



# Test Report: LAD-360C

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360W Economical Security/ Fire Alarm PSU with Battery  
Charger/UPS

## ■ 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

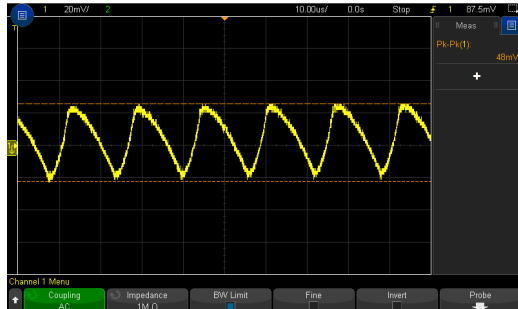
ENVIRONMENT TEST

## DESIGN VERIFY TEST

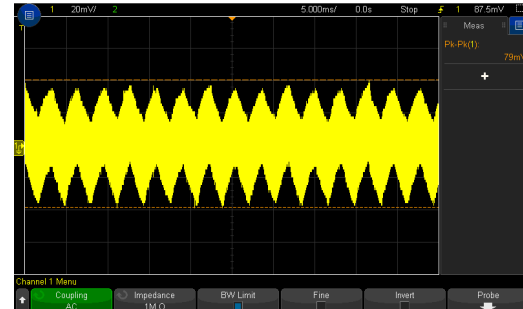
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 32.4V~ 43.5V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	31.006V~45.124V/230VAC 31.018V~45.116V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1% ~ +1 %	I/P: 230VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.0747%~ 0.0747%
3	LINE REGULATION (Max)	V1: -0.5 %~ +0.5 %	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.0072%~0.0458 %
4	LOAD REGULATION(Max)	V1: -0.5 %~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.0747%~ 0.0747%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.4%
6	RIPPLE & NOISE(Max )	V1: 240mVp-p	I/P:230VAC O/P: TESTING LOAD Ta:25°C	V1: 79mVp-p

high frequency :

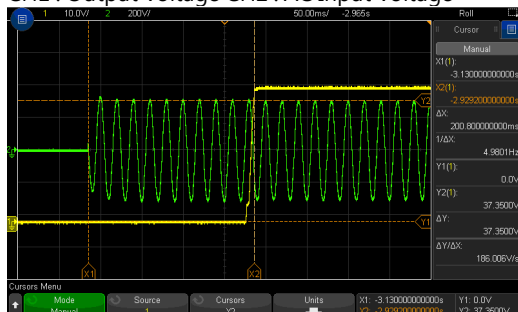


low frequency :

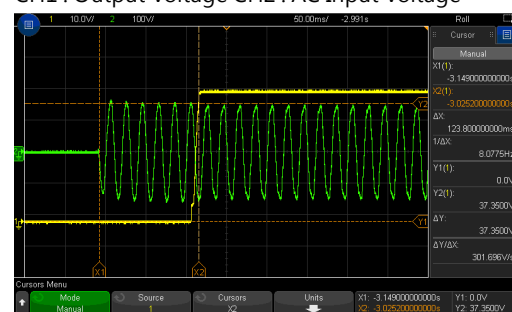


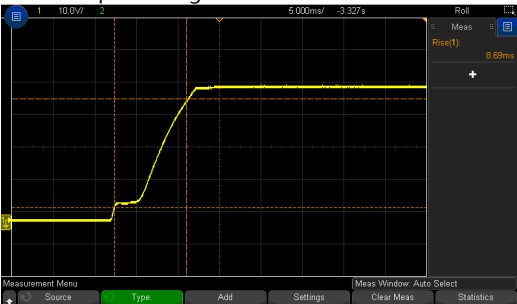
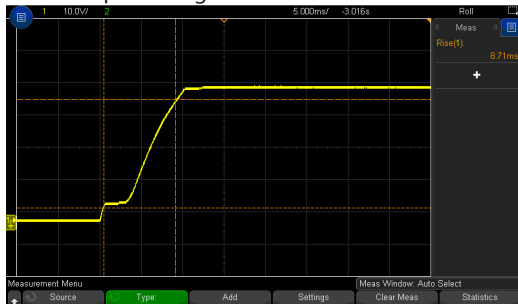
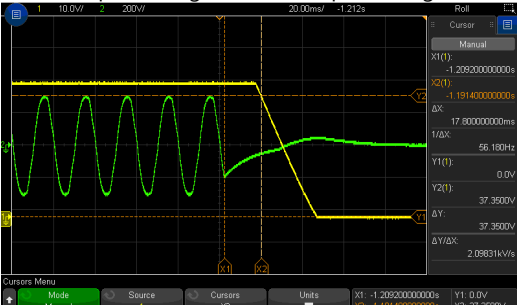
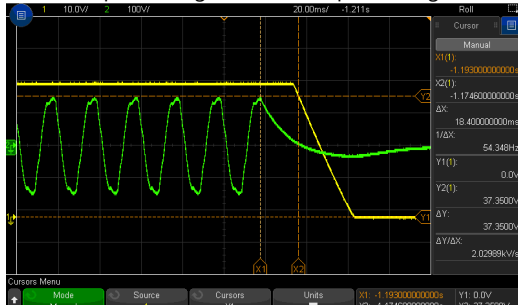
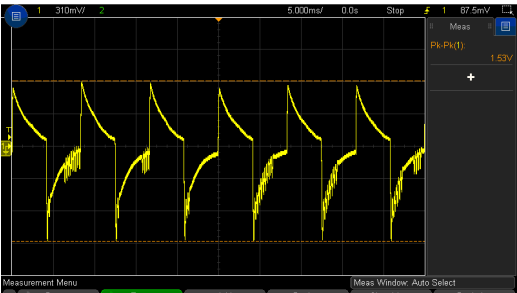
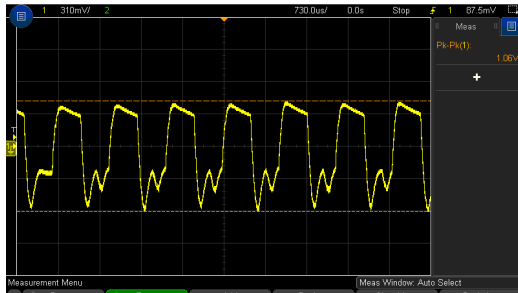
7	SET UP TIME(Max)	230VAC/2000ms 115VAC/2000ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 200.8 ms 115VAC/ 123.8 ms
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INPUT=230VAC/50HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage



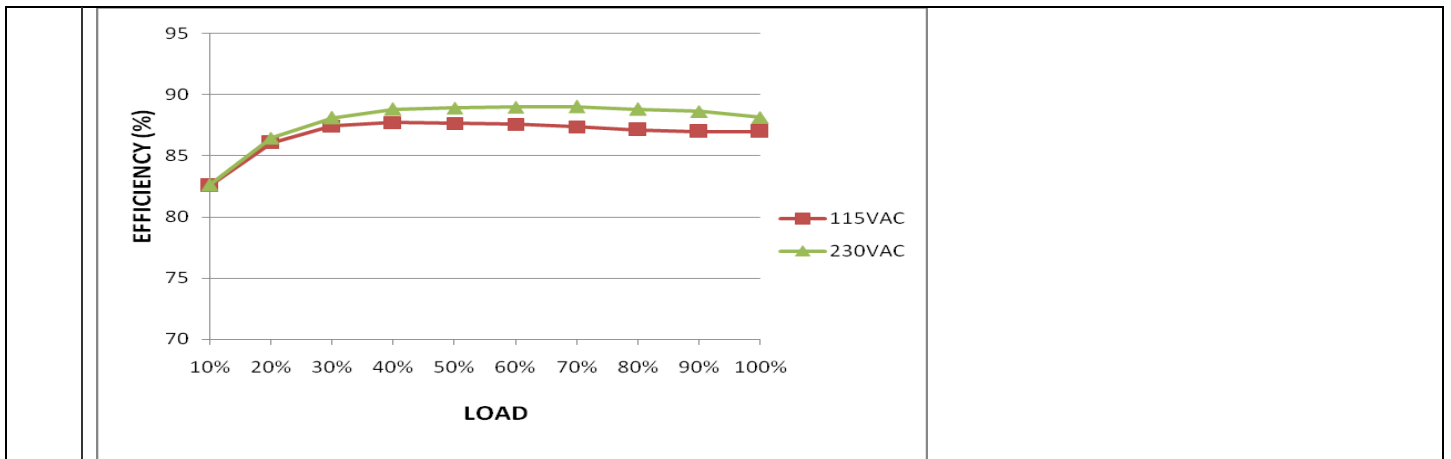
8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/8.69 ms 115VAC/8.71 ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 		
9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/17.8 ms 115VAC/18.4 ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		
10	DYNAMIC LOAD	V1: 4150mVp-p	I/P: 230VAC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	1530mVp-p 1060mVp-p
FULL /MIN LOAD 50%DUTY / 120HZ 		FULL /MIN LOAD 50%DUTY / 1KHZ 		
11	TRANSIENT RECOVERY TIME	V1: 4150mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	647 mVp-p



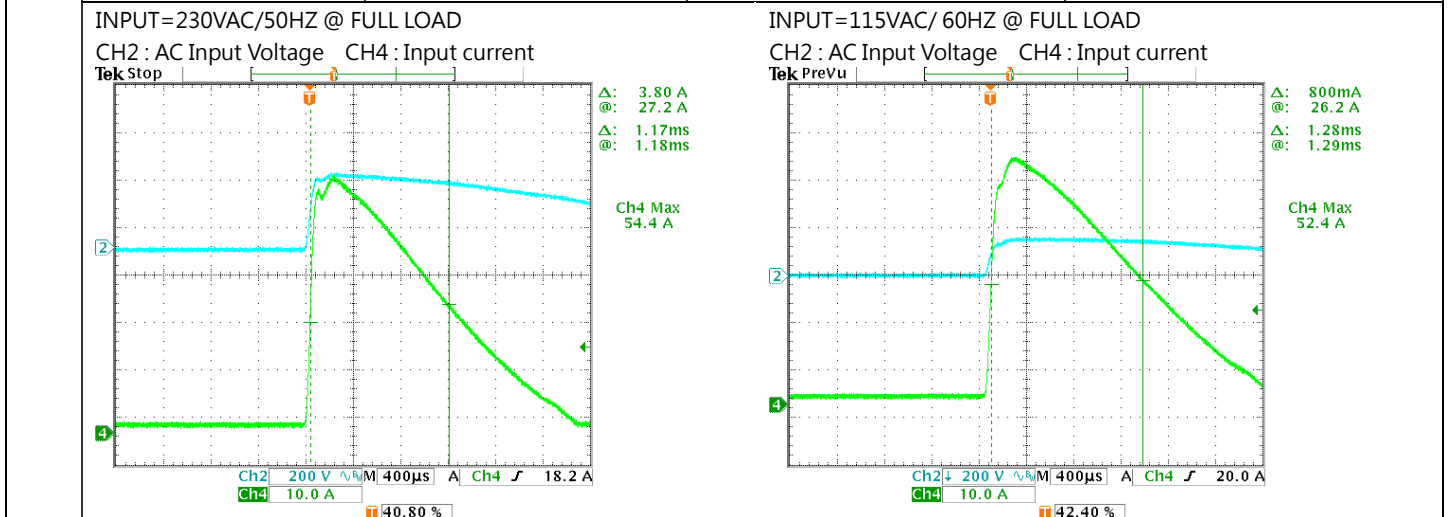
12	Battery static discharge current	After battery low protection <100uA	I/P : 230 VAC O/P : TESTING Ta : 25°C	16.56uA
13	BAT RATED CURRENT	1.5±0.15 A	I/P: 230VAC O/P:CV-2=39.5V Ta:25°C	1.4531A

## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90 ~ 132VAC / 180 ~ 264VAC by switch 240 ~ 370VDC (Default switch at 230VAC)	(1) I/P:TESTING O/P:FULL LOAD/80% LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 80% LOAD (switch on 230VAC) (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 80% LOAD (switch on 230VAC) Ta:25°C	(1) 91.596V~132V/ FULL LOAD 85.436V~132V/ 80% LOAD 164.3V~264V / FULL LOAD (switch on 230VAC) (2) 225.8Vdc~370Vdc/FULL LOAD 225.8Vdc~370Vdc/80% LOAD (3) 225.8Vdc~370Vdc/FULL LOAD 225.8Vdc~370Vdc/80% LOAD
			I/P: switch on 115VAC : LOW-LINE-3V=87 V HIGH-LINE+15%=150V  switch on 230VAC : LOW-LINE-3V=177 V HIGH-LINE+15%=300 VO/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: 90 ~ 132VAC / 180 ~ 264VAC by switch O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 4A 115V/ 8A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =3.31A/ 230VAC I =5.97A/ 115VAC
4	LEAKAGE CURRENT	< 0.5mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	<u>0.469</u> mA(PEAK) <u>0.205</u> mA (RMS)
5	EFFICIENCY(Typ.)	86.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	89.36%
	EFFICIENCY vs LOAD			



6	INRUSH CURRENT(Typ.)	230V/60A 115V/60A COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =54.4A/ 230VAC T50= 1.17ms/230V I =52.4A/ 115VAC T50= 1.28ms/115V
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### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	CH1 : 105%~135% CH2 : 90 ~ 110% Protection type : CH1 OLP, CH2 with battery: The unit will enter to UPS mode when CH1 is around 105%~120%, when total output of CH1 + CH2 reach around 125%~135% output shuts down  CH1 OLP, CH2 without battery:	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta:25°C	121.65%/ 264VAC 121.27/ 230VAC 121.27%/100VAC Protection type : CH1 OLP, CH2 with battery: The unit will enter to UPS mode when CH1 is around 105%~120%, when total output of CH1 + CH2 reach around 125%~135% output shuts down  CH1 OLP, CH2 without battery: Shut



		Shut down o/p voltage, re-power on to removed  CH2 : Constant current limiting; fault condition does not affect CH1 working, recovers automatically after fault condition is removed (External fuse is mandatory in series connection with battery for protection)		down o/p voltage, re-power on to removed  CH2 : Constant current limiting; fault condition does not affect CH1 working, recovers automatically after fault condition is removed (External fuse is mandatory in series connection with battery for protection)
2	OVER VOLTAGE PROTECTION	CH1: 47V~55V Protection type : Shut down o/p voltage , re-power on to removed	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P:MIN LOAD Ta:25°C	50.0V/ 264VAC 50.0V/ 230VAC 50.0V/ 90VAC Protection type : Shut down o/p voltage , re-power on to removed
3	OVER TEMPERATURE PROTECTION	Protection type : Shut down o/p voltage , re-power on to removed	I/P: 264VAC I/P: 90VAC O/P:FULL LOAD	O.T.P Active OK Protection type : Shut down o/p voltage , re-power on to removed
4	BATTERY CUTOFF	32±0.5V	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	<u>32.31 V</u>
5	BATTERY REVERSE POLARITY	Protection type : Protected when reverse polarity , no damage, recovers automatically after fault condition is removed	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	TEST : <u>OK</u>

### CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	AC OK	TTL signal, High / Open : AC OK ; Low : AC Fail ; Ice : max. 30mA@ 50VDC	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	Test: <u>OK</u>
2	DISCHARGE	TTL signal, High / Open : Discharge ; Low : Charge ; Ice : max. 30mA@ 50VDC	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	Test: <u>OK</u>
3	BATTERY FULL	TTL signal, High / Open : Battery full ; Low : Battery charging ; Ice : max. 30mA@ 50VDC	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	Test: <u>OK</u>
4	BATTERY DISCONNECT/ REVERSE POLARITY	TTL signal, High / Open : Battery disconnect/reverse polarity ; Low : Battery connect/normal; Ice : max. 30mA@ 50VDC	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	Test: <u>OK</u>
5	BATTERY LOW	TTL signal, High / Open : Battery low ; Low : Battery normal; Ice : max. 30mA@ 50VDC	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	Test: <u>OK</u>
6	FORCE START	CN2 : PIN7&PIN8 SHORT	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	TEST : <u>OK</u>

### COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor ( D to S) or (C to E) Peak Voltage	Q 1/Q2 Rated : 18A/ 600 V	AC ON/OFF I/P: High-Line +3V =267V 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. Ta:25°C	Q1 Q2 VDS: (1) 506V (2) 562V (3) 510V (4) 506V (5) 506V (6) 506V (7) 506V (1) 530V (2) 570V (3) 534V (4) 530V (5) 530V (6) 538V (7) 542V
2	BAT BUCK Transistor ( D to S) or (C to E) Peak Voltage	Q 304 Rated : 10A/120V	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max)-1 (2)CV(min)=31.5V (3)no load (4)OUTPUT SHORT Ta:25°C	Q304 VDS : (1) 65.8V (2) 65.2V (3) 61.3V (4) 65.8V
3	Diode Peak Voltage	D101 20A/300V D102 20A/400V	AC ON/OFF I/P:High-Line +3V =267V <u>Vo=Vmax</u> 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 <u>Vo=Vnormal</u> O/P: (1)Full Load Ta:25°C	D101: <u>Vo=Vmax</u> VDS: (1) 238V (2) 243V (3) 243V (4) 246V (5) 246V (6) 243V (7) 234V (8) 222V <u>Vo=Vnormal</u> (1) 238V D102: <u>Vo=Vmax</u> VDS: (1) 349V (2) 316V (3) 347V (4) 349V (5) 352V (6) 349V (7) 335V (8) 330V <u>Vo=Vnormal</u> (1) 342V
4	BAT BUCK Diode Peak Voltage	D320 Rated : 5A/100V	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max)-1 (2)CV(min)= 31.5V	D320 VDS : (1) 43.8V (2) 43.8V (3) 44.2V

			(3)no load (4)OUTPUT SHORT Ta:25°C	(4) 44.2V
5	Input Capacitor Voltage	C5/C6 Rated: : 560 $\mu$ / 200 V	I/P:High-Line +3V =267V 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	C5 (1)199V (2)199V (3)191V (4)191V C6 (1)199V (2)199V (3)191V (4)191V
6	Control IC Voltage Test	PWM IC U1 Rated 8 V~ 28V  BAT BUCK IC U304 Rated 8.4V~ 30V	AC ON/OFF U1 I/P:High-Line +3V =267V O/P:(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(Low LINE)  U304 I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max)-1 (2)CV(min) =31.5V (3)no load (4)OUTPUT SHORT Ta:25°C	U1 (1) 19.3V (2) 19.9V (3) 19.3V (4) 19.1V (5) 18.9V  U304 : (1) 14.2V (2) 14.4V (3) 14.2V (4) 14.4V

## ■ SAFETY& E.M.C. TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25°C	I/P-O/P: 2.99mA I/P-FG: 2.75 mA O/P-FG: 2.62 m A NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M $\Omega$ I/P-FG: 500VDC>100M $\Omega$ O/P-FG:500VDC>100M $\Omega$	I/P-O/P: 600 VDC I/P-FG: 600 VDC O/P-FG: 600 VDC Ta:25°C	I/P-O/P: 9999M $\Omega$ I/P-FG: 9999M $\Omega$ O/P-FG: 9999M $\Omega$ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m $\Omega$	40A / 2min Ta:25°C	9m $\Omega$



### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	BS EN/EN55032 (CISPR32), EAC TP TC 020 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
2	RADIATION	BS EN/EN55032 (CISPR32), EAC TP TC 020 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
3	E.S.D	BS EN/EN61000-4-2 Level 3, 8KV air Level 2, 6KV contact	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
4	E.F.T	BS EN/EN61000-4-4 INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
5	SURGE	BS EN/EN61000-4-5 Level 3, 1KV/Line-Line 2KV/Line-FG	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	<input checked="" type="checkbox"/> CRITERIA A <input type="checkbox"/> CRITERIA B
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 : LAD-360B 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 25 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50 °C																																																						
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 25 °C</th> <th>HIGH AMBIENT Ta= 50 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>RTH1</td><td>84.8°C</td><td>100.1°C</td></tr> <tr><td>2</td><td>LF2</td><td>39.5°C</td><td>64.8°C</td></tr> <tr><td>3</td><td>C1</td><td>36.9°C</td><td>62.1°C</td></tr> <tr><td>4</td><td>ZNR1</td><td>36.2°C</td><td>61.4°C</td></tr> <tr><td>5</td><td>BD1</td><td>41.6°C</td><td>66.4°C</td></tr> <tr><td>6</td><td>C6</td><td>36.0°C</td><td>59.4°C</td></tr> <tr><td>7</td><td>Q2</td><td>43.7°C</td><td>72.7°C</td></tr> <tr><td>8</td><td>T2</td><td>31.6°C</td><td>57.2°C</td></tr> <tr><td>9</td><td>Q1</td><td>42.9°C</td><td>71.4°C</td></tr> <tr><td>10</td><td>RTH3</td><td>58.2°C</td><td>84.7°C</td></tr> <tr><td>11</td><td>D10</td><td>31.6°C</td><td>59.0°C</td></tr> <tr><td>12</td><td>R18</td><td>39.6°C</td><td>66.1°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C	1	RTH1	84.8°C	100.1°C	2	LF2	39.5°C	64.8°C	3	C1	36.9°C	62.1°C	4	ZNR1	36.2°C	61.4°C	5	BD1	41.6°C	66.4°C	6	C6	36.0°C	59.4°C	7	Q2	43.7°C	72.7°C	8	T2	31.6°C	57.2°C	9	Q1	42.9°C	71.4°C	10	RTH3	58.2°C	84.7°C	11	D10	31.6°C	59.0°C	12	R18	39.6°C	66.1°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 118.9%LOAD Ta : 25°C	TEST : OK																																																																																																																																					
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC O/P : 100 %LOAD Ta= -25°C	TEST : OK																																																																																																																																					
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C/95 %R.H NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 51 °C HUMIDITY= 95 %R.H	TEST : OK																																																																																																																																					
5	TEMPERATURE COEFFICIENT	±0.03%/°C(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	±0.0081%/°C(0~50°C)																																																																																																																																					



6	STORAGE TEMPERATURE TEST	-30~85°C	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 : 10 CYCLE 5. Input/Output condition : STATIC
7	THERMAL SHOCK TEST	-20~50°C	1. Thermal shock Temperature : -25°C~ +55°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:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test
8	VIBRATION TEST	10 ~ 500Hz, 5G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
9	CAPACITOR LIFE CYCLE	SUPPOSE C110 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50 °C LIFE TIME	(1) 108315.2HRS (2) 152122.8HRS (3) 224210HRS (4) 305609.5HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1394.9K hrs min. Telcordia SR-332 (Bellcore); 153.3K hrs min. MIL-HDBK-217F (25°C)	
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Yuwei	Liutt	WangDZ

2020.10.1 TAG-QA-009