SGS-THOMSON
MICROELECTRONICS

SGSIF325
SGSF425–SGSIF425

FASTSWITCH HOLLOW–EMITTER NPN TRANSISTORS

- HIGH SWITCHING SPEED NPN POWER TRANSISTORS
- HOLLOW EMITTER TECHNOLOGY
- HIGH VOLTAGE FOR OFF-LINE APPLICATIONS
- 50kHz SWITCHING SPEED
- LOW COST DRIVE CIRCUITS
- LOW DYNAMIC SATURATION

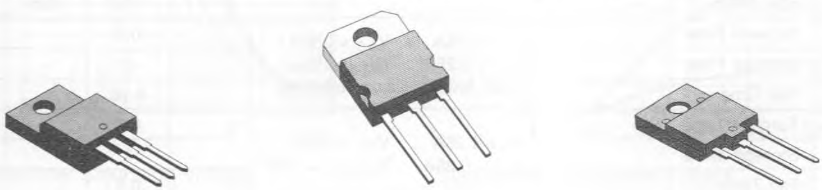
APPLICATIONS

- SMPS
- TV HORIZONTAL DEFLECTION

DESCRIPTION

Hollow emitter FASTSWITCH NPN power transistors are specially designed for 220V (and 117V with input doubler) off-line switching power supply and colour CRT deflection applications. High voltage hollow emitter transistors can operate up to 50kHz with low cost drive circuits. These transistors can be used to advantage in off-line switching power supply applications where their high voltage rating is a benefit because costly transformer clamp windings or over voltage snubbing can be omitted. These transistors are suitable for application in flyback and forward single transistor low power converters, 50W to 100W. When used in conjunction with a Power MOSFET in emitter switch configuration in flyback and forward converters, they can operate at over 100kHz.

These hollow emitter FASTSWITCH transistors are available in TO-218 and fully isolated ISOWATT220 and ISOWATT218 packages. The ISOWATT218 conforms to the creepage distance and isolation requirements of VDE, IEC, and UL specifications.



ISOWATT220 TO-218 ISOWATT218

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	SGS			Unit
		IF325	F425	IF425	
V_{CES}	Collector - Emitter Voltage (V_{BE} = 0)	1300			V
V_{CEO}	Collector - Emitter Voltage (I_B = 0)	600			V
V_{EBO}	Emitter - Base Voltage (I_C = 0)	7			V
I_C	Collector Current	4			A
I_{CM}	Collector Peak Current (t_p < 5ms)	8			A
I_B	Base Current	3			A
I_{BM}	Base Peak Current (t_p < 5ms)	6			A
P_{tot}	Total Dissipation at $T_c \leq 25°C$	35	80	45	W
T_{stg}	Storage Temperature – 65 to	150	150	150	°C
T_j	Junction Temperature	150	150	150	°C

THERMAL DATA

		SGS IF325	SGS F425	SGS IF425	
$R_{thj\text{-}case}$	Thermal Resistance Junction-case Max	3.57	1.56	2.78	°C/W

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cutoff Current (V_{BE} = 0)	V_{CE} = 1300V			200	μA
I_{CEO}	Collector Cutoff Current (I_B = 0)	V_{CE} = 380V V_{CE} = 600V			200 2	μA mA
I_{EBO}	Emitter Cutoff Current (I_C = 0)	V_{EB} = 7V			1	mA
$V_{CEO(sus)}$*	Collector Emitter Sustaining Voltage	I_C = 0.1A	600			V
$V_{CE(sat)}$*	Collector Emitter Saturation Voltage	I_C = 1.25A I_B = 0.25A I_C = 1A I_B = 0.15A			1.5 1.5	V V
$V_{BE(sat)}$*	Base Emitter Saturation Voltage	I_C = 1.25A I_B = 0.25A I_C = 1A I_B = 0.15A			1.5 1.5	V V

RESISTIVE LOAD

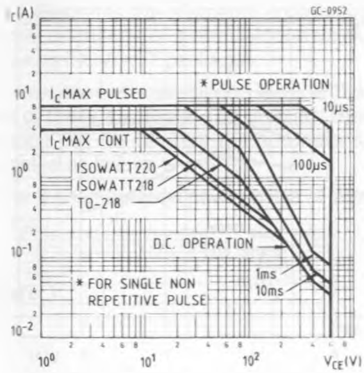
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{on}	Turn-on Time	I_C = 1.25A V_{CC} = 250V I_{B1} = 0.25A I_{B2} = − 2I_{B1}		0.6	1	μs
t_s	Storage Time			3	4.5	μs
t_f	Fall Time			0.2	0.35	μs
t_{on}	Turn-on Time	I_C = 1.25A V_{CC} = 250V I_{B1} = 0.25A I_{B2} = − 2I_{B1} With Antisaturation Network		0.6		μs
t_s	Storage Time			2		μs
t_f	Fall Time			0.16		μs
t_{on}	Turn-on Time	I_C = 1.25A V_{CC} = 250V I_{B1} = 0.25A $V_{BE(off)}$ = − 5V		0.6		μs
t_s	Storage Time			1		μs
t_f	Fall Time			0.5		μs

INDUCTIVE LOAD

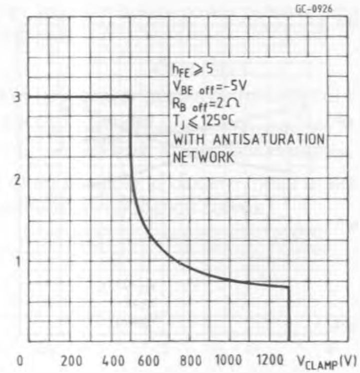
Symbol	Parameter	Test Conditions	Min.	Typ	Max.	Unit
t_s	Storage Time	I_C = 1.25A h_{FE} = 5 V_{CL} = 450V $V_{BE(off)}$ = − 5V L = 300μH $R_{B(off)}$ = 2Ω		1.2	2.5	μs
t_f	Fall Time			0.1	0.2	μs
t_s	Storage Time	I_C = 1.25A h_{FE} = 5 V_{CL} = 450V $V_{BE(off)}$ = − 5V L = 300μH $R_{B(off)}$ = 2Ω T_c = 100°C			3.7	μs
t_f	Fall Time				0.3	μs

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

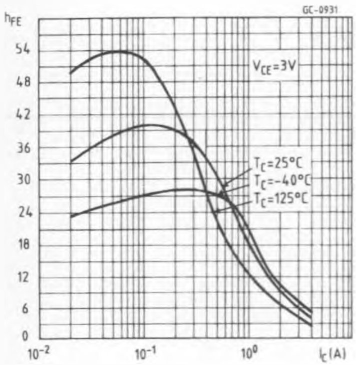
Safe Operating Areas



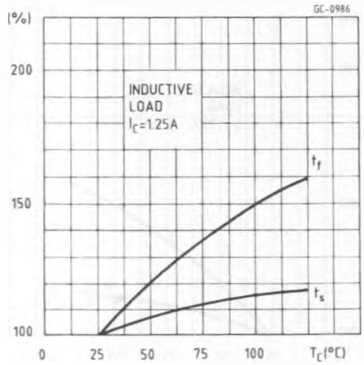
Reverse Biased Safe Operating Area



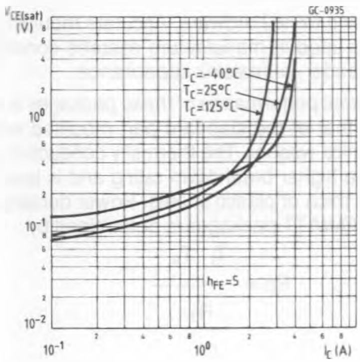
DC Current Gain



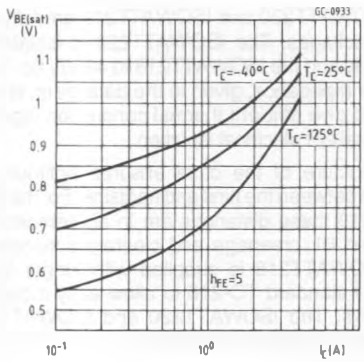
Collector-emitter Saturation Voltage



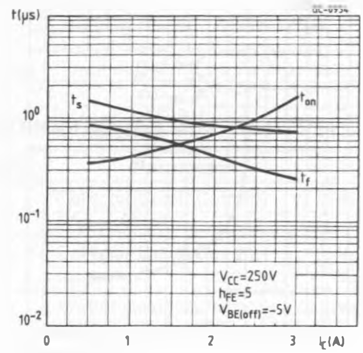
Collector-emitter Saturation Voltage



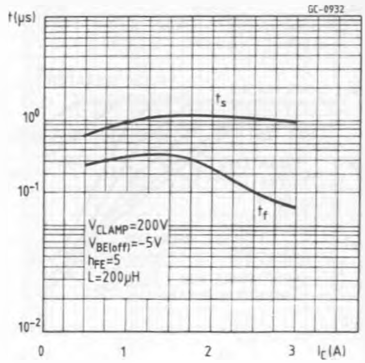
Base-emitter Saturation Voltage



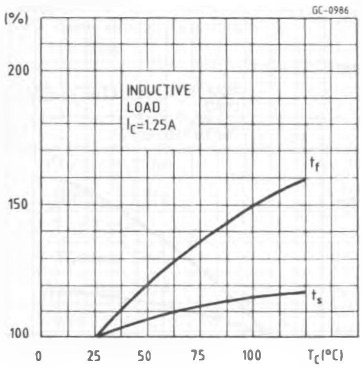
Resistive Load Switching Times



Inductive Load Switching Times



Switching Times Percentance Variation



ISOWATT PACKAGES CHARACTERISTICS AND APPLICATION

The ISOWATT220 and ISOWATT218 are fully isolated packages. The ISOWATT220 is isolated to 2000V dc and the ISOWATT218 to 4000V dc. Their thermal impedance, given in the datasheet, is optimized to give efficient thermal conduction together with excellent electrical isolation.

The structure of the case ensures optimum distances between the pins and heatsink. For the ISOWATT218 these distances are in agreement with VDE and UL creepage and clearance standards. The ISOWATT218 is supplied with longer leads than the standard TO-218 to allow easy mounting on PCB's. The ISOWATT220 and ISOWATT218 packages eliminate the need for external isolation so reducing fixing hardware. Accurate moulding techniques used in manufacture assures consistent heat spreader-to-heatsink capacitance.

The thermal performance of these packages is better than that of the standard part mounted with a 0.1mm mica washer. The thermally conductive plastic has a higher breakdown rating and is less fragile than mica or plastic sheets. Power derating for these ISOWATT packages is determined by :

$$P_D = \frac{T_j - T_c}{R_{th}}$$

THERMAL IMPEDANCE OF ISOWATT PACKAGES

Fig. 1 illustrates the elements contributing to the thermal resistance of a transistor heatsink assembly, using ISOWATT packages.

The total thermal resistance $R_{th(tot)}$ is the sum of each of these elements. The transient thermal impedance, Z_{th} for different pulse durations can be estimated as follows :

1 - For a short duration power pulse of less than 1ms :

$$Z_{th} < R_{thJ\text{-}C}$$

2 - For an intermediate power pulse of 5ms to 50ms seconds :

$$Z_{th} = R_{thJ\text{-}C}$$

3 - For long power pulses of the order of 500ms seconds or greater :

$$Z_{th} = R_{thJ\text{-}C} + R_{thC\text{-}HS} + R_{thHS\text{-}amb}$$

It is often possible to discern these areas on transient thermal impedance curves.

Figure 1.