



## BUW1215

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

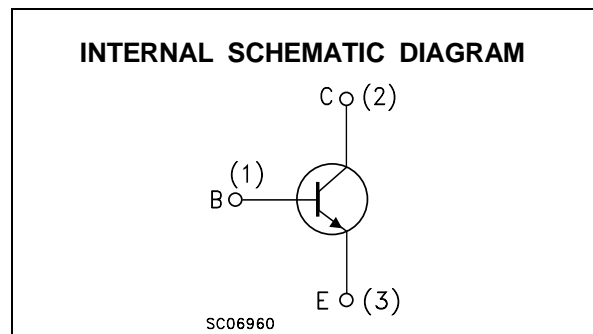
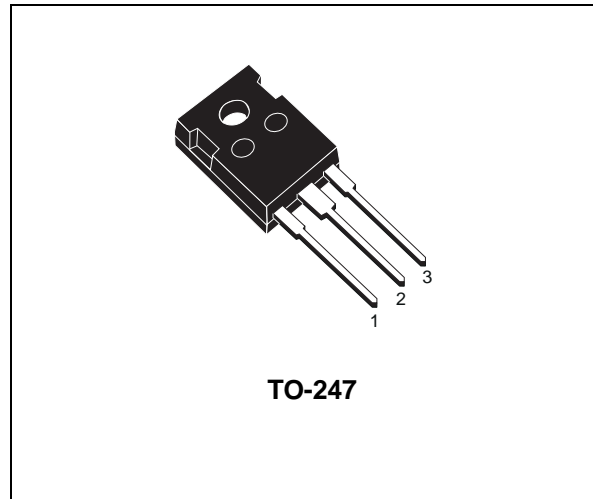
- STMicroelectronics PREFERRED SALESTYPE
- HIGH VOLTAGE CAPABILITY (> 1500 V)
- VERY HIGH SWITCHING SPEED

### APPLICATIONS:

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

### DESCRIPTION

The BUW1215 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	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**

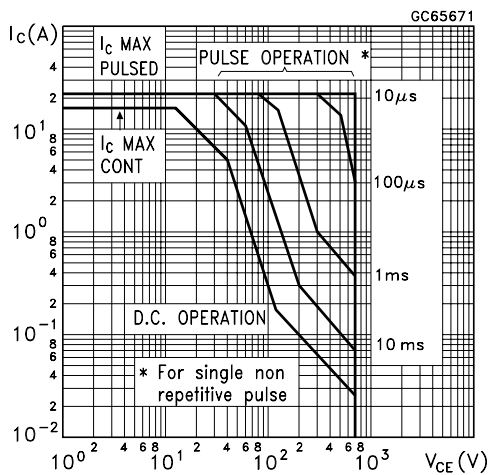
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	0.63	°C/W
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**ELECTRICAL CHARACTERISTICS** (T<sub>case</sub> = 25 °C unless otherwise specified)

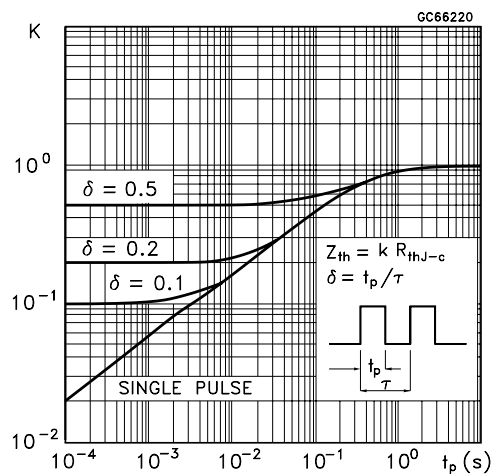
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CES</sub>	Collector Cut-off Current (V <sub>BE</sub> = 0)	V <sub>CE</sub> = 1500 V V <sub>CE</sub> = 1500 V T <sub>j</sub> = 125 °C			0.2 2	mA mA
I <sub>EBO</sub>	Emitter Cut-off Current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 5 V			100	μA
V <sub>CEO(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(π/5 10 <sup>6</sup> ) 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(π/5 10 <sup>6</sup> ) t V		3.5 180		μs ns

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

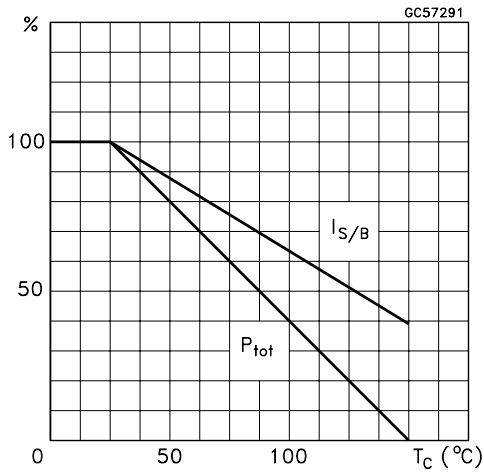
**Safe Operating Area**



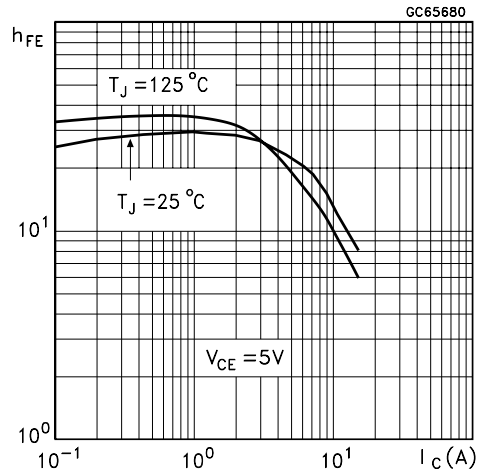
**Thermal Impedance**



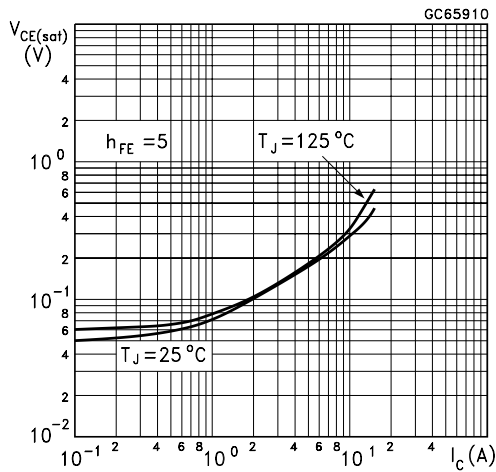
Derating Curve



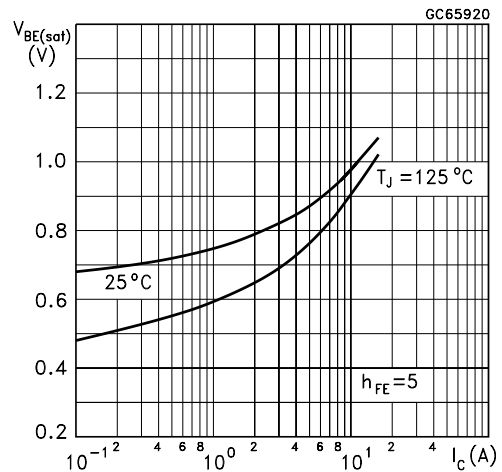
DC Current Gain



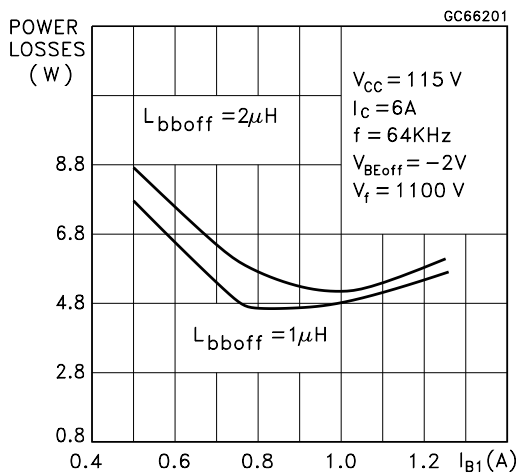
Collector Emitter Saturation Voltage



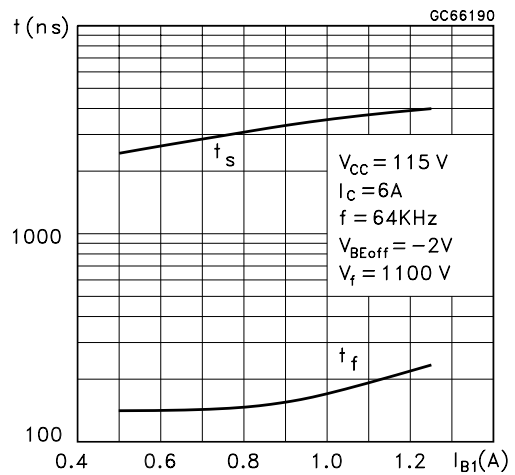
Base Emitter Saturation Voltage



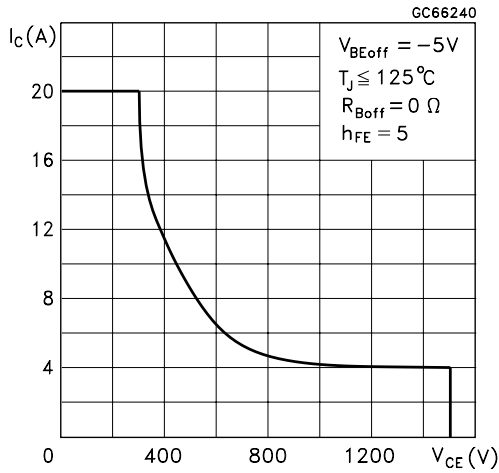
Power Losses at 64 KHz



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  $100^\circ C$  (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:

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

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

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

Figure 1: Inductive Load Switching Test Circuit.

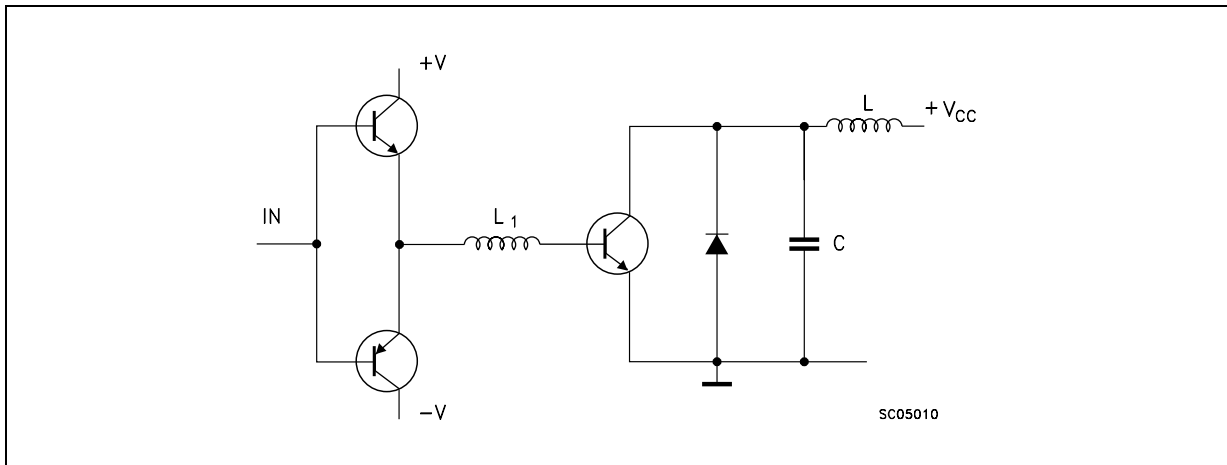
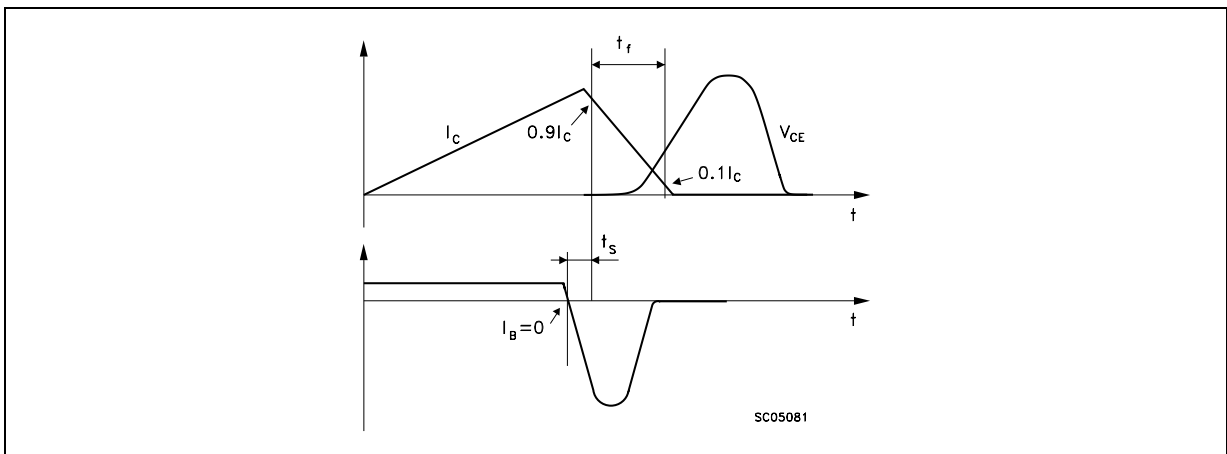
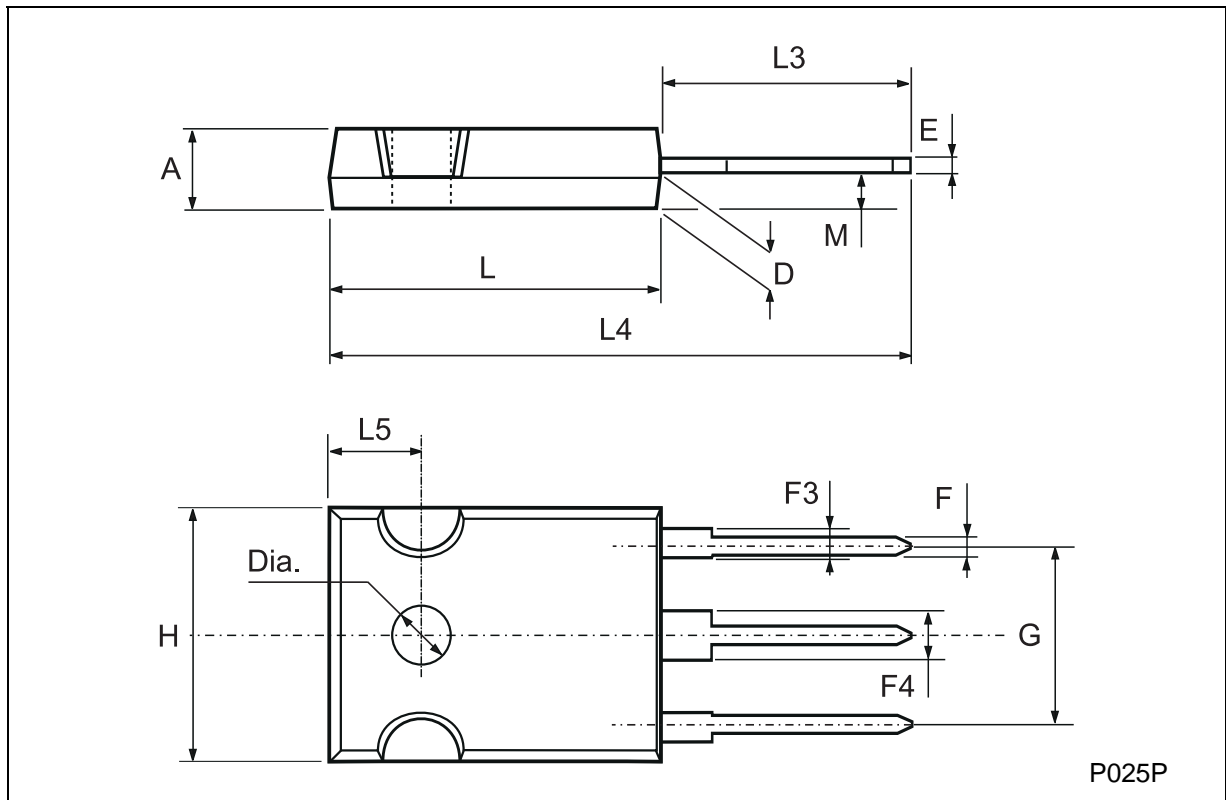


Figure 2: Switching Waveforms in a Deflection Circuit



**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



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