GENESYS™ 5kW

RELIABILITY

DATA

DWG: IA761-79-01		
APPD	CHK	DWG
16/10/17	09/10/2017	9.10.17

TDK-LAMBDA

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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.

M.T.B.F.

Model: G10-500 3P400

Calculation based on parts stress reliability projection of Telcordia (Bellcore)
"Reliability Prediction Procedure for Electronic Equipment" Document number TR-322,Issue5)
Individual failure λss is calculated from electrical stress and temperature rise of each device.

$$MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\pi_E \sum_{i=1}^{m} N_i \cdot \lambda_{SSi}} \times 10^9 \quad \text{(hours)}$$

$$\lambda_{SSi} = \lambda_{Gi} \cdot \pi_{Qi} \cdot \pi_{Si} \cdot \pi_{Ti}$$

λ equip	:	Total Equipment failure rate (FITs = Failures in10^9 hours)
λ Gi	:	Generic failure rate for the *i* th device
π Qi	:	Quality factor for the *i* th device
π Si	:	Stress factor for the *i* th device
π Ti	:	Temperature factor for the *i* th device
m	:	Number of different device types
Ni	:	Quantity of *i* th device type
π E	:	Equipment environmental factor

Conditions:

Ta=25C°
GB - Ground, Bening
Vout=10V
Iout=500A

M.T.B.F. = 378413 (HOURS)

2.COMPONENT DERATING

G 5kW SERIES

Calculation method

(1) Conditions

Input:	Nominal
Output:	Vout - 100%, Iout - 100%
Ambient temperature:	50°C
Mounting Method:	Standard Mounting

(2) Semiconductors

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

(3) IC, Resistors, Capacitors, etc.

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

(4) Calculation method of thermal impedance:

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

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

$\Theta_{j\text{-}l}$: Thermal Impedance between Junction and Lead

Vin = 170Vac Load = 100% Ta=50°C **INPUT 3-PHASE 200V**

D6	Tjmax=	150	°C	θj-c =	0.6	°C/W	Pmax =	---	W
GBJ2506-F	Pd =	18.34	W	ΔTc =	55.0	°C	Tc =	105.0	°C
DIODES	Tj = Tc + (θ j-c x Pd) =>			Tj =	116.0	°C	D.F. =	77.3	%
D13	Tjmax=	150	°C	θj-c =	0.6	°C/W	Pmax =	---	W
GBJ2506-F	Pd =	18.34	W	ΔTc =	55.0	°C	Tc =	105.0	°C
DIODES	Tj = Tc + (θ j-c x Pd) =>			Tj =	116.0	°C	D.F. =	77.3	%
D14	Tjmax=	150	°C	θj-c =	0.6	°C/W	Pmax =	---	W
GBJ2506-F	Pd =	18.34	W	ΔTc =	55.0	°C	Tc =	105.0	°C
DIODES	Tj = Tc + (θ j-c x Pd) =>			Tj =	116.0	°C	D.F. =	77.3	%
A6	Tjmax=	150	°C	θj-c =	3.0	°C/W	Pmax =	---	W
MIP2E4DMY	Pd =	0.71	W	ΔTc =	24.0	°C	Tc =	74.0	°C
MATSUSHITA	Tj = Tc + (θ j-c x Pd) =>			Tj =	76.1	°C	D.F. =	50.8	%
A7	Tjmax=	150	°C	θj-c =	3.0	°C/W	Pmax =	---	W
MIP2E4DMY	Pd =	0.99	W	ΔTc =	26.0	°C	Tc =	76.0	°C
MATSUSHITA	Tj = Tc + (θ j-c x Pd) =>			Tj =	79.0	°C	D.F. =	52.6	%
A8	Tjmax=	150	°C	θj-c =	10.0	°C/W	Pmax =	---	W
MIP2E2DMUL	Pd =	1.23	W	ΔTc =	40.0	°C	Tc =	90.0	°C
PANASONIC	Tj = Tc + (θ j-c x Pd) =>			Tj =	102.3	°C	D.F. =	68.2	%

Vin = 342Vac Load = 100% Ta=50°C **INPUT 3-PHASE 400V**

D9	Tjmax=	150	°C	θj-c =	0.3	°C/W	Pmax =	---	W
D45XT160-7000	Pd =	9.5	W	ΔTc =	24.0	°C	Tc =	74.0	°C
SHINDENGEN	Tj = Tc + (θ j-c x Pd) =>			Tj =	76.9	°C	D.F. =	51.2	%
Q8	Tjmax=	150	°C	θj-c =	0.6	°C/W	Pmax =	---	W
TN5050H-12WY	Pd =	14	W	ΔTc =	24.0	°C	Tc =	74.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	82.4	°C	D.F. =	54.9	%
A2	Tjmax=	150	°C	θj-c =	3.0	°C/W	Pmax =	---	W
MIP2E4DMY	Pd =	0.72	W	ΔTc =	15.0	°C	Tc =	65.0	°C
MATSUSHITA	Tj = Tc + (θ j-c x Pd) =>			Tj =	67.2	°C	D.F. =	44.8	%
A3	Tjmax=	150	°C	θj-c =	3.0	°C/W	Pmax =	---	W
MIP2E4DMY	Pd =	0.87	W	ΔTc =	30.0	°C	Tc =	80.0	°C
MATSUSHITA	Tj = Tc + (θ j-c x Pd) =>			Tj =	82.6	°C	D.F. =	55.1	%
A5	Tjmax=	150	°C	θj-c =	10.0	°C/W	Pmax =	---	W
MIP2E2DMUL	Pd =	0.87	W	ΔTc =	20.0	°C	Tc =	70.0	°C
PANASONIC	Tj = Tc + (θ j-c x Pd) =>			Tj =	78.7	°C	D.F. =	52.5	%

Vin = 170Vac Load = 100% Ta=50°C **PFC200**

Q8	Tjmax=	150	°C	θj-c =	0.5	°C/W	Pmax =	---	W
TK39N60W,S1VF	Pd =	11.38	W	ΔTc =	36.2	°C	Tc =	86.2	°C
Toshiba	Tj = Tc + (θ j-c x Pd) =>			Tj =	91.5	°C	D.F. =	61.0	%
Q9	Tjmax=	150	°C	θj-c =	0.5	°C/W	Pmax =	---	W
TK39N60W,S1VF	Pd =	11.38	W	ΔTc =	32.5	°C	Tc =	82.5	°C
Toshiba	Tj = Tc + (θ j-c x Pd) =>			Tj =	87.8	°C	D.F. =	58.5	%
Q10	Tjmax=	150	°C	θj-c =	0.5	°C/W	Pmax =	---	W
TK39N60W,S1VF	Pd =	11.38	W	ΔTc =	39.5	°C	Tc =	89.5	°C
Toshiba	Tj = Tc + (θ j-c x Pd) =>			Tj =	94.8	°C	D.F. =	63.2	%
Q11	Tjmax=	150	°C	θj-c =	0.5	°C/W	Pmax =	---	W
TK39N60W,S1VF	Pd =	11.38	W	ΔTc =	33.7	°C	Tc =	83.7	°C
Toshiba	Tj = Tc + (θ j-c x Pd) =>			Tj =	89.0	°C	D.F. =	59.3	%
D5	Tjmax=	150	°C	θj-c =	2.4	°C/W	Pmax =	62.0	W
IDH06G65C5	Pd =	5.46	W	ΔTc =	23.4	°C	Tc =	73.4	°C
Toshiba	Tj = Tc + (θ j-c x Pd) =>			Tj =	86.5	°C	D.F. =	57.7	%
D6	Tjmax=	150	°C	θj-c =	2.4	°C/W	Pmax =	62.0	W
IDH06G65C5	Pd =	5.46	W	ΔTc =	22.0	°C	Tc =	72.0	°C
Toshiba	Tj = Tc + (θ j-c x Pd) =>			Tj =	85.1	°C	D.F. =	56.7	%
D7	Tjmax=	150	°C	θj-c =	2.4	°C/W	Pmax =	62.0	W
IDH06G65C5	Pd =	5.46	W	ΔTc =	26.6	°C	Tc =	76.6	°C
Toshiba	Tj = Tc + (θ j-c x Pd) =>			Tj =	89.7	°C	D.F. =	59.8	%
D8	Tjmax=	150	°C	θj-c =	2.4	°C/W	Pmax =	62.0	W
IDH06G65C5	Pd =	5.46	W	ΔTc =	30.0	°C	Tc =	80.0	°C
Toshiba	Tj = Tc + (θ j-c x Pd) =>			Tj =	93.1	°C	D.F. =	62.1	%

Vin = 342Vac Load = 100% Ta=50°C **PFC400**

Q8	Tjmax=	150	°C	θj-c =	0.5	°C/W	Pmax =	250.0	W
STW20N95K5	Pd =	13.98	W	ΔTc =	32.0	°C	Tc =	82.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	89.0	°C	D.F. =	59.3	%
Q9	Tjmax=	150	°C	θj-c =	0.5	°C/W	Pmax =	250.0	W
STW20N95K5	Pd =	13.98	W	ΔTc =	32.0	°C	Tc =	82.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	89.0	°C	D.F. =	59.3	%
Q10	Tjmax=	150	°C	θj-c =	0.5	°C/W	Pmax =	250.0	W
STW20N95K5	Pd =	13.98	W	ΔTc =	39.6	°C	Tc =	89.6	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	96.6	°C	D.F. =	64.4	%
Q11	Tjmax=	150	°C	θj-c =	0.5	°C/W	Pmax =	250.0	W
STW20N95K5	Pd =	13.98	W	ΔTc =	39.5	°C	Tc =	89.5	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	96.5	°C	D.F. =	64.3	%
D5	Tjmax=	175	°C	θj-c =	2.5	°C/W	Pmax =	250.0	W
STTH810D	Pd =	1.69	W	ΔTc =	15.0	°C	Tc =	65.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	69.2	°C	D.F. =	39.6	%
D6	Tjmax=	175	°C	θj-c =	2.5	°C/W	Pmax =	250.0	W
STTH810D	Pd =	1.69	W	ΔTc =	15.0	°C	Tc =	65.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	69.2	°C	D.F. =	39.6	%
D7	Tjmax=	175	°C	θj-c =	2.5	°C/W	Pmax =	250.0	W
STTH810D	Pd =	1.69	W	ΔTc =	15.0	°C	Tc =	65.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	69.2	°C	D.F. =	39.6	%
D8	Tjmax=	175	°C	θj-c =	2.5	°C/W	Pmax =	250.0	W
STTH810D	Pd =	1.69	W	ΔTc =	15.0	°C	Tc =	65.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	69.2	°C	D.F. =	39.6	%

Vin = 342Vac Load = 100% Ta=50°C **PFC480**

Q8	Tjmax=	200	°C	θj-c =	1.0	°C/W	Pmax =	175.0	W
SCT20N120	Pd =	17.57	W	ΔTc =	32.2	°C	Tc =	82.2	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	99.8	°C	D.F. =	49.9	%
Q9	Tjmax=	200	°C	θj-c =	1.0	°C/W	Pmax =	175.0	W
SCT20N120	Pd =	17.57	W	ΔTc =	34.0	°C	Tc =	84.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	101.6	°C	D.F. =	50.8	%
Q10	Tjmax=	200	°C	θj-c =	1.0	°C/W	Pmax =	175.0	W
SCT20N120	Pd =	17.57	W	ΔTc =	55.7	°C	Tc =	105.7	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	123.3	°C	D.F. =	61.6	%
Q11	Tjmax=	200	°C	θj-c =	1.0	°C/W	Pmax =	175.0	W
SCT20N120	Pd =	17.57	W	ΔTc =	49.1	°C	Tc =	99.1	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	116.7	°C	D.F. =	58.3	%
D5	Tjmax=	175	°C	θj-c =	2.5	°C/W	Pmax =	250.0	W
STTH810D	Pd =	1.717	W	ΔTc =	12.6	°C	Tc =	62.6	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	66.9	°C	D.F. =	38.2	%
D6	Tjmax=	175	°C	θj-c =	2.5	°C/W	Pmax =	250.0	W
STTH810D	Pd =	1.717	W	ΔTc =	12.6	°C	Tc =	62.6	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	66.9	°C	D.F. =	38.2	%
D7	Tjmax=	175	°C	θj-c =	2.5	°C/W	Pmax =	250.0	W
STTH810D	Pd =	1.717	W	ΔTc =	15.0	°C	Tc =	65.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	69.3	°C	D.F. =	39.6	%
D8	Tjmax=	175	°C	θj-c =	2.5	°C/W	Pmax =	250.0	W
STTH810D	Pd =	1.717	W	ΔTc =	15.0	°C	Tc =	65.0	°C
ST	Tj = Tc + (θ j-c x Pd) =>			Tj =	69.3	°C	D.F. =	39.6	%

Vin = 170Vac Load = 100% Ta=40°C **DC/DC 10V**

Q1	Tjmax=	150	°C	θj-c =	0.57	°C/W	Pmax =	220.0	W
FMW30N60S1HF	Pd =	13.15	W	ΔTc =	52.0	°C	Tc =	102.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	109.5	°C	D.F. =	73.0	%
Q2	Tjmax=	150	°C	θj-c =	0.57	°C/W	Pmax =	220.0	W
FMW30N60S1HF	Pd =	13.15	W	ΔTc =	60.0	°C	Tc =	110.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	117.5	°C	D.F. =	78.3	%
Q5	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	5.41	W	ΔTc =	51.5	°C	Tc =	101.5	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	106.7	°C	D.F. =	71.1	%
Q6	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	5.39	W	ΔTc =	49.0	°C	Tc =	99.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	104.2	°C	D.F. =	69.4	%
Q9	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	5.58	W	ΔTc =	49.0	°C	Tc =	99.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	104.4	°C	D.F. =	69.6	%
Q10	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	6.64	W	ΔTc =	46.5	°C	Tc =	96.5	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	102.9	°C	D.F. =	68.6	%
Q17,Q19,Q21	Tjmax=	175	°C	θj-c =	0.9	°C/W	Pmax =	167.0	W
IPP023N04N G	Pd =	0.65	W	ΔTc =	51.0	°C	Tc =	101.0	°C
Infineon	Tj = Tc + (θ j-c x Pd) =>			Tj =	101.6	°C	D.F. =	58.0	%
Q23~Q27	Tjmax=	175	°C	θj-c =	0.9	°C/W	Pmax =	167.0	W
IPP023N04N G	Pd =	0.65	W	ΔTc =	51.0	°C	Tc =	101.0	°C
Infineon	Tj = Tc + (θ j-c x Pd) =>			Tj =	101.6	°C	D.F. =	58.0	%
D4	Tjmax=	175	°C	θj-c =	1.7	°C/W	Pmax =	---	W
IDH10G65C5	Pd =	2.6	W	ΔTc =	40.1	°C	Tc =	90.1	°C
Infineon	Tj = Tc + (θ j-c x Pd) =>			Tj =	94.5	°C	D.F. =	54.0	%

Vin = 170Vac Load = 90% Ta=50°C **DC/DC 10V**

Q1	Tjmax=	150	°C	θj-c =	0.57	°C/W	Pmax =	220.0	W
FMW30N60S1HF	Pd =	13.15	W	ΔTc =	52.0	°C	Tc =	102.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	109.5	°C	D.F. =	73.0	%
Q2	Tjmax=	150	°C	θj-c =	0.57	°C/W	Pmax =	220.0	W
FMW30N60S1HF	Pd =	13.15	W	ΔTc =	60.0	°C	Tc =	110.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	117.5	°C	D.F. =	78.3	%
Q5	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	5.41	W	ΔTc =	51.5	°C	Tc =	101.5	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	106.7	°C	D.F. =	71.1	%
Q6	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	5.39	W	ΔTc =	49.0	°C	Tc =	99.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	104.2	°C	D.F. =	69.4	%
Q9	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	5.58	W	ΔTc =	49.0	°C	Tc =	99.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	104.4	°C	D.F. =	69.6	%
Q10	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	6.64	W	ΔTc =	46.5	°C	Tc =	96.5	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	102.9	°C	D.F. =	68.6	%
Q17,Q19,Q21	Tjmax=	175	°C	θj-c =	0.9	°C/W	Pmax =	167.0	W
IPP023N04N G	Pd =	0.65	W	ΔTc =	51.0	°C	Tc =	101.0	°C
Infineon	Tj = Tc + (θ j-c x Pd) =>			Tj =	101.6	°C	D.F. =	58.0	%
Q23~Q27	Tjmax=	175	°C	θj-c =	0.9	°C/W	Pmax =	167.0	W
IPP023N04N G	Pd =	0.65	W	ΔTc =	51.0	°C	Tc =	101.0	°C
Infineon	Tj = Tc + (θ j-c x Pd) =>			Tj =	101.6	°C	D.F. =	58.0	%
D4	Tjmax=	175	°C	θj-c =	1.7	°C/W	Pmax =	---	W
IDH10G65C5	Pd =	2.6	W	ΔTc =	40.1	°C	Tc =	90.1	°C
Infineon	Tj = Tc + (θ j-c x Pd) =>			Tj =	94.5	°C	D.F. =	54.0	%

Vin = 170Vac Load = 100% Ta=50°C **DC/DC 600V**

Q1	Tjmax=	150	°C	θj-c =	0.57	°C/W	Pmax =	220.0	W
FMW30N60S1HF	Pd =	13.37	W	ΔTc =	52.0	°C	Tc =	102.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	109.6	°C	D.F. =	73.1	%
Q2	Tjmax=	150	°C	θj-c =	0.57	°C/W	Pmax =	220.0	W
FMW30N60S1HF	Pd =	11.18	W	ΔTc =	60.0	°C	Tc =	110.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	116.4	°C	D.F. =	77.6	%
Q5	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	4.78	W	ΔTc =	37.0	°C	Tc =	87.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	91.6	°C	D.F. =	61.1	%
Q6	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	4.73	W	ΔTc =	38.0	°C	Tc =	88.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	92.5	°C	D.F. =	61.7	%
Q9	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	5.24	W	ΔTc =	36.0	°C	Tc =	86.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	91.0	°C	D.F. =	60.7	%
Q10	Tjmax=	150	°C	θj-c =	0.96	°C/W	Pmax =	130.0	W
FMV40N60S1	Pd =	5	W	ΔTc =	38.0	°C	Tc =	88.0	°C
Fuji	Tj = Tc + (θ j-c x Pd) =>			Tj =	92.8	°C	D.F. =	61.9	%
D31~D35	Tjmax=	175	°C	θj-c =	2.0	°C/W	Pmax =	---	W
IDH02SG120	Pd =	3.414	W	ΔTc =	40.5	°C	Tc =	90.5	°C
Infineon	Tj = Tc + (θ j-c x Pd) =>			Tj =	97.3	°C	D.F. =	55.6	%
D4	Tjmax=	175	°C	θj-c =	1.7	°C/W	Pmax =	---	W
IDH10G65C5	Pd =	2.2	W	ΔTc =	40.0	°C	Tc =	90.0	°C
Infineon	Tj = Tc + (θ j-c x Pd) =>			Tj =	93.7	°C	D.F. =	53.6	%

3.Main Components Temperature Rise

G10-500 3Φ200

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	T3 IN	Transformer	84.7
	T3 Core	Transformer	55.7
	Q19	Mosfet	56.8
	Q9	Mosfet	40.7
	Q2	Mosfet	56.0
	D4	Diode	36.0
	Q32	Mosfet	33.4
	L3 IN	Choke	58.8
	L3 Core	Choke	39.3
	C5	E-Cap	40.7
	C17	E-Cap	26.9
	R99	Shunt	64.0
PFC200	L1 Core	Choke	18.3
	L1 IN	Choke	47.5
	D7	Diode	29.4
	Q8	Mosfet	44.5
	C21	E-Cap	16.5
OUTPUT FILTER	C8	E-Cap	33.6
	C1	E-Cap	34.0
	L1 Core	Choke	33.6
INPUT200	D13	Bridge	27.6
	RL1	Relay	30.6
	A8	Top-Switch	40.0
	A7	Top-Switch	25.7
	T1	Transformer	15.3
	T2	Transformer	32.8
	C46	E-Cap	9.8
	C19	E-Cap	23.6
	C38	E-Cap	15.4
	C43	E-Cap	20.6

Conditions:

Standard Mounting	
Ta	40°C
Input Voltage	170~265V
Output Voltage	10V
Output Current	500A

3.Main Components Temperature Rise

G10-500 3Φ200

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	T3 IN	Transformer	72.0
	T3 Core	Transformer	46.4
	Q19	Mosfet	50.2
	Q9	Mosfet	35.0
	Q2	Mosfet	48.2
	D4	Diode	39.0
	Q32	Mosfet	32.3
	L3 IN	Choke	49.1
	L3 Core	Choke	34.2
	C5	E-Cap	36.3
	C17	E-Cap	22.0
	R99	Shunt	55.4
PFC200	L1 Core	Choke	18.3
	L1 IN	Choke	47.5
	D7	Diode	29.4
	Q8	Mosfet	44.5
	C21	E-Cap	16.5
OUTPUT FILTER	C8	E-Cap	28.0
	C1	E-Cap	29.1
	L1 Core	Choke	28.3
INPUT200	D13	Bridge	27.6
	RL1	Relay	30.6
	A8	Top-Switch	40.0
	A7	Top-Switch	25.7
	T1	Transformer	15.3
	T2	Transformer	32.8
	C46	E-Cap	9.8
	C19	E-Cap	23.6
	C38	E-Cap	15.4
	C43	E-Cap	20.6

Conditions:

Standard Mounting	
Ta	50°C
Input Voltage	170~265V
Output Voltage	10V
Output Current	450A

3.Main Components Temperature Rise

G10-500 3Φ400

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	T3 IN	Transformer	83.3
	T3 Core	Transformer	54.3
	Q19	Mosfet	54.0
	Q9	Mosfet	34.2
	Q2	Mosfet	49.4
	D4	Diode	38.9
	Q32	Mosfet	33.4
	L3 IN	Choke	56.8
	L3 Core	Choke	37.4
	C5	E-Cap	39.5
	C17	E-Cap	22.4
	R99	Shunt	63.1
PFC400	L2 Core	Choke	15.7
	L2 IN	Choke	49.8
	D8	Diode	11.1
	Q11	Mosfet	44.6
	C21	E-Cap	17.8
OUTPUT FILTER	C8	E-Cap	35.5
	C1	E-Cap	33.5
	L1 Core	Choke	27.7
INPUT400	D9	Bridge	46.0
	L2	Choke	38.0
	A3	Top-Switch	20.2
	A5	Top-Switch	30.3
	T1	Transformer	12.8
	T2	Transformer	30.6
	C35	E-Cap	7.1
	C5	E-Cap	18.8
	C32	E-Cap	13.5
	C10	E-Cap	18.6

Conditions:

Standard Mounting	
Ta	40°C
Input Voltage	342~460V
Output Voltage	10V
Output Current	500A

3.Main Components Temperature Rise

G10-500 3Φ400

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	T3 IN	Transformer	69.8
	T3 Core	Transformer	46.4
	Q19	Mosfet	45.9
	Q9	Mosfet	29.9
	Q2	Mosfet	44.7
	D4	Diode	35.4
	Q32	Mosfet	28.7
	L3 IN	Choke	47.2
	L3 Core	Choke	31.4
	C5	E-Cap	33.0
	C17	E-Cap	19.7
	R99	Shunt	53.1
PFC400	L2 Core	Choke	15.7
	L2 IN	Choke	49.8
	D8	Diode	11.1
	Q11	Mosfet	44.6
	C21	E-Cap	17.8
OUTPUT FILTER	C8	E-Cap	28.3
	C1	E-Cap	27.8
	L1 Core	Choke	23.5
INPUT400	D9	Bridge	46.0
	L2	Choke	38.0
	A3	Top-Switch	20.2
	A5	Top-Switch	30.3
	T1	Transformer	12.8
	T2	Transformer	30.6
	C35	E-Cap	7.1
	C5	E-Cap	18.8
	C32	E-Cap	13.5
	C10	E-Cap	18.6

Conditions:

Standard Mounting	
Ta	50°C
Input Voltage	342~460V
Output Voltage	10V
Output Current	450A

3.Main Components Temperature Rise

G600-8.5 3Φ200

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	Q2	Mosfet	59.1
	D34	Diode	40.4
	Q10	Mosfet	39.8
	T3 IN	Transformer	79.9
	T3 Core	Transformer	43.9
	Q16	Mosfet	29.8
	L1	Choke	34.3
	L2	Choke	65.1
	L2 Core	Choke	38.7
	R99	Shunt	32.0
	C5	E-Cap	29.6
	C8	E-Cap	28.4
PFC200	L1 Core	Choke	55.4
	L1 IN	Choke	18.3
	D7	Diode	47.5
	Q8	Mosfet	29.4
	C21	E-Cap	44.5
OUTPUT FILTER	L1	Choke	27.5
	C14	E-Cap	25.6
	C4	E-Cap	19.5
INPUT200	D13	Bridge	28.3
	RL1	Relay	27.6
	A8	Top-Switch	30.6
	A7	Top-Switch	40.0
	T1	Transformer	25.7
	T2	Transformer	15.3
	C46	E-Cap	32.8
	C19	E-Cap	9.8
	C38	E-Cap	23.6
	C43	E-Cap	15.4

Conditions:

Standard Mounting	
Ta	50°C
Input Voltage	170V~265V
Output Voltage	600V
Output Current	8.50A

3.Main Components Temperature Rise

G600-8.5 3Φ400

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	Q2	Mosfet	59.1
	D34	Diode	40.4
	Q10	Mosfet	39.8
	T3 IN	Transformer	79.9
	T3 Core	Transformer	43.9
	Q16	Mosfet	29.8
	L1	Choke	34.3
	L2	Choke	65.1
	L2 Core	Choke	38.7
	R99	Shunt	32.0
	C5	E-Cap	29.6
	C8	E-Cap	28.4
PFC400	L2 Core	Choke	15.7
	L2 IN	Choke	49.8
	D8	Diode	11.1
	Q11	Mosfet	44.6
	C21	E-Cap	17.8
OUTPUT FILTER	L1	Choke	27.5
	C14	E-Cap	25.6
	C4	E-Cap	19.5
INPUT400	D9	Bridge	46.0
	L2	Choke	38.0
	A3	Top-Switch	20.2
	A5	Top-Switch	30.3
	T1	Transformer	12.8
	T2	Transformer	30.6
	C35	E-Cap	7.1
	C5	E-Cap	18.8
	C32	E-Cap	13.5
	C10	E-Cap	18.6

Conditions:

Standard Mounting	
Ta	50°C
Input Voltage	342~460V
Output Voltage	600V
Output Current	8.5A

4.ELECTROLYTIC CAPACITORS LIFE TIME ESTIMATION

MODEL	COMPUTED LIFE (year) at Tambient		
	30°C	40°C	50°C
G10V-500A	11.8	5.9	2.9
G600V-8.5A	15	15	8.1

FORMULA $L = Lo \times 2^{\frac{105-Tc}{10}}$ (years)

L: Elec.capacitor computed life (24 hours per day,365 days operation)

Lo: Guarantee life for Elec.capacitor

Tc: Case temperature of Elec.capacitor

Standard Mounting	
Input Voltage	Nom.
Output Voltage	100%
Output Current	100%

5. ABNORMAL TEST

INPUT 3P200

Condition: Ta:25°C Input:230VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)																	
	Location No.	Test Point	Short	Open	Fire	Sligth Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	OVP	OCP	OTP	AC FAIL	No Output	No Change	PS functional after AC recycle	Others	Note
1	A8	1-2	•														•		•	•	Display stopped working
2		1		•													•		•	•	Display stopped working
3		2-3	•								•						•				R63
4		2		•													•		•	•	Display stopped working
5		3-1	•								•						•				R63, ZD3, A8
6		3		•													•		•	•	Display stopped working
7	A7	1-2	•														•		•	•	Internal Error
8		1		•													•		•	•	Internal Error
9		2-3	•						•		•						•				R85
10		2		•													•		•	•	Internal Error
11		3-1	•						•		•						•				R85, ZD6, A7
12		3		•													•		•	•	Internal Error
13	A6	1-2	•												•				•	•	Output Hicc-Up, OTP after 3 min
14		1		•											•				•	•	Output Hicc-Up, OTP after 3 min
15		2-3	•								•				•		•				R137, Q8
16		2		•															•	•	Output Hicc-Up, OTP after 3 min
17		3-1	•								•				•		•				R137, ZD5, Q8, Q20, Q17, Q18
18		3		•											•				•	•	Output Hicc-Up, OTP after 3 min
19	C10		•														•		•	•	Internal Error
20				•														•			
29	C48		•														•		•	•	Display stopped working
30				•														•			
37	C42		•												•		•		•	•	FAN's stopped working, OTP after 3 min
38				•														•			
47	D13	1-3	•									•				•	•				F3
48		1		•															•	•	Output - unstable
49		3-4	•									•				•	•				F3
50		4		•															•	•	Output - unstable
55	D25	A-C	•														•		•	•	Display stopped working
56		A		•														•			
61	D16	A-C	•														•		•	•	Internal Error
62		A		•														•			
63	D30	A-C	•																•	•	Output Hicc-Up
64		A		•														•			
65	Q18	B-E	•																•	•	Hicc-Up, OTP after 3 min
66		B		•															•	•	Hicc-Up, OTP after 3 min
67		K-E	•																•	•	VFAN=6V
68		E		•															•	•	Hicc-Up, OTP after 3 min
69		K-B	•																•	•	VFAN=6.5V
70		K		•															•	•	Hicc-Up, OTP after 3 min

5. ABNORMAL TEST

PFC 3P200

Condition: Ta:25°C Input:230VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)																
	Location No.	Test Point	Short	Open	Fire	Sligth Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	OVP	OCP	OTP	AC FAIL	No Output	No Change	PS functional after AC recycle	Others	Note
1	C21		•								•	•					•				D1, Input3P200 - F1, F3
2				•														•			
3	D3	A-C	•															•	•		Input3P200 - F1,F2
4		A		•														•	•		
5	D5	A-C	•														•		•	•	Display shows: V - 0 and I - 0
6		A		•														•			
7	L1		•								•	•					•				Q8, Q10, R30, ZD1; Input3P200 - F1, F3
8				•							•	•					•				Q9, Q11, R17, R31, ZD2; Input3P200 - F1, F3
9	Q3	B-E	•															•			
10		B		•							•	•					•				Q9, Q11, R17, ZD2; Input3P200 - F1, F3
11		K-E	•															•			
12		E		•							•	•					•				Q9, Q11, R17, ZD2; Input3P200 - F1, F3
13		K-B	•								•	•					•				Q9, Q11, R17, ZD2; Input3P200 - F1, F3
14		K		•														•			
15	Q4	B-E	•															•			
16		B		•							•	•					•				Q8, Q10, R30, ZD1; Input3P200 - F1, F3
17		K-E	•								•	•					•				Q9, Q11, R17, R31, ZD2; Input3P200 - F1, F3
18		E		•							•	•					•				Q8, Q10, R30, ZD1; Input3P200 - F1, F3
19		K-B	•								•	•					•				Q9, Q11, R17, R31, ZD2; Input3P200 - F1, F3
20		K		•							•	•					•				Q8, Q10, R30, ZD1; Input3P200 - F2, F3
21	Q10	G-S	•								•	•					•				Q9, Q11, R17, R31, ZD2; Input3P200 - F1, F3
22		G		•							•	•					•				Q8, Q10, R19, ZD1; Input3P200 - F2, F3
23		D-S	•								•	•					•				Q8, Q10; Input3P200 - F1, F2
24		S		•							•	•					•				Q8, Q10, R19, R30, ZD1; Input3P200 - F1, F2
25		D-G	•								•	•					•				Q8, Q10, R19, R30, ZD1; Input3P200 - F1, F2
26		D		•							•	•					•				Q8, Q10, R19, R30, ZD1; Input3P200 - F1, F2

5. ABNORMAL TEST

INPUT 3P400

Condition: Ta:25°C Input:400VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)																	
	Location No.	Test Point	Short	Open	Fire	Sligth Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	OVP	OCP	OTP	AC FAIL	No Output	No Change	PS functional after AC recycle	Others	Note
1	A5	1-2	•														•		•	•	Display stopped working
2		1		•													•		•	•	Display stopped working
3		2-3	•								•	•					•				F1, F3, D22, D23, Q5, R105, C80;
4		2		•													•		•	•	Display stopped working
5		3-1	•								•	•					•				F1, F3, D22, D23, Q5, R105, C95, C80, C100, ZD2
6		3		•													•		•	•	Display stopped working
7	A2	1-2	•												•		•		•	•	FAN's stopped working, OTP after 3 min
8		1		•											•		•		•	•	FAN's stopped working, OTP after 3 min
9		2-3	•								•				•		•				R105, Q5
10		2		•											•		•		•	•	FAN's stopped working, OTP after 3 min
11		2-3	•								•				•		•				R165, Q5, ZD5, Q19, Q20;
12		3		•											•		•		•	•	FAN's stopped working, OTP after 3 min
13	A3	1-2	•														•		•	•	Internal Error
14		1		•													•		•	•	Internal Error
15		2-3	•								•	•					•				F1, F3, R90, Q5
16		2		•													•		•	•	Internal Error
17		3-1	•								•	•					•				F1, F3, R90, A2, ZD1, Q17, Q5
18		3		•													•		•	•	Internal Error
19	C9		•														•		•	•	Internal Error
20				•														•			
21	C34		•														•		•	•	display stopped working
22				•														•			
23	D9	4-1	•									•				•	•				F1, F3
24		4		•															•	•	Output - unstable
25		3-5	•									•				•	•				F2, F3
26		3		•															•	•	Output - unstable
27	D29	A-C	•														•		•	•	Display stopped working
28		A		•														•			
29	D32	A-C	•												•		•		•	•	FAN's stopped working, OTP after 3 min
30		A		•														•			
31	D16	A-C	•														•		•	•	Internal Error
32		A		•														•			
33	Q21	G-S	•															•			
34		G		•														•			
35		D-S	•									•					•				F1, F2
36		S		•														•			
37		D-G	•								•	•					•				F1, F2, Q3
38		D		•												•	•		•		

5. ABNORMAL TEST

PFC 3P400

Condition: Ta:25°C Input:400VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)																
	Location No.	Test Point	Short	Open	Fire	Sligth Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	OVP	OCP	OTP	AC FAIL	No Output	No Change	PS functional after AC recycle	Others	Note
1	C6		•															•			
2				•														•			
3	C9		•														•		•	•	Internal Error
4				•														•			
5	C21		•								•	•			•		•		•		
6				•														•			
7	D5	A-C	•														•		•	•	Display shows: V - 0 and I - 0
8		A		•														•			
9	L1	A-B	•								•	•					•				Q10, Input400 - F1, F3
10		A		•															•	•	Q9, Q11 - temp enlarge from 60°C to 117°C
11		1-2	•						•		•	•					•				L1/1-2, Input400 - F1, F2, F3
12		1		•														•			
13	Q10	G-S	•																•	•	Q9, Q11 - temp enlarge from 60°C to 117°C
14		G		•							•	•					•				Q10; Input400 - F1, F2, F3
15		D-S	•									•					•				Input400 - F1, F2, F3
16		S		•							•	•					•				Q8; Input400 - F1, F2
17		D-G	•								•	•					•				Q10; Input400 - F1, F2, F3
18		D		•							•	•					•				Q8; Input400 - F1, F3

5. ABNORMAL TEST

DCDC 10V

Condition: Ta:25°C Input:230VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)																Note
	Location No.	Test Point	Short	Open	Fire	Sligh Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	OVP	OCP	OTP	AC FAIL	No Output	No Change	PS functional after AC recycle	Others	
1	C8		•						•		•	•					•				A1, Q2, Q6~Q10, D11, D13, D14, ZD1, R6, R39, R40, R41, R42
2				•														•			
3	C17		•								•	•					•				PFC3P200 - D1; Input3P200 - F1, F3
4				•														•			
5	L3		•															•			
6				•													•		•		
7	Q1	G-S	•																•	•	Q2 temp enlarge from 57°C to 76°C
8		G		•									•				•		•		
9		D-S	•										•				•		•		
10		S		•															•	•	Q2 temp enlarge from 57°C to 76°C
11		D-G	•										•				•		•		
12		D		•															•	•	Q2 temp enlarge from 57°C to 76°C
13	Q5	G-S	•																•	•	Vo go down to 6V; Mode CV change to CC
14		G		•					•		•	•					•				A1, Q6, Q5, C12, C14, C20, Q1, D1, R2, ZD1, R5
15		D-S	•						•		•	•					•				A1, Q6, Q5, Q1, D1, R1, R2, ZD1, R5
16		S		•															•	•	Vo go down to 6V; Mode CV change to CC
17		D-G	•						•		•	•					•				A1, Q5, Q6, Q4, Q1, D1, D6, D8, R1, R2, ZD1, R5, R27, R28,
18		D		•															•	•	Vo go down to 6V; Mode CV change to CC
19	Q23	G-S	•															•			
20		G		•														•			
21		D-S	•						•		•	•					•				A1, Q25, Q5~Q7, Q9, Q1, D1, D6, R2, ZD1, R5, R27, R30, R39
22		S		•														•			
23		D-G	•						•		•	•					•				A1, Q22, Q23, Q25, Q5~Q7, Q9, Q1, D1, D6, R2, ZD1, R5, R27, R30, R39, R84
24		D		•														•			
25	T3	1-2	•						•		•	•					•				A1, Q5, Q9, Q10, Q7, C12, C14, C20, Q1, D1, D6, R2, ZD1, R5, R39
26		1		•													•		•		
27		A-C	•								•						•				A1, Q17, Q25, Q1, Q2, Q5~Q7, Q9, D1, D6, ZD1, R5, R6, R27, R30, R39
28		A		•															•	•	Vo go down to 6V
29		B-C	•								•						•				A1, Q17, Q25, Q1, Q2, Q5~Q7, Q9, D1, D6, ZD1, R5, R6, R27, R30, R39
30		B		•															•	•	Vo go down to 6V

5. ABNORMAL TEST

DCDC 600V

Condition: Ta:25°C Input:230VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)																	
	Location No.	Test Point	Short	Open	Fire	Sligth Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	OVP	OCP	OTP	AC FAIL	No Output	No Change	PS functional after AC recycle	Others	Note
1	C4		•										•				•				
2				•														•			
3	C7		•										•				•				
4				•														•			
5	C16		•								•	•					•				PFC3P200 - D1; Input3P200 - F1, F3
6				•														•			
7	D22	A-C	•															•			
8		A		•														•			
9	D32	A-C	•						•		•						•				A1, Q1, Q8, Q9, Q10, Q14, Q15, D1, D35, D13, D11, ZD1, R1, R5, R39, R40 PFC3P200 - Q1
10		A		•							•									•	R63~R66, R68, R71, R66, R69; Vo go down to 360V; Mode CV change to CC
11	L3	8,9-10,11	•															•			
12		8,9		•													•		•		
13		5,4-3,2	•															•			
14		5,4		•													•		•		
15	Q1	G-S	•																•	•	Q2 temp enlarge from 57°C to 76°C
16		G		•									•				•		•		
17		D-S	•										•				•		•		
18		S		•															•	•	Q2 temp enlarge from 57°C to 76°C
19		D-G	•										•				•		•		
20		D		•															•	•	Q2 temp enlarge from 57°C to 76°C
21	Q5	G-S	•																•	•	Vo go down to 360V; Mode CV change to CC
22		G		•					•		•						•				A1, Q6, Q5, C12, Q1, D1, R2, ZD1, R5
23		D-S	•						•		•						•				A1, Q6, Q5, Q1, D1, R1, R2, ZD1, R5
24		S		•															•	•	Vo go down to 360V; Mode CV change to CC
25		D-G	•						•		•						•				A1, R149, Q5, Q6, Q3, Q1, D1, D6, D8, R1, R2, ZD1, R5, R27, R28
26		D		•															•	•	Vo go down to 360V; Mode CV change to CC
27	T3	1-2	•						•		•	•					•				A1, C11, C12, Q1, Q9, Q10, D1, ZD1, R1, R5, R39, R40 PFC3P200 - D1; Input3P200 - F1, F3
28		1		•													•		•		
29		A-B	•						•		•	•					•				A1,C11, C12, Q1, Q9, Q10, D1, ZD1, R1, R5, R39, R40 PFC3P200 - D1; Input3P200 - F1, F3
30		A		•															•	•	Vo go down to 360V
31		C-B	•						•		•						•				A1, C11, C12, Q1, Q9, Q10, D1, ZD1, R1, R5, R39, R40 PFC3P200 - D1; Input3P200 - F1, F3
32		C		•															•	•	Vo go down to 360V