

BLF7G20L-250P; BLF7G20LS-250P

Power LDMOS transistor

Rev. 4 — 12 July 2013

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 (MHz) | I_{Dq} (mA) | V_{DS} (V) | $P_{L(AV)}$ (W) | G_p (dB) | η_D (%) | ACPR (dBc) |
|-------------------|--------------|------------------|-----------------|--------------------|---------------|-----------------|----------------------|
| 2-carrier W-CDMA | 1805 to 1880 | 1900 | 28 | 70 | 18 | 35 | -29.5 ^[1] |

[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

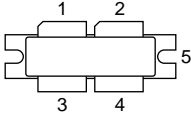
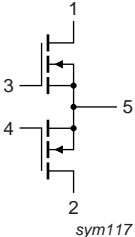
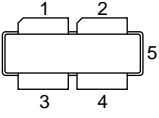
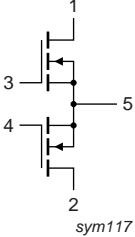
1.3 Applications

- 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 |
|---------------------------------|-------------|--|--|
| BLF7G20L-250P (SOT539A) | | | |
| 1 | drain1 |  |  |
| 2 | drain2 | | |
| 3 | gate1 | | |
| 4 | gate2 | | |
| 5 | source | | |
| BLF7G20LS-250P (SOT539B) | | | |
| 1 | drain1 |  |  |
| 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 | μA |
| 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 | Ω |

7. Test information

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

Class-AB production test circuit; PAR = 8.4 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 64 DPCH; $f = 1805\text{ MHz}$ to 1880 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 |
| η_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 MHz .

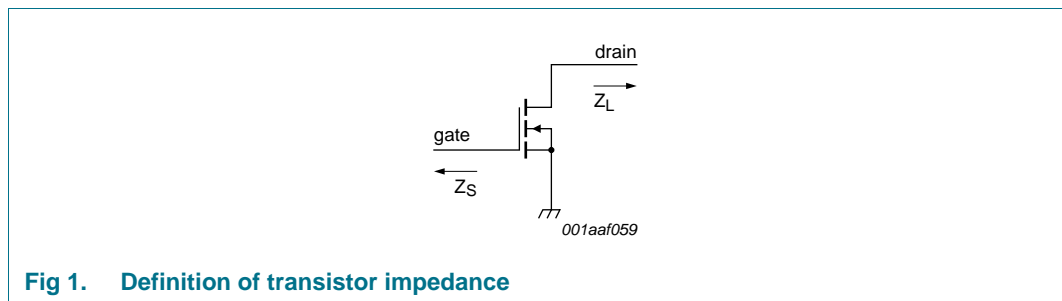
7.2 Impedance information

Table 8. Typical impedance

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

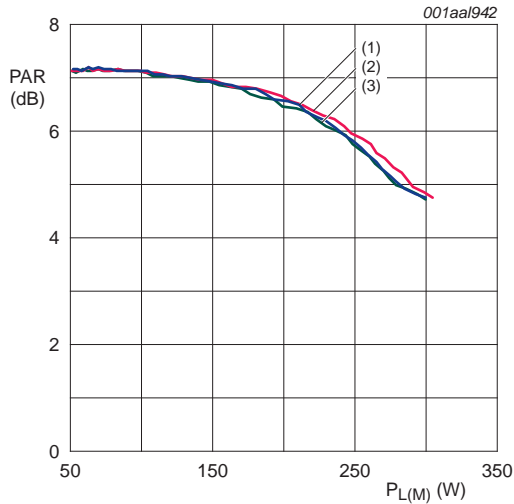
| f (MHz) | Z_S [1] (Ω) | Z_L [1] (Ω) |
|------------|---------------------------|---------------------------|
| 1750 | 1.31 – j3.53 | 2.47 – j3.91 |
| 1805 | 1.39 – j3.75 | 2.27 – j3.63 |
| 1845 | 1.48 – j4.10 | 2.32 – j3.19 |
| 1880 | 1.55 – j4.19 | 1.89 – j3.15 |
| 1930 | 1.97 – j4.48 | 1.70 – j2.95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

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



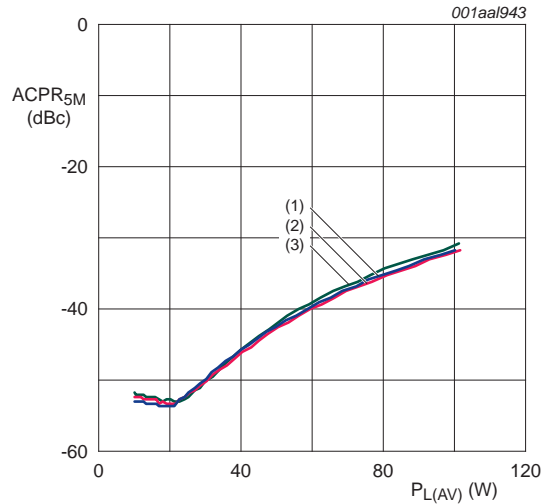
7.3 Single carrier W-CDMA

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



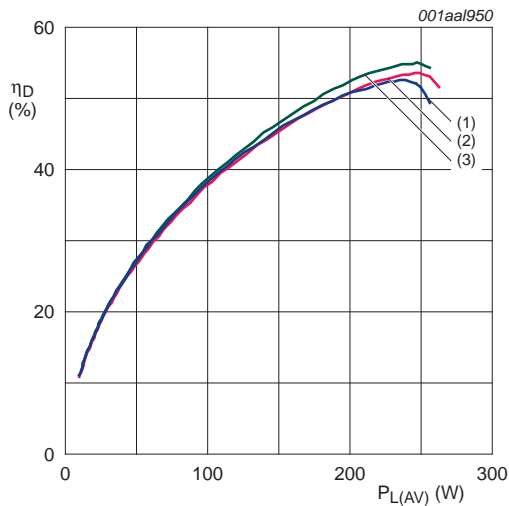
- (1) $f = 1805\text{ MHz}$.
- (2) $f = 1845\text{ MHz}$.
- (3) $f = 1880\text{ MHz}$.

Fig 2. Peak-to-average power ratio as a function of peak output power; typical values



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

Fig 3. Adjacent channel power ratio (5 MHz) 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 4. Efficiency as a function of average output power; typical values

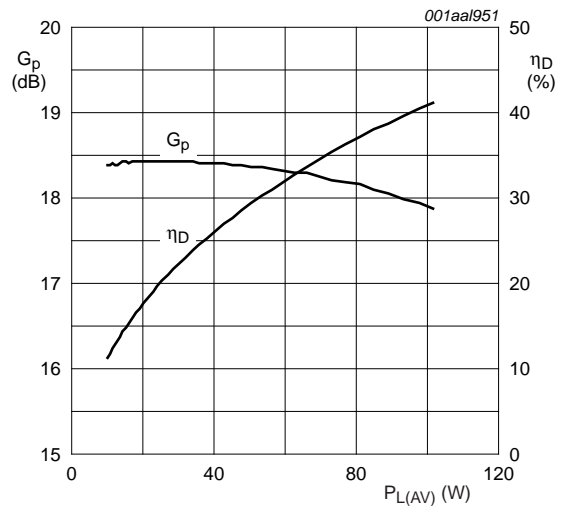
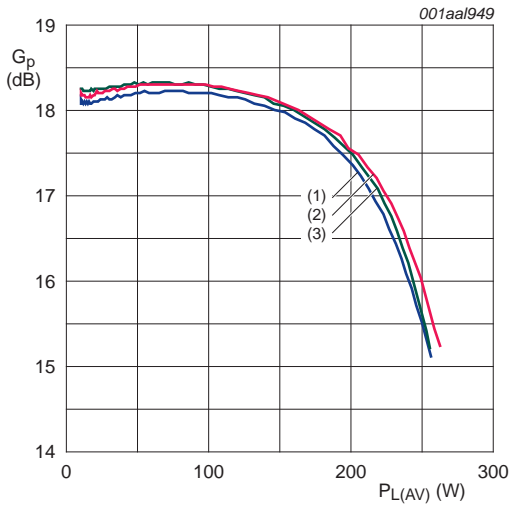


Fig 5. Power gain and drain efficiency as a function of average output power; typical values

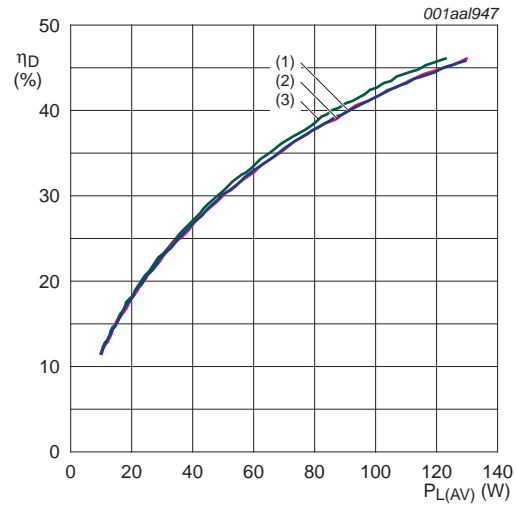
7.4 One tone CW

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



- (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

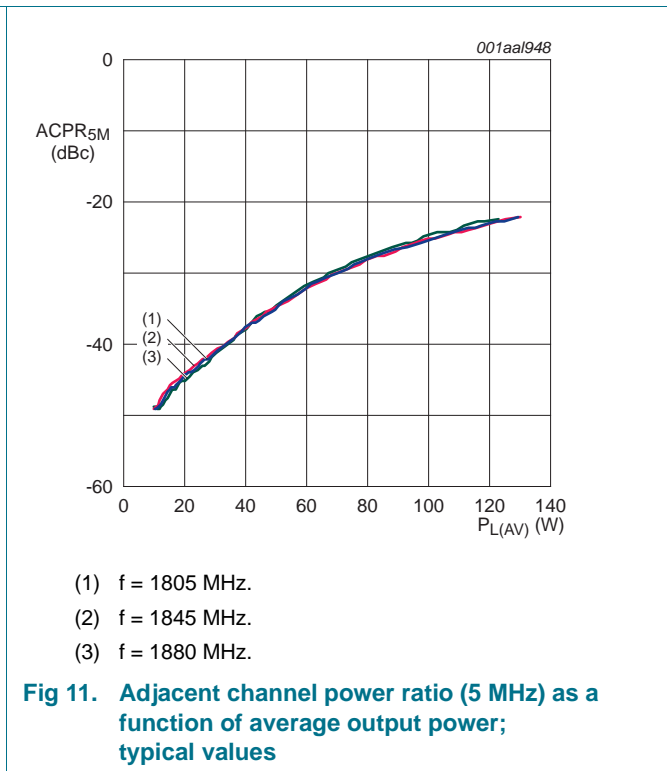
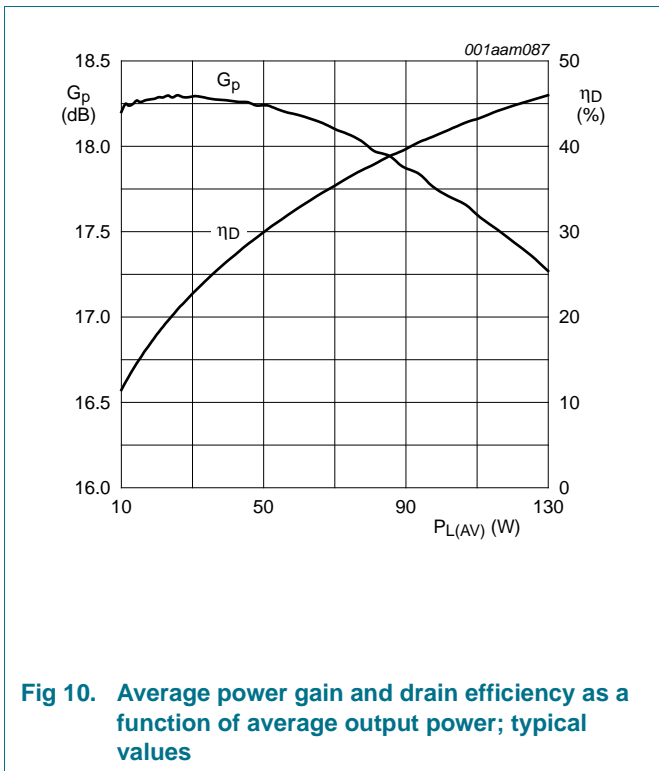
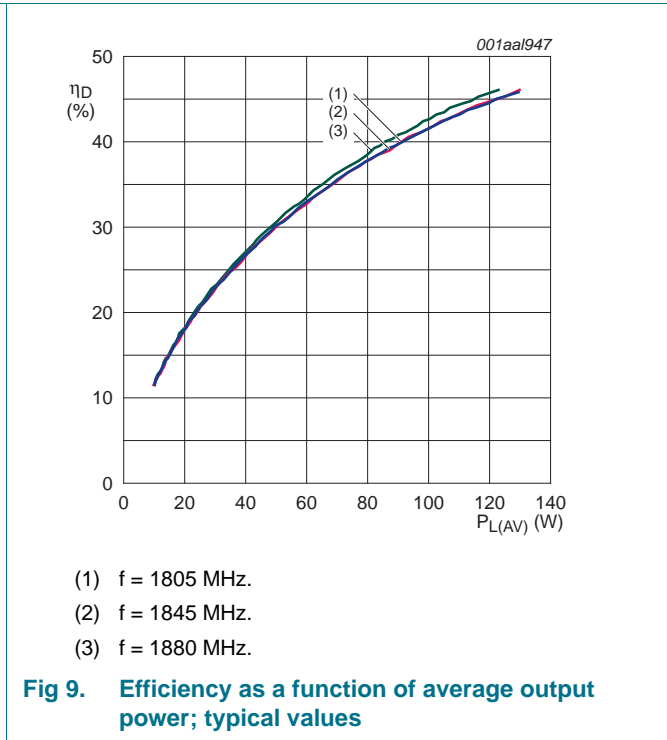
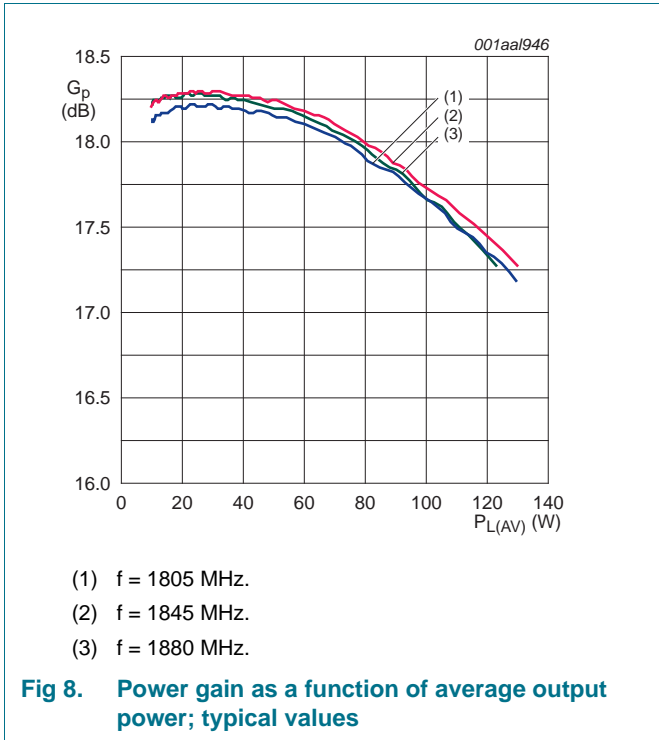


- (1) $f = 1805\text{ MHz}$.
- (2) $f = 1845\text{ MHz}$.
- (3) $f = 1880\text{ MHz}$.

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.



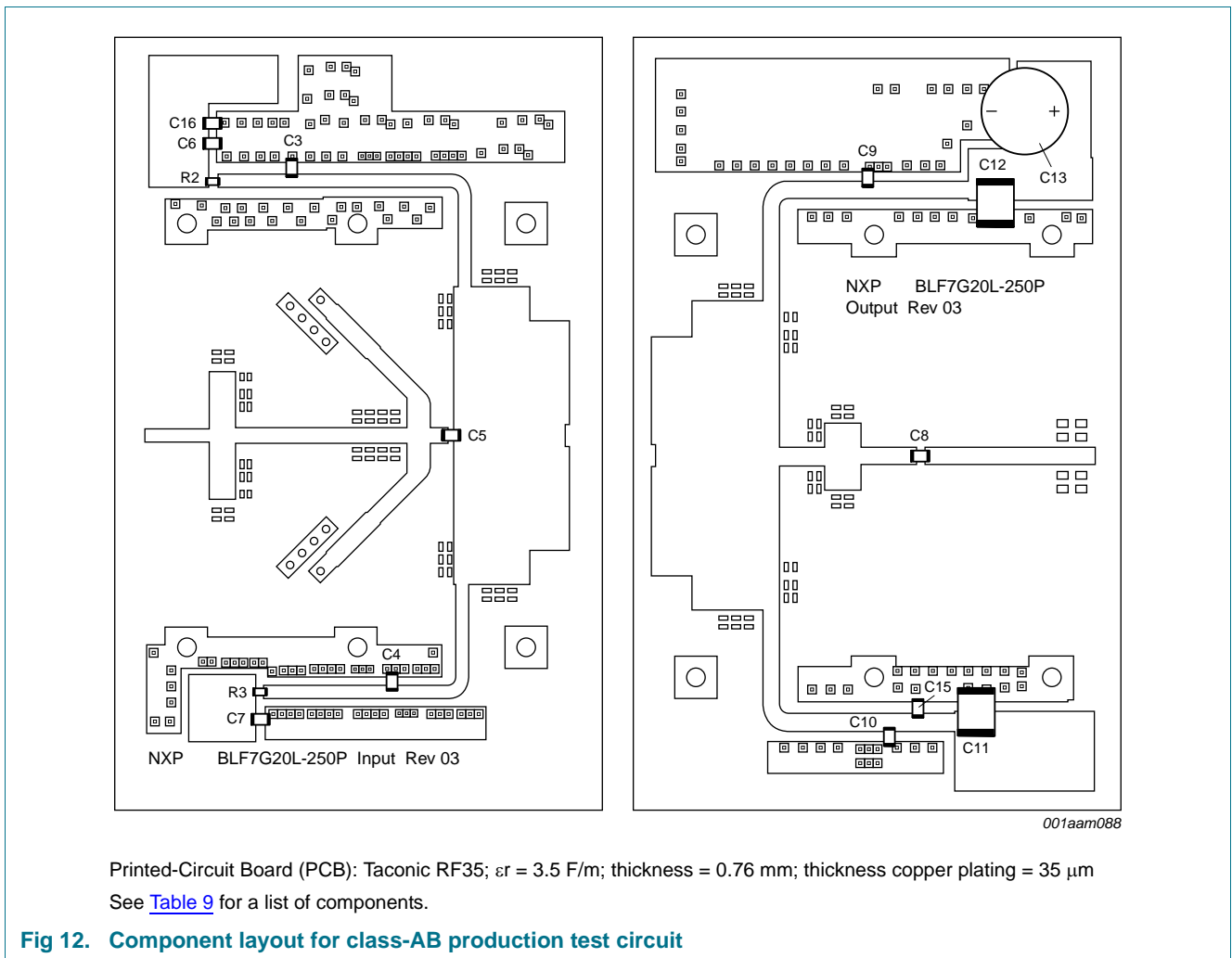
7.6 Test circuit

Table 9. List of components

For test circuit see [Figure 12](#).

| Component | Description | Value | Code number | Type | Remarks |
|-----------------------|------------------------------------|-------------------|-------------|---------------|---------------|
| Base plate [1] | | | | | |
| 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 μ F | | TDK | |
| C13 | electrolytic capacitor | 470 μ F; 63 V | | | |
| C15, C16 | multi layer ceramic chip capacitor | 100 nF | | Phillips 1206 | |
| R2, R3 | chip resistor | 10 Ω | | Philips 0603 | |

[1] See mechanical drawing ([Figure 12](#)).



8. Package outline

Flanged balanced ceramic package; 2 mounting holes; 4 leads

SOT539A

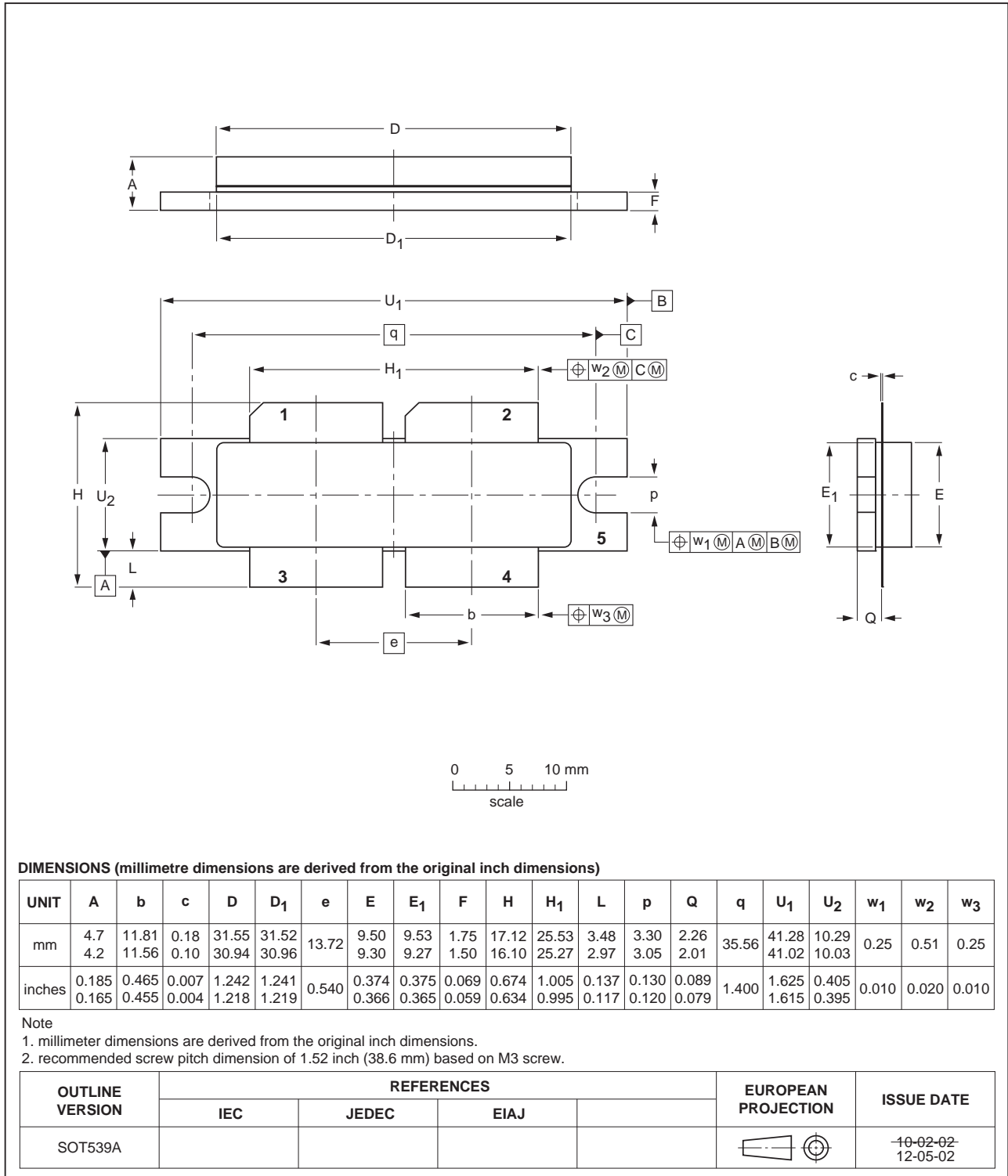


Fig 13. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads

SOT539B

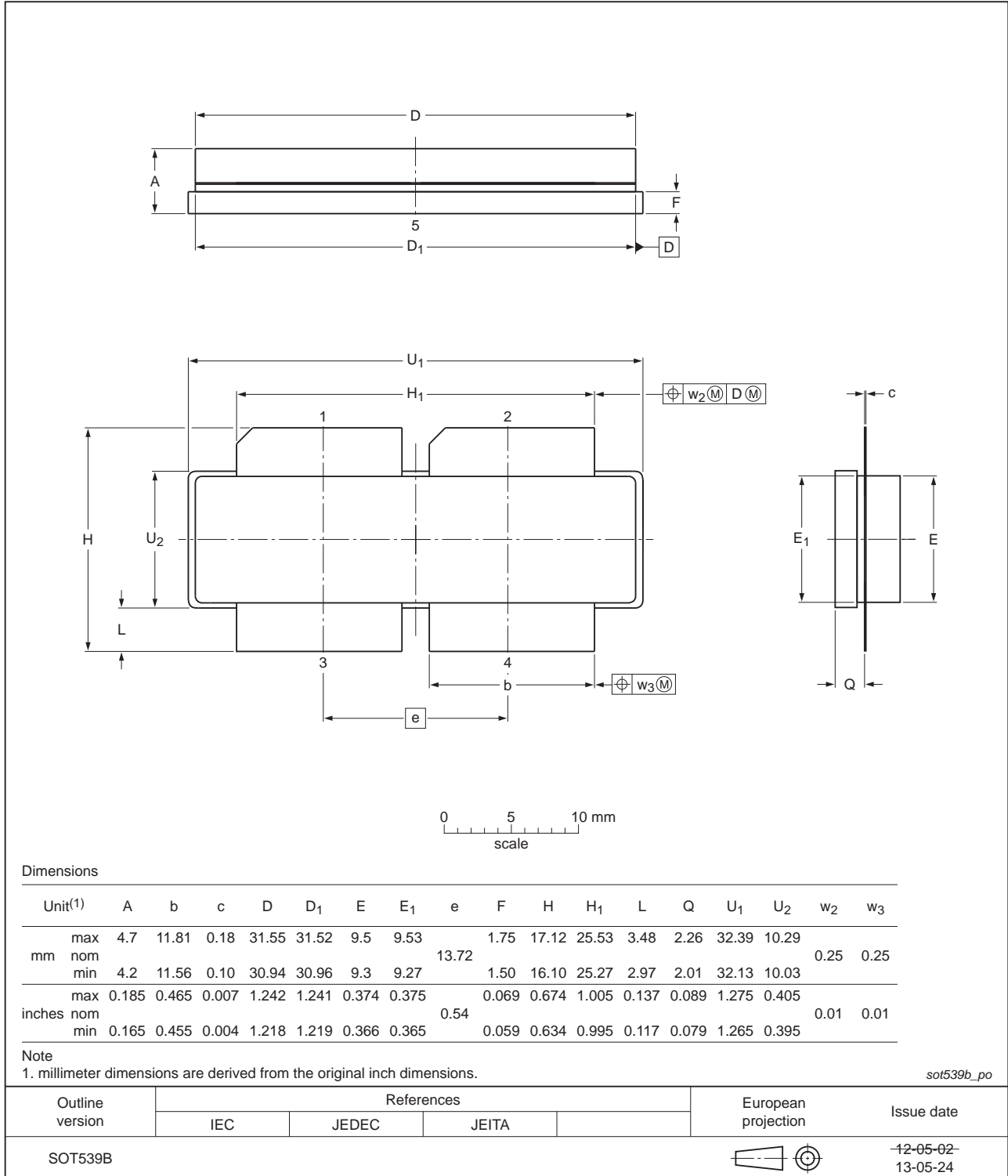


Fig 14. Package outline SOT539B

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 v.4 | 20130712 | Product data sheet | - | BLF7G20L-250P_7G20LS-250P v.3 |
| Modifications: | | | | |
| | | | | <ul style="list-style-type: none"> The package outline Figure 14 is updated. Translation disclaimer added to the legal text. |
| BLF7G20L-250P_7G20LS-250P v.3 | 20110103 | Product data sheet | - | BLF7G20L-250P_7G20LS-250P v.2 |
| Modifications: | | | | |
| | | | | <ul style="list-style-type: none"> Data sheet status changed from Preliminary sheet to Product data sheet Table 1 on page 1: PDPCH has been changed to DPCH Section 1.1 on page 1: caution about ESD has been moved to Section 9 on page 11 Table 4 on page 2: I_D value has been added. Table 7 on page 3: PDPCH has been changed to DPCH Section 7.2 on page 4: section has been added Figure 5 on page 5: redundant conditions about frequency have been removed Table 9 on page 8: title of table has been changed Table 9 on page 8: redundant information has been removed Section 9 on page 11: section has been added. |
| 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

12.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | 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>.

12.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

12.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond

NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

12.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

13. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

14. Contents

| | | |
|-----------|--|-----------|
| 1 | Product profile | 1 |
| 1.1 | General description | 1 |
| 1.2 | Features and benefits | 1 |
| 1.3 | Applications | 1 |
| 2 | Pinning information | 2 |
| 3 | Ordering information | 2 |
| 4 | Limiting values | 2 |
| 5 | Thermal characteristics | 3 |
| 6 | Characteristics | 3 |
| 7 | Test information | 3 |
| 7.1 | Ruggedness in class-AB operation | 3 |
| 7.2 | Impedance information | 4 |
| 7.3 | Single carrier W-CDMA | 5 |
| 7.4 | One tone CW | 6 |
| 7.5 | 2-carrier WCDMA characteristics | 7 |
| 7.6 | Test circuit | 8 |
| 8 | Package outline | 9 |
| 9 | Handling information | 11 |
| 10 | Abbreviations | 11 |
| 11 | Revision history | 12 |
| 12 | Legal information | 13 |
| 12.1 | Data sheet status | 13 |
| 12.2 | Definitions | 13 |
| 12.3 | Disclaimers | 13 |
| 12.4 | Trademarks | 14 |
| 13 | Contact information | 14 |
| 14 | Contents | 15 |

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP B.V. 2013. All rights reserved.

For more information, please visit: <http://www.nxp.com>
 For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 12 July 2013

Document identifier: BLF7G20L-250P_7G20LS-250P

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[NXP:](#)

[BLF7G20L-250P,112](#) [BLF7G20L-250P,118](#) [BLF7G20LS-250P,112](#) [BLF7G20LS-250P,118](#)