

Silicon Diffused Power Transistor

BU508AF

GENERAL DESCRIPTION

High voltage, high-speed switching npn transistors in a fully isolated SOT199 envelope, primarily for use in horizontal deflection circuits of colour television receivers.

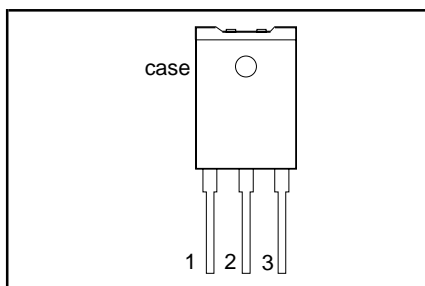
QUICK REFERENCE DATA

| 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) | | - | 700 | V |
| I_C | Collector current (DC) | | - | 8 | A |
| I_{CM} | Collector current peak value | | - | 15 | A |
| P_{tot} | Total power dissipation | $T_{hs} \leq 25\text{ °C}$ | - | 34 | W |
| V_{CESat} | Collector-emitter saturation voltage | $I_C = 4.5\text{ A}; I_B = 1.6\text{ A}$ | - | 1.0 | V |
| I_{Csat} | Collector saturation current | $f = 16\text{ kHz}$ | 4.5 | - | A |
| t_f | Fall time | $I_{Csat} = 4.5\text{ A}; f = 16\text{ kHz}$ | 0.7 | - | μs |

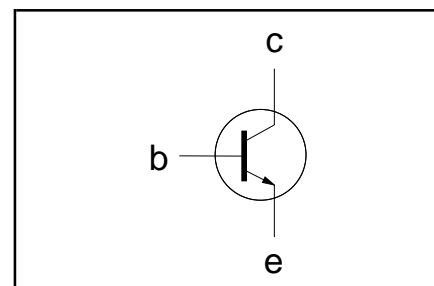
PINNING - SOT199

| 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) | | - | 700 | V |
| I_C | Collector current (DC) | | - | 8 | A |
| I_{CM} | Collector current peak value | | - | 15 | A |
| I_B | Base current (DC) | | - | 4 | A |
| I_{BM} | Base current peak value | | - | 6 | A |
| P_{tot} | Total power dissipation | $T_{hs} \leq 25\text{ °C}$ | - | 34 | 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 | without heatsink compound | - | 3.7 | K/W |
| $R_{th\ j-hs}$ | Junction to heatsink | with heatsink compound | - | 2.8 | K/W |
| $R_{th\ j-a}$ | Junction to ambient | in free air | 35 | - | K/W |

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ISOLATION LIMITING VALUE & 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 ¹ | $V_{BE} = 0\text{ V}; V_{CE} = V_{CESMmax}$ | - | - | 1.0 | mA |
| I_{CES} | | $V_{BE} = 0\text{ V}; V_{CE} = V_{CESMmax}$ $T_j = 125\text{ }^{\circ}\text{C}$ | - | - | 2.0 | mA |
| I_{EBO} | Emitter cut-off current | $V_{EB} = 6.0\text{ V}; I_C = 0\text{ A}$ | - | - | 10 | mA |
| V_{CEOsus} | Collector-emitter sustaining voltage | $I_B = 0\text{ A}; I_C = 100\text{ mA};$ $L = 25\text{ mH}$ | 700 | - | - | V |
| V_{CEsat} | Collector-emitter saturation voltages | $I_C = 4.5\text{ A}; I_B = 1.6\text{ A}$ | - | - | 1.0 | V |
| V_{BEsat} | Base-emitter saturation voltage | $I_C = 4.5\text{ A}; I_B = 2\text{ A}$ | - | - | 1.1 | V |
| h_{FE} | DC current gain | $I_C = 100\text{ mA}; V_{CE} = 5\text{ V}$ | 6 | 13 | 30 | - |

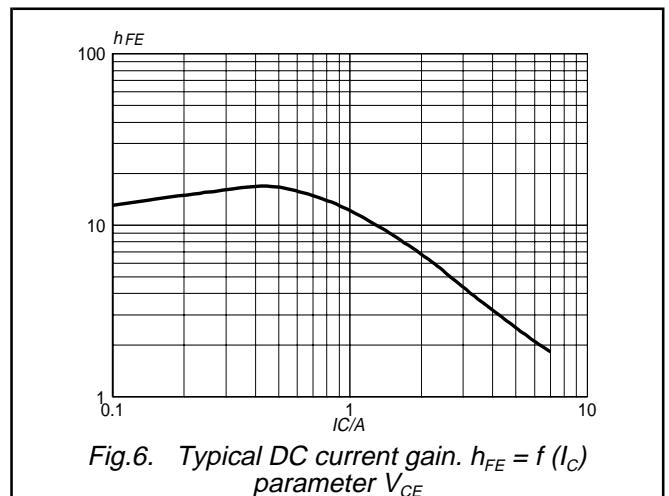
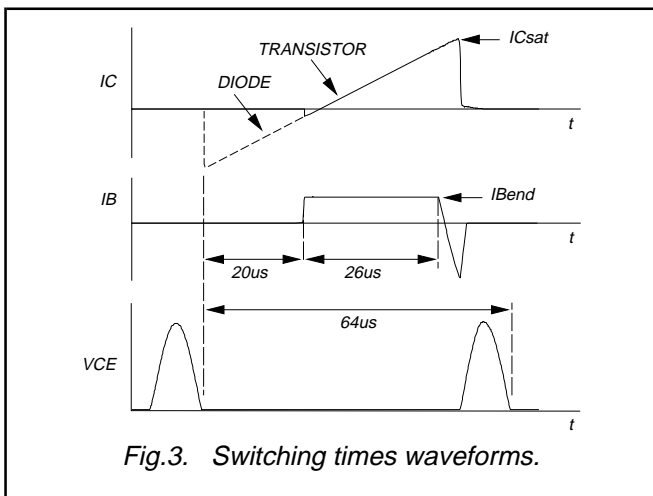
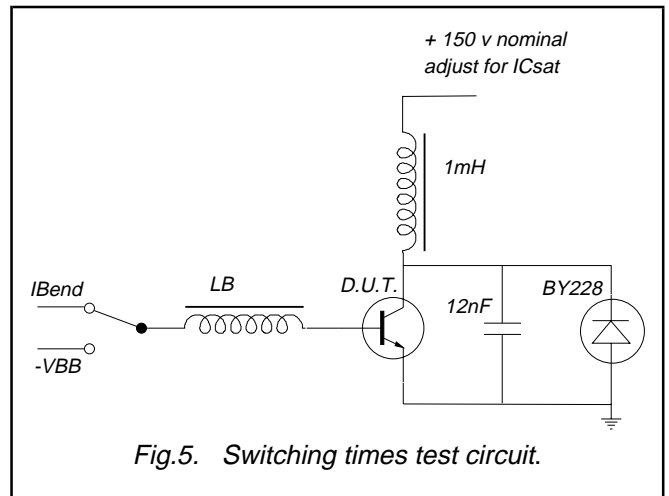
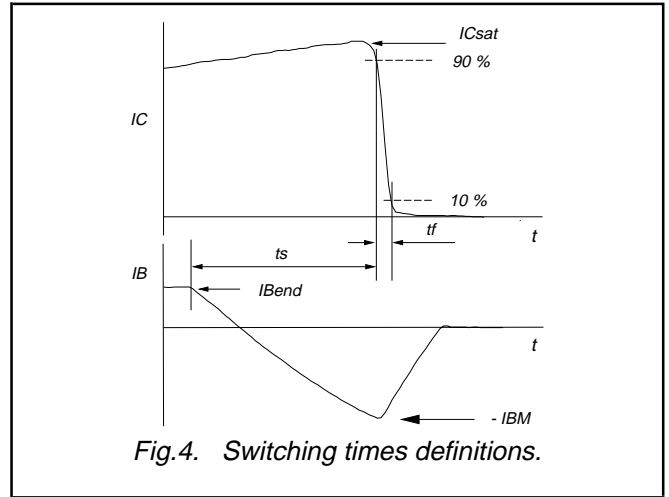
DYNAMIC CHARACTERISTICS $T_{hs} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | TYP. | MAX. | UNIT |
|--------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|---------------|
| f_T | Transition frequency at $f = 5\text{ MHz}$ | $I_C = 0.1\text{ A}; V_{CE} = 5\text{ V}$ | 7 | - | MHz |
| C_C | Collector capacitance at $f = 1\text{ MHz}$ | $V_{CB} = 10\text{ V}$ | 125 | - | pF |
| | Switching times (16 kHz line deflection circuit) | $I_{Csat} = 4.5\text{ A}; L_C = 1\text{ mH}; C_{fb} = 4\text{ nF}$ $I_{B(end)} = 1.4\text{ A}; L_B = 6\text{ }\mu\text{H}; -V_{BB} = -4\text{ V};$ $-I_{BM} = 2.25\text{ A}$ | | | |
| t_s | Turn-off storage time | | 6.5 | - | μs |
| t_f | Turn-off fall time | | 0.7 | - | μs |

¹ Measured with half sine-wave voltage (curve tracer).

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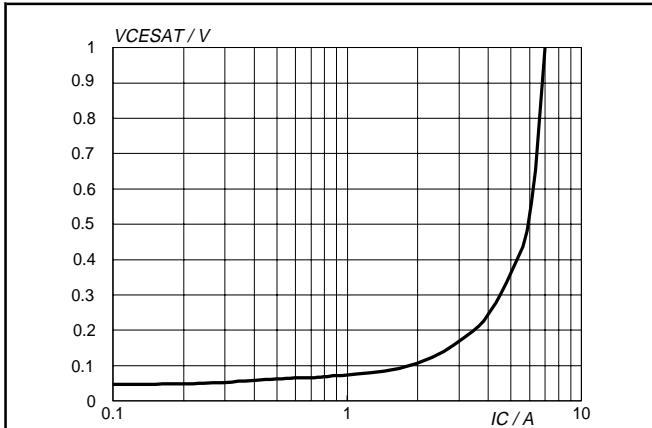


Fig.7. Typical collector-emitter saturation voltage.
 $V_{CEsat} = f(I_C)$; parameter I_C/I_B

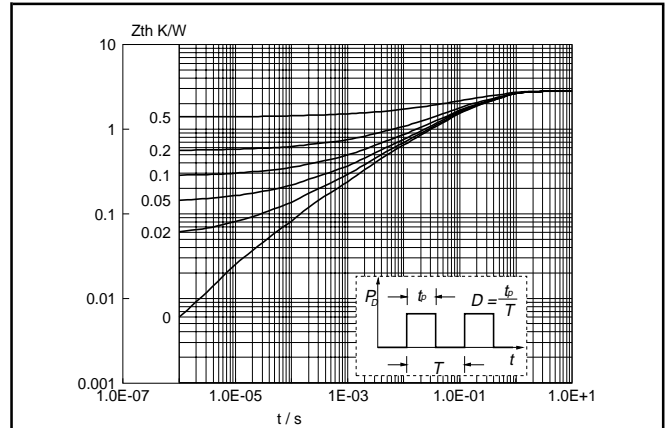


Fig.10. Transient thermal impedance.
 $Z_{th j-hs} = f(t)$; parameter $D = t_p/T$

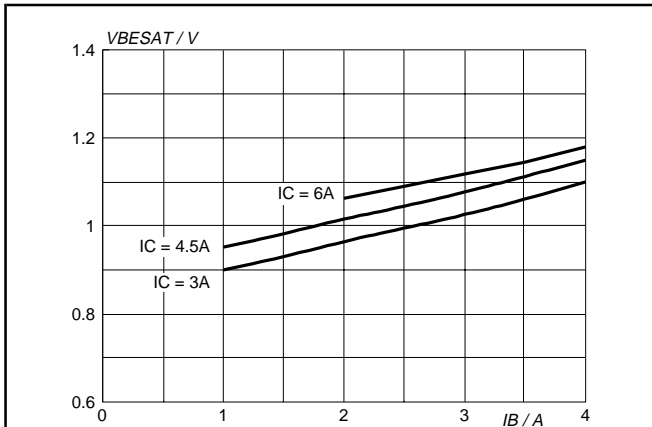


Fig.8. Typical base-emitter saturation voltage.
 $V_{BEsat} = f(I_B)$; parameter I_C

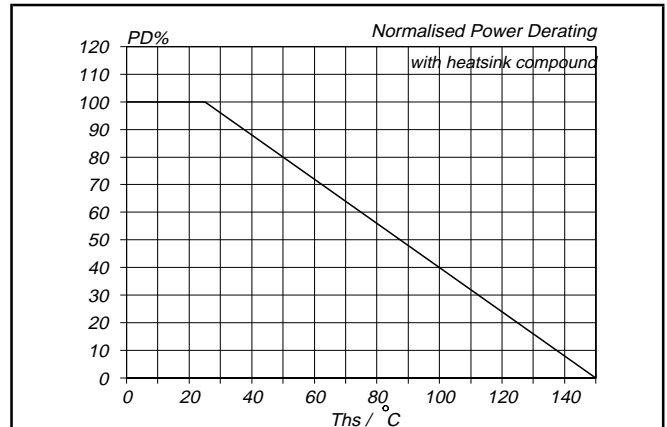


Fig.11. Normalised power dissipation.
 $PD\% = 100 \cdot P_D / P_{D 25^{\circ}C} = f(T_{hs})$

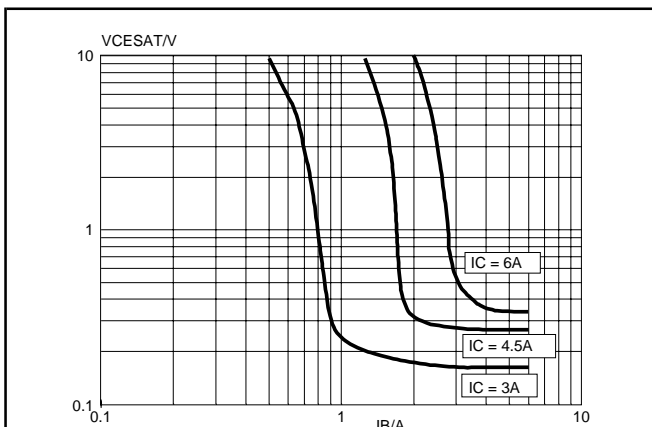


Fig.9. Typical collector-emitter saturation voltage.
 $V_{CEsat} = f(I_B)$; parameter I_C

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Fig.12. Forward bias safe operating area. $T_{hs} = 25^{\circ}\text{C}$
 I Region of permissible DC operation.
 II Extension for repetitive pulse operation.

NB: Mounted with heatsink compound and 30 ± 5 newton force on the centre of the envelope.



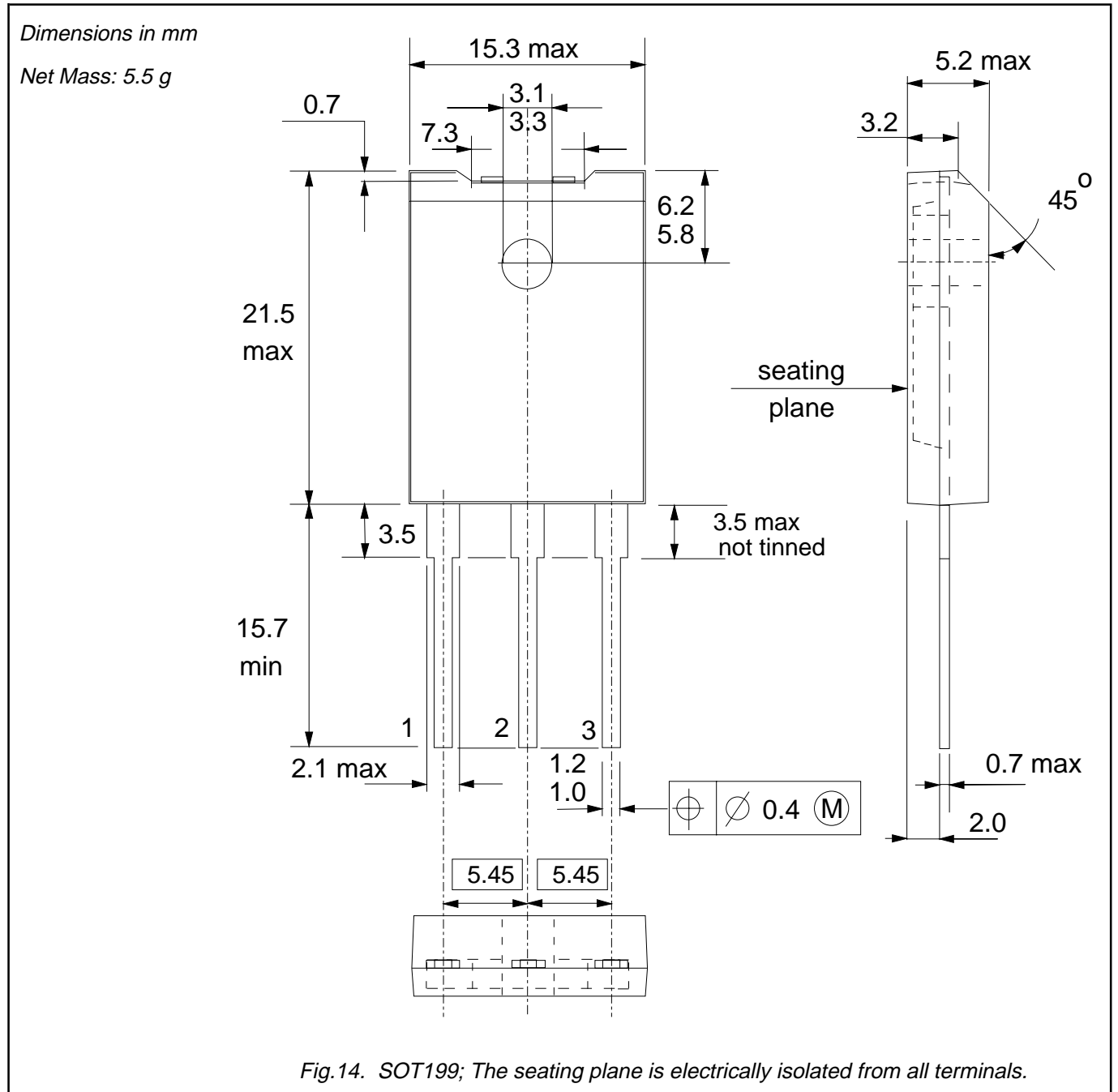
Fig.13. Forward bias safe operating area. $T_{hs} = 25^{\circ}\text{C}$
 I Region of permissible DC operation.
 II Extension for repetitive pulse operation.

NB: Mounted without heatsink compound and 30 ± 5 newton force on the centre of the envelope.

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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

| | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Data sheet status | |
| 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. |
| Limiting values | |
| 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. | |
| Application information | |
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