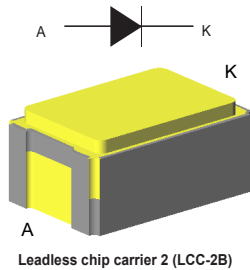


Aerospace 40 V, 3 A Schottky diode in LCC-2B package



Features

- Low forward voltage drop: $V_F = 0.485\text{ V}$ at 3 A and $+25\text{ °C}$
- Very small conduction losses
- Ultrafast switchings with negligible losses
- High thermal conductivity materials
- Surface mount hermetic package
- Radiation performance
 - 150 krad (Si) low dose rate
 - 3 Mrad (Si) high dose rate
- ESCC qualified: detail specification 5106/020

Product status link

[1N5822U](#)

Product summary

| | |
|--------------------|---------|
| $I_{F(AV)}$ | 3 A |
| V_{RRM} | 40 V |
| $V_F(\text{max.})$ | 0.485 V |
| $T_J(\text{max.})$ | 150 °C |

Applications

- Satellite and spacecraft power systems
- Switch mode power supply
- 5 V flyback or forward converter output rectification
- DC motor chopper free wheeling diode
- Reverse polarity protection
- Redundancy OR-Ing diode

Description

The 1N5822U Schottky diode is ESCC qualified. It is housed in a surface mount hermetically sealed ceramic LCC-2B package whose footprint is fully compatible with industry standard as D5B.

Its full planar technology allows superior performances and high reliability up to 150 °C junction temperature.

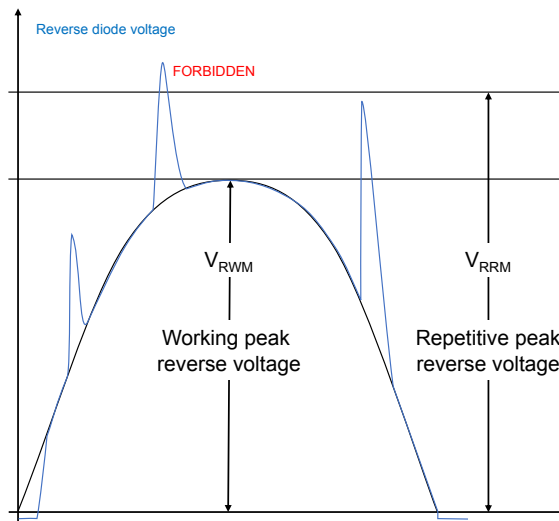
This diode is ESCC qualified, which makes it eligible for use in space programs. It is typically used in switching mode power supplies, high frequency DC-to-DC converters or low voltage step-down chopper drive to perform secondary rectification, redundancy OR-Ing, free wheeling diode or reverse polarity protection.

1 Characteristics

Table 1. Absolute ratings (limiting values)

| Symbol | Parameter | Value | Unit |
|-----------------|--------------------------------------------------------------|----------------------------------------------------|------------------|
| V_{RRM} | Repetitive peak reverse voltage | 40 | V |
| $V_{RWM}^{(1)}$ | Peak working reverse voltage | 40 | V |
| $I_{F(RMS)}$ | RMS forward current | 10 | A |
| $I_{F(AV)}$ | Average forward current | $T_C \geq 139\text{ }^\circ\text{C}, \delta = 0.5$ | A |
| I_{FSM} | Non repetitive surge forward current | $t_p = 10\text{ ms sinusoidal}$ | A |
| T_{stg} | Storage temperature range | -65 to +150 | $^\circ\text{C}$ |
| T_j | Maximum operating junction temperature ⁽²⁾ | 150 | $^\circ\text{C}$ |
| T_{sol} | Maximum soldering temperature ⁽³⁾ | 245 | $^\circ\text{C}$ |
| ESD | Electro static discharge, air discharge, HBM model, class 3B | 8 | kV |

1. See Figure 1.
2. $(dP_{tot}/dT_j) < (1/R_{th(j-a)})$ condition to avoid thermal runaway for a diode on its own heatsink.
3. Maximum duration 5 s. The same package cannot be re-soldered until 3 minutes have elapsed after initial soldering.

Figure 1. V_{RRM} and V_{RWM} definition with their waveform

Table 2. Thermal parameters

| Symbol | Parameter | Max. value | Unit |
|---------------|------------------|------------|--------------------|
| $R_{th(j-c)}$ | Junction to case | 7 | $^\circ\text{C/W}$ |

For more information, please refer to the application note:

- [AN5088: Rectifiers thermal management, handling and mounting recommendation](#)

Table 3. Static electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|-------------|-------------------------|-----------------------|----------------------|------|------|-------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = -55\text{ °C}$ | $V_R = 40\text{ V}$ | - | - | 40 | μA |
| | | $T_j = 25\text{ °C}$ | | - | - | 80 | |
| | | $T_j = 100\text{ °C}$ | | - | - | 12 | mA |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25\text{ °C}$ | $I_F = 1\text{ A}$ | - | - | 0.4 | V |
| | | $T_j = -55\text{ °C}$ | $I_F = 3\text{ A}$ | - | - | 0.56 | |
| | | $T_j = 25\text{ °C}$ | | - | - | 0.485 | |
| | | $T_j = 100\text{ °C}$ | | - | - | 0.455 | |
| | | $T_j = 25\text{ °C}$ | $I_F = 9.4\text{ A}$ | - | - | 0.70 | |

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

2. Pulse test: $t_p = 680\text{ }\mu\text{s}$, $\delta < 2\%$

To evaluate the conduction losses, use the following equation:

$$P = 0.32 \times I_{F(AV)} + 0.050 \times I_F^2 (RMS)$$

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

Table 4. Dynamic characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------|-------------------------|-----------------------------------------|------|------|------|-------------|
| C_j | Total diode capacitance | $V_R = 5\text{ V}$, $F = 1\text{ MHz}$ | | | 240 | pF |

1.1 Characteristics (curves)

Figure 2. Average forward power dissipation versus average forward current

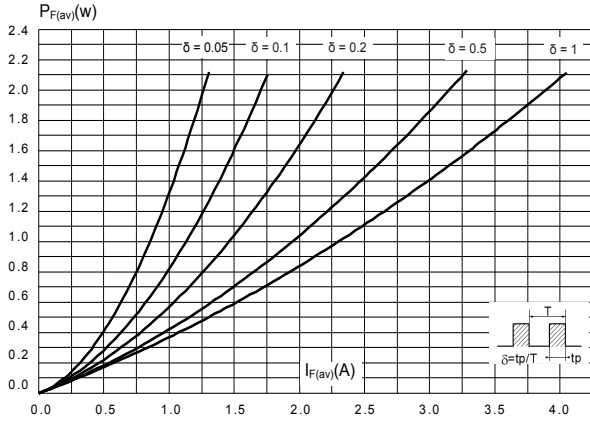


Figure 3. Average forward current versus ambient temperature ($\delta = 0.5$)

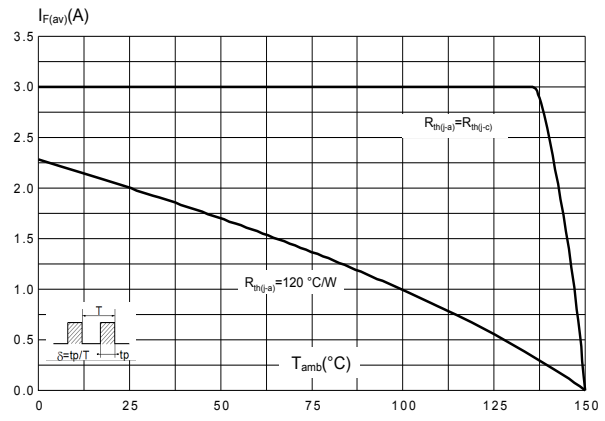


Figure 4. Non repetitive surge peak forward current versus total pulse burst duration (maximum values)

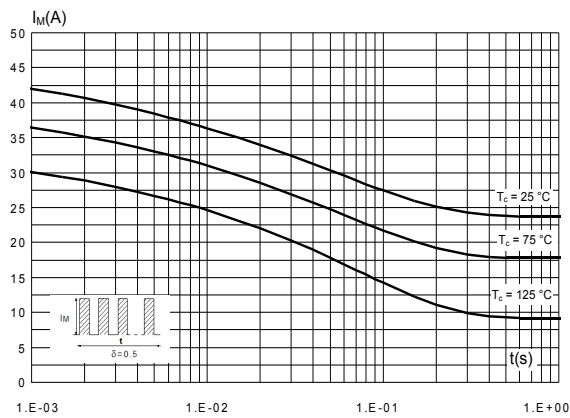


Figure 5. Relative variation of thermal impedance junction to case versus single square pulse duration

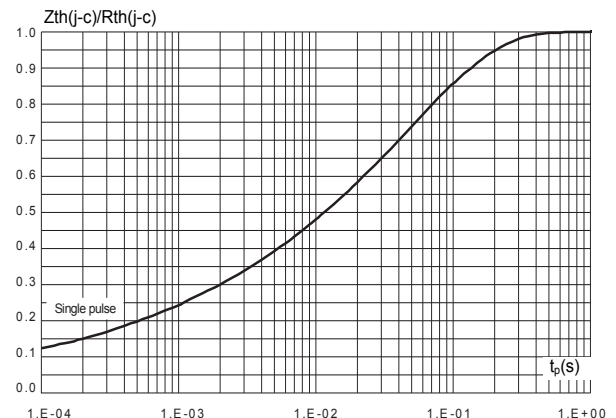


Figure 6. Reverse leakage current versus reverse voltage applied (typical values)

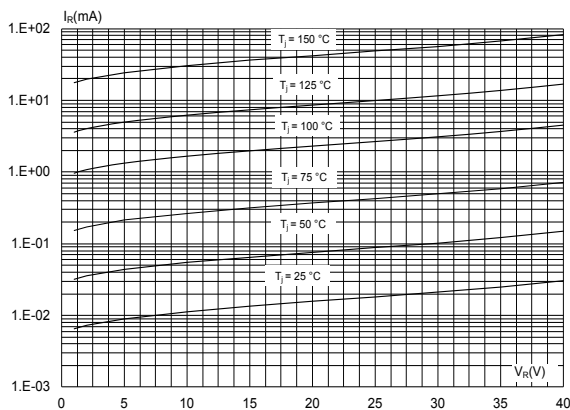


Figure 7. Forward voltage drop versus forward current (typical values)

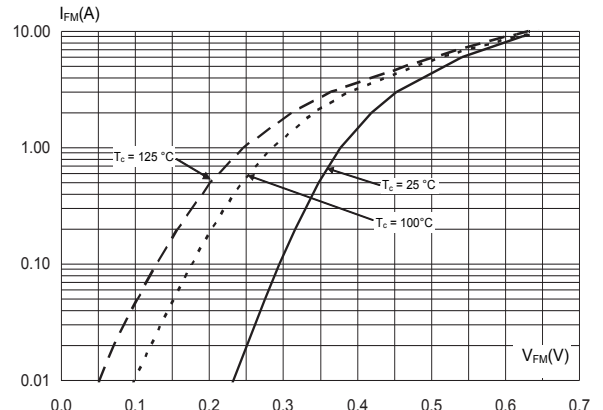
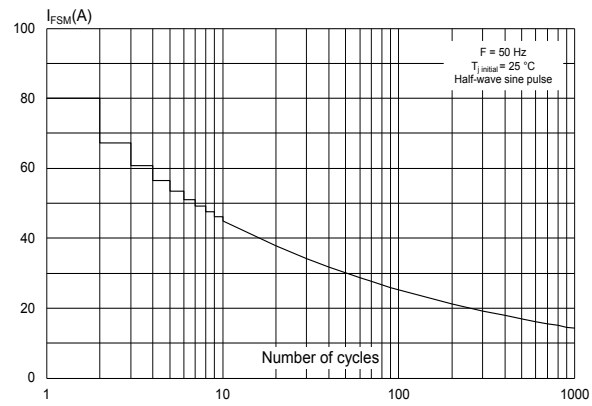


Figure 8. Non repetitive surge peak forward current versus number of cycles



2 Radiation

The technology of the STMicroelectronics Rad-Hard rectifier's diodes is intrinsically highly resistant to radiative environments. For further information refer the ECSS-Q-ST-60-15C1 radiation hardness assurance standard.

The product radiation hardness assurance is supported by a total ionisation dose (TID) characterization at high dose and low dose rates.

2.1 Total ionisation dose

A characterization at both high and low dose rates (HDR and LDR) is done on two sets of 15 samples housed in LCC-2B, 5 reverse biased, 5 forward biased and 5 unbiased.

The irradiation is done according to the ESCC 22900 specification, at 620krad/h for the high dose rate HDR test and at 0.220 krad/h for the low rate LDR test.

Both pre-irradiation and post-irradiation performances are tested using the same circuitry and the same test conditions for a direct comparison ($T_{amb} = 22 \pm 3 \text{ }^\circ\text{C}$ unless otherwise specified).

The following parameters are measured:

- Before irradiation
- After irradiation (target 3 Mrad (Si) HDR or 150 krad(Si) LDR)
- After 24 hours at room temperature
- After 168 hours of annealing at 100 °C

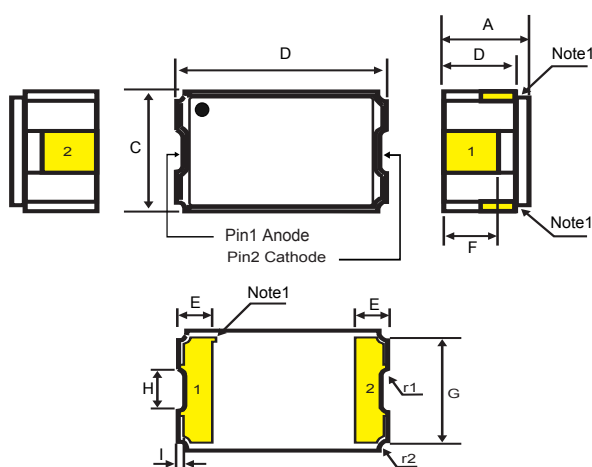
3 Package information

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.

3.1 LCC-2B package information

The LCC-2B package is available with two lead tinning versions : Gold plated or SnPb 63/37 solder dip leads. Its metallic lid is electrically floating and not connected to any pin. Connecting it to ground doesn't affect the electrical characteristics.

Figure 9. LCC-2B package outline



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

Table 5. LCC-2B package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|------|------|-----------------------------|-------|-------|
| | Millimeters | | | Inches (for reference only) | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.04 | 2.23 | 2.42 | 0.080 | 0.088 | 0.095 |
| B | 5.27 | 5.40 | 5.60 | 0.207 | 0.213 | 0.220 |
| C | 3.49 | 3.62 | 3.76 | 0.137 | 0.143 | 0.150 |
| 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 | |

Dimension data specified for the gold plated version and the solder dip version before tinning.

4 Ordering information

Table 6. Ordering information

| Order code | ESCC detail specification | Quality level | Package | Lead finishing | Product marking | Mass | Base qty. | Packing |
|------------|---------------------------|-------------------|---------|----------------|-----------------|--------|-----------|-------------|
| 1N5822UB1 | - | Engineering model | LCC-2B | Gold | 1N5822UB1 | 180 mg | 50 | Waffle pack |
| 1N5822U01B | 5106/020/01 | Flight model | | Gold | 510602001 | | | |
| 1N5822U02B | 5106/020/02 | Flight model | | Solder dip | 510602002 | | | |

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

5 Other information

5.1 Product marking description

Here below is described the marking of the package of both the engineering and flight models.

Figure 10. ESCC flight model marking outline

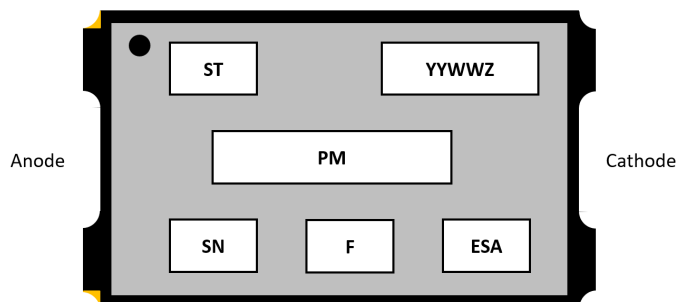


Table 7. ESCC flight model marking

| Field | Description |
|-------|----------------------------------------------------|
| ST | ST logo |
| YYWWZ | Date code and lot index in the week ⁽¹⁾ |
| PM | Product marking |
| SN | Serialization number |
| F | Country of origin |
| ESA | ESA logo |

1. YY = two-digit year, WW = two-digit week, Z = lot week index.

Figure 11. Engineering model marking outline

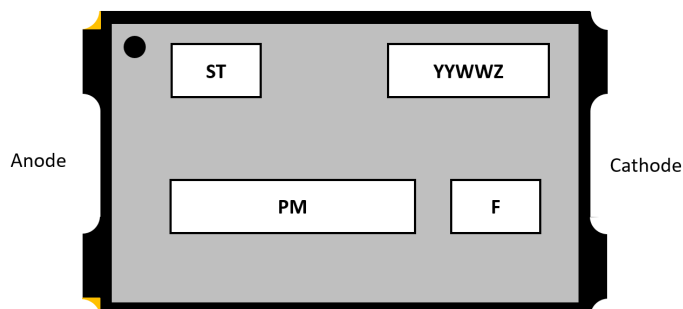


Table 8. Engineering model marking

| Field | Description |
|-------|----------------------------------------------------|
| ST | ST logo |
| YYWWZ | Date code and lot index in the week ⁽¹⁾ |
| PM | Product marking |
| F | Country of origin |

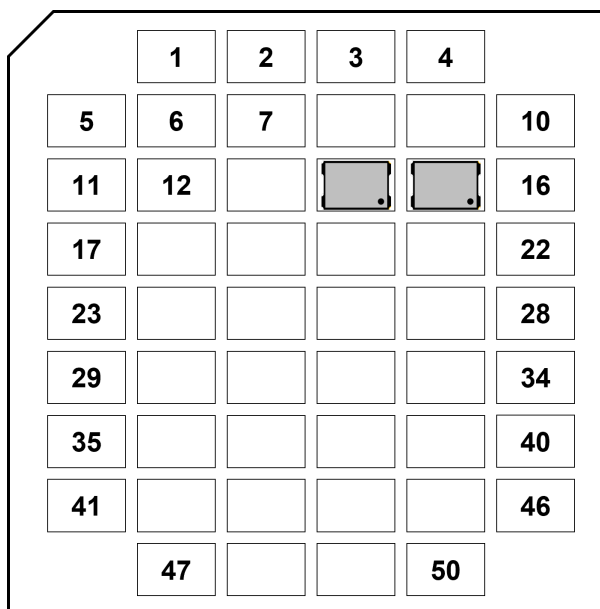
1. YY = two-digit year, WW = two-digit week, Z = lot week index.

5.2 Packing information

The 1N5822U versions are delivered in a 50-position, 50 x 50 mm² waffle pack consecutively populated from position 1.

The Figure 12 shows how to identify position 1, the orientation of the product in the waffle pack.

Figure 12. 1N5822 waffle pack outline



The diode anode is on the right pin of the device, and the anode identification dot is orientated at the opposite of the waffle pack truncated corner.

5.3 Documentation

In the Table 9 is a summary of the documentation provided with each type of products.

Table 9. Documentation provided for each type of product

| Quality level | Documentation |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Engineering model | Certificate of conformance including : <ul style="list-style-type: none"> • Customer name • Customer purchase order number • ST sales order number and item • ST commercial product code • Quantity delivered • Date code • Reference data sheet • Reference to TN1181 on engineering models • ST Rennes assembly lot ID |
| Flight model | Certificate of conformance including : <ul style="list-style-type: none"> • Customer name • Customer purchase order number • ST sales order number and item • ST commercial product code • Quantity delivered • Date code • Serial numbers • Wafer diffusion plant location and wafer size • Wafer diffusion lot ID number and wafer ID number • Reference of the applicable ESCC qualification maintenance lot • Reference to the ESCC detail specification • ST Rennes assembly lot ID number |

Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10-Aug-2009 | 1 | First issue. |
| 25-Sep-2011 | 2 | Updated ESCC status in Features and added footnote to Table 3. |
| 8-Nov-2013 | 3 | Updated Table 1, Table 2, Table 5 and Table 7 and inserted Other information. |
| 08-Dec-2015 | 4 | Updated Table 7 and reformatted to current standard. |
| 21-Mar-2023 | 5 | Updated <i>features</i> , <i>description</i> , and <i>Section 5 Other information</i> . Added application and <i>Section 5.2 Packing information</i> . Minor text changes. |
| 30-Oct-2023 | 6 | Updated <i>Table 6</i> . Minor text changes. |
| 23-Nov-2023 | 7 | Updated <i>Features</i> . |

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