SWS1000L

RELIABILITY DATA

DWG. No. PA578-57-01		
APPD	CHK	DWG
19.Mar.'08	19 Mar 08	19 Mar 08

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Terminology Used

FG ……………. Frame Ground

※ The above data is typical value. As all units have nearly the same characteristics, the data to be considered as ability value.

1. Calculated values of MTBF

MODEL : SWS1000L-5

1. Calculating Method

Calculated based on part count reliability projection of JEITA (RCR-9102).
Individual failure rates λ_G is given to each part and MTBF is calculated by the count of each part

Formula :

$$MTBF = \frac{1}{\lambda_{equip}}$$

$$= \frac{1}{\sum_{i=1}^{n} N_i (\lambda_G \pi_Q)_i} \times 10^6 \text{ (HOURS)}$$

where :

λ_{equip} = Total Equipment Failure Rate (Failure / 10^6 Hours)

λ_G = Generic Failure Rate For The ith Generic Part (Failure / 10^6 Hours)

N_i = Quantity of ith Generic Part

n = Number of Different Generic Part Categories

π_Q = Generic Quality Factor for the ith Generic Part (π_Q = 1)

2. MTBF Values

G_F : (Ground, Fixed)

MTBF = 121,485 (Hours)

However MTBF calculation for fan isn't included.

2. Component derating

MODEL : SWS1000L-5

(1) Calculating method

(a) Measuring Conditions

Input	:	115 , 230VAC	Ambient temperature	:	50°C
Output	:	5V 200A (100%)	Mounting method	:	Mounting A

(b) Semiconductors

Compared with maximum junction temperature and actual one which is calculated based on case temperature, power dissipation and thermal impedance.

(c) IC, Resistors, Capacitors, etc.

Ambient temperature, operating condition, power dissipation and so on are within derating criteria.

(d) Calculating Method of Thermal Impedance

$$\theta_{j-c} = \frac{T_{j(max)} - T_c}{P_{c(max)}} \qquad \theta_{j-a} = \frac{T_{j(max)} - T_a}{P_{c(max)}} \qquad \theta_{j-l} = \frac{T_{j(max)} - T_l}{P_{c(max)}}$$

T_c	: Case temperature at start point of derating ; 25°C in general
T_a	: Ambient temperature at start point of derating ; 25°C in general
T_l	: Lead temperature at start point of derating ; 25°C in general
$P_{c(max)}$ ($P_{ch(max)}$)	: Maximum collector(channel) dissipation
$T_{j(max)}$ ($T_{ch(max)}$)	: Maximum junction(channel) temperature
θ_{j-c} (θ_{ch-c})	: Thermal impedance between junction(channel) and case
θ_{j-a}	: Thermal impedance between junction and air
θ_{j-l}	: Thermal impedance between junction and lead

(2) Component Derating List

Location No.	Vin = 115VAC Load = 100% Ta = 50°C		
Q1, Q2, Q4 F20W60C3-7100 SHINDENGEN	Tchmax = 150°C, Pch = 8.14W, Tch = Tc + ((θ ch-c) × Pch) = 100.31°C D.F. = 66.9%	θ ch-c = 1.66°C/W, Δ Tc = 36.8°C,	Pch(max) = 75W Tc = 86.8°C
Q3, Q5 2SK3907(Q) TOSHIBA	Tchmax = 150°C, Pch = 22.39W, Tch = Tc + ((θ ch-c) × Pch) = 105.55°C D.F. = 70.4%	θ ch-c = 0.833°C/W, Δ Tc = 36.9°C,	Pch(max) = 150W Tc = 86.9°C
Q401 2SC2712-Y(TE85L,F) TOSHIBA	Tjmax = 125°C, Pc = 0.016W, Tj = Ta + ((θ j-a) × Pc) = 86.17°C D.F. = 68.9%	θ j-a = 666.67°C/W, Δ Ta = 25.5°C,	Pc(max) = 0.15W Ta = 75.5°C
Q405 2SA1213-Y(TE12L,CF) TOSHIBA	Tjmax = 150°C, Pc = 0.16W, Tj = Ta + ((θ j-a) × Pc) = 119.00°C D.F. = 79.3%	θ j-a = 250°C/W, Δ Ta = 29.0°C,	Pc(max) = 0.5W Ta = 79.0°C
D1, D12 D25XB60-7000 SHINDENGEN	Tjmax = 150°C, Pd = 12.74W, Tj = Tc + ((θ j-c) × Pd) = 104.74°C D.F. = 69.8%	θ j-c = 1°C/W Δ Tc = 42.0°C	Tc = 92.0°C
D2, D3 YG902C3R FUJI-ELEC.	Tjmax = 150°C, Pd = 3.94W, Tj = Tc + ((θ j-c) × Pd) = 123.09°C D.F. = 82.1%	θ j-c = 3.5°C/W, Δ Tc = 59.3°C,	Tc = 109.3°C
D4, D5 YG902C3R FUJI-ELEC.	Tjmax = 150°C, Pd = 2.33W, Tj = Tc + ((θ j-c) × Pd) = 95.26°C D.F. = 63.5%	θ j-c = 3.5°C/W Δ Tc = 37.1°C	Tc = 87.1°C
D6 - D11, D13 S60SC3ML-7100 SHINDENGEN	Tjmax = 150°C, Pd =13.57W, Tj = Tc + ((θ j-c) × Pd) = 122.29°C D.F. = 81.5%	θ j-c = 0.5°C/W, Δ Tc = 65.5°C,	Tc = 115.5°C
D203, D204 NSU03A60-TE16L NIHON INTER	Tchmax = 150°C, Pd = 0.154W, Tj = Tl + ((θ j-l) × Pd) = 86.00°C D.F. = 57.3%	θ j-l = 13°C/W, Δ Tl = 34.0°C,	Tl = 84.0°C
D205, D206 NSU03A60-TE16L NIHON INTER	Tjmax = 150°C, Pd = 0.154W, Tj = Tl + ((θ j-l) × Pd) = 88.30°C D.F. = 58.9%	θ j-l = 13°C/W, Δ Tl = 36.3°C,	Tl = 86.3°C
D401 U05NU44(TE12L,Q) TOSHIBA	Tjmax = 150°C, Pd = 0.102W, Tj = Ta + ((θ j-a) × Pd) = 91.01°C D.F. = 60.7%	θ j-a = 105°C/W, Δ Ta = 30.3°C,	Ta = 80.3°C
D403 CRH01(TE85L,Q) TOSHIBA	Tjmax = 150°C, Pd = 0.147W, Tj = Ta + ((θ j-a) × Pd) = 111.31°C D.F. = 74.2%	θ j-a = 130°C/W, Δ Ta = 42.2°C,	Ta = 92.2°C
D404 CRH01(TE85L,Q) TOSHIBA	Tjmax = 150°C, Pd = 0.048W, Tj = Ta + ((θ j-a) × Pd) = 80.44°C D.F. = 53.6%	θ j-a = 130°C/W, Δ Ta = 24.2°C,	Ta = 74.2°C
D405, D406 CRH01(TE85L,Q) TOSHIBA	Tjmax = 150°C, Pd = 0.104W, Tj = Ta + ((θ j-a) × Pd) = 107.12°C D.F. = 71.4%	θ j-a = 130°C/W, Δ Ta = 43.6°C,	Ta = 93.6°C
Z410, Z411 U1ZB110(TE12L,Q) TOSHIBA	Tjmax = 150°C, Pd = 0.3W, Tj = Ta + ((θ j-a) × Pd) = 109.50°C D.F. = 73.0%	θ j-a = 125°C/W, Δ Ta = 22.0°C,	Pd(max) = 1W Ta = 72.0°C

Location No.	Vin = 115VAC Load = 100% Ta = 50°C		
SR1 SMG16C60 SANREX	Tjmax = 125°C, Pd = 4.83W, Tj = Tc + ((θ j-c) × Pd) = 90.76°C D.F. = 72.6%	θ j-c = 1.4°C/W Δ Tc = 34.0°C,	Tc = 84.0°C
A1 TA7805S(Q) TOSHIBA	Tjmax = 150°C, Pc = 1.62W, Tj = Tc + ((θ j-c) × Pc) = 102.03°C D.F. = 68.0%	θ j-c = 6.25°C/W, Δ Tc = 41.9°C,	Tc = 91.9°C
A102 FA5502M-H1-TE1 FUJI-ELEC.	Tjmax = 150°C, Pd = 0.08W, Tj = Ta + ((θ j-a) × Pd) = 89.38°C D.F. = 59.6%	θ j-a = 192.3°C/W, Δ Ta = 24.0°C,	Pd(max)= 0.65W Ta = 74.0°C
A203 M51995AFP CF0J RENESAS	Tjmax = 150°C, Pd = 0.08W, Tj = Ta + ((θ j-a) × Pd) = 68.26°C D.F. = 45.5%	θ j-a = 83.3°C/W, Δ Ta =11.6°C,	Ta = 61.6°C
A401 MIP2E3DMUL MATSUSHITA	Tjmax = 150°C, Pd = 1.8W, Tj = Tc + ((θ j-c) × Pd) = 112.40°C D.F. = 74.9%	θ j-c = 10°C/W, Δ Tc = 44.4°C,	Tc = 94.4°C
A402 TA58M12F TOSHIBA	Tjmax = 150°C, Pc = 0.69W, Tj = Tc + ((θ j-c) × Pd) = 77.83°C D.F. = 51.9%	θ j-c = 12.5°C/W, Δ Tc = 19.2°C,	Tc = 69.2°C
PC404-A PS2581L2-E3(D)-A NEC	Tjmax = 125°C, Pd = 0.009W, Tj = Ta + ((θ j-a) × Pd) = 67.40°C D.F. = 53.9%	θ j-a = 666.67°C/W, Δ Ta =11.4°C,	Pd(max) = 0.15W Ta = 61.4°C
PC404-B PS2581L2-E3(D)-A NEC	Tjmax = 125°C, Pd = 0.002W, Tj = Ta + ((θ j-a) × Pd) = 62.73°C D.F. = 50.2%	θ j-a = 666.67°C/W, Δ Ta = 11.4°C,	Pd(max) = 0.15W Ta = 61.4°C

(2) Component Derating List

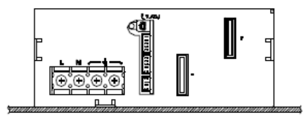
Location No.	Vin = 230VAC Load = 100% Ta = 50°C
Q1, Q2, Q4 F20W60C3-7100 SHINDENGEN	Tchmax = 150°C, θ ch-c = 1.66°C/W, Pch(max) = 75W Pch = 4.13W, Δ Tc = 24.0°C, Tc = 74.0°C Tch = Tc + ((θ ch-c) × Pch) = 80.86°C D.F. = 53.9%
Q3, Q5 2SK3907(Q) TOSHIBA	Tchmax = 150°C, θ ch-c = 0.833°C/W, Pch(max) = 150W Pch = 22.39W, Δ Tc = 36.3 °C, Tc = 86.3°C Tch = Tc + ((θ ch-c) × Pch) = 104.95°C D.F. = 70.0%
Q401 2SC2712-Y(TE85L,F) TOSHIBA	Tjmax = 125°C, θ j-a = 666.67°C/W, Pc(max) = 0.15W Pc = 0.016W, Δ Ta = 24.4°C, Ta = 74.4°C Tj = Ta + ((θ j-a) × Pc) = 85.07°C D.F. = 68.1%
Q405 2SA1213-Y(TE12L,CF) TOSHIBA	Tjmax = 150°C, θ j-a = 250°C/W, Pc(max) = 0.5W Pc = 0.16W, Δ Ta = 29.1°C, Ta = 79.1°C Tj = Ta + ((θ j-a) × Pc) = 119.10°C D.F. = 79.4%
D1, D12 D25XB60-7000 SHINDENGEN	Tjmax = 150°C, θ j-c = 1°C/W, Pd = 6.37W, Δ Tc = 24.4°C, Tc = 74.4°C Tj = Tc + ((θ j-c) × Pd) = 80.77°C D.F. = 53.9%
D2, D3 YG902C3R FUJI-ELEC.	Tjmax = 150°C, θ j-c = 3.5°C/W, Pd = 3.56W, Δ Tc = 50.9°C, Tc = 100.9°C Tj = Tc + ((θ j-c) × Pd) = 113.36°C D.F. = 75.6%
D4, D5 YG902C3R FUJI-ELEC.	Tjmax = 150°C, θ j-c = 3.5°C/W, Pd = 2.46W, Δ Tc = 24.6°C, Tc = 74.6°C Tj = Tc + ((θ j-c) × Pd) = 83.21°C D.F. = 55.5%
D6 - D11, D13 S60SC3ML-7100 SHINDENGEN	Tjmax = 150°C, θ j-c = 0.5°C/W, Pd = 13.57W, Δ Tc = 65.0°C, Tc = 115.0°C Tj = Tc + ((θ j-c) × Pd) = 121.79°C D.F. = 81.2%
D203, D204 NSU03A60-TE16L NIHON INTER	Tchmax = 150°C, θ j-l = 13°C/W, Pd = 0.154W, Δ Tl = 33.4°C, Tl = 83.4°C Tch = Tl + ((θ ch-l) × Pd) = 85.40°C D.F. = 56.9%
D205, D206 NSU03A60-TE16L NIHON INTER	Tjmax = 150°C, θj-l = 13°C/W, Pd = 0.154W, Δ Tl = 35.9°C, Tl = 85.9°C Tj = Tl + ((θ j-l) × Pd) = 87.90°C D.F. = 58.6%
D401 U05NU44(TE12L,Q) TOSHIBA	Tjmax = 150°C, θj-a = 105°C/W, Pd = 0.102W, ΔTa = 27.5°C, Ta = 77.5°C Tj = Ta + ((θ j-a) × Pd) = 88.21°C D.F. = 58.8%
D403 CRH01(TE85L,Q) TOSHIBA	Tjmax = 150°C, θ j-a = 130°C/W, Pd = 0.147W, Δ Ta = 37.4°C, Ta = 87.4°C Tj = Ta + ((θ j-a) × Pd) = 106.51°C D.F. = 71.0%
D404 CRH01(TE85L,Q) TOSHIBA	Tjmax = 150°C, θ j-a = 130°C/W, Pd = 0.048W, Δ Ta = 23.8°C, Ta = 73.8°C Tj = Ta + ((θ j-a) × Pd) = 80.04°C D.F. = 53.4%
D405, D406 CRH01(TE85L,Q) TOSHIBA	Tjmax = 150°C, θ j-a = 130°C/W, Pd = 0.104W, Δ Ta = 43.2°C, Ta = 93.2°C Tj = Ta + ((θ j-a) × Pd) = 106.72°C D.F. = 71.2%
Z410, Z411 U1ZB110(TE12L,Q) TOSHIBA	Tjmax = 150°C, θ j-a = 125°C/W, Pd(max) = 1W Pd = 0.3W, Δ Ta = 24.3°C, Ta = 74.3°C Tj = Ta + ((θ j-a) × Pd) = 111.80°C D.F. = 74.5%

Location No.	Vin = 230VAC Load = 100% Ta = 50°C		
SR1 SMG16C60 SANREX	Tjmax = 125°C, Pd = 4.83W, Tj = Tc + ((θ j-c) × Pd) = 81.86°C D.F. = 65.5%	θj-c = 1.4°C/W Δ Tc = 25.1°C,	Tc = 75.1°C
A1 TA7805S(Q) TOSHIBA	Tjmax = 150°C, Pc = 1.62W, Tj = Tc + ((θ j-c) × Pc) = 98.93°C D.F. = 66.0%	θ j-c = 6.25°C/W, Δ Tc = 38.8°C,	Tc = 88.8°C
A102 FA5502M-H1-TE1 FUJI-ELEC.	Tjmax = 150°C, Pd = 0.08W, Tj = Ta + ((θ j-a) × Pd) = 87.48°C D.F. = 58.3%	θ j-a = 192.3°C/W, Δ Ta = 22.1°C,	Pd(max)= 0.65W Ta = 72.1°C
A203 M51995AFP CF0J RENESAS	Tjmax = 150°C, Pd = 0.08W, Tj = Ta + ((θ j-a) × Pd) = 67.96°C D.F. = 45.3%	θ j-a = 83.3°C/W, Δ Ta =11.3°C,	Ta = 61.3°C
A401 MIP2E3DMUL MATSUSHITA	Tjmax = 150°C, Pd = 1.8W, Tj = Tc + ((θ j-c) × Pd) = 108.40°C D.F. = 72.3%	θ j-c = 10°C/W, Δ Tc = 40.4°C,	Tc = 90.4°C
A402 TA58M12F TOSHIBA	Tjmax = 150°C, Pc = 0.69W, Tj = Tc + ((θ j-c) × Pd) = 76.93°C D.F. = 51.3%	θ j-c = 12.5°C/W, Δ Tc =18.3°C,	Tc = 68.3°C
PC404-A PS2581L2-E3(D)-A NEC	Tjmax = 125°C, Pd = 0.009W, Tj = Ta + ((θ j-a) × Pd) = 66.80°C D.F. = 53.4%	θ j-a = 666.67°C/W, Δ Ta =10.8°C,	Pd(max) = 0.15W Ta = 60.8°C
PC404-B PS2581L2-E3(D)-A NEC	Tjmax = 125°C, Pd = 0.002W, Tj = Ta + ((θj-a) × Pd) = 62.13°C D.F. = 49.7%	θ j-a = 666.67°C/W, Δ Ta =10.8°C,	Pd(max) = 0.15W Ta = 60.8°C

3. Main components temperature rise ΔT list

MODEL : SWS1000L-5

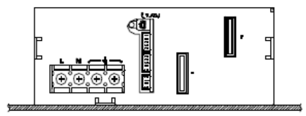
Condition:

Standard Mounting (Mounting Method (A))	(A) 
Input Voltage (VAC)	115
Output Voltage (VDC)	5
Output Current (A)	200

		ΔT Temperature rise (°C)	
Output Derating		Io=100% (Ta =50°C)	Io=50% (Ta =74°C)
Location No	Parts Name	Mounting (A)	Mounting (A)
L1	BALUN COIL	32.6	13.4
L4	BALUN COIL	28.9	12.1
L7	CHOKE COIL	28.2	17.8
L2, L8	CHOKE COIL	38.6	15.4
L17	CHOKE COIL	21.9	7.1
L39	CHOKE COIL	56.4	22.0
T1	DRIVE TRANS.	5.6	2.9
T2	PULSE TRANS.	60.0	24.3
T3	CURRENT TRANS.	13.2	4.7
T4	PULSE TRANS.	32.9	24.7
D1, D12	BRIDGE DIODE	42.0	21.6
D2, D3	DIODE	59.3	28.2
D4, D5	DIODE	37.1	19.6
D6-D11, D13	S.B.D	65.5	30.1
SR1	THYRISTOR	34.0	17.6
Q1, Q2, Q4	MOS FET	36.8	20.6
Q3, Q5	MOS FET	36.9	18.7
A102	CHIP IC	24.0	15.8
A203	CHIP IC	11.6	9.7
A401	CHIP IC	44.4	33.4
C10, C11	E.CAP.	8.7	3.5
C15-C18	E.CAP.	40.2	15.4
C21	E.CAP.	19.4	9.4
C22	E.CAP.	7.5	4.1
C23	E.CAP.	23.3	12.8
C24	E.CAP.	30.4	15.9
C26	E.CAP.	34.5	20.1
C28	E.CAP.	39.6	14.9
C19, C29	E.CAP.	36.3	15.0

MODEL : SWS1000L-5

Condition:

	(A)
Standard Mounting (Mounting Method (A))	
Input Voltage (VAC)	230
Output Voltage (VDC)	5
Output Current (A)	200

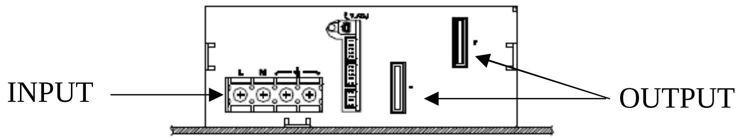
		ΔT Temperature rise (°C)	
Output Derating		Io=100% (Ta =50°C)	Io=50% (Ta =74°C)
Location No	Parts Name	Mounting (A)	Mounting (A)
L1	BALUN COIL	16.1	8.3
L4	BALUN COIL	14.8	8.0
L7	CHOKE COIL	19.4	14.9
L2, L8	CHOKE COIL	20.3	9.1
L17	CHOKE COIL	10.9	4.5
L39	CHOKE COIL	55.9	21.1
T1	DRIVE TRANS.	5.5	2.9
T2	PULSE TRANS.	59.4	23.7
T3	CURRENT TRANS.	12.8	4.6
T4	PULSE TRANS.	30.8	23.3
D1, D12	BRIDGE DIODE	24.4	13.4
D2, D3	DIODE	50.9	23.6
D4, D5	DIODE	24.6	13.8
D6-D11, D13	S.B.D	65.0	29.4
SR1	THYRISTOR	25.1	13.5
Q1, Q2, Q4	MOS FET	24.0	14.2
Q3, Q5	MOS FET	36.3	18.7
A102	CHIP IC	22.1	15.0
A203	CHIP IC	11.3	9.8
A401	CHIP IC	40.4	30.2
C10, C11	E.CAP.	7.2	2.5
C15-C18	E.CAP.	38.9	14.8
C21	E.CAP.	18.0	8.9
C22	E.CAP.	6.9	4.0
C23	E.CAP.	20.4	11.6
C24	E.CAP.	28.7	15.1
C26	E.CAP.	32.0	18.9
C28	E.CAP.	38.0	14.4
C19, C29	E.CAP.	34.6	14.3

4. Electrolytic capacitor lifetime

MODEL: SWS1000L-5

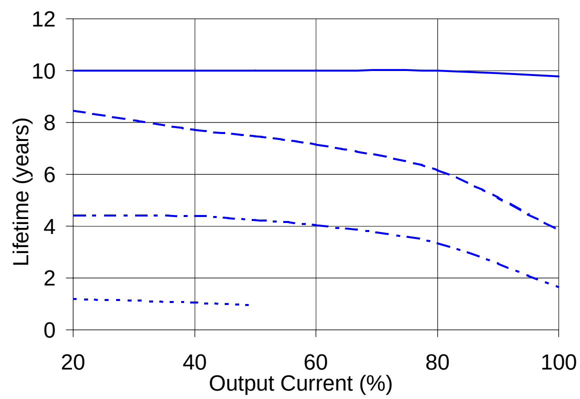
Conditions: Ta = 25°C ———
= 40°C - - - -
= 50°C —·—·
= 74°C ············

Mounting A



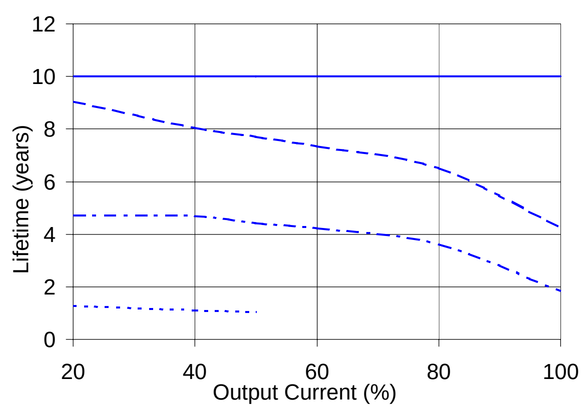
Vin = 115VAC

Load (%)	Life Time (years)			
	Ta = 25°C	Ta = 40°C	Ta = 50°C	Ta = 74°C
20	10.0	8.5	4.4	1.2
40	10.0	7.7	4.4	1.1
50	10.0	7.5	4.2	1.0
60	10.0	7.2	4.0	-
80	10.0	6.2	3.3	-
100	9.8	3.9	1.7	-



Vin = 230VAC

Load (%)	Life Time (years)			
	Ta = 25°C	Ta = 40°C	Ta = 50°C	Ta = 74°C
20	10.0	9.0	4.7	1.3
40	10.0	8.1	4.7	1.1
50	10.0	7.7	4.4	1.1
60	10.0	7.4	4.2	-
80	10.0	6.5	3.6	-
100	10.0	4.3	1.9	-



5. Abnormal test

Model: SWS1000L-5

(1) Test Condition and Circuit

Input Voltage: 230Vac Output: 5V 200A Ta : 25°C , 70%RH

(2) Test Results

(Da: Damaged)

No.	Test Position		Test Mode		Test Results												
	LOCATION	TEST POINT	SHORT	OPEN	1 FIRE	2 SMOKE	3 BURST	4 SMELL	5 RED HOT	6 DAMAGE	7 FUSE BLOW	8 O.C.P.	9 O.V.P.	10 NO OUTPUT	11 NO CHANGE	12 OTHER	NOTE
1	Q1	G		O						O	O			O			Da: F1,Q1
		D		O												O	Pin increase
		S		O												O	Pin increase
		G - S	O							O				O			Da: TFR1,TFR2
		D - G	O							O	O			O			Da: F1,Q1
		D - S	O							O	O			O			Da: F1
2	Q3	G		O						O	O			O			Da:F2,Q3,Q5
		D		O										O			
		S		O										O			
		G - S	O											O			
		D - G	O											O			
		D - S	O											O			
3	Q5	G		O						O	O			O			Da:F2,Q3,Q5
		D		O										O			
		S		O										O			
		G - S	O											O			
		D - G	O											O			
		D - S	O											O			
4	Q104	B		O											O		
		C		O						O	O			O			Da: Q1,Q2,R112,R113,F1
		E		O											O		
		B - E	O							O	O			O			Da: Q1,Q2,R112,R113,F1
		B - C	O							O	O			O			Da: Q1,Q2,Q4,F1
		C - E	O							O	O			O			Da: Q1,Q2,Q4,R110, R111,F1
5	Q106	B		O						O	O			O			Da: Q4,R156,R157,F1
		C		O						O	O			O			Da: Q1,Q2,Q4,R110,R111,F1
		E		O						O	O			O			Da: Q4,R156,R157,Z101,F1
		B - E	O							O	O			O			Da: Q1,Q2,Q4,R156,R157,Z101,R116,F1
		B - C	O											O			
		C - E	O											O			
6	Q201	G		O										O			
		D		O										O			
		S		O										O			
		G - S	O											O			
		D - G	O											O			
		D - S	O											O			

No.	Test Position		Test Mode		Test Results												
	LOCATION	TEST POINT	SHORT	OPEN	1 FIRE	2 SMOKE	3 BURST	4 SMELL	5 RED HOT	6 DAMAGE	7 FUSE BLOW	8 O.C.P.	9 O.V.P.	10 NO OUTPUT	11 NO CHANGE	12 OTHER	NOTE
7	Q203	B		O						O	O			O			Da: D205,Q3, F2
		C		O						O	O			O			Da: D206,Q3, Q5, F2
		E		O						O	O			O			Da: D206, Q3, F2
		B - E	O							O	O			O			Da: Q1,Q2,R112,R113,F1
		B - C	O											O			
		C - E	O											O			
8	D1	AC - AC	O							O	O			O			Da: F1
		AC - DC	O							O	O			O			Da: F1
		DC-DC	O							O	O			O			Da: F1
		AC		O										O			
		DC		O										O			
9	D2	A1		O											O		
		A2		O											O		
		K		O										O			
		A1 - K	O				O	O		O	O			O			Da: F1, Q1, Q2, Q4, D3, R112, R113
		A2 - K	O				O	O		O	O			O			Da: F1, Q1, Q2, Q4, D3, R112, R114
10	D4	A1		O											O		
		A2		O											O		
		K		O										O			
		A1 - K	O												O		
		A2 - K	O												O		
11	D107	A - K	O							O				O			Da: R5
		A - K		O											O		
12	D202	A-K	O							O	O			O			Da: Q2,Q4,R156,R157,F1
		A		O										O			
13	D203	A - K	O											O			
		A - K		O											O		
14	D403	A-K	O											O			
		A		O										O			
15	D404	A-K	O											O			
16	D405	A-K	O											O			
17	A401	CON		O										O			
		D		O										O			
		S		O										O			
		CON - S	O							O	O			O			Da: F3,C404,R402,A401
		D - CON	O							O	O			O			Da: F3
		D - S	O											O			
18	T2	1,2 - 4,5	O											O			
		13,14-15,16	O											O			
		1,2		O										O			
		13,14		O										O			

No.	Test Position		Test Mode		Test Results												
	LOCATION	TEST POINT	SHORT	OPEN	1 FIRE	2 SMOKE	3 BURST	4 SMELL	5 RED HOT	6 DAMAGE	7 FUSE BLOW	8 O.C.P.	9 O.V.P.	10 NO OUTPUT	11 NO CHANGE	12 OTHER	NOTE
19	T4	1 - 2	O											O			
		3 - 4	O											O			
		5 - 7	O											O			
		9 - 10	O											O			
		1		O										O			
		3		O										O			
		5		O										O			
		9		O										O			
20	PC1	1 - 2	O												O		
		5 - 6	O												O		
21	PC402	1 - 2	O											O			
		3 - 4	O												O		
22	PC404	1 - 2	O											O			
		3 - 4	O											O			
		1		O										O			
		2		O										O			
		3		O										O			
		4		O										O			
23	PC405	1 - 2	O												O		
		3 - 4	O											O			

6. MIL-STD-810F VIBRATION & SHOCK TEST

(1) Truck transportation over U.S. highways vibration test

(MIL-STD-810F 514.5 Category 4- Truck/trailer/tracked-restrained cargo)

1. Purpose

Test based on [MIL-STD-810F 514.5 Category 4-Truck/trailer/tracked-restrained cargo-Truck transportation over U.S. highways]

2. Test method

Unit was taken directly from production line.Unit was compliant with production standards.
The performance of vibration test machine is confirmed before vibration test.
Unit is tested in random vibration conditions based on [MIL-STD-810F_figure 514.5C-1]

<MIL-STD-810F_table 514.5C-VII>

Break points for curves of figure 514.5C-1 U.S.highway truck vibration exposures					
Vertical		Transverse		Longitudinal	
Hz	g^2/Hz	Hz	g^2/Hz	Hz	g^2/Hz
10	0.01500	10	0.00013	10	0.00650
40	0.01500	20	0.00065	20	0.00650
500	0.00015	30	0.00065	120	0.00020
1.04	g rms	78	0.00002	121	0.00300
		79	0.00019	200	0.00300
		120	0.00019	240	0.00150
		500	0.00001	340	0.00003
		0.204	g rms	500	0.0002
				0.740	g rms

* See the APPENDIX B [Direction of vibration]

* Test time is 1 hour in each directions. (It shows road transportation of 1000 miles in U.S.by truck.)

3. Acceptable conditions

During vibration test,no destruction in the test unit.
After vibration test,no abnormality in the electric characteristics and the mechanism.

4. Test result

OK

(2) Composite two-wheeled trailer vibration test

(MIL-STD-810F 514.5 Category 4- Truck/trailer/tracked-restrained cargo)

1. Purpose

Test based on [MIL-STD-810F 514.5 Category 4-Truck/trailer/tracked-restrained cargo-Mission/field transportation - Two-wheeled trailer]

2. Test method

Unit was taken directly from production line.Unit was compliant with production standards.
The performance of vibration test machine is confirmed before vibration test.
Unit is tested in random vibration conditions based on [MIL-STD-810F_figure 514.5C-2]

<MIL-STD-810F_table 514.5C-VII>

Break points for curves of figure 514.5C-2 Composite two-wheeled trailer vibration exposures

Vertical				Transverse				Longitudinal			
Hz	g^2/Hz	Hz	g^2/Hz	Hz	g^2/Hz	Hz	g^2/Hz	Hz	g^2/Hz	Hz	g^2/Hz
5	0.2252	45	0.0241	5	0.0474	46	0.0039	5	0.0563	121	0.0214
8	0.5508	51	0.0114	6	0.0303	51	0.0068	6	0.0563	146	0.0450
10	0.0437	95	0.0266	7	0.0761	55	0.0042	8	0.1102	153	0.0236
13	0.0253	111	0.0166	13	0.0130	158	0.0029	13	0.0140	158	0.0549
15	0.0735	136	0.0683	15	0.0335	235	0.0013	16	0.0303	164	0.0261
19	0.0143	147	0.0266	16	0.0137	257	0.0027	20	0.0130	185	0.0577
23	0.0358	185	0.0603	21	0.0120	317	0.0016	23	0.0378	314	0.0015
27	0.0123	262	0.0634	23	0.0268	326	0.0057	27	0.0079	353	0.0096
30	0.0286	330	0.0083	25	0.0090	343	0.0009	30	0.0200	398	0.0009
34	0.0133	360	0.0253	28	0.0090	384	0.0018	33	0.0068	444	0.0027
36	0.0416	500	0.0017	30	0.0137	410	0.0008	95	0.0190	500	0.0014
41	0.0103			34	0.0055	462	0.0020	2.40 g rms			
3.85 g rms				37	0.0081	500	0.0007				
				1.28 g rms							

* See the APPENDIX B [Direction of vibration]
* Test time is 40 minutes in each directions. (It shows road transportation of 500 miles in U.S.by composite two-wheeled trailer.)

3. Acceptable conditions

During vibration test,no destruction in the test unit.
After vibration test,no abnormality in the electric characteristics and the mechanism.

4. Test result

OK

(3) Shipboard random vibration test

(MIL-STD-810F 514.5 Category 10- Ship-surface ship)

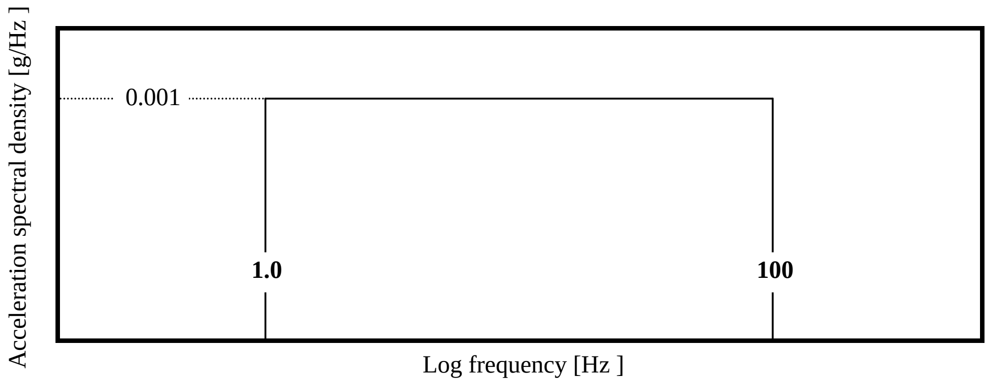
1. Purpose

Test based on [MIL-STD-810F 514.5 Category 10-Ship-surface ship].

2. Test method

Unit was taken directly from production line.Unit was compliant with production standards.
The performance of vibration test machine is confirmed before vibration test.
Unit is tested in random vibration conditions based on [MIL-STD-810F_figure 514.5C-15]

Figure 514.5C-15 Shipboard random vibration exposures



* See the APPENDIX B [Direction of vibration]

* Test time is 2 hours in each directions. (vertical,transverse and longitudinal.)

3. Acceptable conditions

During vibration test,no destruction in the test unit.
After vibration test,no abnormality in the electric characteristics and the mechanism.

4. Test result

OK

(4) Functional shock test

(MIL-STD-810F 516.5 Procedure I)

1. Purpose

Test based on [MIL-STD-810F 516.5 Procedure I - Functional shock].

2. Test method

Unit was taken directly from production line.Unit was compliant with production standards.
The performance of vibration test machine is confirmed before vibration test.
Unit is operating during shock test.

Min.peak value (g's)	Duration	Qty.
40G Half Sine Pulse	11ms	1pc

Input voltage	Output voltage	Output current
AC115V 50Hz	Rated	100%

* See the APPENDIX B [Direction of vibration]

* It does in the directions of ± X, ± Y and ± Z 3 times for each and 18 times in total.

3. Acceptable conditions

During shock test,no discharge of fire or smoke, as well as no output failure.
After shock test,no abnormality in the electric characteristics and the mechanism.

4. Test result

OK

(5) Bench handing test

(MIL-STD-810F 516.5 Procedure VI)

1. Purpose

Test based on [MIL-STD-810F 516.5 Procedure VI - Bench handing].

2. Test method

Unit was taken directly from production line.Unit was compliant with production standards.

Use test bench with thickness of at least 4.25cm.

With unit switched off.

Raise until the chassis forms an angle of 45° with the bench top.

Drop unit on each face on which unit could be placed practically.

In the above test method, repeat drop 4 times in total.

3. Acceptable conditions

During shock test,no destruction in the test unit.

After shock test,no abnormality in the electric characteristics and the mechanism.

4. Test result

OK

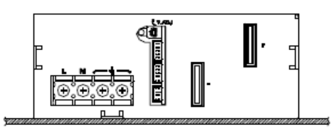
(6) APPENDIX

APPENDIX A : List of equipment used

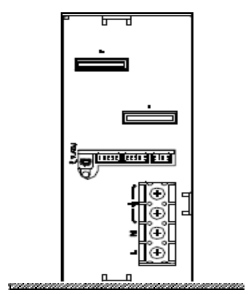
EQUIPMENT USED	MANUFACTURER	MODEL NO.
TRUE RMS MULTIMETER	FLUKE	89 VI
DIGITAL POWER METER	YOKOGAWA ELECT.	WT210
ELECTRONIC LOAD	CHROMA	63206
AC POWER SUPPLY	CHROMA	61505
ED VIBRATION TEST SYSTEM	DONG LING	ES-50/LT1010
ACCELEROMETER	PCB	340A15

APPENDIX B : Direction of vibration

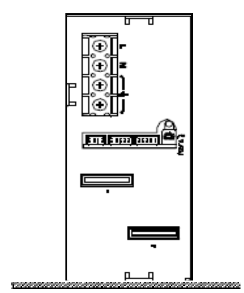
Mounting A



Mounting B

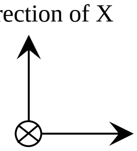


Mounting C



Direction of X

Direction of Y



Direction of Z

Direction of X : Vertical

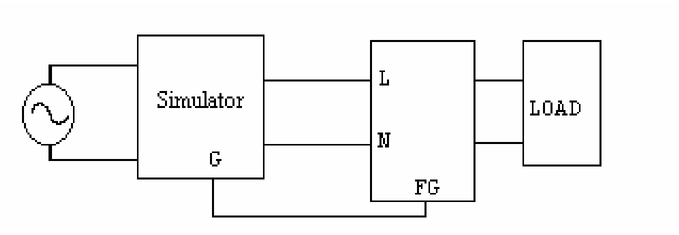
Direction of Y : Transverse

Direction of Z : Longitudinal

7. Noise simulate test

MODEL : SWS1000L-5

(1) Test circuit and equipment



Simulator : ENS-24X SANKI E.IND

(2) Test conditions

- Input voltage : 115, 230VAC
- Output voltage : Rated
- Output current : 0%, 100%
- Ambient temperature : 25°C
- Pulse width : 50ns ~ 1000ns
- Noise level : 0V~2.0kV
- Phase shift : 0° ~ 360°
- Polarity : + , -
- Mode : Normal, Common
- Trigger select : Line

(3) Acceptable conditions

1. Not to be broken.
2. Not to be shut down output.
3. No other out of orders.

(4) Test result

O K

8. Thermal shock test

MODEL : SWS1000L-5

(1) Equipment used

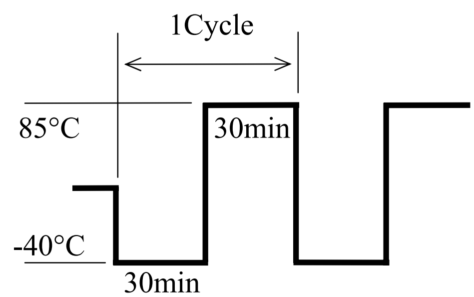
THERMAL SHOCK CHAMBER TSV-40 (TABAI ESPEC CORP.)

(2) The number of D.U.T.(Device Under Test)

1 unit

(3) Test Conditions

- Ambient temperature : -40°C ~ 85°C
- Test time : Refer to drawing
- Test cycle : 100 cycles
- Not operating



(4) Test Method

Before testing, check if there is no abnormal output, then put the D.U.T. in testing chamber, and test it according to the above cycle. 100 cycles later, leave it for 1 hour at the room temperature, then check if there is no abnormal output.

(5) Test Results

O K

9. Fan life expectancy

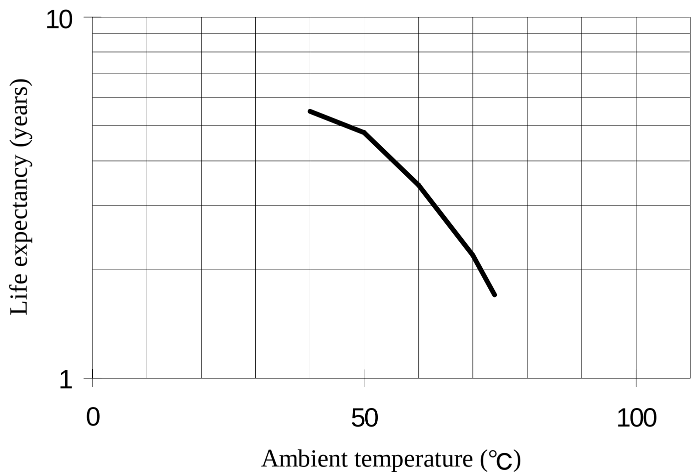
MODEL: SWS1000L

(1) Part name

9A0612G4D041 (SANYO DENKI CO.)

(2) Life expectancy

The data shows fan life expectancy for fan only by manufacture (90% survival rate).
Fig1 shows measuring point of ambient temperature.



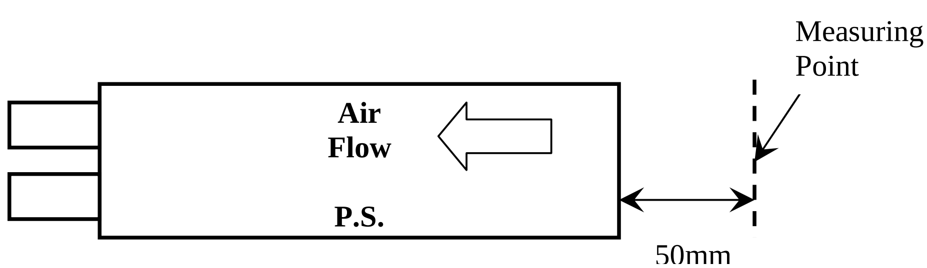


Fig1. Measuring point of ambient temperature

1 year = 365 day x 24 hours/day = 8760 hours