

# BLA1011-200; BLA1011S-200

Avionics LDMOS transistor

Rev. 08 — 26 October 2005

Product data sheet

## 1. Product profile

### 1.1 General description

200 W LDMOS avionics power transistor for transmitter applications at frequencies from 1030 MHz to 1090 MHz.

**Table 1: Typical performance**

RF performance at  $T_h = 25^\circ\text{C}$  in a common source class-AB test circuit;  $I_{Dq} = 150\text{ mA}$ ; typical values.

Mode of operation	Conditions	$V_{DS}$ (V)	$P_L$ (W)	$G_p$ (dB)	$\eta_D$ (%)	$t_r$ (ns)	$t_f$ (ns)
Pulsed class-AB: 1030 MHz to 1090 MHz	$t_p = 50\ \mu\text{s}; \delta = 2\ \%$	36	200	15	50	35	6
	$t_p = 128\ \mu\text{s}; \delta = 2\ \%$	36	250	14	50	35	6
	$t_p = 340\ \mu\text{s}; \delta = 1\ \%$	36	250	14	50	35	6

#### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

### 1.2 Features

- Typical pulsed class-AB performance at a frequencies from 1030 MHz to 1090 MHz, a supply voltage of 36 V and an  $I_{Dq}$  of 150 mA:
  - ◆ Load power  $\geq 200\text{ W}$
  - ◆ Gain  $\geq 13\text{ dB}$
  - ◆ Efficiency  $\geq 45\ \%$
  - ◆ Rise time  $\leq 50\text{ ns}$
  - ◆ Fall time  $\leq 50\text{ ns}$
- High power gain
- Easy power control
- Excellent ruggedness
- Source on mounting flange eliminates DC isolators, reducing common mode inductance

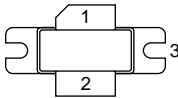
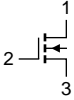
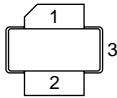
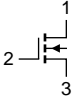
### 1.3 Applications

- Avionics transmitter applications in the 1030 MHz to 1090 MHz frequency range.

# PHILIPS

## 2. Pinning information

**Table 2: Pinning**

Pin	Description	Simplified outline	Symbol
<b>BLA1011-200 (SOT502A)</b>			
1	drain		 sym039
2	gate		
3	source		
<b>BLA1011S-200 (SOT502B)</b>			
1	drain		 sym039
2	gate		
3	source		

[1] Connected to flange

## 3. Ordering information

**Table 3: Ordering information**

Type number	Package		
	Name	Description	Version
BLA1011-200	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLA1011S-200	-	earless flanged LDMOST ceramic package; 2 leads	SOT502B

## 4. Limiting values

**Table 4: Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DS}$	drain-source voltage		-	75	V
$V_{GS}$	gate-source voltage		-	±22	V
$P_{tot}$	total power dissipation	$T_h \leq 25\text{ °C}$ ; $t_p = 50\ \mu\text{s}$ ; $\delta = 2\%$	-	700	W
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C

## 5. Thermal characteristics

**Table 5: Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$Z_{th(j-h)}$	thermal impedance from junction to heatsink	$T_h = 25\text{ °C}$	[1] 0.15	K/W

[1] Thermal resistance is determined under RF operating conditions;  $t_p = 50\text{ }\mu\text{s}$ ,  $\delta = 10\text{ %}$ .

## 6. Characteristics

**Table 6: Characteristics**

$T_j = 25\text{ °C}$  unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ ; $I_D = 3\text{ mA}$	75	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$ ; $I_D = 300\text{ mA}$	4	-	5	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 36\text{ V}$	-	-	1	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 9\text{ V}$ ; $V_{DS} = 10\text{ V}$	45	-	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = \pm 20\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
$g_{fs}$	transfer conductance	$V_{DS} = 10\text{ V}$ ; $I_D = 10\text{ A}$	-	9	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = 9\text{ V}$ ; $I_D = 10\text{ A}$	-	60	-	$\text{m}\Omega$

## 7. Application information

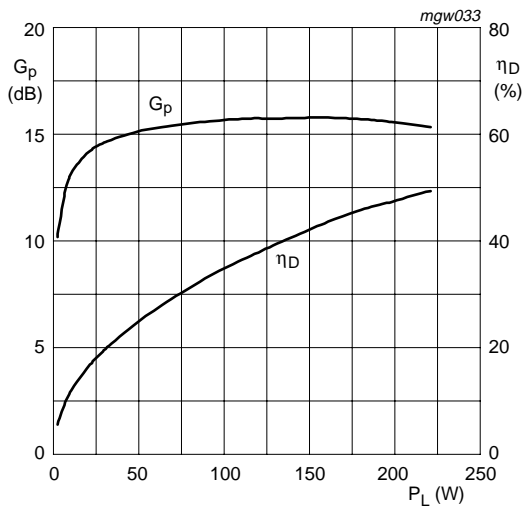
**Table 7: Application information**

RF performance in a common source pulsed class-AB circuit; ( $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\text{ %}$ );  $f = 1030\text{ MHz}$  and  $1090\text{ MHz}$ ;  $T_h = 25\text{ °C}$ ;  $Z_{th(mb-h)} = 0.15\text{ K/W}$ ;  $I_{Dq} = 150\text{ mA}$ ; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage		-	36	-	V
$P_L$	load power	$t_p = 50\text{ }\mu\text{s}$ ; $\delta = 2\text{ %}$	-	200	-	W
$G_p$	power gain	$P_L = 200\text{ W}$	13	-	-	dB
$\eta_D$	drain efficiency	$t_p = 50\text{ }\mu\text{s}$ ; $\delta = 2\text{ %}$	45	-	-	%
$t_r$	rise time		-	-	50	ns
$t_f$	fall time		-	-	50	ns

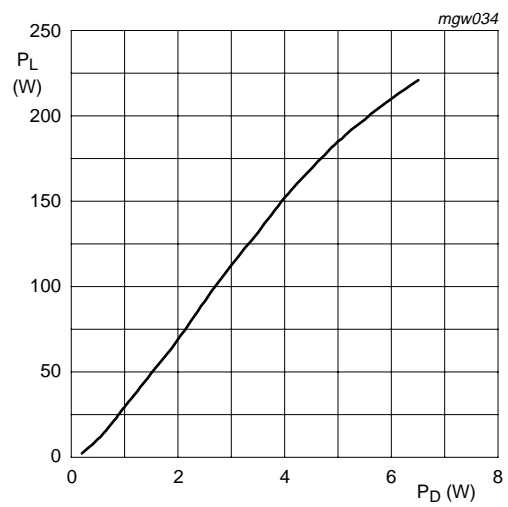
### 7.1 Ruggedness in class-AB operation

The BLA1011-200 and BLA1011S-200 are capable of withstanding a load mismatch corresponding to  $V_{SWR} = 5 : 1$  through all phases under the following conditions:  $V_{DS} = 36\text{ V}$ ;  $f = 1030\text{ MHz}$  to  $1090\text{ MHz}$  at rated load power.



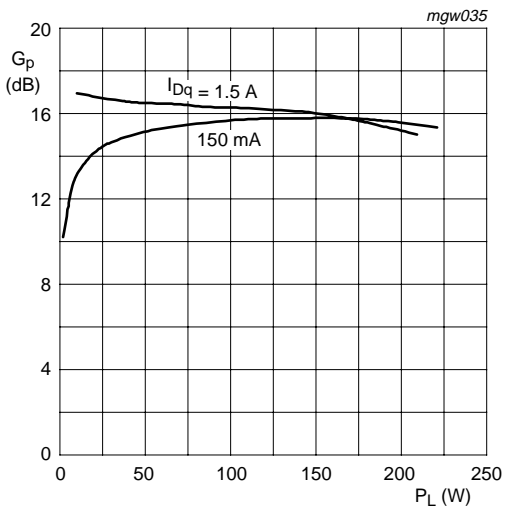
$V_{DS} = 36$  V;  $I_{Dq} = 150$  mA;  $f = 1060$  MHz;  $t_p = 50$   $\mu$ s;  $\delta = 2$  %

Fig 1. Power gain and drain efficiency as functions of load power; typical values



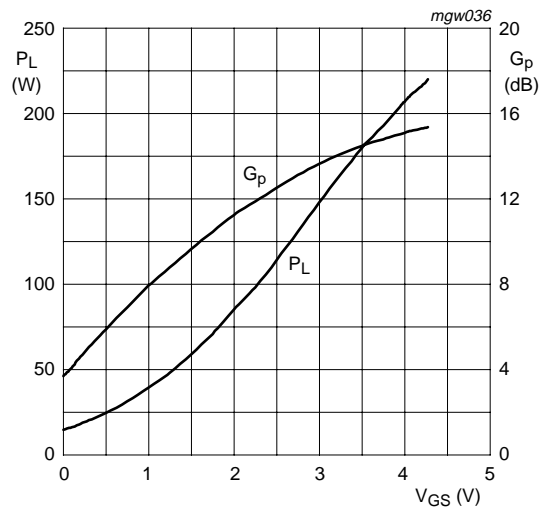
$V_{DS} = 36$  V;  $I_{Dq} = 150$  mA;  $f = 1060$  MHz;  $t_p = 50$   $\mu$ s;  $\delta = 2$  %

Fig 2. Load power as a function of drive power; typical values



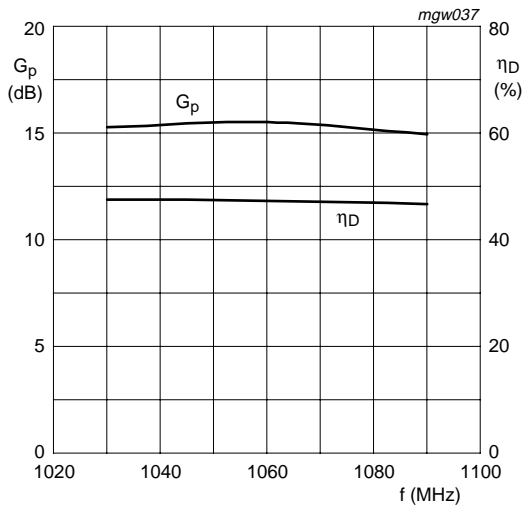
$V_{DS} = 36$  V;  $f = 1060$  MHz;  $t_p = 50$   $\mu$ s;  $\delta = 2$  %

Fig 3. Power gain as a function of load power; typical values



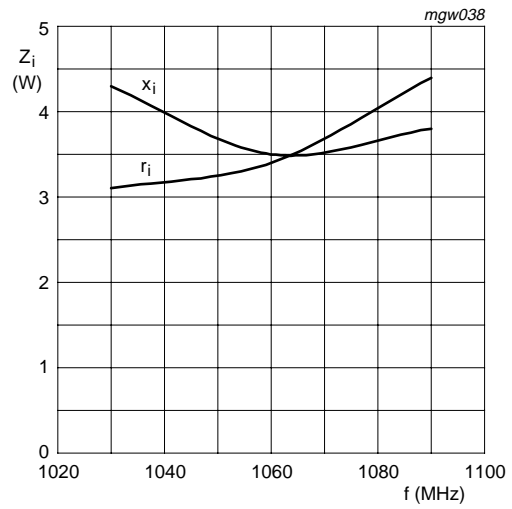
$V_{DS} = 36$  V;  $I_{Dq} = 150$  mA;  $P_i = 5.5$  W;  $f = 1060$  MHz;  $t_p = 50$   $\mu$ s;  $\delta = 2$  %

Fig 4. Load power and power gain as functions of gate-source voltage; typical values



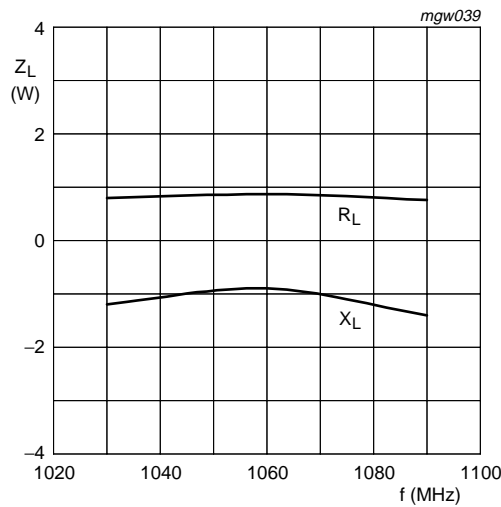
$V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $P_L = 200\text{ W}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$

Fig 5. Power gain and drain efficiency a functions of frequency; typical values



$V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $P_L = 200\text{ W}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$

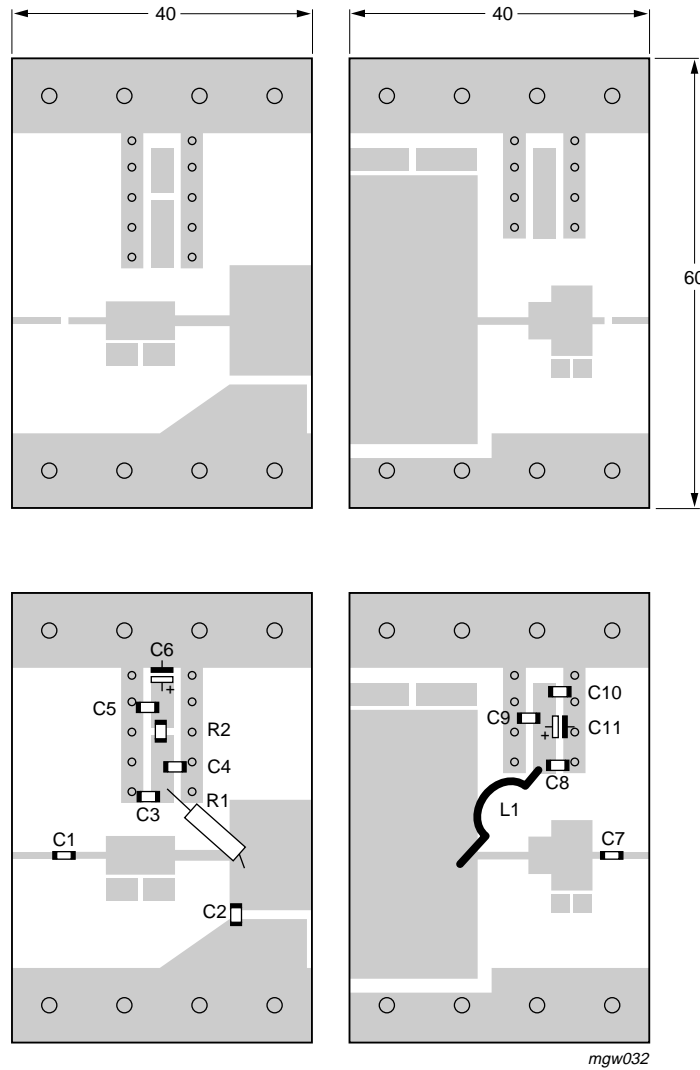
Fig 6. Input Impedance as a function of frequency (series components); typical values



$V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $P_L = 200\text{ W}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$

Fig 7. Load impedance as a function of frequency (series components); typical values

8. Test information



Dimensions in mm.

The components are situated on one side of the copper-clad Duroid Printed-Circuit Board (PCB) with  $\epsilon_r = 6.2$  and thickness 0.64 mm.

The other side is unetched and serves as a ground plane.

See [Table 8](#) for list of components.

**Fig 8. Component layout for 1030 MHz to 1090 MHz test circuit**

Table 8: List of components (see [Figure 8](#))

Component	Description	Value	Dimensions
C1	multilayer ceramic chip capacitor	[1] 39 pF	
C2	multilayer ceramic chip capacitor	[2] 4.3 pF	
C3	multilayer ceramic chip capacitor	[1] 11 pF	
C4, C7	multilayer ceramic chip capacitor	[1] 62 pF	
C5	multilayer ceramic chip capacitor	[1] 100 pF	
C6	electrolytic capacitor	47 $\mu$ F; 20 V	
C8	multilayer ceramic chip capacitor	[2] 20 pF	
C9	multilayer ceramic chip capacitor	[1] 47 pF	
C10	multilayer ceramic chip capacitor	[3] 1.2 nF	
C11	electrolytic capacitor	47 $\mu$ F; 63V	
L1	$\Omega$ -shaped enamelled 1 mm copper wire		length = 38 mm
R1	metal film resistor	301 $\Omega$	
R2	SMD 0508 resistor	18 $\Omega$	

[1] American Technical Ceramics type 100A or capacitor of same quality.

[2] American Technical Ceramics type 100B or capacitor of same quality.

[3] American Technical Ceramics type 700 or capacitor of same quality.

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

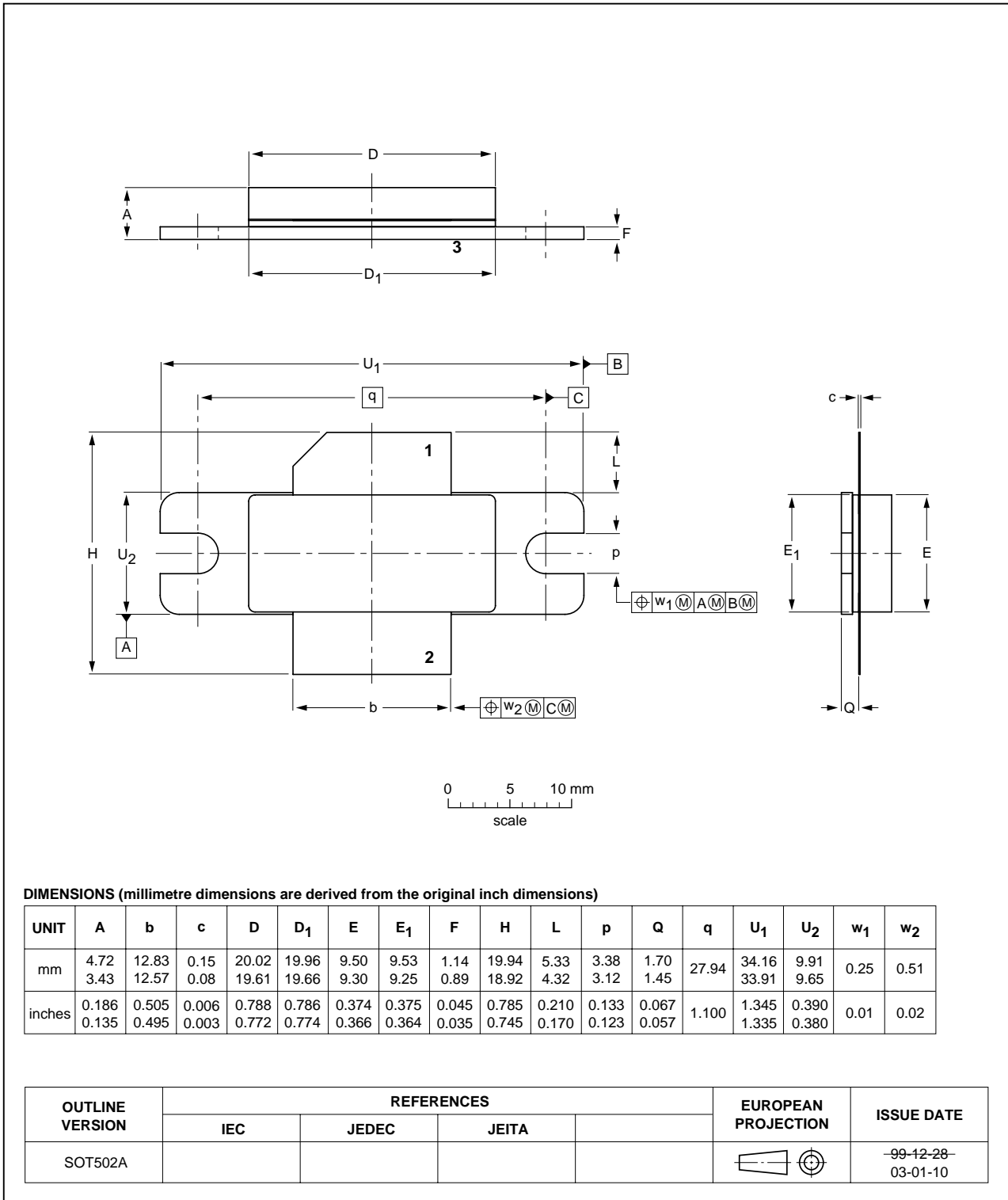


Fig 9. Package outline SOT502A



Earless flanged LDMOST ceramic package; 2 leads

SOT502B

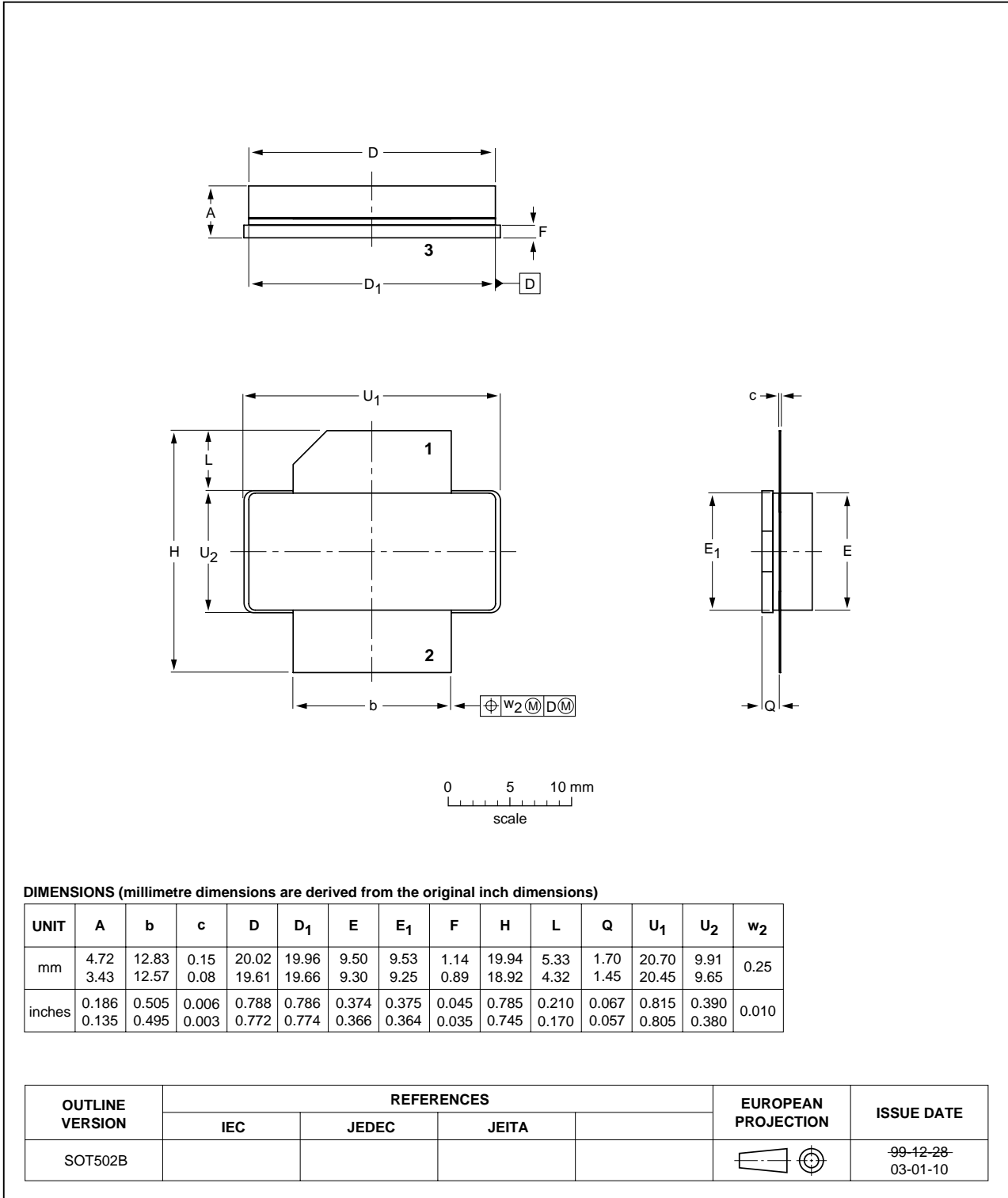


Fig 10. Package outline SOT502B

## 10. Abbreviations

Table 9: Abbreviations

Acronym	Description
$I_{Dq}$	quiescent drain current
LDMOS	Laterally Diffused Metal Oxide Semiconductor
RF	Radio Frequency
SMD	Surface Mount Device
VSWR	Voltage Standing Wave Ratio

## 11. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BLA1011-200_BLA1011S-200_8	20051026	Product data sheet	-	9397 750 14634	BLA1011-200_7
Modifications:					
					<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.</li> <li>SOT502B package added.</li> </ul>
BLA1011-200_7	20031111	Product specification	-	9397 750 12246	BLA1011-200_6
BLA1011-200_6	20020318	Product specification	-	9397 750 09414	BLA1011-200_5
BLA1011-200_5	20010515	Product specification	-	9397 750 08376	BLA1011-200_4
BLA1011-200_4	20010417	Product specification	-	9397 750 08139	BLA1011-200_N_3
BLA1011-200_N_3	20010302	Product specification	-	9397 750 08109	BLA1011-200_N_2
BLA1011-200_N_2	20001201	Product specification	-	9397 750 07638	BLA1011-200_N_1
BLA1011-200_N_1	20000906	Product specification	-	9397 750 07326	-

## 12. Data sheet status

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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**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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## 17. Contents

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<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features . . . . .	1
1.3	Applications . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Limiting values</b> . . . . .	<b>2</b>
<b>5</b>	<b>Thermal characteristics</b> . . . . .	<b>3</b>
<b>6</b>	<b>Characteristics</b> . . . . .	<b>3</b>
<b>7</b>	<b>Application information</b> . . . . .	<b>3</b>
7.1	Ruggedness in class-AB operation . . . . .	3
<b>8</b>	<b>Test information</b> . . . . .	<b>6</b>
<b>9</b>	<b>Package outline</b> . . . . .	<b>8</b>
<b>10</b>	<b>Abbreviations</b> . . . . .	<b>10</b>
<b>11</b>	<b>Revision history</b> . . . . .	<b>11</b>
<b>12</b>	<b>Data sheet status</b> . . . . .	<b>12</b>
<b>13</b>	<b>Definitions</b> . . . . .	<b>12</b>
<b>14</b>	<b>Disclaimers</b> . . . . .	<b>12</b>
<b>15</b>	<b>Trademarks</b> . . . . .	<b>12</b>
<b>16</b>	<b>Contact information</b> . . . . .	<b>12</b>



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