



TEST REPORT: MFM-10-3.3

10W Green Reliable Medical On Board Type

■ DESIGN VERIFY TEST

- Output Function Test
- Input Function Test
- Protection Function Test
- Control Function Test
- Component Stress Test

■ SAFETY & E.M.C. TEST

- Safety Test
- E.M.C. Test

■ RELIABILITY TEST

- ENVIRONMENT TEST

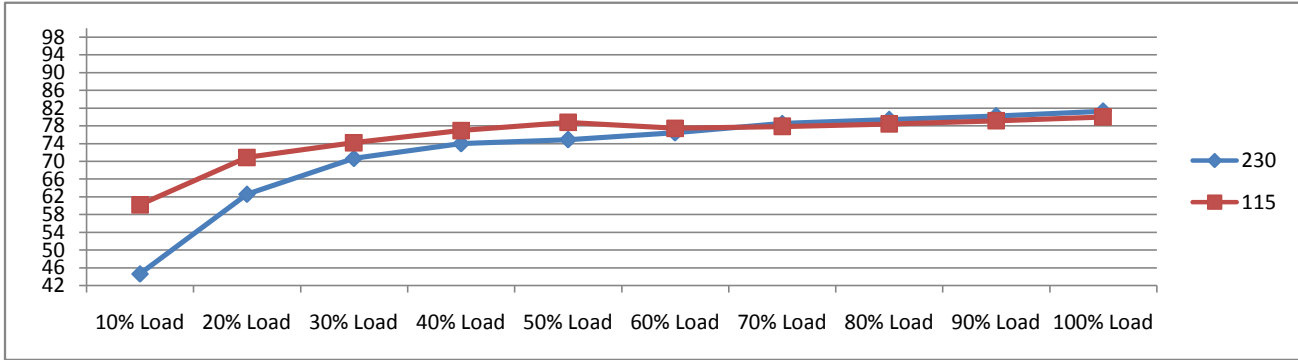
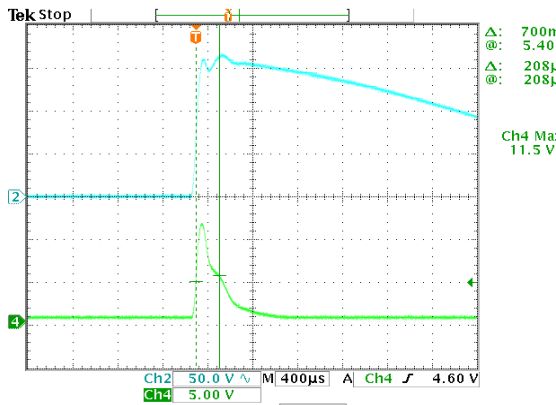
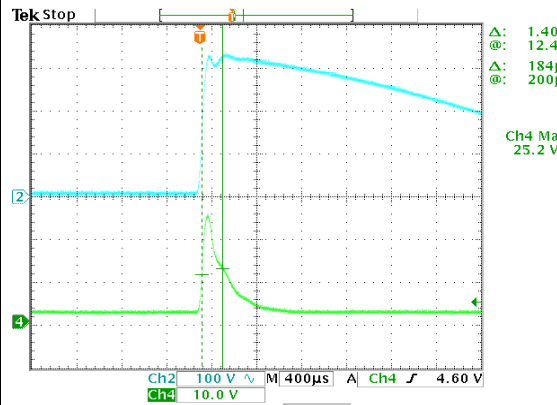
DESIGN VERIFY TEST OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 2.5% ~ -2.5%	I/P : 100VAC / 264VAC O/P: FULL / MINLOAD TA: 25°C	V1: 0.54% ~ -0.18%
2	LINE REGULATION (MAX.)	V1 : 0.3% ~ -0.3%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA: 25°C	V1: 0.00% ~ 0.00%
3	LOAD REGULATION(MAX.)	V1 : 0.5% ~ -0.5%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.18% ~ -0.18%
4	OVER/UNDERSHOOT TEST	< ±15%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 4.6 %
5	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 56.8 mVp-p
			high frequency: low frequency:	
6	SET UP TIME (MAX.)	230VAC : 1000ms 115VAC : 1000ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 428ms 115VAC : 384ms
				INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage Tek Stop Ch1 1.00 V Ch2 200 V 200ms A Ch1 340mV 70.00 %

7	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 7.2ms 115VAC : 7.8ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage	
	Ch1 1.00 V 2 10.0ms A Ch1 340mV 30.00 %		Ch1 1.00 V 2 10.0ms A Ch1 340mV 30.00 %	
8	HOLD UP TIME (TYP.)	230VAC : 40ms 115VAC : 8ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 70.0ms 115VAC : 14.0ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage	
	Ch1 1.00 V 2 Ch2 100 V 2 100ms A Ch1 340mV 70.00 %		Ch1 1.00 V 2 Ch2 100 V 2 100ms A Ch1 340mV 70.00 %	
9	DYNAMIC LOAD	V1 : 990 mVp-p	I/P : 230VAC O/P: (1) Full/Min load 50% duty/120HZ (2) Full/Min load 50% duty/1KHZ TA : 25°C	(1). 422mv (2). 356mv unit:mVp-p
	FULL /MIN LOAD 50%DUTY / 120HZ		FULL /MIN% LOAD 50%DUTY / 1KHZ	
	Ch1 100mV 2 4.00ms A Ch1 174mV 0.00000 s Ch1 Pk-Pk 422mV		Ch1 100mV 2 400μs A Ch1 264mV 0.00000 s Ch1 Pk-Pk 356mV	



INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C 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)	64.0VAC ~ 264VAC TEST : OK
2	INPUT FREQUENCY RANGE	47HZ ~ 440HZ NO DAMAGE	I/P : 100VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK
3	INPUT CURRENT (TYP.)	0.2A / 230VAC 0.3A / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 0.082A / 230VAC I= 0.154A / 115VAC
4	LEAKAGE CURRENT	< 0.08mA	I/P : 240VAC O/P : MIN LOAD TA : 25°C	0.0269 mA
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.0541 W
6	EFFICIENCY (TYP.)	78.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	81.3 %
				
7	INRUSH CURRENT (TYP.)	45A / 230VAC 25A / 115VAC width= 555 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 25.2A / 230VAC I= 11.5A / 115VAC T50= 184.0us / 230VAC
INPUT=230VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A) INPUT=115VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A)  Ch4 Max 25.2 V Ch4 Max 11.5 V 37.40 %				



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PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110% ~ 180%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta: 25°C	147.60% 264VAC 144.10% 230VAC 131.20% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	3.80V ~ 5.00V	Ta: 25°C	4.40V Shut off o/p voltage,damping by zener diode
3	OVER TEMPERATURE PROTECTION	Shut down Re- power ON	I/P: 264VAC I/P: 80VAC O/P: FULL LOAD	O.T.P. Active Shut down Re- power ON
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC I/P: 80VAC 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	U1 Rated : 800V 2.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	VIN: 267VAC VDS: (1). 512.00V (2). 471.00V (3). 510.00V
2	O/P Diode	D100 Rated : 45V 10.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue	D100 VDS : (1). 26.30V (2). 30.20V (3). 26.50V
3	Input Capacitor	C5 Rated : 10uf 400V	I/P : 267VAC O/P : (1)Full Load Turn on /Off (2)Min load Turn on /Off (3)Full Load /Min load Change (4)Full Load Continue Ta : 25°C	(1). 376.00V (2). 378.00V (3). 376.00V (4). 376.00V
4	Control IC	U1 Rated : 27V (max) -0.3V (min)	I/P : 267VAC O/P : (1)Full Load (2)Output Short (3)O.L.P (4)Low Line No Load Vo(min) Ta : 25°C	U1 (1). 18.80V (2). 19.20V (3). 20.10V (4). 18.90V
5	Clamp Diode	D2 Rated : 1000V 1.0A	I/P : 267VAC O/P : (1)Dynamic Load Full/Min Load (2)Full load continue Ta : 25°C	(1). 484.00V (2). 480.00V

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: 4.250KVAC /min Ta : 25°C	I/P-O/P: 0.62mA 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



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2	CONDUCTION	EN55011 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55011 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 MEDICAL AIR: 8KV / Contact: 8KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 MEDICAL INPUT: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
6	SURGE	IEC61000-4-5 MEDICAL L-N:1KV;L/N-PE: 2KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A

RELIABILITY TEST

PRELIMINARY TEST		SPECIFICATION	TEST CONDITION	RESULT	
1	TEMPERATURE RISE TEST	MODEL : MFM-10-5			
		1. ROOM AMBIENT BURN-IN : 1.0hrs			
		IP: 230VAC O/P: 100% LOAD TA= 21.1°C			
		2. HIGH AMBIENT BURN-IN : 1.0hrs			
		IP: 230VAC O/P: 100% LOAD TA= 56.3°C			
		NO.	Position	ROOM AMBIENT 21.1°C	HIGH AMBIENT Ta: 56.3°C
		1	C4	47.9°C	78.7°C
		2	C5	54.4°C	84.0°C
		3	C37	50.4°C	75.8°C
		4	R1	53.7°C	82.5°C
		5	U1	72.4°C	98.0°C
		6	T1	64.4°C	94.0°C
		7	C101	50.2°C	75.3°C
2	OVER LOAD BURN-IN TEST	NO DAMAGE		TEST : OK	
		1 HOUR (MIN)			
		I/P : 230VAC			
		O/P : 129.00% LOAD			
		Ta : 25°C			
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE		TEST : OK	
		1 HOUR (MIN)			
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	I/P : 264VAC / 100VAC		TEST : OK	
		O/P : FULL LOAD			
		Ta : -35.0°C			
5	TEMPERATURE COEFFICIENT	AFTER 12 HOURS		TEST : OK	
		IN CHAMBER ON			
		CONTROL 50°C			
6	STORAGE TEMPERATURE TEST	NO DAMAGE		TEST : OK	
		HUMIDITY= 95.0% RH			
7	THERMAL SHOCK TEST	±0.03% /(0°C~50°C)		±0.0032% /(0°C~50°C)	
		I/P : 230VAC			
8	VIBRATION TEST	O/P : FULL LOAD		TEST : OK	
9	VIBRATION TEST	1. Thermal shock Temperature : -45°C ~ +100°C		TEST : OK	
		2. Temperature change rate : 25°C / MIN			
10	VIBRATION TEST	3. Dwell time low and high temperature : 30 MIN/EACH		TEST : OK	
		4. Total test cycle : 10 CYCLE			
11	VIBRATION TEST	5. Input/Output condition : STATIC		TEST : OK	
12	VIBRATION TEST	1. Thermal shock Temperature : -35°C ~ +55°C		TEST : OK	
		2. Temperature change rate : 25°C / MIN			
13	VIBRATION TEST	3. Dwell time low and high temperature : 30 MIN/EACH		TEST : OK	
		4. Total test cycle : 16 CYCLE			
14	VIBRATION TEST	5. Input/Output condition :		TEST : OK	
		230VAC Full Load AC ON/OFF test turn on 3sec ; turn off 1sec @ 15CYCLE			
15	VIBRATION TEST	230VAC Full Load AC ON turn on continue @ 1CYCLE		TEST : OK	
16	VIBRATION TEST	1 Carton & 1 Set		TEST : OK	
		(1) Waveform : Sine Wave			
17	VIBRATION TEST	(2) Frequency : 10~500Hz		TEST : OK	
		(4) Acceleration : 5G			
18	VIBRATION TEST	(5) Test Time : 60 min in each axis (X.Y.Z)		TEST : OK	
		(6) Ta : 25°C			



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9	CAPACITOR LIFE CYCLE	:SUPPOSE C101 IS THE MOST CRITICAL COMPONENT					
		(1) I/P : 230VAC	O/P : FULL LOAD	Ta= 25.0℃	LIFE TIME	(1).	397820.8 HRS
		(2) I/P : 230VAC	O/P : FULL LOAD	Ta= 50.0℃	LIFE TIME	(2).	141678.4 HRS
		(3) I/P : 230VAC	O/P : 75% LOAD	Ta= 50.0℃	LIFE TIME	(3).	162751.4 HRS
		(4) I/P : 230VAC	O/P : 50% LOAD	Ta= 50.0℃	LIFE TIME	(4).	234746.9 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1756.2Khrs min. MIL-HDBK-217F (25℃)					
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 50℃					

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ

2007/3/20 A50-S014