



# TEST REPORT: ENP-360-12

## 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

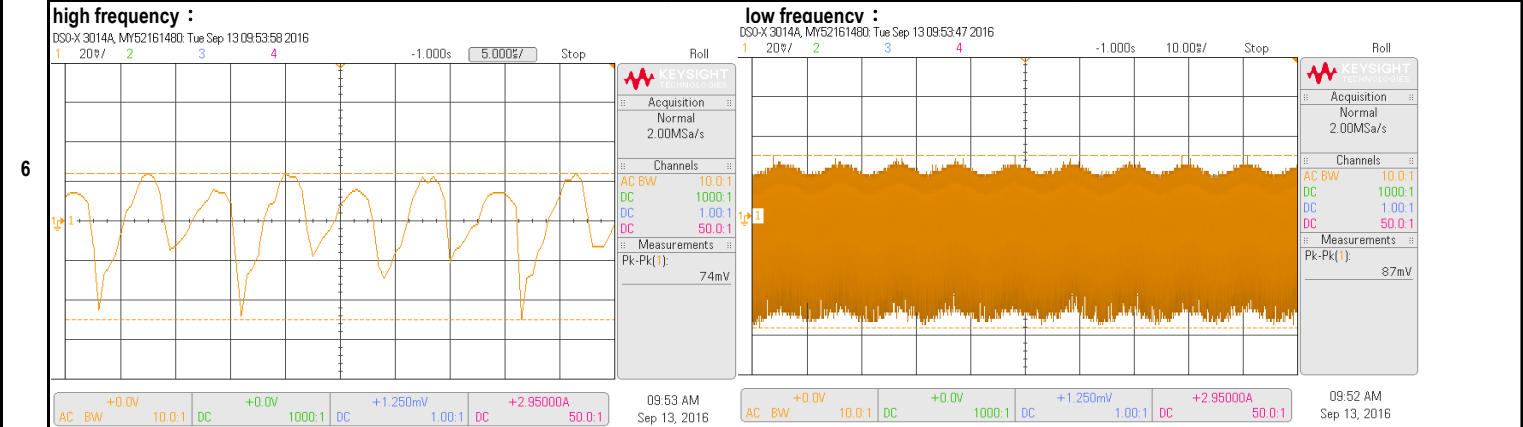
E.M.C. Test

### ■ RELIABILITY TEST

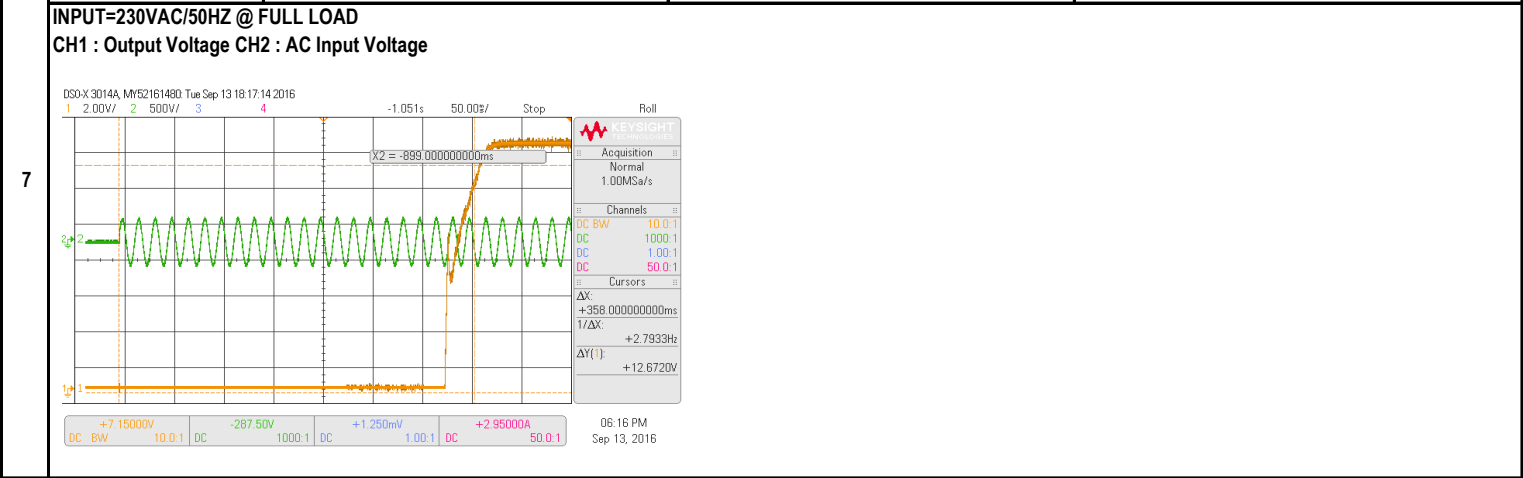
ENVIRONMENT TEST

**DESIGN VERIFY TEST  
OUTPUT FUNCTION**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 11.50V ~ 15.00V	I/P : 230VAC O/P : MIN LOAD TA : 25°C	CH1: 11.09V ~ 15.87V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 264VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.14% ~ -0.28%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25°C	V1: 0.07% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 2.0% ~ -2.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25°C	V1: 0.15% ~ -0.22%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	TEST< 5.000 %
	RIPPLE & NOISE(Max)	V1 : 150 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25°C	V1 : 87 mVp-p



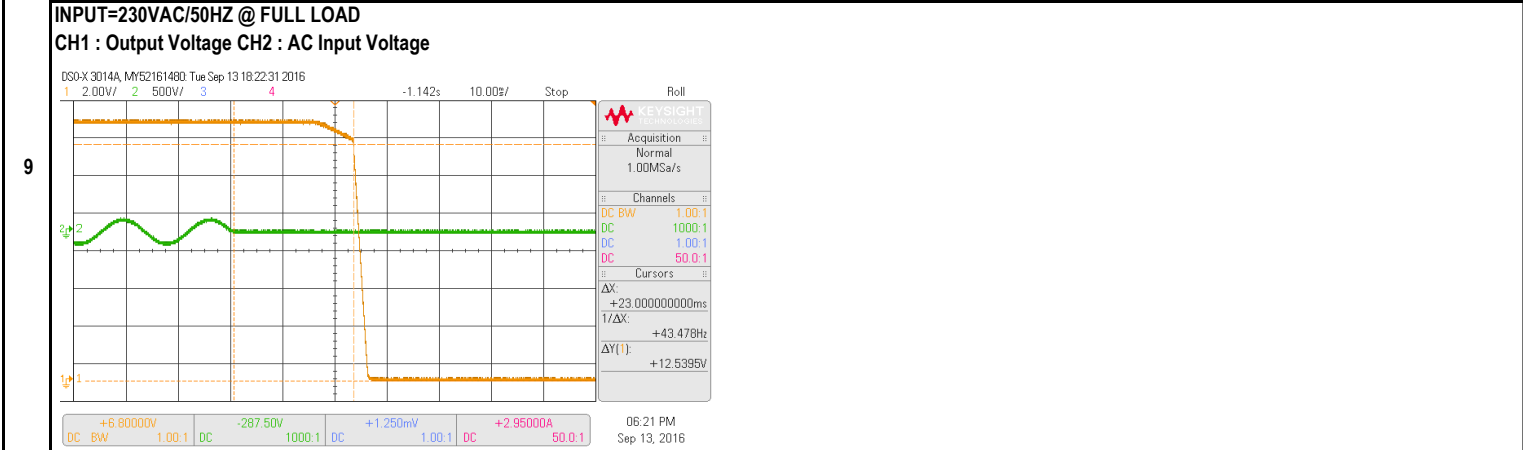
<b>SET UP TIME (MAX.)</b>	230VAC : 1000ms	I/P : 230VAC	230VAC : 358ms
		O/P: FULL LOAD	
		TA : 25°C	



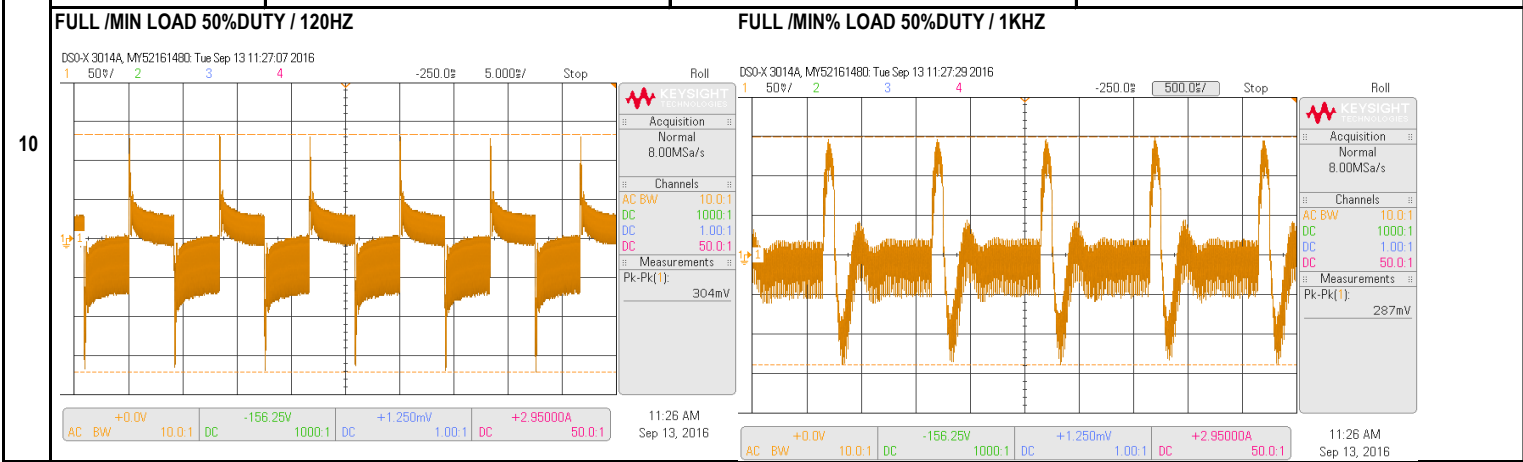
<b>RISE TIME (MAX.)</b>	230VAC : 100ms	I/P : 230VAC	230VAC : 28.8ms
		O/P: FULL LOAD	
		TA : 25°C	



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

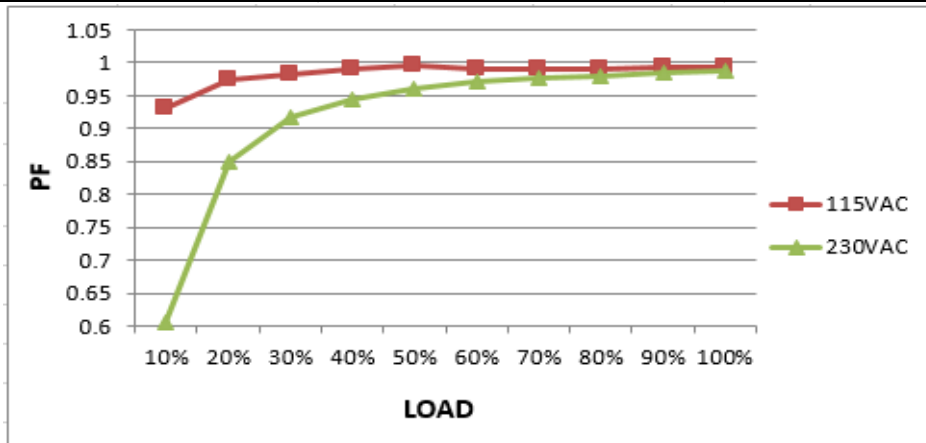


DYNAMIC LOAD	V1 : 1380 mVp-p	I/P : 230VAC	(1). (2). unit:mVp-p
		O/P:	304mv 287mv
		(1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ	
		TA : 25°C	

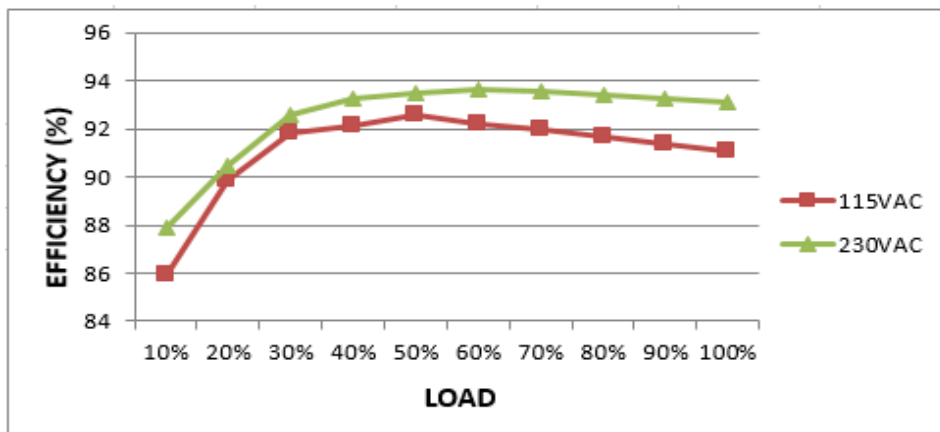


## INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	90VAC ~ 264VAC  (PLEASE CHECK DERATING CURVE)	I/P : TESTING O/P : FULL LOAD Ta : 25°C	51.0VAC ~ 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= 1.7 / 230VAC I= 3.41 / 115VAC
4	LEAKAGE CURRENT	< 3.50mA	I/P : 240VAC O/P: MIN LOAD TA : 25°C	L-FG: 0.74 mA N-FG: 0.74 mA
5	NO LOAD POWER CONSUMPTION	< 0.50W	I/P : 230VAC O/P: MIN LOAD TA : 25°C	< 0.35 W
	POWER FACTOR (TYP.)	0.95 / 230VAC 0.98 / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	PF= 0.987 230VAC PF= 0.993 115VAC



6	EFFICIENCY (TYP.)	91.0%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	93.61 %
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INRUSH CURRENT (TYP.)	60A / 230VAC	I/P : 230VAC O/P: FULL LOAD TA : 25°C	I= 36.5A / 230VAC T50= 1690.0us / 230VAC
INPUT=230VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage			
8			

### 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	119.7 264VAC 119.6 230VAC 119.7 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  138% 264VAC 139% 230VAC 139% 100VAC  Constant current limiting, if >125% rated power, with auto-recovery after the overload condition is removed
2	OVER VOLTAGE PROTECTION	15.50V ~ 18.20V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD TA : 25°C	16.35V 264VAC 16.35V 230VAC 16.35V 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: (1). 531.00V 535.00V (2). 527.00V 539.00V (3). 430.00V 462.00V (4). 527.00V 527.00V (5). 523.00V 539.00V (6). 527.00V 539.00V (7). 474.00V 486.00V

2	O/P Diode (MOSFET)	Q100	Rated :	40V	120.0A	I/P : 267VAC VDS : O/P : (1) Full Load Turn on (1). (2) Output Short (2). (3) Full load continue (3). (4) Dynamic Load Full/Min Load 90%Duty/1KHz (4). (5) Dynamic Load Full/Min Load 90%Duty/5KHz (5). (6) Dynamic Load Full/Min Load 50%Duty/120Hz (6). (7) 0%→400% Load (7). (8) NO LOAD (8).	Q100	Q101	VDS : VDS : VDS : VDS : VDS : VDS : VDS : VDS :	36.20V 39.00V 16.90V 7.20V 36.20V 38.60V 36.60V 39.80V 35.70V 39.00V 35.70V 39.00V 33.30V 35.70V 32.50V 35.70V	
		Q101	Rated :	40V	120.0A	Ta : 25°C					
3	Input Capacitor	C5	Rated :	180uf	420V	I/P : 267VAC O/P : (1) Full Load Turn on /Off (1). (2) Min load Turn on /Off (2). (3) Full Load /Min load Change (3).			418.00V 386.00V 418.00V		
4	Control IC	U1	Rated :	20V (max) 10V (min)		I/P : 267VAC O/P : (1) Full Load Turn on /Off (1). (2) Output Short (2). Change (3). (4) O.V.P (4). (5) Low Line No Load Vo(min) (5).	U1	U901	17.50V 20.20V 15.50V 16.40V 17.50V 16.00V 16.90V 9.60V 14.90V 16.80V		
		U901	Rated :	24V (max) 8V (min)		Ta : 25°C					
5	PFC Power Transistor	Q1	Rated :	650V	22.0A	I/P : 267VAC I/P : 97VAC VDS : O/P : (1) Full Load Turn on (1). (2) Output Short (2). (3) Full load continue (3). (4) Dynamic Load Full/Min Load 90%Duty/1KHz (4). (5) Dynamic Load Full/Min Load 90%Duty/5KHz (5). (6) Dynamic Load Full/Min Load 50%Duty/120Hz (6). (7) 0%→400% Load (7).	VIN:	267VAC	97VAC	VDS: VDS: VDS: VDS: VDS: VDS: VDS:	501.00V 493.00V 497.00V 489.00V 501.00V 489.00V 501.00V 493.00V 497.00V 469.00V 445.00V 457.00V
						Ta : 25°C					
6	PFC Diode	D1	Rated :	600V	6.0A	I/P : 267VAC I/P : 97VAC O/P : (1) Full Load Turn on (1). (2) Output Short (2). (3) Dynamic Load Full/Min Load 90%Duty/5KHz (3). (4) Dynamic Load Full/Min Load 50%Duty/120Hz (4).	267VAC	97VAC		457 445.00V 469 449.00V 457 449.00V 453 445.00V	
						Ta : 25°C					

### 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: 7.99mA I/P-FG: 7.31mA O/P-FG: 8.10mA 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: 7.2GΩ I/P-FG: 4.7GΩ O/P-FG: 18.8GΩ NO DAMAGE
2	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
		EN55022	I/P : 230VAC /50HZ	PASS

2	CONDUCTION	CLASS B	O/P : FULL LOAD / 50% LOAD Ta : 25°C	Test by certified Lab
3	CONDUCTION	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 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 border="1"> <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	
1	BD1	59.0°C	78.0°C																																																																																					
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20	C202	65.3°C	84.3°C																																																																																					
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 @ 15cycle Full Load burn in@ 1cycle	TEST : OK
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