



# TEST REPORT: HDR-15-48

## 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

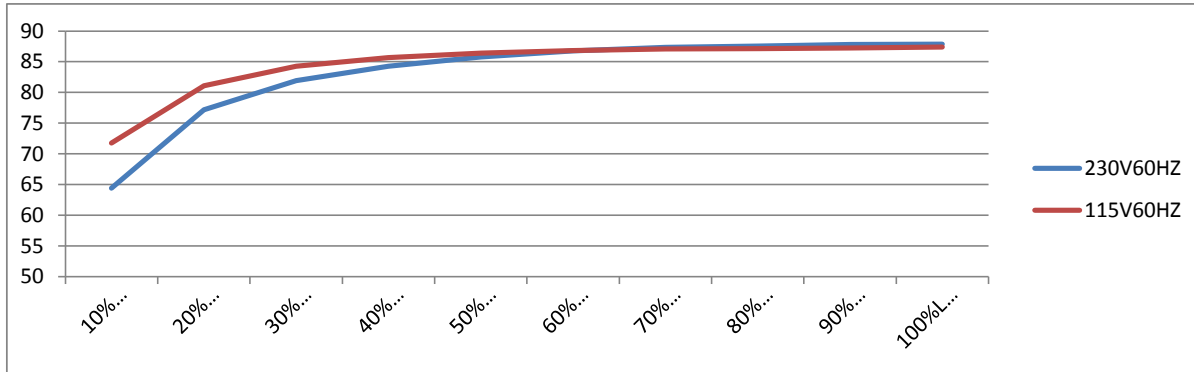
| NO | TEST ITEM                                                                    | SPECIFICATION                                                                | TEST CONDITION                                             | RESULT                            |
|----|------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------|-----------------------------------|
| 1  | OUTPUT VOLTAGE ADJUST RANGE                                                  | CH1: 43.20V ~ 55.20V                                                         | I/P : 230VAC<br>O/P: MIN LOAD<br>TA: 25°C                  | CH1: 40.53V ~ 56.24V              |
| 2  | OUTPUT VOLTAGE TOLERANCE (Max)                                               | V1 : 1.0% ~ -1.0%                                                            | I/P : 85VAC / 277VAC<br>O/P: FULL / MINLOAD<br>TA= 25°C    | V1: 0.37% ~ 0.10%                 |
| 3  | LINE REGULATION (MAX.)                                                       | V1 : 1.0% ~ -1.0%                                                            | I/P : 85VAC / 277VAC<br>O/P: FULL LOAD<br>TA: 25°C         | V1: 0.15% ~ -0.04%                |
| 4  | LOAD REGULATION (MAX.)                                                       | V1 : 1.0% ~ -1.0%                                                            | I/P : 230VAC<br>O/P: MIN LOAD ~ FULL LOAD<br>TA: 25°C      | V1: 0.06% ~ -0.10%                |
| 5  | OVER/UNDERSHOOT TEST                                                         | < ±5%                                                                        | I/P : 230VAC<br>O/P: FULL LOAD<br>TA: 25°C                 | TEST< 1.7 %                       |
| 6  | RIPPLE & NOISE(Max)                                                          | V1 : 240 mVp-p                                                               | I/P : 230VAC<br>O/P: FULL LOAD<br>TA: 25°C                 | V1 : 79.2 mVp-p                   |
|    |                                                                              |                                                                              | high frequency: low frequency:                             |                                   |
| 7  | SET UP TIME (MAX.)                                                           | 230VAC : 2000ms<br>115VAC : 2000ms                                           | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA: 25°C | 230VAC : 684ms<br>115VAC : 1252ms |
|    |                                                                              |                                                                              |                                                            |                                   |
| 7  | INPUT=230VAC/50HZ @ FULL LOAD<br>CH1 : Output Voltage CH2 : AC Input Voltage | INPUT=115VAC/60HZ @ FULL LOAD<br>CH1 : Output Voltage CH2 : AC Input Voltage |                                                            |                                   |
|    |                                                                              |                                                                              |                                                            |                                   |

|    |                                                                                                         |                                        |                                                                                                                |                                                 |
|----|---------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| 8  | <p>RISE TIME (MAX.)</p>                                                                                 | <p>230VAC : 80ms<br/>115VAC : 80ms</p> | <p>I/P : 230VAC<br/>I/P : 115VAC<br/>O/P: FULL LOAD<br/>TA: 25°C</p>                                           | <p>230VAC : 59.2ms<br/>115VAC : 56.8ms</p>      |
|    | <div> <div> INPUT=230VAC/50HZ @ FULL LOAD<br/>CH1 : Output Voltage </div> </div>                        |                                        |                                                                                                                |                                                 |
| 9  | <p>HOLD UP TIME (TYP.)</p>                                                                              | <p>230VAC : 30ms<br/>115VAC : 12ms</p> | <p>I/P : 230VAC<br/>I/P : 115VAC<br/>O/P: FULL LOAD<br/>TA: 25°C</p>                                           | <p>230VAC : 80.0ms<br/>115VAC : 20.0ms</p>      |
|    | <div> <div> INPUT=230VAC/50HZ @ FULL LOAD<br/>CH1 : Output Voltage CH2 : AC Input Voltage </div> </div> |                                        |                                                                                                                |                                                 |
| 10 | <p>DYNAMIC LOAD</p>                                                                                     | <p>V1 : 4800 mVp-p</p>                 | <p>I/P : 230VAC<br/>O/P:<br/>(1)Full/Min load 50%duty/120HZ<br/>(2)Full/Min load 50%duty/1KHZ<br/>TA: 25°C</p> | <p>(1). 167mv<br/>(2). 164mv<br/>unit:mVp-p</p> |
|    | <div> <div> FULL /MIN LOAD 50%DUTY / 120HZ </div> </div>                                                |                                        |                                                                                                                |                                                 |

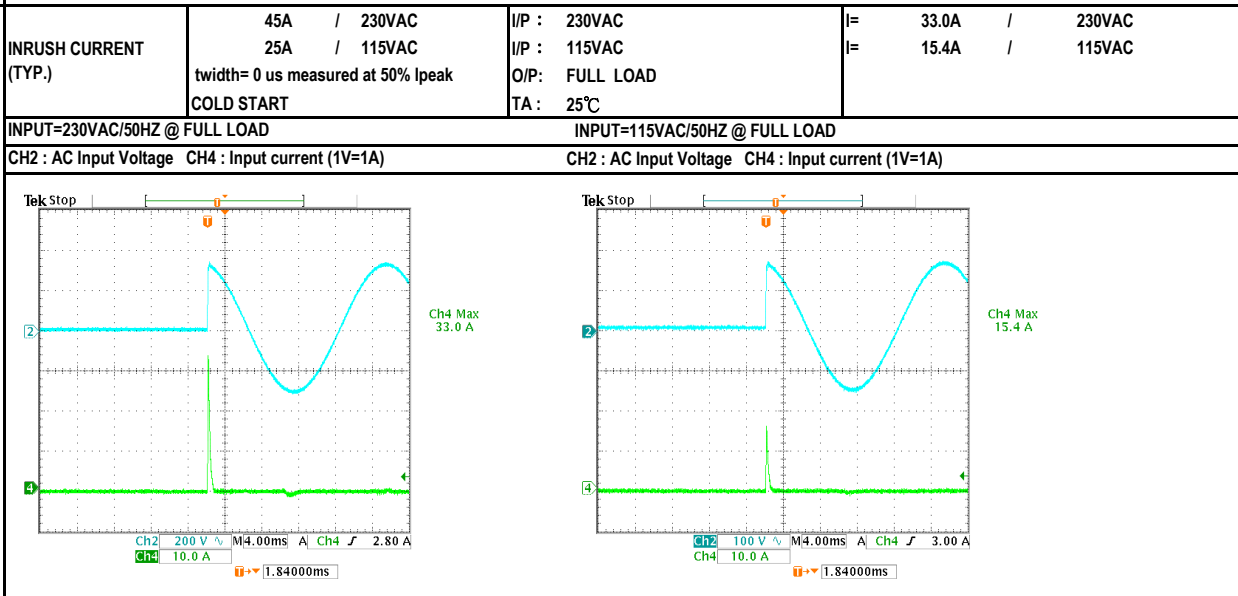
## INPUT FUNCTION TEST

| NO | TEST ITEM                 | SPECIFICATION                    | TEST CONDITION                                                                                                                                                                            | RESULT                                   |
|----|---------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| 1  | INPUT VOLTAGE RANGE       | 85VAC ~ 277VAC                   | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25°C<br><br>I/P :<br>LOW-LINE = 82VAC<br>HIGH-LINE = 300VAC<br>O/P : FULL/MIN LOAD<br>ON:30 Sec ; OFF:30 Sec 10MIN<br>( POWER ON/OFF NO DAMAGE ) | 71.0VAC ~ 277VAC<br><br>TEST : OK        |
| 2  | INPUT FREQUENCY RANGE     | 47HZ ~ 63HZ<br>NO DAMAGE         | I/P : 85VAC ~ 277VAC<br>O/P : FULL~MIN LOAD<br>Ta : 25°C                                                                                                                                  | TEST : OK                                |
| 3  | INPUT CURRENT (TYP.)      | 0.25A / 230VAC<br>0.50A / 115VAC | I/P : 230VAC<br>I/P : 115VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                                                                              | I= 0.128A / 230VAC<br>I= 0.230A / 115VAC |
| 4  | NO LOAD POWER CONSUMPTION | < 0.30W                          | I/P : 230VAC<br>O/P : MIN LOAD<br>TA : 25°C                                                                                                                                               | < 0.1925 W                               |
|    | EFFICIENCY (TYP.)         | 87.0%                            | I/P : 230VAC<br>O/P : FULL LOAD<br>TA : 25°C                                                                                                                                              | 87.89 %                                  |

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**PROTECTION FUNCTION TEST**

| NO | TEST ITEM               | SPECIFICATION                          | TEST CONDITION                                                           | RESULT                                                                                                                                                                                                                                                                                        |
|----|-------------------------|----------------------------------------|--------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | OVER LOAD PROTECTION    | 110% ~ 145%                            | I/P: 277VAC<br>I/P: 230VAC<br>I/P: 85VAC<br>O/P: TESTING<br><br>TA: 25°C | 124.68% 277VAC<br>124.68% 230VAC<br>122.80% 85VAC<br><br>Hiccup mode<br>when output voltage < 50%, recovers automatically after fault condition is removed;<br><br>Constant current limiting<br>within 50%~100% rated output voltage, recovers automatically after fault condition is removed |
| 2  | OVER VOLTAGE PROTECTION | 56.50V ~ 64.80V                        | I/P: 277VAC<br>I/P: 230VAC<br>I/P: 85VAC<br>O/P: MIN LOAD<br>TA: 25°C    | 59.80V 277VAC<br>59.80V 230VAC<br>59.80V 85VAC<br>Shut off o/p voltage, clamping by zener diode                                                                                                                                                                                               |
| 3  | SHORT PROTECTION        | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P: 277VAC<br>I/P: 85VAC<br>O/P: FULL LOAD<br>Ta: 25°C                  | NO DAMAGE<br><br>Hiccup mode                                                                                                                                                                                                                                                                  |

**COMPONENT STRESS TEST**

| NO | TEST ITEM            | SPECIFICATION                    | TEST CONDITION                                                                                                            | RESULT                                                              |
|----|----------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1  | PWM Power Transistor | Q1 Rated : 600V 4.0A             | I/P : 280VAC<br><br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C         | VIN: 280VAC<br>VDS:<br>(1). 518.00V<br>(2). 388.00V<br>(3). 518.00V |
| 2  | O/P Diode            | D100 Rated : 300V 2.0A           | I/P : 280VAC<br><br>VDS :<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C         | D100<br>VDS :<br>(1). 241.00V<br>(2). 210.00V<br>(3). 206.00V       |
| 3  | Input Capacitor      | C5 Rated : 27uf 400V             | I/P : 280VAC<br>O/P : (1)Full Load Turn on /Off<br>(2)Min load Turn on /Off<br>(3)Full Load /Min load Change<br>Ta : 25°C | (1). 352.00V<br>(2). 352.00V<br>(3). 352.00V                        |
| 4  | Control IC           | U1 Rated : 35V (max)<br>9V (min) | I/P : 280VAC<br>O/P : (1)Full Load<br>(2)Output Short<br>(3)O.L.P<br>(5)Low Line No Load Vo(min)<br>Ta : 25°C             | U1<br>(1). 21.80V<br>(2). 21.80V<br>(3). 21.90V<br>(5). 21.80V      |
| 6  | Clamp Diode          | D5 Rated : 1000V 1.0A            | I/P : 280VAC<br>(2)Full load continue<br>Ta : 25°C                                                                        | (2). 494.00V                                                        |

**SAFETY & E.M.C. TEST**
**SAFETY TEST**

| NO | TEST ITEM            | SPECIFICATION            | TEST CONDITION                       | RESULT                       |
|----|----------------------|--------------------------|--------------------------------------|------------------------------|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P : 4.000KVAC /min | I/P-O/P: 4.400KVAC /min<br>Ta : 25°C | I/P-O/P: 2.23mA<br>NO DAMAGE |
| 2  | ISOLATION RESISTANCE | I/P-O/P : 500VDC>100MΩ   | I/P-O/P: 500VDC<br>Ta : 25°C/70%RH   | I/P-O/P: 9999MΩ<br>NO DAMAGE |

## E.M.C. TEST

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

## RELIABILITY TEST

| NO | TEST ITEM                                              | SPECIFICATION                                                                             | TEST CONDITION                                  | RESULT                                                       |
|----|--------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------------------------------------------|
| 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                                                       |
| 2  | OVER LOAD BURN-IN TEST                                 | NO DAMAGE<br>1 HOUR ( MIN )                                                               | I/P : 230VAC<br>O/P : 116.00% LOAD<br>Ta : 25°C | TEST : OK                                                    |
|    |                                                        | 3                                                                                         | LOW TEMPERATURE TURN ON TEST                    | NO DAMAGE<br>1 HOUR ( MIN )                                  |
| 4  | HIGH HUMIDITY<br>HIGH TEMPERATURE<br>HIGH VOLTAGE TEST |                                                                                           |                                                 | AFTER 12 HOURS<br>IN CHAMBER ON<br>CONTROL 50°C<br>NO DAMAGE |
|    |                                                        | 5                                                                                         | TEMPERATURE COEFFICIENT                         | ±0.03% /(0°C~50°C)                                           |
| 6  | STORAGE TEMPERATURE TEST                               | 1. Thermal shock Temperature : -40°C ~ +85°C                                              |                                                 | TEST : OK                                                    |
|    |                                                        | 2. Temperature change rate : 25°C / MIN                                                   |                                                 |                                                              |
| 7  | THERMAL SHOCK TEST                                     | 3. Dwell time low and high temperature : 30 MIN/EACH                                      |                                                 | TEST : OK                                                    |
|    |                                                        | 4. Total test cycle : 5 CYCLE                                                             |                                                 |                                                              |
| 7  | THERMAL SHOCK TEST                                     | 5. Input/Output condition : STATIC                                                        |                                                 | TEST : OK                                                    |
|    |                                                        | 1. Thermal shock Temperature : -35°C ~ +55°C                                              |                                                 |                                                              |
| 7  | THERMAL SHOCK TEST                                     | 2. Temperature change rate : 25°C / MIN                                                   |                                                 | TEST : OK                                                    |
|    |                                                        | 3. Dwell time low and high temperature : 30 MIN/EACH                                      |                                                 |                                                              |
| 7  | THERMAL SHOCK TEST                                     | 4. Total test cycle : 10 CYCLE                                                            |                                                 | TEST : OK                                                    |
|    |                                                        | 5. Input/Output condition : 230VAC Full Load AC ON/OFF test turn on 58sec ; turn off 2sec |                                                 |                                                              |



|    |                              |                                                                                                                                                                                                                                                                                |                                                                                |
|----|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 8  | VIBRATION TEST               | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10~500Hz<br>(4) Acceleration : 2G<br>(5) Test Time : 60 min in each axis (X.Y.Z)<br>(6) Ta : 25°C                                                                                                              | TEST : OK                                                                      |
| 9  | CAPACITOR LIFE CYCLE         | :SUPPOSE C106 IS THE MOST CRITICAL COMPONENT<br>(1) I/P : 230VAC O/P : FULL LOAD Ta= 25.0°C LIFE TIME<br>(2) I/P : 230VAC O/P : FULL LOAD Ta= 50.0°C LIFE TIME<br>(3) I/P : 230VAC O/P : 75% LOAD Ta= 50.0°C LIFE TIME<br>(4) I/P : 230VAC O/P : 50% LOAD Ta= 50.0°C LIFE TIME | (1). 670197.4 HRS<br>(2). 129792.2 HRS<br>(3). 167632.6 HRS<br>(4). 224532 HRS |
| 10 | MTBF                         | Conducted by Parts Stress Analysis Prediction<br>1166K hrs min. MIL-HDBK-217F (25°C)                                                                                                                                                                                           |                                                                                |
| 11 | DMTBF /Accelerated Life test | Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50°C                                                                                                                                                                                              |                                                                                |

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

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