



# Test Report: HVGC-480-M

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480W 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

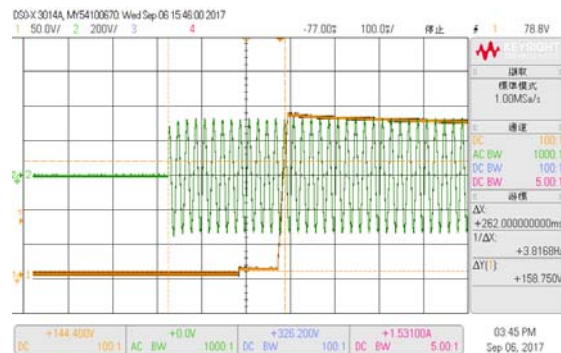
ENVIRONMENT TEST

## DESIGN VERIFY TEST

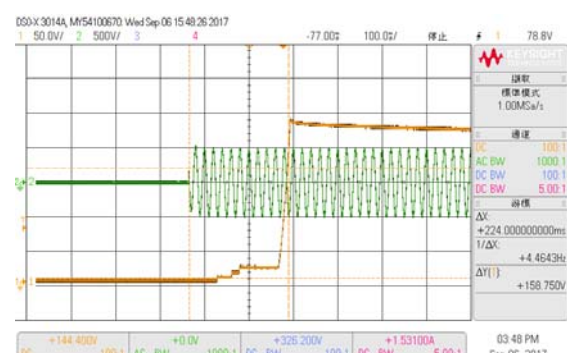
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CURRENT TOLERANCE	±5%	I/P: 347VAC I/P: 480VAC O/P: FULL LOAD Io: 2.1A & 2.625A Ta: 25°C	Io: 2.1A: 2.1024A/347VAC@LED MAX-2V 2.1028A/347VAC@LED MIN 2.1028A/480VAC@LED MAX-2V 2.1028A/480VAC@LED MIN 0.24% Io: 2.625A: 2.6276A/347VAC@LED MAX-2V 2.6276A/347VAC@LED MIN 2.6272A/480VAC@LED MAX-2V 2.6272A/480VAC@LED MIN 0.17%
2	FULL POWER CURRENT RANGE	2100~2625mA	I/P: 347VAC O/P: FULL LOAD Io: 2.1A & 2.625A Ta: 25°C	2.1A / 228.5V 2.625A / 182.8V
3	OPEN CIRCUIT VOLTAGE (max)	240V	I/P: 347VAC O/P: NO LOAD Io: Io Adj = 2.1A Ta: 25°C	232V
4	CONSTANT CURRENT REGION	CH1: 92V~ 229V	I/P: 347VAC O/P: FULL LOAD Io: 2.1A & 2.625A Ta: 25°C	Io: 2.1A: 0.6~228.5V/347VAC Io: 2.625A: 0.6~182.8V/347VAC
5	CURRENT ADJ. RANGE	CH1: 210mA~2625mA	I/P: 347VAC I/P: 480VAC O/P: LED MIN & LED MAX-2V Io: 100k Ta: 25°C	206mA~2667mA/347VAC@LED=182.8V 209mA~2674mA/347VAC@LED=92V 204mA~2668mA/480VAC@LED=182.8V 209mA~2675mA/480VAC@LED=92V
6	CURRENT RIPPLE	5% max. @rated current	I/P: 347VAC O/P: FULL LOAD Io: 2.1A & 2.625A Ta: 25°C	Io: 2.1A: 3.81% Io: 2.625A: 3.81%
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/262ms 347VAC/ 224ms 480VAC/ 202ms

INPUT=230VAC/50HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=347VAC/60HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage



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8	<b>DIMMING OPERATION (for B-Type)</b>
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**※3 in 1 dimming function**

※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.

※Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers.

※Dimming source current from power supply: 100 $\mu$  A (typ.)

◎ Applying additive 0 ~ 10VDC

"DO NOT connect "DIM- to -V"

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

"DO NOT connect "DIM- to -V"

◎ Applying additive resistance:

"DO NOT connect "DIM- to -V"

Short 10k $\Omega$  20k $\Omega$  30k $\Omega$  40k $\Omega$  50k $\Omega$  60k $\Omega$  70k $\Omega$  80k $\Omega$  90k $\Omega$  100k $\Omega$   
(N=driver quantity for synchronized dimming operation)  
Dimming input: Additive resistance

Note : 1. Min. dimming level is about 5% and the output current is not defined when 0% < I<sub>out</sub> < 6%.

2. The output current could drop down to 0% when dimming input is about 0k $\Omega$  or 0Vdc, or 10V PWM signal with 0% duty cycle.

I/P : 347VAC  
O/P : DIMMING TEST  
TA : 25 $^{\circ}$ C

R	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
O/P CURRENT	0.0000A	0.189A	0.391A	0.606A	0.811A	1.027A	1.243A	1.442A	1.668A	1.875A	2.086A	2.100A
%	0.00%	9.00%	18.62%	28.86%	38.62%	48.90%	59.19%	68.67%	79.43%	89.29%	99.33%	100.00%

V	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
O/P CURRENT	0.0000A	0.197A	0.400A	0.615A	0.839A	1.045A	1.262A	1.481A	1.712A	1.919A	2.118A	2.118A
%	0.00%	9.38%	19.05%	29.29%	39.95%	49.76%	60.10%	70.52%	81.52%	91.38%	100.86%	100.86%

PWM (100HZ)	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
O/P CURRENT	0.0000A	0.253A	0.505A	0.769A	1.021A	1.287A	1.555A	1.805A	2.068A	2.320A	2.600A	2.644A
%	0.00%	9.64%	19.24%	29.30%	38.90%	49.03%	59.24%	68.76%	78.78%	88.38%	99.05%	100.72%

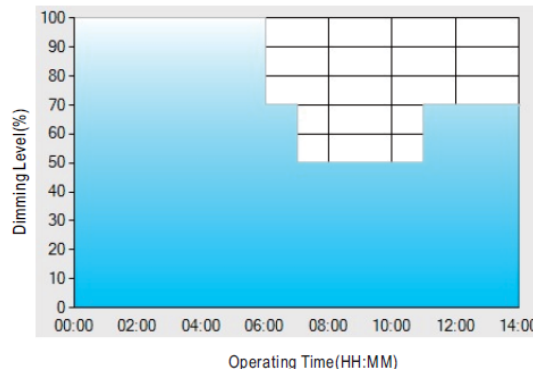
TEST RESULT : OK

**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.

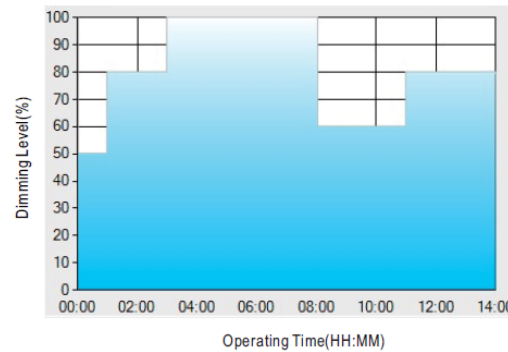
Ex: ☉ D01-Type: the profile recommended for residential lighting



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%

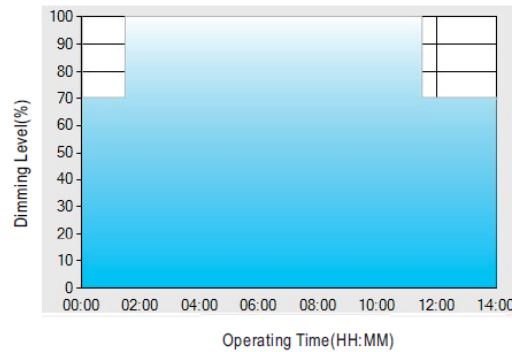
Ex: ☉ D02-Type: the profile recommended for street lighting



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%

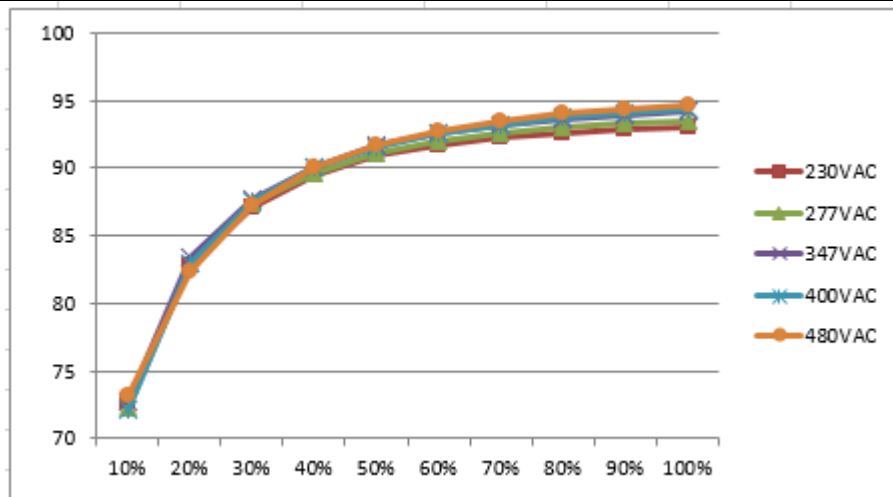
I/P : 347VAC  
O/P : DIMMING TEST  
TA : 25°C  
TEST RESULT : OK

**10 DALI interface(primary side)**

DALI protocol including 16 groups and 64 addresses.  
First step is fixed at 6% of output.  
I/P : 347VAC  
O/P : DALI TEST  
TA : 25°C  
TEST RESULT : OK

## INPUT FUNCTION TEST

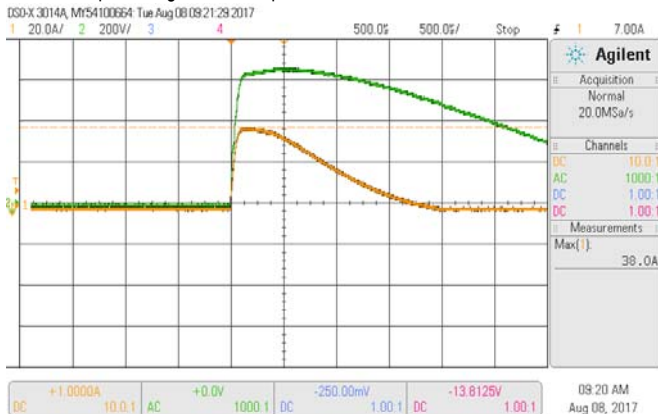
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																		
1	INPUT VOLTAGE RANGE	180VAC~528 VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	159V~528 V																																																																		
			I/P: LOW-LINE-3V=177 V HIGH-LINE+10V=538 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	TEST:OK																																																																		
3	INPUT CURRENT (TYP)	347VAC/ 1.52 A 480VAC/ 1.11A	I/P: 347VAC/480VAC O/P:FULL LOAD Ta:25°C	I =1.517A/ 347VAC I =1.1086A/480VAC																																																																		
4	POWER FACTOR(TYP)	0.98/230 VAC FULL LOAD 0.98/277 VAC FULL LOAD 0.97/347VAC FULL LOAD 0.96/400 VAC FULL LOAD 0.95/480VAC FULL LOAD	I/P: 230VAC/277VAC/347VAC/400VAC/480VAC O/P:FULL LOAD Ta:25°C	PF= 0.99/230V/100%LOAD PF=0.99/277V/100%LOAD PF=0.99 /347V/100%LOAD PF=0.98/400V/100%LOAD PF= 0.97/480V/100%LOAD																																																																		
<p>P.F vs LOAD</p> <table border="1"> <caption>Approximate data from P.F vs LOAD graph</caption> <thead> <tr> <th>Load (%)</th> <th>230VAC</th> <th>277VAC</th> <th>347VAC</th> <th>400VAC</th> <th>480VAC</th> </tr> </thead> <tbody> <tr><td>10%</td><td>0.95</td><td>0.88</td><td>0.78</td><td>0.76</td><td>0.54</td></tr> <tr><td>20%</td><td>0.98</td><td>0.95</td><td>0.88</td><td>0.86</td><td>0.77</td></tr> <tr><td>30%</td><td>0.99</td><td>0.97</td><td>0.93</td><td>0.92</td><td>0.83</td></tr> <tr><td>40%</td><td>0.99</td><td>0.98</td><td>0.96</td><td>0.95</td><td>0.88</td></tr> <tr><td>50%</td><td>0.99</td><td>0.98</td><td>0.97</td><td>0.96</td><td>0.91</td></tr> <tr><td>60%</td><td>0.99</td><td>0.98</td><td>0.97</td><td>0.96</td><td>0.93</td></tr> <tr><td>70%</td><td>0.99</td><td>0.98</td><td>0.97</td><td>0.96</td><td>0.94</td></tr> <tr><td>80%</td><td>0.99</td><td>0.98</td><td>0.97</td><td>0.96</td><td>0.95</td></tr> <tr><td>90%</td><td>0.99</td><td>0.98</td><td>0.97</td><td>0.96</td><td>0.96</td></tr> <tr><td>100%</td><td>0.99</td><td>0.98</td><td>0.97</td><td>0.96</td><td>0.97</td></tr> </tbody> </table>					Load (%)	230VAC	277VAC	347VAC	400VAC	480VAC	10%	0.95	0.88	0.78	0.76	0.54	20%	0.98	0.95	0.88	0.86	0.77	30%	0.99	0.97	0.93	0.92	0.83	40%	0.99	0.98	0.96	0.95	0.88	50%	0.99	0.98	0.97	0.96	0.91	60%	0.99	0.98	0.97	0.96	0.93	70%	0.99	0.98	0.97	0.96	0.94	80%	0.99	0.98	0.97	0.96	0.95	90%	0.99	0.98	0.97	0.96	0.96	100%	0.99	0.98	0.97	0.96	0.97
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5	EFFICIENCY (TYP)	94.5%	I/P: 347VAC O/P:FULL LOAD. Ta:25°C	94.53%																																																																		
	EFFICIENCY vs LOAD																																																																					



6	INRUSH CURRENT (TYP)	480V/ 40A COLD START  (twidth=1100 us measured at 50% Ipeak) COLD START	I/P: 480VAC O/P: FULL LOAD Ta: 25°C	I = 38A / 480VAC  T50= 920 $\mu$ S
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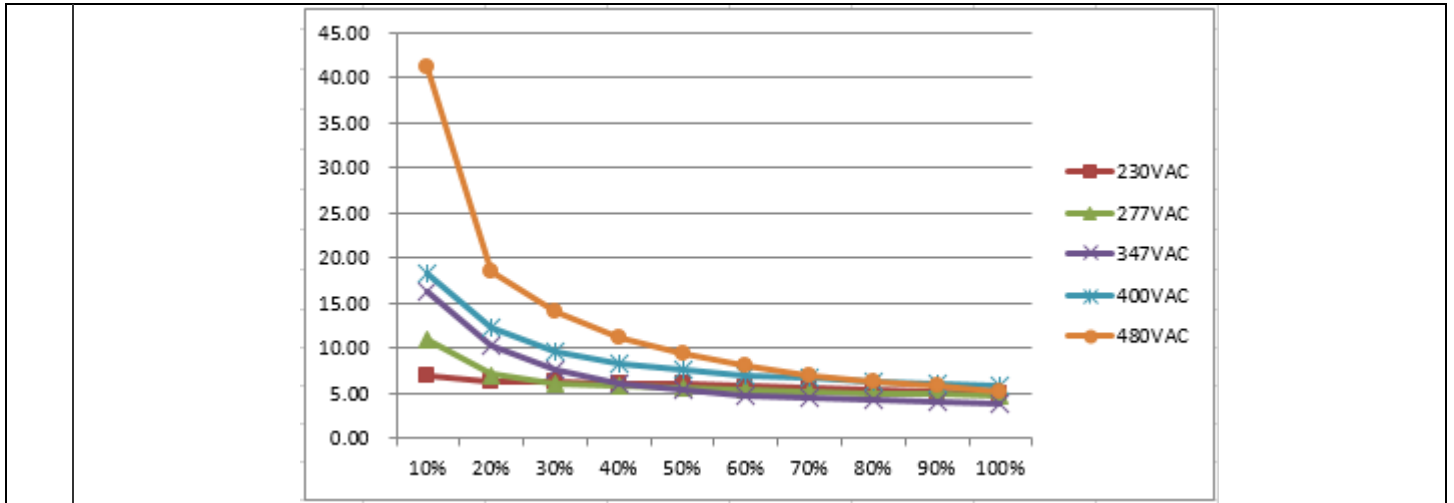
INPUT=480VAC/ 60HZ @ FULL LOAD

CH2 : AC Input Voltage CH1 : Input current



7	TOTAL HARMONIC DISTORTION	THD < 20% output load $\geq$ 50% at 230VAC/277VAC/347VAC /480VAC input	I/P : 230V/277V/347V/480V/400VAC O/P : 100% LOAD 50% LOAD Ta : 25°C	THD : 4.28 %/230V 50% THD : 3.71 %/230V 100% THD : 4.52 %/277V 50% THD : 4.04 %/277V 100% THD : 3.68 %/347V 50% THD : 2.92 %/347V 100% THD : 9.88 %480V 50% THD : 7.19 %480V 100% THD : 7.85 %400V 50% THD : 5.99 %400V100%
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THD vs LOAD



## ROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	V1: 235V~265V PROTECTION TYPE : Shut down output voltage, re-power on to recovery	I/P: 528VAC I/P: 347VAC I/P: 180VAC O/P:MIN LOAD Ta:25°C	247.00V / 528VAC 246.44V/ 347VAC 246.49V/ 180VAC PROTECTION TYPE : Shut down output voltage, re-power on to recovery
2	OVER TEMPERATURE PROTECTION	PROTECTION TYPE : Shut down output voltage, re-power on to recovery	I/P: 528 VAC I/P: 180 VAC O/P:FULL LOAD	O.T.P. Active  PROTECTION TYPE : Shut down output voltage, re-power on to recovery
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE PROTECTION TYPE : Constant current, recovers automatically after fault condition is removed	I/P: 528VAC I/P: 180 VAC O/P: FULL LOAD Io: 2.1A & 2.625A Ta:25°C	Io: 2.1A NO DAMAGE PROTECTION TYPE : Constant current, recovers automatically after fault condition is removed  Io: 2.625A NO DAMAGE PROTECTION TYPE : Constant current, 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	Q11 Rated 9A/ 950V	I/P:High-Line +3V =531v AC ON/OFF <b>Io: 2.1A&amp;2.625A</b> VDS: O/P: (1)Full Load (2)Output Short (3) Full Load continue	<b>Io: 2.1A</b> Q11 VDS: (1)888V (2) 864V (3) 836V  VDS:  <b>Io: 2.625A</b> Q11 VDS: (1) 872V (2) 856V (3) 832V  VDS:

		Q13 Rated 9A/ 950V	I/P:Low-Line -3V = 177V O/P: (1)Full Load (2)Output Short (3) Full Load continue Ta:25°C	(1) 884V (2) 824V (3) 852V	(1) 896V (2) 832V (3) 840V
				Q13 VDS: (1) 880V (2) 864V (3) 836V	Q13 VDS: (1) 876V (2)844V (3) 832V
				VDS: (1) 892V (2) 820V (3)860V	VDS: (1) 880V (2) 828V (3) 801V
2	P.F.C Transistor ( D to S) or (C to E) <b>Peak Voltage</b>	Q4 Rated 9A/ 1050V	I/P:High-Line +3V =531V AC ON/OFF <b>Io: 2.1A</b> VDS: O/P: (1)Full Load (2)Output Short (3) Full Load continue  I/P:Low-Line -3V = 177V O/P: (1)Full Load (2)Output Short (3) Full Load continue Ta:25°C	<b>Io: 2.1A</b> Q4 VDS: (1)880V (2)836V (3)856V	
				VDS: (1)920V (2)824V (3)912V	
3	P.F.C DIODE	D8 Rated 8 A/ 1200 V	I/P:High-Line +3V =531 V AC ON/OFF <b>Io: 2.1A</b> O/P: (1)Full Load (2)Output Short (3) Full Load continue  I/P:Low-Line -3V = 177V AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Full Load continue Ta:25°C	<b>Io: 2.1A</b> (1)852V (2)832V (3)832V	
				(1)900V (2)820V (3)860V	
4	Diode <b>Peak Voltage</b>	D104 Rated 3A/400 V  D114 Rated 3A/ 400V	<b>Io: 2.1A &amp; 2.625A</b> I/P:High-Line +3V =531 V D104 : AC ON/OFF O/P: (1)Full Load (2)Output Short (3) Full Load continue  D112 : AC ON/OFF O/P: (1) Full Load (2)Output Short (3) Full Load continue Ta:25°C	Io: 2.1A D104 VDS: (1)243V (2)4.10V (3)241V	Io: 2.625A D104 VDS: (1)198V (2)3.72V (3)196V
				D114 VDS: (1)241V (2)3.90V (3)239V	D114 VDS: (1)201V (2)4.08V (3)195V
5	<b>Input Capacitor Voltage</b>	C5 Rated: 150 μ/ 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	<b>Io: 2.1A</b> (1)424V (2)406V (3)410V (4)392V	



			Ta:25°C		
6	<b>Control IC Voltage Test</b>	PFC IC U1 Rated 20V~10.5V(MIN.)  PWM IC U2 Rated 16V~ 8.85V(MIN.)	I/P:High-Line +3V =531 V AC ON/OFF  <b>Io: 2.1A</b> O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin.LOW LINE Ta:25°C	<b>Io: 2.1A</b> U1 (1) 13.5V (2) 13.5V (3) 13.4V (4) 13.5V (5) 13.3V	<b>Io: 2.1A</b> U2 (1) 13.6V (2) 13.9V (3) 13.5V (4) 13.5V (5) 13.6V

## 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: 2.74mA I/P-FG: 1.67mA O/P-FG: 6.3mA 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: 24.8G Ω O/P-FG:28.3 G Ω NO DAMAGE
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	28 mΩ
4	LEAKAGE CURRENT	IEC60950-1 < 0.75mA / 480VAC	I/P: 480 VAC O/P:Min LOAD Ta:25°C	L-FG:0.22mA N-FG: 0.22mA
6	Test by certified Lab & Test Report Prepare. Any contradictions of the test results, please refer to the latest EMC test report.			

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	PASS
2	CONDUCTION	FCC Part 15 Subpart B	I/P:230/400/480VAC (50HZ/60HZ) O/P:FULL/80% LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	FCC Part 15 Subpart B	I/P:230/400/480VAC (50HZ/60HZ) O/P:FULL/80% LOAD Ta:25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 230/400VAC (50HZ) O/P:FULL LOAD Ta:25°C	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 230/400VAC (50HZ) O/P:FULL LOAD Ta:25°C	CRITERIA A

6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 230/400VAC (50HZ) O/P:FULL LOAD Ta:25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare. Any contradictions of the test results, please refer to the latest EMC test report.			

## ■ RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																								
1	TEMPERATURE RISE TEST	MODEL : HVGC-480-M 1. ROOM AMBIENT BURN-IN : 3 HRS I/P : 347VAC O/P : FULL LOAD 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 347VAC O/P : FULL LOAD																																																																																										
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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																																																																																								



# 480W Single Output LED Power Supply **HVGC-480** series

4	TEMPERATURE COEFFICIENT	$\pm 0.03\%/^{\circ}\text{C}$ (0~60 $^{\circ}\text{C}$ )	I/P : 347 VAC O/P : FULL LOAD	$\pm 0.013\%/^{\circ}\text{C}$ (0~60 $^{\circ}\text{C}$ )
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -50 $^{\circ}\text{C}$ ~ +125 $^{\circ}\text{C}$ 2. Temperature change rate : 25 $^{\circ}\text{C}$ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 100 CYCLE 5. Input/Output condition : STATIC		OK
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45 $^{\circ}\text{C}$ ~ +65 $^{\circ}\text{C}$ 2. Temperature change rate : 25 $^{\circ}\text{C}$ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 15cycle:347V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:347V/ 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 : 72min in each axis (X.Y.Z) (6) Ta : 25 $^{\circ}\text{C}$		TEST : OK
8	CAPACITOR LIFE CYCLE	SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 347VAC O/P : FULL LOAD Tc= 80 $^{\circ}\text{C}$ LIFE TIME (2) I/P : 347VAC O/P : 75% LOAD Tc= 80 $^{\circ}\text{C}$ LIFE TIME (3) I/P : 347VAC O/P : 50% LOAD Tc= 80 $^{\circ}\text{C}$ LIFE TIME		(1) 62254HRS (2) 63912HRS (3) 64991HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 286.1K hrs min. Telcordia SR-332(Bellcore) ; 72.9K hrs min. MIL-HDBK-217F (25 $^{\circ}\text{C}$ )		
10	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50 $^{\circ}\text{C}$ Demonstration Mean Time Between Failure : 50,000 hours		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT ZENG

12.10.30 A50-F031