



Test Report: EPS-65-5

65W Single Output Switching 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 TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-----------------------------|---|---|--|---------|
| 1 | RIPPLE & NOISE | V1 : 80 mVp-p (Max) | I/P : 230VAC O/P : FULL LOAD Ta : 25°C | V1 : 36 mVp-p (Max) | P |
| 2 | OUTPUT VOLTAGE ADJUST RANGE | CH1 : 4.75 V ~ 5.5 V | I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C | 4.51 V~ 5.71 V/ 230 VAC 4.51 V~ 5.71 V/ 115 VAC | P |
| 3 | OUTPUT VOLTAGE TOLERANCE | V1 : -2 %~ +2 % (Max) | I/P : 90 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C | V1 : -0.45 %~ 0.28 % | P |
| 4 | LINE REGULATION | V1 : -0.5 %~ +0.5 % (Max) | I/P : 100VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C | V1 : -0.01 %~ 0.03 % | P |
| 5 | LOAD REGULATION | V1 : -1 %~ +1 % (Max) | I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C | V1 : -0.45 %~ 0.28 % | P |
| 6 | SET UP TIME | 230VAC : 1000 ms (Max) 115VAC : 2000 ms(Max) | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | 230VAC/ 608 ms 115VAC/ 902 ms | P |
| 7 | RISE TIME | 230VAC : 50 ms (Max) 115VAC : 50 ms (Max) | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | 230VAC/ 5.2 ms 115VAC/ 4.5 ms | P |
| 8 | HOLD UP TIME | 230VAC : 50 ms (TYP) 115VAC : 12 ms (TYP) | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | 230VAC/ 70 ms 115VAC/ 71 ms | P |
| 9 | OVER/UNDERSHOOT TEST | < ±10% | I/P : 230 VAC O/P : FULL LOAD Ta : 25°C | TEST : 2.8 % | P |
| 10 | DYNAMIC LOAD | V1 : 1000 mVp-p | I/P : 230 VAC (1).O/P : FULL /Min LOAD 90%DUTY/ 1KHZ (2).O/P : FULL /Min LOAD 90%DUTY/ 3KHZ (3).O/P : FULL /Min LOAD 90%DUTY/ 5KHZ (4).O/P : FULL /Min LOAD 50%DUTY/ 120HZ Ta : 25°C | (1) 616 mVp-p (2) 616 mVp-p (3) 636 mVp-p (4) 692 mVp-p | P |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-----------------------|--------------------------------------|--|---|---------|
| 1 | INPUT VOLTAGE RANGE | 90VAC~264 VAC 127VDC ~ 370VDC | (1) I/P:TESTING O/P:FULL LOAD (2) I/P:DC TESTING(L:+ N:-) O/P: FULL / 50% LOAD (3) I/P:DC TESTING(L:- N:+) O/P: FULL / 50% LOAD Ta : 25°C I/P : LOW-LINE-3V= 87 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE) | (1) 59V~264V (2) 113.5Vdc~370Vdc/FULL LOAD 113.4Vdc~370Vdc/50% LOAD (3) 113.4Vdc~370Vdc/FULL LOAD 113.4Vdc~370Vdc/50% LOAD TEST : OK | P |
| 2 | INPUT FREQUENCY RANGE | 47HZ ~63 HZ NO DAMAGE OSC | I/P : 90 VAC ~ 264 VAC O/P : FULL~MIN LOAD Ta : 25°C | TEST : OK | P |
| 3 | EFFICIENCY | 82 % (TYP) | I/P : 230 VAC O/P : FULL LOAD Ta : 25°C | 83.8 % | P |
| 4 | INPUT CURRENT | 230V/ 1 A (TYP) 115V/ 1.8 A (TYP) | I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C | I = 0.65 A/ 230 VAC I = 1.03 A/ 115 VAC | P |
| 5 | INRUSH CURRENT | 230V/ 60 A (TYP) COLD START | I/P : 230 VAC O/P : FULL LOAD Ta : 25°C | I = 39.2 A/ 230 VAC | P |
| 6 | LEAKAGE CURRENT | < 2 mA / 240 VAC | I/P : 264 VAC O/P : Min LOAD Ta : 25°C | L-FG : 0.76 mA N-FG : 0.71 mA | P |
| 7 | NO LOAD CONSUMPTION | < 0.3 W | I/P : 240VAC O/P : NO LOAD Ta : 25°C | < 0.239 W | P |

PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-------------------------|--|---|--|---------|
| 1 | OVER LOAD PROTECTION | 115 % ~ 180 % | I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C | 141.6 %/ 230 VAC 134.1 %/ 115 VAC Protection type : Hiccup mode, recovers automatically after fault condition is removed | P |
| 2 | OVER VOLTAGE PROTECTION | CH1 : 5.6 V ~ 6.75 V | I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C | 6.31 V/ 230 VAC 6.33 V/ 115 VAC Protection type : Shut down o/p voltage, re-power on to recover | P |
| 3 | SHORT PROTECTION | SHORT EVERY OUTPUT 1 HOUR NO DAMAGE | I/P : 264 VAC O/P : FULL LOAD Ta : 25°C | NO DAMAGE Hiccup Mode | P |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|---|------------------------------|--|--|---------|
| 1 | Power Transistor (D to S) or (C to E) Peak Voltage | Q 1 Rated : 650 V 12 A | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C | (1) 606 V (2) 546 V (3) 507 V | P |
| 2 | Diode Peak Voltage | Q101 Rated : 40 V 160 A | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C | (1) 30.5 V (2) 27.4 V (3) 30.1 V | P |
| 3 | Clamp Diode Peak Voltage | D 1 Rated : 600 V 3 A | I/P : High-Line +3V = 267 V O/P : (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta : 25°C | (1) 536 V (2) 506 V | P |
| 4 | Input Capacitor Voltage | C5 Rated : 100 u /400V/105°C | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C | (1) 394 V (2) 394 V (3) 394 V | P |
| 5 | Control IC Voltage Test | U1 Rated : 28 V | I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C | (1) 22.9 V (2) 20.6 V (3) 23.1 V | P |

SAFETY & E.M.C. TEST

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|----------------------|--|---|--|---------|
| 1 | WITHSTAND VOLTAGE | I/P-O/P : 3 KVAC/min I/P-FG : 2.0 KVAC/min O/P-FG : 0.5 KVAC/min | I/P-O/P : 3.6 KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 0.6 KVAC/min Ta : 25°C | I/P-O/P : 5.44 mA I/P-FG : 4.39 mA O/P-FG : 3.29 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 /70%RH | I/P-O/P : 9999 MΩ I/P-FG : 9999 MΩ O/P-FG : 9999 MΩ NO DAMAGE | P |
| 3 | GROUNDING CONTINUITY | FG(PE) TO CHASSIS OR TRACE < 100 mΩ | 40 A /2min Ta : 25°C /70%RH | 3 mΩ | P |

E.M.C TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-----------|------------------------------|--|--------|---------|
| 1 | HARMONIC | BS EN/EN61000-3-2 CLASS A | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | PASS | P |

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|---|---|--|--|-------------------------------|---|
| 2 | CONDUCTION | BS EN/EN55032 (CISPR32) CLASS B | I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C | PASS Test by certified Lab | P |
| 3 | RADIATION | BS EN/EN55032 (CISPR32) CLASS B | I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C | PASS Test by certified Lab | P |
| 4 | E.S.D | BS EN/EN61000-4-2 INDUSTRY AIR : 8KV / Contact : 4KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | CRITERIA A | P |
| 5 | E.F.T | BS EN/EN61000-4-4 INDUSTRY INPUT : 2KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | CRITERIA A | P |
| 6 | SURGE | BS EN/EN61000-4-5 INDUSTRY L-N : 2KV L,N-PE : 4KV | I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C | CRITERIA A | P |
| 7 | Test by certified Lab & Test Report Prepare | | | | |

RELIABILITY TEST

ENVIRONMENT TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-----------------------|---|----------------|--------|---------|
| 1 | TEMPERATURE RISE TEST | MODEL : EPS-65-5 PCB ONLY 1. ROOM AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=33.7 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 39.9°C | | | P |
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| NO | Position | PART NUMBER | ROOM AMBIENT Ta= 33.7°C | HIGH AMBIENT Ta= 39.9°C |
|----|----------|------------------------------------|----------------------------|----------------------------|
| 1 | LF1 | TR732-R5 T(9×5×3) 1.41m RPT-75C | 76.8°C | 83.9°C |
| 2 | BD1 | BD 4A/800V GLASS GBU408 | 75.1°C | 81.4°C |
| 3 | C5 | C/E 100u/400V 105°C 18*25 KMG | 68.2°C | 74.1°C |
| 4 | D1 | RD 3A/600V 1N5406 DO-201 T-52mm | 100.0°C | 105.8°C |
| 5 | R42 | R/NW 2W 0.22Ω 5% | 87.5°C | 92.6°C |
| 6 | Q1 | FET STF14NM65N 12A/650V TO220F | 98.7°C | 104.3°C |
| 7 | T1 | MT TF5085-R2 EER-28 EPS-65-5 B | 88.0°C | 93.8°C |
| 8 | U1 | PWM NCP1380BDR2G SO-8 | 98.7°C | 103.5°C |
| 9 | U100 | CONTROL TEA1791T SO8 | 90.2°C | 97.8°C |
| 10 | Q101 | FET AP9963GP 160A/40V TO220 | 91.3°C | 100.8°C |
| 11 | C105 | C/E 2200u/10V UL10Kh 10*25 KZM | 75.6°C | 83.5°C |

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|----|---|---|--|--|---|
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 230 VAC O/P : 126 % LOAD Ta : 25°C | TEST : OK | P |
| 3 | LOW TEMPERATURE TURN ON TEST | TURN ON AFTER 2 HOUR | I/P : 264VAC/100VAC O/P : 100 % LOAD Ta= -30 °C | TEST : OK | P |
| 4 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 40 °C NO DAMAGE | I/P : 272 VAC O/P : FULL LOAD Ta= 40 °C HUMIDITY= 95 %R.H | TEST : OK | P |
| 5 | TEMPERATURE COEFFICIENT | ± 0.03 %/°C (0~50°C) | I/P : 230 VAC O/P : FULL LOAD | ± 0.013 %/°C (0~50°C) | P |
| 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 | | OK | P |
| 7 | THERMAL SHOCK TEST | 1. Thermal shock Temperature : -30°C~ +70°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 | | OK | P |
| 8 | VIBRATION TEST | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 2G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25°C | | TEST : OK | P |
| 9 | CAPACITOR LIFE CYCLE | EPS-65-5 PCB ONLY SUPPOSE C 105 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=40 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40 °C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 40 °C LIFE TIME | | (1) 148297 HRS (2) 47247 HRS (3) 60671 HRS (4) 147240 HRS | P |
| 10 | MTBF | 3077.6K hrs min. Telcordia SR-332 (Bellcore) ; 563.0K hrs min. MIL-HDBK-217F (25°C) | | | P |
| 11 | DMTBF/Accelerated Life Test | Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 40°C | | | P |

| DATE | SAMPLE | TEST RESULT | TESTER | APPROVAL |
|-----------|----------------|-------------|--------|----------|
| 2011.7.18 | RD SAMPLE | PASS | Shenym | Wangdz |
| Y1201C659 | PRODUCT SAMPLE | PASS | Shenym | Wangdz |

2007/3/20 A50-S014