



TEST REPORT: HDR-60-24

60W Ultra Slim Step Shape DIN Rail

■ 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

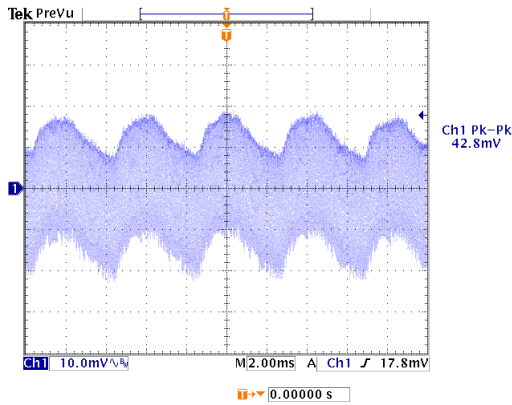
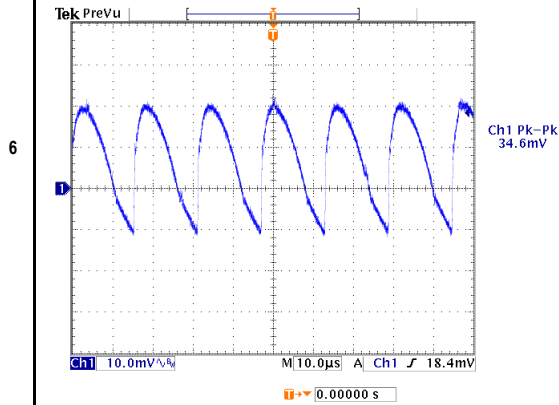
ENVIRONMENT TEST

■ DESIGN VERIFY TEST
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.60V ~ 29.00V	I/P: 230VAC O/P: MIN LOAD TA: 25°C	CH1: 20.97V ~ 29.87V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 1.0% ~ -1.0%	I/P: 85VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.08% ~ -0.12%
3	LINE REGULATION (MAX.)	V1: 1.0% ~ -1.0%	I/P: 85VAC / 277VAC O/P: FULL LOAD TA: 25°C	V1: 0.04% ~ -0.08%
4	LOAD REGULATION (MAX.)	V1: 1.0% ~ -1.0%	I/P: 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.08% ~ -0.12%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P: FULL LOAD TA: 25°C	TEST< 1.7 %
	RIPPLE & NOISE(Max)	V1: 150 mVp-p	I/P: 230VAC O/P: FULL LOAD TA: 25°C	V1: 42.8 mVp-p

high frequency:

low frequency:



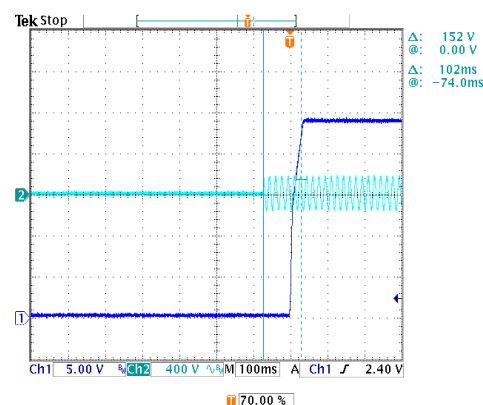
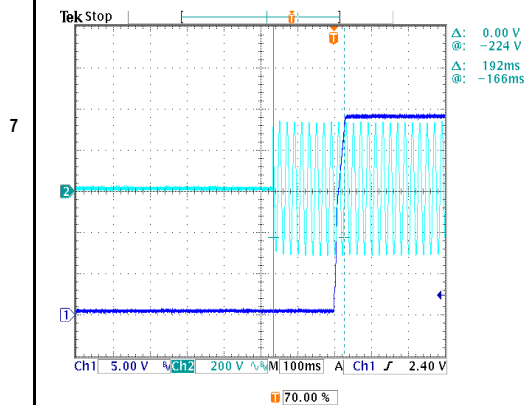
SET UP TIME (MAX.)	230VAC : 500ms	I/P: 230VAC	230VAC : 192ms
	115VAC : 500ms	I/P: 115VAC	115VAC : 102ms
		O/P: FULL LOAD	
		TA: 25°C	

INPUT=230VAC/50HZ @ FULL LOAD

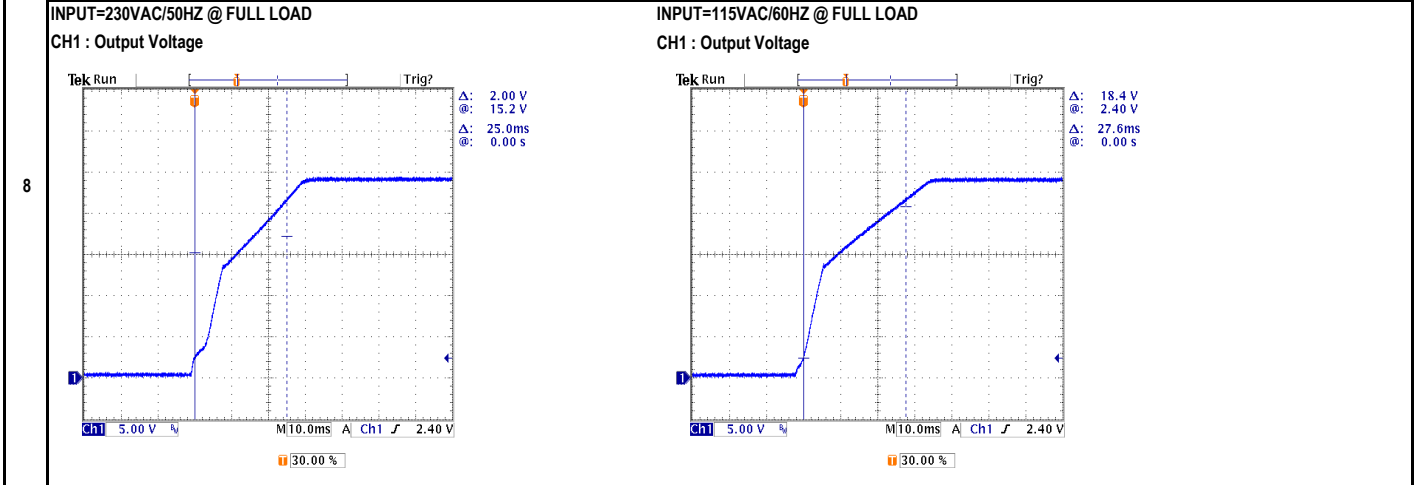
CH1 : Output Voltage CH2 : AC Input Voltage

INPUT=115VAC/60HZ @ FULL LOAD

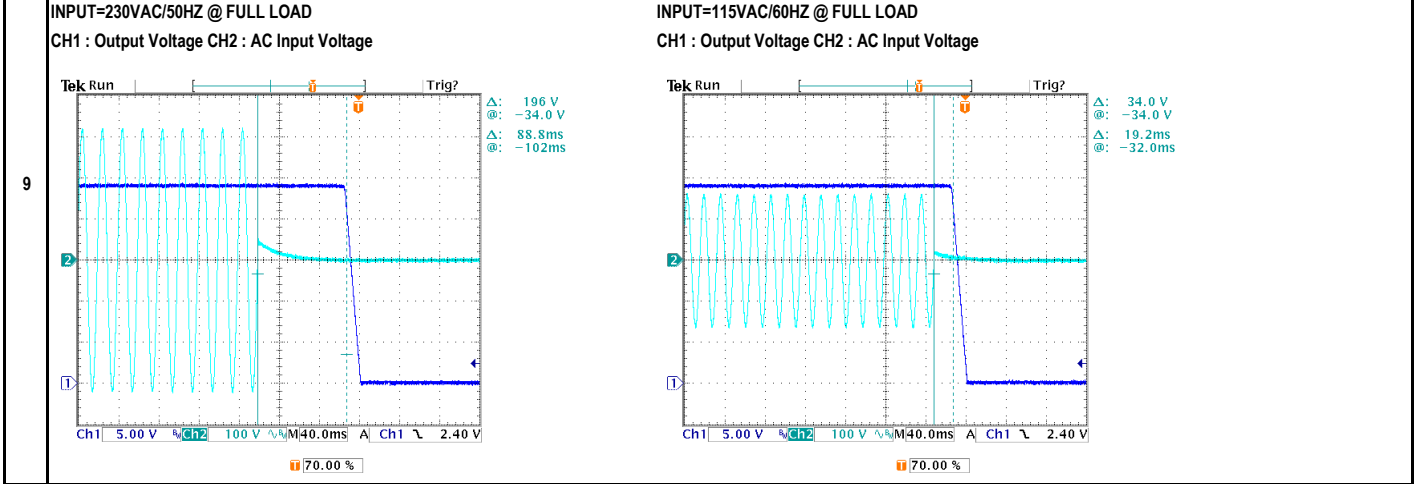
CH1 : Output Voltage CH2 : AC Input Voltage



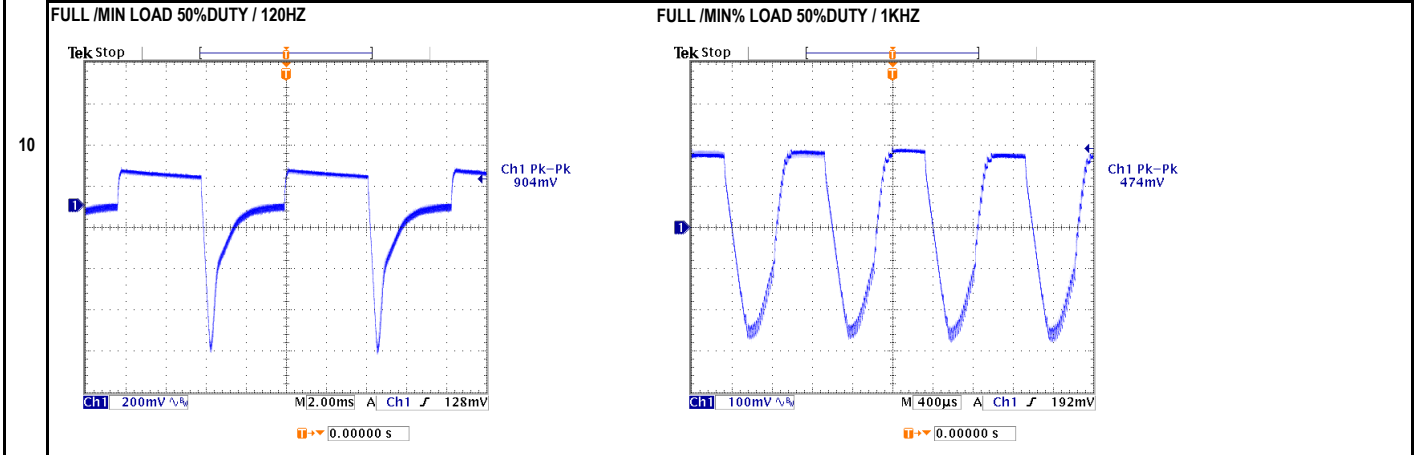
RISE TIME (MAX.)	230VAC	: 50ms	I/P:	230VAC	230VAC	: 25.0ms
	115VAC	: 50ms	I/P:	115VAC	115VAC	: 27.6ms
			O/P:	FULL LOAD		
			TA:	25°C		



HOLD UP TIME (TYP.)	230VAC	: 30ms	I/P:	230VAC	230VAC	: 88.8ms
	115VAC	: 12ms	I/P:	115VAC	115VAC	: 19.2ms
			O/P:	FULL LOAD		
			TA:	25°C		



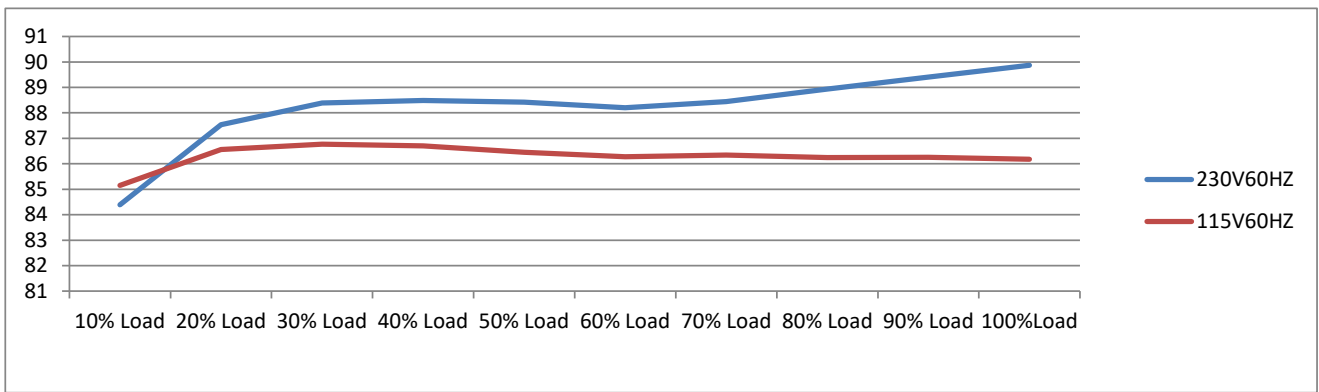
DYNAMIC LOAD	V1:	2400	mVp-p	I/P:	230VAC	(1).	(2).	unit:mVp-p
				O/P:	(1)Full/Min load 50%duty/120HZ	904mv	474mv	
				(2)Full/Min load 50%duty/1KHZ				
				TA:	25°C			



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC ~ 277VAC 120VDC ~ 390VDC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	68.0VAC ~ 277VAC 96.2VDC ~ 390VDC
			I/P: LOW-LINE = 82VAC HIGH-LINE = 300VAC O/P: FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST: OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P: 85VAC ~ 277VAC O/P: FULL-MIN LOAD Ta: 25°C	TEST: OK
3	INPUT CURRENT (TYP.)	0.80A / 230VAC 1.20A / 115VAC	I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA : 25°C	I= 0.52A / 230VAC I= 0.92A / 115VAC
4	NO LOAD POWER CONSUMPTION	< 0.30W	I/P: 230VAC O/P: MIN LOAD TA : 25°C	< 0.1125 W
	EFFICIENCY (TYP.)	90.0%	I/P: 230VAC O/P: FULL LOAD TA : 25°C	90.374 %

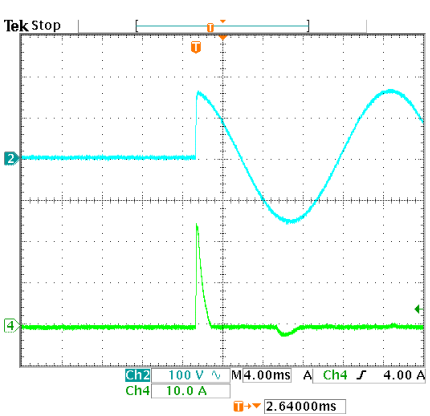
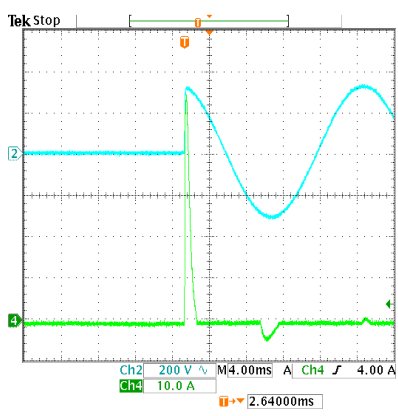
5



6

6	INRUSH CURRENT (TYP.)	60A / 230VAC 30A / 115VAC twidth= 555 us measured at 50% Ipeak COLD START	I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA : 25°C	I= 54.8A / 230VAC I= 24.8A / 115VAC
		INPUT=230VAC/50HZ @ FULL LOAD	INPUT=115VAC/50HZ @ FULL LOAD	

CH2 : AC Input Voltage CH4 : Input current (1V=1A) CH2 : AC Input Voltage CH4 : Input current (1V=1A)



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105% ~ 160%	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: TESTING TA : 25°C	132.40% 277VAC 132.40% 230VAC 132.40% 85VAC 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	30.00V ~ 36.00V	I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD TA : 25°C	33.10V 277VAC 33.10V 230VAC 33.10V 85VAC Shut down Re- power ON
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 hiccup mode,it will recover automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated: 600V 13.0A	I/P: 280VAC VDS : O/P: (1)Full Load Turn on (2) Output Short (3)Full load continue Ta: 25°C	VIN: 280VAC VDS: (1). 560.00V (2). 502.00V (3). 558.00V
2	O/P MOSFET	Q100 Rated: 200V 20.0A	I/P: 280VAC VDS : O/P: (1)Full Load Turn on (2) Output Short (3)Full load continue Ta: 25°C	Q100 VDS : (1). 105.00V (2). 78.40V (3). 105.00V
3	Input Capacitor	C5 Rated: 120uf 400V	I/P: 280VAC O/P: (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta: 25°C	(1). 374.00V (2). 398.00V (3). 376.00V
4	Control IC	U101 Rated: 38V (max) 0V (min) U1 Rated: 35V (max) 0V (min)	I/P: 280VAC O/P: (1)Full Load (2)Output Short Change (4)O.V.P (5)Low Line No Load Vo(min) Ta: 25°C	U101 U1 (1). 24.40V 22.20V (2). 0.62V 11.40V (3). 3.24V 11.40V (4). 33.10V 29.80V (5). 21.20V 18.20V
5	Clamp Diode	D42 Rated: 1000V 2.0A	I/P: 280VAC O/P: (1)Dynamic Load Full/Min Load 90%Duty/1KHz (2)Full load continue Ta: 25°C	(1). 492.00V (2). 288.00V

SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4.000KVAC /min	I/P-O/P: 4.400KVAC /min Ta: 25°C	I/P-O/P: 1.64mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P: 500VDC>100MΩ	I/P-O/P: 500VDC Ta: 25°C/70%RH	I/P-O/P: 180MΩ 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	PASS
2	CONDUCTION	BS EN/EN55032(CISPR32), CNS13438 CLASS B	I/P: 230VAC /50HZ O/P: FULL LOAD / 50% LOAD Ta: 25°C	PASS Test by certified Lab
3	RADIATION	BS EN/EN55032(CISPR32), CNS13438 CLASS B	I/P: 230VAC /50HZ O/P: FULL LOAD Ta: 25°C	PASS Test by certified Lab
4	E.S.D	BS EN/EN61000-4-2 INDUSTRY AIR: 8KV / Contact: 4KV	I/P: 230VAC /50HZ O/P: FULL LOAD Ta: 25°C	CRITERIA A
5	E.F.T	BS EN/EN61000-4-4 INDUSTRY INPUT: 2KV	I/P: 230VAC /50HZ O/P: FULL LOAD Ta: 25°C	CRITERIA A
6	SURGE	BS EN/EN61000-4-5 INDUSTRY L-N: 2KV	I/P: 230VAC /50HZ O/P: FULL LOAD Ta: 25°C	CRITERIA A

RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	TEMPERATURE RISE TEST	MODEL: HDR-60-24 1. ROOM AMBIENT BURN-IN: 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 21.2°C 2. HIGH AMBIENT BURN-IN: 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 49.8°C	ROOM AMBIENT Ta: 21.2°C HIGH AMBIENT Ta: 49.8°C																																													
			<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT Ta: 21.2°C</th> <th>HIGH AMBIENT Ta: 49.8°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>48.5°C</td><td>72.5°C</td></tr> <tr><td>2</td><td>BD1</td><td>52.9°C</td><td>76.3°C</td></tr> <tr><td>3</td><td>C5</td><td>54.6°C</td><td>79.6°C</td></tr> <tr><td>4</td><td>Q1</td><td>66.3°C</td><td>88.6°C</td></tr> <tr><td>5</td><td>D42</td><td>71.5°C</td><td>94.9°C</td></tr> <tr><td>6</td><td>T1</td><td>84.6°C</td><td>105.7°C</td></tr> <tr><td>7</td><td>C105</td><td>65.4°C</td><td>87.3°C</td></tr> <tr><td>8</td><td>Q100</td><td>76.4°C</td><td>98.7°C</td></tr> <tr><td>9</td><td>LF101</td><td>63.9°C</td><td>86.3°C</td></tr> <tr><td>10</td><td>U1</td><td>58.2°C</td><td>81.4°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT Ta: 21.2°C	HIGH AMBIENT Ta: 49.8°C	1	LF1	48.5°C	72.5°C	2	BD1	52.9°C	76.3°C	3	C5	54.6°C	79.6°C	4	Q1	66.3°C	88.6°C	5	D42	71.5°C	94.9°C	6	T1	84.6°C	105.7°C	7	C105	65.4°C	87.3°C	8	Q100	76.4°C	98.7°C	9	LF101	63.9°C	86.3°C	10	U1	58.2°C	81.4°C	
NO.	Position	ROOM AMBIENT Ta: 21.2°C	HIGH AMBIENT Ta: 49.8°C																																													
1	LF1	48.5°C	72.5°C																																													
2	BD1	52.9°C	76.3°C																																													
3	C5	54.6°C	79.6°C																																													
4	Q1	66.3°C	88.6°C																																													
5	D42	71.5°C	94.9°C																																													
6	T1	84.6°C	105.7°C																																													
7	C105	65.4°C	87.3°C																																													
8	Q100	76.4°C	98.7°C																																													
9	LF101	63.9°C	86.3°C																																													
10	U1	58.2°C	81.4°C																																													
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P: 230VAC O/P: 123.10% LOAD Ta: 25°C	TEST: OK																																												
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P: 277VAC / 100VAC O/P: FULL LOAD Ta: -30.0°C	TEST: OK																																												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45°C NO DAMAGE	I/P: 287VAC O/P: FULL LOAD Ta: 45°C HUMIDITY= 95.0% RH	TEST: OK																																												
5	TEMPERATURE COEFFICIENT	±0.03% /(0°C~50°C)	I/P: 230VAC O/P: FULL LOAD	±0.0072% /(0°C~50°C)																																												
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature: -40°C ~ +85°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle: 5 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: 10 CYCLE 5. Input/Output condition: 230VAC Full Load AC ON/OFF test turn on 58sec; turn off 2sec		TEST: OK																																												



8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency: 10~500Hz (4) Acceleration: 2G (5) Test Time: 60 min in each axis (X.Y.Z) (6) Ta: 25°C	TEST: OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P: 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME (2) I/P: 230VAC O/P : FULL LOAD Ta= 45.0°C LIFE TIME (3) I/P: 230VAC O/P : 75% LOAD Ta= 45.0°C LIFE TIME (4) I/P: 230VAC O/P : 50% LOAD Ta= 45.0°C LIFE TIME	(1). 120198 HRS (2). 47838 HRS (3). 73808.8 HRS (4). 153816 HRS
10	MTBF	3524.8K hrs min. Telcordia SR-332 (Bellcore) ; 927.6K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 45°C O/P: FULL LOAD	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014