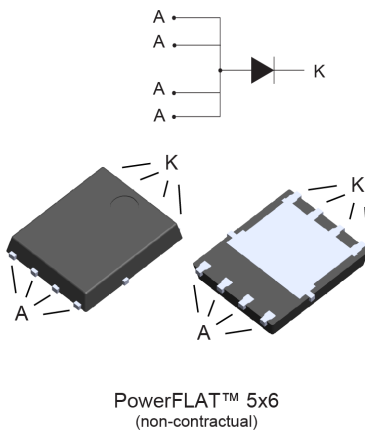


## 50 V, 20 A field effect rectifier



### Features

- ST patented rectifier process
- Stable leakage current over reverse voltage
- Low forward voltage drop
- High frequency operation
- ECOPACK®2 compliant

### Applications

- Set-top box
- Battery charger
- DC / DC converter

### Description

This single rectifier is based on a proprietary technology, enabling to achieve the best in class  $V_F/I_R$  for a given silicon surface.

Packaged in PowerFLAT™ 5x6, the FERD20U50 is optimized for use in rectification and freewheeling operations in switch mode power supplies.

| Product status  |        |
|-----------------|--------|
| FERD20U50       |        |
| Product summary |        |
| Symbol          | Value  |
| $I_{F(AV)}$     | 20 A   |
| $V_{RRM}$       | 50 V   |
| $T_{j(max.)}$   | 150 °C |
| $V_{F(typ.)}$   | 0.44 V |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified, anode terminals short circuited)**

| Symbol              | Parameter   | Value                             | Unit |    |
|---------------------|---|-----------------------------------|------|----|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage                       | 50                                | V    |    |
| I <sub>F(RMS)</sub> | Forward rms current                                   | 45                                | A    |    |
| I <sub>F(AV)</sub>  | Average forward current, $\delta = 0.5$ square wave   | T <sub>C</sub> = 115 °C           | 20   | A  |
| I <sub>FSM</sub>    | Surge non repetitive forward current                  | t <sub>p</sub> = 10 ms sinusoidal | 180  | A  |
| T <sub>stg</sub>    | Storage temperature range                             | -65 to +175                       | °C   |    |
| T <sub>j</sub>      | Maximum operating junction temperature <sup>(1)</sup> | PowerFlat™ 5x6                    | +150 | °C |

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

**Table 2. Thermal resistance parameter**

| Symbol               | Parameter        | Max. value | Unit |
|----------------------|------------------|------------|------|
| R <sub>th(j-c)</sub> | Junction to case | 2.6        | °C/W |

For more information, please refer to the following application note :

- AN5046 : Printed circuit board assembly recommendations for STMicroelectronics PowerFLAT™ packages

**Table 3. Static electrical characteristics (anode terminals short circuited)**

| Symbol                        | Parameter               | Test conditions         | Min.                              | Typ. | Max. | Unit |      |
|-------------------------------|-------------------------|-------------------------|-----------------------------------|------|------|------|------|
| I <sub>R</sub> <sup>(1)</sup> | Reverse leakage current | T <sub>j</sub> = 25 °C  | V <sub>R</sub> = V <sub>RRM</sub> | -    | 800  | μA   |      |
|                               |                         | T <sub>j</sub> = 125 °C |                                   | -    | 30   | 60   | mA   |
| V <sub>F</sub> <sup>(2)</sup> | Forward voltage drop    | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 10 A             | -    | 0.37 | V    |      |
|                               |                         | T <sub>j</sub> = 125 °C |                                   | -    | 0.33 |      |      |
|                               |                         | T <sub>j</sub> = 25 °C  | I <sub>F</sub> = 20 A             | -    | 0.45 |      | 0.51 |
|                               |                         | T <sub>j</sub> = 125 °C |                                   | -    | 0.44 |      |      |

1. Pulse test: t<sub>p</sub> = 5 ms,  $\delta < 2\%$

2. Pulse test: t<sub>p</sub> = 380 μs,  $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

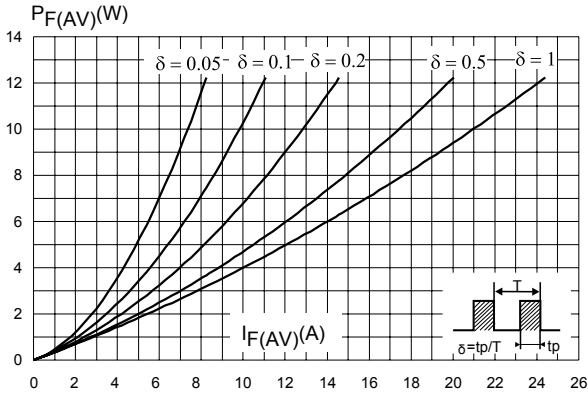
$$P = 0.25 \times I_{F(AV)} + 0.011 \times I_{F(RMS)}^2$$

For more information, please refer to the following application notes related to the power losses :

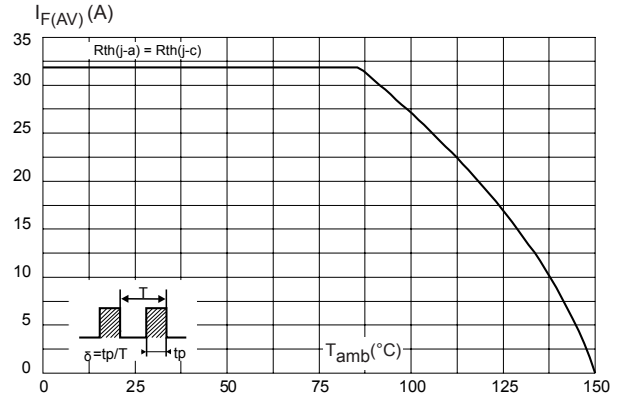
- AN604: Calculation of conduction losses in a power rectifier
- AN4021: Calculation of reverse losses on a power diode

### 1.1 Characteristics (curves)

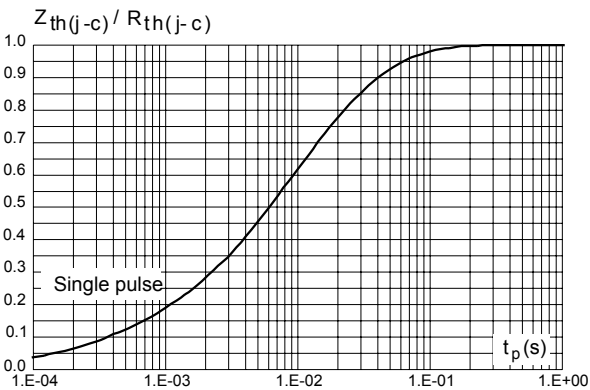
**Figure 1. Average forward power dissipation versus average forward current (anode terminals short circuited)**



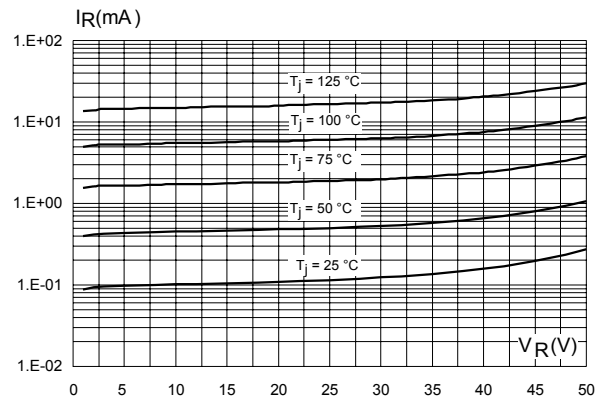
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ , anode terminals short circuited)**



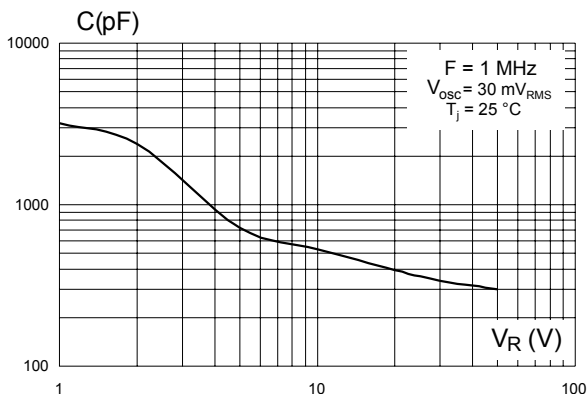
**Figure 3. Relative variation of thermal impedance junction to case versus pulse duration**



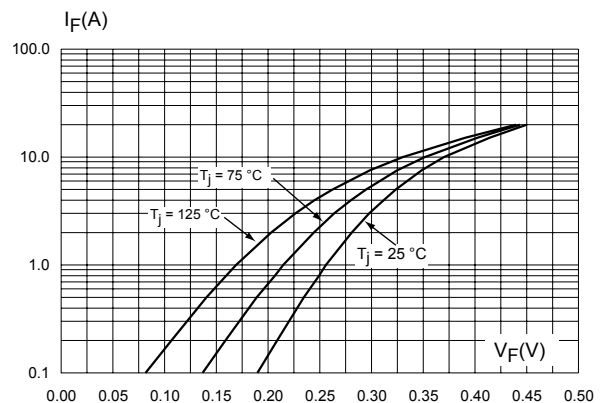
**Figure 4. Reverse leakage current versus reverse voltage applied (typical values)**



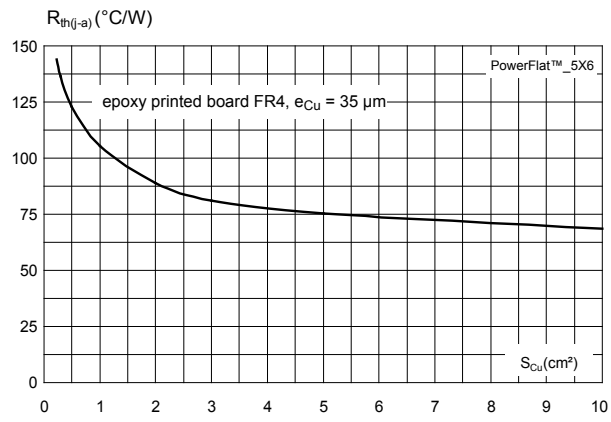
**Figure 5. Junction capacitance versus reverse voltage applied (typical values)**



**Figure 6. Forward voltage drop versus forward current (typical values, anode terminals short circuited)**



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



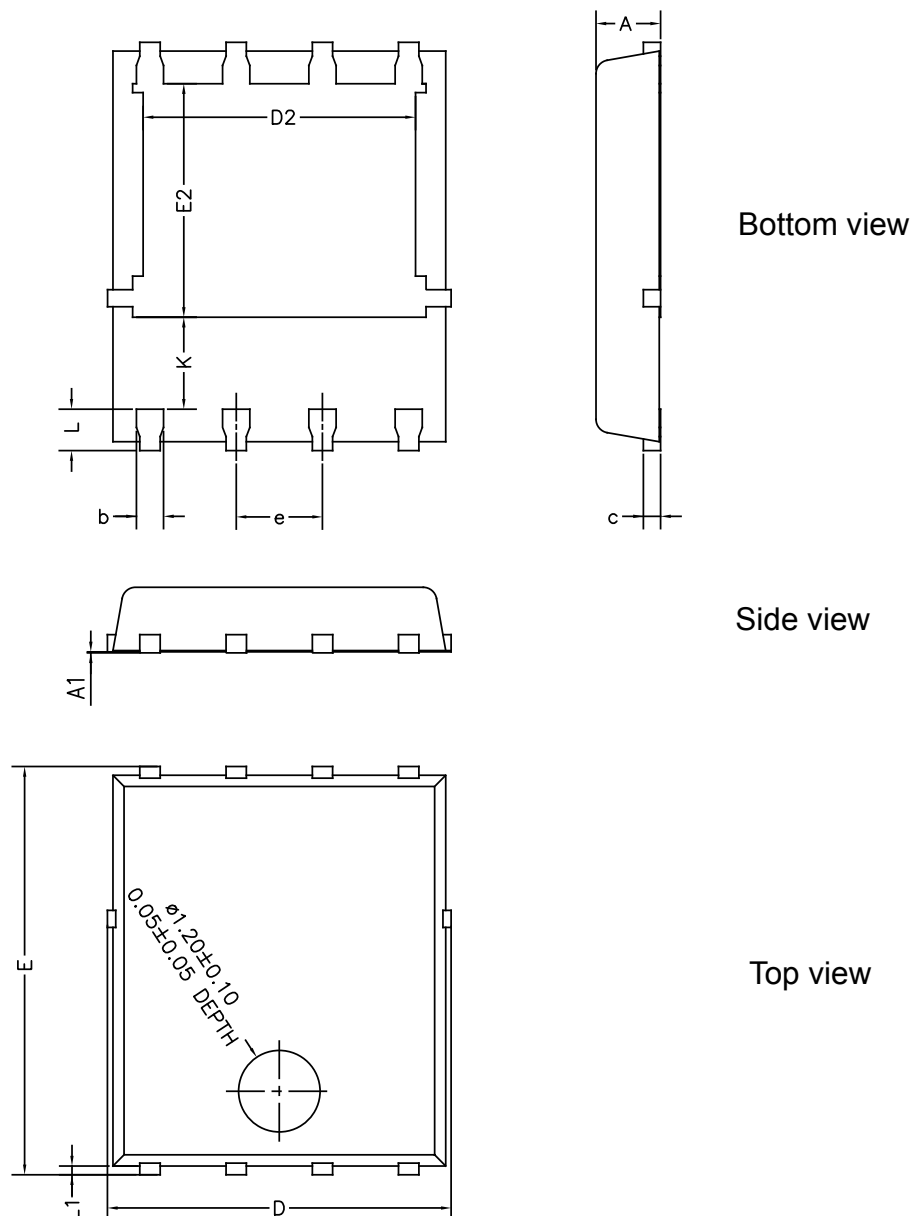
## 2 Package information

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](http://www.st.com). ECOPACK® is an ST trademark.

### 2.1 PowerFLAT™ 5x6 package information

- Epoxy meets UL 94,V0
- Cooling method: by conduction (C)

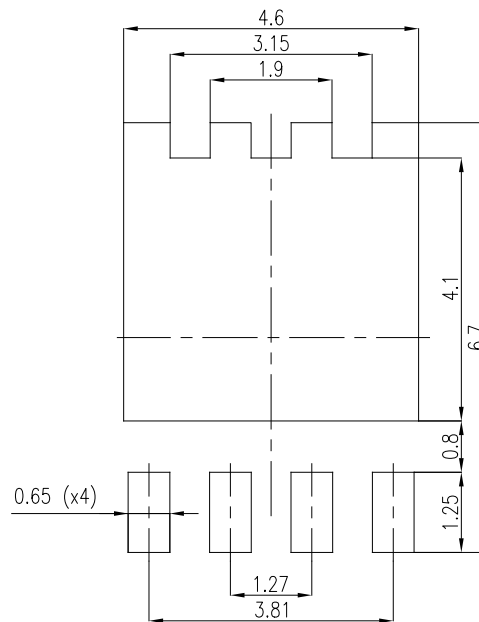
**Figure 8. PowerFLAT™ 5x6 package outline (non-contractual)**



**Table 4. PowerFLAT™ 5x6 mechanical data**

| Ref | Dimensions  |      |       |                             |       |       |
|-----|-------------|------|-------|-----------------------------|-------|-------|
|     | Millimeters |      |       | Inches (for reference only) |       |       |
|     | Min.        | Typ. | Max.  | Min.                        | Typ.  | Max.  |
| A   | 0.80        |      | 1.00  | 0.031                       |       | 0.039 |
| A1  | 0.00        |      | 0.05  | 0.000                       |       | 0.002 |
| b   | 0.30        |      | 0.50  | 0.01                        |       | 0.02  |
| c   |             | 0.25 |       |                             | 0.010 |       |
| D   | 4.80        |      | 5.40  | 0.189                       |       | 0.212 |
| D2  | 3.91        |      | 4.45  | 0.154                       |       | 0.175 |
| e   |             | 1.27 |       |                             | 0.050 |       |
| E   | 5.90        |      | 6.35  | 0.232                       |       | 0.250 |
| E2  | 3.34        |      | 3.70  | 0.138                       |       | 0.146 |
| L   | 0.50        |      | 0.80  | 0.020                       |       | 0.031 |
| K   | 1.10        |      | 1.575 | 0.015                       |       | 0.023 |
| L1  | 0.05        | 0.15 | 0.25  | 0.002                       | 0.006 | 0.009 |

**Figure 9. PowerFLAT™ 5x6 recommended footprint (dimensions are in mm)**



### 3 Ordering information

**Table 5. Ordering information**

| Order code      | Marking  | Package        | Weight | Base qty. | Delivery mode |
|-----------------|----------|----------------|--------|-----------|---------------|
| FERD20U50DJF-TR | FD20 U50 | PowerFLAT™ 5x6 | 95 mg  | 3000      | Tape and reel |

## Revision history

**Table 6. Document revision history**

| Date        | Version | Changes   |
|-------------|---------|---|
| 25-Mar-2014 | 1       | Initial release.  |
| 06-Jun-2014 | 2       | Updated RPN   |
| 06-Aug-2015 | 3       | Updated Table 2 and reformatted to current standard.  |
| 09-Nov-2018 | 4       | Updated <a href="#">Section Cover image</a> and <a href="#">Section 2.1 PowerFLAT™ 5x6 package information</a> . Added <a href="#">Section Applications</a> . |
| 05-Feb-2019 | 5       | Updated <a href="#">Figure 8. PowerFLAT™ 5x6 package outline (non-contractual)</a> and <a href="#">Table 4. PowerFLAT™ 5x6 mechanical data</a> .              |



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