



TEST REPORT: EPP-400-36

400W 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

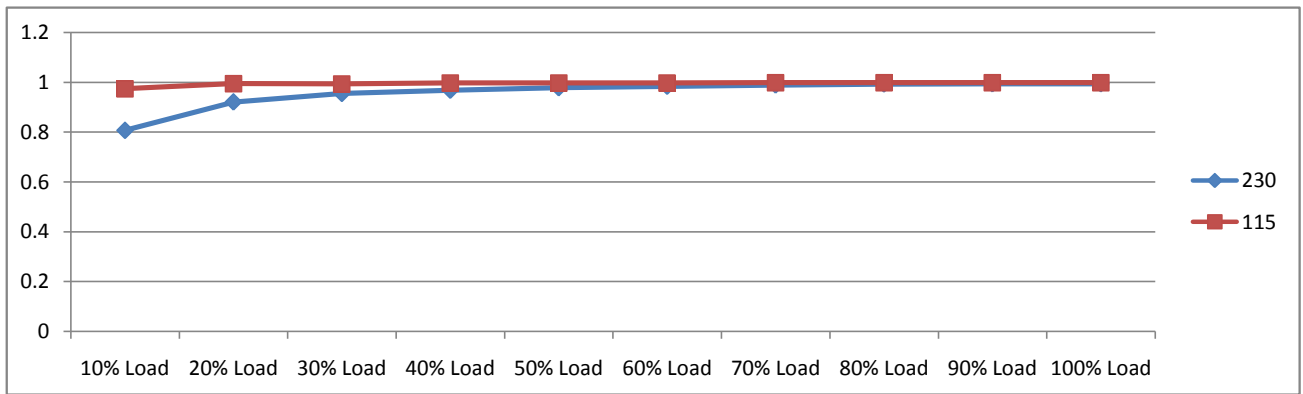
DESIGN VERIFY TEST
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 34.20V ~ 37.80V	I/P : 230VAC O/P: MIN LOAD TA: 25°C	CH1: 33.02V ~ 39.83V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 115VAC / 264VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.33% ~ 0.08%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 115VAC / 264VAC O/P: FULL LOAD TA: 25°C	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°C	V1: 0.14% ~ -0.08%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 2.2 %
6	RIPPLE & NOISE(Max)	V1 : 200 mVp-p	I/P : 230VAC	V1 : 96 mVp-p
			O/P: FULL LOAD TA: 25°C	
high frequency:			low frequency:	
7	SET UP TIME (MAX.)	230VAC : 1000ms 115VAC : 1500ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 588ms 115VAC : 252ms
		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage

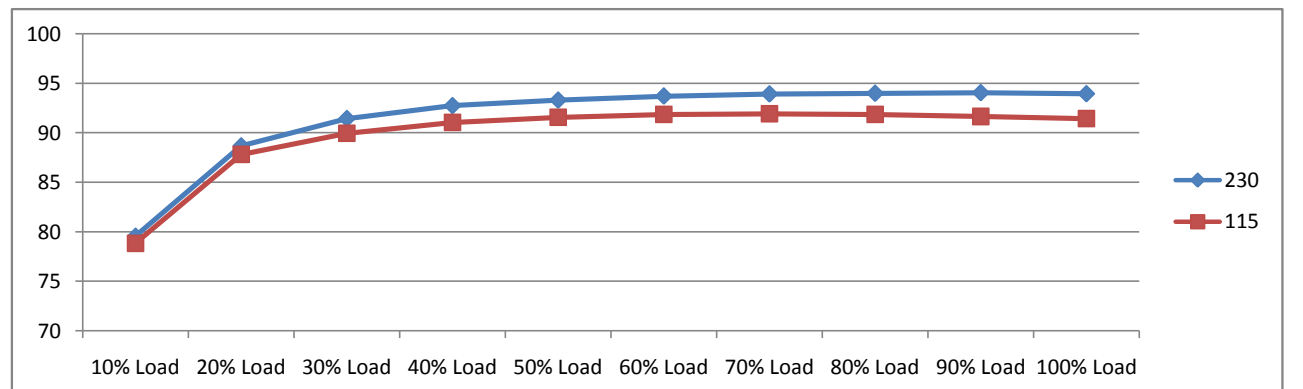
8	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 5.4ms 115VAC : 4.8ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage		
9	HOLD UP TIME (TYP.)	230VAC : 16ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 20.4ms 115VAC : 20.8ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		
10	DYNAMIC LOAD	V1 : 3600 mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50% duty/120HZ (2)Full/Min load 50% duty/1KHZ TA: 25°C	V1: (1). 596mv (2). 784mv unit:mVp-p
	FULL /MIN LOAD 50%DUTY / 120HZ	FULL /MIN% LOAD 50%DUTY / 1KHZ		

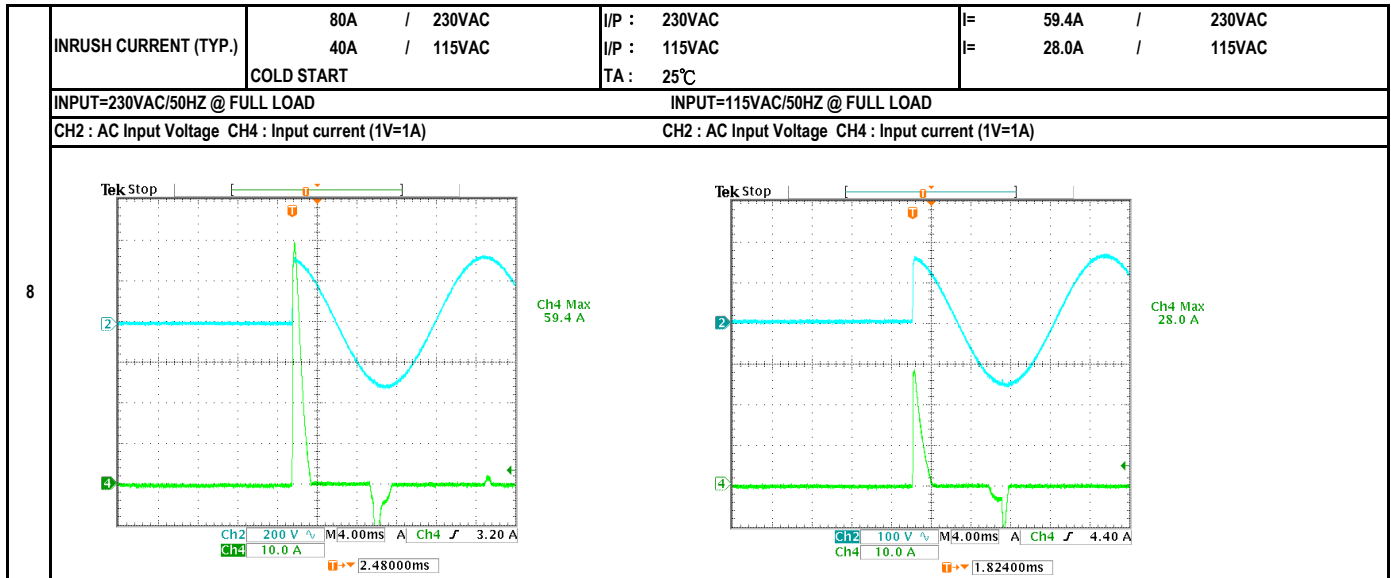
INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC 113VDC ~ 370VDC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	66.0VAC ~ 264VAC 198VDC ~ 370VDC
			I/P : LOW-LINE = 112VAC 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°C	TEST : OK
3	INPUT CURRENT (TYP.)	2.10A / 230VAC 4.20A / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 1.88A / 230VAC I= 3.92A / 115VAC
4	LEAKAGE CURRENT	< 0.75mA	I/P : 240VAC O/P : MIN LOAD TA : 25°C	L-FG 0.23 mA N-FG 0.22 mA
5	NO LOAD POWER CONSUMPTION	< 0.50W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.401 W
6	POWER FACTOR (TYP.)	0.94 / 230VAC 0.98 / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	PF= 0.994 / 230VAC PF= 0.998 / 115VAC



7	EFFICIENCY (TYP.)	93.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	94.05 %
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PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	105% ~ 135%	I/P: 264VAC I/P: 230VAC I/P: 115VAC O/P: TESTING TA : 25°C	116.80% 264VAC 116.80% 230VAC 116.80% 115VAC Hiccup Mode, recovers automatically after fault condition is removed
2	OVER VOLTAGE PROTECTION	39.60V ~ 46.80V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD TA : 25°C	43.40V 264VAC 43.40V 230VAC 43.40V 80VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	Shut down Re- power ON	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD	O.T.P. Active Shut down o/p voltage, recovers automatically after temperature goes down
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Hiccup Mode, recovers automatically after fault condition is removed

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PS-ON INPUT SIGNAL	Power on: PS-ON = "Hi" or " > 2 ~ 5V" ; Power off: PS-ON = "Low" or " < 0 ~ 0.5V"	I/P: 230VAC O/P: FULL LOAD TA : 25°C	OK
2	5V STANDBY	5V / 1.0A ripple & noise: 120 mv Tolerance: ±2%	I/P: 230VAC O/P: FULL LOAD TA: 25°C	4.975 V/ 0.9918 A ripple & noise: 45.8 mv Tolerance: ±0.5 %
3	FAN SUPPLY	12V / 0.5A Tolerance: ±10%	I/P: 230VAC O/P: FULL LOAD TA : 25°C	11.889 V/ 0.4963 A Tolerance: ±0.925 %
4	POWER GOOD/ POWER FAIL	> 1ms 10ms< PG < 500ms	I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA : 25°C	100.0ms 7.0ms /230VAC 98.8ms 7.0ms /115VAC

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q5 Rated : 600V 30.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	VIN: 267VAC VDS: (1). 411.00V (2). 442.00V (3). 398.00V
2	PWM Power Transistor	Q6 Rated : 600V 30.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	VIN: 267VAC VDS: (1). 396.00V (2). 446.00V (3). 396.00V
3	PWM Power Transistor	U900 Rated : 725V 0.7A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	VIN: 267VAC VDS: (1). 494.00V (2). 520.00V (3). 494.00V
4	O/P MOSFET	Q101 Rated : 100V 100.0A Q102 Rated : 100V 100.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q101 Q102 VDS : VDS : (1). 88.80V 88.80V (2). 9.60V 9.40V (3). 87.60V 88.00V
5	Input Capacitor	C5 Rated : 270uf 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°C	(1). 390.00V (2). 398.00V (3). 388.00V
6	Control IC	U2 Rated : 26V (max) -0.3V (min) U1 Rated : 16V (max) -0.3V (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°C	U2 U1 (1). 16.50V 13.90V (2). 16.10V 13.90V (3). 15.60V 13.90V (4). 15.70V 13.70V (5). 16.20V 13.70V
7	Control IC	U101 Rated : 24V (max) -0.3V (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°C	U101 (1). 11.50V (2). 2.14V (3). 11.50V (4). 11.60V (5). 11.40V
8	PFC Power Transistor	Q1 Rated : 600V 35.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	VIN: 267VAC VDS: (1). 468.00V (2). 544.00V (3). 456.00V
9	PFC Diode	D10 Rated : 600V 6.0A	I/P : 267VAC O/P : (1)Full Load Turn on (2) Output Short (3)Dynamic Load Full/Min Load 90%Duty/5KHz (4)Dynamic Load Full/Min Load 50%Duty/120Hz Ta : 25°C	267VAC (1). 398.00V (2). 428.00V (3). 398.00V (4). 402.00V

SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P : 3.000KVAC /min I/P-FG : 2.000KVAC /min O/P-FG : 0.500KVAC /min	I/P-O/P: 3.600KVAC /min I/P-FG: 2.400KVAC /min O/P-FG: 0.600KVAC /min Ta : 25°C	I/P-O/P: 1.43mA I/P-FG: 1.63mA O/P-FG: 0.54mA 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°C/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 Shut down Re- power ON	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 MEDICAL AIR: 15KV / Contact: 8KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	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°C	CRITERIA A

RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT		
1	TEMPERATURE RISE TEST	MODEL : EPP-400-24				
		1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 250W TA= 25.5°C				
		2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 250W TA= 42.1°C				
			NO. Positio	ROOM AMBIENT 25.5°C	HIGH AMBIENT Ta: 42.1°C	
			1 BD1	62.0°C	78.6°C	
			2 LF1	41.7°C	58.8°C	
			3 LF2	43.0°C	59.4°C	
			4 Q5	75.3°C	91.8°C	
			5 Q6	71.0°C	86.7°C	
			6 L1	81.2°C	97.8°C	
			7 D10	70.7°C	86.2°C	
			8 Q1	74.1°C	89.2°C	
			9 C33	58.1°C	76.3°C	
			10 C5	69.0°C	82.7°C	
			11 T1COIL	69.3°C	83.1°C	
			12 T1COIL	65.8°C	81.1°C	
			13 L2	74.6°C	87.7°C	
			14 Q101	53.5°C	70.0°C	
			15 Q102	59.5°C	74.8°C	
			16 TSW1	66.5°C	81.4°C	
			17 C106	48.1°C	64.1°C	
			18 C105	51.3°C	66.6°C	
			19 U900	74.7°C	89.3°C	
			20 U1	69.8°C	84.4°C	
			21 U2	73.7°C	90.1°C	
			22 T900	62.5°C	78.5°C	
	23 LF3	37.8°C	55.1°C			
	24 C1	37.3°C	54.3°C			
	25 C2	39.1°C	55.7°C			
	26 D911	69.1°C	84.0°C			



2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 123.00% LOAD Ta : 25°C	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 115VAC O/P : FULL LOAD Ta : -30.0°C	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45°C NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 45°C HUMIDITY= 95.0% RH	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03% (0°C~50°C)	I/P : 230VAC O/P : FULL LOAD	±0.005% (0°C~50°C)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40°C ~ +85°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		TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C ~ +50°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		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°C		TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 45.0°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 45.0°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 45.0°C LIFE TIME		(1). 505637 HRS (2). 131777.8 HRS (3). 219984.4 HRS (4). 321245.6 HRS
10	MTBF	1395.2K hrs min. Telcordia SR-332 (Bellcore) ; 194.1K hrs min. MIL-HDBK-217F (25°C)		
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 45°C		

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	frank	GESG	WANGDZ

12.10.30 A50-F031