



Test Report: HVG-320-30

320W Constant Voltage + Constant Current LED Driver

■ 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

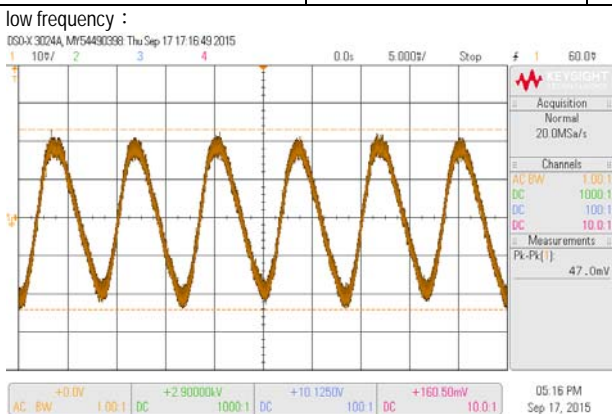
■ RELIABILITY TEST

ENVIRONMENT TEST

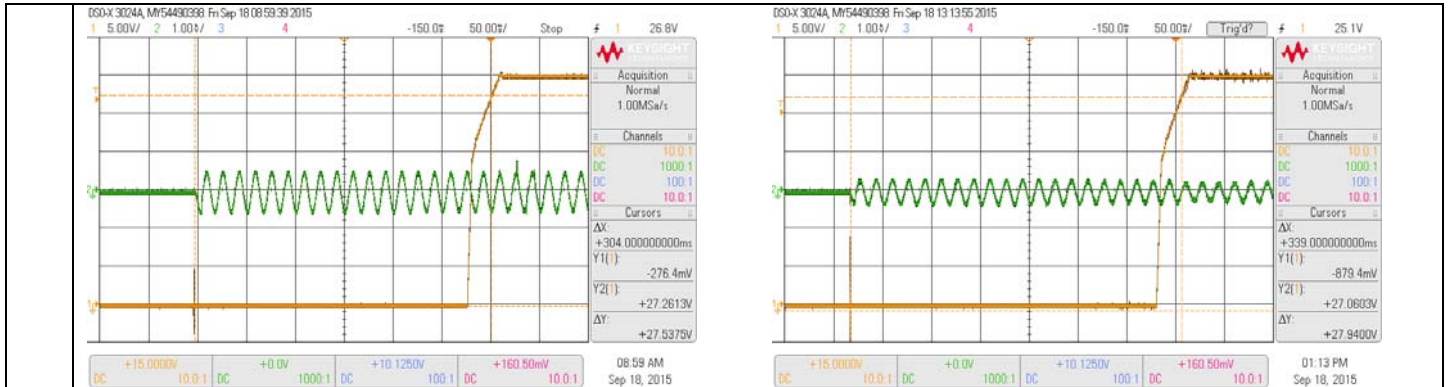
■ **DESIGN VERIFY TEST**

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	CH1: 15V~ 30V	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	0.07V~29V /347VAC
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 26V~ 32 V	I/P: 347 VAC I/P:230VAC O/P:MIN LOAD Ta:25°C	25.44V~ 33.163V /347VAC 25.441V~ 33.161V/230VAC
3	CURRENT ADJ. RANGE	CH1:5.35 A~ 10.7A	I/P: 347 VAC I/P:230VAC O/P:CV MIN & CV MAX-1V Ta:25°C	5.003A~11.63A/347VAC@CV MAX-1V 4.99A~ 11.67A /347VAC@CV MIN 5.002A~11.64 A/230VAC@CV MAX-1V 4.99A~ 11.67A/230VAC@CV MIN
4	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 1 % ~ -1 %	I/P:180VAC /528AC O/P:FULL/ MIN LOAD Ta:25°C	V1: 0.178%~-0.16%
5	LINE REGULATION (Max)	V1: 0.5 % ~ -0.5 %	I/P:180VAC~528AC O/P:FULL LOAD Ta:25°C	V1: 0.01%~0%
6	LOAD REGULATION (Max)	V1: 0.5 % ~ -0.5 %	I/P: 347 VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.164%~-0.158%
7	OVER/UNDERSHOOT TEST	< ±5%	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	TEST: <5 %
8	RIPPLE & NOISE (Max)	V1: 200 mVp-p	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	V1: 47mVp-p



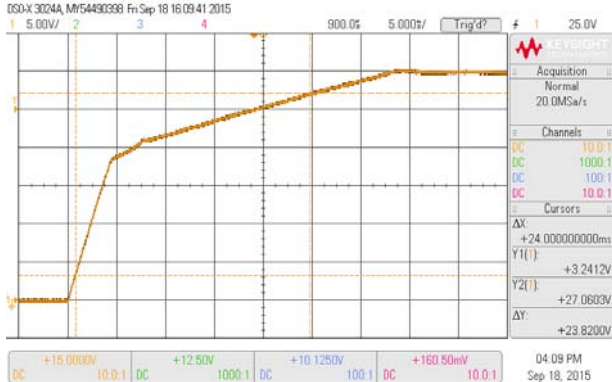
9	SET UP TIME	480VAC/500 ms (Max) 347VAC/ 500 ms (Max) 230VAC/ 500 ms (Max)	I/P: 480 VAC I/P: 347 VAC I/P: 230 VAC O/P:FULL LOAD Ta:25°C	480VAC/291ms 347VAC/304ms 230 VAC/339ms
INPUT=347VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		



10	RISE TIME	480VAC/ 80 ms (Max)	I/P: 480 VAC	480VAC/23.7 ms
		347VAC/ 80 ms (Max)	I/P: 347 VAC	347VAC/24 ms
		230VAC/ 150 ms (Max)	I/P: 230 VAC	230 VAC/24.5ms
			O/P:FULL LOAD	
			Ta:25°C	

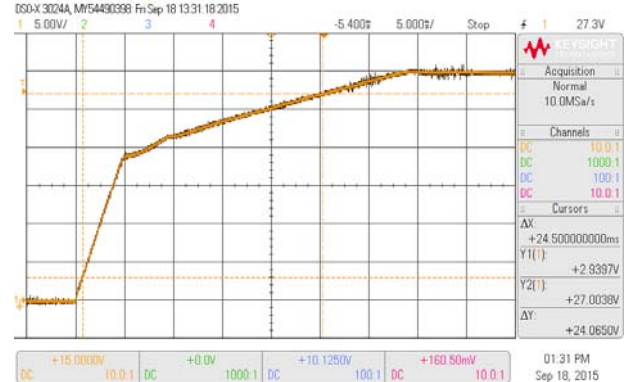
INPUT=347VAC/60HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=230VAC/50HZ @ FULL LOAD

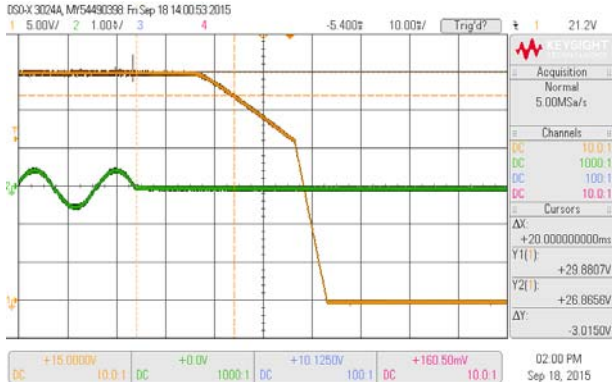
CH1 : Output Voltage



11	HOLD UP TIME	480VAC/ 15 ms (Max)	I/P: 480 VAC	480VAC/ 20.8 ms
		347VAC/ 15 ms (Max)	I/P: 347 VAC	347VAC/ 20ms
			O/P:FULL LOAD	
			Ta:25°C	

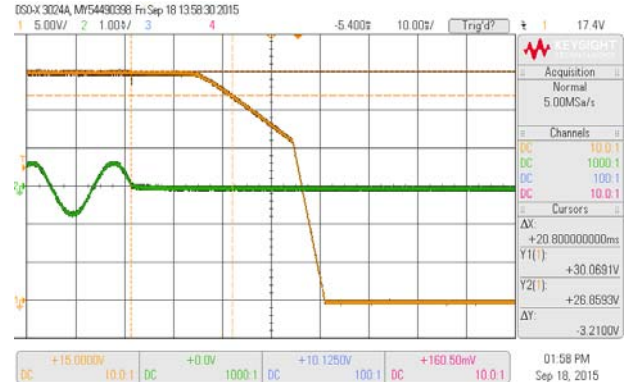
INPUT=347VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

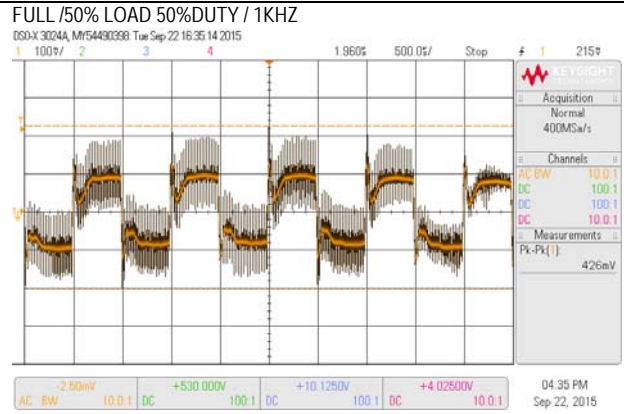
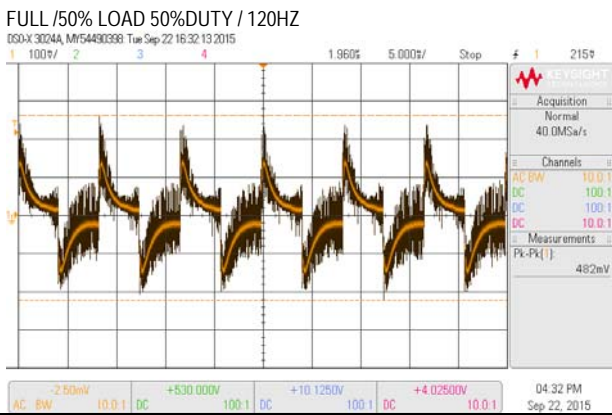


INPUT=480VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



12	DYNAMIC LOAD	V1: 3000 mVp-p	I/P: 347VAC	482mVp-p
			O/P:	426mVp-p
			(1)FULL /50% LOAD 50%DUTY / 120HZ	
			(2)FULL /50% LOAD 50%DUTY / 1KHZ	
			Ta:25°C	

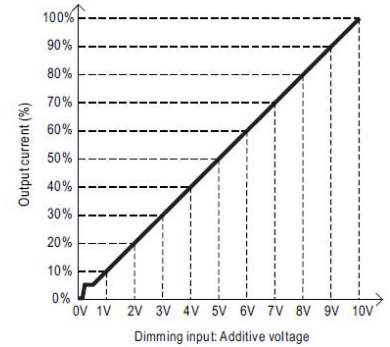
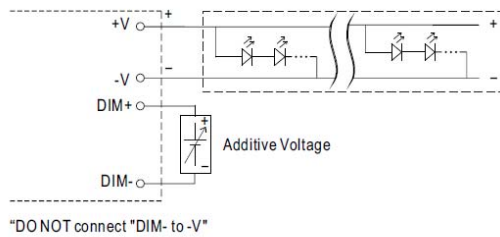


13 DIMMING OPERATION (for B-Type)

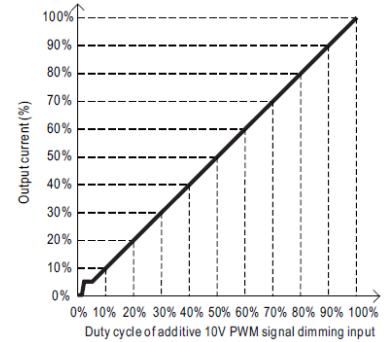
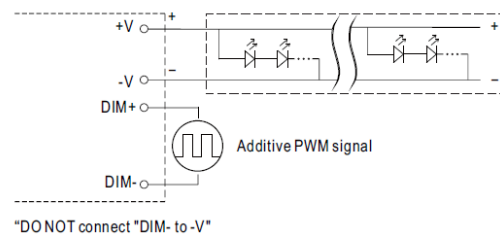
※3 in 1 dimming function

- ※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: 100 μ A (typ.)

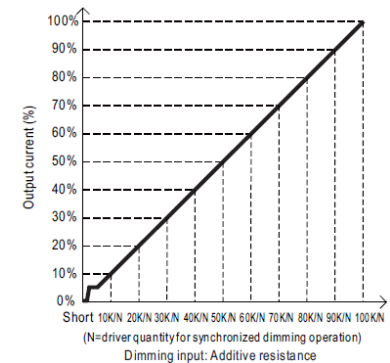
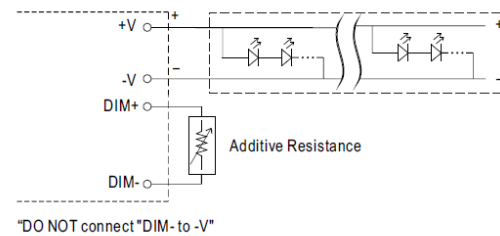
◎ Applying additive 0 ~ 10VDC



◎ 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 0k Ω 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	0A	1.279A	2.307A	3.339A	4.406A	5.415A	6.428A	7.450A	8.428A	9.435A	10.378A	11.025A
%	0.00%	11.95%	21.56%	31.21%	41.18%	50.61%	60.07%	69.63%	78.77%	88.18%	96.99%	103.04%
V	0V	1V	2V	3V	4V	5V	6V	7V	8V	9V	10V	OPEN
O/P CURRENT	0A	1.327A	2.417A	3.492A	4.573A	5.679A	6.679A	7.764A	8.819A	9.863A	10.908A	11.025A
%	0.00%	12.40%	22.59%	32.64%	42.74%	53.07%	62.42%	72.56%	82.42%	92.18%	101.94%	103.04%
PWM (100HZ)	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%	OPEN
O/P CURRENT	0A	1.359A	2.411A	3.490A	4.605A	5.651A	6.718A	7.761A	8.816A	9.873A	10.917A	11.025A
%	0.00%	12.70%	22.53%	32.62%	43.04%	52.81%	62.79%	72.53%	82.39%	92.27%	102.03%	103.04%

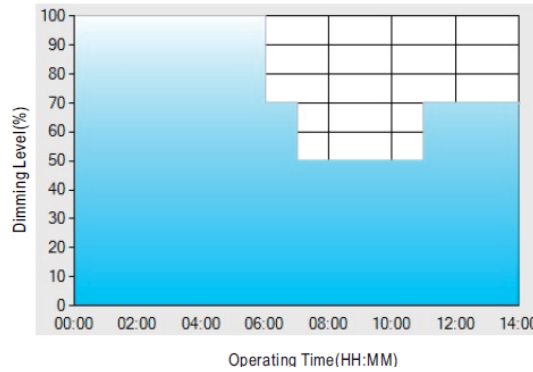
TEST RESULT : OK

14 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.

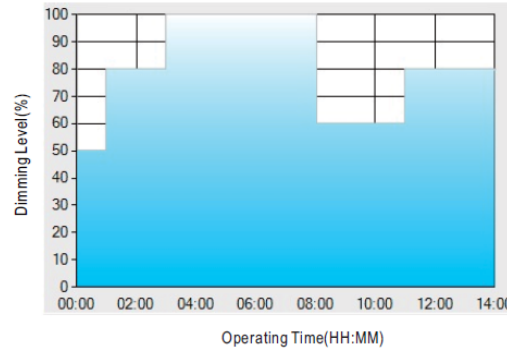
Ex : D01-Type: the profile recommended for residential lighting



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%

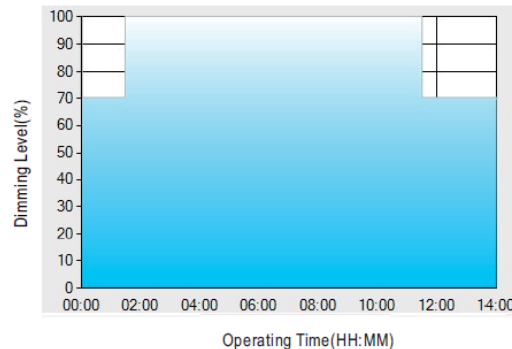
Ex : D02-Type: the profile recommended for street lighting



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%

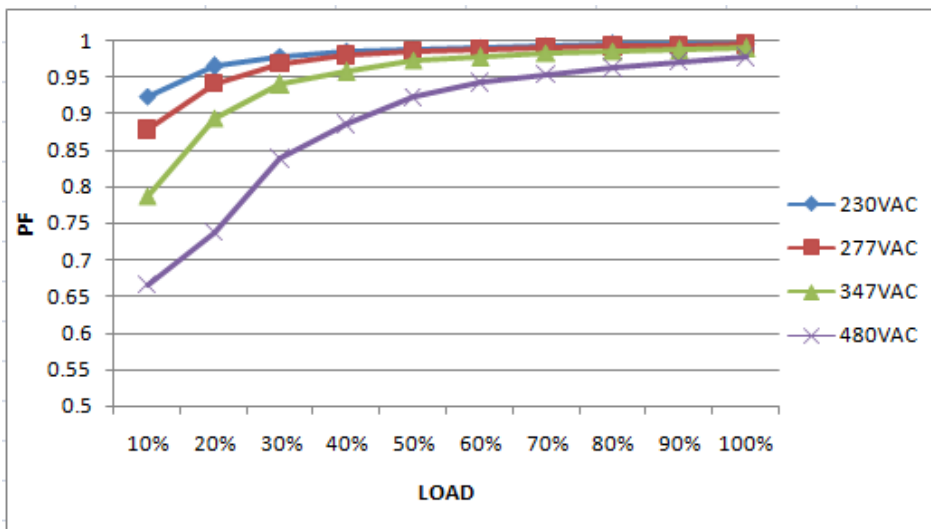
I/P : 347VAC

	O/P : DIMMING TEST TA : 25°C TEST RESULT : OK
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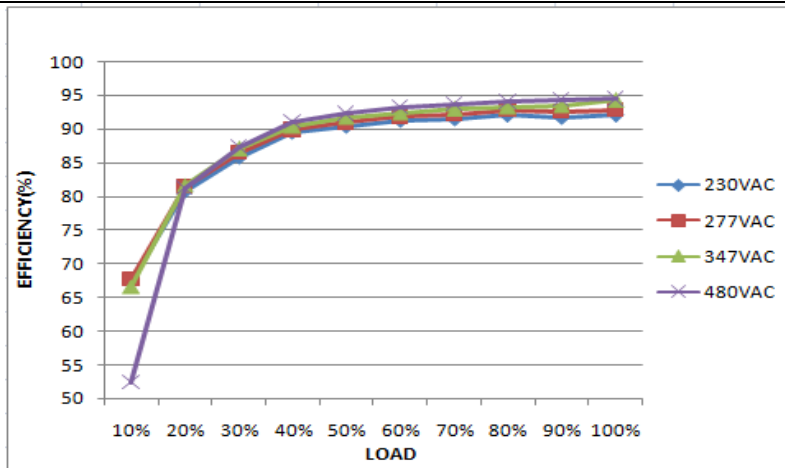
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC-528 VAC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	132V-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)	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)	480 VAC/ 0.8 A 347 VAC/ 1.1A	I/P: 480VAC/347 VAC O/P: FULL LOAD Ta: 25°C	I = 0.7198A/480VAC I = 0.9897A/ 347VAC
4	LEAKAGE CURRENT	< 0.75 mA / 480VAC	I/P : 480 VAC O/P : Min LOAD Ta : 25°C	L-FG: 0.26mA N-FG: 0.41mA L,N -V(+): 0.112mA L,N-V(-): 0.11 mA
5	POWER FACTOR(TYP)	0.93/480 VAC FULL LOAD 0.95/347 VAC FULL LOAD 0.98/230 VAC FULL LOAD 0.97/277 VAC FULL LOAD	I/P: 480VAC/347VAC/230VAC/277VAC O/P: FULL LOAD Ta: 25°C	PF = 0.979 /480V/100%LOAD PF = 0.992 /347V/100%LOAD PF = 0.995 /230V/100%LOAD PF = 0.995 /277V/100%LOAD

P.F vs LOAD



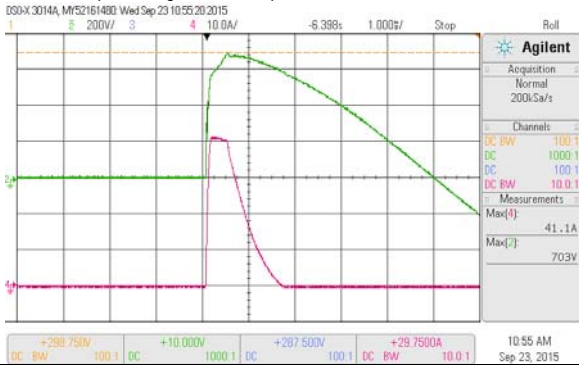
6	EFFICIENCY (TYP)	93%	I/P: 347 VAC O/P: FULL LOAD Ta: 25°C	93.29 %
EFFICIENCY vs LOAD				



7	INRUSH CURRENT (TYP)	480 V/ 50 A COLD START (twidth= 850 us measured at 50% Ipeak) COLD START	I/P: 480VAC O/P:FULL LOAD Ta:25°C	I = 41.1A/ 480VAC T50= 800 us
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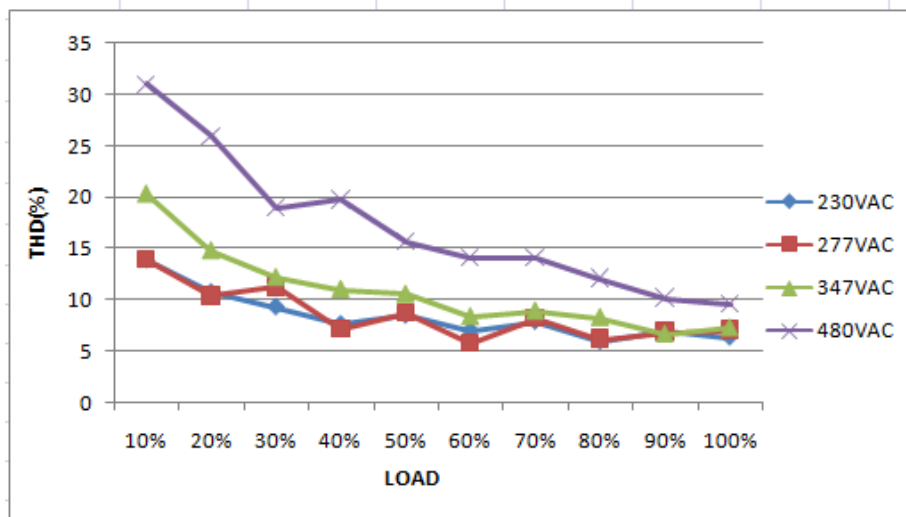
INPUT=480VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current (1V=1A)



9	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 : 347VAC O/P : 100% LOAD 50% LOAD I/P : 230VAC/277VAC/480V O/P : 50% LOAD Ta : 25°C	THD : 5.45 % THD : 8.85 % THD : 7.37 % THD : 9.16 % THD : 13.704 %
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THD&LOAD



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95 %- 108 % PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed	I/P: 528VAC I/P: 347VAC I/P: 180VAC O/P: TESTING Ta: 25°C	104.27%/ 528VAC 104.29%/ 347VAC 104.3%/180VAC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	V1: 33 V- 37 V PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover	I/P: 528VAC I/P: 347VAC I/P: 180VAC O/P: MIN LOAD Ta: 25°C	34.599V/ 528VAC 34.767V/ 347VAC 34.612V/ 180VAC PROTECTION TYPE : Shut down and latch off o/p voltage, re-power on to recover
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 PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed	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	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated 9A/950V	I/P: High-Line +3V =531 V AC ON/OFF O/P: (1) Full Load (2) Output Short (3) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5) Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7) 0% → 400% Load. Ta: 25°C	VDS: (1) 849V (2) 889V (3) 841V (4) 841V (5) 833V (6) 817V (7) 817V
2	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) Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4) Dynamic Load Full Load/ Min. Load 90%Duty/3KHz	VDS: (1) 793V (2) 809V (3) 793V (4) 801V (5) 801V (6) 793V

			(5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C	(7)793V
3	Diode Peak Voltage	Q102 Rated: 80A/100V	I/P:High-Line +3V =531 V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8)NO LOAD Ta:25°C	Q102: VDS: (1)70.6V (2)96.3V (3)70.6V (4)70.6V (5)71.4V (6)69.7V (7)70.6V (8)67.3V
4	Input Capacitor Voltage	C5 Rated: 120u/450V	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)422V (2)426V (3)382V (4) 378V
5	Control IC Voltage Test	PFC IC U1 Rated: . 10V-20V	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) 17.2V (2) 13.61V (3) 13.53V (4) 13.29V

SAFETY & EMC TEST REPORT

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: 1.946mA I/P-FG: 1.999 mA O/P-FG: 1.049mA 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: 21GΩ I/P-FG: 23.2 G 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	25mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
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1	CONDUCTION	FCC Part 15 Subpart B	I/P: 440 VAC /60HZ O/P:FULL/30% LOAD Ta:25°C	PASS Test by certified Lab
2	RADIATION	FCC Part 15 Subpart B	I/P: 480 VAC /60HZ 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: 230VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
3	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 230 VAC/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: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	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

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																												
1	TEMPERATURE RISE TEST	MODEL : HVG-320-24 1. ROOM AMBIENT BURN-IN : 3 HRS I/P : 347VAC O/P : FULL LOAD Ta= 30.5 °C 2. HIGH AMBIENT BURN-IN : 14 HRS I/P : 347VAC O/P : FULL LOAD Ta= 55.9 °C																																																																																														
			<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 30.5 °C</th> <th>HIGH AMBIENT Ta= 55.9 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>67.7°C</td><td>92.5°C</td></tr> <tr><td>2</td><td>Q1</td><td>66.8°C</td><td>92.6°C</td></tr> <tr><td>3</td><td>D1</td><td>77.5°C</td><td>100.2°C</td></tr> <tr><td>4</td><td>Q901</td><td>67.2°C</td><td>93.5°C</td></tr> <tr><td>5</td><td>RTH3</td><td>62.4°C</td><td>88.1°C</td></tr> <tr><td>6</td><td>L2</td><td>64.3°C</td><td>89.4°C</td></tr> <tr><td>7</td><td>C2</td><td>62.6°C</td><td>87.4°C</td></tr> <tr><td>8</td><td>LF1</td><td>63.4°C</td><td>87.7°C</td></tr> <tr><td>9</td><td>ZNR1</td><td>62.2°C</td><td>86.6°C</td></tr> <tr><td>10</td><td>C11</td><td>64.3°C</td><td>89.9°C</td></tr> <tr><td>11</td><td>D2</td><td>65.4°C</td><td>90.9°C</td></tr> <tr><td>12</td><td>C5</td><td>66.9°C</td><td>92.2°C</td></tr> <tr><td>13</td><td>C46</td><td>64.5°C</td><td>90.2°C</td></tr> <tr><td>14</td><td>C902</td><td>66.2°C</td><td>92.0°C</td></tr> <tr><td>15</td><td>T1</td><td>74.7°C</td><td>102.4°C</td></tr> <tr><td>16</td><td>L1</td><td>67.2°C</td><td>93.7°C</td></tr> <tr><td>17</td><td>T2</td><td>67.1°C</td><td>92.8°C</td></tr> <tr><td>18</td><td>C200</td><td>64.9°C</td><td>90.6°C</td></tr> <tr><td>19</td><td>Q102</td><td>63.4°C</td><td>89.4°C</td></tr> <tr><td>20</td><td>C102</td><td>61.3°C</td><td>87.0°C</td></tr> <tr><td>21</td><td>U1</td><td>62.1°C</td><td>87.4°C</td></tr> <tr><td>22</td><td>ZNR5</td><td>65.1°C</td><td>90.5°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 30.5 °C	HIGH AMBIENT Ta= 55.9 °C	1	BD1	67.7°C	92.5°C	2	Q1	66.8°C	92.6°C	3	D1	77.5°C	100.2°C	4	Q901	67.2°C	93.5°C	5	RTH3	62.4°C	88.1°C	6	L2	64.3°C	89.4°C	7	C2	62.6°C	87.4°C	8	LF1	63.4°C	87.7°C	9	ZNR1	62.2°C	86.6°C	10	C11	64.3°C	89.9°C	11	D2	65.4°C	90.9°C	12	C5	66.9°C	92.2°C	13	C46	64.5°C	90.2°C	14	C902	66.2°C	92.0°C	15	T1	74.7°C	102.4°C	16	L1	67.2°C	93.7°C	17	T2	67.1°C	92.8°C	18	C200	64.9°C	90.6°C	19	Q102	63.4°C	89.4°C	20	C102	61.3°C	87.0°C	21	U1	62.1°C	87.4°C	22	ZNR5	65.1°C	90.5°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 : 538 VAC 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	± 0.005 %/°C (0-60°C)
5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°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°C~ +65°C 2. Temperature change rate : 25°C / 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		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°C		TEST : OK
8	CAPACITOR LIFE CYCLE	SUPPOSE C102 IS THE MOST CRITICAL COMPONENT (1) I/P : 347VAC O/P : FULL LOAD Tc= 80 °C LIFE TIME (2) I/P : 347VAC O/P : 75% LOAD Tc= 80 °C LIFE TIME (3) I/P : 347VAC O/P : 50% LOAD Tc= 80 °C LIFE TIME		(1) 75936HRS (2) 111829HRS (3) 145526HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 124.3K hrs min. MIL-HDBK-217F (25°C)		
10	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°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