



Test Report: MSP-600-5

600W Single Output Medical 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 TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	RIPPLE & NOISE	V1 : 150 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 122 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 4.3 V- 5.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	4.2 V- 6.045 V/ 230 VAC 4.2 V- 6.042 V/ 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 2 %- -2 % (Max)	I/P : 100 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.74 %- -0.74 %	P
4	LINE REGULATION	V1 : 0.5 %- -0.5 % (Max)	I/P : 100 VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.23 %- -0.23 %	P
5	LOAD REGULATION	V1 : 1 %- -1 % (Max)	I/P : 230 VAC O/P : FULL -MIN LOAD Ta : 25°C	V1 : 0.61 %- -0.61 %	P
6	SET UP TIME	230VAC : 1000 ms (Max) 115 VAC : 2500 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 484 ms 115VAC/ 968 ms	P
7	RISE TIME	230VAC : 50 ms (Max) 115VAC : 50 ms (Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 17.4 ms 115VAC/ 17.46 ms	P
8	HOLD UP TIME	230VAC : 16 ms (TYP) 115VAC : 16 ms(TYP)	I/P : 230 VAC I/P : 115VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 16.5 ms 115VAC/ 16 ms	P
9	OVER/UNDERSHOOT TEST	< ±5%	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	TEST : < 5 %	P
10	DYNAMIC LOAD	V1 : 1000 mVp-p	I/P : 230 VAC O/P : FULL /Min LOAD 90%DUTY/1KHZ Ta : 25°C	738 mVp-p	P

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	INPUT VOLTAGE RANGE	85VAC-264 VAC	I/P : TESTING O/P : FULL LOAD Ta : 25°C	59.4 V-264V	P
			I/P : LOW-LINE-3V= 97 V HIGH-LINE+15%=300 V O/P : FULL/MIN LOAD ON : 30 Sec . OFF : 30 Sec 10MIN (AC POWER ON/OFF NO DAMAGE)	TEST : OK	
2	INPUT FREQUENCY RANGE	47HZ -63 HZ NO DAMAGE OSC	I/P : 100 VAC ~ 264 VAC O/P : FULL-MIN LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.93 / 230 VAC(TYP) 0.99 / 115 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.956 / 230 VAC PF= 0.99 / 115 VAC	P
4	EFFICIENCY	82% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	82.6 %	P
5	INPUT CURRENT	230V/ 3.6 A (TYP) 115V/ 7.6 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 3.486 A/ 230 VAC I = 7.09 A/ 115 VAC	P
6	INRUSH CURRENT	230V/ 70 A (TYP) 115V/ 35 A(TYP) COLD START	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 70 A/ 230 VAC I = 35 A/ 115 VAC	P
7	LEAKAGE CURRENT	< 300 uA/ for earth leakage current	I/P: 264 VAC O/P:Min LOAD Ta:25°C	L-FG 297 uA N-FG 297 uA	P
		< 100 uA/ for touch leakage current	I/P: 264 VAC O/P:Min LOAD Ta:25°C	L-V+ 81 uA L-V- 81 uA N-V+ 81 uA N-V- 81 uA	
8	No load power consumption	< 0.8 W	I/P : 230 VAC O/P : NO LOAD RC+&RC- SHORT Ta : 25°C	0.71 W	P

PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	OVER LOAD PROTECTION	105 %~ 135 %	I/P : 230 VAC I/P : 115 VAC O/P : TESTING Ta : 25°C	123 %/ 230 VAC 123 %/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 6V~ 7 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	6.8V/ 230 VAC 6.8V/ 115 VAC Shut down Re- power ON	P
3	OVER TEMPERATURE PROTECTION	SPEC : NO DAMAGE	I/P : 230 VAC O/P : FULL LOAD	O.T.P Active Shut down o/p voltage, recovers automatically after temperature goes down	P
4	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P : 264 VAC O/P : FULL LOAD Ta : 25°C	NO DAMAGE Constant current limiting, recovers automatically after fault condition is removed	P

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	DC OK SIGNAL	PSU turn on : 3.3 ~ 5.6V ; PSU turn off : 0 ~ 1V	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	PSU turn on : 5.187 V PSU turn off : -0.066 V	P
2	REMOTE CONTROL	Rc+ / Rc- 4 ~ 10V or open = power on 0 ~ 0.8V or short = power off	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	3.55 V ~ 104 V POWER ON 0 V ~ 3 V POWER OFF	P
3	REMOTE SENSE	>0.5V	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	> 0.5 V	P
4	AUX POWER	4.75V~5.25V / 0.3A Ripple : 50mV	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	4.995V/0.3A Ripple : 16 mv	P
5	FAN ON/OFF control test	----	I/P : 230 VAC O/P : TESTING Ta : 25°C	> 35 %LOAD FAN ON < 28 %LOAD FAN OFF	P

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																																																
1	TEMPERATURE RISE TEST	MODEL : MSP-600-5 1. ROOM AMBIENT BURN-IN : 1.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 31 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50 °C	<table border="1"> <thead> <tr> <th>NO</th> <th>Position</th> <th>ROOM AMBIENT Ta= 31 °C</th> <th>HIGH AMBIENT Ta=50 °C</th> </tr> </thead> <tbody> <tr><td>1</td><td>LF1</td><td>31.5°C</td><td>52.9°C</td></tr> <tr><td>2</td><td>BD1</td><td>40.2°C</td><td>61.0°C</td></tr> <tr><td>3</td><td>L3</td><td>36.8°C</td><td>58.0°C</td></tr> <tr><td>4</td><td>Q1</td><td>37.3°C</td><td>58.3°C</td></tr> <tr><td>5</td><td>D1</td><td>45.5°C</td><td>66.7°C</td></tr> <tr><td>6</td><td>C5</td><td>30.7°C</td><td>50.6°C</td></tr> <tr><td>7</td><td>C18</td><td>37.4°C</td><td>58.6°C</td></tr> <tr><td>8</td><td>TSW1</td><td>32.7°C</td><td>53.1°C</td></tr> <tr><td>9</td><td>U1</td><td>33.5°C</td><td>54.5°C</td></tr> <tr><td>10</td><td>T1</td><td>61.3°C</td><td>84.8°C</td></tr> <tr><td>11</td><td>Q3</td><td>41.9°C</td><td>63.8°C</td></tr> <tr><td>12</td><td>Q100</td><td>56.0°C</td><td>80.1°C</td></tr> <tr><td>13</td><td>L100</td><td>61.7°C</td><td>85.9°C</td></tr> <tr><td>14</td><td>C106</td><td>35.3°C</td><td>57.0°C</td></tr> <tr><td>15</td><td>C150</td><td>41.4°C</td><td>63.8°C</td></tr> <tr><td>16</td><td>RG1</td><td>36.5°C</td><td>58.1°C</td></tr> <tr><td>17</td><td>C152</td><td>36.2°C</td><td>58.2°C</td></tr> <tr><td>18</td><td>HS3</td><td>46.8°C</td><td>70.5°C</td></tr> <tr><td>19</td><td>T900</td><td>33.0°C</td><td>53.7°C</td></tr> <tr><td>20</td><td>L900</td><td>31.2°C</td><td>51.9°C</td></tr> <tr><td>21</td><td>ZD900</td><td>35.8°C</td><td>56.9°C</td></tr> <tr><td>22</td><td>D22</td><td>43.0°C</td><td>66.1°C</td></tr> <tr><td>23</td><td>C956</td><td>34.7°C</td><td>56.1°C</td></tr> <tr><td>24</td><td>C911</td><td>30.9°C</td><td>51.5°C</td></tr> <tr><td>25</td><td>U900</td><td>34.4°C</td><td>55.7°C</td></tr> <tr><td>26</td><td>Q103</td><td>61.2°C</td><td>84.9°C</td></tr> <tr><td>27</td><td>RTH1</td><td>30.0°C</td><td>50.5°C</td></tr> </tbody> </table>	NO	Position	ROOM AMBIENT Ta= 31 °C	HIGH AMBIENT Ta=50 °C	1	LF1	31.5°C	52.9°C	2	BD1	40.2°C	61.0°C	3	L3	36.8°C	58.0°C	4	Q1	37.3°C	58.3°C	5	D1	45.5°C	66.7°C	6	C5	30.7°C	50.6°C	7	C18	37.4°C	58.6°C	8	TSW1	32.7°C	53.1°C	9	U1	33.5°C	54.5°C	10	T1	61.3°C	84.8°C	11	Q3	41.9°C	63.8°C	12	Q100	56.0°C	80.1°C	13	L100	61.7°C	85.9°C	14	C106	35.3°C	57.0°C	15	C150	41.4°C	63.8°C	16	RG1	36.5°C	58.1°C	17	C152	36.2°C	58.2°C	18	HS3	46.8°C	70.5°C	19	T900	33.0°C	53.7°C	20	L900	31.2°C	51.9°C	21	ZD900	35.8°C	56.9°C	22	D22	43.0°C	66.1°C	23	C956	34.7°C	56.1°C	24	C911	30.9°C	51.5°C	25	U900	34.4°C	55.7°C	26	Q103	61.2°C	84.9°C	27	RTH1	30.0°C	50.5°C		P
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 118 % LOAD Ta : 25°C	TEST : OK	P																																																																																																																
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 230 VAC O/P : 100 % LOAD Ta= -40 °C	TEST : OK	P																																																																																																																
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 50 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 50 °C HUMIDITY= 95 %R.H	TEST : OK	P																																																																																																																
5	TEMPERATURE COEFFICIENT	± 0.03 %(0-50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0.01 %(0-50°C)	P																																																																																																																

6	VIBRATION TEST	1 Carton & 1 Set (1) Waveform : Sine Wave (2) Frequency : 10-500Hz (3) Sweep Time : 10min/sweep cycle (4) Acceleration : 5G (5) Test Time : 1 hour in each axis (X.Y.Z) (6) Ta : 25°C	TEST : OK	P
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SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	WITHSTAND VOLTAGE	I/P-O/P : 4 KVAC/min I/P-FG : 2 KVAC/min O/P-FG : 0.5 KVAC/min	I/P-O/P : 4.2 KVAC/min I/P-FG : 2.4 KVAC/min O/P-FG : 0.6 KVAC/min Ta : 25°C	I/P-O/P : 6.3 mA I/P-FG : 5.92 mA O/P-FG : 3.85 mA NO DAMAGE	P
2	ISOLATION RESISTANCE	I/P-O/P : 500VDC>100MΩ I/P-FG : 500VDC>100MΩ O/P-FG : 500VDC>100MΩ	I/P-O/P : 500 VDC I/P-FG : 500 VDC O/P-FG : 500 VDC Ta : 25°C / 70%RH	I/P-O/P : 304 GΩ I/P-FG : 15.8 GΩ O/P-FG : 304 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	11 mΩ	P

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2,-3 CLASS A CLASS D	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	PASS	P
2	CONDUCTION	EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL/50% LOAD Ta : 25°C	PASS Test by certified Lab	P
3	RADIATION	EN55011 CLASS B	I/P : 230 VAC (50HZ) O/P : FULL LOAD Ta : 25°C	PASS Test by certified Lab	P
4	E.S.D	EN61000-4-2 INDUSTRY AIR : 8KV / Contact : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
5	E.F.T	EN61000-4-4 INDUSTRY INPUT : 2KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
6	SURGE	IEC61000-4-5 INDUSTRY L-N : 2KV L,N-PE : 4KV	I/P : 230 VAC/50HZ O/P : FULL LOAD Ta : 25°C	CRITERIA A	P
7	Test by certified Lab & Test Report Prepare				

M.T.B.F & LIFE CYCLE CALCULATION

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	CAPACITOR LIFE CYCLE	MSP-600-5 : SUPPOSE C106 IS THE MOST CRITICAL COMPONENT I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME= 2114922.6 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50 °C LIFE TIME= 310081.8 HRS			P
2	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 138.7K HRS			P
3	Ongoing Reliability Test	I/P : 230VAC O/P : FULL LOAD TA=50°C Demonstration Mean Time Between Failure : 50,000 hours			P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q3 Rated : 20.7A/600V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short Ta : 25°C	(1) 480 V (2) 464 V	P
2	Diode Peak Voltage	Q100 Rated : 80A/30V Q103 Rated : 80A/30V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short Ta : 25°C	(1) 21.8 V (2) 21 V (1) 28 V (2) 27 V	P
3	Input Capacitor Voltage	C5 Rated 470u/400V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 376.7 V (2) 380.6 V (3) 380.8 V	P
4	Control IC Voltage Test	U1 Rated : 10V~20V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on /Off (2) Min load Turn on /Off (3)Full Load /Min load Change Ta : 25°C	(1) 14.231 V (2) 14.023 V (3) 14.051 V	P
5	P.F.C Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : 20A/500V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short Ta : 25°C	(1) 492 V (2) 426 V	P

SAMPLE	TESTER	REVIEW	APPROVAL
PRODUCT SAMPLE	DANIEL GAO	SANFORD SU	VINCENT TSENG

12.10.30 A50-F031