Test Report: LAD-360D

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

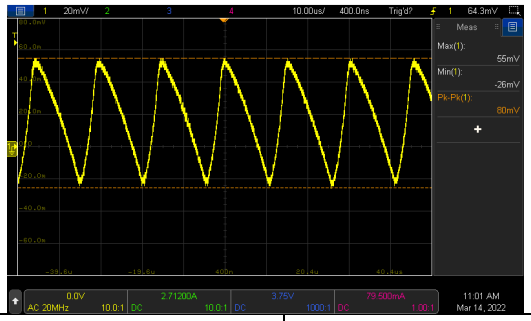
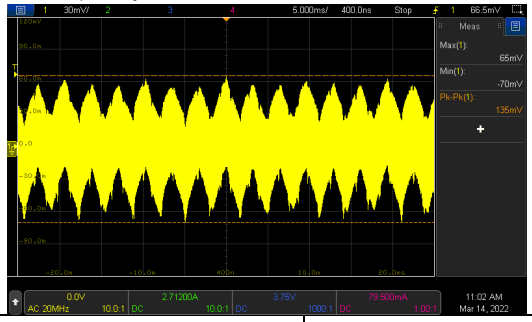
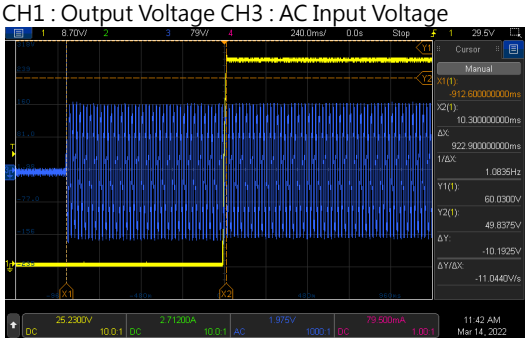
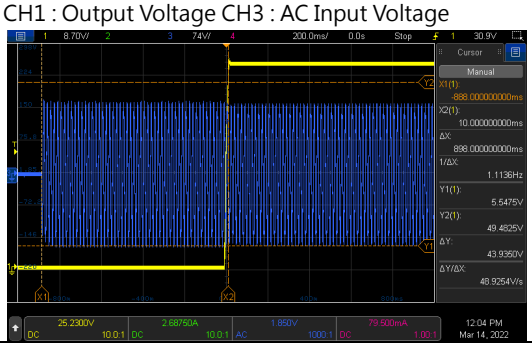
Safety Test
E.M.C. Test

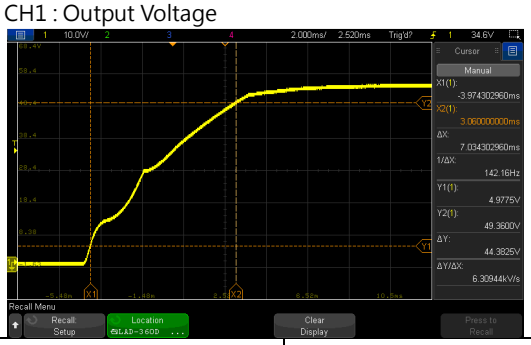
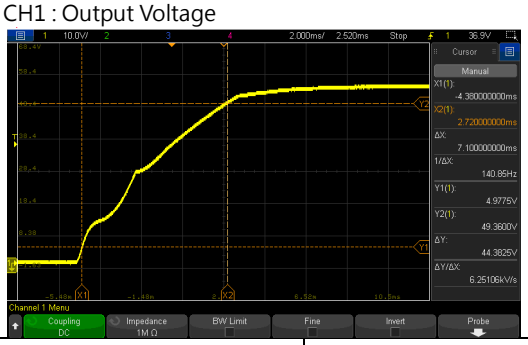
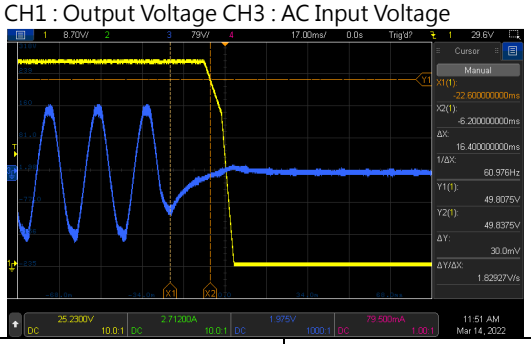
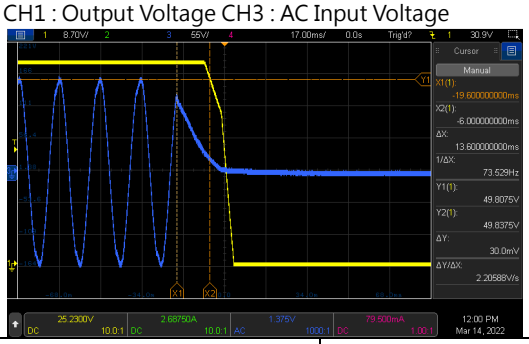
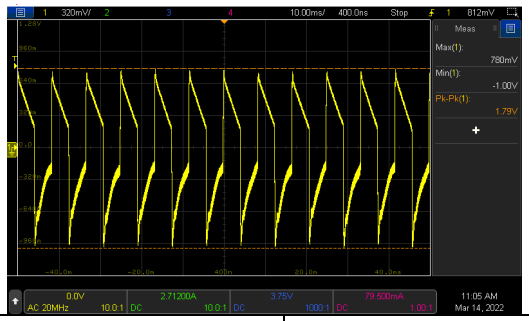
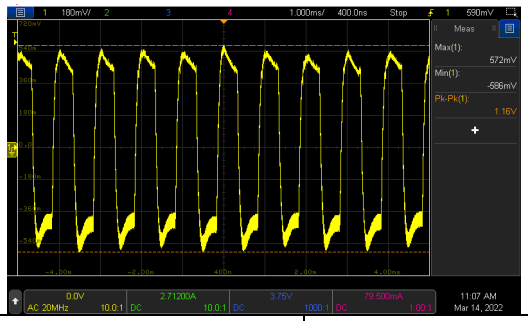
■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

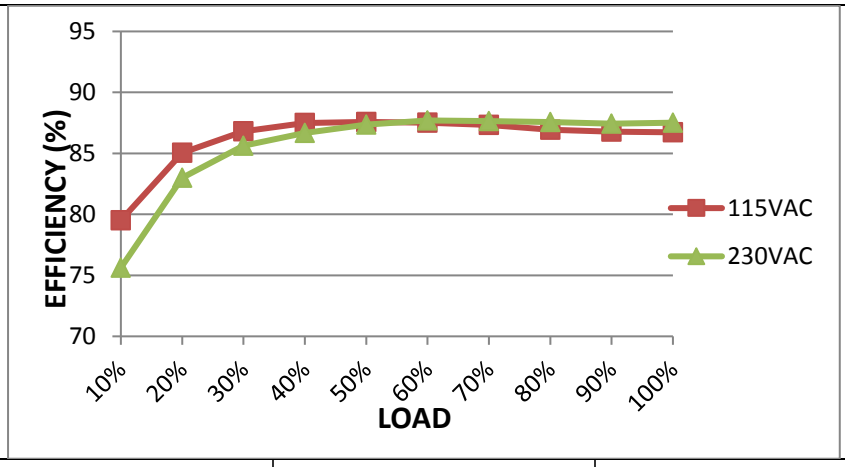
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1:43.5V~ 58V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	42.023V~60.852V/230VAC 42.062V~60.901V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1:-0.5%~+0.5 %	I/P: 230VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -0.127%~0.0906%
3	LINE REGULATION(Max)	V1:-0.5%~+0.5 %	I/P: 90VAC~264VAC O/P:FULL LOAD Ta:25℃	V1:-0.127%~0.0362%
4	LOAD REGULATION(Max)	V1:-0.5%~+0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1:-0.0543%~0.0906%
5	OVER/UNDERSHOOT TEST	<±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	0.78%
6	RIPPLE & NOISE(Max)	V1:240mVp-p	I/P:230VAC O/P: TESTING LOAD Ta:25℃	V1:135mVp-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℃	230VAC/922.9ms 115VAC/898ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH3 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH3 : 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℃	230VAC/7.03ms 115VAC/7.10ms
	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℃	230VAC/16.4ms 115VAC/13.6ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH3 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH3 : AC Input Voltage 	
10	DYNAMIC LOAD	V1:5520mVp-p	I/P: 230VAC O/P: (1)FULL/MINLOAD50%DUTY/120HZ (2)FULL/MINLOAD 50%DUTY/1KHZ Ta:25℃	1790mVp-p 1160mVp-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	986mVp-p
12	Battery static discharge current	After battery low protection <100Ua	I/P： 230 VAC O/P：TESTING Ta：25℃	2.7uA

13	BATRATED CURRENT	1.5±0.15A	I/P: 230VAC O/P:CV=48V Ta:25℃	1.55A

INPUT FUNCTION TEST

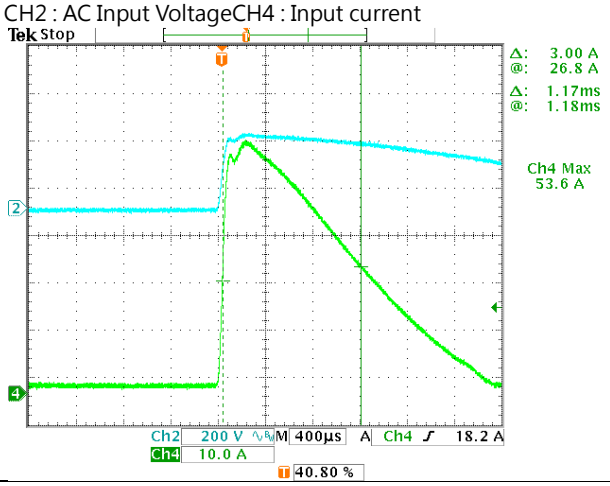
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90 ~ 132VAC / 180 ~ 264VAC by switch 240 ~ 370VDC (Default switch at 230VAC)	(1) I/P:TESTING O/P:FULL LOAD/80% LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 80% LOAD (switch on 230VAC) (3) I/P:DC TESTING(L:- N:+) O/P: FULL /80% LOAD (switch on 230VAC) Ta:25℃	(1) 92.8V~132V/ FULL LOAD 86.7V~132V/80% LOAD 172.5V~264V/ FULL LOAD (switch on 230VAC) (2)229.09Vdc~370Vdc/FULL LOAD 229.09 Vdc~370Vdc/80% LOAD (3) 229.22Vdc~370Vdc/FULL LOAD 229.22dc~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%=300VO/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℃	TEST:OK
3	INPUT CURRENT(Typ.)	230V/ 4A 115V/ 8A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =3.04A/ 230VAC I =6.16A/ 115VAC
4	LEAKAGE CURRENT	<0.5mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	0.415mA(PEAK) 0.457mA (RMS)
5	EFFICIENCY(Typ.)	86.5%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	88.27%
	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℃	I =53.6A/ 230VAC T50= 1.17ms/230V I =54.8A/ 115VAC T50= 1.26ms/115V

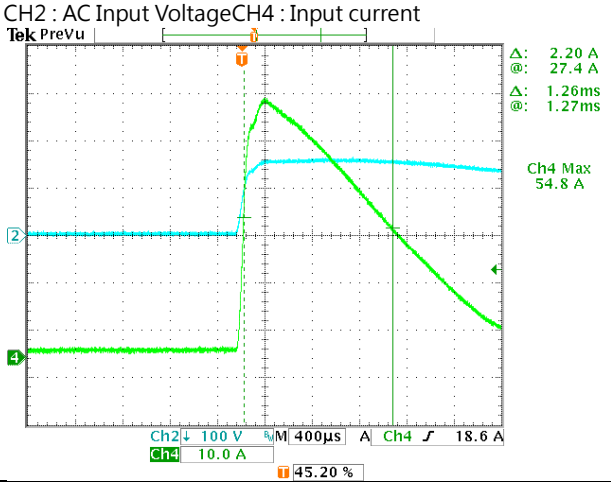
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input VoltageCH4 : Input current



INPUT=115VAC/60HZ @ FULL LOAD

CH2 : AC Input VoltageCH4 : Input current



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOADPROTECTION	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℃	121.59%/ 264VAC 121.13%/ 230VAC 120.83%/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

		Shut down o/p voltage,re-power on to removed CH2 : Constant current limiting; fault condition does not affect CH1 working,recovers automatically after faultcondition is removed (External fuse is mandatory in series connection with battery for protection)		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 faultcondition 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℃	62.7V/264VAC 62.7V/ 230VAC 62.7V/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℃	43.01V
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℃	TEST : OK

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℃	Test：OK
2	DISCHARGE	TTL signal, High / Open : Discharge ; Low : Charge ; Ice : max. 30mA@ 50VDC	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	Test：OK
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℃	Test：OK
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℃	Test：OK
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℃	Test：OK

6	FORCESTART	CN2：PIN7&PIN8SHORT	I/P: 230 VAC O/P:BAT. LOAD Ta:25℃	TEST：OK

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℃	Q1 VDS: (1) 521V (2) 565V (3) 519V (4) 516V (5) 521V (6) 519V (7) 563V Q2 VDS: (1) 541V (2) 559V (3) 538V (4) 538V (5) 538V (6) 538V (7) 558V
2	BATBUCKTransistor (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=54.2V (2)CV(min)=42V (3)no load (4)OUTPUTSHORT Ta:25℃	Q304 VDS : (1) 63.8V (2) 73.7V (3) 70.7V (4) 86.4V
3	Diode PeakVoltage	D101 20A/400V D102 20A/600V	AC ON/OFF I/P:High-Line +3V =267V Vo=Vmax 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 Vo=Vnormal O/P: (1)Full Load Ta:25℃	D101: Vo=Vmax VDS: (1) 273V (2) 283V (3) 311V (4) 376V (5) 278V (6) 283V (7) 276V (8) 270V Vo=Vnormal (1) 273V D102: Vo=Vmax VDS: (1) 552V (2) 476V (3) 524V (4) 524V (5) 532V (6) 496V (7) 456V (8) 443V Vo=Vnormal (1) 556V

4	BATBUCKDiodePeakVoltage	D320 Rated : 5 A/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)OUTPUTSHORT Ta:25℃	D320 VDS : (1) 58.0V (2) 57.6V (3) 56.8V (4) 57.6V
5	Input Capacitor Voltage	C5/C6 Rated: : 560 μ/ 200V	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℃	C5 C6 (1)198V (1)198V (2)190V (2)198V (3)194V (3)192V (4)192V (4)192V
6	Control IC Voltage Test	PWM IC U1Rated 8V~ 28V BATBUCK IC U304Rated 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=54.2V (2)CV(min) =42V (3)no load (4)OUTPUT SHORT Ta:25℃	U1 (1) 19.1V (2) 21.0V (3) 19.9V (4) 20.8V (5) 19.1V U304 : (1) 14.6V (2) 15.2V (3) 13.6V (4) 14.8V

■ SAFETY& E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTANDVOLTAGE	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℃	I/P-O/P: 2.39 mA I/P-FG: 2.08 mA O/P-FG: 3.025 m A NO DAMAGE
2	ISOLATIONRESISTANCE	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℃	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE

3	GROUNDINGCONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	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℃	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℃	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℃	■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℃	■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℃	■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-360B 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 25 ℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 230VAC O/P： FULL LOAD Ta= 50 ℃		

NO	Position	ROOM AMBIENTTa= 25℃	HIGH AMBIENT Ta= 50℃
1	RTH1	84.8℃	100.1℃
2	LF2	39.5℃	64.8℃
3	C1	36.9℃	62.1℃
4	ZNR1	36.2℃	61.4℃
5	BD1	41.6℃	66.4℃
6	C6	36.0℃	59.4℃
7	Q2	43.7℃	72.7℃
8	T2	31.6℃	57.2℃
9	Q1	42.9℃	71.4℃
10	RTH3	58.2℃	84.7℃
11	D10	31.6℃	59.0℃
12	R18	39.6℃	66.1℃

NO	Position	ROOM AMBIENTTa= 25℃	HIGH AMBIENT Ta= 50℃
13	C37	29.1℃	55.4℃
14	T1coil	66.1℃	92.9℃
15	T1core	51.3℃	77.4℃
16	L101	43.0℃	68.9℃
17	L100	66.4℃	94.2℃
18	D101	64.0℃	89.4℃
19	D102	92.1℃	115.7℃
20	Q305	44.9℃	70.4℃
21	L301	41.0℃	66.7℃
22	C105	43.5℃	69.1℃
23	C347	41.9℃	67.7℃
24	C110	42.9℃	68.0℃
25	RY101	39.3℃	65.5℃
26	Q405	39.6℃	65.6℃
27	U400	43.9℃	70.0℃
28	U401	41.8℃	68.3℃
29	U305	46.6℃	72.2℃
30	U1	30.2℃	56.4℃
31	Q30	36.7℃	62.7℃
32	D30	33.9℃	60.2℃
33	D200	46.4℃	72.0℃
34	Q200	58.5℃	82.5℃
35	D320	48.5℃	74.4℃
36	Q304	47.4℃	73.3℃
37	U304	55.5℃	81.1℃
38	J108	50.6℃	76.7℃
39	J107	56.2℃	81.7℃
40	R101	54.7℃	82.5℃
41	R113	64.2℃	91.8℃
42	U6	47.9℃	73.3℃
43	Q315	51.2℃	76.8℃
44	U2	35.8℃	62.0℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P：118.9%LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 264VAC/100VAC O/P： 100%LOAD Ta= -25℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50℃/95 %R.H NO DAMAGE	I/P： 272 VAC O/P：FULL LOAD Ta= 51℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	±0.03%/℃(0~50℃)	I/P： 230 VAC O/P：FULL LOAD	±0.0081%/℃(0~50℃)

6	STORAGE TEMPERATURE TEST	-30~85℃	1. Thermal shock Temperature： -45℃~ +90℃ 2. Temperature change rate ：25℃ / 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℃	1. Thermal shock Temperature： -25℃~ +55℃ 2. Temperature change rate ：25℃ / 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℃
9	CAPACITOR LIFE CYCLE	SUPPOSE C110 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta= 50℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 50℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 50℃ 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℃)	
11	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 30,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	Yuwei	Liutt	WangDZ

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