

Automotive high efficiency ultrafast diode

Datasheet – production data

Features

- High junction temperature
- Combines highest recovery and reverse voltage performance
- Ultrafast, soft and noise-free recovery
- AEC-Q101 qualified

Description

This dual center tap rectifier is suited for switch mode power supplies and high frequency DC to DC converters.

Packaged in D²PAK, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection for automotive applications.

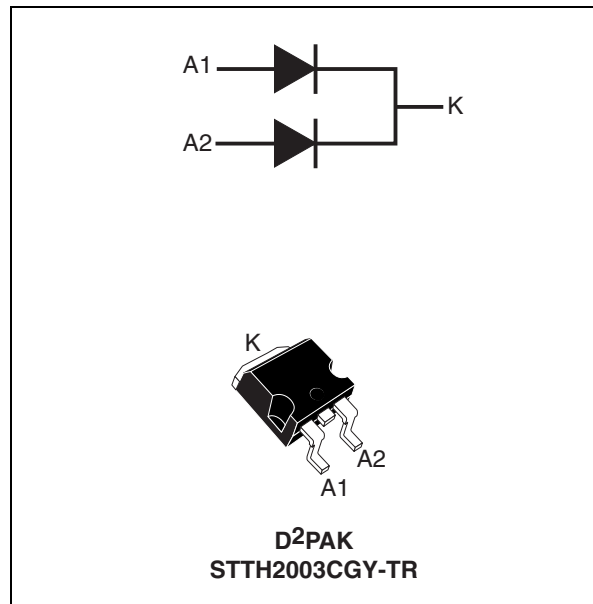


Table 1. Device summary

| | |
|---------------|----------|
| $I_F(AV)$ | 2 x 10 A |
| V_{RRM} | 300 V |
| $T_j(max)$ | 175 °C |
| $V_F(max)$ | 1 V |
| $t_{rr}(max)$ | 40 ns |

1 Characteristics

Table 2. Absolute ratings (limiting values, per diode)

| Symbol | Parameter | | | Value | Unit |
|---------------------|---|--|-------------------------|--------------|------|
| V _{RRM} | Repetitive peak reverse voltage | | | 300 | V |
| I _{F(RMS)} | Forward current rms | | | 48 | A |
| I _{F(AV)} | Average forward current, $\delta = 0.5$ | T _c = 140 °C | Per diode Per device | 10 20 | A |
| I _{FSM} | Surge non repetitive forward current | t _p = 10 ms sinusoidal (T _j = 25 °C) | | 110 | A |
| T _{stg} | Storage temperature range | | | -65 to + 175 | °C |
| T _j | Operating junction temperature range | | | -40 to + 175 | °C |

Table 3. Thermal resistance

| Symbol | Parameter | | Value (Max.) | Unit |
|----------------------|------------------|-----------|--------------|------|
| R _{th(j-c)} | Junction to case | Per diode | 2.5 | °C/W |
| | | Total | 1.3 | |

Table 4. Static electrical characteristics (per diode)

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|-------------------------------|-------------------------|-------------------------|------------------------|------|------|------|------|
| I _R ⁽¹⁾ | Reverse leakage current | T _j = 25 °C | V _R = 300 V | | | 20 | µA |
| | | T _j = 125 °C | | | 30 | 300 | |
| V _F ⁽²⁾ | Forward voltage drop | T _j = 25 °C | I _F = 10 A | | | 1.25 | V |
| | | T _j = 125 °C | | | 0.85 | 1 | |

1. Pulse test: t_p = 5 ms, $\delta < 2\%$

2. Pulse test: t_p = 380 µs, $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.75 \times I_{F(AV)} + 0.025 I_{F(RMS)}^2$$

Table 5. Recovery characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|----------|--------------------------|-----------------------------------|---|------|------|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 0.5\text{ A}, I_{rr} = 0.25\text{ A}$ $I_R = 1\text{ A}$ | | | 25 | ns |
| | | | $I_F = 1\text{ A}, V_R = 30\text{ V}$ $di_F/dt = -50\text{ A}/\mu\text{s}$ | | | 40 | |
| t_{fr} | Forward recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 10\text{ A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ | | | 230 | ns |
| V_{FP} | Peak forward voltage | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 10\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$ | | | 3.5 | V |
| I_{RM} | Reverse recovery current | $T_j = 125\text{ }^\circ\text{C}$ | $I_F = 10\text{ A}, V_{CC} = 200\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ | | | 8 | A |
| S factor | Softness factor | | | | 0.3 | - | |

Figure 1. Conduction losses versus average forward current (per diode)

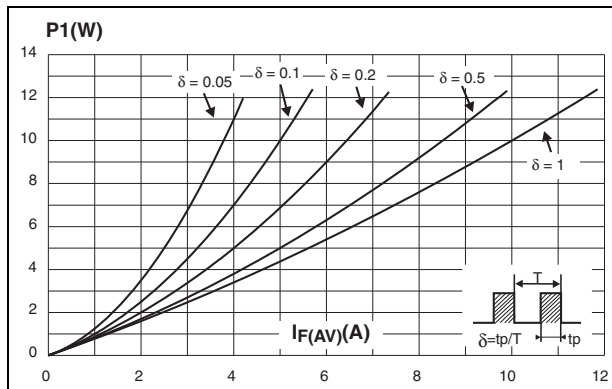


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

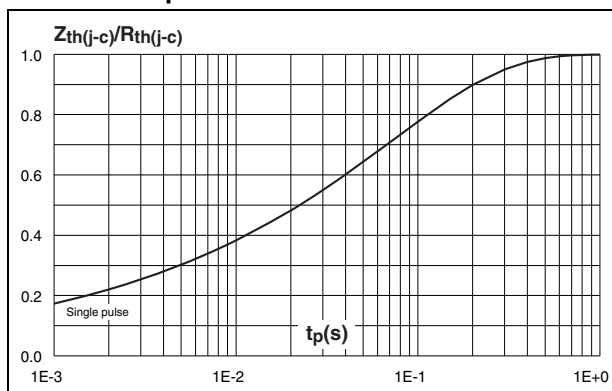


Figure 2. Forward voltage drop versus forward current (maximum values, per diode)

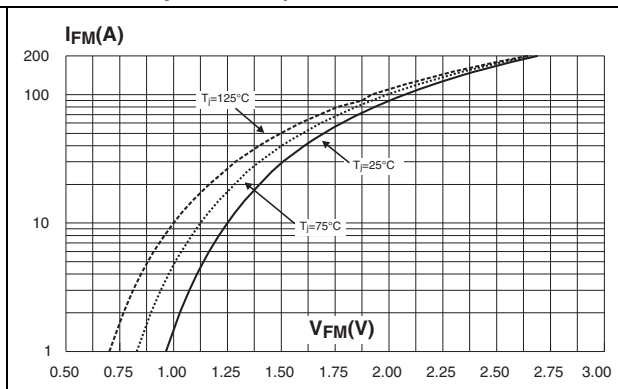


Figure 4. Peak reverse recovery current versus diF/dt (90% confidence, per diode)

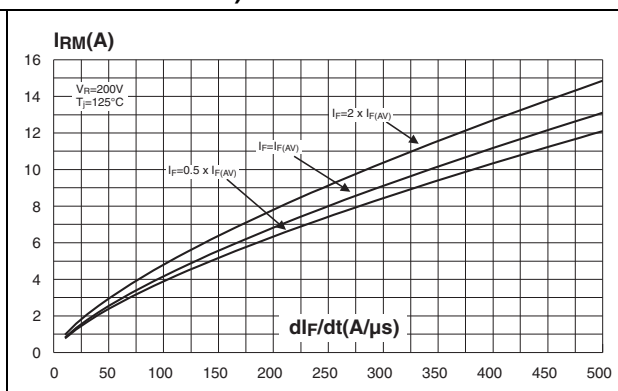


Figure 5. Reverse recovery time versus di_F/dt (90% confidence, per diode)

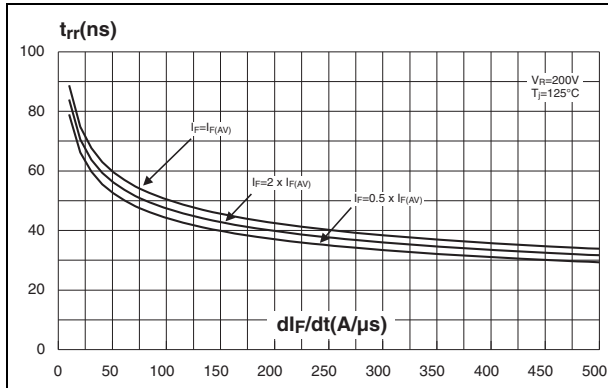


Figure 6. Softness factor (t_b/t_a) versus di_F/dt (typical values, per diode)

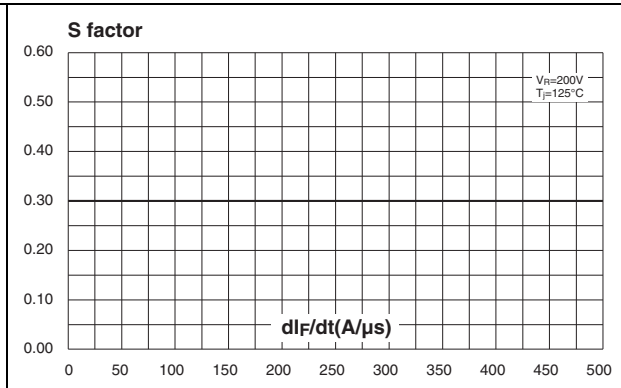


Figure 7. Relative variation of dynamic parameters versus junction temperature (reference: $T_j = 125^\circ\text{C}$)

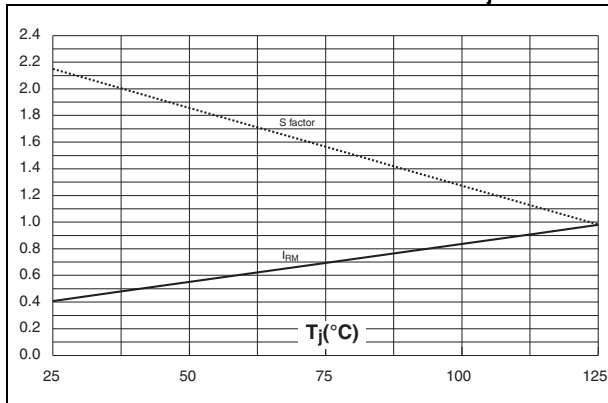


Figure 8. Forward recovery time versus di_F/dt (90% confidence, per diode)

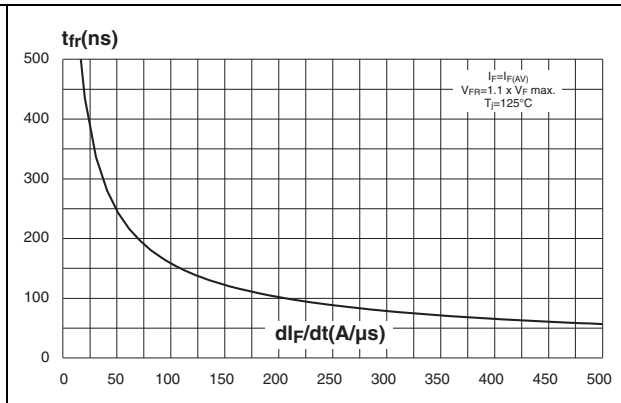


Figure 9. Thermal resistance, junction to ambient, versus copper surface under tab

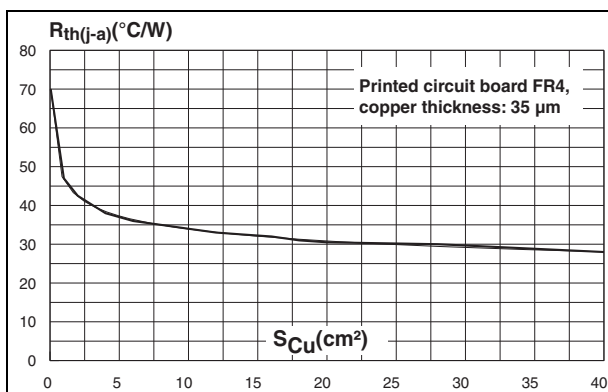
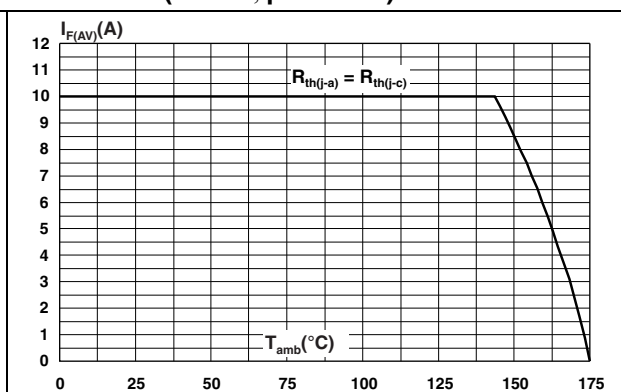


Figure 10. Average forward current versus ambient temperature ($\delta = 0.5$, per diode)



2 Package information

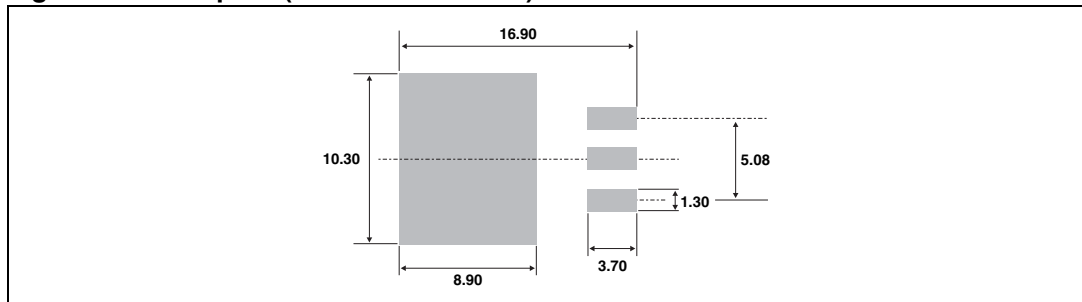
- Epoxy meets UL94, V0
- Cooling method: by conduction (C)

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Table 6. D²PAK dimensions

| Ref. | Dimensions | | | |
|------|-------------|-------|------------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.173 | 0.181 |
| A1 | 2.49 | 2.69 | 0.098 | 0.106 |
| A2 | 0.03 | 0.23 | 0.001 | 0.009 |
| B | 0.70 | 0.93 | 0.027 | 0.037 |
| B2 | 1.14 | 1.70 | 0.045 | 0.067 |
| C | 0.45 | 0.60 | 0.017 | 0.024 |
| C2 | 1.23 | 1.36 | 0.048 | 0.054 |
| D | 8.95 | 9.35 | 0.352 | 0.368 |
| E | 10.00 | 10.40 | 0.393 | 0.409 |
| G | 4.88 | 5.28 | 0.192 | 0.208 |
| L | 15.00 | 15.85 | 0.590 | 0.624 |
| L2 | 1.27 | 1.40 | 0.050 | 0.055 |
| L3 | 1.40 | 1.75 | 0.055 | 0.069 |
| M | 2.40 | 3.20 | 0.094 | 0.126 |
| R | 0.40 typ. | | 0.016 typ. | |
| V2 | 0° | 8° | 0° | 8° |

Figure 11. Footprint (dimensions in mm)



3 Ordering information

Table 7. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|----------------|-------------|--------------------|--------|----------|---------------|
| STTH2003CGY-TR | STTH2003CGY | D ² PAK | 1.48 g | 1000 | Tape and reel |

4 Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|------------------|
| 24-Oct-2012 | 1 | Initial release. |

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