SILICON PLANAR EPITAXIAL SWITCHING TRANSISTOR

N-P-N transistor in a plastic TO-92 envelope intended for high-speed switching applications.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)		V_{CBO}	max.	40	V
Collector-emitter voltage (V_{BE} = 0)		V_{CES}	max.	40	V
Collector-emitter voltage (open base)		V_{CEO}	max.	15	V
Collector current (peak value)		I_{CM}	max.	500	mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	500	mW
D.C. current gain					
I_C = 10 mA; V_{CE} = 1 V	**PH2369**	h_{FE}		40 to 120	
I_C = 10 mA; V_{CE} = 0.35 V	**PH2369A**	h_{FE}		40 to 120	
Transition frequency at f = 100 MHz					
I_C = 10 mA; V_{CE} = 10 V		f_T	>	500	MHz
Storage time					
$I_{Con} = I_{Bon} = -I_{Boff}$ = 10 mA		t_s	<	13	ns

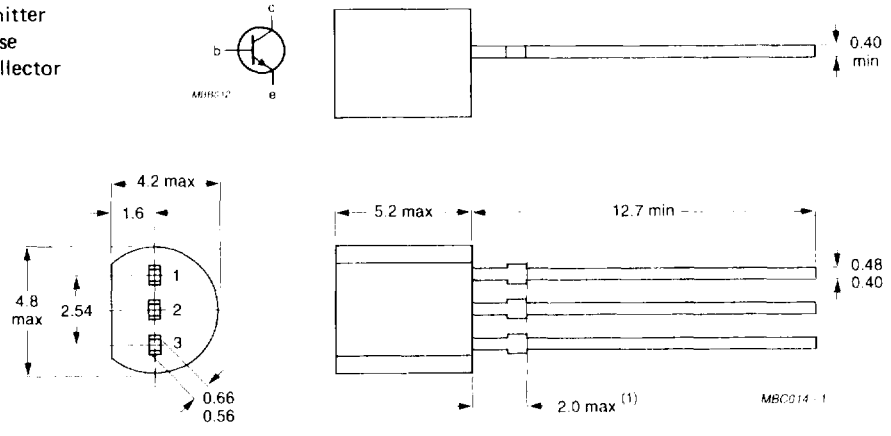
MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-92.

Pinning

1 = emitter
2 = base
3 = collector



Note (1) Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

RATINGS

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

Collector-base voltage (open emitter)		V_{CBO}	max.	40 V
Collector emitter voltage (V_{BE} = 0)		V_{CES}	max.	40 V
Collector-emitter voltage (open base)		V_{CEO}	max.	15 V
Emitter-base voltage (open collector)		V_{EBO}	max.	4,5 V
Collector current (peak value; t_p = 10 μs)		I_{CM}	max.	500 mA
Total power dissipation up to T_{amb} = 25 °C		P_{tot}	max.	500 mW
Storage temperature range		T_{stg}		−65 to + 150 °C
Junction temperature		T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air		$R_{th\ j\text{-}a}$	=	250 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 20 V		I_{CBO}	<	400 nA
I_E = 0; V_{CB} = 20 V; T_j = 125 °C		I_{CBO}	<	30 μA
Emitter cut-off current				
I_C = 0; V_{EB} = 2 V		I_{EBO}	<	100 nA
Saturation voltages				
I_C = 10 mA; I_B = 1 mA	**PH2369**	V_{CEsat}	max.	0,25 V
I_C = 10 mA; I_B = 1 mA		V_{BEsat}	min.	0,70 V
			max.	0,85 V
I_C = 10 mA; I_B = 1 mA	**PH2369A**	V_{CEsat}	<	0,20 V
I_C = 30 mA; I_B = 3 mA		V_{CEsat}	<	0,25 V
I_C = 100 mA; I_B = 10 mA		V_{CEsat}	<	0,50 V
I_C = 10 mA; I_B = 10 mA		V_{CEsat}	<	0,30 V
I_C = 10 mA; I_B = 1 mA		V_{BEsat}	min.	0,70 V
			max.	0,85 V
D.C. current gain				
I_C = 10 mA; V_{CE} = 1 V	**PH2369**	h_{FE}		40 to 120
I_C = 10 mA; V_{CE} = 1 V; T_{amb} = −55 °C		h_{FE}	>	20
I_C = 100 mA; V_{CE} = 2 V		h_{FE}	>	20
I_C = 10 mA; V_{CE} = 0.35 V	**PH2369A**	h_{FE}	>	40 to 120
I_C = 30 mA; V_{CE} = 0.4 V		h_{FE}	>	30
I_C = 100 mA; V_{CE} = 1 V		h_{FE}	>	20
I_C = 10 mA; V_{CE} = 0.35 V; T_{amb} = −55 °C		h_{FE}	>	20
Transition frequency at f = 100 MHz				
I_C = 10 mA; V_{CE} = 10 V		f_T	>	500 MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 5 V		C_c	<	4 pF

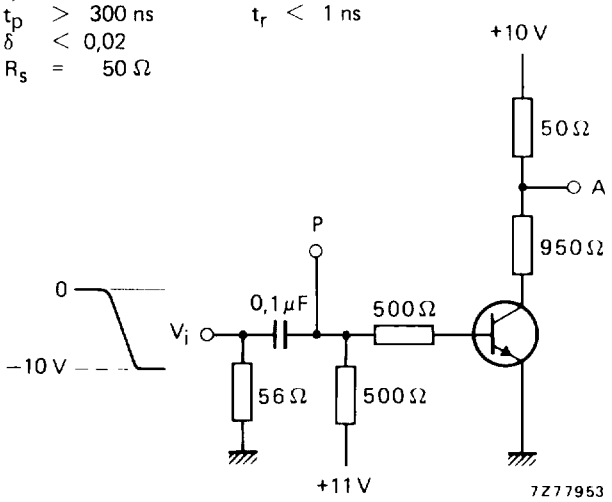
Emitter capacitance at f = 1 MHz
$I_C = I_c = 0$; $V_{EB} = 1$ V — C_e < 4,5 pF

Switching times

Storage time (see Fig. 2)
$I_{Con} = I_{Bon} = -I_{Boff} = 10$ mA — t_s typ. 6 ns; < 13 ns

Pulse generator:
t_r < 1 ns
t_p > 300 ns
δ < 0,02
R_s = 50 Ω

Oscilloscope:
R_i = 50 Ω
t_r < 1 ns



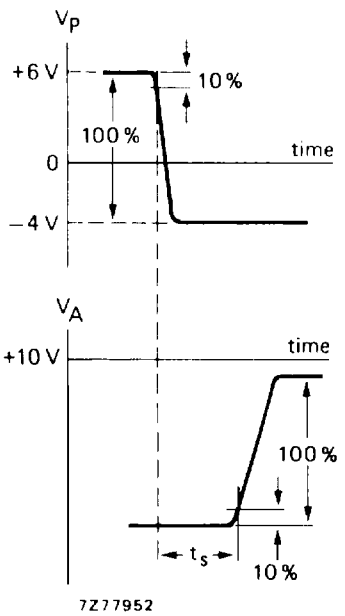


Fig. 2 Test circuit and waveforms.

Turn-on time (see Fig. 3)

from $-V_{BEoff}$ = 1,5 V to I_{Con} = 10 mA; I_{Bon} = 3 mA — t_{on} < 12 ns
from $-V_{BEoff}$ = 2,25 V to I_{Con} = 100 mA; I_{Bon} = 40 mA — t_{on} < 7 ns

Turn-off time (see Fig. 3)

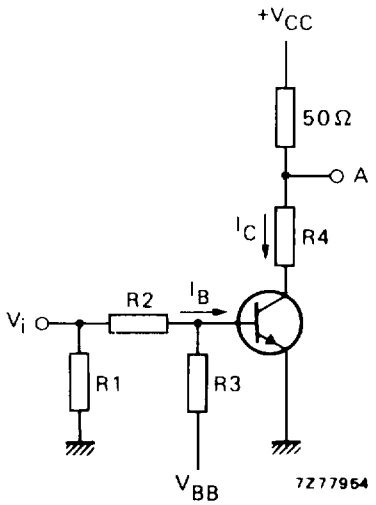
I_{Con} = 10 mA; I_{Bon} = 3 mA; $-I_{Boff}$ = 1,5 mA — t_{off} < 18 ns
I_{Con} = 100 mA; I_{Bon} = 40 mA; $-I_{Boff}$ = 20 mA — t_{off} < 21 ns

Pulse generator:

t_r < 1 ns
t_p > 300 ns
δ < 0,02
R_s = 50 Ω

Oscilloscope:

R_i = 50 Ω
t_r < 1 ns



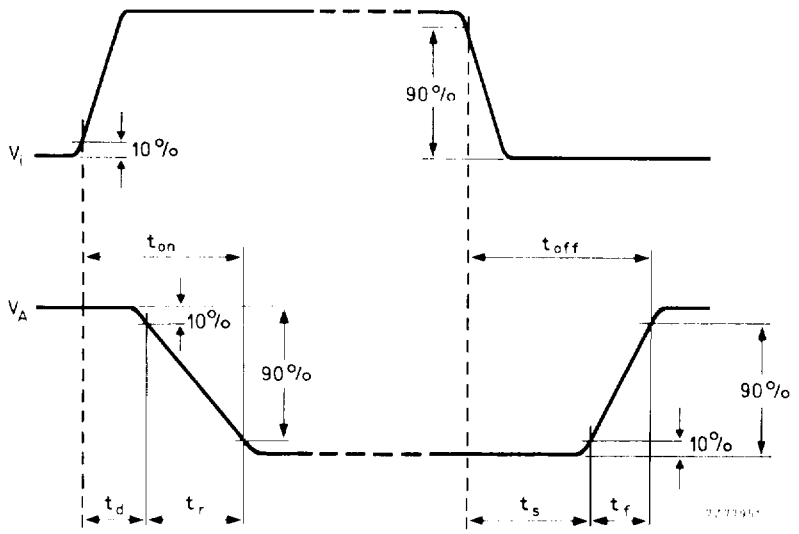


Fig. 3 Test circuit and waveforms.

							turn-on time			turn-off time	
I_{Con} mA	I_{Bon} mA	I_{Boff} mA	V_{CC} V	R1 Ω	R2; R3 kΩ	R4 Ω	V_{BB} V	V_{BE} V	V_i V	V_{BB} V	V_i V
10	3	−1,5	3	50	3,30	220	−3,0	−1,50	15	12,0	−15
100	40	−20	6	56	0,33	0	−4,5	−2,25	20	15,3	−20