

1. General description

Hyperfast power diode in a 2-lead TO220 plastic package.



2. Features and benefits

- Excellent avalanche energy robustness
- Low leakage current
- Low thermal resistance
- Low reverse recovery current
- Reduces switching losses in associated MOSFET or IGBT

3. Applications

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

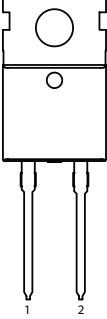
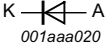
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Notes | Values | | | Unit |
|--------------------------------|-------------------------------------|--|-------|--------|------|------|------|
| Absolute maximum rating | | | | | | | |
| V_{RRM} | repetitive peak reverse voltage | | | 650 | | | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square-wave pulse; $T_{mb} \leq 109$ °C; Fig. 1 ; Fig. 2 ; Fig. 3 | | 30 | | | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25$ μ s; $T_{mb} \leq 109$ °C; square-wave pulse | | 60 | | | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(imit)} = 25$ °C; sine-wave pulse; Fig. 4 | | 270 | | | A |
| | | $t_p = 8.3$ ms; $T_{j(imit)} = 25$ °C; sine-wave pulse | | 297 | | | A |
| Symbol | Parameter | Conditions | Notes | Min | Typ | Max | Unit |
| Static characteristics | | | | | | | |
| V_F | forward voltage | $I_F = 30$ A; $T_j = 25$ °C; Fig. 6 | | - | 2.05 | 2.75 | V |
| | | $I_F = 30$ A; $T_j = 150$ °C; Fig. 6 | | - | 1.38 | 1.80 | V |
| Dynamic characteristics | | | | | | | |
| t_{rr} | reverse recovery time | $I_F = 1$ A; $V_R = 30$ V; $dI_F/dt = 200$ A/ μ s; $T_j = 25$ °C; Fig. 7 | | - | 20 | - | ns |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|------------------------------------|---|---|
| 1 | K | cathode |  |  |
| 2 | A | anode | | |
| mb | mb | mounting base; connected to cathod | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|-------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| BYC30M-650P | TO220-2L | BYC30M-650PQ | Tube | 50 | TO220d-2L | 13-Oct-2022 |

7. Marking

Table 4. Marking codes

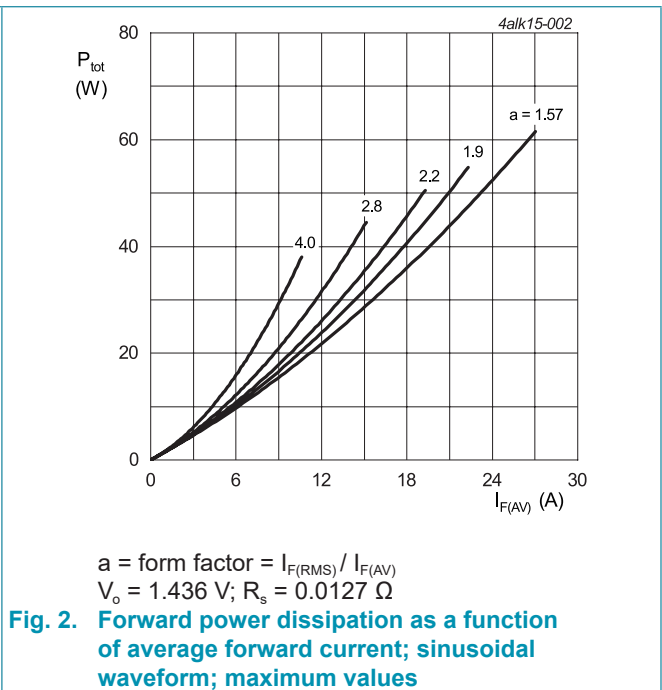
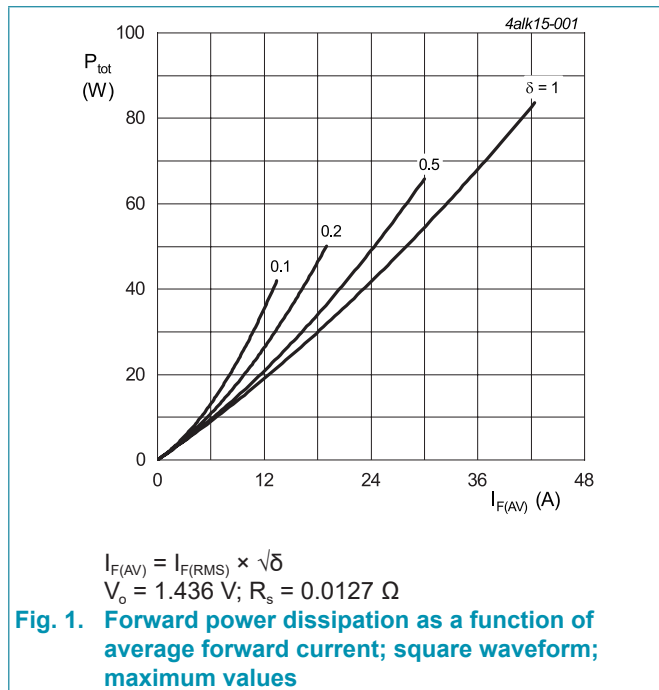
| Type number | Marking codes |
|-------------|----------------|
| BYC30M-650P | BYC30M 650P |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Notes | Values | Unit |
|-------------|-------------------------------------|---|-------|------------|------------------|
| V_{RRM} | repetitive peak reverse voltage | | | 650 | V |
| V_{RWM} | crest working reverse voltage | | | 650 | V |
| V_R | reverse voltage | DC | | 650 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square-wave pulse; $T_{mb} \leq 109\text{ }^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | | 30 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 109\text{ }^\circ\text{C}$; square-wave pulse | | 60 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; sine-wave pulse; Fig. 4 | | 270 | A |
| | | $t_p = 8.3\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; sine-wave pulse | | 297 | A |
| T_{stg} | storage temperature | | | -65 to 175 | $^\circ\text{C}$ |
| T_j | junction temperature | | | -65 to 175 | $^\circ\text{C}$ |



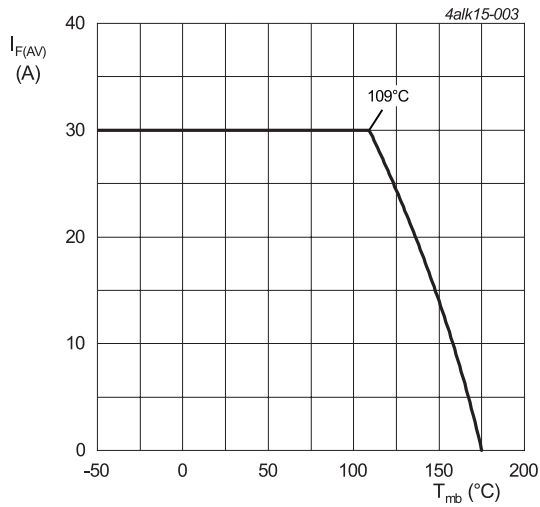


Fig. 3. Forward current as a function of mounting base temperature; maximum values

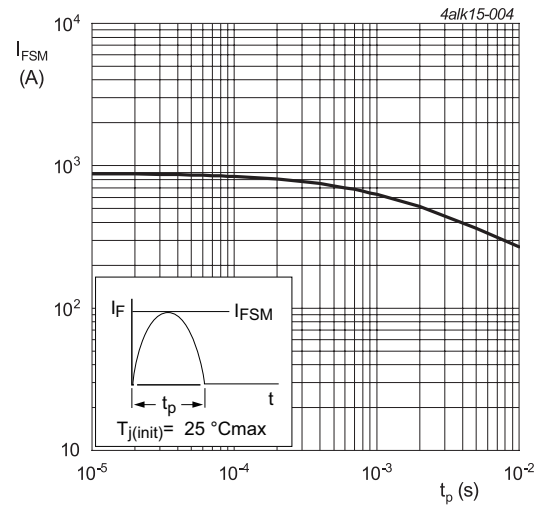


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Notes | Min | Typ | Max | Unit |
|----------------|--|------------------------|-------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 5 | | - | - | 1 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | | - | 60 | - | K/W |

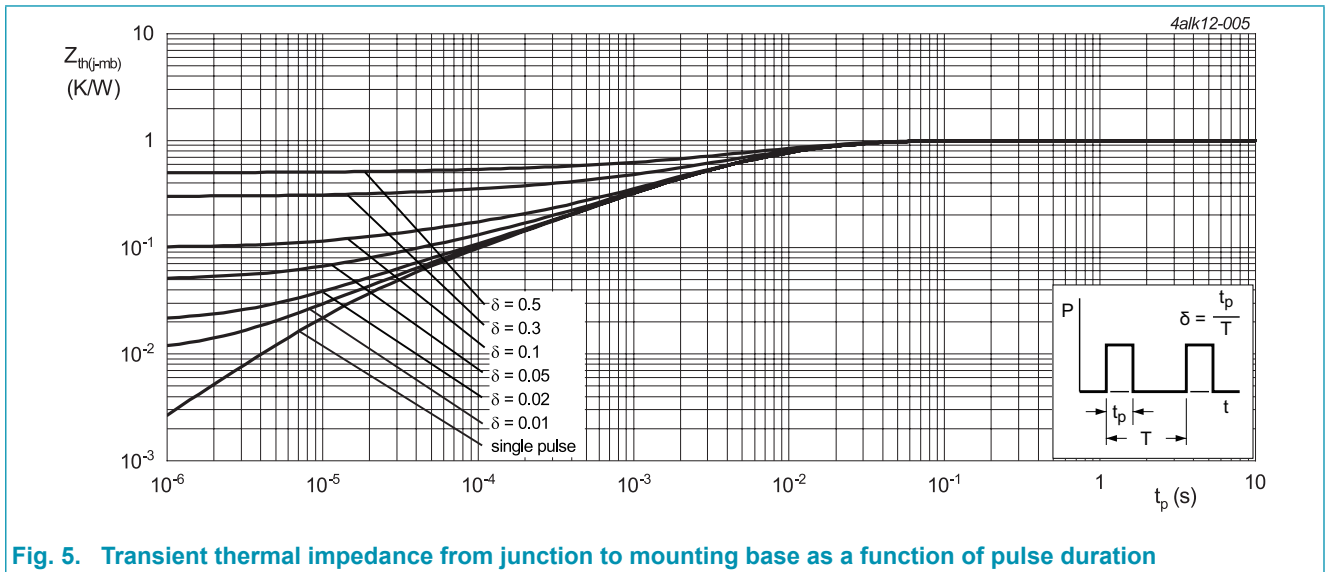
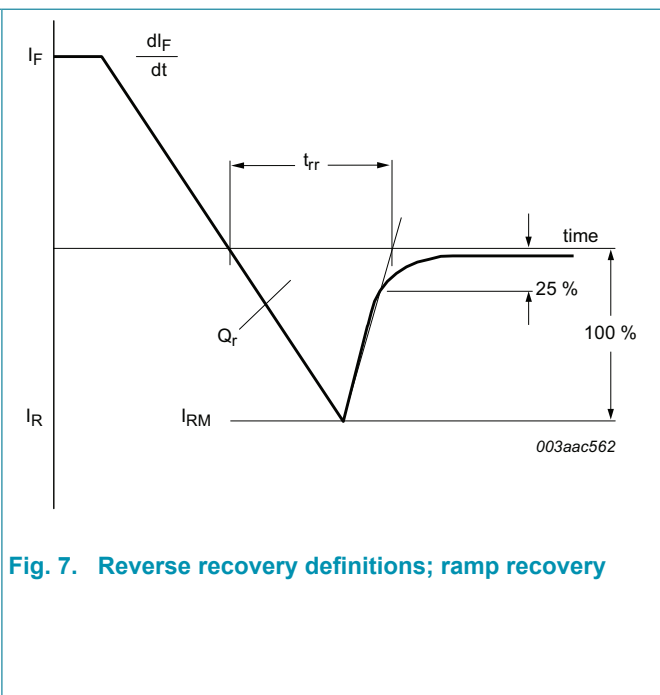
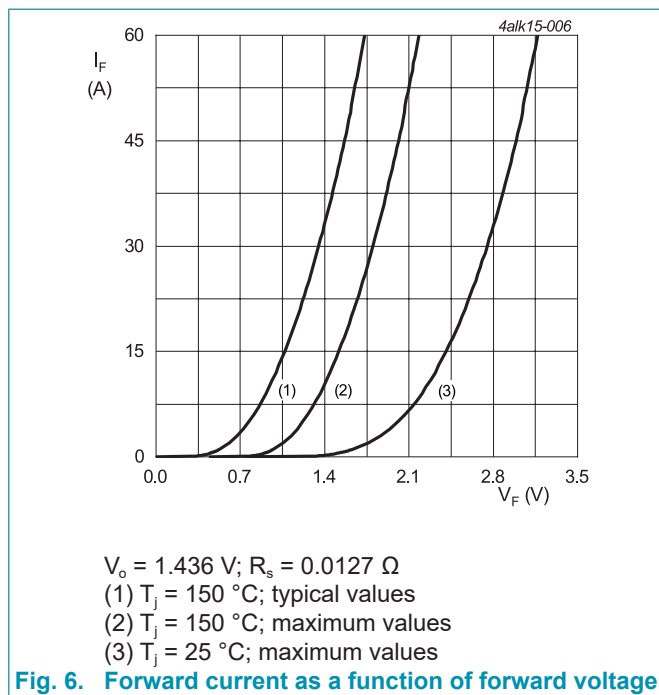


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

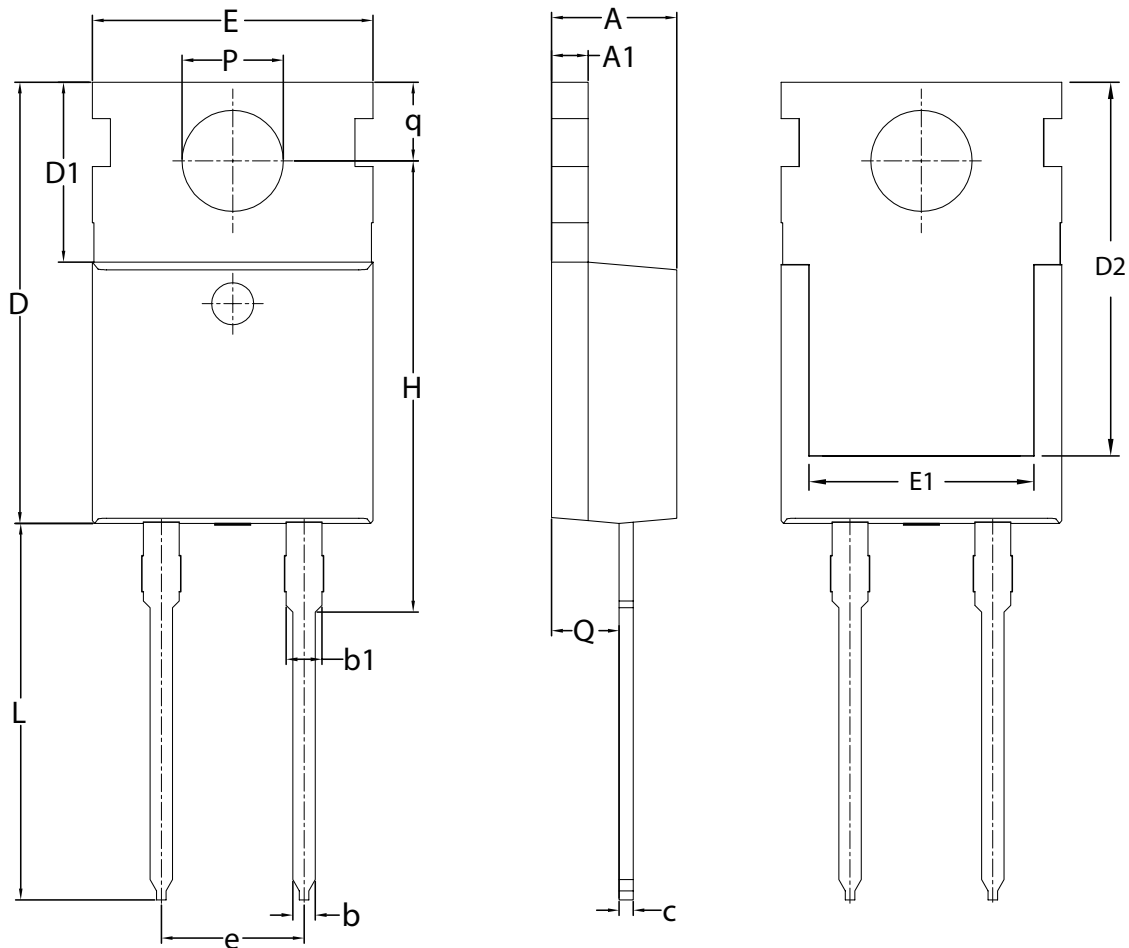
| Symbol | Parameter | Conditions | Notes | Min | Typ | Max | Unit |
|--------------------------------|---|---|-------|-----|------|------|---------------|
| Static characteristics | | | | | | | |
| V_F | forward voltage | $I_F = 30\text{ A}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 6}$ | | - | 2.05 | 2.75 | V |
| | | $I_F = 30\text{ A}; T_j = 150\text{ }^\circ\text{C}; \text{Fig. 6}$ | | - | 1.38 | 1.80 | V |
| I_R | reverse current | $V_R = 650\text{ V}; T_j = 25\text{ }^\circ\text{C}$ | | - | 0.6 | 30 | μA |
| | | $V_R = 650\text{ V}; T_j = 150\text{ }^\circ\text{C}$ | | - | 0.25 | 1 | mA |
| Dynamic characteristics | | | | | | | |
| Q_r | reverse charge | $I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | | - | 68 | - | nC |
| | | $I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C}; \text{Fig. 7}$ | | - | 330 | - | nC |
| t_{rr} | reverse recovery time | $I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | | - | 20 | - | ns |
| | | $I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | | - | 38 | - | ns |
| | | $I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C}; \text{Fig. 7}$ | | - | 73 | - | ns |
| I_{RM} | peak reverse recovery current non-repetitive avalanche energy | $I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | | - | 3.7 | - | A |
| | | $I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C}; \text{Fig. 7}$ | | - | 9.1 | - | A |
| E_{as} | non-repetitive avalanche energy | $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ | | 30 | - | - | mJ |



11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2 leads TO-220

TO220-2L



| Unit | A | A1 | b | b1 | c | D | D1 | D2 | E | E1 | e | H | L | P | Q | q | |
|------|-----|------|------|------|------|------|-------|------|-------|-------|------|------|-------|-------|------|------|------|
| MM | min | 4.30 | 1.15 | 0.70 | 1.20 | 0.45 | 15.50 | 6.20 | 13.00 | 9.65 | 7.80 | 4.95 | 15.70 | 12.60 | 3.65 | 2.20 | 2.70 |
| | max | 4.70 | 1.40 | 0.95 | 1.70 | 0.65 | 16.20 | 6.80 | 13.70 | 10.30 | 8.20 | 5.18 | 16.25 | 13.80 | 3.80 | 2.60 | 2.90 |

Note:

- All dimensions don't include mold flash and metal protrusion.

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| 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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