

## ULTRAFAST RECTIFIER PDP ENERGY RECOVERY

**Table 1: Main Product Characteristics**

|                |       |
|----------------|-------|
| $I_{F(AV)}$    | 40 A  |
| $V_{RRM}$      | 300 V |
| $V_{FP} (typ)$ | 2.5 V |
| $I_{RM} (typ)$ | 5 A   |
| $T_j$          | 175°C |
| $V_F (typ)$    | 0.9 V |

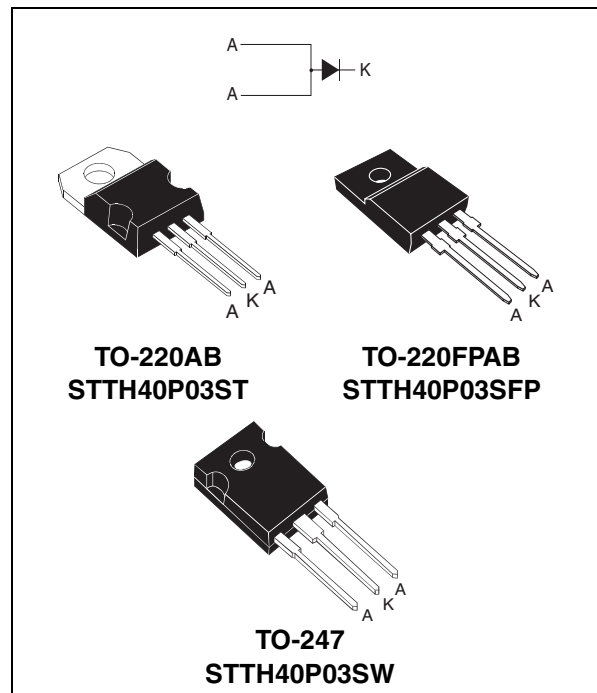
### FEATURES AND BENEFITS

- Ultrafast recovery allowing High Sustain Frequency
- Decrease charge evacuation time ( $t_{clamp}$ ) in the inductance (see figures 1 and 2)
- Minimize switching-on and total power losses
- Increase luminous efficiency and brightness
- Soft and noise-free recovery
- High surge capability
- High junction temperature

### DESCRIPTION

The **STTH40P03S** is an Ultrafast Recovery Power Rectifier dedicated to **energy recovery in PDP application**.

The key parameters of the  $D_{ERC}$  diode for the energy recovery circuit have been optimized in order to decrease power losses.



**Table 2: Order Codes**

| Part Number  | Marking    |
|--------------|------------|
| STTH40P03ST  | STTH40P03S |
| STTH40P03SFP | STTH40P03S |
| STTH40P03SW  | STTH40P03S |

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

| Symbol       | Parameter                              |                                                  | Value        | Unit |
|--------------|----------------------------------------|--------------------------------------------------|--------------|------|
| $V_{RRM}$    | Repetitive peak reverse voltage        |                                                  | 300          | V    |
| $I_{F(RMS)}$ | RMS forward current                    |                                                  | 80           | A    |
| $I_{F(AV)}$  | Average forward current                |                                                  | 40           | A    |
| $I_{FRM}$    | Repetitive peak forward current        | $F = 200kHz, t_p = 500ns$<br>Sinusoidal waveform | 120          | A    |
| $T_{stg}$    | Storage temperature range              |                                                  | -65 to + 175 | °C   |
| $T_j$        | Maximum operating junction temperature |                                                  | 175          | °C   |

Table 4: Thermal Parameters

| Symbol        | Parameter                           |                   | Value | Unit |
|---------------|-------------------------------------|-------------------|-------|------|
| $R_{th(j-c)}$ | Junction to case                    | TO-220AB / TO-247 | 1.15  | °C/W |
|               |                                     | TO-220FPAB        | 4.5   |      |
| $Z_{th(j-c)}$ | Transient thermal resistance at 1μs |                   | 0.002 | °C/W |

Table 5: Static Electrical Characteristics

| Symbol     | Parameter               | Test conditions           |                    | Min. | Typ  | Max. | Unit |
|------------|-------------------------|---------------------------|--------------------|------|------|------|------|
| $I_R^*$    | Reverse leakage current | $T_j = 25^\circ\text{C}$  | $V_R = V_{RRM}$    |      |      | 50   | μA   |
|            |                         | $T_j = 125^\circ\text{C}$ |                    |      | 0.05 | 0.5  | mA   |
| $V_F^{**}$ | Forward voltage drop    | $T_j = 25^\circ\text{C}$  | $I_F = 20\text{A}$ |      |      | 1.5  | V    |
|            |                         | $T_j = 125^\circ\text{C}$ |                    |      | 0.9  | 1.15 |      |
|            |                         | $T_j = 25^\circ\text{C}$  | $I_F = 40\text{A}$ |      | 1.1  | 1.8  | V    |
|            |                         | $T_j = 125^\circ\text{C}$ |                    |      |      | 1.42 |      |

Pulse test: \*  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$ \*\*  $t_p = 380\text{ μs}$ ,  $\delta < 2\%$ To evaluate the conduction losses use the following equation:  $P = 0.88 \times I_{F(AV)} + 0.0135 I_F^2(RMS)$ 

Table 6: Switching Characteristics

| Symbol       | Parameter                | Test conditions           |                                                                       | Min. | Typ | Max. | Unit |
|--------------|--------------------------|---------------------------|-----------------------------------------------------------------------|------|-----|------|------|
| $I_{RM}$     | Reverse recovery current | $T_j = 100^\circ\text{C}$ | $I_F = 40\text{A}$ $V_R = 100\text{V}$<br>$di_F/dt = 200\text{ A/μs}$ |      | 5   | 6.5  | A    |
| $S_{factor}$ | Softness factor          |                           |                                                                       |      | 0.5 |      | -    |

Figure 1: Application Characteristics

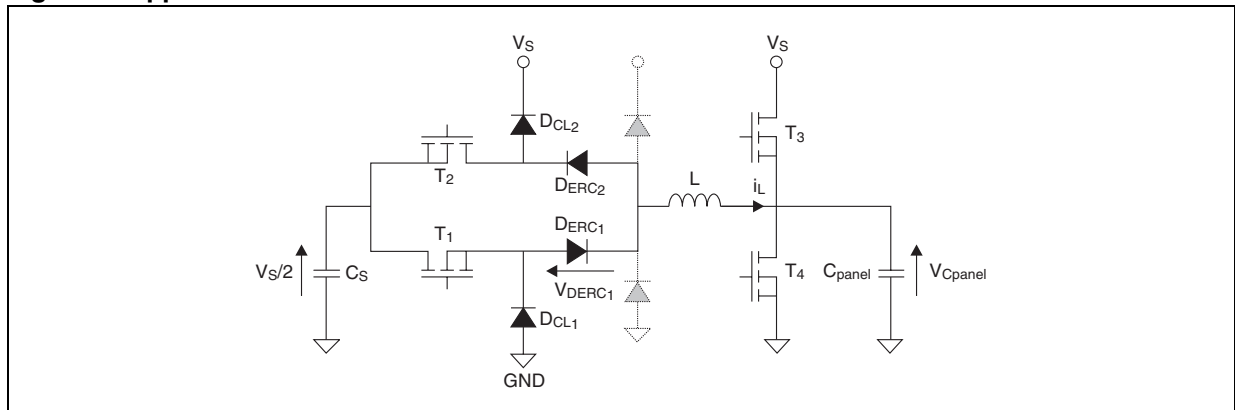


Figure 2: Application Waveforms

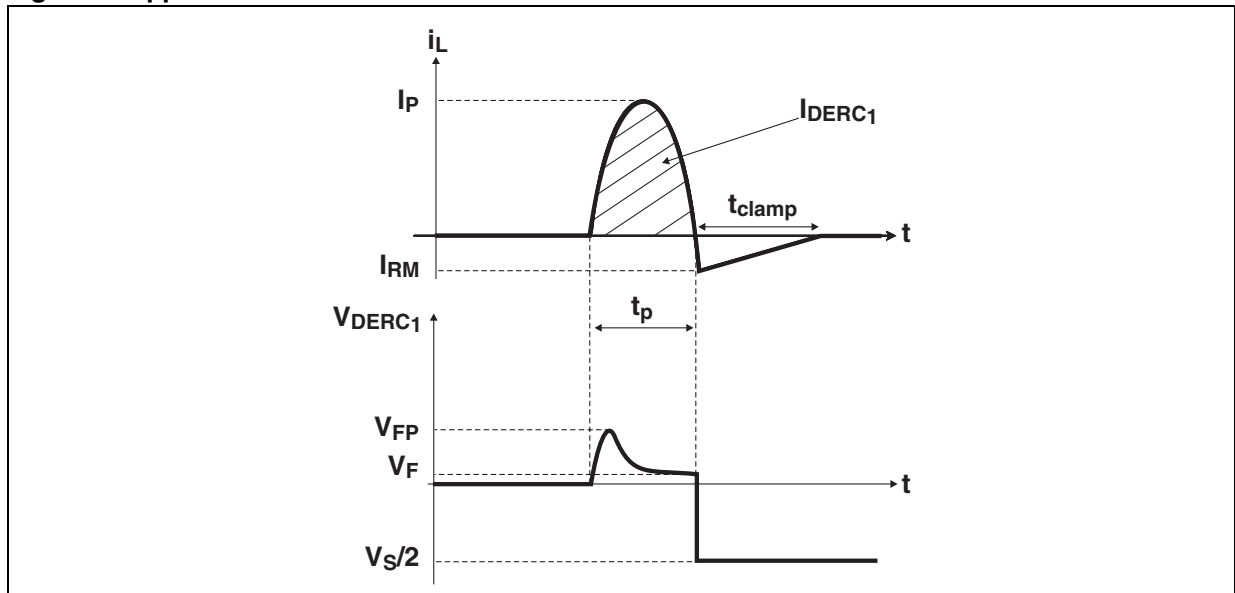


Figure 3: Forward voltage drop versus forward current

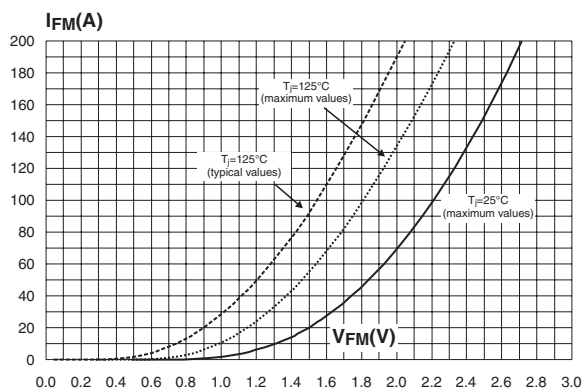
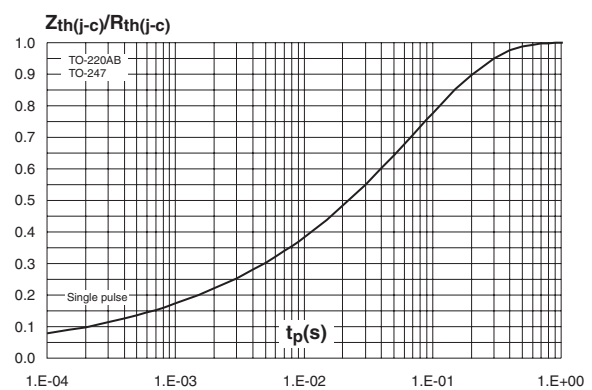
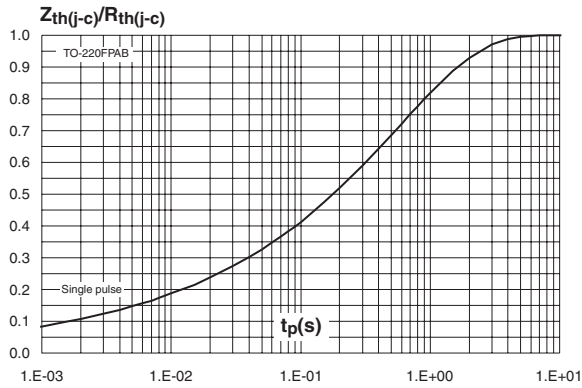


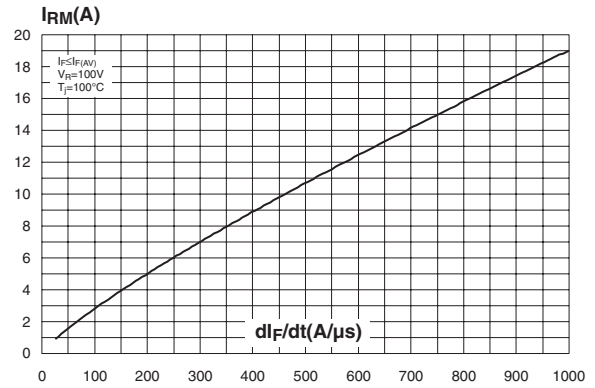
Figure 4: Relative variation of thermal impedance junction to case versus pulse duration (TO-220AB / TO-247)



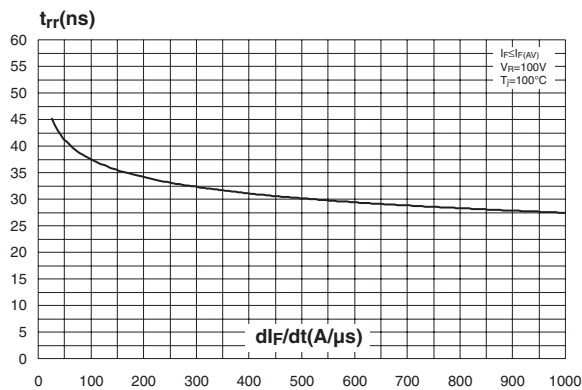
**Figure 5: Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)**



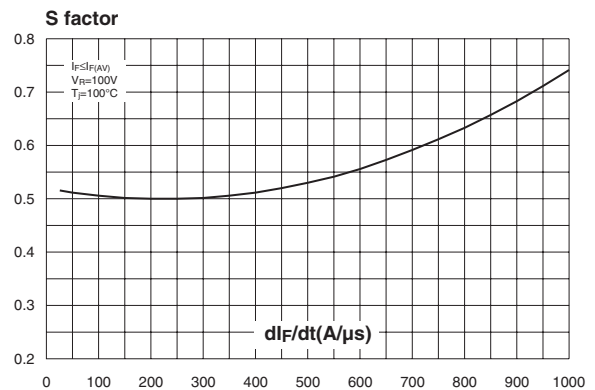
**Figure 6: Peak reverse recovery current versus  $dl_F/dt$  (typical values)**



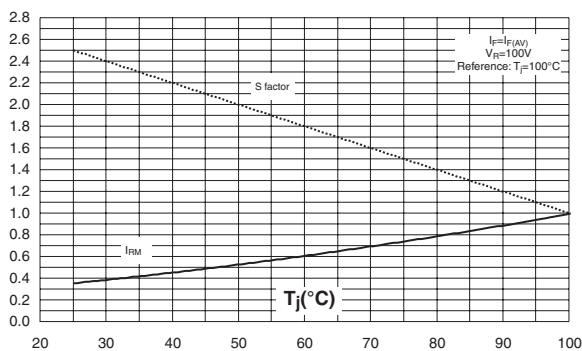
**Figure 7: Reverse recovery time versus  $dl_F/dt$  (typical values)**



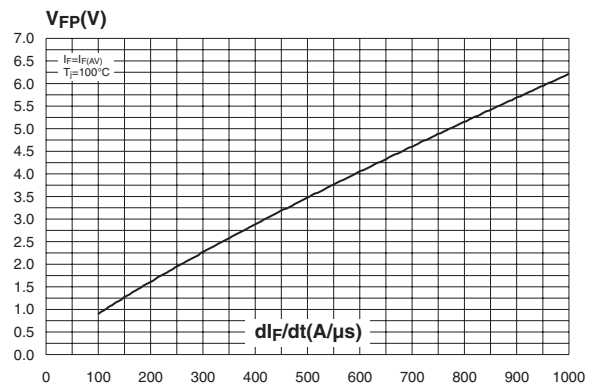
**Figure 8: Reverse recovery softness factor versus  $dl_F/dt$  (typical values)**



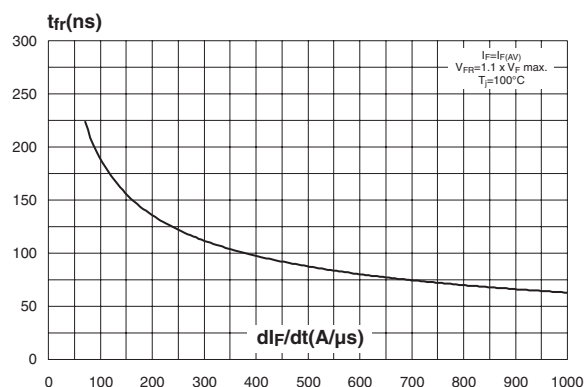
**Figure 9: Relative variations of dynamic parameters versus junction temperature**



**Figure 10: Transient peak forward voltage versus  $dl_F/dt$  (typical values)**



**Figure 11: Forward recovery time versus  $di_F/dt$  (typical values)**



**Figure 12: TO-220FPAB Package Mechanical Data**

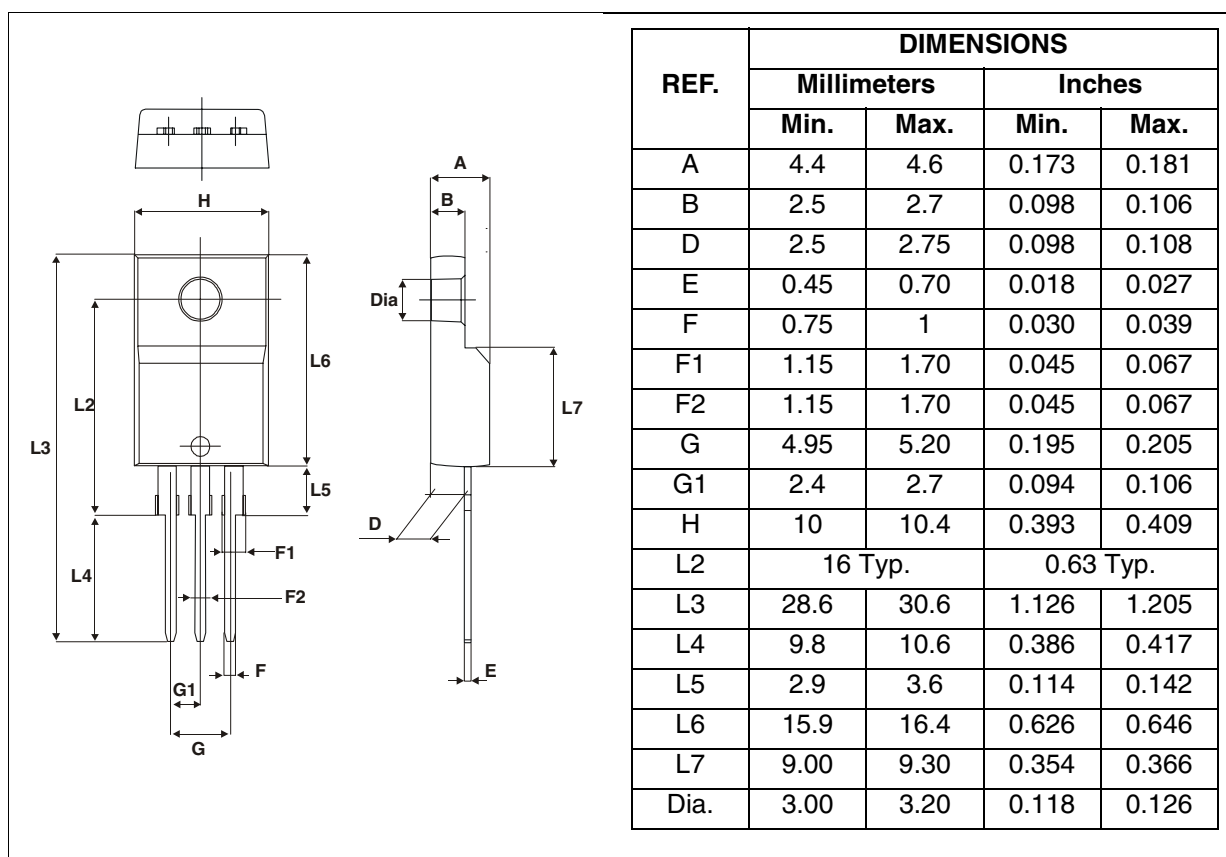


Figure 13: TO-247 Package Mechanical Data

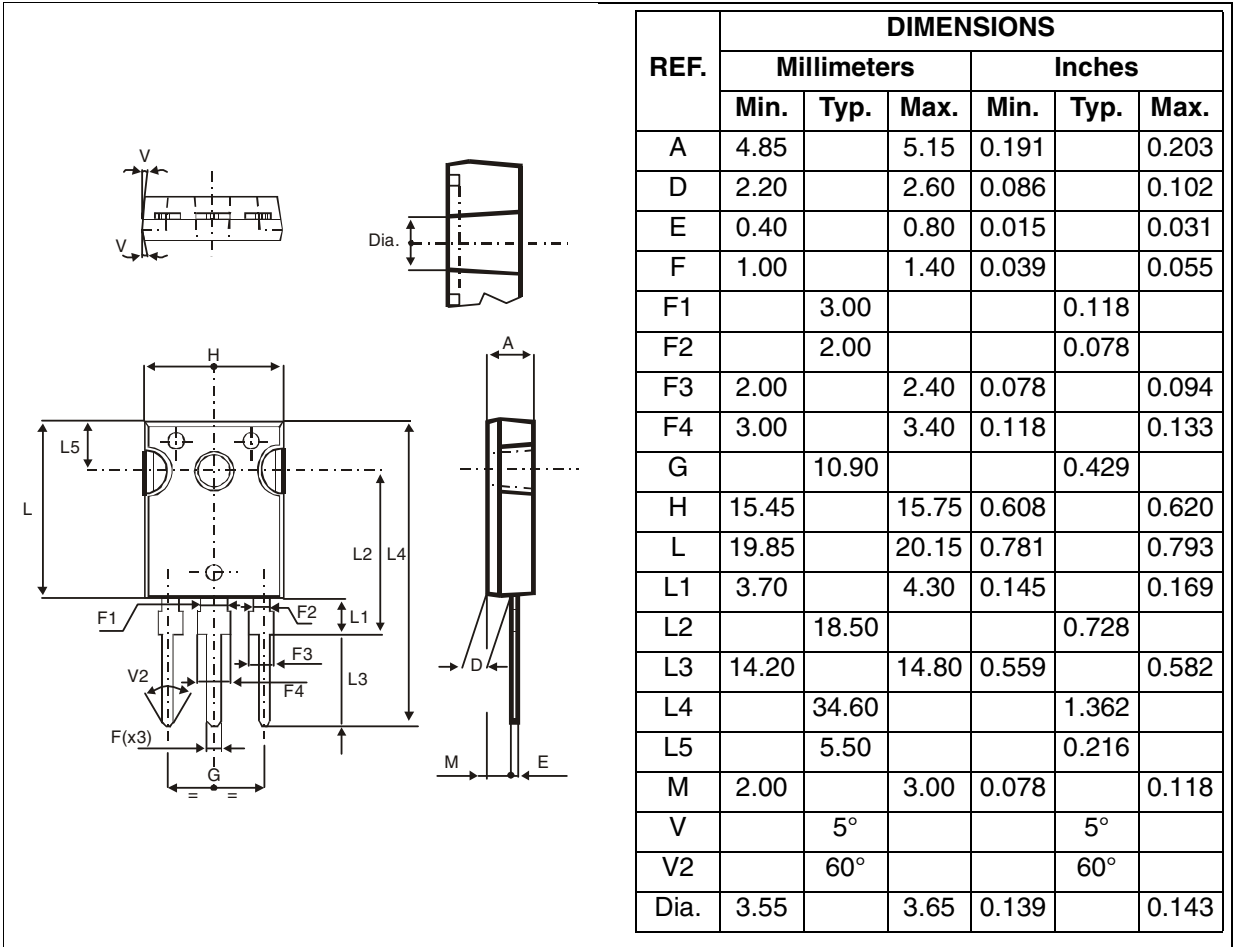


Figure 14: TO-220AB Package Mechanical Data

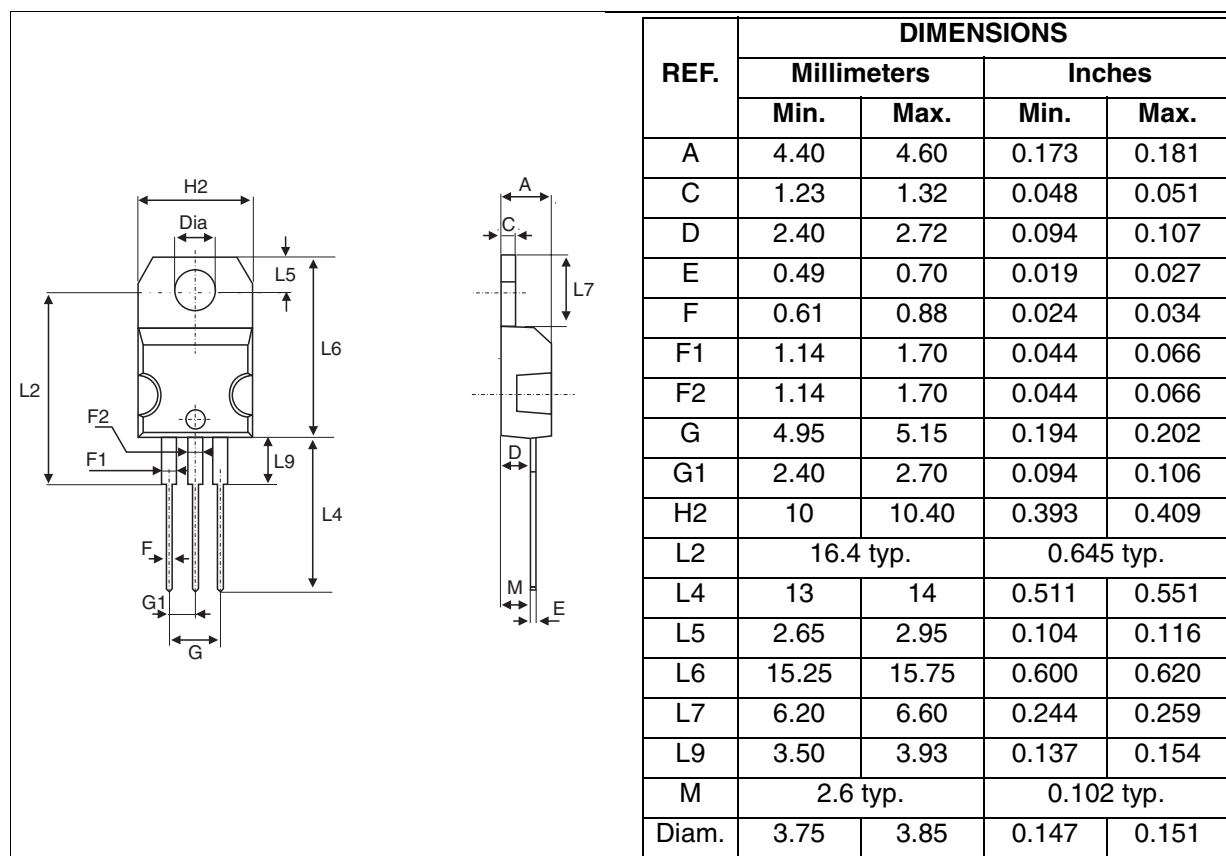


Table 7: Ordering Information

| Ordering type | Marking    | Package    | Weight | Base qty | Delivery mode |
|---------------|------------|------------|--------|----------|---------------|
| STTH40P03ST   | STTH40P03S | TO-220AB   | 2.23 g | 50       | Tube          |
| STTH40P03SFP  | STTH40P03S | TO-220FPAB | 2.0 g  | 50       | Tube          |
| STTH40P03SW   | STTH40P03S | TO-247     | 4.36 g | 30       | Tube          |

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.55 m.N.
- Maximum torque value: 0.70 m.N.

Table 8: Revision History

| Date        | Revision | Description of Changes |
|-------------|----------|------------------------|
| 06-Jul-2005 | 1        | First issue.           |

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