BLF7G22L-160; BLF7G22LS-160

Power LDMOS transistor

Rev. 3 — 1 September 2015

AMPLEON

Product data sheet

1. Product profile

1.1 General description

160 W LDMOS power transistor for base station applications at frequencies from 2000 MHz to 2200 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 (dBc)
2-carrier W-CDMA	2110 to 2170	1300	28	43	18.0	30	–32[1]

[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

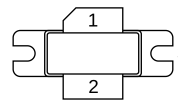
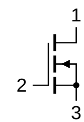
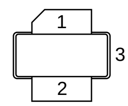
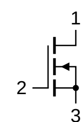
- Excellent ruggedness
- High efficiency
- Low R_{th} providing excellent thermal stability
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous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

1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 2000 MHz to 2200 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLF7G22L-160 (SOT502A)			
1	drain		 sym112
2	gate		
3	source [1]		
BLF7G22LS-160 (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
BLF7G22L-160	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A
BLF7G22LS-160	-	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		-	36	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 = 55 W	0.29	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 = 2.16 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 216 mA	1.5	1.9	2.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	4.5	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	34	-	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	450	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 10.8 A	-	20	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 7.56 A	-	0.06	-	Ω

7. Test information

Table 7. Application information
Mode of operation: 2-carrier W-CDMA; PAR 8.4 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 PDPCH; f_1 = 2112.5 MHz; f_2 = 2117.5 MHz; f_3 = 2162.5 MHz; f_4 = 2167.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 1300 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 43 W	16.5	18.0	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 43 W	-	–15	–6.5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 43 W	27	30	-	%
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)}$ = 43 W	-	–32	–28	dBc

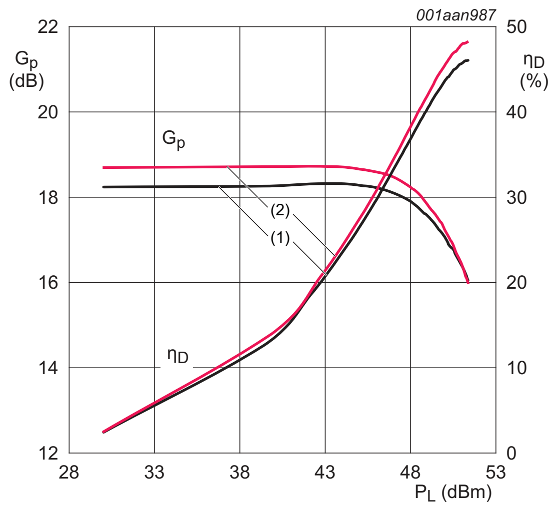
Table 8. Application information
Mode of operation: 1-carrier W-CDMA; PAR 7.2 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 PDPCH; f = 2167.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 1300 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
PAR_O	output peak-to-average ratio	$P_{L(AV)}$ = 100 W; at 0.01 % probability on CCDF	3.9	4.15	-	dB

7.1 Ruggedness in class-AB operation

The BLF7G22L-160 and BLF7G22LS-160 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} = 1300 mA; P_L = 160 W; f = 2110 MHz.

7.2 2-Carrier W-CDMA 5 MHz

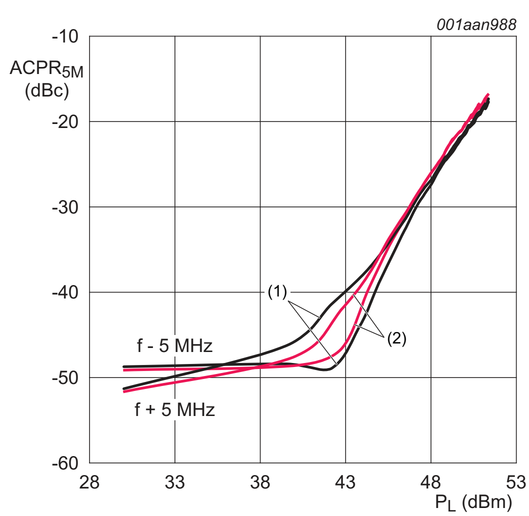


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 1. Power gain and drain efficiency as function of load power; typical values

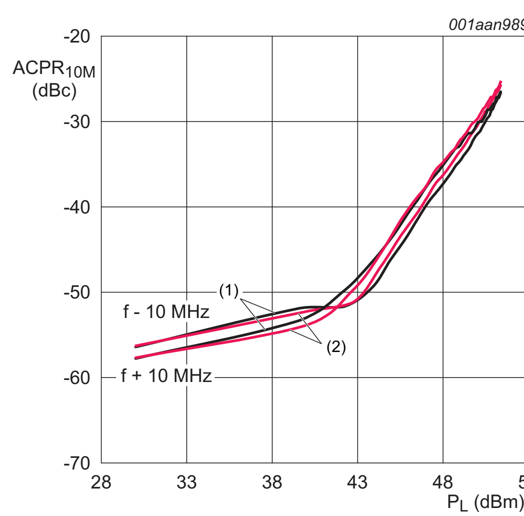


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 2. Adjacent channel power ratio (±5 MHz) as a function of load power; typical values

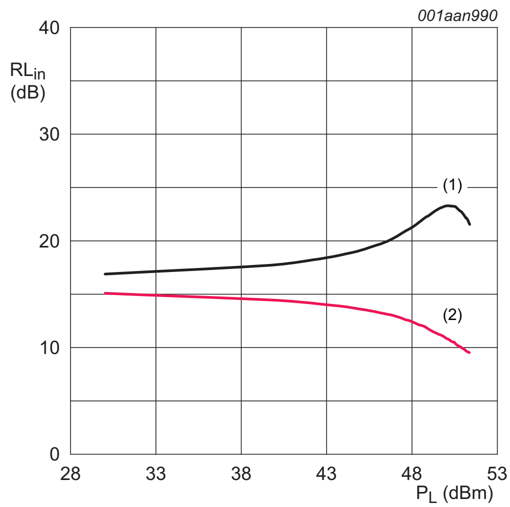


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 3. Adjacent channel power ratio (±10 MHz) as a function of load power; typical values

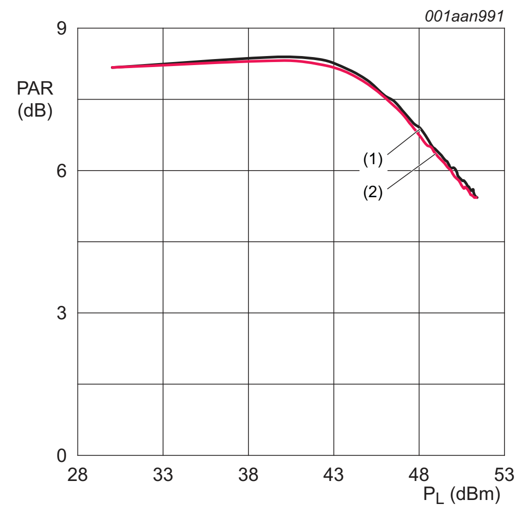


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 4. Input return loss as function of load power; typical values



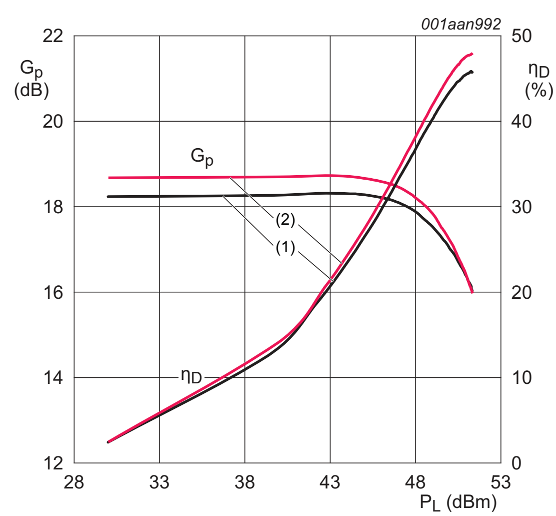
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 5. Peak-to-average power ration as function of load power; typical values

7.3 2-Carrier W-CDMA 10 MHz

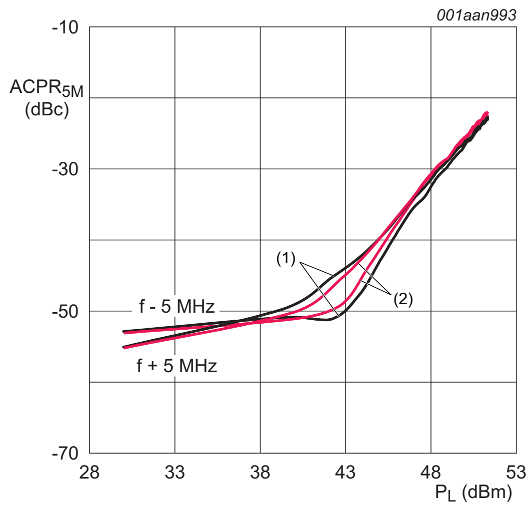


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 6. Power gain and drain efficiency as function of load power; typical values

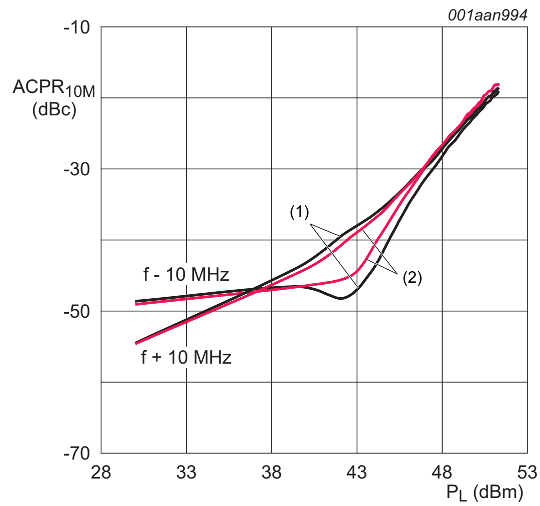


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

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



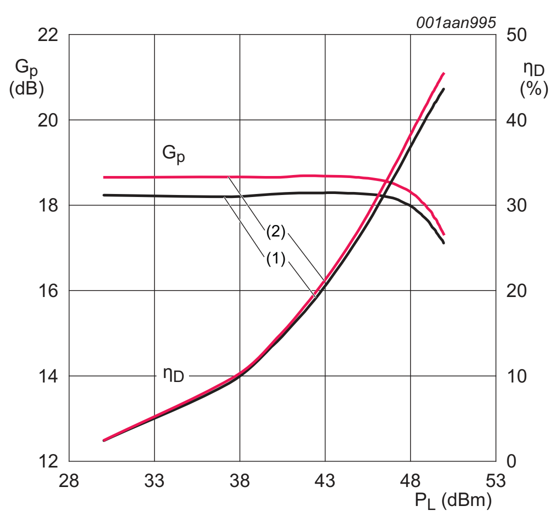
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 8. Adjacent channel power ratio (±10 MHz) as a function of load power; typical values

7.4 1-Carrier W-CDMA

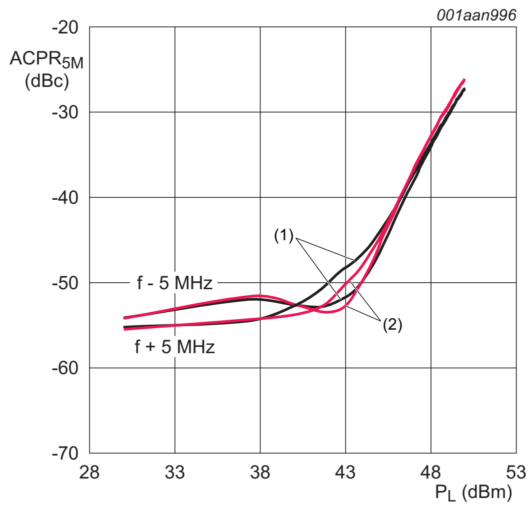


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 9. Power gain and drain efficiency as function of load power; typical values

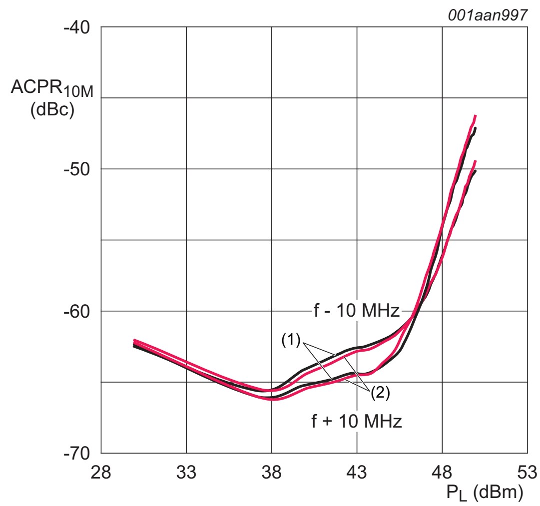


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 10. Adjacent channel power ratio (±5 MHz) as a function of load power; typical values

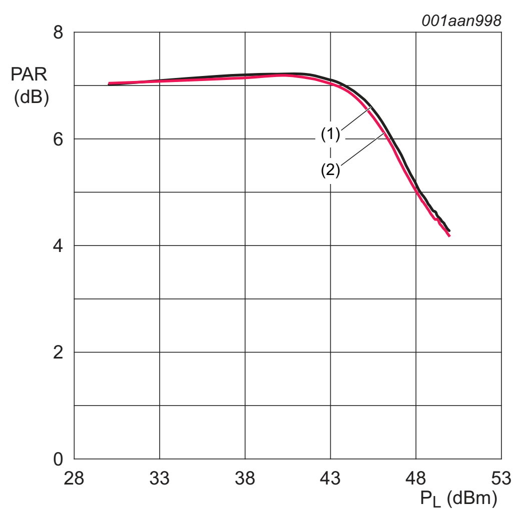


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 11. Adjacent channel power ratio (±10 MHz) as a function of load power; typical values



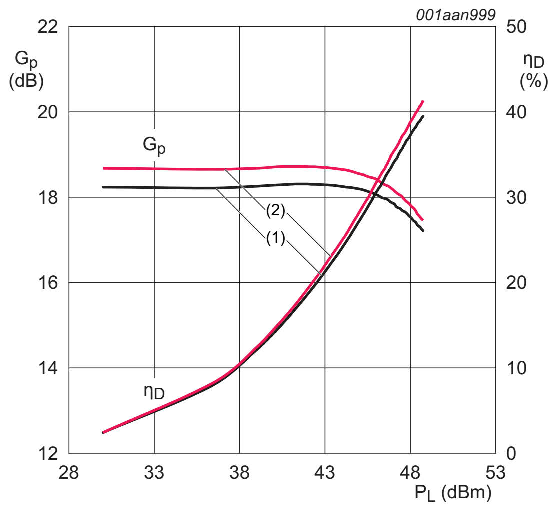
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 12. Peak-to-average power ration as function of load power; typical values

7.5 IS-95

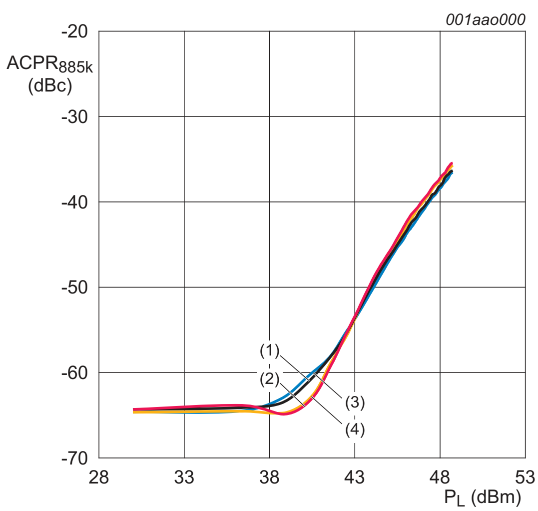


V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 13. Power gain and drain efficiency as function of load power; typical values



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

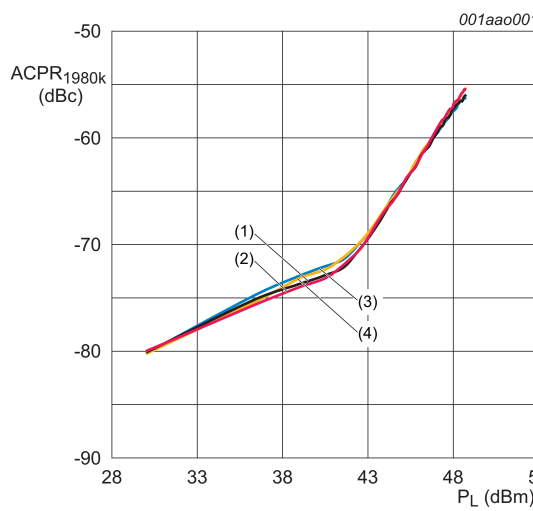
(1) f = 2110 MHz; f + 885 kHz

(2) f = 2170 MHz; f + 885 kHz

(3) f = 2110 MHz; f − 885 kHz

(4) f = 2170 MHz; f − 885 kHz

Fig 14. Adjacent channel power ratio (±5 MHz) as a function of load power; typical values



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

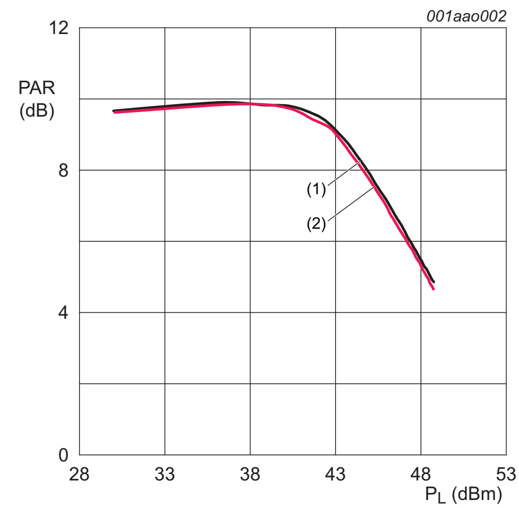
(1) f = 2110 MHz; f + 1980 kHz

(2) f = 2170 MHz; f + 1980 kHz

(3) f = 2110 MHz; f − 1980 kHz

(4) f = 2170 MHz; f − 1980 kHz

Fig 15. Adjacent channel power ratio (±10 MHz) as a function of load power; typical values



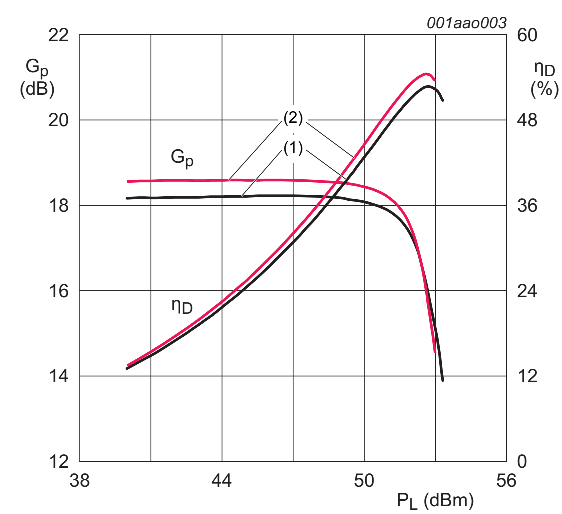
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 16. Peak-to-average power ration as function of load power; typical values

7.6 CW



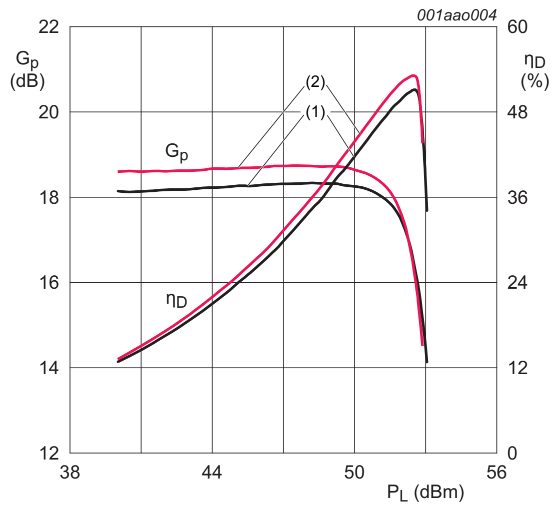
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 17. Power gain and drain efficiency as function of load power; typical values

7.7 CW-pulsed



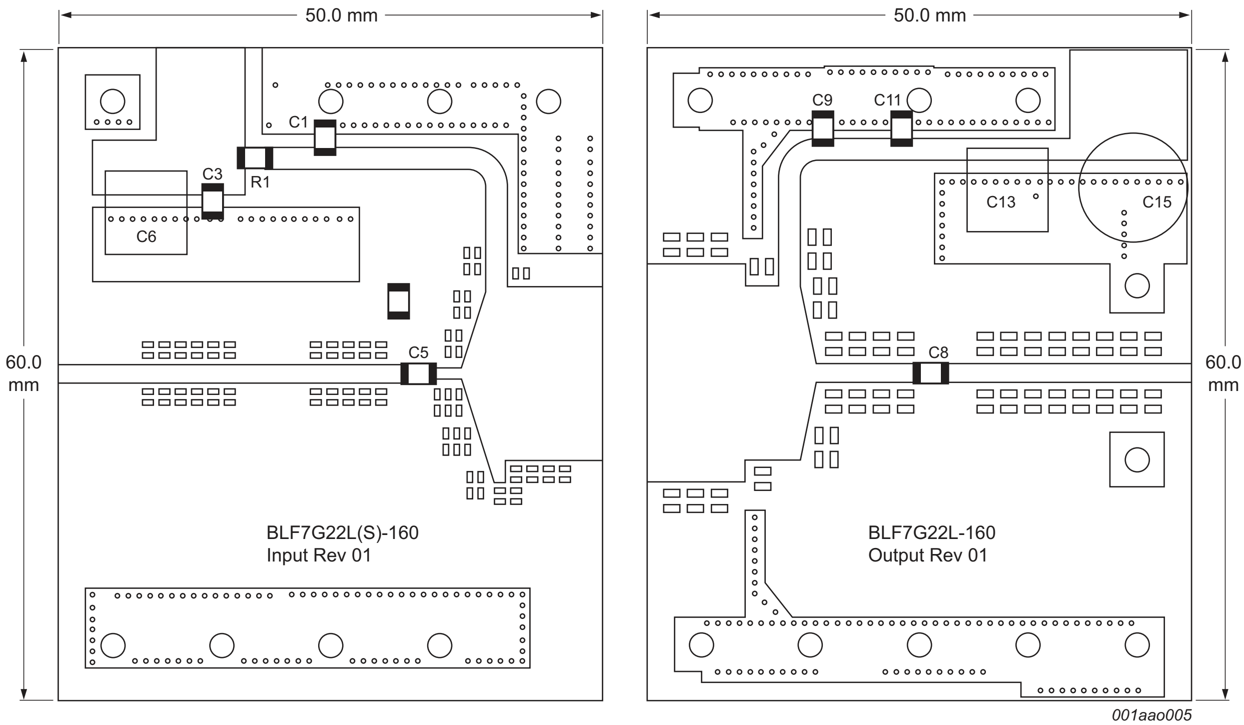
V_{DS} = 28 V; I_{Dq} = 1300 mA; t_p = 0.10 ms; δ = 10 %.

(1) f = 2110 MHz

(2) f = 2170 MHz

Fig 18. Power gain and drain efficiency as function of load power; typical values

7.8 Test circuit



Printed-Circuit Board (PCB): Taconic RF35; ε_r = 3.5; thickness = 0.76 mm; thickness copper plating = 35 μm.

See Table 9 for a list of components.

Fig 19. Component layout for class-AB production test circuit

Table 9. List of components

For test circuit see Figure 19.

Component	Description	Value		Remarks
C1, C5, C8, C9	multilayer ceramic chip capacitor	68 pF	[1]	
C3, C11	multilayer ceramic chip capacitor	820 pF	[2]	
C6, C13	multilayer ceramic chip capacitor	10 μF	[3]	
C15	electrolytic capacitor	470 μF; 63 V		
R1	SMD resistor	12 Ω		Philips 1206

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

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

[3] TDK or capacitor of same quality.

7.9 Impedance information

Table 10. Typical impedance

Typical values unless otherwise specified.

f MHz	Z_S Ω	Z_L Ω
2050	1.39 – j4.13	1.41 – j3.80
2080	1.67 – j3.93	1.38 – j3.63
2110	2.01 – j3.89	1.35 – j3.45
2140	2.28 – j4.09	1.33 – j3.28
2170	2.27 – j4.47	1.31 – j3.12
2200	1.92 – j4.76	1.28 – j2.95
2230	1.42 – j4.75	1.26 – j2.79

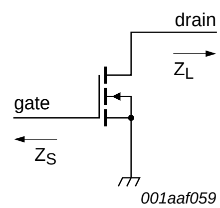
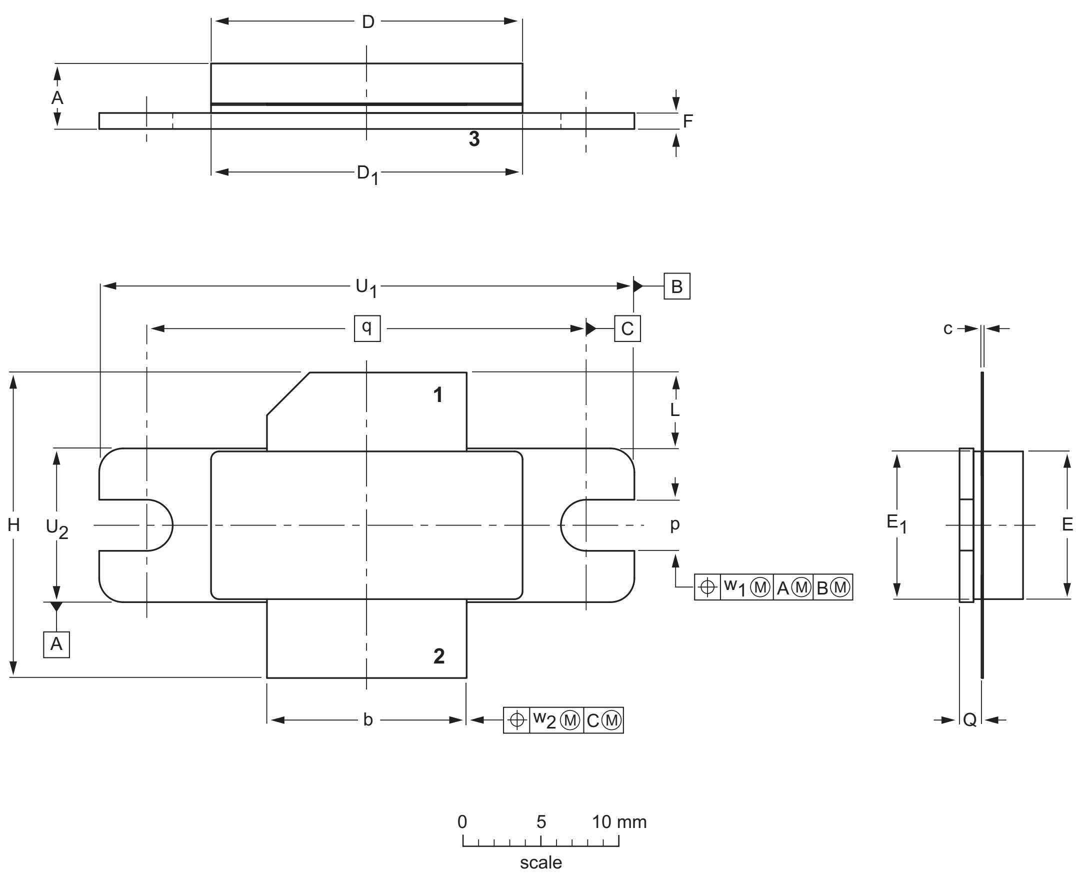


Fig 20. Definition of transistor impedance

8. Package outline

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



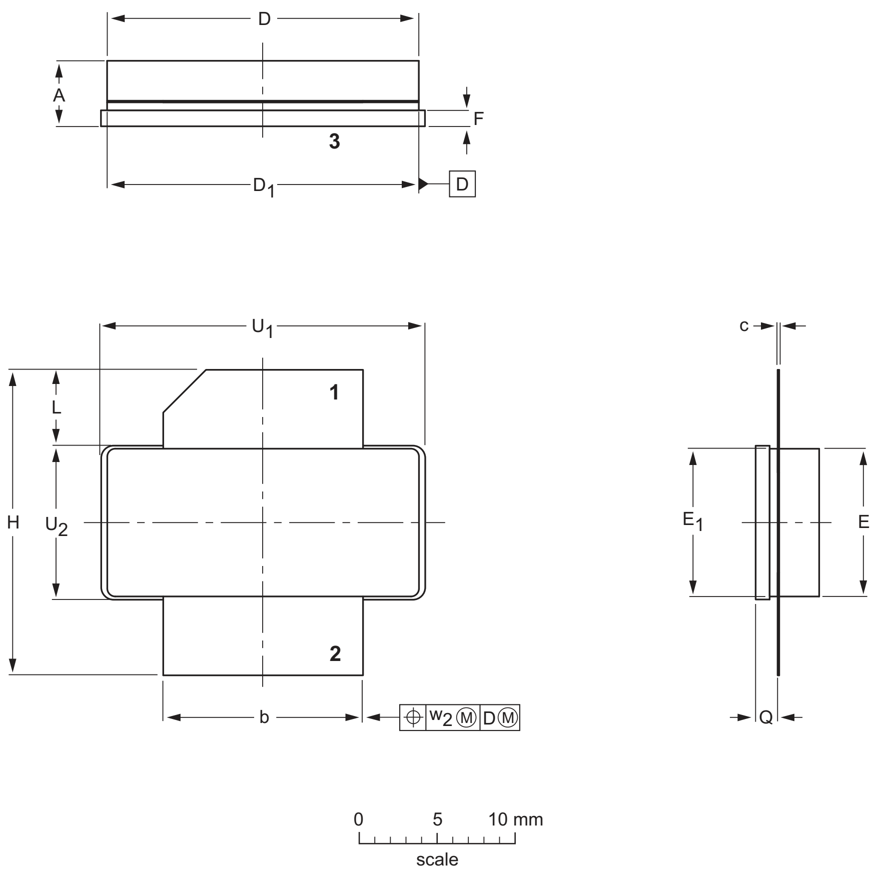
DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

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 21. 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 22. 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
PDPCH	transmission Power of the Dedicated Physical CHannel
RF	Radio Frequency
SMD	Surface Mounted Device
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
BLF7G22L-160_7G22LS-160#3	20150901	Product data sheet	-	BLF7G22L-160_7G22LS-160 v.2.1
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.			
BLF7G22L-160_7G22LS-160 v.2.1	20111102	Product data sheet	-	BLF7G22L-160_7G22LS-160 v.2
BLF7G22L-160_7G22LS-160 v.2	20111020	Product data sheet	-	BLF7G22L-160_7G22LS-160 v.1
BLF7G22L-160_7G22LS-160 v.1	20110427	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.ampleon.com.

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12. Contact information

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

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