Test Report: XLC-40-H-MA

40W Multiple-Stage Constant Power LED Driver

■ 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

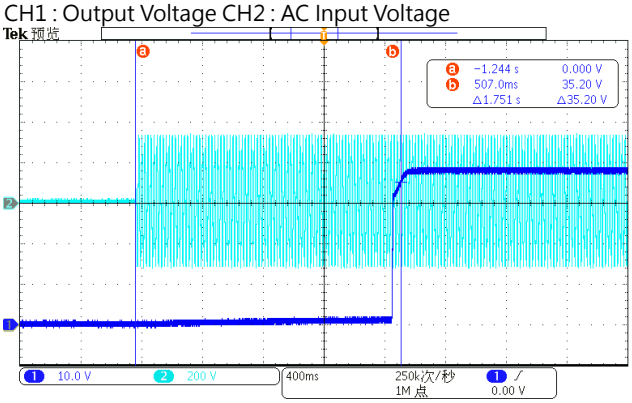
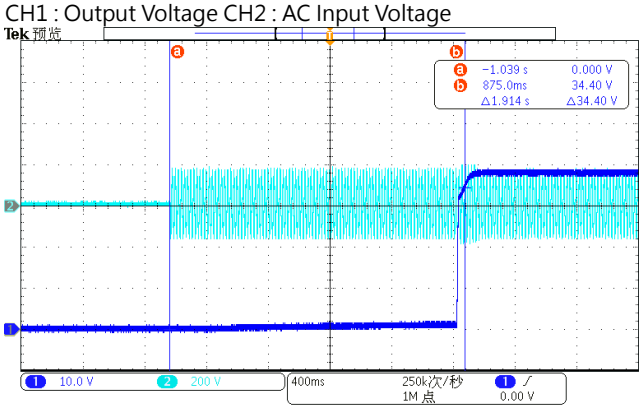
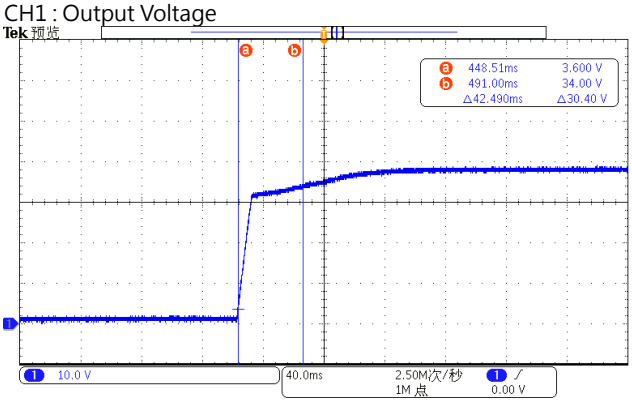
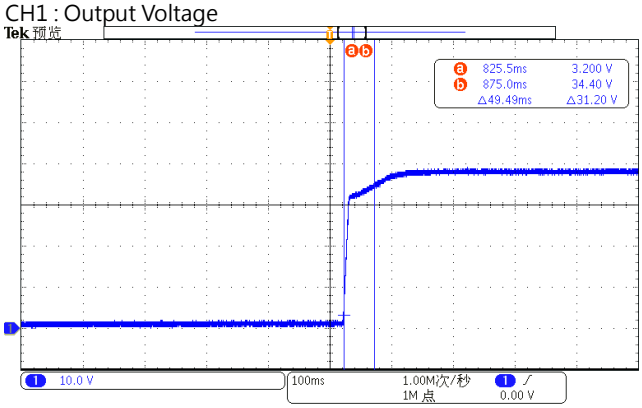
■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

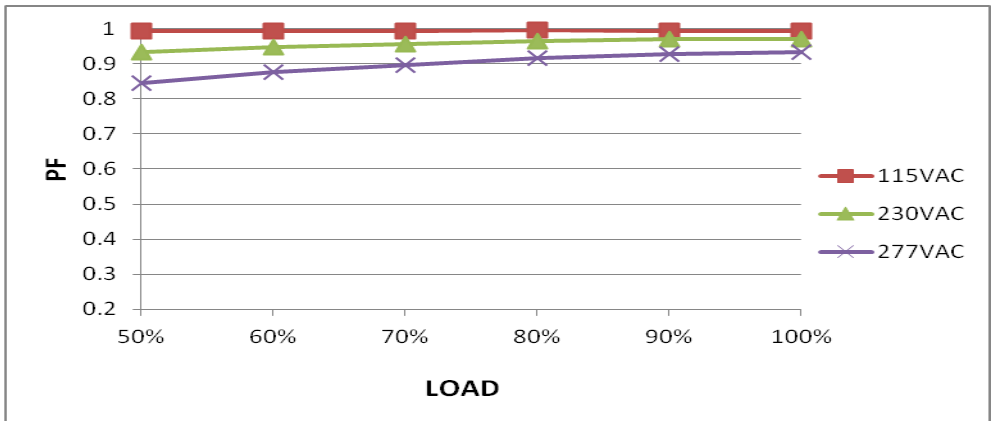
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CURRENT TOLERANCE	± 5%	I/P: 230 VAC I/P:115VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	1.057 A /230VAC@CV MAX-1V 1.064A /230VAC@CV MIN 1.072A/115VAC@CV MAX-1V 1.062A/115VAC@CV MIN 0.67~2.09%
2	CURRENT ADJ. RANGE (BY DIP SWITCH)	CH1:600mA/700mA/800 mA/900mA/1050mA/ 1200mA/1300mA/14 00mA	I/P: 230VAC O/P:CVmin& CVmax-1V CP: 0.6A ~1.05A Ta:25℃	0.611mA/230VAC@CV MAX-1V 0.608mA /230VAC@CV MIN 0.707mA/230VAC@CV MAX-1V 0.704mA/230VAC@CV MIN 0.822mA/230VAC@CV MAX-1V 0.812mA/230VAC@CV MIN 0.899mA/230VAC@CV MAX-1V 0.895mA /230VAC@CV MIN 1.057mA/230VAC@CV MAX-1V 1.064mA /230VAC@CV MIN 1.208mA/230VAC@CV MAX-1V 1.203mA /230VAC@CV MIN 1.312mA/230VAC@CV MAX-1V 1.302mA /230VAC@CV MIN 1.395mA/230VAC@CV MAX-1V 1.393mA /230VAC@CV MIN
3	OPEN CIRCUIT VOLTAGE (max)	60V	I/P: 230VAC O/P: OPEN Ta:25℃	58V
4	CONSTANT CURRENT OPERATION VOLTAGE	CH1: 9V~ 54V	I/P: 230 VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	7.9V~ 56.1V /230VAC
5	CURRENT RIPPLE	< 4%	I/P: 230 VAC I/P:115VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	230VAC: 2.45% 115VAC: 2.26%

6	SET UP TIME (Max)	230VAC/2500ms 115VAC/2500ms	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	230VAC/ 1751ms 115 VAC/1914ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	
7	RISE TIME (Max)	230VAC/100ms 115VAC/ 100ms	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	230VAC/ 42.49ms 115 VAC/49.49 ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	

INPUT FUNCTION TEST

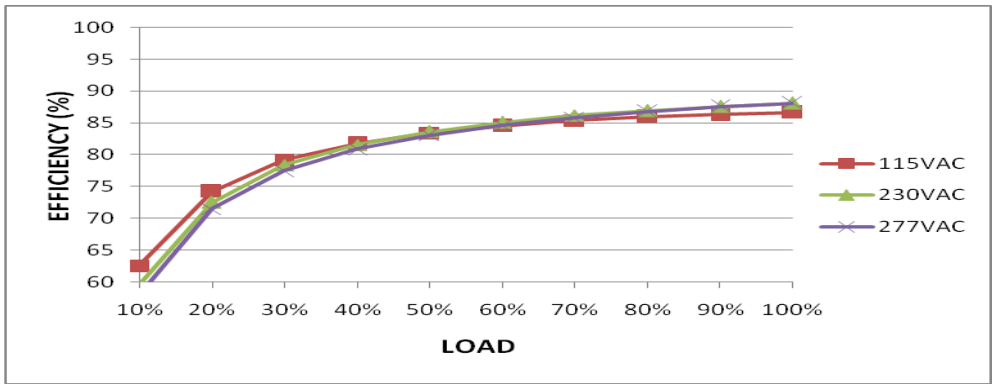
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	100VAC~305VAC 141VDC~400VDC	(1) I/P: TESTING O/P: FULL LOAD (2) I/P: DC TESTING (L: + N:-) O/P: FULL / 50% LOAD (3) I/P: DC TESTING (L: - N: +) O/P: FULL / 50% LOAD (4) I/P: LOW-LINE=141VDC HIGH-LINE=431VDC O/P: Dim on/off 【for Dimming type】 Ta:25℃	(1) 97 VAC ~ 308VAC (2) 141Vdc~431Vdc/FULL LOAD 141 Vdc~431Vdc/50% LOAD (3) 141Vdc~431Vdc/FULL LOAD 141Vdc~431Vdc/50% LOAD (4)OK
			I/P: LOW-LINE-3V=97 VAC HIGH-LINE+10V=315 VAC 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: 100VAC ~305VAC O/P:FULL~MIN LOAD Ta:25℃	OK
3	INPUT CURRENT (TYP)	277VAC/0.2A 230 VAC/0.25A 115 VAC/ 0.5A	I/P: 277VAC/230 VAC/115 VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	I= 0.171A/277VAC I = 0.201A/ 230VAC I = 0.403A/ 115VAC
4	LEAKAGE CURRENT	< 0.75mA / 277VAC	I/P: 277 VAC O/P:Min LOAD Ta:25℃	L-FG: 0.018mA N-FG:0.016mA
5	STANDBY POWER CONSUMPTION	Standby power consumption<0.5W(Dimming off)	I/P：230VAC O/P：TESTING Ta：25℃	0.4825W
6	POWER FACTOR(TYP)	0.95/230 VAC FULL LOAD 0.97/115 VAC FULL LOAD 0.92/277 VAC FULL LOAD	I/P: 230 VAC/115VAC/277VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	PF= 0.971/230V/100%LOAD PF= 0.994/115V/100%LOAD PF= 0.934/277V/100%LOAD

P.F vs LOAD



7	EFFICIENCY (TYP)	88%	I/P: 230 VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	88.32 %

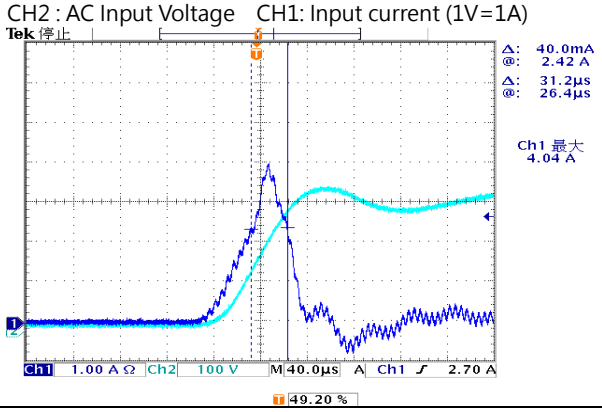
EFFICIENCY vs LOAD

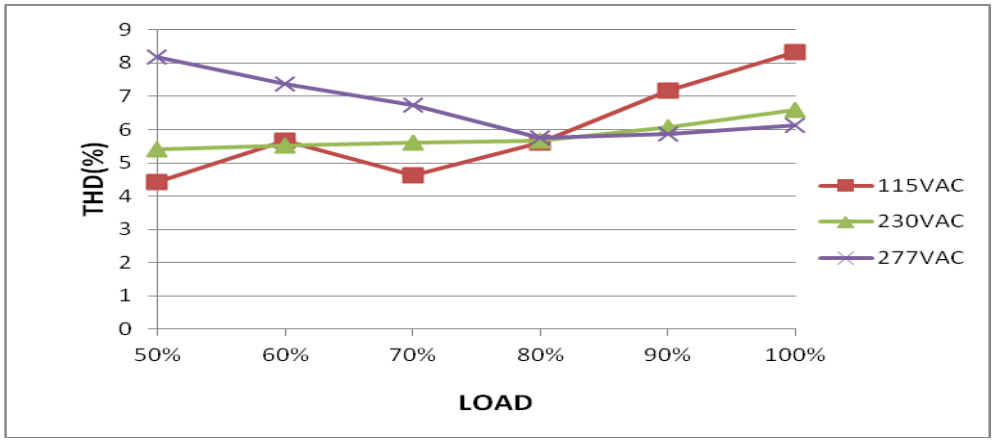


8	INRUSH CURRENT (TYP)	230 V/ 10A COLD START (twidth=100 us measured at 50% Ipeak) COLD START	I/P: 230 VAC O/P:FULL LOAD Ta:25℃ **LEDH MODE TEST**	I =4.04A/ 230VAC T50= **31.2** us

INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH1: Input current (1V=1A)



9	TOTAL HARMONIC DISTORTION	THD< 10%(@load ≥ 50%/230VAC; @load ≥ 75%/277VAC); THD<15%@load 50%/115VAC	I/P : 115VAC/230VAC/277VAC O/P : 50% /75% LOAD Ta : 25℃	THD : 5.4% 230VAC 50% THD : 6.13% 277VAC 75% THD : 4.42% 115VAC 50%
	THD vs LOAD  			

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 305 VAC I/P: 100 VAC O/P:FULL LOAD	O.T.P. Active PROTECTION TYPE : 1: De-rating to 75% loading; Stage 2: De-rating to 50% loading. Recovers automatically after fault condition is removed
2	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC I/P: 100 VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) **Peak Voltage**	Q 1 Rated 800 V/10A	AC ON/OFF I/P: High-Line +3V =308v VDS: O/P: (1) LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short I/P: Low-Line -3V = 97V VDS: O/P: (1) LEDmax (2) LEDmax continue (3) LEDmin (4) LEDmin continue (5) Output Short Ta:25℃	308V **CP: 1.4A** Q1 VDS: (1) 644V (2) 612V (3) 604V (4) 556V (5) 564V **CP: 0.6A** **VDS:** (1) 716V (2) 564V (3) 652V (4) 620V (5) 556V 97V **CP: 1.4A** Q VDS: (1) 382V (2) 370V (3) 382V (4) 334V (5) 318V **CP: 0.6A** VDS: (1) 261V (2) 251V (3) 362V (4) 342V (5) 254V
2	**Diode Peak** Voltage	D100 Rated 3A/ 600 V	AC ON/OFF I/P: High-Line +3V =308 V Q101 : VDS: O/P: (1) LEDmax (2) LEDmax continue (3) Output Short Ta:25℃	D100 (1) 410V (2) 406V (3) 402V

<table>
<tr>
<td>3</td>
<td>Control IC Voltage Test</td>
<td>DD IC U236 Rated (Vin)
8V~100V

MCU IC U261 Rated
2.9V~3.3V</td>
<td>AC ON/OFF
I/P: High-Line +3V =308 V
O/P: (1) LEDmax
(2) LEDmin
(3) OUTPUT SHORT
(4) NO LOAD
(5) Dim off
Ta:25℃</td>
<td>U236
(1) 72.3V
(2) 71.1V
(3) 71.1V
(4) 70.5V
(5) 71.1V

U261
<table>
<tr><th>TEST CONDITION</th><th>Level</th><th>Ripple</th><th>Spike</th></tr>
<tr><td>LEDmax</td><td>3.308V</td><td>0.351%</td><td>3.33%</td></tr>
<tr><td>LEDmin</td><td>3.320V</td><td>0.42%</td><td>3.31%</td></tr>
<tr><td>Output Short</td><td>3.315V</td><td>0.387%</td><td>3.45%</td></tr>
<tr><td>NO LOAD VRmin.LOW LINE</td><td>3.317V</td><td>0.41%</td><td>3.48%</td></tr>
<tr><td>DIM OFF</td><td>3.311V</td><td>0.39%</td><td>3.45%</td></tr>
</table>
</td>
</tr>
<tr>
<td>4</td>
<td>Clamp Diode Peak Voltage</td>
<td>D10 Rated：
1000V/1A</td>
<td>AC ON/OFF
I/P：High-Line +3V = 308 V
O/P: (1) LEDmax
(2) LEDmax continue
(3) LEDmin
(4) LEDmin continue
(5) NO LOAD
Ta：25℃</td>
<td>(1)682V
(2)569V
(3)718V
(4)545V
(5)722V</td>
</tr>
<tr>
<td>5</td>
<td>Dimming MOS</td>
<td>Q110 Rated：
100V /35A</td>
<td>AC ON/OFF
I/P：High-Line +3V = 308 V
O/P: (1) LEDmax
(2) LEDmax continue
(3) Short
Ta:25℃</td>
<td>CP: 0.6A
(1)76V
(2) 75.2V
(3) 76V

CP:1.4A
(1) 75.2V
(2) 74.4V
(3) 72.8V</td>
</tr>
</table>

■ SAFETY & EMC TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min	I/P-O/P: 4.125 KVAC/min Ta:25℃	I/P-O/P: 1.729mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ	I/P-O/P: 500 VDC Ta:25℃	I/P-O/P: 9999MΩ NO DAMAGE

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS C	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	PASS
2	CONDUCTION	EN55015	I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25℃	PASS Test by certified Lab
3	RADIATION	EN55015	I/P: 230 VAC (50HZ) O/P:FULL LOAD Ta:25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 AIR：8KV / Contact：4KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INPUT: 1KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
6	SURGE	IEC61000-4-5 L-N :1KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25℃	CRITERIA A
	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

<table>
<tr><th>NO</th><th>TEST ITEM</th><th>SPECIFICATION</th><th>TEST CONDITION</th><th>RESULT</th></tr>
<tr><td>1</td><td>TEMPERATURE RISE TEST</td><td colspan="3">MODEL：XLC-40-H-MA
1. ROOM AMBIENT BURN-IN：2 HRS
I/P： 230VAC O/P： FULL LOAD Ta=26.0 ℃
2. HIGH AMBIENT BURN-IN： 2 HRS
I/P： 230VAC O/P： FULL LOAD Ta=52.4 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta=26.0 ℃</th><th>HIGH AMBIENT Ta=52.4℃</th></tr>
<tr><td>1</td><td>Q1</td><td>81.3℃</td><td>107.9℃</td></tr>
<tr><td>2</td><td>U1</td><td>68.7℃</td><td>95.1℃</td></tr>
<tr><td>3</td><td>T1</td><td>71.4℃</td><td>97.6℃</td></tr>
<tr><td>4</td><td>D101</td><td>80.7℃</td><td>107.1℃</td></tr>
<tr><td>5</td><td>Q110</td><td>80.2℃</td><td>106.4℃</td></tr>
<tr><td>6</td><td>D112</td><td>78.4℃</td><td>104.8℃</td></tr>
<tr><td>7</td><td>U150</td><td>72.9℃</td><td>99.3℃</td></tr>
<tr><td>8</td><td>L100</td><td>75.5℃</td><td>101.6℃</td></tr>
<tr><td>9</td><td>U236</td><td>68.1℃</td><td>94.5℃</td></tr>
<tr><td>10</td><td>U261</td><td>63.9℃</td><td>90.3℃</td></tr>
<tr><td>11</td><td>U262</td><td>62.3℃</td><td>88.5℃</td></tr>
<tr><td>12</td><td>RT1</td><td>66.8℃</td><td>93.2℃</td></tr>
<tr><td>13</td><td>TC</td><td>62.9℃</td><td>89.3℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 305VAC/110VAC
O/P： 100 % LOAD
Ta=-30 ℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 50 ℃
NO DAMAGE</td><td>I/P： 315 VAC
O/P：FULL LOAD
Ta=50 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03 %(0℃~50℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>± 0.002 %/℃(0~50℃)</td></tr>
<tr><td>5</td><td>STORAGE TEMPERATURE
TEST</td><td>-40~80℃</td><td colspan="2">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：10CYCLE
5. Input/output condition： STATIC
TEST：OK</td></tr>
</table>

6	THERMAL SHOCK TEST	-25~50℃	1. Thermal shock Temperature： -30℃~ +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
7	VIBRATION TEST	10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：10min/sweep cycle (4) Acceleration：3G (5) Test Time：180min in each axis (X.Y.Z) (6) Ta：25℃
8	CAPACITOR LIFE CYCLE	SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Tc=75 ℃ LIFE TIME (2) I/P： 230VAC O/P：75% LOAD Tc=75 ℃ LIFE TIME (3) I/P： 230VAC O/P：50% LOAD Tc=75 ℃ LIFE TIME	 (1) 44175HRS (2) 47567HRS (3) 52398HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 3935.2K hrs min. Telcordia SR-332 (Bellcore) ; 342.9K hrs min. MIL-HDBK-217F (25℃)	
10	Ongoing Reliability Test	I/P：230VAC O/P：FULL LOAD TA=50℃ Demonstration Mean Time Between Failure : 50,000 hours	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	WUWQIN/ZHOUBIAO	WENF	WUWQ

2020.10.1 TAG-QA-009