



# TEST REPORT: IRM-02-12

## 2W Single Output Encapsulated Type

### ■ DESIGN VERIFY TEST

Output Function Test

Input Function Test

Protection Function Test

Component Stress Test

### ■ SAFETY & E.M.C. TEST

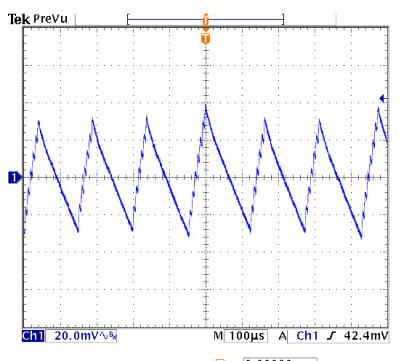
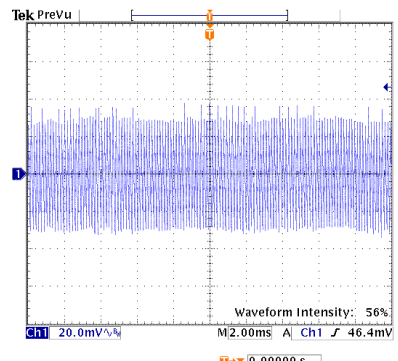
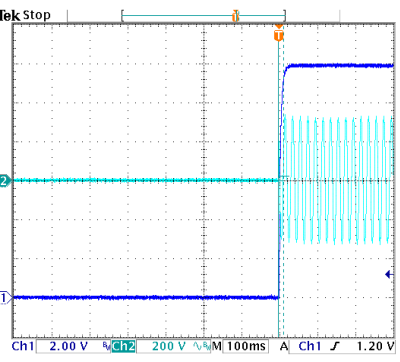
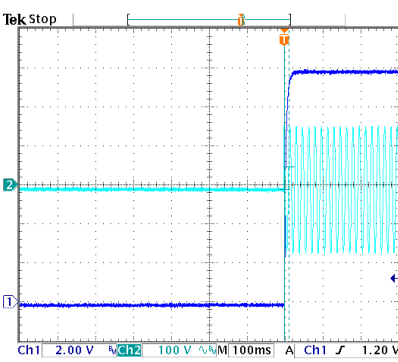
Safety Test

E.M.C. Test

### ■ RELIABILITY TEST

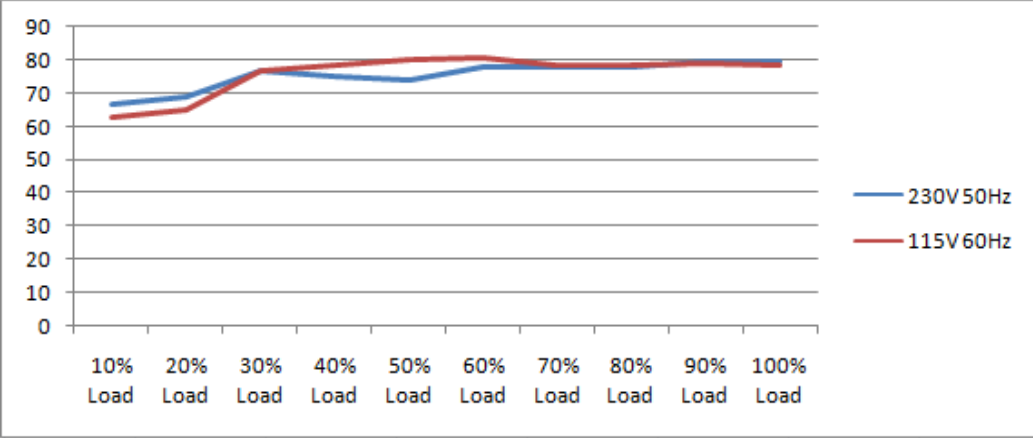
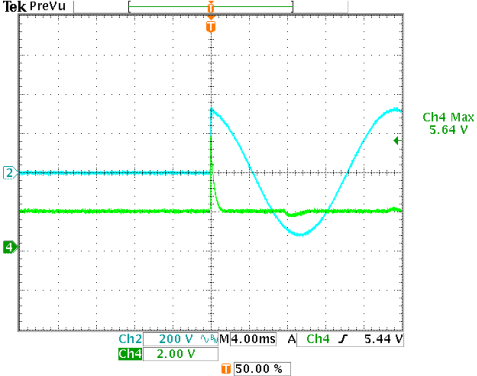
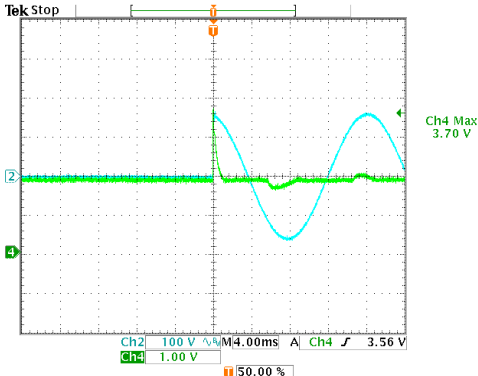
ENVIRONMENT TEST

# DESIGN VERIFY TEST OUTPUT FUNCTION

| NO | TEST ITEM                      | SPECIFICATION                                                                                                                                                                                                                                                                                                                                                      | TEST CONDITION                                              | RESULT                           |
|----|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------|
| 1  | OUTPUT VOLTAGE RANGE           | CH1: 11.88V ~ 12.12V                                                                                                                                                                                                                                                                                                                                               | I/P : 230VAC<br>O/P: MIN LOAD<br>TA : 25°C                  | CH1: 11.95V                      |
| 2  | OUTPUT VOLTAGE TOLERANCE (Max) | V1 : 2.5% ~ -2.5%                                                                                                                                                                                                                                                                                                                                                  | I/P : 100VAC / 305VAC<br>O/P: FULL / MINLOAD<br>TA= 25°C    | V1: -0.42% ~ -0.50%              |
| 3  | LINE REGULATION (MAX.)         | V1 : 0.5% ~ -0.5%                                                                                                                                                                                                                                                                                                                                                  | I/P : 100VAC / 305VAC<br>O/P: FULL LOAD<br>TA : 25°C        | V1: 0.00% ~ -0.08%               |
| 4  | LOAD REGULATION (MAX.)         | V1 : 0.5% ~ -0.5%                                                                                                                                                                                                                                                                                                                                                  | I/P : 230VAC<br>O/P: MIN LOAD ~ FULL LOAD<br>TA : 25°C      | V1: 0.00% ~ -0.08%               |
| 5  | OVER/UNDERSHOOT TEST           | < ±5%                                                                                                                                                                                                                                                                                                                                                              | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C                 | TEST< 3.36 %                     |
| 6  | RIPPLE & NOISE(Max)            | V1 : 150 mVp-p                                                                                                                                                                                                                                                                                                                                                     | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C                 | V1 : 72.8 mVp-p                  |
|    |                                | <div>high frequency :<br/></div> <div>low frequency :<br/></div>                                                                                                                              |                                                             |                                  |
| 7  | SET UP TIME (MAX.)             | 230VAC : 600ms<br>115VAC : 600ms                                                                                                                                                                                                                                                                                                                                   | I/P : 230VAC<br>I/P : 115VAC                                | 230VAC : 14ms<br>115VAC : 12ms   |
|    |                                | <div>INPUT=230VAC/50HZ @ FULL LOAD<br/>CH1 : Output Voltage CH2 : AC Input Voltage<br/></div> <div>INPUT=115VAC/60HZ @ FULL LOAD<br/>CH1 : Output Voltage CH2 : AC Input Voltage<br/></div> |                                                             |                                  |
|    | RISE TIME (MAX.)               | 230VAC : 30ms<br>115VAC : 30ms                                                                                                                                                                                                                                                                                                                                     | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C | 230VAC : 8.4ms<br>115VAC : 8.4ms |

|   |                                                                                                                                                                                             |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8 | <div> <div> INPUT=230VAC/50HZ @ FULL LOAD<br/>CH1 : Output Voltage </div> <div> </div> </div> <div> <div> INPUT=115VAC/60HZ @ FULL LOAD<br/>CH1 : Output Voltage </div> <div> </div> </div> |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## INPUT FUNCTION TEST

| NO                                                                                   | TEST ITEM                 | SPECIFICATION                                                                       | TEST CONDITION                                                                                                                       | RESULT                                                                                                                                                                   |
|--------------------------------------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                                                    | INPUT VOLTAGE RANGE       | 85VAC ~ 305VAC                                                                      | I/P : TESTING<br>O/P : FULL LOAD<br>Ta : 25°C                                                                                        | 44.0VAC ~ 305VAC                                                                                                                                                         |
|                                                                                      |                           |                                                                                     | I/P :<br>LOW-LINE = 97VAC<br>HIGH-LINE = 315VAC<br>O/P : FULL/MIN LOAD<br>ON:30 Sec ; OFF:30 Sec 10MIN<br>( POWER ON/OFF NO DAMAGE ) | TEST : OK                                                                                                                                                                |
| 2                                                                                    | INPUT FREQUENCY RANGE     | 47HZ ~ 63HZ<br>NO DAMAGE                                                            | I/P : 100VAC ~ 305VAC<br>O/P : FULL-MIN LOAD<br>Ta : 25°C                                                                            | TEST : OK                                                                                                                                                                |
| 3                                                                                    | INPUT CURRENT (TYP.)      | 0.030A / 230VAC<br>0.045A / 115VAC                                                  | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C                                                                          | I= 0.01876A / 230VAC<br>I= 0.03149A / 115VAC                                                                                                                             |
| 4                                                                                    | LEAKAGE CURRENT           | < 0.25mA                                                                            | I/P : 277VAC<br>O/P: MIN LOAD<br>TA : 25°C                                                                                           | L-FG: 0.0709 mA<br>N-FG: 0.0708 mA                                                                                                                                       |
| 5                                                                                    | NO LOAD POWER CONSUMPTION | < 0.075W                                                                            | I/P : 230VAC<br>O/P: MIN LOAD<br>TA : 25°C                                                                                           | < 0.0344 W                                                                                                                                                               |
| 6                                                                                    | EFFICIENCY (TYP.)         | 74.0%                                                                               | I/P : 230VAC<br>O/P: FULL LOAD<br>TA : 25°C                                                                                          | 79.38 %                                                                                                                                                                  |
|  |                           |                                                                                     |                                                                                                                                      |                                                                                                                                                                          |
| 7                                                                                    | INRUSH CURRENT (TYP.)     | 20A / 230VAC<br>10A / 115VAC<br>twidh= 0 us measured at 50% Ipeak<br>COLD START     | I/P : 230VAC<br>I/P : 115VAC<br>O/P: FULL LOAD<br>TA : 25°C                                                                          | I= 5.64A / 230VAC<br>I= 3.70A / 115VAC                                                                                                                                   |
|                                                                                      |                           | INPUT=230VAC/50HZ @ FULL LOAD<br>CH2 : Input current (1V=1A) CH4 : AC Input Voltage | INPUT=115VAC/50HZ @ FULL LOAD<br>CH2 : Input current (1V=1A) CH4 : AC Input Voltage                                                  |   |

**PROTECTION FUNCTION TEST**

| NO | TEST ITEM               | SPECIFICATION                          | TEST CONDITION                                                        | RESULT                                                                                          |
|----|-------------------------|----------------------------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| 1  | OVER LOAD PROTECTION    | > 110%                                 | I/P: 305VAC<br>I/P: 230VAC<br>I/P: 100VAC<br>O/P: TESTING<br>Ta: 25°C | 383.0% 305VAC<br>323.0% 230VAC<br>239.0% 100VAC<br>Hiccup Mode                                  |
| 2  | OVER VOLTAGE PROTECTION | 12.60V ~ 16.20V                        | I/P: 305VAC<br>I/P: 230VAC<br>I/P: 85VAC<br>O/P: MIN LOAD<br>Ta: 25°C | 15.10V 305VAC<br>15.10V 230VAC<br>15.10V 85VAC<br>Shut off o/p voltage, clamping by zener diode |
| 3  | SHORT PROTECTION        | SHORT EVERY OUTPUT<br>1 HOUR NO DAMAGE | I/P: 305VAC<br>I/P: 85VAC<br>O/P: FULL LOAD<br>Ta: 25°C               | NO DAMAGE<br>Hiccup Mode                                                                        |

**COMPONENT STRESS TEST**

| NO | TEST ITEM            | SPECIFICATION                         | TEST CONDITION                                                                                                            | RESULT                                                              |
|----|----------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| 1  | PWM Power Transistor | Q1 Rated : 700V 0.4A                  | I/P : 315VAC<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: 315VAC<br>VDS:<br>(1). 638.00V<br>(2). 674.00V<br>(3). 628.00V |
| 2  | Input Capacitor      | C6 Rated : 5uf 450V                   | I/P : 315VAC<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). 438.00V<br>(2). 440.00V<br>(3). 440.00V                        |
| 3  | Control IC           | U1 Rated : 9.00V (max)<br>-0.3V (min) | I/P : 315VAC<br>O/P : (1)Full Load<br>(2)Output Short<br>(3)O.L.P<br>(4)Low Line No Load Vo(min)<br>Ta : 25°C             | U1<br>(1). 6.56V<br>(2). 6.36V<br>(3). 6.36V<br>(4). 6.56V          |
| 5  | O/P Diode            | D100 Rated : 80V 2.0A                 | I/P : 315VAC<br>O/P : (1)Full Load Turn on<br>(2) Output Short<br>(3)Full load continue<br>Ta : 25°C                      | (1). 67.20V<br>(2). 54.80V<br>(3). 66.80V                           |
| 6  | Clamp Diode          | D1 Rated : 1000V 1.0A                 | I/P : 315VAC<br>O/P : (1)Full load continue<br>Ta : 25°C                                                                  | (1). 606.00V                                                        |

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

| NO | TEST ITEM            | SPECIFICATION            | TEST CONDITION                       | RESULT                       |
|----|----------------------|--------------------------|--------------------------------------|------------------------------|
| 1  | WITHSTAND VOLTAGE    | I/P-O/P : 3.000KVAC /min | I/P-O/P: 3.300KVAC /min<br>Ta : 25°C | I/P-O/P: 0.50mA<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: 1KV               | 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 : IRM-02-12<br>1. ROOM AMBIENT BURN-IN : 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 18.9°C<br>2. HIGH AMBIENT BURN-IN : 1.0hrs<br>IP: 230VAC O/P: 100% LOAD TA= 73.0°C                                                                                                         | NO. Position ROOM AMBIENT 18.9°C HIGH AMBIENT Ta: 73.0°C<br>1 C101 30.1°C 81.4°C<br>2 T1 33.8°C 84.4°C<br>3 C6 31.4°C 81.4°C<br>4 BD1 32.6°C 82.3°C<br>5 R2 31.0°C 80.8°C<br>6 L1 31.9°C 81.6°C<br>7 U1 35.9°C 85.2°C<br>8 D100 31.9°C 83.4°C<br>9 D1 33.6°C 83.2°C<br>10 CASE 31.3°C 81.4°C |                      |
| 2  | OVER LOAD BURN-IN TEST                           | NO DAMAGE<br>1 HOUR ( MIN )                                                                                                                                                                                                                                                       | I/P : 230VAC<br>O/P : 269.46% LOAD<br>Ta : 25°C                                                                                                                                                                                                                                              | TEST : OK            |
| 3  | LOW TEMPERATURE TURN ON TEST                     | NO DAMAGE<br>1 HOUR ( MIN )                                                                                                                                                                                                                                                       | I/P : 305VAC / 100VAC<br>O/P : FULL LOAD<br>Ta : -30.0°C                                                                                                                                                                                                                                     | TEST : OK            |
| 4  | HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST | AFTER 12 HOURS IN CHAMBER ON CONTROL 75°C<br>NO DAMAGE                                                                                                                                                                                                                            | I/P : 315VAC<br>O/P : FULL LOAD<br>Ta : 75°C<br>HUMIDITY= 95.0% RH                                                                                                                                                                                                                           | TEST : OK            |
| 5  | TEMPERATURE COEFFICIENT                          | ±0.03% /(0°C~75°C)                                                                                                                                                                                                                                                                | I/P : 230VAC<br>O/P : FULL LOAD                                                                                                                                                                                                                                                              | ±0.0000% /(0°C~75°C) |
| 6  | STORAGE TEMPERATURE TEST                         | 1. Thermal shock Temperature : -40°C ~ +100°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 5 CYCLE<br>5. Input/Output condition : STATIC                                                           |                                                                                                                                                                                                                                                                                              | TEST : OK            |
| 7  | THERMAL SHOCK TEST                               | 1. Thermal shock Temperature : -35°C ~ +80°C<br>2. Temperature change rate : 25°C / MIN<br>3. Dwell time low and high temperature : 30 MIN/EACH<br>4. Total test cycle : 10 CYCLE<br>5. Input/Output condition :<br>230VAC Full Load AC ON/OFF test turn on 58sec ; turn off 2sec |                                                                                                                                                                                                                                                                                              | TEST : OK            |



|    |                              |                                                                                                                                                                                                                                                                                |                                                                           |
|----|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 8  | VIBRATION TEST               | 1 Carton & 1 Set<br>(1) Waveform : Sine Wave<br>(2) Frequency : 10~500Hz<br>(4) Acceleration : 5G<br>(5) Test Time : 60 min in each axis (X.Y.Z)<br>(6) Ta : 25°C                                                                                                              | TEST : OK                                                                 |
| 9  | CAPACITOR LIFE CYCLE         | :SUPPOSE C101 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= 75.0°C LIFE TIME<br>(3) I/P : 230VAC O/P : 75% LOAD Ta= 75.0°C LIFE TIME<br>(4) I/P : 230VAC O/P : 50% LOAD Ta= 75.0°C LIFE TIME | (1). 158118 HRS<br>(2). 56064 HRS<br>(3). 62984.4 HRS<br>(4). 70605.6 HRS |
| 10 | MTBF                         | MIL-HDBK-217F<br>TOTAL FAILURE RATE : 0 KHR                                                                                                                                                                                                                                    |                                                                           |
| 11 | DMTBF /Accelerated Life test | Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 75°C                                                                                                                                                                                              |                                                                           |

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

2007/3/20 A50-S014