



# Test Report: LAD-360BU

---

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

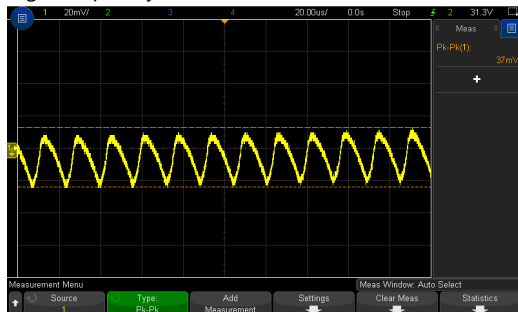
ENVIRONMENT TEST

## DESIGN VERIFY TEST

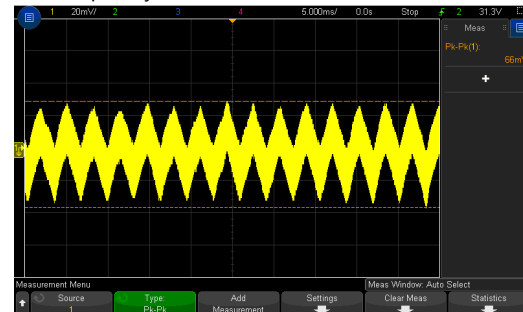
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6V~ 29V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	20.897~29.907/230VAC 20.931~29.909/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1% ~ +1 %	I/P: 230VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.09%~ 0.11%
3	LINE REGULATION (Max)	V1: -0.5 %~ +0.5 %	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.02%~ 0.04%
4	LOAD REGULATION(Max)	V1: -0.5 %~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.09%~ 0.11%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	0.4 %
6	RIPPLE & NOISE(Max )	V1: 150mVp-p	I/P:230VAC O/P: TESTING LOAD Ta:25°C	V1: 66mVp-p

high frequency :

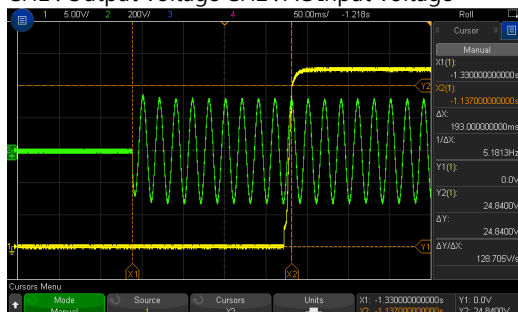


low frequency :

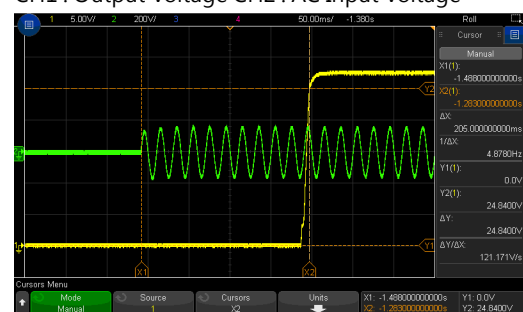


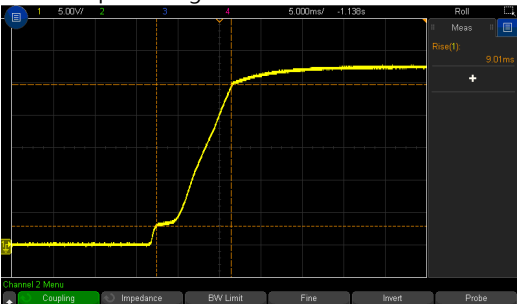
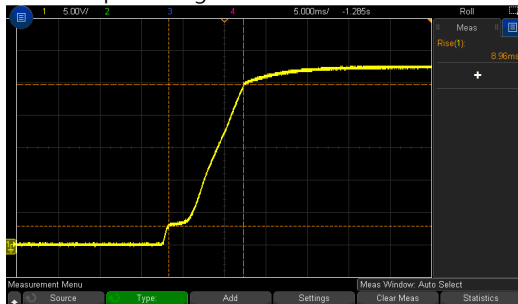
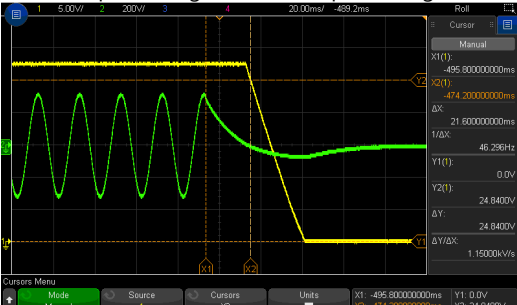
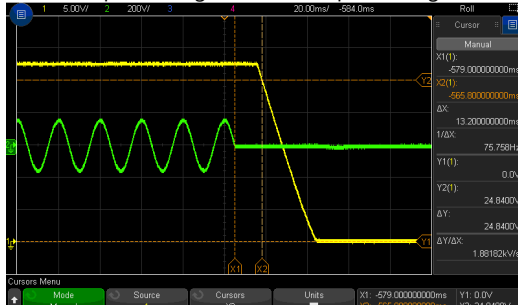
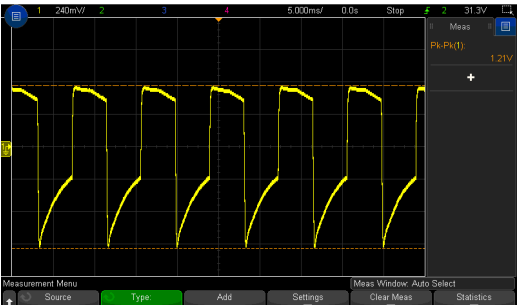
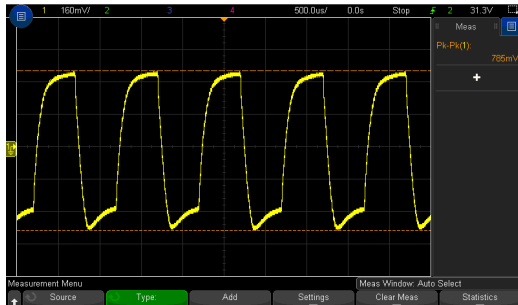
7	SET UP TIME(Max)	230VAC/2000ms 115VAC/2000ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 193ms 115VAC/ 205ms
---	------------------	--------------------------------	--	--------------------------------

INPUT=230VAC/50HZ @ FULL LOAD  
CH1 : Output Voltage CH2 : AC Input Voltage



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



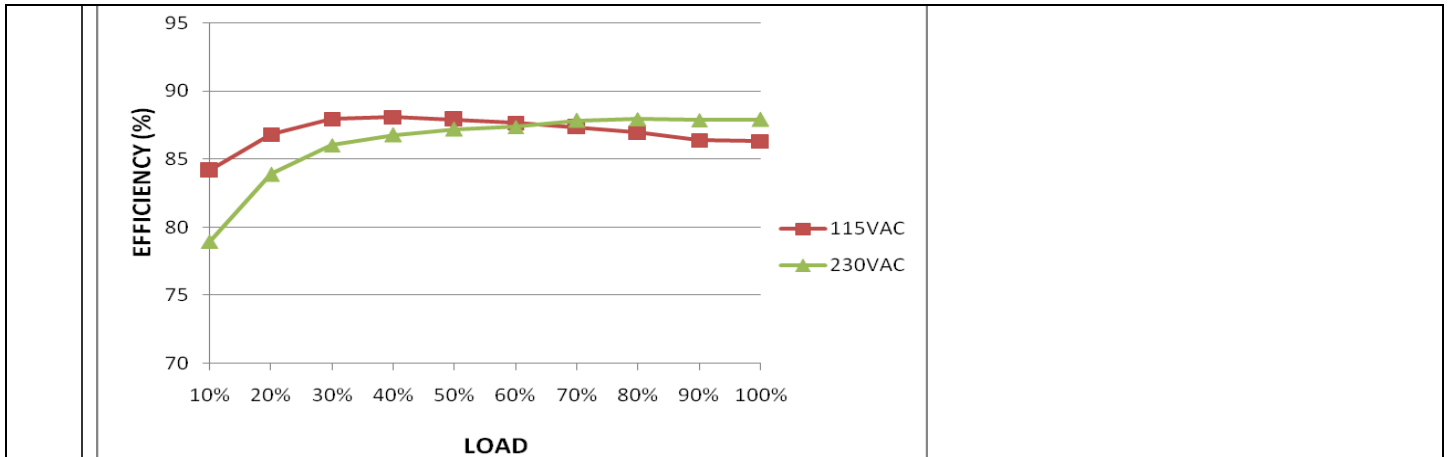
8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 9.01ms 115VAC/ 8.96ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 		
9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 21.6ms 115VAC/ 13.2ms
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: 2760mVp-p	I/P: 230VAC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	1210mVp-p 785mVp-p
FULL /MIN LOAD 50%DUTY / 120HZ 		FULL /MIN LOAD 50%DUTY / 1KHZ 		
11	TRANSIENT RECOVERY TIME	V1: 2760mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	599mVp-p



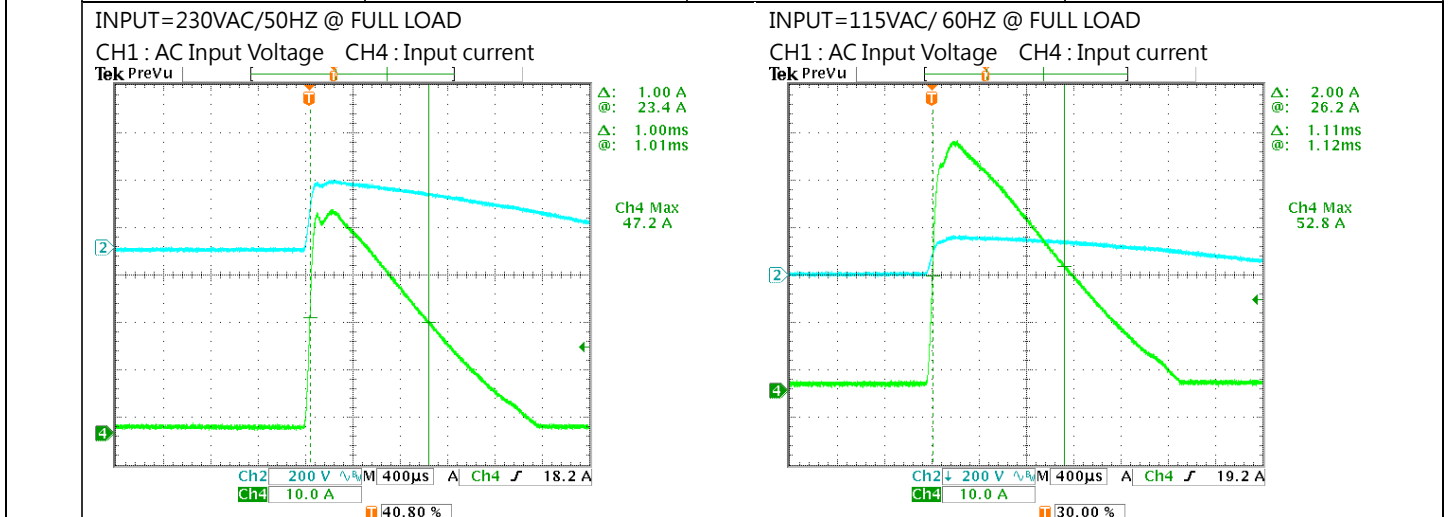
12	Battery static discharge current	After battery low protection <100uA	I/P : 230 VAC O/P : TESTING Ta : 25°C	0uA
13	BAT RATED CURRENT	1.5±0.15A	I/P: 230VAC O/P:CV=24V Ta:25°C	1.44A

### 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) 90V~132V/ FULL LOAD 86V~132V/ 80% LOAD 168V~264V/ FULL LOAD (switch on 230VAC) (2) 229.6Vdc~370Vdc/FULL LOAD 229.6Vdc~370Vdc/80% LOAD (3) 229.6Vdc~370Vdc/FULL LOAD 229.6Vdc~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/ 4 A 115V/8 A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =3.28A/ 230VAC I =5.94A/ 115VAC
4	LEAKAGE CURRENT	< 0.5mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	<u>0.486</u> mA(PeAK) <u>0.208</u> mA (RMS)
5	EFFICIENCY(Typ.)	86%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	87.9%
	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 =47.2A/ 230VAC T50= 1ms/230V I =52.8A/ 115VAC T50= 1.11ms/115V
---	----------------------	------------------------------------	--	---



### 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	119.4%/ 264VAC 118.6%/ 230VAC 119.2%/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 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)		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)
2	OVER VOLTAGE PROTECTION	CH1: 31V~36V 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	31.5V/ 264VAC 31.5V/ 230VAC 31.5V/ 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	21.5±0.5V	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	<u>21.3</u> V
5	BATTERY REVERSE POLARITY	Protection type : Protected by 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	115VAC Input: Signals AC failure and activates when input voltage <75VAC Recover the main power supply when input voltage >85VAC 230VAC Input: Signals AC failure and activates when input voltage <165VAC Recover the main power supply when input voltage >175VAC	I/P: 115VAC/230 VAC O/P:BAT. LOAD Ta:25°C	TEST : ( 1 ) 115VAC : ≤ <u>73.66</u> V AC failure ≥ <u>82.75</u> V AC OK  ( 2 ) 230VAC : ≤ <u>164.4</u> V AC failure ≥ <u>174.4</u> V AC OK
2	CHARGER CIRCUIT FAIL	Battery disconnected, battery reverse polarity , signal failure	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	TEST: <u>OK</u>



3	BUZZER ALARM	Battery low( fire alarm system selectable by UART)  AC fail, Battery low, battery disconnected, battery reverse connect, overload status (evacuation system selectable by UART)	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: VDS: (1) 480V (1) 492V (2) 512V (2) 581V (3) 480V (3) 492V (4) 480V (4) 492V (5) 484V (5) 492V (6) 480V (6) 492V (7) 501V (7) 557V
2	BAT BUCK Transistor ( D to S) or (C to E) Peak Voltage	Q 304 Rated : 70A/60V	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max)-1=26.6V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C	Q304 VDS : (1) 26.8V (2) 28.8V (3) 26.3V (4) 26.8V
3	Diode Peak Voltage	D101 20A/200V D102 20A/300V	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/	D101: D102: <u>Vo=Vmax</u> <u>Vo=Vmax</u> VDS: VDS: (1) 175V (1) 229V (2) 183V (2) 241V (3) 176V (3) 225V (4) 175V (4) 227V (5) 175V (5) 225V (6) 175V (6) 219V (7) 182V (7) 217V

			<p>Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8)NO LOAD <math>V_o=V_{normal}</math> O/P: (1)Full Load Ta:25°C</p>	<p>(8) 165V <math>V_o=V_{normal}</math> (1) 178V</p>	<p>(8) 209V <math>V_o=V_{normal}</math> (1) 223V</p>
4	BAT BUCK Diode Peak Voltage	D320 Rated : 5A/100V	<p>AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max)-1=26.6V (2)CV(min)= 21V (3)no load (4)OUTPUT SHORT Ta:25°C</p>	D320 VDS : (1) 31.2V (2) 31.2V (3) 31.5V (4) 30.3V	
5	Input Capacitor Voltage	C5/C6 Rated: : 560 $\mu$ / 200 V	<p>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</p>	C5 (1)198V (2)190V (3)190V (4)194V	C6 (1)198V (2)192V (3)192V (4)194V
6	Control IC Voltage Test	<p>PWM IC U1 Rated 8 V~ 28V  MCU IC U300 Rated 2.4V~ 3.6V  BAT BUCK IC U304 Rated 8.4V~ 30V</p>	<p>AC ON/OFF U1/U300 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=26.6V (2)CV(min)=21V (3)no load (4)OUTPUT SHORT Ta:25°C</p>	<p>U1 (1) 19.0V (2) 19.2V (3) 19.2V (4) 19.0V (5) 18.8V  U300 (1) 3.33V (2) 3.33V (3) 3.33V (4) 3.33V (5) 3.33V</p>	<p>U304 : (1) 13.6V (2) 13.6V (3) 13.6V (4) 13.6V</p>

## ■ 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: 2.93mA I/P-FG: 2.74mA O/P-FG: 2.61 mA 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: 600 VDC I/P-FG: 600 VDC O/P-FG: 600 VDC Ta:25°C	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	8 mΩ

### 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-360BU 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		



		NO	Position	ROOM AMBIENT Ta= 25 °C	HIGH AMBIENT Ta= 50 °C
		1	RTH1	60.9°C	81.4°C
		2	C5	40.5°C	62.7°C
		3	LF2	42.1°C	66.9°C
		4	ZNR1	39.6°C	64.2°C
		5	C1	40.3°C	65.0°C
		6	Q2	44.8°C	72.6°C
		7	D10	34.8°C	60.6°C
		8	BD1	42.6°C	67.2°C
		9	T2	32.8°C	57.2°C
		10	Q1	44.1°C	71.8°C
		11	R18	46.0°C	70.3°C
		12	U6	34.8°C	59.8°C
		13	T1coil	73.3°C	98.2°C
		14	T1core	46.2°C	71.1°C
		15	D102	71.3°C	94.8°C
		16	D101	52.4°C	77.4°C
		17	U301	43.1°C	68.4°C
		18	U300	42.0°C	67.2°C
		19	U305	41.4°C	66.7°C
		20	L100	70.2°C	96.9°C
		21	C37	31.9°C	56.5°C
		22	Q200	60.6°C	84.2°C
		23	L101	45.9°C	70.9°C
		24	C110	41.6°C	66.3°C
		25	RTH3	60.3°C	86.0°C
		26	C108	47.0°C	72.1°C
		27	C105	46.5°C	71.4°C
		28	C367	45.8°C	71.0°C
		29	Q305	43.1°C	68.3°C
		30	U500	58.9°C	84.7°C
		31	R112	71.5°C	79.7°C
		32	L301	43.6°C	69.2°C
		33	J107	51.7°C	76.8°C
		34	RG1	48.5°C	78.4°C
		35	D320	47.3°C	72.8°C
		36	BD2	45.9°C	69.5°C
		37	U1	30.2°C	55.7°C
		38	Q304	45.4°C	71.0°C
		39	U304	45.7°C	71.4°C
		40	D30	34.4°C	60.2°C
		41	U2	39.3°C	64.7°C
		42	D201	47.3°C	72.6°C
		43	J108	46.5°C	72.0°C
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	±0.0078%/°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) 817914.2HRS (2) 143589.4HRS (3) 237752.2HRS (4) 332834.6HRS	
10	MTBF	Conducted by Parts Stress Analysis Prediction 1160.5K hrs min. Telcordia SR-332 (Bellcore) ; 126.5K 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