



**Glass cloth base epoxy resin
 flame retardant copper clad laminate**

NP-170R

FEATURES

- High Tg 170°C (DSC)
- Excellent dimensional stability and through-hole reliability
- Excellent electrical, chemical and heat resistance properties
- IPC-4101C specification is applicable
- U. L designation: ANSI grade FR-4
- U.L file number E98983
- Outstanding heat resistance
- High luminance of multi-functional epoxy contrast with copper for A.O.I
- Traditional FR-4 methods processability

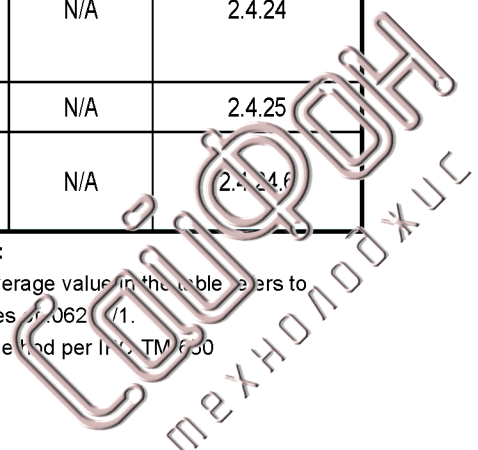
PERFORMANCE LIST

| Characteristics | Unit | Conditioning | Typical Values | SPEC | Test Method | |
|--|--------|---------------------------|--|-------------------|-------------|-------|
| Volume resistivity | MΩ-cm | C-96/35/90 | 5 x10 ⁸ ~ 5x10 ⁹ | 10 ⁶ ↑ | 2.5.17 | |
| Surface resistivity | MΩ | C-96/35/90 | 5 x10 ⁶ ~ 5x10 ⁷ | 10 ⁴ ↑ | 2.5.17 | |
| Permittivity 1MHZ | - | C-24/23/50 | 4.5-4.7 | 5.4 ↓ | 2.5.5.9 | |
| Permittivity 1GHZ | - | C-24/23/50 | 4.0-4.2 | - | 2.5.5.9 | |
| Loss Tangent 1MHZ | - | C-24/23/50 | 0.015-0.020 | 0.035 ↓ | 2.5.5.9 | |
| Loss Tangent 1GHZ | - | C-24/23/50 | 0.011-0.013 | - | 2.5.5.9 | |
| Arc resistance | SEC | D-48/50+D-0.5/23 | 120 ↑ | 60 ↑ | 2.5.1 | |
| Dielectric breakdown | KV | D-48/50 | 60 ↑ | 40 ↑ | 2.5.6 | |
| Moisture absorption | % | D-24/23 | 0.05-0.10 | 0.35 ↓ | 2.6.2.1 | |
| Flammability | - | C-48/23/50 | 94V0 | 94V0 | UL94 | |
| Peel strength 1 oz | lb/in | 288°Cx10" solder floating | 8-12 | 6 ↑ | 2.4.8 | |
| Thermal stress | SEC | 288°C solder dipping | 200 ↑ | 10 ↑ | 2.4.13.1 | |
| Pressure cooker (2 atm 120°C) | 1/2 hr | SEC | 288°C dipping | 150↑ | N/A | - |
| | 1 hr | SEC | 288°C dipping | 150↑ | N/A | - |
| | 2 hr | SEC | 288°C dipping | 150 | N/A | - |
| Flexural strength | LW | N/mm ² | A | 480-550 | 415 ↑ | 2.4.4 |
| | CW | N/mm ² | A | 415-480 | 345 ↑ | 2.4.4 |
| Dimensional stability X-Y axis | % | E-0.5/170 | 0.005-0.030 | 0.050 ↓ | 2.4.39 | |
| Coefficient of thermal expansion | | | | | | |
| Z-axis before Tg | ppm/°C | TMA | 50-70 | N/A | 2.4.24 | |
| Z-axis after Tg | ppm/°C | TMA | 200-300 | | | |
| Glass transition temp | °C | DSC | 170 ± 5 | N/A | 2.4.25 | |
| Decomposition Temperature (Td 5% W/L) | °C | TGA | 310 | N/A | 2.4.24f | |

Data shown are nominal values for reference only.

NOTE:

The average value in the table refers to samples of 062 ± 0.1.
 Test method per IEC TM 630





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 flame retardant copper clad laminate**

NP-170TL

■ FEATURES

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■ PERFORMANCE LIST

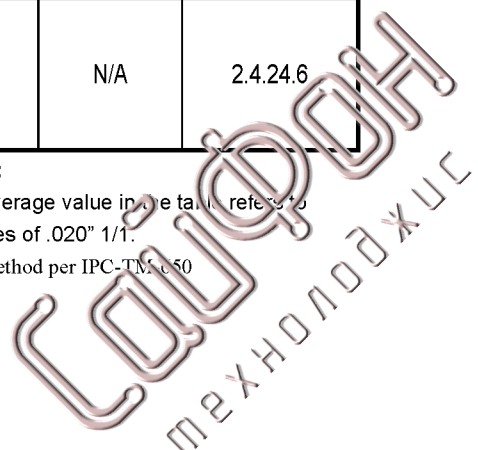
| Characteristics | Unit | Conditioning | Typical Values | SPEC | Test Method |
|---------------------------------------|--------|---------------------------|----------------------|-------------------|-------------|
| Volume resistivity | MΩ-cm | C-96/35/90 | 5.0 x10 ⁹ | 10 ⁶ ↑ | 2.5.17 |
| Surface resistivity | MΩ | C-96/35/90 | 5.0 x10 ⁷ | 10 ⁴ ↑ | 2.5.17 |
| Permittivity 1 MHZ | - | C-24/23/50 | 4.2-4.4 | 5.4 ↓ | 2.5.5.9 |
| Permittivity 1 GHZ | - | C-24/23/50 | 3.8-4.0 | - | 2.5.5.9 |
| Loss Tangent 1 MHZ | - | C-24/23/50 | 0.015-0.020 | 0.035 ↓ | 2.5.5.9 |
| Loss Tangent 1 GHZ | - | C-24/23/50 | 0.013-0.015 | - | 2.5.5.9 |
| Arc resistance | SEC | D-48/50+D-0.5/23 | 120 ↑ | 60 ↑ | 2.5.1 |
| Dielectric breakdown | KV | D-48/50 | 60 ↑ | 40 ↑ | 2.5.6 |
| Moisture absorption | % | D-24/23 | 0.20-0.30 | 0.35 ↓ | 2.6.2.1 |
| Flammability | - | C-48/23/50 | 94V0 | 94V0 | UL94 |
| Peel strength 1 oz | lb/in | 288°Cx10" solder floating | 8-12 | 6 ↑ | 2.4.8 |
| Thermal stress | SEC | 288°C solder dipping | 200 ↑ | 10 ↑ | 2.4.13.1 |
| Glass transition temp | °C | DSC | 170 ± 5 | N/A | 2.4.25 |
| Dimensional stability X-Y axis | % | E 4/105 | 0.01-0.03 | 0.05 ↓ | 2.4.39 |
| Coefficient of thermal expansion | | | | | |
| Z-axis before Tg | ppm/°C | TMA | 50-70 | N/A | 2.4.24 |
| Z-axis after Tg | ppm/°C | TMA | 200-300 | | |
| Decomposition Temperature (Td 5% W/L) | °C | TGA | 310 | N/A | 2.4.24.6 |

Data shown are nominal values for reference only.

NOTE:

The average value in the table refers to samples of .020" 1/1.

Test method per IPC-TM-650





■ **CONSTRUCTION:**

| THICKNESS | | CONSTRUCTION | | THICKNESS | | CONSTRUCTION | |
|-----------|-----|--------------|---------|-----------|------|---------------|---------|
| mm | mil | | | mm | mil | | |
| 0.10 | 4 | 1080 | 2 plies | 0.38 | 15 | 7628 | 2 plies |
| 0.11 | 4 | 2116 | 1 ply | 0.45 | 17 | 7628x2+1080x1 | |
| 0.13 | 5 | 1080 | 2 plies | 0.50 | 20 | 7628 | 3 plies |
| 0.13sp | 5 | 2116 | 1 ply | 0.53 | 21 | 7628 | 3 plies |
| 0.15 | 6 | 1506 | 1 ply | 0.60 | 24 | 7628 | 3 plies |
| 0.16 | 6 | 2112 | 2 plies | 0.77 | 30 | 7628 | 4 plies |
| 0.21 | 8 | 7628 | 1 ply | 0.8 | 31.5 | 7628 | 4 plies |
| 0.26 | 10 | 2116 | 2 plies | 0.9 | 36 | 7628 | 5 plies |
| 0.30 | 12 | 2116 | 3 plies | 1.0 | 39 | 7628 | 5 plies |
| 0.30sp | 12 | 1506 | 2 plies | 1.1 | 43 | 7628 | 6 plies |
| 0.35 | 14 | 7628 | 2 plies | 1.2 | 47 | 7628 | 6 plies |

• 1.2, 1.1, 1.0, 0.9 0.77 mm THICKNESS INCLUDE CLADDING, ALL OTHERS EXCLUDE CLADDING

■ **PRODUCT SIZE & THICKNESS**

| THICKNESS INCH(mm) | COPPER CLADDING OZ (µm) | SIZE | | THICKNESS TOLERANCE |
|-----------------------|----------------------------|-------------|-------------|-----------------------------|
| | | INCH | mm | |
| 0.004 (0.1) | 0.5 (17) | 48.8 x 36.6 | 1240 x 0930 | IPC-4101C SPEC CLASS C/M |
| to | 1.0 (35) | 48.8 x 40.5 | 1240 x 1030 | |
| 0.039(1.0) | 2.0 (70) | 48.8 x 42.5 | 1240 x 1080 | |

■ **Keeping the core and prepreg in the same grain direction is crucial to ensure the flatness of multilayer boards.**

Grain direction is shown on the Certificate of Conformance

■ **CERTIFICATION UL**

• UL File No. : E98983 • ANSI TYPE:FR-4

UL 746 Recognition

| Minimum Material Thickness Inch (mm) | Clad cond. Thickness min. max. mils mils (mic) (mic) | | Max. Area Diameter Inch (mm) | Sold Lts Temp Time °C sec | UL 94 Flame class |
|--|--|-------|--|---------------------------------|-------------------------|
| | | | | | |
| 0.002 | 0.68 | 4.08 | 2.0 | 288 30 | V-0 |
| 0.051 | (17) | (102) | (50.8) | | |



**Glass cloth base epoxy resin
 flame retardant prepreg**

NP-170B

■ FEATURES

- Rheology of resin controlled to benefit the lamination of the boards.
- Multi-functional epoxy provides outstanding heat resistance, better dimensional stability, and through-hole reliability.
- Higher Tg: 170 ± 5°C
- Other properties are similar to standard FR-4

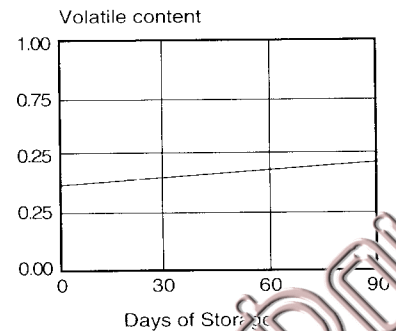
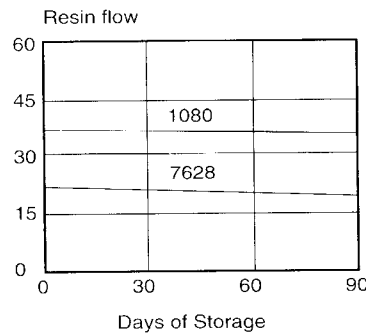
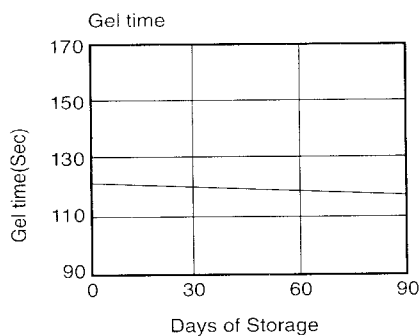
■ PERFORMANCE LIST

Specification: IPC-4101C is applicable

| Glass style | RC% | RF% | GT sec (171°C) | VC% | After Pressed Thickness (per ply) | |
|-------------|--------|--------|-------------------|--------|-----------------------------------|-----------|
| | | | | | mm | Mil |
| 7628HR | 50 ± 3 | 30 ± 5 | 120 ± 20 | 0.75 ↓ | 0.200 ± 0.01 | 7.9 ± 0.4 |
| 7628MR | 47 ± 3 | 25 ± 5 | | | 0.190 ± 0.01 | 7.5 ± 0.4 |
| 7628 | 43 ± 3 | 20 ± 5 | | | 0.180 ± 0.01 | 7.1 ± 0.4 |
| 1506MR | 52 ± 3 | 30 ± 5 | | | 0.160 ± 0.01 | 6.3 ± 0.4 |
| 1506 | 48 ± 3 | 25 ± 5 | | | 0.150 ± 0.01 | 6.0 ± 0.4 |
| 2116HR | 58 ± 3 | 36 ± 5 | | | 0.130 ± 0.01 | 5.0 ± 0.4 |
| 2116MR | 54 ± 3 | 30 ± 5 | | | 0.118 ± 0.01 | 4.6 ± 0.4 |
| 2116 | 50 ± 3 | 25 ± 5 | | | 0.105 ± 0.01 | 4.1 ± 0.4 |
| 2313 | 55 ± 3 | 30 ± 5 | | | 0.090 ± 0.01 | 3.5 ± 0.4 |
| 2113 | 56 ± 3 | 32 ± 5 | | | 0.090 ± 0.008 | 3.5 ± 0.4 |
| 2112 | 60 ± 3 | 37 ± 5 | | | 0.075 ± 0.008 | 3.0 ± 0.3 |
| 1086 | 62 ± 3 | 38 ± 5 | | | 0.074 ± 0.008 | 2.9 ± 0.3 |
| 1080HR | 68 ± 3 | 47 ± 5 | | | 0.071 ± 0.008 | 2.8 ± 0.3 |
| 1080MR | 65 ± 3 | 43 ± 5 | | | 0.068 ± 0.008 | 2.7 ± 0.3 |
| 1080 | 62 ± 3 | 38 ± 5 | | | 0.065 ± 0.008 | 2.6 ± 0.3 |
| 106 | 68 ± 3 | 40 ± 5 | | | 0.053 ± 0.008 | 2.1 ± 0.3 |
| * 1086 | 62 ± 3 | 38 ± 5 | | | 0.074 ± 0.008 | 2.9 ± 0.3 |
| * 1067 | 68 ± 3 | 36 ± 5 | | | 0.056 ± 0.008 | 2.2 ± 0.3 |
| * 1078 | 62 ± 3 | 35 ± 5 | | | 0.065 ± 0.008 | 2.6 ± 0.3 |

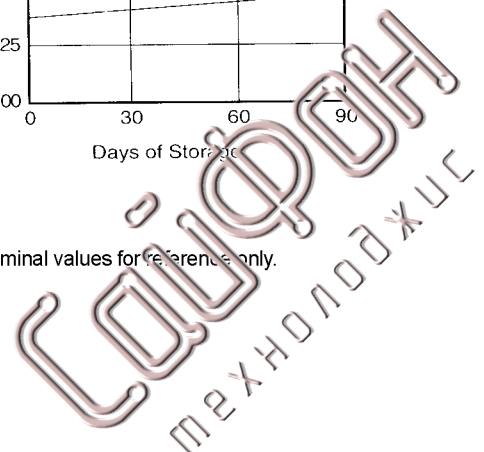
*Laser drillable prepreg

Storage ability



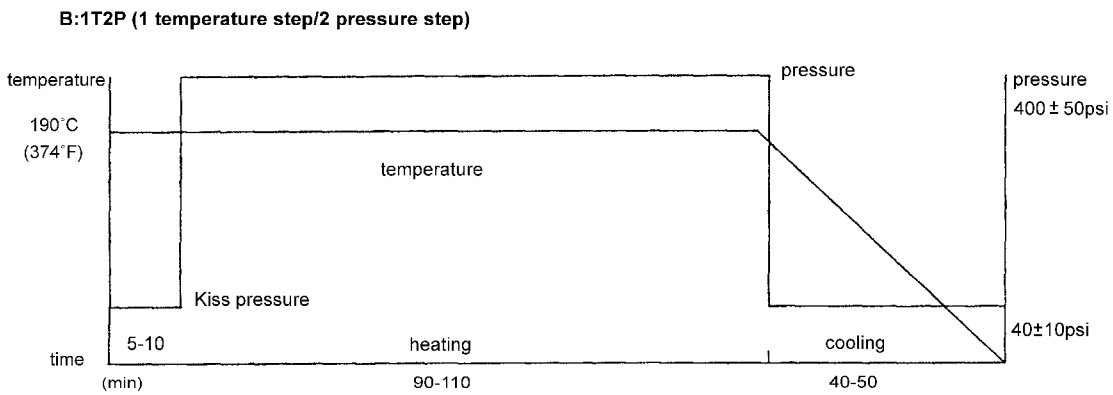
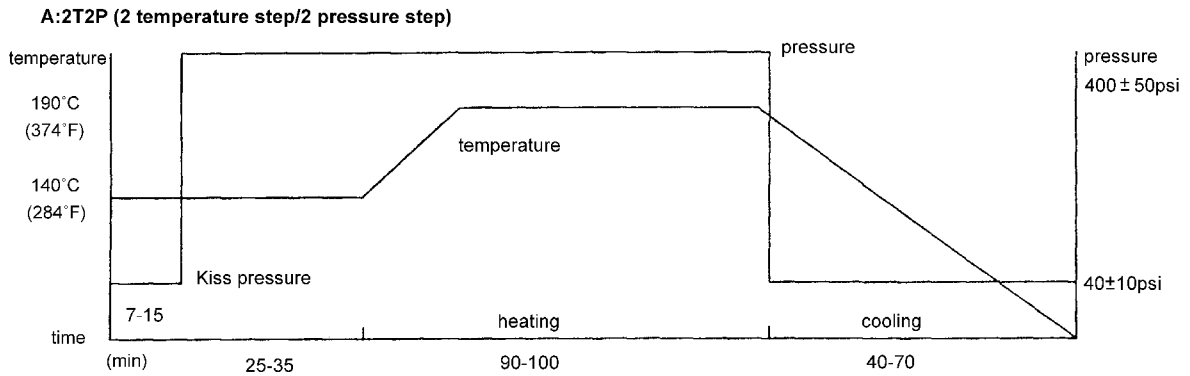
Storage Condition : 20°C, 50% RH for 3 months
 : Max 5°C for 6 months

Data shown are nominal values for reference only.





Recommended press cycles:



Suggestions:

1. Heating rate of material between 70°C(158°F) and 140°C(284°F)
 1-3°C/min (1.8~5.4°F/min) is acceptable.
 1.5-2.5°C/min (2.7~4.5°F/min) would be better.
2. Temperature of material over 170°C(338°F) must be held for at least 60min to allow resin to fully cure.
3. The pressure should be kept below 100psi during cooling to ambient temperature.
4. Cooling rate of material should be kept under 2.5°C/min (4.5°F/min) when the temperature of material is over 100°C(212°F), in order to avoid introducing twist.

■ CERTIFICATION UL

• UL File No. : E98983 • ANSI TYPE:FR-4

UL 746 Recognition

| Minimum Material Thickness Inch (mm) | Clad cond. Thickness | | Max. Area Diameter Inch (mm) | Sold Lts Temp Time °C sec | UL 94 Flame class | Max. Operating Temp (°C) |
|--|-------------------------|---------------|--|---------------------------------|-------------------------|-----------------------------------|
| | min. | max. | | | | |
| | mils (mic) | mils (mic) | | | | |
| 0.002 (0.051) | 0.68 (17) | 4.08 (102) | 2.0 (50.8) | 288 30 | 94V-0 | 130 |

