5SDF 0102C0400

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}	=	10 159	A
I_{FSM}	=	70 000	A
V_{TO}	=	0.977	V
r_T	=	0.022	mΩ

Types

	V_{RRM}
5SDF 0102C0400	**400 V**
Conditions:	$T_j = -40 \div 190\ °C$, half sine waveform, $f = 50\ Hz$

Mechanical Data

F_m	Mounting force	35 ÷ 40	kN
m	Weight	0.22	kg
D_S	Surface creepage distance	4	mm
D_a	Air strike distance	4	mm
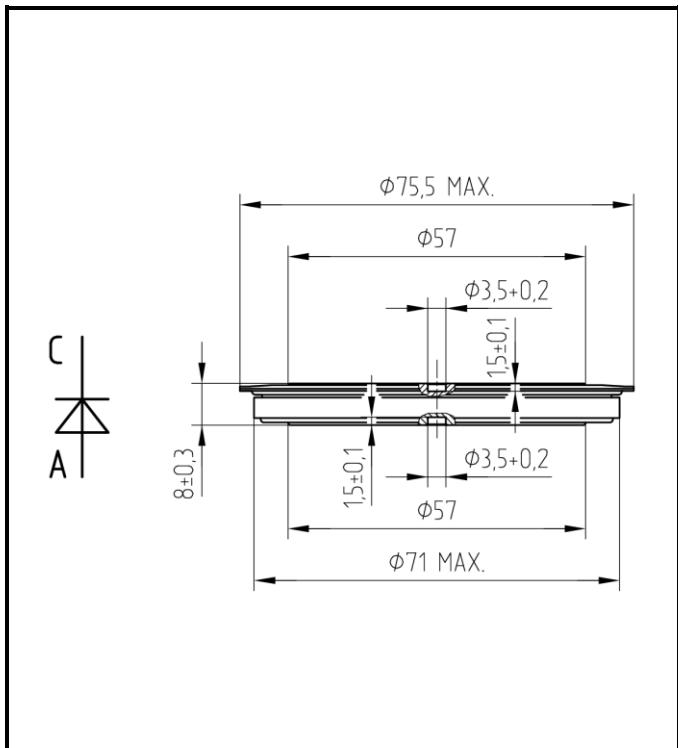
Fig. 1 Case

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** $T_j = -40 \div 190\ °C$		**400**	**V**
I_{FAVm}	**Average forward current**	$T_c = 85\ °C$	**10 159**	**A**
		$T_c = 110\ °C$	**8 286**	
I_{FRMS}	**RMS forward current**	$T_c = 85\ °C$	**15 958**	**A**
		$T_c = 110\ °C$	**13 016**	
I_{RRM}	**Repetitive reverse current** $V_R = V_{RRM}$		**200**	**mA**
I_{FSM}	**Non repetitive peak surge current** $V_R = 0\ V$, half sine pulse	$t_p = 8.3\ ms$	**75 000**	**A**
		$t_p = 10\ ms$	**70 000**	
I^2t	**Limiting load integral** $V_R = 0\ V$, half sine pulse	$t_p = 8.3\ ms$	**23 205 000**	**A²s**
		$t_p = 10\ ms$	**24 500 000**	
$T_{jmin} - T_{jmax}$	**Operating temperature range**		**- 40 ÷ 190**	**°C**
$T_{stgmin} - T_{stgmax}$	**Storage temperature range**		**- 40 ÷ 190**	

Unless otherwise specified $T_j = 190\ °C$

Characteristics			Value			Unit
			min	typ	max	
V_{T0}	**Threshold voltage**				0.977	**V**
r_T	**Forward slope resistance** $I_{F1} = 10\ 000\ A,\ I_{F2} = 30\ 000\ A$				0.022	**mΩ**
V_{FM}	**Maximum forward voltage**	$I_{FM} = 8\ 000\ A$			1.140	**V**
		$I_{FM} = 10\ 000\ A$			1.190	
Q_{rr}	**Recovered charge** $I_{FM} = 2\ 000\ A,\ di/dt = -30\ A/\mu s,\ V_R = 50\ V$				300	**μC**

Unless otherwise specified $T_j = 190\ °C$

Thermal Parameters			Value	Unit
R_{thjc}	**Thermal resistance junction to case**	*double side cooling*	**6**	**K/kW**
		single side cooling	**12**	
R_{thch}	**Thermal resistance case to heatsink**	*double side cooling*	**3**	**K/kW**
		single side cooling	**6**	

Transient Thermal Impedance

Analytical function for transient thermal impedance

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

Conditions:

$F_m = 35 \div 40$ kN, Double side cooled

Correction for periodic waveforms

180°	sine:	0.8	K/kW
180°	rectangular:	0.7	K/kW
120°	rectangular:	1.2	K/kW
60°	rectangular:	2.1	K/kW

i	1	2	3	4
τ_i (s)	0.0950	0.0480	0.0035	0.0010
R_i (K/kW)	3.2000	1.5000	0.6300	0.6700
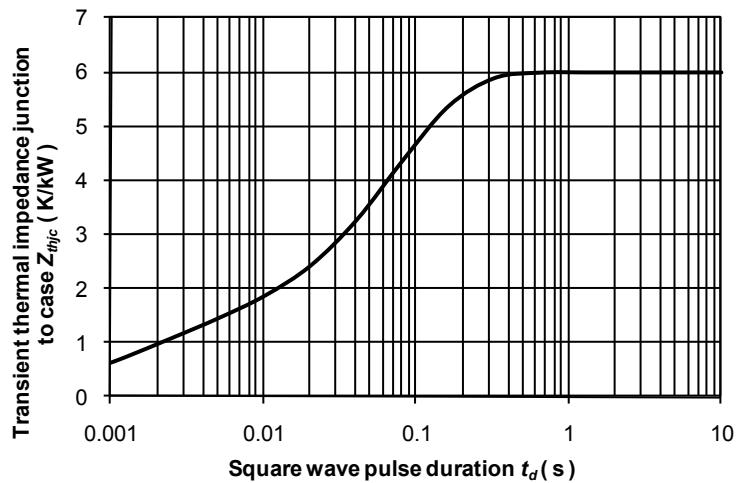
Fig. 2   *Dependence transient thermal impedance junction to case on square pulse*
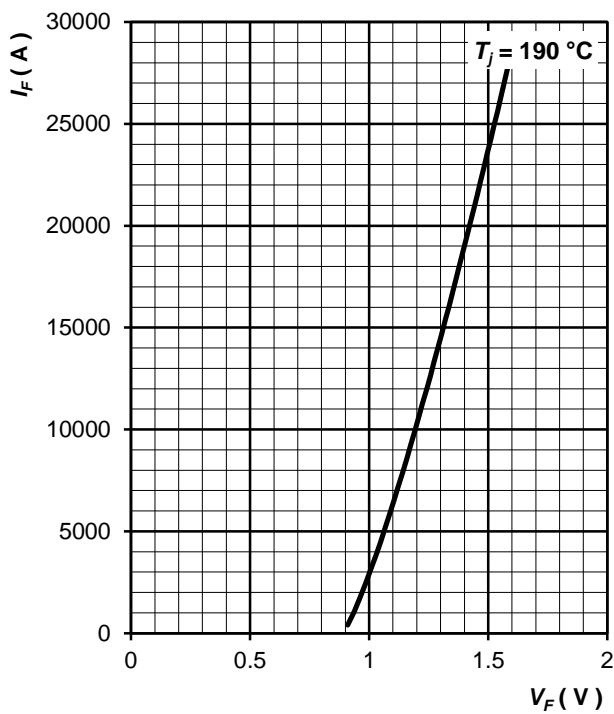
Fig. 3 Maximum forward voltage drop
        characteristics
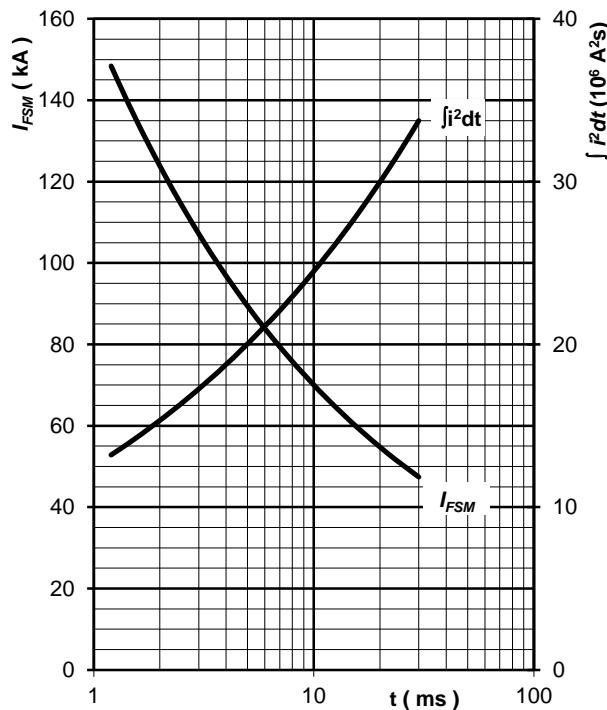
Fig. 4 Surge forward current vs. pulse length,
        half sine wave, single pulse,
        $V_R = 0$ V, $T_j = T_{jmax}$
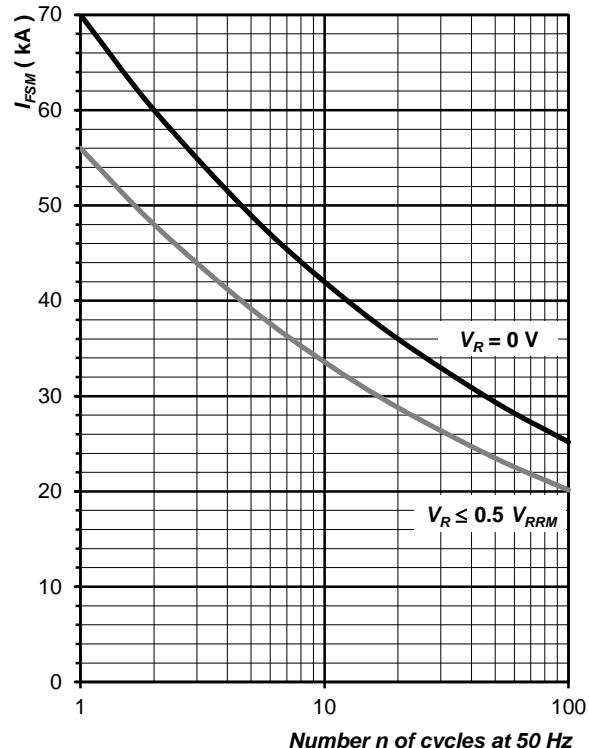
Fig. 5 Surge forward current vs. number
   of pulses, half sine wave, $T_j = T_{jmax}$
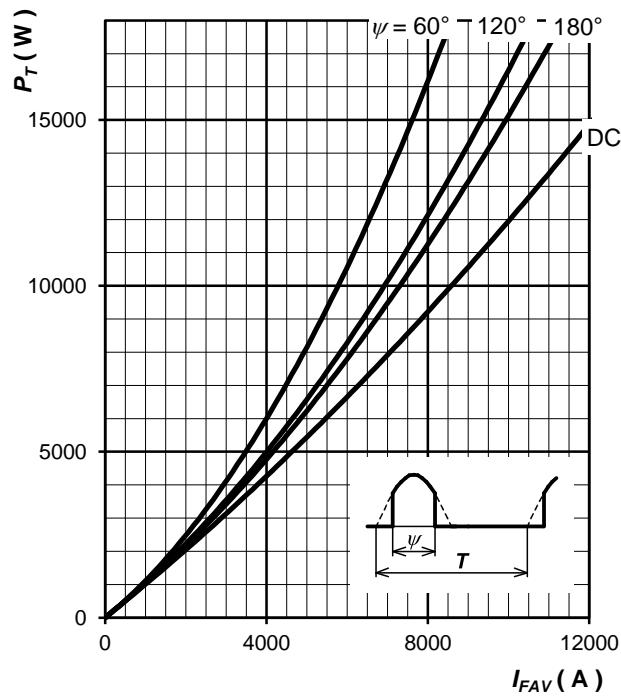
Fig. 6   Forward power loss vs. average forward
         current, sine waveform, f = 50 Hz, T = 1/f
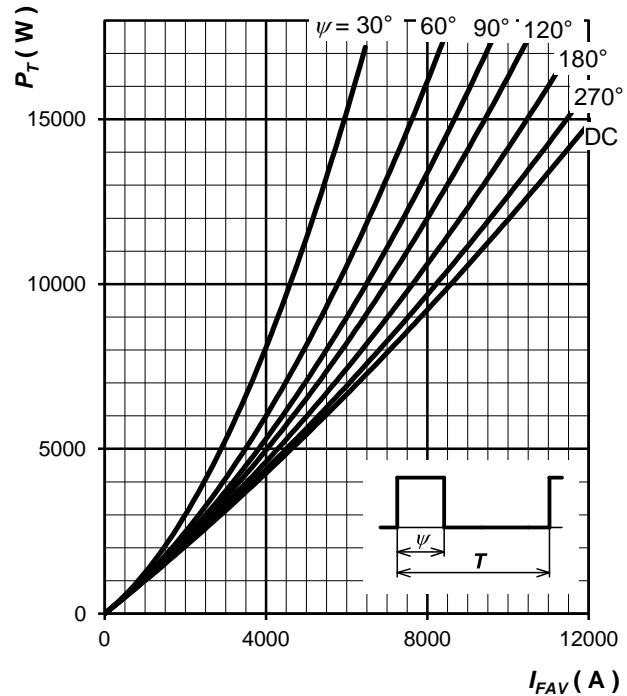
Fig. 7   Forward power loss vs. average forward
         current, square waveform, f = 50 Hz, T = 1/f
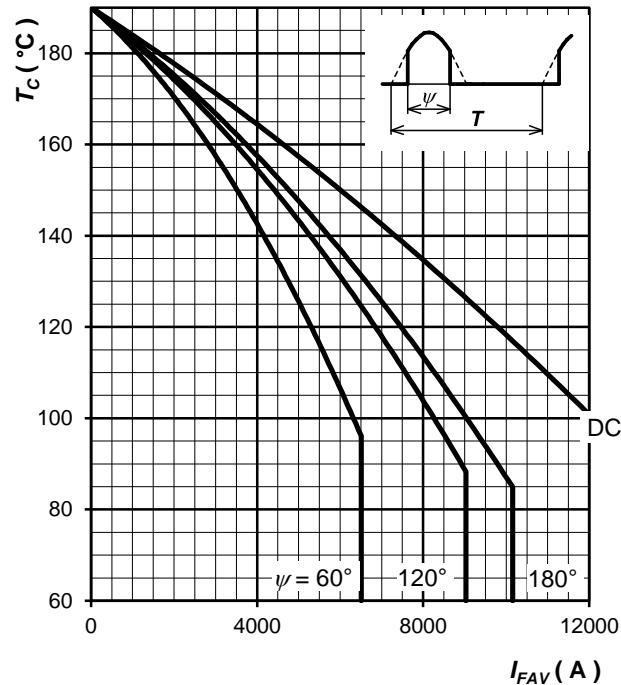
Fig. 8   Max. case temperature vs. aver. forward
         current, sine waveform, f = 50 Hz, T = 1/f
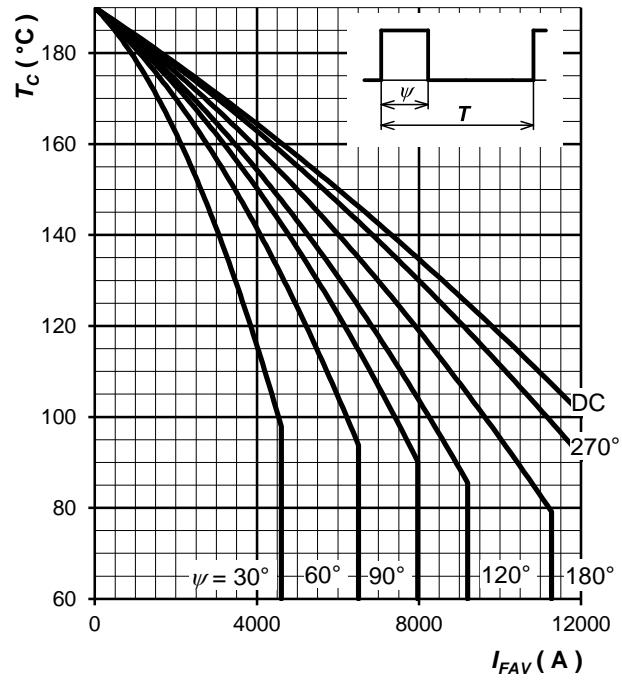
Fig. 9   Max.case temperature vs. aver. forward
         current, square waveform, f = 50 Hz, T = 1/f

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.

ABB s.r.o., Novodvorska 1768/138a, 142 21 Praha 4, Czech Republic

ABB s.r.o. reserves the right to change the data contained herein at any time without notice
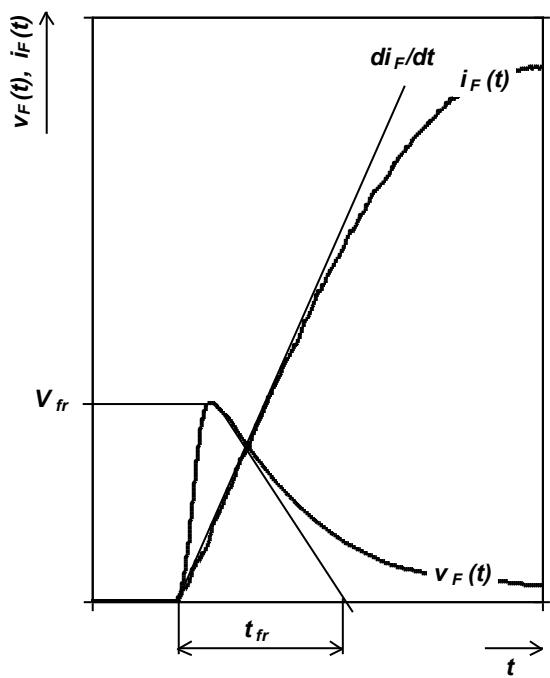
Fig. 10 Typical forward recovery voltage waveform
when the diode is turned on with high di_F/dt
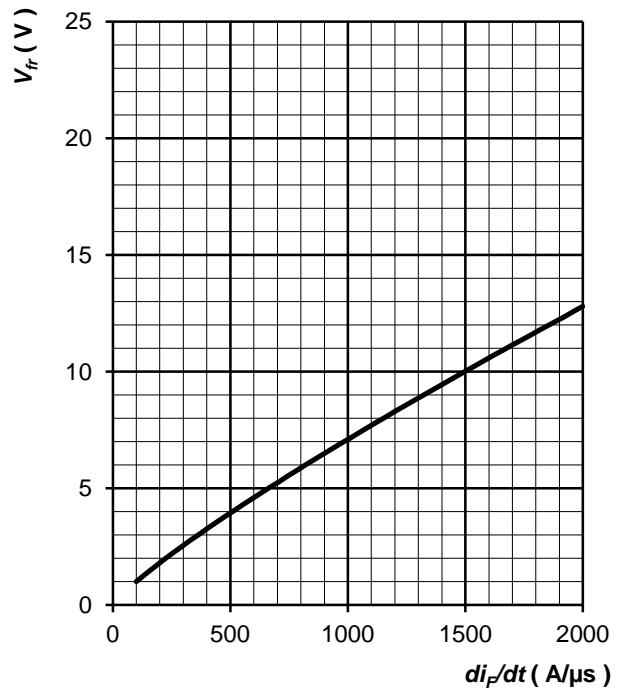
Fig. 11 Max. forward recovery voltage vs.
rate of rise forward current,
trapezoid pulse, $T_j = T_{jmax}$, $t_{fr} \leq 10 \ \mu s$
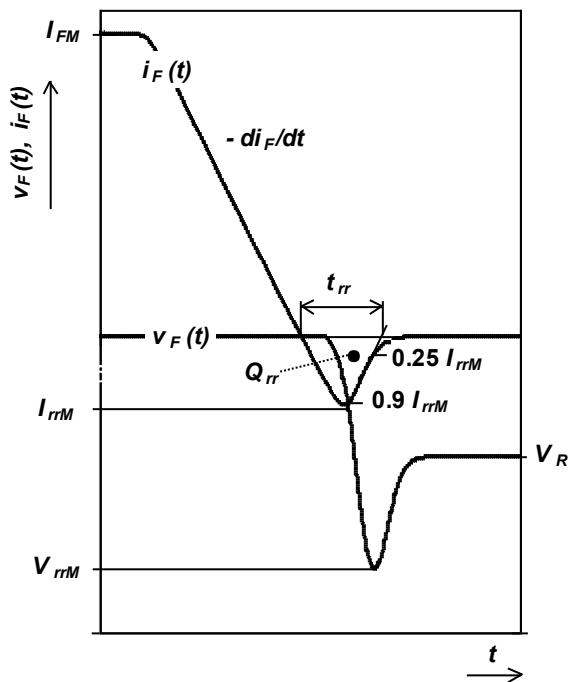
Fig. 12 Definition of reverse recovery parameters
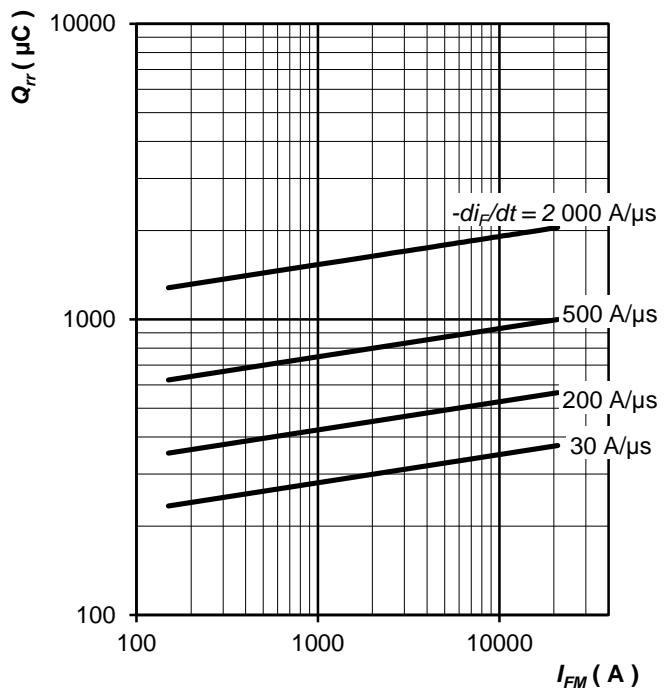
Fig. 13 Max. recovered charge vs. forward
current, trapezoid pulse, $T_j = T_{jmax}$
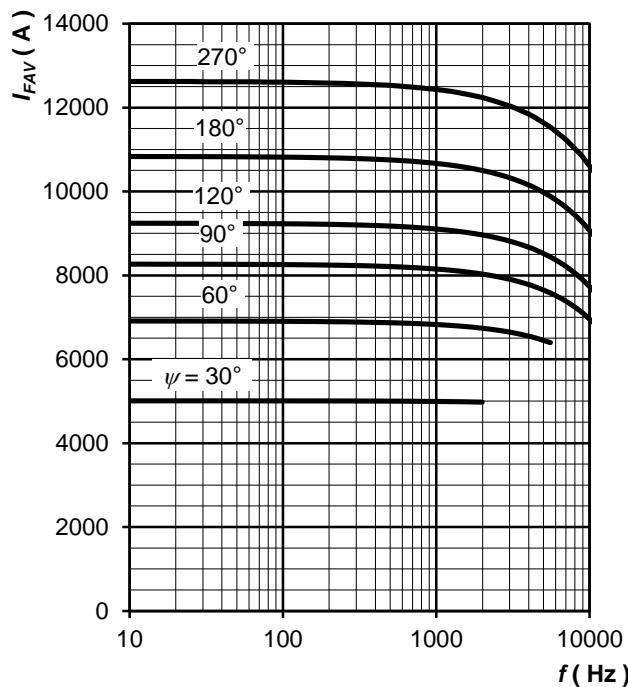
Fig. 14   *Average forward current vs. frequency,*
trapezoid waveform, $T_C = 85 °C$,
$di_F/dt = \pm 2\ 000\ A/\mu s$, $V_R = 50\ V$
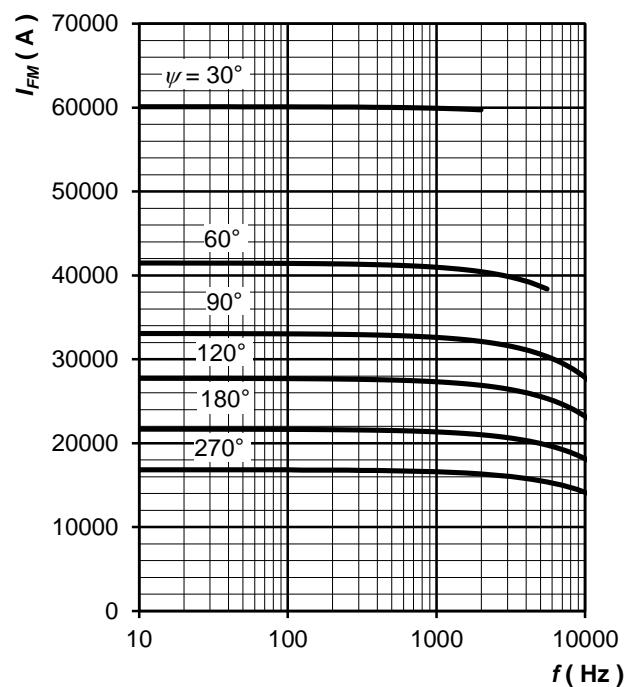
Fig. 15   *Maximum forward current vs. frequency,*
trapezoid waveform, $T_C = 85 °C$,
$di_F/dt = \pm 2\ 000\ A/\mu s$, $V_R = 50\ V$

$$ED = \frac{T1}{T2}$$

Welding time   Holding time   Gun opening time   Time for moving gun to next welding spot   Gun closing time
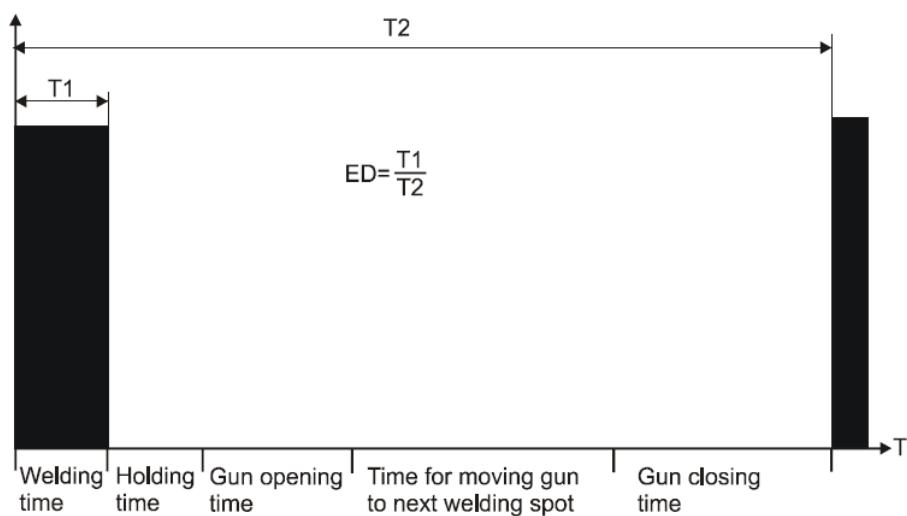
Fig. 16   *Definition of ED for typical welding sequence*
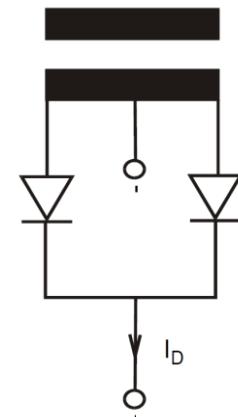

Fig. 17   *Definition of I_D*
for single-phase
centre tap
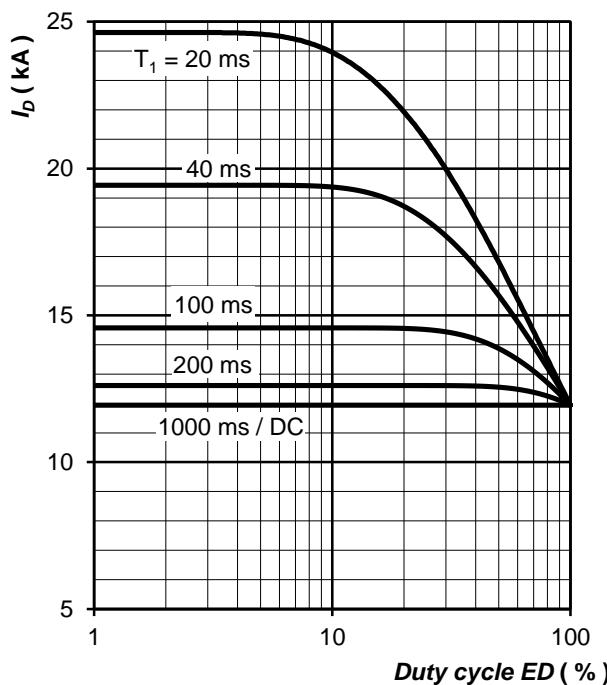
Fig. 18   Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
$f = 10$ kHz, square wave, $\Delta T_j = 80\ ^{\circ}C$
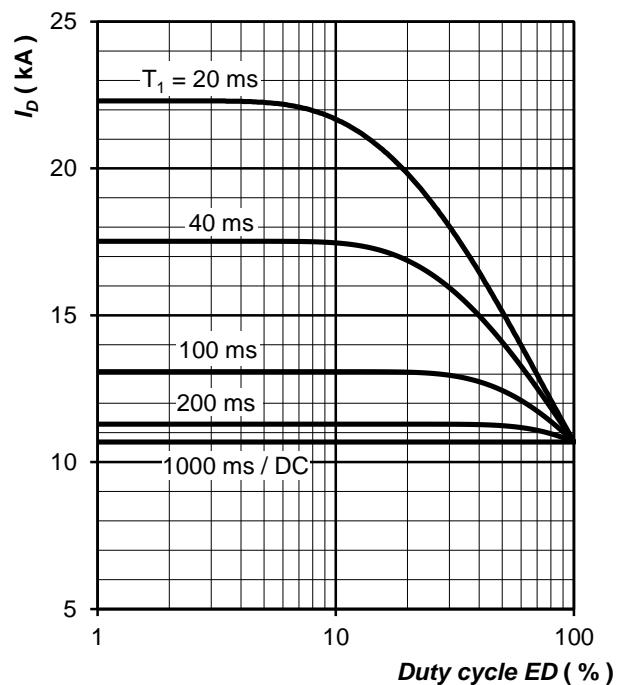
Fig. 19   Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
$f = 10$ kHz, square wave, $\Delta T_j = 70\ ^{\circ}C$
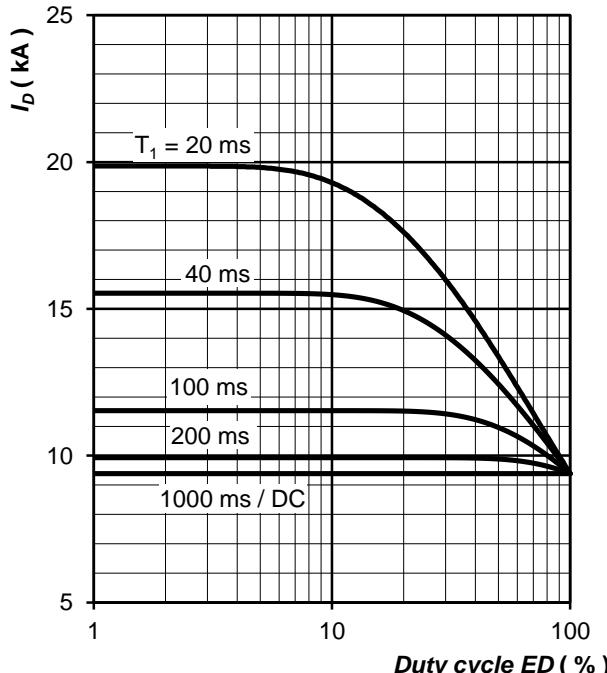
Fig. 20   Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
$f = 10$ kHz, square wave, $\Delta T_j = 60\ ^{\circ}C$
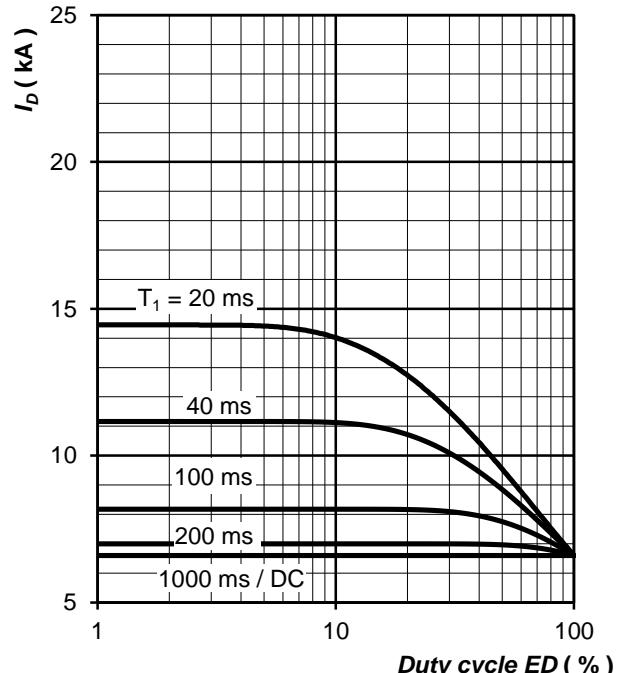
Fig. 21   Current load capacity, cont.,
DC output welding current with single-phase
centre tap vs. duty cycle
$f = 10$ kHz, square wave, $\Delta T_j = 40\ ^{\circ}C$

ABB s.r.o., Novodvorska 1768/138a, 142 21 Praha 4, Czech Republic

ABB s.r.o. reserves the right to change the data contained herein at any time without notice

Notes:

TS - DS/293/11e   Nov-14