SGS-THOMSON MICROELECTRONICS

BUW42/42P/42PFI BUW42A/42AP/42APFI

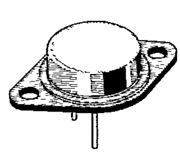
S G S-THOMSON 30E D

HIGH VOLTAGE POWER SWITCH

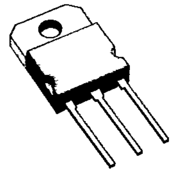
DESCRIPTION

The BUW42/A, BUW42P/42AP and BUW42PFI/APFI are silicon multiepitaxial mesa PNP transistors mounted respectively in TO-3 metal case, TO-218 plastic package and ISOWATT218 fully isolated package.

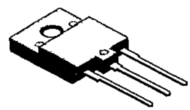
They are intended in fast switching applications for high output power.



TO-3

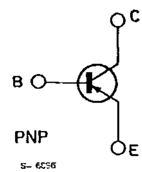


TO-218



ISOWATT218

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

<table>
<tr><th rowspan="2">Symbol</th><th rowspan="2">Parameter</th><th colspan="3">BUW</th><th rowspan="2">Unit</th></tr>
<tr><th colspan="2">42/P/PFI</th><th>42A/AP/APFI</th></tr>
<tr><td>V_{CES}</td><td>Collector-emitter Voltage ($V_{BE} = 0$)</td><td colspan="2">– 400</td><td>– 450</td><td>V</td></tr>
<tr><td>V_{CEO}</td><td>Collector-emitter Voltage ($I_B = 0$)</td><td colspan="2">– 350</td><td>– 400</td><td>V</td></tr>
<tr><td>V_{EBO}</td><td>Emitter-base Voltage ($I_C = 0$)</td><td colspan="3">– 7</td><td>V</td></tr>
<tr><td>I_C</td><td>Collector Current</td><td colspan="3">– 15</td><td>A</td></tr>
<tr><td>I_{CM}</td><td>Collector Peak Current</td><td colspan="3">– 30</td><td>A</td></tr>
<tr><td>I_B</td><td>Base Current</td><td colspan="3">– 10</td><td>A</td></tr>
<tr><td></td><td></td><td>TO-3</td><td>TO-218</td><td>ISOWATT218</td><td></td></tr>
<tr><td>P_{tot}</td><td>Total Dissipation at $T_c < 25°C$</td><td>150</td><td>105</td><td>65</td><td>W</td></tr>
<tr><td>T_{stg}</td><td>Storage Temperature</td><td>– 65 to 175</td><td>– 65 to 150</td><td>– 65 to 150</td><td>°C</td></tr>
<tr><td>T_j</td><td>Max. Operating Junction Temperature</td><td>175</td><td>150</td><td>150</td><td>°C</td></tr>
</table>

THERMAL DATA

		TO-3	SOT-93	ISOWATT218	Unit
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case Max	1.2	1.2	1.92	°C/W

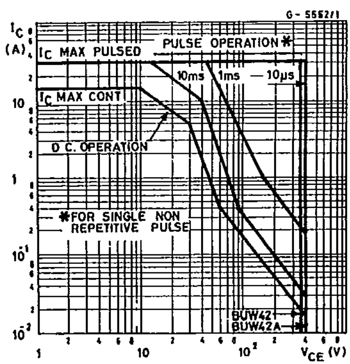
T-33-23

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

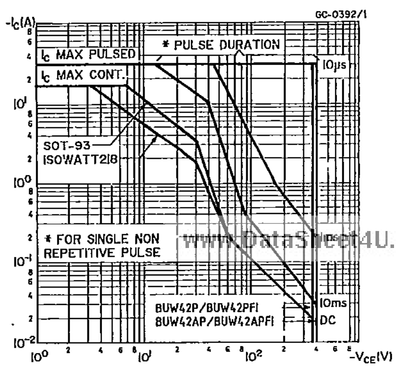
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector Cutoff Current (V_{BE} = 0)	V_{CE} = – 400V for **BUW42/P/PFI** V_{CE} = – 450V for **BUW42A/AP/APFI**			– 1 – 1	mA mA
I_{EBO}	Emitter Cutoff Current	V_{EB} = – 5V for **BUW42/P/PFI** V_{EB} = – 7V for **BUW42A/AP/APFI**			– 1 – 1	mA mA
$V_{CEO(sus)}$*	Collector-emitter Sustaining Voltage (I_B = 0)	I_C = – 100mA for **BUW42/P/PFI** for **BUW42A/AP/APFI**	– 350 – 400			V V
$V_{CE(sat)}$*	Collector-emitter Saturation Voltage	I_C = – 10A I_B = – 3A			– 1.5	V
$V_{BE(sat)}$*	Base-emitter Saturation Voltage	I_C = – 10A I_B = – 3A			– 2	V
h_{FE}*	DC Current Gain	I_C = – 3A V_{CE} = – 5V	12		80	
t_{on} t_s t_f	RESISTIVE LOAD Turn-on Time Storage Time Fall Time	V_{CC} = – 250V I_C = – 10A I_{B1} = – I_{B2} = – 3.3A		0.3 0.5 0.3	0.6 1.5 0.6	µs µs µs

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

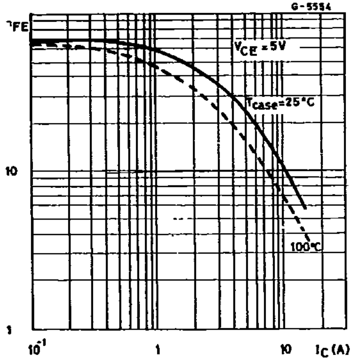
Safe Operating Areas.
(TO-3).



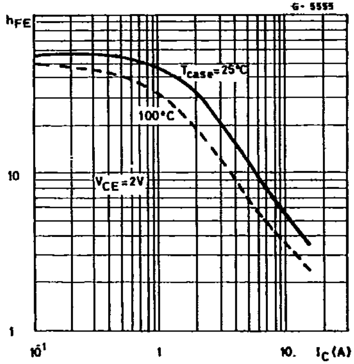
Safe Operating Areas.
(TO-218, ISOWATT218).



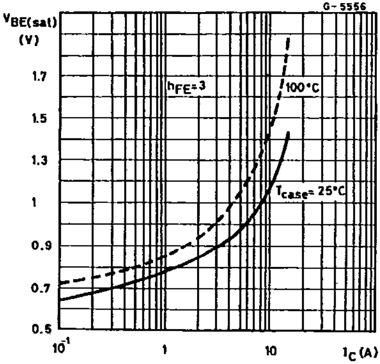
DC Current Gain.



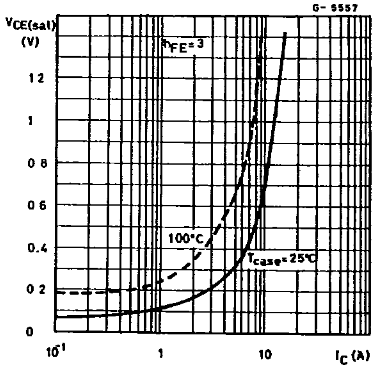
DC Current Gain.



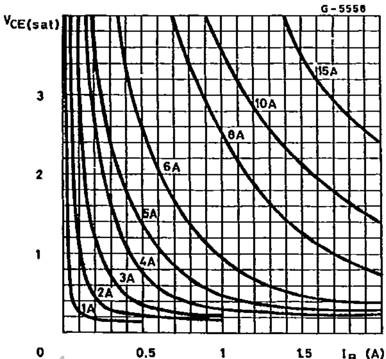
Base-emitter Saturation Voltage.



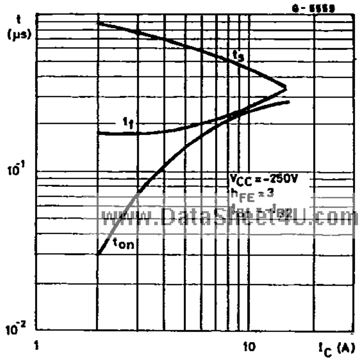
Collector-emitter Saturation Voltage.



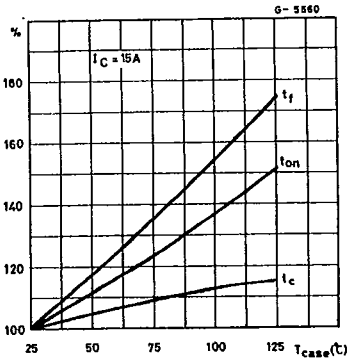
Collector-emitter Saturation Voltage.



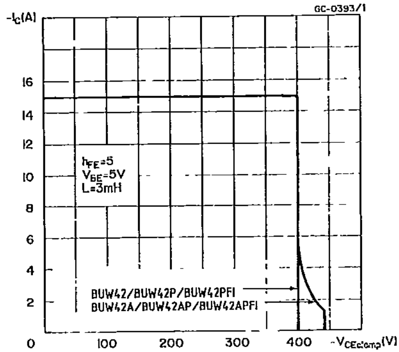
Saturated Switching-times Resistive Load.



Switching Times Percentage Variation vs. T_{case} Resistive Load.



Clamped Reverse Bias Safe Operating Areas.



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

Figure 3 illustrates the elements contributing to the thermmal 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 3.