BLF174XR; BLF174XRS

Power LDMOS transistor

Rev. 2 — 1 September 2015

AMPLEON

Product data sheet

1. Product profile

1.1 General description

A 600 W extremely rugged LDMOS power transistor for broadcast and industrial applications in the HF to 128 MHz band.

Table 1. Application information

Test signal	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η_D (%)
CW	108	50	600	28.5	74
pulsed RF	108	50	600	29	73

1.2 Features and benefits

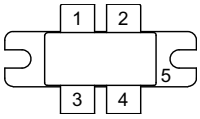
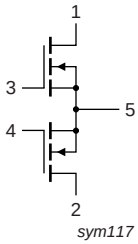
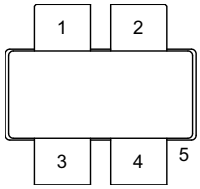
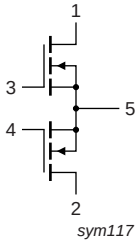
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (HF to 128 MHz)
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- Industrial, scientific and medical applications
- Broadcast transmitter applications

2. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Graphic symbol
BLF174XR (SOT1214A)				
1	drain1			
2	drain2			
3	gate1			
4	gate2			
5	source	[1]		
BLF174XRS (SOT1214B)				
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
BLF174XR	-	flanged ceramic package; 2 mounting holes; 4 leads	SOT1214A
BLF174XRS	-	earless flanged ceramic package; 2 leads	SOT1214B

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			-	110	V
V_{GS}	gate-source voltage			–6	+11	V
T_{stg}	storage temperature			–65	+150	°C
T_j	junction temperature		[1]	-	225	°C

[1] Continuous use at maximum temperature will affect the reliability, for details refer to the on-line MTF calculator

All information provided in this document is subject to legal disclaimers.

© Ampleon The Netherlands B.V. 2015. All rights reserved.

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	T_j = 150 °C	[1][2]	0.18	K/W

[1] T_j is the junction temperature.

[2] $R_{th(j-c)}$ is measured under RF conditions.

6. Characteristics

Table 6. DC 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 = 2.75 mA	110	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 275 mA	1.25	1.7	2.25	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 50 V	-	-	1.4	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	-	38	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	140	nA
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 9.625 A	-	0.15	-	Ω

Table 7. AC characteristics

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

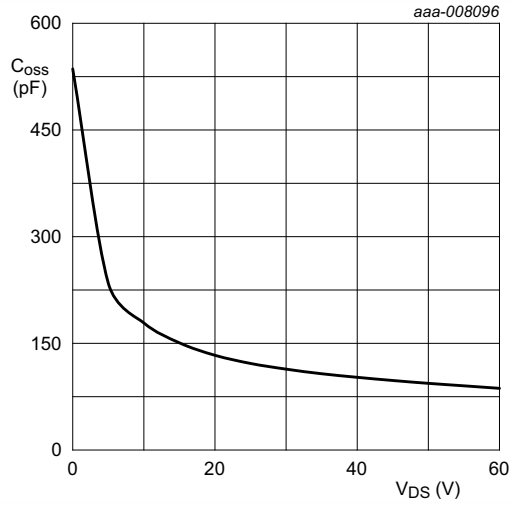
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_{rs}	feedback capacitance	V_{GS} = 0 V; V_{DS} = 50 V; f = 1 MHz	-	2.4	-	pF
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 50 V; f = 1 MHz	-	210	-	pF
C_{oss}	output capacitance	V_{GS} = 0 V; V_{DS} = 50 V; f = 1 MHz	-	94	-	pF

Table 8. RF characteristics

Test signal: CW; f = 108 MHz; RF performance at V_{DS} = 50 V; I_{Dq} = 100 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 = 600 W	27.0	28.5	-	dB
RL_{in}	input return loss	P_L = 600 W	-	−21	−13	dB
η_D	drain efficiency	P_L = 600 W	70	74	-	%

All information provided in this document is subject to legal disclaimers.
© Ampleon The Netherlands B.V. 2015. All rights reserved.



V_{GS} = 0 V; f = 1 MHz.

Fig 1. Output capacitance as a function of drain-source voltage; typical values per section

7. Test information

7.1 Ruggedness in class-AB operation

The BLF174XR and BLF174XRS are capable of withstanding a load mismatch corresponding to VSWR > 65 : 1 through all phases under the following conditions: V_{DS} = 50 V; I_{Dq} = 100 mA; P_L = 600 W pulsed; f = 108 MHz.

7.2 Impedance information

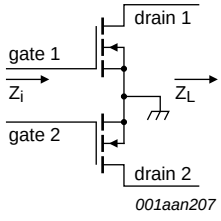


Fig 2. Definition of transistor impedance

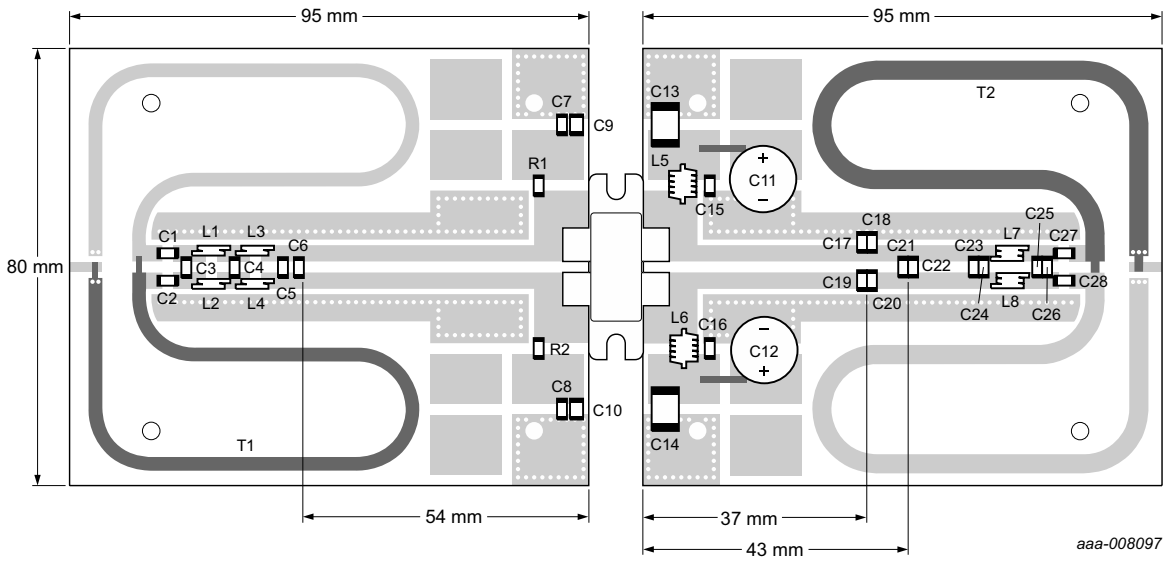
Table 9. Typical push-pull impedance

Simulated Z_i and Z_L device impedance; impedance info at V_{DS} = 50 V and P_L = 600 W.

f (MHz)	Z_i (Ω)	Z_L (Ω)
108	4.66 – j12.04	6.47 + j1.16

All information provided in this document is subject to legal disclaimers.
© Ampleon The Netherlands B.V. 2015. All rights reserved.

7.3 Test circuit



Printed-Circuit Board (PCB): RF 35; ε_r = 3.5; thickness = 0.765 mm; thickness copper plating = 35 μm.

See Table 10 for a list of components.

Fig 3. Component layout for class-AB production test circuit

Table 10. List of components

For test circuit see Figure 3.

Component	Description	Value		Remarks
C1, C2	multilayer ceramic chip capacitor	910 pF	[1]	
C3	multilayer ceramic chip capacitor	51 pF	[2]	
C4	multilayer ceramic chip capacitor	43 pF	[1]	
C5	multilayer ceramic chip capacitor	100 pF	[1]	
C6	multilayer ceramic chip capacitor	75 pF	[1]	
C7, C8, C15, C16	multilayer ceramic chip capacitor	820 pF	[1]	
C9, C10	multilayer ceramic chip capacitor	4.7 μF, 100 V		TDK C5750X7R2A475KT
C11, C12	electrolytic capacitor	470 μF, 63 V		
C13, C14	multilayer ceramic chip capacitor	4.7 μF, 100 V		
C17, C18, C19, C20	multilayer ceramic chip capacitor	39 pF	[1]	
C21, C23	multilayer ceramic chip capacitor	22 pF	[1]	
C22	multilayer ceramic chip capacitor	15 pF	[1]	
C24	multilayer ceramic chip capacitor	20 pF	[1]	
C25, C26	multilayer ceramic chip capacitor	27 pF	[1]	
C27, C28	multilayer ceramic chip capacitor	1 nF	[2]	
L1, L2, L3, L4	1.5 turn 0.8 mm copper wire	D = 3.6 mm, length = 1.8 mm		

All information provided in this document is subject to legal disclaimers.
© Ampleon The Netherlands B.V. 2015. All rights reserved.

Table 10. List of components *...continued*
For test circuit see Figure 3.

Component	Description	Value	Remarks
L5, L6	5.5 turn 0.8 mm copper wire	D = 4.4 mm, length = 5.2 mm	
L7, L8	1.5 turn 1.5 mm copper wire	D = 6.5 mm, length = 3.2 mm	
R1, R2	resistor	10.0 Ω	SMD 1206
T1	semi rigid coax	25 Ω, 160 mm	Micro-Coax UT-090C-25
T2	semi rigid coax	25 Ω, 160 mm	Micro-Coax UT-141C-25

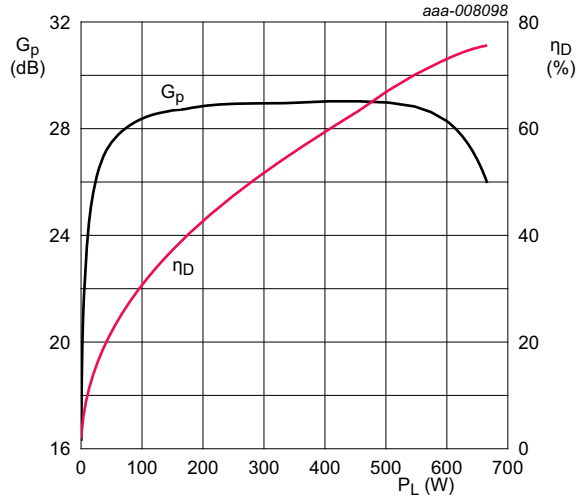
[1] American Technical Ceramics type 800B or capacitor of same quality.

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

7.4 Graphical data

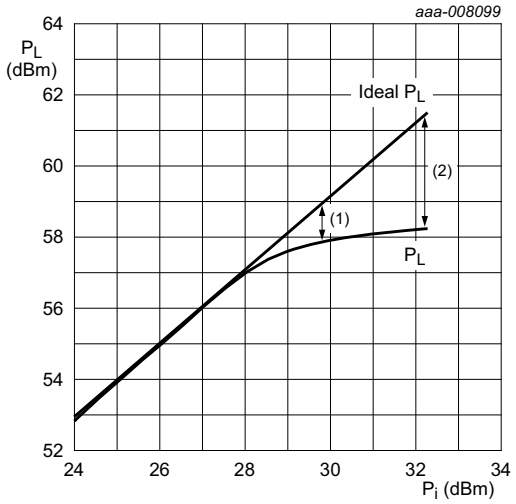
The following figures are measured in a class-AB production test circuit.

7.4.1 1-Tone CW



V_{DS} = 50 V; I_{Dq} = 100 mA; f = 108 MHz.

Fig 4. Power gain and drain efficiency as function of output power; typical values



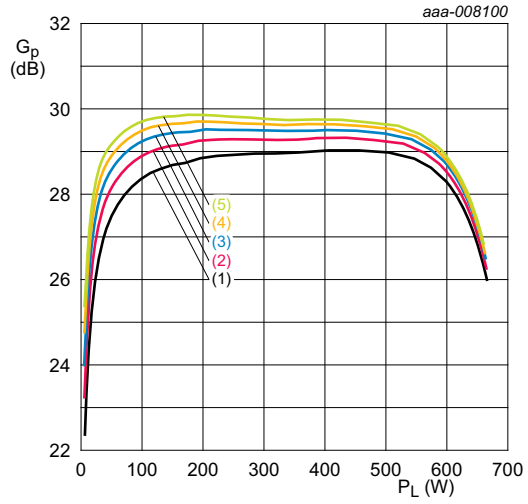
V_{DS} = 50 V; I_{Dq} = 100 mA; f = 108 MHz.

(1) $P_{L(1dB)}$ = 57.9 dBm (613 W)

(2) $P_{L(3dB)}$ = 58.2 dBm (665 W)

Fig 5. Output power as a function of input power; typical values

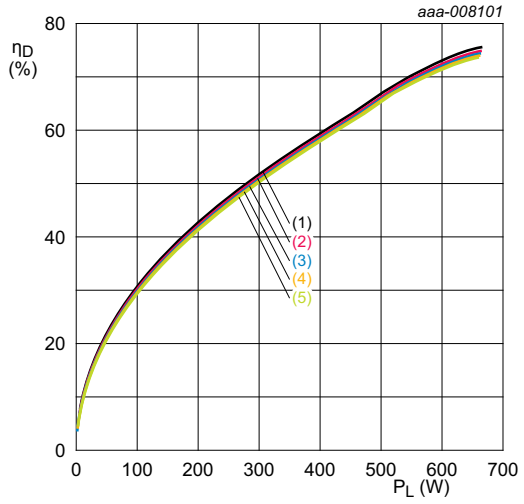
All information provided in this document is subject to legal disclaimers.
© Ampleon The Netherlands B.V. 2015. All rights reserved.



V_{DS} = 50 V; f = 108 MHz.

(1) I_{Dq} = 100 mA
(2) I_{Dq} = 200 mA
(3) I_{Dq} = 300 mA
(4) I_{Dq} = 400 mA
(5) I_{Dq} = 500 mA

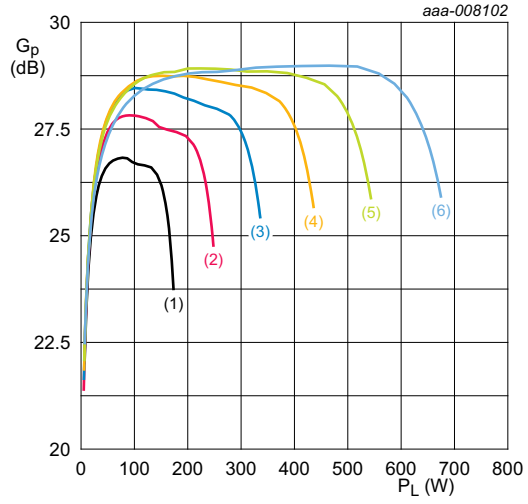
Fig 6. Power gain as a function of output power; typical values



V_{DS} = 50 V; f = 108 MHz.

(1) I_{Dq} = 100 mA
(2) I_{Dq} = 200 mA
(3) I_{Dq} = 300 mA
(4) I_{Dq} = 400 mA
(5) I_{Dq} = 500 mA

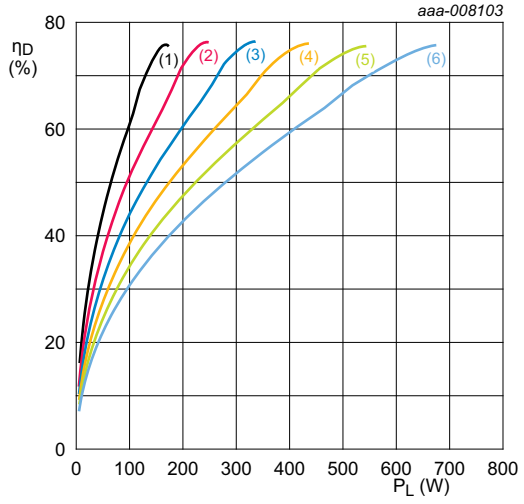
Fig 7. Drain efficiency as a function of output power; typical values



I_{Dq} = 100 mA; f = 108 MHz.

(1) V_{DS} = 25 V
(2) V_{DS} = 30 V
(3) V_{DS} = 35 V
(4) V_{DS} = 40 V
(5) V_{DS} = 45 V
(6) V_{DS} = 50 V

Fig 8. Power gain as a function of output power; typical values



I_{Dq} = 100 mA; f = 108 MHz.

(1) V_{DS} = 25 V
(2) V_{DS} = 30 V
(3) V_{DS} = 35 V
(4) V_{DS} = 40 V
(5) V_{DS} = 45 V
(6) V_{DS} = 50 V

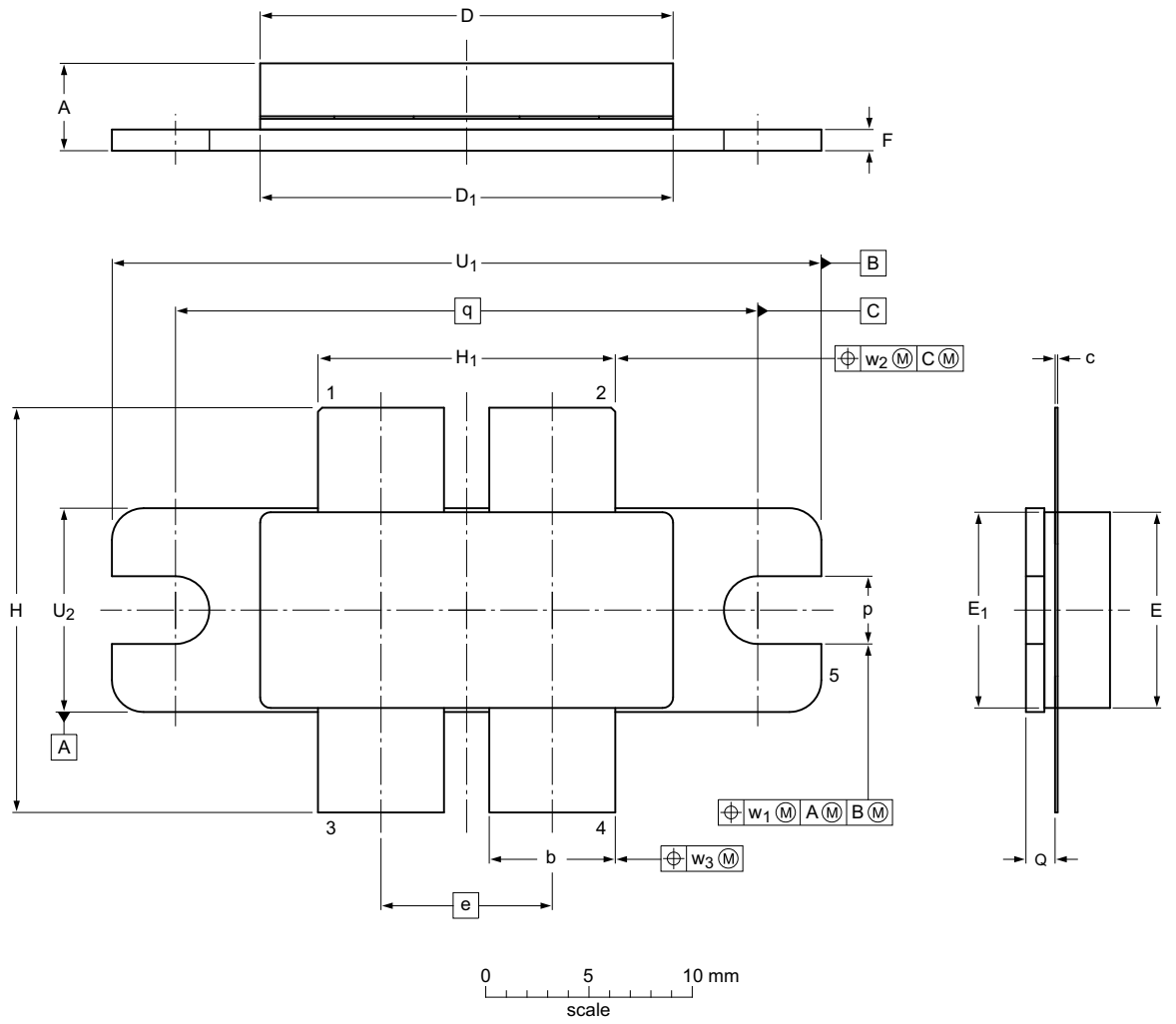
Fig 9. Drain efficiency as a function of output power; typical values

All information provided in this document is subject to legal disclaimers.

© Ampleon The Netherlands B.V. 2015. All rights reserved.

8. Package outline

Flanged ceramic package; 2 mounting holes; 4 leads **SOT1214A**



Dimensions

Unit(1)		A	b	c	D	D1	e	E	E1	F	H	H1	p	Q(2)	q	U1	U2	w1	w2	w3
mm	max	4.72	6.17	0.15	20.02	19.96		9.53	9.50	1.14	19.94		3.38	1.70		34.16	9.91			
	nom						8.21					14.24			27.94			0.25	0.51	0.25
	min	3.43	5.92	0.08	19.61	19.66		9.27	9.29	0.89	18.92		3.12	1.45		33.91	9.65			
inches	max	0.187	0.243	0.006	0.788	0.786		0.375	0.374	0.045	0.785		0.133	0.067		1.345	0.39			
	nom						0.323					0.56			1.10			0.01	0.02	0.01
	min	0.135	0.233	0.003	0.772	0.774		0.365	0.366	0.035	0.745		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 body.

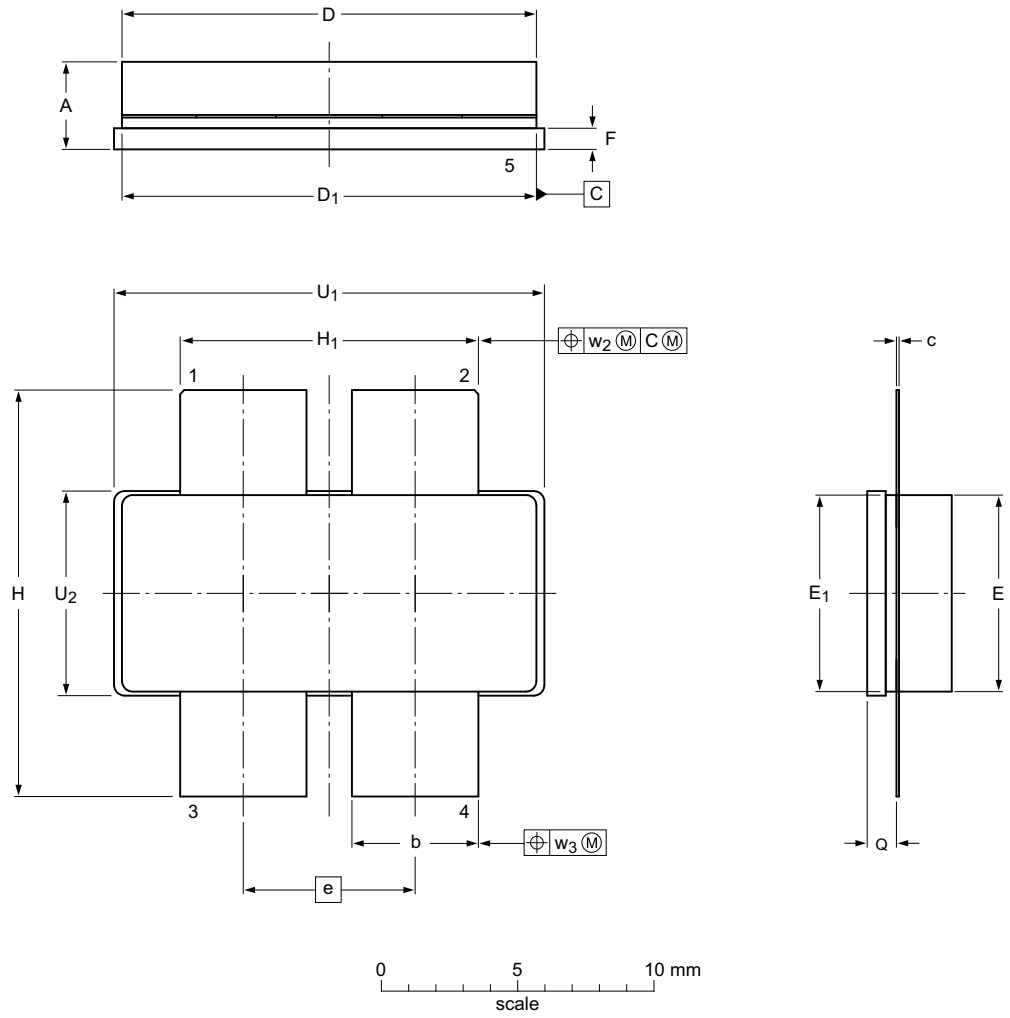
sot1214a_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1214A						~~12-08-16~~ 12-10-10

Fig 10. Package outline SOT1214A

All information provided in this document is subject to legal disclaimers.
© Ampleon The Netherlands B.V. 2015. All rights reserved.

Earless flanged ceramic package; 4 leads **SOT1214B**



Dimensions

Unit(1)		A	b	c	D	D1	e	E	E1	F	H	H1	Q(2)	U1	U2	w2	w3
mm	max	4.72	6.17	0.15	20.02	19.96		9.53	9.50	1.14	19.94		1.70	20.70	9.91		
	nom						8.21					14.24				0.51	0.25
	min	3.43	5.92	0.08	19.61	19.66		9.27	9.29	0.89	18.92		1.45	20.45	9.65		
inches	max	0.187	0.243	0.006	0.788	0.786		0.375	0.374	0.045	0.785		0.067	0.815	0.39		
	nom						0.323					0.56				0.02	0.01
	min	0.135	0.233	0.003	0.772	0.774		0.365	0.366	0.035	0.745		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 body.

sot1214b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1214B						~~12-10-10~~ 14-03-27

Fig 11. Package outline SOT1214B

All information provided in this document is subject to legal disclaimers.
© Ampleon The Netherlands B.V. 2015. All rights reserved.

9. Handling information

CAUTION	
	This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices. Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

10. Abbreviations

Table 11. Abbreviations

Acronym	Description
CW	Continuous Wave
ESD	ElectroStatic Discharge
HF	High Frequency
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
MTF	Median Time to Failure
SMD	Surface Mounted Device
VSWR	Voltage Standing-Wave Ratio
XR	eXtremely Rugged

11. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF174XR_BLF174XRS#2	20150901	Product data sheet	-	BLF174XR_BLF174XRS v.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.			
BLF174XR_BLF174XRS v.1	20130625	Product data sheet	-	-

All information provided in this document is subject to legal disclaimers.
© Ampleon The Netherlands B.V. 2015. All rights reserved.

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.

All information provided in this document is subject to legal disclaimers.

© Ampleon The Netherlands B.V. 2015. All rights reserved.

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

All information provided in this document is subject to legal disclaimers.

© Ampleon The Netherlands B.V. 2015. All rights reserved.

14. Contents

1 Product profile 1
1.1 General description 1
1.2 Features and benefits 1
1.3 Applications 1
2 Pinning information 2
3 Ordering information 2
4 Limiting values 2
5 Thermal characteristics 3
6 Characteristics 3
7 Test information 4
7.1 Ruggedness in class-AB operation 4
7.2 Impedance information 4
7.3 Test circuit 5
7.4 Graphical data 6
7.4.1 1-Tone CW 6
8 Package outline 8
9 Handling information 10
10 Abbreviations 10
11 Revision history 10
12 Legal information 11
12.1 Data sheet status 11
12.2 Definitions 11
12.3 Disclaimers 11
12.4 Trademarks 12
13 Contact information 12
14 Contents 13

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© Ampleon The Netherlands B.V. 2015. All rights reserved.

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

Date of release: 1 September 2015
Document identifier: BLF174XR_BLF174XRS#2

Unikeyic Electronics

Global Electronic Components Distributor

Click to view pricing, inventory, delivery, and lifecycle information:

AMPLEON:

BLC9G20LS-120VZ BLF8G27LS-100GVQ BLL6H1214LS-250,11 BLL9G1214LS-600U BLP05H675XRGY BLF7G20LS-90P,118 BLA9H0912LS-250GU BLC9G20LS-150PVZ BLP9LA25SGZ BLM9D3538-12AMZ BLU9H0408L-800PU CLF1G0035S-100P BLC9G24XS-170AVZ BLF184XRSU BLF888B,112 BLA0912-250 BLM8G0710S-60PBGY BLS9G3135LS-115U B11G3338N81DYZ BLC9G20LS-361AVTZ BLF8G22LS-220U BLC10G20LS-240PWTZ BLF6G10LS-200RN:11 BLS3135-65I CLF3H0035-100U BLF7G27LS-140,112 BLC2425M8LS300PZ BLF6G15L-40RN,112 BLF8G38LS-75VU MX0912B251Y