GENERAL DESCRIPTION
Enhanced performance, new generation, high-voltage, high-speed switching npn transistor in a plastic envelope intended for use in high frequency electronic lighting ballast applications.

QUICK REFERENCE DATA

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V_{CESM})</td>
<td>Collector-emitter voltage peak value</td>
<td>(V_{BE} = 0\ V)</td>
<td>-</td>
<td>1750</td>
<td>V</td>
</tr>
<tr>
<td>(V_{CEO})</td>
<td>Collector-emitter voltage (open base)</td>
<td>-</td>
<td>850</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>(I_C)</td>
<td>Collector current (DC)</td>
<td>-</td>
<td>5</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>(I_{CM})</td>
<td>Collector current peak value</td>
<td>-</td>
<td>8</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>(P_{tot})</td>
<td>Total power dissipation</td>
<td>(T_{mb} \leq 25\ ^\circ\ C)</td>
<td>100</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>(V_{CEsat})</td>
<td>Collector-emitter saturation voltage (I_C = 1.5\ A; I_B = 0.3\ A)</td>
<td>(I_{CM} = 1.5\ A; I_B(on) = 0.3\ A)</td>
<td>0.25</td>
<td>0.6</td>
<td>(\mu)s</td>
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</table>

PINNING - TO220AB

<table>
<thead>
<tr>
<th>PIN</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>base</td>
</tr>
<tr>
<td>2</td>
<td>collector</td>
</tr>
<tr>
<td>3</td>
<td>emitter</td>
</tr>
<tr>
<td>tab</td>
<td>collector</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
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<td>(V_{CESM})</td>
<td>Collector-emitter voltage peak value</td>
<td>(V_{BE} = 0\ V)</td>
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<td>V</td>
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<td>(V_{CEO})</td>
<td>Collector-emitter voltage (open base)</td>
<td>-</td>
<td>850</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>(I_C)</td>
<td>Collector current (DC)</td>
<td>-</td>
<td>5</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>(I_{CM})</td>
<td>Collector current peak value</td>
<td>-</td>
<td>8</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>(I_B)</td>
<td>Base current (DC)</td>
<td>-</td>
<td>3</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>(I_{SM})</td>
<td>Base current peak value</td>
<td>-</td>
<td>5</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>(-I_{B(AV)})</td>
<td>Reverse base current average over any 20ms period</td>
<td>-</td>
<td>100</td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td>(-I_{BM})</td>
<td>Reverse base current peak value</td>
<td>-</td>
<td>4</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>(P_{tot})</td>
<td>Total power dissipation</td>
<td>(T_{mb} \leq 25\ ^\circ\ C)</td>
<td>100</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>(T_{stg})</td>
<td>Storage temperature</td>
<td>-65</td>
<td>150</td>
<td>ºC</td>
<td></td>
</tr>
<tr>
<td>(T_j)</td>
<td>Junction temperature</td>
<td>-</td>
<td>150</td>
<td>ºC</td>
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THERMAL RESISTANCES

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<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R_{thj-mb})</td>
<td>Junction to mounting base</td>
<td>-</td>
<td>1.25</td>
<td>K/W</td>
<td></td>
</tr>
<tr>
<td>(R_{thj-a})</td>
<td>Junction to ambient</td>
<td>in free air</td>
<td>60</td>
<td>-</td>
<td>K/W</td>
</tr>
</tbody>
</table>
STATIC CHARACTERISTICS

$T_{mb} = 25 \degree C$ unless otherwise specified

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{CES}$</td>
<td>Collector cut-off current</td>
<td>$V_{BE} = 0 \ V; V_{CE} = V_{CES, \text{max}}$</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>mA</td>
</tr>
<tr>
<td>$I_{CES}$</td>
<td></td>
<td>$V_{BE} = 0 \ V; V_{CE} = 1500 \ V$</td>
<td>-</td>
<td>-</td>
<td>0.6</td>
<td>mA</td>
</tr>
<tr>
<td>$I_{CES}$</td>
<td></td>
<td>$V_{BE} = 0 \ V; V_{CE} = V_{CES, \text{max}}$</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
<td>mA</td>
</tr>
<tr>
<td>$I_{EBO}$</td>
<td>Emitter cut-off current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CE, \text{sust}}$</td>
<td>Collector-emitter sustaining voltage</td>
<td>$I_B = 0 \ A; I_C = 100 \ mA; L = 25 \ mH$</td>
<td>750</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$V_{CE, \text{sat}}$</td>
<td>Base-emitter saturation voltage</td>
<td>$I_C = 1.5 \ A; I_B = 0.3 \ A$</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>V</td>
</tr>
<tr>
<td>$h_{FE}$</td>
<td>DC current gain</td>
<td>$I_C = 1.5 \ A; V_{CE} = 10 \ V$</td>
<td>8</td>
<td>-</td>
<td>1.3</td>
<td>V</td>
</tr>
<tr>
<td>$h_{FE}$</td>
<td></td>
<td>$I_C = 400 \ mA; V_{CE} = 3 \ V$</td>
<td>12</td>
<td>18</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>$h_{FE}$</td>
<td></td>
<td>$I_C = 1.5 \ A; V_{CE} = 1 \ V$</td>
<td>5</td>
<td>7</td>
<td>-</td>
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</table>

DYNAMIC CHARACTERISTICS

$T_{mb} = 25 \degree C$ unless otherwise specified

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>PARAMETER</th>
<th>CONDITIONS</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_{on}$</td>
<td>Switching times (resistive load)</td>
<td>$I_{Con} = 1.5 \ A; I_{Bon} = -I_{Boff} = 0.3 \ A$</td>
<td>1.1</td>
<td>1.5</td>
<td>µs</td>
</tr>
<tr>
<td>$t_{ts}$</td>
<td>Turn-on time</td>
<td></td>
<td>5</td>
<td>6.5</td>
<td>µs</td>
</tr>
<tr>
<td>$t_{t}$</td>
<td>Turn-off storage time</td>
<td></td>
<td>0.75</td>
<td>1.0</td>
<td>µs</td>
</tr>
<tr>
<td>$t_{f}$</td>
<td>Turn-off fall time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SYMBOL</th>
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<th>CONDITIONS</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_{on}$</td>
<td>Switching times (inductive load)</td>
<td>$I_{Con} = 1.5 \ A; I_{Bon} = 0.3 \ A; L = 1 \ \mu H; V_{BB} = 5 \ V$</td>
<td>2.0</td>
<td>3.0</td>
<td>µs</td>
</tr>
<tr>
<td>$t_{ts}$</td>
<td>Turn-on storage time</td>
<td></td>
<td>0.25</td>
<td>0.6</td>
<td>µs</td>
</tr>
<tr>
<td>$t_{t}$</td>
<td>Turn-off storage time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{f}$</td>
<td>Turn-off fall time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Fig. 1. Test circuit for $V_{CE, \text{sust}}$

Fig. 2. Oscilloscope display for $V_{CE, \text{sust}}$
Philips Semiconductors

Silicon Diffused Power Transistor

BU1706A

Fig. 3. Test circuit resistive load. $V_{IM} = -6$ to $+8$ V

$V_{CC} = 250$ V; $tp = 20$ µs; $\delta = tp / T = 0.01$.

$R_B$ and $R_L$ calculated from $I_{Con}$ and $I_{Bon}$ requirements.

Fig. 4. Switching times waveforms with resistive load.

Fig. 5. Test circuit inductive load.

$V_{CC} = 300$ V; $-V_{BE} = 5$ V; $L_B = 1$ µH

Fig. 6. Test Circuit RBSOA.

$V_{CC} = 150$ V; $-V_{BB} = 5$ V; $L_C = 2$ mH; $V_{CL} \leq 1500$ V;

$L_B = 1$ µH

Fig. 7. Switching times waveforms with inductive load.

Fig. 8. Normalised power dissipation.

$PD\% = 100 \cdot PD / PD_{25 \degree C} = f(T_{mb})$
Fig. 9. Transient thermal impedance. 
\[ Z_{th\;j\;mb} = f(t); \text{ parameter } D = t_p/T \]

Fig. 10. Typical base-emitter saturation voltage. 
\[ V_{BE\;sat} = f(I_C); \text{ parameter } I_C/I_B \]

Fig. 11. Typical collector-emitter saturation voltage. 
\[ V_{CE\;sat} = f(I_C); \text{ parameter } I_C/I_B \]

Fig. 12. Typical base-emitter saturation voltage. 
\[ V_{BE\;sat} = f(I_B); \text{ parameter } I_C \]

Fig. 13. Typical collector-emitter saturation voltage. 
\[ V_{CE\;sat} = f(I_B); \text{ parameter } I_C \]

Fig. 14. Typical DC current gain. 
\[ h_{FE} = f(I_C); \text{ parameter } V_{CE} \]
Fig. 15. Forward bias safe operating area. $T_{mb} = 25$ °C

I Region of permissible DC operation.

II Extension for repetitive pulse operation.

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

Fig. 16. Reverse bias safe operating area. $T_j \leq T_{j\text{max}}$
MECHANICAL DATA

Dimensions in mm

Net Mass: 2 g

Fig. 17. TO220AB; pin 2 connected to mounting base.

Notes
1. Refer to mounting instructions for TO220 envelopes.
2. Epoxy meets UL94 V0 at 1/8".
DEFINITIONS

<table>
<thead>
<tr>
<th>Data sheet status</th>
<th></th>
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<tbody>
<tr>
<td>Objective specification</td>
<td>This data sheet contains target or goal specifications for product development.</td>
</tr>
<tr>
<td>Preliminary specification</td>
<td>This data sheet contains preliminary data; supplementary data may be published later.</td>
</tr>
<tr>
<td>Product specification</td>
<td>This data sheet contains final product specifications.</td>
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</table>

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<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>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.</td>
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</table>

<table>
<thead>
<tr>
<th>Application information</th>
<th></th>
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</thead>
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<td>Where application information is given, it is advisory and does not form part of the specification.</td>
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</table>

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