



TEST REPORT: MPM-05-12

5W Reliable Green Medical Encapsulated Type

■ DESIGN VERIFY TEST

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

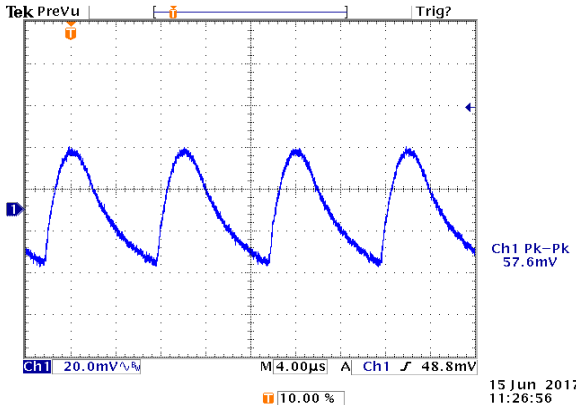
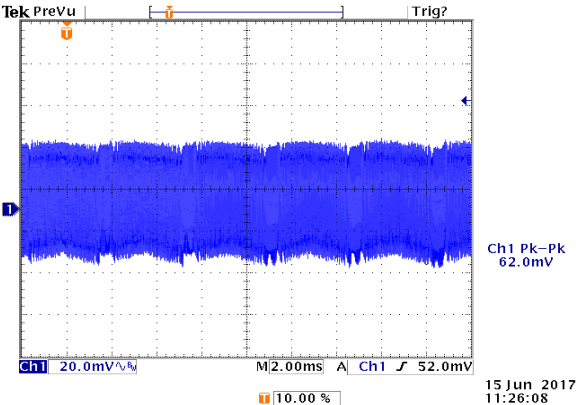
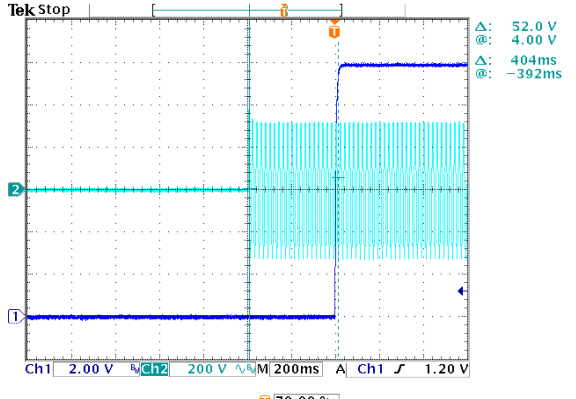
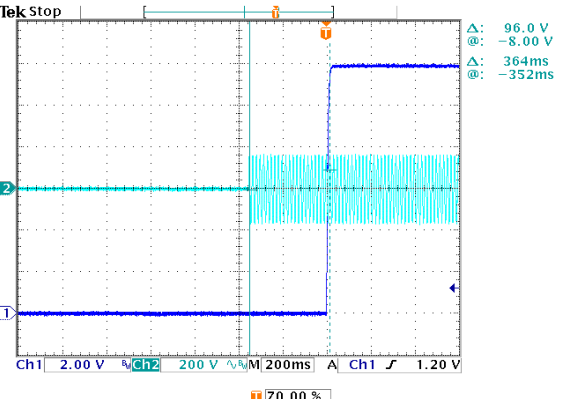
■ SAFETY & E.M.C. TEST

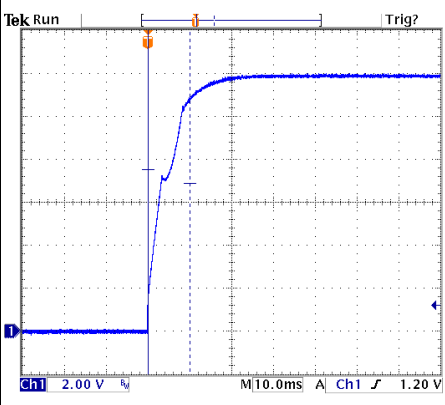
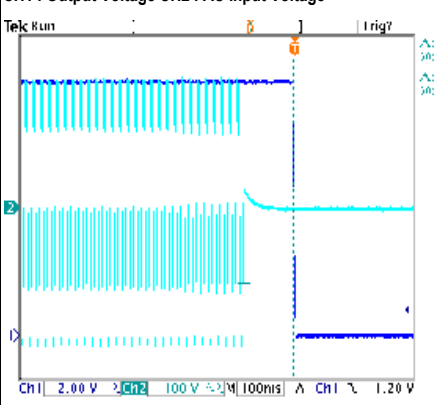
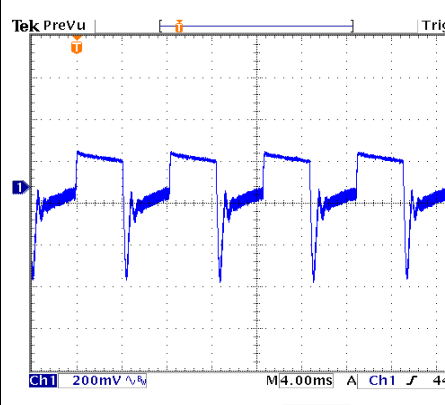
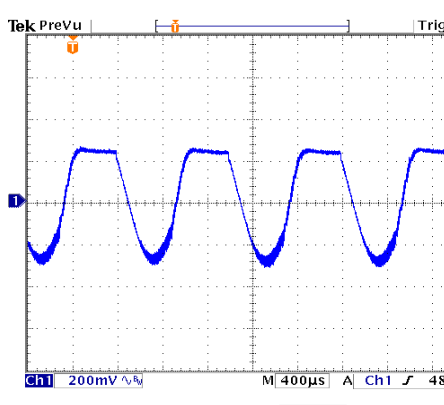
Safety Test
E.M.C. Test

■ RELIABILITY TEST

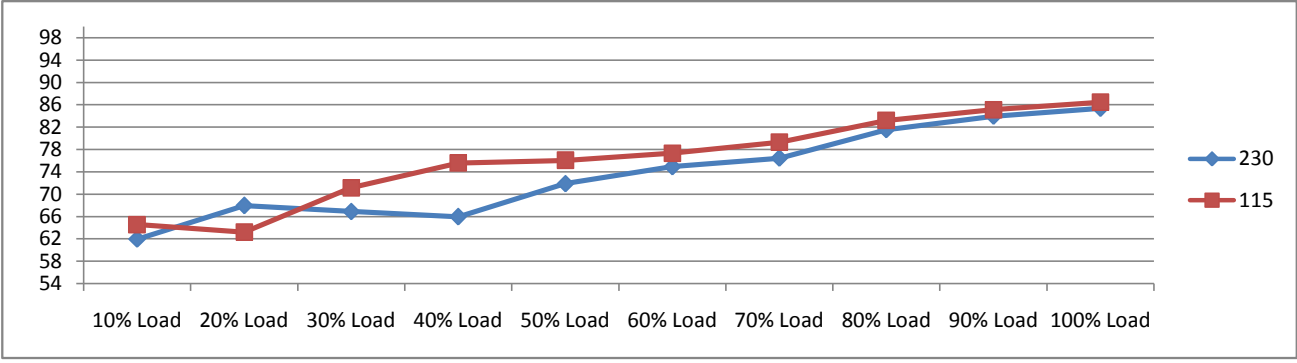
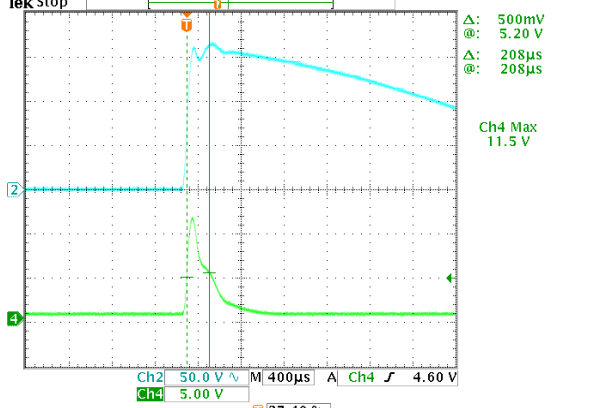
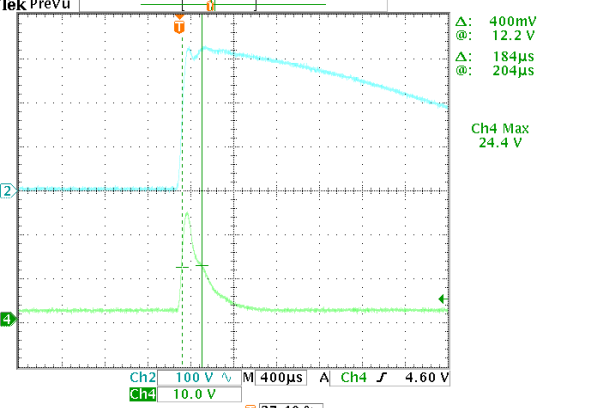
ENVIRONMENT TEST

DESIGN VERIFY TEST OUTPUT FUNCTION

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: -0.16% ~ 0.04.%
2	LINE REGULATION (MAX.)	V1 : 0.3% ~ -0.3%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA: 25°C	V1: -0.04% ~ 0.04%
3	LOAD REGULATION(MAX.)	V1 : 0.5% ~ -0.5%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: -0.16% ~ 0.00%
4	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 4.2 %
5	RIPPLE & NOISE(Max)	V1 : 150 mVp-p	I/P : 230VAC O/P: FULL LOAD TA: 25°C	V1 : 62 mVp-p
		high frequency:		low frequency:
		 Ch1 Pk-Pk 57.6mV 15 Jun 2017 11:26:56		 Ch1 Pk-Pk 62.0mV 15 Jun 2017 11:26:08
6	SET UP TIME (MAX.)	230VAC : 1000ms 115VAC : 1000ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 404ms 115VAC : 364ms
		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage
		 Δ: 52.0 V @: 4.00 V Δ: 404ms @: -392ms 15 Jun 2017 11:26:56		 Δ: 96.0 V @: -8.00 V Δ: 364ms @: -352ms 15 Jun 2017 11:26:08

7	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 10.0ms 115VAC : 10.6ms
		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		
8	HOLD UP TIME (TYP.)	230VAC : 40ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	230VAC : 126.0ms 115VAC : 28.0ms
		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		
9	DYNAMIC LOAD	V1 : 1200 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). 632mv (2). 580mv unit:mVp-p
		FULL /MIN LOAD 50%DUTY / 120HZ 		
9		FULL /MIN% LOAD 50%DUTY / 1KHZ 		

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℃	50.0VAC ~ 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℃	TEST : OK
3	INPUT CURRENT (TYP.)	0.1A / 230VAC 0.2A / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25℃	I= 0.051A / 230VAC I= 0.084A / 115VAC
4	LEAKAGE CURRENT	< 0.08mA	I/P : 240VAC O/P : MIN LOAD TA : 25℃	0.0272 mA
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P : 230VAC O/P : MIN LOAD TA : 25℃	< 0.051 W
6	EFFICIENCY (TYP.)	80.0%	I/P : 230VAC O/P : FULL LOAD TA : 25℃	80.42 %
				
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℃	I= 24.4A / 230VAC I= 11.5A / 115VAC T50= 204.0us / 230VAC
		INPUT=230VAC/50HZ @ FULL LOAD INPUT=115VAC/50HZ @ FULL LOAD CH2 : AC Input Voltage CH4 : Input current (1V=1A) CH2 : AC Input Voltage CH4 : Input current (1V=1A)		
				


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	148.70% 264VAC 144.70% 230VAC 140.40% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	13.80V ~ 16.20V	Ta: 25°C	15.20V 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). 486.00V (2). 448.00V (3). 486.00V
2	O/P Diode	D100 Rated : 100V 10.0A	I/P : 267VAC VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue	D100 VDS : (1). 80.40V (2). 68.00V (3). 82.00V
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). 400.00V (2). 400.00V (3). 400.00V (4). 398.00V
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). 17.10V (2). 17.10V (3). 17.10V (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). 462.00V (2). 460.00V

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: 0.06mA 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 : MPM-05-24				
		1. ROOM AMBIENT BURN-IN : 1.0hrs				
		IP: 230VAC O/P: 100% LOAD TA= 27.9℃				
		2. HIGH AMBIENT BURN-IN : 1.0hrs				
		IP: 230VAC O/P: 100% LOAD TA= 60.5℃				
		NO. Position	ROOM AMBIENT 27.9℃	HIGH AMBIENT Ta: 60.5℃		
		1 C4	47.7℃	71.5℃		
		2 C5	49.5℃	72.7℃		
		3 C37	47.7℃	71.6℃		
		4 R1	48.4℃	72.0℃		
		5 U1	58.2℃	80.3℃		
		6 T1	51.6℃	74.5℃		
		7 C101	44.5℃	69.7℃		
2	OVER LOAD BURN-IN TEST	NO DAMAGE	I/P : 230VAC	TEST : OK		
		1 HOUR (MIN)	O/P : 136.09% LOAD			
			Ta : 25℃			
		3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE	I/P : 264VAC / 100VAC	TEST : OK
				1 HOUR (MIN)	O/P : FULL LOAD	
					Ta : -45.0℃	
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60℃	I/P : 272VAC	TEST : OK		
		NO DAMAGE	O/P : FULL LOAD			
5	TEMPERATURE COEFFICIENT	±0.03% /(0℃~60℃)	I/P : 230VAC	±0.0013% /(0℃~60℃)		
			O/P : FULL LOAD			
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -50℃ ~ 125℃	TEST : OK			
		2. Temperature change rate : 25℃ / MIN				
		3. Dwell time low and high temperature : 30 MIN/EACH				
		4. Total test cycle : 100 CYCLE				
		5. Input/Output condition : STATIC				
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45℃ ~ +65℃	TEST : OK			
		2. Temperature change rate : 25℃ / 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				
8	VIBRATION TEST	1 Carton & 1 Set	TEST : OK			
		(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℃				



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).	699926.4 HRS
		(2) I/P : 230VAC	O/P : FULL LOAD	Ta= 60.0℃	LIFE TIME	(2).	52358.4 HRS
		(3) I/P : 230VAC	O/P : 75% LOAD	Ta= 60.0℃	LIFE TIME	(3).	71569.2 HRS
		(4) I/P : 230VAC	O/P : 50% LOAD	Ta= 60.0℃	LIFE TIME	(4).	111788.2 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 1799.5K hrs min. MIL-HDBK-217F (25℃)					
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): Above 30000HRS @ TA 60℃					

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ