

# BLF6G10-135RN; BLF6G10LS-135RN

Power LDMOS transistor

Rev. 02 — 21 January 2010

Product data sheet

## 1. Product profile

### 1.1 General description

135 W LDMOS power transistor for base station applications at frequencies from 700 MHz to 1000 MHz.

**Table 1. Typical performance**

Typical RF performance at  $T_{case} = 25\text{ °C}$  in a class-AB production test circuit.

Mode of operation	f (MHz)	$V_{DS}$ (V)	$P_{L(AV)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	ACPR (dBc)
2-carrier W-CDMA	869 to 894	28	26.5	21.0	28.0	-39 <sup>[1]</sup>

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7.5 dB at 0.01 % probability on CCDF per carrier; carrier spacing 5 MHz.

#### CAUTION



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

### 1.2 Features

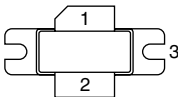
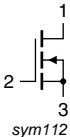
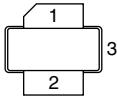
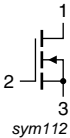
- Typical 2-carrier W-CDMA performance at frequencies of 869 MHz and 894 MHz, a supply voltage of 28 V and an  $I_{DQ}$  of 950 mA:
  - ◆ Average output power = 26.5 W
  - ◆ Power gain = 21.0 dB
  - ◆ Efficiency = 28.0 %
  - ◆ ACPR = -39 dBc
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (700 MHz to 1000 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding restriction of hazardous substances (RoHS)

## 1.3 Applications

- RF power amplifiers for GSM, GSM EDGE, W-CDMA and CDMA base stations and multi carrier applications in the 700 MHz to 1000 MHz frequency range

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
<b>BLF6G10-135RN (SOT502A)</b>			
1	drain		 sym112
2	gate		
3	source		
<b>BLF6G10LS-135RN (SOT502B)</b>			
1	drain		 sym112
2	gate		
3	source		

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLF6G10-135RN	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF6G10LS-135RN	-	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		-	65	V
$V_{GS}$	gate-source voltage		-0.5	+13	V
$I_D$	drain current		-	32	A
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	225	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Type	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_L = 25\text{ W}$	BLF6G10-135RN	0.68	K/W
			BLF6G10LS-135RN	0.56	K/W

## 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	$V_{GS} = 0\text{ V}; I_D = 0.8\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$	1.4	1.9	2.4	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 28\text{ V}; I_D = 950\text{ mA}$	1.6	2.1	2.6	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	3	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	24	32	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	300	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 9\text{ A}$	7	13	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 6.3\text{ A}$	-	0.1	-	$\Omega$
$C_{rs}$	feedback capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$	-	2.0	-	pF

## 7. Application information

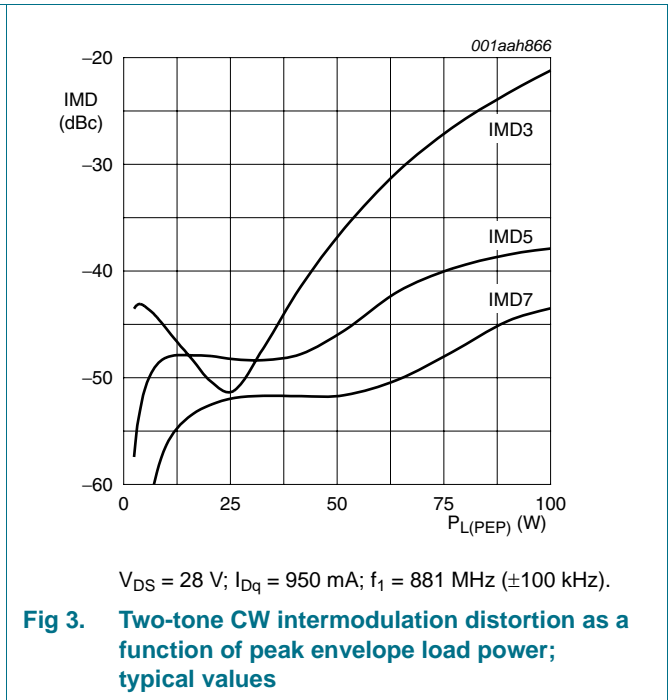
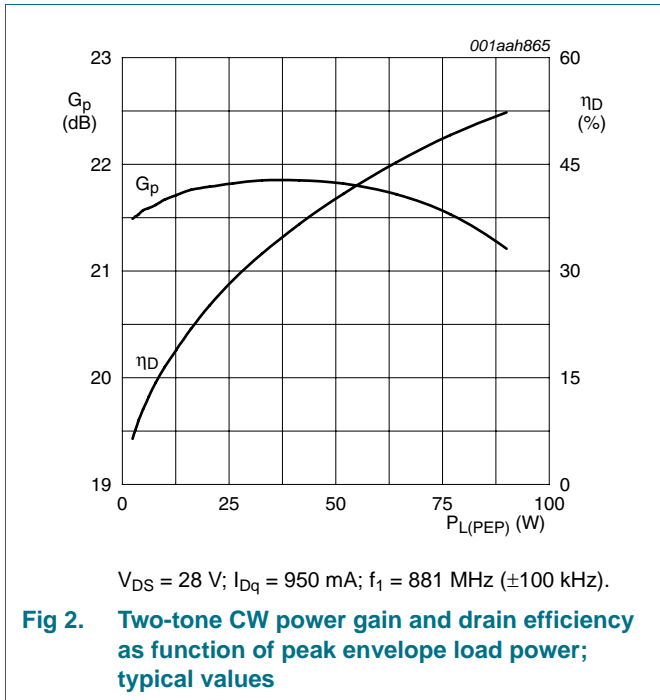
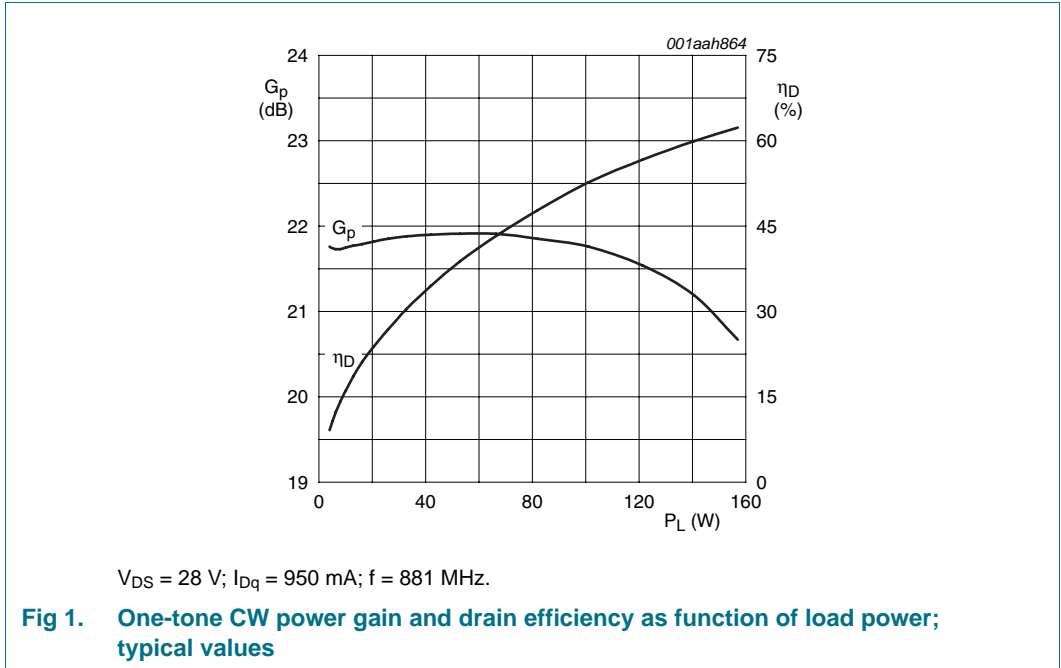
**Table 7. Application information**

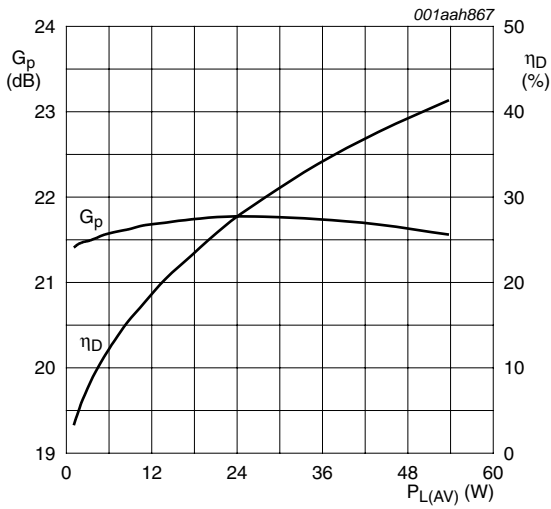
Mode of operation: 2-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1-64 PDPCH;  $f_1 = 871.5\text{ MHz}; f_2 = 876.5\text{ MHz}; f_3 = 886.5\text{ MHz}; f_4 = 891.5\text{ MHz};$  RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}; T_{case} = 25\text{ °C};$  unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	26.5	-	W
$G_p$	power gain	$P_{L(AV)} = 26.5\text{ W}$	20.0	21.0	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 26.5\text{ W}$	-	-10.0	-6.5	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 26.5\text{ W}$	26.0	28.0	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)} = 26.5\text{ W}$	-	-39	-36.5	dBc

### 7.1 Ruggedness in class-AB operation

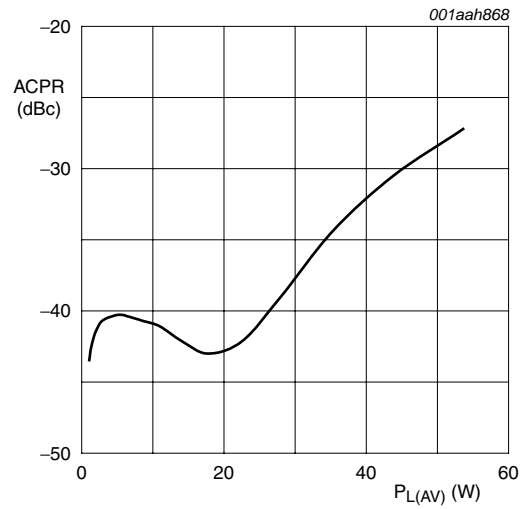
The BLF6G10-135RN and BLF6G10LS-135RN are capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 950\text{ mA}; P_L = 135\text{ W}; f = 894\text{ MHz}.$





$V_{DS} = 28$  V;  $I_{DQ} = 950$  mA;  $f_1 = 881$  MHz;  $f_2 = 886$  MHz; carrier spacing 5 MHz.

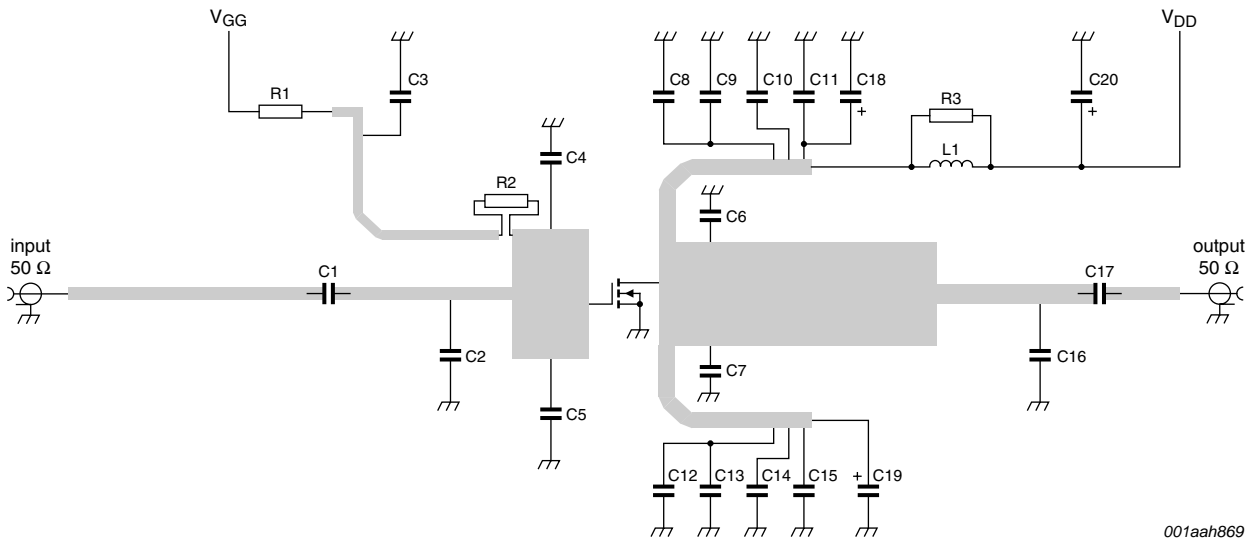
**Fig 4. 2-carrier W-CDMA power gain and drain efficiency as function of average load power; typical values**



$V_{DS} = 28$  V;  $I_{DQ} = 950$  mA;  $f_1 = 881$  MHz;  $f_2 = 886$  MHz; carrier spacing 5 MHz.

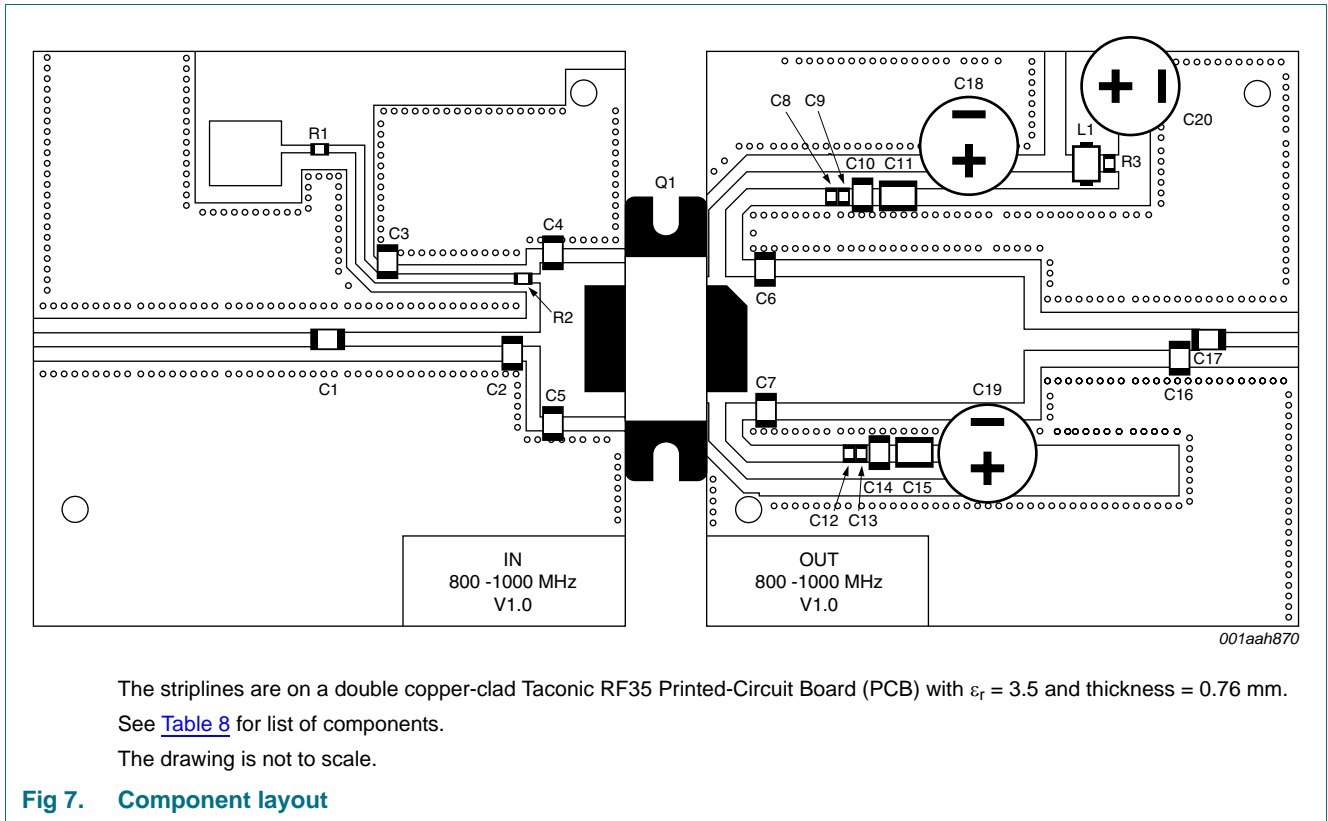
**Fig 5. 2-carrier W-CDMA adjacent power channel ratio as a function of average load power; typical values**

**8. Test information**



The drawing is not to scale.

**Fig 6. Test circuit for operation at 800 MHz**



The striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) with  $\epsilon_r = 3.5$  and thickness = 0.76 mm. See Table 8 for list of components.

**Table 8. List of components**

See Figure 6 and Figure 7.

Component	Description	Value	Remarks
C1, C3, C10, C14, C17	multilayer ceramic chip capacitor	68 pF	[1] solder vertically
C2, C4, C5	multilayer ceramic chip capacitor	8.2 pF	[1] solder vertically
C6, C7	multilayer ceramic chip capacitor	10 pF	[1] solder vertically
C8, C9, C12, C13	electrolytic capacitor	100 nF	Vishay or capacitor of same quality.
C11, C15	multilayer ceramic chip capacitor	4.7 $\mu$ F; 50 V	[2]
C16	multilayer ceramic chip capacitor	3.0 pF	[1] solder vertically
C18, C19, C20	electrolytic capacitor	220 $\mu$ F; 63 V	
L1	ferrite SMD bead		Ferroxcube BDS 3/3/4.6-4S2 or equivalent
Q1	BLF6G10LS-135RN		
R1, R2, R3	SMD resistor	9.1 $\Omega$ ; 0.1 W	

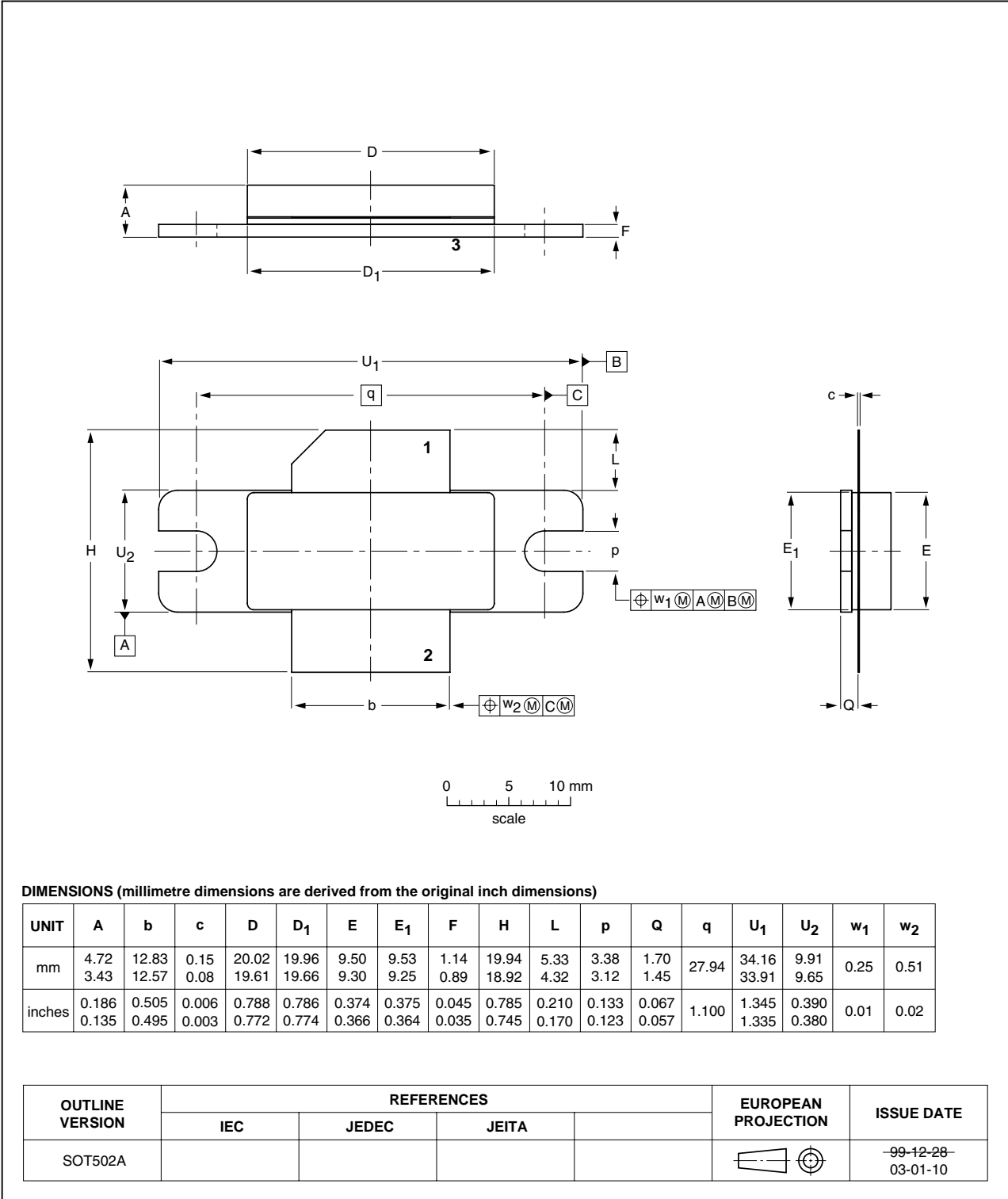
[1] American Technical Ceramics type 100B or capacitor of same quality.

[2] TDK or capacitor of same quality.

**9. Package outline**

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A



**Fig 8. Package outline SOT502A**

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

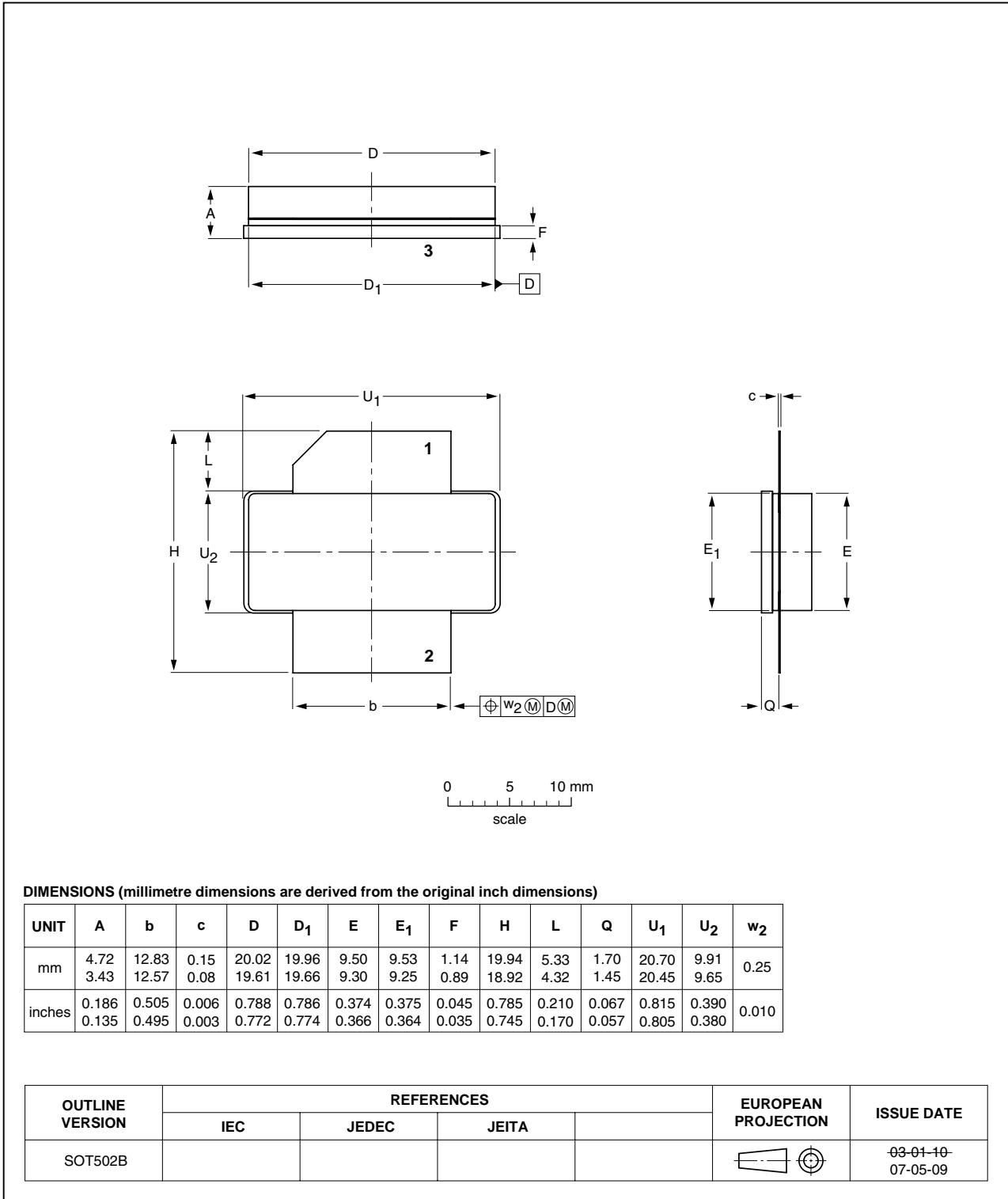


Fig 9. Package outline SOT502B



## 10. Abbreviations

Table 9. Abbreviations

Acronym	Description
3GPP	Third Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CDMA	Code Division Multiple Access
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
EDGE	Enhanced Data rates for GSM Evolution
GSM	Global System for Mobile communications
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
PAR	Peak-to-Average power Ratio
PDPCH	transmission Power of the Dedicated Physical CHannel
RF	Radio Frequency
SMD	Surface Mounted Device
VSWR	Voltage Standing-Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

## 11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G10-135RN_10LS-135RN_2	20100121	Product data sheet	-	BLF6G10-135RN_10LS-135RN_1
Modifications				
				<ul style="list-style-type: none"> <li>• <a href="#">Section 1.1 "General description"</a> lower frequency range extended to 700 MHz from 800 MHz.</li> <li>• <a href="#">Section 1.2 "Features"</a> lower frequency range extended to 700 MHz from 800 MHz.</li> <li>• <a href="#">Section 1.3 "Applications"</a> lower frequency range extended to 700 MHz from 800 MHz.</li> <li>• <a href="#">Section 12 "Legal information"</a> export control disclaimer added.</li> </ul>
BLF6G10-135RN_10LS-135RN_1	20090210	Product data sheet	-	-

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### 12.1 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.

[1] Please consult the most recently issued document before initiating or completing a design.

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

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