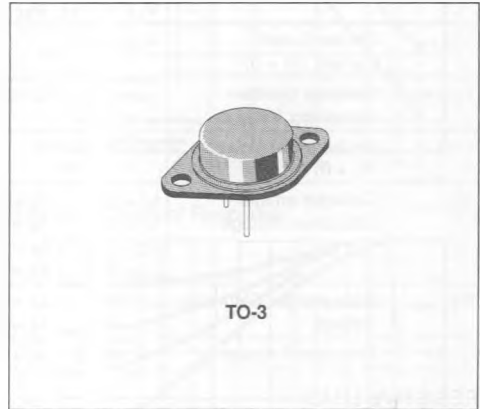
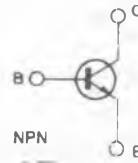


NPN HIGH CURRENT SWITCHING POWER TRANSISTORS

- HIGH CURRENT CAPABILITY
- VERY LOW SATURATION VOLTAGE AT $I_C = 20\text{ A}$
- FAST TURN-OFF AND TURN-ON
- HIGH FREQUENCY AND EFFICIENCY CONVERTERS
- SWITCHING REGULATORS
- MOTOR CONTROLS



INTERNAL SCHEMATIC DIAGRAM



DESCRIPTION

High current, high speed transistors suited for low voltage applications.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		BUW38	BUW39	
V_{CBO}	Collector-base Voltage ($I_E = 0$)	120	160	V
V_{CEO}	Collector-emitter Voltage ($I_B = 0$)	60	80	V
V_{EBO}	Emitter-base Voltage ($I_C = 0$)	7	7	V
I_C	Collector Current	30	30	A
I_{CM}	Collector Peak Current ($t_p < 5\text{ms}$)	45	40	A
I_B	Base Current	8	6	A
I_{BM}	Base Peak Current ($t_p < 5\text{ms}$)	20	15	A
P_{tot}	Total Dissipation at $T_c < 25^\circ\text{C}$	150		W
T_{stg}	Storage Temperature	- 65 to 200		$^\circ\text{C}$
T_j	Max. Operating Junction Temperature	200		$^\circ\text{C}$

THERMAL DATA

$R_{th(j-case)}$	Thermal Resistance Junction-case	max	1.17	°C/W
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ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}\text{C}$ unless otherwise specified)

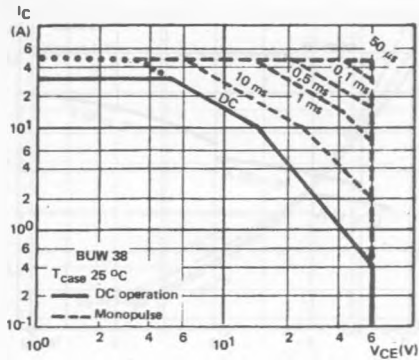
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CEX}	Collector Cutoff Current	$V_{CE} = V_{CEX}$ $V_{BE} = -1.5\text{V}$ $V_{CE} = V_{CEX}$ $V_{BE} = -1.5\text{V}$ $T_c = 100^{\circ}\text{C}$			1 3	mA mA
I_{EBO}	Emitter Cutoff Current ($I_C = 0$)	$V_{EB} = 5\text{V}$			1	mA
$V_{CE0(sus)}^*$	Collector Emitter Sustaining Voltage	$I_C = 0.2\text{A}$ $L = 25\text{mH}$ for BUW38 for BUW39	60 80			V V
V_{EBO}	Emitter-base Voltage ($I_C = 0$)	$I_E = 50\text{mA}$	7			V
$V_{CE(sat)}^*$	Collector-emitter Saturation Voltage	$I_C = 20\text{A}$ $I_B = 2\text{A}$ for BUW38 $I_C = 40\text{A}$ $I_B = 4\text{A}$ for BUW38 $I_C = 15\text{A}$ $I_B = 1.5\text{A}$ for BUW39 $I_C = 30\text{A}$ $I_B = 3\text{A}$ for BUW39			0.6 1.4 0.5 1.2	V V V V
$V_{BE(sat)}^*$	Base-emitter Saturation Voltage	$I_C = 40\text{A}$ $I_B = 4\text{A}$ for BUW38 $I_C = 30\text{A}$ $I_B = 3\text{A}$ for BUW39			2.1 2	V V
f_T	Transition Frequency	$f = 10\text{MHz}$ $V_{CE} = 15\text{A}$ $I_C = 1\text{A}$	8			MHz

RESISTIVE LOAD

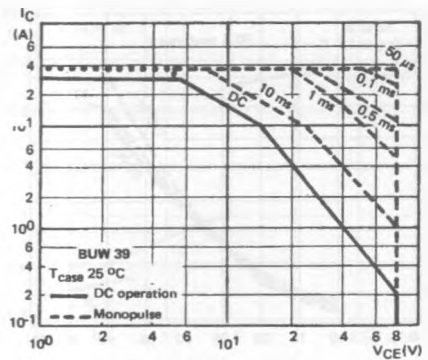
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{on}	Turn-on Time	for BUW38		1.2	1.5	μs
t_s	Storage Time	$V_{CC} = 60\text{V}$ $I_C = 40\text{A}$		0.6	1.1	μs
t_f	Fall Time	$I_{B1} = -I_{B2} = 4\text{A}$		0.17	0.25	μs
t_s	Storage Time	for BUW38			1.65	μs
t_f	Fall Time	$V_{CC} = 60\text{V}$ $I_C = 40\text{A}$ $I_{B1} = -I_{B2} = 4\text{A}$ $T_c = 125^{\circ}\text{C}$			0.5	μs
t_{on}	Turn-on Time	for BUW39		0.8	1.2	μs
t_s	Storage Time	$V_{CC} = 80\text{V}$ $I_C = 30\text{A}$		0.6	1.1	μs
t_f	Fall Time	$I_{B1} = -I_{B2} = 3\text{A}$		0.15	0.25	μs
t_s	Storage Time	for BUW39			1.65	μs
t_f	Fall Time	$V_{CC} = 80\text{V}$ $I_C = 30\text{A}$ $I_{B1} = -I_{B2} = 3\text{A}$ $T_c = 125^{\circ}\text{C}$			0.5	μs

* Pulsed : Pulse duration = 300 μs , duty cycle = 2 %.

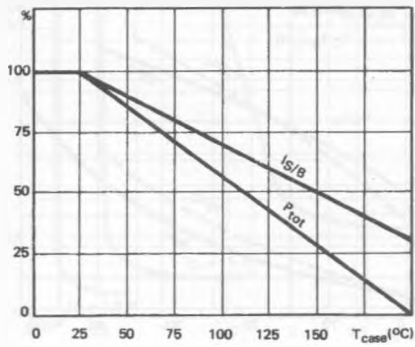
DC and AC Pulse Area.



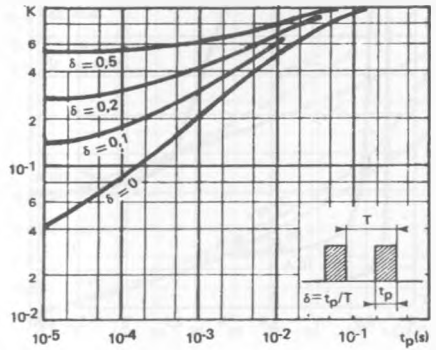
DC and AC Pulse Area.



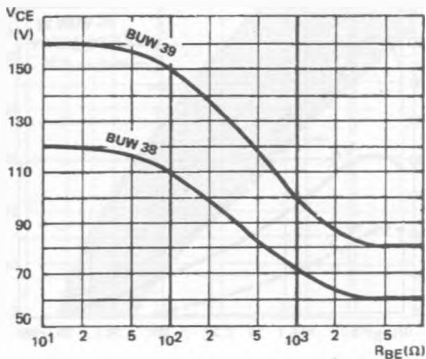
Power and $I_{S/B}$ Derating vs. Case Temperature.



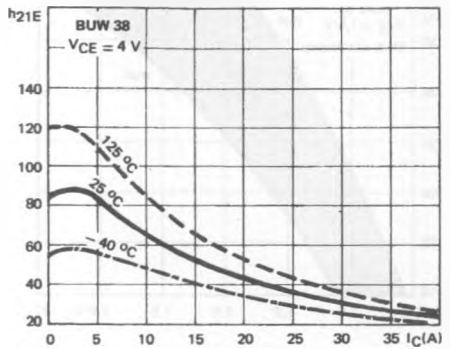
Transient Thermal Response.



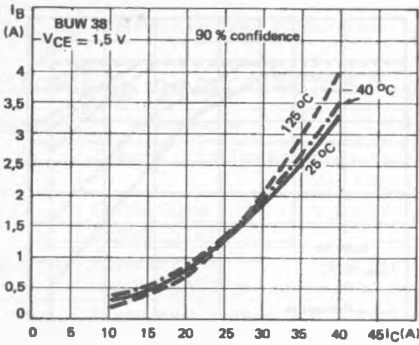
Collector-emitter Voltage vs. Base-emitter Resistance.



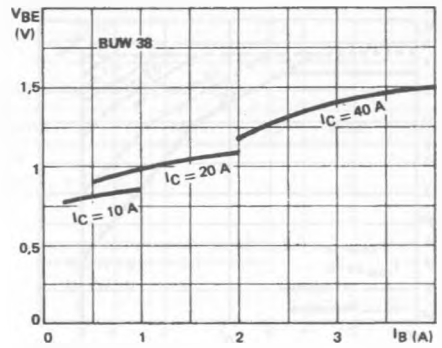
DC Current Gain.



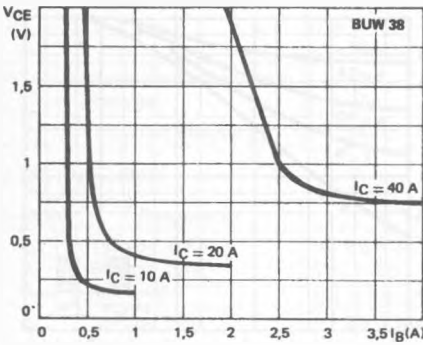
Minimum Base Current to Saturate the Transistor.



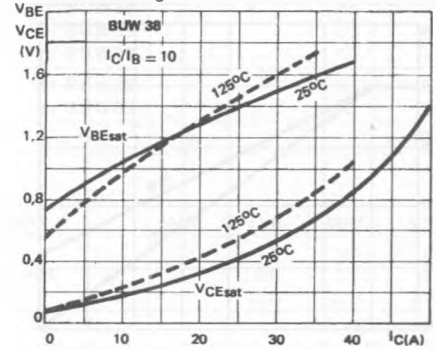
Base Characteristics.



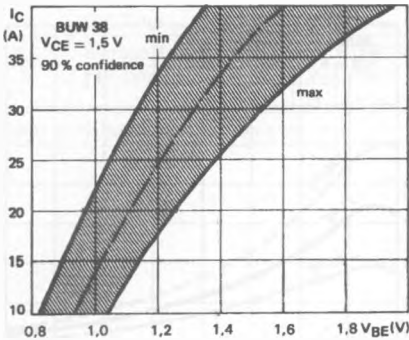
Collector Saturation Region.



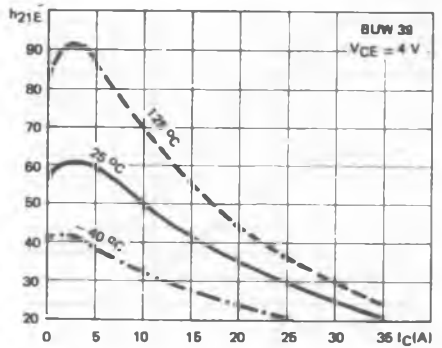
Saturation Voltages.



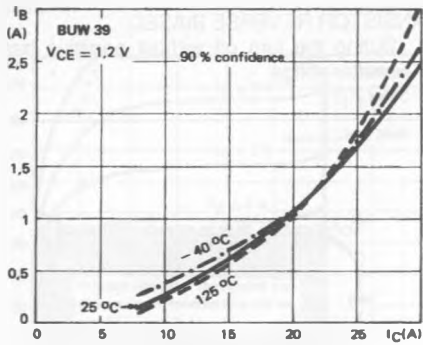
Collector Current Spread vs. Base Emitter Voltage.



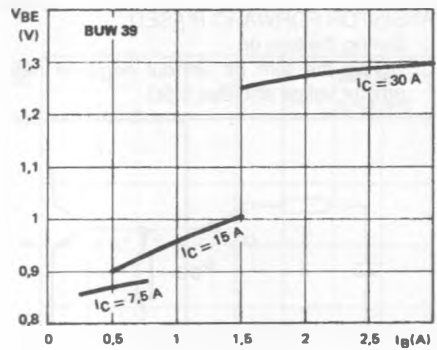
DC Current Gain.



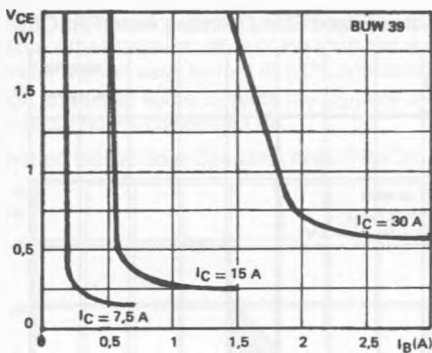
Minimum Base Current to saturate the Transistor.



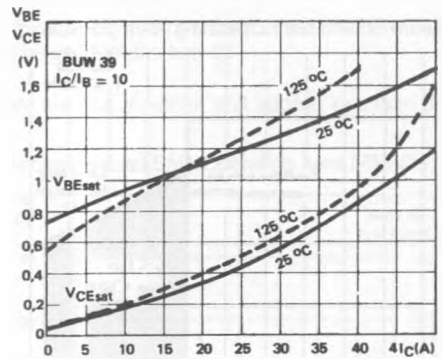
Base Characteristics.



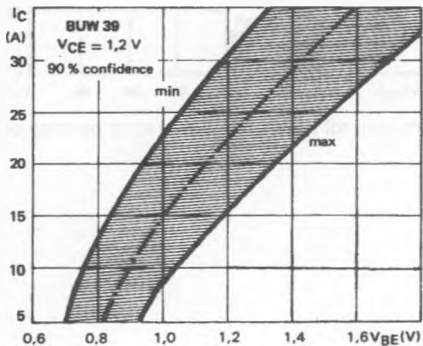
Collector Saturation Region.



Saturation Voltages.



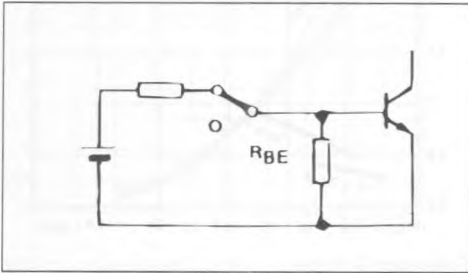
Collector Current Spread vs. Base Emitter Voltage.



SWITCHING OPERATING AND OVERLOAD AREAS

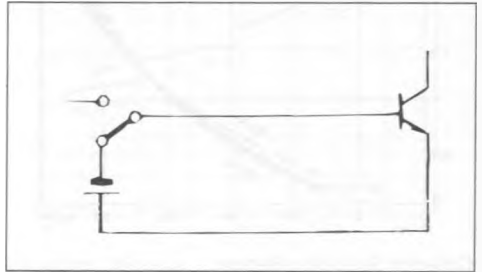
TRANSISTOR FORWARD BIASED

- During the turn on
- During the turn off without negative base-emitter voltage and $R_{BE} \geq 5\Omega$

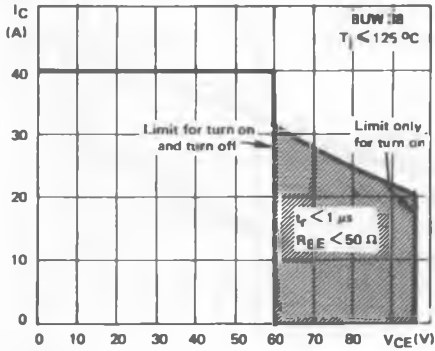


TRANSISTOR REVERSE BIASED

- During the turn off without negative base-emitter voltage

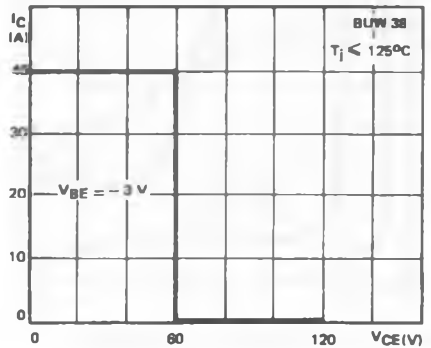


Forward Biased Safe Operating Area (FBSOA).

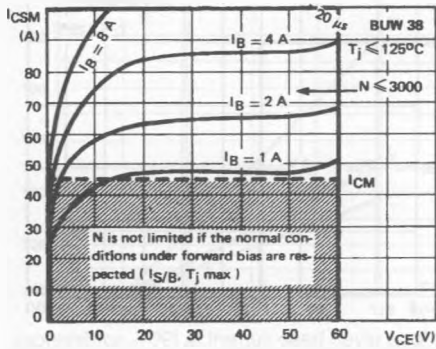


The hatched zone can only be used for turn-on.

Reverse Biased Safe Operating Area (RBSOA).

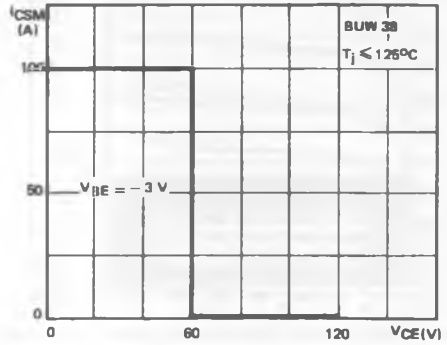


Forward Biased Accidental Overload Area (FBAOA).



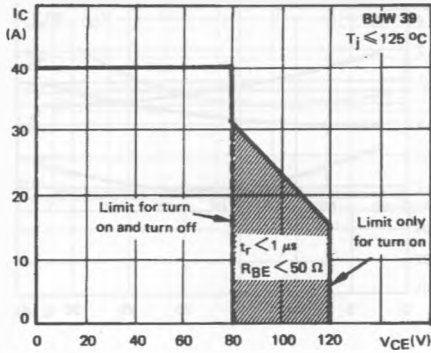
The Kellogg network (heavy print) allows the calculation of the maximum value of the short circuit current for a given base current I_B (90% confidence). High accidental surge currents ($I > I_{CM}$) are allowed if they are non repetitive and applied less than 3000 times during the component life.

Reverse Biased Accidental Overload Area (RBAOA).



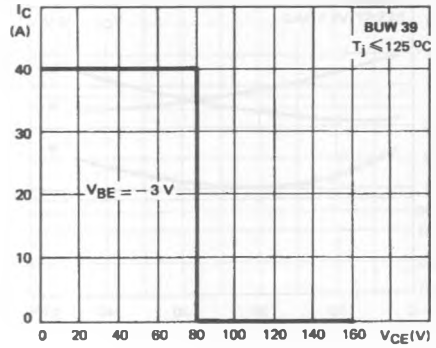
After the accidental overload current, the RBAOA has to be used for the turn off.

Forward Biased Safe Operating Area (FBSOA).

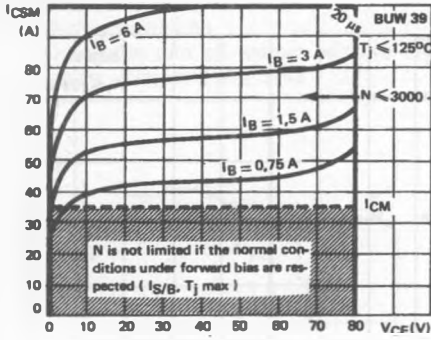


The hatched zone can only be used for turn-on.

Reverse Biased Safe Operating Area (RBSOA).

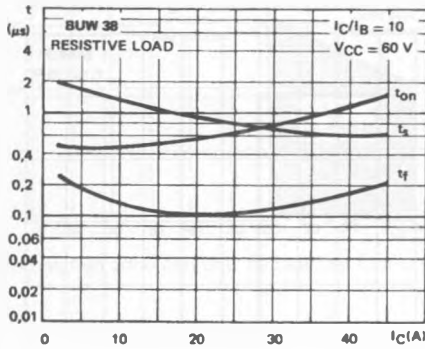


Forward Biased Accidental Overload Area (FBAOA).

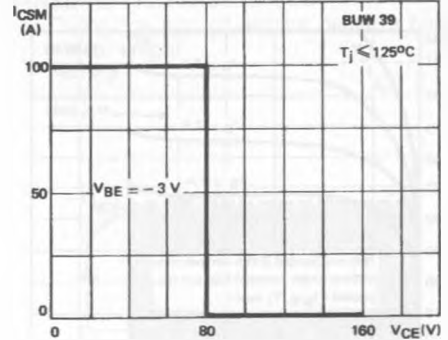


The Kellog network (heavy print) allows the calculation of the maximum value of the short-circuit current. High accidental surge currents ($I > I_{CM}$) are allowed if they are non repetitive and applied less than 3000 times during the component life.

Switching Times vs. Collector Current (resistive load).

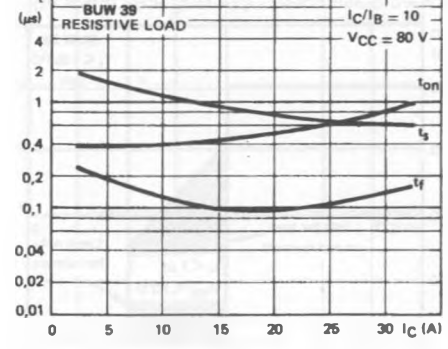


Reverse Biased Accidental Overload Area (RBAOA).

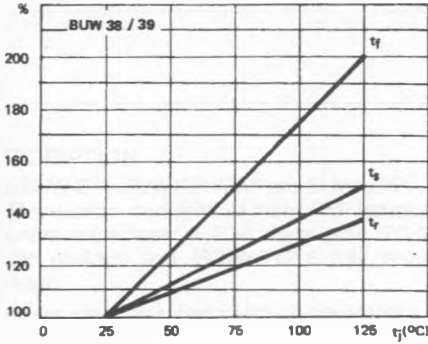


rent for a given base current I_B (90% confidence).

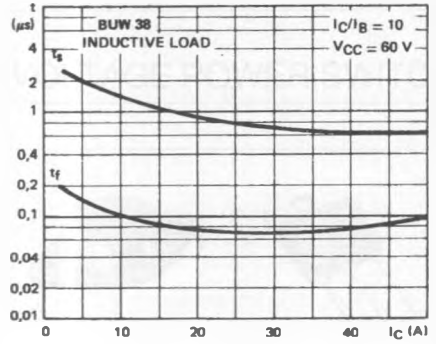
Switching Times vs. Collector Current (resistive load).



Switching Times vs. Junction Temperature.



Switching Times vs. Collector Current (inductive load).



Switching Times vs. Collector Current (inductive load).

