



Test Report: LRS-600-36

600W Single Output Switching Power Supply

■ 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

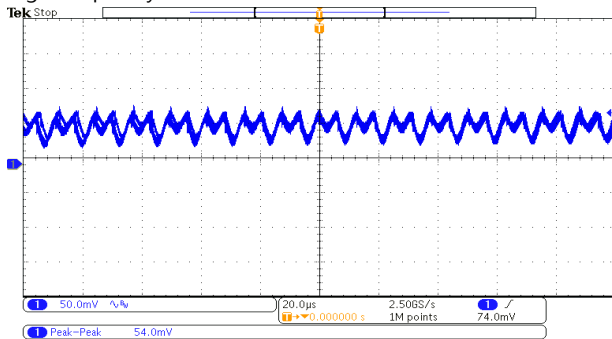
ENVIRONMENT TEST

DESIGN VERIFY TEST

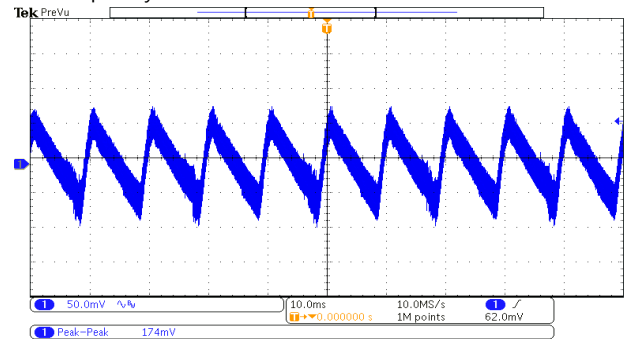
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 34.2 V~ 39.6V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	33.07V~41.17V/230VAC 33.04V~41.14V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1 %~+1%	I/P: 90VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1: 0.11%~0.27%
3	LINE REGULATION (Max)	V1: -0.5%~ 0.5 %	I/P: 90VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: 0%~ 0.02%
4	LOAD REGULATION(Max)	V1: -0.5%~ 0.5 %	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: -0.05%~ 0.05%
5	RIPPLE & NOISE(Max)	V1: 360 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 174mVp-p

high frequency :

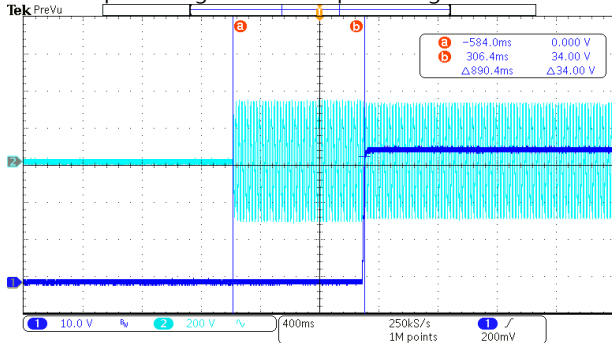


low frequency :



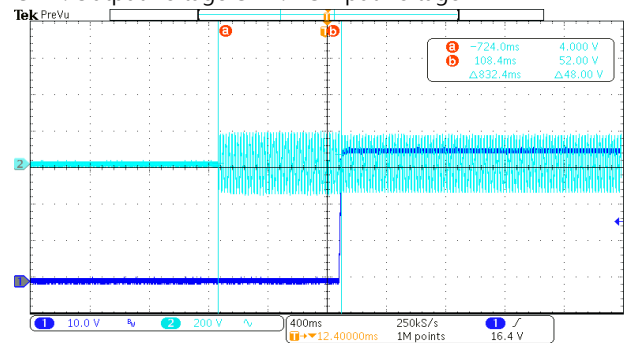
6	SET UP TIME(Max)	230VAC/1300ms 115VAC/1300ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/890.4ms 115VAC/832.4ms
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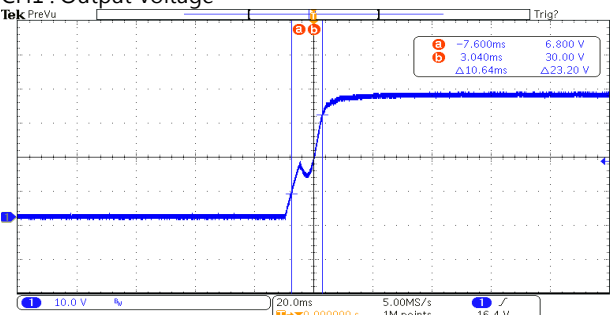
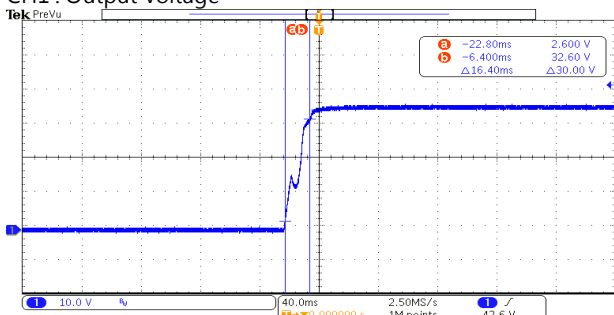
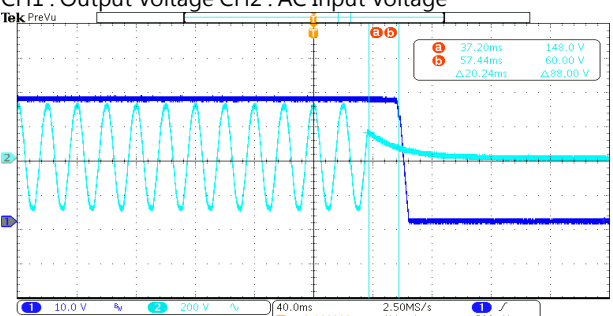
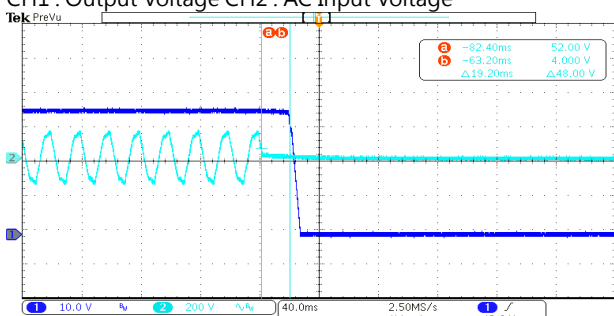
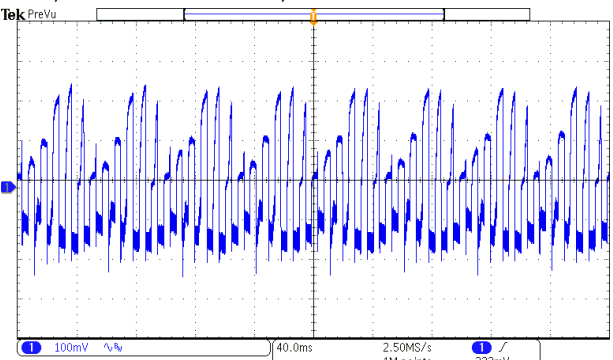
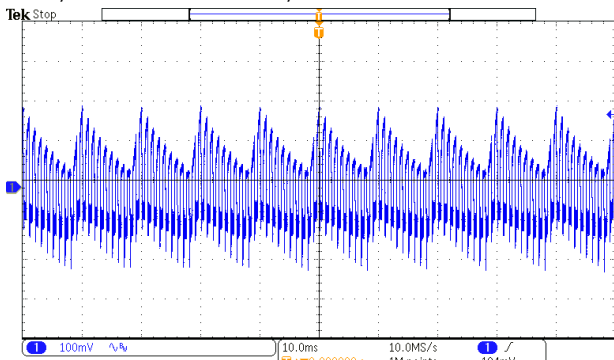
INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



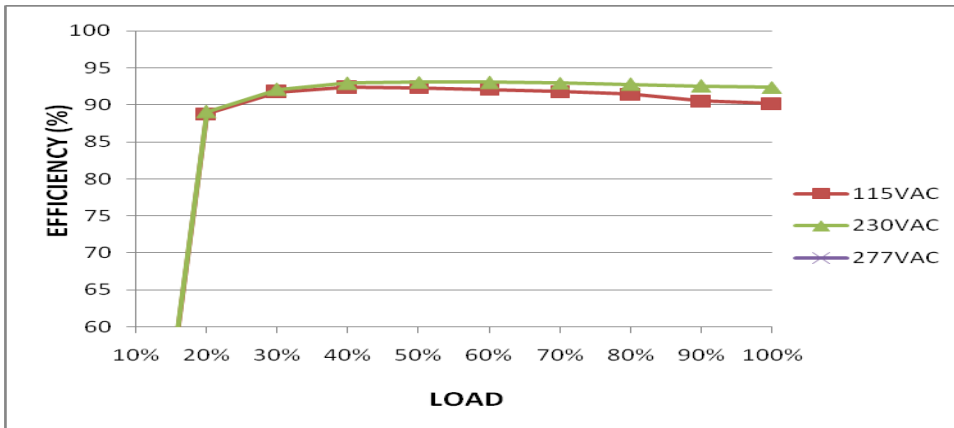
INPUT=115VAC/60HZ @ FULL LOAD

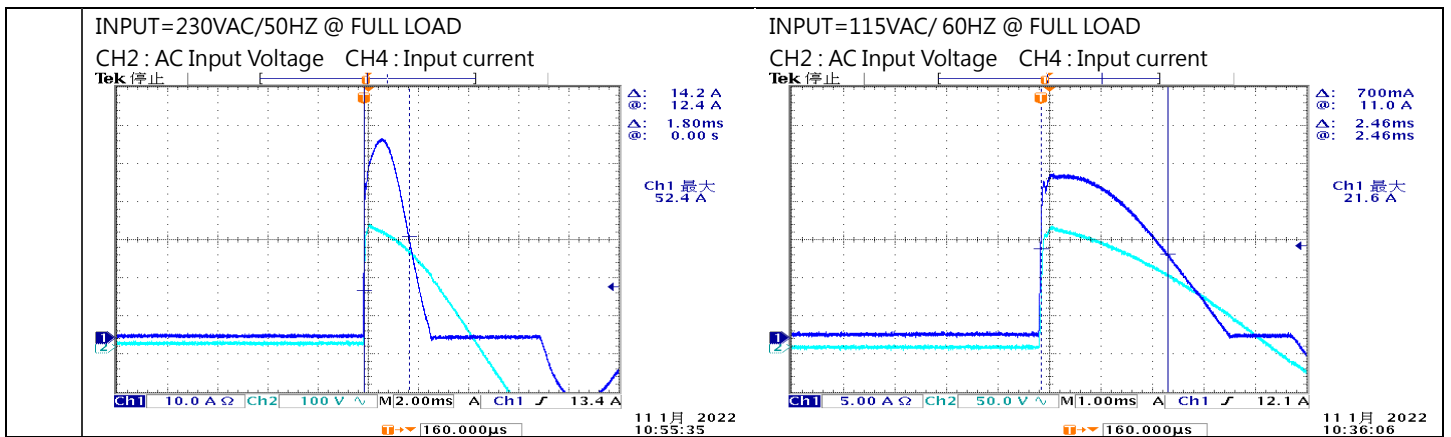
CH1 : Output Voltage CH2 : AC Input Voltage



7	RISE TIME (Max)	230VAC/50ms 115VAC/50ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/10.64ms 115VAC/16.4ms
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> 		
8	HOLD UP TIME (Typ.)	230VAC/20ms 115VAC/16ms	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/20.2ms 115VAC/19.2ms
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH2 : AC Input Voltage</p> 		
9	DYNAMIC LOAD	V1: 3600mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	488mVp-p 420mVp-p
<p>FULL /50% LOAD 50%DUTY / 120HZ</p> 		<p>FULL /50% LOAD 50%DUTY / 1KHZ</p> 		

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	INPUT VOLTAGE RANGE	90 ~ 132VAC / 180 ~ 264VAC by switch 250VDC~ 370VDC (switch on 230VAC)	(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)87VAC ~ 267VAC (2)250Vdc~370Vdc/FULL LOAD 250Vdc~370Vdc/50% LOAD (3) 250Vdc~370Vdc/FULL LOAD 250Vdc~370Vdc/50% LOAD																																												
			I/P: LOW-LINE-3V=87 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:90 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25°C	TEST:OK																																												
3	INPUT CURRENT (Typ.)	230V/7.5A 115V/12A	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =6.07A/ 230VAC I =10.29A/ 115VAC																																												
4	LEAKAGE CURRENT	< 2mA / 240 VAC	I/P : 240 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.7571mA N-FG : 0.7541 mA																																												
5	EFFICIENCY(Typ.)	92%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	92.1%																																												
<p>EFFICIENCY vs LOAD</p>  <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>LOAD (%)</th> <th>115VAC (%)</th> <th>230VAC (%)</th> <th>277VAC (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>60</td><td>60</td><td>60</td></tr> <tr><td>20%</td><td>89</td><td>89</td><td>89</td></tr> <tr><td>30%</td><td>92</td><td>92</td><td>92</td></tr> <tr><td>40%</td><td>92</td><td>92</td><td>92</td></tr> <tr><td>50%</td><td>92</td><td>92</td><td>92</td></tr> <tr><td>60%</td><td>92</td><td>92</td><td>92</td></tr> <tr><td>70%</td><td>92</td><td>92</td><td>92</td></tr> <tr><td>80%</td><td>92</td><td>92</td><td>92</td></tr> <tr><td>90%</td><td>92</td><td>92</td><td>92</td></tr> <tr><td>100%</td><td>92</td><td>92</td><td>92</td></tr> </tbody> </table>					LOAD (%)	115VAC (%)	230VAC (%)	277VAC (%)	10%	60	60	60	20%	89	89	89	30%	92	92	92	40%	92	92	92	50%	92	92	92	60%	92	92	92	70%	92	92	92	80%	92	92	92	90%	92	92	92	100%	92	92	92
LOAD (%)	115VAC (%)	230VAC (%)	277VAC (%)																																													
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50%	92	92	92																																													
60%	92	92	92																																													
70%	92	92	92																																													
80%	92	92	92																																													
90%	92	92	92																																													
100%	92	92	92																																													
6	INRUSH CURRENT(Typ.)	230V/60A 115V/35A COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I =52.4A/ 230VAC I =21.6A/ 115VAC T50=2460 us																																												



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105%~ 140 %	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta: 25°C	117.4%/ 264VAC 116.3%/ 230VAC 116.8%/100VAC PROTECTION TYPE : Constant current limiting, unit will shut down after 3 sec. re-power on to recover
2	OVER VOLTAGE PROTECTION	41.4V~48.6V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD Ta: 25°C	46.1V/ 264VAC 46.09V/ 230VAC 46.12V/ 90VAC PROTECTION TYPE : Shut down o/p voltage, re-power on to recover
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 264VAC I/P: 90VAC O/P: FULL LOAD	O.T.P. Active Protection type : Shut down o/p voltage, re-power on to recover

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	FAN ON/OFF CONTROL (Typ)	RTH3 ≥ 50°C FAN ON RTH3 ≤ 40°C FAN OFF	I/P: 230 VAC O/P: FULL LOAD	RTH3 > 50°C FAN ON RTH3 < 40°C FAN OFF

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) Peak Voltage	Q2 Rated 22A/600V	AC ON/OFF I/P:High-Line +3V =300V VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. I/P:Low-Line -3V = 97V O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25°C	VDS: (1) 481V (2) 472V (3) 483V (4) 478V (5) 486V (6) 475V (7) 485V VDS: (1) 302V (2) 326V (3) 298V (4) 315V (5) 313V (6) 318V (7) 332V
2	Diode Peak Voltage	D101 Rated 30A/ 150V D104 Rated 30A/ 150V	AC ON/OFF I/P:High-Line +3V =267 V O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25°C	D101: VDS: (1) 93.5V (2) 12.8V (3) 94.2V (4) 93.8V (5) 93.5V (6) 93.6V (7) 18.3V (8) 88.7V D104: VDS: (1) 95.2V (2) 17.4V (3) 93.8V (4) 94.2 V (5) 93.6V (6) 93.2V (7) 94.5V (8) 89.8V

3	Input Voltage	Capacitor C5 Rated: 1000 μ /200V	I/P:High-Line +3V =267V 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)193V (2)189V (3)191V (4) 187V
4	Control IC Test	PWM IC U1 Rated 8.9V~ 15.5V O/P IC U102 Rated 40V	AC ON/OFF I/P:High-Line +3V =267 V O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VRmin(LOW LINE) (6)NO LOAD(AC continue) Ta:25°C	U2 (1) 15.1V (2) 14.8V (3) 14.9V (4) 15V (5) 13.6V (6) 14V U102 (1)12.2V (1) 12V (2) 12.2V (3) 16.7V (4) 12.5V (5) 11.8V
5	VCC Diode Peak Voltage	D30 Rated : 400V 2 A D34 Rated : 400V 2 A D200 Rated : 400V 2 A	AC ON/OFF I/P : High-Line +3V = 267 V O/P : (1) Full load (2) Full load continue (3) Dynamic Load 90%Duty/1KHz Ta : 25°C	D30 (1)83.1 V (2)59.7 V (3)82.3V D200 (1) 67.9V (2)48.2 V (3) 62.3V D34 (1) 65.2V (2) 46.1V (3) 69.3V

■ SAFETY& E.M.C. TEST

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/P-O/P:3.125mA I/P-FG:2.637mA O/P-FG:1.824mA 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: 9999M 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	4 m Ω

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	CONDUCTION	EN55032 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
2	RADIATION	EN55032 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab
3	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
4	E.F.T	EN61000-4-4 INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	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
6	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 : LRS-600-48 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=26.2 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=45.8 °C																																																																										
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta=26.2 °C</th> <th>HIGH AMBIENT Ta=45.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>BD1</td><td>36.9°C</td><td>55.8°C</td></tr> <tr><td>2</td><td>C5</td><td>41.8°C</td><td>61.7°C</td></tr> <tr><td>3</td><td>C6</td><td>38.5°C</td><td>57.9°C</td></tr> <tr><td>4</td><td>Q1</td><td>47.3°C</td><td>68.6°C</td></tr> <tr><td>5</td><td>Q2</td><td>46.9°C</td><td>67.4°C</td></tr> <tr><td>6</td><td>C36</td><td>40.5°C</td><td>60.1°C</td></tr> <tr><td>7</td><td>T1</td><td>62.0°C</td><td>81.7°C</td></tr> <tr><td>8</td><td>C205</td><td>38.5°C</td><td>57.6°C</td></tr> <tr><td>9</td><td>C105</td><td>31.2°C</td><td>50.5°C</td></tr> <tr><td>10</td><td>C106</td><td>32.1°C</td><td>51.4°C</td></tr> <tr><td>11</td><td>RTH1</td><td>30.7°C</td><td>50.0°C</td></tr> <tr><td>12</td><td>D100</td><td>39.4°C</td><td>58.1°C</td></tr> <tr><td>13</td><td>D101</td><td>37.6°C</td><td>56.4°C</td></tr> <tr><td>14</td><td>D103</td><td>41.7°C</td><td>62.1°C</td></tr> <tr><td>15</td><td>D104</td><td>42.6°C</td><td>61.7°C</td></tr> <tr><td>16</td><td>R125</td><td>46.9°C</td><td>67.6°C</td></tr> <tr><td>17</td><td>RTH3</td><td>43.6°C</td><td>62.4°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta=26.2 °C	HIGH AMBIENT Ta=45.8 °C	1	BD1	36.9°C	55.8°C	2	C5	41.8°C	61.7°C	3	C6	38.5°C	57.9°C	4	Q1	47.3°C	68.6°C	5	Q2	46.9°C	67.4°C	6	C36	40.5°C	60.1°C	7	T1	62.0°C	81.7°C	8	C205	38.5°C	57.6°C	9	C105	31.2°C	50.5°C	10	C106	32.1°C	51.4°C	11	RTH1	30.7°C	50.0°C	12	D100	39.4°C	58.1°C	13	D101	37.6°C	56.4°C	14	D103	41.7°C	62.1°C	15	D104	42.6°C	61.7°C	16	R125	46.9°C	67.6°C	17	RTH3	43.6°C	62.4°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 119.2 % 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 45 °C/95 %R.H 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	± 0.0148 %/°C(0~50°C)																																																																								

6	STORAGE TEMPERATURE TEST	-40~85°C	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
7	THERMAL SHOCK TEST	-20~45°C	1. Thermal shock Temperature : -25°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
8	VIBRATION TEST	10 ~ 500Hz, 5G 10min./1cycle, 60min. each along X, Y, Z axes	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 6G (5) Test Time : 180min in each axis (X.Y.Z) (6) Ta : 25°C
9	CAPACITOR LIFE CYCLE	SUPPOSE C106 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) 2356861HRS (2) 601596HRS (3) 722640HRS (4) 813682HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1533.4K hrs min. Telcordia SR-332 (Bellcore) ; 301.7K 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	WUWQ/HUANGMK	WENF	LINKX

2020.10.1 TAG-QA-009