SGSF464
SGSIF464/F564

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

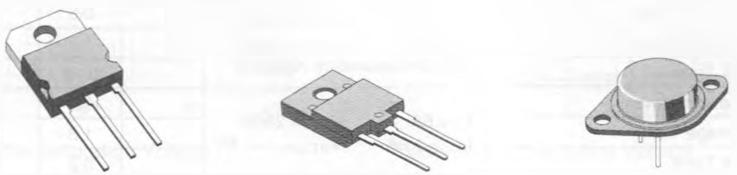
APPLICATIONS

- SMPS
- TV HORIZONTAL DEFLECTION

DESCRIPTION

These 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. Hollow emitter transistors can be used to advantage in off-line switching power supply applications where their high voltage rating is a benefit in forward and flyback converters because a costly transformer clamp winding or over voltage snubbers can be omitted. High voltage hollow emitter transistors can operate up to 50kHz with simple drive circuits which help to simplify design and improve reliability. These transistors can also be used in half bridge, push-pull and full bridge medium power converters, 450W to 950W. When used in conjunction with a low voltage Power MOSFET in emitter switch configuration in flyback and forward converters, they can operate at up to 100kHz.

These hollow emitter FASTSWITCH transistors are available in TO-218 and fully isolated TO-218 packages. The ISOWATT218 conforms to the creepage distance and isolation requirements of VDE, IEC, and UL specifications. Additionally these FASTSWITCH transistors are available in metal TO-3 packages.



TO-218 ISOWATT218 TO-3

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	SGS			Unit
		F464	IF464	F564	
V_{CES}	Collector - Emitter Voltage (V_{BE} = 0)	1200			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	10			A
I_{CM}	Collector Peak Current (t_p < 5ms)	15			A
I_B	Base Current	7			A
I_{BM}	Base Peak Current (t_p < 5ms)	12			A
P_{tot}	Total Dissipation at $T_c \leq 25°C$	125	65	150	W
T_{stg}	Storage Temperature – 65 to	150	150	175	°C
T_j	Junction Temperature	150	150	175	°C

THERMAL DATA

		SGS			
		F464	IF464	F564	
$R_{thj-case}$	Thermal Resistance Junction-case Max	1	1.92	1	°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} = 1200V			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 = 6A I_B = 1.2A I_C = 3.5A I_B = 0.5A			1.5 1.5	V V
$V_{BE(sat)}$*	Base Emitter Saturation Voltage	I_C = 6A I_B = 1.2A I_C = 3.5A I_B = 0.5A			1.5 1.5	V V

RESISTIVE LOAD

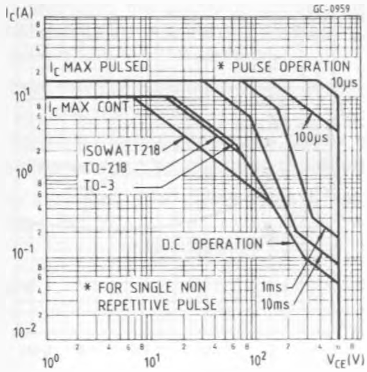
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{on}	Turn-on Time	I_C = 6A V_{CC} = 250V I_{B1} = 1.2A I_{B2} = – 2I_{B1}		0.6	1.2	μs
t_s	Storage Time			2.45	3.5	μs
t_f	Fall Time			0.12	0.4	μs
t_{on}	Turn-on Time	I_C = 6A V_{CC} = 250V I_{B1} = 1.2A I_{B2} = – 2I_{B1} With Antisaturation Network		0.6		μs
t_s	Storage Time			1.7		μs
t_f	Fall Time			0.12		μs
t_{on}	Turn-on Time	I_C = 6A V_{CC} = 250V I_{B1} = 1.2A $V_{BE(off)}$ = – 5V		0.6		μs
t_s	Storage Time			1.3		μs
t_f	Fall Time			0.2		μs

INDUCTIVE LOAD

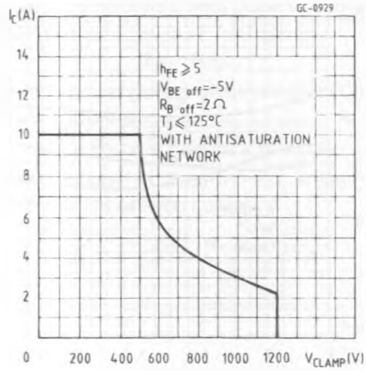
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_s	Storage Time	I_C = 6A h_{FE} = 5 V_{CL} = 450V $V_{BE(off)}$ = – 5V L = 300μH $R_{B(off)}$ = 0.8Ω		1.4	2.8	μs
t_f	Fall Time			0.1	0.2	μs
t_s	Storage Time	I_C = 6A h_{FE} = 5 V_{CL} = 450V $V_{BE(off)}$ = – 5V L = 300μH $R_{B(off)}$ = 0.8Ω T_c = 100°C			4	μs
t_f	Fall Time				0.3	μs

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

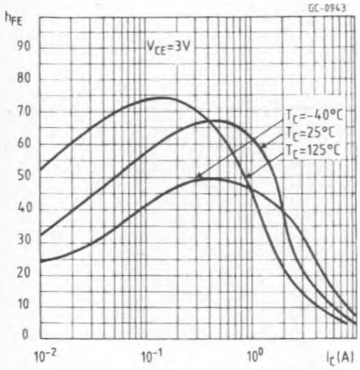
Safe Operating Areas



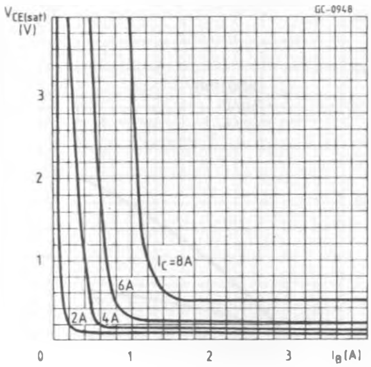
Reverse Biased Safe Operating Area



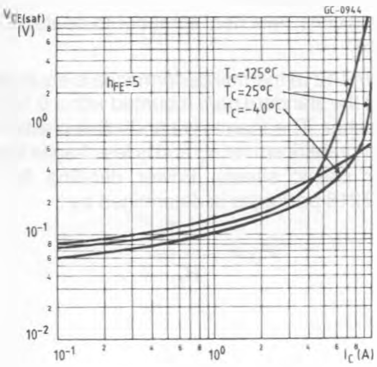
DC Current Gain



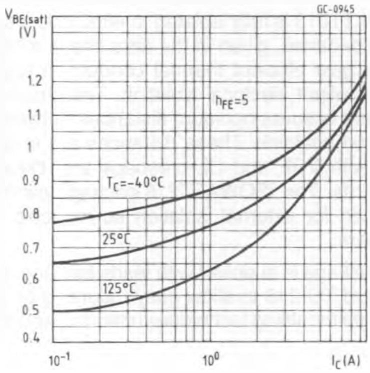
Collector-emitter Saturation Voltage



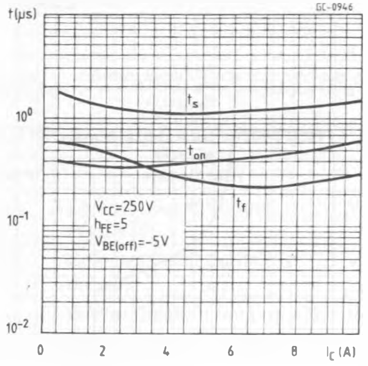
Collector-emitter Saturation Voltage



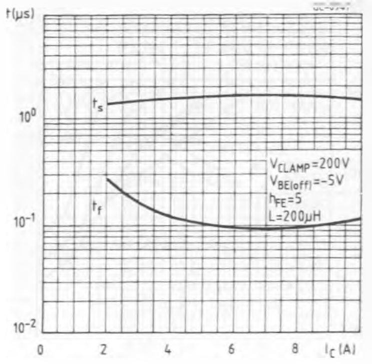
Base-emitter Saturation Voltage



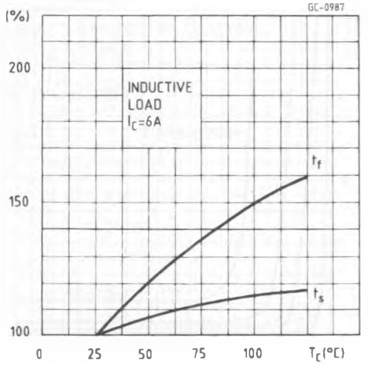
Resistive Load Switching Times



Inductive Load Switching Times



Switching Times Percentance Variation



ISOWATT218 PACKAGE CHARACTERISTICS AND APPLICATION

ISOWATT218 is fully isolated to 4000V dc. Its thermal impedance, given in the data sheet, is optimised to give efficient thermal conduction together with excellent electrical isolation. The structure of the case ensures optimum distances between the pins and heatsink. These distances are in agreement with VDE and UL creepage and clearance standards. The ISOWATT218 package eliminates the need for external isolation so reducing fixing hardware.

The package is supplied with leads longer than the standard TO-218 to allow easy mounting on pcbs. Accurate moulding techniques used in manufacture assures consistent heat spreader-to-heatsink capacitance.

ISOWATT218 thermal performance is equivalent to 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 ISOWATT218 packages is determined by :

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

THERMAL IMPEDANCE OF ISOWATT218 PACKAGE

Fig. 1 illustrates the elements contributing to the thermal resistance of a transistor heatsink assembly, using ISOWATT218 package.

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.