Test Report: HVGC-320-1050

320W 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

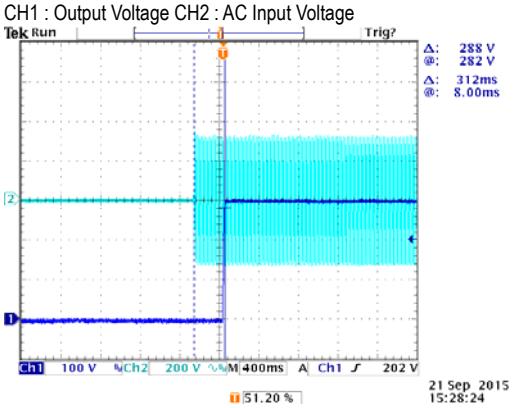
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CURRENT TOLERANCE	±5%	I/P: 347VAC I/P:480VAC O/P:FULL LOAD Ta:25℃	1.0779A /347VAC@CV MAX-1V 1.0664A /347VAC@CV MIN 1.0783A/480VAC@CV MAX-1V 1.0693A/480VAC@CV MIN 2.69%
2	OPEN CIRCUIT VOLTAGE (max)	311V	I/P: 347VAC O/P:NO LOAD Ta:25℃	305.5V
3	CONSTANT CURRENT REGION	CH1:152.4V~ 304.8 V	I/P: 347VAC O/P:FULL LOAD Ta:25℃	152.4V~304.8V /347VAC
4	CURRENT ADJ. RANGE	CH1: 525mA~1050mA	I/P: 347VAC I/P:480VAC O/P:CV MIN & CV MAX-1V Ta:25℃	0.455A~1.1231A /347VAC@CV MAX-1V 0.4546A~1.1171 A /347VAC@CV MIN 0.4654A~1.1231A/480VAC@CV MAX-1V 0.4529A~1.1171A/480VAC@CV MIN
5	CURRENT RIPPLE	5.0% max. @rated current	I/P: 347VAC O/P:FULL LOAD Ta:25℃	2.3%
6	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℃	230VAC/ 312ms 347VAC/ 276ms 480VAC/ 292ms

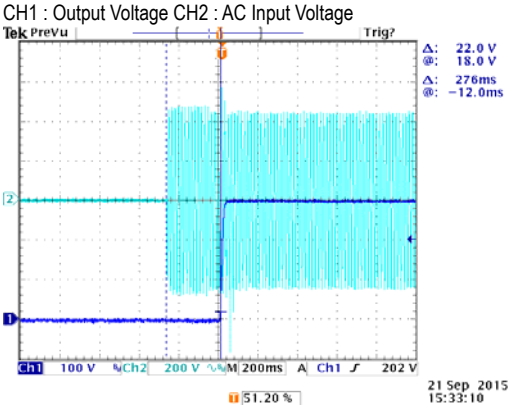
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



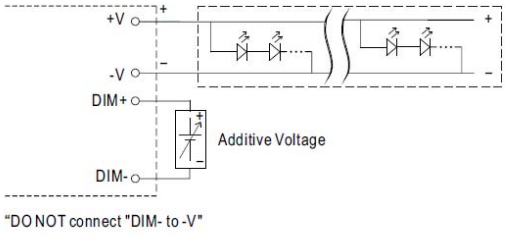
INPUT=347VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

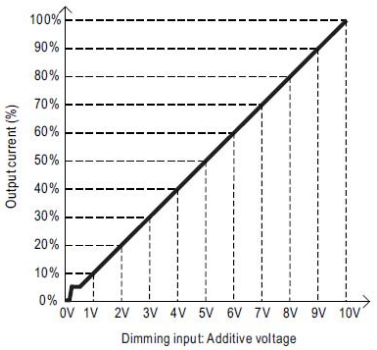


7	DIMMING OPERATION **(for B-Type)**	※**3 in 1 dimming function** ※Output constant current level can be adjusted by applying one of the three methodologies between DIM+ and DIM-: 0 ~ 10VDC, or 10V PWM signal or resistance. ※Direct connecting to LEDs is suggested. It is not suitable to be used with additional drivers. ※Dimming source current from power supply: 100μ A (typ.)

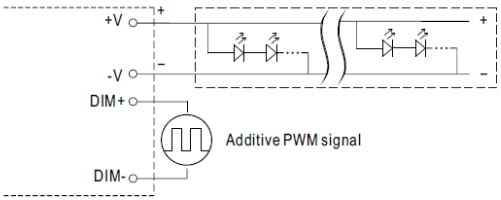
◎ Applying additive 0 ~ 10VDC



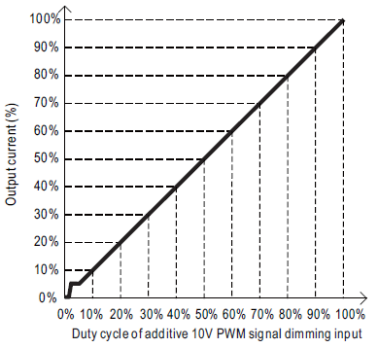
"DO NOT connect "DIM- to -V"



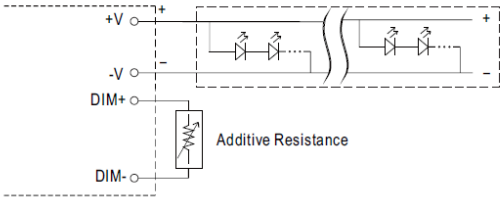
◎ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



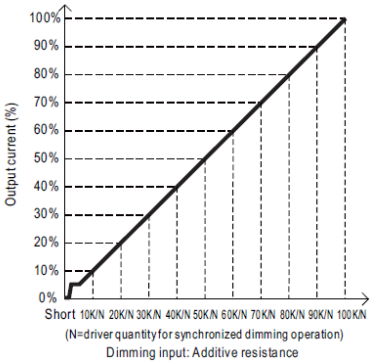
"DO NOT connect "DIM- to -V"



◎ Applying additive resistance:



"DO NOT connect "DIM- to -V"



Note : 1. Min. dimming level is about 5% and the output current is not defined when 0%< Iout<5%.

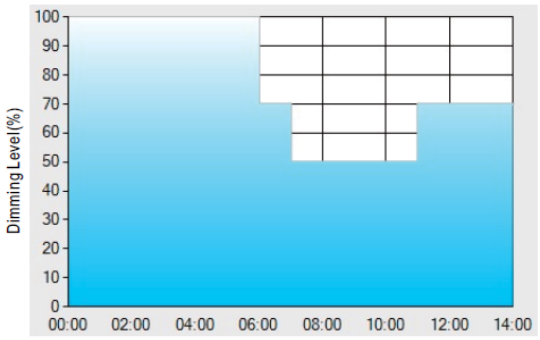
2. The output current could drop down to 0% when dimming input is about 0kΩ or 0Vdc, or 10V PWM signal with 0% duty cycle.

I/P：347VAC
O/P：DIMMING TEST
TA：25℃

R	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
O/P CURRENT	0.00000A	0.111A	0.218A	0.317A	0.417A	0.513A	0.614A	0.710A	0.817A	0.914A	1.010A	1.082A
%	0.00%	10.57%	20.76%	30.19%	39.71%	48.86%	58.48%	67.62%	77.81%	87.05%	96.19%	103.05%
V	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
O/P CURRENT	0.00000A	0.130A	0.230A	0.335A	0.441A	0.541A	0.634A	0.737A	0.841A	0.946A	1.050A	1.082A
%	0.00%	12.38%	21.90%	31.90%	42.00%	51.52%	60.38%	70.19%	80.10%	90.10%	100.00%	103.05%
PWM (100HZ)	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
O/P CURRENT	0.00000A	0.114A	0.215A	0.323A	0.422A	0.530A	0.631A	0.731A	0.843A	0.956A	1.040A	1.082A
%	0.00%	10.86%	20.48%	30.76%	40.19%	50.48%	60.10%	69.62%	80.29%	91.05%	99.05%	103.05%

TEST RESULT：OK

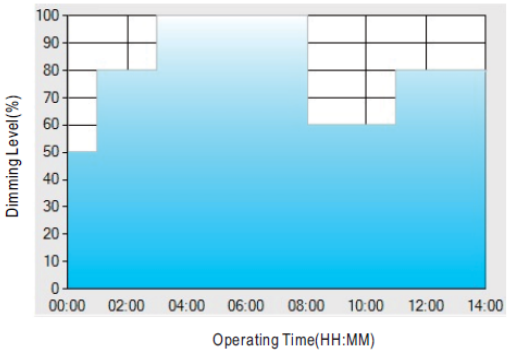
8	DIMMING OPERATION **(for Dxx-Type by User definition)**	※**Smart timer dimming function (for Dxx-Type by User definition)** MEAN WELL Smart timer dimming primarily provides the adaptive proportion dimming profile for the output constant current level to perform up to 14 consecutive hours. 3 dimming 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%

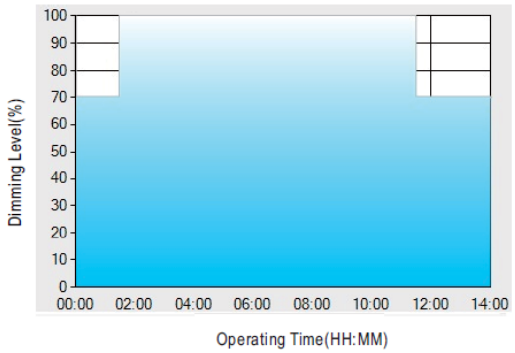
Ex: ◎ D02-Type: the profile recommended for street lighting



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



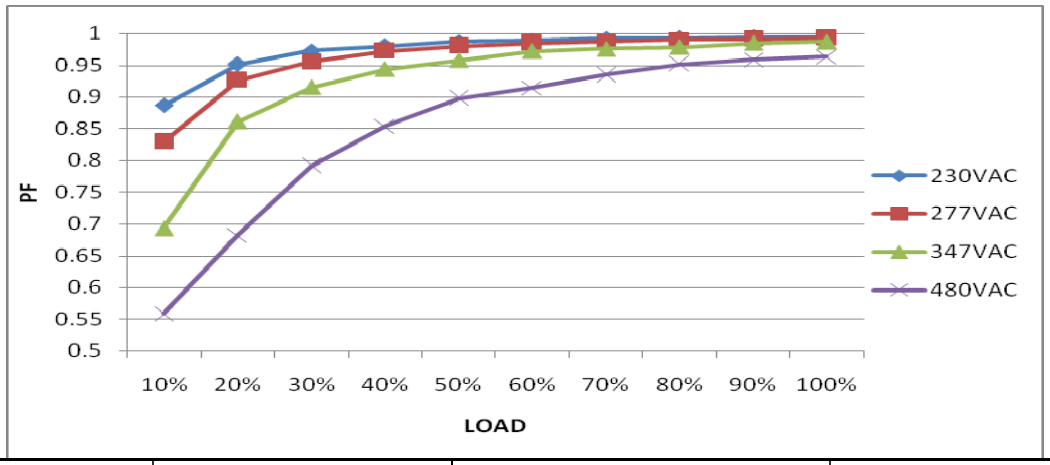
Set up for D03-Type in Smart timer dimming software program:

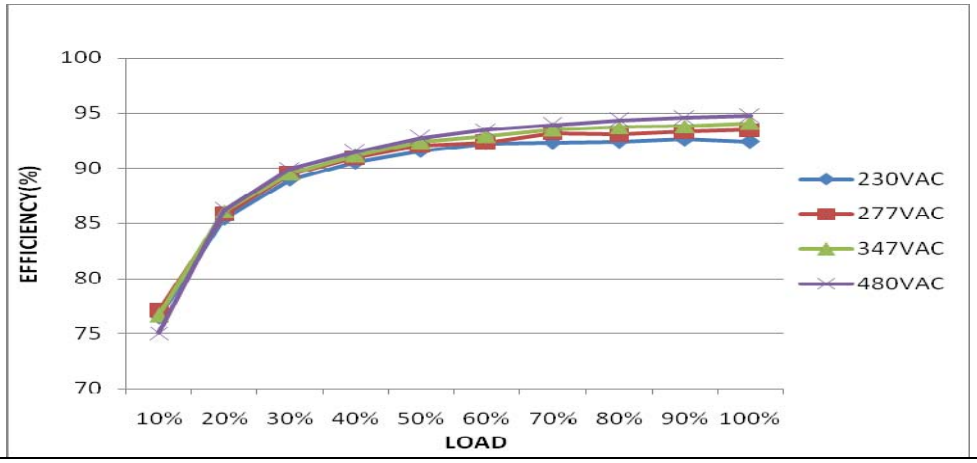
	T1	T2	T3
TIME**	01:30	11:00	---
LEVEL**	70%	100%	70%

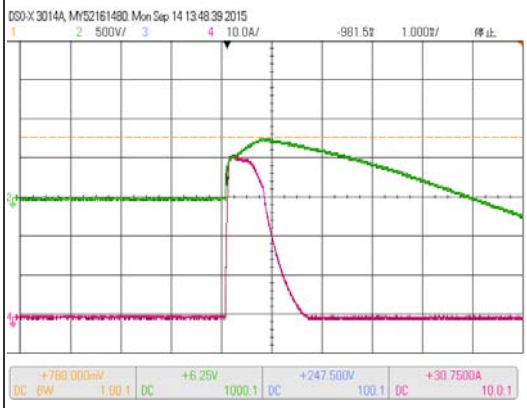
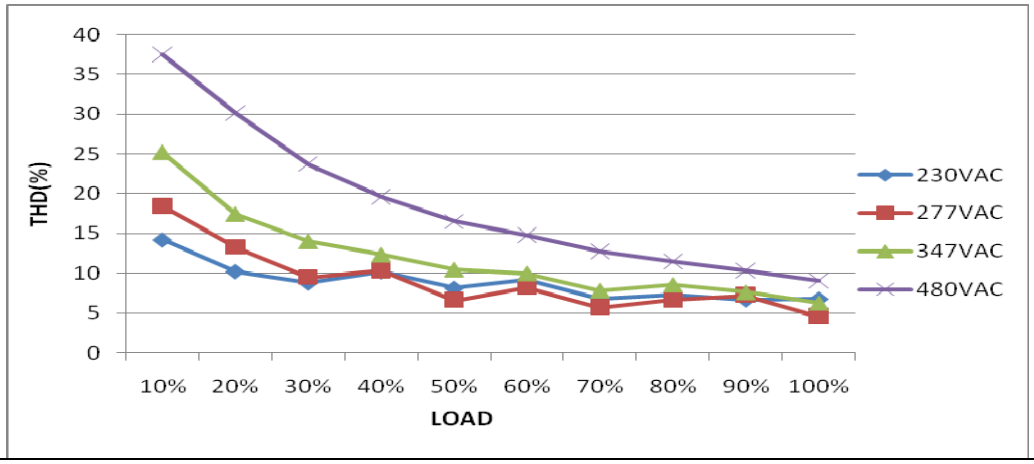
I/P：347VAC
O/P：DIMMING TEST
TA：25℃
TEST RESULT：OK

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℃	90V~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℃	OK
3	INPUT CURRENT (TYP)	347VAC/ 1.1 A 480VAC/ 0.8 A	I/P: 347VAC/480VAC O/P:FULL LOAD Ta:25℃	I =0.9965 A/ 347VAC I =0.7277 A/ 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℃	PF= 0.9908 /347V/100%LOAD PF= 0.9766 /480V/100%LOAD PF=0.9915 /277V/100%LOAD PF= 0.9945 /230V/100%LOAD
	P.F vs LOAD			
5	EFFICIENCY (TYP)	93.5 %	I/P: 347VAC O/P:FULL LOAD Ta:25℃	94.03%
	EFFICIENCY vs LOAD			





6	INRUSH CURRENT (TYP)	480VV/ 50 A COLD START (twidth= 920us measured at 50% Ipeak) COLD START	I/P: 480VAC O/P:FULL LOAD Ta:25℃	I = 41.6A/ 480VAC T50= 920 us
	INPUT=480VAC/ 60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A) 			
7	TOTAL HARMONIC DISTORTION	THD< 20%@ ≧ 50% load/230VAC, or 277VAC, or 347VAC, or @ ≧ 60% load/480VAC	I/P： 230V/277V/347V O/P：100% LOAD 50% LOAD I/P：480VAC O/P：60% LOAD Ta：25℃	THD：6.576 %/230V 50% THD：3.860 %/230V 100% THD：5.177 %/277V 50% THD：6.314 %/277V 100% THD：12.182 %/347V 50% THD：6.994 %/347V 100% THD：16.09 %480V 60% THD：11.49 %480V 100%
	THD vs LOAD 			

ROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER VOLTAGE PROTECTION	V1: 320 V~ 351 V	I/P: 528VAC I/P: 347VAC I/P: 180VAC O/P:MIN LOAD Ta:25℃	329.11V/ 528VAC 327.47V/ 347VAC 329.59V/ 180VAC PROTECTION TYPE： Shut down o/p voltage with re-power on to recovery
2	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
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 528VAC I/P: 180 VAC O/P: FULL LOAD Ta:25℃	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**	Q901Rated 9A950V	I/P:High-Line +3V =531V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Full Load continue Ta:25℃	VDS: (1) 816V/7.62A (2)816V/7.78A (3)777V/2.01A
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 Ta:25℃	VDS: (1)819V/3.93A (2)813V/3.17A (3)807V/1.89A
3	Diode Peak **Voltage**	D103 Rated 10 A/400 V D104 Rated 3 A/ 400 V	I/P:High-Line +3V =531 V D103： 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℃	VDS: (1)289V (2)0V (3)297V VDS: (1)297V (2)0V (3)297V
4	**Input Capacitor Voltage**	C6 Rated: 120 μ / 450 V	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	(1)382V (2)406V (3)398V (4) 382V

			Ta:25℃	
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℃	(1) 14.3V (2) 14.3V (3) 14.06V (4) 12.9V

■ 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℃	I/P-O/P:1.511 mA I/P-FG:3.11 mA O/P-FG: 0.596 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℃	I/P-O/P: 30GΩ I/P-FG: 4.23 G Ω O/P-FG:30 G Ω NO DAMAGE
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	27 mΩ
4	LEAKAGE CURRENT	IEC60950-1 < 0.75mA / 480VAC	I/P: 480 VAC O/P:Min LOAD Ta:25℃	L-FG: 0.5mA N-FG:0.5mA L,N -V(+):0.11mA L,N-V(-): 0.11 mA

E.M.C TEST

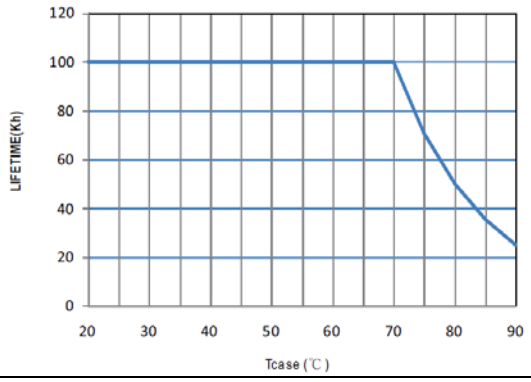
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	FCC Part 15 Subpart B	I/P: 440VAC (60HZ) O/P:FULL/50% LOAD Ta:25℃	PASS Test by certified Lab
2	RADIATION	FCC Part 15 Subpart B	I/P: 480VAC (60HZ) O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 230VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
4	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 230VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
5	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 230VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
6	Test by certified Lab & Test Report Prepare			

■ 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： HVGC-320-700
1. ROOM AMBIENT BURN-IN： 18 HRS
I/P： 347VAC O/P： FULL LOAD Ta= 29 ℃
2. HIGH AMBIENT BURN-IN： 6 HRS
I/P： 347VAC O/P： FULL LOAD Ta= 59.3 ℃</td></tr>
<tr><td>2</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 528VAC/180VAC
O/P： 100 % LOAD
Ta= -45℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 60 ℃
NO DAMAGE</td><td>I/P： 538VAC
O/P：FULL LOAD
Ta= 60 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03%/℃(0~60℃)</td><td>I/P：347 VAC
O/P：FULL LOAD</td><td>± 0.011 %/℃(0~60℃)</td></tr>
<tr><td>5</td><td>STORAGE TEMPERATURE TEST</td><td colspan="2">1. Thermal shock Temperature： -50℃~ +125℃
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>
</table>

CH.	Position	ROOM AMBIENT Ta= 29 ℃	HIGH AMBIENT Ta= 59.3 ℃
1	BD1	60.7℃	97.1℃
2	L2	57.5℃	93.8℃
3	ZNR2	56.4℃	92.1℃
4	C10	58.8℃	95.1℃
5	C2	56.1℃	91.6℃
6	Q1	61.3℃	97.9℃
7	C5	60.3℃	96.9℃
8	RTH2	77.8℃	108.3℃
9	Q902	61.7℃	104.1℃
10	T2	61.1℃	99.3℃
11	C902	62.1℃	99.6℃
12	L1	59.9℃	98.3℃
13	C54	58.1℃	97.8℃
14	C46	58.7℃	99.7℃
15	RTH3	56.1℃	94.5℃
16	T1	62.8℃	98.9℃
17	C200	57.9℃	93.5℃
18	C201	58.3℃	94.7℃
19	D100	57.9℃	92.7℃
20	D103	59.0℃	94.1℃
21	C105	56.1℃	91.4℃
22	LF100	56.4℃	91.6℃
23	U1	56.2℃	91.9℃
24	U901	56.1℃	94.5℃
25	C6	59.7℃	99.8℃

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) 530076 HRS (2) 33197 HRS (3) 57609HRS (4) 65385HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 141.2K hrs min. MIL-HDBK-217F (25℃)	
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 80℃ 	

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

12.10.30 A50-F031