



功得電子工業股份有限公司
CONQUER ELECTRONICS CO.,LTD.

規格書

Specification For Approval

Spec. No. SFA111

型號：SEM 系列方型瓷管保險絲

Model : SEM Series

Square Ceramic Surface Mount Fuse

www.conquer.com.tw

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History of Change

REV.	Description	Date	Drawn	Designed	Checked	Approved
1.0	(1) Issue	2018.06.08	陳志強	邱俊偉	蔡進義	蕭順益
2.0	(1) 增加0.5A及2A規格 (2) 封面改為SEM Series規格書	2018.07.13	陳志強	彭彥鳴	蔡進義	蕭順益
3.0	(1) 更新項次9 雷擊試驗規範內容 (2) 更新項次10 AC Power Fault Test (3) 新增項次16 波峰焊曲線圖 (4) 更新項次19 信賴性作業規定	2018.12.14	陳志強	彭彥鳴	蔡進義	蕭順益

～ 筒管狀保險絲 ～

Fuses for Instrument, Power and Telephone (Non-indicating)

1 適用範圍 Available Range:

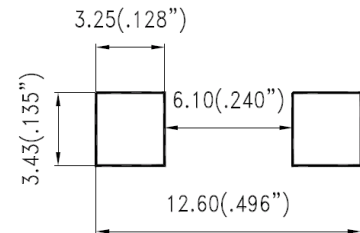
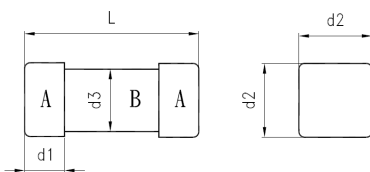
本標準適用於保護儀器、電源供應器和電話機用之筒管式熔斷保險絲。
在K.21的標準要求中可能需要一系列額外的阻抗元件。

For protecting instruments, power supplies and telephone sets.

The coordination requirement contained in K.21 may require a series of impedance devices.

2 形狀及尺寸如下圖 單位: mm

Shape & Size as Following Illustrations.



Recommended Pad Layout

2.1 構造形狀 Structure & Shape: 如上圖 As shown in figure above

2.2 額定電壓 Rated Voltage: 600Vac

2.3 額定電流 Rated Current: 0.5A / 1.25A / 2A

3 材料 Material:

3.1 筒管本體: 不透明瓷管不可破裂或變形。

Tube (Body): Non-Transparent ceramic tube fuse. No breaking or deformation is allowed.

3.2 兩端銅蓋: 需以導電率良好之黃銅為材料。

Two brass end caps: Made of brass of good conductivity.

3.3 銅蓋處理: 銅蓋部份鍍金。

Coating of brass caps: Plating the surface with Gold.

SEM Series

No.	Part Name 部品名稱	Volume 數量
A	Square Cap - Gold Plating 方型銅帽 - 鍍金	2
B	Square Ceramic Tube - Non-Transparent Ceramic 方型瓷管 - 不透明瓷管	1
C	Fuse Element 可熔體	1
d1	Height of Cap - 1.75±0.20 mm 銅帽高度	
d2	Dimension of Cap - 3.10±0.20 mm 銅帽尺寸	
d3	Dimension of Ceramic - 2.65±0.20 mm 瓷管尺寸	
L	Body of Fuse - 10.10±0.40 mm 本體尺寸	

4 電氣特性 Electrical Characteristics:

4.1 負載容量 Loading Capacity:

通過額定電流值 100 % (亦即 $1.0 \times I_n A$) , 能繼續通電至少 4小時無任何熔化現象。

Loading 100% Rated Current (i.e. $1.0 \times I_n A$) for flowing, and it's available to let current keep on flowing at least 4 hour without any melting. (Can keep 4 Hour minimum)

4.2 溫度特性 Temperature:

通過額定電流值100%(亦即 $1.0 \times I_n A$)1.5小時，繼續維持原加之電流，每隔十分鐘測試一次，連續測三次，溫度不得升高，若使用熱偶式測量方法，

(Thermocouple method) 則本體溫升在 175K 以下。

Loading the 100 % ($1.0 \times I_n A$) for 1.5 hours, keep testing it with the original current every 10 minutes. Continue to test it for 3 times. The temperature is not allowed to be higher. The main temperature rise is below 175K by way of thermocouple method.

4.3 過載熔斷 Melting due to Overloading:

請參照下表。 Details as Follows Table.

※最大熔斷時限 Operating Characteristics

安培數 Rating	100% Rating		250% Rating	
	Min.	Max.	Min.	Max.
0.5A ~ 2A	4 Hr		1 sec	120 sec

5 機械特性 Mechanical Properties:

拉力強度 Terminal Strength:

當施加軸拉力1.0kgf於兩端銅帽，無鬆動或損壞現象發生。

Caps are soldered (adhered) to withstand axial pulling force of 1.0kgf without loosening or any harmfulness to firmly attachment.

6 突波實驗 Pulse Test:

為適應電感或電容性電路所產之暫態電流，本品於10倍額定電流的熔斷時間最少為 10ms。

In order to stand transient current caused by inductive or capacitive, the fuses are designed to have minimum clearing time of 10 millisecond at 1000% rated current.

7 脈波實驗 Cycle Test (On-Off Test):

本實驗乃保證產品之壽命與可靠度，施加60%額定電流之脈波，1分鐘ON，2分鐘OFF，1000次以後，本品不熔斷且內阻變化20%以下。

This test is designed to assure a reliable fuse, Controls are set giving 60% of rated ampere.

1 minute ON, 2 minutes OFF per time, the fuse will not open before 1000 times and the internal resistance change will be below 20%.

8 遮斷能力 Interrupting Rating:

0.5A ~ 2A : 60 amperes at 600Vac
 60 amperes at 250Vac
 50 amperes at 250Vdc
 100 amperes at 125Vdc

9 雷擊測試規範 Lightning Surge Specifications: (Fuse can not open)

Surge Specification	Surge	Max. Rise / Min. Decay (μ sec.)	Min. Peak Current (A)	Min. Peak Voltage (V)	Repetitions Each Polarity	Recommended Fuse
Telcordia / Bellcore GR-1089	First Level Lightning	10 / 1000	100	600	25	1.25A / 2A
			100	1000	25	1.25A / 2A
			100*	2000	5	1.25A / 2A
		10 / 700	160	4000	5	1.25A / 2A
		10 / 360	100	1000	25	1.25A / 2A
			25	1000	5	0.5A / 1.25A / 2A
		10 / 250	200*	4000	5	1.25A / 2A
		1.2 / 50 Voltage & 8 / 20 Current	600*	6000	5	1.25A / 2A
			300	5000	5	1.25A / 2A
			800*	2000	5	1.25A / 2A
			750	1500	5	1.25A / 2A
			400	800	5	1.25A / 2A
			300	600	5	1.25A / 2A
		2 / 10	500	2500	10	1.25A / 2A
			300	1500	10	1.25A / 2A
			200	1000	5	1.25A / 2A
			100	800	5	1.25A / 2A
	Second Level Lightning	1.2 / 50 Voltage & 8 / 20 Current	750*	6000	1	1.25A / 2A
		2 / 10	500	5000	1	1.25A / 2A

* 需增加額外的阻抗進行試驗

* The test shall be added additional impedance devices.

Surge Specification	Surge	Waveform (μ sec.)	Current (A)	Voltage (V)	Repetitions Each	Recommended Fuse
FCC Part 68 (TIA-968-A)	Metallic A	10 x 560	100	800	1	1.25A / 2A
	Longitudinal A	10 x 160	200	1500	1	1.25A / 2A

Surge Specification	Impulse	Waveform (μ sec.)	Current (A)	Voltage (V)	Repetitions Each	Recommended Fuse
UL / EN 60950 (ITU-T K20)	Non-handheld	10 x 700	37.5	1500	5	0.5A / 1.25A / 2A
	Handheld units		62.5	2500	5	0.5A / 1.25A / 2A

10 AC Power Fault Tests (Fuse can not open)

GR-1089 1st Level Test	Voltage (Vrms)	Short Circuit Current (A)	Hits	Duration	Recommended Fuse
1	50	0.33	1	15min	0.5A / 1.25A / 2A
2	100	0.17	1	15min	0.5A / 1.25A / 2A
3	600	0.5	1	30sec	0.5A / 1.25A / 2A
4	1000	1	60	1sec	0.5A / 1.25A / 2A
5	200	0.47	60	1sec	0.5A / 1.25A / 2A
6	425	0.71	5	2sec	0.5A / 1.25A / 2A
7	440	2.2	5	2sec	1.25A / 2A
8	600	3	1	1.1sec	1.25A / 2A
9	1000	5	1	0.4sec	1.25A / 2A

※ 此項目試驗之電壓可高於上表規範，但電流值需與上表規範一致。

※ These tests can be performed at a higher voltage, but the current is to be as specified.

11 AC Current Limiting Protector Tests / Fusing Coordination Tests

Voltage (Vac)	Current (A)	Duration	Maximum Time For Fuse To Open (Seconds)		
			0.5A	1.25A	2A
600	2.2	Up to 15 min	1	Will not open	Will not open
600	2.6		0.8	900	Will not open
600	3.0		0.5	20	Will not open
600	3.75		0.3	10	20
600	5.0		0.2	4	10
600	7.0		0.1	2	4
600	10.0		0.05	1	1.2
600	12.5		0.03	0.40	0.6
600	20		0.01	0.14	0.2
600	25		0.008	0.08	0.14
600	30		0.006	0.04	0.10

12 包裝 Packing:

打帶軸裝：SEM 2500pcs/軸(13")/盒

內盒印明下列標示：料號、額定(電壓、電流、遮斷能力)及安規名稱。

包裝材料均符合RoHS或者HF的環保要求，且包裝材料不會和零件發生化學反應造成不良。

Tape in reel: SEM 2500pcs in a reel(13") in an inner box.

The following items indicated on the box.

Mark: Catalog number, ratings (voltage, current, interrupting capacity) and safety mark.

The packing material conforms to RoHS or the HF environmental protection request.

And the packing material can't have the chemical reaction with the components.

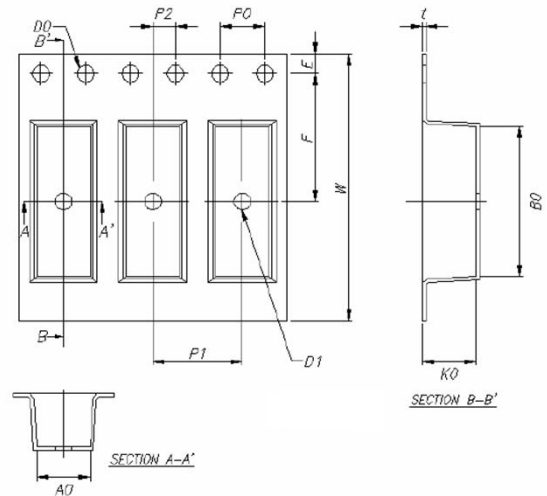
SEM Series

Item	W	P1	E	F	D0	D1
Spec	24.00	8.00	1.75	11.50	1.50	1.50
Tolerance	+0.30	+0.10	+0.10	+0.10	+0.10	+0.10
	-0.30	-0.10	-0.10	-0.10	-0.00	-0.00

(Unit: mm)

Item	P0	P2	t	K0	A0	B0
Spec	4.00	2.00	0.30	3.40	3.40	10.40
Tolerance	+0.10	+0.10	+0.05	+0.10	+0.10	+0.10
	-0.10	-0.10	-0.05	-0.10	-0.10	-0.10

(Unit: mm)



13 其他 Other:

13.1 除非另有指定，上述機械、電器特性，係於常溫，標準狀況下測試之。

Unless otherwise specified, all tests to be performed at 25±5°C and 35-75% RH.

13.2 於標準狀況下儲放一年，本品乃確保上述機械與電氣之特性。

After one year's storage under normal condition, this item is guaranteed to meet the requirements mentioned above.

13.3 使用於此產品之材料中，使用高溫熔化型之焊錫，此焊錫成份中鉛含量大於85%，故此產品符合RoHS指令要求之焊錫含鉛量超過85%之排除條款規範。

Because the materials used in these fuses include high melting temperature type solder and this solder contains more than 85% lead (Pb), so these products can conform to the exemptions of the requirements of RoHS Directive.

14 標記/安規認證 Mark/Safety Certification:

SEM Series

Approvals Rating		Nominal Resistance Cold Ohms	Nominal Melting I^2t A ² Sec	Max. Power Dissipation (W)
0.5 A	*	0.3360-0.6240	1.40	0.4
1.25 A	*	0.0700-0.1300	22.0	0.6
2 A	*	0.0385-0.0715	24.0	0.8

I^2t is measured at 10 times of rated current

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15 產品描述 Product Description:

例: SEM 1.25A 600V
1 2 3

- 1 系列品名 Series Model : SEM
- 2 安培數 Ampere Rating : 0.5A / 1.25A / 2A
- 3 伏特數 Voltage : 600V

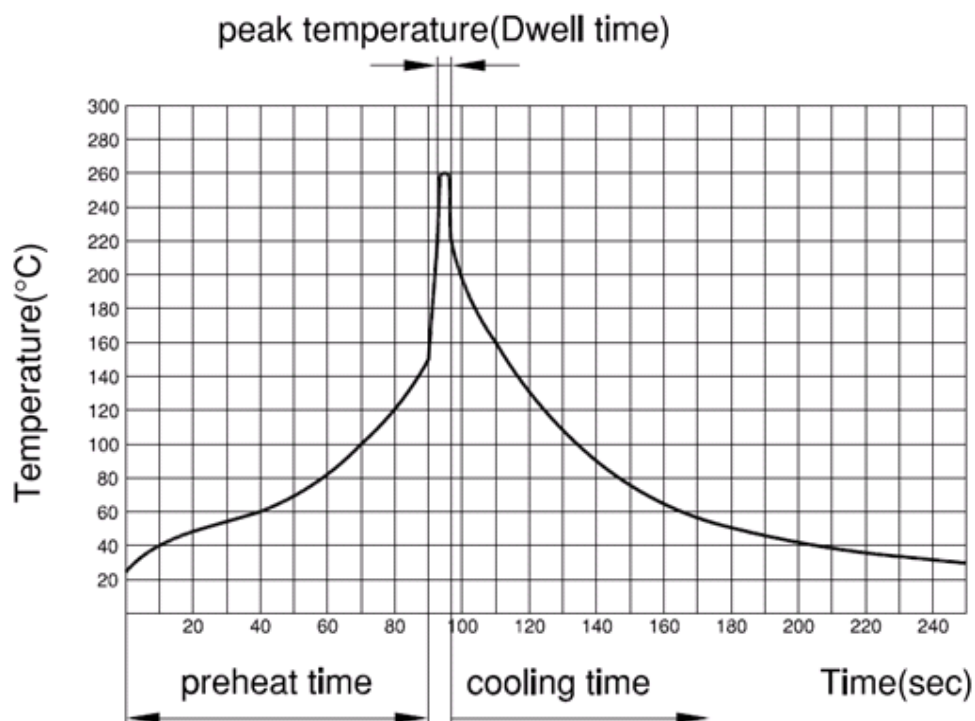
16 建議焊接方式及生產參數(無鉛焊錫使用及回流焊):

Recommended Soldering Method and Process Parameters

(for the action to Lead-free solder alloy and reflow soldering) :

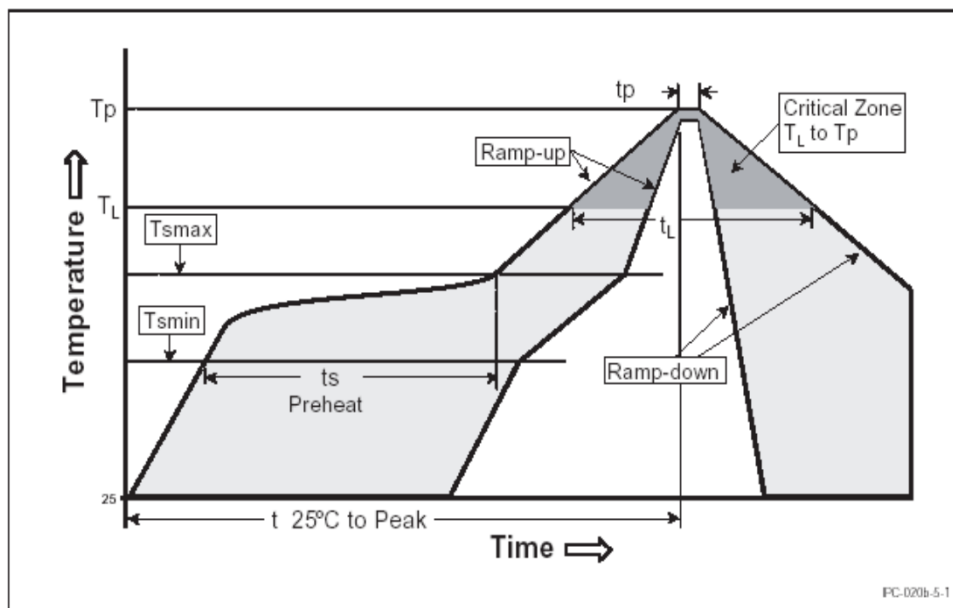
16.1 Hand Soldering : 350°C, 3sec. max. (Do not touch the terminal cap.)

16.2 Wave Soldering : 260°C, 3sec. max.



Wave Soldering Condition		Lead-free Assembly
Pre-Heat	Temperature Max.	150°C
	Time (Min. to Max.)	60 - 90 sec
Solder Pot Temperature		260°C max.
Solder Dwell Time		2 - 3 sec

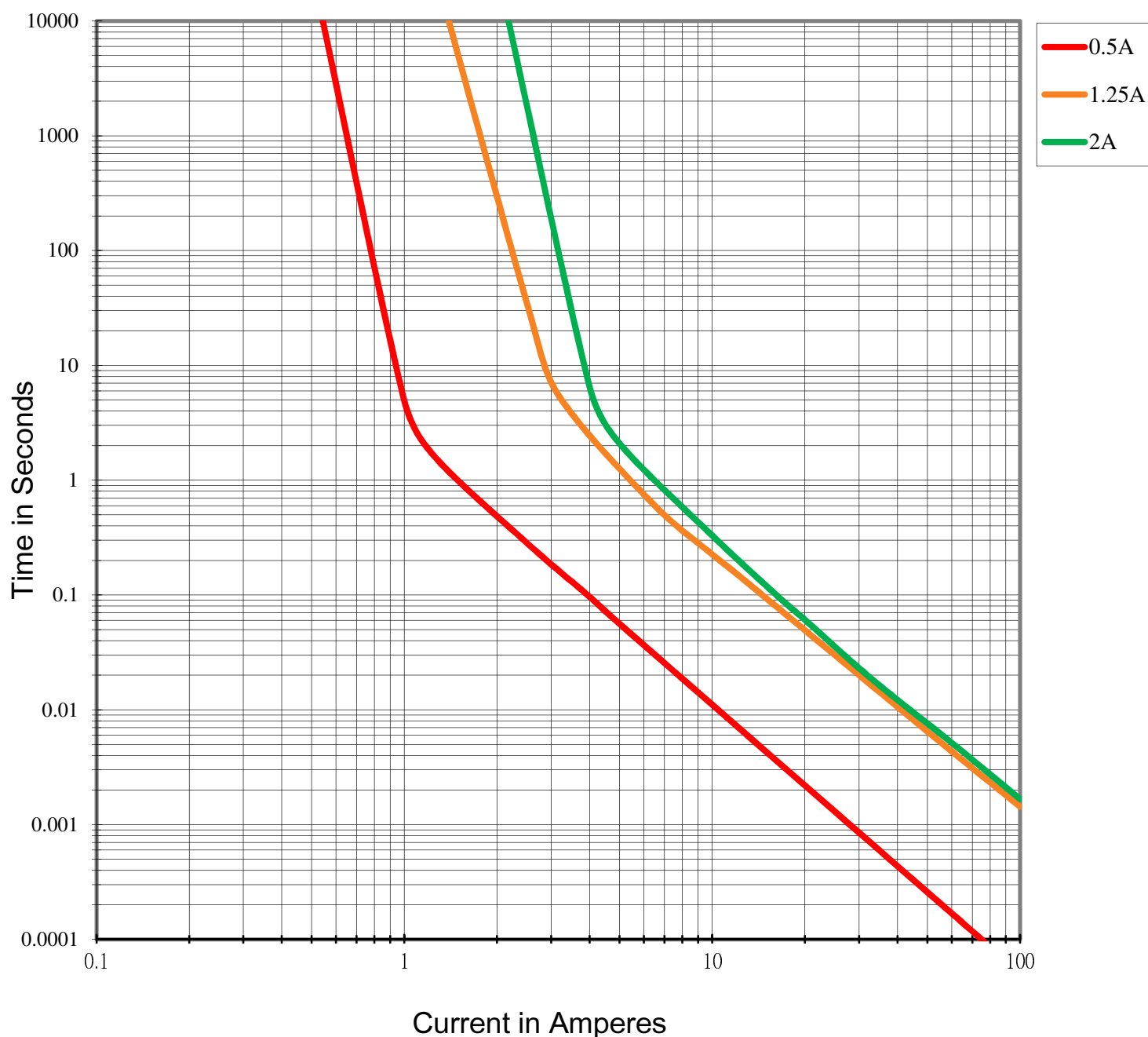
16.3 Reflow Soldering : 235°C, 30Sec. max.. See detail in the soldering profile.



Reflow Condition		Pb-free assembly
Pre-Heat	Temperature Min. (T _{s (min)})	150°C
	Temperature Max. (T _{s (max)})	200°C
	Time (Min to Max) (t _s)	60 - 180 sec
Average Ramp-up Rate (Liquidus Temp (T _L) to peak)		3°C / sec max
T _{s (max)} to T _L -Ramp-up Rate		5°C / sec max
Reflow	Temperature (T _L) (Liquidus)	217°C
	Time (t _L)	60 - 90 sec
Peak Temperature (T _p)		235 ± 5°C
Time within 5°C of actual peak Temperature (t _p)		20 - 30 sec.
Ramp-down Rate		6°C / sec max.
Time 25°C to peak Temperature (t 25°C to peak)		8 min max.
Do not exceed		240°C

17 IT曲線圖 Clear Time Curve (I vs t curve):

Average Melting It Curves



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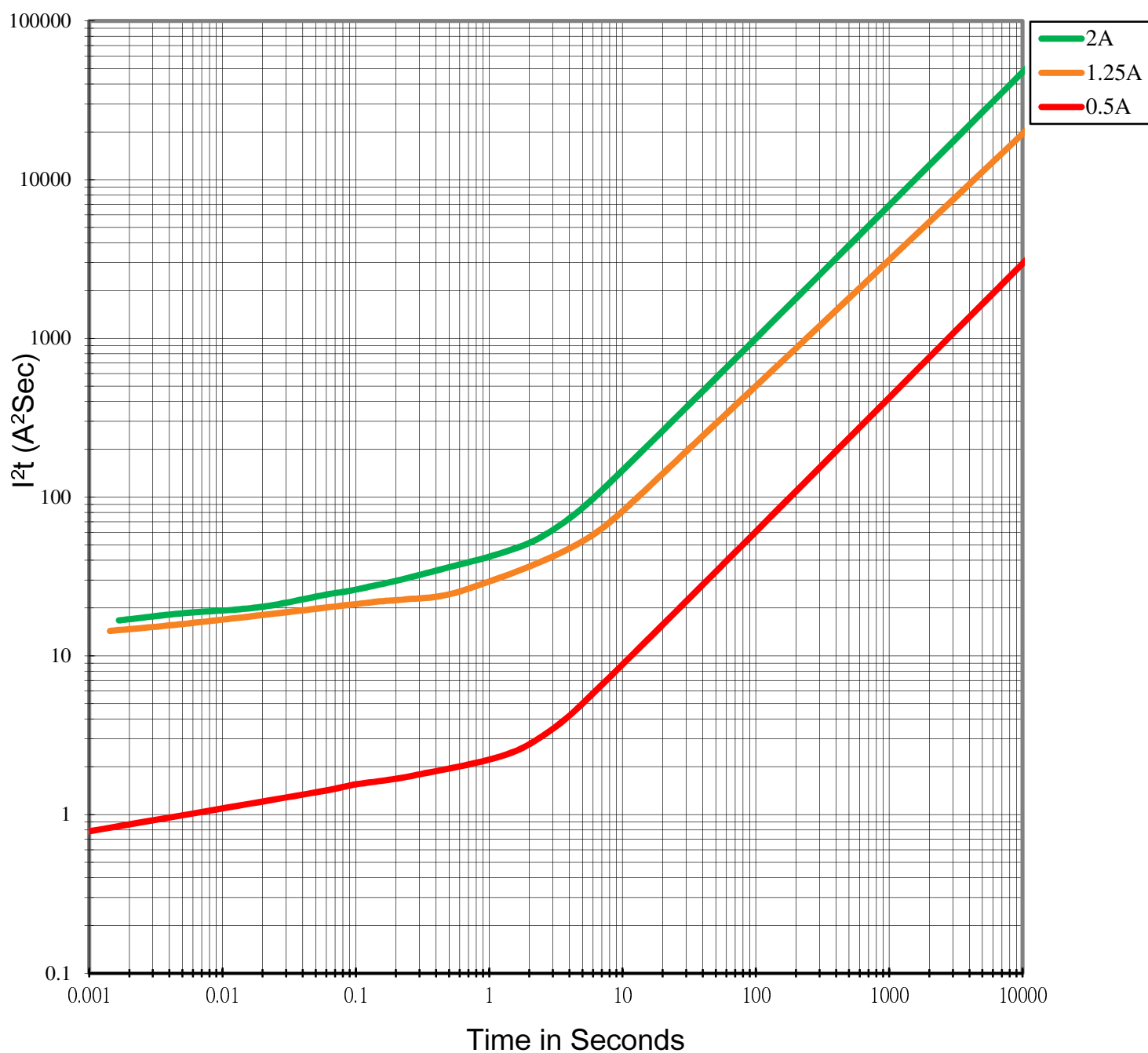
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18 I²T曲線圖 Standing Pulse (I²t vs t curve):

Average Melting I²t Curves



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19 信賴性作業測試規定 Product Characteristics & Reliability Tests:

Product Characteristics & Reliability Tests

Test item	Test Description & Reference
Humidity unload test	MIL-STD-202G , Method 103B , Test Condition A Heat ($85\pm0.5^{\circ}\text{C}$) & High Humidity ($85\pm1\%$ RH), 240 hours , $\Delta R<15\%$
Thermal shock test	MIL-STD-202G, Method 107g , Test Condition B Temperature setup : $25^{\circ}\text{C} \sim -65^{\circ}\text{C} \sim 25^{\circ}\text{C} \sim 125^{\circ}\text{C}$ Time setup : $-65^{\circ}\text{C}(30\text{min})\sim 25^{\circ}\text{C}(5\text{min})\sim 125^{\circ}\text{C}(30\text{min})\sim 25^{\circ}\text{C}(5\text{min})$ 5 cycles , $\Delta R<15\%$
Vibration test	MIL-STD-202G , Method 201A Frequency setup : $10 \sim 55 \sim 10\text{ Hz}$ Time setup : 1 Minutes/cycle (X-Y-Z,120 Cycles) 6 hrs, $\Delta R<15\%$
Salt spray test	MIL-STD-202G , Method 101E , Test Condition A Salt spray concentration : $5 \pm 1\%$ Test liquid temperature : $35 \pm 0.5^{\circ}\text{C}$ 96 hrs, $\Delta R<15\%$
Solderability test (for reflow soldering condition)	Reference IEC 60068-2-58 Temperature setup : $235 \pm 5^{\circ}\text{C}$, $10 \pm 1\text{ sec}$ After test terminal electrode wetting area must be greater than 95 %
Resistance to solder heat test (for reflow soldering condition)	Reference IEC 60068-2-58 Temperature setup : $235\pm 5^{\circ}\text{C}$, $30\pm 5\text{ sec}$ $\Delta R<15\%$
Bending test	Reference IEC 60127-4 The board shall be bent by 1mm at a rate of 1mm/sec $\Delta R<15\%$

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