TEST REPORT: IRM-02-9

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

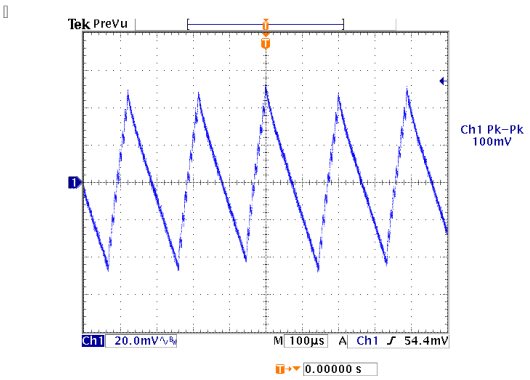
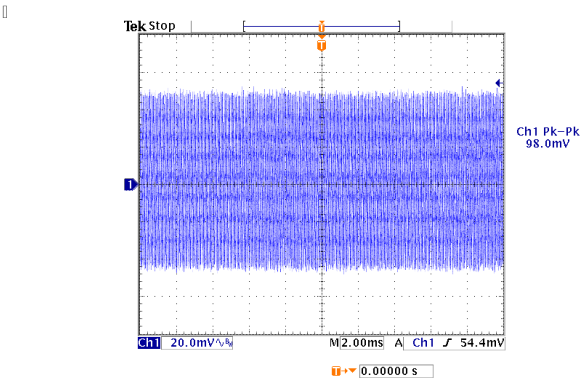
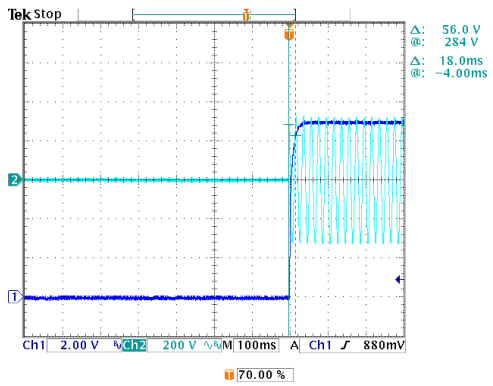
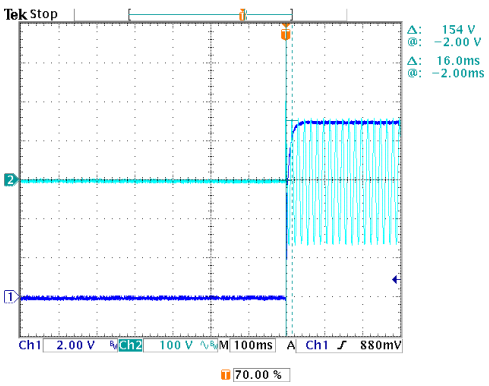
- Safety Test
- E.M.C. Test

■ RELIABILITY TEST

- ENVIRONMENT TEST

■ DESIGN VERIFY TEST

OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE RANGE	CH1: 8.910V ~ 9.090V	I/P : 230VAC O/P: MIN LOAD TA : 25℃	CH1: 9.05V
2	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 2.5% ~ -2.5%	I/P : 100VAC / 305VAC O/P: FULL / MINLOAD TA= 25℃	V1: 0.56% ~ 0.44%
3	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 100VAC / 305VAC O/P: FULL LOAD TA : 25℃	V1: 0.00% ~ 0.00%
4	LOAD REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25℃	V1: 0.11% ~ 0.00%
5	OVER/UNDERSHOOT TEST	< ±10%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	TEST< 2.22 %
6	RIPPLE & NOISE(Max)	V1 : 150 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25℃	V1 : 100.00 mVp-p
	high frequency :  low frequency : 			
7	SET UP TIME (MAX.)	230VAC : 600ms 115VAC : 600ms	I/P : 230VAC I/P : 115VAC	230VAC : 18ms 115VAC : 16ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage  INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 			
	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 13.0ms 115VAC : 13.4ms

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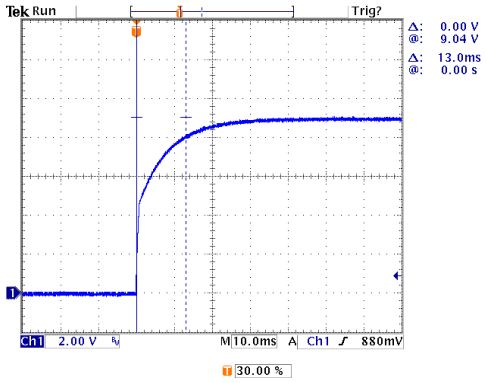
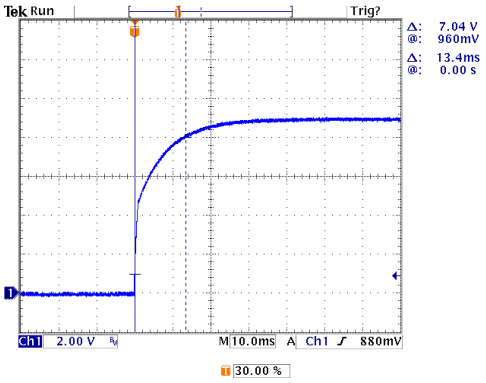
INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage



INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage



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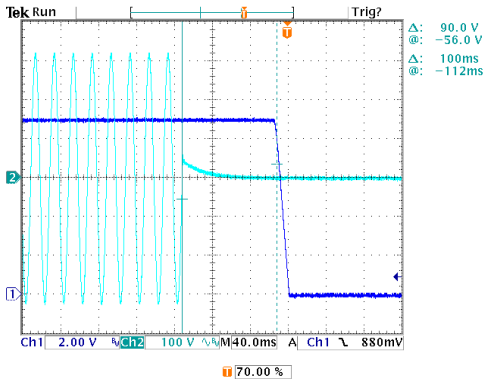
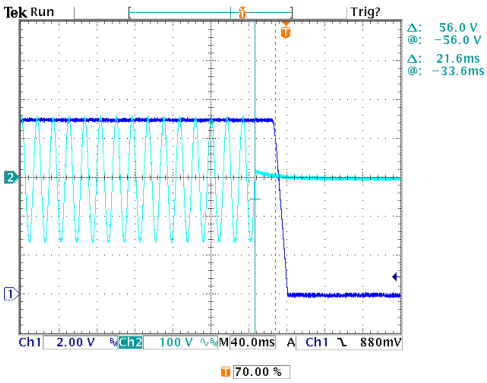
HOLD UP TIME (TYP.)	230VAC : 40ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	230VAC : 100.0ms 115VAC : 21.6ms

INPUT=230VAC/50HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



INPUT=115VAC/60HZ @ FULL LOAD
CH1 : Output Voltage CH2 : AC Input Voltage



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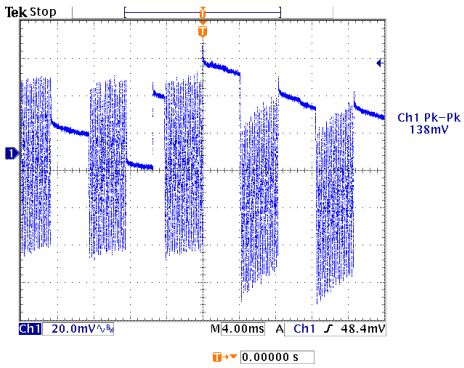
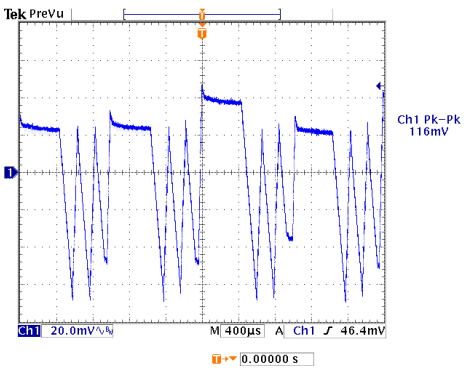
DYNAMIC LOAD	V1 : 1800 mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA : 25℃	(1). (2). unit:mVp-p V1: 138.0mv 116.0mv

FULL /Min LOAD 50%DUTY / 120HZ

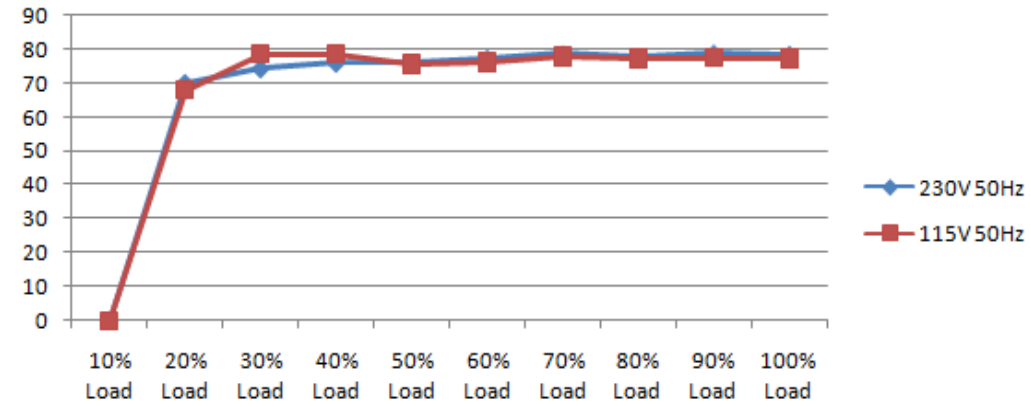


FULL /Min LOAD 50%DUTY / 1KHZ

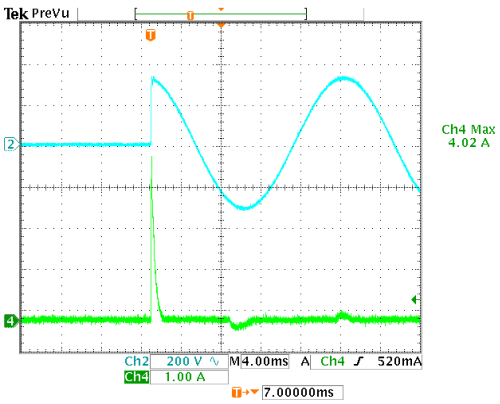


INPUT FUNCTION TEST

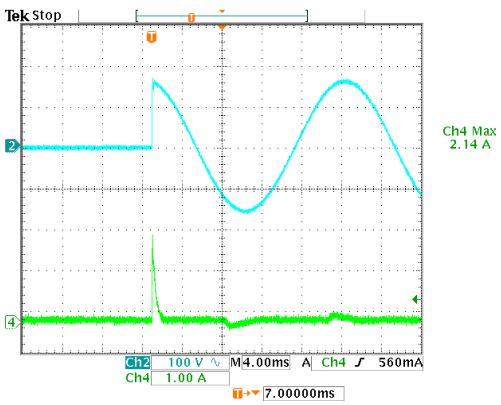
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC ~ 305VAC	I/P : TESTING O/P : FULL LOAD Ta : 25℃	48.0VAC ~ 305VAC
			I/P : LOW-LINE = 97VAC HIGH-LINE = 315VAC O/P : FULL/MIN LOAD ON:30 Sec ; OFF:30 Sec 10MIN (POWER ON/OFF NO DAMAGE)	TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 63HZ NO DAMAGE	I/P : 100VAC ~ 305VAC O/P : FULL~MIN LOAD Ta : 25℃	TEST : OK
3	INPUT CURRENT (TYP.)	0.030A / 230VAC 0.045A / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 0.01812A / 230VAC I= 0.03255A / 115VAC
4	LEAKAGE CURRENT	< 0.25mA	I/P : 277VAC O/P: MIN LOAD TA : 25℃	L-O/P: 0.0112 mA N-O/P: 0.011 mA
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P : 230VAC O/P: MIN LOAD TA : 25℃	< 0.0332 W
6	EFFICIENCY (TYP.)	72.0%	I/P : 230VAC O/P: FULL LOAD TA : 25℃	79.3 %
7	INRUSH CURRENT (TYP.)	20A / 230VAC 10A / 115VAC twidth= 0 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25℃	I= 4.02A / 230VAC I= 2.14A / 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℃	375% 305VAC 316% 230VAC 237% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	10.30V ~ 12.20V	I/P: 305VAC I/P: 230VAC I/P: 85VAC O/P: MIN LOAD TA : 25℃	10.90V 305VAC 10.90V 230VAC 10.90V 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℃	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)Fulll load continue Ta： 25℃	VIN: 315VAC VDS: (1). 628.00V (2). 668.00V (3). 628.00V
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℃	(1). 448.00V (2). 448.00V (3). 448.00V
3	Control IC	U1 Rated： 9.00V (max) -0.3V (min)	I/P： 315VAC O/P： (1)Full Load (2)Output Short (3)O.L.P (4)Low Line No Load Vo(min) Ta： 25℃	U1 (1). 6.60V (2). 6.36V (3). 6.36V (4). 6.60V
5	O/P Diode	D100 Rated： 60V 3.0A	I/P： 315VAC O/P： (1)Full Load Turn on (2) Output Short (3)Fulll load continue Ta： 25℃	(1). 56.40V (2). 47.20V (3). 56.40V
6	Clamp Diode	D1 Rated： 1000V 1.0A	I/P： 315VAC O/P： (1)Fulll load continue Ta： 25℃	(1). 596.00V

■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℃	I/P-O/P: 0.05mA NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P： 500VDC>100MΩ	I/P-O/P: 500VDC Ta： 25℃/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℃	PASS
2	CONDUCTION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25℃	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	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℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT： 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N：1KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25℃	CRITERIA A

■RELIABILITY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL : IRM-02-3.3 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 18.9℃ 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC O/P: 100% LOAD TA= 73.0℃		
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 275.00% LOAD Ta : 25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 305VAC / 100VAC O/P : FULL LOAD Ta : -30.0℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 75℃ NO DAMAGE	I/P : 315VAC O/P : FULL LOAD Ta : 75℃ HUMIDITY= 95.0% RH	TEST：OK
5	TEMPERATURE COEFFICIENT	±0.03% /(0℃~75℃)	I/P : 230VAC O/P : FULL LOAD	±0.0000% /(0℃~75℃)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -40℃ ~ +100℃ 2. Temperature change rate ：25℃ / 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℃ ~ +80℃ 2. Temperature change rate ：25℃ / 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

NO.	Position	ROOM AMBIENT 18.9℃	HIGH AMBIENT Ta： 73.0℃
1	C101	40.1℃	92.1℃
2	T1	41.7℃	95.1℃
3	C6	35.3℃	88.2℃
4	BD1	37.1℃	90.4℃
5	R2	34.4℃	87.6℃
6	L1	35.9℃	88.9℃
7	U1	40.1℃	94.0℃
8	D100	46.3℃	100.1℃
9	D1	39.6℃	93.3℃
10	CASE	36.9℃	89.7℃

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℃	TEST：OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C101 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25.0℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta= 75.0℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 75.0℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 75.0℃ LIFE TIME	(1). 158118 HRS (2). 17782.8 HRS (3). 28119.6 HRS (4). 70605.6 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction T159K hrs min. Telcordia SR-332 (Bellcore) ; 46.3K hrs min. MIL-HDBK-217F (25℃)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 75℃	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	FRANK	GESG	WANGDZ

2007/3/20 A50-S014