

# BLF7G15LS-200

## Power LDMOS transistor

Rev. 3 — 22 July 2011

Product data sheet

## 1. Product profile

### 1.1 General description

200 W LDMOS power transistor for base station applications at frequencies from 1450 MHz to 1550 MHz.

**Table 1. Typical performance**

Typical RF performance at  $T_{case} = 25^\circ\text{C}$  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	1476 to 1511	1600	28	50	19.5	29	-35 <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.

### 1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low  $R_{th}$  providing excellent thermal stability
- Designed for broadband operation (1450 MHz to 1550 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)

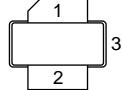
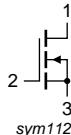
### 1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 1450 MHz to 1550 MHz frequency range



## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	drain		
2	gate		
3	source	[1]	  sym112

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package			Version
	Name	Description		
BLF7G15LS-200	-	earless flanged LDMOST ceramic package; 2 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		-	56	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	$T_{case} = 80$ °C; $P_L = 50$ W; $V_{DS} = 28$ V; $I_{Dq} = 1600$ mA	0.30	K/W

## 6. Characteristics

Table 6. Characteristics

$T_j = 25$  °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0$ V; $I_D = 2.7$ mA	65	67	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10$ V; $I_D = 270$ mA	1.5	1.9	2.3	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0$ V; $V_{DS} = 28$ V	-	-	4.2	μA

**Table 6. Characteristics ...continued**  
 $T_j = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(\text{th})} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	42	49	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	420	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 13.5\text{ A}$	17	19.3	19.7	S
$R_{DS(\text{on})}$	drain-source on-state resistance	$V_{GS} = V_{GS(\text{th})} + 3.75\text{ V}; I_D = 9.45\text{ A}$	0.012	0.048	0.093	$\Omega$

## 7. Test information

**Table 7. Functional test information**

Mode of operation: 2-carrier W-CDMA; PAR = 7.5 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 1473.5\text{ MHz}$ ;  $f_2 = 1478.5\text{ MHz}$ ;  $f_3 = 1508.5\text{ MHz}$ ;  $f_4 = 1513.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ;  $T_{\text{case}} = 25^\circ\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(\text{AV})}$	average output power		-	50	-	W
$G_p$	power gain	$P_{L(\text{AV})} = 50\text{ W}$	18.3	19.5	-	dB
$RL_{\text{in}}$	input return loss	$P_{L(\text{AV})} = 50\text{ W}$	-	-8	-5.5	dB
$\eta_D$	drain efficiency	$P_{L(\text{AV})} = 50\text{ W}$	27	29	-	%
ACPR	adjacent channel power ratio	$P_{L(\text{AV})} = 50\text{ W}$	-	-35	-33	dBc

**Table 8. PAR performance**

Mode of operation: 1-carrier W-CDMA; PAR = 7.5 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 1511\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ;  $T_{\text{case}} = 25^\circ\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$\text{PAR}_0$	output peak-to-average ratio	$P_{L(\text{AV})} = 100\text{ W}$ at 0.01 % probability on CCDF	4.2	4.6	-	dB

### 7.1 Ruggedness in class-AB operation

The BLF7G15LS-200 is capable of withstanding a load mismatch corresponding to  $\text{VSWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1600\text{ mA}$ ;  $P_L = 150\text{ W}$  (CW);  $f = 1476\text{ MHz}$  to  $1511\text{ MHz}$ .

### 7.2 Impedance information

**Table 9. Typical impedance information**

$I_{Dq} = 1600\text{ mA}$ ; main transistor  $V_{DS} = 28\text{ V}$ .

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

f (MHz)	$Z_S$ ( $\Omega$ )	$Z_L$ ( $\Omega$ )
1410	$0.74 - j1.52$	$3.5 - j1.7$
1480	$0.65 - j1.7$	$4.0 - j0.74$
1560	$0.61 - j1.74$	$3.8 + j0.5$

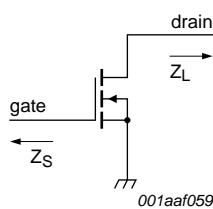
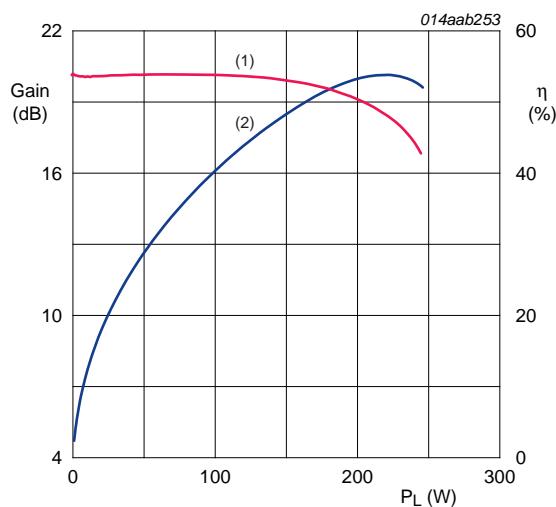


Fig 1. Definition of transistor impedance

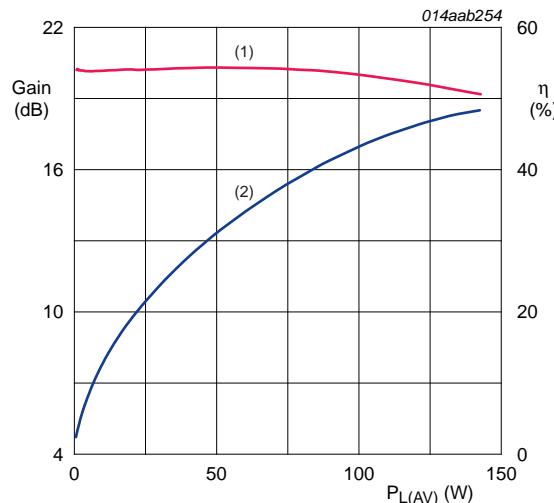
### 7.3 Graphs



$V_{DS} = 28$  V;  $I_{Dq} = 1600$  mA;  $f = 1511$  MHz.

- (1) gain
- (2) efficiency

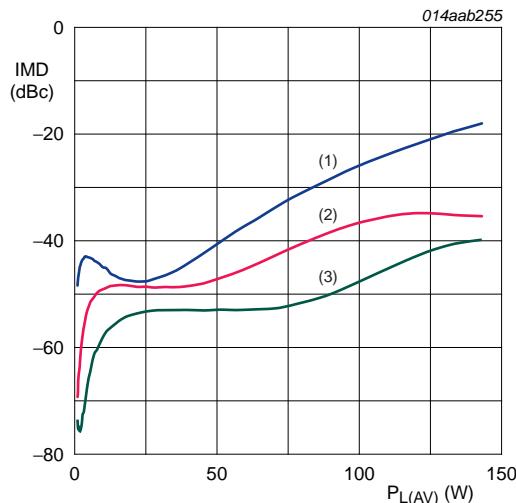
Fig 2. One-tone CW power gain and drain efficiency as function of load power; typical values



$V_{DS} = 28$  V;  $I_{Dq} = 1600$  mA;  $f = 1511$  MHz;  
tone spacing 0.1 MHz.

- (1) gain
- (2) efficiency

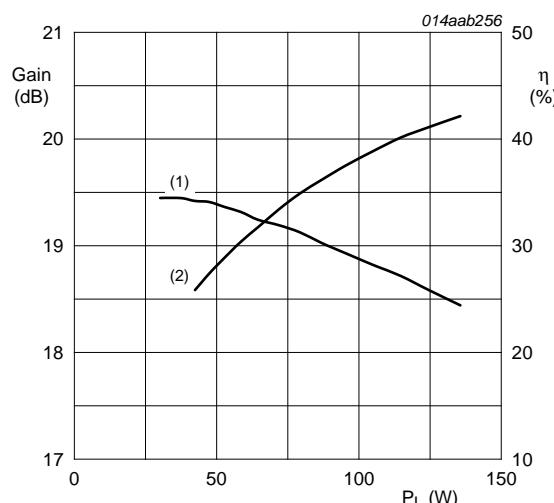
**Fig 3. Two-tone CW power gain and drain efficiency as function of average load power; typical values**



$V_{DS} = 28$  V;  $I_{Dq} = 1600$  mA;  $f = 1511$  MHz;  
tone spacing 0.1 MHz.

- (1) IMD3
- (2) IMD5
- (3) IMD7

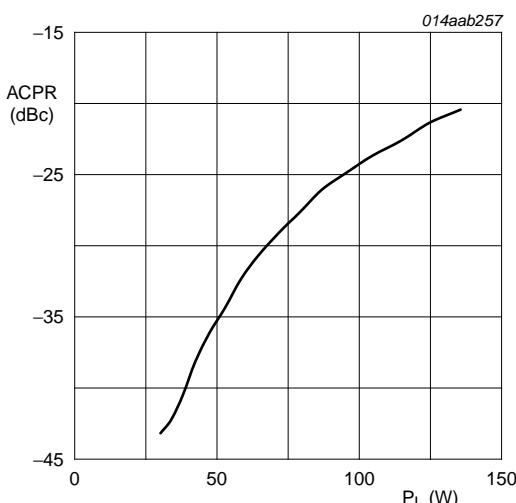
**Fig 4. Two-tone intermodulation distortion as a function of average load power; typical values**



$V_{DS} = 28$  V;  $I_{Dq} = 1600$  mA;  $f = 1511$  MHz;  
carrier spacing 5 MHz.

- (1) gain
- (2) efficiency

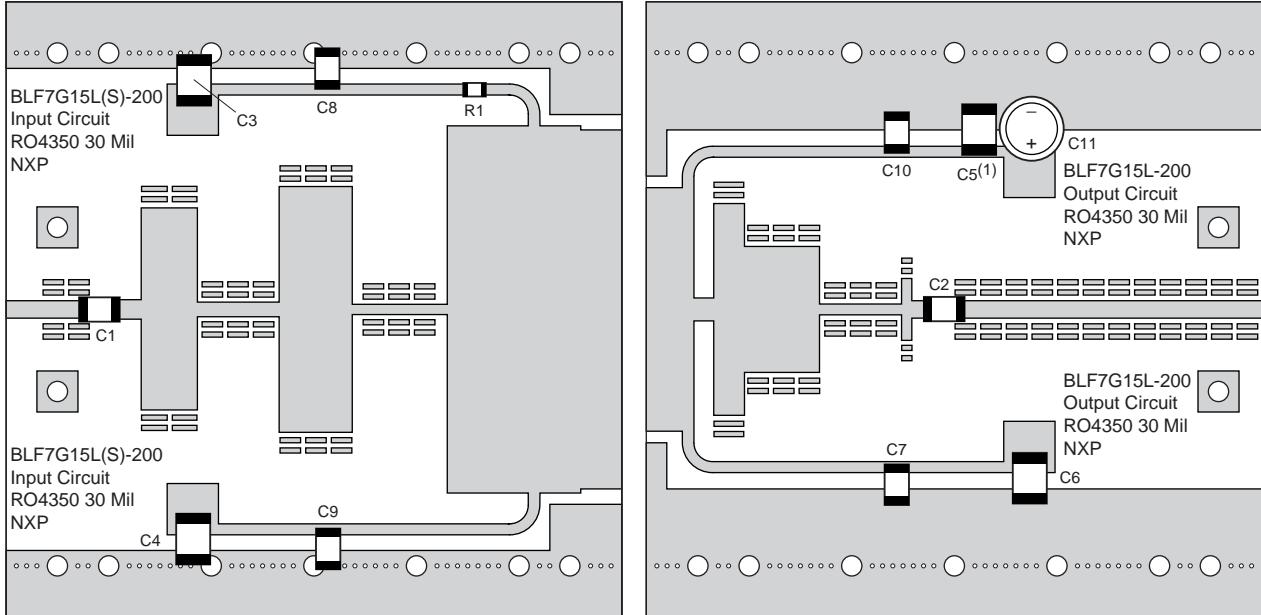
**Fig 5. 2-carrier W-CDMA power gain and drain efficiency as function of load power; typical values**



$V_{DS} = 28$  V;  $I_{Dq} = 1600$  mA;  $f = 1511$  MHz;  
carrier spacing 5 MHz.

**Fig 6. 2-carrier W-CDMA adjacent channel power ratio as function of load power 5 MHz frequency offset; typical values**

## 7.4 Test circuit



014aab258

(1) C5 should be mounted under C11.

Rogers RO4350 Printed-Circuit Board (PCB) with  $\epsilon_r = 3.48$  and thickness = 0.765 mm (30 mil).

See [Table 10](#) for list of components. The drawing is not to scale.

The vias can be as a reference to place components.

The above layout shows the test circuit used to measure devices in production. The RF Power and Bas-Station group can provide a more appropriate application demonstration for specific customer needs.

**Fig 7. Component layout**

**Table 10. List of components**

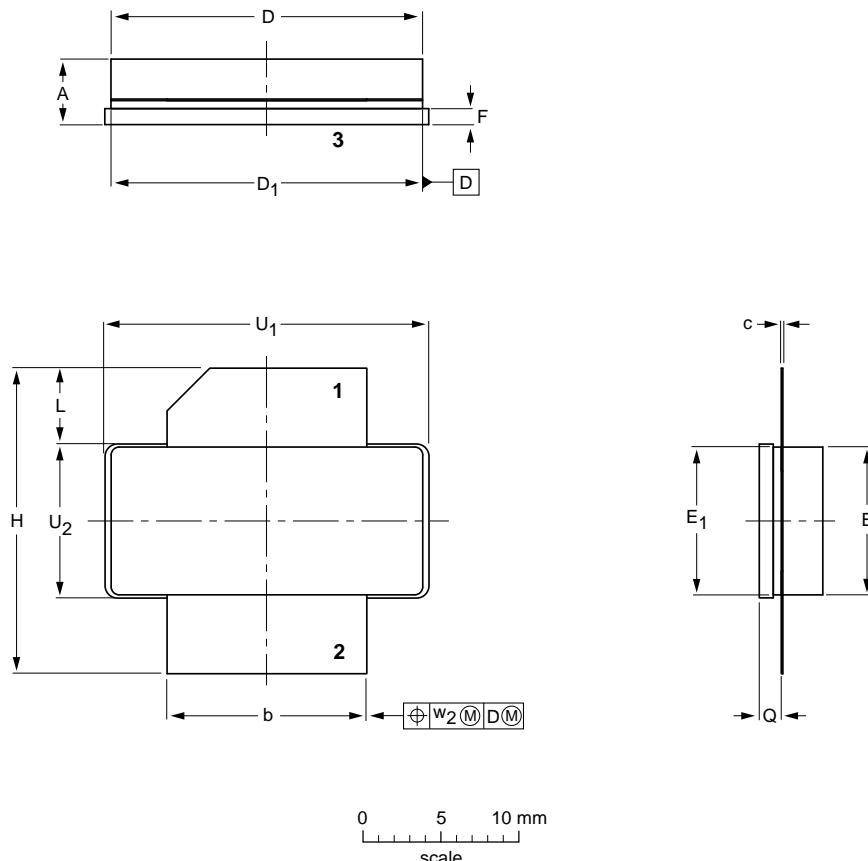
See [Figure 7](#) for test circuit.

Component	Description	Value	Remarks
C1	multi layer ceramic chip capacitor	10 pF	ATC 800B
C2, C7, C10	multi layer ceramic chip capacitor	47 pF	ATC 800A
C3, C4, C5, C6	multi layer ceramic chip capacitor	10 $\mu$ F	Murata
C8, C9	multi layer ceramic chip capacitor	36 pF	ATC 800B
C11	electrolytic capacitor	470 $\mu$ F; 63 V	
R1	chip resistor	15 $\Omega$	Philips 1206

## 8. Package outline

Earless flanged LDMOST ceramic package; 2 leads

SOT502B



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D <sub>1</sub>	E	E <sub>1</sub>	F	H	L	Q	U <sub>1</sub>	U <sub>2</sub>	w <sub>2</sub>
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	1.70 1.45	20.70 20.45	9.91 9.65	0.25
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.067 0.057	0.815 0.805	0.390 0.380	0.010

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502B						-03-01-10- 07-05-09

Fig 8. 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
RF	Radio Frequency
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
BLF7G15LS-200 v.3	20110722	Product data sheet	-	BLF7G15LS-200 v.2
Modifications:		• The status of this data sheet has been changed to Product data sheet		
BLF7G15LS-200 v.2	20110301	Preliminary data sheet	-	BLF7G15LS-200 v.1
BLF7G15LS-200 v.1	20100913	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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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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>2</b>
<b>7</b>	<b>Test information</b>	<b>3</b>
7.1	Ruggedness in class-AB operation	3
7.2	Impedance information	3
7.3	Graphs	4
7.4	Test circuit	6
<b>8</b>	<b>Package outline</b>	<b>7</b>
<b>9</b>	<b>Abbreviations</b>	<b>8</b>
<b>10</b>	<b>Revision history</b>	<b>8</b>
<b>11</b>	<b>Legal information</b>	<b>9</b>
11.1	Data sheet status	9
11.2	Definitions	9
11.3	Disclaimers	9
11.4	Trademarks	10
<b>12</b>	<b>Contact information</b>	<b>10</b>
<b>13</b>	<b>Contents</b>	<b>11</b>

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