

## Silicon Diffused Power Transistor

BU2515AF

## GENERAL DESCRIPTION

New generation, high-voltage, high-speed switching npn transistor in a plastic full-pack envelope intended for use in horizontal deflection circuits of pc monitors.

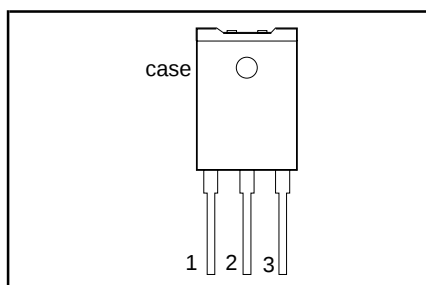
## QUICK REFERENCE DATA

| SYMBOL      | PARAMETER                             | CONDITIONS                                   | TYP. | MAX. | UNIT          |
|-------------|---------------------------------------|----------------------------------------------|------|------|---------------|
| $V_{CESM}$  | Collector-emitter voltage peak value  | $V_{BE} = 0\text{ V}$                        | -    | 1500 | V             |
| $V_{CEO}$   | Collector-emitter voltage (open base) |                                              | -    | 800  | V             |
| $I_C$       | Collector current (DC)                |                                              | -    | 9    | A             |
| $I_{CM}$    | Collector current peak value          |                                              | -    | 20   | A             |
| $P_{tot}$   | Total power dissipation               | $T_{hs} \leq 25\text{ }^{\circ}\text{C}$     | -    | 45   | W             |
| $V_{CESat}$ | Collector-emitter saturation voltage  | $I_C = 4.5\text{ A}; I_B = 0.9\text{ A}$     | -    | 5.0  | V             |
| $I_{Csat}$  | Collector saturation current          | $f = 56\text{ kHz}$                          | 4.5  | -    | A             |
| $t_f$       | Fall time                             | $I_{Csat} = 4.5\text{ A}; f = 56\text{ kHz}$ | 0.2  | 0.4  | $\mu\text{s}$ |

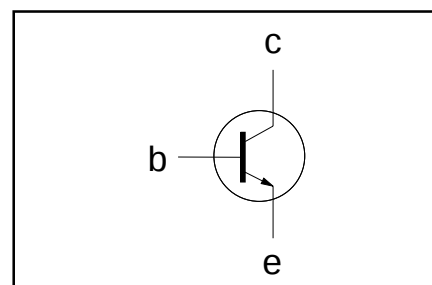
## PINNING - SOT199

| 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-emitter voltage peak value         | $V_{BE} = 0\text{ V}$                    | -    | 1500 | V                  |
| $V_{CEO}$    | Collector-emitter voltage (open base)        |                                          | -    | 800  | V                  |
| $I_C$        | Collector current (DC)                       |                                          | -    | 9    | A                  |
| $I_{CM}$     | Collector current peak value                 |                                          | -    | 20   | A                  |
| $I_B$        | Base current (DC)                            |                                          | -    | 5    | A                  |
| $I_{BM}$     | Base current peak value                      |                                          | -    | 7.5  | A                  |
| $-I_{B(AV)}$ | Reverse base current                         | average over any 20 ms period            | -    | 125  | mA                 |
| $-I_{BM}$    | Reverse base current peak value <sup>1</sup> |                                          | -    | 6    | A                  |
| $P_{tot}$    | Total power dissipation                      | $T_{hs} \leq 25\text{ }^{\circ}\text{C}$ | -    | 45   | W                  |
| $T_{stg}$    | Storage temperature                          |                                          | -55  | 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 | -    | 2.8  | K/W  |
| $R_{th\ j-a}$  | Junction to ambient  | in free air            | 35   | -    | K/W  |

<sup>1</sup> Turn-off current.

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## ISOLATION LIMITING VALUE &amp; CHARACTERISTIC

 $T_{hs} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

| SYMBOL     | PARAMETER                                                             | CONDITIONS                            | MIN. | TYP. | MAX. | UNIT |
|------------|-----------------------------------------------------------------------|---------------------------------------|------|------|------|------|
| $V_{isol}$ | Repetitive peak voltage from all three terminals to external heatsink | R.H. $\leq 65\%$ ; clean and dustfree | -    |      | 2500 | V    |
| $C_{isol}$ | Capacitance from T2 to external heatsink                              | $f = 1\text{ MHz}$                    | -    | 22   | -    | pF   |

## STATIC CHARACTERISTICS

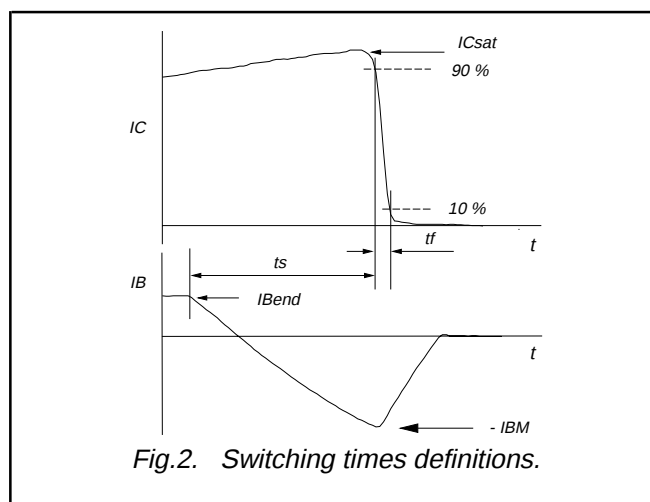
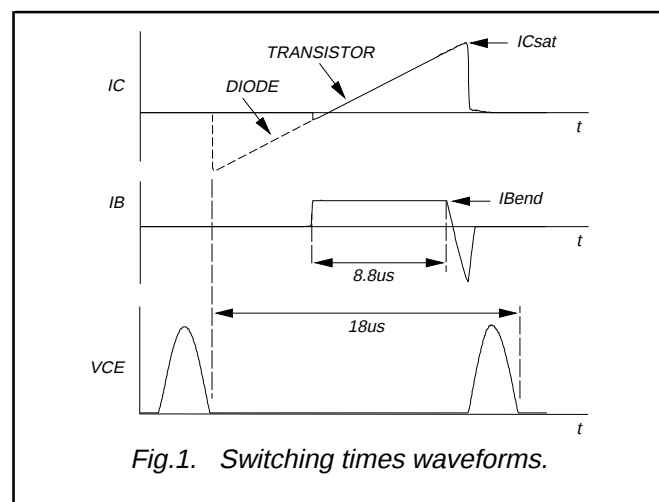
 $T_{hs} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

| SYMBOL      | PARAMETER                              | CONDITIONS                                                                         | MIN. | TYP. | MAX. | UNIT |
|-------------|----------------------------------------|------------------------------------------------------------------------------------|------|------|------|------|
| $I_{CES}$   | Collector cut-off current <sup>2</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>$T_J = 125\text{ }^{\circ}\text{C}$ | -    | -    | 2.0  | mA   |
| $I_{EBO}$   | Emitter cut-off current                | $V_{EB} = 7.5\text{ V}; I_C = 0\text{ A}$                                          | -    | -    | 1.0  | mA   |
| $BV_{EBO}$  | Emitter-base breakdown voltage         | $I_B = 1\text{ mA}$                                                                | 7.5  | 13.5 | -    | V    |
| $V_{CESat}$ | Collector-emitter saturation voltage   | $I_C = 4.5\text{ A}; I_B = 0.9\text{ A}$                                           | -    | -    | 5.0  | V    |
| $V_{BEsat}$ | Base-emitter saturation voltage        | $I_C = 4.5\text{ A}; I_B = 0.9\text{ A}$                                           | -    | -    | 1.0  | V    |
| $h_{FE}$    | DC current gain                        | $I_C = 500\text{ mA}; V_{CE} = 5\text{ V}$                                         | -    | 17.2 | -    |      |
| $h_{FE}$    |                                        | $I_C = 4.5\text{ A}; V_{CE} = 5\text{ V}$                                          | 5    | 8.2  | 10.8 |      |

## DYNAMIC CHARACTERISTICS

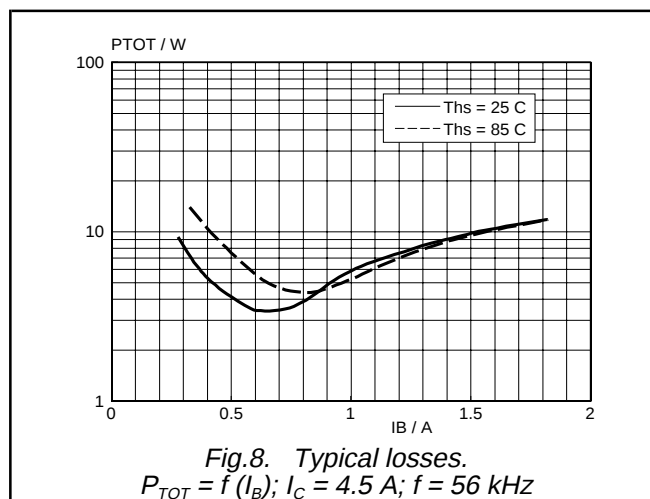
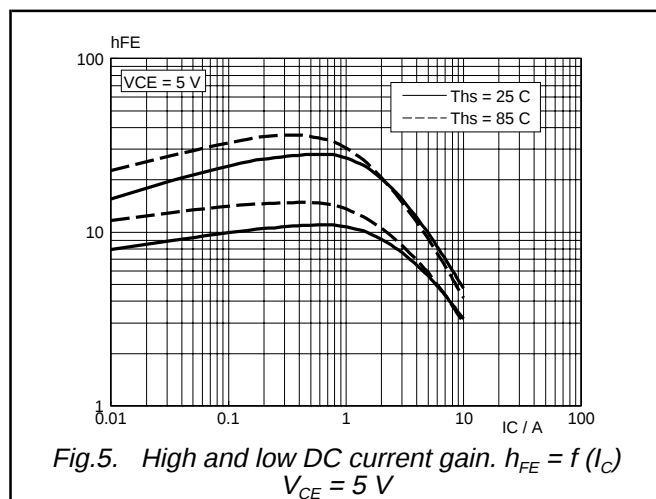
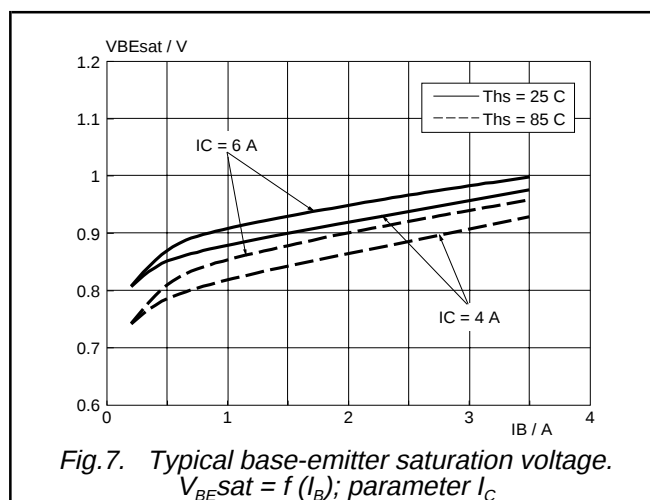
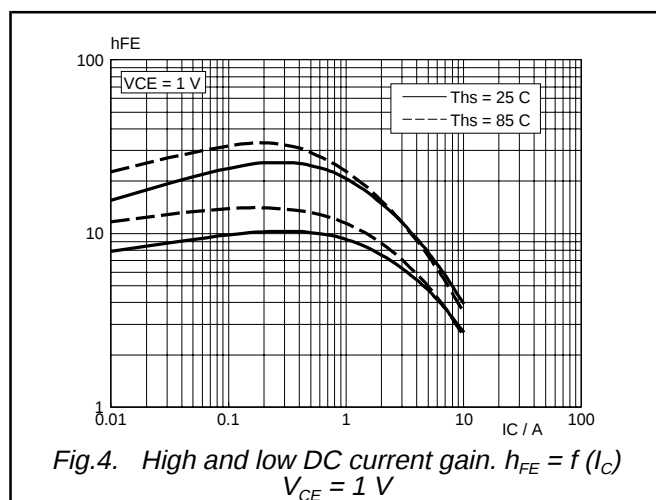
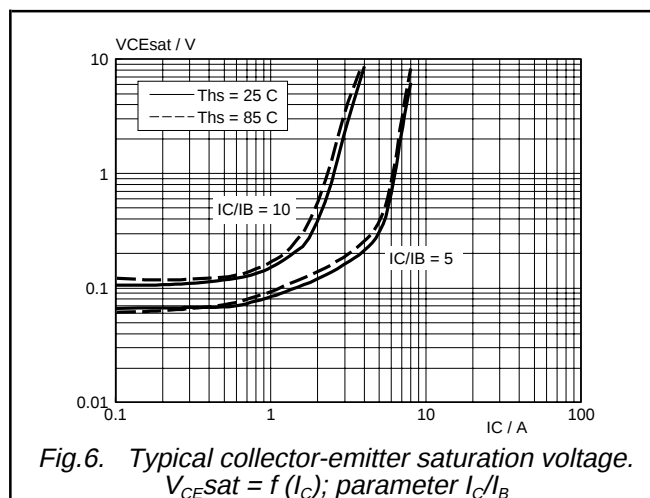
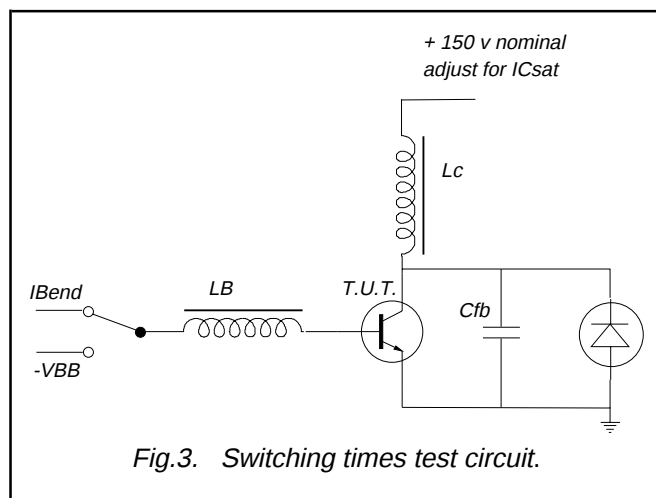
 $T_{hs} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

| SYMBOL | PARAMETER                                        | CONDITIONS                                                                                                                                                                                       | TYP. | MAX. | UNIT          |
|--------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|---------------|
|        | Switching times (56 kHz line deflection circuit) | $I_{Csat} = 4.5\text{ A}; L_C = 250\text{ }\mu\text{H}; C_{fb} = 4\text{ nF};$<br>$I_{B(end)} = 0.65\text{ A}; L_B = 1.5\text{ }\mu\text{H};$<br>$-V_{BB} = -4\text{ V}; -I_{BM} = 2.7\text{ A}$ |      |      |               |
| $t_s$  | Turn-off storage time                            |                                                                                                                                                                                                  | 2.2  | 3.0  | $\mu\text{s}$ |
| $t_f$  | Turn-off fall time                               |                                                                                                                                                                                                  | 0.2  | 0.4  | $\mu\text{s}$ |

<sup>2</sup> Measured with half sine-wave voltage (curve tracer).

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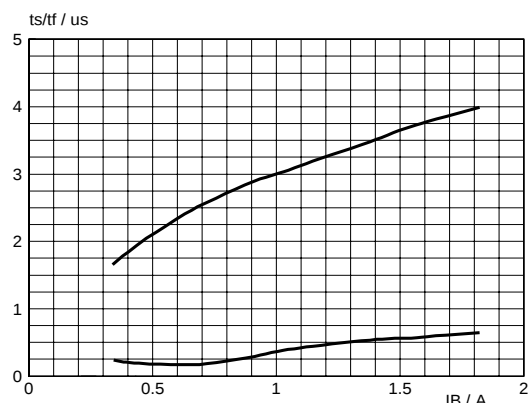


Fig.9. Typical collector storage and fall time.  
 $t_s = f(I_B)$ ;  $t_f = f(I_B)$ ;  $I_C = 4.5 \text{ A}$ ;  $T_j = 85^\circ\text{C}$ ;  $f = 56 \text{ kHz}$

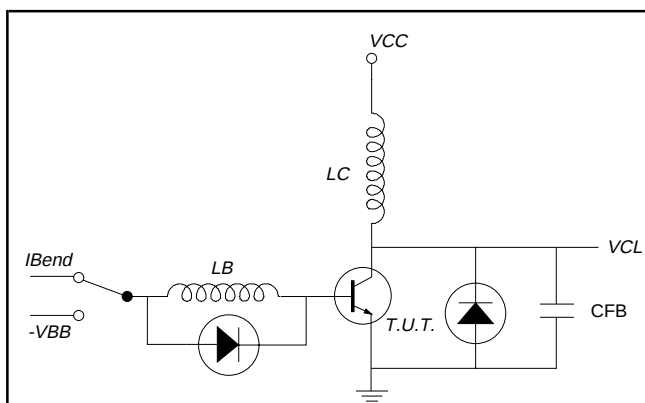


Fig.12. Test Circuit RBSOA.  $V_{CC} = 150 \text{ V}$ ;  
 $-V_{BB} = 1 - 5 \text{ V}$ ;  
 $L_C = 1.5 \text{ mH}$ ;  $V_{CL} = 1450 \text{ V}$ ;  $L_B = 0.3 - 2 \mu\text{H}$ ;  
 $C_{FB} = 0.5 - 8 \text{ nF}$ ;  $I_{B(\text{end})} = 0.65 - 1.3 \text{ A}$

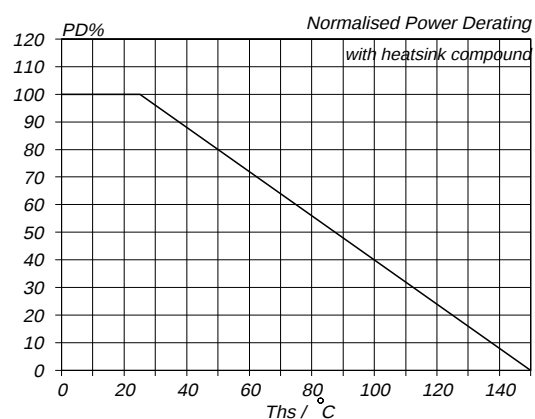


Fig.10. Normalised power dissipation.  
 $PD\% = 100 \cdot P_D / P_{D 25^\circ\text{C}} = f(T_{mb})$

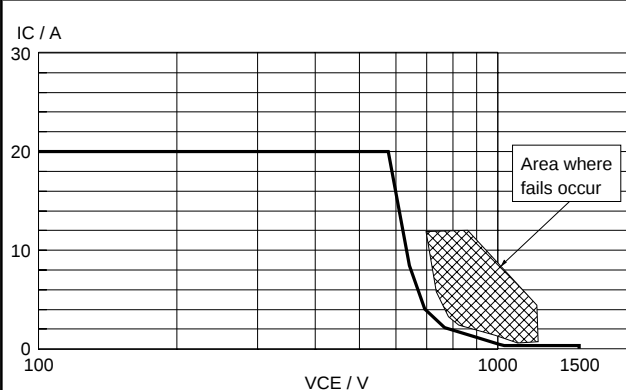


Fig.13. Reverse bias safe operating area.  $T_j \leq T_{j\text{max}}$

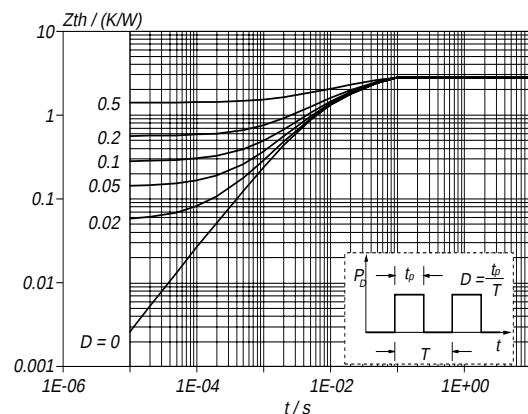


Fig.11. Transient thermal impedance.  
 $Z_{th j-hs} = f(t)$ ; parameter  $D = t_p / T$

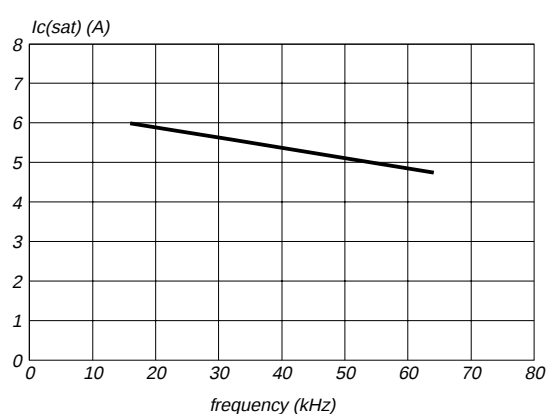
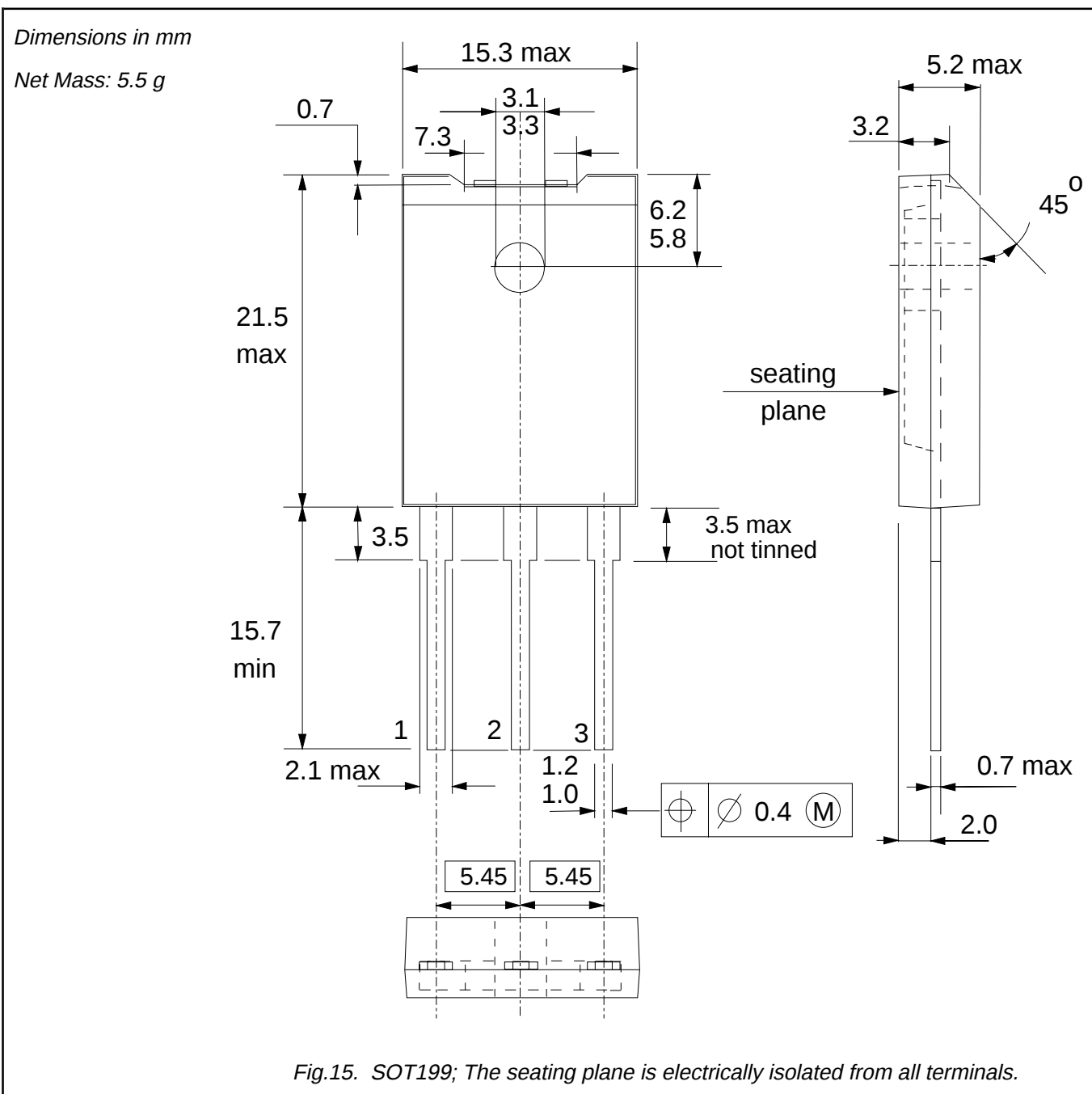


Fig.14.  $I_{C\text{sat}}$  during normal running vs. frequency of operation for optimum performance

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## MECHANICAL DATA



## Notes

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

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**DEFINITIONS**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Data sheet status</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                       |
| Objective specification                                                                                                                                                                                                                                                                                                                                                                                                                                    | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification                                                                                                                                                                                                                                                                                                                                                                                                                                  | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification                                                                                                                                                                                                                                                                                                                                                                                                                                      | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                       |
| Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |                                                                                       |
| <b>Application information</b>                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                       |
| Where application information is given, it is advisory and does not form part of the specification.                                                                                                                                                                                                                                                                                                                                                        |                                                                                       |
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