



TEST REPORT: MFM-30-15

30W High Reliable Green 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

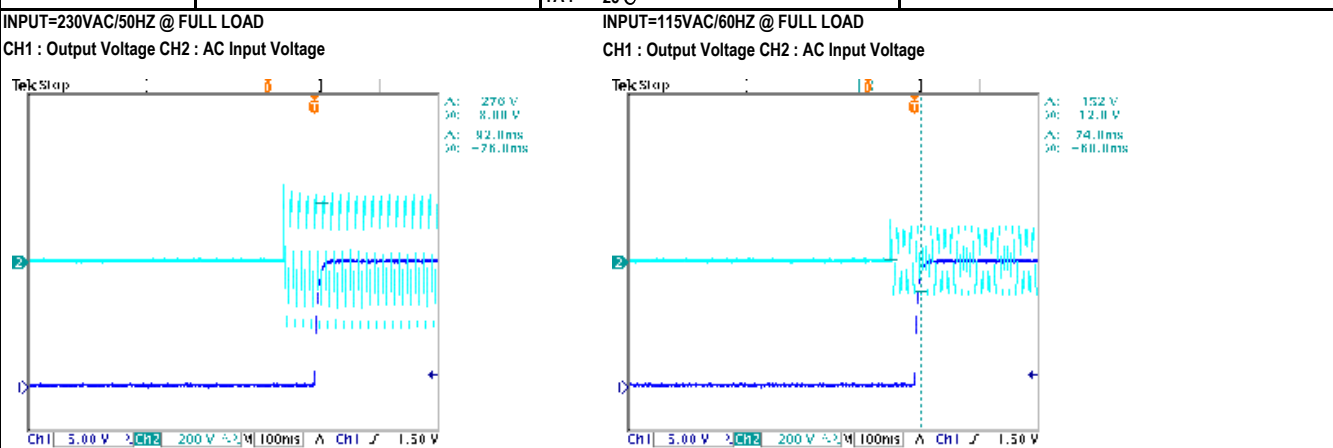
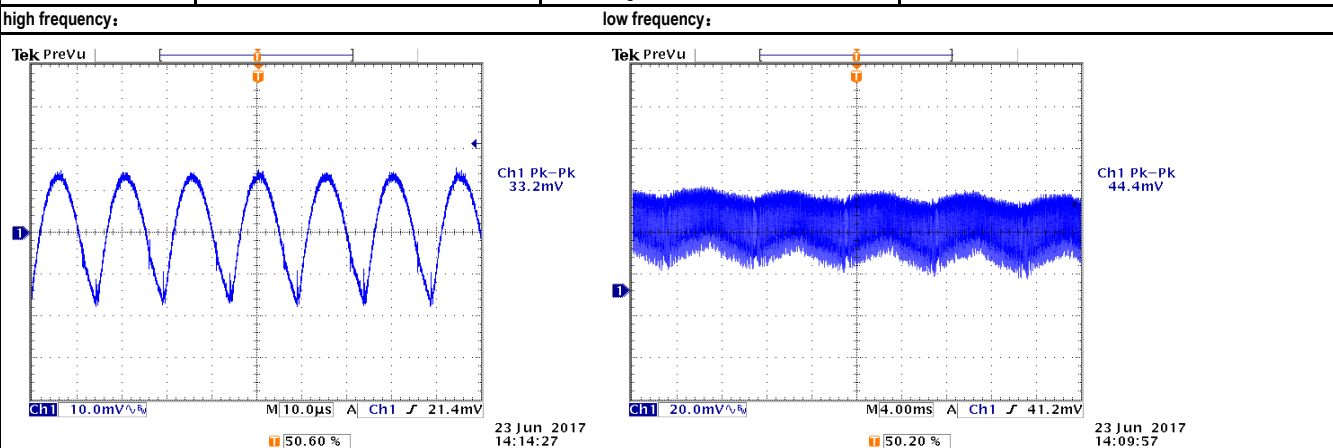
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

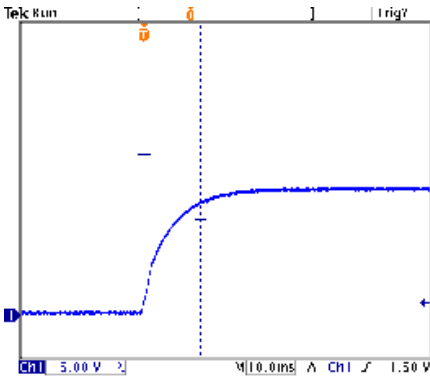
DESIGN VERIFY TEST OUTPUT FUNCTION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE TOLERANCE (Max)	V1 : 2.0% ~ -2.0%	I/P : 80VAC / 264VAC O/P: FULL / MINLOAD TA: 25°C	V1: -0.13% ~ -0.20%
2	LINE REGULATION (MAX.)	V1 : 0.5% ~ -0.5%	I/P : 80VAC / 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: 0.07% ~ -0.07%
4	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 2.7 %
5	RIPPLE & NOISE(Max)	V1 : 120 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 44.4 mVp-p
			high frequency: low frequency:	
6	SET UP TIME (MAX.)	230VAC : 500ms 115VAC : 500ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 92ms 115VAC : 74ms



7	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 13.8ms 115VAC : 13.4ms
8	HOLD UP TIME (TYP.)	230VAC : 40ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 66.0ms 115VAC : 16.0ms
9	DYNAMIC LOAD	V1 : 1500 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). 404mv (2). 300mv unit:mVp-p

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

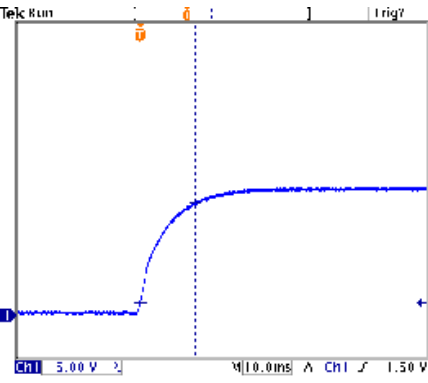


7.80 V
12.8 V
13.8ms
0.00 s

Ch1 5.00 V 10.0ms Ch1 1.50 V

30.00 %

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

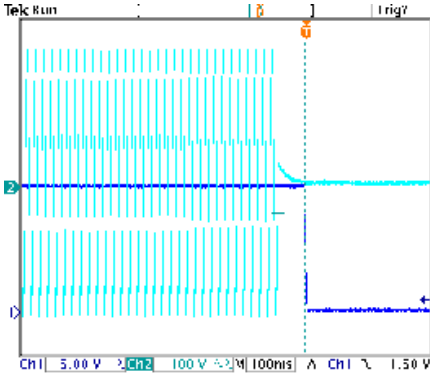


12.8 V
12.8 V
13.4ms
0.00 s

Ch1 5.00 V 10.0ms Ch1 1.50 V

30.00 %

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

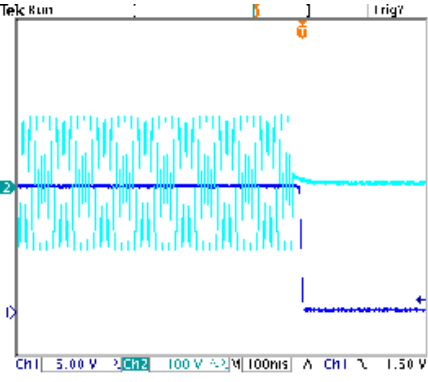


300 V
-62.0 V
88.0ms
-72.0ms

Ch1 5.00 V Ch2 100 V 100ms Ch1 1.50 V

70.00 %

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

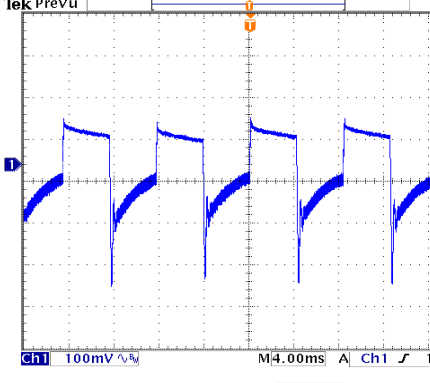


128 V
-118 V
18.0ms
-24.0ms

Ch1 5.00 V Ch2 100 V 100ms Ch1 1.50 V

70.00 %

FULL /MIN LOAD 50%DUTY / 120HZ



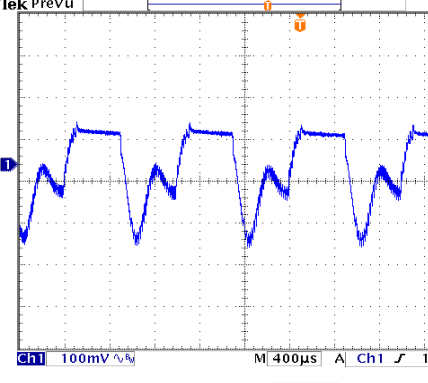
Ch1 Pk-Pk 404mV

Ch1 100mV 4.00ms Ch1 186mV

50.60 %

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FULL /MIN% LOAD 50%DUTY / 1KHZ



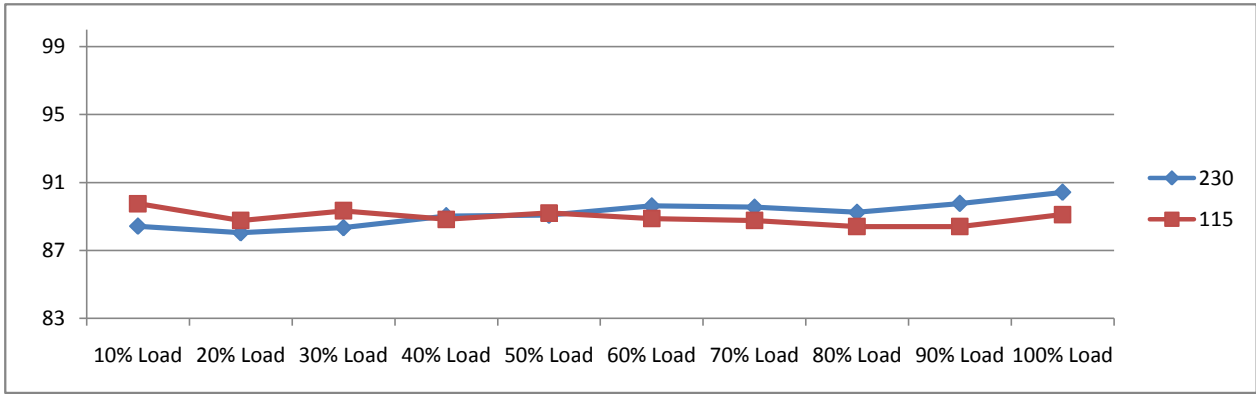
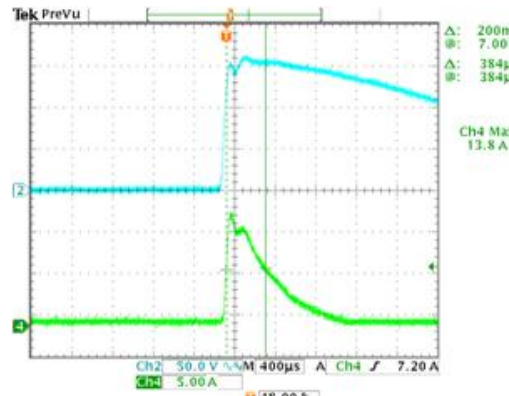
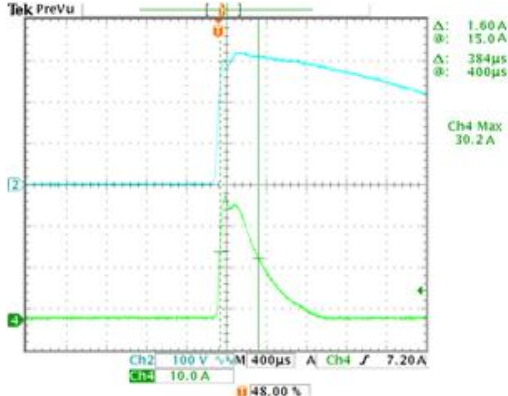
Ch1 Pk-Pk 300mV

Ch1 100mV 400μs Ch1 154mV

62.60 %

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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	72.0VAC ~ 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 ~ 63HZ NO DAMAGE	I/P : 80VAC ~ 264VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK
3	INPUT CURRENT (TYP.)	0.50A / 230VAC 0.75A / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	I= 0.24A / 230VAC I= 0.46A / 115VAC
4	LEAKAGE CURRENT	< 80.00μA	I/P : 264VAC O/P: MIN LOAD TA : 25°C	53.2 μA
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P : 230VAC O/P: MIN LOAD TA : 25°C	< 0.0439 W
7	EFFICIENCY (TYP.)	89.0%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	90.43 %
				
8	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= 30.2A / 230VAC I= 13.8A / 115VAC T50= 384.0us / 230VAC
		INPUT=230VAC/50HZ @ FULL LOAD INPUT=115VAC/50HZ @ FULL LOAD		
CH2 : AC Input Voltage CH4 : Input current CH2 : AC Input Voltage CH4 : Input current				
				


PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	115% ~ 165%	I/P: 264VAC I/P: 230VAC I/P: 100VAC O/P: TESTING Ta: 25°C	158.00% 264VAC 152.00% 230VAC 143.50% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	15.80V ~ 20.30V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD Ta: 25°C	19.10V 264VAC 19.20V 230VAC 19.10V 80VAC Shut down Re- power ON
3	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 OK

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Power Transistor	Q1 Rated : 600V 7.5A	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). 468.00V (2). 536.00V (3). 474.00V
2	O/P MOSFET	Q100 Rated : 120V 20.0A Rated :	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q100 VDS : (1). 106.00V (2). 103.00V (3). 105.00V
3	Input Capacitor	C5 Rated : 56uf 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). 362.00V (2). 372.00V (3). 364.00V (4). 362.00V
4	Control IC	U1 Rated : 28V (max) -0.3 (min)	I/P : 267VAC O/P : (1)Full Load (2)Output Short (3)O.L.P (4)O.V.P (5)Low Line No Load Vo(min) Ta : 25°C	U1 (1). 19.30V (2). 12.50V (3). 19.80V (4). 23.00V (5). 18.60V
5	Clamp Diode	D5 Rated : 1000V 1.0A	I/P : 267VAC O/P : (1)Dynamic Load Full/Min Load (2)Full load continue Ta : 25°C	(1). 454.00V (2). 456.00V

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: 1.08mA 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: 9999.0MΩ 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	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 AIR: 15KV / 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	EN61000-4-5 MEDICAL LINE-LINE: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 : MFM-30-24			
		1. ROOM AMBIENT BURN-IN : 1.0hrs			
		IP: 230VAC O/P: 100% LOAD TA= 25.2°C			
		2. HIGH AMBIENT BURN-IN : 1.0hrs			
		IP: 230VAC O/P: 100% LOAD TA= 61.2°C			
		NO.	Position	ROOM AMBIENT 25.2°C	HIGH AMBIENT Ta: 61.2°C
		1	LF1	41.9°C	77.1°C
		2	LF2	48.1°C	80.3°C
		3	C5	46.8°C	81.7°C
		4	C40	50.2°C	87.4°C
		5	BD1	59.8°C	91.2°C
		6	R7	65.8°C	101.5°C
		7	T1 COIL	75.0°C	107.7°C
		8	Q100	67.5°C	101.5°C
		9	C105	53.9°C	90.8°C
		10	L100	41.0°C	78.3°C
		11	Q1	60.6°C	95.3°C
12	U1	55.7°C	91.1°C		
13	D5	62.5°C	100.0°C		
14	R40	60.6°C	93.1°C		
60	TA	25.2°C	61.2°C		
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 162.0% 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 : -40.0°C	TEST : OK	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60°C NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 60°C HUMIDITY= 95.0% RH	TEST : OK	
5	TEMPERATURE COEFFICIENT	±0.03% /°C(0~60°C)	I/P : 230VAC O/P : FULL LOAD	±0.0023% /°C(0~60°C)	
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°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 : -45°C ~ 65°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	



30W High Reliable Green Medical On Board Type

MFM-30 series

8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 3G (5) Test Time : 60min in each axis (X.Y.Z) (6) Ta : 25℃	TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 60℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 60℃ LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 60℃ LIFE TIME	(1). 496583.6 HRS (2). 82527.6 HRS (3). 129361.8 HRS (4). 185681.6 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 779Khrs min. MIL-HDBK-217F (25℃)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): 30000HRS @ TA 60℃	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ