



# PNE20080CPE

200 V, 2 x 4 A dual common cathode hyperfast recovery rectifier

9 September 2021

Product data sheet

## 1. General description

High power density, hyperfast switching time dual recovery rectifier in common cathode configuration with high-efficiency planar technology, encapsulated in a CFP15B (SOT1289B) power and flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Reverse voltage:  $V_R \leq 200$  V
- Forward current:  $I_F \leq 4$  A (per diode)
- Switching time:  $t_{tr} \leq 30$  ns
- Pt doped life time control
- Low inductance
- Power and flat lead SMD plastic package
- Package height typical 0.95 mm
- High power capability due to clip-bond technology
- Planar die design
- AEC-Q101 qualified

## 3. Applications

- General-purpose rectification
- Hyperfast switching
- Solenoid control
- Piezo injection
- Freewheeling applications

## 4. Quick reference data

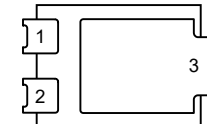
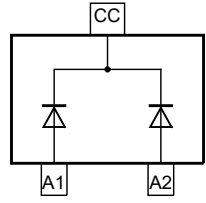
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode (unless otherwise specified)</b>						
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_{sp} \leq 155$ °C	-	-	4	A
$V_R$	reverse voltage	$T_j = 25$ °C	-	-	200	V
$V_{RRM}$	repetitive peak reverse voltage		-	-	200	V
$V_F$	forward voltage	$I_F = 4$ A; $T_j = 25$ °C	[1]	860	930	mV
		$I_F = 4$ A; $T_j = 125$ °C	[1]	710	810	mV
$I_R$	reverse current	$V_R = 200$ V; $T_j = 25$ °C	[1]	-	1	µA
		$V_R = 200$ V; $T_j = 125$ °C	[1]	2	40	µA

[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	A1	anode (diode 1)	 <p>CFP15B (SOT1289B)</p>	 <p>aaa-030081</p>
2	A2	anode (diode 2)		
3	CC	common cathode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PNE20080CPE	CFP15B	plastic, thermal enhanced ultra thin SMD package; 3 leads; 2.13 mm pitch; 5.8 x 4.3 x 0.95 mm body	SOT1289B

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PNE20080CPE	200E 008C

## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC60134)

Symbol	Parameter	Conditions		Min	Max	Unit
<b>Per diode (unless otherwise specified)</b>						
$V_R$	reverse voltage	$T_j = 25\text{ °C}$		-	200	V
$V_{RRM}$	repetitive peak reverse voltage			-	200	V
$V_{R(RMS)lim}$	limiting RMS reverse voltage			-	140	V
$I_F$	forward current	$\delta = 1; T_{sp} \leq 150\text{ °C}$		-	5.6	A
$I_{F(AV)}$	average forward current	$\delta = 0.5; f = 20\text{ kHz};$ square wave; $T_{sp} \leq 155\text{ °C}$		-	4	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8.3\text{ ms};$ single half sine wave (applied at rated load condition); $T_{j(init)} = 25\text{ °C}$		-	90	A
		$t_p = 8.3\text{ ms};$ single half sine wave (applied at rated load condition); per device; $T_{j(init)} = 25\text{ °C}$		-	170	A
<b>Per device, one diode loaded</b>						
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	1.66	W
			[2]	-	2.15	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 Printed-Circuit Board (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 cm<sup>2</sup>.

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Per device, one diode loaded</b>							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	90	K/W
			[2]	-	-	70	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[3]	-	-	7	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 cm<sup>2</sup>.

[3] Soldering point of cathode tab.

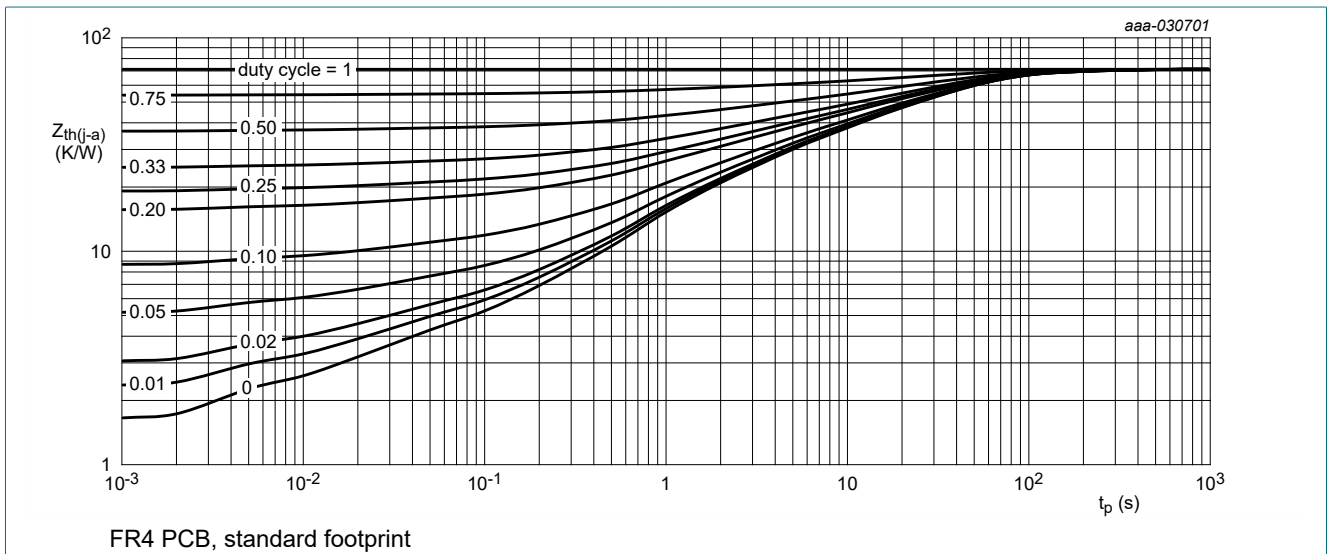


Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

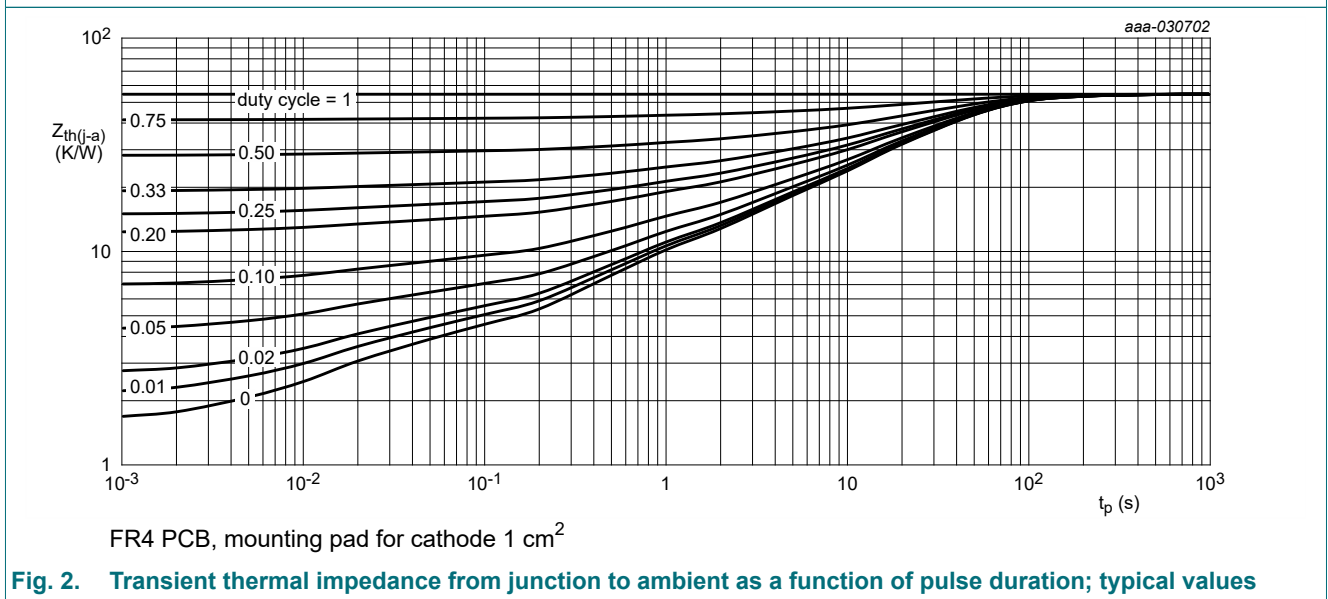


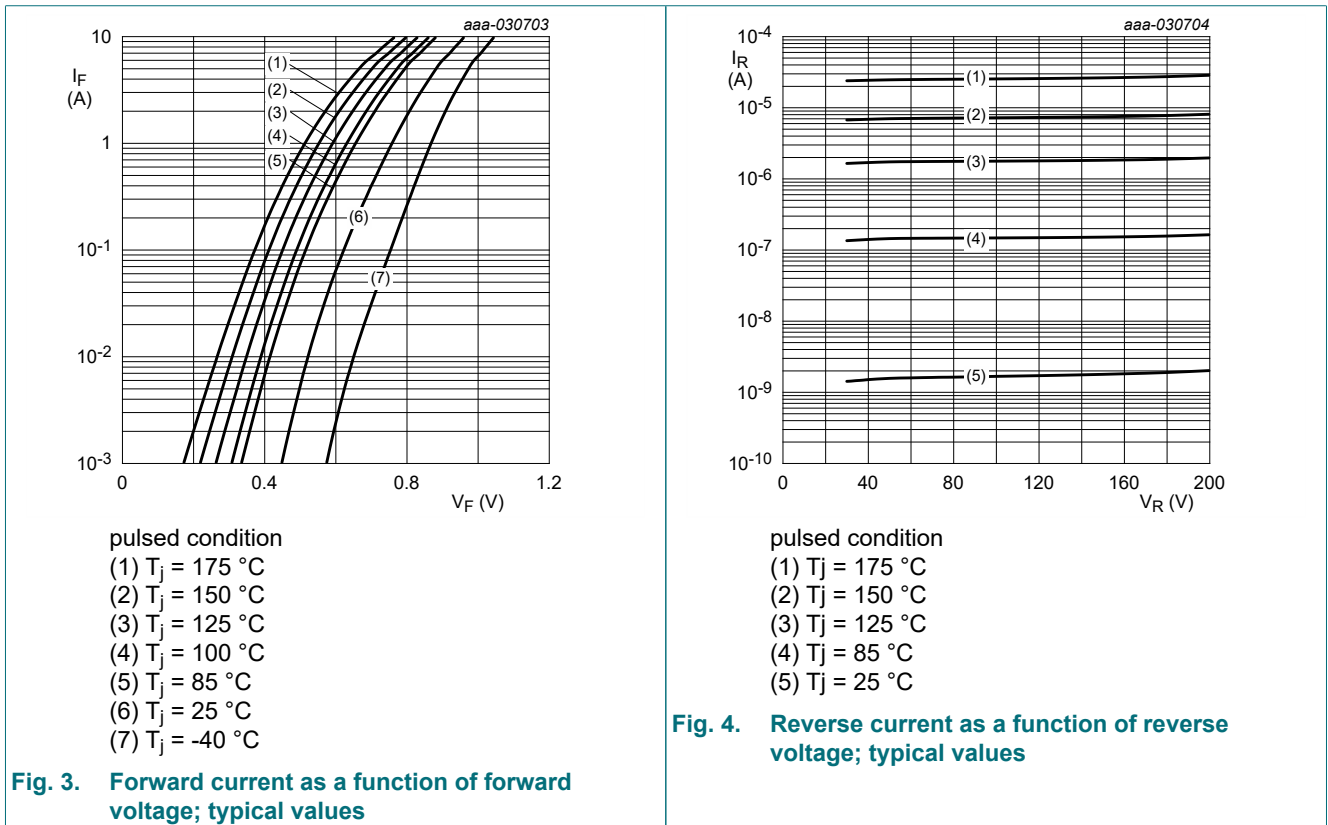
Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

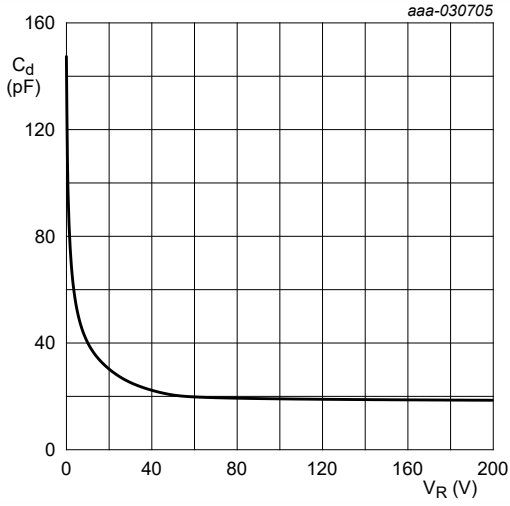
## 10. Characteristics

Table 7. Characteristics

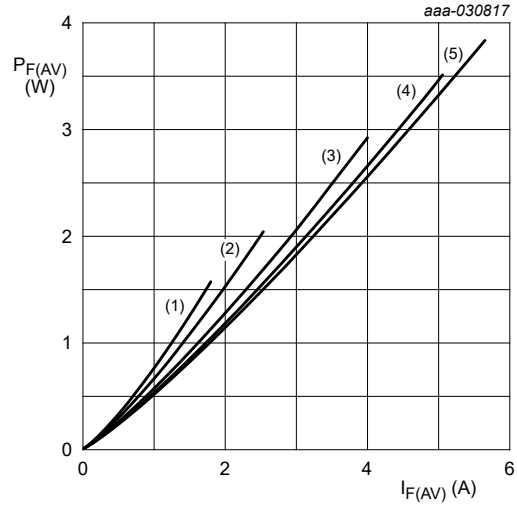
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>Per diode (unless otherwise specified)</b>							
$V_{(BR)R}$	reverse breakdown voltage	$I_R = 100 \mu A$ ; $T_j = 25 \text{ }^\circ\text{C}$	[1]	200	-	V	
$V_F$	forward voltage	$I_F = 4 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	860	930	mV
		$I_F = 4 \text{ A}$ ; $T_j = 125 \text{ }^\circ\text{C}$	[1]	-	710	810	mV
$I_R$	reverse current	$V_R = 200 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$	[1]	-	-	1	$\mu\text{A}$
		$V_R = 200 \text{ V}$ ; $T_j = 125 \text{ }^\circ\text{C}$	[1]	-	2	40	$\mu\text{A}$
$C_d$	diode capacitance	$V_R = 4 \text{ V}$ ; $f = 1 \text{ MHz}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	60	pF	
$t_{rr}$	reverse recovery time step recovery	$I_F = 0.5 \text{ A}$ ; $I_R = 1 \text{ A}$ ; $I_{R(\text{meas})} = 0.25 \text{ A}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	12	30	ns
	reverse recovery time ramp recovery	$dI_F/dt = 50 \text{ A}/\mu\text{s}$ ; $I_F = 1 \text{ A}$ ; $V_R = 30 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	19	-	ns
	reverse recovery time	$dI_F/dt = 100 \text{ A}/\mu\text{s}$ ; $I_F = 1 \text{ A}$ ; $V_R = 30 \text{ V}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	15	-	ns
$I_{RM}$	peak reverse recovery current	$T_j = 25 \text{ }^\circ\text{C}$		-	1	A	
$Q_{rr}$	reverse recovery charge			-	9	nC	
$V_{FRM}$	peak forward recovery voltage	$I_F = 1 \text{ A}$ ; $dI_F/dt = 50 \text{ A}/\mu\text{s}$ ; $T_j = 25 \text{ }^\circ\text{C}$		-	785	mV	

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

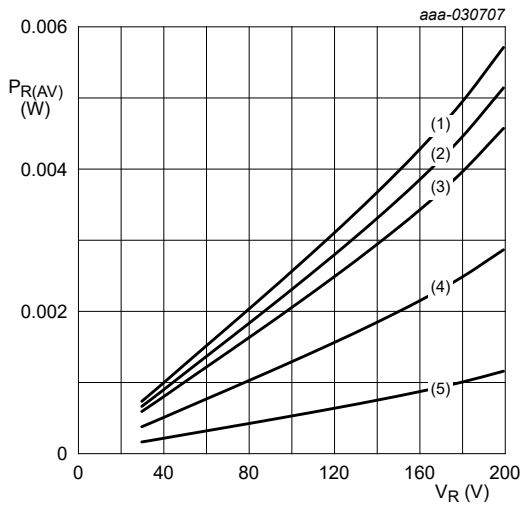




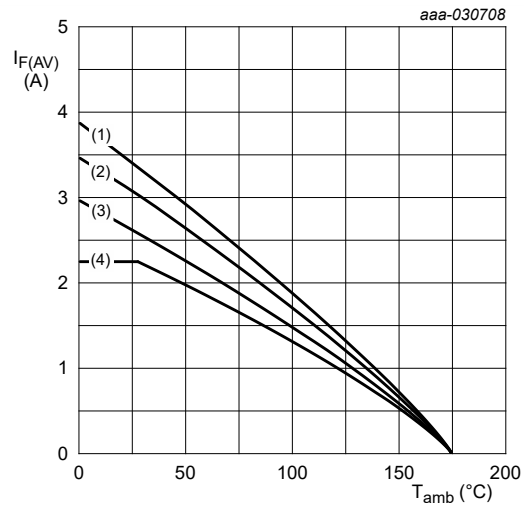
**Fig. 5. Diode capacitance as a function of reverse voltage; typical values**



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

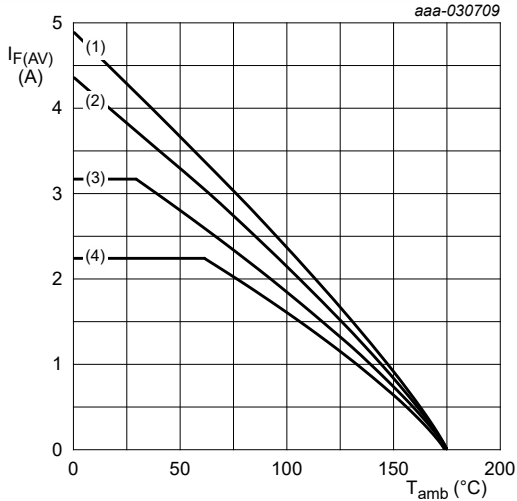


**Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values**



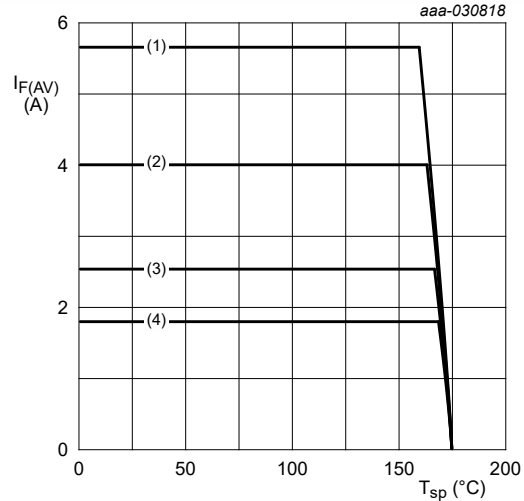
**Fig. 8. Average forward current as a function of ambient temperature; typical values**

200 V, 2 x 4 A dual common cathode half-bridge recovery rectifier



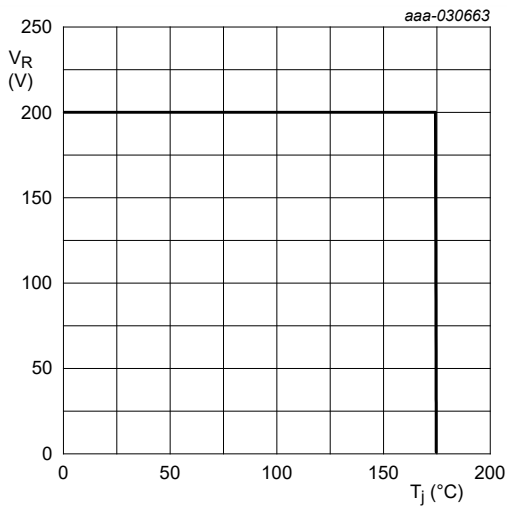
FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 $T_j = 175$  °C  
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20$  kHz  
 (3)  $\delta = 0.2$ ;  $f = 20$  kHz  
 (4)  $\delta = 0.1$ ;  $f = 20$  kHz

**Fig. 9. Average forward current as a function of ambient temperature; typical values**



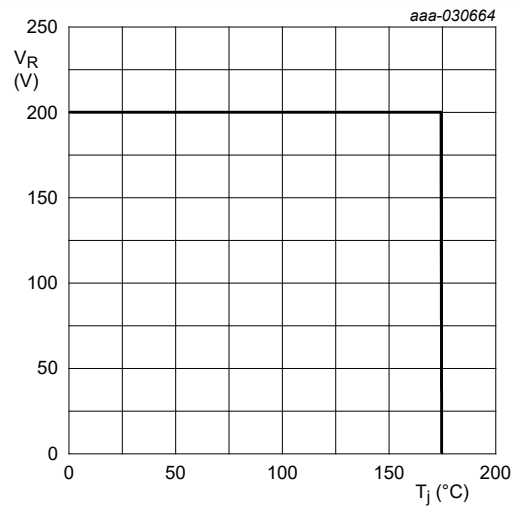
$T_j = 175$  °C  
 (1)  $\delta = 1$ ; DC  
 (2)  $\delta = 0.5$ ;  $f = 20$  kHz  
 (3)  $\delta = 0.2$ ;  $f = 20$  kHz  
 (4)  $\delta = 0.1$ ;  $f = 20$  kHz

**Fig. 10. Average forward current as a function of solder point temperature; typical values**



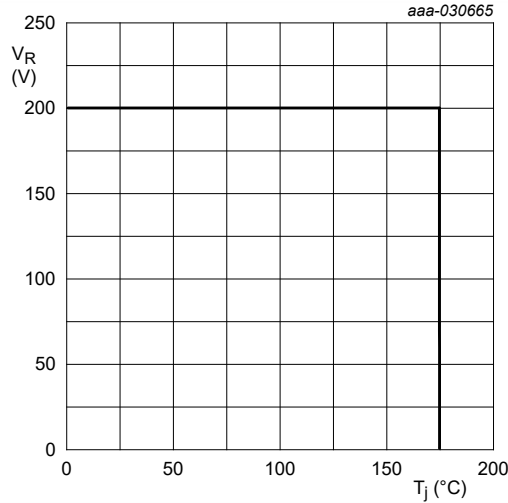
FR4 PCB, standard footprint  
 $R_{th} = 90$  K/W

**Fig. 11. Derated maximum reverse voltage as a function of junction temperature; typical values**



FR4 PCB, mounting pad for cathode 1 cm<sup>2</sup>  
 $R_{th} = 70$  K/W

**Fig. 12. Derated maximum reverse voltage as a function of junction temperature; typical values**



Soldering point of cathode tab  
 $R_{th} = 7 \text{ K/W}$

Fig. 13. Derated maximum reverse voltage as a function of junction temperature; typical values

### 11. Test information

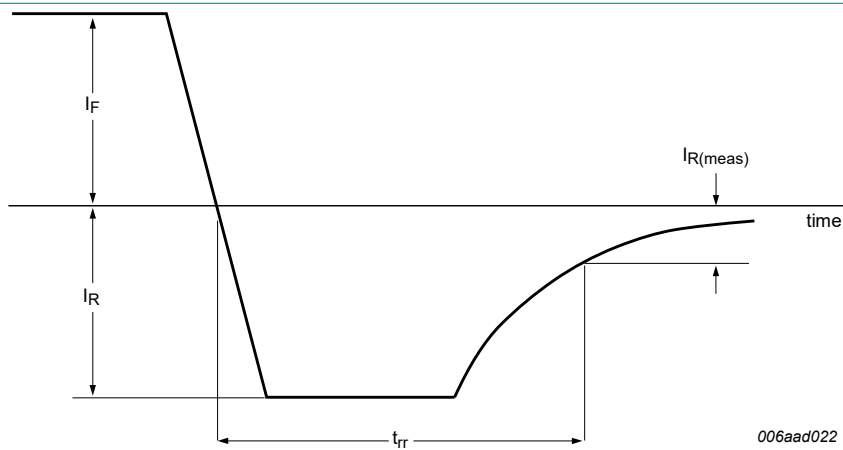


Fig. 14. Reverse recovery definition; step recovery

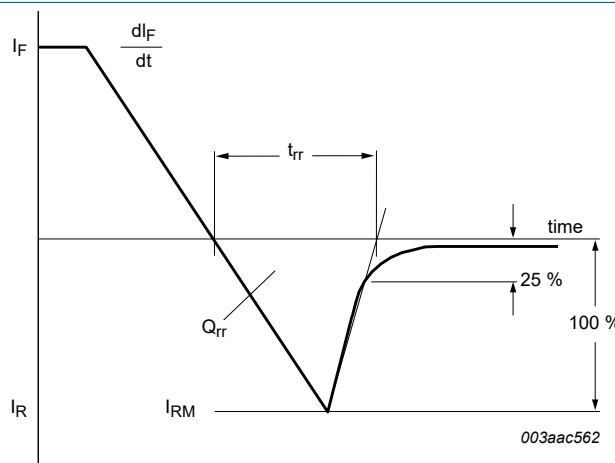


Fig. 15. Reverse recovery definition; ramp recovery

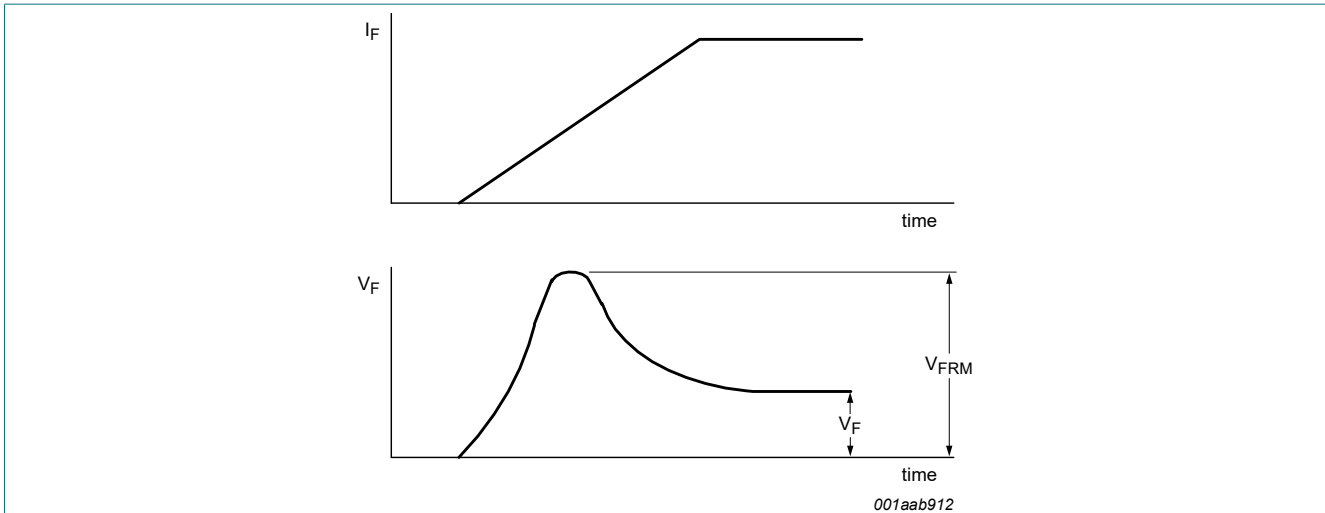


Fig. 16. Forward recovery definition

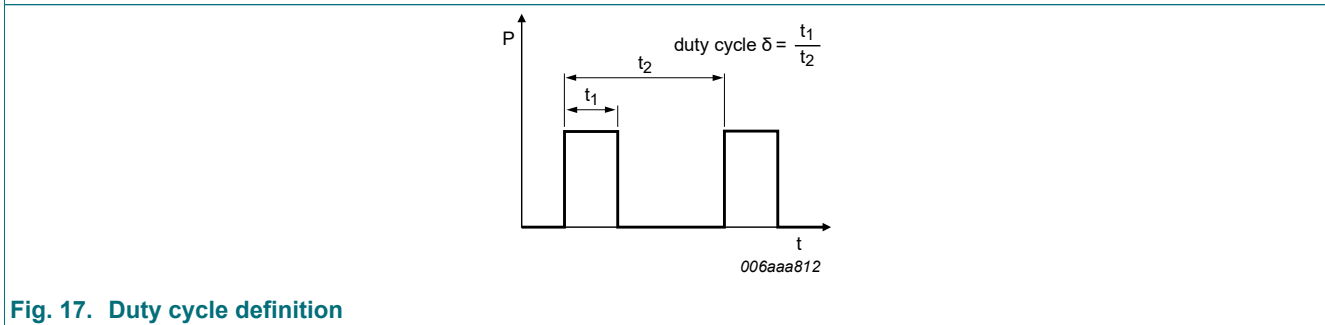


Fig. 17. Duty cycle definition

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.

### Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

## 12. Package outline

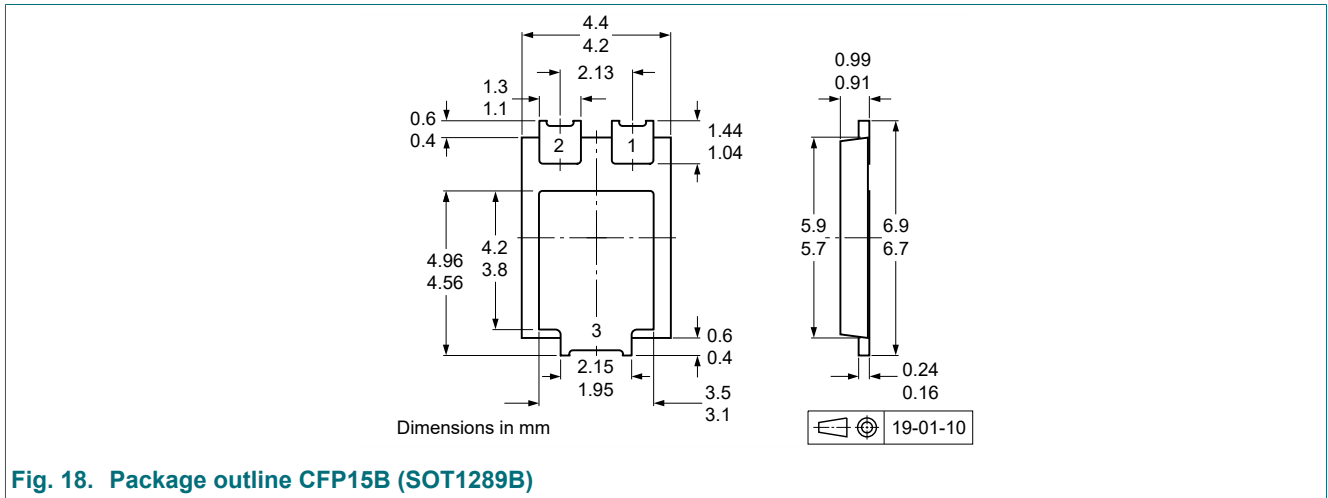


Fig. 18. Package outline CFP15B (SOT1289B)

## 13. Soldering

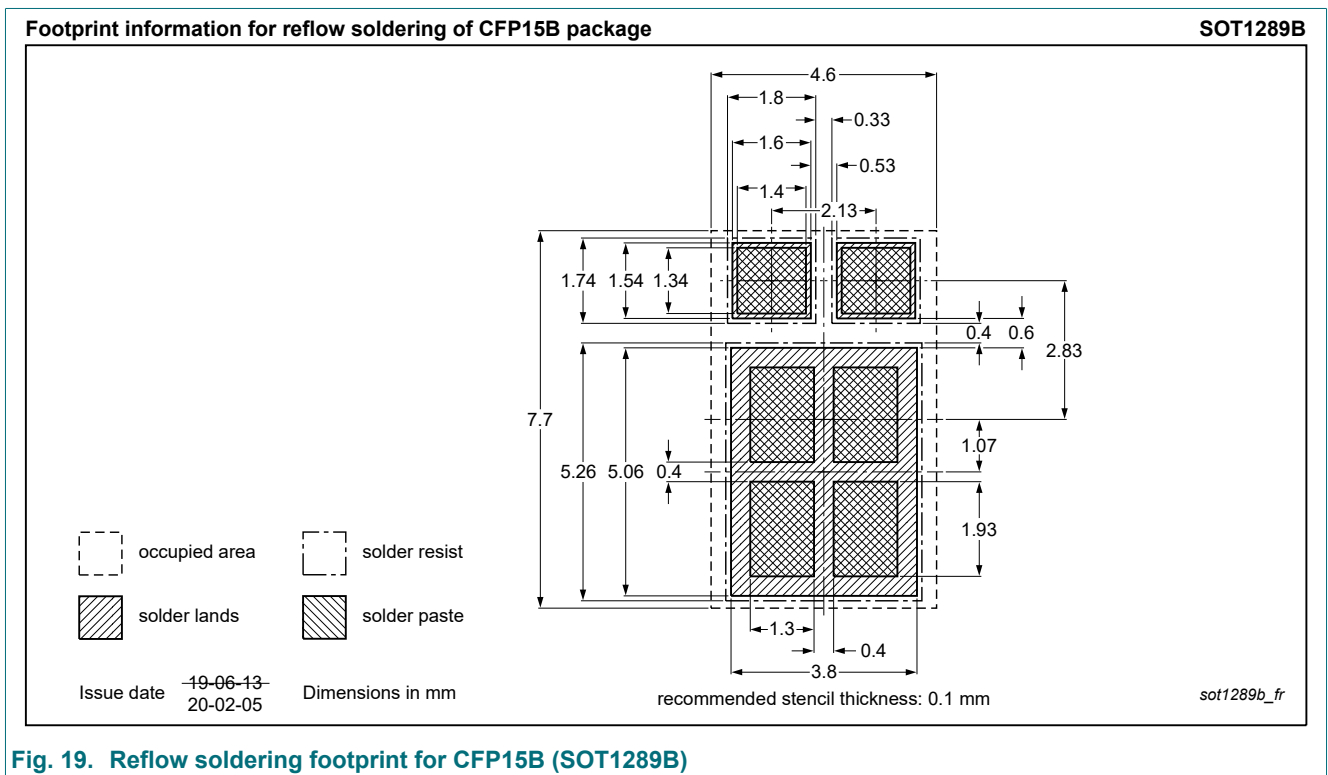


Fig. 19. Reflow soldering footprint for CFP15B (SOT1289B)

## 14. Revision history

**Table 8. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PNE20080CPE v.3	20210909	Product data sheet	-	PNE20080CPE v.2
Modifications:	• Characteristics: Graph Fig. 4. revised (unlabeled curve removed); no technical change			
PNE20080CPE v.2	20200214	Product data sheet	-	PNE20080CPE v.1
PNE20080CPE v.1	20200127	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.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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