

# BLF6G15L-250PBRN

Power LDMOS transistor

Rev. 2 — 3 November 2010

Product data sheet

## 1. Product profile

### 1.1 General description

250 W LDMOS power transistor for base station applications at frequencies from 1450 MHz to 1550 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 <sub>DS</sub> (V)	P <sub>L(AV)</sub> (W)	G <sub>p</sub> (dB)	η <sub>D</sub> (%)	ACPR (dBc)
2C-WCDMA	1476 to 1511	28	60	18.5	33.0	-32 <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 and benefits

- Typical 2C-WCDMA performance at frequencies of 1476 MHz and 1511 MHz, a supply voltage of 28 V and an I<sub>DQ</sub> of 1410 mA:
  - ◆ Average output power = 60 W
  - ◆ Power gain = 18.5 dB
  - ◆ Efficiency = 33.0 %
  - ◆ ACPR = -32 dBc
- Easy power control
- Integrated ESD protection
- Enhanced ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1450 MHz to 1550 MHz)
- Internally matched for ease of use
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC
- Integrated current sense



## 1.3 Applications

- RF power amplifiers for GSM, GSM EDGE, CDMA and W-CDMA and multi carrier applications in the 1450 MHz to 1550 MHz frequency range

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source <a href="#">[1]</a>		
6, 7	sense drain		
8, 9	sense gate		

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLF6G15L-250PBRN	-	flanged LDMOST ceramic package; 2 mounting holes; 8 leads	SOT1110A

## 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	+11	V
$I_D$	drain current		-	64	A
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_L = 60\text{ W (CW)}$	0.29	K/W

## 6. Characteristics

**Table 6. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 1.8\text{ mA}$	65	75	-	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
$I_{Dq}$	quiescent drain current	sense transistor: $I_{DS} = 20.1\text{ mA};$ $V_{DS} = 12\text{ V}$ main transistor: $V_{DS} = 28\text{ V}$	1.31	1.41	1.51	A
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	2.8	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $V_{DS} = 10\text{ V}$	25.3	29	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	280	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 9\text{ A}$	8.1	11.3	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $I_D = 6.3\text{ A}$	0.03	0.1	0.16	$\Omega$

## 7. Application information

**Table 7. RF performance**

Mode of operation: 2-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 1473.4\text{ MHz}; f_2 = 1478.4\text{ MHz}; f_3 = 1508.4\text{ MHz}; f_4 = 1513.4\text{ MHz};$  RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 1410\text{ mA}; T_{case} = 25\text{ °C};$  unless otherwise specified in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	60	-	W
$G_p$	power gain	$P_{L(AV)} = 60\text{ W}$	16.5	18.5	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 60\text{ W}$	8	12	-	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 60\text{ W}$	30	33	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)} = 60\text{ W}$	-	-32	-27	dBc

**Table 8. PAR performance**

Mode of operation; 1-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 1510.9\text{ MHz};$  RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 1410\text{ mA}; T_{case} = 25\text{ °C};$  unless otherwise specified in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$PAR_O$	output peak-to-average ratio	$P_{L(AV)} = 120\text{ W}$ at 0.01 % probability on CCDF	3.4	4.2	-	dB

**Table 9. Phase binning**

Off state  $S_{11}$  measurement;  $V_{DS} = 28\text{ V}$ ;  $V_{GS} = 0\text{ V}$

Marking code	Input Resonance Frequency (GHz)	
	Min	Max
1	1.85	1.89
2	1.89	1.93
3	1.93	1.97

**Table 10. Gain binning**

Mode of operation: 2-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 1473.4\text{ MHz}$ ,  $f_2 = 1478.4\text{ MHz}$ ;  $P_{L(AV)} = 60\text{ W}$ ;  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1410\text{ mA}$

Marking code	Gain at a center frequency of 1475.9 MHz in dB	
	Min	Max
BT	17.0	17.5
BU	17.5	18.0
BW	18.0	18.5
BX	18.5	19.0

### 7.1 Ruggedness in class-AB operation

The BLF6G15L-250PBRN is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1410\text{ mA}$ ;  $P_L = 200\text{ W}$ ;  $f = 1475\text{ MHz}$ .

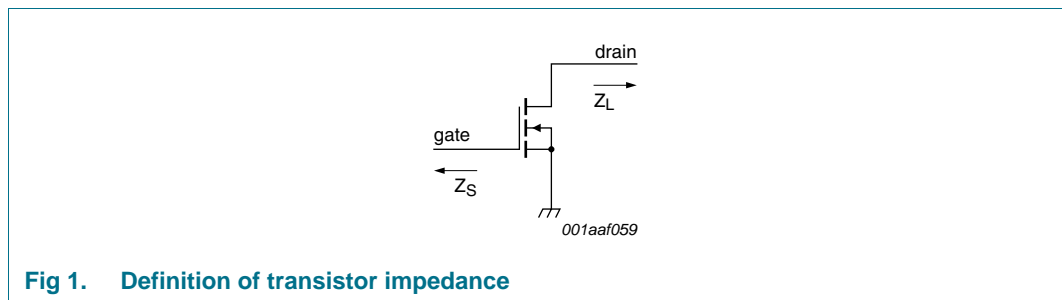
### 7.2 Impedance information

**Table 11. Typical impedance per section**

$I_{Dq} = 950\text{ mA}$ ; main transistor  $V_{DS} = 28\text{ V}$

f (MHz)	$Z_S$ [1] ( $\Omega$ )	$Z_L$ [1] ( $\Omega$ )
1480	1.1 – j2.8	2.3 – j3.2
1510	1.3 – j2.8	2.1 – j2.8

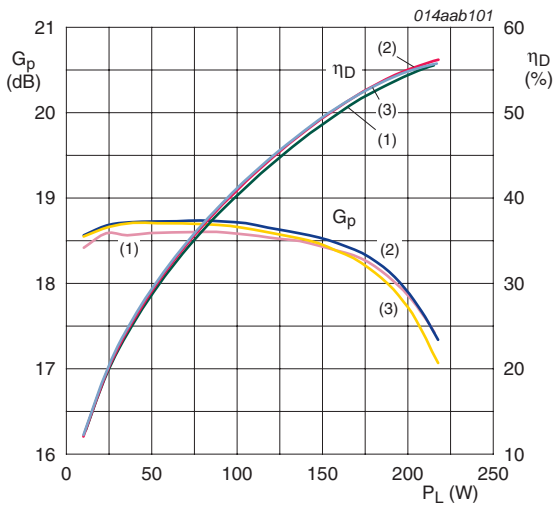
[1]  $Z_S$  and  $Z_L$  defined in [Figure 1](#).



**Fig 1. Definition of transistor impedance**

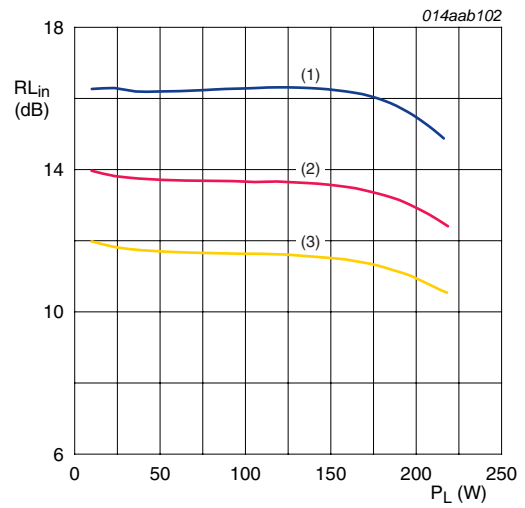
**7.3 Graphs**

**7.3.1 CW**



- (1)  $f = 1475$  MHz
- (2)  $f = 1493$  MHz
- (3)  $f = 1511$  MHz

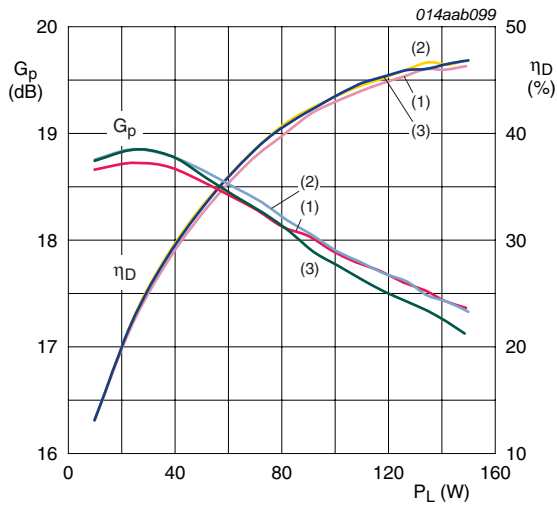
**Fig 2. Power gain and drain efficiency as function of output power; typical values**



- (1)  $f = 1475$  MHz
- (2)  $f = 1493$  MHz
- (3)  $f = 1511$  MHz

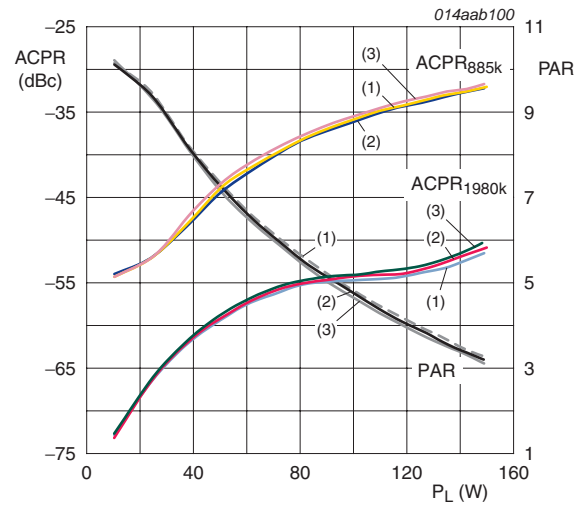
**Fig 3. Input return loss as a function of output power; typical values**

7.3.2 IS-95



IS-95: PAR = 9.8 dB at 0.01 % probability of the CCDF.  
 (1) f = 1475 MHz  
 (2) f = 1493 MHz  
 (3) f = 1511 MHz

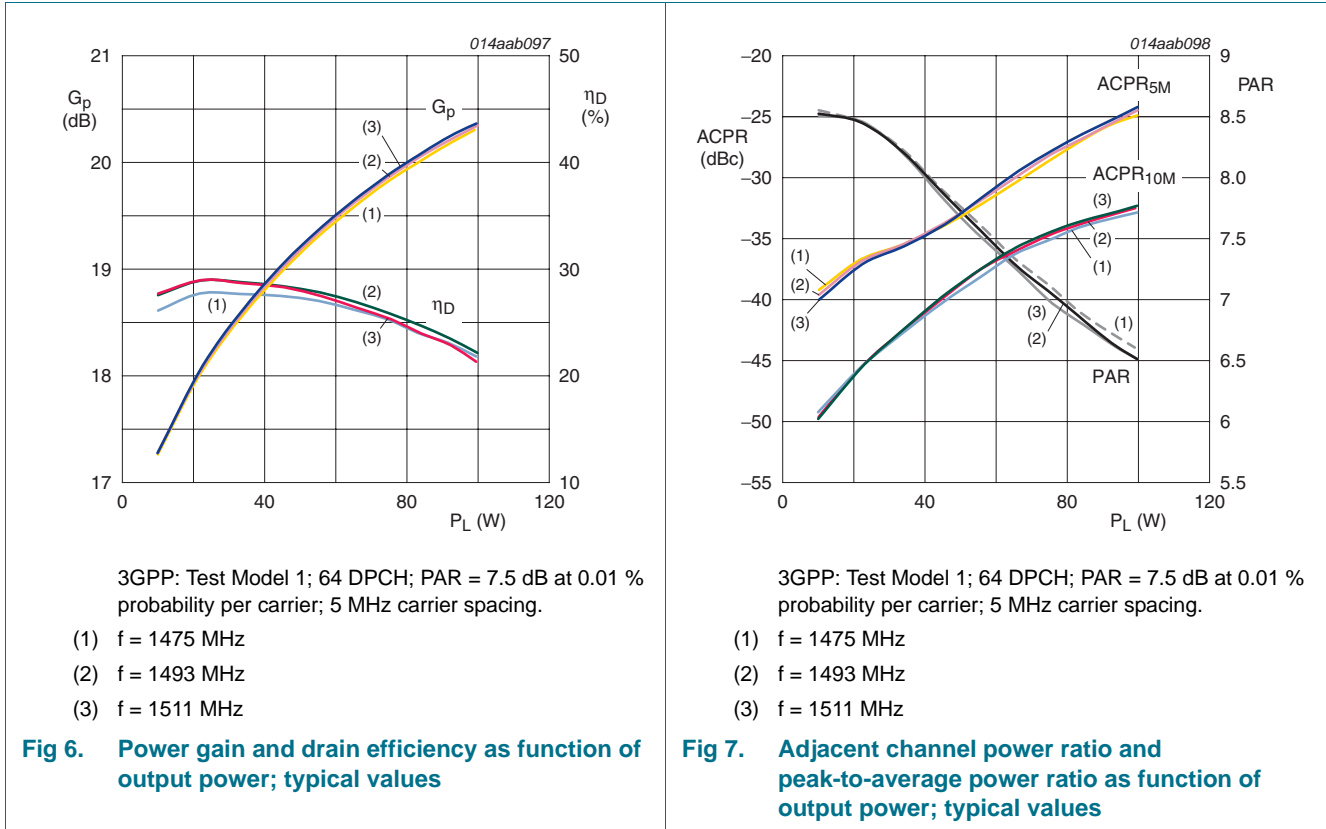
**Fig 4. Power gain and drain efficiency as function of output power; typical values**



IS-95: PAR = 9.8 dB at 0.01 % probability of the CCDF.  
 (1) f = 1475 MHz  
 (2) f = 1493 MHz  
 (3) f = 1511 MHz

**Fig 5. Adjacent channel power ratio and peak-to-average power ratio as function of output power; typical values**

**7.3.3 2C-WCDMA (5 MHz spacing)**



**8. Test information**

**Table 12. List of components**

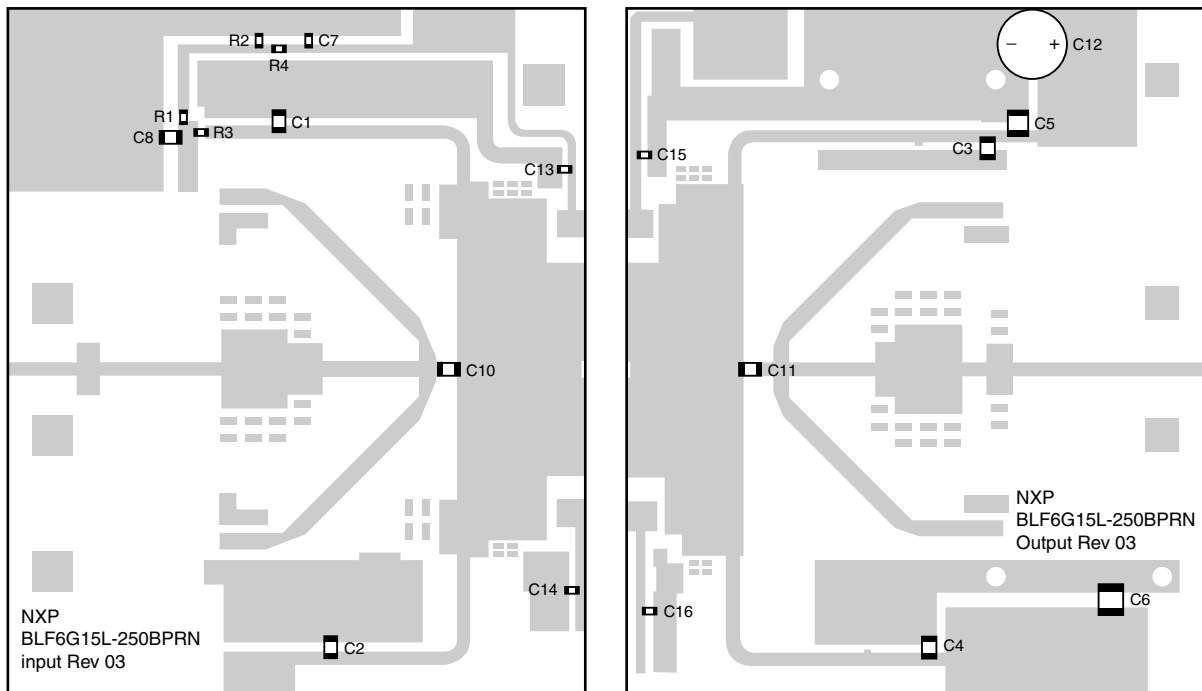
See [Figure 8](#) for component layout.

Component	Description	Value	Remarks
C1, C2, C3, C4	multi layer ceramic chip capacitor	100 pF	[1]
C5, C6	multi layer ceramic chip capacitor	10 μF	[2]
C7	multi layer ceramic chip capacitor	10 nF	[2] on input gate line as shown
C8	multi layer ceramic chip capacitor	100 nF	[2]
C10	multi layer ceramic chip capacitor	2.4 pF	[1]
C11	multi layer ceramic chip capacitor	3.6 pF	[3]
C12	electrolytic capacitor	470 μF; 63 V	
C13, C14, C15, C16	multi layer ceramic chip capacitor	33 pF	[3]
R1	chip resistor	3.9 kΩ	Philips 0603
R2	chip resistor	2.2 kΩ	Philips 0603
R3	chip resistor	10 Ω	Philips 0603
R4	chip resistor	0 Ω	Philips 0603

[1] American Technical Ceramics type 800B or capacitor of same quality.

[2] TDK or capacitor of same quality.

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



014aab104

Printed-Circuit Board (PCB): Taconic RF-35A2;  $\epsilon_r = 3.5$  F/m; thickness = 0.762 mm; thickness copper plating = 35  $\mu\text{m}$ .

The vias can be as a reference to place components.

The above layout shows the test circuit used to measure the devices in production. A more appropriate application demonstration for specific customer needs can be provided.

See [Table 12](#) for list of components.

**Fig 8. Component layout**



9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 8 leads

SOT1110A

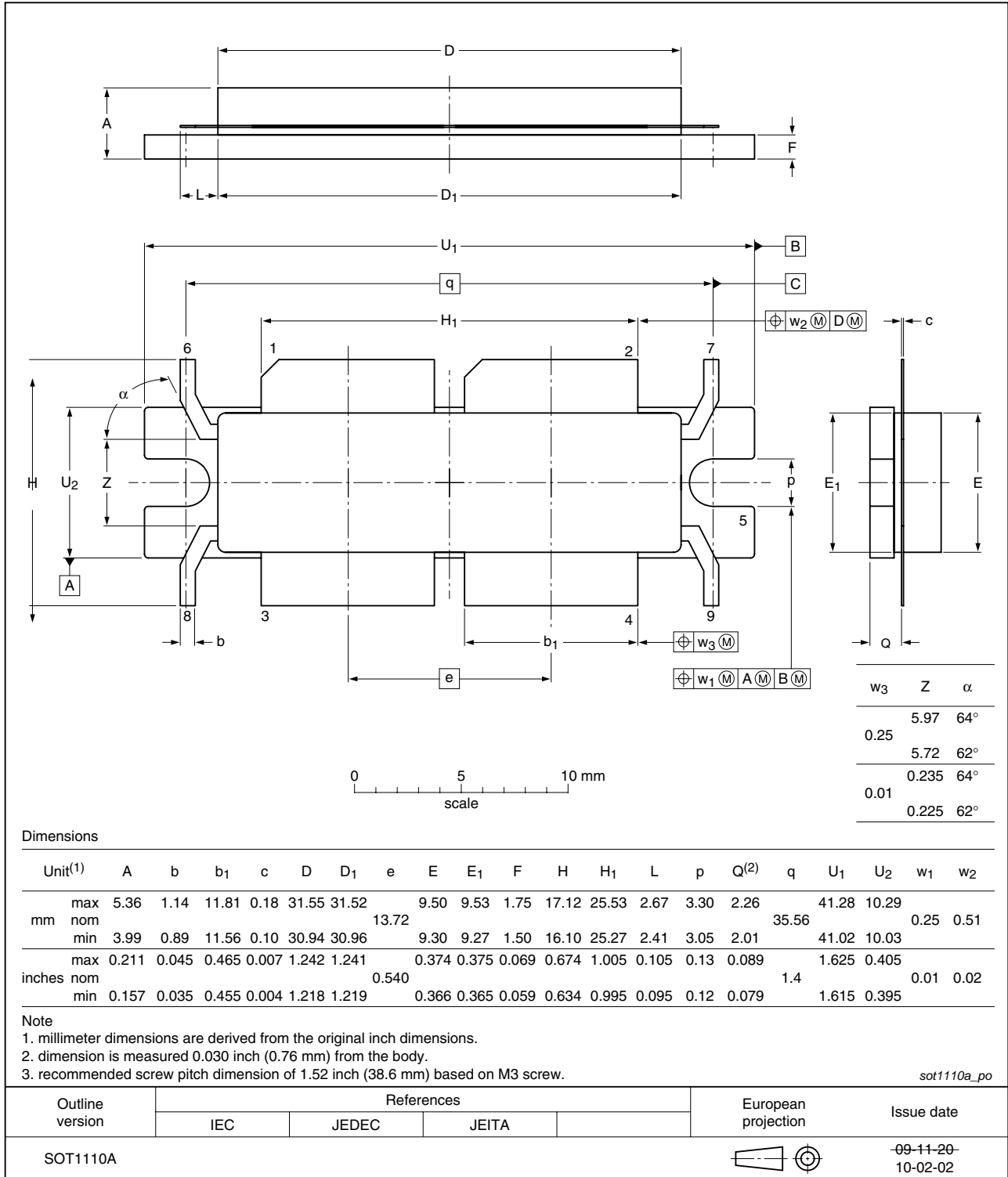


Fig 9. Package outline SOT1110A

## 10. Abbreviations

**Table 13. Abbreviations**

Acronym	Description
CCDF	Complementary Cumulative Distribution Function
CDMA	Code Division Multiple Access
CW	Continuous Wave
EDGE	Enhanced Data rates for GSM Evolution
DPCH	Dedicated Physical CHannel
GSM	Global System for Mobile communications
IS-95	Interim Standard 95
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
PAR	Peak-to-Average power Ratio
RF	Radio Frequency
VSWR	Voltage Standing-Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

## 11. Revision history

**Table 14. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G15L-250PBRN v.2	20101103	Product data sheet	-	BLF6G15L-250PBRN v.1
BLF6G15L-250PBRN v.1	20100914	Preliminary data sheet	-	-

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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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Date of release: 3 November 2010  
 Document identifier: BLF6G15L-250PBRN