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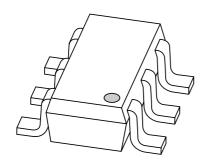
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Team Nexperia

DISCRETE SEMICONDUCTORS

DATA SHEET



PBSS4240DPN40 V low V_{CEsat} NPN/PNP transistor

Product data sheet 2003 Feb 20



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 hFE at high IC
- 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	MA	LINUT	
STIVIBUL	PARAMETER	NPN	PNP	UNIT
V _{CEO}	emitter-collector voltage	40	-40	V
I _C	collector current (DC)	1.35	-1.1	Α
I _{CRP}	repetitive peak collector current	2	-2	Α
I _{CM}	peak collector current	3	-3	Α
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	

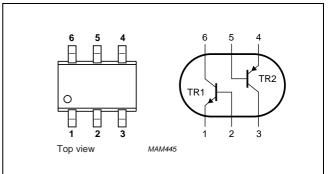


Fig.1 Simplified outline SOT457 (SC-74) and symbol.

40 V low V_{CEsat} NPN/PNP transistor

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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	Α
	PNP		_	-1.1	Α
I _{CRP}	repetitive peak collector current	note 1	_	2	А
I _{CM}	peak collector current	single peak	_	3	А
I _B	base current (DC)		_	300	mA
I _{BM}	peak base current		_	1	А
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C; note 2	_	370	mW
		T _{amb} ≤ 25 °C; note 3	_	310	mW
		T _{amb} ≤ 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} ≤ 25 °C; note 2	_	600	mW

Notes

- 1. Operated under pulsed conditions: duty cycle $\delta \le 20\%$; 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 cm².
- 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-a}	thermal resistance from junction to	in free air; note 1	340	K/W	
	ambient	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 cm².
- 2. Operated under pulsed conditions: pulse width $t_p \le 10$ ms; duty cycle $\delta \le 0.20$; mounting pad for collector standard footprint.

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CHARACTERISTICS

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

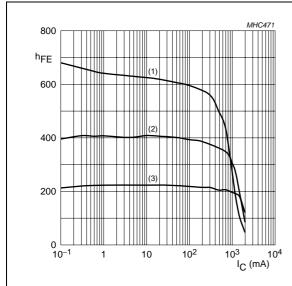
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT	
Per transistor unless otherwise specified; for the PNP transistor with negative polarity							
I _{CBO}	collector-base cut-off current	V _{CB} = 40 V; I _E = 0	_	_	100	nA	
		$V_{CB} = 40 \text{ V}; I_E = 0; T_j = 150 ^{\circ}\text{C}$	_	_	50	μΑ	
I _{CEO}	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	<u> </u>	_	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	$V_{CB} = 10 \text{ V}; I_E = I_e = 0;$ 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	Ī-	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	
		$I_C = 2 \text{ A}$; $I_B = 200 \text{ mA}$; 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	$V_{CE} = -5 \text{ V}; I_{C} = -100 \text{ mA}$	300	_	800		
		$V_{CE} = -5 \text{ V}; I_{C} = -500 \text{ mA}$	250	_	_		
		$V_{CE} = -5 \text{ V; } I_{C} = -1 \text{ A}$	160	_	_		
		$V_{CE} = -5 \text{ V}; I_{C} = -2 \text{ A}; \text{ note 1}$	50	_	_		
V _{CEsat}	saturation voltage	$I_C = -100 \text{ mA}; I_B = -1 \text{ mA}$	-	-90	-120	mV	
		$I_C = -500 \text{ mA}; I_B = -50 \text{ mA}$	_	-100	-145	mV	
		$I_C = -1 \text{ A}; I_B = -100 \text{ mA}$	_	-180	-260	mV	
		$I_C = -2 \text{ A}$; $I_B = -200 \text{ mA}$; note 1	_	-400	-530	mV	
V_{BEsat}	saturation voltage	$I_C = -1 A$; $I_B = -50 \text{ mA}$	_	_	-1.1	V	
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = -5 \text{ V}; I_{C} = -1 \text{ A}$	_	_	-1	V	
R _{CEsat}	equivalent on-resistance	$I_C = -1 \text{ A}$; $I_B = -100 \text{ mA}$; note 1	_	_	260	mΩ	

Note

1. Pulse test: $t_p \leq 300~\mu s;~\delta \leq 0.02.$

40 V low V_{CEsat} NPN/PNP transistor

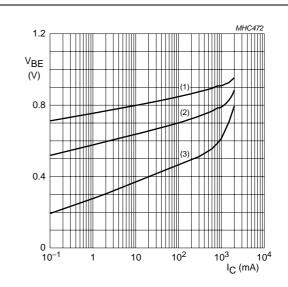
PBSS4240DPN



TR1 (NPN); $V_{CE} = 5 \text{ V}.$

- (1) $T_{amb} = 150 \, ^{\circ}C$.
- (2) $T_{amb} = 25 \, ^{\circ}C$.
- (3) $T_{amb} = -55 \, ^{\circ}C$.

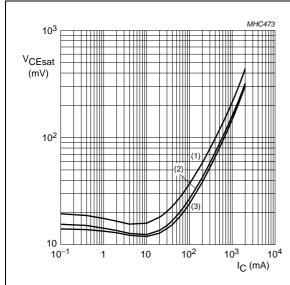
Fig.2 DC current gain as a function of collector current; typical values.



TR1 (NPN); $V_{CE} = 5 \text{ V}.$

- (1) $T_{amb} = -55 \, ^{\circ}C$.
- (2) T_{amb} = 25 °C.
- (3) $T_{amb} = 150 \, ^{\circ}C$.

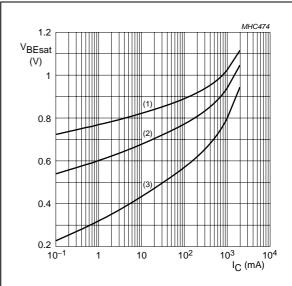
Fig.3 Base-emitter voltage as a function of collector current; typical values.



TR1 (NPN); $I_{\text{C}}/I_{\text{B}} = 20$.

- (1) $T_{amb} = 150 \, ^{\circ}C$.
- (2) $T_{amb} = 25 \, ^{\circ}C$.
- (3) $T_{amb} = -55 \, ^{\circ}C$.

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



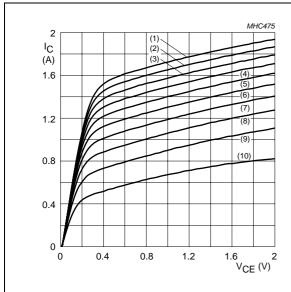
TR1 (NPN); $I_C/I_B = 20$.

- (1) $T_{amb} = -55 \,^{\circ}C$.
- (2) $T_{amb} = 25 \, ^{\circ}C$.
- (3) $T_{amb} = 150 \, ^{\circ}C$.

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

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TR1 (NPN); $T_{amb} = 25 \, ^{\circ}C$.

(1) $I_B = 30 \text{ mA}.$

(5) $I_B = 18 \text{ mA}.$ (6) $I_B = 15 \text{ mA}.$

(9) $I_B = 6 \text{ mA}.$ (10) $I_B = 3 \text{ mA}$.

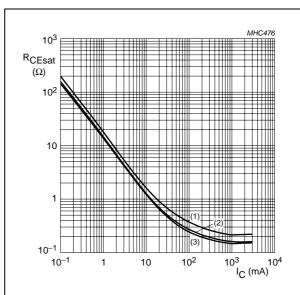
(2) $I_B = 27 \text{ mA}.$

(7) $I_B = 12 \text{ mA}.$

(3) $I_B = 24 \text{ mA}.$ (4) $I_B = 21 \text{ mA}.$

(8) $I_B = 9 \text{ mA}.$

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



TR1 (NPN); $I_C/I_B = 20$.

(1) $T_{amb} = 150 \, ^{\circ}C$.

(2) $T_{amb} = 25 \, ^{\circ}C$.

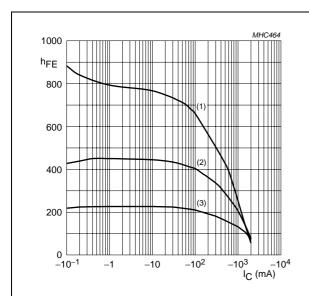
(3) $T_{amb} = -55 \, ^{\circ}C$.

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

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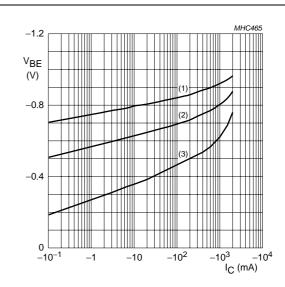
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TR2 (PNP); $V_{CE} = -5 \text{ V}.$

- (1) $T_{amb} = 150 \, ^{\circ}C$.
- (2) $T_{amb} = 25 \, ^{\circ}C$.
- (3) $T_{amb} = -55 \, ^{\circ}C$.

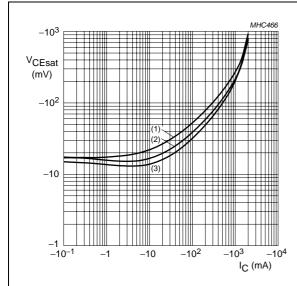
Fig.8 DC current gain as a function of collector current; typical values.



TR2 (PNP); $V_{CE} = -5 \text{ V}.$

- (1) $T_{amb} = -55 \, ^{\circ}C$.
- (2) T_{amb} = 25 °C.
- (3) $T_{amb} = 150 \, ^{\circ}C$.

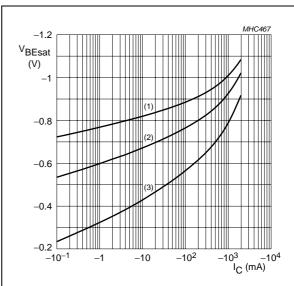
Fig.9 Base-emitter voltage as a function of collector current; typical values.



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

- (1) $T_{amb} = 150 \, ^{\circ}C$.
- (2) $T_{amb} = 25 \, ^{\circ}C$.
- (3) $T_{amb} = -55 \, ^{\circ}C$.

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



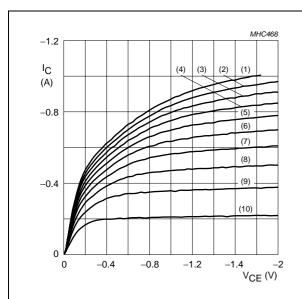
TR2 (PNP); $I_C/I_B = 20$.

- (1) $T_{amb} = -55 \,^{\circ}C$.
- (2) $T_{amb} = 25 \, ^{\circ}C$.
- (3) T_{amb} = 150 °C.

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

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TR2 (PNP); $T_{amb} = 25 \, ^{\circ}C$.

(1) $I_B = -7 \text{ mA}$.

(5) $I_B = -4.2 \text{ mA}.$ (6) $I_B = -3.5 \text{ mA}.$ (9) $I_B = -1.4 \text{ mA}.$ (10) $I_B = -0.7 \text{ mA}.$

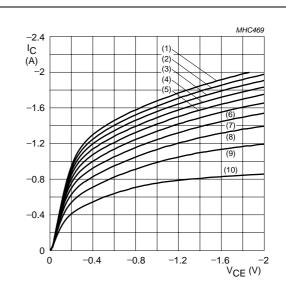
(2) $I_B = -6.3 \text{ mA}.$ (3) $I_B = -5.6 \text{ mA}.$

(7) $I_B = -2.8 \text{ mA}.$

(4) $I_B = -4.9 \text{ mA}.$

(8) $I_B = -2.1 \text{ mA}.$

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



TR2 (PNP); $T_{amb} = 25 \, ^{\circ}C$.

(1) $I_B = -50 \text{ mA}.$

(5) $I_B = -30 \text{ mA}.$ (6) $I_B = -25 \text{ mA}.$ (9) $I_B = -10 \text{ mA}.$ (10) $I_B = -5 \text{ mA}.$

(2) $I_B = -45 \text{ mA}.$ (3) $I_B = -40 \text{ mA}.$ (4) $I_B = -35 \text{ mA}.$

8

(7) $I_B = -20 \text{ mA}.$

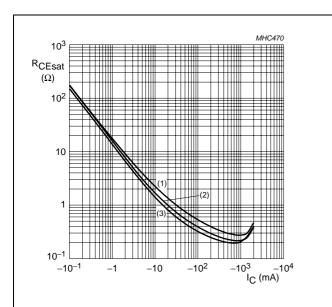
(8) $I_B = -15 \text{ mA}.$

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

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TR2 (PNP); $I_{\text{C}}/I_{\text{B}} = 20$.

- (1) $T_{amb} = 150 \, ^{\circ}C$.
- (2) $T_{amb} = 25 \, ^{\circ}C$.
- (3) $T_{amb} = -55 \, ^{\circ}C$.

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

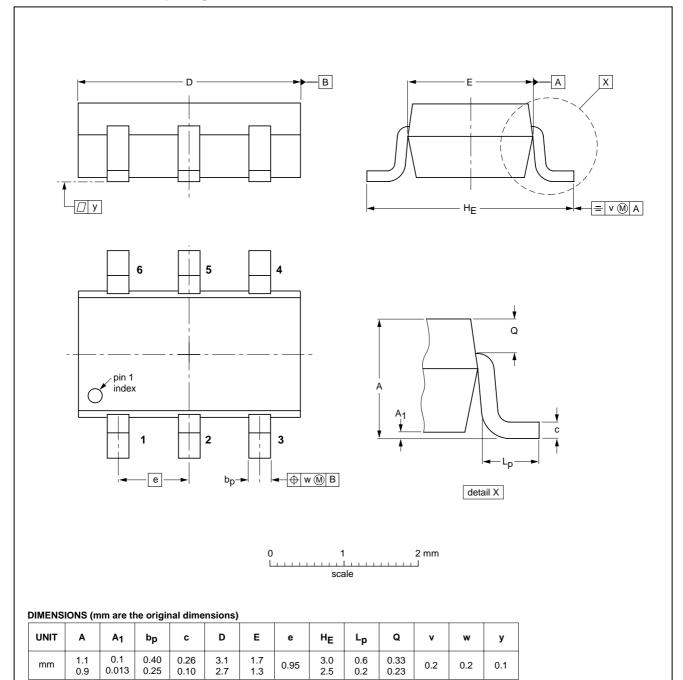
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PACKAGE OUTLINE

Plastic surface mounted package; 6 leads

SOT457



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

40 V low V_{CEsat} NPN/PNP transistor

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DATA SHEET STATUS

DOCUMENT STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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NXP Semiconductors

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