



# Test Report: LRS-350-4.2

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350W Single Output Switching Power Supply

## ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

## ■ SAFETY TEST

## ■ RELIABILITY TEST

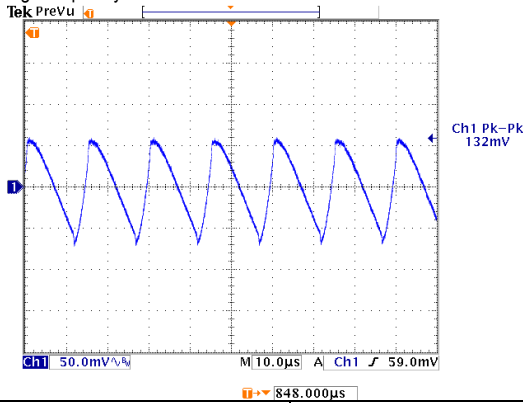
ENVIRONMENT TEST

## DESIGN VERIFY TEST

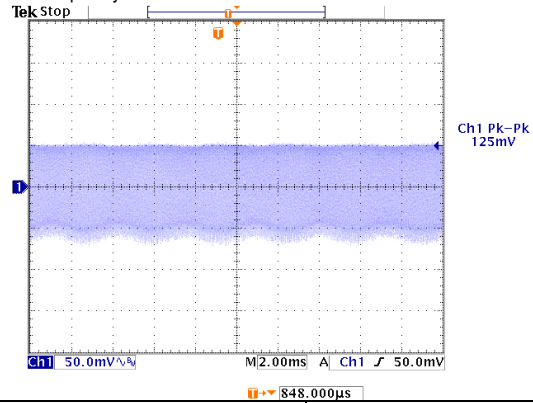
### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 3.6V~ 4.4V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	3.500V~4.666V/230VAC 3.501V~4.669V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -4 %~ 4%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:- 0.12 %~ 0.12%
3	LINE REGULATION (Max)	V1: -0.5 %~ 0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0 %~0 %
4	LOAD REGULATION(Max)	V1: 2.5 %~ -2.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1:- 0%~ 0%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max )	V1: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 132mVp-p

high frequency :



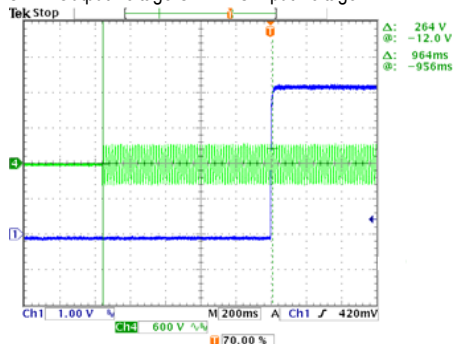
low frequency :



7	SET UP TIME(Max)	230VAC/1500ms 115VAC/ 1500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 964ms 115VAC/ 1092ms
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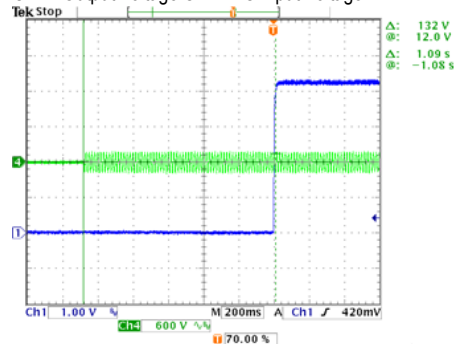
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH4 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

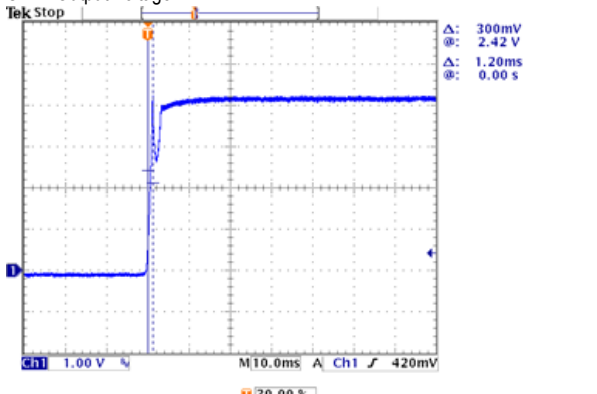
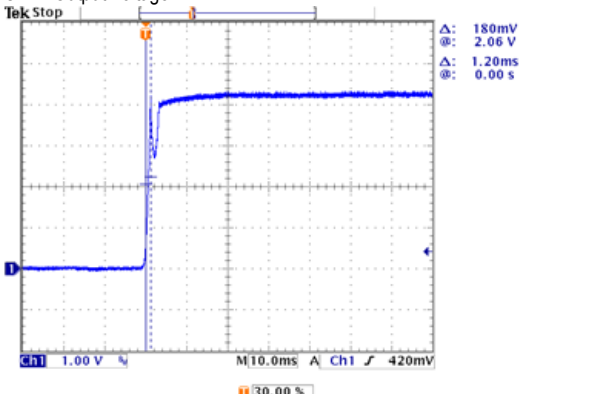
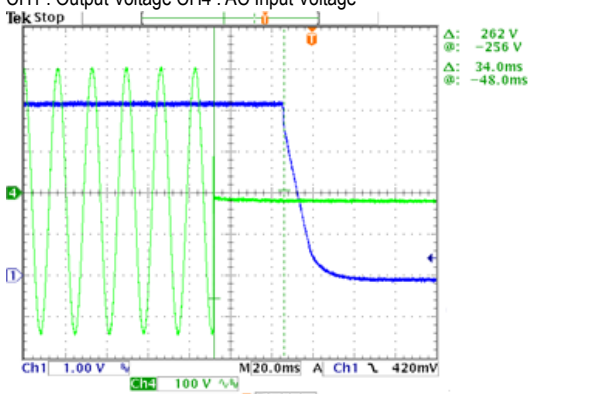
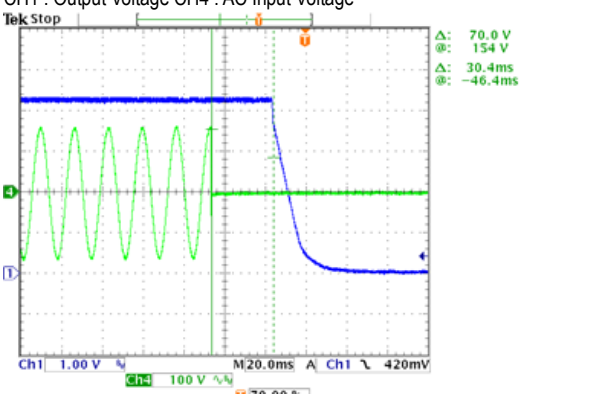
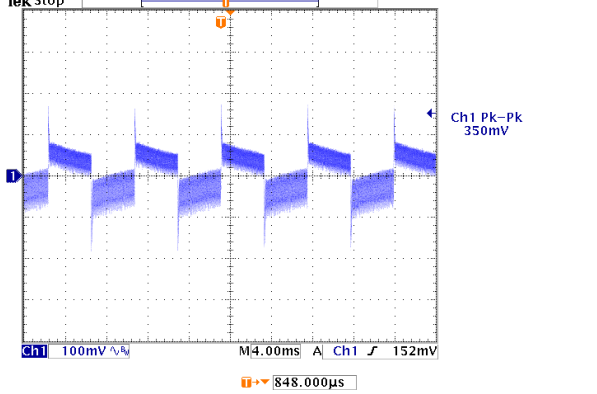
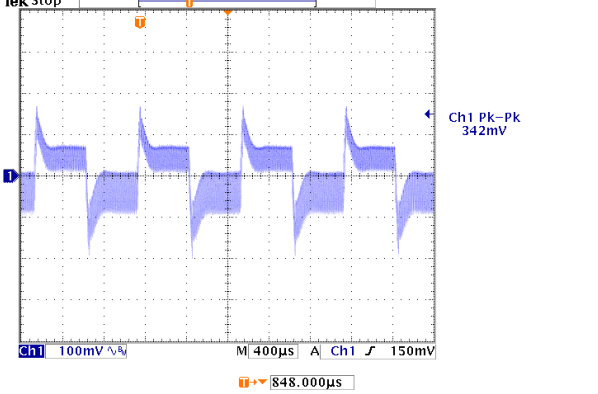
CH1 : Output Voltage CH4 : AC Input Voltage





# 350W Single Output Switching Power Supply

# LRS-350 series

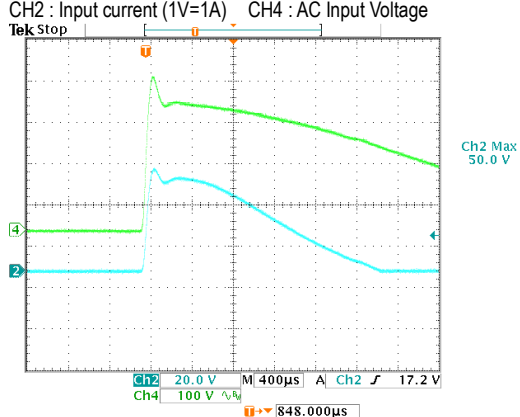
8	RISE TIME (Max)	230VAC/ 50ms 115VAC/ 50ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 1.20ms 115VAC/1.20ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 		
9	HOLD UP TIME(Typ )	230VAC/ 16ms 115VAC/ 12ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/34.0ms 115VAC/ 30.4ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		
10	DYNAMIC LOAD	V1: 840mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	350mVp-p 342mVp-p
FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 		



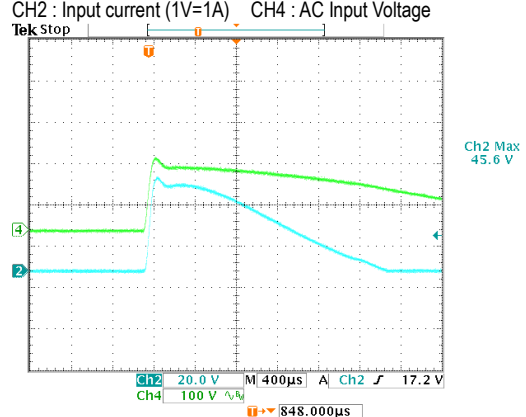
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90 ~ 132VAC / 180 ~ 264VAC by switch 240 ~ 370VDC (switch on 230VAC)	I/P:TESTING O/P:FULL LOAD Ta:25°C  I/P: (1)LOW-LINE-3V=87 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230Vac ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230Vac ON:3Sec OFF:3Sec 12HOURS ( POWER ON/OFF NO DAMAGE )	79V~132V 134V~264V 228VDC ~ 370VDC(switch on 230VAC)  TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P: 180 VAC ~264 VAC 90 VAC ~132 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK
3	INPUT CURRENT (Typ)	230V/ 3.4A 115V/ 6.8A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I =2.58A/ 230VAC I =4.76A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.495mA N-FG: 0.495mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.68W < 0.73 W
6	INRUSH CURRENT(Typ)	230V/ 60A 115V/ 60A COLD START	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I =50.0A/ 230VAC I =45.6A/ 115VAC

INPUT=230VAC/50HZ @ FULL LOAD  
CH2 : Input current (1V=1A) CH4 : AC Input Voltage



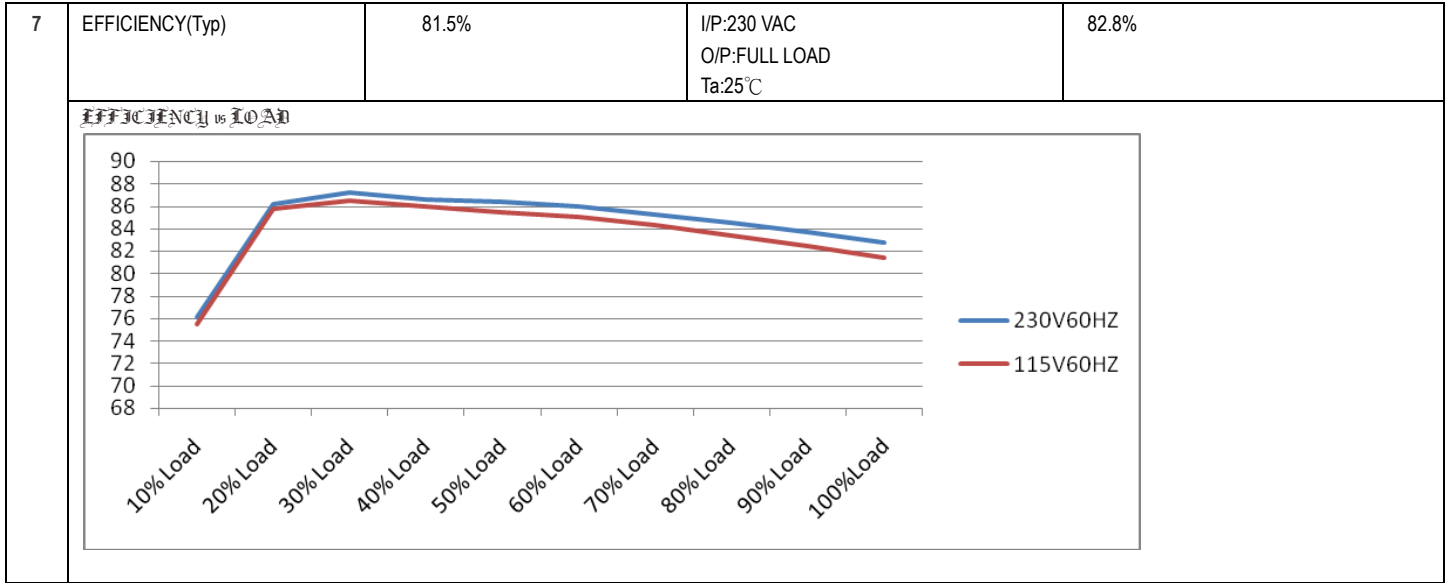
INPUT=115VAC/50HZ @ FULL LOAD  
CH2 : Input current (1V=1A) CH4 : AC Input Voltage





### 350W Single Output Switching Power Supply

# LRS-350 series



## PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110 %~ 140 % rated output power Hiccup mode, recovers automatically after fault condition is removed.	I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	126.80%/ 230VAC 126.61%/115VAC Protection type : 110 %~ 140 % rated output power Hiccup mode, recovers automatically after fault condition is removed.
2	OVER VOLTAGE PROTECTION	CH: 4.6V~5.4V Hiccup mode, recovers automatically after fault condition is removed.	I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25°C	5.32V/ 230VAC 5.32V/115VAC Protection type : Hiccup mode, recovers automatically after fault condition is removed.
3	OVER TEMPERATURE PROTECTION	NO DAMAGE Hiccup mode, recovers automatically after fault condition is removed.	I/P: 230 VAC O/P: FULL LOAD	O.T.P. Active Protection type : Hiccup mode, recovers automatically after fault condition is removed.
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25°C	NO DAMAGE 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) <b>Peak Voltage</b>	Q 1 Rated 13 A/500V	I/P: High-Line +3V =267V O/P: (1) Full Load Turn on (2) Output Short (3) Full Load Continue Ta:25°C	(1) 440V (2) 440V (3) 434V
2	Diode <b>Peak Voltage</b>	Q102 Rated 120 A/40V  Q103 Rated 120A/40V	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off (2) Output Short (3) Full Load Continue Ta:25°C	Q102 (1) 39.4V (2) 39.6V (3) 32.8V  Q103:



## 350W Single Output Switching Power Supply

# LRS-350 series

				(1)31.4V (2)31.6V (3)27.8V
3	<b>Input Capacitor Voltage</b>	C5 Rated: 560 $\mu$ / 200V	I/P:High-Line +3V =267 V O/P: (1)Full Load input on/off (2) MinLoad input on /Off (3)Full Load /Min load Change Ta:25°C	(1)188V (2)184V (3)187V
4	<b>Control IC Voltage Test</b>	PWM IC U1 Rated 28 V (MAX.) 10V (MIN.)	I/P:High-Line +3V =267 V O/P: (1)Full Load input on/off (2)Min Load input on/off (3)Full Load/Min load change Ta:25°C	U1 (1) 19.4V (2) 19.4V (3) 19.2V

## SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 3.6 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25°C	I I/P-O/P: 2.38mA I/P-FG: 3.40mA O/P-FG:2.68 m A NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M $\Omega$ I/P-FG: 500VDC>100M $\Omega$ O/P-FG:500VDC>100M $\Omega$	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 9999M $\Omega$ I/P-FG: 9999M $\Omega$ O/P-FG: 9999M $\Omega$ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m $\Omega$	40A / 2min Ta:25°C	26 m $\Omega$

## RELIABILITY TEST

### ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	TEMPERATURE RISE TEST	MODEL: LRS-350-5 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=23.5°C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=52.9°C																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 23.5 °C</th> <th>HIGH AMBIENT Ta=52.9 °C</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>LF1</td> <td>41.5°C</td> <td>72.0°C</td> </tr> <tr> <td>2</td> <td>L100</td> <td>74.7°C</td> <td>113.3°C</td> </tr> <tr> <td>3</td> <td>C105</td> <td>57.2°C</td> <td>90.9°C</td> </tr> <tr> <td>4</td> <td>T1</td> <td>68.6°C</td> <td>103.0°C</td> </tr> <tr> <td>5</td> <td>BD1</td> <td>42.3°C</td> <td>71.0°C</td> </tr> <tr> <td>6</td> <td>C5</td> <td>35.7°C</td> <td>62.7°C</td> </tr> <tr> <td>7</td> <td>T2</td> <td>29.6°C</td> <td>57.8°C</td> </tr> <tr> <td>8</td> <td>Q2</td> <td>42.9°C</td> <td>74.9°C</td> </tr> <tr> <td>9</td> <td>Q1</td> <td>41.5°C</td> <td>73.0°C</td> </tr> <tr> <td>10</td> <td>Q103</td> <td>58.3°C</td> <td>90.3°C</td> </tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 23.5 °C	HIGH AMBIENT Ta=52.9 °C	1	LF1	41.5°C	72.0°C	2	L100	74.7°C	113.3°C	3	C105	57.2°C	90.9°C	4	T1	68.6°C	103.0°C	5	BD1	42.3°C	71.0°C	6	C5	35.7°C	62.7°C	7	T2	29.6°C	57.8°C	8	Q2	42.9°C	74.9°C	9	Q1	41.5°C	73.0°C	10	Q103	58.3°C	90.3°C
NO	Position	ROOM AMBIENT Ta= 23.5 °C	HIGH AMBIENT Ta=52.9 °C																																													
1	LF1	41.5°C	72.0°C																																													
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4	T1	68.6°C	103.0°C																																													
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6	C5	35.7°C	62.7°C																																													
7	T2	29.6°C	57.8°C																																													
8	Q2	42.9°C	74.9°C																																													
9	Q1	41.5°C	73.0°C																																													
10	Q103	58.3°C	90.3°C																																													



350W Single Output Switching Power Supply

LRS-350 series

		NO	Position	ROOM AMBIENT Ta= 23.5 °C	HIGH AMBIENT Ta=52.9 °C
		11	Q102	59.4°C	92.4°C
		12	Q104	57.1°C	88.7°C
		13	U1	29.9°C	58.6°C
		14	U100	60.1°C	91.5°C
		15	D10	35.7°C	65.1°C
		16	C36	27.5°C	56.3°C
		17	RTH3	50.9°C	80.3°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )		I/P: 230 VAC O/P: 113% LOAD Ta: 25°C	TEST: OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR		I/P: 264VAC/100VAC O/P: 100 % LOAD Ta= -25 °C	TEST: OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE		I/P: 272 VAC O/P: FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST: OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/°C (0~50°C)		I/P: 230 VAC O/P: FULL LOAD	±0%/°C (0~50°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: 5 CYCLE 5. Input/Output condition: STATIC			OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature: -25°C~ 70°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			OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency: 10~500Hz (3) Sweep Time: 10min/sweep cycle (4) Acceleration: 5G (5) Test Time: 60min 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 °C LIFE TIME (2) I/P: 230VAC O/P: FULL LOAD Ta= 50 °C LIFE TIME (3) I/P: 230VAC O/P: 75% LOAD Ta= 50 °C LIFE TIME (4) I/P: 230VAC O/P: 50% LOAD Ta= 50 °C LIFE TIME			(1) 276816HRS (2) 36335HRS (3) 108557HRS (4) 220246HRS
10	MTBF	2099.9K hrs min. Telcordia SR-332 (Bellcore) ; 328.6Khrs min. MIL-HDBK-217F (25°C)			
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C			

TEST RESULT	TESTER	APPROVAL
PASS	FRANK	WANGDZ