



TEST REPORT: ENP-360-48

360W Level VI Desktop Type Power Supply

■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

■ SAFETY & E.M.C. TEST

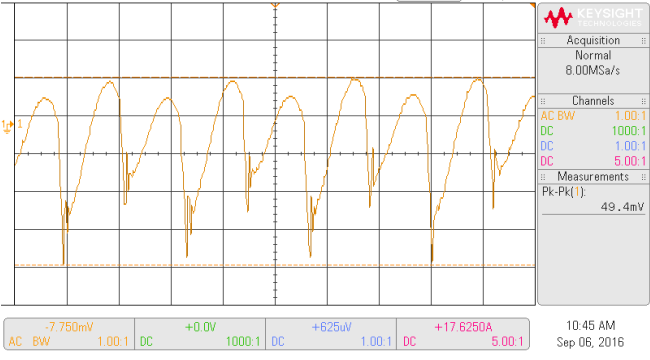
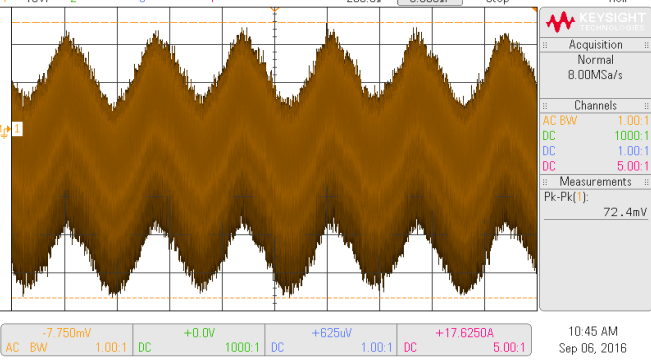
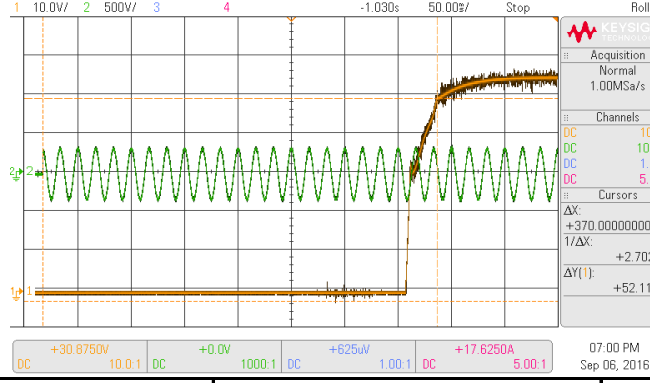
Safety Test

E.M.C. Test

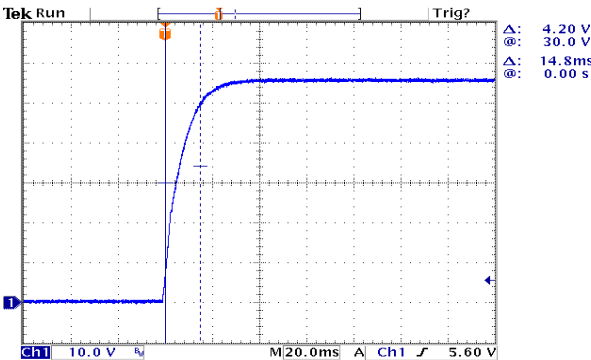
■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST OUTPUT FUNCTION

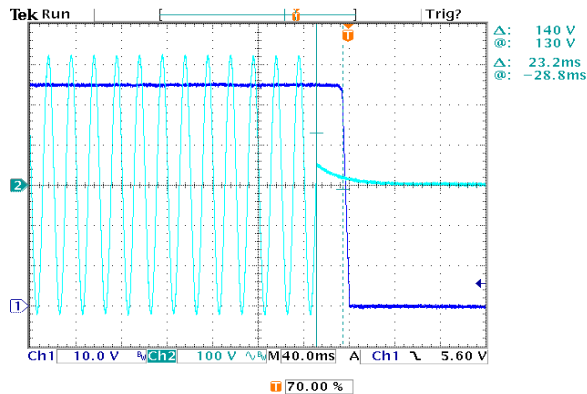
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 47.50V ~ 58.80V	I/P : 230VAC O/P: MIN LOAD TA : 25°C	CH1: 46.38V ~ 60.04V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 264VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.01% ~ -0.01%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25°C	V1: 0.01% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25°C	V1: 0.01% ~ -0.01%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	TEST< 5.0 %
6	RIPPLE & NOISE(Max)	V1 : 350 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25°C	V1 : 72.4 mVp-p
		high frequency :  low frequency : 		
SET UP TIME (MAX.)		230VAC : 1000ms	I/P : 230VAC O/P: FULL LOAD TA : 25°C	230VAC : 370ms
INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 				
RISE TIME (MAX.)		230VAC : 100ms	I/P : 230VAC O/P: FULL LOAD TA : 25°C	230VAC : 14.8ms

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



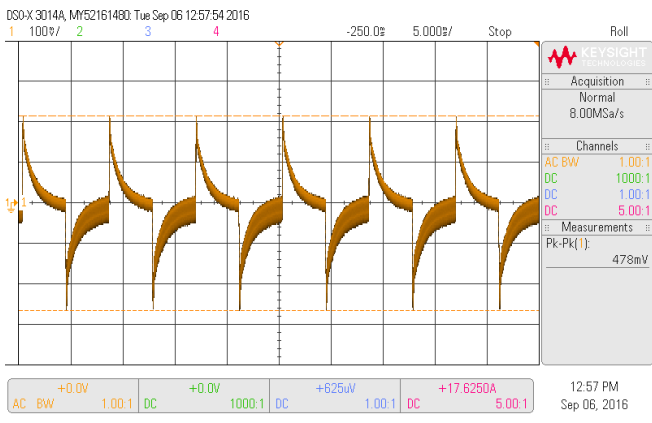
HOLD UP TIME (TYP.)	230VAC	: 20ms	I/P : 230VAC	230VAC	: 23.2ms
			O/P: FULL LOAD		
			TA : 25°C		

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

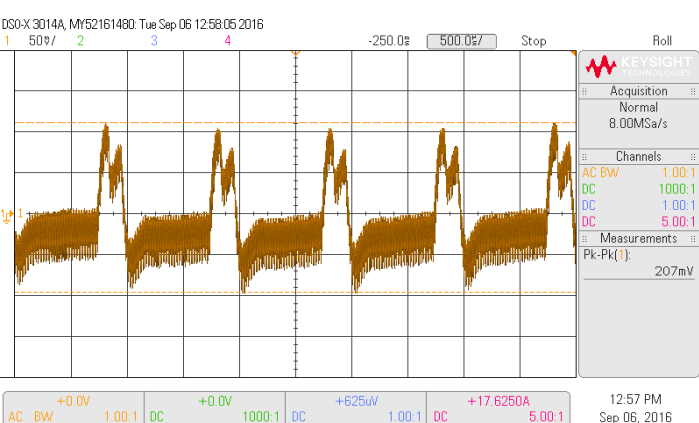


DYNAMIC LOAD	V1 : 5520 mVp-p	I/P : 230VAC	(1).	(2).	unit:mVp-p
		O/P:	V1: 478mv	207mv	
		(1)Full/Min load 50%duty/120HZ			
		(2)Full/Min load 50%duty/1KHZ			
		TA : 25°C			

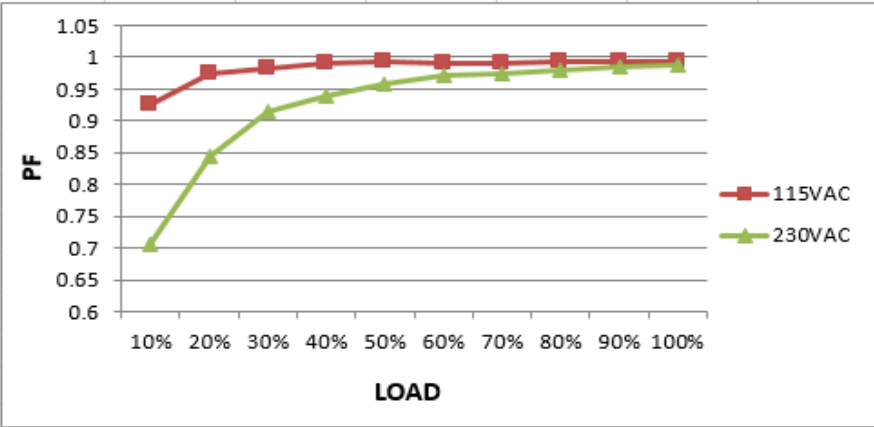
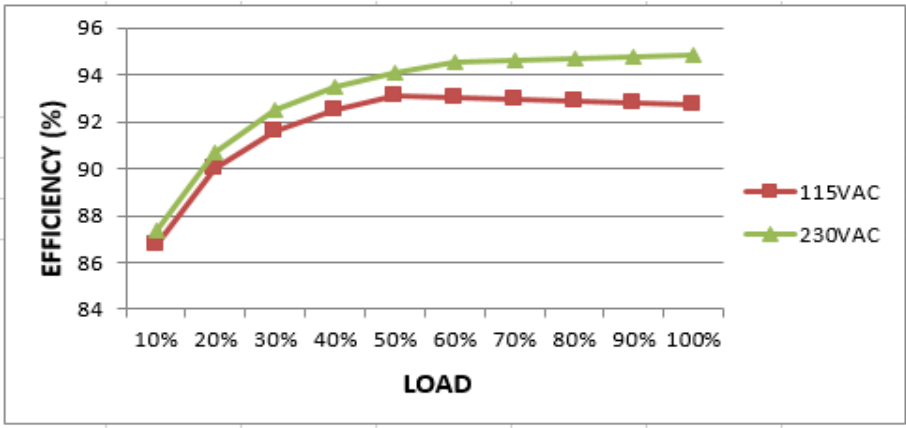
FULL /MIN LOAD 50%DUTY / 120HZ

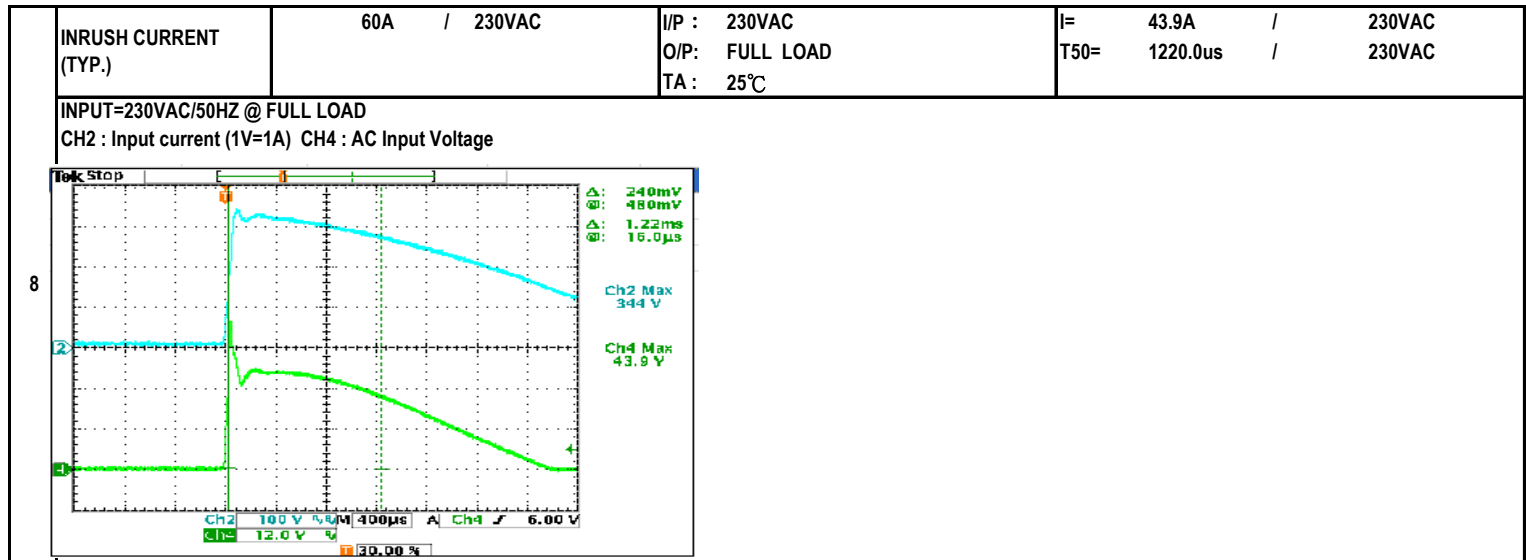


FULL /MIN% LOAD 50%DUTY / 1KHZ



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	59.0VAC ~ 264VAC
			I/P : LOW-LINE = 97VAC 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 : 100VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK
3	INPUT CURRENT (TYP.)	1.9 / 230VAC 3.8 / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 1.68 / 230VAC I= 3.35 / 115VAC
4	LEAKAGE CURRENT	< 3.50mA	I/P : 240VAC O/P : MIN LOAD TA : 25°C	L-FG: 0.7 mA N-FG: 0.68 mA
5	NO LOAD POWER CONSUMPTION	< 0.50W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.382 W
6	POWER FACTOR (TYP.)	0.95 / 230VAC 0.98 / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	PF= 0.97 / 230VAC PF= 0.993 / 115VAC
				
7	EFFICIENCY (TYP.)	94.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	94.59 %
				



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	1 110% ~ 125% 2 > 125%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING TA : 25°C	117.40% 264VAC 117.20% 230VAC 117.50% 100VAC Normally works within 110 ~ 125% rated output power for more than 3 seconds and switches to constant current limiting, with auto-recovery after the peak load condition is removed 129% 264VAC 129% 230VAC 129% 100VAC Constant current limiting, if >125% rated power, with auto-recovery after the overload condition is removed
2	OVER VOLTAGE PROTECTION	62.10V ~ 72.90V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD TA : 25°C	66.87V 264VAC 66.82V 230VAC 66.23V 90VAC Shut down Re- power ON
3	OVER TEMPERATURE PROTECTION	Shut down O/P voltage, recovers automatically after temperature goes down	I/P: 264VAC I/P: 90VAC 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: 90VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Constant current limiting, recovers automatically after fault condition is removed

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q901 Rated : 600V 20.0A	I/P : 267VAC I/P : 97VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz (6)Dynamic Load Full/Min Load 50%Duty/120Hz (7)0%→400% Load Ta : 25°C	VIN: 267VAC 97VAC VDS: VDS: (1). 535.00V 535.00V (2). 515.00V 459.00V (3). 431.00V 439.00V (4). 531.00V 535.00V (5). 535.00V 535.00V (6). 539.00V 535.00V (7). 447.00V 451.00V
		Q100 Rated : 150V 104.0A	I/P : 267VAC	Q100 Q101

2	O/P Diode (MOSFET)	Q101	Rated : 150V 104.0A	VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz (6)Dynamic Load Full/Min Load 50%Duty/120Hz (7)0%→400% Load (8) NO LOAD (9) Burst mode Ta : 25°C	VDS : (1). 127.10V 125.50V (2). 23.40V 30.70V (3). 126.30V 125.50V (4). 127.10V 125.50V (5). 126.30V 124.70V (6). 126.30V 123.90V (7). 128.80V 124.70V (8). 118.30V 123.10V (9). 122.3V 121.5V
3	Input Capacitor	C5	Rated : 180uf 420V	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). 415.00V (2). 402.00V (3). 419.00V
4	Control IC	U1 U901	Rated : 20V (max) 10V (min) Rated : 24V (max) 8V (min)	I/P : 267VAC O/P : (1)Full Load Turn on /Off (2)Output Short Change (4)O.V.P (5)Low Line No Load Vo(min) Ta : 25°C	U1 U901 (1). 18.30V 19.70V (2). 15.10V 19.10V (3). 15.30V 16.50V (4). 17.70V 17.90V (5). 15.90V 15.90V
5	PFC Power Transistor	Q1	Rated : 650V 22.0A	I/P : 267VAC I/P : 97VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue (4)Dynamic Load Full/Min Load 90%Duty/1KHz (5)Dynamic Load Full/Min Load 90%Duty/5KHz (6)Dynamic Load Full/Min Load 50%Duty/120Hz (7)0%→400% Load Ta : 25°C	VIN: 267VAC 97VAC VDS: 484.00V 504.00V (1). 484.00V 504.00V (2). 480.00V 464.00V (3). 452.00V 508.00V (4). 460.00V 500.00V (5). 468.00V 496.00V (6). 448.00V 512.00V (7). 428.00V 452.00V
6	PFC Diode	D1	Rated : 600V 15.0A	I/P : 267VAC I/P : 97VAC 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 97VAC (1). 436.00V 456.00V (2). 424.00V 440.00V (3). 452.00V 452.00V (4). 460.00V 452.00V

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: 5.72mA I/P-FG: 5.61mA O/P-FG: 3.85mA 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: 12.7GΩ I/P-FG: 5.5GΩ O/P-FG: 30.0GΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C/70%RH	25.0mΩ

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°C	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD	PASS Test by certified Lab

3	CONDUCTION	EN55022 CLASS B	Ta : 25°C I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 LIGHT INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 LIGHT INDUSTRY INPUT : 1KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 LIGHT INDUSTRY L-N:1KV ; L/N-PE:2KV	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 : ENP-360-24																																																																																						
		1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 30.6°C																																																																																						
		2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 49.6°C																																																																																						
		<table><tr><td>1</td><td>BD1</td><td>59.0°C</td><td>78.0°C</td></tr><tr><td>2</td><td>C2</td><td>56.7°C</td><td>75.7°C</td></tr><tr><td>3</td><td>LF2</td><td>58.8°C</td><td>77.8°C</td></tr><tr><td>4</td><td>C10</td><td>59.9°C</td><td>78.9°C</td></tr><tr><td>5</td><td>RY1</td><td>63.4°C</td><td>82.4°C</td></tr><tr><td>6</td><td>L1</td><td>62.4°C</td><td>81.4°C</td></tr><tr><td>7</td><td>Q2</td><td>61.6°C</td><td>80.6°C</td></tr><tr><td>8</td><td>C5</td><td>61.3°C</td><td>80.3°C</td></tr><tr><td>9</td><td>Q901</td><td>62.9°C</td><td>81.9°C</td></tr><tr><td>10</td><td>C44</td><td>61.9°C</td><td>80.9°C</td></tr><tr><td>11</td><td>C90</td><td>66.3°C</td><td>85.3°C</td></tr><tr><td>12</td><td>C42</td><td>65.1°C</td><td>84.1°C</td></tr><tr><td>13</td><td>C43</td><td>63.3°C</td><td>82.3°C</td></tr><tr><td>14</td><td>T1</td><td>73.8°C</td><td>92.8°C</td></tr><tr><td>15</td><td>U1</td><td>56.4°C</td><td>75.4°C</td></tr><tr><td>16</td><td>U901</td><td>59.4°C</td><td>78.4°C</td></tr><tr><td>17</td><td>Q100</td><td>69.5°C</td><td>88.5°C</td></tr><tr><td>18</td><td>Q101</td><td>70.9°C</td><td>89.9°C</td></tr><tr><td>19</td><td>C105</td><td>65.8°C</td><td>84.8°C</td></tr><tr><td>20</td><td>C202</td><td>65.3°C</td><td>84.3°C</td></tr><tr><td>21</td><td>TSW1</td><td>61.4°C</td><td>80.4°C</td></tr></table>			1	BD1	59.0°C	78.0°C	2	C2	56.7°C	75.7°C	3	LF2	58.8°C	77.8°C	4	C10	59.9°C	78.9°C	5	RY1	63.4°C	82.4°C	6	L1	62.4°C	81.4°C	7	Q2	61.6°C	80.6°C	8	C5	61.3°C	80.3°C	9	Q901	62.9°C	81.9°C	10	C44	61.9°C	80.9°C	11	C90	66.3°C	85.3°C	12	C42	65.1°C	84.1°C	13	C43	63.3°C	82.3°C	14	T1	73.8°C	92.8°C	15	U1	56.4°C	75.4°C	16	U901	59.4°C	78.4°C	17	Q100	69.5°C	88.5°C	18	Q101	70.9°C	89.9°C	19	C105	65.8°C	84.8°C	20	C202	65.3°C	84.3°C	21	TSW1	61.4°C	80.4°C
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21	TSW1	61.4°C	80.4°C																																																																																					
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 115.0% LOAD Ta : 25°C	TEST : OK																																																																																				
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 100VAC 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 50°C NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 50°C HUMIDITY= 95.0% RH	TEST : OK																																																																																				
5	TEMPERATURE COEFFICIENT	±0.05% /°C (0~50°C)	I/P : 230VAC O/P : FULL LOAD	±0.03% /°C (0~50°C)																																																																																				
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		TEST : OK																																																																																				
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 : 16 CYCLE 5. Input/Output condition : 230VAC Full Load AC ON/OFF test turn on 3sec ; turn off 1sec @ 15cvcle		TEST : OK																																																																																				

		Full Load burn in@ 1cycle	
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK
9	CAPACITOR LIFE CYCLE	ENP-360-24 :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 : FULL LOAD Ta= 50°C LIFE TIME (4) I/P : 230VAC O/P : FULL LOAD Ta= 50°C LIFE TIME	(1). 351392 HRS (2). 54766 HRS (3). 116054 HRS (4). 199280 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 147.5K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): 30000HRS @ TA 50°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	DANIEL GAO	SANFORD SU	VINCENT ZENG