

High power cycling capability
 Low on-state and switching losses
 Optimized for line frequency rectifiers
 Designed for traction and industrial applications

Rectifier Diode Type D173-6300-18

| | | | | | | | | |
|---------------------------------|-----------|------|------|-----------|------|---------------|------|------|
| Average forward current | | | | I_{FAV} | | 6300 A | | |
| Repetitive peak reverse voltage | | | | V_{RRM} | | 1000 ÷ 1800 V | | |
| V_{RRM}, V | 1000 | 1100 | 1200 | 1300 | 1400 | 1500 | 1600 | 1800 |
| Voltage code | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 18 |
| $T_j, ^\circ C$ | -60 ÷ 175 | | | | | | | |

MAXIMUM ALLOWABLE RATINGS

| Symbols and parameters | | Units | Values | Test conditions | |
|------------------------|--------------------------------------|-------------------|----------------------|--|---|
| ON-STATE | | | | | |
| I_{FAV} | Average forward current | A | 6300 6410 | $T_c=102^\circ C$; Double side cooled; $T_c=100^\circ C$; Double side cooled; 180° half-sine wave; 50 Hz | |
| I_{FRMS} | RMS forward current | A | 9891 | $T_c=102^\circ C$; Double side cooled; 180° half-sine wave; 50 Hz | |
| I_{FSM} | Surge forward current | kA | 76.0 87.0 | $T_j=T_{jmax}$ $T_j=25^\circ C$ | 180° half-sine wave; 50 Hz ($t_p=10$ ms); single pulse; $V_R=0$ V |
| | | | 80.0 92.0 | $T_j=T_{jmax}$ $T_j=25^\circ C$ | 180° half-sine wave; 60 Hz ($t_p=8.3$ ms); single pulse; $V_R=0$ V |
| I^2t | Safety factor | $A^2s \cdot 10^3$ | 28880 37845 | $T_j=T_{jmax}$ $T_j=25^\circ C$ | 180° half-sine wave; 50 Hz ($t_p=10$ ms); single pulse; $V_R=0$ V |
| | | | 26560 35125 | $T_j=T_{jmax}$ $T_j=25^\circ C$ | 180° half-sine wave; 60 Hz ($t_p=8.3$ ms); single pulse; $V_R=0$ V |
| BLOCKING | | | | | |
| V_{RRM} | Repetitive peak reverse voltages | V | 1000÷1800 | $T_{jmin} < T_j < T_{jmax}$; 180° half-sine wave; 50 Hz; | |
| V_{RSM} | Non-repetitive peak reverse voltages | V | 1100÷1900 | $T_{jmin} < T_j < T_{jmax}$; 180° half-sine wave; 50 Hz; single pulse; | |
| V_R | Reverse continuous voltages | V | $0.75 \cdot V_{RRM}$ | $T_j=T_{jmax}$; | |
| THERMAL | | | | | |
| T_{stg} | Storage temperature | $^\circ C$ | -60÷50 | | |
| T_j | Operating junction temperature | $^\circ C$ | -60÷175 | | |
| MECHANICAL | | | | | |
| F | Mounting force | kN | 40÷50 | | |
| a | Acceleration | m/s^2 | 50 | Device unclamped | |
| | | | 100 | Device clamped | |

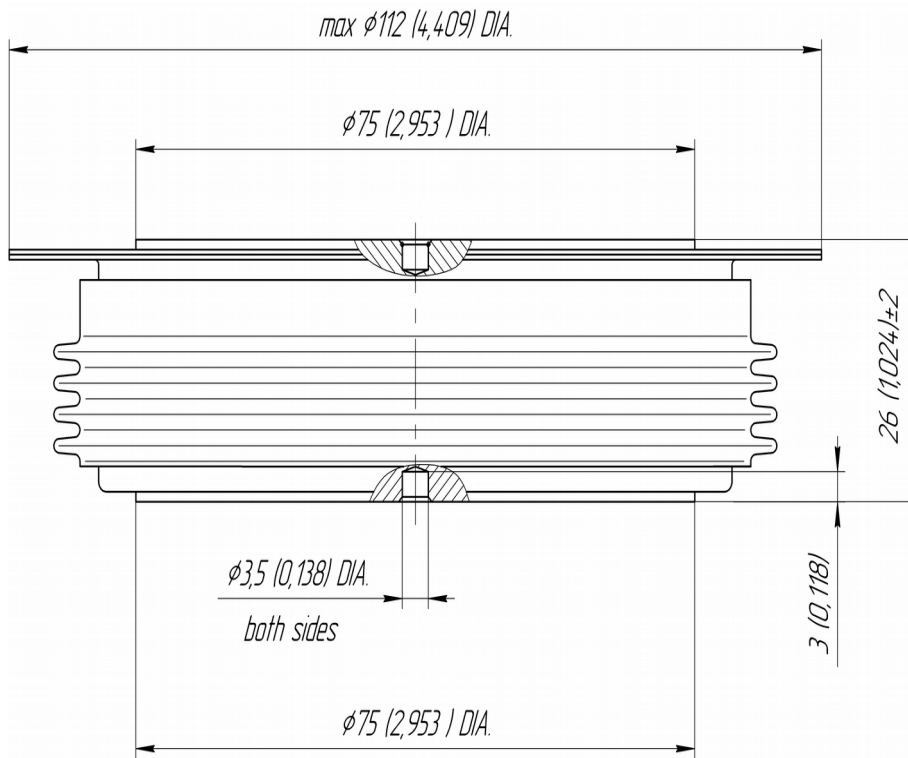
CHARACTERISTICS

| Symbols and parameters | | Units | Values | Conditions |
|------------------------|---|---------------------------|------------------|---|
| ON-STATE | | | | |
| V_{FM} | Peak forward voltage, max | V | 1.40 | $T_j=25\text{ }^\circ\text{C}; I_{FM}=12560\text{ A}$ |
| $V_{F(TO)}$ | Forward threshold voltage, max | V | 0.70 | $T_j=T_{j\text{ max}};$ |
| r_T | Forward slope resistance, max | m Ω | 0.043 | $0.5\pi I_{FAV} < I_T < 1.5\pi I_{FAV}$ |
| BLOCKING | | | | |
| I_{RRM} | Repetitive peak reverse current, max | mA | 150 | $T_j=T_{j\text{ max}};$ $V_R=V_{RRM}$ |
| SWITCHING | | | | |
| Q_{rr} | Total recovered charge, max | μC | 4000 | $T_j=T_{j\text{ max}}; I_{FM}=2000\text{ A};$ |
| t_{rr} | Reverse recovery time, max | μs | 33 | $di_R/dt=-10\text{ A}/\mu\text{s};$ |
| I_{rrM} | Peak reverse recovery current, max | A | 242 | $V_R=100\text{ V}$ |
| THERMAL | | | | |
| R_{thjc} | Thermal resistance, junction to case, max | $^\circ\text{C}/\text{W}$ | 0.0085 | Double side cooled |
| R_{thjc-A} | | | 0.0187 | Anode side cooled |
| R_{thjc-K} | | | 0.0153 | Cathode side cooled |
| R_{thck} | Thermal resistance, case to heatsink, max | $^\circ\text{C}/\text{W}$ | 0.0020 | Direct current |
| MECHANICAL | | | | |
| w | Weight, typ | g | 1500 | |
| D_s | Surface creepage distance | mm (inch) | 41.40 (1.630) | |
| D_a | Air strike distance | mm (inch) | 23.10 (0.909) | |

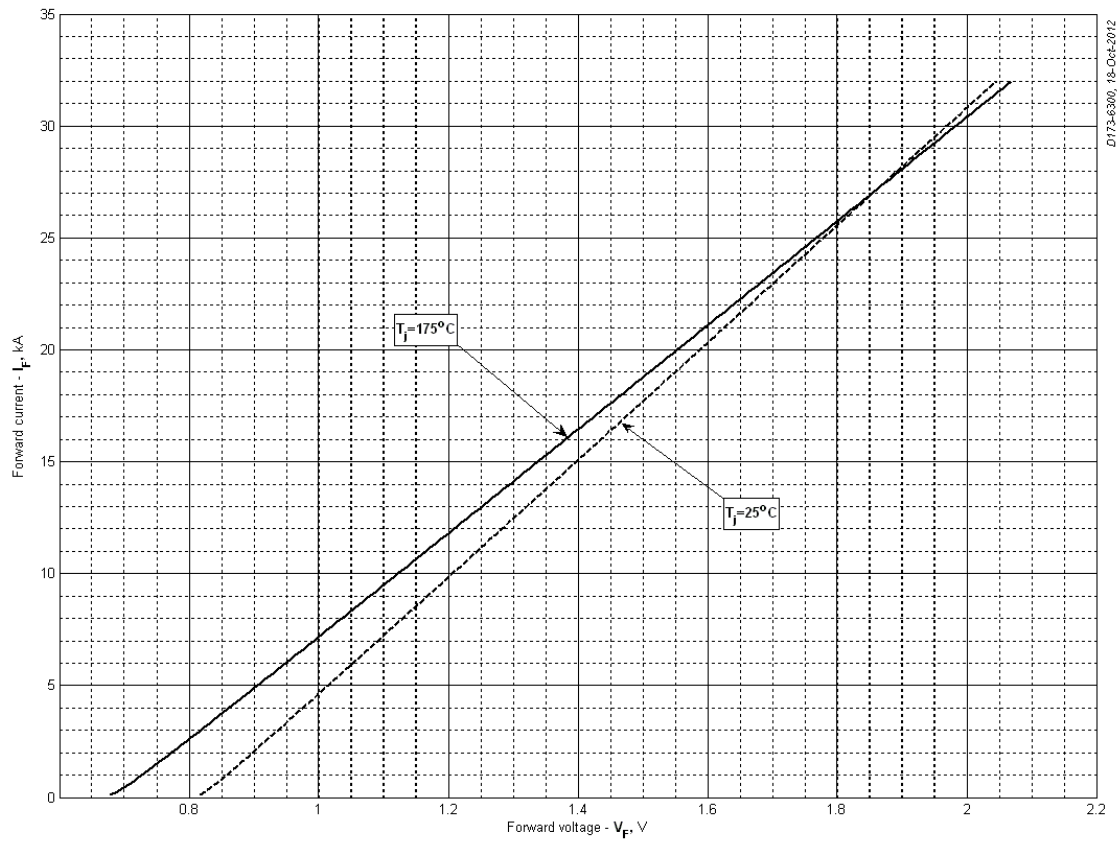
PART NUMBERING GUIDE

| | | | | |
|---|-----|------|----|---|
| D | 173 | 6300 | 18 | N |
| 1 | 2 | 3 | 4 | 5 |

1. D — Rectifier Diode
2. Design version
3. Average forward current, A
4. Voltage code
5. Ambient conditions: N – normal; T – tropical



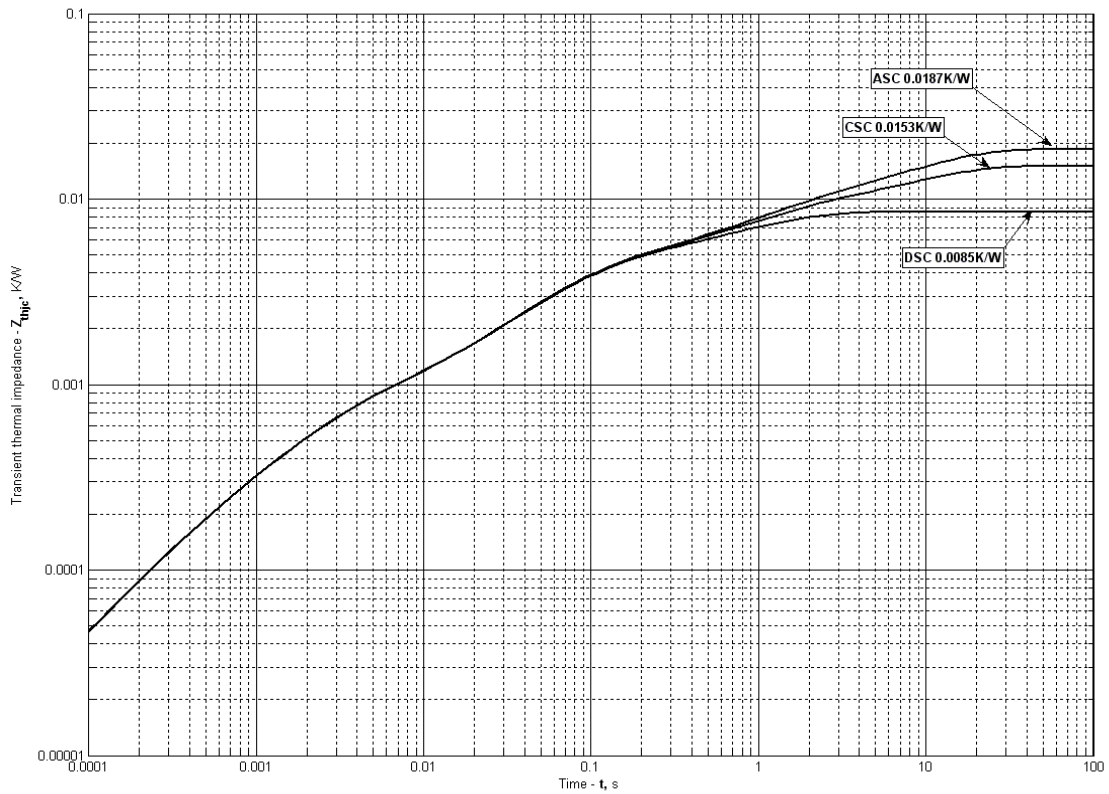
All dimensions in millimeters (inches)



$$V_F = A + B \cdot i_F + C \cdot \ln(i_F + 1) + D \cdot \sqrt{i_F}$$

| | Coefficients for max curves | |
|----------|-----------------------------|-------------------------|
| | $T_j = 25^\circ\text{C}$ | $T_j = T_{j\text{max}}$ |
| A | 0.817500 | 0.681308 |
| B | 0.038275 | 0.043214 |
| C | 0.009650 | 0.014507 |
| D | -0.005437 | -0.008174 |

Forward characteristic model (see Fig. 1).



$$Z_{thjc} = \sum_{i=1}^n R_i \left(1 - e^{-\frac{t}{\tau_i}} \right)$$

Where $i = 1$ to n , n is the number of terms in the series.

t = Duration of heating pulse in seconds.

Z_{thjc} = Thermal resistance at time t .

R_i = Amplitude of p_{th} term.

τ_i = Time constant of r_{th} term.

DC Double side cooled

| i | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|------------|----------|-----------|----------|------------|----------|
| R_i , K/W | 0.00007989 | 0.002973 | 0.0005936 | 0.000846 | 0.00005975 | 0.003948 |
| τ_i , S | 1.688 | 0.06219 | 0.002329 | 0.138 | 0.0003243 | 0.9533 |

DC Cathode side cooled

| i | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|----------|----------|-----------|----------|----------|-----------|
| R_i , K/W | 0.006619 | 0.004034 | 0.0008595 | 0.002956 | 0.0 | 0.05965 |
| τ_i , S | 9.744 | 1.025 | 0.1394 | 0.06237 | 0.002318 | 0.0003037 |

DC Anode side cooled

| i | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|---------|----------|-----------|----------|-----------|------------|
| R_i , K/W | 0.01013 | 0.004062 | 0.0009401 | 0.002853 | 0.0005963 | 0.00005641 |
| τ_i , S | 9.747 | 1.058 | 0.1304 | 0.06179 | 0.002313 | 0.0003013 |

Transient thermal impedance junction to case Z_{thjc} model (see Fig. 2)

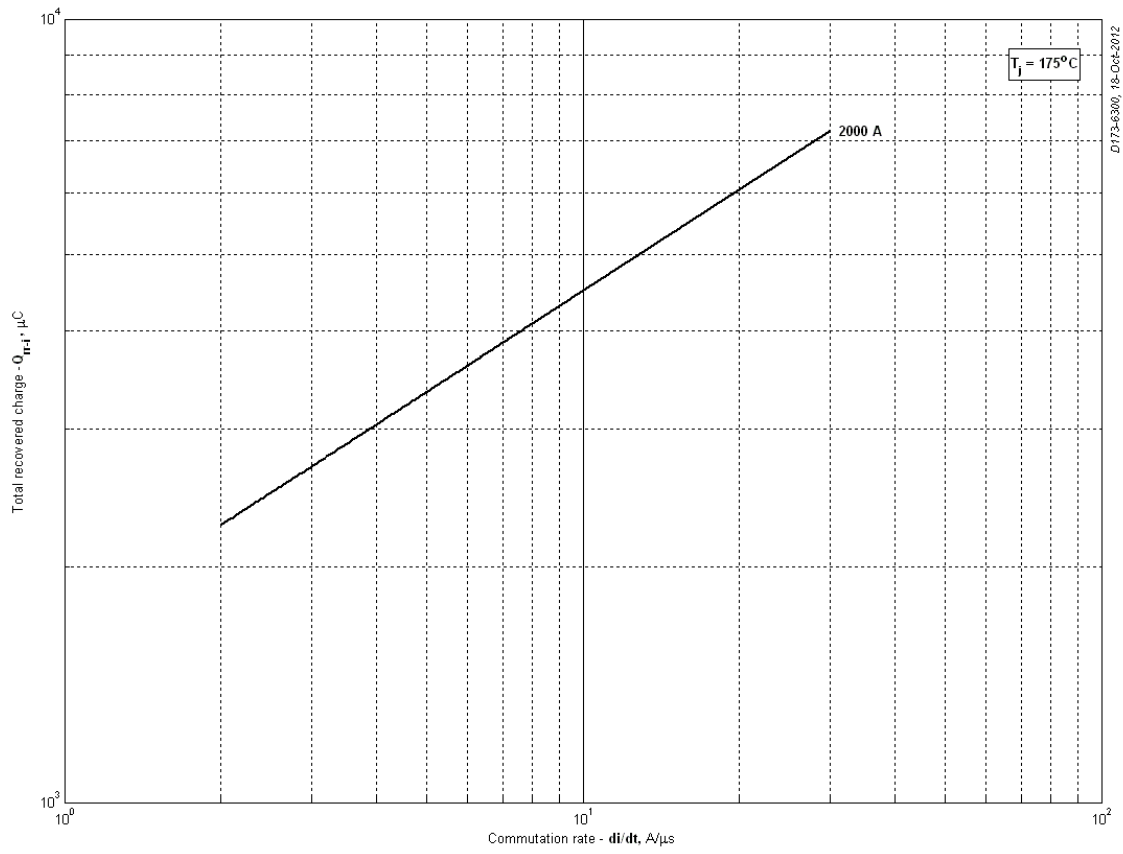


Fig 3 - Total recovered charge(integral), Q_{rr-i}

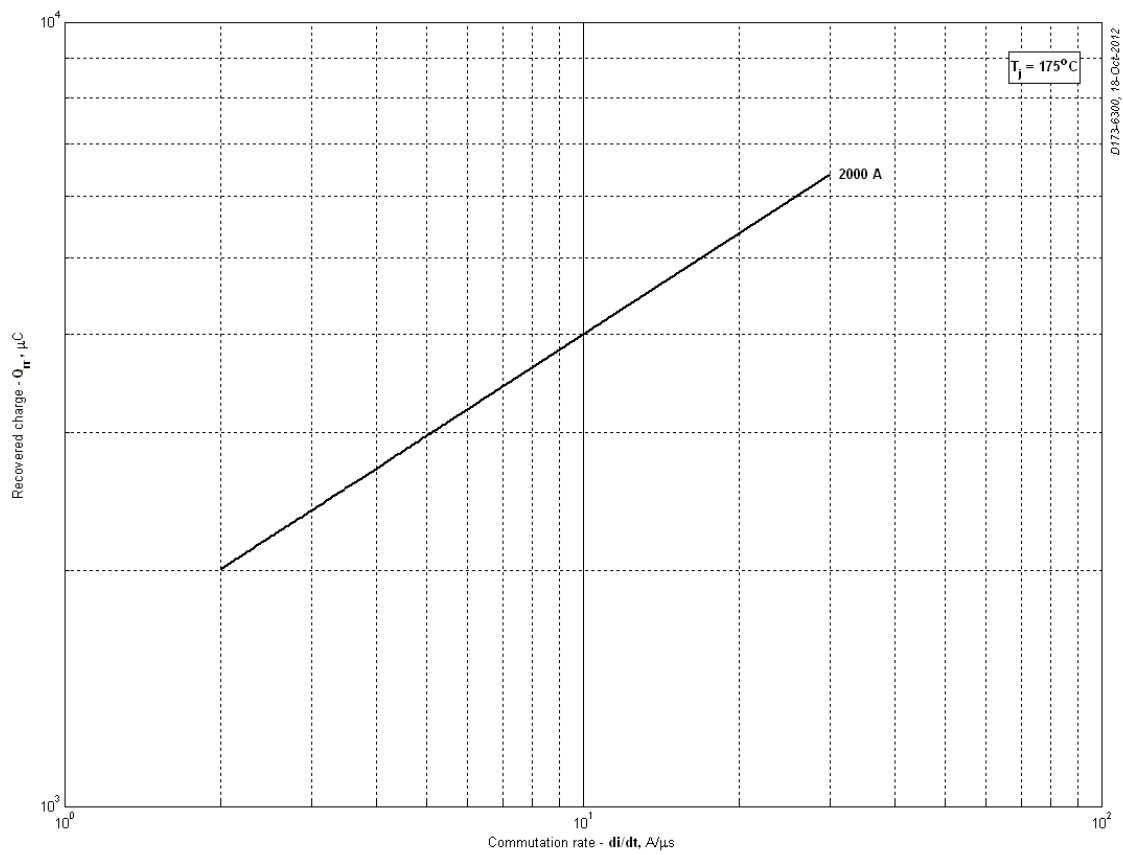


Fig 4 - Total recovered charge(50% chord), Q_{rr}

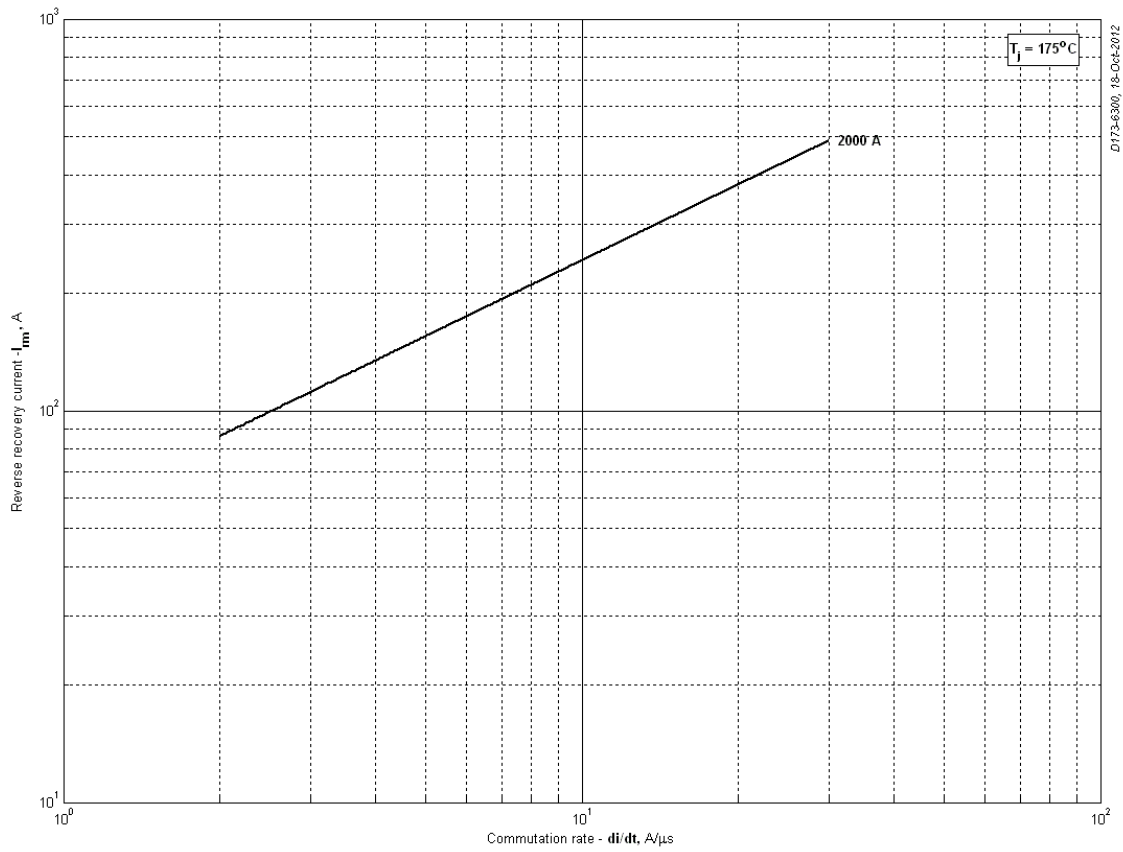


Fig 5 - Peak reverse recovery current, I_{rm}

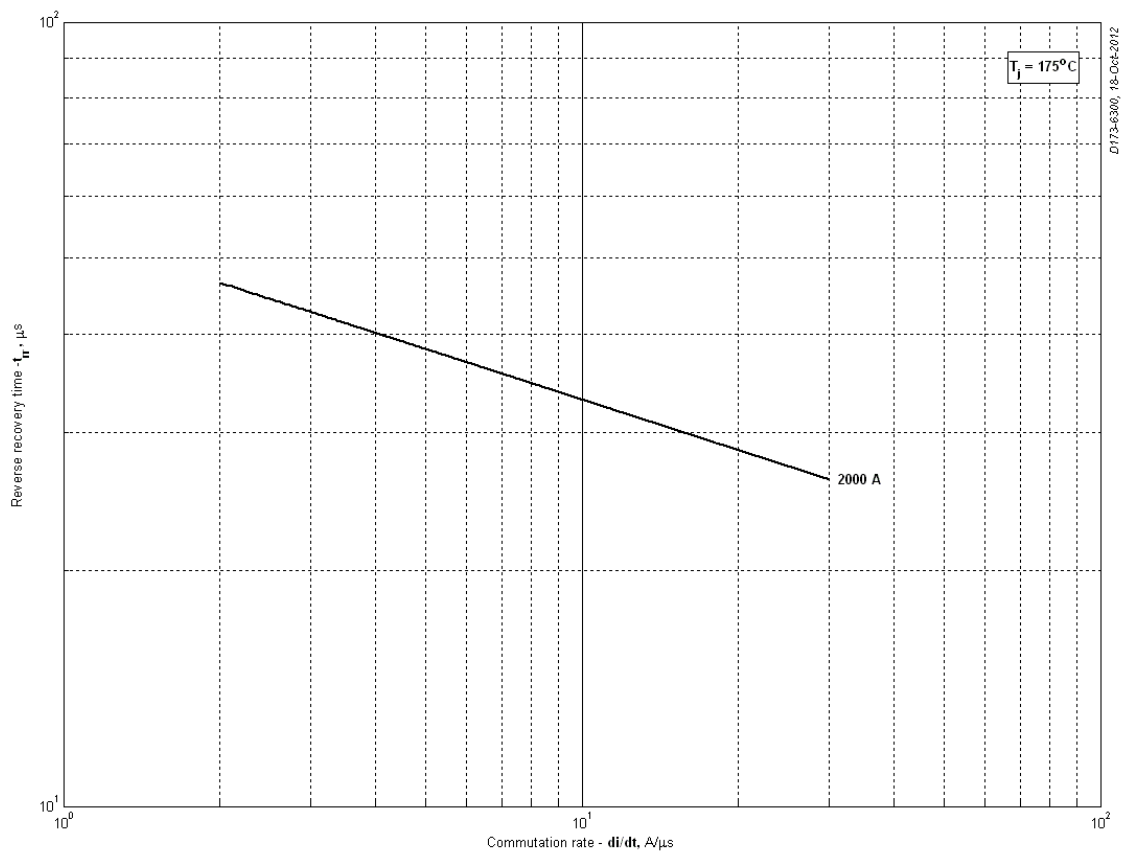


Fig 6 - Recovery time, t_{rr} (50% chord)

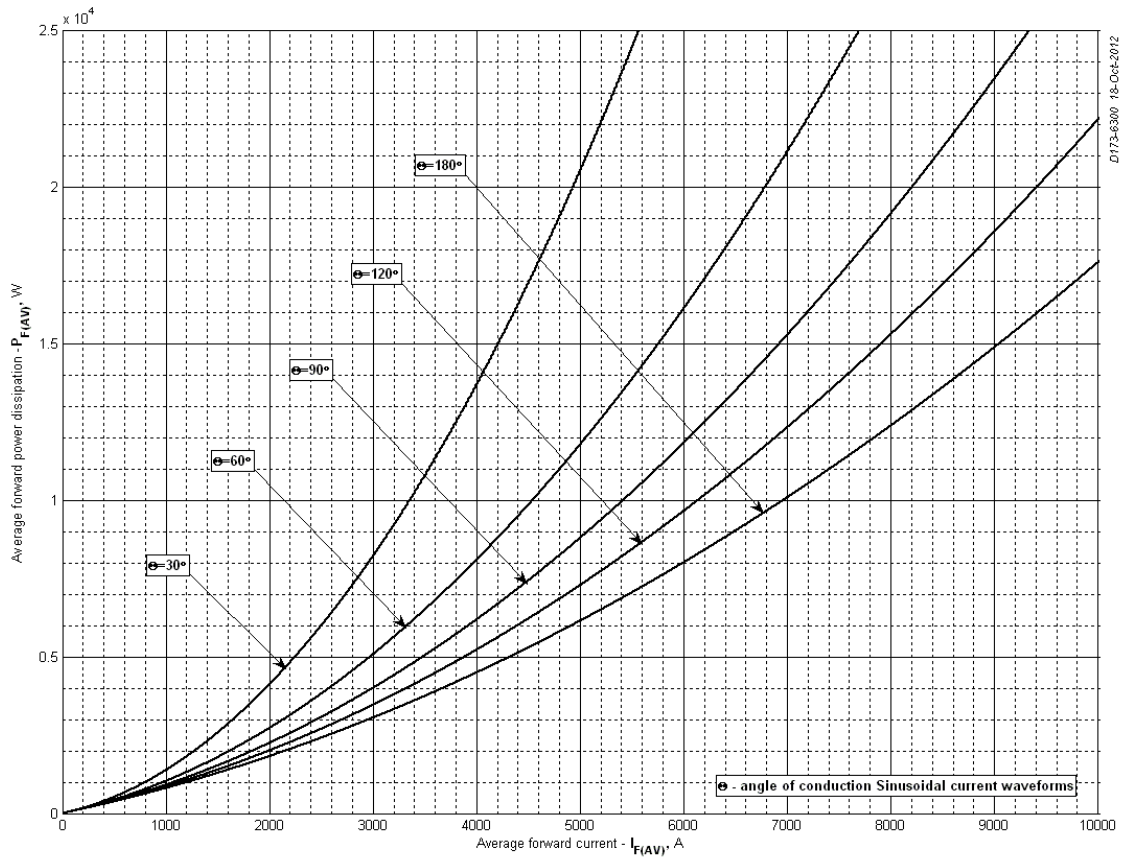


Fig 7 - Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

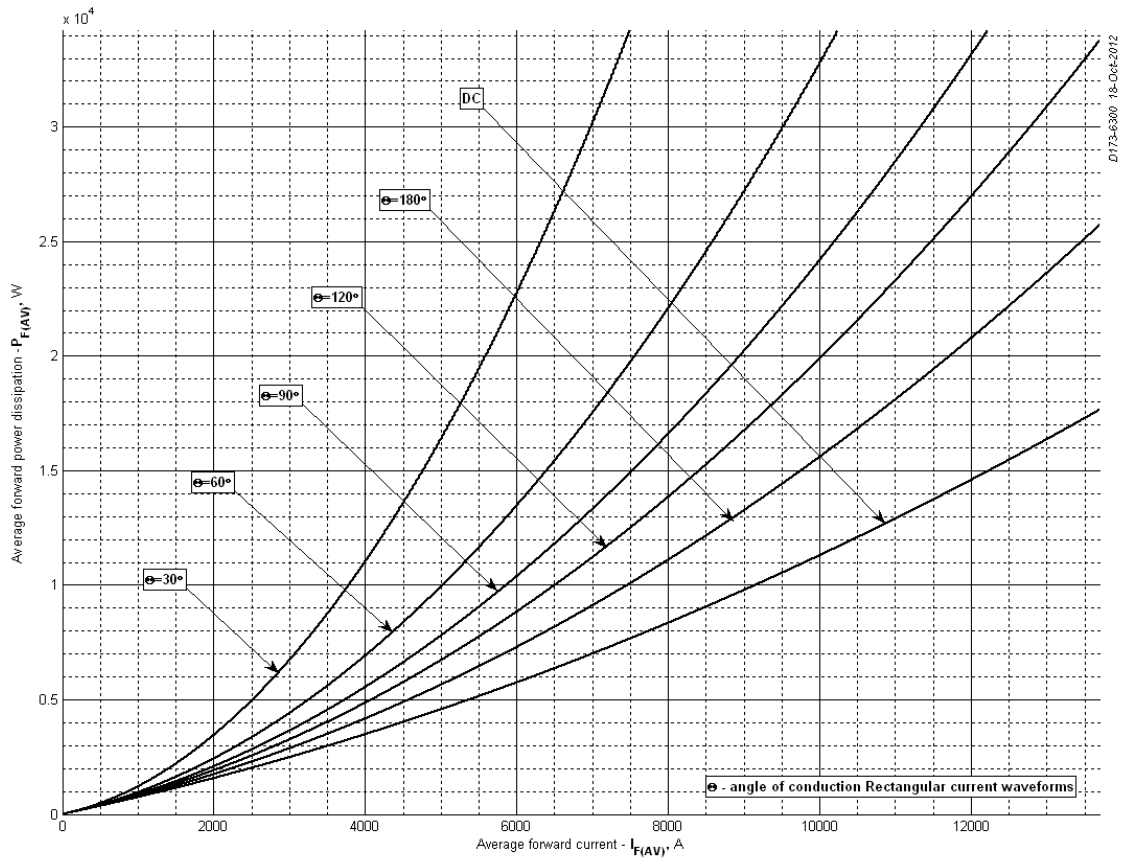


Fig 8 – Mean forward power dissipation P_{FAV} vs. Mean forward current I_{FAV} for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

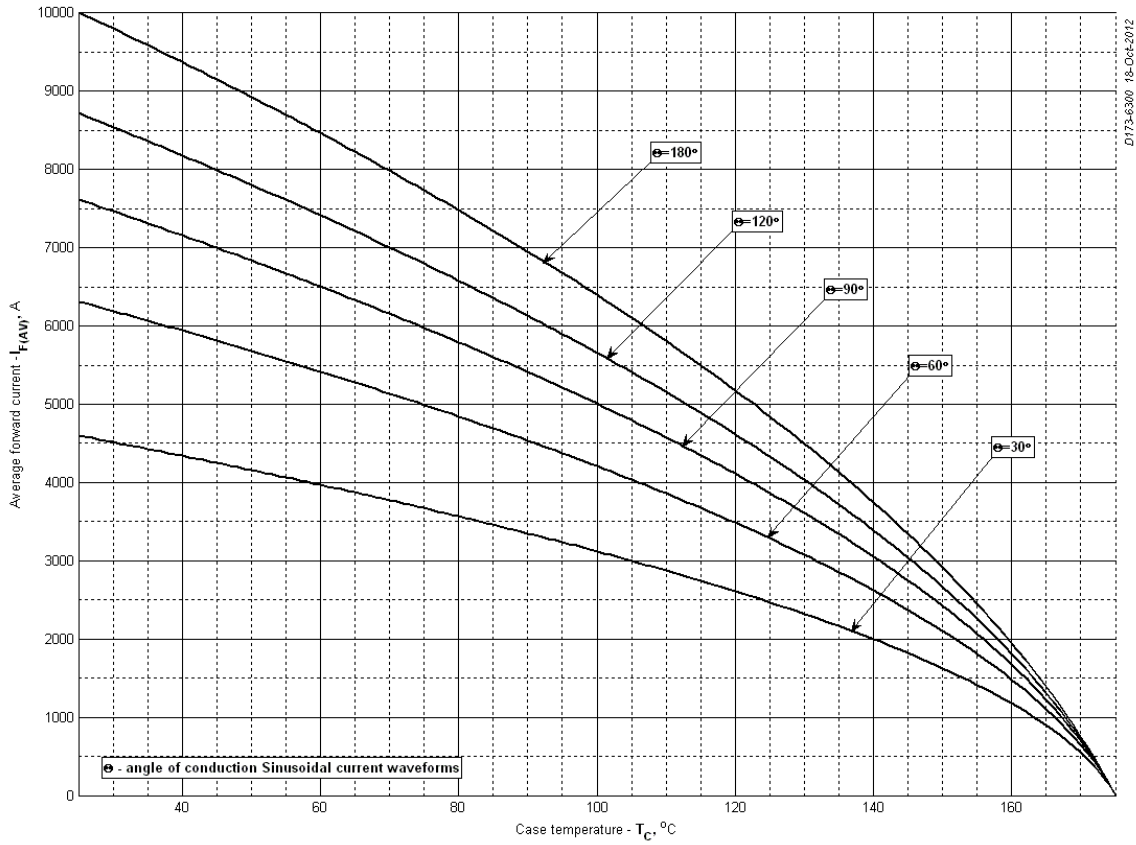


Fig 9 – Mean forward current I_{FAV} vs. Case temperature T_C for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$, DSC)

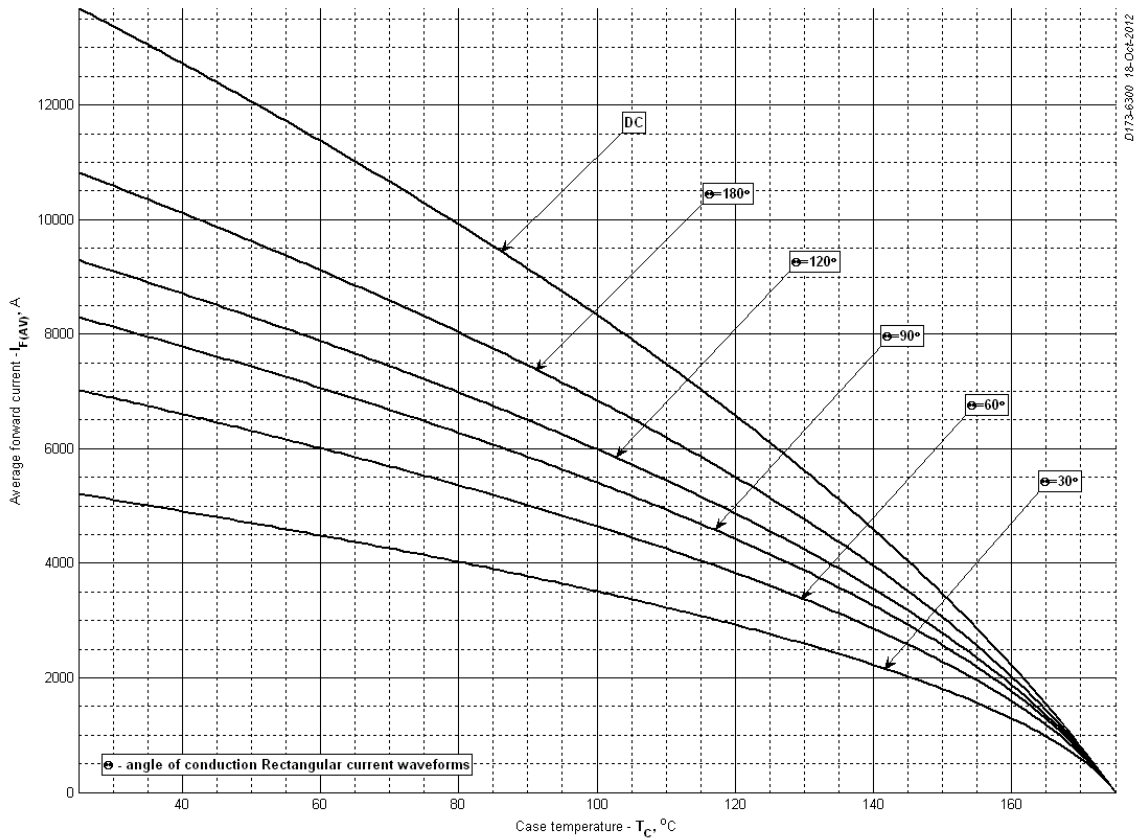


Fig 10 - Mean forward current I_{FAV} vs. Case temperature T_C for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$, DSC)

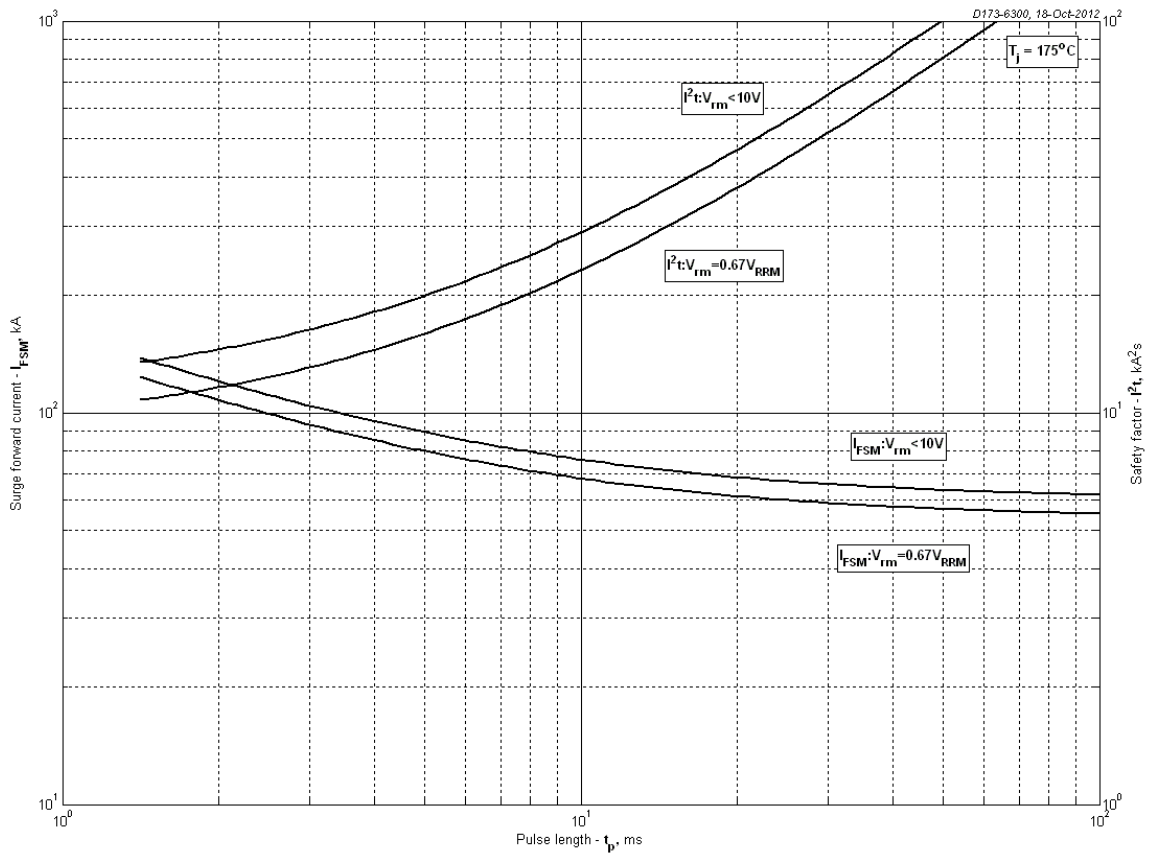


Fig 11 – Maximum surge and I²t ratings

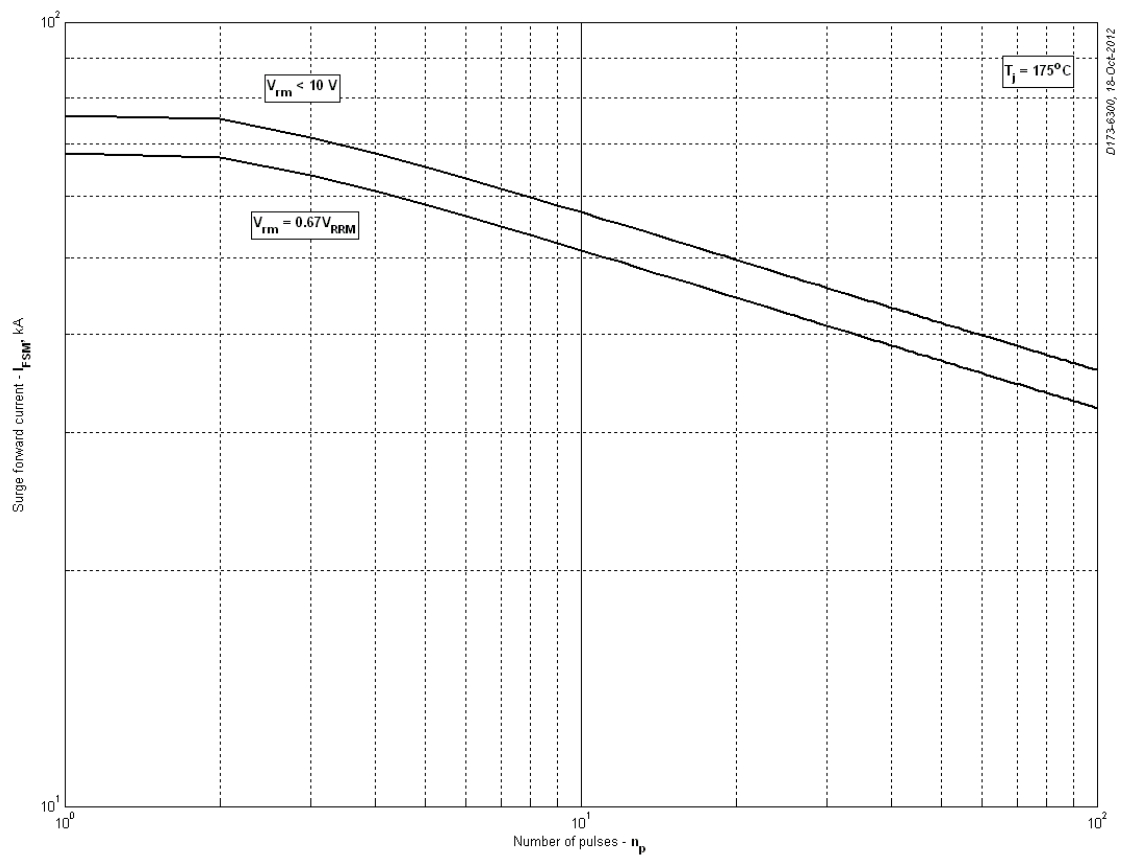


Fig 12 - Maximum surge ratings