



320W Single Output with PFC Function

SP-320 series



■ Features :

- Universal AC input / Full range
- Built-in active PFC function, PF>0.95
- Protections: Short circuit / Overload / Over voltage / Over temperature
- Forced air cooling by built-in DC Fan
- Built-in fan speed control
- Fixed switching frequency at 100KHz
- 3 years warranty

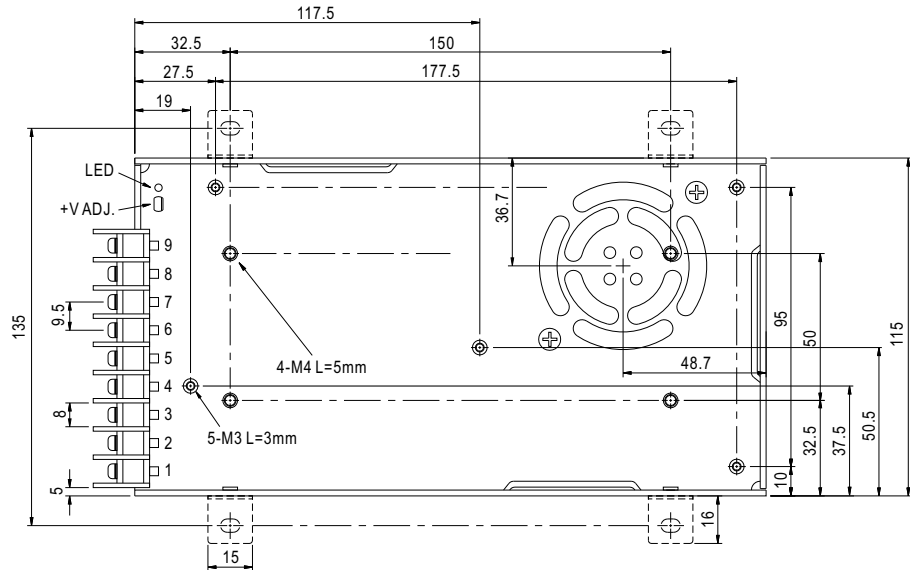


SPECIFICATION

| MODEL | | SP-320-3.3 | SP-320-5 | SP-320-7.5 | SP-320-12 | SP-320-13.5 | SP-320-15 | SP-320-24 | SP-320-27 | SP-320-36 | SP-320-48 | |
|-----------------------|--|---|--------------|-----------------------------|--------------|--------------|------------|--------------|--------------|--------------|--------------|--|
| OUTPUT | DC VOLTAGE | 3.3V | 5V | 7.5V | 12V | 13.5V | 15V | 24V | 27V | 36V | 48V | |
| | RATED CURRENT | 55A | 55A | 40A | 25A | 22A | 20A | 13A | 11.7A | 8.8A | 6.7A | |
| | CURRENT RANGE | 0 ~ 60A | 0 ~ 55A | 0 ~ 40A | 0 ~ 25A | 0 ~ 22A | 0 ~ 20A | 0 ~ 13A | 0 ~ 11.7A | 0 ~ 8.8A | 0 ~ 6.7A | |
| | RATED POWER | 181.5W | 275W | 300W | 300W | 297W | 300W | 312W | 315.9W | 316.8W | 321.6W | |
| | RIPPLE & NOISE (max.) Note.2 | 150mVp-p | 150mVp-p | 150mVp-p | 150mVp-p | 150mVp-p | 150mVp-p | 150mVp-p | 200mVp-p | 220mVp-p | 240mVp-p | |
| | VOLTAGE ADJ. RANGE | 3.14 ~ 3.63V | 4.5 ~ 5.5V | 6 ~ 9V | 10 ~ 13.2V | 12 ~ 15V | 13.5 ~ 18V | 20 ~ 26.4V | 26 ~ 31.5V | 32.4 ~ 39.6V | 41 ~ 56V | |
| | VOLTAGE TOLERANCE Note.3 | ±1.0% | ±2.0% | ±2.0% | ±1.0% | ±1.0% | ±1.0% | ±1.0% | ±1.0% | ±1.0% | ±1.0% | |
| | LINE REGULATION | ±0.5% | ±0.5% | ±0.5% | ±0.3% | ±0.3% | ±0.3% | ±0.2% | ±0.2% | ±0.2% | ±0.2% | |
| | LOAD REGULATION | ±1.5% | ±1.0% | ±1.0% | ±0.5% | ±0.5% | ±0.5% | ±0.5% | ±0.5% | ±0.5% | ±0.5% | |
| | SETUP, RISE TIME | 800ms, 50ms/230VAC 2500ms, 50ms/115VAC at full load | | | | | | | | | | |
| HOLD UP TIME (Typ.) | 16ms/230VAC 16ms/115VAC at full load | | | | | | | | | | | |
| INPUT | VOLTAGE RANGE Note.5 | 88 ~ 264VAC | | 124 ~ 370VDC | | | | | | | | |
| | FREQUENCY RANGE | 47 ~ 63Hz | | | | | | | | | | |
| | POWER FACTOR (Typ.) | PF>0.95/230VAC | | PF>0.98/115VAC at full load | | | | | | | | |
| | EFFICIENCY (Typ.) | 74% | 79% | 83% | 86% | 86% | 86% | 87% | 88% | 87% | 89% | |
| | AC CURRENT (Typ.) | 115VAC | 2.5A | 5A | | | | | | | | |
| | | 230VAC | 1.5A | 2.5A | | | | | | | | |
| | INRUSH CURRENT (Typ.) | 20A/115VAC | | 40A/230VAC | | | | | | | | |
| LEAKAGE CURRENT | <1mA / 240VAC | | | | | | | | | | | |
| PROTECTION | OVERLOAD | 105 ~ 135% rated output power Protection type : Hiccup mode, recovers automatically after fault condition is removed | | | | | | | | | | |
| | OVER VOLTAGE | 3.8 ~ 4.5V | 5.75 ~ 6.75V | 9.4 ~ 10.9V | 13.8 ~ 16.2V | 15.5 ~ 18.2V | 18 ~ 21V | 27.6 ~ 32.4V | 33.7 ~ 39.2V | 45 ~ 52.5V | 57.6 ~ 67.2V | |
| | | Protection type : Shut down o/p voltage, re-power on to recover | | | | | | | | | | |
| OVER TEMPERATURE | 80°C ±5°C (70°C ±5°C 3.3V,5V only) (TSW1 : detect on heatsink of power transistor) Protection type : Shut down o/p voltage, recovers automatically after temperature goes down | | | | | | | | | | | |
| ENVIRONMENT | WORKING TEMP. | -20 ~ +65°C (Refer to output load derating curve) | | | | | | | | | | |
| | WORKING HUMIDITY | 20 ~ 90% RH non-condensing | | | | | | | | | | |
| | STORAGE TEMP., HUMIDITY | -40 ~ +85°C, 10 ~ 95% RH | | | | | | | | | | |
| | TEMP. COEFFICIENT | ±0.03%/°C (0 ~ 50°C) | | | | | | | | | | |
| | VIBRATION | 10 ~ 500Hz, 2G 10min./1cycle, 60min. each along X, Y, Z axes | | | | | | | | | | |
| SAFETY & EMC (Note 4) | SAFETY STANDARDS | UL60950-1, TUV EN60950-1 approved | | | | | | | | | | |
| | WITHSTAND VOLTAGE | I/P-O/P:3KVAC I/P-FG:1.5KVAC O/P-FG:0.5KVAC | | | | | | | | | | |
| | ISOLATION RESISTANCE | I/P-O/P, I/P-FG, O/P-FG:100M Ohms/500VDC | | | | | | | | | | |
| | EMI CONDUCTION & RADIATION | Compliance to EN55022 (CISPR22) Class B | | | | | | | | | | |
| | HARMONIC CURRENT | Compliance to EN61000-3-2,-3 | | | | | | | | | | |
| | EMS IMMUNITY | Compliance to EN61000-4-2,3,4,5,6,8,11; ENV50204, EN55024, light industry level, criteria A | | | | | | | | | | |
| OTHERS | MTBF | 207K hrs min. MIL-HDBK-217F (25°C) | | | | | | | | | | |
| | DIMENSION | 215*115*50mm (L*W*H) | | | | | | | | | | |
| | PACKING | 1.1Kg; 12pcs/14Kg/0.92CUFT | | | | | | | | | | |
| NOTE | <ol style="list-style-type: none"> 1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature. 2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf & 47uf parallel capacitor. 3. Tolerance : includes set up tolerance, line regulation and load regulation. 4. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives. 5. Derating may be needed under low input voltages. Please check the derating curve for more details. | | | | | | | | | | | |

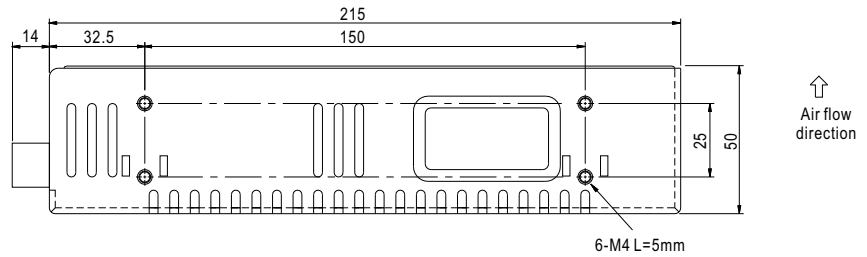
■ Mechanical Specification

Case No. 912G Unit:mm

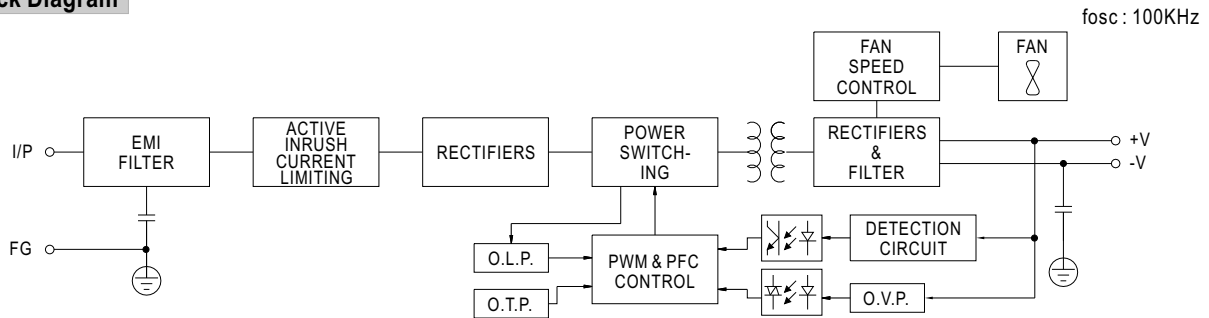


Terminal Pin No. Assignment :

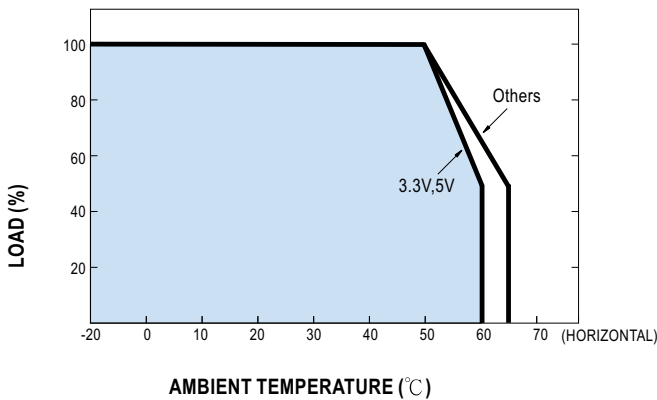
| Pin No. | Assignment | Pin No. | Assignment |
|---------|------------|---------|--------------|
| 1 | AC/L | 4~6 | DC OUTPUT -V |
| 2 | AC/N | 7~9 | DC OUTPUT +V |
| 3 | FG \perp | | |



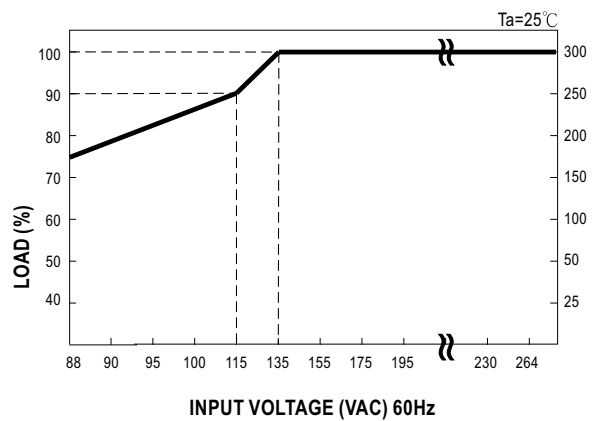
■ Block Diagram



■ Derating Curve



■ Static Characteristics





320W Single output Switching Power Supply with PFC function

SP-320 series

MODEL : SP-320-24

OUTPUT FUNCTION TEST

| NO | TEST ITEM | SPECICATION | TEST CONDITION | RESULT | VERDICT |
|----|--------------------------------|---|---|--|---------|
| 1 | RIPPLE & NOISE | V1: 150 mVp-p (Max) | I/P: 230 VAC O/P:FULL LOAD Ta:25°C | V1: 40 mVp-p (Max) | P |
| 2 | OUTPUT VOLTAGE ADJUST RANGE | CH1: 20 V~ 26.4 V | I/P: 230 VAC I/P: 115 VAC O/P:MIN LOAD Ta:25°C | 18.4V~ 27.2 V/230 VAC 18.4V~ 27.2V/ 115 VAC | P |
| 3 | OUTPUT VOLTAGE TOLERANCE | V1: 1 %~ -1 % (Max) | I/P: 264 VAC / 100 VAC O/P:FULL/ MIN % LOAD Ta:25°C | V1: 0.15 %~ -0.15 % | P |
| 4 | LINE REGULATION | V1:0.2 %~ 0.2 % (Max) | I/P: 100 VAC ~ 264 VAC O/P:FULL LOAD Ta:25°C | V1: 0 %~ 0 % | P |
| 5 | LOAD REGULATION | V1:0.5 %~ 0.5 % (Max) | I/P: 230 VAC O/P:FULL ~MIN LOAD Ta:25°C | V1: -0.05 %~ -0.07 % | P |
| 6 | SET UP TIME | 230 VAC/ 800 ms (Max) 115 VAC/ 2500 ms (Max) | I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C | 230 VAC/ 466 ms 115 VAC/ 1500 ms | P |
| 7 | RISE TIME | 230 VAC/ 50 ms (Max) 115 VAC/ 50 ms (Max) | I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C | 230 VAC/ 26 ms 115 VAC/ 26 ms | P |
| 8 | HOLD UP TIME | 230 VAC/ 20 ms (TYP) 115 VAC/ 20 ms(TYP) | I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C | 230 VAC/ 22 ms 115 VAC/ 22 ms | P |
| 9 | OVER/UNDERSHOOT TEST | < ±5% | I/P: 230 VAC O/P:FULL LOAD Ta:25°C | TEST: OK | P |
| 10 | DYNAMIC LOAD | V1: 2400 mVp-p | I/P: 230 VAC O/P:FULL /Min LOAD 90%DUTY/1KHZ Ta:25°C | 341 mVp-p | P |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-----------------------|--|--|--|---------|
| 1 | INPUT VOLTAGE RANGE | 88VAC~ 264 VAC | I/P:TESTING O/P:FULL LOAD Ta:25°C | 78 V~ 264 V | P |
| | | | I/P: LOW-LINE-3V= 85 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD ON: 30 Sec . OFF: 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE) | TEST: OK | |
| 2 | INPUT FREQUENCY RANGE | 47 HZ ~ 63 HZ NO DAMAGE OSC | I/P: 135 VAC ~ 264 VAC O/P:FULL-MIN LOAD Ta:25°C | TEST: OK | P |
| 3 | POWER FACTOR | 230VAC/ 0.95 (TYP) 115VAC/ 0.98 (TYP) | I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C | PF= 0.98 / 230 VAC PF= 0.99/ 115 VAC | P |
| 4 | EFFICIENCY | 87 % (TYP) | I/P: 230 VAC O/P:FULL LOAD Ta:25°C | 87.9 % | P |
| 5 | INPUT CURRENT | 230 V/2.5 A(TYP) 115 V/ 5 A(TYP) | I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C | I = 1.5 A/ 230 VAC I = 3.2 A/ 115 VAC | P |
| 6 | INRUSH CURRENT | 230 V/ 40 A (TYP) 115 V/ 22 A (TYP) COLD START | I/P: 230 VAC I/P: 115 VAC O/P:FULL LOAD Ta:25°C | I =28 A/230 VAC I =18 A/115 VAC | P |
| 7 | LEAKAGE CURRENT | < 1 mA / 240 VAC | I/P: 254VAC O/P:Min LOAD Ta:25°C | L-FG: 0.7 mA N-FG: 0.7 mA | P |



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PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-----------------------------|---|---|---|---------|
| 1 | OVER LOAD PROTECTION | 105 %~ 135 % | I/P: 230 VAC I/P: 115 VAC O/P: TESTING Ta: 25°C | 121 %/ 230 VAC 121 %/ 115 VAC Hiccup Mode | P |
| 2 | OVER VOLTAGE PROTECTION | CH1: 27.6 V~ 32.4V | I/P: 230 VAC I/P: 115 VAC O/P: MIN LOAD Ta: 25°C | 28.2 V/ 230 VAC 28.2 V/ 115 VAC Shunt down Re- power ON | P |
| 3 | OVER TEMPERATURE PROTECTION | SPEC: 80°C ± 5°C O.T.P. NO DAMAGE | I/P: 230 VAC O/P: FULL LOAD | O.T.P. Active Shut down o/p voltage , recovers automatically after temperature goes down | P |
| 4 | SHORT PROTECTION | SHORT EVERY OUTPUT 1 HOUR NO DAMAGE | I/P: 264 VAC O/P: 100% LOAD Ta: 25°C | NO DAMAGE Hiccup Mode | P |

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|---|--|---|-------------------|---------|
| 1 | TEMPERATURE RISE TEST | MODEL : SP-320-24 1. ROOM AMBIENT BURN-IN : 3 HRS I/P: 230 VAC O/P: 100% LOAD Ta= 28.1 °C 2. HIGH AMBIENT BURN-IN : 5 HRS I/P: 230 VAC O/P: 100% LOAD Ta= 54 °C | | | P |
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| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P: 230 VAC O/P: 120% LOAD Ta:25°C | TEST : OK | P |
| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P: 230 VAC O/P: 100 % LOAD Ta= -21.1 °C | TEST : OK | P |
| 4 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE | I/P: 272 VAC O/P:FULL LOAD Ta= 50.4 °C HUMIDITY= 95 %R.H | TEST : OK | P |
| 5 | TEMPERATURE COEFFICIENT | ± 0.03 % (0~50°C) | I/P: 230 VAC O/P:FULL LOAD | ± 0.01 % (0~50°C) | P |
| 6 | VIBRATION TEST | 1 Carton & 1 Set Operating at I/P: 230 VAC NO LOAD (1) Waveform: Sine Wave (2) Frequency:10~500Hz (3) Sweep Time:10min/sweep cycle (4) Acceleration:2G (5) Test Time:1 hour in each axis (X.Y.Z) (6) Ta:25°C | | TEST : OK | P |



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SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|----------------------|---|--|--|---------|
| 1 | WITHSTAND VOLTAGE | I/P-O/P: 3 KVAC/min I/P-FG: 1.5 KVAC/min O/P-FG: 0.5 KVAC/min | I/P-O/P: 3.6 KVAC/min I/P-FG: 1.8 KVAC/min O/P-FG: 0.6 KVAC/min Ta:25°C | I/P-O/P: 5.2 mA I/P-FG: 4.3 mA O/P-FG: 4 mA NO DAMAGE | P |
| 2 | ISOLATION RESISTANCE | I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ | I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25°C | I/P-O/P: 7G Ω I/P-FG: 6G Ω O/P-FG: 5G Ω NO DAMAGE | P |
| 3 | GROUNDING CONTINUITY | FG(PE) TO CHASSIS OR TRACE < 100 mΩ | 40 A / 2min Ta:25°C | 39 mΩ | P |
| 4 | APPROVAL | TUV: Certificate NO : R50026832 UL: File NO : E183223 | | | P |

E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|---|--|---|-------------------------------|---------|
| 1 | HARMONIC | EN61000-3-2 CLASS A | I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C | PASS | P |
| 2 | CONDUCTION | EN55022 CLASS B | I/P: 230 VAC (50HZ) O/P:FULL/50% LOAD Ta:25°C | PASS Test by certified Lab | P |
| 3 | RADIATION | EN55022 CLASS B | I/P: 230 VAC (50HZ) O/P:FULL LOAD Ta:25°C | PASS Test by certified Lab | P |
| 4 | E.S.D | EN61000-4-2 LIGHT INDUSTRY AIR:8KV / Contact:4KV | I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C | CRITERIA A | P |
| 5 | E.F.T | EN61000-4-4 LIGHT INDUSTRY INPUT: 1KV | I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C | CRITERIA A | P |
| 6 | SURGE | IEC61000-4-5 LIGHT INDUSTRY L-N :1KV L,N-PE:2KV | I/P: 230 VAC/50HZ O/P:FULL LOAD Ta:25°C | CRITERIA A | P |
| 7 | Test by certified Lab & Test Report Prepare | | | | |

M.T.B.F & LIFE CYCLE CALCULATION

| NO | TEST ITEM | SPECICATION | TEST CONDITION | RESULT | VERDICT |
|----|-------------------------|--|----------------|--------|---------|
| 1 | CAPACITOR LIFE CYCLE | SUPPOSE C 52 IS THE MOST CRITICAL COMPONENT I/P: 230 VAC O/P:FULL LOAD Ta= 25 °C LIFE TIME= 1482897 HRS I/P: 230 VAC O/P:FULL LOAD Ta= 50 °C LIFE TIME= 258526 HRS | | | P |
| 2 | MTBF | MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE: 207k HRS | | | P |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECICATION | TEST CONDITION | RESULT | VERDICT |
|----|---|----------------------------------|---|-------------------------------------|---------|
| 1 | Power Transistor (D to S) or (C to E) Peak Voltage | Q 2 Rated 2SK2611: 900 V/ 9 A | I/P:High-Line +3V = 267 V O/P: (1)Full Load Turn on (2) Full Load (3)Output Short Ta:25°C | (1) 732 V (2) 772 V (3) 804 V | P |
| 2 | Diode Peak Voltage | D 19 Rated D9202 :200 V/20 A | I/P:High-Line +3V = 267 V O/P: (1)Full Load Turn on (2) Full Load (3)Output Short Ta:25°C | (1) 58 V (2) 102 V (3) 105 V | P |
| 3 | Clamp Diode Peak Voltage | D 4 Rated HER208 : 1K V/ 2 A | I/P:High-Line +3V = 267 V O/P: (1)Full Load (2) Dynamic Load 90%Duty/1KHz Ta:25°C | (1) 756 V (2) 756 V | P |

| DATE | SAMPLE | TEST RESULT | TESTER | APPROVAL |
|-----------|---------------------------|-------------|---------------|----------|
| 2003/4/1 | RD SMAPLE | PASS | VINCENT TSENG | MAX LIN |
| 2003/5/2 | PRODUCT SMAPLE A304B28 | PASS | VINCENT TSENG | MAX LIN |
| 2003/6/22 | PRODUCT SMAPLE A306A21 | PASS | VINCENT TSENG | MAX LIN |

2003/12/12 A50-F023