



Test Report: LRS-150F-24

150W Single Output Switching Power Supply

■ 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

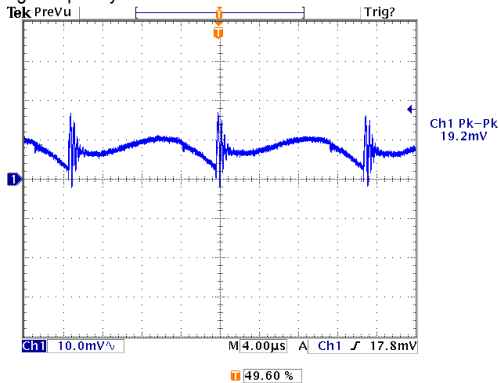
ENVIRONMENT TEST

DESIGN VERIFY TEST

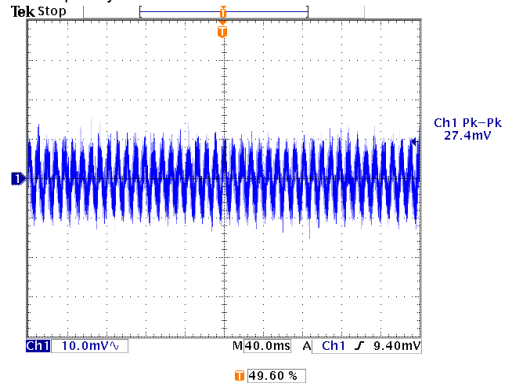
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 21.6V~ 28.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	20.69V~30.53V/230VAC 20.69V~30.53V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: 1 %~ -1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0%~0.04%
3	LINE REGULATION (Max)	V1: 0.5 %~ -0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1:0 %~0.04%
4	LOAD REGULATION(Max)	V1: 0.5 %~ -0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1:0 %~0%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	< 5%
6	RIPPLE & NOISE(Max)	V1: 200 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1:27.4 mVp-p

high frequency :



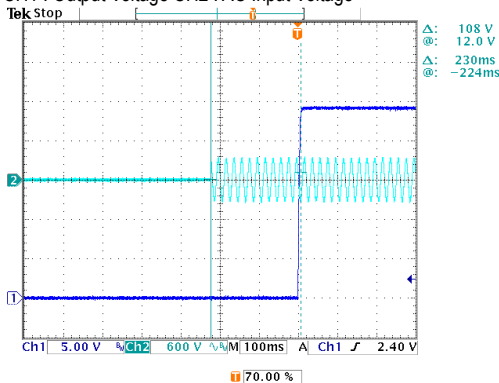
low frequency :



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/230ms 115VAC/110ms
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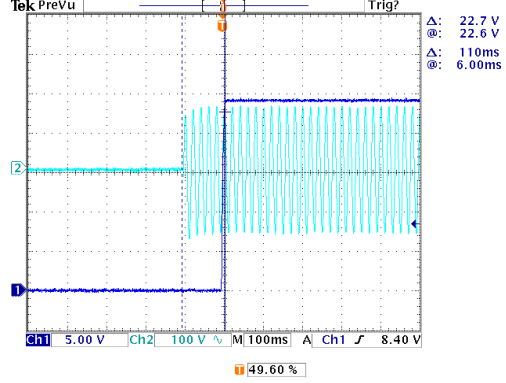
INPUT=230VAC/50HZ @ FULL LOAD

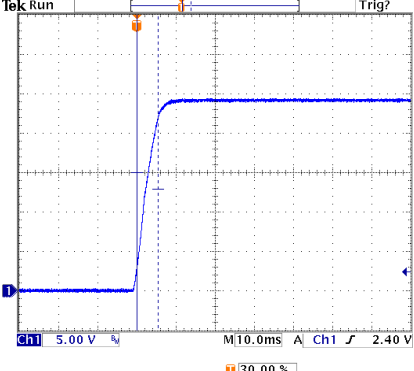
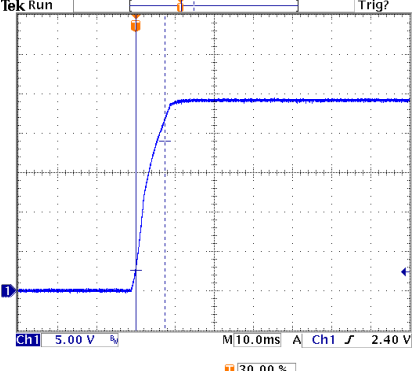
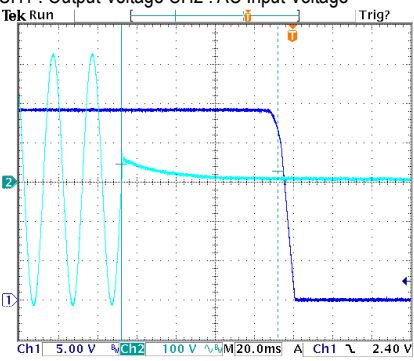
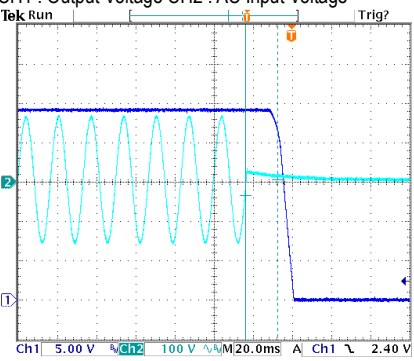
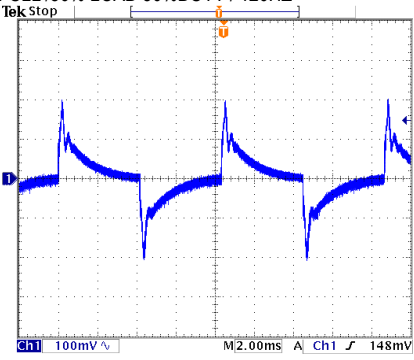
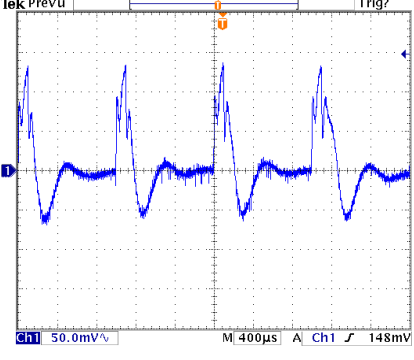
CH1 : Output Voltage CH2 : AC Input Voltage



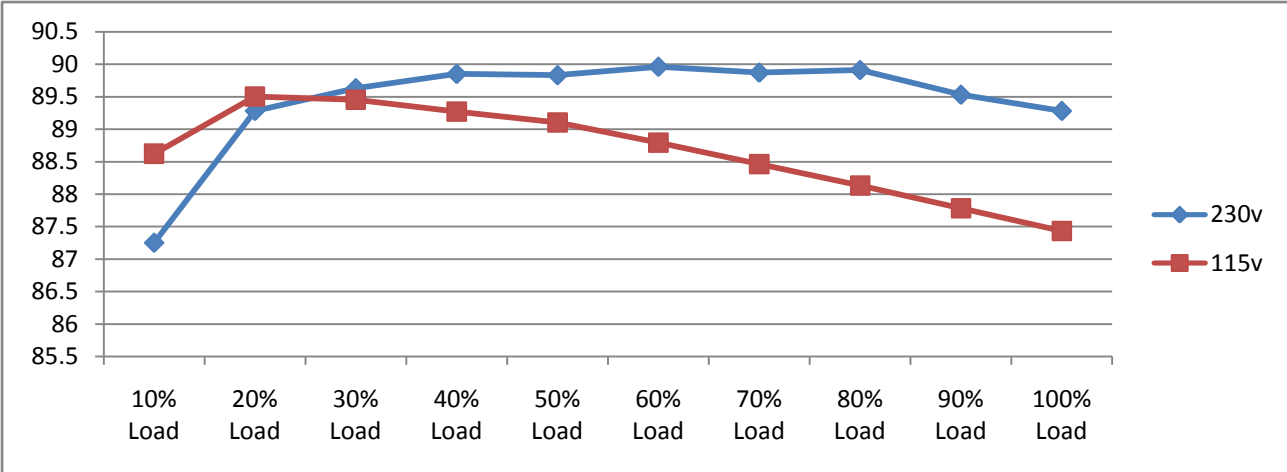
INPUT=115VAC/60HZ @ FULL LOAD

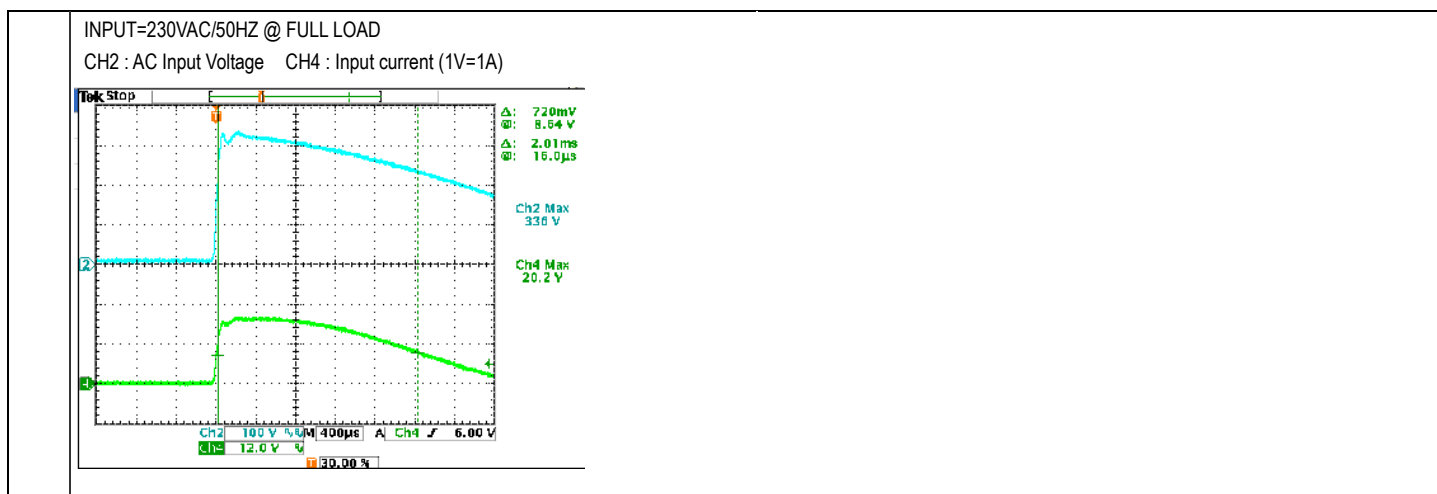
CH1 : Output Voltage CH2 : AC Input Voltage



<p>8</p>	<p>RISE TIME (Max)</p> <p>230VAC/30ms 115VAC/30ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/5.4ms 115VAC/7.4ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p>  <p>Δ: 2.10 V @: 15.0 V Δ: 5.40ms @: 0.00 s</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p>  <p>Δ: 16.4 V @: 2.60 V Δ: 7.40ms @: 0.00 s</p>	
<p>9</p>	<p>HOLD UP TIME (Typ.)</p> <p>230VAC/16ms 115VAC/12ms</p>	<p>I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C</p>	<p>230VAC/80ms 115VAC/16.4ms</p>
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p>  <p>Δ: 18.0 V @: 46.0 V Δ: 80.0ms @: -88.0ms</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p>  <p>Δ: 40.0 V @: -34.0 V Δ: 16.4ms @: -24.0ms</p>	
<p>10</p>	<p>DYNAMIC LOAD</p> <p>V1: 2400 mVp-p</p>	<p>I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C</p>	<p>396mVp-p 206 mVp-p</p>
<p>FULL /50% LOAD 50%DUTY / 120HZ</p>  <p>Ch1 Pk-Pk 396mV</p>		<p>FULL /50% LOAD 50%DUTY / 1KHZ</p>  <p>Ch1 Pk-Pk 206mV</p>	

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																	
1	INPUT VOLTAGE RANGE	85VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25°C	72V~264V																																	
			I/P: (1)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 (2)230Vac ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230Vac ON:3Sec OFF:3Sec 12HOURS (POWER ON/OFF NO DAMAGE)	TEST:OK																																	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:100 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST: OK																																	
3	INPUT CURRENT (Typ.)	230V/ 1.6A 115V/ 2.8A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =1.21A/ 230VAC I =2.43A/ 115VAC																																	
4	LEAKAGE CURRENT	< 0.75mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.530mA N-FG : 0.530mA																																	
5	NO LOAD CONSUMPTION	< 0.5W	I/P : 115VAC I/P : 230VAC O/P : NO LOAD Ta : 25°C	<0.2601 W < 0.3566W																																	
6	EFFICIENCY(Typ.)	89%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	89.17%																																	
<p>EFFICIENCY vs LOAD</p>  <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>230v Efficiency (%)</th> <th>115v Efficiency (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>87.2</td><td>88.6</td></tr> <tr><td>20%</td><td>89.2</td><td>89.5</td></tr> <tr><td>30%</td><td>89.6</td><td>89.4</td></tr> <tr><td>40%</td><td>89.8</td><td>89.2</td></tr> <tr><td>50%</td><td>89.7</td><td>89.0</td></tr> <tr><td>60%</td><td>89.8</td><td>88.7</td></tr> <tr><td>70%</td><td>89.7</td><td>88.4</td></tr> <tr><td>80%</td><td>89.7</td><td>88.1</td></tr> <tr><td>90%</td><td>89.5</td><td>87.8</td></tr> <tr><td>100%</td><td>89.2</td><td>87.4</td></tr> </tbody> </table>					Load (%)	230v Efficiency (%)	115v Efficiency (%)	10%	87.2	88.6	20%	89.2	89.5	30%	89.6	89.4	40%	89.8	89.2	50%	89.7	89.0	60%	89.8	88.7	70%	89.7	88.4	80%	89.7	88.1	90%	89.5	87.8	100%	89.2	87.4
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80%	89.7	88.1																																			
90%	89.5	87.8																																			
100%	89.2	87.4																																			
7	INRUSH CURRENT(Typ.)	230V/60A COLD START	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I =20.2A/ 230VAC																																	



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~ 140 %	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P:TESTING Ta:25°C	124.6%/ 264VAC 124.9%/ 230VAC 122.6%/100VAC PROTECTION TYPE : Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	28.8V~33.6V	I/P: 264VAC I/P: 230VAC I/P: 85VAC O/P:MIN LOAD Ta:25°C	32.15V/ 264VAC 32.2V/ 230VAC 32.15V/ 85VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 264VAC I/P:85VAC O/P:FULL LOAD	O.T.P.Active PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC 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	Q1 Rated :13A/600V	I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4) 0%→400% Load. (4) 0%→400% Load. Ta:25°C	VDS: (1) 574V (2) 532V (3) 588V (4) 536V
2	Diode Peak Voltage	Q101 Rated :20 A/150 V	I/P:High-Line +3V =267 V AC ON/OFF O/P: (1)Full Load	Q101: VDS: (1) 143V

			(2)Output Short (3) Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (4) 0%→400% Load. (5).NO LOAD Ta:25°C	(2) 135V (3) 142V (4) 142V (5) 135V
3	Input Capacitor Voltage	C5 Rated: : 120 μ /400 V 105 °C	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	(1) 366V (2) 368V (3) 368V
4	Control IC Voltage Test	PWM IC U1 Rated : 28V 10.5V(MIN.)	I/P:High-Line +3V =267 V AC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR Min. .LOW LINE Ta:25°C	1. 21.6V 2. 13.3V 3. 20.6V 4. 25.8V 5. 16.7V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75KVAC/min I/P-FG :2KVAC/min O/P-FG:1.25KVAC/min	I/P-O/P: 4.125 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25°C	I/P-O/P: 3.24mA I/P-FG: 3.88mA O/P-FG: 3.25mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100M Ω I/P-FG: 500VDC>100M Ω O/P-FG:500VDC>100M Ω	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P:9999M Ω I/P-FG:9999 M Ω O/P-FG:9999M Ω NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 m Ω	40A / 2min Ta:25°C	28m Ω

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P:80%LOAD Ta:25°C	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55022 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 INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 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 L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
7	Test by certified Lab & Test Report Prepare			

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																
1	TEMPERATURE RISE TEST	MODEL : LRS-150F-12 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=27.2°C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=40.6°C																																																		
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 27.2 °C</th> <th>HIGH AMBIENT Ta=40.6 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>D6</td><td>66.2°C</td><td>77.9°C</td></tr> <tr><td>2</td><td>C6</td><td>67.4°C</td><td>76.7°C</td></tr> <tr><td>3</td><td>Q1</td><td>84.7°C</td><td>96.6°C</td></tr> <tr><td>4</td><td>C35</td><td>66.3°C</td><td>76.3°C</td></tr> <tr><td>5</td><td>BD1</td><td>86.4°C</td><td>95.7°C</td></tr> <tr><td>6</td><td>Q100</td><td>96.9°C</td><td>107.0°C</td></tr> <tr><td>7</td><td>C106</td><td>77.9°C</td><td>89.5°C</td></tr> <tr><td>8</td><td>LF1</td><td>65.6°C</td><td>76.5°C</td></tr> <tr><td>9</td><td>RTH10</td><td>75.4°C</td><td>86.7°C</td></tr> <tr><td>10</td><td>R14</td><td>73.7°C</td><td>86.1°C</td></tr> <tr><td>11</td><td>T1</td><td>82.4°C</td><td>92.4°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 27.2 °C	HIGH AMBIENT Ta=40.6 °C	1	D6	66.2°C	77.9°C	2	C6	67.4°C	76.7°C	3	Q1	84.7°C	96.6°C	4	C35	66.3°C	76.3°C	5	BD1	86.4°C	95.7°C	6	Q100	96.9°C	107.0°C	7	C106	77.9°C	89.5°C	8	LF1	65.6°C	76.5°C	9	RTH10	75.4°C	86.7°C	10	R14	73.7°C	86.1°C	11	T1	82.4°C	92.4°C
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7	C106	77.9°C	89.5°C																																																	
8	LF1	65.6°C	76.5°C																																																	
9	RTH10	75.4°C	86.7°C																																																	
10	R14	73.7°C	86.1°C																																																	
11	T1	82.4°C	92.4°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= -30 °C	TEST : OK																																																
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 45 °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 : -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		OK																																																
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -30°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=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) 81305HRS (2) 23047HRS (3) 48975HRS (4) 93362HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE : 648.6KHRS	
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

2007/3/20 A50-S014