

# BLF8G22LS-270

Power LDMOS transistor

Rev. 3 — 20 December 2012

Product data sheet

## 1. Product profile

### 1.1 General description

270 W LDMOS power transistor for base station applications at frequencies from 2110 MHz to 2170 MHz.

**Table 1. Typical performance**

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

| Test signal      | f<br>(MHz)   | $I_{DQ}$<br>(mA) | $V_{DS}$<br>(V) | $P_{L(AV)}$<br>(W) | $G_p$<br>(dB) | $\eta_D$<br>(%) | ACPR <sub>5M</sub><br>(dBc) |
|------------------|--------------|------------------|-----------------|--------------------|---------------|-----------------|-----------------------------|
| 2-carrier W-CDMA | 2110 to 2170 | 2400             | 28              | 80                 | 17.7          | 30              | -29 <a href="#">[1]</a>     |

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

### 1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low  $R_{th}$  providing excellent thermal stability
- Designed for broadband operation
- 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)

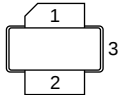
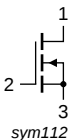
### 1.3 Applications

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



## 2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline                                                                  | Graphic symbol                                                                      |
|-----|-------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | drain       |  |  |
| 2   | gate        |                                                                                     |                                                                                     |
| 3   | source      |                                                                                     |                                                                                     |

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

| Type number   | Package |                                          |         |
|---------------|---------|------------------------------------------|---------|
|               | Name    | Description                              | Version |
| BLF8G22LS-270 | -       | earless flanged 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 | [1]        | -    | 225  | °C   |

[1] Continuous use at maximum temperature will affect the reliability.

## 5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol        | Parameter                                | Conditions                                                                                              | Typ  | Unit |
|---------------|------------------------------------------|---------------------------------------------------------------------------------------------------------|------|------|
| $R_{th(j-c)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C}$ ; $P_L = 80\text{ W}$ ;<br>$V_{DS} = 28\text{ V}$ ; $I_{Dq} = 2400\text{ mA}$ | 0.26 | K/W  |

## 6. Characteristics

**Table 6. DC characteristics**

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

| Symbol        | Parameter                        | Conditions                                                        | Min | Typ  | Max | Unit          |
|---------------|----------------------------------|-------------------------------------------------------------------|-----|------|-----|---------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage   | $V_{GS} = 0\text{ V}$ ; $I_D = 4.5\text{ mA}$                     | 65  | -    | -   | V             |
| $V_{GS(th)}$  | gate-source threshold voltage    | $V_{DS} = 20\text{ V}$ ; $I_D = 450\text{ mA}$                    | 1.5 | 1.8  | 2.3 | V             |
| $V_{GSq}$     | gate-source quiescent voltage    | $V_{DS} = 28\text{ V}$ ; $I_D = 2400\text{ mA}$                   | 1.7 | 2.1  | 2.5 | V             |
| $I_{DSS}$     | drain leakage current            | $V_{GS} = 0\text{ V}$ ; $V_{DS} = 28\text{ V}$                    | -   | -    | 4.2 | $\mu\text{A}$ |
| $I_{DSX}$     | drain cut-off current            | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ;<br>$V_{DS} = 20\text{ V}$ | -   | 80   | -   | A             |
| $I_{GSS}$     | gate leakage current             | $V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$                    | -   | -    | 420 | nA            |
| $g_{fs}$      | forward transconductance         | $V_{DS} = 20\text{ V}$ ; $I_D = 15.75\text{ mA}$                  | -   | 3.8  | -   | S             |
| $R_{DS(on)}$  | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ;<br>$I_D = 15.75\text{ A}$ | -   | 0.04 | -   | $\Omega$      |

**Table 7. RF characteristics**

Test signal: 2-carrier W-CDMA; PAR = 8.4 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 1-64 DPCH;  $f_1 = 2112.5\text{ MHz}$ ;  $f_2 = 2117.5\text{ MHz}$ ;  $f_3 = 2162.5\text{ MHz}$ ;  $f_4 = 2167.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 2400\text{ mA}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

| Symbol      | Parameter                            | Conditions                | Min  | Typ  | Max   | Unit |
|-------------|--------------------------------------|---------------------------|------|------|-------|------|
| $G_p$       | power gain                           | $P_{L(AV)} = 80\text{ W}$ | 16.5 | 17.7 | -     | dB   |
| $RL_{in}$   | input return loss                    | $P_{L(AV)} = 80\text{ W}$ | -    | -17  | -7    | dB   |
| $\eta_D$    | drain efficiency                     | $P_{L(AV)} = 80\text{ W}$ | 26   | 30   | -     | %    |
| $ACPR_{5M}$ | adjacent channel power ratio (5 MHz) | $P_{L(AV)} = 80\text{ W}$ | -    | -29  | -26.5 | dBc  |

## 7. Test information

### 7.1 Ruggedness in class-AB operation

The BLF8G22LS-270 is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 2400\text{ mA}$ ;  $P_L = 270\text{ W}$  (CW);  $f = 2110\text{ MHz}$ .

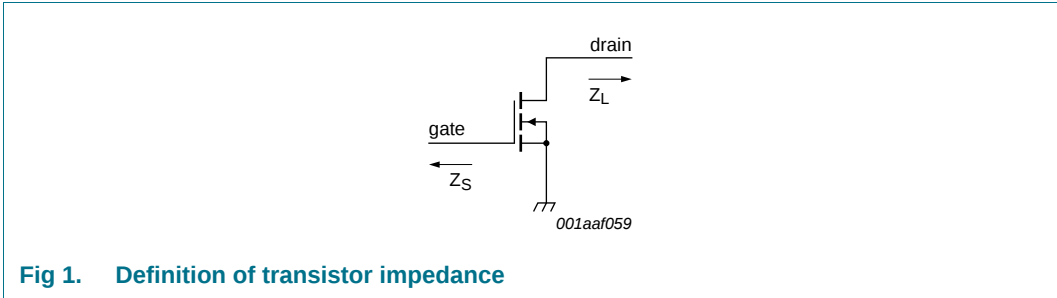
### 7.2 Impedance information

**Table 8. Typical impedance information**

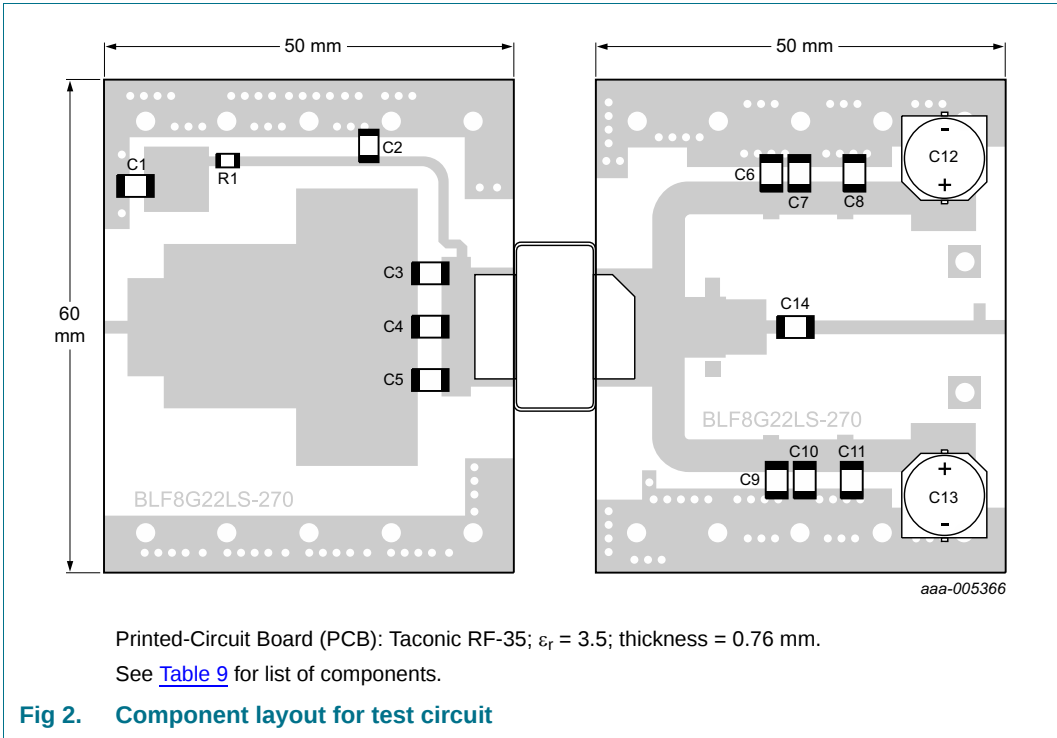
$I_{Dq} = 2400\text{ mA}$ ; main transistor  $V_{DS} = 28\text{ V}$ .

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

| f<br>(MHz) | $Z_S$<br>( $\Omega$ ) | $Z_L$<br>( $\Omega$ ) |
|------------|-----------------------|-----------------------|
| 2110       | $0.68 - j4.73$        | $2.42 - j2.08$        |
| 2140       | $0.80 - j4.94$        | $2.67 - j2.24$        |
| 2170       | $0.96 - j5.37$        | $2.68 - j2.24$        |



7.3 Test circuit

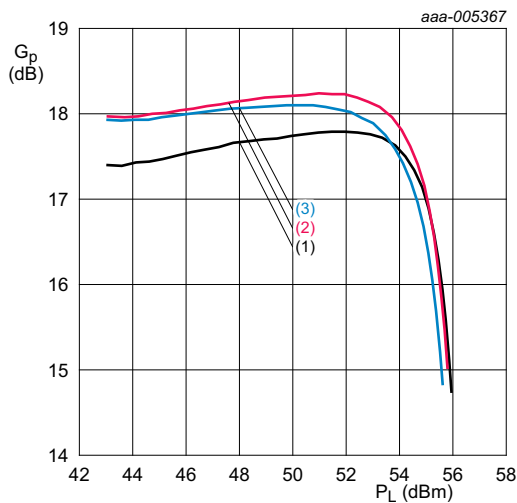


**Table 9. List of components**  
For test circuit, see [Figure 2](#).

| Component | Description                       | Value             | Remarks          |
|-----------|-----------------------------------|-------------------|------------------|
| C1        | multilayer ceramic chip capacitor | 10 $\mu$ F, 50 V  | Murata; SMD 2220 |
| C2        | multilayer ceramic chip capacitor | 47 pF             | ATC100B          |
| C3, C4    | multilayer ceramic chip capacitor | 0.7 pF            | ATC100B          |
| C5        | multilayer ceramic chip capacitor | 0.2 pF            | ATC100B          |
| C6, C9    | multilayer ceramic chip capacitor | 12 pF             | ATC100B          |
| C7, C10   | multilayer ceramic chip capacitor | 100 pF            | ATC100B          |
| C8, C11   | multilayer ceramic chip capacitor | 100 pF            | ATC800B          |
| C12, C13  | electrolytic capacitor            | 470 $\mu$ F, 63 V |                  |
| C14       | multilayer ceramic chip capacitor | 33 pF             | ATC100B          |
| R1        | resistor                          | 5.1 $\Omega$      | SMD 0805         |

7.4 Graphs

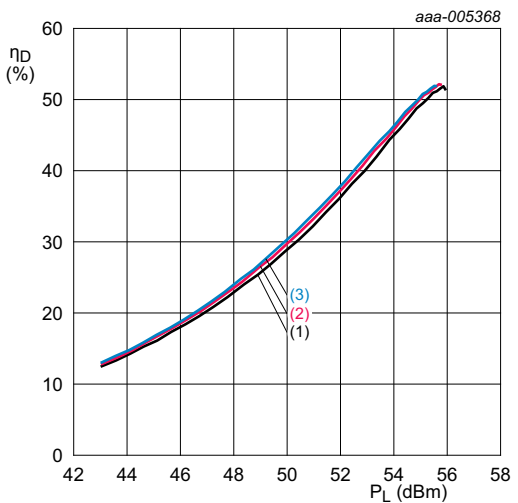
7.4.1 Pulsed CW



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

Fig 3. Power gain as a function of output power; typical values

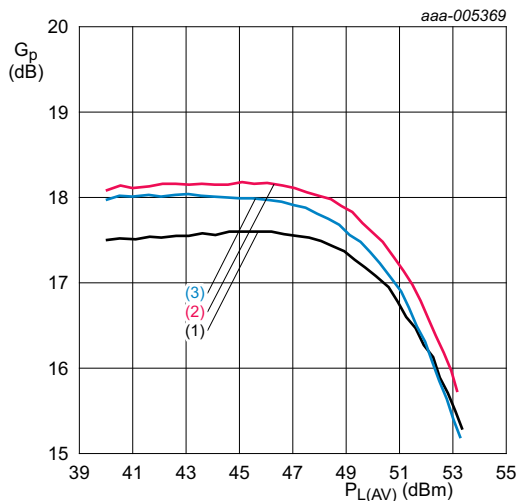


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

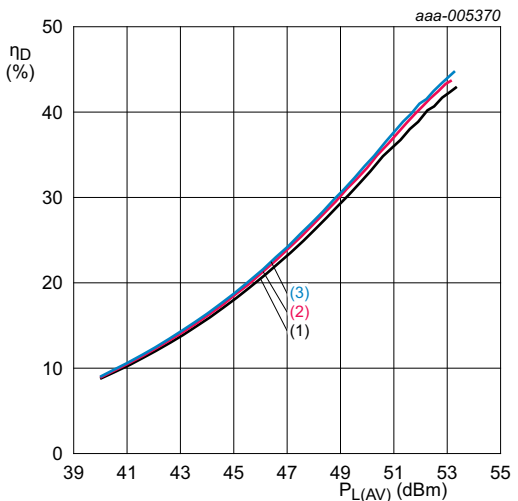
Fig 4. Drain efficiency as a function of output power; typical values

7.4.2 IS-95



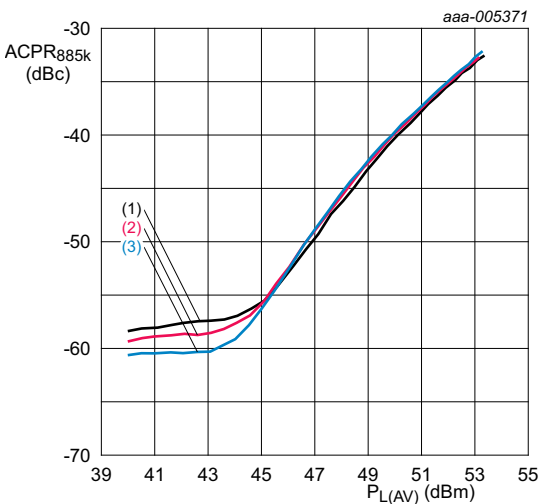
$V_{DS} = 28\text{ V}; I_{Dq} = 2400\text{ mA}.$   
(1)  $f = 2110\text{ MHz}$   
(2)  $f = 2140\text{ MHz}$   
(3)  $f = 2170\text{ MHz}$

Fig 5. Power gain as a function of average output power; typical values



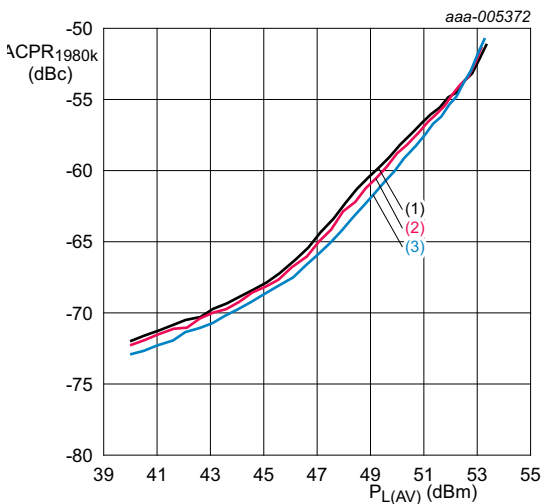
$V_{DS} = 28\text{ V}; I_{Dq} = 2400\text{ mA}.$   
(1)  $f = 2110\text{ MHz}$   
(2)  $f = 2140\text{ MHz}$   
(3)  $f = 2170\text{ MHz}$

Fig 6. Drain efficiency as a function of average output power; typical values



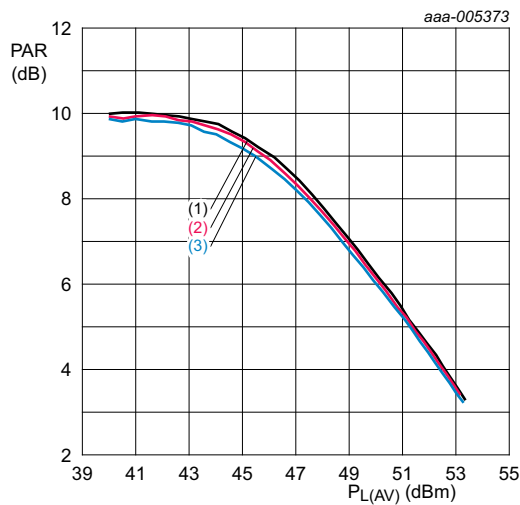
$V_{DS} = 28\text{ V}; I_{Dq} = 2400\text{ mA}.$   
(1)  $f = 2110\text{ MHz}$   
(2)  $f = 2140\text{ MHz}$   
(3)  $f = 2170\text{ MHz}$

Fig 7. Adjacent channel power ratio (885 kHz) as a function of average output power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 2400\text{ mA}.$   
(1)  $f = 2110\text{ MHz}$   
(2)  $f = 2140\text{ MHz}$   
(3)  $f = 2170\text{ MHz}$

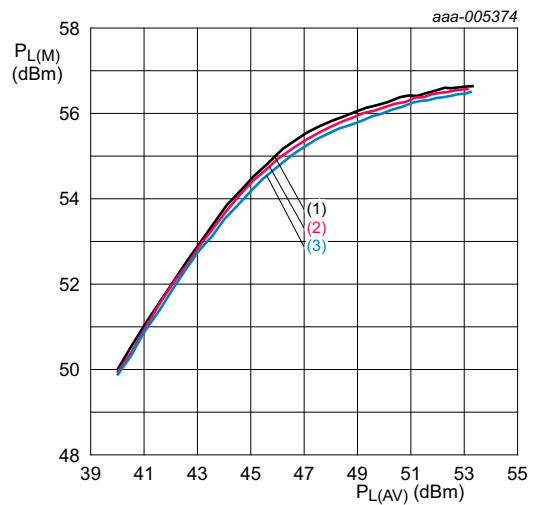
Fig 8. Adjacent channel power ratio (1980 kHz) as a function of average output power; typical values



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ .

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

**Fig 9. Peak-to-average power ratio as a function of average output power; typical values**

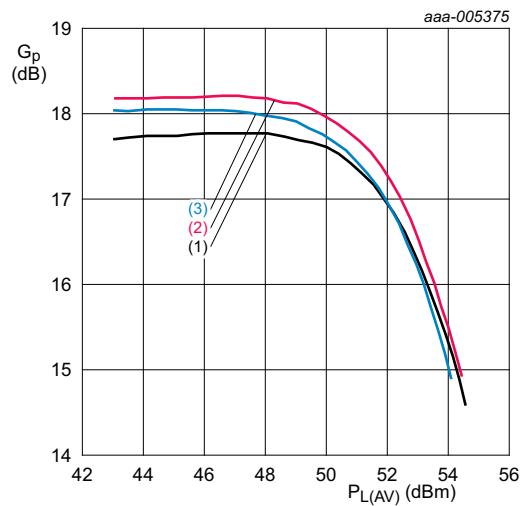


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ .

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

**Fig 10. Peak output power as a function of average output power; typical values**

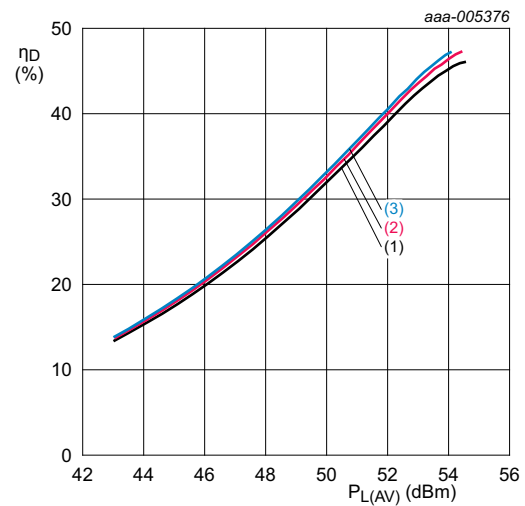
### 7.4.3 1-carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ .

- (1)  $f = 2112.5\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2167.5\text{ MHz}$

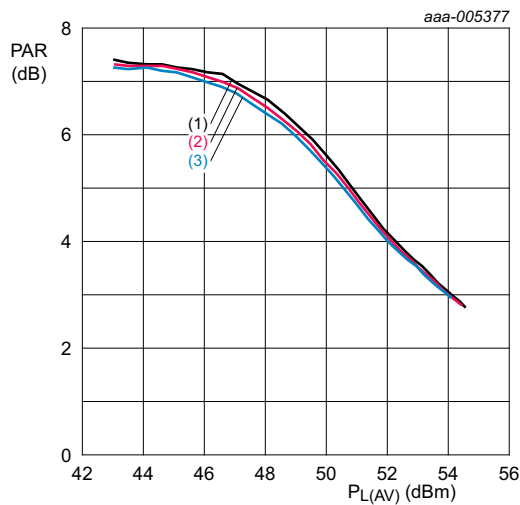
**Fig 11. Power gain as a function of average output power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ .

- (1)  $f = 2112.5\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2167.5\text{ MHz}$

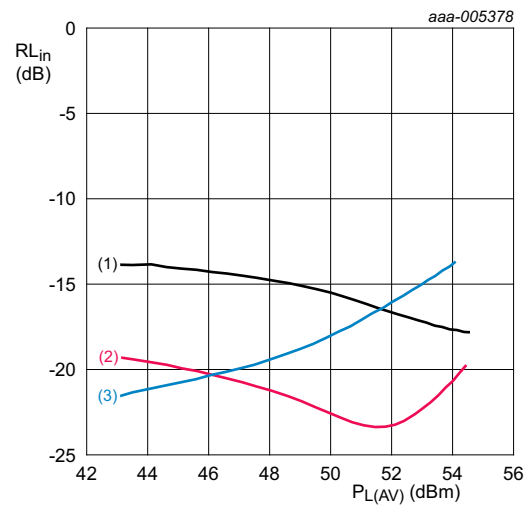
**Fig 12. Drain efficiency as a function of average output power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ .

- (1)  $f = 2112.5\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2167.5\text{ MHz}$

**Fig 13. Peak-to-average power ratio as a function of average output power; typical values**

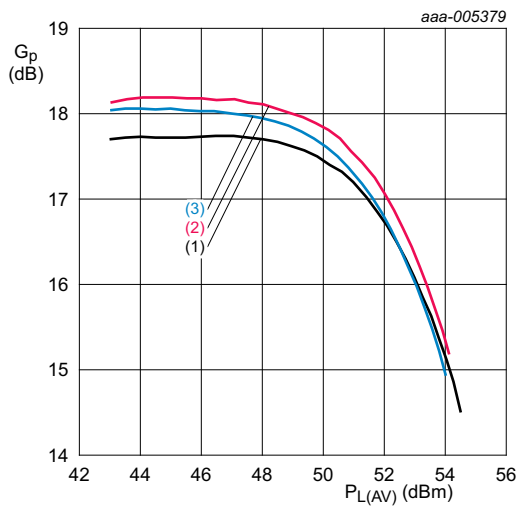


$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ .

- (1)  $f = 2112.5\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2167.5\text{ MHz}$

**Fig 14. Input return loss as a function of average output power; typical values**

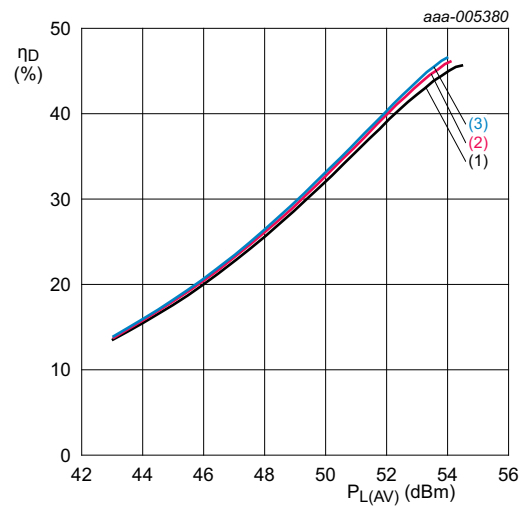
#### 7.4.4 2-carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ ; 5 MHz carrier spacing.

- (1)  $f = 2115\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2165\text{ MHz}$

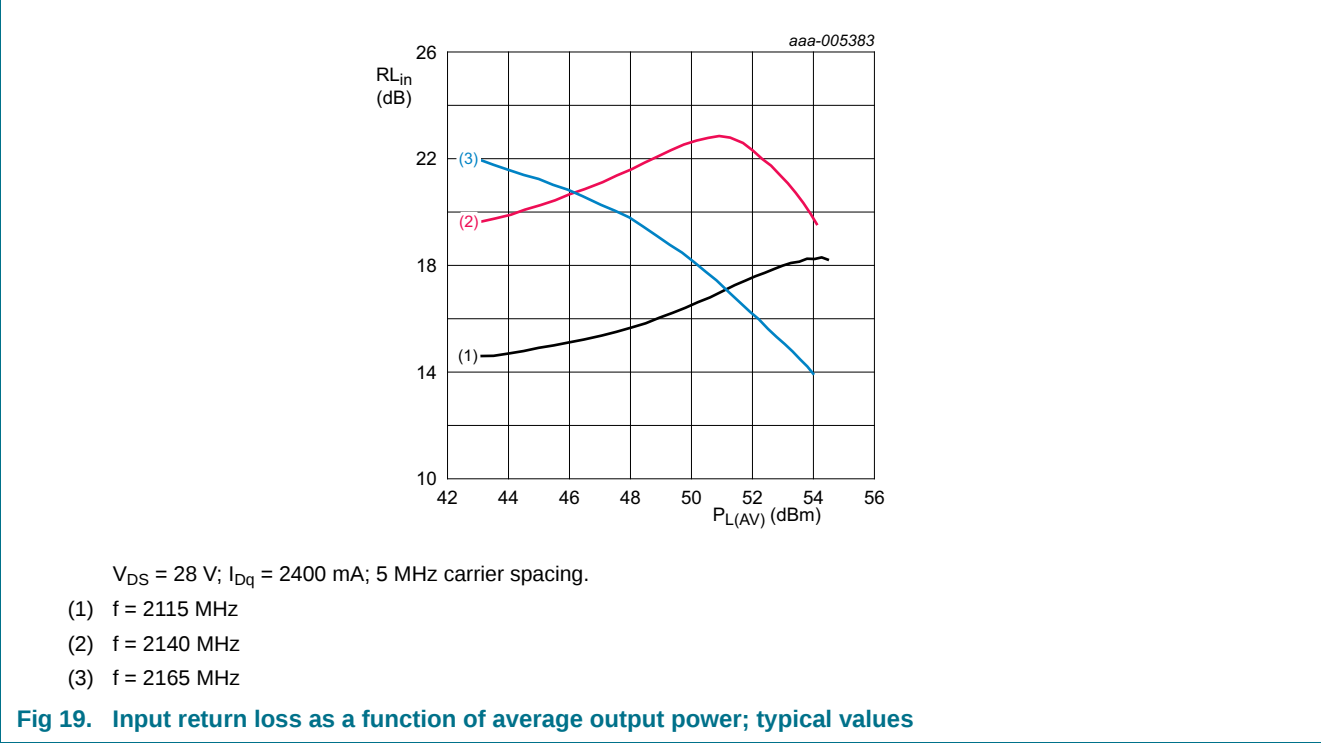
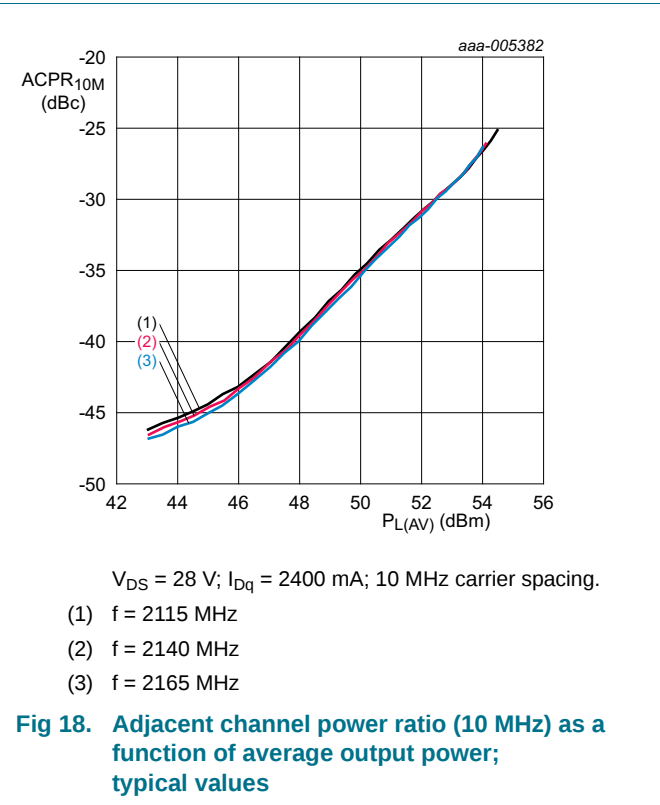
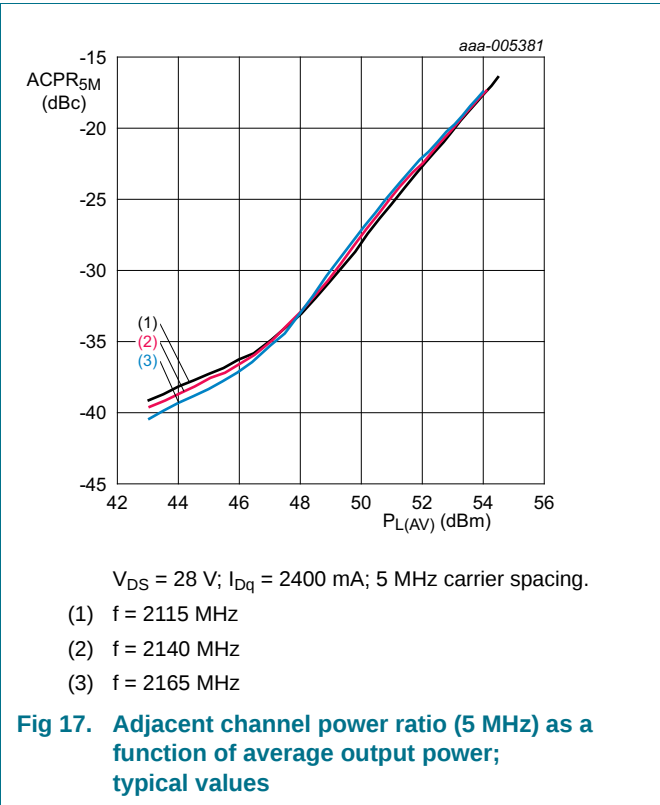
**Fig 15. Power gain as a function of average output power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 2400\text{ mA}$ ; 5 MHz carrier spacing.

- (1)  $f = 2115\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2165\text{ MHz}$

**Fig 16. Drain efficiency as a function of average output power; typical values**



8. Package outline

Earless flanged ceramic package; 2 leads
SOT502B

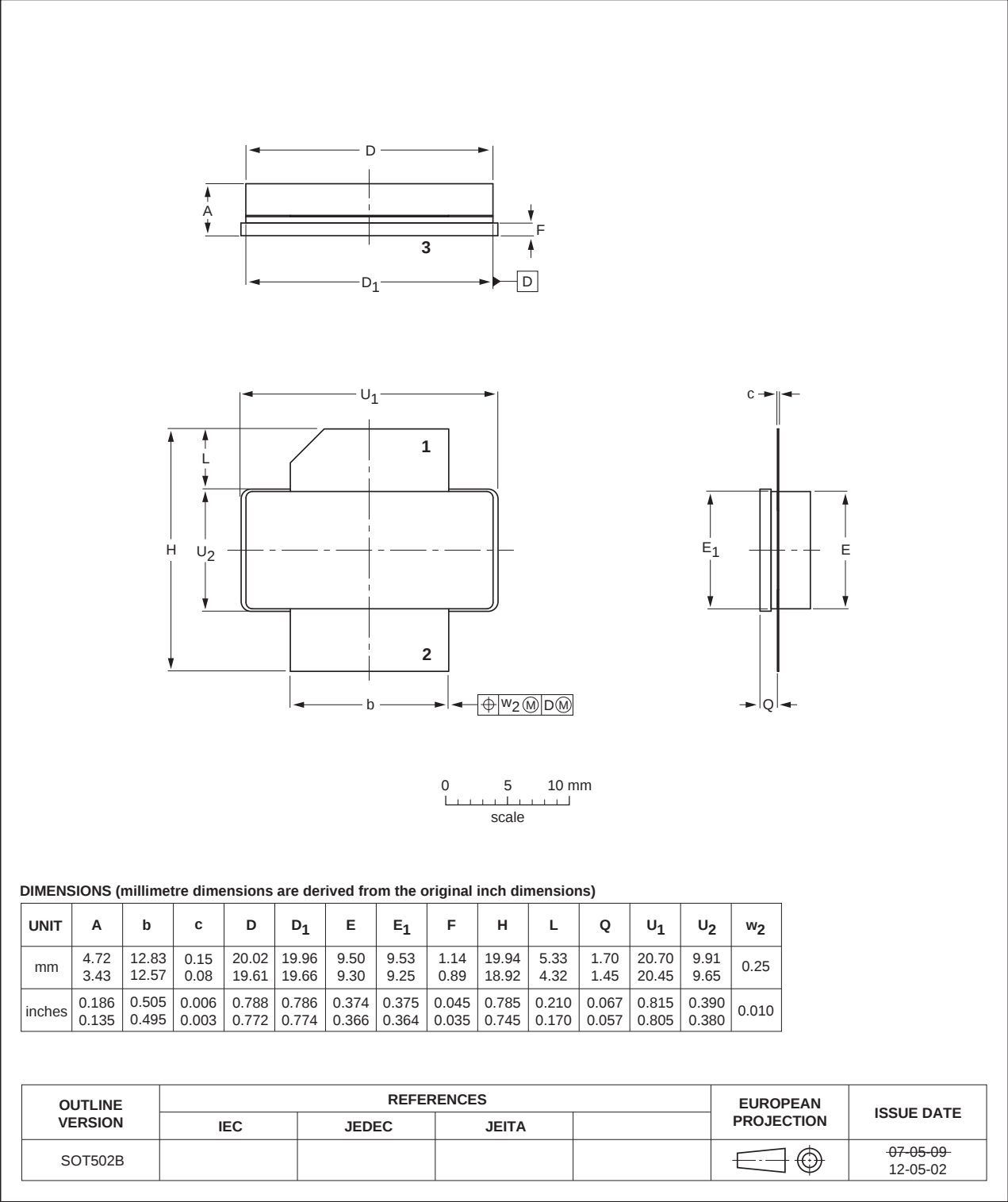


Fig 20. Package outline SOT502B

## 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    | 3rd 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   |
| PAR     | Peak-to-Average Ratio                          |
| SMD     | Surface Mounted Device                         |
| 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        |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------------|-------------------|
| BLF8G22LS-270 v.3 | 20121220                                                                                                                                                                                                                                                                                                                                                                                        | Product data sheet     | -             | BLF8G22LS-270 v.2 |
| Modifications:    | <ul style="list-style-type: none"><li>The status of this document has been changed to Product data sheet.</li><li><a href="#">Table 1 on page 1</a>: table has been updated.</li><li><a href="#">Table 4 on page 2</a>: table has been updated.</li><li><a href="#">Table 6 on page 3</a>: table has been updated.</li><li><a href="#">Table 7 on page 3</a>: table has been updated.</li></ul> |                        |               |                   |
| BLF8G22LS-270 v.2 | 20121203                                                                                                                                                                                                                                                                                                                                                                                        | Preliminary data sheet | -             | BLF8G22LS-270 v.1 |
| BLF8G22LS-270 v.1 | 20121012                                                                                                                                                                                                                                                                                                                                                                                        | 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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