



Test Report: MSP-200-5

200W 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 : 90 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 36 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 4.3V ~ 5.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	4.084 V ~ 5.978 V/ 230 VAC 4.083 V ~ 5.977 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 : 0.4 %~ -0.4 %	P
4	LINE REGULATION	V1 : 0.5 %~ -0.5 % (Max)	I/P : 100VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.12 %~ -0.12 %	P
5	LOAD REGULATION	V1 : 1%~ -1 % (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.3 %~ -0.3 %	P
6	SET UP TIME	230VAC : 1000 ms (Max) 115VAC : 2500 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 160 ms 115VAC/ 320 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/ 32 ms 115VAC/ 29 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/ 51 ms 115VAC/ 51 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	450 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	69 V~264V	P
			I/P : LOW-LINE-3V= 82 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 : 85 VAC ~ 264 VAC O/P : FULL~MIN LOAD Ta : 25°C	TEST : OK	P
3	POWER FACTOR	0.95 / 230 VAC(TYP) 0.99 / 115 VAC(TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.959 / 230 VAC PF= 0.996 / 115 VAC	P
4	EFFICIENCY	84 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	85 %	P
5	INPUT CURRENT	230V/ 1.1 A (TYP) 115V/ 2.2 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 0.91 A/ 230 VAC I = 1.79 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 = 68 A/ 230 VAC I = 34 A/ 115 VAC	P
7	NO LOAD POWER CONSUMPTION	< 0.5W	I/P : 240 VAC O/P : NO LOAD RC+/RC- SHORT Ta : 25°C	0.22 W	P
8	LEAKAGE CURRENT	< 300 uA/ for earth leakage current	I/P: 264 VAC O/P:Min LOAD Ta:25°C	L-FG 208 uA N-FG 208 uA	P
		< 100 uA/ for touch leakage current	I/P: 264 VAC O/P:Min LOAD Ta:25°C	L-V+ 85 uA L-V- 85 uA N-V+ 85 uA N-V- 85 uA	

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	124 %/ 230 VAC 124 %/ 115 VAC Constant current limiting, Recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 6 V~ 7 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	6.22 V/ 230 VAC 6.22 V/ 115 VAC Shut down Re- power ON	P
3	OVER TEMPERATURE PROTECTION (optional)	SPEC : TSW1 : $95 \pm 5^{\circ}\text{C}$ O.T.P. detect on heatsink of power transistor TSW2 : $105 \pm 5^{\circ}\text{C}$ O.T.P. detect on main power output choke 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	P

CONTROL FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	REMOTE CONTROL	Rc+ / Rc- 0 V~ 0.8 V POWER OFF 4 V~ 10V POWER ON	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	0 V~ 2.6 V POWER ON 2.7 V~ 10 V POWER OFF	P
2	5V STANDBY	5VSB : 5V@0.3A ; tolerance $\pm 5\%$, ripple : 50mVp-p(max)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	5VSB : 4.907 V / 0.3A Ripple : 18 mV	P

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	Power Transistor (D to S) or (C to E) Peak Voltage	Q 3 Rated : 2SK4106 12A/500V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25℃	(1) 430 V (2) 420 V (3) 422 V	P
2	Diode Peak Voltage	Q101 Rated : STP85N3LH5 80A/30V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25℃	(1) 28 V (2) 27.8 V (3) 29 V	P
3	Input Capacitor Voltage	C5 Rated : 100u/400V 105℃ KMG	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℃	(1) 372.4 V (2) 380.4 V (3) 382.3 V	P
4	Control IC Voltage Test	U1 Rated : FAN4801NY 10V~30V	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℃	(1) 16.01 V (2) 16.24 V (3) 16.23 V	P
5	Power Transistor (D to S) or (C to E) Peak Voltage	Q1 Rated : IRFP460A 20A/500V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2) Output Short (3)Full load continue Ta : 25℃	(1) 489 V (2) 388 V (3) 398 V	P

SAFETY & E.M.C. TEST

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: 4.2KVAC/min I/P-FG: 2.4KVAC/min O/P-FG: 0.6 KVAC/min Ta:25°C	I/P-O/P: 4.7 mA I/P-FG: 3.62 mA O/P-FG: 3.64 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 : 21.8 GΩ I/P-FG : 15.3 GΩ O/P-FG : 23.9 GΩ NO DAMAGE	P
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40 A / 2min Ta : 25°C / 70%RH	9 mΩ	P

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT
1	HARMONIC	EN61000-3-2 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:6KV	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				

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																																														
1	TEMPERATURE RISE TEST	MODEL : MSP-200-5 1. ROOM AMBIENT BURN-IN : 3 HRS I/P : 230VAC O/P : FULL LOAD Ta= 26.3 °C 2. HIGH AMBIENT BURN-IN : 2.5 HRS I/P : 230VAC O/P : FULL LOAD Ta= 43.8 °C <table><thead><tr><th>NO</th><th>Position</th><th>P/N</th><th>ROOM AMBIENT Ta= 26.3 °C</th><th>HIGH AMBIENT Ta= 43.8 °C</th></tr></thead><tbody><tr><td>1</td><td>LF2</td><td>TR548-R2</td><td>57.1°C</td><td>74.0°C</td></tr><tr><td>2</td><td>BD1</td><td>6A/800V SILICON GBU608</td><td>74.9°C</td><td>91.2°C</td></tr><tr><td>3</td><td>L3</td><td>TR872 CS234125E14</td><td>70.8°C</td><td>87.5°C</td></tr><tr><td>4</td><td>Q1</td><td>IRFP460A 20A/500V TO247</td><td>65.4°C</td><td>82.8°C</td></tr><tr><td>5</td><td>C5</td><td>100u/400V 105°C 18*25 KMG</td><td>66.0°C</td><td>82.6°C</td></tr><tr><td>6</td><td>Q3</td><td>2SK4106 12A/500V TO220F</td><td>76.7°C</td><td>95.4°C</td></tr><tr><td>7</td><td>T2</td><td>TR435-R4 R13x7x5A MA070</td><td>67.0°C</td><td>81.4°C</td></tr><tr><td>8</td><td>T1</td><td>TF2029 EER-35</td><td>84.7°C</td><td>101.1°C</td></tr><tr><td>9</td><td>C150</td><td>100u/25V L5Kh 6.3*11 KY</td><td>74.5°C</td><td>90.6°C</td></tr><tr><td>10</td><td>C61</td><td>100u/25V L5Kh 6.3*11 KY</td><td>70.9°C</td><td>89.3°C</td></tr><tr><td>11</td><td>D1</td><td>BYC8-600 8A/600V TO220</td><td>67.0°C</td><td>84.5°C</td></tr><tr><td>12</td><td>Q101</td><td>STP85N3LH5 80A/30V TO220</td><td>76.1°C</td><td>93.8°C</td></tr><tr><td>13</td><td>L100</td><td>TR874 Ku090125-2*2</td><td>93.3°C</td><td>111.5°C</td></tr><tr><td>14</td><td>C105</td><td>3900u/10V UL10Kh 12.5*25 ZLH</td><td>77.1°C</td><td>97.3°C</td></tr><tr><td>15</td><td>T900</td><td>TF1593-R2</td><td>91.8°C</td><td>109.7°C</td></tr><tr><td>16</td><td>ZD900</td><td>ST02D-200 AX078</td><td>84.2°C</td><td>103.8°C</td></tr><tr><td>17</td><td>U900</td><td>TNY275PN DIP-8C</td><td>84.7°C</td><td>104.8°C</td></tr><tr><td>18</td><td>C911</td><td>22u/50V UL10Kh 5*11 YXM</td><td>81.3°C</td><td>98.3°C</td></tr><tr><td>19</td><td>C956</td><td>47u/50V L5Kh 6.3*11 YXF</td><td>79.7°C</td><td>96.5°C</td></tr><tr><td>20</td><td>TSW1</td><td>ST-22W-R0 170mm</td><td>88.0°C</td><td>105.2°C</td></tr><tr><td>21</td><td>TSW2</td><td>ST-22W-R0 170mm</td><td>84.8°C</td><td>102.8°C</td></tr></tbody></table>			NO	Position	P/N	ROOM AMBIENT Ta= 26.3 °C	HIGH AMBIENT Ta= 43.8 °C	1	LF2	TR548-R2	57.1°C	74.0°C	2	BD1	6A/800V SILICON GBU608	74.9°C	91.2°C	3	L3	TR872 CS234125E14	70.8°C	87.5°C	4	Q1	IRFP460A 20A/500V TO247	65.4°C	82.8°C	5	C5	100u/400V 105°C 18*25 KMG	66.0°C	82.6°C	6	Q3	2SK4106 12A/500V TO220F	76.7°C	95.4°C	7	T2	TR435-R4 R13x7x5A MA070	67.0°C	81.4°C	8	T1	TF2029 EER-35	84.7°C	101.1°C	9	C150	100u/25V L5Kh 6.3*11 KY	74.5°C	90.6°C	10	C61	100u/25V L5Kh 6.3*11 KY	70.9°C	89.3°C	11	D1	BYC8-600 8A/600V TO220	67.0°C	84.5°C	12	Q101	STP85N3LH5 80A/30V TO220	76.1°C	93.8°C	13	L100	TR874 Ku090125-2*2	93.3°C	111.5°C	14	C105	3900u/10V UL10Kh 12.5*25 ZLH	77.1°C	97.3°C	15	T900	TF1593-R2	91.8°C	109.7°C	16	ZD900	ST02D-200 AX078	84.2°C	103.8°C	17	U900	TNY275PN DIP-8C	84.7°C	104.8°C	18	C911	22u/50V UL10Kh 5*11 YXM	81.3°C	98.3°C	19	C956	47u/50V L5Kh 6.3*11 YXF	79.7°C	96.5°C	20	TSW1	ST-22W-R0 170mm	88.0°C	105.2°C	21	TSW2	ST-22W-R0 170mm	84.8°C	102.8°C	P
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2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P : 230 VAC O/P : 125 % LOAD Ta : 25°C	TEST : OK	P																																																																																																														
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P : 264VAC/100VAC 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 40 °C NO DAMAGE	I/P : 272 VAC O/P : FULL LOAD Ta= 40°C HUMIDITY= 95 %R.H	TEST : OK	P																																																																																																														
5	TEMPERATURE COEFFICIENT	± 0.04 %(0~50°C)	I/P : 230 VAC O/P : FULL LOAD	± 0 %(0~50°C)	P																																																																																																														
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature : -45°C~ +90°C 2. Temperature change rate : 25°C / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 5 CYCLE 5. Input/Output condition : STATIC		OK	P																																																																																																														

7	THERMAL SHOCK TEST	1. Thermal shock Temperature : -40℃~ +45℃ 2. Temperature change rate : 25℃ / MIN 3. Dwell time low and high temperature : 30 MIN/EACH 4. Total test cycle : 10 CYCLE 5. Input/Output condition : 230VAC/Full Load	OK	P
8	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 : 60min in each axis (X.Y.Z) (6) Ta : 25℃	TEST : OK	P
9	CAPACITOR LIFE CYCLE	MSP-200-5 :SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P : 230VAC O/P : FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 40 ℃ LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40 ℃ LIFE TIME	(1) 86373.7HRS (2) 25330.2HRS (3) 76218.8HRS	P
10	MTBF	MIL-HDBK-217F NOTICES2 PARTS COUNT TOTAL FAILURE RATE : 189.1K HRS		P

DATE	SAMPLE	TEST RESULT	TESTER	APPROVAL
2012/6/14	PRODUCT SAMPLE	PASS	SANFORD SU	VINCENT TSENG

2009/08/04 A50-F023