



Test Report: ULP-150-12

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 : 100 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 70 mVp-p (Max)	PASS
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 11 V ~ 13.2 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	10.77 V ~ 13.80 V / 230 VAC 10.77 V ~ 13.80 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 : -0.208 %~ 0.367 %	PASS
4	LINE REGULATION	V1 : -0.5 %~ 0.5 % (Max)	I/P : 100VAC ~ 295 VAC O/P : FULL LOAD Ta : 25°C	V1 : -0.008 %~ 0.008 %	PASS
5	LOAD REGULATION	V1 : -1 %~ 1 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : -0.207 %~ 0.149 %	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/ 208.865 ms 115VAC/ 801.363 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/ 4.6 ms 115VAC/ 4.7 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/ 21.36 ms 115VAC/ 21.42 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 : 1200 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). 360 mVp-p (2). 340 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	83 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= 0.978 / 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= 0.958 / 277 VAC	
4	EFFICIENCY	91.5% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	91.51 %	PASS
5	INPUT CURRENT	230V/ 1 A (TYP)	I/P : 230 VAC	I = 0.74 A/ 230 VAC	PASS
		115V/ 2 A (TYP)	I/P : 115 VAC	I = 1.48 A/ 115 VAC	
		277V/ 0.7 A (TYP)	I/P : 277 VAC O/P : FULL LOAD Ta : 25°C	I = 0.53 A/ 277 VAC	
6	INRUSH CURRENT	230V/ 65 A (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	I = 48.92 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	155.8 %/ 230 VAC 155.7 %/ 115 VAC Hiccup Mode	PASS
2	OVER VOLTAGE PROTECTION	CH1 : 13.6 V- 16.3 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	15.4 V/ 230 VAC 15.3 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	95.2°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) 468 V (2) 464 V (3) 464 V	PASS
2	Diode Peak Voltage	Q101 Rated : IRF1405PBF: 65 V 169 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) 44.6 V (2) 22.1 V (3) 44.4 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) 445 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) 12.9 V (2) 12.8 V (3) 12.9 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) 522 V (2) 498 V (3) 518 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 : 3.197 mA I/P-FG : 2.461 mA O/P-FG : 3.787 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-150-12 1. ROOM AMBIENT BURN-IN : HRS I/P : 230VAC O/P : FULL LOAD Ta= 30.7 °C 2. HIGH AMBIENT BURN-IN : HRS I/P : 230VAC O/P : FULL LOAD Ta= 64.7 °C			PASS																																																																																																									
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 151 % LOAD Ta : 25°C	TEST : OK	PASS																																																																																																									
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 295VAC/100VAC O/P : 100 % LOAD Ta= -30 °C	TEST : OK	PASS																																																																																																									
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL °C NO DAMAGE	I/P : 298 VAC O/P : FULL LOAD Ta= 65°C HUMIDITY= 95 %R.H	TEST : OK	PASS																																																																																																									
5	TEMPERATURE COEFFICIENT	± 0.03 %(0-50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.004 %(0-50°C)	PASS																																																																																																									
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	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 C03 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) 603438 HRS (2) 31043 HRS (3) 53374 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	W1009C381	PASS	ZOULF	HOWAY
2011/02/08	W1101G291	PASS	ZOULF	HOWAY

2009/08/04 A50-F023