



Test Report: MSP-600-24

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 : 116 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 21.6 V~ 28.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	20.29 V~ 30.46 V/ 230 VAC 20.29 V~ 30.46 V/ 115 VAC	P
3	OUTPUT VOLTAGE TOLERANCE	V1 : 1 %~ -1 % (Max)	I/P : 100 VAC / 264 VAC O/P : FULL/ MIN LOAD Ta : 25°C	V1 : 0.2 %~ -0.2 %	P
4	LINE REGULATION	V1 : 0.2 %~ -0.2 % (Max)	I/P : 100 VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.05 %~ -0.05 %	P
5	LOAD REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.08 %~ -0.08 %	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/ 541 ms 115VAC/ 1082 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/ 23 ms 115VAC/ 23 ms	P
8	HOLD UP TIME	230VAC : 16 ms (TYP) 115VAC : 16 ms (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 21 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 : 2400 mVp-p	I/P : 230 VAC O/P : FULL /Min LOAD 90%DUTY/1KHZ Ta : 25°C	1581 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	51 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	0.94 / 230 VAC(TYP) 0.99 / 115 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.957 / 230 VAC PF= 0.998 / 115 VAC	P
4	EFFICIENCY	88% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	88.7 %	P
5	INPUT CURRENT	230V/ 5 A (TYP) 115V/ 8.5 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 3.34 A/ 230 VAC I = 6.64 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 = 61 A/ 230 VAC I = 31 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	117 %/ 230 VAC 117 %/ 115 VAC Constant current limiting, recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 30V~ 34.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	32.76 V/ 230 VAC 32.72 V/ 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 : 5.191 V PSU turn off : 0 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	3.5V ~ 10 V POWER ON 0V ~ 3.4 V POWER OFF	P
3	CURRENT SHARING	PSU1-PSU2 < 10%	I/P : 230 VAC O/P : 90% LOAD / 50% LOAD Ta : 25°C	O/P : 90% PSU1 : 745 W PSU2 : 747 W PSU3 : 746 W PSU4 : 732 W O/P : 50% PSU1 : 369 W PSU2 : 368 W PSU3 : 374 W PSU4 : 365 W	P
4	REMOTE SENSE	>0.5V	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	> 0.5V	P
5	AUX POWER	4.75V~5.25V / 0.3A Ripple : 50mV	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	4.94V/0.3A Ripple : 39 mv	P
6	No load power consumption	<0.75W	I/P : 230 VAC O/P : O/P:NO LOAD RC+&RC- SHORT Ta : 25°C	0.67W	P
7	FAN ON/OFF control test	----	I/P : 230 VAC O/P : TESTING Ta : 25°C	> 28.1%LOAD FAN ON < 25.18 %LOAD FAN OFF	P

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																																																
1	TEMPERATURE RISE TEST	<div>MODEL : MSP-600-24</div> <div>1. ROOM AMBIENT BURN-IN : 1 HRS</div> <div>I/P : 230VAC O/P : FULL LOAD Ta= 29.2 °C</div> <div>2. HIGH AMBIENT BURN-IN : 2 HRS</div> <div>I/P : 230VAC O/P : FULL LOAD Ta= 58.4 °C</div> <table><thead><tr><th>NO</th><th>Position</th><th>ROOM AMBIENT Ta= 29.2 °C</th><th>HIGH AMBIENT Ta=58.4 °C</th></tr></thead><tbody><tr><td>1</td><td>LF1</td><td>32.8°C</td><td>60.0°C</td></tr><tr><td>2</td><td>BD1</td><td>42.4°C</td><td>69.5°C</td></tr><tr><td>3</td><td>L3</td><td>40.1°C</td><td>68.1°C</td></tr><tr><td>4</td><td>Q1</td><td>33.5°C</td><td>66.8°C</td></tr><tr><td>5</td><td>D1</td><td>34.3°C</td><td>73.8°C</td></tr><tr><td>6</td><td>C5</td><td>56.3°C</td><td>61.0°C</td></tr><tr><td>7</td><td>C18</td><td>33.0°C</td><td>63.5°C</td></tr><tr><td>8</td><td>CN2</td><td>49.8°C</td><td>64.7°C</td></tr><tr><td>9</td><td>C61</td><td>54.7°C</td><td>60.9°C</td></tr><tr><td>10</td><td>U1</td><td>47.6°C</td><td>61.7°C</td></tr><tr><td>11</td><td>T1</td><td>40.7°C</td><td>84.8°C</td></tr><tr><td>12</td><td>T2</td><td>44.7°C</td><td>60.5°C</td></tr><tr><td>13</td><td>Q3</td><td>41.9°C</td><td>81.8°C</td></tr><tr><td>14</td><td>Q100</td><td>38.4°C</td><td>82.7°C</td></tr><tr><td>15</td><td>L100</td><td>39.2°C</td><td>76.4°C</td></tr><tr><td>16</td><td>C106</td><td>34.7°C</td><td>70.1°C</td></tr><tr><td>17</td><td>C150</td><td>34.8°C</td><td>75.1°C</td></tr><tr><td>18</td><td>RG1</td><td>33.2°C</td><td>71.8°C</td></tr><tr><td>19</td><td>C152</td><td>38.2°C</td><td>67.8°C</td></tr><tr><td>20</td><td>CN102</td><td>38.4°C</td><td>66.7°C</td></tr><tr><td>21</td><td>C231</td><td>34.9°C</td><td>62.2°C</td></tr><tr><td>22</td><td>C251</td><td>52.9°C</td><td>62.5°C</td></tr><tr><td>23</td><td>C235</td><td>29.2°C</td><td>60.5°C</td></tr><tr><td>24</td><td>T900</td><td>32.8°C</td><td>65.7°C</td></tr><tr><td>25</td><td>ZD900</td><td>38.4°C</td><td>66.3°C</td></tr><tr><td>26</td><td>U900</td><td>34.9°C</td><td>62.7°C</td></tr><tr><td>27</td><td>Q103</td><td>52.9°C</td><td>80.4°C</td></tr></tbody></table>			NO	Position	ROOM AMBIENT Ta= 29.2 °C	HIGH AMBIENT Ta=58.4 °C	1	LF1	32.8°C	60.0°C	2	BD1	42.4°C	69.5°C	3	L3	40.1°C	68.1°C	4	Q1	33.5°C	66.8°C	5	D1	34.3°C	73.8°C	6	C5	56.3°C	61.0°C	7	C18	33.0°C	63.5°C	8	CN2	49.8°C	64.7°C	9	C61	54.7°C	60.9°C	10	U1	47.6°C	61.7°C	11	T1	40.7°C	84.8°C	12	T2	44.7°C	60.5°C	13	Q3	41.9°C	81.8°C	14	Q100	38.4°C	82.7°C	15	L100	39.2°C	76.4°C	16	C106	34.7°C	70.1°C	17	C150	34.8°C	75.1°C	18	RG1	33.2°C	71.8°C	19	C152	38.2°C	67.8°C	20	CN102	38.4°C	66.7°C	21	C231	34.9°C	62.2°C	22	C251	52.9°C	62.5°C	23	C235	29.2°C	60.5°C	24	T900	32.8°C	65.7°C	25	ZD900	38.4°C	66.3°C	26	U900	34.9°C	62.7°C	27	Q103	52.9°C	80.4°C	P
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 116 % 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	± 0.004 %(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 : 6.33 mA I/P-FG : 5.38 mA O/P-FG : 4.21 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 : 26.4 GΩ I/P-FG : 19 GΩ O/P-FG : 30 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-600-24 : SUPPOSE C 106 I/P : 230VAC O/P : FULL LOAD Ta= 25 °C LIFE TIME= 2024763 HRS I/P : 230VAC O/P : FULL LOAD Ta= 50 °C LIFE TIME= 232873.8 HRS	IS THE MOST CRITICAL COMPONENT		P
2	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 138.7K HRS			P
3	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure(Expected Life) : Above 50,000 hours @ TA 50°C			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) 446 V (2) 512 V	P
2	Diode Peak Voltage	Q100 Rated : 20A/150V Q103 Rated : 20A/200V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short Ta : 25°C	(1) 101 V (2) 108 V (1) 152 V (2) 154 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) 377.5 V (2) 380.4 V (3) 380.5 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) 14.292 V (2) 14.532 V (3) 14.532 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) 470 V (2) 424 V	P

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

12.10.30 A50-F031