs laminated with conventional FR4 PCBs
- Laser via that satisfies automotive-grade reliability
- Transmission loss characteristics similar to those of fluorocarbon resin substrates

Ultra-low losses have been achieved by applying any-layer structure and build-up type PCBs that are made of fluorocarbon polymers, and dramatic performance improvement can be expected for millimeter wave applications.



## Product number representation

**N P C - F 300 A S - 0.8 × 680×510 × (18/18)**

① ② ③ ④ ⑤ ⑥ ⑦

① Dielectric type

F: Standard type

H: High heat resistance type

② Nominal dielectric constant

300: Corresponding to 3.0

③ Copper foil type

A: Electrolytic copper foil

④ Configuration of prepregs

⑤ Nominal dielectric thickness (in mm)

⑥ Product size (in mm)

⑦ Copper foil thickness (in μm)



Caution

- Dispose of this product as incombustible. Do not incinerate. Incinerating fluorocarbon polymers generates toxic gases.



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Safety  
precaution

- When using this product, please use correctly and pay sufficient attention to safety.

\* Please understand that this catalog may change without prior notice.  
\* The values shown on this catalog are reference values, not guaranteed values.