



TEST REPORT: HDR-15-24

15W Ultra Slim Step Shape DIN Rail

■ 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

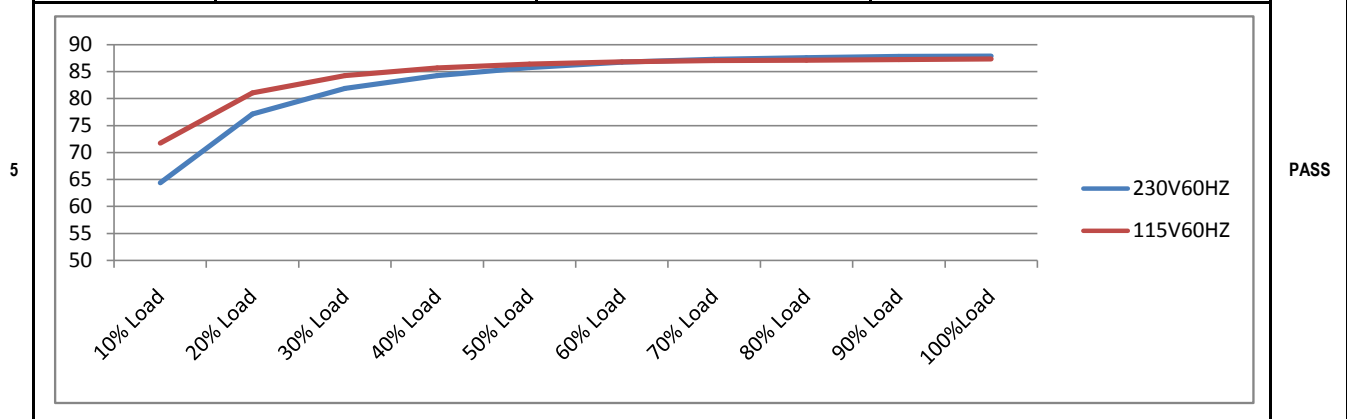
DESIGN VERIFY TEST
OUTPUT FUNCTION

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|--------------------------------|--|---|----------------------------------|---------|
| 1 | OUTPUT VOLTAGE ADJUST RANGE | CH1: 21.60V ~ 29.00V | I/P : 230VAC O/P: MIN LOAD TA: 25°C | CH1: 21.04V ~ 29.75V | PASS |
| 2 | OUTPUT VOLTAGE TOLERANCE (Max) | V1 : 1.0% ~ -1.0% | I/P : 100VAC / 277VAC O/P: FULL / MINLOAD TA= 25°C | V1: 0.54% ~ 0.04% | PASS |
| 3 | LINE REGULATION (MAX.) | V1 : 1.0% ~ -1.0% | I/P : 100VAC / 277VAC O/P: FULL LOAD TA: 25°C | V1: 0.25% ~ -0.04% | PASS |
| 4 | LOAD REGULATION (MAX.) | V1 : 1.0% ~ -1.0% | I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C | V1: 0.21% ~ -0.17% | PASS |
| 5 | OVER/UNDERSHOOT TEST | < ±5% | I/P : 230VAC O/P: FULL LOAD TA: 25°C | TEST< 1.7 % | PASS |
| 6 | RIPPLE & NOISE(Max) | V1 : 150 mVp-p | I/P : 230VAC O/P: FULL LOAD TA: 25°C | V1 : 50.8 mVp-p | PASS |
| | | | <p>high frequency: low frequency:</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Ch1 Pk-Pk 50.8mV</p> </div> <div style="text-align: center;"> <p>Ch1 Pk-Pk 44.4mV</p> </div> </div> | | |
| 7 | SET UP TIME (MAX.) | 230VAC : 2000ms 115VAC : 2000ms | I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C | 230VAC : 340ms 115VAC : 992ms | PASS |
| | | <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>Δ: 292 V @: 288 V Δ: 340ms @: -316ms</p> | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> <p>Δ: 80.0 V @: -84.0 V Δ: 992ms @: -972ms</p> | | |

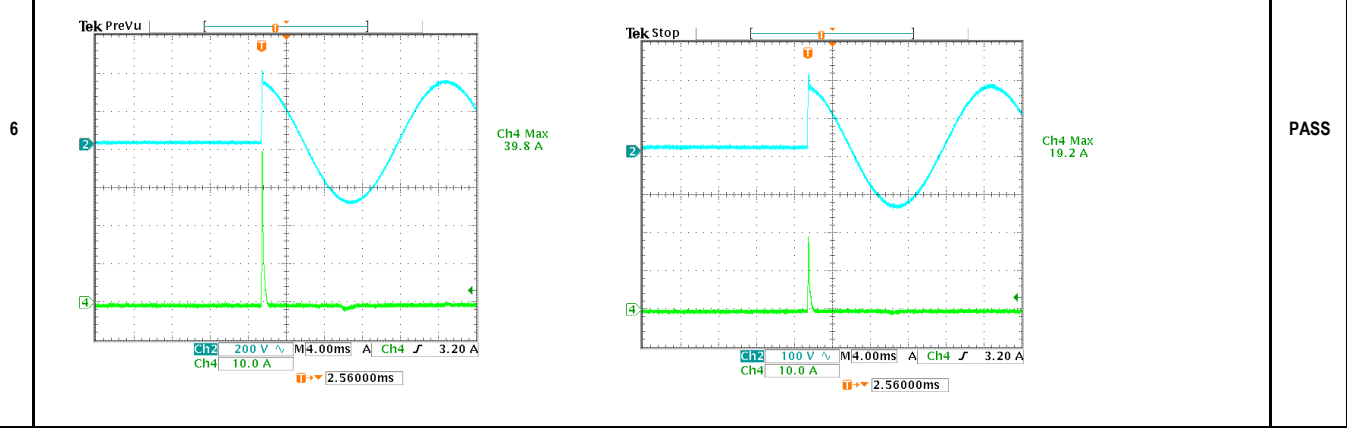
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|----|-------------------------|--|--|--|---|------|
| 8 | <p>RISE TIME (MAX.)</p> | <p>230VAC : 80ms 115VAC : 80ms</p> | <p>I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C</p> | <p>230VAC : 22.0ms 115VAC : 21.2ms</p> | PASS | |
| | | <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p> | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p> | | | |
| 9 | | <p>HOLD UP TIME (TYP.)</p> | <p>230VAC : 30ms 115VAC : 12ms</p> | <p>I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C</p> | <p>230VAC : 74.4ms 115VAC : 16.0ms</p> | PASS |
| | | <p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> | <p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p> | | | |
| 10 | | <p>DYNAMIC LOAD</p> | <p>V1 : 2400 mVp-p</p> | <p>I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA: 25°C</p> | <p>V1: (1). 249mv (2). 199mv unit:mVp-p</p> | PASS |
| | | <p>FULL /MIN LOAD 50%DUTY / 120HZ</p> | <p>FULL /MIN% LOAD 50%DUTY / 1KHZ</p> | | | |
| | | | | | | |

INPUT FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|---------------------------|----------------------------------|--|--|---------|
| 1 | INPUT VOLTAGE RANGE | 85VAC ~ 277VAC | I/P : TESTING O/P : FULL LOAD Ta : 25°C | 72.0VAC ~ 277VAC | PASS |
| | | | 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 ~ 277VAC O/P : FULL-MIN LOAD Ta : 25°C | TEST : OK | PASS |
| 3 | INPUT CURRENT (TYP.) | 0.25A / 230VAC 0.50A / 115VAC | I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C | I= 0.125A / 230VAC I= 0.231A / 115VAC | PASS |
| 4 | NO LOAD POWER CONSUMPTION | < 0.30W | I/P : 230VAC O/P : MIN LOAD TA : 25°C | < 0.1338 W | PASS |
| | EFFICIENCY (TYP.) | 86.0% | I/P : 230VAC O/P : FULL LOAD TA : 25°C | 87.059 % | |



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|---|-----------------------|--|--|--|------|
| 6 | INRUSH CURRENT (TYP.) | 45A / 230VAC 25A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START | I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C | I= 39.8A / 230VAC I= 19.2A / 115VAC | PASS |
| | | INPUT=230VAC/50HZ @ FULL LOAD | INPUT=115VAC/50HZ @ FULL LOAD | | |
| | | CH2 : AC Input Voltage CH4 : Input current (1V=1A) | CH2 : AC Input Voltage CH4 : Input current (1V=1A) | | |



PROTECTION FUNCTION TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|-------------------------|--|---|---|---------|
| 1 | OVER LOAD PROTECTION | 110% ~ 145% | I/P: 277VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta: 25°C | 127.14% 277VAC 126.26% 230VAC 122.68% 100VAC Constant Current Limiting | PASS |
| 2 | OVER VOLTAGE PROTECTION | 30.00V ~ 36.00V | I/P: 277VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD Ta: 25°C | 34.10V 277VAC 34.10V 230VAC 34.10V 85VAC Shut off o/p voltage, clamping by zener diode | PASS |
| 3 | SHORT PROTECTION | SHORT EVERY OUTPUT 1 HOUR NO DAMAGE | I/P: 277VAC I/P: 85VAC O/P: FULL LOAD Ta: 25°C | NO DAMAGE Constant Current Limiting | PASS |

COMPONENT STRESS TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|----------------------|----------------------------------|---|---|---------|
| 1 | PWM Power Transistor | Q1 Rated : 600V 4.0A | I/P : 280VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C | VIN: 280VAC VDS: (1). 518.00V (2). 392.00V (3). 516.00V | PASS |
| 2 | O/P Diode | D100 Rated : 200V 3.0A | I/P : 280VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C | D100 VDS : (1). 128.00V (2). 107.00V (3). 126.00V | PASS |
| 3 | Input Capacitor | C5 Rated : 27uf 400V | I/P : 280VAC O/P : (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C | (1). 348.00V (2). 346.00V (3). 346.00V | PASS |
| 4 | Control IC | U1 Rated : 35V (max) 9V (min) | I/P : 280VAC O/P : (1)Full Load (2)Output Short (3)O.L.P (4)Low Line No Load Vo(min) Ta : 25°C | U1 (1). 21.20V (2). 21.20V (3). 21.20V (5). 21.20V | PASS |
| 6 | Clamp Diode | D5 Rated : 1000V 1.0A | I/P : 280VAC (1)Full load continue Ta : 25°C | (1). 486.00V | PASS |

SAFETY & E.M.C. TEST

SAFETY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|----------------------|--------------------------|--------------------------------------|------------------------------|---------|
| 1 | WITHSTAND VOLTAGE | I/P-O/P : 3.000KVAC /min | I/P-O/P: 3.600KVAC /min Ta : 25°C | I/P-O/P: 2.03mA NO DAMAGE | PASS |
| 2 | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ | I/P-O/P: 500VDC Ta : 25°C/70%RH | I/P-O/P: 9999MΩ NO DAMAGE | PASS |



E.M.C. TEST

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

RELIABILITY TEST

| NO | TEST ITEM | SPECIFICATION | TEST CONDITION | RESULT | VERDICT |
|----|--|---|--|-----------------------|---------|
| 1 | TEMPERATURE RISE TEST | MODEL : HDR-15-24 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 23.1°C 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 48.5°C | NO. Positio ROOM AMBIENT 23.1°C HIGH AMBIENT Ta: 48.5°C 1 LF1 43.6°C 69.0°C 2 C5 52.6°C 77.2°C 3 Q1 71.3°C 94.6°C 4 T1 PRI 63.4°C 87.2°C 5 T1 SEC 68.3°C 91.2°C 6 C40 52.8°C 78.0°C 7 C105 54.0°C 76.9°C 8 D100 65.8°C 86.5°C 9 C106 44.9°C 69.0°C 10 LF101 46.3°C 70.7°C 11 U1 50.4°C 75.7°C 12 BD1 55.5°C 77.5°C | | PASS |
| 2 | OVER LOAD BURN-IN TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 230VAC O/P : 116.00% LOAD Ta : 25°C | TEST : OK | PASS |
| 3 | LOW TEMPERATURE TURN ON TEST | NO DAMAGE 1 HOUR (MIN) | I/P : 277VAC / 100VAC O/P : FULL LOAD Ta : -30.0°C | TEST : OK | PASS |
| 4 | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 50°C NO DAMAGE | I/P : 287VAC O/P : FULL LOAD Ta : 50°C HUMIDITY= 95.0% RH | TEST : OK | PASS |
| 5 | TEMPERATURE COEFFICIENT | ±0.03% / (0°C~50°C) | I/P : 230VAC O/P : FULL LOAD | ±0.0033% / (0°C~50°C) | PASS |



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|----|------------------------------|---|--|------|
| 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 | TEST : OK | PASS |
| 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 : 10 CYCLE 5. Input/Output condition : 230VAC Full Load AC ON/OFF test turn on 58sec ; turn off 2sec | TEST : OK | PASS |
| 8 | VIBRATION TEST | 1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (5) Test Time : 60 min in each axis (X.Y.Z) (6) Ta : 25°C | TEST : OK | PASS |
| 9 | CAPACITOR LIFE CYCLE | :SUPPOSE C106 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 50.0°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 50.0°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 50.0°C LIFE TIME | (1). 670197.4 HRS (2). 129792.2 HRS (3). 167632.6 HRS (4). 224532 HRS | PASS |
| 10 | MTBF | Conducted by Parts Stress Analysis Prediction T159K hrs min. Telcordia SR-332 (Bellcore) ; 46.3K hrs min. MIL-HDBK-217F (25°C) | | PASS |
| 11 | DMTBF /Accelerated Life test | Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50°C O/P : FULL LOAD | | PASS |

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|-------------|--------|--------|----------|
| TEST RESULT | TESTER | REVIEW | APPROVAL |
| PASS | FRANK | GESG | WANGDZ |

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