BLF7G27L-135

Power LDMOS transistor

Rev. 2 — 26 March 2012 Product data sheet

1. Product profile

1.1 General description

135 W LDMOS power transistor for base station applications at frequencies from 2600 MHz to 2700 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 (MHz)	I_{Dq} (mA)	V_{DS} (V)	$P_{L(AV)}$ (W)	G_p (dB)	η_D (%)	$ACPR_{5M}$ (dBc)
2-carrier W-CDMA	2600 to 2700	1300	28	35	16.5	27.5	–29 [1]

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF. carrier spacing 5 MHz; channel bandwidth is 3.84 MHz.

1.2 Features and benefits

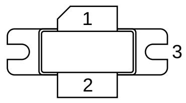
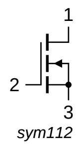
- Excellent ruggedness
- High efficiency
- Low R_{th} providing excellent thermal stability
- Designed for low memory effects providing excellent digital pre-distortion capability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 2600 MHz to 2700 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		
2	gate		
3	source [1]		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF7G27L-135	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A

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		-	28	A
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature	[1]	-	+200	°C

[1] Continuous use at maximum temperature will affect MTF.

5. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage		-	32	V
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 °C; P_L = 35 W	0.28	K/W

7. Characteristics

Table 7. 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 = 1 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 216 mA	1.5	1.8	2.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	5	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	34.2	40.5	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	500	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 216 mA	-	1.87	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 7.56 A	-	0.07	-	Ω

8. Test information

Remark: All testing performed in a class-AB production test circuit.

Table 8. Functional test information

Mode of operation: 2-carrier W-CDMA, 3GPP; test model 1; 64 DPCH;. PAR = 8.4 dB at 0.01 % probability on the CCDF, carrier spacing 5 MHz; f_1 = 2627.5 MHz; f_2 = 2687.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 1300 mA; T_{case} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$P_{L(AV)}$	average output power			-	35	-	W
G_p	power gain	$P_{L(AV)}$ = 35 W		15.3	16.5	17.7	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 35 W		-	−16	−9.5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 35 W		24.0	27.5	-	%
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)}$ = 35 W		-	−29	−26	dBc
$ACPR_{10M}$	adjacent channel power ratio (10 MHz)	$P_{L(AV)}$ = 35 W		-	−39	−31	dBc
$P_{L(M)}$	peak output power	$P_{L(AV)}$ = 70 W	[1]	184	195	210	W
PAR	peak-to-average ratio	$P_{L(AV)}$ = 70 W	[1]	4.1	4.45	4.9	dB

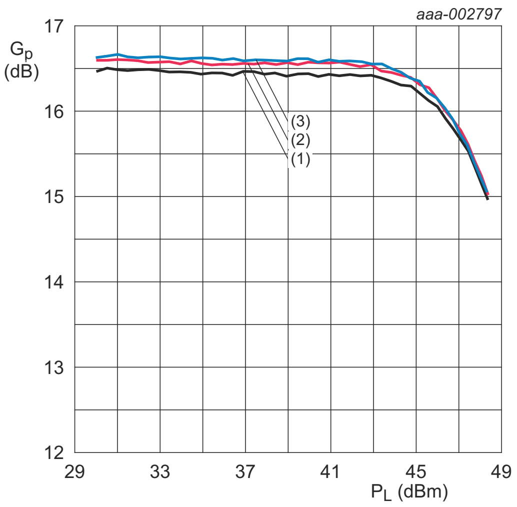
[1] Mode of operation: 1-carrier W-CDMA, 3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF; channel bandwidth is 3.84 MHz; f = 2687.5 MHz. Rohde&Schwarz FSU spectrum analyzer, CCDF method.

8.1 Ruggedness in class-AB operation

The BLF7G27L-135 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} = 1300 mA; P_L = 135 W (CW); f = 2600 MHz.

8.2 Single carrier IS-95

Single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13). PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz.



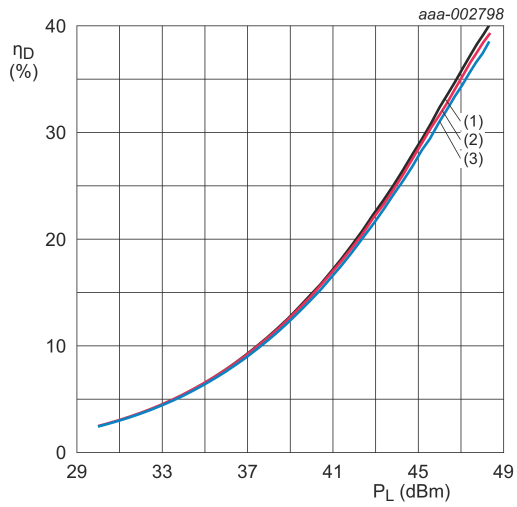
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 1. Single carrier IS-95 power gain as a function of average output power; typical values



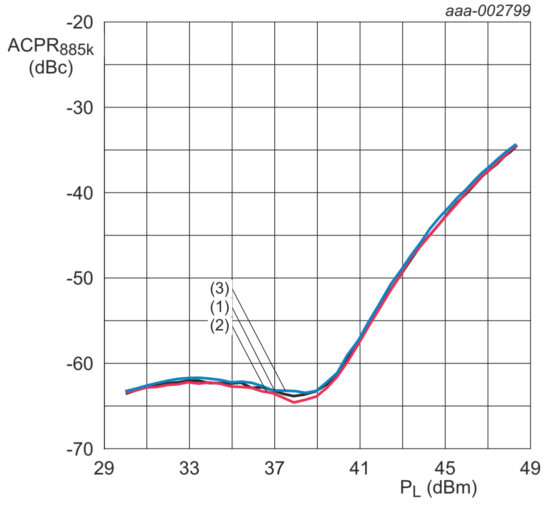
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

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



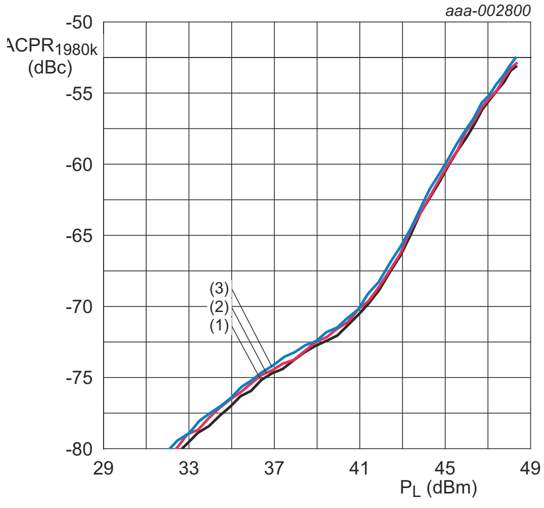
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 3. Single carrier IS-95 ACPR at 885 kHz as a function of average output power; typical values



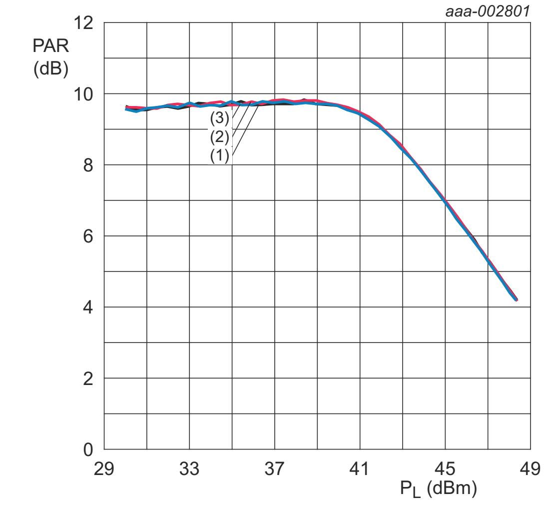
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 4. Single carrier IS-95 ACPR at 1980 kHz as a function of average output power; typical values



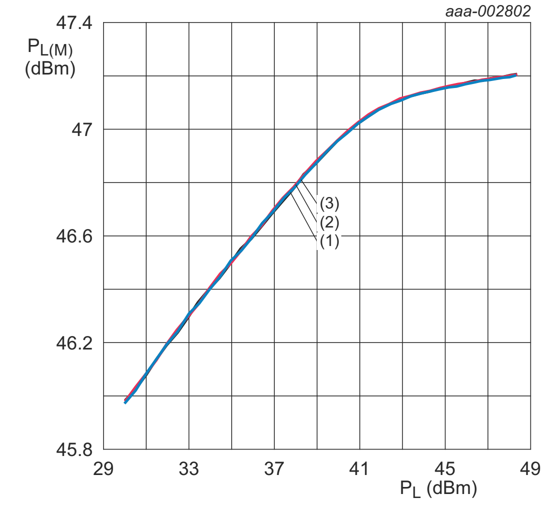
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 5. Single carrier IS-95 peak-to-average power ratio as a function of average output power; typical values



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

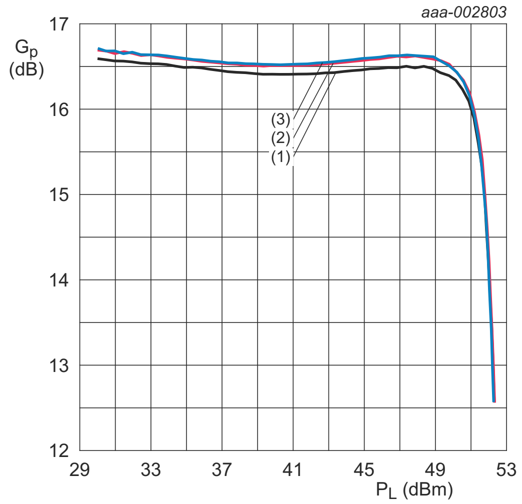
(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 6. Single carrier IS-95 peak output power as a function of average output power; typical values

8.3 Pulsed CW



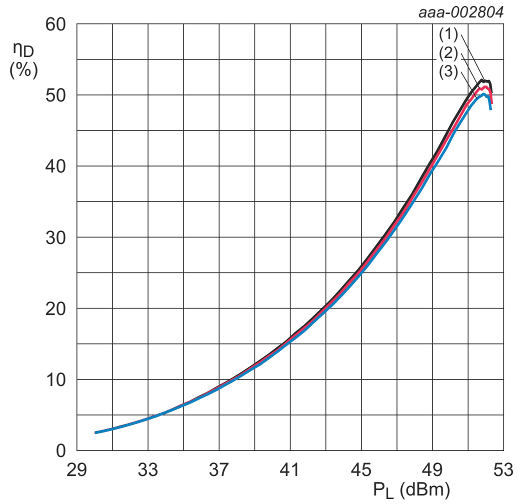
V_{DS} = 28 V; I_{Dq} = 1300 mA; t_p = 100 μs; δ = 10 %.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 7. Pulsed CW power gain as a function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 1300 mA; t_p = 100 μs; δ = 10 %.

(1) f = 2620 MHz

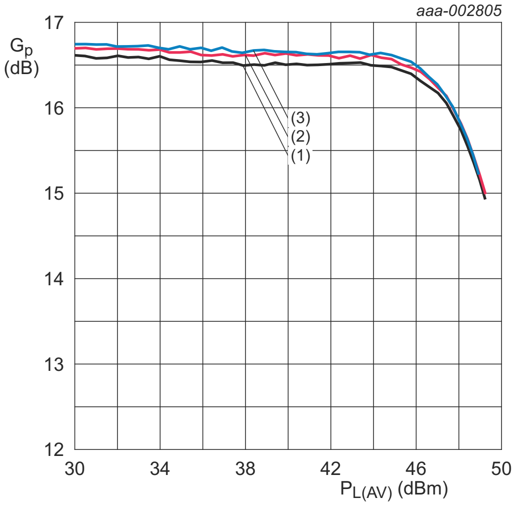
(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 8. Pulsed CW drain efficiency as a function of output power; typical values

8.4 Single carrier W-CDMA

3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF. Channel bandwidth is 3.84 MHz.



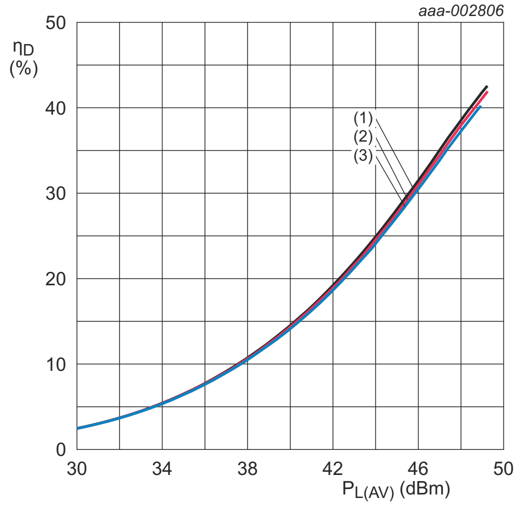
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2627.5 MHz

(2) f = 2655 MHz

(3) f = 2682.5 MHz

Fig 9. Single carrier W-CDMA power gain as a function of average output power; typical values



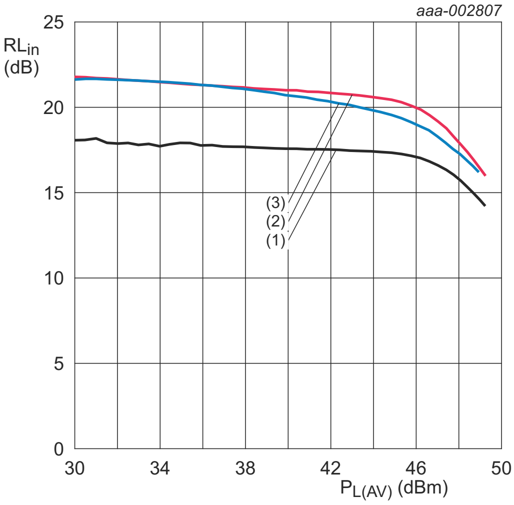
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2627.5 MHz

(2) f = 2655 MHz

(3) f = 2682.5 MHz

Fig 10. Single carrier W-CDMA drain efficiency as a function of average output power; typical values



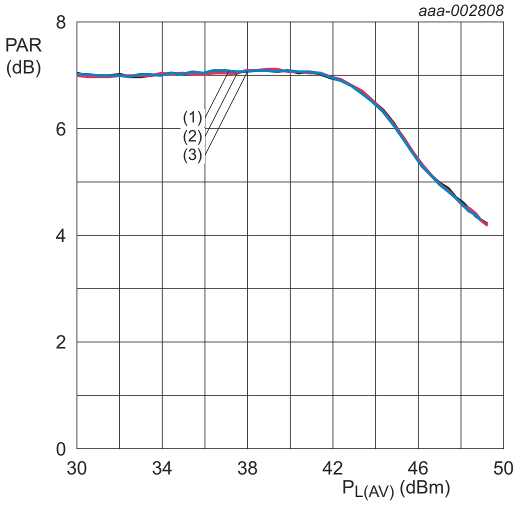
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2627.5 MHz

(2) f = 2655 MHz

(3) f = 2682.5 MHz

Fig 11. Single carrier W-CDMA input return loss as a function of average output power; typical values



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

(1) f = 2627.5 MHz

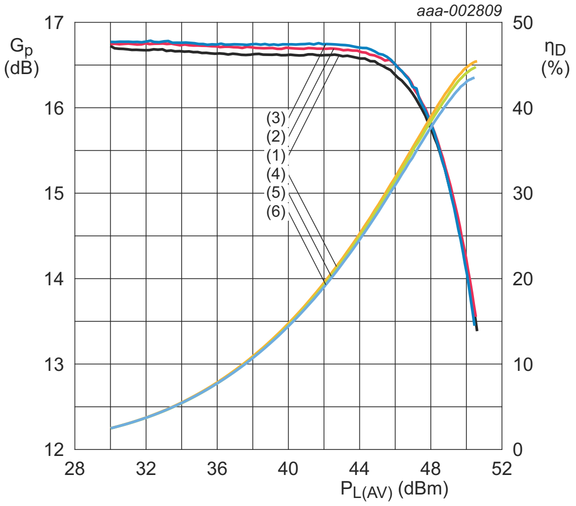
(2) f = 2655 MHz

(3) f = 2682.5 MHz

Fig 12. Single carrier W-CDMA peak-to-average power ratio as a function of average output power; typical values

8.5 Two carrier W-CDMA

3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF.
Carrier spacing is 5 MHz.



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

(1) G_p at f = 2625 MHz

(2) G_p at f = 2650 MHz

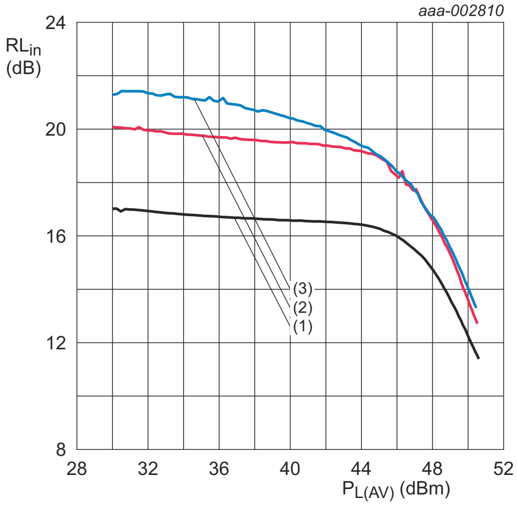
(3) G_p at f = 2685 MHz

(4) η_D at f = 2625 MHz

(5) η_D at f = 2650 MHz

(6) η_D at f = 2685 MHz

Fig 13. Two carrier W-CDMA power gain and drain efficiency as function of average output power; typical values



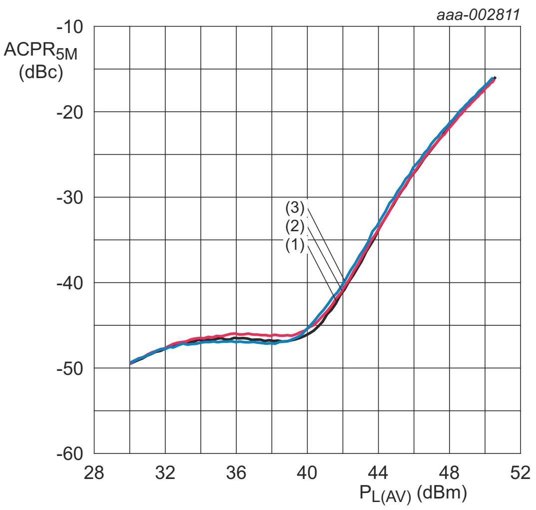
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2625 MHz

(2) f = 2650 MHz

(3) f = 2685 MHz

Fig 14. Two carrier W-CDMA input return loss as a function of average output power; typical values



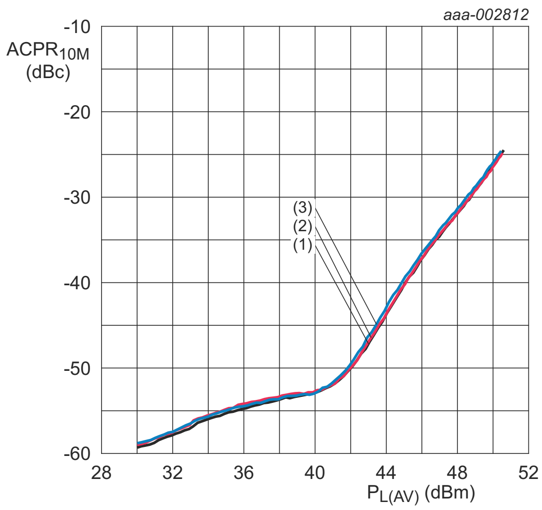
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2625 MHz

(2) f = 2650 MHz

(3) f = 2685 MHz

Fig 15. Two carrier W-CDMA ACPR at 5 MHz as a function of average output power; typical values



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

(1) f = 2625 MHz

(2) f = 2650 MHz

(3) f = 2685 MHz

Fig 16. Two carrier W-CDMA ACPR at 10 MHz as a function of average output power; typical values

8.6 Impedance information

Table 9. Typical impedance

Measured load-pull data. Typical values per section.

Z_S and Z_L defined in Figure 17.

f (MHz)	Z_S (Ω)	Z_L (Ω)
2500	1.8 – j3.2	1.42 – j3.19
2600	2.0 – j3.8	1.32 – j3.10
2700	3.4 – j4.1	1.17 – j3.10

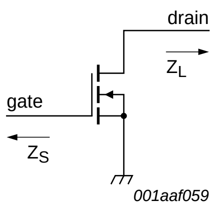
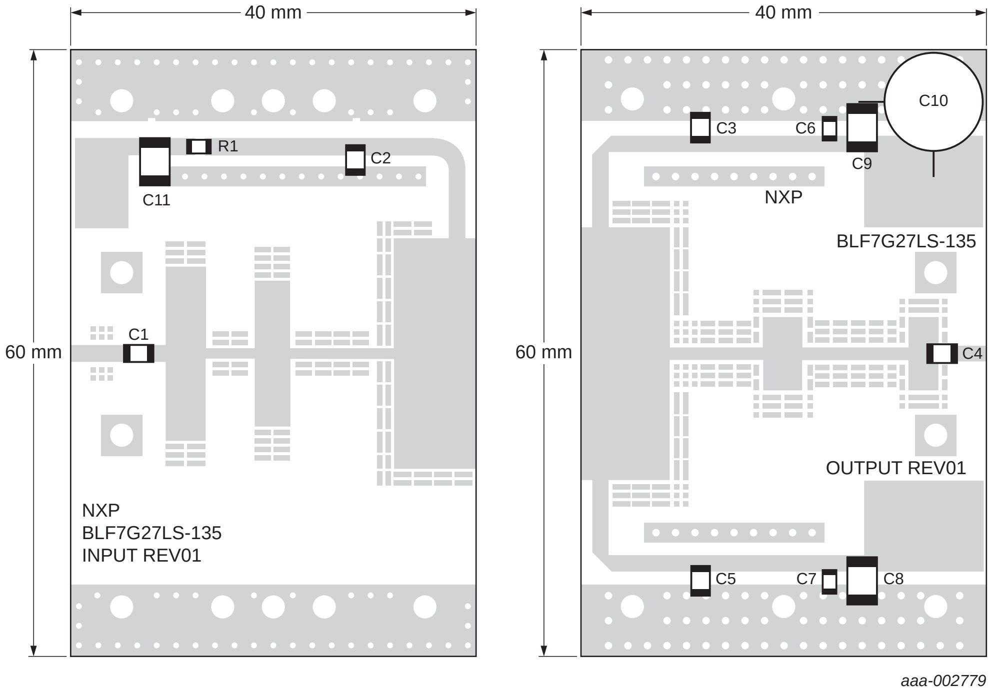


Fig 17. Definition of transistor impedance

8.7 Test circuit



Striplines are on a Taconics RF35 Printed-Circuit Board (PCB) with ε_r = 3.5 and thickness = 0.76 mm and thickness copper plating = 35 μm.

See Table 10 for list of components.

Fig 18. Component layout for test circuit

Table 10. List of components

For test circuit, see Figure 18.

Component	Description	Value	Remarks
C1, C2, C3, C4, C5	multilayer ceramic chip capacitor	24 pF	[1]
C6, C7	multilayer ceramic chip capacitor	100 nF; SMD 0805	[2]
C8, C9	multilayer ceramic chip capacitor	10 nF	[3]
C10	electrolytic capacitor	220 μF, 63 V	
C11	multilayer ceramic chip capacitor	1 μF	[2]
R1	chip resistor	2.2 Ω; SMD 0805	

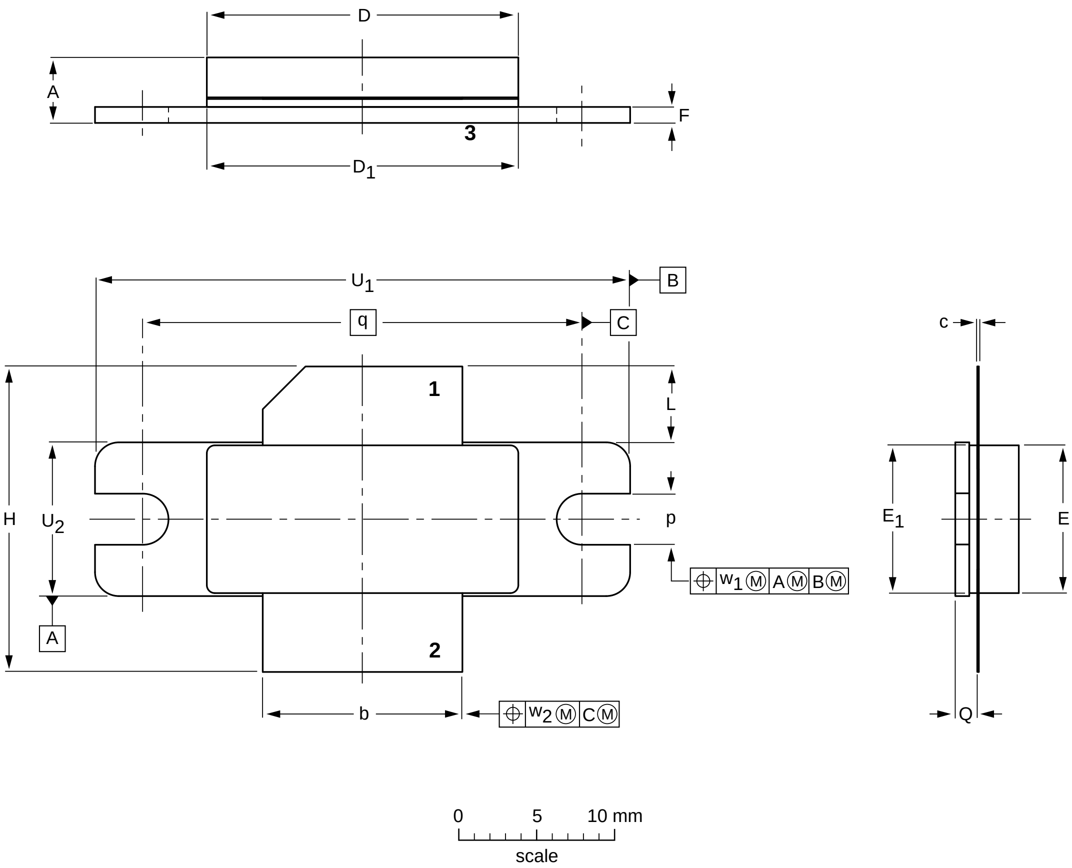
[1] American technical ceramics type 800B or capacitor of same quality.

[2] Murata or capacitor of same quality.

[3] Vishay BCcomponents or capacitor of same quality.

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads **SOT502A**



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

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	p	Q	q	U_1	U_2	w_1	w_2
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	3.38 3.12	1.70 1.45	27.94	34.16 33.91	9.91 9.65	0.25	0.51
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	0.133 0.123	0.067 0.057	1.100	1.345 1.335	0.390 0.380	0.01	0.02

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502A						~~99-12-28~~ 03-01-10

Fig 19. Package outline SOT502A

10. 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
IS-95	Interim Standard 95
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Laterally Diffused Metal Oxide Semiconductor Transistor
MTF	Median Time to Failure
PAR	Peak-to-Average Ratio
RF	Radio Frequency
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF7G27L-135 v.2	20120326	Product data sheet	-	BLF7G27L-135 v.1
Modifications:	• Table 1 on page 1: ‘mode of operation’ has been changed and the values accordingly. • Table 4 on page 2: added table note. • Section 5 on page 2: section has been added. • Table 8 on page 3: several values and conditions have been changed. • Section 8.2 on page 4: graphs have been changed. • Section 8.3 on page 6: graphs have been changed. • Section 8.4 on page 7: graphs have been changed. • Section 8.5 on page 9: section has been added.			
BLF7G27L-135 v.1	20111101	Objective data sheet	-	-

12. Legal information

12.1 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.

12.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

12.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nxp.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

12.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

13. Contact information

For more information, please visit: **http://www.nxp.com**

For sales office addresses, please send an email to: **salesaddresses@nxp.com**

14. Contents

For more information, please visit: http://www.nxp.com
For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 26 March 2012

Document identifier: BLF7G27L-135