BLF7G15LS-300P

Power LDMOS transistor

Rev. 2 — 3 December 2010 Product data sheet

1. Product profile

1.1 General description

300 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 °C in a common source class-AB production test circuit.

Mode of operation	f	I_{Dq}	V_{DS}	$P_{L(AV)}$	G_p	η_D	ACPR
	(MHz)	(mA)	(V)	(W)	(dB)	(%)	(dBc)
2-carrier W-CDMA	1476 to 1511	2600	28	85	18	31	–32 [1]

[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

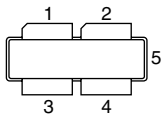
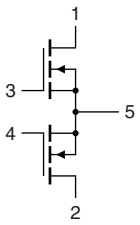
- High efficiency
- Low R_{th} providing excellent thermal stability
- Designed for broadband operation (1450 MHz to 1550 MHz)
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for 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. Discrete pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source [1]		

[1] Connected to flange

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF7G15LS-300P	-	earless flanged balanced LDMOST ceramic package; 4 leads	SOT539B

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	per section	-	45	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 = 85 W; V_{DS} = 28 V; I_{Dq} = 2600 mA	0.21	K/W

6. Characteristics

Table 6. Characteristics

T_j = 25 °C; per section unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 2.2 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 220 mA	1.5	1.9	2.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	2.8	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	34	39	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	280	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 11.0 A	-	16.2	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 7.7 A	-	0.065	-	Ω

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 MHz; f_2 = 1478.5 MHz; f_3 = 1508.5 MHz; f_4 = 1513.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 2600 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	85	-	W
G_p	power gain	$P_{L(AV)}$ = 85 W	17	18	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 85 W	-	–7	–6	dB
η_D	drain efficiency	$P_{L(AV)}$ = 85 W	28	31	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)}$ = 85 W	-	–32	–28	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 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 2600 mA; T_{case} = 25 °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	$P_{L(AV)}$ = 130 W at 0.01 % probability on CCDF	4.4	5.0	-	dB

7.1 Ruggedness in class-AB operation

The BLF7G15LS-300P is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq} = 2600 mA; P_L = 100 W (CW); f = 1450 MHz to 1550 MHz.

7.2 Impedance information

Table 9. Typical impedance per section (for the maximum peak power)

I_{Dq} = 1300 mA; V_{DS} = 28 V.
Z_S and Z_L defined in Figure 1.

f	Z_S	Z_L
(MHz)	(Ω)	(Ω)
1410	0.65 – j2.06	6.3 – j2.1
1480	0.55 – j1.92	7.2 – j1.3
1560	0.63 – j2.14	6.8 + j0.26

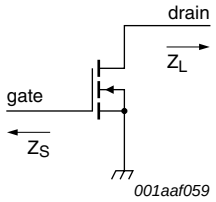
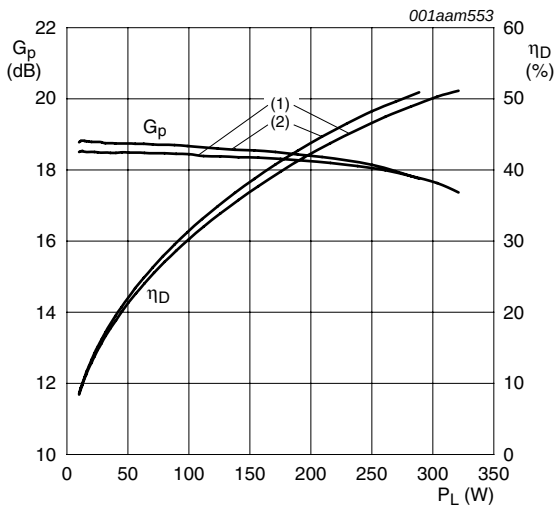


Fig 1. Definition of transistor impedance

7.3 Graphs

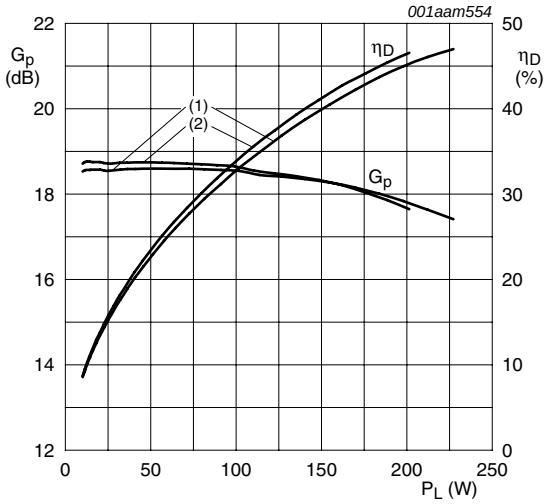


V_{DS} = 28 V; I_{Dq} = 2600 mA.

(1) f = 1476 MHz

(2) f = 1511 MHz

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

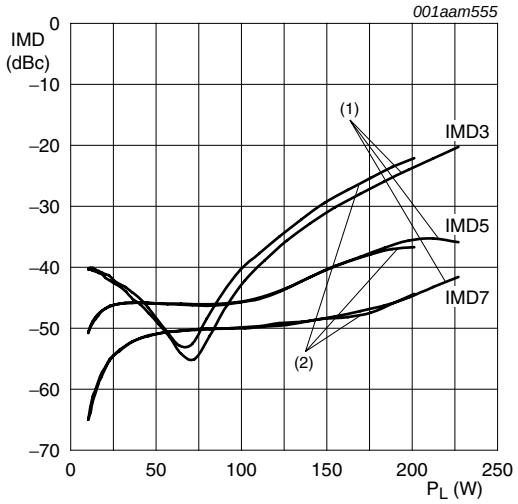


V_{DS} = 28 V; I_{Dq} = 2600 mA;
tone spacing 0.1 MHz.

(1) f = 1476 MHz

(2) f = 1511 MHz

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

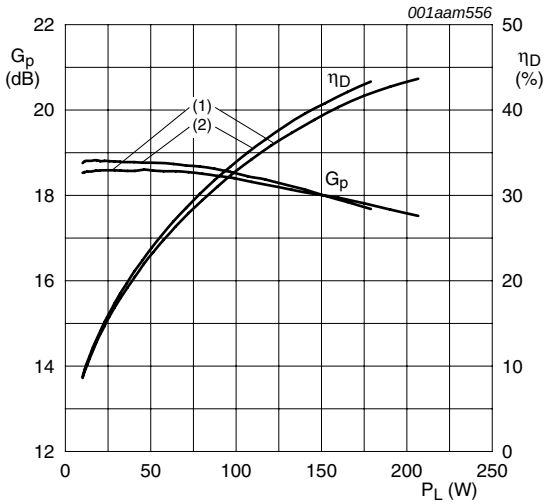


V_{DS} = 28 V; I_{Dq} = 2600 mA;
tone spacing 0.1 MHz.

(1) f = 1476 MHz

(2) f = 1511 MHz

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

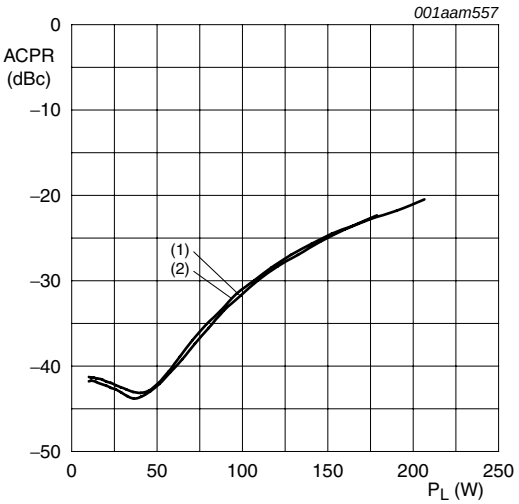


V_{DS} = 28 V; I_{Dq} = 2600 mA;
carrier spacing 5 MHz.

(1) f = 1476 MHz

(2) f = 1511 MHz

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



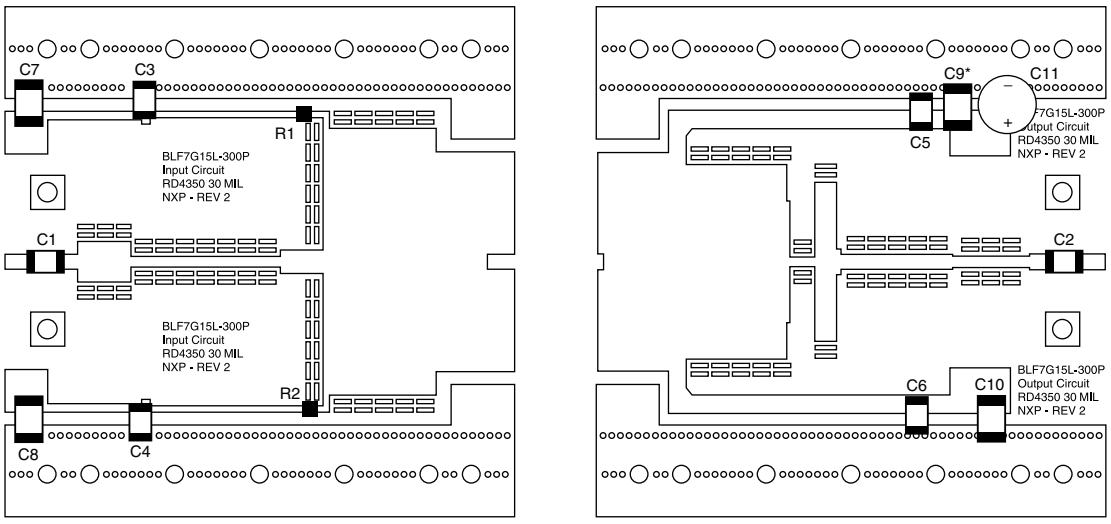
V_{DS} = 28 V; I_{Dq} = 2600 mA;
carrier spacing 5 MHz.

(1) f = 1476 MHz

(2) f = 1511 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



Rogers RO4350 Printed-Circuit Board (PCB) with ε_r = 3.5 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 Base-Station group can provide a more appropriate application demonstration for specific customer needs.

Fig 7. Component layout

Table 10. List of components

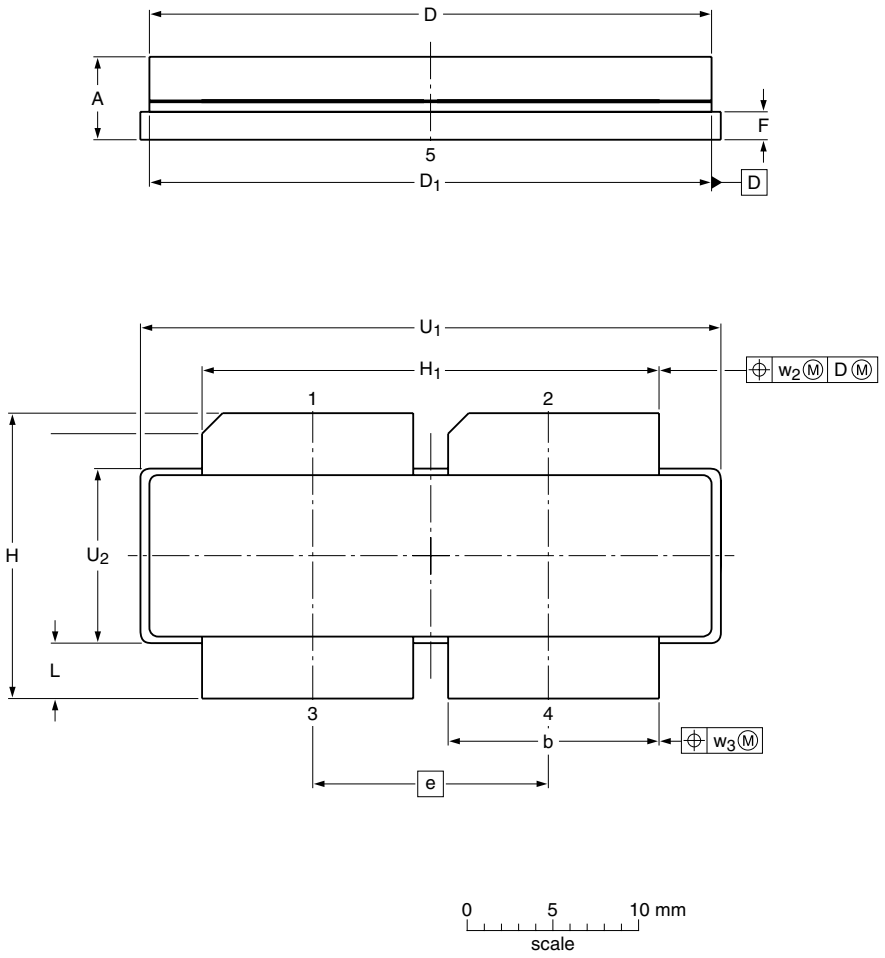
See Figure 7 for test circuit.

Component	Description	Value		Remarks
C1, C2	multi layer ceramic chip capacitor	100 pF	[1]	ATC 800B
C3, C4	multi layer ceramic chip capacitor	68 pF	[1]	ATC 800B
C5, C6	multi layer ceramic chip capacitor	47 pF	[1]	ATC 800A
C7, C8, C9, C10	multi layer ceramic chip capacitor	10 μF		Murata
C11	electrolytic capacitor	470 μF; 63 V		
R1, R2	chip resistor	15 Ω		Philips 1206

[1] All ATC chip capacitors need to be soldered vertically.

8. Package outline

Earless flanged balanced LDMOST ceramic package; 4 leads **SOT539B**



Dimensions

Unit[1]		A	b	c	D	D_1	E	E_1	e	F	H	H_1	L	Q	U_1	U_2	w_2	w_3
mm	max	4.7	11.81	0.18	31.55	31.52	9.5	9.53		1.75	17.12	25.53	3.48	2.26	32.77	10.29		
	nom								13.72								0.25	0.25
	min	4.2	11.56	0.10	30.94	30.96	9.3	9.27		1.50	16.10	25.27	2.97	2.01	32.13	10.03		
mm	max	0.185	0.465	0.007	1.242	1.241	0.374	0.375		0.069	0.674	1.005	0.137	0.089	1.275	0.405		
	nom								0.54								0.01	0.01
	min	0.165	0.455	0.004	1.218	1.219	0.366	0.365		0.059	0.634	0.995	0.117	0.079	1.265	0.395		

Note

1. millimeter dimensions are derived from the original inch dimensions.

sot539b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT539B						~~09-10-16~~ 10-02-02

Fig 8. Package outline SOT539B

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-300P v.2	20101203	Product data sheet	-	BLF7G15LS-300P v.1
Modifications:	• Section 1.2 on page 1: list item “Excellent ruggedness” removed. • Table 7 on page 3: values of RL_{in} have been projected on negative scale. • Section “Handling information” removed			
BLF7G15LS-300P v.1	20100921	Preliminary data sheet	-	-

11. Legal information

11.1 Data sheet status

Document status[1][2]	Product status[3]	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

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