

**NPN SWITCHING TRANSISTOR**  
*TRANSISTOR NPN DE COMMUTATION*

## TENTATIVE DATA

### SUPERSWITCH

**HIGH CURRENT, HIGH POWER TRANSISTORS**

**Pressure contact construction**

**Thermal fatigue free**

**Key parameters characterised at 100°C**

- \*High current capability
- \*Very low saturation resistance at 100°C
- \*High specified gain at 100 A
- \*Fast turn-on and and turn-off

	ESM 3000	ESM 3001
$V_{CE0sus}$	120 V	150 V
$V_{CEV}$	200 V	200 V
$I_{Csat}$	150 A	150 A
$I_{CM}$	300 A	300 A

Case TO 83  
Boîtier

Mounting with M 12 screw  
Montage avec vis M 12

Torques Min : 14 m N  
Couples de serrage Max : 18 m N



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

		ESM 3000	ESM 3001		
Collector-emitter voltage <i>Tension collecteur-émetteur</i>	$V_{CE0}$	120	150	V	
Collector-emitter voltage <i>Tension-collecteur-émetteur</i>	$V_{BE} = -1,5 V$	$V_{CEV}$	200	200	V
Emitter-base voltage <i>Tension émetteur-base</i>	$V_{EBO}$	7	7	V	
Collector current repetitive <i>Courant collecteur répétitif</i>	$t_p \leq 1 \text{ ms}$	$I_C(RMS)$ $I_{CM}$	150 300	150 300	A
Base current <i>Courant base</i>	$t_p \leq 1 \text{ ms}$	$I_B(RMS)$ $I_{BM}$	20 40	20 40	A
Power dissipation <i>Dissipation de puissance</i>	$T_{case} 75^\circ C$	$P_{tot}$	400	400	W
Junction temperature <i>Température de jonction</i>	$T_j$	- 65 + 175	- 65 + 175	°C	

Junction-case thermal resistance <i>Résistance thermique jonction-boîtier</i> Double sided cooling	max	$R_{th(j-c)}$	0,25	0,25	°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**

$V_{CE0sus}$	120 150			V	ESM 3000 ESM 3001	$I_B = 0$ $I_L = 25$ mA, $I_C = 0,5$ A
$V_{(BR)EBO}$	7			V		$I_C = 0$ , $I_E = 100$ mA
$I_{CEV}$			6	mA		$V_{CE} = 200$ V $V_{BE} = -1,5$ V, $T_j = 125^\circ\text{C}$
$I_{CER}$			10	mA		$V_{CE} = 200$ V, $R_{BE} = 10\ \Omega$ , $T_j = 125^\circ\text{C}$
$I_{EBO}$			30	mA		$I_C = 0$ , $V_{EB} = 5$ V

**ON CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT CONDUCTEUR**

$V_{CEsat}$	0,6 0,5	1,5 1,5	V			$I_C = I_{Csat} = 150$ A, $I_B = I_{Bsat} = 15$ A
						$I_C = 100$ A $I_B = 5$ A
						$I_C = 100$ A $I_B = 10$ A
						$I_C = 80$ A $I_B = 4$ A
$V_{BEsat}^*$		2,2	V			$I_C = I_{Csat}$ , $I_B = I_{Bsat}$ , $T_j = 100^\circ\text{C}$

$T_j = 100^\circ\text{C}$

**SWITCHING TIMES ON RESISTIVE LOAD - TEMPS DE COMMUTATION SUR CHARGE RESISTIVE**

$t_{on}$		1		$\mu\text{s}$	$V_{CC} = 60$ V $I_C = I_{Csat}$ $I_{B1} = -I_{B2} = I_{Bsat}$
$t_s$		1,8		$\mu\text{s}$	
$t_f$		0,5		$\mu\text{s}$	

**TURN-ON SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION A LA MISE EN CONDUCTION**

$V_{CE}$ (2 $\mu\text{s}$ )	4 6	V				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$
$V_{CE}$ (4 $\mu\text{s}$ )	2 3	V				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$

$V_{CC} = 60$  V  
 $R_C = 0,4\ \Omega$   
 $I_{B1} = I_{Bsat}$

**TURN-OFF SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION A L'OUVERTURE**

**ON INDUCTIVE LOAD - SUR CHARGE INDUCTIVE**

**With negative bias - Avec polarisation négative**

$t_{si}$	1 1,7	$\mu\text{s}$				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$
$t_{fi}$	0,15 0,25	$\mu\text{s}$				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$
$t_{ti}$	0,03 0,1	$\mu\text{s}$				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$
$t_c$	0,15 0,3	$\mu\text{s}$				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$

$V_{CC} = 60$  V  
 $I_C = I_{Csat}$   
 $I_{B1} = -I_{B2} = I_{Bsat}$   
 $V_{clamp} = 0,7 V_{CEO}$

**With antisaturation network - Avec réseau antisaturation**

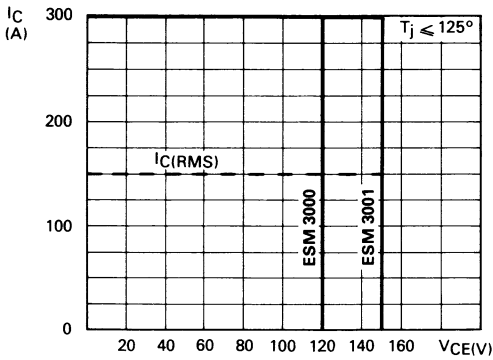
$t_{si}$	4 7	$\mu\text{s}$				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$
$t_{fi}$	1,8 2,5	$\mu\text{s}$				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$
$t_{ti}$	0,3 0,6	$\mu\text{s}$				$T_j = 25^\circ\text{C}$
						$T_j = 100^\circ\text{C}$

$V_{CC} = 60$  V  
 $I_C = I_{Csat}$   
 $I_{B1} = I_{Bsat}$   
 $I_{B2} = 0$   
 $V_{clamp} = 0,7 V_{CEO}$

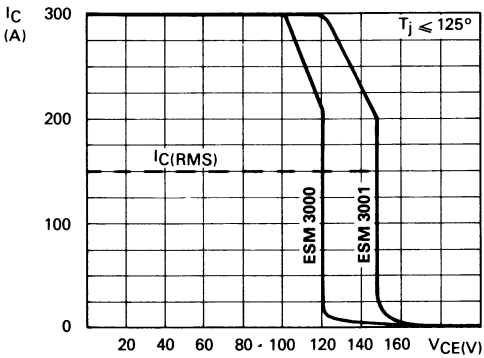
\*\* $T_j = 25^\circ\text{C}$  Unless otherwise stated

\*Pulses Impulsions

$t_p \leq 300\ \mu\text{s}$   $\delta \leq 2\%$



Forward biased safe operating area (FBFOA)  
(switching area)



Reverse bias safe operating area (RBFOA)

**NPN SWITCHING TRANSISTOR**  
*TRANSISTOR NPN DE COMMUTATION*

## TENTATIVE DATA

### SUPERSWITCH

**HIGH CURRENT, HIGH POWER TRANSISTORS**

**Pressure contact construction**

**Thermal fatigue free**

**High power capability**

**Wide operating area**

**Suited for use on the Darlington configuration**

**Key parameters characterized at 100°C**

#### APPLICATIONS

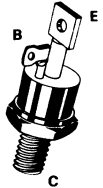
**MOTOR CONTROL**  
**DC/AC INVERTERS**  
**POWER SUPPLY BREAKERS**

$V_{CE0sus}$  200 V  
 $V_{CEV}$  350 V  
 $I_{Csat}$  140 A  
 $t_f$  (100°C) 0,7  $\mu$ s  
Darlington switch 200 A

Case TO 83  
Boîtier

Mounting with M 12 screw  
Montage avec vis M 12

Torques Min : 14 m $\wedge$ N  
Couple de serrage Max : 18 m $\wedge$ N



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

Collector-emitter voltage <i>Tension collecteur-émetteur</i>		$V_{CEO}$	200	V
Collector-emitter voltage <i>Tension collecteur-émetteur</i>	$V_{BE} = -1,5$ V	$V_{CEV}$	350	V
Emitter-base voltage <i>Tension émetteur-base</i>		$V_{EBO}$	7	V
Collector current <i>Courant collecteur</i>	$t_p \leq 1$ ms	$I_C$ (RMS) $I_{CM}$	125 250	A
Base current <i>Courant base</i>	$t_p \leq 1$ ms	$I_B$ (RMS) $I_{BM}$	20 65	A
Power dissipation <i>Dissipation de puissance</i>	$T_{case}$ 75 °C	$P_{tot}$	400	W
Junction temperature <i>Température de jonction</i>		$T_j$	- 65 + 150	°C

Junction-case thermal resistance <i>Résistance thermique jonction-boîtier</i>	max	$R_{th(j-c)}$	0,25	°C/W
Double sided colling				

## 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

$V_{CE0sus}$	200			V	$I_B = 0, I_C = 25 \text{ mA}, I_C = 0,5 \text{ A}$
$V_{(BR)EBO}$	7			V	$I_C = 0, I_E = 100 \text{ mA}$
$I_{CEV}$			5	mA	$V_{CE} = 350 \text{ V}, V_{BE} = -1,5 \text{ V}, T_j = 125^\circ\text{C}$
$I_{CER}$			10	mA	$V_{CE} = 350 \text{ V}, R_{BE} = 10 \Omega, T_j = 125^\circ\text{C}$
$I_{EBO}$			30	mA	$I_C = 0, V_{EB} = 5 \text{ V}$

## ON CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT CONDUCTEUR

$V_{CEsat}^*$			1,5	V	$I_C = I_{Csat} = 140 \text{ A}, I_B = I_{Bsat} = 28 \text{ A}, T_j = 100^\circ\text{C}$
			1,5	V	$I_C = 120 \text{ A}, I_B = 12 \text{ A}$
$V_{BEsat}^*$			2,2	V	$I_C = I_{Csat}, I_B = I_{Bsat}$

## SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION

Resistive load - Charge résistive					
$t_{on}$		1,5		$\mu\text{s}$	$V_{CC} = 100 \text{ V}, I_C = I_{Csat}^{(1)}$ $I_{B1} = -I_{B2} = I_{Bsat}$
$t_s$		2			
$t_f$		0,7			
Inductive load - Charge inductive					
$t_f$			0,5	$\mu\text{s}$	$\left. \begin{array}{l} T_j = 25^\circ\text{C} \\ T_j = 100^\circ\text{C} \end{array} \right\} \begin{array}{l} V_{CC} = 100 \text{ V}, I_C = I_{Csat}^{(1)} \\ I_{B1} = -I_{B2} = I_{Bsat} \end{array}$
		0,3	0,7		

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

(1)  $V_{CEclamp} < V_{CE0sus}$

**Application**

The ESM 3002 is suited in Darlington configuration. This allows a higher collector current.

**Example :**

Darlington with  
ESM 3002 (output)  
BUT 91 (driver)

$I_{CD} = 200 \text{ A}$  Total output current

$I_B = 4 \text{ A}$  Drive current

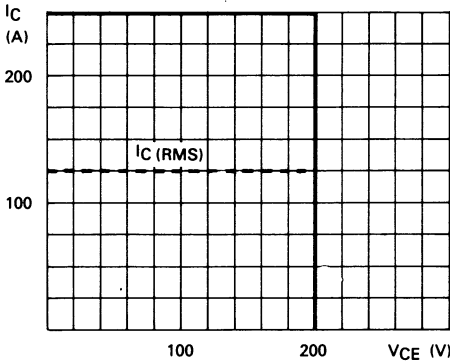
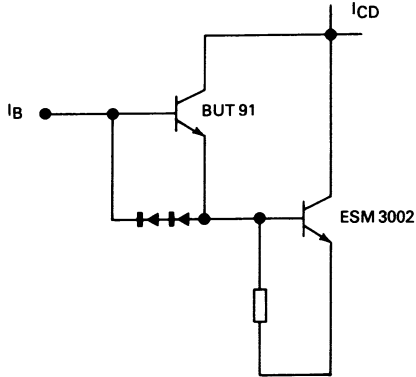


Fig.1 — Forward biased safe operating area (FBSOA)

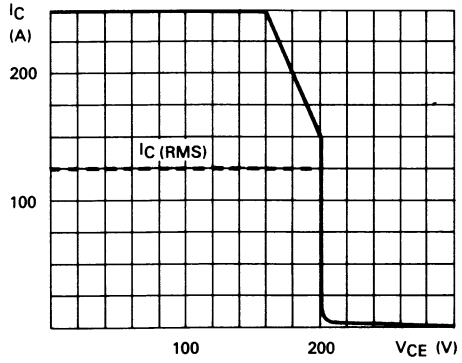


Fig.2 — Reverse biased safe operating area (RBSOA)

**NPN HIGH VOLTAGE SWITCHING TRANSISTORS**  
*TRANSISTORS NPN HAUTE TENSION DE COMMUTATION*

## SUPERSWITCH

### HIGH CURRENT, HIGH POWER TRANSISTORS

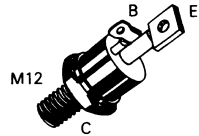
- Pressure contact construction
- Thermal fatigue free
- High power capability
- Wide operating area
- Key parameters characterized at 100°C
- Suited for use on the Darlington configuration

### APPLICATIONS

MOTOR CONTROL  
DC/AC INVERTERS  
POWER SUPPLY-BREAKERS

	ESM 3004	ESM 3005
$V_{CE0sus}$	400 V	500 V
$V_{CEV}$	600 V	600 V
$I_{Csat}$	65 A	50 A
$I_{CM}$	150 A	150 A
<b>DARLINGTON SWITCH</b>	<b>130 A</b>	<b>110 A</b>

Case : TO-83 (CB - 183)  
Boîtier



Stud torque  
Couple de serrage : 14 mAN

### ABSOLUTE RATINGS (LIMITING VALUES)

*VALEURS LIMITEES ABSOLUES D'UTILISATION*

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

		ESM 3004	ESM 3005	Units
Collector-emitter voltage <i>Tension collecteur-émetteur</i>	$V_{CEO}$	400	500	V
Collector-emitter voltage <i>Tension collecteur-émetteur</i>	$V_{BE} = -1,5 V$ $V_{CEV}$	600		V
Emitter-base voltage <i>Tension émetteur-base</i>	$V_{EBO}$	10		V
Collector current <i>Courant collecteur</i>	repetitive $t_p \leq 1 ms$ $I_{C(RMS)}$ $I_{CM}$	120 150		A
Base current <i>Courant base</i>	$t_p \leq 1 ms$ $I_{B(RMS)}$ $I_{BM}$	20 40		A
Power dissipation <i>Dissipation de puissance</i>	$T_{case} 75^{\circ}C$ $P_{tot}$	400		W
Junction temperature <i>Température de jonction</i>	$T_j$	- 65, + 175		$^{\circ}C$

Junction-case thermal resistance <i>Résistance thermique jonction-boîtier</i>	max. $R_{th(j-c)}$	0,25	$^{\circ}C/W$
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**ELECTRICAL CHARACTERISTICS - CARACTÉRISTIQUES ÉLECTRIQUES\***

SYMBOLS	Min	Typ	Max	UNITS	TEST CONDITIONS - CONDITIONS DE MESURE
<b>OFF CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT BLOUÉ</b>					
$V_{CE0}$ (sus)	400 500			V	ESM 3004 } ESM 3005 } $I_B = 0, L = 25 \text{ mH}, I_C = 0,5 \text{ A}$
$V_{(B)REBO}$	10			V	$I_C = 0, I_E = 200 \text{ mA}$
$I_{CEV}$			5	mA	$V_{CE} = 600 \text{ V}, V_{BE} = -1,5 \text{ V}, T_j = 125^\circ\text{C}$
$I_{CER}$			10	mA	$V_{CE} = 600 \text{ V}, R_{BE} = 10 \Omega, T_j = 125^\circ\text{C}$
$I_{EBO}$			30	mA	$I_C = 0, V_{EB} = 5 \text{ V}$

**ON CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT CONDUCTEUR**

$V_{CEsat}^{**}$			1,5	V	ESM 3004 } ESM 3005 } $I_C = I_{Csat} = 65 \text{ A}, I_B = I_{Bsat} = 13 \text{ A}$	$T_j 100^\circ\text{C}$
			2	V	ESM 3004 } ESM 3005 } $I_C = 100 \text{ A}, I_B = 33 \text{ A}$	
$V_{BEsat}^{**}$			2,2	V	$I_C = I_{Csat}, I_B = I_{Bsat}$	$T_j 100^\circ\text{C}$

**SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION**

**SWITCHING TIMES ON RESISTIVE LOAD - TEMPS DE COMMUTATION SUR CHARGE RÉSISTIVE (Fig. 1)**

$t_r$		1,0	1,5	$\mu\text{s}$	$V_{CC} = 200 \text{ V}, I_C = I_{Csat}$ $I_{B1} = -I_{B2} = I_{Bsat}$
$t_s$			3,5		
$t_f$		0,5	1		

**TURN-ON SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION A LA MISE EN CONDUCTION (Fig. 2)**

$V_{CE}$ (2 $\mu\text{s}$ )		5		V	} $R_C = 0,7 V_{CE0}/I_{Csat}$ $V_{CC} = 0,7 V_{CE0}$ $I_{B1} = I_{Bsat}, I_C = I_{Csat}$
		18			
$V_{CE}$ (4 $\mu\text{s}$ )		3		V	
		9			

**TURN-OFF SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION A L'OUVERTURE (Fig. 3)**

**ON INDUCTIVE LOAD - SUR CHARGE INDUCTIVE**

<b>With negative bias - Avec polarisation négative</b>						
$t_{si}$		3,6		$\mu\text{s}$	} $V_{CC} = 200 \text{ V}$ $I_C = I_{Csat}$ $I_{B1} = -I_{B2} = I_{Bsat}$ $V_{clamp.} = 0,7 V_{CE0}$	
		4,5				$T_j = 100^\circ\text{C}$
$t_{fi}$		0,25	0,6			$T_j = 100^\circ\text{C}$
		0,7	1			
$t_{ti}$		0,1		$T_j = 100^\circ\text{C}$		
		0,2				
$t_c$		0,8		$T_j = 100^\circ\text{C}$		
		2				
<b>Without negative bias - Sans polarisation négative</b>						
$t_{si}$		7		$\mu\text{s}$	} $V_{CC} = 200 \text{ V}, R_{B2} = 1 \Omega$ $I_C = I_{Csat}$ $I_{B1} = I_{Bsat}$ $I_{B2} = 0$ $V_{clamp.} = 0,7 V_{CE0}$	
		12				$T_j = 100^\circ\text{C}$
$t_{fi}$		1				$T_j = 100^\circ\text{C}$
		3				
$t_{ti}$		0,3		$T_j = 100^\circ\text{C}$		
		0,5				

\* $T_j = 25^\circ\text{C}$  unless otherwise stated - \*\* Pulsed - Impulsions  $t_p \leq 300 \mu\text{s}, \delta \leq 2 \%$



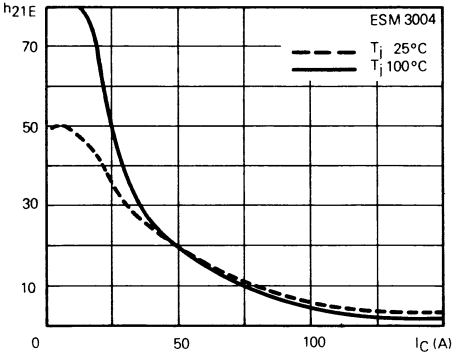


Fig.1 : DC current gain.

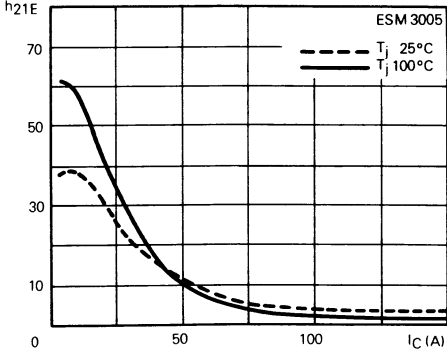


Fig.2 : DC current gain.

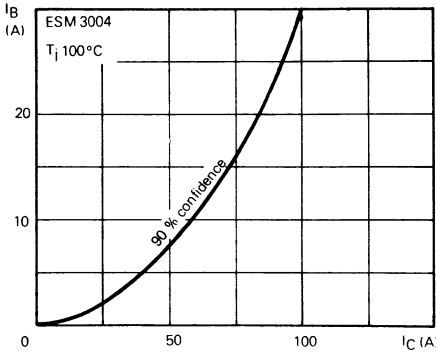


Fig.3 : Minimum base current to saturate the transistor.

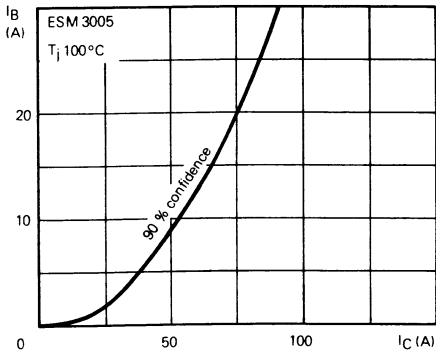


Fig.4 : Minimum base current to saturate the transistor.

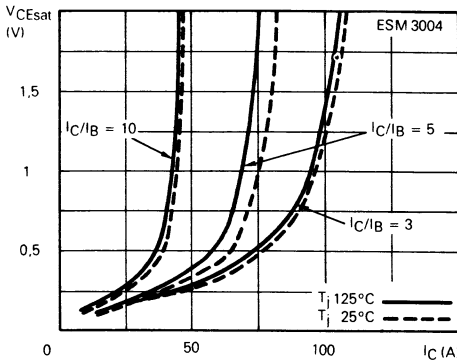


Fig.5 : Saturation voltage.

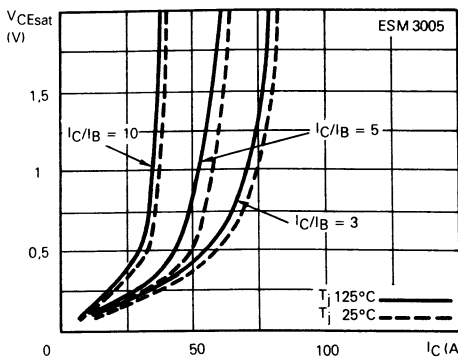


Fig.6 : Saturation voltage.

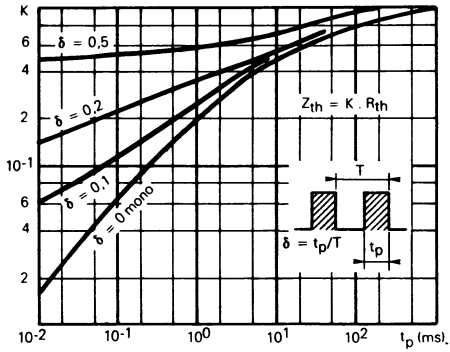


Fig. 7 : Transient thermal response.

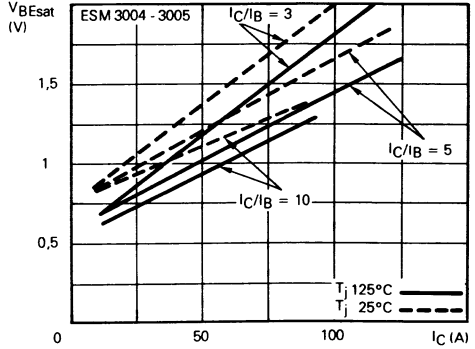


Fig. 8 : Saturation voltage.

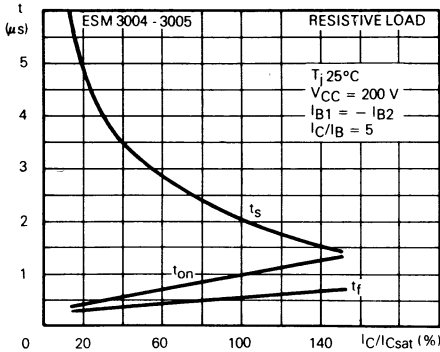


Fig. 9 : Switching times versus collector current.

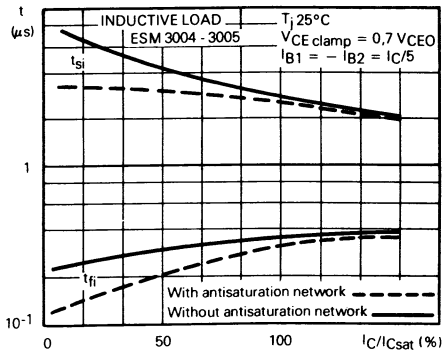


Fig. 10 : Switching times versus collector current (with and without antisaturation network).

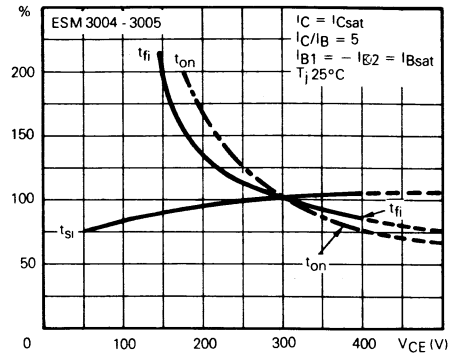


Fig. 11 : Switching times versus collector-emitter voltage.

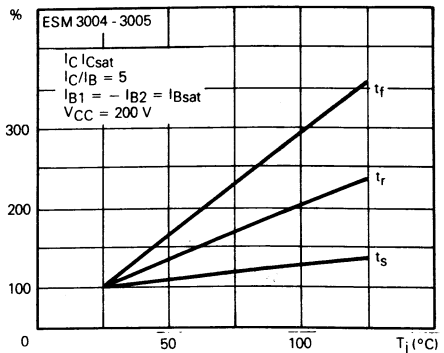
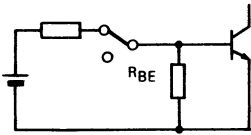


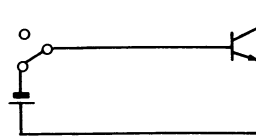
Fig. 12 : Switching times versus junction temperature.

### SWITCHING SAFE OPERATING AREAS



#### TRANSISTOR FORWARD BIASED

- During the turn-on
- During the turn-off without negative base-emitter voltage and  $R_{BE} < 22\Omega$ .



#### TRANSISTOR REVERSE BIASED

- During the turn-off with negative base-emitter voltage

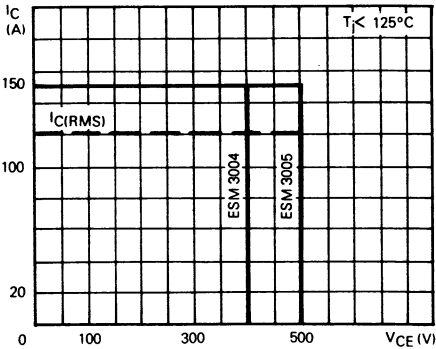


Fig.13 : Forward biased safe operating area (FBSOA).

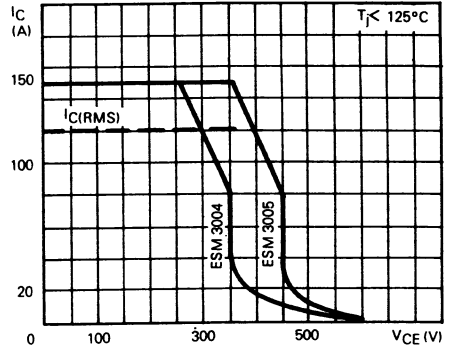


Fig.14 : Reverse biased safe operating area (RBSOA).

### SAFE OPERATING AREA

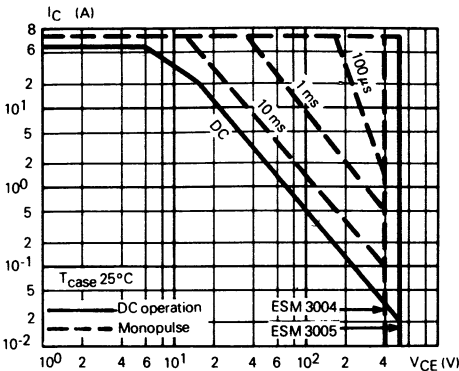


Fig.15 : DC and pulse area.

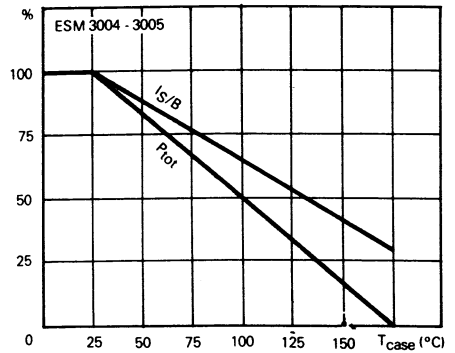


Fig.16 : Power and IS/B derating versus case temperature.

## APPLICATIONS

The ESM 3004/3005 are suited for use on the Darlington configuration. This allows a higher collector current.

**EXAMPLE :**

DARLINGTON WITH  
 ESM 3004 (output) - BUX 98 (driver)  
 $I_{CD} = 130 \text{ A}$ ,  $I_B = 5 \text{ A}$

DARLINGTON WITH  
 ESM 3005 (output) - BUX 98 A (driver)  
 $I_{CD} = 110 \text{ A}$ ,  $I_B = 5 \text{ A}$

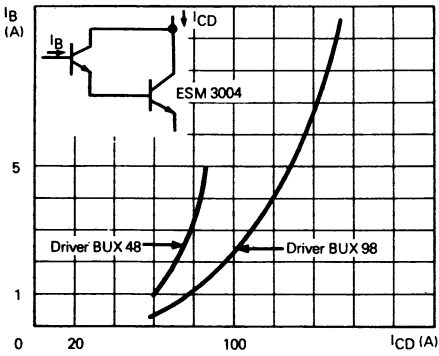


Fig. 17 : Base current to saturate the Darlington configuration.

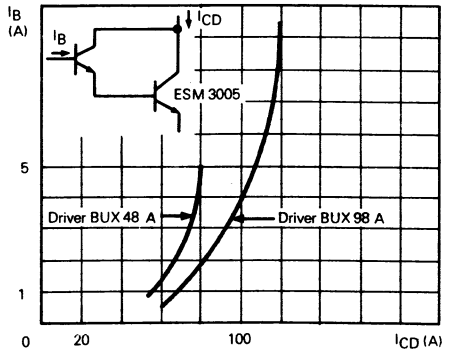
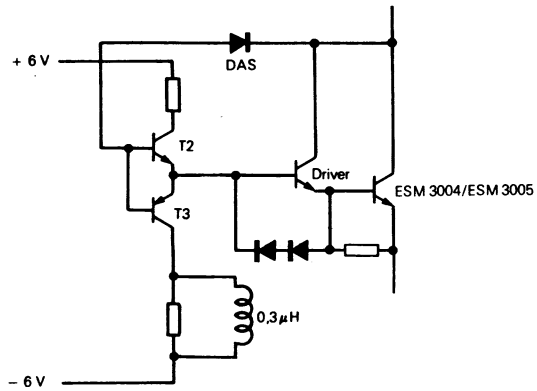


Fig.18 : Base current to saturate the Darlington configuration.

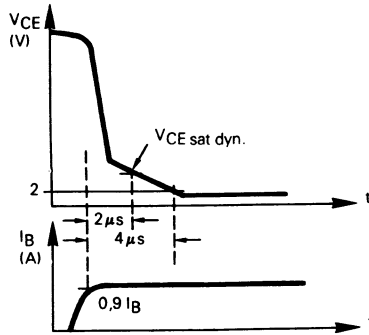
## DRIVER CIRCUIT



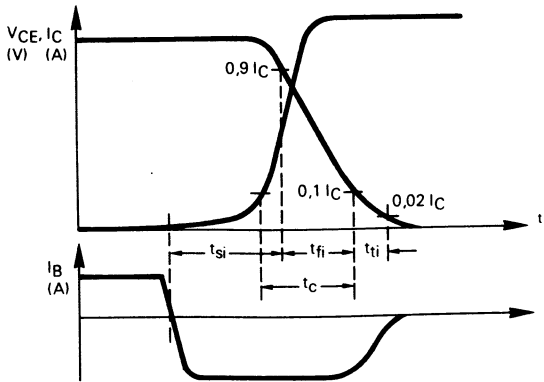
The use of an antisaturation circuit (DAS with T2) enables turn-off of the ESM 3004/ESM 3005 directly from the quasi-saturation state. This gives the following advantages:

- Lower switching times  $t_f$  and  $t_s$  and smaller switching losses,
- Narrower spread of storage time  $t_s$ ,
- Enlarged RBSOA area.

**TURN-ON SWITCHING WAVEFORMS**



**TURN-OFF SWITCHING WAVEFORMS (INDUCTIVE LOAD)**



**NPN HIGH VOLTAGE SWITCHING TRANSISTORS**  
*TRANSISTORS NPN HAUTE TENSION DE COMMUTATION*

## ADVANCE INFORMATION

### SUPERSWITCH

#### HIGH CURRENT, HIGH VOLTAGE POWER TRANSISTORS

- Pressure contact construction
- Thermal fatigue free
- High power capability
- Wide operating area

Suited for use :

- on the 380 V mains
- on the Darlington configuration

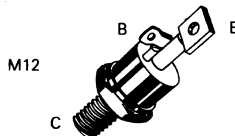
#### APPLICATIONS

MOTOR CONTROL  
AC/DC AND DC/AC CONVERTERS

#### ESM 3006 ESM 3007

$V_{CEO}$ (sus)	600 V	700 V
$V_{CEV}$	1000 V	1000 V
$I_{Csat}$	35 A	30 A
$I_{CM}$	80 A	
$t_{fi}$ (100°C)	2 $\mu$ s	

**Case** : TO-83 (CB - 183)  
**Boîtier**



**Stud torque** : 14 m $\Delta$ N  
**Couple de serrage**

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

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

		ESM 3006	ESM 3007	Units
Collector-emitter voltage <i>Tension collecteur-émetteur</i>	$V_{CEO}$	600	700	V
Collector-emitter voltage <i>Tension collecteur-émetteur</i>	$V_{BE} = - 1,5 V$ $V_{CEV}$	1000		V
Emitter-base voltage <i>Tension émetteur-base</i>	$V_{EBO}$	10		V
Collector current <i>Courant collecteur</i>	repetitive $t_p \leq 1 \text{ ms}$	$I_{CM}$	80	A
Base current <i>Courant base</i>	$t_p \leq 1 \text{ ms}$	$I_{B(RMS)}$ $I_{BM}$	20 40	A
Power dissipation <i>Dissipation de puissance</i>	$T_{case} 75^{\circ}C$	$P_{tot}$	300	W
Junction temperature <i>Température de jonction</i>	$T_j$	- 65, + 150		$^{\circ}C$

Junction-case thermal resistance <i>Résistance thermique jonction-boîtier</i>	max.	$R_{th(j-c)}$	0,25	$^{\circ}C/W$
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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**

$V_{CE0}$ (sus)	600			V	ESM 3006 } $I_B = 0, I_C = 25 \text{ mA}, I_C = 0,5 \text{ A}$ ESM 3007 }
	700				
$V_{(BR)EBO}$	10				$I_C = 0, I_E = 200 \text{ mA}$
$I_{CEV}$			6	mA	$V_{CE} = 1000 \text{ V}, V_{BE} = -1,5 \text{ V}, T_j = 125^\circ\text{C}$
$I_{CER}$			10		$V_{CE} = 600 \text{ V}, R_{BE} = 10 \Omega, T_j = 125^\circ\text{C}$
$I_{EBO}$			30		$I_C = 0, V_{EB} = 5 \text{ V}$

**ON CHARACTERISTICS - CARACTÉRISTIQUES A L'ÉTAT CONDUCTEUR**

$V_{CEsat}^*$			1,5	V	ESM 3006 } $I_C = I_{Csat} = 35 \text{ A}, I_B = I_{Bsat} = 7 \text{ A}$ ESM 3007 } $I_C = I_{Csat} = 30 \text{ A}, I_B = I_{Bsat} = 6 \text{ A}$ } $T_j = 100^\circ\text{C}$
			2		
$V_{BEsat}^*$			2,1		ESM 3006 } $I_C = 50 \text{ A}, I_B = 16,5 \text{ A}$ ESM 3007 } $I_C = 40 \text{ A}, I_B = 13,5 \text{ A}$ } $T_j = 100^\circ\text{C}$

**SWITCHING CHARACTERISTICS - CARACTÉRISTIQUES DE COMMUTATION**

<b>On resistive load - Sur charge résistive</b>					
$t_{on}$		1,5		$\mu\text{s}$	$V_{CC} = 400 \text{ V}, I_C = I_{Csat}, I_{B1} = -I_{B2} = I_{Bsat}$
$t_s$			5		
$t_f$			1,5		
<b>On inductive load - Sur charge inductive</b>					
$t_{fi}$			1	$\mu\text{s}$	$V_{CC} = 400 \text{ V}, I_C = I_{Csat}$ $T_j = 100^\circ\text{C}$ } $I_{B1} = -I_{B2} = I_{Bsat}$
			2		

\* Measured with pulses  $t_p = 300 \mu\text{s}, \delta \leq 2 \%$ .

\*\*  $T_{case} = 25^\circ\text{C}$  unless otherwise stated.