



# Test Report: MSP-200-15

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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 : 150 mVp-p (Max)	I/P : 230VAC O/P : FULL LOAD Ta : 25°C	V1 : 107 mVp-p (Max)	P
2	OUTPUT VOLTAGE ADJUST RANGE	CH1 : 13.5 V ~ 18 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	12.747 V ~ 19.141 V / 230 VAC 12.741 V ~ 19.133 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 : 0.3 % ~ -0.3 % (Max)	I/P : 100VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0 % ~ 0 %	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) 115VAC : 2500 ms(Max)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	230VAC/ 146 ms 115VAC/ 292 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/ 22 ms 115VAC/ 20 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/ 46 ms 115VAC/ 38 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 : 1500 mVp-p	I/P : 230 VAC O/P : FULL /Min LOAD 90%DUTY/ 1KHZ Ta : 25°C	516 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)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.96 / 230 VAC	P
		0.99 / 115 VAC(TYP)		PF= 0.997 / 115 VAC	
4	EFFICIENCY	88 % (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	89 %	P
5	INPUT CURRENT	230V/ 1.1 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 1 A/ 230 VAC	P
		115V/ 2.2 A (TYP)		I = 2 A/ 115 VAC	
6	INRUSH CURRENT	230V/ 70 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 67 A/ 230 VAC	P
		115V/ 35 A(TYP) COLD START		I = 34 A/ 115 VAC	
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	P
		< 100 uA/ for touch leakage current		N-FG 208 uA	
			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	120 %/ 230 VAC 120 %/ 115 VAC Constant current limiting recovers automatically after fault condition is removed	P
2	OVER VOLTAGE PROTECTION	CH1 : 18.8 V~ 21.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	20.8 V/ 230 VAC 20.8 V/ 115 VAC Shut down Re- power ON	P
3	OVER TEMPERATURE PROTECTION (optional)	SPEC : TSW1 : 95 ± 5°C O.T.P. detect on heatsink of power transistor TSW2 : 105 ± 5°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 ±5%, ripple : 50mVp-p(max)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	5VSB : 4.852 V / 0.3A Ripple : 21 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	Q3 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°C	(1) 442 V (2) 434 V (3) 410 V	P
2	Diode Peak Voltage	Q101 Rated : IRFB3307 130A/75V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short (3)Full load continue Ta : 25°C	(1) 73.6 V (2) 71.6 V (3) 72.4 V	P
3	Input Capacitor Voltage	C5 Rated : 100u/400V 105°C 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°C	(1) 372.7 V (2) 376.2 V (3) 376.3 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°C	(1) 15.088 V (2) 15.345 V (3) 15.366 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°C	(1) 588 V (2) 290 V (3) 416 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: 5 mA I/P-FG: 4.06 mA O/P-FG: 3.62 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 : 24.7 GΩ I/P-FG : 15.5 GΩ O/P-FG : 16.7 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			P			
		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						
			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			
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°C~ +45°C 2. Temperature change rate : 25°C / 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°C	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 °C LIFE TIME (2) I/P : 230VAC O/P : FULL LOAD Ta= 40 °C LIFE TIME (3) I/P : 230VAC O/P : 75% LOAD Ta= 40 °C 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