

# **G+GENESYS™ 7.5kW**

## **RELIABILITY DATA**

DWG: IA922-79-01		
APPD	CHK	DWG
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**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.**

Calculation based on parts stress reliability projection of Telcordia (Bellcore)  
 "Reliability Prediction Procedure for Electronic Equipment" Document number TR-322, Issue 5)  
 Individual failure  $\lambda_{SSi}$  is calculated from electrical stress and temperature rise of each device.

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

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

- $\lambda_{equip}$  : Total Equipment failure rate (FITs = Failures in  $10^9$  hours)
- $\lambda_{Gi}$  : Generic failure rate for the  $i$  th device
- $\pi_{Qi}$  : Quality factor for the  $i$  th device
- $\pi_{Si}$  : Stress factor for the  $i$  th device
- $\pi_{Ti}$  : Temperature factor for the  $i$  th device
- $m$  : Number of different device types
- $N_i$  : Quantity of  $i$  th device type
- $\pi_E$  : Equipment environmental factor

Conditions:

Vin=200VAC

Vo=600V

Io=12.5A

Ta=25°C

Environmental Factor: Gf - Ground, Fixed, Uncontrolled

**M.T.B.F. = 367163 (HOURS)**

**2.COMPONENT DERATING**

**G+7.5KW 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:

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

*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

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

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

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

Vin = 170Vac      Load = 100%      Ta=50°C      **INPUT 3-PHASE 208V**

D1 STBR6012W ST	Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.45 °C/W DTc = 44.9 °C Tj = 100.5 °C	Pmax = --- W Tc = 94.9 °C D.F. = 57.4 %
D2 STBR6012W ST	Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.45 °C/W DTc = 47.3 °C Tj = 102.9 °C	Pmax = --- W Tc = 97.3 °C D.F. = 58.8 %
D3 STBR6012W ST	Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.45 °C/W DTc = 44.9 °C Tj = 100.5 °C	Pmax = --- W Tc = 94.9 °C D.F. = 57.4 %
D4 STBR6012W ST	Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.45 °C/W DTc = 47.6 °C Tj = 103.2 °C	Pmax = --- W Tc = 97.6 °C D.F. = 59.0 %
D5 STBR6012W ST	Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.45 °C/W DTc = 44.6 °C Tj = 100.3 °C	Pmax = --- W Tc = 94.6 °C D.F. = 57.3 %
D6 STBR6012W ST	Tjmax= 175 °C Pd = 12.5 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.45 °C/W DTc = 40.2 °C Tj = 95.8 °C	Pmax = --- W Tc = 90.2 °C D.F. = 54.8 %
A1 TL432AQDBZR Texas Instruments	Tjmax= 150 °C Pd = --- W Tj = Tc + (q j-c x Pd) =>	qj-c = --- °C/W DTc = 30.0 °C Tj = 80.0 °C	Pmax = --- W Tc = 80.0 °C D.F. = 53.3 %
A2 TL432AQDBZR Texas Instruments	Tjmax= 150 °C Pd = --- W Tj = Tc + (q j-c x Pd) =>	qj-c = --- °C/W DTc = 30.0 °C Tj = 80.0 °C	Pmax = --- W Tc = 80.0 °C D.F. = 53.3 %
L1 IA938-35-01 TDK	Tjmax= 155 °C Pd = --- W Tj = Tc + (q j-c x Pd) =>	qj-c = --- °C/W DTc = 54.1 °C Tj = 104.1 °C	Pmax = --- W Tc = 104.1 °C D.F. = 67.2 %
L2 IA938-35-01 TDK	Tjmax= 155 °C Pd = --- W Tj = Tc + (q j-c x Pd) =>	qj-c = --- °C/W DTc = 45.7 °C Tj = 95.7 °C	Pmax = --- W Tc = 95.7 °C D.F. = 61.7 %

Vin = 342Vac      Load = 100%      Ta=50°C      **INPUT 3-PHASE 480V**

L1 IA765-35-03 TDK	Tjmax= 155 °C Pd = --- W Tj = Tc + (q j-c x Pd) =>	qj-c = --- °C/W DTc = 55.9 °C Tj = 105.9 °C	Pmax = --- W Tc = 105.9 °C D.F. = 68.3 %
A1 TL432AQDBZR Texas Instruments	Tjmax= 150 °C Pd = --- W Tj = Tc + (q j-c x Pd) =>	qj-c = --- °C/W DTc = 22.0 °C Tj = 72.0 °C	Pmax = --- W Tc = 72.0 °C D.F. = 48.0 %
A2 TL432AQDBZR Texas Instruments	Tjmax= 150 °C Pd = --- W Tj = Tc + (q j-c x Pd) =>	qj-c = --- °C/W DTc = 22.0 °C Tj = 72.0 °C	Pmax = --- W Tc = 72.0 °C D.F. = 48.0 %

Vin = 170Vac      Load = 100%      Ta=50°C      **BIAS 208**

A3 MIP2E2DMUL MATSUSHITA	Tjmax= 150 °C Pd = 1.23 W Tj = Tc + (q j-c x Pd) =>	qj-c = 10.0 °C/W DTc = 40.0 °C Tj = 102.3 °C	Pmax = --- W Tc = 90.0 °C D.F. = 68.2 %
A4 MIP2E5DMY PANASONIC	Tjmax= 150 °C Pd = 0.99 W Tj = Tc + (q j-c x Pd) =>	qj-c = 3.0 °C/W DTc = 26.0 °C Tj = 79.0 °C	Pmax = --- W Tc = 76.0 °C D.F. = 52.6 %
A5 MIP2E4DMY PANASONIC	Tjmax= 150 °C Pd = 0.71 W Tj = Tc + (q j-c x Pd) =>	qj-c = 3.0 °C/W DTc = 24.0 °C Tj = 76.1 °C	Pmax = --- W Tc = 74.0 °C D.F. = 50.8 %

 Vin = 342Vac      Load = 100%      Ta=50°C      **BIAS 480**

D9 STBR6012W ST	Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C	Pmax = --- W Tc = 74.0 °C D.F. = 44.7 %
D32 STBR6012W ST	Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C	Pmax = --- W Tc = 74.0 °C D.F. = 44.7 %
D33 STBR6012W ST	Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C	Pmax = --- W Tc = 74.0 °C D.F. = 44.7 %
D34 STBR6012W ST	Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C	Pmax = --- W Tc = 74.0 °C D.F. = 44.7 %
D35 STBR6012W ST	Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C	Pmax = --- W Tc = 74.0 °C D.F. = 44.7 %
D36 STBR6012W ST	Tjmax= 175 °C Pd = 8.51 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 24.0 °C Tj = 78.3 °C	Pmax = --- W Tc = 74.0 °C D.F. = 44.7 %
A2 MIP2E4DMY PANASONIC	Tjmax= 150 °C Pd = 0.72 W Tj = Tc + (q j-c x Pd) =>	qj-c = 3.0 °C/W DTc = 15.0 °C Tj = 67.2 °C	Pmax = --- W Tc = 65.0 °C D.F. = 44.8 %
A3 MIP2E4DMY PANASONIC	Tjmax= 150 °C Pd = 0.87 W Tj = Tc + (q j-c x Pd) =>	qj-c = 3.0 °C/W DTc = 30.0 °C Tj = 82.6 °C	Pmax = --- W Tc = 80.0 °C D.F. = 55.1 %
A5 MIP2E2DMUL PANASONIC	Tjmax= 150 °C Pd = 0.87 W Tj = Tc + (q j-c x Pd) =>	qj-c = 10.0 °C/W DTc = 28.7 °C Tj = 87.4 °C	Pmax = --- W Tc = 78.7 °C D.F. = 58.3 %

Vin = 170Vac      Load = 100%      Ta=50°C      **PFC 208**

Q3 IPW60R037P7 INFINEON	Tjmax= 150 °C Pd = 10.8 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 47.2 °C Tj = 102.5 °C	Pmax = 255.0 W Tc = 97.2 °C D.F. = 68.3 %
Q4 IPW60R037P7 INFINEON	Tjmax= 150 °C Pd = 10.8 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 46.5 °C Tj = 101.8 °C	Pmax = 255.0 W Tc = 96.5 °C D.F. = 67.8 %
Q7 IPW60R037P7 INFINEON	Tjmax= 150 °C Pd = 10.8 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 47.2 °C Tj = 102.5 °C	Pmax = 255.0 W Tc = 97.2 °C D.F. = 68.3 %
Q8 IPW60R037P7 INFINEON	Tjmax= 150 °C Pd = 10.8 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.5 °C/W DTc = 44.7 °C Tj = 100.0 °C	Pmax = 255.0 W Tc = 94.7 °C D.F. = 66.6 %
D2 IDH10G65C6XKSA1 INFINEON	Tjmax= 175 °C Pd = 7.3 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.3 °C/W DTc = 33.4 °C Tj = 92.8 °C	Pmax = 72.0 W Tc = 83.4 °C D.F. = 53.1 %
D3 IDH10G65C6XKSA1 INFINEON	Tjmax= 175 °C Pd = 7.3 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.3 °C/W DTc = 24.8 °C Tj = 84.2 °C	Pmax = 72.0 W Tc = 74.8 °C D.F. = 48.1 %
D5 IDH10G65C6XKSA1 INFINEON	Tjmax= 175 °C Pd = 7.3 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.3 °C/W DTc = 24.5 °C Tj = 83.9 °C	Pmax = 72.0 W Tc = 74.5 °C D.F. = 48.0 %
D6 IDH10G65C6XK+B65SA INFINEON	Tjmax= 175 °C Pd = 7.3 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.3 °C/W DTc = 28.6 °C Tj = 88.1 °C	Pmax = 72.0 W Tc = 78.6 °C D.F. = 50.3 %

 Vin = 342Vac      Load = 100%      Ta=50°C      **PFC 480**

Q8 SCT2160KEC ROHM	Tjmax= 175 °C Pd = 12.7 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.7 °C/W DTc = 55.7 °C Tj = 114.6 °C	Pmax = 165.0 W Tc = 105.7 °C D.F. = 65.5 %
Q9 SCT2160KEC ROHM	Tjmax= 175 °C Pd = 12.7 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.7 °C/W DTc = 41.2 °C Tj = 100.1 °C	Pmax = 165.0 W Tc = 91.2 °C D.F. = 57.2 %
Q10 SCT2160KEC ROHM	Tjmax= 175 °C Pd = 12.7 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.7 °C/W DTc = 59.6 °C Tj = 118.5 °C	Pmax = 165.0 W Tc = 109.6 °C D.F. = 67.7 %
Q11 SCT2160KEC ROHM	Tjmax= 175 °C Pd = 12.7 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.7 °C/W DTc = 55.2 °C Tj = 114.1 °C	Pmax = 165.0 W Tc = 105.2 °C D.F. = 65.2 %
D5 SCS205KGC ROHM	Tjmax= 175 °C Pd = 1.32 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.5 °C/W DTc = 13.4 °C Tj = 65.4 °C	Pmax = 88.0 W Tc = 63.4 °C D.F. = 37.4 %
D6 SCS205KGC ROHM	Tjmax= 175 °C Pd = 1.32 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.5 °C/W DTc = 10.5 °C Tj = 62.5 °C	Pmax = 88.0 W Tc = 60.5 °C D.F. = 35.7 %
D7 SCS205KGC ROHM	Tjmax= 175 °C Pd = 1.32 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.5 °C/W DTc = 14.5 °C Tj = 66.5 °C	Pmax = 88.0 W Tc = 64.5 °C D.F. = 38.0 %
D8 SCS205KGC ROHM	Tjmax= 175 °C Pd = 1.32 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.5 °C/W DTc = 14.4 °C Tj = 66.4 °C	Pmax = 88.0 W Tc = 64.4 °C D.F. = 37.9 %

Vin = 170Vac

Load = 100%

Ta=50°C

**DC/DC 20V**

Q1 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 6.2 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 27.2 °C Tj = 80.8 °C	Pmax = 220.0 W Tc = 77.2 °C D.F. = 53.8 %
Q2 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 6.26 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 25.1 °C Tj = 78.6 °C	Pmax = 220.0 W Tc = 75.1 °C D.F. = 52.4 %
Q33 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 6.03 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 26.2 °C Tj = 79.7 °C	Pmax = 220.0 W Tc = 76.2 °C D.F. = 53.1 %
Q5 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.75 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 21.5 °C Tj = 73.0 °C	Pmax = 130.0 W Tc = 71.5 °C D.F. = 48.7 %
Q6 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.48 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 25.7 °C Tj = 77.1 °C	Pmax = 130.0 W Tc = 75.7 °C D.F. = 51.4 %
Q9 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.99 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 22.7 °C Tj = 74.3 °C	Pmax = 130.0 W Tc = 72.7 °C D.F. = 49.5 %
Q10 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.59 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 25.3 °C Tj = 76.7 °C	Pmax = 130.0 W Tc = 75.3 °C D.F. = 51.1 %
Q17,Q19,Q21 IPP023N10N5 INFINEON	Tjmax= 175 °C Pd = 2.48 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.4 °C/W DTc = 38.8 °C Tj = 89.8 °C	Pmax = 375.0 W Tc = 88.8 °C D.F. = 51.3 %
Q23-Q27 IPP023N10N5 INFINEON	Tjmax= 175 °C Pd = 2.48 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.4 °C/W DTc = 39.4 °C Tj = 90.4 °C	Pmax = 375.0 W Tc = 89.4 °C D.F. = 51.6 %
D4 IDH10G65C6 INFINEON	Tjmax= 175 °C Pd = 8.3 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.3 °C/W DTc = 26.7 °C Tj = 87.5 °C	Pmax = 72.0 W Tc = 76.7 °C D.F. = 50.0 %



Vin = 170Vac      Load = 100%      Ta=50°C      DC/DC 150V

Q1 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 6.33 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 21.0 °C Tj = 74.6 °C	Pmax = 220.0 W Tc = 71.0 °C D.F. = 49.7 %
Q2 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 5.61 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 25.9 °C Tj = 79.1 °C	Pmax = 220.0 W Tc = 75.9 °C D.F. = 52.7 %
Q17 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 5.94 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 25.1 °C Tj = 78.5 °C	Pmax = 220.0 W Tc = 75.1 °C D.F. = 52.3 %
Q5 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.55 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 22.4 °C Tj = 73.8 °C	Pmax = 130.0 W Tc = 72.4 °C D.F. = 49.2 %
Q6 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.72 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 26.4 °C Tj = 77.9 °C	Pmax = 130.0 W Tc = 76.4 °C D.F. = 51.9 %
Q9 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.38 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.5 °C	Pmax = 130.0 W Tc = 69.1 °C D.F. = 47.0 %
Q10 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.66 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.6 °C	Pmax = 130.0 W Tc = 69.1 °C D.F. = 47.0 %
D30~D33 STTH50W03CW ST	Tjmax= 175 °C Pd = 8.33 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.0 °C/W DTc = 46.0 °C Tj = 104.3 °C	Pmax = --- W Tc = 96.0 °C D.F. = 59.6 %
D4 IDH10G65C6 INFINEON	Tjmax= 175 °C Pd = 8.96 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.3 °C/W DTc = 27.2 °C Tj = 88.8 °C	Pmax = 72.0 W Tc = 77.2 °C D.F. = 50.8 %

Vin = 170Vac

Load = 100%

Ta=50°C

**DC/DC 500V (For 1500-5 P.S)**

Q1 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 5.82 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 21.0 °C Tj = 74.3 °C	Pmax = 220.0 W Tc = 71.0 °C D.F. = 49.5 %
Q2 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 4.59 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 25.5 °C Tj = 78.1 °C	Pmax = 220.0 W Tc = 75.5 °C D.F. = 52.1 %
Q5 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.03 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 30.9 °C Tj = 82.2 °C	Pmax = 130.0 W Tc = 80.9 °C D.F. = 54.8 %
Q6 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.14 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 33.1 °C Tj = 84.4 °C	Pmax = 130.0 W Tc = 83.1 °C D.F. = 56.3 %
Q9 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 3.99 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.3 °C	Pmax = 130.0 W Tc = 69.1 °C D.F. = 46.9 %
Q10 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 3.72 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.3 °C	Pmax = 130.0 W Tc = 69.1 °C D.F. = 46.8 %
D30, D32, D34, D37 IDH05G120C5XKSA1 INFINEON	Tjmax= 175 °C Pd = 4.5 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.1 °C/W DTc = 36.6 °C Tj = 91.4 °C	Pmax = 109.0 W Tc = 86.6 °C D.F. = 52.2 %
D4 IDH10G65C6 INFINEON	Tjmax= 175 °C Pd = 2.2 W Tj = Tc + (q j-c x Pd) =>	qj-c = 2.1 °C/W DTc = 27.3 °C Tj = 81.9 °C	Pmax = 72.0 W Tc = 77.3 °C D.F. = 46.8 %

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


Q1 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 5.82 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 21.0 °C Tj = 74.3 °C	Pmax = 220.0 W Tc = 71.0 °C D.F. = 49.5 %
Q2 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 4.59 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 25.5 °C Tj = 78.1 °C	Pmax = 220.0 W Tc = 75.5 °C D.F. = 52.1 %
Q17 FMW30N60S1HF Fuji	Tjmax= 150 °C Pd = 5.82 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.57 °C/W DTc = 27.7 °C Tj = 81.0 °C	Pmax = 220.0 W Tc = 77.7 °C D.F. = 54.0 %
Q5 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.03 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 30.9 °C Tj = 82.2 °C	Pmax = 130.0 W Tc = 80.9 °C D.F. = 54.8 %
Q6 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 4.14 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 33.1 °C Tj = 84.4 °C	Pmax = 130.0 W Tc = 83.1 °C D.F. = 56.3 %
Q9 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 3.99 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.3 °C	Pmax = 130.0 W Tc = 69.1 °C D.F. = 46.9 %
Q10 TK62N60W5,S1VF TOSHIBA	Tjmax= 150 °C Pd = 3.72 W Tj = Tc + (q j-c x Pd) =>	qj-c = 0.31 °C/W DTc = 19.1 °C Tj = 70.3 °C	Pmax = 130.0 W Tc = 69.1 °C D.F. = 46.8 %
D29~D36 IDH02G120C5 INFINEON	Tjmax= 175 °C Pd = 3.54 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.5 °C/W DTc = 36.6 °C Tj = 92.1 °C	Pmax = --- W Tc = 86.6 °C D.F. = 52.6 %
D3 IDH10G65C6 INFINEON	Tjmax= 175 °C Pd = 2.2 W Tj = Tc + (q j-c x Pd) =>	qj-c = 1.3 °C/W DTc = 27.3 °C Tj = 80.2 °C	Pmax = 72.0 W Tc = 77.3 °C D.F. = 45.8 %

**3.Main Components Temperature Rise**

**G20-375 3Φ208**

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DCDC	C5	E-Cap	32.05
	D4	Diode	26.67
	L1 core	Choke	54.43
	L1 in	Choke	47.00
	L2	Choke	36.76
	L3 core	Choke	34.65
	Q1	Mosfet	27.23
	Q23	Mosfet	39.39
	Q32	Mosfet	31.00
	Q6	Mosfet	27.49
	R90	Shunt	52.94
	T2	Transformer	24.56
	T3 core	Transformer	33.91
	T3 in	Transformer	62.78
PFC208	C21	E-Cap	9.86
	D2	Diode	37.31
	L1 core	Choke	7.88
	L1 in	Choke	50.73
	Q3	Mosfet	55.61
	T1	Transformer	27.81
	T2	Transformer	26.39
OUTPUT FILTER	C3	E-Cap	38.97
	C8	E-Cap	39.22
	L1 core	Choke	34.84
INPUT208	D4	Diode	47.62
	L1	Choke	73.03
	L2	Choke	59.71
	L3	Choke	46.98
BIAS208	A5	Top-Switch	30.18
	C10	E-Cap	20.34
	C31	E-Cap	20.43
	C33	E-Cap	13.69
	C35	E-Cap	10.48
	T2	Transformer	43.04
	T3	Transformer	46.14

Conditions:


Standard Mounting	
Ta	50°C
Input Voltage	170~265V
Output Voltage	20V
Output Current	375A

**3.Main Components Temperature Rise**

**G20-375 3Φ480**

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DCDC	C5	E-Cap	31.20
	C12	E-Cap	13.10
	D4	Diode	24.48
	L1 core	Choke	48.32
	L1 in	Choke	42.32
	L2	Choke	30.78
	L3 core	Choke	28.77
	Q1	Mosfet	25.42
	Q23	Mosfet	38.74
	Q32	Mosfet	26.98
	Q6	Mosfet	21.69
	R90	Shunt	53.76
	T1	Transformer	15.56
	T2	Transformer	21.94
	T3 core	Transformer	27.43
T3 in	Transformer	58.23	
PFC480	C21	E-Cap	8.52
	D7	Diode	15.91
	L1 core	Choke	7.30
	L1 in	Choke	44.50
	Q10	Mosfet	60.70
OUTPUT FILTER	C3	E-Cap	38.97
	C8	E-Cap	39.22
	L1 core	Choke	34.84
INPUT480	L1	Choke	74.58
BIAS 480	A5	Top-Switch	33.02
	C10	E-Cap	21.52
	C18	E-Cap	21.52
	C21	E-Cap	19.92
	C5	E-Cap	24.49
	L1	Choke	37.59
	L2	Choke	73.22
	L3	Choke	14.83
	T1	Transformer	45.31
	T2	Transformer	10.52
T3	Transformer	41.88	

Conditions:


Standard Mounting	
Ta	50°C
Input Voltage	342~520V
Output Voltage	20V
Output Current	375A

**3.Main Components Temperature Rise**

**G150-50 3Φ208**

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	C5	E-Cap	27.46
	C57	E-Cap	20.14
	D4	Diode	27.20
	D33	Diode	45.95
	L1 core	Choke	46.68
	L1 in	Choke	45.26
	L2	Choke	36.68
	L3	Choke	60.31
	Q16	Mosfet	25.34
	Q2	Mosfet	25.86
	Q6	Mosfet	26.67
	R96	Shunt	40.65
	T1	Transformer	18.17
	T2	Transformer	20.63
	T3 core	Transformer	33.44
T3 in	Transformer	60.48	
OUTPUT FILTER	C15	E-Cap	33.34
	C4	E-Cap	33.91
	L1 core	Choke	30.36

Conditions:


Standard Mounting	
Ta	50°C
Input Voltage	170~265V
Output Voltage	150V
Output Current	50A

**3.Main Components Temperature Rise**

**G600-12.5 3Φ208**

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	C13	E-Cap	27.98
	C8	E-Cap	29.15
	D3	Diode	27.35
	D36	Diode	36.65
	L1 core	Choke	59.95
	L1 in	Choke	52.48
	L2	Choke	28.91
	L3	Choke	70.71
	Q16	Mosfet	29.45
	Q17	Mosfet	27.66
	Q6	Mosfet	33.12
	R99	Shunt	31.28
	T1	Transformer	22.69
	T2	Transformer	23.10
T3	Transformer	66.12	
PFC208	C21	E-Cap	9.96
	D2	Diode	32.11
	L1 core	Choke	8.74
	L1 in	Choke	50.08
	Q3	Mosfet	50.81
	T1	Transformer	25.28
	T2	Transformer	23.48
OUTPUT FILTER	C67	E-Cap	28.52
	C7	E-Cap	27.78
	L1 core	Choke	27.85
INPUT208	D2	Diode	47.21
	L1	Choke	67.33
	L2	Choke	56.83
	L3	Choke	44.10
BIAS208	A5	Top-Switch	25.31
	C10	E-Cap	18.51
	C31	E-Cap	18.57
	C33	E-Cap	13.93
	C35	E-Cap	10.49
	T2	Transformer	42.14
	T3	Transformer	37.72

Conditions:


Standard Mounting	
Ta	50°C
Input Voltage	170V~265V
Output Voltage	600V
Output Current	12.5A

**3.Main Components Temperature Rise**

**G600-12.5 3Φ480**

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	C13	E-Cap	24.10
	C8	E-Cap	24.65
	D3	Diode	25.70
	D36	Diode	33.30
	L1 core	Choke	51.04
	L1 in	Choke	45.09
	L2	Choke	26.67
	L3	Choke	68.34
	Q16	Mosfet	25.67
	Q17	Mosfet	25.64
	Q6	Mosfet	26.25
	R99	Shunt	29.07
	T1	Transformer	19.08
	T2	Transformer	21.02
T3	Transformer	63.72	
PFC480	C21	E-Cap	8.07
	D5	Diode	14.66
	L1 core	Choke	5.69
	L1 in	Choke	42.60
	Q10	Mosfet	54.07
OUTPUT FILTER	C67	E-Cap	27.18
	C7	E-Cap	26.49
	L1 core	Choke	26.98
INPUT480	L1	Choke	74.82
BIAS 480	A5	Top-Switch	31.55
	C10	E-Cap	19.97
	C18	E-Cap	20.27
	C21	E-Cap	19.68
	C5	E-Cap	24.45
	L1	Choke	41.09
	L2	Choke	48.62
	L3	Choke	17.34
	T1	Transformer	41.02
	T2	Transformer	9.24
T3	Transformer	42.68	

Conditions:

Standard Mounting	
Ta	50°C
Input Voltage	342~520V
Output Voltage	600V
Output Current	12.5A




**3.Main Components Temperature Rise**

**G1500-5 3Φ208**

Location No.		Parts Name	ΔT Temperature Rise (°C)
			Standard Mounting
DC-DC	C13	E-Cap	25.65
	C5	E-Cap	26.80
	D32	Diode	34.83
	D4	Diode	21.63
	L1 core	Choke	40.29
	L1 in	Choke	35.51
	L2	Choke	35.65
	L3	Choke	59.44
	Q10	Mosfet	24.38
	Q16	Mosfet	27.00
	Q2	Mosfet	27.28
	T1	Transformer	20.53
	T2	Transformer	16.85
	T3 core	Transformer	39.86
T3 in	Transformer	61.77	
OUTPUT FILTER	L1 Core	Choke	24.08
	R14	Shunt	30.27

Conditions:

Standard Mounting	
Ta	50°C
Input Voltage	170V~265V
Output Voltage	1500V
Output Current	5A

**4.ELECTROLYTIC CAPACITORS LIFE TIME ESTIMATION**


MODEL	COMPUTED LIFE (year) at Tambient		
	30°C	40°C	50°C
G20V-375A	12.4	6.2	3.1
G150V-50A	15.0	7.6	3.8
G600V-12.5A	15.0	7.6	3.8
G1500V-5A	15.0	7.6	3.8

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

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

*L<sub>o</sub>*: Guarantee life for Elec.capacitor

*T<sub>c</sub>*: Case temperature of Elec.capacitor

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



**5. ABNORMAL TEST**

**PFC 3P208**

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	Slight Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	P	O	V	P	C	O		P	-	O	AC FAIL	No Output	No Change	PS functional after AC recycle	Others
1	C21, C24		•	•							•	•											•	•			D1, Input3P208 - F1, F3, DC/DC 20V- F1,Q11
2																											Display shows: V - 0 and I - 0
3	D2, D3, D5, D6	A-C	•	•																							
4		A	•	•																							
5	L1, L2		•	•							•	•											•	•			Q3, Q4, R10, R14, ZD1: Input - F1, F3
6			•	•							•	•											•	•			Q7, Q8, R24, R28, ZD2: Input - F1, F3
7	Q3, Q4, Q7, Q8	G-S	•	•																							
8		G	•	•																							
9		D-S	•	•							•	•											•	•			
10		S	•	•																							
11		D-G	•	•							•	•											•	•			
12		D	•	•																							
13	Q9, Q10, Q11	G-S	•	•																							
14		G	•	•																							
15		D-S	•	•																							
16		S	•	•																							
17		D-G	•	•																							
18		D	•	•																							

5. ABNORMAL TEST

BIAS 3P480

Condition: Ta:25°C Input:480VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)														Note									
	Location No.	Test Point	Short	Open	Fire	Slight Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	P	O	V	P	C	O		P	O	AC FAIL	No Output	No Change	PS functional	after AC recycle	Others	
1	A2	1-2	•																									FAN's stopped working, OTP after 3 min
2	based on GEN+ 5 abnormal test	1		•																								FAN's stopped working, OTP after 3 min
3		2-3	•																									R118, Q5
4		2		•																								FAN's stopped working, OTP after 3 min
5		2-3	•																									R118,Q5,Q22,Q20,Q19
6		3		•																								FAN's stopped working, OTP after 3 min
7	A3	1-2	•																									Internal Error
8	based on GEN+ 5 abnormal test	1		•																								Internal Error
9		2-3	•																									F1, F3, R74, Q5
10		2		•																								Internal Error
11		3-1	•																									F1, F3, R74, Q5
12		3		•																								Internal Error
13	A5	1-2	•																									Display stopped working
14	based on GEN+ 5 abnormal test	1		•																								Display stopped working
15		2-3	•																									Display stopped working
16		2		•																								Display stopped working
17		3-1	•																									Display stopped working
18		3		•																								Display stopped working
19	C3, C9, C10		•																									Internal Error
20				•																								based on GEN+ 5 abnormal test
21	C24		•																									display stopped working
22				•																								based on GEN+ 5 abnormal test
23	D9, D32-D36	A-C	•																									F1, F2, F3
24		A		•																								Output - unstable, based on GEN+ 5 abnormal test
25	D15, D16	A-C	•																									Internal Error
26		A		•																								based on GEN+ 5 abnormal test
27	D26-D28	A-C	•																									Display stopped working
28		A		•																								based on GEN+ 5 abnormal test
29	D30,D31,D37	A-C	•																									FAN's stopped working, OTP after 3 min
30		A		•																								based on GEN+ 5 abnormal test
31	Q21	G-S	•																									
32		G		•																								
33		D-S	•																									F1, F2
34		S		•																								
35		D-G	•																									F1, F2, Q3
36		D		•																								based on GEN+5 abnormal test

**5. ABNORMAL TEST**

**PFC 3P480**

Condition: Ta:25°C Input:480VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)														Note		
	Location No.	Test Point	Short	Open	Fire	Slight Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	P O	P C	P O	AC FAIL	No Output	No Change after AC recycle		Others	
1	C4, C5, C6, C8		•																		Based on gen+5 abnormal test
2				•																	Internal Error
3	C2, C7, C9		•																		Based on gen+5 abnormal test
4				•																	DC/DC 20V- F1, Q11
5	C21, C24		•								•	•									
6				•																	
7	D5-D8	A-C	•																		Display shows: V - 0 and I - 0
8		A	•																		Based on gen+5 abnormal test
9	L1	A-B	•								•	•									Q10, Input480 - F1, F3
10		A	•																		Q9, Q11 - temp enlarge from 60°C to 117°C
11		1-2	•								•	•									L1/1-2, Input480 - F1, F2, F3
12		1	•																		Based on gen+5 abnormal test
13	Q10, Q11	G-S	•																		Q8, Q10 - temp enlarge from 60°C to 117°C
14		G	•								•	•									Q11; Input480 - F1, F2, F3
15		D-S	•								•	•									Input480 - F1, F2, F3
16		S	•								•	•									Q9; Input480 - F1, F2
17		D-G	•								•	•									Q11; Input480 - F1, F2, F3
18		D	•								•	•									Q9; Input480 - F1, F3

5. ABNORMAL TEST

DCDC 20V

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

No.	Test Position		Study result (prediction of the phenomena)														Note												
	Location No.	Test Point	Failure Mode	Short	Open	Fire	Slight Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	P	O	V		P	C	O	P	-	O	AC FAIL	No Output	No Change	PS functional after AC recycle	Others	
1	C4, C5, C7, C8			•																									Q5, Q6, Q1, R5, R137, TS1, A1, A7, A9, A10, A11, D5(input), D3(input), F2, F3, ZD3(PFC)
2					•																								
3	C12, C13, C58			•																									
4					•																								fuse open and in bias 208 bypass diode will be damaged
5	L3			•																									
6					•																								
7	Q1	G-S		•																									Vo go down to 26V; Mode CV change to CC
8		G		•																									Q2 temp enlarge from 50°C to 58°C
9		D-S		•																									A10 Damaged
10		S		•																									Q2 temp enlarge from 51°C to 56°C
11		D-G		•																									
12		D		•																									
13	Q5	G-S		•																									
14		G		•																									
15		D-S		•																									
16		S		•																									
17		D-G		•																									
18		D		•																									
19	Q23	G-S		•																									
20		G		•																									
21		D-S		•																									
22		S		•																									
23		D-G		•																									
24		D		•																									
25	T3	A-B		•																									
26		1		•																									
27		A-C		•																									
28		A		•																									
29		B-C		•																									
30		B		•																									

**5. ABNORMAL TEST**

**DCDC 500V**

Condition: Ta:25°C Input:480VAC Vout:100% Iout:100%

No.	Test Position		Failure Mode		Study result (prediction of the phenomena)													Note			
	Location No.	Test Point	Short	Open	Fire	Slight Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	P-O	P-C	P-O	AC FAIL	No Output		No Change after AC recycle	Others	
1	C4,C5,C7,C8		•	•													•	•			
2				•														•	•		
3	C12, C13, C54		•	•														•	•		
4				•														•	•		
5	D32	A-C	•								•								•	•	
6		A		•							•								•	•	
7	L3	9-10	•																•	•	
8		9		•															•	•	
9	Q1	G-S	•																•	•	
10		G		•												•			•	•	
11		D-S	•																•	•	
12		S		•							•								•	•	
13		D-G	•																•	•	
14		D		•															•	•	
15	Q5	G-S	•																•	•	
16		G		•							•								•	•	
17		D-S	•								•								•	•	
18		S		•							•								•	•	
19		D-G	•								•								•	•	
20		D		•							•								•	•	
21	T3	1		•															•	•	
22		2		•															•	•	
23		2-3	•																•	•	
24		A-C	•								•					•					
25		A		•															•	•	
26		C		•															•	•	



5. ABNORMAL TEST

DCDC 600V

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

No.	Test Position		Study result (prediction of the phenomena)														Note											
	Location No.	Test Point	Failure Mode	Short	Open	Fire	Slight Smoke	Smoke	Burst	Smell	Red Hot	Damaged	Fuse Open	P	O	V		P	C	O	P	-	O	AC FAIL	No Output	No Change PS functional after AC recycle	Others	
1	C4,C5,C7,C8			•																								
2					•																							
3	C12, C13, C56			•																								
4					•																							
5	D21-D28	A-C		•																								
6		A			•																							
7	D29-D36	A-C		•																								
8		A			•																							
9	Q1, Q2, Q17	G-S		•																								
10		G			•																							
11		D-S		•																								
12		S			•																							
13		D-G		•																								
14		D			•																							
15	Q5, Q6, Q9, Q10	G-S		•																								
16		G			•																							
17		D-S		•																								
18		S			•																							
19		D-G		•																								
20		D			•																							
21	T3	1-2		•																								
22		1			•																							
23		3			•																							
24		A-C		•																								
25		A			•																							
26		B-C		•																								
27		B			•																							
28		C			•																							

**6.VIBRATION TEST**

MODEL: G600-12.5 3P480

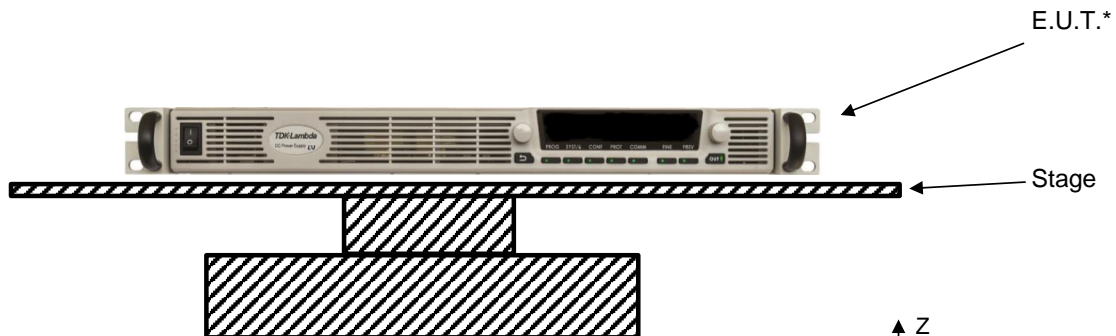
(1) Vibration test class

Frequency variable endurance test

(2) Equipment used

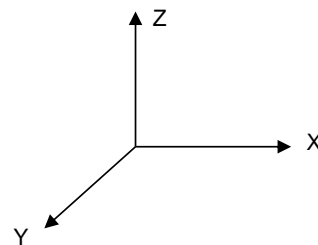
Name	Manufaturer	Model
Vibration Test System (Amplifier #SP6893-011/1, Remote Control Panel #SP9663-008/1, Vibrator #SP6893-005/1, Slip Table, Driver Bar, Pump, Fan, Head Expander)	Ling Dynamic Systems	V875
Precision Barometer, 870 - 1050 hPa	LUFFT Mess- und Regeltechnik GmbH	DKD-K-26701
Temp. & Humidity Meter, (-50 ~+70) deg, (20 - 99 )% RH	Mad Electronics	HTC-1
APEX SL VIBRATION CONTROLLER	Unholtz-Dickie	APEX SL
Isotron Accelerometer 100.2 mVlg	Dytran Instruments Inc.	3256A2
Altitude Test Chamber, Alt.:100.0 feet, 75~177) deg. C, Hum.: (20 to 95)%	Thermotron	FA-46_CHM-5-5

(3) Testing method



Test condition:

Random frequency 10Hz~500Hz  
 Acceleration X: 0.24  
 Y: 0.89  
 Z: 1.25  
 Direction X,Y,Z  
 Test time 1H.each



\*E.U.T. is fixed to vibrator surface by mounting straps

(4)Test Result

OK NG

Vin=400Vac; Iout=12.5A

Check item	Vout [V]	Ripple [mVp-p]	E.U.T.state
Directions \Initial	600.076	9.57	O.K.
X	600.076	9.57	O.K.
Y	600.076	9.57	O.K.
Z	600.076	9.57	O.K.