



TEST REPORT: MPM-05-24

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

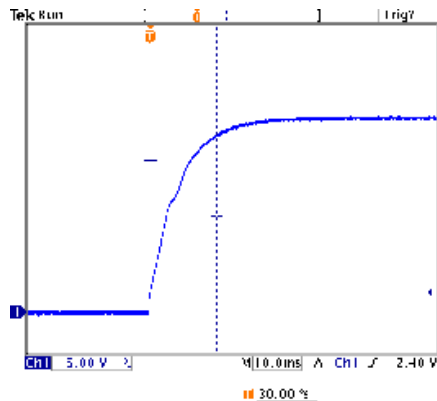
DESIGN VERIFY TEST OUTPUT FUNCTION

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: -0.05% ~ 0.20%
2	LINE REGULATION (MAX.)	V1 : 0.3% ~ -0.3%	I/P : 100VAC / 264VAC O/P: FULL LOAD TA : 25°C	V1: 0.00% ~ -0.03%
3	LOAD REGULATION(MAX.)	V1 : 0.5% ~ -0.5%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.00% ~ -0.03%
4	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230VAC O/P: FULL LOAD TA : 25°C	TEST< 2.1 %
5	RIPPLE & NOISE(Max)	V1 : 180 mVp-p	I/P : 230VAC O/P: FULL LOAD TA : 25°C	V1 : 50.4 mVp-p
		high frequency:		low frequency:
		Ch1 Pk-Pk 40.4mV	Ch1 Pk-Pk 50.4mV	
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 : 372ms
		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: 260 V @: -8.00 V Δ: 416ms @: -396ms	Δ: 116 V @: -12.0 V Δ: 372ms @: -350ms	

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
8	HOLD UP TIME (TYP.)	230VAC : 40ms 115VAC : 12ms	I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA: 25°C	230VAC : 62.0ms 115VAC : 12.2ms
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	V1: (1). 512mv (2). 496mv unit:mVp-p

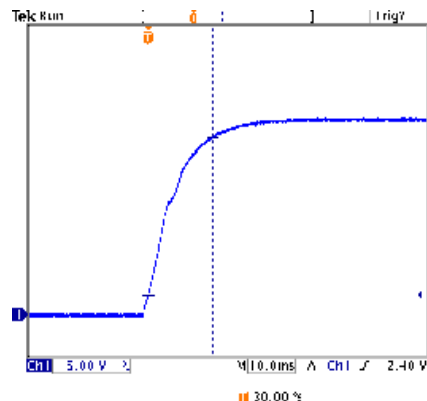
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage



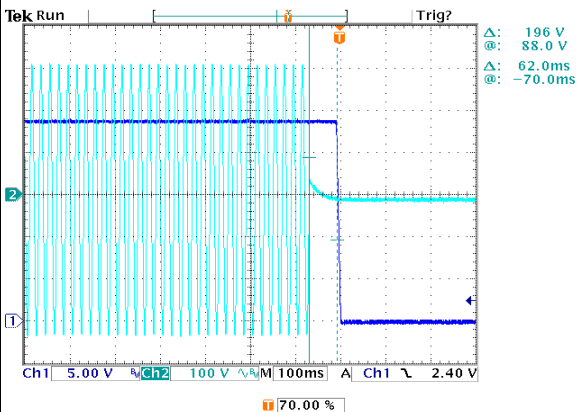
INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage



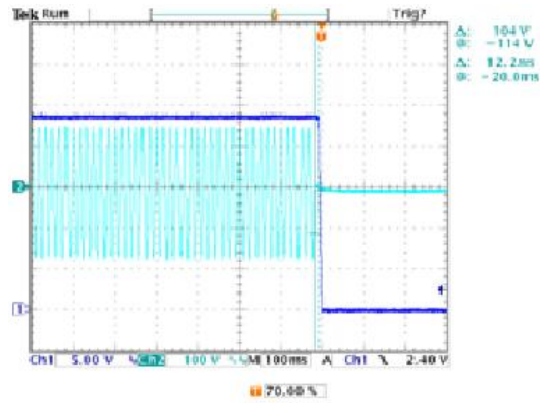
INPUT=230VAC/50HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

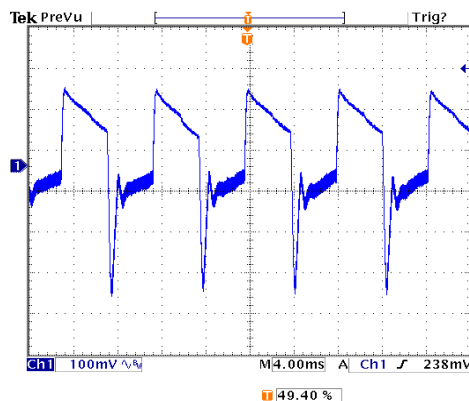


INPUT=115VAC/60HZ @ FULL LOAD

CH1 : Output Voltage CH2 : AC Input Voltage

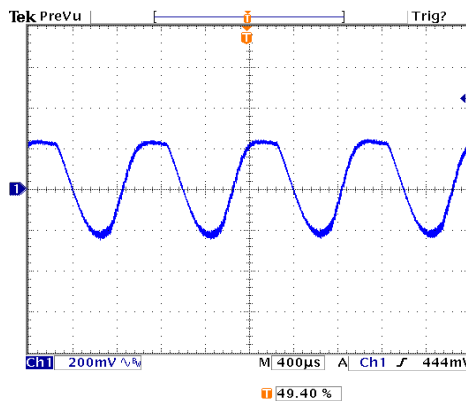


FULL /MIN LOAD 50%DUTY / 120HZ


Ch1 Pk-Pk
512mV

16 Jun 2017
09:32:07

FULL /MIN% LOAD 50%DUTY / 1KHZ


Ch1 Pk-Pk
496mV

15 Jun 2017
18:28:02

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)	52.0VAC ~ 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.)	0.1A / 230VAC 0.2A / 115VAC	I/P : 230VAC I/P : 115VAC O/P : FULL LOAD TA : 25°C	I= 0.055A / 230VAC I= 0.086A / 115VAC																																	
4	LEAKAGE CURRENT	< 0.08mA	I/P : 240VAC O/P : MIN LOAD TA : 25°C	0.0273 mA																																	
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.0665 W																																	
6	EFFICIENCY (TYP.)	82.0%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	85.37 %																																	
<table><caption>Efficiency Data (Approximate)</caption><thead><tr><th>Load (%)</th><th>230VAC Efficiency (%)</th><th>115VAC Efficiency (%)</th></tr></thead><tbody><tr><td>10%</td><td>65</td><td>65</td></tr><tr><td>20%</td><td>68</td><td>65</td></tr><tr><td>30%</td><td>68</td><td>72</td></tr><tr><td>40%</td><td>68</td><td>75</td></tr><tr><td>50%</td><td>72</td><td>75</td></tr><tr><td>60%</td><td>75</td><td>78</td></tr><tr><td>70%</td><td>78</td><td>80</td></tr><tr><td>80%</td><td>82</td><td>82</td></tr><tr><td>90%</td><td>84</td><td>84</td></tr><tr><td>100%</td><td>85</td><td>85</td></tr></tbody></table>					Load (%)	230VAC Efficiency (%)	115VAC Efficiency (%)	10%	65	65	20%	68	65	30%	68	72	40%	68	75	50%	72	75	60%	75	78	70%	78	80	80%	82	82	90%	84	84	100%	85	85
Load (%)	230VAC Efficiency (%)	115VAC Efficiency (%)																																			
10%	65	65																																			
20%	68	65																																			
30%	68	72																																			
40%	68	75																																			
50%	72	75																																			
60%	75	78																																			
70%	78	80																																			
80%	82	82																																			
90%	84	84																																			
100%	85	85																																			
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= 24.8A / 230VAC I= 11.5A / 115VAC T50= 192.0us / 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)																																					
Ch2 Max 24.8 V Ch2 Max 11.5 V																																					



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	132.10% 264VAC 132.20% 230VAC 120.10% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	27.60V ~ 32.40V	TA: 25°C	29.20V 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). 452.00V (3). 488.00V
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). 188.00V (2). 216.00V (3). 194.00V
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). 368.00V (2). 368.00V (3). 370.00V (4). 366.00V
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). 19.80V (2). 19.80V (3). 19.60V (4). 19.20V
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). 442.00V (2). 440.00V

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: 0.60mA 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℃		
		8 D100 46.5℃ 71.3℃		
9 BD1 46.5℃ 70.8℃				
10 D2 56.8℃ 79.3℃				
60 TA 27.9℃ 60.5℃				
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230VAC O/P : 136.09% LOAD Ta : 25℃	TEST : OK
3	LOW TEMPERATURE TURN ON TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 264VAC / 100VAC O/P : FULL LOAD Ta : -45.0℃	TEST : OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 60℃ NO DAMAGE	I/P : 272VAC O/P : FULL LOAD Ta : 60℃ HUMIDITY= 95.0% RH	TEST : OK
5	TEMPERATURE COEFFICIENT	±0.03% /(0℃~60℃)	I/P : 230VAC O/P : FULL LOAD	±0.0013% /(0℃~60℃)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -50℃ ~ 125℃ 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		TEST : OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -45℃ ~ +65℃ 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		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℃		TEST : OK



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