



Test Report: ULP-150-36

150W 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	VERDICT
1	RIPPLE & NOISE	V1 : 250 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 40 mVp-p (Max)	PASS
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 32.4 V ~ 39.6 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	29.87 V ~ 40.46 V / 230 VAC 29.87 V ~ 40.46 V / 115 VAC	PASS
3	OUTPUT VOLTAGE TOLERANCE	V1 : -2 %~ 2 % (Max)	I/P : 100 VAC / 295 VAC O/P : FULL / MIN LOAD Ta : 25°C	V1 : -0.069 %~ 0.346 %	PASS
4	LINE REGULATION	V1 : -0.5 %~ 0.5 % (Max)	I/P : 100VAC ~ 295 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 %~ 0 %	PASS
5	LOAD REGULATION	V1 : -1 %~ 1 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : -0.017 %~ 0 %	PASS
6	SET UP TIME	230VAC : 500 ms (Max) 115VAC : 3000 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 216.509 ms 115VAC/ 821.268 ms	PASS
7	RISE TIME	230VAC : 100 ms (Max) 115VAC : 100 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 8.9 ms 115VAC/ 9.0 ms	PASS
8	HOLD UP TIME	230VAC : 16 ms (TYP) 115VAC : 16 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 25.5 ms 115VAC/ 25.4 ms	PASS
9	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : < 5 %	PASS
10	DYNAMIC LOAD	V1 : 3600 mVp-p	I/P : 230 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C	(1). 206 mVp-p (2). 1730 mVp-p	PASS

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90VAC~295 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	82 V~295V	PASS
			I/P : LOW-LINE-3V= 87 V HIGH-LINE+15V=315 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST : OK	
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P : 90 VAC ~ 295 VAC O/P : FULL -MIN LOAD Ta : 25°C	TEST : OK	PASS
3	POWER FACTOR	0.96 / 230 VAC(TYP)	I/P : 230 VAC	PF= 0.974 / 230 VAC	PASS
		0.98 / 115 VAC(TYP)	I/P : 115 VAC	PF= 0.997 / 115 VAC	
		0.94 / 277 VAC(TYP)	I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.954 / 277 VAC	
4	EFFICIENCY	93% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	93.72 %	PASS
5	INPUT CURRENT	230V/ 1 A (TYP)	I/P : 230 VAC	I = 0.73 A/ 230 VAC	PASS
		115V/ 2 A (TYP)	I/P : 115 VAC	I = 1.46 A/ 115 VAC	
		277V/ 0.7 A (TYP)	I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	I = 0.52 A/ 277 VAC	
6	INRUSH CURRENT	230V/ 65 A (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 43.80 A/ 230 VAC	PASS
		COLD START			
7	LEAKAGE CURRENT	< 0.75 mA / 277 VAC	I/P : 295 VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.27 mA N-FG : 0.27 mA	PASS

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	130 %- 185 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	161.0 %/ 230 VAC 168.5 %/ 115 VAC Hiccup Mode	PASS
2	OVER VOLTAGE PROTECTION	CH1 : 41.4 V- 48.6 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	44.6 V/ 230 VAC 44.6 V/ 115 VAC Shut down Re- power ON	PASS
3	OVER TEMPERATURE PROTECTION	SPEC : TSW1 : 95 ± 5°C O.T.P. NO DAMAGE	I/P : 230 VAC O/P : FULL LOAD	93.7°C O.T.P. Active Shut down o/p voltage , recovers automatically after temperature goes down	PASS
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 295 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Hiccup Mode	PASS

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q5 Rated : STF13NM60N : 600 V 11 A	I/P : High-Line +3V = 298 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 474 V (2) 452 V (3) 468 V	PASS
2	Diode Peak Voltage	Q101 Rated : IRF3415: 150 V 43 A	I/P : High-Line +3V = 298 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 94.0 V (2) 43.0 V (3) 93.4 V	PASS
4	Input Capacitor Voltage	C5 Rated : 100u / 450V / 105 °C	I/P : High-Line +3V = 298 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 448 V (2) 444 V (3) 446 V	PASS
5	Control IC Voltage Test	U900 Rated : L6599AD: 16 V	I/P : High-Line +3V = 298 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 13.1 V (2) 12.9 V (3) 13.0 V	PASS
6	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : STF22NM60N: 600 V 16 A	I/P : High-Line +3V = 298 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 506 V (2) 494 V (3) 496 V	PASS

■ SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.75 KVAC/min I/P-FG : 1.88 KVAC/min O/P-FG : 0.5 KVAC/min	I/P-O/P : 4.2 KVAC/min I/P-FG : 2.25 KVAC/min O/P-FG : 0.6 KVAC/min Ta : 25°C	I/P-O/P : 3.200 mA I/P-FG : 2.459 mA O/P-FG : 3.693 mA NO DAMAGE	PASS
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/70%RH	I/P-O/P : >9999 MΩ I/P-FG : >9999 MΩ O/P-FG : >9999 MΩ NO DAMAGE	PASS
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	9 mΩ	PASS

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS C	I/P : 230VAC/277V/50HZ O/P : 100%/75%/60%LOAD Ta : 25°C	PASS	PASS
2	CONDUCTION	EN55015	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	PASS
3	RADIATION	EN55015	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab	PASS
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	PASS
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 1KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	PASS
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	PASS
7	Test by certified Lab & Test Report Prepare				

■ RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																																									
1	TEMPERATURE RISE TEST	MODEL : ULP-150-24 1. ROOM AMBIENT BURN-IN : HRS I/P : 230VAC O/P : FULL LOAD Ta= 31.4℃ 2. HIGH AMBIENT BURN-IN : HRS I/P : 230VAC O/P : FULL LOAD Ta= 63.5 ℃	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>P/N</th> <th>ROOM AMBIENT Ta= 31.4 ℃</th> <th>HIGH AMBIENT Ta= 63.5 ℃</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF2</td><td>TR-652</td><td>46.2℃</td><td>81.0℃</td></tr> <tr><td>2</td><td>BD1</td><td>GBU408</td><td>50.1℃</td><td>80.1℃</td></tr> <tr><td>3</td><td>RTH2</td><td>NTC 220KΩ</td><td>51.6℃</td><td>81.5℃</td></tr> <tr><td>4</td><td>L1</td><td>TR-654</td><td>49.3℃</td><td>80.1℃</td></tr> <tr><td>5</td><td>L2</td><td>TF-6294</td><td>54.2℃</td><td>84.6℃</td></tr> <tr><td>6</td><td>D2</td><td>8E2TH06FP</td><td>54.5℃</td><td>84.6℃</td></tr> <tr><td>7</td><td>Q5</td><td>STF13NM60N</td><td>51.3℃</td><td>81.9℃</td></tr> <tr><td>8</td><td>Q1</td><td>STF22NM60N</td><td>50.5℃</td><td>80.4℃</td></tr> <tr><td>9</td><td>T1</td><td>TF-6290</td><td>65.3℃</td><td>94.6℃</td></tr> <tr><td>10</td><td>Q101</td><td>IRFB3607PBF</td><td>51.3℃</td><td>82.4℃</td></tr> <tr><td>11</td><td>U1</td><td>NCP1608B</td><td>48.8℃</td><td>79.1℃</td></tr> <tr><td>12</td><td>U900</td><td>L6599AD</td><td>50.0℃</td><td>80.1℃</td></tr> <tr><td>13</td><td>C36</td><td>47uF/50V YXM</td><td>49.5℃</td><td>79.9℃</td></tr> <tr><td>14</td><td>C5</td><td>100uF/450V KXG</td><td>49.2℃</td><td>79.0℃</td></tr> <tr><td>15</td><td>C38</td><td>100uF/25V YXM</td><td>51.2℃</td><td>81.6℃</td></tr> <tr><td>16</td><td>C16</td><td>100uF/50V KY</td><td>50.0℃</td><td>79.7℃</td></tr> <tr><td>17</td><td>C201</td><td>47uF/50V YXM</td><td>49.1℃</td><td>79.1℃</td></tr> <tr><td>18</td><td>C61</td><td>10uF/50V YXM</td><td>50.1℃</td><td>80.1℃</td></tr> <tr><td>19</td><td>C103</td><td>1000uF/35V ZLH</td><td>48.3℃</td><td>79.2℃</td></tr> <tr><td>20</td><td>C205</td><td>100uF/25V YXM</td><td>45.6℃</td><td>76.4℃</td></tr> </tbody> </table>	NO	Position	P/N	ROOM AMBIENT Ta= 31.4 ℃	HIGH AMBIENT Ta= 63.5 ℃	1	LF2	TR-652	46.2℃	81.0℃	2	BD1	GBU408	50.1℃	80.1℃	3	RTH2	NTC 220KΩ	51.6℃	81.5℃	4	L1	TR-654	49.3℃	80.1℃	5	L2	TF-6294	54.2℃	84.6℃	6	D2	8E2TH06FP	54.5℃	84.6℃	7	Q5	STF13NM60N	51.3℃	81.9℃	8	Q1	STF22NM60N	50.5℃	80.4℃	9	T1	TF-6290	65.3℃	94.6℃	10	Q101	IRFB3607PBF	51.3℃	82.4℃	11	U1	NCP1608B	48.8℃	79.1℃	12	U900	L6599AD	50.0℃	80.1℃	13	C36	47uF/50V YXM	49.5℃	79.9℃	14	C5	100uF/450V KXG	49.2℃	79.0℃	15	C38	100uF/25V YXM	51.2℃	81.6℃	16	C16	100uF/50V KY	50.0℃	79.7℃	17	C201	47uF/50V YXM	49.1℃	79.1℃	18	C61	10uF/50V YXM	50.1℃	80.1℃	19	C103	1000uF/35V ZLH	48.3℃	79.2℃	20	C205	100uF/25V YXM	45.6℃	76.4℃		PASS
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 150 % LOAD Ta : 25℃	TEST : OK	PASS																																																																																																									
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 295VAC/100VAC O/P : 100 % LOAD Ta= -30 ℃	TEST : OK	PASS																																																																																																									
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL ℃ NO DAMAGE	I/P : 298 VAC O/P : FULL LOAD Ta= 65℃ HUMIDITY= 95 %R.H	TEST : OK	PASS																																																																																																									
5	TEMPERATURE COEFFICIENT	± 0.03 %(0-50℃)	I/P : 230 VAC O/P : FULL LOAD	± 0.008 %(0-50℃)	PASS																																																																																																									
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45℃~ +90℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK	PASS																																																																																																									

7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°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	PASS
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10-500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 5G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK	PASS
9	CAPACITOR LIFE CYCLE	SUPPOSE C103 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=65 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 65 °C LIFE TIME	(1) 975882 HRS (2) 66297 HRS (3) 79335 HRS	PASS
10	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 216.3 K HRS		PASS
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 65°C		PASS

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2010/04/07	RD SAMPLE	PASS	ZOULF	HOWAY
2010/09/30	W1009C384	PASS	ZOULF	HOWAY
2011/03/19	W1103E341	PASS	ZOULF	HOWAY

2009/08/04 A50-F023