



# Test Report: HDR-150-48

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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

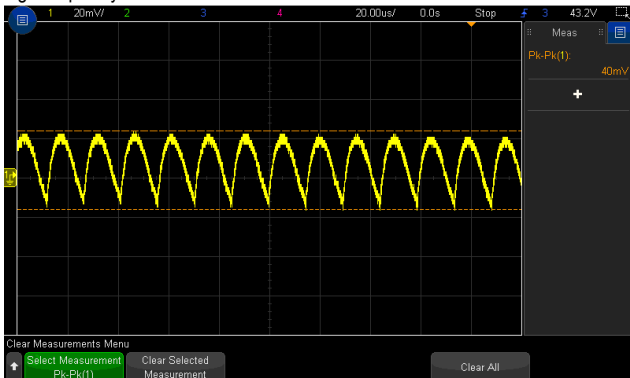
ENVIRONMENT TEST

DESIGN VERIFY TEST

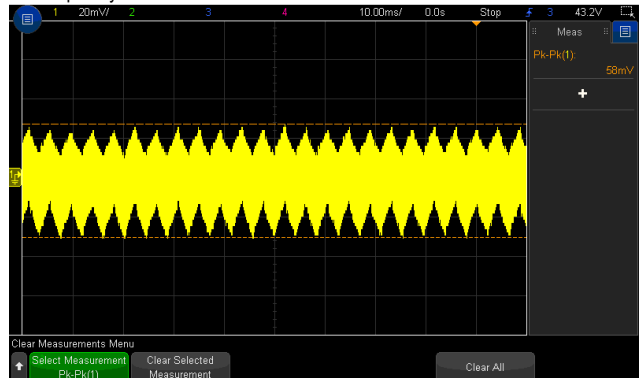
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 43.2V~ 55.2V	I/P : 230 VAC O/P : MIN LOAD Ta : 25°C	42.15V~52.42V /230VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0%~1.0%	I/P: 85VAC /277VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1 : -0.05%~0.05%
3	LINE REGULATION (Max)	V1: -1.0%~ 1.0%	I/P: 85VAC~ 277VAC O/P:FULL LOAD Ta:25°C	V1 : -0.00%~0.02%
4	LOAD REGULATION(Max)	V1: -1.0%~1.0%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1 : -0.05%~0.05%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.2%
6	RIPPLE & NOISE(Max )	V1: 200mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 58mVp-p

high frequency (V1) :



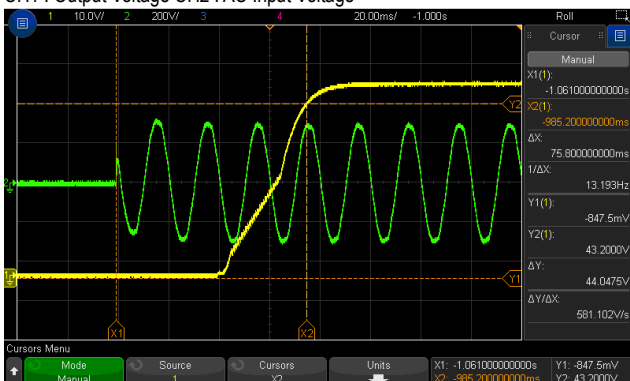
low frequency (V1) :



7	SET UP TIME(Max)	230VAC/500ms 115VAC/500ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 75.8 ms 115VAC/ 86.2ms
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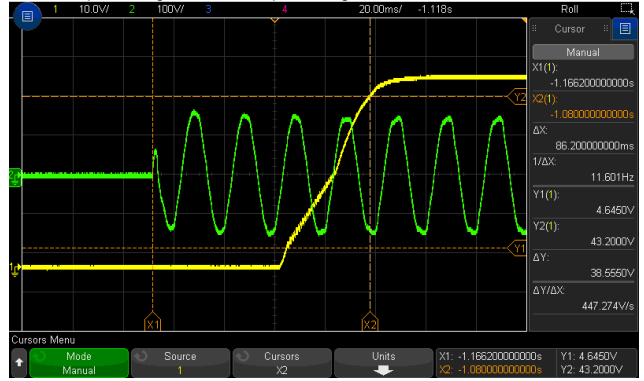
INPUT=230VAC/50HZ @ FULL LOAD

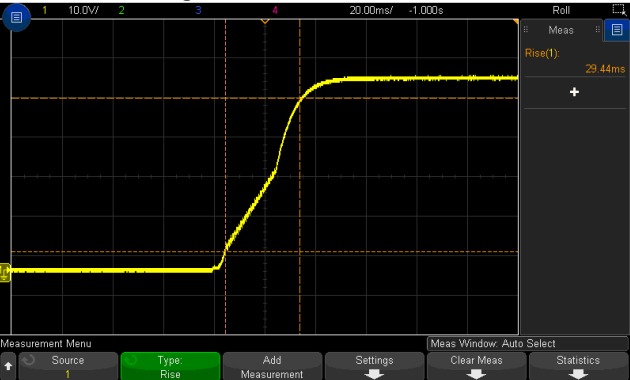
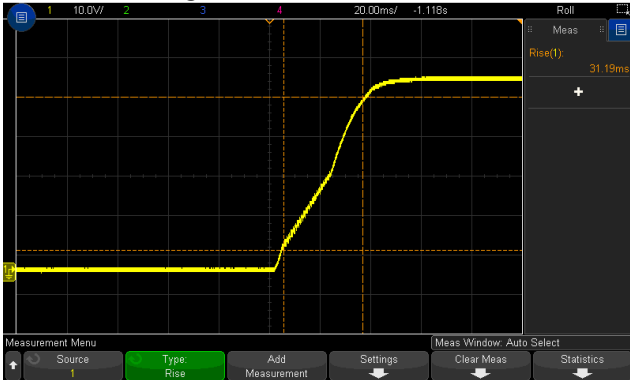
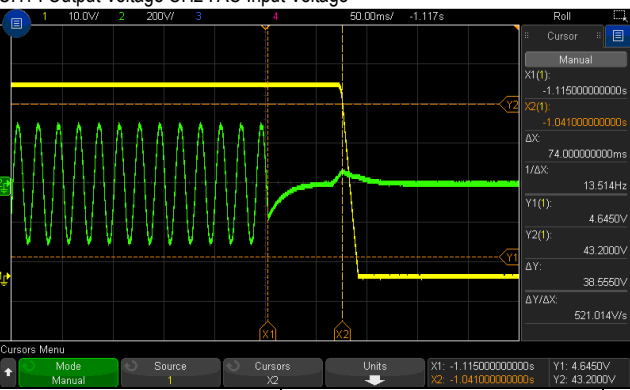
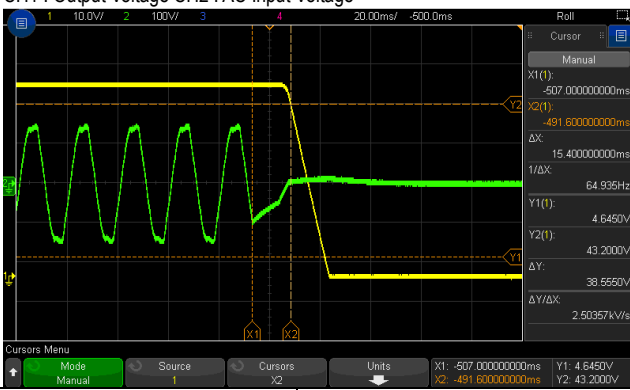
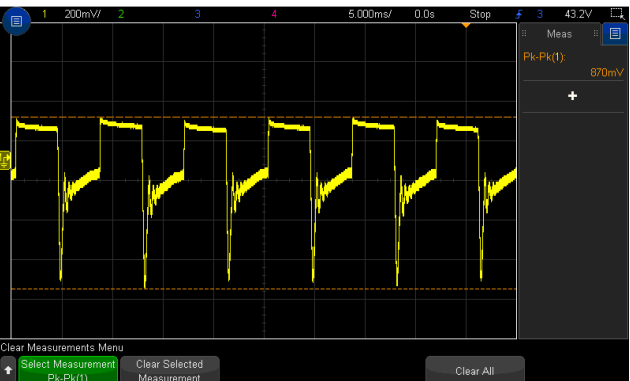

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

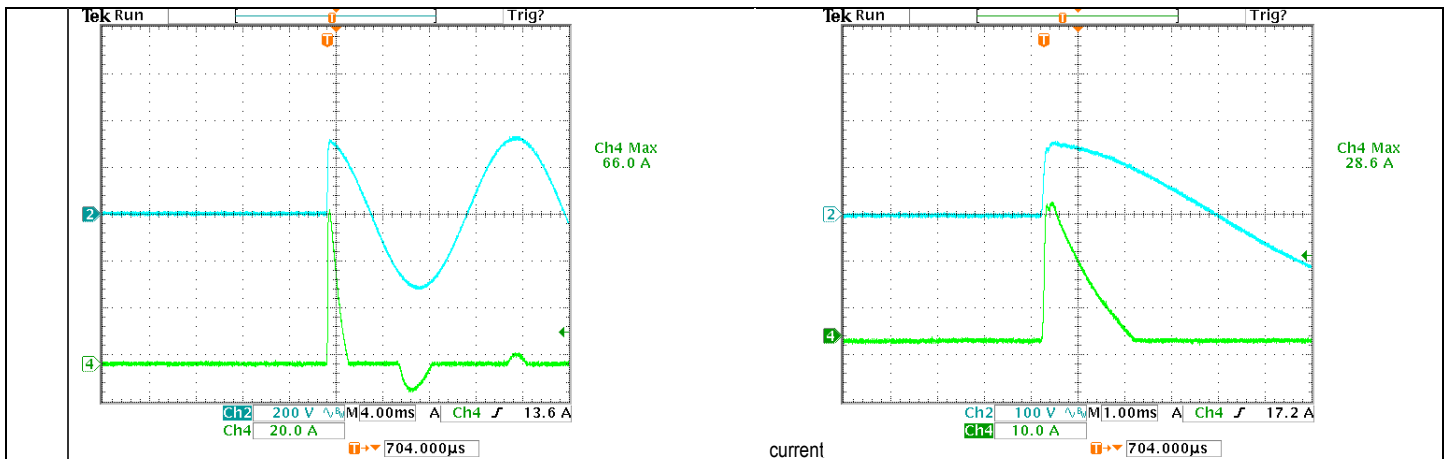
CH1 : Output Voltage CH2 : AC Input Voltage



<b>8</b> RISE TIME (Max)	230VAC/60ms 115VAC/60ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 29.44ms 115VAC/ 31.19ms
INPUT=230VAC/50HZ @ FULL LOAD 		INPUT=115VAC/60HZ @ FULL LOAD 	
<b>9</b> HOLD UP TIME (Typ.)	230VAC/30ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 74.0ms 115VAC/ 15.4ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	
<b>10</b> DYNAMIC LOAD	V1: 4800 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	(1)      (2) V1: 870mVp-p      830mVp-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 120VDC ~ 390VDC	(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 Ta:25°C	(1) 75V~277V (2) 106.89Vdc~390Vdc/FULL LOAD 106.88Vdc~390Vdc/50% LOAD (3) 106.89Vdc~390Vdc/FULL LOAD 106.89Vdc~390Vdc/50% LOAD																						
			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:85VAC ~277 VAC O/P:FULL~MIN LOAD Ta:25°C	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°C	I =1.20A/ 230VAC I =2.06A/ 115VAC																						
4	NO LOAD POWER CONSUMPTION	< 0.3W	I/P : 230 VAC O/P : Min LOAD Ta : 25°C	0.2W																						
5	EFFICIENCY(Typ.)	90.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	91.99%																						
<p>EFFICIENCY vs LOAD</p> <table border="1"> <caption>Efficiency vs Load Data (230V)</caption> <thead> <tr> <th>Load (%)</th> <th>Efficiency (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>86.5</td></tr> <tr><td>20%</td><td>90.5</td></tr> <tr><td>30%</td><td>90.5</td></tr> <tr><td>40%</td><td>90.5</td></tr> <tr><td>50%</td><td>90.5</td></tr> <tr><td>60%</td><td>89.5</td></tr> <tr><td>70%</td><td>89.5</td></tr> <tr><td>80%</td><td>90.5</td></tr> <tr><td>90%</td><td>91.5</td></tr> <tr><td>100%</td><td>92.5</td></tr> </tbody> </table>					Load (%)	Efficiency (%)	10%	86.5	20%	90.5	30%	90.5	40%	90.5	50%	90.5	60%	89.5	70%	89.5	80%	90.5	90%	91.5	100%	92.5
Load (%)	Efficiency (%)																									
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6	INRUSH CURRENT(Typ.)	230V / 70A 115V / 35A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I =66.0A/ 230VAC I =28.6A/ 230VAC																						
			INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current	INPUT=115VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input																						



## 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°C	117.81%/ 277VAC 118.43%/ 230VAC 118.43%/88VAC 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	56.5V~64.8V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta:25°C	60.4V/ 277VAC 60.4V/ 230VAC 60.4V/ 88VAC 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°C	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°C	VDS: (1) 511V (2) 471V (3) 511V
2	O/P MOFET	Q100 Rated : 300 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°C	D55 (1) 256V (2) 211V (3) 256V

3	Input Capacitor Voltage	C5 Rated :120 $\mu$ / 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°C	(1) 189V (2) 185V (3) 185V (4) 183 V
4	Control IC Voltage Test	U1 Rated : 0V~ 35 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°C	U1 (1) 20.2V (2) 12.3V (3) 20.2V (4) 20.0V (5) 19.8V
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°C	(1) 481V (2) 481V

## 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°C	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°C	I/P-O/P: 9999MΩ NO DAMAGE

## E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	BS EN/EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:FULL LOAD Ta:25°C	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL
2	CONDUCTION	BS EN/EN55032(CISPR32) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	BS EN/EN55032(CISPR32) CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	BS EN/EN61000-4-2 <input type="checkbox"/> LIGHT INDUSTRY AIR: 8KV / Contact: 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A

		<input checked="" type="checkbox"/> INDUSTRY AIR: 8KV / Contact: 4KV <input type="checkbox"/> Din rail Model : AIR: 15KV / Contact: 8KV		
5	E.F.T	BS EN/EN61000-4-4 <input type="checkbox"/> LIGHT INDUSTRY INPUT : 1KV <input type="checkbox"/> MEDICAL <input checked="" type="checkbox"/> INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	BS EN/EN61000-4-5 INDUSTRY L-N : 2KV	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 : HDR-150-48 1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta= 24.5 °C 2. HIGH AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta= 45.3 °C																																																																						
		<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= °C</th> <th>HIGH AMBIENT Ta= °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>U1</td><td>76.7°C</td><td>92.0°C</td></tr> <tr><td>2</td><td>LF1</td><td>47.6°C</td><td>65.9°C</td></tr> <tr><td>3</td><td>LF2</td><td>64.3°C</td><td>78.0°C</td></tr> <tr><td>4</td><td>BD1</td><td>75.8°C</td><td>90.5°C</td></tr> <tr><td>5</td><td>T2</td><td>68.3°C</td><td>88.2°C</td></tr> <tr><td>6</td><td>C5</td><td>62.0°C</td><td>80.0°C</td></tr> <tr><td>7</td><td>RTH2</td><td>77.3°C</td><td>94.2°C</td></tr> <tr><td>8</td><td>C10</td><td>74.3°C</td><td>95.0°C</td></tr> <tr><td>9</td><td>T1COIL</td><td>87.9°C</td><td>108.1°C</td></tr> <tr><td>10</td><td>Q4</td><td>87.0°C</td><td>106.0°C</td></tr> <tr><td>11</td><td>L100</td><td>56.5°C</td><td>76.2°C</td></tr> <tr><td>12</td><td>Q100</td><td>69.1°C</td><td>88.6°C</td></tr> <tr><td>13</td><td>D10</td><td>73.3°C</td><td>95.7°C</td></tr> <tr><td>14</td><td>R1</td><td>87.3°C</td><td>101.2°C</td></tr> <tr><td>15</td><td>C103</td><td>62.7°C</td><td>83.7°C</td></tr> <tr><td>16</td><td>C105</td><td>59.3°C</td><td>79.3°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= °C	HIGH AMBIENT Ta= °C	1	U1	76.7°C	92.0°C	2	LF1	47.6°C	65.9°C	3	LF2	64.3°C	78.0°C	4	BD1	75.8°C	90.5°C	5	T2	68.3°C	88.2°C	6	C5	62.0°C	80.0°C	7	RTH2	77.3°C	94.2°C	8	C10	74.3°C	95.0°C	9	T1COIL	87.9°C	108.1°C	10	Q4	87.0°C	106.0°C	11	L100	56.5°C	76.2°C	12	Q100	69.1°C	88.6°C	13	D10	73.3°C	95.7°C	14	R1	87.3°C	101.2°C	15	C103	62.7°C	83.7°C	16	C105	59.3°C	79.3°C		
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230 VAC O/P : 120% LOAD Ta : 25°C	TEST : OK																																																																				



3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 277VAC/100VAC O/P : 100 % LOAD Ta= -30 °C	TEST : OK												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 °C /95 %R.H NO DAMAGE	I/P : 285 VAC O/P : FULL LOAD Ta= 45 °C HUMIDITY= 95 %R.H	TEST : OK												
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0~45°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.0102 %/°C (0~45°C)												
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : STATIC		TEST : OK												
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C~ +50°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		TEST : OK												
8	VIBRATION TEST	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°C  2 Din Rail <table border="1" style="margin-left: 20px;"> <thead> <tr> <th></th> <th>Displacement</th> <th>Acceleration</th> </tr> </thead> <tbody> <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> </tbody> </table>			Displacement	Acceleration	2 (+3/-0) Hz up to 15Hz	±2.5mm	-----	15Hz up to 50Hz	-----	2.3g	Sweep rate	Max 1 Octave/minute		TEST : OK
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2 (+3/-0) Hz up to 15Hz	±2.5mm	-----														
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Sweep rate	Max 1 Octave/minute															
9	CAPACITOR LIFE CYCLE	SUPPOSE C103 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 45 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45 °C LIFE TIME		(1) 176531.8 HRS (2) 43524.4 HRS (3) 81896.1 HRS (4) 145527.5 HRS												
10	MTBF	3046.3K hrs min. Telcordia SR-332 (Bellcore) ; 535.9K hrs min. MIL-HDBK-217F (25°C)														
11	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 30,000 hours														

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010