



# Test Report: LRS-200-36

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200W 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

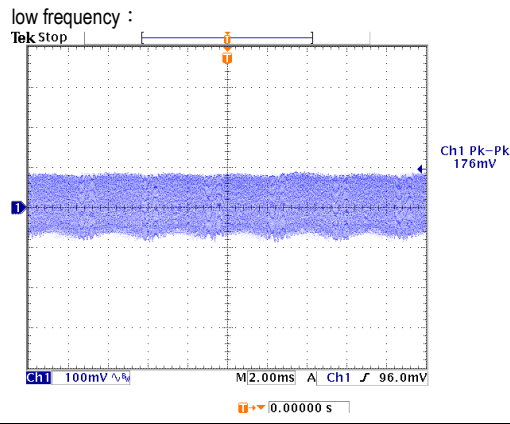
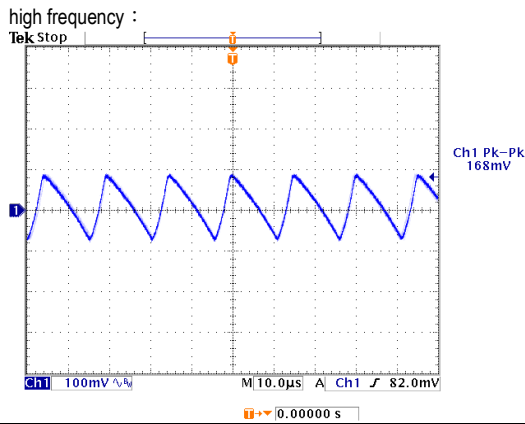
## ■ RELIABILITY TEST

ENVIRONMENT TEST

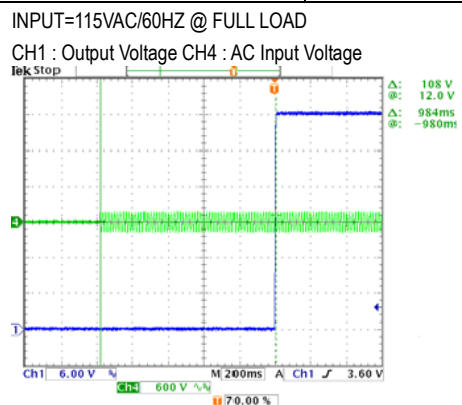
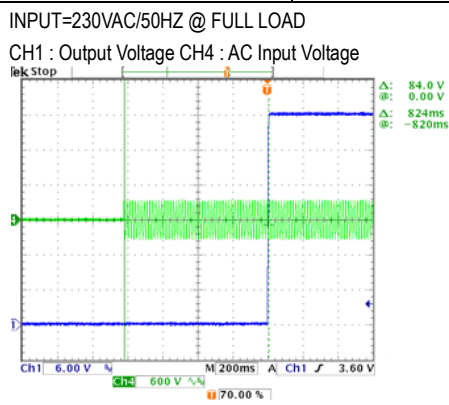
## DESIGN VERIFY TEST

### OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 32.4~ 39.6V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	28.728V~40.854V/230VAC 28.638V~40.847V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1%~ 1%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:- 0.41 %~ 0.41%
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:-0.5%~ 0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25°C	V1: 0.013%~ 0.013%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25°C	<5%
6	RIPPLE & NOISE(Max)	V1: 200mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 176mVp-p



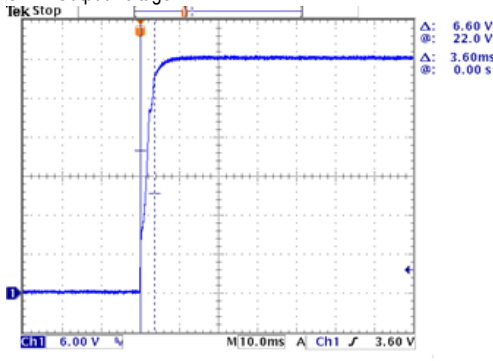
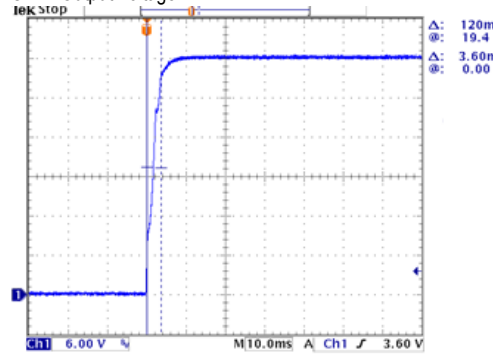
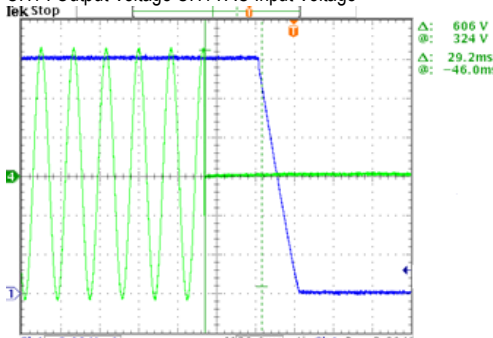
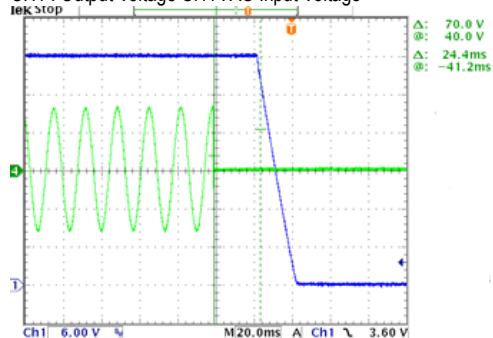
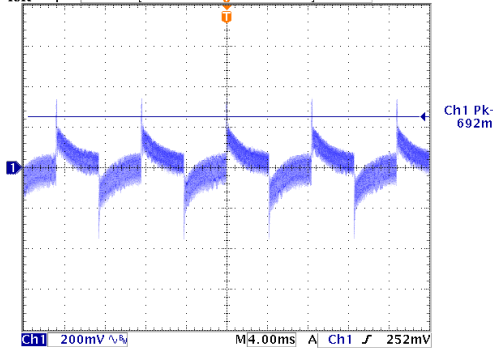
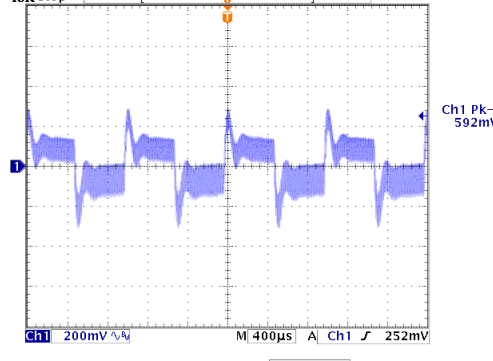
7	SET UP TIME(Max)	230VAC/1500ms 115VAC/ 1500ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/ 824ms 115VAC/ 984ms
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200W Single Output Switching Power Supply

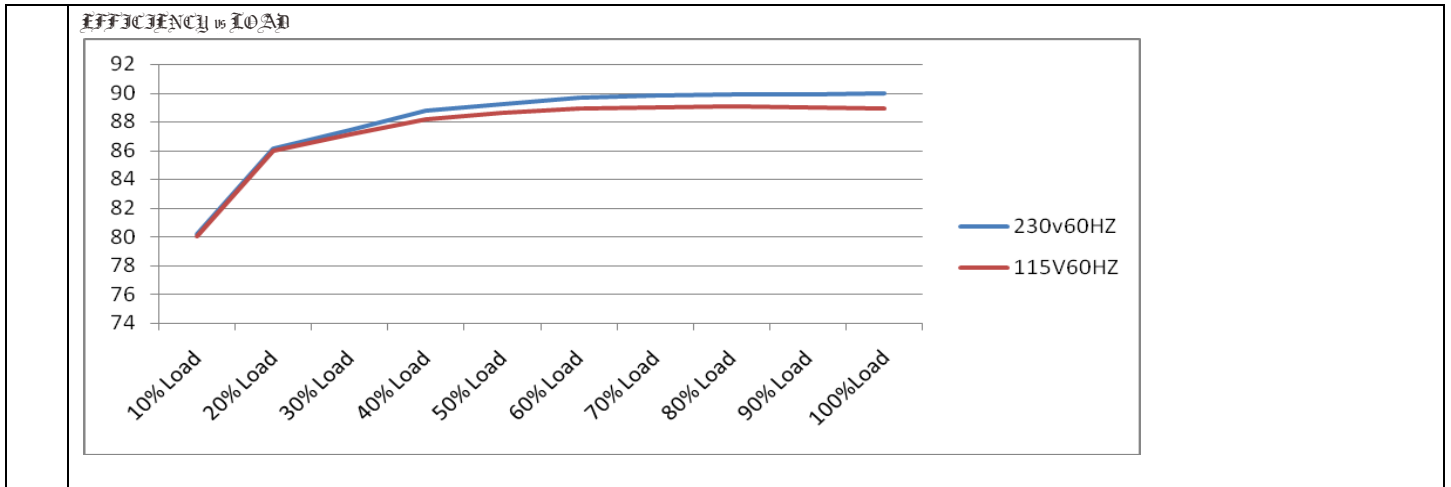
LRS-200 series

8	RISE TIME (Max)	230VAC/ 50ms 115VAC/ 50ms	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/3.60ms 115VAC/3.60ms
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage</p> 		
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/ 29.2ms 115VAC/ 24.4ms
<p>INPUT=230VAC/50HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH4 : AC Input Voltage</p> 		<p>INPUT=115VAC/60HZ @ FULL LOAD</p> <p>CH1 : Output Voltage CH4 : AC Input Voltage</p> 		
10	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	692mVp-p 592mVp-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 240 ~ 370VDC (switch on 230VAC)	I/P:TESTING O/P:FULL LOAD Ta:25°C	79V~132V 132V~264V 229VDC ~ 370VDC(switch on 230VAC)
			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 )	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/ 2.2A 115V/ 4A	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	I =2.04A/ 230VAC I =3.69A/ 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 < 0.63W
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 =52.0A/ 230VAC I =51.6A/ 115VAC
INPUT=230VAC/50HZ @ FULL LOAD		INPUT=115VAC/50HZ @ FULL LOAD		
<p>CH2 : Input current (1V=1A) CH4 : AC Input Voltage</p>		<p>CH2 : Input current (1V=1A) CH4 : AC Input Voltage</p>		
7	EFFICIENCY(Typ)	89.5%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	90.01%



### PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110 %~ 140 %	I/P: 230VAC I/P: 115VAC O/P: TESTING Ta:25°C	128.14%/ 230VAC 126.78%/115VAC Hiccup mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	CH:41.4V~46.8V	I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25°C	46.6V/ 230VAC 46.4V/115VAC Hiccup mode, recovers automatically after fault condition is removed
3	OVER TEMPERATURE PROTECTION	NO DAMAGE	I/P: 230 VAC O/P: FULL LOAD	O.T.P. Active 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/600V	I/P: High-Line +3V =267V O/P: (1) Full Load Turn on (2) output short (3) Dynamic Load 100% Load/ Min. Load 50% Duty/120Hz Ta:25°C	(1)444V (2)438V (3)450V
2	Diode <b>Peak Voltage</b>	Q102 Rated 10 A/200V  Q103 Rated 20A/300V	I/P: High-Line +3V =267 V O/P: (1) Full Load input on/off (2) Output Short Ta:25°C	Q101: (1)135V (2)157V  Q103: (1)261V (2)235V
3	Input Capacitor Voltage	C5 Rated: 330 μ / 200V	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	(1)184V (2)183V (3)189V



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**LRS-200 series**

			Ta:25°C	
4	Control IC Voltage Test	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) Output short (3)No load VR (min) Ta:25°C	U1 (1) 19.1V (2) 19.3V (3) 19.1V

**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:2. 187 mA I/P-FG: 3. 34mA O/P-FG: 2. 71mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25°C	24 mΩ

**RELIABILITY TEST**

**ENVIRONMENT TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																												
1	TEMPERATURE RISE TEST	MODEL: LRS-200-24 1. ROOM AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=24.6°C 2. HIGH AMBIENT BURN-IN: 2 HRS I/P: 230VAC O/P: FULL LOAD Ta=48.6°C																																																														
				<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 24.6 °C</th> <th>HIGH AMBIENT Ta=40.8 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>U1</td><td>58.3°C</td><td>79.7°C</td></tr> <tr><td>2</td><td>LF1</td><td>50.5°C</td><td>73.3°C</td></tr> <tr><td>3</td><td>BD1</td><td>54.0°C</td><td>75.8°C</td></tr> <tr><td>4</td><td>C36</td><td>62.8°C</td><td>86.5°C</td></tr> <tr><td>5</td><td>C5</td><td>59.3°C</td><td>80.1°C</td></tr> <tr><td>6</td><td>C6</td><td>60.1°C</td><td>80.6°C</td></tr> <tr><td>7</td><td>T2</td><td>59.2°C</td><td>81.1°C</td></tr> <tr><td>8</td><td>Q1</td><td>64.5°C</td><td>88.4°C</td></tr> <tr><td>9</td><td>Q2</td><td>60.4°C</td><td>83.9°C</td></tr> <tr><td>10</td><td>T1coil</td><td>85.4°C</td><td>108.6°C</td></tr> <tr><td>11</td><td>RTH3</td><td>79.2°C</td><td>102.2°C</td></tr> <tr><td>12</td><td>L100</td><td>84.3°C</td><td>108.8°C</td></tr> <tr><td>13</td><td>C106</td><td>49.5°C</td><td>73.9°C</td></tr> <tr><td>14</td><td>Q102</td><td>68.0°C</td><td>89.7°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 24.6 °C	HIGH AMBIENT Ta=40.8 °C	1	U1	58.3°C	79.7°C	2	LF1	50.5°C	73.3°C	3	BD1	54.0°C	75.8°C	4	C36	62.8°C	86.5°C	5	C5	59.3°C	80.1°C	6	C6	60.1°C	80.6°C	7	T2	59.2°C	81.1°C	8	Q1	64.5°C	88.4°C	9	Q2	60.4°C	83.9°C	10	T1coil	85.4°C	108.6°C	11	RTH3	79.2°C	102.2°C	12	L100	84.3°C	108.8°C	13	C106	49.5°C	73.9°C	14	Q102	68.0°C	89.7°C
NO	Position	ROOM AMBIENT Ta= 24.6 °C	HIGH AMBIENT Ta=40.8 °C																																																													
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**LRS-200 series**

		NO	Position	ROOM AMBIENT Ta= 24.6 °C	HIGH AMBIENT Ta=40.8 °C
		15	Q103	71.7°C	93.7°C
		16	C201	56.7°C	80.2°C
		17	C200	64.6°C	88.1°C
		18	L101	65.9°C	88.5°C
		19	RTH1	86.7°C	106.9°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )		I/P: 230 VAC O/P: 125% 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	±0.005%/°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 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=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) 553675HRS (2) 93919HRS (3) 138388HRS (4) 183951HRS
10	MTBF	2346.6K hrs min. Telcordia SR-332 (Bellcore) ; 279.4Khrs 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