



# THE DATASHEET OF BYC30X-600PSQ

## 1. General description

WeEn's 5th Generation Hyper Fast diode with softer recovery in a 2-lead TO220F plastic package.

## 2. Features and benefits

- Isolated plastic package
- Low leakage current
- Low thermal resistance
- Soft reverse recovery with low recovery current
- Reduces switching losses in associated MOSFET or IGBT

## 3. Applications

- Active PFC in air conditioner
- Continuous Current Mode (CCM) Power Factor Correction (PFC)
- Half-bridge/full-bridge switched-mode power supplies

## 4. Quick reference data

Table 1. Quick reference data

Table 1. Quick reference data

| Symbol                  | Parameter                           | Conditions                                                                                                                    | Values |     |     |      | Unit |
|-------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------|-----|-----|------|------|
| Absolute maximum rating |                                     |                                                                                                                               |        |     |     |      |      |
| V <sub>RRM</sub>        | repetitive peak reverse voltage     |                                                                                                                               | 600    |     |     |      | V    |
| I <sub>F(AV)</sub>      | average forward current             | δ = 0.5 ; square-wave pulse; T <sub>h</sub> ≤ 51 °C; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 30     |     |     |      | A    |
| I <sub>FRM</sub>        | repetitive peak forward current     | δ = 0.5 ; t <sub>p</sub> = 25 μs; T <sub>h</sub> ≤ 51 °C; square-wave pulse                                                   | 60     |     |     |      | 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. 4</a>                                 | 260    |     |     |      | A    |
|                         |                                     | t <sub>p</sub> = 8.3 ms; T <sub>j(init)</sub> = 25 °C; sine-wave pulse                                                        | 286    |     |     |      | A    |
| Symbol                  | Parameter                           | Conditions                                                                                                                    |        | Min | Typ | Max  | Unit |
| Static characteristics  |                                     |                                                                                                                               |        |     |     |      |      |
| V <sub>F</sub>          | forward voltage                     | I <sub>F</sub> = 30 A; T <sub>J</sub> = 25 °C; <a href="#">Fig. 6</a>                                                         |        | -   | 2   | 2.75 | V    |
|                         |                                     | I <sub>F</sub> = 30 A; T <sub>J</sub> = 150 °C; <a href="#">Fig. 6</a>                                                        |        | -   | 1.5 | 2    | 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. 7</a>    |        | -   | -   | 45   | 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 | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|--------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| BYC30X-600PS | TO220F-2L    | BYC30X-600PSQ         | Tube           | 50                     | TO220FE-2L (E)  | 21-Dec-2020        |
|              |              |                       |                |                        | SOD113A (A)     | 10-April-2014      |

## 7. Marking

Table 4. Marking codes

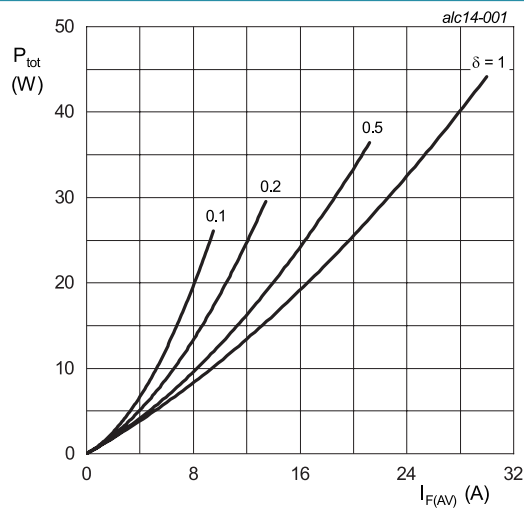
| Type number  | Marking codes                 |                               |
|--------------|-------------------------------|-------------------------------|
|              | Assembly factory: E           | Assembly factory: A           |
| BYC30X-600PS | BYC30X<br>600PS<br>PJExxxx xx | BYC30X<br>600PS<br>PJAxxxx xx |

## 8. Limiting values

**Table 5. Limiting values**

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

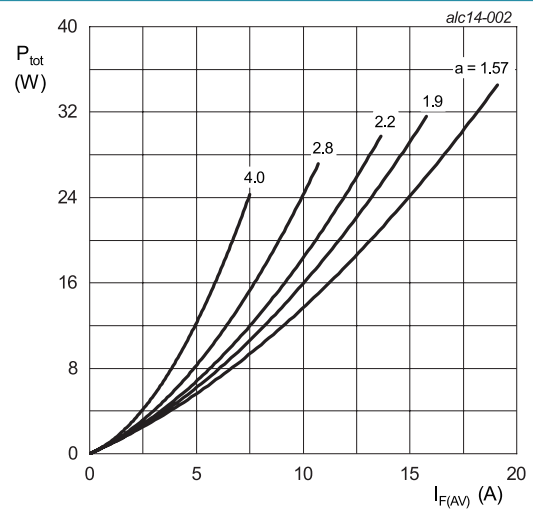
| Symbol      | Parameter                           | Conditions                                                                                                                                 | Values     | Unit             |
|-------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |                                                                                                                                            | 600        | V                |
| $V_{RWM}$   | crest working reverse voltage       |                                                                                                                                            | 600        | V                |
| $V_R$       | reverse voltage                     | DC                                                                                                                                         | 600        | V                |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; square-wave pulse; $T_h \leq 51^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 30         | A                |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\ \mu\text{s}$ ; $T_h \leq 51^\circ\text{C}$ ; square-wave pulse                                                 | 60         | A                |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 10\ \text{ms}$ ; $T_{j(\text{init})} = 25^\circ\text{C}$ ; sine-wave pulse; <a href="#">Fig. 4</a>                                  | 260        | A                |
|             |                                     | $t_p = 8.3\ \text{ms}$ ; $T_{j(\text{init})} = 25^\circ\text{C}$ ; sine-wave pulse                                                         | 286        | A                |
| $T_{stg}$   | storage temperature                 |                                                                                                                                            | -65 to 175 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |                                                                                                                                            | 175        | $^\circ\text{C}$ |



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

$$V_o = 0.883\ \text{V}; R_s = 0.0197\ \Omega$$

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



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

$$V_o = 0.883\ \text{V}; R_s = 0.0197\ \Omega$$

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

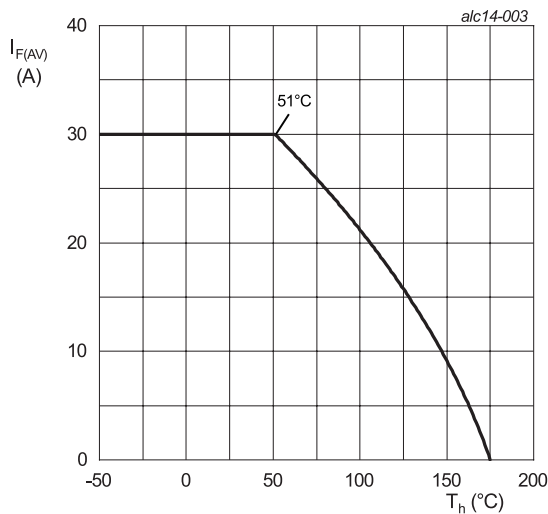


Fig. 3. Forward current as a function of heatsink temperature; maximum values

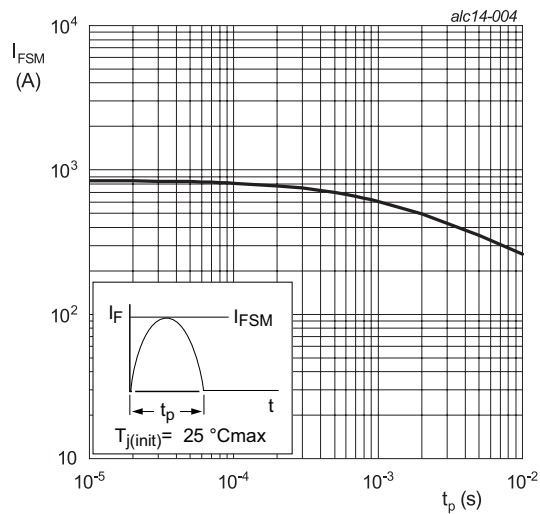
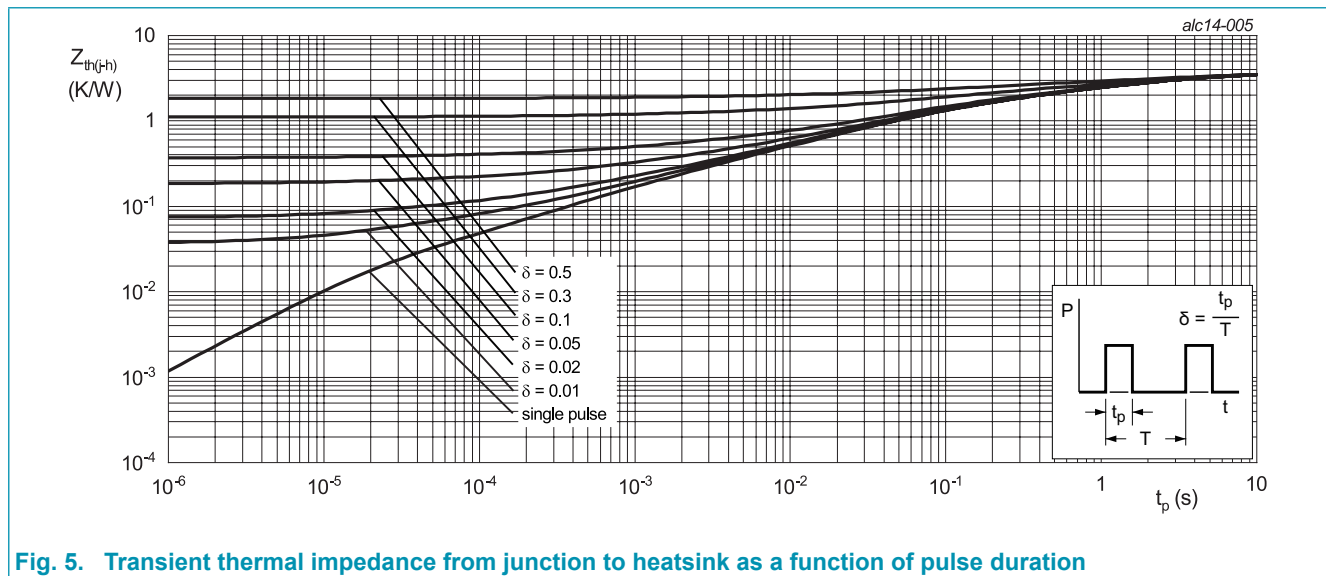


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

## 9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol        | Parameter                                            | Conditions  | Min | Typ | Max | Unit |
|---------------|------------------------------------------------------|-------------|-----|-----|-----|------|
| $R_{th(j-c)}$ | thermal resistance from junction to case             |             | -   | -   | 3   | K/W  |
| $R_{th(c-h)}$ | thermal resistance from case to heatsink             |             | -   | -   | 0.5 | K/W  |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | -   | 55  | -   | K/W  |



## 10. Isolation characteristics

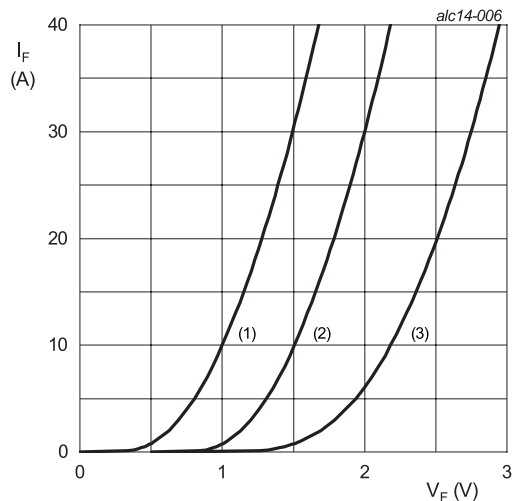
Table 7. Isolation characteristics

| 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

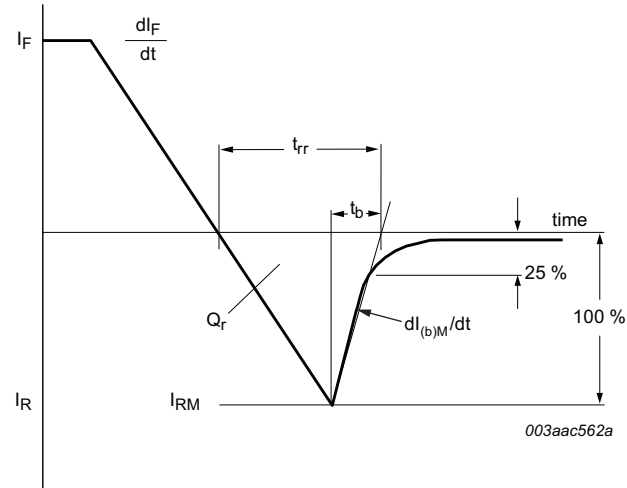
Table 8. Characteristics

| Symbol                  | Parameter                     | Conditions                                                                                                                     |  | Min | Typ  | Max  | Unit |
|-------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--|-----|------|------|------|
| Static characteristics  |                               |                                                                                                                                |  |     |      |      |      |
| V <sub>F</sub>          | forward voltage               | I <sub>F</sub> = 30 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>                                                          |  | -   | 2    | 2.75 | V    |
|                         |                               | I <sub>F</sub> = 30 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 6</a>                                                         |  | -   | 1.5  | 2    | V    |
| I <sub>R</sub>          | reverse current               | V <sub>R</sub> = 600 V; T <sub>j</sub> = 25 °C                                                                                 |  | -   | -    | 10   | μA   |
|                         |                               | V <sub>R</sub> = 600 V; T <sub>j</sub> = 150 °C                                                                                |  | -   | -    | 600  | μA   |
| 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. 7</a>     |  | -   | -    | 45   | ns   |
|                         |                               | I <sub>F</sub> = 30 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  |  | -   | 51   | -    | ns   |
|                         |                               | I <sub>F</sub> = 30 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a> |  | -   | 105  | -    | ns   |
| I <sub>RM</sub>         | peak reverse recovery current | I <sub>F</sub> = 30 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  |  | -   | 3.7  | -    | A    |
|                         |                               | I <sub>F</sub> = 30 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a> |  | -   | 9.5  | -    | A    |
| Q <sub>r</sub>          | recovered charge              | I <sub>F</sub> = 30 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  |  | -   | 95   | -    | nC   |
|                         |                               | I <sub>F</sub> = 30 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a> |  | -   | 498  | -    | nC   |
| S <sub>factor</sub>     | softness factor               | I <sub>F</sub> = 30 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a> |  | -   | 0.55 | -    |      |



$V_o = 0.883\text{ V}$ ;  $R_s = 0.0197\Omega$   
 (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. 6. Forward current as a function of forward voltage



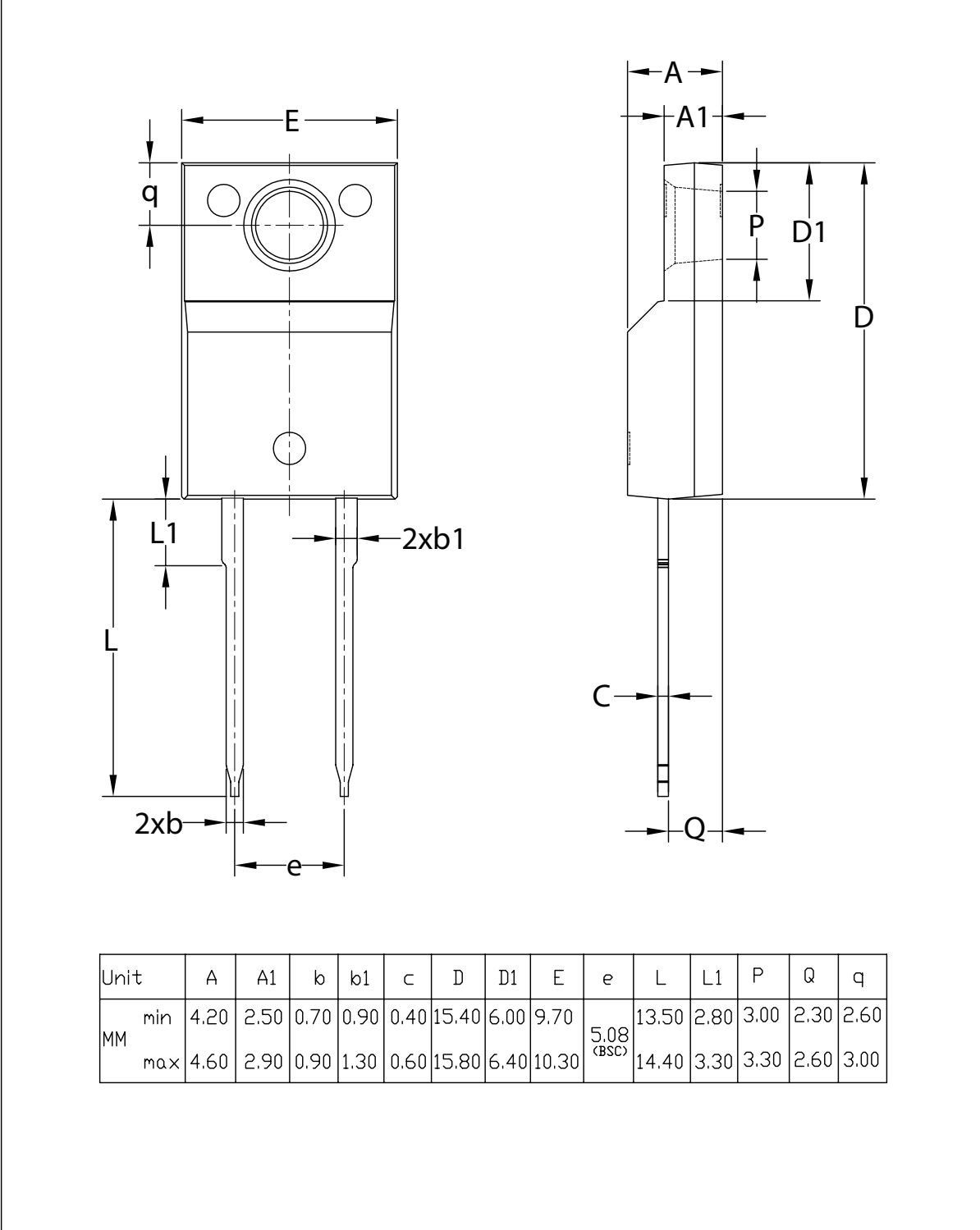
$S_{factor} = [dI_F/dt] / [dI_{(b)M}/dt]$   
 $dI_{(b)M}/dt$  = peak rate of change of current during  $t_b$  portion of  $t_{rr}$

Fig. 7. Reverse recovery definitions; ramp recovery

12. Package outline

Assembly factory: E

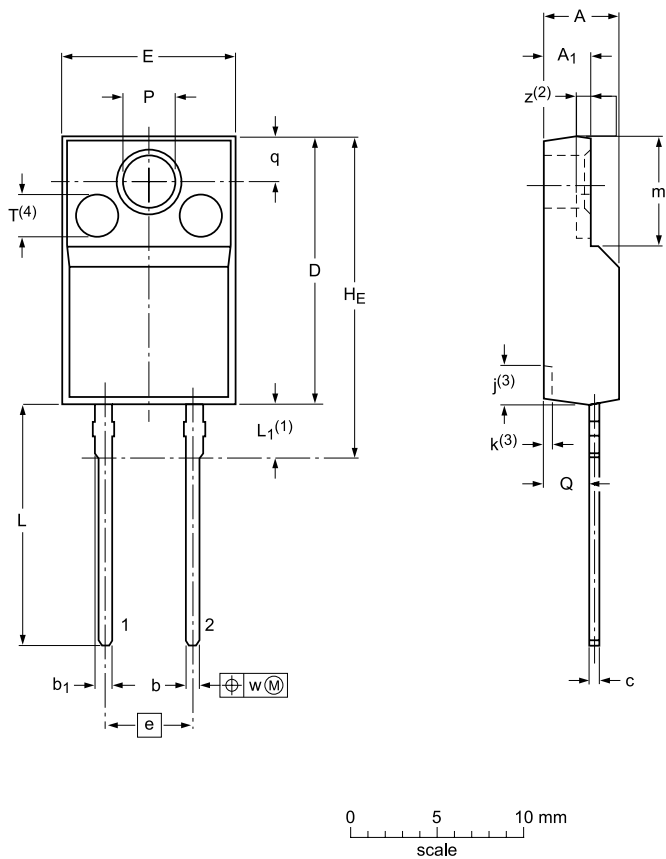
Plastic single-ended package; isolated heatsink mounted;1 mounting hole; 2 leads TO-220 'full pack' TO220F-2L



Assembly factory: A

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

SOD113A

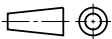


Dimensions (mm are the original dimensions)

| 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> <sup>(1)</sup> | m   | P   | Q   | q   | T <sup>(4)</sup> | W   | z <sup>(2)</sup> |
|------|------------|-----|----------------|-----|----------------|-----|------|------|------|-----------------------|------------------|------------------|------|-------------------------------|-----|-----|-----|-----|------------------|-----|------------------|
| mm   | max        | 4.6 | 3.1            | 0.9 | 1.1            | 0.7 | 15.8 | 10.3 | 5.08 | 19.0                  | 2.7              | 0.8              | 14.4 | 3.3                           | 6.5 | 3.2 | 2.8 | 2.6 | 2.55             | 0.4 | 0.8              |
|      | nom<br>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 |     |                  |     |                  |

- Note
- 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.

sod113a\_po

| Outline version | References |                |       |  | European projection                                                                   | Issue date           |
|-----------------|------------|----------------|-------|--|---------------------------------------------------------------------------------------|----------------------|
|                 | IEC        | JEDEC          | JEITA |  |                                                                                       |                      |
| SOD113A         |            | 2 LEADS TO220F |       |  |  | 14-01-14<br>14-04-10 |

## 13. 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. |
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| 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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Date of release: 20 October 2021

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