

## HIGH POWER NPN SILICON TRANSISTOR

- SGS-THOMSON PREFERRED SALESTYPE
- NPN TRANSISTOR
- HIGH CURRENT CAPABILITY
- FAST SWITCHING SPEED
- VERY LOW SATURATION VOLTAGE AND HIGH GAIN

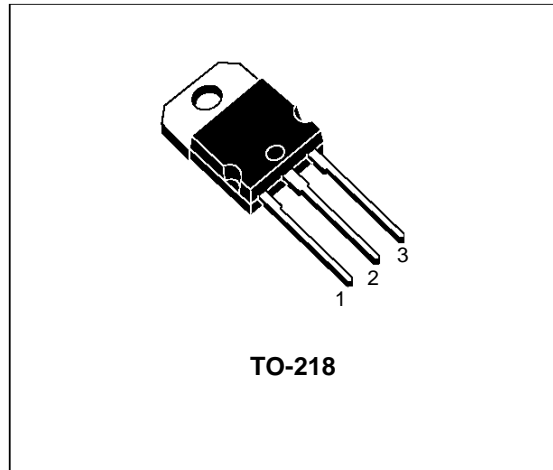
### APPLICATION

- SWITCHING REGULATORS
- MOTOR CONTROL
- HIGH FREQUENCY AND EFFICIENCY CONVERTERS

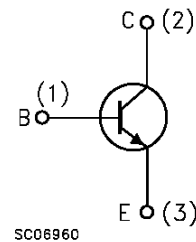
### DESCRIPTION

The BUW89 is a Multi-epitaxial planar NPN transistor in TO-218 plastic package.

It's intended for use in high frequency and efficiency converters such as motor controllers and industrial equipment.



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CEV}$	Collector-emitter Voltage ( $V_{BE} = -1.5V$ )	160	V
$V_{CEO}$	Collector-emitter Voltage ( $I_B = 0$ )	90	V
$V_{EBO}$	Emitter-Base Voltage ( $I_C = 0$ )	7	V
$I_C$	Collector Current	25	A
$I_{CM}$	Collector Peak Current	45	A
$I_B$	Base Current	6	A
$I_{BM}$	Base Peak Current	9	A
$P_{Base}$	Reverse Bias Base Power Dissipation (B.E. junction in avalanche)	1	W
$P_{tot}$	Total Power Dissipation at $T_{case} < 25\text{ }^\circ\text{C}$	125	W
$T_{stg}$	Storage Temperature	-65 to 175	$^\circ\text{C}$
$T_j$	Max Operating Junction Temperature	175	$^\circ\text{C}$

**THERMAL DATA**

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.2	$^{\circ}C/W$
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**ELECTRICAL CHARACTERISTICS** ( $T_{case} = 25^{\circ}C$  unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{CER}$	Collector Cut-off Current ( $R_{BE} = 10\Omega$ )	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ $T_C = 100^{\circ}C$			1 5	mA mA
$I_{CEV}$	Collector Cut-off Current	$V_{CE} = V_{CEV}$ $V_{BE} = -1.5V$ $V_{CE} = V_{CEV}$ $V_{BE} = -1.5V$ $T_C=100^{\circ}C$			1 5	mA mA
$I_{EBO}$	Emitter Cut-off Current ( $I_C = 0$ )	$V_{EB} = 5V$			1	mA
$V_{CEO(sus)*}$	Collector-Emitter Sustaining Voltage	$I_C = 0.2A$ $L = 25mH$	90			V
$V_{EB0}$	Emitter-base Voltage ( $I_C = 0$ )	$I_E = 50mA$	7			V
$V_{CE(sat)*}$	Collector-Emitter Saturation Voltage	$I_C = 7.5A$ $I_B = 0.375A$ $I_C = 15A$ $I_B = 1.5A$ $I_C = 7.5A$ $I_B = 0.375A$ $T_j = 100^{\circ}C$ $I_C = 15A$ $I_B = 1.5A$ $T_j = 100^{\circ}C$		0.5 0.65 0.5 0.8	0.8 0.9 0.9 1.5	V V V V
$V_{BE(sat)*}$	Base-Emitter Saturation Voltage	$I_C = 15A$ $I_B = 1.5A$ $I_C = 15A$ $I_B = 1.5A$ $T_j = 100^{\circ}C$		1.4 1.45	1.7 1.8	V V
$di_C/dt^*$	Rated of Rise of on-state Collector Current	$V_{CC} = 72V$ $R_C = 0$ $I_{B1} = 2.25A$ $T_j = 25^{\circ}C$ $T_j = 100^{\circ}C$	35 30	50 45		A/ $\mu s$ A/ $\mu s$
$V_{CE(2\mu s)}$	Collector Emitter Dynamic Voltage	$V_{CC} = 72V$ $R_C = 4.8\Omega$ $I_{B1} = 1.5A$ $T_j = 25^{\circ}C$ $T_j = 100^{\circ}C$		1.7 2	2.5 4	V V
$V_{CE(4\mu s)}$	Collector Emitter Dynamic Voltage	$V_{CC} = 72V$ $R_C = 4.8\Omega$ $I_{B1} = 1.5A$ $T_j = 25^{\circ}C$ $T_j = 100^{\circ}C$		1 1.5	2 3	V V

\* Pulsed: Pulse duration = 300  $\mu s$ , duty cycle < 2 %

**RESISTIVE LOAD**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r$	Rise Time	$V_{CC} = 72V$ $I_C = 20A$		0.55	1.1	$\mu s$
$t_s$	Storage Time	$V_{BB} = -5V$ $I_{B1} = 2.5A$		0.55	1	$\mu s$
$t_f$	Fall Time	$R_{B2} = 1\Omega$ $T_p = 30\mu s$		0.12	0.25	$\mu s$

**INDUCTIVE LOAD**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_s$	Storage Time	$V_{CC} = 72V$ $V_{clamp} = 90V$		0.75	1.2	$\mu s$
$t_f$	Fall Time	$I_C = 15A$ $I_B = 1.5A$		0.09	0.2	$\mu s$
$t_t$	Tail Time in Turn-on	$V_{BB} = -5V$ $R_{B2} = 1.7\Omega$		0.03	0.05	$\mu s$
$t_c$	Crossover Time			0.14	0.3	$\mu s$
$t_s$	Storage Time	$V_{CC} = 72V$ $V_{clamp} = 90V$		0.95	1.7	$\mu s$
$t_f$	Fall Time	$I_C = 15A$ $I_B = 1.5A$		0.15	0.3	$\mu s$
$t_t$	Tail Time in Turn-on	$V_{BB} = -5V$ $R_{B2} = 1.7\Omega$		0.06	0.1	$\mu s$
$t_c$	Crossover Time	$L_C = 0.25mH$ $T_j = 100^{\circ}C$		0.3	0.5	$\mu s$

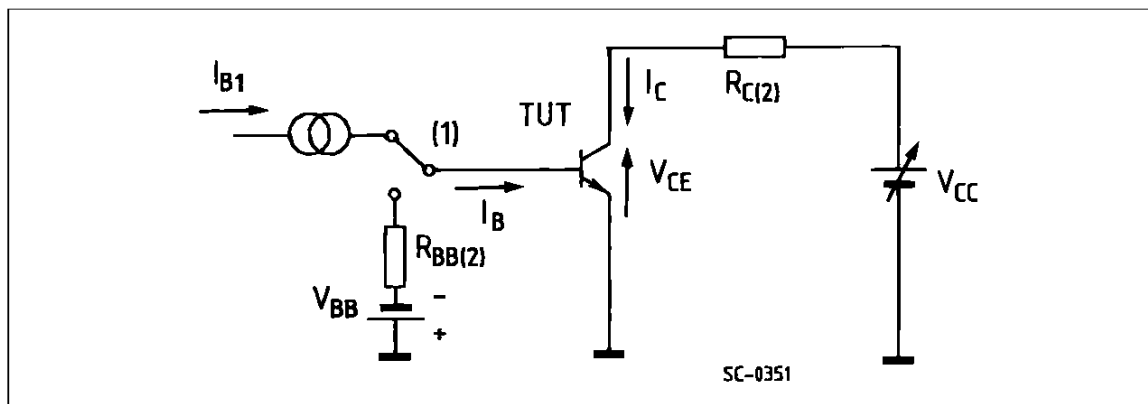
**ELECTRICAL CHARACTERISTICS** (continued)

INDUCTIVE LOAD

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_s$	Storage Time	$V_{CC} = 72V$		1.4		$\mu s$
$t_f$	Fall Time	$I_C = 15A$		0.7		$\mu s$
$t_t$	Tail Time in Turn-on	$V_{BB} = 0$		0.22		$\mu s$
		$L_C = 0.25mH$				
$t_s$	Storage Time	$V_{CC} = 72V$		1.85		$\mu s$
$t_f$	Fall Time	$I_C = 15A$		1		$\mu s$
$t_t$	Tail Time in Turn-on	$V_{BB} = 0$		0.44		$\mu s$
		$L_C = 0.25mH$				
		$T_j = 100^\circ C$				

\* Pulsed test  $t_p < 300 \mu s$  duty cycle  $< 2 \%$

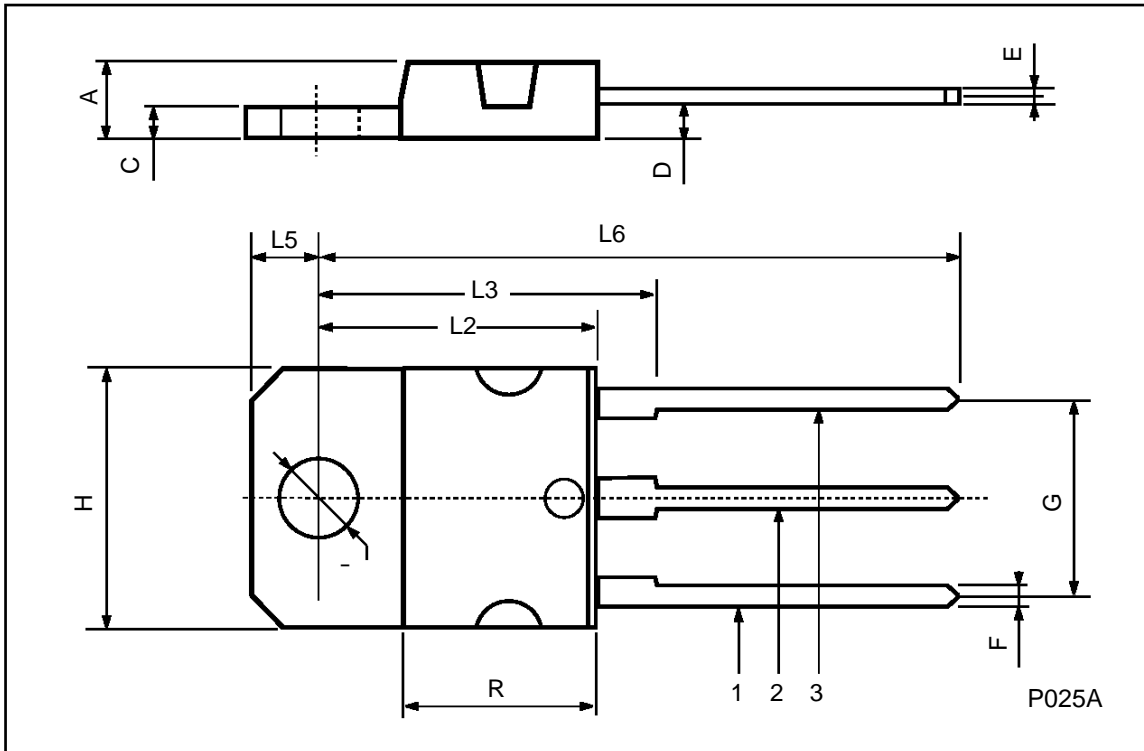
**Figure 1** : Switching Times Test Circuit (resistive load).



1 Fast electronic switch 2 Non-inductive Resistor

TO-218 (SOT-93) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		4.9	0.185		0.193
C	1.17		1.37	0.046		0.054
D		2.5			0.098	
E	0.5		0.78	0.019		0.030
F	1.1		1.3	0.043		0.051
G	10.8		11.1	0.425		0.437
H	14.7		15.2	0.578		0.598
L2	-		16.2	-		0.637
L3		18			0.708	
L5	3.95		4.15	0.155		0.163
L6		31			1.220	
R	-		12.2	-		0.480
Ø	4		4.1	0.157		0.161



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