



5SDF 63X0400

High Frequency Welding Diode

Properties

- High forward current capability
- Low forward and reverse recovery losses
- High operational reliability

Applications

- Welding equipment
- High current application up to 10 kHz

Key Parameters

V_{RRM}	=	400	V
I_{FAVm}	=	6 266	A
I_{FSM}	=	44 000	A
V_{TO}	=	0.962	V
r_T	=	0.036	mΩ

Types

	V_{RRM}
5SDF 63X0400	400 V
Conditions:	$T_j = -40 \div 190\text{ °C}$, half sine waveform, $f = 50\text{ Hz}$

Mechanical Data

F_m	Mounting force	$22 \pm 2\text{ kN}$
m	Weight	0.14 kg
D_s	Surface creepage distance	4 mm
D_a	Air strike distance	4 mm

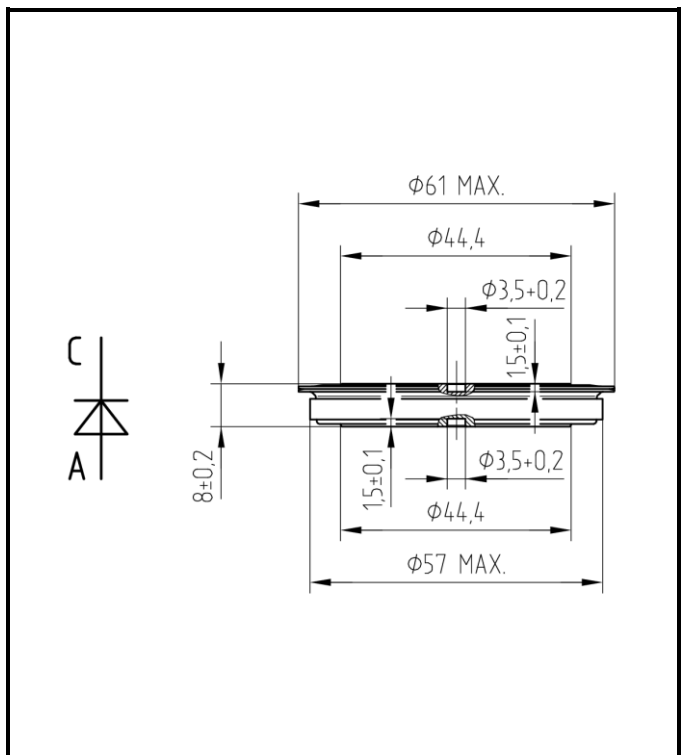


Fig. 1 Case



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Maximum Ratings			Maximum Limits	Unit
V_{RRM}	Repetitive peak reverse voltage $T_j = -40 \div 190\text{ }^{\circ}\text{C}$		400	V
I_{FAVm}	Average forward current	$T_c = 85\text{ }^{\circ}\text{C}$	6 266	A
		$T_c = 110\text{ }^{\circ}\text{C}$	5 120	
I_{FRMS}	RMS forward current	$T_c = 85\text{ }^{\circ}\text{C}$	9 843	A
		$T_c = 110\text{ }^{\circ}\text{C}$	8 042	
I_{RRM}	Repetitive reverse current $V_R = V_{RRM}$		200	mA
I_{FSM}	Non repetitive peak surge current $V_R = 0\text{ V}$, half sine pulse	$t_p = 8.3\text{ ms}$	47 000	A
		$t_p = 10\text{ ms}$	44 000	
I^2t	Limiting load integral $V_R = 0\text{ V}$, half sine pulse	$t_p = 8.3\text{ ms}$	9 168 000	A^2s
		$t_p = 10\text{ ms}$	9 680 000	
$T_{jmin} - T_{jmax}$	Operating temperature range		- 40 $\div$ 190	$^{\circ}\text{C}$
$T_{stgmin} - T_{stgmax}$	Storage temperature range		- 40 $\div$ 190	

Unless otherwise specified $T_j = 190\text{ }^{\circ}\text{C}$

Characteristics		Value			Unit
		min	typ	max	
V_{T0}	Threshold voltage			0.962	V
r_T	Forward slope resistance $I_{F1} = 5\text{ }000\text{ A}$, $I_{F2} = 15\text{ }000\text{ A}$			0.036	m Ω
V_{FM}	Maximum forward voltage $I_{FM} = 5\text{ }000\text{ A}$			1.140	V
Q_{rr}	Recovered charge $I_{FM} = 2\text{ }000\text{ A}$, $di/dt = -30\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$			180	μC

Unless otherwise specified $T_j = 190\text{ }^{\circ}\text{C}$

Thermal Parameters			Value	Unit
R_{thjc}	Thermal resistance junction to case	double side cooling	10	K/kW
		single side cooling	20	
R_{thch}	Thermal resistance case to heatsink	double side cooling	5	K/kW
		single side cooling	10	

Transient Thermal Impedance

Analytical function for transient thermal impedance

$$Z_{thjc} = \sum_{i=1}^4 R_i (1 - \exp(-t / \tau_i))$$

Conditions:

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

Correction for periodic waveforms

180° sine:	1.0 K/kW
180° rectangular:	0.9 K/kW
120° rectangular:	1.4 K/kW
60° rectangular:	2.3 K/kW

i	1	2	3	4
τ_i (s)	0.2900	0.1400	0.0270	0.0011
R_i (K/kW)	2.3300	4.8000	2.0000	0.8700

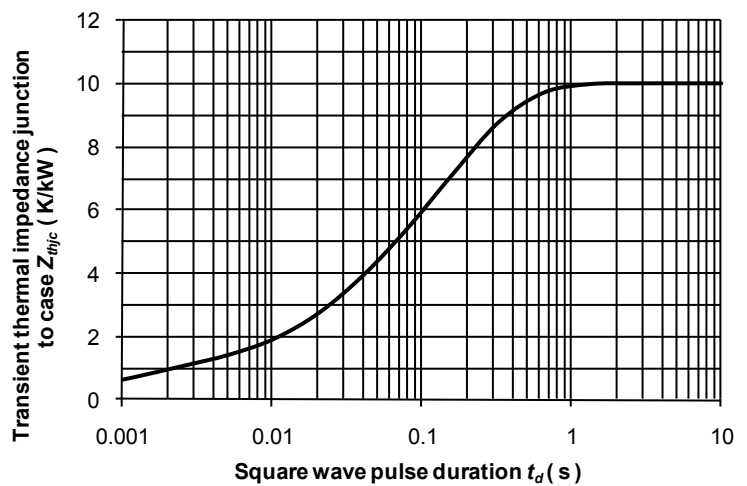


Fig. 2 Dependence transient thermal impedance junction to case on square pulse

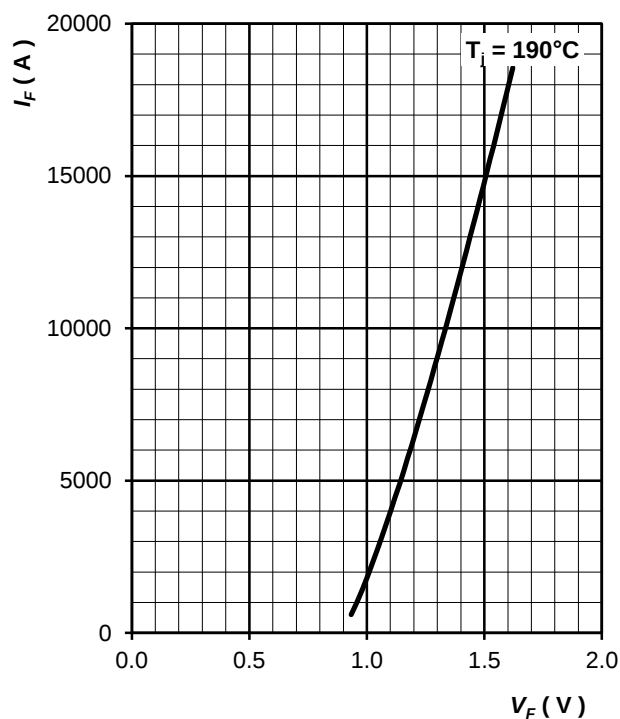


Fig. 3 Maximum forward voltage drop characteristics

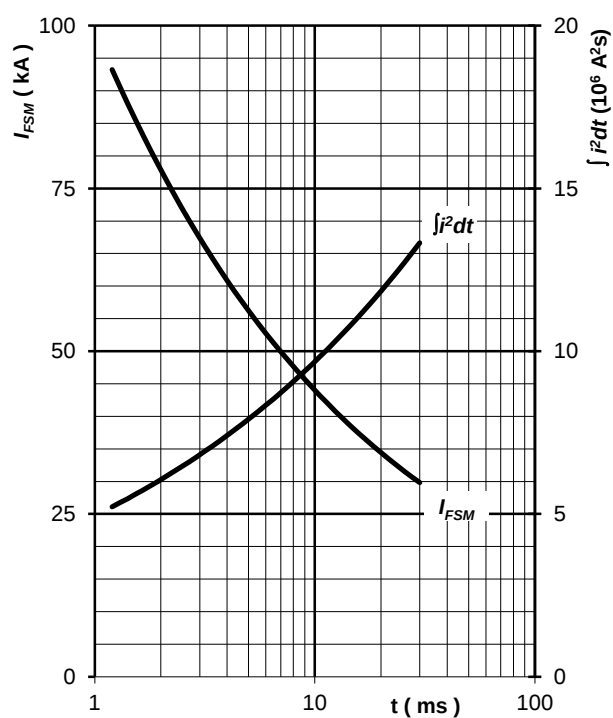


Fig. 4 Surge forward current vs. pulse length, half sine wave, single pulse, $V_R = 0 \text{ V}$, $T_j = T_{jmax}$

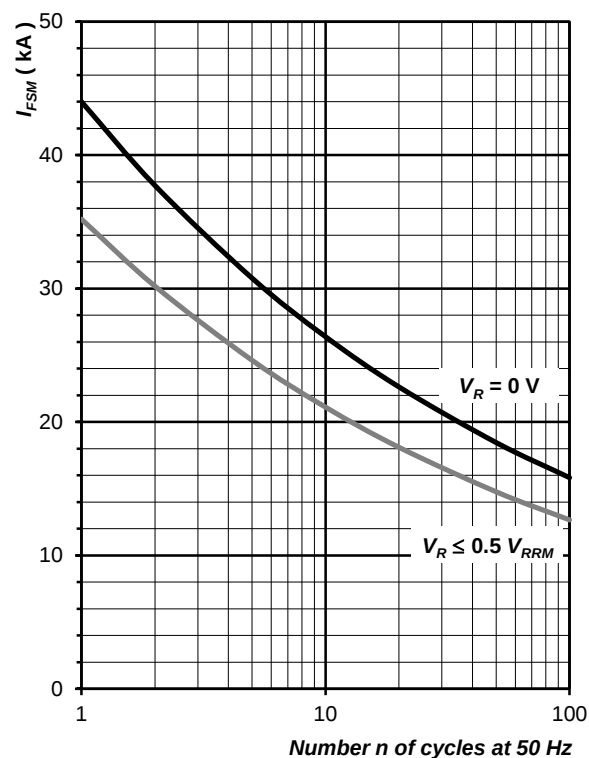


Fig. 5 Surge forward current vs. number of pulses, half sine wave, $T_j = T_{jmax}$

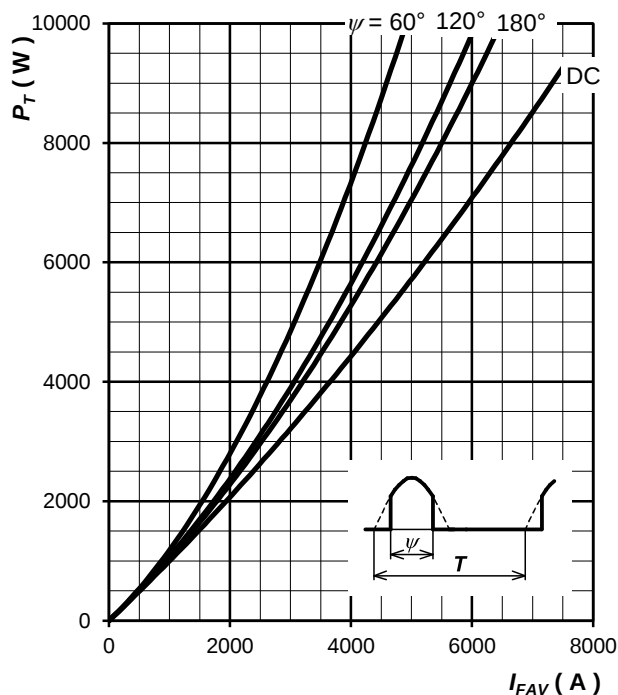


Fig. 6 Forward power loss vs. average forward current, sine waveform, $f = 50$ Hz, $T = 1/f$

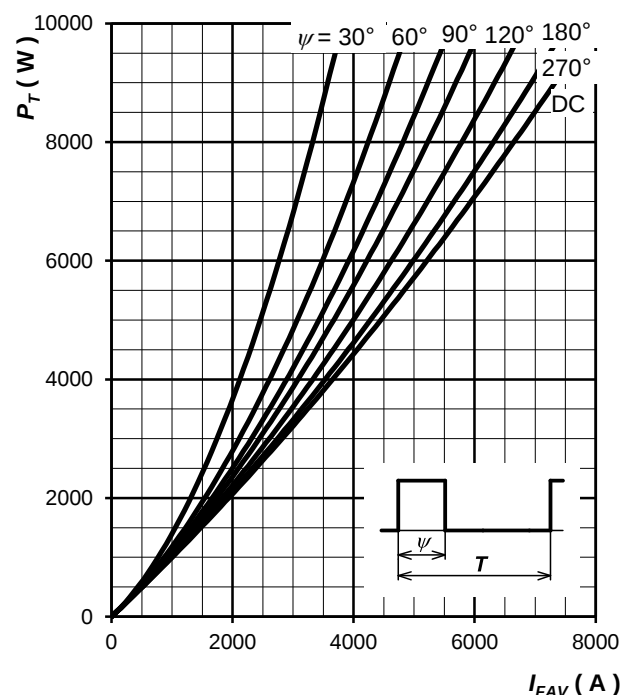


Fig. 7 Forward power loss vs. average forward current, square waveform, $f = 50$ Hz, $T = 1/f$

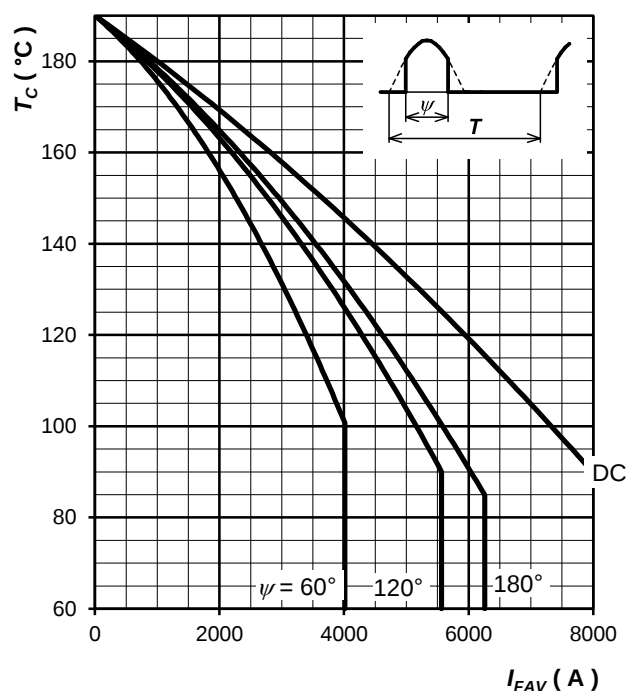


Fig. 8 Max. case temperature vs. aver. forward current, sine waveform, $f = 50$ Hz, $T = 1/f$

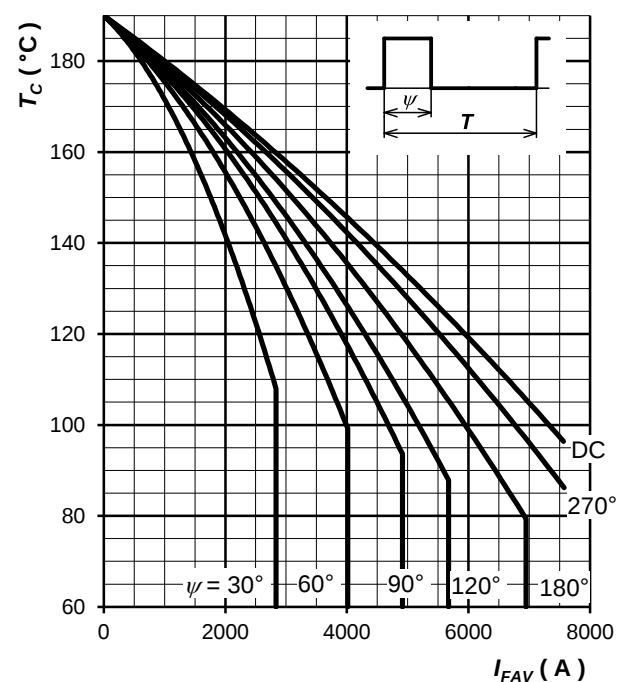


Fig. 9 Max. case temperature vs. aver. forward current, square waveform, $f = 50$ Hz, $T = 1/f$

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.

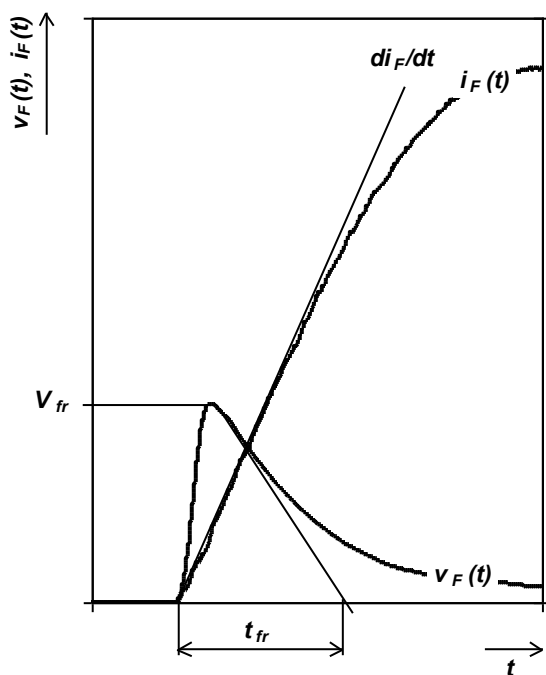


Fig. 10 Typical forward recovery voltage waveform when the diode is turned on with high di_F/dt

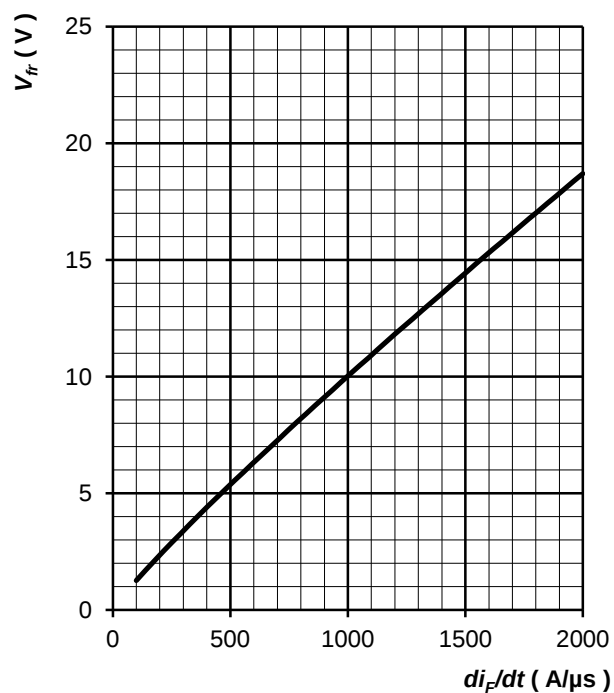


Fig. 11 Max. forward recovery voltage vs. rate of rise forward current, trapezoid pulse, $T_j = T_{jmax}$, $t_{fr} \leq 10 \mu s$

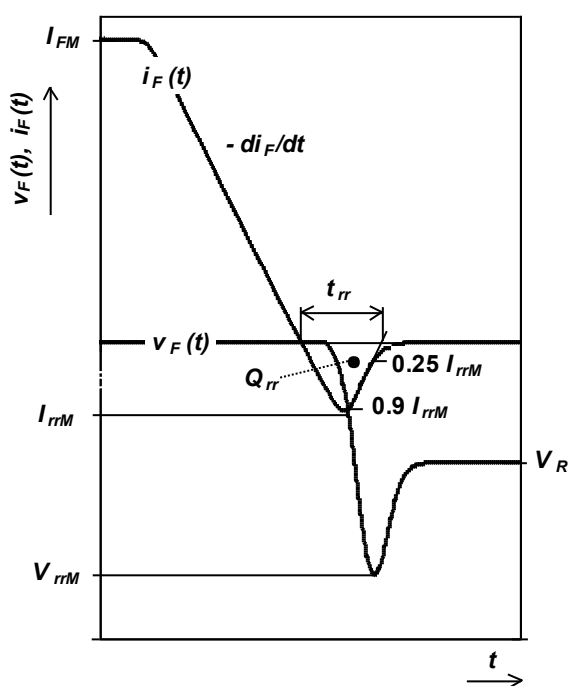


Fig. 12 Definition of reverse recovery parameters

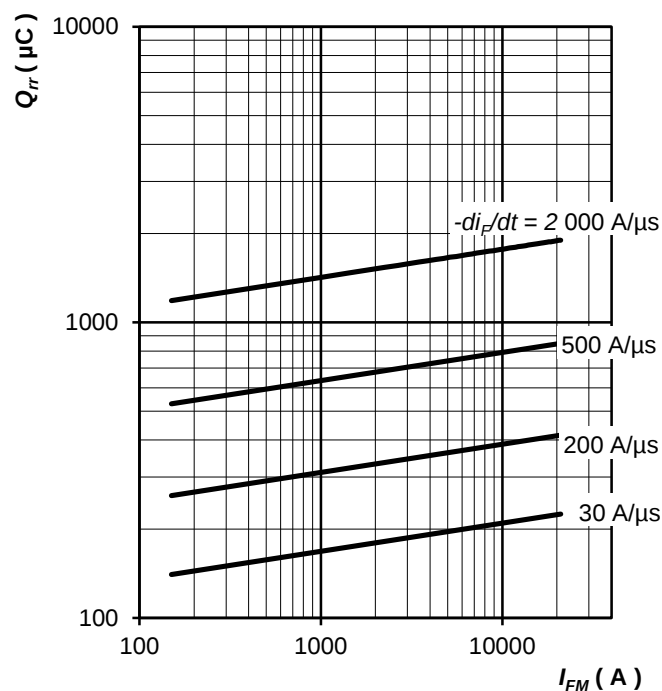


Fig. 13 Max. recovered charge vs. forward current, trapezoid pulse, $T_j = T_{jmax}$

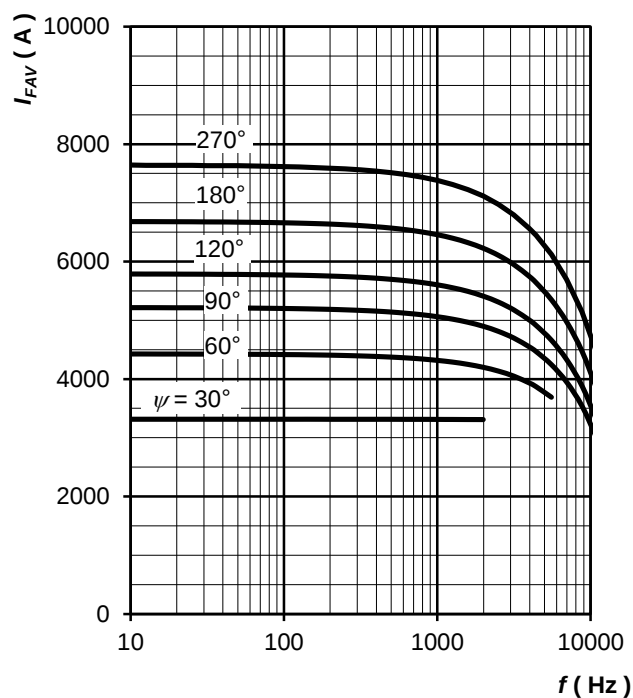


Fig. 14 Average forward current vs. frequency, trapezoid waveform, $T_C = 85\text{ }^{\circ}\text{C}$, $di_F/dt = \pm 2\,000\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$

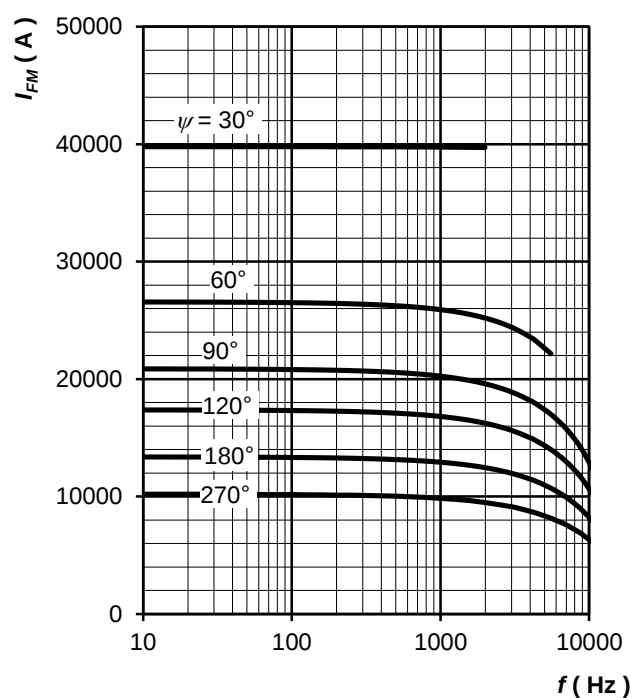


Fig. 15 Maximum forward current vs. frequency, trapezoid waveform, $T_C = 85\text{ }^{\circ}\text{C}$, $di_F/dt = \pm 2\,000\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$

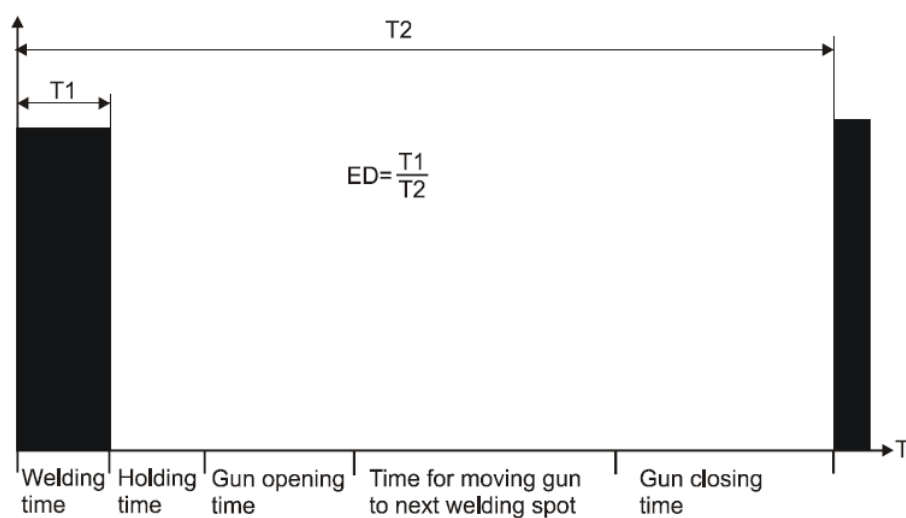


Fig. 16 Definition of ED for typical welding sequence

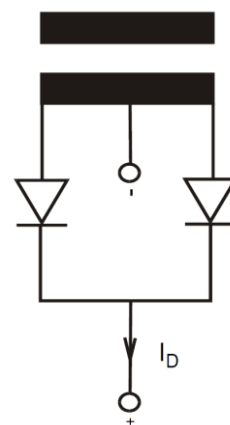


Fig. 17 Definition of I_D for single-phase centre tap

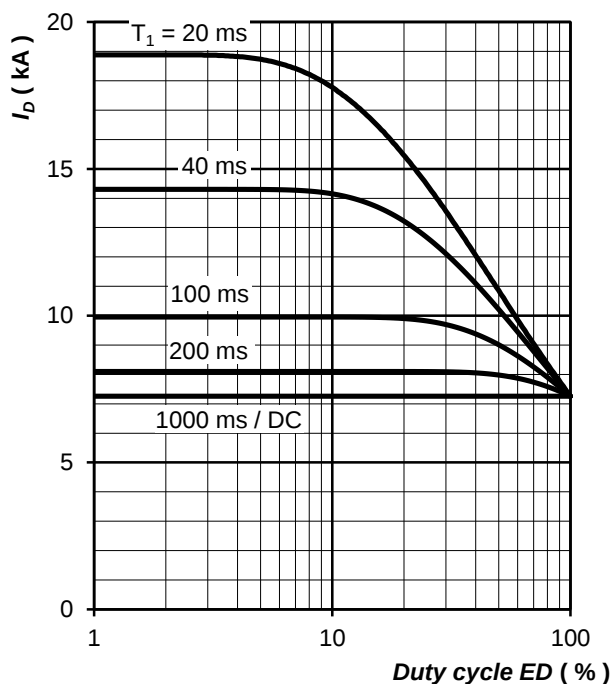


Fig. 18 Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
 $f = 10 \text{ kHz}$, square wave, $\Delta T_j = 80 \text{ }^{\circ}\text{C}$

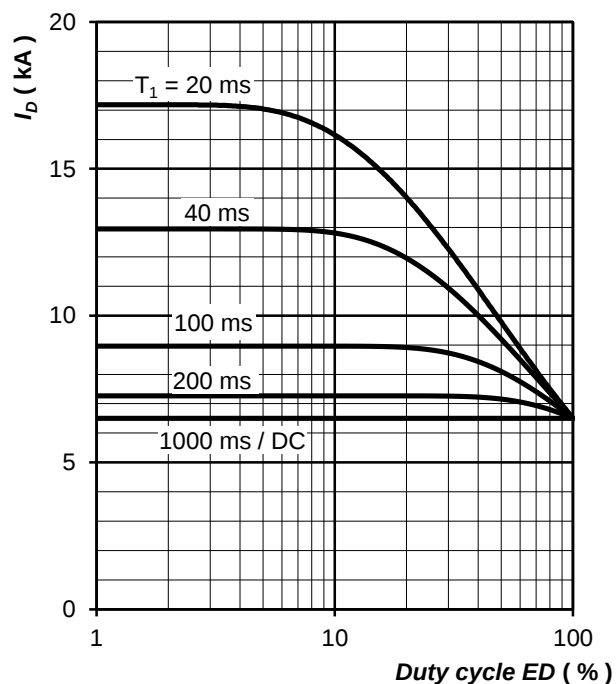


Fig. 19 Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
 $f = 10 \text{ kHz}$, square wave, $\Delta T_j = 70 \text{ }^{\circ}\text{C}$

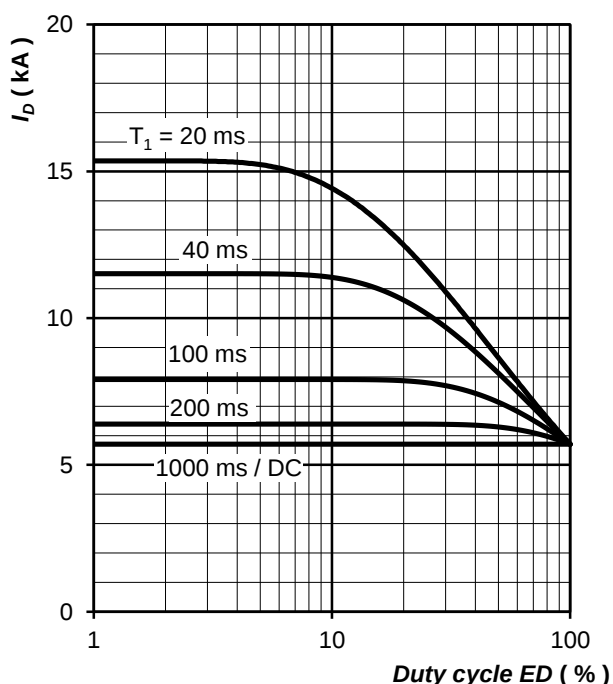


Fig. 20 Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
 $f = 10 \text{ kHz}$, square wave, $\Delta T_j = 60 \text{ }^{\circ}\text{C}$

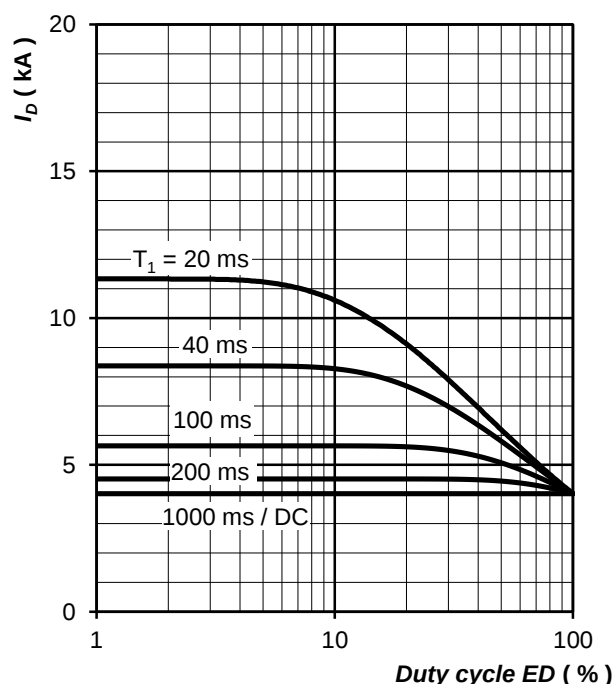


Fig. 21 Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
 $f = 10 \text{ kHz}$, square wave, $\Delta T_j = 40 \text{ }^{\circ}\text{C}$

Notes: