



# TEST REPORT: MPM-30-5

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## 30W High 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



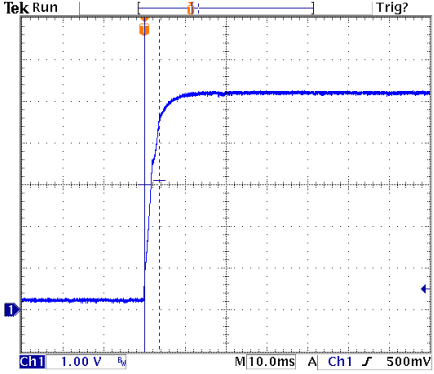
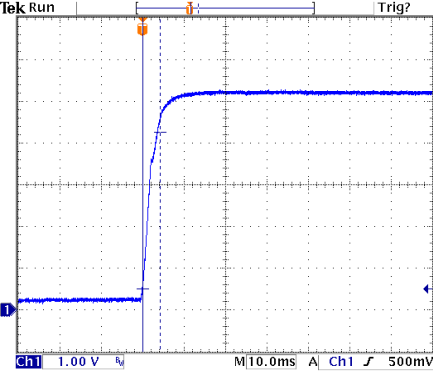
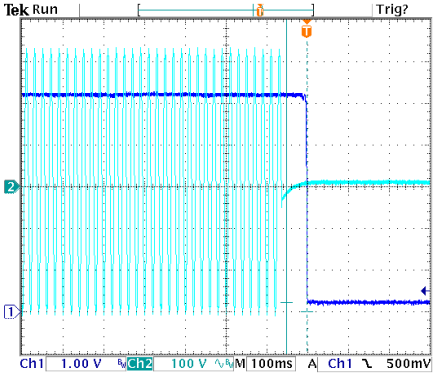
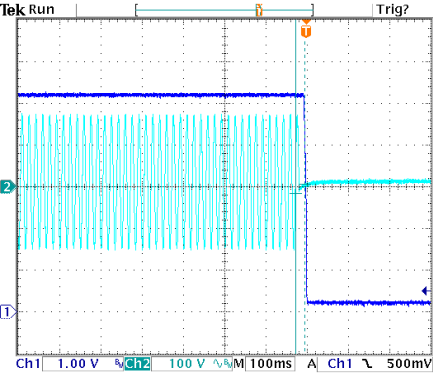
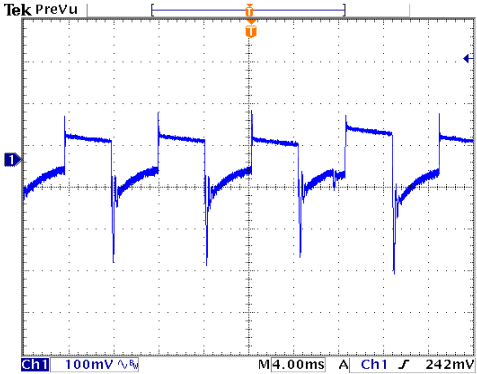
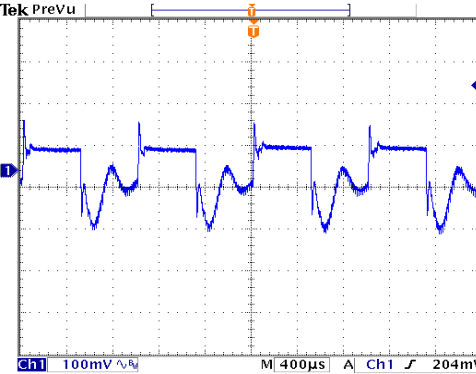
# 30W High Reliable Green Medical Encapsulated Type MPM-30 series

## 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: 0.10% ~ -0.10%
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 : 1.0% ~ -1.0%	I/P : 230VAC O/P: MIN LOAD ~ FULL LOAD TA: 25°C	V1: 0.10% ~ -0.10%
4	OVER/UNDERSHOOT TEST	< ±10%	I/P : 230VAC O/P: FULL LOAD TA: 25°C	TEST< 4.0 %
5	RIPPLE & NOISE(Max)	V1 : 80 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 : 74ms 115VAC : 58ms
		<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>	



# 30W High Reliable Green Medical Encapsulated Type MPM-30 series

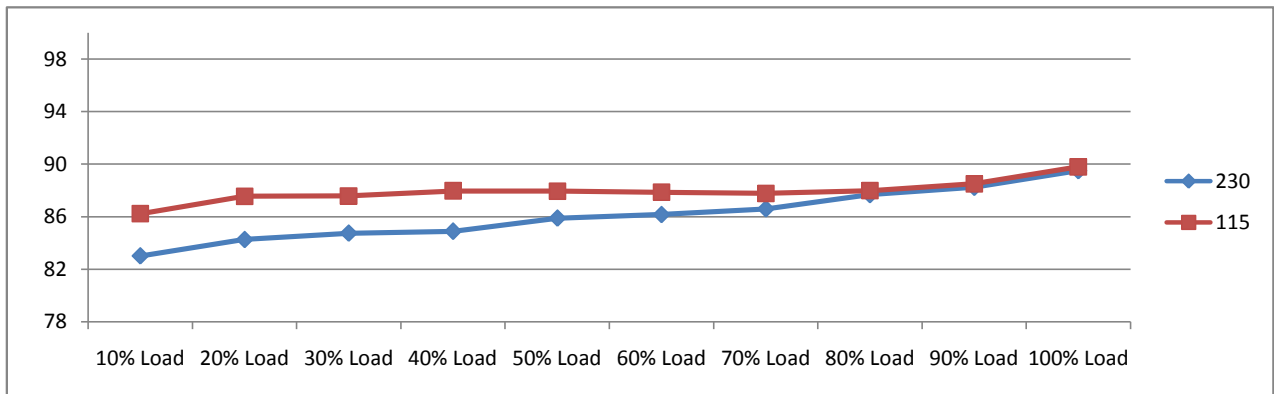
<p>RISE TIME (MAX.)</p>	<p>230VAC : 30ms 115VAC : 30ms</p>	<p>I/P : 230VAC I/P : 115VAC TA : 25°C</p>	<p>230VAC : 3.6ms 115VAC : 4.2ms</p>
<p>7</p>	<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage</p>  <p>Δ: 100mV @: 3.00 V Δ: 3.60ms @: 0.00 s</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage</p>  <p>Δ: 3.76 V @: 500mV Δ: 4.20ms @: 0.00 s</p>
<p>8</p>	<p>HOLD UP TIME (TYP.)</p> <p>230VAC : 40ms 115VAC : 12ms</p>	<p>I/P : 230VAC I/P : 115VAC O/P: FULL LOAD TA : 25°C</p>	<p>230VAC : 50.0ms 115VAC : 22.0ms</p>
<p>9</p>	<p>INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>  <p>Δ: 22.0 V @: -27.8 V Δ: 50.0ms @: -52.0ms</p>		<p>INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH2 : AC Input Voltage</p>  <p>Δ: 22.0 V @: -16.0 V Δ: 22.0ms @: -28.0ms</p>
<p>DYNAMIC LOAD</p>	<p>V1 : 1000 mVp-p</p>	<p>I/P : 230VAC O/P: (1)Full/Min load 50%duty/120HZ (2)Full/Min load 50%duty/1KHZ TA : 25°C</p>	<p>V1: (1). 392mv (2). 272mv unit:mVp-p</p>  <p>Ch1 Pk-Pk 392mV</p> <p>26 Jun 2017 11:53:33</p>
<p>FULL /MIN LOAD 50%DUTY / 120HZ</p>	<p>FULL /MIN% LOAD 50%DUTY / 1KHZ</p>  <p>Ch1 Pk-Pk 272mV</p> <p>26 Jun 2017 11:54:26</p>		<p>Ch1 Pk-Pk 272mV</p>



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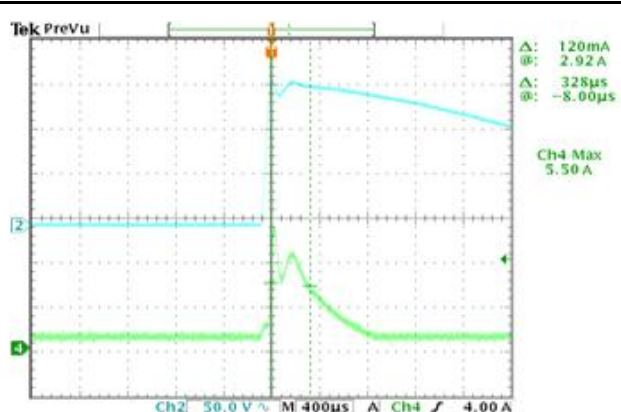
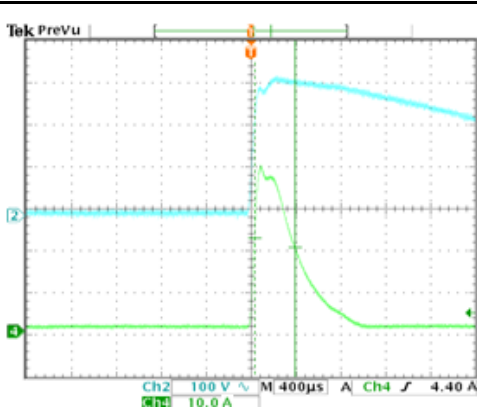
## INPUT FUNCTION TEST

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= 0.25A / 230VAC I= 0.47A / 115VAC
4	LEAKAGE CURRENT	< 80.00uA	I/P : 264VAC O/P : MIN LOAD TA : 25°C	Touch current 51.3 μA
5	NO LOAD POWER CONSUMPTION	< 0.075W	I/P : 230VAC O/P : MIN LOAD TA : 25°C	< 0.0721 W
6	EFFICIENCY (TYP.)	86.5%	I/P : 230VAC O/P : FULL LOAD TA : 25°C	89.5 %



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= 39.6A / 230VAC I= 5.5A / 115VAC T50= 360.0us / 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





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## 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	146.66% 264VAC 148.30% 230VAC 148.30% 100VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	5.30V ~ 6.80V	I/P: 264VAC I/P: 230VAC I/P: 80VAC O/P: MIN LOAD Ta: 25°C	6.45V 264VAC 6.42V 230VAC 6.39V 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). 456.00V (3). 458.00V
2	O/P MOSFET	Q100 Rated : 60V 60.0A	I/P : 267VAC  VDS : O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25°C	Q100 VDS : (1). 38.40V (2). 33.40V (3). 35.80V
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). 354.00V (2). 356.00V (3). 354.00V (4). 354.00V
4	Control IC	U1 Rated : 28V (max) -0.3 (min)  U100 Rated : 38V (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 U100 (1). 20.40V 26.80V (2). 13.80V 20.40V (3). 20.80V 26.20V (4). 24.40V 28.40V (5). 18.20V 10.60V
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). 444.00V (2). 434.00V

## 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: 0.95mA 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



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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 AIR: 15KV / Contact: 8KV	I/P : 230VAC /50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY 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 : MPM-30-5 1. ROOM AMBIENT BURN-IN : 1.0hrs IP: 230VAC                      O/P: 100% LOAD                      TA= 29.2°C 2. HIGH AMBIENT BURN-IN : 1.0hrs IP: 230VAC                      O/P: 100% LOAD                      TA= 61.3°C	<table border="1"> <thead> <tr> <th>NO.</th> <th>Position</th> <th>ROOM AMBIENT 29.2°C</th> <th>HIGH AMBIENT Ta: 61.3°C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>52.4°C</td><td>81.9°C</td></tr> <tr><td>2</td><td>LF2</td><td>53.1°C</td><td>81.9°C</td></tr> <tr><td>3</td><td>C5</td><td>57.2°C</td><td>87.5°C</td></tr> <tr><td>4</td><td>C40</td><td>61.0°C</td><td>91.5°C</td></tr> <tr><td>5</td><td>BD1</td><td>63.1°C</td><td>92.6°C</td></tr> <tr><td>6</td><td>R40</td><td>69.8°C</td><td>99.2°C</td></tr> <tr><td>7</td><td>T1</td><td>66.4°C</td><td>97.9°C</td></tr> <tr><td>8</td><td>Q100</td><td>61.7°C</td><td>93.1°C</td></tr> <tr><td>9</td><td>C105</td><td>65.0°C</td><td>96.5°C</td></tr> <tr><td>10</td><td>L100</td><td>58.2°C</td><td>89.1°C</td></tr> <tr><td>11</td><td>Q1</td><td>63.4°C</td><td>93.8°C</td></tr> <tr><td>12</td><td>U1</td><td>61.1°C</td><td>90.7°C</td></tr> <tr><td>60</td><td>TA</td><td>29.2°C</td><td>61.3°C</td></tr> </tbody> </table>	NO.	Position	ROOM AMBIENT 29.2°C	HIGH AMBIENT Ta: 61.3°C	1	LF1	52.4°C	81.9°C	2	LF2	53.1°C	81.9°C	3	C5	57.2°C	87.5°C	4	C40	61.0°C	91.5°C	5	BD1	63.1°C	92.6°C	6	R40	69.8°C	99.2°C	7	T1	66.4°C	97.9°C	8	Q100	61.7°C	93.1°C	9	C105	65.0°C	96.5°C	10	L100	58.2°C	89.1°C	11	Q1	63.4°C	93.8°C	12	U1	61.1°C	90.7°C	60	TA	29.2°C	61.3°C	
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12	U1	61.1°C	90.7°C																																																									
60	TA	29.2°C	61.3°C																																																									
2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR ( MIN )	I/P : 230VAC O/P : 159.0% 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	±0.0062% /°C(0~60°C)																																																								
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -50°C~ +125°C 2. Temperature change rate : 25°C / 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°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																																																								



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8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10~500Hz (4) Acceleration : 2G (Blank) /5G (ST) (5) Test Time : 60min in each axis (X,Y,Z) (6) Ta : 25°C	TEST : OK
9	CAPACITOR LIFE CYCLE	:SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25°C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 60°C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 60°C LIFE TIME (4) I/P : 230VAC O/P : 50% LOAD Ta= 60°C LIFE TIME	(1). 215470.2 HRS (2). 30493.9 HRS (3). 34062.7 HRS (4). 54721 HRS
10	MTBF	Conducted by Parts Stress Analysis Prediction 6325.8K hrs min. Telcordia SR-332 (Bellcore) ; 778.9K hrs min. MIL-HDBK-217F (25°C)	
11	DMTBF /Accelerated Life test	Demonstration Mean Time Between Failure (Expected Life): 30000HRS @ TA 60°C	

TEST RESULT	TESTER	REVIEW	APPROVAL
PASS	LIUTT		WANGDZ