



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:	$T_j = -40 \div 180 \text{ }^\circ\text{C}$, half sine waveform, $f = 50 \text{ Hz}$

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

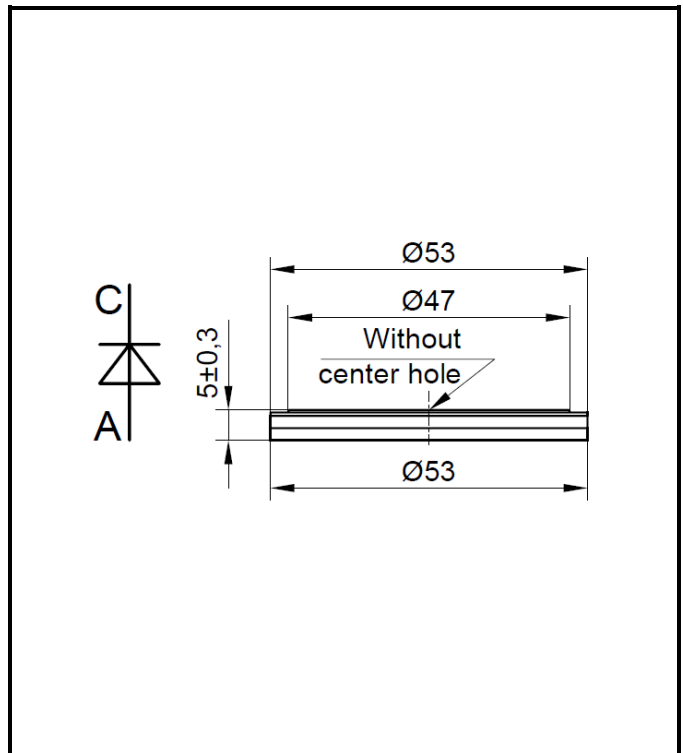


Fig. 1 Case



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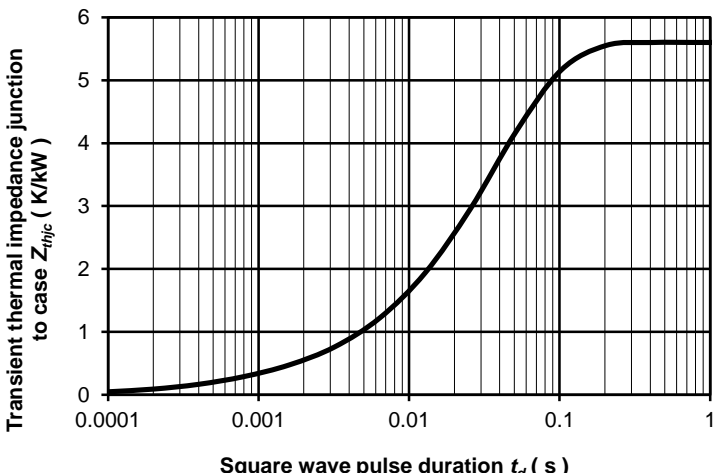
Maximum Ratings			Maximum Limits	Unit
V_{RRM}	Repetitive peak reverse voltage $T_j = -40 \div 180 \text{ }^\circ\text{C}$		400	V
I_{FAVm}	Average forward current	$T_c = 85 \text{ }^\circ\text{C}$	9 244	A
		$T_c = 110 \text{ }^\circ\text{C}$	7 489	
I_{FRMS}	RMS forward current	$T_c = 85 \text{ }^\circ\text{C}$	14 520	A
		$T_c = 110 \text{ }^\circ\text{C}$	11 763	
I_{RRM}	Repetitive reverse current $V_R = V_{RRM}$		50	mA
I_{FSM}	Non repetitive peak surge current $V_R = 0 \text{ V}$, half sine pulse	$t_p = 8.3 \text{ ms}$	64 000	A
		$t_p = 10 \text{ ms}$	60 000	
I^2t	Limiting load integral $V_R = 0 \text{ V}$, half sine pulse	$t_p = 8.3 \text{ ms}$	17 049 000	A²s
		$t_p = 10 \text{ ms}$	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 $T_j = 180 \text{ }^\circ\text{C}$

Characteristics			Value			Unit
			<i>min</i>	<i>typ</i>	<i>max</i>	
V_{T0}	Threshold voltage				0.780	V
r_T	Forward slope resistance $I_{F1} = 7\,000 \text{ A}$, $I_{F2} = 21\,000 \text{ A}$				0.031	mΩ
V_{FM}	Maximum forward voltage	$I_{FM} = 5\,000 \text{ A}$			0.920	V
		$I_{FM} = 8\,000 \text{ A}$			1.030	
Q_{rr}	Recovered charge $I_{FM} = 1\,000 \text{ A}$, $di/dt = -30 \text{ A}/\mu\text{s}$, $V_R = 50 \text{ V}$			400		μC

Unless otherwise specified $T_j = 180 \text{ }^\circ\text{C}$

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																												
<p>Analytical function for transient thermal impedance</p> $Z_{thjc} = \sum_{i=1}^4 R_i (1 - \exp(-t / \tau_i))$ <p>Conditions: $F_m = 22 \pm 2$ kN, Double side cooled</p> <p>Correction for periodic waveforms</p> <table border="1"> <tr> <td>180° sine:</td> <td>1.3 K/kW</td> </tr> <tr> <td>120° sine:</td> <td>1.6 K/kW</td> </tr> <tr> <td>60° sine:</td> <td>2.7 K/kW</td> </tr> <tr> <td>180° rectangular:</td> <td>1.1 K/kW</td> </tr> <tr> <td>120° rectangular:</td> <td>1.8 K/kW</td> </tr> <tr> <td>60° rectangular:</td> <td>3.0 K/kW</td> </tr> </table>	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	<table border="1"> <thead> <tr> <th>i</th> <th>1</th> <th>2</th> <th>3</th> <th>4</th> </tr> </thead> <tbody> <tr> <td>τ_i (s)</td> <td>0.0461</td> <td>0.0241</td> <td>0.0045</td> <td>0.0006</td> </tr> <tr> <td>R_i (K/kW)</td> <td>3.8860</td> <td>1.1830</td> <td>0.3610</td> <td>0.1700</td> </tr> </tbody> </table>  <p>Fig. 2 Dependence transient thermal impedance junction to case on square pulse</p>	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
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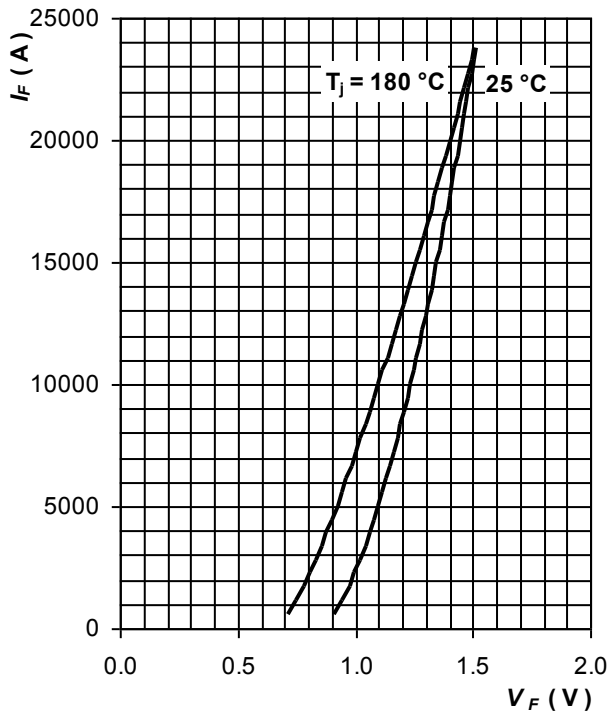


Fig. 3 Maximum forward voltage drop characteristics

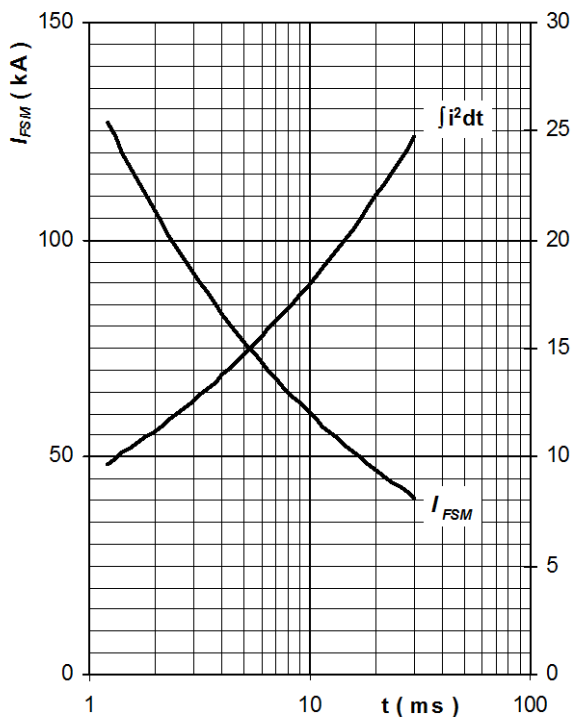


Fig. 4 Surge forward current vs. pulse length, half sine wave, single pulse, $V_R = 0\text{ V}$, $T_j = T_{jmax}$

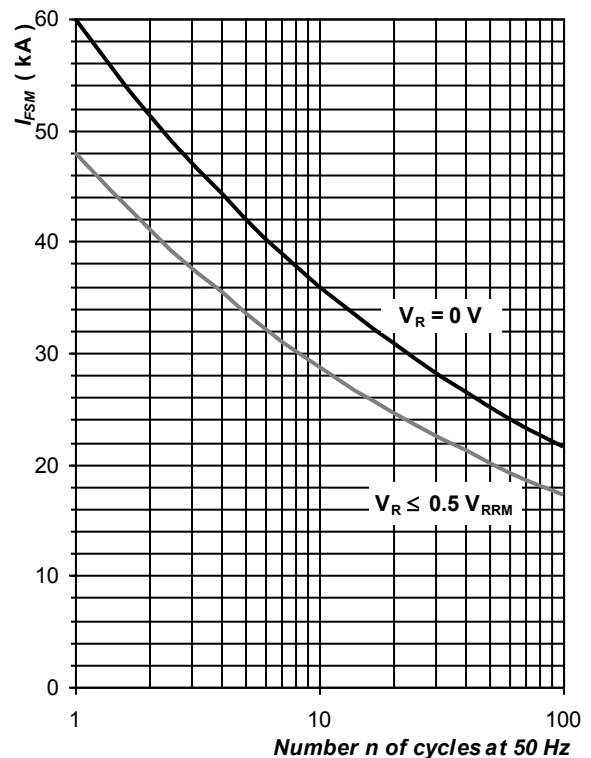


Fig. 5 Surge forward current vs. number of pulses, half sine wave, $T_j = T_{jmax}$

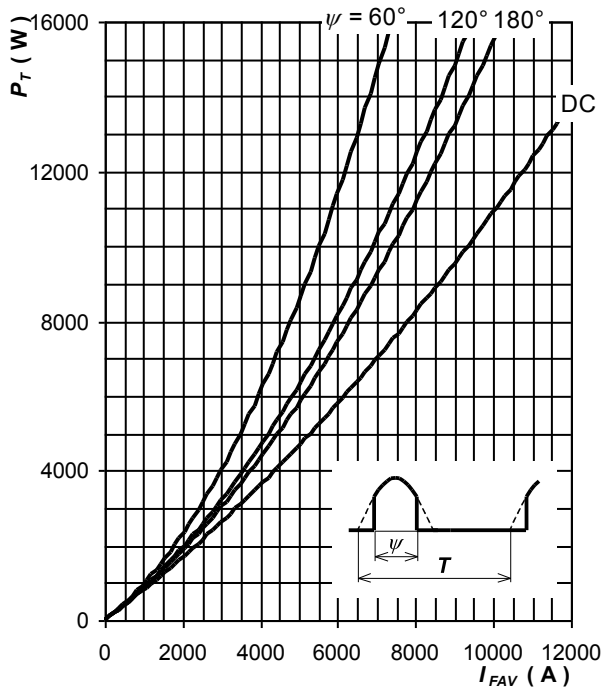


Fig. 6 Forward power loss vs. average forward current, sine waveform, $f = 50 \text{ Hz}$, $T = 1/f$

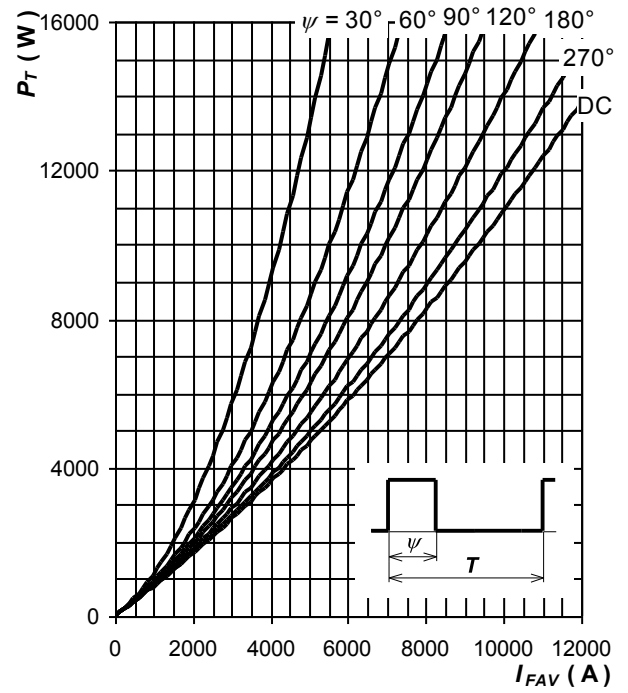


Fig. 7 Forward power loss vs. average forward current, square waveform, $f = 50 \text{ Hz}$, $T = 1/f$

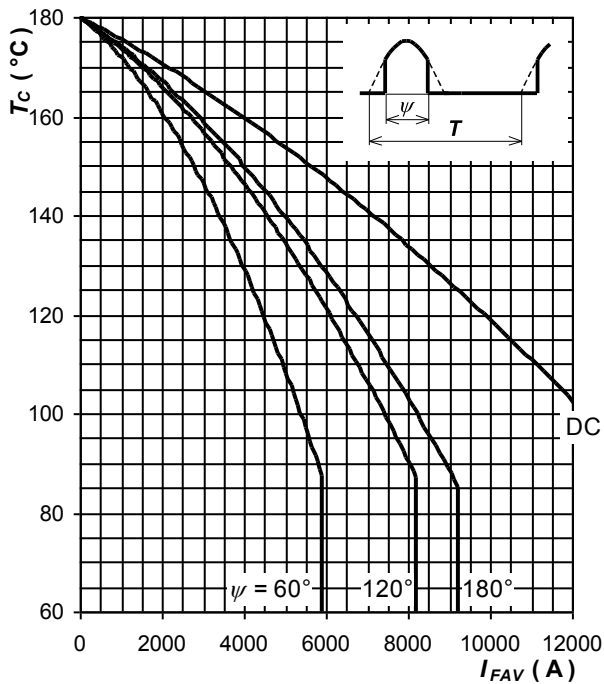


Fig. 8 Max. case temperature vs. aver. forward current, sine waveform, $f = 50 \text{ Hz}$, $T = 1/f$

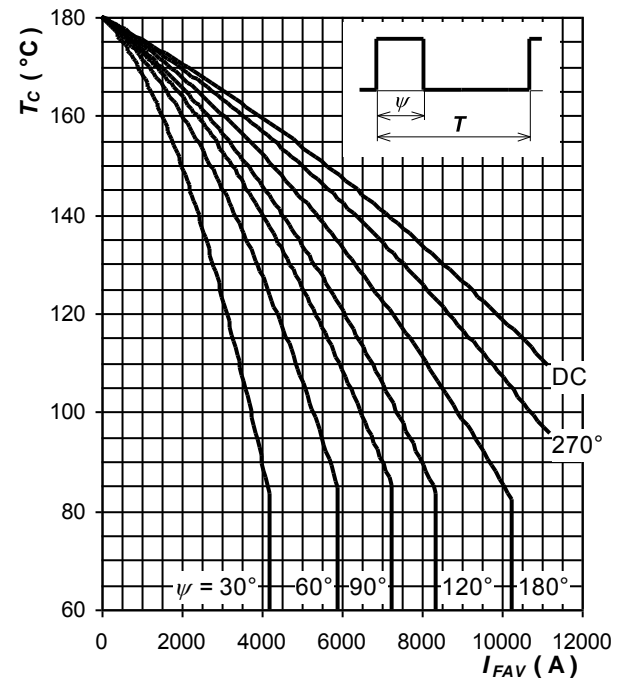


Fig. 9 Max. case temperature vs. aver. forward current, square waveform, $f = 50 \text{ Hz}$, $T = 1/f$

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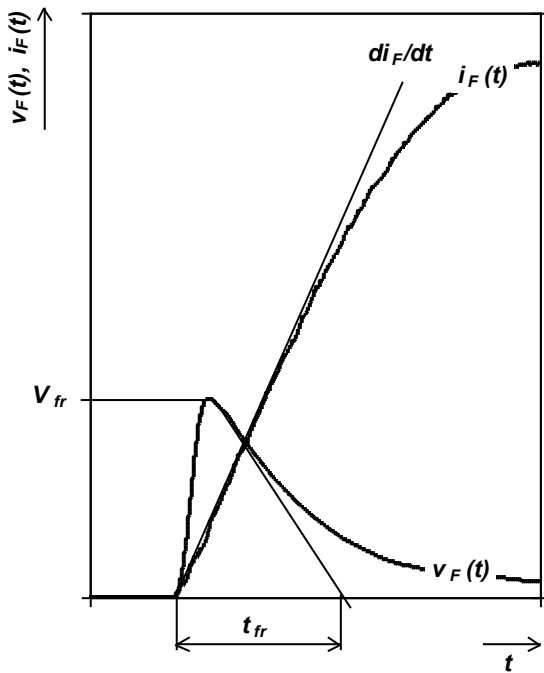


Fig. 10 Typical forward recovery voltage waveform when the diode is turned on with high di_F/dt

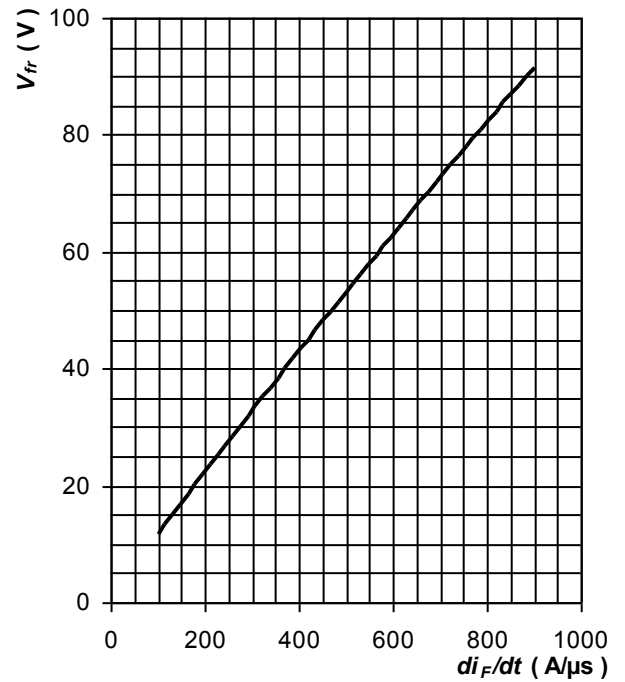


Fig. 11 Max. forward recovery voltage vs. rate of rise forward current, trapezoid pulse, $T_j = T_{jmax}$, $t_{fr} \leq 10 \mu s$

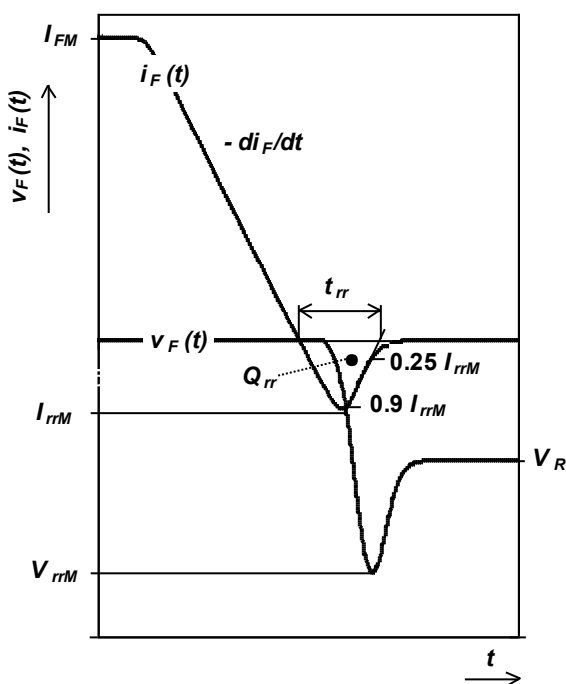


Fig. 12 Definition of reverse recovery parameters

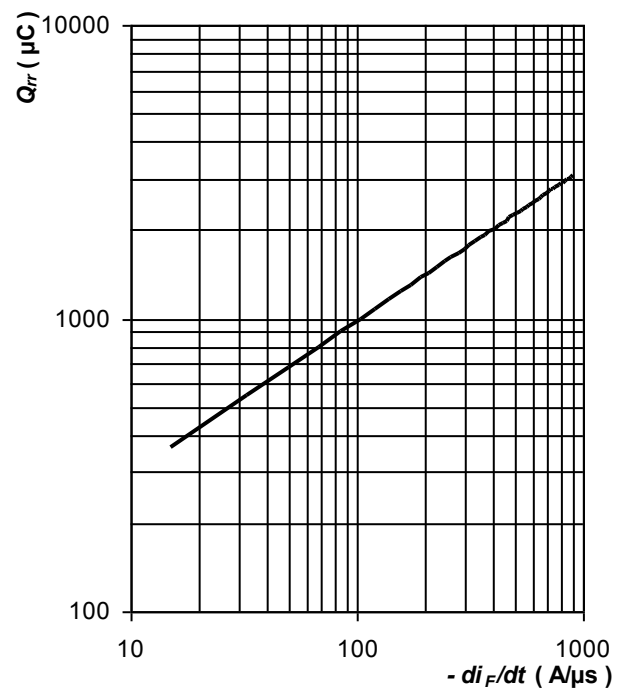


Fig. 13 Max. recovered charge vs. rate of fall forward current, trapezoid pulse, $I_{FM} = 2\ 000\ A$, $V_R = 100\ V$, $T_j = T_{jmax}$

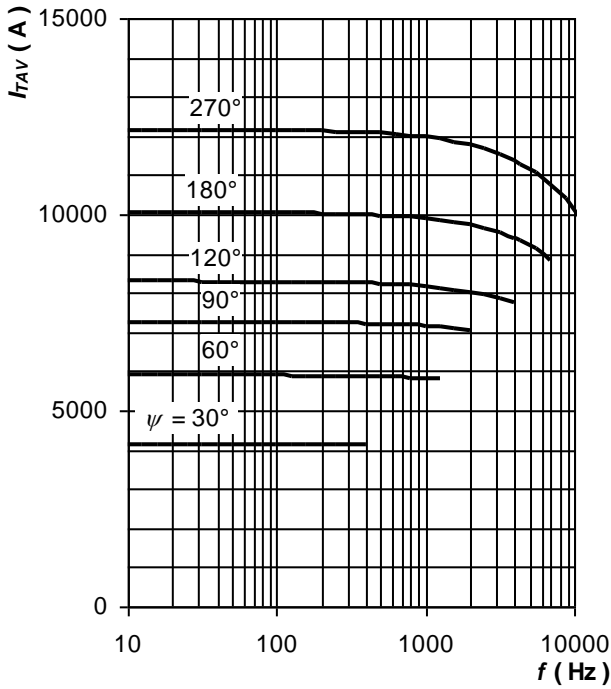


Fig. 14 Average forward current vs. frequency, trapezoid waveform, $T_C = 85\text{ }^\circ\text{C}$, $di_F/dt = \pm 500\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$

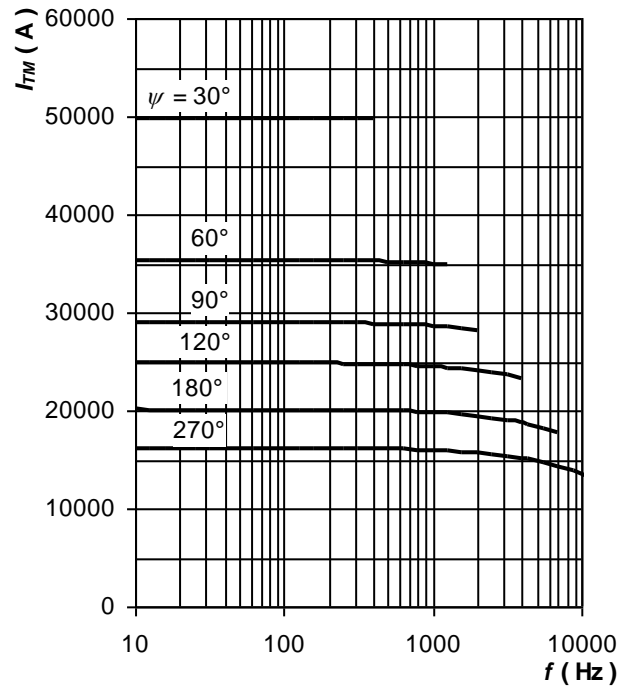


Fig. 15 Maximum forward current vs. frequency, trapezoid waveform, $T_C = 85\text{ }^\circ\text{C}$, $di_F/dt = \pm 500\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$

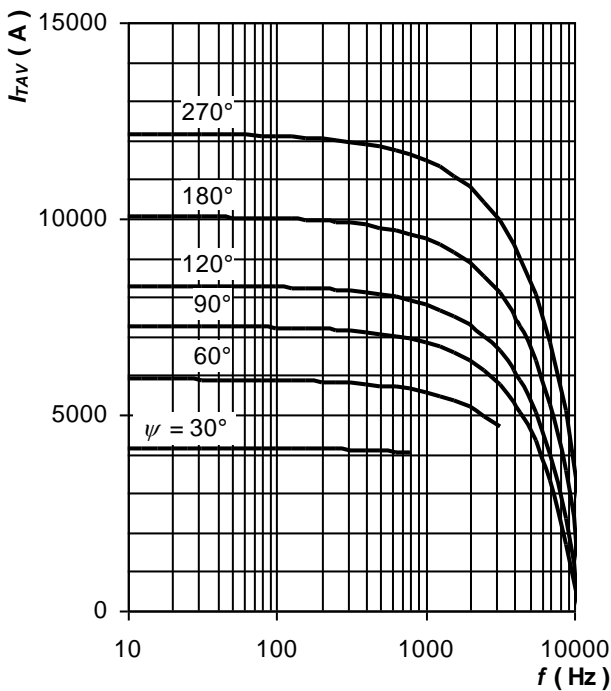


Fig. 16 Average forward current vs. frequency, trapezoid waveform, $T_C = 85\text{ }^\circ\text{C}$, $di_F/dt = \pm 1000\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$

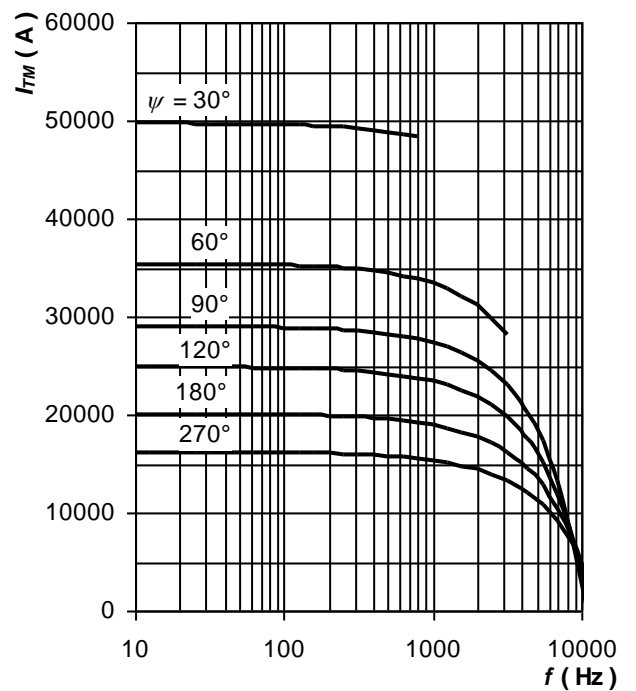


Fig. 17 Maximum forward current vs. frequency, trapezoid waveform, $T_C = 85\text{ }^\circ\text{C}$, $di_F/dt = \pm 1000\text{ A}/\mu\text{s}$, $V_R = 50\text{ V}$

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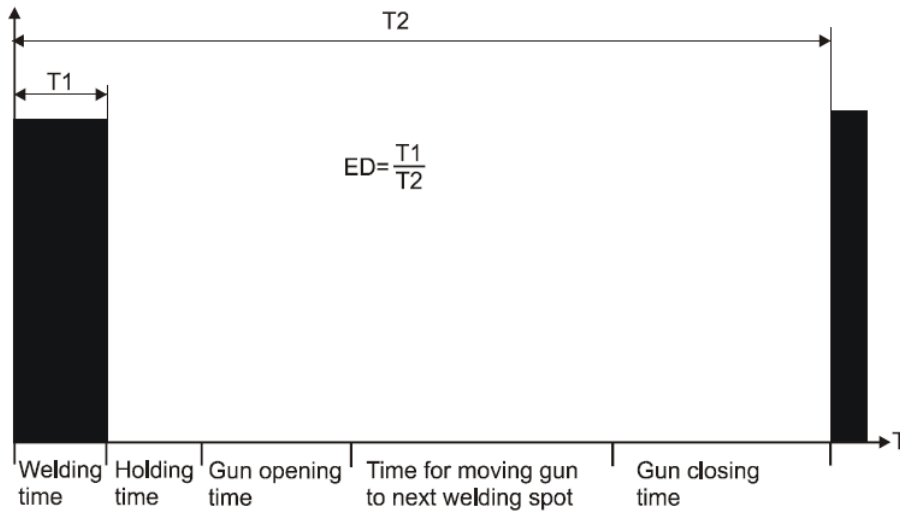


Fig. 18 Definition of ED for typical welding sequence

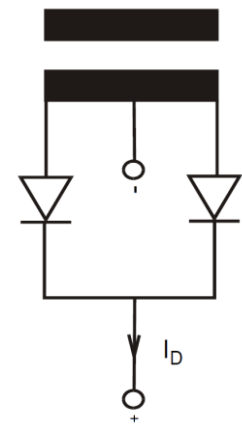


Fig. 19 Definition of I_D for single-phase centre tap

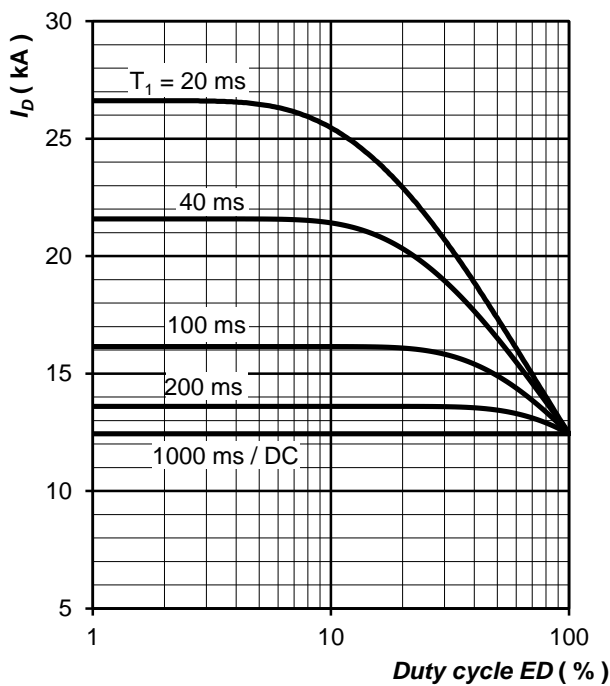


Fig. 20 Current load capacity, cont.,
DC output welding current with single-phase centre tap vs. duty cycle
 $f = 1000 \text{ Hz}$, square wave, $\Delta T_j = 80 \text{ }^\circ\text{C}$

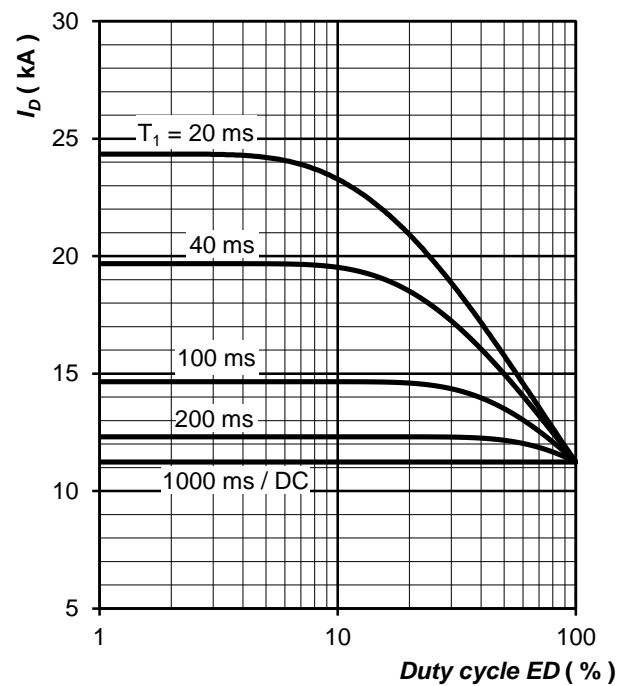


Fig. 21 Current load capacity, cont.,
DC output welding current with single-phase centre tap vs. duty cycle
 $f = 1000 \text{ Hz}$, square wave, $\Delta T_j = 70 \text{ }^\circ\text{C}$

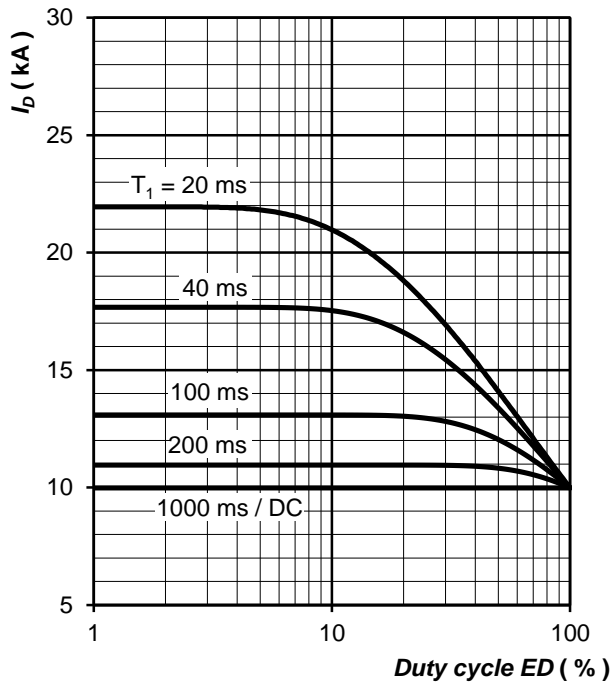


Fig. 22 Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
 $f = 1000 \text{ Hz}$, square wave, $\Delta T_j = 60 \text{ }^\circ\text{C}$

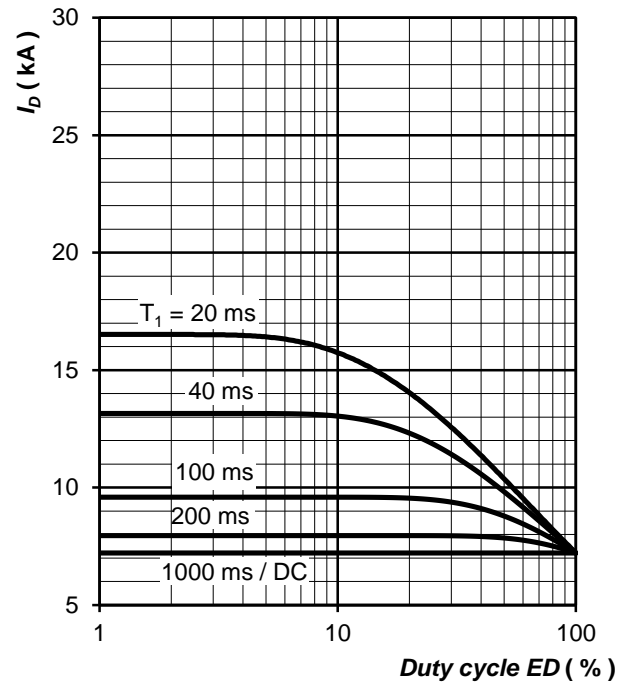


Fig. 23 Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
 $f = 1000 \text{ Hz}$, square wave, $\Delta T_j = 40 \text{ }^\circ\text{C}$

Notes:

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