5SDD 92Z0401

Housingless Welding Diode

Properties

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

Applications

- Welding equipment
- High current application up to 2000 Hz

Key Parameters

V_{RRM}	=	400	V
I_{FAVm}	=	9 244	A
I_{FSM}	=	60 000	A
V_{TO}	=	0.780	V
r_T	=	0.031	mΩ

Types

	V_{RRM}
5SDD 92Z0401	**400 V**
Conditions:	*T_j = -40 ÷ 180 °C, half sine waveform, f = 50 Hz*

Mechanical Data

F_m	**Mounting force**	22 ÷ 50	kN
m	**Weight**	0.10	kg
D_S	**Surface creepage distance**	2	mm
D_a	**Air strike distance**	2	mm

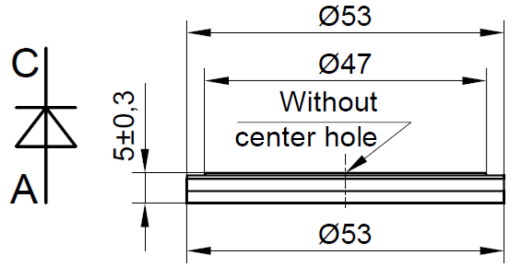

Fig. 1 Case

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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*	**9 244**	**A**
		T_c = 110 °C	**7 489**	
I_{FRMS}	***RMS forward current***	*T_c = 85 °C*	**14 520**	**A**
		T_c = 110 °C	**11 763**	
I_{RRM}	***Repetitive reverse current*** *$V_R = V_{RRM}$*		**50**	**mA**
I_{FSM}	**Non repetitive peak surge current** *V_R = 0 V, half sine pulse*	*t_p = 8.3 ms*	**64 000**	**A**
		t_p = 10 ms	**60 000**	
I^2t	**Limiting load integral** *V_R = 0 V, half sine pulse*	*t_p = 8.3 ms*	**17 049 000**	**A^2s**
		t_p = 10 ms	**18 000 000**	
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**				**0.780**	**V**
r_T	**Forward slope resistance** *I_{F1} = 7 000 A, I_{F2} = 21 000 A*				**0.031**	**mΩ**
V_{FM}	**Maximum forward voltage**	*I_{FM} = 5 000 A*			**0.920**	**V**
		I_{FM} = 8 000 A			**1.030**	
Q_{rr}	**Recovered charge** *I_{FM} = 1 000 A, di/dt = -30 A/µs, V_R = 50 V*			**400**		**µC**

Unless otherwise specified T_j = 180 °C

Thermal Parameters			*Value*	*Unit*
R_{thjc}	**Thermal resistance junction to case**	*double side cooling*	**5.6**	**K/kW**
		anode side cooling	**7.4**	
		cathode side cooling	**23.5**	
R_{thch}	**Thermal resistance case to heatsink**	*double side cooling*	**3.6**	**K/kW**
		anode side cooling	**6.7**	
		cathode side cooling	**8.0**	

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 ± 2 kN, Double side cooled

Correction for periodic waveforms

180°	**sine:**	**1.3**	**K/kW**
120°	**sine:**	**1.6**	**K/kW**
60°	**sine:**	**2.7**	**K/kW**
180°	**rectangular:**	**1.1**	**K/kW**
120°	**rectangular:**	**1.8**	**K/kW**
60°	**rectangular:**	**3.0**	**K/kW**

i	1	2	3	4
τ_i (s)	0.0461	0.0241	0.0045	0.0006
R_i(K/kW)	3.8860	1.1830	0.3610	0.1700

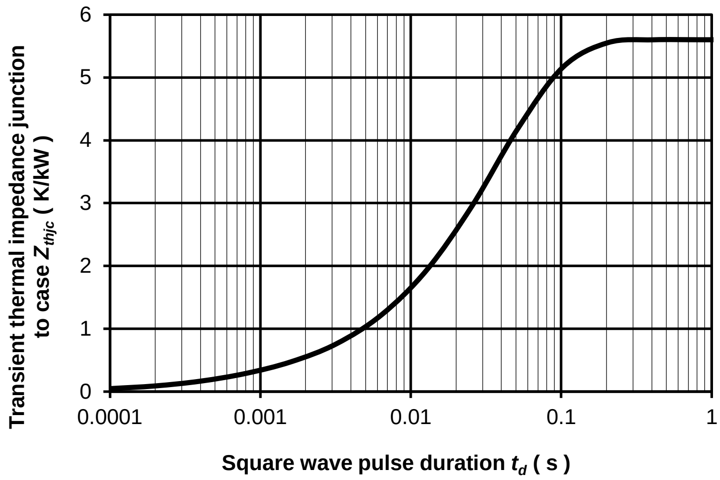


Fig. 2 Dependence transient thermal impedance junction to case on square pulse

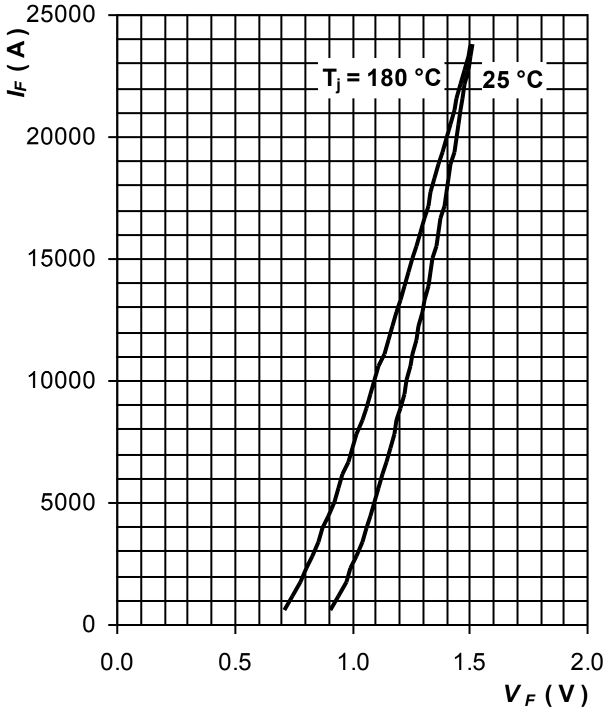


Fig. 3 Maximum forward voltage drop characteristics

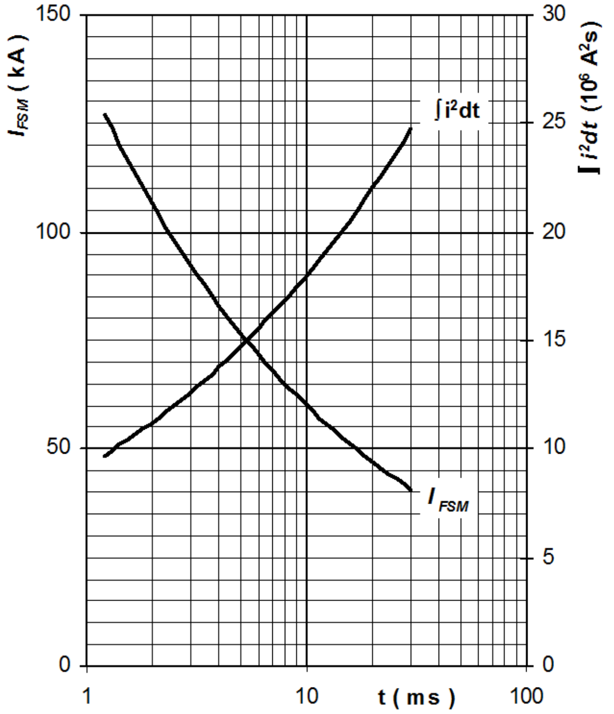


Fig. 4 Surge forward current vs. pulse length, half sine wave, single pulse, V_R = 0 V, T_j = T_{jmax}

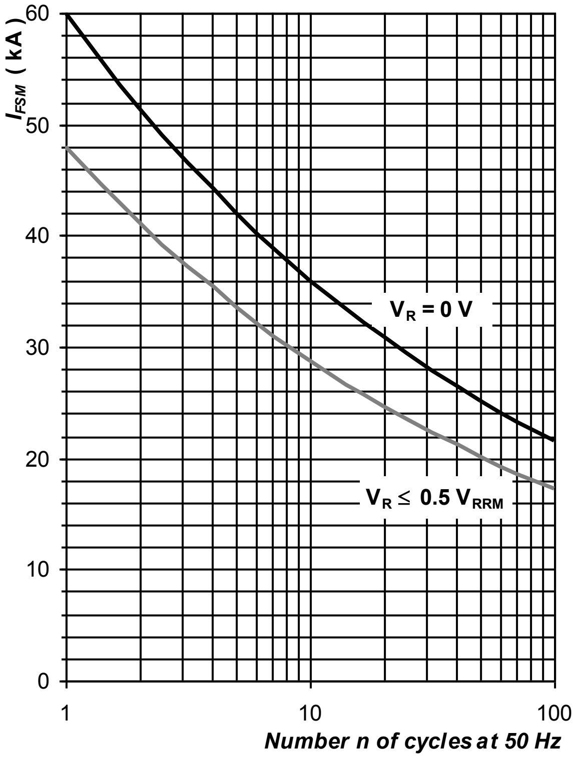


Fig. 5 Surge forward current vs. number of pulses, half sine wave, T_j = T_{jmax}

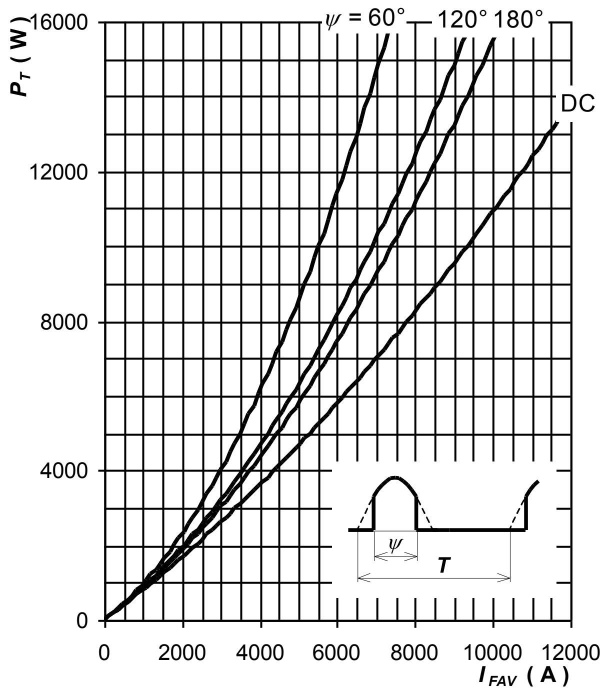


Fig. 6 Forward power loss vs. average forward current, sine waveform, f = 50 Hz, T = 1/f

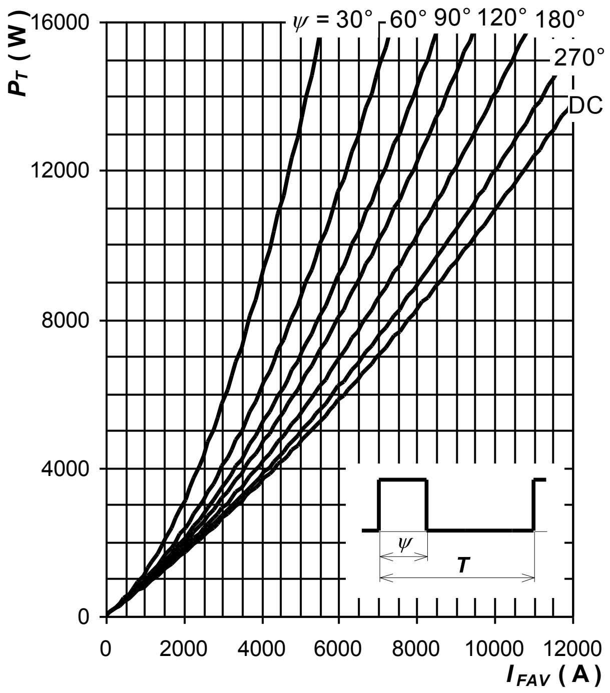


Fig. 7 Forward power loss vs. average forward current, square waveform, f = 50 Hz, T = 1/f

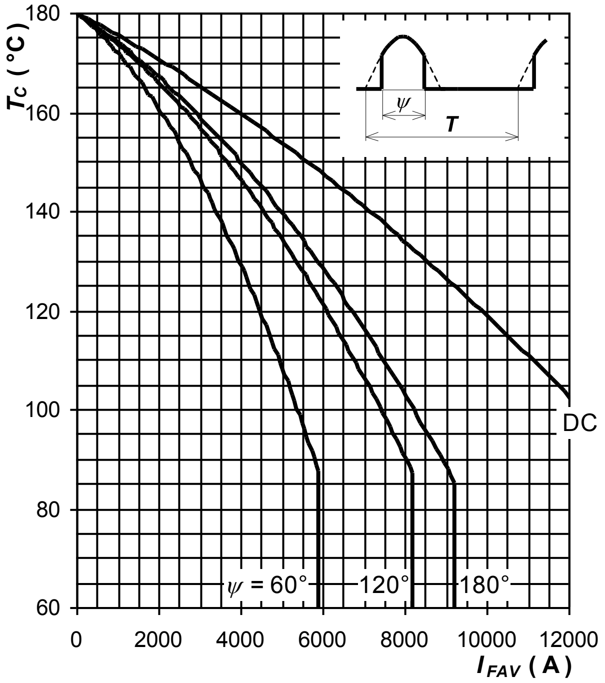


Fig. 8 Max. case temperature vs. aver. forward current, sine waveform, f = 50 Hz, T = 1/f

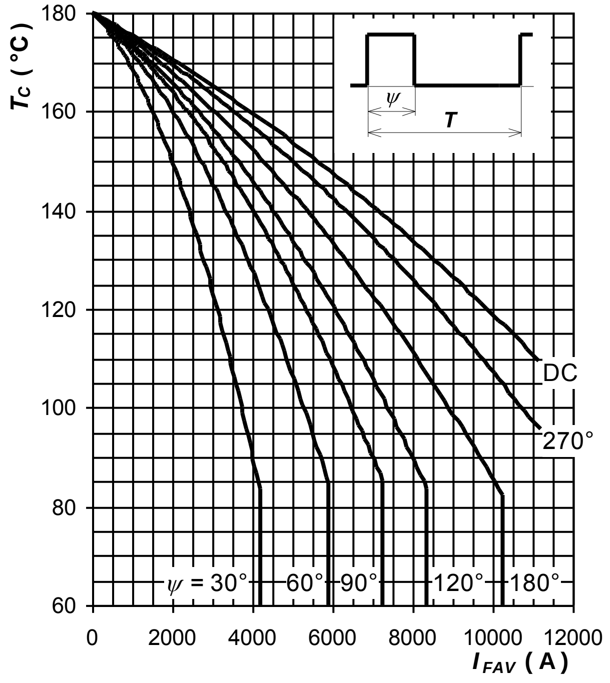


Fig. 9 Max.case temperature vs. aver. forward current, square waveform, f = 50 Hz, T = 1/f

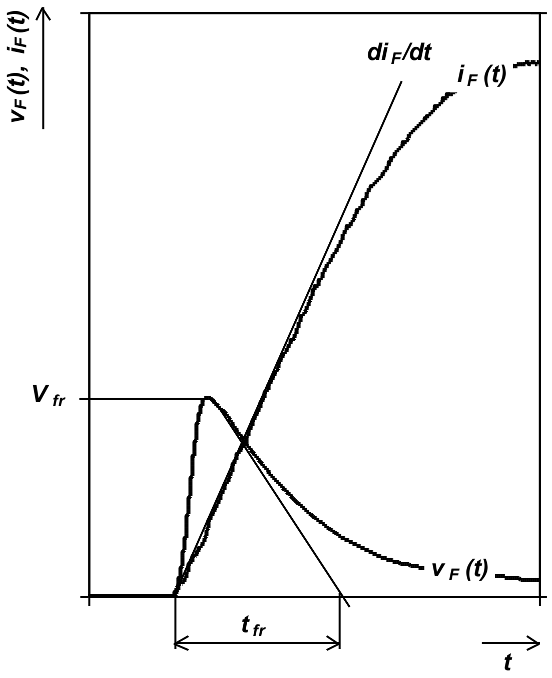


Fig. 10 *Typical forward recovery voltage waveform when the diode is turned on with high* di_F/dt

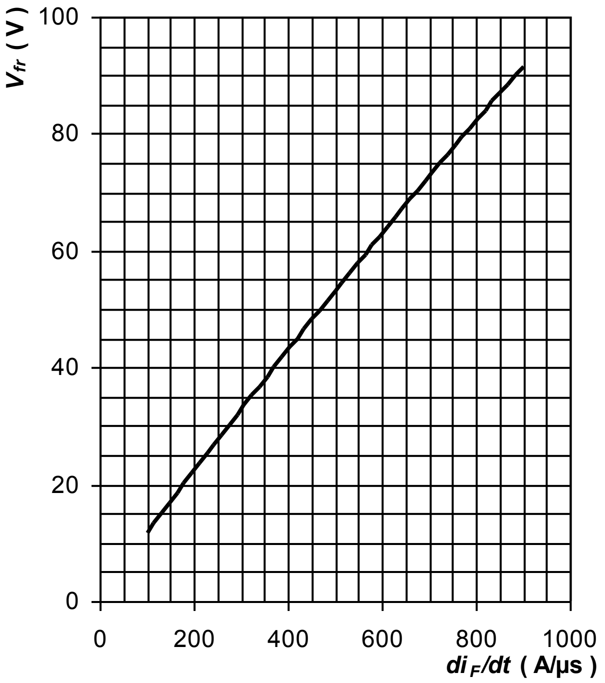


Fig. 11 *Max. forward recovery voltage vs. rate of rise forward current, trapezoid pulse,* $T_j = T_{jmax}$, $t_{fr} \leq 10$ *µs*

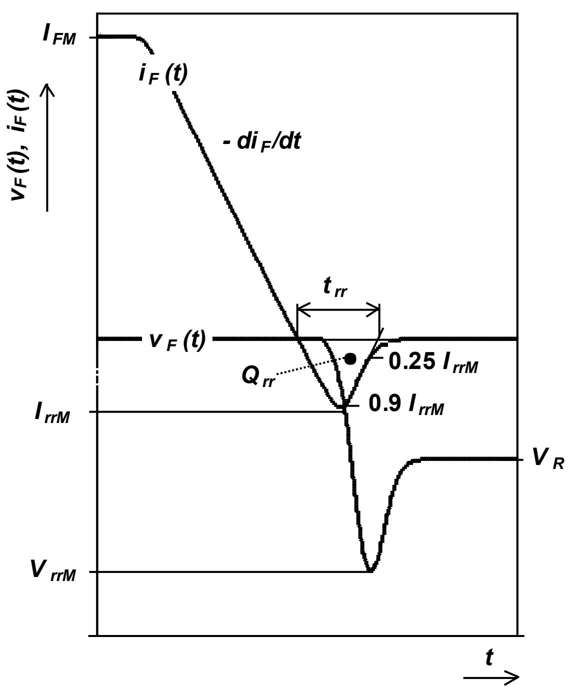


Fig. 12 *Definition of reverse recovery parameters*

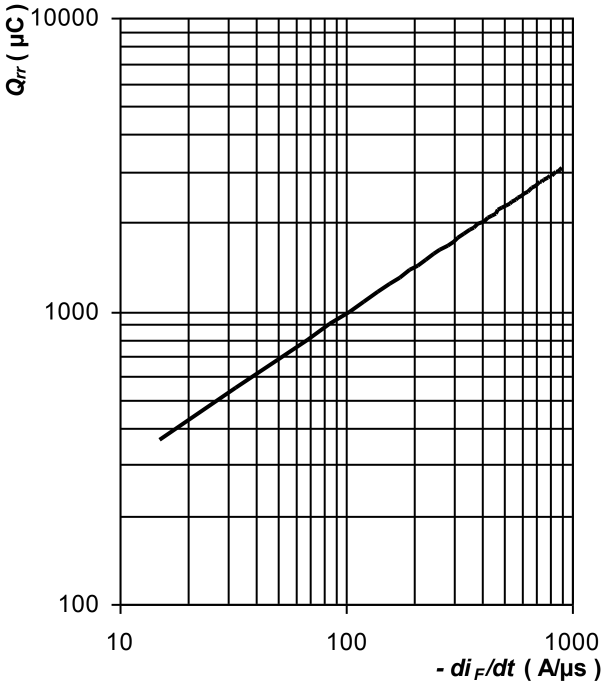


Fig. 13 *Max. recovered charge vs. rate of fall forward current, trapezoid pulse,* $I_{FM} = 2\,000$ *A,* $V_R = 100$ *V,* $T_j = T_{jmax}$

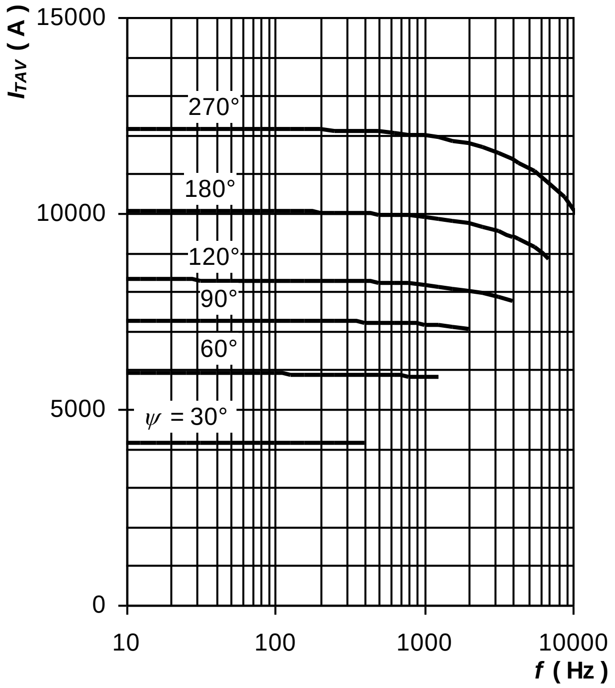


Fig. 14 *Average forward current vs. frequency, trapezoid waveform, T_C = 85 °C, $di_F/dt = \pm 500$ A/µs, V_R = 50 V*

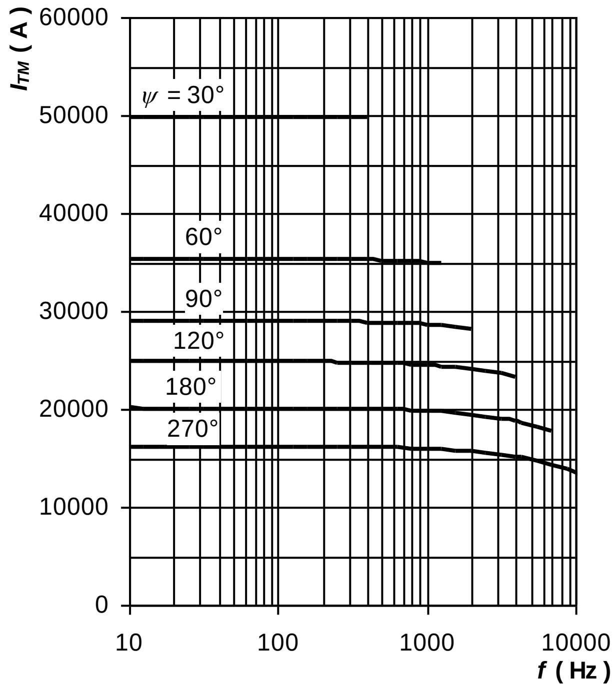


Fig. 15 *Maximum forward current vs. frequency, trapezoid waveform, T_C = 85 °C, $di_F/dt = \pm 500$ A/µs, V_R = 50 V*

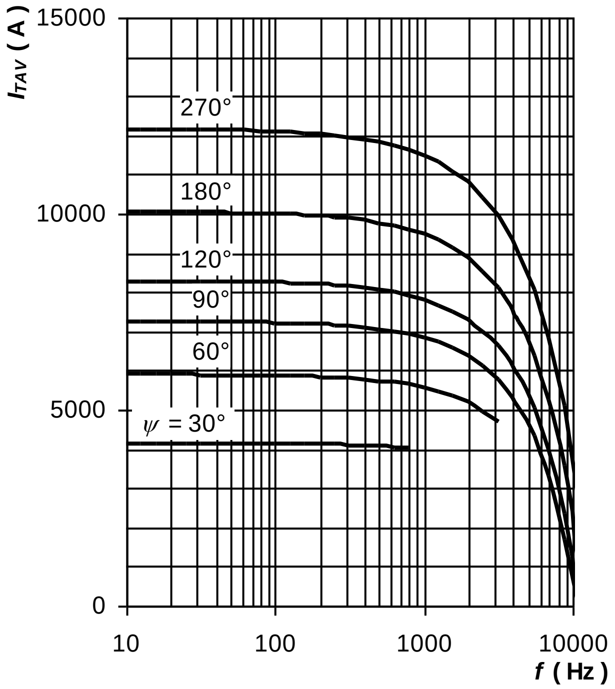


Fig. 16 *Average forward current vs. frequency, trapezoid waveform, T_C = 85 °C, $di_F/dt = \pm 1\,000$ A/µs, V_R = 50 V*

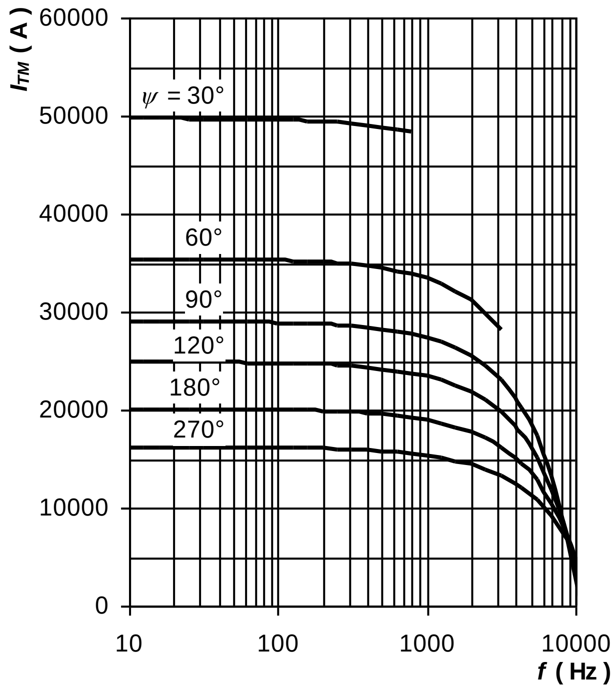
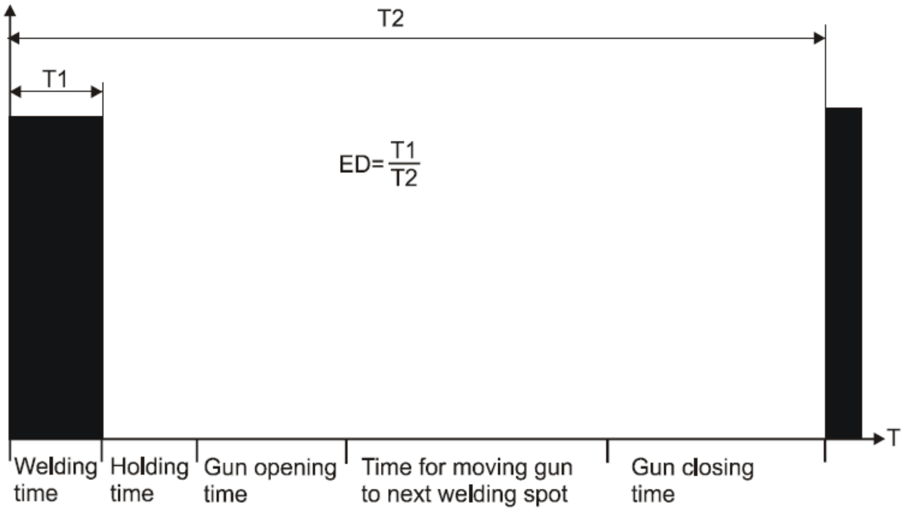


Fig. 17 *Maximum forward current vs. frequency, trapezoid waveform, T_C = 85 °C, $di_F/dt = \pm 1\,000$ A/µs, V_R = 50 V*



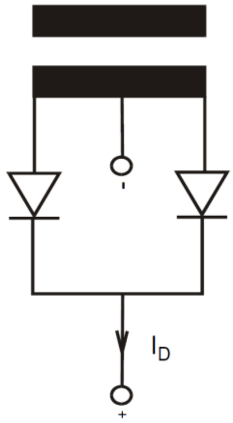
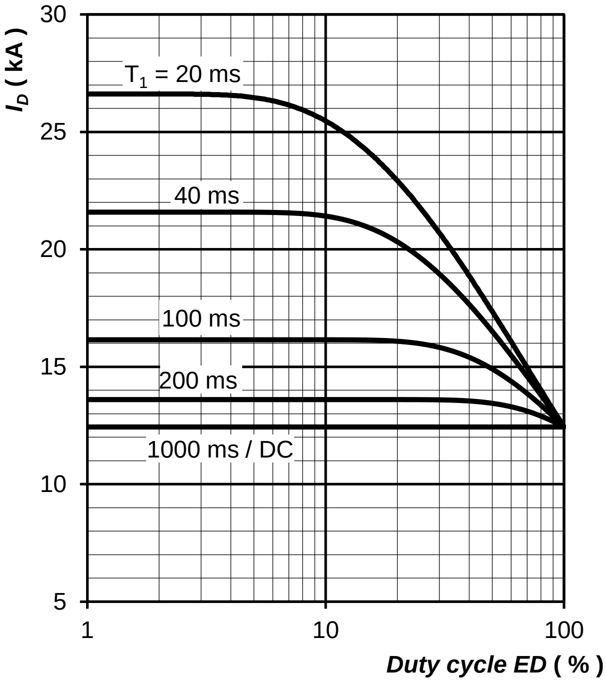


Fig. 18 Definition of ED for typical welding sequence

Fig. 19 Definition of I_D for single-phase centre tap



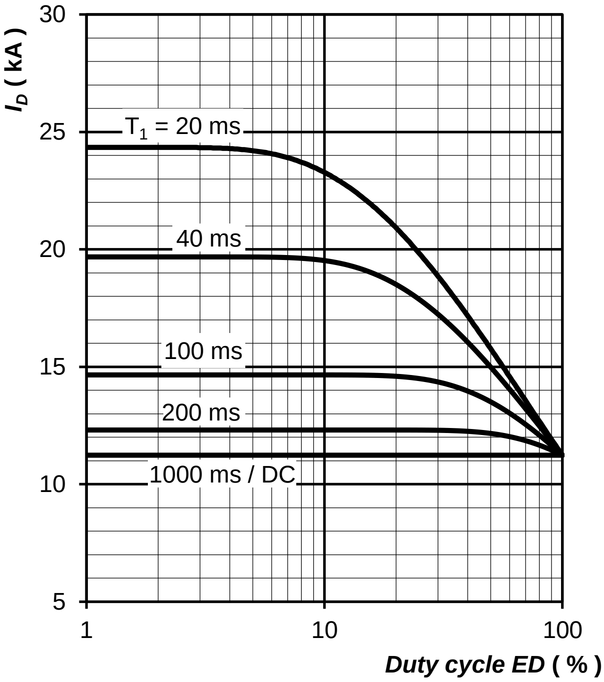


Fig. 20 Current load capacity, cont., DC output welding current with single-phase centre tap vs. duty cycle f = 1000 Hz, square wave, ΔT_j = 80 °C

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 = 70 °C

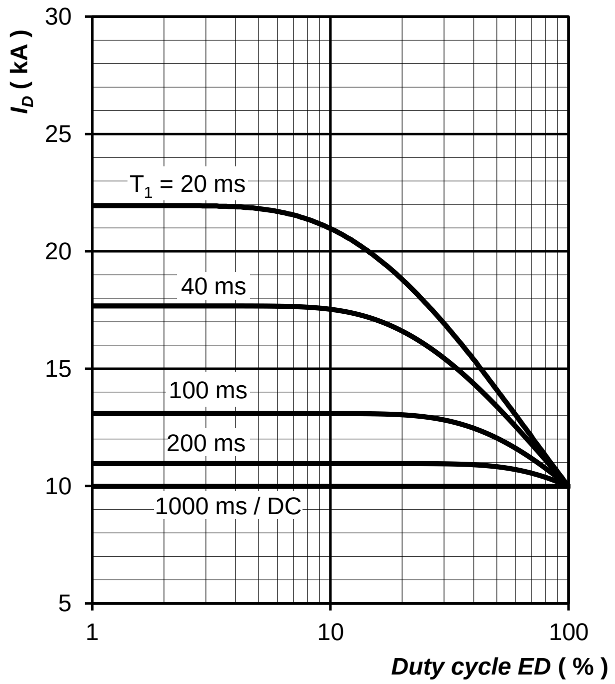


Fig. 22 Current load capacity, cont., DC output welding current with single-phase centre tap vs. duty cycle f = 1000 Hz, square wave, ΔT_j = 60 °C

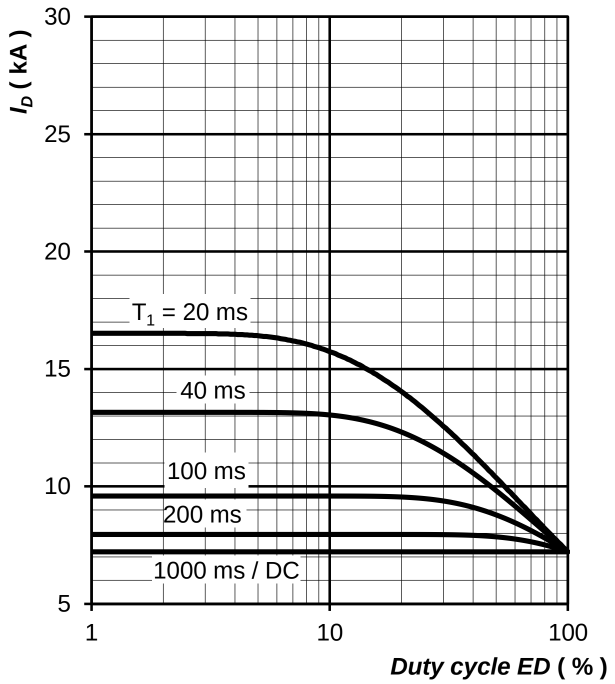


Fig. 23 Current load capacity, cont., DC output welding current with single-phase centre tap vs. duty cycle f = 1000 Hz, square wave, ΔT_j = 40 °C

Notes: