

# BLF7G20L-250P; BLF7G20LS-250P

Power LDMOS transistor

Rev. 5 — 1 September 2015

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

250 W LDMOS power transistor for base station applications at frequencies from 1805 MHz to 1880 MHz.

**Table 1. Typical performance**

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

| Mode of operation | f<br>(MHz)   | $I_{Dq}$<br>(mA) | $V_{DS}$<br>(V) | $P_{L(AV)}$<br>(W) | $G_p$<br>(dB) | $\eta_D$<br>(%) | ACPR<br>(dBc)        |
|-------------------|--------------|------------------|-----------------|--------------------|---------------|-----------------|----------------------|
| 2-carrier W-CDMA  | 1805 to 1880 | 1900             | 28              | 70                 | 18            | 35              | -29.5 <sup>[1]</sup> |

[1] Test signal: 3GPP; test model 1;64 DPCH; PAR = 8.4 dB at 0.01% probability on CCDF.

### 1.2 Features and benefits

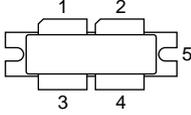
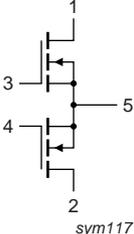
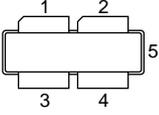
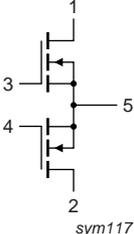
- Excellent ruggedness
- High-efficiency
- Low  $R_{th}$  providing excellent thermal stability
- Designed for broadband operation (1805 MHz to 1880 MHz)
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent digital pre-distortion capability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

### 1.3 Applications

- RF power amplifiers for W-CDMA base stations and multicarrier applications in the 1805 MHz to 1880 MHz frequency range

## 2. Pinning information

Table 2. Pinning

| Pin                             | Description | Simplified outline  | Graphic symbol   |
|---------------------------------|-------------|---|--|
| <b>BLF7G20L-250P (SOT539A)</b>  |             |   |  |
| 1                               | drain1      |  | <br>sym117  |
| 2                               | drain2      |   |  |
| 3                               | gate1       |   |  |
| 4                               | gate2       |   |  |
| 5                               | source      |   |  |
| <b>BLF7G20LS-250P (SOT539B)</b> |             |   |  |
| 1                               | drain1      |  | <br>sym117 |
| 2                               | drain2      |   |  |
| 3                               | gate1       |   |  |
| 4                               | gate2       |   |  |
| 5                               | source      |   |  |

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

| Type number    | Package |  |         |
|----------------|---------|--|---------|
|                | Name    | Description  | Version |
| BLF7G20L-250P  | -       | flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads | SOT539A |
| BLF7G20LS-250P | -       | earless flanged balanced LDMOST ceramic package; 4 leads           | SOT539B |

## 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        |            | -    | 65   | 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 | $T_{case} = 80\text{ °C}$ ; $P_L = 70\text{ W}$ ; $V_{DS} = 28\text{ V}$ ; $I_{Dq} = 1900\text{ mA}$ ; $T_j \leq 150\text{ °C}$ | 0.20 | K/W  |

## 6. Characteristics

**Table 6. Characteristics**

$T_j = 25\text{ °C}$  unless otherwise specified.

| Symbol        | Parameter                        | Conditions   | Min | Typ   | Max   | Unit          |
|---------------|----------------------------------|--|-----|-------|-------|---------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage   | $V_{GS} = 0\text{ V}$ ; $I_D = 1.5\text{ mA}$                  | 65  | -     | -     | V             |
| $V_{GS(th)}$  | gate-source threshold voltage    | $V_{DS} = 10\text{ V}$ ; $I_D = 150\text{ mA}$                 | 1.5 | 1.78  | 2.3   | V             |
| $I_{DSS}$     | drain leakage current            | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 28\text{ V}$                 | -   | -     | 2.8   | $\mu\text{A}$ |
| $I_{DSX}$     | drain cut-off current            | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $V_{DS} = 10\text{ V}$ | -   | 33.4  | 37.54 | A             |
| $I_{GSS}$     | gate leakage current             | $V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$                 | -   | 68.3  | -     | nA            |
| $g_{fs}$      | forward transconductance         | $V_{DS} = 10\text{ V}$ ; $I_D = 7.5\text{ A}$                  | -   | 12.37 | -     | S             |
| $R_{DS(on)}$  | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $I_D = 5.25\text{ A}$  | -   | 0.078 | 0.135 | $\Omega$      |

## 7. Test information

**Table 7. 2-carrier W-CDMA functional test information**

Class-AB production test circuit;  $PAR = 8.4\text{ dB}$  at 0.01 % probability on the CCDF; 3GPP test model 1; 64 DPCH;  $f = 1805\text{ MHz}$  to  $1880\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1900\text{ mA}$ ;  $T_{case} = 25\text{ °C}$ ; unless otherwise specified.

| Symbol      | Parameter                    | Conditions                | Min | Typ   | Max   | Unit |
|-------------|------------------------------|---------------------------|-----|-------|-------|------|
| $P_{L(AV)}$ | average output power         |                           | -   | 70    | -     | W    |
| $G_p$       | power gain                   | $P_{L(AV)} = 70\text{ W}$ | 16  | 18    | -     | dB   |
| $RL_{in}$   | input return loss            | $P_{L(AV)} = 70\text{ W}$ | -   | -12   | -     | dB   |
| $\eta_D$    | drain efficiency             | $P_{L(AV)} = 70\text{ W}$ | 30  | 35    | -     | %    |
| ACPR        | adjacent channel power ratio | $P_{L(AV)} = 70\text{ W}$ | -   | -29.5 | -24.5 | dBc  |

### 7.1 Ruggedness in class-AB operation

The BLF7G20L-250P and BLF7G20LS-250P are capable of withstanding a load mismatch corresponding to a VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1900\text{ mA}$ ;  $P_{L(1dB)} = 245\text{ W}$  (CW);  $f = 1805\text{ MHz}$  to  $1880\text{ MHz}$ .

7.2 Impedance information

Table 8. Typical impedance

Measured load-pull data half device;  $I_{Dq} = 950 \text{ mA}$ ;  $V_{DS} = 28 \text{ V}$ .

| f (MHz) | $Z_S$ <sup>[1]</sup> ( $\Omega$ ) | $Z_L$ <sup>[1]</sup> ( $\Omega$ ) |
|---------|-----------------------------------|-----------------------------------|
| 1750    | 1.31 – j3.53                      | 2.47 – j3.91                      |
| 1805    | 1.39 – j3.75                      | 2.27 – j3.63                      |
| 1845    | 1.48 – j4.10                      | 2.32 – j3.19                      |
| 1880    | 1.55 – j4.19                      | 1.89 – j3.15                      |
| 1930    | 1.97 – j4.48                      | 1.70 – j2.95                      |

[1]  $Z_S$  and  $Z_L$  defined in [Figure 1](#).

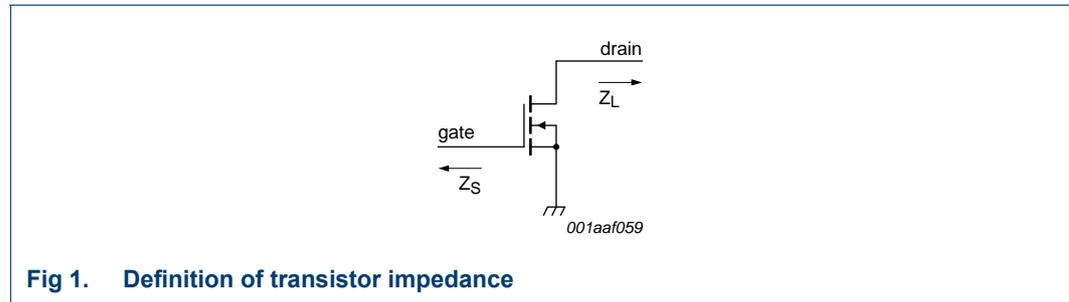
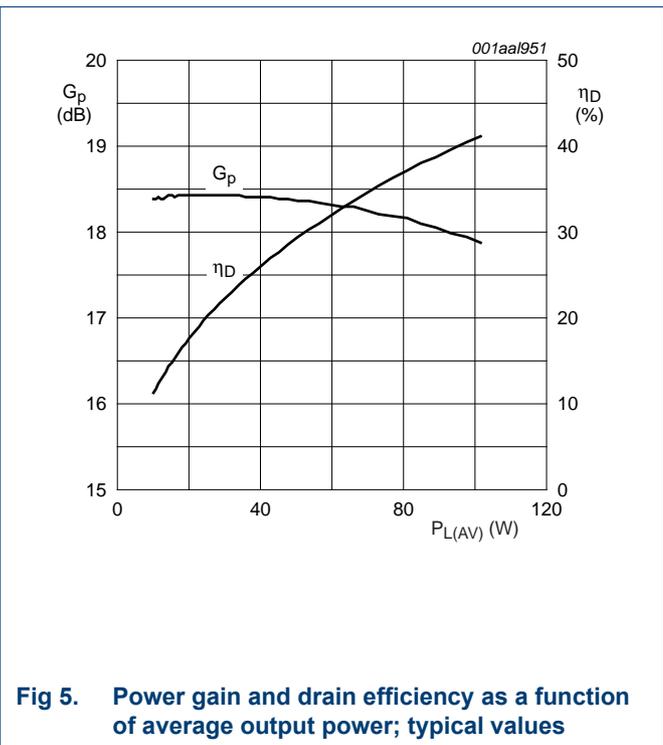
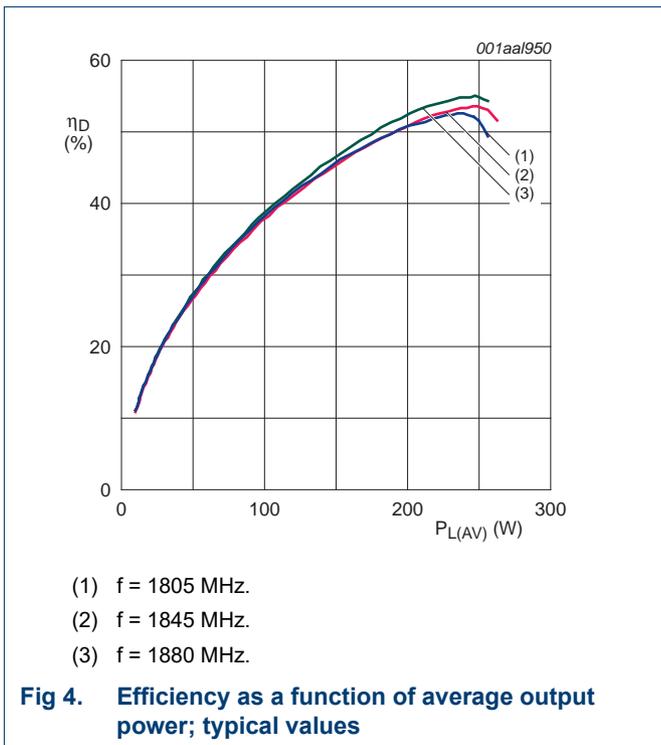
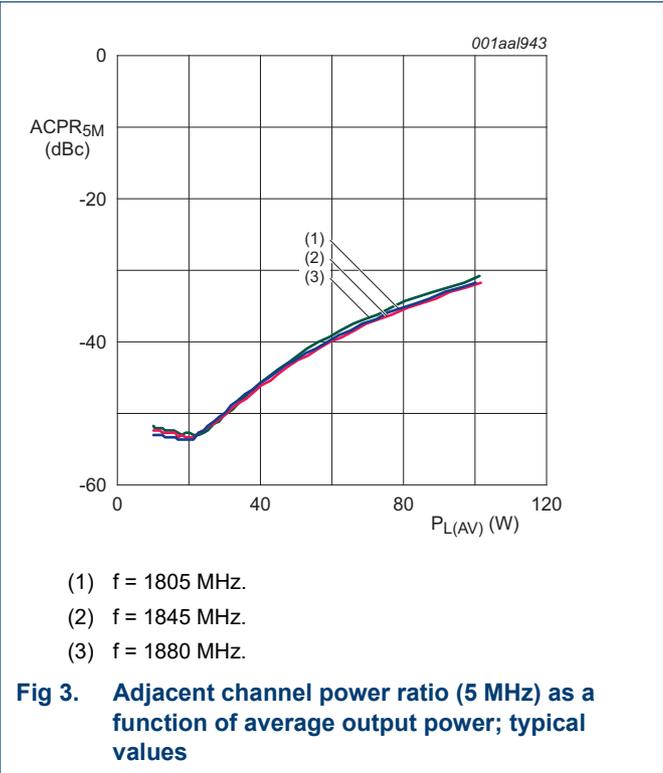
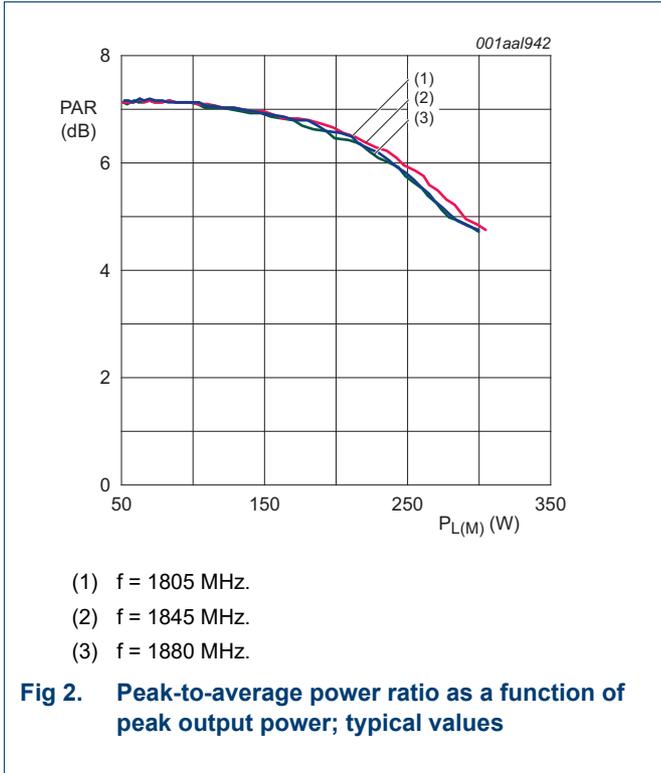


Fig 1. Definition of transistor impedance

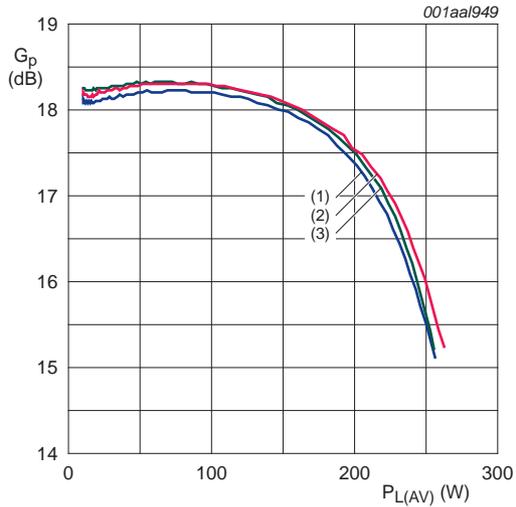
7.3 Single carrier W-CDMA

3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF. Channel bandwidth is 3.84 MHz; channel spacing = 5 MHz;  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1900\text{ mA}$



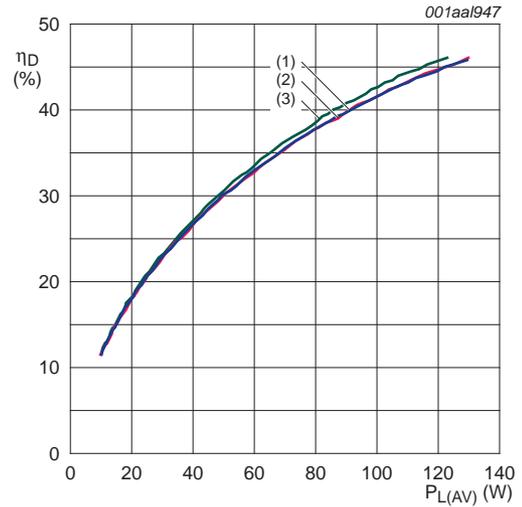
7.4 One tone CW

$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1900\text{ mA}$ .



- (1)  $f = 1805\text{ MHz}$ .
- (2)  $f = 1845\text{ MHz}$ .
- (3)  $f = 1880\text{ MHz}$ .

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

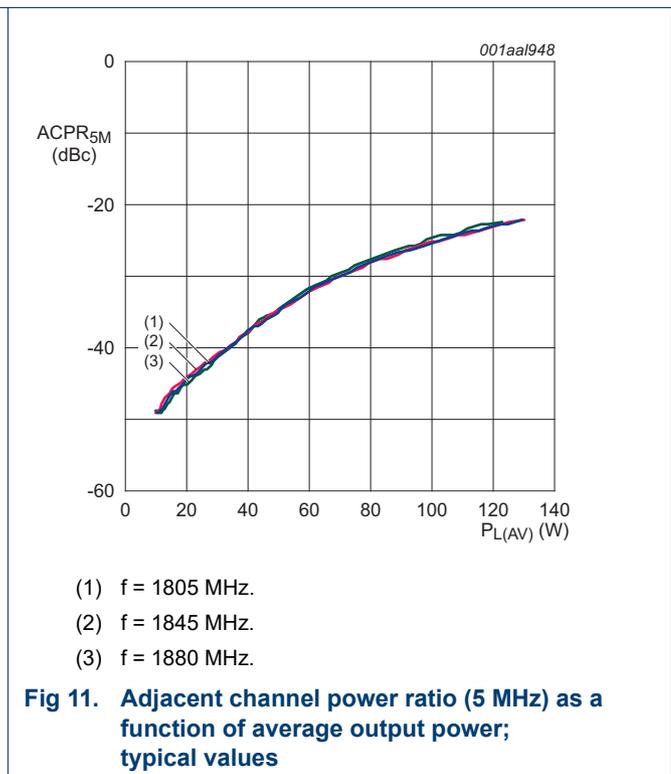
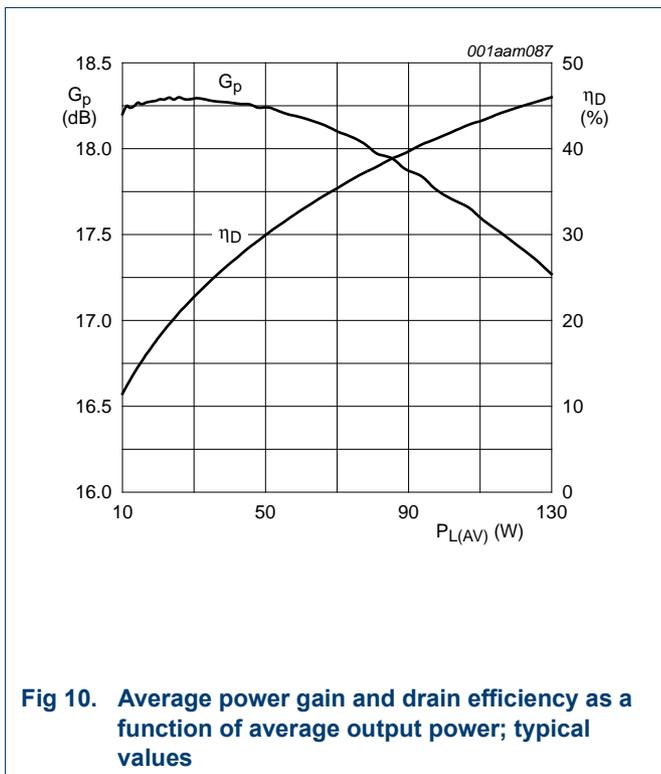
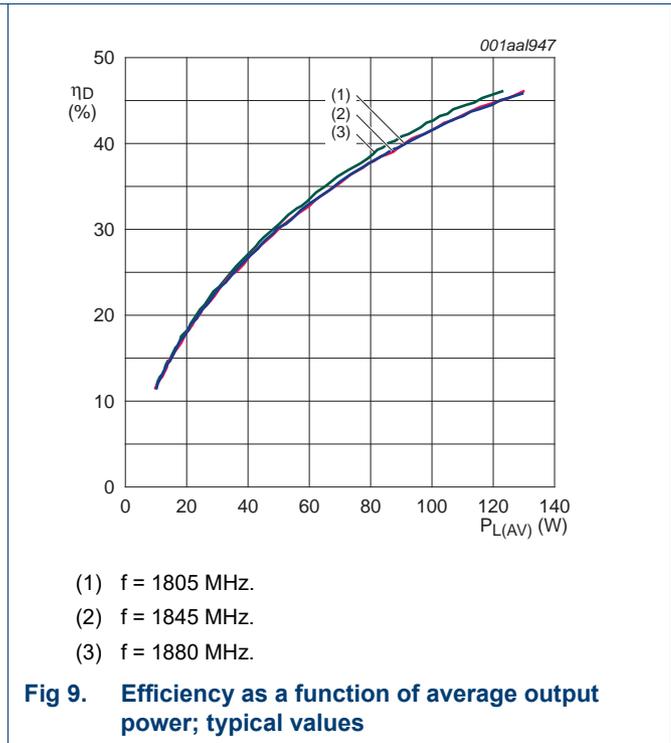
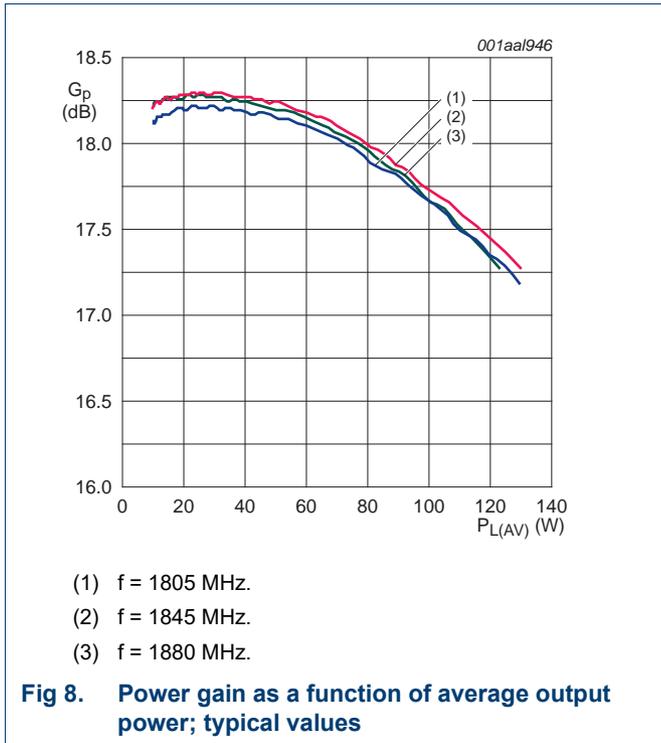


- (1)  $f = 1805\text{ MHz}$ .
- (2)  $f = 1845\text{ MHz}$ .
- (3)  $f = 1880\text{ MHz}$ .

Fig 7. Efficiency as a function of average output power; typical values

7.5 2-carrier WCDMA characteristics

$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1900\text{ mA}$ ; channel spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on the CCDF.



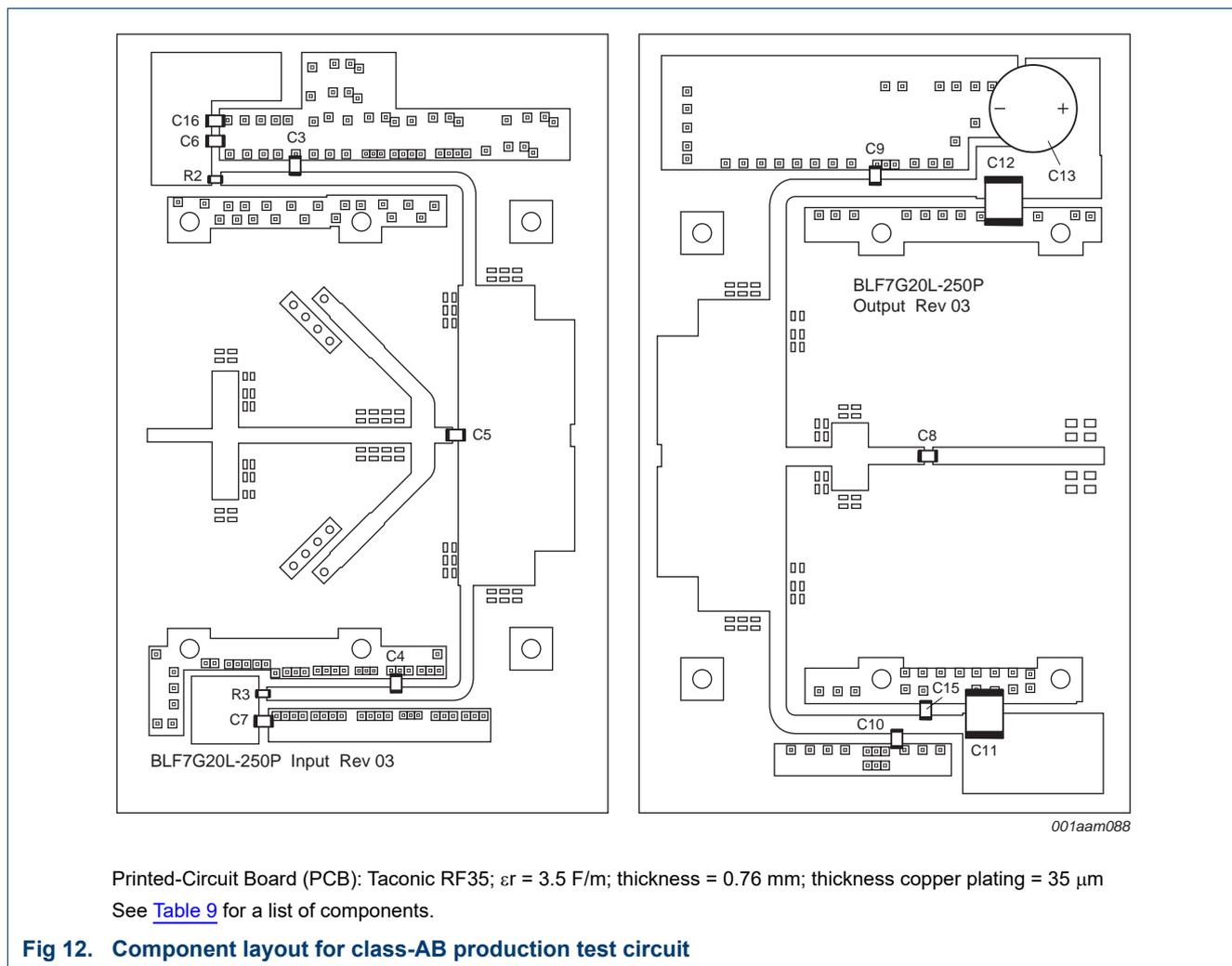
7.6 Test circuit

Table 9. List of components

For test circuit see Figure 12.

| Component             | Description                        | Value             | Code number | Type          | Remarks       |
|-----------------------|------------------------------------|-------------------|-------------|---------------|---------------|
| <b>Base plate [1]</b> |                                    |                   |             |               |               |
| C3, C4, C9, C10       | multi layer ceramic chip capacitor | 47 pF             |             | ATC 800B      | mount on edge |
| C5                    | multi layer ceramic chip capacitor | 1.2 pF            |             | ATC 800B      | mount on edge |
| C6, C7                | chip capacitor                     | 560 pF            |             | ATC 100A      |               |
| C8                    | multi layer ceramic chip capacitor | 68 pF             |             | ATC 800B      | mount on edge |
| C11, C12              | multi layer ceramic chip capacitor | 10 $\mu$ F        |             | TDK           |               |
| C13                   | electrolytic capacitor             | 470 $\mu$ F; 63 V |             |               |               |
| C15, C16              | multi layer ceramic chip capacitor | 100 nF            |             | Phillips 1206 |               |
| R2, R3                | chip resistor                      | 10 $\Omega$       |             | Philips 0603  |               |

[1] See mechanical drawing (Figure 12).



Printed-Circuit Board (PCB): Taconic RF35;  $\epsilon_r = 3.5$  F/m; thickness = 0.76 mm; thickness copper plating = 35  $\mu$ m  
 See Table 9 for a list of components.

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

8. Package outline

Flanged balanced ceramic package; 2 mounting holes; 4 leads

SOT539A

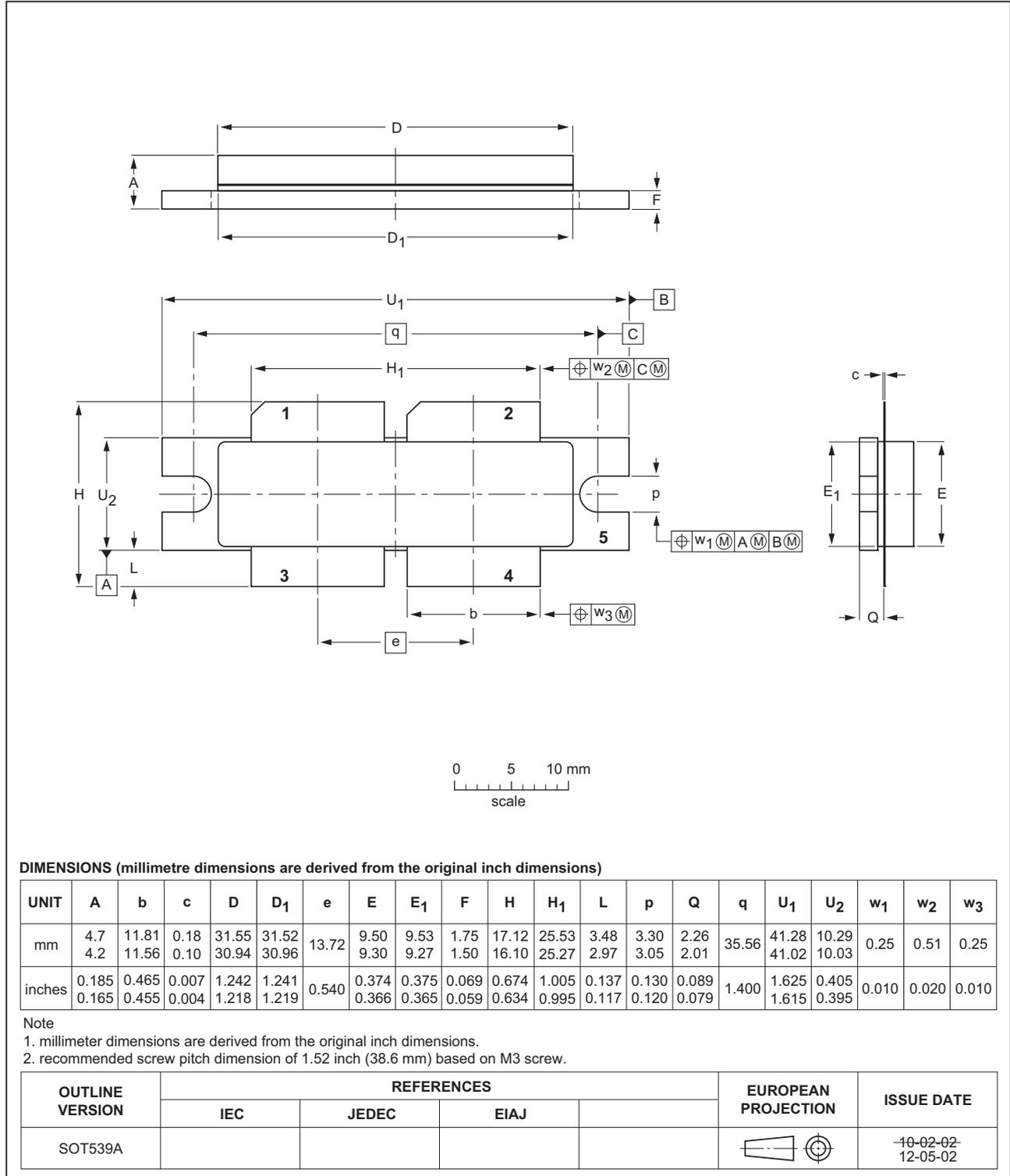


Fig 13. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads

SOT539B

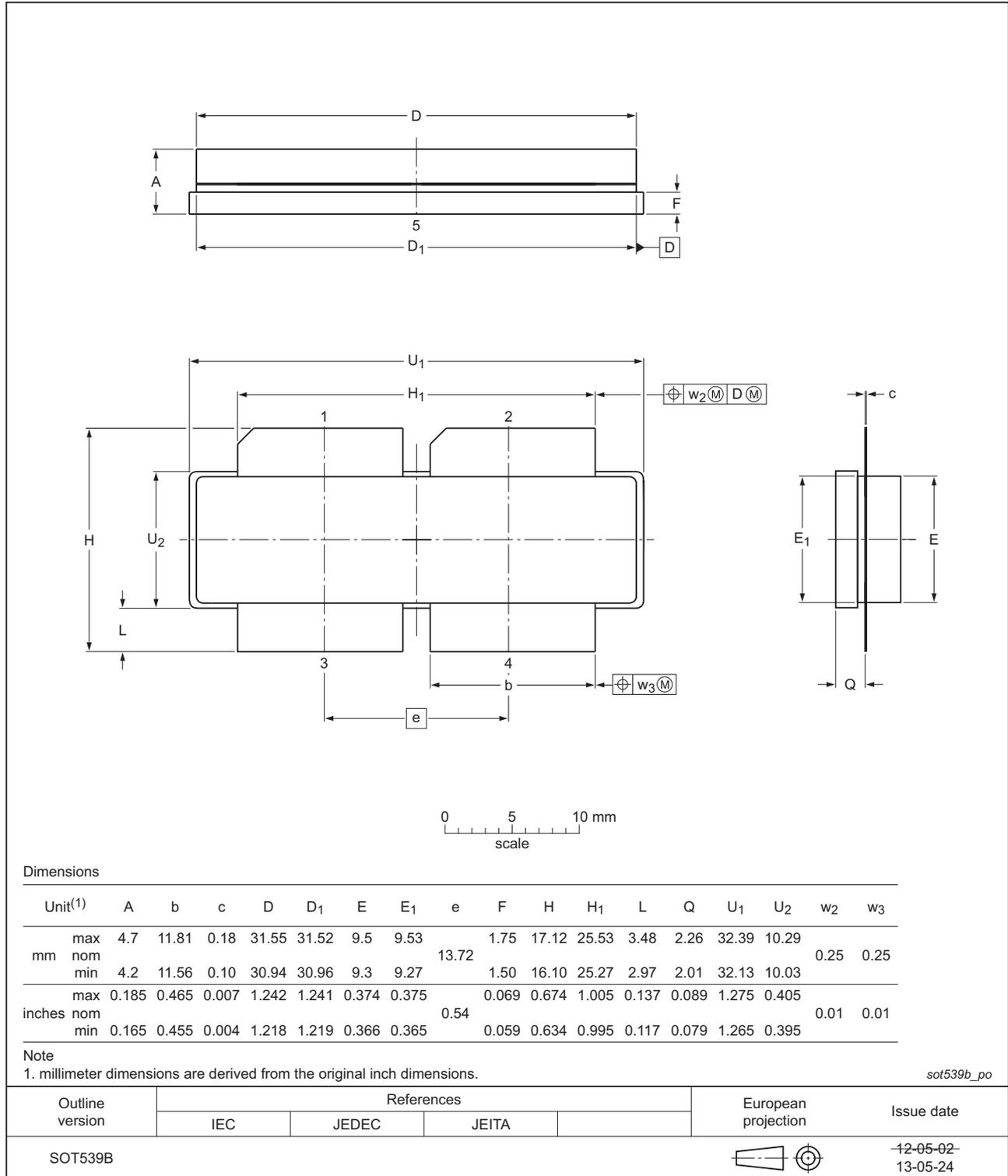


Fig 14. Package outline SOT539B

## 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 10. 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                             |
| 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                    |
|-------------------------------|--|------------------------|---------------|-------------------------------|
| BLF7G20L-250P_7G20LS-250P#5   | 20150901   | Product data sheet     | -             | BLF7G20L-250P_7G20LS-250P v.4 |
| Modifications:                | <ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul> |                        |               |                               |
| BLF7G20L-250P_7G20LS-250P v.4 | 20130712   | Product data sheet     | -             | BLF7G20L-250P_7G20LS-250P v.3 |
| BLF7G20L-250P_7G20LS-250P v.3 | 20110103   | Product data sheet     | -             | BLF7G20L-250P_7G20LS-250P v.2 |
| BLF7G20L-250P_7G20LS-250P v.2 | 20100909   | Preliminary data sheet | -             | BLF7G20L-250P_7G20LS-250P v.1 |
| BLF7G20L-250P_7G20LS-250P v.1 | 20091216   | Objective data sheet   | -             | -                             |

## 12. Legal information

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| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition  |
|-----------------------------------|-------------------------------|---|
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