

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

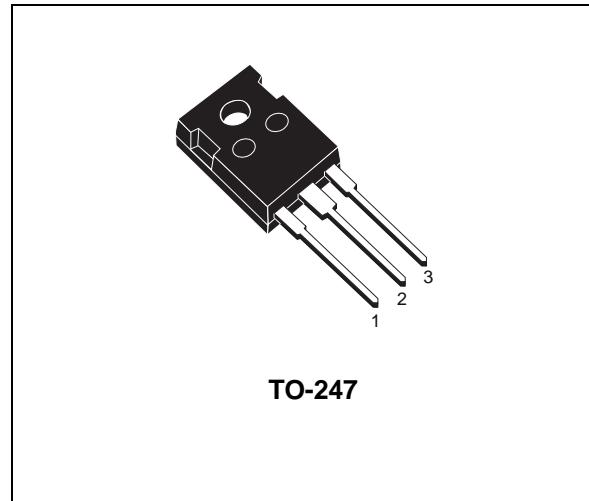
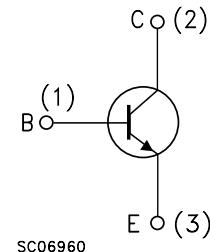
- STMicroelectronics PREFERRED SALES TYPE
- HIGH VOLTAGE CAPABILITY ( $> 1500$  V)
- VERY HIGH SWITCHING SPEED

**APPLICATIONS:**

- HORIZONTAL DEFLECTION FOR HIGH-END COLOUR TV AND 21" MONITORS

**DESCRIPTION**

The BUW1215 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
$V_{CBO}$	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 $T_c = 25$ °C	200	W
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_j$	Max. Operating Junction Temperature	150	°C

## THERMAL DATA

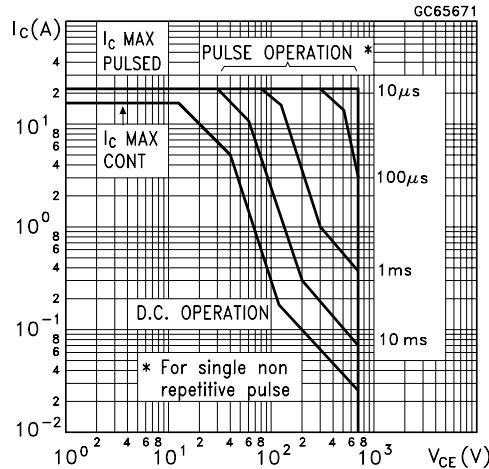
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	0.63	°C/W
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ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

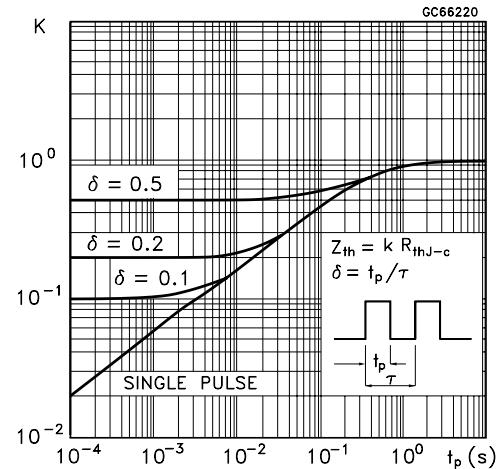
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CES</sub>	Collector Cut-off Current (V <sub>BE</sub> = 0)	V <sub>CE</sub> = 1500 V V <sub>CE</sub> = 1500 V T <sub>j</sub> = 125 °C			0.2 2	mA mA
I <sub>EBO</sub>	Emitter Cut-off Current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 5 V			100	μA
V <sub>CCEO(sus)*</sub>	Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 100 mA	700			V
V <sub>EBO</sub>	Emitter-Base Voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = 10 mA	10			V
V <sub>CE(sat)*</sub>	Collector-Emitter Saturation Voltage	I <sub>C</sub> = 12 A I <sub>B</sub> = 2.4 A			1.5	V
V <sub>BE(sat)*</sub>	Base-Emitter Saturation Voltage	I <sub>C</sub> = 12 A I <sub>B</sub> = 2.4 A			1.5	V
h <sub>FE</sub> *	DC Current Gain	I <sub>C</sub> = 12 A V <sub>CE</sub> = 5 V I <sub>C</sub> = 12 A V <sub>CE</sub> = 5 V T <sub>j</sub> = 100 °C	7 5	10	14	
t <sub>s</sub> t <sub>f</sub>	RESISTIVE LOAD Storage Time Fall Time	V <sub>CC</sub> = 400 V I <sub>C</sub> = 12 A I <sub>B1</sub> = 2 A I <sub>B2</sub> = -6 A		1.5 110		μs ns
t <sub>s</sub> t <sub>f</sub>	INDUCTIVE LOAD Storage Time Fall Time	I <sub>C</sub> = 12 A f = 31250 Hz I <sub>B1</sub> = 2 A I <sub>B2</sub> = -1.5 A V <sub>ceflyback</sub> = 1050 sin( $\frac{\pi}{5} 10^6 t$ ) V		4 220		μs ns
t <sub>s</sub> t <sub>f</sub>	INDUCTIVE LOAD Storage Time Fall Time	I <sub>C</sub> = 6 A f = 64 KHz I <sub>B1</sub> = 1 A V <sub>BE(off)</sub> = -2 A V <sub>ceflyback</sub> = 1200 sin( $\frac{\pi}{5} 10^6 t$ ) V		3.5 180		μs ns

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

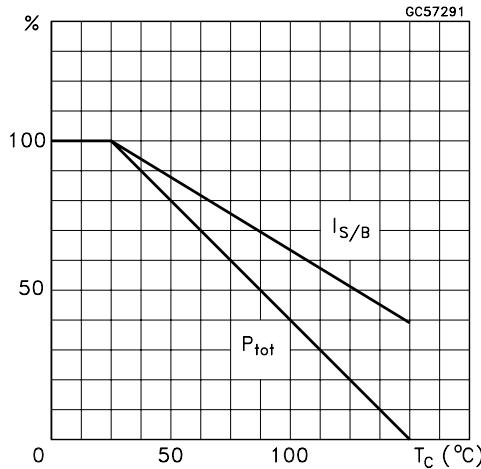
## Safe Operating Area



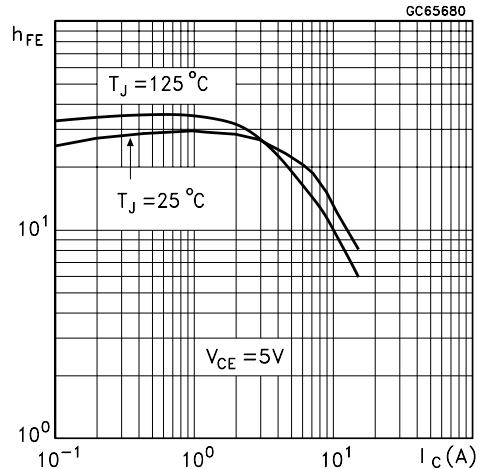
## Thermal Impedance



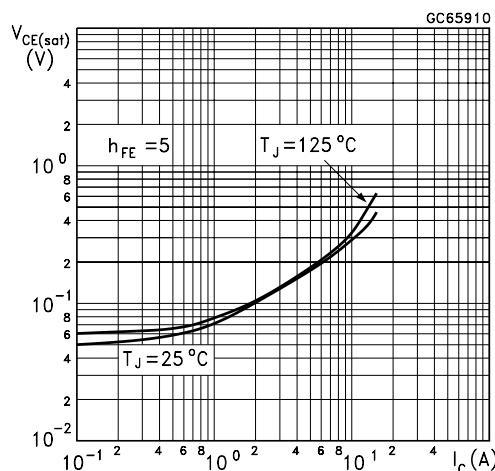
Derating Curve



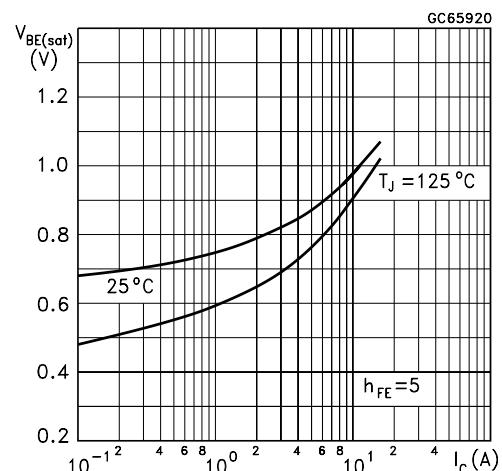
DC Current Gain



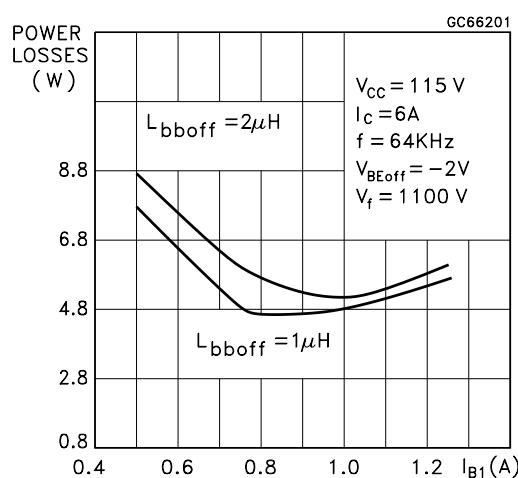
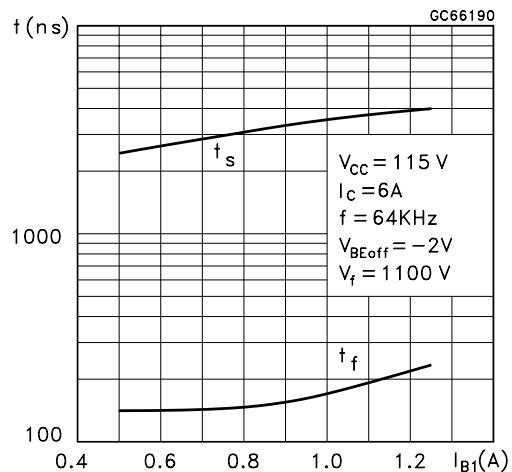
Collector Emitter Saturation Voltage



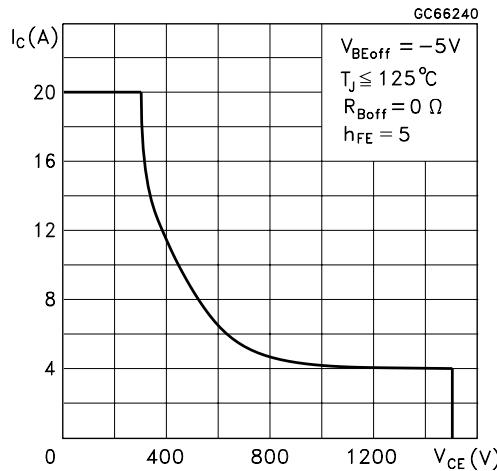
Base Emitter Saturation Voltage



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 °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

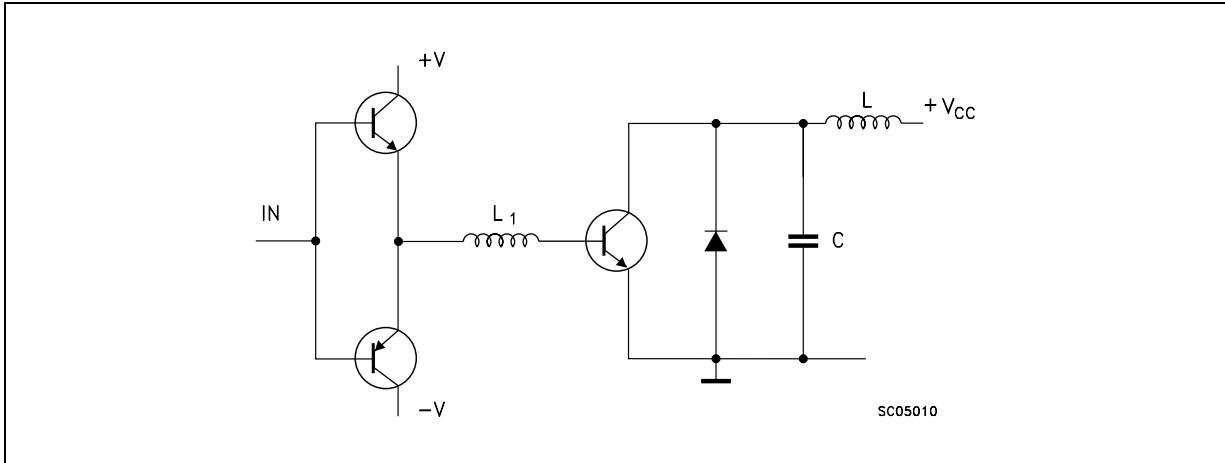
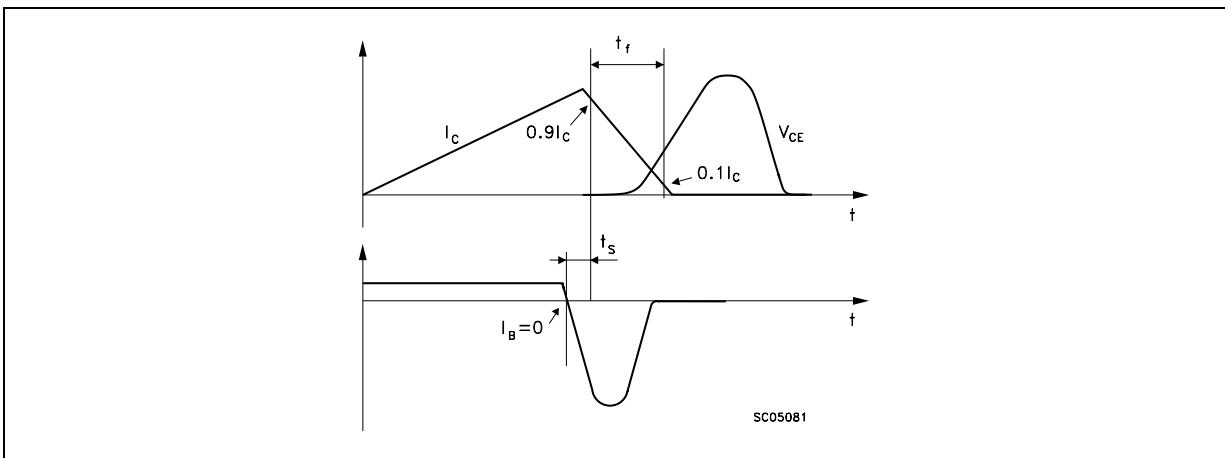
optimum negative drive. The test circuit is illustrated in figure 1.

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

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

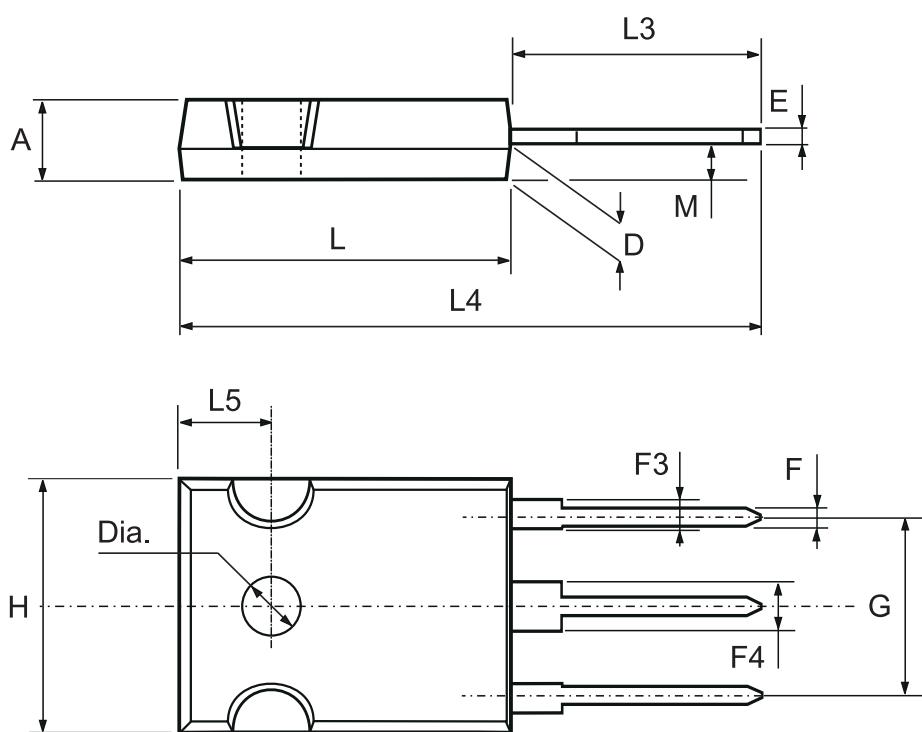
$$\omega = 2 \pi f = \frac{1}{\sqrt{L C}}$$

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

**Figure 1:** Inductive Load Switching Test 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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