

Ultrafast recovery diode

Main product characteristics

| | |
|----------------------|--------|
| $I_{F(AV)}$ | 15 A |
| V_{RRM} | 200 V |
| $T_j(\text{max})$ | 175° C |
| $V_F(\text{typ})$ | 0.85 V |
| $t_{rr}(\text{typ})$ | 20 ns |

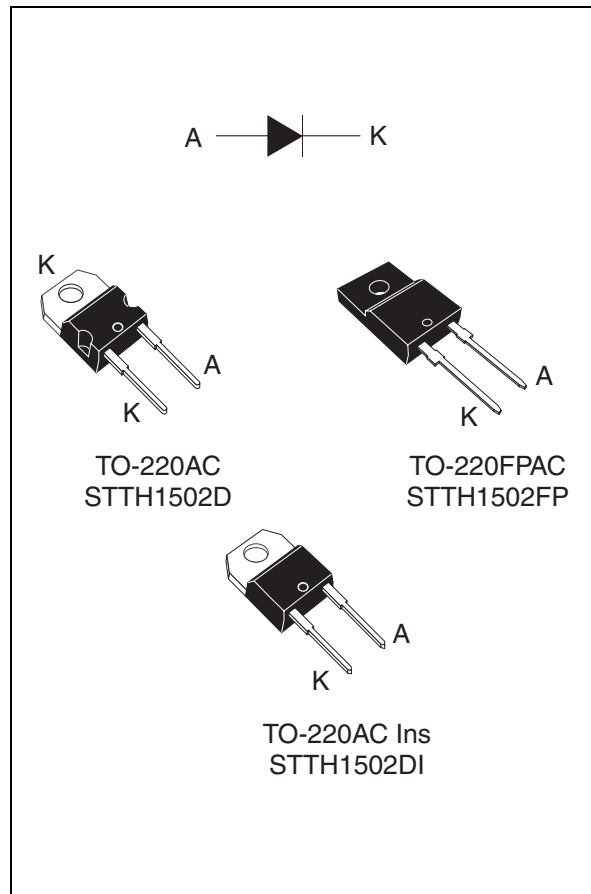
Features and benefits

- Very low conduction losses
- Negligible switching losses
- Low forward and reverse recovery time
- High junction temperature
- Insulated packages
 - TO-220FPAC
Electrical insulation 2000 V_{DC}
 - TO-220AC Ins
Electrical insulation 2500 V_{RMS}

Description

The STTH1502 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-220 Ins, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection.



Order codes

| Part Number | Marking |
|-------------|------------|
| STTH1502D | STTH1502 |
| STTH1502FP | STTH1502 |
| STTH1502DI | STTH1502DI |

1 Characteristics

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

| Symbol | Parameter | | Value | Unit | |
|--------------|---|---------------------------------|---------------------------|------------------|---|
| V_{RRM} | Repetitive peak reverse voltage | | 200 | V | |
| $I_{F(RMS)}$ | RMS forward current | | 32 | A | |
| $I_{F(AV)}$ | Average forward current, $\delta = 0.5$ | TO-220AC | $T_c = 130^\circ\text{C}$ | 15 | A |
| | | TO-220AC Ins | $T_c = 105^\circ\text{C}$ | | |
| | | TO-220FPAC | $T_c = 85^\circ\text{C}$ | | |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10\text{ ms}$ Sinusoidal | 150 | A | |
| T_{stg} | Storage temperature range | | -65 to + 175 | $^\circ\text{C}$ | |
| T_j | Maximum operating junction temperature | | 175 | $^\circ\text{C}$ | |

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 | 3.8 | |
| | | 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 | μA |
| | | $T_j = 125^\circ\text{C}$ | | | 10 | 100 | |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25^\circ\text{C}$ | $I_F = 15\text{ A}$ | | 1 | 1.1 | V |
| | | $T_j = 150^\circ\text{C}$ | | | 0.85 | 0.95 | |
| | | $T_j = 125^\circ\text{C}$ | $I_F = 30\text{ A}$ | | 1.05 | 1.20 | |
| | | $T_j = 25^\circ\text{C}$ | | | 1.15 | 1.3 | |
| | | $T_j = 150^\circ\text{C}$ | | | 1 | 1.15 | |

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:

$$P = 0.74 \times I_{F(AV)} + 0.014 I_{F(RMS)}^2$$

Table 4. Dynamic characteristics

| Symbol | Parameter | Test conditions | Min. | Typ | Max. | Unit |
|----------|--------------------------|---|------|-----|------|------|
| t_{rr} | Reverse recovery time | $I_F = 1\text{ A}$, $di_F/dt = -50\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25^\circ\text{ C}$ | | 28 | 36 | ns |
| | | $I_F = 1\text{ A}$, $di_F/dt = -100\text{ A}/\mu\text{s}$, $V_R = 30\text{ V}$, $T_j = 25^\circ\text{ C}$ | | 20 | 25 | |
| I_{RM} | Reverse recovery current | $I_F = 15\text{ A}$, $di_F/dt = -200\text{ A}/\mu\text{s}$, $V_R = 160\text{ V}$, $T_j = 125^\circ\text{ C}$ | | 5.7 | 7.2 | A |
| t_{fr} | Forward recovery time | $I_F = 15\text{ A}$, $di_F/dt = 50\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$, $T_j = 25^\circ\text{ C}$ | | 200 | | ns |
| V_{FP} | Forward recovery voltage | $I_F = 15\text{ A}$, $di_F/dt = 50\text{ A}/\mu\text{s}$, $T_j = 25^\circ\text{ C}$ | | 1.3 | | V |

Figure 1. Peak current versus duty cycle

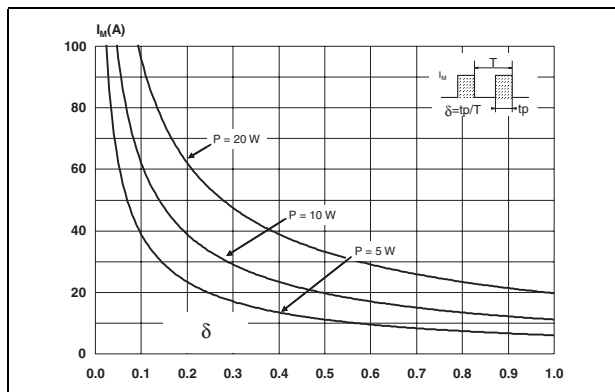


Figure 2. Forward voltage drop versus forward current (typical values)

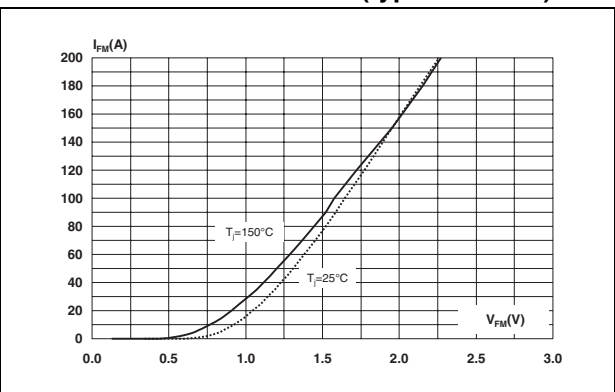


Figure 3. Forward voltage drop versus forward current (maximum values)

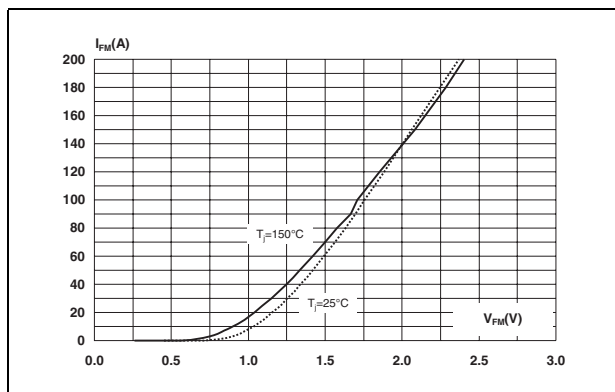


Figure 4. Relative variation of thermal impedance, junction to case, versus pulse duration (TO-220AC)

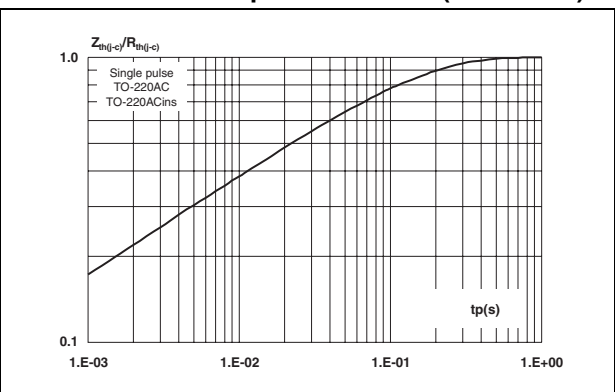


Figure 5. Relative variation of thermal impedance, junction to case, versus pulse duration (TO-220FPAC)

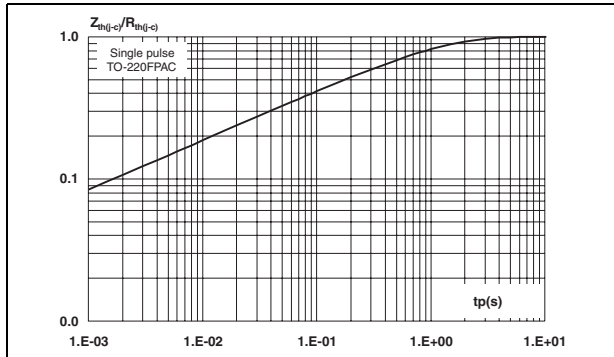


Figure 6. Junction capacitance versus reverse applied voltage (typical values)

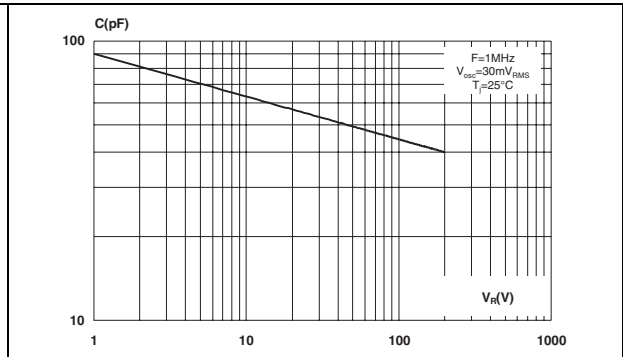


Figure 7. Reverse recovery charges versus di_F/dt (typical values)

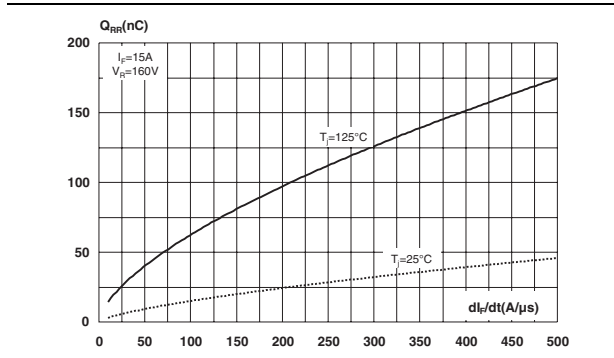


Figure 8. Reverse recovery time versus di_F/dt (typical values)

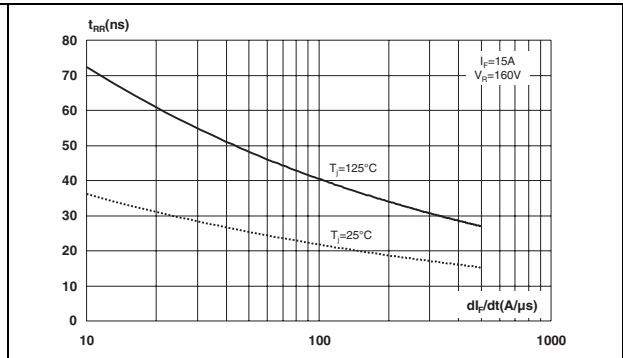


Figure 9. Peak reverse recovery current versus di_F/dt (typical values)

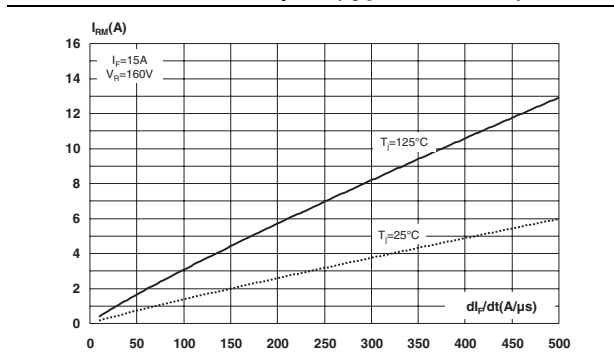
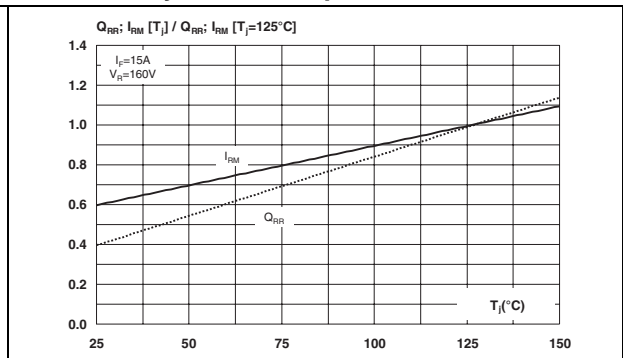
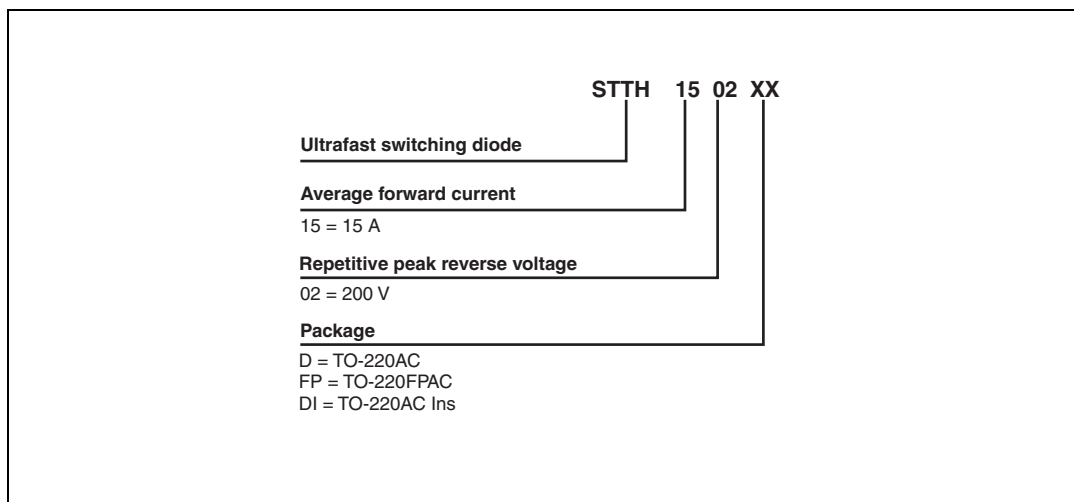


Figure 10. Dynamic parameters versus junction temperature



2 Ordering information scheme



3 Package information

Epoxy meets UL94, V0

Cooling method: by conduction (C)

Recommended torque value: 0.8 Nm

Maximum torque value: 1.0 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 |

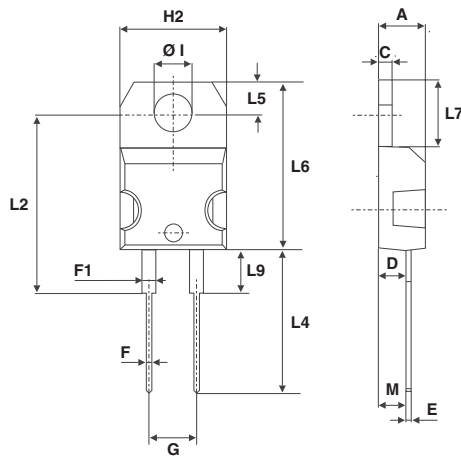
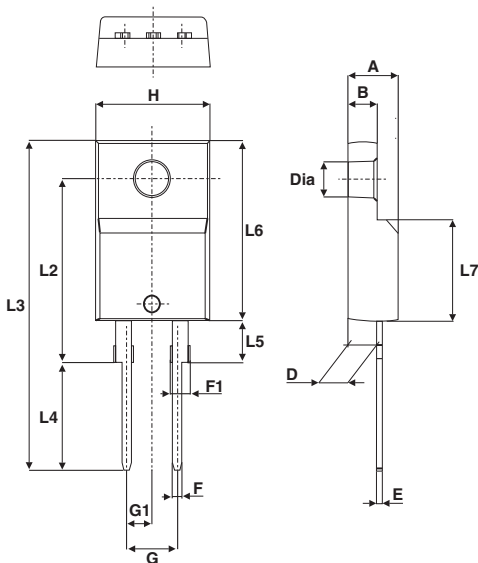
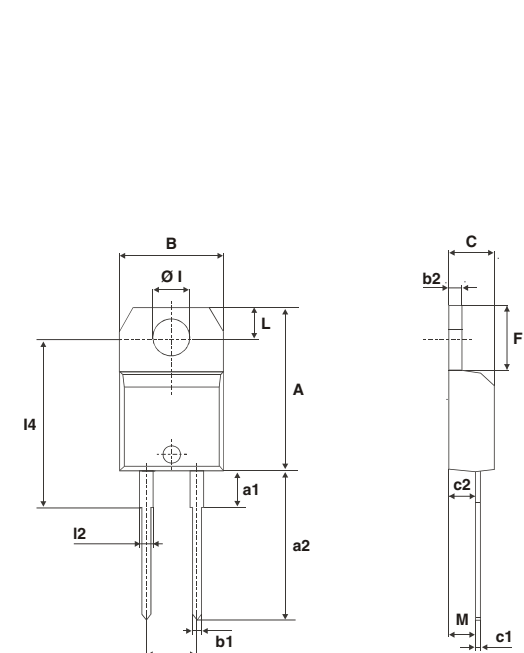


Table 6. T0-220FPAC dimensions



| 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 |
| I4 | 15.80 | 16.40 | 16.80 | 0.622 | 0.646 | 0.661 |
| L | 2.65 | | 2.95 | 0.104 | | 0.116 |
| I2 | 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.

4 Ordering information

| Part Number | Marking | Package | Weight | Base qty | Delivery mode |
|-------------|------------|--------------|--------|----------|---------------|
| STTH1502D | STTH1502 | TO-220AC | 1.86 g | 50 | Tube |
| STTH1502FP | STTH1502 | TO-220FPAC | 2.2 g | 50 | Tube |
| STTH1502DI | STTH1502DI | TO-220AC Ins | 1.86 | 50 | Tube |

5 Revision history

| Date | Revision | Description of Changes |
|-------------|----------|----------------------------|
| 05-Apr-2006 | 1 | First issue |
| 10-Oct-2006 | 2 | Added TO-220AC Ins package |

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