



TEST REPORT: MFM-10-24

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

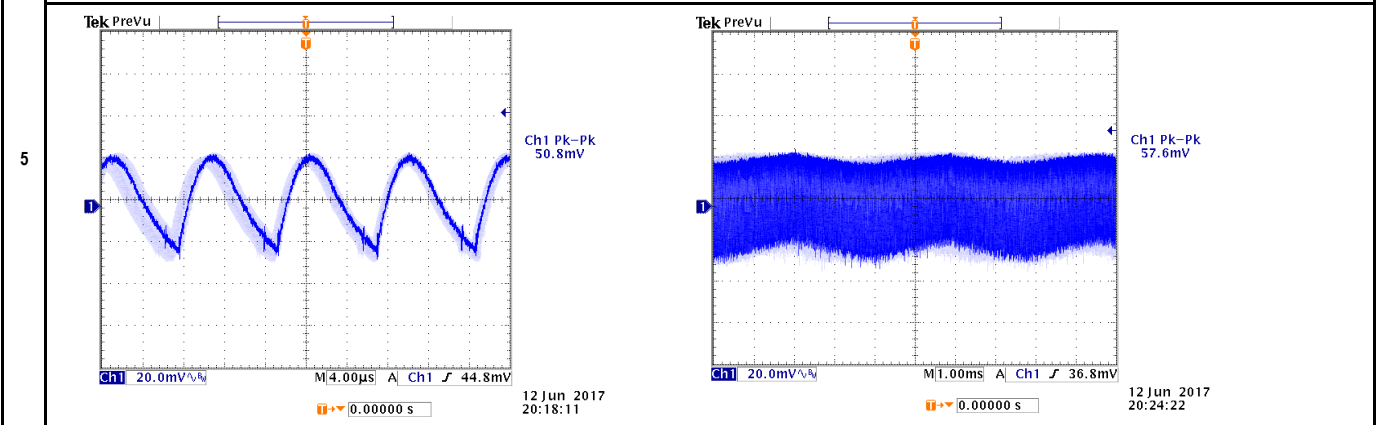


DESIGN VERIFY TEST
OUTPUT FUNCTION

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: 0.30% ~ -0.40%
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: 0.00% ~ 0.00%
4	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 1.7 %
	RIPPLE & NOISE(Max)	V1 : 200 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 57.6 mVp-p

high frequency:

low frequency:



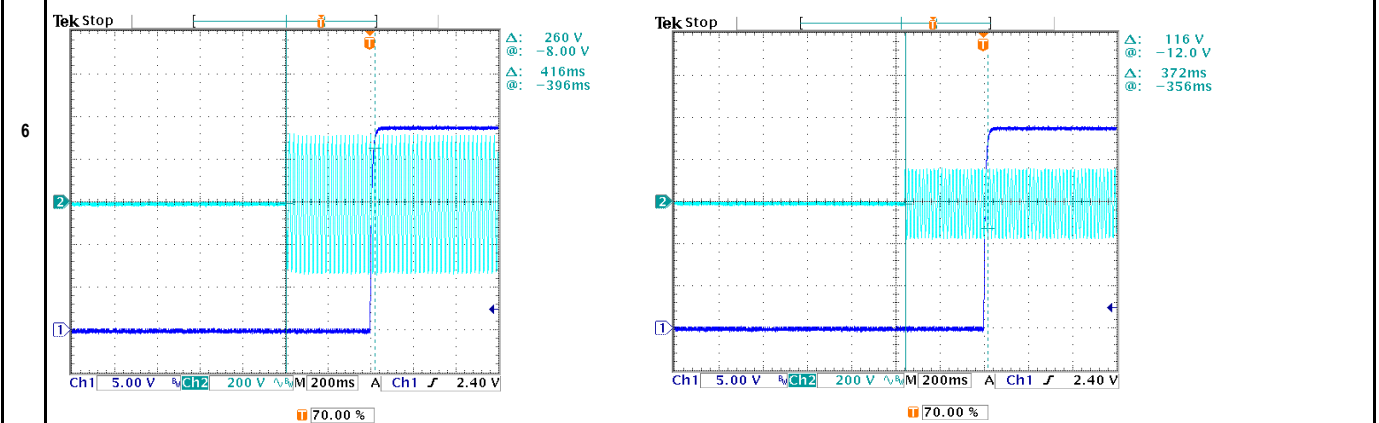
SET UP TIME (MAX.)	230VAC : 1000ms	I/P : 230VAC	230VAC : 416ms
	115VAC : 1000ms	I/P : 115VAC	115VAC : 372ms
		O/P: FULL LOAD	
		TA: 25°C	

INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage





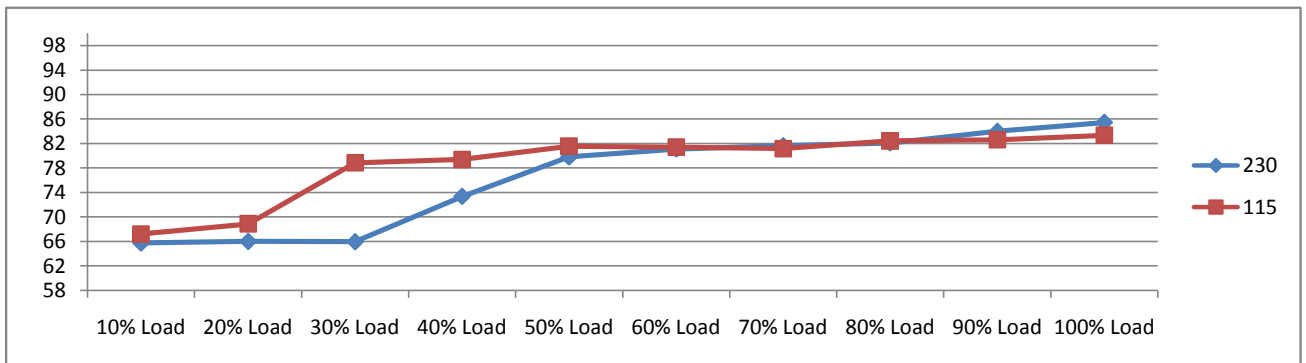
10W Green Reliable Medical On Board Type MFM-10 series

7	RISE TIME (MAX.) 230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 16.2ms 115VAC : 16.2ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage
8	HOLD UP TIME (TYP.) 230VAC : 40ms 115VAC : 8ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 62.0ms 115VAC : 12.0ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage
9	DYNAMIC LOAD V1 : 2400 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). 362mv (2). 348mv unit:mVp-p
	FULL /MIN LOAD 50%DUTY / 120HZ		FULL /MIN% LOAD 50%DUTY / 1KHZ
13 Jun 2017 09:40:32		13 Jun 2017 09:43:47	

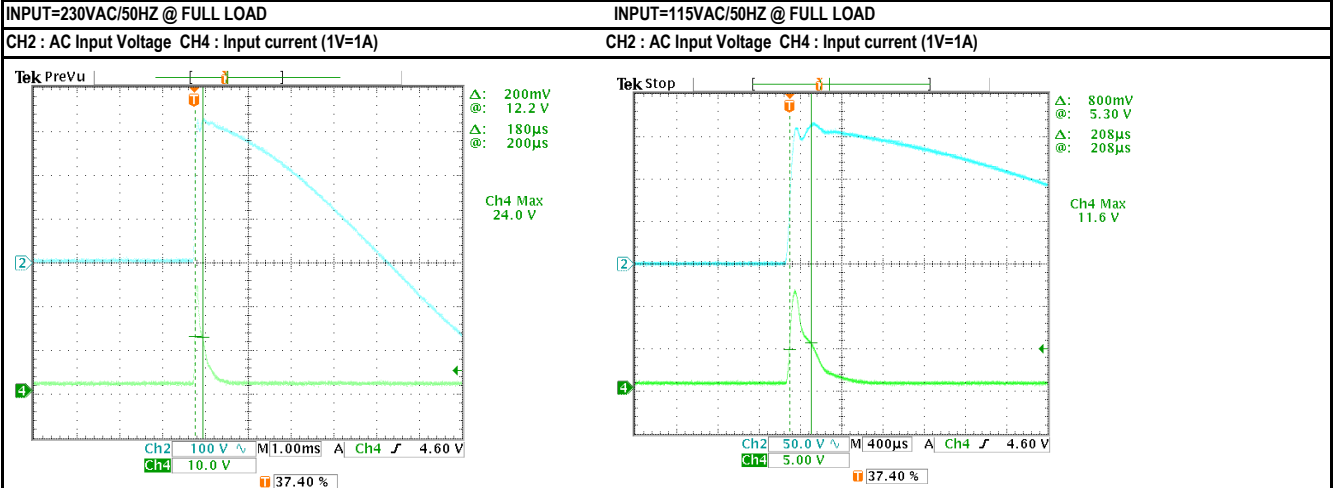


INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	80VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	64.0VAC ~ 264VAC
			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)	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= 0.08A / 230VAC I= 0.161A / 115VAC
4	LEAKAGE CURRENT	< 0.08mA	I/P : 240VAC O/P : MIN LOAD TA : 25°C	0.0275 mA
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.0574 W
	EFFICIENCY (TYP.)	84.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	85.42 %



7	INRUSH CURRENT (TYP.)	45A / 230VAC 25A / 115VAC twidth= 555 us measured at 50% Ipeak COLD START	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 24.0A / 230VAC I= 11.6A / 115VAC T50= 180.0us / 230VAC
		INPUT=230VAC/50HZ @ FULL LOAD	INPUT=115VAC/50HZ @ FULL LOAD	





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	157.00% 264VAC 150.00% 230VAC 142.80% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	27.60V ~ 32.40V	Ta: 25°C	30.40V 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). 516.00V (2). 544.00V (3). 520.00V
2	O/P Diode	D100 Rated : 300V 2.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue	D100 VDS : (1). 324.00V (2). 370.00V (3). 208.00V
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). 396.00V (2). 396.00V (3). 394.00V (4). 392.00V
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). 17.20V (2). 16.90V (3). 17.30V (4). 16.80V
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). 480.00V (2). 484.00V

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: 0.63mA 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	EN55011 CLASS B	I/P : 230VAC /50HZ O/P : FULL LOAD / 50% LOAD Ta : 25°C	PASS Test by certified Lab
3	RADIATION	EN55015 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

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT																																												
1	TEMPERATURE RISE TEST	MODEL : MFM-10-24 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	<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT 21.1°C</th> <th>HIGH AMBIENT Ta: 56.3°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>C4</td><td>45.4°C</td><td>76.9°C</td></tr> <tr><td>2</td><td>C5</td><td>50.0°C</td><td>80.8°C</td></tr> <tr><td>3</td><td>C37</td><td>47.5°C</td><td>73.8°C</td></tr> <tr><td>4</td><td>R1</td><td>51.5°C</td><td>80.8°C</td></tr> <tr><td>5</td><td>U1</td><td>76.4°C</td><td>101.1°C</td></tr> <tr><td>6</td><td>T1</td><td>60.8°C</td><td>90.5°C</td></tr> <tr><td>7</td><td>C101</td><td>43.1°C</td><td>71.4°C</td></tr> <tr><td>8</td><td>D100</td><td>54.7°C</td><td>86.3°C</td></tr> <tr><td>9</td><td>BD1</td><td>44.7°C</td><td>76.8°C</td></tr> <tr><td>60</td><td>TA</td><td>21.1°C</td><td>56.3°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT 21.1°C	HIGH AMBIENT Ta: 56.3°C	1	C4	45.4°C	76.9°C	2	C5	50.0°C	80.8°C	3	C37	47.5°C	73.8°C	4	R1	51.5°C	80.8°C	5	U1	76.4°C	101.1°C	6	T1	60.8°C	90.5°C	7	C101	43.1°C	71.4°C	8	D100	54.7°C	86.3°C	9	BD1	44.7°C	76.8°C	60	TA	21.1°C	56.3°C	
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60	TA	21.1°C	56.3°C																																													
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 133.00% LOAD Ta : 25°C	TEST : OK																																												
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 100VAC O/P : FULL LOAD Ta : -35.0°C	TEST : OK																																												
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50°C NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 50°C HUMIDITY= 95.0% RH	TEST : OK																																												
5	TEMPERATURE COEFFICIENT	±0.03% /(0°C~50°C)	I/P : 230VAC O/P : FULL LOAD	±0.0032% /(0°C~50°C)																																												
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C ~ +100°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 : STATIC		TEST : OK																																												
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -35°C ~ +55°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 16 CYCLE 5. Input/Output condition : 230VAC Full Load AC ON/OFF test turn on 3sec ; turn off 1sec @ 15CYCLE 230VAC Full Load AC ON turn on continue @ 1CYCLE		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																																												



10W Green Reliable Medical On Board Type MFM-10 series

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	(1).	484095.4 HRS
		(2) I/P : 230VAC	O/P : FULL LOAD	Ta= 50.0°C	LIFE TIME	(2).	138052.3 HRS
		(3) I/P : 230VAC	O/P : 75% LOAD	Ta= 50.0°C	LIFE TIME	(3).	105759.4 HRS
		(4) I/P : 230VAC	O/P : 50% LOAD	Ta= 50.0°C	LIFE TIME	(4).	161622 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1756.2Khrs 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	LIUTT		WANGDZ

2007/3/20 A50-S014