# BYC30JT-600PS

## Hyperfast power diode

Rev.01 - 09 September 2021 Product data sheet

## 1. General description

Hyperfast power diode in a TO3PF plastic package.

## 2. Features and benefits

- Isolated plastic package
- Low leakage current
- Low thermal resistance
- Low reverse recovery current
- Soft reverse recovery with low recovery current
- Reduces switching losses in associated MOSFET or IGBT
- High operating temperature capability ($T_{j(max)}$ = 175°C)

## 3. Applications

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

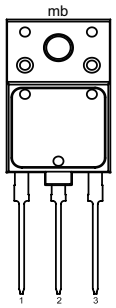
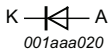
## 4. Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | Values | | | | Unit |
|---|---|---|---|---|---|---|---|
| **Absolute maximum rating** | | | | | | | |
| $V_{RRM}$ | repetitive peak reverse voltage | | 600 | | | | V |
| $I_{F(AV)}$ | average forward current | δ = 0.5 ; square-wave pulse; $T_h \leq 36$ °C; Fig. 1; Fig. 2; Fig. 3 | 30 | | | | A |
| $I_{FRM}$ | repetitive peak forward current | δ = 0.5 ; $t_p$ = 25 µs; $T_h \leq 36$ °C; square-wave pulse | 60 | | | | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p$ = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4 | 270 | | | | A |
| | | $t_p$ = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse | 300 | | | | A |
| **Symbol** | **Parameter** | **Conditions** | | **Min** | **Typ** | **Max** | **Unit** |
| **Static characteristics** | | | | | | | |
| $V_F$ | forward voltage | $I_F$ = 30 A; $T_j$ = 25 °C; Fig. 6 | | - | 2 | 2.75 | V |
| | | $I_F$ = 30 A; $T_j$ = 150 °C; Fig. 6 | | - | 1.4 | 1.8 | V |
| **Dynamic characteristics** | | | | | | | |
| $t_{rr}$ | reverse recovery time | $I_F$ = 1 A; $V_R$ = 30 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 25 °C; Fig. 7 | | - | 18 | 22 | ns |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | A | anode |   |   |
| 2 | K | cathode | | |
| 3 | 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 |
|---|---|---|---|---|---|---|
| BYC30JT-600PS | TO3PF | BYC30JT-600PSQ | Tube | 30 | SOT1293 | 01-Mar-2017 |

## 7. Marking

**Table 4. Marking codes**

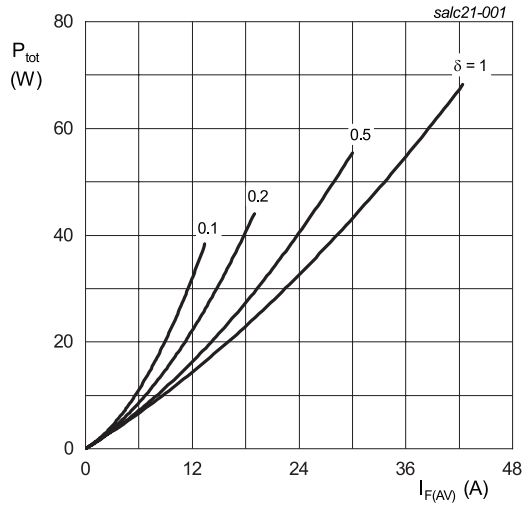
| Type number | Marking codes |
|---|---|
| BYC30JT-600PS | BYC30JT<br>600PS |

# 8. Limiting values

**Table 5. Limiting values**

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

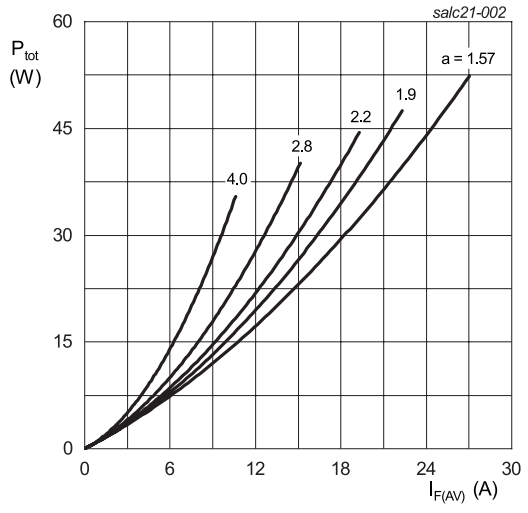
| Symbol | Parameter | Conditions | Values | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | repetitive peak reverse voltage | | 600 | V |
| $V_{RWM}$ | crest working reverse voltage | | 600 | V |
| $V_R$ | reverse voltage | DC | 600 | V |
| $I_{F(AV)}$ | average forward current | δ = 0.5 ; square-wave pulse; $T_h \leq 36$ °C; Fig. 1; Fig. 2; Fig. 3 | 30 | A |
| $I_{FRM}$ | repetitive peak forward current | δ = 0.5 ; $t_p$ = 25 µs; $T_h \leq 36$ °C; square-wave pulse | 60 | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p$ = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4 | 270 | A |
| | | $t_p$ = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse | 300 | A |
| $T_{stg}$ | storage temperature | | -65 to 175 | °C |
| $T_j$ | junction temperature | | 175 | °C |




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

$V_o$ = 1.410 V; $R_s$ = 0.0136 Ω

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




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

$V_o$ = 1.410 V; $R_s$ = 0.0136 Ω

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

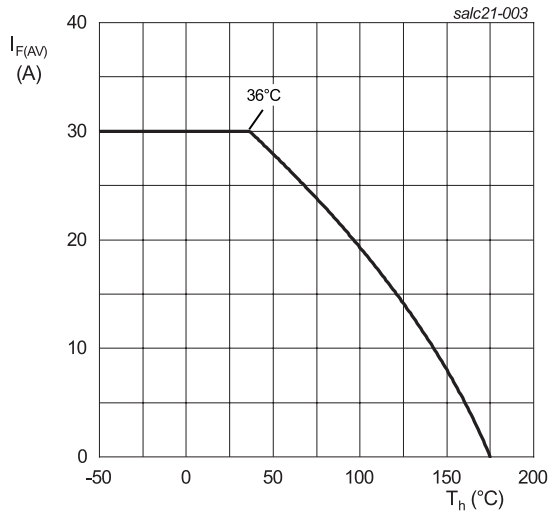



**Fig. 3. Forward current as a function of heatsink temperature; typical values**

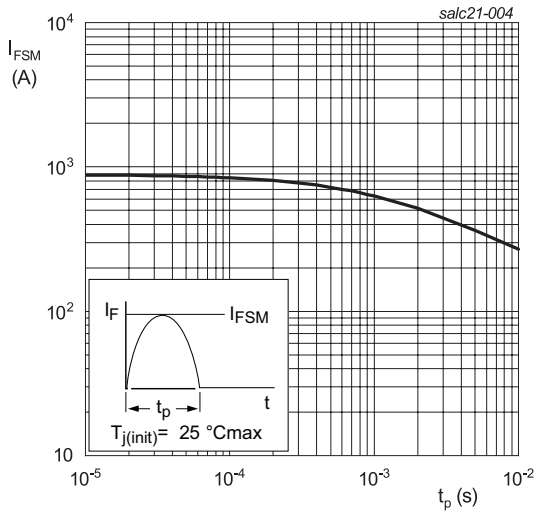



**Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values**

# 9. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink | with heatsink compound; Fig. 5 | | - | - | 3.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | | - | 35 | - | K/W |

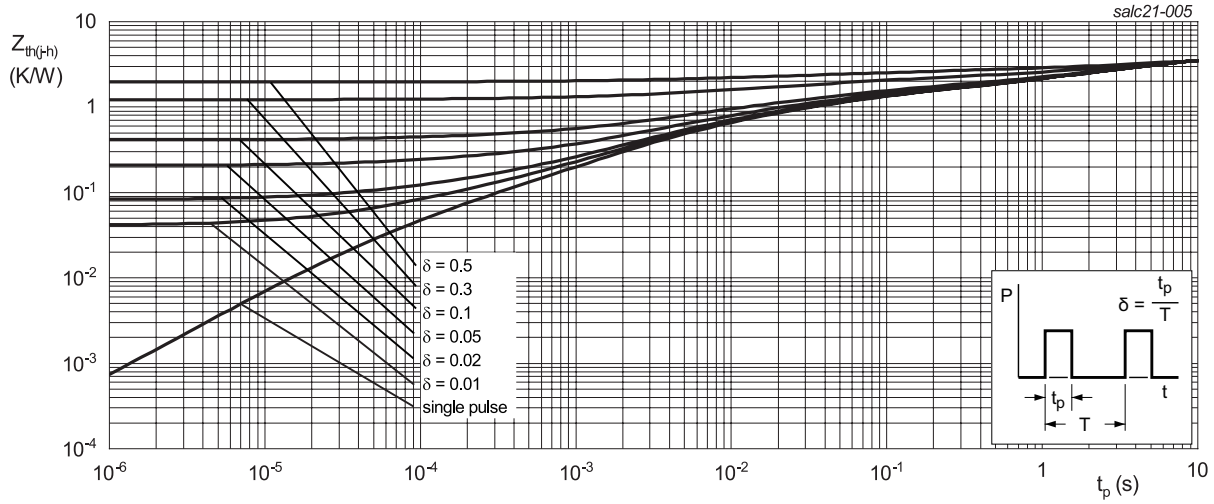



**Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration**

# 10. Isolation characteristics

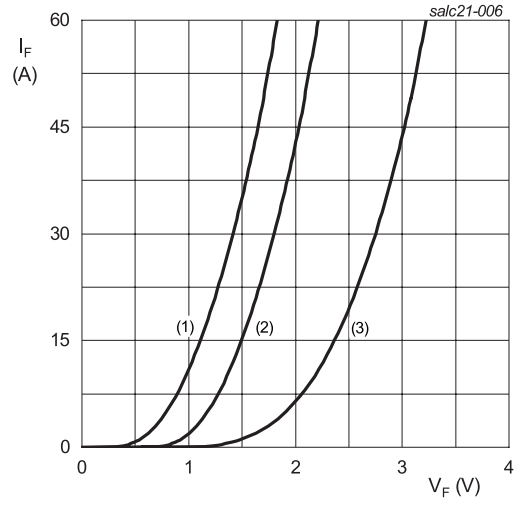
**Table 7. Isolation characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{isol(RMS)}$ | RMS isolation voltage | 50 Hz ≤ f ≤ 60 Hz; RH ≤ 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

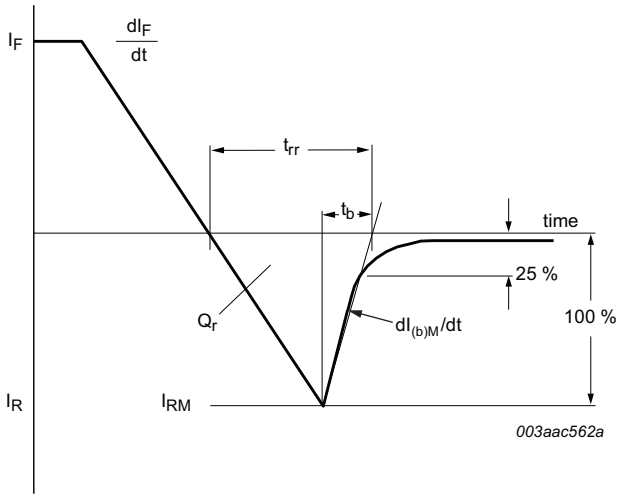
**Table 8. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | | |
| $V_F$ | forward voltage | $I_F$ = 30 A; $T_j$ = 25 °C; Fig. 6 | | - | 2 | 2.75 | V |
| | | $I_F$ = 30 A; $T_j$ = 150 °C; Fig. 6 | | - | 1.4 | 1.8 | V |
| $I_R$ | reverse current | $V_R$ = 600 V; $T_j$ = 25 °C | | - | - | 10 | µA |
| | | $V_R$ = 600 V; $T_j$ = 150 °C | | - | - | 600 | µA |
| **Dynamic characteristics** | | | | | | | |
| $t_{rr}$ | reverse recovery time | $I_F$ = 1 A; $V_R$ = 30 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 25 °C; Fig. 7 | | - | 18 | 22 | ns |
| | | $I_F$ = 30 A; $V_R$ = 200 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 25 °C; Fig. 7 | | - | 35 | - | ns |
| | | $I_F$ = 30 A; $V_R$ = 200 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 125 °C; Fig. 7 | | - | 70 | - | ns |
| | | $I_F$ = 30 A; $V_R$ = 400 V; $dI_F/dt$ = 500 A/µs; $T_j$ = 25 °C; Fig. 7 | | - | 29 | - | ns |
| $I_{RM}$ | peak reverse recovery current | $I_F$ = 30 A; $V_R$ = 200 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 25 °C; Fig. 7 | | - | 3.5 | - | A |
| | | $I_F$ = 30 A; $V_R$ = 200 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 125 °C; Fig. 7 | | - | 7.6 | - | A |
| $Q_r$ | recovered charge | $I_F$ = 30 A; $V_R$ = 200 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 25 °C; Fig. 7 | | - | 50 | - | nC |
| | | $I_F$ = 30 A; $V_R$ = 200 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 125 °C; Fig. 7 | | - | 280 | - | nC |
| $E_{as}$ | non-repetitive avalanche energy | $I_R$ = 2 A; L = 5 mH; $T_{j(init)}$ = 25 °C | | 10 | - | - | mJ |
| $S_{factor}$ | softness factor | $I_F$ = 30 A; $V_R$ = 200 V; $dI_F/dt$ = 200 A/µs; $T_j$ = 125 °C; Fig. 7 | | - | 0.26 | - | |




$V_o$ = 1.410 V; $R_s$ = 0.0136 Ω
(1) $T_j$ = 150 °C; typical values
(2) $T_j$ = 150 °C; maximum values
(3) $T_j$ = 25 °C; maximum values

**Fig. 6. Forward current as a function of forward voltage**

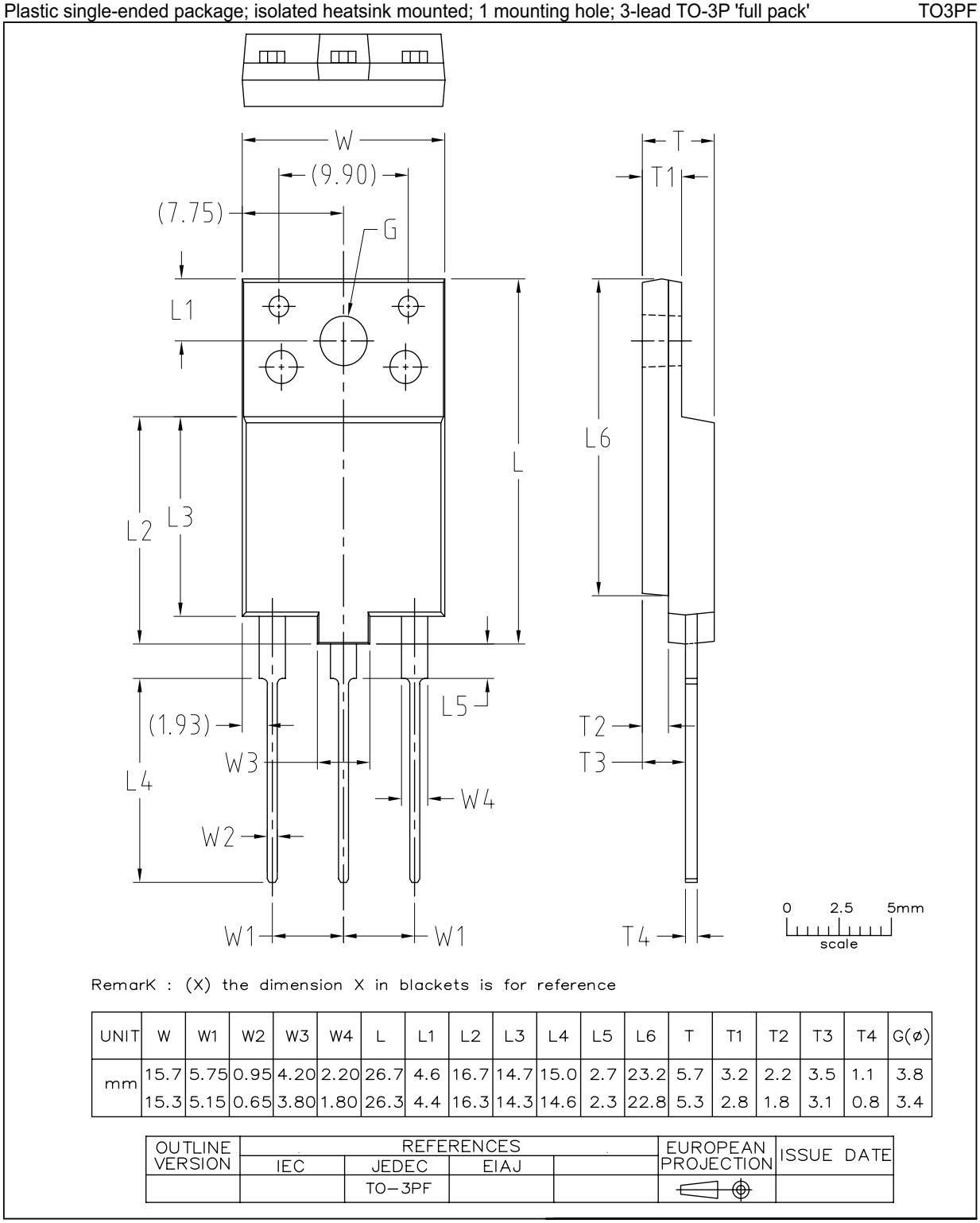



$S_{factor}$ = $[dI_F/dt]$ / $[dI_{(b)M}/dt]$
$dI_{(b)M}/dt$ = peak rate of change of current during $t_b$ portion of $t_{rr}$

**Fig. 7. Reverse recovery definitions; ramp recovery**

## 12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-3P 'full pack' TO3PF




RemarK : (X) the dimension X in blackets is for reference

| UNIT | W | W1 | W2 | W3 | W4 | L | L1 | L2 | L3 | L4 | L5 | L6 | T | T1 | T2 | T3 | T4 | G(ø) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 15.7 | 5.75 | 0.95 | 4.20 | 2.20 | 26.7 | 4.6 | 16.7 | 14.7 | 15.0 | 2.7 | 23.2 | 5.7 | 3.2 | 2.2 | 3.5 | 1.1 | 3.8 |
| | 15.3 | 5.15 | 0.65 | 3.80 | 1.80 | 26.3 | 4.4 | 16.3 | 14.3 | 14.6 | 2.3 | 22.8 | 5.3 | 2.8 | 1.8 | 3.1 | 0.8 | 3.4 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| | | TO−3PF | | | | |

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|---|---|---|
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