

## HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTORS

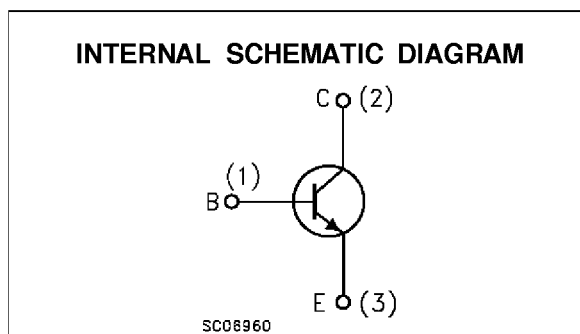
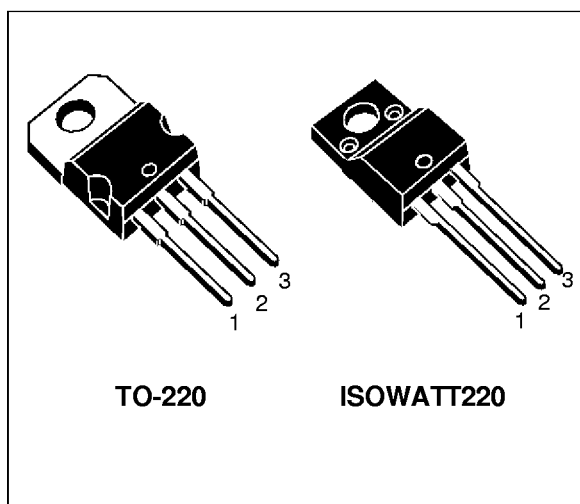
- HIGH VOLTAGE CAPABILITY (450V  $V_{CE0}$ )
- VERY HIGH SWITCHING SPEED:  $t_f = 35\text{ns}$   
TYPICAL AT  $I_C = 2.5\text{A}$ ,  $I_{B1} = 0.5\text{A}$ ,  $V_{BE\text{off}} = -5\text{V}$
- LOW SATURATION VOLTAGE
- COMPLETE CHARACTERIZATION AT  $100^\circ\text{C}$
- U.L. RECOGNISED ISOWATT220 PACKAGE  
(U.L. FILE # E81734 (N)).

### APPLICATION

- SWITCH MODE POWER SUPPLIES
- FLYBACK AND FORWARD SINGLE TRANSISTOR LOW POWER CONVERTERS

### DESCRIPTION

The SGSF313 and SGSF313PI are high voltage NPN FASTSWITCHING transistors designed to be used as switch in high efficiency OFF-LINE (220V mains) switching power supplies for consumer applications like sets VCR's and monitors.



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		SGSF313	SGSF313PI	
$V_{CEX}$	Collector-Emitter Voltage ( $V_{BE} = -2.5\text{V}$ )	1000		V
$V_{CES}$	Collector-Emitter Voltage ( $V_{BE} = 0$ )	1000		V
$V_{CE0}$	Collector-Emitter Voltage ( $I_B = 0$ )	450		V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	10		V
$I_C$	Collector Current	7		A
$I_{CM}$	Collector Peak Current ( $t_p < 5\text{ms}$ )	10		A
$I_B$	Base Current	3		A
$I_{BM}$	Base Peak Current ( $t_p < 5\text{ms}$ )	6		A
$P_{tot}$	Total Dissipation at $T_c = 25^\circ\text{C}$	70	35	W
$T_{stg}$	Storage Temperature	-65 to 150		$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	150		$^\circ\text{C}$

**THERMAL DATA**

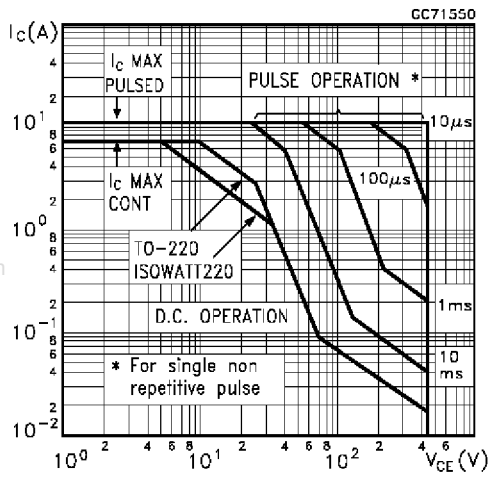
			TO-220	ISOWATT221	
$R_{thj-case}$	Thermal Resistance Junction-Case	Max	1.78	3.57	°C/W

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

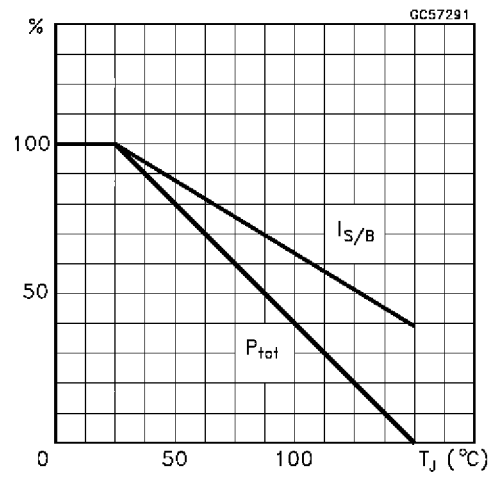
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector Cut-off Current ( $V_{BE} = 0$ )	$V_{CE} = 1000\text{ V}$ $V_{CE} = 1000\text{ V}$ $T_j = 125\text{ °C}$			10 100	$\mu\text{A}$ $\mu\text{A}$
$I_{CEO}$	Collector Cut-off Current ( $I_B = 0$ )	$V_{EC} = 450\text{ V}$			100	$\mu\text{A}$
$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage	$I_C = 100\text{ mA}$ $L = 25\text{ mH}$	450			V
$V_{CE(sat)*}$	Collector-Emitter Saturation Voltage	$I_C = 1\text{ A}$ $I_B = 0.1\text{ A}$ $I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$ $I_C = 2.5\text{ A}$ $I_B = 0.5\text{ A}$ $I_C = 1\text{ A}$ $I_B = 0.1\text{ A}$ $T_j = 125\text{ °C}$ $I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$ $T_j = 125\text{ °C}$			0.5 0.45 0.75 0.6 0.8	V V V V V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 1\text{ A}$ $I_B = 0.1\text{ A}$ $I_C = 2\text{ A}$ $I_B = 0.4\text{ A}$ $I_C = 2.5\text{ A}$ $I_B = 0.5\text{ A}$			1.1 1.25 1.3	V V V
$h_{FE*}$	DC Current Gain	$I_C = 1\text{ A}$ $V_{CE} = 2.5\text{ V}$ $I_C = 1\text{ A}$ $V_{CE} = 5\text{ V}$ $I_C = 2\text{ A}$ $V_{CE} = 1\text{ V}$ $I_C = 5\text{ mA}$ $V_{CE} = 5\text{ V}$ $I_C = 1\text{ A}$ $V_{CE} = 2.5\text{ V}$ $T_j = 125\text{ °C}$ $I_C = 1\text{ A}$ $V_{CE} = 5\text{ V}$ $T_j = 125\text{ °C}$ $I_C = 2\text{ A}$ $V_{CE} = 1\text{ V}$ $T_j = 125\text{ °C}$	12 15 6 10	30	45	
$t_{ON}$ $t_s$ $t_f$	RESISTIVE LOAD Turn-on Time Storage Time Fall Time	$V_{CC} = 250\text{ V}$ $I_C = 2.5\text{ A}$ $I_{B1} = 0.5\text{ A}$ $I_{B2} = -1\text{ A}$		0.5 1.5 0.18	1 2.5 0.3	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_{ON}$ $t_s$ $t_f$	RESISTIVE LOAD Turn-on Time Storage Time Fall Time	$V_{CC} = 250\text{ V}$ $I_C = 2.5\text{ A}$ $I_{B1} = 0.5\text{ A}$ $I_{B2} = -1\text{ A}$ With Antisaturation Network		0.5 1.1 0.13		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_{ON}$ $t_s$ $t_f$	RESISTIVE LOAD Turn-on Time Storage Time Fall Time	$V_{CC} = 250\text{ V}$ $I_C = 2.5\text{ A}$ $I_{B1} = 0.5\text{ A}$ $V_{BE(off)} = -5\text{ V}$		0.5 1.1 0.13		$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2.5\text{ A}$ $h_{FE} = 5A$ $V_{BE(off)} = -5\text{ V}$ $R_{BB} = 2\ \Omega$ $V_{CL} = 300\text{ V}$ $L = 300\ \mu\text{H}$		1 0.1	2 0.2	$\mu\text{s}$ $\mu\text{s}$
$t_s$ $t_f$	INDUCTIVE LOAD Storage Time Fall Time	$I_C = 2.5\text{ A}$ $h_{FE} = 5A$ $V_{BE(off)} = -5\text{ V}$ $R_{BB} = 2\ \Omega$ $V_{CL} = 300\text{ V}$ $L = 300\ \mu\text{H}$ $T_j = 100\text{ °C}$			3 0.3	$\mu\text{s}$ $\mu\text{s}$

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

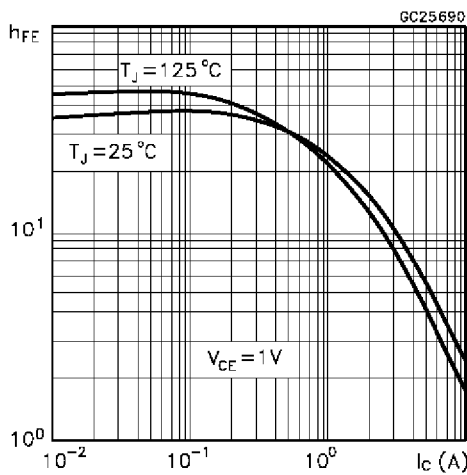
Safe Operating Area Thermal Impedance



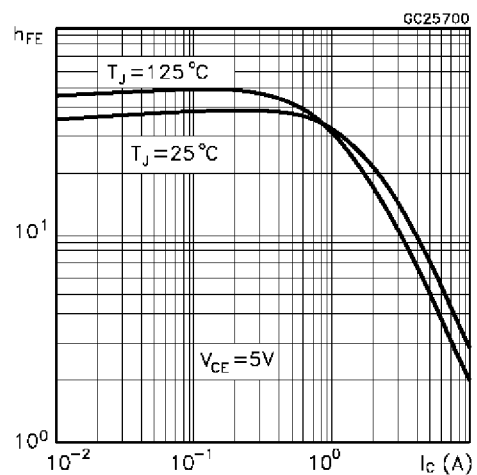
Derating Curve



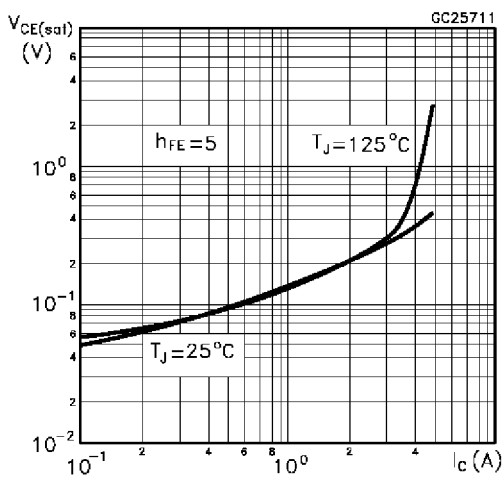
DC Current Gain



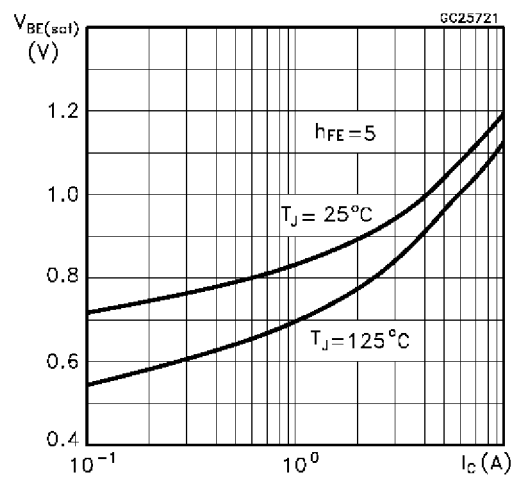
DC Current Gain



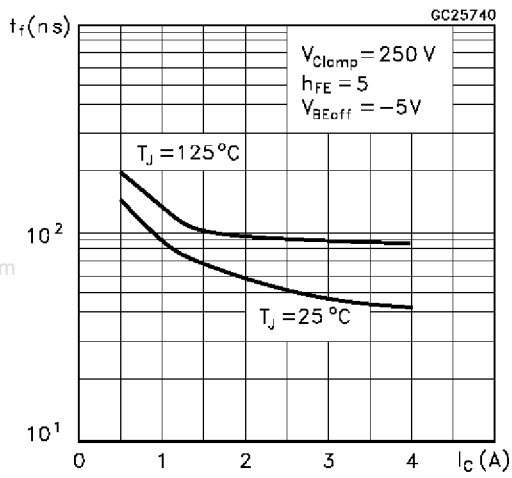
Collector Emitter Saturation Voltage



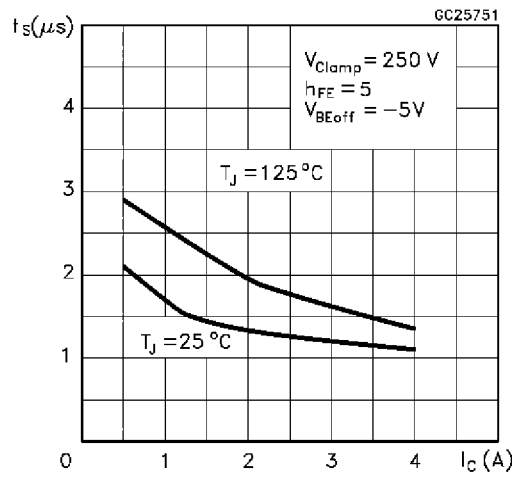
Base Emitter Saturation Voltage



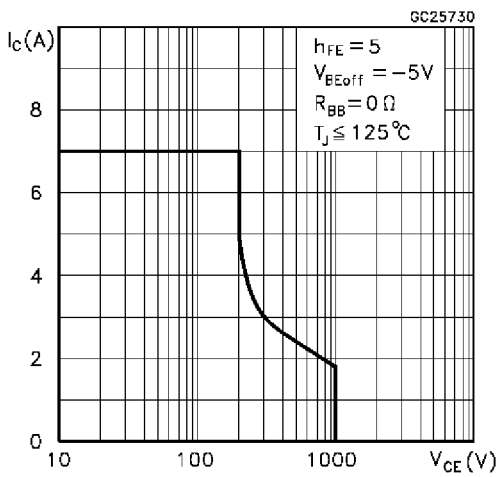
Inductive Fall Time



Inductive Storage Time

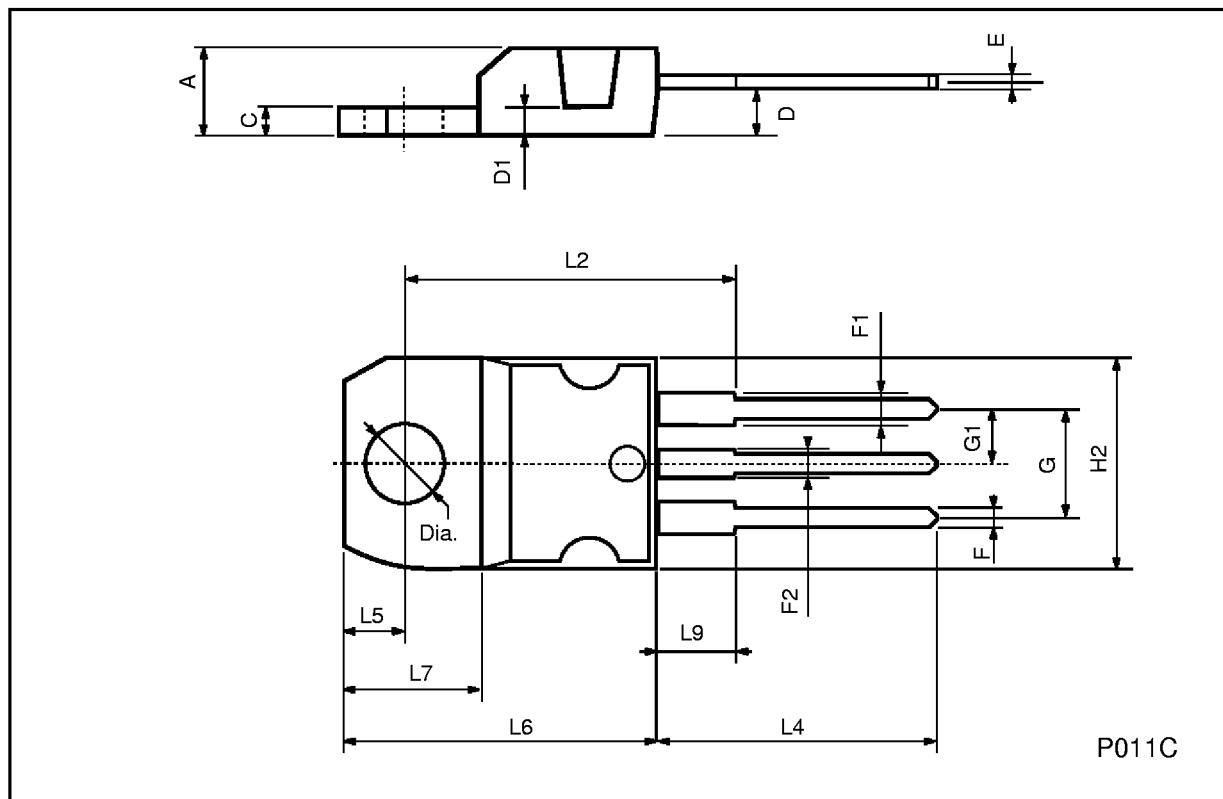


Reverse Biased SOA



## 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		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
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		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



**ISOWATT220 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	0.4		0.7	0.015		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

