PHILIPS INTERNATIONAL 56E D ■ 7110826 0042350 575 ■PHIN
T-37-29

P-N-P DARLINGTON TRANSISTORS

Silicon planar transistors in TO-39 metal envelopes, intended for industrial switching applications e.g. print hammer, solenoid, relay and lamp driving.

N-P-N complements are the BSS50, BSS51 and BSS52.

QUICK REFERENCE DATA

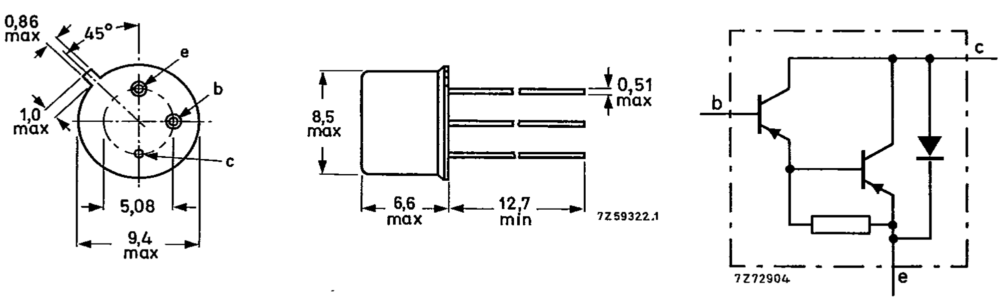
			BSS60	BSS61	BSS62	
Collector-base voltage (open emitter)	$-V_{CBO}$	max.	60	80	90	V
Collector-emitter voltage (see Fig. 4)	$-V_{CER}$	max.	45	60	80	V
Collector current (d.c.)	$-I_C$	max.		1,0		A
Total power dissipation						
up to T_{amb} = 25 °C	P_{tot}	max.		0,8		W
up to T_{case} = 25 °C	P_{tot}	max.		5,0		W
Collector-emitter saturation voltage						
$-I_C$ = 1,0 A; $-I_B$ = 1,0 mA BSS61	$-V_{CEsat}$	<		1,6		V
$-I_C$ = 1,0 A; $-I_B$ = 4,0 mA BSS60; BSS62	$-V_{CEsat}$	<		1,6		V
D.C. current gain						
$-I_C$ = 500 mA; $-V_{CE}$ = 10 V	h_{FE}	>		2000		
Turn-off time when switched from $-I_{Con}$ = 500 mA; $-I_{Bon}$ = 0,5 mA to cut-off with $-I_{Boff}$ = 0,5 mA	t_{off}	typ.		1,5		μs

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39.

Collector connected to case



Maximum lead diameter is guaranteed only for 12,7 mm

Qualification approved to CECC 50 004-074

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RATINGS

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

			BSS60	BSS61	BSS62	
Collector-base voltage (open emitter)	$-V_{CBO}$	max.	60	80	90	V
Collector-emitter voltage (see Fig. 4)	$-V_{CER}$	max.	45	60	80	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	5,0	5,0	5,0	V

Collector current (d.c.)	$-I_C$	max.	1,0	A
Collector current (peak value)	$-I_{CM}$	max.	2,0	A
Base current (d.c.)	$-I_B$	max.	0,1	A
Total power dissipation				
up to $T_{amb} = 25\ ^oC$	P_{tot}	max.	0,8	W
up to $T_{case} = 25\ ^oC$	P_{tot}	max.	5,0	W
Storage temperature range	T_{stg}		−65 to + 150	^oC
Junction temperature *	T_j	max.	200	^oC

THERMAL RESISTANCE *

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	220	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	35	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					
$I_E = 0; -V_{CB} = 45$ V	**BSS60**	$-I_{CBO}$	<	50	nA
$I_E = 0; -V_{CB} = 60$ V	**BSS61**	$-I_{CBO}$	<	50	nA
$I_E = 0; -V_{CB} = 80$ V	**BSS62**	$-I_{CBO}$	<	50	nA
Emitter cut-off current					
$I_C = 0; -V_{EB} = 4{,}0$ V		$-I_{EBO}$	<	100	nA
Saturation voltages					
$-I_C = 500$ mA; $-I_B = 0{,}5$ mA		$-V_{CEsat}$	<	1,3	V
		$-V_{BEsat}$	<	1,9	V
$-I_C = 500$ mA; $-I_B = 0{,}5$ mA; $T_j = 200$ °C		$-V_{CEsat}$	<	1,3	V
$-I_C = 1{,}0$ A; $-I_B = 1{,}0$ mA	**BSS61**	$-V_{CEsat}$	<	1,6	V
		$-V_{BEsat}$	<	2,2	V
$-I_C = 1{,}0$ A; $-I_B = 1{,}0$ mA; $T_j = 200$ °C	**BSS61**	$-V_{CEsat}$	<	1,6	V
$-I_C = 1{,}0$ A; $-I_B = 4{,}0$ mA	**BSS60; BSS62**	$-V_{CEsat}$	<	1,6	V
		$-V_{BEsat}$	<	2,2	V
$-I_C = 1{,}0$ A; $-I_B = 4{,}0$ mA; $T_j = 200$ °C	**BSS60; BSS62**	$-V_{CEsat}$	<	1,6	V
D.C. current gain					
$-I_C = 150$ mA; $-V_{CE} = 10$ V		h_{FE}	>	1000	
$-I_C = 500$ mA; $-V_{CE} = 10$ V		h_{FE}	>	2000	
Small-signal current gain at f = 35 MHz					
$-I_C = 500$ mA; $-V_{CE} = 5$ V		h_{fe}	typ.	10	

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Switching times (see Figs 2 and 3)

$-I_{Con}$ = 500 mA; $-I_{Bon}$ = I_{Boff} = 0,5 mA			
Turn-on time	t_{on}	typ.	0,4 μs
Turn-off time	t_{off}	typ.	1,5 μs
$-I_{Con}$ = 1,0 A; $-I_{Bon}$ = I_{Boff} = 1,0 mA			
Turn-on time	t_{on}	typ.	0,4 μs
Turn-off time	t_{off}	typ.	1,5 μs

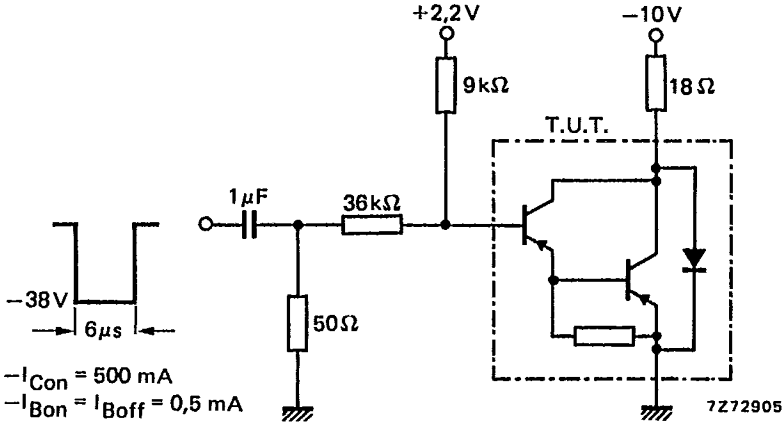

Fig. 2 Test circuit for 500 mA switching.

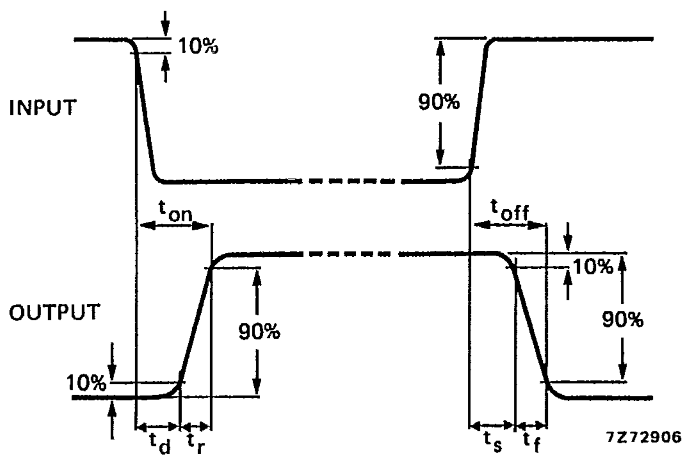

Fig. 3 Switching waveforms.

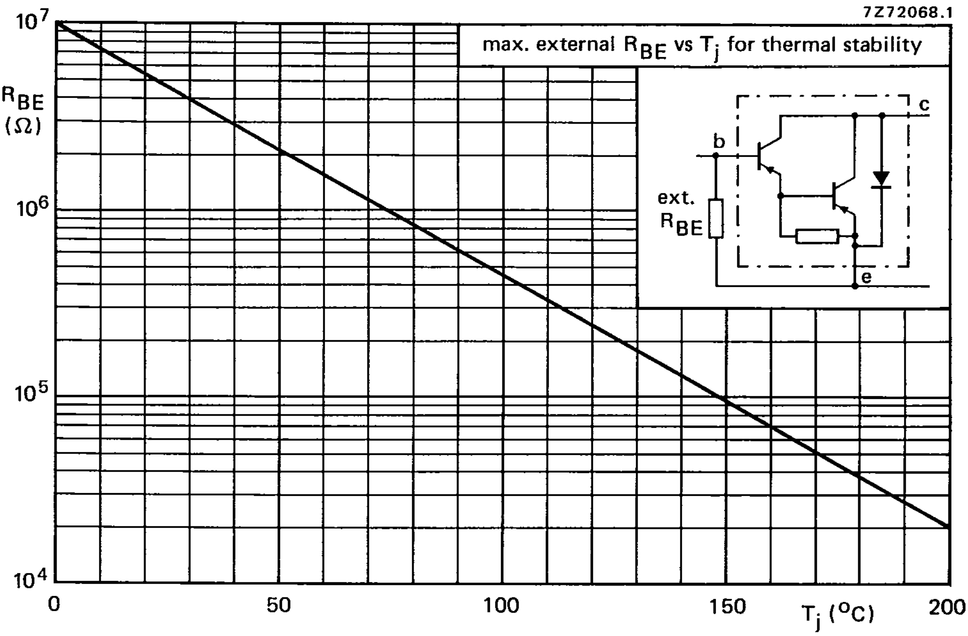
7Z72068.1
max. external R_{BE} vs T_j for thermal stability
R_{BE} (Ω)
10^7
10^6
10^5
10^4
0
50
100
150
200
T_j (°C)
b
c
e
ext. R_{BE}

Fig. 4.

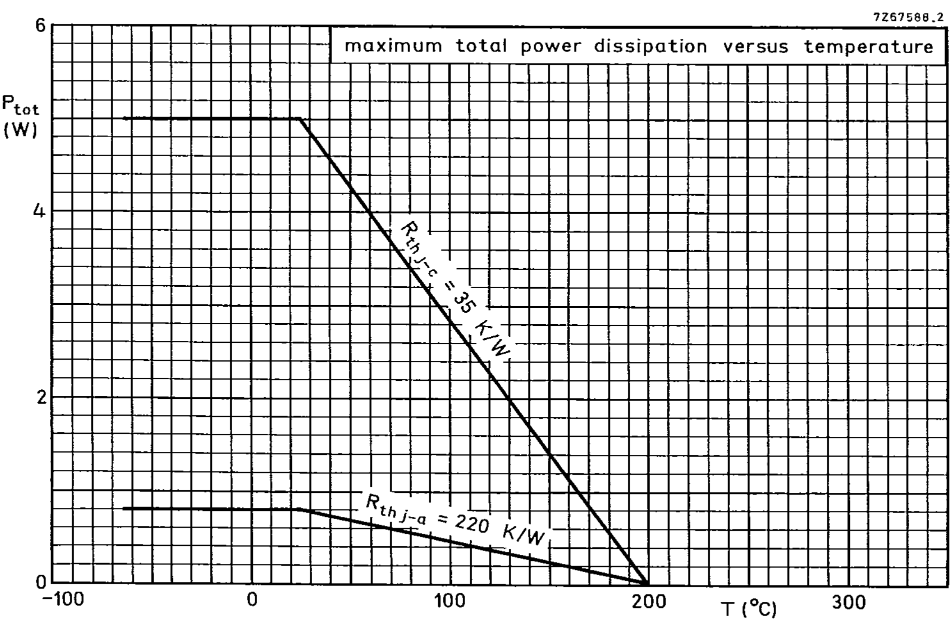
7Z67588.2
maximum total power dissipation versus temperature
P_{tot} (W)
6
4
2
0
−100
0
100
200
300
T (°C)
$R_{th\,j-c}$ = 35 K/W
$R_{th\,j-a}$ = 220 K/W

Fig. 5.

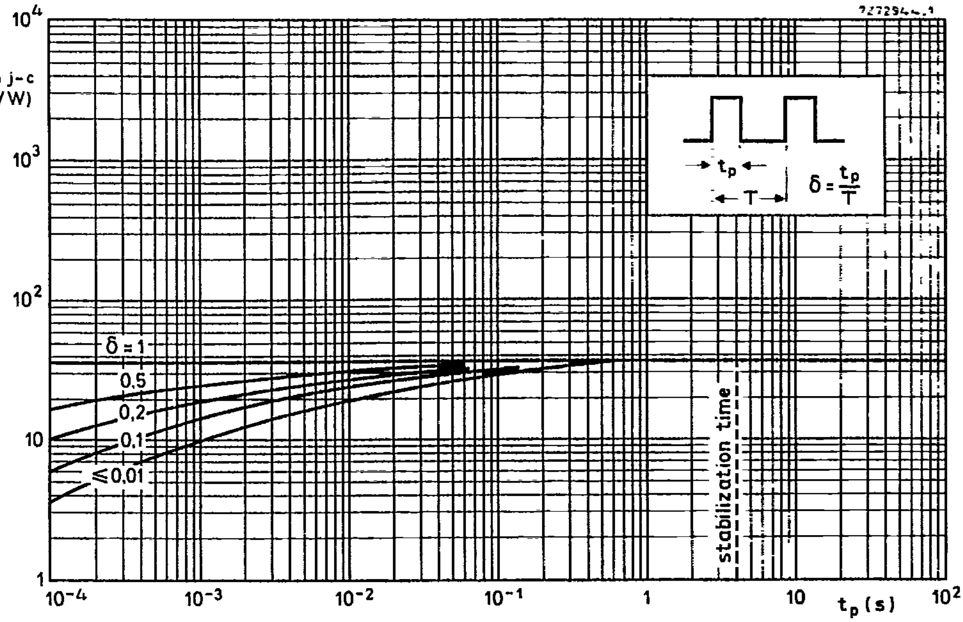

Fig. 6 Thermal impedance as a function of pulse duration.

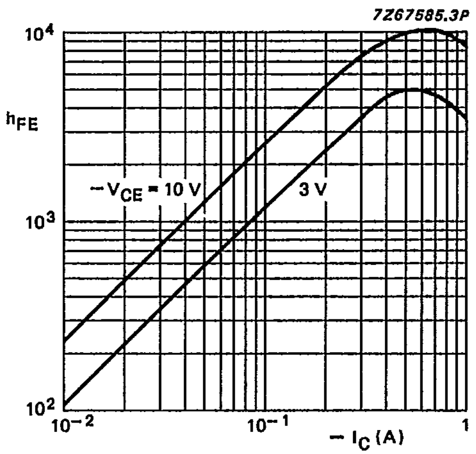

Fig. 7 T_j = 25 °C; typical values

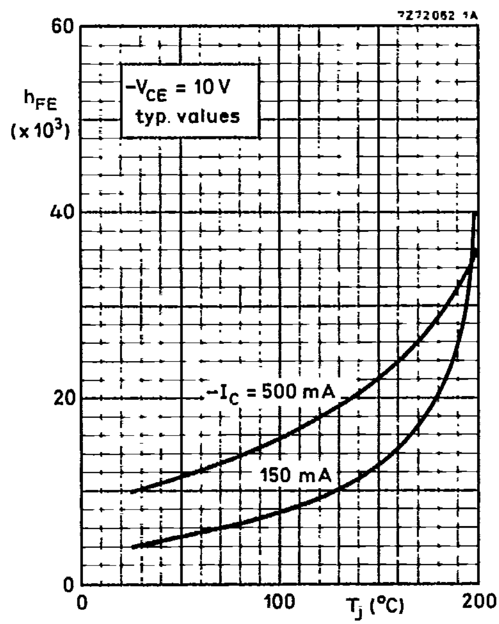

Fig. 8.

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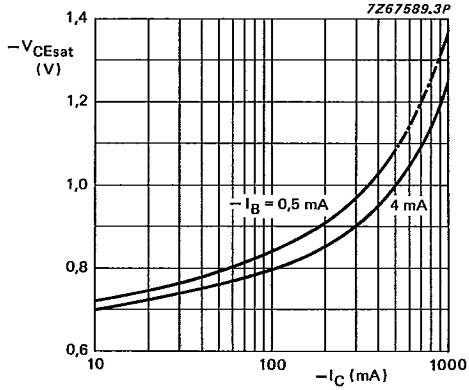

Fig. 9.

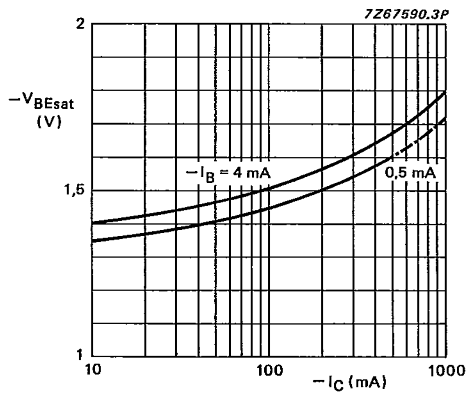

Fig. 10.

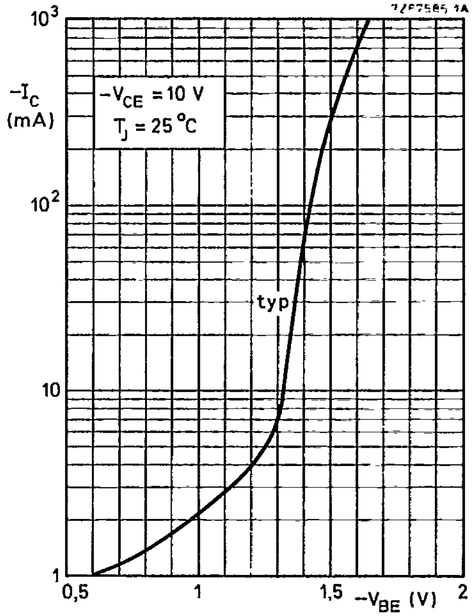
7Z67585.1A
10^3
$-I_C$ (mA)
$-V_{CE}$ = 10 V
T_j = 25 °C
10^2
typ
10
1
0,5
1
1,5
$-V_{BE}$ (V)
2

Fig. 11.

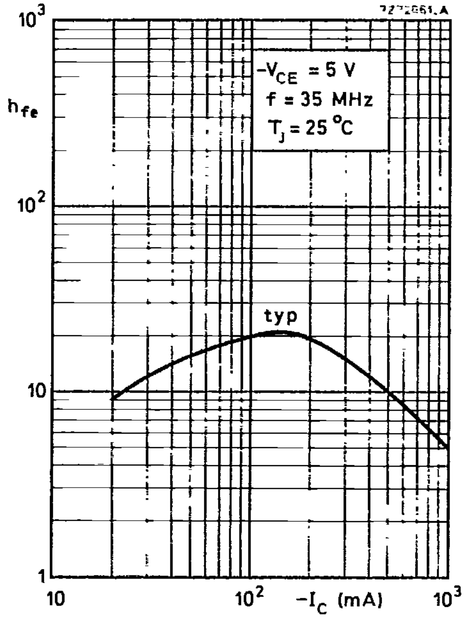
10^3
h_{fe}
$-V_{CE}$ = 5 V
f = 35 MHz
T_j = 25 °C
10^2
typ
10
1
10
10^2
$-I_C$ (mA)
10^3

Fig. 12.