5SDD 0135Z0401

Housingless Welding Diode

Properties

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

Key Parameters

V_{RRM}	=	400	V
I_{FAVm}	=	13 526	A
I_{FSM}	=	85 000	A
V_{TO}	=	0.758	V
r_T	=	0.021	mΩ

Applications

- Welding equipment
- High current application up to 2 kHz

Types

	V_{RRM}
5SDD 0135Z0401	**400 V**
Conditions:	*T_j = -40 ÷ 180 °C, half sine waveform, f = 50 Hz*

Mechanical Data

F_m	**Mounting force**	35 ÷ 70 kN
m	**Weight**	0.14 kg
D_S	**Surface creepage distance**	2 mm
D_a	**Air strike distance**	2 mm

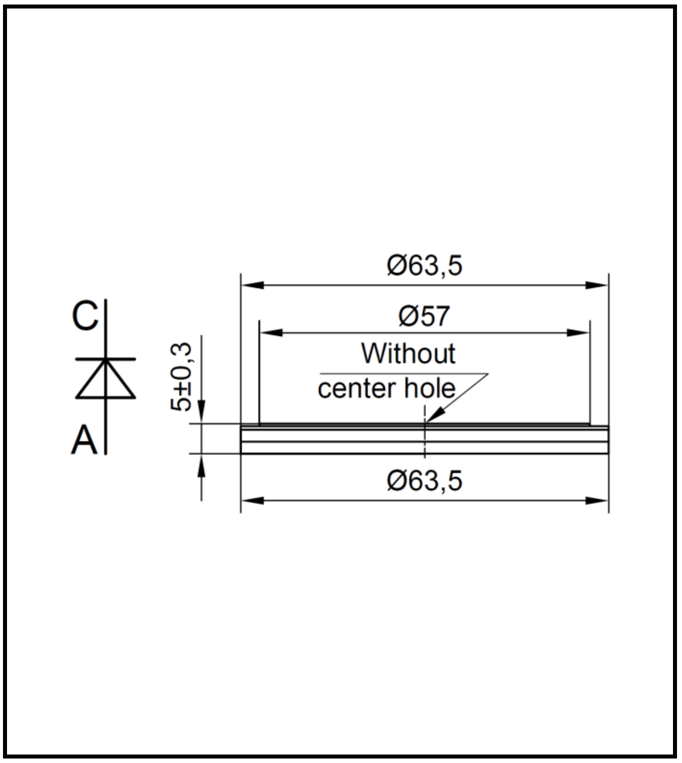

Fig. 1 Case

ABB s.r.o.
Novodvorska 1768/138a, 142 21 Praha 4, Czech Republic
tel.: +420 261 306 250, http://www.abb.com/semiconductors

Maximum Ratings			***Maximum Limits***	***Unit***
V_{RRM}	**Repetitive peak reverse voltage** *T_j = -40 ÷ 180 °C*		**400**	**V**
I_{FAVm}	***Average forward current***	*T_c = 85 °C*	**13 526**	**A**
		T_c = 110 °C	**10 967**	
I_{FRMS}	***RMS forward current***	*T_c = 85 °C*	**21 247**	**A**
		T_c = 110 °C	**17 227**	
I_{RRM}	***Repetitive reverse current*** *$V_R = V_{RRM}$*		**75**	**mA**
I_{FSM}	**Non repetitive peak surge current** *V_R = 0 V, half sine pulse*	*t_p = 8.3 ms*	**91 000**	**A**
		t_p = 10 ms	**85 000**	
I^2t	**Limiting load integral** *V_R = 0 V, half sine pulse*	*t_p = 8.3 ms*	**34 200 000**	**A^2s**
		t_p = 10 ms	**36 100 000**	
$T_{jmin} – T_{jmax}$	***Operating temperature range***		**- 40 ÷ 180**	**°C**
T_{stgmin} - T_{stgmax}	***Storage temperature range***		**- 40 ÷ 180**	

Unless otherwise specified T_j = 180 °C

Characteristics			***Value***			***Unit***
			min	***typ***	***max***	
V_{T0}	**Threshold voltage**				**0.758**	**V**
r_T	**Forward slope resistance** *I_{F1} = 10 000 A, I_{F2} = 30 000 A*				**0.021**	**mΩ**
V_{FM}	**Maximum forward voltage**	*I_{FM} = 8 000 A*			**0.920**	**V**
		I_{FM} = 10 000 A			**0.970**	
Q_{rr}	**Recovered charge** *I_{FM} = 1 000 A, di/dt = -30 A/µs, V_R = 100 V*			**600**		**µC**

Unless otherwise specified T_j = 180 °C

Thermal Parameters			***Value***	***Unit***
R_{thjc}	**Thermal resistance junction to case**	*double side cooling*	**3.9**	**K/kW**
		anode side cooling	**5.2**	
		cathode side cooling	**15.1**	
R_{thch}	**Thermal resistance case to heatsink**	*double side cooling*	**2.6**	**K/kW**
		anode side cooling	**4.7**	
		cathode side cooling	**5.8**	

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 = 35 ÷ 70 kN, Double side cooled

Correction for periodic waveforms

180°	**sine:**	**0.9**	**K/kW**
120°	**sine:**	**1.2**	**K/kW**
60°	**sine:**	**2.2**	**K/kW**
180°	**rectangular:**	**0.8**	**K/kW**
120°	**rectangular:**	**1.2**	**K/kW**
60°	**rectangular:**	**2.2**	**K/kW**

i	**1**	**2**	**3**	**4**
τ_i **(s)**	**0.0454**	**0.0255**	**0.0041**	**0.0006**
R_i **(K/kW)**	**2.6480**	**0.8700**	**0.2200**	**0.1500**

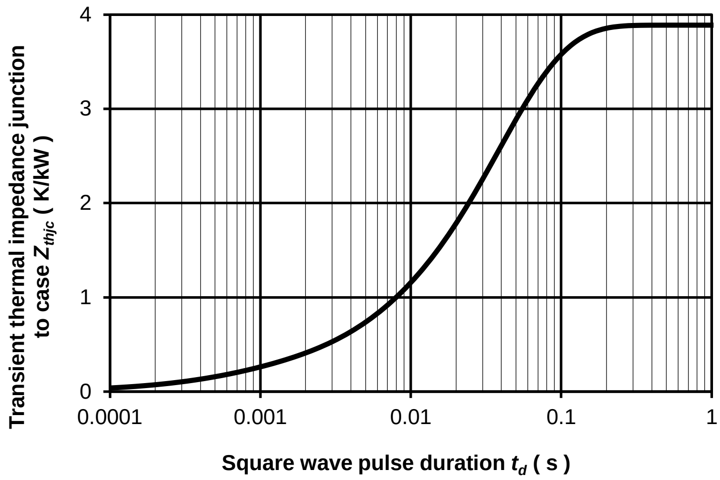

Fig. 2 Dependence transient thermal impedance junction to case on square pulse

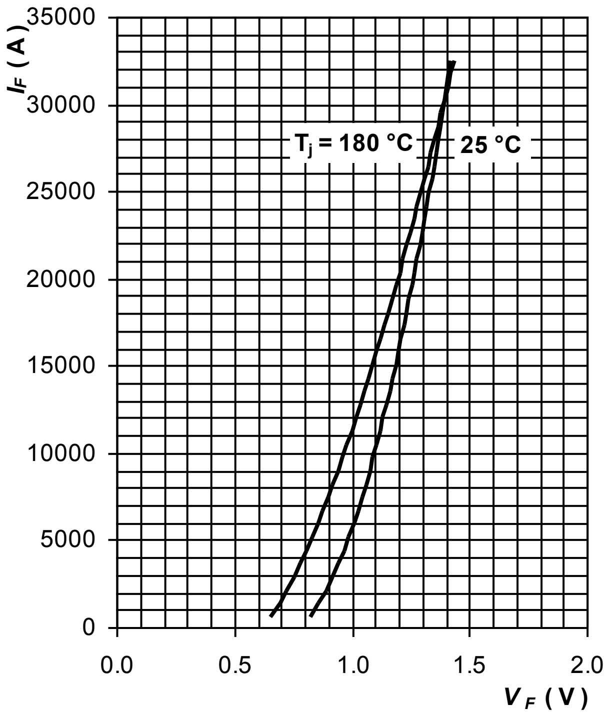

Fig. 3 Maximum forward voltage drop characteristics

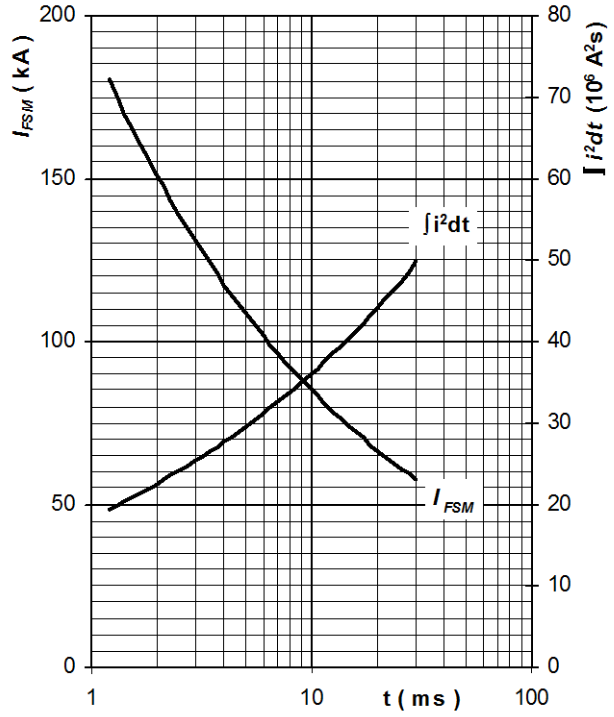

Fig. 4 Surge forward current vs. pulse length, half sine wave, single pulse, V_R = 0 V, T_j = T_{jmax}

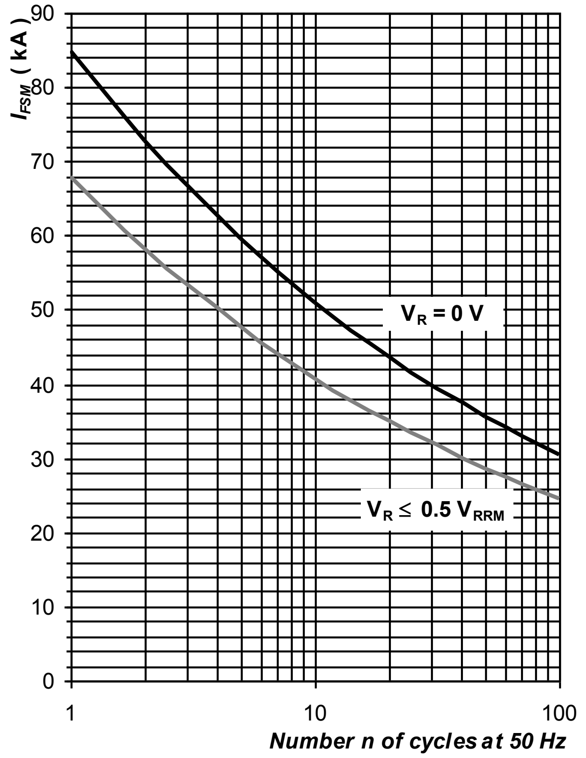

Fig. 5 Surge forward current vs. number of pulses, half sine wave, T_j = T_{jmax}

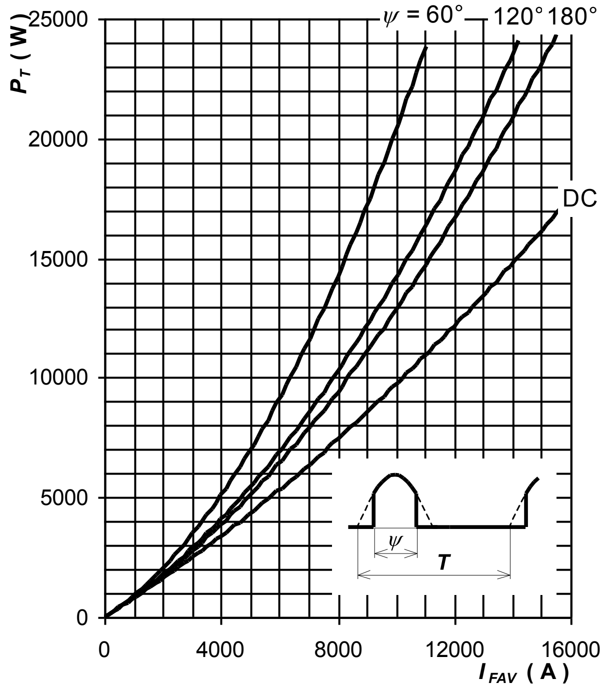

Fig. 6 Forward power loss vs. average forward current, sine waveform, f = 50 Hz, T = 1/f

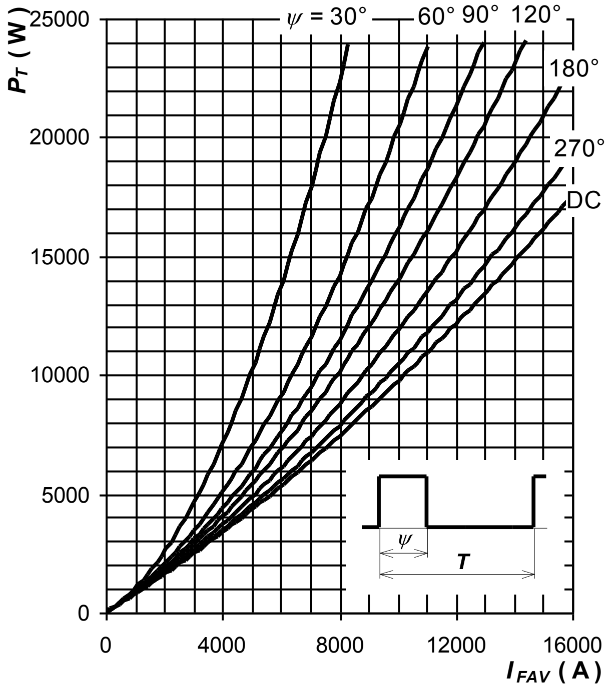

Fig. 7 Forward power loss vs. average forward current, square waveform, f = 50 Hz, T = 1/f

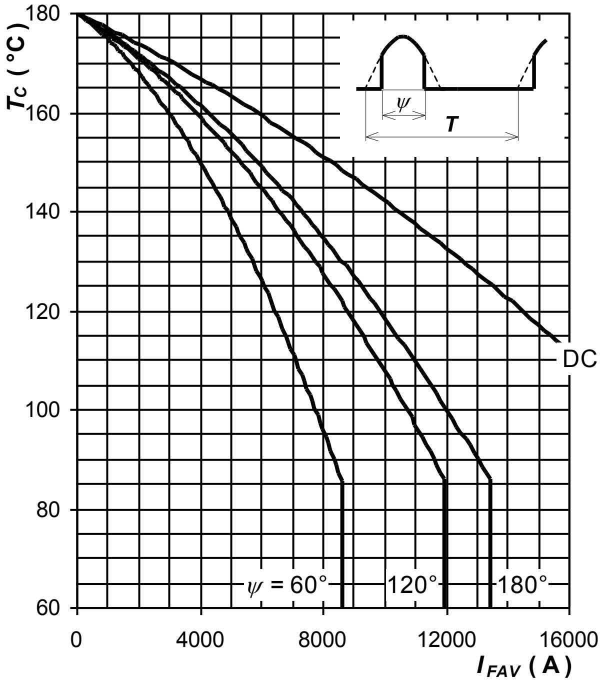

Fig. 8 Max. case temperature vs. aver. forward current, sine waveform, f = 50 Hz, T = 1/f

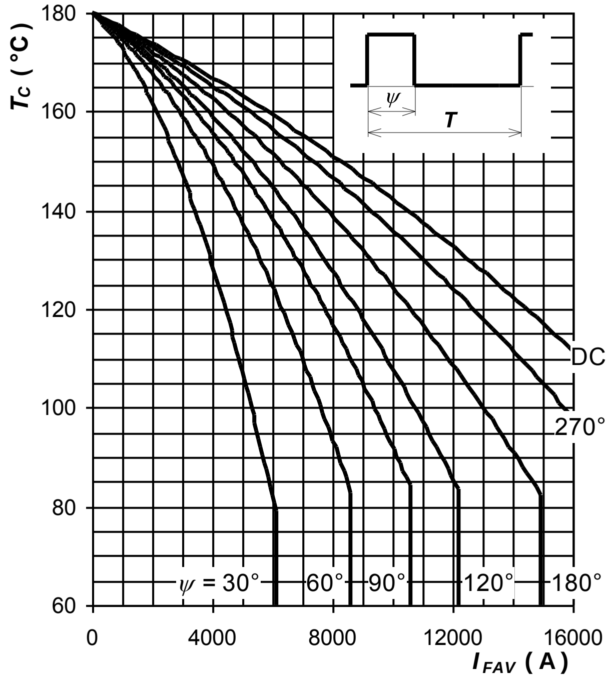

Fig. 9 Max.case temperature vs. aver. forward current, square waveform, f = 50 Hz, T = 1/f

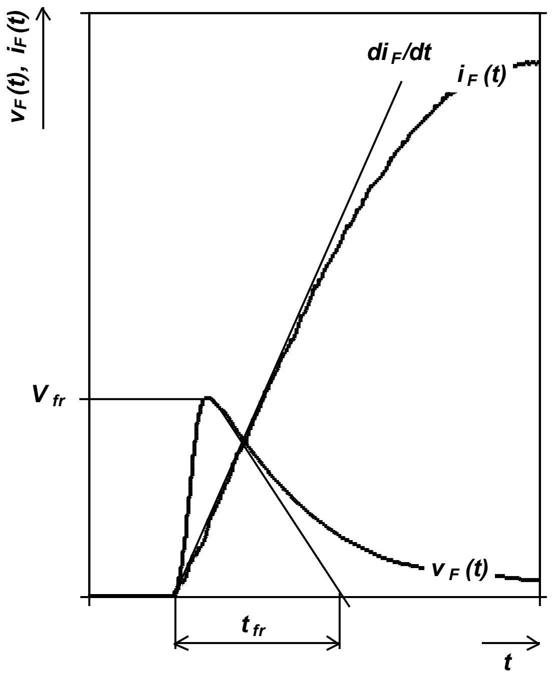

Fig. 10 Typical forward recovery voltage waveform when the diode is turned on with high di_F/dt

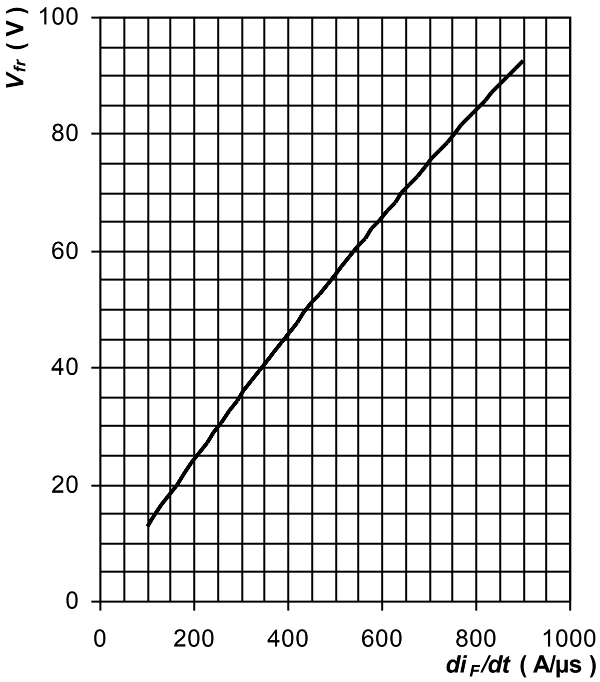

Fig. 11 Max. forward recovery voltage vs. rate of rise forward current, trapezoid pulse, $T_j = T_{jmax}$, $t_{fr} \leq 10$ µs

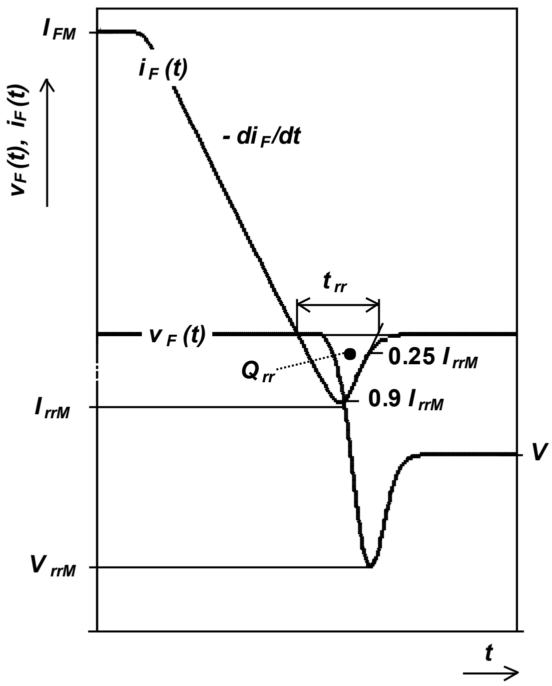

Fig. 12 Definition of reverse recovery parameters

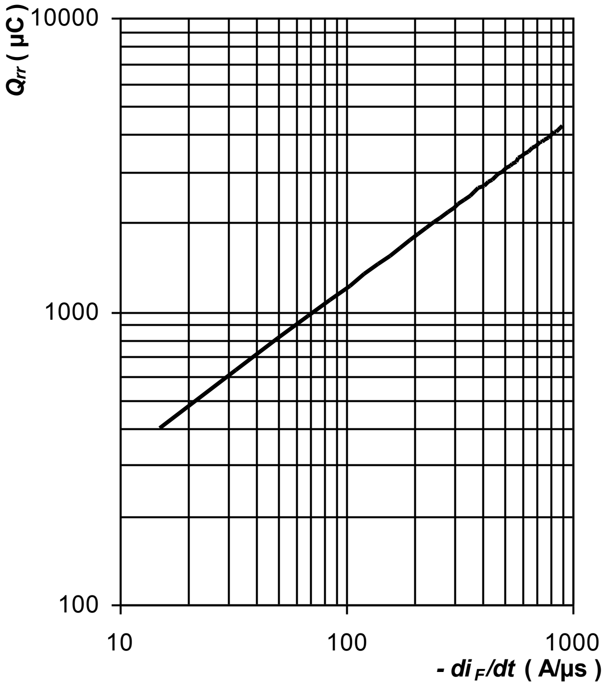

Fig. 13 Max. recovered charge vs. rate of fall forward current, trapezoid pulse, $I_{FM} = 2\ 000$ A, $V_R = 100$ V, $T_j = T_{jmax}$

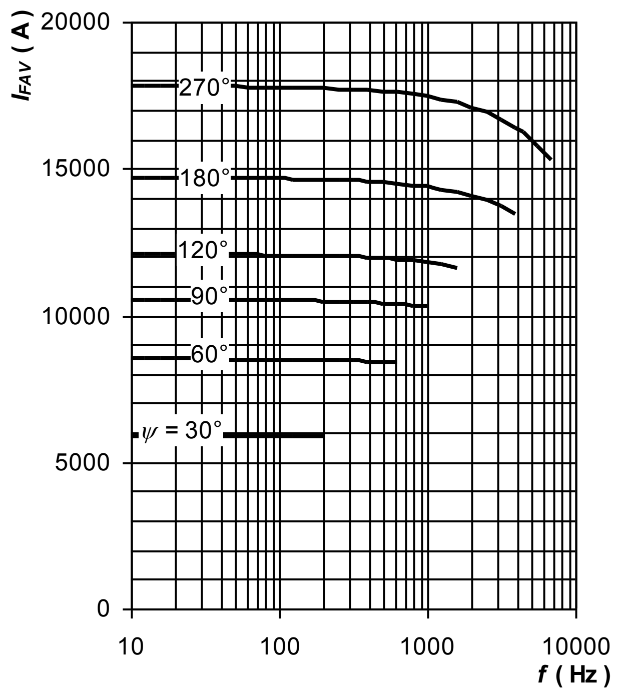

Fig. 14 Average forward current vs. frequency, trapezoid waveform, T_C = 85 °C, $di_F/dt = \pm 500$ A/µs, V_R = 100 V

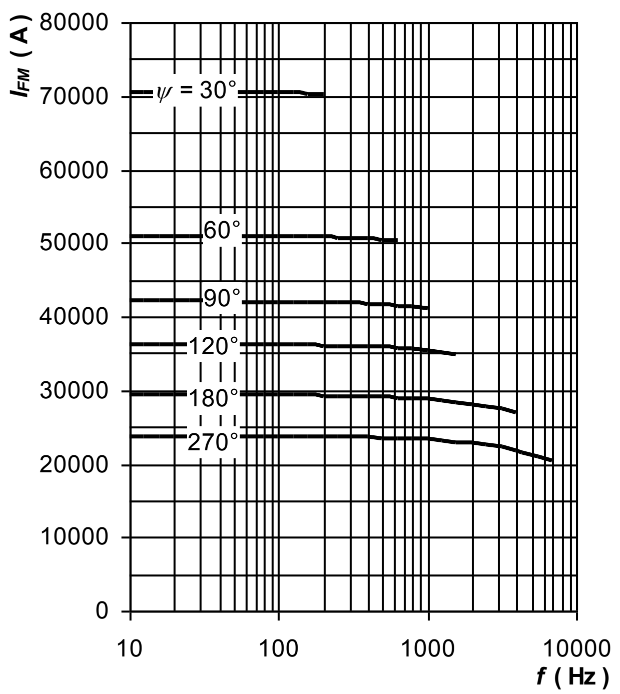

Fig. 15 Maximum forward current vs. frequency, trapezoid waveform, T_C = 85 °C, $di_F/dt = \pm 500$ A/µs, V_R = 100 V

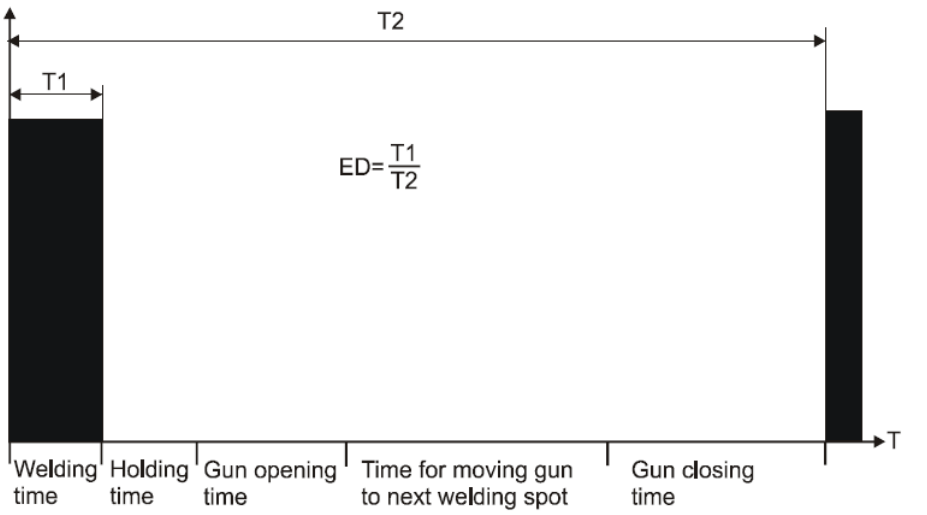

Fig. 16 Definition of ED for typical welding sequence

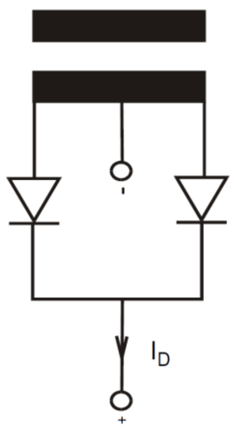

Fig. 17 Definition of I_D for single-phase centre tap

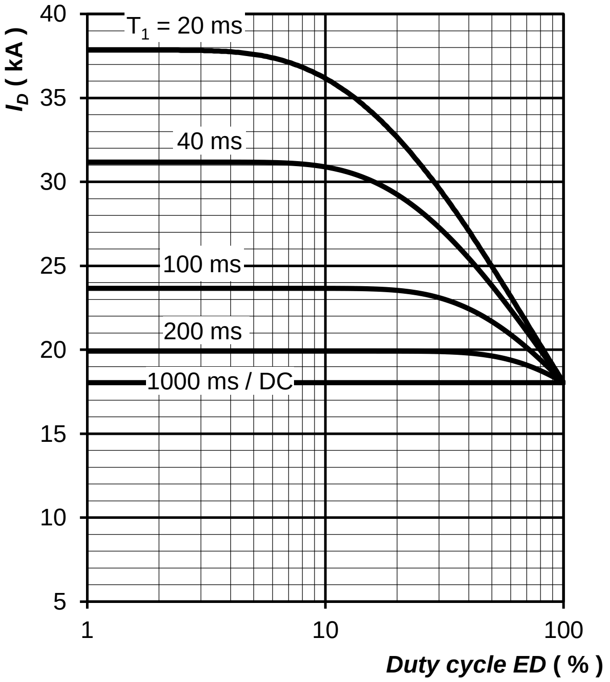

Fig. 18 *Current load capacity, cont., DC output welding current with single-phase centre tap vs. duty cycle*
f = 1000 Hz, square wave, ΔT_j = 80 °C

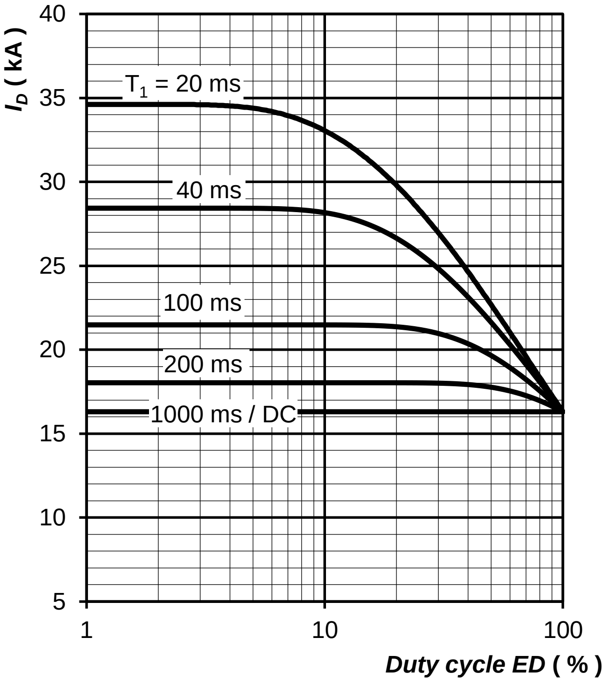

Fig. 19 *Current load capacity, cont., DC output welding current with single-phase centre tap vs. duty cycle*
f = 1000 Hz, square wave, ΔT_j = 70 °C

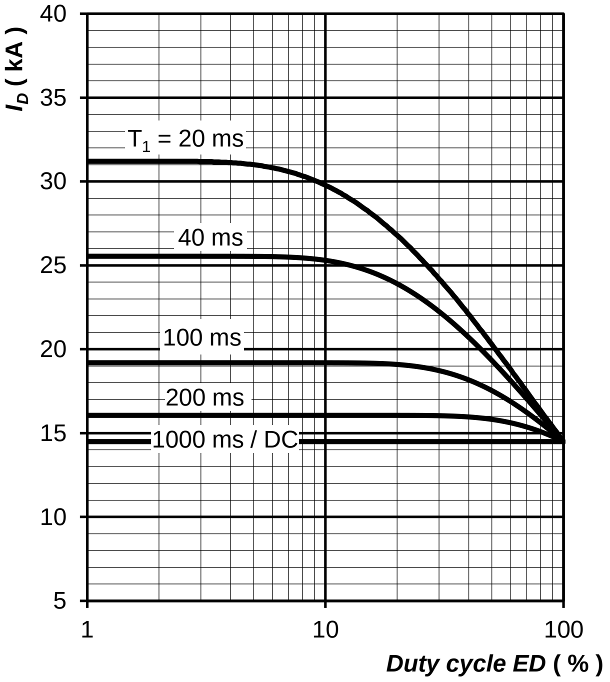

Fig. 20 *Current load capacity, cont., DC output welding current with single-phase centre tap vs. duty cycle*
f = 1000 Hz, square wave, ΔT_j = 60 °C

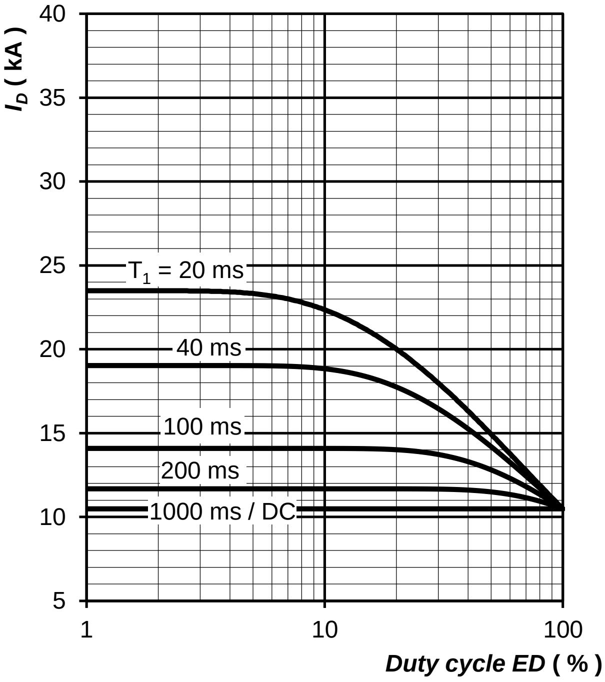

Fig. 21 *Current load capacity, cont., DC output welding current with single-phase centre tap vs. duty cycle*
f = 1000 Hz, square wave, ΔT_j = 40 °C

Notes: