



Diode Modules

MDx-320-28-C1



| | | | | | |
|---------------------------------|------------------|---------------|---|------|------|
| Average forward current | I _{FAV} | 320 A | | | |
| Repetitive peak reverse voltage | V _{RRM} | 2000...2800 V | | | |
| V _{RRM} , V | 2000 | 2200 | 2400 | 2600 | 2800 |
| Voltage code | 20 | 22 | 24 | 26 | 28 |
| T _j , °C | -40...+150 | | | | |
| MD3 | MD4 | MD5 | | | |
| | | | | | |
| | | | <p>The technical drawing shows the front view of the diode module. It features a rectangular housing with a flange at the bottom. On the top flange, there are four mounting holes. The top surface has a stepped profile. Dimensions include:</p> <ul style="list-style-type: none"> Overall height: 52 (2.047) Step height: 4.95±0.8 (1.949) Step width: 32 (1.26) Step angle: 10° Mounting hole diameter: Ø6.0 (0.236) Mounting hole distance: 4 holes Mounting hole depth: 18 (0.709) - screwing depth, max 12 mm (0.472 in) Mounting hole side clearance: 7 (0.276) Bottom flange thickness: 17.9 (0.705) Bottom flange width: 22.5 (0.886) Bottom flange height: 19 (0.748) Bottom flange center-to-center distance: 42.5 (1.673) and 35 (1.378) M8-6H mounting holes: 22.5 (0.886), 42.5 (1.673), 35 (1.378), and 24 (0.945) Bottom flange total length: 115 (4.528) Bottom flange internal widths: 80 (3.15), 89.5 (3.524), 92 (3.622), and 5±0.5 (0.197) Bottom flange total height: 38 (1.496) Bottom flange total width: 50 (1.969) | | |

MAXIMUM ALLOWABLE RATINGS

| Symbols and parameters | | Units | Values | Test conditions | |
|------------------------|---|----------------------------------|-------------|--|---|
| ON-STATE | | | | | |
| I _{FAV} | Maximum allowable average forward current | A | 320 428 | T _c = 116 °C; T _c = 100 °C; 180° half-sine wave; 50 Hz | |
| I _{FRMS} | RMS forward current | A | 502 | T _c = 116 °C; 180° half-sine wave; 50 Hz | |
| I _{FSM} | Surge forward current | kA | 8.5 10.0 | T _j =T _j max T _j =25 °C | 180° half-sine wave; t _p =10 ms; single pulse; V _R =0 V; |
| | | | 9.0 10.5 | T _j =T _j max T _j =25 °C | 180° half-sine wave; t _p =8.3 ms; single pulse; V _R =0 V; |
| I ² t | Safety factor | A ² s·10 ³ | 360 500 | T _j =T _j max T _j =25 °C | 180° half-sine wave; t _p =10 ms; single pulse; V _R =0 V; |
| | | | 330 450 | T _j =T _j max T _j =25 °C | 180° half-sine wave; t _p =8.3 ms; single pulse; V _R =0 V; |

BLOCKING

| | | | | |
|------------------|--------------------------------------|---|----------------------|--|
| V _{RRM} | Repetitive peak reverse voltages | V | 2000...2800 | T _{j min} < T _j <T _j max; 180° half-sine wave; 50 Hz; |
| V _{RSM} | Non-repetitive peak reverse voltages | V | 2100...2900 | T _{j min} < T _j <T _j max; 180° half-sine wave; single pulse; |
| V _R | Reverse continuous voltages | V | 0.6·V _{RRM} | T _j =T _j max; |

THERMAL

| | | | | |
|-------------------|--------------------------------|----|------------|--|
| T _{stg} | Storage temperature | °C | -40...+50 | |
| T _j | Operating junction temperature | °C | -40...+150 | |
| T _{c op} | Operating temperature | °C | -40...+125 | |

MECHANICAL

| | | | | |
|---|------------------------------|------------------|----|--|
| a | Acceleration under vibration | m/s ² | 50 | |
|---|------------------------------|------------------|----|--|

CHARACTERISTICS

| Symbols and parameters | | Units | Values | Conditions |
|------------------------|--------------------------------------|-------|------------|---|
| ON-STATE | | | | |
| V _{FM} | Peak forward voltage, max | V | 1.40 | T _j =25 °C; I _{FM} =785 A |
| V _{F(TO)} | Forward threshold voltage, max | V | 0.937 | T _j =T _j max; |
| r _T | Forward slope resistance, max | mΩ | 0.495 | 0.5 π I _{FAV} < I _T < 1.5 π I _{FAV} |
| BLOCKING | | | | |
| I _{RRM} | Repetitive peak reverse current, max | mA | 30 2.50 | T _j =T _j max T _j =25 °C V _R =V _{RRM} |
| SWITCHING | | | | |
| Q _r | Recovered charge, max | µC | 2160 | T _j =T _j max; I _{FM} =I _{FAV} ; |
| t _{rr} | Reverse recovery time, max | µs | 31 | di _R /dt=-10 A/µs; |
| I _{rr} | Reverse recovery current, max | A | 139 | V _R =100 V; |
| THERMAL | | | | |
| R _{thjc} | Thermal resistance, junction to case | | | 180° half-sine wave, 50 Hz |
| | per module | °C/W | 0.0400 | |
| | per arm | °C/W | 0.0800 | |
| R _{thch} | Thermal resistance, case to heatsink | | | |
| | per module | °C/W | 0.0200 | |
| | per arm | °C/W | 0.0400 | |

| INSULATION | | | | | | |
|---|---|----|------|---|-----------------|--|
| V _{ISOL} | Insulation test voltage | kV | 3.00 | Sine wave, 50 Hz; | t=60 sec | |
| | | | 3.60 | RMS | t=1 sec | |
| MECHANICAL | | | | | | |
| M ₁ | Mounting torque (M6) ¹⁾ | | Nm | 6.00 | Tolerance ± 15% | |
| M ₂ | Terminal connection torque (M8) ¹⁾ | | Nm | 9.00 | Tolerance ± 15% | |
| m | Weight, max | | g | 860 | | |
| PART NUMBERING GUIDE | | | | NOTES | | |
| MD | 3 | - | 320 | - | 28 - C1 - N | |
| 1 | 2 | | 3 | 4 | 5 6 | |
| 1. MD - Rectifier Diode 2. Circuit Schematic 3. Average Forward Current, A 4. Voltage Code 5. Package Type (M.C1) 6. Ambient Conditions: N – Normal | | | | ¹⁾ The screws must be lubricated | | |
| | | | | | | |

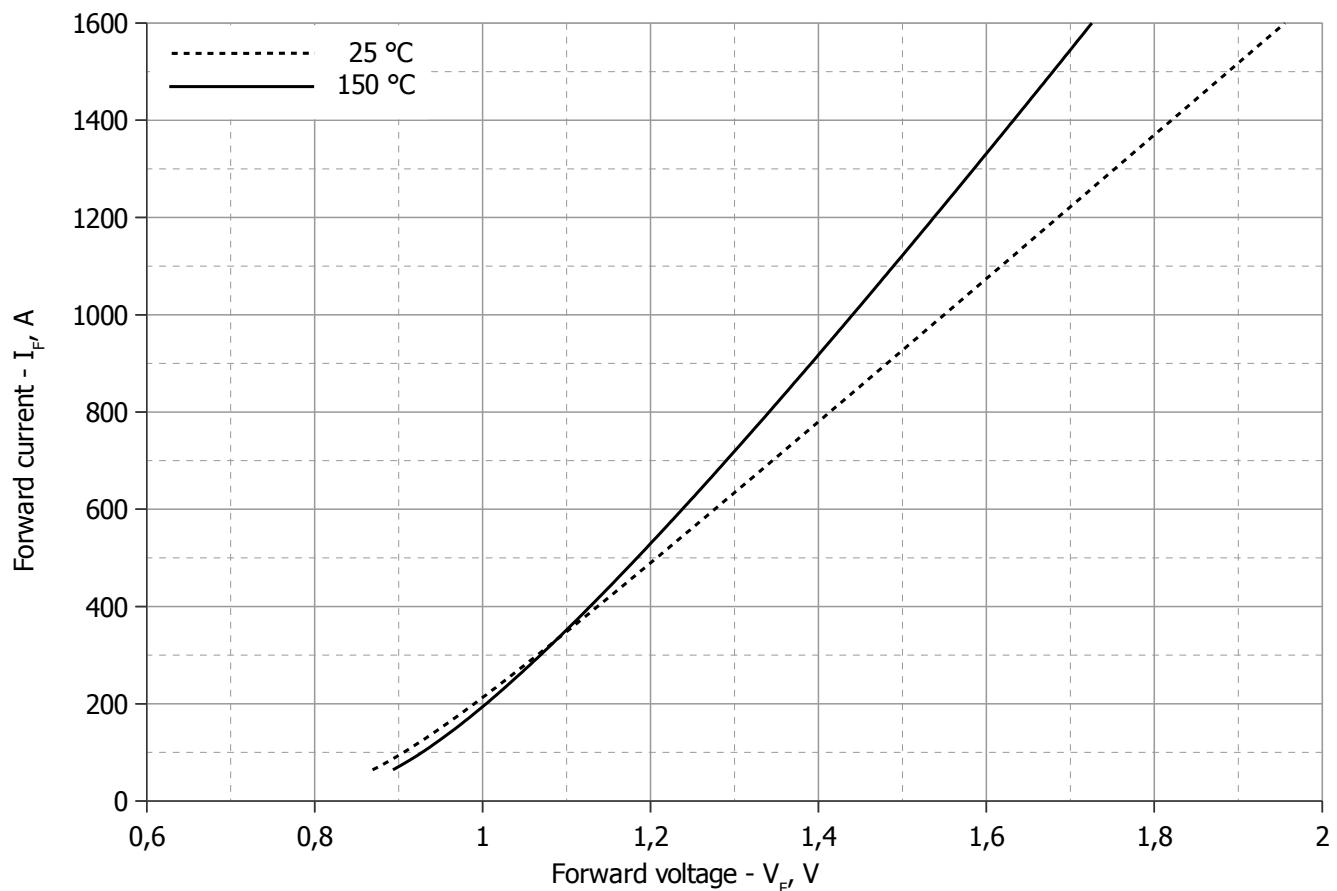


Fig 1 – Forward characteristics of Limit device

Analytical function for Forward characteristic:

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

| | Коэффициенты для графика | |
|----------|--------------------------|--------------------|
| | $T_j = 25^\circ\text{C}$ | $T_j = T_{j,\max}$ |
| A | 0.66691207 | 0.72796686 |
| B | 0.00069885 | 0.00038313 |
| C | 0.04567533 | 0.02361196 |
| D | -0.00416396 | 0.00526168 |

Forward characteristic model (see Fig. 1).

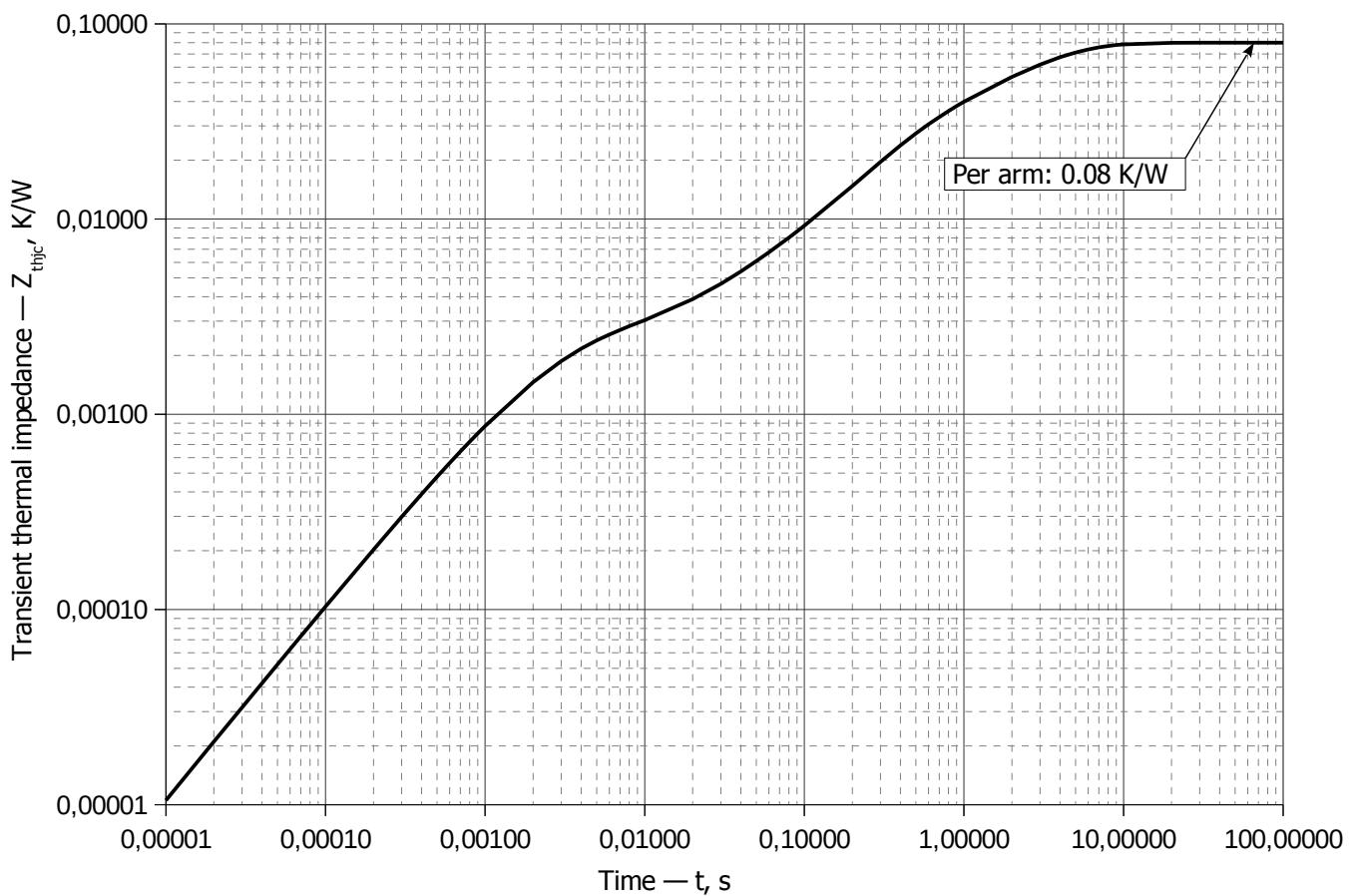


Fig 2 – Transient thermal impedance Z_{thjc} vs. time t

Analytical function for Transient thermal impedance junction to case Z_{thjc} for DC:

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

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

| i | 1 | 2 | 3 | 4 | 5 | 6 |
|--------------|--------|----------|---------|-----------|---------|----------|
| R_i , K/W | 0.0507 | 0.007806 | 0.02226 | -0.007688 | 0.00471 | 0.00217 |
| τ_i , s | 2.801 | 1.283 | 0.3281 | 0.09408 | 0.0572 | 0.002255 |

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

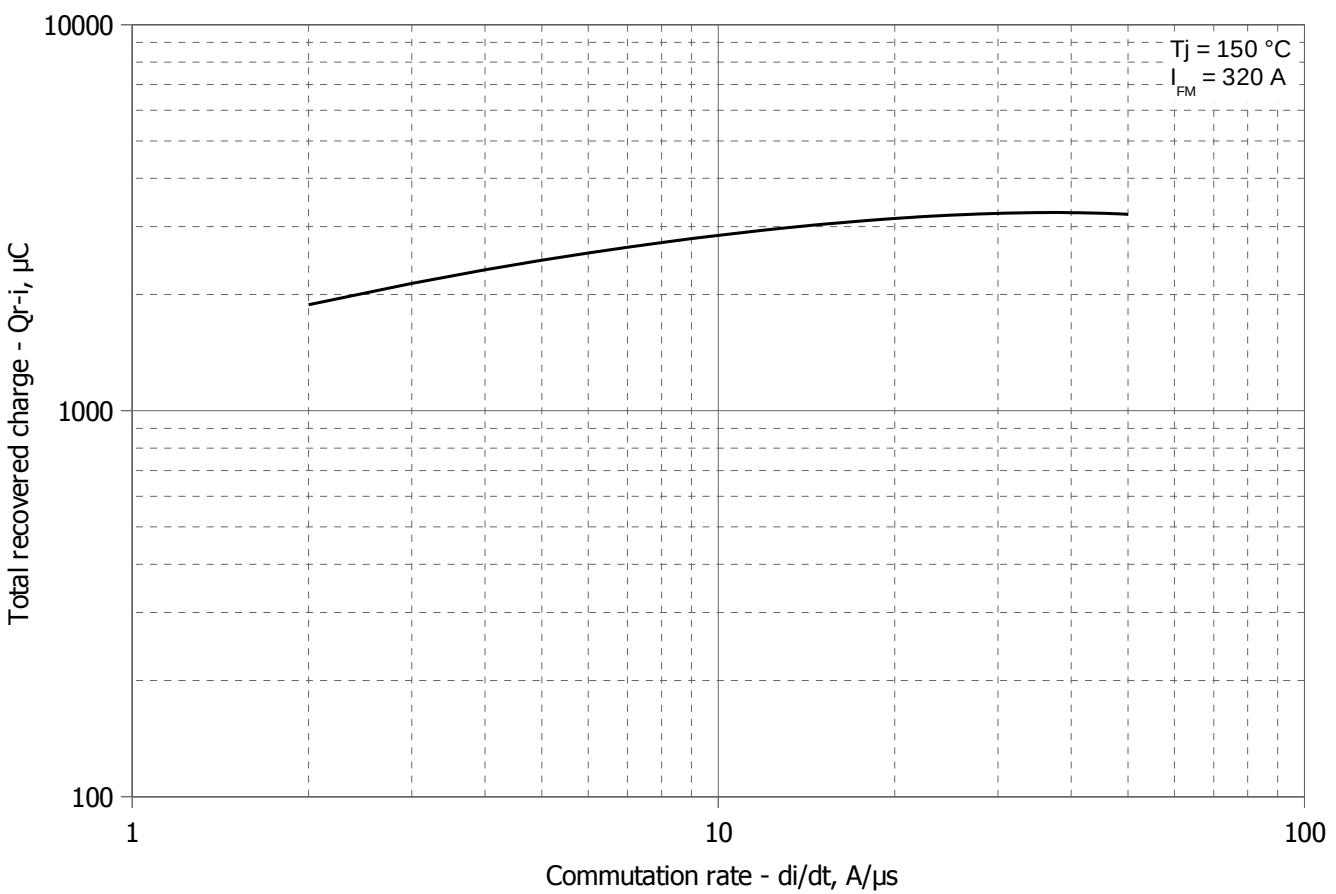


Fig 3 – Maximum recovered charge Q_{r-i} (integral) vs. commutation rate di_R/dt

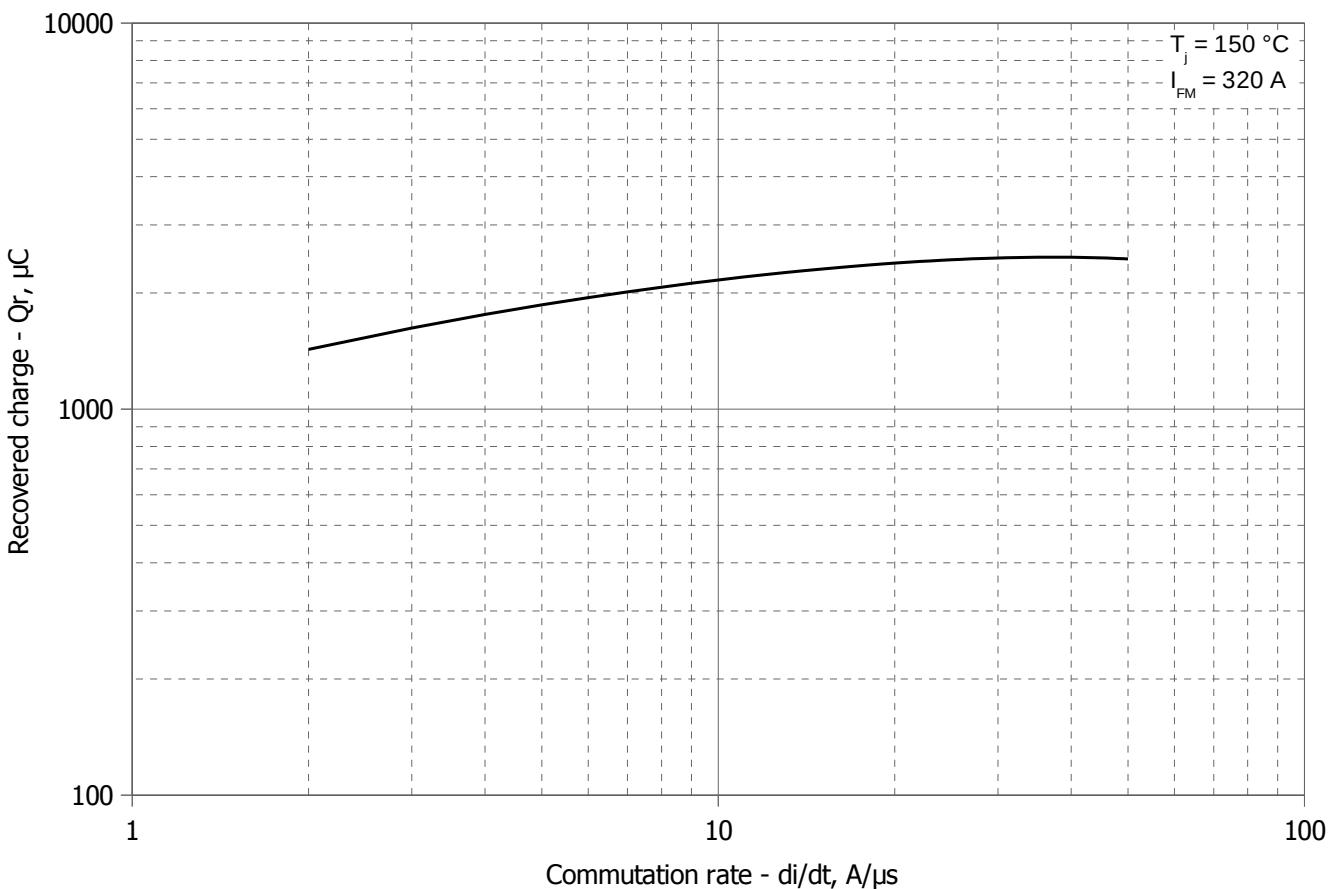


Fig 4 – Maximum recovered charge Q_r vs. commutation rate di_R/dt (25% chord)

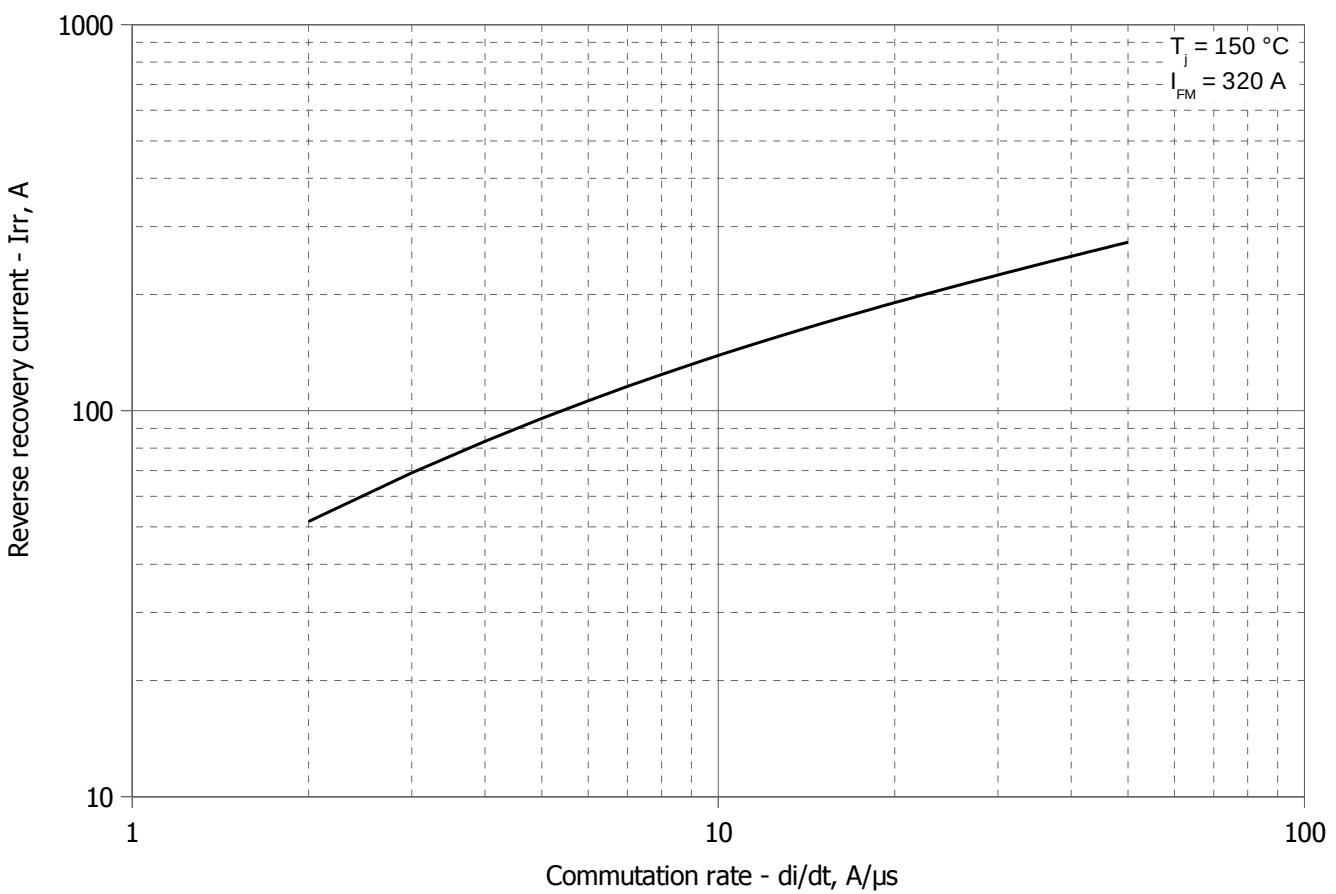


Fig 5 – Maximum reverse recovery current I_{rr} vs. commutation rate di_r/dt

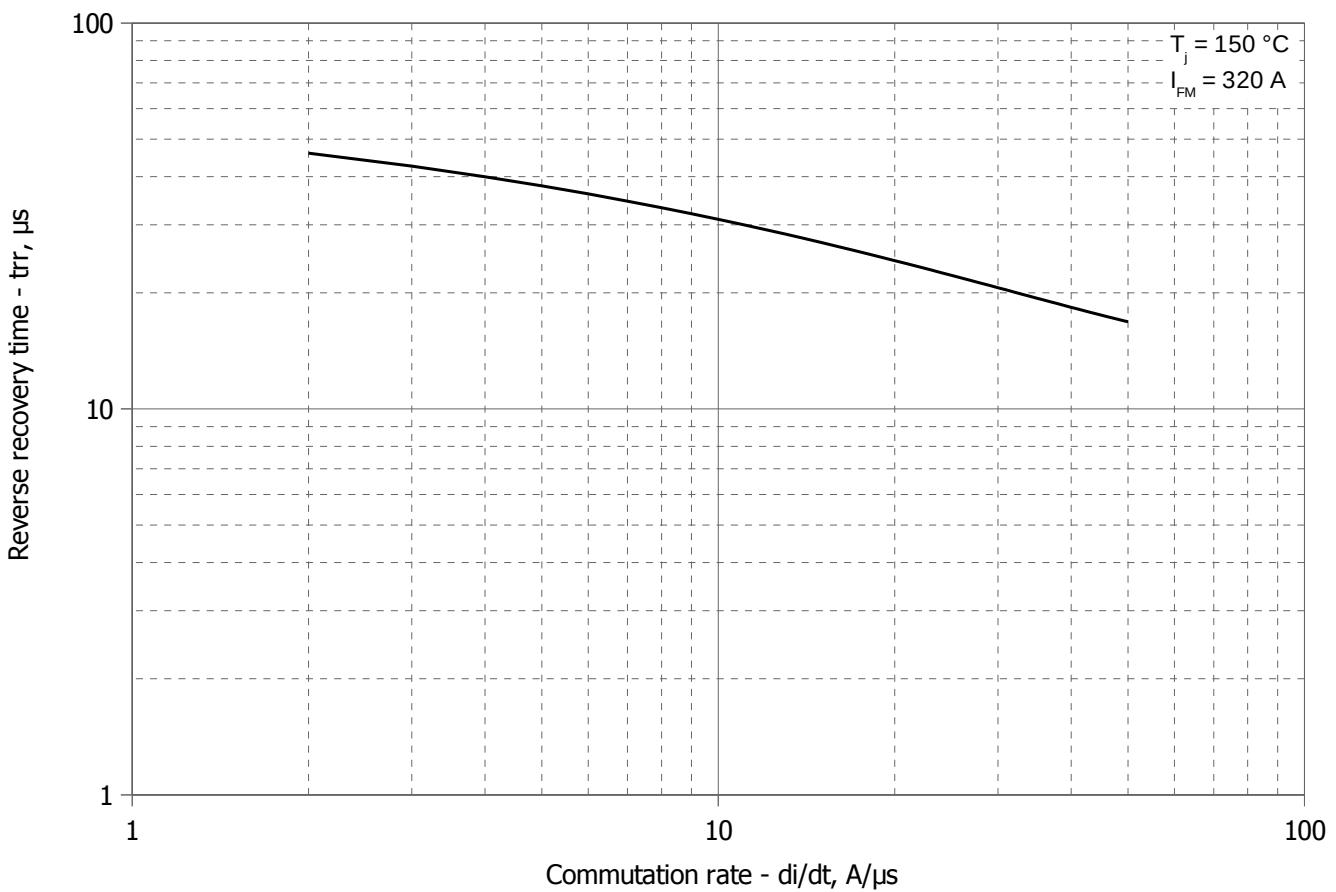


Fig 6 – Maximum recovery time t_{rr} vs. commutation rate di_r/dt (25% chord)

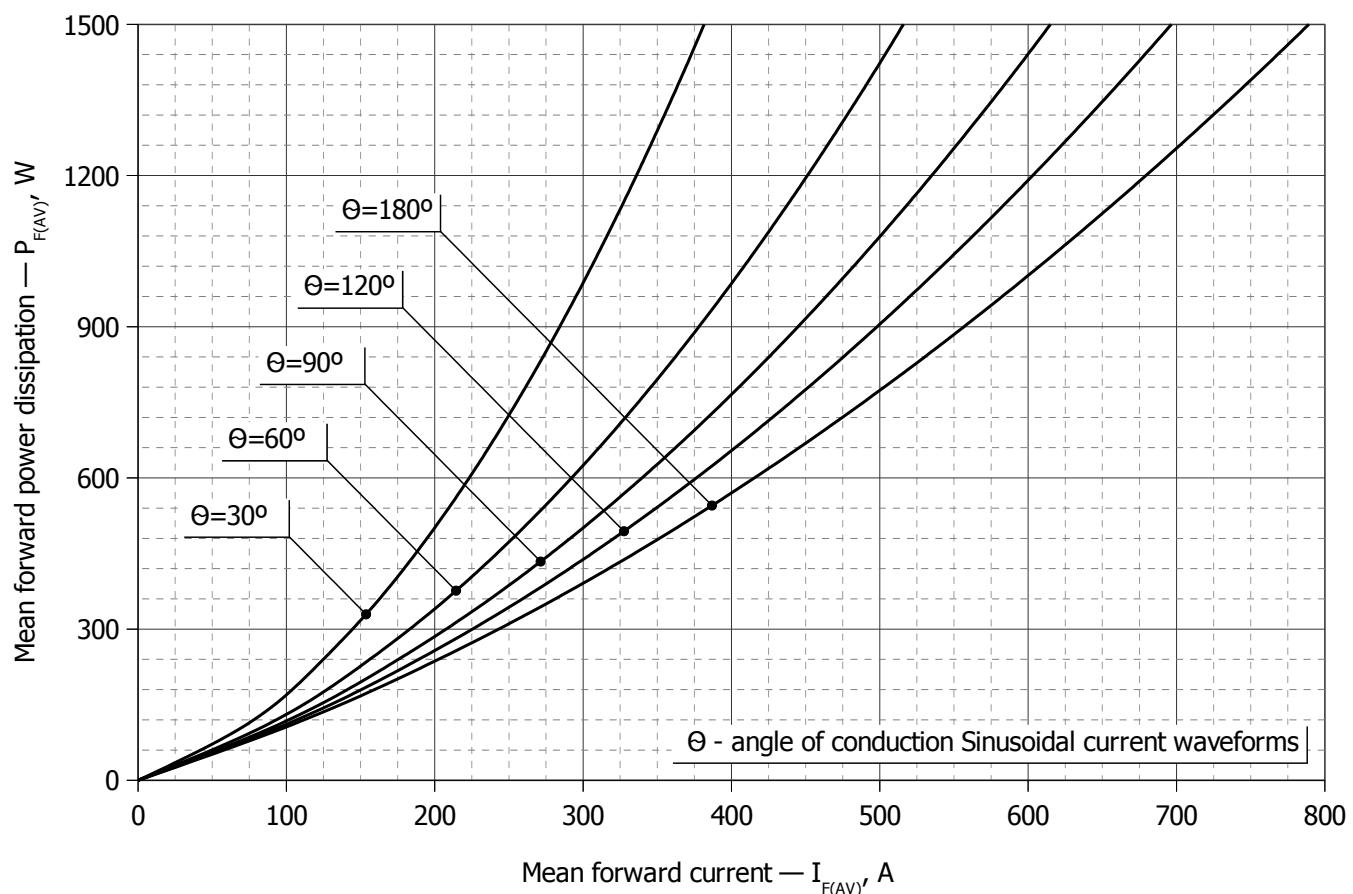


Fig. 7 - Mean forward power dissipation $P_{FA(V)}$ vs. mean forward current $I_{FA(V)}$ for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

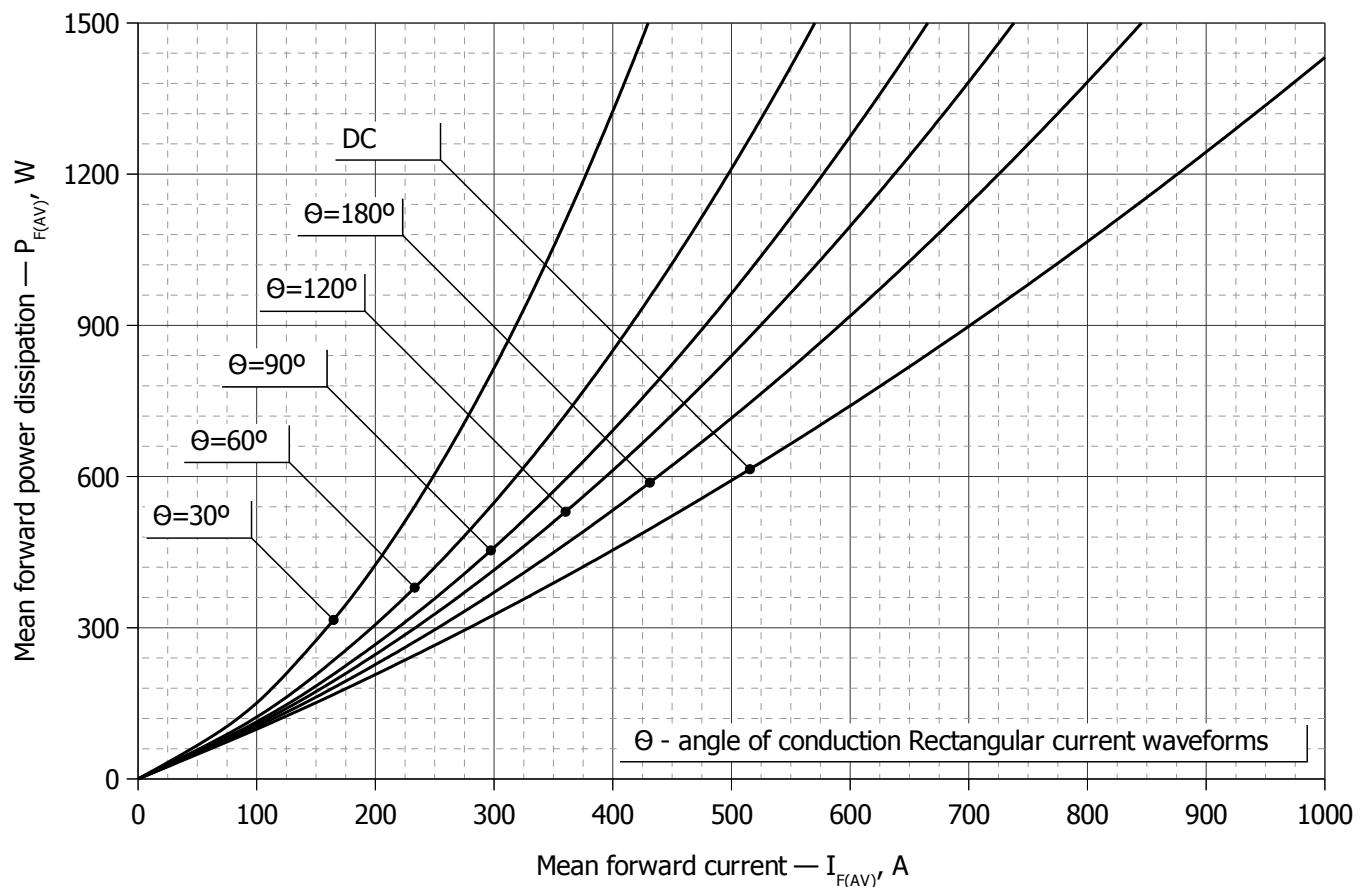


Fig. 8 – Mean forward power dissipation $P_{FA(V)}$ vs. mean forward current $I_{FA(V)}$ for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

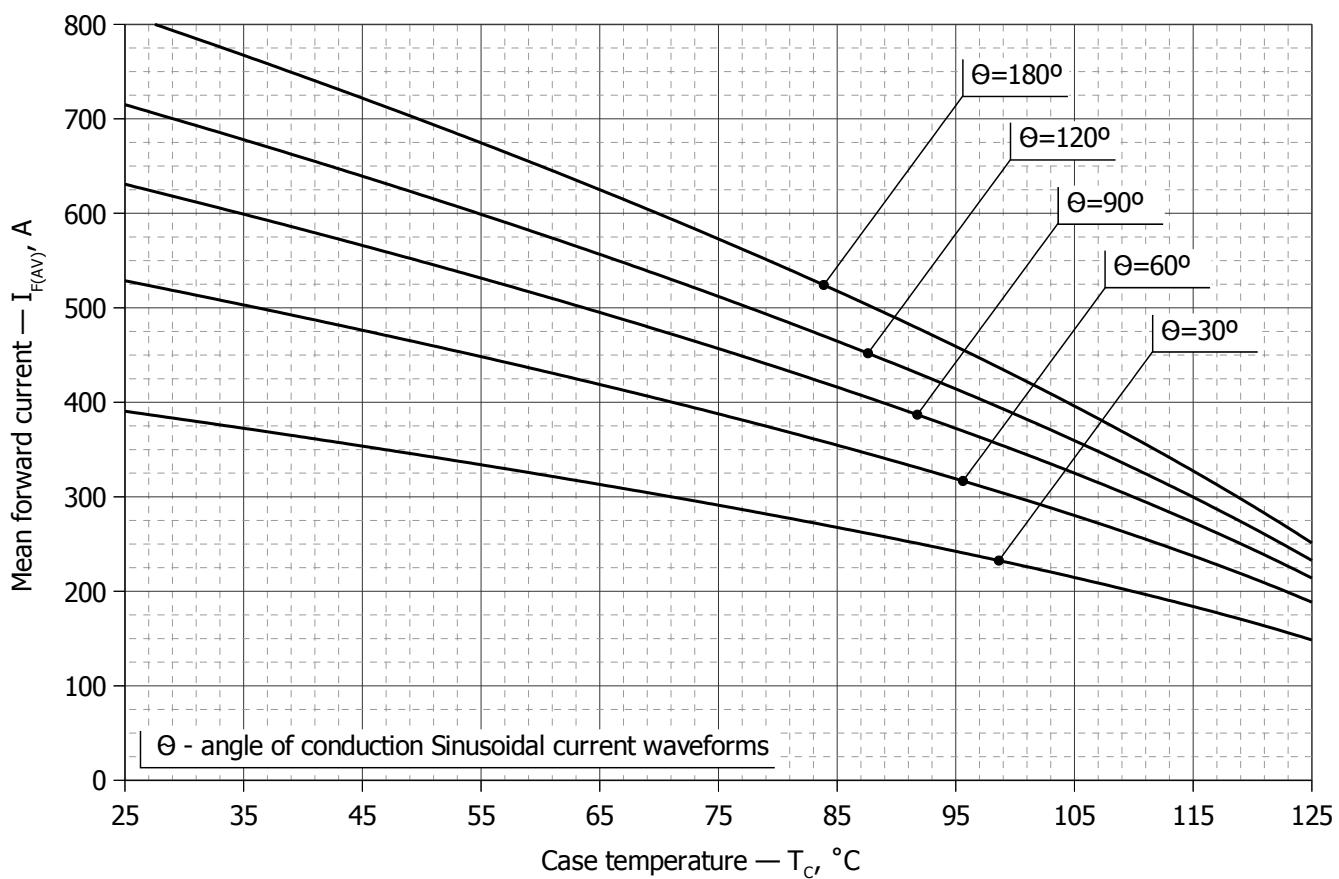


Fig. 9 – Mean forward current I_{FAV} vs. case temperature T_c for sinusoidal current waveforms at different conduction angles ($f=50\text{Hz}$)

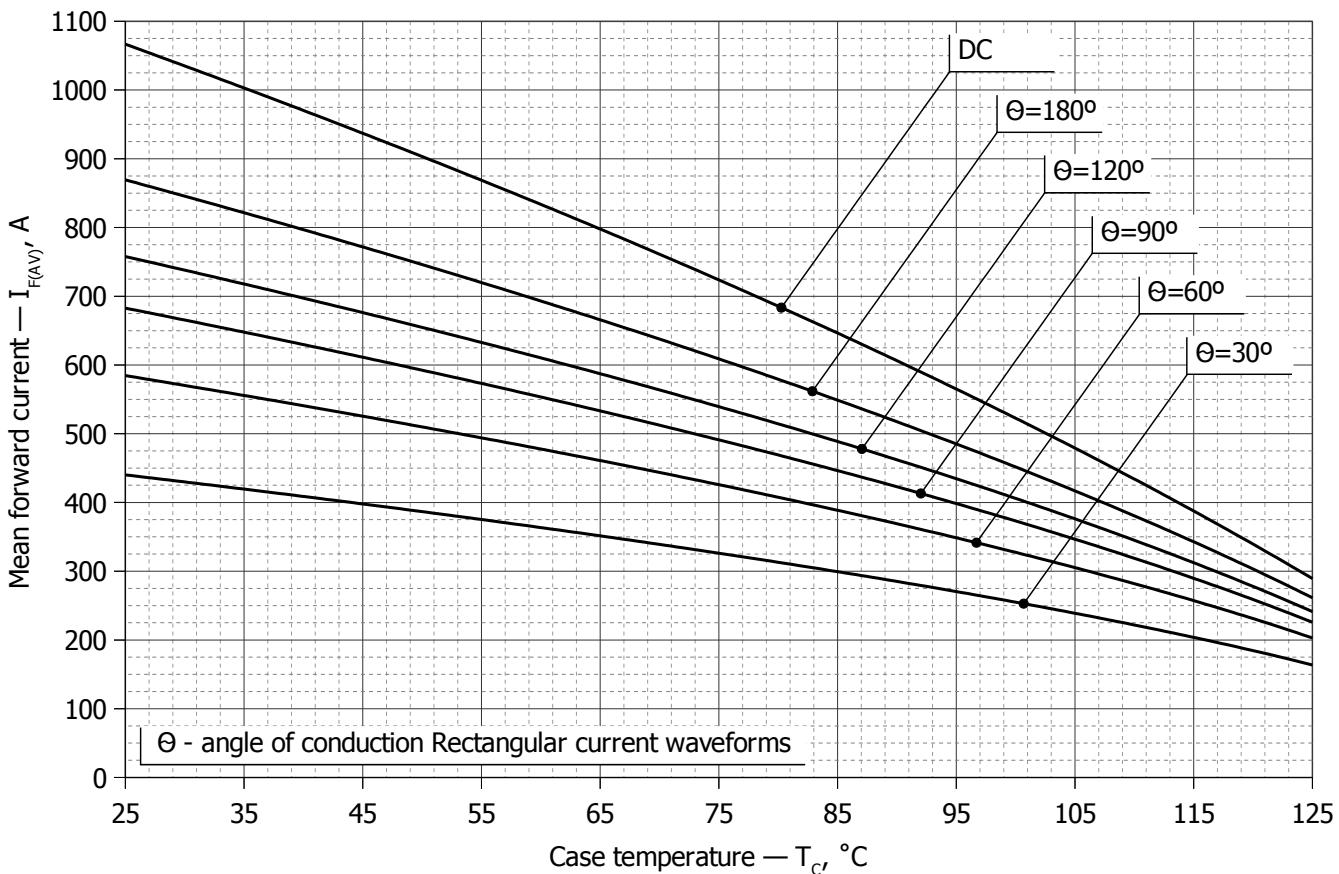


Fig. 10 - Mean forward current I_{FAV} vs. case temperature T_c for rectangular current waveforms at different conduction angles and for DC ($f=50\text{Hz}$)

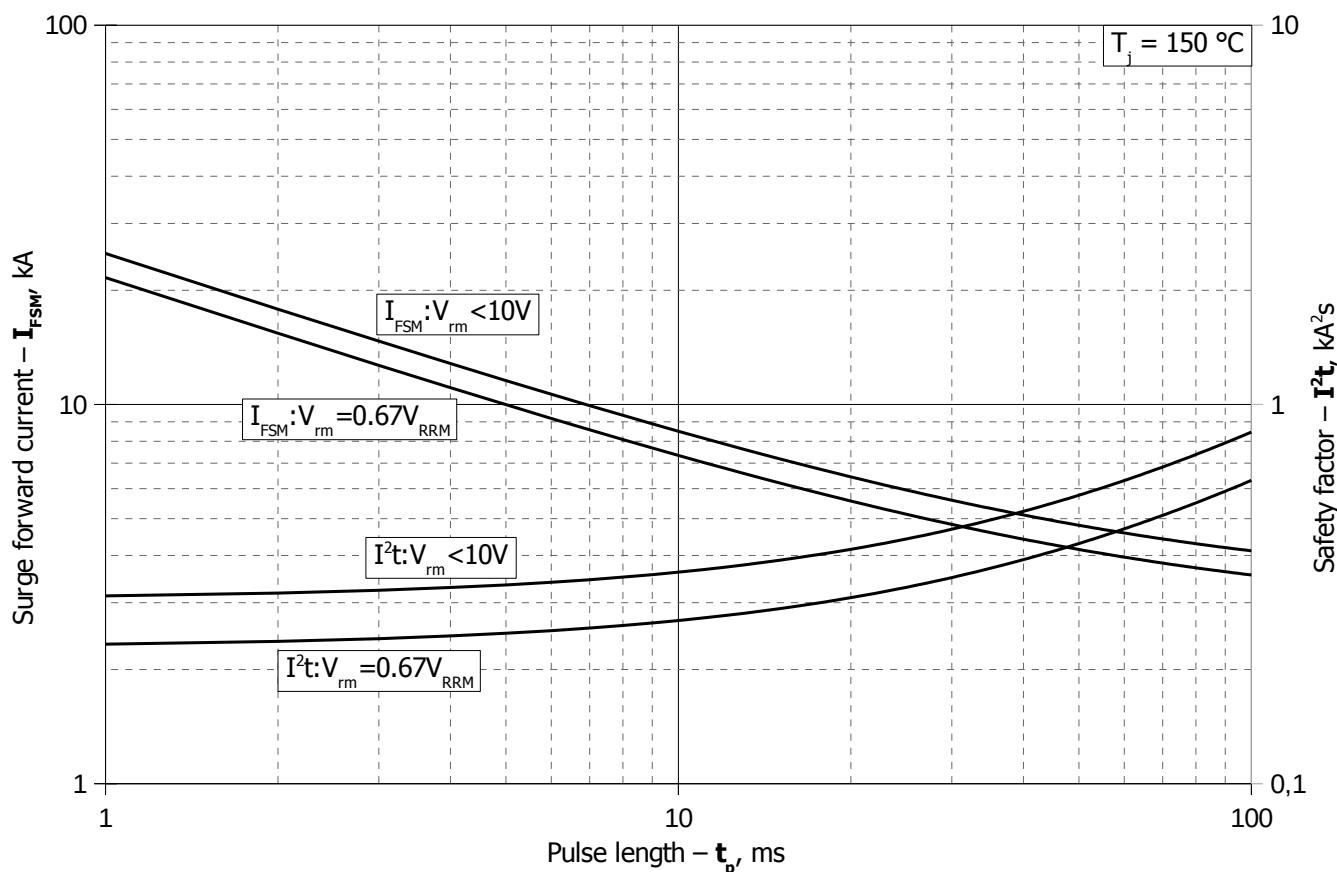


Fig. 11 – Maximum surge forward current I_{FSM} and safety factor I^2t vs. pulse length t_p

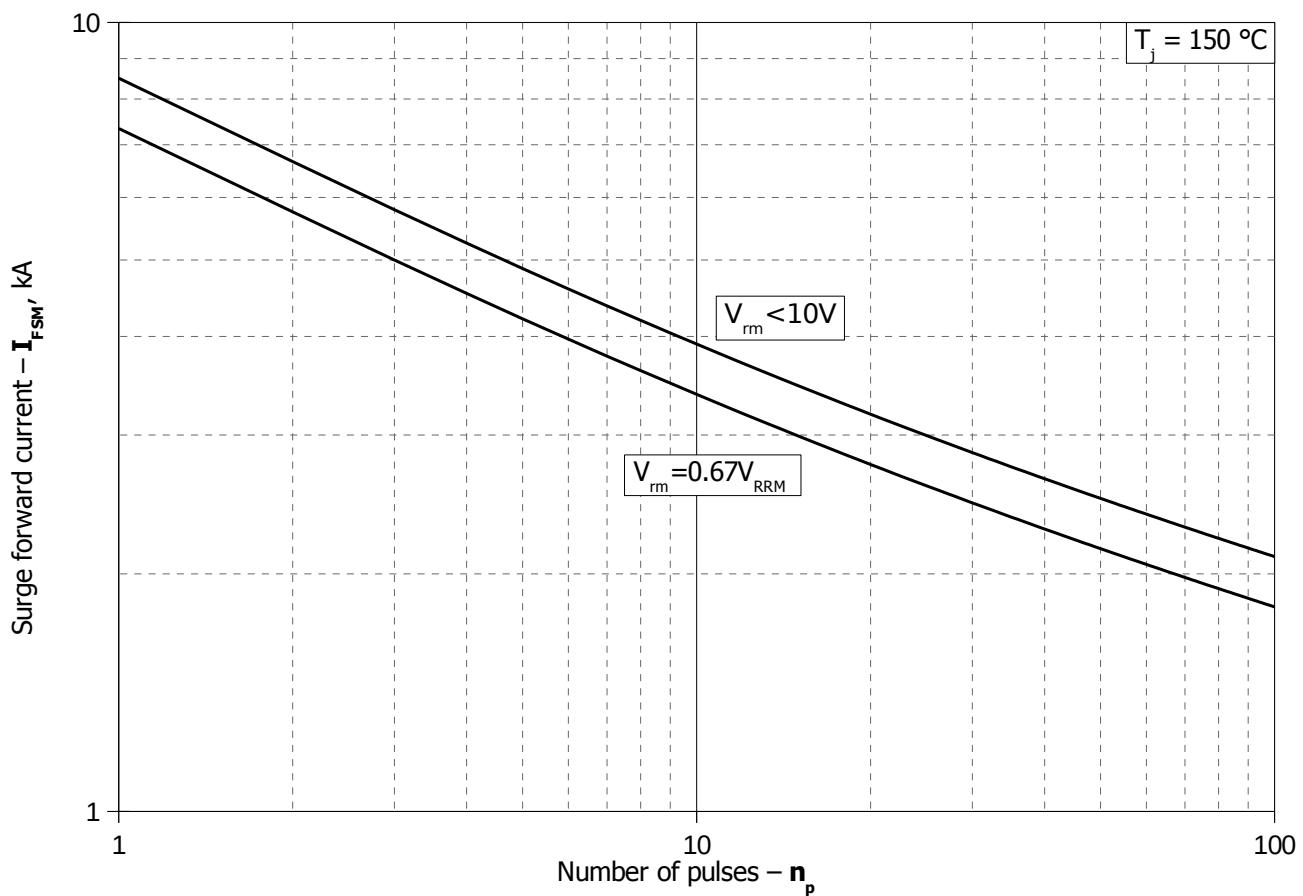


Fig. 12 - Maximum surge forward current I_{FSM} vs. number of pulses n_p