

# 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

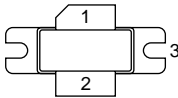
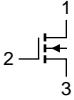
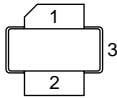
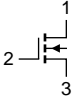
### 1.3 Applications

- 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	$T_h \leq 25\text{ °C}$ ; $t_p = 50\text{ }\mu\text{s}$ ; $\delta = 2\%$	-	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

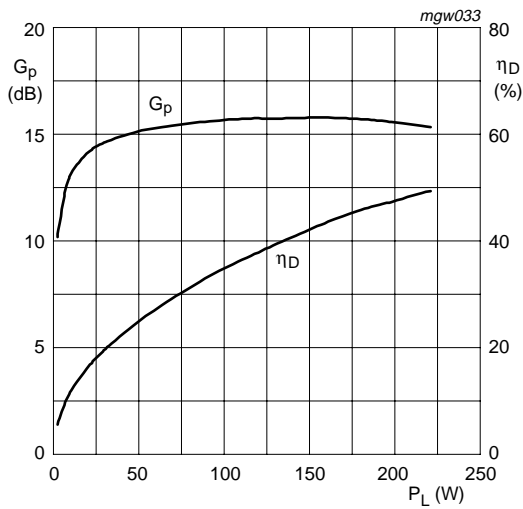
**Table 7: Application information**

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

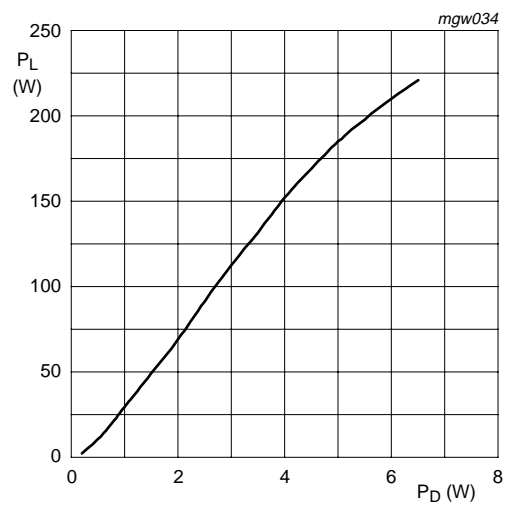
### 7.1 Ruggedness in class-AB operation

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.



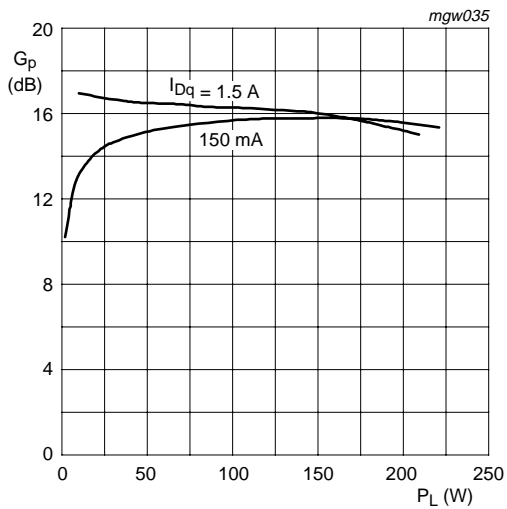
$V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $f = 1060\text{ MHz}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$

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



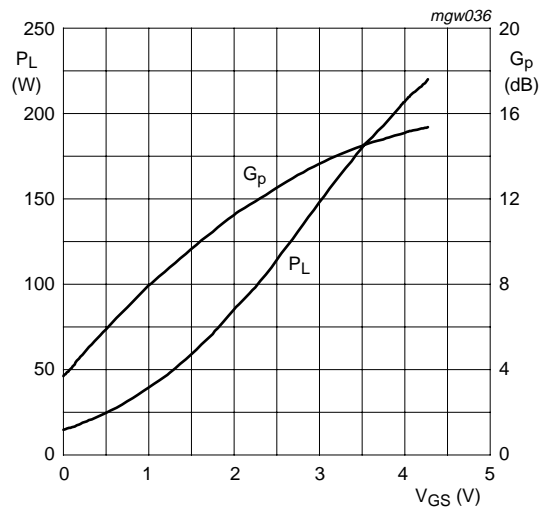
$V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $f = 1060\text{ MHz}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$

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



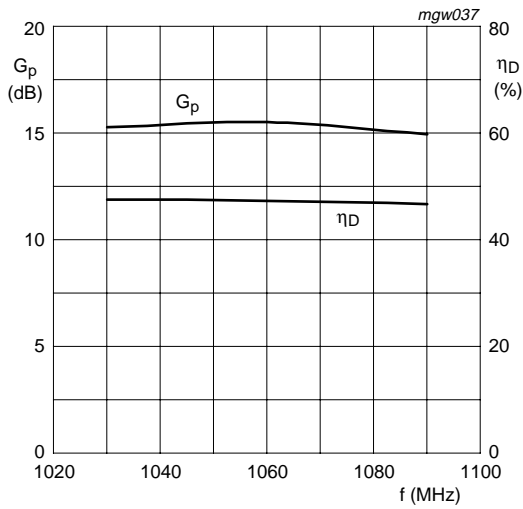
$V_{DS} = 36\text{ V}$ ;  $f = 1060\text{ MHz}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$

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



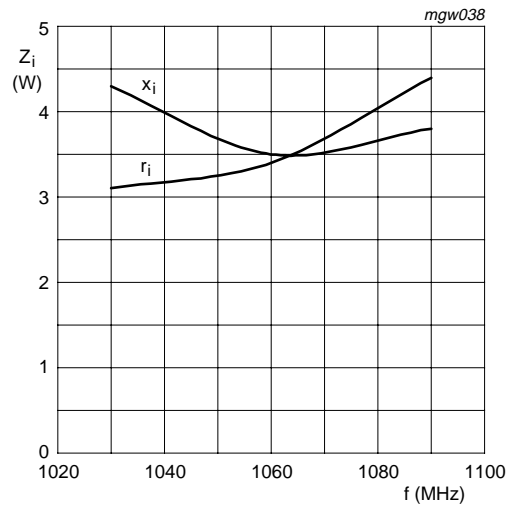
$V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $P_i = 5.5\text{ W}$ ;  $f = 1060\text{ MHz}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$

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



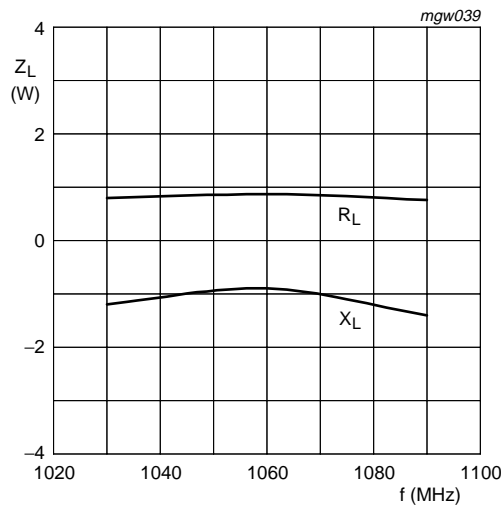
$V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $P_L = 200\text{ W}$ ;  $t_p = 50\text{ }\mu\text{s}$ ;  $\delta = 2\%$

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



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

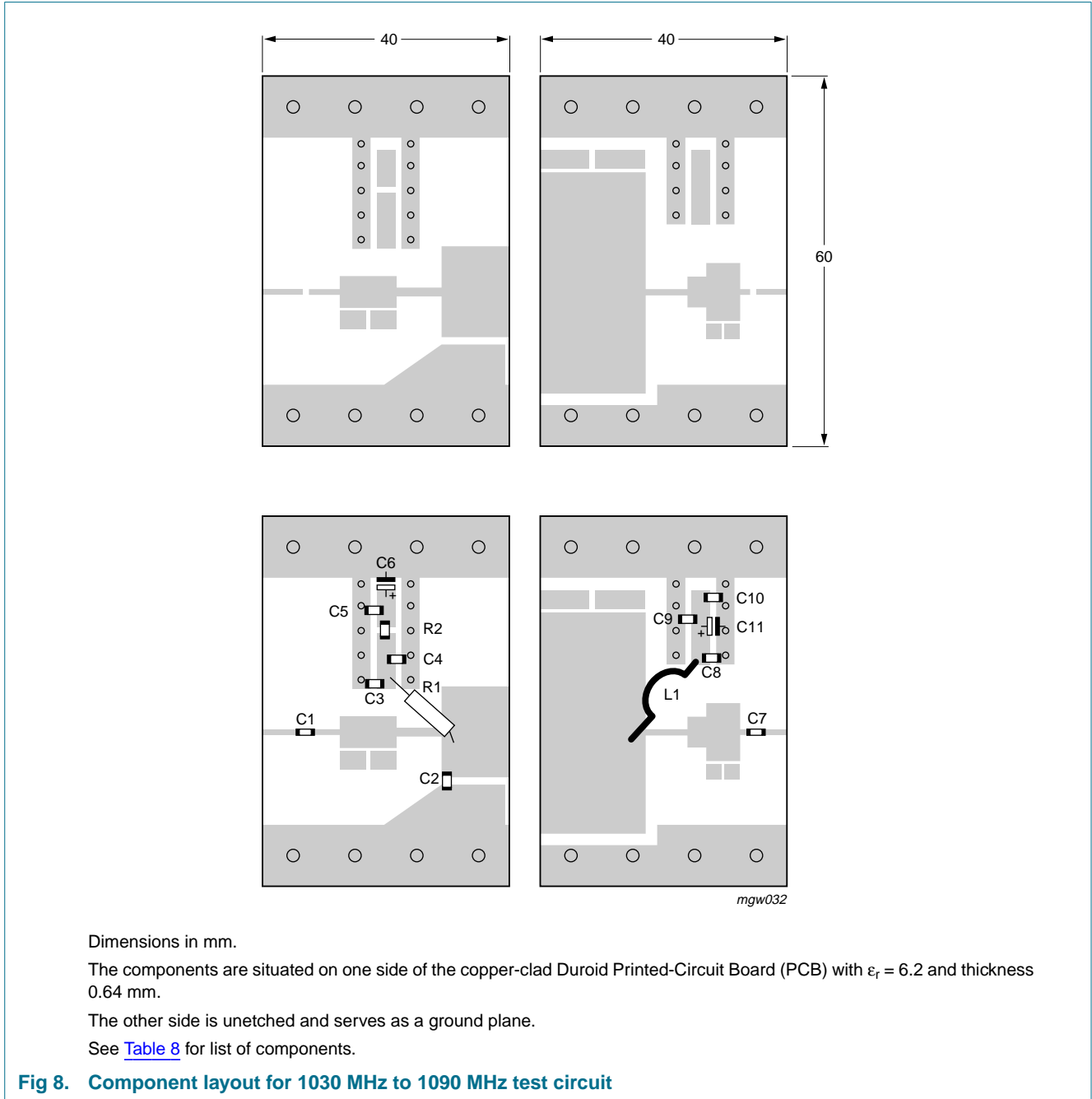
Fig 6. Input Impedance as a function of frequency (series components); typical values



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

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

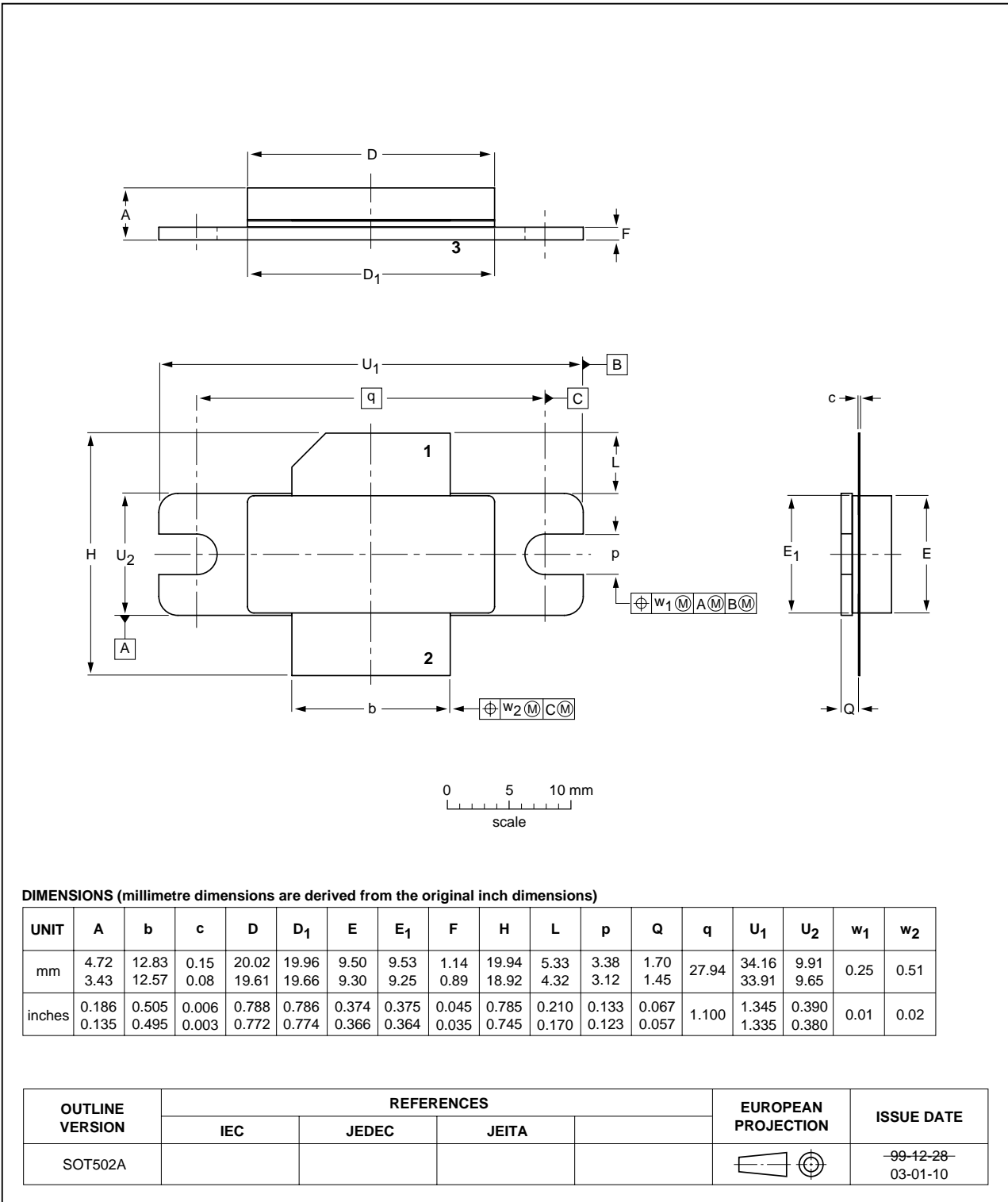


Fig 9. Package outline SOT502A



Earless flanged LDMOST ceramic package; 2 leads

SOT502B

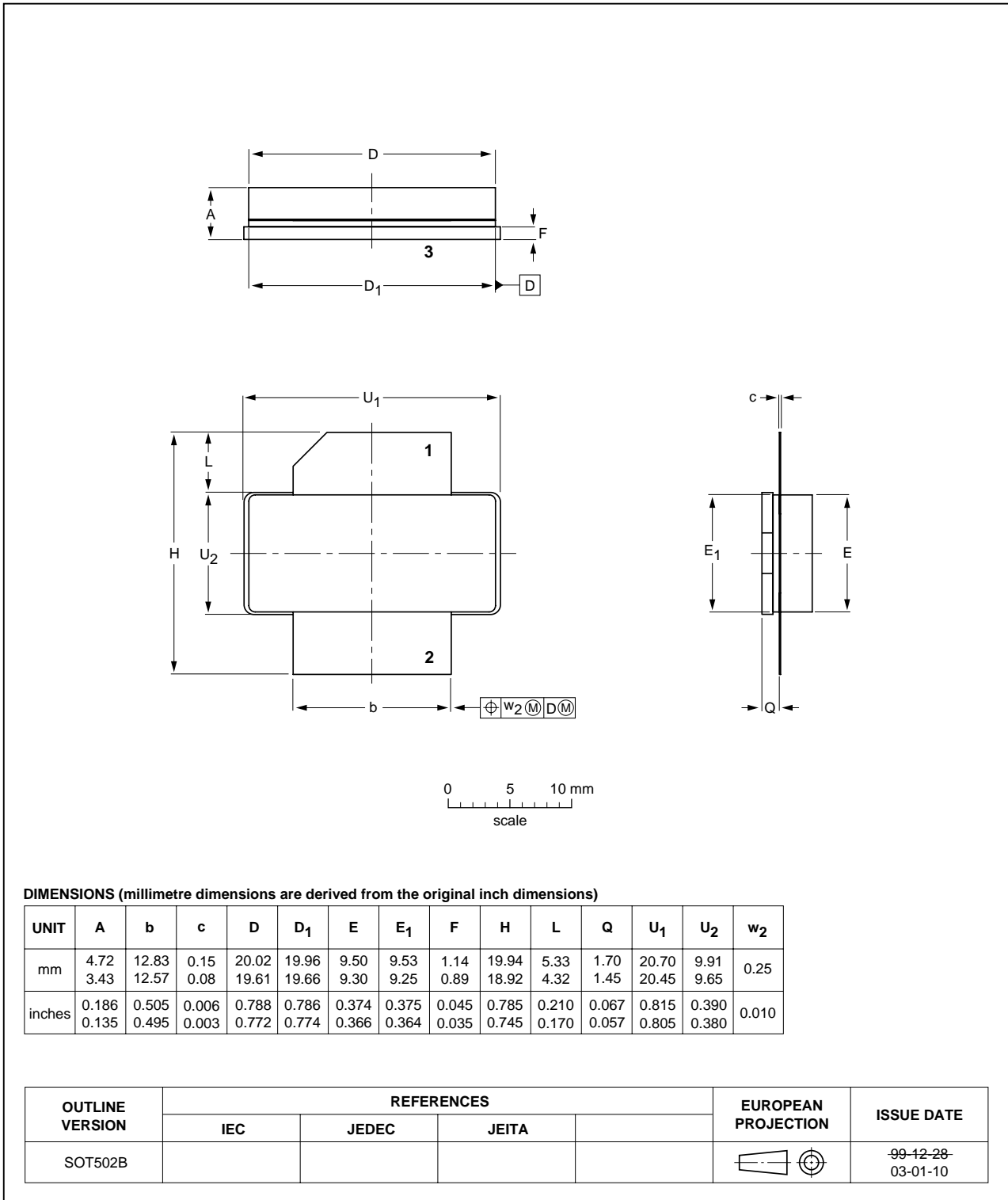


Fig 10. Package outline SOT502B

## 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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## 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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