

# BLF6G22L-40P; BLF6G22LS-40P

Power LDMOS transistor

Rev. 1 — 22 September 2011

Product data sheet

## 1. Product profile

### 1.1 General description

LDMOS power transistor for base station applications at frequencies from 2110 MHz to 2170 MHz and 1805 MHz to 1880 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	2110 to 2170	410	28	13.5	19	30	-30 [2]
	1805 to 1880 [1]	410	28	5	20.3	18.3	-34.9 [2]
1-carrier W-CDMA	2110 to 2170	410	28	15	19	32	-37 [3]
	1805 to 1880 [1]	410	28	5	20.5	18.0	-42.3 [3]

[1] The performance is tested on the Class AB demo board as depicted in [Figure 11](#).

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

[3] 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
- 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)

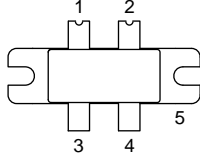
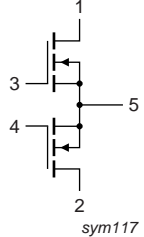
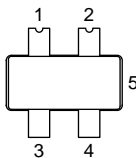
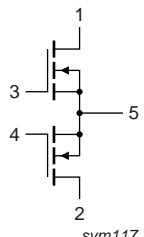
### 1.3 Applications

- RF power amplifier for base stations and multi carrier applications in the 2110 MHz to 2170 MHz frequency band
- RF driver amplifier in the 1805 MHz to 1880 MHz frequency band



## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>BLF6G22L-40P (SOT1121A)</b>			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		
<a href="#">[1]</a>			
<b>BLF6G22LS-40P (SOT1121B)</b>			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		
<a href="#">[1]</a>			

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF6G22L-40P	-	flanged LDMOST ceramic package; 2 mounting holes; 4 leads	SOT1121A
BLF6G22LS-40P	-	earless flanged LDMOST ceramic package; 4 leads	SOT1121B

## 4. Limiting values

Table 4. Limiting values (2 sections combined)

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		-	16	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
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}$ ; $P_L = 40\text{ W}$	0.7	K/W

## 6. Characteristics

Table 6. Characteristics (per section)

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ ; $I_D = 0.4\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$ ; $I_D = 40\text{ mA}$	1.4	1.9	2.4	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 28\text{ V}$	-	-	2	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $V_{DS} = 10\text{ V}$	6	7	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	-	200	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}$ ; $I_D = 2.0\text{ A}$	1.8	2.9	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $I_D = 1.4\text{ A}$	0.14	0.37	0.57	$\Omega$

## 7. Application information

Table 7. Application information (2 sections combined)

Mode of operation: 2-carrier W-CDMA; PAR 8.4 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 2112.5\text{ MHz}$ ;  $f_2 = 2117.5\text{ MHz}$ ;  $f_3 = 2162.5\text{ MHz}$ ;  $f_4 = 2167.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 410\text{ mA}$ ;  $T_{case} = 25\text{ °C}$ ; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 13.5\text{ W}$ [1]	17.8	19	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 13.5\text{ W}$ [1]	-	-15	-9	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 13.5\text{ W}$ [1]	26.5	30	-	%
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)} = 13.5\text{ W}$ [1]	-	-30	-27	dBc
$ACPR_{10M}$	adjacent channel power ratio (10 MHz)	$P_{L(AV)} = 13.5\text{ W}$ [1]	-	-39	-36	dBc

[1] In production, all testing are only performed at 2110 MHz to 2170 MHz frequency band.

### 7.1 Ruggedness in class-AB operation

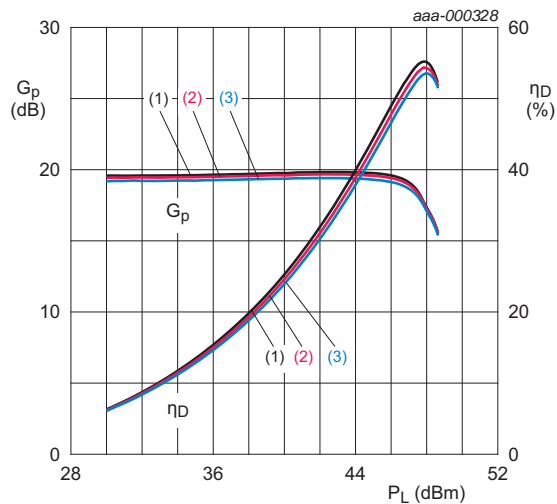
The BLF6G22L-40P and BLF6G22LS-40P are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:

$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 410\text{ mA}$ ;  $P_L = 40\text{ W}$  (CW);  $f = 2110\text{ MHz}$ .

The BLF6G22L-40P and BLF6G22LS-40P are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:

$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 410\text{ mA}$ ;  $P_L = 40\text{ W}$  (CW pulse, 10 %);  $f = 1842\text{ MHz}$ .

## 7.2 CW



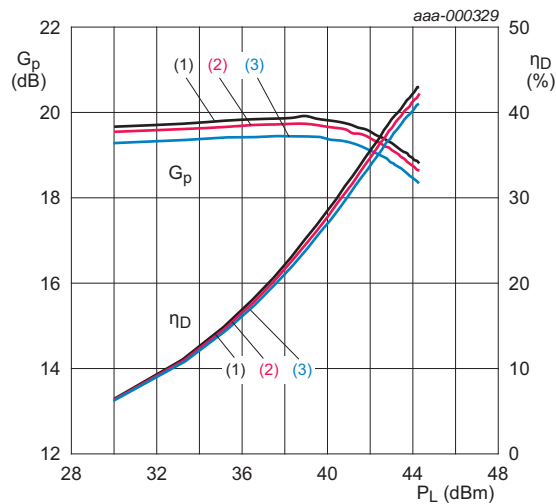
$V_{DS} = 28 \text{ V}$ ;  $I_{DQ} = 410 \text{ mA}$ .

- (1)  $f = 2110 \text{ MHz}$
- (2)  $f = 2140 \text{ MHz}$
- (3)  $f = 2170 \text{ MHz}$

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

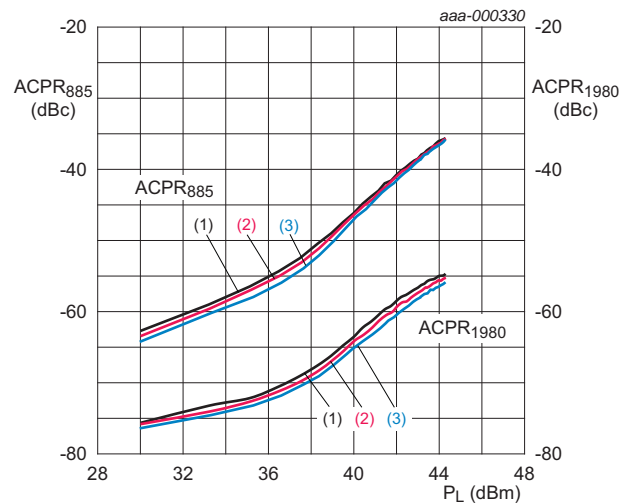
7.3 IS-95

Single carrier IS-95; PAR = 9.7 dB at 0.01 % probability on the CCDF.



$V_{DS} = 28\text{ V}; I_{Dq} = 410\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2170\text{ MHz}$

Fig 2. Single carrier IS-95 power gain and drain efficiency as function of output power; typical values

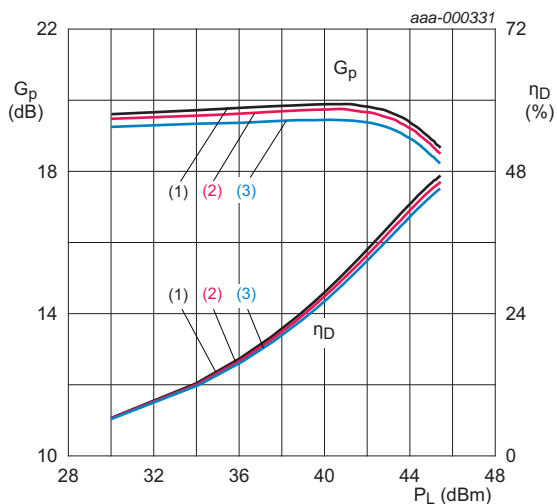


$V_{DS} = 28\text{ V}; I_{Dq} = 410\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2140\text{ MHz}$   
 (3)  $f = 2170\text{ MHz}$

Fig 3. Single carrier IS-95 adjacent channel power ratio as a function of output power; typical values

## 7.4 1-carrier W-CDMA

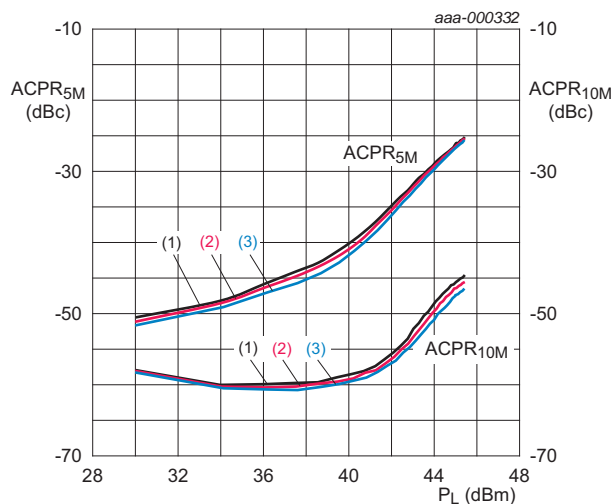
Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF.



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 410\text{ mA}$ .

- (1)  $f = 2112.5\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2167.5\text{ MHz}$

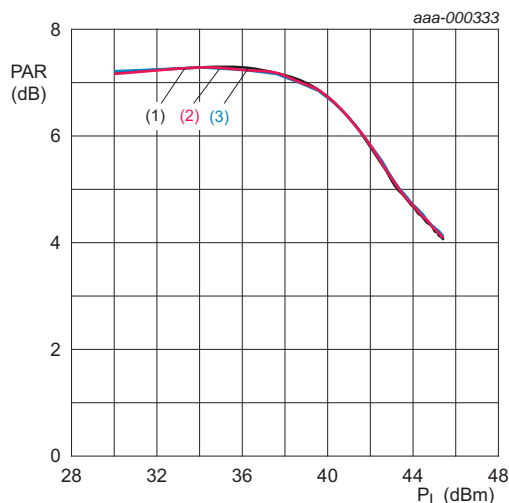
**Fig 4. 1-carrier W-CDMA power gain and drain efficiency as function of output power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 410\text{ mA}$ .

- (1)  $f = 2112.5\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2167.5\text{ MHz}$

**Fig 5. 1-carrier W-CDMA adjacent channel power ratio as a function of output power; typical values**



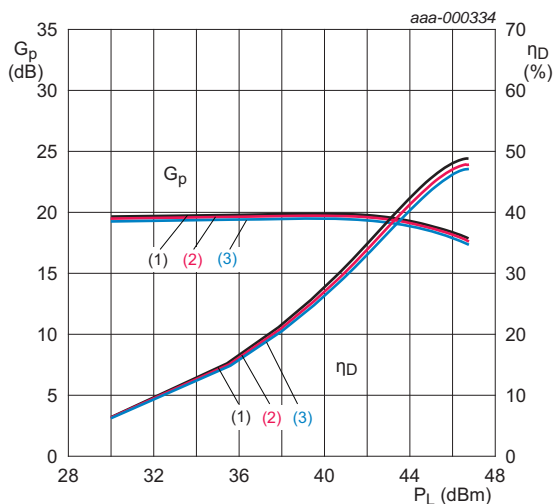
$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 410\text{ mA}$ .

- (1)  $f = 2112.5\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2167.5\text{ MHz}$

**Fig 6. 1-carrier W-CDMA power gain and drain efficiency as function of output power; typical values**

## 7.5 2-carrier W-CDMA

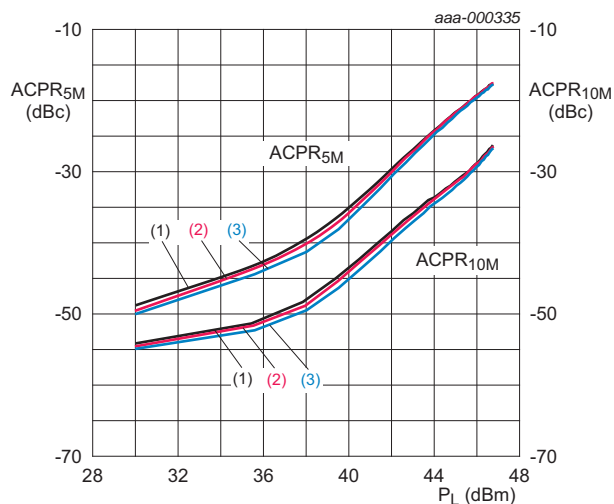
Test signal: 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF; carrier spacing 5 MHz.



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 410\text{ mA}$ .

- (1)  $f = 2115\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2165\text{ MHz}$

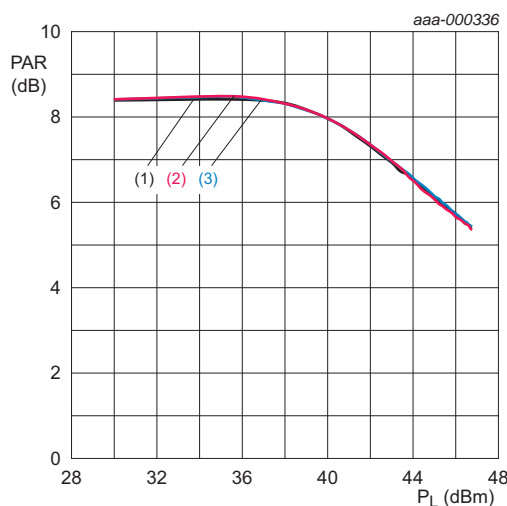
**Fig 7. 2-carrier W-CDMA power gain and drain efficiency as function of output power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 410\text{ mA}$ .

- (1)  $f = 2115\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2165\text{ MHz}$

**Fig 8. 2-carrier W-CDMA adjacent channel power ratio as a function of output power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 410\text{ mA}$ .

- (1)  $f = 2115\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2165\text{ MHz}$

**Fig 9. 2-carrier W-CDMA peak-to-average power ratio as function of output power; typical values**

8. Test information

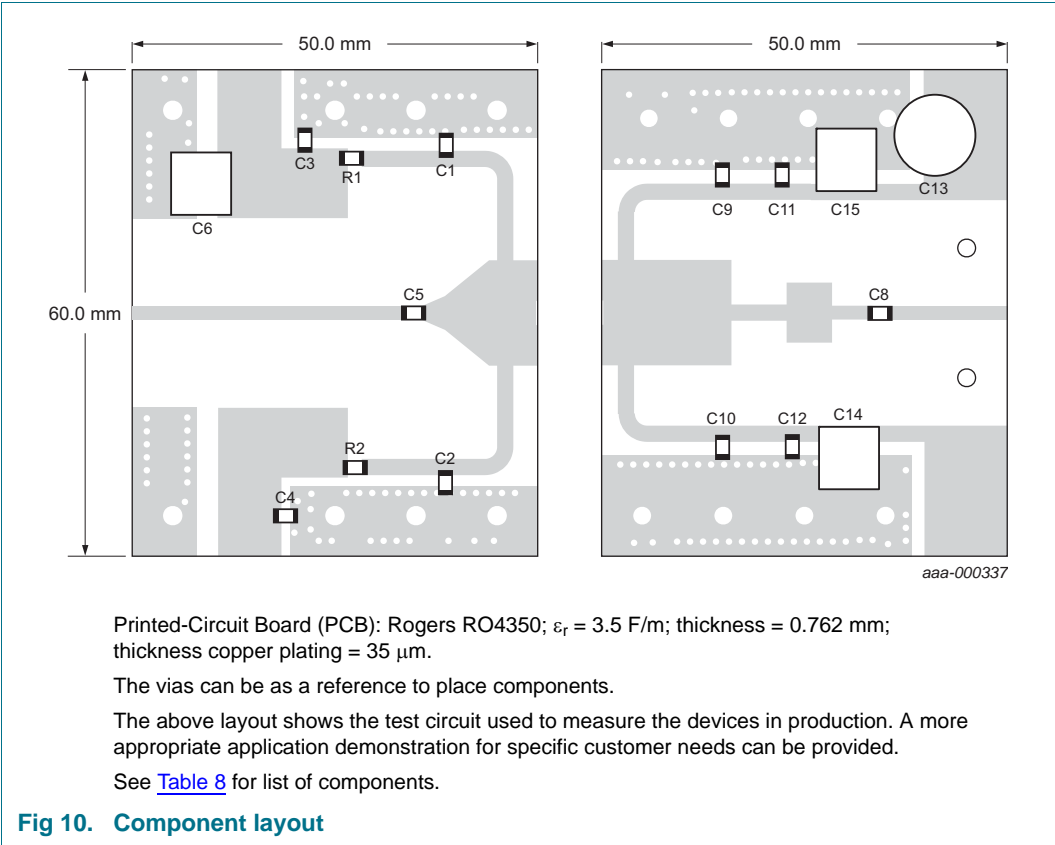


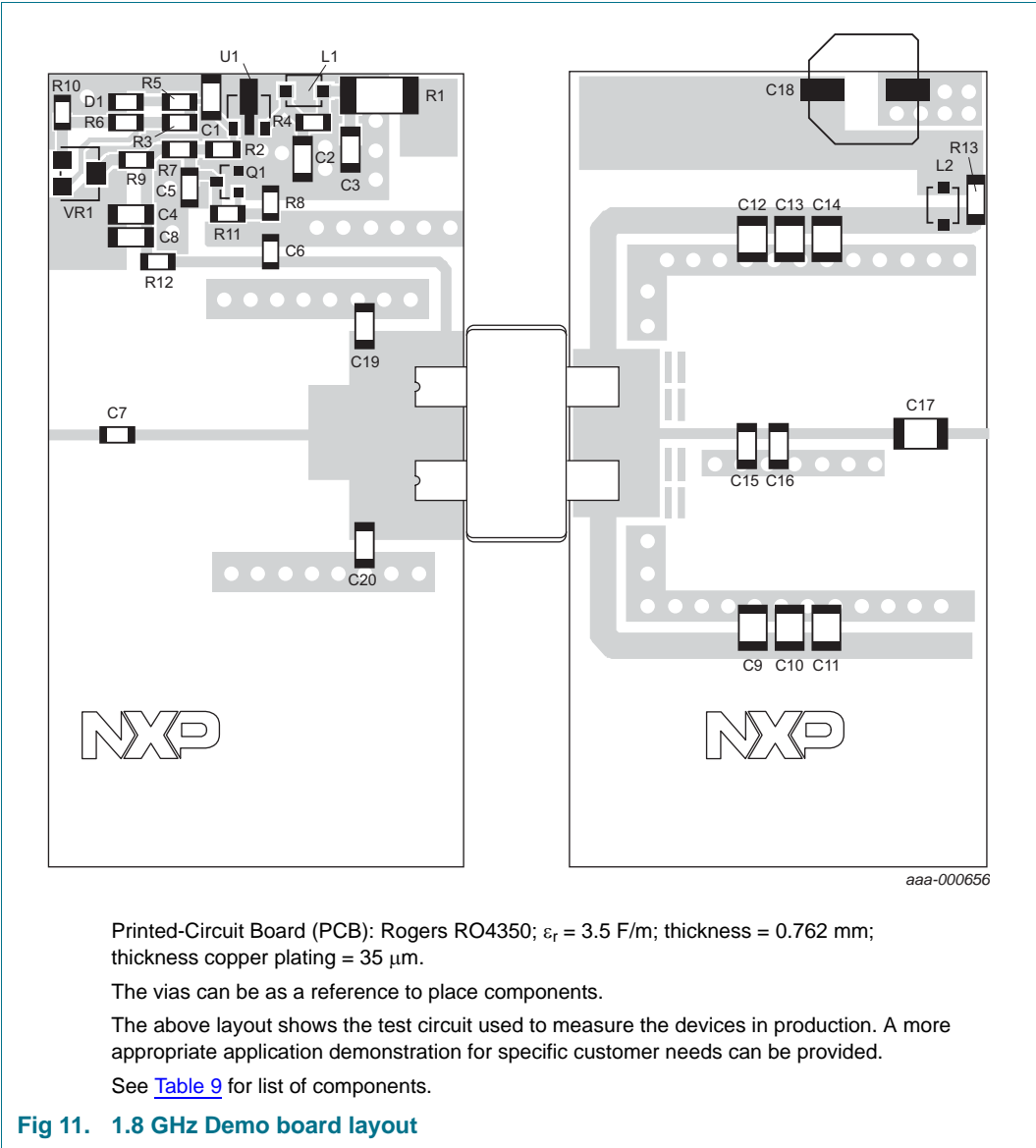
Table 8. List of components  
See [Figure 10](#) for component layout.

Component	Description	Value	Remarks
C1, C2, C9, C10	multilayer ceramic chip capacitor	68 pF	[1]
C3, C4, C11, C12	multilayer ceramic chip capacitor	820 pF	[2]
C5, C8	multilayer ceramic chip capacitor	4.7 pF	[1]
C6, C14, C15	multilayer ceramic chip capacitor	10 $\mu\text{F}$	TDK
C13	electrolytic capacitor	470 $\mu\text{F}$ ; 63 V	
R1, R2	chip 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.





**Table 9. List of components**  
 See [Figure 11](#) for component layout.

Component	Description	Value	Remarks
C1, C2, C5, C8	multilayer ceramic chip capacitor	100 nF	Murata
C3, C4, C11, C14	multilayer ceramic chip capacitor	1 $\mu\text{F}$	Murata
C6	multilayer ceramic chip capacitor	47 pF	ATC
C7	multilayer ceramic chip capacitor	10 pF	ATC
C9, C12	multilayer ceramic chip capacitor	12 pF	ATC
C10, C13	multilayer ceramic chip capacitor	330 pF	Murata
C15, C16	multilayer ceramic chip capacitor	1.5 pF	ATC
C17	multilayer ceramic chip capacitor	10 pF	ATC
C18	electrolytic capacitor	2200 $\mu\text{F}$ , 50 V	Panasonic
C19, C20	multilayer ceramic chip capacitor	1 pF	ATC

**Table 9. List of components**See [Figure 11](#) for component layout.

Component	Description	Value	Remarks
L1, L2	ferrite bead	5 A	Fair Rite
R1	chip resistor	500 $\Omega$	Vishay Dale
R2, R5	chip resistor	1.1 k $\Omega$	Vishay Dale
R3, R6	chip resistor	432 $\Omega$	Vishay Dale
R4, R11	chip resistor	9.1 $\Omega$	Vishay Dale
R9	chip resistor	2 k $\Omega$	Vishay Dale
R10	chip resistor	75 $\Omega$	Vishay Dale
R12	chip resistor	1.5 $\Omega$	Vishay Dale
VR1	potentiometer	200 $\Omega$	Bourns
U1	voltage regulator		NJR

9. Package outline

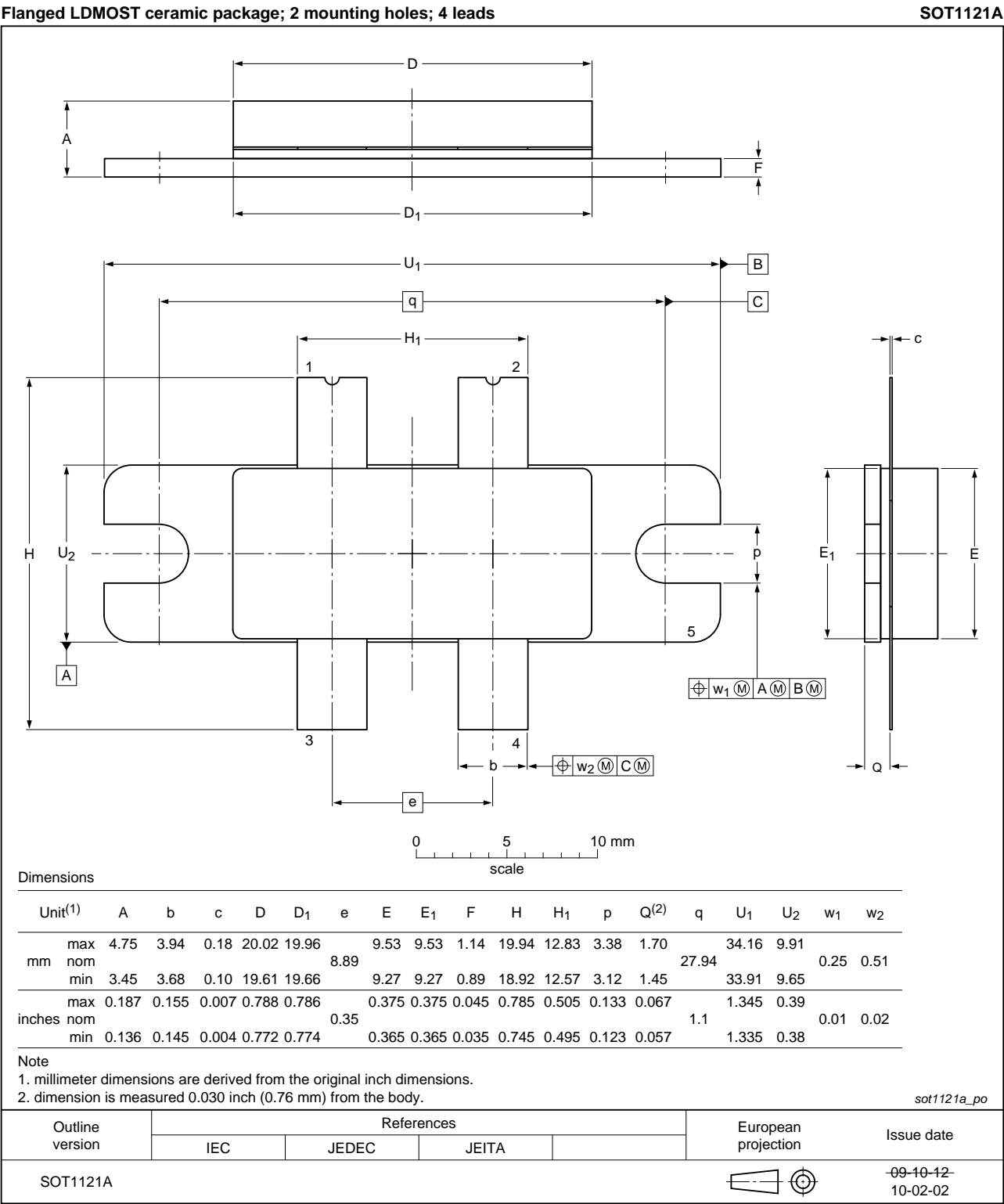


Fig 12. Package outline SOT1121A

Earless flanged LDMOST ceramic package; 4 leads

SOT1121B

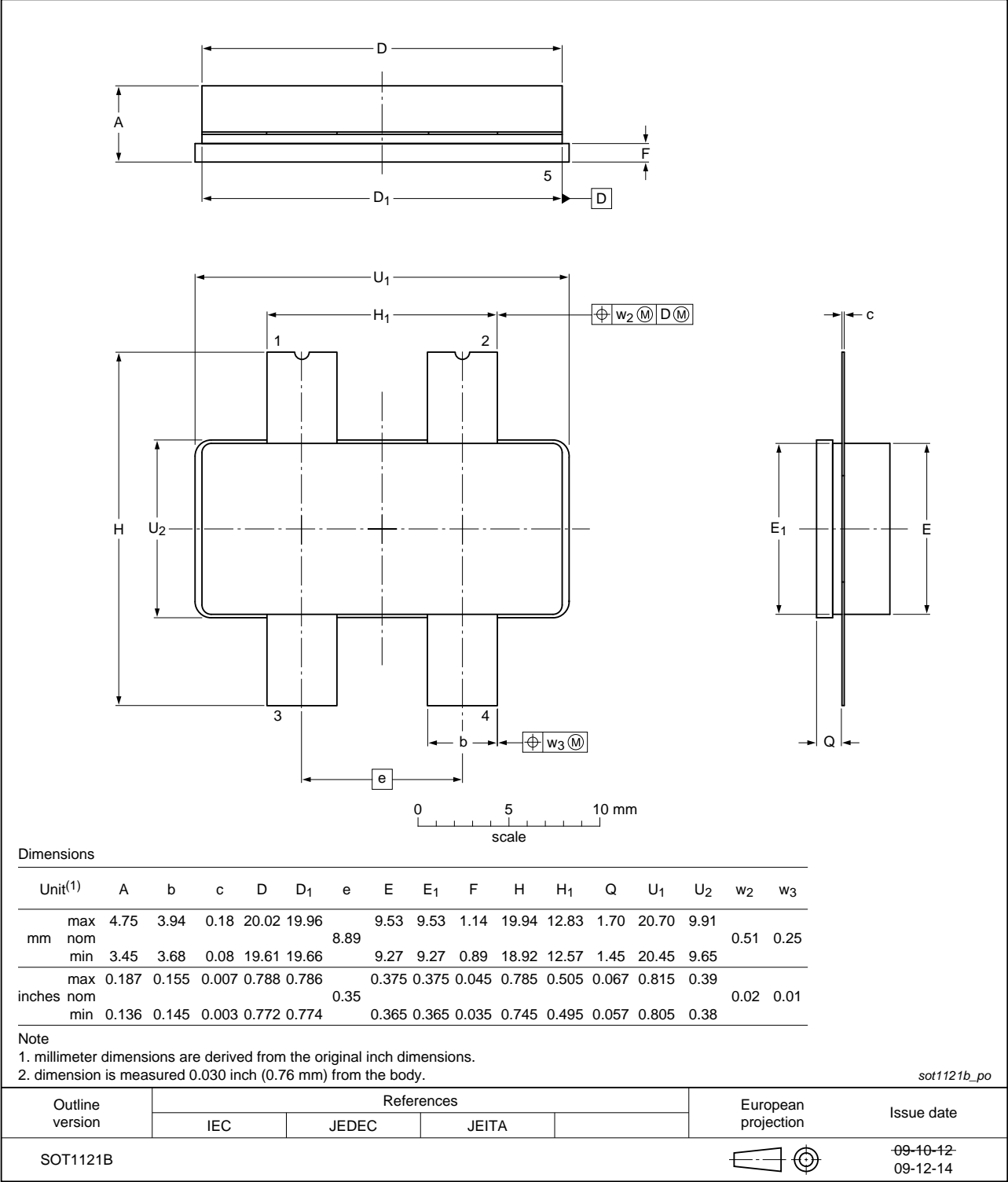


Fig 13. Package outline SOT1121B

## 10. Abbreviations

Table 10. Abbreviations

Acronym	Description
3GPP	3rd Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
ESD	ElectroStatic Discharge
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 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G22L-40P_6G22LS-40P v.1	20110922	Product data sheet	-	-

## 12. Legal information

### 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.
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Product [short] data sheet	Production	This document contains the product specification.

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