# BLF7G22L-200; BLF7G22LS-200

**Power LDMOS transistor**

**Rev. 5 — 1 September 2015**

AMPLEON

**Product data sheet**

## 1. Product profile

### 1.1 General description

200 W LDMOS power transistor for base station applications at frequencies from 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 | $I_{Dq}$ | $V_{DS}$ | $P_{L(AV)}$ | $G_p$ | $\eta_D$ | ACPR |
|---|---|---|---|---|---|---|---|
| | (MHz) | (mA) | (V) | (W) | (dB) | (%) | (dBc) |
| 2-carrier W-CDMA | 2110 to 2170 | 1620 | 28 | 55 | 18.5 | 31 | –31[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

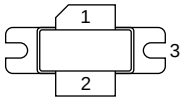
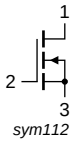
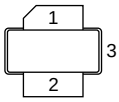
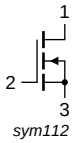
- Excellent ruggedness
- High efficiency
- Low $R_{th}$ providing excellent thermal stability
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous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

### 1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 2110 MHz to 2170 MHz frequency range

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| **BLF7G22L-200 (SOT502A)** | | | | |
| 1 | drain | |  |  |
| 2 | gate | | | |
| 3 | source | [1] | | |
| **BLF7G22LS-200 (SOT502B)** | | | | |
| 1 | drain | |  |  |
| 2 | gate | | | |
| 3 | source | [1] | | |

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BLF7G22L-200 | - | flanged LDMOST ceramic package; 2 mounting holes; 2 leads | SOT502A |
| BLF7G22LS-200 | - | 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 |
| $T_{stg}$ | 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; $P_L$ = 80 W (CW); $V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA | 0.26 | K/W |


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# 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; $I_D$ = 1.5 mA | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS}$ = 10 V; $I_D$ = 150 mA | 1.5 | 1.9 | 2.3 | V |
| $I_{DSS}$ | drain leakage current | $V_{GS}$ = 0 V; $V_{DS}$ = 28 V | - | - | 4.2 | μA |
| $I_{DSX}$ | drain cut-off current | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $V_{DS}$ = 10 V | 42 | 50.8 | - | A |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = 11 V; $V_{DS}$ = 0 V | - | - | 420 | nA |
| $g_{fs}$ | forward transconductance | $V_{DS}$ = 10 V; $I_D$ = 5.25 A | - | 18.9 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $I_D$ = 5.25 A | - | 0.054 | - | Ω |

# 7. Test information

**Table 7. Functional test information**

*Mode of operation: 2-carrier W-CDMA; PAR = 8.4 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 1-64 DPCH; $f_1$ = 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; $I_{Dq}$ = 1620 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 | | - | 55 | - | W |
| $G_p$ | power gain | $P_{L(AV)}$ = 55 W | 16.8 | 18.5 | - | dB |
| $RL_{in}$ | input return loss | $P_{L(AV)}$ = 55 W | - | –15 | –6 | dB |
| $\eta_D$ | drain efficiency | $P_{L(AV)}$ = 55 W | 27 | 31 | - | % |
| ACPR | adjacent channel power ratio | $P_{L(AV)}$ = 55 W | - | –31 | –25.5 | dBc |

## 7.1 Ruggedness in class-AB operation

The BLF7G22L-200 and BLF7G22LS-200 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA; $P_L$ = 200 W (CW); f = 2110 MHz to 2170 MHz.


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## 7.2 Impedance information

**Table 8. Typical impedance**

*Measured load-pull data; $I_{Dq}$ = 1620 mA; $V_{DS}$ = 28 V.*

| f (MHz) | $Z_S$[1] (Ω) | $Z_L$[1] (Ω) |
|---|---|---|
| 2050 | 1.05 – j4.04 | 2.04 – j1.28 |
| 2110 | 1.18 – j4.17 | 1.67 – j1.52 |
| 2140 | 1.32 – j4.68 | 1.67 – j1.52 |
| 2170 | 1.58 – j4.37 | 1.62 – j1.63 |
| 2230 | 2.55 – j5.14 | 1.51 – j1.83 |

[1] $Z_S$ and $Z_L$ defined in Figure 1.

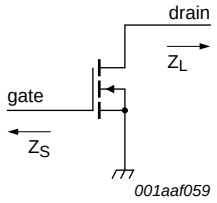
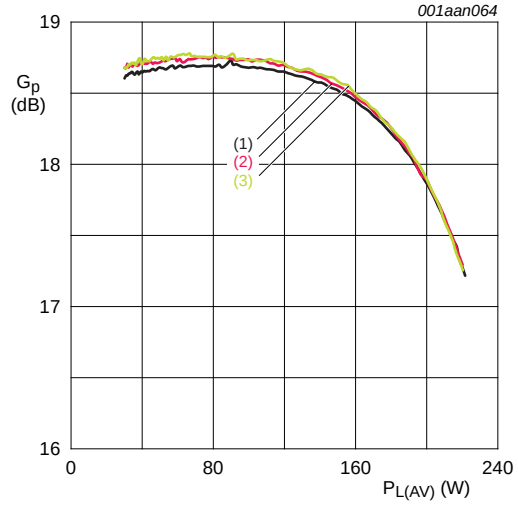



**Fig 1. Definition of transistor impedance**

## 7.3 1 Tone CW



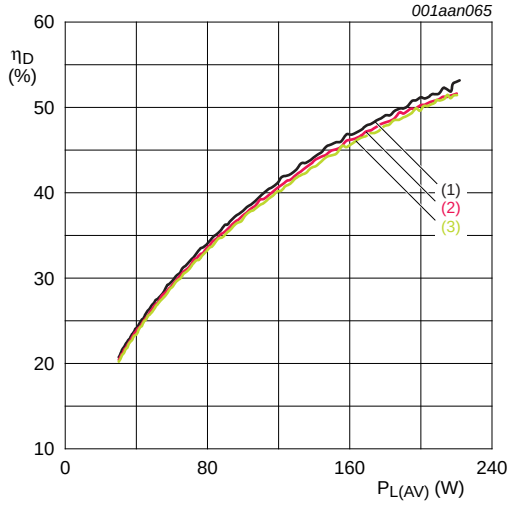

$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA.

(1) f = 2110 MHz

(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 2. Power gain as a function of average load power; typical values**




$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA.

(1) f = 2110 MHz

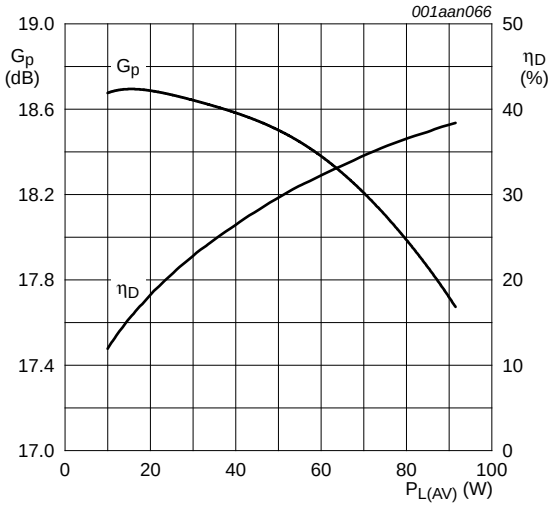
(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 3. Drain efficiency as a function of average load power; typical values**

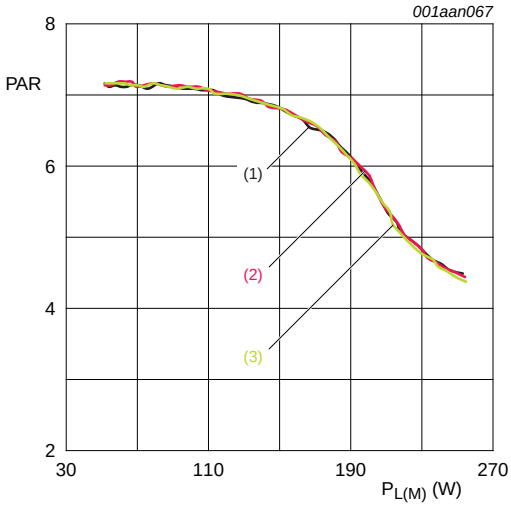

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## 7.4 1-carrier W-CDMA




$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA; f = 2140 MHz; PAR = 7.2 dB at 0.01 % probability on the CCDF.

**Fig 4. Power gain and drain efficiency as functions of average load power; typical values**



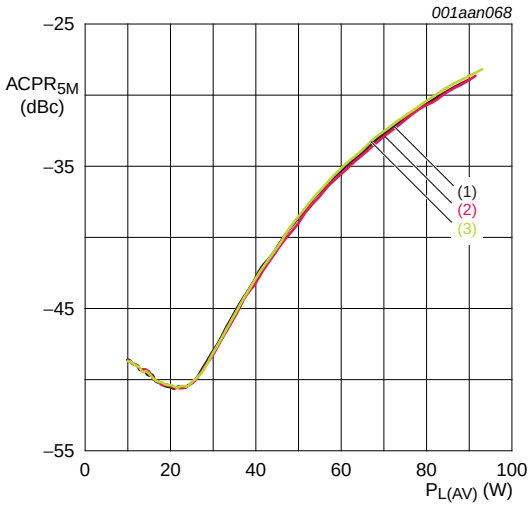

$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA; PAR = 7.2 dB at 0.01 % probability on the CCDF.

(1) f = 2110 MHz

(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 5. Peak-to-average power ratio as function of peak power; typical values**




$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA; PAR = 7.2 dB at 0.01 % probability on the CCDF.

(1) f = 2110 MHz

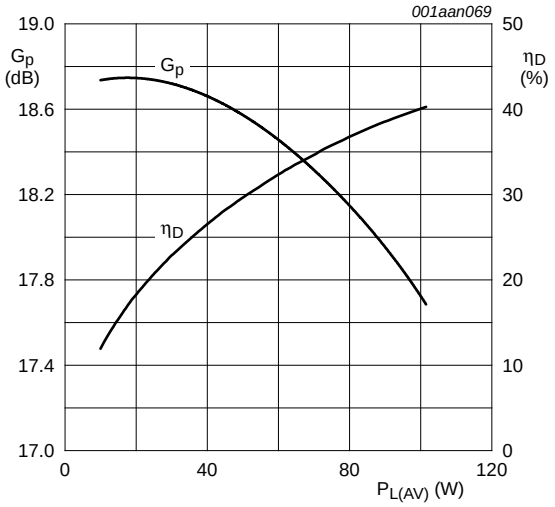
(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 6. Adjacent power channel ratio (5 MHZ) as function of average load power; typical values**

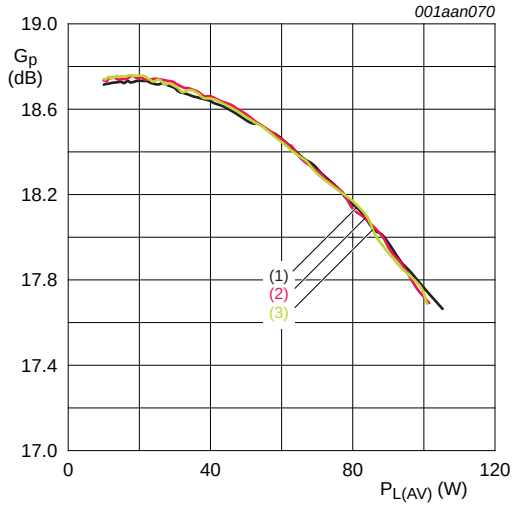

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## 7.5 2-carrier W-CDMA




$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA; f = 2140 MHz; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

**Fig 7. Power gain and drain efficiency as functions of average load power; typical values**



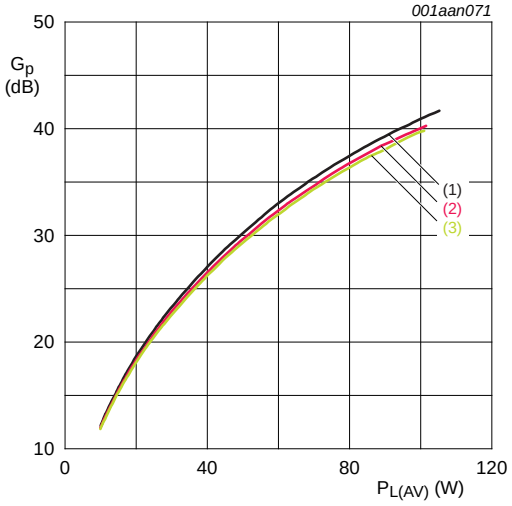

$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

(1) f = 2110 MHz

(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 8. Power gain as a function of average load power; typical values**



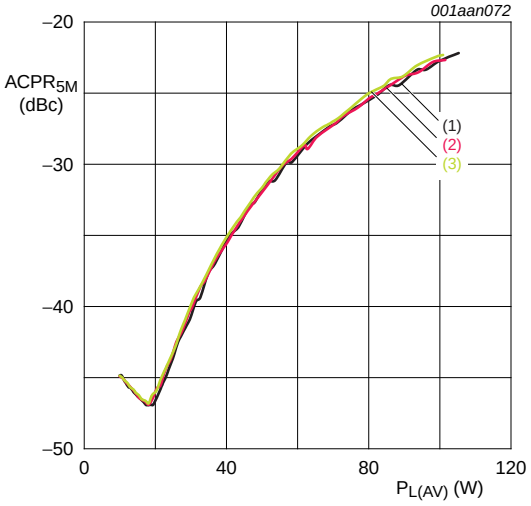

$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

(1) f = 2110 MHz

(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 9. Drain efficiency as function of average load power; typical values**




$V_{DS}$ = 28 V; $I_{Dq}$ = 1620 mA; Channel Spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.

(1) f = 2110 MHz

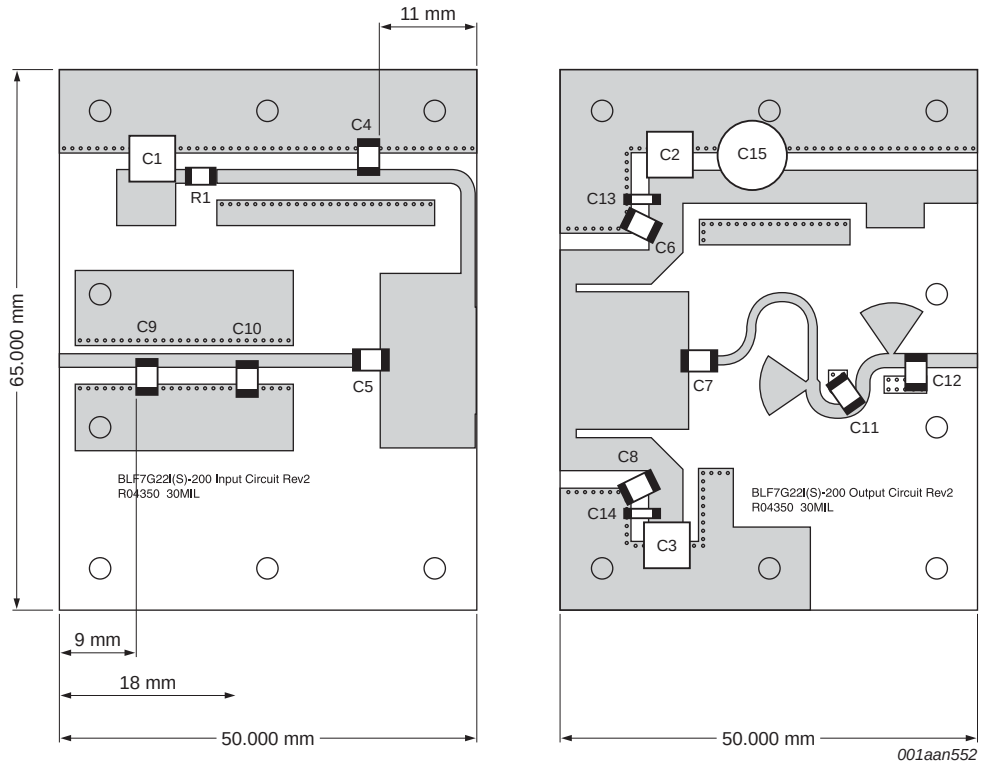
(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 10. Adjacent power channel ratio (5 MHZ) as function of average load power; typical values**


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## 7.6 Test circuit




See Table 9 for list of components.

**Fig 11. Component layout**

**Table 9. List of components**

*See Figure 11 for component layout.*

| Component | Description | Value | | Remarks |
|---|---|---|---|---|
| C1 | multilayer ceramic chip capacitor | 10 μF | [1] | TDK |
| C2, C3 | multilayer ceramic chip capacitor | 4.7 μF | [1] | TDK |
| C4, C5, C6, C7, C8 | multilayer ceramic chip capacitor | 22 pF | [2] | ATC100B |
| C9 | multilayer ceramic chip capacitor | 2.0 pF | [2] | ATC100B |
| C10 | multilayer ceramic chip capacitor | 2.1 pF | [2] | ATC100B |
| C11 | multilayer ceramic chip capacitor | 0.5 pF | [2] | ATC100B |
| C12 | multilayer ceramic chip capacitor | 0.9 pF | [2] | ATC100B |
| C13, C14 | multilayer ceramic chip capacitor | 330 nF | [1] | TDK |
| C15 | electrolytic capacitor | 470 μF; 63 V | | |
| R1 | chip resistor | 10 Ω | | Philips 1206 |

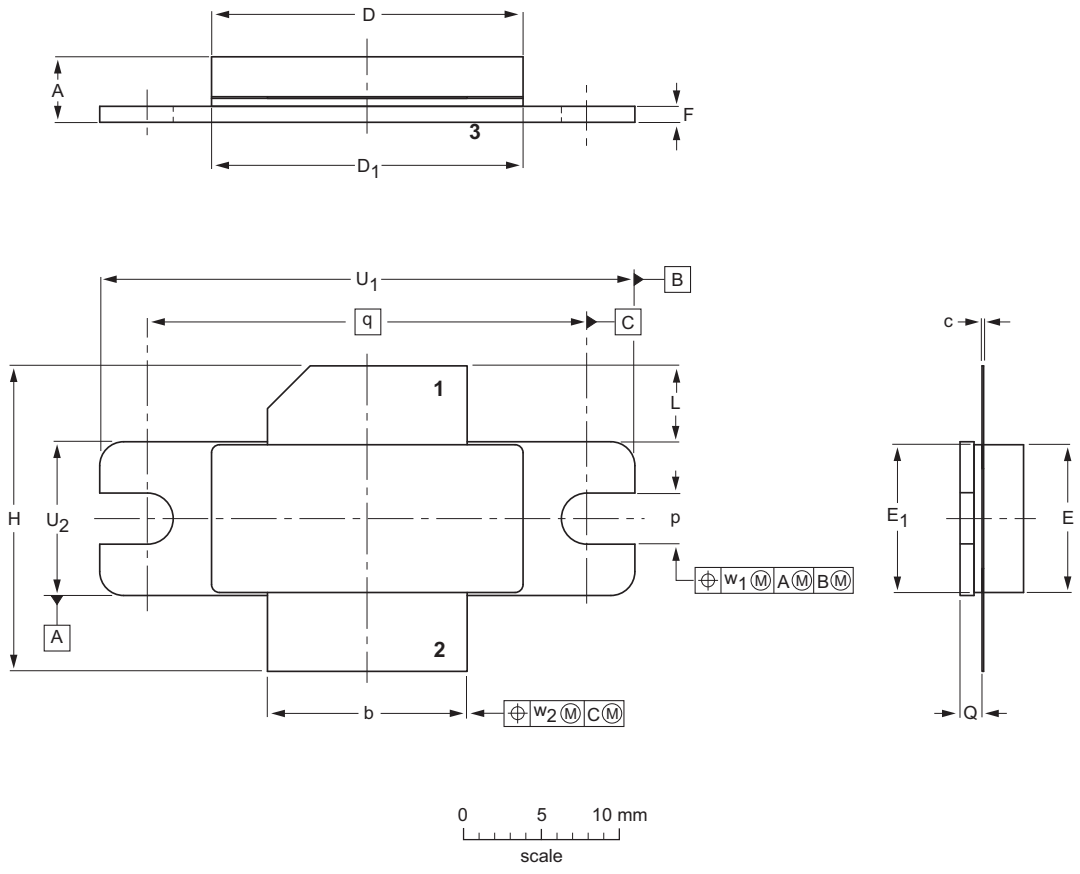
[1] TDK or capacitor of same quality.

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


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## 8. Package outline

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




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

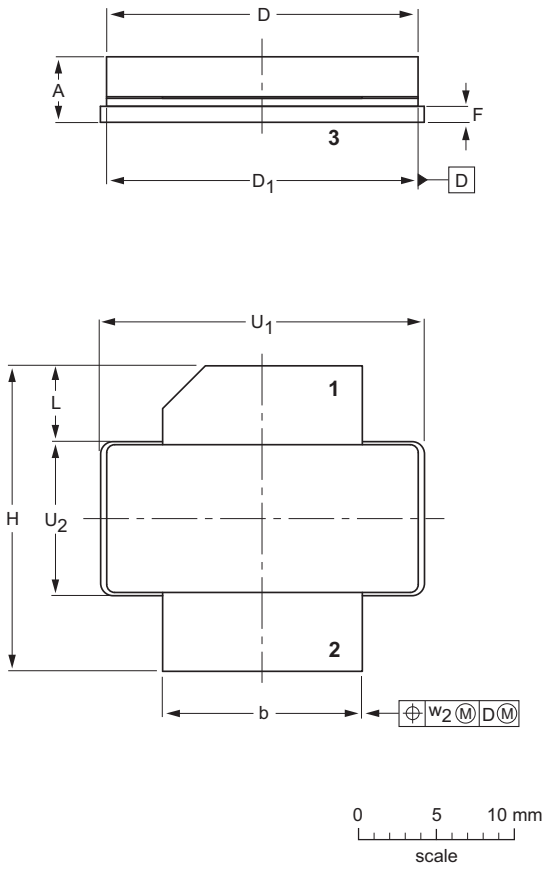
| UNIT | A | b | c | D | $D_1$ | E | $E_1$ | F | H | L | p | Q | q | $U_1$ | $U_2$ | $w_1$ | $w_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 4.72<br>3.43 | 12.83<br>12.57 | 0.15<br>0.08 | 20.02<br>19.61 | 19.96<br>19.66 | 9.50<br>9.30 | 9.53<br>9.25 | 1.14<br>0.89 | 19.94<br>18.92 | 5.33<br>4.32 | 3.38<br>3.12 | 1.70<br>1.45 | 27.94 | 34.16<br>33.91 | 9.91<br>9.65 | 0.25 | 0.51 |
| inches | 0.186<br>0.135 | 0.505<br>0.495 | 0.006<br>0.003 | 0.788<br>0.772 | 0.786<br>0.774 | 0.374<br>0.366 | 0.375<br>0.364 | 0.045<br>0.035 | 0.785<br>0.745 | 0.210<br>0.170 | 0.133<br>0.123 | 0.067<br>0.057 | 1.100 | 1.345<br>1.335 | 0.390<br>0.380 | 0.01 | 0.02 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT502A | | | | | | ~~03-01-10~~<br>12-05-02 |

**Fig 12. Package outline SOT502A**


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**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<br>3.43 | 12.83<br>12.57 | 0.15<br>0.08 | 20.02<br>19.61 | 19.96<br>19.66 | 9.50<br>9.30 | 9.53<br>9.25 | 1.14<br>0.89 | 19.94<br>18.92 | 5.33<br>4.32 | 1.70<br>1.45 | 20.70<br>20.45 | 9.91<br>9.65 | 0.25 |
| inches | 0.186<br>0.135 | 0.505<br>0.495 | 0.006<br>0.003 | 0.788<br>0.772 | 0.786<br>0.774 | 0.374<br>0.366 | 0.375<br>0.364 | 0.045<br>0.035 | 0.785<br>0.745 | 0.210<br>0.170 | 0.067<br>0.057 | 0.815<br>0.805 | 0.390<br>0.380 | 0.010 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT502B | | | | | | ~~07-05-09~~<br>12-05-02 |

**Fig 13. Package outline SOT502B**


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## 9. Handling information

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

## 10. Abbreviations

**Table 10. Abbreviations**

| Acronym | Description |
|---|---|
| 3GPP | Third Generation Partnership Project |
| CCDF | Complementary Cumulative Distribution Function |
| CW | Continuous Wave |
| DPCH | Dedicated Physical CHannel |
| LDMOS | Laterally Diffused Metal Oxide Semiconductor |
| LDMOST | Laterally Diffused Metal Oxide Semiconductor Transistor |
| PAR | Peak-to-Average power Ratio |
| RF | Radio Frequency |
| VSWR | Voltage Standing Wave Ratio |
| W-CDMA | Wideband Code Division Multiple Access |

## 11. Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BLF7G22L-200_7G22LS-200#5 | 20150901 | Product data sheet | - | BLF7G22L-200_7G22LS-200 v.4 |
| Modifications: | • The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.<br>• Legal texts have been adapted to the new company name where appropriate. | | | |
| BLF7G22L-200_7G22LS-200 v.4 | 20110722 | Product data sheet | - | BLF7G22L-200_7G22LS-200 v.3 |
| BLF7G22L-200_7G22LS-200 v.3 | 20110401 | Preliminary data sheet | - | BLF7G22L-200_7G22LS-200 v.2 |
| BLF7G22L-200_7G22LS-200 v.2 | 20101228 | Preliminary data sheet | - | BLF7G22L-200_7G22LS-200 v.1 |
| BLF7G22L-200_7G22LS-200 v.1 | 20100419 | Objective data sheet | - | - |


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# 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.

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