

# BLP7G22-10

## LDMOS driver transistor

Rev. 2 — 30 May 2013

Product data sheet

## 1. Product profile

### 1.1 General description

10W plastic LDMOS power transistor for base station applications at frequencies from 700 MHz to 2700 MHz.

**Table 1. Application performance (multiple frequencies)**

Typical RF performance at  $T_{case} = 25\text{ }^{\circ}\text{C}$ ;  $I_{DQ} = 110\text{ mA}$ ; in a class-AB application 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) |
|------------------|------------|------------------|-----------------|--------------------|---------------|-----------------|-----------------------------|
| Pulsed CW        | 2700       | 110              | 28              | 2                  | 14.5          | 26              | -                           |
| 1-carrier W-CDMA | 748        | 110              | 28              | 0.7                | 27.5          | 13.5            | -43 <a href="#">[1]</a>     |
|                  | 748        | 110              | 28              | 2                  | 27.5          | 25              | -40                         |
| 2-carrier W-CDMA | 2140       | 110              | 28              | 0.7                | 17.4          | 13              | -51                         |
|                  | 2140       | 110              | 28              | 2                  | 17.4          | 25              | -40                         |

[1] Test signal: 2-carrier W-CDMA; carrier spacing = 5 MHz; PAR = 8.4 dB at 0.01 % probability on CCDF; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 110\text{ mA}$ .

### 1.2 Features and benefits

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

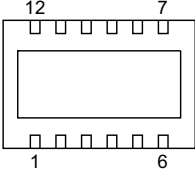
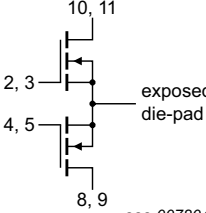
### 1.3 Applications

- CDMA
- W-CDMA
- GSM EDGE
- MC-GSM
- LTE
- WiMAX



## 2. Pinning information

Table 2. Pinning

| Pin             | Description | Simplified outline                                                                                             | Graphic symbol <a href="#">[1]</a>                                                                    |
|-----------------|-------------|----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 1, 6, 7, 12     | n.c.        |  <p>Transparent top view</p> |  <p>aaa-007804</p> |
| 2, 3, 4, 5      | gate        |                                                                                                                |                                                                                                       |
| 8, 9, 10, 11    | drain       |                                                                                                                |                                                                                                       |
| exposed die-pad | source      |                                                                                                                |                                                                                                       |

[1] To be used in single ended applications only.

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                                                                                        |           |
|-------------|---------|--------------------------------------------------------------------------------------------------------|-----------|
|             | Name    | Description                                                                                            | Version   |
| BLP7G22-10  | HVSON12 | plastic thermal enhanced very thin small outline package; no leads; 12 terminals; body 6 × 4 × 0.85 mm | SOT1179-2 |

## 4. Limiting values

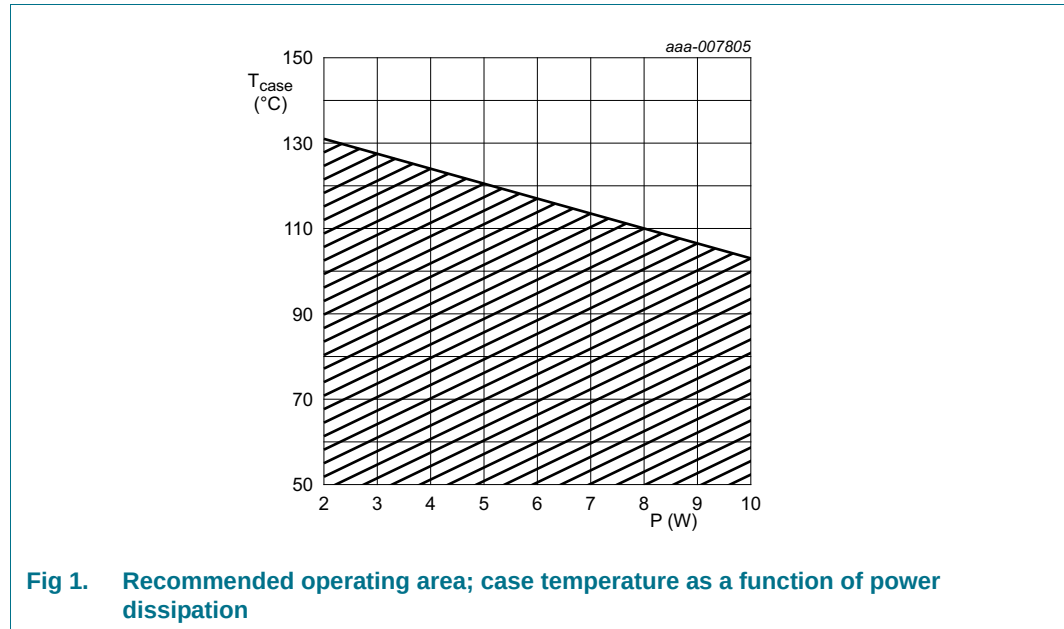
Table 4. Limiting values

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 |            | -    | 150  | °C   |

## 5. Recommended operating conditions

See application note *AN11198* for more details.



## 6. Thermal characteristics

Table 5. Thermal characteristics

| Symbol        | Parameter                                | Conditions                                  | Typ | Unit |
|---------------|------------------------------------------|---------------------------------------------|-----|------|
| $R_{th(j-c)}$ | thermal resistance from junction to case | $T_{case} = 70\text{ °C}; P_L = 2\text{ W}$ | 3.2 | K/W  |

## 7. Characteristics

Table 6. DC characteristics

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

| Symbol        | Parameter                        | Conditions                                                                       | Min  | Typ  | Max  | Unit          |
|---------------|----------------------------------|----------------------------------------------------------------------------------|------|------|------|---------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage   | $V_{GS} = 0\text{ V}; I_D = 0.18\text{ mA}$                                      | 65   | -    | -    | V             |
| $V_{GS(th)}$  | gate-source threshold voltage    | $V_{DS} = 10\text{ V}; I_D = 18\text{ mA}$                                       | 1.5  | 1.9  | 2.3  | V             |
| $I_{DSS}$     | drain leakage current            | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$                                      | -1.4 | -    | +1.4 | $\mu\text{A}$ |
| $I_{DSX}$     | drain cut-off current            | $V_{GS} = V_{GS(th)} + 3.75\text{ V}$                                            | -    | 3.2  | -    | A             |
| $I_{GSS}$     | gate leakage current             | $V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$                                      | -    | -    | 140  | nA            |
| $g_{fs}$      | forward transconductance         | $V_{DS} = 10\text{ V}; I_D = 18\text{ mA}$                                       | -    | 160  | -    | mS            |
| $R_{DS(on)}$  | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}; I_D = 630\text{ mA}$ | -    | 1000 | -    | m $\Omega$    |

**Table 7. RF characteristics**

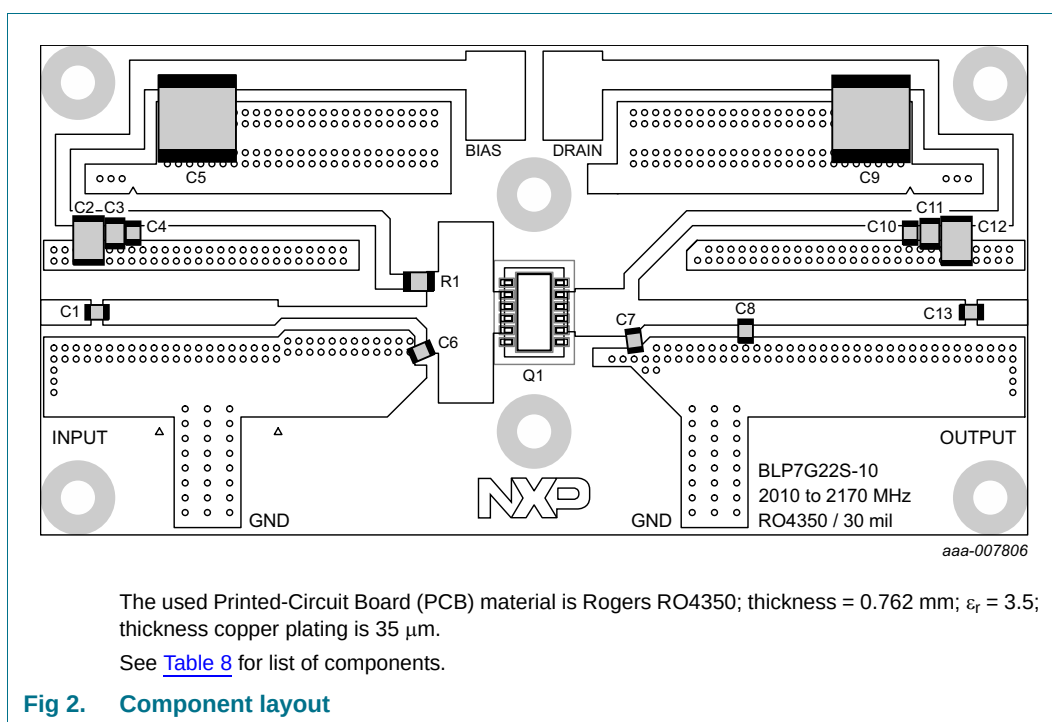
Test signal: 1-tone pulsed;  $t_p = 50 \mu\text{s}$ ;  $\delta = 10\%$ ;  $f = 2140 \text{ MHz}$ ; RF performance at  $V_{DS} = 28 \text{ V}$ ;  $I_{DQ} = 110 \text{ mA}$ ;  $T_{case} = 25^\circ\text{C}$ ; unless otherwise specified, in a production circuit.

| Symbol       | Parameter                             | Conditions                | Min | Typ | Max | Unit |
|--------------|---------------------------------------|---------------------------|-----|-----|-----|------|
| $G_p$        | power gain                            | $P_{L(AV)} = 2 \text{ W}$ | 15  | 16  | -   | dB   |
| $\eta_D$     | drain efficiency                      | $P_{L(AV)} = 2 \text{ W}$ | 20  | 23  | -   | %    |
| $P_{L(1dB)}$ | output power at 1 dB gain compression |                           | 11  | -   | -   | W    |
| $RL_{in}$    | input return loss                     | $P_{L(AV)} = 2 \text{ W}$ | -   | -16 | -12 | dB   |

## 8. Application information

### 8.1 Frequency band 2110 MHz to 2170 MHz

#### 8.1.1 Application circuit

**Table 8. List of components**

See [Figure 2](#) for component layout.

The used Printed-Circuit Board (PCB) material is Rogers RO4350; thickness = 0.762 mm;  $\epsilon_r = 3.5$ ; thickness copper plating is 35  $\mu\text{m}$ .

| Component        | Description                       | Value                   | Remarks             |
|------------------|-----------------------------------|-------------------------|---------------------|
| C1, C4, C10, C13 | multilayer ceramic chip capacitor | 22 pF                   | <a href="#">[1]</a> |
| C2, C12          | multilayer ceramic chip capacitor | 1 $\mu\text{F}$         | <a href="#">[2]</a> |
| C3, C11          | multilayer ceramic chip capacitor | 100 nF                  | <a href="#">[3]</a> |
| C5, C9           | multilayer ceramic chip capacitor | 10 $\mu\text{F}$ ; 50 V | <a href="#">[4]</a> |
| C6               | multilayer ceramic chip capacitor | 2.8 pF                  | <a href="#">[1]</a> |

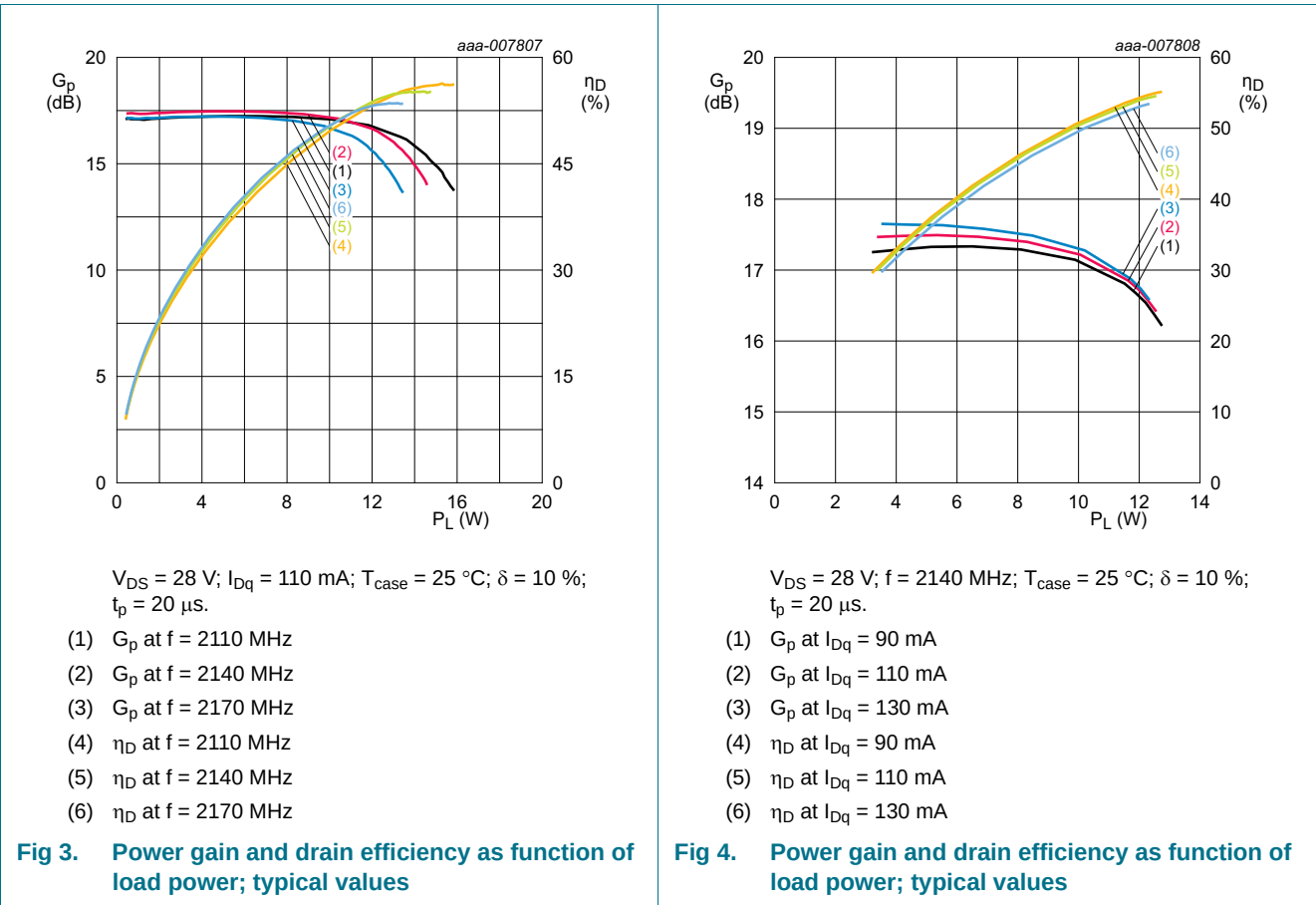
**Table 8. List of components ...continued**  
See [Figure 2](#) for component layout.  
The used Printed-Circuit Board (PCB) material is Rogers RO4350; thickness = 0.762 mm;  $\epsilon_r = 3.5$ ; thickness copper plating is 35  $\mu\text{m}$ .

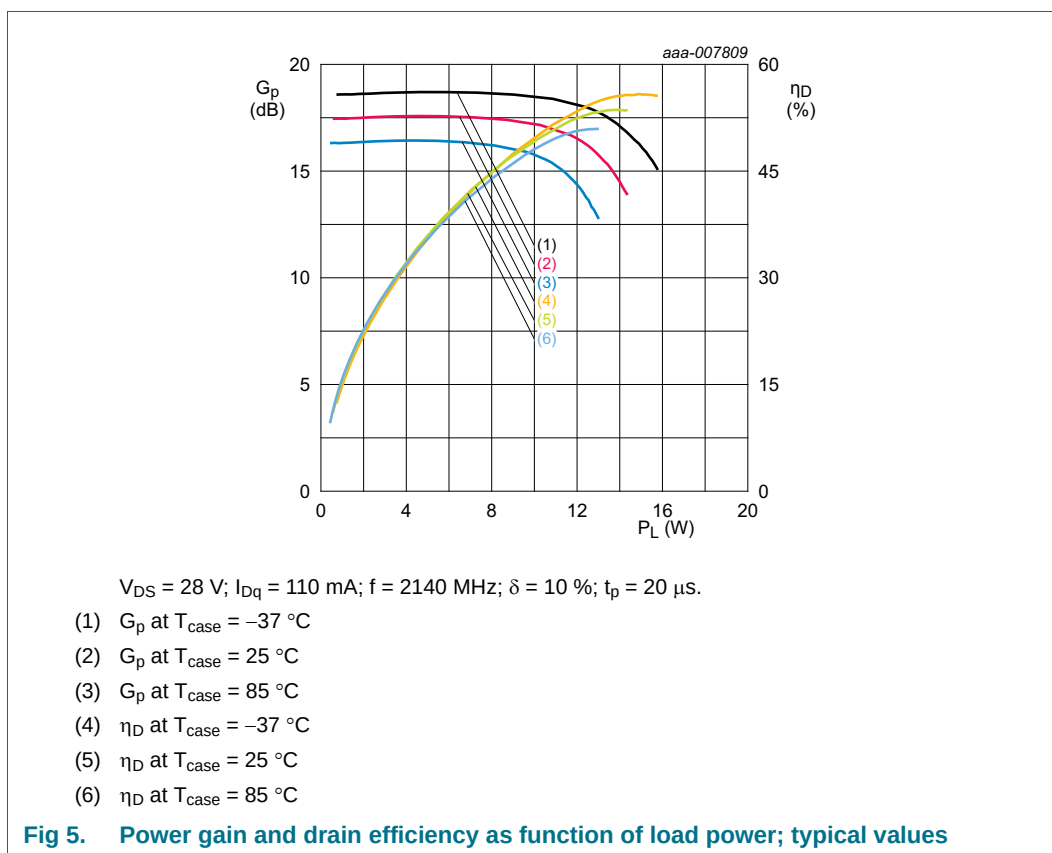
| Component | Description                       | Value       | Remarks                 |
|-----------|-----------------------------------|-------------|-------------------------|
| C7        | multilayer ceramic chip capacitor | 3.9 pF      | [1]                     |
| C8        | multilayer ceramic chip capacitor | 1.7 pF      | [1]                     |
| R1        | chip resistor                     | 10 $\Omega$ | SMD 0805; 1 % tolerance |

- [1] American Technical Ceramics type 100A or capacitor of same quality.  
[2] Murata GRM31MR71H105KA88L or capacitor of same quality.  
[3] Murata GRM21BR71H104KA01L or capacitor of same quality.  
[4] Murata GRM32ER71H106KA88L or capacitor of same quality.

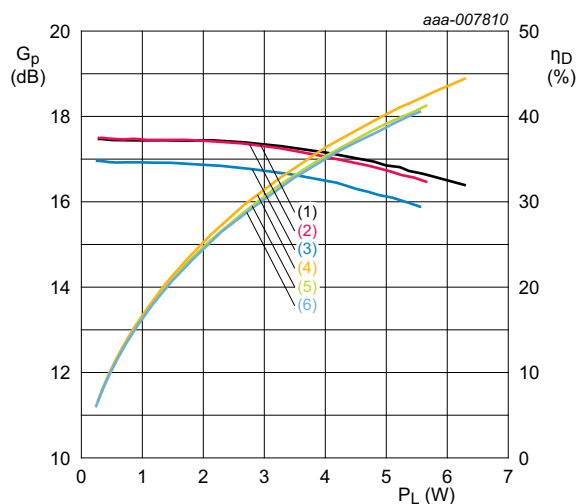
8.1.2 Graphs

8.1.2.1 Pulsed CW





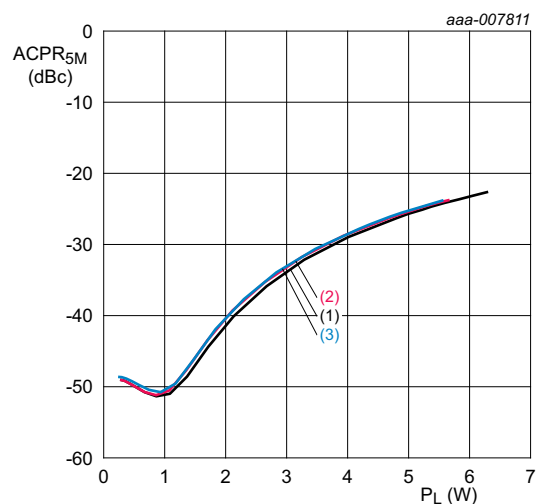
### 8.1.2.2 2-Carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 110\text{ mA}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ ;  
carrier spacing = 5 MHz; 46 % clipping; PAR = 8.4 dB at  
0.01 % probability on CCDF.

- (1)  $G_p$  at  $f = 2110\text{ MHz}$
- (2)  $G_p$  at  $f = 2140\text{ MHz}$
- (3)  $G_p$  at  $f = 2170\text{ MHz}$
- (4)  $\eta_D$  at  $f = 2110\text{ MHz}$
- (5)  $\eta_D$  at  $f = 2140\text{ MHz}$
- (6)  $\eta_D$  at  $f = 2170\text{ MHz}$

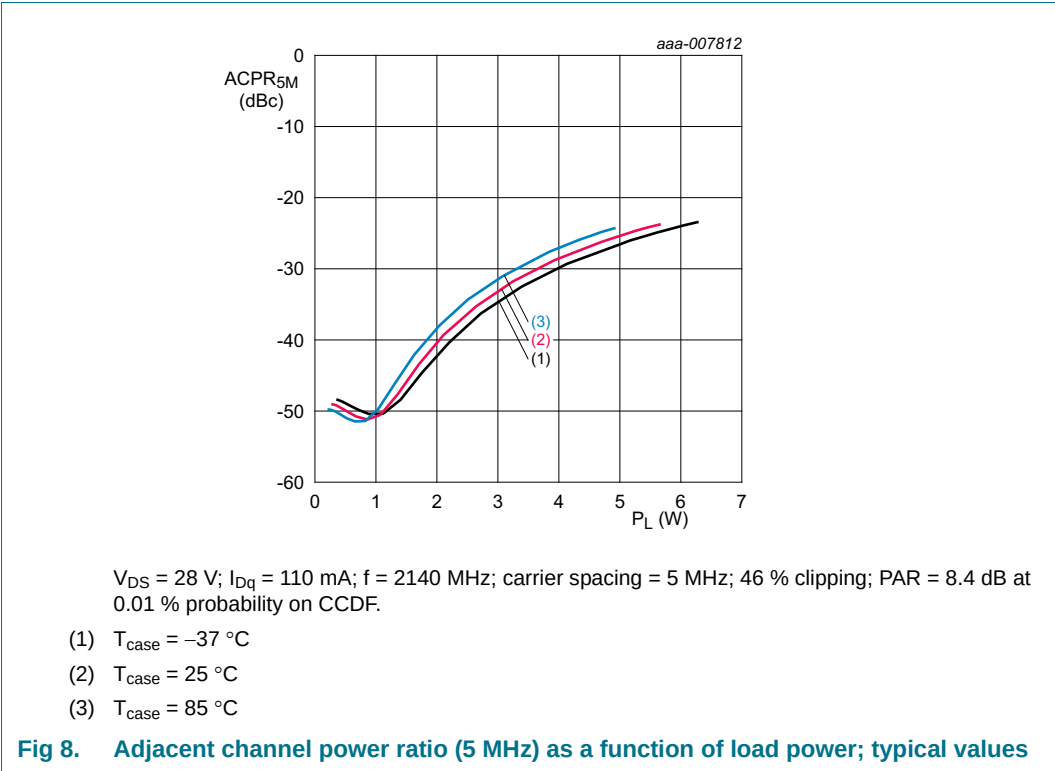
**Fig 6. Power gain and drain efficiency as function of load power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 110\text{ mA}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ ;  
carrier spacing = 5 MHz; 46 % clipping; PAR = 8.4 dB at  
0.01 % probability on CCDF.

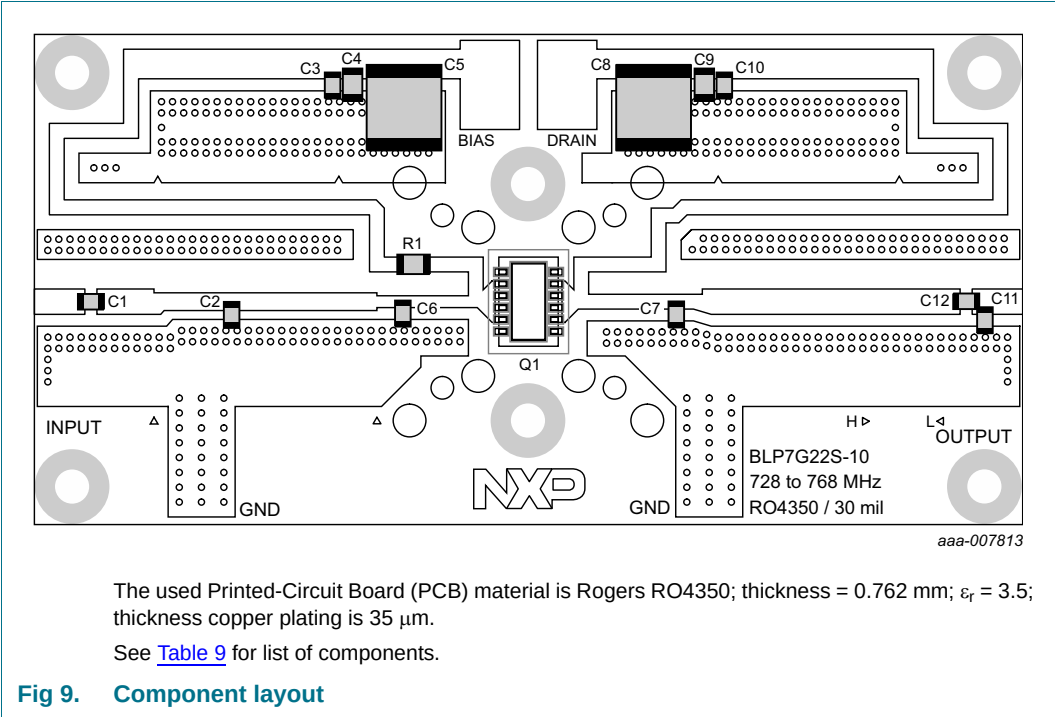
- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

**Fig 7. Adjacent channel power ratio (5 MHz) as a function of load power; typical values**



8.2 Frequency band 728 MHz to 768 MHz

8.2.1 Application circuit





**Table 9. List of components**See [Figure 9](#) for component layout.The used Printed-Circuit Board (PCB) material is Rogers RO4350; thickness = 0.762 mm;  $\epsilon_r = 3.5$ ; thickness copper plating is 35  $\mu\text{m}$ .

| Component | Description                       | Value                   | Remarks                 |
|-----------|-----------------------------------|-------------------------|-------------------------|
| C1, C12   | multilayer ceramic chip capacitor | 68 pF                   | [1]                     |
| C2        | multilayer ceramic chip capacitor | 10 pF                   | [1]                     |
| C3, C10   | multilayer ceramic chip capacitor | 100 pF                  | [1]                     |
| C4, C9    | multilayer ceramic chip capacitor | 100 nF                  | [2]                     |
| C5, C8    | multilayer ceramic chip capacitor | 10 $\mu\text{F}$ ; 50 V | [3]                     |
| C6        | multilayer ceramic chip capacitor | 36 pF                   | [1]                     |
| C7        | multilayer ceramic chip capacitor | 9.1 pF                  | [1]                     |
| C11       | multilayer ceramic chip capacitor | 7.5 pF                  | [1]                     |
| R1        | chip resistor                     | 5.1 $\Omega$            | SMD 0805; 1 % tolerance |

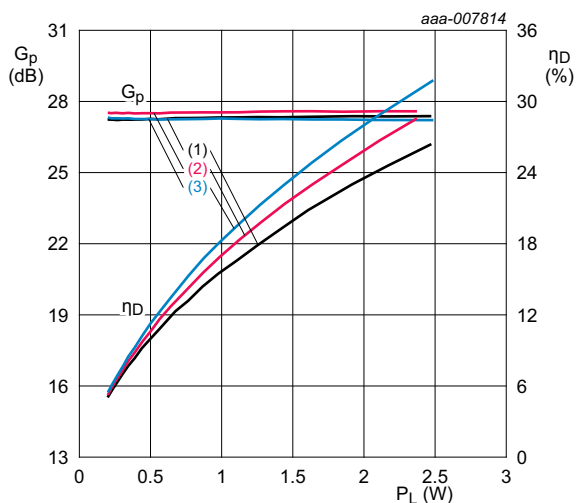
[1] American Technical Ceramics type 100A or capacitor of same quality.

[2] Murata GRM21BR71H104KA01L or capacitor of same quality.

[3] Murata GRM32ER71H106KA88L or capacitor of same quality.

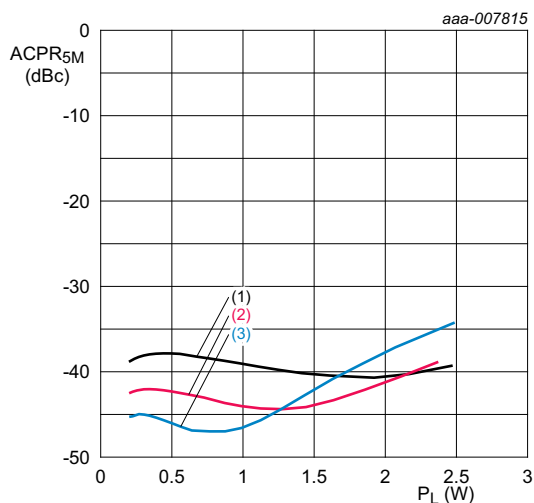
## 8.2.2 Graphs

### 8.2.2.1 2-Carrier W-CDMA



$V_{DS} = 28 \text{ V}$ ;  $I_{DQ} = 110 \text{ mA}$ ;  $T_{case} = 25 \text{ }^{\circ}\text{C}$ ;  
carrier spacing = 5 MHz; 46 % clipping; PAR = 8.4 dB at  
0.01 % probability on CCDF.

- (1)  $f = 728 \text{ MHz}$
- (2)  $f = 748 \text{ MHz}$
- (3)  $f = 768 \text{ MHz}$

**Fig 10. Power gain and drain efficiency as function of load power; typical values**

$V_{DS} = 28 \text{ V}$ ;  $I_{DQ} = 110 \text{ mA}$ ;  $T_{case} = 25 \text{ }^{\circ}\text{C}$ ;  
carrier spacing = 5 MHz; 46 % clipping; PAR = 8.4 dB at  
0.01 % probability on CCDF.

- (1)  $f = 728 \text{ MHz}$
- (2)  $f = 748 \text{ MHz}$
- (3)  $f = 768 \text{ MHz}$

**Fig 11. Adjacent channel power ratio (5 MHz) as a function of load power; typical values**

## 9. Test information

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### 9.1 Ruggedness in class-AB operation

The BLP7G22-10 is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 110\text{ mA}$ ;  $P_L = 10\text{ W}$ ; frequency from 700 MHz to 2700 MHz.

10. Package outline

HVSON12: plastic thermal enhanced very thin small outline package; no leads;  
 12 terminals; body 6 x 4 x 0.85 mm

SOT1179-2

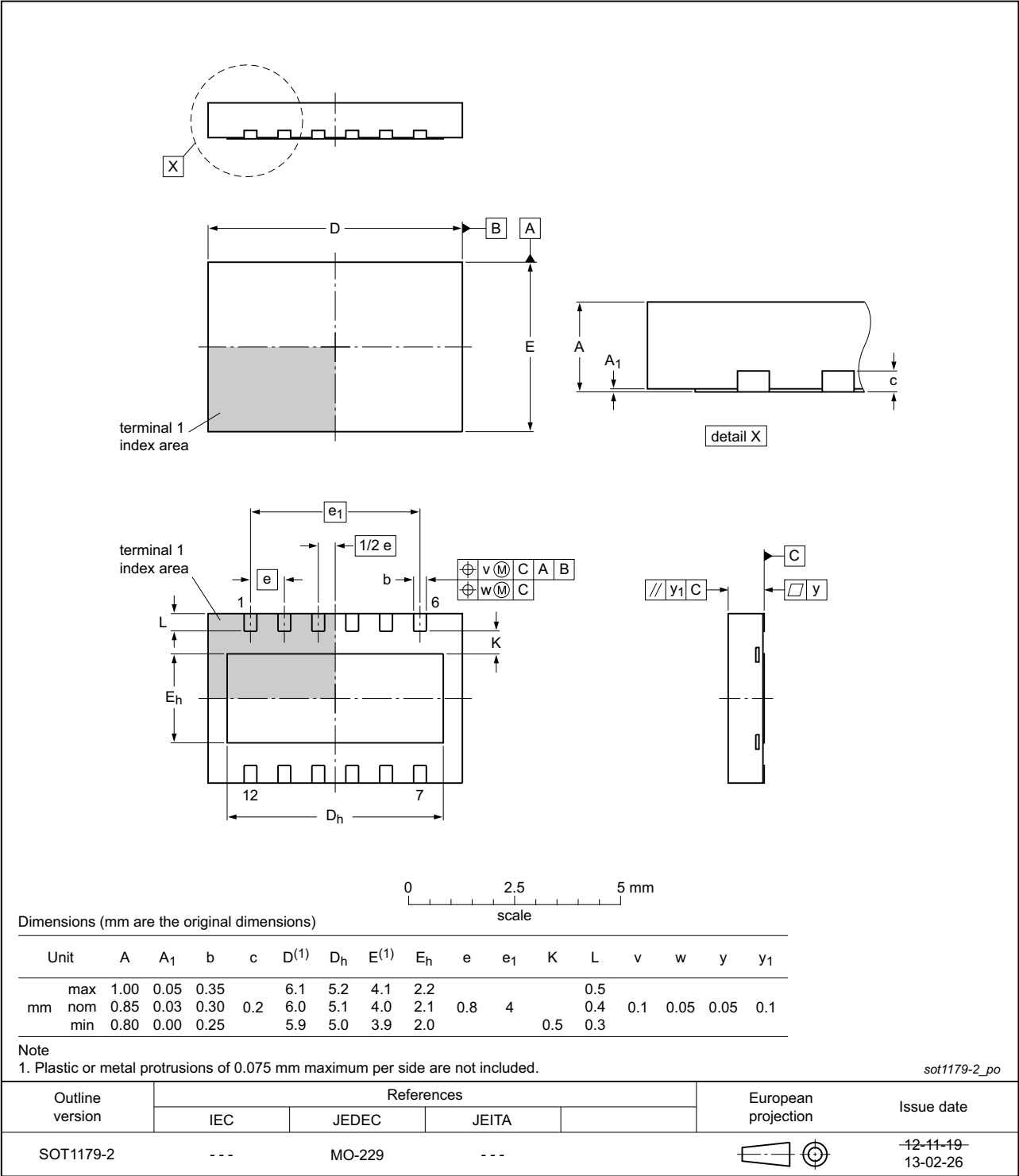


Fig 12. Package outline SOT1179-2 (HVSON12)

## 11. 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.

## 12. Abbreviations

Table 10. Abbreviations

| Acronym | Description                                     |
|---------|-------------------------------------------------|
| 3GPP    | 3rd Generation Partnership Project              |
| CCDF    | Complementary Cumulative Distribution Function  |
| CDMA    | Code Division Multiple Access                   |
| CW      | Continuous Wave                                 |
| DPCH    | Dedicated Physical CHannel                      |
| EDGE    | Enhanced Data rates for GSM Evolution           |
| ESD     | ElectroStatic Discharge                         |
| GSM     | Global System for Mobile Communication          |
| LDMOS   | Laterally Diffused Metal-Oxide Semiconductor    |
| LTE     | Long Term Evolution                             |
| MC-GSM  | Multi Carrier GSM                               |
| PAR     | Peak-to-Average Ratio                           |
| SMD     | Surface Mounted Device                          |
| VSWR    | Voltage Standing-Wave Ratio                     |
| W-CDMA  | Wideband Code Division Multiple Access          |
| WiMAX   | Worldwide Interoperability for Microwave Access |

## 13. Revision history

Table 11. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Data sheet status    | Change notice | Supersedes     |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|---------------|----------------|
| BLP7G22-10 v.2 | 20130530                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Product data sheet   | -             | BLP7G22-10 v.1 |
| Modifications: | <ul style="list-style-type: none"><li>• <a href="#">Section 1 on page 1</a>: several changes have been made</li><li>• <a href="#">Section 2 on page 2</a>: several changes have been made</li><li>• <a href="#">Section 3 on page 2</a>: several changes have been made</li><li>• <a href="#">Section 5 on page 3</a>: section has been added</li><li>• <a href="#">Section 6 on page 3</a>: several changes have been made</li><li>• <a href="#">Section 7 on page 3</a>: several changes have been made</li><li>• <a href="#">Section 8 on page 4</a>: section has been added</li><li>• <a href="#">Section 9 on page 10</a>: section has been added</li><li>• <a href="#">Section 9.1 on page 10</a>: section has been moved here from <a href="#">Section 7 on page 3</a></li><li>• <a href="#">Section 10 on page 11</a>: the package outline has been changed</li></ul> |                      |               |                |
| BLP7G22-10 v.1 | 20120213                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Objective data sheet | -             | -              |

## 14. Legal information

### 14.1 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".

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