

1. General description

Ultrafast power diode in a TO-247 (True 2- pin) plastic package.

2. Features and benefits

- Low thermal resistance
- Low leakage current
- Low reverse recovery current
- Reduces switching losses in associated MOSFET or IGBT
- Increased creepage distance

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

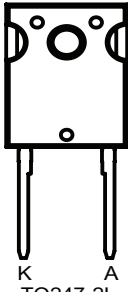

Table 1. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Values | | | | Unit |
|-------------------------|-------------------------------------|---|--------|-----|------|------|------|
| Absolute maximum rating | | | | | | | |
| V _{RRM} | repetitive peak reverse voltage | | 600 | | | | V |
| I _{F(AV)} | average forward current | δ = 0.5 ; square-wave pulse; T _{mb} ≤ 122 °C; Fig. 1 ; Fig. 2 ; Fig. 3 | 40 | | | | A |
| I _{FRM} | repetitive peak forward current | δ = 0.5 ; t _p = 25 μs; T _{mb} ≤ 122 °C; square-wave pulse | 80 | | | | A |
| I _{FSM} | non-repetitive peak forward current | t _p = 10 ms; T _{j(init)} = 25 °C; sine-wave pulse; Fig. 4 | 290 | | | | A |
| | | t _p = 8.3 ms; T _{j(init)} = 25 °C; sine-wave pulse; | 330 | | | | A |
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
| Static characteristics | | | | | | | |
| V _F | forward voltage | I _F = 40 A; T _j = 25 °C; Fig. 6 | | - | 1.13 | 1.6 | V |
| | | I _F = 40 A; T _j = 150 °C; Fig. 6 | | - | 0.97 | 1.45 | V |
| Dynamic characteristics | | | | | | | |
| t _{rr} | reverse recovery time | I _F = 1 A; V _R = 30 V; dI _F /dt = 50 A/μs; T _j = 25 °C; Fig. 7 | | - | 52 | - | 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 cathode | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|----------|--|-----------|
| | Name | Description | Version |
| BYV40W-600P | TO247-2L | Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 2 leads TO-247 | TO247A-2L |

7. Marking

Table 4. Marking codes

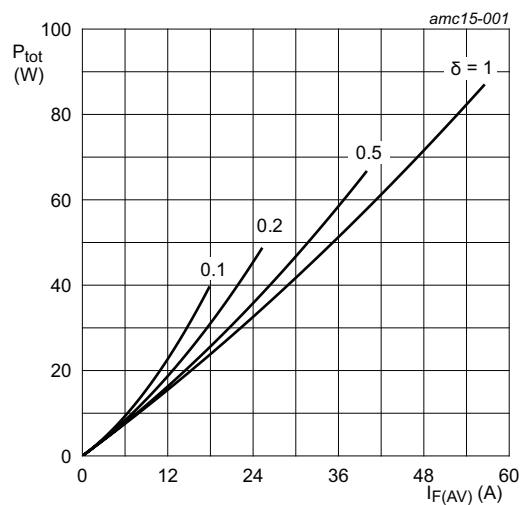
| Type number | Marking codes |
|-------------|---------------|
| BYV40W-600P | BYV40W-600P |

8. Limiting values

Table 5. Limiting values

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

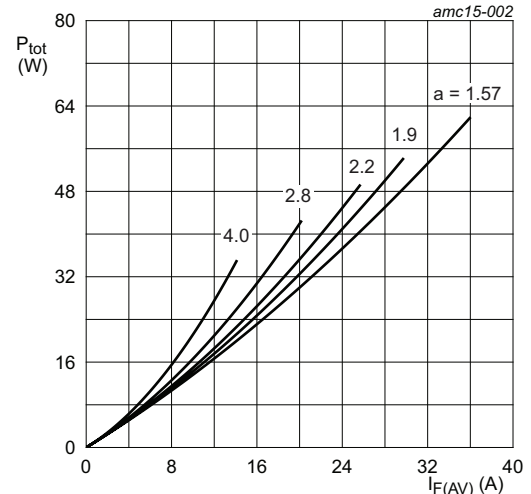
| Symbol | Parameter | Conditions | Values | Unit |
|-------------|-------------------------------------|---|------------|--------------------|
| V_{RRM} | repetitive peak reverse voltage | | 600 | V |
| V_{RWM} | crest working reverse voltage | | 600 | V |
| V_R | reverse voltage | DC | 600 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square-wave pulse; $T_{mb} \leq 122\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 40 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 122\text{ }^{\circ}\text{C}$; square-wave pulse | 80 | 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 | 290 | A |
| | | $t_p = 8.3\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; sine-wave pulse; | 330 | A |
| T_{stg} | storage temperature | | -55 to 175 | $^{\circ}\text{C}$ |
| T_j | junction temperature | | 175 | $^{\circ}\text{C}$ |



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

$$V_o = 1.224\text{ V}; R_s = 0.0056\text{ }\Omega$$

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



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

$$V_o = 1.224\text{ V}; R_s = 0.0056\text{ }\Omega$$

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

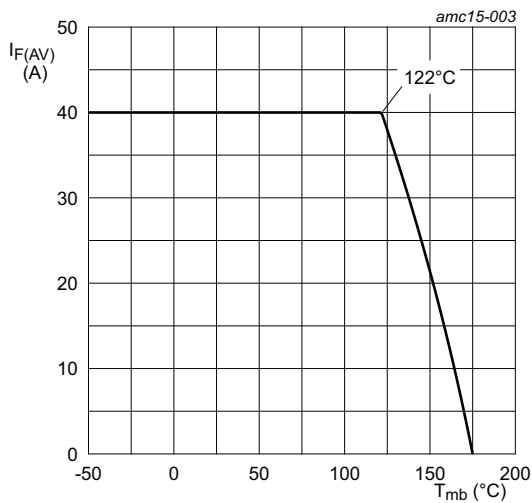


Fig. 3. Forward current as a function of mounting base temperature; maximum values

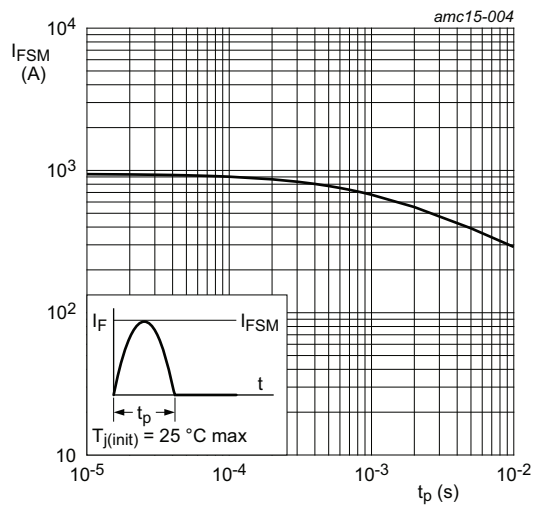


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|----------------|--|------------------------|--|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | Fig. 5 | | - | - | 0.8 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | | - | 40 | - | K/W |

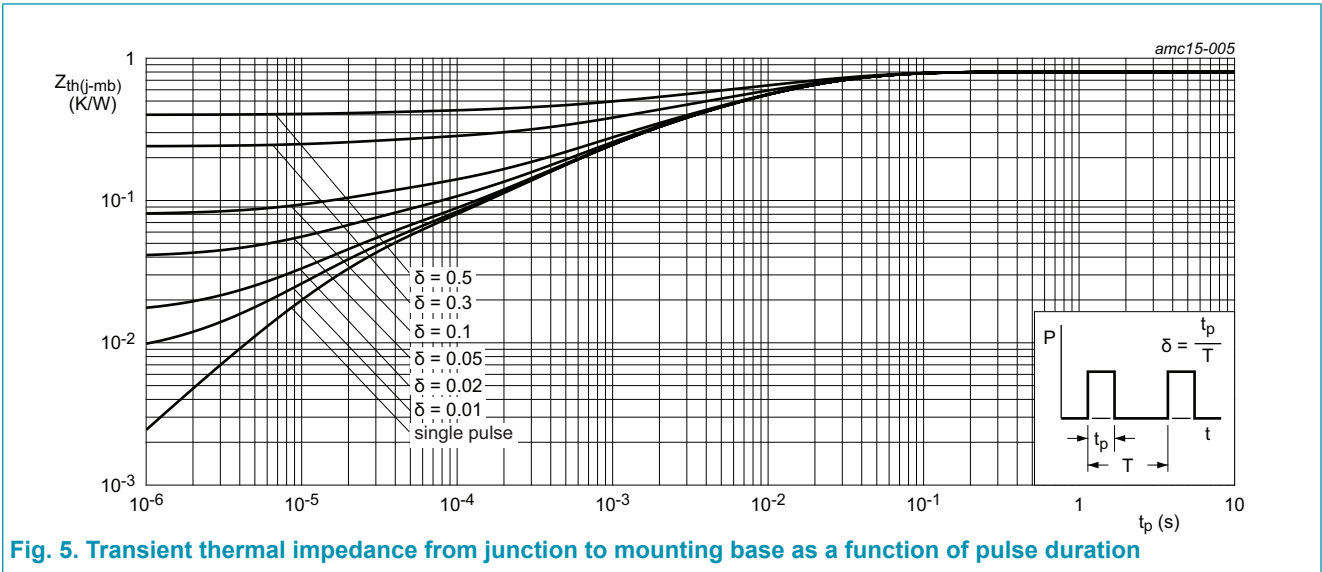
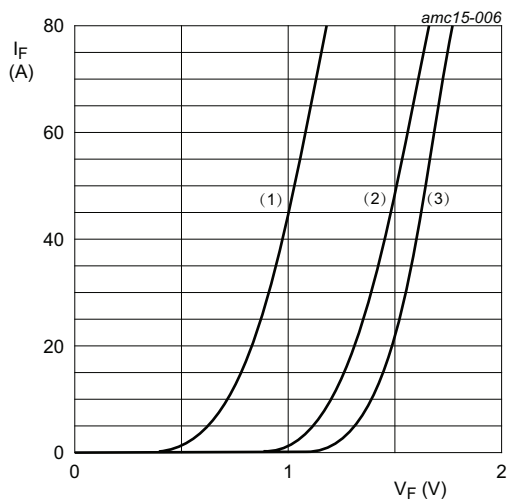


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-------------------------|-------------------------------|--|--|-----|------|------|------|
| Static characteristics | | | | | | | |
| V _F | forward current | I _F = 40 A; T _j = 25 °C; Fig. 6 | | - | 1.13 | 1.6 | V |
| | | I _F = 40 A; T _j = 150 °C; Fig. 6 | | - | 0.97 | 1.45 | V |
| I _R | reverse current | V _R = 600 V; T _j = 25 °C | | - | - | 10 | μA |
| | | V _R = 600 V; T _j = 150 °C | | - | - | 1 | mA |
| Dynamic characteristics | | | | | | | |
| Q _r | reverse charge | I _F = 40 A; V _R = 400 V; dI _F /dt = 200 A/μs; T _j = 25 °C; Fig. 7 | | - | 416 | - | nC |
| | | I _F = 40 A; V _R = 400 V; dI _F /dt = 200 A/μs; T _j = 125 °C; Fig. 7 | | - | 1208 | - | nC |
| t _{rr} | reverse recovery time | I _F = 1 A; V _R = 30 V; dI _F /dt = 50 A/μs; T _j = 25 °C; Fig. 7 | | - | 52 | - | ns |
| | | I _F = 40 A; V _R = 400 V; dI _F /dt = 200 A/μs; T _j = 25 °C; Fig. 7 | | - | 79 | - | ns |
| | | I _F = 40 A; V _R = 400 V; dI _F /dt = 200 A/μs; T _j = 125 °C; Fig. 7 | | - | 136 | - | ns |
| | | I _F = 40 A; V _R = 400 V; dI _F /dt = 500 A/μs; T _j = 25 °C; Fig. 7 | | - | 74 | - | ns |
| I _{RM} | peak reverse recovery current | I _F = 40 A; V _R = 400 V; dI _F /dt = 200 A/μs; T _j = 25 °C; Fig. 7 | | - | 11 | - | A |
| | | I _F = 40 A; V _R = 400 V; dI _F /dt = 200 A/μs; T _j = 125 °C; Fig. 7 | | - | 18 | - | A |



$V_o = 1.224\text{ V}; R_s = 0.0056\text{ }\Omega$

(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. 6. Forward current as a function of forward voltage

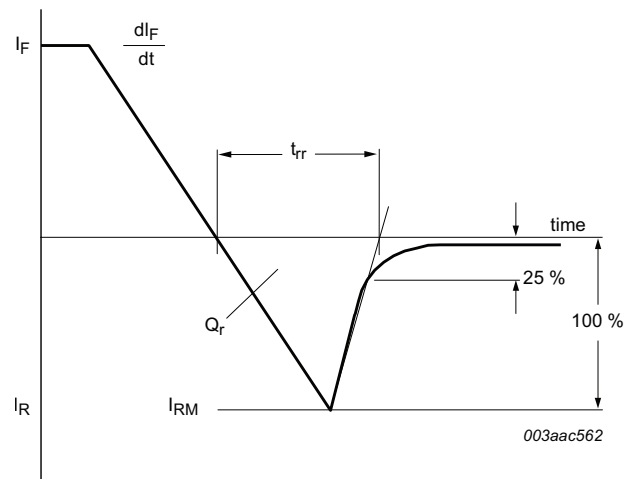
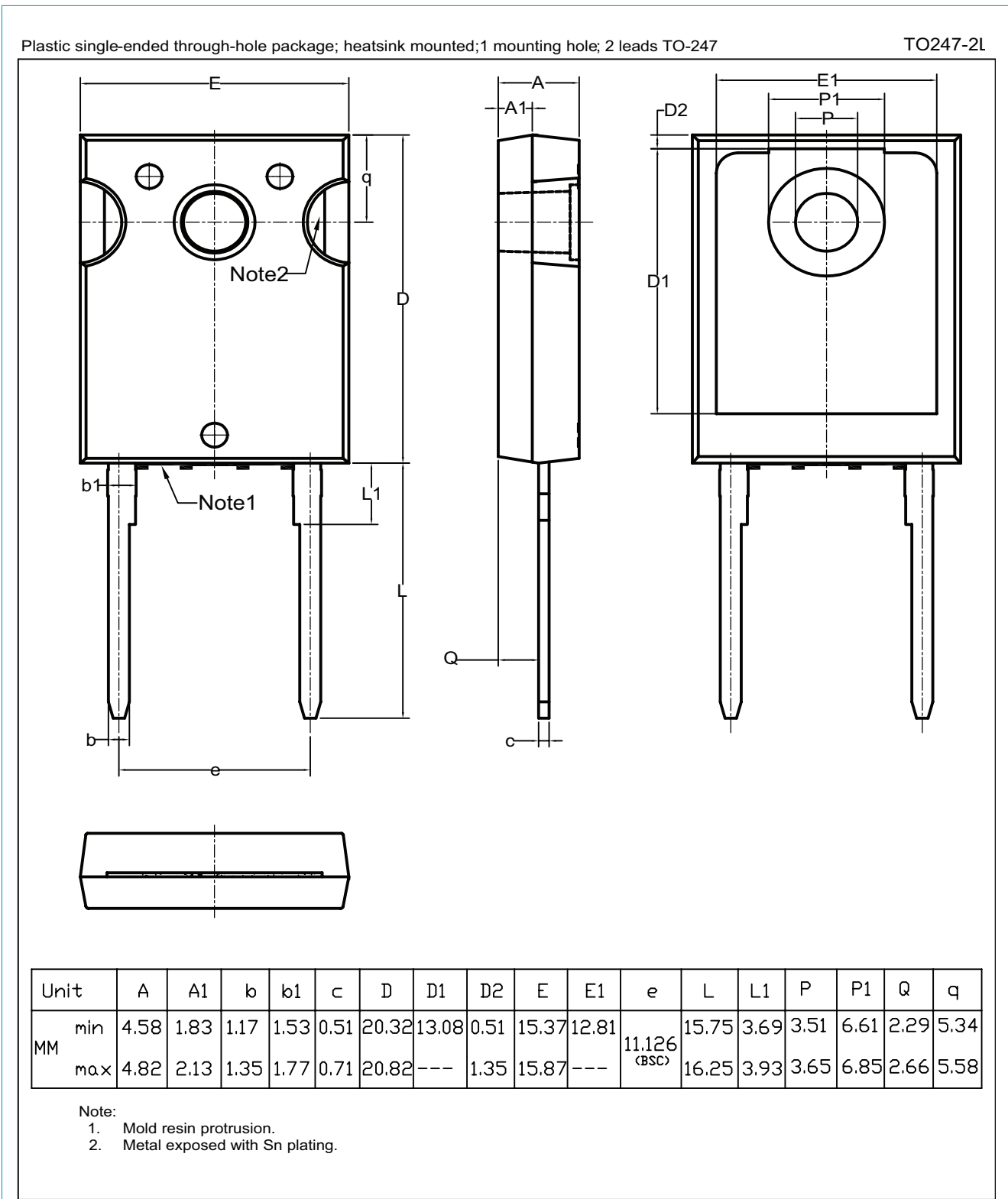


Fig. 7. Reverse recovery definitions; ramp recovery

11. Package outline



12. 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. |
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- [2] The term 'short data sheet' is explained in section "Definitions".
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