

Description

This dual rectifier is based on a proprietary technology that achieves the best in class V_F/I_R for a given silicon surface.

Packaged in TO-220AB, and D²PAK, this device is intended to be used in switch mode power supplies, or automotive applications

Table 1. Device summary

| | |
|-------------------|----------|
| $I_{F(AV)}$ | 2 x 20 A |
| V_{RRM} | 45 V |
| $V_F(\text{typ})$ | 0.34 V |

Features

- ST advanced rectifier process
- Stable leakage current over reverse voltage
- Low forward voltage drop
- High frequency operation

1 Characteristics

Table 2. Absolute ratings (limiting values, per diode at 25° C, unless otherwise stated)

| Symbol | Parameter | | | Value | Unit |
|--------------|---|--|---------------------------------|--------------|------|
| V_{RRM} | Repetitive peak reverse voltage | | | 45 | V |
| $I_{F(RMS)}$ | Forward rms current | | | 40 | A |
| $I_{F(AV)}$ | Average forward current, $\delta = 0.5$ | $T_c = 150^\circ\text{C}$ | Per diode | 20 | A |
| | | $T_c = 140^\circ\text{C}$ | Per device | 40 | |
| I_{FSM} | Surge non repetitive forward current | | $t_p = 10\text{ ms sinusoidal}$ | 275 | A |
| T_{stg} | Storage temperature range | | | -65 to + 175 | °C |
| T_j | Maximum operating junction temperature ⁽¹⁾ | TO-220AB, D ² PAK | | 175 | °C |
| | | D ² PAK (DC forward current without reverse bias, t = 1 hour) | | 200 | |

1. $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal resistances

| Symbol | Parameter | | Value | Unit |
|---------------|------------------|-----------|-------|------|
| $R_{th(j-c)}$ | Junction to case | Per diode | 1.6 | °C/W |
| | | Total | 1.1 | |
| $R_{th(c)}$ | Coupling | | 0.5 | °C/W |

When the diodes 1 and 2 are used simultaneously:

$$\Delta T_j(\text{diode 1}) = P(\text{diode1}) \times R_{th(j-c)}(\text{Per diode}) + P(\text{diode2}) \times R_{th(c)}$$

Table 4. Static electrical characteristics (per diode)

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|-------------|-------------------------|---------------------------|---------------------|------|------|-------|------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^\circ\text{C}$ | $V_R = V_{RRM}$ | | | 650 | μA |
| | | $T_j = 125^\circ\text{C}$ | | | 25 | 50 | mA |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25^\circ\text{C}$ | $I_F = 10\text{ A}$ | | 0.38 | 0.415 | V |
| | | $T_j = 125^\circ\text{C}$ | | | 0.34 | 0.37 | |
| | | $T_j = 25^\circ\text{C}$ | $I_F = 20\text{ A}$ | | 0.46 | 0.50 | |
| | | $T_j = 125^\circ\text{C}$ | | | 0.46 | 0.50 | |

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

2. Pulse test: $t_p = 380\text{ }\mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.31 \times I_{F(AV)} + 0.0095 I_{F(RMS)}^2$$

Figure 1. Average forward power dissipation versus average forward current (per diode)

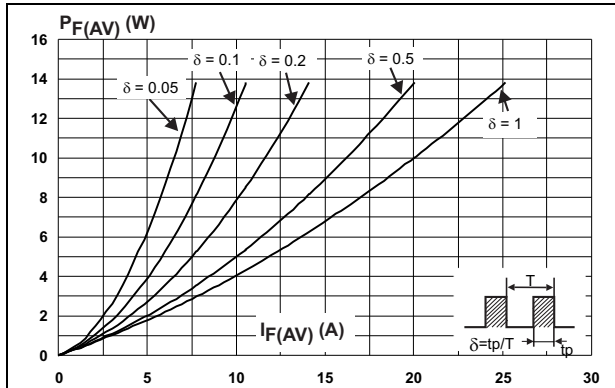


Figure 2. Average forward current versus ambient temperature ($\delta = 0.5$, per diode)

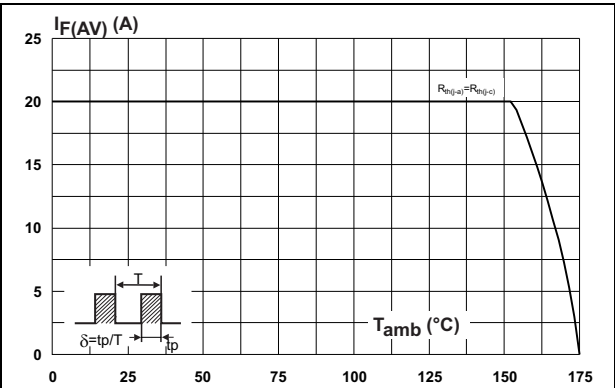


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

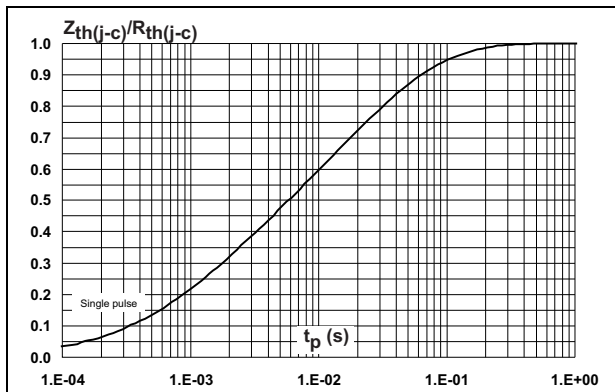


Figure 4. Reverse leakage current versus reverse voltage applied (typical values, per diode)

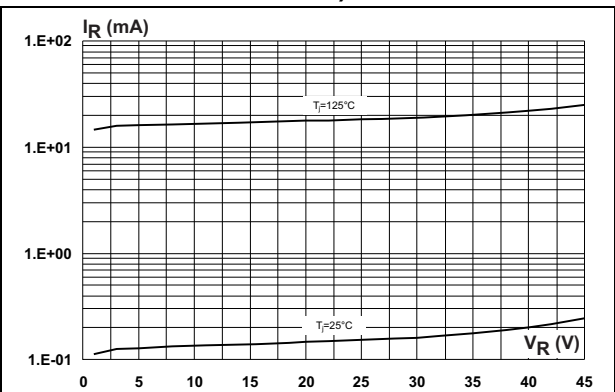


Figure 5. Junction capacitance versus reverse voltage applied (typical values, per diode)

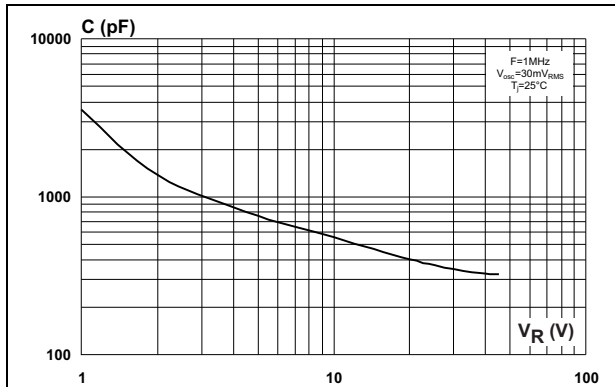


Figure 6. Forward voltage drop versus forward current (typical values, per diode)

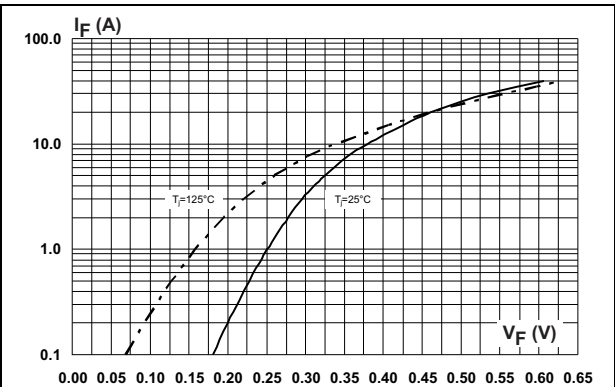
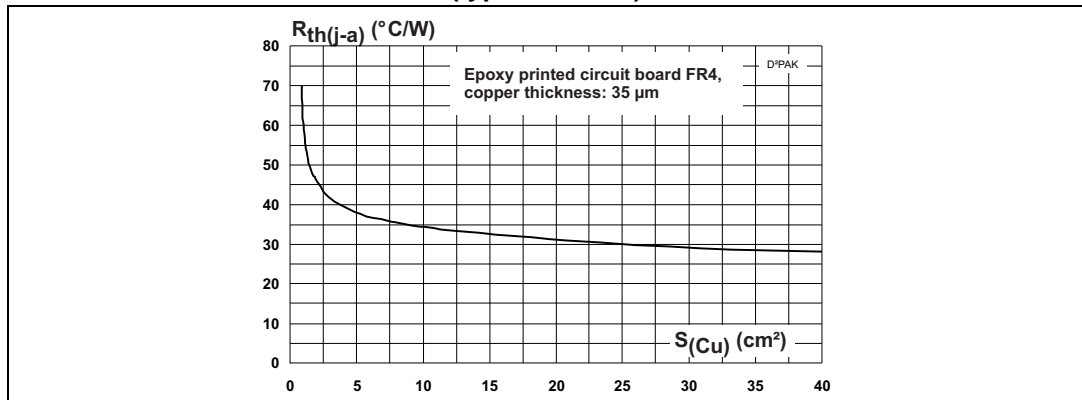


Figure 7. Thermal resistance junction to ambient versus copper surface under tab (typical values)



2 Package Information

- Epoxy meets UL94,V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m (TO-220AB)

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Figure 8. TO-220AB dimension definitions

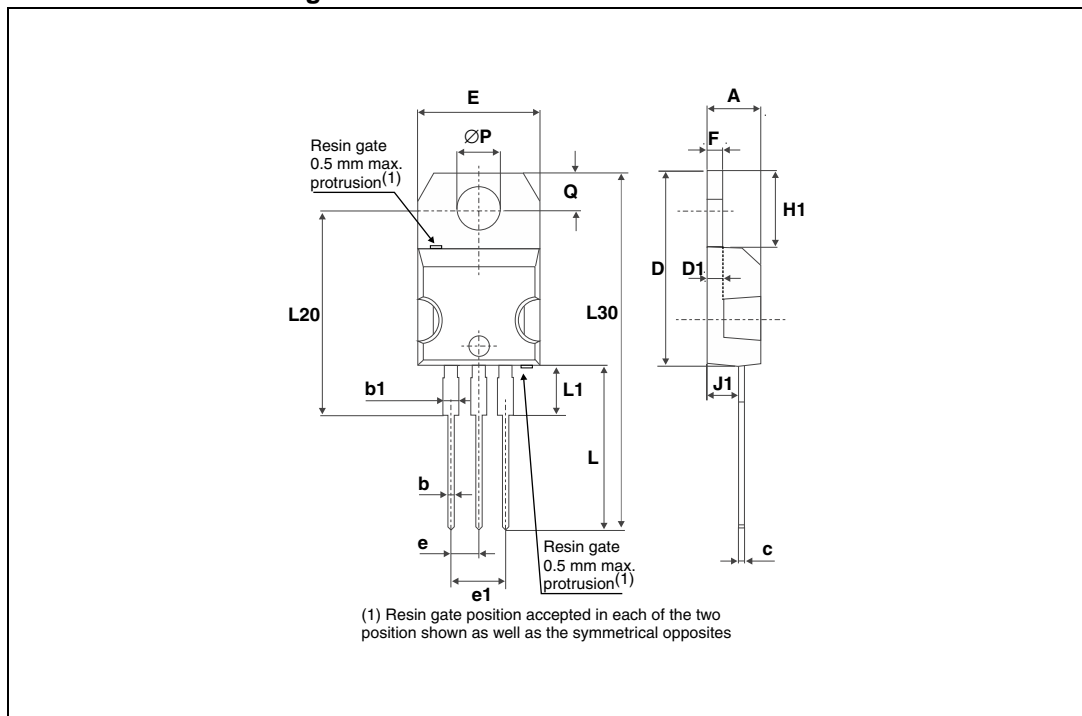


Table 5. TO-220AB dimension values

| Ref. | Dimensions | | | |
|------|-------------|-------|-----------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.17 | 0.18 |
| b | 0.61 | 0.88 | 0.024 | 0.035 |
| b1 | 1.14 | 1.70 | 0.045 | 0.067 |
| c | 0.48 | 0.70 | 0.019 | 0.027 |
| D | 15.25 | 15.75 | 0.60 | 0.62 |
| D1 | 1.27 typ. | | 0.05 typ. | |
| E | 10 | 10.40 | 0.39 | 0.41 |
| e | 2.40 | 2.70 | 0.094 | 0.106 |
| e1 | 4.95 | 5.15 | 0.19 | 0.20 |
| F | 1.23 | 1.32 | 0.048 | 0.052 |
| H1 | 6.20 | 6.60 | 0.24 | 0.26 |
| J1 | 2.40 | 2.72 | 0.094 | 0.107 |
| L | 13 | 14 | 0.51 | 0.55 |
| L1 | 3.50 | 3.93 | 0.137 | 0.154 |
| L20 | 16.40 typ. | | 0.64 typ. | |
| L30 | 28.90 typ. | | 1.13 typ. | |
| ∅P | 3.75 | 3.85 | 0.147 | 0.151 |
| Q | 2.65 | 2.95 | 0.104 | 0.116 |

Figure 9. D²PAK dimension definitions

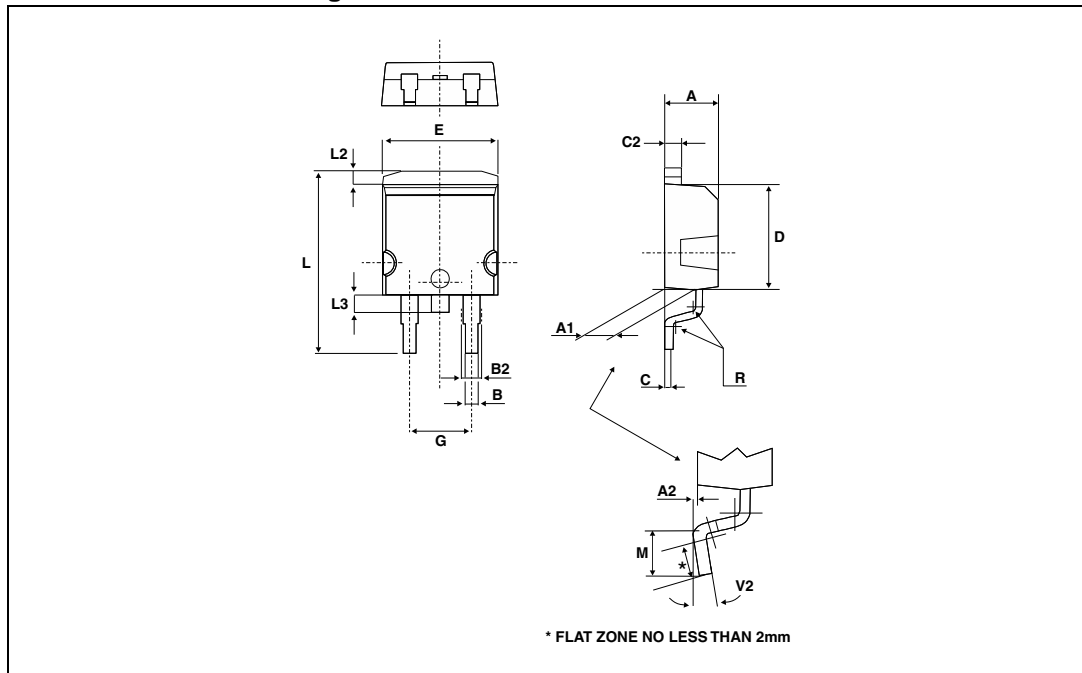
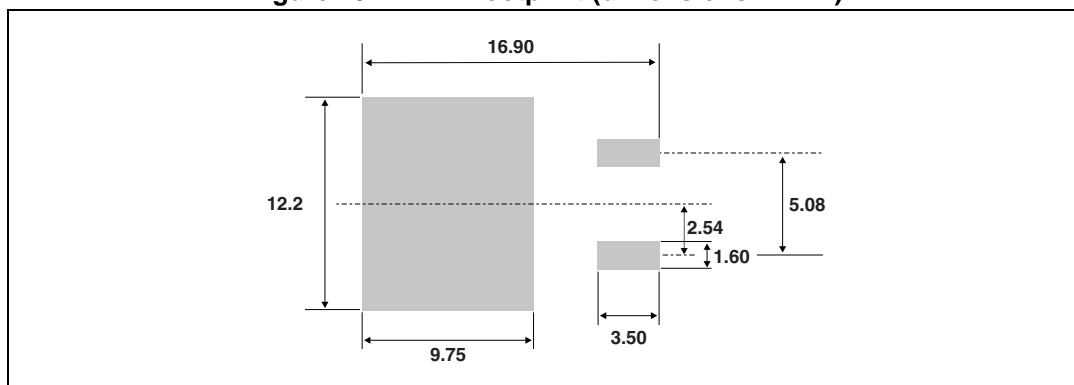


Table 6. D²PAK dimension values

| 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 | 1.30 | 1.75 | 0.051 | 0.069 |
| M | 2.29 | 2.79 | 0.090 | 0.110 |
| R | 0.40 typ. | | 0.016 typ. | |
| V2 | 0° | 8° | 0° | 8° |

Figure 10. D²PAK footprint (dimensions in mm)



3 Ordering Information

Table 7. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|----------------|-------------|--------------------|--------|----------|---------------|
| FERD40M45CT | FERD40M45CT | TO-220AB | 2.2 g | 50 | Tube |
| FERD40M45CG-TR | FERD40M45CG | D ² PAK | 1.8 g | 500 | Tape and reel |

4 Revision history

Table 8. Document revision history

| Date | Revision | Description of Changes |
|-------------|----------|------------------------|
| 13-Nov-2013 | 1 | Initial release |

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