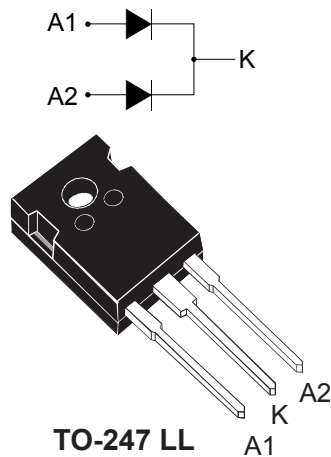


600 V, 2 X 30 A ultrafast high voltage rectifier



Features

- High junction temperature capability
- Ultrafast with soft recovery behavior
- Low reverse current
- Low thermal resistance
- Reduced switching and conduction losses
- **ECOPACK2** compliant component

Applications

- Solar boost diode
- Output rectification
- PFC
- UPS
- Air conditioning
- Charging station
- OBC in EV-HEV

Description

The **STTH60RQ06CWL** has been developed for applications requiring a high-voltage (HV) capability such as in secondary rectification in HV LLC full bridge topology or in high voltage boost function.

It is ideal for switching power supplies and industrial applications, as rectification function, or even freewheeling and clamping diode.

| Product status link | |
|-------------------------------|----------|
| STTH60RQ06CWL | |
| Product summary | |
| Symbol | Value |
| $I_{F(AV)}$ | 2 X 30 A |
| V_{RRM} | 600 V |
| $V_F(max.)$ | 1.45 V |
| $t_{rr}(max.)$ | 30 ns |
| $T_j(max.)$ | 175 °C |

1 Characteristics

Table 1. Absolute ratings (limiting values at 25 °C, unless otherwise specified)

| Symbol | Parameter | | Value | Unit |
|--------------|--|---|-------------|------|
| V_{RRM} | Repetitive peak reverse voltage | | 600 | V |
| $I_{F(RMS)}$ | Forward rms current | | 50 | A |
| $I_{F(AV)}$ | Average forward current | Per diode | 30 | A |
| | | Per device | | |
| | | $T_C = 103\text{ °C}$, $\delta = 0.5$ square | | |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10$ ms sinusoidal | 200 | A |
| T_{stg} | Storage temperature range | | -65 to +175 | °C |
| T_j | Maximum operating junction temperature | | 175 | °C |

Table 2. Thermal resistance parameters

| Symbol | Parameter | | Max. | Unit |
|---------------|------------------|------------|------|------|
| $R_{th(j-c)}$ | Junction to case | Per diode | 0.9 | °C/W |
| | | Per device | 0.45 | |

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

- AN5088: Rectifiers thermal management, handling and mounting recommendations

Table 3. Static electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|-------------|-------------------------|-----------------------|----------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$ | $V_R = 600\text{ V}$ | - | | 40 | μA |
| | | $T_j = 150\text{ °C}$ | | - | 80 | 800 | |
| $V_F^{(2)}$ | Forward voltage drop | $T_j = 25\text{ °C}$ | $I_F = 15\text{ A}$ | - | | 2.45 | V |
| | | $T_j = 150\text{ °C}$ | | - | 1.15 | 1.45 | |
| | | $T_j = 25\text{ °C}$ | $I_F = 30\text{ A}$ | - | | 2.95 | |
| | | $T_j = 150\text{ °C}$ | | - | 1.45 | 1.85 | |

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:

$$P = 1.05 \times I_{F(AV)} + 0.026 \times I_{F(RMS)}^2$$

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
- AN5028: Calculation of turn-off power losses generated by an ultrafast diode

Table 4. Dynamic electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|----------|--------------------------|-----------------------|--|------|------|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ °C}$ | $I_F = 0.5\text{ A}, I_{rr} = 0.25\text{ A}, I_R = 1\text{ A}$ | - | | 30 | ns |
| | | | $I_F = 1\text{ A}, V_R = 30\text{ V}, dI_F/dt = -50\text{ A}/\mu\text{s}$ | - | 40 | 55 | |
| I_{RM} | Reverse recovery current | $T_j = 125\text{ °C}$ | $I_F = 30\text{ A}, V_R = 400\text{ V}, dI_F/dt = -200\text{ A}/\mu\text{s}$ | - | 8 | 11 | A |
| Q_{rr} | Reverse recovery charge | | | - | 485 | | nC |
| t_{rr} | Reverse recovery time | | | - | 95 | | ns |

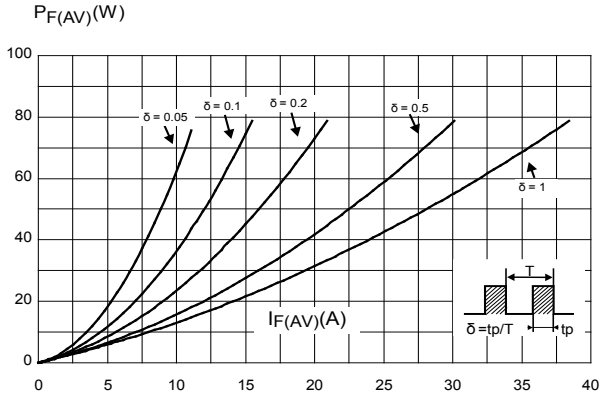
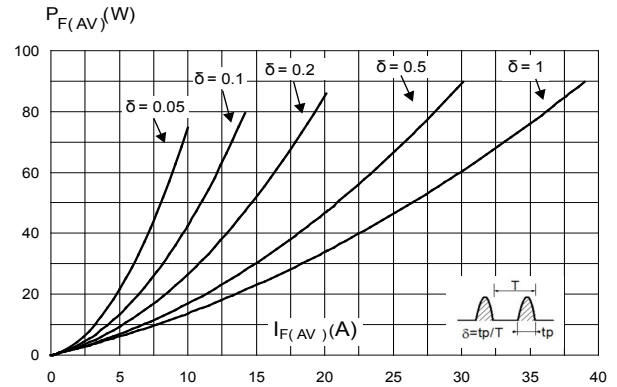
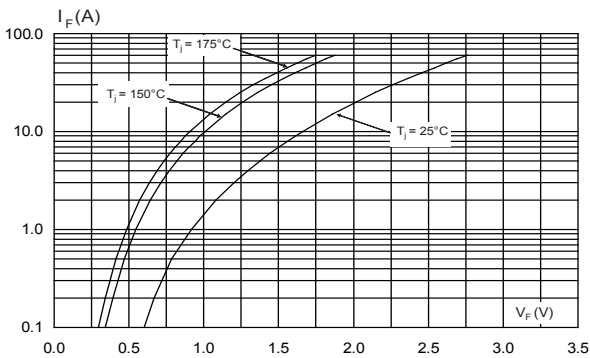
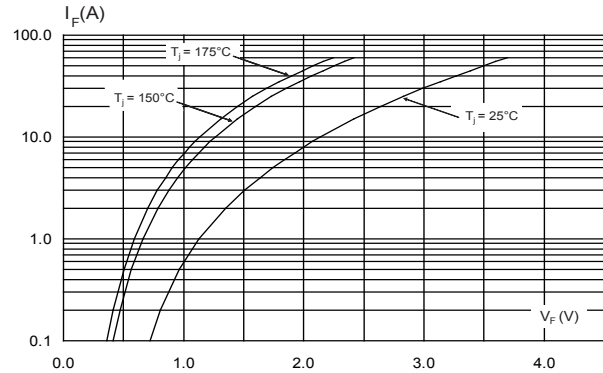
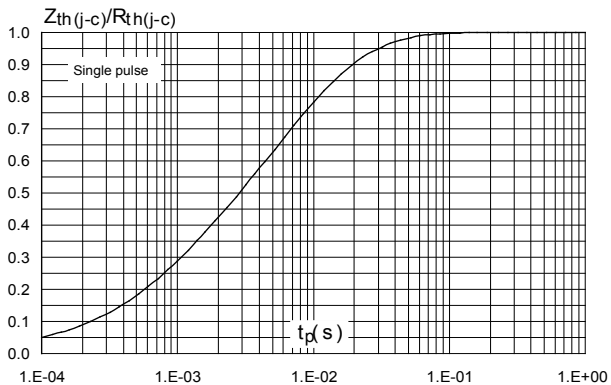
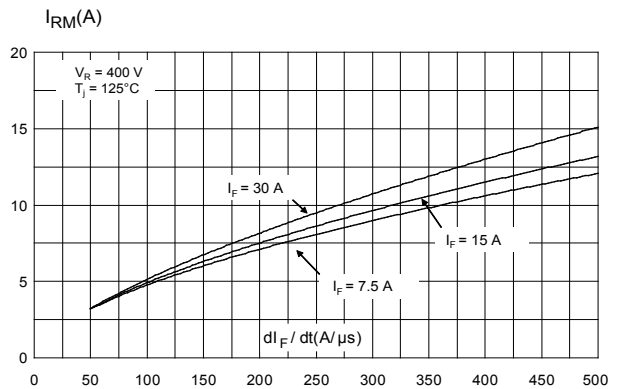
1.1 Characteristics (curves)
Figure 1. Average forward power dissipation versus average forward current (square waveform)

Figure 2. Average forward power dissipation versus average forward current (sinusoidal waveform)

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

Figure 4. Forward voltage drop versus forward current (maximum values)

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

Figure 6. Peak reverse recovery current versus di_F/dt (typical values)


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

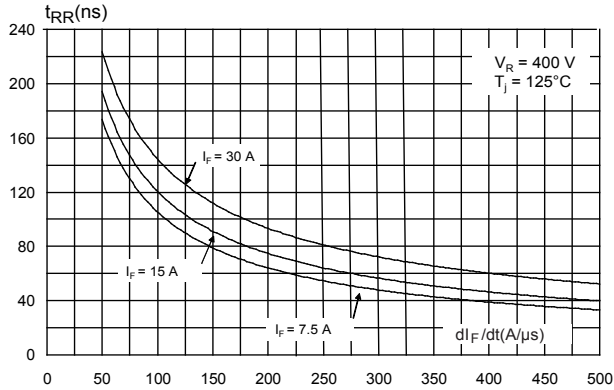


Figure 8. Reverse recovery charges versus di_F/dt (typical values)

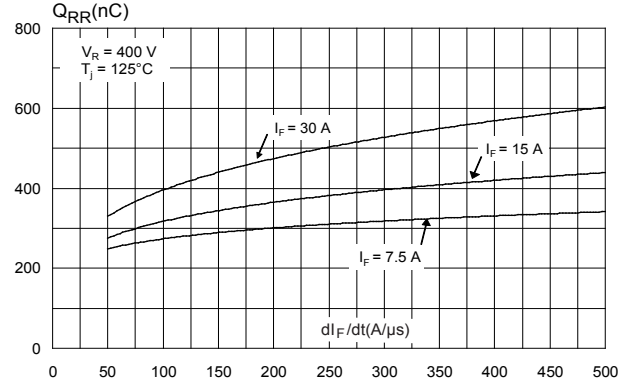


Figure 9. Reverse recovery softness factor versus di_F/dt (typical values)

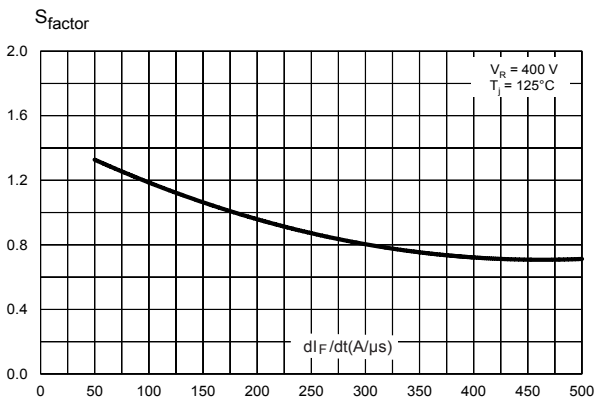


Figure 10. Relative variations of dynamic parameters versus junction temperature

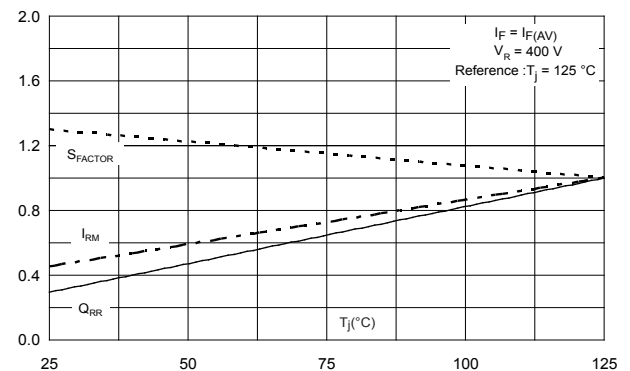


Figure 11. Junction capacitance versus reverse voltage applied (typical values)

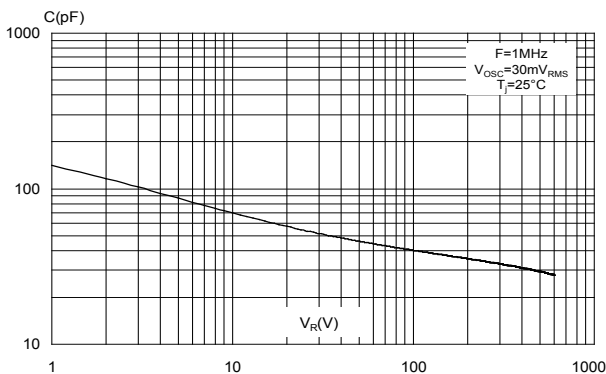


Figure 12. Relative variation of non-repetitive peak surge forward current versus pulse duration (sinusoidal waveform)

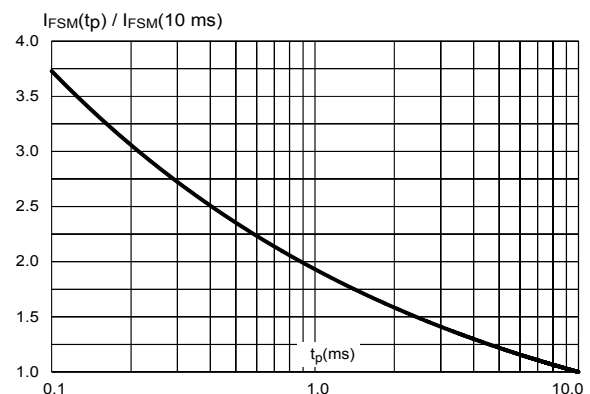
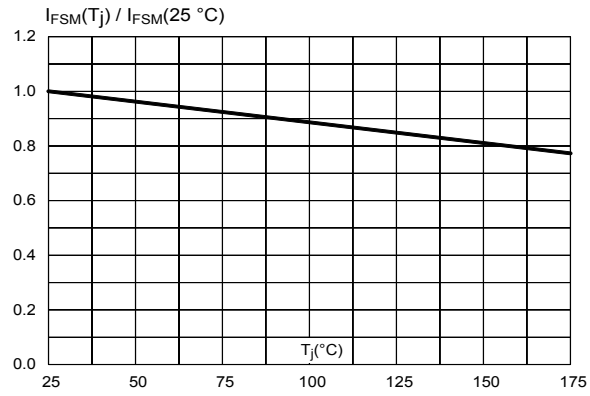


Figure 13. Relative variation of non-repetitive peak surge forward current versus initial junction temperature (sinusoidal waveform)



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 TO-247 LL package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1.0 N·m

Figure 14. TO-247 long leads package outline

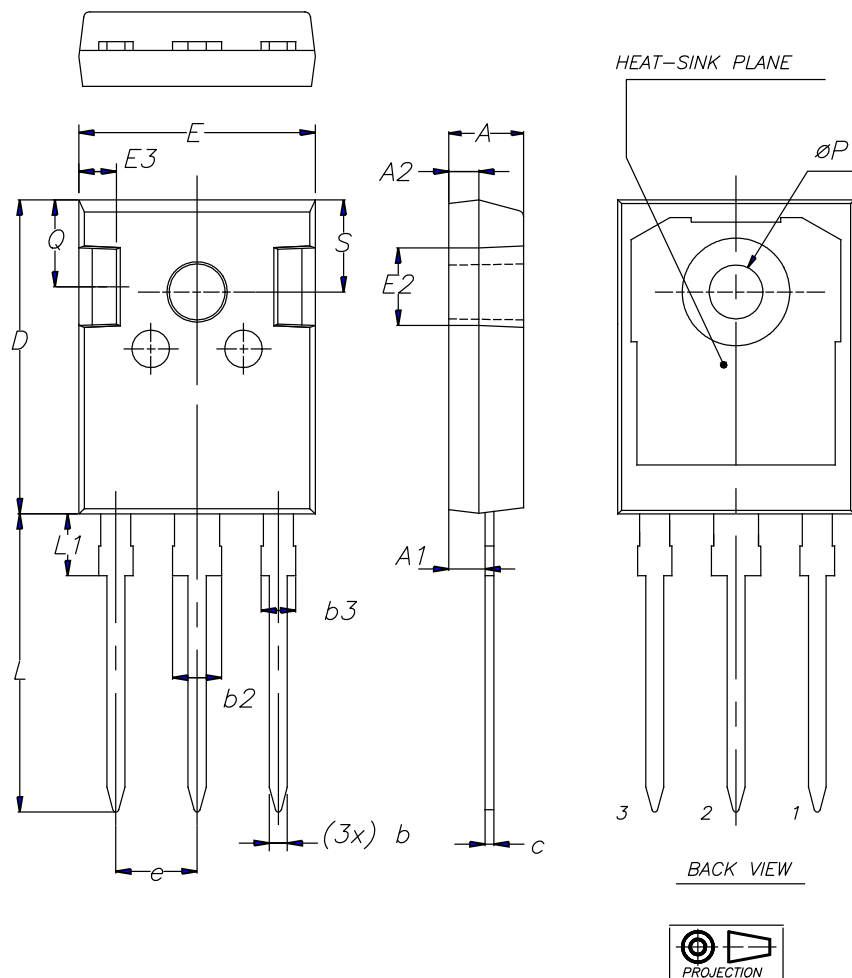


Table 5. TO-247 long leads package mechanical data

| Dim. | mm. | | | Inches | | |
|------|-------|------|-------|--------|------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.90 | - | 5.15 | 0.192 | - | 0.203 |
| A1 | 2.25 | - | 2.55 | 0.088 | - | 0.101 |
| A2 | 1.85 | - | 2.10 | 0.072 | - | 0.083 |
| B | 1.07 | - | 1.32 | 0.042 | - | 0.052 |
| B2 | 2.87 | - | 3.38 | 0.112 | - | 0.134 |
| B3 | 1.90 | - | 2.38 | 0.074 | - | 0.094 |
| C | 0.55 | - | 0.67 | 0.021 | - | 0.027 |
| D | 20.82 | - | 21.10 | 0.819 | - | 0.831 |
| E | 15.70 | - | 16.02 | 0.618 | - | 0.631 |
| E2 | 4.90 | - | 5.10 | 0.192 | - | 0.201 |
| E3 | 2.40 | - | 2.60 | 0.094 | - | 0.103 |
| e | 5.34 | - | 5.54 | 0.210 | - | 0.219 |
| L | 19.80 | - | 20.30 | 0.779 | - | 0.800 |
| L1 | 4.16 | - | 4.47 | 0.163 | - | 0.176 |
| P | 3.50 | - | 3.70 | 0.137 | - | 0.146 |
| Q | 5.49 | - | 6.00 | 0.216 | - | 0.237 |
| S | 6.04 | - | 6.29 | 0.237 | - | 0.248 |

3 Ordering information

Table 6. Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|---------------|---------------|-----------|--------|-----------|---------------|
| STTH60RQ06CWL | STTH60RQ06CWL | TO-247 LL | 6.1 g | 30 | Tube |

Revision history

Table 7. Document revision history

| Date | Version | Changes |
|-------------|---------|---|
| 02-Mar-2020 | 1 | Initial release. |
| 30-Mar-2020 | 2 | Updated Figure 1 and Figure 2 . |

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