



# Test Report: EPP-300-27

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300W Single Output With PFC Function

## ■ 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 : 200 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 78 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 25.65V ~ 28.35 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	24.486 V ~ 29.008 V / 230 VAC 24.484 V ~ 29.008 V / 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 2%~ -2% (Max)	I/P : 115 VAC / 264 VAC O/P : FULL / MIN LOAD Ta : 25°C	V1 : 0.4 %~ -0.4 %	P
4	LINE REGULATION	V1 : 0.5%~ -0.5% (Max)	I/P : 115 VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.03 %~ -0.03 %	P
5	LOAD REGULATION	V1 : 1%~ -1% (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.4 %~ -0.4 %	P
6	SET UP TIME	230VAC : 2500 ms (Max) 115VAC : 3000 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 931 ms 115VAC/ 998 ms	P
7	RISE TIME	230VAC : 30 ms (Max) 115VAC : 30 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 16 ms 115VAC/ 10 ms	P
8	HOLD UP TIME	230VAC : 13 ms (TYP) 115VAC : 13 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 17 ms 115VAC/ 17 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : <5 %	P
10	DYNAMIC LOAD	V1 : 2700 mVp-p	I/P : 230 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 90%DUTY/ 3KHZ (3).O/P : FULL /Min LOAD 90%DUTY/ 5KHZ (4).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C	(1)324 mVp-p (2)332 mVp-p (3)340 mVp-p (4) 568 mVp-p	P

## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	90VAC~264 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C  I/P : LOW-LINE -3V= 87 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN ( AC POWER ON/OFF NO DAMAGE )	73.8V~264V  TEST : OK	P
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE OSC	I/P : 90VAC ~ 264 VAC O/P : FULL -MIN LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.93 / 230 VAC(TYP) 0.98 / 115 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.989 / 230 VAC PF= 0.996 / 115 VAC	P
4	EFFICIENCY	93 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	93.53 %	P
5	INPUT CURRENT	230V/ 1.8 A (TYP) 115V/ 3.5 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 1.44 A/ 230 VAC I = 2.98 A/ 115 VAC	P
6	INRUSH CURRENT	230V/ 80 A (TYP) 115V/ 40 A (TYP) COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 79 A/ 230 VAC I = 39 A/ 115 VAC	P
7	LEAKAGE CURRENT	< 2 mA/ 240 VAC	I/P : 240VAC O/P : Min LOAD Ta : 25°C	L-FG : 0.08 mA N-FG : 0.08 mA	P
8	NO LOAD CONSUMPTION	< 0.5 W	I/P : 240VAC O/P : NO LOAD PS-ON="Low"or"<0-0.5V" Ta : 25°C	< 0.36 W	P

## PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105 % ~ 135 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	118 %/ 230 VAC 118%/ 115 VAC Hiccup Mode	P
2	OVER VOLTAGE PROTECTION	CH1 : 29.5 V ~ 33.5 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	31.443 V/ 230 VAC 31.595V/ 115 VAC Shut down Re- power ON	P
3	OVER TEMPERATURE PROTECTION	SPEC : TSW1 : 110±5°C O.T.P. TSW2 : 85±5°C O.T.P. NO DAMAGE	I/P : 230 VAC O/P : FULL LOAD	O.T.P. Active TSW1 : Shut down o/p voltage · recovers automatically after temperature goes down TSW2 : Shut down o/p voltage · Re-power on to recover	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 264 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Hiccup Mode	P

## CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	5V STANDBY	5V@1A : TOLERANCE±2% RIPPLE : 120mVp-p	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	5VSB : 4.9634 V RIPPLE : 33.6 mVp-p	P
2	AUXILIARY POWER	12V@0.5A : TOLERANCE-15%~+10%	I/P : 230 VAC O/P : FULL/NO LOAD Ta : 25°C	AUX : 11.247 V / 0.5A AUX : 12.456 V / 0 A	P
3	PS-ON INPUT SIGNAL	POWER ON="Hi"or">2-5V" POWEROFF="Low"or"<0-0.5V"	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	POWER ON= 2.309 V POWEROFF= 0 V	P
4	POWER GOOD / POWER FAIL SIGNAL	500ms>PG>10ms PF>1ms	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	POWER GOOD : 84.8 ms POWER FAIL : 13.4 ms	P

## COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 5 Rated : STL26NM60N 19A/600V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 408 V (2) 396 V (3) 402 V	P
2	Diode Peak Voltage	Q101Rated : IRFB3607PBF 80A/75V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 64.4 V (2) 15.5 V (3) 63.6 V	P
3	Input Capacitor Voltage	C 5 Rated : 150u/400V 105°C CXW	I/P : High-Line +3V = 267 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) 387.02 V (2) 387.21 V (3) 398 V	P
4	Control IC Voltage Test	U 1 Rated : PWM L6599AD 8.85V-16V	I/P : High-Line +3V = 267 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) 13.609 V (2) 13.615 V (3) 13.634 V	P
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q 1 Rated : STW26NM60N 20A/600V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	(1) 408 V (2) 400 V (3) 409 V	P

## ■ SAFETY & E.M.C. TEST

### SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 3 KVAC/min I/P-FG : 2 KVAC/min O/P-FG : 0.5 KVAC/min	I/P-O/P : 3.6KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 0.6 KVAC/min Ta : 25°C	I/P-O/P : 1.227 mA I/P-FG : 1.241 mA O/P-FG : 0.143 mA NO DAMAGE	P
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 : 30 GΩ I/P-FG : 30 GΩ O/P-FG : 30 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	24 mΩ	P

### E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 CLASS A CLASS D	I/P : 230 VAC/50HZ O/P:100/75/50%ELECTRONIC LOAD Ta : 25°C	PASS	P
2	CONDUCTION	EN55022 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	P
3	RADIATION	EN55022 CLASS A	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 MEDICAL AIR : 8KV / Contact : 6KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
5	E.F.T	EN61000-4-4 MEDICAL INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
6	SURGE	IEC61000-4-5 MEDICAL L-N : 1KV L,N-PE : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
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 : EPP-300-24 with 20.5CFM Fan			P			
		1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 29.8 °C						
		2. HIGH AMBIENT BURN-IN : 3 HRS I/P : 230VAC O/P : FULL LOAD Ta= 54 °C						
			NO	Position		P/N	ROOM AMBIENT Ta= 29.8°C	HIGH AMBIENT Ta= 54 °C
			1	LF2		TR953-R1	31.6°C	56.1°C
			2	C33		823/630V 5% P=15 R76	32.8°C	57.2°C
			3	BD1		10A/800V SILICON US10KB80R	46.0°C	69.6°C
			4	L1		TR1019	51.1°C	72.9°C
			5	Q1		STW26NM60N 20A/600V TO247	41.5°C	66.7°C
			6	T1		TF2391	41.7°C	66.4°C
			7	C5		150u/400V 105°C 18*31.5 CXW	40.0°C	54.7°C
			8	L2		TF2394	47.0°C	71.7°C
			9	U1		L6599AD SO-16N	42.1°C	67.2°C
			10	Q5		STL26NM60N 19A/600V	40.2°C	67.3°C
			11	Q6		STL26NM60N 19A/600V	40.6°C	67.4°C
			12	TSW1		110°C	41.3°C	65.3°C
			13	TSW2		85°C	35.4°C	61.5°C
			14	C105		1000u/35V UL10Kh 12.5*20 ZLH	33.4°C	59.0°C
			15	T900		TF2395	55.5°C	81.8°C
			16	C955		1000u/16V UL10Kh 10*16 ZLH	38.7°C	64.5°C
			17	C911		47u/50V UL10Kh 6.3*11 YXM	47.8°C	74.1°C
			18	C950		47u/25V UL10Kh 5*11 YXM	41.5°C	67.2°C
			19	U903		VIPER37	54.7°C	81.6°C
	20	D951	SB540 5A/40V DO-201	51.7°C	76.6°C			
	22	Q101	TR953-R1	32.6°C	58.9°C			
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 114 % LOAD Ta : 25°C	TEST : OK	P			
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 230VAC/115VAC O/P : 100 % LOAD Ta= -35 °C	TEST : OK	P			
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	P			
5	TEMPERATURE COEFFICIENT	±0.03%(0-50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0 %(0-50°C)	P			

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	P
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°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	P
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10-500Hz (3) Sweep Time : 12min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK	P
9	CAPACITOR LIFE CYCLE	EPP-300-24V 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 The experiments above are tested with a 20.5CFM Fan.	(1) 2423560HRS (2) 388800HRS (3) 437400HRS (4) 472027HRS	P
10	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 160 KHRS		P
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50°C		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2012/4/13	RD SAMPLE	PASS	SANFORD SU	VINCENT TSENG

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