



# BUW1015

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

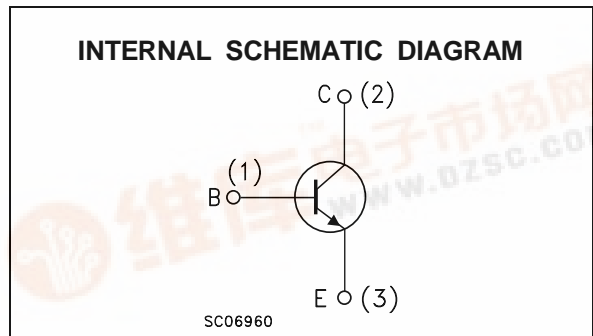
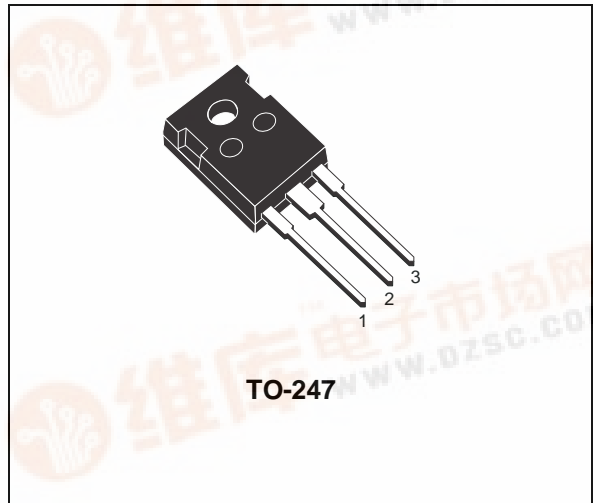
- STMicroelectronics PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY (> 1500 V)
- VERY HIGH SWITCHING SPEED

### APPLICATIONS:

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

### DESCRIPTION

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



### 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	14	A
$I_{CM}$	Collector Peak Current ( $t_p < 5$ ms)	18	A
$I_B$	Base Current	8	A
$I_{BM}$	Base Peak Current ( $t_p < 5$ ms)	11	A
$P_{tot}$	Total Dissipation at $T_c = 25$ °C	160	W
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_j$	Max. Operating Junction Temperature	150	°C



## BUW1015

### THERMAL DATA

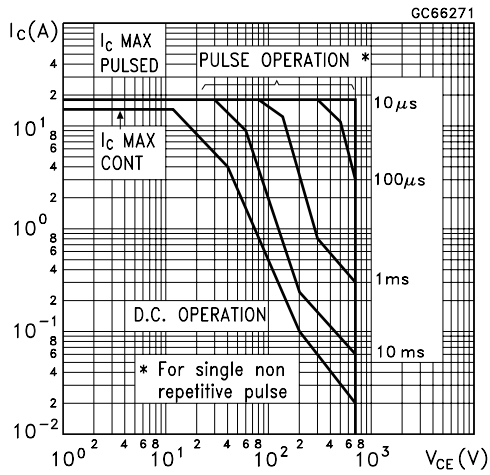
$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.78	°C/W
----------------	----------------------------------	-----	------	------

### ELECTRICAL CHARACTERISTICS ( $T_{case} = 25\text{ °C}$ unless otherwise specified)

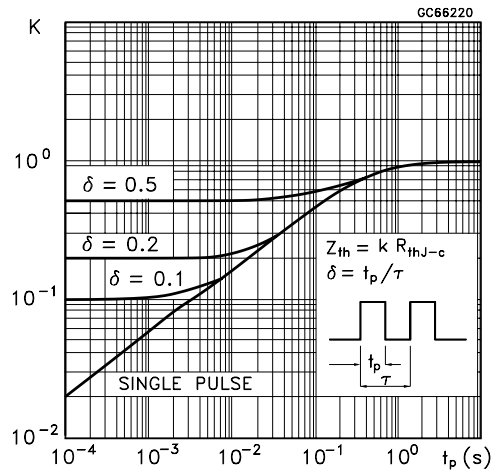
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 1500\text{ V}$ $V_{CE} = 1500\text{ V}$ $T_j = 125\text{ °C}$			0.2 2	mA mA
$I_{EBO}$	Emitter Cut-off Current ( $I_C = 0$ )	$V_{EB} = 5\text{ V}$			100	$\mu\text{A}$
$V_{CEO(sus)*}$	Collector-Emitter Sustaining Voltage ( $I_B = 0$ )	$I_C = 100\text{ mA}$	700			V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	$I_E = 10\text{ mA}$	10			V
$V_{CE(sat)*}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{ A}$ $I_B = 2\text{ A}$			1.5	V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 10\text{ A}$ $I_B = 2\text{ A}$			1.5	V
$h_{FE*}$	DC Current Gain	$I_C = 10\text{ A}$ $V_{CE} = 5\text{ V}$ $I_C = 10\text{ A}$ $V_{CE} = 5\text{ V}$ $T_j = 100\text{ °C}$	7 5	10	14	
$t_s$ $t_f$	RESISTIVE LOAD Storage Time Fall Time	$V_{CC} = 400\text{ V}$ $I_C = 10\text{ A}$ $I_{B1} = 2\text{ A}$ $I_{B2} = -6\text{ A}$		1.5 110		$\mu\text{s}$ ns
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 10\text{ A}$ $f = 31250\text{ Hz}$ $I_{B1} = 2\text{ A}$ $I_{B2} = -6\text{ A}$ $V_{ceflyback} = 1200 \sin\left(\frac{\pi}{5} 10^6\right) t\text{ V}$		4 220		$\mu\text{s}$ ns
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 6\text{ A}$ $f = 64\text{ KHz}$ $I_{B1} = 1\text{ A}$ $V_{beoff} = -2\text{ V}$ $V_{ceflyback} = 1100 \sin\left(\frac{\pi}{5} 10^6\right) t\text{ V}$		3.7 200		$\mu\text{s}$ ns

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

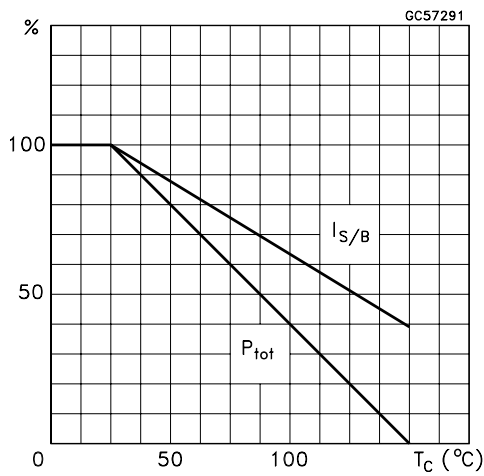
Safe Operating Area



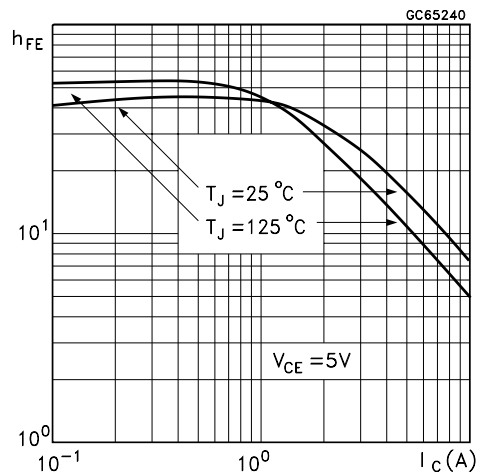
Thermal Impedance



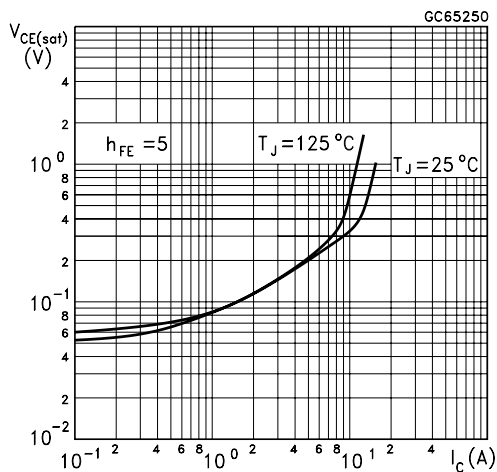
Derating Curve



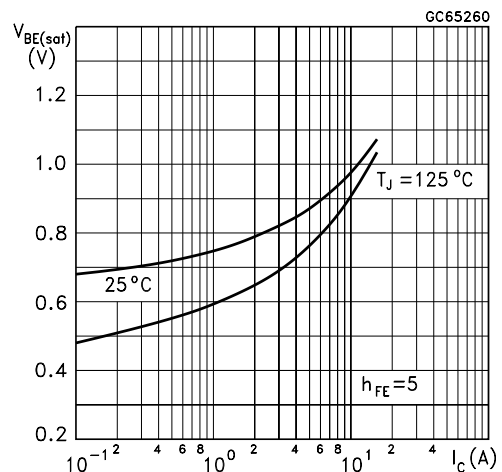
DC Current Gain



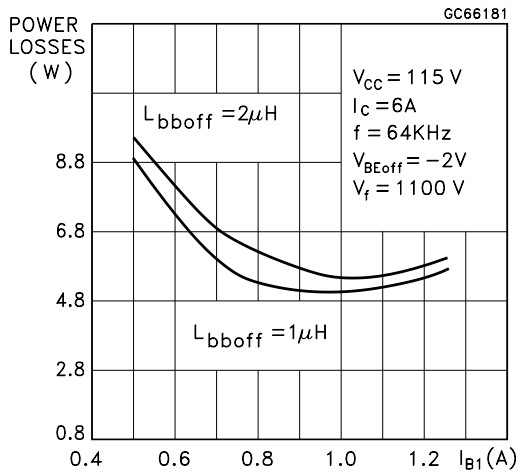
Collector Emitter Saturation Voltage



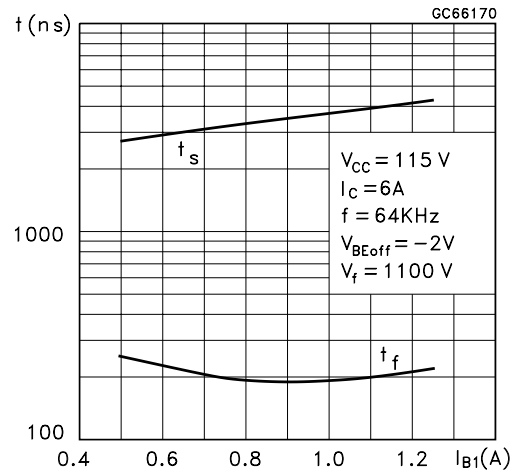
Base Emitter Saturation Voltage



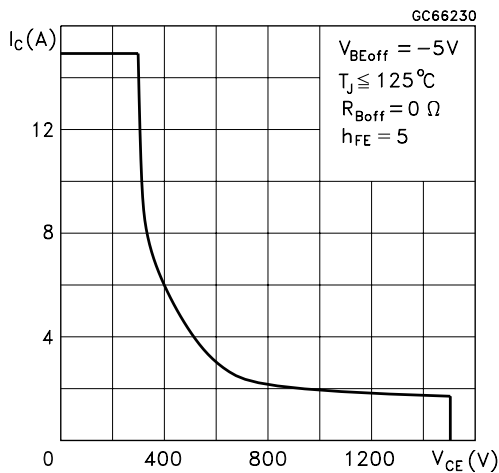
Power Losses at 64 KHz



Switching Time Inductive Load at 64KHz (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  $T_j = 100^\circ\text{C}$  (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 drive. The test circuit is illustrated in figure 1.

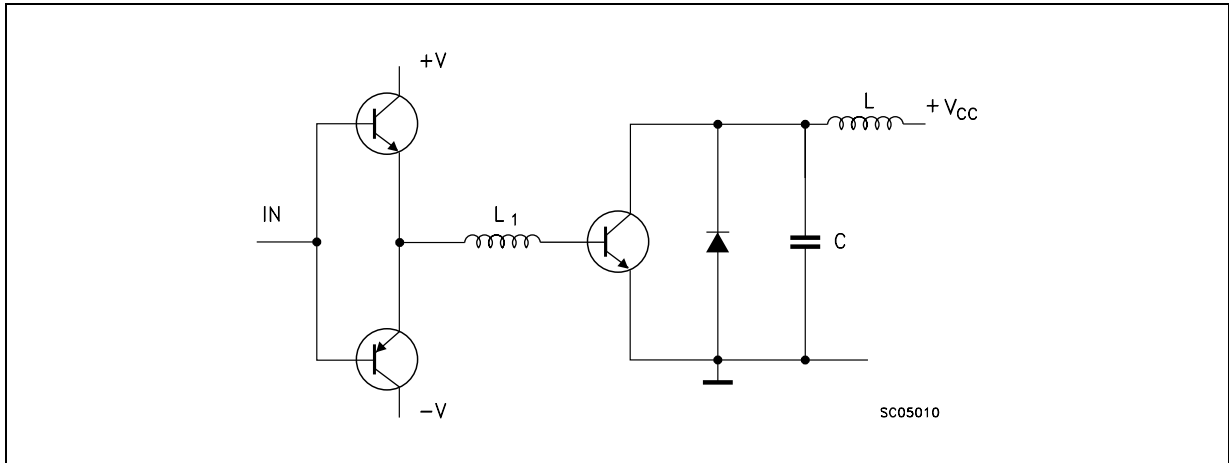
The values of L and C are calculated from the following equations:

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

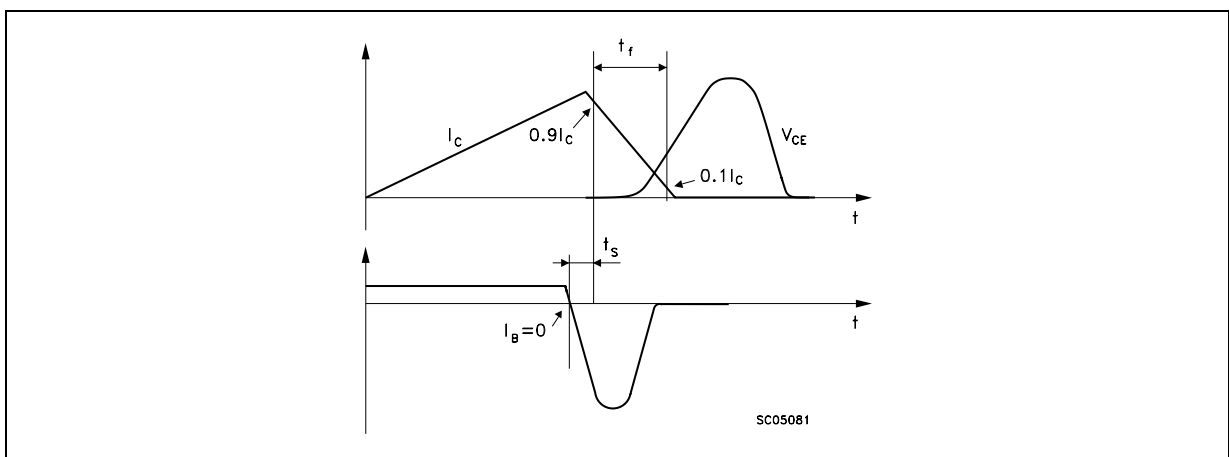
$$\omega = 2 \pi f = \frac{1}{\sqrt{LC}}$$

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

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

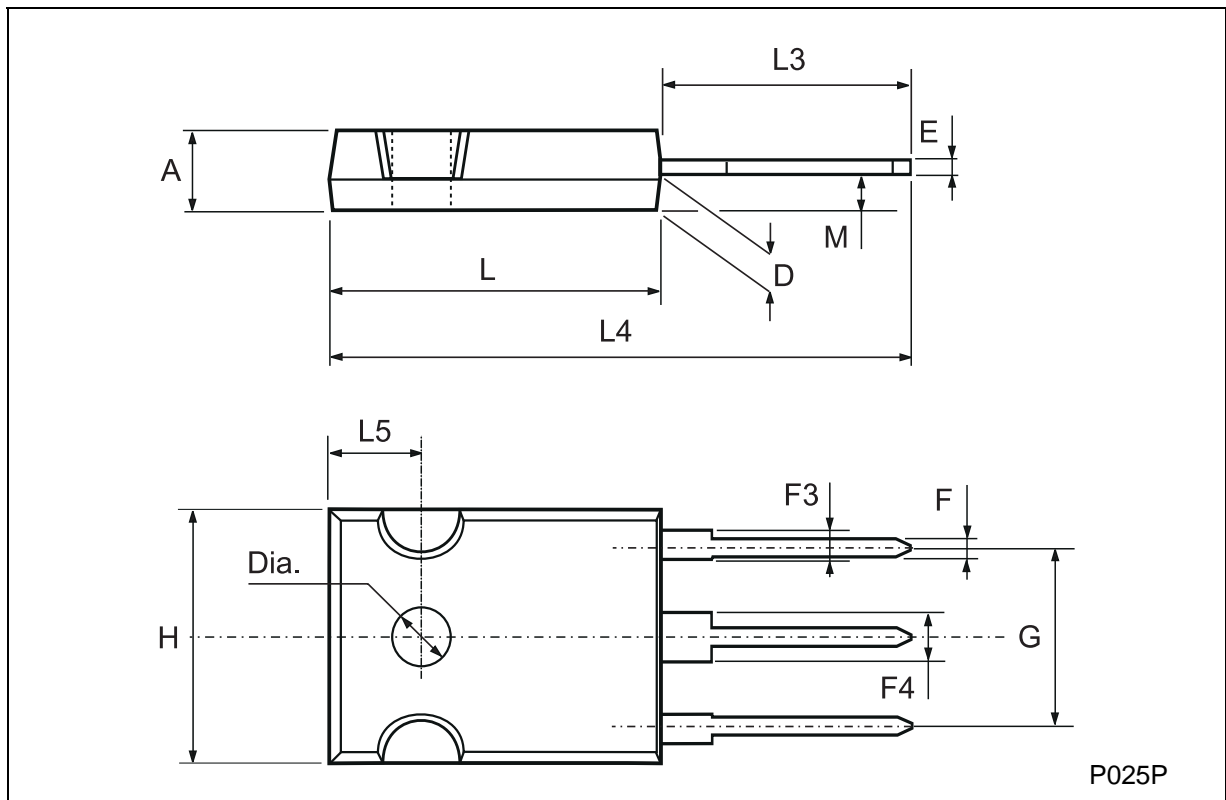


**Figure 2:** Switching Waveforms in a Deflection Circuit



**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



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specification mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a trademark of STMicroelectronics

© 2002 STMicroelectronics – Printed in Italy – All Rights Reserved  
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco -  
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

<http://www.st.com>