THOMSON-CSF
DIVISION SEMICONDUCTEURS DISCRETS

SUPERSWITCH

BUV 98, (V)
BUV 98 A, (V)

NPN HIGH VOLTAGE SWITCHING TRANSISTORS
TRANSISTORS NPN HAUTE TENSION DE COMMUTATION

SUPERSWITCH

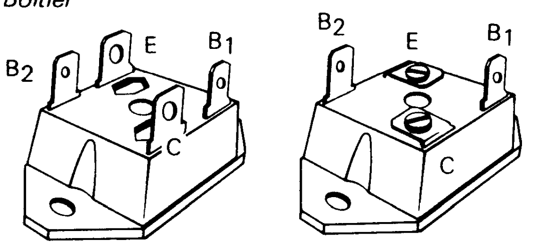
HIGH VOLTAGE, HIGH CURRENT AND HIGH SPEED TRANSISTOR SUITED FOR :
- **THE 220/380 V MAINS**
- **THE PARALLEL AND DARLINGTON CONFIGURATIONS**
- **DC/DC AND DC/AC CONVERTERS**
- **MOTOR CONTROL**

Data sheet tailored for swiching applications

- **ISOTOP : isolated collector package**
- **Key parameters characterized at 100°C**
- **High blocking capability - 1000 V**
- **Information for parallel mounting**
- **Information for use in darlington configuration**

	BUV 98, (V)	BUV 98 A, (V)
V_{CEOsus}	400 V	450 V
V_{CEX}	850 V	1000 V
I_{Csat}	20 A	16 A
I_{CSM}	110A	
t_f (100 °C) max	400 ns	

Case *Boîtier* **: ISOTOP**



BUV 98 - BUV 98 A **CB-285** — **BUV 98,(V) - BUV, 98A(V)** **CB-416**

Isolation voltage : 2,5 kV$_{(RMS)}$

ABSOLUTE RATINGS (LIMITING VALUES)
VALEURS LIMITES ABSOLUES D'UTILISATION

			BUV 98, (V)	BUV 98 A, (V)	
Collector-emitter voltage *Tension collecteur-émetteur*		V_{CEO}	400	450	V
Collector-emitter voltage *Tension collecteur-émetteur*	$V_{BE} = - 2,5$ V	V_{CEX}	850	1000	V
Emitter-base voltage *Tension émetteur-base*		V_{EBO}	7		V
Collector current *Courant collecteur*	$t_p \leqslant 5$ ms	I_C I_{CM}	30 60		A
Base current *Courant base*	$t_p \leqslant 5$ ms	I_B I_{BM}	8 30		A
Power dissipation *Dissipation de puissance*	T_{case} 25 °C	P_{tot}	150		W
Junction temperature *Température de jonction*	max	T_j	150		°C

Junction-case thermal resistance *Résistance thermique jonction-boitier*	max	$R_{th(j-c)}$	0,83	°C/W

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THOMSON-CSF
COMPOSANTS

ELECTRICAL CHARACTERISTICS – CARACTÉRISTIQUES ÉLECTRIQUES **

SYMBOLS	Min	Typ	Max	UNIT		TEST CONDITIONS – CONDITIONS DE MESURE
OFF CHARACTERISTICS – CARACTÉRISTIQUES A L'ETAT BLOQUÉ						
V_{CEOsus}	400 450			V	BUV 98, (V) BUV 98 A, (V)	$I_B = 0$, $I_C = 0{,}2$ A, L = 25 mH
$V_{(BR)EBO}$	7		30	V		$I_C = 0$, $I_B = 0{,}1$ A
I_{CEX}			0,4 4	mA		$T_{case} = 25$ °C $T_{case} = 125$ °C $V_{CE} = V_{CEX}$, $V_{BE} = -2{,}5$ V
I_{CER}			1 8	mA		$T_{case} = 25$ °C $T_{case} = 125$ °C $V_{CE} = V_{CEX}$, $R_{BE} \leqslant 5\ \Omega$
I_{EBO}			2	mA		$I_C = 0$, $V_{EB} = 5$ V
ON CHARACTERISTICS – CARACTÉRISTIQUES A L'ÉTAT CONDUCTEUR						
V_{CEsat}*			1,5 3,5	V	BUV 98, (V)	$I_C = 20$ A, $I_B = 4$ A $I_C = 30$ A, $I_B = 8$ A
			1,5 5	V	BUV 98 A, (V)	$I_C = 16$ A, $I_B = 3{,}2$ A $I_C = 24$ A, $I_B = 5$ A
V_{BEsat}*			1,6	V	BUV 98, (V) BUV 98 A, (V)	$I_C = 20$ A, $I_B = 4$ A $I_C = 16$ A, $I_B = 3{,}2$ A
DYNAMIC CHARACTERISTICS – CARACTÉRISTIQUES DYNAMIQUES						
f_T		5		MHz		f = 1 MHz, $I_C = 1$ A, $V_{CE} = 10$ V
C_{22b}		500		pF		f = 1 MHz, $V_{CE} = 10$ V

SWITCHING CHARACTERISTICS – CARACTÉRISTIQUES DE COMMUTATION

Resistive load – Charge résistive

SYMBOLS	Min	Typ	Max	UNIT		TEST CONDITIONS
t_{on}		0,55	1	µs	BUV 98, (V)	$V_{CC} = 150$ V, $I_C = 20$ A, $I_{B1} = -I_{B2} = 4$ A
t_s		1,5	3	µs	BUV 98 A, (V)	$V_{CC} = 150$ V, $I_C = 16$ A, $I_{B1} = -I_{B2} = 3{,}2$ A
t_f		0,3	0,8	µs		

Inductive load – Charge inductive

SYMBOLS	Min	Typ	Max	UNIT		TEST CONDITIONS
t_s		3,5		µs		$T_J = 25$°C — BUV 98, (V): $V_{CC} = 300$ V, $I_C = 20$ A, $L_B = 1{,}5$ µH, $-V_B = 5$ V, $I_{Bend} = 4$ A
			5	µs		$T_J = 100$°C
t_f		0,08		µs		$T_J = 25$°C — BUV 98 A, (V): $V_{CC} = 300$ V, $I_C = 16$ A, $L_B = 1{,}5$ µH, $-V_B = 5$ V, $I_{Bend} = 3{,}2$ A
			0,4	µs		$T_J = 100$°C

* Pulse - Impulsions $t_p = 300$ µs $\delta \leqslant 2$ % ** T_{case} 25 °C Unless otherwise stated - Sauf indications contraires

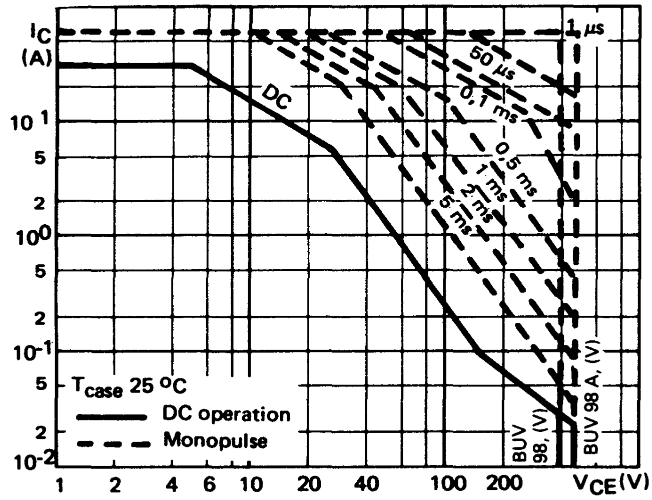


FIGURE 1 : DC and pulse area

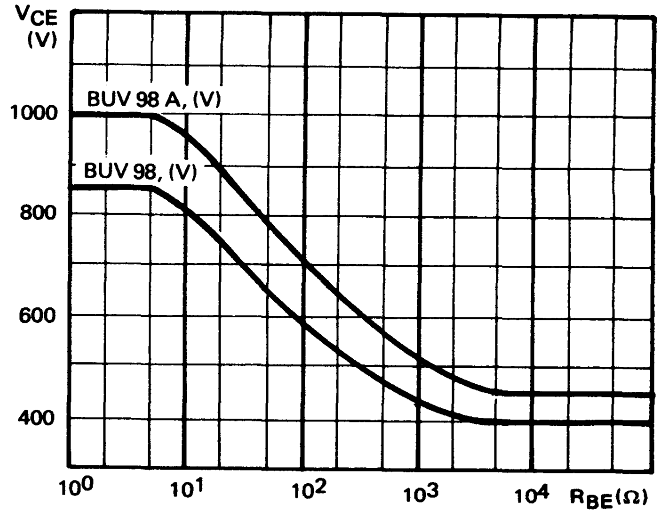


FIGURE 2 : Collector-emitter voltage vs base-emitter resistance

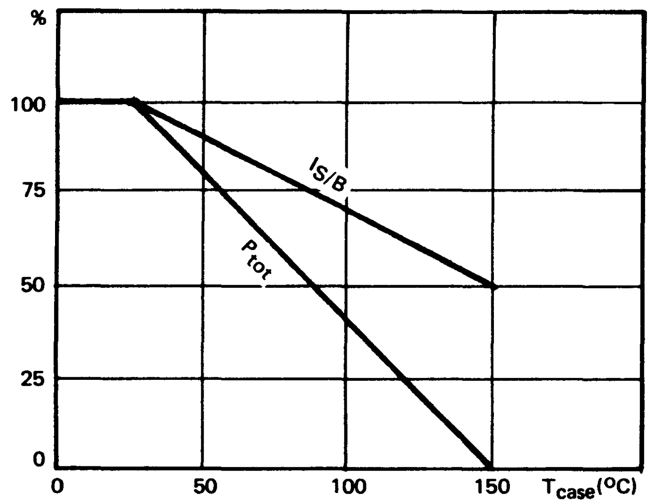


FIGURE 3 : Power and $I_{S/B}$ derating vs case temperature

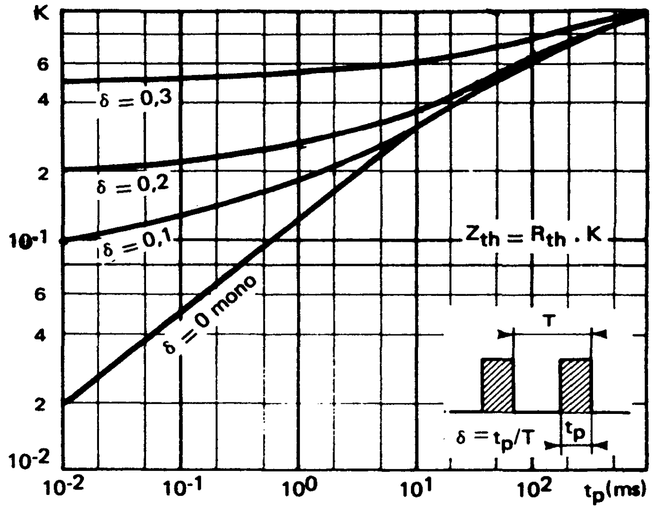
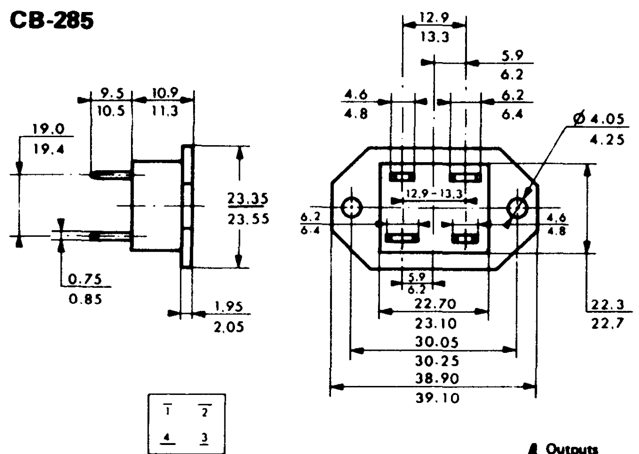


FIGURE 4 : Transient thermal response

CASE OUTLINES

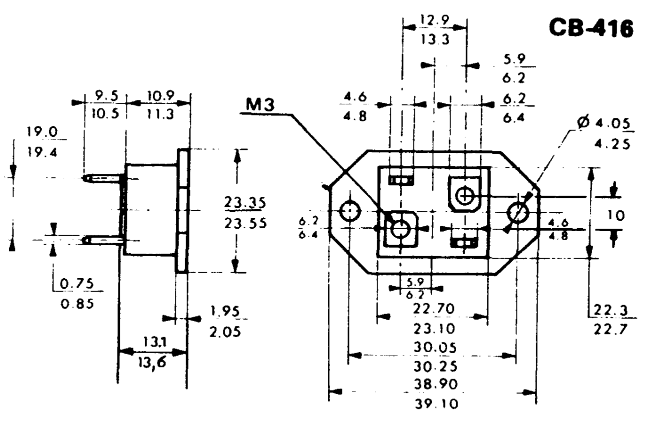
CB-285



Marking : clear
Marquage : en clair
Note : Pin 3 may be omitted
La broche 3 peut être omise

4 Outputs Sorties

CB-416



3/7

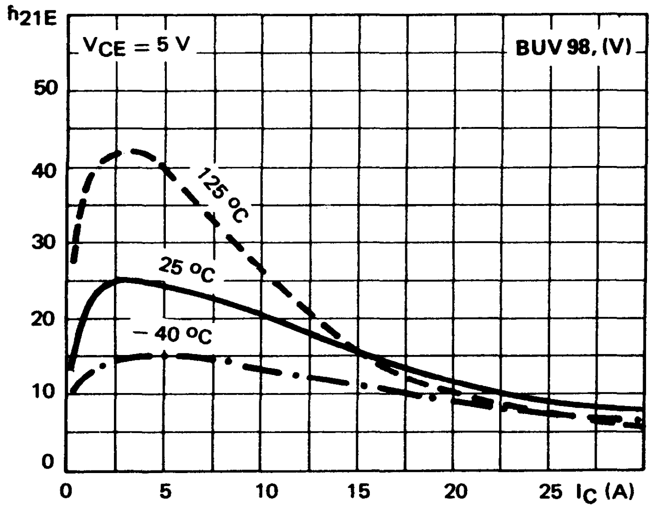


FIGURE 6 : DC current gain

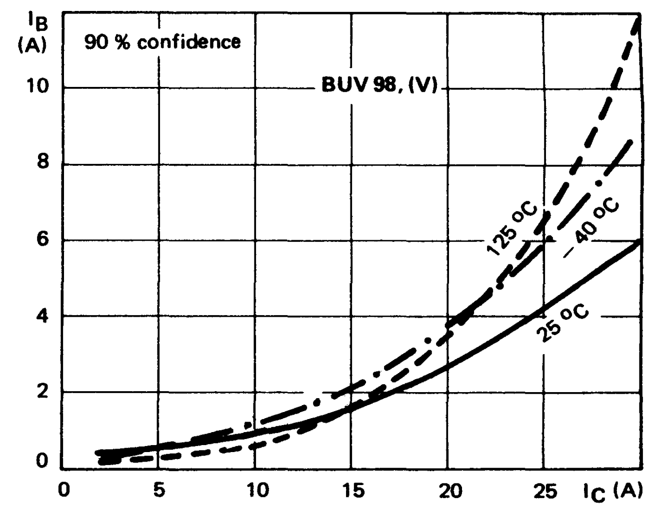


FIGURE 7 : Minimum base current to saturate the transistor

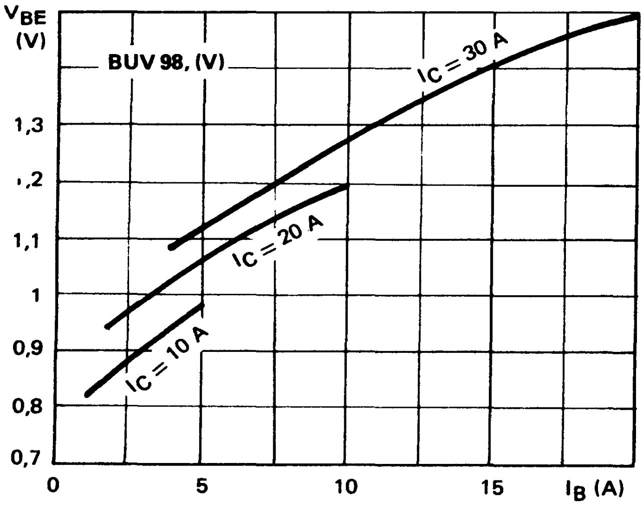


FIGURE 8 : Base characteristics

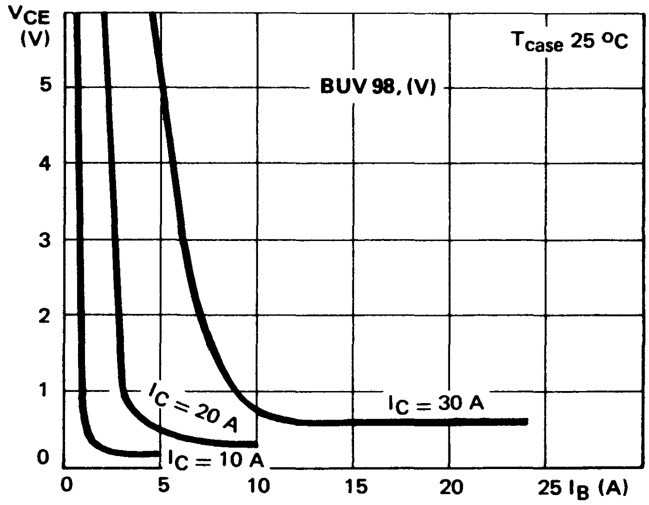


FIGURE 9 : Collector saturation region

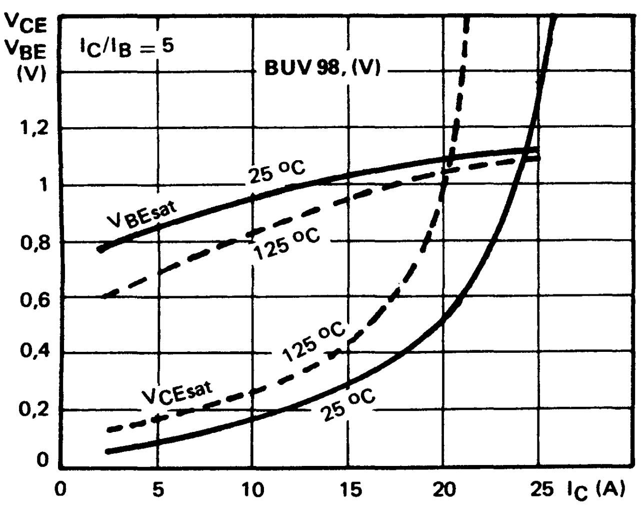


FIGURE 10 : Saturation voltage

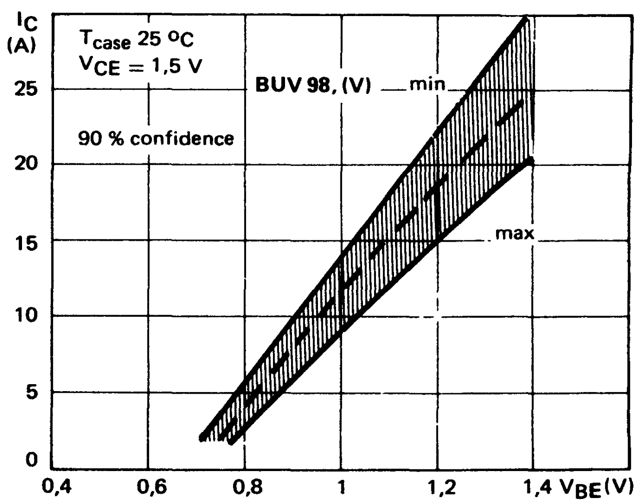
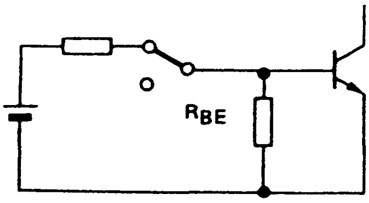
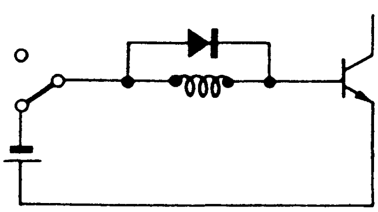


FIGURE 11 : Collector current spread vs base-emitter voltage

SWITCHING OPERATING AND OVERLOAD AREAS



TRANSISTOR FORWARD BIASED
- During the turn on
- During the turn off without negative base-emitter voltage and $R_{BE} \leqslant 50\ \Omega$



TRANSISTOR REVERSE BIASED
- During the turn off with negative base-emitter voltage

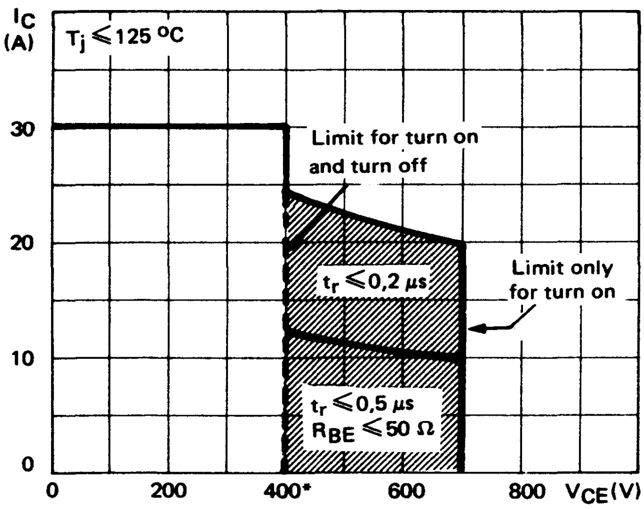


FIGURE 12 :Forward biased safe operating area (FBSOA)

* BUV 98 A, (V) : 450 V

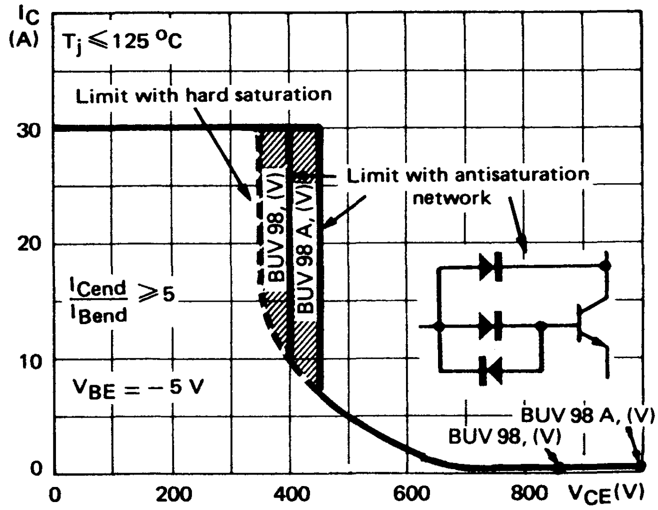


FIGURE 13 : Reverse biased safe operating area (RBSOA)

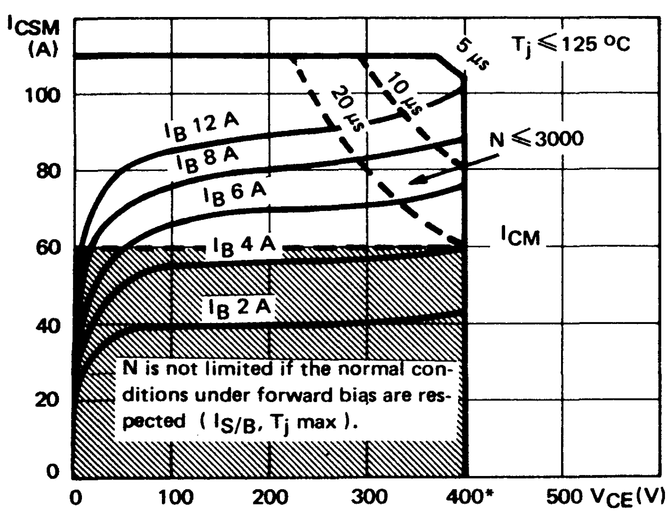


FIGURE 14 : Forward biased accidental overload area (FBAOA)

* BUV 98 A, (V) : 450 V

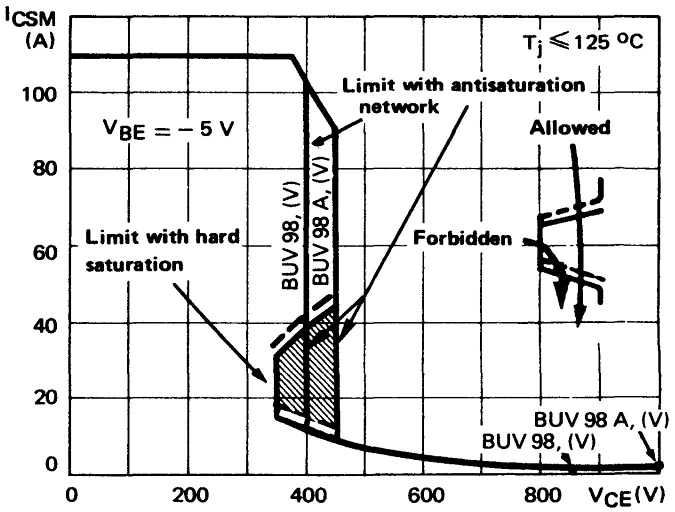


FIGURE 15 :Reverse biased accidental overload area (RBAOA)

Figure 12 : The hatched zone can only be used for turn on.

Figures 13 and 15 : Switch off starting from the quasi saturated state ($V_{CE} \geqslant$ 1'5 V) allows to extend the RBSOA and the RBAOA to the hatched zone.

Figures 14 and 15 : High accidental surge currents ($I > I_{CM}$) are allowed if they are non repetitive and applied less than 3000 times during the component life.

Figure 14 : The Kellog network (heavy point) allows the calculation of the maximum value of the short-circuit current for a given base current I_B (90 % confidence).

Figure 15 : After the accidental overload current, the RBAOA has to be used for the turn off. As in traffic regulation one is allowed to cross the broken line before the continuous line. One is forbidden to cross the single continuous line.

Figure 12 : *La zone hachurée ne doit être utilisée que pour la mise en conduction.*

Figures 13 et 15 : *Le blocage à partir de l'état quasi-saturé ($V_{CE} \geqslant$ 1,5 V) permet d'étendre les aires de fonctionnement et de surcharge en inverse jusqu'à la zone hachurée.*

Figures 14 et 15 : *De forts courants de surcharge ($I > I_{CM}$) sont permis s'ils sont non répétitifs et appliqués moins de 3000 fois dans la vie du composant.*

Figure 14 : *Le réseau de Kellog (trait gras) permet le calcul de la valeur maximale du courant de court-circuit pour un courant de base donné I_B (90 % de confiance).*

Figure 15 : *Après le passage dù courant de surcharge accidentelle on doit utiliser l'aire de surcharge accidentelle en polarisation inverse pour l'ouverture. Il est permis de traverser la ligne continue à condition de traverser d'abord la ligne pointillée.*

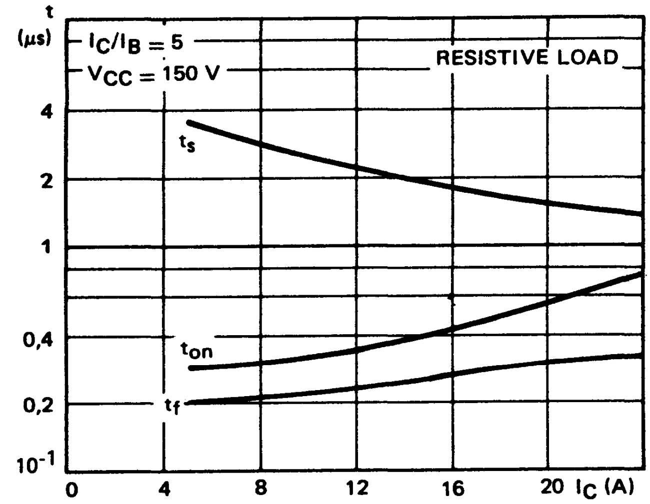


FIGURE 16 : Switching times vs collector current (resistive load)

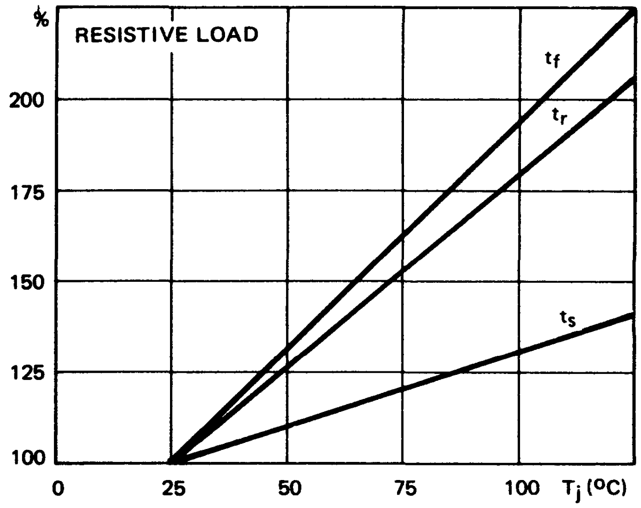


FIGURE 17 : Switching times vs junction temperature (resistive load)

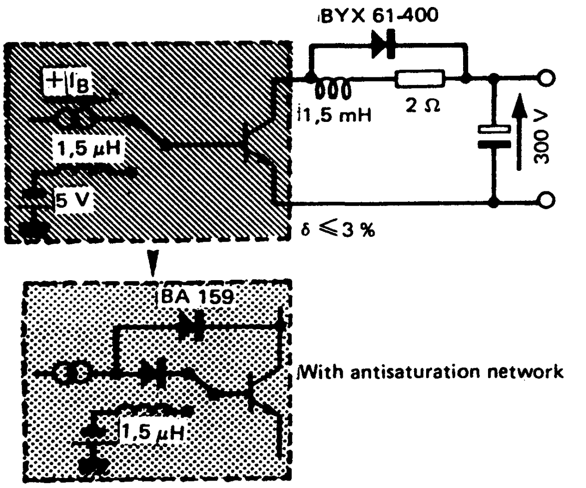


FIGURE 18 : Switching times test circuit on inductive load (with and without antisaturation network)

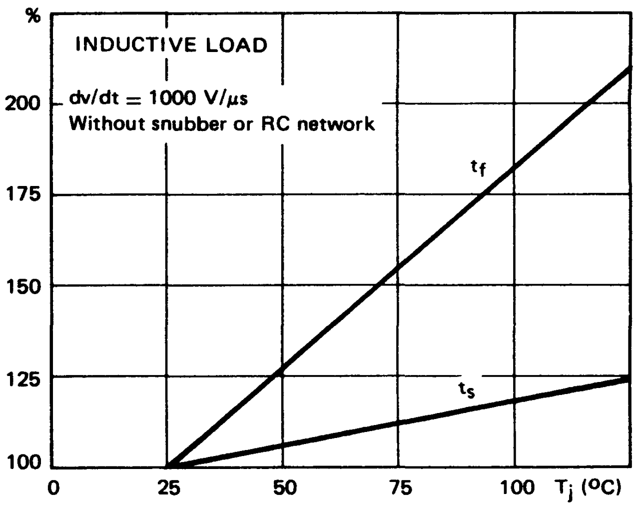


FIGURE 19 : Switching times vs junction temperature (inductive load)

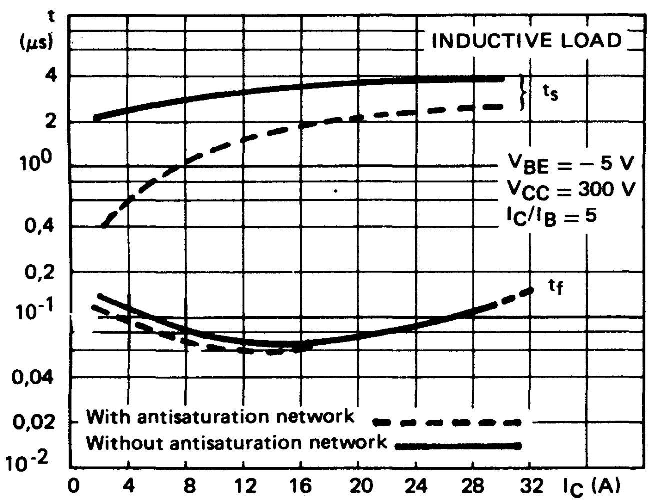


FIGURE 20 : Switching times vs collector current (with and without antisaturation network)

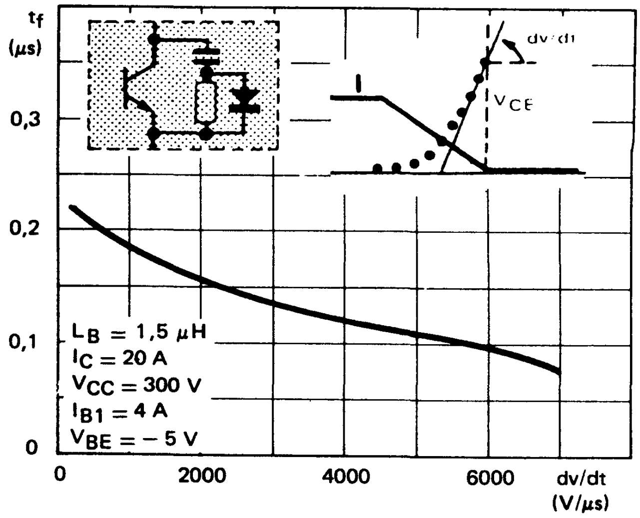


FIGURE 21 : Fall times vs reapplied voltage slope

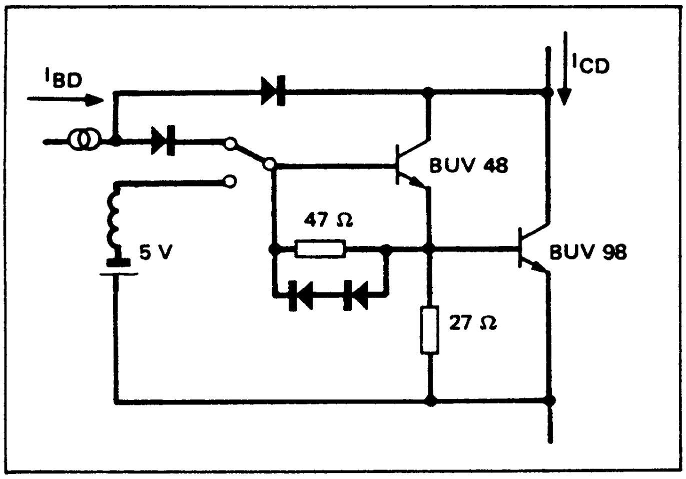
applications

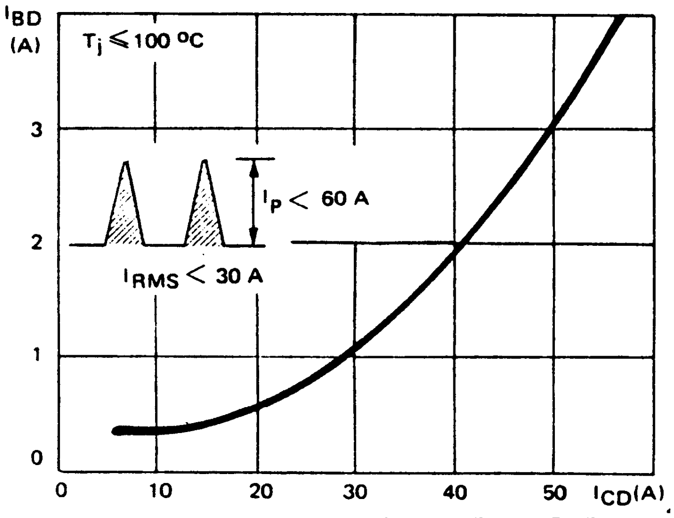
The BUV 98 is designed for high voltage (220/380 V mains) and high current applications.

I_{Csat} = 20 A P_S switchable power = $V_{CEO} \cdot I_{Csat}$ = 8 KW

To increase its power switching capability, it can be used in discrete Darlington configurations.

EXAMPLE 1 :



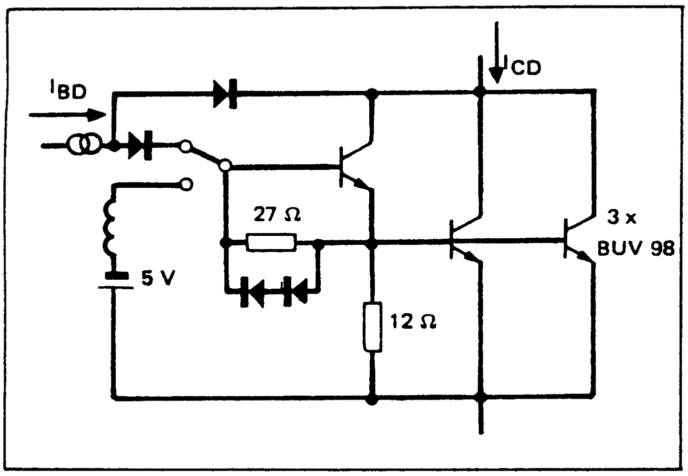


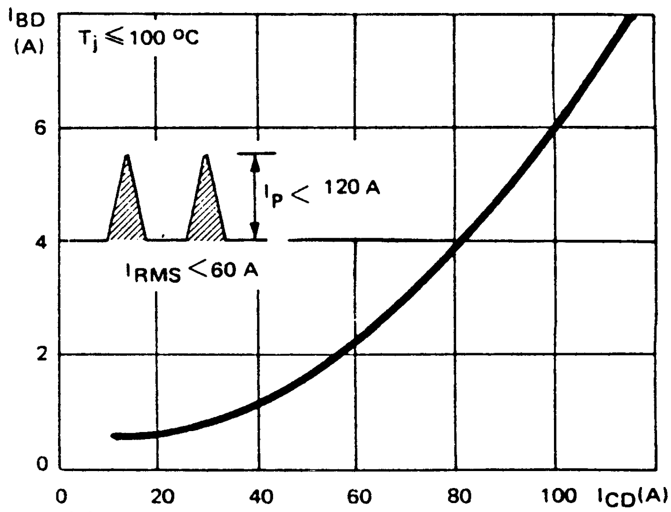
Minimum base current I_{BD} to drive the discrete Darlington

In this configuration the discrete Darlington can switch:

I_{CD} = 40 A	with	I_{BD} = 2 A
I_{CD} = 20 A	with	I_{BD} = 0,4 A

EXAMPLE 2 :





Minimum base current I_{BD} to drive the discrete Darlington

In this configuration the discrete Darlington can switch :

I_{CD} = 80 A	with	I_{BD} = 4 A
I_{CD} = 40 A	with	I_{BD} = 1 A