

# BLF8G20LS-200V

Power LDMOS transistor

Rev. 4 — 21 October 2013

Product data sheet

## 1. Product profile

### 1.1 General description

200 W LDMOS power transistor with improved video bandwidth for base station applications at frequencies from 1800 MHz to 2000 MHz.

**Table 1. Typical performance**

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

Test signal	f (MHz)	$I_{DQ}$ (mA)	$V_{DS}$ (V)	$P_{L(AV)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	ACPR (dBc)
2-carrier W-CDMA	1805 to 1880	1600	28	55	17.5	33	-30 <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
- Decoupling leads to enable improved video bandwidth (80 MHz typical)
- 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)

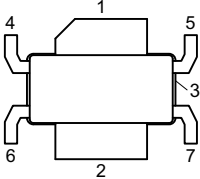
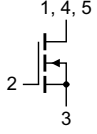
### 1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 1800 MHz to 2000 MHz frequency range



## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		 aaa-003884
2	gate		
3	source <a href="#">[1]</a>		
4,5	video decoupling		
6	n.c.		
7	n.c.		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF8G20LS-200V	-	earless flanged LDMOST ceramic package; 6 leads	SOT1120B

## 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
$T_{case}$	case temperature		<a href="#">[1]</a>	150	°C

[1] Continuous use at maximum temperature will affect MTTF

## 5. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
$T_{case}$	case temperature		-40	+125	°C

## 6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_L = 55\text{ W}$	0.27	K/W

## 7. Characteristics

**Table 7. DC 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	$V_{GS} = 0\text{ V}; I_D = 1.5\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 270\text{ mA}$	1.5	1.9	2.3	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 28\text{ V}; I_D = 1.6\text{ A}$	1.7	2.1	2.5	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	4.2	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	-	50.6	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	420	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 13.5\text{ A}$	-	19.6	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 9.45\text{ A}$	-	0.057	-	$\Omega$

**Table 8. RF characteristics**

Test signal: 2-carrier W-CDMA; PAR = 8.4 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 1807.5\text{ MHz}; f_2 = 1812.5\text{ MHz}; f_3 = 1872.5\text{ MHz}; f_4 = 1877.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 1600\text{ mA}; T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 55\text{ W}$	16.3	17.5	19.2	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 55\text{ W}$	29	33	-	%
$RL_{in}$	input return loss	$P_{L(AV)} = 55\text{ W}$	-	-15	-7	dB
ACPR	adjacent channel power ratio	$P_{L(AV)} = 55\text{ W}$	-	-30	-26	dBc

## 8. Test information

### 8.1 Ruggedness in class-AB operation

The BLF8G20LS-200V is capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 1600\text{ mA}; P_L = 200\text{ W (CW)}; f = 1805\text{ MHz}$ .

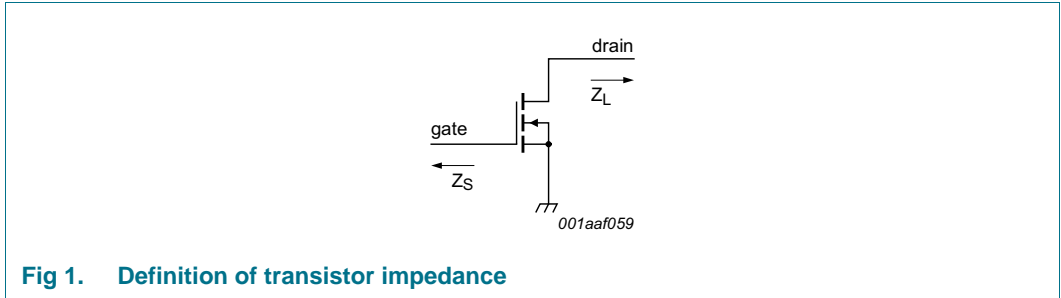
### 8.2 Impedance information

**Table 9. Typical impedance**

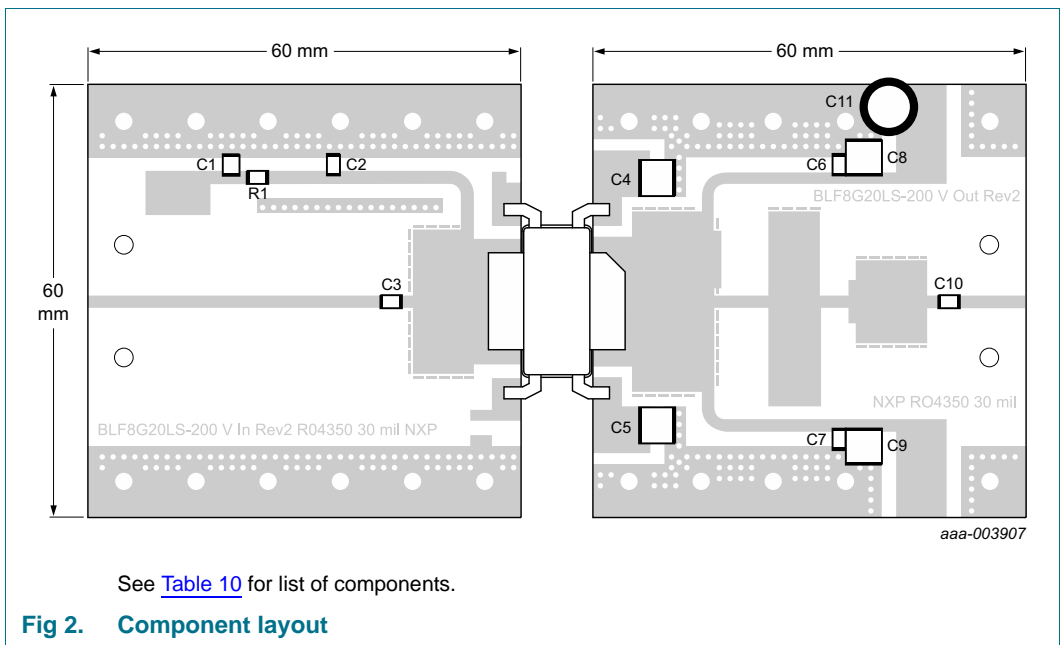
Measured load-pull data;  $I_{Dq} = 1600\text{ mA}; V_{DS} = 28\text{ V}$ .

f (MHz)	$Z_S$ <sup>[1]</sup> ( $\Omega$ )	$Z_L$ <sup>[1]</sup> ( $\Omega$ )
1805	1.01 – j3.66	1.04 – j2.44
1843	1.12 – j3.97	1.04 – j2.44
1880	1.37 – j4.20	1.04 – j2.44

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



**8.3 Test circuit**



**Table 10. List of components**

See [Figure 2](#) for component layout.

The used PCB material is Rogers RO4350B with a thickness of 0.76 mm.

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	4.7 $\mu$ F	[1] Murata
C2, C3	multilayer ceramic chip capacitor	20 pF	[2] ATC100B
C4, C5	multilayer ceramic chip capacitor	4.7 $\mu$ F	[3] TDK
C6, C7	multilayer ceramic chip capacitor	8.2 pF	[4] ATC800B
C8, C9	multilayer ceramic chip capacitor	4.7 $\mu$ F	[3] TDK
C10	multilayer ceramic chip capacitor	20 pF	[4] ATC800B
C11	electrolytic capacitor	470 $\mu$ F, 63 V	
R1	chip resistor	4.7 $\Omega$	1206

[1] Murata or capacitor of same quality.

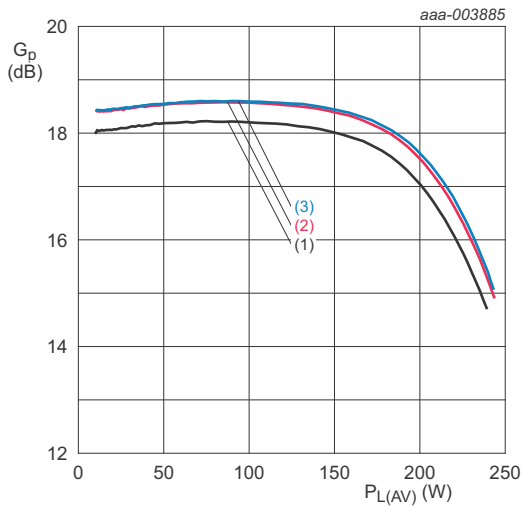
[2] American Technical Ceramics type 100B or capacitor of same quality.

[3] TDK or capacitor of same quality.

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

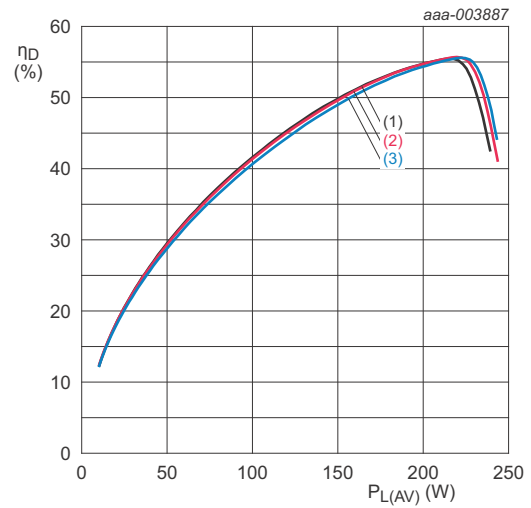
**8.4 Graphical data**

**8.4.1 1-Tone CW**



- $V_{DS} = 28\text{ V}; I_{Dq} = 1600\text{ mA.}$
- (1)  $f = 1805\text{ MHz}$
  - (2)  $f = 1843\text{ MHz}$
  - (3)  $f = 1880\text{ MHz}$

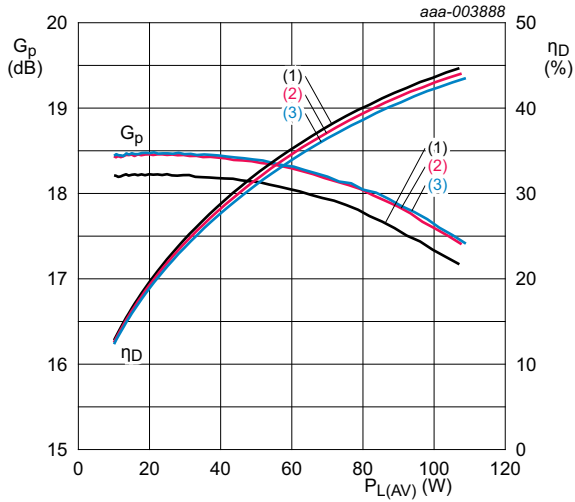
**Fig 3. Power gain as a function of average output power; typical values**



- $V_{DS} = 28\text{ V}; I_{Dq} = 1600\text{ mA.}$
- (1)  $f = 1805\text{ MHz}$
  - (2)  $f = 1843\text{ MHz}$
  - (3)  $f = 1880\text{ MHz}$

**Fig 4. Drain efficiency as a function of average output power; typical values**

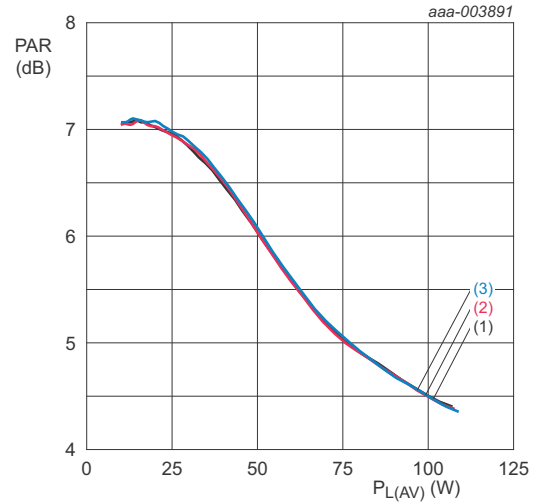
8.4.2 1-Carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ; PAR = 7.2 dB at 0.01 % probability on the CCDF.

- (1)  $f = 1805\text{ MHz}$
- (2)  $f = 1843\text{ MHz}$
- (3)  $f = 1880\text{ MHz}$

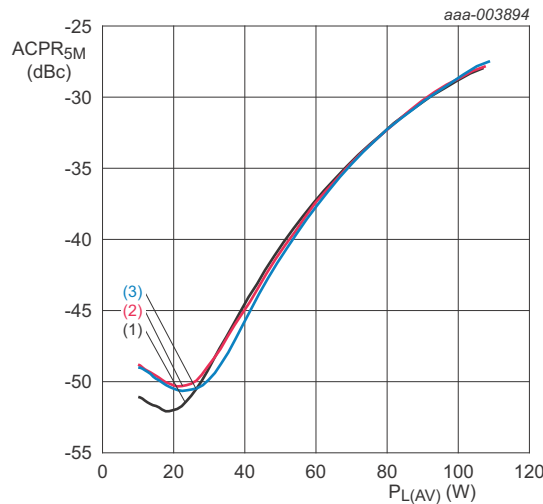
Fig 5. Power gain and drain efficiency as function of average output power; typical values



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ; PAR = 7.2 dB at 0.01 % probability on the CCDF.

- (1)  $f = 1805\text{ MHz}$
- (2)  $f = 1843\text{ MHz}$
- (3)  $f = 1880\text{ MHz}$

Fig 6. Peak-to-average power ratio as a function of average output power; typical values

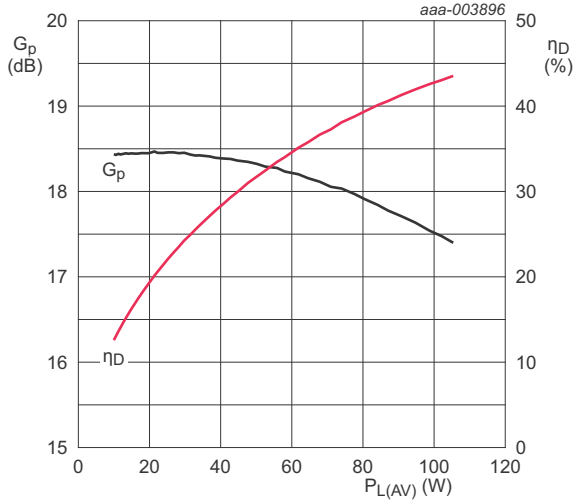


$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ; PAR = 7.2 dB at 0.01 % probability on the CCDF.

- (1)  $f = 1805\text{ MHz}$
- (2)  $f = 1843\text{ MHz}$
- (3)  $f = 1880\text{ MHz}$

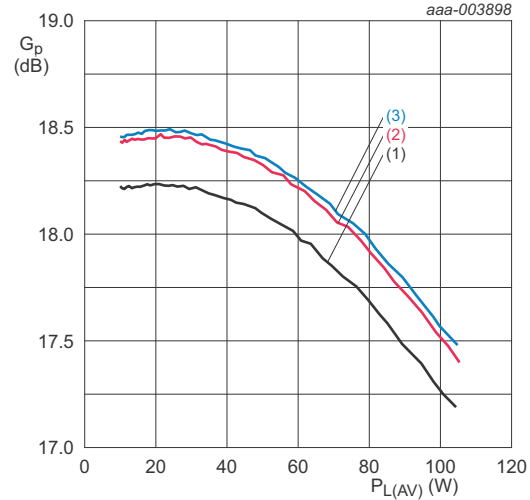
Fig 7. Adjacent power channel ratio (5 MHz) as a function of average output power; typical values

8.4.3 2-Carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ;  $f = 1843\text{ MHz}$ ; channel spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

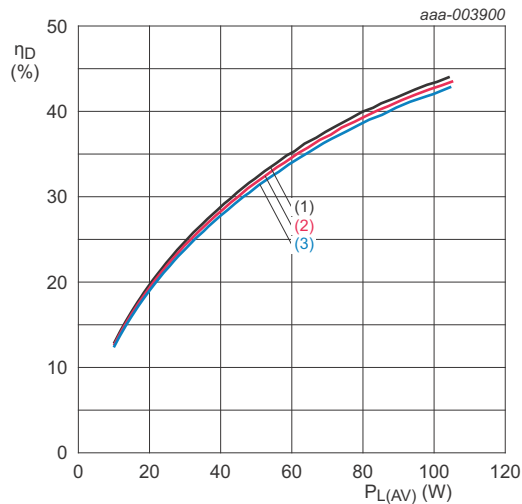
Fig 8. Power gain and drain efficiency as function of average output power; typical values



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ; channel spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 1805\text{ MHz}$
- (2)  $f = 1843\text{ MHz}$
- (3)  $f = 1880\text{ MHz}$

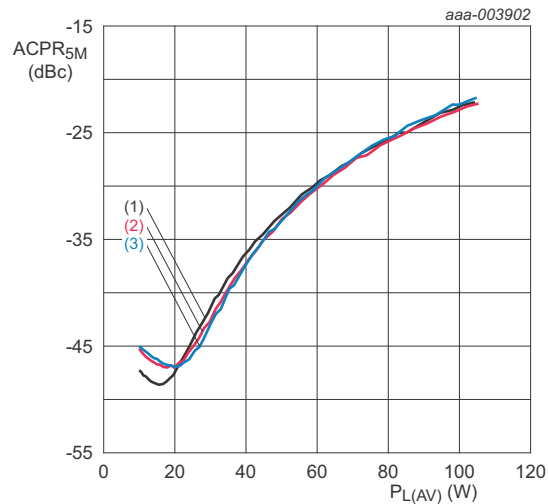
Fig 9. Power gain as a function of average output power; typical values



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ; channel spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 1805\text{ MHz}$
- (2)  $f = 1843\text{ MHz}$
- (3)  $f = 1880\text{ MHz}$

Fig 10. Drain efficiency as a function of average output power; typical values

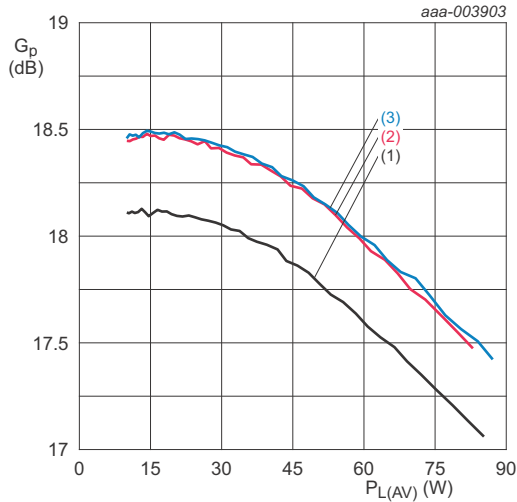


$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ; channel spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

- (1)  $f = 1805\text{ MHz}$
- (2)  $f = 1843\text{ MHz}$
- (3)  $f = 1880\text{ MHz}$

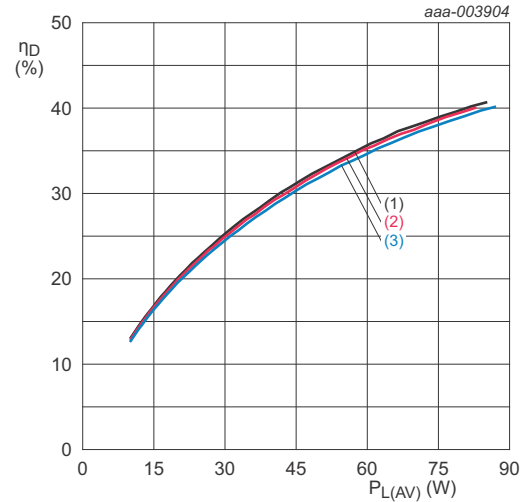
Fig 11. Adjacent power channel ratio (5 MHz) as a function of average output power; typical values

8.4.4 IS-95



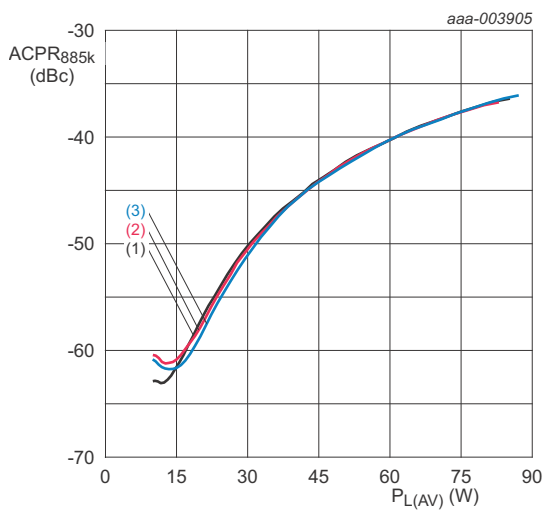
$V_{DS} = 28\text{ V}; I_{Dq} = 1600\text{ mA}.$   
 (1)  $f = 1805\text{ MHz}$   
 (2)  $f = 1843\text{ MHz}$   
 (3)  $f = 1880\text{ MHz}$

**Fig 12. Power gain as a function of average output power; typical values**



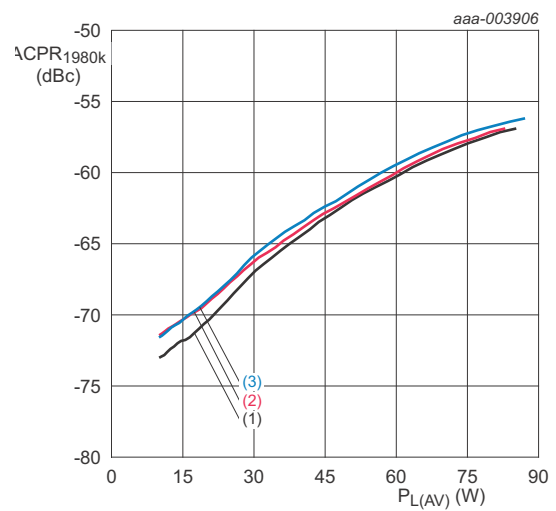
$V_{DS} = 28\text{ V}; I_{Dq} = 1600\text{ mA}.$   
 (1)  $f = 1805\text{ MHz}$   
 (2)  $f = 1843\text{ MHz}$   
 (3)  $f = 1880\text{ MHz}$

**Fig 13. Drain efficiency as a function of average output power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1600\text{ mA}.$   
 (1)  $f = 1805\text{ MHz}$   
 (2)  $f = 1843\text{ MHz}$   
 (3)  $f = 1880\text{ MHz}$

**Fig 14. Adjacent power channel ratio (885 kHz) as a function of average output power; typical values**

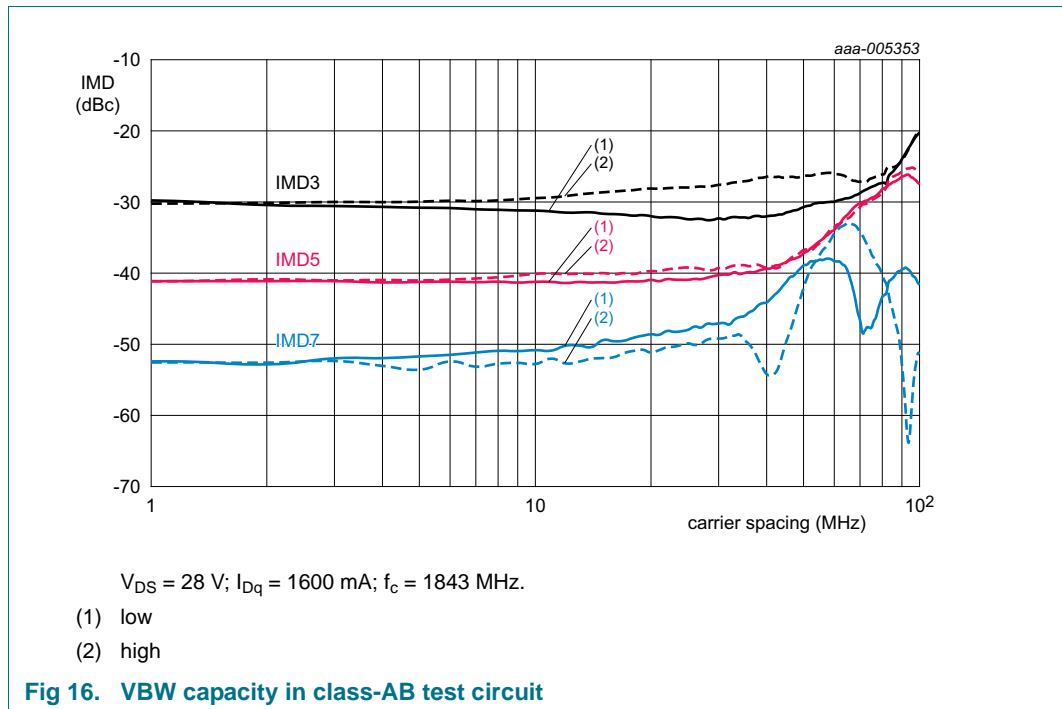


$V_{DS} = 28\text{ V}; I_{Dq} = 1600\text{ mA}.$   
 (1)  $f = 1805\text{ MHz}$   
 (2)  $f = 1843\text{ MHz}$   
 (3)  $f = 1880\text{ MHz}$

**Fig 15. Adjacent power channel ratio (1980 kHz) as a function of average output power; typical values**



**8.4.5 2-Tone VBW**



9. Package outline

Earless flanged LDMOST ceramic package; 6 leads

SOT1120B

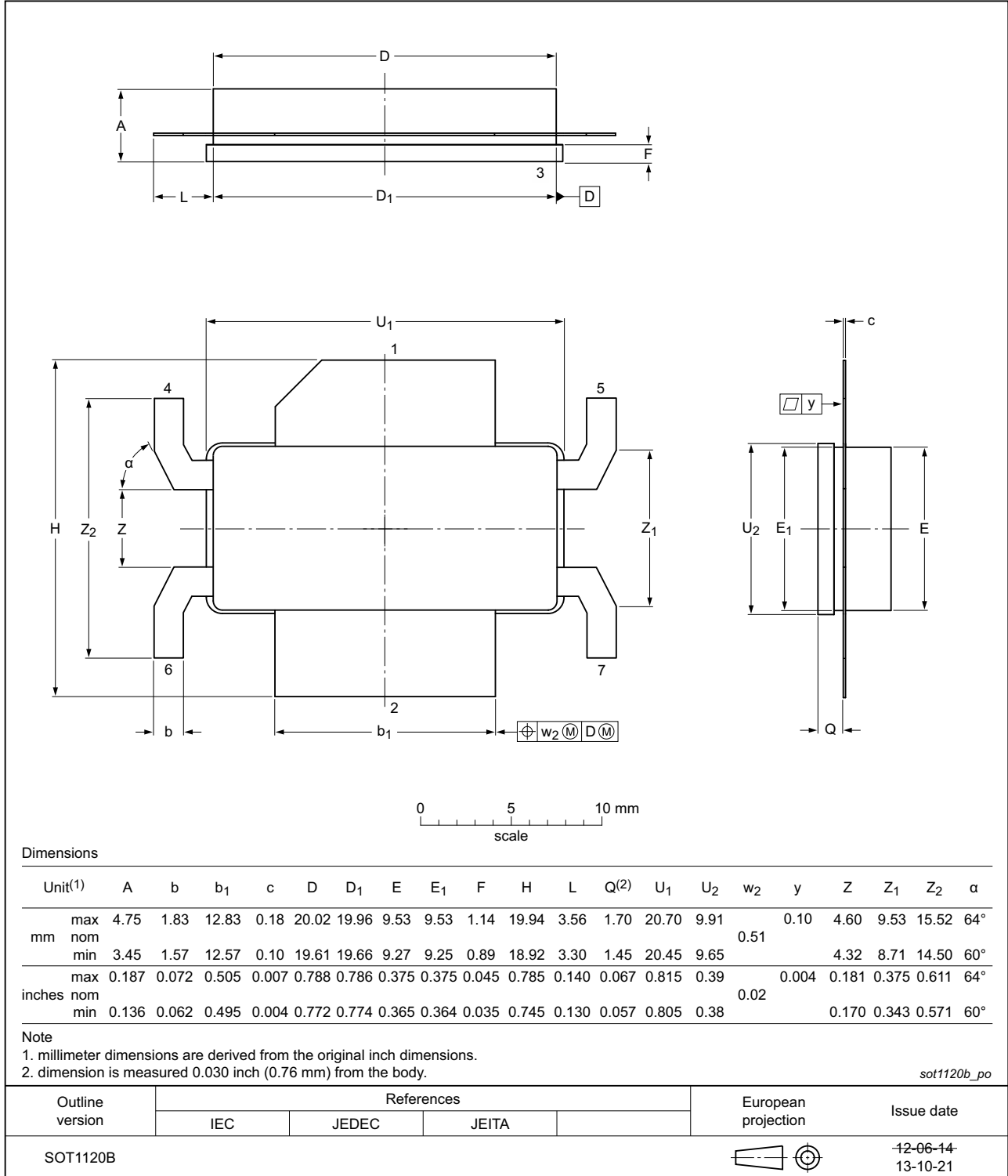


Fig 17. Package outline SOT1120B

## 10. Handling information

### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

## 11. Abbreviations

**Table 11. Abbreviations**

Acronym	Description
3GPP	3rd 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
MTTF	Mean Time To Failure
PAR	Peak-to-Average Ratio
VSWR	Voltage Standing Wave Ratio
VBW	Video BandWidth
W-CDMA	Wideband Code Division Multiple Access

## 12. Revision history

**Table 12. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF8G20LS-200V v.4	20131021	Product data sheet	-	BLF8G20LS-200V v.3
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Figure 17 on page 10</a>: figure has been updated.</li> </ul>			
BLF8G20LS-200V v.3	20130121	Product data sheet	-	BLF8G20LS-200V v.2
BLF8G20LS-200V v.2	20121012	Product data sheet	-	BLF8G20LS-200V v.1
BLF8G20LS-200V v.1	20120704	Objective data sheet	-	-

## 13. Legal information

### 13.1 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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For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

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Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.