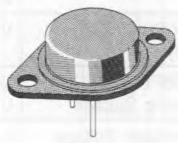
SGS-THOMSON
MICROELECTRONICS

BUV41

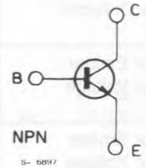
FAST SWITCHING POWER TRANSISTOR

- FAST SWITCHING TIMES
- LOW SWITCHING LOSSES
- VERY LOW SATURATION VOLTAGE AND HIGH GAIN FOR REDUCED LOAD OPERATION



TO-3

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CEV}	Collector-emitter Voltage (V_{BE} = – 1.5 V)	300	V
V_{CEO}	Collector-emitter Voltage (I_B = 0)	200	V
V_{EBO}	Emitter-base Voltage (I_C = 0)	7	V
I_C	Collector Current	15	A
I_{CM}	Collector Peak Current	20	A
I_B	Base Current	3	A
I_{BM}	Base Peak Current	5	A
P_{base}	Reverse Bias Base Dissipation (B.E. junction in avalanche)	1	W
P_{tot}	Total Dissipation at T_c < 25°C	120	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	1.46	°C/W

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
I_{CER}	Collector Cutoff Current (R_{BE} = 10Ω)	$V_{CE} = V_{CEV}$ $V_{CE} = V_{CEV}$ T_c = 100°C			0.5 2.5	mA mA
I_{CEV}	Collector Cutoff Current	$V_{CE} = V_{CEV}$ V_{BE} = – 1.5V $V_{CE} = V_{CEV}$ V_{BE} = – 1.5V T_c = 100°C			0.5 2	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	200			V
V_{EBO}	Emitter-base Voltage (I_C = 0)	I_E = 50mA	7			V
$V_{CE(sat)}$*	Collector-emitter Saturation Voltage	I_C = 3A I_B = 0.15A I_C = 6A I_B = 0.6A I_C = 8A I_B = 1A I_C = 3A I_B = 0.15A T_j = 100°C I_C = 6A I_B = 0.6A T_j = 100°C I_C = 8A I_B = 1A T_j = 100°C		0.3 0.45 0.55 0.3 0.55 0.65	0.8 0.9 1.2 0.9 1.2 1.5	V V V V V V
$V_{BE(sat)}$*	Base-emitter Saturation Voltage	I_C = 6A I_B = 0.6A I_C = 8A I_B = 1A I_C = 6A I_B = 0.6A T_j = 100°C I_C = 8A I_B = 1A T_j = 100°C		1.15 1.3 1.15 1.3	1.6 1.8 1.6 1.8	V V V V
di_C/dt	Rated of Rise of on-state Collector Current	V_{CC} = 160V R_C = 0 I_{B1} = 0.9A T_j = 25°C See fig. 2 T_j = 100°C	 30 25	 33 28		 A/µs A/µs
$V_{CE(2\mu s)}$	Collector Emitter Dynamic Voltage	V_{CC} = 160V I_{B1} = 0.6A R_C = 27Ω T_j = 25°C See fig. 2 T_j = 100°C		 1.05 1.53	 2.5 4	 V V
$V_{CE(4\mu s)}$	Collector Emitter Dynamic Voltage	V_{CC} = 160V I_{B1} = 0.6A R_C = 27Ω T_j = 25°C See fig. 2 T_j = 100°C		 0.75 0.95	 1.7 2	 V V

RESISTIVE LOAD

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_r t_s t_f	Rise Time Storage Time Fall Time	V_{CC} = 160V I_C = 8A V_{BB} = – 5V I_{B1} = 1A R_{B2} = 2.5Ω t_p = 30µs See fig. 1		0.3 0.6 0.12	0.5 1.2 0.3	µs µs µs

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

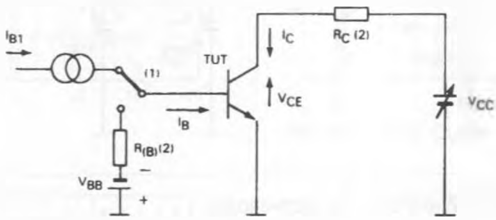
ELECTRICAL CHARACTERISTICS (continued)

INDUCTIVE LOAD

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
t_s t_f t_t t_c	Storage Time Fall Time Tail Time in Turn-on Crossover Time	V_{CC} = 160V I_C = 6A V_{BB} = – 5V L_C = 1.3mH	V_{clamp} = 200V I_B = 0.6A R_{B2} = 4.2Ω See fig. 3		0.75 0.08 0.01 0.12	1.5 0.2 0.07 0.3	µs µs µs µs
t_s t_f t_t t_c	Storage Time Fall Time Tail Time in Turn-on Crossover Time	V_{CC} = 160V I_C = 6A V_{BB} = – 5V L_C = 1.3mH See fig. 3	V_{clamp} = 200V I_B = 0.6A R_{B2} = 4.2Ω T_j = 100°C		1.2 0.12 0.03 0.22	2 0.3 0.15 0.5	µs µs µs µs
t_s t_f t_t	Storage Time Fall Time Tail Time in Turn-on	V_{CC} = 160V I_C = 6A V_{BB} = 0 L_C = 1.3mH	V_{clamp} = 200V I_B = 0.6A R_{B2} = 6.8Ω See fig. 3		1.8 0.45 0.15		µs µs µs
t_s t_f t_t	Storage Time Fall Time Tail Time in Turn-on	V_{CC} = 160V I_C = 6A V_{BB} = 0 L_C = 1.3mH See fig. 3	V_{clamp} = 200V I_B = 0.6A R_{B2} = 6.8Ω T_j = 100°C		3.3 0.8 0.44		µs µs µs

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

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



(1) Fast electronic switch
(2) Non-inductive resistor

Figure 2 : Turn-on Switching Waveforms.

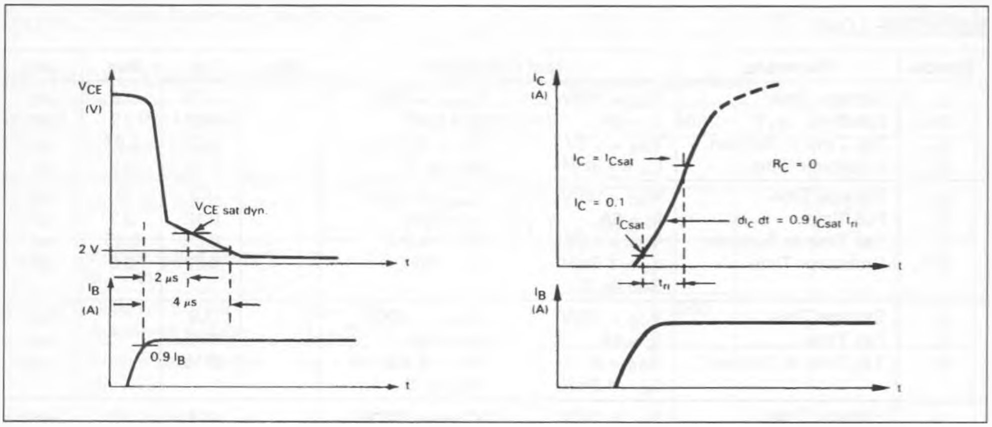


Figure 3a : Turn-off Switching Test Circuits.

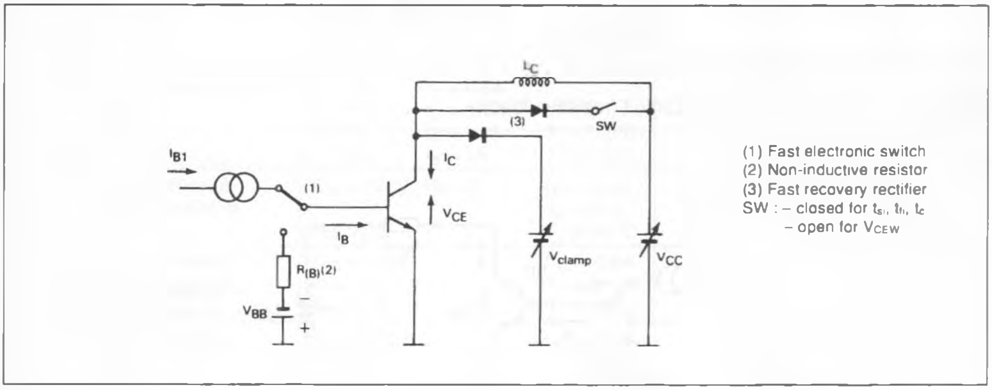
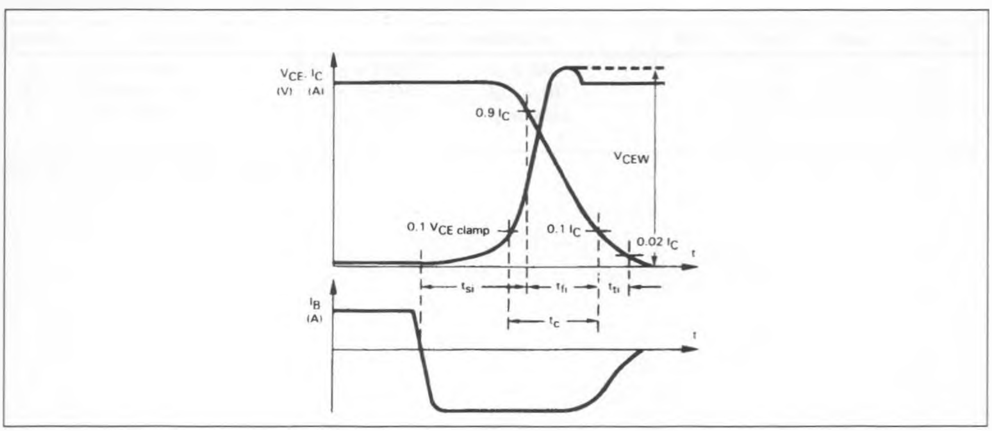
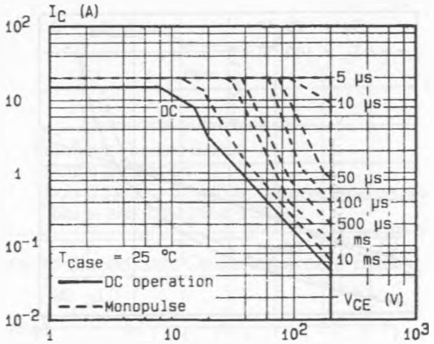


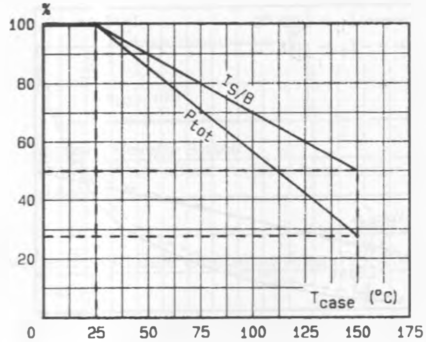
Figure 3b : Turn-off Switching Waveforms (inductive load).



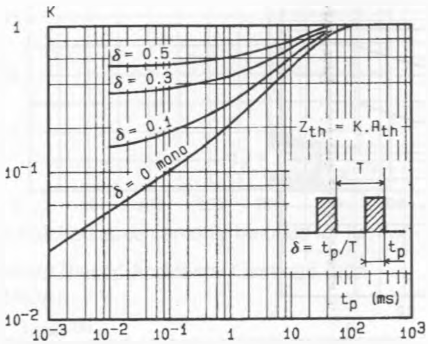
DC and Pulse Area.



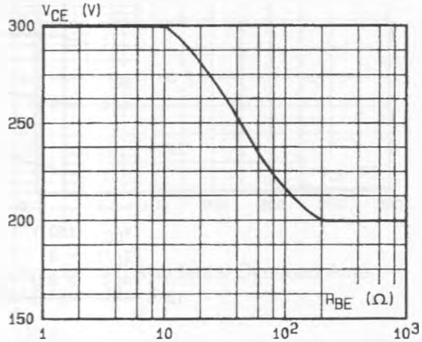
Power and $I_{S/B}$ Derating vs. Case Temperature.



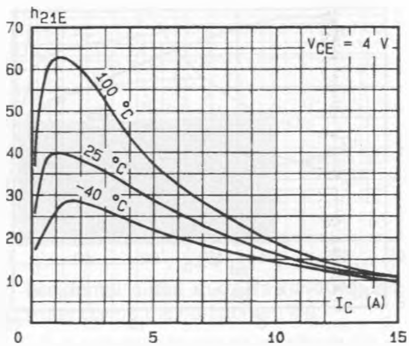
Transient Thermal Response.



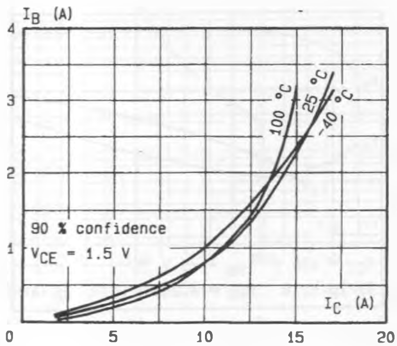
Collector-emitter Voltage vs. Base-emitter Resistance.



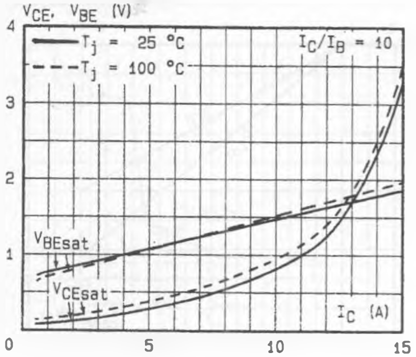
DC Current Gain.



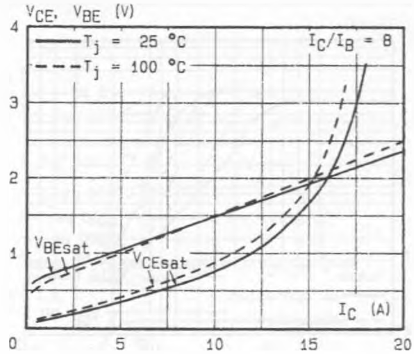
Minimum Base Current to saturate the Transistor.



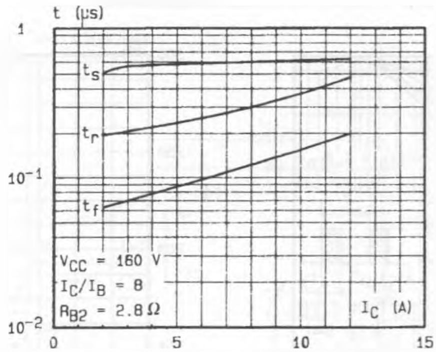
Saturation Voltage.



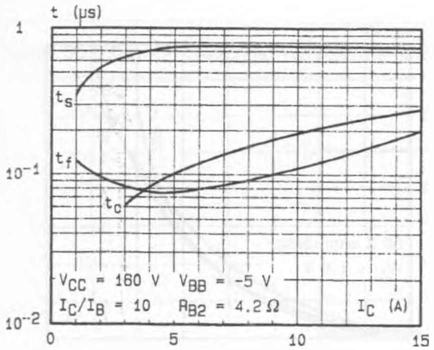
Saturation Voltage.



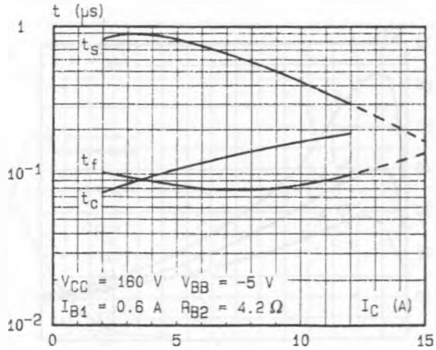
Switching Times versus Collector Current (resistive load).



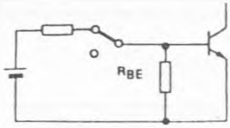
Switching Times versus Collector Current (inductive load).



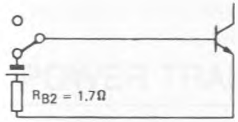
Switching Times versus Collector Current (inductive load).



SWITCHING OPERATING AND OVERLOAD AREAS

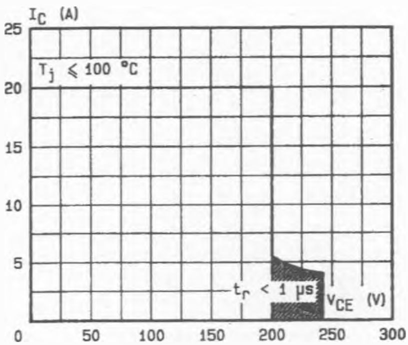


Transistor Forward Biased
- During the turn-on
- During the turn-off without negative base-emitter voltage and $6.8\Omega \leq R_{BE} \leq 50\ \Omega$



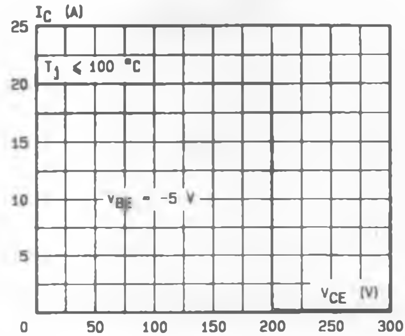
Transistor Reverse Biased
- During the turn-off with negative base emitter voltage

Forward Biased Safe Operating Area (FBSOA).

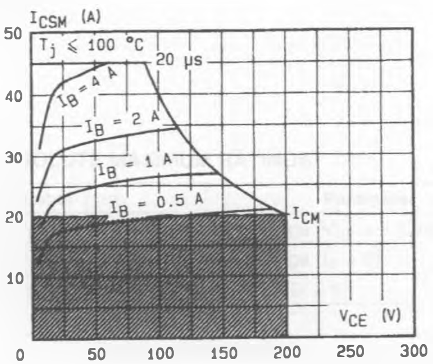


The hatched zone can only be used for turn-on

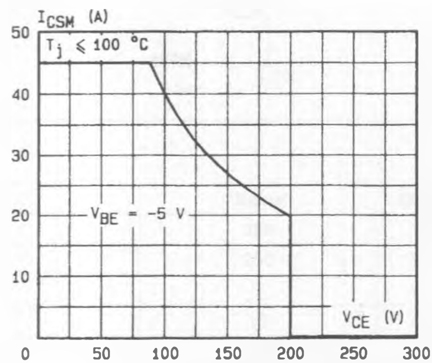
Reverse Biased Safe Operating Area (RBSOA).



Forward Biased Accidental Overload Area (FBAOA).



Reverse Biased Accidental Overload Area (RBAOA).



High accidental surge currents (I > ICM) are allowed if they are non repetitive and applied less than 3000 times during the component life

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

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