

# DATA SHEET

## **BUT11APX-1200** Silicon Diffused Power Transistor

Product specification

April 1999



**Silicon Diffused Power Transistor**

**BUT11APX-1200**

**GENERAL DESCRIPTION**

Enhanced performance new generation, high voltage, high-speed switching npn transistor in a plastic full-pack envelope intended for use in horizontal deflection circuits of colour television receivers. Features exceptional tolerance to base drive and collector current load variations resulting in a very low worst case dissipation.

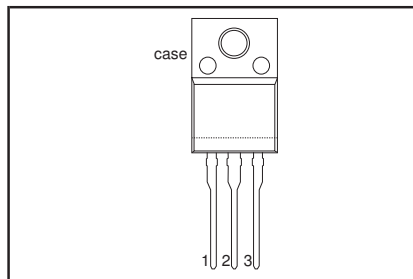
**QUICK REFERENCE DATA**

| SYMBOL      | PARAMETER                             | CONDITIONS                                  | TYP. | MAX. | UNIT |
|-------------|---------------------------------------|---|------|------|------|
| $V_{CESM}$  | Collector-emitter voltage peak value  | $V_{BE} = 0\text{ V}$                       | -    | 1200 | V    |
| $V_{CBO}$   | Collector-Base voltage (open emitter) |   | -    | 1200 | V    |
| $V_{CEO}$   | Collector-emitter voltage (open base) |   | -    | 550  | V    |
| $I_C$       | Collector current (DC)                |   | -    | 6    | A    |
| $I_{CM}$    | Collector current peak value          |   | -    | 10   | A    |
| $P_{tot}$   | Total power dissipation               | $T_{hs} \leq 25\text{ }^\circ\text{C}$      | -    | 32   | W    |
| $V_{CEsat}$ | Collector-emitter saturation voltage  | $I_C = 2\text{ A}; I_B = 0.4\text{ A}$      | 0.15 | 1.0  | V    |
| $h_{FEsat}$ | DC current gain                       | $I_C = 3\text{ A}; V_{CE} = 5\text{ V}$     | 15.5 | -    |      |
| $t_f$       | Fall time                             | $I_C = 2.5\text{ A}; I_{B1} = 0.5\text{ A}$ | 170  | 300  | ns   |

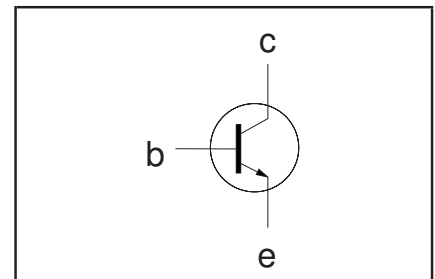
**PINNING - SOT186A**

| PIN  | DESCRIPTION |
|------|-------------|
| 1    | base        |
| 2    | collector   |
| 3    | emitter     |
| case | isolated    |

**PIN CONFIGURATION**



**SYMBOL**



**LIMITING VALUES**

Limiting values in accordance with the Absolute Maximum Rating System (IEC 134)

| SYMBOL     | PARAMETER                                | CONDITIONS                             | MIN. | MAX. | UNIT             |
|------------|--|--|------|------|------------------|
| $V_{CESM}$ | Collector to emitter voltage             | $V_{BE} = 0\text{ V}$                  | -    | 1200 | V                |
| $V_{CEO}$  | Collector to emitter voltage (open base) |  | -    | 550  | V                |
| $V_{CBO}$  | Collector to base voltage (open emitter) |  | -    | 1200 | V                |
| $I_C$      | Collector current (DC)                   |  | -    | 6    | A                |
| $I_{CM}$   | Collector current peak value             |  | -    | 10   | A                |
| $I_B$      | Base current (DC)                        |  | -    | 3    | A                |
| $I_{BM}$   | Base current peak value                  |  | -    | 5    | A                |
| $P_{tot}$  | Total power dissipation                  | $T_{hs} \leq 25\text{ }^\circ\text{C}$ | -    | 32   | W                |
| $T_{stg}$  | Storage temperature                      |  | -65  | 150  | $^\circ\text{C}$ |
| $T_j$      | Junction temperature                     |  | -    | 150  | $^\circ\text{C}$ |

**THERMAL RESISTANCES**

| SYMBOL         | PARAMETER            | CONDITIONS             | TYP. | MAX. | UNIT |
|----------------|----------------------|------------------------|------|------|------|
| $R_{th\ j-hs}$ | Junction to heatsink | with heatsink compound | -    | 3.95 | K/W  |
| $R_{th\ j-a}$  | Junction to ambient  | in free air            | 55   | -    | K/W  |

## Silicon Diffused Power Transistor

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**ISOLATION LIMITING VALUE & CHARACTERISTIC** $T_{hs} = 25\text{ °C}$  unless otherwise specified

| SYMBOL     | PARAMETER  | CONDITIONS   | MIN. | TYP. | MAX. | UNIT |
|------------|--|--|------|------|------|------|
| $V_{isol}$ | R.M.S. isolation voltage from all three terminals to external heatsink | $f = 50\text{-}60\text{ Hz}$ ; sinusoidal waveform;<br>$R.H. \leq 65\%$ ; clean and dustfree | -    | -    | 2500 | V    |
| $C_{isol}$ | Capacitance from T2 to external heatsink                               | $f = 1\text{ MHz}$   | -    | 10   | -    | pF   |

**STATIC CHARACTERISTICS** $T_{hs} = 25\text{ °C}$  unless otherwise specified

| SYMBOL        | PARAMETER                              | CONDITIONS  | MIN. | TYP. | MAX. | UNIT |
|---------------|--|---|------|------|------|------|
| $I_{CES}$     | Collector cut-off current <sup>1</sup> | $V_{BE} = 0\text{ V}$ ; $V_{CE} = V_{CESMmax}$                          | -    | -    | 1.0  | mA   |
| $I_{CES}$     |  | $V_{BE} = 0\text{ V}$ ; $V_{CE} = V_{CESMmax}$<br>$T_j = 125\text{ °C}$ | -    | -    | 2.0  | mA   |
| $I_{EBO}$     | Emitter cut-off current                | $V_{EB} = 7\text{ V}$ ; $I_C = 0\text{ A}$                              | -    | -    | 0.1  | mA   |
| $V_{CEOsust}$ | Collector-emitter sustaining voltage   | $I_B = 0\text{ A}$ ; $I_C = 10\text{ mA}$ ;<br>$L = 25\text{ mH}$       | 550  | -    | -    | V    |
| $V_{CEsat}$   | Collector-emitter saturation voltage   | $I_C = 2.0\text{ A}$ ; $I_B = 0.4\text{ A}$                             | -    | 0.15 | 1.0  | V    |
| $V_{BEsat}$   | Base-emitter saturation voltage        | $I_C = 2.0\text{ A}$ ; $I_B = 0.4\text{ A}$                             | -    | 0.91 | 1.5  | V    |
| $h_{FE}$      | DC current gain                        | $I_C = 1\text{ mA}$ ; $V_{CE} = 5\text{ V}$                             | 13   | 25   | -    |      |
| $h_{FE}$      |  | $I_C = 500\text{ mA}$ ; $V_{CE} = 5\text{ V}$                           | 20   | 30   | 47   |      |
| $h_{FEsat}$   | DC current gain                        | $I_C = 2\text{ A}$ ; $V_{CE} = 5\text{ V}$                              | 13   | 18.5 | 25   |      |
| $h_{FEsat}$   |  | $I_C = 3.0\text{ A}$ ; $V_{CE} = 5\text{ V}$                            | -    | 15.5 | -    |      |

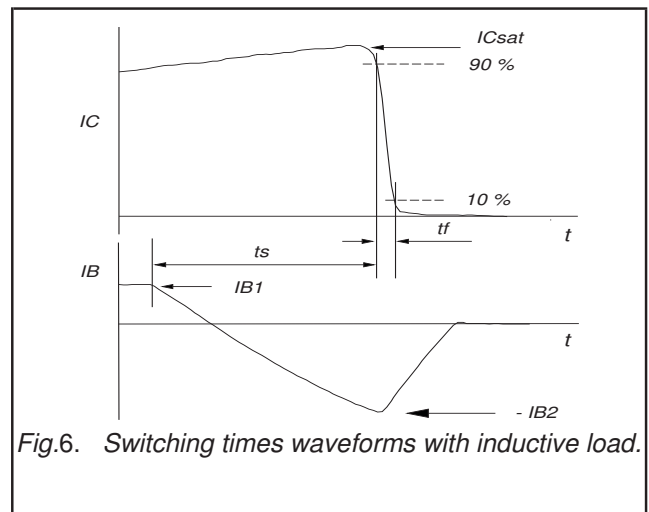
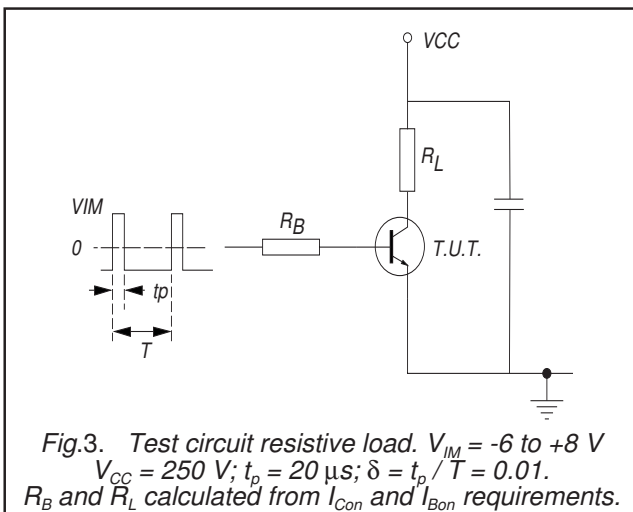
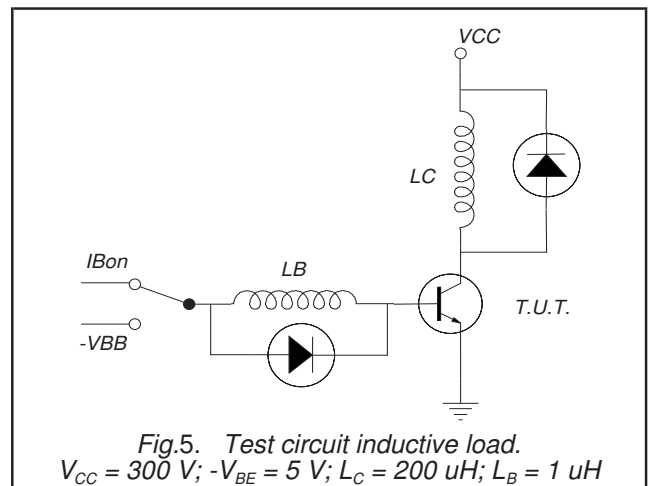
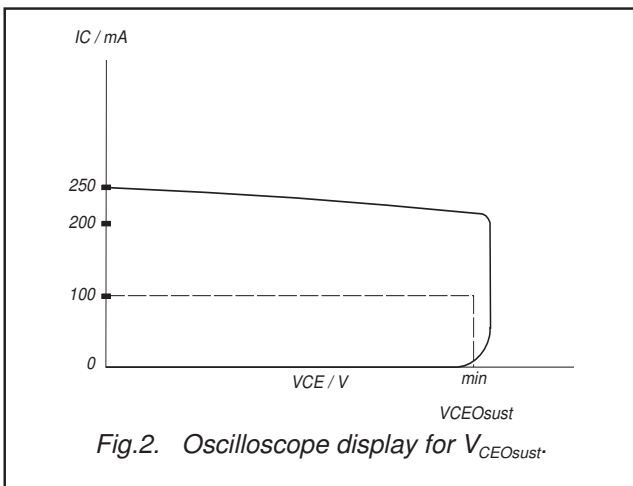
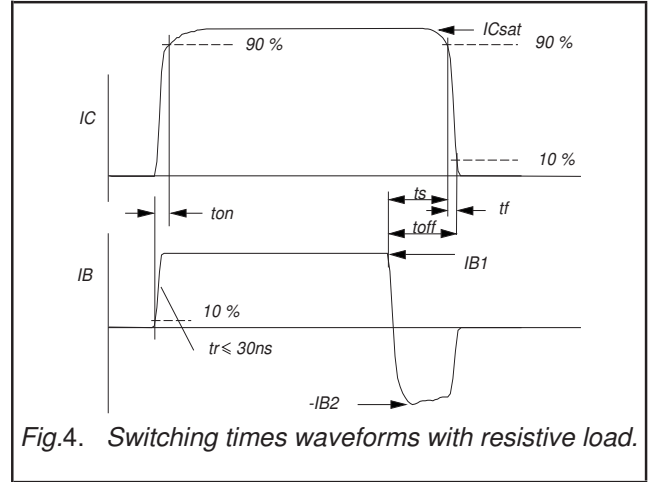
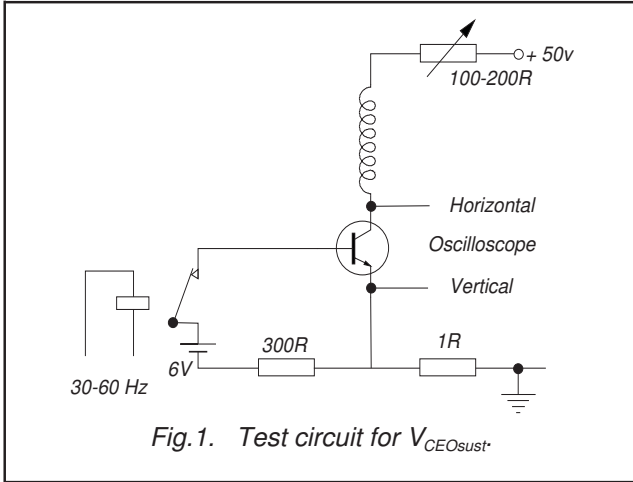
**DYNAMIC CHARACTERISTICS** $T_{hs} = 25\text{ °C}$  unless otherwise specified<sup>8</sup>

| SYMBOL   | PARAMETER                        | CONDITIONS   | TYP. | MAX. | UNIT          |
|----------|----------------------------------|--|------|------|---------------|
|          | Switching times (resistive load) | $I_{Con} = 2.5\text{ A}$ ; $I_{Bon} = -I_{Boff} = 0.5\text{ A}$ ;<br>$R_L = 75\text{ ohms}$ ; $V_{BB2} = 4\text{ V}$ ;                 |      |      |               |
| $t_{on}$ | Turn-on time                     |  | -    | 0.5  | $\mu\text{s}$ |
| $t_s$    | Turn-off storage time            |  | -    | 3    | $\mu\text{s}$ |
| $t_f$    | Turn-off fall time               |  | -    | 0.3  | $\mu\text{s}$ |
|          | Switching times (inductive load) | $I_{Csat} = 2.5\text{ A}$ ; $I_{B1} = 0.5\text{ A}$ ; $L_B = 1\text{ }\mu\text{H}$ ;<br>$-V_{BB} = 5\text{ V}$                         |      |      |               |
| $t_s$    | Turn-off storage time            |  | -    | 1.5  | $\mu\text{s}$ |
| $t_f$    | Turn-off fall time               |  | 170  | 300  | ns            |
|          | Switching times (inductive load) | $I_{Csat} = 2.5\text{ A}$ ; $I_{B1} = 0.5\text{ A}$ ; $L_B = 1\text{ }\mu\text{H}$ ;<br>$-V_{BB} = 5\text{ V}$ ; $T_j = 100\text{ °C}$ |      |      |               |
| $t_s$    | Turn-off storage time            |  | -    | 1.8  | $\mu\text{s}$ |
| $t_f$    | Turn-off fall time               |  | -    | 300  | ns            |

<sup>1</sup> Measured with half sine-wave voltage (curve tracer).

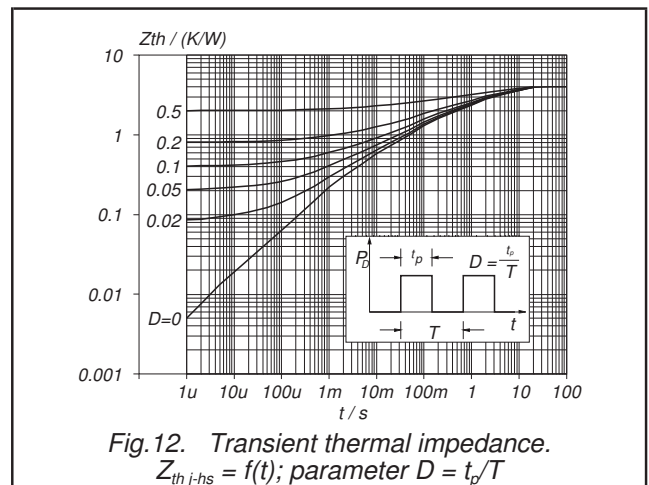
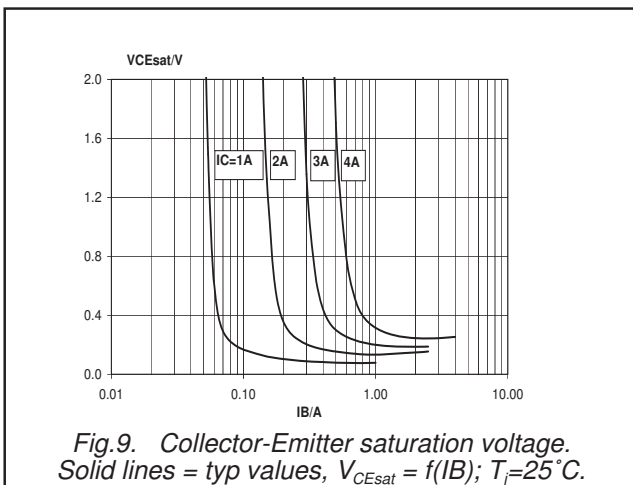
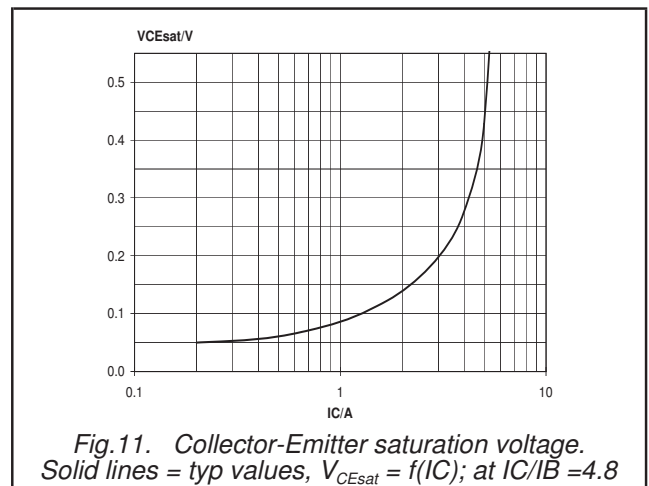
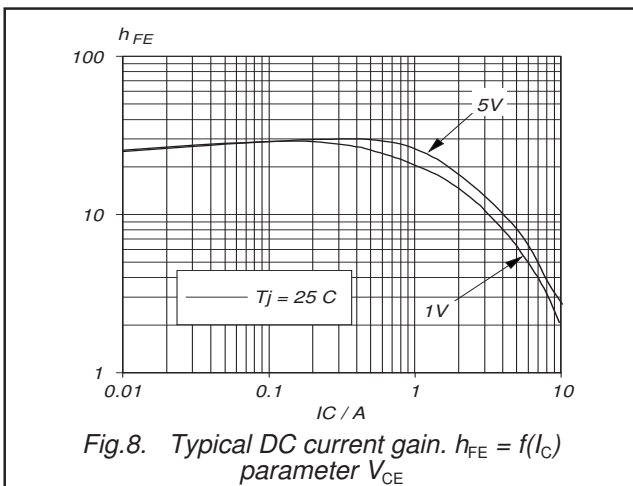
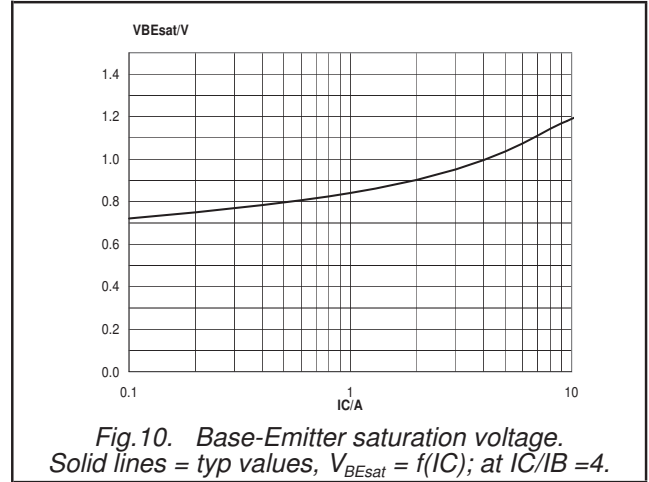
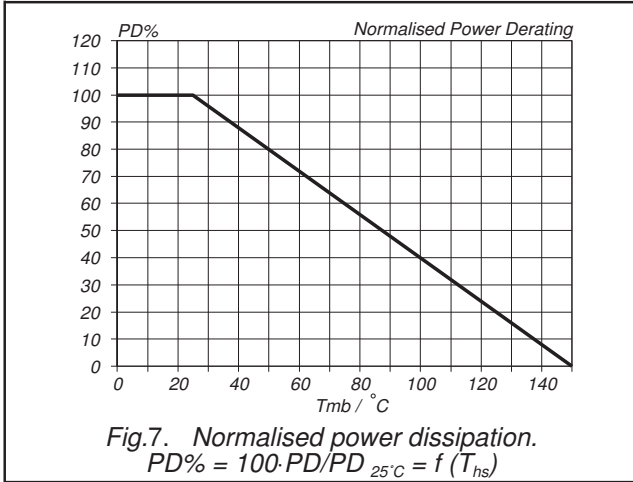
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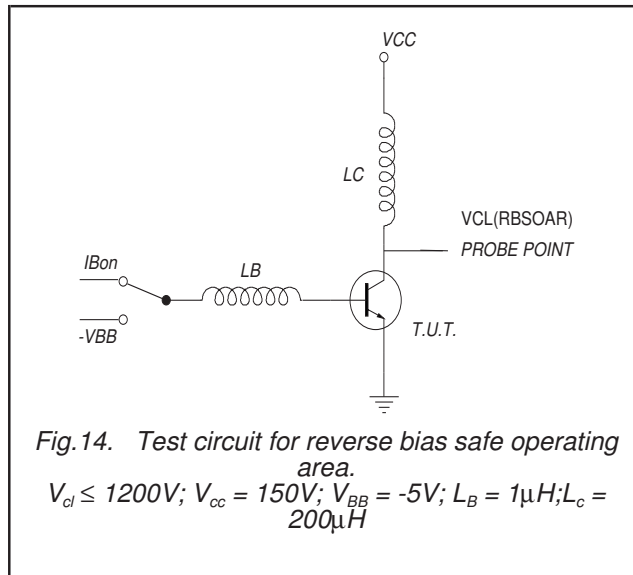
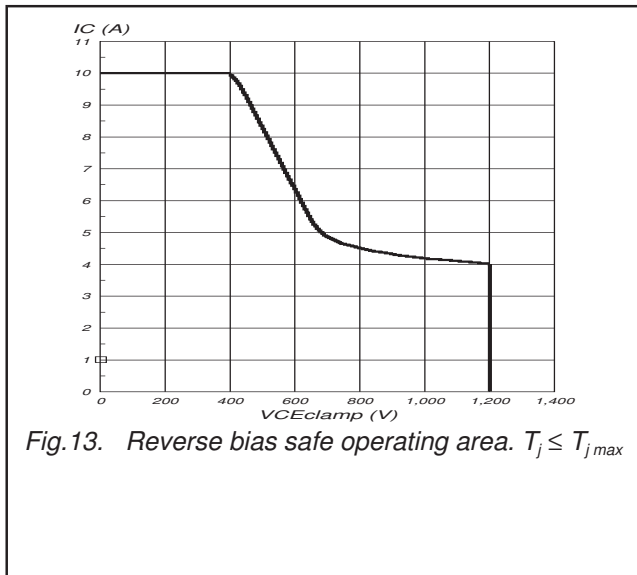
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**MECHANICAL DATA**

Dimensions in mm

Net Mass: 2 g

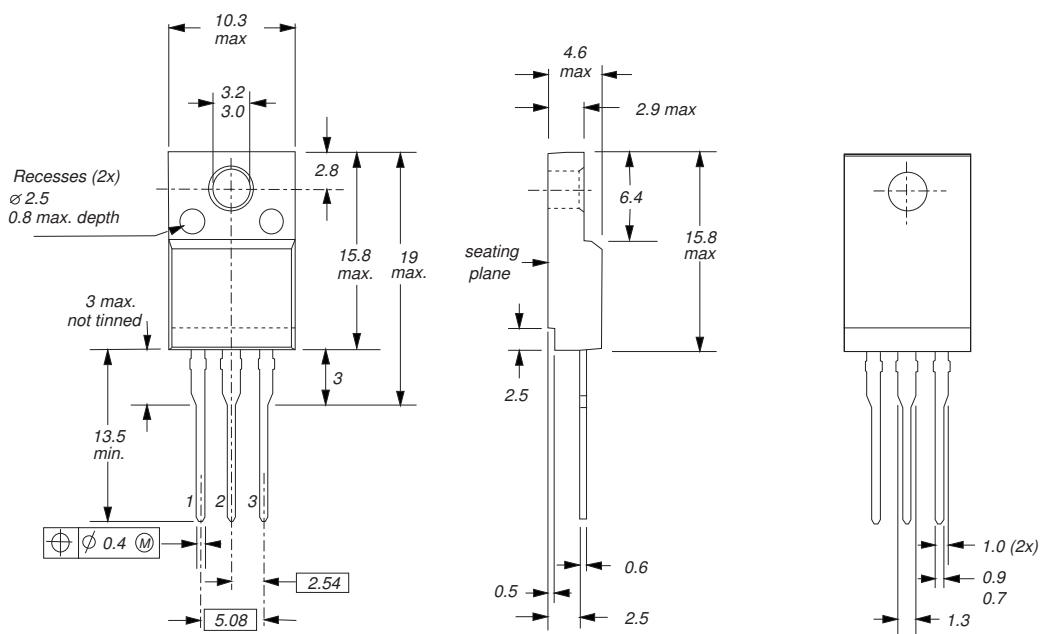


Fig. 15. SOT186A; The seating plane is electrically isolated from all terminals.

**Notes**

1. Refer to mounting instructions for F-pack envelopes.
2. Epoxy meets UL94 V0 at 1/8".

## Legal information

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|--------------------------------|-------------------------------|---|
| Objective data sheet           | Development                   | This document contains data from the objective specification for product development. |
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| Product data sheet             | Production                    | This document contains the product specification.                                     |

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