



## BUL416

# HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- STMicroelectronics PREFERRED SALESTYPE
- NPN TRANSISTOR
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERISED AT 125°C
- LOW SPREAD OF DYNAMIC PARAMETERS

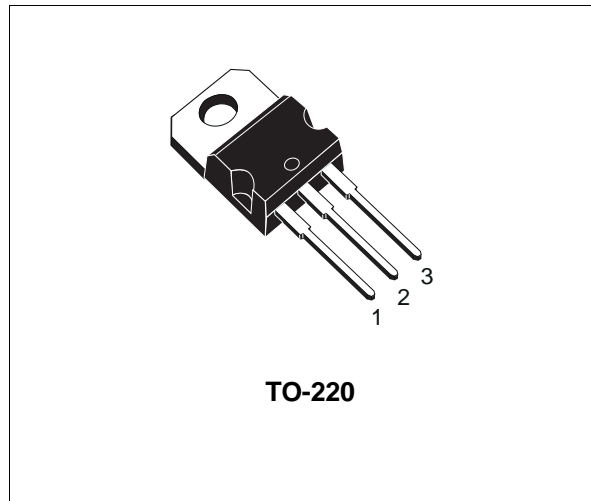
### APPLICATIONS

- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING
- SWITCH MODE POWER SUPPLIES

### DESCRIPTION

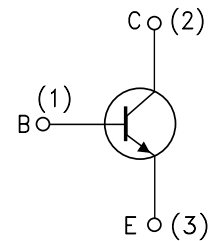
The BUL416 is manufactured using high voltage Multi-epitaxial Mesa technology for cost-effective high performance. It uses a Hollow Emitter structure to enhance switching speeds.

The BUL series is designed for use in lighting applications and low cost switch-mode power supplies.



TO-220

### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage ( $V_{BE} = 0$ )	1600	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	800	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	9	V
$I_C$	Collector Current	6	A
$I_{CM}$	Collector Peak Current ( $t_p < 5$ ms)	9	A
$I_B$	Base Current	5	A
$I_{BM}$	Base Peak Current ( $t_p < 5$ ms)	8	A
$P_{tot}$	Total Dissipation at $T_c = 25$ °C	110	W
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_j$	Max. Operating Junction Temperature	150	°C

# BUL416

## THERMAL DATA

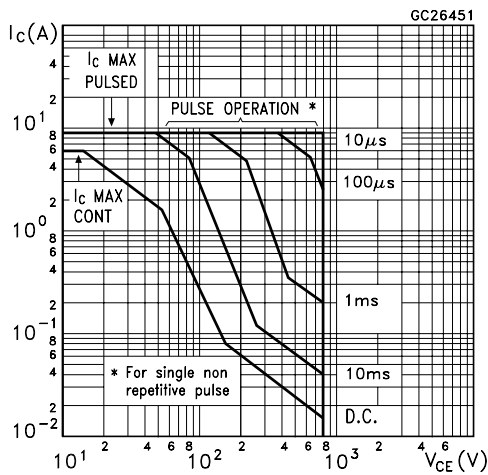
R <sub>thj-case</sub>	Thermal Resistance Junction-Case	Max	1.14	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-Ambient	Max	62.5	°C/W

## ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

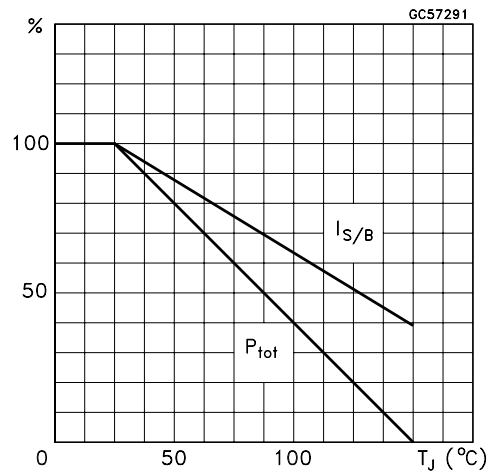
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I <sub>CES</sub>	Collector Cut-off Current (V <sub>BE</sub> = 0)	V <sub>CE</sub> = 1600 V V <sub>CE</sub> = 1600 V T <sub>j</sub> = 125 °C			100 500	μA μA
I <sub>CEO</sub>	Collector Cut-off Current (I <sub>B</sub> = 0)	V <sub>CE</sub> = 800 V			250	μA
V <sub>CEO(sus)</sub>	Collector-Emitter Sustaining Voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 100 mA L = 25 mH	800			V
V <sub>EBO</sub>	Emitter-Base Voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = 10 mA	9			V
V <sub>CE(sat)*</sub>	Collector-Emitter Saturation Voltage	I <sub>C</sub> = 2 A I <sub>B</sub> = 0.4 A I <sub>C</sub> = 4 A I <sub>B</sub> = 1.33 A			1.5 3	V V
V <sub>BE(sat)*</sub>	Base-Emitter Saturation Voltage	I <sub>C</sub> = 2 A I <sub>B</sub> = 0.4 A I <sub>C</sub> = 4 A I <sub>B</sub> = 1.33 A			1.2 1.5	V V
h <sub>FE*</sub>	DC Current Gain	I <sub>C</sub> = 0.7 A V <sub>CE</sub> = 5 V I <sub>C</sub> = 10 mA V <sub>CE</sub> = 5 V	12 10		40	
t <sub>s</sub> t <sub>f</sub>	INDUCTIVE LOAD Storage Time Fall Time	I <sub>C</sub> = 3 A I <sub>B1</sub> = 1 A V <sub>BE(off)</sub> = -5 V R <sub>BB</sub> = 0 Ω V <sub>CL</sub> = 200 V L = 200 μH		2.3 650		μs ns
t <sub>s</sub> t <sub>f</sub>	INDUCTIVE LOAD Storage Time Fall Time	I <sub>C</sub> = 3 A I <sub>B1</sub> = 1 A V <sub>BE(off)</sub> = -5 V R <sub>BB</sub> = 0 Ω V <sub>CL</sub> = 200 V L = 200 μH T <sub>j</sub> = 100 °C		3 680		μs ns

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

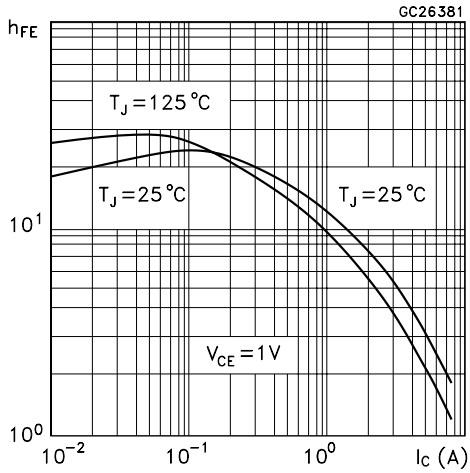
## Safe Operating Areas



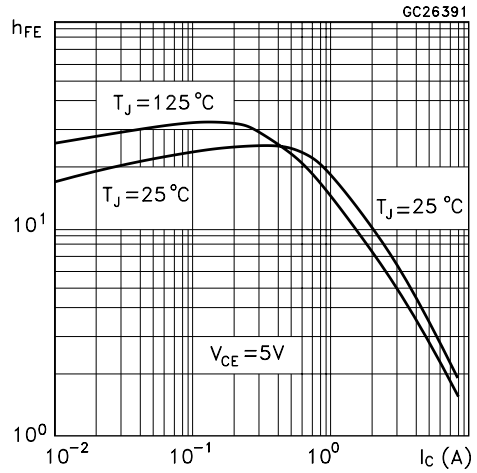
## Derating Curve



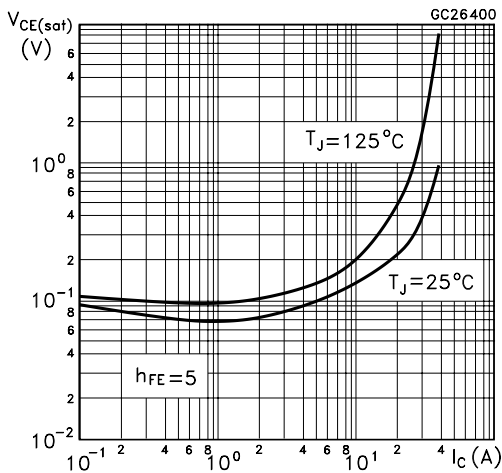
DC Current Gain



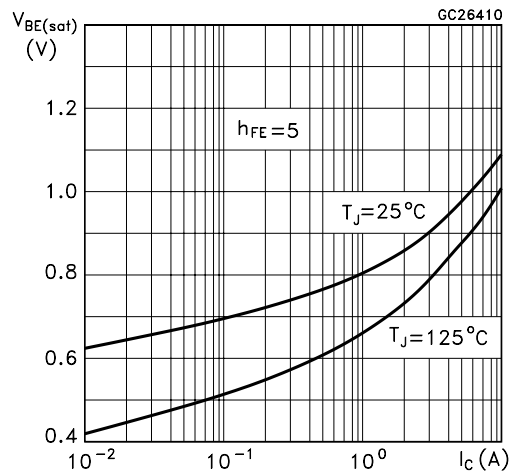
DC Current Gain



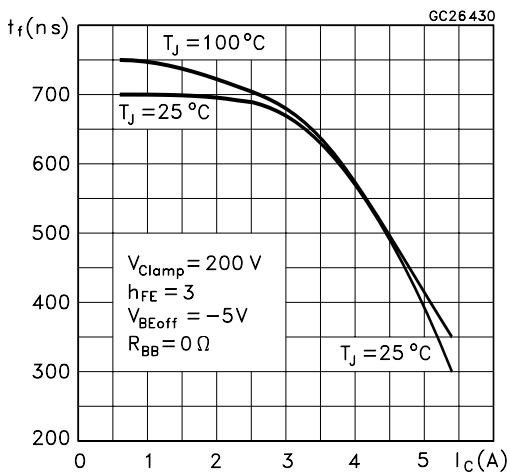
Collector Emitter Saturation Voltage



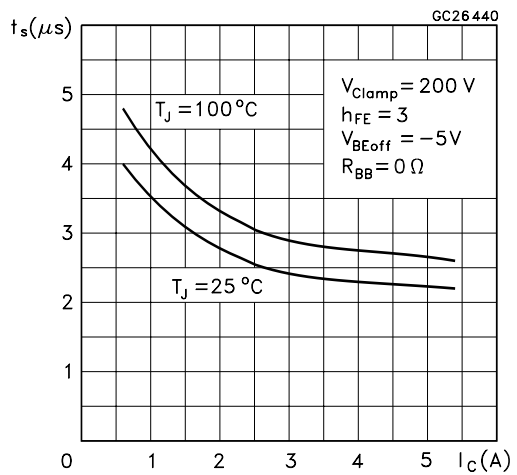
Base Emitter Saturation Voltage



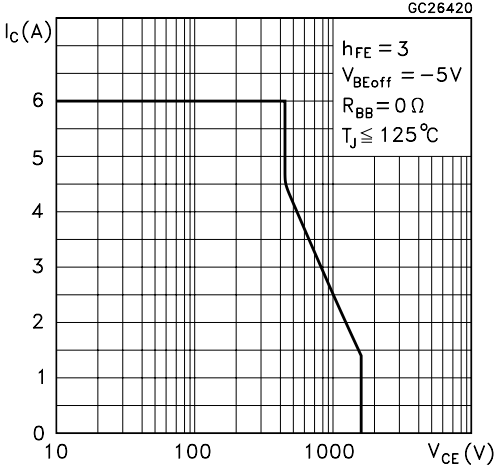
Inductive Fall Time



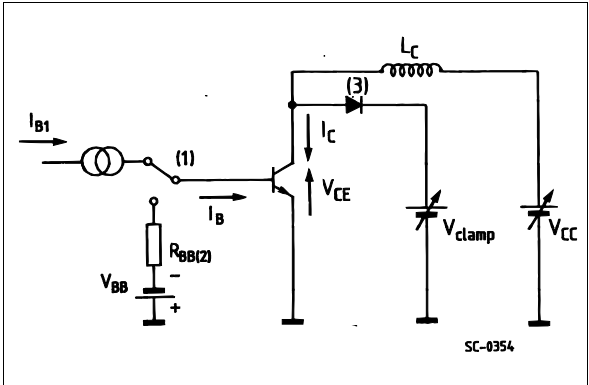
Inductive Storage Time



Reverse Biased SOA



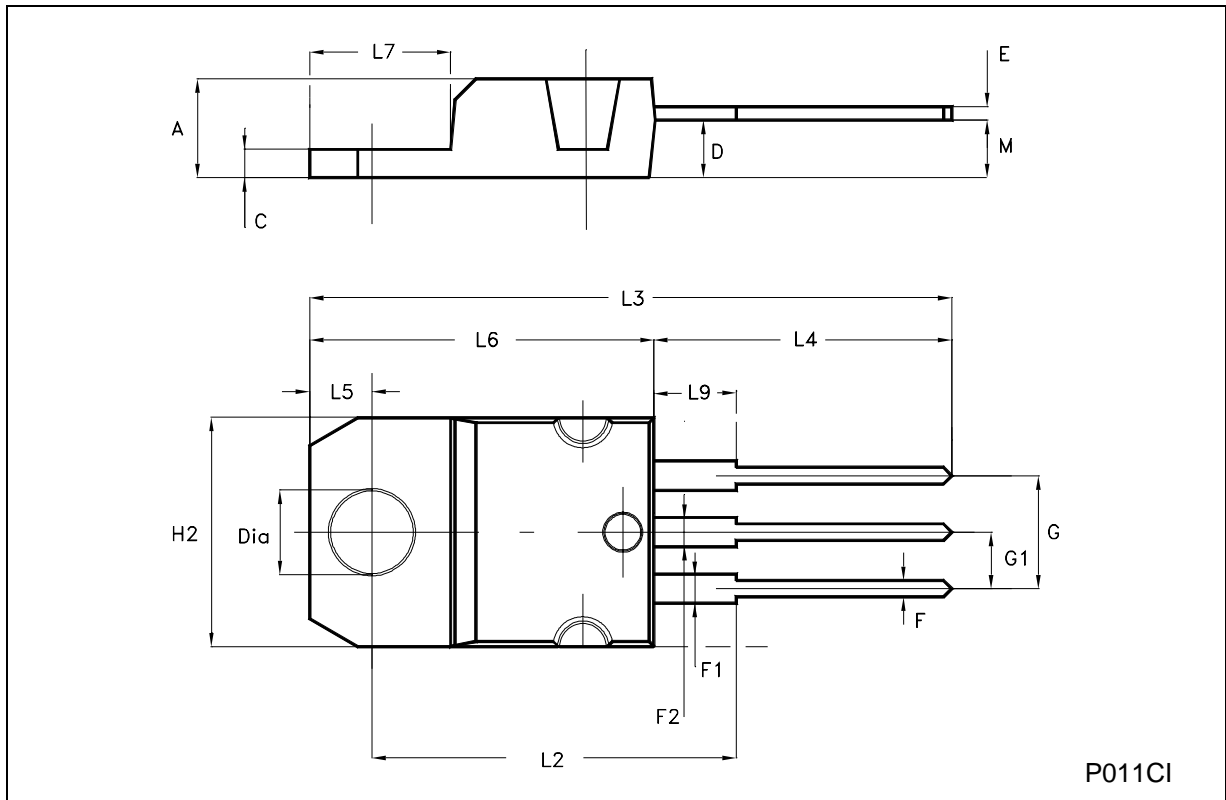
RBSOA and Inductive Load Switching Test Circuit



- (1) Fast electronic switch
- (2) Non-inductive Resistor
- (3) Fast recovery rectifier

**TO-220 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.052
D	2.40		2.72	0.094		0.107
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.202
G1	2.40		2.70	0.094		0.106
H2	10.00		10.40	0.394		0.409
L2		16.40			0.645	
L4	13.00		14.00	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.20		6.60	0.244		0.260
L9	3.50		3.93	0.137		0.154
M		2.60			0.102	
DIA.	3.75		3.85	0.147		0.151



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