



Xbright Technology

潢 填 科 技 股 份 有 限 公 司

產品介紹

■ 奈米輻射散熱漆

■ 型號:XT-TC009-G

散熱導論

一般而言, 電子零件的壽命會隨溫度每升高 10°C 而壽命減少一半。如何讓零件保持在適當的溫度?

■ 熱傳導：

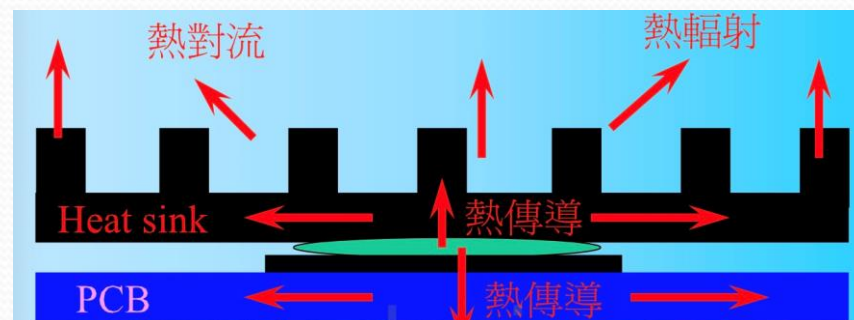
- 不同物體之間或同一物體內部存在溫度差時，就會通過物體內部分子、原子和電子的微觀振動、位移和相互碰撞而發生能量傳遞現象。
- 熱傳導能力取決於材料本身,一般說來：金屬的熱導率最大，非金屬次之，液體的較小，而氣體的最小

■ 熱對流：

- 自然對流：由密度差(溫度差)所引起。
- 強制對流：由外力因素(如風扇)所引起。

■ 熱輻射：

- 物體由於具有溫度而輻射電磁波的現象,稱為熱輻射。
- 一切溫度高於絕對零度的物體都能產生熱輻射，溫度愈高，輻射出的總能量就愈大。
- 熱輻射的光譜是連續譜，波長覆蓋範圍理論上可從0直至 ∞ ，一般的熱輻射主要靠波長較長的可見光和紅外線傳播。



XT-TC009-G 奈米輻射散熱漆

- 所添加的散熱填料具有超高的導熱率, 同時還具有接近理論黑體的輻射率.
 - 有效提高熱交換能力.
- 在油漆中加入散熱填料, 使油漆噴塗在金屬基板上
 - 增加導熱K值
 - 導熱K值由原本213 增加至402
 - 增加熱輻射係數
 - 熱輻射係數由原本0.1 增加至0.95
- 通過SGS 檢測,
 - 符合RoHS 2011/65/EU Annex II 之要求
 - 符合 修訂指令EU 2015/863之要求

特性

高散熱效果之特殊功能性環保塗料，十分適合塗佈於鋁、銅、不鏽鋼等金屬材質所製成的散熱片表面以協助散熱。具有以下特點：

- 高烘培效率(180°C/20min)。
- 成分充分分散及懸浮。
- 上色容易，用量節省。
- 提供了高效能的輻射散熱效果。
- 有效降低素材表面溫度。
- 達到散熱功能與裝飾美觀兼備之用。
- 特殊碳奈米材料分散技術，充分發揮新材料散熱效能。

輻射散熱漆導熱K值測試報告

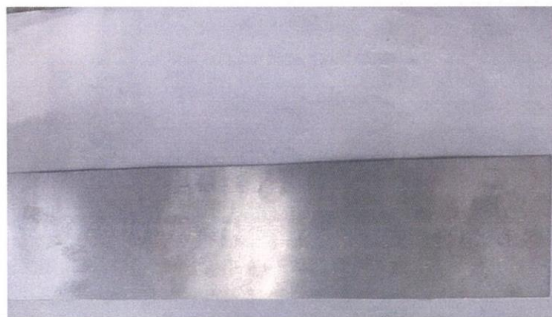
■ 測試單位：清華大學先進冷卻散熱實驗室

2.2 Test Results

2.2.1 Table 2-1— α , C , K_{sp} values for all samples

Table 2.2.1 TDMI 測量的樣品熱擴散率

Item	XT-701
$\rho(\text{g}/\text{cm}^3)$	$\rho_{\text{ave}}=2.75$
$C(\text{J}/\text{g} \cdot ^\circ\text{C})$	0.883
$L \times W \times T (\text{mm}^3)$	$250 \times 60.3 \times 0.41$
$\tau=T/W$	$\tau=0.41/60.3=0.0068<0.022$
mode	2D mode (A)
$\alpha (\text{cm}^2/\text{s})$ (Homogeneous)	$\alpha_{\text{total}}=0.88$
$K_{VC, \text{TDMI}} (\text{W}/\text{m}\cdot\text{k})$	$K_{VC-A}=2.75 \times 0.883 \times 0.88 \times 100=213.686$
ΔT (at $L=3\text{cm}$, $P=10\text{W}$)	15.7°C
ΔT (sine wave)	12.6°C

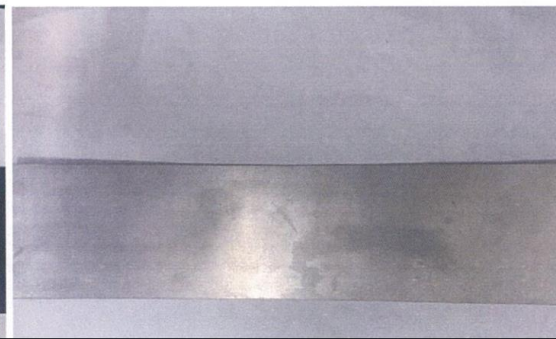
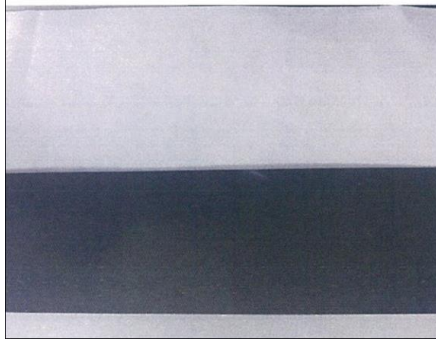


2.2 Test Results

2.2.1 Table 2-1— α , C , K_{sp} values for all samples

Table 2.2.1 TDMI 測量的樣品熱擴散率

Item	XT-701with XT-TC009-G
$\rho(\text{g}/\text{cm}^3)$	$\rho_{\text{ave}}=2.32$
$C(\text{J}/\text{g} \cdot ^\circ\text{C})$	0.81
$L \times W \times T (\text{mm}^3)$	$250 \times 60.3 \times 0.49$
$\tau=T/W$	$\tau=0.49/60.3=0.0081<0.022$
mode	2D mode (A)
$\alpha (\text{cm}^2/\text{s})$ (Homogeneous)	$\alpha_{\text{total}}=2.141$
$K_{XT-701 \text{ with XT-TC009-G}} (\text{W}/\text{m}\cdot\text{k})$	$K=2.32 \times 0.81 \times 2.141 \times 100=402.337$
ΔT (at $L=3\text{cm}$, $P=10\text{W}$)	5.9°C
ΔT (sine wave)	3.6°C



SGS RoHS測試報告

SGS

測試報告

Test Report

號碼(No.) : CE/2020/42284 日期(Date) : 2020/04/17

頁數(Page) : 1 of 9

漢填科技股份有限公司

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以下測試樣品係由申請廠商所提供及確認 (The following sample(s) was/were submitted and identified by/on behalf of the applicant as):

送樣廠商(Sample Submitted By) : 漢填科技股份有限公司 (XBRIGHT TECHNOLOGY CO. LTD.)
樣品名稱(Sample Description) : 奈米散熱漆
樣品型號(Style/Item No.) : XT-TC009-G
收件日期(Sample Receiving Date) : 2020/04/13
測試期間(Testing Period) : 2020/04/13 to 2020/04/17

測試需求(Test Requested) :

- (1) 依據客戶指定, 參考RoHS 2011/65/EU Annex II及其修訂指令(EU) 2015/863測試鎘、鉛、汞、六價鉻、多溴聯苯、多溴聯苯醚, DBP, BBP, DEHP, DIBP. (As specified by client, with reference to RoHS 2011/65/EU Annex II and amending Directive (EU) 2015/863 to determine Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP contents in the submitted sample(s).)
- (2) 依據客戶指定, 進行鹵素-氯、氟、溴、碘測試. (As specified by client, to test Halogen-Fluorine, Chlorine, Bromine, Iodine contents in the submitted sample(s).)

測試結果(Test Results) : 請參閱下一頁 (Please refer to following pages).

結論(Conclusion)

- (1) 根據客戶所提供的樣品, 其鎘、鉛、汞、六價鉻、多溴聯苯、多溴聯苯醚, DBP, BBP, DEHP, DIBP的測試結果符合RoHS 2011/65/EU Annex II暨其修訂指令(EU) 2015/863之限值要求. (Based on the performed tests on submitted sample(s), the test results of Cadmium, Lead, Mercury, Cr(VI), PBBs, PBDEs, DBP, BBP, DEHP, DIBP comply with the limits as set by RoHS Directive (EU) 2015/863 amending Annex II to Directive 2011/65/EU.)

Troy Chang
Troy Chang / Manager - Tech
Signed for and behalf of
SGS TAIWAN LTD.
Chemical Laboratory - Taipei



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散熱漆測試：顯卡模組 → 熱源降低11.5°C

測試環境：1.全封閉溫控箱30°C

2. 加熱熱源: 40W

TIM(熱介面材料): 導熱膏, K=5

廣填輻射漆: XT-TC009-G, 雙面噴塗

尺寸:	廣填輻射散熱漆
A.270x110x30	NO
B.270x110x30	YES



A.未噴散熱漆

B.噴塗散熱漆



全封閉式溫控箱(30度)

厚度: 30mm	廣填輻射散熱漆	TC 熱源	T2	T3	T4	T5	T6
A.270x110x30mm	NO	111.3	85.2	83.9	75.8	77.9	49.8
B.270x110x30mm	YES	99.8	77.5	77.7	67.9	77.3	48.9

■ A vs. B, B熱源低 11.5度

散熱漆測試：沖壓件,手機中框→熱源降低8.4°C

測試環境：1.全封閉溫控箱30°C

2. 加熱熱源: 5W

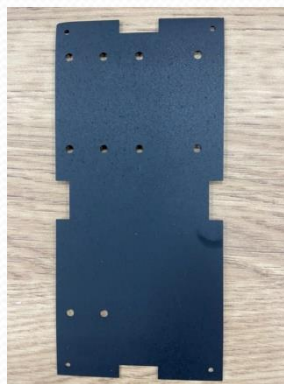
TIM(熱介面材料): 導熱膏, K=3

廣填輻射漆: XT-TC009-G, 雙面噴塗

Item	Thermal paint
A. 157x72x0.2 mm	NO
B. 157x72 x0.2 mm	YES
C. 157x72x0.5 mm	NO
D. 157x72x0.5 mm	YES



A.0.2mm厚度
未噴漆



B.0.2mm厚度
噴塗散熱漆



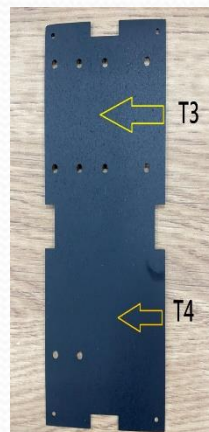
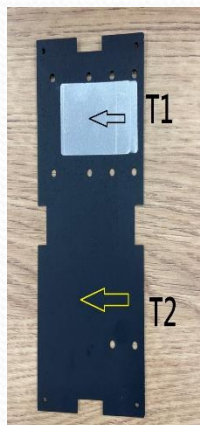
C.0.5mm厚度
未噴漆



D.0.5mm厚度
噴塗散熱漆



Chamber at 30°C



Item	Thermal Paint	T1 Heat source	T2	T3	T4	T5 Amb.
A.157x72x0.2 mm	NO	91.8	48.8	85.6	47.8	33.0
B.157x72x0.2 mm	YES	83.4	40.8	79.2	40.9	32.3
C.157x72x0.5 mm	NO	78.6	54.1	71.6	51.9	33.2
D.157x72x0.5 mm	YES	70.6	45.7	66.7	45.8	32.3

■ A vs. B. B lower 8.4°C

■ C vs .D. D lower 8.0°C

散熱漆測試：鋁擠散熱片→熱源降低11.2°C

測試環境：1.全封閉溫控箱30°C

2. 加熱熱源: 2W

TIM(熱介面材料): 導熱膏, K=3

AL6063 鋁擠散熱片

漢填輻射漆: XT-TC009-G, 單面噴塗

Item	Thermal paint
A. 52x52x45.5 mm	NO
B. 52x 52x 45.5mm (Xbright)	YES
C.52x52x45.5mm (Other brand)	YES
D.52x52x45.5mm Anode	NO



A. 未噴散熱漆



B. 噴塗漢填散熱漆



C. 噴塗他牌散熱漆



Chamber at 30°C



D. 陽極處理

Item	Thermal paint	T1 heat source	T4 Amb.
A. 52x52x45.5 mm	NO	89	30
B. 52x 52x 45.5mm (Xbright)	YES	77.8	27.9
C.52x52x45.5mm (Other brand)	YES	82.9	28
D.52x52x45.5mm Anode	NO	84.3	33.6

■ A vs. B, B lower 11.2°C

■ A vs. C, C lower 6.1°C

■ B vs. C, B lower 5.1°C

■ B vs. D, B lower 6.5°C

散熱漆測試：EAP天線壓鑄底板→ 熱源降低8.8°C

測試環境：1.全封閉溫控箱30°C

2. 加熱熱源: 18W

TIM(熱介面材料): 導熱膏, K=5

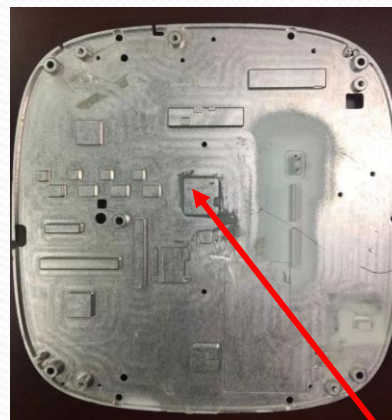
鋁壓鑄底板: ADC1

漢填輻射漆: XT-TC009-G, 單面噴塗

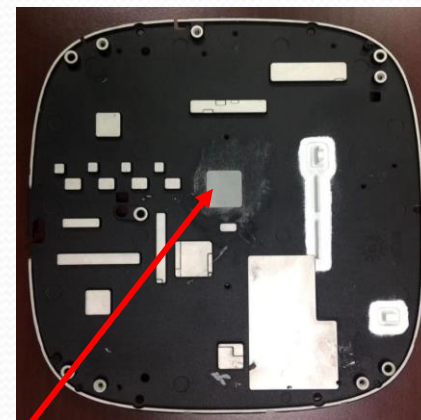
Sample:	Thermal paint
A. 205 x 205 x 2.5 mm	NO
B. 205 x 205 x 2.5 mm, one side	YES



Chamber at 30°C



A.



B.

熱源T_c

Sample	T _c Heat source	T ₅ Amb.
A. 205 x 205 x 2.5 mm	103.2	37.8
B. 205 x 205 x 2.5 mm, one side	94.4	37.8

■ A vs. B, B heat source lower 8.8 °C

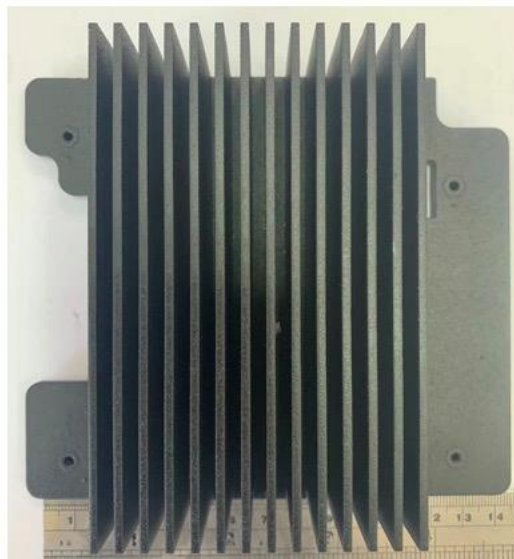
散熱漆測試: 各種材料(沖壓, 鋁擠, 壓鑄) 測試結果

Thermal Test Report

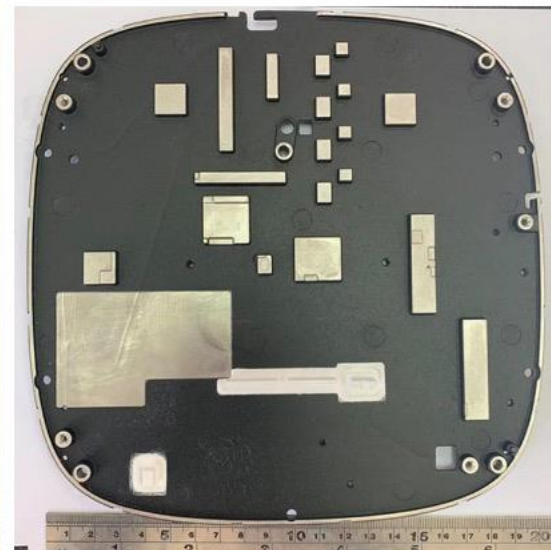
Type	熱源	Desc.	環境溫度	熱源溫度	溫差
沖壓散熱片	10W	Smple A: 10x10x2 mm, AL1050, 黑色陽極處理	26.8	101	
沖壓散熱片	10W	Smple A-1: 10x10x2 mm, AL1050, 潢填散熱漆	26.8	91.3	9.7
鋁擠散熱片	15W	Sample B: 145x125x37 mm 黑色陽極處理	24.4	86.9	
鋁擠散熱片	15W	Sample B-1: 145x125x37 mm 潢填散熱漆	24.4	79.6	7.3
壓鑄散熱片	15W	Sample C: 205 x 205 x 2.5mm, ADC1, 素材	30	76.1	
壓鑄散熱片	15W	Sample C-1: 205 x 205 x 2.5mm, ADC1, 潢填散熱漆	30	67.7	8.4



Sample A-1



Sample B-1



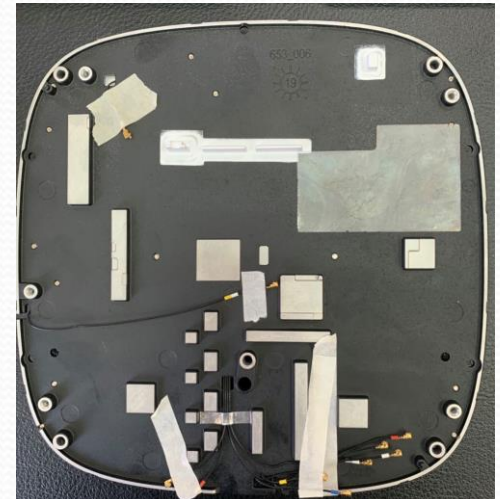
Sample C-1

可靠性測試

Test Item 測試項目	樣品數量	測試結果
Salt spray test 鹽霧測試	1	PASS
3M610 tape test 3M3610 膠帶測試	25	PASS
Cross-cut test 百格測試	5	PASS
Temperature shock test 溫度冷熱衝擊測試	25	PASS

可靠性測試：鹽霧測試

- ✓ Test requirement: No oxidation corrosion, blackening, protruding and white on the appearance.
(外觀無氧化腐蝕，發黑，突出和白色)
- ✓ Test Standard: JIS-Z2371-2
- ✓ Test condition: PH 6.5+/-0.5, brine concentration: 5%, Spray pressure: 1.0kgf, Experimental temperature: 35°C, Pressure barrel temperature: 47°C
(PH 6.5 +/- 0.5，鹽水濃度：5%，噴霧壓力：1.0kgf，實驗溫度：35°C，壓力桶溫度：47°C)
- ✓ Test time: 24 Hours
- ✓ Sample Quantity: 1pcs;
- ✓ Test result: PASS



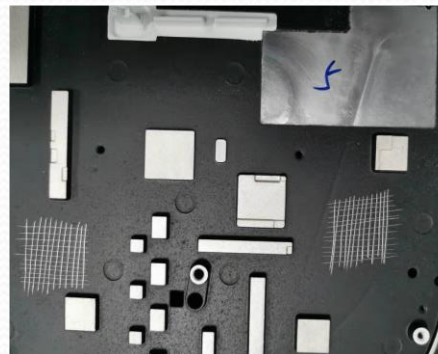
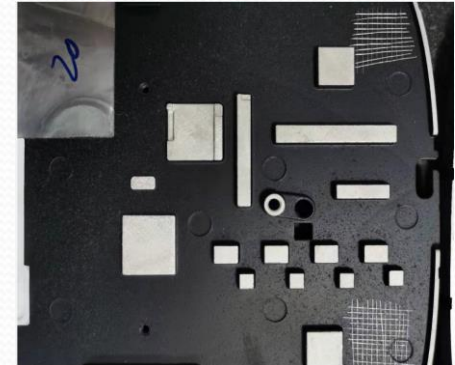
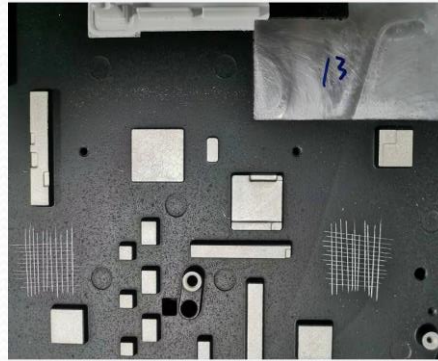
可靠性测试：3M610 膠帶測試

- ✓ Test requirement: Adhesion test; the painting no peel off (附著力測試；散熱漆沒有剝落)
- ✓ Test Method: 3M610 tape
- ✓ Sample Quantity: 25pcs;
- ✓ Test result: PASS



可靠性測試：百格測試

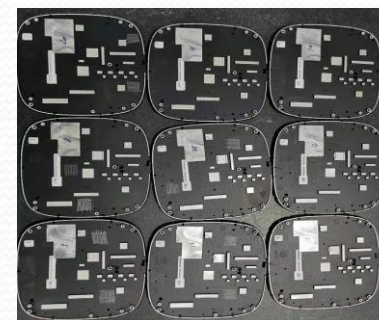
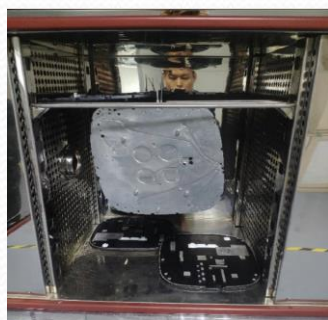
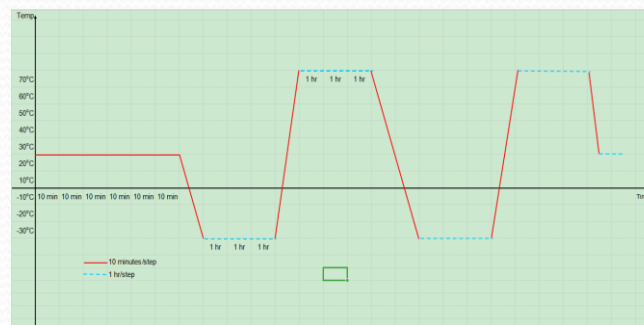
- ✓ Test requirement: Adhesion test; the painting no peel off. 附著力測試；散熱漆沒有剝落
- ✓ Test Method: Use the blade row “#” on the surface of painting, and then use 3M610 tape to confirm the painting adhesion;
使用刀片在散熱漆表面上畫出“#”百格，然後使用3M610膠帶以確認散熱漆附著力；
- ✓ Sample Quantity: 5pcs;
- ✓ Test result: PASS



可靠性測試：溫度冷熱衝擊測試

- ✓ Test requirement: It's placed under high and low temperature shock test to run 15 hours. The painting no peel off.
 將其置於高溫和低溫衝擊測試15小時,散熱漆沒有剝落。
- ✓ Test method: -30°C to 70 temperature cycle test. -30°C至70溫度循環測試
- ✓ Sample Quantity: 25pcs;
- ✓ Test result: PASS

Step	Temperature	Absolute Humidity	Event	Duration	Comment
1	20 ± 2 °C	Uncontrolled	Soak	01:00:00	Starting point
2	-30 ± 3 °C	Uncontrolled	Decrease temp.	00:12:00	5 °C/min
3	-30 ± 3 °C	Uncontrolled	Soak	03:00:00	Low temp.
4	70 ± 2 °C	Uncontrolled	Increase temp	00:09:10	12 °C/min
5	70 ± 2 °C	Uncontrolled	Soak	03:00:00	High temp.
6	-30 ± 3 °C	Uncontrolled	Decrease temp.	00:22:00	5 °C/min
7	-30 ± 3 °C	Uncontrolled	Soak	03:00:00	Low temp.
8	70 ± 2 °C	Uncontrolled	Increase temp	00:09:10	12 °C/min
9	70 ± 2 °C	Uncontrolled	Soak	03:00:00	High temp.
10	20 ± 2 °C	Uncontrolled	Decrease temp.	00:05:30	9 °C/min
11	20 ± 2 °C	Uncontrolled	Soak	01:00:00	End point



規格

漿料外觀	黑色有光澤流體
成膜外觀	黑色平/無光
黏度(#2岩田杯測試)	20~22 cps
固型份	21+/-1%
PH值	5.5+/-1
RoHS	PASS(SGS認證)
塗料輻射率	0.95
建議最低乾燥溫度	140°C/20min
對鋁板密著度	5B(0%脫落)
對銅板密著度	5B(0%脫落)
對不鏽鋼密著度	5B(0%脫落)
耐鹽霧	生鏽面積<2%(PASS)
耐候性(240Hr)	測試無退色
耐鹼性(0.1%NaOH, 2Hr)	浸泡無脫落
耐高溫性(200°C, 30min)	測試無脫落
耐蒸氣(Boiling Steam)	測試無脫落
耐沸水(Boiling immersion)	測試無脫落

規格

耐高溫高濕(Wet Stack A, 95%/50°C/120Hr	$\Delta E=1.11$ (PASS)
耐高溫高濕(Wet Stack B, 95%/50°C/120Hr	$\Delta E=1.32$ (PASS)
耐高溫高濕(CH, 90%/50°C/120H)	$\Delta E=0.68$ (PASS)
耐甲苯擦拭	>100次
耐MEK擦拭	>50次
鉛筆硬度	>2H
百格測試	測試無脫落
ESD(靜電放電測試	2KV



**Your Choice
Our Promise**