



# Test Report: HDR-150-24

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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

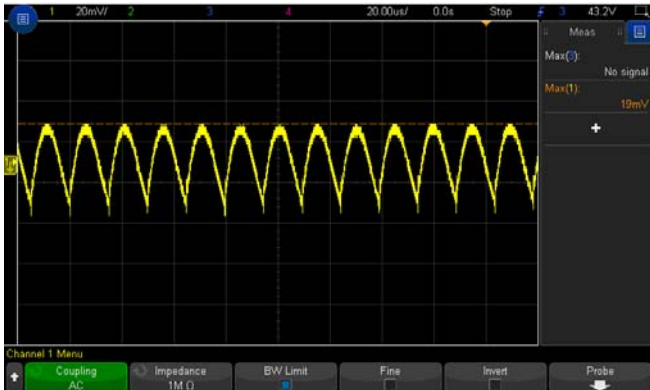
ENVIRONMENT TEST

DESIGN VERIFY TEST

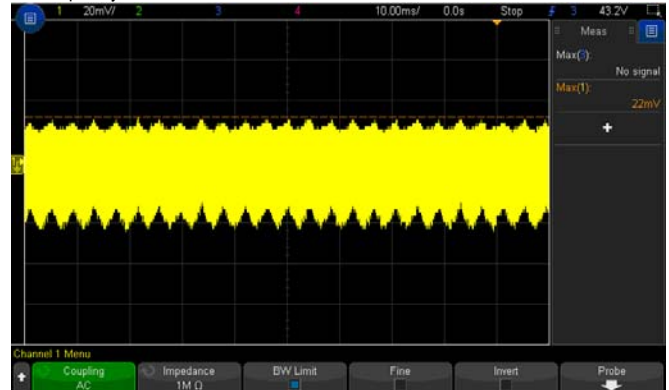
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6V~ 29.0V	I/P : 230 VAC O/P : MIN LOAD Ta : 25°C	20.12V~30.49V /230VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.0%~1.0%	I/P: 85VAC /277VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1 : -0.13%~0.13%
3	LINE REGULATION (Max)	V1: -1.0%~ 1.0%	I/P: 85VAC~ 277VAC O/P:FULL LOAD Ta:25°C	V1 : -0.02%~0.03%
4	LOAD REGULATION(Max)	V1: -1.0%~1.0%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1 : -0.13%~0.13%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	1.3%
6	RIPPLE & NOISE(Max )	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 22mVp-p

high frequency (V1) :



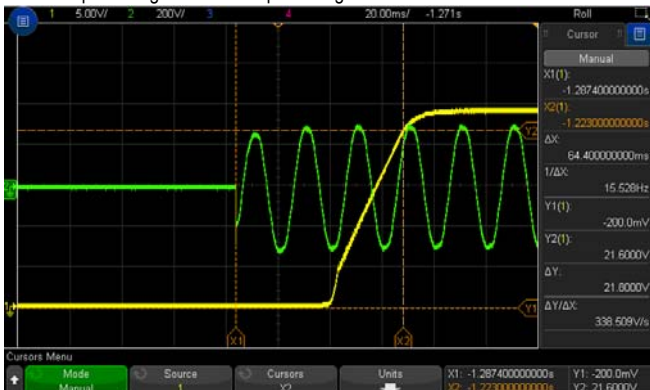
low frequency (V1):



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/ 64 ms 115VAC/ 72ms
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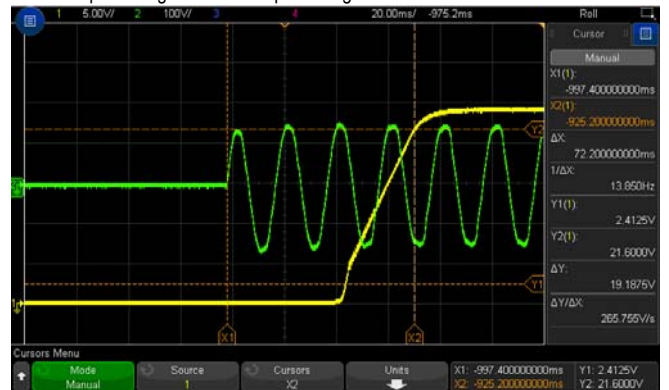
INPUT=230VAC/50HZ @ FULL LOAD

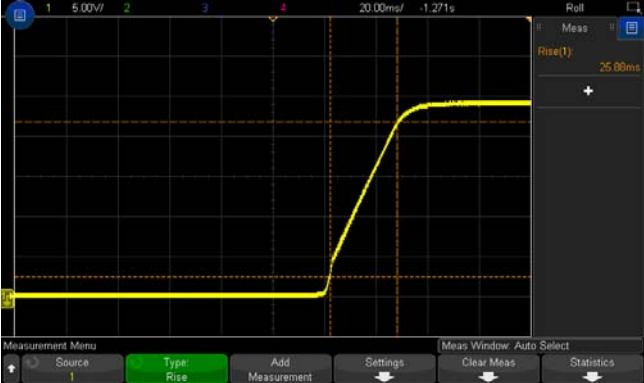
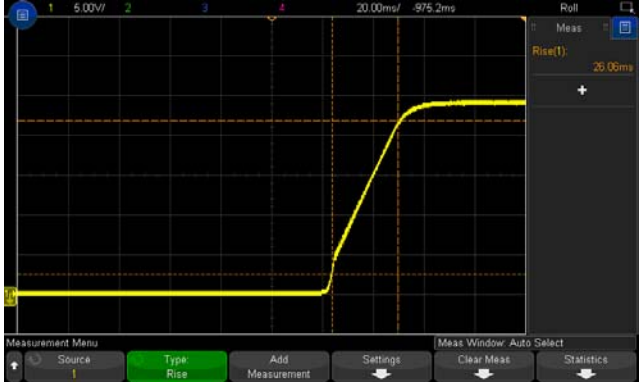
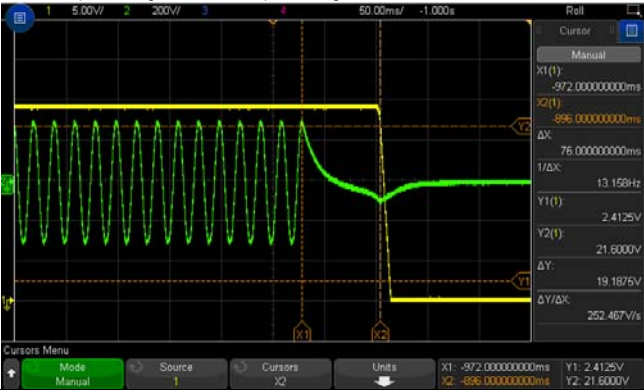

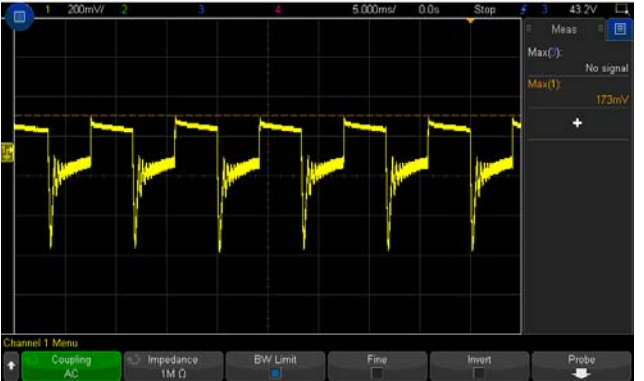
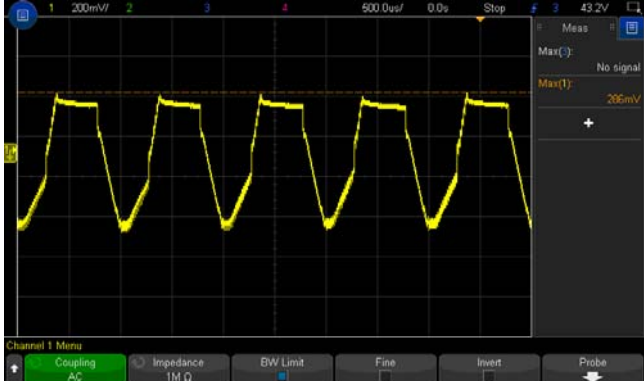
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

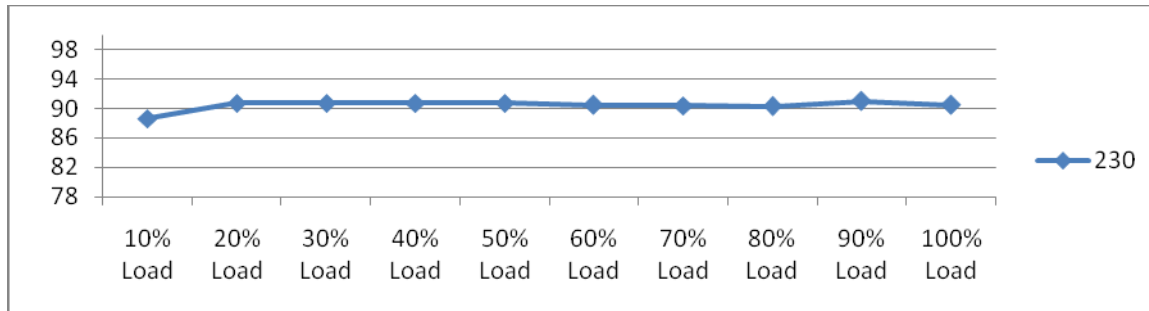


8	RISE TIME (Max)  230VAC/60ms 115VAC/60ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/25.8ms 115VAC/ 26.0ms
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> 	
9	HOLD UP TIME (Typ.)  230VAC/30ms 115VAC/12ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 76ms 115VAC/ 14.6ms
<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	DYNAMIC LOAD  V1: 2400 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: 173mVp-p 286mVp-p
<p>FULL /50% LOAD 50%DUTY / 120HZ (V1)</p> 		<p>FULL /50% LOAD 50%DUTY / 1KHZ (V1)</p> 	

INPUT FUNCTION TEST

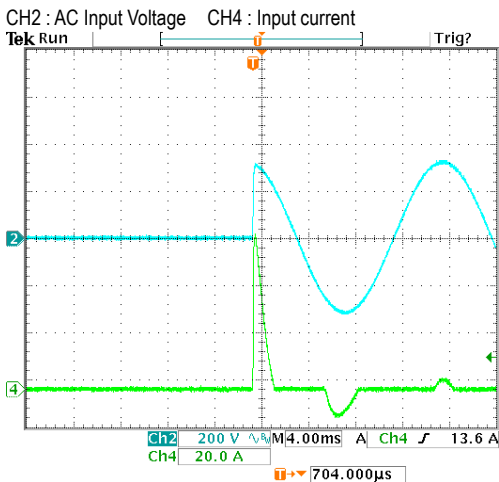
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~277VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	80V~277V
			I/P: LOW-LINE-3V=82 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD (PLEASE CHECK DERATING CURVE) ON: 30 Sec OFF: 30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:85 VAC ~277 VAC O/P:FULL~MIN LOAD Ta:25°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 =1.18A/ 230VAC I =2.01A/ 115VAC
4	NO LOAD POWER CONSUMPTION	< 0.3W	I/P : 230 VAC O/P : Min LOAD Ta : 25°C	0.12W
5	EFFICIENCY(Typ.)	90.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	92.1%

EFFICIENCY vs LOAD

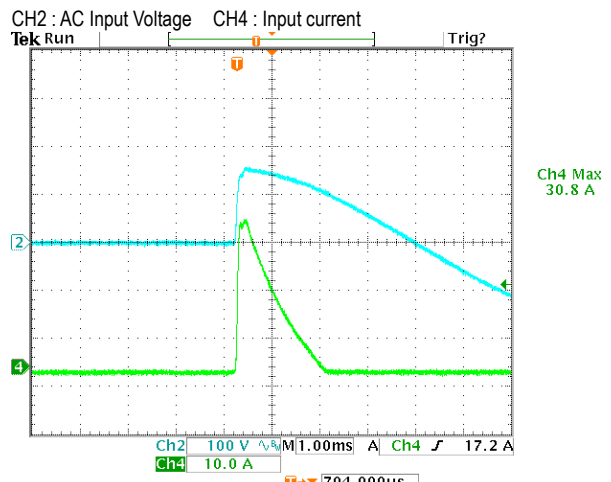


6	INRUSH CURRENT(Typ.)	230V / 70A	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I =66A/ 230VAC
		115V / 35A COLD START		I =30.8A/115VAC

INPUT=230VAC/50HZ @ FULL LOAD



INPUT=115VAC/50HZ @ FULL LOAD



**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	117.12%V/ 277VAC 117.12%/ 230VAC 117.12%/115VAC PROTECTION TYPE : Constant current limiting, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	30.0V~36.0V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta: 25°C	33.1V/ 264VAC 33.1V/ 230VAC 33.1V/ 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 : 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	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) 535V (2) 495V (3) 535V
2	O/P MOFET	Q100 Rated : 150 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	VDS: (1) 130V (2) 106V (3) 130V
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) 397V (2) 394V (3) 394V (4) 386V
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°C	U1 U100 (1) 20.0V (1) 24.9V (2) 12.2V (2) 2.4V (3) 12.2V (3) 5.3V (4) 19.8V (4) 33.1 V (5) 15.8V (5) 22.2
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) 485V (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	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	EN55032 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55032 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 <input type="checkbox"/> LIGHT INDUSTRY AIR: 8KV / Contact: 4KV <input checked="" type="checkbox"/> INDUSTRY AIR: 8KV / Contact: 4KV <input type="checkbox"/> Din rail Model : AIR: 15KV / Contact: 8KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	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	IEC61000-4-5 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= 24.5 °C</th> <th>HIGH AMBIENT Ta= 45.3 °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= 24.5 °C	HIGH AMBIENT Ta= 45.3 °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	<p>1 Carton &amp; 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</p> <p>2 Din Rail</p> <table border="1" data-bbox="450 510 1126 645"> <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	-----													
15Hz up to 50Hz	-----	2.3g													
Sweep rate	Max 1 Octave/minute														
9	CAPACITOR LIFE CYCLE	<p>SUPPOSE C103 IS THE MOST CRITICAL COMPONENT</p> <p>(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</p>	<p>(1) 176531.8 HRS            (2) 43524.4 HRS            (3) 81896.1 HRS            (4) 145527.5 HRS</p>												
10	MTBF	<p>Conducted by Parts Stress Analysis Prediction            536K hrs min. MIL-HDBK-217F (25°C)</p>													
11	Ongoing Reliability Test	<p>I/P : 230VAC O/P : FULL LOAD TA=50°C            Demonstration Mean Time Between Failure : 30,000 hours</p>													

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2018.4.30 GP-A50-F010