



# TEST REPORT: IRM-02-24

## 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

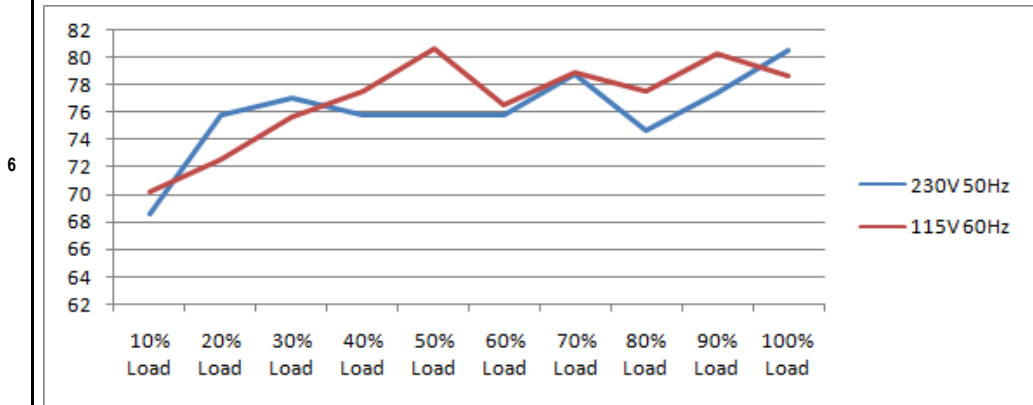
DESIGN VERIFY TEST  
OUTPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE RANGE	CH1: 23.760V ~ 24.240V	I/P: 230VAC O/P: MIN LOAD TA: 25°C	CH1: 23.89V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1: 2.5% ~ -2.5%	I/P: 100VAC / 305VAC O/P: FULL / MINLOAD TA= 25°C	V1: -0.46% ~ -0.50%
3	LINE REGULATION (MAX.)	V1: 0.5% ~ -0.5%	I/P: 100VAC / 305VAC O/P: FULL LOAD TA: 25°C	V1: 0.00% ~ -0.04%
4	LOAD REGULATION (MAX.)	V1: 0.5% ~ -0.5%	I/P: 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.00% ~ 0.00%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P: FULL LOAD TA: 25°C	TEST< 1.24 %
6	RIPPLE & NOISE(Max)	V1: 200 mVp-p	I/P: 230VAC O/P: FULL LOAD TA: 25°C	V1: 101 mVp-p
7	SET UP TIME (MAX.)	230VAC : 600ms 115VAC : 600ms	I/P: 230VAC I/P: 115VAC	230VAC : 18ms 115VAC : 16ms
7	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	

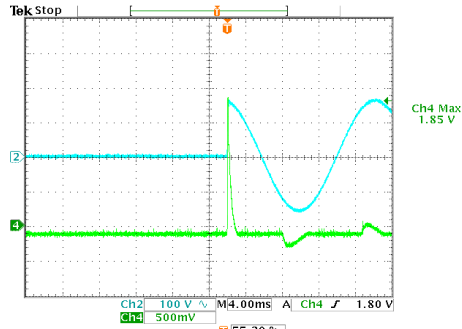
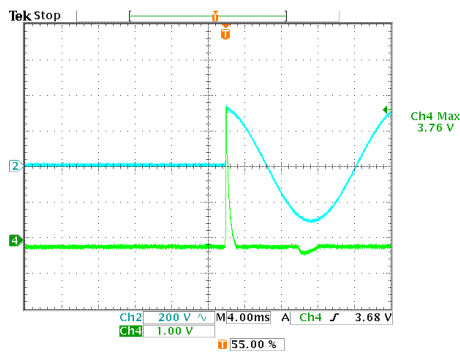
8	<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>												
	<p>HOLD UP TIME (TYP.)</p> <table border="0"> <tr> <td>230VAC</td> <td>:</td> <td>40ms</td> </tr> <tr> <td>115VAC</td> <td>:</td> <td>12ms</td> </tr> </table>	230VAC	:	40ms	115VAC	:	12ms	<p>I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA : 25°C</p>	<table border="0"> <tr> <td>230VAC</td> <td>:</td> <td>116.0ms</td> </tr> <tr> <td>115VAC</td> <td>:</td> <td>26.4ms</td> </tr> </table>	230VAC	:	116.0ms	115VAC	:	26.4ms
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	<p>DYNAMIC LOAD</p> <table border="0"> <tr> <td>V1:</td> <td>2400</td> <td>mVp-p</td> </tr> </table>	V1:	2400	mVp-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>	<table border="0"> <tr> <td>V1:</td> <td>(1). 148.0mv</td> <td>(2). 120.0mv</td> <td>unit:mVp-p</td> </tr> </table>	V1:	(1). 148.0mv	(2). 120.0mv	unit:mVp-p					
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10	<p>FULL /50% LOAD 50%DUTY / 120HZ</p>		<p>FULL /50% LOAD 50%DUTY / 1KHZ</p>												

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC ~ 305VAC 120VDC ~ 430VDC	I/P: TESTING O/P: FULL LOAD Ta: 25°C	45.0VAC ~ 305VAC 71VDC ~ 430VDC
			I/P: LOW-LINE = 97VAC HIGH-LINE = 315VAC 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 ~ 305VAC O/P: FULL-MIN LOAD Ta: 25°C	TEST: OK
3	INPUT CURRENT (TYP.)	0.030A / 230VAC 0.045A / 115VAC 0.025A / 277VAC	I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA: 25°C	I= 0.01817A / 230VAC I= 0.03200A / 115VAC I= 0.01750A / 277VAC
4	LEAKAGE CURRENT	< 0.25mA	I/P: 277VAC O/P: MIN LOAD TA: 25°C	L-FG: 0.0729 mA N-FG: 0.0729 mA
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P: 230VAC O/P: MIN LOAD TA: 25°C	< 0.0355 W
	EFFICIENCY (TYP.)	77.0%	I/P: 230VAC O/P: FULL LOAD TA: 25°C	80.6 %



7	INRUSH CURRENT (TYP.)	10A / 230VAC 5A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START	I/P: 230VAC I/P: 115VAC O/P: FULL LOAD TA: 25°C	I= 3.76A / 230VAC I= 1.85A / 115VAC
		INPUT=230VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage	INPUT=115VAC/50HZ @ FULL LOAD 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 I/P: 230VAC I/P: 100VAC O/P: TESTING TA: 25°C	376% 305VAC 325% 230VAC 240% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	25.20V ~ 32.40V	I/P: 305VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD TA: 25°C	30.20V 305VAC 30.20V 230VAC 30.20V 85VAC Shut off o/p voltage, clamping by zener diode
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 305VAC I/P: 85VAC O/P: FULL LOAD Ta: 25°C	NO DAMAGE Hiccup Mode

**COMPONENT STRESS TEST**

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated: 700V 0.4A	I/P: 315VAC  VDS : O/P: (1)Full Load Turn on (2) Output Short (3)Full load continue Ta: 25°C	VIN: 315VAC VDS: (1). 634.00V (2). 684.00V (3). 630.00V
2	Input Capacitor	C6 Rated: 5uf 450V	I/P: 315VAC O/P: (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change Ta: 25°C	(1). 442.00V (2). 446.00V (3). 446.00V
3	Control IC	U1 Rated: 9.00V (max) -0.3V (min)	I/P: 315VAC O/P: (1)Full Load (2)Output Short Change (4)Low Line No Load Vo(min) Ta: 25°C	U1 (1). 6.58V (2). 6.30V (3). 6.30V (4). 6.54V
5	O/P Diode	D100 Rated: 200V 2.0A	I/P: 315VAC O/P: (1)Full Load Turn on (2) Output Short (3)Full load continue Ta: 25°C	(1). 148.00V (2). 123.00V (3). 147.00V
6	Clamp Diode	D1 Rated: 1000V 1.0A	I/P: 315VAC (1)Full load continue Ta: 25°C	(1). 594.00V

**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 Ta: 25°C	I/P-O/P: 0.05mA NO DAMAGE
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



E.M.C. TEST

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

RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																																							
1	TEMPERATURE RISE TEST	MODEL: IRM-02-12 1. ROOM AMBIENT BURN-IN: 1.0hrs IP: 230VAC 2. HIGH AMBIENT BURN-IN: 1.0hrs IP: 230VAC	O/P: 100% LOAD TA= 18.9°C O/P: 100% LOAD TA= 73.0°C	<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT Ta</th> <th>18.9°C</th> <th>HIGH AMBIENT Ta: 73.0°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C101</td><td></td><td>30.1°C</td><td>81.4°C</td></tr> <tr><td>2</td><td>T1</td><td></td><td>33.8°C</td><td>84.4°C</td></tr> <tr><td>3</td><td>C6</td><td></td><td>31.4°C</td><td>81.4°C</td></tr> <tr><td>4</td><td>BD1</td><td></td><td>32.6°C</td><td>82.3°C</td></tr> <tr><td>5</td><td>R2</td><td></td><td>31.0°C</td><td>80.8°C</td></tr> <tr><td>6</td><td>L1</td><td></td><td>31.9°C</td><td>81.6°C</td></tr> <tr><td>7</td><td>U1</td><td></td><td>35.9°C</td><td>85.2°C</td></tr> <tr><td>8</td><td>D100</td><td></td><td>31.9°C</td><td>83.4°C</td></tr> <tr><td>9</td><td>D1</td><td></td><td>33.6°C</td><td>83.2°C</td></tr> <tr><td>10</td><td>CASE</td><td></td><td>31.3°C</td><td>81.4°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT Ta	18.9°C	HIGH AMBIENT Ta: 73.0°C	1	C101		30.1°C	81.4°C	2	T1		33.8°C	84.4°C	3	C6		31.4°C	81.4°C	4	BD1		32.6°C	82.3°C	5	R2		31.0°C	80.8°C	6	L1		31.9°C	81.6°C	7	U1		35.9°C	85.2°C	8	D100		31.9°C	83.4°C	9	D1		33.6°C	83.2°C	10	CASE		31.3°C	81.4°C
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P: 230VAC O/P: 269.46% LOAD Ta: 25°C	TEST: OK																																																							
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR ( MIN )	I/P: 305VAC / 100VAC O/P: FULL LOAD Ta: -30.0°C	TEST: OK																																																							
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 75°C NO DAMAGE	I/P: 315VAC O/P: FULL LOAD Ta: 75°C HUMIDITY= 95.0% RH	TEST: OK																																																							
5	TEMPERATURE COEFFICIENT	±0.03% /(0°C~75°C)	I/P: 230VAC O/P: FULL LOAD	±0.0000% /(0°C~75°C)																																																							
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature: -40°C ~ +100°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																																																							
7	THERMAL SHOCK TEST	1. Thermal shock Temperature: -35°C ~ +80°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																																																							



8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform: Sine Wave (2) Frequency: 10~500Hz (4) Acceleration: 5G (5) Test Time: 60 min in each axis (X.Y.Z) (6) Ta: 25°C	TEST: OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C101 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= 75.0°C LIFE TIME (3) I/P: 230VAC O/P : 75% LOAD Ta= 75.0°C LIFE TIME (4) I/P: 230VAC O/P : 50% LOAD Ta= 75.0°C LIFE TIME	(1). 158118 HRS (2). 56064 HRS (3). 62984.4 HRS (4). 70605.6 HRS
10	MTBF	13571.4K hrs min. Telcordia SR-332 (Bellcore) ; 1960.2K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 75°C O/P: FULL LOAD	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014