



Test Report: LRS-350-12

350W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY TEST

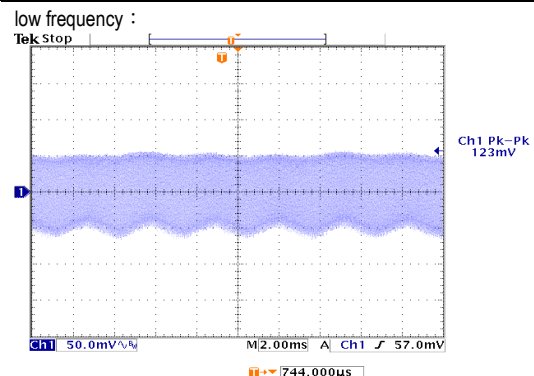
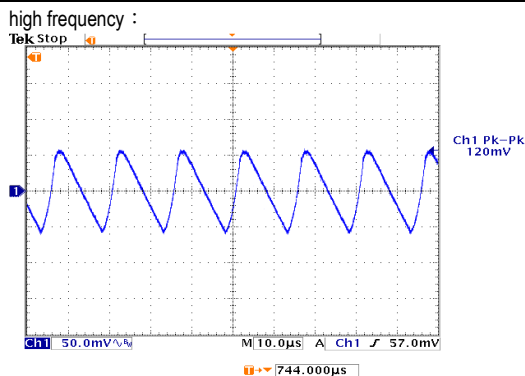
■ RELIABILITY TEST

ENVIRONMENT TEST

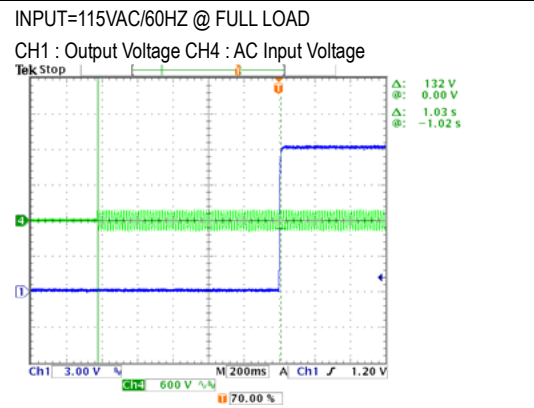
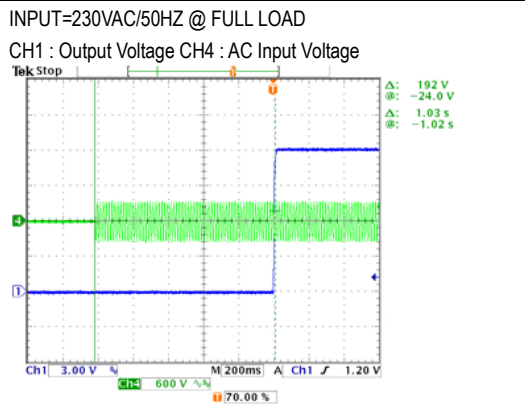
DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.2V~ 13.8V	I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C	9.609V~14.140V/230VAC 9.605V~14.151V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1.5%~ 1.5%	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25°C	V1:- 0.08%~ 0.08%
3	LINE REGULATION (Max)	V1: -0.5%~ 0.5%	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25°C	V1: -0.04%~-0.04%
4	LOAD REGULATION(Max)	V1: -1%~ 1%	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: 150mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25°C	V1: 123mVp-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/ 1028ms 115VAC/ 1032ms
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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/ 6.80ms 115VAC/6.40ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage		
9		HOLD UP TIME(Typ)	I/P: 230 VAC I/P: 115 VAC O/P: FULL LOAD Ta: 25°C	230VAC/26.0ms 115VAC/ 21.6ms
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: 1200mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25°C	274mVp-p 304mVp-p
FULL /50% LOAD 50%DUTY / 120HZ Ch1 Pk-Pk 274mV		FULL /50% LOAD 50%DUTY / 1KHZ Ch1 Pk-Pk 304mV		

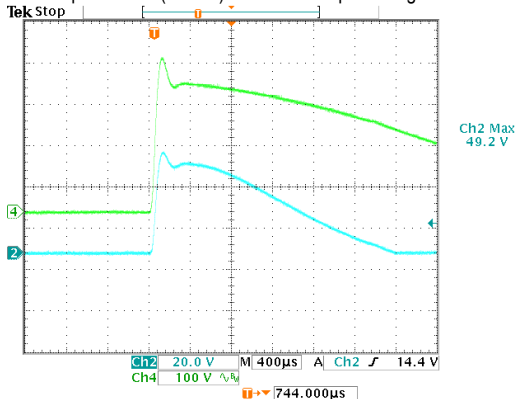


INPUT FUNCTION TEST

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)	80V~132V 149V~264V 230VDC ~ 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 =3.41A/ 230VAC I =6.25A/ 115VAC
4	LEAKAGE CURRENT	< 2 mA / 240 VAC	I/P: 240 VAC O/P: Min LOAD Ta: 25°C	L-FG: 0.481mA N-FG: 0.481mA
5	NO LOAD CONSUMPTION	< 0.75 W	I/P: 115VAC I/P: 230VAC O/P: NO LOAD Ta: 25°C	< 0.55W < 0.60 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 =49.2A/ 230VAC I =36.0A/ 115VAC

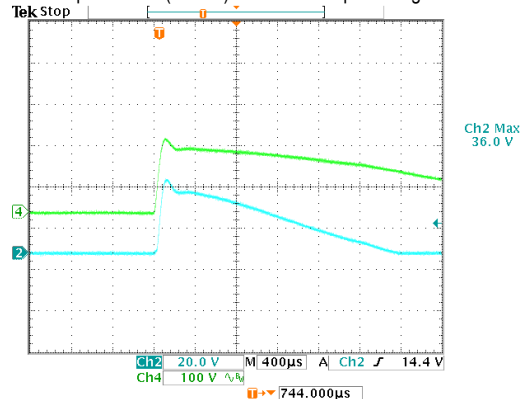
INPUT=230VAC/50HZ @ FULL LOAD

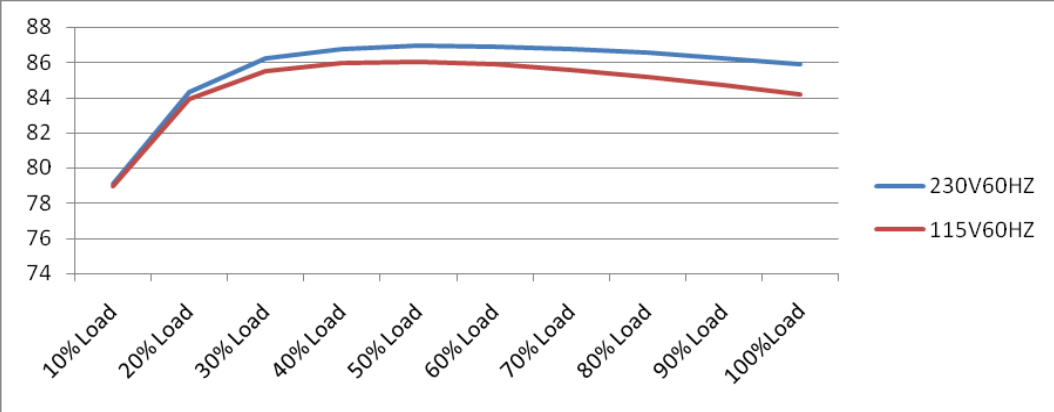
CH2 : Input current (1V=1A) CH4 : AC Input Voltage



INPUT=115VAC/50HZ @ FULL LOAD

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



7	EFFICIENCY(Typ)	85%	I/P:230 VAC O/P:FULL LOAD Ta:25°C	85.86%																																	
<p>EFFICIENCY vs LOAD</p>  <table border="1"> <caption>Efficiency vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>230V60HZ Efficiency (%)</th> <th>115V60HZ Efficiency (%)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>79</td><td>79</td></tr> <tr><td>20%</td><td>84</td><td>83</td></tr> <tr><td>30%</td><td>86</td><td>85</td></tr> <tr><td>40%</td><td>86.5</td><td>85.5</td></tr> <tr><td>50%</td><td>87</td><td>86</td></tr> <tr><td>60%</td><td>86.5</td><td>85.5</td></tr> <tr><td>70%</td><td>86</td><td>85</td></tr> <tr><td>80%</td><td>85.5</td><td>84.5</td></tr> <tr><td>90%</td><td>85</td><td>84</td></tr> <tr><td>100%</td><td>84</td><td>83</td></tr> </tbody> </table>					Load (%)	230V60HZ Efficiency (%)	115V60HZ Efficiency (%)	10%	79	79	20%	84	83	30%	86	85	40%	86.5	85.5	50%	87	86	60%	86.5	85.5	70%	86	85	80%	85.5	84.5	90%	85	84	100%	84	83
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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	122.07%/ 230VAC 121.86%/115VAC Protection type : 110 %~ 140 % rated output power Hiccup mode, recovers automatically after fault condition is removed.
2	OVER VOLTAGE PROTECTION	CH: 13.8V~16.2 V Hiccup mode, recovers automatically after fault condition is removed.	I/P: 230VAC I/P: 115VAC O/P: MIN LOAD Ta:25°C	15.1V/ 230VAC 15.0V/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) Peak Voltage	Q 1 Rated 13.8 A/600V	I/P:High-Line +3V =267V O/P: (1)Full Load Turn on (2)Output Short (3)Full Load Continue Ta:25°C	(1)480V (2)462V (3)456V
2	Diode Peak Voltage	Q102 Rated 20 A/120V Q103 Rated 20A/120V	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)94.8V (2)89.2V (3)82.0V Q103: (1)87.2V (2)80.0V (3)81.2V
3	Input Capacitor Voltage	C5 Rated: 560 μ / 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)194V (2)183V (3)194V
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)Min Load input on/off (3)Full Load/Min load change Ta:25°C	U1 (1) 19.6V (2) 19.4V (3) 19.6V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 3.75 KVAC/min I/P-FG :2KVAC/min O/P-FG:0.5KVAC/min	I/P-O/P: 4.125 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:0.6 KVAC/min Ta:25°C	I/P-O/P: 2. 41mA I/P-FG: 3. 34mA O/P-FG: 2. 74mA 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	23 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



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LRS-350 series

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-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> <tr><td>11</td><td>Q102</td><td>59.4°C</td><td>92.4°C</td></tr> <tr><td>12</td><td>Q104</td><td>57.1°C</td><td>88.7°C</td></tr> <tr><td>13</td><td>U1</td><td>29.9°C</td><td>58.6°C</td></tr> <tr><td>14</td><td>U100</td><td>60.1°C</td><td>91.5°C</td></tr> <tr><td>15</td><td>D10</td><td>35.7°C</td><td>65.1°C</td></tr> <tr><td>16</td><td>C36</td><td>27.5°C</td><td>56.3°C</td></tr> <tr><td>17</td><td>RTH3</td><td>50.9°C</td><td>80.3°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	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
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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																																																																								



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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: -30°C~ 55°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	WANGDEZHAO