BLF6G20-75; BLF6G20LS-75

Power LDMOS transistor

AMPLEON

Rev. 3 — 1 September 2015

Product data sheet

1. Product profile

1.1 General description

75 W LDMOS power transistor for base station applications at frequencies from 1800 MHz to 2000 MHz.

Table 1. Typical performance

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

Mode of operation	f (MHz)	V_{DS} (V)	$P_{L(AV)}$ (W)	G_p (dB)	η_D (%)	$ACPR_{400k}$ (dBc)	$ACPR_{600k}$ (dBc)	EVM_{rms} (%)
CW	1930 to 1990	28	63	19	52	-	-	-
GSM EDGE	1930 to 1990	28	29.5	19	37.5	–61.5	–73	1.7

CAUTION

This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features

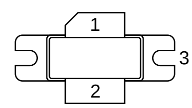
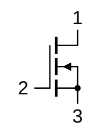
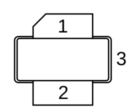
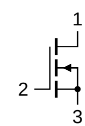
- Typical GSM EDGE performance at frequencies of 1930 MHz and 1990 MHz, a supply voltage of 28 V and an I_{Dq} of 550 mA:
  - Average output power = 29.5 W
  - Gain = 19 dB
  - Efficiency = 37.5 %
  - $ACPR_{400k}$ = –61.5 dBc
  - $ACPR_{600k}$ = –73 dBc
  - EVM_{rms} = 1.7 %
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for GSM, GSM EDGE, W-CDMA and 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
BLF6G20-75 (SOT502A)			
1	drain		 sym112
2	gate		
3	source [1]		
BLF6G20LS-75 (SOT502B)			
1	drain		 sym112
2	gate		
3	source [1]		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF6G20-75	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF6G20LS-75	-	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		-	18	A
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		-	225	°C

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Type	Typ	Unit
$R_{th(j\text{-}case)}$	thermal resistance from junction to case	T_{case} = 80 °C; P_L = 29.5 W (CW)	BLF6G20-75	0.9	K/W
			BLF6G20LS-75	0.75	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 = 0.5 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 100 mA	1.4	2	2.4	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 600 mA	1.6	2.1	2.6	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	3	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	14.9	18.5	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	300	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 5 A	-	7	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 3.5 A	-	0.15	0.235	Ω
C_{rs}	feedback capacitance	V_{GS} = 0 V; V_{DS} = 28 V; f = 1 MHz	-	1.6	-	pF

7. Application information

Table 7. Application information

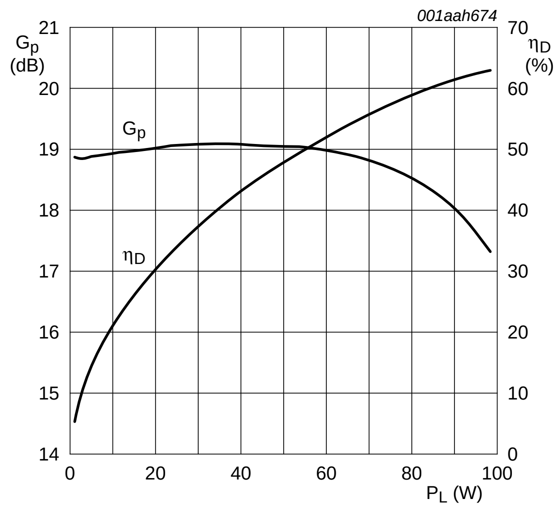
Mode of operation: GSM EDGE; f = 1930 MHz and 1990 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 550 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	29.5	-	W
G_p	power gain	$P_{L(AV)}$ = 29.5 W	17.5	19	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 29.5 W	-	−10	−5.5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 29.5 W	33.5	37.5	-	%
$ACPR_{400k}$	adjacent channel power ratio (400 kHz)	$P_{L(AV)}$ = 29.5 W	-	−61.5	−59.5	dBc
$ACPR_{600k}$	adjacent channel power ratio (600 kHz)	$P_{L(AV)}$ = 29.5 W	-	−73	−69.5	dBc
EVM_{rms}	RMS EDGE signal distortion error	$P_{L(AV)}$ = 29.5 W	-	1.7	3	%
EVM_M	peak EDGE signal distortion error	$P_{L(AV)}$ = 29.5 W	-	4.8	10	%

7.1 Ruggedness in class-AB operation

The BLF6G20-75 and BLF6G20LS-75 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq} = 550 mA; P_L = 75 W (CW); f = 1990 MHz.

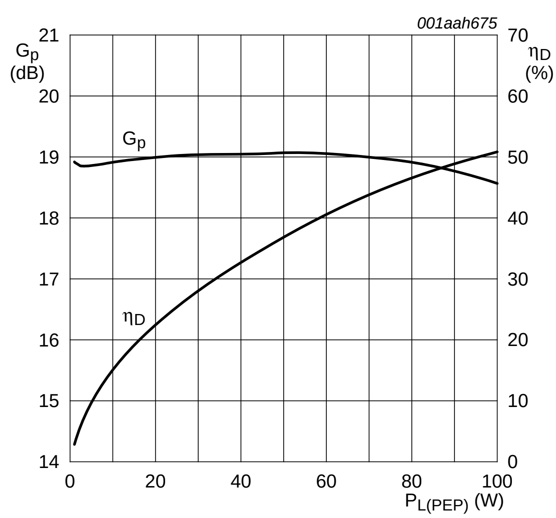
7.2 One-tone CW



V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz.

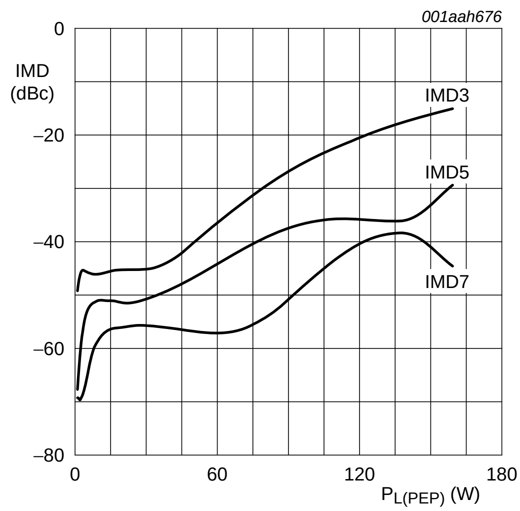
Fig 1. One-tone CW power gain and drain efficiency as functions of load power; typical values

7.3 Two-tone CW



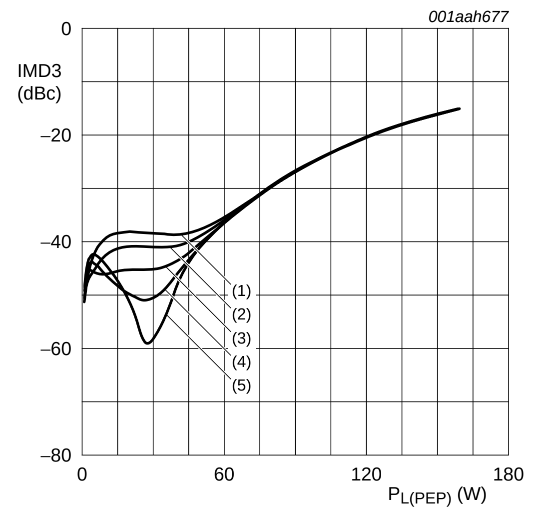
V_{DS} = 28 V; I_{Dq} = 550 mA; f_1 = 1989.95 MHz; f_2 = 1990.05 MHz.

Fig 2. Two-tone CW power gain and drain efficiency as functions of peak envelope load power; typical values



V_{DS} = 28 V; I_{Dq} = 550 mA; f_1 = 1989.95 MHz; f_2 = 1900.05 MHz.

Fig 3. Two-tone CW intermodulation distortion as function of peak envelope load power; typical values

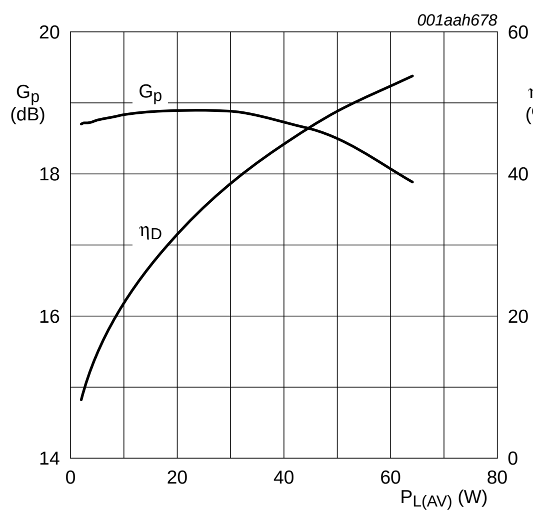


V_{DS} = 28 V; f_1 = 1989.95 MHz; f_2 = 1900.05 MHz.

(1) 450 MHz
(2) 500 MHz
(3) 550 MHz
(4) 600 MHz
(5) 650 MHz

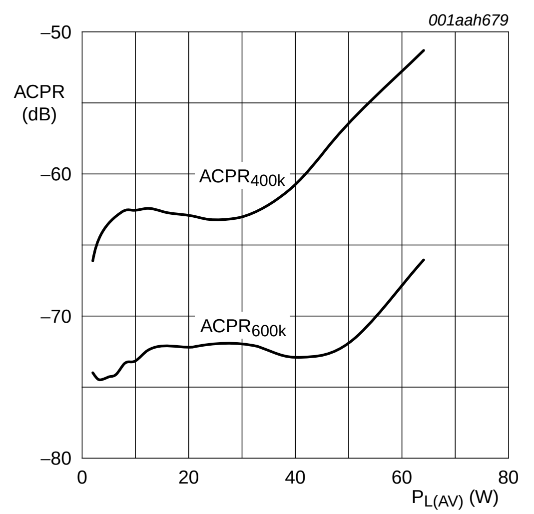
Fig 4. Third order intermodulation distortion as a function of peak envelope load power; typical values

7.4 GSM-EDGE



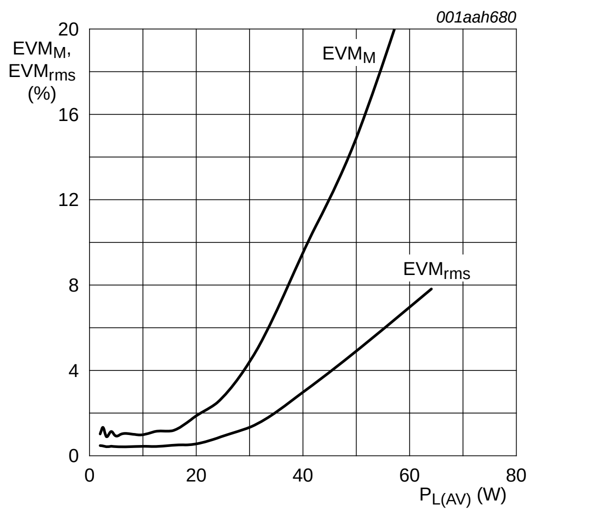
V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz; T_{case} = 25 °C.

Fig 5. GSM-EDGE power gain and drain efficiency as functions of average load power; typical values



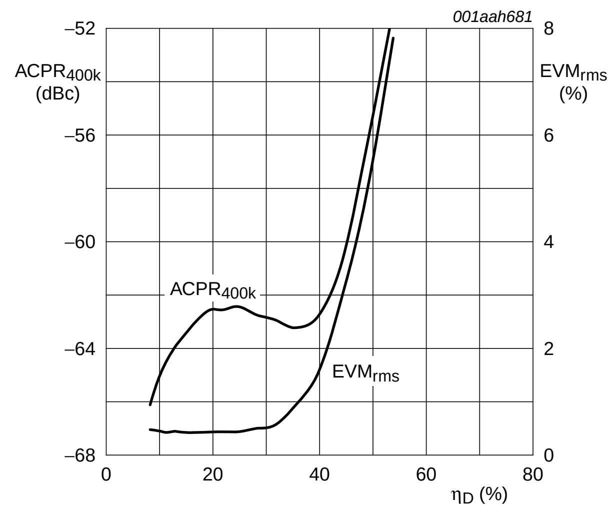
V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz; T_{case} = 25 °C.

Fig 6. GSM-EDGE ACPR at 400 kHz and at 600 kHz as functions of average load power; typical values



V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz; T_{case} = 25 °C.

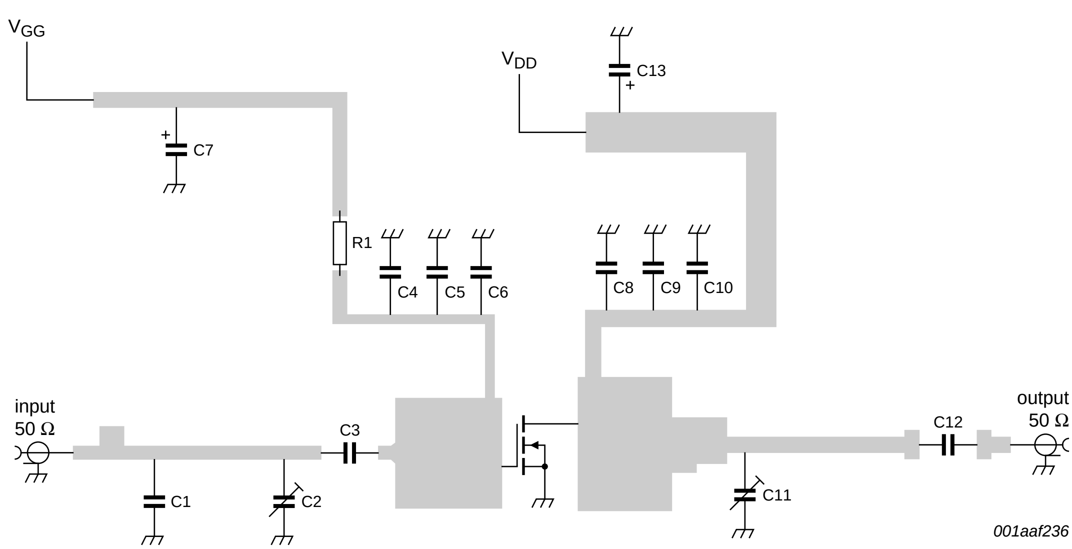
Fig 7. GSM EDGE RMS EVM and peak EVM as functions of average load power; typical values



V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz; T_{case} = 25 °C.

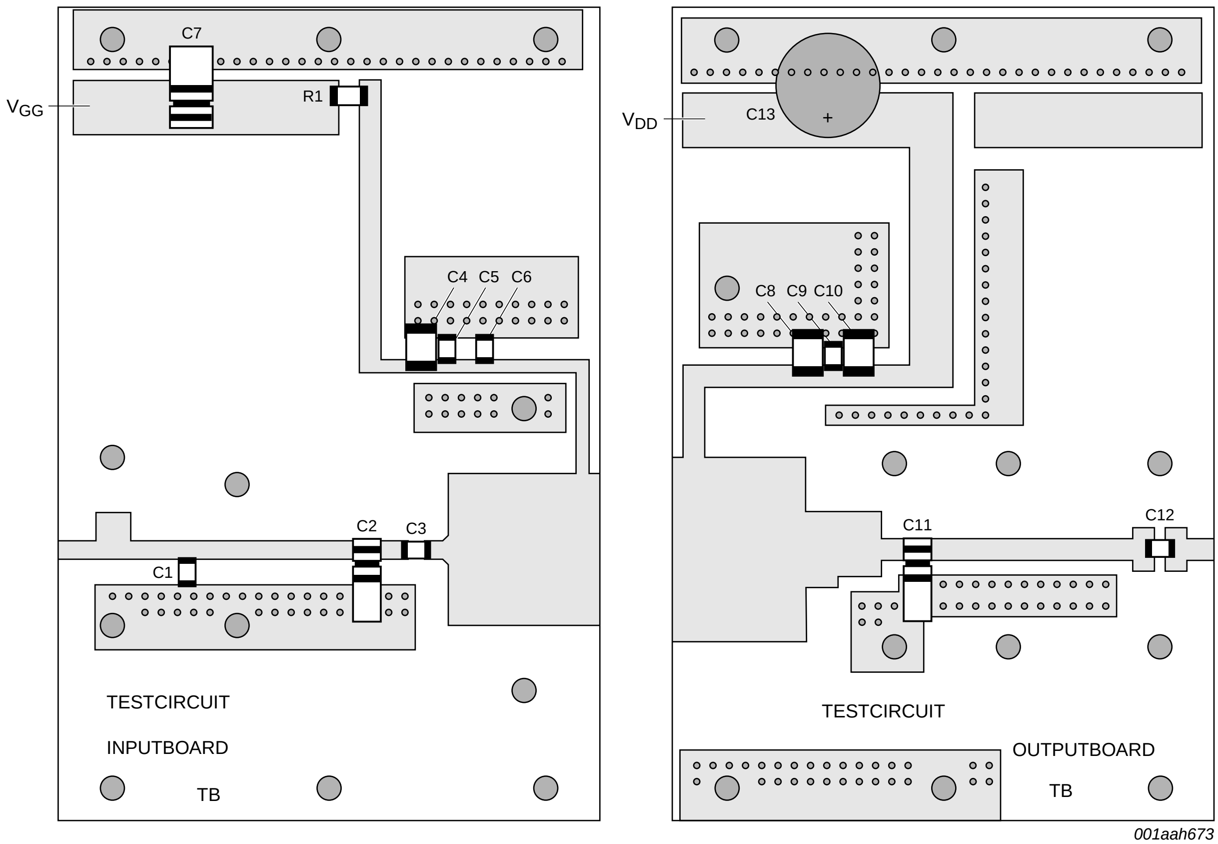
Fig 8. GSM EDGE ACPR at 400 kHz and RMS EVM as functions of drain efficiency; typical values

8. Test information



See Table 8 for list of components.

Fig 9. Test circuit for operation at 1990 MHz



The striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) with ε_r = 3.5 and thickness = 0.76 mm.

See Table 8 for list of components.

Fig 10. Component layout for 1990 MHz test circuit

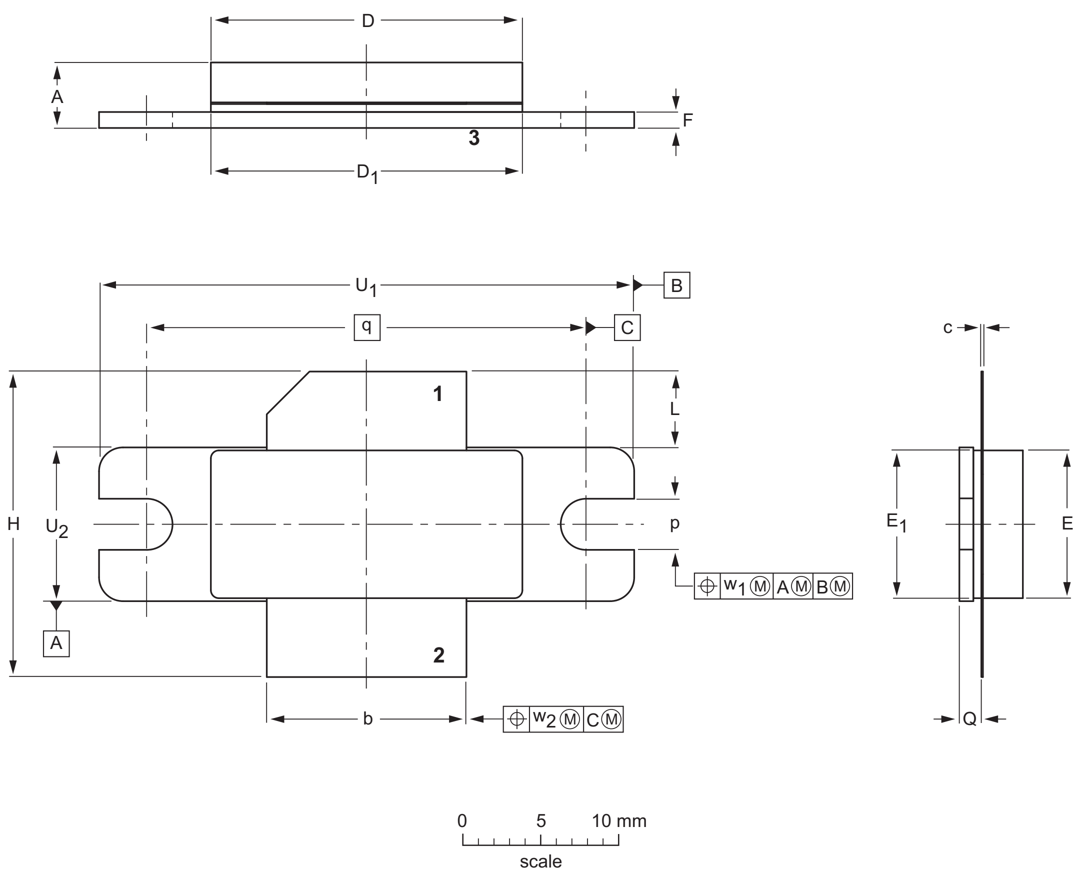
Table 8. List of components (see Figure 9 and Figure 10)

Component	Description	Value		Remarks
C1	multilayer ceramic chip capacitor	1 pF	[1]	
C2, C11	gigahertz trimmer	0.6 pF to 4.5 pF		Temex AT SM270 or equivalent
C3, C6, C9	multilayer ceramic chip capacitor	12 pF	[1]	
C4, C8, C10	multilayer ceramic chip capacitor	10 μF; 50 V		TDK C5750X7R1H106M or equivalent
C5	multilayer ceramic chip capacitor	1.5 μF; 50 V		TDK C3225X7R1H155M or equivalent
C7	tantalum capacitor	10 μF; 50 V		Kemet T491 series or equivalent
C12	multilayer ceramic chip capacitor	12 pF	[1]	
C13	electrolytic capacitor	220 μF; 50 V		
R1	Philips chip resistor	5.6 Ω; 1206		

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

9. Package outline

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



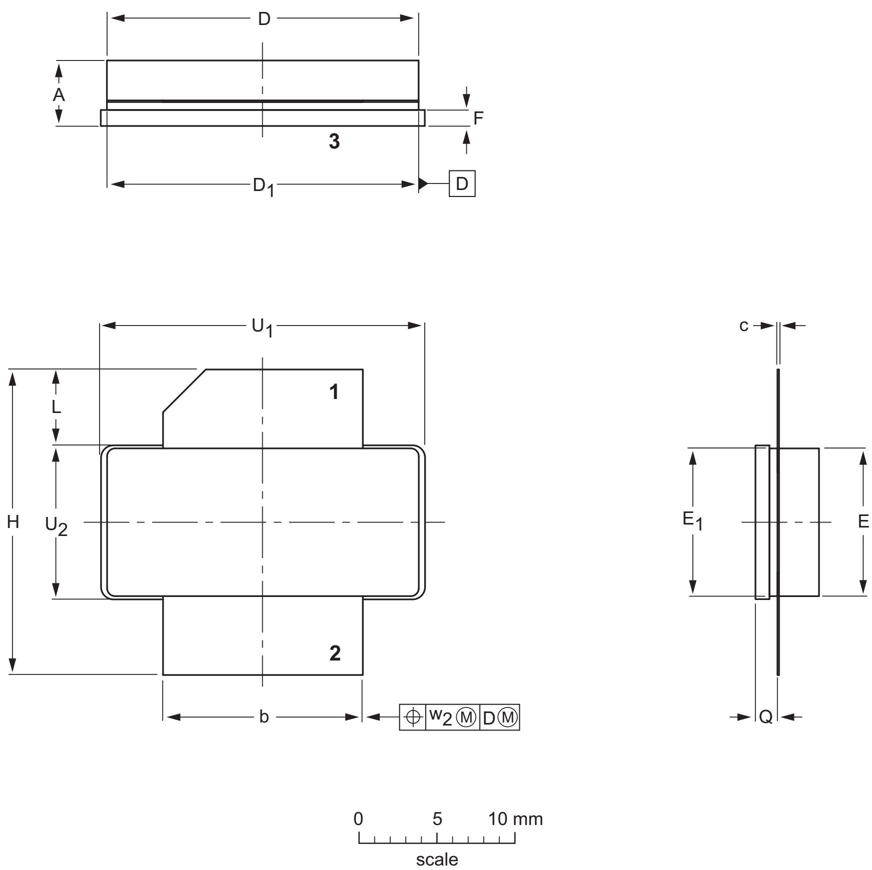
DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

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						~~03-01-10~~ 12-05-02

Fig 11. Package outline SOT502A

Earless flanged ceramic package; 2 leads **SOT502B**



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

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	Q	U_1	U_2	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	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						~~07-05-09~~ 12-05-02

Fig 12. Package outline SOT502B

10. Abbreviations

Table 9. Abbreviations

Acronym	Description
CDMA	Code Division Multiple Access
CW	Continuous Wave
EDGE	Enhanced Data rates for GSM Evolution
EVM	Error Vector Magnitude
GSM	Global System for Mobile communications
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
RMS	Root Mean Square
VSWR	Voltage Standing-Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G20-75_BLF6G20LS-75#3	20150901	Product data sheet	-	BLF6G20-75_1BLF6G20LS-75_2
Modifications:	• The format of this document has been redesigned to comply with the new identity guidelines of Ampleon. • Legal texts have been adapted to the new company name where appropriate.			
BLF6G20-75_1BLF6G20LS-75_2	20090209	Product data sheet	-	BLF6G20-75_1BLF6G20LS-75_1
BLF6G20-75_1	20080306	Preliminary data sheet	-	-
BLF6G20LS-75_1	20080218	Preliminary 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.ampleon.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. Ampleon 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 Ampleon 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 Ampleon and its customer, unless Ampleon and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Ampleon 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, Ampleon 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. Ampleon takes no responsibility for the content in this document if provided by an information source outside of Ampleon.

In no event shall Ampleon 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, Ampleon' 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 Ampleon.

Right to make changes — Ampleon 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 — Ampleon 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 Ampleon product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Ampleon and its suppliers accept no liability for inclusion and/or use of Ampleon 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. Ampleon 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 Ampleon products, and Ampleon accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Ampleon 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.

Ampleon 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 Ampleon 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). Ampleon 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 — Ampleon products are sold subject to the general terms and conditions of commercial sale, as published at http://www.ampleon.com/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. Ampleon hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Ampleon 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 Ampleon 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. Ampleon 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 Ampleon' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond Ampleon' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Ampleon for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond Ampleon' standard warranty and Ampleon' 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.

Any reference or use of any 'NXP' trademark in this document or in or on the surface of Ampleon products does not result in any claim, liability or entitlement vis-à-vis the owner of this trademark. Ampleon is no longer part of the NXP group of companies and any reference to or use of the 'NXP' trademarks will be replaced by reference to or use of Ampleon's own Any reference or use of any 'NXP' trademark in this document or in or on the surface of Ampleon products does not result in any claim, liability or entitlement vis-à-vis the owner of this trademark. Ampleon is no longer part of the NXP group of companies and any reference to or use of the 'NXP' trademarks will be replaced by reference to or use of Ampleon's own trademarks.

13. Contact information

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

For sales office addresses, please visit: http://www.ampleon.com/sales

14. Contents

Date of release: 1 September 2015
Document identifier: BLF6G20-75_BLF6G20LS-75#3