SILICON DARLINGTON POWER TRANSISTORS

N-P-N epitaxial base transistors in monolithic Darlington circuit for audio output stages and general amplifier and switching applications; TO-3 envelope. P-N-P complements are BDX64, BDX64A, BDX64B and BDX64C.

QUICK REFERENCE DATA

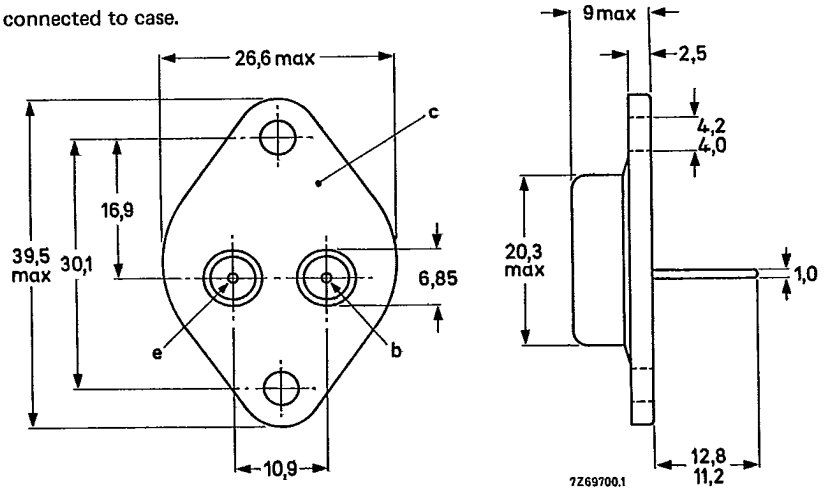
			BDX65	65A	65B	65C	
Collector-base voltage (open emitter)	V_{CBO}	max.	80	100	120	140	V
Collector-emitter voltage (open base)	V_{CEO}	max.	60	80	100	120	V
Collector current (peak value)	I_{CM}	max.		16			A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.		117			W
Junction temperature	T_j	max.		200			°C
D.C. current gain							
I_C = 1 A; V_{CE} = 3 V	h_{FE}	typ.		3300			
I_C = 5 A; V_{CE} = 3 V	h_{FE}	>		1000			
Cut-off frequency							
I_C = 5 A; V_{CE} = 3 V	f_{hfe}	typ.		50			kHz

MECHANICAL DATA

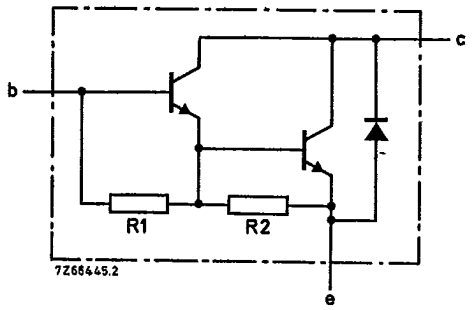
Dimensions in mm

Fig. 1 TO-3.

Collector connected to case.



See also chapters Mounting instructions and Accessories.



R1 typ. 5 kΩ
R2 typ. 80 Ω

Fig. 2 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			BDX65	65A	65B	65C	
Collector-base voltage (open emitter)	V_{CBO}	max.	80	100	120	140	V
Collector-emitter voltage (open base)	V_{CEO}	max.	60	80	100	120	V
Emitter-base voltage (open collector)	V_{EBO}	max.	5	5	5	5	V
Collector current (d.c.)	I_C	max.		12			A
Collector current (peak value)	I_{CM}	max.		16			A
Base current (d.c.)	I_B	max.		200			mA
Total power dissipation up to $T_{mb} = 25\ ^oC$	P_{tot}	max.		117			W
Storage temperature	T_{stg}			−65 to + 200			°C
Junction temperature*	T_j	max.		200			°C

THERMAL RESISTANCE *

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1,5	K/W

* Based on maximum average junction temperature in line with common industrial practice. The resulting higher junction temperature of the output transistor part is taken into account.

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CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $V_{CB} = V_{CEOmax}$	I_{CBO}	<	0,4 mA
$I_E = 0$; $V_{CB} = ½ V_{CBOmax}$; T_j = 200 °C	I_{CBO}	<	3 mA
$I_B = 0$; $V_{CE} = ½ V_{CEOmax}$	I_{CEO}	<	0,2 mA ←
Emitter cut-off current			
$I_C = 0$; V_{EB} = 5 V	I_{EBO}	<	5 mA
D.C. current gain (note 1)			
I_C = 1 A; V_{CE} = 3 V	h_{FE}	typ.	3300
I_C = 5 A; V_{CE} = 3 V	h_{FE}	>	1000
I_C = 12 A; V_{CE} = 3 V	h_{FE}	typ.	3700
Base-emitter voltage (notes 1 and 2)			
I_C = 5 A; V_{CE} = 3 V	V_{BE}	<	2,5 V
Collector-emitter saturation voltage (note 1)			
I_C = 5 A; I_B = 20 mA	V_{CEsat}	<	2 V
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; V_{CB} = 10 V	C_c	typ.	200 pF
Cut-off frequency			
I_C = 5 A; V_{CE} = 3 V	f_{hfe}	typ.	50 kHz
Turn-off breakdown energy with inductive load (Fig. 5)			
$-I_{Boff} = 0$; I_{CC} = 6,3 A	$E_{(BR)}$	>	100 mJ

Notes
1. Measured under pulse conditions: $t_p < 300\ \mu s$, $\delta < 2\%$.
2. V_{BE} decreases by about 3,6 mV/K with increasing temperature.

CHARACTERISTICS (continued)

Diode, forward voltage			
I_F = 5 A	V_F	typ.	1,2 V
Switching times			
(between 10% and 90% levels)			
I_{Con} = 5 A; $I_{Bon} = -I_{Boff}$ = 20 mA			
Turn-on time	t_{on}	typ.	1 μs
Turn-off time	t_{off}	typ.	6 μs

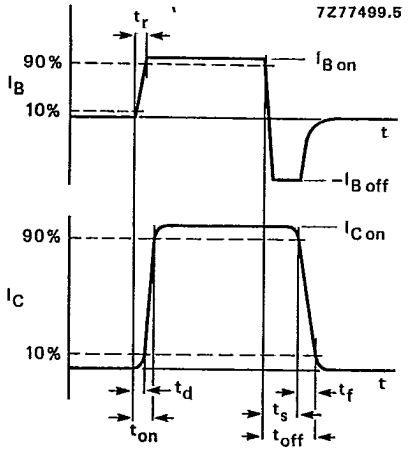
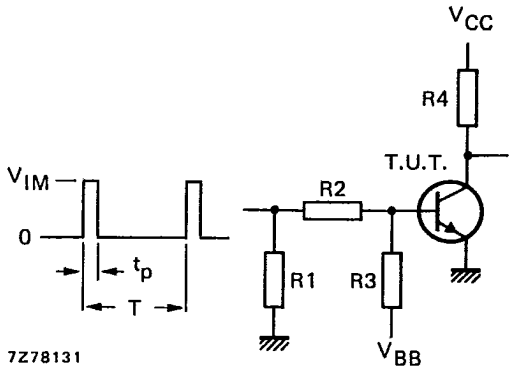


Fig. 3 Switching times waveforms.



V_{IM}	=	15	V
V_{CC}	=	15	V
$-V_{BB}$	=	4	V
R1	=	56	Ω
R2	=	410	Ω
R3	=	560	Ω
R4	=	3	Ω
$t_r = t_f \leqslant$		15	ns
t_p	=	10	μs
T	=	500	μs

Fig. 4 Switching times test circuit.

CHARACTERISTICS (continued)

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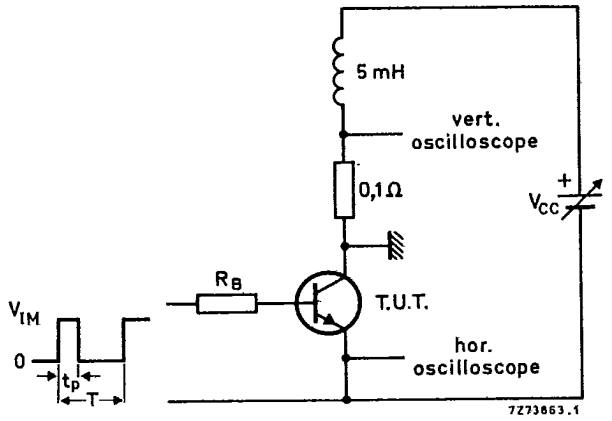

Fig. 5 Test circuit for turn-off breakdown energy. V_{IM} = 12 V; R_B = 270 Ω; I_{CC} = 6,3 A; δ = 1%.

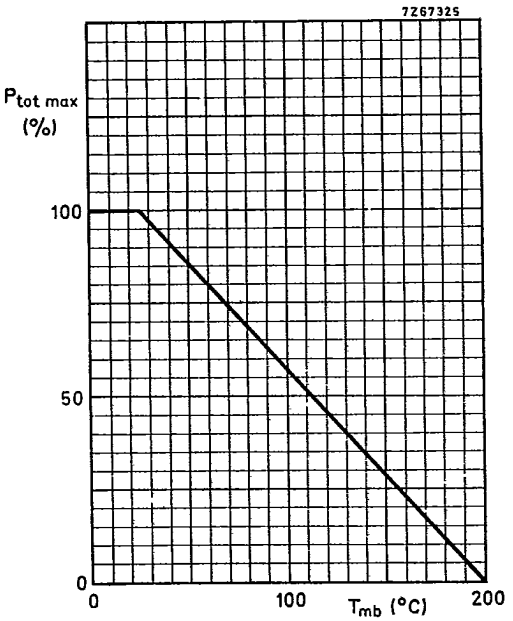

Fig. 6 Power derating curve.

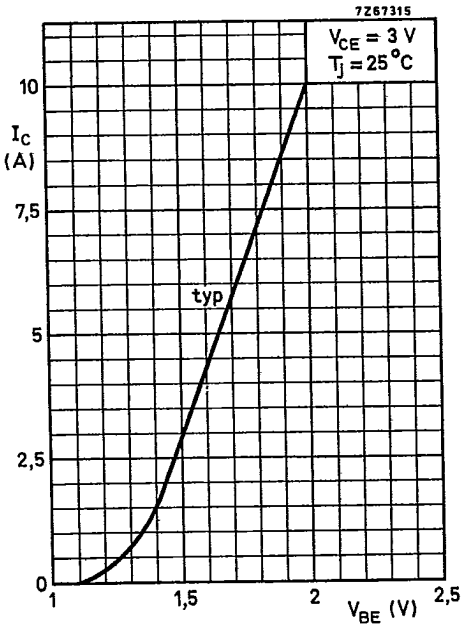

Fig. 7 Typical collector current.

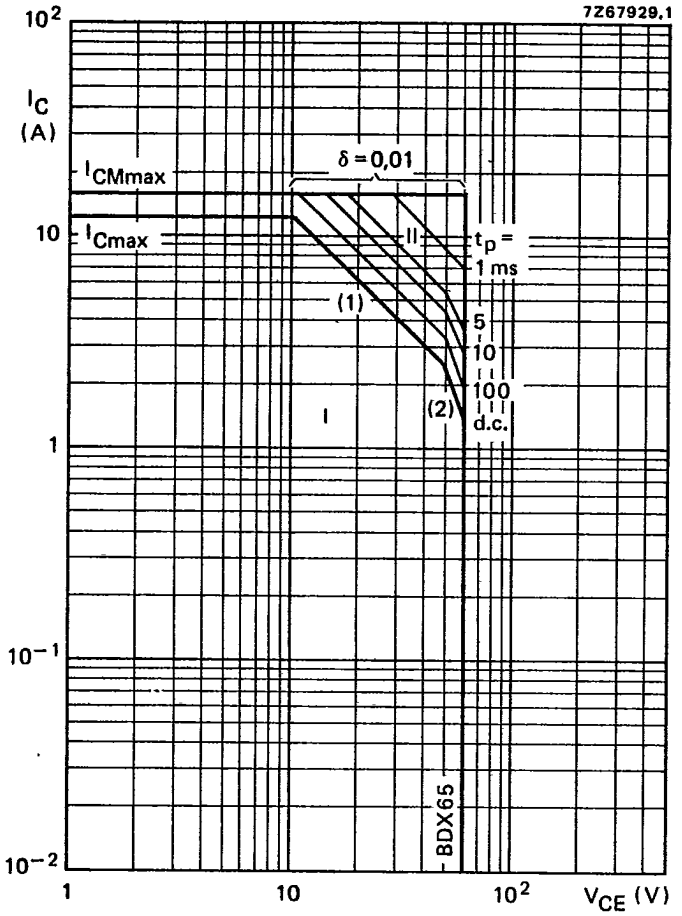

Fig. 8 Safe Operating ARea at $T_{mb} \leqslant 25$ °C of BDX65.

I Region of permissible d.c. operation.

II Permissible extension for repetitive pulse operation.

(1) $P_{tot\ max}$ and $P_{tot\ peak\ max}$ lines.

(2) Second-breakdown limits.

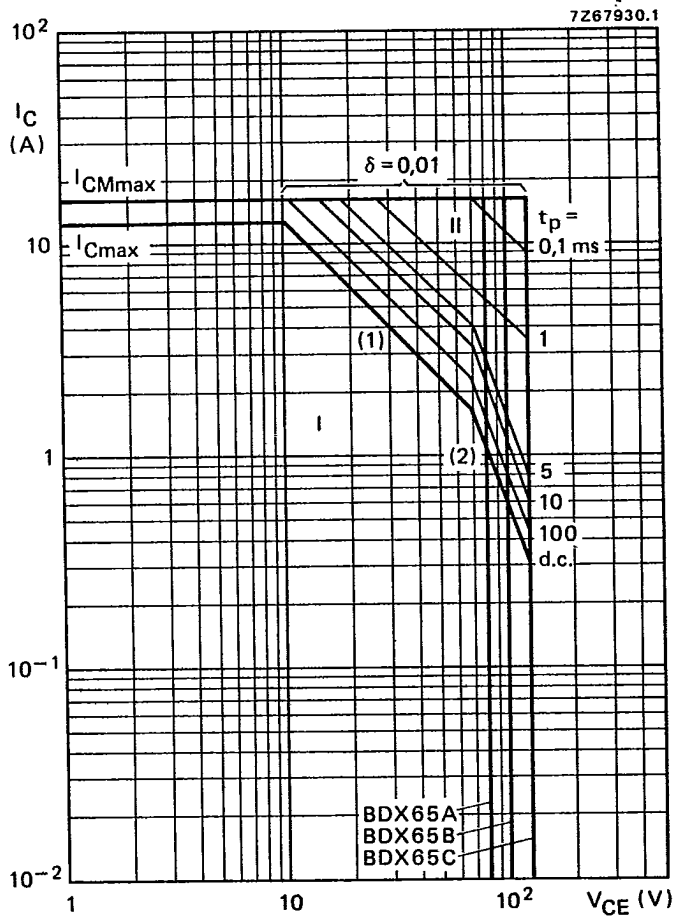

Fig. 9 Safe Operating ARea at $T_{mb} \leqslant 25\ ^oC$.

I Region of permissible d.c. operation.

II Permissible extension for repetitive pulse operation.

(1) $P_{tot\ max}$ and $P_{tot\ peak\ max}$ lines.

(2) Second-breakdown limits.

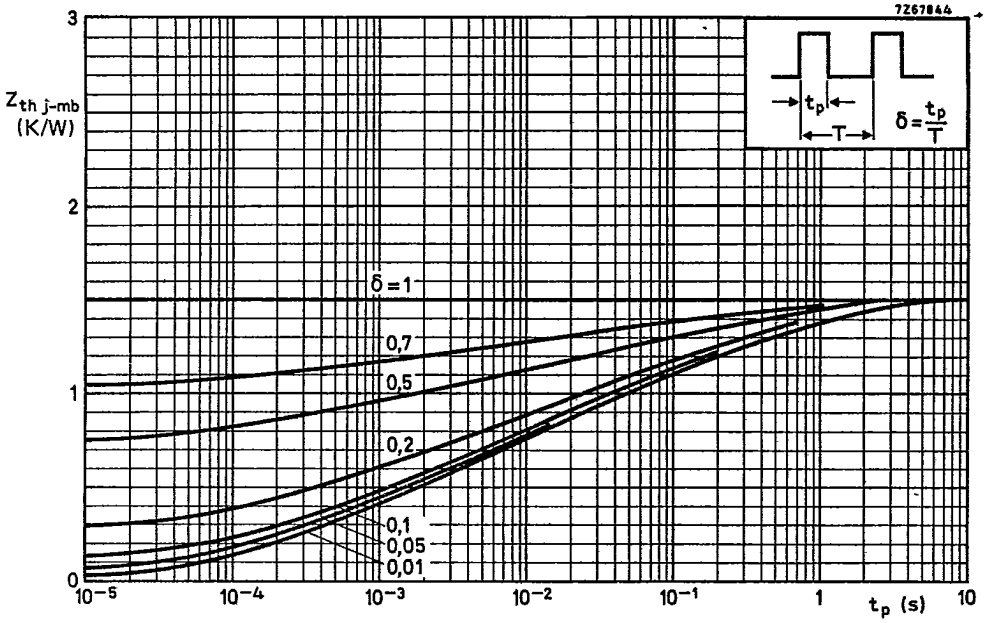

Fig. 10 Pulse power rating chart.

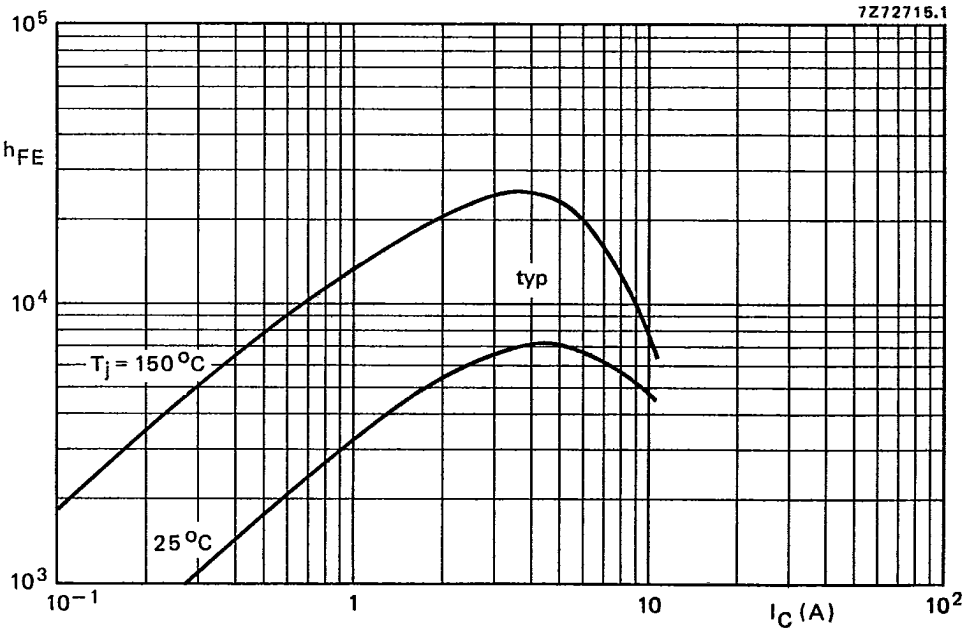

Fig. 11 Typical d.c. current gain at V_{CE} = 3 V.

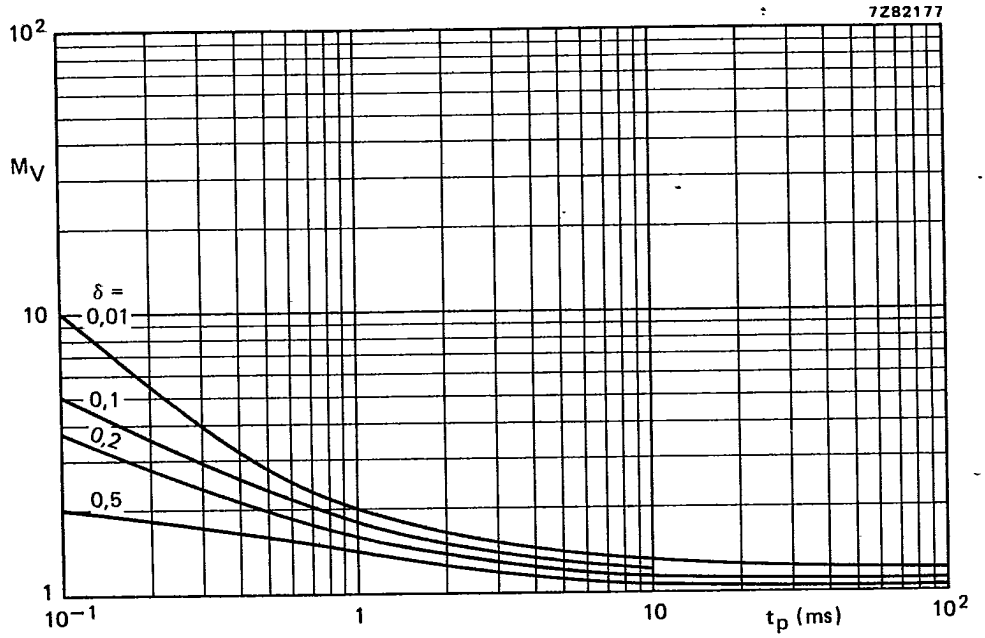

Fig. 12 S.B. voltage multiplying factor at the I_{Cmax} level.

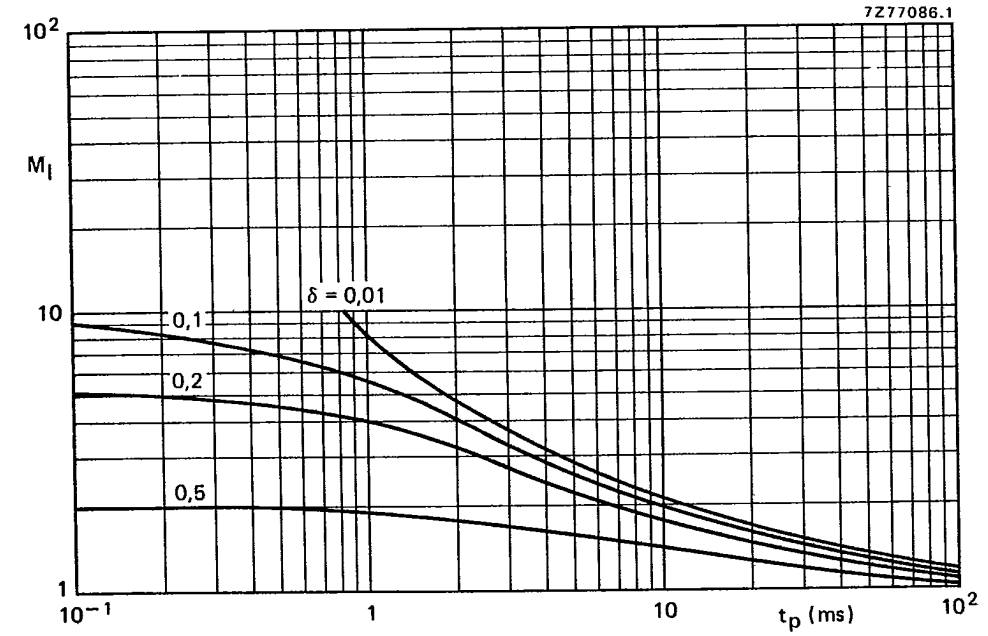

Fig. 13 S.B. current multiplying factor at V_{CEO} 100 V and 60 V level.

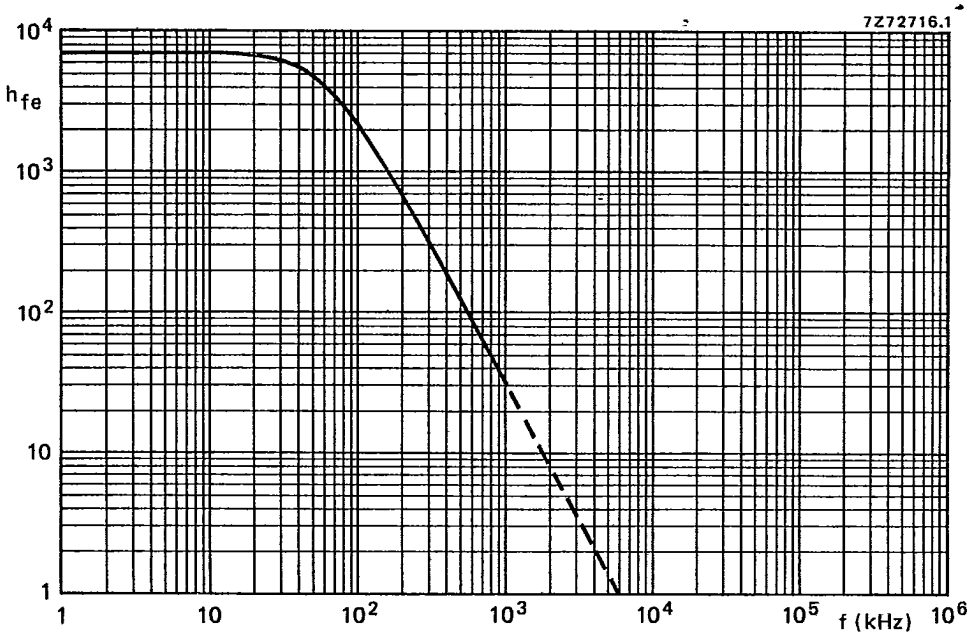

Fig. 14 Typical small-signal current gain, I_C = 5 A; V_{CE} = 3 V; T_j = 25 °C.

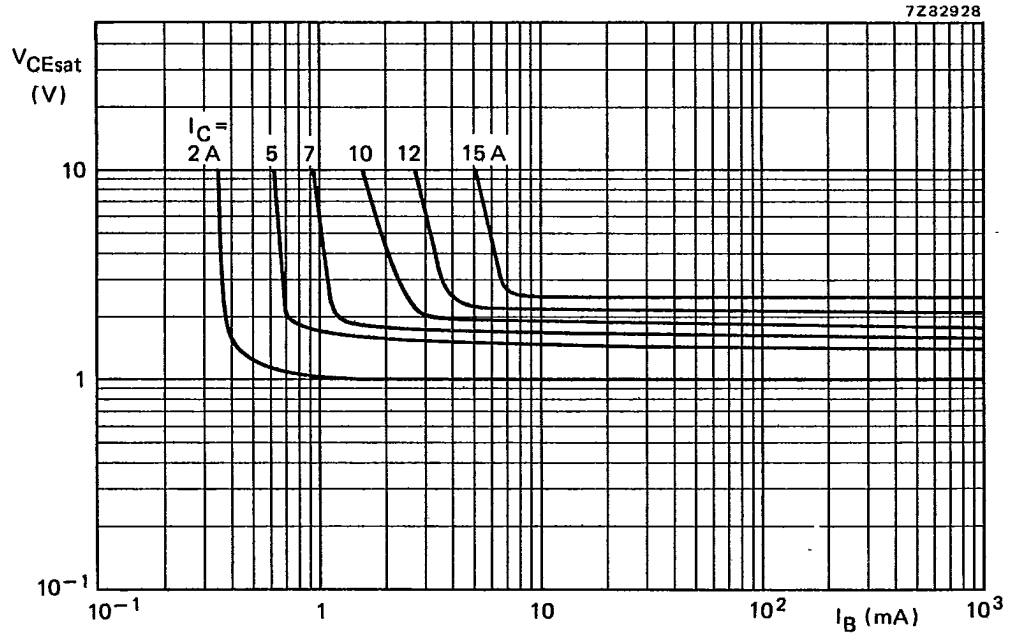

Fig. 15 Typical values collector-emitter saturation voltage. T_{amb} = 25 °C.