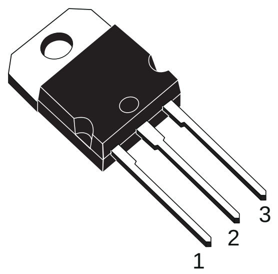
BUH1215

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- STMicroelectronics PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED




TO-218

**APPLICATIONS:**

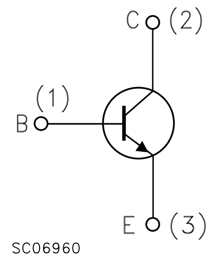
- HORIZONTAL DEFLECTION FOR COLOUR TV AND MONITORS

**DESCRIPTION**

The BUH1215 is manufactured using Multiepitaxial Mesa technology for cost-effective high performance and uses a Hollow Emitter structure to enhance switching speeds.

The BUH series is designed for use in horizontal deflection circuits in televisions and monitors.

**INTERNAL SCHEMATIC DIAGRAM**




**ABSOLUTE MAXIMUM RATINGS**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CBO}$ | Collector-Base Voltage ($I_E = 0$) | 1500 | V |
| $V_{CEO}$ | Collector-Emitter Voltage ($I_B = 0$) | 700 | V |
| $V_{EBO}$ | Emitter-Base Voltage ($I_C = 0$) | 10 | V |
| $I_C$ | Collector Current | 16 | A |
| $I_{CM}$ | Collector Peak Current ($t_p < 5$ ms) | 22 | A |
| $I_B$ | Base Current | 9 | A |
| $I_{BM}$ | Base Peak Current ($t_p < 5$ ms) | 12 | A |
| $P_{tot}$ | Total Dissipation at $T_c = 25\ ^oC$ | 200 | W |
| $T_{stg}$ | Storage Temperature | -65 to 150 | $^oC$ |
| $T_j$ | Max. Operating Junction Temperature | 150 | $^oC$ |

## THERMAL DATA

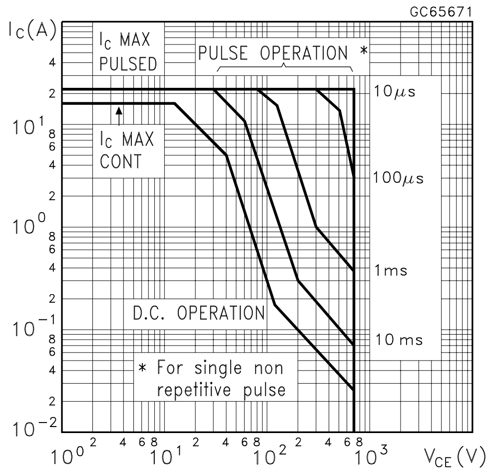
| | | | | |
|---|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-case | Max | 0.63 | $^oC/W$ |

## ELECTRICAL CHARACTERISTICS ($T_{case}$ = 25 $^oC$ unless otherwise specified)

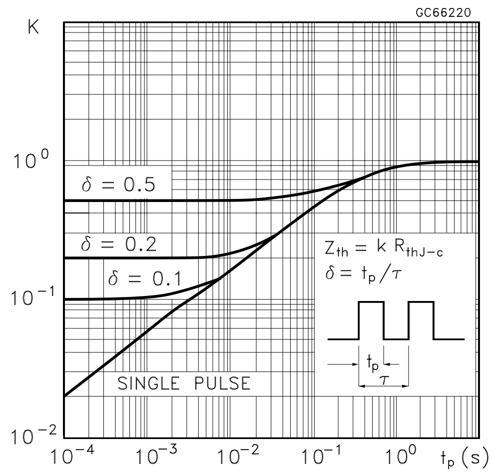
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{CES}$ | Collector Cut-off Current ($V_{BE}$ = 0) | $V_{CE}$ = 1500 V<br>$V_{CE}$ = 1500 V $T_j$ = 125 $^oC$ | | | 0.2<br>2 | mA<br>mA |
| $I_{EBO}$ | Emitter Cut-off Current ($I_C$ = 0) | $V_{EB}$ = 5 V | | | 100 | μA |
| $V_{CEO(sus)}$ | Collector-Emitter Sustaining Voltage | $I_C$ = 100 mA | 700 | | | V |
| $V_{EBO}$ | Emitter-Base Voltage ($I_C$ = 0) | $I_E$ = 10 mA | 10 | | | V |
| $V_{CE(sat)}$* | Collector-Emitter Saturation Voltage | $I_C$ = 12 A $I_B$ = 2.4 A | | | 1.5 | V |
| $V_{BE(sat)}$* | Base-Emitter Saturation Voltage | $I_C$ = 12 A $I_B$ = 2.4 A | | | 1.5 | V |
| $h_{FE}$* | DC Current Gain | $I_C$ = 12 A $V_{CE}$ = 5 V<br>$I_C$ = 12 A $V_{CE}$ = 5 V $T_j$ = 100 $^oC$ | 7<br>5 | 10 | 14 | |
| <br>$t_s$<br>$t_f$ | RESISTIVE LOAD<br>Storage Time<br>Fall Time | $V_{CC}$ = 400 V $I_C$ = 12 A<br>$I_{B1}$ = 2 A $I_{B2}$ = -6 A | | <br>1.5<br>110 | | <br>μs<br>ns |
| <br>$t_s$<br>$t_f$ | INDUCTIVE LOAD<br>Storage Time<br>Fall Time | $I_C$ = 12 A f = 31250 Hz<br>$I_{B1}$ = 2 A $I_{B2}$ = -1.5 A<br>$V_{ceflyback} = 1050 \sin\left(\frac{\pi}{5} 10^6\right) t$ V | | <br>4<br>220 | | <br>μs<br>ns |
| <br>$t_s$<br>$t_f$ | INDUCTIVE LOAD<br>Storage Time<br>Fall Time | $I_C$ = 6 A f = 64 KHz<br>$I_{B1}$ = 1 A $V_{beoff}$ = -2 A<br>$V_{ceflyback} = 1200 \sin\left(\frac{\pi}{5} 10^6\right) t$ V | | <br>3.5<br>180 | | <br>μs<br>ns |

* Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %

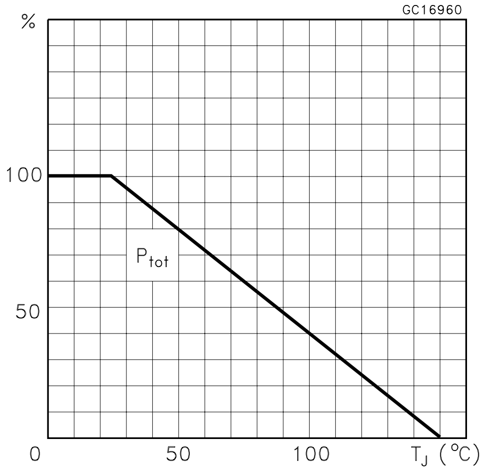
### Safe Operating Area



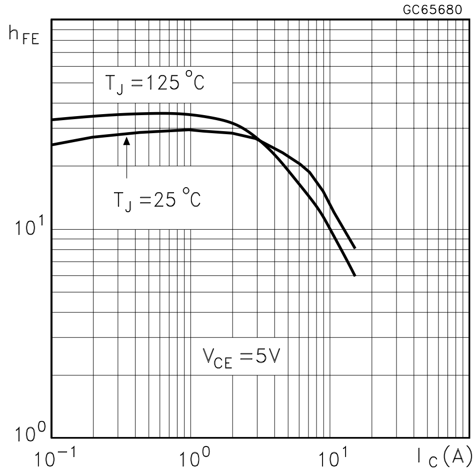

### Thermal Impedance



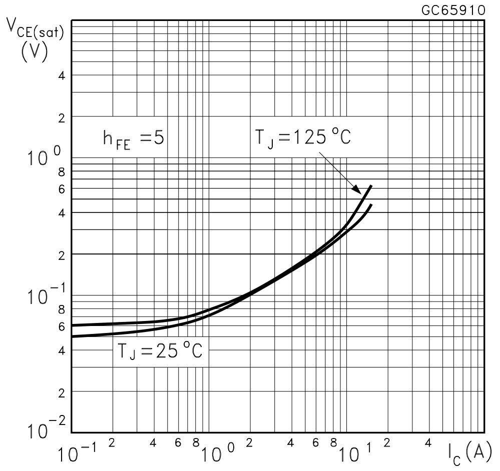
Derating Curve



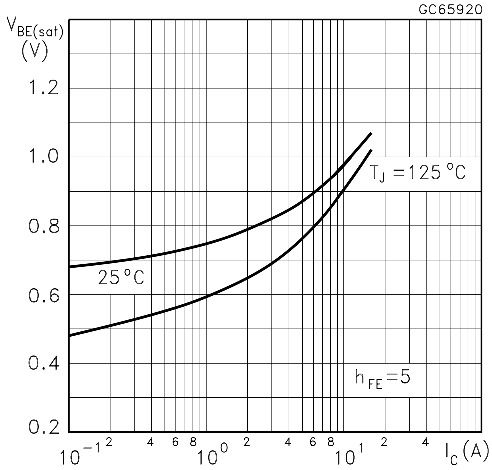

DC Current Gain



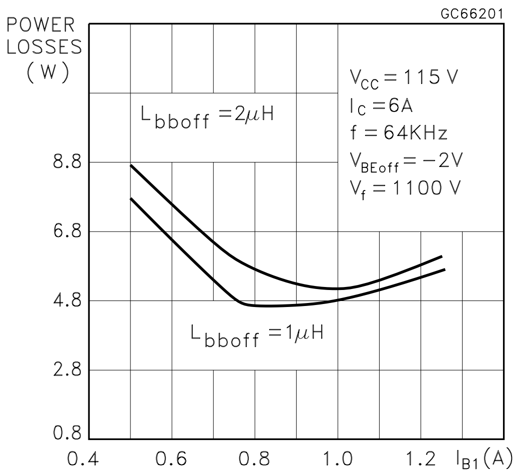

Collector Emitter Saturation Voltage



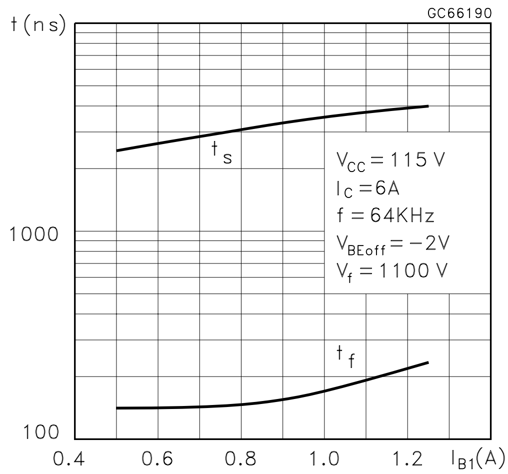

Base Emitter Saturation Voltage



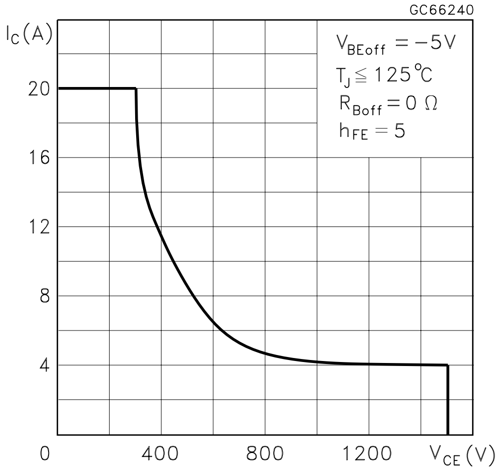

Power Losses at 64 KHz




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



Reverse Biased SOA




## BASE DRIVE INFORMATION

In order to saturate the power switch and reduce conduction losses, adequate direct base current $I_{B1}$ has to be provided for the lowest gain $h_{FE}$ at 100 $^{o}$C (line scan phase). On the other hand, negative base current $I_{B2}$ 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 $I_{B2}$ 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, $t_s$ and $t_f$ as a function of $I_{B1}$ at 64 KHz scanning frequencies for choosing the optimum negative drive. The test circuit is illustrated in figure 1.

The values of L and C are calculated from the following equations:

$$\frac{1}{2} L\,(I_C)^2 = \frac{1}{2} C\,(V_{CEfly})^2$$

$$\omega = 2\,\pi f = \frac{1}{\sqrt{L\,C}}$$

Where $I_C$ = operating collector current, $V_{CEfly}$= flyback voltage, f= frequency of oscillation during retrace.

**Figure 1:** Inductive Load Switching Test Circuits.

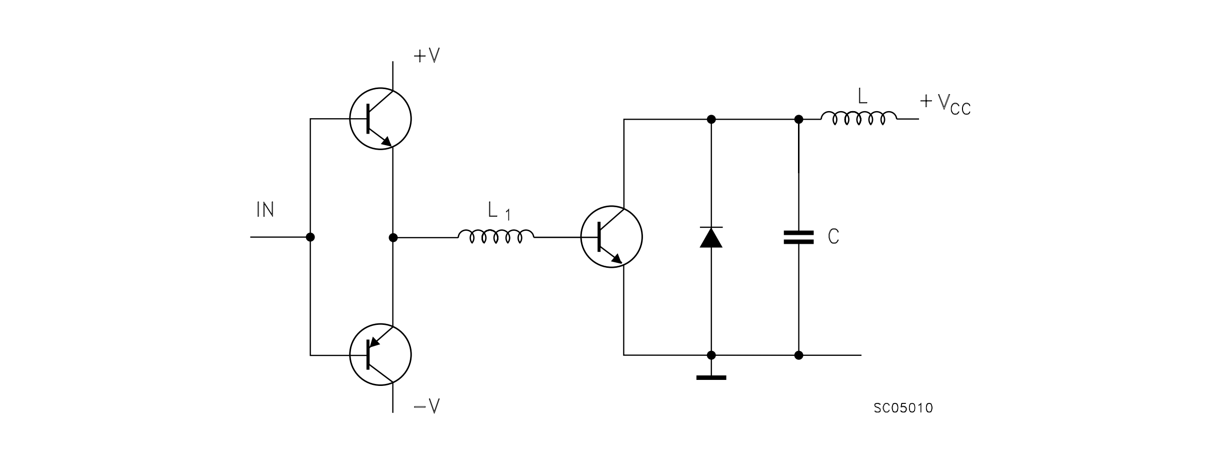
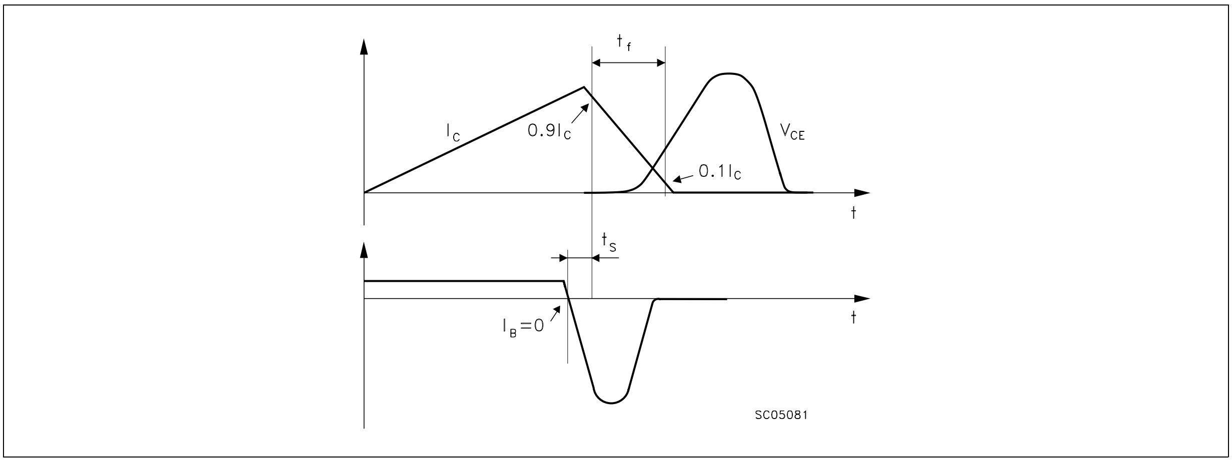
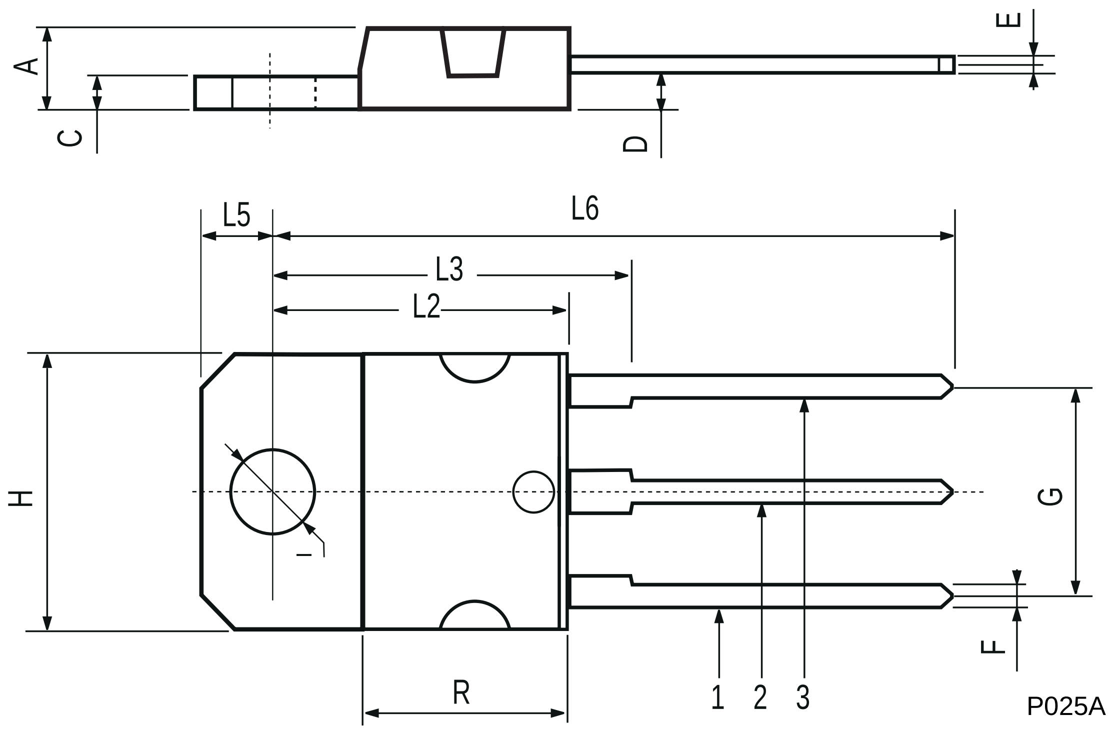



**Figure 2:** Switching Waveforms in a Deflection Circuit



# TO-218 (SOT-93) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.7 | | 4.9 | 0.185 | | 0.193 |
| C | 1.17 | | 1.37 | 0.046 | | 0.054 |
| D | | 2.5 | | | 0.098 | |
| E | 0.5 | | 0.78 | 0.019 | | 0.030 |
| F | 1.1 | | 1.3 | 0.043 | | 0.051 |
| G | 10.8 | | 11.1 | 0.425 | | 0.437 |
| H | 14.7 | | 15.2 | 0.578 | | 0.598 |
| L2 | – | | 16.2 | – | | 0.637 |
| L3 | | 18 | | | 0.708 | |
| L5 | 3.95 | | 4.15 | 0.155 | | 0.163 |
| L6 | | 31 | | | 1.220 | |
| R | – | | 12.2 | – | | 0.480 |
| Ø | 4 | | 4.1 | 0.157 | | 0.161 |

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