

SNUBBERLESS™ &amp; LOGIC LEVEL

**4A TRIACs**
**Table 1: Main Features**

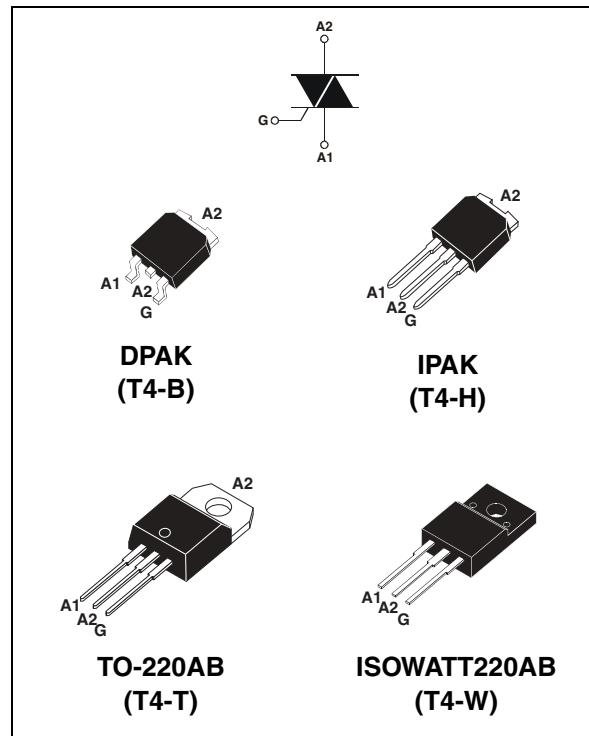
| Symbol            | Value      | Unit |
|-------------------|------------|------|
| $I_{T(RMS)}$      | 4          | A    |
| $V_{DRM}/V_{RRM}$ | 600 to 800 | V    |
| $I_{GT} (Q_1)$    | 5 to 35    | mA   |

**DESCRIPTION**

Based on ST's Snubberless / Logic level technology providing high commutation performances, the T4 series is suitable for use on AC inductive loads.

They are recommended for applications using universal motors, electrovalves.... such as kitchen aid equipments, power tools, dishwashers,...

Available in a fully insulated package, the T4...-...W version complies with UL standards (ref. E81734).


**Table 2: Order Codes**

| Part Number                | Marking |
|----------------------------|---------|
| T405-xxxB                  |         |
| T405-xxxB-TR               |         |
| T405-xxxH                  |         |
| T405-xxxT                  |         |
| T405-xxxW                  |         |
| T410-xxxB                  |         |
| T410-xxxB-TR               |         |
| T410-xxxH                  |         |
| T4105-xxxT                 |         |
| T410-xxxW                  |         |
| T435-xxxB                  |         |
| T435-xxxB-TR               |         |
| T435-xxxH                  |         |
| T435-xxxT                  |         |
| T435-xxxW                  |         |
| See page table 8 on page 9 |         |

## T4 Series

**Table 3: Absolute Maximum Ratings**

| Symbol             | Parameter   |                           |                           | Value | Unit  |
|--------------------|---|---------------------------|---------------------------|-------|---|
| $I_{T(RMS)}$       | RMS on-state current (full sine wave)   | IPAK/DPAK/<br>TO-220AB    | $T_c = 110^\circ\text{C}$ | 4     | A   |
|                    |   | ISOWATT220AB              | $T_c = 105^\circ\text{C}$ |       |   |
| $I_{TSM}$          | Non repetitive surge peak on-state current (full cycle, $T_j$ initial = 25°C)                 | $F = 50 \text{ Hz}$       | $t = 20 \text{ ms}$       | 30    | A   |
|                    |   | $F = 60 \text{ Hz}$       | $t = 16.7 \text{ ms}$     | 31    |   |
| $I^2t$             | $I^2t$ Value for fusing   | $t_p = 10 \text{ ms}$     |                           |       | 5.1 $\text{A}^2\text{s}$                    |
| $dI/dt$            | Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100 \text{ ns}$ | $F = 120 \text{ Hz}$      | $T_j = 125^\circ\text{C}$ | 50    | $\text{A}/\mu\text{s}$                      |
| $I_{GM}$           | Peak gate current   | $t_p = 20 \mu\text{s}$    | $T_j = 125^\circ\text{C}$ | 4     | A   |
| $P_{G(AV)}$        | Average gate power dissipation  | $T_j = 125^\circ\text{C}$ |                           | 1     | W   |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range                    |                           |                           |       | -40 to +150<br>-40 to +125 $^\circ\text{C}$ |

**Tables 4: Electrical Characteristics ( $T_j = 25^\circ\text{C}$ , unless otherwise specified)**

| Symbol         | Test Conditions  | Quadrant     | T4   |      |      | Unit |                  |
|----------------|--|--------------|------|------|------|------|------------------|
|                |  |              | T405 | T410 | T435 |      |                  |
| $I_{GT}$ (1)   | $V_D = 12 \text{ V}$ $R_L = 30 \Omega$                                   | I - II - III | MAX. | 5    | 10   | 35   | mA               |
| $V_{GT}$       |  | I - II - III | MAX. | 1.3  |      |      | V                |
| $V_{GD}$       | $V_D = V_{DRM}$ $R_L = 3.3 \text{ k}\Omega$<br>$T_j = 125^\circ\text{C}$ | I - II - III | MIN. | 0.2  |      |      | V                |
| $I_H$ (2)      | $I_T = 100 \text{ mA}$   |              | MAX. | 10   | 15   | 35   | mA               |
| $I_L$          | $I_G = 1.2 I_{GT}$   | I - III      | MAX. | 10   | 25   | 50   | mA               |
|                |  | II           |      | 15   | 30   | 60   |                  |
| $dV/dt$ (2)    | $V_D = 67 \% V_{DRM}$ gate open<br>$T_j = 125^\circ\text{C}$             |              | MIN. | 20   | 40   | 400  | V/ $\mu\text{s}$ |
| $(dI/dt)c$ (2) | $(dV/dt)c = 0.1 \text{ V}/\mu\text{s}$ $T_j = 125^\circ\text{C}$         |              | MIN. | 1.8  | 2.7  | -    | A/ms             |
|                | $(dV/dt)c = 10 \text{ V}/\mu\text{s}$ $T_j = 125^\circ\text{C}$          |              |      | 0.9  | 2.0  | -    |                  |
|                | Without snubber $T_j = 125^\circ\text{C}$                                |              |      | -    | -    | 2.5  |                  |

**Note 1:** minimum  $I_{GT}$  is guaranteed at 5% of  $I_{GT}$  max.

**Note 2:** for both polarities of A2 referenced to A1.

**Table 5: Static Characteristics**

| <b>Symbol</b>          | <b>Test Conditions</b>   |                           |                           | <b>Value</b> | <b>Unit</b>   |
|------------------------|--------------------------|---------------------------|---------------------------|--------------|---------------|
| $V_T$ (2)              | $I_{TM} = 5.5 \text{ A}$ | $t_p = 380 \mu\text{s}$   | $T_j = 25^\circ\text{C}$  | MAX.         | 1.56          |
| $V_{to}$ (2)           | Threshold voltage        |                           | $T_j = 125^\circ\text{C}$ | MAX.         | 0.89          |
| $R_d$ (2)              | Dynamic resistance       |                           | $T_j = 125^\circ\text{C}$ | MAX.         | 120           |
| $I_{DRM}$<br>$I_{RRM}$ | $V_{DRM} = V_{RRM}$      | $T_j = 25^\circ\text{C}$  | MAX.                      | 5            | $\mu\text{A}$ |
|                        |                          | $T_j = 125^\circ\text{C}$ |                           | 1            | mA            |

**Note 1:** minimum  $I_{GT}$  is guaranteed at 5% of  $I_{GT}$  max.

**Note 2:** for both polarities of A2 referenced to A1.

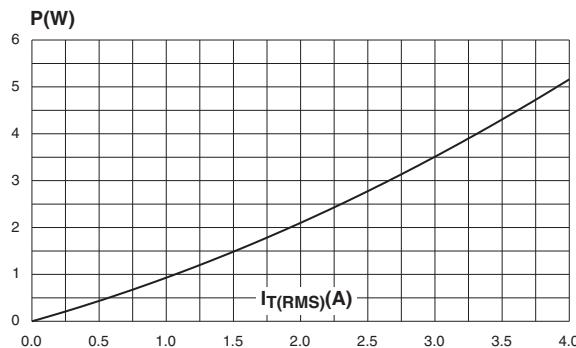
**Table 6: Thermal resistance**

| <b>Symbol</b> | <b>Parameter</b>      |                        |                         | <b>Value</b> | <b>Unit</b>        |
|---------------|-----------------------|------------------------|-------------------------|--------------|--------------------|
| $R_{th(j-c)}$ | Junction to case (AC) |                        | IPAK / DPAK / TO-220AB  | 2.6          | $^\circ\text{C/W}$ |
|               |                       |                        | ISOWATT220AB            | 4.0          |                    |
| $R_{th(j-a)}$ | Junction to ambient   | $S = 0.5 \text{ cm}^2$ | DPAK                    | 70           | $^\circ\text{C/W}$ |
|               |                       |                        | TO-220AB / ISOWATT220AB | 60           |                    |
|               |                       |                        | IPAK                    | 100          |                    |

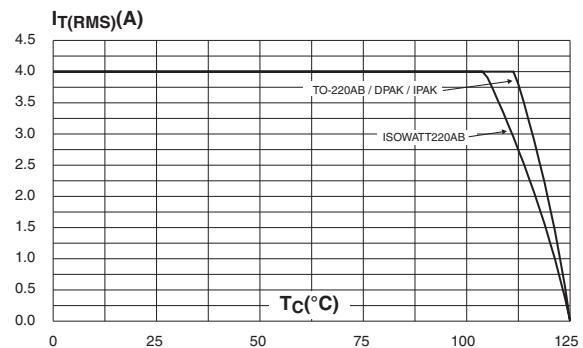
S = Copper surface under tab.

## T4 Series

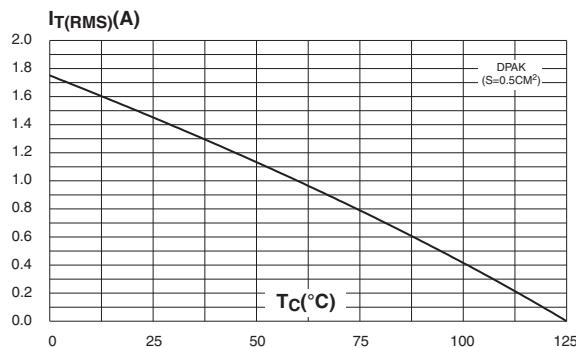
**Figure 1: Maximum power dissipation versus RMS on-state current (full cycle)**



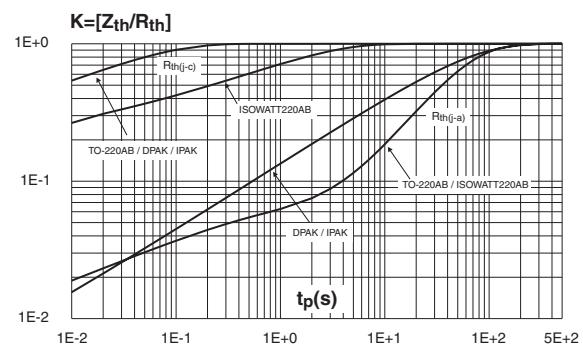
**Figure 2: RMS on-state current versus case temperature (full cycle)**



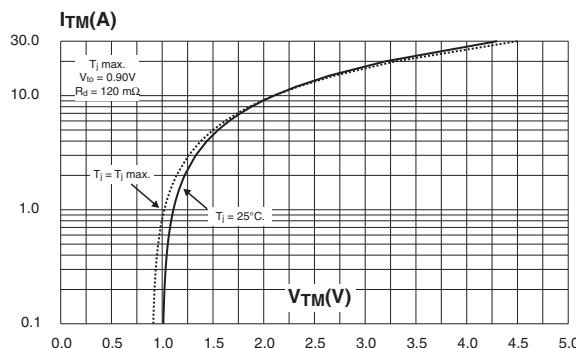
**Figure 3: RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm) (full cycle)**



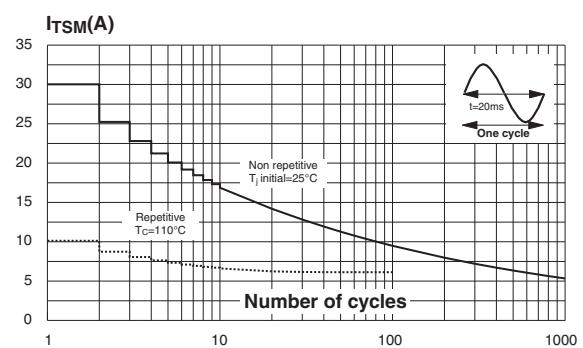
**Figure 4: Relative variation of thermal impedance versus pulse duration**



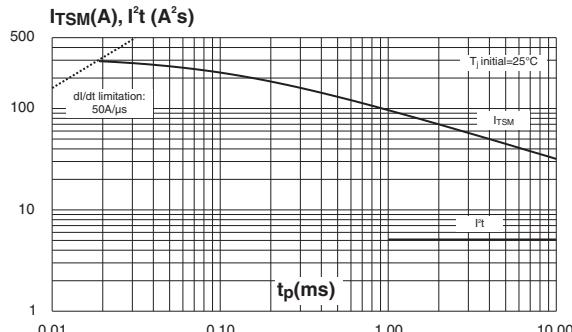
**Figure 5: On-state characteristics (maximum values)**



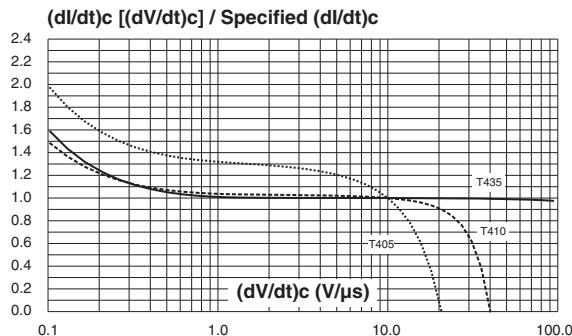
**Figure 6: Surge peak on-state current versus number of cycles**



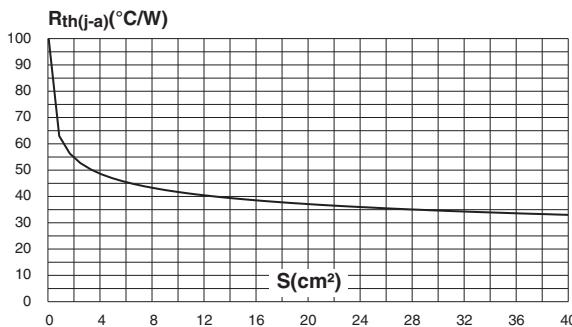
**Figure 7: Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms and corresponding value of  $I^2t$**



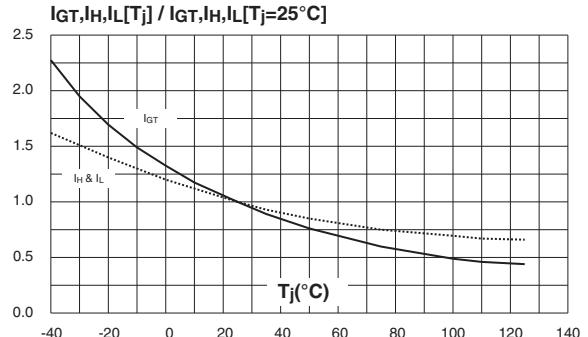
**Figure 9: Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values)**



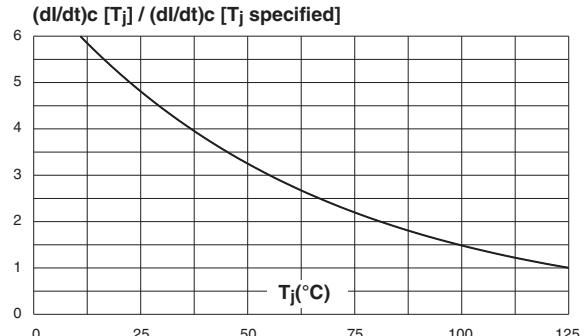
**Figure 11: DPAK thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 μm)**



**Figure 8: Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)**



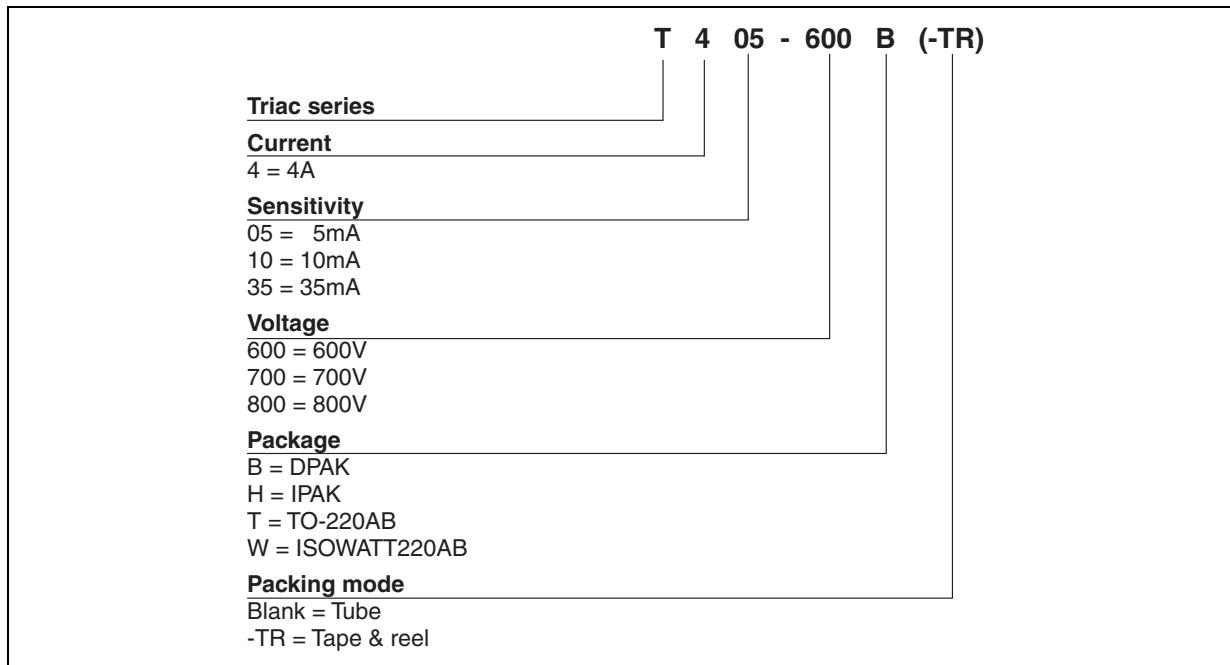
**Figure 10: Relative variation of critical rate of decrease of main current versus junction temperature**



## T4 Series

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**Figure 12: Ordering Information Scheme**

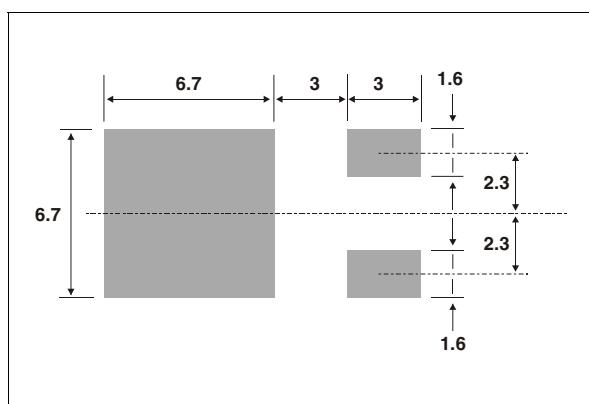


**Table 7: Product Selector**

| Part Number | Voltage (xxx) |       |       | Sensitivity | Type        | Package      |
|-------------|---------------|-------|-------|-------------|-------------|--------------|
|             | 600 V         | 700 V | 800 V |             |             |              |
| T405-xxxB   | X             | X     | X     | 5 mA        | Logic level | DPAK         |
| T405-xxxF   | X             | X     | X     | 5 mA        | Logic level | IPAK         |
| T405-xxxF   | X             | X     | X     | 5 mA        | Logic level | TO-220AB     |
| T405-xxxF   | X             | X     | X     | 5 mA        | Logic level | ISOWATT220AB |
| T410-xxxB   | X             | X     | X     | 10 mA       | Logic level | DPAK         |
| T410-xxxF   | X             | X     | X     | 10 mA       | Logic Level | IPAK         |
| T410-xxxF   | X             | X     | X     | 10 mA       | Logic Level | TO-220AB     |
| T410-xxxF   | X             | X     | X     | 10 mA       | Logic Level | ISOWATT220AB |
| T435-xxxB   | X             | X     | X     | 35 mA       | Snubberless | DPAK         |
| T435-xxxF   | X             | X     | X     | 35 mA       | Snubberless | IPAK         |
| T435-xxxF   | X             | X     | X     | 35 mA       | Snubberless | TO-220AB     |
| T435-xxxF   | X             | X     | X     | 35 mA       | Snubberless | ISOWATT220AB |

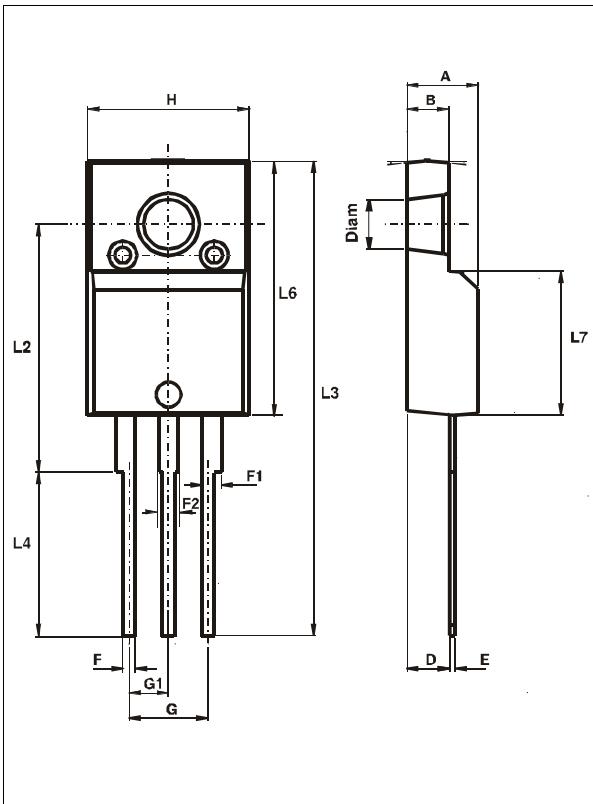
Figure 13: DPAK Package Mechanical Data

| REF. | DIMENSIONS  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max   | Min.       | Max.  |
| A    | 2.20        | 2.40  | 0.086      | 0.094 |
| A1   | 0.90        | 1.10  | 0.035      | 0.043 |
| A2   | 0.03        | 0.23  | 0.001      | 0.009 |
| B    | 0.64        | 0.90  | 0.025      | 0.035 |
| B2   | 5.20        | 5.40  | 0.204      | 0.212 |
| C    | 0.45        | 0.60  | 0.017      | 0.023 |
| C2   | 0.48        | 0.60  | 0.018      | 0.023 |
| D    | 6.00        | 6.20  | 0.236      | 0.244 |
| E    | 6.40        | 6.60  | 0.251      | 0.259 |
| G    | 4.40        | 4.60  | 0.173      | 0.181 |
| H    | 9.35        | 10.10 | 0.368      | 0.397 |
| L2   | 0.80 typ.   |       | 0.031 typ. |       |
| L4   | 0.60        | 1.00  | 0.023      | 0.039 |
| V2   | 0°          | 8°    | 0°         | 8°    |

Figure 14: DPAK Foot Print Dimensions  
(in millimeters)

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Figure 15: ISOWATT220AB Package Mechanical Data



| REF. | DIMENSIONS  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| B    | 2.50        | 2.70  | 0.098      | 0.106 |
| D    | 2.50        | 2.75  | 0.098      | 0.108 |
| E    | 0.40        | 0.70  | 0.016      | 0.028 |
| F    | 0.75        | 1.00  | 0.030      | 0.039 |
| F1   | 1.15        | 1.70  | 0.045      | 0.067 |
| F2   | 1.15        | 1.70  | 0.045      | 0.067 |
| G    | 4.95        | 5.20  | 0.195      | 0.205 |
| G1   | 2.40        | 2.70  | 0.094      | 0.106 |
| H    | 10.00       | 10.40 | 0.394      | 0.409 |
| L2   | 16.00 typ.  |       | 0.630 typ. |       |
| L3   | 28.60       | 30.60 | 1.125      | 1.205 |
| L4   | 9.80        | 10.60 | 0.386      | 0.417 |
| L6   | 15.90       | 16.40 | 0.626      | 0.646 |
| L7   | 9.00        | 9.30  | 0.354      | 0.366 |
| Diam | 3.00        | 3.20  | 0.118      | 0.126 |

Figure 16: IPAK Package Mechanical Data

<img alt="Mechanical drawing of the IPAK package showing top and side views with dimension labels A-A1-A3, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23, A24, A25, A26, A27, A28, A29, A30, A31, A32, A33, A34, A35, A36, A37, A38, A39, A40, A41, A42, A43, A44, A45, A46, A47, A48, A49, A50, A51, A52, A53, A54, A55, A56, A57, A58, A59, A60, A61, A62, A63, A64, A65, A66, A67, A68, A69, A70, A71, A72, A73, A74, A75, A76, A77, A78, A79, A80, A81, A82, A83, A84, A85, A86, A87, A88, A89, A90, A91, A92, A93, A94, A95, A96, A97, A98, A99, A100, A101, A102, A103, A104, A105, A106, A107, A108, A109, A110, A111, A112, A113, A114, A115, A116, A117, A118, A119, A120, A121, A122, A123, A124, A125, A126, A127, A128, A129, A130, A131, A132, A133, A134, A135, A136, A137, A138, A139, A140, A141, A142, A143, A144, A145, A146, A147, A148, A149, A150, A151, A152, A153, A154, A155, A156, A157, A158, A159, A160, A161, A162, A163, A164, A165, A166, A167, 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Figure 17: TO-220AB Package Mechanical Data

| 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    | 2.40        |       | 2.70  | 0.094  |       | 0.106 |
| 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 |
| I3   | 1.14        |       | 1.70  | 0.044  |       | 0.066 |
| M    |             | 2.60  |       |        | 0.102 |       |

Table 8: Ordering Information

| Ordering type | Marking   | Package      | Weight | Base qty | Delivery mode |
|---------------|-----------|--------------|--------|----------|---------------|
| T4xx-yyyB     | T4 xxyy   | DPAK         | 0.3 g  | 75       | Tube          |
| T4xx-yyyB-TR  | T4 xxyy   | DPAK         | 0.3 g  | 2500     | Tape & reel   |
| T4xx-yyyH     | T4 xxyy   | IPAK         | 0.4 g  | 75       | Tube          |
| T4xx-yyyT     | T4xx yyYT | TO-220AB     | 2.3 g  | 50       | Tube          |
| T4xx-yyyB     | T4xxyyW   | ISOWATT220AB | 2.1 g  | 50       | Tube          |

Note: xxx = voltage, yy = sensitivity

Table 9: Revision History

| Date        | Revision | Description of Changes            |
|-------------|----------|-----------------------------------|
| Jun-2003    | 5        | Last update.                      |
| 25-Mar-2005 | 6        | Layout update. No content change. |
| 25-Jan-2005 | 7        | Markings changed in Table 8       |

## T4 Series

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