- STMicroelectronics PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY (> 1500 V)
- VERY HIGH SWITCHING SPEED


## APPLICATIONS:

- HORIZONTAL DEFLECTION FOR HIGH-END COLOUR TV AND 19" MONITORS


## DESCRIPTION

The BUW1015 is manufactured using Multiepitaxial Mesa technology for cost-effective high performance and uses a Hollow Emitter structure to enhance switching speeds.


INTERNAL SCHEMATIC DIAGRAM


## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
| :---: | :--- | :---: | :---: |
| $\mathrm{V}_{\mathrm{CBO}}$ | Collector-Base Voltage $\left(\mathrm{I}_{\mathrm{E}}=0\right)$ | 1500 | V |
| $\mathrm{~V}_{\mathrm{CEO}}$ | Collector-Emitter Voltage $\left(\mathrm{I}_{\mathrm{B}}=0\right)$ | 700 | V |
| $\mathrm{~V}_{\mathrm{EBO}}$ | Emitter-Base Voltage $\left(\mathrm{I}_{\mathrm{C}}=0\right)$ | 10 | V |
| $\mathrm{I}_{\mathrm{C}}$ | Collector Current | 14 | A |
| $\mathrm{I}_{\mathrm{CM}}$ | Collector Peak Current $\left(\mathrm{t}_{\mathrm{p}}<5 \mathrm{~ms}\right)$ | 18 | A |
| $\mathrm{I}_{\mathrm{B}}$ | Base Current | 8 | A |
| $\mathrm{I}_{\mathrm{BM}}$ | Base Peak Current $\left(\mathrm{t}_{\mathrm{p}}<5 \mathrm{~ms}\right)$ | 11 | A |
| $\mathrm{P}_{\text {tot }}$ | Total Dissipation at $\mathrm{T}_{\mathrm{C}}=25^{\circ} \mathrm{C}$ | 160 | W |
| $\mathrm{~T}_{\text {stg }}$ | Storage Temperature | -65 to 150 | ${ }^{\circ} \mathrm{C}$ |
| $\mathrm{T}_{\mathrm{j}}$ | Max. Operating Junction Temperature | 150 | ${ }^{\circ} \mathrm{C}$ |

THERMAL DATA

| $\mathrm{R}_{\mathrm{th} \text {-case }}$ | Thermal Resistance Junction-case | Max | 0.78 | ${ }^{\circ} \mathrm{C} / \mathrm{W}$ |
| :--- | :--- | :---: | :---: | :---: |

ELECTRICAL CHARACTERISTICS ( $\mathrm{T}_{\text {case }}=25^{\circ} \mathrm{C}$ unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Ices | Collector Cut-off <br> Current ( $\mathrm{V}_{\mathrm{BE}}=0$ ) | $\begin{array}{\|ll} \hline \mathrm{V}_{\mathrm{CE}}=1500 \mathrm{~V} & \\ \mathrm{~V}_{\mathrm{CE}}=1500 \mathrm{~V} & \mathrm{~T}_{\mathrm{j}}=125^{\circ} \mathrm{C} \\ \hline \end{array}$ |  |  | $\begin{gathered} 0.2 \\ 2 \end{gathered}$ | $\begin{aligned} & \mathrm{mA} \\ & \mathrm{~mA} \end{aligned}$ |
| Iebo | Emitter Cut-off Current ( $\mathrm{I}_{\mathrm{C}}=0$ ) | $\mathrm{V}_{\mathrm{Eb}}=5 \mathrm{~V}$ |  |  | 100 | $\mu \mathrm{A}$ |
| $\mathrm{V}_{\text {ceo (sus)* }}$ | Collector-Emitter Sustaining Voltage $\left(\mathrm{I}_{\mathrm{B}}=0\right)$ | $\mathrm{Ic}=100 \mathrm{~mA}$ | 700 |  |  | V |
| Vebo | Emitter-Base Voltage $\left(I_{C}=0\right)$ | $\mathrm{I}_{\mathrm{E}}=10 \mathrm{~mA}$ | 10 |  |  | V |
| $\mathrm{V}_{\text {CE(sat) }}$ * | Collector-Emitter Saturation Voltage | $\mathrm{IC}_{\mathrm{C}}=10 \mathrm{~A} \quad \mathrm{I}_{\mathrm{B}}=2 \mathrm{~A}$ |  |  | 1.5 | V |
| $\mathrm{V}_{\mathrm{BE} \text { (sat) }}$ * | Base-Emitter Saturation Voltage | $\mathrm{IC}_{\mathrm{C}}=10 \mathrm{~A} \quad \mathrm{I}_{\mathrm{B}}=2 \mathrm{~A}$ |  |  | 1.5 | V |
| $\mathrm{hfE}^{*}$ | DC Current Gain | $\begin{array}{lll} \mathrm{I}_{\mathrm{C}}=10 \mathrm{~A} & \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V} \\ \mathrm{I}_{\mathrm{C}}=10 \mathrm{~A} & \mathrm{~V}_{\mathrm{CE}}=5 \mathrm{~V} & \mathrm{~T}_{\mathrm{j}}=100^{\circ} \mathrm{C} \end{array}$ | $\begin{aligned} & 7 \\ & 5 \end{aligned}$ | 10 | 14 |  |
| $\begin{aligned} & \mathrm{t}_{\mathrm{s}} \\ & \mathrm{t}_{\mathrm{f}} \end{aligned}$ | RESISTIVE LOAD <br> Storage Time Fall Time | $\begin{array}{ll} \hline \mathrm{V}_{\mathrm{CC}}=400 \mathrm{~V} & \mathrm{I}_{\mathrm{C}}=10 \mathrm{~A} \\ \mathrm{I}_{\mathrm{B} 1}=2 \mathrm{~A} & \mathrm{I}_{\mathrm{B} 2}=-6 \mathrm{~A} \end{array}$ |  | $\begin{array}{r} 1.5 \\ 110 \\ \hline \end{array}$ |  | $\begin{aligned} & \mu \mathrm{s} \\ & \mathrm{~ns} \end{aligned}$ |
| $\begin{aligned} & \mathrm{t}_{\mathrm{s}} \\ & \mathrm{t}_{\mathrm{f}} \end{aligned}$ | INDUCTIVE LOAD <br> Storage Time Fall Time | $\begin{array}{lc} \begin{array}{l} \mathrm{IC}=10 \mathrm{~A} \end{array} \quad \mathrm{f}=31250 \mathrm{~Hz} \\ \mathrm{I}_{\mathrm{B} 1}=2 \mathrm{~A} & \mathrm{I}_{\mathrm{B} 2}=-6 \mathrm{~A} \\ \mathrm{~V}_{\text {ceflyback }}=1200 \sin \left(\frac{\pi}{5} 10^{6}\right) \mathrm{t} \end{array}$ |  | $\begin{gathered} 4 \\ 220 \end{gathered}$ |  | $\begin{aligned} & \mu \mathrm{s} \\ & \mathrm{~ns} \end{aligned}$ |
| $\begin{aligned} & \mathrm{t}_{\mathrm{s}} \\ & \mathrm{t}_{\mathrm{f}} \end{aligned}$ | INDUCTIVE LOAD <br> Storage Time Fall Time | $\begin{aligned} & \begin{array}{l} I_{\mathrm{C}}=6 \mathrm{~A} \quad \mathrm{f}=64 \mathrm{KHz} \\ \mathrm{I}_{\mathrm{B} 1}=1 \mathrm{~A} \\ \mathrm{~V}_{\text {beoff }}=-2 \mathrm{~V} \\ \mathrm{~V}_{\text {ceflyback }}=1100 \sin \left(\frac{\pi}{5} 10^{6}\right) \mathrm{t} \end{array} \end{aligned}$ |  | $\begin{aligned} & 3.7 \\ & 200 \end{aligned}$ |  | $\begin{aligned} & \mu \mathrm{s} \\ & \mathrm{~ns} \end{aligned}$ |

* Pulsed: Pulse duration = $300 \mu \mathrm{~s}$, duty cycle $1.5 \%$


## Safe Operating Area



Derating Curve


Collector Emitter Saturation Voltage


Thermal Impedance


DC Current Gain


## Base Emitter Saturation Voltage



Power Losses at 64 KHz


Reverse Biased SOA


## BASE DRIVE INFORMATION

In order to saturate the power switch and reduce conduction losses, adequate direct base current $\mathrm{l}_{\mathrm{B} 1}$ has to be provided for the lowest gain hFe at $\mathrm{T}_{\mathrm{j}}$ $=100^{\circ} \mathrm{C}$ (line scan phase). On the other hand, negative base current $\mathrm{I}_{\mathrm{B} 2}$ must be provided the transistor to turn off (retrace phase). Most of the dissipation, especially in the deflection application, occurs at switch-off so it is essential to determine the value of $\mathrm{I}_{\mathrm{B} 2}$ which minimizes power losses, fall time $t_{f}$ and, consequently, $T_{j}$. A new set of curves have been defined to give total power losses, $\mathrm{t}_{\mathrm{s}}$ and $\mathrm{t}_{\mathrm{f}}$ as a function of $\mathrm{I}_{\mathrm{B} 1}$ at 64 KHz scanning frequencies for choosing the

Switching Time Inductive Load at 64 KHz (see figure 2)


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Figure 1: Inductive Load Switching Test Circuit.


Figure 2: Switching Waveforms in a Deflection Circuit


## TO-247 MECHANICAL DATA

| DIM. | mm |  |  | inch |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.7 |  | 5.3 | 0.185 |  | 0.209 |
| D | 2.2 |  | 2.6 | 0.087 |  | 0.102 |
| E | 0.4 |  | 0.8 | 0.016 |  | 0.031 |
| F | 1 |  | 1.4 | 0.039 |  | 0.055 |
| F3 | 2 |  | 2.4 | 0.079 |  | 0.094 |
| F4 | 3 |  | 3.4 | 0.118 |  | 0.134 |
| G |  | 10.9 |  |  | 0.429 |  |
| H | 15.3 |  | 15.9 | 0.602 |  | 0.626 |
| L | 19.7 |  | 20.3 | 0.776 |  | 0.779 |
| L3 | 14.2 |  | 14.8 | 0.559 |  | 0.582 |
| L4 |  | 34.6 |  |  | 1.362 |  |
| L5 |  | 5.5 |  |  | 0.217 |  |
| M | 2 |  | 3 | 0.079 |  | 0.118 |



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