TEST REPORT: HVG-240-42

240W Constant Voltage + Constant Current LED Driver

■ DESIGN VERIFY TEST

- Output Function Test
- Input Function Test
- Protection Function Test
- Control Function Test
- Component Stress Test

■ SAFETY & E.M.C. TEST

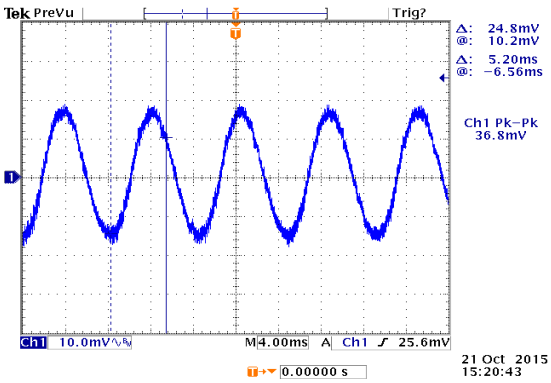
- Safety Test
- E.M.C. Test

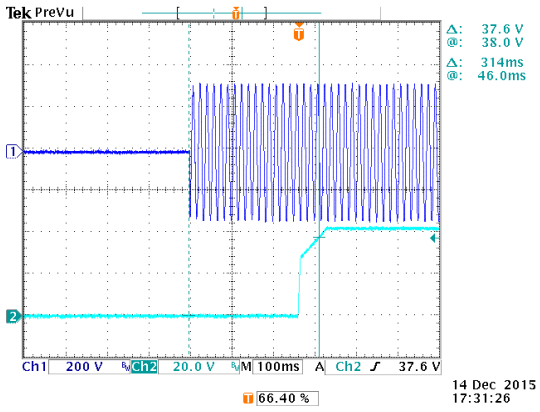
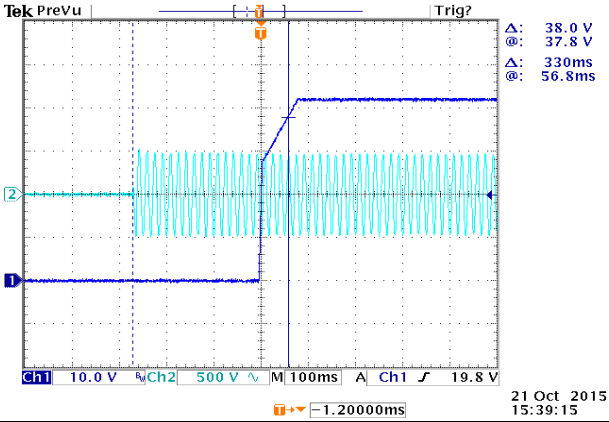
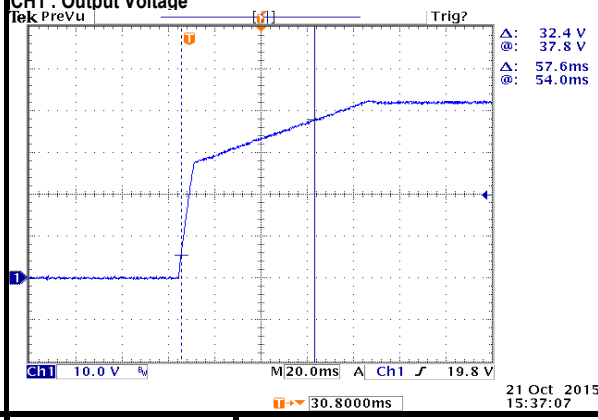
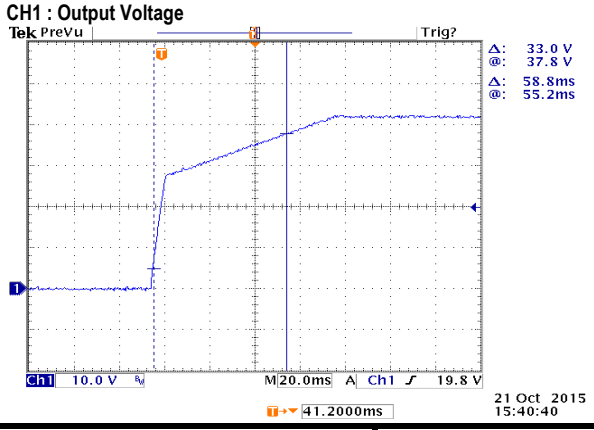
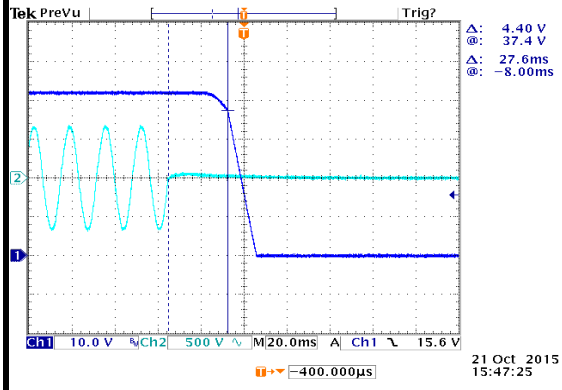
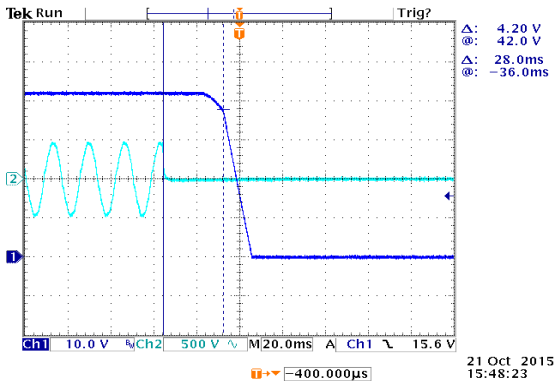
■ RELIABILITY TEST

- ENVIRONMENT TEST

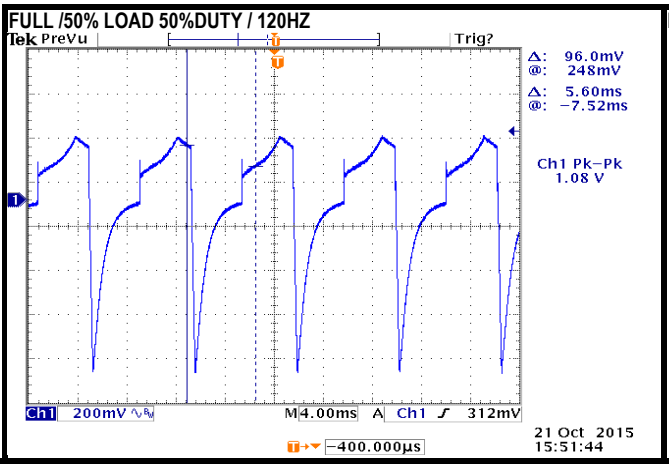
■ DESIGN VERIFY TEST

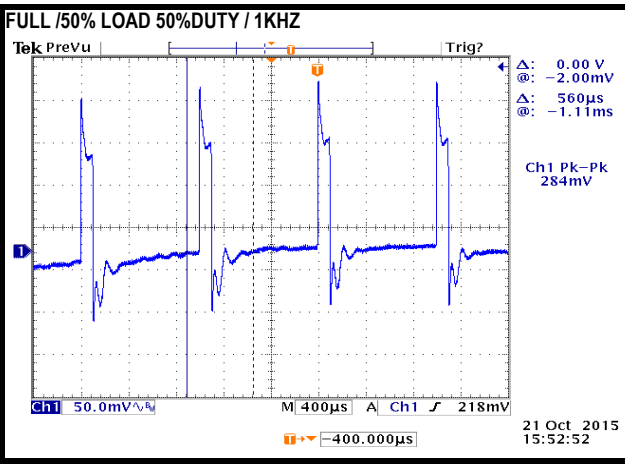
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 39.00V ~ 45.00V	I/P : 347VAC O/P: MIN LOAD TA : 25℃	CH1: 36.57V ~ 46.36V
2	CONSTANT CURRENT REGION	CH1: 21V ~ 42V	I/P : 347VAC O/P: FULL LOAD TA : 25℃	CH1: 0.075V ~ 41.00V
3	CURRENT ADJ. RANGE	CH1: 2.85A ~ 5.7A	I/P : 347VAC I/P : 230VAC O/P: CV MIN& CV MAX-1V TA : 25℃	2.124A ~ 6.07A 347VAC-CV MAX-1V 2.109A ~ 6.03A 347VAC-CV MIN 2.137A ~ 6.076A 230VAC-CV MAX-1V 2.113A ~ 6.031A 347VAC-CV MIN
4	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 200VAC / 528VAC O/P: FULL / MINLOAD TA= 25℃	V1: 0.06% ~ -0.06%
5	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 200VAC / 528VAC O/P: FULL LOAD TA : 25℃	V1: 0.01% ~ -0.05%
6	LOAD REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 347VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 0.06% ~ -0.06%
7	OVER/UNDERSHOOT TEST	< ±5%	I/P : 347VAC O/P: FULL LOAD TA : 25℃	TEST < ±5%
8	RIPPLE & NOISE(Max)	V1 : 250 mVp-p	I/P : 347VAC O/P: FULL LOAD TA : 25℃	V1 : 36.8 mVp-p
	low frequency : 			
	SET UP TIME (MAX.)	347VAC : 500ms 230VAC : 500ms 480VAC : 500ms	I/P : 347VAC I/P : 230VAC I/P : 480VAC O/P: FULL LOAD TA : 25℃	347VAC: 330ms 230VAC 314ms 480VAC 334ms

9	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	INPUT=347VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		
	RISE TIME (MAX.)	347VAC : 150ms 230VAC : 150ms 480VAC : 150ms	I/P : 347VAC I/P : 230VAC I/P : 480VAC O/P: FULL LOAD TA : 25℃	347VAC: 58.8ms 230VAC 57.6ms 480VAC 58ms
10	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 	INPUT=347VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		
	HOLD UP TIME (TYP.)	347VAC : 12ms 480VAC : 12ms	I/P : 347VAC I/P : 480VAC O/P: FULL LOAD TA : 25℃	347VAC: 28.0ms 480VAC: 27.6ms
11	INPUT=480VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	INPUT=347VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		
	DYNAMIC LOAD	V1 : 4200 mVp-p	I/P : 347VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 90%duty/1KHZ TA : 25℃	(1). (2). unit:mVp-p V1: 1080mv 284mv

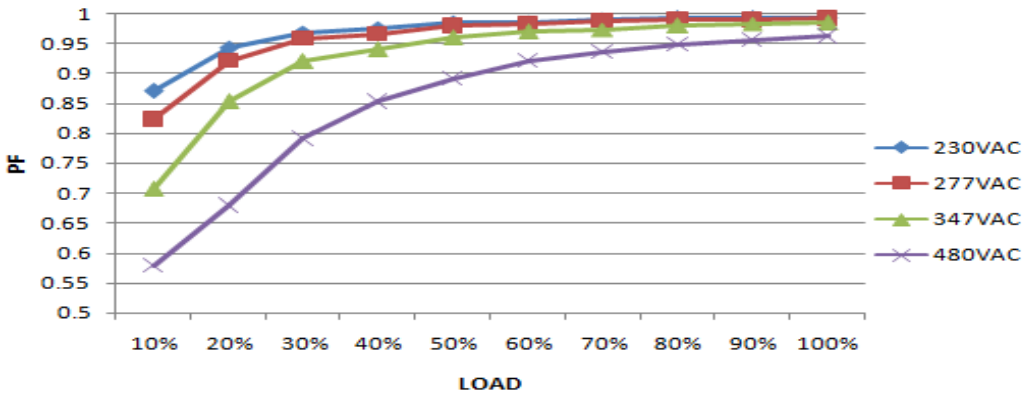
12	FULL /50% LOAD 50%DUTY / 120HZ	FULL /50% LOAD 50%DUTY / 1KHZ





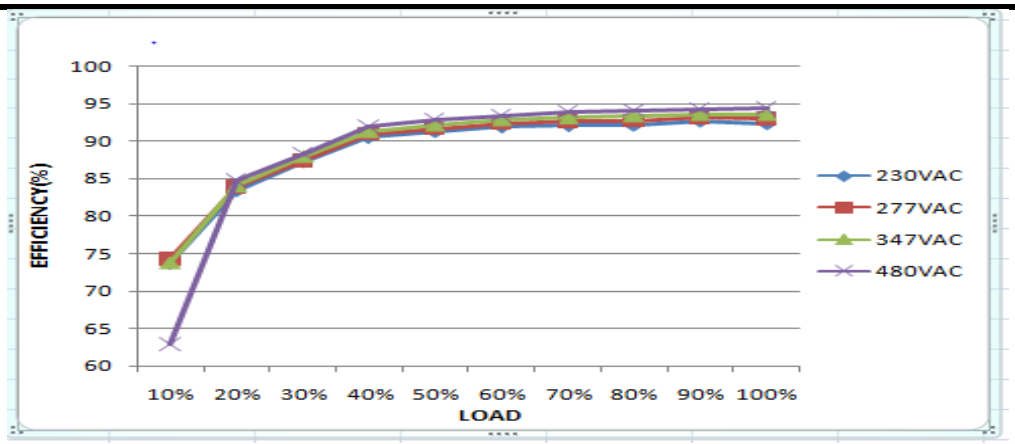
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
			I/P : TESTING O/P : FULL LOAD Ta : 25℃	130.0VAC ~ 528VAC
1	INPUT VOLTAGE RANGE	180VAC ~ 528VAC	I/P : LOW-LINE = 197VAC HIGH-LINE = 538VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 200VAC ~ 528VAC O/P : FULL~MIN LOAD Ta : 25℃	TEST : OK
3	INPUT CURRENT (TYP.)	0.8 / 347VAC 0.6 / 480VAC	I/P : 347VAC I/P : 480VAC O/P: FULL LOAD TA : 25℃	I= 0.779 / 347VAC I= 0.557A / 480VAC
4	LEAKAGE CURRENT	< 0.75mA	I/P : 480VAC O/P: MIN LOAD TA : 25℃	L-FG: 0.15 mA N-FG: 0.155 mA
	POWER FACTOR (TYP.)	0.95 / 347VAC 0.93 / 480VAC 0.97 / 277VAC 0.98 / 230VAC	I/P : 347VAC I/P : 480VAC I/P : 277VAC O/P: FULL LOAD TA : 25℃	PF= 0.9825 / 347VAC PF= 0.9634 / 480VAC PF= 0.9909 / 277VAC PF= 0.9948 / 230VAC
5				

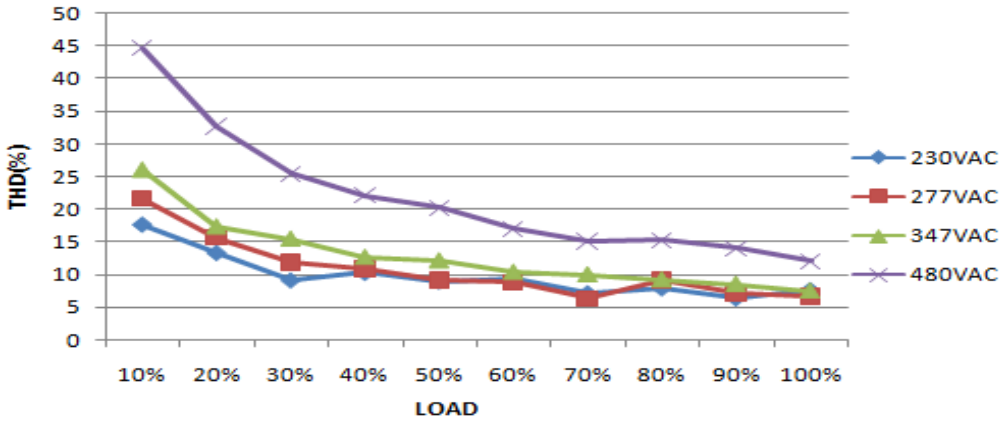


	EFFICIENCY (TYP.)	93.0%	I/P : 347VAC O/P: FULL LOAD TA : 25℃	93.3 %

6

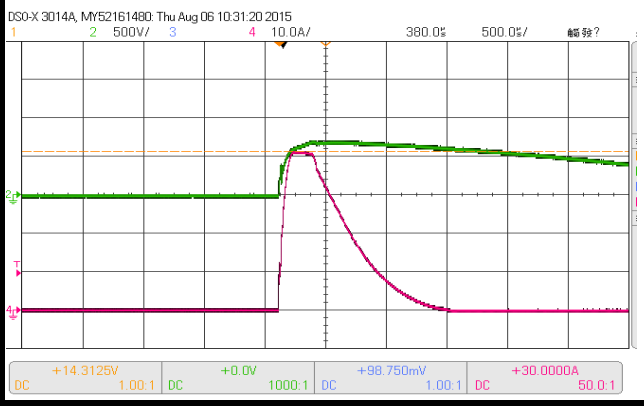


7	TOTAL HARMONIC DISTORTION	Total harmonic distortion will be lower than 20% when output loading is 50% or higher at 230VAC / 277VAC / 347VAC / 480VAC	I/P : 347VAC / 50% LOAD I/P : 480VAC / 60% LOAD TA : 25℃	THD : 15.922 / 347VAC THD : 12.7 / 480VAC



8	INRUSH CURRENT (TYP.)	50A / 480VAC twidth= 532 us measured at 50% Ipeak COLD START	I/P : 480VAC O/P: FULL LOAD TA : 25℃	I= 41.3 / 480VAC T50= 540 us

INPUT=480VAC/50HZ @ FULL LOAD
CH2 : Input current (1V=1A) CH4 : AC Input Voltage

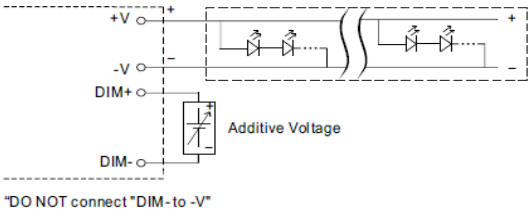


9 DIMMING OPERATION (for B-Type)

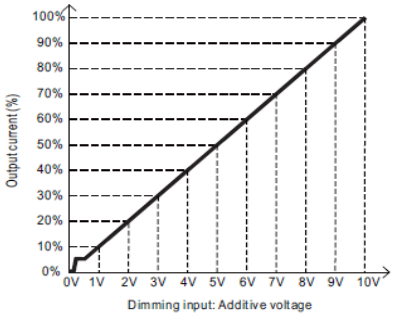
※ 3 in 1 dimming function (for B-Type)

- 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: 100μA (typ.)

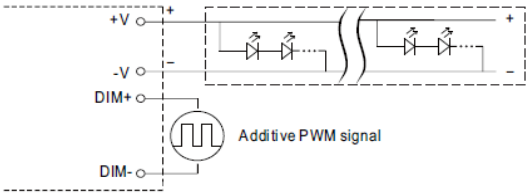
◎ Applying additive 0 ~ 10VDC



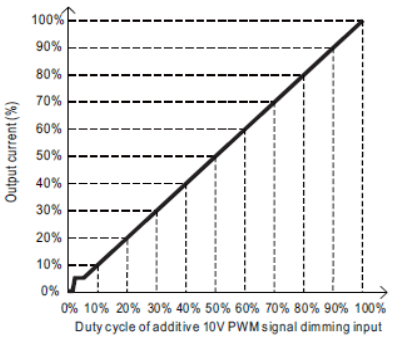
"DO NOT connect "DIM- to -V"



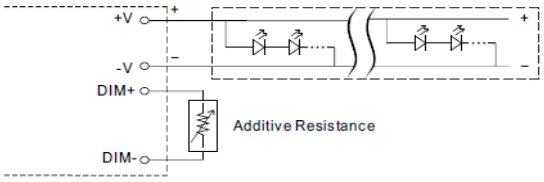
◎ Applying additive 10V PWM signal (frequency range 100Hz ~ 3KHz):



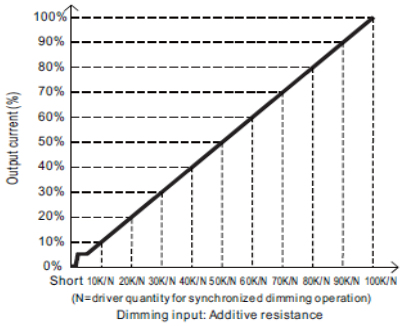
"DO NOT connect "DIM- to -V"



◎ Applying additive resistance:



"DO NOT connect "DIM- to -V"

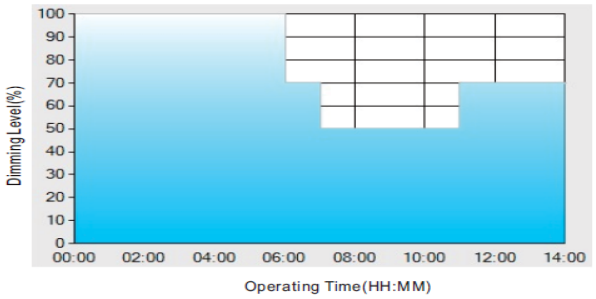


Note : 1. Min. dimming level is about 5% and the output current is not defined when 0%< Iout<5%.
2. The output current could drop down to 0% when dimming input is about 0k Ω or 0Vdc, or 10V PWM signal with 0% duty cycle.

42V	R	SHORT	10K	20K	30K	40K	50K	60K	70K	80K	90K	100K	OPEN
	O/P CURRENT	0.000A	0.543A	1.100A	1.656A	2.242A	2.794A	3.345A	3.909A	4.453A	5.014A	5.535A	5.876A
	%	0.00%	9.53%	19.30%	29.05%	39.33%	49.02%	58.68%	68.58%	78.12%	87.96%	97.11%	103.09%
	V	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
	O/P CURRENT	0.000A	0.569A	1.143A	1.702A	2.303A	2.909A	3.449A	4.045A	4.617A	5.175A	5.727A	5.876A
	%	0.00%	9.98%	20.05%	29.86%	40.40%	51.04%	60.51%	70.96%	81.00%	90.79%	100.47%	103.09%
	PWM (100HZ)	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
	O/P CURRENT	0.000A	0.579A	1.149A	1.725A	2.326A	2.902A	3.473A	4.041A	4.616A	5.189A	5.757A	5.876A
	%	0.00%	10.16%	20.16%	30.26%	40.81%	50.91%	60.93%	70.89%	80.98%	91.04%	101.00%	103.09%

10	**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

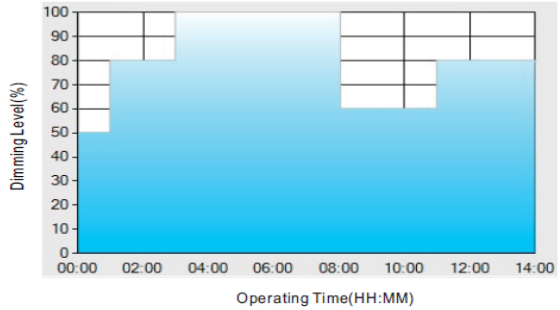


Set up for D01-Type in Smart timer dimming software program:

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

**: TIME matches Operating Time in the diagram whereas LEVEL matches Dimming Level.
Example: If a residential lighting application adopts D01-Type, when turning on the power supply at 6:00pm, for instance:
[1] The power supply will switch to the constant current level at 100% starting from 6:00pm.
[2] The power supply will switch to the constant current level at 70% in turn, starting from 0:00am, which is 06:00 after the power supply turns on.
[3] The power supply will switch to the constant current level at 50% in turn, starting from 1:00am, which is 07:00 after the power supply turns on.
[4] The power supply will switch to the constant current level at 70% in turn, starting from 5:00am, which is 11:00 after the power supply turns on. The constant current level remains till 8:00am, which is 14:00 after the power supply turns on.

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

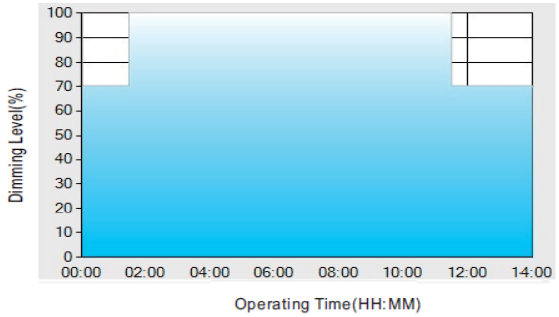


Set up for D02-Type in Smart timer dimming software program:

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

**: TIME matches Operating Time in the diagram whereas LEVEL matches Dimming Level.
Example: If a street lighting application adopts D02-Type, when turning on the power supply at 5:00pm, for instance:
[1] The power supply will switch to the constant current level at 50% starting from 5:00pm.
[2] The power supply will switch to the constant current level at 80% in turn, starting from 6:00pm, which is 01:00 after the power supply turns on.
[3] The power supply will switch to the constant current level at 100% in turn, starting from 8:00pm, which is 03:00 after the power supply turns on.
[4] The power supply will switch to the constant current level at 60% in turn, starting from 1:00am, which is 08:00 after the power supply turns on.
[5] The power supply will switch to the constant current level at 80% in turn, starting from 4:00am, which is 11:00 after the power supply turns on. The constant current level remains till 6:30am, which is 14:00 after the power supply turns on.

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%

**: TIME matches Operating Time in the diagram whereas LEVEL matches Dimming Level.
Example: If a tunnel lighting application adopts D03-Type, when turning on the power supply at 4:30pm, for instance:
[1] The power supply will switch to the constant current level at 70% starting from 4:30pm.
[2] The power supply will switch to the constant current level at 100% in turn, starting from 6:00pm, which is 01:30 after the power supply turns on.
[3] The power supply will switch to the constant current level at 70% in turn, starting from 5:00am, which is 11:00 after the power supply turns on.
The constant current level remains till 6:30am, which is 14:00 after the power supply turns on.

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95% ~ 108%	I/P: 528VAC I/P: 180VAC O/P: TESTING TA : 25℃	102.0% /528VAC 102.0% /180 VAC Constant Current Limiting
2	OVER VOLTAGE PROTECTION	48.00V ~ 54.00V	I/P: 528VAC I/P: 180VAC O/P: MIN LOAD TA : 25℃	51.22 528VAC 51.09 180VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	Shut down Re- power ON	I/P: 347VAC O/P: FULL LOAD	O.T.P. Active Shut down Re- power ON
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 528VAC O/P: FULL LOAD Ta: 25℃	NO DAMAGE Constant Current Limiting

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q901 Rated : 950V 9.0A	I/P : 531VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Fulll load continue (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz 50%Duty/120Hz (7)0%→400% Load Ta : 25℃	VIN: 531VAC VDS: (1). 892.0V (2). 868.0V (3). 796.0V (4). 917.0V (5). 876.0V (6). 884.0V (7). 884.0V
2	O/P Diode (MOSFET)	Q101 Rated : 120V 75.0A Q102 Rated : 120V 75.0A	I/P : 531VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Fulll load continue (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz (6)Dynamic Load Full/Min Load 50%Duty/120Hz (7)0%→400% Load (8/) NO LOAD Ta : 25℃	Q101 Q102 VDS : VDS : (1). 95.5V 96.0V (2). 28.1V 18.7V (3). 95.2V 96.1V (4). 98.4V 97.7V (5). 96.0V 96.9V (6). 95.2V 96.9V (7). 92.8V 94.5V (8). 90.4V 93.7V
3	Input Capacitor	C5 Rated : 82uf 450V	I/P : 531VAC O/P : (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta : 25℃	(1). 411.0V (2). 435.0V (3). 395.0V
4	Control IC	U1 Rated : 20V (max) 10V (min)	I/P : 531VAC O/P : (1)Full Load (2)Output Short Change (4)O.V.P (5)Low Line No Load Vo(min) Ta : 25℃	U1 (1). 17.0V (2). 15.2V (3). 15.2V (4). 15.2V (5). 11.6V
5	PFC Power Transistor	Q1 Rated : 1050V 9.0A	I/P : 531VAC I/P : 177VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Fulll load continue (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz (6)Dynamic Load Full/Min Load 50%Duty/120Hz (7)0%→400% Load	VIN: 531VAC 177VAC VDS: VDS: (1). 846.0V 886.0V (2). 975.0V 806.0V (3). 838.0V 886.0V (4). 838.0V 886.0V (5). 838.0V 878.0V (6). 846.0V 919.0V (7). 822.0V 911.0V

			Ta： 25℃	

■SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P： 3.75KVAC /min I/P-FG： 2.0KVAC /min O/P-FG： 1.5KVAC /min	I/P-O/P: 4.13KVAC /min I/P-FG: 2.40KVAC /min O/P-FG: 1.80KVAC /min Ta： 25℃	I/P-O/P: 1.96 mA I/P-FG: 1.9 mA O/P-FG: 1.24 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: 500VDC I/P-FG: 500VDC O/P-FG: 500VDC Ta： 25℃/70%RH	I/P-O/P: 9.5GΩ I/P-FG: 5.5GΩ O/P-FG: 11.7GΩ NO DAMAGE
2	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta： 25℃/70%RH	26 mΩ

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 LOAD / 30% LOAD Ta： 25℃	PASS Test by certified Lab
2	RADIATION	FCC Part 15 Subpart B	I/P： 480VAC/60HZ O/P： FULL LOAD / 10% LOAD Ta： 25℃	PASS Test by certified Lab
3	E.S.D	EN61000-4-2 LIGHT INDUSTRY INPUT： 1KV	I/P： 230VAC/50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A
4	E.F.T	EN61000-4-4 INDUSTRY L-N：2KV;L/N-PE：4KV	I/P： 230VAC/50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A
5	SURGE	IEC61000-4-5 0	I/P： 230VAC/50HZ O/P： FULL LOAD Ta： 25℃	CRITERIA A
6	Test by certified Lab & Test Report Prepare. Any contradictions of the test results, please refer to the latest EMC test report.			

■RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL： HVG-240-24 1. ROOM AMBIENT BURN-IN： 3.0hrs IP: 230VAC O/P: 100% LOAD TA= 24.8℃ 2. HIGH AMBIENT BURN-IN： 2.0hrs IP: 230VAC O/P: 100% LOAD TA= 59.2℃		
	LOW TEMPERATURE	NO DAMAGE	I/P： 528VAC / 180VAC	TEST：OK

CH.	Position	ROOM AMBIENT Ta= 24.8℃	HIGH AMBIENT Ta= 59.2℃
1	BD1	62.0℃	93.3℃
2	Q1	62.5℃	94.5℃
3	Q901	63.9℃	96.4℃
4	L2	60.7℃	91.6℃
5	C2	58.9℃	88.5℃
6	C10	61.3℃	92.9℃
7	L1	64.2℃	97.1℃
8	ZNR2	76.4℃	103.3℃
9	RTH3	58.8℃	90.5℃
10	T1	68.5℃	103.7℃
11	C46	62.0℃	93.8℃
12	C54	60.6℃	92.1℃
13	Q102	62.0℃	94.8℃
14	C102	59.6℃	91.8℃
15	C201	63.0℃	94.5℃
16	C200	61.7℃	93.6℃
17	U1	63.6℃	95.2℃
20	C5	61.9℃	93.4℃

2	LOW TEMPERATURE TURN ON TEST	1 HOUR (MIN)	O/P： FULL LOAD Ta： -45.0℃	
3	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60℃ NO DAMAGE	I/P： 528VAC O/P： FULL LOAD Ta： 60℃ HUMIDITY= 95.0% RH	TEST：OK
4	TEMPERATURE COEFFICIENT	±0.03% /℃(0~60℃)	I/P： 347VAC O/P： FULL LOAD	±0.01% /℃(0~60℃)
5	STORAGE TEMPERATURE TEST	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		TEST：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： 230V Full Load AC ON/OFF te turn on 3sec；turn off 1sec @ 15cycle Full Load burn in@ 1cycle		TEST：OK
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (4) Acceleration： 5G (5) Test Time：72min in each axis (X.Y.Z) (6) Ta：25℃		TEST：OK
8	CAPACITOR LIFE CYCLE	HVG-240-24 :SUPPOSE C102 IS THE MOST CRITICAL COMPONENT (1) I/P：347VAC O/P：FULL LOAD Tc= 80℃ LIFE TIME (2) I/P：347VAC O/P：75% LOAD Tc= 80℃ LIFE TIME (3) I/P：347VAC O/P：50% LOAD Tc= 80℃ LIFE TIME		(1). 46672 HRS (2). 56952 HRS (3). 68401 HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 114.5K hrs min. MIL-HDBK-217F (25℃)		
10	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 50,000 hours		

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