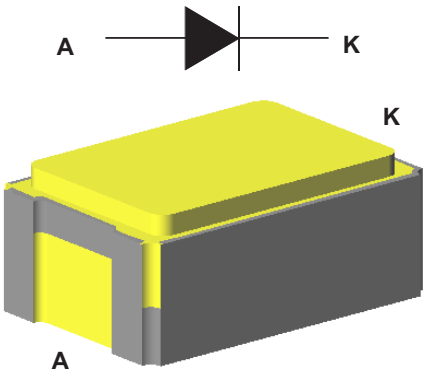
# 1N5811U

## Aerospace 6 A fast recovery rectifier

**Datasheet - production data**




**Leadless chip carrier 2 (LCC2B)**

## Description

This power ultrafast recovery rectifier is designed and packaged to comply with the ESCC5000 specification for aerospace products. It is housed in a surface mount hermetically sealed LCC2B package whose footprint is 100% compatible with industry standard solutions in D5B.

The 1N5811U is suitable for switching mode power supplies and high frequency DC to DC converters such as low voltage high frequency inverter, free wheeling or polarity protection.

## Features

- Aerospace applications
- Surface mount hermetic package
- High thermal conductivity materials
- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Low forward voltage drop
- Package mass: 0.18 g
- Target radiation qualification
  - 150 krad (Si) low dose rate
  - 3 Mrad (Si) high dose rate
- ESCC qualified

**Table 1. Device summary(1)**

| Order code | ESCC detailed specification | Quality level | Lead finish | EPPL | $I_{F(AV)}$ | $V_{RRM}$ | $T_{j(max)}$ | $VF_{(max)}$ |
|---|---|---|---|---|---|---|---|---|
| 1N5811UB1 | | Engineering model | Gold | | 6 | 150 | 175 | 0.95 |
| 1N5811U01B | 5101/013/11 | ESCC | Gold | yes | | | | |
| 1N5811U02B | 5101/013/12 | ESCC | Solder dip | yes | | | | |

1. Contact ST sales office for information about the specific conditions for products in die form.

# 1 Characteristics

**Table 2. Absolute ratings (limiting values)**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive peak reverse voltage | | 150 | V |
| $I_{F(RMS)}$ | Forward rms current | | 10 | A |
| $I_{F(AV)}$ | Average forward rectified current | $T_c \geq 136$ °C, $\delta = 0.5$ | 6 | A |
| $I_{FSM}$ | Forward surge current | $t_p$ = 8.3 ms sinusoidal | 105 | A |
| | | $t_p$ = 10 ms sinusoidal | 100 | |
| $T_{stg}$ | Storage temperature range | | -65 to + 175 | °C |
| $T_j$ | Maximum operating junction temperature | | 175 | °C |
| $T_{sol}$ | Maximum soldering temperature (1) | | 245 | °C |

1. Maximum duration 5 s. The same package must not be re-soldered until 3 minutes have elapsed.

**Table 3. Thermal resistance**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{th\ (j\text{-}c)}$ (1) | Junction to case | 6.5 | °C/W |

1. Package mounted on infinite heatsink

**Table 4. Static electrical characteristics**

| Symbol | Parameter | Tests conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $I_R$ (1) | Reverse current | $T_j$ = 25 °C | $V_R$ = 150 V | - | - | 2 | µA |
| | | $T_j$ = 125 °C | | - | - | 30 | |
| | | $T_j$ = 25 °C | $V_R$ = 160 V | - | - | 10 | |
| | | $T_j$ = -65 °C | | - | - | 10 | |
| $V_F$ (2) | Forward voltage | $T_j$ = 25 °C | $I_F$ = 3 A | - | - | 865 | mV |
| | | $T_j$ = 25 °C | $I_F$ = 4 A | - | - | 900 | |
| | | $T_j$ = 125 °C | | - | - | 800 | |
| | | $T_j$ = -65 °C | | - | - | 1075 | |
| | | $T_j$ = 25 °C | $I_F$ = 6 A | - | - | 955 | |

1. Pulse test: $t_p$ = 5 ms, $\delta$ < 2%
2. Pulse test: $t_p$ = 680 µs, $\delta$ < 2%

To evaluate the conduction losses use the following equation:

$P = 0.68 \times I_{F(AV)} + 0.03 \times I_F{}^2{}_{(RMS)}$

**Table 5. Dynamic characteristics**

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{RR}$ | Reverse recovery time | $I_F = I_R = 0.5$ A, $I_{rr} = 0.1$ A, dI/dt = -100 A/µs (min.) | - | - | 30 | ns |
| | | $I_F = 1$ A, $V_R = 30$ V, dI/dt = -50 A/µs, | - | - | 35 | |
| $V_{FP}$ | Forward recovery voltage | $I_{FM} = 500$ mA | - | - | 2.2 | V |
| $t_{FR}$ | Forward recovery time | $I_{FM} = 500$ mA, $V_{RF} = 1.1 \times V_F$ | - | - | 15 | ns |
| $C_j$ | Diode capacitance | $V_R = 10$ V, F = 1 MHz | - | - | 60 | pF |

**Figure 1. Forward voltage drop versus forward current (typical values)**

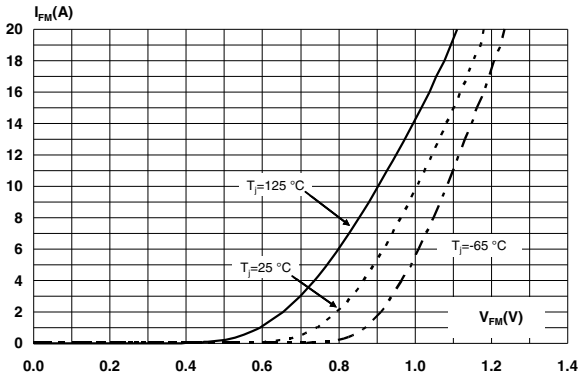



**Figure 2. Forward voltage drop versus forward current (maximum values)**

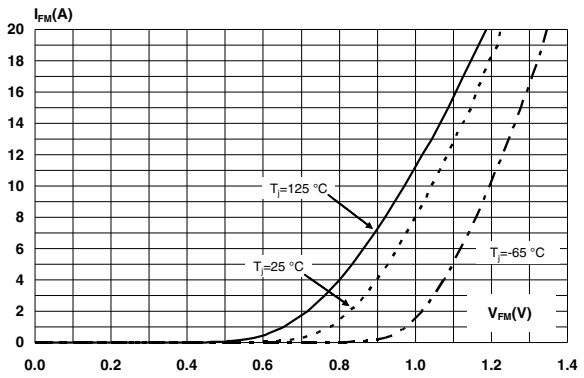



**Figure 3. Reverse leakage current versus reverse voltage applied (typical values)**

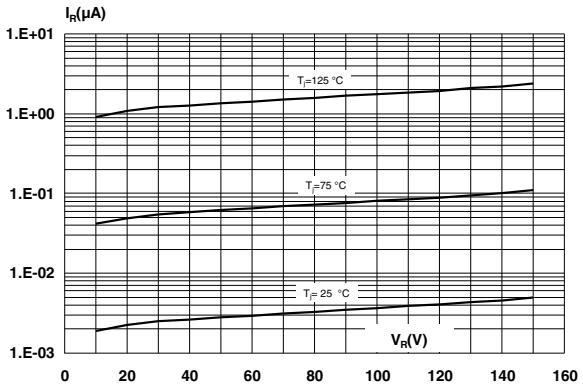



**Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration**

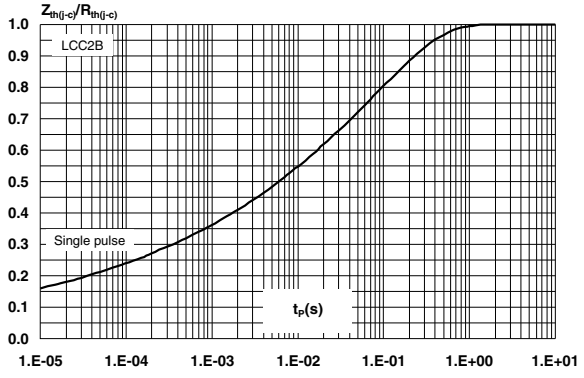


**Figure 5. Reverse recovery time versus $dI_F/dt$**

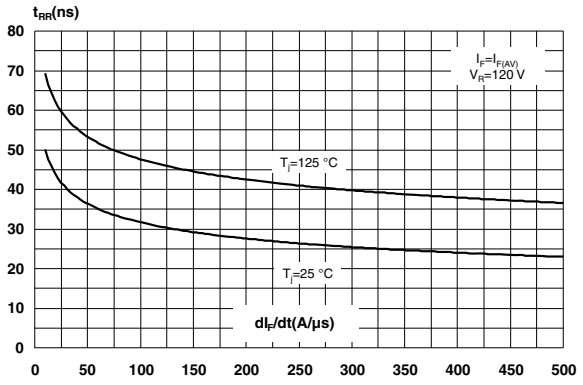
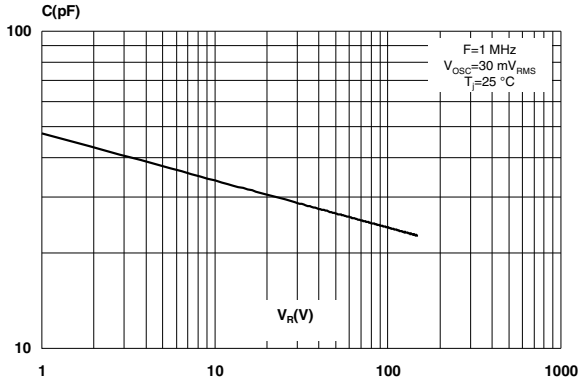



**Figure 6. Junction capacitance versus reverse voltage applied (typical values)**

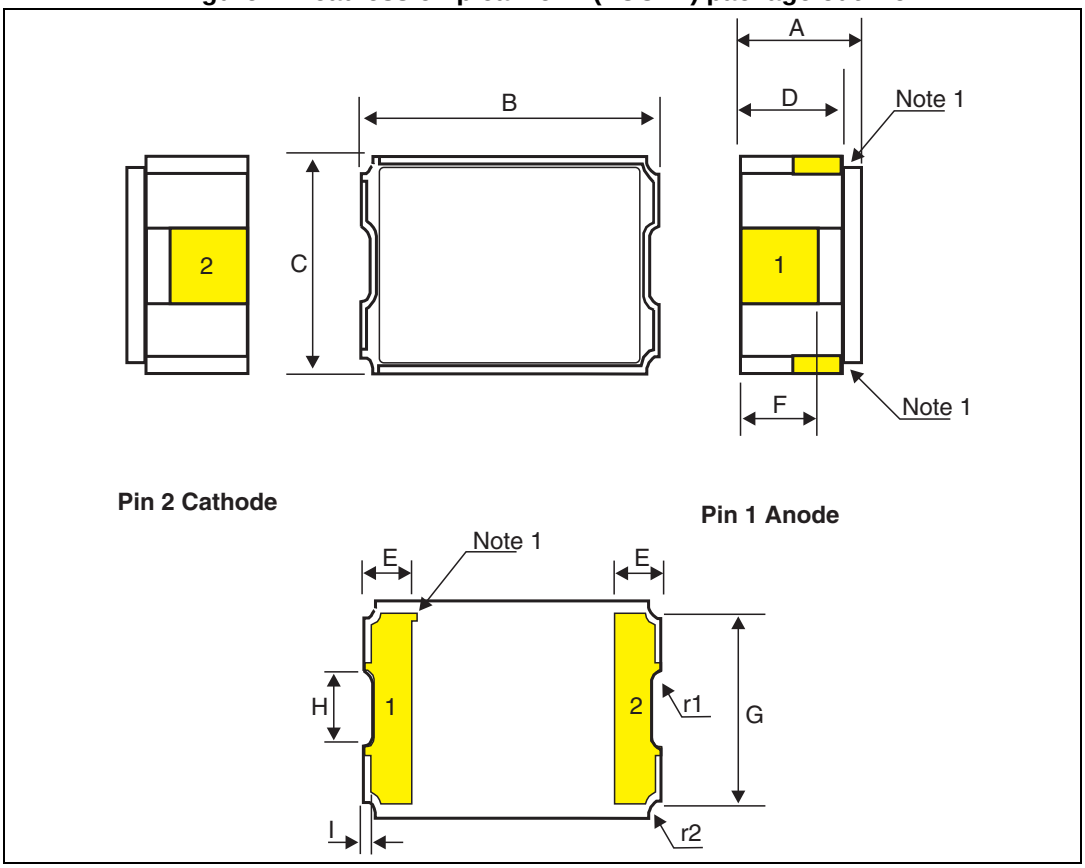


# 2 Package information

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*. ECOPACK® is an ST trademark.

## 2.1 Leadless chip carrier 2 (LCC2B) package information

**Figure 7. Leadless chip carrier 2 (LCC2B) package outline**




1. The anode is identified by metalization in two top internal angles and the index mark.

**Table 6. Leadless chip carrier 2 (LCC2B) package mechanical data**

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A(1) | 2.04 | 2.23 | 2.42 | 0.080 | 0.088 | 0.095 |
| B | 5.27 | 5.4 | 5.6 | 0.207 | 0.213 | 0.220 |
| C | 3.49 | 3.62 | 3.76 | 0.137 | 0.143 | 0.148 |
| D | 1.71 | 1.90 | 2.09 | 0.067 | 0.075 | 0.082 |
| E | 0.48 | - | 0.71 | 0.019 | - | 0.028 |
| F | - | 1.4 | - | - | 0.055 | - |
| G | - | 3.32 | - | - | 0.131 | - |
| H | - | 1.82 | - | - | 0.072 | - |
| I | - | 0.15 | - | - | 0.006 | - |
| r1 | - | 0.15 | - | - | 0.006 | - |
| r2 | - | 0.20 | - | - | 0.008 | - |

1. Measurement prior to solder coating the mounting pads on bottom of package

# 3 Ordering information

**Table 7. Ordering information(1)**

| Order code | ESCC detailed specification | Package | Lead finish | Marking(2) | EPPL | Mass | Packing |
|---|---|---|---|---|---|---|---|
| 1N5811UB1 | - | LCC2B | Gold | 1N5811UB1 | - | 0.18 g | Waffle pack |
| 1N5811U01B | 5101/013/11 | | Gold | 510101311 | Y | | |
| 1N5811U02B | 5101/013/12 | | Solder dip | 510101312 | Y | | |

1. Contact ST sales office for information about the specific conditions for products in die form.
2. Specific marking only. The full marking includes in addition:

For the engineering models: ST logo, date code, country of origin (FR).

For ESCC flight parts: ST logo, date code, country of origin (FR), ESA logo, serial number of the part within the assembly lot.

# 4 Other information

## 4.1 Date code

Date code is structured as describe below:

- EM xyywwz
- ESCC flight yywwz

Where:

- x (EM only): 3, assembly location Rennes (France)
- yy: last two digits year
- ww: week digits
- z: lot index in the week

## 4.2 Documentation

In *Table 8* is a summary of the documentation provided with each type of products.

**Table 8. Documentation provided with each type of products**

| Quality level | Documentation |
|---|---|
| Engineering model | |
| ESCC flight | Certificate of conformance |

# 5 Revision history

Table 9. Document revision history

| Date | Revision | Changes |
|---|---|---|
| 27-Jul-2009 | 1 | First issue. |
| 25-Mar-2010 | 2 | Updated ESCC status in Features and added footnote to Table 3. |
| 8-Nov-2013 | 3 | Updated Table 1, Table 5 and Table 7 and inserted Other information. |
| 04-Dec-2015 | 4 | Updated *Table 7* and reformatted to current standard. |