NND15

RELIABILITY DATA

DWG. No. IA502-79-01			
Q.A. NLJ	Q.A. NLI	ENG.	APP.
A. Kohmata AUG. 9. '93		Oswa Sano-22-92 JUL-7-92	shirohon JUL-1-92

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Jul/14/93

NEMIC-LAMBDA

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The above data are typical values. As all units have the same characteristics, the data to be considered as ability values.

NEMIC-LAMBDA

NND15-1212

M. T. B. F.

1. Method of calculation:

This calculation is by 'components count method' laid down by the DC Stabilized Power Supplies (Switcing mode) committee of EIAJ.

The MTBF is determined by means of a fixed component failure rate λ_G given to each component and the number of component count of each type of component. λ_G is determined based on MIL-HDBK-217D.

Please refer to EIAJ handbook no. RCF-9021 for formula:

$$MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\sum_{i=1}^{n} Ni(\lambda_G)i} \times 10^6 \text{ (Hrs)}$$

λ_{equip} = Total equipment failure rate (failures / 10^6 hrs)

λ_G = Failure rate of the i^{th} compoment

Ni = Number of i^{th} component

n = Number of categories of component

2. MTBF Value:

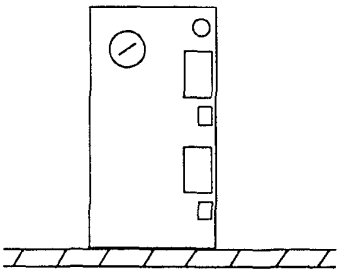
Conditions: Nominal line, rated load

Ambient Temperature 25 C °

MTBF = 130,000 hrs

2. COMPONENT DERATING

MODEL : NND15-1212



Mounting Method : Standard

(1) calculation method:

conditions:

Input: 100VAC Output: +/-12V 0.75A (100%)

Ambient temperature : 50° C

(b) Semiconductor

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

(c) IC, Resistors, Capacitors, etc.

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

(d) Calculating criteria:

$$\Theta_{j\text{-}c} = \frac{Tj(max) - Tc}{Pc(max)} \qquad \Theta_{j\text{-}a} = \frac{Tj(max) - Ta}{Pc(max)}$$

Tc : Case Temperature at Start Point of derating ; 25° C in general

Ta : Ambient Temperature at Start Point of Derating ; 25° C in general

Pc(max) : Maximum Power Dissipation

Tj(max) : Maximum Junction Temperature

$\Theta_{j\text{-}c}$: Thermal Impedance between Junction and Case

$\Theta_{j\text{-}a}$: Thermal Impedance between Junction and Air

(2) Component Derating List

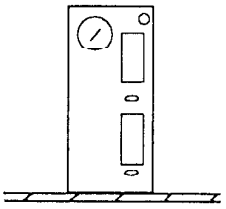
Location No.	Parts Name	MAX Rating	Actual Rating	Derating Factor	Note
Q1,Q3	MOSFET	Tj_{max}= 150°C	Tj = 80.8° C	53.8%	
CR1,CR10	BRIDGE	Tj_{max}= 150°C	Tj = 103.5°C	69%	
CR2,CR11	ZENER	Tj_{max}= 150°C	Tj = 80°C	53.3%	
CR9,CR18	DIODE	Tj_{max}= 150°C	Tj = 80.2°C	53.5%	
CR6,CR15	DIODE	Tj_{max} = 150° C	Tj = 83.4°C	55.6%	
CR3,CR12	ZENER	Tj_{max}= 150°C	Tj = 75°C	50%	
CR4,CR13	LED	If_{max}= 35mA	If = 10mA	28.5%	
IC1,IC3	OP - AMP	Tj_{max}= 175°C	Tj = 101.8° C	58.2%	
IC2,IC4	REFERENCE	Tj_{max}= 150°C	Tj = 67.1° C	44.7%	
Q2,Q4	SCR	Tj = 125°C	Tj = 71.6° C	57.3%	

3. △T TEMPERATURE RISE

MODEL: NND15-1212

Location No.	Parts Name	△T'C TEMP. RISE
Q1,Q3	MOSFET	26.1
Q2,Q4	SCR	21.6
CR1,CR10	BRIDGE RECTIFIER	50.75
C2,C11	ELEC. CAP.	24.4
C6,C15	ELEC. CAP	18
T1	TRANSFORMER	38

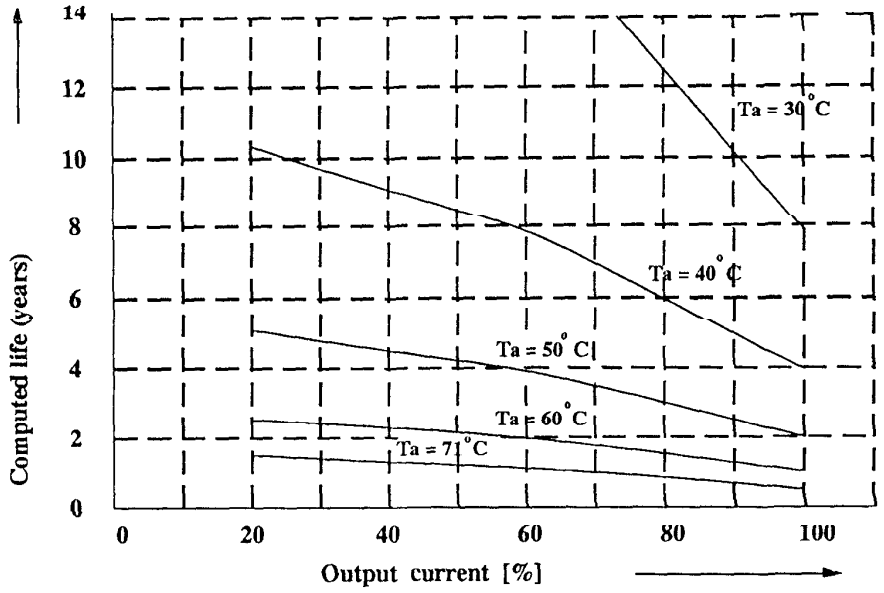
Conditions:

Mounting Method	 (STANDARD)
Input Voltage	100VAC
Output Volt.	+/-12V
Output Curr.	.75A (100%)

ELEC. CAPACITOR COMPUTED LIFE

MODEL: NND15-1212

Computation Life curve



Formula: $L = L_0 X\ 2^{\frac{105 - Tc}{10}}$ (year)

L: Elec. capacitor computed life

(24 houres per day, 365 days operation)

L_0: Guarentee life for Elec. Cap.

Tc: Case temperature of Elec. Cap.

CONDITIONS: Mounting method: Standard mounting

Input Voltage: 100VAC

Output Voltage: +/-12V

Cooling: convection cooling

5. ABNORMAL TEST

MODEL - NND15-1212

(1) Conditions

Input: 115VAC Output: +/-12V 0.75A Ta: 25c Selector: 100VAC

(2) Test Results

No.	Test Point		Test Mode		Test Result												
					①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	
	Location No.	Test Point	Short	Open	Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Blown	OVP	OCP	No Output	No Change	Others	Note
1	C2		●								●			●			
2	C11			●												●	OUTPUT OSCILLATIONS
3	C6		●											●			
4	C15			●												●	OUTPUT OSCILLATIONS
5	CR1	~		●										●			
6		⊕		●										●			
7	CR10	⊕–~	●								●			●			
8		⊖–~	●								●			●			
9	CR2		●												●		
10	CR11			●								●		●			OVP
11	CR3		●									●		●			OVP
12	CR12			●											●		
13	CR5		●													●	VOUT=5.1V
14	CR14			●											●		
15	CR6		●												●		
16	CR15			●												●	VOUT=5.1V
17	CR7		●											●			OVP
18	CR16			●											●		
19	CR8		●												●		
20	CR17			●											●		
21	CR9		●											●			
22	CR18			●											●		

No.	Test Point		Test Mode		Test Result												
					①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	
	Location No.	Test Point	Short	Open	Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Blown	OVP	OCP	No Output	No Change	Others	Note
23	Q1 Q3	D		●										●			
24		S		●										●			
25		G		●							●			●			
26		D-S	●								●			●			
27		G-S	●											●			
28		D-G	●								●			●			
29	Q2 Q4	A-K	●										●	●			
30		A		●											●		
31		K		●											●		
32	IC2 IC4	1-6	●											●			
33		1		●								●		●			
34		6		●								●		●			
35	T1	PRIM WINDING	●								●			●			
36				●										●			
37		SEC WINDING	●								●			●			
38				●										●			

6. VIBRATION TEST

MODEL: NND15-1212

(1) Vibration test class:

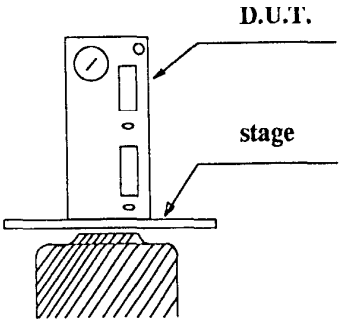
Frequency variable endurance test

(2) Equipment used:

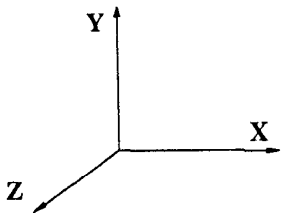
Controller: SHIN-NIPPON SOKKI CO.LTD F-400-BM-E4M

Vibrator : 905 - FN

(3) Testing method:



Vibrator



D.U.T. Direction

Sweep frequency : 10 ~ 55Hz

Sweep time: 1min

Acceleration: const. (2G)

Direction: X, Y, Z.

Test time: 1H each

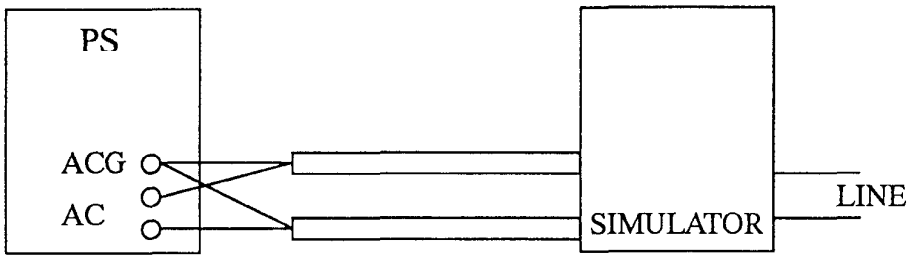
Result: (OK) NG

Check item / Direc.	Vout	Ripple (mVp-p)	D.U.T. stage	Note
Initial	12.029	1.5	OK	
X	12.029	1.5	OK	
Y	12.029	1.5	OK	
Z	12.129	1.5	OK	

NOISE SIMULATE TEST

MODEL : NND 15

(1) Test circuit and equipment



Simulator: INS - 4420
(Noise laboratory Co. Ltd.)

(2) Measuring Conditions

Input voltage	: Rated
Output voltage	: Rated
Output current	: 0%, 100%
Ambient temperature	: 25 °C
Pulse width	: 50ns ~1000ns
Noise level	: 0 ~2KV
Phase shift	: 0 ~360 °C
Polarity	: +, −
MODE	: NORMAL, COMMON
TRIG SELECT	: LINE

(3) Acceptable conditions

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

(4) Results

(OK) NG

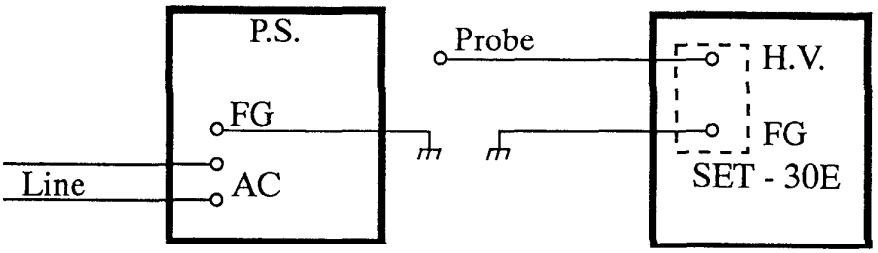
ELECTRO - STATIC DISCHARGE TEST
MODEL : NND 15

NND 15

(1) Equipment used
ESS - 630A (Noise Laboratory Co. Ltd.)
Discharge resistance : 330 OHM Capacity : 150 pF

(2) Measuring Conditions
Input voltage : Rated (100 VAC)
Output voltage : Rated
Output current : Rated
Ambient temperature : 25 °C
Test voltage : ± 3KV, ± 5KV, ± 10KV, ± 15KV

(3) Testing Method
Check if there is no abnormal output when the testing voltage is applied to operating D.U.T. (Device Under Test) on its case, input terminal, output terminal, FG terminal and ACG terminal - which are parts exposed to the human body. Testing cycle is at positive, negative polarity for three times each, and the applied voltage is to be gradually increased from 3KV to 15KV.



(4) Acceptable Conditions
1. Not to be broken
2. Output not to be shut down
3. No other out of order conditions

(5) Results
(OK) NG

IMPULSE TEST

NND 15

MODEL : NND 15

(1) Equipment used

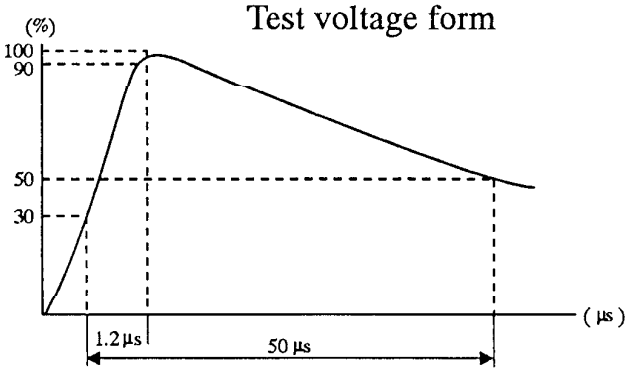
LSS - 710B (Noise laboratory Co. Ltd.)

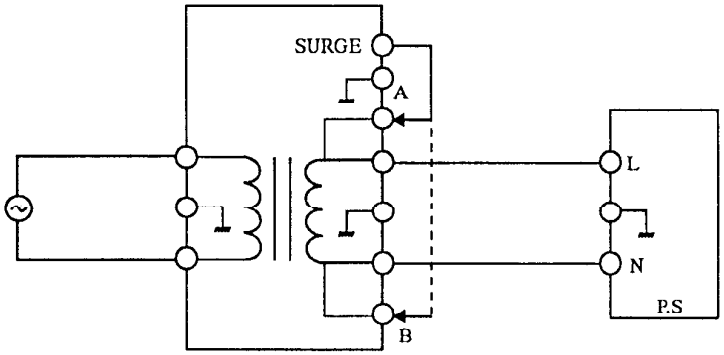
(2) Measuring Conditions

Input voltage	: Rated	Test voltage	: 5KV
Output voltage	: Rated	Test point	: Between FG - AC
Output current	: Full load	Test time	: 3 times
Ambient temperature	: 25 °C	Polarity	: + , −

(3) Testing method

Test voltage form





(4) Acceptable conditions

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

(5) Results

(OK) NG