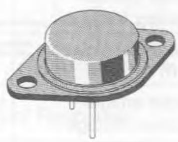
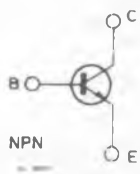
NPN HIGH CURRENT SWITCHING POWER TRANSISTORS

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



TO-3

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 ($t_p < 5ms$)	45	40	A
I_B	Base Current	8	6	A
I_{BM}	Base Peak Current ($t_p < 5ms$)	20	15	A
P_{tot}	Total Dissipation at $T_c < 25°C$	150		W
T_{stg}	Storage Temperature	– 65 to 200		°C
T_j	Max. Operating Junction Temperature	200		°C

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	max	1.17	°C/W

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

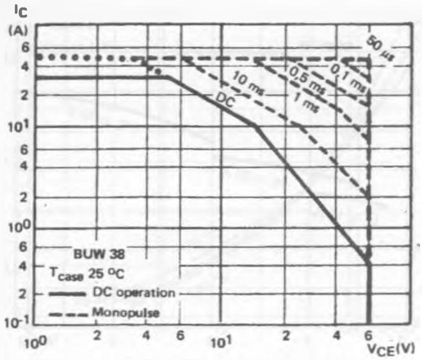
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CEX}	Collector Cutoff Current	$V_{CE} = V_{CEX}$ $V_{BE} = -1.5V$ $V_{CE} = V_{CEX}$ $V_{BE} = -1.5V$ $T_c = 100°C$			1 3	mA mA
I_{EBO}	Emitter Cutoff Current ($I_C = 0$)	$V_{EB} = 5V$			1	mA
$V_{CEO(sus)}$*	Collector Emitter Sustaining Voltage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

RESISTIVE LOAD

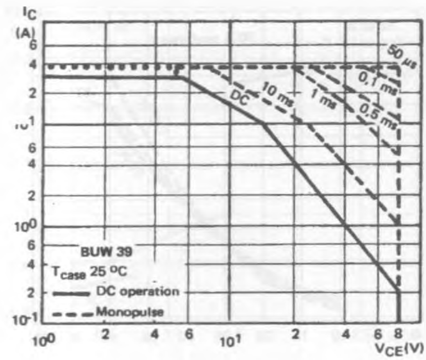
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_{on} t_s t_f	Turn-on Time Storage Time Fall Time	for **BUW38** $V_{CC} = 60V$ $I_C = 40A$ $I_{B1} = -I_{B2} = 4A$		1.2 0.6 0.17	1.5 1.1 0.25	µs µs µs
t_s t_f	Storage Time Fall Time	for **BUW38** $V_{CC} = 60V$ $I_C = 40A$ $I_{B1} = -I_{B2} = 4A$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

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

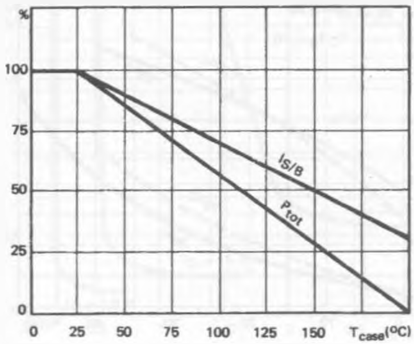
DC and AC Pulse Area.



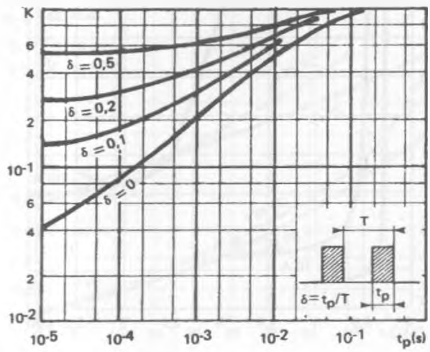
DC and AC Pulse Area.



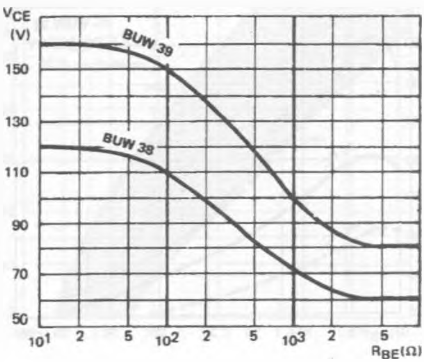
Power and $I_{S/B}$ Derating vs. Case Temperature.



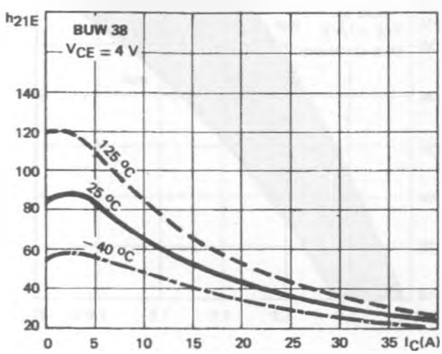
Transient Thermal Response.



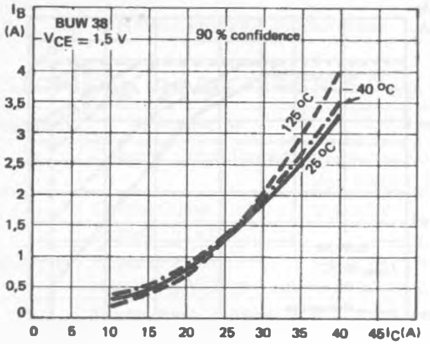
Collector-emitter Voltage vs. Base- emitter Resistance.



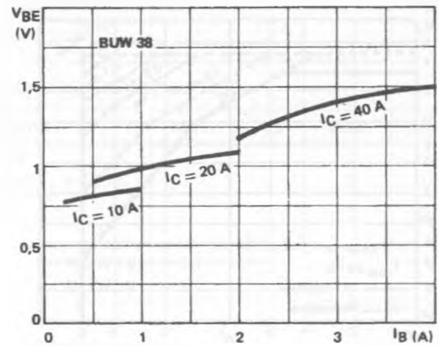
DC Current Gain.



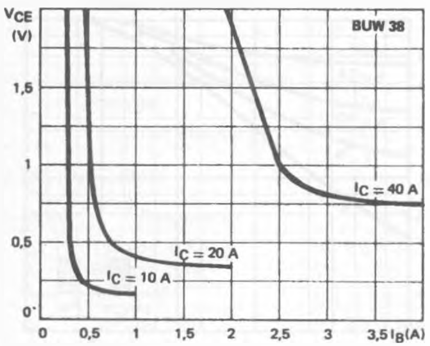
Minimum Base Current to Saturate the Transistor.



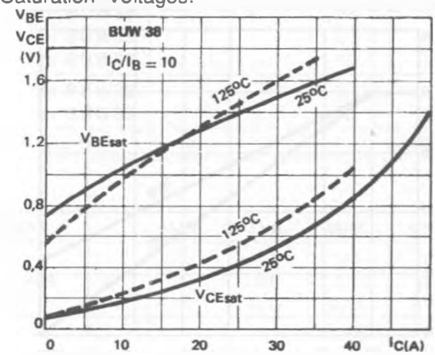
Base Characteristics.



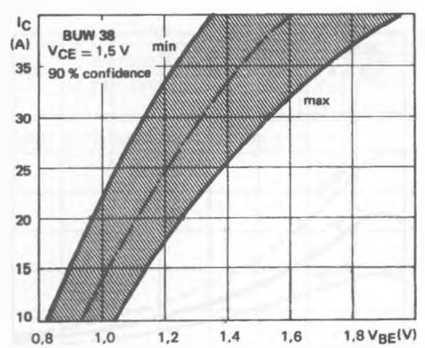
Colle ctor Saturation Region.



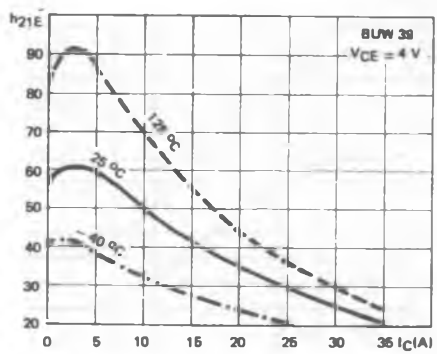
Saturation Voltages.



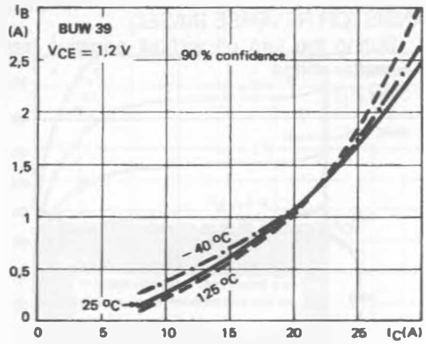
Collector Current Spread vs. Base Emitter Voltage.



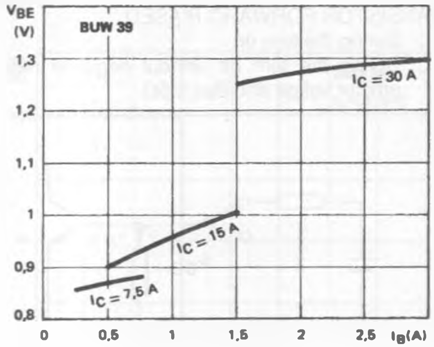
DC Current Gain.



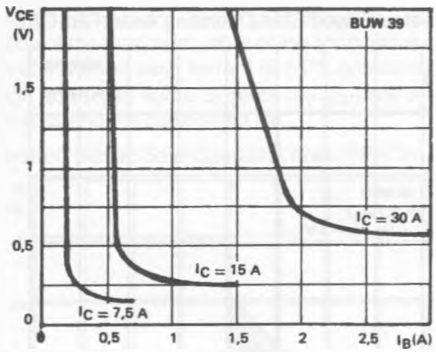
Minimum Base Current to saturate the Transistor.



Base Characteristics.



Collector Saturation Region.



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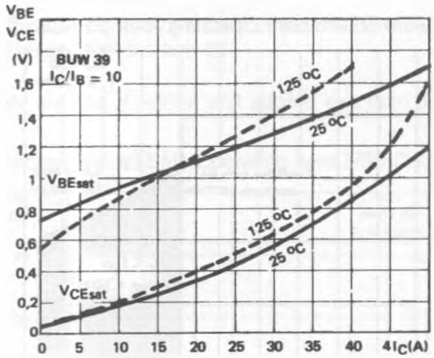
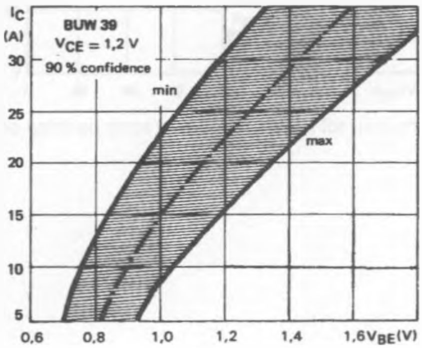


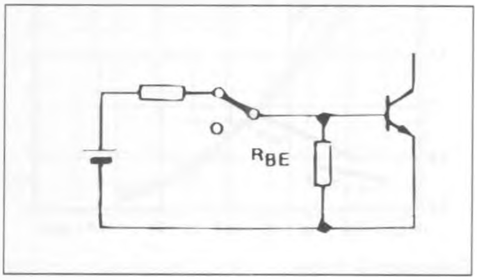
Collector Current Spread vs. Base Emitter Voltage.



SWITCHING OPERATING AND OVERLOAD AREAS

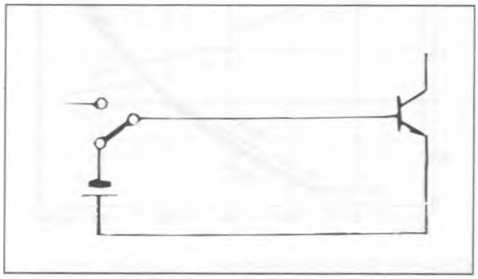
TRANSISTOR FORWARD BIASED

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

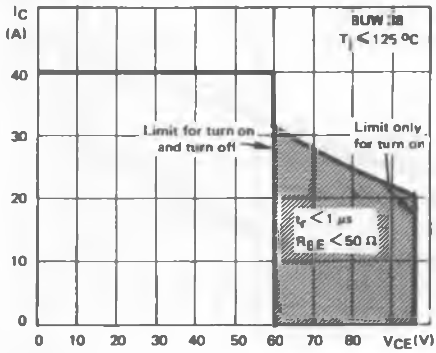


TRANSISTOR REVERSE BIASED

- During the turn off without negative base-emitter voltge

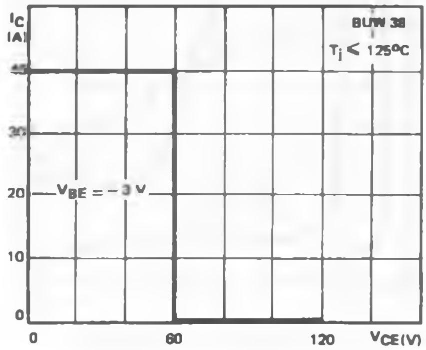


Forward Biased Safe Operating Area (FBSOA).

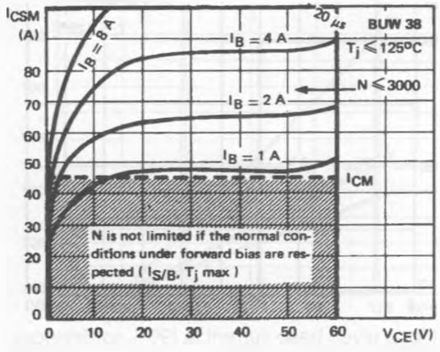


The hatched zone can only be used for turn-on.

Reverse Biased Safe Operating Area (RBSOA).

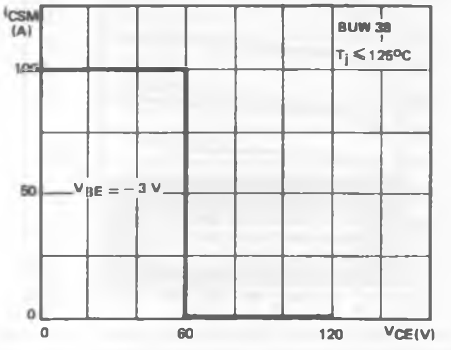


Forward Biased Accidental Overload Area (FBAOA).



The Kellog network (heavy print) allows the calculation of the maximum value of the short circuit current for a given base current IB (90% confidence).

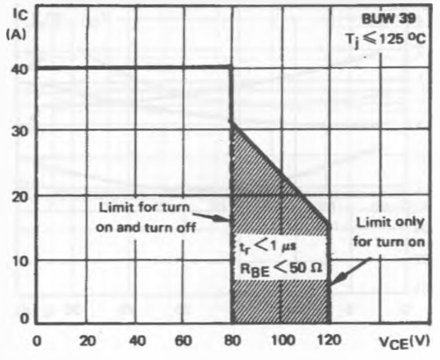
Reverse Biased Accidental Overload Area (RBAOA).



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

High accidental surge currents ($I > I_{CM}$) are allowed if they are non repetitive and applied less than 3000 times during the component life.

Forward Biased Safe Operating Area (FBSOA).



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

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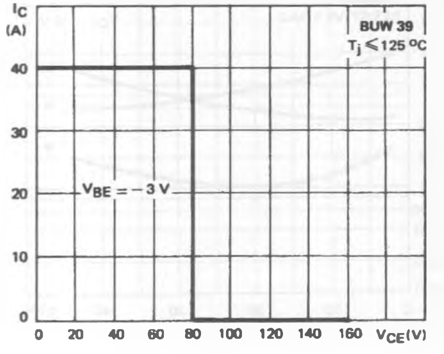

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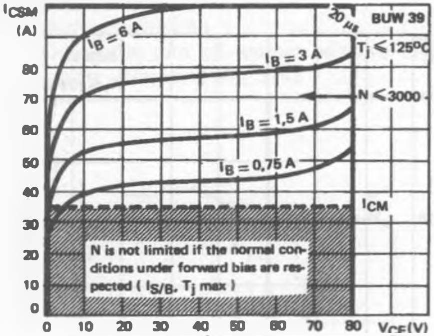

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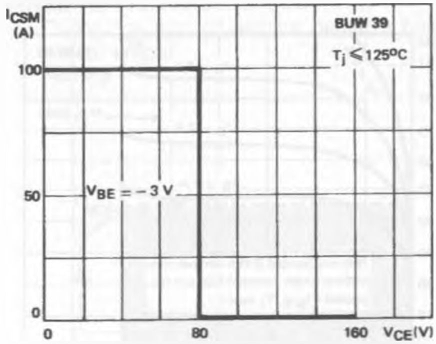

The Kellog network (heavy print) allows the calculation of the maximum value of the short-circuit current for a given base current I_B (90% confidence).

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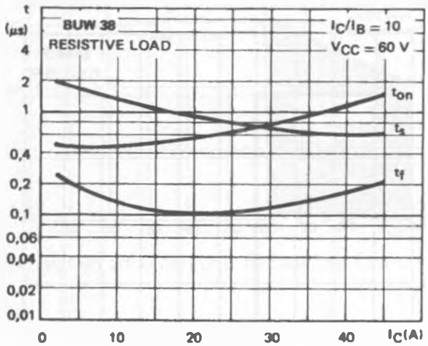
Switching Times vs. Collector Current (resistive load).



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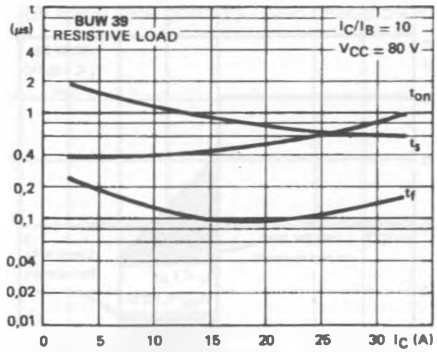
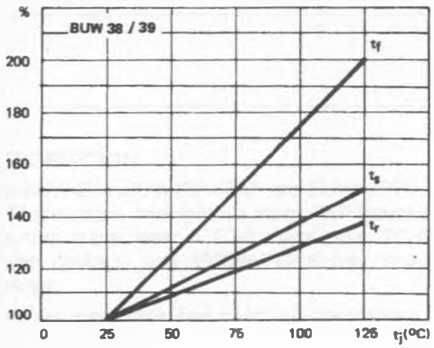
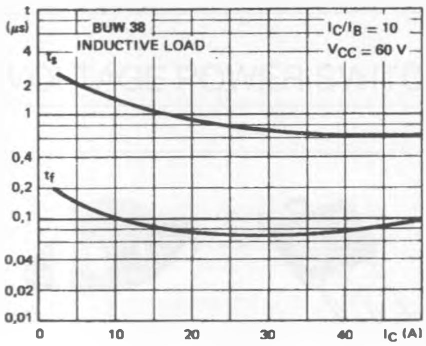


Switching Times vs. Junction Temperature.



Switching Times vs. Collector Current (inductive load).



Switching Times vs. Collector Current (inductive load).