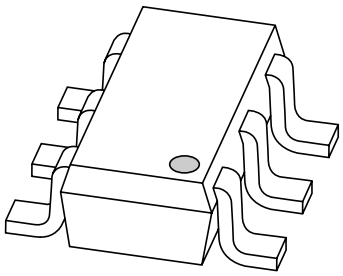
DATA SHEET



PBSS4240DPN

40 V low V_{CEsat} NPN/PNP transistor

Product specification

2003 Feb 20

Philips Semiconductors

40 V low V_{CEsat} NPN/PNP transistor PBSS4240DPN

FEATURES

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High collector current gain h_{FE} at high I_C
- High efficiency leading to reduced heat generation
- Reduced printed-circuit board area requirements.

APPLICATIONS

- Power management:
  - Complementary MOSFET driver
  - Dual supply line switching.
- Peripheral driver:
  - Half and full bridge motor drivers
  - Multi-phase stepper motor driver.

DESCRIPTION

NPN/PNP low V_{CEsat} transistor pair in a SOT457 (SC-74) plastic package.

MARKING

TYPE NUMBER	MARKING CODE
PBSS4240DPN	M3

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.		UNIT
		NPN	PNP	
V_{CEO}	emitter-collector voltage	40	–40	V
I_C	collector current (DC)	1.35	–1.1	A
I_{CRP}	repetitive peak collector current	2	–2	A
I_{CM}	peak collector current	3	–3	A
R_{CEsat}	equivalent on-resistance	200	260	mΩ

PINNING

PIN	DESCRIPTION	
1, 4	emitter	TR1; TR2
2, 5	base	TR1; TR2
6, 3	collector	TR1; TR2

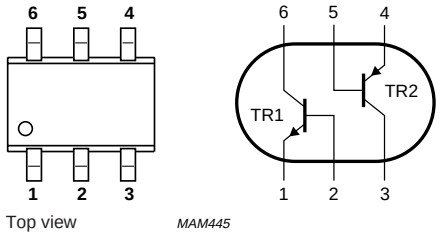


Fig.1 Simplified outline SOT457 (SC-74) and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
Per transistor unless otherwise specified; for the PNP transistor with negative polarity					
V_{CBO}	collector-base voltage	open emitter	–	40	V
V_{CEO}	collector-emitter voltage	open base	–	40	V
V_{EBO}	emitter-base voltage	open collector	–	5	V
I_C	collector current (DC)		–		
	NPN		–	1.35	A
	PNP		–	–1.1	A
I_{CRP}	repetitive peak collector current	note 1	–	2	A
I_{CM}	peak collector current	single peak	–	3	A
I_B	base current (DC)		–	300	mA
I_{BM}	peak base current		–	1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C; note 2	–	370	mW
		$T_{amb} \leq 25$ °C; note 3	–	310	mW
		$T_{amb} \leq 25$ °C; note 1	–	1.1	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C
Per device					
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C; note 2	–	600	mW

Notes

1. Operated under pulsed conditions: duty cycle $\delta \leq 20\%$; pulse width tp ≤ 10 ms; mounting pad for collector standard footprint.
2. Device mounted on a printed-circuit board; single-sided copper; tinplated; mounting pad for collector 1 cm^2.
3. Device mounted on a printed-circuit board; single-sided copper; tinplated; standard footprint.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
Per transistor				
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	in free air; note 1	340	K/W
		in free air; note 2	110	K/W

Notes

1. Device mounted on a printed-circuit board, single-sided copper, tinplated, mounting pad for collector 1 cm^2.
2. Operated under pulsed conditions: pulse width $t_p \leq 10$ ms; duty cycle $\delta \leq 0.20$; mounting pad for collector standard footprint.

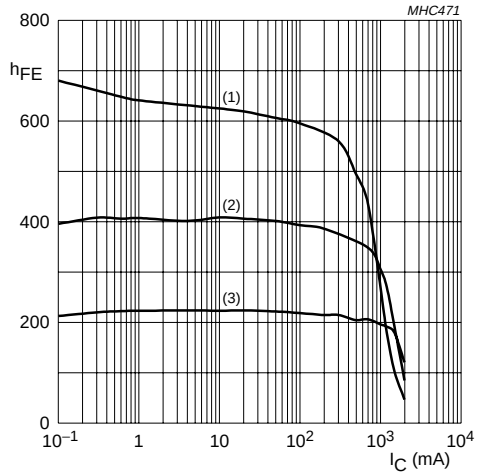
CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Per transistor unless otherwise specified; for the PNP transistor with negative polarity						
I_{CBO}	collector-base cut-off current	V_{CB} = 40 V; I_E = 0	–	–	100	nA
		V_{CB} = 40 V; I_E = 0; T_j = 150 °C	–	–	50	µA
I_{CEO}	collector-emitter cut-off current	V_{CE} = 30 V; I_B = 0	–	–	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0	–	–	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 mA	300	–	–	
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; f = 100 MHz	150	–	–	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = I_e = 0; f = 1 MHz	–	–	12	pF
TR1 (NPN)						
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 500 mA	300	–	900	
		V_{CE} = 5 V; I_C = 1 A	200	–	–	
		V_{CE} = 5 V; I_C = 2 A; note 1	75	–	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 1 mA	–	60	75	mV
		I_C = 500 mA; I_B = 50 mA	–	80	100	mV
		I_C = 1 A; I_B = 100 mA	–	150	200	mV
		I_C = 2 A; I_B = 200 mA; note 1	–	300	400	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 100 mA	–	–	1.2	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A	–	–	1.1	V
R_{CEsat}	equivalent on-resistance	I_C = 1 A; I_B = 100 mA	–	–	200	mΩ
TR2 (PNP)						
h_{FE}	DC current gain	V_{CE} = –5 V; I_C = –100 mA	300	–	800	
		V_{CE} = –5 V; I_C = –500 mA	250	–	–	
		V_{CE} = –5 V; I_C = –1 A	160	–	–	
		V_{CE} = –5 V; I_C = –2 A; note 1	50	–	–	
V_{CEsat}	saturation voltage	I_C = –100 mA; I_B = –1 mA	–	–90	–120	mV
		I_C = –500 mA; I_B = –50 mA	–	–100	–145	mV
		I_C = –1 A; I_B = –100 mA	–	–180	–260	mV
		I_C = –2 A; I_B = –200 mA; note 1	–	–400	–530	mV
V_{BEsat}	saturation voltage	I_C = –1 A; I_B = –50 mA	–	–	–1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = –5 V; I_C = –1 A	–	–	–1	V
R_{CEsat}	equivalent on-resistance	I_C = –1 A; I_B = –100 mA; note 1	–	–	260	mΩ

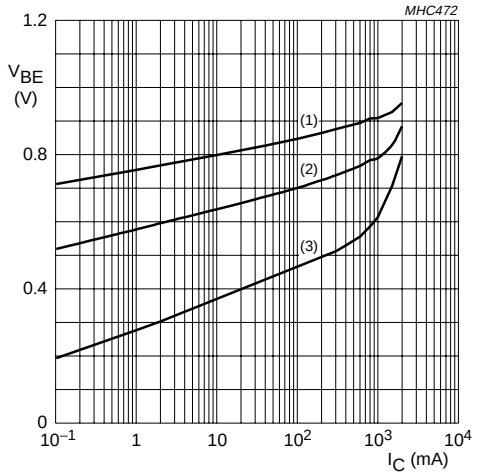
Note

1. Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.



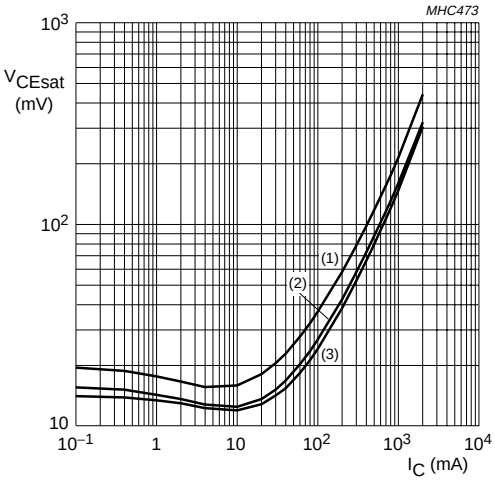
TR1 (NPN); V_{CE} = 5 V.
(1) T_{amb} = 150 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.2 DC current gain as a function of collector current; typical values.



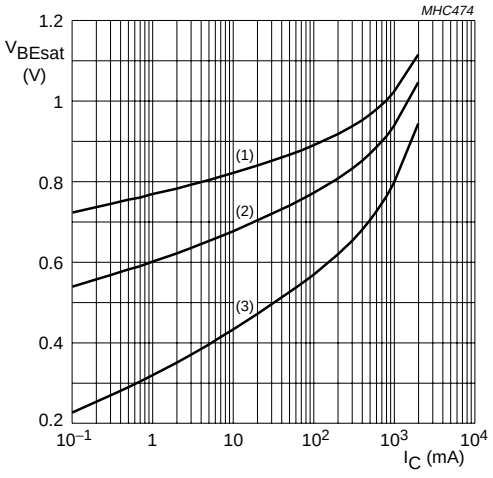
TR1 (NPN); V_{CE} = 5 V.
(1) T_{amb} = –55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 150 °C.

Fig.3 Base-emitter voltage as a function of collector current; typical values.



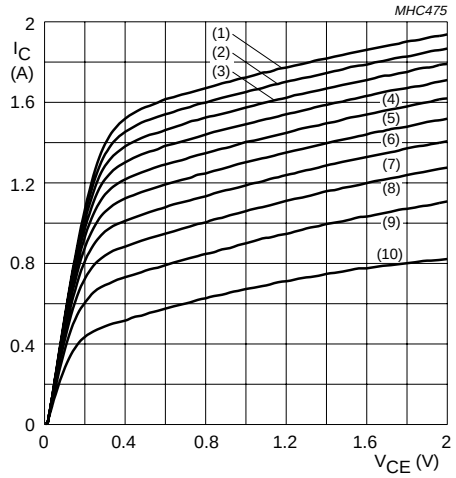
TR1 (NPN); I_C/I_B = 20.
(1) T_{amb} = 150 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.4 Collector-emitter saturation voltage as a function of collector current; typical values.



TR1 (NPN); I_C/I_B = 20.
(1) T_{amb} = –55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 150 °C.

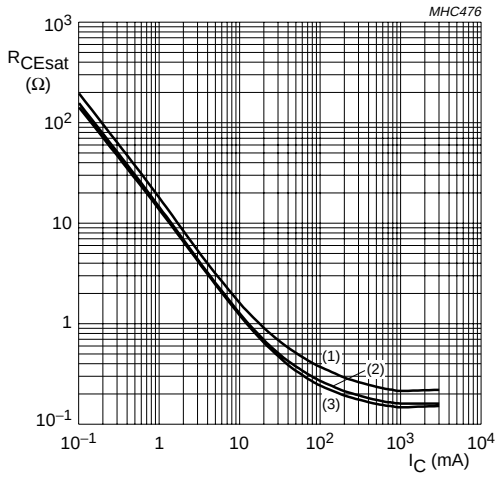
Fig.5 Base-emitter saturation voltage as a function of collector current; typical values.



TR1 (NPN); T_{amb} = 25 °C.

(1) I_B = 30 mA.
(2) I_B = 27 mA.
(3) I_B = 24 mA.
(4) I_B = 21 mA.
(5) I_B = 18 mA.
(6) I_B = 15 mA.
(7) I_B = 12 mA.
(8) I_B = 9 mA.
(9) I_B = 6 mA.
(10) I_B = 3 mA.

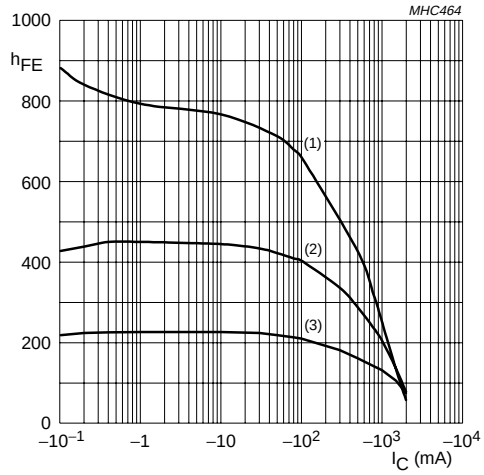
Fig.6 Collector current as a function of collector-emitter voltage; typical values.



TR1 (NPN); I_C/I_B = 20.

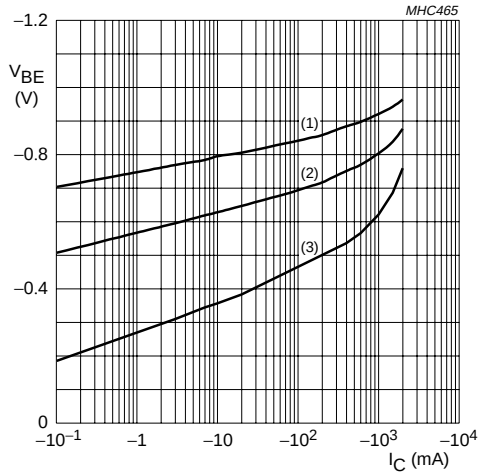
(1) T_{amb} = 150 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.7 Collector-emitter equivalent on-resistance as a function of collector current; typical values.



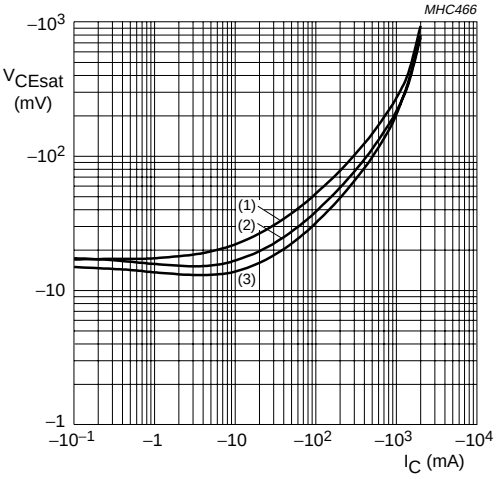
TR2 (PNP); V_{CE} = −5 V.
(1) T_{amb} = 150 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = −55 °C.

Fig.8 DC current gain as a function of collector current; typical values.



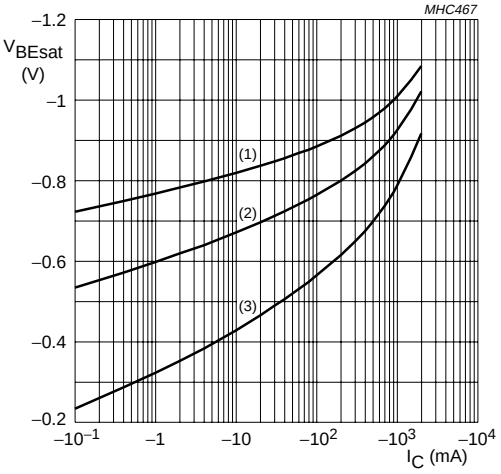
TR2 (PNP); V_{CE} = −5 V.
(1) T_{amb} = −55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 150 °C.

Fig.9 Base-emitter voltage as a function of collector current; typical values.



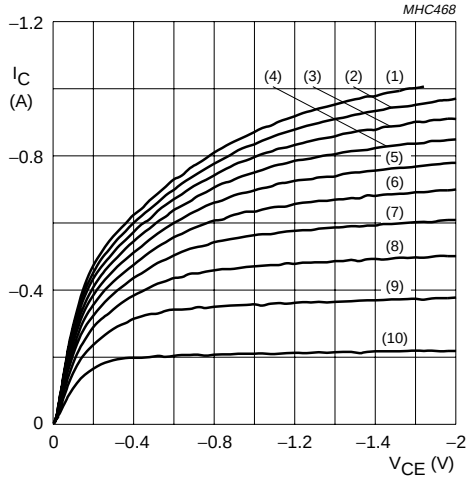
TR2 (PNP); I_C/I_B = 20.
(1) T_{amb} = 150 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = −55 °C.

Fig.10 Collector-emitter saturation voltage as a function of collector current; typical values.



TR2 (PNP); I_C/I_B = 20.
(1) T_{amb} = −55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 150 °C.

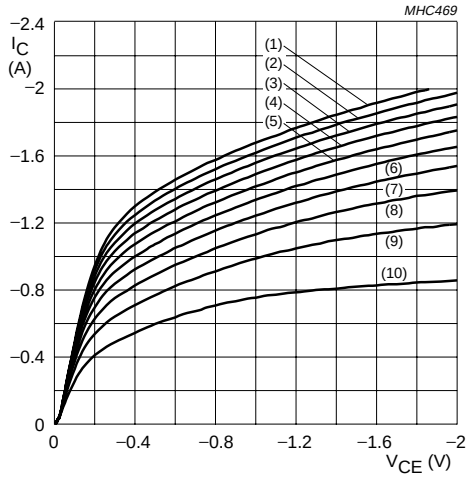
Fig.11 Base-emitter saturation voltage as a function of collector current; typical values.



TR2 (PNP); T_{amb} = 25 °C.

(1) I_B = –7 mA.
(2) I_B = –6.3 mA.
(3) I_B = –5.6 mA.
(4) I_B = –4.9 mA.
(5) I_B = –4.2 mA.
(6) I_B = –3.5 mA.
(7) I_B = –2.8 mA.
(8) I_B = –2.1 mA.
(9) I_B = –1.4 mA.
(10) I_B = –0.7 mA.

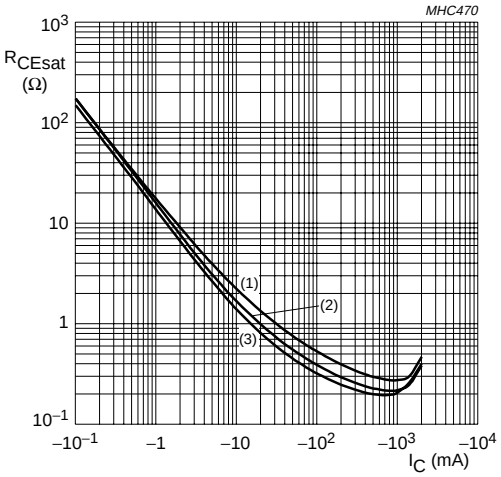
Fig.12 Collector current as a function of collector-emitter voltage; typical values.



TR2 (PNP); T_{amb} = 25 °C.

(1) I_B = –50 mA.
(2) I_B = –45 mA.
(3) I_B = –40 mA.
(4) I_B = –35 mA.
(5) I_B = –30 mA.
(6) I_B = –25 mA.
(7) I_B = –20 mA.
(8) I_B = –15 mA.
(9) I_B = –10 mA.
(10) I_B = –5 mA.

Fig.13 Collector current as a function of collector-emitter voltage; typical values.



TR2 (PNP); $I_C/I_B = 20$.

(1) $T_{amb} = 150$ °C.

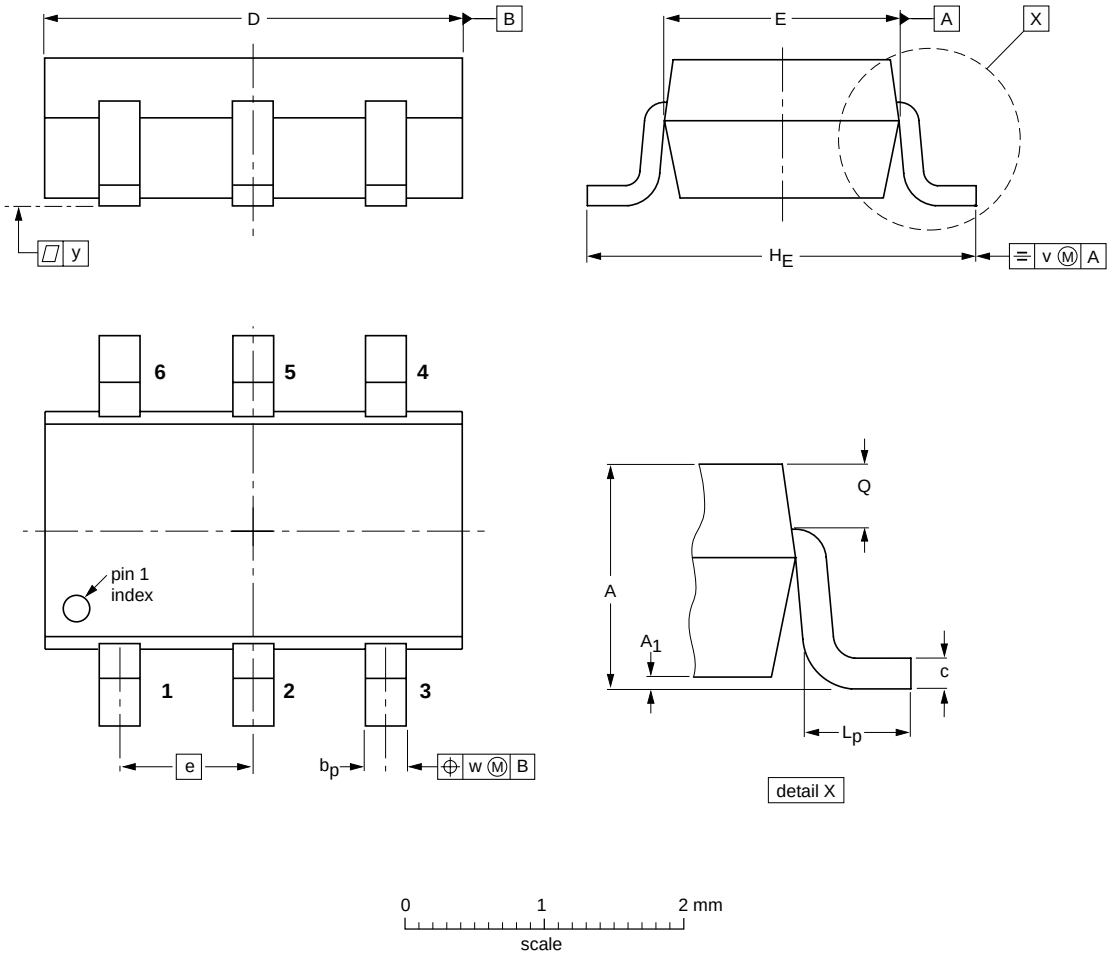
(2) $T_{amb} = 25$ °C.

(3) $T_{amb} = -55$ °C.

Fig.14 Collector-emitter equivalent on-resistance as a function of collector current; typical values.

PACKAGE OUTLINE

Plastic surface mounted package; 6 leads **SOT457**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.1 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT457			SC-74			~~97-02-28~~ 01-05-04

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS[1]	PRODUCT STATUS[2][3]	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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