



# Test Report: GC120A24

---

120W Single Output Battery Charger

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

## ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

## ■ RELIABILITY TEST

ENVIRONMENT TEST

**DESIGN VERIFY TEST**
**OUTPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	DC VOLTAGE (Typ.)	27.2V	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	27.112 V /230V 27.140 V /115V	P
2	CONTINUOUS OUTPUT CURRENT (Typ.)	4.42A	I/P : 230 VAC I/P : 115 VAC O/P : CV=24V Ta : 25°C	4.45 A /230V 4.44 A /115V	P
3	LED INDICATOR	Charging(CC) : RED Floating charging(CC) : GREEN	I/P : 230 VAC O/P : setting Ta : 25°C	> 0.504 A,LED :RED < 0.474 A,LED :GREEN	P

**INPUT FUNCTION TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90VAC~264 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C  I/P : LOW-LINE-3V= 87 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec. OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	69 V~264V  TEST : OK	P
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P : 90 VAC ~ 264 VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.97 / 230 VAC(TYP) 0.99 / 115 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.978 / 230 VAC PF= 0.998 / 115 VAC	P
4	EFFICIENCY	90% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	90.82 %	P
5	INPUT CURRENT	230V/ 0.7 A (TYP) 115V/ 1.4 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.52 A / 230 VAC I = 1.05 A / 115 VAC	P
6	INRUSH CURRENT	230V/ 70 A (TYP)  COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 22 A / 230 VAC	P
7	LEAKAGE CURRENT	< 0.75 mA / 240 VAC	I/P : 264 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.2 mA N-FG : 0.18 mA	P
8	No load consumption	< 0.5 W	I/P : 230 VAC I/P : 115VAC O/P : MIN LOAD Ta : 25°C	< 0.40 W/230V < 0.40 W/115V	P

### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	90 %~ 110 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	100.3 %/ 230 VAC 100 %/ 115 VAC Constant current limiting recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 29 V~ 33 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	31.50V/ 230 VAC 31.33V/ 115 VAC Shut down o/p voltage, re-power on to recover	P
3	OVER TEMPERATURE PROTECTION	SPEC : RTH2 : 100 ± 10°C O.T.P. NO DAMAGE	I/P : 230 VAC O/P : FULL LOAD	O.T.P. Active Shut down o/p voltage, re-power on to recover	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 264 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Hiccup mode	P

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor ( D to S) or (C to E) Peak Voltage	Q 3 Rated : STF14NM65N 12A/650V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 608 V (2) 452 V (3) 604 V	P
2	Diode Peak Voltage	Q101 Rated : YA868C15RSC 30A/150V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 126 V (2) 121 V (3) 125 V	P
3	Input Capacitor Voltage	C 5 Rated : 120u/420V 105°C 18*31.5 PT	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 383.63 V (2) 373.88 V (3) 373.63 V	P
4	Control IC Voltage Test	U 1 Rated : PFC FAN6921MR 11V~30V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 17.73 V (2) 17.641 V (3) 17.652 V	P
5	Power Transistor ( D to S) or (C to E) Peak Voltage	Q1 Rated : STF13NM50N 12A/500V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 438 V (2) 394 V (3) 418 V	P

**■ SAFETY & E.M.C. TEST**
**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3 KVAC/min	I/P-O/P : 3.6 KVAC/min Ta : 25°C	I/P-O/P : 4.77 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ	I/P-O/P : 500 VDC Ta : 25°C/70%RH	I/P-O/P : 9.10 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	26mΩ	P
4	APPROVAL	TUV : Certificate NO : S50185150 UL : File NO : E329126			P

**E.M.C TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2,-3 CLASS A CLASS D	I/P : 220 /230/240VAC/50HZ O/P : FULL LOAD Ta : 25°C	PASS	P
2	CONDUCTION	EN55022 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 1KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
6	SURGE	IEC61000-4-5 LIGHT INDUSTRY L-N : 1KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare				

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																																				
1.	THERMO TRACER TEST (ROOM AMBIENT)	MODEL:GC120A12	TEST CONDITION: 100VAC FULL LOAD ROOM AMBIENT = 26°C	<p>熱顯像調整 座標: 160, 46 自動調整 原資料溫度: 24.2°C (EO.94) 放射率: 0.94 補正後溫度: 24.2°C (EO.94) 環境溫度: 30.1°C</p> <p>高溫 92.9°C 低溫 12.7°C</p> <p>最高溫(H): 85.8°C 座標: 132, 121 最低溫(L): 22.9°C 座標: 253, 46 全域放射率: 0.940</p> <p>日期: 2010/2/21 時間: 11:19:38</p> <table border="1"> <thead> <tr> <th></th> <th>Position</th> <th>Temp</th> </tr> </thead> <tbody> <tr><td>P1</td><td>BD1</td><td>62.5</td></tr> <tr><td>P2</td><td>D1</td><td>61.8</td></tr> <tr><td>P3</td><td>Q1</td><td>62.3</td></tr> <tr><td>P4</td><td>Q3</td><td>62.6</td></tr> <tr><td>P5</td><td>L3</td><td>62.5</td></tr> <tr><td>P6</td><td>D2</td><td>81.9</td></tr> <tr><td>P7</td><td>C41</td><td>36.2</td></tr> <tr><td>P8</td><td>C42</td><td>37.8</td></tr> <tr><td>P9</td><td>C5</td><td>24.8</td></tr> <tr><td>P10</td><td>T1</td><td>74.3</td></tr> <tr><td>P11</td><td>Q101</td><td>76.2</td></tr> <tr><td>P12</td><td>Q102</td><td>73.2</td></tr> <tr><td>P13</td><td>C106</td><td>28.8</td></tr> <tr><td>P14</td><td>LF100</td><td>71.4</td></tr> </tbody> </table>		Position	Temp	P1	BD1	62.5	P2	D1	61.8	P3	Q1	62.3	P4	Q3	62.6	P5	L3	62.5	P6	D2	81.9	P7	C41	36.2	P8	C42	37.8	P9	C5	24.8	P10	T1	74.3	P11	Q101	76.2	P12	Q102	73.2	P13	C106	28.8	P14	LF100	71.4	P																																																							
	Position	Temp																																																																																																							
P1	BD1	62.5																																																																																																							
P2	D1	61.8																																																																																																							
P3	Q1	62.3																																																																																																							
P4	Q3	62.6																																																																																																							
P5	L3	62.5																																																																																																							
P6	D2	81.9																																																																																																							
P7	C41	36.2																																																																																																							
P8	C42	37.8																																																																																																							
P9	C5	24.8																																																																																																							
P10	T1	74.3																																																																																																							
P11	Q101	76.2																																																																																																							
P12	Q102	73.2																																																																																																							
P13	C106	28.8																																																																																																							
P14	LF100	71.4																																																																																																							
2	TEMPERATURE RISE TEST	MODEL : GC120A12 1. ROOM AMBIENT BURN-IN : 12 HRS I/P : 230VAC O/P : FULL LOAD Ta= 28.3 °C 2. HIGH AMBIENT BURN-IN : 3HRS I/P : 230VAC O/P : FULL LOAD Ta= 47.1°C		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>P/N</th> <th>ROOM AMBIENT Ta= 28.3 °C</th> <th>HIGH AMBIENT Ta= 47.1°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>L3</td><td>TF2125</td><td>75.9°C</td><td>92.2°C</td></tr> <tr><td>2</td><td>C5</td><td>120u/420V 105°C 18*31.5 PT</td><td>75.1°C</td><td>91.0°C</td></tr> <tr><td>3</td><td>BD1</td><td>4A/800V GLASS GBU408</td><td>73.2°C</td><td>88.9°C</td></tr> <tr><td>4</td><td>Q1</td><td>STF13NM50N 12A/500V</td><td>78.8°C</td><td>91.4°C</td></tr> <tr><td>5</td><td>Q3</td><td>STF14NM65N 12A/650V</td><td>87.0°C</td><td>102.7°C</td></tr> <tr><td>6</td><td>R4</td><td>1W 150KΩ 5%</td><td>86.7°C</td><td>101.8°C</td></tr> <tr><td>7</td><td>C11</td><td>474/450V 10% P=10 MMX</td><td>73.0°C</td><td>89.5°C</td></tr> <tr><td>8</td><td>C42</td><td>22u/50V UL10Kh 5*11 YXM</td><td>82.7°C</td><td>97.8°C</td></tr> <tr><td>9</td><td>C41</td><td>82u/35V L5kh 6.3*11 KY</td><td>77.8°C</td><td>92.9°C</td></tr> <tr><td>10</td><td>RTH2</td><td>100KΩ 3Φ TTC3A104F4193EY 1%</td><td>75.9°C</td><td>91.4°C</td></tr> <tr><td>11</td><td>D2</td><td>3A/600V GP30J DO-201</td><td>92.6°C</td><td>108.5°C</td></tr> <tr><td>12</td><td>T1</td><td>TF2175</td><td>84.8°C</td><td>99.4°C</td></tr> <tr><td>13</td><td>C216</td><td>22u/50V UL10Kh 5*11 YXM</td><td>77.2°C</td><td>92.2°C</td></tr> <tr><td>14</td><td>C107</td><td>1500u/16V UL10Kh 10*20 ZLH</td><td>79.1°C</td><td>94.2°C</td></tr> <tr><td>15</td><td>C105</td><td>2200u/16V UL10Kh 12.5*20 ZLH</td><td>82.0°C</td><td>97.5°C</td></tr> <tr><td>16</td><td>C111</td><td>470u/16V UL8Kh 8*11.5 ZLH</td><td>73.6°C</td><td>88.9°C</td></tr> <tr><td>17</td><td>LF100</td><td>TR965</td><td>86.4°C</td><td>100.9°C</td></tr> <tr><td>18</td><td>Q101</td><td>V30100S 30A/100V</td><td>102.0°C</td><td>117.2°C</td></tr> <tr><td>19</td><td>U1</td><td>PFC FAN6921MR</td><td>75.1°C</td><td>90.7°C</td></tr> </tbody> </table>	NO	Position	P/N	ROOM AMBIENT Ta= 28.3 °C	HIGH AMBIENT Ta= 47.1°C	1	L3	TF2125	75.9°C	92.2°C	2	C5	120u/420V 105°C 18*31.5 PT	75.1°C	91.0°C	3	BD1	4A/800V GLASS GBU408	73.2°C	88.9°C	4	Q1	STF13NM50N 12A/500V	78.8°C	91.4°C	5	Q3	STF14NM65N 12A/650V	87.0°C	102.7°C	6	R4	1W 150KΩ 5%	86.7°C	101.8°C	7	C11	474/450V 10% P=10 MMX	73.0°C	89.5°C	8	C42	22u/50V UL10Kh 5*11 YXM	82.7°C	97.8°C	9	C41	82u/35V L5kh 6.3*11 KY	77.8°C	92.9°C	10	RTH2	100KΩ 3Φ TTC3A104F4193EY 1%	75.9°C	91.4°C	11	D2	3A/600V GP30J DO-201	92.6°C	108.5°C	12	T1	TF2175	84.8°C	99.4°C	13	C216	22u/50V UL10Kh 5*11 YXM	77.2°C	92.2°C	14	C107	1500u/16V UL10Kh 10*20 ZLH	79.1°C	94.2°C	15	C105	2200u/16V UL10Kh 12.5*20 ZLH	82.0°C	97.5°C	16	C111	470u/16V UL8Kh 8*11.5 ZLH	73.6°C	88.9°C	17	LF100	TR965	86.4°C	100.9°C	18	Q101	V30100S 30A/100V	102.0°C	117.2°C	19	U1	PFC FAN6921MR	75.1°C	90.7°C	P
NO	Position	P/N	ROOM AMBIENT Ta= 28.3 °C	HIGH AMBIENT Ta= 47.1°C																																																																																																					
1	L3	TF2125	75.9°C	92.2°C																																																																																																					
2	C5	120u/420V 105°C 18*31.5 PT	75.1°C	91.0°C																																																																																																					
3	BD1	4A/800V GLASS GBU408	73.2°C	88.9°C																																																																																																					
4	Q1	STF13NM50N 12A/500V	78.8°C	91.4°C																																																																																																					
5	Q3	STF14NM65N 12A/650V	87.0°C	102.7°C																																																																																																					
6	R4	1W 150KΩ 5%	86.7°C	101.8°C																																																																																																					
7	C11	474/450V 10% P=10 MMX	73.0°C	89.5°C																																																																																																					
8	C42	22u/50V UL10Kh 5*11 YXM	82.7°C	97.8°C																																																																																																					
9	C41	82u/35V L5kh 6.3*11 KY	77.8°C	92.9°C																																																																																																					
10	RTH2	100KΩ 3Φ TTC3A104F4193EY 1%	75.9°C	91.4°C																																																																																																					
11	D2	3A/600V GP30J DO-201	92.6°C	108.5°C																																																																																																					
12	T1	TF2175	84.8°C	99.4°C																																																																																																					
13	C216	22u/50V UL10Kh 5*11 YXM	77.2°C	92.2°C																																																																																																					
14	C107	1500u/16V UL10Kh 10*20 ZLH	79.1°C	94.2°C																																																																																																					
15	C105	2200u/16V UL10Kh 12.5*20 ZLH	82.0°C	97.5°C																																																																																																					
16	C111	470u/16V UL8Kh 8*11.5 ZLH	73.6°C	88.9°C																																																																																																					
17	LF100	TR965	86.4°C	100.9°C																																																																																																					
18	Q101	V30100S 30A/100V	102.0°C	117.2°C																																																																																																					
19	U1	PFC FAN6921MR	75.1°C	90.7°C																																																																																																					
3	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 264 VAC O/P : O/P SHORT TEST Ta : 25°C	TEST : OK	P																																																																																																				

4	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : CV=12V Ta= -35 °C	TEST : OK	P
5	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 272 VAC O/P : CV=12V Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK	P
6	TEMPERATURE COEFFICIENT	± 0.03 %(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.005 %(0~50°C)	P
7	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK	P
8.	THERMAL SHOCK TEST	1. Thermal shock Temperature : -30°C~ +55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 230VAC/Full Load turn on 58 sec ; turn off 2 sec		OK	P
9	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C		TEST : OK	P
10	CAPACITOR LIFE CYCLE	GC160A12: SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta=25°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta=45°C LIFE TIME		(1) 75828 HRS (2) 23030 HRS	P
11	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 400.7K HRS			P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2010/8/24	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2010/9/20	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

2003/12/12 A50-F023