



# Test Report: HLG-480H-54

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480W Constant Voltage + Constant Current LED Driver

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

## ■ SAFETY & E.M.C. TEST

Safety Test

E.M.C. Test

## ■ RELIABILITY TEST

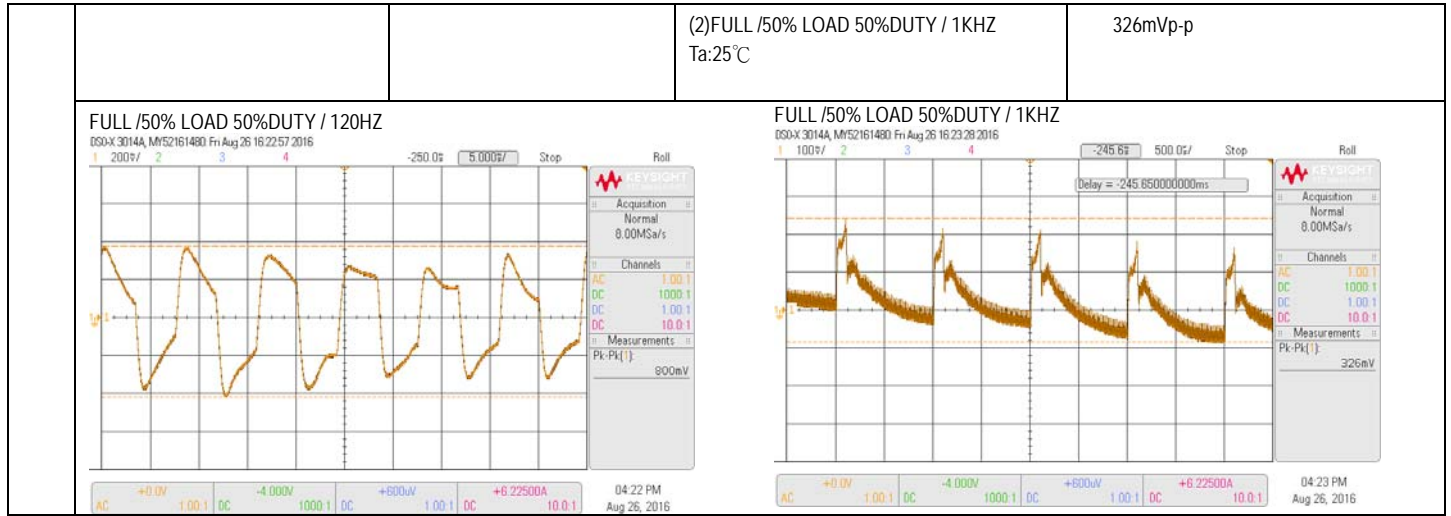
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	CH1: 27 V - 54V	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	0.1V-54V /230VAC
2	VOLTAGE ADJUST RANGE	CH1: 45.9 V - 56.7V	I/P: 230 VAC I/P: 115VAC O/P: MIN LOAD Ta: 25°C	42.106V-58.426V /230VAC 42.104V-58.42V/115VAC
3	CURRENT ADJ. RANGE	CH1: 4.4 A - 8.9 A	I/P: 230 VAC I/P: 115VAC O/P: CV MIN & CV MAX-1V Ta: 25°C	3.614A-9.92A /230VAC@CV MAX-1V 3.607A-9.857A /230VAC@CV MIN 3.597A-9.919 A/115VAC@CV MAX-1V 3.605A-9.854A/115VAC@CV MIN
4	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 1% ~ -1 %	I/P: 100VAC /305AC O/P: FULL / MIN LOAD Ta: 25°C	V1: 0.24%~-0.314 %
5	LINE REGULATION (Max)	V1: 0.5% ~ -0.5 %	I/P: 100VAC-305AC O/P: FULL LOAD Ta: 25°C	V1: 0.054%~ -0.018%
6	LOAD REGULATION (Max)	V1: 0.5 % ~ -0.5 %	I/P: 230 VAC O/P: FULL -MIN LOAD Ta: 25°C	V1: 0.166 %~ -0.333%
7	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	TEST: <5 %
8	RIPPLE & NOISE (Max)	V1: 350 mVp-p	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	V1: 199mVp-p
<p>high frequency :</p>		<p>low frequency :</p>		
9	SET UP TIME (Max)	230VAC / 500 ms 115VAC / 500 ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC / 200ms 115 VAC / 230ms
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>			<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	

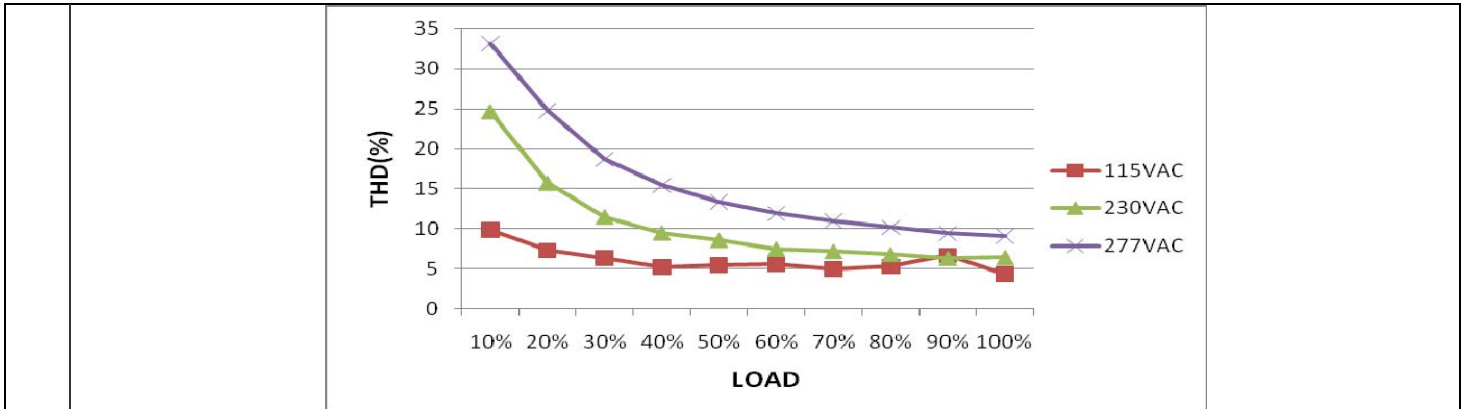
<p>10 RISE TIME (Max)</p>	<p>230VAC/ 80 ms 115VAC/ 80 ms</p>	<p>I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C</p>	<p>230VAC/ 42.8ms 115 VAC/ 42.4ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>
<p>11 HOLD UP TIME (Typ.)</p>	<p>230VAC/ 16 ms 115VAC/ 16 ms</p>	<p>I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C</p>	<p>230VAC/ 29.6ms 115 VAC/ 29.2ms</p>
<p>12 DYNAMIC LOAD</p>	<p>V1: 5400 mVp-p</p>	<p>I/P: 230VAC O/P: (1) FULL /50% LOAD 50% DUTY / 120HZ</p>	<p>800mVp-p</p>



### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC~305 VAC	I/P: TESTING O/P: FULL LOAD Ta:25°C	72V~305 V
			I/P: LOW-LINE-3V=87 V HIGH-LINE+10V=315 V 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: 100 VAC ~305VAC O/P: FULL-MIN LOAD Ta:25°C	OK
3	INPUT CURRENT (TYP)	277VAC/ 2 A 230 VAC/ 2.45 A 115 VAC/ 5 A	I/P: 277VAC/230 VAC/115 VAC O/P: FULL LOAD Ta:25°C	I=1.79 A/277VAC I = 2.12A/ 230VAC I = 4.25A/ 115VAC
4	LEAKAGE CURRENT	< 0.75 mA/ 277VAC	I/P : 277 VAC O/P : Min LOAD Ta : 25°C	L-FG: 0.24mA N-FG: 0.25mA
6	POWER FACTOR(TYP)	0.97/230 VAC FULL LOAD 0.98/115 VAC FULL LOAD 0.95/277 VAC FULL LOAD	I/P: 230 VAC/115VAC/277VAC O/P: FULL LOAD Ta:25°C	PF= 0.981 /230V/100%LOAD PF= 0.997/115V/100%LOAD PF= 0.958/277V/100%LOAD
7	EFFICIENCY (TYP)	95 % 95%	I/P: 230 VAC I/P: 277 VAC O/P: FULL LOAD	95.01% /230V 95.21% /277V

				Ta:25°C	
8	INRUSH CURRENT (TYP)	230 V/35A COLD START  (twidth=1800us measured at 50% Ipeak) COLD START	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	I =33.1 A/ 230VAC  T50= 1500 us	
<p>INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)</p>					
9	TOTAL HARMONIC DISTORTION	THD< 20% @ output load≥ 40% at 115VAC/230/277VAC input	<p>I/P : 115VAC O/P : 100% LOAD 40% LOAD Ta : 25°C</p> <p>I/P : 230VAC O/P : 100% LOAD 40% LOAD Ta : 25°C</p> <p>I/P : 277VAC O/P : 100% LOAD 40% LOAD Ta : 25°C</p>	<p>THD : 6.8 % THD : 6 %</p> <p>THD : 6.42 % THD : 9.68 %</p> <p>THD : 8.83 % THD : 15.06 %</p>	



### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	95 %~ 108 %  PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed	I/P: 305VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta:25°C	99.86%/ 305VAC 100.92%/ 230VAC 100.91%/100VAC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	V1: 60 V~ 70 V  PROTECTION TYPE : Shut down output voltage, re-power on to recovery	I/P: 305VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta:25°C	61.02V/ 305VAC 61.14V/ 230VAC 61.13V/ 90VAC PROTECTION TYPE : Shut down output voltage, re-power on to recovery
3	OVER TEMPERATURE PROTECTION	PROTECTION TYPE : Shut down output voltage, re-power on to recovery	I/P: 305 VAC I/P: 90 VAC O/P: FULL LOAD	O.T.P Active PROTECTION TYPE : Shut down output voltage, re-power on to recovery
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE  PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed	I/P: 305VAC I/P: 90 VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE PROTECTION TYPE : Constant current limiting, 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 10 Rated 13 A/ 650 V       Q 13 Rated 13 A/ 650V	I/P: High-Line +3V =308V AC ON/OFF 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	Q10 Q13  VDS: VDS: (1)478V (1)530V (2)470V (2)518V (3)478V (3)526V (4)478V (4)526V (5)482V (5)530V (6)478V (6)526V (7)466V (7)518V

			(7)0%→400% Load. Ta:25°C	
2	P.F.C Transistor (D to S) or (C to E) <b>Peak Voltage</b>	Q1 Rated 13 A/650V	I/P:High-Line +3V =305V AC ON/OFF 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	VDS: (1)530V (2)474V (3)526V (4)530V (5)522V (6)538V (7)470V
3	P.F.C DIODE	D8 Rated 12A/ 600V	I/P:High-Line +3V =305V AC ON/OFF O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (4)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz Ta:25°C	308V (1) 502V (2) 466V (3) 482V (4) 490V
4	Diode Peak <b>Voltage</b>	Q120 Rated 43A/150V  Q121 Rated 43A/150V	I/P:High-Line +3V =305V AC ON/OFF 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 Ta:25°C	Q120: Q121: VDS: VDS: (1) 124.3V (1) 119V (2) 25.4V (2) 57V (3) 124.3V (3) 119V (4) 124.3V (4) 123V (5) 130.7V (5) 123V (6) 123.5V (6) 119V (7) 142V (7) 127V (8)140V (8) 121V
5	<b>Input Capacitor Voltage</b>	C5 Rated: 150 $\mu$ / 450V	I/P:High-Line +3V =308V 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	(1) 447V (2) 449V (3) 447V (4) 443V
6	<b>Control IC Voltage Test</b>	PWM IC U2 Rated 16V~ 8.85V(MIN.)  PFC IC U1 Rated 20V~10.5V(MIN.)	I/P:High-Line +3V =305V AC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. Ta:25°C	U2 U1 (1) 13.5V (1) 14.9V (2) 13.98V (2) 14.42V (3) 13.74V (3) 14.42V (4) 13.42V (4) 14.4V

**SAFETY & EMC TEST REPORT**

**SAFETY TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	IEC60950-1 I/P-O/P: 3.75KVAC/min I/P-FG:2 KVAC/min O/P-FG:1.5KVAC/min	I/P-O/P: 4.125 KVAC/min I/P-FG: 2.4KVAC/min O/P-FG: 1.8 KVAC/min Ta:25°C	I/P-O/P: 5.67mA I/P-FG: 4.61 mA O/P-FG: 6.18mA 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: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 30 GΩ I/P-FG: 30G Ω O/P-FG: 30G Ω NO DAMAGE
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	25mΩ

**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°C	PASS
2	CONDUCTION	EN55015 CLASS B	I/P: 230 VAC /50HZ O/P:FULL/50% LOAD Ta:25°C	PASS Test by certified Lab
3	RADIATION	EN55015 CLASS B	I/P: 230 VAC /50HZ O/P:FULL LOAD Ta:25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N :2KV L,N-PE:4KV	I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare			



■ **RELIABILITY TEST**

**ENVIRONMENT TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																																																																												
1	TEMPERATURE RISE TEST	MODEL : HLG-480H-48 1. ROOM AMBIENT BURN-IN : 2.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 29.4 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 63.8 °C																																																																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 29.4 °C</th> <th>HIGH AMBIENT Ta= 63.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD2</td><td>84.4°C</td><td>97.6°C</td></tr> <tr><td>2</td><td>C10</td><td>81.5°C</td><td>94.7°C</td></tr> <tr><td>3</td><td>Q1</td><td>82.4°C</td><td>95.6°C</td></tr> <tr><td>4</td><td>D8</td><td>84.6°C</td><td>97.6°C</td></tr> <tr><td>5</td><td>Q10</td><td>83.0°C</td><td>96.2°C</td></tr> <tr><td>6</td><td>Q12</td><td>83.7°C</td><td>96.9°C</td></tr> <tr><td>7</td><td>RY1</td><td>83.1°C</td><td>95.9°C</td></tr> <tr><td>8</td><td>ZNR2</td><td>77.8°C</td><td>89.2°C</td></tr> <tr><td>9</td><td>C1</td><td>76.8°C</td><td>88.2°C</td></tr> <tr><td>10</td><td>C5</td><td>77.8°C</td><td>89.8°C</td></tr> <tr><td>11</td><td>L3</td><td>83.0°C</td><td>96.5°C</td></tr> <tr><td>12</td><td>U1</td><td>78.4°C</td><td>89.9°C</td></tr> <tr><td>13</td><td>U2</td><td>79.1°C</td><td>91.1°C</td></tr> <tr><td>14</td><td>T1 Primary side</td><td>83.2°C</td><td>98.0°C</td></tr> <tr><td>15</td><td>T2 Primary side</td><td>85.1°C</td><td>99.2°C</td></tr> <tr><td>16</td><td>Q100</td><td>82.9°C</td><td>98.0°C</td></tr> <tr><td>17</td><td>Q121</td><td>83.0°C</td><td>98.2°C</td></tr> <tr><td>18</td><td>C115</td><td>77.6°C</td><td>91.8°C</td></tr> <tr><td>19</td><td>C117</td><td>75.1°C</td><td>89.2°C</td></tr> <tr><td>20</td><td>LF100</td><td>74.5°C</td><td>88.9°C</td></tr> <tr><td>21</td><td>T500</td><td>78.6°C</td><td>91.6°C</td></tr> <tr><td>22</td><td>C511</td><td>78.8°C</td><td>91.8°C</td></tr> <tr><td>23</td><td>U501</td><td>78.0°C</td><td>91.1°C</td></tr> <tr><td>24</td><td>J101</td><td>77.9°C</td><td>92.5°C</td></tr> <tr><td>25</td><td>RTH2</td><td>79.3°C</td><td>91.8°C</td></tr> <tr><td>26</td><td>C93</td><td>80.6°C</td><td>93.4°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 29.4 °C	HIGH AMBIENT Ta= 63.8 °C	1	BD2	84.4°C	97.6°C	2	C10	81.5°C	94.7°C	3	Q1	82.4°C	95.6°C	4	D8	84.6°C	97.6°C	5	Q10	83.0°C	96.2°C	6	Q12	83.7°C	96.9°C	7	RY1	83.1°C	95.9°C	8	ZNR2	77.8°C	89.2°C	9	C1	76.8°C	88.2°C	10	C5	77.8°C	89.8°C	11	L3	83.0°C	96.5°C	12	U1	78.4°C	89.9°C	13	U2	79.1°C	91.1°C	14	T1 Primary side	83.2°C	98.0°C	15	T2 Primary side	85.1°C	99.2°C	16	Q100	82.9°C	98.0°C	17	Q121	83.0°C	98.2°C	18	C115	77.6°C	91.8°C	19	C117	75.1°C	89.2°C	20	LF100	74.5°C	88.9°C	21	T500	78.6°C	91.6°C	22	C511	78.8°C	91.8°C	23	U501	78.0°C	91.1°C	24	J101	77.9°C	92.5°C	25	RTH2	79.3°C	91.8°C	26	C93	80.6°C	93.4°C
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	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 100 % LOAD Ta= -45 °C	TEST : OK																																																																																																												
	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60 °C NO DAMAGE	I/P : 315 VAC O/P : FULL LOAD Ta= 60°C HUMIDITY= 95 %R.H	TEST : OK																																																																																																												
	TEMPERATURE COEFFICIENT	± 0.02 %/°C(0-60°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.004 %/°C(0-60°C)																																																																																																												



STORAGE TEMPERATURE TEST	<ol style="list-style-type: none"> <li>1. Thermal shock Temperature : -50°C~ +125°C</li> <li>2. Temperature change rate : 25°C / MIN</li> <li>3. Dwell time low and high temperature : 30 MIN/EACH</li> <li>4. Total test cycle : 100 CYCLE</li> <li>5. Input/Output condition : STATIC</li> </ol>	OK
THERMAL SHOCK TEST	<ol style="list-style-type: none"> <li>1. Thermal shock Temperature : -45°C~ +65°C</li> <li>2. Temperature change rate : 25°C / MIN</li> <li>3. Dwell time low and high temperature : 30 MIN/EACH</li> <li>4. Total test cycle : 16 CYCLE</li> <li>5. Input/Output condition : 15cycle:230V/ FULL LOAD AC ON 3sec/AC OFF 1sec TEST 1cycle:230V/ FULL LOAD Burn In Test</li> </ol>	OK
VIBRATION TEST	<ol style="list-style-type: none"> <li>1 Carton &amp; 1 Set</li> <li>(1) Waveform : Sine Wave</li> <li>(2) Frequency : 10-500Hz</li> <li>(3) Sweep Time : 12min/sweep cycle</li> <li>(4) Acceleration : 5G</li> <li>(5) Test Time : 72min in each axis (X.Y.Z)</li> <li>(6) Ta : 25°C</li> </ol>	TEST : OK
CAPACITOR LIFE CYCLE	<p>SUPPOSE C117 IS THE MOST CRITICAL COMPONENT</p> <ol style="list-style-type: none"> <li>(1) I/P : 230VAC O/P : FULL LOAD Ta= 25°C LIFE TIME</li> <li>(2) I/P : 230VAC O/P : FULL LOAD Ta= 60°C LIFE TIME</li> <li>(3) I/P : 230VAC O/P : 75% LOAD Ta= 60°C LIFE TIME</li> <li>(4) I/P : 230VAC O/P : 50% LOAD Ta= 60°C LIFE TIME</li> </ol>	<ol style="list-style-type: none"> <li>(1) 132638HRS</li> <li>(2) 47580HRS</li> <li>(3) 58920HRS</li> <li>(4) 89096HRS</li> </ol>
MTBF	Conducted by Parts Stress Analysis Prediction 345.5K hrs min. Telcordia SR-332 (Bellcore) ; 95.3K hrs min. MIL-HDBK-217F (25°C)	
DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : 62,000 hours @ Tcase75°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT TSENG

12.10.30 A50-F031