

RFE1600

RELIABILITY DATA

DWG: IA745-79-01		
APPD	CHK	DWG
<i>Pi P</i>	<i>Asher Shitrit</i>	<i>Solomon Tzulkha</i>
5-Mar-2014	20-Feb-14	19-2-14

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

1. M.T.B.F

1.1 Method of calculation according to JEITA (RCR-9102B)

based on part count reliability projection of MIL-HDBK-217F, GF (Ground,Fixed)
Individual failure rates is given to each part and M.T.B.F is
calculated by the count of each part.

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

Where:

- λ_{equip} = Total Equipment Failure Rate (Failures / 10⁶ Hours)
- λ_G = Generic Failure Rate For The ith Generic Part (Failure / 10⁶ Hours)
- N_i = Quantity of ith Generic Part
- n = Number of Different Generic Part Categories
- π_Q = Generic Quality factor for the Generic Part ($\pi_Q = 1$)

1.2 M.T.B.F Value according to JEITA (RCR-9102B)

$$\underline{\text{M.T.B.F} = 34,221 \text{ (HOURS)}}$$

(MTBF calculation for fan isn't included)

2.COMPONENT DERATING

Calculation method

a) Condition

Output: Vout - 100%, Iout - 100%
 Ambient temperature: 50°C
 Mounting Method: Standard (horizontal) mounting

b) Semiconductors

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

c) Semiconductors, Resistors, Capacitors, etc.

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

d) Calculation method of thermal impedance

$$\theta_{j-c} = \frac{T_j(\max) - T_c}{P_c(\max)} \quad \theta_{j-a} = \frac{T_j(\max) - T_a}{P_c(\max)} \quad \theta_{j-l} = \frac{T_j(\max) - T_l}{P_c(\max)}$$

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

θ_{j-c} : Thermal Impedance between Junction 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 №	Vin=230VAC	Load = 100%	Ta=50°C
A107	Tjmax= 150 °C	$\theta_{j-c} = 3.0$ °C/W	
MIP0224SY	Pd = 3.5 W	$\Delta T_c = 37.8$ °C	Tc = 87.8 °C
MATSUSHITA	$T_j = T_c + (\theta_{j-c} \times P_d) =$	98.3 °C	D.F. = 65.5 %
A104	Tjmax= 150 °C	$\theta_{j-c} = 42.0$ °C/W	
MC33063AD	Pd = 0.9 W	$\Delta T_c = 37.9$ °C	Tc = 87.9 °C
TI	$T_j = T_c + (\theta_{j-c} \times P_d) =$	125.7 °C	D.F. = 83.8 %
A801	Tjmax= 150 °C	$\theta_{j-c} = 42.0$ °C/W	
MC33063AD	Pd = 0.5 W	$\Delta T_c = 61.8$ °C	Tc = 106.1 °C
TI	$T_j = T_c + (\theta_{j-c} \times P_d) =$	127.1 °C	D.F. = 85.7 %
D101	Tjmax= 150 °C	$\theta_{j-c} = 0.6$ °C/W	
GBJ2506	Pd = 24 W	$\Delta T_c = 37.7$ °C	Tc = 87.7 °C
DIODES	$T_j = T_c + (\theta_{j-c} \times P_d) =$	102.1 °C	D.F. = 68.1 %
D107	Tjmax= 150 °C	$\theta_{j-c} = 3.5$ °C/W	
YG912S6RR	Pd = 4 W	$\Delta T_c = 25.6$ °C	Tc = 75.6 °C
FUJI	$T_j = T_c + (\theta_{j-c} \times P_d) =$	89.6 °C	D.F. = 59.7 %
D108	Tjmax= 150 °C	$\theta_{j-c} = 3.5$ °C/W	
YG912S6RR	Pd = 4 W	$\Delta T_c = 26.1$ °C	Tc = 76.1 °C
FUJI	$T_j = T_c + (\theta_{j-c} \times P_d) =$	90.1 °C	D.F. = 60.0 %
D109	Tjmax= 150 °C	$\theta_{j-c} = 3.5$ °C/W	
YG902C3R	Pd = 3.5 W	$\Delta T_c = 36.0$ °C	Tc = 86.0 °C
FUJI	$T_j = T_c + (\theta_{j-c} \times P_d) =$	98.3 °C	D.F. = 65.5 %
D110	Tjmax= 150 °C	$\theta_{j-c} = 3.5$ °C/W	
YG902C3R	Pd = 3.5 W	$\Delta T_c = 35.8$ °C	Tc = 85.8 °C
FUJI	$T_j = T_c + (\theta_{j-c} \times P_d) =$	98.1 °C	D.F. = 65.4 %
Q101	Tjmax= 150 °C	$\theta_{j-c} = 0.5$ °C/W	
IPW60R099CP	Pd = 4 W	$\Delta T_c = 25.2$ °C	Tc = 75.2 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	77.2 °C	D.F. = 51.5 %
Q102	Tjmax= 150 °C	$\theta_{j-c} = 0.5$ °C/W	
IPW60R099CP	Pd = 4 W	$\Delta T_c = 21.4$ °C	Tc = 71.4 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	73.4 °C	D.F. = 48.9 %
Q103	Tjmax= 150 °C	$\theta_{j-c} = 0.5$ °C/W	
IPP60R099CP	Pd = 10 W	$\Delta T_c = 57.8$ °C	Tc = 107.8 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	112.8 °C	D.F. = 75.2 %
Q104	Tjmax= 150 °C	$\theta_{j-c} = 0.5$ °C/W	
IPP60R099CP	Pd = 10.0 W	$\Delta T_c = 63.3$ °C	Tc = 113.3 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	118.3 °C	D.F. = 78.9 %
Q113	Tjmax= 150 °C	$\theta_{j-c} = 0.4$ °C/W	
IPW60R075CP	Pd = 12.0 W	$\Delta T_c = 69.6$ °C	Tc = 119.6 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	124.4 °C	D.F. = 82.9 %
Q114	Tjmax= 150 °C	$\theta_{j-c} = 0.4$ °C/W	
IPW60R075CP	Pd = 12.0 W	$\Delta T_c = 48.2$ °C	Tc = 98.2 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	101.2 °C	D.F. = 67.5 %

12V

Location №	Vin=230VAC	Load = 100%	Ta=50°C
Q502	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC017N04NS G	Pd = 0.47 W	$\Delta T_c = 29.0$ °C	Tc = 79.0 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	79.4 °C	D.F. = 52.9 %
Q503	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC017N04NS G	Pd = 0.47 W	$\Delta T_c = 36.7$ °C	Tc = 86.7 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	87.1 °C	D.F. = 58.1 %
Q504	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC017N04NS G	Pd = 0.47 W	$\Delta T_c = 33.6$ °C	Tc = 83.6 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	84.0 °C	D.F. = 56.0 %
Q510	Tjmax= 150 °C	$\theta_{j-c} = 0.9$ °C/W	
BSC017N04NS G	Pd = 0.47 W	$\Delta T_c = 27.3$ °C	Tc = 77.3 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	77.7 °C	D.F. = 51.8 %

24V

Location №	Vin=230VAC	Load = 100%	Ta=50°C
Q503	Tjmax= 150 °C	$\theta_{j-c} = 0.8$ °C/W	
BSC079N10NS G	Pd = 0.69 W	$\Delta T_c = 42.4$ °C	Tc = 92.4 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	93.0 °C	D.F. = 62.0 %
Q504	Tjmax= 150 °C	$\theta_{j-c} = 0.8$ °C/W	
BSC079N10NS G	Pd = 0.69 W	$\Delta T_c = 29.9$ °C	Tc = 79.9 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	80.5 °C	D.F. = 53.7 %
Q508	Tjmax= 150 °C	$\theta_{j-c} = 0.8$ °C/W	
BSC079N10NS G	Pd = 0.69 W	$\Delta T_c = 46.8$ °C	Tc = 96.8 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	97.4 °C	D.F. = 64.9 %
Q509	Tjmax= 150 °C	$\theta_{j-c} = 0.8$ °C/W	
BSC079N10NS G	Pd = 0.69 W	$\Delta T_c = 29.4$ °C	Tc = 79.4 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	80.0 °C	D.F. = 53.3 %
Q510	Tjmax= 150 °C	$\theta_{j-c} = 0.8$ °C/W	
BSC079N10NS G	Pd = 0.69 W	$\Delta T_c = 42.8$ °C	Tc = 92.8 °C
INFINEON	$T_j = T_c + (\theta_{j-c} \times P_d) =$	93.4 °C	D.F. = 62.2 %

48V

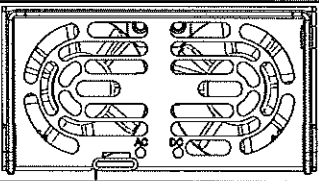
Location №	Vin=230VAC	Load = 100%	Ta=50°C
Q551 BSC079N10NS G INFINEON	Tjmax= 150 °C Pd = 0.65 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.8 °C/W ΔTc = 30.4 °C 80.9 °C	Tc = 80.4 °C D.F. = 53.9 %
Q552 BSC079N10NS G INFINEON	Tjmax= 150 °C Pd = 0.65 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.8 °C/W ΔTc = 39.8 °C 90.3 °C	Tc = 89.8 °C D.F. = 60.2 %
Q553 BSC079N10NS G INFINEON	Tjmax= 150 °C Pd = 0.65 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.8 °C/W ΔTc = 36.6 °C 87.1 °C	Tc = 86.6 °C D.F. = 58.1 %
Q554 BSC079N10NS G INFINEON	Tjmax= 150 °C Pd = 0.65 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.8 °C/W ΔTc = 30.1 °C 80.6 °C	Tc = 80.1 °C D.F. = 53.7 %
Q555 BSC079N10NS G INFINEON	Tjmax= 150 °C Pd = 0.65 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.8 °C/W ΔTc = 31.3 °C 81.8 °C	Tc = 81.3 °C D.F. = 54.5 %
Q557 BSC079N10NS G INFINEON	Tjmax= 150 °C Pd = 0.65 W Tj = Tc + ($\theta_{j-c} \times Pd$) =	θ_{j-c} = 0.8 °C/W ΔTc = 27.3 °C 77.8 °C	Tc = 77.3 °C D.F. = 51.9 %

3.MAIN COMPONENTS TEMPERATURE RISE ΔT LIST

12V

Location No.	Parts Name	ΔT Temperature Rise ($^{\circ}\text{C}$)	
		115Vac	230Vac
A107	TOP SWITCH	31.0	30.8
A801	AUX REGULATOR	53.4	61.8
C101	"X" CAPACITOR	26.4	26.0
C110	ELEC. CAP.	9.5	9.7
C162	ELEC. CAP.	23.0	31.8
C180	ELEC. CAP.	17.1	21.5
D101	BRIDGE	42.5	34.5
D108	PF DIODE	23.5	26.1
D110	BUCK CLMP. DIODE	37.9	35.1
L102	EMI CHOKE	47.7	33.6
L104	PF CHOKE	62.2	60.1
L105	BUCK CHOKE	22.7	29.5
Q101	PF MOSFET	49.0	24.2
Q103	BUCK MOSFET	44.3	43.7
Q113	DC-DC MOSFET	27.2	37.8
Q503	RECTIFIER	25.1	36.7
Q701	ORING	32.6	50.3
T101	BIAS X'MER	38.8	39.7
T102	DRIVER X'MER	12.1	11.7
T104	DC-DC X'MER	38.1	61.3

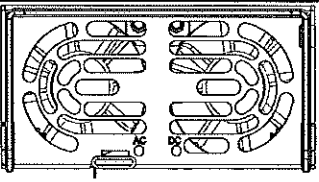
Conditions:

Standard Mounting		
Input Voltage	115VAC	230VAC
Output Voltage	12V	12V
Output Current	92A	133A
Aux. Output Voltage	12V	12V
Aux. Output Current	0.5A	0.5A
Ambient Temperature	50 $^{\circ}\text{C}$	

24V

Location No.	Parts Name	ΔT Temperature Rise ($^{\circ}C$)	
		115Vac	230Vac
A107	TOP SWITCH	37.0	37.8
A801	AUX REGULATOR	47.5	56.2
C101	"X" CAPACITOR	26.2	27.2
C110	ELEC. CAP.	10.9	11.0
C162	ELEC. CAP.	22.9	34.5
C180	ELEC. CAP.	18.4	28.0
D101	BRIDGE	44.5	37.7
D108	PF DIODE	22.3	25.0
D110	BUCK CLMP. DIODE	37.4	35.8
L102	EMI CHOKE	47.8	37.5
L104	PF CHOKE	53.4	55.0
L105	BUCK CHOKE	18.1	22.6
Q101	PF MOSFET	43.7	23.9
Q103	BUCK MOSFET	54.4	57.8
Q113	DC-DC MOSFET	29.6	69.6
Q510	RECTIFIER	25.5	42.8
Q701	ORING	27.9	42.7
T101	BIAS X'MER	49.0	50.7
T102	DRIVER X'MER	15.2	16.1
T104	DC-DC X'MER	52.4	71.1

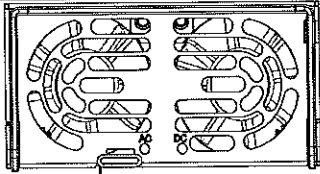
Conditions:

Standard Mounting		
Input Voltage	115VAC	230VAC
Output Voltage	24V	24V
Output Current	46A	67A
Aux. Output Voltage	12V	12V
Aux. Output Current	0.5A	0.5A
Ambient Temperature	50 $^{\circ}C$	

48V

Location No.	Parts Name	ΔT Temperature Rise ($^{\circ}C$)	
		115Vac	230Vac
A107	TOP SWITCH	29.3	28.3
A801	AUX REGULATOR	51.6	57.1
C101	"X" CAPACITOR	26.6	24.3
C110	ELEC. CAP.	10.2	9.8
C162	ELEC. CAP.	19.0	27.3
C180	ELEC. CAP.	16.0	23.4
D101	BRIDGE	45.3	36.5
D108	PF DIODE	19.4	20.0
D110	BUCK CLMP.DIODE	38.3	35.7
L102	EMI CHOKE	42.1	32.6
L104	PF CHOKE	64.9	61.8
L105	BUCK CHOKE	22.5	29.4
Q101	PF MOSFET	48.3	25.2
Q103	BUCK MOSFET	50.2	49.9
Q113	DC-DC MOSFET	26.0	52.3
Q552	RECTIFIER	24.2	39.8
Q701	ORING	24.9	37.6
T101	BIAS X'MER	47.9	48.7
T102	DRIVER X'MER	21.8	21.8
T104	DC-DC X'MER	58.6	64.4

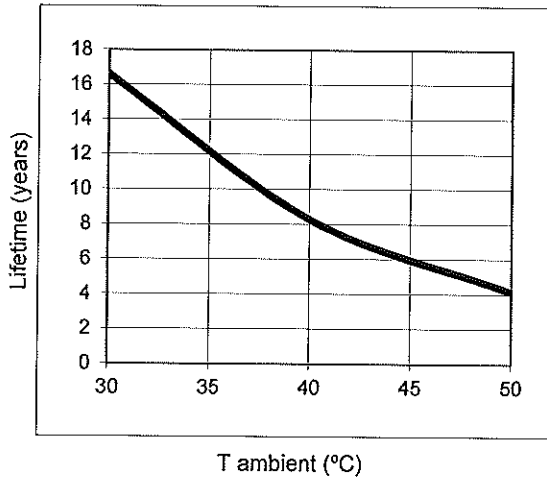
Conditions:

Standard Mounting		
Input Voltage	115VAC	230VAC
Output Voltage	48V	48V
Output Current	23A	33A
Aux. Output Voltage	12V	12V
Aux. Output Current	0.5A	0.5A
Ambient Temperature	50 $^{\circ}C$	

4.ELECTROLYTIC CAPACITORS LIFE TIME ESTIMATION

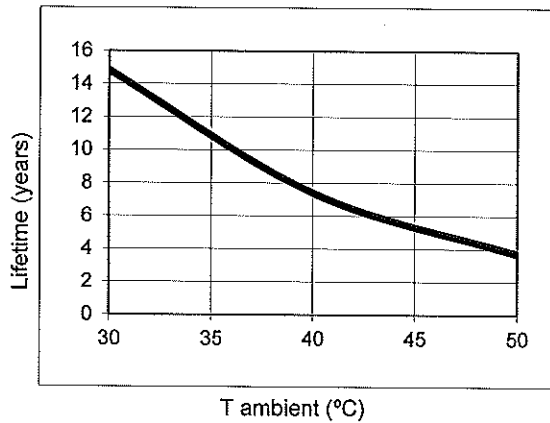
Vin=115Vac

MODEL	COMPUTED LIFE (year) at Tambient		
	30°C	40°C	50°C
RFE-1600	16.6	8.3	4.1



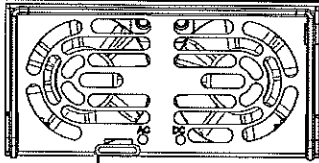
Vin=230Vac

MODEL	COMPUTED LIFE (year) at Tambient		
	30°C	40°C	50°C
RFE-1600	14.8	7.4	3.7



FORMULA:
$$L = L_0 \times 2^{\frac{105 - T_c}{10}} \quad (\text{years})$$

- L: Elec.capacitor computed life (24 hours per day,365 days operation)
- L₀: Guaranteed life for Elec.capacitor
- T_c: Case temperature of Elec.capacitor

Standard Mounting	
Output Voltage	100%
Output Current	100%

5. ABNORMAL TEST

RFE1600

Vout=48V

Iout=33A

Model:48V

Input:230VAC

Ta:25°C, 70% RH

(Da:Damaged)

№	Test Position		Test Mode		Test Result												Note	
	Location №	Test Point	Short	Open	1	2	3	4	5	6	7	8	9	10	11	12		
					Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	V < O	V > O	No Output	No Change	Others		
1	D101	AC-DC	<input type="radio"/>											<input type="radio"/>			D101	
		AC-AC	<input type="radio"/>								<input type="radio"/>			<input type="radio"/>			F101	
		AC		<input type="radio"/>												<input type="radio"/>		
		DC		<input type="radio"/>												<input type="radio"/>		
2	D107		<input type="radio"/>							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			D101, F101, MOD104, MOD103	
				<input type="radio"/>							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			F101, Q101
3	D108		<input type="radio"/>							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			F101, Q102, PFC/BUCK Control circuit	
				<input type="radio"/>							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			F101, Q102
4	D109		<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			F101, D101, ZD101, ZD104, Q103, Q104	
				<input type="radio"/>										<input type="radio"/>			R122, R123, Q103, Q104,	
5	D110		<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			R103, Q103, Q104, D109	
				<input type="radio"/>							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			F101, Q103, Q104,
6	D111		<input type="radio"/>											<input type="radio"/>			R103	
7	Q101	G-S	<input type="radio"/>							<input type="radio"/>						<input type="radio"/>	Vo decrease to 35V Da: R408	
		D-S	<input type="radio"/>								<input type="radio"/>			<input type="radio"/>			R103, Q101, RL101, R271, R272, R273, F101, MOD101	
		D-G	<input type="radio"/>							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			D101, Q101, Q102, F101	
		S		<input type="radio"/>							<input type="radio"/>			<input type="radio"/>			Q101, R408, R411, R412, Q402, ZD401, A401	
		G		<input type="radio"/>							<input type="radio"/>	<input type="radio"/>		<input type="radio"/>			F101, D101, Q101, Q102	
		D		<input type="radio"/>												<input type="radio"/>	Vo decrease to 35V	
8	Q102	G-S	<input type="radio"/>							<input type="radio"/>						<input type="radio"/>	Vo decrease to 35V Da: R407	
		D-S	<input type="radio"/>								<input type="radio"/>			<input type="radio"/>			F101	
		D-G	<input type="radio"/>							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			F101, Q102, R407, R409, R410, Q401, ZD402, A401	
		S		<input type="radio"/>						<input type="radio"/>				<input type="radio"/>			Q102, R407, R409, R410, Q401, ZD402, A401	
		G		<input type="radio"/>						<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			F101, Q102	
		D		<input type="radio"/>												<input type="radio"/>	Vo decrease to 30V	
9	Q103	G-S	<input type="radio"/>											<input type="radio"/>		<input type="radio"/>	Pin=22W	
		D-S	<input type="radio"/>									<input type="radio"/>		<input type="radio"/>				
		D-G	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			ZD101, Q106, R444, R445, D404, A403	
		S		<input type="radio"/>						<input type="radio"/>				<input type="radio"/>			ZD101, Q106, R444, R445, D404, A403	
		G		<input type="radio"/>						<input type="radio"/>				<input type="radio"/>			Da: Q103	
		D		<input type="radio"/>												<input type="radio"/>	Q104 temp. rise 52°C --> 72°C	
10	Q104	G-S	<input type="radio"/>											<input type="radio"/>			Pin=22W	
		D-S	<input type="radio"/>									<input type="radio"/>		<input type="radio"/>				
		D-G	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			ZD101, Q106, R444, R445, D404, A403	
		S		<input type="radio"/>						<input type="radio"/>				<input type="radio"/>			ZD101, Q106, R444, R445, D404, A403	
		G		<input type="radio"/>						<input type="radio"/>				<input type="radio"/>			Da: Q104	
		D		<input type="radio"/>												<input type="radio"/>	Q103 temp. rise 50°C --> 72°C	

No	Test Position		Test Mode		Test Result													
	Location No	Test Point	Short	Open	1	2	3	4	5	6	7	8	9	10	11	12	Note	
					Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	P < O	P O O	No Output	No Change	Others		
11	Q113	G-S	<input type="radio"/>											<input type="radio"/>				
		D-S	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>	<input type="radio"/>			Q114
		D-G	<input type="radio"/>								<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q113, Q114, D130, R188, R265
		S		<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q113, Q114, D130, R188, R265
		G		<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q113, Q114
		D		<input type="radio"/>											<input type="radio"/>			
12	Q114	G-S	<input type="radio"/>											<input type="radio"/>				
		D-S	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>	<input type="radio"/>			Q113
		D-G	<input type="radio"/>								<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q113, Q114, D132, R190, R266
		S		<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q113, Q114, D132, R190, R266
		G		<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q113, Q114
		D		<input type="radio"/>											<input type="radio"/>			
13	Q501~Q504	G-S	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	Pin up by 50W; after 7min No Output Da: Q501~Q504	
		D-S	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q507~Q510	
		D-G	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q501~Q504, Q505	
		S		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
		G		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
		D		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
14	Q507~Q510	G-S	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	Pin up by 50W; after 7min No Output Da: Q507~Q510	
		D-S	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q501~Q504	
		D-G	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q507~Q510, Q506	
		S		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
		G		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
		D		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
15	Q551, Q552	G-S	<input type="radio"/>													<input type="radio"/>	Input power was increased by 10W	
		D-S	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q555, Q556	
		D-G	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q551, Q552, Q555, Q556, D656, R663, A652	
		S		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
		G		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
		D		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
16	Q553, Q554	G-S	<input type="radio"/>													<input type="radio"/>	Input power was increased by 10W	
		D-S	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q557, Q558	
		D-G	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			Q553, Q554, Q557, Q558, D657, R657, A653	
		S		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
		G		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W
		D		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W

№	Test Position		Test Mode		Test Result														
	Location №	Test Point	Short	Open	1	2	3	4	5	6	7	8	9	10	11	12	Note		
					Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	P < O	P C O	No Output	No Change	Others			
17	Q555, Q556	G-S	<input type="radio"/>													<input type="radio"/>	Input power was increased by 10W		
		D-S	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	Q551, Q552	
		D-G	<input type="radio"/>								<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	Q551, Q552, Q555, Q556, D654, R662, A652
		S		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W	
		G		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W	
		D		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W	
18	Q557, Q558	G-S	<input type="radio"/>													<input type="radio"/>	Input power was increased by 10W		
		D-S	<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	Q553, Q554	
		D-G	<input type="radio"/>								<input type="radio"/>			<input type="radio"/>	<input type="radio"/>			<input type="radio"/>	Q553, Q554, Q557, Q558, D655, R656, A653
		S		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W	
		G		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W	
		D		<input type="radio"/>													<input type="radio"/>	Input power was increased by 5W	
19	C106~C109		<input type="radio"/>											<input type="radio"/>		<input type="radio"/>	D101, D107, D108		
20	C144~C159		<input type="radio"/>										<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	Output voltage ripple increase		
21	C160~C162		<input type="radio"/>										<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	Output voltage ripple increase		
22	C611~C618		<input type="radio"/>										<input type="radio"/>	<input type="radio"/>		<input type="radio"/>			
23	C619~C626		<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	Q113, Q114, Q551, Q552, Q555, Q556		
24	C627~C634		<input type="radio"/>							<input type="radio"/>			<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	Q113, Q114, Q553, Q554, Q557, Q558		
25	T101	1-2	<input type="radio"/>											<input type="radio"/>		<input type="radio"/>			
		3-5	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			<input type="radio"/>	R151, R172, R173	
		6-7	<input type="radio"/>											<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		
		7-8	<input type="radio"/>											<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		
		9-10	<input type="radio"/>											<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		
		11-12	<input type="radio"/>											<input type="radio"/>	<input type="radio"/>		<input type="radio"/>		
		3		<input type="radio"/>											<input type="radio"/>		<input type="radio"/>		
		1		<input type="radio"/>											<input type="radio"/>		<input type="radio"/>		
		6		<input type="radio"/>											<input type="radio"/>		<input type="radio"/>	Voutput increase to maximum	
		8		<input type="radio"/>											<input type="radio"/>	<input type="radio"/>		<input type="radio"/>	
		9		<input type="radio"/>											<input type="radio"/>		<input type="radio"/>		
11		<input type="radio"/>											<input type="radio"/>		<input type="radio"/>	Vaux=0			

№	Test Position		Test Mode		Test Result												
	Location №	Test Point	Short	Open	1	2	3	4	5	6	7	8	9	10	11	12	Note
					Fire	Smoke	Burst	Smell	Red Hot	Damaged	Fuse opened	PCO	PCO	No Output	No Change	Others	
26	T102	1-2	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			Q651~Q654, D658~D661
		3-4	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			Q651~Q654, D658~D661
		7-8	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			Q651~Q654, D658~D661
		1		<input type="radio"/>										<input type="radio"/>			
		3		<input type="radio"/>										<input type="radio"/>			
		7		<input type="radio"/>										<input type="radio"/>			
27	T103	1-2	<input type="radio"/>												<input type="radio"/>		
		1		<input type="radio"/>											<input type="radio"/>		
28	T104	Prim	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			Q113, Q114, Q103, Q104, R103
		Sec	<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			Q113, Q114, Q103, Q104, R103
		Prim		<input type="radio"/>										<input type="radio"/>			
		Sec		<input type="radio"/>										<input type="radio"/>			
29	L104		<input type="radio"/>							<input type="radio"/>	<input type="radio"/>			<input type="radio"/>			Q102
				<input type="radio"/>											<input type="radio"/>		Q101 temp. rise increase from 45°C to 95°C, D107 temp. rise increase from 50°C to 80°C
30	L105		<input type="radio"/>							<input type="radio"/>				<input type="radio"/>			Q103, Q104, R103
				<input type="radio"/>										<input type="radio"/>			

6.VIBRATION TEST

1) Vibration test class

Sinusoidal vibration test

2) Equipment used

Controller: Dactron

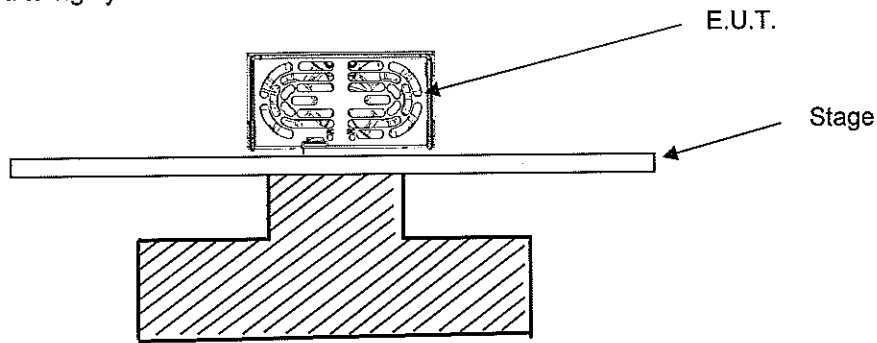
Model:Laser

Vibrator: Ling Dynamic Systems

Model:V875

3) Testing method

RFE1600 mounted to Jig by 3 x M3 screw.



4)Test condition

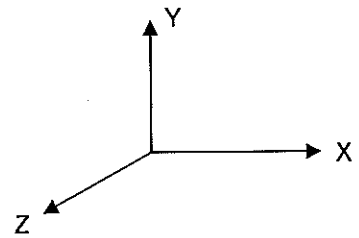
A) Sinusoidal vibration test (in non-operational mode).

Sinusoidal Vibration in Freq.: 10 - 55 Hz

Test level: 2G constant.

Test time: Sweeps for 1min Per axis (60min Duration per axis).

Test performed in Axes x-y-z



B) Mech. Shock

Test level: Sawtooth, 30G 11ms

Shock directions $\pm Z, \pm X, \pm Y$

3 mech.shocks in all of the 3 axes at each direction.

5)Test Result

Vibration:

Check item	Vout	Ripple and noise
Initial Directions	24.06	177mV
X	24.06	175mV
Y	24.06	175mV
Z	24.06	175mV

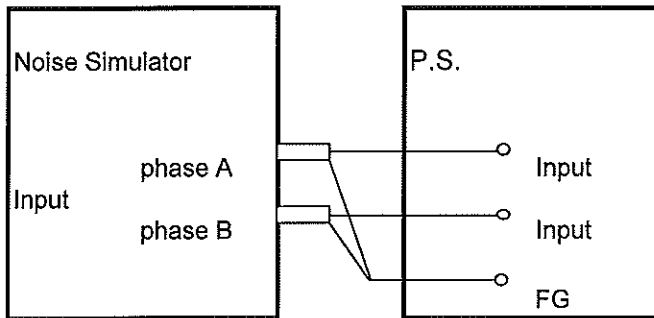
Shock:

Check item	Vout	Ripple and noise
Initial Directions	24.06V	177mV
X	24.07	175mV
Y	24.07	175mV
Z	24.06	175mV

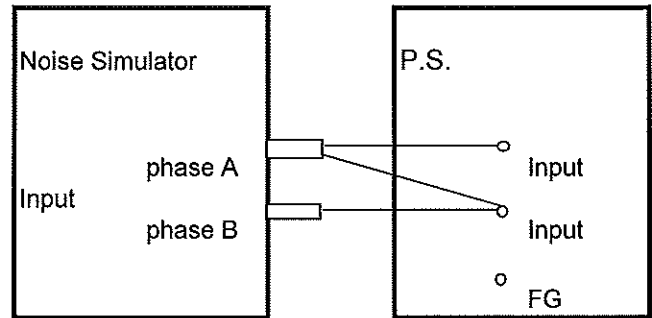
7. NOISE SIMULATION TEST

48V

1) Test circuit and Equipment



Common Mode Noise Test



Normal Mode Noise Test

Impulse noise simulator: INS-4040 (NoiseKen)
 Coupling decoupling network: IJ -4050 (NoiseKEN)

2) Acceptance criteria

No damage to P.S.
 No output shutdown
 No other abnormalities

3) Test condition:

Input voltage: 115, 230Vac
 Output voltage: Rated
 Output current: 0%, 100%
 Ambient temperature: 25°C
 Pulse width: 50ns~1000ns

Noise level: 0V~2kV
 Phase shift: 0~360° (step 45°)
 Polarity: +, -
 Mode: Normal, Common
 Line: Trigger select

4) Test Result : **OK**

8.THERMAL SHOCK TEST

24V

1) Test Equipment

Thermal Shock Chamber: TSA-101S-W (TABAI ESPEC CORP.)

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

1 (unit)

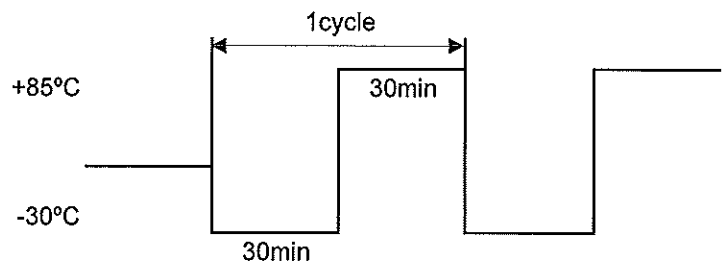
3)Test condition

Ambient temperature:-30°C <=> +85°C

Test time: Refer to Dwg.

Test cycle: 200cycles

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. 200cycles later,leave it for 1hour at the room temperature,then check if there is no abnormal output.

5)Test Result

OK

Vin:200Vac

Before testing			After testing		
Vout-100%,Iout-100%	Vout-100%,Iout-0%	P-t-P	Vout-100%,Iout-100%	Vout-100%,Iout-0%	P-t-P
24.05V	24.01V	91.6mV	24.046V	23.994V	92mV

9.FAN LIFE EXPECTANCY

1) Part name

109P0412K3563 (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 fan exhaust temperature.

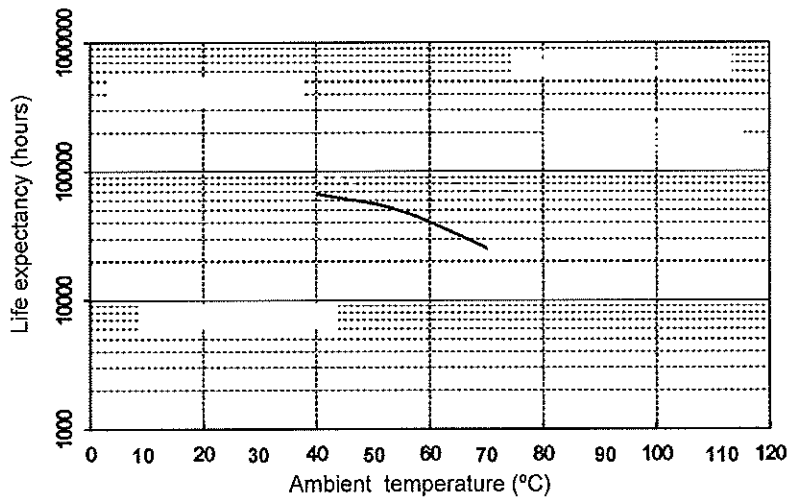


Fig1.

Measuring point of fan exhaust temperature.

