

## TURBO 2 ULTRAFast HIGH VOLTAGE RECTIFIER

**Table 1: Main Product Characteristics**

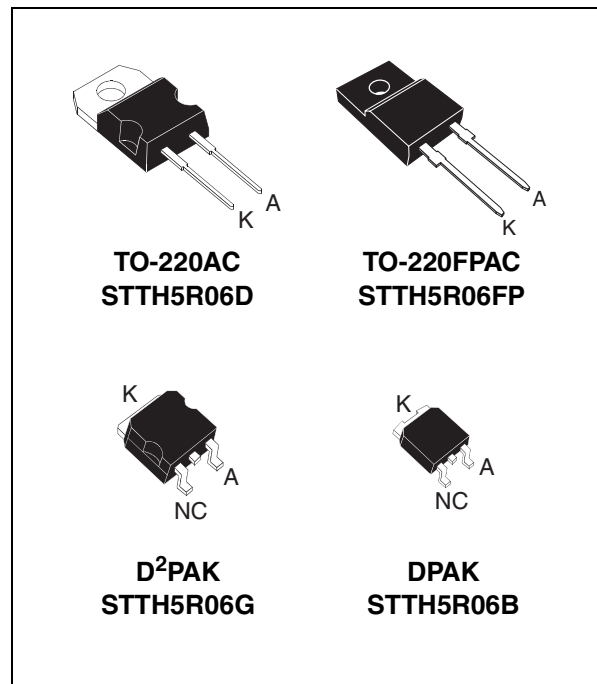
|                |       |
|----------------|-------|
| $I_{F(AV)}$    | 5 A   |
| $V_{RRM}$      | 600 V |
| $T_j$          | 175°C |
| $V_F$ (typ)    | 1.4 V |
| $t_{rr}$ (max) | 40 ns |

**FEATURES AND BENEFITS**

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses

**DESCRIPTION**

The STTH5R06, which is using ST Turbo 2 600V technology, is specially suited as boost diode in continuous mode power factor corrections and hard switching conditions. This device is also intended for use as a free wheeling diode in power supplies and other power switching applications.


**Table 2: Order Codes**

| Part Number | Marking    |
|-------------|------------|
| STTH5R06D   | STTH5R06D  |
| STTH5R06FP  | STTH5R06FP |
| STTH5R06B   | STTH5R06B  |

| Part Number  | Marking   |
|--------------|-----------|
| STTH5R06B-TR | STTH5R06B |
| STTH5R06G    | STTH5R06G |
| STTH5R06G-TR | STTH5R06G |

**Table 3: Absolute Ratings** (limiting values)

| Symbol       | Parameter                              |                               | Value        | Unit |
|--------------|----------------------------------------|-------------------------------|--------------|------|
| $V_{RRM}$    | Repetitive peak reverse voltage        |                               | 600          | V    |
| $I_{F(RMS)}$ | RMS forward voltage                    | TO-220AC / TO-220FPAC / D²PAK | 20           | A    |
|              |                                        | DPAK                          | 10           |      |
| $I_{F(AV)}$  | Average forward current                | TO-220AC / DPAK / D²PAK       | 5            | A    |
|              |                                        | TO-220FPAC                    | 5            |      |
| $I_{FSM}$    | Surge non repetitive forward current   | $t_p = 10ms$ sinusoidal       | 50           | A    |
| $T_{stg}$    | Storage temperature range              |                               | -65 to + 175 | °C   |
| $T_j$        | Maximum operating junction temperature |                               | 175          | °C   |

Table 4: Thermal Resistance

| Symbol        | Parameter        |                                     | Value (max). | Unit |
|---------------|------------------|-------------------------------------|--------------|------|
| $R_{th(j-c)}$ | Junction to case | TO-220AC / DPA / D <sup>2</sup> PAK | 3.0          | °C/W |
|               |                  | TO-220FPAC                          | 5.5          |      |

Table 5: Static Electrical Characteristics

| Symbol     | Parameter               | Test conditions           |                   | Min. | Typ | Max. | Unit          |
|------------|-------------------------|---------------------------|-------------------|------|-----|------|---------------|
| $I_R^*$    | Reverse leakage current | $T_j = 25^\circ\text{C}$  | $V_R = V_{RRM}$   |      |     | 20   | $\mu\text{A}$ |
|            |                         | $T_j = 125^\circ\text{C}$ |                   |      | 25  | 250  |               |
| $V_F^{**}$ | Forward voltage drop    | $T_j = 25^\circ\text{C}$  | $I_F = 5\text{A}$ |      |     | 2.9  | V             |
|            |                         | $T_j = 125^\circ\text{C}$ |                   |      | 1.4 | 1.8  |               |

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

\*\*  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:  $P = 1.164 \times I_{F(AV)} + 0.128 I_F^2 (\text{RMS})$

Table 6: Dynamic Characteristics

| Symbol   | Parameter                | Test conditions           |                                                                                         | Min. | Typ  | Max. | Unit |
|----------|--------------------------|---------------------------|-----------------------------------------------------------------------------------------|------|------|------|------|
| $t_{rr}$ | Reverse recovery time    | $T_j = 25^\circ\text{C}$  | $I_F = 0.5\text{A}$ $I_{rr} = 0.25\text{A}$ $I_R = 1\text{A}$                           |      |      | 25   | ns   |
|          |                          |                           | $I_F = 1\text{A}$ $di_F/dt = -50\text{ A}/\mu\text{s}$ $V_R = 30\text{V}$               |      |      | 40   |      |
| $I_{RM}$ | Reverse recovery current | $T_j = 125^\circ\text{C}$ | $I_F = 5\text{A}$ $V_R = 400\text{V}$<br>$di_F/dt = -200\text{ A}/\mu\text{s}$          |      | 5.0  | 6.0  | A    |
| S factor | Softness factor          |                           |                                                                                         |      | 0.35 |      |      |
| Qrr      | Reverse recovery charges |                           |                                                                                         |      | 110  |      |      |
| $t_{fr}$ | Forward recovery time    | $T_j = 25^\circ\text{C}$  | $I_F = 5\text{A}$ $di_F/dt = 40\text{ A}/\mu\text{s}$<br>$V_{FR} = 1.1 \times V_{Fmax}$ |      |      | 150  | ns   |
| $V_{FP}$ | Forward recovery voltage | $T_j = 25^\circ\text{C}$  | $I_F = 5\text{A}$ $di_F/dt = 40\text{ A}/\mu\text{s}$<br>$V_{FR} = 1.1 \times V_{Fmax}$ |      |      | 4.5  | V    |

Figure 1: Conduction losses versus average current

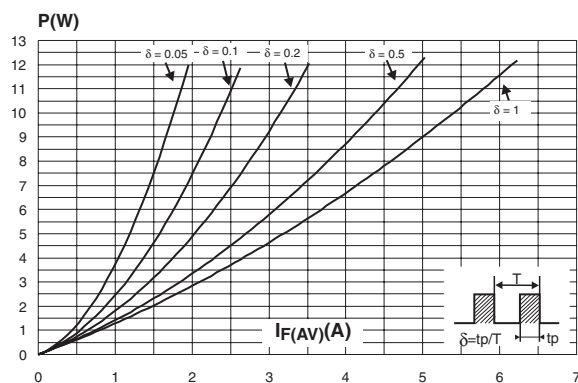
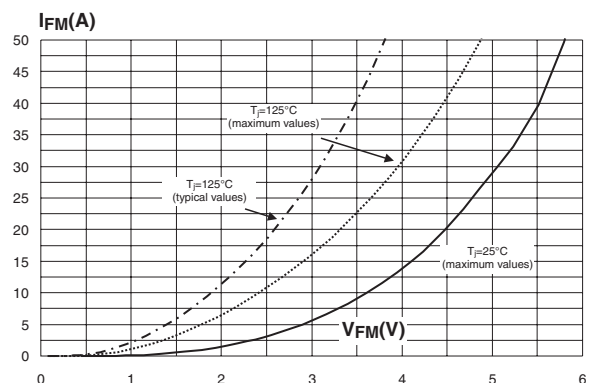
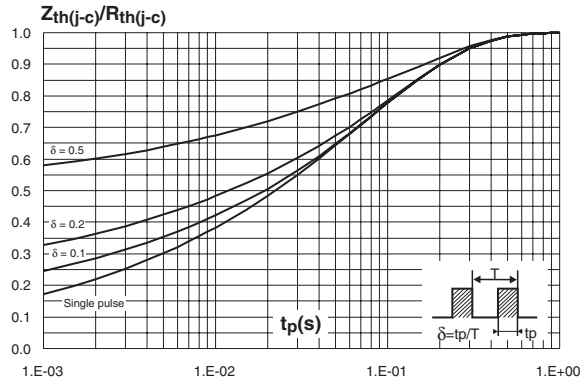


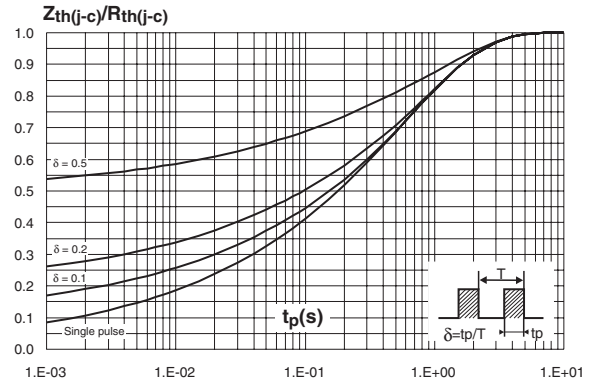
Figure 2: Forward voltage drop versus forward current



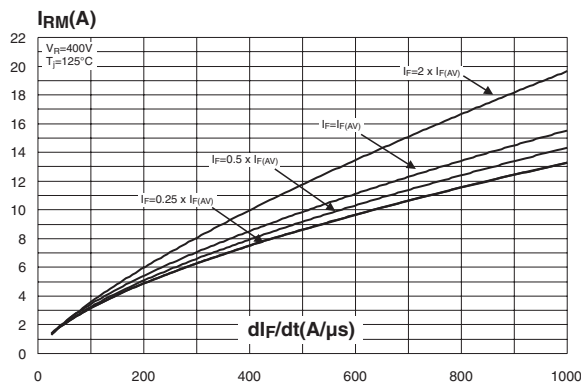
**Figure 3: Relative variation of thermal impedance junction to case versus pulse duration (TO-220AC, DPAK, D<sup>2</sup>PAK)**



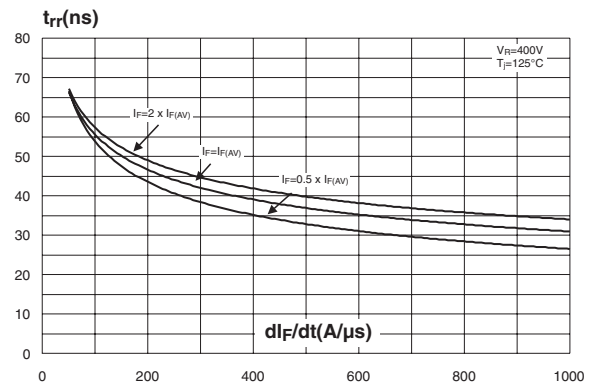
**Figure 4: Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAC)**



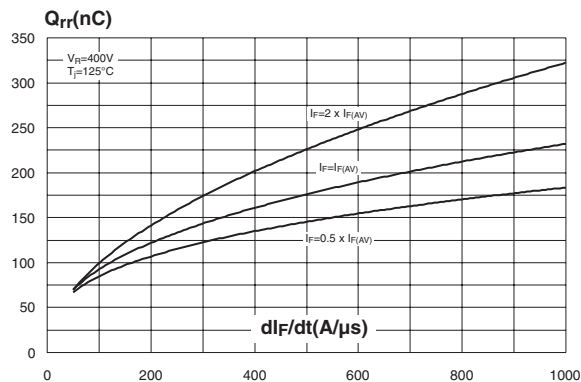
**Figure 5: Peak reverse recovery current versus  $di_F/dt$  (90% confidence)**



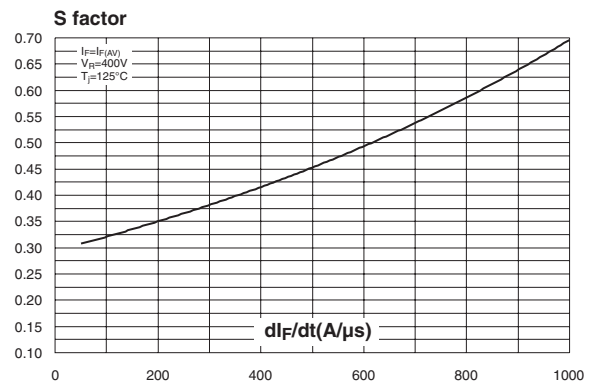
**Figure 6: Reverse recovery time versus  $di_F/dt$  (90% confidence)**



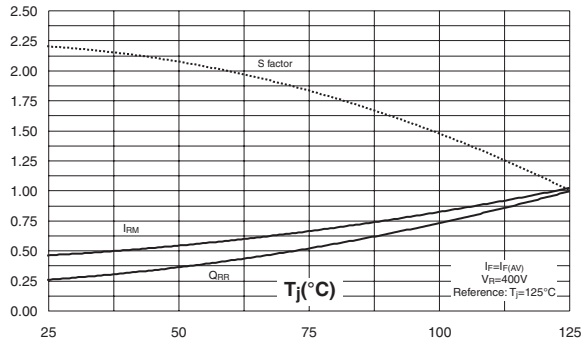
**Figure 7: Reverse recovery charges versus  $di_F/dt$  (90% confidence)**



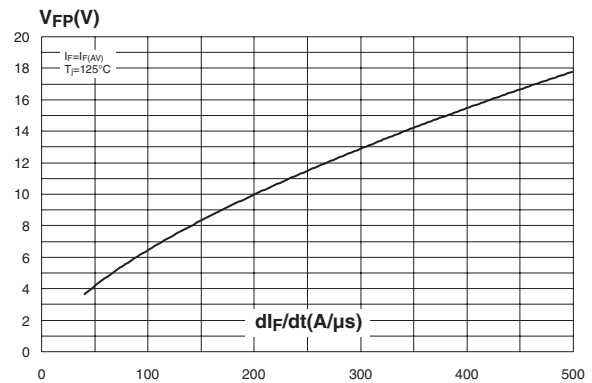
**Figure 8: Softness factor versus  $di_F/dt$  (typical values)**



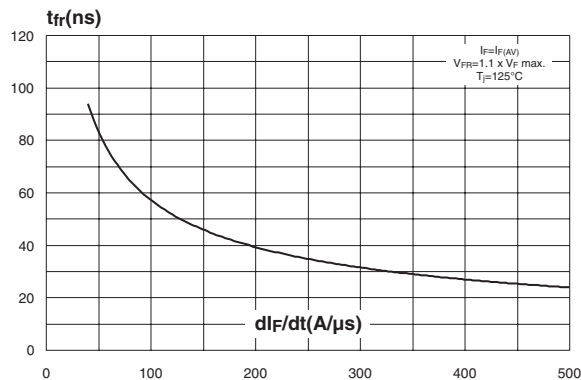
**Figure 9: Relative variations of dynamic parameters versus junction temperature**



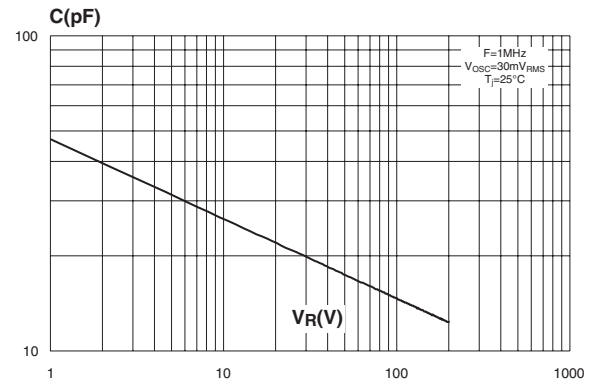
**Figure 10: Transient peak forward voltage versus  $di_F/dt$  (90% confidence)**



**Figure 11: Forward recovery time versus  $di_F/dt$  (90% confidence)**



**Figure 12: Junction capacitance versus reverse voltage applied (typical values)**



**Figure 13: Thermal resistance junction to ambient versus copper surface under tab (epoxy FR4,  $e_{CU}=35\mu m$ ) (DPAK and D<sup>2</sup>PAK)**

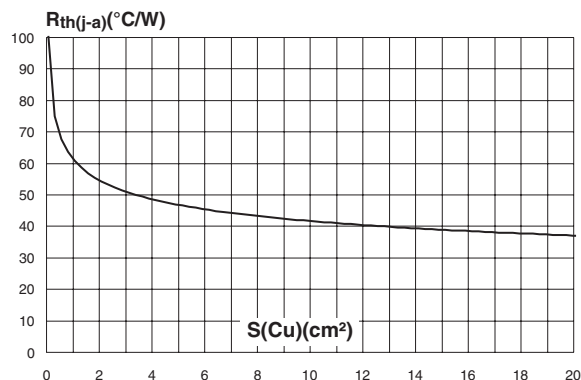


Figure 14: DPAK Package Mechanical Data

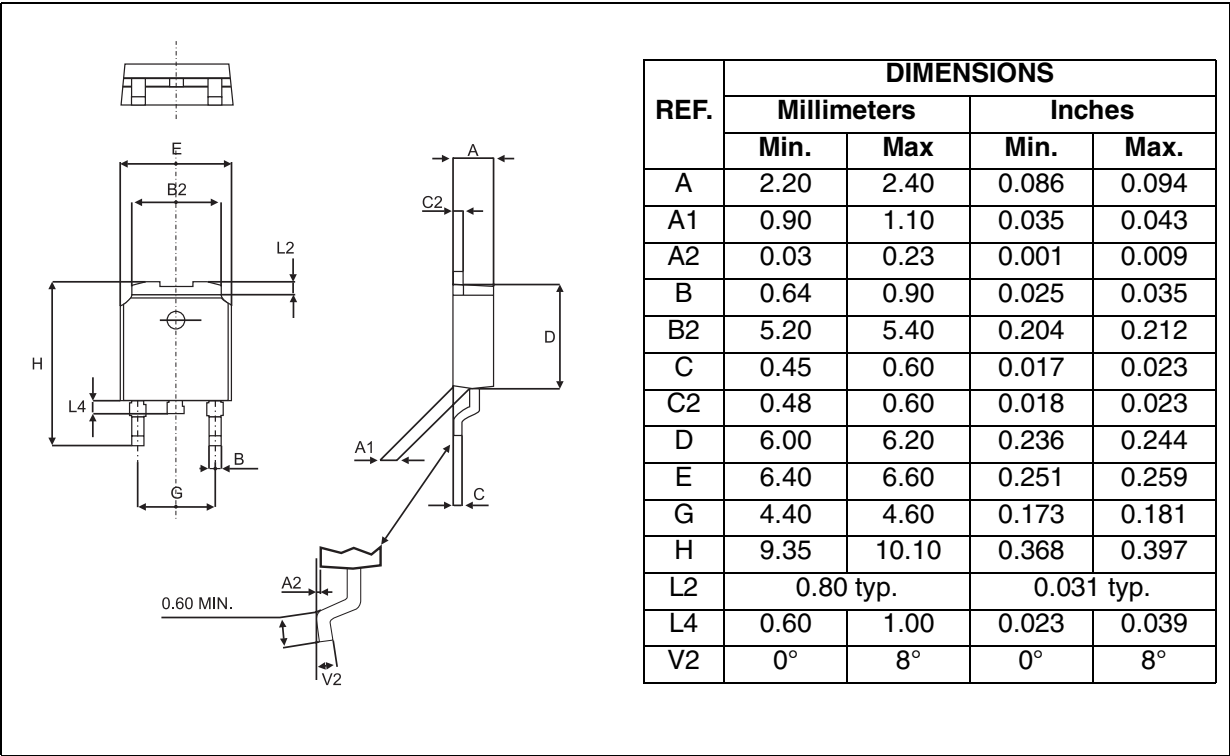


Figure 15: DPAK Foot Print Dimensions  
(in millimeters)

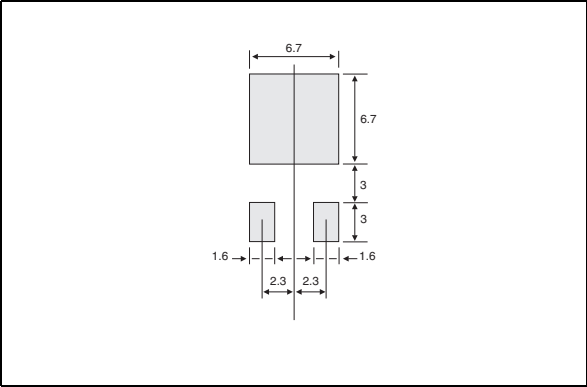


Figure 16: D<sup>2</sup>PAK Package Mechanical Data

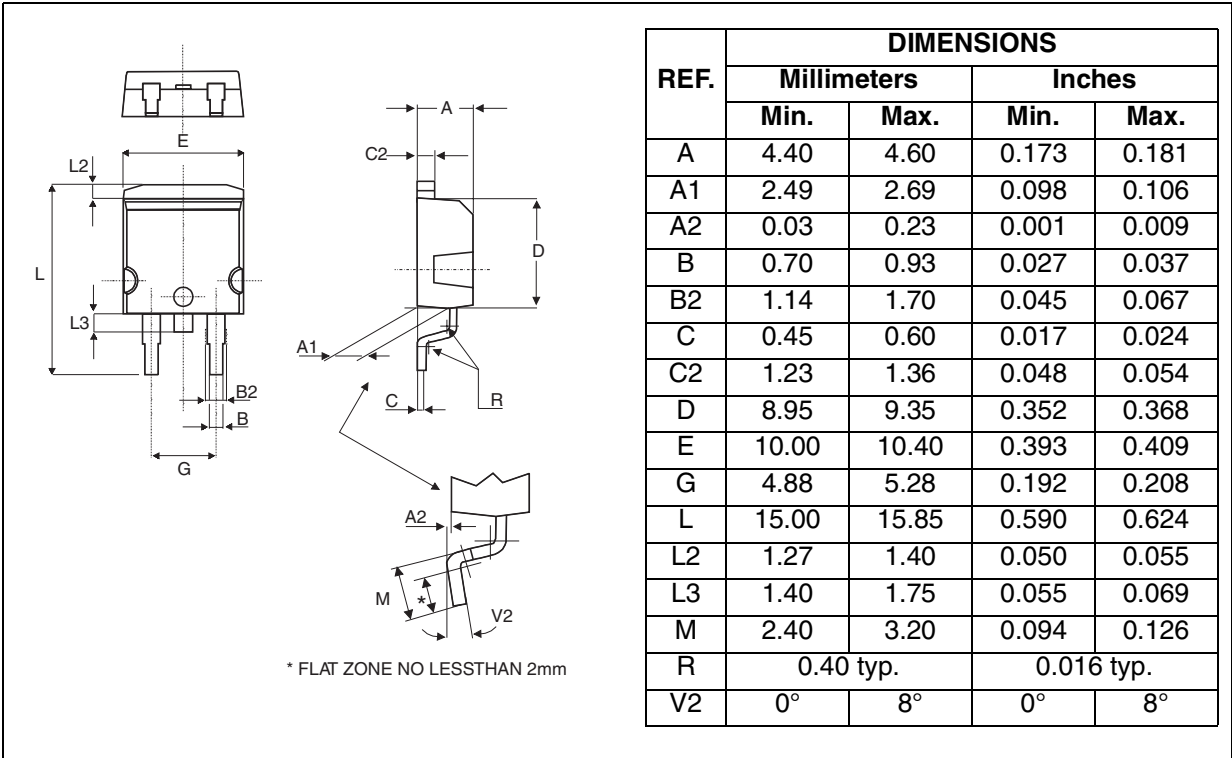


Figure 17: D<sup>2</sup>PAK Foot Print Dimensions  
(in millimeters)

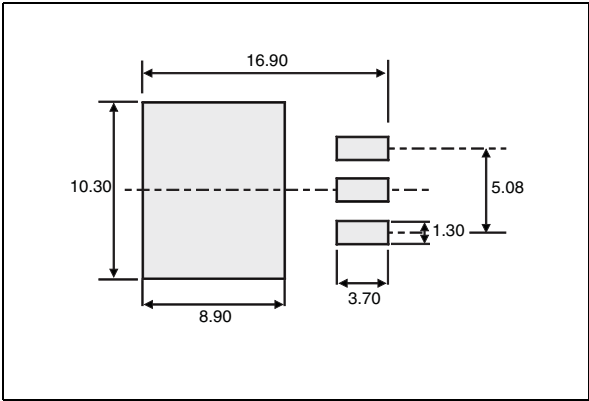


Figure 18: TO-220FPAC Package Mechanical Data

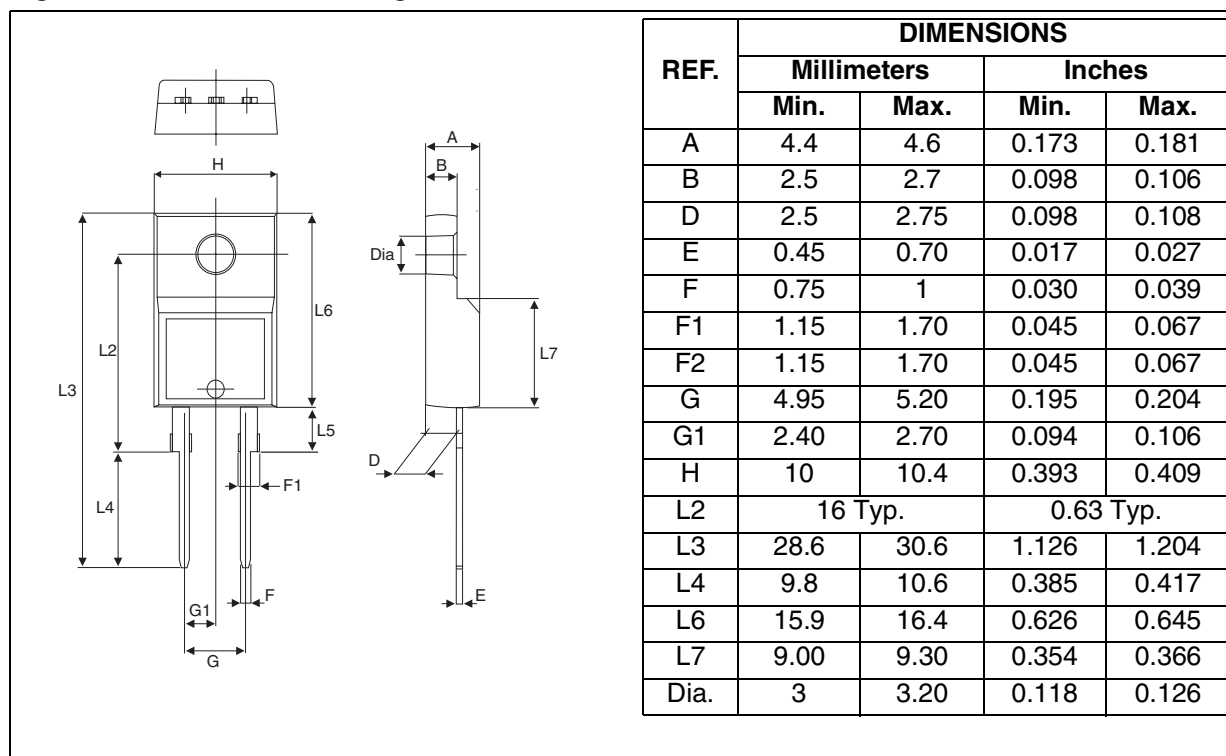
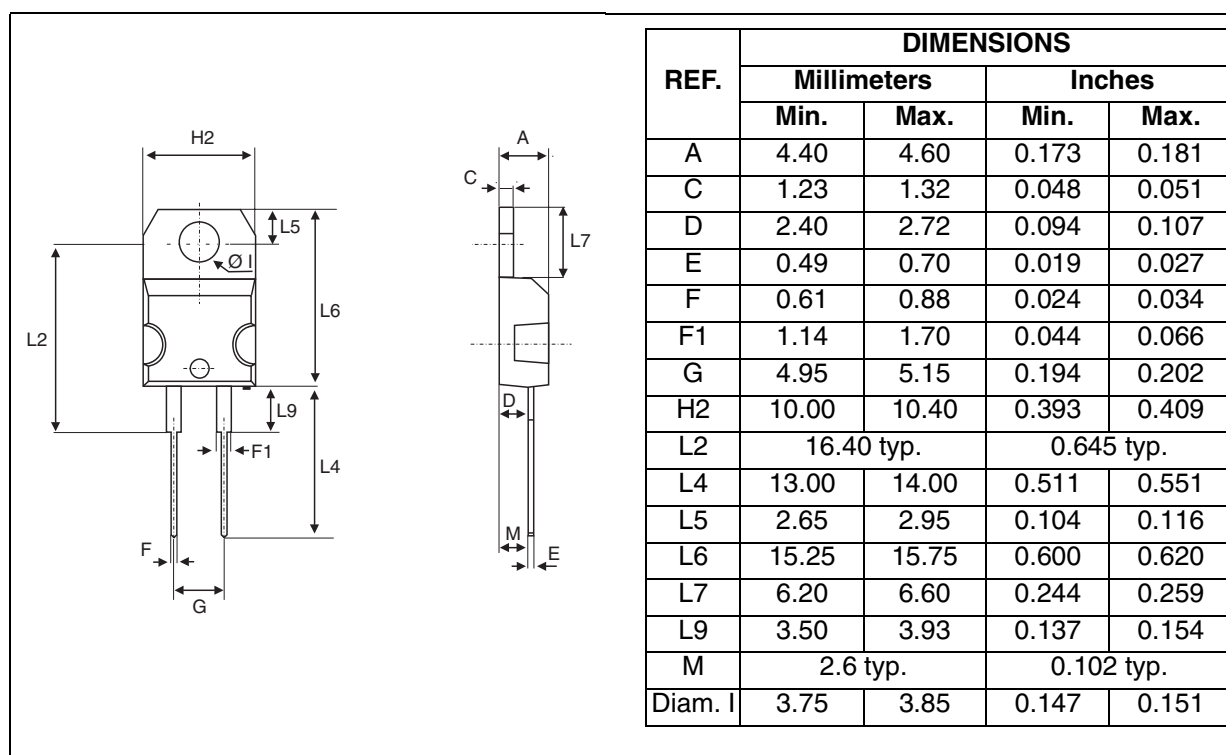


Figure 19: TO-220AC Package Mechanical Data



## STTH5R06

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**Table 7: Ordering Information**

| Ordering type | Marking       | Package            | Weight | Base qty | Delivery mode |
|---------------|---------------|--------------------|--------|----------|---------------|
| STTH5R06D     | STTH5R06D     | TO-220AC           | 1.90 g | 50       | Tube          |
| STTHR5R06G    | STTH5R06G     | D <sup>2</sup> PAK | 1.48 g | 50       | Tube          |
| STTHR5R06G-TR | STTHR5R06G    | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape & reel   |
| STTHR5R06FP   | STTHR5R06FP   | TO-220FPAC         | 1.70 g | 50       | Tube          |
| STTHR5R06B    | STTHR5R06B    | DPAK               | 0.3 g  | 75       | Tube          |
| STTHR5R06B-TR | STTHR5R06B-TR | DPAK               | 0.3 g  | 2500     | Tape & reel   |

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 m.N. (TO-220FPAC) / 0.55 m.N. (TO-220AC)
- Maximum torque value: 1.0 m.N. (TO-220FPAC) / 0.70 m.N. (TO-220AC)

**Table 8: Revision History**

| Date        | Revision | Description of Changes                        |
|-------------|----------|-----------------------------------------------|
| Oct-2002    | 3        | Last update                                   |
| 07-Sep-2004 | 4        | Tcases values splitted for TO-220FPAC package |

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