

# BLF7G21LS-160

Power LDMOS transistor

Rev. 1 — 20 April 2012

Product data sheet

## 1. Product profile

### 1.1 General description

160 W LDMOS power transistor for base station applications at frequencies from 1800 MHz to 2050 MHz.

**Table 1. Typical performance**

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

Mode of operation	f (MHz)	$I_{DQ}$ (mA)	$V_{DS}$ (V)	$P_{L(AV)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	ACPR (dBc)
2-carrier W-CDMA	1930 to 1990	1080	28	45	18	34	-30 [1]
1-carrier W-CDMA	1930 to 1990	1080	28	50	18	36	-34 [2]

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF; carrier spacing 5 MHz.

[2] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF.

### 1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low  $R_{th}$  providing excellent thermal stability
- Designed for broadband operation (1800 MHz to 2050 MHz)
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

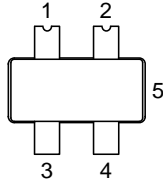
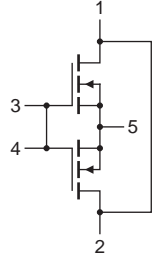
### 1.3 Applications

- RF power amplifiers for base stations and multi carrier applications in the 1800 MHz to 2050 MHz frequency range



## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	drain		
2	drain		
3	gate		
4	gate		
5	source		

aaa-001924

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
BLF7G21LS-160	-	earless flanged LDMOST ceramic package; 4 leads	SOT1121B

## 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
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_L = 100\text{ W}$	0.41	K/W

## 6. Characteristics

**Table 6. Characteristics**

$T_j = 25\text{ }^\circ\text{C}$ .

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	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$	1.5	1.9	2.3	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	2.8	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $V_{DS} = 10\text{ V}$	-	34	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	280	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 9\text{ A}$	-	13	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $I_D = 6.3\text{ A}$	-	0.08	-	$\Omega$

## 7. Test information

**Table 7. Application information**

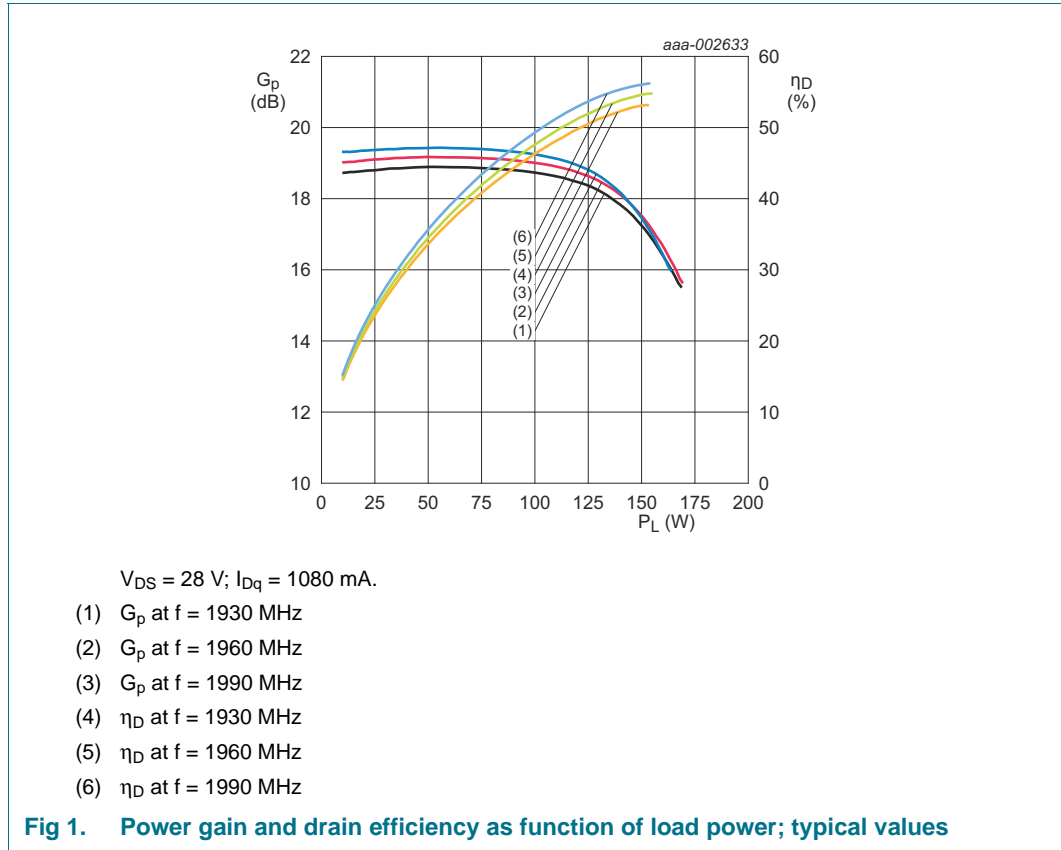
Mode of operation: 2-carrier W-CDMA; PAR 8.4 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 PDPCH;  $f_1 = 1932.5\text{ MHz}$ ;  $f_2 = 1937.5\text{ MHz}$ ;  $f_3 = 1982.5\text{ MHz}$ ;  $f_4 = 1987.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1080\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 45\text{ W}$	17.0	18.0	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 45\text{ W}$	-	-15	-8	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 45\text{ W}$	31	34	-	%
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)} = 45\text{ W}$	-	-30	-25	dBc

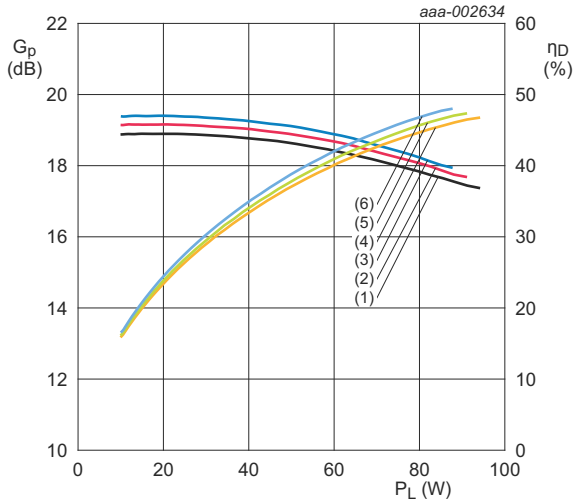
### 7.1 Ruggedness in class-AB operation

The BLF7G21LS-160 is capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1080\text{ mA}$ ;  $P_L = 160\text{ W (CW)}$ ;  $f = 1805\text{ MHz}$ .

**7.2 1-Tone CW**

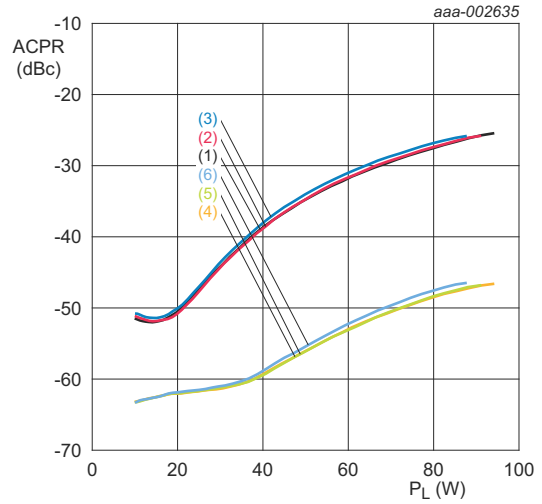


7.3 1-Carrier W-CDMA



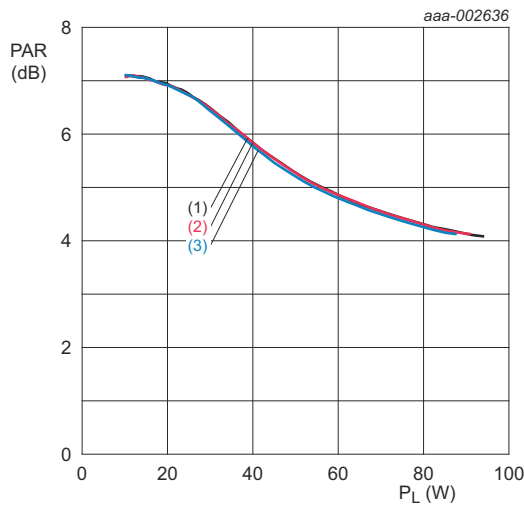
- $V_{DS} = 28\text{ V}; I_{DQ} = 1080\text{ mA.}$
- (1)  $G_p$  at  $f = 1930\text{ MHz}$
  - (2)  $G_p$  at  $f = 1960\text{ MHz}$
  - (3)  $G_p$  at  $f = 1990\text{ MHz}$
  - (4)  $\eta_D$  at  $f = 1930\text{ MHz}$
  - (5)  $\eta_D$  at  $f = 1960\text{ MHz}$
  - (6)  $\eta_D$  at  $f = 1990\text{ MHz}$

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



- $V_{DS} = 28\text{ V}; I_{DQ} = 1080\text{ mA.}$
- (1)  $ACPR_{5M}$  at  $f = 1930\text{ MHz}$
  - (2)  $ACPR_{5M}$  at  $f = 1960\text{ MHz}$
  - (3)  $ACPR_{5M}$  at  $f = 1990\text{ MHz}$
  - (4)  $ACPR_{10M}$  at  $f = 1930\text{ MHz}$
  - (5)  $ACPR_{10M}$  at  $f = 1960\text{ MHz}$
  - (6)  $ACPR_{10M}$  at  $f = 1990\text{ MHz}$

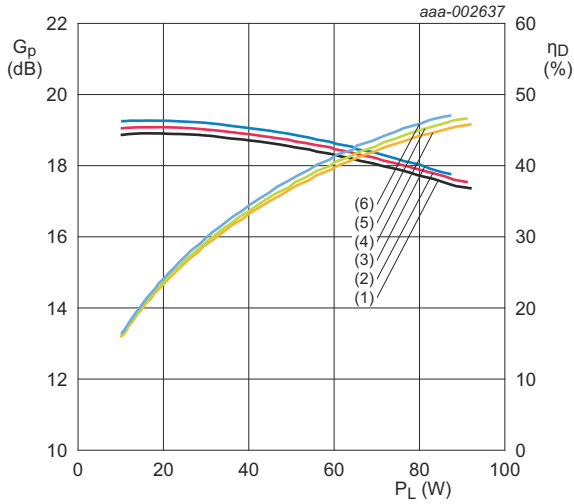
Fig 3. Adjacent channel power ratio (5 MHz) and Adjacent channel power ratio (10 MHz) as a function of load power; typical values



- $V_{DS} = 28\text{ V}; I_{DQ} = 1080\text{ mA.}$
- (1)  $f = 1930\text{ MHz}$
  - (2)  $f = 1960\text{ MHz}$
  - (3)  $f = 1990\text{ MHz}$

Fig 4. Peak-to-average ratio as a function of load power; typical values

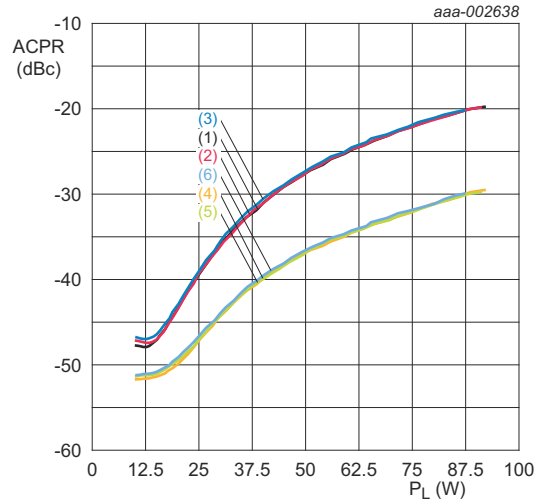
7.4 2-Carrier W-CDMA at 5 MHz carrier spacing



$V_{DS} = 28\text{ V}; I_{Dq} = 1080\text{ mA}$ .

- (1)  $G_p$  at  $f = 1930\text{ MHz}$
- (2)  $G_p$  at  $f = 1960\text{ MHz}$
- (3)  $G_p$  at  $f = 1990\text{ MHz}$
- (4)  $\eta_D$  at  $f = 1930\text{ MHz}$
- (5)  $\eta_D$  at  $f = 1960\text{ MHz}$
- (6)  $\eta_D$  at  $f = 1990\text{ MHz}$

Fig 5. Power gain and drain efficiency as function of load power; typical values

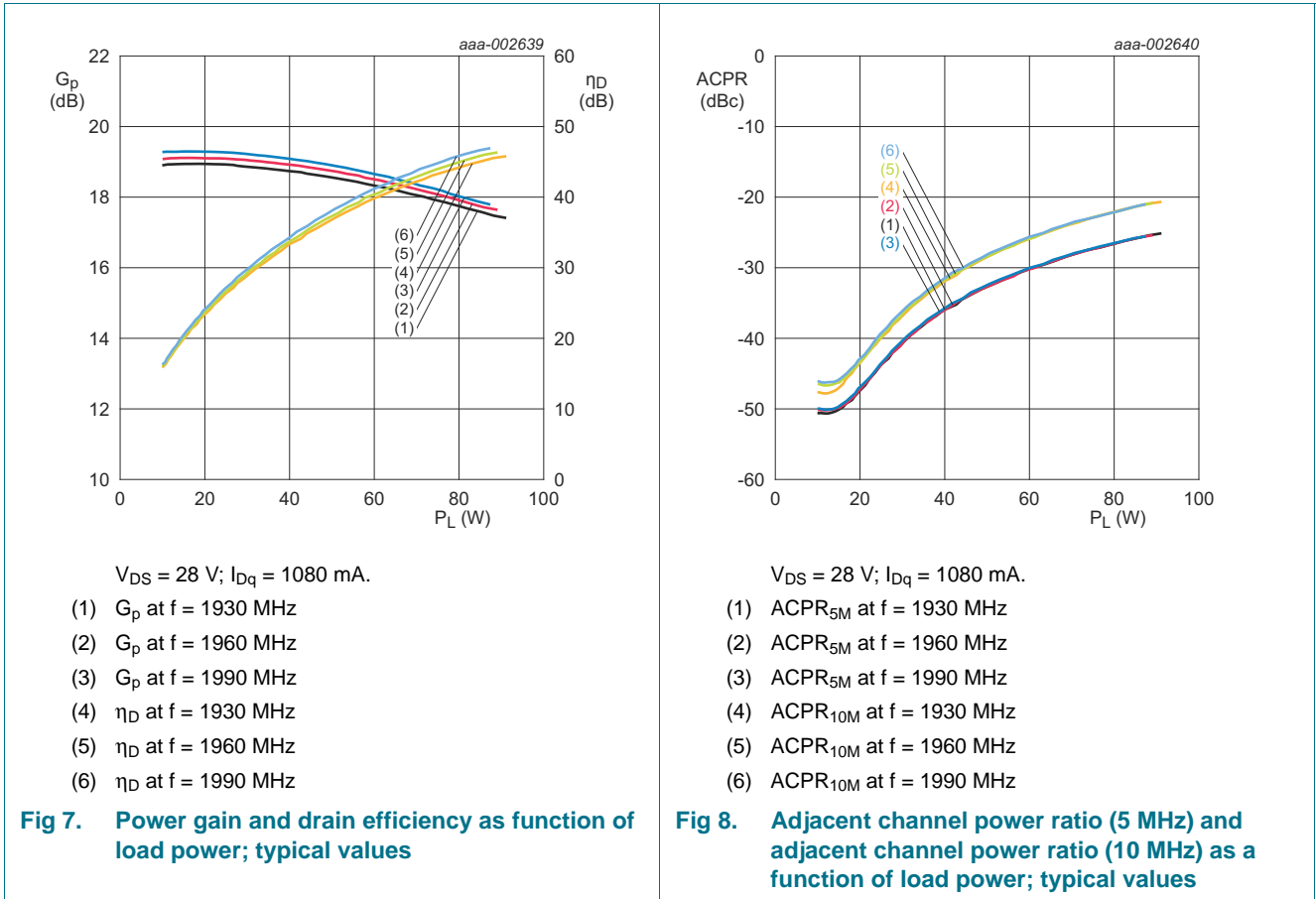


$V_{DS} = 28\text{ V}; I_{Dq} = 1080\text{ mA}$ .

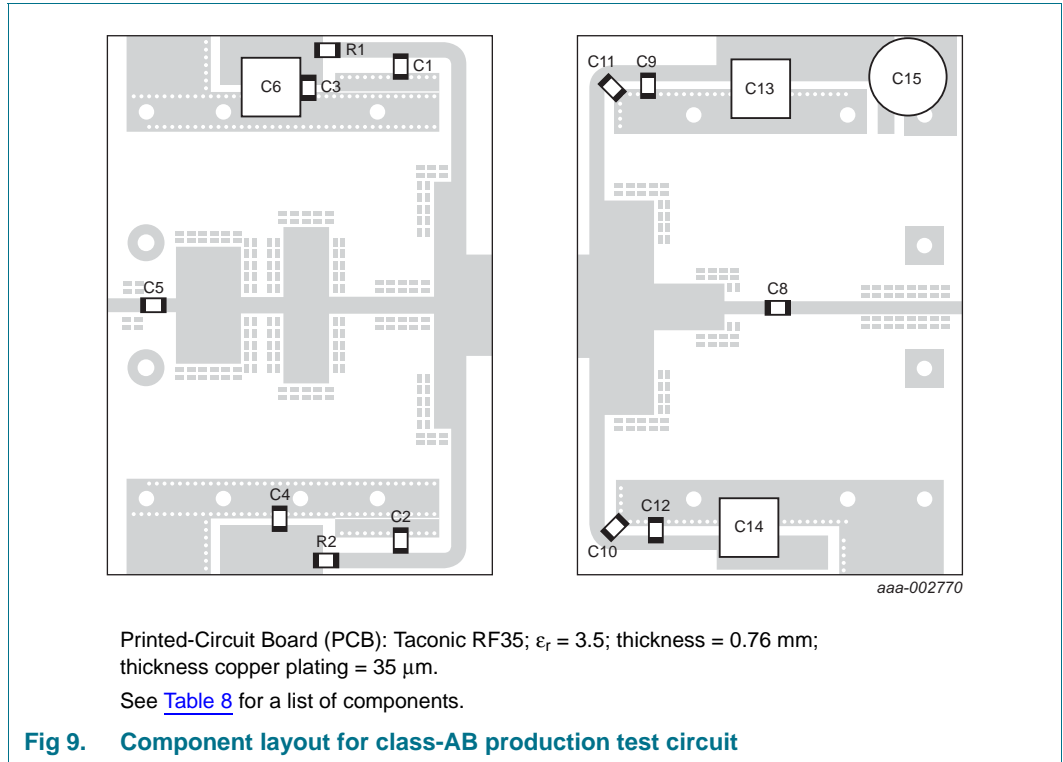
- (1)  $ACPR_{5M}$  at  $f = 1930\text{ MHz}$
- (2)  $ACPR_{5M}$  at  $f = 1960\text{ MHz}$
- (3)  $ACPR_{5M}$  at  $f = 1990\text{ MHz}$
- (4)  $ACPR_{10M}$  at  $f = 1930\text{ MHz}$
- (5)  $ACPR_{10M}$  at  $f = 1960\text{ MHz}$
- (6)  $ACPR_{10M}$  at  $f = 1990\text{ MHz}$

Fig 6. Adjacent channel power ratio (5 MHz) and adjacent channel power ratio (10 MHz) as a function of load power; typical values

7.5 2-Carrier W-CDMA at 10 MHz carrier spacing



**7.6 Test circuit**



**Table 8. List of components**

For test circuit see [Figure 9](#).

Component	Description	Value	Remarks
C1, C2, C5, C9, C10	multilayer ceramic chip capacitor	68 pF	[1]
C3, C4, C11, C12	multilayer ceramic chip capacitor	820 pF	[2]
C6, C13, C14	multilayer ceramic chip capacitor	10 $\mu\text{F}$	[3]
C8	multilayer ceramic chip capacitor	10 pF	[1]
C15	electrolytic capacitor	470 $\mu\text{F}$ ; 63 V	
R1, R2	SMD resistor	12 $\Omega$	Philips 1206

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

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

[3] TDK or capacitor of same quality.

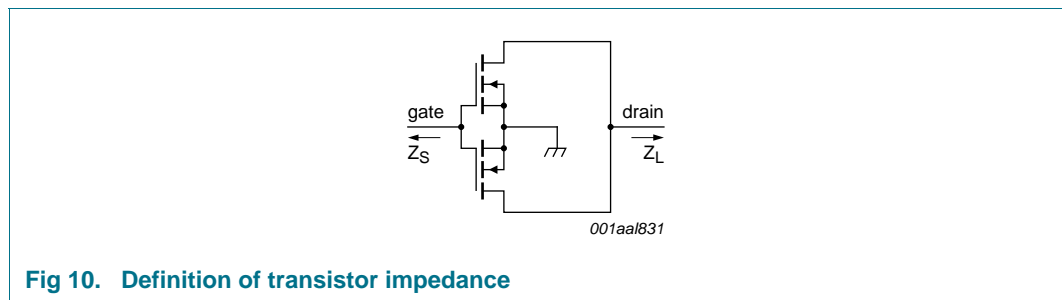


**7.7 Impedance information**

**Table 9. Typical impedance**

Typical values valid for both section in parallel;  $I_{DQ} = 1800\text{ mA}$ ;  $V_{DS} = 28\text{ V}$ , unless otherwise specified.

<b>f</b> <b>MHz</b>	<b>Z<sub>S</sub></b> <b>Ω</b>	<b>Z<sub>L</sub></b> <b>Ω</b>
1750	0.99 – j4.09	2.32 – j2.35
1805	1.12 – j4.39	2.20 – j2.20
1840	1.23 – j4.58	2.08 – j2.14
1880	1.31 – j4.74	1.94 – j2.12
1930	1.49 – j5.01	1.76 – j2.15
1960	1.61 – j5.19	1.66 – j2.20
1990	1.75 – j5.36	1.56 – j2.26
2020	1.91 – j5.54	1.48 – j2.34
2050	2.13 – j5.75	1.4 – j2.42



**Fig 10. Definition of transistor impedance**

8. Package outline

Earless flanged LDMOST ceramic package; 4 leads

SOT1121B

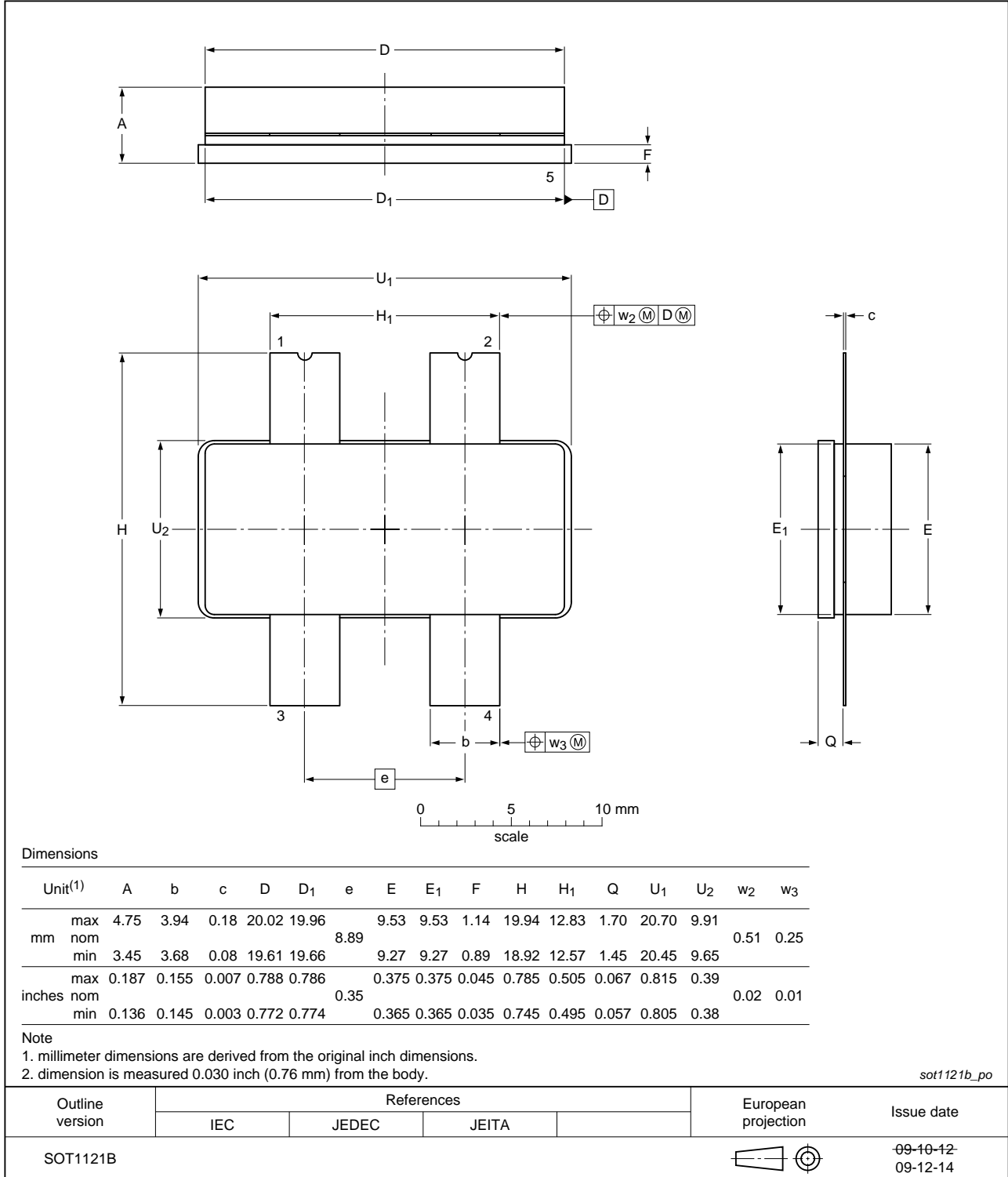


Fig 11. Package outline SOT1121B

## 9. Abbreviations

**Table 10. Abbreviations**

Acronym	Description
3GPP	Third Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Laterally Diffused Metal Oxide Semiconductor Transistor
PAR	Peak-to-Average 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

## 10. Revision history

**Table 11. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF7G21LS-160 v.1	20120420	Product data sheet	-	-

## 11. Legal information

### 11.1 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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