

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- SGS-THOMSON PREFERRED SALESTYPE
- NPN TRANSISTOR
- HIGH VOLTAGE CAPABILITY
- LOW SPREAD OF DYNAMIC PARAMETERS
- MINIMUM LOT-TO-LOT SPREAD FOR RELIABLE OPERATION
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERIZED AT 125°C
- LARGE RBSOA
- FULLY MOLDED ISOLATED PACKAGE
- 2000 V DC ISOLATION (U.L. COMPLIANT)

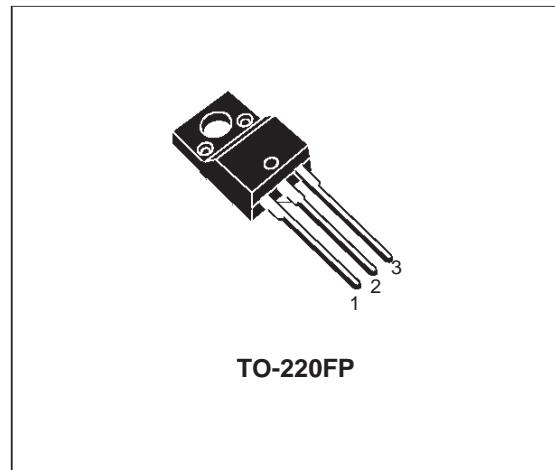
### APPLICATIONS

- ELECTRONIC BALLASTS FOR FLUORESCENT LIGHTING
- FLYBACK AND FORWARD SINGLE TRANSISTOR LOW POWER CONVERTERS

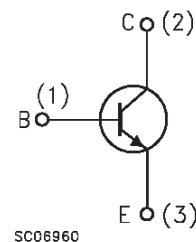
### DESCRIPTION

The BUL310FP is manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capability. It uses a Cellular Emitter structure with planar edge termination to enhance switching speeds while maintaining a wide RBSOA.

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



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-Emitter Voltage ( $V_{BE} = 0$ )	1000	V
$V_{CEO}$	Collector-Emitter Voltage ( $I_B = 0$ )	500	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	9	V
$I_C$	Collector Current	5	A
$I_{CM}$	Collector Peak Current ( $t_p < 5$ ms)	10	A
$I_B$	Base Current	3	A
$I_{BM}$	Base Peak Current ( $t_p < 5$ ms)	4	A
$P_{tot}$	Total Dissipation at $T_c = 25$ °C	36	W
$T_{stg}$	Storage Temperature	-65 to 150	°C
$T_j$	Max. Operating Junction Temperature	150	°C

## BUL310FP

### THERMAL DATA

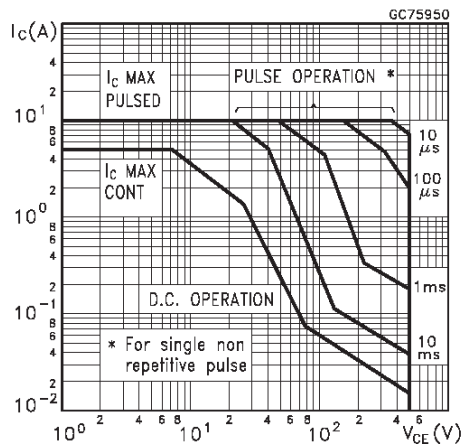
$R_{thj-case}$	Thermal Resistance Junction-Case	Max	3.5	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-Ambient	Max	62.5	$^{\circ}C/W$

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

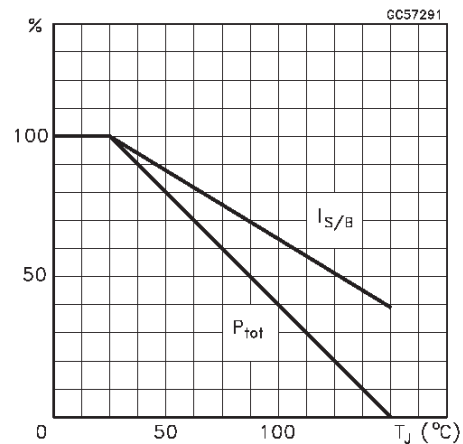
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 1000\text{ V}$ $V_{CE} = 1000\text{ V}$ $T_j = 125^{\circ}C$			100 500	$\mu A$ $\mu A$
$I_{CEO}$	Collector Cut-off Current ( $I_B = 0$ )	$V_{EC} = 400\text{ V}$			250	$\mu A$
$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage	$I_C = 100\text{ mA}$ $L = 25\text{ mH}$	500			V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	$I_E = 10\text{ mA}$	9			V
$V_{CE(sat)*}$	Collector-Emitter Saturation Voltage	$I_C = 1\text{ A}$ $I_B = 0.2\text{ A}$ $I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$ $I_C = 3\text{ A}$ $I_B = 0.6\text{ A}$			0.5 0.7 1.1	V V V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 1\text{ A}$ $I_B = 0.2\text{ A}$ $I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$ $I_C = 3\text{ A}$ $I_B = 0.6\text{ A}$			1 1.1 1.2	V V V
$h_{FE*}$	DC Current Gain	$I_C = 10\text{ mA}$ $V_{CE} = 5\text{ V}$ $I_C = 3\text{ A}$ $V_{CE} = 2.5\text{ V}$	10	10		
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2\text{ A}$ $I_{B1} = 0.4\text{ A}$ $V_{BE(off)} = -5\text{ V}$ $R_{BB} = 0\ \Omega$ $V_{CL} = 250\text{ V}$ $L = 200\ \mu H$		1.2 80	1.9 160	$\mu s$ ns
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2\text{ A}$ $I_{B1} = 0.4\text{ A}$ $V_{BE(off)} = -5\text{ V}$ $R_{BB} = 0\ \Omega$ $V_{CL} = 250\text{ V}$ $L = 200\ \mu H$ $T_j = 125^{\circ}C$		1.8 150		$\mu s$ ns

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

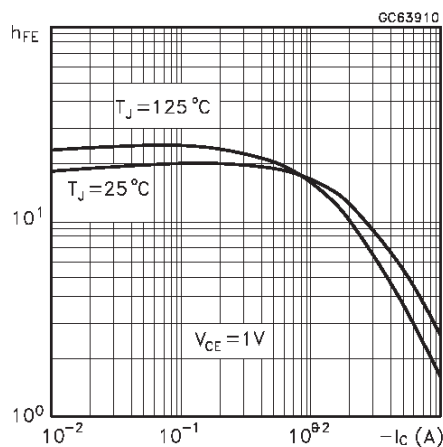
### Safe Operating Areas



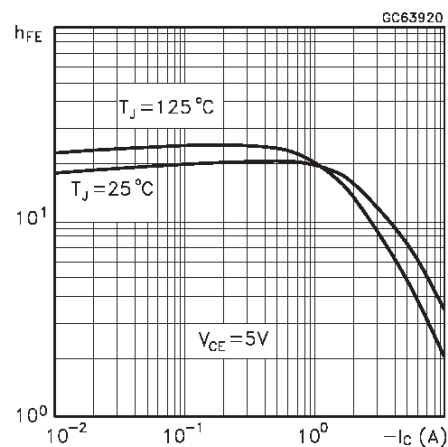
### Derating Curve



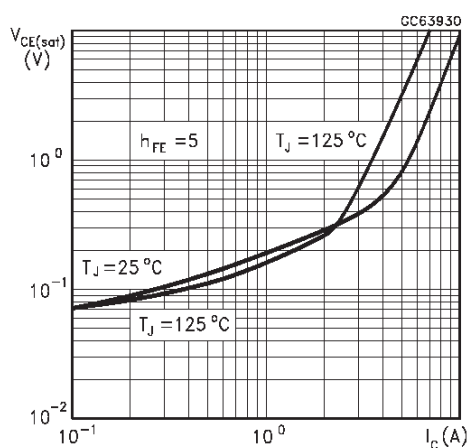
DC Current Gain



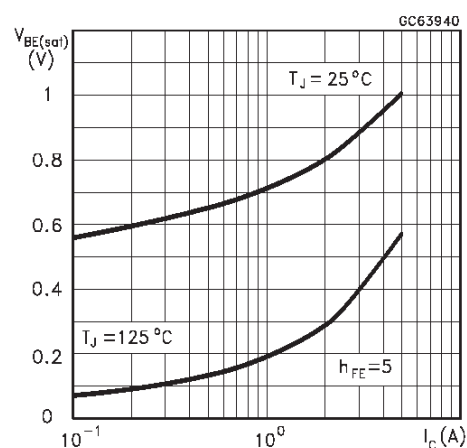
DC Current Gain



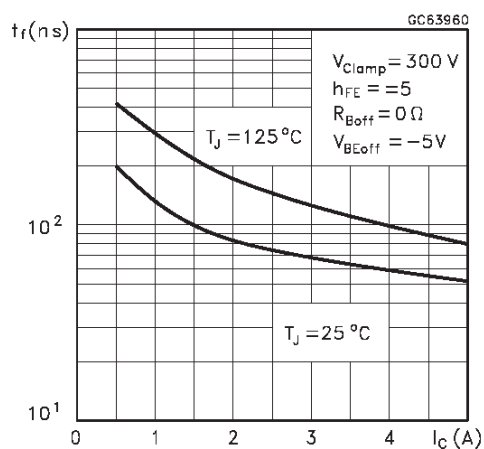
Collector Emitter Saturation Voltage



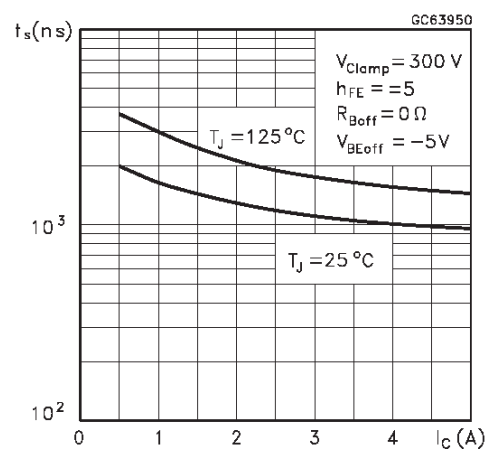
Base Emitter Saturation Voltage



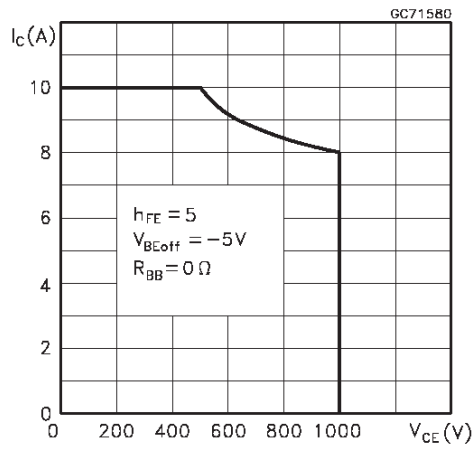
Inductive Fall Time



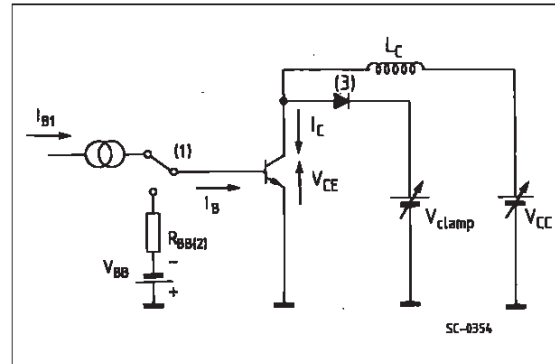
Inductive Storage Time



## Reverse Biased SOA



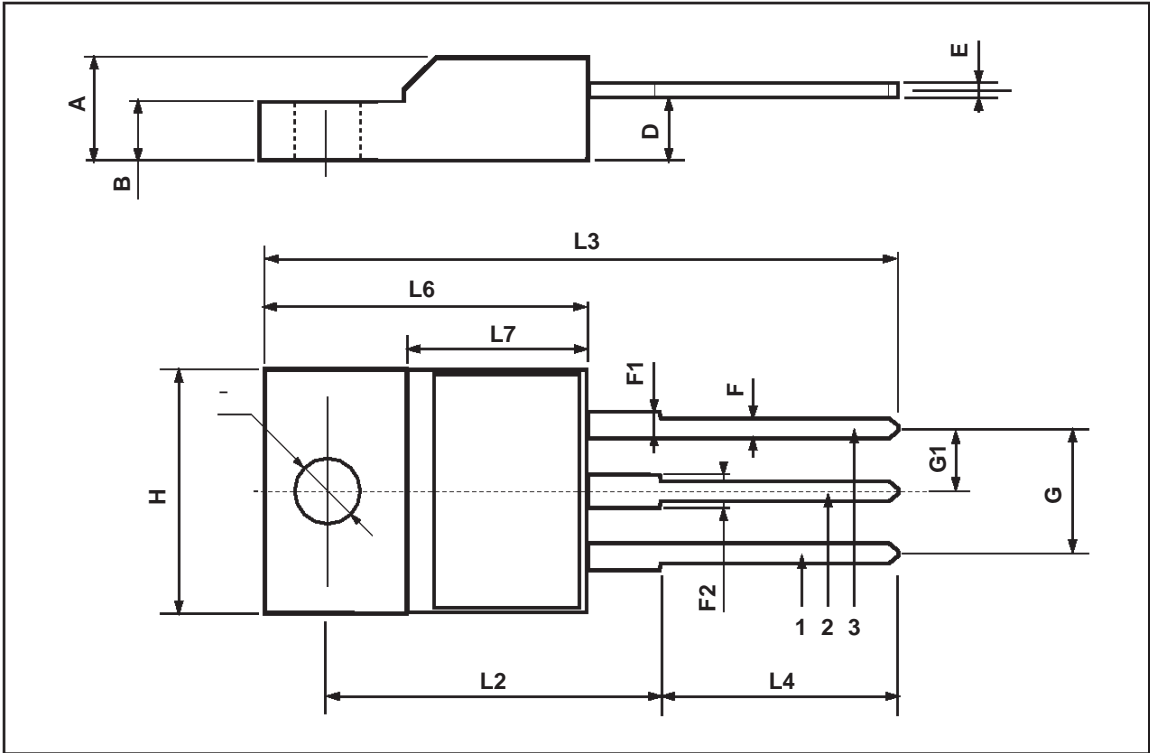
## RBSOA and Inductive Load Switching Test Circuit



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

TO-220FP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



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