



Test Report: HVG-480-48

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

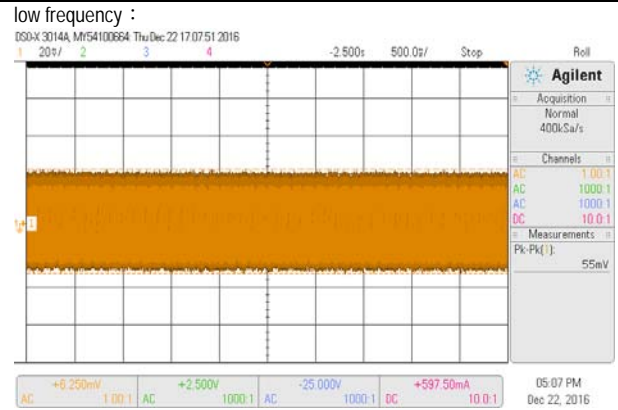
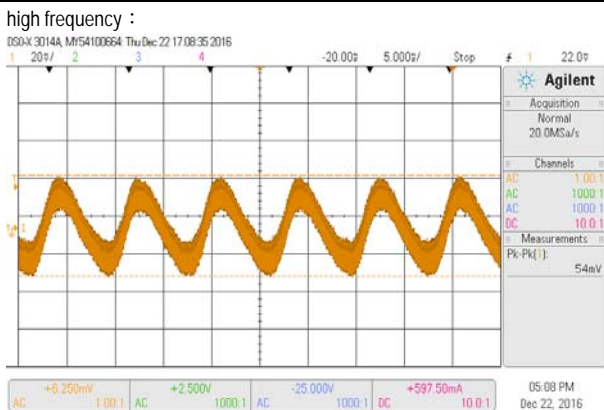
■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

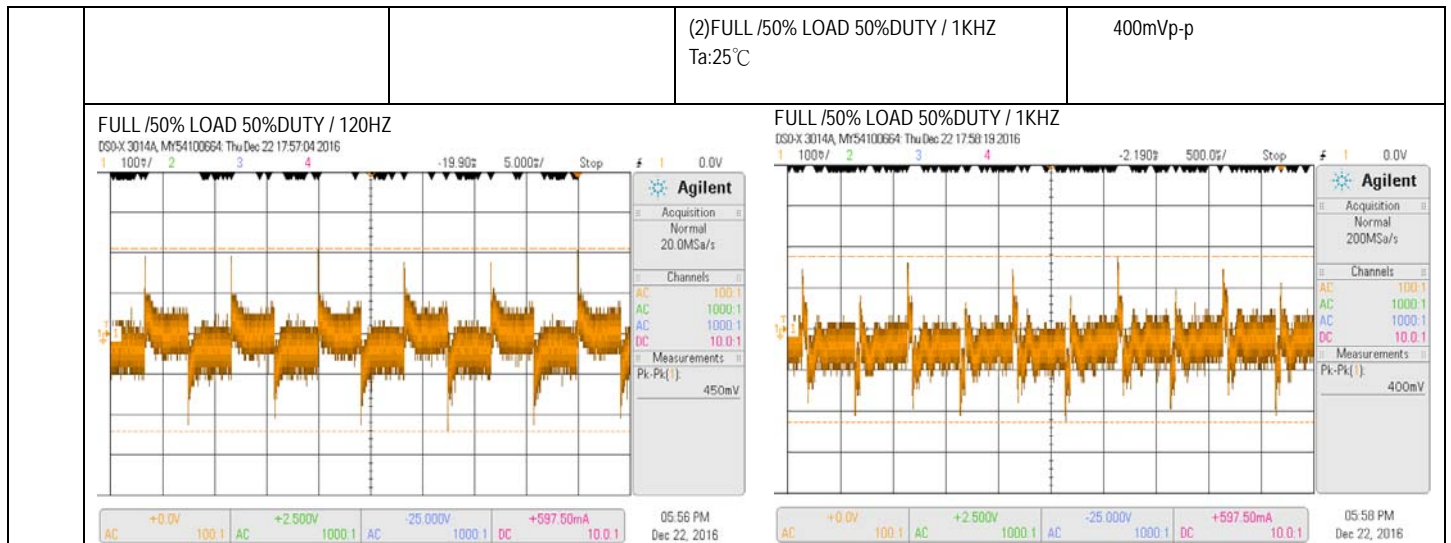
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	CH1: 24V~ 48V	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	2V~47 V /347VAC
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 40.8V~ 50.4V	I/P: 347 VAC I/P:230VAC O/P:MIN LOAD Ta:25°C	37.27V~ 51.54V /347VAC 37.271V~51.54 V/230VAC
3	CURRENT ADJ. RANGE	CH1:5A-10A	I/P: 347 VAC I/P:230VAC O/P:CV MIN & CV MAX-1V Ta:25°C	3.9904A~10.9412A /347VAC@CV MAX-1V 3.9912A~ 10.956A /347VAC@CV MIN 3.9920A~10.9446A/230VAC@CV MAX-1V 3.9920A~10.958A/230VAC@CV MIN
4	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 1 % ~ -1 %	I/P:180VAC /528AC O/P:FULL/ MIN LOAD Ta:25°C	V1: 0.7%-0.08%
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	V1:0.28 %~ -0.34%
7	OVER/UNDERSHOOT TEST	< ±5%	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	TEST: < 1.05%
8	RIPPLE & NOISE (Max)	V1: 250 mVp-p	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	V1: 55 mVp-p



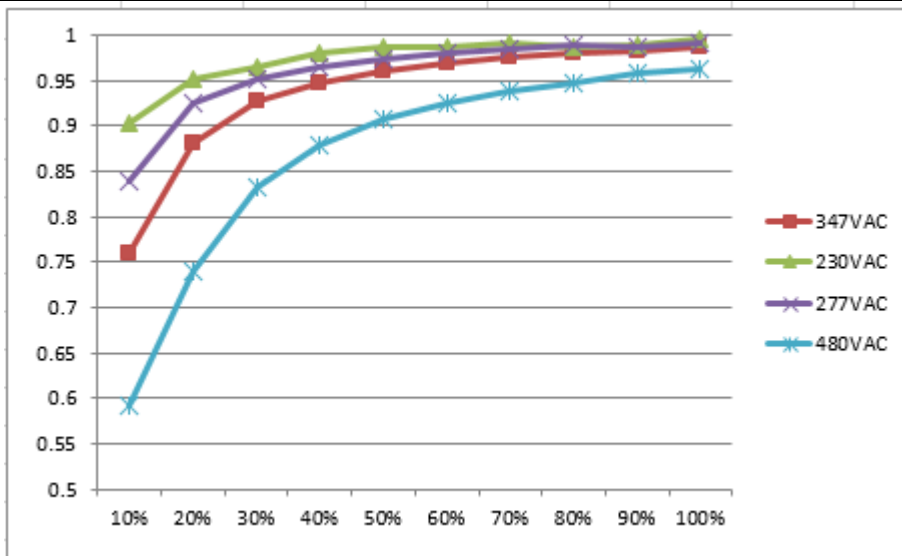
9	SET UP TIME	480VAC/ 500 ms (Max) 347VAC/ 500 ms (Max) 230VAC/ 500 ms (Max)	I/P: 480 VAC I/P: 347 VAC I/P: 230 VAC O/P:FULL LOAD Ta:25°C	480VAC/400ms 347VAC/398ms 230VAC/410ms
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	<p>INPUT=347VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p>		<p>INPUT=480VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p>	
<p>10</p>	<p>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/50ms 347VAC/49.2ms 230VAC/43ms</p>
	<p>INPUT=347VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p>		<p>INPUT=480VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p>	
<p>11</p>	<p>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/ 18ms 347VAC/20.8ms</p>
	<p>INPUT=347VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p>		<p>INPUT=480VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p>	
<p>12</p>	<p>DYNAMIC LOAD</p>	<p>V1: 4800 mVp-p</p>	<p>I/P: 347VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ</p>	<p>450mVp-p</p>

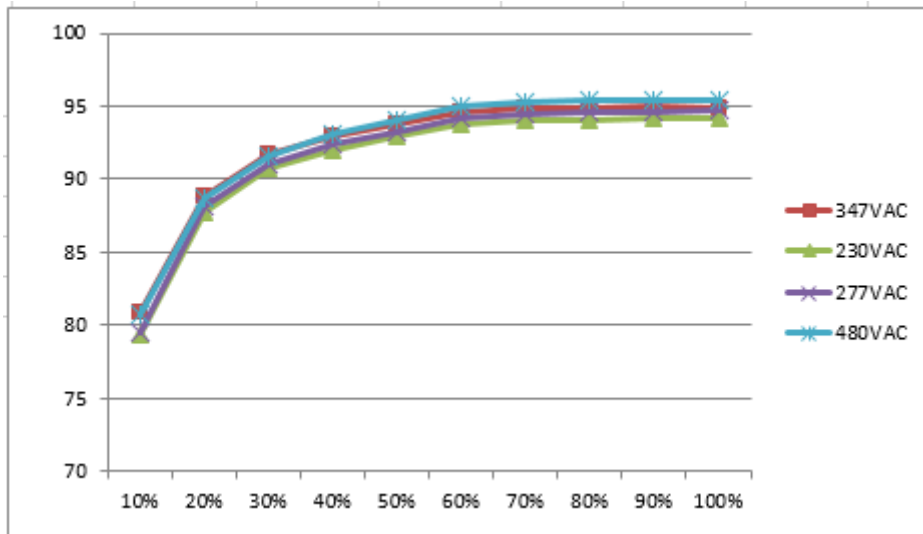


INPUT FUNCTION TEST

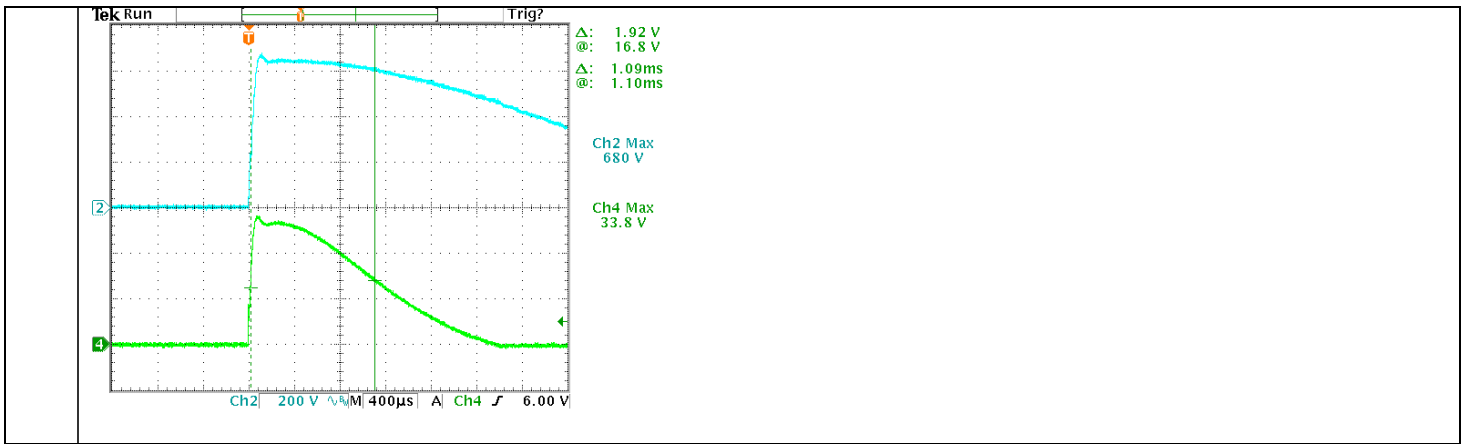
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC-528 VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	128V-528 V
			I/P: LOW-LINE-3V=177 V HIGH-LINE+10V=538 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY 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=1.093A/480VAC I=1.49A/ 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=0.963/480V/100%LOAD PF=0.984/347V/100%LOAD PF=0.991/277V/100%LOAD PF=0.994/230V/100%LOAD
	P.F vs LOAD			



6	EFFICIENCY (TYP)	95%	I/P: 347 VAC O/P: FULL LOAD Ta: 25°C	95.03 %
	EFFICIENCY vs LOAD			

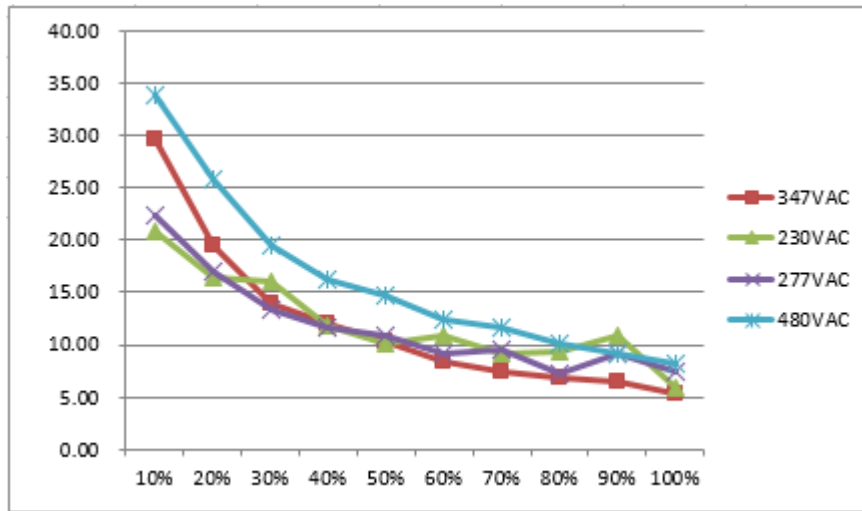


7	INRUSH CURRENT (TYP)	480 V/40A COLD START (twidth=1100us measured at 50% Ipeak) COLD START	I/P: 480VAC O/P: FULL LOAD Ta: 25°C	I = 33.8A / 480VAC T50=1090 us
	INPUT=480VAC/60HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)			



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 :	9.22	%/230V/ 50%
				THD :	7.39	%/230V /100%
				THD :	9.27	%/277V/ 50%
				THD :	8.98	%/277V/ 100%
				THD :	8.747	%/347V/ 50%
				THD :	6.77	%/347V /100%
				THD :	13.42	%480V/ 50%
				THD :	9.87	%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	102.3%/ 528VAC 102.4%/ 347VAC 102.3%/180VAC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	V1: 51.5-58V 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	53.59V/ 528VAC 53.23V/ 347VAC 53.36V/ 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) 813V (2) 796V (3) 813V (4) 813V (5) 813V (6) 805V (7) 821V VDS: (1)877V (2)796V (3)885V (4)893V (5)893V (6)861V (7)877V
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	Q10 531V: VDS: (1)782V (2)774V (3)798V (4)782V (5)790V (6)782V (7)806V 177V: VDS: Q12 531V: VDS: (1)788V (2)780V (3)796V (4)788V (5)788V (6)796V (7)805V 177V VDS:

			(5)NO LOAD VR MIN.(LOW LINE) Ta:25°C	(1) 14.3V (2) 14.3V (3) 14.3V (4) 14.1V (5) 14.1V
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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: 2.892mA I/P-FG:1.95mA O/P-FG:6.51mA 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: 11.6G 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	25 mΩ

E.M.C TEST

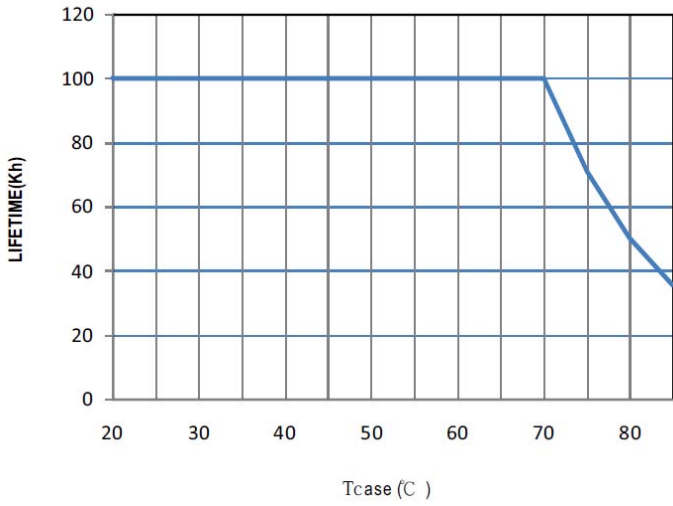
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	FCC Part 15 Subpart B	I/P: 440VAC /60HZ O/P:FULL LOAD/40% LOAD Ta:25°C	PASS Test by certified Lab
2	RADIATION	FCC Part 15 Subpart B	I/P: 480VAC /60HZ O/P:FULL LOAD/30% LOAD Ta:25°C	PASS Test by certified Lab
3	SURGE	IEC61000-4-5 INDUSTRY L-N :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-480-54 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	HIGH AMBIENT
				Ta= 25 °C	Ta= 60 °C
		1	BD1	62.8°C	96.7°C
		2	C10	59.8°C	94.7°C
		3	Q1	59.0°C	94.3°C
		4	D8	63.8°C	101.2°C
		5	LF2	58.7°C	91.7°C
		6	Q10	62.8°C	99.3°C
		7	RY1	61.5°C	96.6°C
		8	C1	56.5°C	90.1°C
		9	C5	59.6°C	94.1°C
		10	L3	62.7°C	99.2°C
		11	U1	57.4°C	91.7°C
		12	U107	57.0°C	91.4°C
		13	T1-1	63.8°C	99.9°C
		14	T2-2	63.7°C	99.1°C
		15	Q100	61.3°C	96.6°C
		16	C118	55.2°C	89.3°C
		17	LF100	55.2°C	89.3°C
		18	C511	62.4°C	96.0°C
		19	RTH2	60.9°C	94.5°C
		20	T3	61.8°C	96.0°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	± 0.001 %/°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	<p>SUPPOSE C115 IS THE MOST CRITICAL COMPONENT</p> <p>(1) I/P : 347VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME</p> <p>(2) I/P : 347VAC O/P : FULL LOAD Ta= 60 °C LIFE TIME</p> <p>(3) I/P : 347VAC O/P : 75% LOAD Ta= 60 °C LIFE TIME</p> <p>(4) I/P : 347VAC O/P : 50% LOAD Ta= 60 °C LIFE TIME</p>	<p>(1) 433003HRS</p> <p>(2) 40748HRS</p> <p>(3) 53713HRS</p> <p>(4) 75326HRS</p>																		
9	MTBF	318.9K hrs min. Telcordia SR-332(Bellcore) ; 84.5K hrs min. MIL-HDBK-217F (25°C)																			
10	DMTBF/Accelerated Life Test	<p>Demonstration Mean Time Between Failure(Expected Life) : 50,000 hours @ Tcase 80°C</p>  <table border="1"> <caption>Graph Data: Lifetime (kh) vs Tcase (°C)</caption> <thead> <tr> <th>Tcase (°C)</th> <th>Lifetime (kh)</th> </tr> </thead> <tbody> <tr><td>20</td><td>100</td></tr> <tr><td>30</td><td>100</td></tr> <tr><td>40</td><td>100</td></tr> <tr><td>50</td><td>100</td></tr> <tr><td>60</td><td>100</td></tr> <tr><td>70</td><td>100</td></tr> <tr><td>75</td><td>70</td></tr> <tr><td>80</td><td>35</td></tr> </tbody> </table>		Tcase (°C)	Lifetime (kh)	20	100	30	100	40	100	50	100	60	100	70	100	75	70	80	35
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TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT ZENG

12.10.30 A50-F031