



Test Report: LAD-360DU

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

■ 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

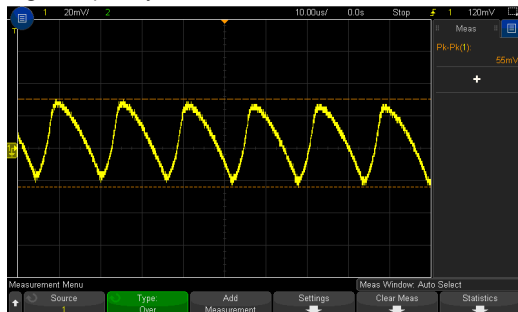
ENVIRONMENT TEST

DESIGN VERIFY TEST

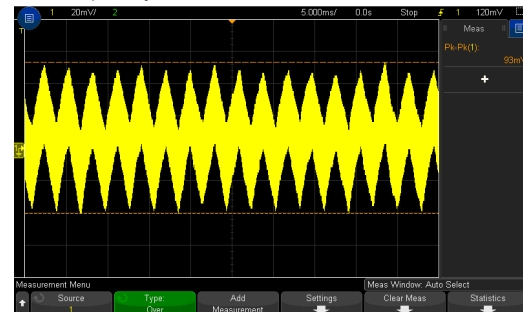
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 43.5V~ 58V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	41.281V~60.86V/230VAC 41.303V~60.87V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -0.5% ~ +0.5 %	I/P: 230VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: -0.0725%~ 0.0725%
3	LINE REGULATION (Max)	V1: -0.5 %~ +0.5 %	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.0181%~ 0.0181%
4	LOAD REGULATION(Max)	V1: -0.5 %~ +0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.0725%~ 0.0725%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.1 %
6	RIPPLE & NOISE(Max)	V1: 240mVp-p	I/P:230VAC O/P: TESTING LOAD Ta:25°C	V1: 93mVp-p

high frequency :

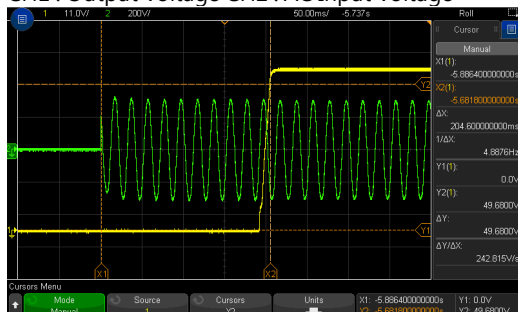


low frequency :

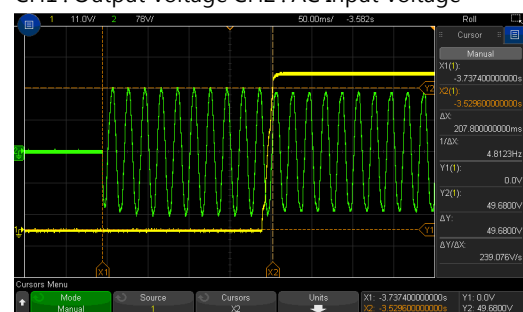


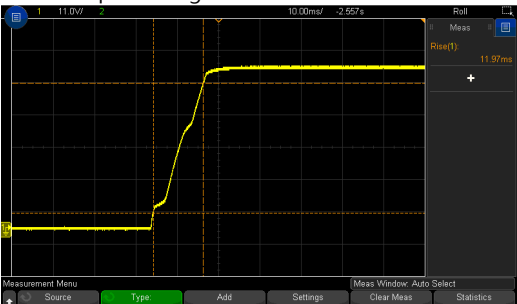
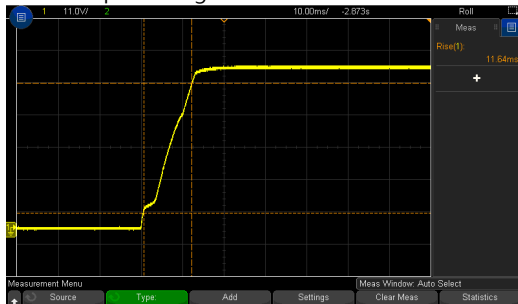
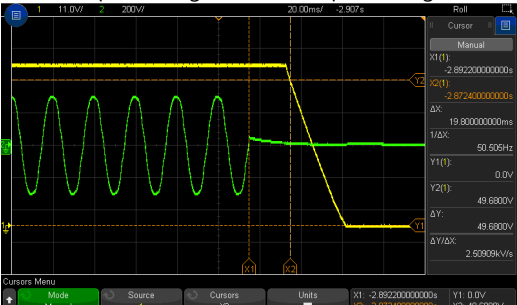
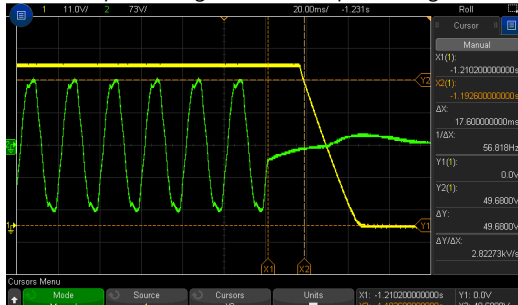
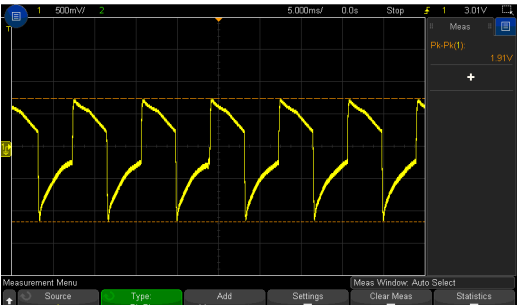
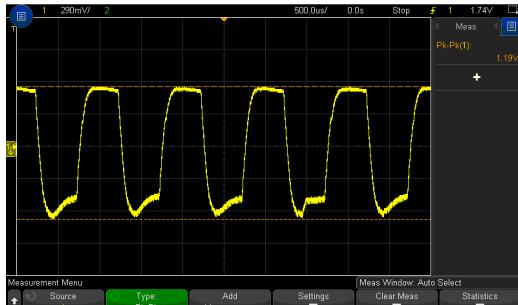
7	SET UP TIME(Max)	230VAC/2000ms 115VAC/2000ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/204.6 ms 115VAC/207.8 ms
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INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



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



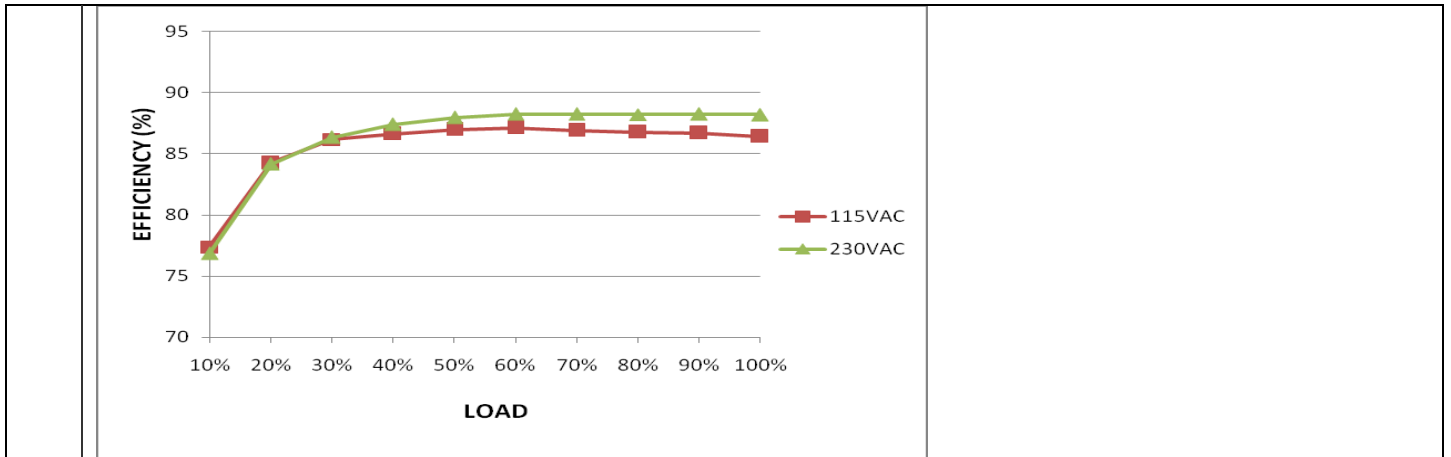
8	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/11.97 ms 115VAC/ 11.64ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME (Typ.)	230VAC/16ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/19.80 ms 115VAC/ 17.60 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: 5520mVp-p	I/P: 230VAC O/P: (1)FULL /MIN LOAD 50%DUTY / 120HZ (2)FULL /MIN LOAD 50%DUTY / 1KHZ Ta:25°C	1910mVp-p 1190mVp-p
	FULL /MIN LOAD 50%DUTY / 120HZ 		FULL /MIN LOAD 50%DUTY / 1KHZ 	
11	TRANSIENT RECOVERY TIME	V1: 5520mVp-p	I/P: 230VAC O/P:40% LOAD CHANGE 50%DUTY/120HZ 1.25A/us	770mVp-p



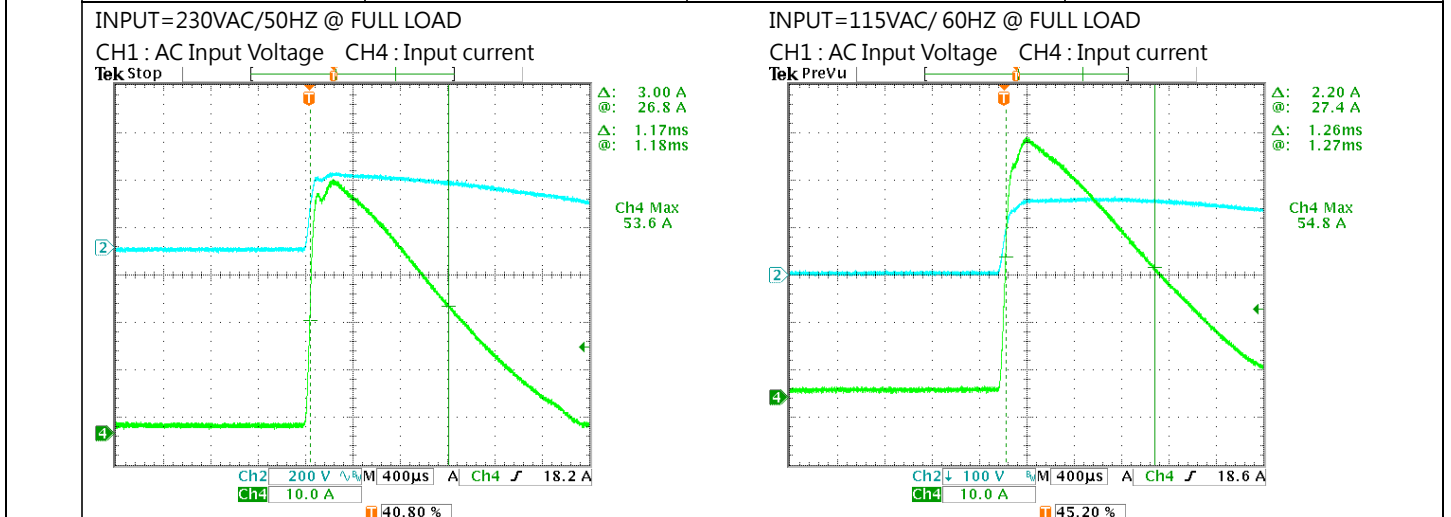
12	Battery static discharge current	After battery low protection <100uA	I/P : 230 VAC O/P : TESTING Ta : 25°C	17.28uA
13	BAT RATED CURRENT	1.5±0.15 A	I/P: 230VAC O/P:CV=48V Ta:25°C	1.4222A

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) 89.806V~132V/ FULL LOAD 86.62V~132V/ 80% LOAD 165.28V~264V/ FULL LOAD (switch on 230VAC) (2) 229.4Vdc~370Vdc/FULL LOAD 229.3Vdc~370Vdc/80% LOAD (3) 229.4Vdc~370Vdc/FULL LOAD 229.3Vdc~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 =3.275A/ 230VAC I =5.977A/ 115VAC
4	LEAKAGE CURRENT	< 0.5mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	0.4472 mA / (PEAK) 0.2017 mA / (RMS)
5	EFFICIENCY(Typ.)	86.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	89.26 %
	EFFICIENCY vs LOAD			



6	INRUSH CURRENT(Typ.)	230V/60A	I/P : 230 VAC	I =53.6A/ 230VAC
		115V/60A	I/P : 115 VAC	T50= 1.17ms/230V
		COLD START	O/P : FULL LOAD	I =54.8A/ 115VAC
			Ta : 25°C	T50= 1.26ms/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	117.61%/ 264VAC 116.57%/ 230VAC 116.998%/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: 59V~69V 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	63.2 V/ 264VAC 63.2V/ 230VAC 63.2 V/ 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	43±0.5V	I/P: 230 VAC O/P:BAT. LOAD Ta:25°C	<u>43.41</u> V
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	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: 230 VAC O/P:BAT. LOAD Ta:25°C	TEST : (1) 115VAC : ≤ <u>76.81 V</u> AC failure ≥ <u>86.22 V</u> AC OK (2) 230VAC : ≤ <u>165.74 V</u> AC failure ≥ <u>175.69 V</u> 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>
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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) 487V (2) 539V (3) 491V (4) 491V (5) 491V (6) 491V (7) 499V (1) 504V (2) 587V (3) 504V (4) 493V (5) 488V (6) 488V (7) 516V
2	BAT BUCK Transistor (D to S) or (C to E) Peak Voltage	Q 304 Rated : 53A/100V	AC ON/OFF I/P:High-Line +3V = 267 V VDS : O/P: (1)CV (max)-1=54.2V (2)CV(min)=42V (3)no load (4)OUTPUT SHORT Ta:25°C	Q304 VDS : (1) 68.0V (2) 68.0V (3) 68.0V (4) 68.0V
3	Diode Peak Voltage	D101 20A/400V D102 20A/600V	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) 303V (2) 289V (3) 297V (4) 305V (5) 301V (6) 303V (7) 281V (1) 514V (2) 450V (3) 527V (4) 523V (5) 523V (6) 506V (7) 458V



			<p>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</p>	<p>(8) 265V <u>Vo=Vnormal</u> (1) 303V</p>	<p>(8) 474V <u>Vo=Vnormal</u> (1) 510V</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=54.2V (2)CV(min)= 42V (3)no load (4)OUTPUT SHORT Ta:25°C</p>	D320 VDS : (1) 56.7V (2) 56.7V (3) 56.7V (4) 56.1V	
5	Input Capacitor Voltage	C5/C6 Rated: : 560 μ / 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)191V (3)193V (4)191V	C6 (1)198V (2)197V (3)193V (4)191V
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=54.2V (2)CV(min)=42V (3)no load (4)OUTPUT SHORT Ta:25°C</p>	<p>U1 (1) 19.1V (2) 19.5V (3) 19.3V (4) 19.3V (5) 18.9V U300 (1) 3.34V (2) 3.34V (3) 3.34V (4) 3.34V (5) 3.34V U304 : (1) 13.7V (2) 13.7V (3) 13.6V (4) 13.7V</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: 2.983 mA I/P-FG: 2.693 mA O/P-FG: 2.532 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	8mΩ

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	■ CRITERIA A □ 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	■ CRITERIA A □ 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	■ CRITERIA A □ 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-360DU 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	C5	41.2°C	63.0°C
2	RTH1	96.0°C	107.8°C
3	LF2	42.0°C	67.0°C
4	C1	41.3°C	66.0°C
5	ZNR1	40.5°C	64.7°C
6	T2	31.4°C	56.3°C
7	Q1	43.6°C	71.5°C
8	Q2	43.7°C	71.6°C
9	D10	35.5°C	60.4°C
10	R18	51.1°C	75.8°C
11	U305	42.8°C	68.9°C
12	T1coil	71.3°C	93.2°C
13	T1core	51.4°C	77.7°C
14	D102	60.7°C	83.1°C
15	D101	46.9°C	72.6°C
16	C37	32.5°C	57.3°C
17	U6	34.1°C	59.4°C
18	L101	40.4°C	65.7°C
19	Q200	52.4°C	75.5°C
20	C108	46.1°C	72.2°C
21	RTH3	61.9°C	88.6°C
22	L301	44.4°C	70.8°C
23	Q305	43.7°C	69.5°C
24	RY101	39.2°C	65.0°C
25	L100	76.1°C	104.4°C
26	U2	38.9°C	64.9°C
27	U1	32.5°C	57.9°C
28	Q30	37.0°C	62.2°C
29	BD2	43.8°C	66.4°C
30	RG1	55.2°C	75.6°C
31	D200	42.0°C	67.8°C
32	U304	47.9°C	73.8°C
33	Q304	47.6°C	73.7°C
34	D320	45.9°C	71.6°C
35	D361	52.0°C	78.2°C
36	R112	87.3°C	91.9°C
37	U500	67.2°C	89.0°C
38	U301	42.1°C	68.0°C
39	U300	40.8°C	66.5°C
40	C110	39.9°C	65.3°C
41	C106	44.8°C	70.2°C

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 113.9%LOAD Ta : 25°C	TEST : OK
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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	±0.0067%/°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) 610367.8HRS (2) 99977.7HRS (3) 149089.3HRS (4) 200111.4HRS	
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