

# BLF7G22L-160; BLF7G22LS-160

Power LDMOS transistor

Rev. 1 — 27 April 2011

Preliminary data sheet

## 1. Product profile

### 1.1 General description

160 W LDMOS power transistor for base station applications at frequencies from 2000 MHz to 2200 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	1300	28	43	18.0	30	-32 <sup>[1]</sup>

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

### 1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low  $R_{th}$  providing excellent thermal stability
- 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)

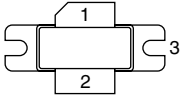
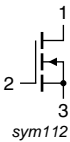
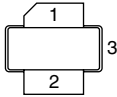
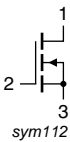
### 1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 2000 MHz to 2200 MHz frequency range



## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
<b>BLF7G22L-160 (SOT502A)</b>			
1	drain		 sym112
2	gate		
3	source		
<b>BLF7G22LS-160 (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
BLF7G22L-160	-	flanged LDMOST ceramic package; 2 mounting holes; 6 leads	SOT502A
BLF7G22LS-160	-	earless flanged LDMOST ceramic package; 6 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		-	36	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	$T_{case} = 80\text{ °C}; P_L = 55\text{ W}$	0.29	K/W

## 6. Characteristics

**Table 6. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ ; $I_D = 2.16\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$ ; $I_D = 216\text{ mA}$	1.5	1.9	2.3	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 28\text{ V}$	-	-	4.5	$\mu\text{A}$
$I_{DSX}$	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	$V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	-	450	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}$ ; $I_D = 10.8\text{ A}$	-	20	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $I_D = 7.56\text{ A}$	-	0.06	-	$\Omega$

## 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;  $f_1 = 2112.5\text{ MHz}$ ;  $f_2 = 2117.5\text{ MHz}$ ;  $f_3 = 2162.5\text{ MHz}$ ;  $f_4 = 2167.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1300\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 43\text{ W}$	16.5	18.0	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 43\text{ W}$	-	-15	-6.5	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 43\text{ W}$	28	30	-	%
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)} = 43\text{ W}$	-	-32	-28	dBc

**Table 8. Application information**

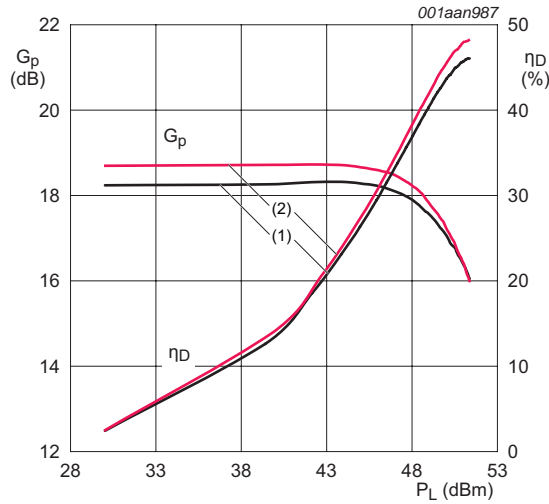
Mode of operation: 1-carrier W-CDMA; PAR 7.2 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 PDPCH;  $f = 2167.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1300\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$PAR_O$	output peak-to-average ratio	$P_{L(AV)} = 100\text{ W}$ ; at 0.01 % probability on CCDF	3.9	4.15	-	dB

### 7.1 Ruggedness in class-AB operation

The BLF7G22L-160 and BLF7G22LS-160 are capable of withstanding a load mismatch corresponding to  $V_{SWR} = <td>$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1300\text{ mA}$ ;  $P_L = 160\text{ W}$ ;  $f = 2110\text{ MHz}$ .

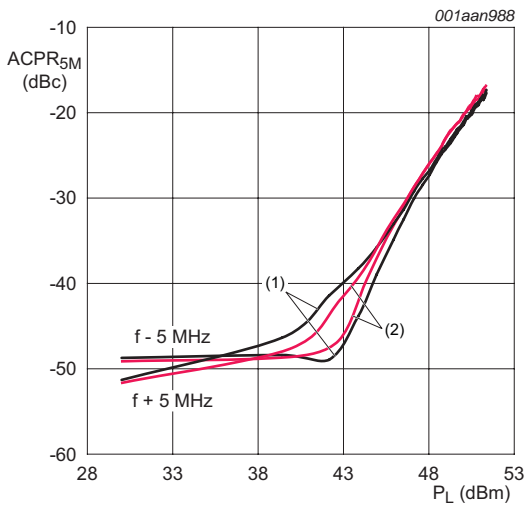
7.2 2-Carrier W-CDMA 5 MHz



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .

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

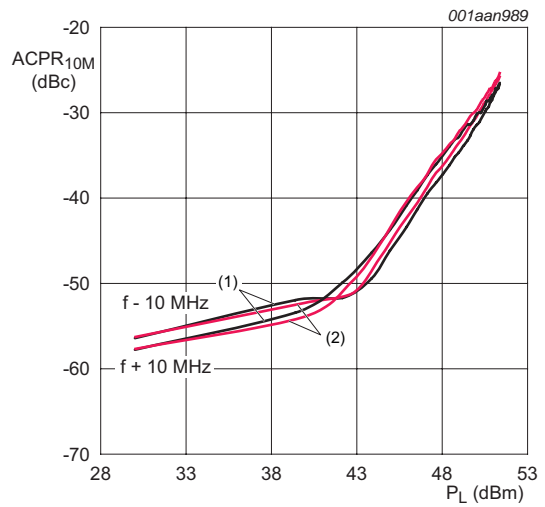
Fig 1. Power gain and drain efficiency as function of load power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .

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

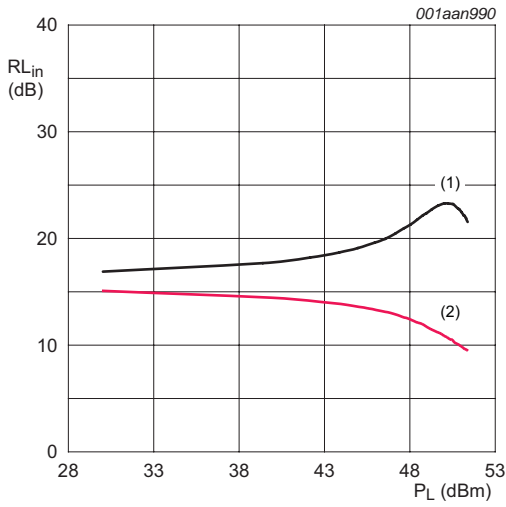
Fig 2. Adjacent channel power ratio ( $\pm 5\text{ MHz}$ ) as a function of load power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .

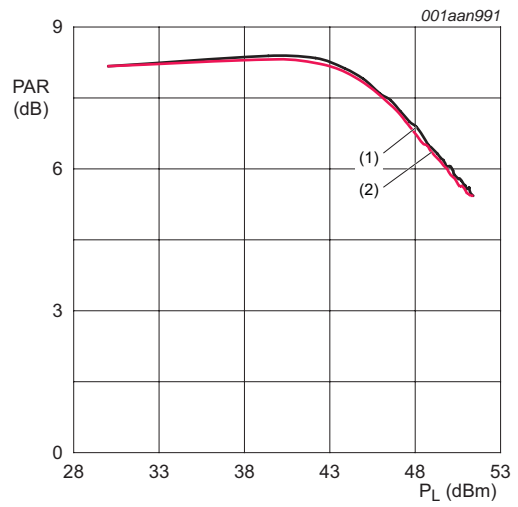
- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2170\text{ MHz}$

Fig 3. Adjacent channel power ratio ( $\pm 10\text{ MHz}$ ) as a function of load power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

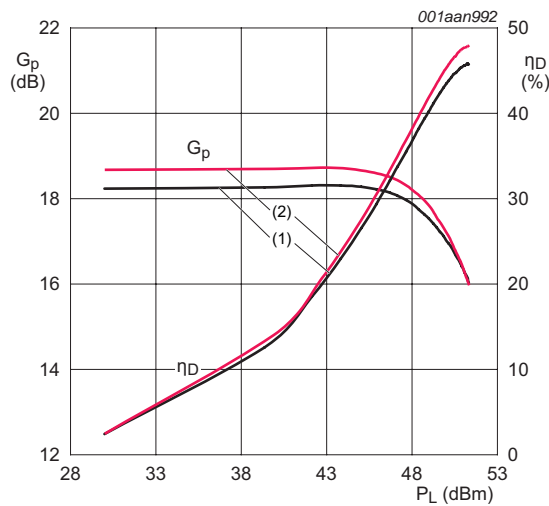
**Fig 4. Input return loss as function of load power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

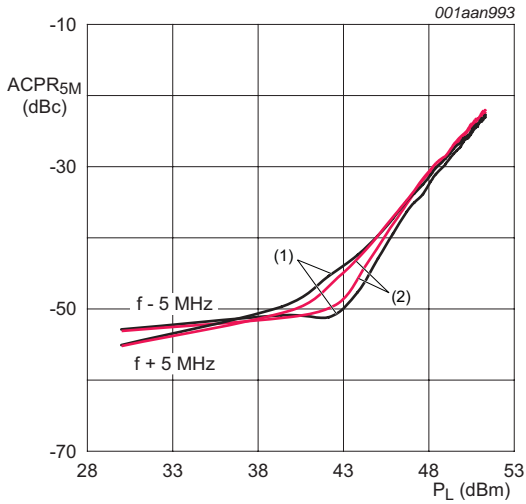
**Fig 5. Peak-to-average power ratio as function of load power; typical values**

**7.3 2-Carrier W-CDMA 10 MHz**



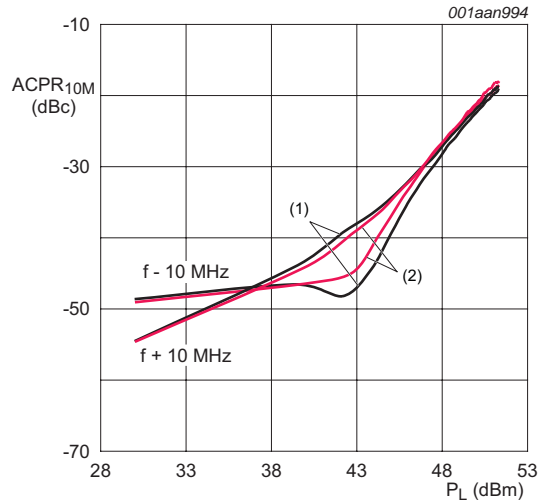
$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

**Fig 6. Power gain and drain efficiency as function of load power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

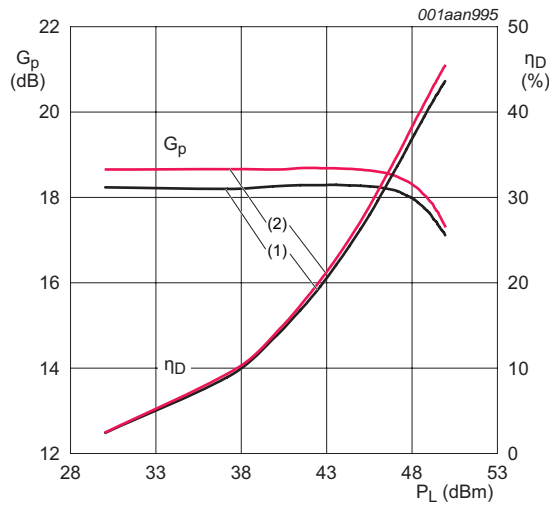
**Fig 7. Adjacent channel power ratio ( $\pm 5\text{ MHz}$ ) as a function of load power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

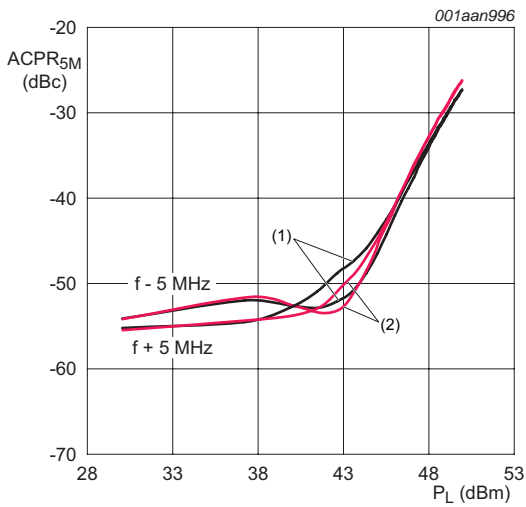
**Fig 8. Adjacent channel power ratio ( $\pm 10\text{ MHz}$ ) as a function of load power; typical values**

## 7.4 1-Carrier W-CDMA



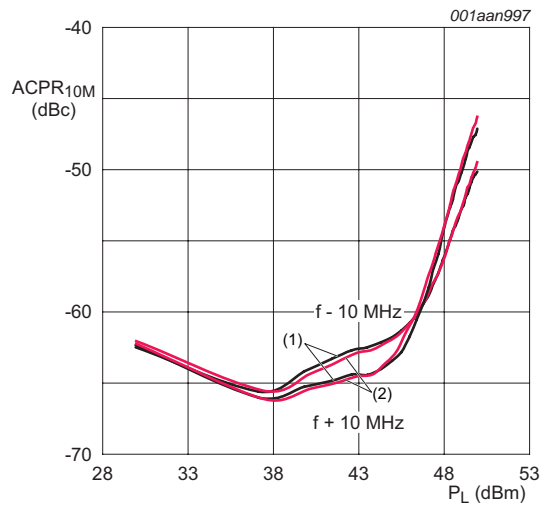
$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

**Fig 9. Power gain and drain efficiency as function of load power; typical values**



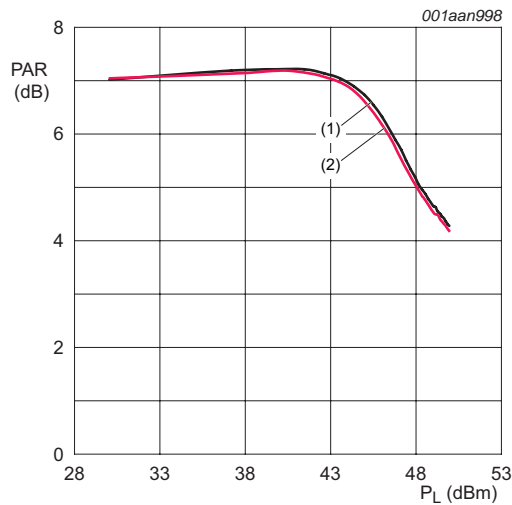
$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

**Fig 10. Adjacent channel power ratio ( $\pm 5\text{ MHz}$ ) as a function of load power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

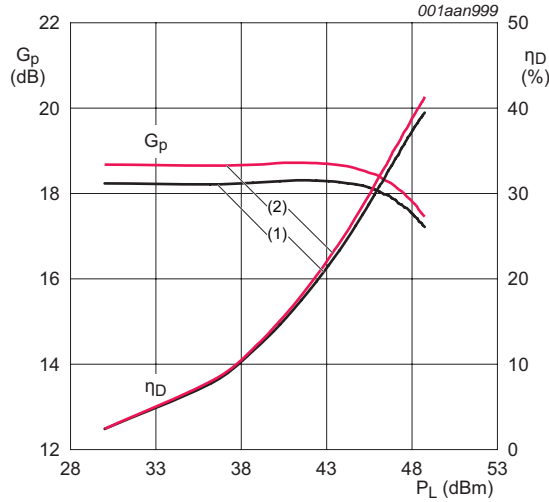
**Fig 11. Adjacent channel power ratio ( $\pm 10\text{ MHz}$ ) as a function of load power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

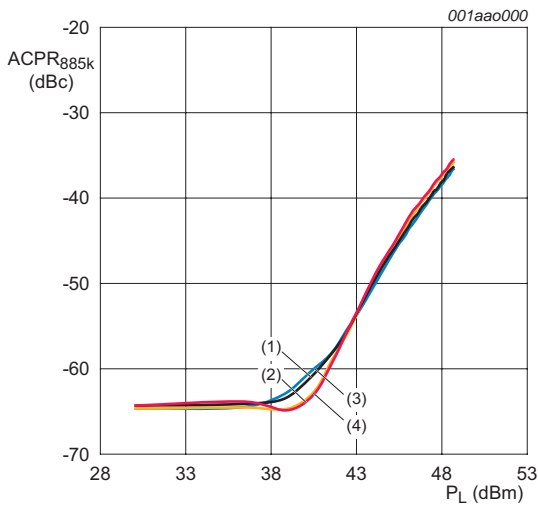
**Fig 12. Peak-to-average power ratio as function of load power; typical values**

7.5 IS-95



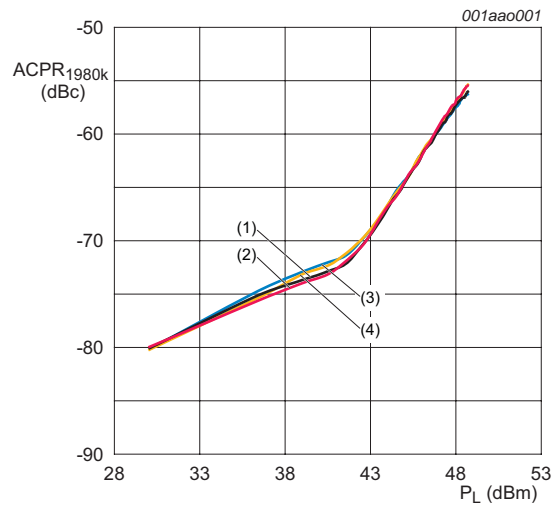
$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}$   
 (2)  $f = 2170\text{ MHz}$

Fig 13. Power gain and drain efficiency as function of load power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}; f + 885\text{ kHz}$   
 (2)  $f = 2170\text{ MHz}; f + 885\text{ kHz}$   
 (3)  $f = 2110\text{ MHz}; f - 885\text{ kHz}$   
 (4)  $f = 2170\text{ MHz}; f - 885\text{ kHz}$

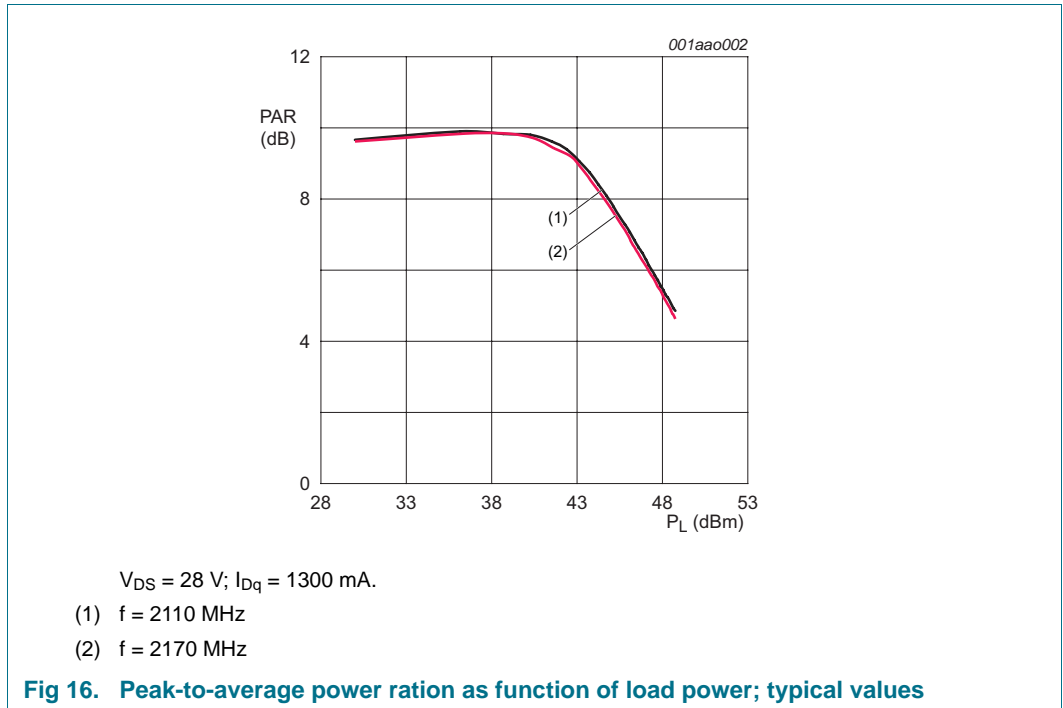
Fig 14. Adjacent channel power ratio ( $\pm 5\text{ MHz}$ ) as a function of load power; typical values



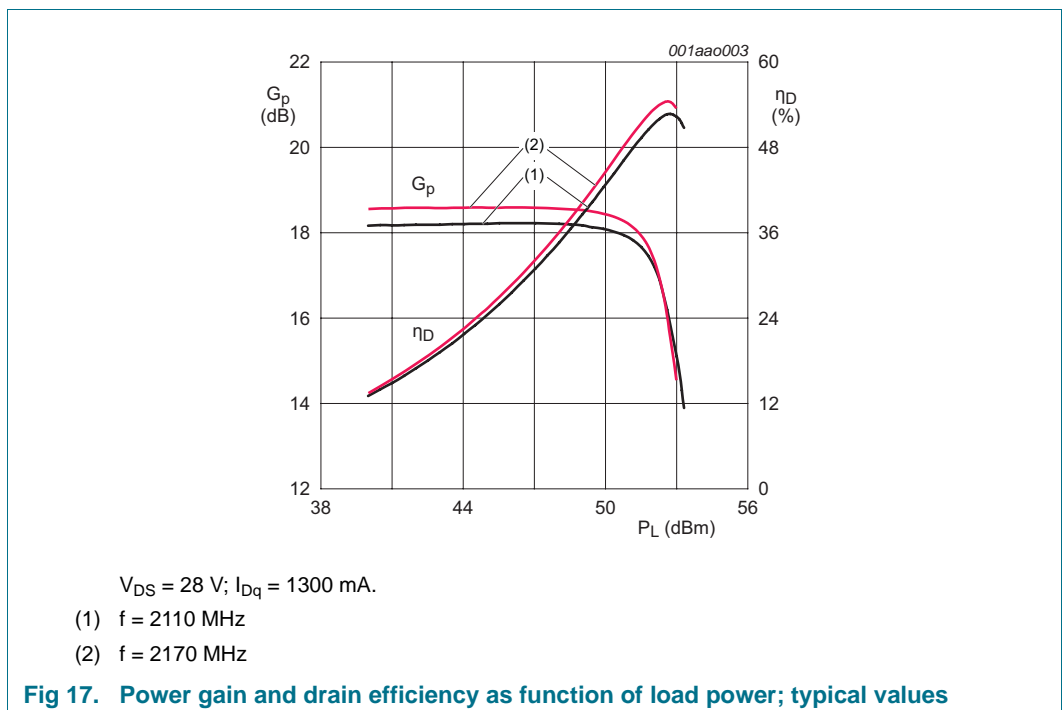
$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}.$   
 (1)  $f = 2110\text{ MHz}; f + 1980\text{ kHz}$   
 (2)  $f = 2170\text{ MHz}; f + 1980\text{ kHz}$   
 (3)  $f = 2110\text{ MHz}; f - 1980\text{ kHz}$   
 (4)  $f = 2170\text{ MHz}; f - 1980\text{ kHz}$

Fig 15. Adjacent channel power ratio ( $\pm 10\text{ MHz}$ ) as a function of load power; typical values

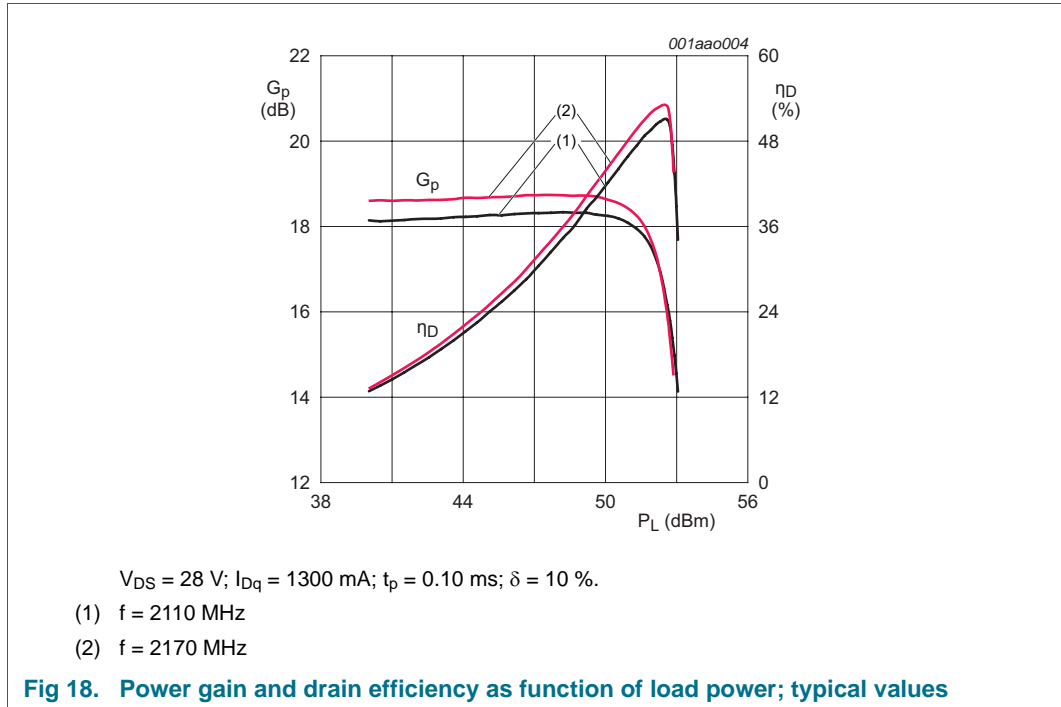




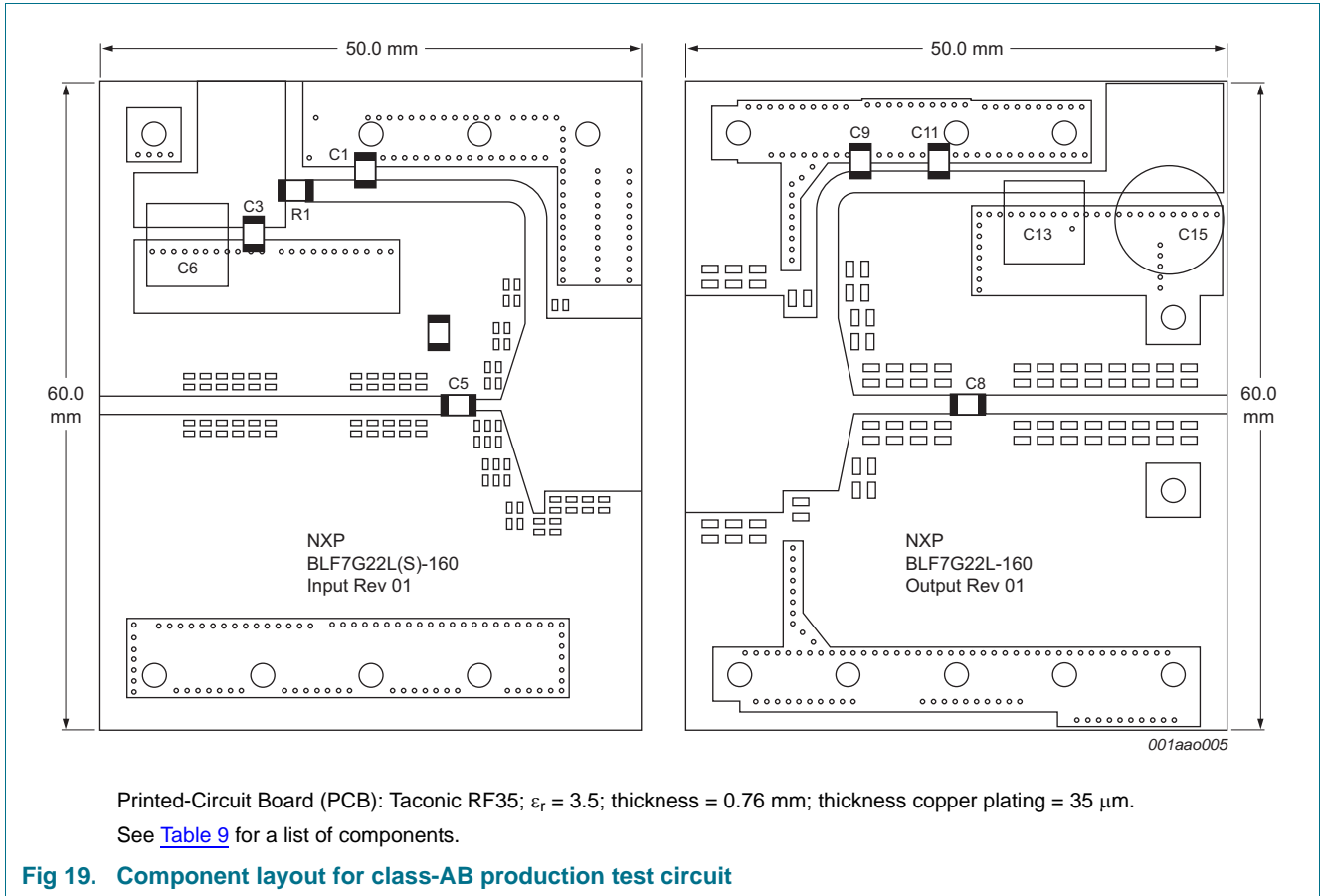
## 7.6 CW



7.7 CW-pulsed



**7.8 Test circuit**



**Table 9. List of components**

For test circuit see [Figure 19](#).

Component	Description	Value	Remarks
C1, C5, C8, C9	multilayer ceramic chip capacitor	68 pF	[1]
C3, C11	multilayer ceramic chip capacitor	820 pF	[2]
C6, C13	multilayer ceramic chip capacitor	10 $\mu\text{F}$	[3]
C15	electrolytic capacitor	470 $\mu\text{F}$ ; 63 V	
R1	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.

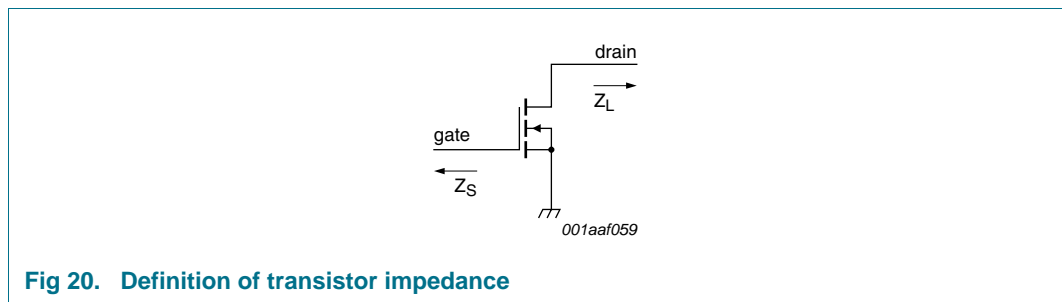
[3] TDK or capacitor of same quality.

## 7.9 Impedance information

**Table 10. Typical impedance**

*Typical values unless otherwise specified.*

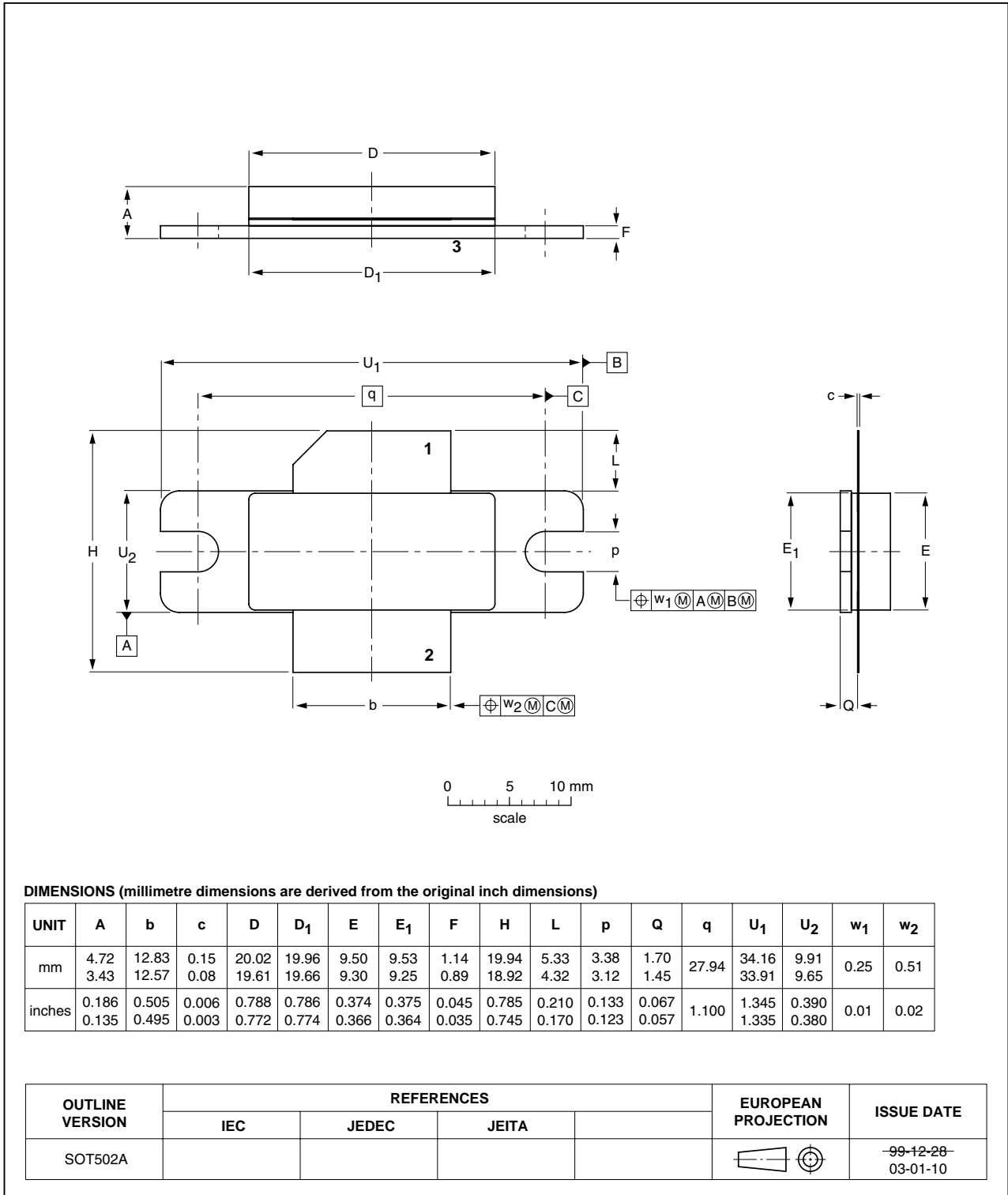
<b>f</b> <b>MHz</b>	<b>Z<sub>S</sub></b> <b>Ω</b>	<b>Z<sub>L</sub></b> <b>Ω</b>
2050	1.39 – j4.13	1.41 – j3.80
2080	1.67 – j3.93	1.38 – j3.63
2110	2.01 – j3.89	1.35 – j3.45
2140	2.28 – j4.09	1.33 – j3.28
2170	2.27 – j4.47	1.31 – j3.12
2200	1.92 – j4.76	1.28 – j2.95
2230	1.42 – j4.75	1.26 – j2.79



**8. Package outline**

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A



**Fig 21. Package outline SOT502A**

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

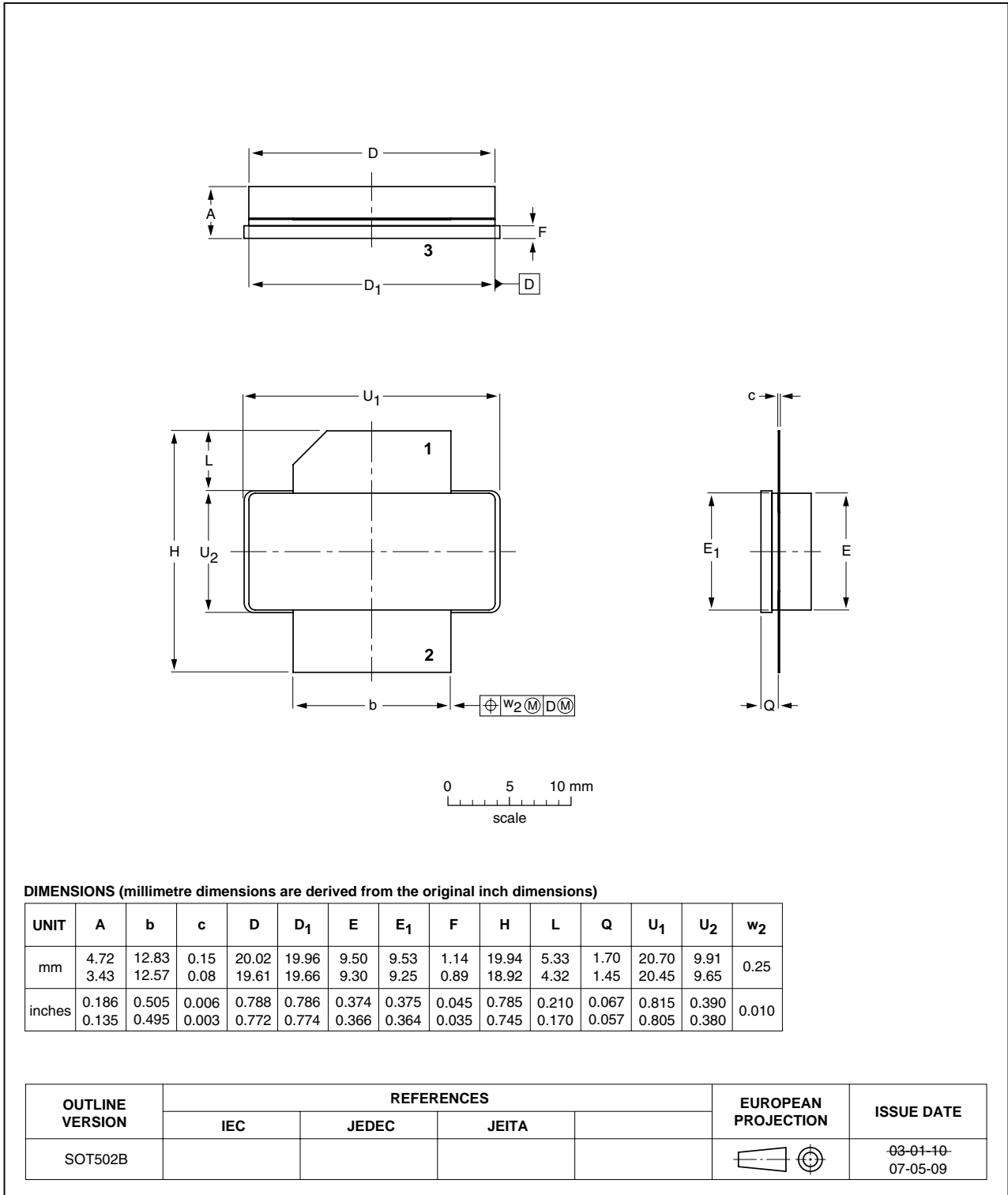


Fig 22. Package outline SOT502B

## 9. Abbreviations

**Table 11. 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 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

## 10. Revision history

**Table 12. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF7G22L-160_7G22LS-160 v.1	20110427	Preliminary 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.

[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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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## 13. Contents

<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features and benefits . . . . .	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>2</b>
<b>6</b>	<b>Characteristics</b> . . . . .	<b>3</b>
<b>7</b>	<b>Test information</b> . . . . .	<b>3</b>
7.1	Ruggedness in class-AB operation . . . . .	3
7.2	2-Carrier W-CDMA 5 MHz . . . . .	4
7.3	2-Carrier W-CDMA 10 MHz . . . . .	5
7.4	1-Carrier W-CDMA . . . . .	6
7.5	IS-95 . . . . .	8
7.6	CW . . . . .	9
7.7	CW-pulsed . . . . .	10
7.8	Test circuit . . . . .	11
7.9	Impedance information . . . . .	12
<b>8</b>	<b>Package outline</b> . . . . .	<b>13</b>
<b>9</b>	<b>Abbreviations</b> . . . . .	<b>15</b>
<b>10</b>	<b>Revision history</b> . . . . .	<b>15</b>
<b>11</b>	<b>Legal information</b> . . . . .	<b>16</b>
11.1	Data sheet status . . . . .	16
11.2	Definitions . . . . .	16
11.3	Disclaimers . . . . .	16
11.4	Trademarks . . . . .	17
<b>12</b>	<b>Contact information</b> . . . . .	<b>17</b>
<b>13</b>	<b>Contents</b> . . . . .	<b>18</b>

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