

MEGTRON4

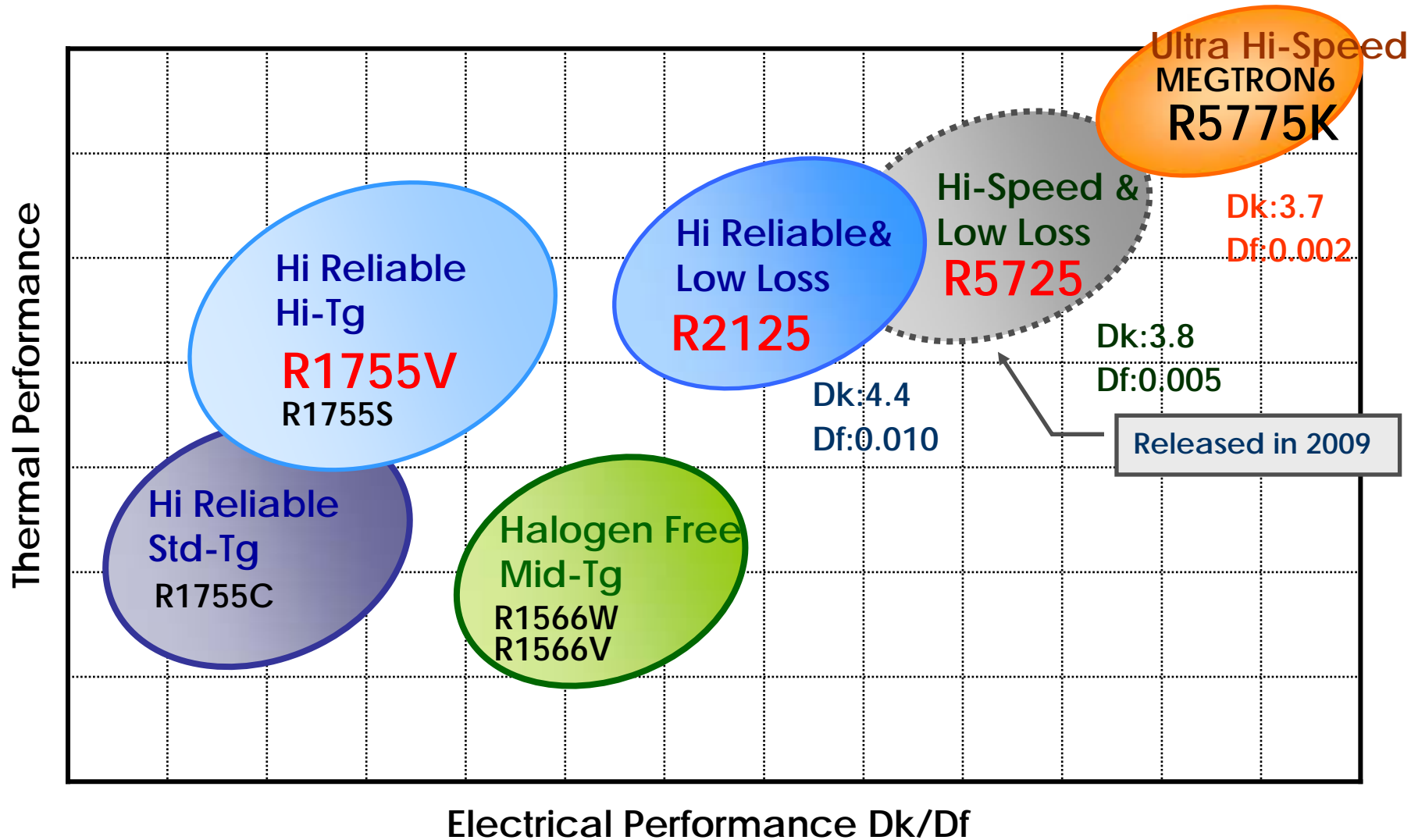
R-5725

Low Dk, Df and

High heat resistance material
(Core:R-5725, Prepreg:R-5620)

April. 2009
Panasonic Electric Works, Ltd.
Electronic Materials Division

New Low Dk/Df product



*The above data show actual values and are not guaranteed.

1.General Property

| Test Item | unit | R-5725 (Megtron4) | R-5775K (Megtron6) | R-2125 | R-1755V | R-1755S |
|--|------------------|----------------------|-----------------------|--------------|--------------|--------------|
| Dk (1GHz) | - | 3.8 | 3.7 | 4.4 | 4.4 | 4.4 |
| Df (1GHz) | - | 0.005 | 0.002 | 0.010 | 0.016 | 0.016 |
| Tg (DSC) | | 176 | 185 | 170 | 173 | 175 |
| Thermal expansion Z (< Tg) | ppm/ | 35 | 45 | 33 | 44 | 50 |
| Degradation Temp. | | 362 | 410 | 380 | 350 | 370 |
| Oven Heat resistance (JIS) | | 280 | 280 | 280 | 265 | 280 |
| T-288 | 分 | 30 | 120 | 50 | 20 | 60 |
| Cu Peel Strength (35 μ m) | kN/m (lbs/in) | 1.2 (6.8) | 1.2 (6.8) | 1.3 (7.3) | 1.5 (8.5) | 1.4 (7.9) |
| Inflammability | UL94 | Equivalent to V-0 | V-0 | V-0 | V-0 | V-0 |

*0.8mmt (32mil) CCL

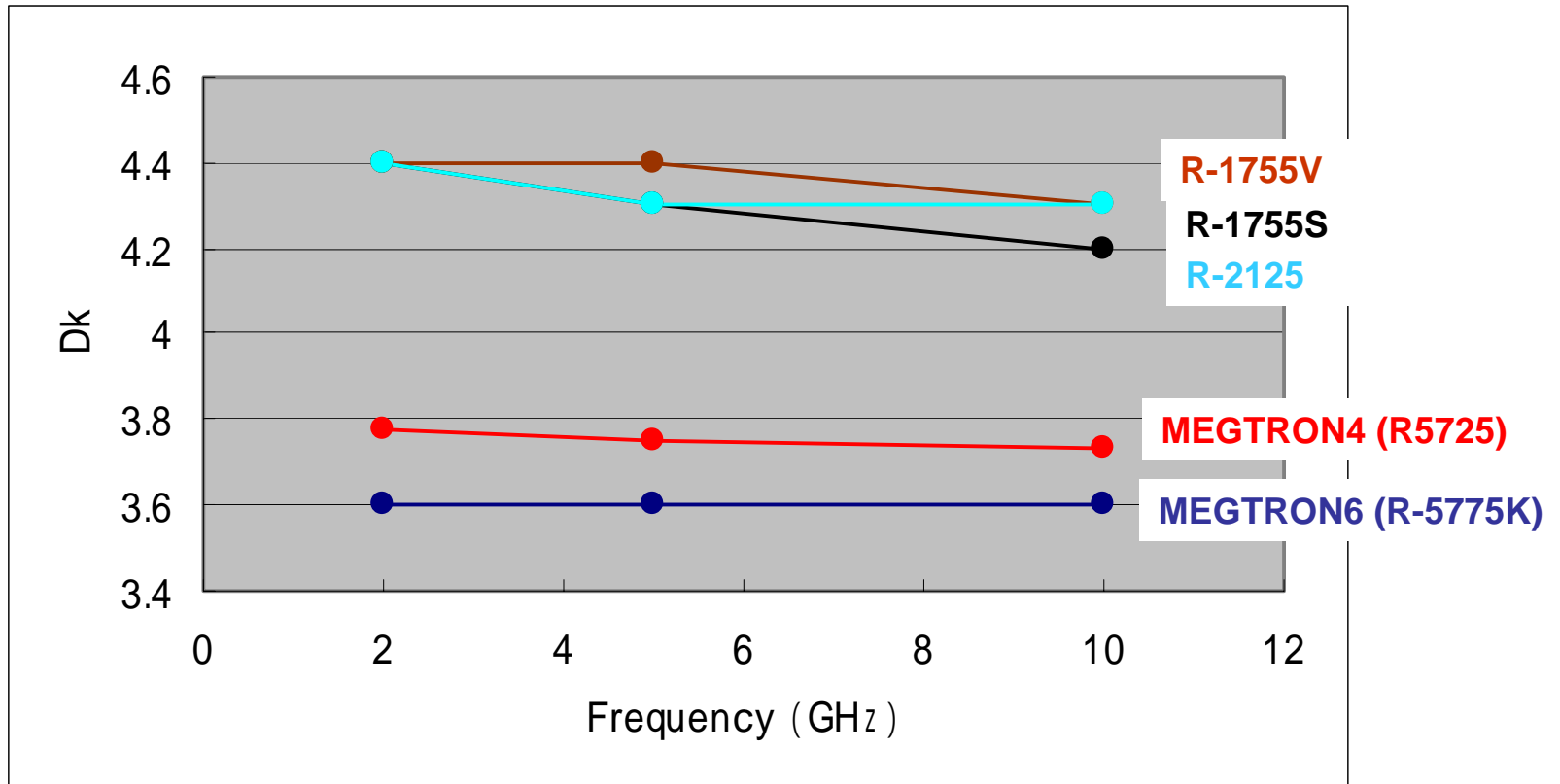
2.CCL property vs. Copper-foil type

| Test Item | unit | ST | RTC | VLP |
|-------------------------------|------------------|--------------|--------------|--------------|
| Oven Heat Resistance (JIS) | | 280 | 280 | 275 |
| Cu Peel Strength (35 μ m) | kN/m (lbs/in) | 1.2 (6.8) | 0.9 (5.1) | 0.8 (4.5) |

*0.1mmt(4mil) CCL

3.Dielectric Property

Dk Data

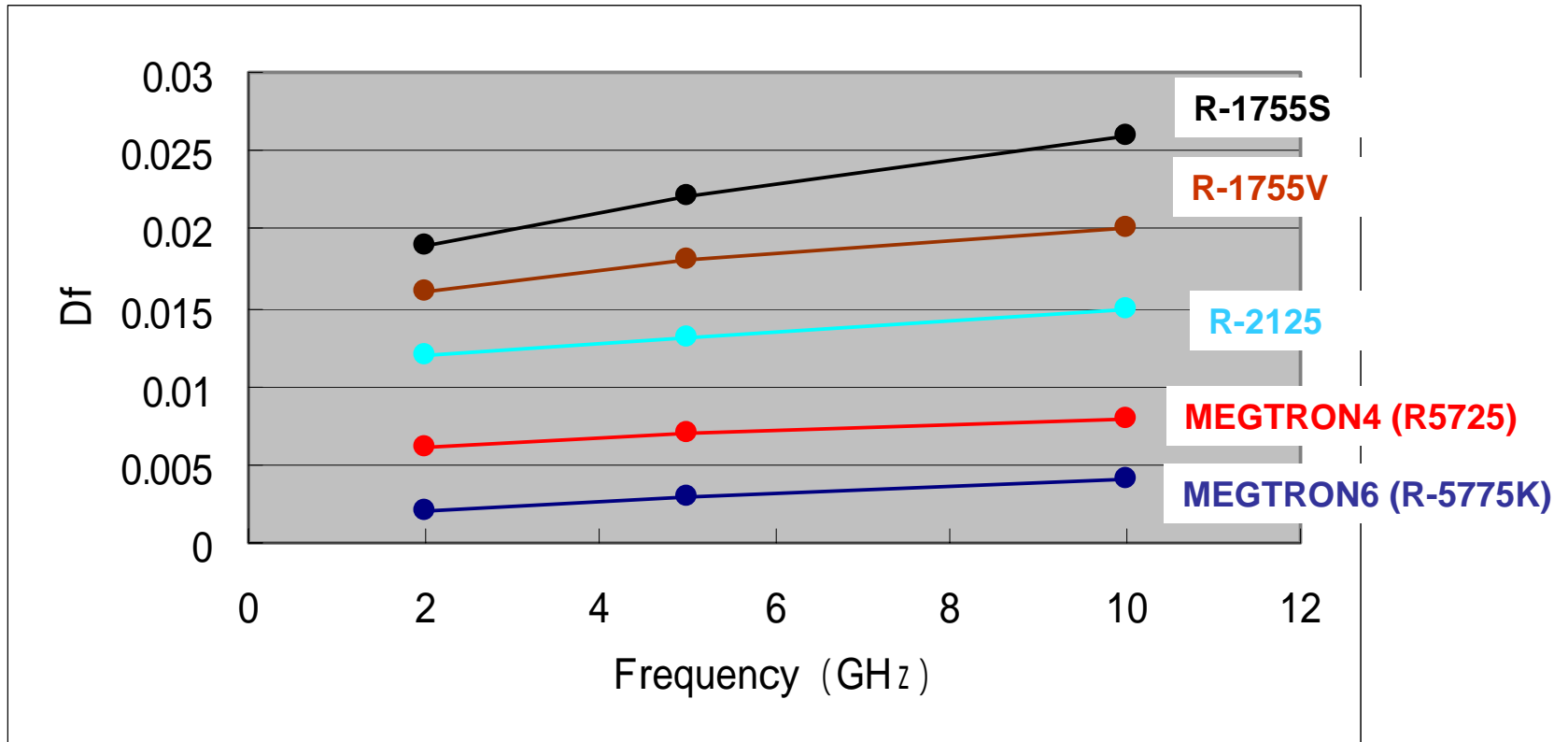


***IPC TM-650 2.5.5.5**

*The above data show actual values and are not guaranteed.

3.Dielectric Property

Df Data

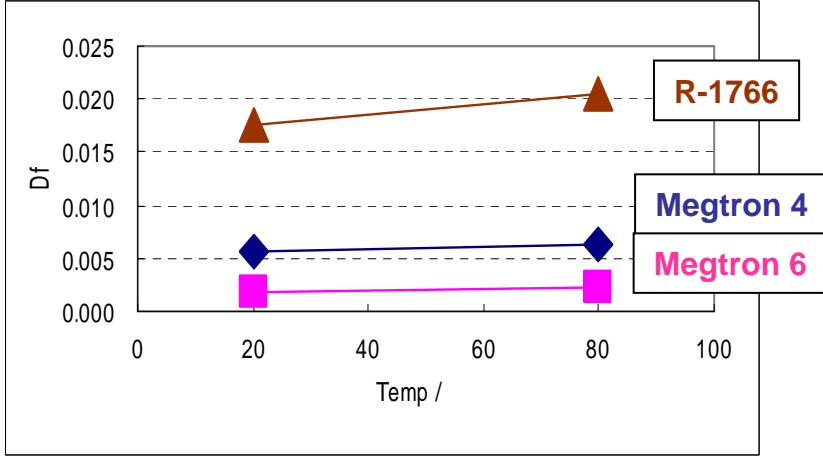
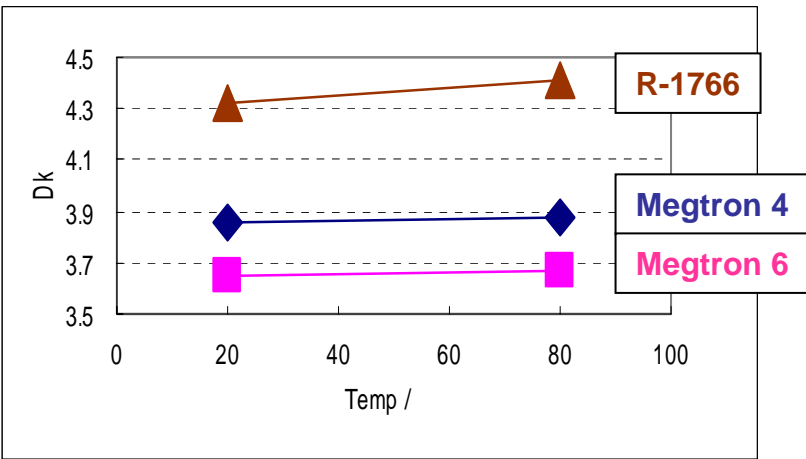


*The above data show actual values and are not guaranteed.

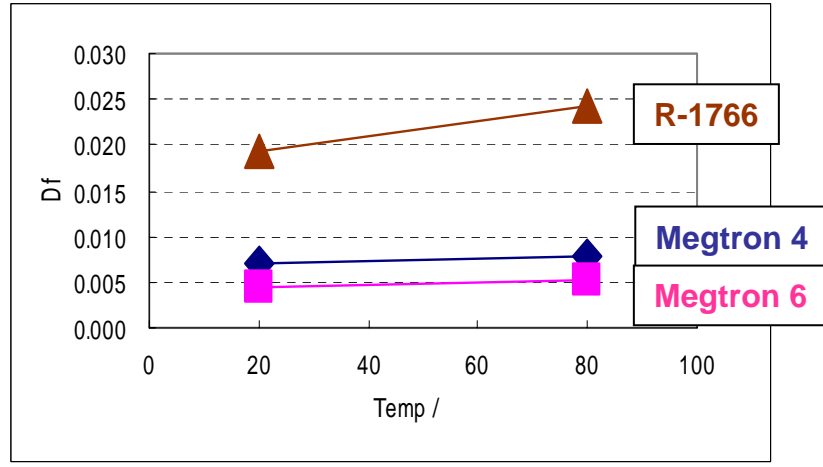
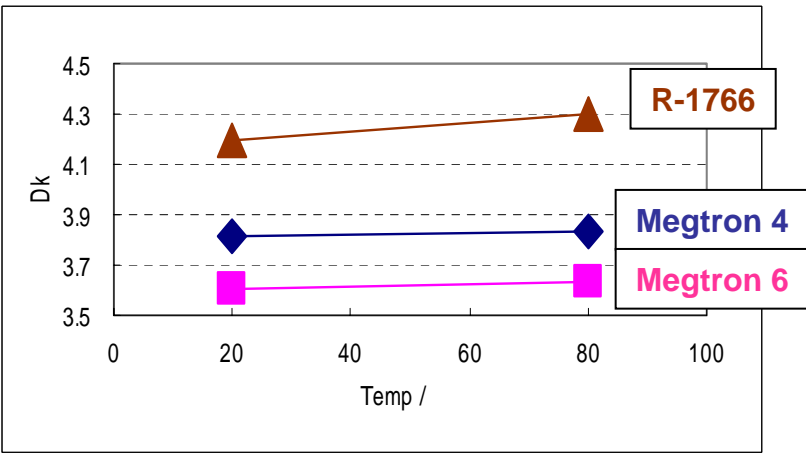
3. Dielectric Property

Dk, Df vs. Temp.

2GHz



10GHz



* IPC TM-650 2.5.5.5

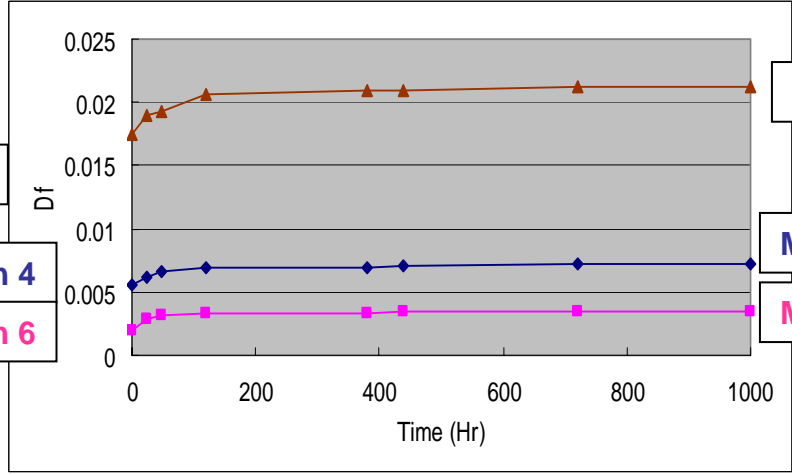
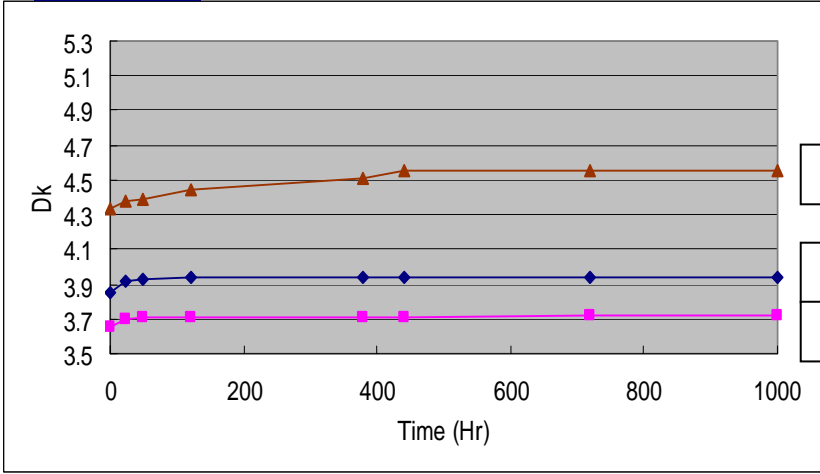
*The above data show actual values and are not guaranteed.

3. Dielectric Property

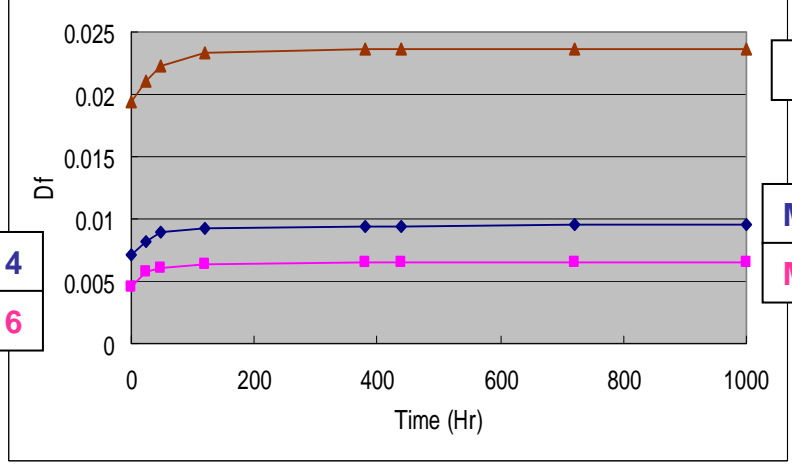
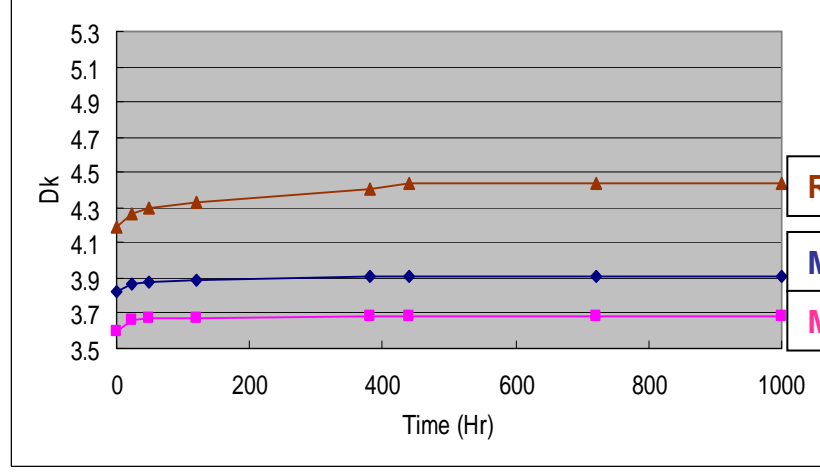
Dk, Df vs. Moisture

Condition : 85 85%

2GHz

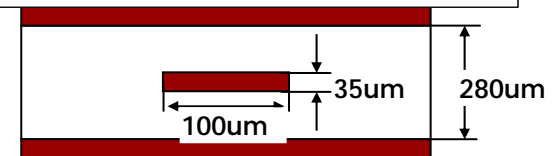
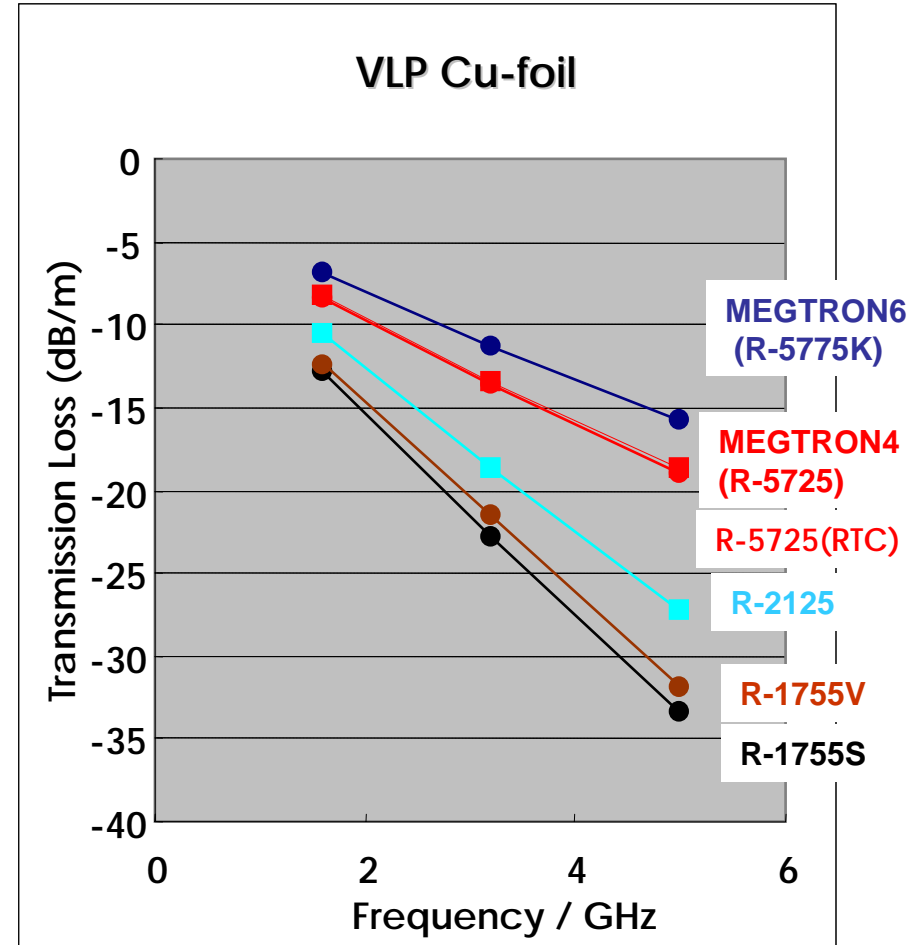
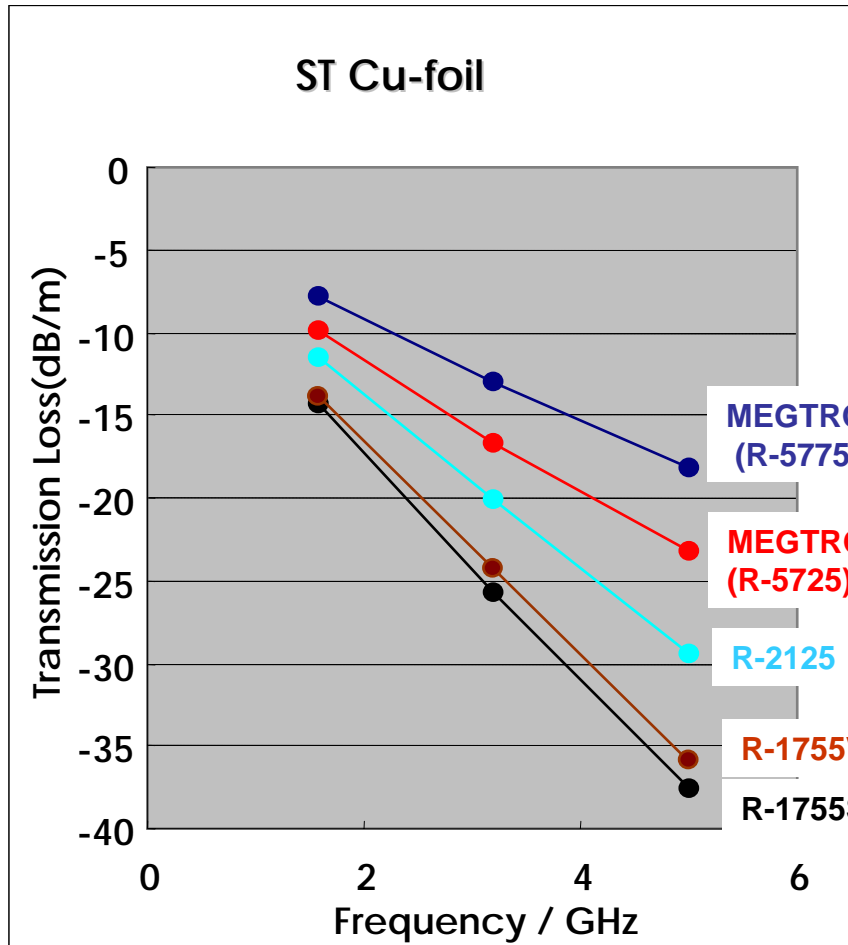


10GHz



*The above data show actual values and are not guaranteed.

4. Transmission Loss Data

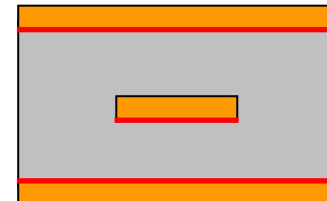


*The above data show actual values and are not guaranteed.

5.Eye Pattern Test Data

| Product | 1Gbps | 2.5Gbps | 5Gbps |
|--|-------|---------|-------|
| R1755V Phenolic High Tg FR-4 | | | |
| R2125 Phenolic High Tg Low Df FR-4 | | | |
| Megtron4 R5725 High Tg Low Dk/Df | | | |

Sample Construction



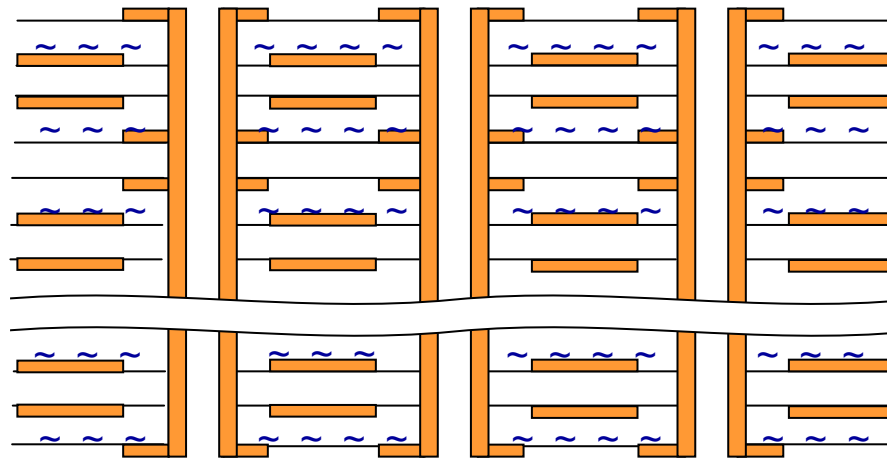
1 oz copper (mat side down)
0.06PP × 2 ply
1 oz copper (mat side down)
0.1mm Core
1 oz copper (mat side up)

Line length : 50 cm
Cu foil : Standard Type

*The above data show actual values and are not guaranteed.

6. Heat Resistance (High layer-count board)

[Sample Construction]



Prepreg 2116 54% 1ply
Core 0.1mmt 18/18

Layer Count : 40 layers
Thickness : 5.0mm

TH through-hole
Wall to wall : 0.5mm
Diameter : 0.45, 0.65, 0.80mm

[Test result of Heat Resistance (Delamination)]

Heat Condition

| | | | | |
|----|-----|--------|--------------|---------------|
| 1. | 288 | 10sec. | Solder float | 6cycle |
| 2. | 85 | 85% | 255 | Reflow 8cycle |

No Delamination

TH Crosssection

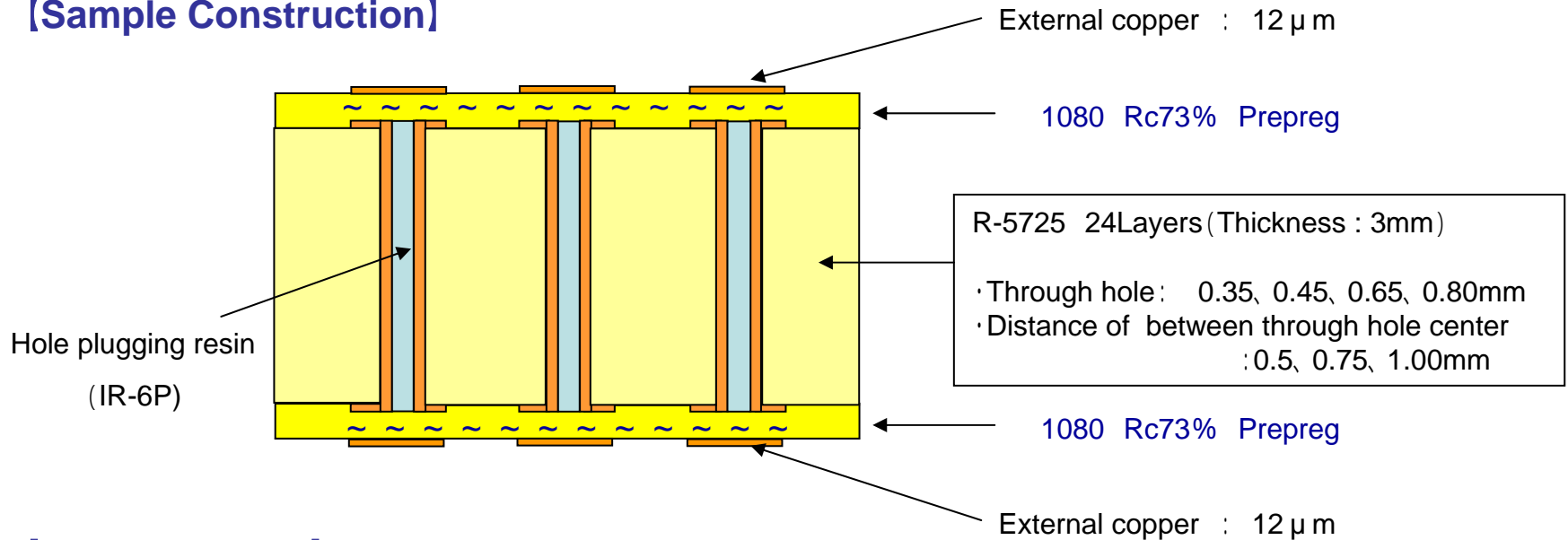


6. Heat Resistance (Sequential Structure)

[Sample]

R-5725 (MEGTRON4)

[Sample Construction]





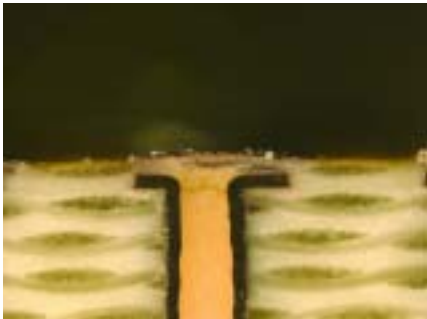
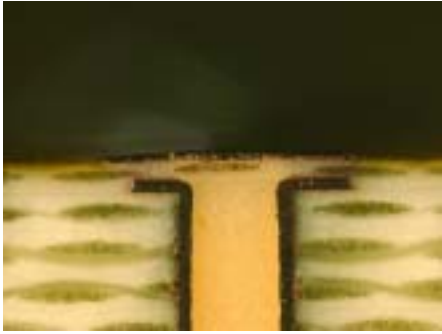
[Test Condition]

Drying (110 , 30min)
Reflow (260 × 10cycles)

→ Cross section →

No Delamination

6. Heat resistance as sequential structure

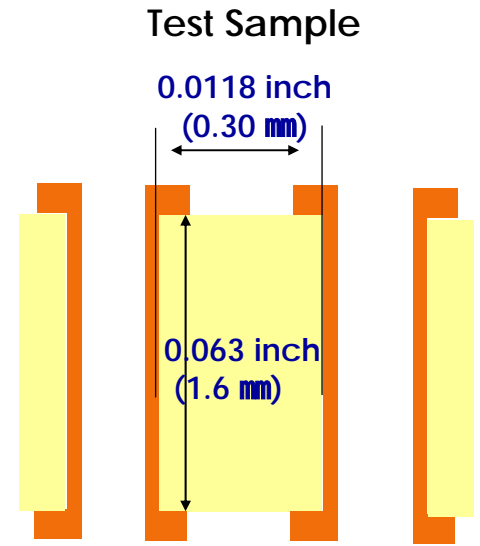
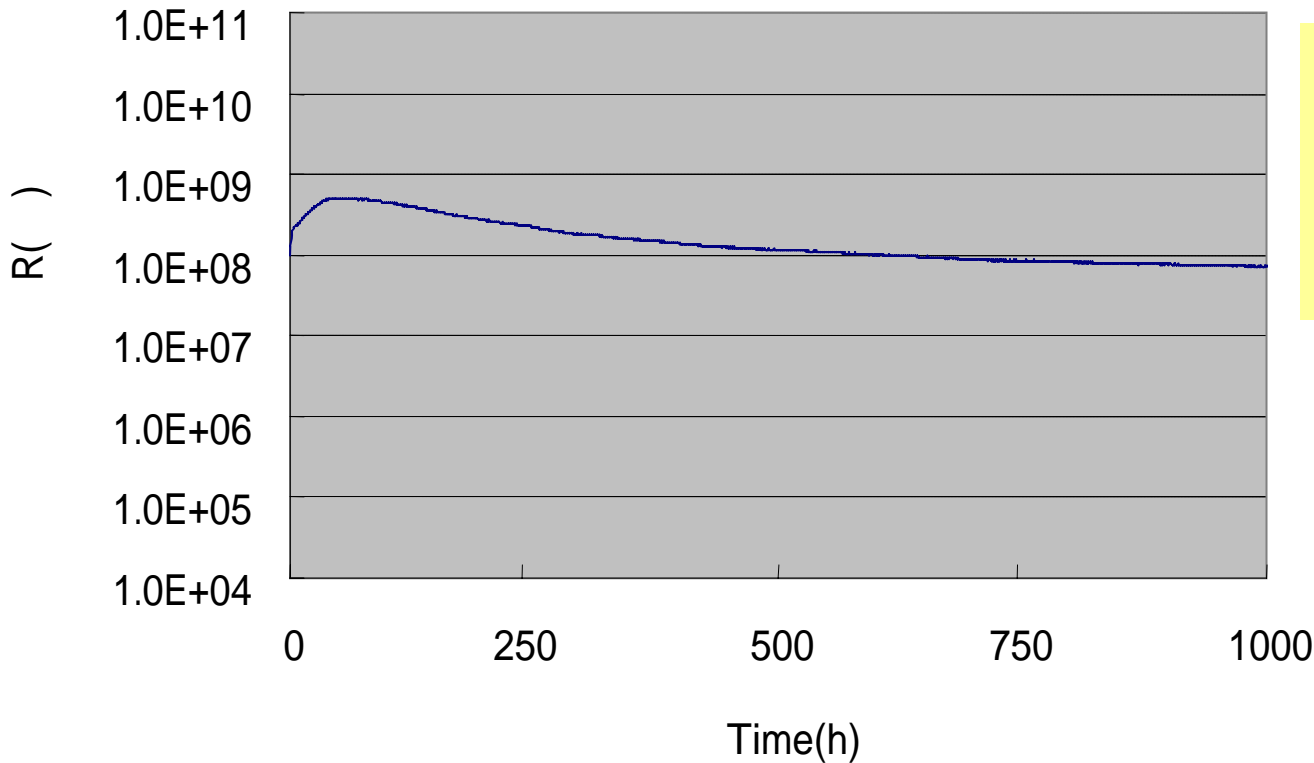
| | | Through hole Diameter | |
|---|--------|--|--|
| | | 0.30 | 0.45 |
| TH Pitch (Distance between through hole center) | 0.50mm | 0/27 | 0/21 |
| | |  |  |
| | 0.75mm | 0/20 | 0/17 |
| | |  |  |

*The above data show actual values and are not guaranteed.

7. CAF Resistance ~ HAST ~

HAST: Highly Accelerated Stress Test

Test Condition : 120 85% DC50V
Precondition : None



GC : #3313 16ply
Through-hole
TH Diameter : 0.0118 inch (0.30mm)
Wall to wall : 0.0118 inch (0.30mm)
TH Pitch : 0.0236 inch (0.60mm)

*The above data show actual values and are not guaranteed.

7. CAF Resistance ~ THB ~

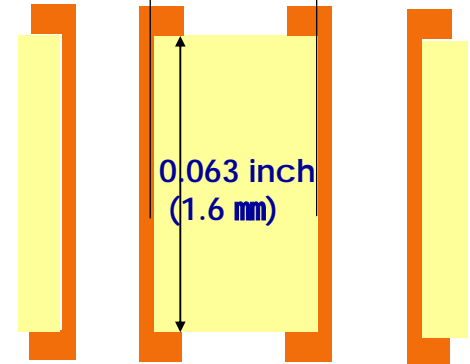
Test Condition : 85 85% DC50V
Precondition : None

THB: Thermal Humidity Bias

Test Sample

0.0118 inch
(0.30 mm)

0.063 inch
(1.6 mm)



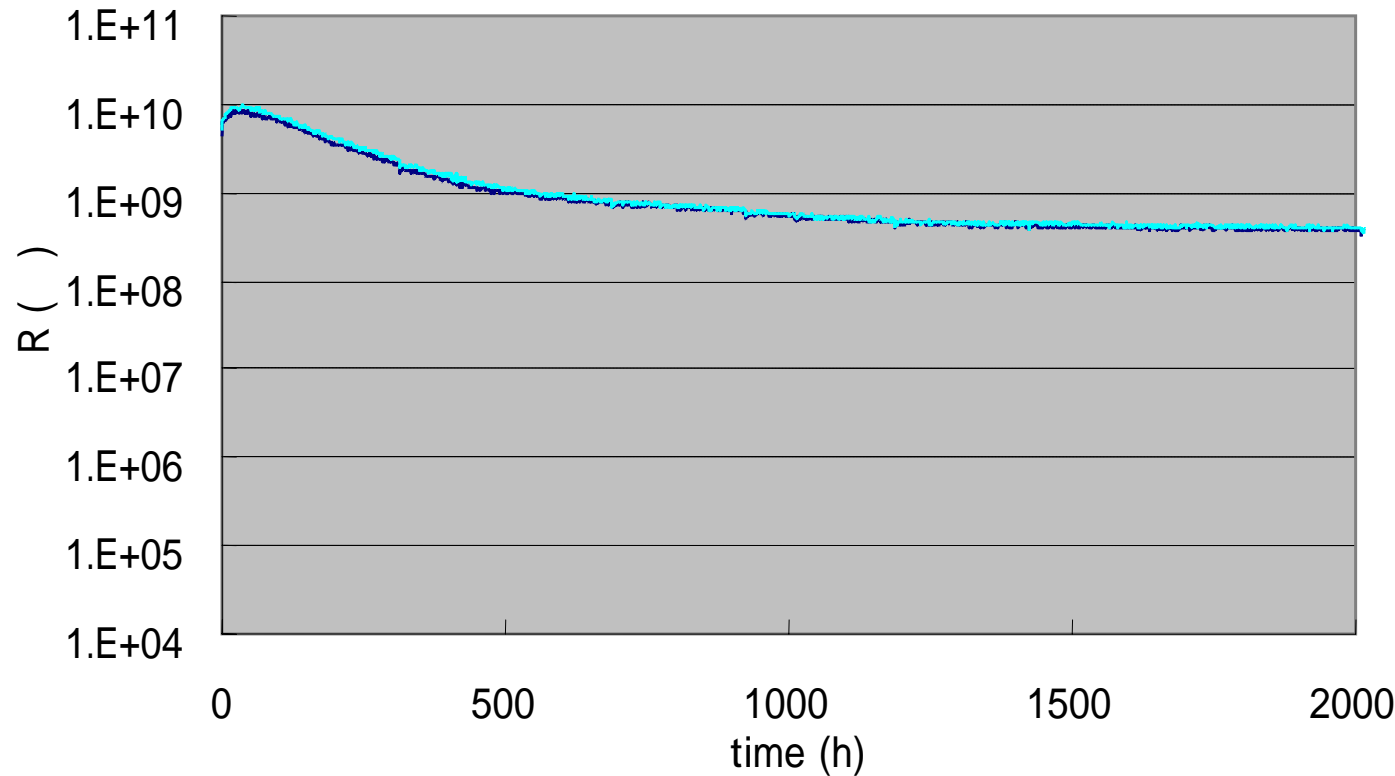
GC : #3313, 2116, 1080

Through-hole

TH Diameter : 0.0118 inch
(0.30mm)

Wall to wall : 0.0118 inch
(0.30mm)

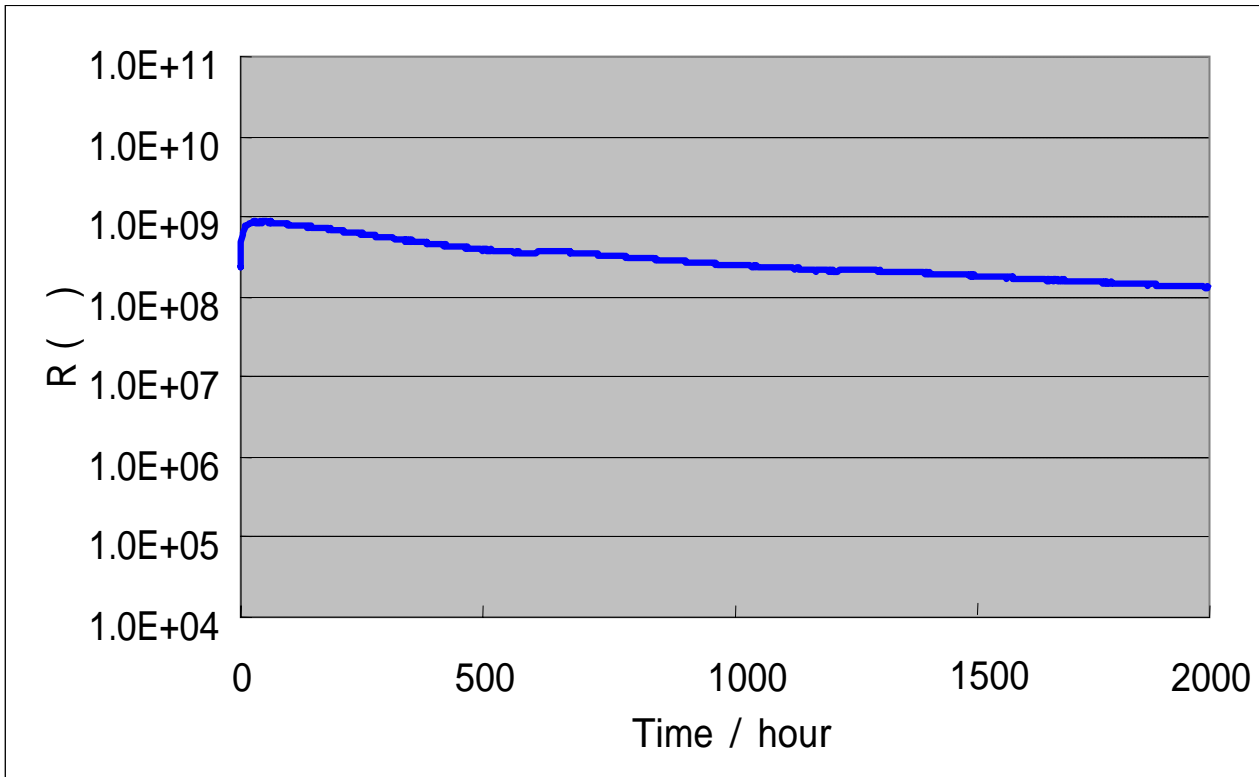
TH Pitch : 0.0236 inch
(0.60mm)



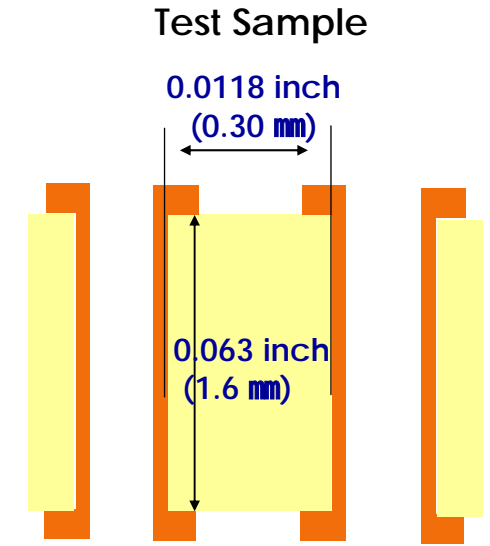
*The above data show actual values and are not guaranteed.

7. CAF Resistance ~ THB ~

Test Condition : 85 85% DC50V
Precondition : Reflow 260deg. X6cycles



THB: Thermal Humidity Bias



Construction

GC : #3313

TH Diameter : 0.0118 inch (0.30mm)

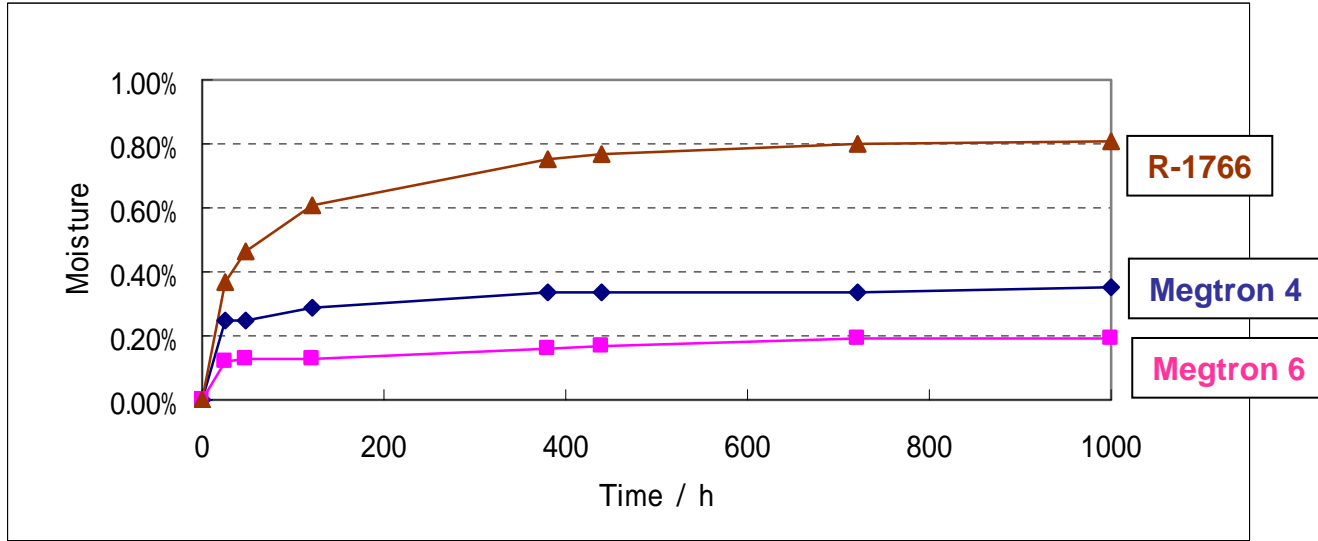
Wall to wall : 0.0118 inch (0.30mm)

TH Pitch : 0.0236 inch (0.60mm)

*The above data show actual values and are not guaranteed.

8. Water Absorption

Condition : 85 85%



Data

| Time (hr) | Megtron 4 | Megtron 6 | R-1766 |
|-----------|-----------|-----------|--------|
| 0 | 0 | 0 | 0 |
| 24 | 0.25% | 0.12% | 0.37% |
| 48 | 0.25% | 0.13% | 0.46% |
| 120 | 0.29% | 0.13% | 0.61% |
| 380 | 0.33% | 0.16% | 0.75% |
| 440 | 0.34% | 0.17% | 0.77% |
| 720 | 0.34% | 0.19% | 0.80% |
| 1000 | 0.35% | 0.19% | 0.81% |

*The above data show actual values and are not guaranteed.

9. Through Hole Reliability (IST)

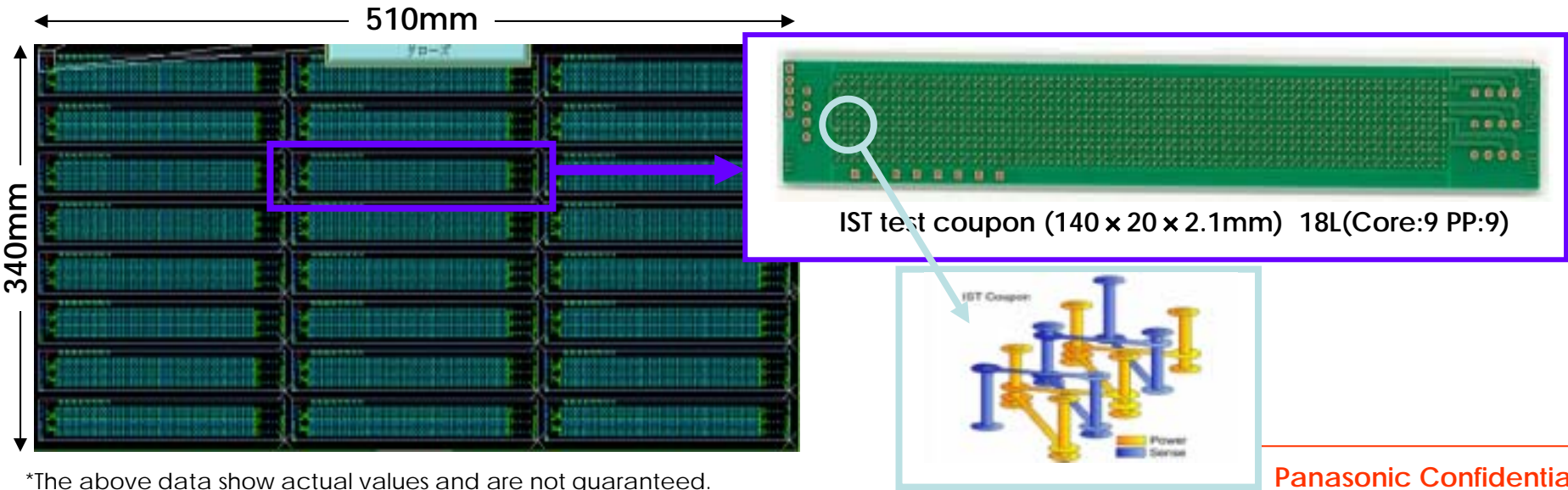
| Item | R-5725 | | R-2125 | |
|--------------|--------------|--------------|--------------|--------------|
| Precondition | 230 × 6cycle | 260 × 6cycle | 230 × 6cycle | 260 × 6cycle |
| IST | 1000c OK | 1000c OK | 1000c OK | 1000c OK |

IPC-TM-650 2.6.26

Precondition : 230 ~ 260 3~6 times

Cycle Test : 1000 cycle

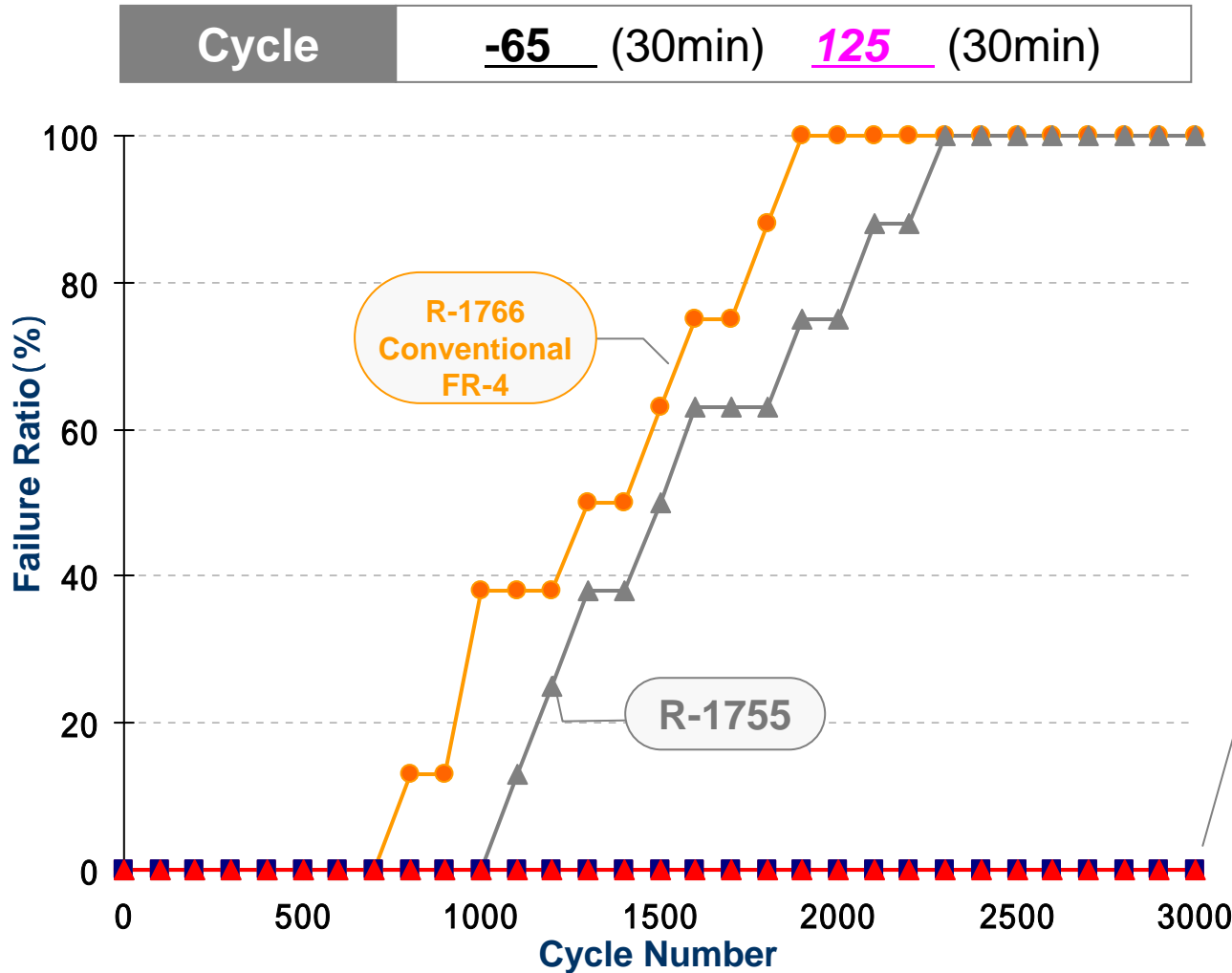
(Test Condition : 25 /2min 150 /3min)



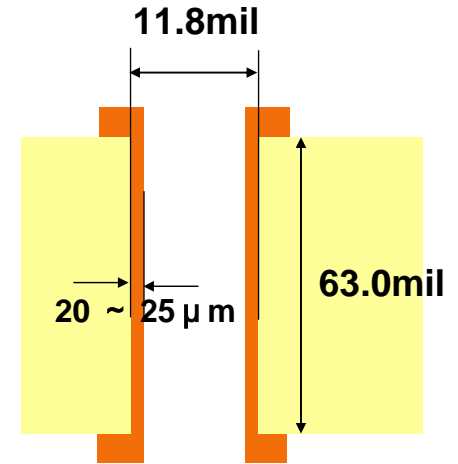
*The above data show actual values and are not guaranteed.

9. Through Hole Reliability (T/C-1)

Result



Test Sample



Failure Criteria :
10% of resistance value increase

R-1755 S

R-1755 V

R-2125

Meg 4

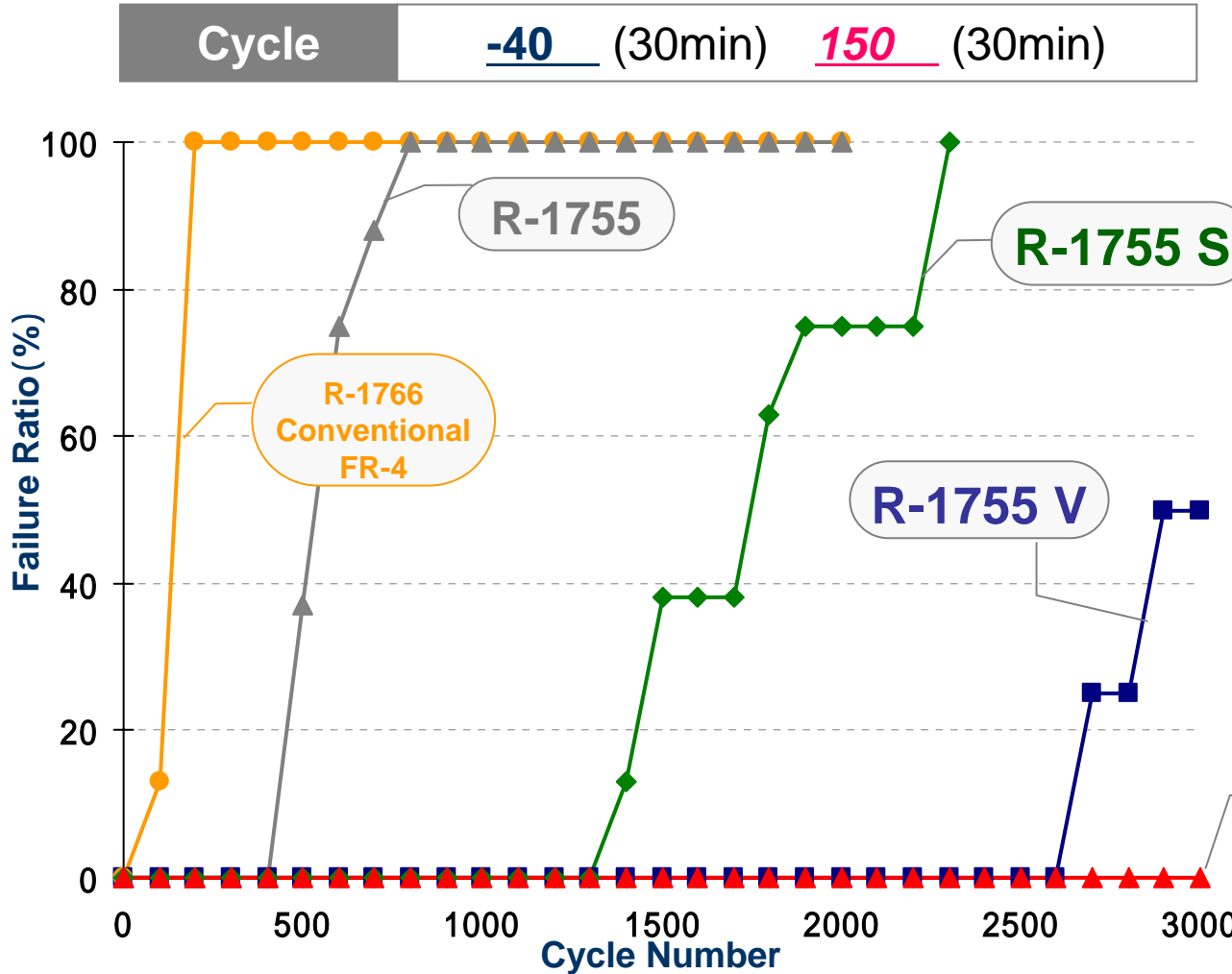
Meg 6

The above data are our actual values and not assured values.

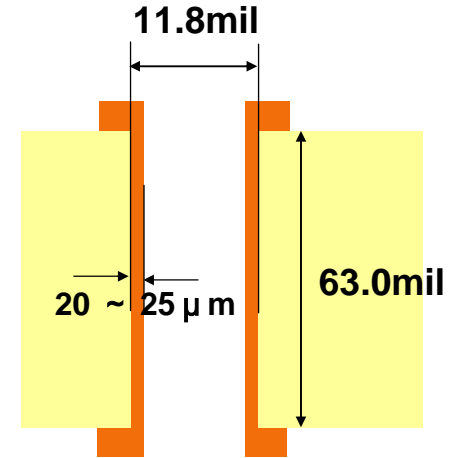
*The above data show actual values and are not guaranteed.

9. Through Hole Reliability (T/C-2)

Result



Test Sample



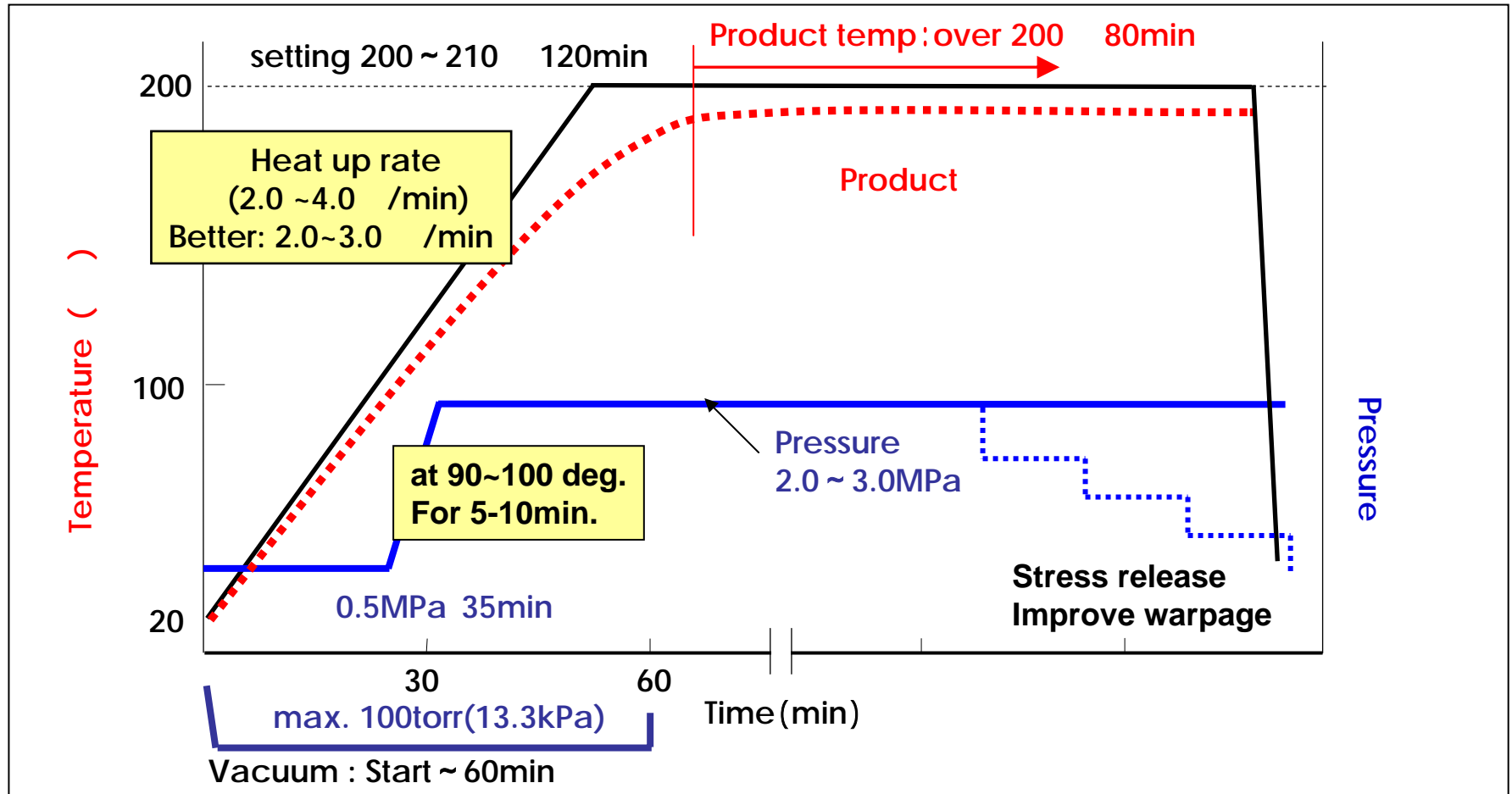
Failure Criteria :
10% of resistance value increase

R-2125
Meg 4

The above data are our actual values and not assured values.

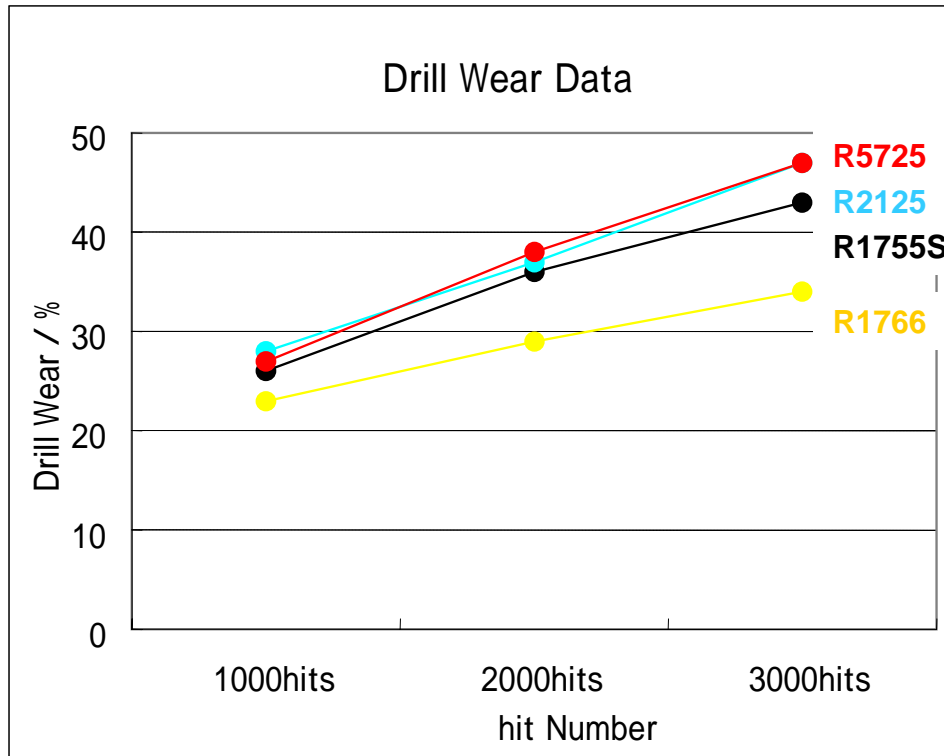
*The above data show actual values and are not guaranteed.

10.Press Condition



*The above data show actual values and are not guaranteed.

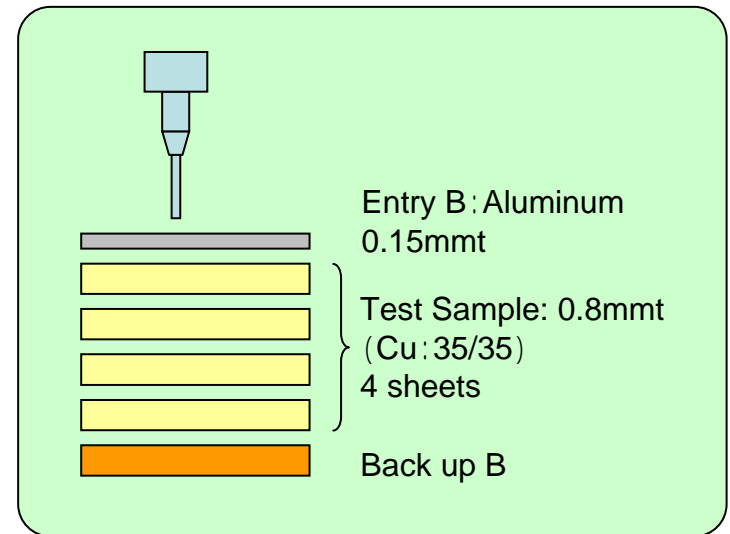
11. Drilling Processability-1



[Test Condition]

Bit : 0.3mm

Feed : 3.2m/min. (20 μ /rev.)



*The above data show actual values and are not guaranteed.

Drilling process

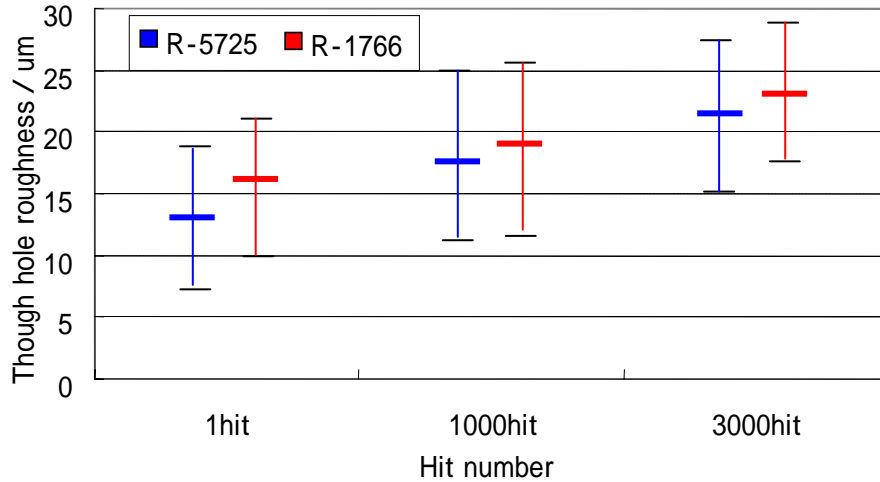
Max 160,000rev. Drill Machine

| Diameter (mm) | Spindle (rpm) | Velocity (m/min) | Feed Speed (m/min) | Chipload (μ m/rev) |
|------------------|------------------|---------------------|-----------------------|----------------------------|
| 0.20 | 160,000 | 100 | 1.6 - 2.4 | 10 - 15 |
| 0.25 | 160,000 | 126 | 1.8 - 2.8 | 11 - 18 |
| 0.30 | 160,000 | 151 | 1.9 - 3.2 | 12 - 20 |
| 0.35 | 137,000 | 151 | 1.8 - 3.0 | 13 - 22 |
| 0.40 | 120,000 | 151 | 1.8 - 2.9 | 15 - 24 |
| 0.45 | 107,000 | 151 | 1.8 - 2.7 | 17 - 25 |
| 0.50 | 96,000 | 151 | 1.8 - 2.7 | 19 - 28 |
| 0.55 | 87,000 | 150 | 1.8 - 2.6 | 21 - 30 |
| 0.60 | 80,000 | 151 | 1.7 - 2.6 | 21 - 33 |
| 0.65 | 74,000 | 151 | 1.7 - 2.6 | 23 - 35 |
| 0.70 | 68,000 | 149 | 1.7 - 2.6 | 25 - 38 |
| 0.75 | 64,000 | 151 | 1.6 - 2.6 | 25 - 41 |
| 0.80 | 60,000 | 151 | 1.6 - 2.5 | 27 - 42 |
| 0.85 | 56,000 | 149 | 1.6 - 2.4 | 29 - 43 |
| 0.90 | 53,000 | 150 | 1.6 - 2.4 | 30 - 45 |

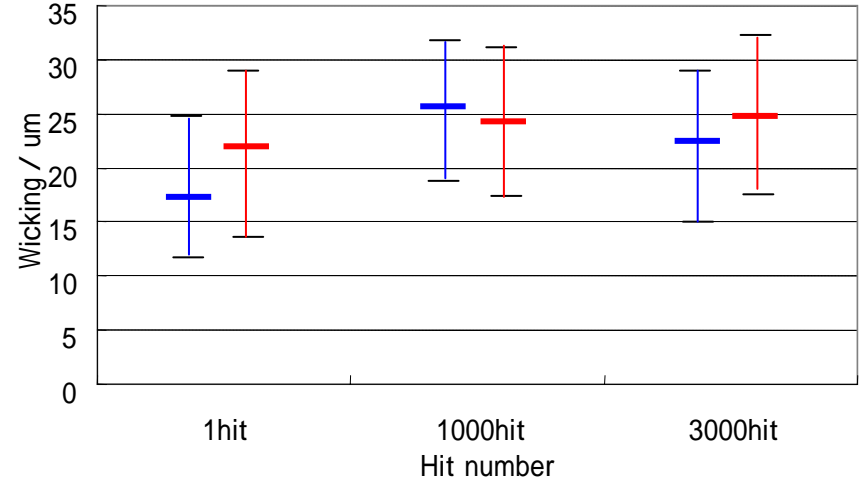
*The above data show actual values and are not guaranteed.

11. Drilling Processability-2

Through hole roughness



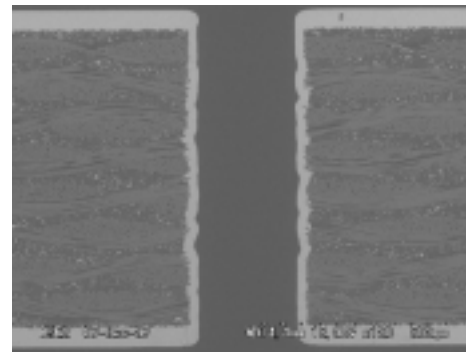
Wicking



Desmear Process

**Mac-Dermid Sweller 9204(Organic Type)
R-5725 2 Pass, R-1766 1Pass**

Crosssection of Through Hole (R-5725)

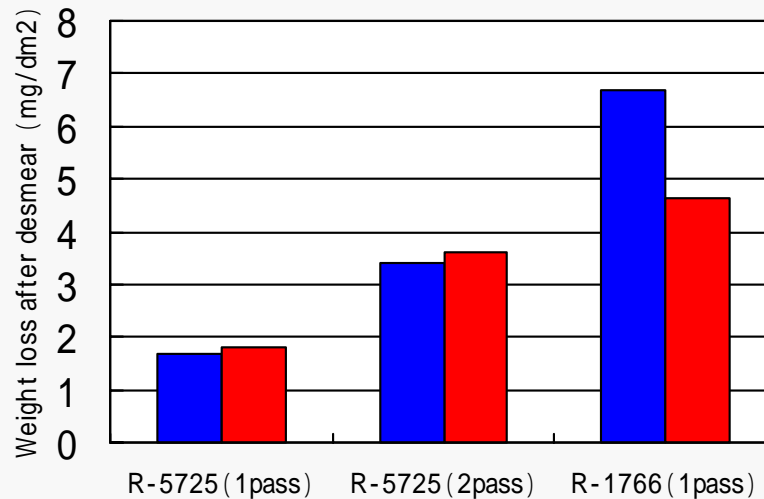


*The above data show actual values and are not guaranteed.

12.Desmear Data-1

Atotek process

| Operation | Chemicals | Temperature () | Process Time (min) |
|-----------------------------|-------------|-----------------|--------------------|
| Sweller (Hole Conditioning) | Sweller P | 70 | 5 |
| | Sweller SBU | 70 | 5 |
| Permanganate acid etching | | 70 | 10 |
| Reduction | | 40 | 5 |



Sweller P

Sweller SBU

*Sample Size : 100 × 100 × 1.0mmt

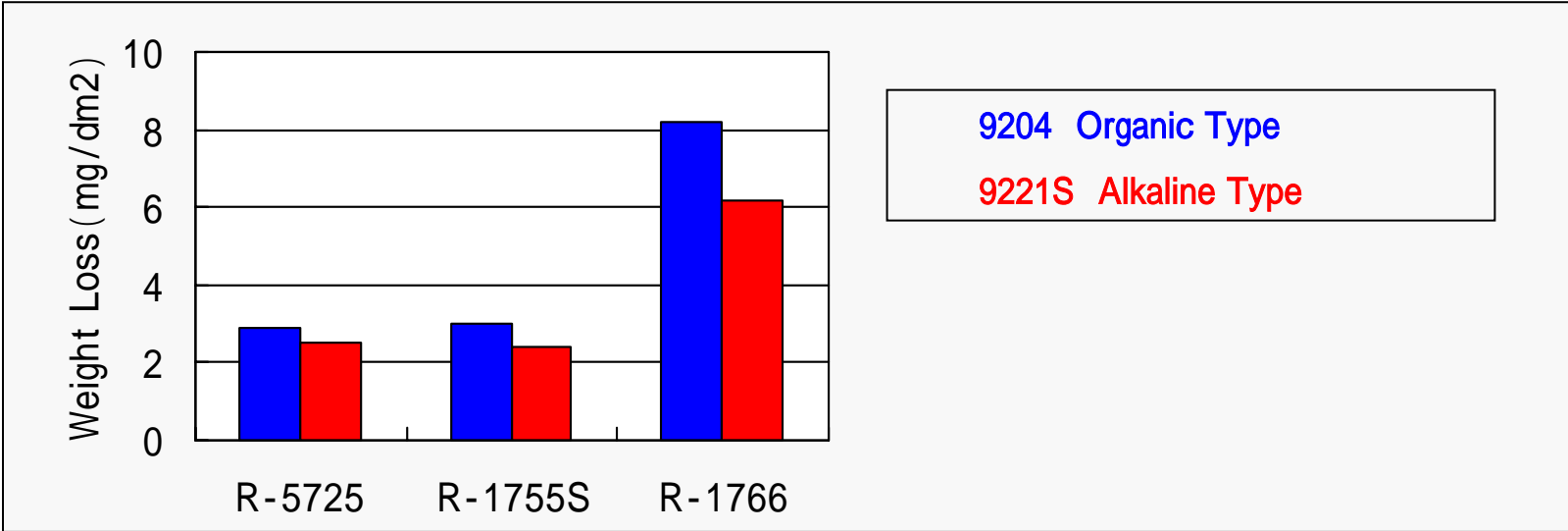
*ATOTEK system

*The above data show actual values and are not guaranteed.

12.Desmear Data-2

Mac Dermid process

| Operation | Chemicals | Temperature () | Process Time (min) |
|-----------------------------|---------------------|-----------------|--------------------|
| Sweller (Hole Conditioning) | 9204 Organic type | 35 | 7 |
| | 9221S Alkaline type | 55 | 5 |
| Permanganate acid etching | | 75 | 15 |
| Reduction | | 43 | 5 |



*The above data show actual values and are not guaranteed.