



TEST REPORT: ENP-360-24

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

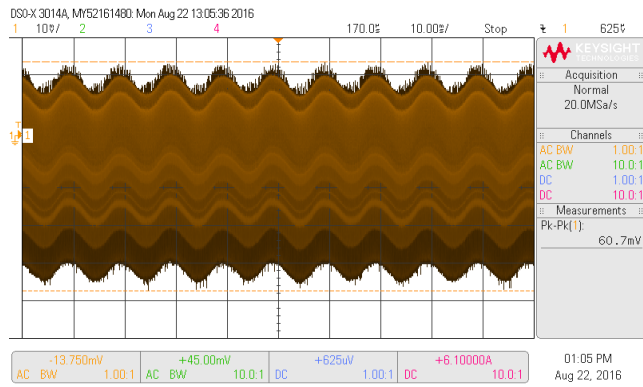
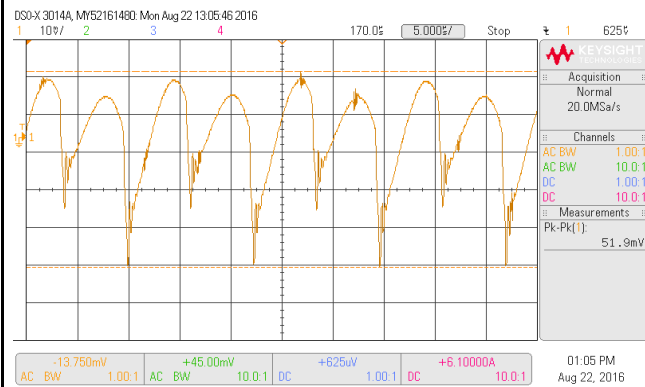
ENVIRONMENT TEST

DESIGN VERIFY TEST
OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 23.50V ~ 30.00V	I/P : 230VAC O/P: MIN LOAD TA : 25°C	CH1: 22.86V ~ 31.07V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 1.0% ~ -1.0%	I/P : 100VAC / 264VAC O/P: FULL / MINLOAD TA= 25°C	V1: 0.00% ~ 0.40%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25°C	V1: 0.04% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25°C	V1: 0.07% ~ -0.07%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	TEST< 5.0 %
	RIPPLE & NOISE(Max)	V1 : 150 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25°C	V1 : 60.7 mVp-p

high frequency :

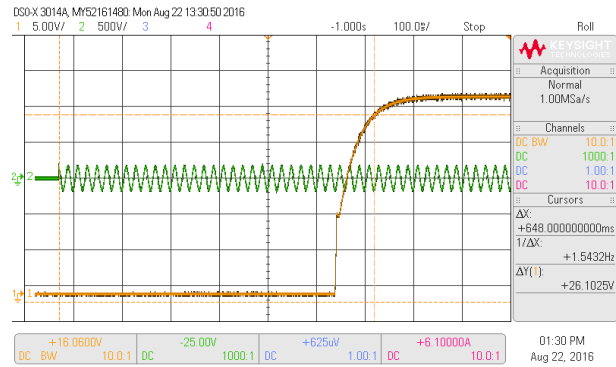
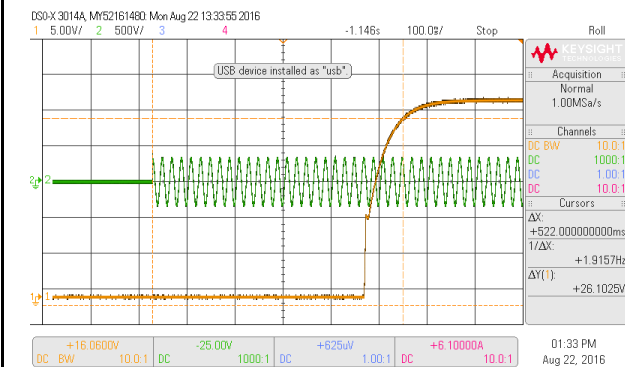
low frequency :



SET UP TIME (MAX.)	230VAC : 1000ms	I/P : 230VAC O/P: FULL LOAD TA : 25°C	230VAC : 542ms
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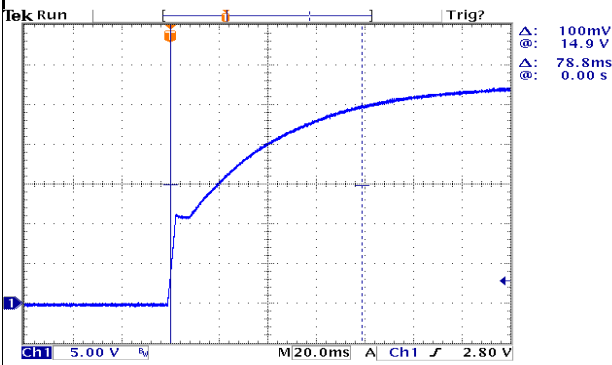
INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage

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



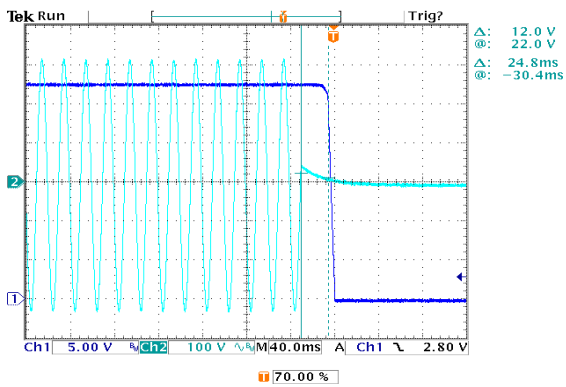
RISE TIME (MAX.)	230VAC : 100ms	I/P : 230VAC O/P: FULL LOAD TA : 25°C	230VAC : 78.8ms
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INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage



HOLD UP TIME (TYP.)	230VAC : 20ms	I/P : 230VAC	230VAC : 24.8ms
		O/P: FULL LOAD	
		TA : 25°C	

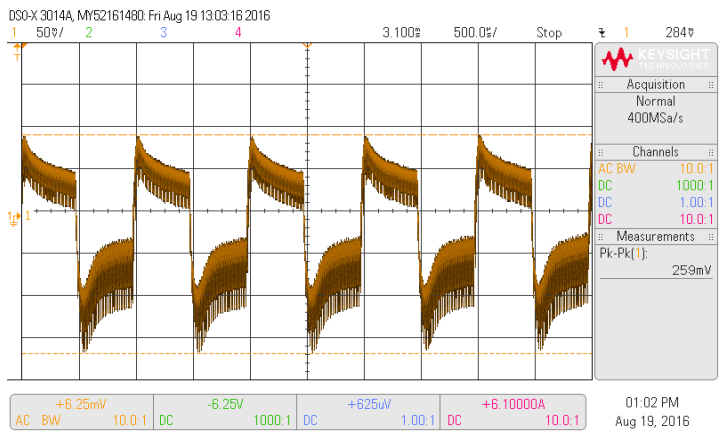
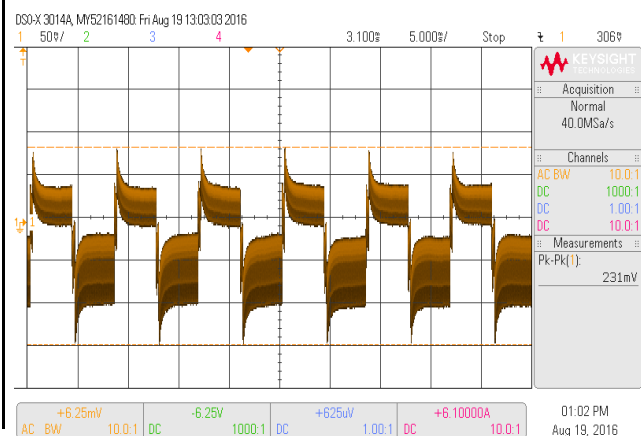
INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



DYNAMIC LOAD	V1 : 2760 mVp-p	I/P : 230VAC	(1). (2). unit:mVp
		O/P:	V1: 231mv 259mv
		(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



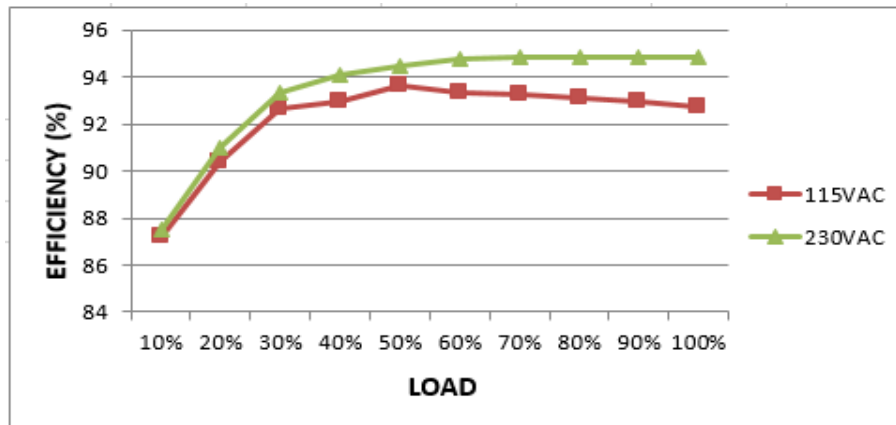
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INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																															
1	INPUT VOLTAGE RANGE	90VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	53.0VAC ~ 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= 3.39 / 115VAC																															
4	LEAKAGE CURRENT	< 3.50mA	I/P : 240VAC O/P : MIN LOAD TA : 25°C	L-FG: 0.82 mA N-FG: 0.82 mA																															
5	NO LOAD POWER CONSUMPTION	< 0.50W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.2641 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= 0.977 / 230VAC PF= 0.993 / 115VAC																															
		<table border="1"> <caption>Power Factor vs Load Data</caption> <thead> <tr> <th>Load (%)</th> <th>PF (115VAC)</th> <th>PF (230VAC)</th> </tr> </thead> <tbody> <tr><td>10%</td><td>0.93</td><td>0.71</td></tr> <tr><td>20%</td><td>0.97</td><td>0.85</td></tr> <tr><td>30%</td><td>0.98</td><td>0.92</td></tr> <tr><td>40%</td><td>0.99</td><td>0.95</td></tr> <tr><td>50%</td><td>1.00</td><td>0.97</td></tr> <tr><td>60%</td><td>0.99</td><td>0.98</td></tr> <tr><td>70%</td><td>0.99</td><td>0.98</td></tr> <tr><td>80%</td><td>1.00</td><td>0.99</td></tr> <tr><td>90%</td><td>1.00</td><td>0.99</td></tr> <tr><td>100%</td><td>1.00</td><td>1.00</td></tr> </tbody> </table>			Load (%)	PF (115VAC)	PF (230VAC)	10%	0.93	0.71	20%	0.97	0.85	30%	0.98	0.92	40%	0.99	0.95	50%	1.00	0.97	60%	0.99	0.98	70%	0.99	0.98	80%	1.00	0.99	90%	1.00	0.99	100%
Load (%)	PF (115VAC)	PF (230VAC)																																	
10%	0.93	0.71																																	
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50%	1.00	0.97																																	
60%	0.99	0.98																																	
70%	0.99	0.98																																	
80%	1.00	0.99																																	
90%	1.00	0.99																																	
100%	1.00	1.00																																	
	EFFICIENCY (TYP.)	93.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	94.58 %																															

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INRUSH CURRENT (TYP.)

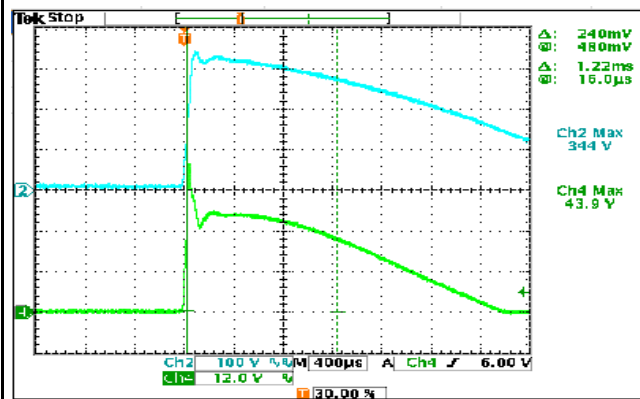
60A / 230VAC

I/P: 230VAC
O/P: FULL LOAD
TA: 25°C

I= 43.9A / 230VAC
T50= 1220.0us

INPUT=230VAC/50HZ @ FULL LOAD

CH2 : Input current (1V=1A) CH4 : AC Input Voltage



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PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	1 110% ~ 125%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING	116.31% 264VAC 116.31 117.54% 230VAC 117.54 117.30% 100VAC 117.3 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
		2 > 125%	TA: 25°C	130.77% 264VAC 130.77% 230VAC 130.77% 100VAC Constant current limiting, if >125% rated power, with auto-recovery after the overload condition is removed
2	OVER VOLTAGE PROTECTION	31.00V ~ 36.50V	I/P: 264VAC I/P: 230VAC I/P: 90VAC O/P: MIN LOAD TA: 25°C	34.21V 264VAC 34.17V 230VAC 34.19V 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). 454.00V 458.00V (2). 462.00V 458.00V (3). 426.00V 422.00V (4). 450.00V 462.00V (5). 458.00V 458.00V (6). 462.00V 462.00V (7). 450.00V 454.00V
2	O/P Diode (MOSFET)	Q100 Rated : 100V 80.0A Q101 Rated : 100V 80.0A VGS : ± 25V	I/P : 267VAC 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	Q100 Q101 VDS : VDS : (1). 68.70V 67.10V (2). 21.20V 8.80V (3). 68.30V 67.10V (4). 68.70V 67.50V (5). 68.70V 67.10V (6). 68.30V 67.10V (7). 63.80V 65.40V (8). 63.40V 63.80V (9). 64.2V 65.4V
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). 423.00V (2). 395.00V (3). 431.00V
4	Control IC	U1 Rated : 20V (max) 9.75V (min) U901 Rated : 20V (max) 9V (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). 17.50V 18.90V (2). 15.50V 16.30V (3). 16.10V 14.70V (4). 9.10V 9.50V (5). 15.90V 16.70V
5	PFC Power Transistor	Q1 Rated : 600V 21.0A	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). 526.00V 534.00V (2). 462.00V 482.00V (3). 454.00V 506.00V (4). 522.00V 522.00V (5). 522.00V 506.00V (6). 514.00V 478.00V (7). 422.00V 434.00V
6	PFC Diode	D1 Rated : 600V 12.0A	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). 451.00V 435.00V (2). 415.00V 423.00V (3). 459.00V 463.00V (4). 463.00V 459.00V

SAFETY & E.M.C. TEST

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
		I/P-O/P : 3.000KVAC /min	I/P-O/P: 3.600KVAC /min	I/P-O/P: 5.86mA

1	WITHSTAND VOLTAGE	I/P-FG : 2.000KVAC /min O/P-FG : 0.500KVAC /min	I/P-FG: 2.400KVAC /min O/P-FG: 0.600KVAC /min Ta : 25°C	I/P-FG: 5.67mA O/P-FG: 3.98mA 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: 11.4GΩ I/P-FG: 4.2GΩ 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 Ta : 25°C	PASS 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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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 1199.8K hrs min. Telcordia SR-332 (Bellcore) ; 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