

# BLF7G27L-135

## Power LDMOS transistor

Rev. 2 — 26 March 2012

Product data sheet

## 1. Product profile

### 1.1 General description

135 W LDMOS power transistor for base station applications at frequencies from 2600 MHz to 2700 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 <sub>DQ</sub><br>(mA) | V <sub>DS</sub><br>(V) | P <sub>L(AV)</sub><br>(W) | G <sub>p</sub><br>(dB) | η <sub>D</sub><br>(%) | ACPR <sub>5M</sub><br>(dBc) |
|-------------------|--------------|-------------------------|------------------------|---------------------------|------------------------|-----------------------|-----------------------------|
| 2-carrier W-CDMA  | 2600 to 2700 | 1300                    | 28                     | 35                        | 16.5                   | 27.5                  | -29 <a href="#">[1]</a>     |

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF.  
carrier spacing 5 MHz; channel bandwidth is 3.84 MHz.

### 1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low R<sub>th</sub> providing excellent thermal stability
- Designed for low memory effects providing excellent digital pre-distortion capability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

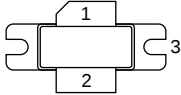
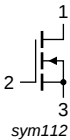
### 1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 2600 MHz to 2700 MHz frequency range



## 2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline                                                                  | Graphic symbol                                                                                |
|-----|-------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | drain       |  | <br>sym112 |
| 2   | gate        |                                                                                     |                                                                                               |
| 3   | source      |                                                                                     |                                                                                               |

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

| Type number  | Package |                                                           |         |
|--------------|---------|-----------------------------------------------------------|---------|
|              | Name    | Description                                               | Version |
| BLF7G27L-135 | -       | flanged LDMOST ceramic package; 2 mounting holes; 2 leads | SOT502A |

## 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        |            | -    | 28   | A    |
| $T_{stg}$ | storage temperature  |            | -65  | +150 | °C   |
| $T_j$     | junction temperature | [1]        | -    | +200 | °C   |

[1] Continuous use at maximum temperature will affect MTF.

## 5. Recommended operating conditions

Table 5. Operating conditions

| Symbol     | Parameter            | Conditions | Min | Max  | Unit |
|------------|----------------------|------------|-----|------|------|
| $V_{DS}$   | drain-source voltage |            | -   | 32   | V    |
| $T_{case}$ | case temperature     |            | -40 | +125 | °C   |

## 6. Thermal characteristics

Table 6. Thermal characteristics

| Symbol        | Parameter                                | Conditions                                      | Typ  | Unit |
|---------------|------------------------------------------|-------------------------------------------------|------|------|
| $R_{th(j-c)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C}$ ; $P_L = 35\text{ W}$ | 0.28 | K/W  |

## 7. Characteristics

**Table 7. Characteristics**

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

| Symbol        | Parameter                        | Conditions                                                        | Min  | Typ  | Max | Unit          |
|---------------|----------------------------------|-------------------------------------------------------------------|------|------|-----|---------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage   | $V_{GS} = 0\text{ V}$ ; $I_D = 1\text{ mA}$                       | 65   | -    | -   | V             |
| $V_{GS(th)}$  | gate-source threshold voltage    | $V_{DS} = 10\text{ V}$ ; $I_D = 216\text{ mA}$                    | 1.5  | 1.8  | 2.3 | V             |
| $I_{DSS}$     | drain leakage current            | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 28\text{ V}$                    | -    | -    | 5   | $\mu\text{A}$ |
| $I_{DSX}$     | drain cut-off current            | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ;<br>$V_{DS} = 10\text{ V}$ | 34.2 | 40.5 | -   | A             |
| $I_{GSS}$     | gate leakage current             | $V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$                    | -    | -    | 500 | nA            |
| $g_{fs}$      | forward transconductance         | $V_{DS} = 10\text{ V}$ ; $I_D = 216\text{ mA}$                    | -    | 1.87 | -   | S             |
| $R_{DS(on)}$  | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ;<br>$I_D = 7.56\text{ A}$  | -    | 0.07 | -   | $\Omega$      |

## 8. Test information

**Remark:** All testing performed in a class-AB production test circuit.

**Table 8. Functional test information**

Mode of operation: 2-carrier W-CDMA, 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on the CCDF; carrier spacing 5 MHz;  $f_1 = 2627.5\text{ MHz}$ ;  $f_2 = 2687.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1300\text{ mA}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified.

| Symbol       | Parameter                             | Conditions                                    | Min  | Typ  | Max  | Unit |
|--------------|---------------------------------------|-----------------------------------------------|------|------|------|------|
| $P_{L(AV)}$  | average output power                  |                                               | -    | 35   | -    | W    |
| $G_p$        | power gain                            | $P_{L(AV)} = 35\text{ W}$                     | 15.3 | 16.5 | 17.7 | dB   |
| $RL_{in}$    | input return loss                     | $P_{L(AV)} = 35\text{ W}$                     | -    | -16  | -9.5 | dB   |
| $\eta_D$     | drain efficiency                      | $P_{L(AV)} = 35\text{ W}$                     | 24.0 | 27.5 | -    | %    |
| $ACPR_{5M}$  | adjacent channel power ratio (5 MHz)  | $P_{L(AV)} = 35\text{ W}$                     | -    | -29  | -26  | dBc  |
| $ACPR_{10M}$ | adjacent channel power ratio (10 MHz) | $P_{L(AV)} = 35\text{ W}$                     | -    | -39  | -31  | dBc  |
| $P_{L(M)}$   | peak output power                     | $P_{L(AV)} = 70\text{ W}$ <a href="#">[1]</a> | 184  | 195  | 210  | W    |
| PAR          | peak-to-average ratio                 | $P_{L(AV)} = 70\text{ W}$ <a href="#">[1]</a> | 4.1  | 4.45 | 4.9  | dB   |

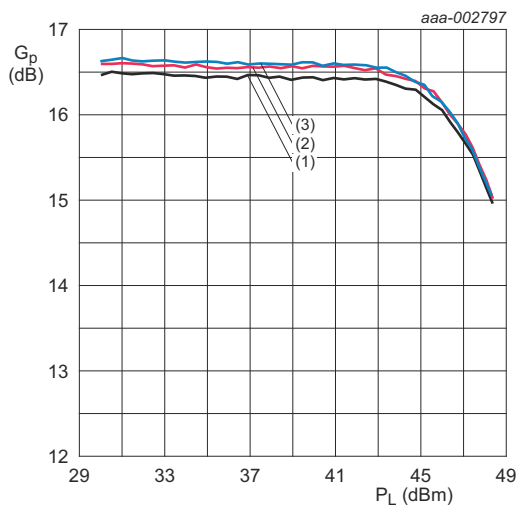
[1] Mode of operation: 1-carrier W-CDMA, 3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF; channel bandwidth is 3.84 MHz;  $f = 2687.5\text{ MHz}$ . Rohde&Schwarz FSU spectrum analyzer, CCDF method.

### 8.1 Ruggedness in class-AB operation

The BLF7G27L-135 is capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1300\text{ mA}$ ;  $P_L = 135\text{ W (CW)}$ ;  $f = 2600\text{ MHz}$ .

8.2 Single carrier IS-95

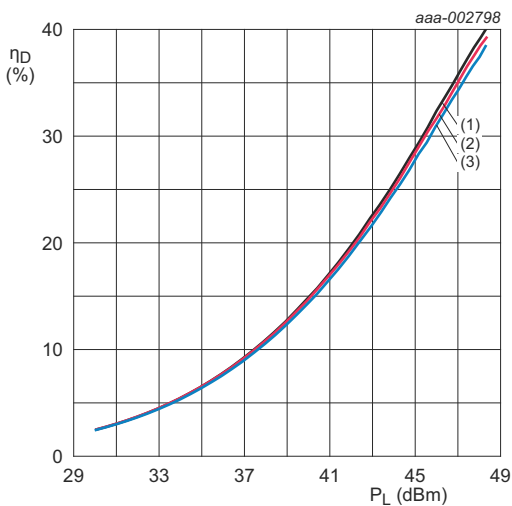
Single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13).  
PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz.



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1300\text{ mA}$ .

- (1)  $f = 2620\text{ MHz}$
- (2)  $f = 2655\text{ MHz}$
- (3)  $f = 2690\text{ MHz}$

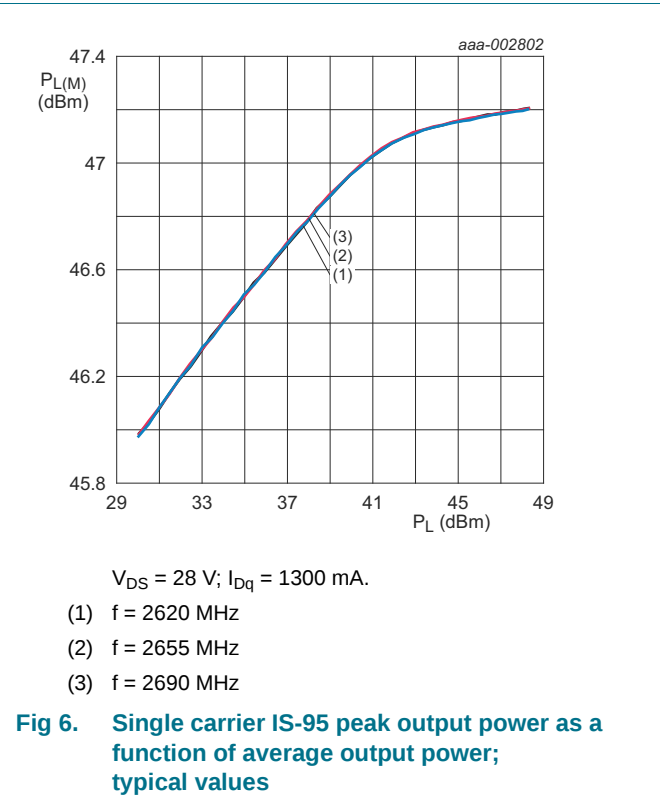
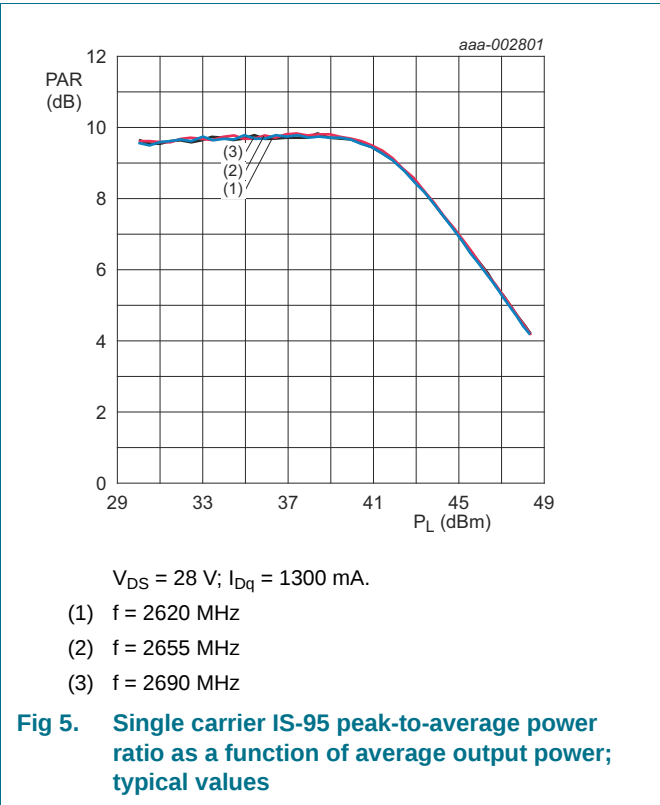
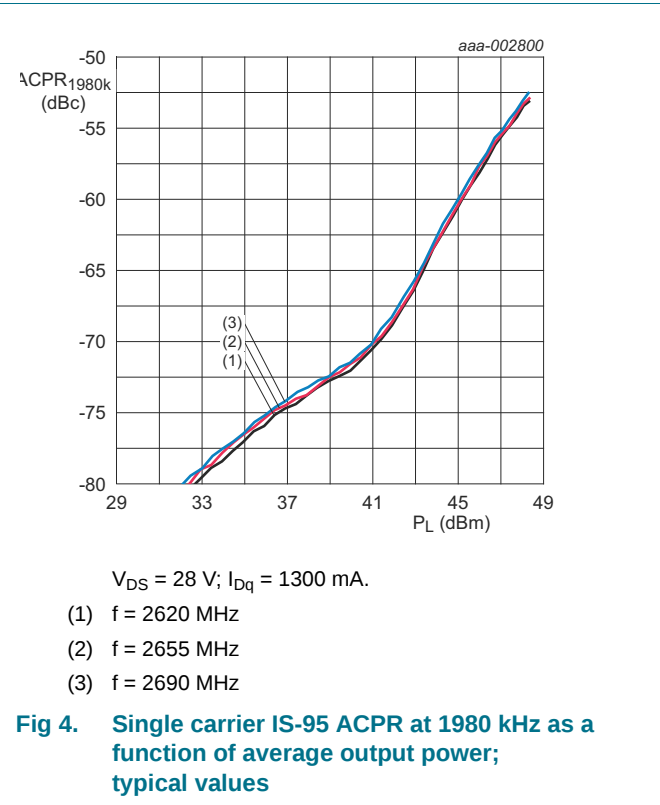
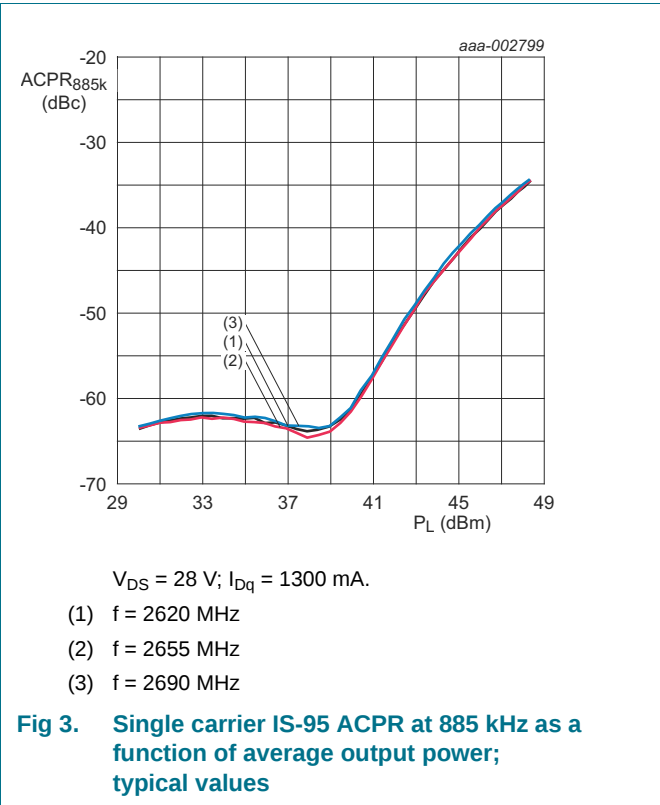
Fig 1. Single carrier IS-95 power gain as a function of average output power; typical values



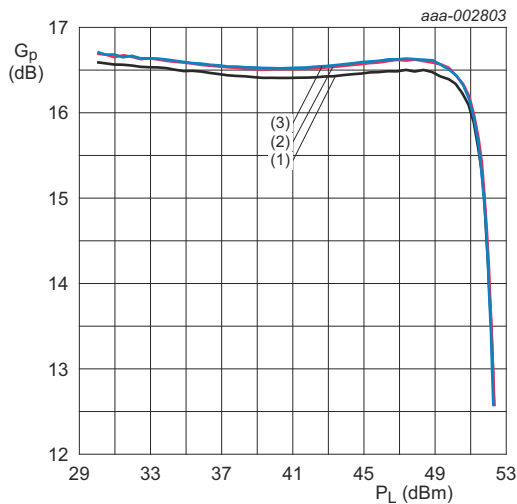
$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1300\text{ mA}$ .

- (1)  $f = 2620\text{ MHz}$
- (2)  $f = 2655\text{ MHz}$
- (3)  $f = 2690\text{ MHz}$

Fig 2. Single carrier IS-95 drain efficiency as a function of average output power; typical values



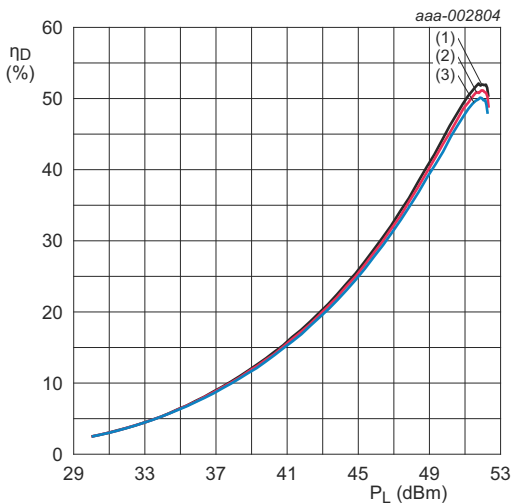
8.3 Pulsed CW



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1300\text{ mA}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

(1)  $f = 2620\text{ MHz}$   
(2)  $f = 2655\text{ MHz}$   
(3)  $f = 2690\text{ MHz}$

Fig 7. Pulsed CW power gain as a function of output power; typical values



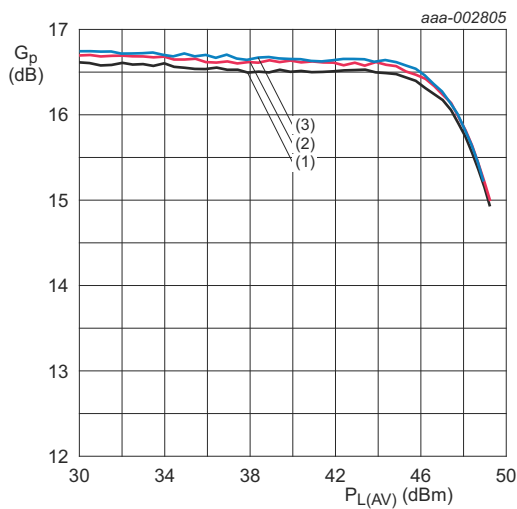
$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 1300\text{ mA}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

(1)  $f = 2620\text{ MHz}$   
(2)  $f = 2655\text{ MHz}$   
(3)  $f = 2690\text{ MHz}$

Fig 8. Pulsed CW drain efficiency as a function of output power; typical values

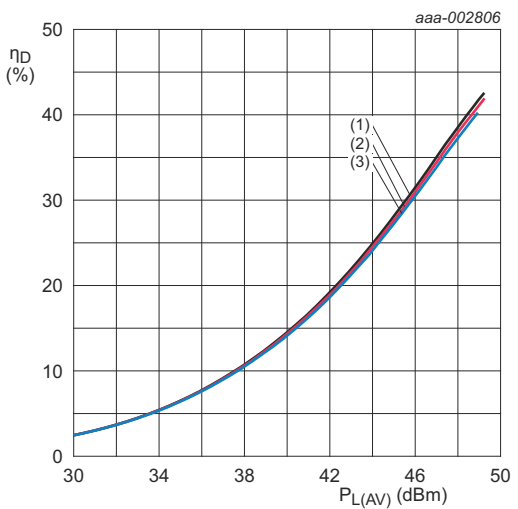
8.4 Single carrier W-CDMA

3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF.  
Channel bandwidth is 3.84 MHz.



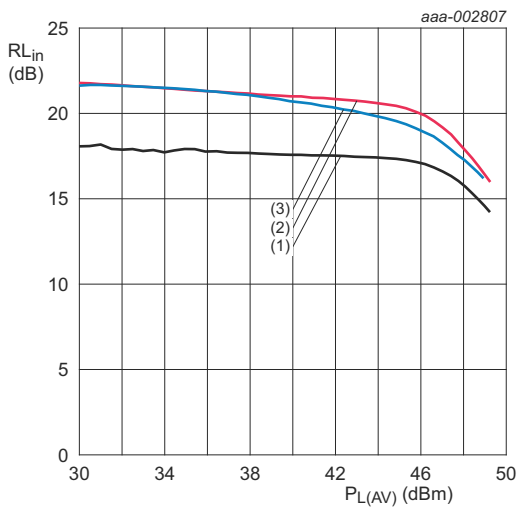
$V_{DS} = 28\text{ V}; I_{DQ} = 1300\text{ mA}.$   
(1)  $f = 2627.5\text{ MHz}$   
(2)  $f = 2655\text{ MHz}$   
(3)  $f = 2682.5\text{ MHz}$

Fig 9. Single carrier W-CDMA power gain as a function of average output power; typical values



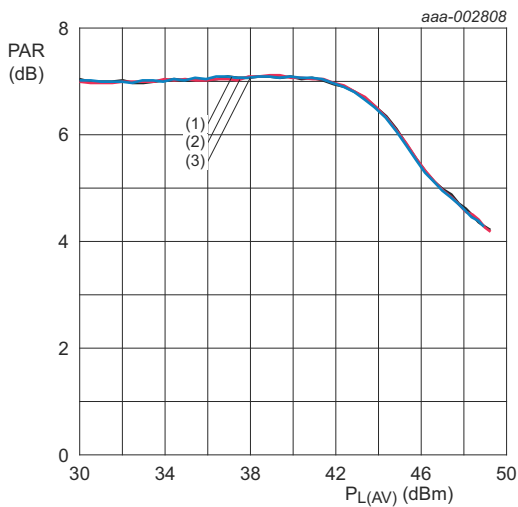
$V_{DS} = 28\text{ V}; I_{DQ} = 1300\text{ mA}.$   
(1)  $f = 2627.5\text{ MHz}$   
(2)  $f = 2655\text{ MHz}$   
(3)  $f = 2682.5\text{ MHz}$

Fig 10. Single carrier W-CDMA drain efficiency as a function of average output power; typical values



$V_{DS} = 28\text{ V}; I_{DQ} = 1300\text{ mA}.$   
(1)  $f = 2627.5\text{ MHz}$   
(2)  $f = 2655\text{ MHz}$   
(3)  $f = 2682.5\text{ MHz}$

**Fig 11.** Single carrier W-CDMA input return loss as a function of average output power; typical values

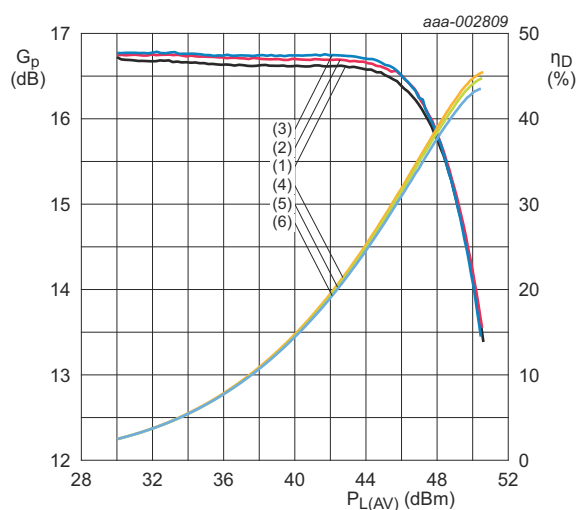


$V_{DS} = 28\text{ V}; I_{DQ} = 1300\text{ mA}.$   
(1)  $f = 2627.5\text{ MHz}$   
(2)  $f = 2655\text{ MHz}$   
(3)  $f = 2682.5\text{ MHz}$

**Fig 12.** Single carrier W-CDMA peak-to-average power ratio as a function of average output power; typical values

## 8.5 Two carrier W-CDMA

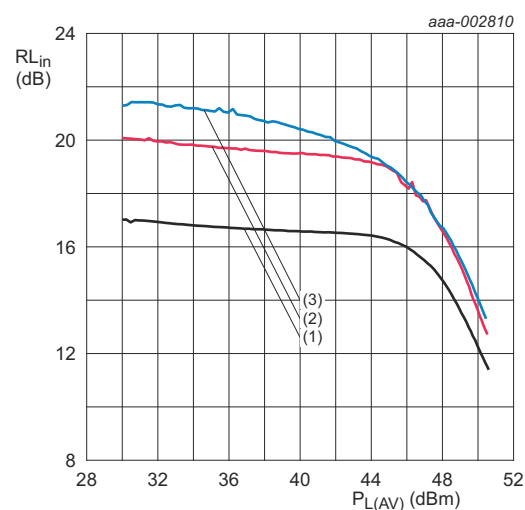
3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF.  
Carrier spacing is 5 MHz.



$V_{DS} = 28 \text{ V}$ ;  $I_{DQ} = 1300 \text{ mA}$ .

- (1)  $G_p$  at  $f = 2625 \text{ MHz}$
- (2)  $G_p$  at  $f = 2650 \text{ MHz}$
- (3)  $G_p$  at  $f = 2685 \text{ MHz}$
- (4)  $\eta_D$  at  $f = 2625 \text{ MHz}$
- (5)  $\eta_D$  at  $f = 2650 \text{ MHz}$
- (6)  $\eta_D$  at  $f = 2685 \text{ MHz}$

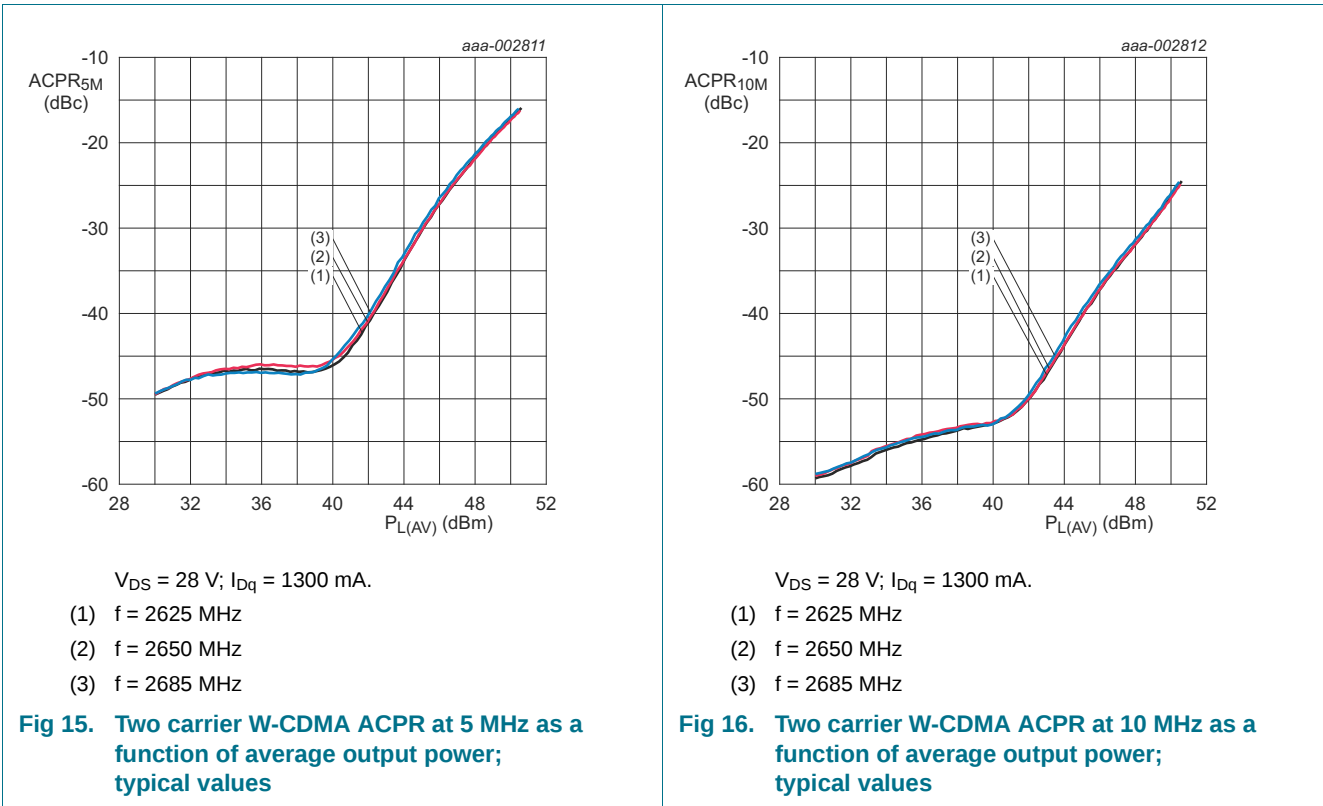
**Fig 13.** Two carrier W-CDMA power gain and drain efficiency as function of average output power; typical values



$V_{DS} = 28 \text{ V}$ ;  $I_{DQ} = 1300 \text{ mA}$ .

- (1)  $f = 2625 \text{ MHz}$
- (2)  $f = 2650 \text{ MHz}$
- (3)  $f = 2685 \text{ MHz}$

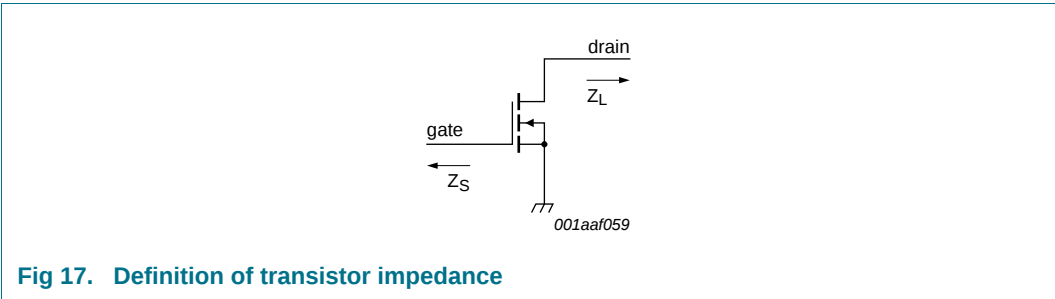
**Fig 14.** Two carrier W-CDMA input return loss as a function of average output power; typical values



8.6 Impedance information

**Table 9. Typical impedance**  
Measured load-pull data. Typical values per section.  
 $Z_S$  and  $Z_L$  defined in [Figure 17](#).

| f<br>(MHz) | $Z_S$<br>( $\Omega$ ) | $Z_L$<br>( $\Omega$ ) |
|------------|-----------------------|-----------------------|
| 2500       | $1.8 - j3.2$          | $1.42 - j3.19$        |
| 2600       | $2.0 - j3.8$          | $1.32 - j3.10$        |
| 2700       | $3.4 - j4.1$          | $1.17 - j3.10$        |



8.7 Test circuit

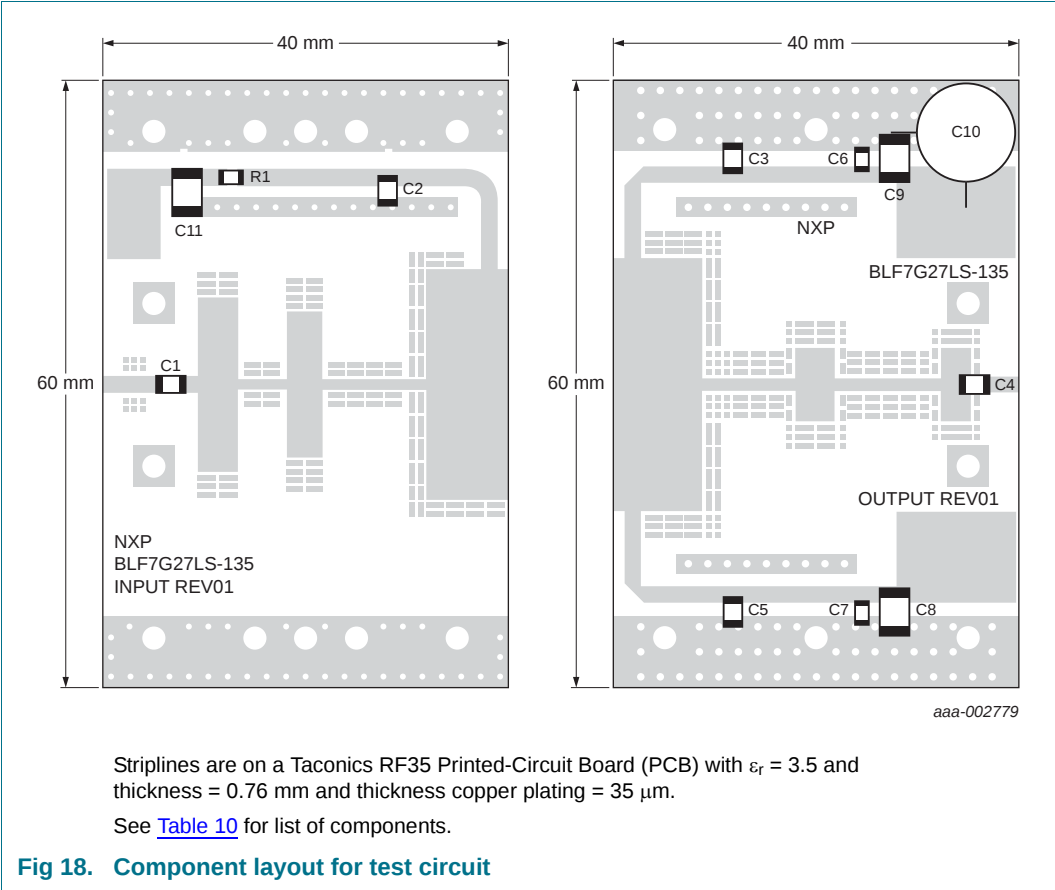


Table 10. List of components

For test circuit, see [Figure 18](#).

| Component          | Description                       | Value                    | Remarks |
|--------------------|-----------------------------------|--------------------------|---------|
| C1, C2, C3, C4, C5 | multilayer ceramic chip capacitor | 24 pF                    | [1]     |
| C6, C7             | multilayer ceramic chip capacitor | 100 nF; SMD 0805         | [2]     |
| C8, C9             | multilayer ceramic chip capacitor | 10 nF                    | [3]     |
| C10                | electrolytic capacitor            | 220 $\mu\text{F}$ , 63 V |         |
| C11                | multilayer ceramic chip capacitor | 1 $\mu\text{F}$          | [2]     |
| R1                 | chip resistor                     | 2.2 $\Omega$ ; SMD 0805  |         |

[1] American technical ceramics type 800B or capacitor of same quality.

[2] Murata or capacitor of same quality.

[3] Vishay BCcomponents or capacitor of same quality.

9. Package outline

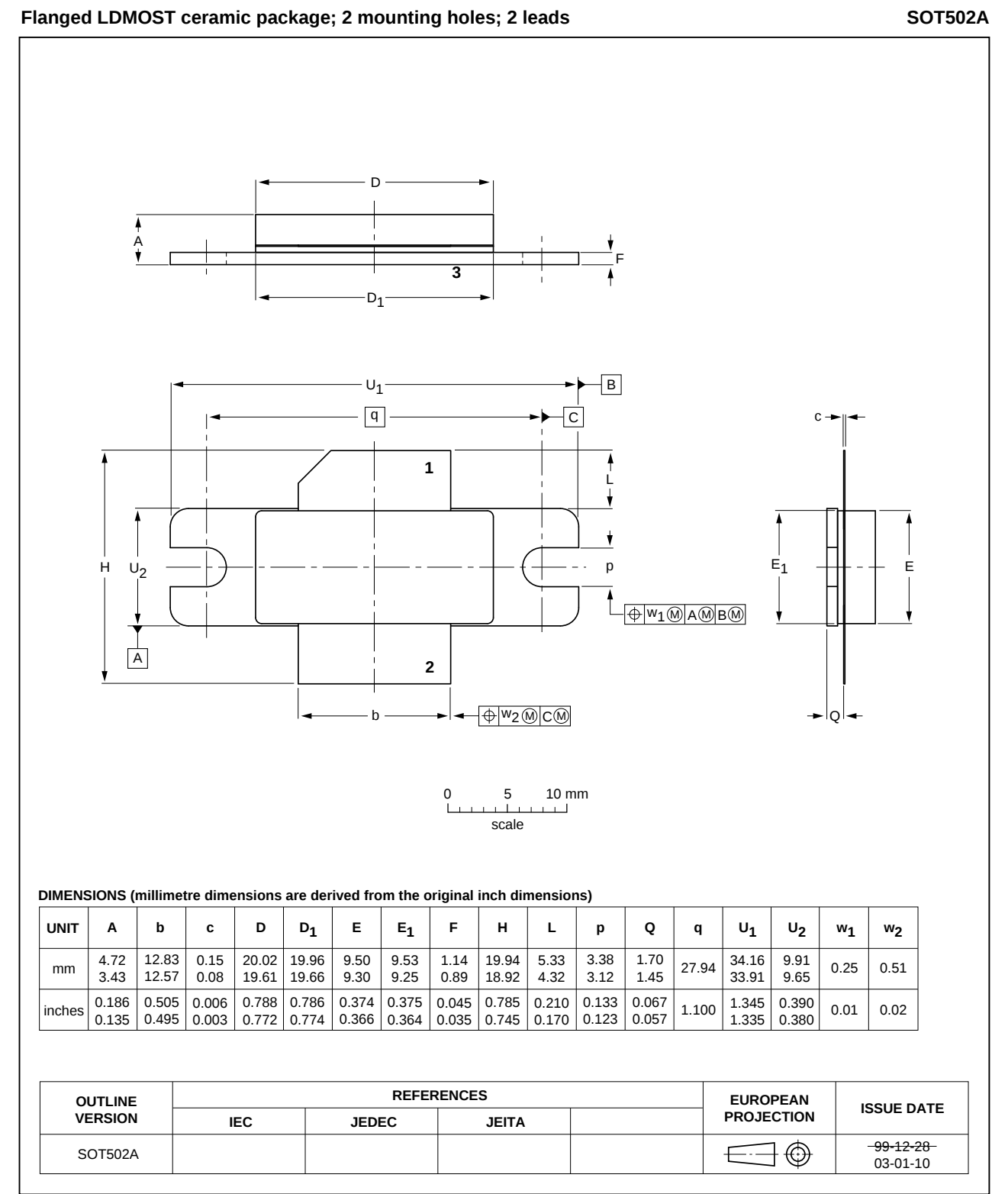


Fig 19. Package outline SOT502A

## 10. 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                                 |
| IS-95   | Interim Standard 95                                     |
| LDMOS   | Laterally Diffused Metal Oxide Semiconductor            |
| LDMOST  | Laterally Diffused Metal Oxide Semiconductor Transistor |
| MTF     | Median Time to Failure                                  |
| PAR     | Peak-to-Average Ratio                                   |
| RF      | Radio Frequency                                         |
| VSWR    | Voltage Standing Wave Ratio                             |
| W-CDMA  | Wideband Code Division Multiple Access                  |

## 11. Revision history

Table 12. Revision history

| Document ID      | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Data sheet status    | Change notice | Supersedes       |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------|------------------|
| BLF7G27L-135 v.2 | 20120326                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Product data sheet   | -             | BLF7G27L-135 v.1 |
| Modifications:   | <ul style="list-style-type: none"> <li>• <a href="#">Table 1 on page 1</a>: 'mode of operation' has been changed and the values accordingly.</li> <li>• <a href="#">Table 4 on page 2</a>: added table note.</li> <li>• <a href="#">Section 5 on page 2</a>: section has been added.</li> <li>• <a href="#">Table 8 on page 3</a>: several values and conditions have been changed.</li> <li>• <a href="#">Section 8.2 on page 4</a>: graphs have been changed.</li> <li>• <a href="#">Section 8.3 on page 6</a>: graphs have been changed.</li> <li>• <a href="#">Section 8.4 on page 7</a>: graphs have been changed.</li> <li>• <a href="#">Section 8.5 on page 9</a>: section has been added.</li> </ul> |                      |               |                  |
| BLF7G27L-135 v.1 | 20111101                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Objective data sheet | -             | -                |

## 12. Legal information

### 12.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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.nxp.com>.

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