



Test Report: HVGC-240-700

240W Single Output LED Power Supply

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY & E.M.C. TEST

Safety Test

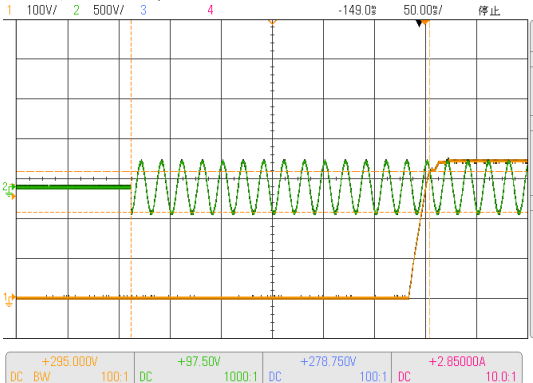
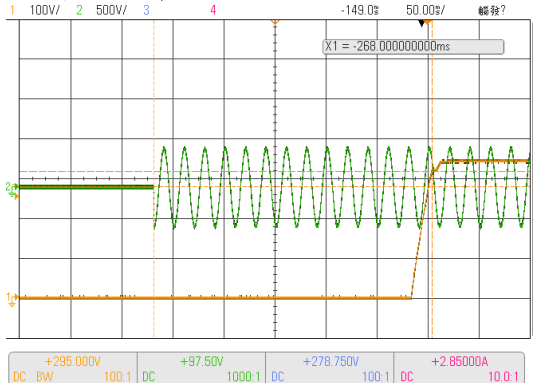
E.M.C. Test

■ RELIABILITY TEST

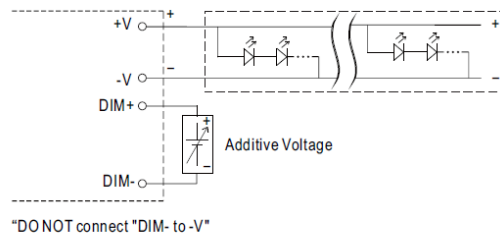
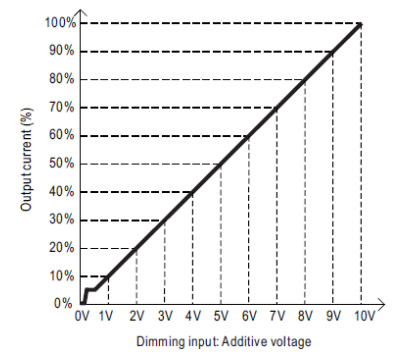
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

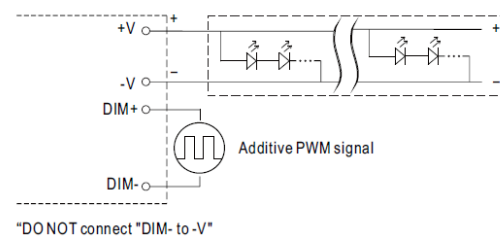
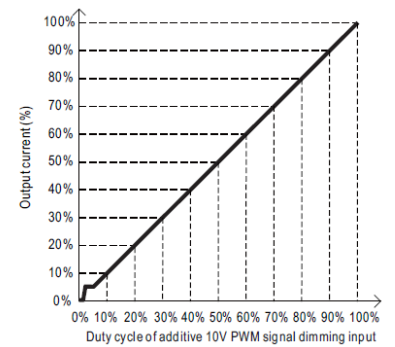
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CURRENT ACCURACY	±5%	I/P: 347VAC I/P: 480VAC O/P: FULL LOAD Ta: 25°C	0.7049A /347VAC@CV MAX-1V 0.7021A /347VAC@CV MIN 0.7046A /480VAC@CV MAX-1V 0.7022A /480VAC@CV MIN 0.47%
2	CONSTANT CURRENT REGION	CH1: 171.4 V~ 342.8 V	I/P: 347VAC O/P: FULL LOAD Ta: 25°C	19.416V~342.8V /347VAC
3	CURRENT ADJ. RANGE	CH1: 305mA~ 700mA	I/P: 347VAC I/P: 480VAC O/P: CV MIN & CV MAX-1V Ta: 25°C	0.298A~0.763A/347VAC@CV MAX-1V 0.595A~7.668 A /347VAC@CV MIN 0.298A~0.764A/480VAC@CV MAX-1V 0.5972A~0.7668 A/480VAC@CV MIN
4	OPEN CIRCUIT VOLTAGE (max.)	354V	I/P: 347VAC O/P: NO LOAD Ta: 25°C	347.4V
5	CURRENT RIPPLE	5.0% max. @rated current	I/P: 347VAC O/P: FULL LOAD Ta: 25°C	3.86%
6	OVER/UNDERSHOOT TEST	< ±5%	I/P: 347 VAC O/P: FULL LOAD Ta: 25°C	TEST: <5 %
7	SET UP TIME	230VAC/ 500 ms (Max) 347VAC/ 500 ms (Max) 480VAC/ 500 ms (Max)	I/P: 230VAC I/P: 347VAC I/P: 480VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 292 ms 347VAC/ 273 ms 480VAC/ 272 ms
<div style="display: flex; justify-content: space-around;"> <div style="width: 45%;"> <p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>DSO-X 3014A, M/52161480 Tue Sep 08 18:48:58 2015</p>  <p>DC: 295.000V 100.1 DC +97.50V 1000.1 DC +278.750V 100.1 DC +2.85000A 10.0.1</p> </div> <div style="width: 45%;"> <p>INPUT=347VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>DSO-X 3014A, M/52161480 Tue Sep 08 18:49:19 2015</p>  <p>DC: 295.000V 100.1 DC +97.50V 1000.1 DC +278.750V 100.1 DC +2.85000A 10.0.1</p> </div> </div>				
8	DIMMING OPERATION (for B-Type)	<p>※3 in 1 dimming function</p> <p>※Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-: 0 ~ 10VDC, or 10V PWM signal or resistance.</p> <p>※Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.</p> <p>※Dimming source current from power supply: 100μ A (typ.)</p>		

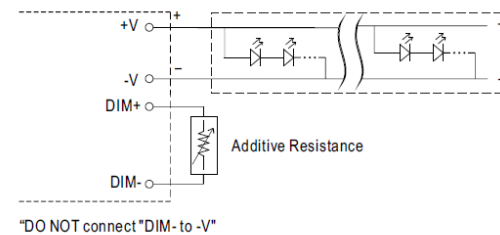
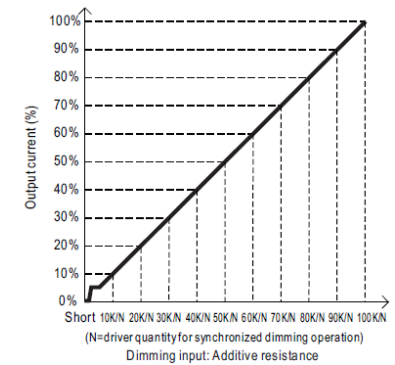
◎ Applying additive 0 ~ 10VDC



◎ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



◎ Applying additive resistance:



Note : 1. Min. dimming level is about 5% and the output current is not defined when $0\% < I_{out} < 5\%$.
 2. The output current could drop down to 0% when dimming input is about 0kΩ or 0Vdc, or 10V PWM signal with 0% duty cycle.

I/P : 347VAC

O/P : DIMMING TEST

TA : 25°C

R	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
O/P CURRENT	0.00000A	0.076A	0.144A	0.216A	0.279A	0.345A	0.410A	0.477A	0.541A	0.606A	0.666A	0.733A
%	0.00%	10.87%	20.60%	30.86%	39.79%	49.23%	58.59%	68.14%	77.24%	86.54%	95.16%	104.76%
V	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
O/P CURRENT	0.00000A	0.077A	0.147A	0.218A	0.286A	0.355A	0.426A	0.496A	0.564A	0.632A	0.703A	0.733A
%	0.00%	11.03%	20.94%	31.16%	40.79%	50.71%	60.79%	70.79%	80.60%	90.30%	100.37%	104.76%
PWM (100HZ)	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
O/P CURRENT	0.00000A	0.067A	0.139A	0.211A	0.281A	0.351A	0.420A	0.489A	0.558A	0.627A	0.697A	0.733A
%	0.00%	9.50%	19.86%	30.09%	40.17%	50.16%	60.00%	69.86%	79.74%	89.60%	99.54%	104.76%

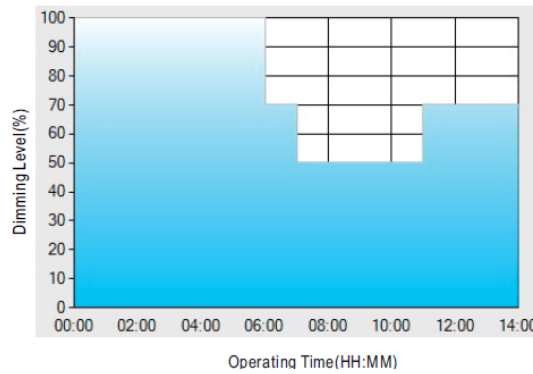
TEST RESULT : OK

9 DIMMING OPERATION (for Dxx-Type by User definition)

※Smart timer dimming function (for Dxx-Type by User definition)

MEAN WELL Smart timer dimming primarily provides the adaptive proportion dimming profile for the output constant current level to perform up to 14 consecutive hours. 3 dimming profiles hereunder are defined accounting for the most frequently seen applications. If other options may be needed, please contact MEAN WELL for details.

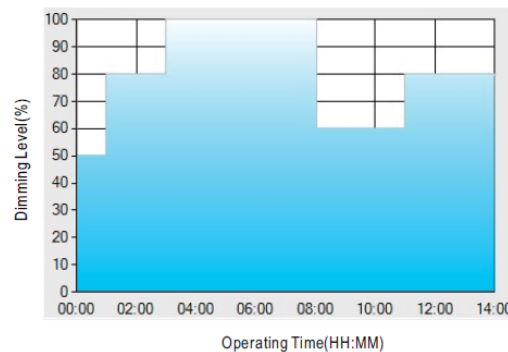
Ex : Ⓒ D01-Type: the profile recommended for residential lighting



Set up for D01-Type in Smart timer dimming software program:

	T1	T2	T3	T4
TIME**	06:00	07:00	11:00	---
LEVEL**	100%	70%	50%	70%

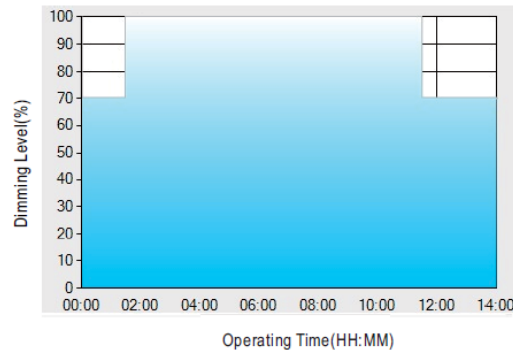
Ex : Ⓒ D02-Type: the profile recommended for street lighting



Set up for D02-Type in Smart timer dimming software program:

	T1	T2	T3	T4	T5
TIME**	01:00	03:00	8:00	11:00	---
LEVEL**	50%	80%	100%	60%	80%

Ex : Ⓒ D03-Type: the profile recommended for tunnel lighting



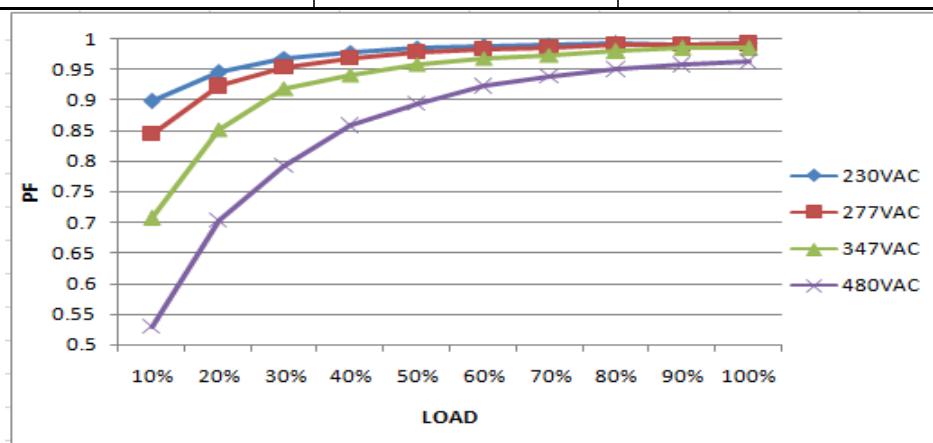
Set up for D03-Type in Smart timer dimming software program:

	T1	T2	T3
TIME**	01:30	11:00	---
LEVEL**	70%	100%	70%

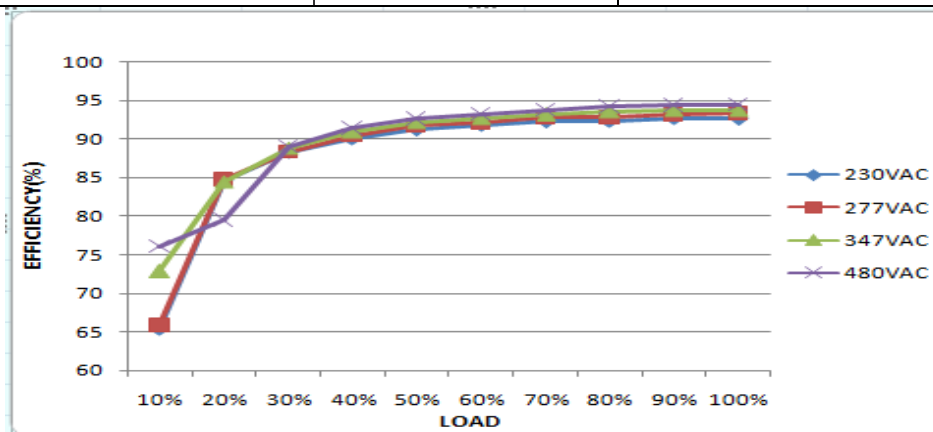
I/P : 347VAC
O/P : DIMMING TEST
TA : 25°C
TEST RESULT : OK

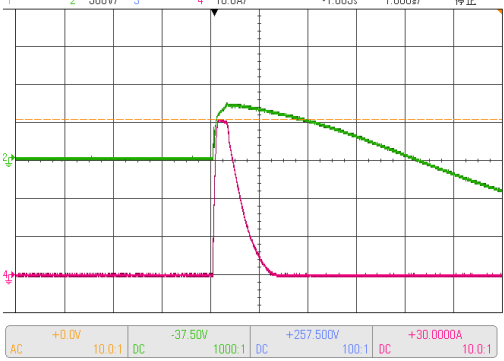
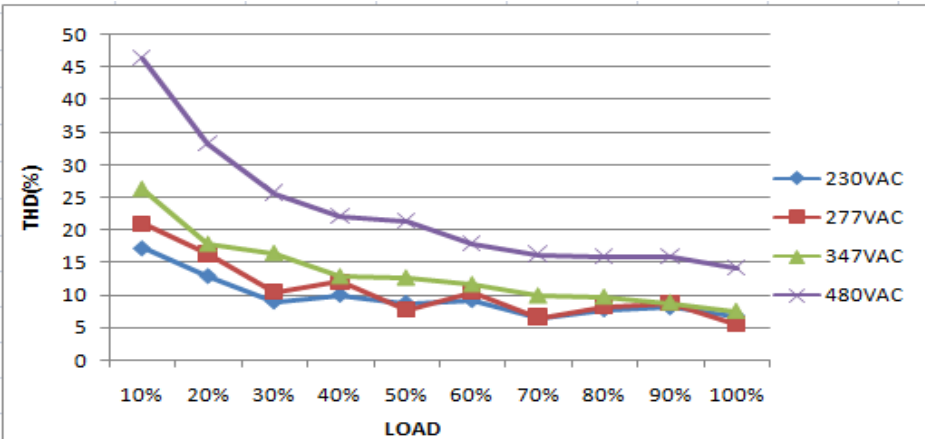
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC~528 VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	137V~528 V
			I/P: LOW-LINE-3V=177 V HIGH-LINE+10V=538 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	(1).TEST:OK (2).TEST :OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 180 VAC ~528VAC O/P:FULL ~MIN LOAD Ta:25°C	OK
3	INPUT CURRENT (TYP)	347VAC/ 0.76 A 480VAC/ 0.56A	I/P: 347VAC/480VAC O/P:FULL LOAD Ta:25°C	I = 0.742 A/ 347VAC I = 0.539A/ 480VAC
4	POWER FACTOR(TYP)	0.95/347VAC FULL LOAD 0.93/480VAC FULL LOAD 0.97/277 VAC FULL LOAD 0.98/230 VAC FULL LOAD	I/P: 347VAC/480VAC/277VAC/230VAC O/P:FULL LOAD Ta:25°C	PF= 0.991 /347V/100%LOAD PF= 0.972 /480V/100%LOAD PF= 0.992 /277V/100%LOAD PF= 0.993 /230V/100%LOAD



5	EFFICIENCY (TYP)	93.5 %	I/P: 347VAC O/P:FULL LOAD Ta:25°C	93.69%
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6	INRUSH CURRENT (TYP)	480VV/ 50 A COLD START (twidth= 532 us measured at 50% Ipeak) COLD START	I/P:480VAC O/P:FULL LOAD Ta:25°C	I =40.9A/ 480VAC T50= 520 us																																																							
<p>INPUT=480VAC/ 60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)</p> <p>DSO-X 3014A, MY52161480 Wed Sep 09 11:38:24 2015</p>  <p>AC +0.0V 10.0 1 DC -37.50V 1000.1 DC +257.500V 100.1 DC +30.0000A 10.0 1</p>																																																											
7	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 50% or higher at 230V/277V/347V/480V	I/P : 230V/277V/347V O/P : 100% LOAD 50% LOAD I/P : 480V O/P : 60% LOAD Ta : 25°C	THD : 12.73%/230V 50% THD : 9.42%/230V 100% THD : 13.33%/277V 50% THD : 10.03%/277V 100% THD : 10.42%/347V 50% THD : 6.17%/347V 100% THD : 16.56 %/480V60% THD : 14.78%480V 100%																																																							
<p>THD vs LOAD</p>  <table border="1"> <caption>THD vs LOAD Data (Approximate)</caption> <thead> <tr> <th>LOAD (%)</th> <th>230VAC (%)</th> <th>277VAC (%)</th> <th>347VAC (%)</th> <th>480VAC (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>18</td><td>22</td><td>25</td><td>48</td></tr> <tr><td>20%</td><td>15</td><td>18</td><td>20</td><td>35</td></tr> <tr><td>30%</td><td>12</td><td>15</td><td>18</td><td>25</td></tr> <tr><td>40%</td><td>10</td><td>12</td><td>15</td><td>22</td></tr> <tr><td>50%</td><td>8</td><td>10</td><td>12</td><td>20</td></tr> <tr><td>60%</td><td>9</td><td>11</td><td>11</td><td>18</td></tr> <tr><td>70%</td><td>8</td><td>10</td><td>10</td><td>16</td></tr> <tr><td>80%</td><td>9</td><td>11</td><td>9</td><td>15</td></tr> <tr><td>90%</td><td>8</td><td>10</td><td>8</td><td>14</td></tr> <tr><td>100%</td><td>7</td><td>9</td><td>7</td><td>13</td></tr> </tbody> </table>					LOAD (%)	230VAC (%)	277VAC (%)	347VAC (%)	480VAC (%)	10%	18	22	25	48	20%	15	18	20	35	30%	12	15	18	25	40%	10	12	15	22	50%	8	10	12	20	60%	9	11	11	18	70%	8	10	10	16	80%	9	11	9	15	90%	8	10	8	14	100%	7	9	7	13
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ROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
2	OVER VOLTAGE PROTECTION	V1: 360 V~ 394 V	I/P: 528VAC I/P: 347VAC I/P: 180VAC O/P:MIN LOAD Ta:25°C	371.71V/ 528VAC 371.81V/ 347VAC 371.6V/ 180VAC PROTECTION TYPE : Shut down o/p voltage with re-power on to recovery

3	OVER TEMPERATURE PROTECTION	PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover	I/P: 528 VAC I/P: 180 VAC O/P: FULL LOAD	O.T.P. Active PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 528VAC I/P: 180 VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q901 Rated 9A/ 950V	I/P: High-Line +3V =531V AC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) Full Load continue	VDS: (1) 871V/8.48A (2) 798V/7.52A (3) 871V/3.28A
2	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated 6A/1050V	I/P: High-Line +3V =531V AC ON/OFF VDS: O/P: (1) Full Load (2) Output Short (3) Full Load continue	VDS: (1) 894V/4.04A (2) 814V/3.84A (3) 846V/3.84A
3	Diode Peak Voltage	D103 Rated 20A/600V D104 Rated 4A/600V	I/P: High-Line +3V =531 V D101 : AC ON/OFF O/P: (1) Full Load (2) Output Short (3) Full Load continue D104 : AC ON/OFF O/P: (1) Full Load (2) Output Short (3) Full Load continue Ta:25°C	D103 VDS: (1) 357V (2) 13.9V (3) 353V VDS: (1) 357V (2) 17V (3) 352V
4	Input Capacitor Voltage	C6 Rated: 82u/450V 105°C	I/P: High-Line +3V =531V O/P: (1) Full Load input on/off (2) Min load input on /Off (3) Full Load /Min load Change (4) Full load continue Ta:25°C	(1) 416V (2) 453V (3) 416V (4) 404V
5	Control IC Voltage Test	PWM IC U901 Rated 8.85V~16V	I/P: High-Line +3V =531 V AC ON/OFF O/P: (1) FULL LOAD (2) Output Short (3) O.L.P (4) O.V.P. Ta:25°C	(1) 14.42V (2) 14.1V (3) 13.7V (4) 14.5V

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: 4.125 KVAC/min I/P-FG: 2.4KVAC/min O/P-FG: 1.8 KVAC/min Ta:25°C	I/P-O/P: 1.6 mA I/P-FG: 1.01 mA O/P-FG: 0.645 mA 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°C	I/P-O/P: 30GΩ I/P-FG: 14.2G 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°C	21 mΩ
4	LEAKAGE CURRENT	IEC60950-1 < 0.75mA / 480VAC	I/P: 480VAC O/P:Min LOAD Ta:25°C	L-FG: 0.16 mA N-FG: 0.16 mA L,N -V(+): 0.17 mA L,N-V(-): 0.18 mA

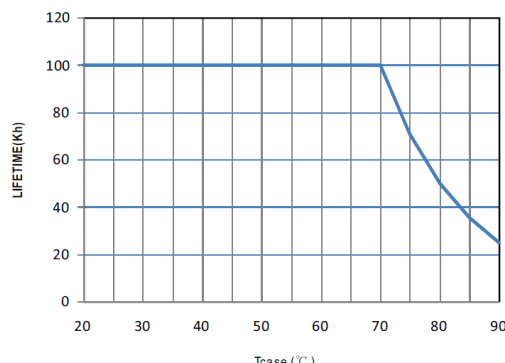
E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	FCC PART 15	I/P: 347VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
2	RADIATION	FCC PART 15	I/P: 347VAC (50HZ) O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 347VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 347VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
5	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 347VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
6	Test by certified Lab & Test Report Prepare			

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																				
1	TEMPERATURE RISE TEST	<div>MODEL : HVGC-240-700</div> <div>1. ROOM AMBIENT BURN-IN : 15 HRS</div> <div>I/P : 347VAC O/P : FULL LOAD Ta= 25.5 °C</div> <div>2. HIGH AMBIENT BURN-IN : 3.5 HRS</div> <div>I/P : 347VAC O/P : FULL LOAD Ta= 56.3 °C</div> <table><tr><th>CH.</th><th>Position</th><th>ROOM AMBIENT Ta= 25.5 °C</th><th>HIGH AMBIENT Ta= 56.3 °C</th></tr><tr><td>1</td><td>C1</td><td>62.2°C</td><td>92.2°C</td></tr><tr><td>2</td><td>BD1</td><td>65.4°C</td><td>95.7°C</td></tr><tr><td>3</td><td>L2</td><td>65.1°C</td><td>95.4°C</td></tr><tr><td>4</td><td>C10</td><td>65.1°C</td><td>95.4°C</td></tr><tr><td>5</td><td>C11</td><td>69.8°C</td><td>97.0°C</td></tr><tr><td>6</td><td>Q2</td><td>67.3°C</td><td>97.9°C</td></tr><tr><td>7</td><td>RTH2</td><td>76.4°C</td><td>103.5°C</td></tr><tr><td>8</td><td>Q901</td><td>69.0°C</td><td>100.1°C</td></tr><tr><td>9</td><td>T2</td><td>62.3°C</td><td>94.1°C</td></tr><tr><td>10</td><td>L1</td><td>67.3°C</td><td>98.4°C</td></tr><tr><td>11</td><td>C5</td><td>66.0°C</td><td>96.9°C</td></tr><tr><td>12</td><td>ZNR1</td><td>60.1°C</td><td>89.7°C</td></tr><tr><td>13</td><td>Q35</td><td>65.7°C</td><td>97.6°C</td></tr><tr><td>14</td><td>C46</td><td>64.7°C</td><td>96.8°C</td></tr><tr><td>15</td><td>C54</td><td>67.0°C</td><td>98.5°C</td></tr><tr><td>16</td><td>RTH3</td><td>63.0°C</td><td>94.7°C</td></tr><tr><td>17</td><td>U1</td><td>63.2°C</td><td>94.2°C</td></tr><tr><td>18</td><td>U901</td><td>63.6°C</td><td>95.3°C</td></tr><tr><td>19</td><td>T1</td><td>66.3°C</td><td>98.5°C</td></tr><tr><td>20</td><td>D103</td><td>62.6°C</td><td>93.0°C</td></tr><tr><td>21</td><td>D104</td><td>63.7°C</td><td>94.2°C</td></tr><tr><td>22</td><td>C106</td><td>61.1°C</td><td>91.6°C</td></tr><tr><td>23</td><td>C201</td><td>61.2°C</td><td>91.9°C</td></tr><tr><td>24</td><td>LF100</td><td>61.2°C</td><td>91.8°C</td></tr></table>			CH.	Position	ROOM AMBIENT Ta= 25.5 °C	HIGH AMBIENT Ta= 56.3 °C	1	C1	62.2°C	92.2°C	2	BD1	65.4°C	95.7°C	3	L2	65.1°C	95.4°C	4	C10	65.1°C	95.4°C	5	C11	69.8°C	97.0°C	6	Q2	67.3°C	97.9°C	7	RTH2	76.4°C	103.5°C	8	Q901	69.0°C	100.1°C	9	T2	62.3°C	94.1°C	10	L1	67.3°C	98.4°C	11	C5	66.0°C	96.9°C	12	ZNR1	60.1°C	89.7°C	13	Q35	65.7°C	97.6°C	14	C46	64.7°C	96.8°C	15	C54	67.0°C	98.5°C	16	RTH3	63.0°C	94.7°C	17	U1	63.2°C	94.2°C	18	U901	63.6°C	95.3°C	19	T1	66.3°C	98.5°C	20	D103	62.6°C	93.0°C	21	D104	63.7°C	94.2°C	22	C106	61.1°C	91.6°C	23	C201	61.2°C	91.9°C	24	LF100	61.2°C	91.8°C
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2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 528VAC/180VAC O/P : 100 % LOAD Ta= -45°C	TEST : OK																																																																																																				
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 °C NO DAMAGE	I/P : 538VAC O/P : FULL LOAD Ta= 60 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																																				
4	TEMPERATURE COEFFICIENT	± 0.03%/°C (0~60°C)	I/P : 347 VAC O/P : FULL LOAD	± 0.009 %/°C (0~60°C)																																																																																																				
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -50°C~ +125°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																																																																																																				

6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45℃ ~ +65℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test	OK																		
7	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 : 70min in each axis (X.Y.Z) (6) Ta : 25℃	TEST : OK																		
8	CAPACITOR LIFE CYCLE	SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 347VAC O/P : FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P : 347VAC O/P : FULL LOAD Ta= 60 ℃ LIFE TIME (3) I/P : 347VAC O/P : 75% LOAD Ta= 60 ℃ LIFE TIME (4) I/P : 347VAC O/P : 50% LOAD Ta= 60 ℃ LIFE TIME	(1) 221268 HRS (2) 19976 HRS (3) 37783HRS (4) 43303HRS																		
9	MTBF	Conducted by Parts Stress Analysis Prediction 143.6K hrs min. MIL-HDBK-217F (25℃)																			
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 80℃ <div><table><caption>Approximate data points from the Lifetime vs Tcase graph</caption><thead><tr><th>Tcase (°C)</th><th>Lifetime (kh)</th></tr></thead><tbody><tr><td>20</td><td>100</td></tr><tr><td>30</td><td>100</td></tr><tr><td>40</td><td>100</td></tr><tr><td>50</td><td>100</td></tr><tr><td>60</td><td>100</td></tr><tr><td>70</td><td>100</td></tr><tr><td>80</td><td>50</td></tr><tr><td>90</td><td>25</td></tr></tbody></table></div>		Tcase (°C)	Lifetime (kh)	20	100	30	100	40	100	50	100	60	100	70	100	80	50	90	25
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TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT ZENG

12.10.30 A50-F031