



# 2PD601BRL; 2PD601BSL

50 V, 200 mA NPN general-purpose transistors

Rev. 1 — 28 June 2010

Product data sheet

## 1. Product profile

### 1.1 General description

NPN general-purpose transistors in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP complement
	Nexperia	JEDEC	
2PD601BRL	SOT23	TO-236AB	2PB709BRL
2PD601BSL			2PB709BSL

### 1.2 Features and benefits

- Collector current  $I_C \leq 200$  mA
- Two current gain selections
- AEC-Q101 qualified
- Small SMD plastic package

### 1.3 Applications

- General-purpose switching and amplification

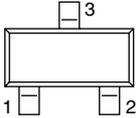
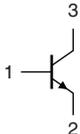
### 1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CE0}$	collector-emitter voltage	open base	-	-	50	V
$I_C$	collector current		-	-	200	mA
$h_{FE}$	DC current gain	$V_{CE} = 10$ V; $I_C = 2$ mA	210	-	460	
	$h_{FE}$ group R		210	-	340	
	$h_{FE}$ group S		290	-	460	

## 2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		
2	emitter		
3	collector		

*sym021*

## 3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
2PD601BRL	-	plastic surface-mounted package; 3 leads	SOT23
2PD601BSL			

## 4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
2PD601BRL	ML*
2PD601BSL	MM*

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

## 5. Limiting values

Table 6. Limiting values

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

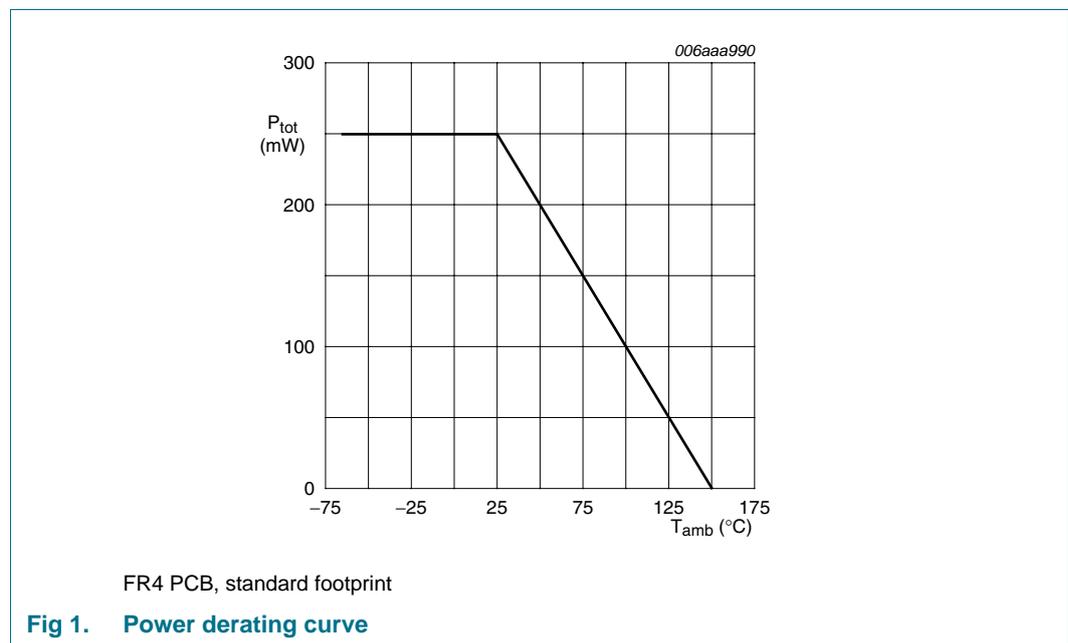
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	60	V
$V_{CEO}$	collector-emitter voltage	open base	-	50	V
$V_{EBO}$	emitter-base voltage	open collector	-	6	V
$I_C$	collector current		-	200	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	300	mA
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms	-	200	mA

**Table 6.** Limiting values ...continued

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

Symbol	Parameter	Conditions	Min	Max	Unit
$P_{\text{tot}}$	total power dissipation	$T_{\text{amb}} \leq 25\text{ °C}$	[1] -	250	mW
$T_{\text{j}}$	junction temperature		-	150	°C
$T_{\text{amb}}$	ambient temperature		-55	+150	°C
$T_{\text{stg}}$	storage temperature		-65	+150	°C

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

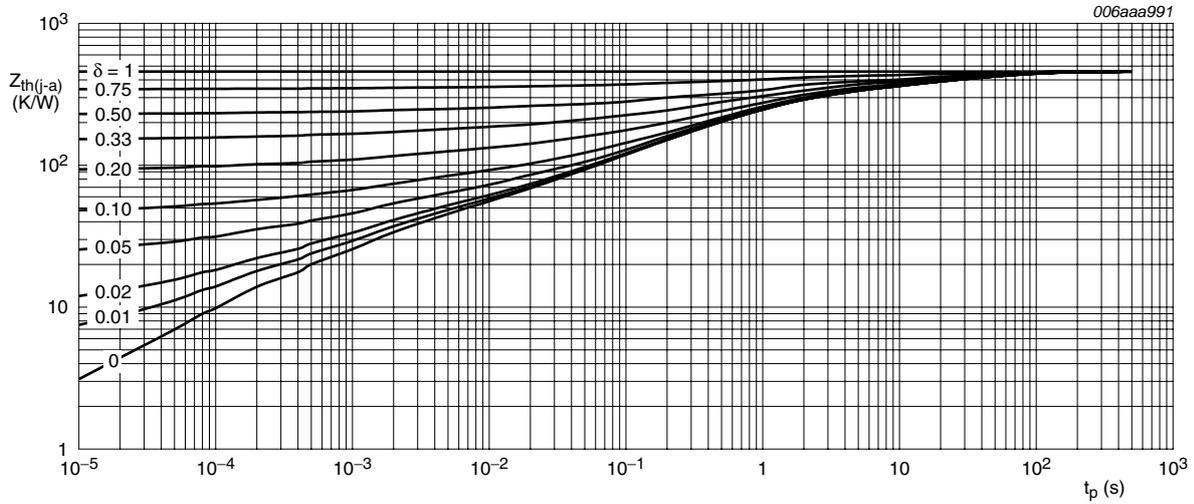


## 6. Thermal characteristics

**Table 7.** Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{\text{th(j-a)}}$	thermal resistance from junction to ambient	in free air	[1] -	-	500	K/W
$R_{\text{th(j-sp)}}$	thermal resistance from junction to solder point		-	-	140	K/W

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



FR4 PCB, standard footprint

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

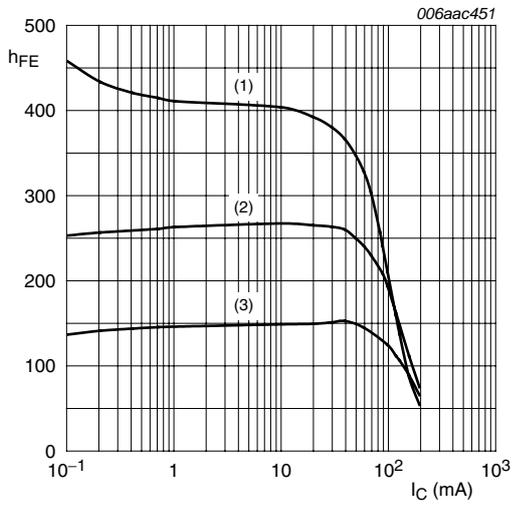
## 7. Characteristics

Table 8. Characteristics

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

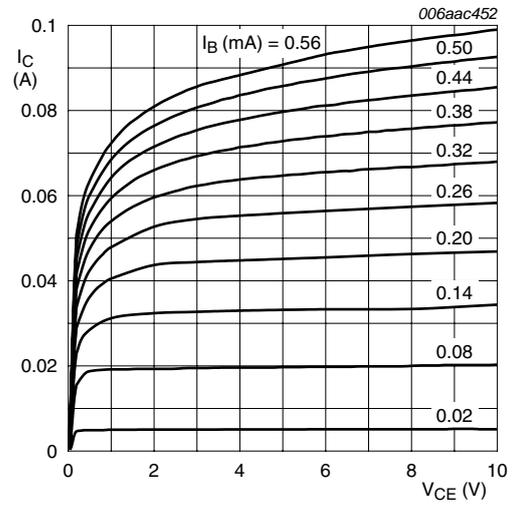
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 60\text{ V}; I_E = 0\text{ A}$	-	-	10	nA
		$V_{CB} = 60\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	-	-	5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	10	nA
$h_{FE}$	DC current gain	$V_{CE} = 10\text{ V}; I_C = 2\text{ mA}$	210	-	460	
		$h_{FE}$ group R	210	-	340	
		$h_{FE}$ group S	290	-	460	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 100\text{ mA}; I_B = 10\text{ mA}$	[1]	-	250	mV
$f_T$	transition frequency	$V_{CE} = 6\text{ V}; I_C = 10\text{ mA}; f = 100\text{ MHz}$	100	250	-	MHz
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	3	pF

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



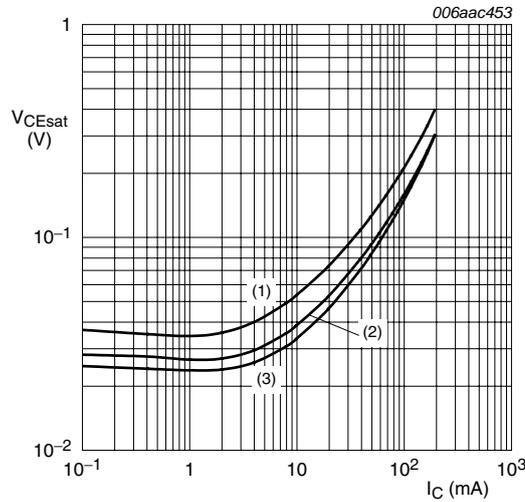
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig 3. 2PD601BRL: DC current gain as a function of collector current; typical values**



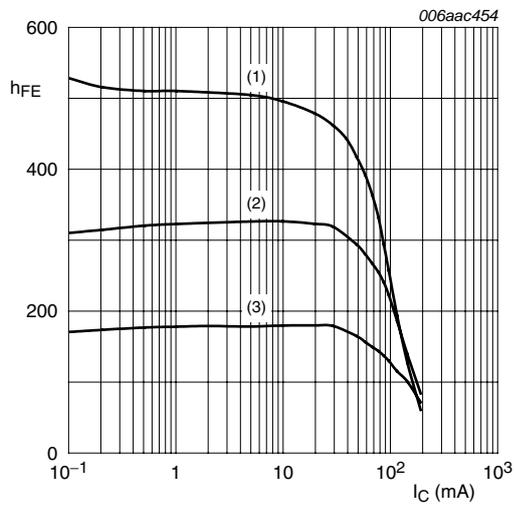
$T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 4. 2PD601BRL: Collector current as a function of collector-emitter voltage; typical values**



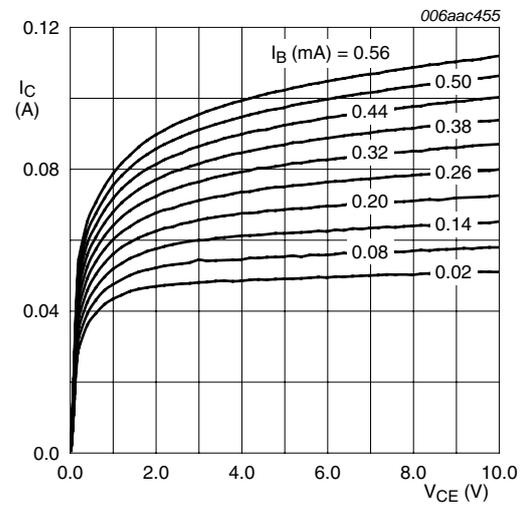
$I_C/I_B = 10$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig 5. 2PD601BRL: Collector-emitter saturation voltage as a function of collector current; typical values**



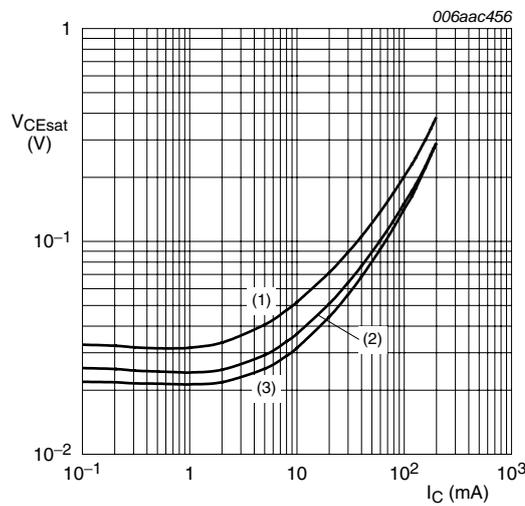
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig 6. 2PD601BSL: DC current gain as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$

**Fig 7. 2PD601BSL: Collector current as a function of collector-emitter voltage; typical values**



$I_C/I_B = 10$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

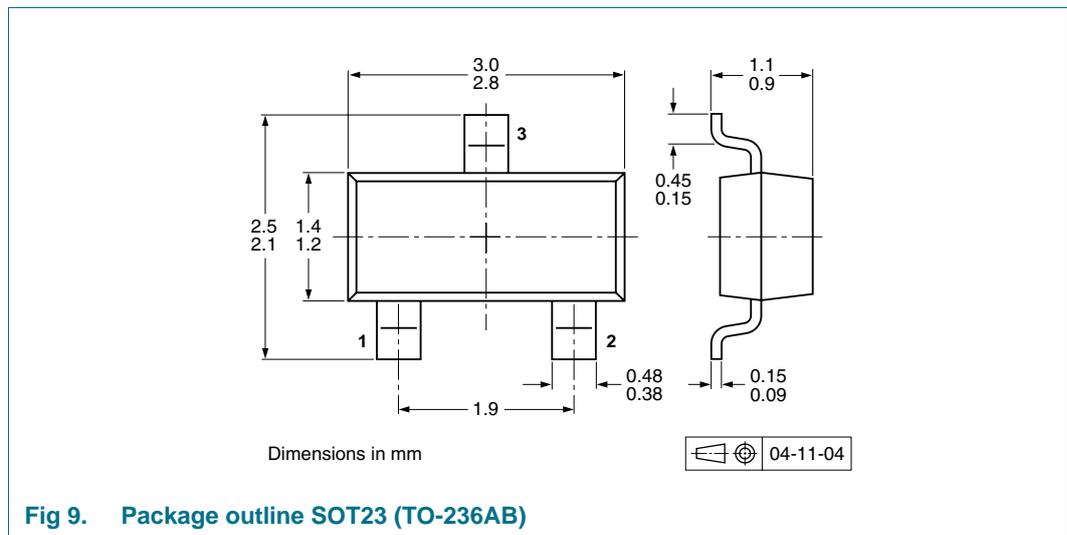
**Fig 8. 2PD601BSL: Collector-emitter saturation voltage as a function of collector current; typical values**

## 8. Test information

### 8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 9. Package outline



## 10. Packing information

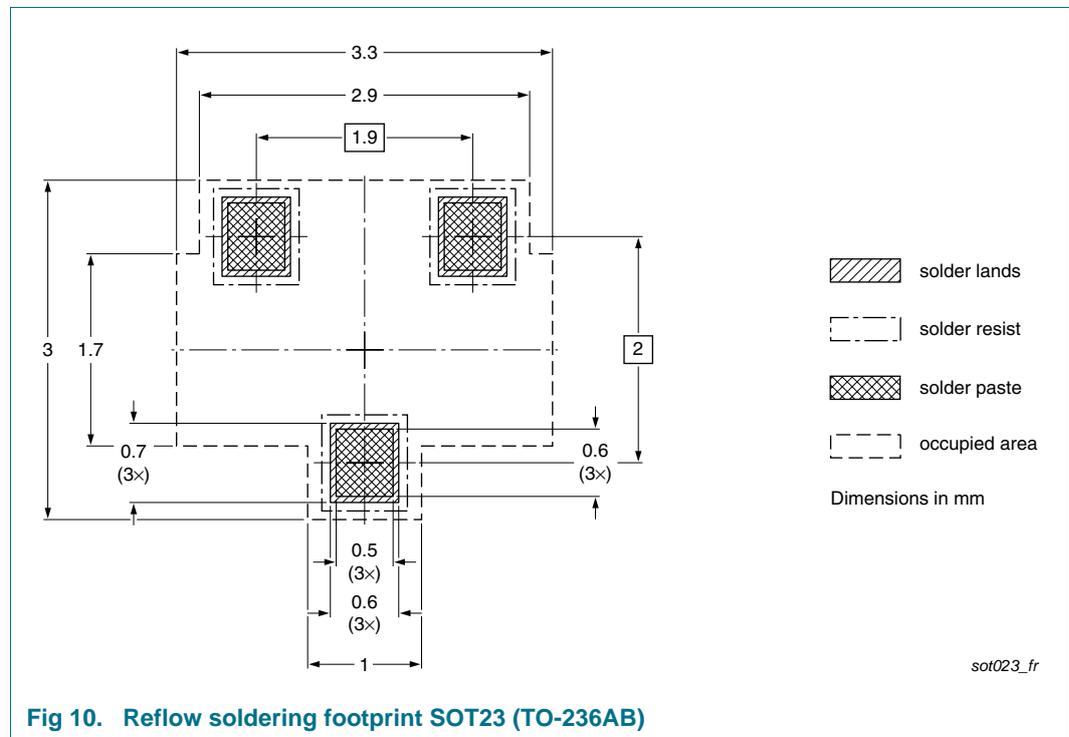
**Table 9. Packing methods**

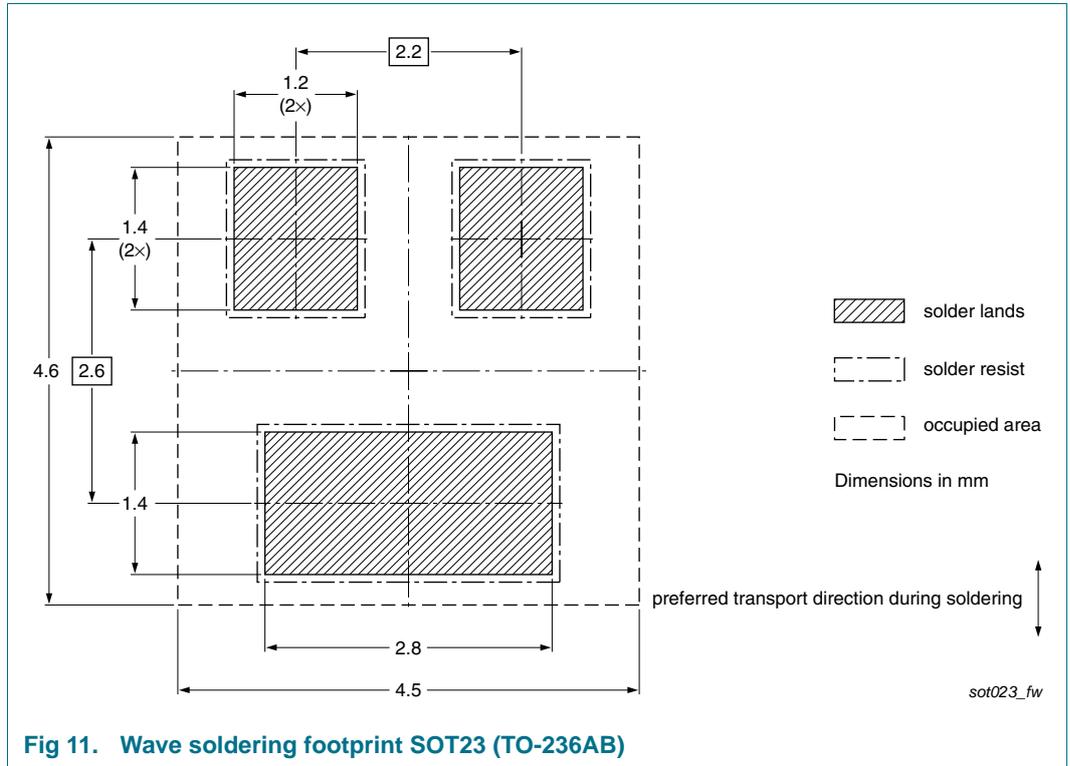
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

Type number	Package	Description	Packing quantity	
			3000	10000
2PD601BRL	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235
2PD601BSL				

[1] For further information and the availability of packing methods, see [Section 14](#).

## 11. Soldering





## 12. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
2PD601BRL_2PD601BSL v.1	20100628	Product data sheet	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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[2] The term 'short data sheet' is explained in section "Definitions".

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