

# 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  $T_{case} = 25\text{ °C}$ ;  $I_{DQ} = 110\text{ mA}$ ; in a class-AB application circuit.

Test signal	f (MHz)	$I_{DQ}$ (mA)	$V_{DS}$ (V)	$P_{L(AV)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	ACPR <sub>5M</sub> (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)

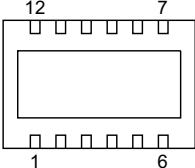
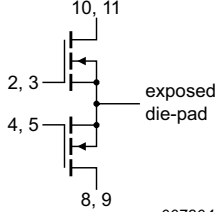
### 1.3 Applications

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



## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol [1]
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

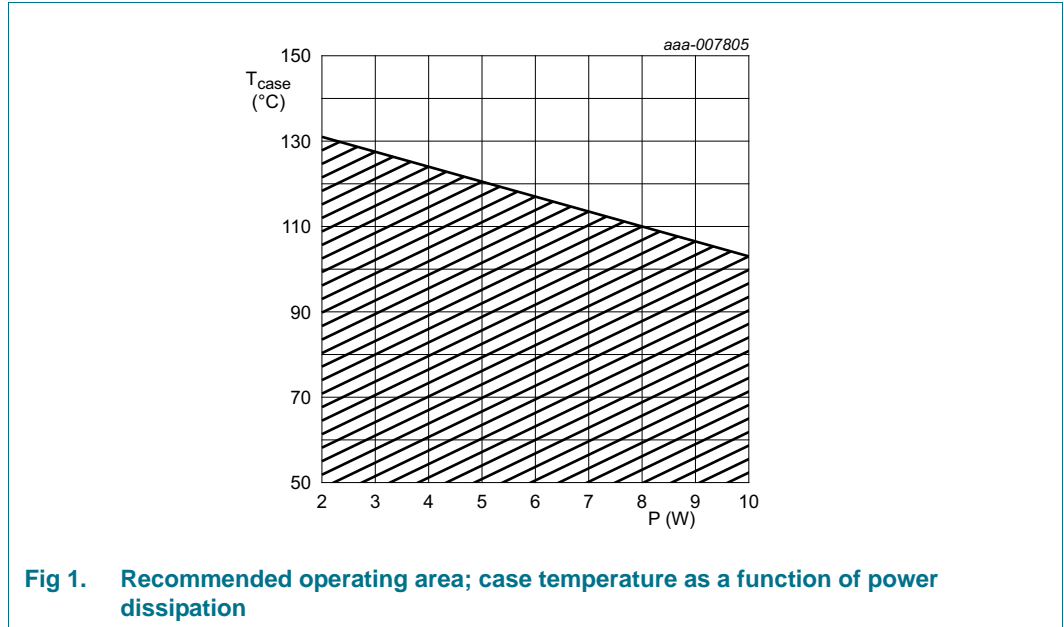
**Table 4. Limiting values**

*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	$T_{case} = 70\text{ }^{\circ}\text{C}; P_L = 2\text{ W}$	3.2	K/W

## 7. Characteristics

**Table 6. DC 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	$V_{GS} = 0\text{ V}; I_D = 0.18\text{ mA}$	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	-	$\text{m}\Omega$

**Table 7. RF characteristics**

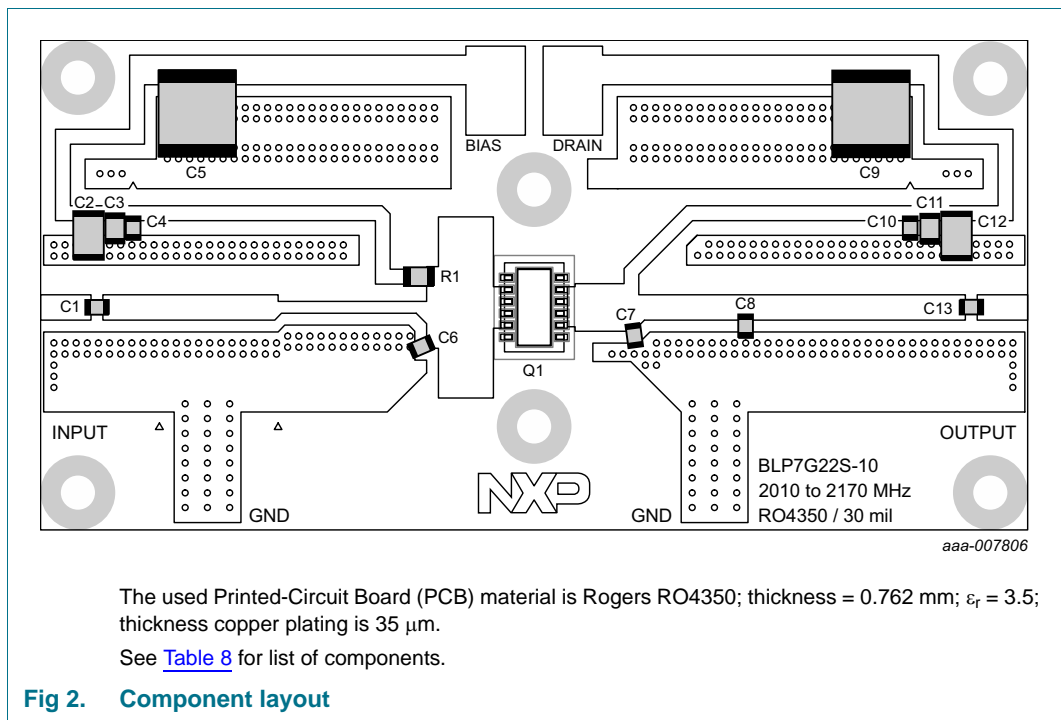
Test signal: 1-tone pulsed;  $t_p = 50 \mu s$ ;  $\delta = 10 \%$ ;  $f = 2140 \text{ MHz}$ ; RF performance at  $V_{DS} = 28 \text{ V}$ ;  $I_{DQ} = 110 \text{ mA}$ ;  $T_{case} = 25 \text{ }^\circ\text{C}$ ; unless otherwise specified, in a production circuit.

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



**Fig 2. Component layout**

**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  $\mu m$ .

Component	Description	Value	Remarks
C1, C4, C10, C13	multilayer ceramic chip capacitor	22 pF	[1]
C2, C12	multilayer ceramic chip capacitor	1 $\mu F$	[2]
C3, C11	multilayer ceramic chip capacitor	100 nF	[3]
C5, C9	multilayer ceramic chip capacitor	10 $\mu F$ ; 50 V	[4]
C6	multilayer ceramic chip capacitor	2.8 pF	[1]

**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.

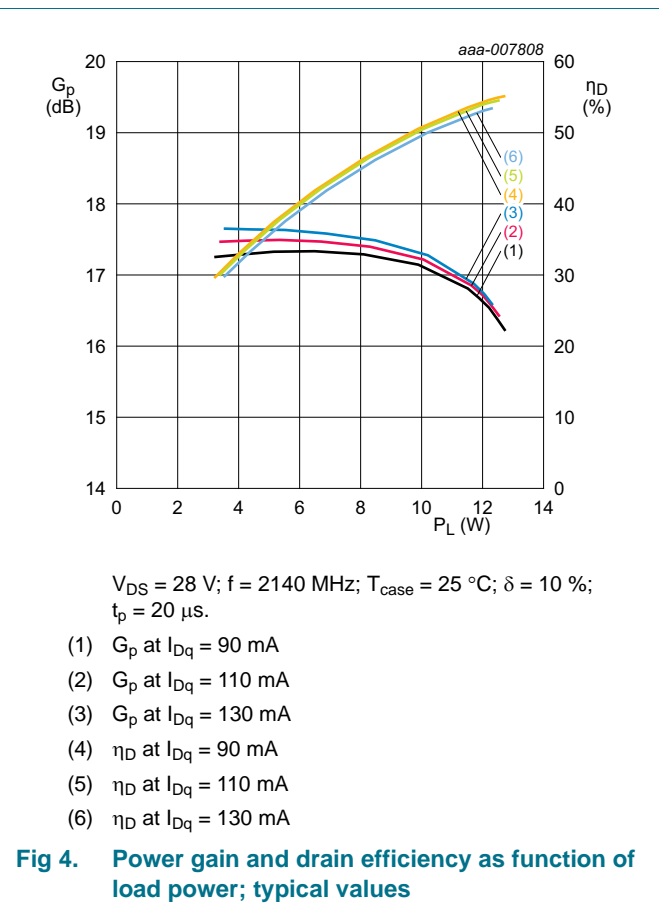
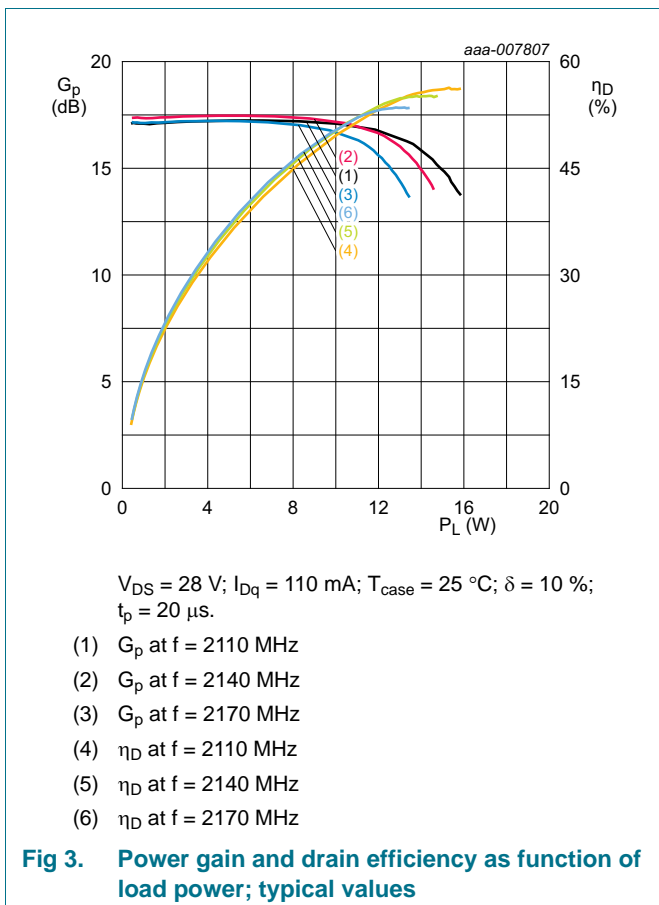
[2] Murata GRM31MR71H105KA88L or capacitor of same quality.

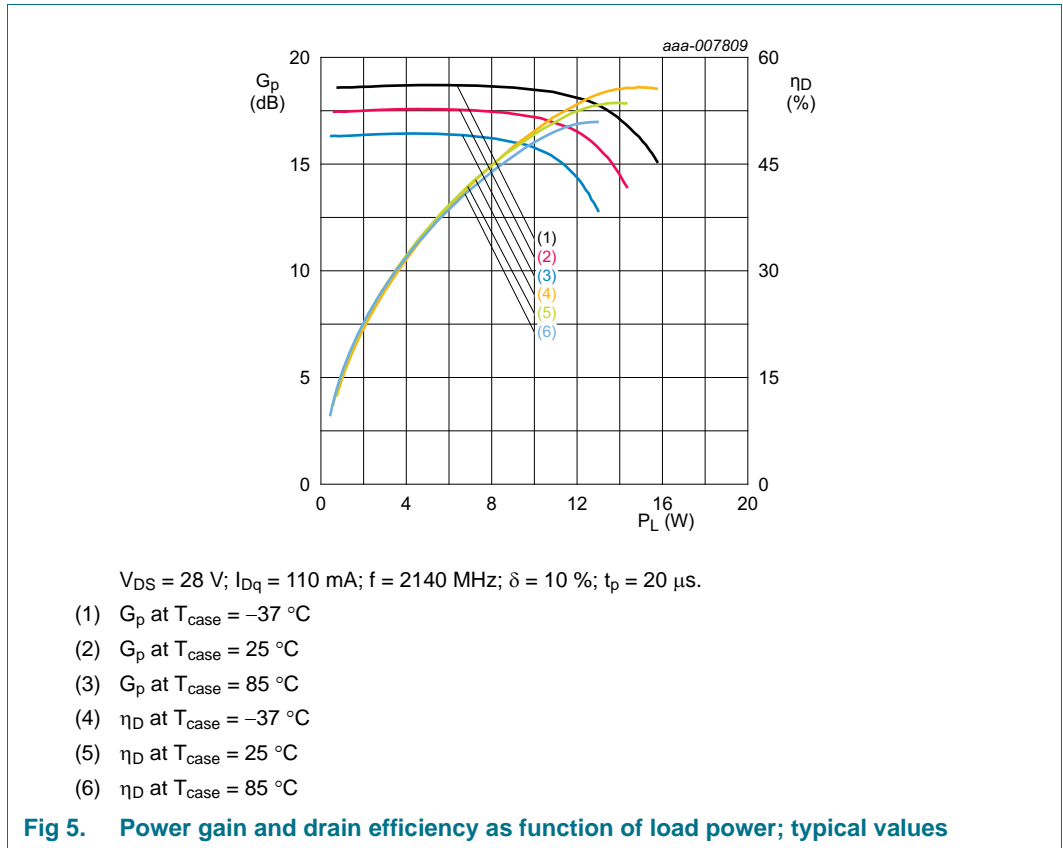
[3] Murata GRM21BR71H104KA01L or capacitor of same quality.

[4] Murata GRM32ER71H106KA88L or capacitor of same quality.

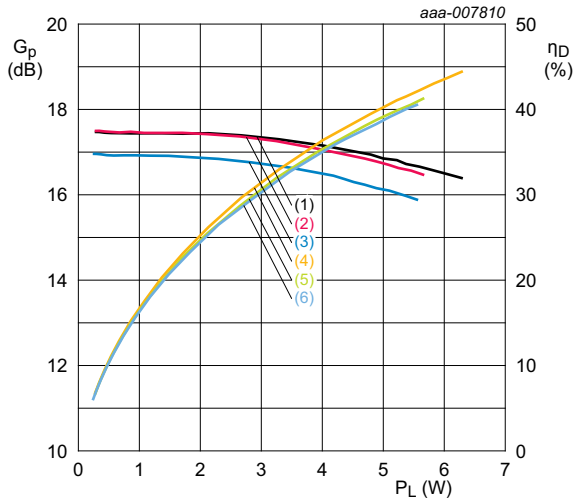
### 8.1.2 Graphs

#### 8.1.2.1 Pulsed CW





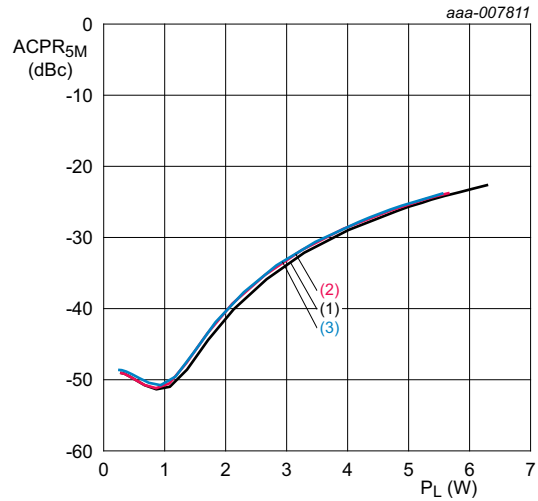
8.1.2.2 2-Carrier W-CDMA



$V_{DS} = 28\text{ V}$ ;  $I_{DQ} = 110\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ;  
 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  $f = 2170\text{ MHz}$

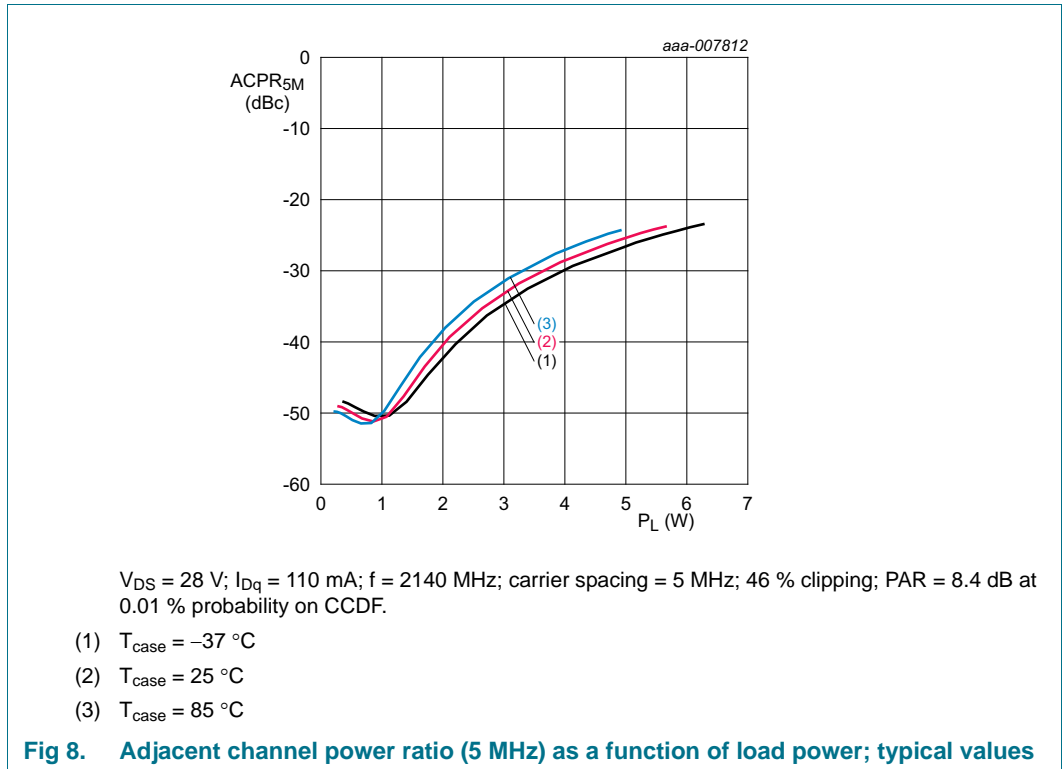
Fig 6. Power gain and drain efficiency as function of load power; typical values



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

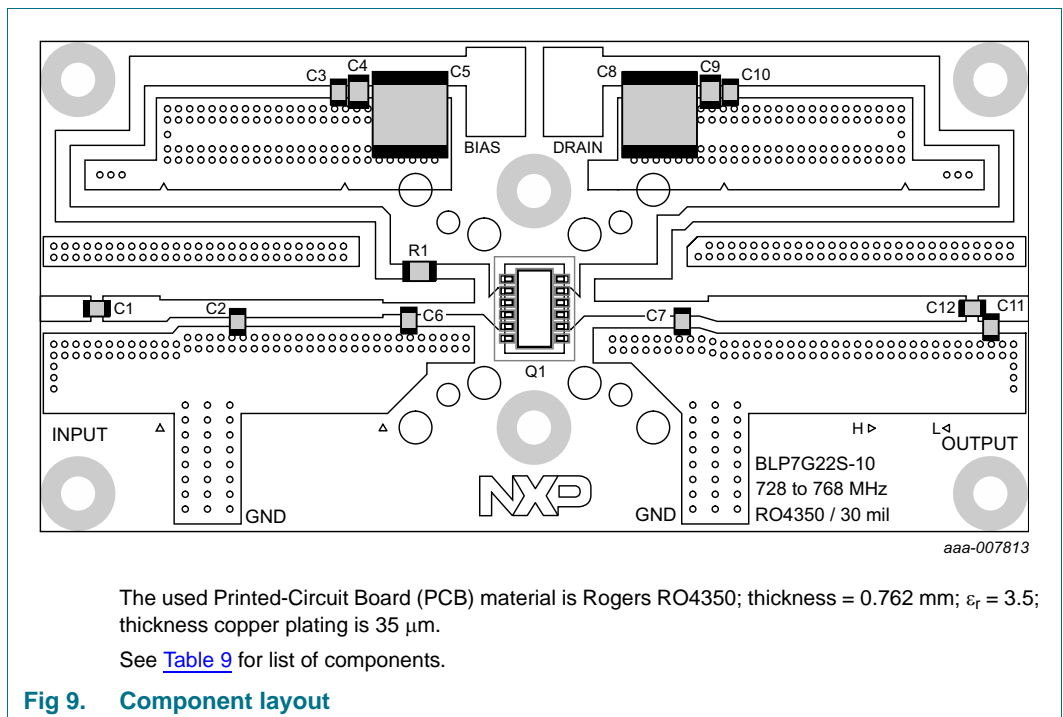
- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

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

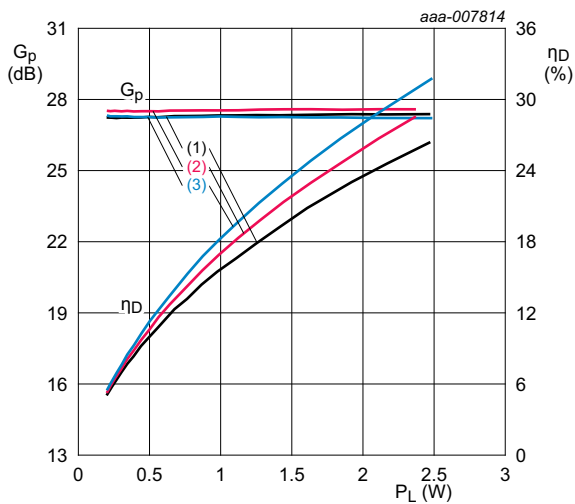
[1] American Technical Ceramics type 100A or capacitor of same quality.

[2] Murata GRM21BR71H104KA01L or capacitor of same quality.

[3] Murata GRM32ER71H106KA88L or capacitor of same quality.

## 8.2.2 Graphs

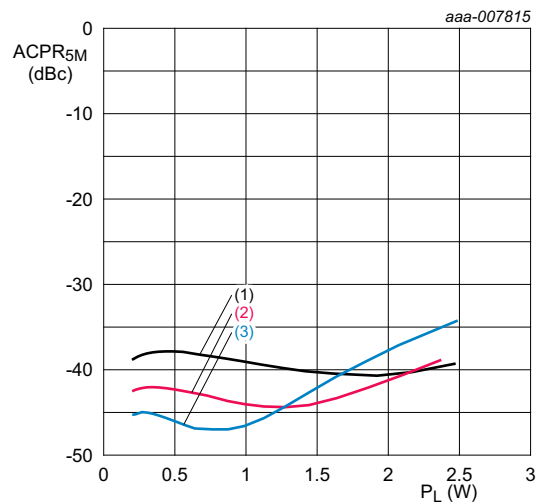
### 8.2.2.1 2-Carrier W-CDMA



$V_{DS} = 28 \text{ V}$ ;  $I_{DQ} = 110 \text{ mA}$ ;  $T_{case} = 25 \text{ }^\circ\text{C}$ ;  
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

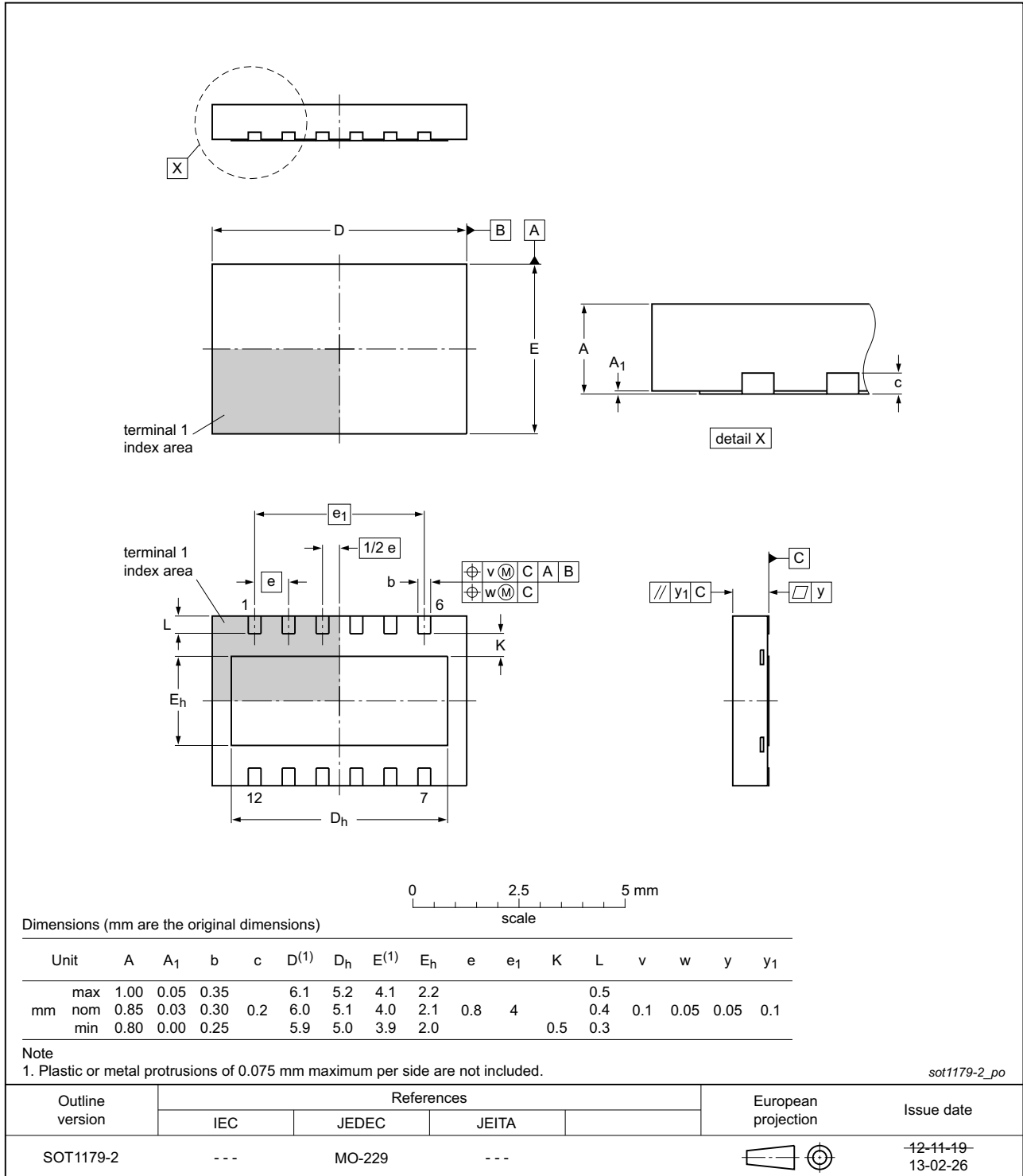


Fig 12. Package outline SOT1179-2 (HVSON12)

## 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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