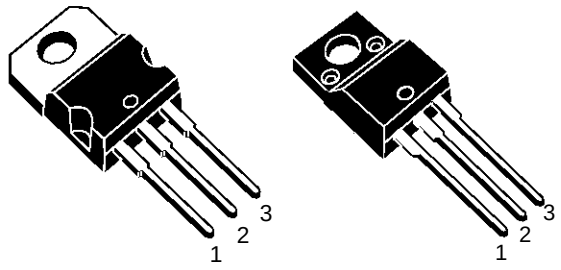
SGS-THOMSON MICROELECTRONICS

SGSF313
SGSF313PI

HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTORS

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



TO-220 **ISOWATT220**

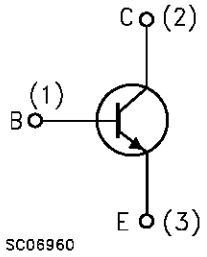
APPLICATION

- 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 efficency OFF-LINE (220V mains) switching power supplies for consumer applications like sets VCR's and monitors.

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

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

THERMAL DATA

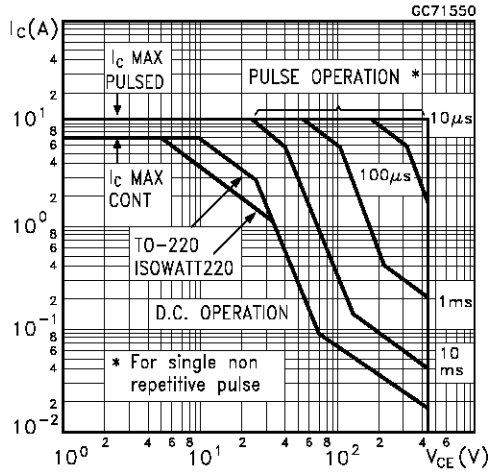
		TO-220	ISOWATT221	
$R_{thj\text{-}case}$	Thermal Resistance Junction-Case Max	1.78	3.57	°C/W

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

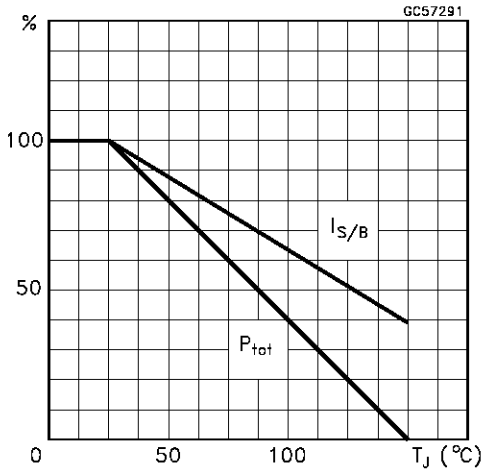
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cut-off Current (V_{BE} = 0)	V_{CE} = 1000 V V_{CE} = 1000 V T_j = 125 °C			10 100	µA µA
I_{CEO}	Collector Cut-off Current (I_B = 0)	V_{EC} = 450 V			100	µA
$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage	I_C = 100 mA L = 25 mH	450			V
$V_{CE(sat)}$*	Collector-Emitter Saturation Voltage	I_C = 1 A I_B = 0.1 A I_C = 2 A I_B = 0.4 A I_C = 2.5 A I_B = 0.5 A I_C = 1 A I_B = 0.1 A T_j = 125 °C I_C = 2 A I_B = 0.4 A T_j = 125 °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 A I_B = 0.1 A I_C = 2 A I_B = 0.4 A I_C = 2.5 A I_B = 0.5 A			1.1 1.25 1.3	V V V
h_{FE}*	DC Current Gain	I_C = 1 A V_{CE} = 2.5 V I_C = 1 A V_{CE} = 5 V I_C = 2 A V_{CE} = 1 V I_C = 5 mA V_{CE} = 5 V I_C = 1 A V_{CE} = 2.5 V T_j = 125 °C I_C = 1 A V_{CE} = 5 V T_j = 125 °C I_C = 2 A V_{CE} = 1 V T_j = 125 °C	12 15 6 10	 30 25 28 12	 45	
t_{ON} t_s t_f	RESISTIVE LOAD Turn-on Time Storage Time Fall Time	V_{CC} = 250 V I_C = 2.5 A I_{B1} = 0.5 A I_{B2}= -1 A		 0.5 1.5 0.18	 1 2.5 0.3	 µs µs µs
t_{ON} t_s t_f	RESISTIVE LOAD Turn-on Time Storage Time Fall Time	V_{CC} = 250 V I_C = 2.5 A I_{B1} = 0.5 A I_{B2}= -1 A With Antisaturation Network		 0.5 1.1 0.13		 µs µs µs
t_{ON} t_s t_f	RESISTIVE LOAD Turn-on Time Storage Time Fall Time	V_{CC} = 250 V I_C = 2.5 A I_{B1} = 0.5 A $V_{BE(off)}$= -5 V		 0.5 1.1 0.13		 µs µs µs
t_s t_f	INDUCTIVE LOAD Storage Time Fall Time	I_C = 2.5 A h_{FE} =5A $V_{BE(off)}$ = -5 V R_{BB} = 2 Ω V_{CL} = 300 V L = 300 µH		 1 0.1	 2 0.2	 µs µs
t_s t_f	INDUCTIVE LOAD Storage Time Fall Time	I_C = 2.5 A h_{FE} =5A $V_{BE(off)}$ = -5 V R_{BB} = 2 Ω V_{CL} = 300 V L = 300 µH T_j = 100 °C			3 0.3	µs µs

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

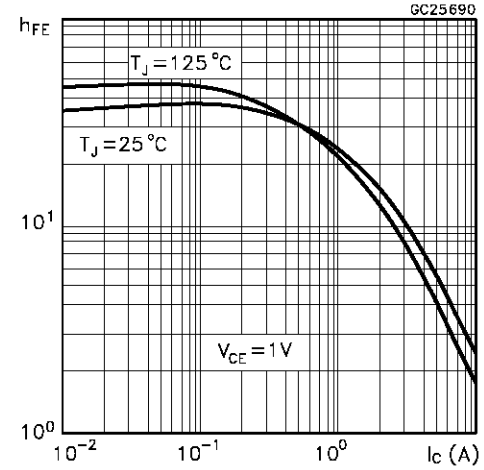
Safe Operating AreaThermal Impedance



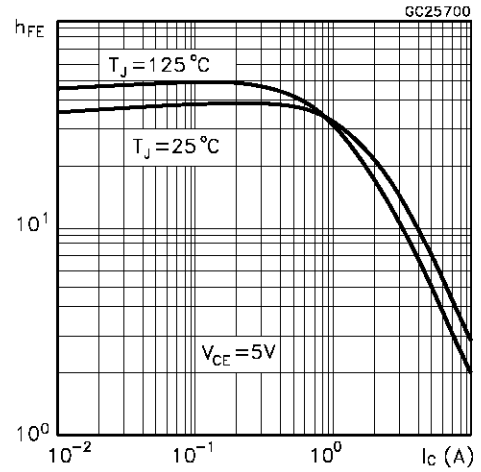
Derating Curve



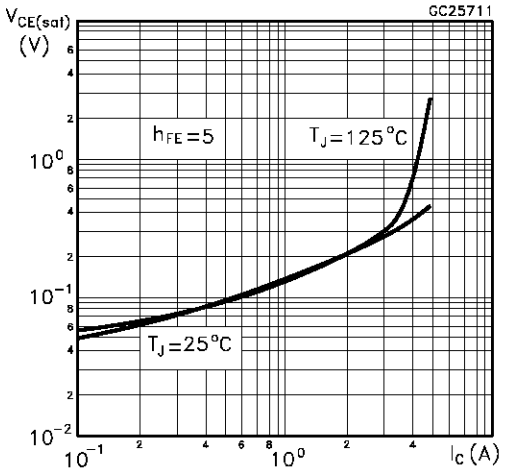
DC Current Gain



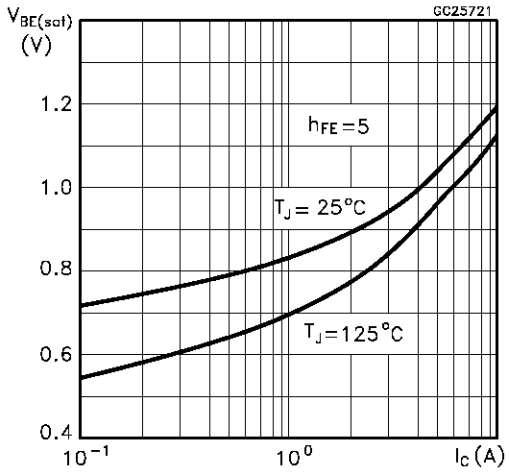
DC Current Gain



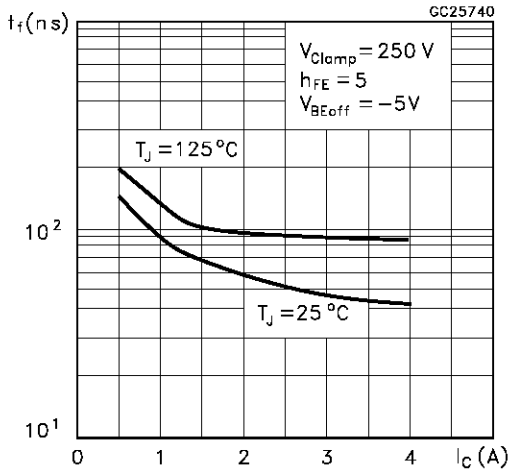
Collector Emitter Saturation Voltage



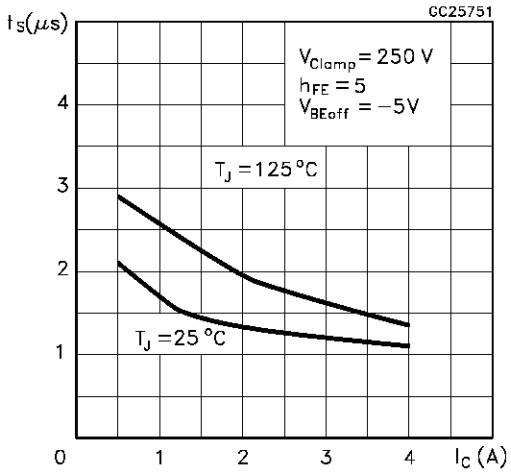
Base Emitter Saturation Voltage



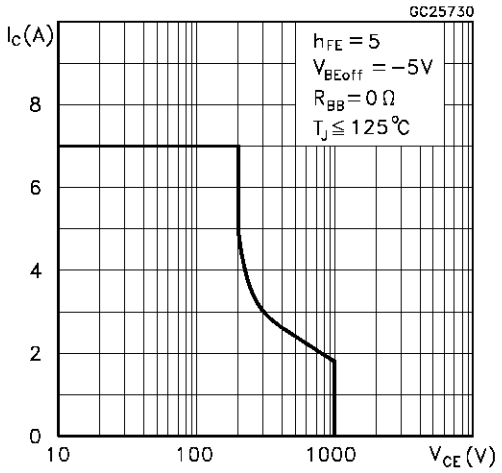
Inductive Fall Time



Inductive Storage Time

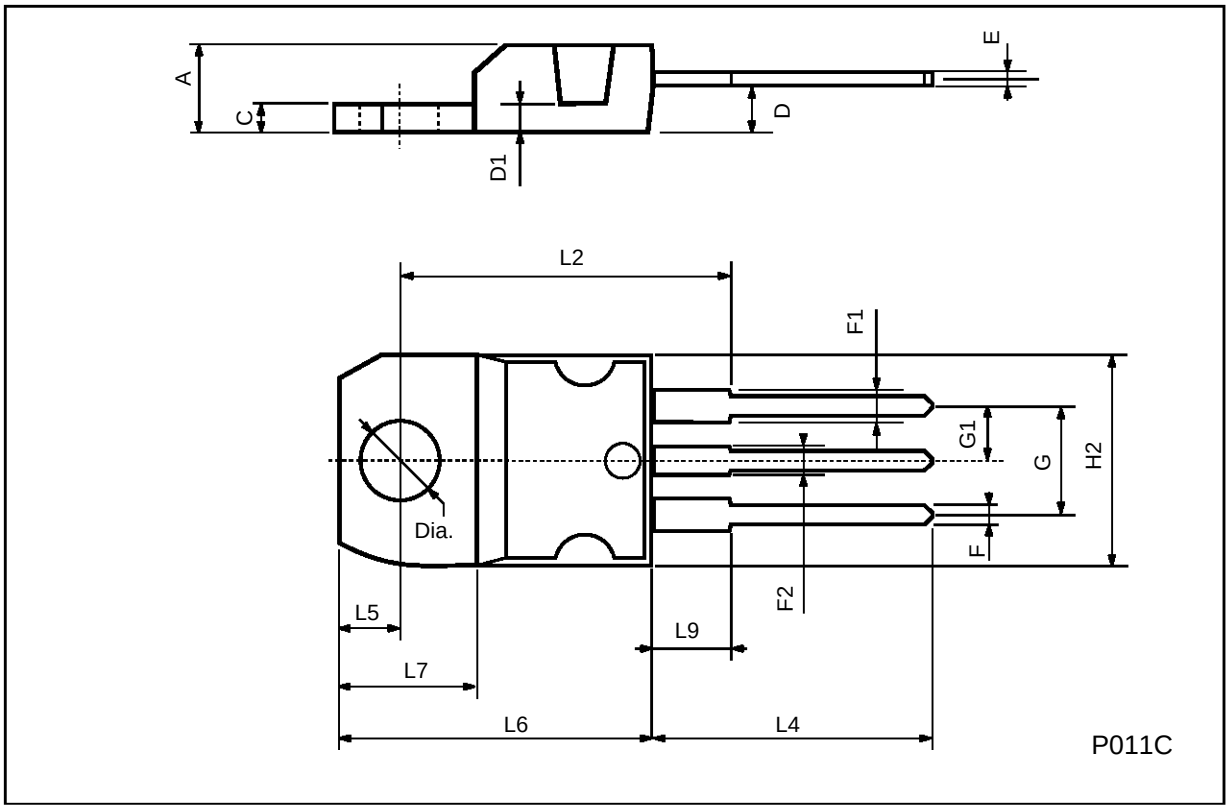


Reverse Biased SOA



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