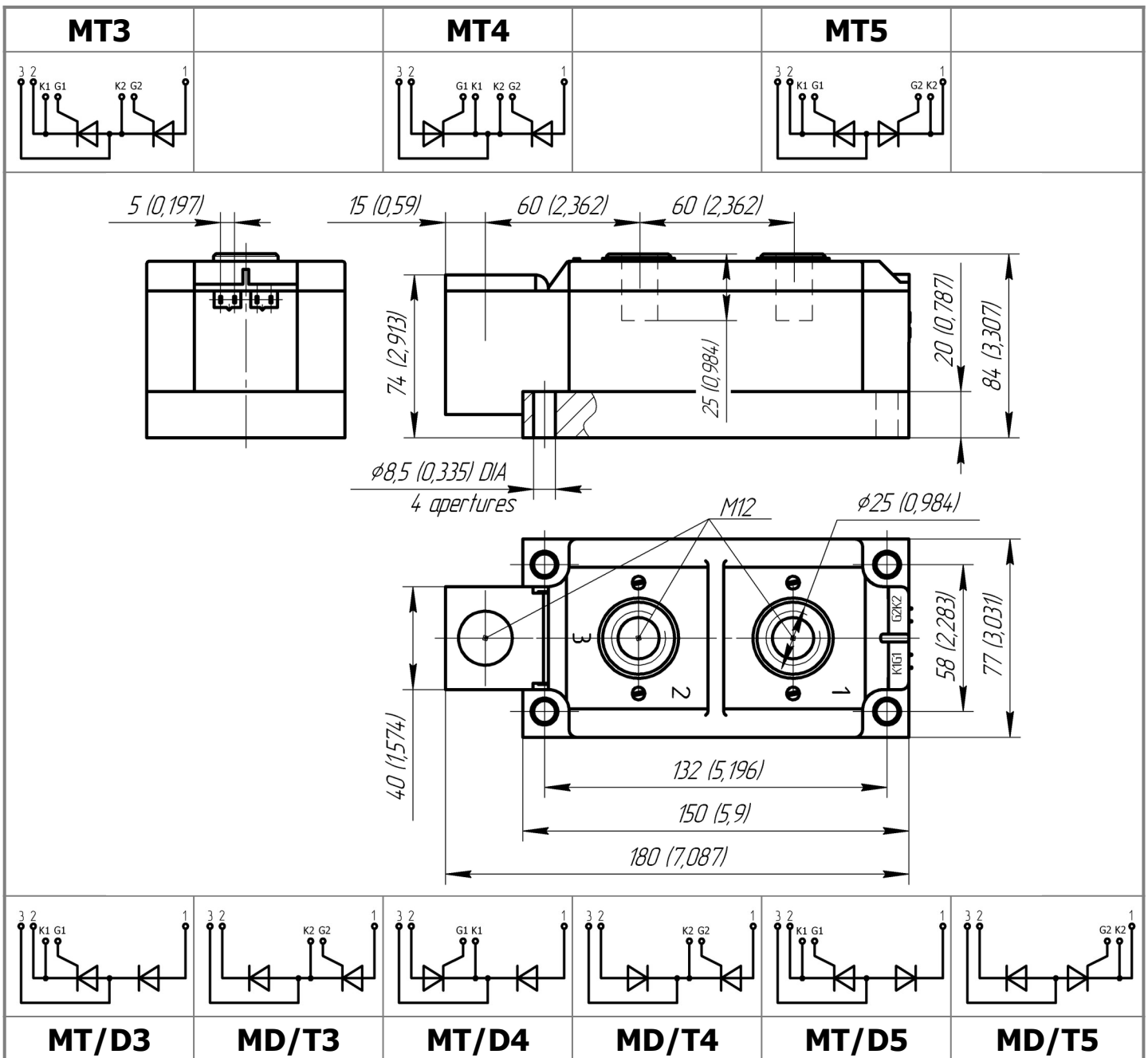


Electrically isolated base plate
 Industrial standard package
 Simplified mechanical design, rapid assembly
 Pressure contact

Double Thyristor Module For Phase Control MTx-1250-8-D

| | | | | | | | | |
|-----------------------------------|------------|-----|-----------|-------------|-----|-----|-----|-----|
| Mean on-state current | | | I_{TAV} | 1250 A | | | | |
| Repetitive peak off-state voltage | | | V_{DRM} | 100 ÷ 800 V | | | | |
| Repetitive peak reverse voltage | | | V_{RRM} | | | | | |
| Turn-off time | | | t_q | 160 μ s | | | | |
| V_{DRM}, V_{RRM}, V | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 |
| Voltage code | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| $T_j, ^\circ C$ | - 40 ÷ 150 | | | | | | | |



All dimensions in millimeters (inches)

MAXIMUM ALLOWABLE RATINGS

| Symbols and parameters | | Units | Values | Test conditions |
|---------------------------|--|--------------------------------|--|--|
| ON-STATE | | | | |
| I_{TAV} | Mean on-state current | A | 1250 1140 | $T_c=77\text{ }^\circ\text{C}$; $T_c=85\text{ }^\circ\text{C}$; 180° half-sine wave; 50 Hz |
| I_{TRMS} | RMS on-state current | A | 1963 | $T_c=77\text{ }^\circ\text{C}$; 180° half-sine wave; 50 Hz |
| I_{TSM} | Surge on-state current | kA | 34.0 39.0 | $T_j=T_{j\text{ max}}$ $T_j=25\text{ }^\circ\text{C}$ 180° half-sine wave; $t_p=10\text{ ms}$; single pulse; $V_D=V_R=0\text{ V}$; Gate pulse: $I_G=2\text{ A}$; $t_{GP}=50\text{ }\mu\text{s}$; $di_G/dt\geq 1\text{ A}/\mu\text{s}$ |
| | | | 36.0 41.0 | $T_j=T_{j\text{ max}}$ $T_j=25\text{ }^\circ\text{C}$ 180° half-sine wave; $t_p=8.3\text{ ms}$; single pulse; $V_D=V_R=0\text{ V}$; Gate pulse: $I_G=2\text{ A}$; $t_{GP}=50\text{ }\mu\text{s}$; $di_G/dt\geq 1\text{ A}/\mu\text{s}$ |
| I^2t | Safety factor | $\text{A}^2\text{s}\cdot 10^3$ | 5700 7600 | $T_j=T_{j\text{ max}}$ $T_j=25\text{ }^\circ\text{C}$ 180° half-sine wave; $t_p=10\text{ ms}$; single pulse; $V_D=V_R=0\text{ V}$; Gate pulse: $I_G=2\text{ A}$; $t_{GP}=50\text{ }\mu\text{s}$; $di_G/dt\geq 1\text{ A}/\mu\text{s}$ |
| | | | 5300 6900 | $T_j=T_{j\text{ max}}$ $T_j=25\text{ }^\circ\text{C}$ 180° half-sine wave; $t_p=8.3\text{ ms}$; single pulse; $V_D=V_R=0\text{ V}$; Gate pulse: $I_G=2\text{ A}$; $t_{GP}=50\text{ }\mu\text{s}$; $di_G/dt\geq 1\text{ A}/\mu\text{s}$ |
| BLOCKING | | | | |
| V_{DRM}, V_{RRM} | Repetitive peak off-state and Repetitive peak reverse voltages | V | 100÷800 | $T_{j\text{ min}} < T_j < T_{j\text{ max}}$; 180° half-sine wave; 50 Hz; Gate open |
| V_{DSM}, V_{RSM} | Non-repetitive peak off-state and Non-repetitive peak reverse voltages | V | 200÷900 | $T_{j\text{ min}} < T_j < T_{j\text{ max}}$; 180° half-sine wave; single pulse; Gate open |
| V_D, V_R | Direct off-state and Direct reverse voltages | V | $0.6\cdot V_{DRM}$ $0.6\cdot V_{RRM}$ | $T_j=T_{j\text{ max}}$; Gate open |
| TRIGGERING | | | | |
| I_{FGM} | Peak forward gate current | A | 8 | $T_j=T_{j\text{ max}}$ |
| V_{RGM} | Peak reverse gate voltage | V | 5 | |
| P_G | Gate power dissipation | W | 4 | $T_j=T_{j\text{ max}}$ for DC gate current |
| SWITCHING | | | | |
| $(di_T/dt)_{\text{crit}}$ | Critical rate of rise of on-state current non-repetitive ($f=1\text{ Hz}$) | $\text{A}/\mu\text{s}$ | 400 | $T_j=T_{j\text{ max}}$; $V_D=0.67\cdot V_{DRM}$; $I_{TM}=2 I_{TAV}$; Gate pulse: $I_G=2\text{ A}$; $t_{GP}=50\text{ }\mu\text{s}$; $di_G/dt\geq 2\text{ A}/\mu\text{s}$ |
| THERMAL | | | | |
| T_{stg} | Storage temperature | $^\circ\text{C}$ | -40 ÷ 50 | |
| T_j | Operating junction temperature | $^\circ\text{C}$ | -40 ÷ 150 | |
| $T_{c\text{ op}}$ | Operating temperature | $^\circ\text{C}$ | -40 ÷ 125 | |
| MECHANICAL | | | | |
| a | Acceleration under vibration | m/s^2 | 50 | |

CHARACTERISTICS

| Symbols and parameters | | Units | Values | Conditions | |
|------------------------|--|---------------------------|----------------------|--|---|
| ON-STATE | | | | | |
| V_{TM} | Peak on-state voltage, max | V | 1.30 | $T_j=25\text{ }^\circ\text{C}; I_{TM}=3925\text{ A}$ | |
| $V_{T(TO)}$ | On-state threshold voltage, max | V | 0.80 | $T_j=T_{j\text{ max}};$ | |
| r_T | On-state slope resistance, max | m Ω | 0.120 | $0.5\pi I_{TAV} < I_T < 1.5\pi I_{TAV}$ | |
| I_L | Latching current, max | mA | 1500 | $T_j=25\text{ }^\circ\text{C}; V_D=12\text{ V};$ Gate pulse: $I_G=2\text{ A};$ $t_{GP}=50\text{ }\mu\text{s}; di_G/dt\geq 1\text{ A}/\mu\text{s}$ | |
| I_H | Holding current, max | mA | 300 | $T_j=25\text{ }^\circ\text{C};$ $V_D=12\text{ V};$ Gate open | |
| BLOCKING | | | | | |
| I_{DRM}, I_{RRM} | Repetitive peak off-state and Repetitive peak reverse currents, max | mA | 100 | $T_j=T_{j\text{ max}};$ $V_D=V_{DRM}; V_R=V_{RRM}$ | |
| $(dv_D/dt)_{crit}$ | Critical rate of rise of off-state voltage ¹⁾ , min | V/ μs | 1000 | $T_j=T_{j\text{ max}};$ $V_D=0.67\cdot V_{DRM};$ Gate open | |
| TRIGGERING | | | | | |
| V_{GT} | Gate trigger direct voltage, max | V | 4.00 2.50 2.00 | $T_j= T_{j\text{ min}}$ $T_j=25\text{ }^\circ\text{C}$ $T_j= T_{j\text{ max}}$ | $V_D=12\text{ V}; I_D=3\text{ A};$ Direct gate current |
| I_{GT} | Gate trigger direct current, max | mA | 500 300 200 | $T_j= T_{j\text{ min}}$ $T_j= 25\text{ }^\circ\text{C}$ $T_j= T_{j\text{ max}}$ | |
| V_{GD} | Gate non-trigger direct voltage, min | V | 0.25 | $T_j=T_{j\text{ max}};$ $V_D=0.67\cdot V_{DRM};$ | |
| I_{GD} | Gate non-trigger direct current, min | mA | 10.00 | Direct gate current | |
| SWITCHING | | | | | |
| t_{gd} | Delay time | μs | 1.60 | $T_j=25\text{ }^\circ\text{C}; V_D=600\text{ V}; I_{TM}=I_{TAV};$ $di/dt=200\text{ A}/\mu\text{s};$ Gate pulse: $I_G=2\text{ A}; V_G=20\text{ V};$ $t_{GP}=50\text{ }\mu\text{s}; di_G/dt=2\text{ A}/\mu\text{s}$ | |
| t_q | Turn-off time ²⁾ , max | μs | 160 | $dv_D/dt=50\text{ V}/\mu\text{s}; T_j=T_{j\text{ max}}; I_{TM}= I_{TAV};$ $di_R/dt=-10\text{ A}/\mu\text{s}; V_R=100\text{ V};$ $V_D=0.67 V_{DRM};$ | |
| Q_{rr} | Total recovered charge, max | μC | 800 | $T_j=125\text{ }^\circ\text{C}; I_{TM}=1000\text{ A};$ $di_R/dt=-10\text{ A}/\mu\text{s};$ | |
| t_{rr} | Reverse recovery time, typ | μs | 16.0 | | |
| I_{rrM} | Peak reverse recovery current, max | A | 100 | | |
| THERMAL | | | | | |
| R_{thjc} | Thermal resistance, junction to case | | | 180° half-sine wave, 50 Hz | |
| | per module | $^\circ\text{C}/\text{W}$ | 0.0250 | | |
| | per arm | $^\circ\text{C}/\text{W}$ | 0.0500 | | |
| R_{thch} | Thermal resistance, case to heatsink | | | | |
| | per module | $^\circ\text{C}/\text{W}$ | 0.0080 | | |
| | per arm | $^\circ\text{C}/\text{W}$ | 0.0160 | | |
| INSULATION | | | | | |
| V_{ISOL} | Insulation test voltage | kV | 3.00 | Sine wave, 50 Hz; RMS | t=60 sec |
| | | | 3.60 | | t=1 sec |
| MECHANICAL | | | | | |
| M_1 | Mounting torque (M8) ³⁾ | Nm | 9.00 | Tolerance $\pm 15\%$ | |
| M_2 | Terminal connection torque (M12) ³⁾ | Nm | 18.00 | Tolerance $\pm 15\%$ | |
| w | Weight, max | g | 4100 | | |

PART NUMBERING GUIDE

| | | | | | | | | | | | | |
|----|---|---|------|---|---|---|----|----|---|---|---|---|
| MT | 3 | - | 1250 | - | 8 | - | A2 | T2 | - | D | - | N |
| 1 | 2 | | 3 | | 4 | | 5 | 6 | | 7 | | 8 |

1. Thyristor module (MT)
Thyristor – Diode module (MT/D)
Diode – Thyristor module (MD/T)
2. Circuit Schematic
3 – serial connection
4 – common Cathode
5 – common Anode
3. Average On-state Current, A
4. Voltage Code
5. Critical rate of rise of off-state voltage
6. Group of turn-off time ($dv_D/dt=50\text{ V}/\mu\text{s}$)
7. Package Type (M.D)
8. Ambient Conditions:
N – Normal

NOTES

¹⁾ Critical rate of rise of off-state voltage

| | |
|---|------|
| Symbol of group | A2 |
| $(dv_D/dt)_{crit}, \text{ V}/\mu\text{s}$ | 1000 |

²⁾ Turn-off time ($dv_D/dt=50\text{ V}/\mu\text{s}$)

| | |
|----------------------|-----|
| Symbol of group | T2 |
| $t_{q}, \mu\text{s}$ | 160 |

³⁾ The screws must be lubricated



UL certified file-No. E255404

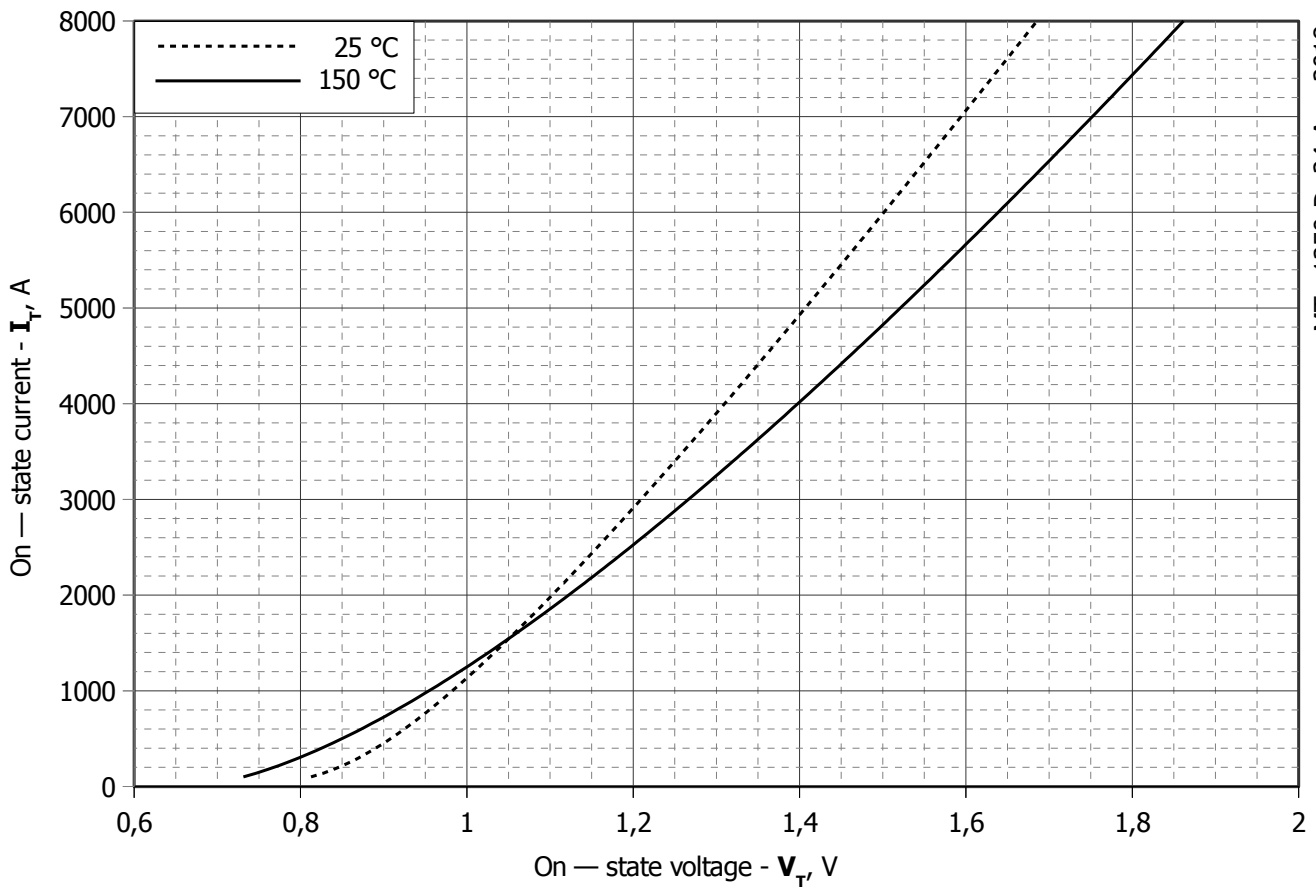


Fig 1 – On-state characteristics of Limit device

Analytical function for On-state characteristic:

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

| | Coefficients for max curves | |
|----------|-----------------------------|---------------------------|
| | $T_j = 25^\circ\text{C}$ | $T_j = T_{j \text{ max}}$ |
| A | 0.668030000 | 0.670910000 |
| B | 0.000076524 | 0.000061738 |
| C | 0.025368000 | -0.0065693000 |
| D | 0.001981500 | 0.008450600 |

On-state characteristic model (see Fig. 1)

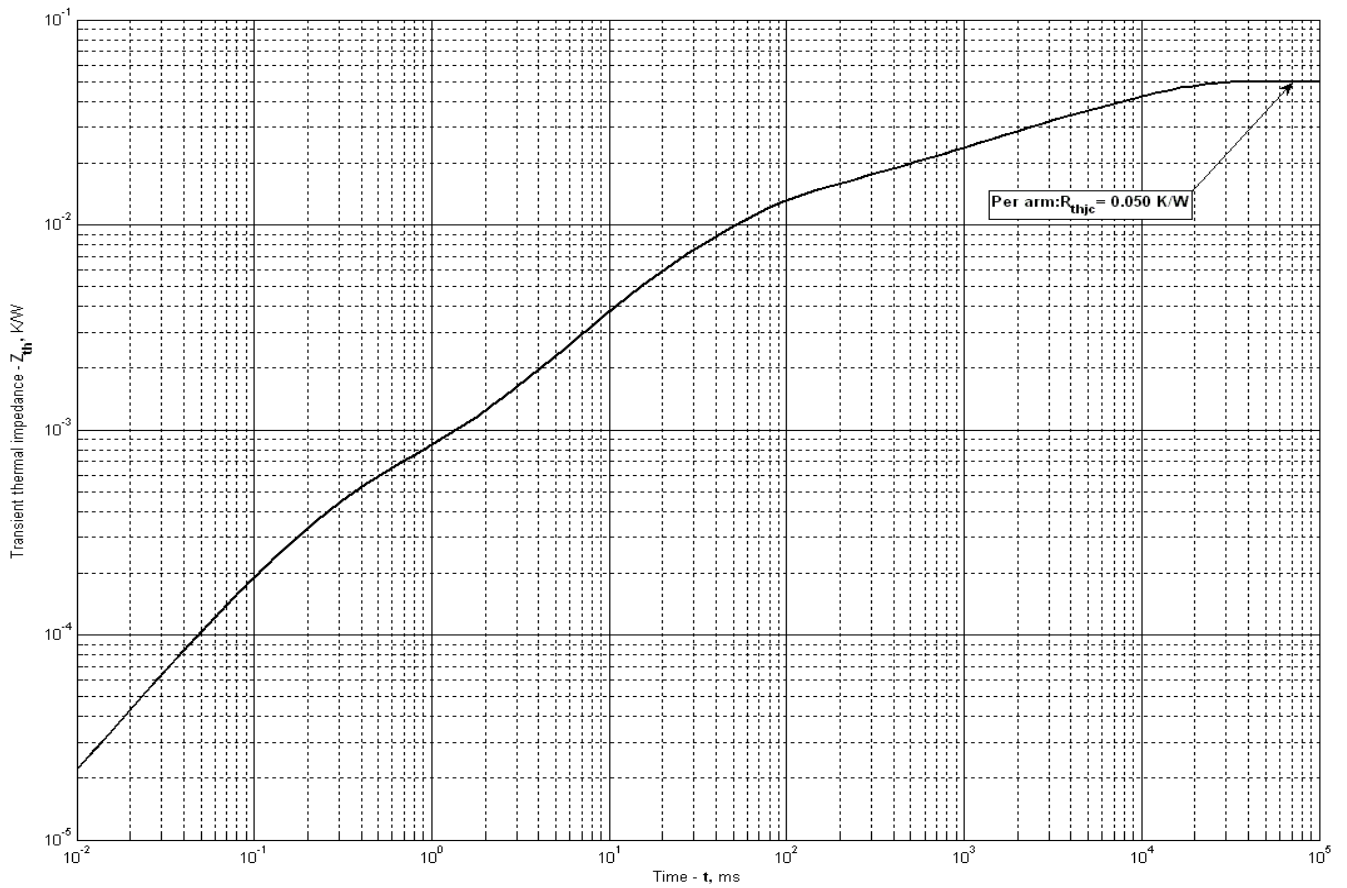


Fig 2 – Transient thermal impedance

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.

| i | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------------------------|----------|----------|----------|----------|----------|-----------|
| R_i, K/W | 0.02506 | 0.009643 | 0.00348 | 0.009712 | 0.001719 | 0.0004399 |
| τ_i, s | 8.474 | 1.110 | 0.2289 | 0.04529 | 0.009524 | 0.0002414 |

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

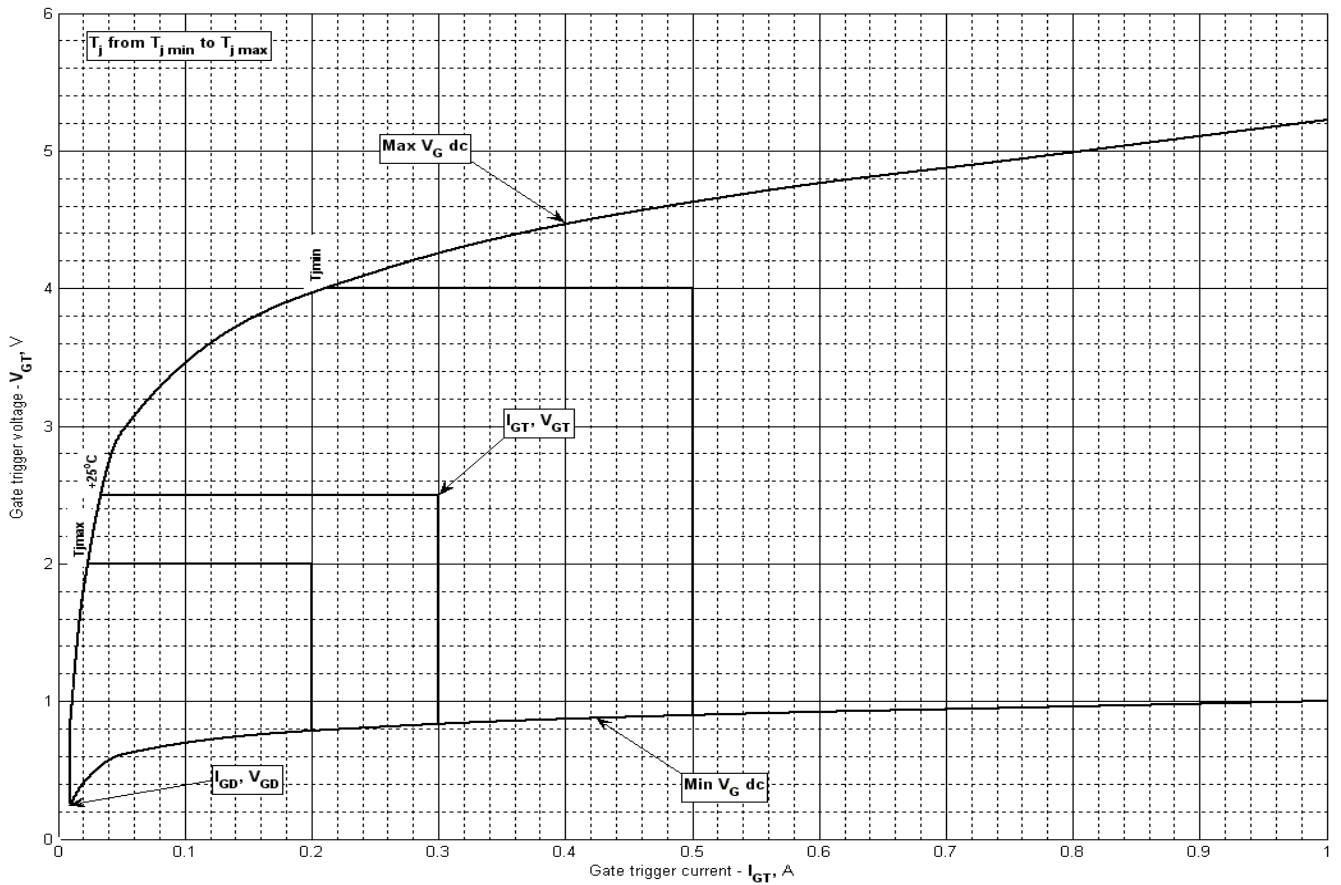


Fig 3 – Gate characteristics – Trigger limits

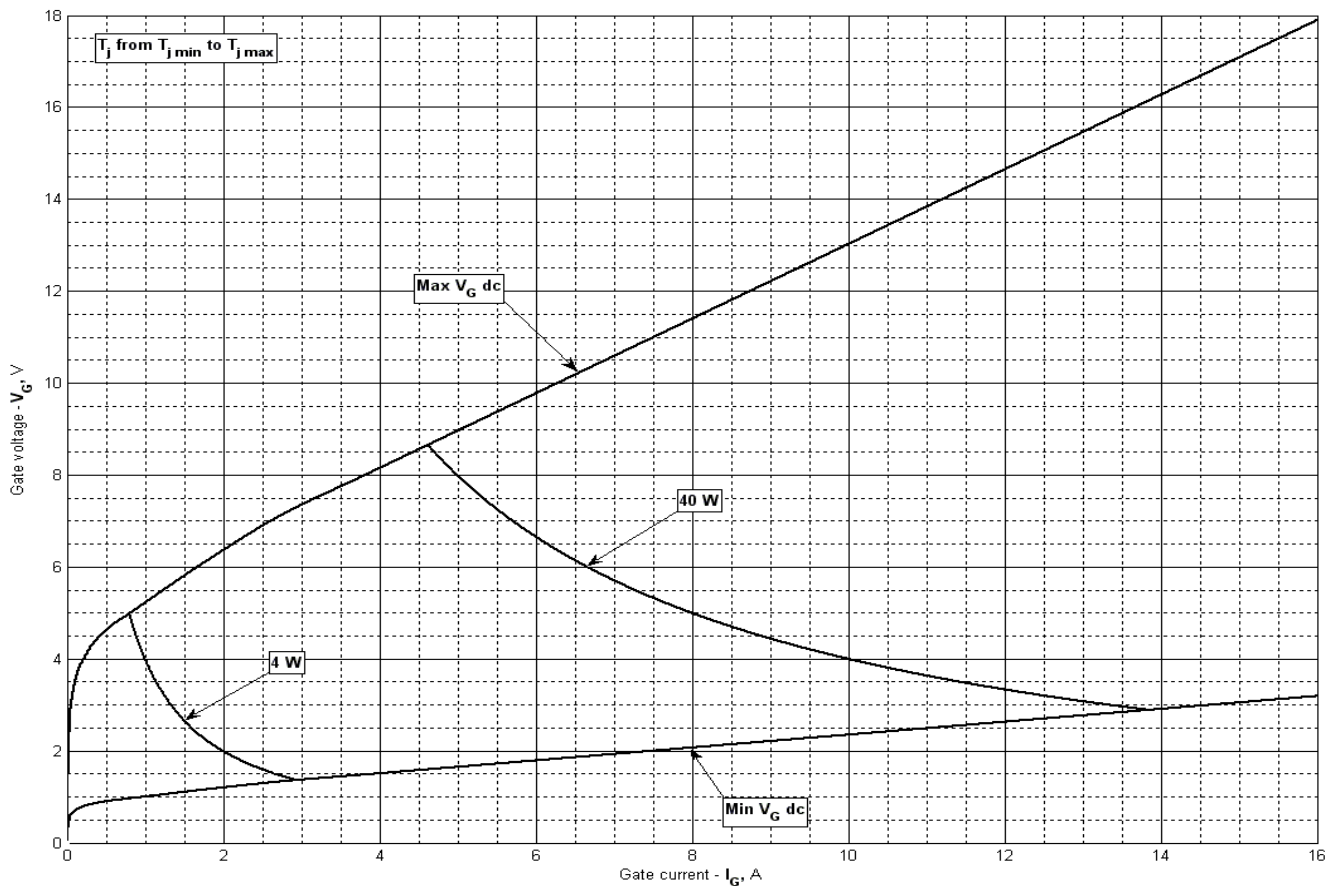


Fig 4 - Gate characteristics – Power curves

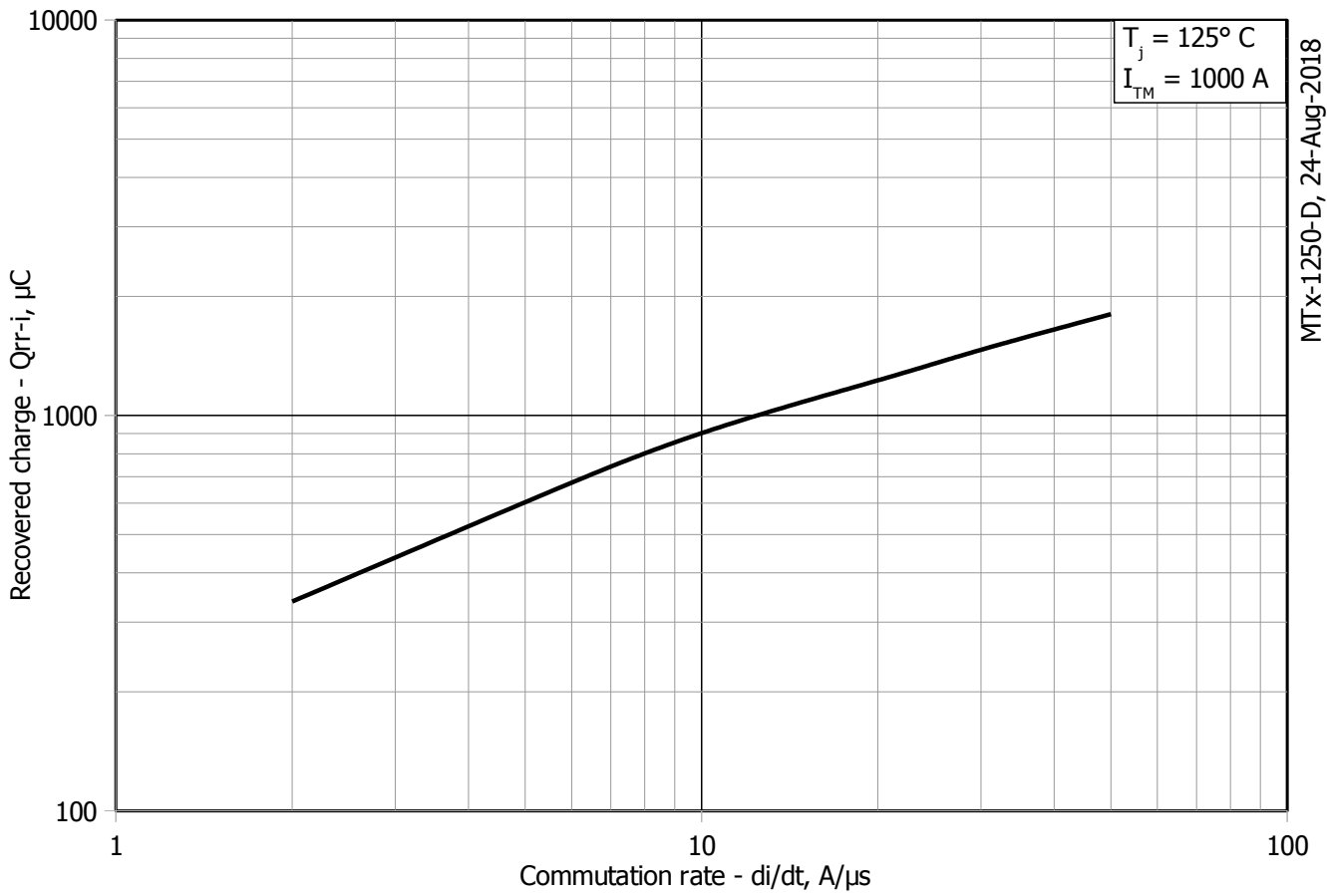


Fig 5 - Total recovered charge, Q_{rr-i} (integral)

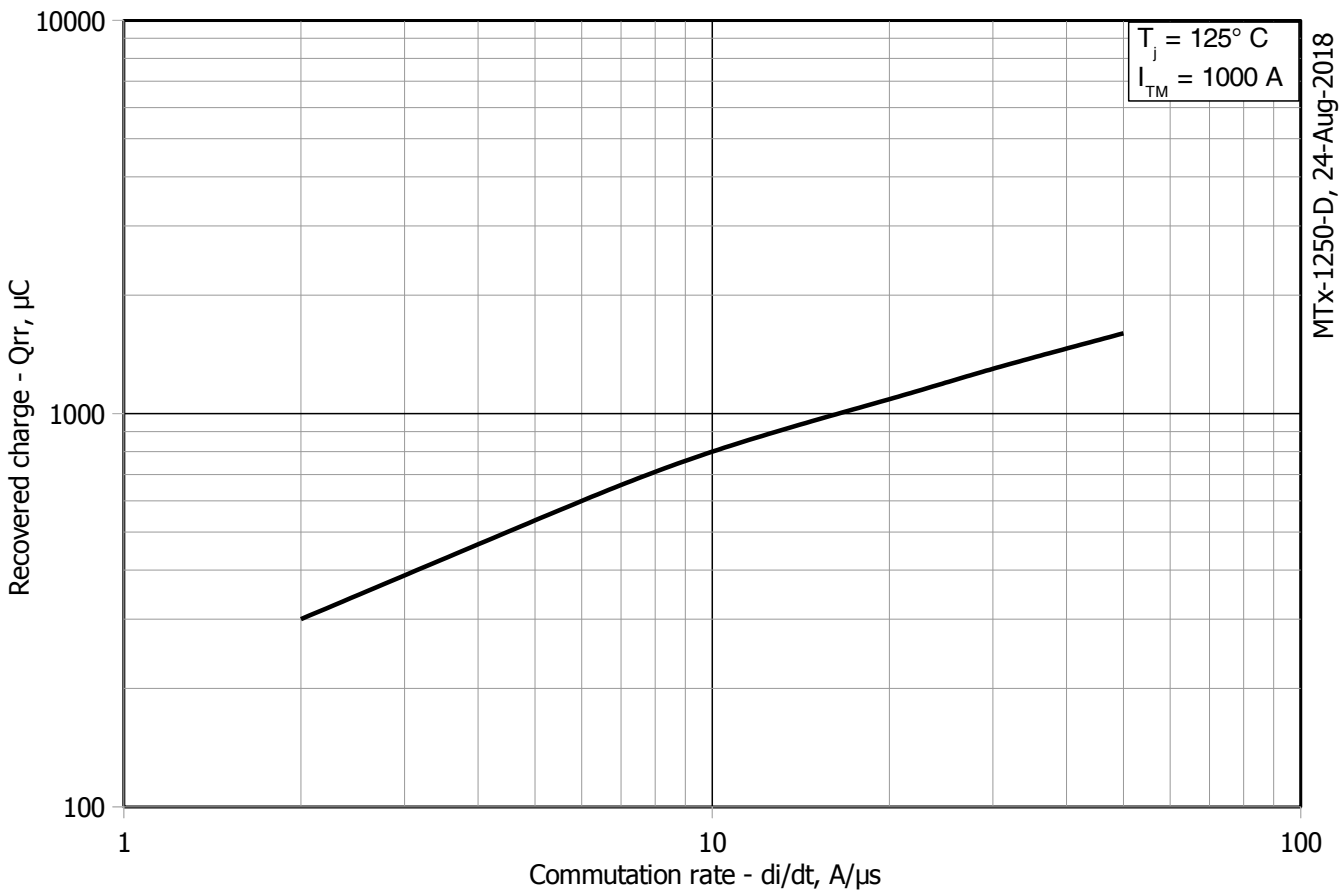
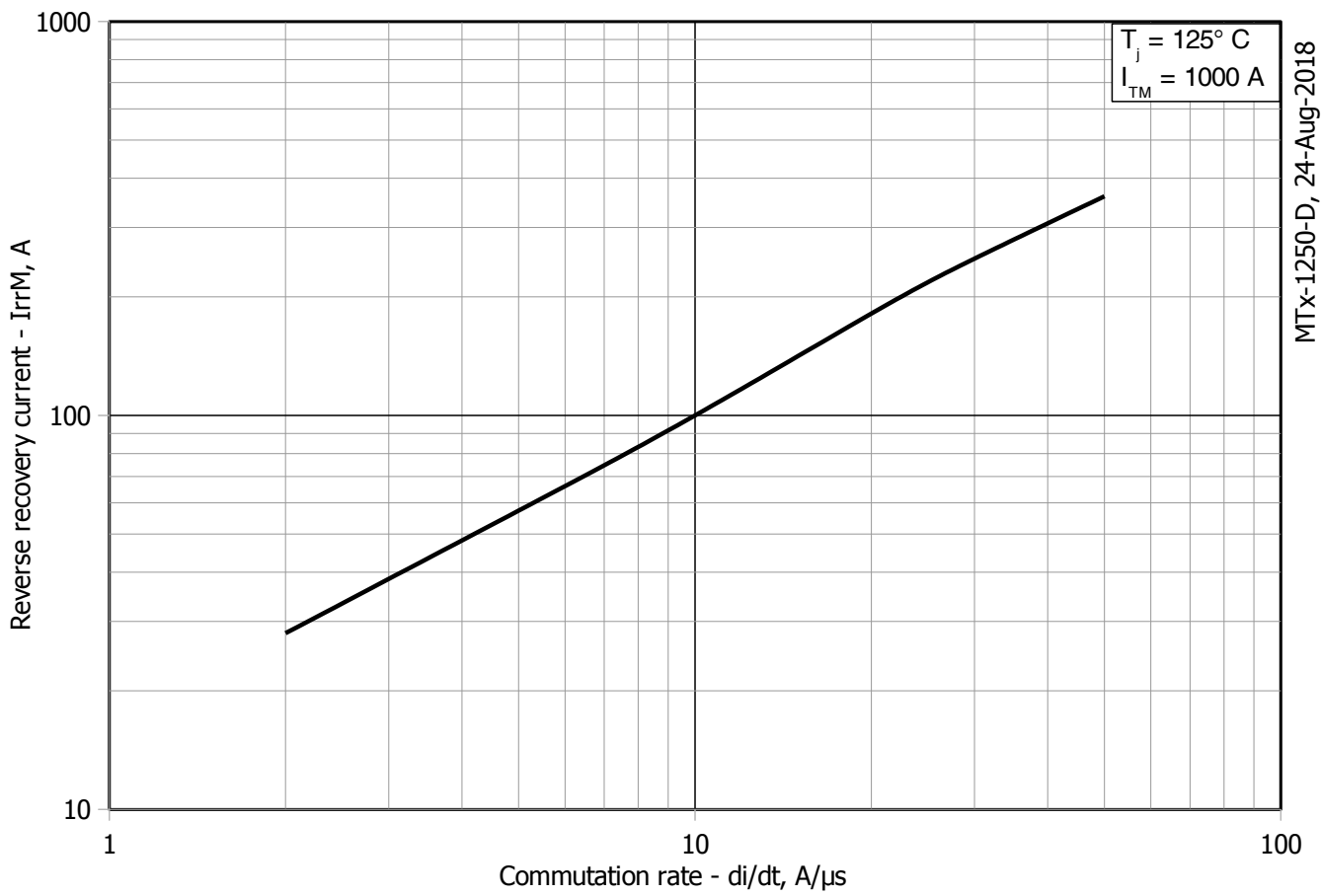
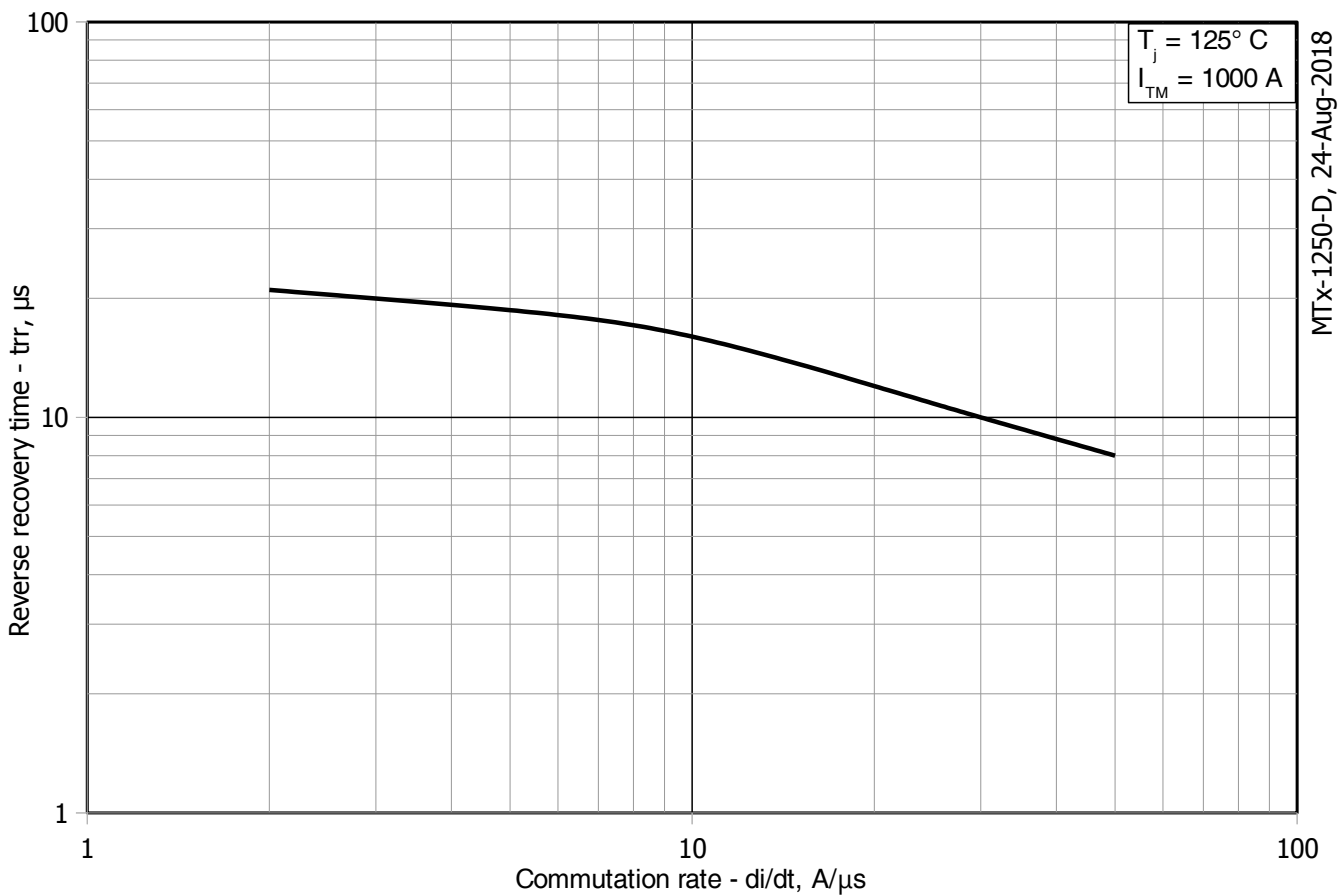


Fig 6 - Recovered charge, Q_{rr} (25% chord)



MTx-1250-D, 24-Aug-2018

Fig 7 - Peak reverse recovery current, I_{rrM}



MTx-1250-D, 24-Aug-2018

Fig 8 - Maximum recovery time, t_{rr} (25% chord)

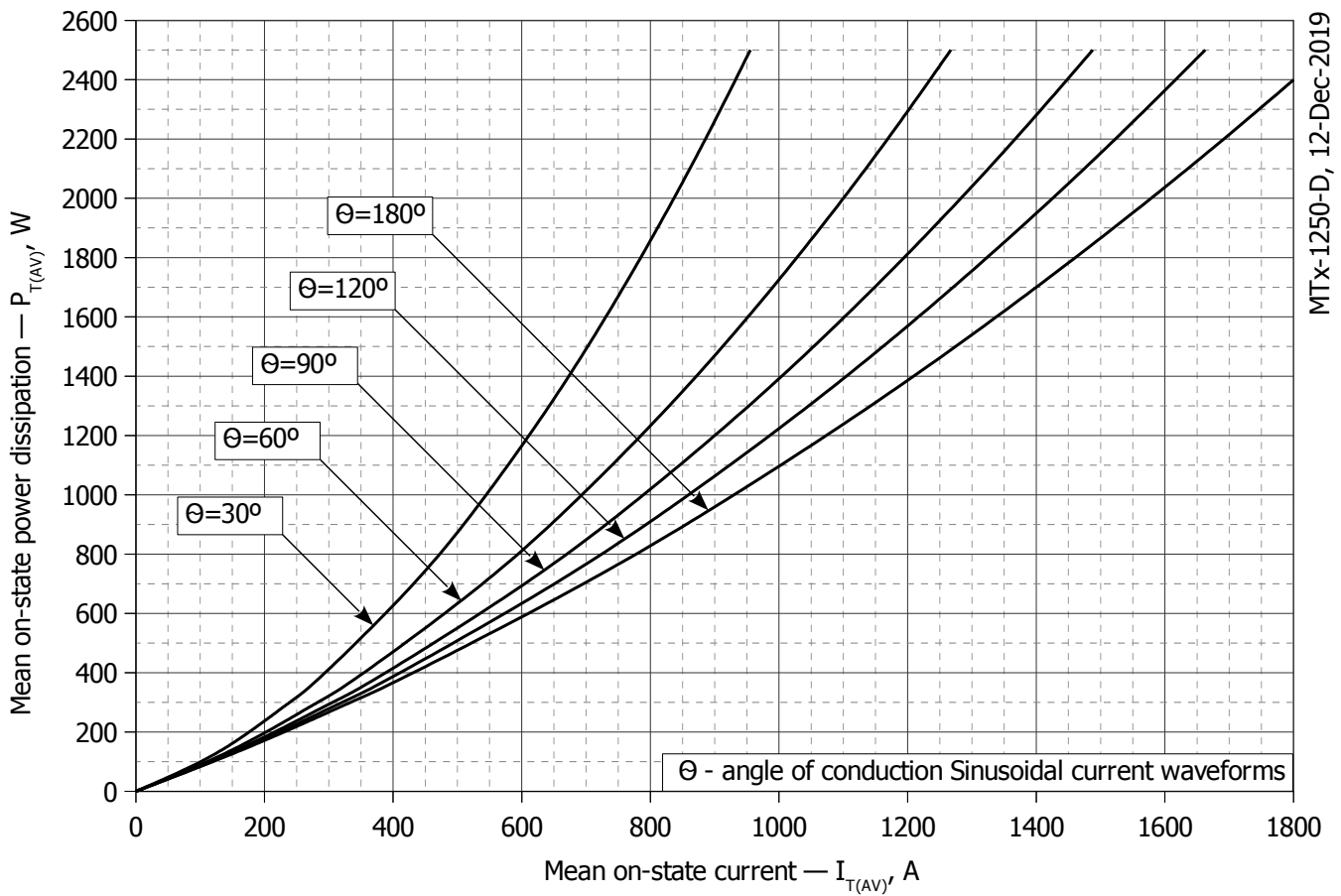


Fig 9 – On-state power loss (sinusoidal current waveforms)

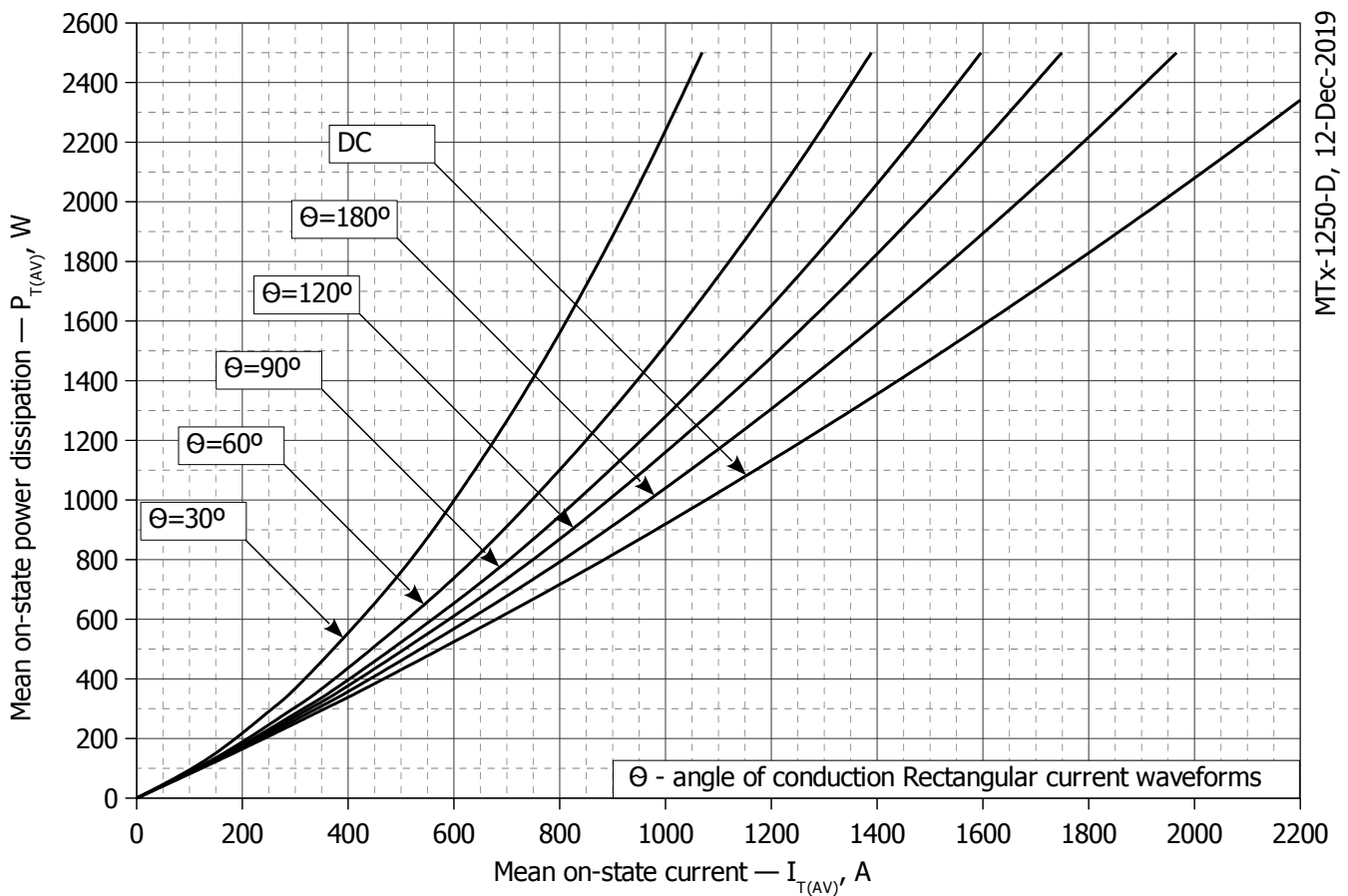


Fig 10 - On-state power loss (rectangular current waveforms)

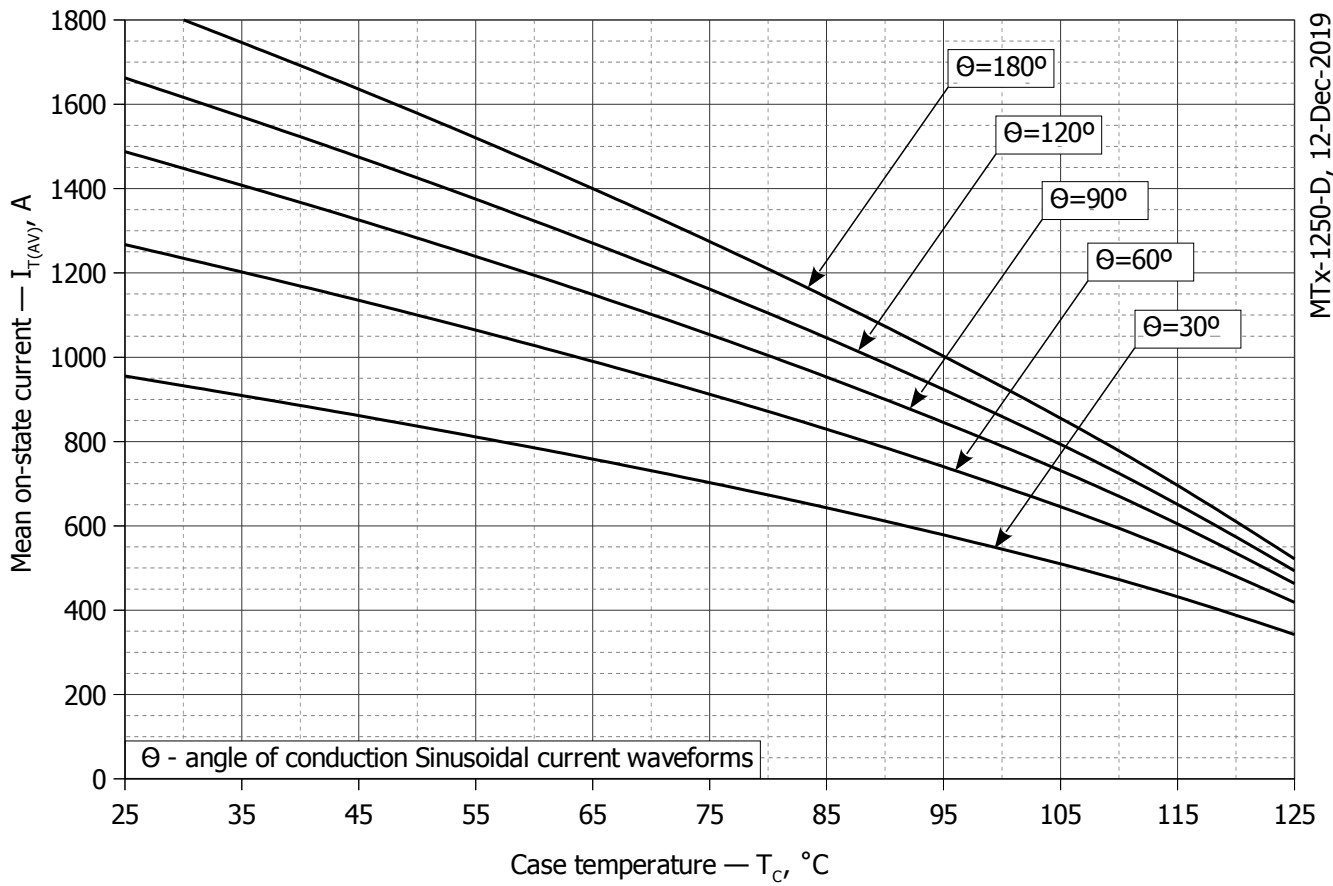


Fig 11 – Maximum case temperature (sinusoidal current waveforms)

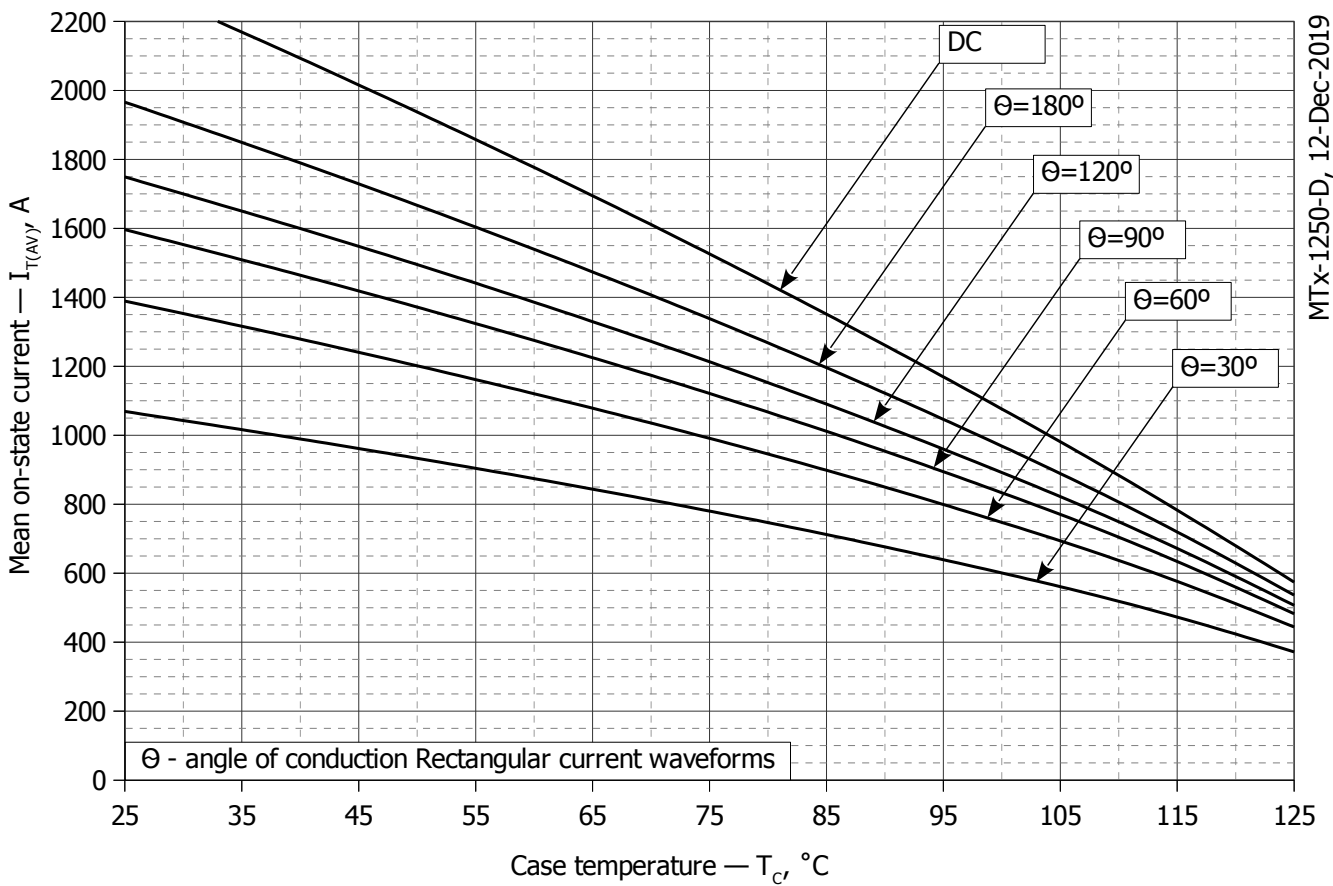


Fig 12 - Maximum case temperature (rectangular current waveforms)

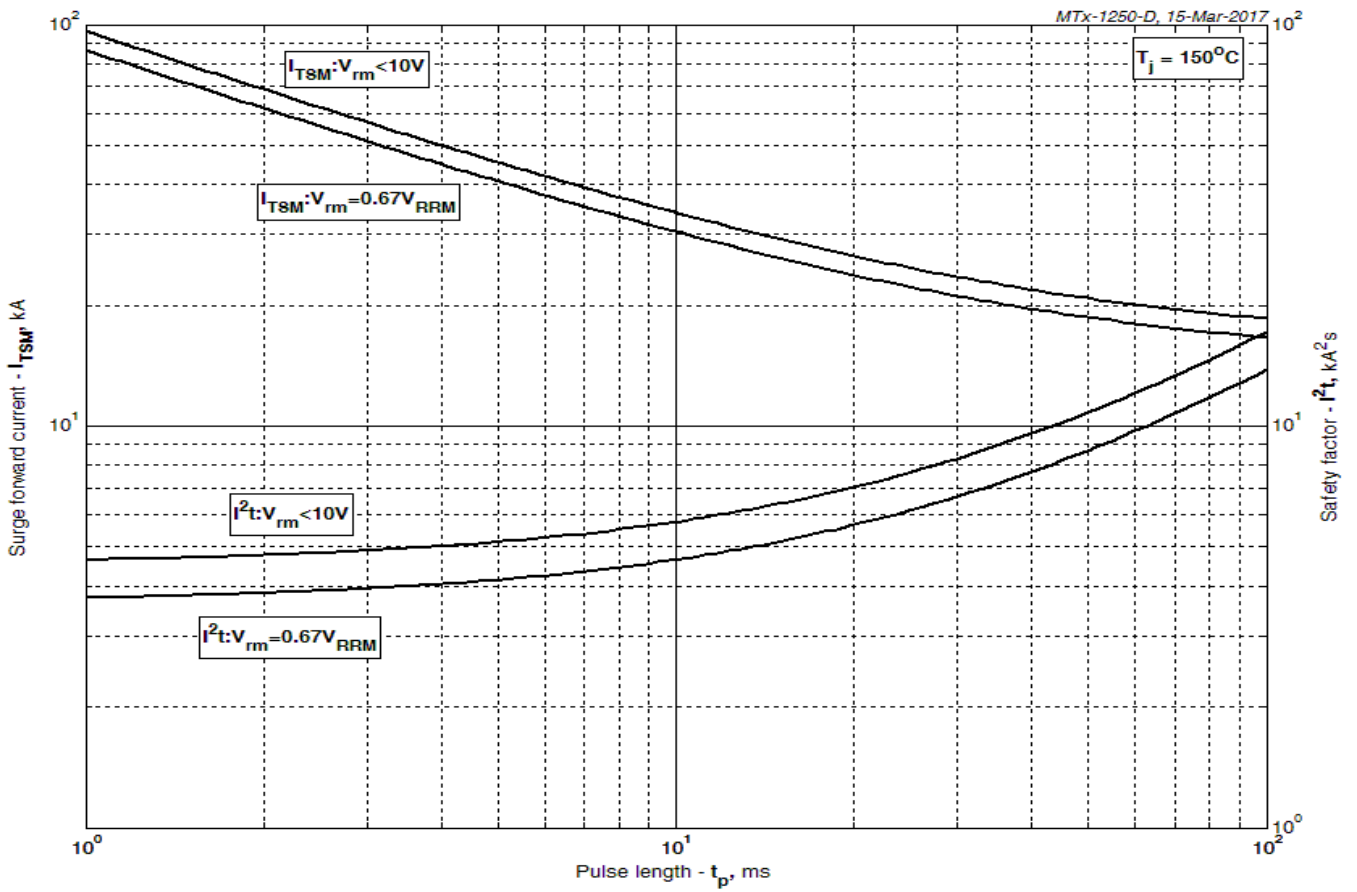


Fig 13 – Maximum surge and I^2t ratings

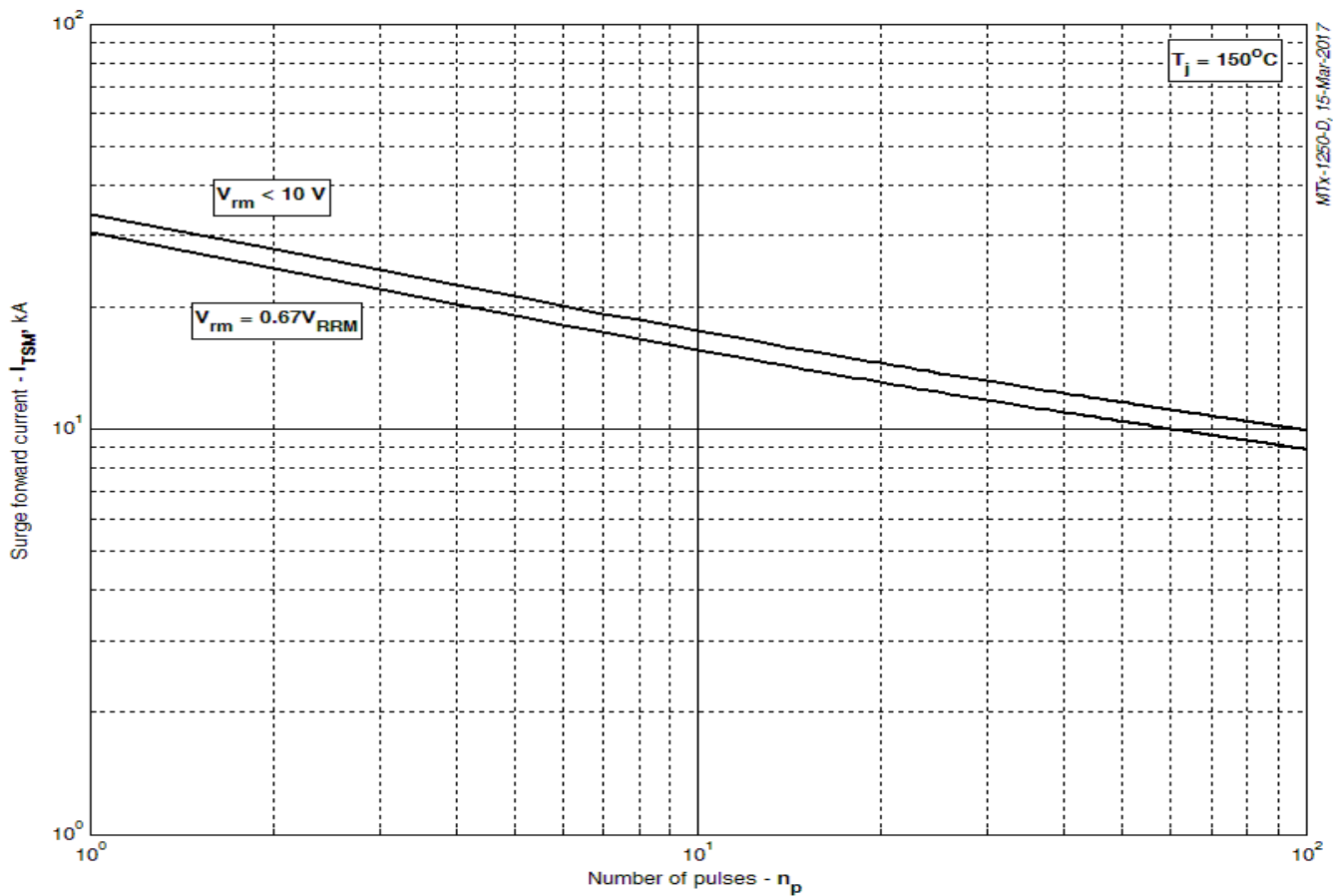


Fig 14 - Maximum surge ratings