

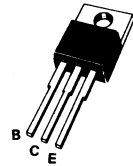
**ADVANCE INFORMATION****SUPERSWITCH**

HIGH VOLTAGE , HIGH SPEED SWITCHING NPN POWER TRANSISTOR IN TO 220 CASE.

DESIGNED FOR USE IN CONVERTERS, INVERTERS, SWITCHING REGULATORS AND POWER SWITCHING APPLICATIONS.

V_{CEO}sus	400 V
V_{CEX}	800 V
I_{Csat}	1 A
t_f (max)	0,4 μs

Case TO 220
Boîtier



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

Collector-emitter voltage <i>Tension collecteur-émetteur</i>		V _{CEO}	400	V
Collector-emitter voltage <i>Tension collecteur-émetteur</i>	V _{BE} = -1,5 V	V _{CEX}	800	V
Emitter-base voltage <i>Tension émetteur-base</i>		V _{EBO}	7	V
Collector current <i>Courant collecteur</i>	t _p ≤ 5 ms	I _C I _{CM}	2 3	A
Base current <i>Courant base</i>	t _p ≤ 5 ms	I _B I _{BM}	0,75 1,5	A
Power dissipation <i>Dissipation de puissance</i>	T _{case} 50 °C	P _{tot}	50	W
Junction temperature <i>Température de jonction</i>		T _j	-65 + 175	°C

Junction-case thermal resistance <i>Résistance thermique jonction boîtier</i>	max	R _{th(j-c)}	2,5	°C/W
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ELECTRICAL CHARACTERISTICS - CARACTÉRISTIQUES ÉLECTRIQUES **

SYMBOLS	Min	Typ	Max	UNITS	TEST CONDITIONS - CONDITIONS DE MESURE
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OFF CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT BLOUÉ

V_{CE0sus}	400			V	$I_C = 0,2 A, I_B = 0, L = 25 mH$
I_{CES}			200	μA	$T_{case} 25 ^\circ C$
			1	mA	$T_{case} 125 ^\circ C$
I_{EBO}			1	mA	$V_{EB} = 5 V, I_C = 0$

ON CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT CONDUCTEUR

h_{21E}		50			$V_{CE} = 5 V, I_C = 0,1 A$
V_{CEsat}^*			1	V	$I_C = 1 A, I_B = 0,2 A$
			0,5		$I_C = 300 mA, I_B = 30 mA$
V_{BEsat}^*			1,1	V	$I_C = 1 A, I_B = 0,2 A$

DYNAMIC CHARACTERISTICS - CARACTÉRISTIQUES DYNAMIQUES

f_T		6		MHz	$f = 1 MHz, I_C = 200 mA, V_{CE} = 10 V$
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SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION

Resistive load - Charge résistive					
t_{on}		0,2	0,5	μs	$V_{CC} = 250 V, I_C = 1 A$ $I_{B1} = 0,2 A, I_{B2} = 0,4 A$
t_s		1,7	2,5		
t_f			0,4		

* Measured with pulses $t_p = 300 \mu s$ $\delta \leq 2\%$ ** $T_{case} 25 ^\circ C$ Unless otherwise stated

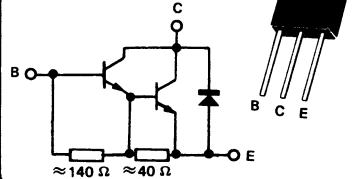
NPN HIGH VOLTAGE DARLINGTON
DARLINGTON NPN HAUTE TENSION

Power monolithic Darlington, specially intended for use in automotive ignition circuits.

Darlington monolithique de puissance spécialement conçu pour l'allumage électronique automobile

V_{CE0sus} 400 V
 V_{CEsat} (10 A) < 2 V
 I_C 15 A
 P_{tot} (25°C) 100 W

Case
Boitier TOP 3 (CB 244)



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

Collector-emitter voltage <i>Tension collecteur-émetteur</i>		V_{CE0sus}	400	V
Collector current <i>Courant collecteur</i>	$t_p \leq 10$ ms	I_C I_{CM}	15 30	A
Base current <i>Courant base</i>		I_B	4	A
Power dissipation <i>Dissipation de puissance</i>	T_{case} 25 °C	P_{tot}	100	W
Junction temperature <i>Température de jonction</i>		T_j	- 65 + 150	°C

Junction-case thermal resistance <i>Résistance thermique jonction-boitier</i>		$R_{th(j-c)}$	1,25	°C/W
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ELECTRICAL CHARACTERISTICS - CARACTÉRISTIQUES ÉLECTRIQUES **

SYMBOLS	Min	Typ	Max	UNITS	TEST CONDITIONS - CONDITIONS DE MESURE
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OFF CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT BLOQUÉ

$V_{CE_{sat}}^*$ (1)	400			V	$I_C = 5 A, I_B = 0, L = 15 \text{ mH}, V_{CE_{cl.}} = 400 \text{ V}$
I_{CEO}			0,25	mA	$I_B = 0, V_{CE} = 400 \text{ V}$

ON CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT CONDUCTEUR

h_{21E}^*	20				$V_{CE} = 5 \text{ V}, I_C = 15 \text{ A}$
$V_{CE_{sat}}^*$			2	V	$I_C = 10 \text{ A}, I_B = 0,15 \text{ A}$
			1,5		$I_C = 7 \text{ A}, I_B = 0,07 \text{ A}$
			2,9		$T_{case} = -40 \text{ }^\circ\text{C}, I_C = 10 \text{ A}, I_B = 0,15 \text{ A}$
$V_{BE_{sat}}^*$			2,7	V	$T_{case} = 25 \text{ }^\circ\text{C}$
			3,5		$T_{case} = -40 \text{ }^\circ\text{C}$

(1) Collector-emitter voltage limited at $V_{CE_{cl.}} = 400 \text{ V}$ by an auxiliary clamping circuit.
Limitation de la tension $V_{CE_{cl.}} = 400 \text{ V}$ par système d'écrêtage.

** $T_{case} 25 \text{ }^\circ\text{C}$ Unless otherwise stated

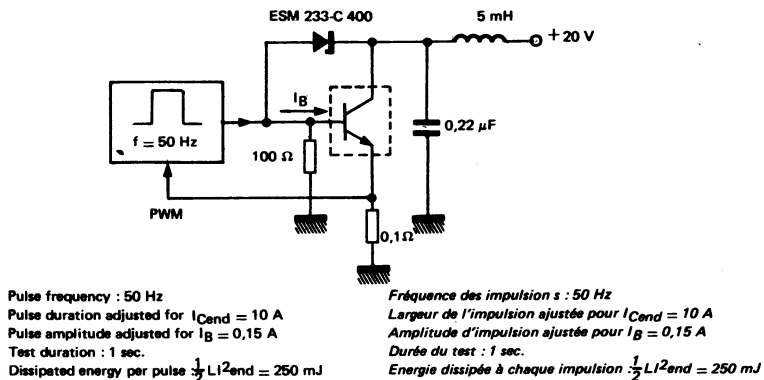


FIGURE 2 : Second breakdown fonctional test

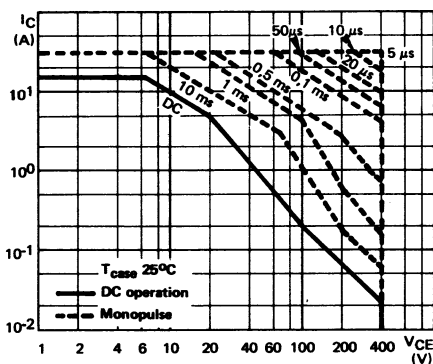


FIGURE 3 : DC and pulse area

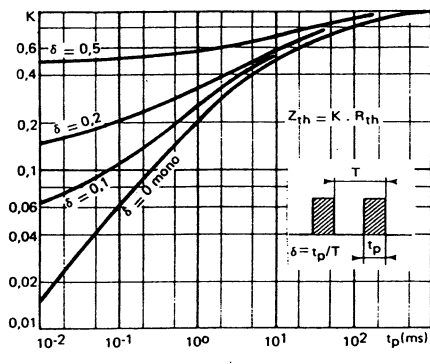


FIGURE 4 : Transient thermal response

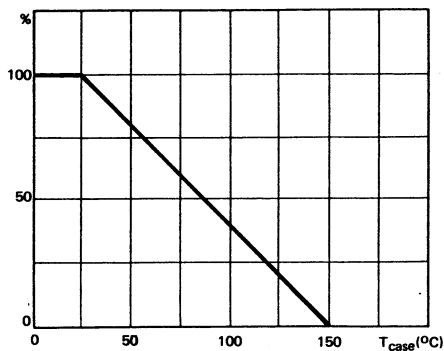


FIGURE 5 : Power derating vs case temperature

ADVANCE INFORMATION

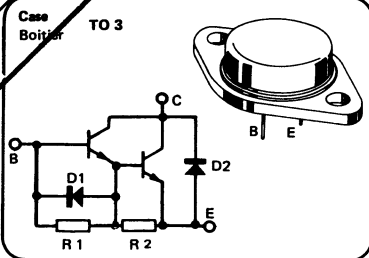
SUPERSWITCH

HIGH VOLTAGE, FAST SWITCHING DARLINGTON SUITED FOR MOTOR SPEED CONTROL, INVERTERS, SWITCHED MODE POWER SUPPLIES WITH SWITCHING FREQUENCIES UP TO 50 kHz.

- *Very fast switching
- *Wide safe operating area
- *High current gain
- *Design orientated specifications
- *Switching times specified with inductive load

V_{CE0sus}	400 V
V_{CEX}	600 V
I_{Csat}	17 A
$t_f (100^\circ C)$	$\leq 0,25 \mu s$

DATA SHEET UNDER REVISION
NOTICE EN COURS DE MODIFICATION



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

Collector-emitter voltage <i>Tension collecteur-émetteur</i>		V_{CEO}	400	V
Collector-base voltage <i>Tension collecteur-base</i>		V_{CBO}	600	V
Emitter-base voltage <i>Tension émetteur-base</i>		V_{EBO}	8	V
Collector current <i>Courant collecteur</i>	$t_p \leq 5 \text{ ms}$	I_C I_{CM}	18 35	A
Base current <i>Courant base</i>	$t_p \leq 5 \text{ ms}$	I_B I_{BM}	6 10	A
Power dissipation <i>Dissipation de puissance</i>	$T_C = 25^\circ C$	P_{tot}	150	W
Junction temperature <i>Température de jonction</i>		T_j	- 65 + 200	$^\circ C$

Junction-case thermal resistance <i>Résistance thermique jonction boîtier</i>	max	$R_{th(j-c)}$	1,17	$^\circ C/W$
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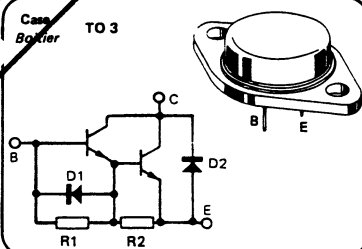
ADVANCE INFORMATION

SUPERSWITCH

HIGH VOLTAGE, FAST SWITCHING DARLINGTON SUITED FOR MOTOR SPEED CONTROL, INVERTERS, SWITCHED MODE POWER SUPPLIES WITH SWITCHING FREQUENCIES UP TO 50 kHz.

- *Very fast switching
- *Wide safe operating area
- *High current gain
- *Design orientated specifications
- *Switching times specified with inductive load

V_{CE0sus} 400 V
 V_{CEX} 600 V
 I_{Csat} 24 A
 $t_f (100^\circ C)$ $< 0,25 \mu s$



DATA SHEET UNDER REVISION
NOTICE EN COURS DE MODIFICATION

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

Collector-emitter voltage <i>Tension collecteur-émetteur</i>		V_{CEO}	400	V
Collector-base voltage <i>Tension collecteur-base</i>		V_{CBO}	600	V
Emitter-base voltage <i>Tension émetteur-base</i>		V_{EBO}	8	V
Collector current <i>Courant collecteur</i>	$t_p \leq 5 \text{ ms}$	I_C I_{CM}	36 70	A
Base current <i>Courant base</i>	$t_p \leq 5 \text{ ms}$	I_B I_{BM}	12 20	A
Power dissipation <i>Dissipation de puissance</i>	$T_C = 25^\circ C$	P_{tot}	250	W
Junction temperature <i>Température de jonction</i>		T_j	-65 +200	$^\circ C$

Junction-case thermal resistance <i>Résistance thermique jonction boîtier</i>	max	$R_{th(j-c)}$	0,7	$^\circ C/W$
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Mars 1981 1/3

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 :

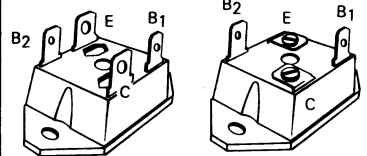
- THE 220/380 V MAINS
- THE PARALLEL AND DARLINGTON CONFIGURATIONS
- DC/DC AND DC/AC CONVERTERS
- MOTOR CONTROL

Data sheet tailored for switching 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_{CE0sus}	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 : ISOTOP
Boîtier :



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

Isolation voltage : 2,5 kV(RMS)

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

			BUV 98, (V)	BUV 98 A, (V)	
Collector-emitter voltage <i>Tension collecteur-émetteur</i>		V_{CEO}	400	450	V
Collector-emitter voltage <i>Tension collecteur-émetteur</i>	$V_{BE} = - 2,5 V$	V_{CEX}	850	1000	V
Emitter-base voltage <i>Tension émetteur-base</i>		V_{EBO}	7		V
Collector current <i>Courant collecteur</i>	$t_p \leq 5 ms$	I_C I_{CM}	30 60		A
Base current <i>Courant base</i>	$t_p \leq 5 ms$	I_B I_{BM}	8 30		A
Power dissipation <i>Dissipation de puissance</i>	$T_{case} 25 °C$	P_{tot}	150		W
Junction temperature <i>Température de jonction</i>	max	T_j	150		°C
Junction-case thermal resistance <i>Résistance thermique jonction-boîtier</i>	max	$R_{th(j-c)}$	0,83		°C/W

BUV 98, (V) - BUV 98 A, (V)
ELECTRICAL CHARACTERISTICS – CARACTÉRISTIQUES ÉLECTRIQUES **

SYMBOLS	Min	Typ	Max	UNIT	TEST CONDITIONS – CONDITIONS DE MESURE
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OFF CHARACTERISTICS – CARACTÉRISTIQUES A L'ÉTAT BLOQUÉ

V_{CE0us}	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		$T_{case} = 25\text{ °C}$ $T_{case} = 125\text{ °C}$ $V_{CE} = V_{CEX}, V_{BE} = -2,5 V$
I_{CER}			1 8	mA		$T_{case} = 25\text{ °C}$ $T_{case} = 125\text{ °C}$ $V_{CE} = V_{CEX}, R_{BE} \leq 5 \Omega$
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

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			
t_f		0,3	0,8		BUV 98 A, (V)	$V_{CC} = 150 V, I_C = 16 A, I_{B1} = - I_{B2} = 3,2 A$

Inductive load – Charge inductive

t_s		3,5		μs		$T_J = 25\text{ °C}$ $T_J = 100\text{ °C}$	$V_{CC} = 300 V, I_C = 20 A, L_B = 1,5 \mu H$ $- V_B = 5 V, I_{Bend} = 4 A$
	t_f		0,08				

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

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

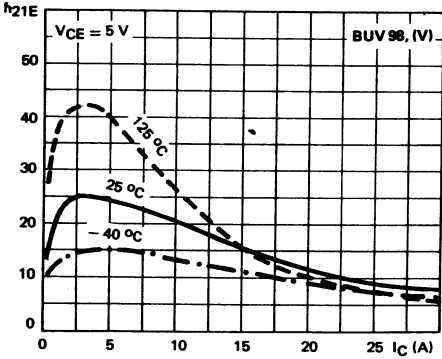


FIGURE 6 : DC current gain

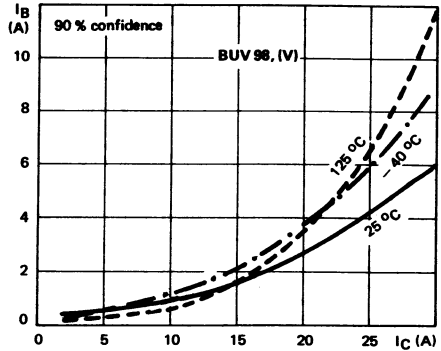


FIGURE 7 : Minimum base current to saturate the transistor

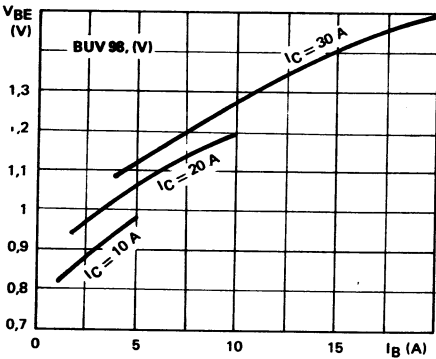


FIGURE 8 : Base characteristics

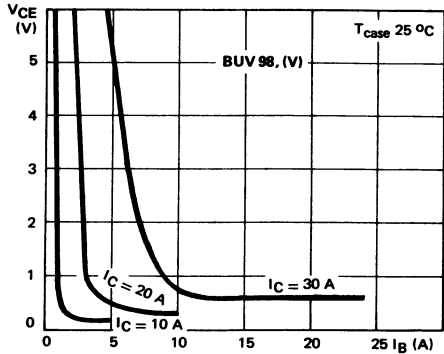


FIGURE 9 : Collector saturation region

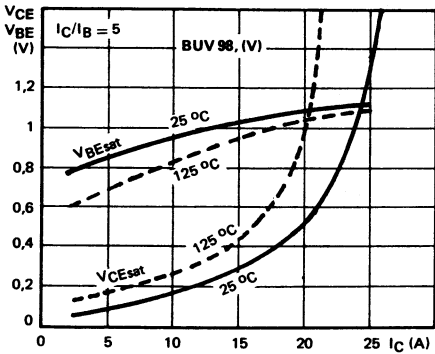


FIGURE 10 : Saturation voltage

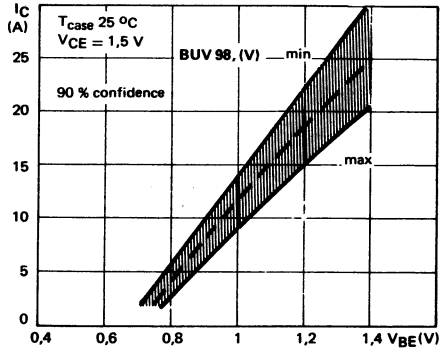
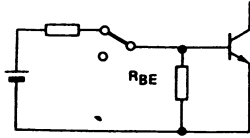


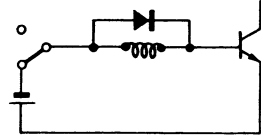
FIGURE 11 : Collector current spread vs base-emitter voltage

SWITCHING OPERATING AND OVERLOAD AREAS



TRANSISTOR FORWARD BIASED

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



TRANSISTOR REVERSE BIASED

- During the turn off with negative base-emitter voltage

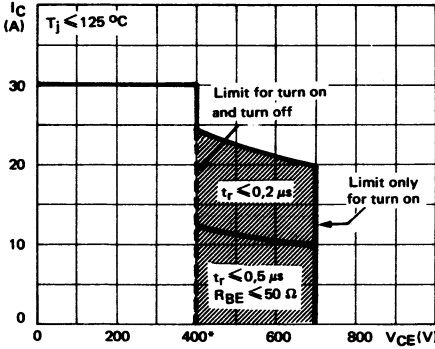


FIGURE 12 : Forward biased safe operating area (FBSOA)

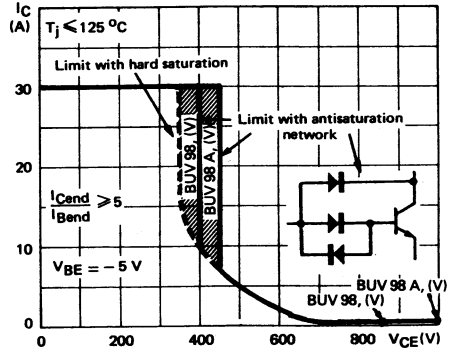


FIGURE 13 : Reverse biased safe operating area (RBSOA)

* BUV 98 A, (V) : 450 V

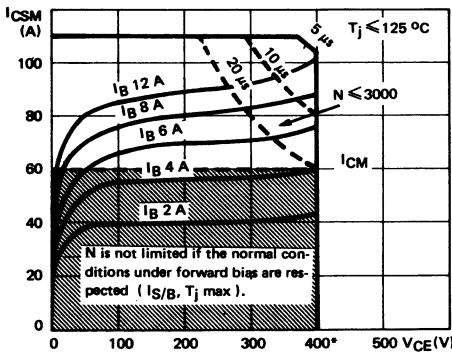


FIGURE 14 : Forward biased accidental overload area (FBAOA)

* BUV 98 A, (V) : 450 V

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

Figures 13 and 15 : Switch off starting from the quasi saturated state ($V_{CE} \geq 1,5 V$) 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.

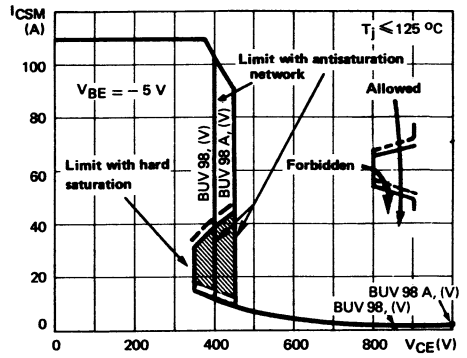


FIGURE 15 : Reverse biased accidental overload area (RBAOA)

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 ($V_{CE} \geq 1,5 V$) 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 du 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.

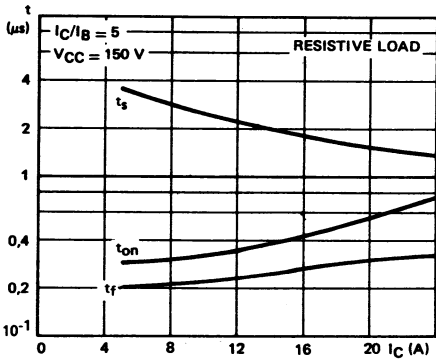


FIGURE 16 : Switching times vs collector current (resistive load)

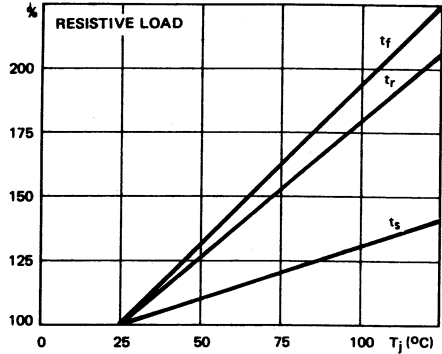


FIGURE 17 : Switching times vs junction temperature (resistive load)

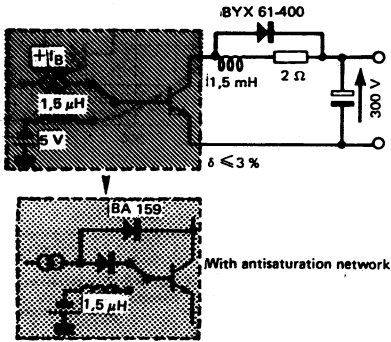


FIGURE 18 : Switching times test circuit on inductive load (with and without antisaturation network)

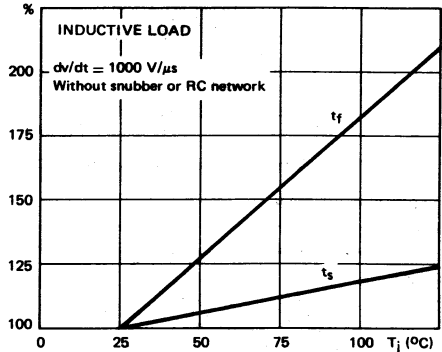


FIGURE 19 : Switching times vs junction temperature (inductive load)

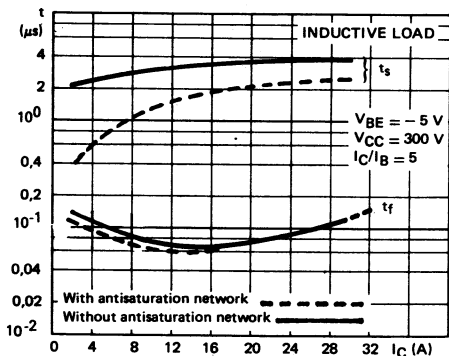


FIGURE 20 : Switching times vs collector current (with and without antisaturation network)

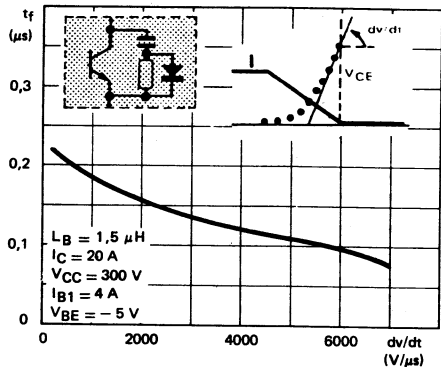


FIGURE 21 : Fall times vs reapplied voltage slope

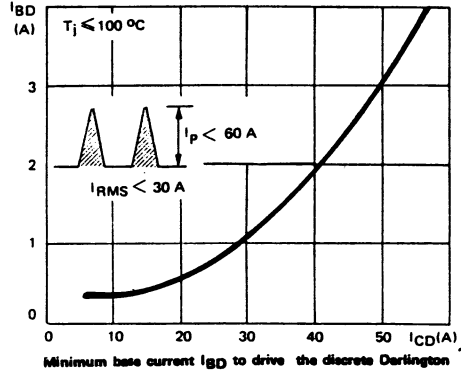
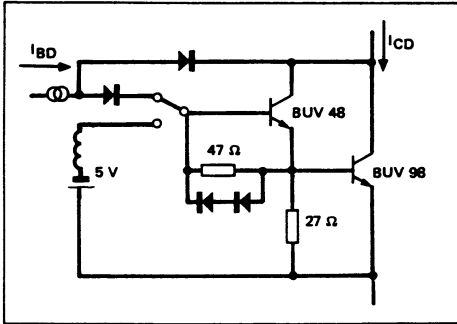
applications

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

$I_{Csat} = 20 \text{ A}$	$P_S \text{ switchable power} = V_{CE0} \cdot I_{Csat} = 8 \text{ KW}$
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To increase its power switching capability, it can be used in discrete Darlington configurations.

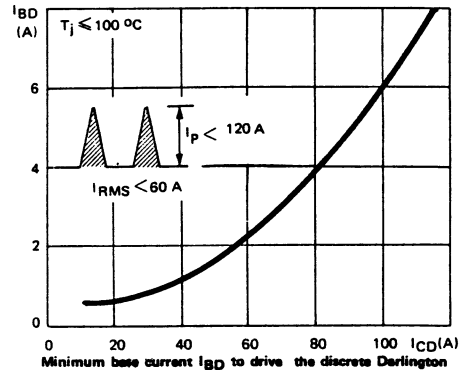
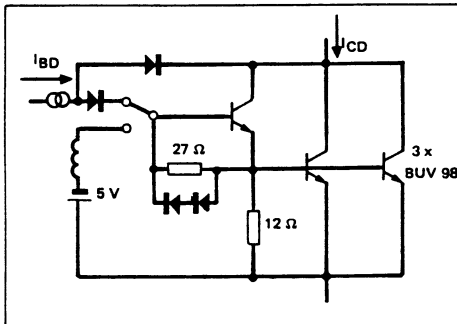
EXAMPLE 1 :



In this configuration the discrete Darlington can switch:

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

EXAMPLE 2 :



In this configuration the discrete Darlington can switch :

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

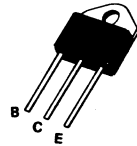
ADVANCE INFORMATION

SUPERSWITCH

VERY FAST SWITCHING PNP POWER TRANSISTOR SUITED FOR USE AS A DRIVER FOR NPN SUPERSWITCH POWER TRANSISTORS IN QUASI-DARLINGTON CONFIGURATION AND IN SWITCH-MODE APPLICATIONS AS DC MOTOR CONTROL, DC/DC POWER SUPPLY AND BOOST REGULATORS.

V_{CE0max} - 150 V
 V_{CEX} - 200 V
 I_{Csat} - 10 A
 t_f (100°C) < 0,5 μ s

Case TOP 3
 Boitier



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

Collector-emitter voltage <i>Tension collecteur-émetteur</i>		V_{CEO}	- 150	V
Collector-base voltage <i>Tension collecteur-base</i>		V_{CBO}	- 200	V
Emitter-base voltage <i>Tension émetteur-base</i>		V_{EBO}	- 7	V
Collector current <i>Courant collecteur</i>	$t_p \leq 5$ ms	I_C I_{CM}	- 15 - 30	A
Base current <i>Courant base</i>	$t_p \leq 5$ ms	I_B I_{BM}	- 4 - 8	A
Power dissipation <i>Dissipation de puissance</i>	$T_{case} 25$ °C	P_{tot}	150	W
Junction temperature <i>Température de jonction</i>		T_j	- 65 + 175	°C

Junction-case thermal resistance <i>Résistance thermique jonction boîtier</i>	max	$R_{th(j-c)}$	1	°C/W
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ELECTRICAL CHARACTERISTICS - CARACTÉRISTIQUES ÉLECTRIQUES **

SYMBOLS	Min	Typ	Max	UNITS	TEST CONDITIONS - CONDITIONS DE MESURE
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OFF CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT BLOQUÉ

V_{CE0us}	-150			V	$I_C = -0,2A, I_B = 0, L = 25\text{ mH}$	
$V_{(BR)EBO}^*$	-7			V	$I_C = 0, I_E = -0,05\text{ A}$	
I_{CEX}			-1	mA	$T_{case}\ 25\ ^\circ\text{C}$ $T_{case}\ 125\ ^\circ\text{C}$	$V_{CE} = V_{CEX}, V_{BE} = +1,5\text{ V}$
			-4			
I_{CER}			-1	mA	$T_{case}\ 25\ ^\circ\text{C}$ $T_{case}\ 125\ ^\circ\text{C}$	$V_{CE} = V_{CER}, R_{BE} \leq 10\ \Omega$
			-5			
I_{EBO}			-1	mA	$V_{EB} = -5\text{ V}, I_C = 0$	

ON CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT CONDUCTEUR

V_{CEsat}^*		-0,7		V	$T_{case}\ 25\ ^\circ\text{C}$ $T_{case}\ 100^\circ\text{C}$	$I_C = -10\text{ A}, I_B = -1\text{ A}$
			-1,5			
V_{BEsat}^*			-1,8	V		$I_C = -10\text{ A}, I_B = -1\text{ A}$

DYNAMIC CHARACTERISTICS - CARACTÉRISTIQUES DYNAMIQUES

f_T		5		MHz	$f = 1\text{ MHz}, I_C = -2\text{ A}, V_{CE} = -5\text{ V}$
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SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION

On resistive load - Sur charge résistive						
t_{on}			0,5	μs	$V_{CC} = -60\text{ V}, I_C = -10\text{ A}$ $I_{B1} = -I_{B2} = -1\text{ A}$	
t_s			1			
t_f			0,5			
On inductive load - Sur charge inductive						
t_s			1,5	μs	$V_{CC} = -150\text{ V}, I_C = -10\text{ A}$ $I_B = -I_{B2} = -1\text{ A}$	$T_j = 100^\circ\text{C}$
t_f			0,5			

* Measured with pulses $t_p = 300\ \mu\text{s}$ $\delta \leq 2\%$ ** $T_{case}\ 25\ ^\circ\text{C}$ Unless otherwise stated