



MBR140ESF

High temperature 40 V, 1 A low VF Schottky barrier rectifier

2 August 2024

Product data sheet

1. General description

Planar Schottky barrier rectifier with an integrated guard ring for stress protection, encapsulated in a SOD123FL small and flat lead Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Average forward current: $I_{F(AV)} \leq 1$ A
- Reverse voltage: $V_R \leq 40$ V
- Low forward voltage
- High power capability due to clip-bonding technology
- Small and flat lead SMD plastic package
- High temperature $T_j \leq 175$ °C

3. Applications

- Low voltage rectification
- High efficiency DC-to-DC conversion
- Switch mode power supply
- Reverse polarity protection



4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20$ kHz; square wave; $T_{sp} \leq 170$ °C	-	-	1	A
V_R	reverse voltage	$T_j = 25$ °C	-	-	40	V
V_F	forward voltage	$I_F = 1$ A; $T_j = 25$ °C	-	430	490	mV
I_R	reverse current	$V_R = 40$ V; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_j = 25$ °C; pulsed	-	10	50	μ A

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 Transparent top view SOD123FL	 <i>sym001</i>
2	A	anode		

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
MBR140ESF	SOD123FL	plastic, surface mounted package; 2 terminals; 3 mm x 1.9 mm x 1 mm body	SOD123FL

7. Marking

Table 4. Marking codes

Type number	Marking code
MBR140ESF	P9

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_R	reverse voltage	$T_j = 25\text{ }^{\circ}\text{C}$		-	40	V
I_F	forward current	$T_{sp} = 165\text{ }^{\circ}\text{C}$		-	1.4	A
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $f = 20\text{ kHz}$; square wave; $T_{sp} \leq 170\text{ }^{\circ}\text{C}$		-	1	A
I_{FSM}	non-repetitive peak forward current	$t_p = 8.3\text{ ms}$; half sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$		-	40	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	[1]	-	680	mW
			[2]	-	1.15	W
T_j	junction temperature			-	175	$^{\circ}\text{C}$
T_{amb}	ambient temperature			-55	175	$^{\circ}\text{C}$
T_{stg}	storage temperature			-65	175	$^{\circ}\text{C}$

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] [2]	-	-	220	K/W
			[1] [3]	-	-	130	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[4]	-	-	18	K/W

- [1] For Schottky barrier diodes thermal runaway has to be considered, as in some applications the reverse power losses P_R are a significant part of the total power losses.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².
- [4] Soldering point of cathode tab.

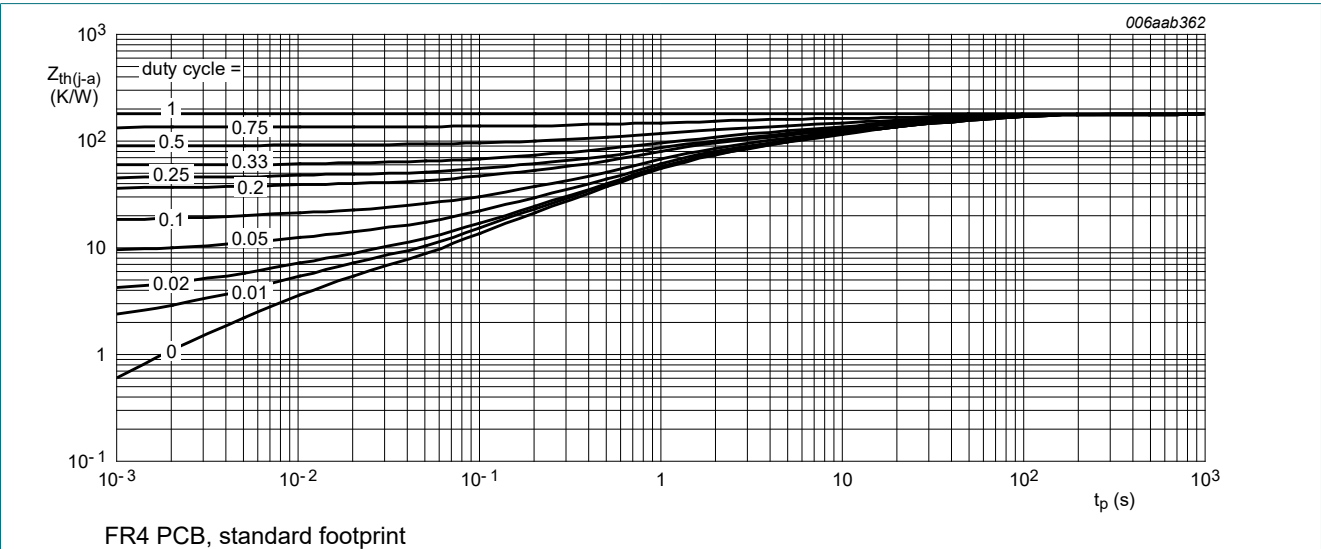


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

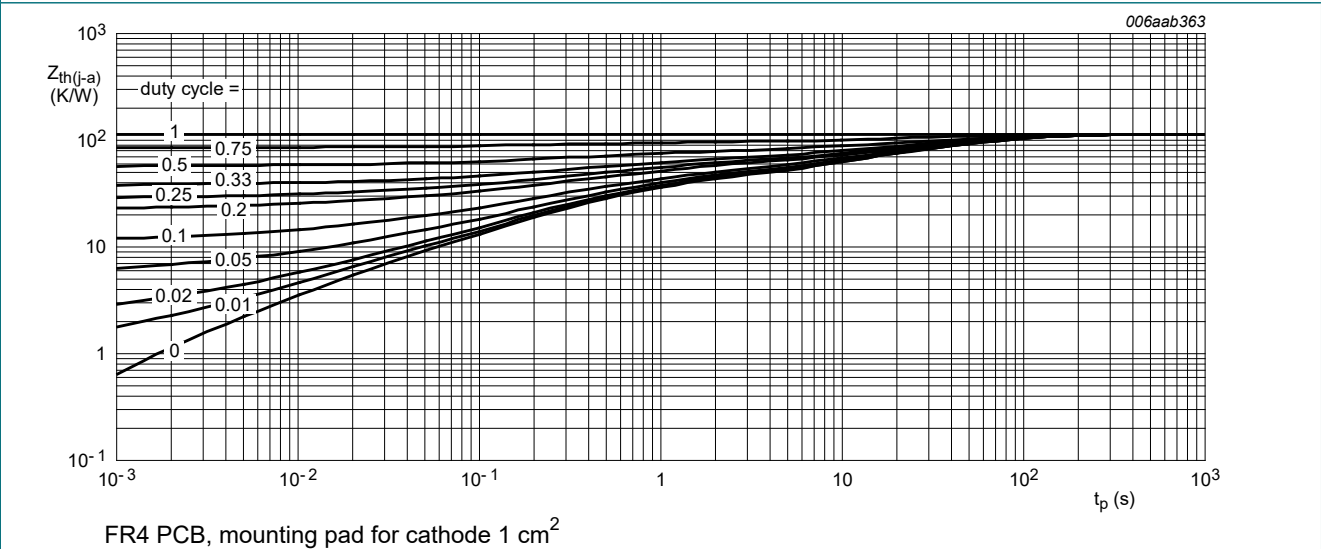
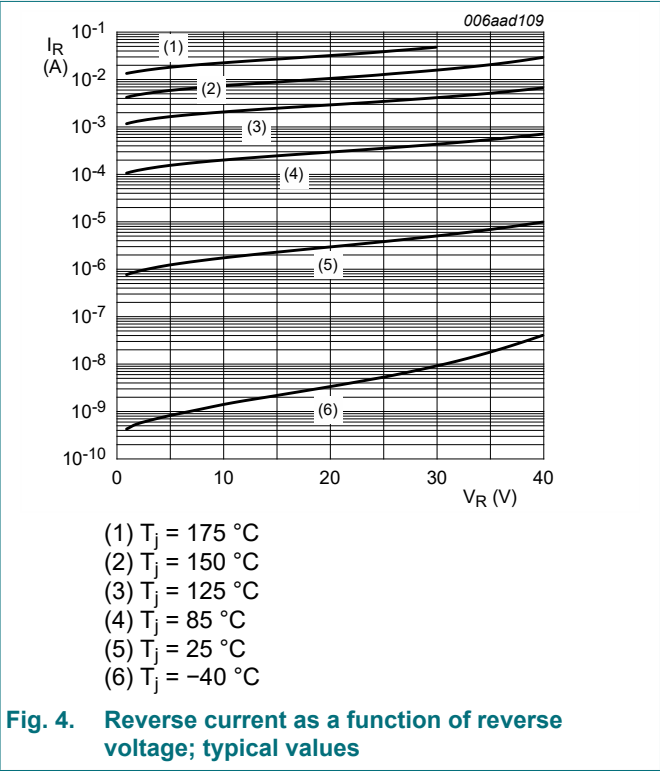
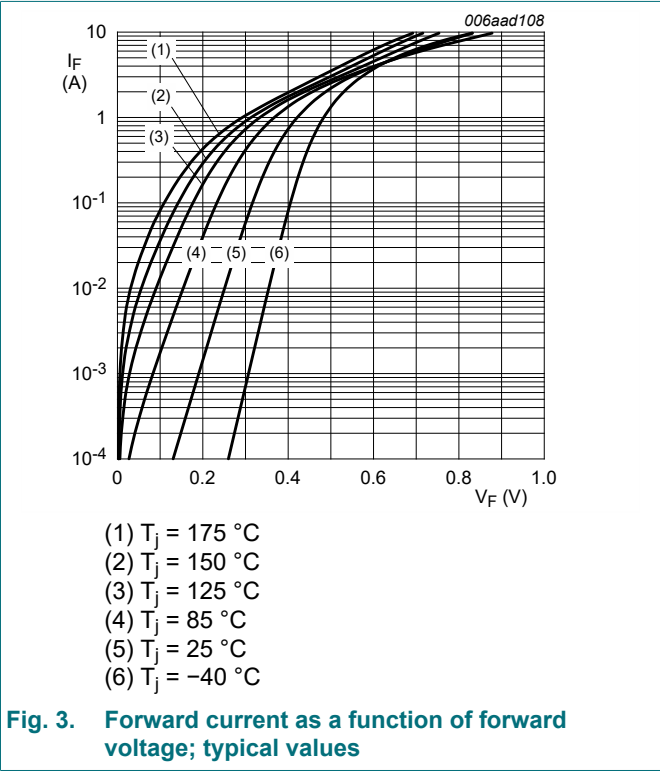


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _F	forward voltage	I _F = 0.1 A; T _j = 25 °C	-	310	360	mV
		I _F = 1 A; T _j = 25 °C	-	430	490	mV
		I _F = 1 A; T _j = -40 °C	-	480	570	mV
		I _F = 1 A; T _j = 125 °C	-	330	410	mV
		I _F = 1 A; T _j = 150 °C	-	310	390	mV
		I _F = 1 A; T _j = 175 °C	-	290	370	mV
I _R	reverse current	V _R = 10 V; t _p ≤ 300 μs; δ ≤ 0.02; T _j = 25 °C; pulsed	-	3	13	μA
		V _R = 40 V; t _p ≤ 300 μs; δ ≤ 0.02; T _j = 25 °C; pulsed	-	10	50	μA
		V _R = 40 V; t _p ≤ 300 μs; δ ≤ 0.02; T _j = -40 °C; pulsed	-	0.05	1	μA
		V _R = 40 V; t _p ≤ 300 μs; δ ≤ 0.02; T _j = 125 °C; pulsed	-	6.5	30	mA
C _d	diode capacitance	V _R = 1 V; f = 1 MHz; T _j = 25 °C	-	114	-	pF
		V _R = 4 V; f = 1 MHz; T _j = 25 °C	-	63	-	pF
		V _R = 10 V; f = 1 MHz; T _{amb} = 25 °C	-	41	-	pF
t _{rr}	reverse recovery time	I _F = 0.5 A; I _R = 0.5 A; I _{R(meas)} = 0.1 A; T _j = 25 °C	-	4.4	-	ns
V _{FRM}	peak forward recovery voltage	I _F = 1 A; dI _F /dt = 40 A/μs; T _j = 25 °C	-	484	-	mV



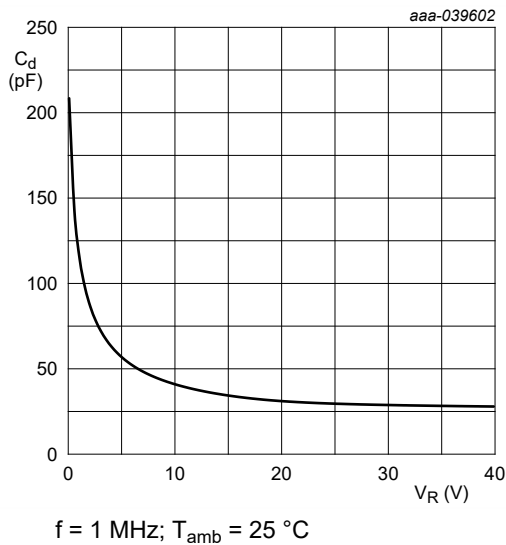


Fig. 5. Diode capacitance as a function of reverse voltage; typical values

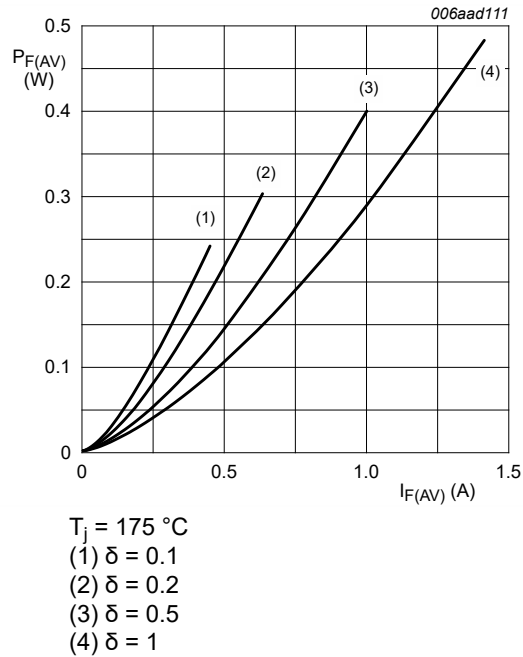


Fig. 6. Average forward power dissipation as a function of average forward current; typical values

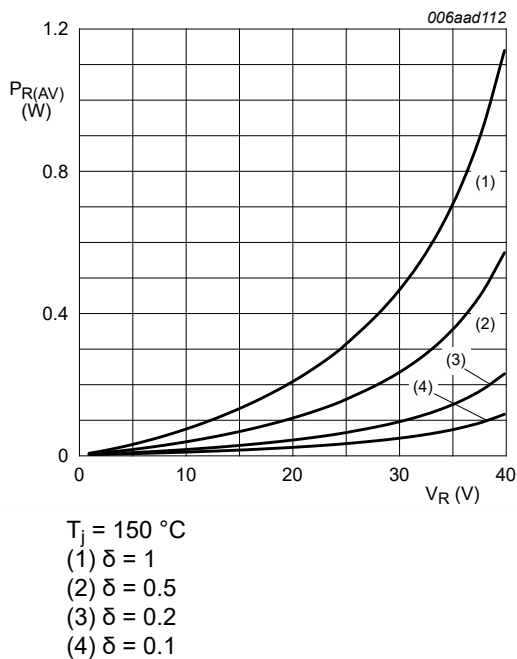


Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values

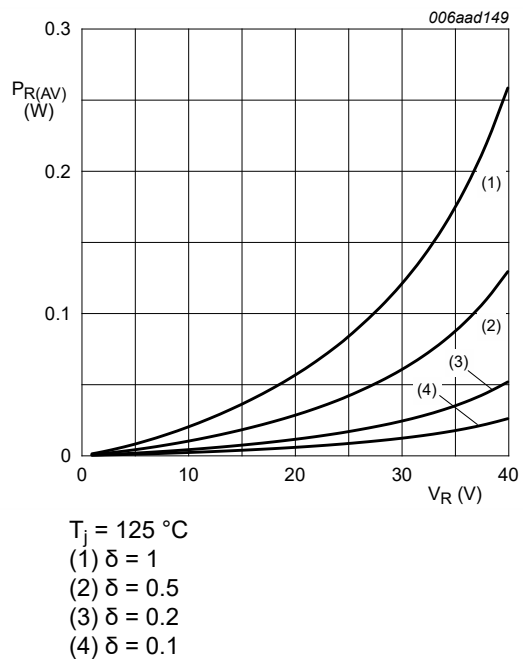


Fig. 8. Average reverse power dissipation as a function of reverse voltage; typical values

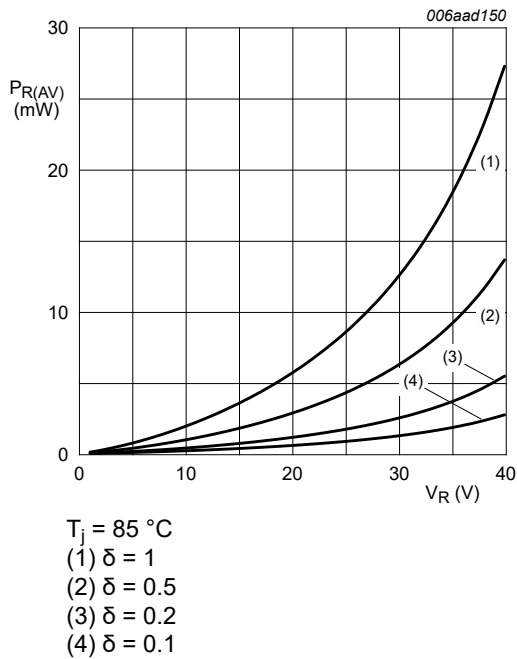


Fig. 9. Average reverse power dissipation as a function of reverse voltage; typical values

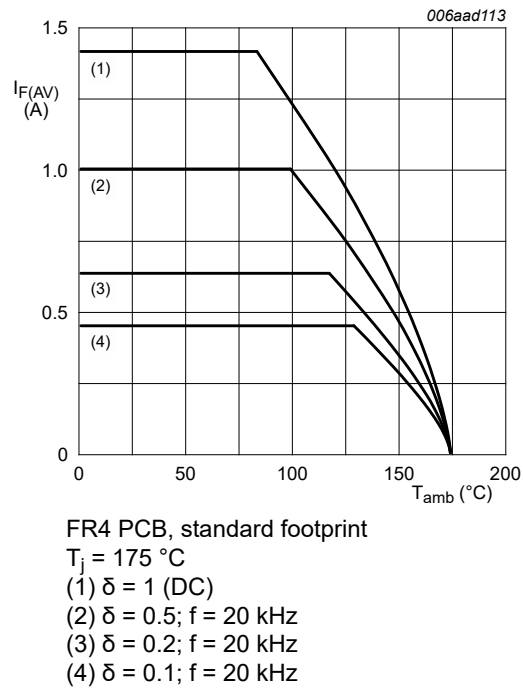


Fig. 10. Average forward current as a function of ambient temperature; typical values

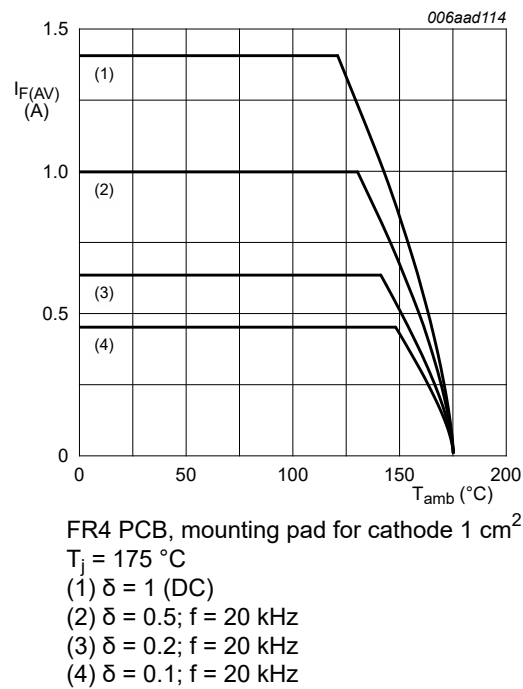


Fig. 11. Average forward current as a function of ambient temperature; typical values

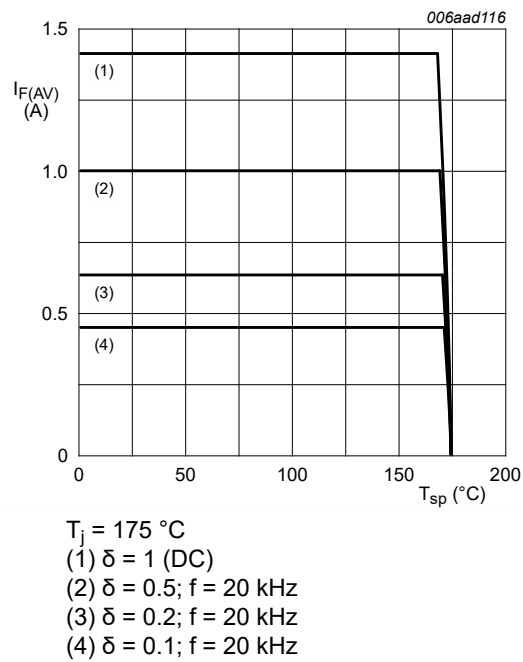


Fig. 12. Average forward current as a function of solder point temperature; typical values

11. Test information

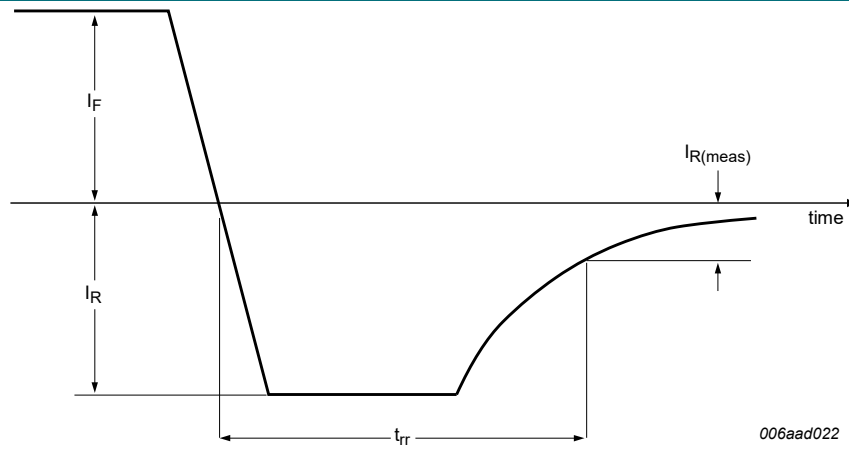


Fig. 13. Reverse recovery definition

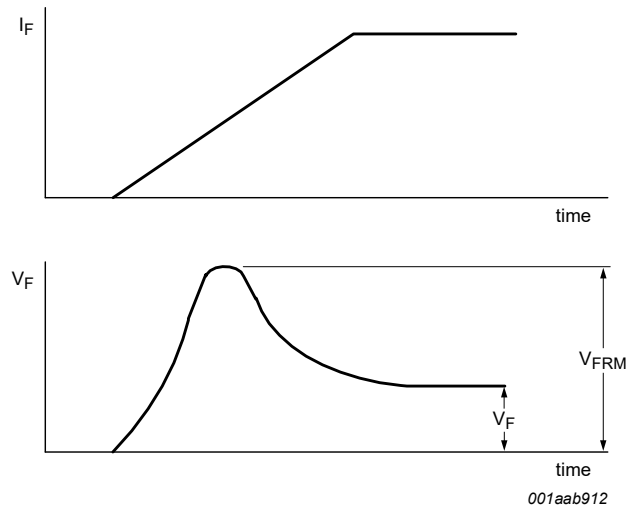


Fig. 14. Forward recovery definition

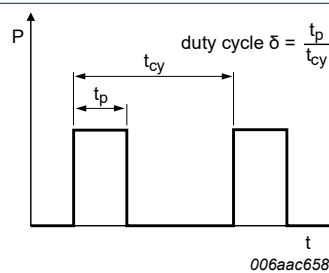


Fig. 15. Duty cycle definition

The current ratings for the typical waveforms are calculated according to the equations:

$$I_{F(AV)} = I_M \times \delta \text{ with } I_M \text{ defined as peak current,}$$

$$I_{RMS} = I_{F(AV)} \text{ at DC,}$$

$$I_{RMS} = I_M \times \sqrt{\delta} \text{ with } I_{RMS} \text{ defined as RMS current.}$$

12. Package outline

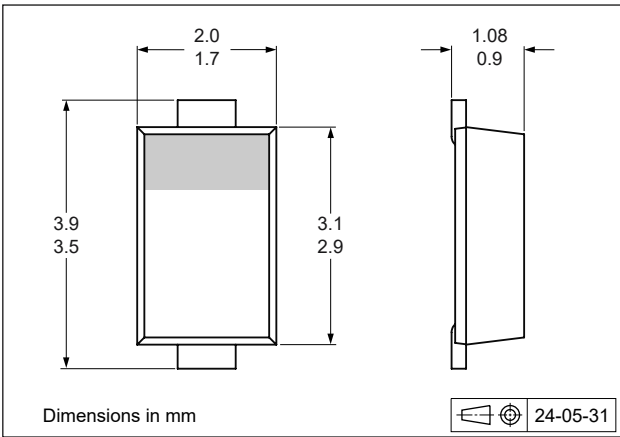


Fig. 16. Package outline SOD123FL

13. Soldering

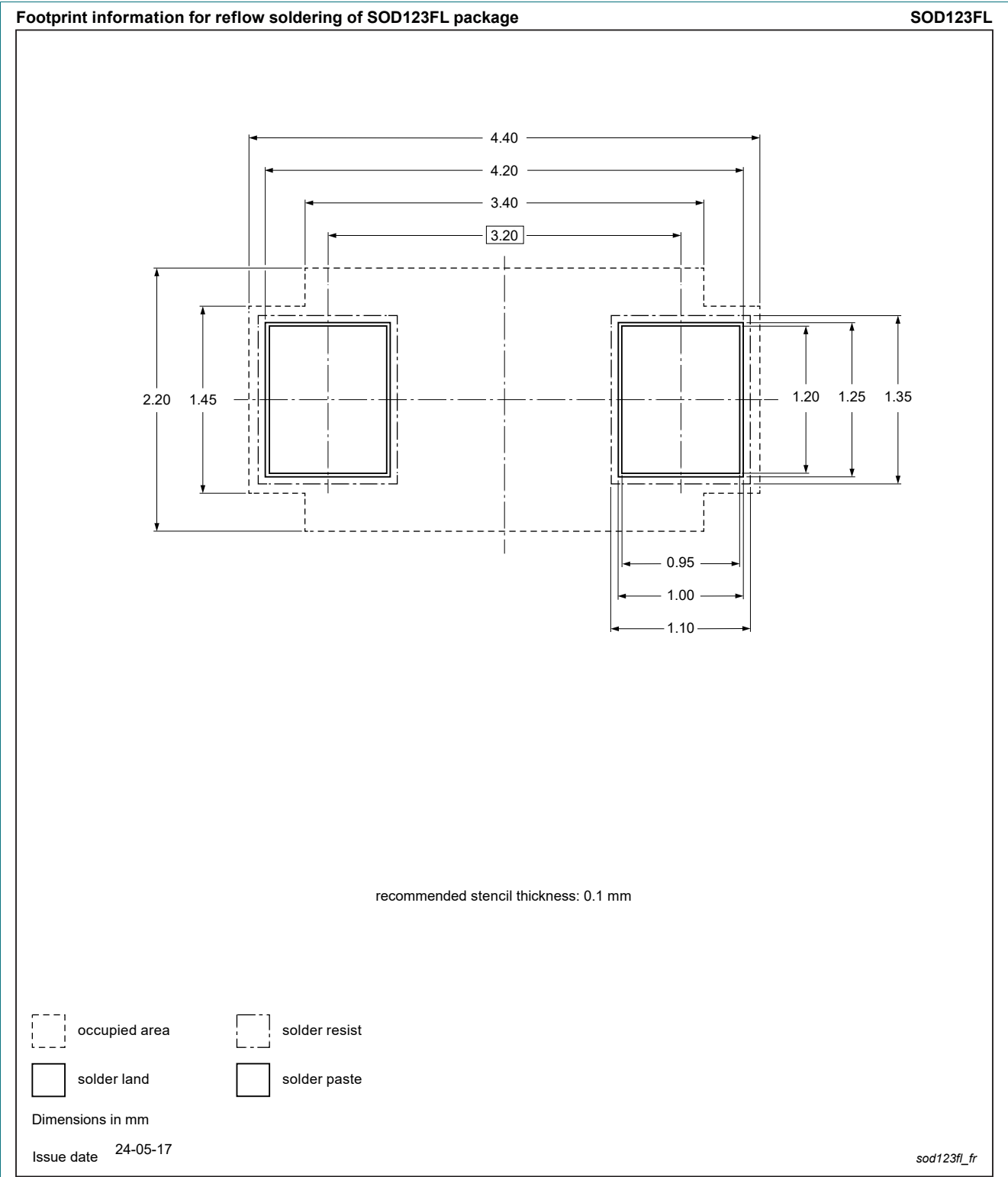


Fig. 17. Reflow soldering footprint for SOD123FL

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
MBR140ESF v.1	20240802	Product data sheet	-	-

15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
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