TEST REPORT: EPS-120-27

120W 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

- Safety Test
- E.M.C. Test

■ RELIABILITY TEST

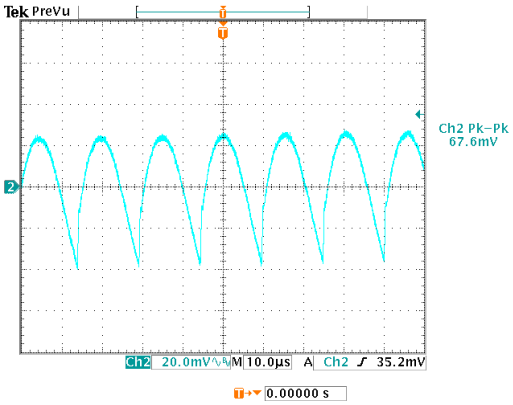
- ENVIRONMENT TEST

DESIGN VERIFY TEST

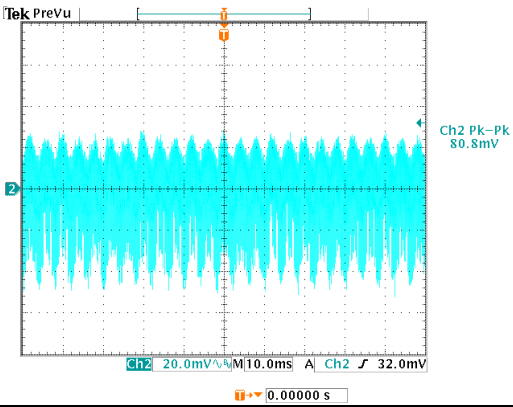
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 25.60V ~ 28.40V	I/P : 230VAC O/P: MIN LOAD TA : 25℃	CH1: 22.83V ~ 29.51V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 115VAC / 264VAC O/P: FULL / MINLOAD TA= 25℃	V1: 0.56% ~ 0.00%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 115VAC / 264VAC O/P: FULL LOAD TA : 25℃	V1: 0.00% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 0.26% ~ -0.30%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	TEST< 1.090 %
6	RIPPLE & NOISE(Max)	V1 : 150 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25℃	V1 : 80.8 mVp-p

high frequency：67.6



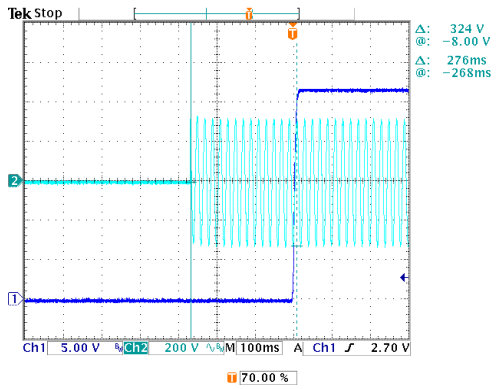
low frequency：80.8



7	SET UP TIME (MAX.)	230VAC : 500ms 115VAC : 500ms	I/P : 230VAC I/P : 115VAC	230VAC 276ms 115VAC 102ms

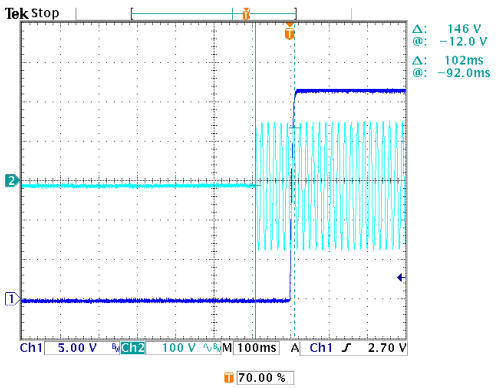
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD

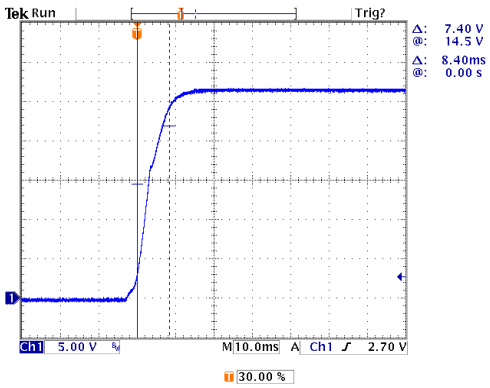
CH1 : Output Voltage CH2 : AC Input Voltage



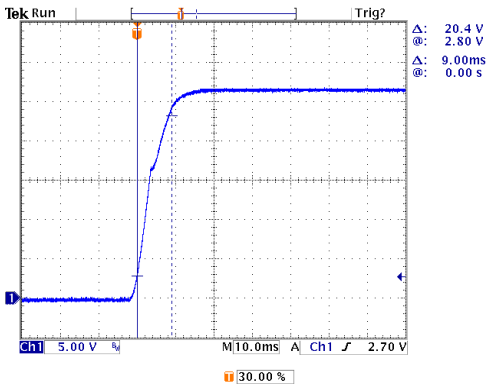
	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 8.4ms 115VAC : 9.0ms

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INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage



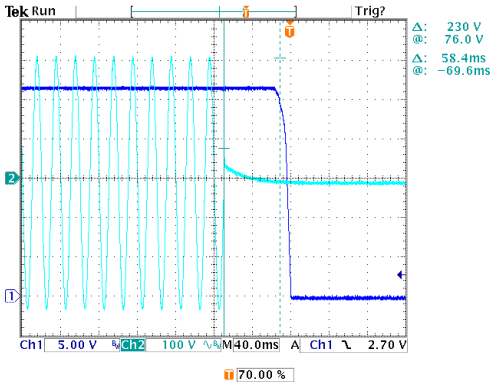
INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage



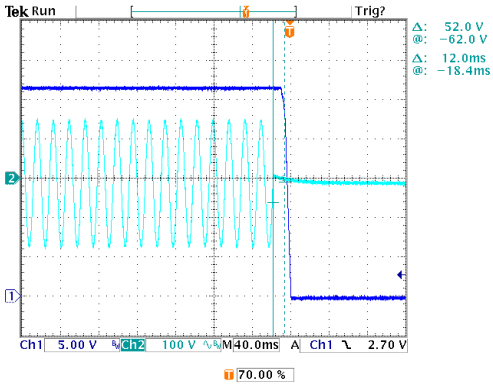
HOLD UP TIME (TYP.)	230VAC	:	50ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC	:	58.4ms
	115VAC	:	10ms		115VAC	:	12.0ms

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INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



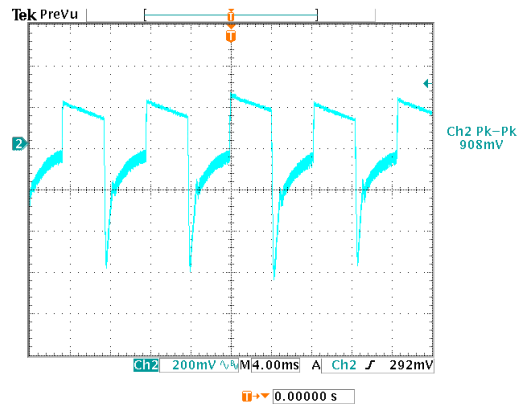
INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



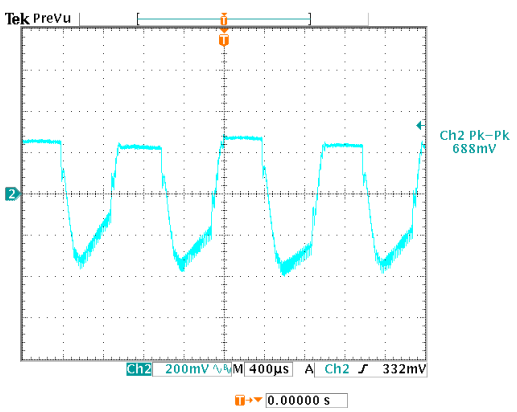
DYNAMIC LOAD	V1 :	2700	mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA : 25℃		(1).	(2). unit:mVp-p
					V1:	908.0mv	688.0mv

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FULL/Min LOAD 50%DUTY / 120HZ

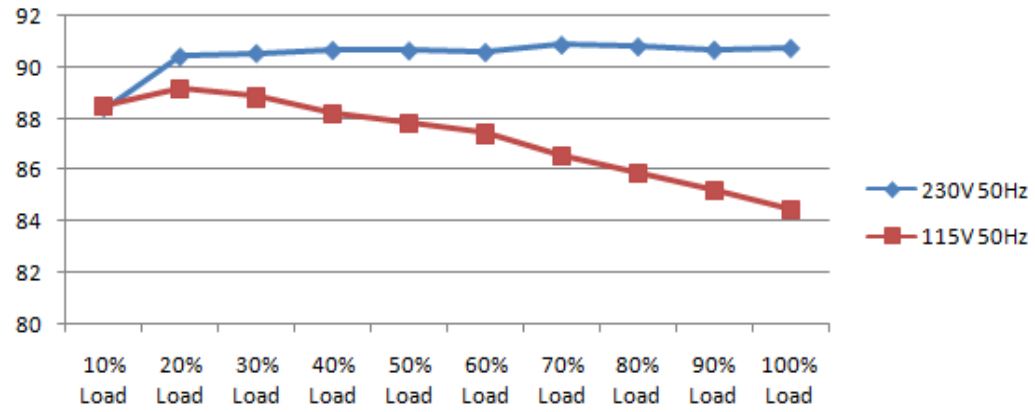


FULL/Min LOAD 50%DUTY / 1KHZ



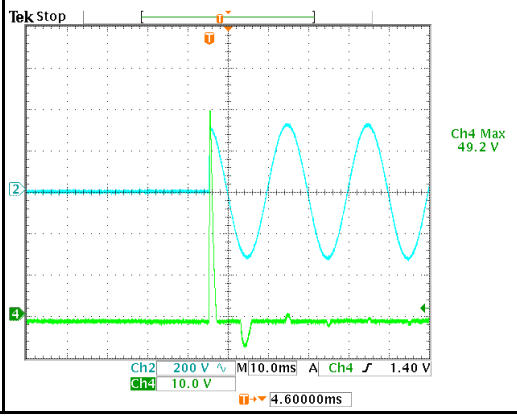
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25℃	74.0VAC ~ 264VAC
			I/P : LOW-LINE = 77VAC HIGH-LINE = 300VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 115VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25℃	TEST : OK
3	INPUT CURRENT (TYP.)	1.2 / 230VAC 2.1 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 0.909 / 230VAC I= 1.88 / 115VAC
4	LEAKAGE CURRENT	< 0.19mA	I/P : 264VAC O/P: MIN LOAD TA : 25℃	L-FG: 0.0454 mA N-FG: 0.0458 mA O/P-FG: 0.0671 mA
5	NO LOAD POWER CONSUMPTION	< 0.30W	I/P : 230VAC O/P: MIN LOAD TA : 25℃	< 0.1961 W
6	EFFICIENCY (TYP.)	90.0%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	90.751 %

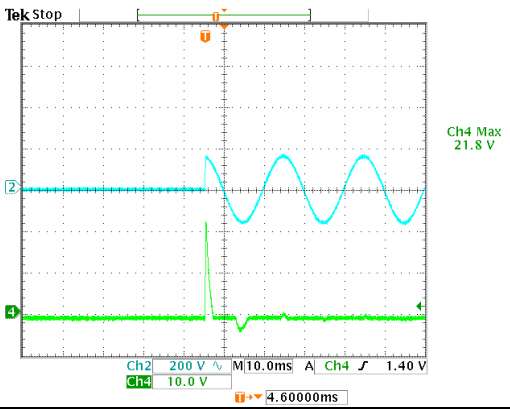


7	INRUSH CURRENT (TYP.)	60A / 230VAC 30A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 49.20A / 230VAC I= 21.80A / 115VAC

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



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	115% ~ 150%	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING TA : 25℃	133.7% 264VAC 136.2% 230VAC 126.8% 115VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	29.70V ~ 35.00V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD TA : 25℃	31.30V 264VAC 31.30V 230VAC 31.30V 80VAC Shut down Re- power ON
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD Ta: 25℃	NO DAMAGE Hiccup Mode

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	AUXILIARY POWER	12V / 0.5A ripple & noise: * mv Tolerance: -15~10 %	I/P: 230VAC O/P: FULL LOAD TA : 25℃	11.87 V/ 0.5 A ripple & noise: * mv Tolerance: -1.03 %

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated： 600V 16.0A	I/P： 267VAC VDS： O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	VIN: 267VAC VDS: (1). 576.00V (2). 556.00V (3). 598.00V
2	Input Capacitor	C5 Rated： 180uf 400V	I/P： 267VAC O/P： (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta： 25℃	(1). 382.00V (2). 380.00V (3). 380.00V
3	Control IC	U1 Rated： 26.0V (max) 9.0V (min)	I/P： 267VAC O/P： (1)Full Load (2)Output Short (3)O.L.P (4)O.V.P (5)Low Line No Load Vo(min) Ta： 25℃	U1 (1). 20.50V (2). 12.10V (3). 19.10V (4). 20.10V (5). 16.00V
4	O/P Diode (MOSFET)	Q101 Rated： 200V 10.0A	I/P： 267VAC O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	(1). 122.00V (2). 93.20V (3). 121.00V
5	Clamp Diode	D5 Rated： 600V 3.0A	I/P： 267VAC O/P： (1)Fulll load continue Ta： 25℃	(1). 486.00V

■SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 4.000KVAC /min I/P-FG : 2.000KVAC /min O/P-FG : 1.500KVAC /min	I/P-O/P: 4.400KVAC /min I/P-FG: 2.400KVAC /min O/P-FG: 1.800KVAC /min Ta : 25℃	I/P-O/P: 1.87mA I/P-FG: 2.26mA O/P-FG: 1.08mA 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: 500VDC I/P-FG: 500VDC O/P-FG: 500VDC Ta : 25℃/70%RH	I/P-O/P: 9999MΩ I/P-FG: 9999MΩ O/P-FG: 9999MΩ NO DAMAGE

E.M.C. TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25℃	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR：8KV / Contact：4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT： 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N：2KV;L/N-PE：4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A

■RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : EPS-120-24 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 23.5℃ 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 45.0℃		
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 128% LOAD Ta : 25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 115VAC O/P : FULL LOAD Ta : -30.0℃	TEST：OK

NO.	Position	ROOM AMBIENT 23.5℃	HIGH AMBIENT Ta： 45.0℃
1	LF1	37.9℃	58.6℃
2	LF2	38.2℃	58.7℃
3	BD1	38.0℃	58.6℃
4	Q1	37.5℃	59.4℃
5	C5	34.4℃	55.1℃
6	D5	35.2℃	56.8℃
7	T1	48.6℃	69.0℃
8	C105	62.0℃	83.0℃
9	C106	49.0℃	70.3℃
10	L100	47.8℃	68.6℃
11	Q101	69.7℃	89.4℃
12	U1	41.9℃	63.0℃
13	RTH3	34.3℃	55.0℃

4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50℃ NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 50℃ HUMIDITY= 95.0% RH	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03% /(0℃~50℃)	I/P : 230VAC O/P : FULL LOAD	±0.0000% /(0℃~50℃)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40℃ ~ +85℃ 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		TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35℃ ~ +55℃ 2. Temperature change rate : 25℃ / 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		TEST : OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (5) Test Time : 60 min in each axis (X.Y.Z) (6) Ta : 25℃		TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50.0℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50.0℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50.0℃ LIFE TIME		(1). 108630 HRS (2). 19890 HRS (3). 90625.5 HRS (4). 214493.4 HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE : 653.5 KHRS		
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50℃		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

12.10.30 A50-F031