JAMECO ELECTRONICS **Jameco SKU Number: 2107004**

MEAN WELL

1000W Single Output DC-DC Converter

SD-1000 series

■ Features :

- 1U low profile 41mm
- High power density 10.7w/inch^3
- 2000VAC I/O Isolation
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Output OK signal
- Built-in remote ON-OFF control
- Built-in remote sense function
- Forced air cooling by built-in DC fan with fan speed control
- 12V, 0.25A auxiliary output
- 3 years warranty

CB CE

SPECIFICATION

MODEL		SD-1000L-12	SD-1000L-24	SD-1000L-48	SD-1000H-12	SD-1000H-24	SD-1000H-48
OUTPUT	DC VOLTAGE	12V	24V	48V	12V	24V	48V
	RATED CURRENT	60A	40A	21A	60A	40A	21A
	CURRENT RANGE	0 ~ 60A	0 ~ 40A	0 ~ 21A	0 ~ 60A	0 ~ 40A	0 ~ 21A
	RATED POWER	720W	960W	1008W	720W	960W	1008W
	RIPPLE & NOISE (max.) Note.2	150mVp-p	150mVp-p	150mVp-p	150mVp-p	150mVp-p	150mVp-p
	VOLTAGE ADJ. RANGE	11 ~ 15V	23 ~ 30V	46 ~ 60V	11 ~ 15V	23 ~ 30V	46 ~ 60V
	VOLTAGE TOLERANCE Note.3	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
	LOAD REGULATION	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%	±0.5%
	SETUP, RISE TIME	500ms, 50ms at full load					
INPUT	VOLTAGE RANGE Note.5	19 ~ 72VDC			72 ~ 144VDC		
	EFFICIENCY (Typ.)	84%	88%	90%	85%	89%	92%
	DC CURRENT (Typ.)	23.5A/48VDC			11.6A/96VDC		
	INRUSH CURRENT (Typ.)	-----			100A/96VDC		
PROTECTION	OVERLOAD	105 ~ 125% rated output power					
		Protection type : Constant current limiting, unit will shut down o/p voltage after about 5sec. Re-power on to recover					
	OVER VOLTAGE	16 ~ 19V	30.8 ~ 35.2V	62 ~ 68V	16 ~ 19V	30.8 ~ 35.2V	62 ~ 68V
		Protection type : Shut down o/p voltage, re-power on to recover					
	OVER TEMPERATURE	85℃±5℃ (TSW2) detect on heatsink of O/P diode; 75℃±5℃ (TSW1) detect on heatsink of power transistor					
		Protection type : Shut down o/p voltage, recovers automatically after temperature goes down					
FUNCTION	REMOTE ON/OFF CONTROL	Please refer to function manual					
	OUTPUT OK SIGNAL	Open collector signal low when PSU turns on, maximum, sink current :10mA					
ENVIRONMENT	WORKING TEMP.	-20 ~ +60℃ (Refer to output load derating curve)					
	WORKING HUMIDITY	20 ~ 90% RH non-condensing					
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH					
	TEMP. COEFFICIENT	±0.02%/℃ (0 ~ 50℃)					
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes					
SAFETY & EMC (Note 4)	SAFETY STANDARDS	IEC60950-1 CB approved by TUV					
	WITHSTAND VOLTAGE	I/P-O/P:2KVAC I/P-FG:1.5KVAC O/P-FG:0.5KVAC					
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG:100M Ohms/500VDC 25℃ 70%RH					
	EMI CONDUCTION & RADIATION	Compliance to EN55022 (CISPR22)					
	EMS IMMUNITY	Compliance to EN61000-4-2,3,4,6,8; ENV50204, light industry level, criteria A					
OTHERS	MTBF	32K hrs min. MIL-HDBK-217F (25℃)					
	DIMENSION	295*127*41mm (L*W*H)					
	PACKING	1.94Kg; 6pcs/12.6Kg/0.99CUFT					
NOTE	1. All parameters NOT specially mentioned are measured at 48, 96VDC input, rated load and 25℃ of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives. 5. Derating may be needed under low input voltages. Please check the derating curve for more details.						

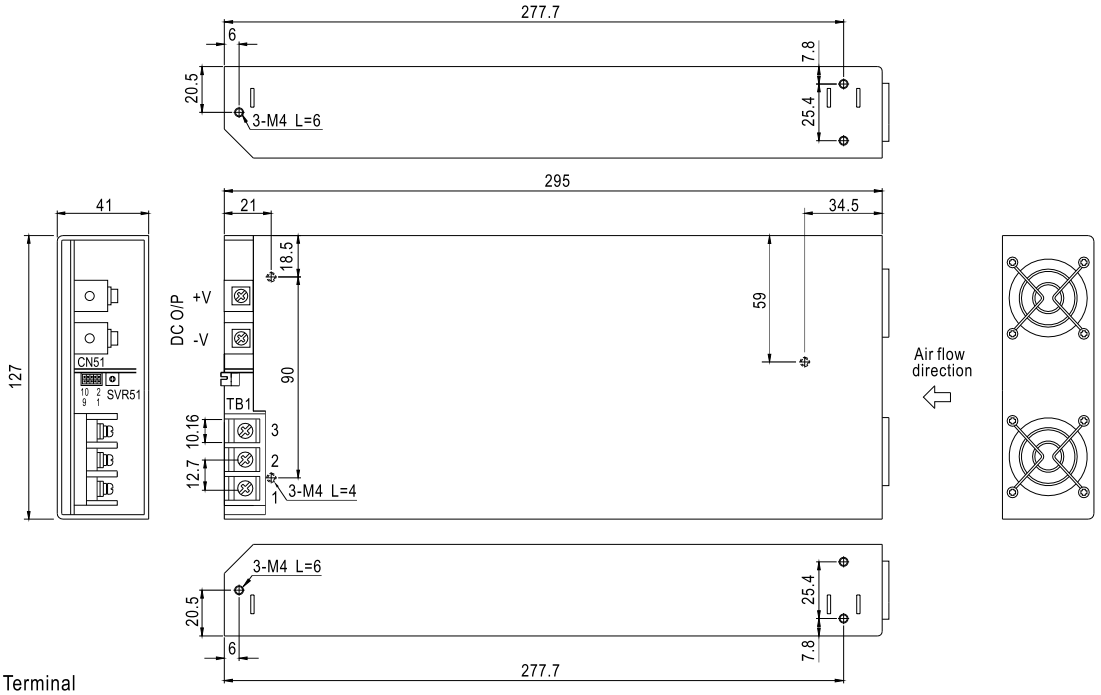
MEAN WELL

1000W Single Output DC-DC Converter

SD-1000 series

■ Mechanical Specification

Case No. 952B Unit:mm



DC Input Terminal Pin No. Assignment

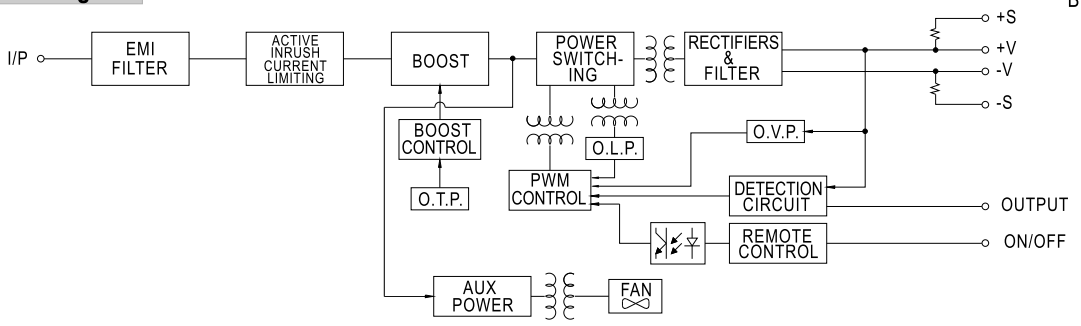
Pin No.	Assignment
1	DC INPUT V+
2	DC INPUT V-
3	FG ⏚

Control pin number assignment (CN51) : JST B10B-PHDSS or equivalent

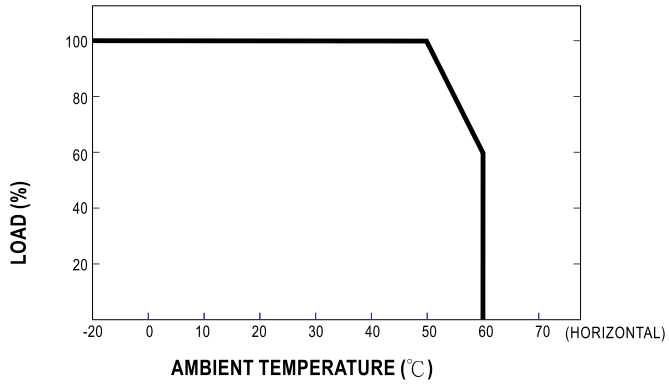
Pin No.	Assignment	Pin No.	Assignment	Pin No.	Assignment	Mating Housing	Terminal
1	+S	5	AUX	9	RCG	JST PHDR-10VS or equivalent	JST SPHD-002T-P0.5 or equivalent
2	-S	6	AUXG	10	NC		
3	OUTPUT OK	7	RC1				
4	GND	8	RC2				

■ Block Diagram

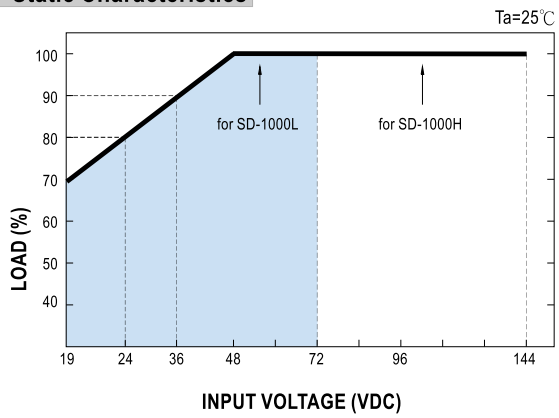
BOOST fosc : 70KHz
PWM fosc : 90KHz



■ Derating Curve



■ Static Characteristics



■ Function Description of CN51

Pin No.	Function	Description
1	+S	Positive sensing. The +S signal should be connected to the positive terminal of the load. The +S and -S leads should be twisted in pair to minimize noise pick-up effect. The maximum line drop compensation is 0.5V.
2	-S	Negative sensing. The -S signal should be connected to the negative terminal of the load. The -S and +S leads should be twisted in pair to minimize noise pick-up effect. The maximum line drop compensation is 0.5V.
3	O/P OK	Open collector signal, referenced to pin4(GND). Low when PSU turns on. The maximum sink current is 10mA and the maximum external voltage is 13V.
4	GND	These pins connect to the negative terminal (-V).
5	AUX	Auxiliary voltage output, 10.8~13.2V referenced to pin6(AUXG).The maximum load current is 0.25A.
6	AUXG	Auxiliary voltage output ground. The signal return is isolated from the output terminals(+V & -V).
7	RC1	Remote ON/OFF
8	RC2	Remote ON/OFF
9	RCG	Remote ON/OFF ground
10	NC	No connection

■ Function Manual

1.Remote ON/OFF

(1)Remote ON/OFF control becomes available by applying voltage in CN51

(2)Table 1.1 shows the specification of Remote ON/OFF function

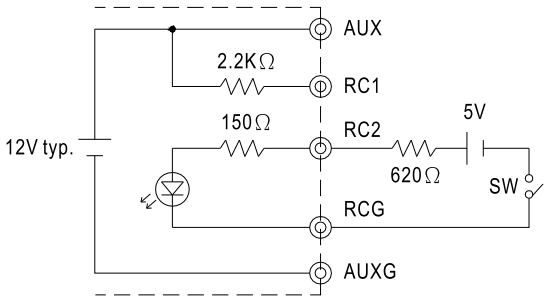
(3)Fig.1.2 shows the example to connect Remote ON/OFF control function

Table 1.1 Specification of Remote ON/OFF

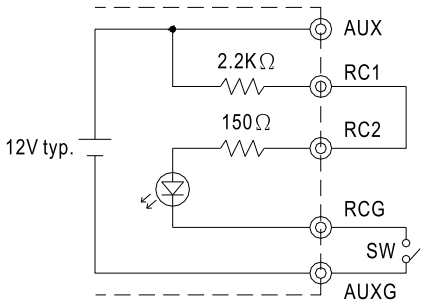
Connection Method		Fig. 1.2(A)	Fig. 1.2(B)	Fig. 1.2(C)
SW Logic	Output on	SW Open	SW Open	SW Close
	Output off	SW Close	SW Close	SW Open

Fig.1.2 Examples of connecting remote ON/OFF

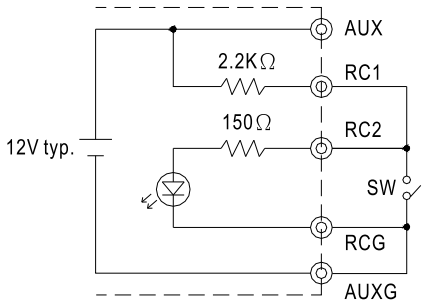
(A)Using external voltage source



(B)Using internal 12V auxiliary output



(C)Using internal 12V auxiliary output



2.Output OK signal

"Output OK" is an open collector signal.
It indicates the output status of the PSU. It can operate in two ways : One is sinking current from external signal ; the other is sending out a voltage signal.

2-1 Sink current :

The maximum sink current is 10mA and the maximum external voltage is 13V.

2-2 Voltage signal :

Between O/P OK(pin3) and GND(pin4)	Output Status
0 ~ 0.5V	ON
12 ~ 13V	OFF

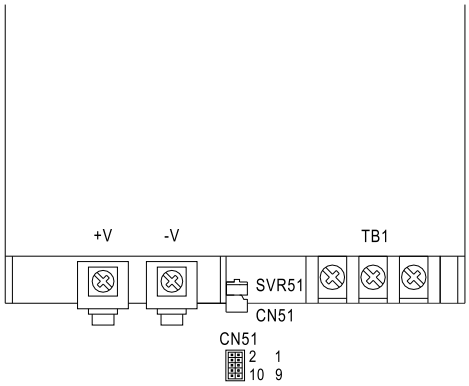
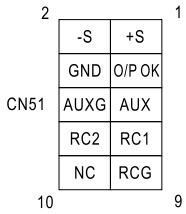


Fig 2.1



3.Remote Sense

The remote sensing compensates voltage drop on the load wiring up to 0.5V.

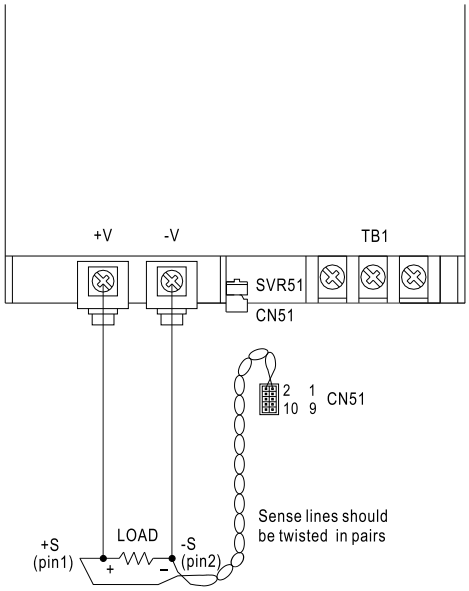
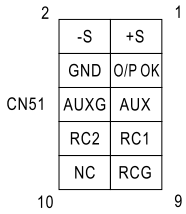


Fig 3.1



MODEL：SD-1000L-12

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1: 150 mVp-p (Max)	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	V1: 72 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1:11 V~ 15 V	I/P: 48 VDC O/P:MIN LOAD Ta:25℃	10.3V~ 15.61V	P
3	OUTPUT VOLTAGE TOLERANCE	V1: 1%~ -1 % (Max)	I/P: 48 VDC / 72VDC O/P:FULL/ MIN LOAD Ta:25℃	V1: 0.21 %~ -0.21 %	P
4	LINE REGULATION	V1: 0.5 %~ -0.5 % (Max)	I/P: 48VDC ~ 72VDC O/P:FULL LOAD Ta:25℃	V1: 0 %~ 0 %	P
5	LOAD REGULATION	V1: 0.5 %~ -0.5 % (Max)	I/P: 48 VDC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0.21 %~ -0.21 %	P
6	SET UP TIME	500 ms (Max)	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	90 ms	P
7	RISE TIME	50 ms (Max)	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	23 ms	P
8	OVER/UNDERSHOOT TEST	< ±5%	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	TEST: <5 %	P
9	DYNAMIC LOAD	V1: 1200 mVp-p	I/P: 48 VDC O/P:FULL /Min LOAD 90%DUTY/1KHZ Ta:25℃	518 mVp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	19VDC~ 72 VDC	I/P:TESTING O/P:LOW LINE /70% LOAD HIGH LINE /FULL LOAD Ta:25℃	17.9 V~ 72 V	P
			I/P: LOW-LINE-0.2V= 18.8V O/P:70%/MIN LOAD ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE) HIGH-LINE+5%= 75 V O/P:FULL/MIN LOAD ON: 30 Sec . OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST: OK	
2	EFFICIENCY	84 % (TYP)	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	84.3 %	P
3	INPUT CURRENT	23.5 A/ 48 V (TYP)	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	I = 18 A	p

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105 %~ 125 %	I/P: 48VDC O/P:TESTING Ta:25℃	112 % Constant Current Limiting, unit will shut down o/p voltage above 5sec Re-power on to recover	P
2	OVER VOLTAGE PROTECTION	CH1: 16V~ 19V	I/P: 48VDC O/P:MIN LOAD Ta:25℃	17.4 V Shunt down Re- power ON	P
3	OVER TEMPERATURE PROTECTION	SPEC: 75℃ ±5℃ OT.P. (TSW1) 85℃ ±5℃ OT.P. (TSW2) NO DAMAGE	I/P: 48 VDC O/P:FULL LOAD	O.T.P. Active Shut down o/p volotage，recovers automatically after temperature goes down	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 72 VDC O/P: FULL LOAD Ta:25℃	NO DAMAGE Constant Current Limiting, unit will shut down o/p voltage above 5sec Re-power on to recover	p

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	FAN SPEED CONTROL	0%LOAD=6V~8.5V 100%LOAD=11.8V~12.8V	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	Fan Voltage= 6.8V/ NO LOAD Fan Voltage= 12.31V/ 100%LOAD	P
2	REMOTE CONTROL	Rc+ / Rc- POWER ON:OPEN BETWEEN ON/OFF POWEROFF:SHORT BETWEEN ON/OFF (A) Using External Voltage Source (B) Using Internal 12V Auxiliary Output (C) Using Internal 12V Auxiliary Output	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	(A)OK (B)OK (C)OK	P
3	REMOTE SENSE	>0.3V	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	> 0.3 V	P
4	OUTPUT OK SIGNAL	OPEN COLLECTOR SIGNAL LOW WHEN PSU TURN ON,MAX.SINK CURRENT 10mA,external voltage is 13V 0~0.5V OUTPUT STATUS ON 12~13V OUTPUT STATUS OFF	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	SINK CURRENT: 10 mA OUTPUT STATUS ON= 0 V OUTPUT STATUS OFF= 12.5V	P
5	FAN LOCK	SHUTDOWN RE-POWER ON	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	SHUTDOWN RE-POWER ON	P
6	AUX POWER	0~0.25A(10.8V~13.2V)	I/P: 48 VDC Ta:25℃	12.8 V/0A 12.1 V/0.25A	P
7	DC I/P UVP	17V~18.7V	O/P:70% LOAD Ta:25℃	17.9 VDC	P

ENVIRONMENT TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th><th>VERDICT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：SD-1000L-24
1. ROOM AMBIENT BURN-IN：1 HRS
I/P: 48 VDC O/P: FULL LOAD Ta= 29.6℃
2. HIGH AMBIENT BURN-IN：2HRS
I/P: 48 VDC O/P: FULL LOAD Ta= 53.6℃

<table>
<tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 29.6 ℃</th><th>HIGH AMBIENT Ta= 53.6 ℃</th></tr>
<tr><td>1</td><td>U2</td><td>UCC28220D</td><td>46.6℃</td><td>65.0℃</td></tr>
<tr><td>2</td><td>D2</td><td>60CPQ150 60A/150V</td><td>44.0℃</td><td>64.6℃</td></tr>
<tr><td>3</td><td>Q3</td><td>IRFP3710 57A/100V</td><td>53.3℃</td><td>69.3℃</td></tr>
<tr><td>4</td><td>Q1</td><td>IRFP3710 57A/100V</td><td>50.0℃</td><td>73.8℃</td></tr>
<tr><td>5</td><td>TSW1</td><td>ST-22 75℃</td><td>42.2℃</td><td>63.1℃</td></tr>
<tr><td>6</td><td>LF1</td><td>TR-757</td><td>51.3℃</td><td>72.3℃</td></tr>
<tr><td>7</td><td>C8</td><td>1000U/100V 105℃ MXR</td><td>50.7℃</td><td>71.2℃</td></tr>
<tr><td>8</td><td>T2 COIL</td><td>TF-1684</td><td>66.2℃</td><td>87.9℃</td></tr>
<tr><td>9</td><td>D901</td><td>S3L60 2.2A/600V</td><td>56.9℃</td><td>78.1℃</td></tr>
<tr><td>10</td><td>L2</td><td>TF-1655</td><td>59.5℃</td><td>79.3℃</td></tr>
<tr><td>11</td><td>U9</td><td>TNY280PN</td><td>58.8℃</td><td>80.7℃</td></tr>
<tr><td>12</td><td>ZD10</td><td>P6KE100A</td><td>56.5℃</td><td>78.3℃</td></tr>
<tr><td>13</td><td>U1</td><td>IR1150IS(PbF)</td><td>39.6℃</td><td>60.1℃</td></tr>
<tr><td>14</td><td>Q903</td><td>IRFP260N 50A/200V</td><td>66.6℃</td><td>91.5℃</td></tr>
<tr><td>15</td><td>C73</td><td>10U/50V 105℃ KY</td><td>54.9℃</td><td>76.1℃</td></tr>
<tr><td>16</td><td>L100</td><td>TF-1455</td><td>58.6℃</td><td>80.1℃</td></tr>
<tr><td>17</td><td>Q161</td><td>TIP42C -5A/100V</td><td>51.0℃</td><td>72.8℃</td></tr>
<tr><td>18</td><td>TSW2</td><td>ST-22 90℃</td><td>61.1℃</td><td>85.9℃</td></tr>
<tr><td>19</td><td>D102</td><td>ESAD83-006 30A/60V</td><td>70.4℃</td><td>92.0℃</td></tr>
<tr><td>20</td><td>PCB</td><td>T2 與 ZD10 間</td><td>59.4℃</td><td>82.2℃</td></tr>
<tr><td>21</td><td>內 TA</td><td>C303 上方處</td><td>43.8℃</td><td>64.5℃</td></tr>
<tr><td>22</td><td>C113</td><td>1000U/35V 105℃YXG</td><td>58.1℃</td><td>78.9℃</td></tr>
</table></td><td>P</td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P: 48 VDC
O/P: 113 % LOAD
Ta:25℃</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P: 48 VDC
O/P: 100% LOAD
Ta= -20℃</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 50℃
NO DAMAGE</td><td>I/P: 72 VDC
O/P:FULL LOAD
Ta= 50℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td><td>P</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.02%(0~50℃)</td><td>I/P: 48VDC
O/P:FULL LOAD</td><td>± 0.013 %(0~50℃)</td><td>P</td></tr>
<tr><td>6</td><td>VIBRATION TEST</td><td colspan="2">1 Carton & 1 Set
(1) Waveform: Sine Wave
(2) Frequency:10~500Hz
(3) Sweep Time:10min/sweep cycle
(4) Acceleration:2G
(5) Test Time:1 hour in each axis (X.Y.Z)
(6) Ta:25℃</td><td>TEST：OK</td><td>P</td></tr>
</table>

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P: 2 KVAC/min I/P-FG: 1.5 KVAC/min O/P-FG: 0.5 KVAC/min	I/P-O/P: 2.4 KVAC/min I/P-FG: 1.8 KVAC/min O/P-FG: 0.6 KVAC/min Ta:25℃ / 70%RH	I/P-O/P: 3.98 mA I/P-FG: 3.87 mA O/P-FG: 2.92 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25℃	I/P-O/P: 2.2 GΩ I/P-FG: 1.5 GΩ O/P-FG: 4.7 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta:25℃ / 70%RH	10 mΩ	P
4	APPROVAL	TUV: Certificate NO ： UL: File NO ：			N/A

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RADIATION	EN55022 CLASS B	I/P: 48VDC O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab	P
2	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	CRITERIA A	P
3	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 48VDC O/P:FULL LOAD Ta:25℃	CRITERIA A	P
4	SURGE	IEC61000-4-5 LIGHT INDUSTRY L-N :0.5KV L,N-PE:0.5KV	I/P: 48 VDC O/P:FULL LOAD Ta:25℃	CRITERIA A	P
5	Test by certified Lab & Test Report Prepare				

M.T.B.F & LIFE CYCLE CALCULATION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	CAPACITOR LIFE CYCLE	SD-1000L-24 : SUPPOSE C113 IS THE MOST CRITICAL COMPONENT I/P: 48VDC O/P:FULL LOAD Ta=50 ℃ LIFE TIME= 251623 HRS I/P: 48VDC O/P:FULL LOAD Ta=50 ℃ LIFE TIME= 55554 HRS			P
2	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE: 32KKHRS			P
3	ORT (Ongoing Reliability test)	SD-1000L-48:I/P ：230VAC O/P ：FULL LOAD TA=50℃ Sample=5pcs TEST TIME=2544HRS			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 900 Rated IRFP260N: 200 V 50 A	I/P:High-Line +3V = 75V O/P: (1)Full Load Turn on (2) Output Short Ta:25℃	(1) 204 V (2) 200 V	P
2	Diode Peak **Voltage**	D101 Rated ESAD83-006 30A/60V	I/P:High-Line +3V = 75 V O/P: (1)Full Load Turn on (2)Output Short Ta:25℃	(1) 42 V (2) 22 VV	P
3	Clamp Diode Peak **Voltage**	D 900 Rated S3L60 2.2A/600V	I/P:High-Line +3V = 75 V O/P: (1) Dynamic Load 90%Duty/1KHz Ta:25℃	(1) 177 V	P
4	**Input Capacitor Voltage**	C5 Rated 1000u /100 V /105℃	I/P:High-Line +3V = 75 V O/P: (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta:25℃	(1) 78 V (2) 78 V (3) 78 V	P
5	**Control IC Voltage Test**	U2 Rated UCC28220: 8V~14 V	I/P:High-Line +3V = 75 V O/P: (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta:25℃	(1) 13.76 V (2) 13.56 V (3) 13.76 V	P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2007/9/14	RD SAMPLE	PASS	VINCENT TSENG	MAX LIN
2007/11/16	PRODUCT SAMPLE W0710C50	PASS	VINCENT TSENG	MAX LIN
2007/12/24	PRODUCT SAMPLE W0712A53	PASS	SANFORD SU	VINCENT TSENG

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