



TEST REPORT: MPM-05-5

5W Reliable Green Medical Encapsulated Type

■ DESIGN VERIFY TEST

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

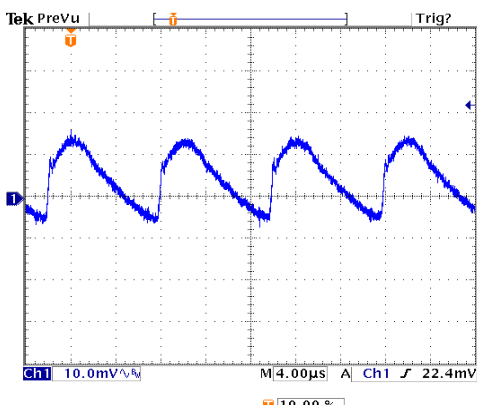
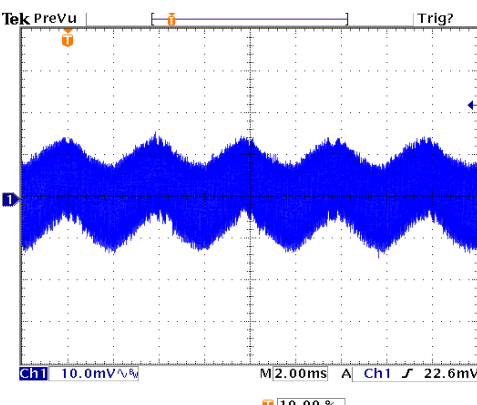
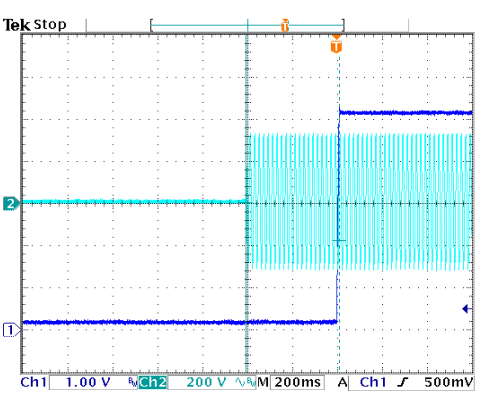
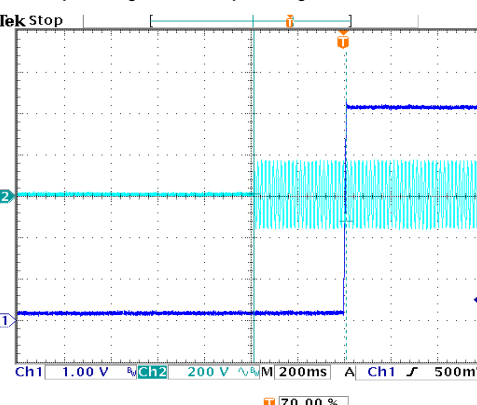
■ SAFETY & E.M.C. TEST

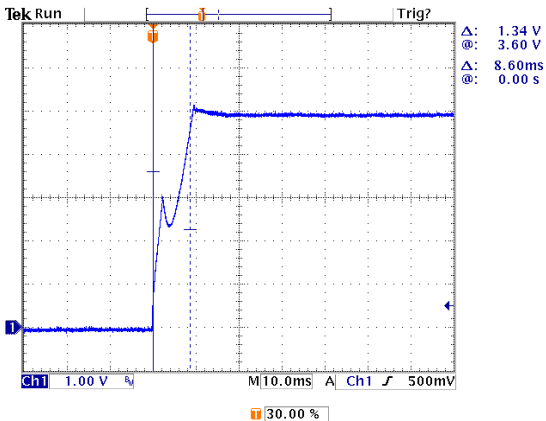
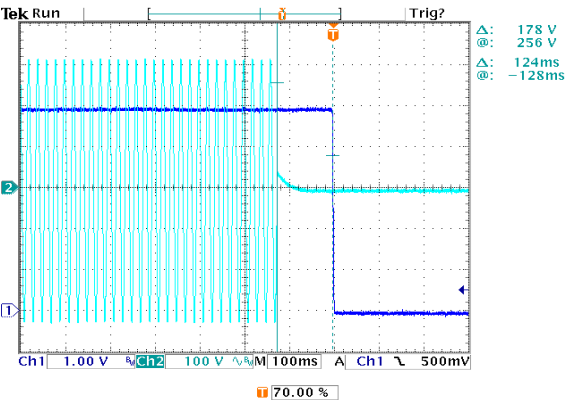
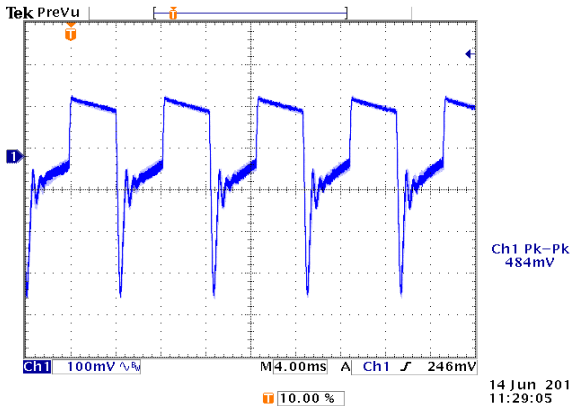
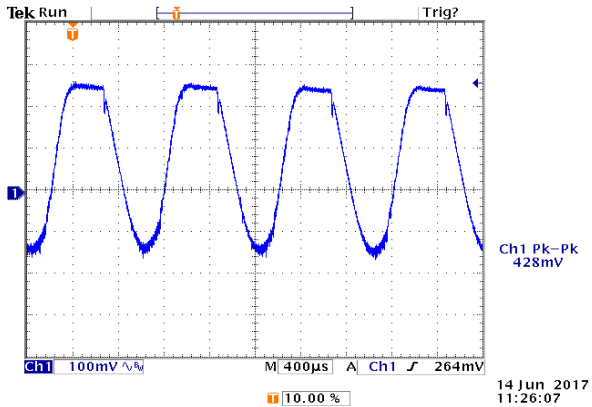
Safety Test
E.M.C. Test

■ RELIABILITY TEST

ENVIRONMENT TEST

DESIGN VERIFY TEST OUTPUT FUNCTION

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: 0.20% ~ -0.12%
2	LINE REGULATION (MAX.)	V1 : 0.3% ~ -0.3%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25°C	V1: 0.20% ~ 0.00%
3	LOAD REGULATION(MAX.)	V1 : 0.5% ~ -0.5%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA : 25°C	V1: 0.20% ~ -0.12%
4	OVER/UNDERSHOOT TEST	< ±10%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	TEST< 3.7 %
5	RIPPLE & NOISE(Max)	V1 : 100 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25°C	V1 : 30.2 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 : 416ms 115VAC : 396ms
		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 	

7	RISE TIME (MAX.)	230VAC : 30ms 115VAC : 30ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 8.6ms 115VAC : 9.4ms
		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 : 124.0ms 115VAC : 26.0ms
		INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage 		
9	DYNAMIC LOAD	V1 : 1000 mVp-p	I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA: 25°C	V1: (1). 484mv (2). 428mv unit:mVp-p
		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	80VAC ~ 264VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	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°C	TEST : OK																														
3	INPUT CURRENT (TYP.)	0.1A / 230VAC 0.2A / 115VAC	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C	I= 0.05A / 230VAC I= 0.082A / 115VAC																														
4	LEAKAGE CURRENT	< 0.08mA	I/P : 240VAC O/P: MIN LOAD TA : 25°C	0.028 mA																														
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P : 230VAC O/P: MIN LOAD TA : 25°C	0.0633 W																														
6	EFFICIENCY (TYP.)	80.0%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	81.8 %																														
			<table><caption>Efficiency Data (Approximate from Graph)</caption><thead><tr><th>Load (%)</th><th>230V Efficiency (%)</th><th>115V Efficiency (%)</th></tr></thead><tbody><tr><td>10%</td><td>58</td><td>66</td></tr><tr><td>20%</td><td>58</td><td>70</td></tr><tr><td>30%</td><td>66</td><td>72</td></tr><tr><td>40%</td><td>70</td><td>75</td></tr><tr><td>50%</td><td>74</td><td>78</td></tr><tr><td>60%</td><td>75</td><td>80</td></tr><tr><td>70%</td><td>76</td><td>80</td></tr><tr><td>80%</td><td>78</td><td>81</td></tr><tr><td>90%</td><td>79</td><td>81</td></tr><tr><td>100%</td><td>81.8</td><td>82</td></tr></tbody></table>		Load (%)	230V Efficiency (%)	115V Efficiency (%)	10%	58	66	20%	58	70	30%	66	72	40%	70	75	50%	74	78	60%	75	80	70%	76	80	80%	78	81	90%	79	81
Load (%)	230V Efficiency (%)	115V Efficiency (%)																																
10%	58	66																																
20%	58	70																																
30%	66	72																																
40%	70	75																																
50%	74	78																																
60%	75	80																																
70%	76	80																																
80%	78	81																																
90%	79	81																																
100%	81.8	82																																
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= 24.4A / 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)																																
Δ: 400mV @: 12.2 V Δ: 184μs @: 204μs Ch4 Max 24.4 V Ch2 100 V Ch4 10.0 V 4.60 V 37.40 % Δ: 500mV @: 5.20 V Δ: 208μs @: 208μs Ch4 Max 11.5 V Ch2 50.0 V Ch4 5.00 V 4.60 V 37.40 %																																		



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	144.50% 264VAC 142.00% 230VAC 140.60% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	5.80V ~ 6.80V	Ta: 25°C	6.30V 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 Ta: 25°C	O.T.P. Active OK 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 OK 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). 492.00V (2). 450.00V (3). 490.00V
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 Ta : 25°C	D100 VDS : (1). 38.80V (2). 42.00V (3). 37.20V
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). 390.00V (2). 388.00V (3). 390.00V (4). 388.00V
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). 19.40V (2). 19.20V (3). 18.80V (4). 19.00V
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). 466.00V (2). 468.00V

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: 0.59mA 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-05-5				
		1. ROOM AMBIENT BURN-IN :	1.0hrs				
		IP: 230VAC	O/P: 100% LOAD	TA= 27.9°C			
		2. HIGH AMBIENT BURN-IN :	1.0hrs				
		IP: 230VAC	O/P: 100% LOAD	TA= 60.5°C			
		NO.	Position	ROOM AMBIENT 27.9°C	HIGH AMBIENT Ta: 60.5°C		
		1	C4	45.1°C	70.8°C		
		2	C5	46.2°C	71.2°C		
		3	C37	45.3°C	70.6°C		
		4	R1	44.4°C	70.1°C		
		5	U1	52.9°C	78.8°C		
		6	T1	48.1°C	72.7°C		
		7	C101	44.6°C	69.0°C		
2	OVER LOAD BURN-IN TEST	NO DAMAGE	I/P : 230VAC	TEST : OK			
		1 HOUR (MIN)	O/P : 147.0% LOAD				
			Ta : 25°C				
		3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE	I/P : 264VAC / 100VAC	TEST : OK	
				1 HOUR (MIN)	O/P : FULL LOAD		
					Ta : -45.0°C		
		4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS	I/P : 272VAC	TEST : OK	
IN CHAMBER ON	O/P : FULL LOAD						
CONTROL 60°C	Ta : 60°C						
5	TEMPERATURE COEFFICIENT	NO DAMAGE	HUMIDITY= 95.0% RH				
		±0.03% /°C (0~60°C)	I/P : 230VAC	±0.00% /°C (0~60°C)			
			O/P : FULL LOAD				
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -50°C ~ 125°C	TEST : OK				
		2. Temperature change rate : 25°C / MIN					
7	THERMAL SHOCK TEST	3. Dwell time low and high temperature : 30 MIN/EACH					
		4. Total test cycle : 100 CYCLE					
8	VIBRATION TEST	5. Input/Output condition : STATIC					
		1 Carton & 1 Set	TEST : OK				
9	VIBRATION TEST	(1) Waveform : Sine Wave					
		(2) Frequency : 10~500Hz					
10	VIBRATION TEST	(4) Acceleration : 5G					
		(5) Test Time : 60min in each axis (X.Y.Z)					
11	VIBRATION TEST	(6) Ta : 25°C					



9	CAPACITOR LIFE CYCLE	:SUPPOSE C101 IS THE MOST CRITICAL COMPONENT						
		(1) I/P : 230VAC	O/P : FULL LOAD	Ta= 25℃	LIFE TIME	(1).	951884.4	HRS
		(2) I/P : 230VAC	O/P : FULL LOAD	Ta= 60℃	LIFE TIME	(2).	148491.6	HRS
		(3) I/P : 230VAC	O/P : FULL LOAD	Ta= 60℃	LIFE TIME	(3).	172149.1	HRS
		(4) I/P : 230VAC	O/P : FULL LOAD	Ta= 60℃	LIFE TIME	(4).	182235.2	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): 30000HRS @ TA 60℃						

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ