

# PBSS2540E

40 V, 500 mA NPN low  $V_{CEsat}$  (BISS) transistor

Rev. 01 — 4 May 2005

Product data sheet

## 1. Product profile

### 1.1 General description

NPN low  $V_{CEsat}$  Breakthrough in Small Signal (BISS) transistor in a SOT416 (SC-75) SMD plastic package.

PNP complement: PBS3540E.

### 1.2 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 due to less heat generation
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors

### 1.3 Applications

- DC-to-DC conversion
- MOSFET gate driving
- Motor control
- Charging circuits
- Low power switches (e.g. motors, fans)

### 1.4 Quick reference data

Table 1: Quick reference data

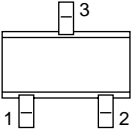
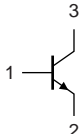
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	40	V
$I_C$	collector current (DC)		-	-	500	mA
$I_{CM}$	peak collector current		-	-	1	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 500 \text{ mA};$ $I_B = 50 \text{ mA}$	[1]	380	500	$m\Omega$

[1] Pulse test:  $t_p \leq 300 \mu\text{s}; \delta \leq 0.02$ .

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## 2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
1	base		
2	emitter		
3	collector		

*sym021*

## 3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PBSS2540E	SC-75	plastic surface mounted package; 3 leads	SOT416

## 4. Marking

Table 4: Marking codes

Type number	Marking code
PBSS2540E	1S

## 5. Limiting values

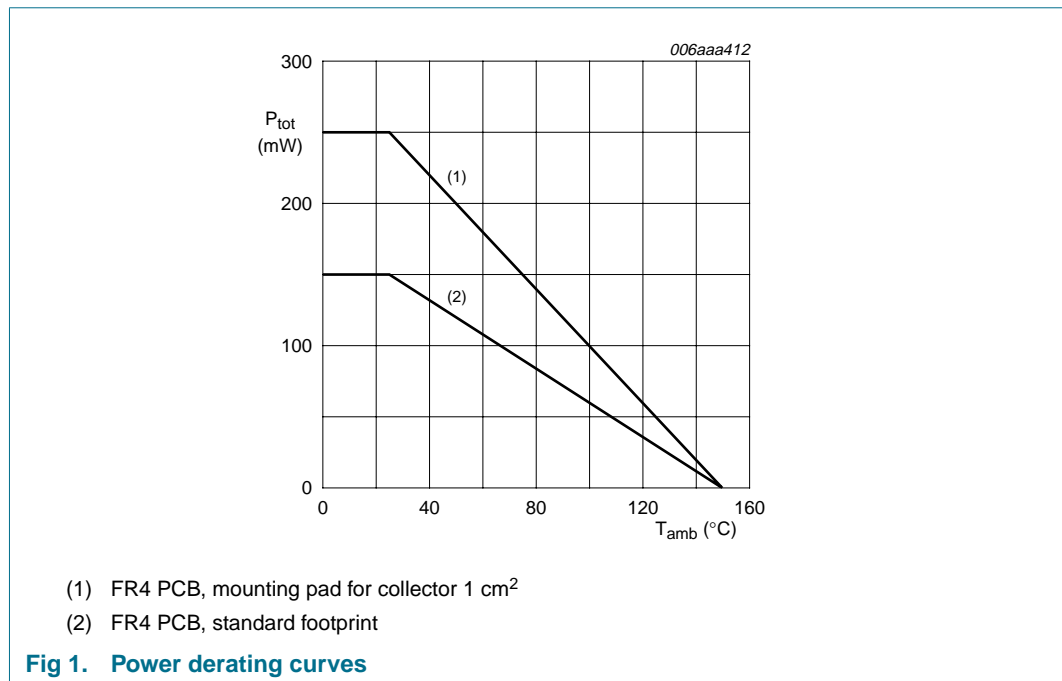
**Table 5: Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{CBO}$	collector-base voltage	open emitter	-	40	V	
$V_{CEO}$	collector-emitter voltage	open base	-	40	V	
$V_{EBO}$	emitter-base voltage	open collector	-	6	V	
$I_C$	collector current (DC)		-	500	mA	
$I_{CM}$	peak collector current		-	1	A	
$I_{BM}$	peak base current		-	100	mA	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	150	mW
			[2]	-	250	mW
$T_j$	junction temperature		-	150	°C	
$T_{amb}$	ambient temperature		-65	+150	°C	
$T_{stg}$	storage temperature		-65	+150	°C	

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.



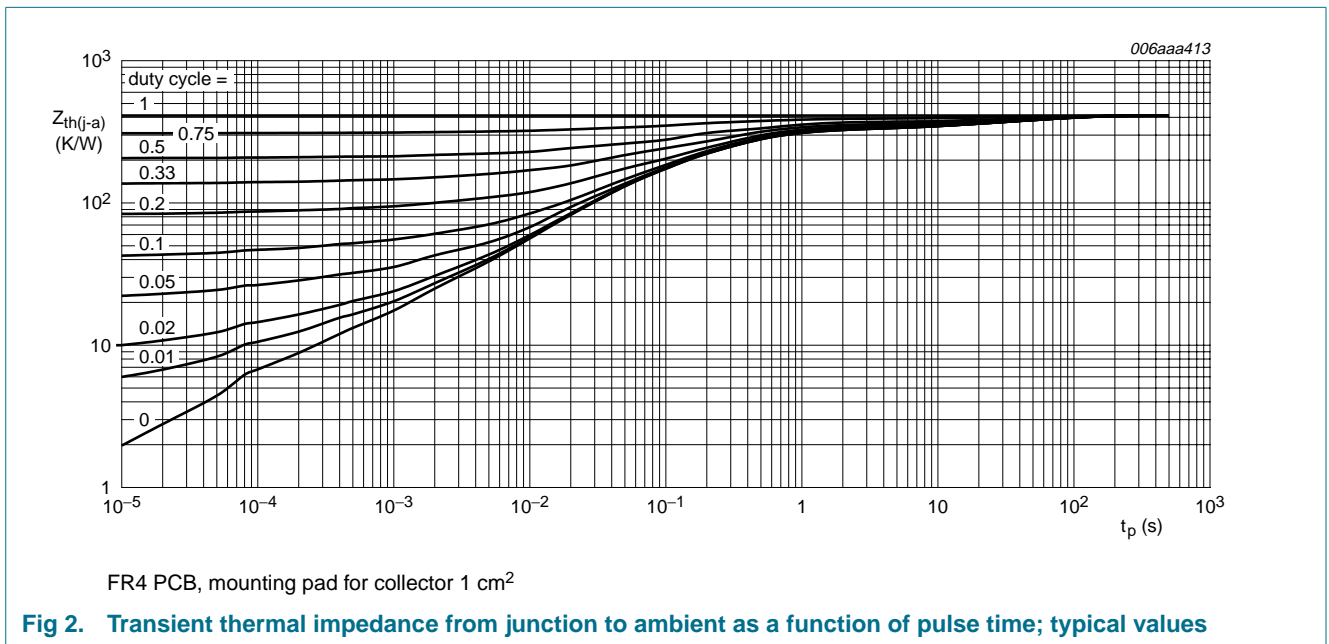
## 6. Thermal characteristics

**Table 6: Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	833	K/W
			[2]	-	500	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

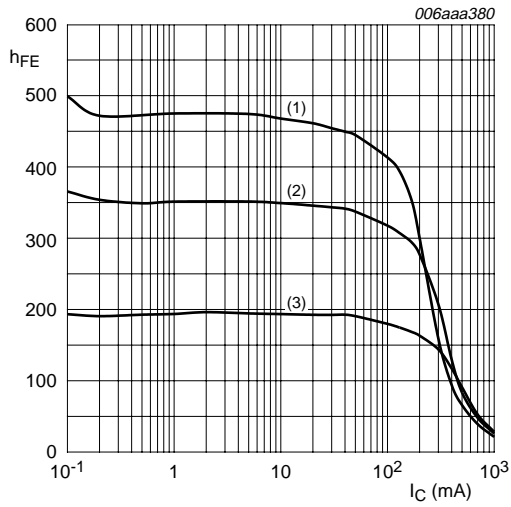


## 7. Characteristics

**Table 7: Characteristics**
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

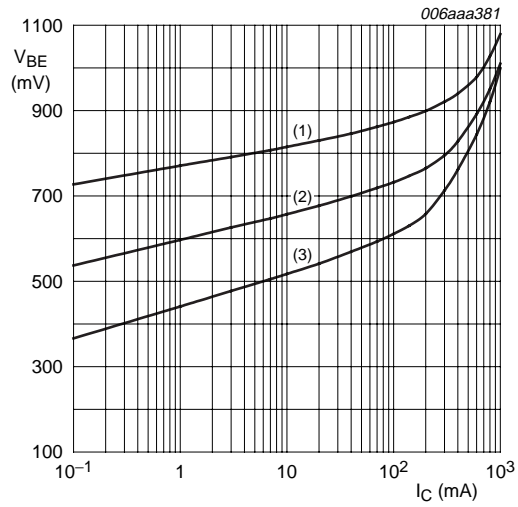
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 2\text{ V}; I_C = 10\text{ mA}$	200	-	-	
		$V_{CE} = 2\text{ V}; I_C = 100\text{ mA}$	[1] 100	-	-	
		$V_{CE} = 2\text{ V}; I_C = 500\text{ mA}$	[1] 50	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	-	50	mV
		$I_C = 100\text{ mA}; I_B = 5\text{ mA}$	-	-	100	mV
		$I_C = 200\text{ mA}; I_B = 10\text{ mA}$	-	-	200	mV
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	[1] -	-	250	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	[1] -	380	500	$\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	[1] -	-	1.2	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = 2\text{ V}; I_C = 100\text{ mA}$	-	-	1.1	V
$f_T$	transition frequency	$V_{CE} = 5\text{ V}; I_C = 100\text{ mA}; f = 100\text{ MHz}$	250	450	-	MHz
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_E = 0\text{ A}; f = 1\text{ MHz}$	-	-	6	pF

[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ .



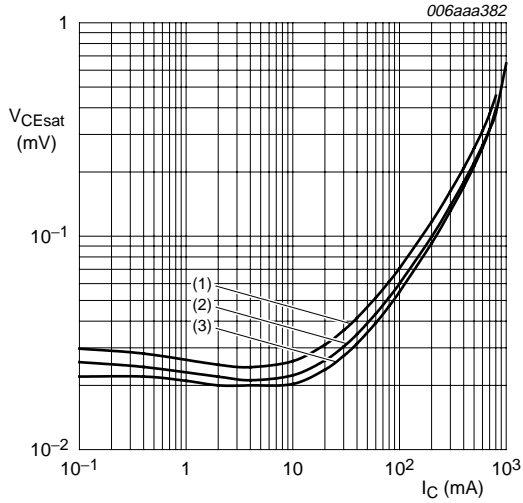
$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

**Fig 3. DC current gain as a function of collector current; typical values**



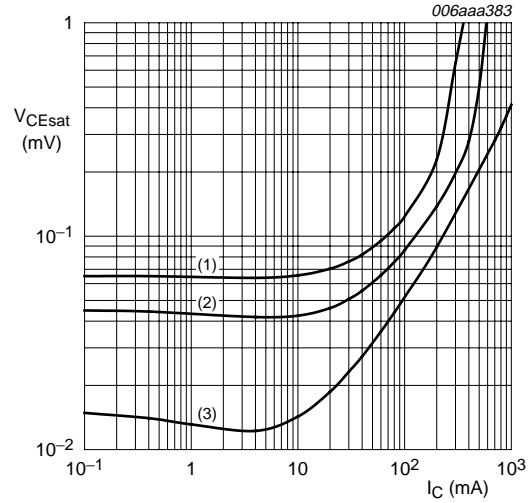
$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

**Fig 4. Base-emitter voltage as a function of collector current; typical values**



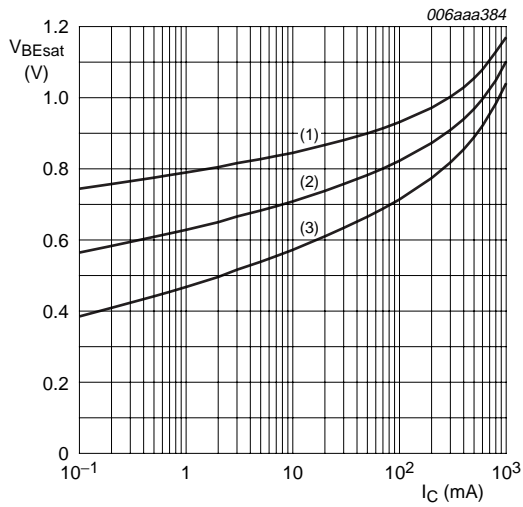
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



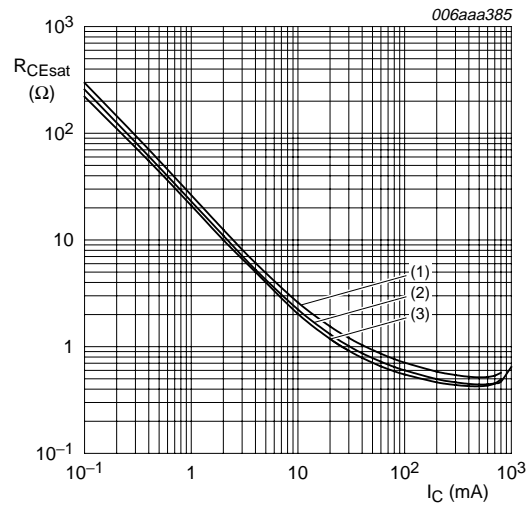
$T_{amb} = 25\text{ }^\circ\text{C}$   
 (1)  $I_C/I_B = 100$   
 (2)  $I_C/I_B = 50$   
 (3)  $I_C/I_B = 10$

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



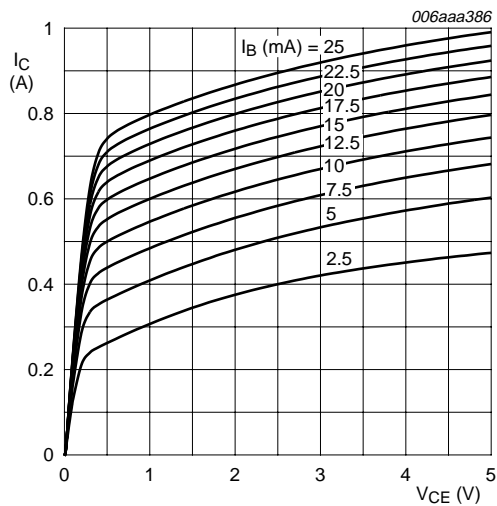
$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

**Fig 7. Base-emitter saturation voltage as a function of collector current; typical values**



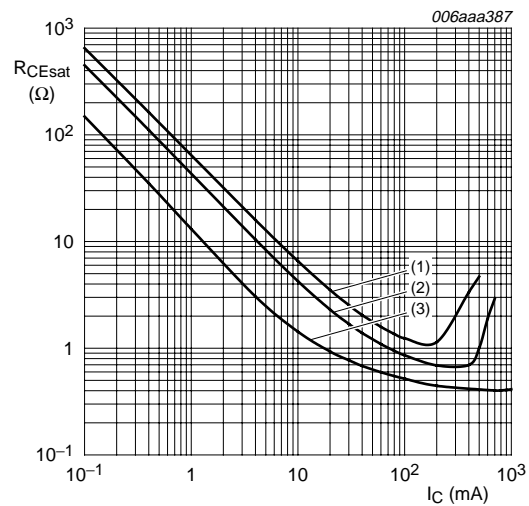
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig 8. Collector-emitter saturation resistance as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$

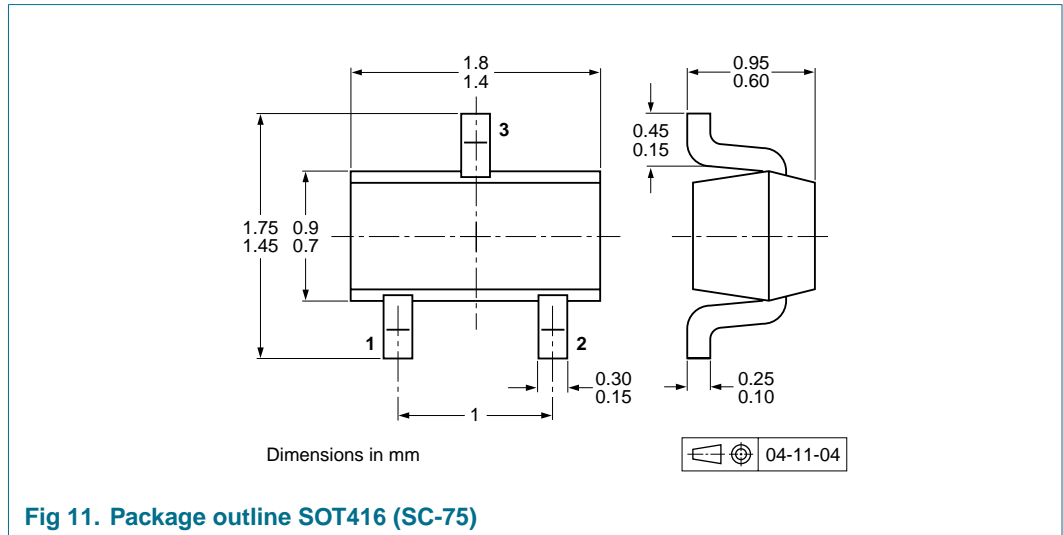
**Fig 9. Collector current as a function of collector-emitter voltage; typical values**



$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 100$   
 (2)  $I_C/I_B = 50$   
 (3)  $I_C/I_B = 10$

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

## 8. Package outline



## 9. Packing information

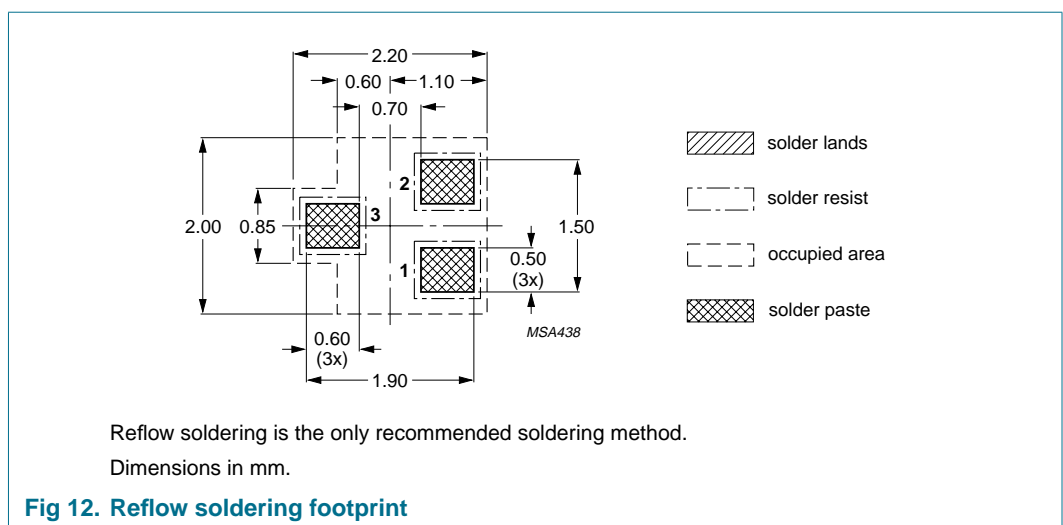
**Table 8: Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code. [1]

Type number	Package	Description	Packing quantity	
			3000	10000
PBSS2540E	SOT416	4 mm pitch, 8 mm tape and reel	-115	-135

[1] For further information and the availability of packing methods, see [Section 16](#).

## 10. Soldering





## 11. Revision history

**Table 9:** Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PBSS2540E_1	20050504	Product data sheet	-	9397 750 15063	-

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Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	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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