

## Ultrafast recovery diode

### Main product characteristics

|                |        |
|----------------|--------|
| $I_{F(AV)}$    | 12 A   |
| $V_{RRM}$      | 200 V  |
| $T_j$ (max)    | 175° C |
| $V_F$ (typ)    | 0.82 V |
| $t_{rr}$ (typ) | 18 ns  |

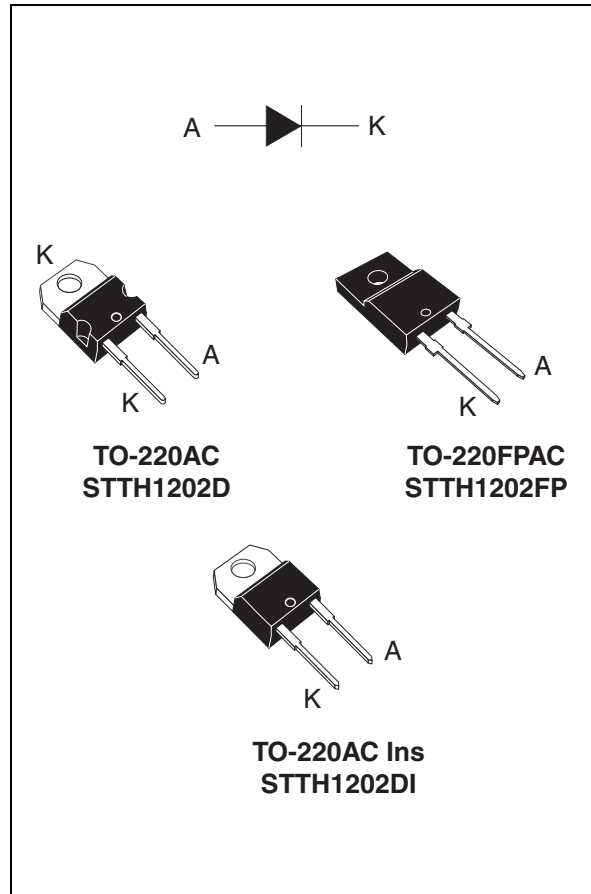
### Features and benefits

- Very low conduction losses
- Negligible switching losses
- Low forward and reverse recovery time
- High junction temperature
- Insulated packages
  - TO-220FPAC  
Electrical insulation 1500 V<sub>RMS</sub>
  - TO-220AC Ins  
Electrical insulation 2500 V<sub>RMS</sub>

### Description

The STTH1202 uses ST's new 200V planar Pt doping technology, and is specially suited for switching mode base drive and transistor circuits.

Packaged in TO-220AC, TO-220FPAC, and TO-220AC Ins, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.



### Order codes

| Part Number | Marking    |
|-------------|------------|
| STTH1202D   | STTH1202   |
| STTH1202FP  | STTH1202   |
| STTH1202DI  | STTH1202DI |

# 1 Characteristics

**Table 1. Absolute ratings (limiting values at  $T_j = 25^\circ\text{C}$ , unless otherwise specified)**

| Symbol              | Parameter                              |                                         |                         | Value        | Unit |
|---------------------|----------------------------------------|-----------------------------------------|-------------------------|--------------|------|
| V <sub>RRM</sub>    | Repetitive peak reverse voltage        |                                         |                         | 200          | V    |
| V <sub>RSM</sub>    | Non repetitive peak reverse voltage    |                                         |                         | 200          |      |
| I <sub>F(RMS)</sub> | RMS forward current                    |                                         |                         | 30           | A    |
| I <sub>F(AV)</sub>  | Average forward current, δ = 0.5       | TO-220AC                                | T <sub>c</sub> = 140° C | 12           | A    |
|                     |                                        | TO-220AC Ins                            | T <sub>c</sub> = 130° C |              |      |
|                     |                                        | TO-220FPAC                              | T <sub>c</sub> = 105° C |              |      |
| I <sub>FRM</sub>    | Repetitive peak forward current        | t <sub>p</sub> = 10 μs F = 5 kHz square |                         | 130          | A    |
| I <sub>FSM</sub>    | Surge non repetitive forward current   | t <sub>p</sub> = 10 ms Sinusoidal       |                         | 100          | A    |
| T <sub>stg</sub>    | Storage temperature range              |                                         |                         | -65 to + 175 | ° C  |
| T <sub>j</sub>      | Maximum operating junction temperature |                                         |                         | 175          | ° C  |

**Table 2. Thermal parameters**

| Symbol        | Parameter        |              |  | Value | Unit               |
|---------------|------------------|--------------|--|-------|--------------------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC     |  | 2.5   | $^\circ\text{C/W}$ |
|               |                  | TO-220AC Ins |  | 3     |                    |
|               |                  | TO-220FPAC   |  | 5     |                    |

**Table 3. Static electrical characteristics**

| Symbol      | Parameter               | Test conditions           |                      | Min. | Typ  | Max. | Unit          |
|-------------|-------------------------|---------------------------|----------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25^\circ\text{C}$  | $V_R = V_{RRM}$      |      |      | 10   | $\mu\text{A}$ |
|             |                         | $T_j = 125^\circ\text{C}$ |                      |      | 10   | 100  |               |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25^\circ\text{C}$  | $I_F = 12\ \text{A}$ |      | 1.0  | 1.10 | V             |
|             |                         | $T_j = 150^\circ\text{C}$ |                      |      | 0.82 | 0.95 |               |
|             |                         | $T_j = 25^\circ\text{C}$  | $I_F = 15\ \text{A}$ |      |      | 1.15 |               |
|             |                         | $T_j = 125^\circ\text{C}$ |                      |      | 0.91 | 1.05 |               |
|             |                         | $T_j = 150^\circ\text{C}$ |                      |      | 0.87 | 1.0  |               |

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

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

To evaluate the conduction losses use the following equation:

$$P = 0.77 \times I_{F(AV)} + 0.015 \times I_{F(RMS)}^2$$

Table 4. Dynamic characteristics

| Symbol   | Parameter                | Test conditions                                                                                                           | Min. | Typ | Max. | Unit |
|----------|--------------------------|---------------------------------------------------------------------------------------------------------------------------|------|-----|------|------|
| $t_{rr}$ | Reverse recovery time    | $I_F = 1\text{ A}$ , $di_F/dt = -50\text{ A}/\mu\text{s}$ ,<br>$V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$             |      | 28  | 35   | ns   |
|          |                          | $I_F = 1\text{ A}$ , $di_F/dt = -100\text{ A}/\mu\text{s}$ ,<br>$V_R = 30\text{ V}$ , $T_j = 25^\circ\text{C}$            |      | 18  | 24   |      |
| $I_{RM}$ | Reverse recovery current | $I_F = 12\text{ A}$ , $di_F/dt = -200\text{ A}/\mu\text{s}$ ,<br>$V_R = 160\text{ V}$ , $T_j = 125^\circ\text{C}$         |      | 5.8 | 7.5  | A    |
| $t_{fr}$ | Forward recovery time    | $I_F = 12\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ ,<br>$V_{FR} = 1.1 \times V_{Fmax}$ , $T_j = 25^\circ\text{C}$ |      | 110 |      | ns   |
| $V_{FP}$ | Forward recovery voltage | $I_F = 12\text{ A}$ , $di_F/dt = 100\text{ A}/\mu\text{s}$ ,<br>$T_j = 25^\circ\text{C}$                                  |      | 2   |      | V    |

Figure 1. Peak current versus duty cycle

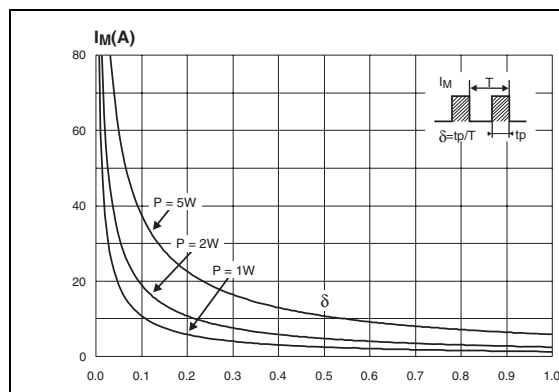


Figure 3. Relative variation of thermal impedance, junction to case, versus pulse duration (TO-220AC, TO-220AC Ins)

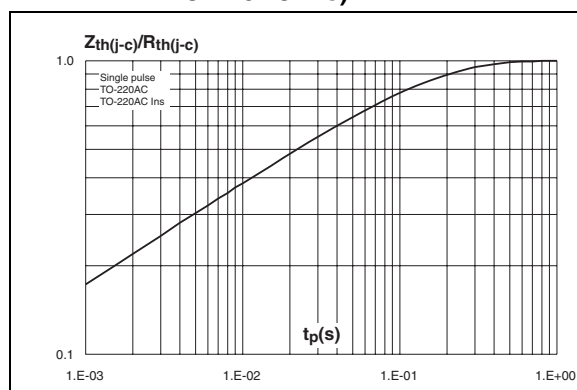


Figure 2. Forward voltage drop versus forward current (typical values)

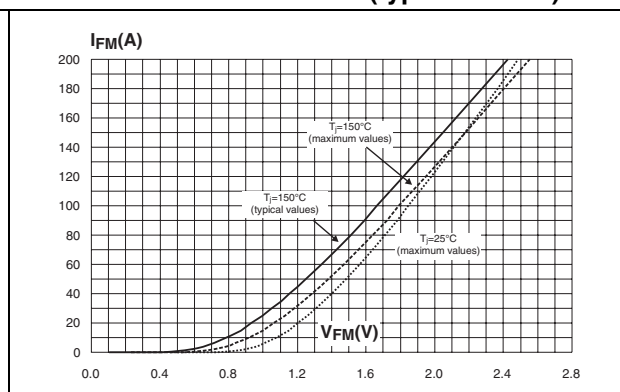
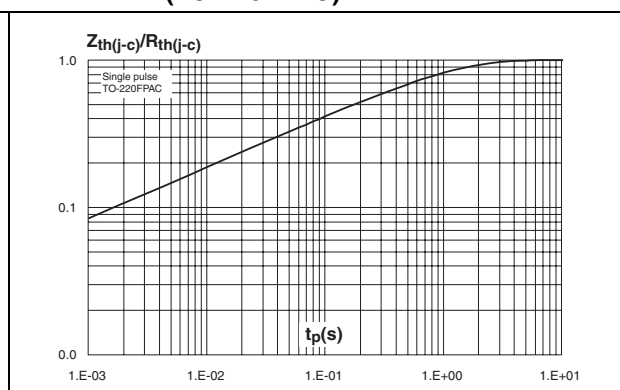
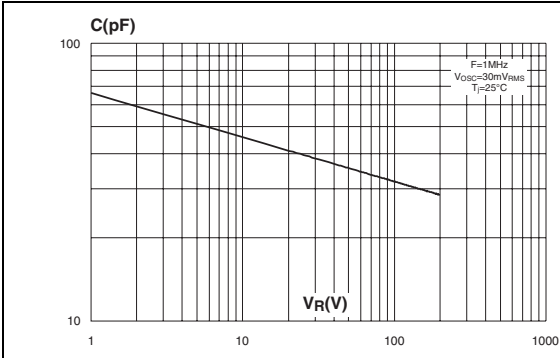


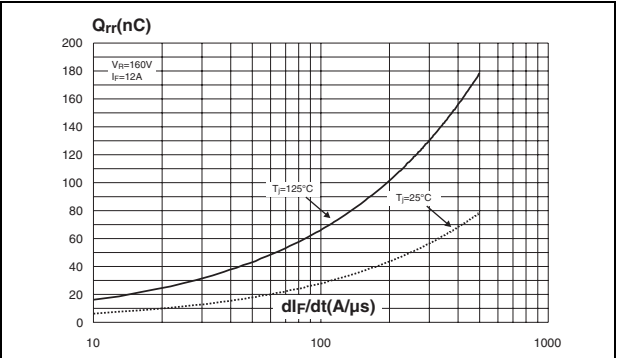
Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration (TO-220FPAC)



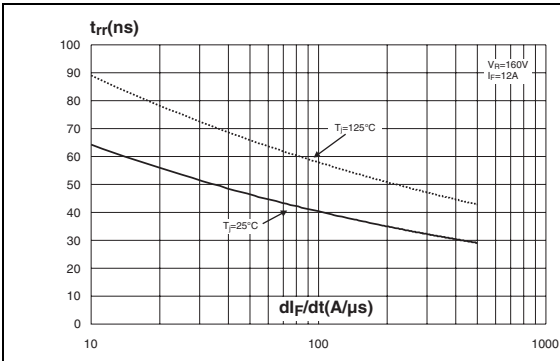
**Figure 5. Junction capacitance versus reverse applied voltage (typical values)**



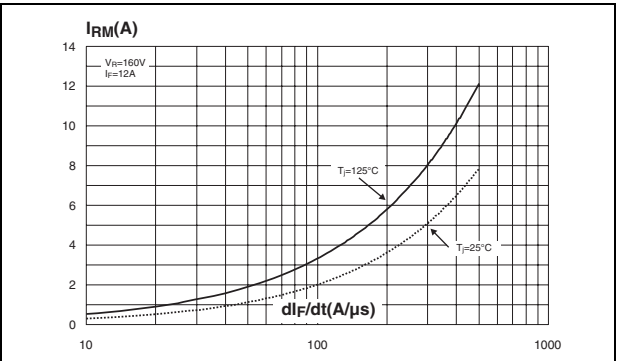
**Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)**



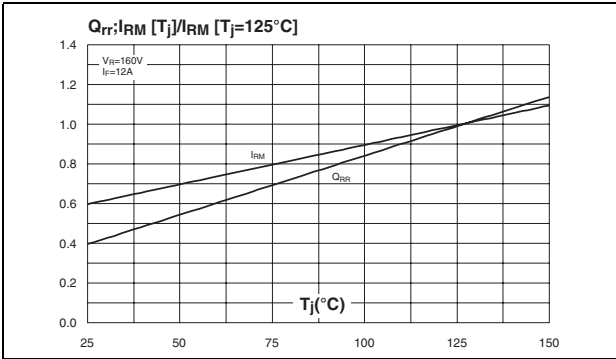
**Figure 7. Reverse recovery time versus  $di_F/dt$  (typical values)**



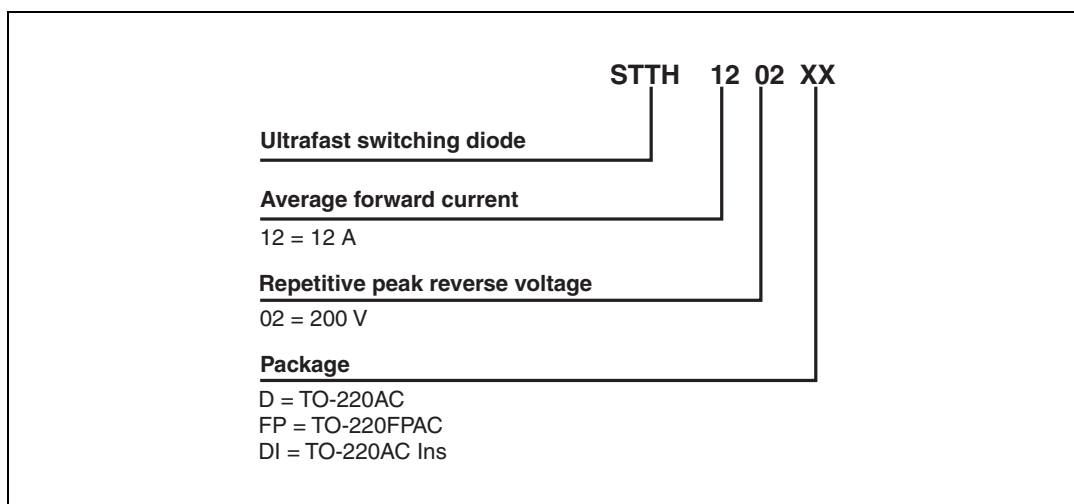
**Figure 8. Peak reverse recovery current versus  $di_F/dt$  (typical values)**



**Figure 9. Dynamic parameters versus junction temperature**



## 2 Ordering information scheme



### 3 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 Nm
- Maximum torque value: 0.7 Nm

Table 5. T0-220AC dimensions

| REF.    | DIMENSIONS  |       |            |       |
|---------|-------------|-------|------------|-------|
|         | Millimeters |       | Inches     |       |
|         | Min.        | Max.  | Min.       | Max.  |
| A       | 4.40        | 4.60  | 0.173      | 0.181 |
| C       | 1.23        | 1.32  | 0.048      | 0.051 |
| D       | 2.40        | 2.72  | 0.094      | 0.107 |
| E       | 0.49        | 0.70  | 0.019      | 0.027 |
| F       | 0.61        | 0.88  | 0.024      | 0.034 |
| F1      | 1.14        | 1.70  | 0.044      | 0.066 |
| G       | 4.95        | 5.15  | 0.194      | 0.202 |
| H2      | 10.00       | 10.40 | 0.393      | 0.409 |
| L2      | 16.40 typ.  |       | 0.645 typ. |       |
| L4      | 13.00       | 14.00 | 0.511      | 0.551 |
| L5      | 2.65        | 2.95  | 0.104      | 0.116 |
| L6      | 15.25       | 15.75 | 0.600      | 0.620 |
| L7      | 6.20        | 6.60  | 0.244      | 0.259 |
| L9      | 3.50        | 3.93  | 0.137      | 0.154 |
| M       | 2.6 typ.    |       | 0.102 typ. |       |
| Diam. I | 3.75        | 3.85  | 0.147      | 0.151 |

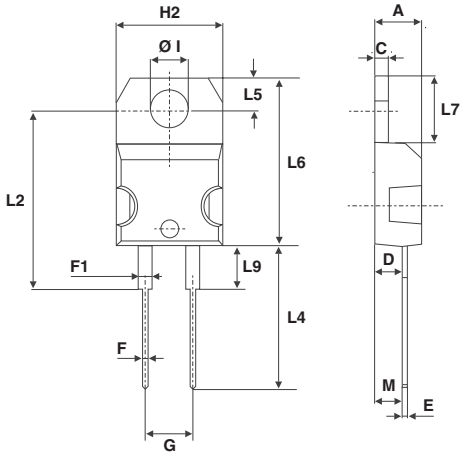


Table 6. T0-220FPAC dimensions

| REF  | DIMENSIONS  |      |           |       |
|------|-------------|------|-----------|-------|
|      | Millimeters |      | Inches    |       |
|      | Min.        | Max. | Min.      | Max.  |
| A    | 4.4         | 4.6  | 0.173     | 0.181 |
| B    | 2.5         | 2.7  | 0.098     | 0.106 |
| D    | 2.5         | 2.75 | 0.098     | 0.108 |
| E    | 0.45        | 0.70 | 0.018     | 0.027 |
| F    | 0.75        | 1    | 0.030     | 0.039 |
| F1   | 1.15        | 1.70 | 0.045     | 0.067 |
| G    | 4.95        | 5.20 | 0.195     | 0.205 |
| G1   | 2.4         | 2.7  | 0.094     | 0.106 |
| H    | 10          | 10.4 | 0.393     | 0.409 |
| L2   | 16 Typ.     |      | 0.63 Typ. |       |
| L3   | 28.6        | 30.6 | 1.126     | 1.205 |
| L4   | 9.8         | 10.6 | 0.386     | 0.417 |
| L5   | 2.9         | 3.6  | 0.114     | 0.142 |
| L6   | 15.9        | 16.4 | 0.626     | 0.646 |
| L7   | 9.00        | 9.30 | 0.354     | 0.366 |
| Dia. | 3.00        | 3.20 | 0.118     | 0.126 |

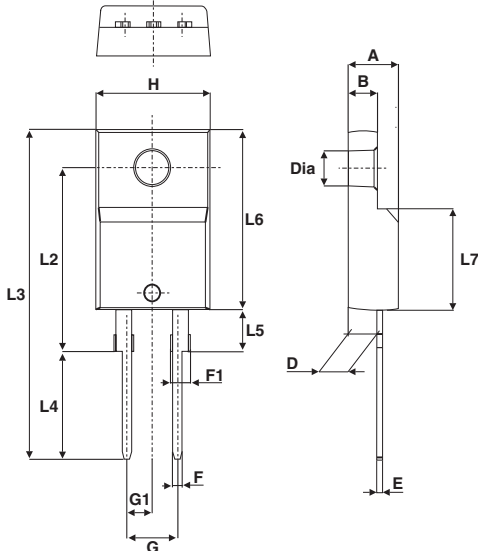


Table 7. TO-220AC Ins. dimensions

| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| A    | 15.20       |       | 15.90 | 0.598  |       | 0.625 |
| a1   |             | 3.75  |       |        | 0.147 |       |
| a2   | 13.00       |       | 14.00 | 0.511  |       | 0.551 |
| B    | 10.00       |       | 10.40 | 0.393  |       | 0.409 |
| b1   | 0.61        |       | 0.88  | 0.024  |       | 0.034 |
| b2   | 1.23        |       | 1.32  | 0.048  |       | 0.051 |
| C    | 4.40        |       | 4.60  | 0.173  |       | 0.181 |
| c1   | 0.49        |       | 0.70  | 0.019  |       | 0.027 |
| c2   | 2.40        |       | 2.72  | 0.094  |       | 0.107 |
| e    | 4.80        |       | 5.40  | 0.189  |       | 0.212 |
| F    | 6.20        |       | 6.60  | 0.244  |       | 0.259 |
| ØI   | 3.75        |       | 3.85  | 0.147  |       | 0.151 |
| l4   | 15.80       | 16.40 | 16.80 | 0.622  | 0.646 | 0.661 |
| L    | 2.65        |       | 2.95  | 0.104  |       | 0.116 |
| l2   | 1.14        |       | 1.70  | 0.044  |       | 0.066 |
| M    |             | 2.60  |       |        | 0.102 |       |

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com).

## 4 Ordering information

| Part Number | Marking    | Package      | Weight | Base qty | Delivery mode |
|-------------|------------|--------------|--------|----------|---------------|
| STTH1202D   | STTH1202   | TO-220AC     | 1.86 g | 50       | Tube          |
| STTH1202FP  | STTH1202   | TO-220FPAC   | 1.64 g | 50       | Tube          |
| STTH1202DI  | STTH1202DI | TO-220AC Ins | 2.3 g  | 50       | Tube          |

## 5 Revision history

| Date        | Revision | Description of Changes |
|-------------|----------|------------------------|
| 01-Mar-2007 | 1        | First issue.           |

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