



Test Report: HVG-480-42

480W 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

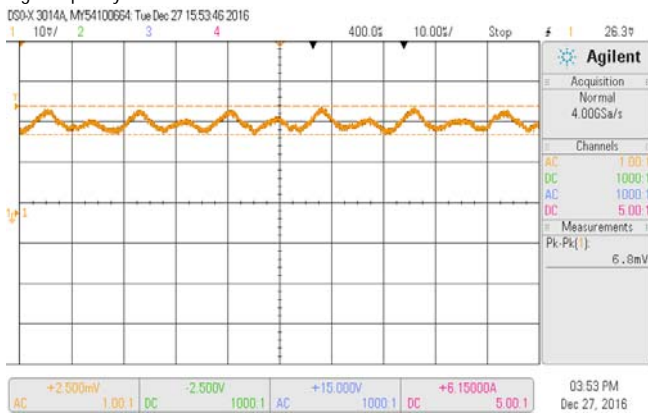
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

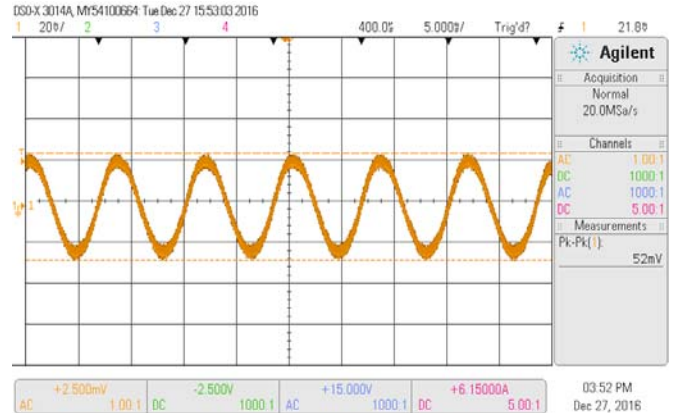
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	CH1: 21V~ 42V	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	2V~41 V /347VAC
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 35.7V~44.1V	I/P: 347 VAC I/P:230VAC O/P:MIN LOAD Ta:25°C	32.524V~ 45.178V /347VAC 32.527V~45.178 V/230VAC
3	CURRENT ADJ. RANGE	CH1:5.7A~11.4A	I/P: 347 VAC I/P:230VAC O/P:CV MIN & CV MAX-1V Ta:25°C	4.286A~12.0713A /347VAC@CV MAX-1V 4.294A~ 12.0843A /347VAC@CV MIN 4.289A~12.0591A/230VAC@CVMAX-1V 4.296A~12.0825A/230VAC@CV MIN
4	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 1 % ~ -1 %	I/P:180VAC /528AC O/P:FULL/ MIN LOAD Ta:25°C	V1: 0.21%~0%
5	LINE REGULATION (Max)	V1: 0.5 % ~ -0.5 %	I/P:180VAC~528AC O/P:FULL LOAD Ta:25°C	V1: 0 %~0%
6	LOAD REGULATION (Max)	V1: 0.5 % ~ -0.5 %	I/P: 347 VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.06%~-0.12%
7	OVER/UNDERSHOOT TEST	< ±5%	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	TEST: < 1.97%
8	RIPPLE & NOISE (Max)	V1: 250 mVp-p	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	V1: 52 mVp-p

high frequency :

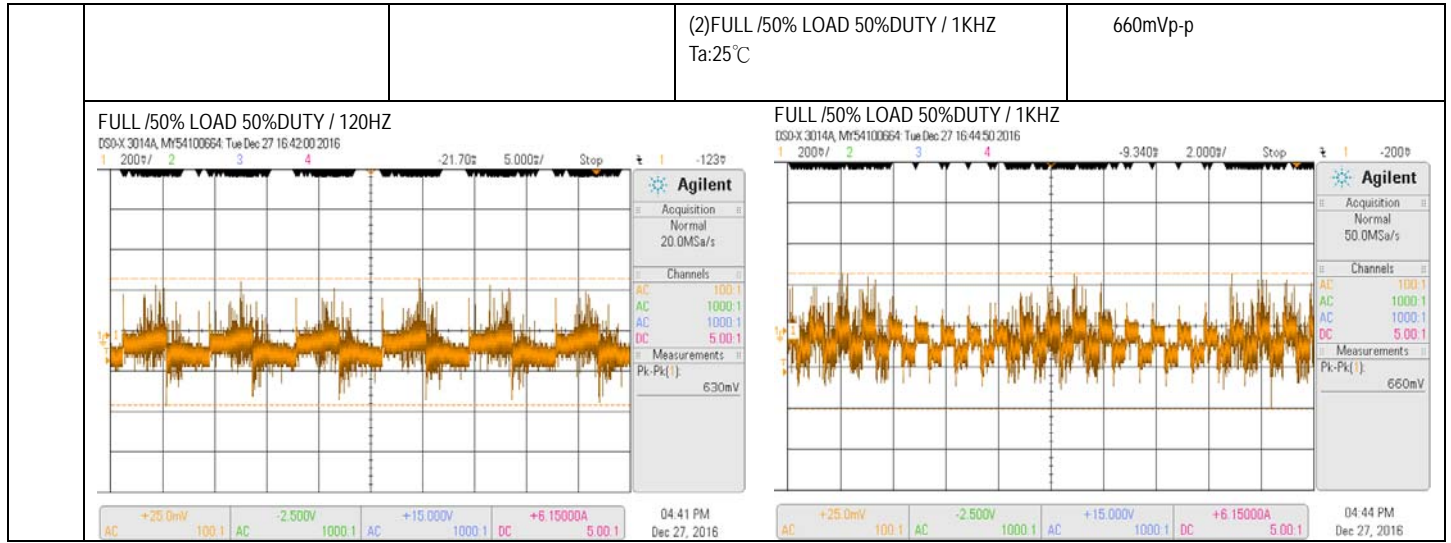


low frequency :



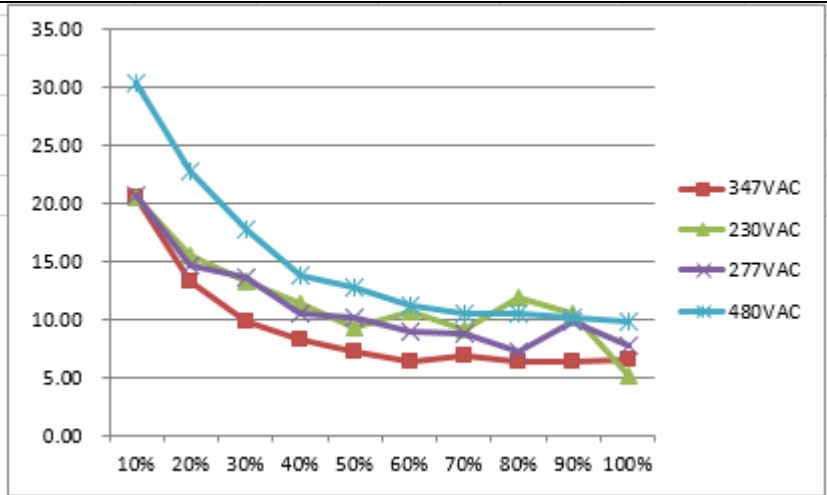
9	SET UP TIME	480VAC/ 500 ms (Max) 347VAC/ 500 ms (Max) 230VAC/ 500 ms (Max)	I/P: 480 VAC I/P: 347 VAC I/P: 230 VAC O/P:FULL LOAD Ta:25°C	480VAC/249ms 347VAC/250ms 230VAC/260ms
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	<p>INPUT=347VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	<p>INPUT=480VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	
<p>10 RISE TIME</p>	<p>480VAC/ 100 ms (Max) 347VAC/ 100 ms (Max) 230VAC/ 100 ms (Max)</p>	<p>I/P: 480 VAC I/P: 347 VAC I/P: 230 VAC O/P: FULL LOAD Ta:25°C</p>	<p>480VAC/40.4ms 347VAC/48ms 230VAC/51.2ms</p>
	<p>INPUT=347VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=480VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>
<p>11 HOLD UP TIME</p>	<p>480VAC/ 16ms (Max) 347VAC/ 16 ms (Max)</p>	<p>I/P: 480 VAC I/P: 347 VAC O/P:FULL LOAD Ta:25°C</p>	<p>480VAC/ 22.2ms 347VAC/22.2ms</p>
	<p>INPUT=347VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>		<p>INPUT=480VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>
<p>12 DYNAMIC LOAD</p>	<p>V1: 4200 mVp-p</p>	<p>I/P: 347VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ</p>	<p>630mVp-p</p>

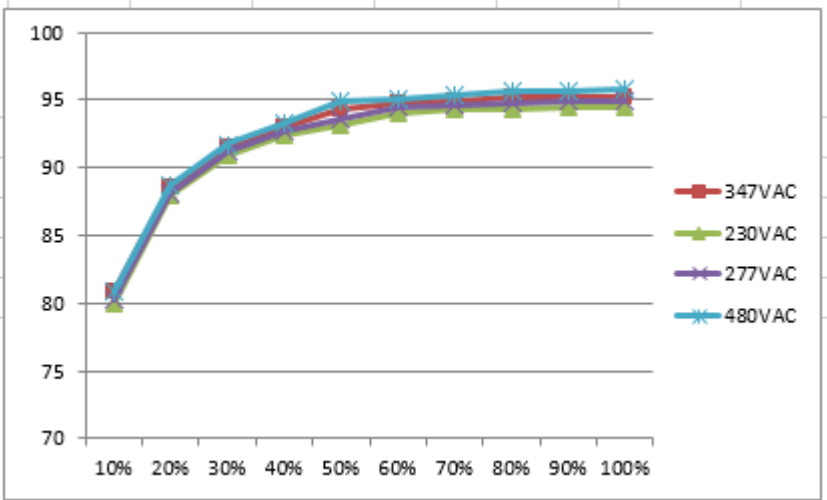


INPUT FUNCTION TEST

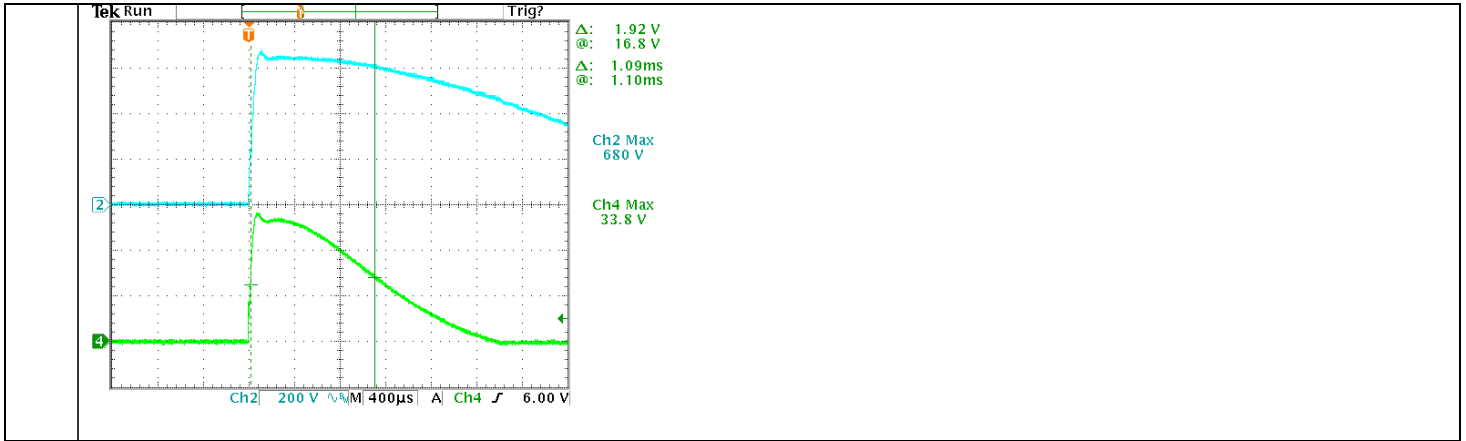
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC-528 VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	130V-528 V
			I/P: LOW-LINE-3V=177 V HIGH-LINE+10V=538 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 180 VAC ~528VAC O/P:FULL-MIN LOAD Ta:25°C	OK
3	INPUT CURRENT (TYP)	480VAC/ 1.15 A 347 VAC/ 1.52A	I/P: 480VAC/347 VAC O/P:FULL LOAD Ta:25°C	I=1.0819A/480VAC I =1.466A/ 347VAC
4	LEAKAGE CURRENT	< 0.75 mA / 480VAC	I/P : 480 VAC O/P : Min LOAD Ta : 25°C	L-FG: 0.34mA N-FG:0.34 mA
5	POWER FACTOR(TYP)	0.95/480 VAC FULL LOAD 0.97/347 VAC FULL LOAD 0.98/277 VAC FULL LOAD 0.98/230 VAC FULL LOAD	I/P: 480VAC/347VAC/230VAC/277VAC O/P:FULL LOAD Ta:25°C	PF=0.9599/480V/100%LOAD PF=0.9855/347V/100%LOAD PF=0.991/277V/100%LOAD PF=0.997/230V/100%LOAD
	P.F vs LOAD			



6	EFFICIENCY (TYP)	95%	I/P: 347 VAC O/P: FULL LOAD Ta: 25°C	95.24 %
	EFFICIENCY vs LOAD			

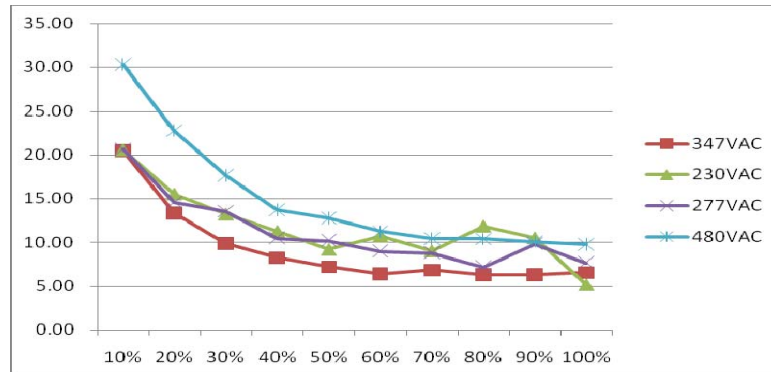


7	INRUSH CURRENT (TYP)	480 V/40A COLD START (width=1100us measured at 50% Ipeak) COLD START	I/P: 480VAC O/P: FULL LOAD Ta: 25°C	I = 33.8A / 480VAC T50=1090 us
	INPUT=480VAC/60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)			



8	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/480V O/P : 100% LOAD 50% LOAD Ta : 25°C	THD :	9.21	%/230V/ 50%
				THD :	5.19	%/230V /100%
				THD :	10.19	%/277V/ 50%
				THD :	7.67	%/277V/ 100%
				THD :	7.2	%/347V/ 50%
				THD :	6.53	%/347V /100%
				THD :	12.79	%480V/ 50%
				THD :	9.76	%480V /100%

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	105.75%/ 528VAC 105.77%/ 347VAC 105.9%/180VAC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	V1: 46~50V PROTECTION TYPE : Shut down o/p voltage re-power on to recovery	I/P: 528VAC I/P: 347VAC I/P: 180VAC O/P: MIN LOAD Ta: 25°C	47.654V/ 528VAC 48.031V/ 347VAC 47.62V/ 180VAC PROTECTION TYPE : Shut down o/p voltage re-power on to recovery

3	OVER TEMPERATURE PROTECTION	PROTECTION TYPE : Shut down 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 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	PFC Transistor (D to S) or (C to E) Peak Voltage	Q1 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 (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. I/P:Low-Line -3V = 177V 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)819V (2)819V (3)819V (4)819V (5)819V (6)827V (7) 811V VDS: (1)875V (2)907V (3)859V (4)899V (5)883V (6)859V (7)867V
2	PWM Transistor (D to S) or (C to E) Peak Voltage	Q10 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.	Q10 Q12 531V: 531V: VDS: VDS: (1)795V (1)795V (2)803V (2)811V (3)795V (3)803V (4)795V (4)795V (5)795V (5)795V (6)795V (6)803V (7)795V (7)795V 177V: 177V VDS: VDS: (1)803V (1)811V

		Q12 Rated 9A/950V	I/P:Low-Line -3V = 177V 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	(2)795V (3)827V (4)811V (5)819V (6)811V (7)819V	(2)795V (3)827V (4)827V (5)827V (6)803V (7)827V
3	P.F.C DIODE	D9 Rated 8A/1200V	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/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz I/P:Low-Line -3V = 177V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25°C	(1)796V (2)788V (3)796V (4)796V	(1)821V (2)788V (3)813V (4)813V
4	Diode Peak Voltage	Q101 Rated 43A/150 V Q120 Rated 43A/150 V	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	Q101: VDS: (1)97.4V (2)90.2V (3)95V (4)97.4V (5)96.6V (6)93.4V (7)95V (8)91.8V	Q120: VDS: (1)98.2V (2)97.4V (3)100.8V (4)100.8V (5)101.4V (6)99V (7)98V (8)89.4V
5	Input Capacitor Voltage	C5 Rated: 150 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 Ta:25°C	(1)389V (2)393V (3)393V (4)389V	
6	Control IC Voltage Test	PWM IC U2 Rated 8.85V~16V PFC IC U1 Rated 10.5V~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. (5)NO LOAD VMIN.(LOW LINE)	(1) 14.5V (2) 14.5V (3) 14.7V (4) 14.5V (5) 14.5V	(1) 14.7V

			Ta:25°C	(2) 14.7V (3) 14.7V (4) 14.5V (5) 14.5V
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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:2.764 mA I/P-FG:1.88mA O/P-FG:6.36mA 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:26.5GΩ I/P-FG: 20.3G Ω O/P-FG: 30GΩ NO DAMAGE
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	25 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/40% LOAD Ta:25°C	PASS Test by certified Lab
2	RADIATION	FCC Part 15 Subpart B	I/P: 480VAC /60HZ O/P:FULL LOAD/30% LOAD Ta:25°C	PASS Test by certified Lab
3	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 230VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A

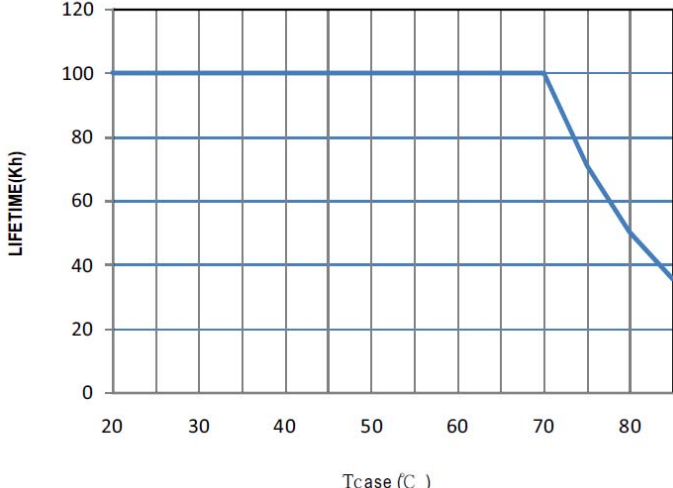
RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : HVG-480-24 1. ROOM AMBIENT BURN-IN : 3 HRS I/P : 347VAC O/P : FULL LOAD Ta=25 °C 2. HIGH AMBIENT BURN-IN : 14 HRS I/P : 347VAC O/P : FULL LOAD Ta= 60 °C		

		NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 60 °C
		1	BD1	62.1°C	95.6°C
		2	C10	60.9°C	94.8°C
		3	Q1	61.7°C	96.0°C
		4	D8	65.6°C	102.8°C
		5	Q10	64.1°C	100.5°C
		6	RY1	63.3°C	98.4°C
		7	LF2	60.4°C	93.9°C
		8	C1	58.2°C	91.9°C
		9	C5	61.0°C	95.3°C
		10	L3	64.3°C	100.6°C
		11	U1	58.2°C	92.1°C
		12	U107	57.9°C	92.5°C
		13	T1-1	66.0°C	101.2°C
		14	T2-2	70.9°C	106.9°C
		15	Q100	62.3°C	97.6°C
		16	C115	58.6°C	92.8°C
		17	LF100	59.9°C	94.5°C
		18	C511	64.2°C	98.8°C
		19	RTH2	65.6°C	101.1°C
		20	T3	63.2°C	98.6°C
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 %/°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 : 100 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 : 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°C			TEST : OK



8	CAPACITOR LIFE CYCLE	SUPPOSE C115 IS THE MOST CRITICAL COMPONENT (1) I/P : 347VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 347VAC O/P : FULL LOAD Ta= 60 °C LIFE TIME (3) I/P : 347VAC O/P : 75% LOAD Ta= 60 °C LIFE TIME (4) I/P : 347VAC O/P : 50% LOAD Ta= 60 °C LIFE TIME	(1) 313619HRS (2) 29311HRS (3) 45290HRS (4) 59976HRS
9	MTBF	318.9K hrs min. Telcordia SR-332(Bellcore) ; 84.5K hrs min. MIL-HDBK-217F (25°C)	
10	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 80°C 	

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

12.10.30 A50-F031