NPN switching transistors PH2369; PH2369A

FEATURES

- Low current (max. 200 mA)
- Low voltage (max. 15 V).

APPLICATIONS

- High-speed switching.

DESCRIPTION

NPN switching transistor in a TO-92; SOT54 plastic package.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector

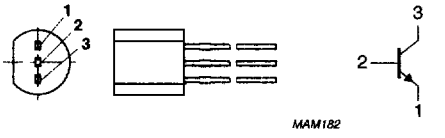


Fig.1 Simplified outline (TO-92; SOT54) and symbol.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
I_C	collector current (DC)		–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	500	mW
h_{FE}	DC current gain				
	PH2369	I_C = 10 mA; V_{CE} = 1 V	40	120	
	PH2369A	I_C = 10 mA; V_{CE} = 350 mV	40	120	
f_T	transition frequency	I_C = 10 mA; V_{CE} = 10 V; f = 100 MHz	500	–	MHz
t_{off}	turn-off time	I_{Con} = 10 mA; I_{Bon} = 3 mA; I_{Boff} = −1.5 mA	–	30	ns
		I_{Con} = 100 mA; I_{Bon} = 40 mA; I_{Boff} = −20 mA	–	35	ns

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
V_{EBO}	emitter-base voltage	open collector	–	4.5	V
I_C	collector current (DC)		–	200	mA
I_{CM}	peak collector current		–	300	mA
I_{BM}	peak base current		–	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	500	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	250	K/W

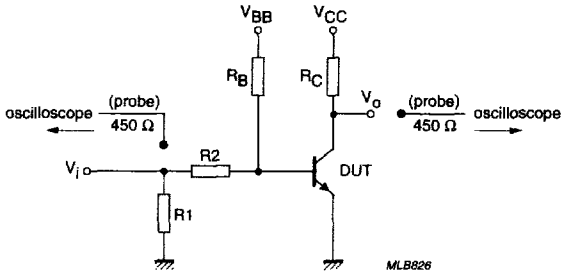
Note

1. Transistor mounted on an FR4 printed-circuit board.

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 20 V	–	400	nA
		I_E = 0; V_{CB} = 20 V; T_j = 125 °C	–	30	μA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 4 V	–	100	nA
h_{FE}	DC current gain PH2369	I_C = 10 mA; V_{CE} = 1 V	40	120	
		I_C = 10 mA; V_{CE} = 1 V; T_{amb} = −55 °C	20	–	
		I_C = 100 mA; V_{CE} = 2 V	20	–	
h_{FE}	DC current gain PH2369A	I_C = 10 mA; V_{CE} = 350 mV	40	120	
		I_C = 10 mA; V_{CE} = 350 mV; T_{amb} = −55 °C	20	–	
		I_C = 30 mA; V_{CE} = 400 mV	30	–	
		I_C = 100 mA; V_{CE} = 1 V	20	–	
V_{CEsat}	collector-emitter saturation voltage PH2369	I_C = 10 mA; I_B = 1 mA	–	250	mV
V_{CEsat}	collector-emitter saturation voltage PH2369A	I_C = 10 mA; I_B = 1 mA	–	200	mV
		I_C = 10 mA; I_B = 10 mA	–	300	mV
		I_C = 30 mA; I_B = 3 mA	–	250	mV
		I_C = 100 mA; I_B = 10 mA	–	500	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 1 mA	700	850	mV
C_c	collector capacitance	I_E = i_e = 0; V_{CB} = 5 V; f = 1 MHz	–	4	pF
C_e	emitter capacitance	I_C = i_c = 0; V_{EB} = 1 V; f = 1 MHz	–	4.5	pF
f_T	transition frequency	I_C = 10 mA; V_{CE} = 10 V; f = 100 MHz	500	–	MHz
Switching times (between 10% and 90% levels)					
t_{on}	turn-on time	I_{Con} = 10 mA; I_{Bon} = 3 mA; I_{Boff} = −1.5 mA; see Fig.2 test conditions A	–	10	ns
t_d	delay time		–	4	ns
t_r	rise time		–	6	ns
t_{off}	turn-off time		–	30	ns
t_s	storage time		–	15	ns
t_f	fall time		–	15	ns
t_{on}	turn-on time	I_{Con} = 100 mA; I_{Bon} = 40 mA; I_{Boff} = −20 mA; see Fig.2 test conditions B	–	13	ns
t_{off}	turn-off time		–	35	ns



Test conditions A.
V_i = 0.5 to 4.2 V; T = 500 μs; τ_p = 10 μs; $t_r = t_f \leq 3$ ns.
R1 = 56 Ω; R2 = 1 kΩ; R_B = 1 kΩ; R_C = 270 Ω.
V_{BB} = 0.2 V; V_{CC} = 2.7 V.
Oscilloscope: input impedance Z_i = 50 Ω.

Test conditions B.
V_i = 0.5 to 4.52 V; T = 200 μs; t_p = 10 μs; $t_r = t_f \leq 3$ ns.
R1 = 100 Ω; R2 = 68 Ω; R_B = 390 Ω; R_C = 47 Ω.
V_{BB} = −3 V; V_{CC} = 4.6 V.
Oscilloscope: input impedance Z_i = 50 Ω.

Fig.2 Test circuit for switching times.