

## 1. General description

Hyperfast power diode in a SOD113 (2-lead TO-220F) plastic package.

## 2. Features and benefits

- Isolated plastic package
- Low thermal resistance
- Low reverse recovery current
- Reduces switching losses in associated MOSFET

## 3. Applications

- Continuous Current Mode (CCM) Power Factor Correction (PFC)
- Half-bridge/full-bridge switched-mode power supplies
- Half-bridge lighting ballasts

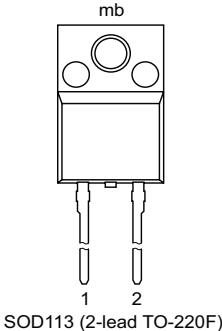
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                  | Parameter                           | Conditions                                                                                                                 | Values |     |      |      | Unit |
|-------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------|-----|------|------|------|
| Absolute maximum rating |                                     |                                                                                                                            |        |     |      |      |      |
| V <sub>RRM</sub>        | repetitive peak reverse voltage     |                                                                                                                            | 500    |     |      |      | V    |
| I <sub>F(AV)</sub>      | average forward current             | δ = 0.5 ; square-wave pulse; T <sub>h</sub> ≤ 103 °C; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>                      | 5      |     |      |      | A    |
| I <sub>FRM</sub>        | repetitive peak forward current     | δ = 0.5 ; t <sub>p</sub> = 25 μs; T <sub>h</sub> ≤ 103 °C; square-wave pulse                                               | 10     |     |      |      | A    |
| I <sub>FSM</sub>        | non-repetitive peak forward current | t <sub>p</sub> = 10 ms; T <sub>j(init)</sub> = 25 °C; sine-wave pulse; <a href="#">Fig. 3</a>                              | 40     |     |      |      | A    |
|                         |                                     | t <sub>p</sub> = 8.3 ms; T <sub>j(init)</sub> = 25 °C; sine-wave pulse                                                     | 44     |     |      |      | A    |
| Symbol                  | Parameter                           | Conditions                                                                                                                 |        | Min | Typ  | Max  | Unit |
| Static characteristics  |                                     |                                                                                                                            |        |     |      |      |      |
| V <sub>F</sub>          | forward voltage                     | I <sub>F</sub> = 5 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 5</a>                                                       |        | -   | 1.5  | 2    | V    |
|                         |                                     | I <sub>F</sub> = 5 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 5</a>                                                      |        | -   | 1.15 | 1.45 | V    |
|                         |                                     | I <sub>F</sub> = 10 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 5</a>                                                     |        | -   | 1.4  | 1.7  | V    |
| Dynamic characteristics |                                     |                                                                                                                            |        |     |      |      |      |
| t <sub>rr</sub>         | reverse recovery time               | I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 50 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a> |        | -   | 15   | 30   | ns   |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description             | Simplified outline                                                                 | Graphic symbol                                                                      |
|-----|--------|-------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | K      | cathode                 |  |  |
| 2   | A      | anode                   |                                                                                    |                                                                                     |
| mb  | n.c.   | mounting base; isolated |                                                                                    |                                                                                     |

6. Ordering information

Table 3. Ordering information

| Type number | Package |                                                                                                     |         |
|-------------|---------|-----------------------------------------------------------------------------------------------------|---------|
|             | Name    | Description                                                                                         | Version |
| BYC5DX-500  | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack" | SOD113  |

7. Marking

Table 4. Marking codes

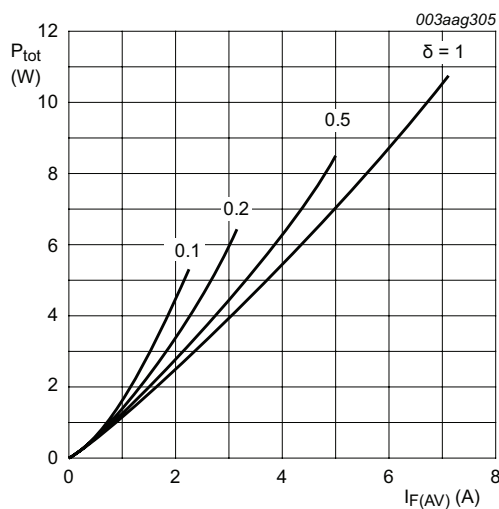
| Type number | Marking codes |
|-------------|---------------|
| BYC5DX-500  | BYC5DX-500    |

## 8. Limiting values

**Table 5. Limiting values**

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

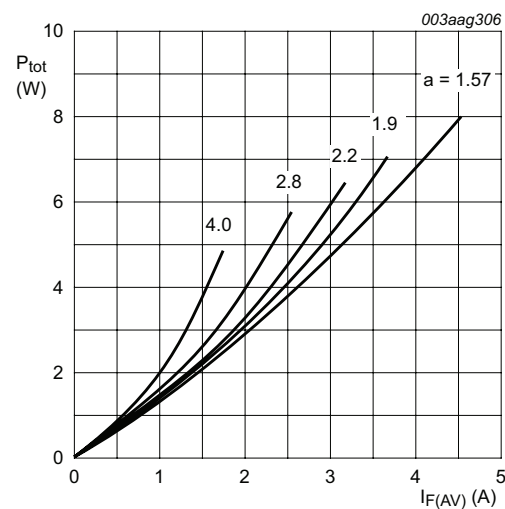
| Symbol      | Parameter                           | Conditions                                                                                                            | Values     | Unit             |
|-------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------------|------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |                                                                                                                       | 500        | V                |
| $V_{RWM}$   | crest working reverse voltage       |                                                                                                                       | 500        | V                |
| $V_R$       | reverse voltage                     | DC                                                                                                                    | 500        | V                |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; square-wave pulse; $T_h \leq 103^\circ\text{C}$ ;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> | 5          | A                |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\ \mu\text{s}$ ; $T_h \leq 103^\circ\text{C}$ ;<br>square-wave pulse                        | 10         | A                |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 10\ \text{ms}$ ; $T_{j(\text{init})} = 25^\circ\text{C}$ ; sine-wave pulse;<br><a href="#">Fig. 3</a>          | 40         | A                |
|             |                                     | $t_p = 8.3\ \text{ms}$ ; $T_{j(\text{init})} = 25^\circ\text{C}$ ; sine-wave pulse                                    | 44         | A                |
| $T_{stg}$   | storage temperature                 |                                                                                                                       | -40 to 150 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |                                                                                                                       | 150        | $^\circ\text{C}$ |



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

$$V_o = 1.141\ \text{V}; R_s = 0.057\ \Omega$$

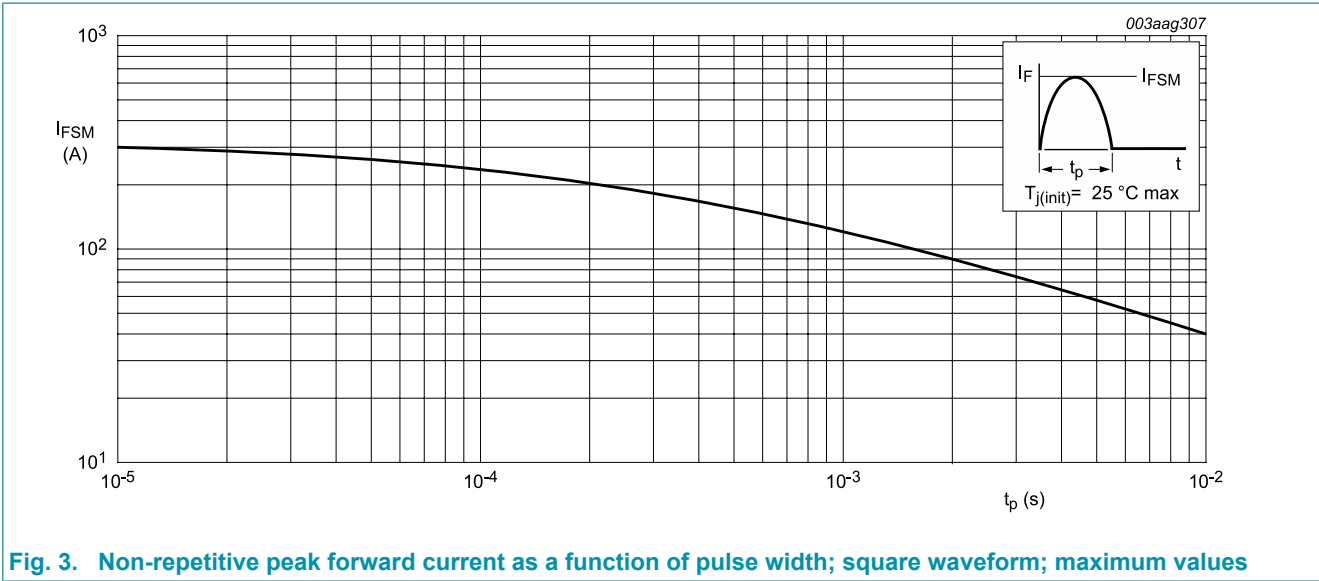
**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**



$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$

$$V_o = 1.141\ \text{V}; R_s = 0.057\ \Omega$$

**Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**



9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol        | Parameter                                            | Conditions                    | Min | Typ | Max | Unit |
|---------------|------------------------------------------------------|-------------------------------|-----|-----|-----|------|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink         | with heatsink compound; Fig 4 | -   | -   | 5.5 | K/W  |
|               |                                                      | without heatsink compound     | -   | -   | 7.2 | K/W  |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air                   | -   | 60  | -   | K/W  |

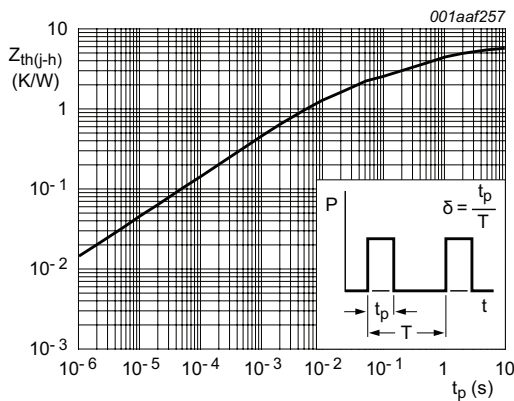


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

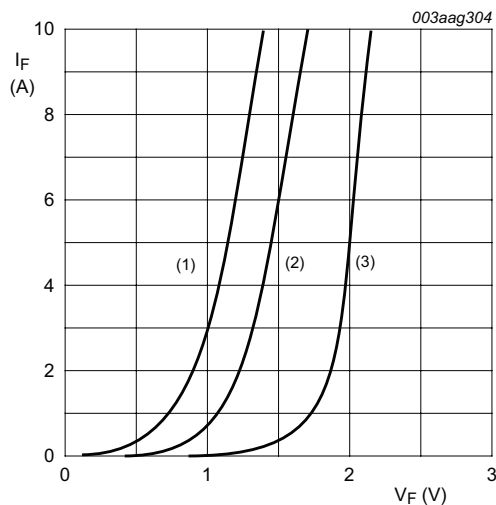
Table 7. Isolation characteristics

| Symbol          | Parameter             | Conditions                                                                                                              | Min | Typ | Max  | Unit |
|-----------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | 50 Hz $\leq f \leq$ 60 Hz; RH $\leq$ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free | -   | -   | 2500 | V    |
| $C_{isol}$      | isolation capacitance | $f = 1$ MHz; from cathode to external heatsink                                                                          | -   | 10  | -    | pF   |

## 11. Characteristics

Table 8. Characteristics

| Symbol                  | Parameter                     | Conditions                                                                                                                    |  | Min | Typ  | Max  | Unit |
|-------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--|-----|------|------|------|
| Static characteristics  |                               |                                                                                                                               |  |     |      |      |      |
| V <sub>F</sub>          | forward voltage               | I <sub>F</sub> = 5 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 5</a>                                                          |  | -   | 1.5  | 2    | V    |
|                         |                               | I <sub>F</sub> = 5 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 5</a>                                                         |  | -   | 1.15 | 1.45 | V    |
|                         |                               | I <sub>F</sub> = 10 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 5</a>                                                        |  | -   | 1.4  | 1.7  | V    |
| I <sub>R</sub>          | reverse current               | V <sub>R</sub> = 500 V; T <sub>j</sub> = 25 °C                                                                                |  | -   | 9    | 40   | μA   |
|                         |                               | V <sub>R</sub> = 500 V; T <sub>j</sub> = 100 °C                                                                               |  | -   | 0.9  | 3    | mA   |
| Dynamic characteristics |                               |                                                                                                                               |  |     |      |      |      |
| t <sub>rr</sub>         | reverse recovery time         | I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 50 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>    |  | -   | 15   | 30   | ns   |
|                         |                               | I <sub>F</sub> = 5 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>  |  |     | 16   | -    | ns   |
| I <sub>RM</sub>         | peak reverse recovery current | I <sub>F</sub> = 5 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>j</sub> = 100 °C; <a href="#">Fig. 6</a> |  | -   | 9.5  | 11   | A    |
|                         |                               | I <sub>F</sub> = 5 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 50 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 6</a>  |  | -   | 0.9  | 3    | A    |
| V <sub>FR</sub>         | forward recovery voltage      | I <sub>F</sub> = 5 A; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>                          |  | -   | 9    | 11   | V    |



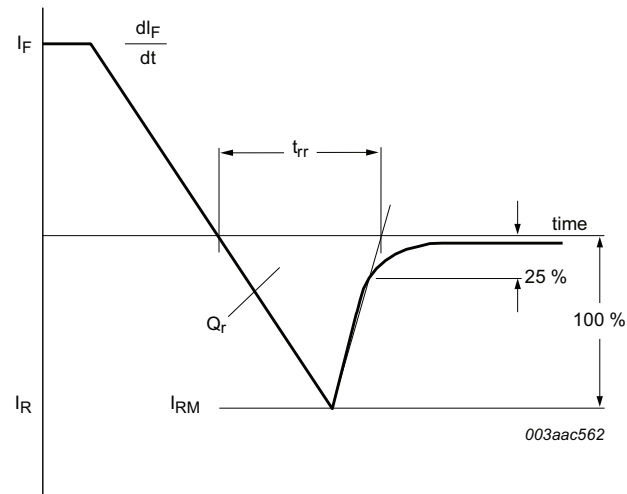
$V_o = 1.141\text{ V}; R_s = 0.057\text{ }\Omega$

(1)  $T_J = 150\text{ °C}$ ; typical values

(2)  $T_J = 150\text{ °C}$ ; maximum values

(3)  $T_J = 25\text{ °C}$ ; maximum values

**Fig. 5. Forward current as a function of forward voltage**



**Fig. 6. Reverse recovery definitions; ramp recovery**

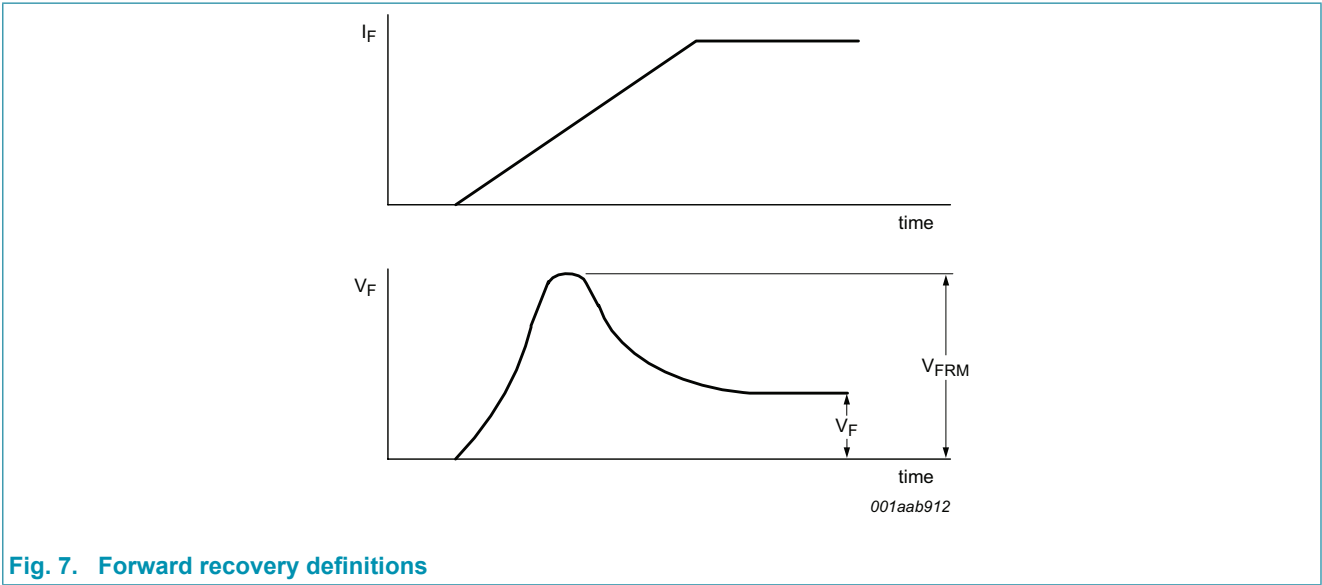
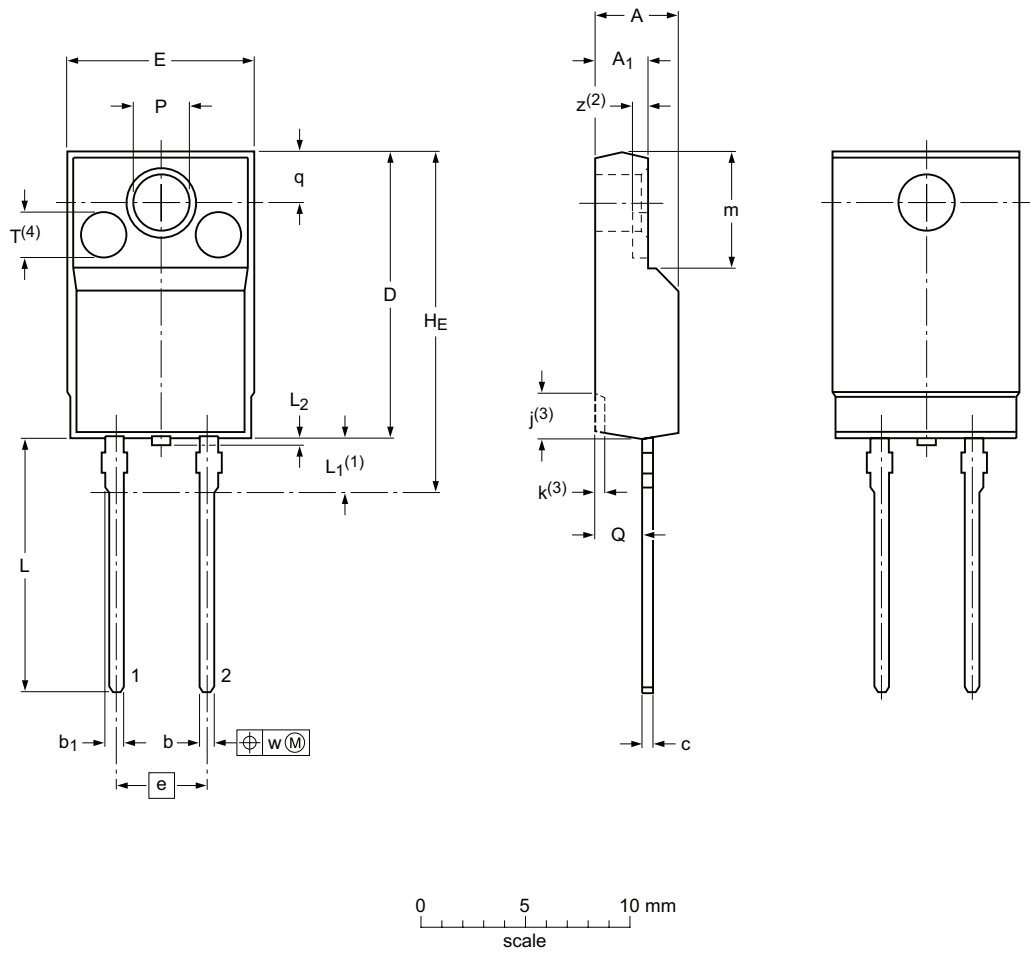


Fig. 7. Forward recovery definitions

12. Package outline

Plastic single-ended package; isolated heatsink mounted;  
1 mounting hole; 2-lead TO-220 'full pack'

SOD113

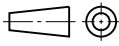


Dimensions (mm are the original dimensions)

| Unit | A   | A <sub>1</sub> | b   | b <sub>1</sub> | c   | D    | E    | e    | H <sub>E</sub><br>max | j <sup>(3)</sup> | k <sup>(3)</sup> | L    | L <sub>1</sub> (1) | L <sub>2</sub><br>max | m   | P   | Q   | q   | T <sup>(4)</sup> | w   | z <sup>(2)</sup> |
|------|-----|----------------|-----|----------------|-----|------|------|------|-----------------------|------------------|------------------|------|--------------------|-----------------------|-----|-----|-----|-----|------------------|-----|------------------|
| max  | 4.6 | 2.9            | 0.9 | 1.1            | 0.7 | 15.8 | 10.3 |      |                       | 2.7              | 0.6              | 14.4 | 3.3                |                       | 6.5 | 3.2 | 2.6 |     |                  |     |                  |
| nom  |     |                |     |                |     |      |      | 5.08 | 19.0                  |                  |                  |      |                    | 0.5                   |     |     |     | 2.6 | 2.55             | 0.4 | 0.8              |
| min  | 4.0 | 2.5            | 0.7 | 0.9            | 0.4 | 15.2 | 9.7  |      |                       | 1.7              | 0.4              | 13.5 | 2.8                |                       | 6.3 | 3.0 | 2.3 |     |                  |     |                  |

- Notes
1. Terminals are uncontrolled within zone L1.
  2. z is depth of T.
  3. Dot lines area designs may vary.
  4. Eject pin mark is for reference only.

sod113\_po

| Outline<br>version | References |                |       |  | European<br>projection                                                                | Issue date           |
|--------------------|------------|----------------|-------|--|---------------------------------------------------------------------------------------|----------------------|
|                    | IEC        | JEDEC          | JEITA |  |                                                                                       |                      |
| SOD113             |            | 2-lead TO-220F |       |  |  | 07-06-08<br>15-08-28 |

### 13. Revision history

Table 9. Revision history

| Document ID                                            | Release date | Data sheet status  | Change notice | Supersedes     |
|--------------------------------------------------------|--------------|--------------------|---------------|----------------|
| BYC5DX-500 v.2                                         | 20180129     | Product data sheet | -             | BYC5DX-500 v.1 |
| Modifications: Change from NXP version to WeEn version |              |                    |               |                |
| BYC5DX-500 v.1                                         | 20110706     | Product data sheet | -             | -              |

## 14. 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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15. 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 ..... 5

10. Isolation characteristics ..... 5

11. Characteristics..... 6

12. Package outline ..... 8

13. Revision history..... 9

14. Legal information ..... 10

15. Contents ..... 12

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For sales office addresses, please send an email to: [salesaddresses@ween-semi.com](mailto:salesaddresses@ween-semi.com)  
Date of release: 29 January 2018

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