Test Report: HDR-150-12

150W Ultra Slim Step Shape DIN Rail

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Control Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

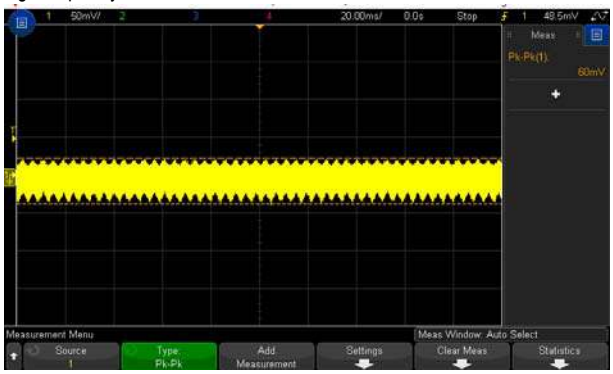
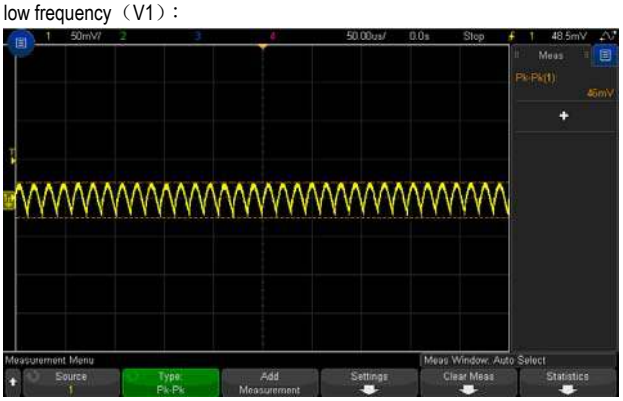
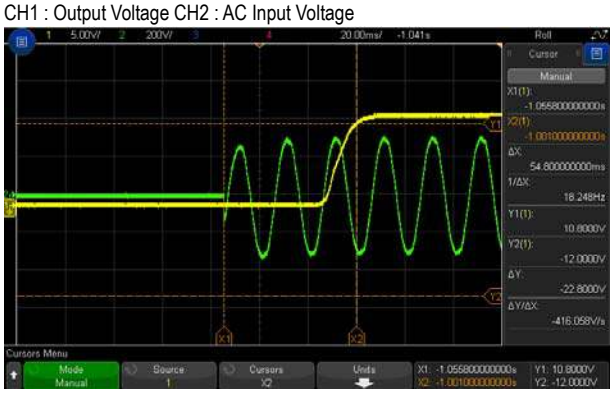
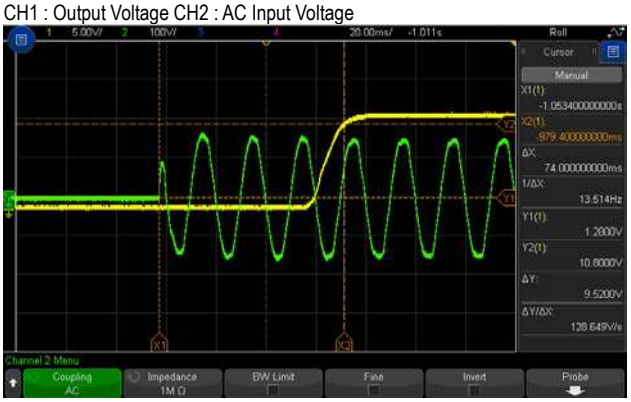
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

■ DESIGN VERIFY TEST

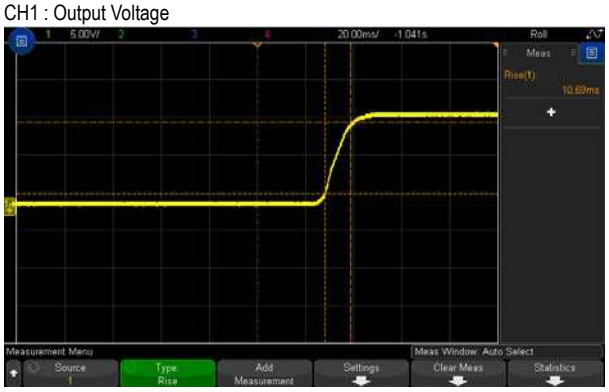
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.8V~ 13.8V	I/P： 230 VAC O/P：MIN LOAD Ta：25℃	9.86V~14.11V /230VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1： -2.0%~2.0%	I/P: 85VAC /277VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1 : -0.35%~0.34%
3	LINE REGULATION (Max)	V1: -1.0%~ 1.0%	I/P: 85VAC~ 277VAC O/P:FULL LOAD Ta:25℃	V1： -0.02%~0.16%
4	LOAD REGULATION(Max)	V1: -1.0%~1.0%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1 : -0.35%~0.34%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	2.5%
6	RIPPLE & NOISE(Max)	V1: 100mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 60mVp-p
	high frequency（V1）： 		low frequency（V1）： 	
7	SET UP TIME(Max)	230VAC/500ms 115VAC/500ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 54.8 ms 115VAC/74.0ms
	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/60ms 115VAC/60ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/10.69ms 115VAC/ 10.91ms

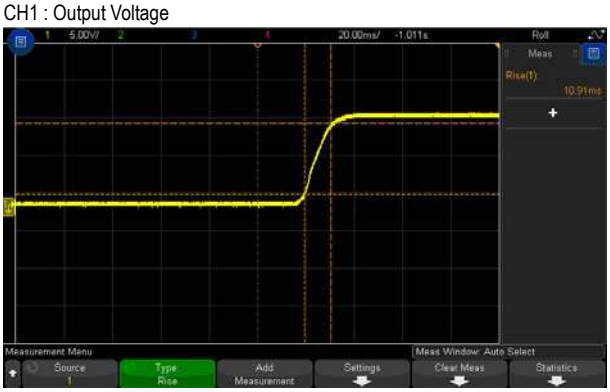
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



INPUT=115VAC/60HZ @ FULL LOAD

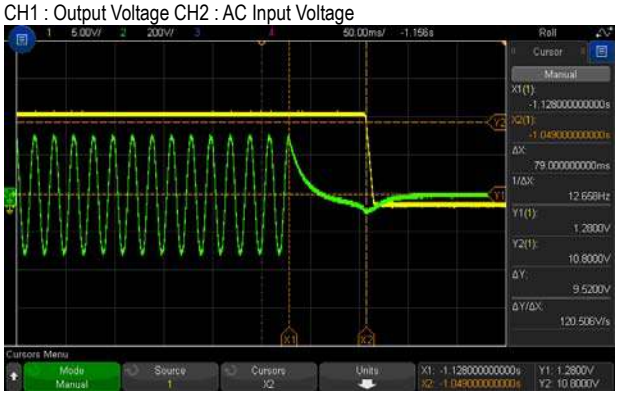
CH1 : Output Voltage



9	HOLD UP TIME (Typ.)	230VAC/30ms 115VAC/12ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 79ms 115VAC/ 19.2ms

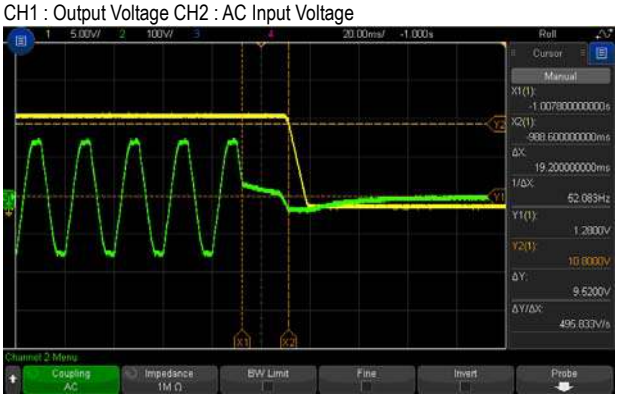
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



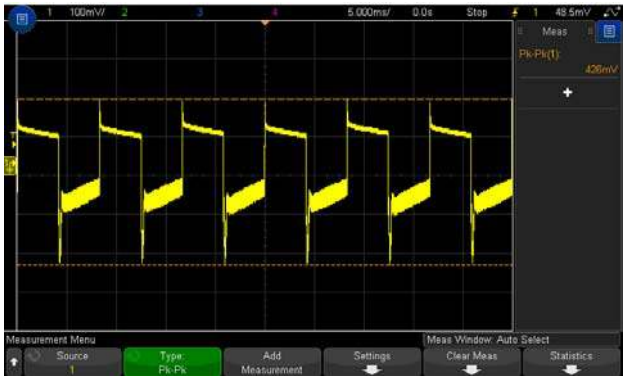
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

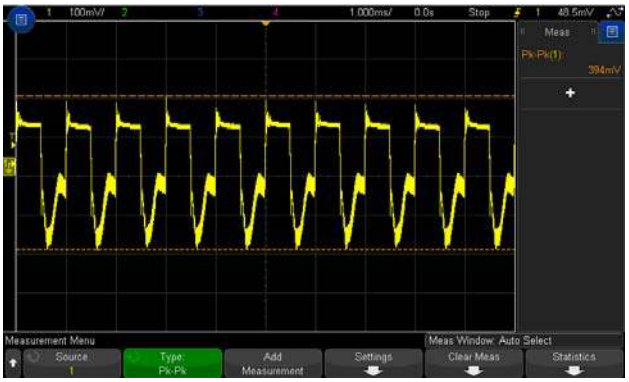


10	DYNAMIC LOAD	V1: 1200 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	（1） （2） V1：426mVp-p 394mVp-p

FULL /50% LOAD 50%DUTY / 120HZ（V1）



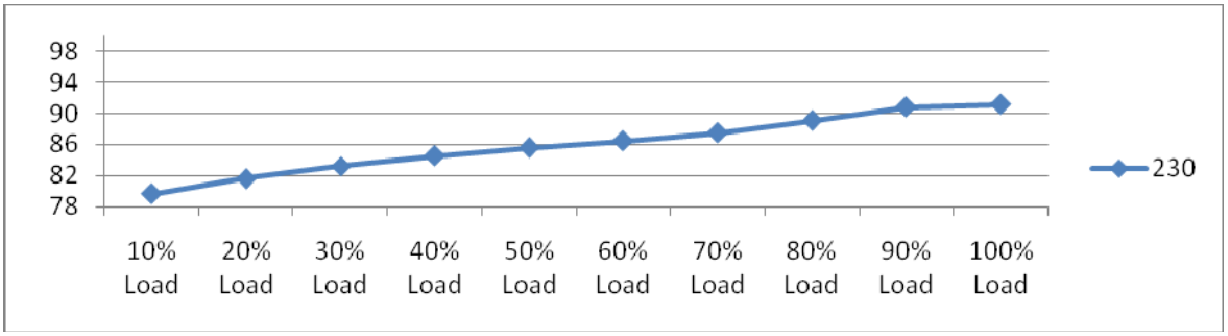
FULL /50% LOAD 50%DUTY / 1KHZ（V1）



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~277VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	70V~277V
			I/P: LOW-LINE-3V=82 V HIGH-LINE+15%=300 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:85 VAC ~277 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ.)	230V/ 1.6A 115V/ 3.0A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =1.09A/ 230VAC I =1.85A/ 115VAC
4	NO LOAD POWER CONSUMPTION	< 0.3W	I/P： 230 VAC O/P：Min LOAD Ta：25℃	0.08W
5	EFFICIENCY(Typ.)	89%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	91.2%

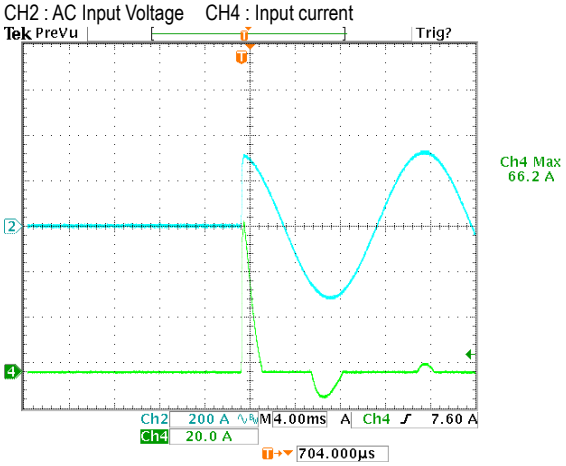
EFFICIENCY vs LOAD



6	INRUSH CURRENT(Typ.)	230V / 70A 115V / 35A COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I =66.2A/ 230VAC I =27.4A/ 115VAC

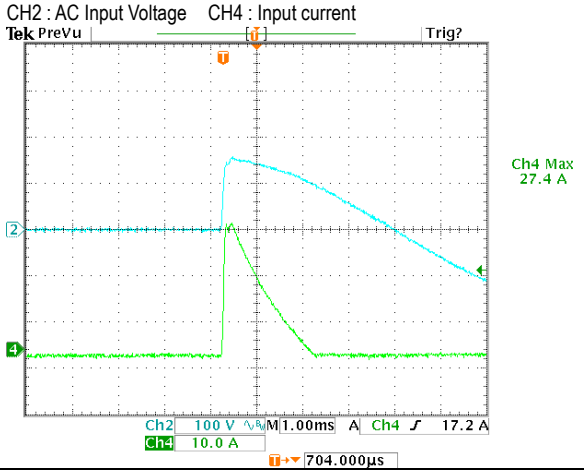
INPUT=230VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



INPUT=115VAC/50HZ @ FULL LOAD

CH2 : AC Input Voltage CH4 : Input current



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~135%	I/P: 277VAC I/P: 230VAC I/P: 115VAC O/P:TESTING Ta:25℃	118.2%/ 277VAC 117.7%/ 230VAC 117.7%/115VAC PROTECTION TYPE： Hiccup mode when output voltage ＜ 50%, recovers automatically after fault condition is removed; Constant current limiting within 50%~100% rated output voltage, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	14.2V~16.2V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P:MIN LOAD Ta:25℃	15.3V/ 277VAC 15.3V/ 230VAC 15.3V/ 85VACC PROTECTION TYPE： Shut down o/p voltage, repower on to recover
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 277VAC I/P: 85VAC 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	Q4 Rated : 650 V	AC ON/OFF I/P:High-Line +3V =280V VDS: O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25℃	VDS: (1) 536V (2) 500V (3) 536V
2	O/P MOFET	Q100 Rated : 80 V	AC ON/OFF I/P:High-Line +3V =280 V O/P: (1)Full Load (2)Output Short (3) Full Load Continue Ta:25℃	VDS: (1) 63.8V (2) 67.8V (3) 63.8V
3	Input Capacitor Voltage	C5 Rated :120 μ / 400 V	I/P:High-Line +3V =280V 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℃	(1) 392V (2) 396V (3) 392V (4) 380 V
4	Control IC Voltage Test	U1 Rated : 0V~ 35 V U100 Rated : 0V~ 37 V	AC ON/OFF I/P:High-Line +3V =280 V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(LOW LINE) Ta:25℃	U1 (1) 15.9V (2) 13.3V (3) 13.3V (4) 15.7V (5) 14.3V U100 (1) 12.9V (2) 2.7V (3) 3.8V (4) 15.1V (5) 11.1V

5	Clamp Diode Peak Voltage	D10 Rated ：1000 V	AC ON/OFF I/P：High-Line +3V = 280 V O/P： (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta：25℃	(1) 495V (2) 487V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC/min	I/P-O/P: 4.4 KVAC/min Ta:25℃	I/P-O/P:1.41mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ	I/P-O/P: 600 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 A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25℃	☑PASS ☐FAIL
2	CONDUCTION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	EN55032 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 □LIGHT INDUSTRY AIR：8KV / Contact：4KV ☑INDUSTRY AIR：8KV / Contact：4KV □Din rail Model : AIR：15KV / Contact：8KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	EN61000-4-4 □LIGHT INDUSTRY INPUT： 1KV □MEDICAL ☑INDUSTRY INPUT： 2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N ：2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	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

<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： HDR-150-12
1. ROOM AMBIENT BURN-IN：1 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 25.3 ℃
2. HIGH AMBIENT BURN-IN：1 HRS
I/P： 230VAC O/P： FULL LOAD Ta= 45.3 ℃
<table>
<tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 25.3 ℃</th><th>HIGH AMBIENT Ta= 45.3 ℃</th></tr>
<tr><td>1</td><td>U1</td><td>70.0℃</td><td>90.5℃</td></tr>
<tr><td>2</td><td>LF1</td><td>42.5℃</td><td>54.0℃</td></tr>
<tr><td>3</td><td>LF2</td><td>58.0℃</td><td>74.5℃</td></tr>
<tr><td>4</td><td>BD1</td><td>67.9℃</td><td>84.8℃</td></tr>
<tr><td>5</td><td>T2</td><td>55.8℃</td><td>88.4℃</td></tr>
<tr><td>6</td><td>C5</td><td>57.8℃</td><td>78.9℃</td></tr>
<tr><td>7</td><td>RTH2</td><td>72.2℃</td><td>93.9℃</td></tr>
<tr><td>8</td><td>C10</td><td>80.8℃</td><td>92.1℃</td></tr>
<tr><td>9</td><td>T1CORE</td><td>84.8℃</td><td>101.7℃</td></tr>
<tr><td>10</td><td>T1COIL</td><td>95.4℃</td><td>108.0℃</td></tr>
<tr><td>11</td><td>Q4</td><td>64.3℃</td><td>95.8℃</td></tr>
<tr><td>12</td><td>L100</td><td>86.7℃</td><td>97.1℃</td></tr>
<tr><td>13</td><td>Q100</td><td>78.6℃℃</td><td>95.2℃</td></tr>
<tr><td>14</td><td>D10</td><td>88.5℃</td><td>101.0℃</td></tr>
<tr><td>15</td><td>R1</td><td>89.7℃</td><td>95.0℃</td></tr>
<tr><td>16</td><td>C105</td><td>85.2℃</td><td>93.1℃</td></tr>
<tr><td>17</td><td>C104</td><td>82.7℃</td><td>90.7℃</td></tr>
<tr><td>18</td><td>C107</td><td>69.3℃</td><td>94.0℃</td></tr>
</table></td></tr>
<tr><td>2</td><td>OVER LOAD BURN-IN TEST</td><td>NO DAMAGE
1 HOUR (MIN)</td><td>I/P： 230 VAC
O/P：120% LOAD
Ta：25℃</td><td>TEST：OK</td></tr>
<tr><td>3</td><td>LOW TEMPERATURE
TURN ON TEST</td><td>TURN ON AFTER 2 HOUR</td><td>I/P： 277VAC/100VAC
O/P： 100 % LOAD
Ta= -30 ℃</td><td>TEST：OK</td></tr>
<tr><td>4</td><td>HIGH HUMIDITY
HIGH TEMPERATURE
HIGH VOLTAGE
TURN ON TEST</td><td>AFTER 12 HOURS
IN CHAMBER ON
CONTROL 45℃ / 95 %R.H
NO DAMAGE</td><td>I/P： 285 VAC
O/P：FULL LOAD
Ta= 45 ℃
HUMIDITY= 95 %R.H</td><td>TEST：OK</td></tr>
<tr><td>5</td><td>TEMPERATURE
COEFFICIENT</td><td>± 0.03%/℃ (0~45℃)</td><td>I/P： 230 VAC
O/P：FULL LOAD</td><td>± 0.0067 %/℃ (0~45℃)</td></tr>
<tr><td>6</td><td>STORAGE TEMPERATURE TEST</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：10 CYCLE
5. Input/Output condition： STATIC</td><td>TEST：OK</td></tr>
</table>

<table>
<tr><td>7</td><td>THERMAL SHOCK TEST</td><td>1. Thermal shock Temperature： -35℃~ +50℃
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</td><td>TEST：OK</td></tr>
<tr><td>8</td><td>VIBRATION TEST</td><td>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℃
2 Din Rail
<table><tr><td></td><td>Displacement</td><td>Acceleration</td></tr><tr><td>2（+3/-0）Hz up to 15Hz</td><td>±2.5mm</td><td>————</td></tr><tr><td>15Hz up to 50Hz</td><td>————</td><td>2.3g</td></tr><tr><td>Sweep rate</td><td colspan="2">Max 1 Octave/minute</td></tr></table></td><td>TEST：OK</td></tr>
<tr><td>9</td><td>CAPACITOR
LIFE CYCLE</td><td>SUPPOSE C104 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= 45 ℃ LIFE TIME
(3) I/P： 230VAC O/P：75% LOAD Ta= 45 ℃ LIFE TIME
(4) I/P： 230VAC O/P：50% LOAD Ta= 45 ℃ LIFE TIME</td><td>(1) 106475.4 HRS
(2) 36877.5 HRS
(3) 78848.6 HRS
(4) 166200.3 HRS</td></tr>
<tr><td>10</td><td>MTBF</td><td colspan="2">Conducted by Parts Stress Analysis Prediction
536K hrs min. MIL-HDBK-217F (25℃)</td></tr>
<tr><td>11</td><td>Ongoing Reliability Test</td><td colspan="2">I/P：230VAC O/P：FULL LOAD TA=50℃
Demonstration Mean Time Between Failure : 30,000 hours</td></tr>
</table>

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010