



Test Report:HVG-480-30

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

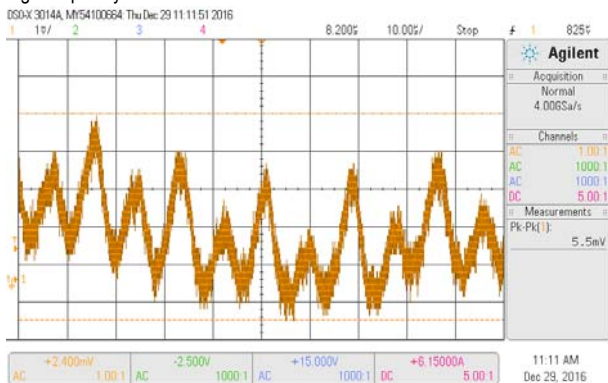
ENVIRONMENT TEST

DESIGN VERIFY TEST

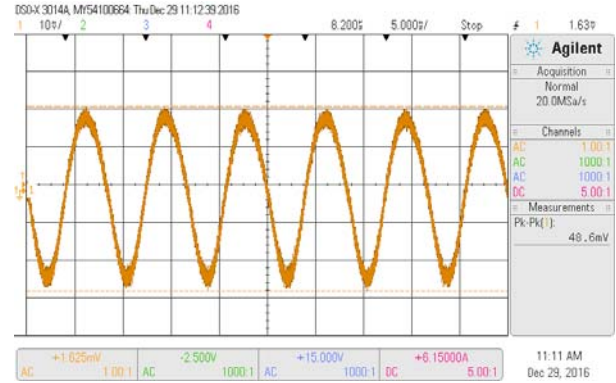
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	CH1: 15V~30V	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	2V~29 V /347VAC
2	OUTPUT VOLTAGE ADJUST RANGE	CH1: 25.5V~31.5V	I/P: 347 VAC I/P:230VAC O/P:MIN LOAD Ta:25°C	22.857V~32.281V /347VAC 22.849V~32.269 V/230VAC
3	CURRENT ADJ. RANGE	CH1:8A~16A	I/P: 347 VAC I/P:230VAC O/P:CV MIN & CV MAX-1V Ta:25°C	6.1856A~17.078A /347VAC@CV MAX-1V 6.201A~ 17.067A /347VAC@CV MIN 6.1903A~17.0822A/230VAC@CVMAX-1V 6.201A~17.0625A/230VAC@CV MIN
4	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 1 % ~ -1 %	I/P:180VAC /528AC O/P:FULL/ MIN LOAD Ta:25°C	V1: 0.37%~0.07%
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: 0.20%~-0.23%
7	OVER/UNDERSHOOT TEST	< ±5%	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	TEST: < 3.57%
8	RIPPLE & NOISE (Max)	V1: 200 mVp-p	I/P: 347 VAC O/P:FULL LOAD Ta:25°C	V1: 48.6 mVp-p

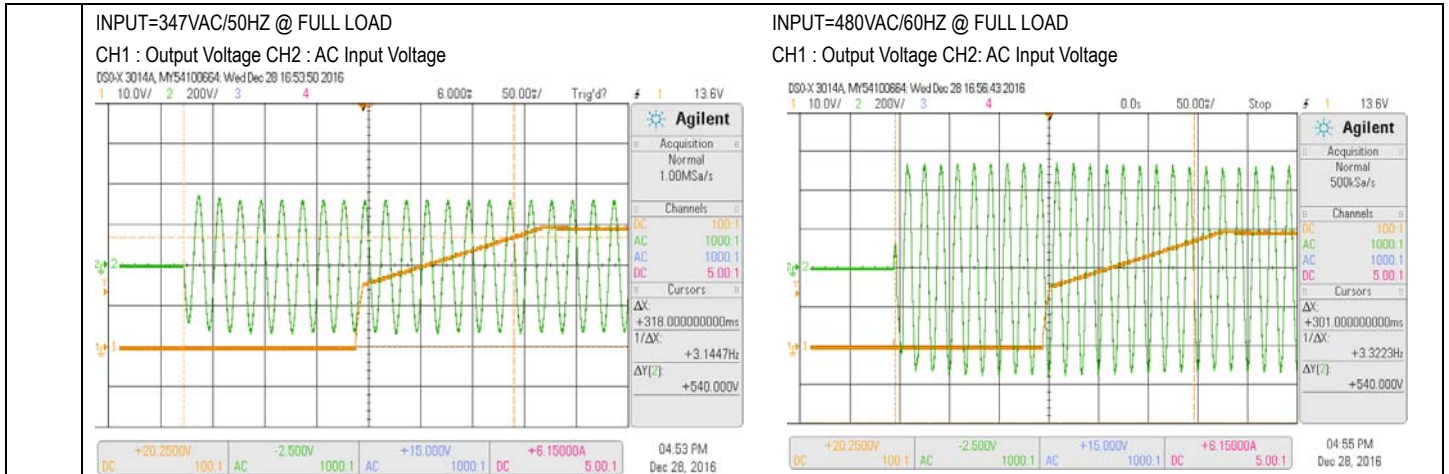
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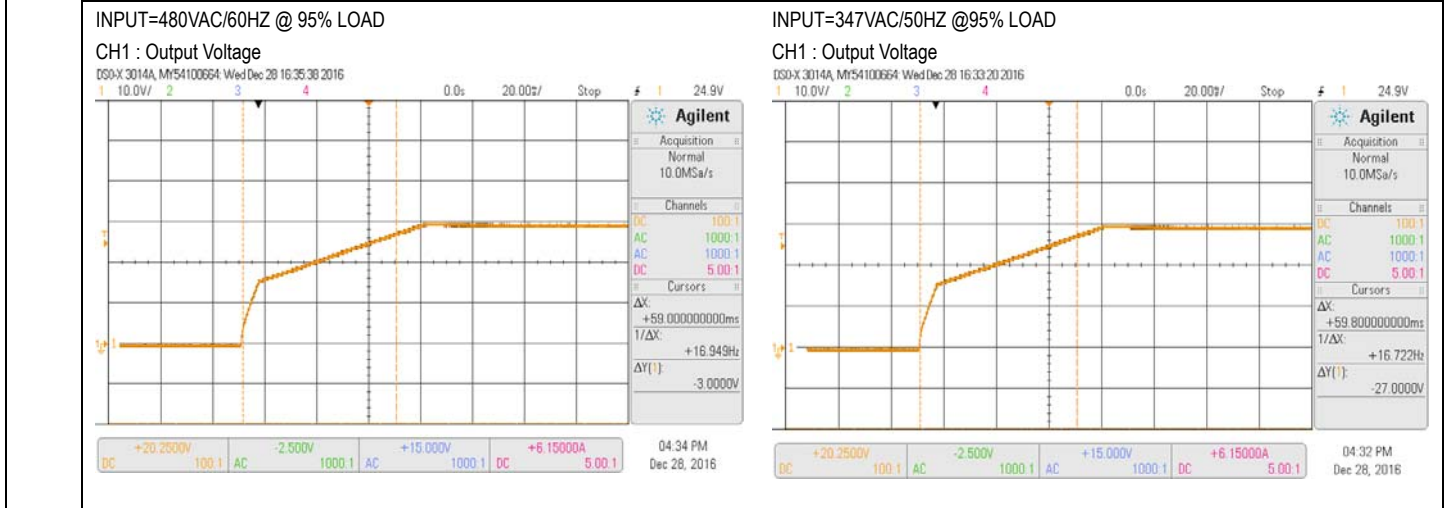
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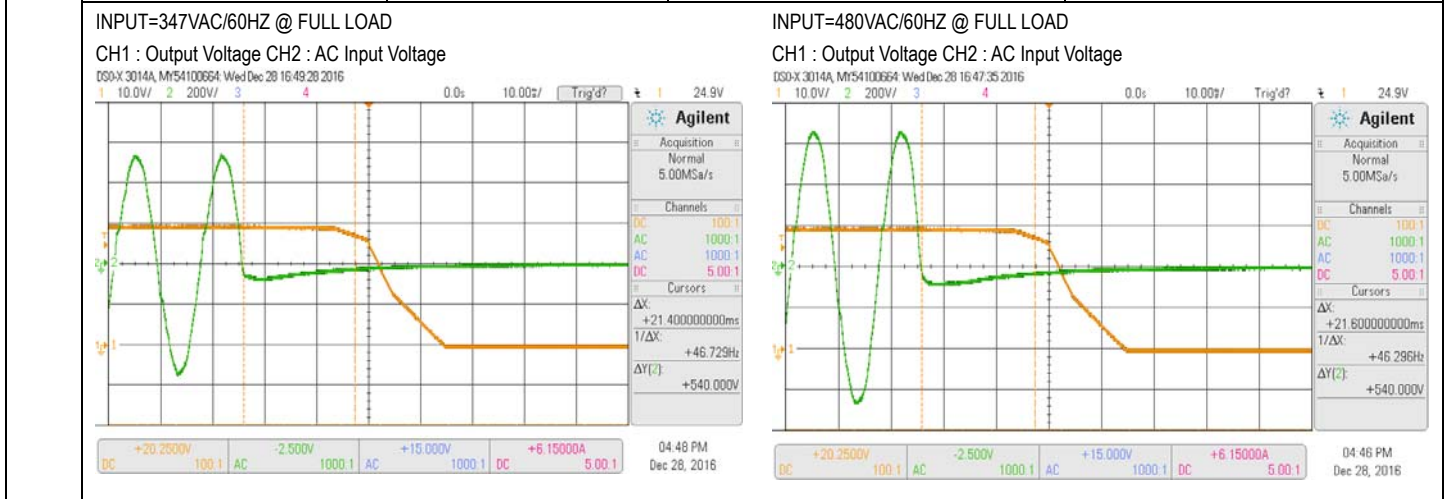
9	SET UP TIME	480VAC/ 500 ms (Max) 347VAC/ 500 ms (Max) 230VAC/ 500 ms (Max)	I/P: 480 VAC I/P: 347 VAC I/P: 230 VAC O/P:FULL LOAD Ta:25°C	480VAC/301ms 347VAC/318ms 230VAC/320ms
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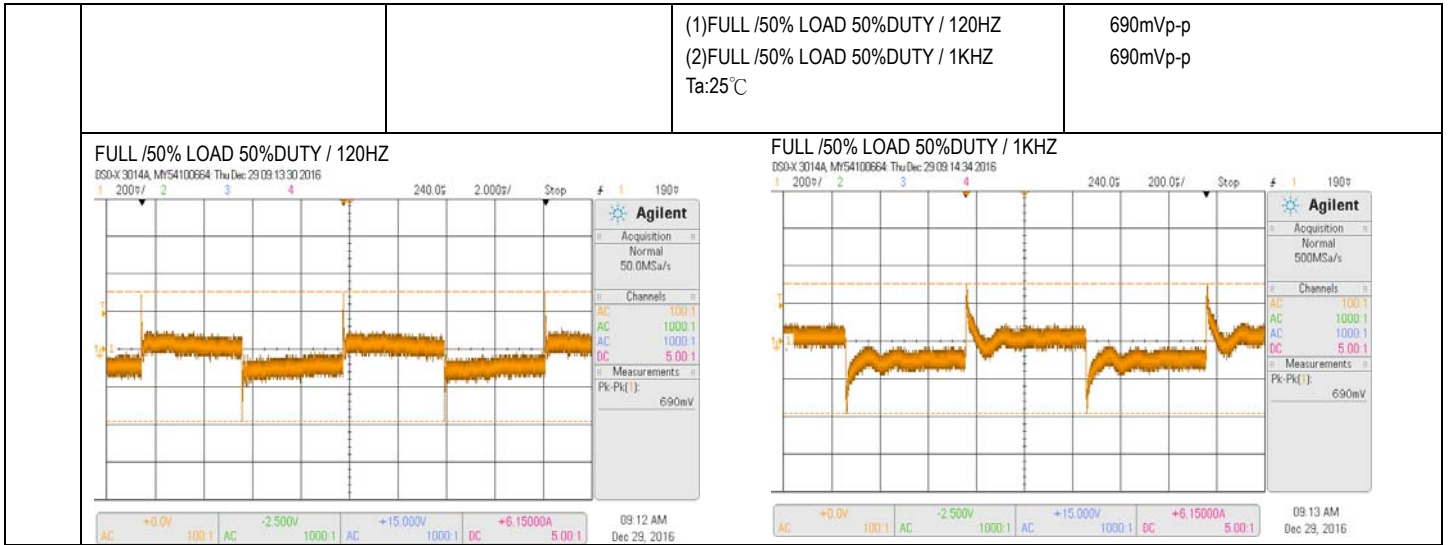
10	RISE TIME	480VAC/ 100 ms (Max) 347VAC/ 100 ms (Max) 230VAC/ 100 ms (Max)	I/P: 480 VAC I/P: 347 VAC I/P: 230 VAC O/P:95% LOAD Ta:25°C	480VAC/59ms 347VAC/59.8ms 230VAC/54ms
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11	HOLD UP TIME	480VAC/ 16ms (Max) 347VAC/ 16 ms (Max)	I/P: 480 VAC I/P: 347 VAC O/P:FULL LOAD Ta:25°C	480VAC/21.6ms 347VAC/21.4ms
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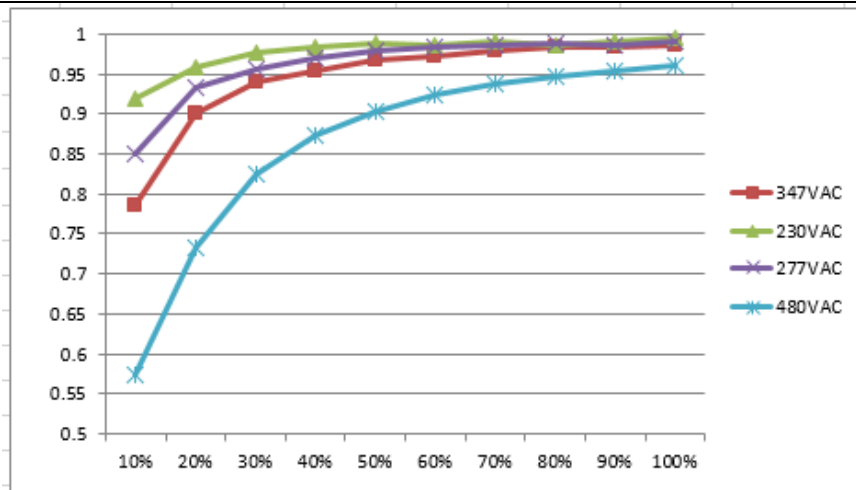


12	DYNAMIC LOAD	V1: 3000 mVp-p	I/P: 347VAC O/P:	
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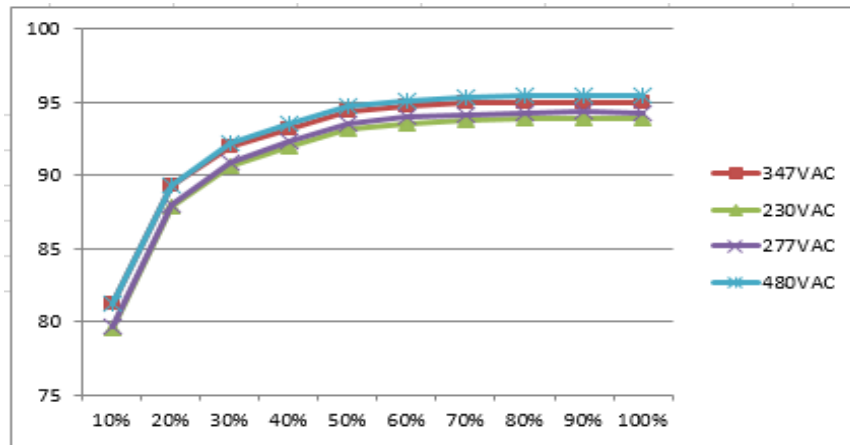
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	180VAC~528 VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	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=1.091A/480VAC I=1.471A/ 347VAC
4	LEAKAGE CURRENT	< 0.75 mA / 480VAC	I/P : 480 VAC O/P : Min LOAD Ta : 25°C	L-FG: 0.24mA N-FG:0.24 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=0.9604/480V/100%LOAD PF=0.9867/347V/100%LOAD PF=0.991/277V/100%LOAD PF=0.996/230V/100%LOAD
	P.F vs LOAD			



6	EFFICIENCY (TYP)	94%	I/P: 347 VAC O/P: FULL LOAD Ta: 25°C	94.926 %
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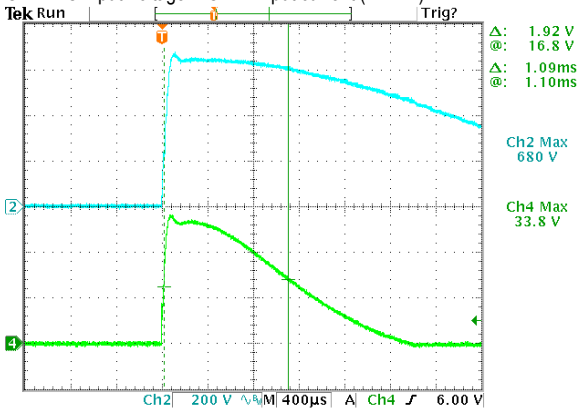
EFFICIENCY vs LOAD



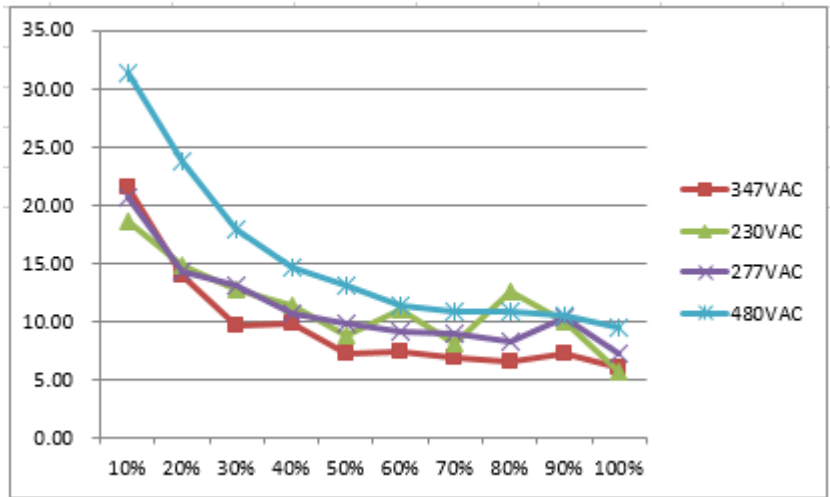
7	INRUSH CURRENT (TYP)	480 V/40A COLD START (twidh=1100us measured at 50% Ipeak) COLD START	I/P: 480VAC O/P: FULL LOAD Ta: 25°C	I = 33.8A / 480VAC T50 = 1090 us
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INPUT=480VAC/60HZ @ FULL LOAD

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 : 8.72 %/230V/ 50% THD : 5.64 %/230V /100% THD : 9.84 %/277V/ 50% THD : 7.21 %/277V/ 100% THD : 7.23 %/347V/ 50% THD : 6.02 %/347V /100% THD : 13.12 %480V/ 50% THD : 9.42 %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	102.44%/ 528VAC 102.44%/ 347VAC 102.48%/180VAC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	V1: 32.5~36.5V 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	34.378V/ 528VAC 34.284V/ 347VAC 34.357V/ 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	<p>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.</p> <p>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</p>	<p>VDS: (1)819V (2)794V (3)810V (4)819V (5)802V (6)802V (7)802V</p> <p>VDS: (1)875V (2)794V (3)875V (4)875V (5)867V (6)843V (7)802V</p>
2	PWM Transistor (D to S) or (C to E) Peak Voltage	<p>Q10 Rated 9A/950V</p> <p>Q12 Rated 9A/950V</p>	<p>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.</p> <p>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</p>	<p>531V: 531V: VDS: VDS: (1)786V (1)770V (2)794V (2)786V (3)778V (3)778V (4)778V (4)786V (5)778V (5)778V (6)778V (6)770V (7)786V (7)786V 177V: 177V VDS: VDS: (1)802V (1)794V (2)786V (2)786V (3)794V (3)794V (4)802V (4)770V (5)794V (5)794V (6)794V (6)802V (7)778V (7)786V</p>

3	P.F.C DIODE	D9 Rated 8A/1200V	<p>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</p> <p>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</p> <p>Ta:25°C</p>	<p>(1)793V (2)793V (3)801V (4)809V</p> <p>(1)833V (2)841V (3)833V (4)833V</p>																				
4	Diode Peak Voltage	<p>Q101 Rated 80A/100 V</p> <p>Q120 Rated 80A/100 V</p>	<p>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</p>	<table border="0"> <tr> <td>Q101:</td> <td>Q120:</td> </tr> <tr> <td>VDS:</td> <td>VDS:</td> </tr> <tr> <td>(1)76.9V</td> <td>(1)77.7V</td> </tr> <tr> <td>(2)7.7V</td> <td>(2)18.2V</td> </tr> <tr> <td>(3)80.1V</td> <td>(3)79.3V</td> </tr> <tr> <td>(4)81.7V</td> <td>(4)84.9V</td> </tr> <tr> <td>(5)82.5V</td> <td>(5)84.1V</td> </tr> <tr> <td>(6)78.5V</td> <td>(6)80.9V</td> </tr> <tr> <td>(7)77.7V</td> <td>(7)79.3V</td> </tr> <tr> <td>(8)70.4V</td> <td>(8)67.2V</td> </tr> </table>	Q101:	Q120:	VDS:	VDS:	(1)76.9V	(1)77.7V	(2)7.7V	(2)18.2V	(3)80.1V	(3)79.3V	(4)81.7V	(4)84.9V	(5)82.5V	(5)84.1V	(6)78.5V	(6)80.9V	(7)77.7V	(7)79.3V	(8)70.4V	(8)67.2V
Q101:	Q120:																							
VDS:	VDS:																							
(1)76.9V	(1)77.7V																							
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(7)77.7V	(7)79.3V																							
(8)70.4V	(8)67.2V																							
5	Input Capacitor Voltage	C5 Rated: 150μ/ 450 V 105 °C	<p>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</p> <p>Ta:25°C</p>	<p>(1)392V (2)392V (3)392V (4)388V</p>																				
6	Control IC Voltage Test	<p>PWM IC U2 Rated 8.85V~16V</p> <p>PFC IC U1 Rated 10.5V~20V</p>	<p>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 VR MIN.(LOW LINE)</p> <p>Ta:25°C</p>	<table border="0"> <tr> <td>U2</td> <td>U1</td> </tr> <tr> <td>(1) 14.6V</td> <td>(1) 14.7V</td> </tr> <tr> <td>(2) 15.8V</td> <td>(2) 14.8V</td> </tr> <tr> <td>(3) 15.4V</td> <td>(3) 14.7V</td> </tr> <tr> <td>(4) 14.4V</td> <td>(4) 14.5V</td> </tr> <tr> <td>(5) 14.4V</td> <td>(5) 14.5V</td> </tr> </table>	U2	U1	(1) 14.6V	(1) 14.7V	(2) 15.8V	(2) 14.8V	(3) 15.4V	(3) 14.7V	(4) 14.4V	(4) 14.5V	(5) 14.4V	(5) 14.5V								
U2	U1																							
(1) 14.6V	(1) 14.7V																							
(2) 15.8V	(2) 14.8V																							
(3) 15.4V	(3) 14.7V																							
(4) 14.4V	(4) 14.5V																							
(5) 14.4V	(5) 14.5V																							

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: 2.790mA I/P-FG:1.832mA O/P-FG:5.82mA 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:15.5GΩ I/P-FG: 12.5G 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
4	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-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	HIGH AMBIENT
				Ta= 25 °C	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 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) 52836HRS (2) 65359HRS (3) 68829HRS
9	MTBF	318.9K hrs min. Telcordia SR-332(Bellcore) ; 84.5K 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