5SDF 0131Z0401

High Frequency Housingless Welding Diode

Properties

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

Key Parameters

V_{RRM}	=	400	V
I_{FAVm}	=	13 058	A
I_{FSM}	=	70 000	A
V_{TO}	=	0.977	V
r_T	=	0.022	mΩ

Applications

- Welding equipment
- High current application up to 10 kHz

Types

	V_{RRM}
5SDF 0131Z0401	**400 V**
Conditions:	*T_j = -40 ÷ 190 °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

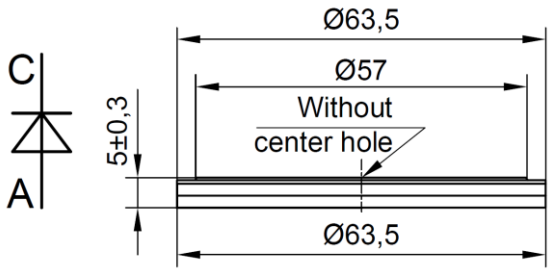

Fig. 1 Case

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tel.: +420 261 306 250, http://www.abb.com/semiconductors

Maximum Ratings			Maximum Limits	Unit
V_{RRM}	**Repetitive peak reverse voltage** T_j = -40 ÷ 190 °C		400	V
I_{FAVm}	***Average forward current***	T_c = 85 °C	13 058	A
		T_c = 110 °C	10 743	
I_{FRMS}	***RMS forward current***	T_c = 85 °C	20 512	A
		T_c = 110 °C	16 875	
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	A^2s
		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/µs, 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*	**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:

$F_m = 35\ ^{+5}_{-0}$ 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

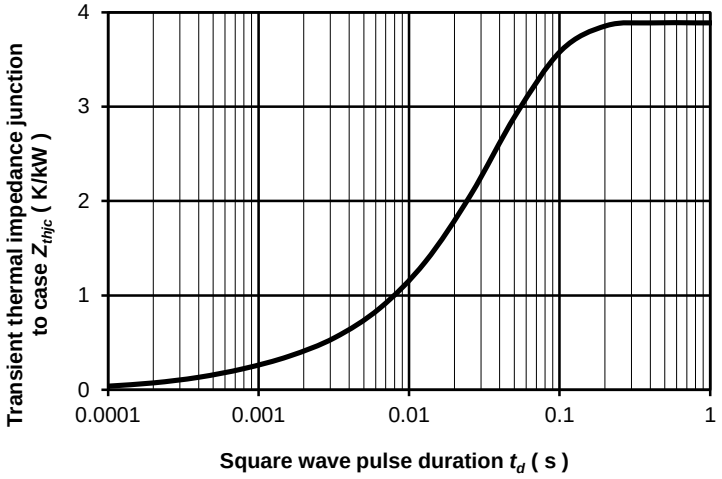

Fig. 2 Dependence transient thermal impedance junction to case on square pulse

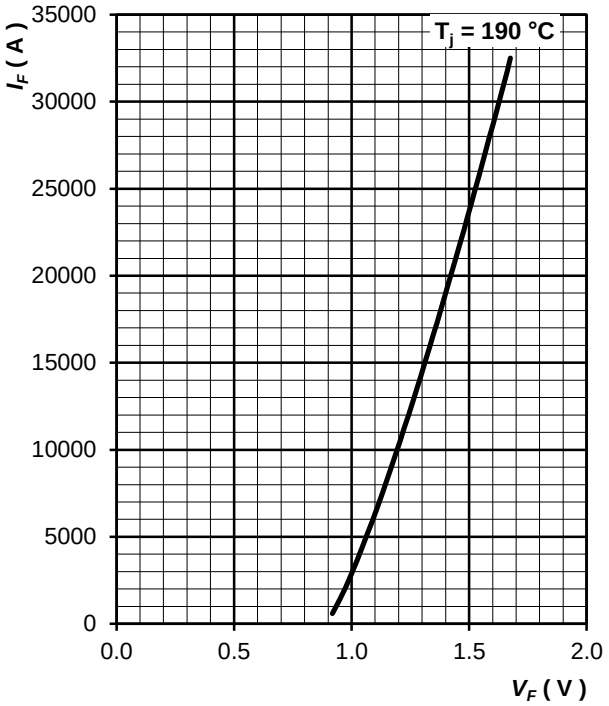

Fig. 3 Maximum forward voltage drop characteristics

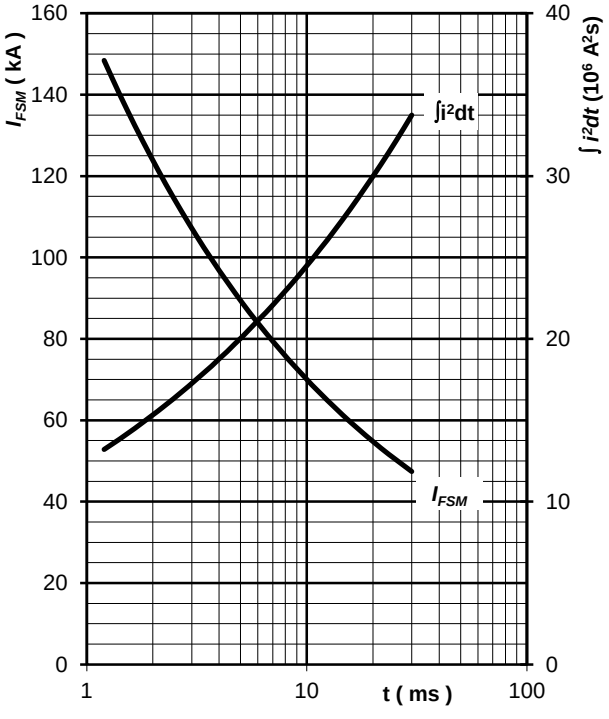

Fig. 4 Surge forward current vs. pulse length, half sine wave, single pulse, V_R = 0 V, $T_j = T_{jmax}$

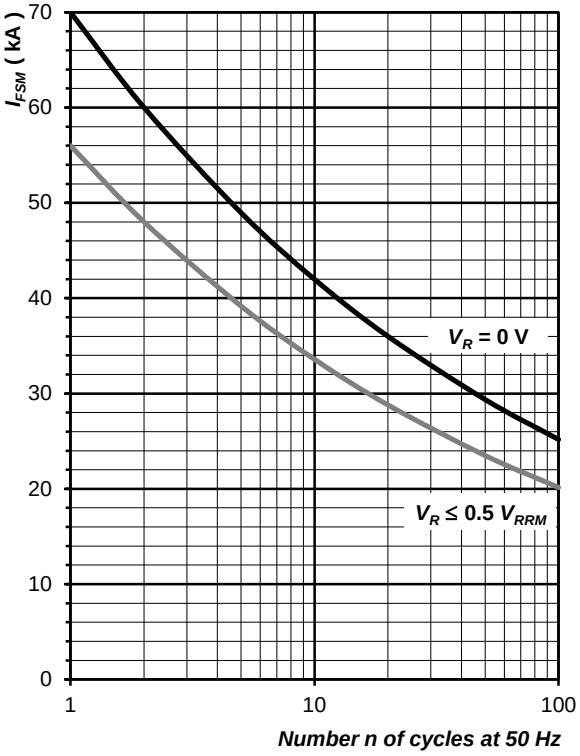

Fig. 5 Surge forward current vs. number of pulses, half sine wave, $T_j = T_{jmax}$

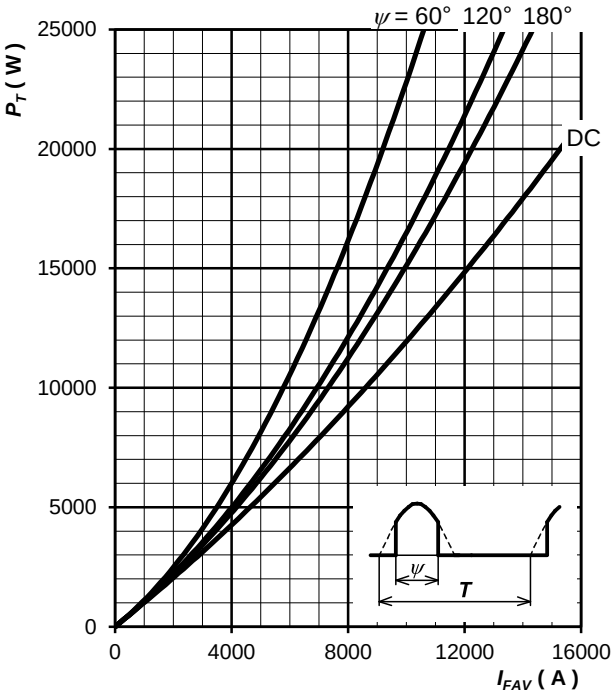

Fig. 6 Forward power loss vs. average forward current, sine waveform, f = 50 Hz, T = 1/f

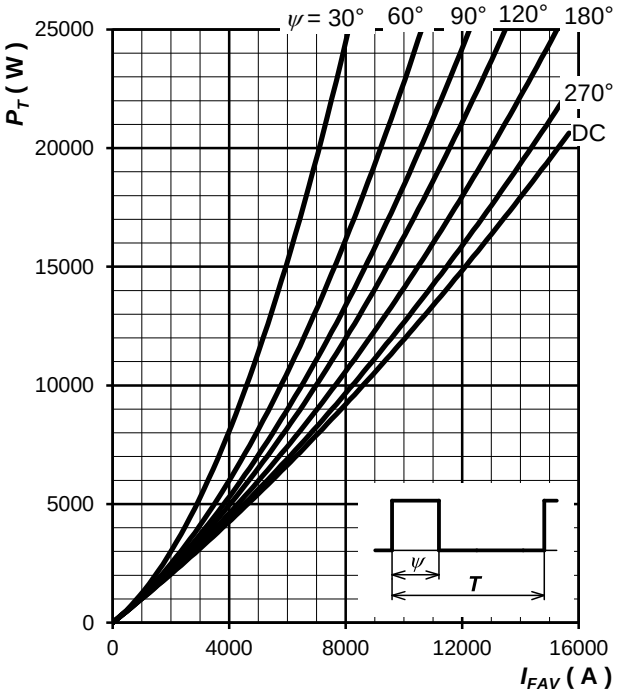

Fig. 7 Forward power loss vs. average forward current, square waveform, f = 50 Hz, T = 1/f

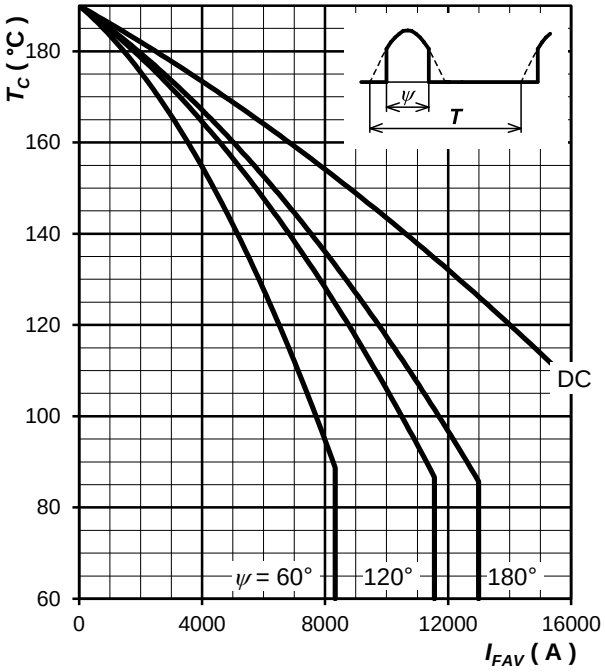

Fig. 8 Max. case temperature vs. aver. forward current, sine waveform, f = 50 Hz, T = 1/f

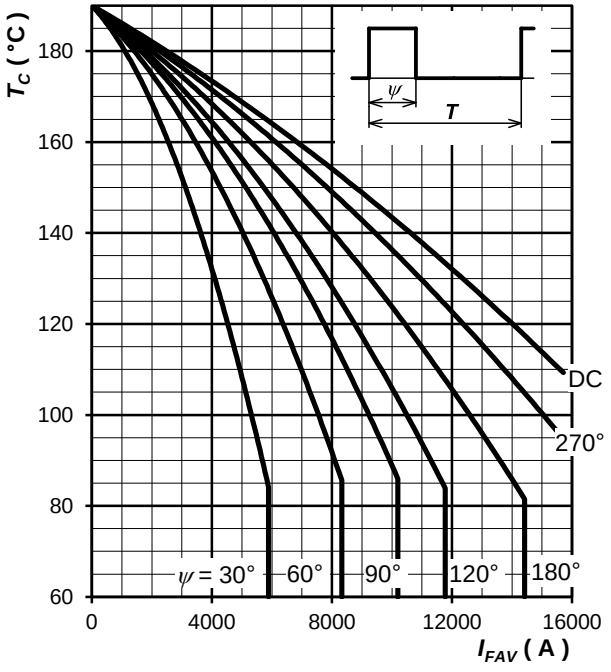

Fig. 9 Max.case temperature vs. aver. forward current, square waveform, f = 50 Hz, T = 1/f

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.

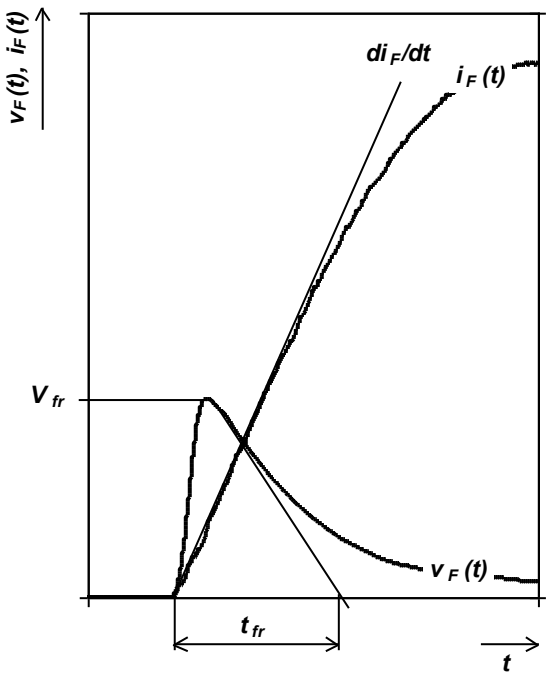

Fig. 10 Typical forward recovery voltage waveform when the diode is turned on with high di_F/dt

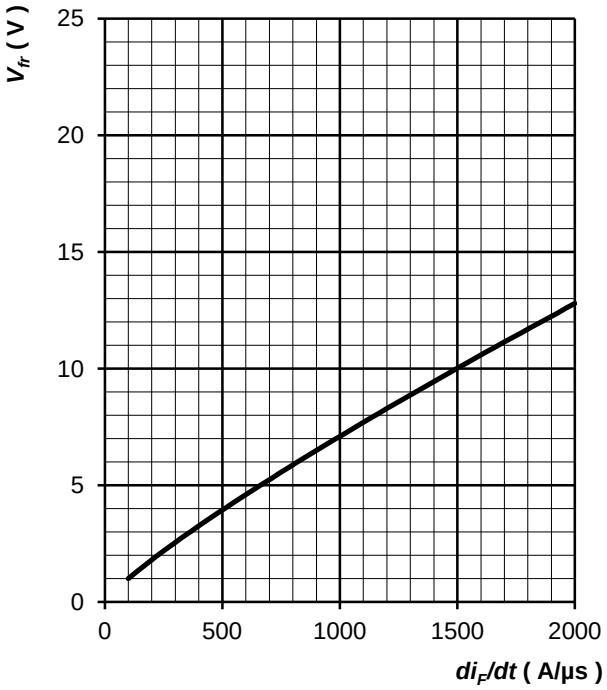

Fig. 11 Max. forward recovery voltage vs. rate of rise forward current, trapezoid pulse, $T_j = T_{jmax}$, $t_{fr} \leq 10$ µs

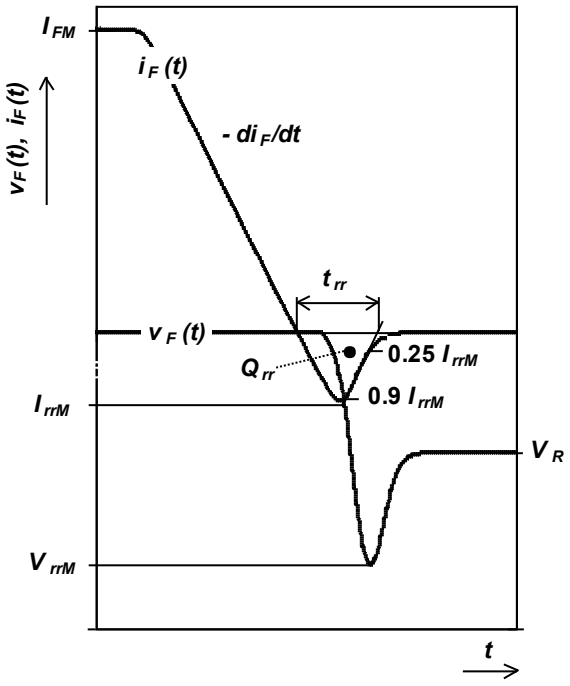

Fig. 12 Definition of reverse recovery parameters

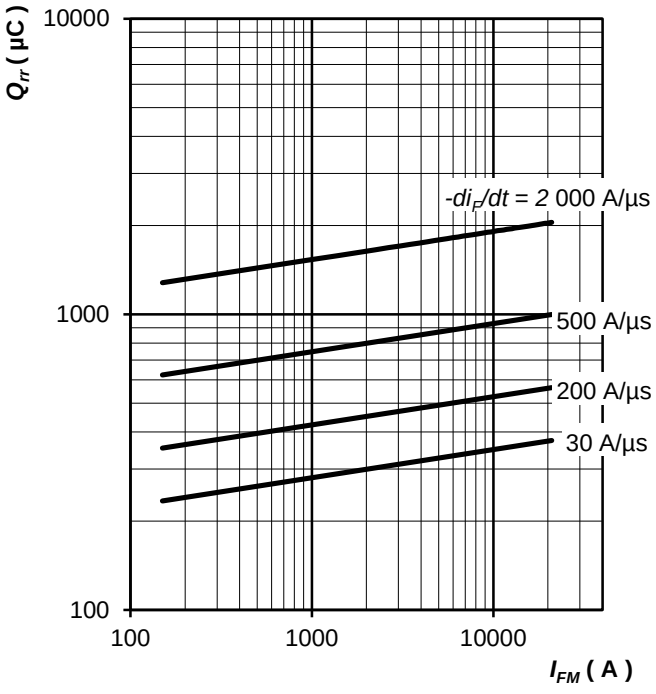

Fig. 13 Max. recovered charge vs. forward current,trapezoid pulse, $T_j = T_{jmax}$

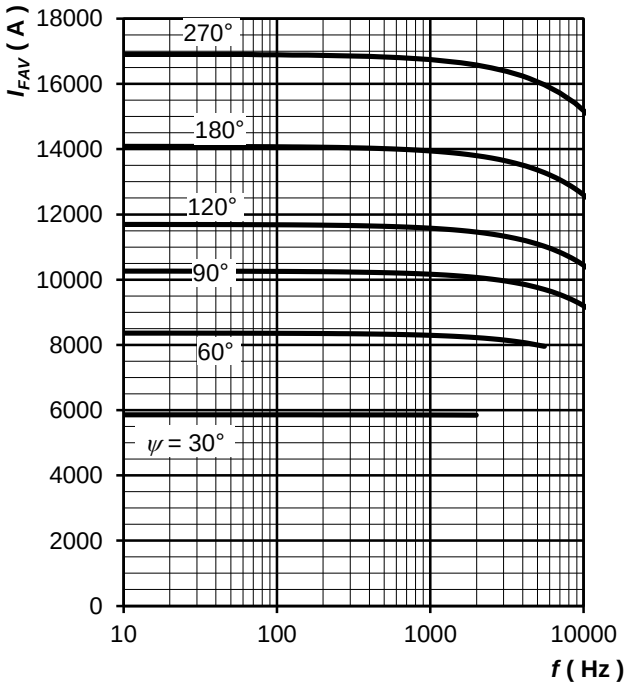

Fig. 14 Average forward current vs. frequency, trapezoid waveform, T_C = 85 °C, $di_F/dt = \pm 2\ 000$ A/µs, V_R = 50 V

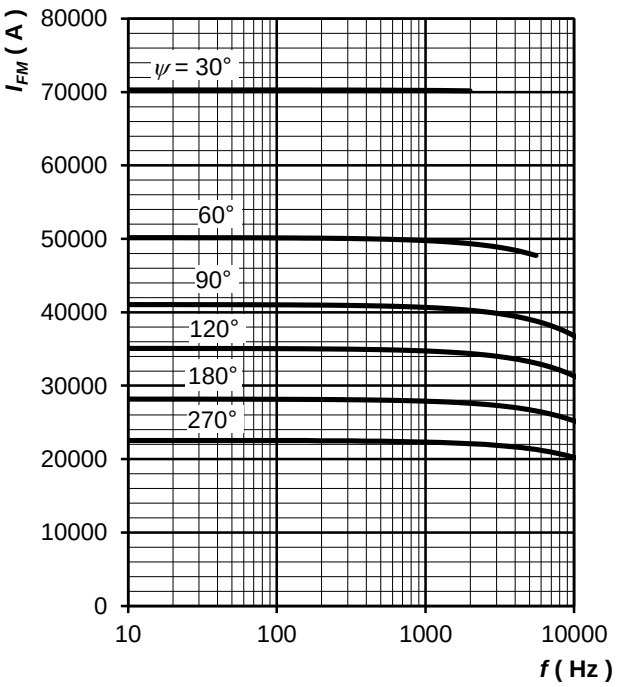

Fig. 15 Maximum forward current vs. frequency, trapezoid waveform, T_C = 85 °C, $di_F/dt = \pm 2\ 000$ A/µs, V_R = 50 V

Notes: