



# Test Report: MSP-600-15

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## 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 : 60 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	13.052 V~ 19.040 V / 230 VAC 13.046 V~ 19.040 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 : 100 VAC ~ 264 VAC O/P : FULL LOAD Ta : 25°C	V1 : 0.08%~-0.08%	P
5	LOAD REGULATION	V1 : 0.5%~-0.5% (Max)	I/P : 230 VAC O/P : FULL ~MIN LOAD Ta : 25°C	V1 : 0.04%~-0.04%	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/ 436 ms 115VAC/ 872 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/ 19 ms 115VAC/ 20 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/ 24 ms 115VAC/ 18 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	863 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	55 ~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)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	PF= 0.959 / 230 VAC	P
		0.99 / 115 VAC(TYP)		PF= 0.995 / 115 VAC	
4	EFFICIENCY	88% (TYP)	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	89.2%	P
5	INPUT CURRENT	230V/ 3.6 A (TYP)	I/P : 230 VAC I/P : 115 VAC O/P : FULL LOAD Ta : 25°C	I = 3.32 A/ 230 VAC	P
		115V/ 7.6 A (TYP)		I = 6.59 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 = 70 A/ 230 VAC	P
		115V/ 35 A (TYP) COLD START		I = 35 A/ 115 VAC	
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		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 : 18.8V~ 21.8 V	I/P : 230 VAC I/P : 115 VAC O/P : MIN LOAD Ta : 25°C	20.72 V/ 230 VAC 20.83 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 : 5.187 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	3.6V ~10V POWER ON 0 V~3.2V POWER OFF	P
3	REMOTE SENSE	>0.5V	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	> 0.5V	P
4	AUX POWER	4.75V~5.25V / 0.3A Ripple : 50mV	I/P : 230 VAC O/P : FULL LOAD Ta : 25°C	5.001V/0.3A Ripple : 29 mV	P
5	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
6	FAN ON/OFF control test	----	I/P : 230 VAC O/P : TESTING Ta : 25°C	> 34.3%LOAD FAN ON < 31.1%LOAD FAN OFF	P

## ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT	VERDICT																																																																																																																
1	TEMPERATURE RISE TEST	MODEL : MSP-600-24			P																																																																																																																
		1. ROOM AMBIENT BURN-IN : 1 HRS I/P : 230VAC O/P : FULL LOAD Ta=29.2 °C 2. HIGH AMBIENT BURN-IN : 2 HRS I/P : 230VAC O/P : FULL LOAD Ta=58.4 °C																																																																																																																			
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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 : 5.49 mA I/P-FG : 4.59 mA O/P-FG : 3.69 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 : 30 GΩ I/P-FG : 30 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				



# 600W Single Output Medical Type

# MSP-600 series

## 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	Conducted by Parts Stress Analysis Prediction 1126.7Khrs. Telcordia SR-332 (Bellcore) ; 138.7K hrs min. MIL-HDBK-217F (25°C)			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) 476 V (2) 498 V	P
2	Diode Peak Voltage	Q100 Rated : 80A/75V  Q103 Rated : 80A/100V	I/P : High-Line +3V = 267 V O/P : (1)Full Load Turn on (2)Output Short Ta : 25°C	(1) 67.6 V (2) 68.6 V  (1) 96.8 V (2) 98.8 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 V (2) 384.1 V (3) 384.2 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) 14.113 V (2) 14.248 V (3) 14.248 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) 488 V (2) 432 V	P

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

12.10.30 A50-F031