



# PNE20030EP

200 V, 3 A hyperfast recovery rectifier

10 January 2024

Product data sheet

## 1. General description

High power density, hyperfast recovery rectifier with high-efficiency planar technology, encapsulated in a small and flat lead CFP5 (SOD128) Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Reverse voltage  $V_R \leq 200$  V
- Forward current  $I_F \leq 3$  A
- Switching time  $t_{tr} \leq 30$  ns
- Pt doped life time control
- Low inductance
- Small and flat lead SMD plastic package
- Package height typ. 1 mm
- High power capability due to clip-bond technology
- Planar die design
- Capable for reflow and wave soldering

## 3. Applications

- General-purpose rectification
- Reverse polarity protection
- Hyperfast switching
- Freewheeling applications

## 4. Quick reference data


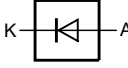
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_{sp} \leq 155$ °C		-	-	3	A
$V_{RRM}$	repetitive peak reverse voltage	$T_j = 25$ °C		-	-	200	V
$V_R$	reverse voltage			-	-	200	V
$V_F$	forward voltage	$I_F = 3$ A; $T_j = 25$ °C	[1]	-	875	980	mV
		$I_F = 3$ A; $T_j = 125$ °C	[1]	-	730	820	mV
$I_R$	reverse current	$V_R = 200$ V; $T_j = 25$ °C	[1]	-	-	1	$\mu$ A
		$V_R = 200$ V; $T_j = 125$ °C	[1]	-	1.5	35	$\mu$ A

[1] Very short pulse, in order to maintain a stable junction temperature.

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 CFP5 (SOD128)	 006aab040
2	A	anode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">PNE20030EP</a>	CFP5	plastic, surface mounted package; 2 terminals; 4 mm pitch; 3.8 mm x 2.6 mm x 1 mm body	<a href="#">SOD128</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PNE20030EP	DG

## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 601134).

Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{RRM}$	repetitive peak reverse voltage	$T_j = 25\text{ °C}$	-	200	V	
$V_R$	reverse voltage		-	200	V	
$V_{RMS}$	RMS voltage		-	140	V	
$I_F$	forward current	$\delta = 1; T_{sp} \leq 150\text{ °C}$	-	4.2	A	
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz};$ square wave; $T_{sp} \leq 155\text{ °C}$	-	3	A	
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8.3\text{ ms};$ single half sine wave (applied at rated load condition); $T_{j(\text{init})} = 25\text{ °C}$	-	75	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	0.81	W
			[2]	-	1.3	W
$T_j$	junction temperature		-	175	°C	
$T_{amb}$	ambient temperature		-55	175	°C	
$T_{stg}$	storage temperature		-65	175	°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  $1\text{ cm}^2$ .

## 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]	-	-	185	K/W
			[2]	-	-	115	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[3]	-	-	8	K/W

[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  $1\text{ cm}^2$ .

[3] Soldering point of cathode tab.

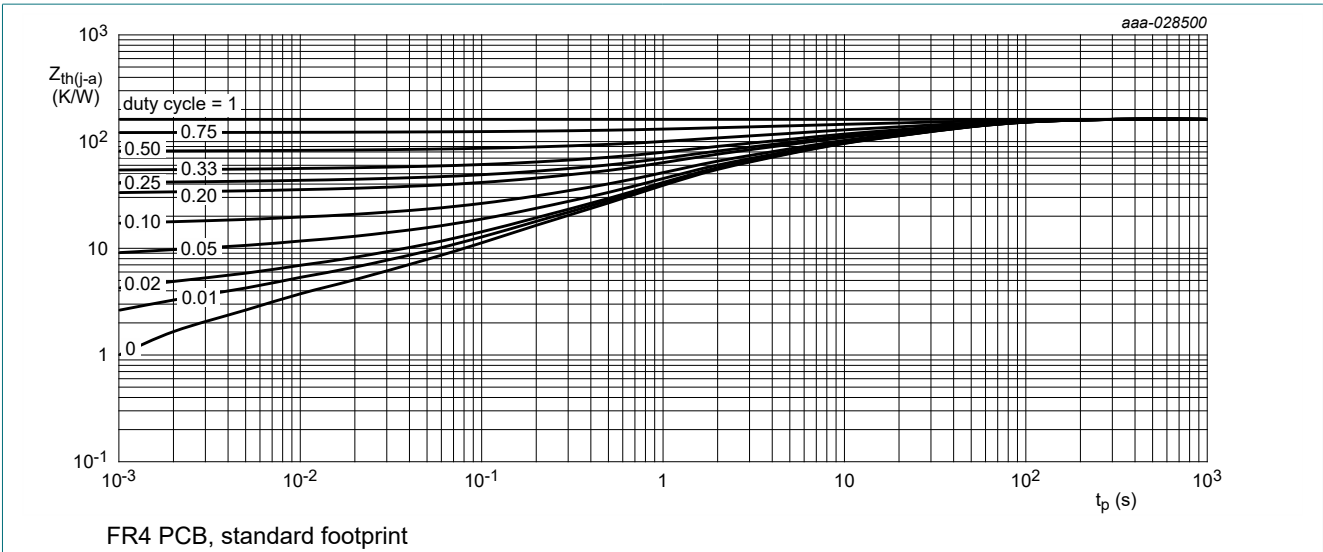


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

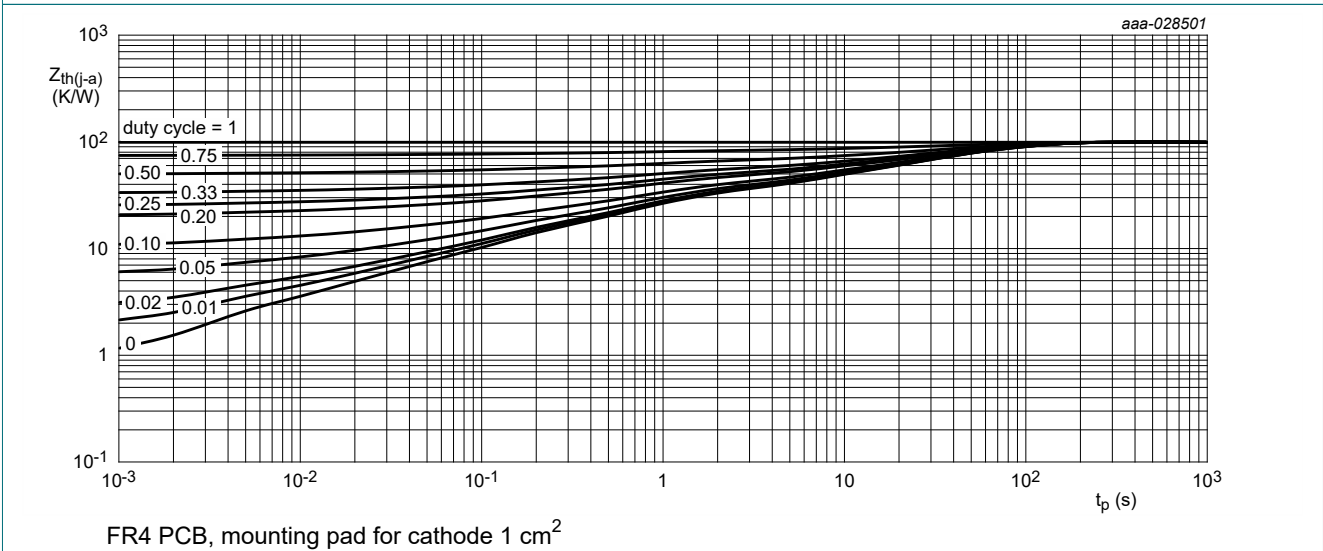


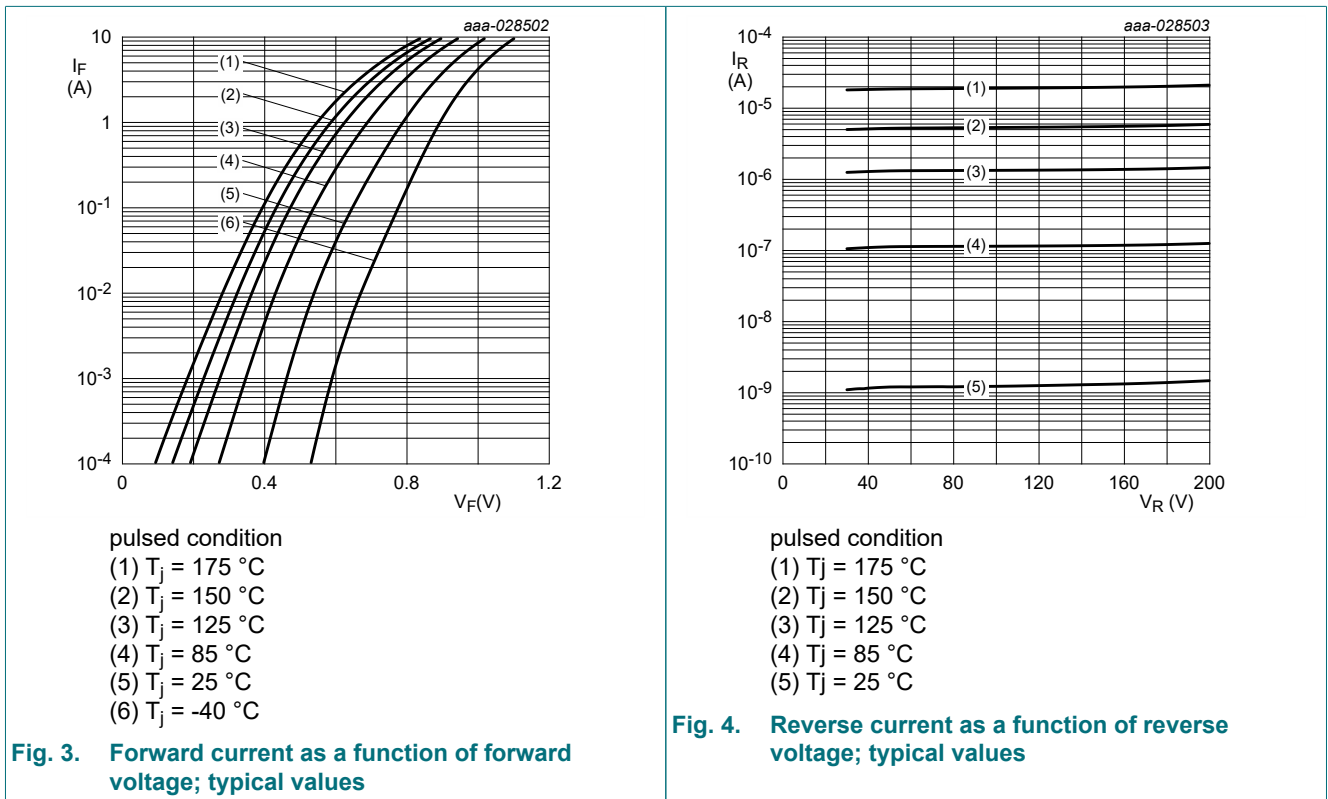
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

### 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 100 \mu A; T_j = 25 \text{ }^\circ C$	[1]	200	-	-	V
$V_F$	forward voltage	$I_F = 3 \text{ A}; T_j = 25 \text{ }^\circ C$	[1]	-	875	980	mV
		$I_F = 3 \text{ A}; T_j = 125 \text{ }^\circ C$	[1]	-	730	820	mV
$I_R$	reverse current	$V_R = 200 \text{ V}; T_j = 25 \text{ }^\circ C$	[1]	-	-	1	$\mu A$
		$V_R = 200 \text{ V}; T_j = 125 \text{ }^\circ C$	[1]	-	1.5	35	$\mu A$
$C_d$	diode capacitance	$V_R = 4 \text{ V}; f = 1 \text{ MHz}; T_j = 25 \text{ }^\circ C$		-	32	-	pF
$t_{rr}$	reverse recovery time ; step recovery	$I_F = 0.5 \text{ A}; I_R = 1 \text{ A}; I_{R(meas)} = 0.25 \text{ A}; T_j = 25 \text{ }^\circ C$		-	13	30	ns
		$I_F = 1 \text{ A}; dI_F/dt = 50 \text{ A}/\mu s; V_R = 30 \text{ V}; T_j = 25 \text{ }^\circ C$		-	22	-	ns
		$I_F = 1 \text{ A}; dI_F/dt = 100 \text{ A}/\mu s; V_R = 30 \text{ V}; T_j = 25 \text{ }^\circ C$		-	17	-	ns
$I_{RM}$	peak reverse recovery current	$T_j = 25 \text{ }^\circ C$		-	1	-	A
$Q_{rr}$	reverse recovery charge			-	16	-	nC
$V_{FRM}$	peak forward recovery voltage	$I_F = 1 \text{ A}; dI_F/dt = 50 \text{ A}/\mu s; T_j = 25 \text{ }^\circ C$		-	820	-	mV

[1] Very short pulse, in order to maintain a stable junction temperature.



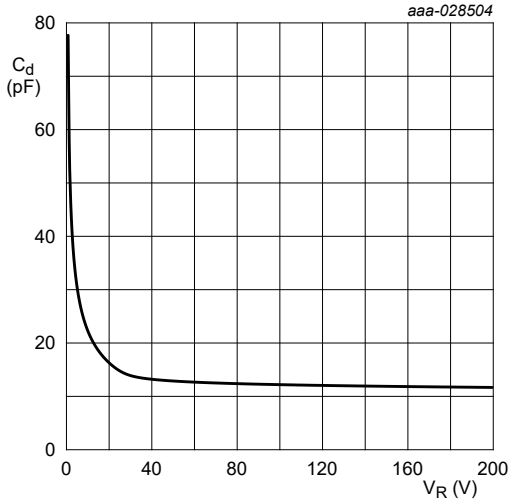


Fig. 5. Diode capacitance as a function of reverse voltage; typical values

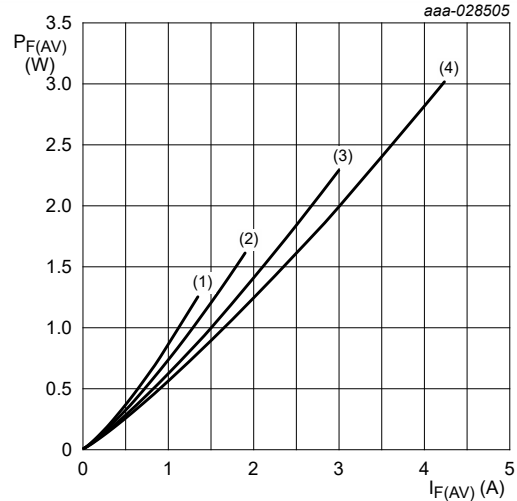


Fig. 6. Average forward power dissipation as a function of average forward current; typical values

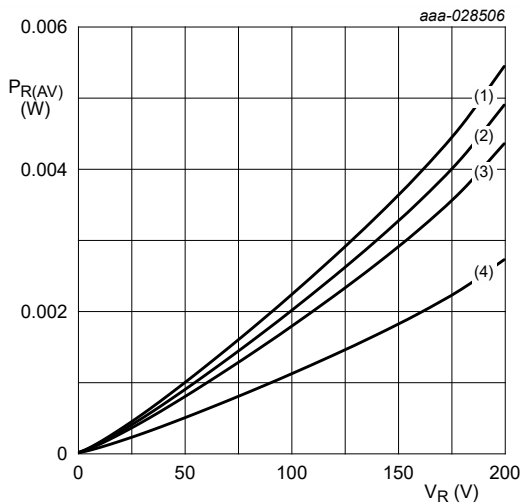


Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values

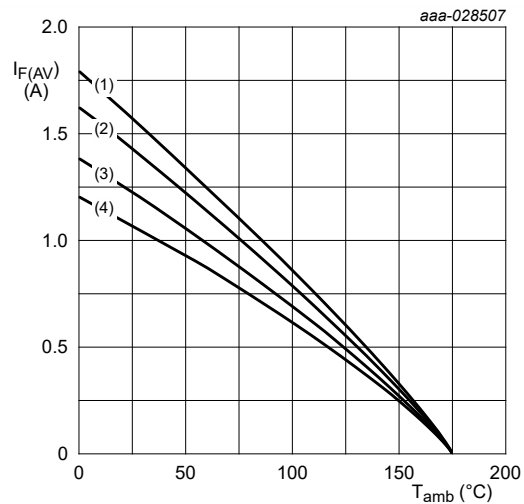
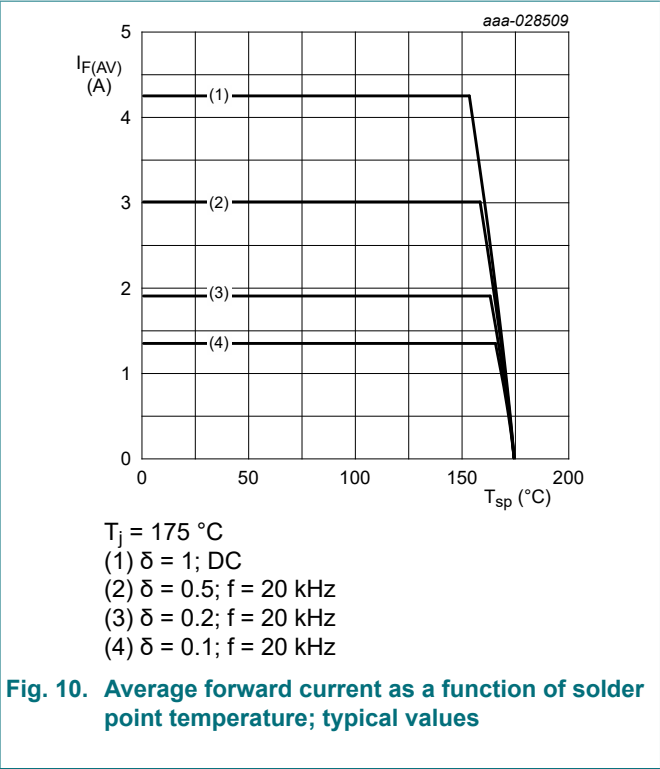
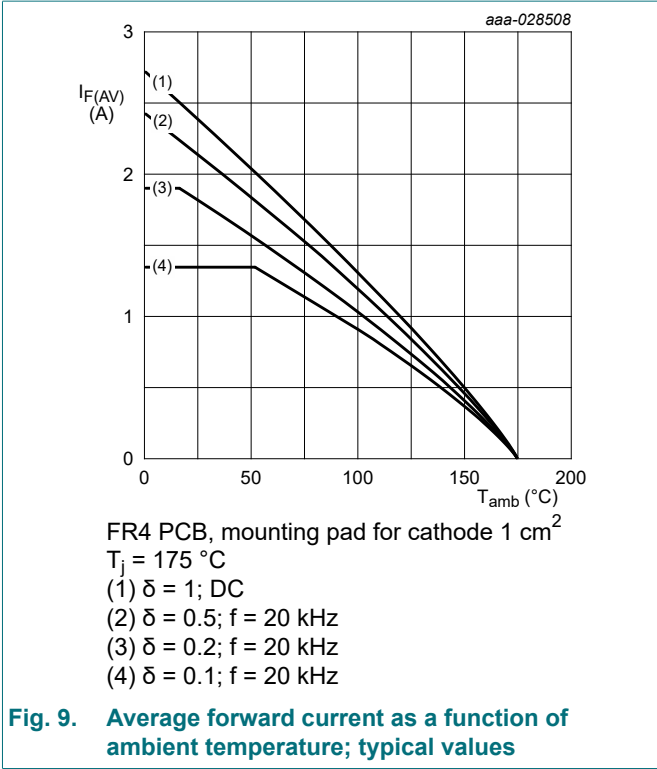
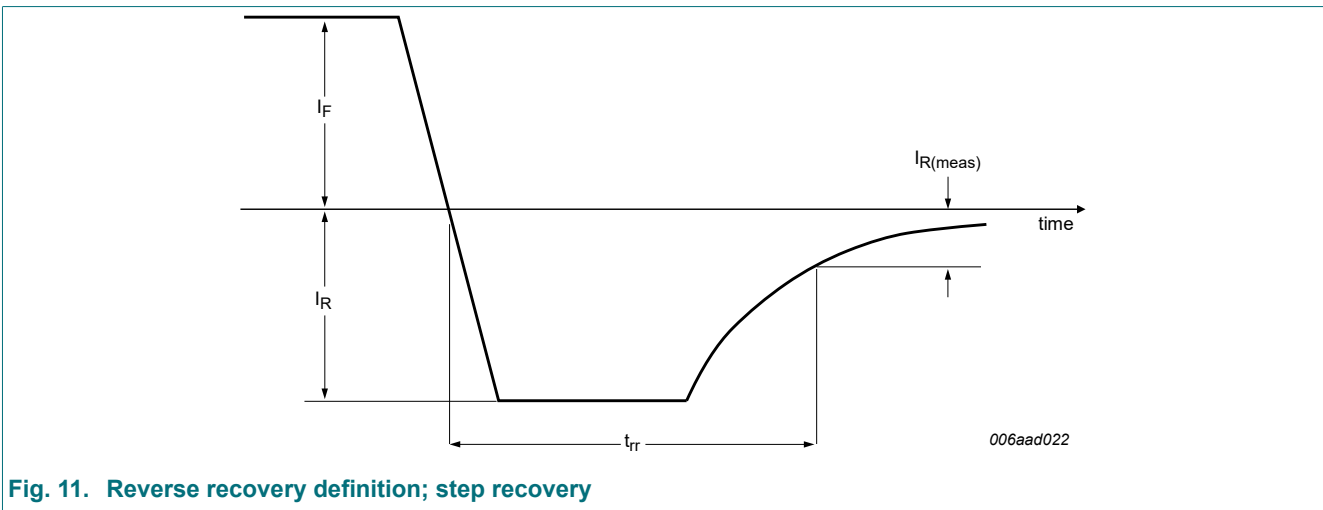


Fig. 8. Average forward current as a function of ambient temperature; typical values



### 11. Test information



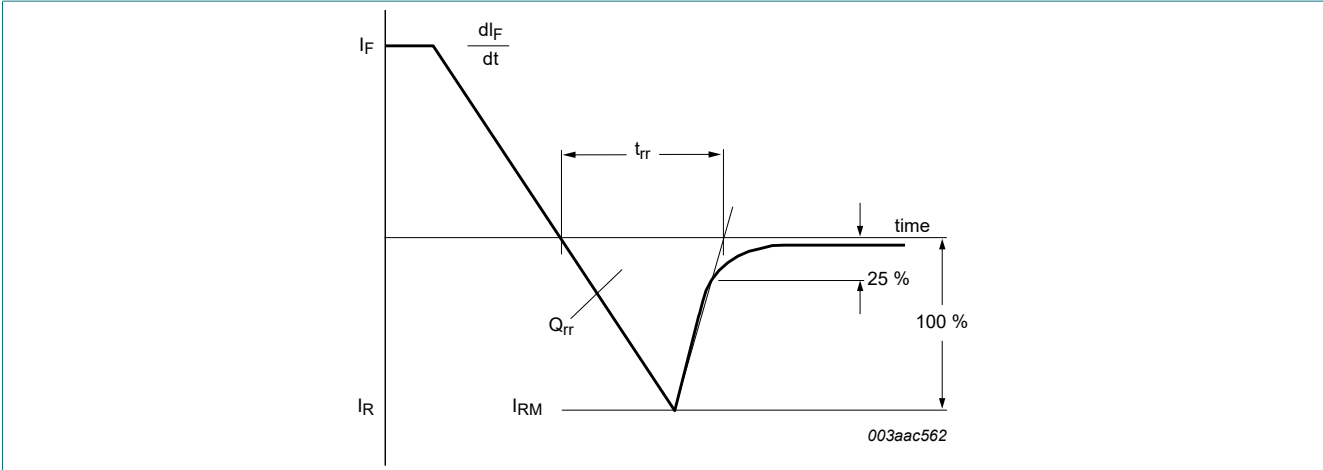


Fig. 12. Reverse recovery definition; ramp recovery

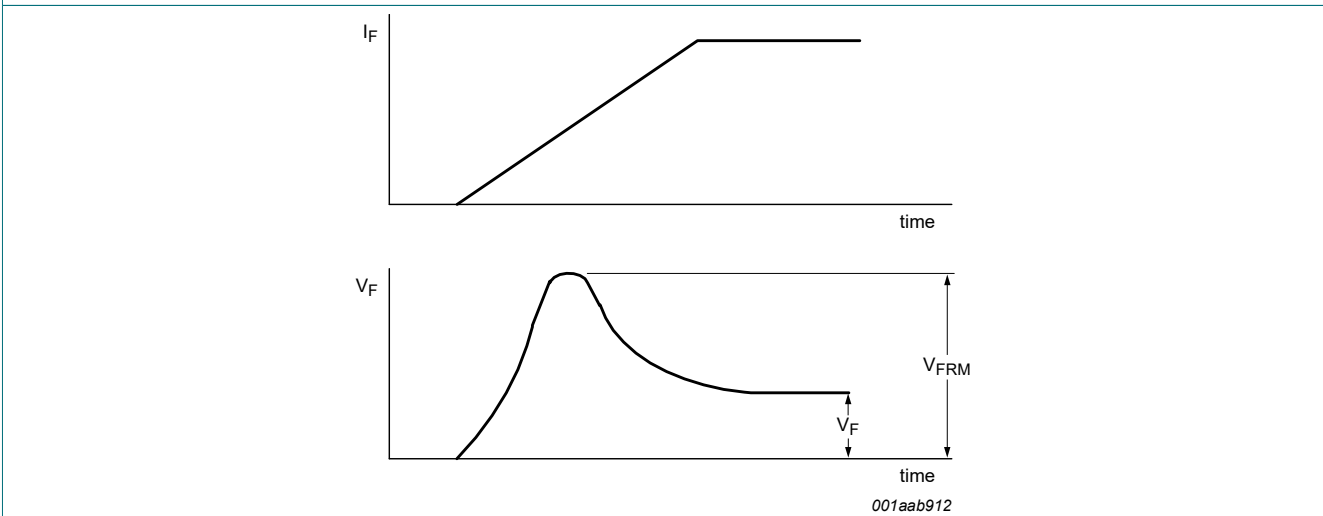


Fig. 13. Forward recovery definition

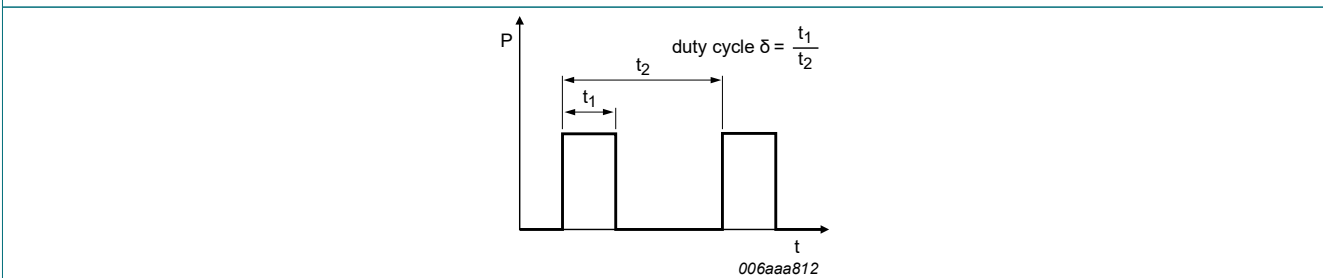


Fig. 14. Duty cycle definition

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

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

$$I_{RMS} = I_{F(AV)} \text{ at DC, and } I_{RMS} = I_M \times \sqrt{\delta}$$

with  $I_{RMS}$  defined as RMS current.



## 12. Package outline

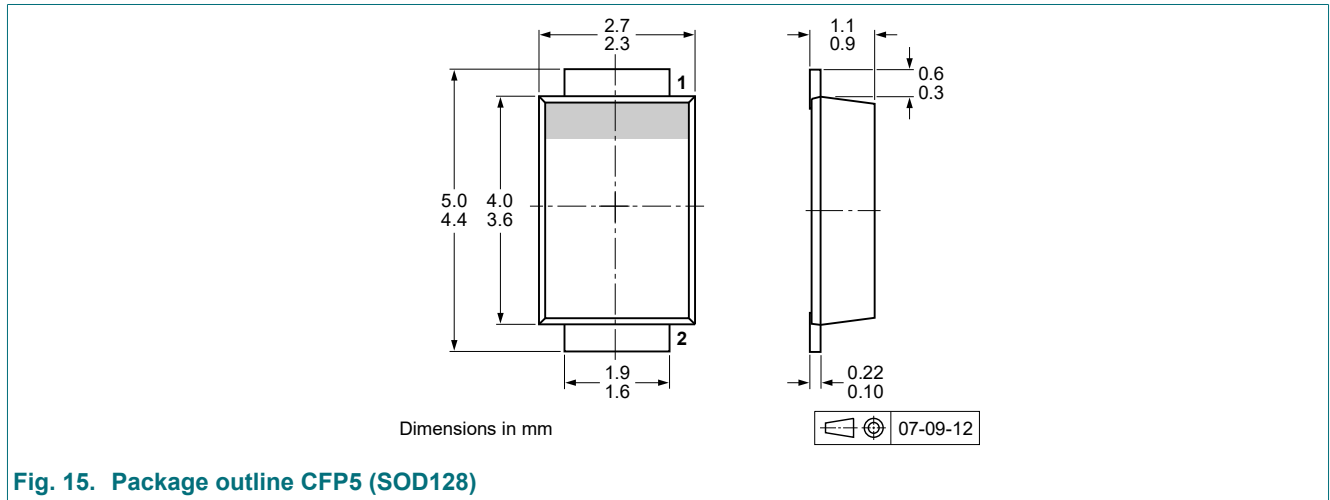


Fig. 15. Package outline CFP5 (SOD128)

## 13. Soldering

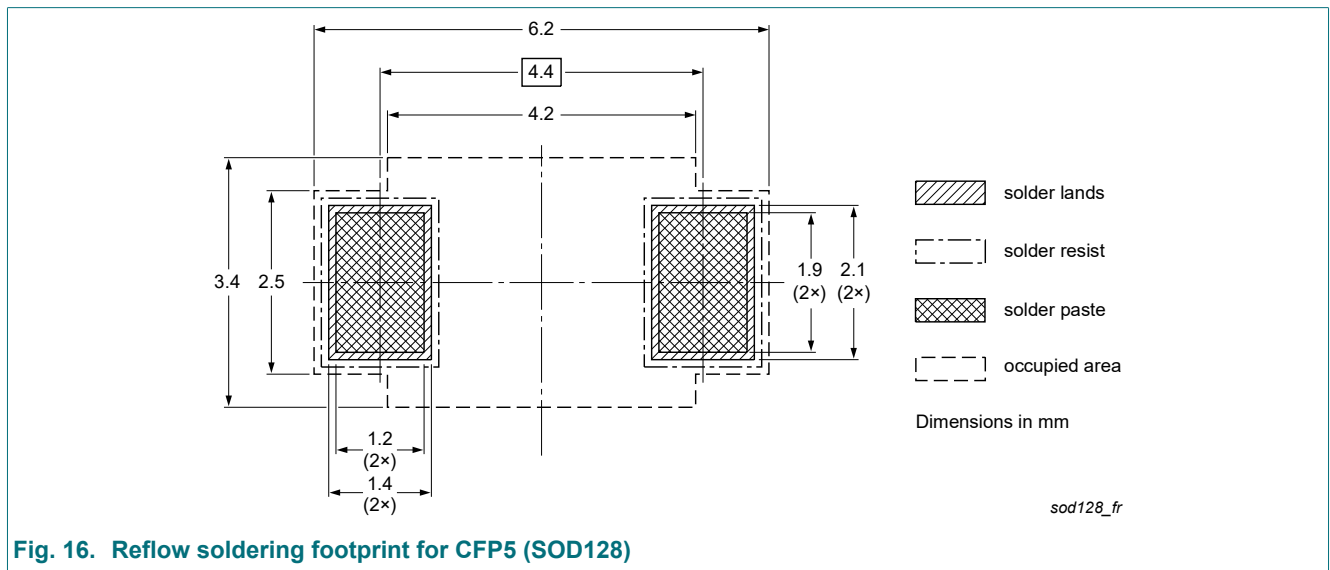
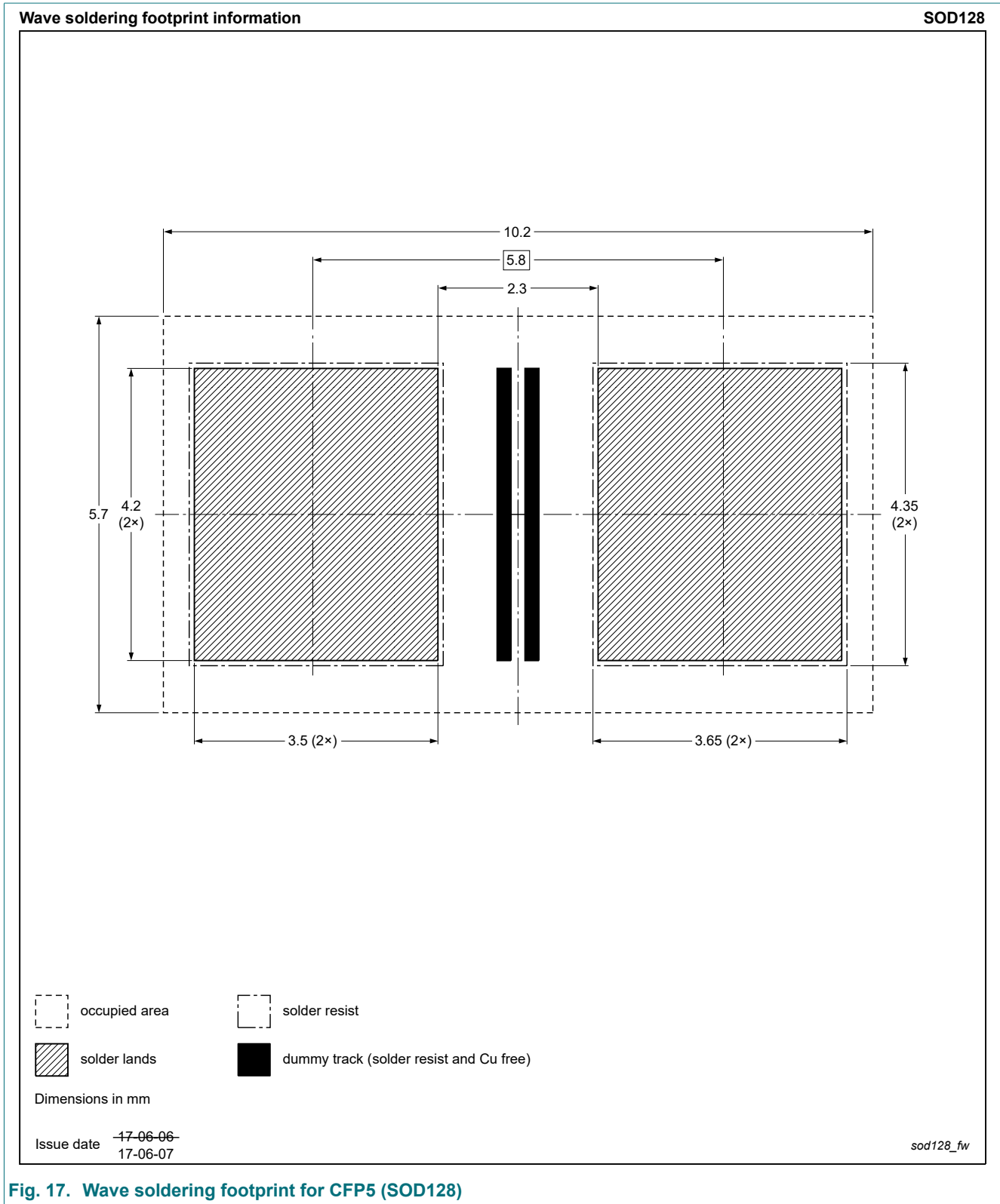


Fig. 16. Reflow soldering footprint for CFP5 (SOD128)



**Fig. 17. Wave soldering footprint for CFP5 (SOD128)**

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PNE20030EP v.5	20240110	Product data sheet	-	PNE20030EP v.4
Modifications:	<ul style="list-style-type: none"> <li>Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).</li> </ul>			
PNE20030EP v.4	20191218	Product data sheet	-	PNE20030EP v.3
PNE20030EP v.3	20191125	Preliminary data sheet	-	PNE20030EP v.2
PNE20030EP v.2	20191120	Product data sheet	-	PNE20030EP v.1
PNE20030EP v.1	20190227	Objective 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.
- [2] The term 'short data sheet' is explained in section "Definitions".
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## Contents

1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Quick reference data.....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values.....	3
9. Thermal characteristics.....	3
10. Characteristics.....	5
11. Test information.....	7
12. Package outline.....	9
13. Soldering.....	9
14. Revision history.....	11
15. Legal information.....	12

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