BLF7G20L-90P; BLF7G20LS-90P

Power LDMOS transistor

Rev. 3 — 1 September 2015

AMPLEON

Product data sheet

1. Product profile

1.1 General description

90 W LDMOS power transistor for base station applications at frequencies from 1800 MHz to 2000 MHz, designed for operation at 1427 MHz to1525 MHz, 1805 MHz to 1880 MHz and 2110 MHz to 2170 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	$ACPR_{400k}$	$ACPR_{600k}$	EVM_{rms}
	(MHz)	(mA)	(V)	(W)	(dB)	(%)	(dBc)	(dBc)	(%)
CW	1805 to 1880	550	28	84	19	54	-	-	-
GSM EDGE	1805 to 1880	550	28	40	19.5	41	−61	−74	2.5

1.2 Features and benefits

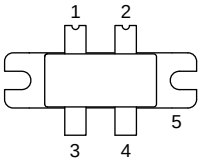
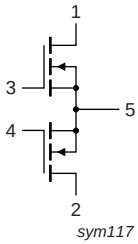
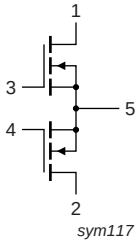
- Excellent ruggedness
- High efficiency
- Low R_{th} providing excellent thermal stability
- Designed for broadband operation (1427 MHz to1525 MHz, 1805 MHz to 1880 MHz and 2110 MHz to 2170 MHz)
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects 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 base stations and multi carrier applications in the frequency bands of 1427 MHz to 1525 MHz, 1805 MHz to 1880 MHz and 2110 MHz to 2170 MHz.

2. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Graphic symbol
BLF7G20L-90P (SOT1121A)				
1	drain1			
2	drain2			
3	gate1			
4	gate2			
5	source	[1]		
BLF7G20LS-90P (SOT1121B)				
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
BLF7G20L-90P	-	flanged LDMOST ceramic package; 2 mounting holes; 4 leads	SOT1121A
BLF7G20LS-90P	-	earless flanged LDMOST ceramic package; 4 leads	SOT1121B

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		-	200	°C

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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 = 90 W	0.49	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 = 0.5 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 50 mA	1.5	1.9	2.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	2	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	8.2	9.5	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	200	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 2.5 A	-	3.8	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 1.75 A	-	0.28	-	Ω

7. Test information

Table 7. Application information

f = 1805 MHz to 1880 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 550 mA; T_{case} = 25 °C; 2 sections combined unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Mode of operation: GSM EDGE; $P_{L(AV)}$ = 40 W						
G_p	power gain		18.3	19.5	-	dB
RL_{in}	input return loss		-	−15	−8	dB
η_D	drain efficiency		38	41	-	%
$ACPR_{400k}$	adjacent channel power ratio (400 kHz)		-	−61	−58	dBc
$ACPR_{600k}$	adjacent channel power ratio (600 kHz)		-	−74	−70.5	dBc
EVM_{rms}	RMS EDGE signal distortion error		-	2.5	3.8	%
EVM_M	peak EDGE signal distortion error		-	8	12.5	%
Mode of operation: CW; $P_{L(AV)}$ = 84 W						
G_p	power gain		17.8	19	-	dB
η_D	drain efficiency		51	54	-	%

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7.1 Ruggedness in class-AB operation

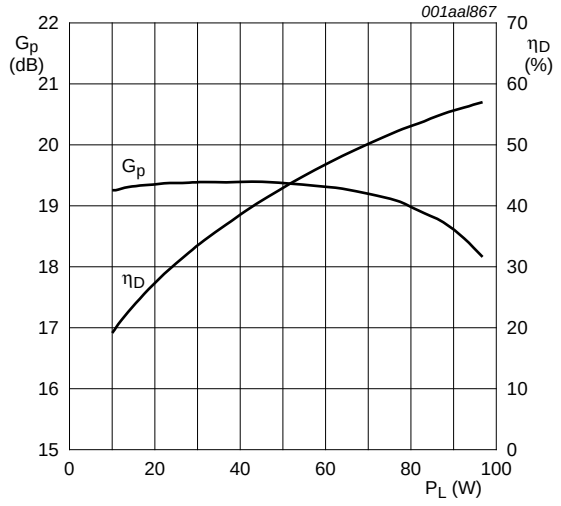
The BLF7G20L-90P and BLF7G20LS-90P are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:

V_{DS} = 28 V; I_{Dq} = 550 mA; P_L = 90 W (CW), f = 1805 MHz,

V_{DS} = 28 V; I_{Dq} = 380 mA; P_L = 40 W (CW, half device), f = 2110 MHz,

V_{DS} = 28 V; I_{Dq} = 380 mA; P_L = 55 W (CW pulse, 10 %, 100 μs, halve device), f = 1427 MHz.

7.2 One-tone CW

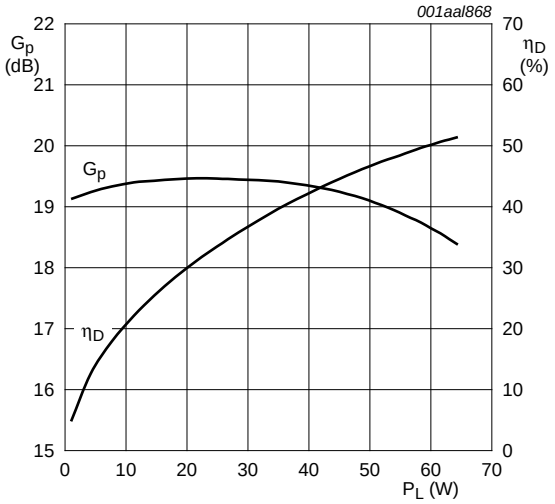


V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1880 MHz.

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

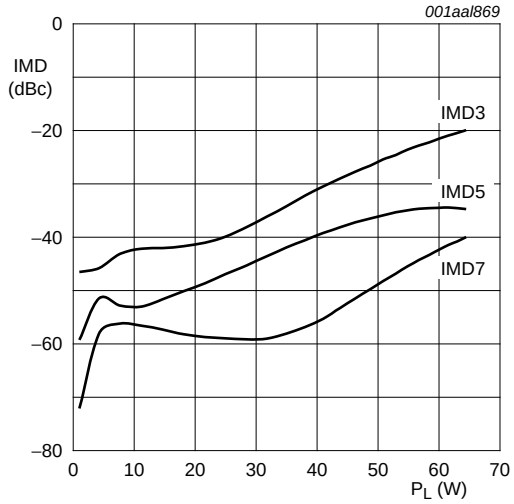
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7.3 Two-tone CW



V_{DS} = 28 V; I_{Dq} = 550 mA; f_1 = 1879.95 MHz; f_2 = 1880.05 MHz.

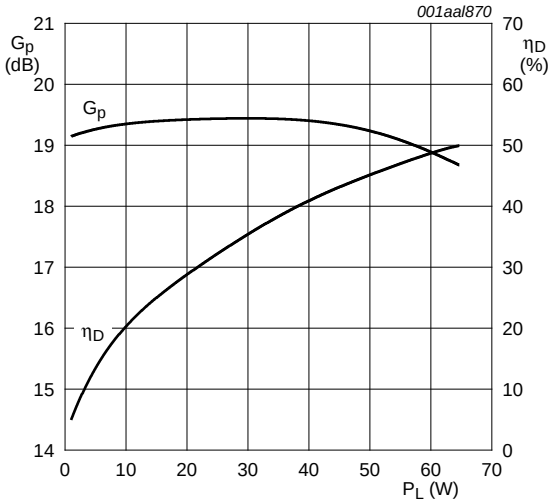
Fig 2. Two-tone CW power gain and drain efficiency as function of load power; typical values



V_{DS} = 28 V; I_{Dq} = 550 mA; f_1 = 1879.95 MHz; f_2 = 1880.05 MHz.

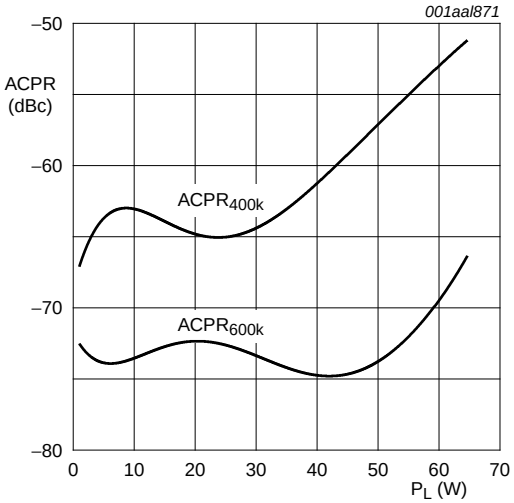
Fig 3. Two-tone CW intermodulation distortion as a function of load power; typical values

7.4 GSM EDGE



V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1880 MHz.

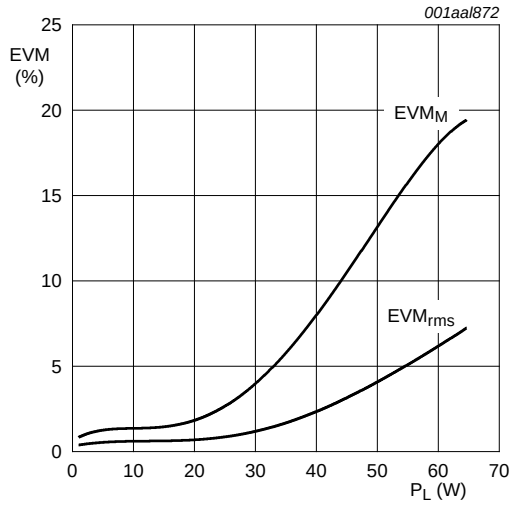
Fig 4. GSM EDGE power gain and drain efficiency as function of load power; typical values



V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1880 MHz.

Fig 5. GSM EDGE ACPR at 400 kHz and at 600 kHz as function of load power; typical values

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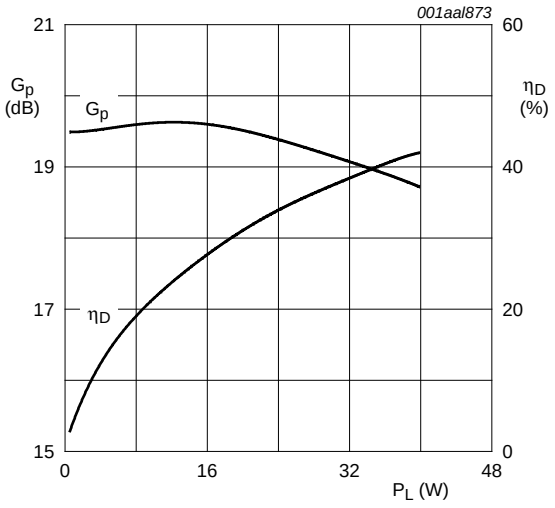


V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1880 MHz.

Fig 6. GSM EDGE RMS EDGE and peak EDGE as function of load power; typical values

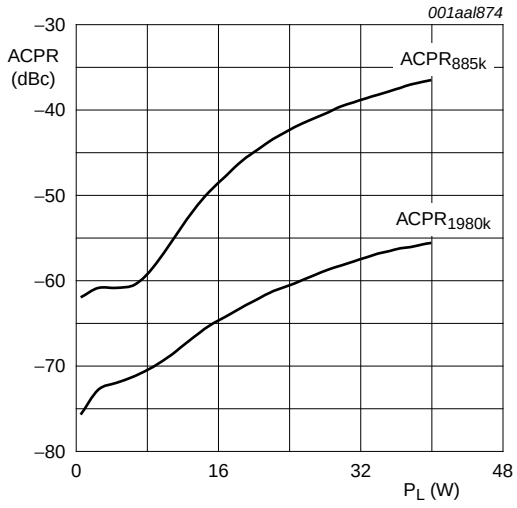
7.5 Single carrier IS-95

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} = 600 mA; f = 1880 MHz.

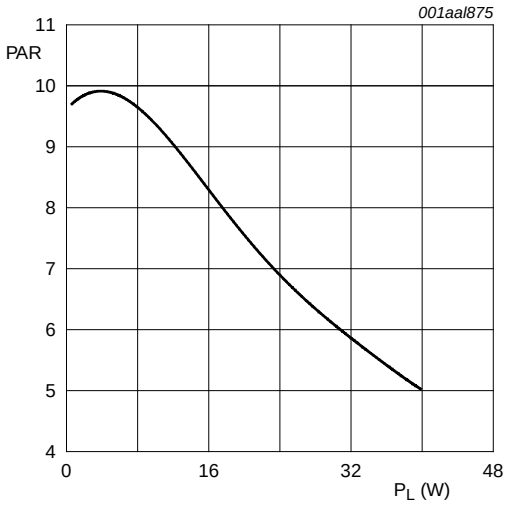
Fig 7. Single carrier IS-95 power gain and drain efficiency as function of load power; typical values



V_{DS} = 28 V; I_{Dq} = 600 mA; f = 1880 MHz.

Fig 8. Single carrier IS-95 ACPR at 885 kHz and at 1980 kHz as function of load power; typical values

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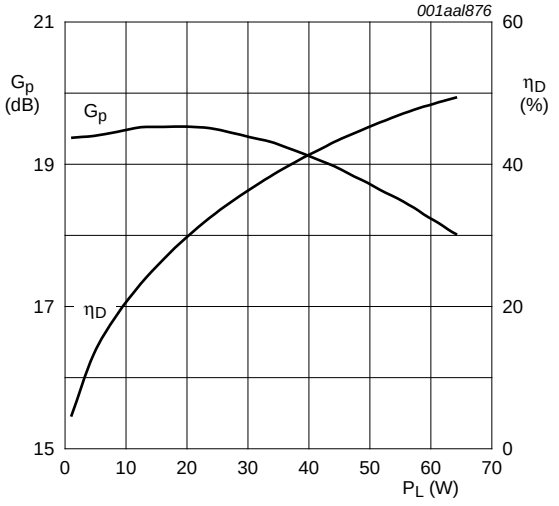


V_{DS} = 28 V; I_{Dq} = 600 mA; f = 1880 MHz.

Fig 9. Single carrier IS-95 peak-to-average power ratio as a function of load power; typical values

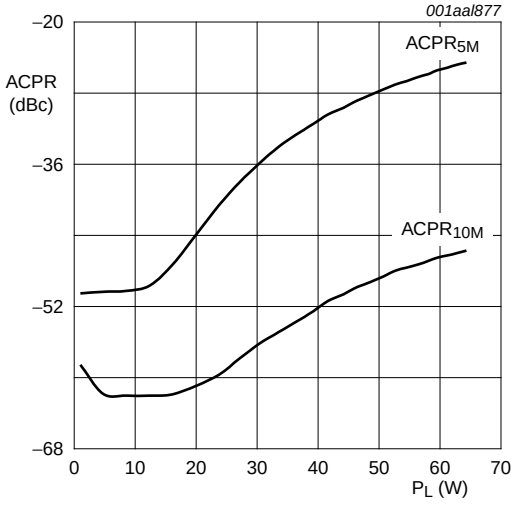
7.6 Single carrier W-CDMA

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} = 600 mA; f = 1880 MHz.

Fig 10. Single carrier W-CDMA power gain and drain efficiency as function of load power; typical values



V_{DS} = 28 V; I_{Dq} = 600 mA; f = 1880 MHz.

Fig 11. Single carrier W-CDMA ACPR at 5 MHz and at 10 MHz as function of load power; typical values

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7.7 Test circuit

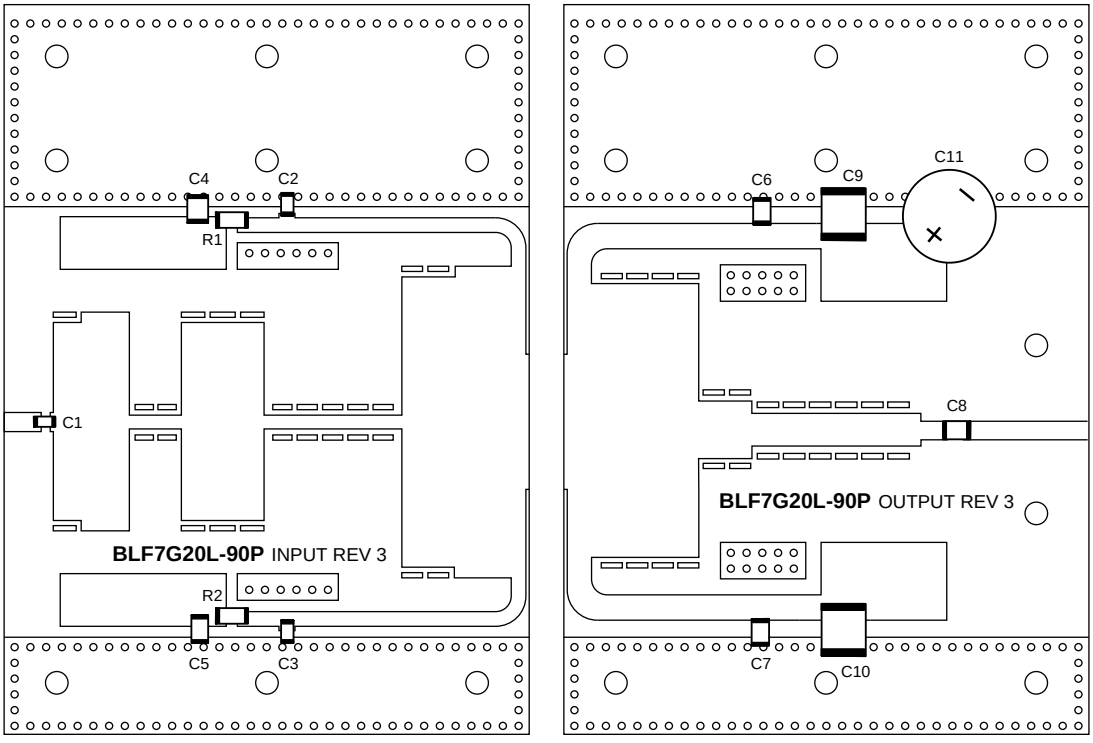
Table 8. List of components
For test circuit see Figure 12.

Component	Description	Value		Remarks
C1, C2, C3	multilayer ceramic chip capacitor	24 pF	[1]	
C4, C5	multilayer ceramic chip capacitor	4.7 μF	[2]	
C6, C7, C8	multilayer ceramic chip capacitor	11 pF	[3]	
C9, C10	multilayer ceramic chip capacitor	10 μF	[2]	
C11	electrolytic capacitor	470 μF; 63 V		
R1, R2	SMD resistor	12 Ω		Philips 1206

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

[2] TDK or capacitor of same quality.

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



Printed-Circuit Board (PCB): Taconic RF35; ε_r = 3.5 F/m; thickness = 0.76 mm; thickness copper plating = 35 μm.
See Table 8 for a list of components.

Fig 12. Component layout for class-AB production test circuit

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7.8 Impedance information

Table 9. Typical impedance

Typical values valid for both section in parallel unless otherwise specified.

f	Z_S	Z_L
MHz	Ω	Ω
1800	1.0 – j3.3	2.8 – j2.7
1840	1.2 – j3.3	2.8 – j2.5
1880	1.1 – j3.4	2.7 – j2.4

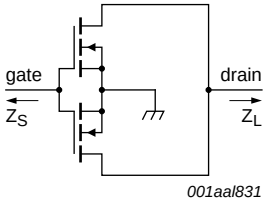
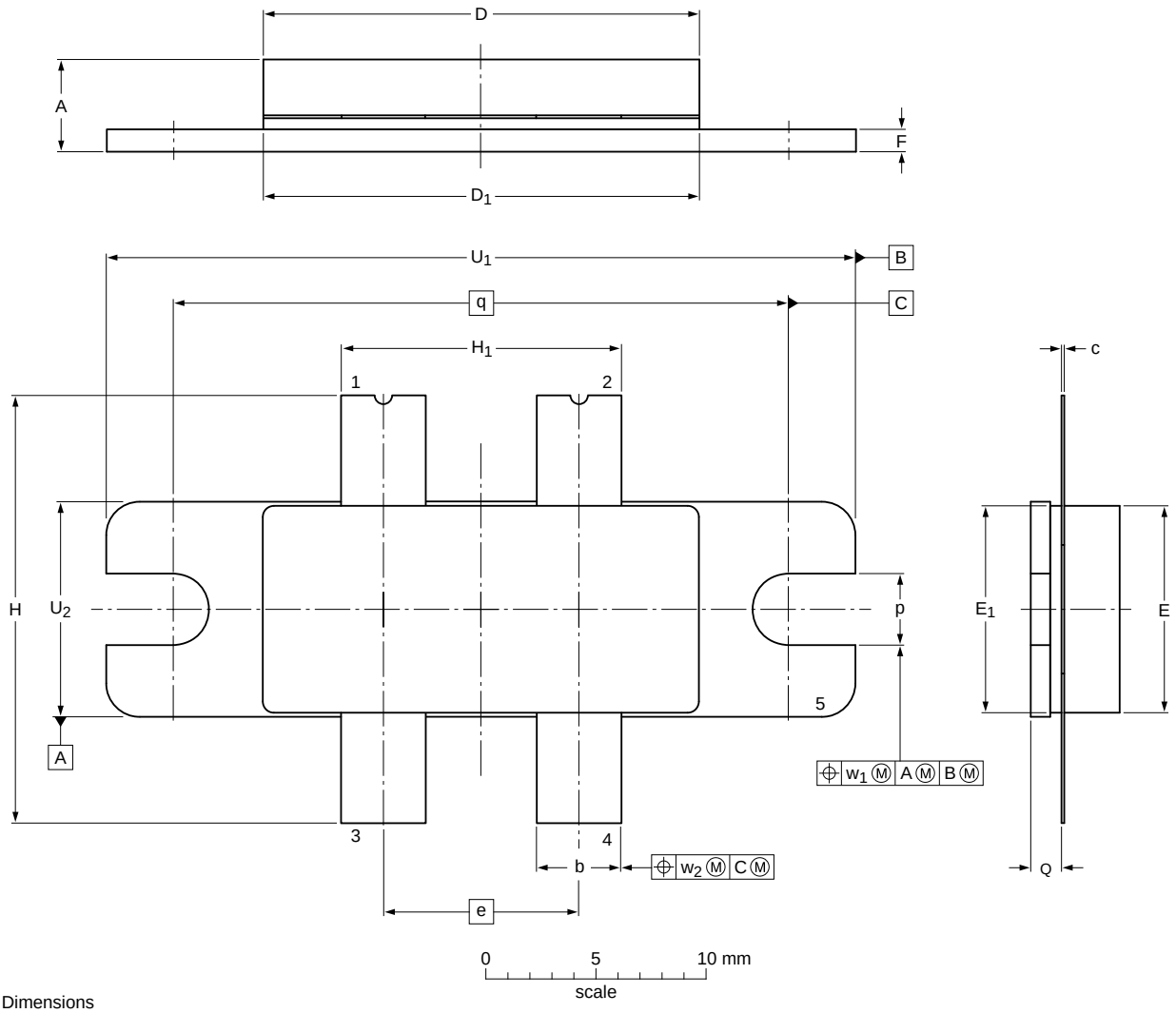


Fig 13. Definition of transistor impedance

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8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 4 leads **SOT1121A**



Dimensions

Unit[1]		A	b	c	D	D1	e	E	E1	F	H	H1	p	Q[2]	q	U1	U2	w1	w2
mm	max	4.75	3.94	0.18	20.02	19.96		9.53	9.53	1.14	19.94	12.83	3.38	1.70		34.16	9.91		
	nom						8.89								27.94			0.25	0.51
	min	3.45	3.68	0.10	19.61	19.66		9.27	9.27	0.89	18.92	12.57	3.12	1.45		33.91	9.65		
inches	max	0.187	0.155	0.007	0.788	0.786		0.375	0.375	0.045	0.785	0.505	0.133	0.067		1.345	0.39		
	nom						0.35								1.1			0.01	0.02
	min	0.136	0.145	0.004	0.772	0.774		0.365	0.365	0.035	0.745	0.495	0.123	0.057		1.335	0.38		

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

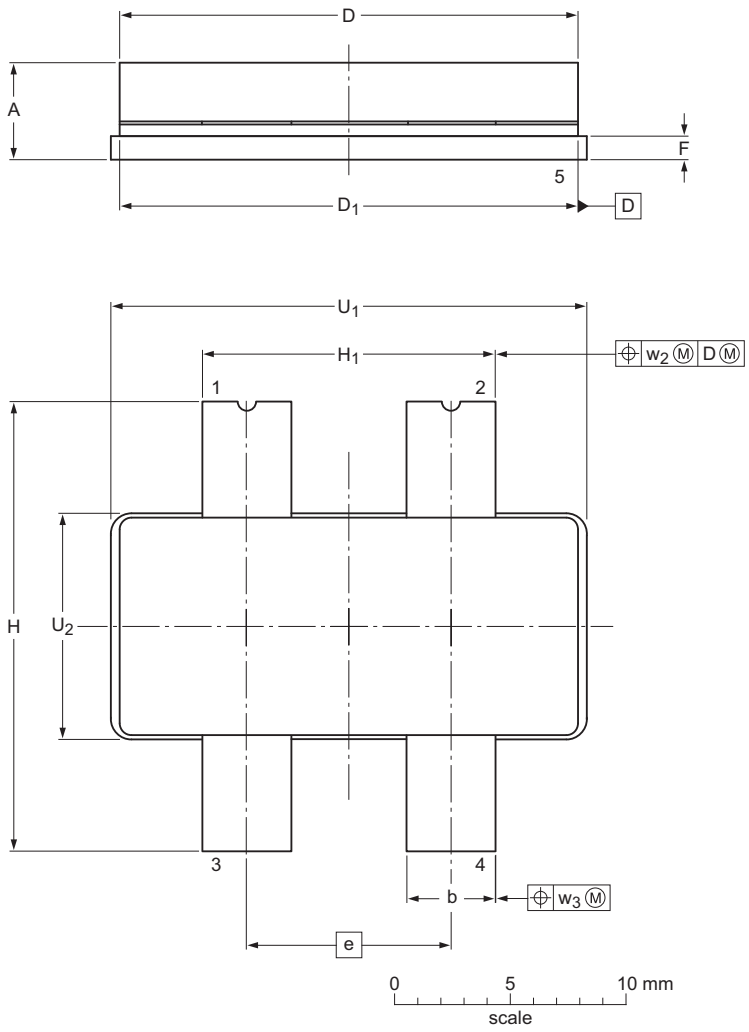
sot1121a_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1121A						~~09-10-12~~ 10-02-02

Fig 14. Package outline SOT1121A

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Earless flanged ceramic package; 4 leads **SOT1121B**



Dimensions

Unit[1]		A	b	c	D	D_1	e	E	E_1	F	H	H_1	Q	U_1	U_2	w_2	w_3	y
mm	max	4.75	3.94	0.18	20.02	19.96		9.53	9.53	1.14	19.94	12.83	1.70	20.70	9.91	0.51	0.25	0.25
	nom						8.89											
	min	3.45	3.68	0.08	19.61	19.66		9.27	9.27	0.89	18.92	12.57	1.45	20.45	9.65			
inches	max	0.187	0.155	0.007	0.788	0.786		0.375	0.375	0.045	0.785	0.505	0.067	0.815	0.39	0.02	0.01	0.01
	nom						0.35											
	min	0.136	0.145	0.003	0.772	0.774		0.365	0.365	0.035	0.745	0.495	0.057	0.805	0.38			

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

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Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1121B						~~09-12-14~~ 12-06-07

Fig 15. Package outline SOT1121B

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9. Abbreviations

Table 10. Abbreviations

Acronym	Description
3GPP	3rd Generation Partnership Project
CW	Continuous Wave
CCDF	Complementary Cumulative Distribution Function
DPCH	Dedicated Physical Channel
EDGE	Enhanced Data rates for GSM Evolution
ESD	ElectroStatic Discharge
GSM	Global System for Mobile Communications
IS-95	Interim Standard 95
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Laterally Diffused Metal Oxide Semiconductor Transistor
PAR	Peak-to-Average power Ratio
RF	Radio Frequency
SMD	Surface Mounted Device
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

10. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF7G20L-90P_7G20LS-90P#3	20150901	Product data sheet	-	BLF7G20L-90P_7G20LS-90P v.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.			
BLF7G20L-90P_7G20LS-90P v.2	20111020	Product data sheet	-	BLF7G20L-90P_7G20LS-90P v.1
BLF7G20L-90P_7G20LS-90P v.1	20100428	Product data sheet	-	-

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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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