Test Report: CEN-60-54

60W Single Output LED Power Supply

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Other Test
Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test
E.M.C. Test

■ RELIABILITY TEST

DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	RIPPLE & NOISE	V1: 5 Vp-p (Max)	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	V1:1.92Vp-p (Max)
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 49 V ~ 58 V	I/P: 230 VAC I/P:115VAC O/P:MIN LOAD Ta:25℃	47.39V~59.59V/230VAC 47.37V~59.57V/115VAC
3	CURRENT ADJ RANGE	0.9A ~ 1.15 A	I/P: 230 VAC O/P: CV=Vo-2V Ta:25℃	0.718A~1.284 A
4	CONSTANT CURRENT REGION	40.5 V ~ 54V	I/P: 230 VAC O/P:CV MODE Ta:25℃	O/P=40.5V: 1.178A O/P=53 V: 1.067A
5	OUTPUT VOLTAGE TOLERANCE	V1: 10% ~ -10 % (Max)	I/P: 100 VAC /295VAC O/P:FULL/ 0 % LOAD Ta:25℃	V1:1.8%~ -1.8%
6	LINE REGULATION	V1: 3 % ~ -3 % (Max)	I/P:100 VAC ~295 VAC O/P:FULL LOAD Ta:25℃	V1:0.25%~ -0.25%
7	LOAD REGULATION	V1: 5 % ~ -5 % (Max)	I/P: 230 VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0.07%~ -0.07%
8	SET UP TIME	230VAC/500 ms (Max) 115VAC/ 1200 ms (Max)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	230VAC/ 367ms 115 VAC/ 906ms
9	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	TEST:< 10%

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~295 VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	40V~264V
			I/P: (1)LOW-LINE-3V=87 V (2)HIGH-LINE=305 V O/P:FULL/MIN LOAD ON: 30 Sec . OFF: 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 100 VAC ~295AC O/P:FULL~MIN LOAD Ta:25℃	OK
3	POWER FACTOR	0.95/ 230 VAC FULL LOAD 0.97/ 115 VAC FULL LOAD 0.9/ 277 VAC FULL LOAD	I/P: 230 VAC I/P: 115 VAC I/P: 277 VAC O/P:FULL LOAD Ta:25℃	PF=0.968 /230V/100%LOAD PF=0.991 /115V/100%LOAD PF=0.91 /277V/100%LOAD
4	EFFICIENCY	91% (TYP)	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	92.18%
5	INPUT CURRENT	230 V/ 0.4 A (Typ) 115 V/ 0.8 A (Typ)	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃	I = 0.29A/ 230VAC I = 0.58A/ 115VAC
6	INRUSH CURRENT	230 V/ 45 A (Typ) COLD START	I/P: 230 VAC O/P:FULL LOAD Ta:25℃	I = 39A/ 230VAC

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95 %~110 %	I/P: 230 VAC I/P: 115 VAC O/P:TESTING Ta:25℃	105%/ 230VAC 104%//115VAC Constant current limiting,
2	OVER VOLTAGE PROTECTION	V1: 59V~ 65V	I/P: 230 VAC I/P: 115 VAC O/P:MIN LOAD Ta:25℃	62V/ 230VAC 62V/ 115VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230 VAC O/P:FULL LOAD	O.T.P. Active Shut down o/p voltage，re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 295VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE Hiccup Mode

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 13A/600V	I/P：High-Line +3V = 298 V O/P： (1)Full Load Turn on (2) Output Short (3)Full load continue Ta：25℃	(1) 554 V (2) 520 V (3) 556 V
2	Diode Peak Voltage	D100 Rated 10A/400V	I/P：High-Line +3V = 298 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1)278 V (2) 227 V (3)277 V
3	Clamp Diode Peak Voltage	D2 Rated 3A/800V	I/P：High-Line +3V = 298 V O/P： (1)Full Load Turn on (2)Output Short (3)Full load continue Ta：25℃	(1) 564 V (2) 490 V (3) 534 V
4	Control IC Voltage Test	U 1 Rated 10.5V~21V	I/P：High-Line +3V = 298 V O/P： (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta：25℃	(1)14.457 V (2)14.412V (3)14.417V

SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	IEC60950-1 I/P-O/P: 3.75KVAC/min I/P-FG:2 KVAC/min<4.5mA O/P-FG:1.5KVAC/min	I/P-O/P: 4 KVAC/min I/P-FG: 2.4KVAC/min O/P-FG: 1.8 KVAC/min Ta:25℃	I/P-O/P:4.61mA I/P-FG:3.41mA O/P-FG:3.79mA NO DAMAGE
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: 25.5GΩ I/P-FG: 22.9G Ω O/P-FG: 30G Ω NO DAMAGE
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	9 mΩ
4	LEAKAGE CURRENT	IEC60950-1 < 0.75 mA / 240VAC	I/P: 264 VAC O/P:Min LOAD Ta:25℃	L-FG:0.34 mA N-FG:0.34 mA

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A CLASS C	I/P: 230VAC/50HZ LOAD:LED/ELECTRONIC LOAD O/P:100% LOAD Ta:25℃	PASS
2	CONDUCTION	EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25℃	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B	I/P: 230 VAC (50HZ) O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 2KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A

RELIABILITY TEST

ENVIRONMENT TEST

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL： CEN-60-24
1. ROOM AMBIENT BURN-IN：2 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 25 ℃
2. HIGH AMBIENT BURN-IN：2 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 50.4 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT
Ta= 25 ℃</th><th>HIGH AMBIENT
Ta= 50.4 ℃</th></tr>
<tr><td>1</td><td>L1</td><td>55.2℃</td><td>75.7℃</td></tr>
<tr><td>2</td><td>BD1</td><td>43.0℃</td><td>64.3℃</td></tr>
<tr><td>3</td><td>Q1</td><td>49.7℃</td><td>70.9℃</td></tr>
<tr><td>4</td><td>D100</td><td>52.5℃</td><td>73.0℃</td></tr>
<tr><td>5</td><td>C105</td><td>50.6℃</td><td>70.8℃</td></tr>
<tr><td>6</td><td>T1</td><td>53.3℃</td><td>73.2℃</td></tr>
<tr><td>7</td><td>RTH1</td><td>50.3℃</td><td>71.3℃</td></tr>
<tr><td>8</td><td>C5</td><td>49.3℃</td><td>70.2℃</td></tr>
<tr><td>9</td><td>C47</td><td>55.4℃</td><td>75.6℃</td></tr>
<tr><td>10</td><td>D2</td><td>74.5℃</td><td>97.8℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P： 230 VAC
O/P：100 % LOAD
Ta：25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 295VAC/100VAC
O/P： 100 % LOAD
Ta= -35 ℃</td><td>TEST：OK</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： 295 VAC
O/P：FULL LOAD
Ta= 50 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0~50℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>± 0.011 %(0~50℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -45℃~ +90℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：5 CYCLE
5. Input/Output condition： STATIC</td><td>OK</td></tr>
<tr><td>7</td><td>THERMAL SHOCK TEST</td><td colspan="2">1. Thermal shock Temperature： -35℃~ +55℃
2. Temperature change rate ：25℃ / MIN
3. Dwell time low and high temperature ： 30 MIN/EACH
4. Total test cycle：10 CYCLE
5. Input/Output condition： 230VAC/Full Load AC ON/OFF TEST
turn on 58sec；turn off 2sec</td><td>OK</td></tr>
</table>

8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：12min/sweep cycle (4) Acceleration：5G (5) Test Time：72min in each axis (X.Y.Z) (6) Ta：25℃	TEST：OK
9	CAPACITOR LIFE CYCLE	CEN-60-24: SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta= 50.4 ℃ LIFE TIME	(1) 530904 HRS (2) 134530 HRS
10	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE： 523.4 K HRS	
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 30,000 hours @ Tcase 65℃; 50,000 hours @ Tcase 55℃	

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2010/1/21	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG
2010/3/1	PRODUCT SAMPLE W1002B53	PASS	SANFORD SU	VINCENT TSENG

2003/12/12 A50-F023