

# DM 818-800-45

## Fast Recovery Diode

### Properties

- Optimized recovery characteristics
- Industry standard housing

### Applications

- suited for GTO applications
- Snubber diode
- Freewheeling diode

### Key Parameters

$V_{RRM}$	=	4 500	V
$I_{FAVm}$	=	767	A
$I_{FSM}$	=	15 000	A
$V_{TO}$	=	1.807	V
$r_T$	=	0.735	mΩ

### Types

	$V_{RRM}$
DM 818-800-45	4 500 V
DM 818-800-40	4 000 V
DM 818-800-35	3 500 V
Conditions: $T_j = -40 \div 125$ °C, half sine waveform, $f = 50$ Hz	

### Mechanical Data

$F_m$	Mounting force	22 ± 2 kN
$m$	Weight	0.49 kg
$D_s$	Surface creepage distance	33 mm
$D_a$	Air strike distance	20 mm

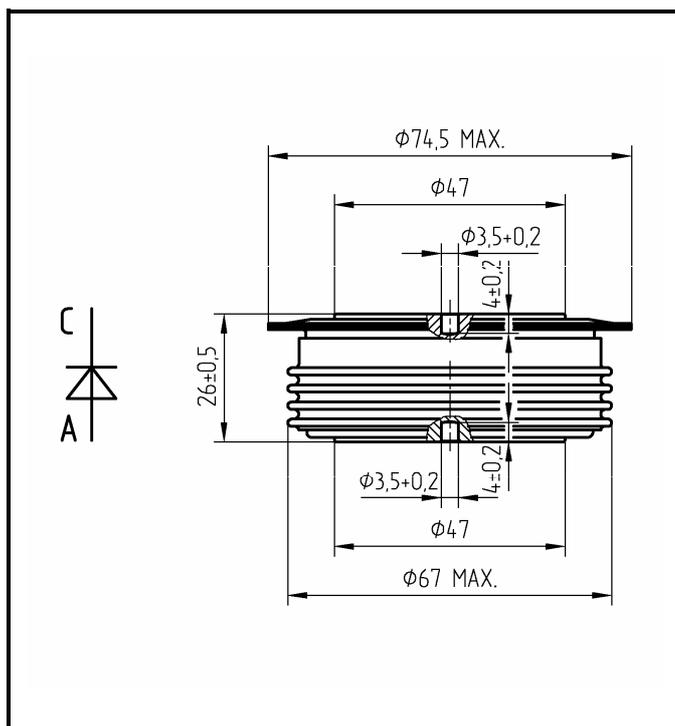


Fig. 1 Case

<b>Maximum Ratings</b>			<b>Maximum Limits</b>	<b>Unit</b>
$V_{RRM}$	<b>Repetitive peak reverse voltage</b> $T_j = -40 \div 125 \text{ }^\circ\text{C}$	DM 818-800-45 DM 818-800-40 DM 818-800-35	4 500 4 000 3 500	V
$I_{FAVm}$	<b>Average forward current</b> $T_c = 85 \text{ }^\circ\text{C}$		767	A
$I_{FRMS}$	<b>RMS forward current</b> $T_c = 85 \text{ }^\circ\text{C}$		1 205	A
$I_{RRM}$	<b>Repetitive reverse current</b> $V_R = V_{RRM}$		50	mA
$I_{FSM}$	<b>Non repetitive peak surge current</b> $V_R = 0 \text{ V, half sine pulse}$	$t_p = 8.3 \text{ ms}$	16 000	A
		$t_p = 10 \text{ ms}$	15 000	A
$\int^2 t$	<b>Limiting load integral</b> $V_R = 0 \text{ V, half sine pulse}$	$t_p = 8.3 \text{ ms}$	1 066 000	A <sup>2</sup> s
		$t_p = 10 \text{ ms}$	1 125 000	A <sup>2</sup> s
$T_{jmin} - T_{jmax}$	<b>Operating temperature range</b>		-40 $\div$ 125	$^\circ\text{C}$
$T_{STG}$	<b>Storage temperature range</b>		-40 $\div$ 125	$^\circ\text{C}$

Unless otherwise specified  $T_j = 125 \text{ }^\circ\text{C}$

Characteristics		Value			Unit	
		min	typ	max		
$V_{T0}$	Threshold voltage				1.807	V
$r_T$	Forward slope resistance $I_{F1} = 1\,257\text{ A}$ , $I_{F2} = 3\,770\text{ A}$				0.735	m $\Omega$
$V_{FM}$	Maximum forward voltage $I_{FM} = 2\,000\text{ A}$				3.310	V
$Q_{rr}$	Recovered charge $V_R = 100\text{ V}$ , $I_{FM} = 1000\text{ A}$ , $di/dt = -80\text{ A}/\mu\text{s}$			500	700	$\mu\text{C}$
$I_{rrM}$	Reverse recovery maximum current <i>the same conditions as at <math>Q_{rr}</math></i>			160	230	A
$t_{rr}$	Reverse recovery time <i>the same conditions as at <math>Q_{rr}</math></i>	group of $t_{rr}$				
		N			4.0	$\mu\text{s}$
P				5.0		
S	Soft factor, $S = t_s / t_f$ $I_{FM} = 1\,000\text{ A}$ , $di_f/dt = -200\text{ A}/\mu\text{s}$ , $V_R = 400\text{ V}$			2.0		-
$I_{rrM}$	Reverse recovery maximum current <i>the same conditions as at S</i>				400	A
$V_{rrM}$	Reverse recovery maximum voltage <i>the same conditions as at S</i>				1 100	V

Unless otherwise specified  $T_j = 125\text{ }^\circ\text{C}$

Thermal Parameters			Value	Unit
$R_{thjc}$	Thermal resistance junction to case	double side cooling	15	K/kW
		anode side cooling	24	
		cathode side cooling	40	
$R_{thch}$	Thermal resistance case to heatsink	double side cooling	4	K/kW
		single side cooling	8	

**Transient Thermal Impedance**

Analytical function for transient thermal impedance

$$Z_{thjc} = \sum_{i=1}^5 R_i (1 - \exp(-t/\tau_i))$$

Conditions:  
 $F_m = 22 \pm 2$  kN, Double side cooled

**Correction for periodic waveforms**

180° sine:	1.3 K/kW
180° rectangular:	1.7 K/kW
120° rectangular:	2.9 K/kW
60° rectangular:	4.8 K/kW

$i$	1	2	3	4	5
$\tau_i$ (s)	0.6937	0.2040	0.0452	0.0040	0.0005
$R_i$ (K/kW)	6.04	3.83	3.76	1.31	0.07

Fig. 2 Dependence transient thermal impedance junction to case on square pulse

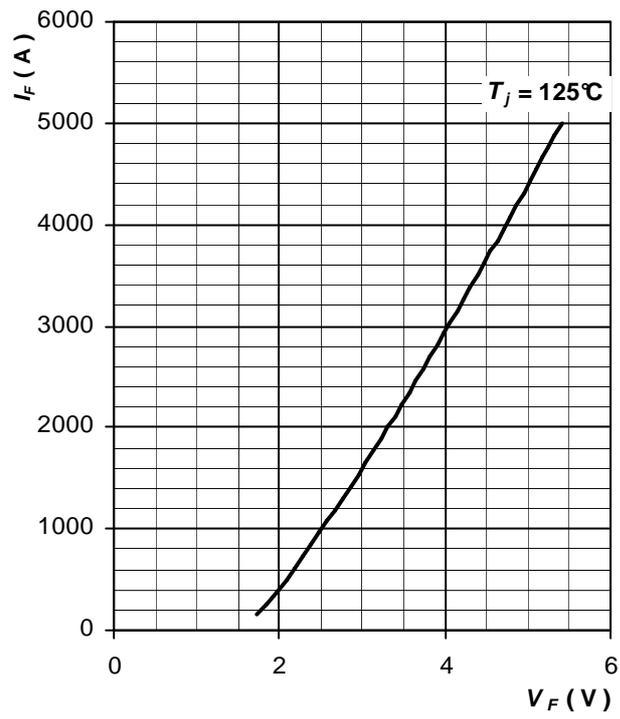
**Forward Characteristics**

Fig. 3 Maximum forward voltage drop characteristics

**Surge Characteristics**

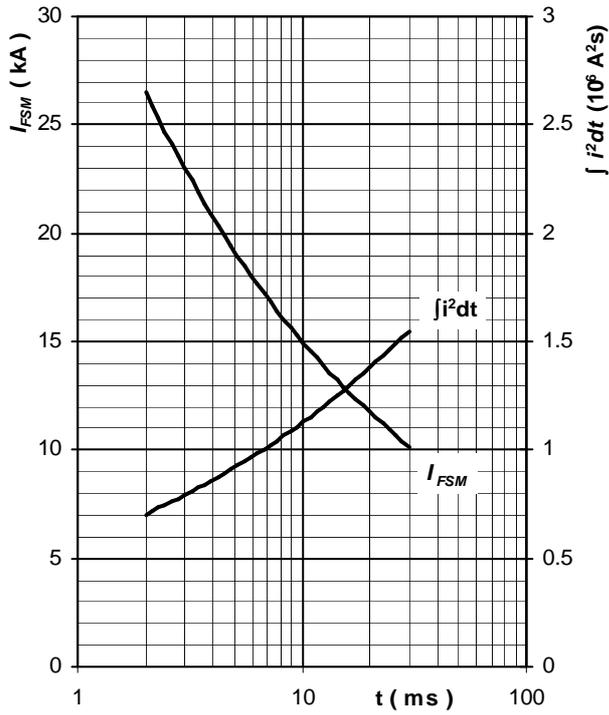


Fig. 4 Surge forward current vs. pulse length, half sine wave, single pulse,  $V_R = 0 V$ ,  $T_j = T_{jmax}$

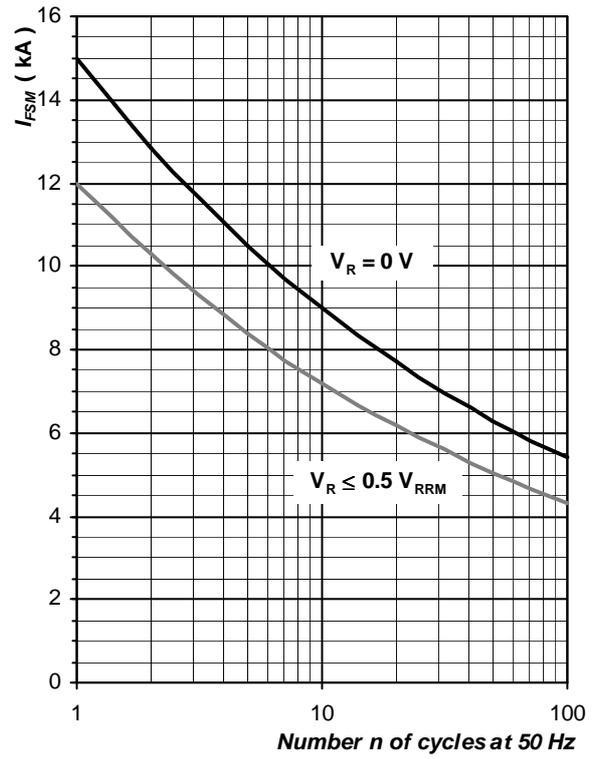


Fig. 5 Surge forward current vs. number of pulses, half sine wave,  $T_j = T_{jmax}$

**Power Loss and Maximum Case Temperature Characteristics**

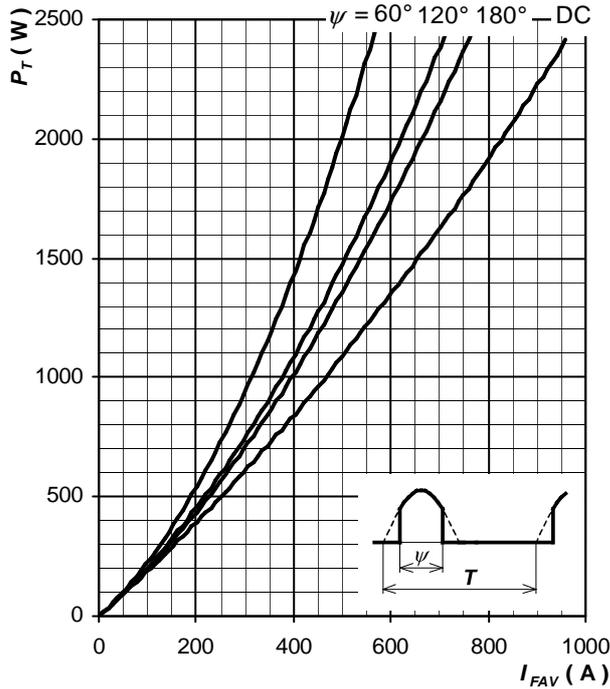


Fig. 6 Forward power loss vs. average forward current, sine waveform,  $f = 50$  Hz,  $T = 1/f$

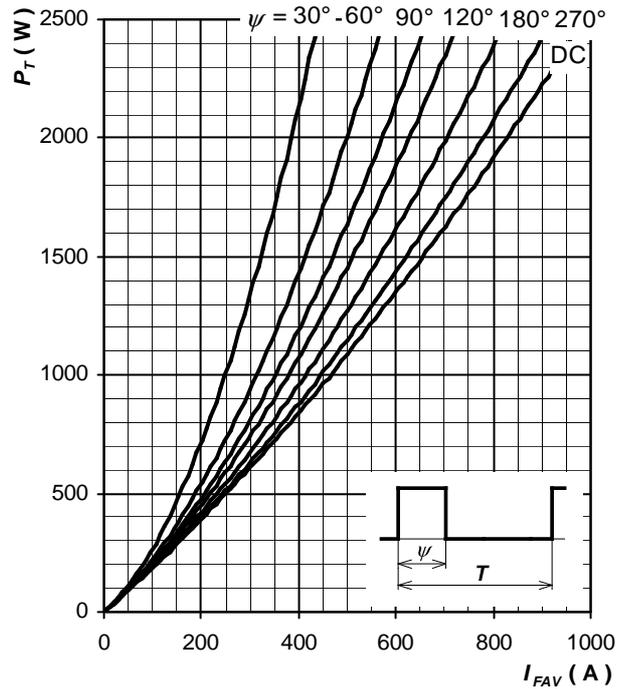


Fig. 7 Forward power loss vs. average forward current, square waveform,  $f = 50$  Hz,  $T = 1/f$

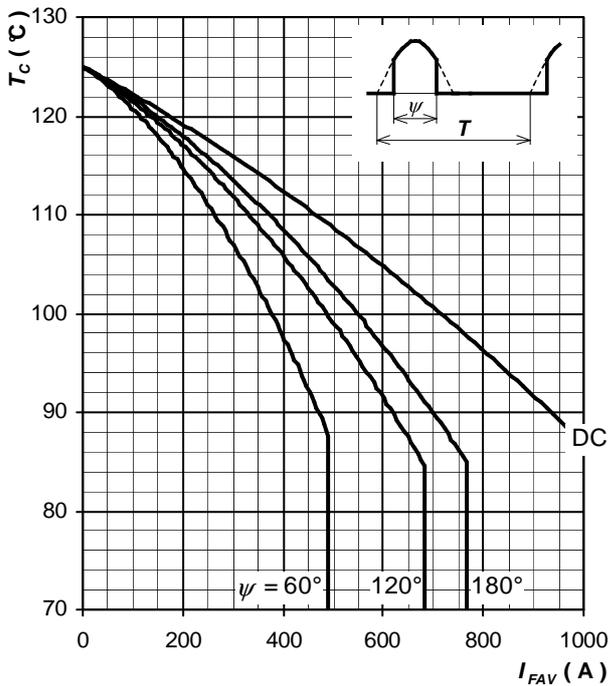


Fig. 8 Max. case temperature vs. aver. forward current, sine waveform,  $f = 50$  Hz,  $T = 1/f$

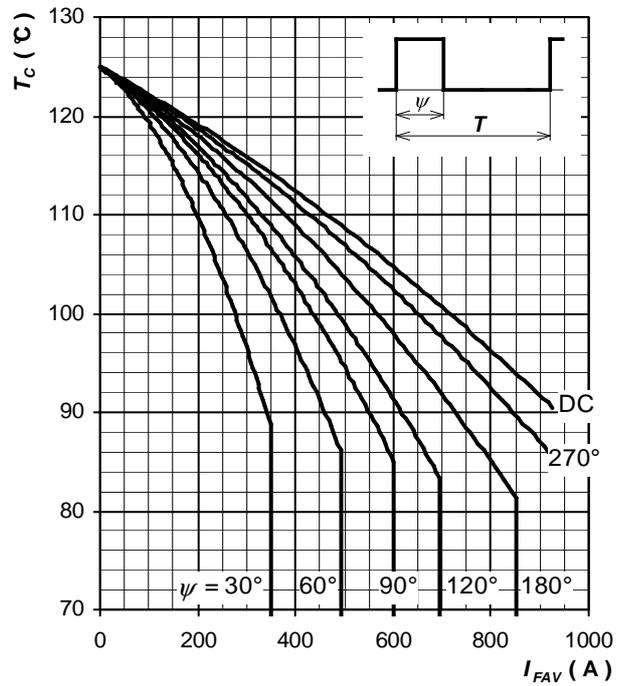


Fig. 9 Max. case temperature vs. aver. forward current, square waveform,  $f = 50$  Hz,  $T = 1/f$

Note 2: Figures number 6 ÷ 9 have been calculated without considering any forward and reverse recovery losses. They are valid for  $f = 50$  or  $60$  Hz operation.

**Forward Recovery Characteristics**

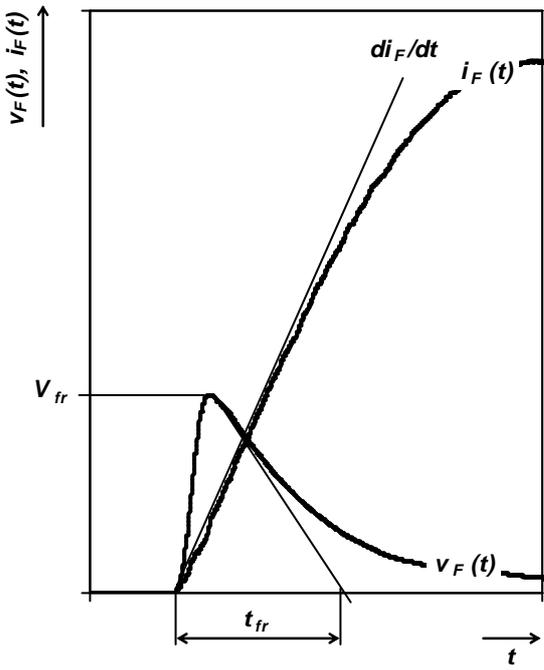


Fig. 10 Typical forward recovery voltage waveform when the diode is turned on with high  $di_F/dt$

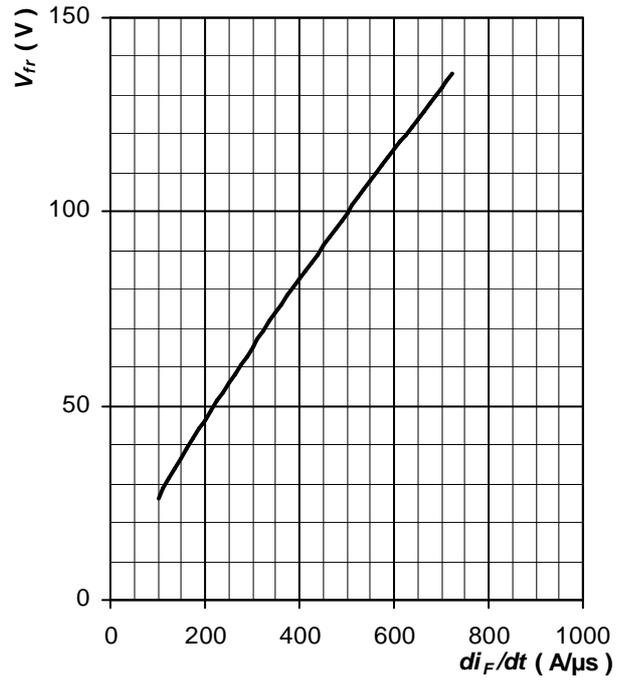


Fig. 11 Max. forward recovery voltage vs. rate of rise of forward current, trapezoid pulse,  $T_j = T_{jmax}$ ,  $t_{fr} \leq 10 \mu s$

**Reverse Recovery Characteristics**

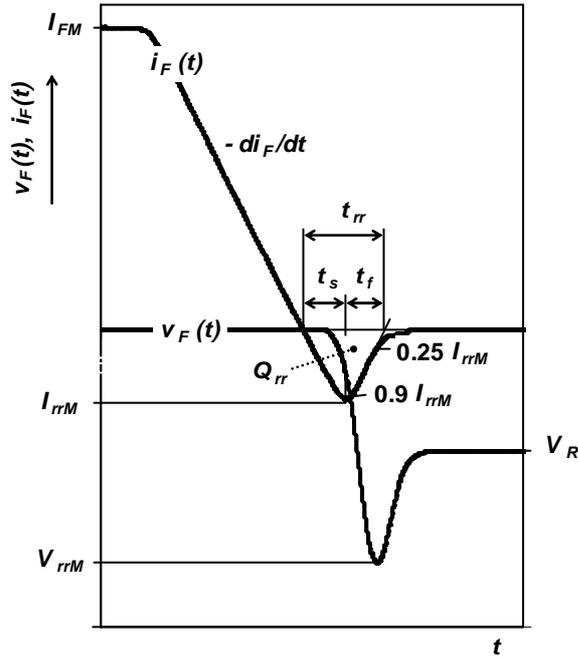


Fig. 12 Typical waveforms and definition of symbols at reverse recovery of a diode, inductive switching without RC snubber

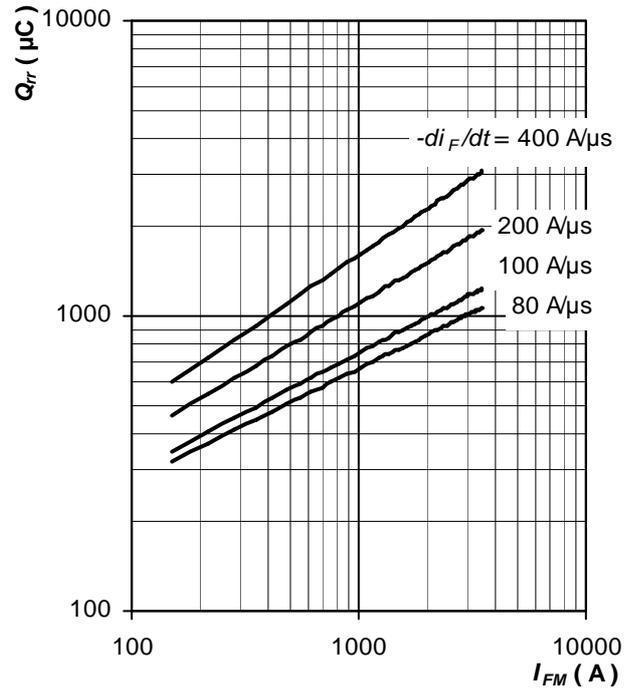


Fig. 13 Max. recovered charge vs. forward current, trapezoid pulse,  $T_j = T_{jmax}$

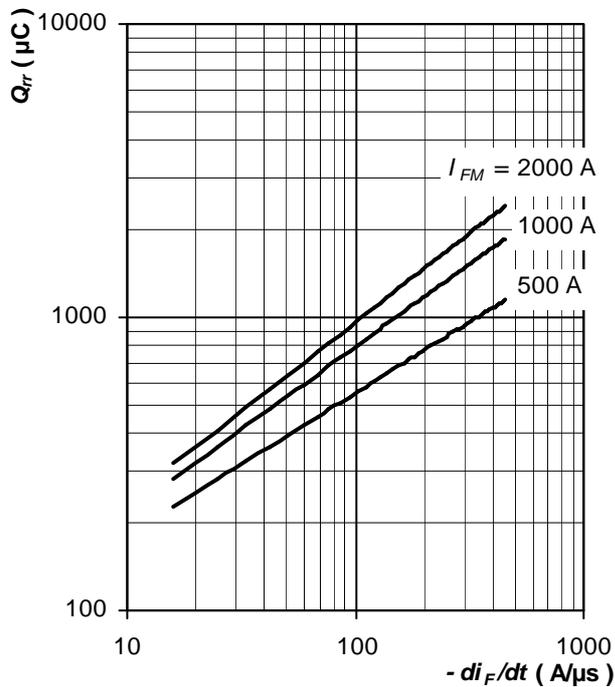


Fig. 14 Max. recovered charge vs. rate of fall of forward current, trapezoid pulse,  $T_j = T_{jmax}$

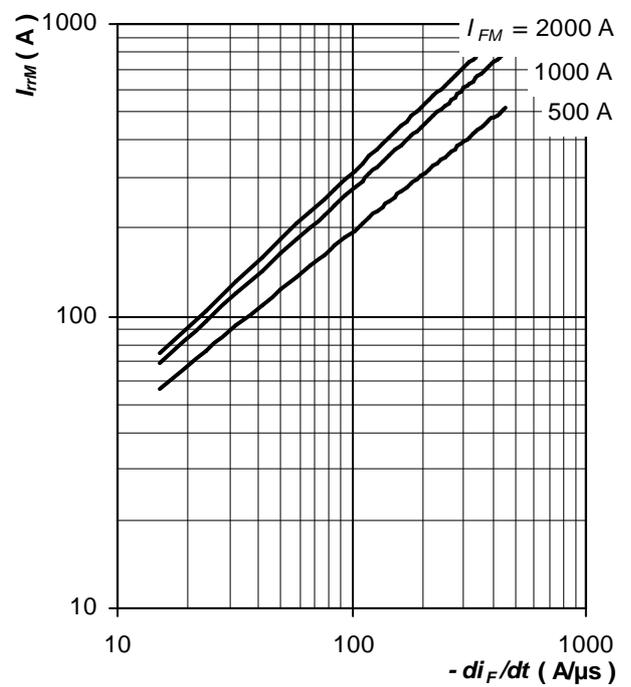


Fig. 15 Max. reverse recovery current vs. rate of fall of forward current, trapezoid pulse,  $T_j = T_{jmax}$