KWS15

RELIABILITY DATA

信頼性データ

No. RD-08T-627A		
承認	査閲	担当
Kurosawa 31.Oct'08	Y. Kihara 30. Oct. '08	M. Nagai 30. Oct. '08

TDK-Lambda

I N D E X

PAGE

※信頼性試験は代表データであり、この値は実力値とお考え願います。
※本データに掲載してあります内蔵部品の名称は、本製品を開発した当初のものです。
　これらは改善等の為に変更されている可能性もありますが、ご了承下さい。

The following data are typical values and the data to be considered as ability values.
The built-in components names on this data are the things the time of Development.
Please understand that it may be changed for an improvement etc.

KWS15

M . T. B . F

1. Method of calculation

This calculation is by the 'components count method' laid down by the DC Stabilized Power Supplies (Switching 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 the EIAJ handbook no. RCF-9021 for detail.

Formula:

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

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

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

Ni = Number of i^{th} component

n = Number of categories of components

2. MTBF Value

Condition : Nominal line, rated load

Ambient Temperature 25°C

MTBF = 183,715.5 hrs.

Components Derating Data

(At Nominal Line and Rated Load, Ambient Temperature 50°C)

Calculation Method

A. Semiconductors

The derating factor is taken as the ratio of the actual operating junction temperature taking into consideration operating ambient temperature, power loss and thermal resistance to the maximum rated junction temperature specifications of the components.

B. IC, Resistors, Capacitors etc.

Operating ambient temperature, operating condition, power loss for each individual component are all designed to meet the requirements of Nemic-Lambda's design standard.

C. Thermal Resistance Calculation

$$\theta jc = \frac{Tj(max) - Tc}{Pc(max)} \qquad \theta ja = \frac{Tj(max) - Ta}{Pc(max)}$$

Tc : Case Temperature (Normally 25°C)

Ta : Ambient Temperature (Normally 25°C)

Pc(max) : Maximum Power Loss

Tj(max) : Maximum Junction Temperature

θjc : Junction to Case Thermal Resistance

θja : Junction to ambient Thermal Resistance

認・APPD		設 計 ENGR		図面番号 DWG－No.	
	. .		. .	PA768-56-02	
検 図 CHK		製 図 DWG			
	. .		. .		

SEMICONDUCTOR DERATING

DWG. NO. PA768-56-03

DATE : 21-MAY-1992

MODEL : KWS15-5

VIN = AC 100V LOAD = 100% Ta = 50 °C

Q1 2SK1663L FUJI	Tchmax = 150 °C	θch-c = 1.563 °C/W	Pd(max) = 80.0 W
	Pd = 1.073 W	ΔTc = 47.7 °C	Tc = 97.7 °C
	Tch = Tc + (θch-c) * Pd = 99.38 °C		
	D.F. = 66.25 %		
A1 UC2842ADW UNITRODE	Tjmax = 150 °C	θj-c = 70.0 °C/W	Pd(max) = 0.725 W
	Pd = 0.31 W	ΔTc = 43.1 °C	Tc = 93.1 °C
	Tj = Tc + (θj-c) * Pd = 114.8 °C		
	D.F. = 76.53 %		
A2 HA17431FPA HITACHI	Tjmax = 125 °C	θj-c = 259.74 °C/W	Pd(max) = 0.385 W
	Pd = 0.30 mW	ΔTc = 37.0 °C	Tc = 87.0 °C
	Tj = Tc + (θj-c) * Pd = 87.08 °C		
	D.F. = 69.66 %		
PC1 (LED) TLP121GR TOSHIBA	Tjmax = 125 °C	θj-c = -- °C/W	Pd(max) = 50 mW
	If = 0.10 mA	ΔTc = 32.9 °C	Tc = 82.9 °C
	Allowable If (max.) = 30 mA (at Tc = 82.9 °C)		
	D.F. = 0.33 %		
PC1 (TRANSISTOR) TLP121GR TOSHIBA	Tjmax = 125 °C	θj-c = 400 °C/W	Pd(max) = 150 mW
	Pd = 0.37 mW	ΔTc = 32.9 °C	Tc = 82.9 °C
	Tj = Tc + (θj-c) * Pd = 83.05 °C		
	D.F. = 66.44 %		
D1 S1WB(A)60B SHINDENGEN	Tjmax = 150 °C	θj-l = 10.0 °C/W	Pd(max) = 12.5 W
	Pd = 0.634 W	ΔT(lead) = 44.2 °C	T(lead) = 94.2 °C
	Tj = Tl + (θj-l) * Pd = 100.54 °C		
	D.F. = 67.0 %		
D2 1SS184TE85L TOSHIBA	Tjmax = 125 °C	θj-l = 100 °C/W	Pd(max) = 150 mW
	Pd = 42.77 mW	ΔT(lead) = 46.4 °C	T(lead) = 96.4 °C
	Tj = Tl + (θj-l) * Pd = 100.68 °C		
	D.F. = 80.54 %		

SEMICONDUCTOR DERATING

DWG. NO. PA768-56-04

DATE : 21-MAY-1992

MODEL : KWS15-5

VIN = AC 100V LOAD = 100% Ta = 50 °C

D3 D1FL20U SHINDENGEN	Tjmax = 150 °C	Θj-l = 23.0 °C/W	Pd(max) = 5.43 W
	Pd = 46.59 mW	⊿T(lead) = 45.8 °C	T(lead) = 95.8 °C
	Tj = Tl + (Θj-l) * Pd = 96.87 °C		
	D.F. = 64.58 %		
D4 EC8FS6 NIHON-INTER	Tjmax = 150 °C	Θj-l = 23.0 °C/W	Pd(max) = 5.43 W
	Pd = 52.93 mW	⊿T(lead) = 47.9 °C	T(lead) = 97.9 °C
	Tj = Tl + (Θj-l) * Pd = 99.12 °C		
	D.F. = 66.08 %		
D5 TP802C04 FUJI	Tjmax = 150 °C	Θj-c = 3.0 °C/W	Pd(max) = 41.7 W
	Pd = 1.02 W	⊿Tc = 58.8 °C	Tc = 108.8 °C
	Tj = Tc + (Θj-c) * Pd = 111.86 °C		
	D.F. = 74.57 %		
D6 TP802C04 FUJI	Tjmax = 150 °C	Θj-c = 3.0 °C/W	Pd(max) = 41.7 W
	Pd = 1.02 W	⊿Tc = 58.8 °C	Tc = 108.8 °C
	Tj = Tc + (Θj-c) * Pd = 111.86 °C		
	D.F. = 74.57 %		
D7 1SS184TE85L TOSHIBA	Tjmax = 125 °C	Θj-l = 100 °C/W	Pd(max) = 150 mW
	Pd = 0 mW	⊿T(lead) = 40.0 °C	T(lead) = 90.0 °C
	Tj = Tl + (Θj-l) * Pd = 90.0 °C		
	D.F. = 72.0 %		
ZD1 1N4735A MOTOROLA	Tjmax = 200 °C	Θj-c = 175 °C/W	Pd(max) = 1.0 W
	Pd = 0 W	⊿Tc = 43.5 °C	Tc = 93.5 °C
	Tj = Tc + (Θj-c) * Pd = 93.5 °C		
	D.F. = 46.6 %		
Q2 2SC2873-Y TOSHIBA	Tjmax = 150 °C	Θj-c = 125 °C/W	Pd(max) = 1.0 W
	Pd = 0 W	⊿Tc = 30.0 °C	Tc = 80.0 °C
	Tj = Tc + (Θj-c) * Pd = 80.0 °C		
	D.F. = 53.3 %		

dT TEMPERATURE RISE

DWG. NO. PA768-66-02

MODEL : KWS15-5

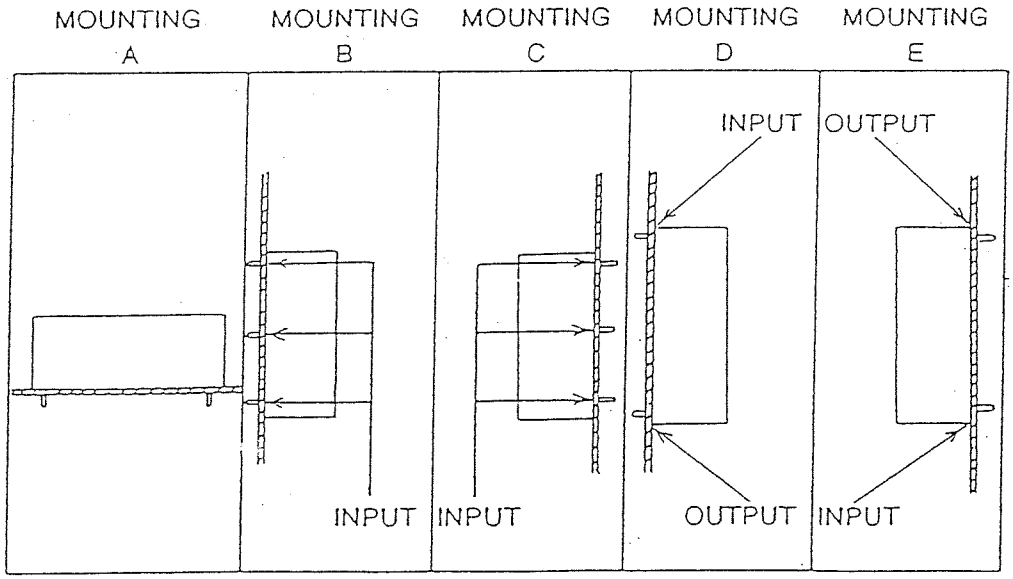
DATE : 15-MAY-1992

INPUT VOLTAGE = 100VAC

Ta = 50 °C		dT TEMPERATURE RISE (°C)				
OUTPUT DERATING (%)		100%	100%	100%	100%	100%
SYMBOL	PARTS NAME	MOUNTING A	MOUNTING B	MOUNTING C	MOUNTING D	MOUNTING E
Q1	MOSFET	47.7	47.4	45.3	44.2	45.4
A1	PWM IC	43.1	43.3	40.2	39.5	40.2
D5	SBD	58.8	58.2	58.4	58.6	58.6
T1	X'TMER	53.0	52.3	52.0	49.4	51.8
C5	E.CAP	36.3	37.0	33.8	32.8	34.5
C16	OS CAP.	36.5	37.1	33.7	31.7	37.0

INPUT VOLTAGE = 200VAC

Ta = 50 °C		dT TEMPERATURE RISE (°C)				
OUTPUT DERATING (%)		100%	100%	100%	100%	100%
SYMBOL	PARTS NAME	MOUNTING A	MOUNTING B	MOUNTING C	MOUNTING D	MOUNTING E
Q1	MOSFET	53.8	53.3	49.6	49.9	49.8
A1	PWM IC	45.7	45.7	41.3	41.8	41.4
D5	SBD	60.6	60.8	60.1	60.0	60.2
T1	X'TMER	55.4	54.5	52.9	51.5	52.6
C5	E.CAP	39.7	40.2	35.4	35.8	36.2
C16	OS CAP.	38.6	39.0	34.4	33.4	37.8



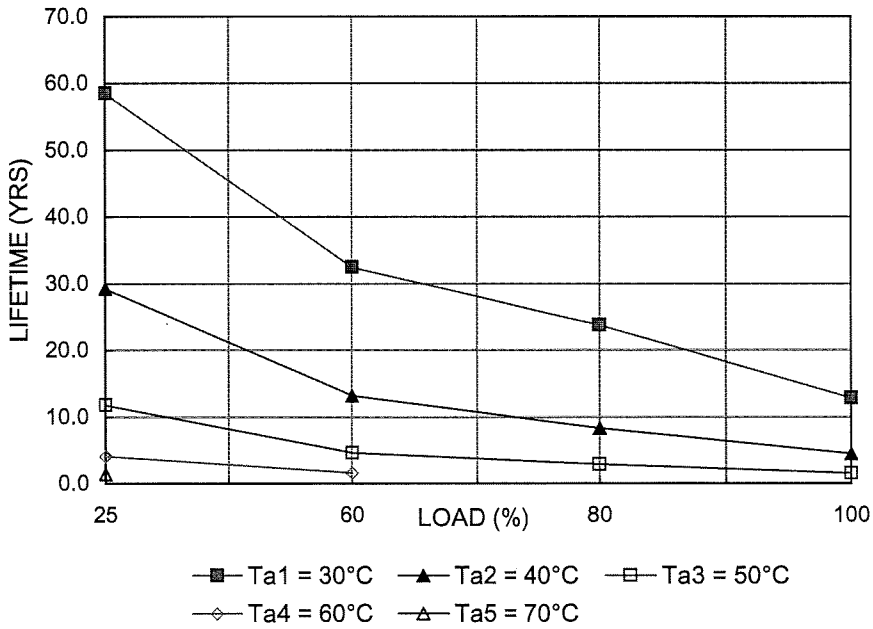
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : A

VIN : 100VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	58.5	29.3	11.8	4.1	1.5
60	32.5	13.2	4.7	1.6	
80	23.8	8.4	2.9		
100	12.8	4.5	1.6		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING A KWS15-5



計算式 **FORMULA**

1. アルミ電解コンデンサ
   AL. Electrolytic capacitor
   $L = Lo \times 2^{(105-Tc)/10}$ (year)

2. OSコンデンサ
   O.S capacitor
   $L = Lo \times 10^{(105-Tc)/20}$ (year)

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

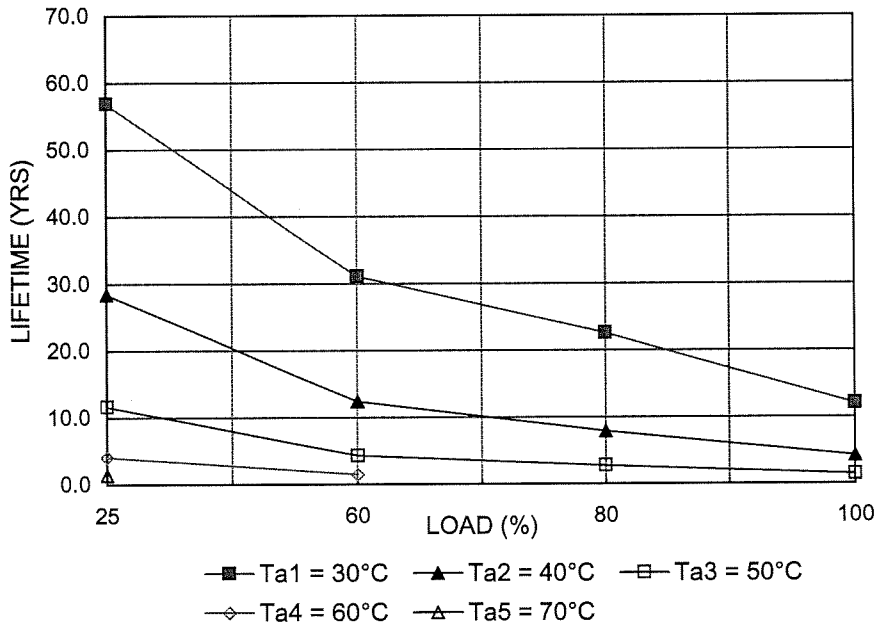
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : B

VIN : 100VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	56.9	28.5	11.7	4.1	1.4
60	31.1	12.4	4.4	1.5	
80	22.6	7.9	2.8		
100	12.1	4.2	1.5		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING B KWS15-5



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   O.S capacitor
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L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
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(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5

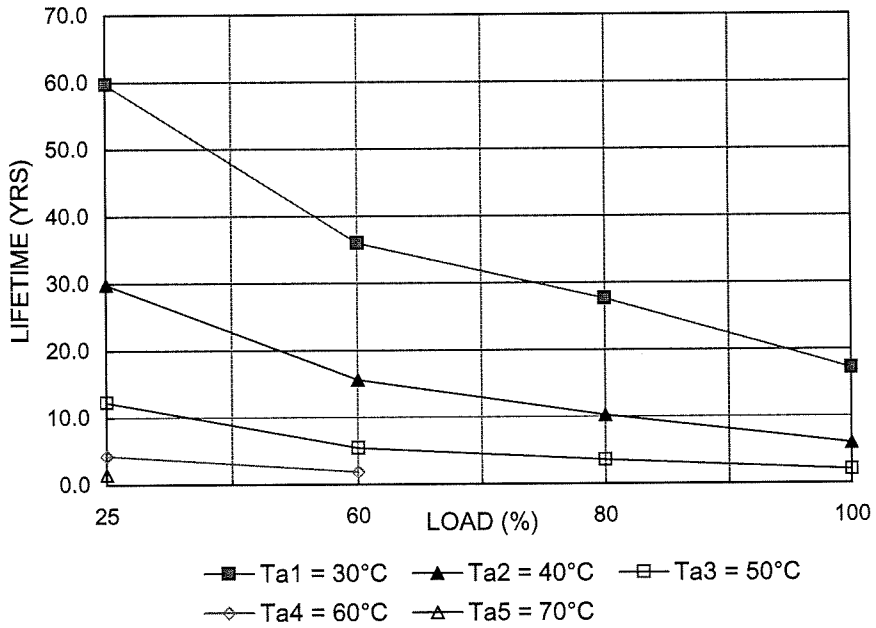
MOUNTING : C

VIN : 100VAC

DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	59.8	29.9	12.3	4.3	1.5
60	36.0	15.7	5.5	1.9	
80	27.7	10.3	3.6		
100	17.2	6.0	2.1		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING C KWS15-5



計算式 **FORMULA**

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2. OSコンデンサ
   O.S capacitor
   $L = Lo \times 10^{(105-Tc)/20}$ (year)

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

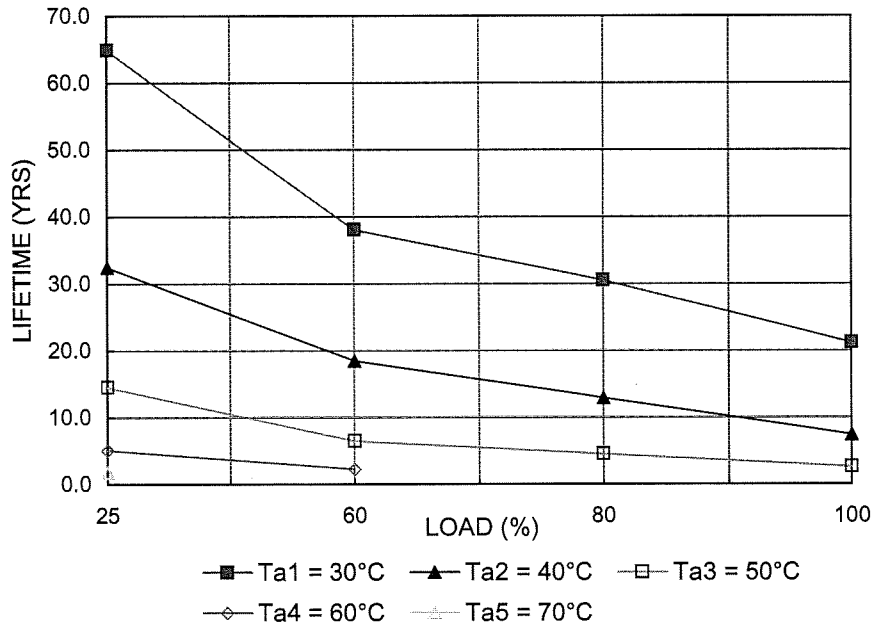
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : D

VIN : 100VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	64.9	32.5	14.6	5.1	1.8
60	38.1	18.5	6.5	2.3	
80	30.5	13.0	4.6		
100	21.2	7.5	2.6		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING D KWS15-5



計算式 **FORMULA**

1. アルミ電解コンデンサ
   AL. Electrolytic capacitor
   $L = Lo \times 2^{(105-Tc)/10}$ (year)

2. OSコンデンサ
   O.S capacitor
   $L = Lo \times 10^{(105-Tc)/20}$ (year)

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

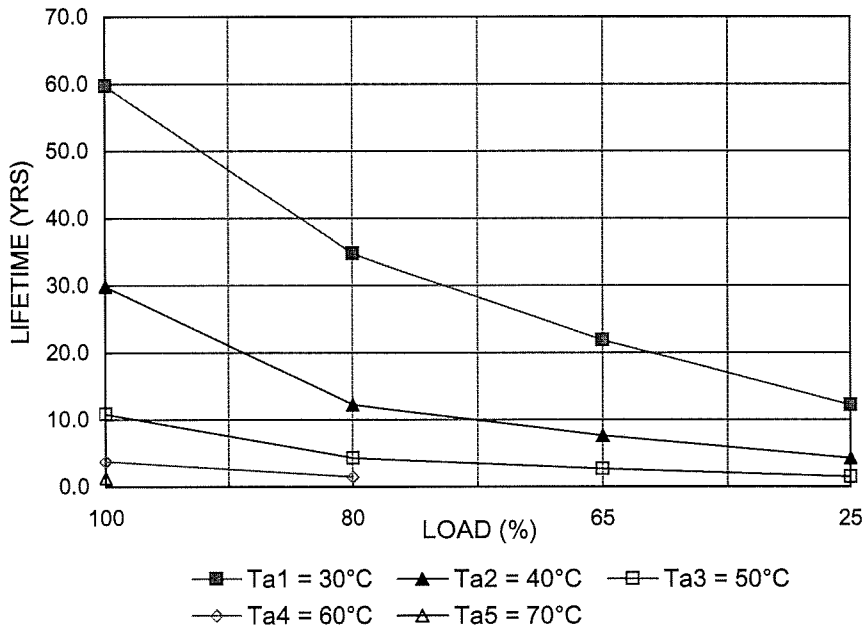
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : E

VIN : 100VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
100	59.8	29.9	10.9	3.8	1.3
80	34.8	12.3	4.3	1.5	
65	21.9	7.7	2.7		
25	12.2	4.3	1.5		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING E KWS15-5



計算式 **FORMULA**

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   AL. Electrolytic capacitor
   $L = Lo \times 2^{(105-Tc)/10}$ (year)

2. OSコンデンサ
   O.S capacitor
   $L = Lo \times 10^{(105-Tc)/20}$ (year)

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

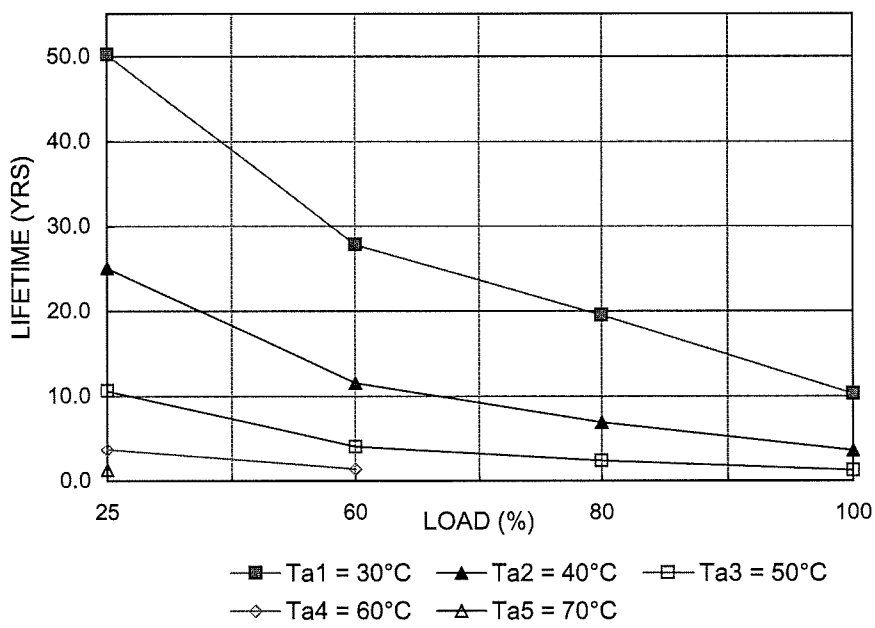
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : A

VIN : 200VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	50.2	25.1	10.6	3.73389631	1.31104259
60	27.9	11.6	4.1	1.42554337	
80	19.6	6.9	2.4		
100	10.3	3.6	1.3		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING A KWS15-5



計算式 **FORMULA**

1. アルミ電解コンデンサ
   AL. Electrolytic capacitor
   $L = Lo \times 2^{\frac{105-Tc}{10}}$ (year)
2. OSコンデンサ
   O.S capacitor
   $L = Lo \times 10^{\frac{105-Tc}{22}}$ (year)

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

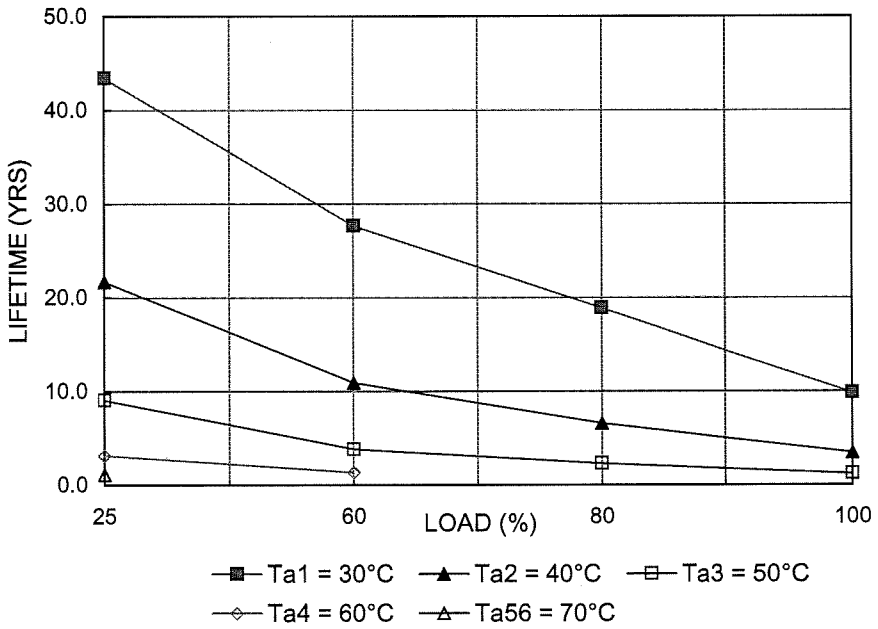
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : B

VIN : 200VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	43.4	21.7	9.1	3.2	1.1
60	27.7	11.0	3.9	1.4	
80	18.9	6.6	2.3		
100	9.9	3.5	1.2		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING B KWS15-5



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L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

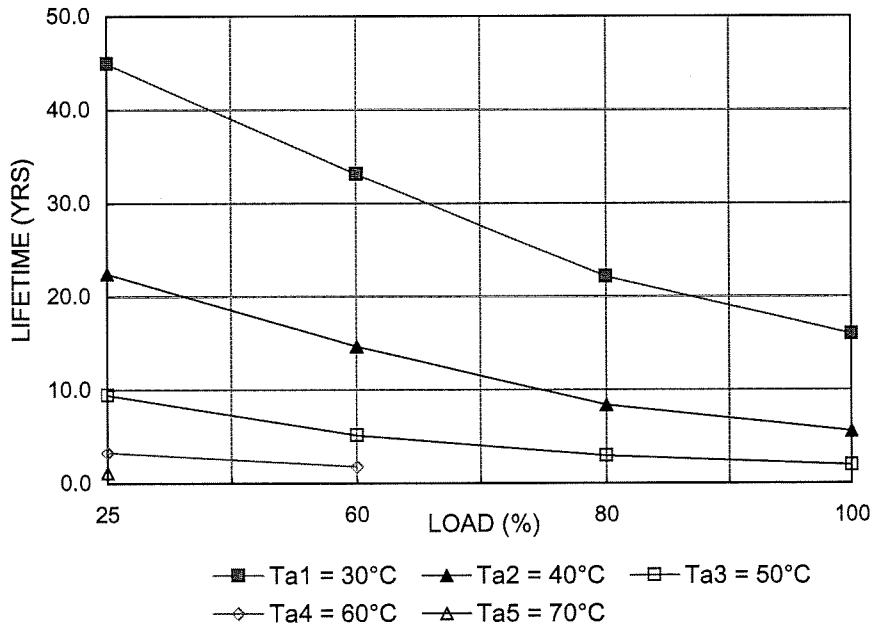
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : C

VIN : 200VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	45.0	22.5	9.5	3.3	1.2
60	33.2	14.7	5.2	1.8	
80	22.2	8.4	3.0		
100	16.0	5.6	2.0		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING C KWS15-5



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   O.S capacitor
   $L = Lo \times 10^{(105-Tc)/20}$ (year)

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

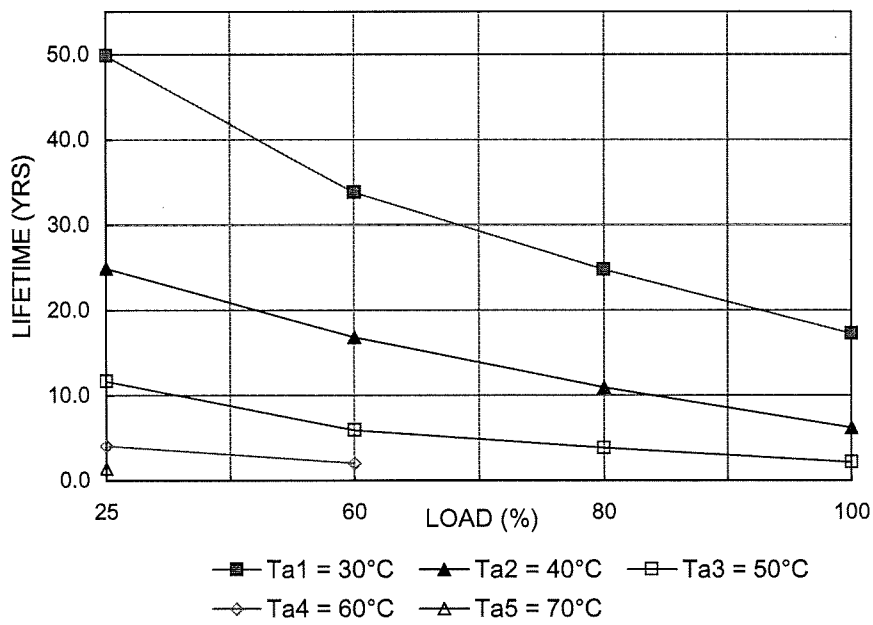
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : D

VIN : 200VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	49.9	25.0	11.7	4.1	1.4
60	33.8	16.9	5.9	2.1	
80	24.8	11.0	3.9		
100	17.3	6.2	2.2		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING D KWS15-5



計算式 **FORMULA**

1. アルミ電解コンデンサ
   AL. Electrolytic capacitor
   $L = Lo \times 2^{(105-Tc)/10}$ (year)

2. OSコンデンサ
   O.S capacitor
   $L = Lo \times 10^{(105-Tc)/20}$ (year)

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

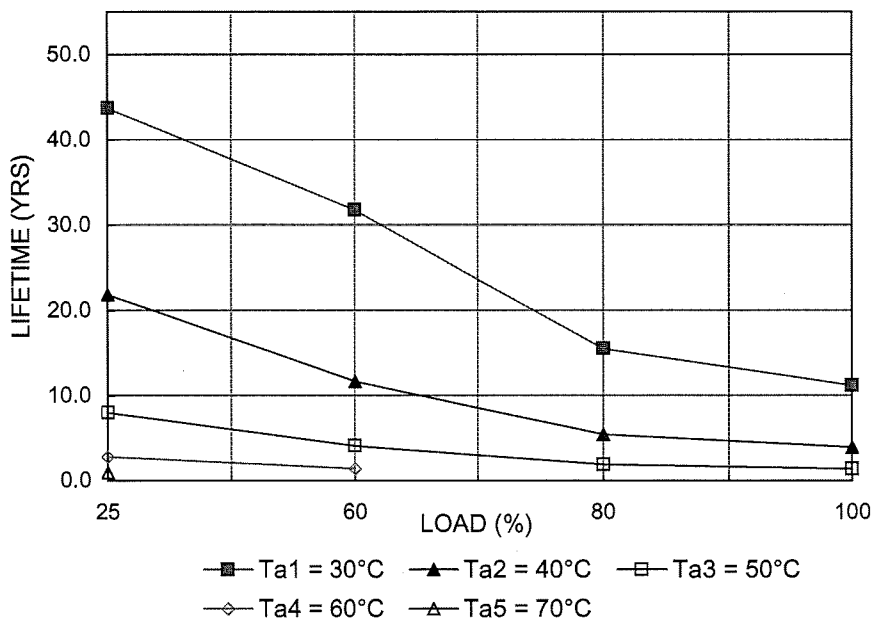
ELECTROLYTIC CAPACITOR LIFETIME VERSUS LOAD

MODEL : KWS15-5 MOUNTING : E

VIN : 200VAC DATE: SEPT 12, 2008

LOAD (%)	LIFETIME (YRS)				
	Ta = 30°C	Ta = 40°C	Ta = 50°C	Ta = 60°C	Ta = 70°C
25	43.7	21.9	8.0	2.8	1.0
60	31.8	11.7	4.1	1.4	
80	15.5	5.4	1.9		
100	11.2	3.9	1.4		

GRAPH OF ELECTROLYTIC CAPACITOR LIFETIME VS LOAD
MOUNTING E KWS15-5



計算式 **FORMULA**

1. アルミ電解コンデンサ
   AL. Electrolytic capacitor
   $L = Lo \times 2^{(105-Tc)/10}$ (year)

2. OSコンデンサ
   O.S capacitor
   $L = Lo \times 10^{(105-Tc)/20}$ (year)

L : 電解コンデンサ推定寿命計算値
Elec. Capacitor computed life.
（２４時間連続稼動、３６５日）
(24 hrs per day, 365 days per year)

Lo : 電解コンデンサ保証寿命値
Guarantee life for Elec. cap.

Tc : 電解コンデンサのケース温度
Case temperature of Elec. cap.

DWG NO : PA768-57-02

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
		LOAD = 100 %	Vin = 100VAC Ta = 25℃	

	PARTS NAME	PART NO.	TEST MODE	SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	UF1717H-702Y0R3-01	L1		*														*			*		
2	UF1717H-702Y0R3-01	L1			*												*				*		
3																							
4	S1WB(A)60B	D1	AC	*										*							*		
5	S1WB(A)60B	D1	AC		*												*				*		
6	S1WB(A)60B	D1	DC	*										*							*		
7	S1WB(A)60B	D1	DC		*												*				*		
8																							
9	1SS184TE85L	D2	A-K	*														*			*		
10	1SS184TE85L	D2	A-K		*													*			*		
11																							
12	D1FL20U	D3	A-K	*													*				*		
13	D1FL20U	D3	A-K		*														*	hiccup	*		
14																							
15	EC8FS6	D4	A-K	*															*	hiccup	*		
16	EC8FS6	D4	A-K		*													*			*		
17																							
18	TP802C04	D5	A-K	*															*	hiccup	*		
19	TP802C04	D5	A-K		*													*			*		
20																							
21	TP802C04	D6	A-K	*															*	hiccup	*		
22	TP802C04	D6	A-K		*													*			*		
23																							
24																							

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-03

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
		LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.	TEST MODE	SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	1SS184TE85L	D7	A-K	*														*			*		
2	1SS184TE85L	D7	A-K		*													*			*		
3																							
4	1N4735A	ZD1	A-K	*															*	hiccup	*		
5	1N4735A	ZD1	A-K		*													*			*		
6																							
7	TLP121GR (DIODE)	PC1	1-3	*															*	hiccup ZD1 - shorted	*		
8	TLP121GR (DIODE)	PC1	1-3		*														*	hiccup ZD1 - shorted	*		
9	TLP121GR (TRANS)	PC1	4-6	*													*				*		
10	TLP121GR (TRANS)	PC1	4-6		*													*			*		
11																							
12	HA17431FPA-TR	A2	A-K	*															*	hiccup	*		
13	HA17431FPA-TR	A2	REF-A	*															*	hiccup ZD1 - shorted	*		
14																							
15	2SK1663L	Q1	D-S	*									*							Q1,A1,R13,R14,R15,F1	*		
16	2SK1663L	Q1	G-S	*													*				*		
17																							
18	2SC2873-Y	Q2	B-E	*														*			*		
19	2SC2873-Y	Q2	C-E	*													*				*		
20	2SC2873-Y	Q2	B-C	*													*				*		
21																							
22																							
23																							
24																							

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-04

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
		LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.	TEST MODE	SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	MKC-S683M	C1		*										*							*		
2	MKC-S683M	C1			*													*			*		
3																							
4	MKC-S683M	C2		*										*							*		
5	MKC-S683M	C2			*													*			*		
6																							
7	PME290MA4330M	C3		*														*			*		
8	PME290MA4330M	C3			*													*			*		
9																							
10	PME290MA4330M	C4		*														*			*		
11	PME290MA4330M	C4			*													*			*		
12																							
13	LXA400VBSN-75(M)	C5		*										*							*		
14	LXA400VBSN-75(M)	C5			*													*			*		
15																							
16	C55Y5U1E186Z-TE12	C6		*													*				*		
17	C55Y5U1E186Z-TE12	C6			*												*				*		
18																							
19	C2012X7R1E104KT	C7		*													*				*		
20	C2012X7R1E104KT	C7			*													*			*		
21																							
22	C3225C0G1H332J	C8		*													*				*		
23	C3225C0G1H332J	C8			*														*	Pin incr, D-S w/f unstable	*		
24																							

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-05

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
		LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.	TEST MODE	SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	C2012C0G1H101KT	C9		*									*							Q1,A1,R8,R10,R13,R14,R15	*		
2	C2012C0G1H101KT	C9			*													*			*		
3																							
4	C2012C0G1H221KT	C10		*													*				*		
5	C2012C0G1H221KT	C10			*													*			*		
6																							
7	GR43-2W5R103K500PT	C11		*															*	hiccup	*		
8	GR43-2W5R103K500PT	C11			*													*			*		
9																							
10	C2012X7R1H473KT	C12		*															*	hiccup	*		
11	C2012X7R1H473KT	C12			*													*			*		
12																							
13	C25Y5U1E106Z	C13		*															*	hiccup	*		
14	C25Y5U1E106Z	C13			*													*			*		
15																							
16	C25Y5U1E106Z	C14		*															*	hiccup	*		
17	C25Y5U1E106Z	C14			*													*			*		
18																							
19	C25Y5U1E106Z	C15		*															*	hiccup	*		
20	C25Y5U1E106Z	C15			*													*			*		
21																							
22	10SA68M+H	C16		*															*	hiccup	*		
23	10SA68M+H	C16			*													*			*		
24																							

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-06

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
		LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.	TEST MODE	SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	C2012X7R1E104KT	C17		*															*	low Vout and Pin	*		
2	C2012X7R1E104KT	C17			*													*		high pitch sound	*		
3																							
4	DE7100FZ472PVA1-KC	C18		*														*			*		
5	DE7100FZ472PVA1-KC	C18			*													*			*		
6																							
7	CM21W5R102K200BT	C20		*															*	hiccup	*		
8	CM21W5R102K200BT	C20			*													*			*		
9																							
10	C3216X7R1E334KT	C21		*														*			*		
11	C3216X7R1E334KT	C21			*													*			*		
12																							
13	10SA68M+H	C22		*															*	hiccup	*		
14	10SA68M+H	C22			*													*			*		
15																							
16	ERJ8GEYJ304V	R1		*														*			*		
17	ERJ8GEYJ304V	R1			*													*			*		
18																							
19	ERJ8GEYJ304V	R2		*														*			*		
20	ERJ8GEYJ304V	R2			*													*			*		
21																							
22	ERJ8GEYJ304V	R3		*														*			*		
23	ERJ8GEYJ304V	R3			*													*			*		
24																							

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-07

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
	TEST MODE	LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.		SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	ERG1SJ623	R4		*														*			*		
2	ERG1SJ623	R4			*													*			*		
3																							
4	ERG1SJ623	R5		*														*			*		
5	ERG1SJ623	R5			*													*			*		
6																							
7	CR1/10W2001DV	R6		*													*				*		
8	CR1/10W2001DV	R6			*												*				*		
9																							
10	CR1/10W152JV	R7		*															*	high Vout and Pin	*		
11	CR1/10W152JV	R7			*													*			*		
12																							
13	ERJ8GEYJ100V	R8		*														*			*		
14	ERJ8GEYJ100V	R8			*												*				*		
15																							
16	ERJ8GEYJ390V	R9		*														*			*		
17	ERJ8GEYJ390V	R9			*												*				*		
18																							
19	CR1/10W102JV	R10		*														*			*		
20	CR1/10W102JV	R10			*												*				*		
21																							
22	CR1/10W331JV	R11		*														*			*		
23	CR1/10W331JV	R11			*													*			*		
24																							

***a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-08

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
	TEST MODE	LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.		SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	CR1/10W183JV	R12		*													*				*		
2	CR1/10W183JV	R12			*													*			*		
3																							
4	ERJ8GEYJ3R9V	R13		*														*		Vds waveform unstable	*		
5	ERJ8GEYJ3R9V	R13			*										*						*		
6																							
7	ERJ8GEYJ3R9V	R14		*														*		Vds waveform unstable	*		
8	ERJ8GEYJ3R9V	R14			*										*						*		
9																							
10	ERJ8GEYJ3R9V	R15		*														*		Vds waveform unstable	*		
11	ERJ8GEYJ3R9V	R15			*										*						*		
12																							
13	ERJ8GEYJ620V	R16		*														*			*		
14	ERJ8GEYJ620V	R16			*													*			*		
15																							
16	ERJ8GEYJ620V	R17		*														*			*		
17	ERJ8GEYJ620V	R17			*													*			*		
18																							
19	ERJ8GEYJ620V	R18		*														*			*		
20	ERJ8GEYJ620V	R18			*													*			*		
21																							
22	ERJ8GEYJ823V	R19		*														*			*		
23	ERJ8GEYJ823V	R19			*													*			*		
24																							

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-09

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
		LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.	TEST MODE	SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	ERJ8GEYJ823V	R20		*														*			*		
2	ERJ8GEYJ823V	R20			*													*			*		
3																							
4	ERJ8GEYJ823V	R21		*														*			*		
5	ERJ8GEYJ823V	R21			*													*			*		
6																							
7	ERJ8GEYJ823V	R22		*														*			*		
8	ERJ8GEYJ823V	R22			*													*			*		
9																							
10	ERJ8GEYJ100V	R23		*														*			*		
11	ERJ8GEYJ100V	R23			*													*			*		
12																							
13	ERJ8GEYJ100V	R24		*														*			*		
14	ERJ8GEYJ100V	R24			*													*			*		
15																							
16	ERJ8GEYJ100V	R25		*														*			*		
17	ERJ8GEYJ100V	R25			*													*			*		
18																							
19	ERJ8GEYJ100V	R26		*														*			*		
20	ERJ8GEYJ100V	R26			*													*			*		
21																							
22	ERJ8GEYJ241V	R27		*															*	hiccup	*		
23	ERJ8GEYJ241V	R27			*													*			*		
24																							

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-10

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
		LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.	TEST MODE	SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	ERJ8GEYJ241V	R28		*															*	hiccup	*		
2	ERJ8GEYJ241V	R28			*													*			*		
3																							
4	ERJ8GEYJ241V	R29		*															*	hiccup	*		
5	ERJ8GEYJ241V	R29			*													*			*		
6																							
7	CR1/10W2001DV	R30		*															*	high Pin and Vout	*		
8	CR1/10W2001DV	R30			*														*	low Pin and Vout	*		
9																							
10	CR1/10W2051DV	R31		*															*	high Pin and Vout	*		
11	CR1/10W2051DV	R31			*														*	high Pin and Vout	*		
12																							
13	CR1/10W152JV	R32		*														*			*		
14	CR1/10W152JV	R32			*													*			*		
15																							
16	CR1/10W222JV	R33		*															*	high Pin and Vout	*		
17	CR1/10W222JV	R33			*													*			*		
18																							
19	ERJ8GEYJ301V	R34		*															*	low Pin and Vout	*		
20	ERJ8GEYJ301V	R34			*														*	high Pin and Vout	*		
21																							
22	ERJ8GEYJ101V	R35		*														*			*		
23	ERJ8GEYJ101V	R35			*													*			*		
24																							

*** a : slight b : prolonged

TDK-Lambda

DWG NO : PA768-57-11

MODEL : KWS15-5	ABNORMAL TESTING	TEST CONDITIONS	APPROVED BY	TESTED BY
		LOAD = 100 % Vin = 100VAC Ta = 25℃		

	PARTS NAME	PART NO.	TEST MODE	SHORT	OPEN		FIRE	SMOKE (a)	SMOKE (b)	BURST	SMELL	RED HOT	DAMAGE	FUSE BLOWN	O.C.P.	O.V.P.	NO OUTPUT	NO CHANGE	OTHERS	NOTE	OK	RE TEST	NO GOOD
1	ERJ8GEYJ563V	R36		*													*				*		
2	ERJ8GEYJ563V	R36			*													*			*		
3																							
4	ERJ8GEYJ332V	R37		*														*			*		
5	ERJ8GEYJ332V	R37			*													*			*		
6																							
7	ERJ8GEYJ100V	R38		*														*			*		
8	ERJ8GEYJ100V	R38			*													*			*		
9																							
10	ERJ8GEYJ241V	R39		*															*	hiccup	*		
11	ERJ8GEYJ241V	R39			*													*			*		
12																							
13																							
14																							
15																							
16																							
17																							
18																							
19																							
20																							
21																							
22																							
23																							
24																							

*** a : slight b : prolonged

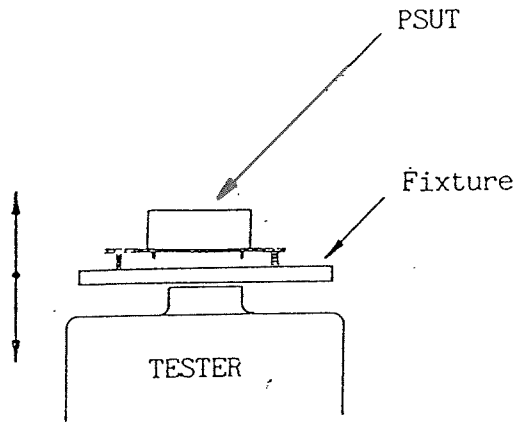
TDK-Lambda

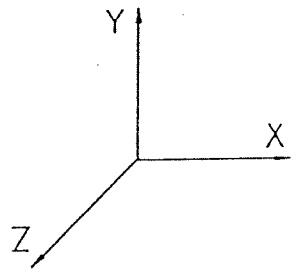
VIBRATION TEST

TYPES OF VIBRATION TEST :
A) OSCILLATOR FREQUENCY SWEEP
B) RESONANCE FREQUENCY

EQUIPMENT : EMIC CORPORATION VIBRATION TEST SYSTEM F-400-BM-E47
VIBRATION GENERATOR 905-FN

PROCEDURE :





PSUT Direction

VIBRATION TEST WITH FREQUENCY SWEEP

FREQUENCY	10～55 Hz.
SWEEP TIME	1 min.
ACCELERATION	MAX 10G.
AMPLITUDE	1.65mm$_{p-p}$ CONSTANT.
DIRECTION	X, Y, Z.
DURATION	1 hr. for each direction.

TEST POINT :
1. Output voltage (Apply some shock when checking the o/p voltage, and observe any abnormalities.)
2. Ripple voltage (At nominal output and AC100V)
3. Mechanical Condition (No breakage)

認・APPD	11・JUN・92	設計 ENGR	P.C.Gan 3・May・92	図面番号 DWG—No.	—
検図 CHK	KTNG 2・MAY・92	製図 DWG	13・4・92	PA768-64-01	

TEST RESULTS :
(after vibration)

TEST POINT (BEFORE TEST / DIRECTION)	OUTPUT VOLTAGE (V) CH1	CH2	CH3	RIPPLE VOLTAGE (mV) CH1	CH2	CH3	MECHANICAL CONDITION	NOTE
BEFORE TEST	11.89	—	—	83.5	—	—	O.K	
X	11.90	—	—	83.5	—	—	O.K	
Y	11.90	—	—	83.5	—	—	O.K	
Z	11.90	—	—	83.0	—	—	O.K	

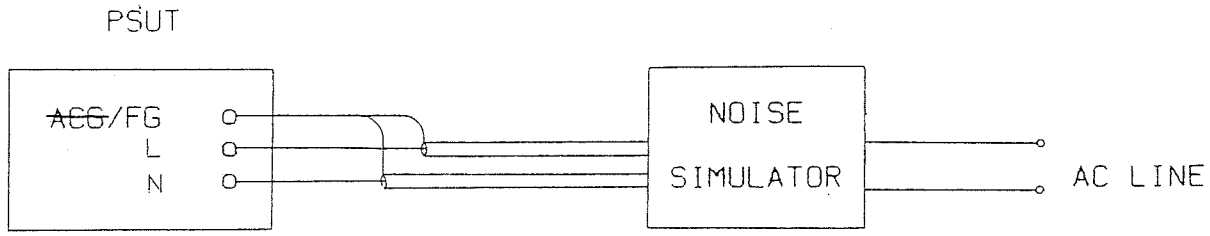
EVALUATION RESULT : (PASS) / ~~FAIL~~

VISUAL INSPECTION RESULT : (PASS) / ~~FAIL~~

認・APPD		設計 ENGR		図面番号 DWG—No.	—
検図 CHK		製図 DWG	13 · 4 · 92	PA768-64-02	

NOISE SIMULATION TEST

Circuit for measurement and equipment used :



MODEL : ENS-24X (SANKI)

Testing Conditions :

Input Voltage : AC100V

Output Voltage : Rated

Output Current : 0% , 100%

Ambient Temp. : 25 °C

Settings :

MODE ..... Normal , Common

TRIG SELECT .... Line or Ext (Line)

PULSE WIDTH 50, 200, 800, 1000ns

PHASE SHIFT .... 0 ~ 360 Degree

POLARITY ..... + , −

NOISE LEVEL .... 0 ~ 2KV

Acceptance Criteria :

1) No damage of PSUT

2) No output failure
(eg. Over/Undershooot ≤ 3% of Vo)

3) Check any abnormalities (eg. noise)

Evaluation Result : PASS / ~~FAIL~~

認・APPD		設計 ENGR	S Y Lim 20 · 4 · 92	図面番号 DWG−No.	
検図 CHK	20 · APR · 92	製図 DWG	13 · 4 · 92	PA768-61-01	

ELECTROSTATIC DISCHARGE TEST

EQUIPMENT : SET-30E (SANKI ELECTRONIC)

Discharge Resistor : 250 ohm
Capacitor unit : 200 pF

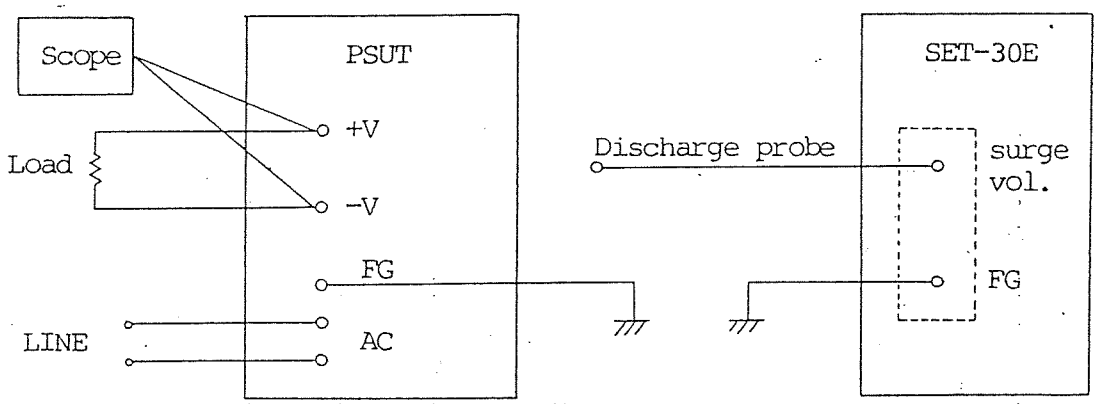
CONDITIONS :

Ambient Temperature	:	25°C
Input Voltage	:	AC100V
Output Voltage	:	Rated
Output Current	:	Rated
Applied Voltage	:	±3kV, ±5kV, ±10kV, ±15kV

PROCEDURE :

The PSUT should be in a good working condition. Discharge the applied voltage to the touchable parts of the PSUT (Chassis, Input Terminal, Output Terminal, FG Terminal, ACG Terminal) and check any abnormalities.

Each point to be tested 3 times with different polarity. Voltage should be applied from 3kV to 15kV.



ACCEPTANCE CRITERIA :

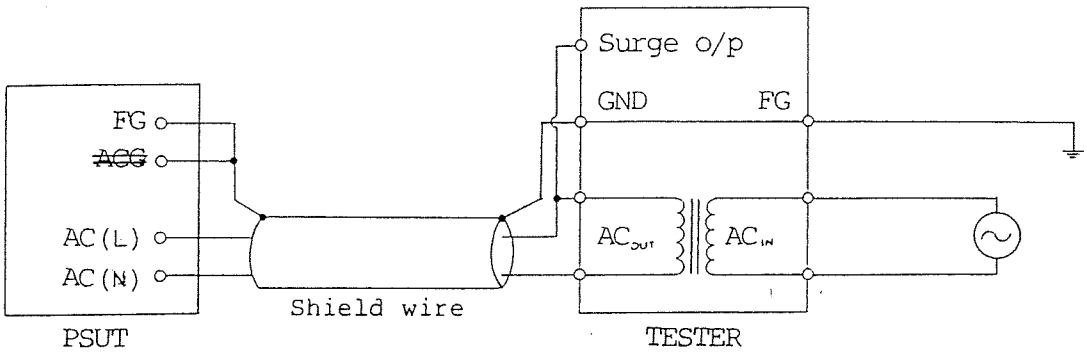
1. No damage of PSUT
2. No output failure (ΔVo < 3% of Vo)
3. No abnormalities

EVALUATION RESULT : PASS / ~~FAIL~~

認・APPD	11 · JUN · 92	設計 ENGR	P.S. Gan 5 · May · 92	図面番号 DWG—No. PA768-62-01
検図 CHK	2 · MAY · 92	製図 DWG	14 · 4 · 92	

LIGHTNING SURGE TEST

TEST CIRCUIT, TEST EQUIPMENT

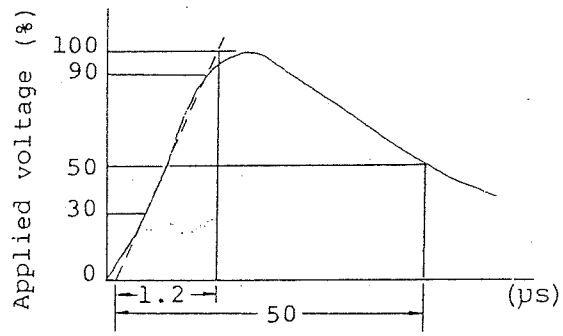


MODEL : LSG-12K-E (SANKI)

CONDITIONS :

Input Voltage	:	AC100V
Output Voltage	:	Rated
Output Current	:	Rated
Applied Voltage	:	From 3kV in steps of 0.5kV Check the max. withstand voltage
Applied Point	:	Between FG - AC
Number of Test	:	Each voltage 3 times
Polarity	:	+ , -
Ambient Temp.	:	25°C

APPLIED VOLTAGE WAVEFORM :



ACCEPTANCE CRITERIA :

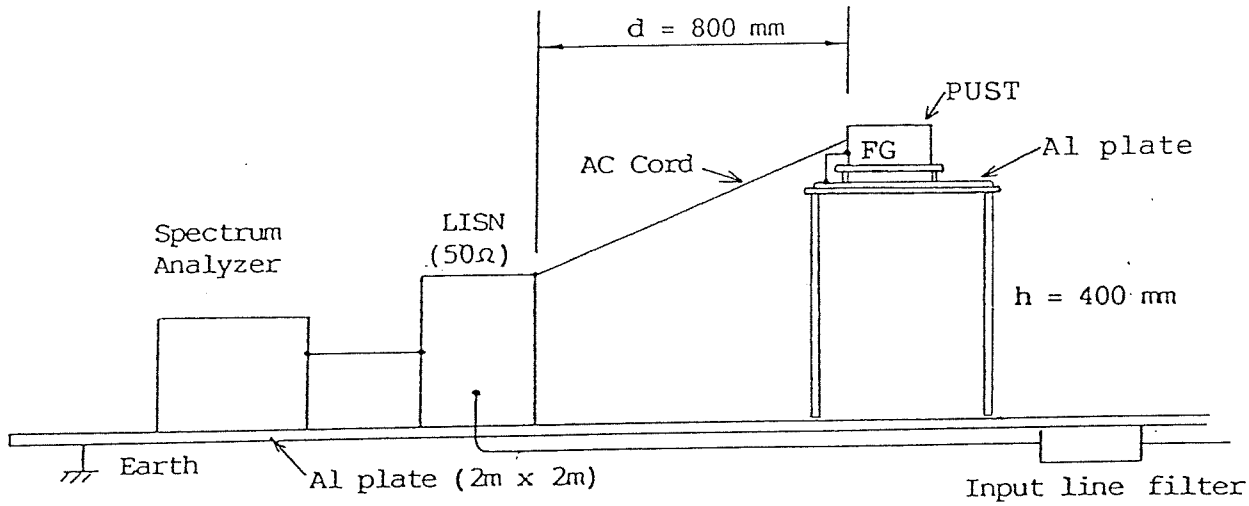
1. No damage to the PSUT
2. No output failure
3. No abnormalities

EVALUATION RESULT : 6.0 KV PASS / ~~FAIL~~

認・APPD	11・JUN・92	設計 ENGR	P.S. Chan 2・May・92	図面番号 DWG—No. PA768-74-01
検図 CHK	K TNG 2・MAY・92	製図 DWG	13・4・92	

EMI TEST

TEST CIRCUIT :



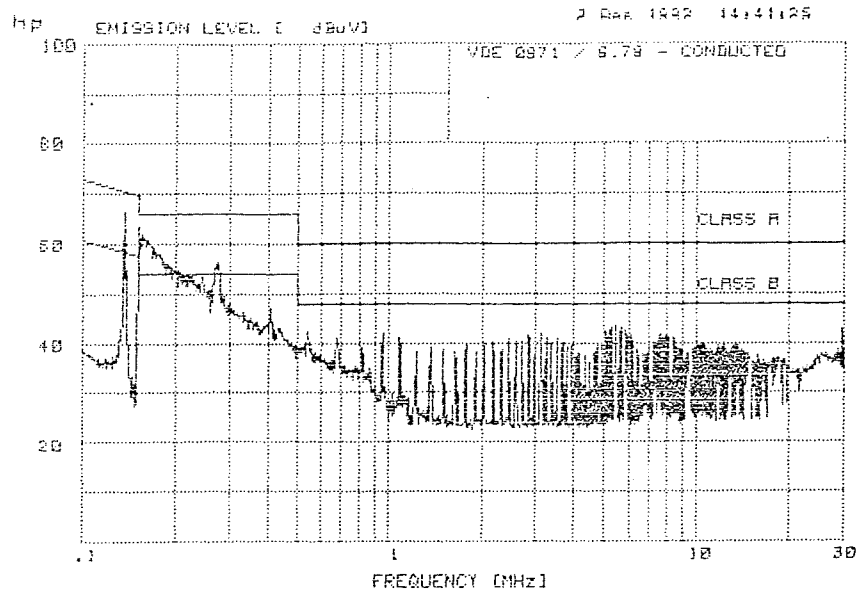
TEST EQUIPMENTS :

SPECTRUM ANALYZER	8568B	HEWLETT PACKARD
QUASI-PEAK ADAPTER	85650A	HEWLETT PACKARD
RF PRESELECTOR	85685A	HEWLETT PACKARD
LISN	3825/2	EMCO

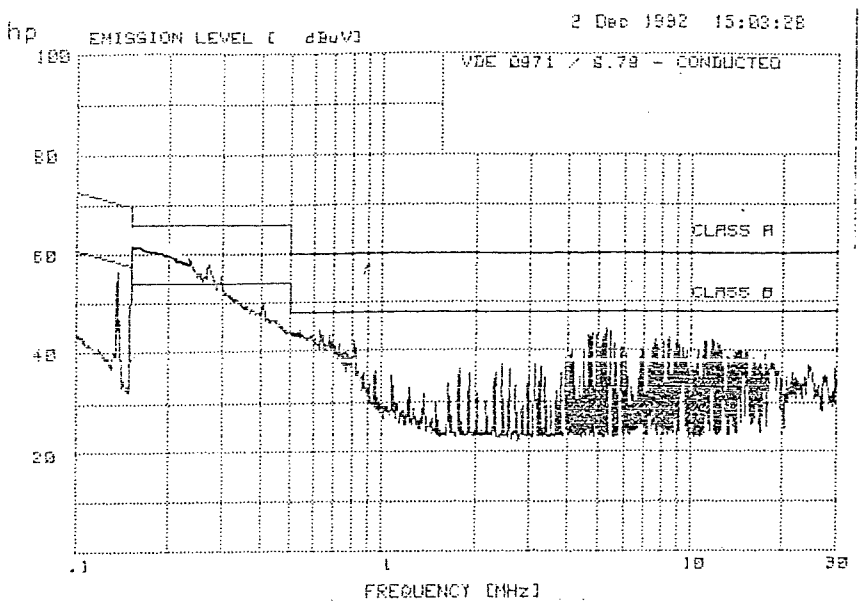
CONDITIONS :

INPUT VOLTAGE	:	AC100V, AC200V
OUTPUT VOLTAGE	:	RATED
OUTPUT CURRENT	:	RATED
AMBIENT TEMP.	:	25℃

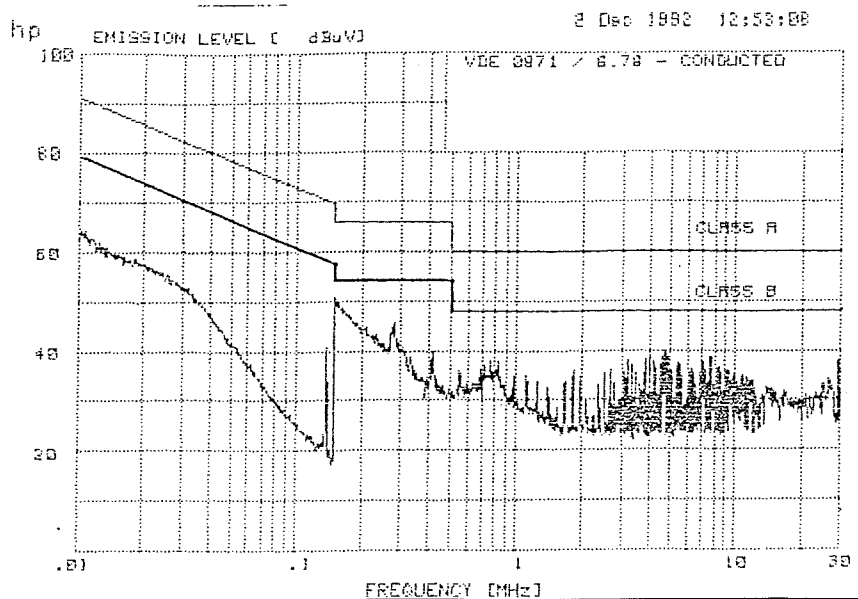
認・APPD		設計 ENGR		図面番号 DWG－No.	PA768-71-02-
検図 CHK		製図 DWG			



Vin = 100Vac



Vin = 200Vac

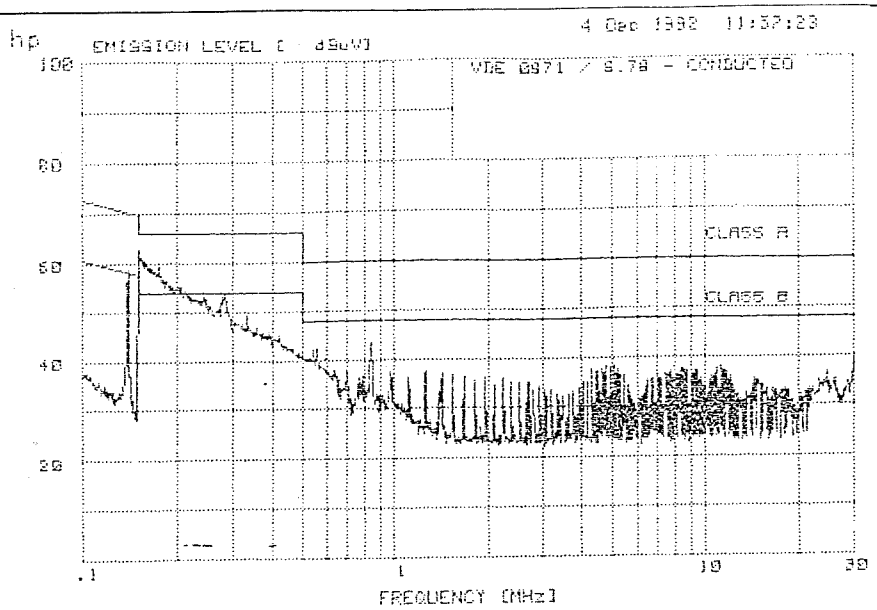


Vin = 200Vac

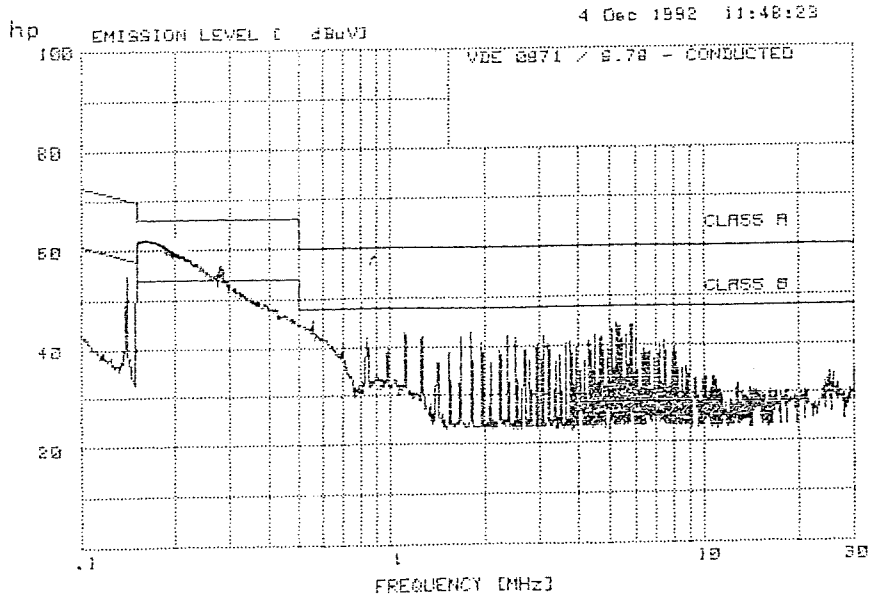
V D E

With external cap. 0.33μF between Ac(L) and Ac(N).

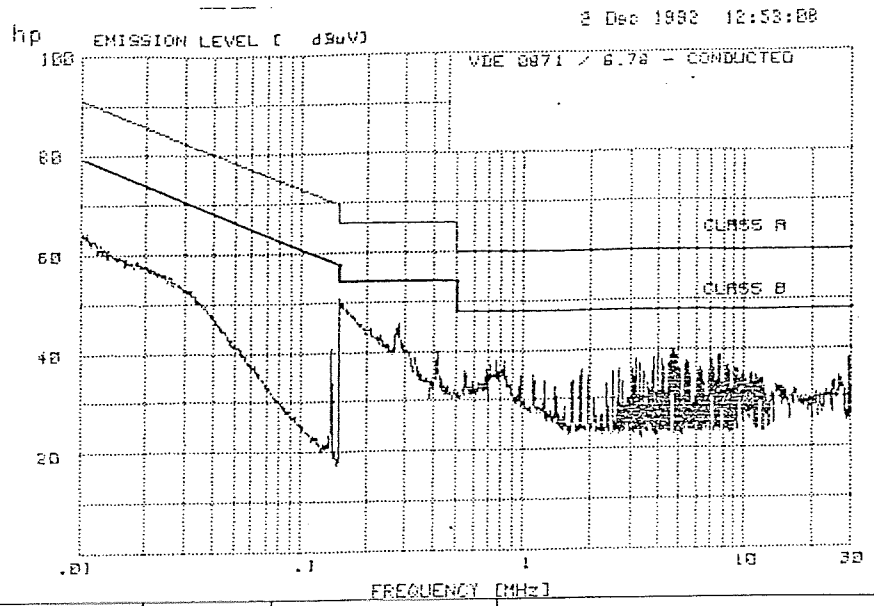
認・APPD		設 計 ENGR		図面番号 DWG—No.	PA768-71-03 –
検 図 CHK		製 図 DWG			



Vin = 100Vac



Vin = 200Vac



Vin = 200Vac

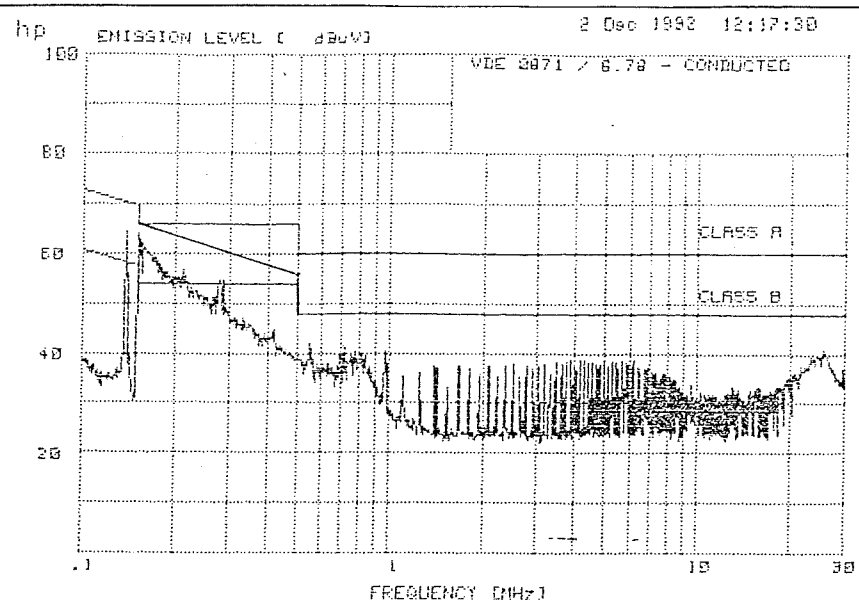
V D E

With external cap. 0.33μF between Ac(L) and Ac(N).

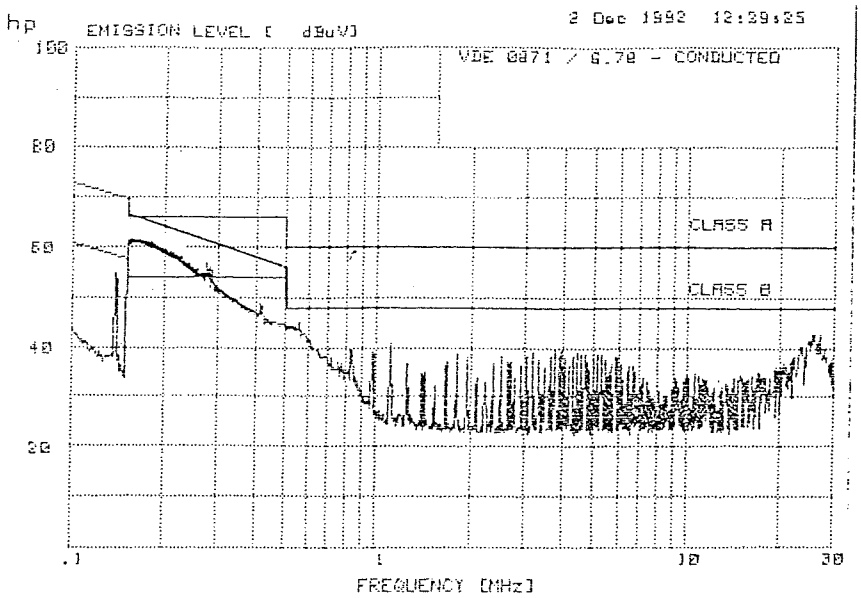
認・ APPD		設 計 ENGR		図面番号 D W G — No.	PA768-71-04 -
検 図 C H K		製 図 D W G			

KWS15-15

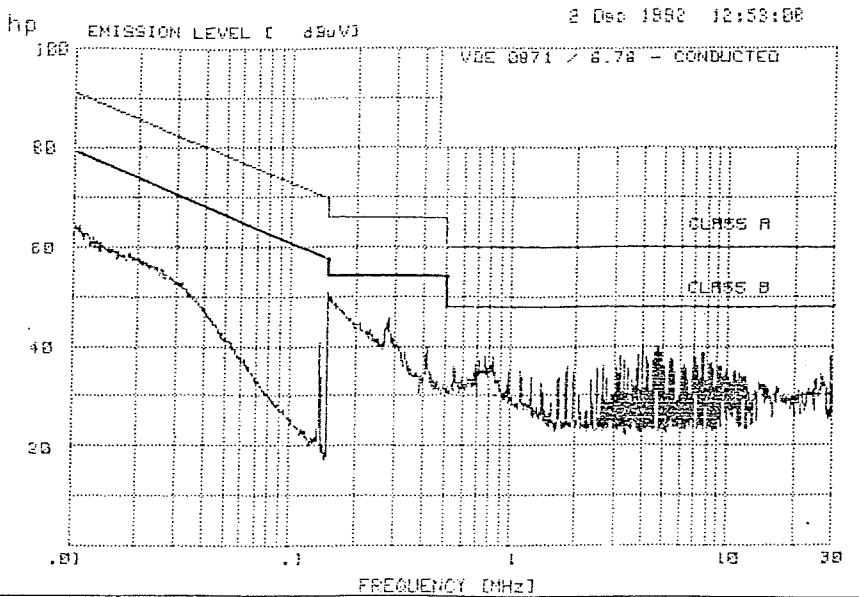
DATE 2·FEB·1993·



Vin = 100Vac



Vin = 200Vac



Vin = 200Vac

-V D E

With external cap. 0.33μF between Ac(L) and Ac (N).

認・APPD		設 計 ENGR		図面番号 D WG — No.	PA768-71-05 -
検 図 CHK		製 図 DWG			