



# Test Report: HLG-480H-30

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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

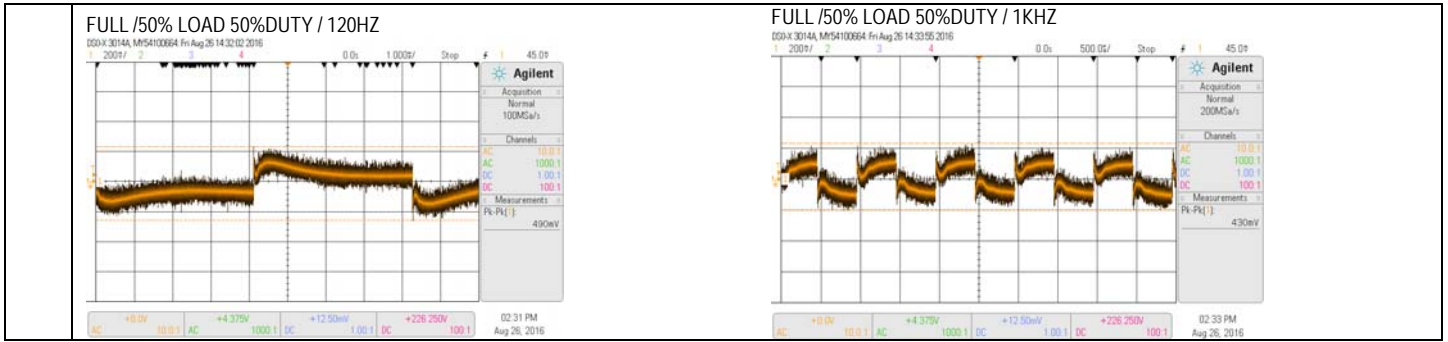
ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

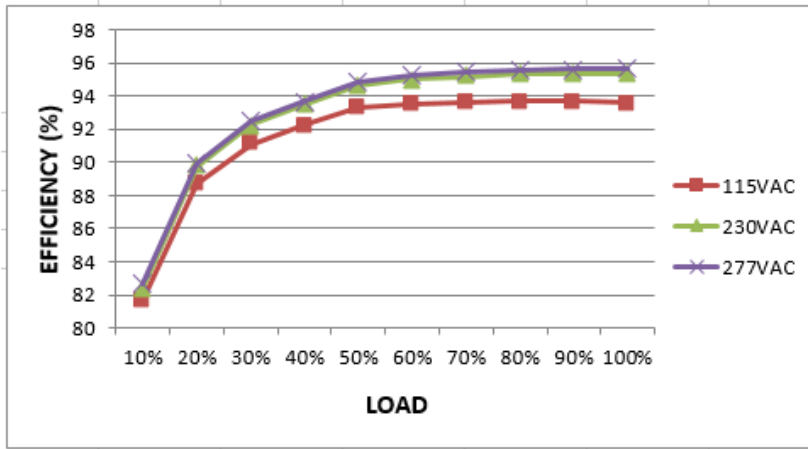
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONSTANT CURRENT REGION	CH1: 15 V- 30V	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	0.8V-30 VAC
2	VOLTAGE ADJUST RANGE	CH1: 25.5 V- 31.5V	I/P: 230 VAC I/P:115VAC O/P:MIN LOAD Ta:25°C	22.89V-32.21V /230VAC 22.89V-32.21V/115VAC
3	CURRENT ADJ. RANGE	CH1: 8 A- 16 A	I/P: 230 VAC I/P:115VAC O/P:CV MIN & CV MAX-1V Ta:25°C	6.598A-17.263A /230VAC@CV MAX-1V 6.616A- 17.25A /230VAC@CV MIN 6.594A- 17.253A/115VAC@CV MAX-1V 6.617A-17.25 A/115VAC@CV MIN
4	OUTPUT VOLTAGE TOLERANCE (Max)	V1:1% ~ -1 %	I/P:100VAC /305AC O/P:FULL/ MIN LOAD Ta:25°C	V1:0.3%~-0.1 %
5	LINE REGULATION (Max)	V1: 0.5% ~ -0.5 %	I/P:100VAC~305AC O/P:FULL LOAD Ta:25°C	V1: 0 %~ 0 %
6	LOAD REGULATION (Max)	V1: 0.5 % ~ -0.5 %	I/P: 230 VAC O/P:FULL -MIN LOAD Ta:25°C	V1:0.2 %- -0.2 %
7	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	TEST: <1.2%
8	RIPPLE & NOISE (Max)	V1: 200 mVp-p	I/P: 230 VAC O/P:FULL LOAD Ta:25°C	V1: 88 mVp-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/180 ms 115 VAC/ 204ms
<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>	

10	RISE TIME (Max)	230VAC/ 80 ms 115VAC/ 80 ms	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/53.2 ms 115 VAC/53.2ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
11	HOLD UP TIME (Typ.)	230VAC/ 16 ms 115VAC/ 16 ms	I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C	230VAC/ 28ms 115 VAC/28.8 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 	
12	DYNAMIC LOAD	V1: 3000 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	490mVp-p 430mVp-p



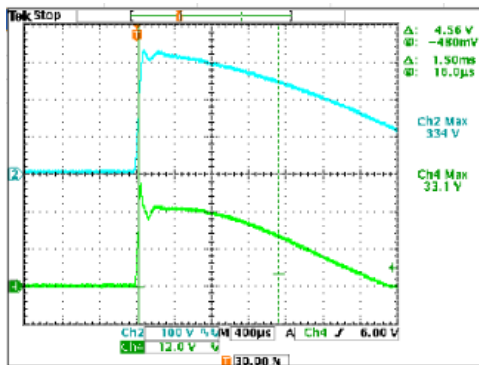
### INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	INPUT VOLTAGE RANGE	90VAC~305 VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	75V~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= 1.888A/277VAC I = 2236A/ 230VAC I = 4.547A/ 115VAC																																												
4	LEAKAGE CURRENT	< 0.75 mA/ 277VAC	I/P : 277 VAC O/P : Min LOAD Ta : 25°C	L-FG: 0.34mA N-FG: 0.34mA																																												
5	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= 0.996/115V/100%LOAD PF= 0.958/277V/100%LOAD																																												
<table border="1"> <caption>Power Factor vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>115VAC PF</th> <th>230VAC PF</th> <th>277VAC PF</th> </tr> </thead> <tbody> <tr><td>10%</td><td>0.95</td><td>0.70</td><td>0.55</td></tr> <tr><td>20%</td><td>0.97</td><td>0.85</td><td>0.75</td></tr> <tr><td>30%</td><td>0.98</td><td>0.92</td><td>0.82</td></tr> <tr><td>40%</td><td>0.99</td><td>0.95</td><td>0.88</td></tr> <tr><td>50%</td><td>0.99</td><td>0.97</td><td>0.92</td></tr> <tr><td>60%</td><td>0.99</td><td>0.98</td><td>0.94</td></tr> <tr><td>70%</td><td>0.99</td><td>0.98</td><td>0.95</td></tr> <tr><td>80%</td><td>0.99</td><td>0.98</td><td>0.96</td></tr> <tr><td>90%</td><td>0.99</td><td>0.98</td><td>0.97</td></tr> <tr><td>100%</td><td>0.99</td><td>0.98</td><td>0.97</td></tr> </tbody> </table>					Load (%)	115VAC PF	230VAC PF	277VAC PF	10%	0.95	0.70	0.55	20%	0.97	0.85	0.75	30%	0.98	0.92	0.82	40%	0.99	0.95	0.88	50%	0.99	0.97	0.92	60%	0.99	0.98	0.94	70%	0.99	0.98	0.95	80%	0.99	0.98	0.96	90%	0.99	0.98	0.97	100%	0.99	0.98	0.97
Load (%)	115VAC PF	230VAC PF	277VAC PF																																													
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6	EFFICIENCY (TYP)	94.5 % 95%	I/P: 230 VAC I/P: 277 VAC O/P:FULL LOAD Ta:25°C	94.677%/230V 95.004%/277V																																												

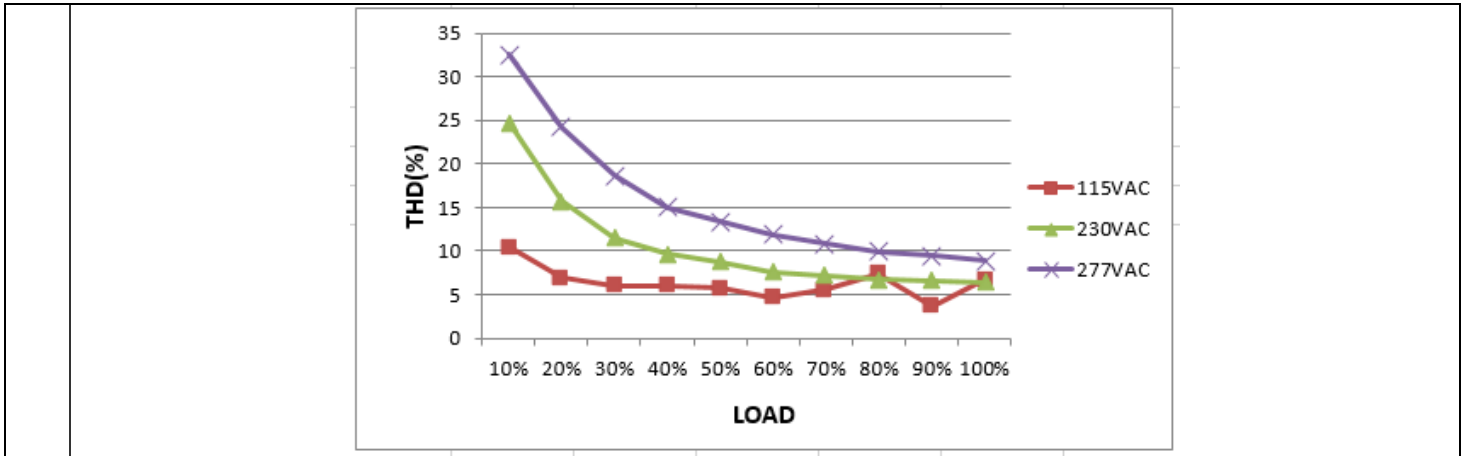


7	<b>INRUSH CURRENT (TYP)</b> 230 V/ 35A COLD START  (twidth=1800us measured at 50% Ipeak) COLD START	I/P: 230 VAC O/P: FULL LOAD Ta: 25°C	I = 33.1A/ 230VAC  T50= 1500 us
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INPUT=230VAC/50HZ @ FULL LOAD  
 CH2 : AC Input Voltage CH4 : Input current (1V=1A)



8	<b>TOTAL HARMONIC DISTORTION</b> THD < 20% @ output load ≥ 40% at 115VAC/230/277VAC input	I/P : 115VAC O/P : 100% LOAD 40% LOAD Ta : 25°C	THD : 6.3 % THD : 6.36 %
		I/P : 230VAC O/P : 100% LOAD 40% LOAD Ta : 25°C	THD : 6.46 % THD : 9.24 %
		I/P : 277VAC O/P : 100% LOAD 40% LOAD Ta : 25°C	THD : 8.99 % THD : 15.76 %



### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER CURRENT 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	103.1%/ 305VAC 103.4%/ 230VAC 103.8%/100VAC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	V1: 33 V~ 40 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	34.471V/ 305VAC 34.423V/ 230VAC 34.531V/ 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 13Rated 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	Q10 Q13  VDS: VDS: (1)537V (1)550V (2)533V (2)525V (3)537V (3)550V (4)541V (4)550V (5)537V (5)546V (6)537V (6)550V (7)550V (7)537V

			(6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (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 =308 V 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	308V VDS: (1)533V (2)456V (3)533V (4)541V (5)537V (6)541V (7)537V
3	P.F.C DIODE	D8 Rated 12A/ 600V	I/P:High-Line +3V =308 V 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	VDS: 305V (1)486V (2)474V (3)486V (4)478V
4	Diode Peak <b>Voltage</b>	Q100 Rated 80A/100 V  Q101 Rated 80A/100 V	I/P:High-Line +3V =308 V 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	Q100: Q101: VDS: VDS: (1)72.3V (1)77.1V (2)9.6V (2)12.8V (3)73.9V (3)77.1V (4)73.1V (4)79.5V (5)73.9V (5)79.5V (6)73.1V (6)76.3V (7)8.8V (7)8V (8)66.7V (8)73.9V
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)443V (2)443V (3)449V (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 =308 V 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) 13.12V (1)14.5V (2) 13.37V (2)14.5V (3) 13.37V (3)14.5V (4) 13.81V (4)14.5V (5)14.5V

**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:4.132 mA I/P-FG:4.82 mA O/P-FG:6.21 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: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P:17.6 GΩ I/P-FG: 10.7G Ω O/P-FG:30 G Ω NO DAMAGE
3	GROUNDING CONTINUITY	IEC60950-1 FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	26 mΩ

**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. 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 : HLG-480H-24 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>89.8°C</td><td>98.1°C</td></tr> <tr><td>2</td><td>C10</td><td>86.5°C</td><td>94.8°C</td></tr> <tr><td>3</td><td>Q1</td><td>86.4°C</td><td>97.8°C</td></tr> <tr><td>4</td><td>D8</td><td>90.1°C</td><td>99.1°C</td></tr> <tr><td>5</td><td>Q10</td><td>88.8°C</td><td>94.8°C</td></tr> <tr><td>6</td><td>Q12</td><td>89.7°C</td><td>98.7°C</td></tr> <tr><td>7</td><td>RY1</td><td>87.6°C</td><td>96.1°C</td></tr> <tr><td>8</td><td>LF2</td><td>83.3°C</td><td>90.7°C</td></tr> <tr><td>9</td><td>ZNR2</td><td>83.2°C</td><td>90.3°C</td></tr> <tr><td>10</td><td>C1</td><td>82.2°C</td><td>89.4°C</td></tr> <tr><td>11</td><td>C5</td><td>83.3°C</td><td>90.5°C</td></tr> <tr><td>12</td><td>L3</td><td>87.9°C</td><td>97.2°C</td></tr> <tr><td>13</td><td>U1</td><td>83.6°C</td><td>90.2°C</td></tr> <tr><td>14</td><td>U2</td><td>83.4°C</td><td>90.9°C</td></tr> <tr><td>15</td><td>T1 Primary side</td><td>89.7°C</td><td>100.7°C</td></tr> <tr><td>16</td><td>T2 Primary side</td><td>91.8°C</td><td>101.6°C</td></tr> <tr><td>17</td><td>Q100</td><td>84.9°C</td><td>95.7°C</td></tr> <tr><td>18</td><td>Q121</td><td>84.4°C</td><td>95.4°C</td></tr> <tr><td>19</td><td>C115</td><td>81.2°C</td><td>91.6°C</td></tr> <tr><td>20</td><td>C117</td><td>80.9°C</td><td>99.5°C</td></tr> <tr><td>21</td><td>LF100</td><td>80.1°C</td><td>91.8°C</td></tr> <tr><td>22</td><td>T500</td><td>83.1°C</td><td>91.6°C</td></tr> <tr><td>23</td><td>C511</td><td>84.3°C</td><td>92.7°C</td></tr> <tr><td>24</td><td>U501</td><td>83.4°C</td><td>90.9°C</td></tr> <tr><td>25</td><td>J101</td><td>86.3°C</td><td>97.5°C</td></tr> <tr><td>26</td><td>RTH2</td><td>84.4°C</td><td>92.6°C</td></tr> <tr><td>27</td><td>C93</td><td>86.1°C</td><td>98.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 29.4 °C	HIGH AMBIENT Ta= 63.8 °C	1	BD2	89.8°C	98.1°C	2	C10	86.5°C	94.8°C	3	Q1	86.4°C	97.8°C	4	D8	90.1°C	99.1°C	5	Q10	88.8°C	94.8°C	6	Q12	89.7°C	98.7°C	7	RY1	87.6°C	96.1°C	8	LF2	83.3°C	90.7°C	9	ZNR2	83.2°C	90.3°C	10	C1	82.2°C	89.4°C	11	C5	83.3°C	90.5°C	12	L3	87.9°C	97.2°C	13	U1	83.6°C	90.2°C	14	U2	83.4°C	90.9°C	15	T1 Primary side	89.7°C	100.7°C	16	T2 Primary side	91.8°C	101.6°C	17	Q100	84.9°C	95.7°C	18	Q121	84.4°C	95.4°C	19	C115	81.2°C	91.6°C	20	C117	80.9°C	99.5°C	21	LF100	80.1°C	91.8°C	22	T500	83.1°C	91.6°C	23	C511	84.3°C	92.7°C	24	U501	83.4°C	90.9°C	25	J101	86.3°C	97.5°C	26	RTH2	84.4°C	92.6°C	27	C93	86.1°C	98.7°C
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16	T2 Primary side	91.8°C	101.6°C																																																																																																																	
17	Q100	84.9°C	95.7°C																																																																																																																	
18	Q121	84.4°C	95.4°C																																																																																																																	
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22	T500	83.1°C	91.6°C																																																																																																																	
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24	U501	83.4°C	90.9°C																																																																																																																	
25	J101	86.3°C	97.5°C																																																																																																																	
26	RTH2	84.4°C	92.6°C																																																																																																																	
27	C93	86.1°C	98.7°C																																																																																																																	
2	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 305VAC/100VAC O/P : 100 % LOAD Ta= -45 °C	TEST : OK																																																																																																																
3	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																																																																																																																
4	TEMPERATURE COEFFICIENT	± 0.02 %/°C(0-60°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.006 %/°C(0-60°C)																																																																																																																



5	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -50°C~ +125°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 100 CYCLE 5. Input/Output condition : STATIC	OK
6	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45°C~ +65°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	OK
7	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10-500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 5G (5) Test Time : 72min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
8	CAPACITOR LIFE CYCLE	SUPPOSE C117 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Tc= 75°C LIFE TIME (2) I/P : 230VAC O/P : 75% LOAD Tc= 75°C LIFE TIME (3) I/P : 230VAC O/P : 50% LOAD Tc= 75°C LIFE TIME	(1) 46525HRS (2) 68944HRS (3) 95093HRS
9	MTBF	Conducted by Parts Stress Analysis Prediction 345.5K hrs min. Telcordia SR-332 (Bellcore) ; 95.3K hrs min. MIL-HDBK-217F (25°C)	
10	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 62,000 hours	

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

12.10.30 A50-F031