

# BLF6G20LS-140

## Power LDMOS transistor

Rev. 01 — 27 February 2009

Product data sheet

## 1. Product profile

### 1.1 General description

140 W LDMOS power transistor for base station applications at frequencies from 1800 MHz to 2000 MHz.

**Table 1. Typical performance**

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

| Mode of operation | f<br>(MHz)   | V <sub>DS</sub><br>(V) | P <sub>L(AV)</sub><br>(W) | G <sub>p</sub><br>(dB) | $\eta_D$<br>(%) | IMD3<br>(dBc)      | ACPR<br>(dBc)      |
|-------------------|--------------|------------------------|---------------------------|------------------------|-----------------|--------------------|--------------------|
| 2-carrier W-CDMA  | 1930 to 1990 | 28                     | 35.5                      | 16.5                   | 30              | -37 <sup>[1]</sup> | -40 <sup>[1]</sup> |

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7 dB at 0.01 % probability on CCDF per carrier; carrier spacing 10 MHz.

#### CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

### 1.2 Features

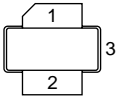
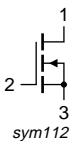
- Typical 2-carrier W-CDMA performance at frequencies of 1930 MHz and 1990 MHz, a supply voltage of 28 V and an I<sub>DQ</sub> of 1000 mA:
  - ◆ Average output power = 35.5 W
  - ◆ Power gain = 16.5 dB (typ)
  - ◆ Efficiency = 30 %
  - ◆ IMD3 = -37 dBc
  - ◆ ACPR = -40 dBc
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- RF power amplifiers for GSM, GSM EDGE, W-CDMA and CDMA base stations and multi carrier applications in the 1800 MHz to 2000 MHz frequency range

## 2. Pinning information

Table 2. Pinning

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

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

| Type number   | Package |   |         |
|---------------|---------|---|---------|
|               | Name    | Description                                     | Version |
| BLF6G20LS-140 | -       | earless flanged LDMOST 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    |
| $I_D$     | drain current        |            | -    | 39   | A    |
| $T_{stg}$ | storage temperature  |            | -65  | +150 | °C   |
| $T_j$     | junction temperature |            | -    | 225  | °C   |

## 5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol           | Parameter                                | Conditions                                      | Typ  | Unit |
|------------------|--|---|------|------|
| $R_{th(j-case)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C}$ ; $P_L = 35\text{ W}$ | 0.49 | K/W  |

## 6. Characteristics

**Table 6. 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   | $V_{GS} = 0\text{ V}; I_D = 0.5\text{ mA}$                         | 65   | -    | -    | V             |
| $V_{GS(th)}$  | gate-source threshold voltage    | $V_{DS} = 10\text{ V}; I_D = 216\text{ mA}$                        | 1.4  | 2    | 2.4  | V             |
| $V_{GSq}$     | gate-source quiescent voltage    | $V_{DS} = 28\text{ V};$<br>$I_D = 1000\text{ mA}$                  | 1.53 | 2    | 2.53 | 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>$V_{DS} = 10\text{ V}$   | 31   | 39   | -    | A             |
| $I_{GSS}$     | gate leakage current             | $V_{GS} = 13\text{ V}; V_{DS} = 0\text{ V}$                        | -    | -    | 450  | nA            |
| $g_{fs}$      | forward transconductance         | $V_{DS} = 10\text{ V}; I_D = 10.8\text{ A}$                        | 9.7  | 13.5 | 15   | 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 | -    | $\Omega$      |
| $C_{rs}$      | feedback capacitance             | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$<br>$f = 1\text{ MHz}$ | -    | 3.57 | -    | pF            |

## 7. Application information

**Table 7. Application information**

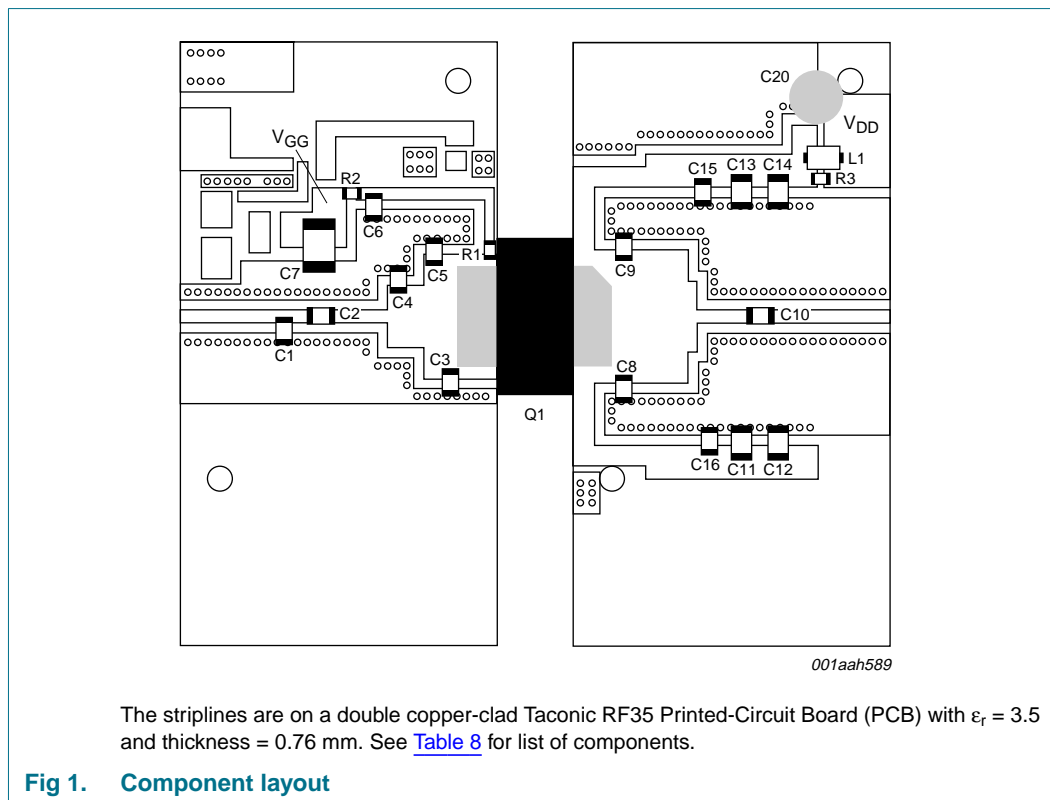
Mode of operation: 2-carrier W-CDMA; PAR 7 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1-64 PDPCH;  $f_1 = 1932.5\text{ MHz}$ ;  $f_2 = 1942.5\text{ MHz}$ ;  $f_3 = 1977.5\text{ MHz}$ ;  $f_4 = 1987.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1000\text{ mA}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

| Symbol      | Parameter                              | Conditions                  | Min  | Typ  | Max | Unit |
|-------------|--|-----------------------------|------|------|-----|------|
| $P_{L(AV)}$ | average output power                   |                             | -    | 35.5 | -   | W    |
| $G_p$       | power gain                             | $P_{L(AV)} = 35.5\text{ W}$ | 15.5 | 16.5 | -   | dB   |
| $RL_{in}$   | input return loss                      | $P_{L(AV)} = 35.5\text{ W}$ | -    | 8    | 5   | dB   |
| $\eta_D$    | drain efficiency                       | $P_{L(AV)} = 35.5\text{ W}$ | 27   | 30   | -   | %    |
| IMD3        | third order intermodulation distortion | $P_{L(AV)} = 35.5\text{ W}$ | -    | -37  | -35 | dBc  |
| ACPR        | adjacent channel power ratio           | $P_{L(AV)} = 35.5\text{ W}$ | -    | -40  | -38 | dBc  |

### 7.1 Ruggedness in class-AB operation

The BLF6G20LS-140 is capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 1000\text{ mA}$ ;  $P_L = 140\text{ W (CW)}$ ;  $f = 1990\text{ MHz}$ .

## 8. Test information



**Table 8.** List of components (see [Figure 1](#))

| Component          | Description                       | Value             | Remarks                                  |
|--------------------|-----------------------------------|-------------------|--|
| C1                 | multilayer ceramic chip capacitor | 0.5 pF            | [1]                                      |
| C2                 | multilayer ceramic chip capacitor | 10 pF             | [2]                                      |
| C3                 | multilayer ceramic chip capacitor | 0.9 pF            | [2]                                      |
| C4                 | multilayer ceramic chip capacitor | 1.1 pF            | [2]                                      |
| C5                 | multilayer ceramic chip capacitor | 1.4 pF            | [2]                                      |
| C6                 | multilayer ceramic chip capacitor | 15 pF             | [2]                                      |
| C7                 | multilayer ceramic chip capacitor | 10 $\mu$ F; 50 V  | TDK C5750X7R1H106M or equivalent         |
| C8, C9             | multilayer ceramic chip capacitor | 1.2 pF            | [2]                                      |
| C10                | multilayer ceramic chip capacitor | 13 pF             | [2]                                      |
| C11, C12, C13, C14 | multilayer ceramic chip capacitor | 4.7 $\mu$ F; 50 V | TDK C4532X7R1H475M or equivalent         |
| C20                | electrolytic capacitor            | 220 $\mu$ F; 35 V |  |
| L1                 | ferrite SMD bead                  | -                 | Ferroxcube BDS 3/3/8.9-4S2 or equivalent |
| Q1                 | BLF6G20LS-140                     | -                 |  |
| R1                 | SMD resistor                      | 0 $\Omega$        |  |
| R2                 | SMD resistor                      | 3.3 k $\Omega$    |  |
| R3                 | SMD resistor                      | 9.1 $\Omega$      |  |

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

[2] American Technical Ceramics type 100B or capacitor of same quality.

9. Package outline

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

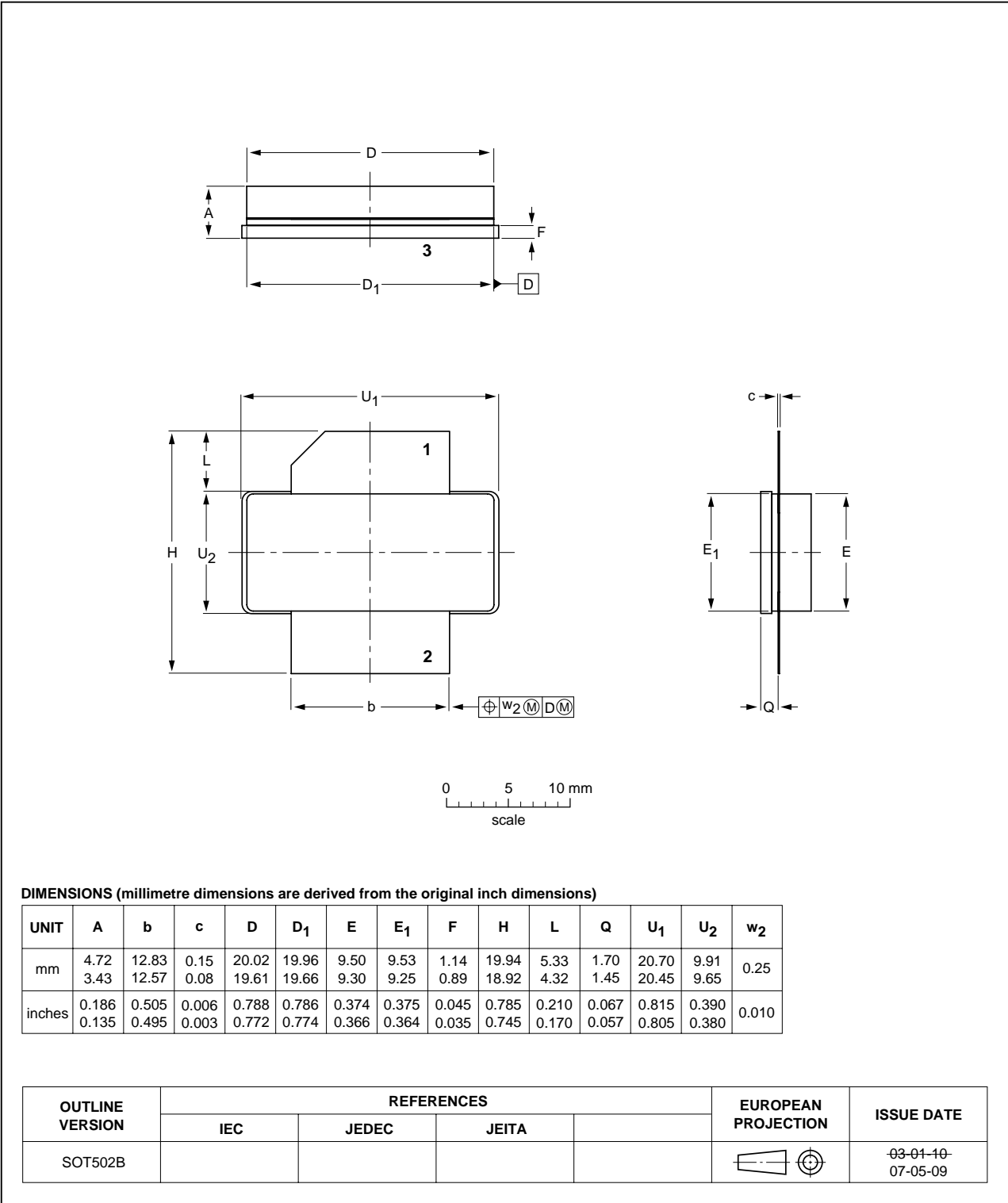


Fig 2. Package outline SOT502B

## 10. Abbreviations

Table 9. Abbreviations

| Acronym | Description   |
|---------|---|
| 3GPP    | Third 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                   |
| GSM     | Global System for Mobile communications                 |
| LDMOS   | Laterally Diffused Metal Oxide Semiconductor            |
| LDMOST  | Laterally Diffused Metal-Oxide Semiconductor Transistor |
| PAR     | Peak-to-Average power Ratio                             |
| PDPCH   | transmission Power of the Dedicated Physical CHannel    |
| RF      | Radio Frequency   |
| SMD     | Surface Mounted Device                                  |
| VSWR    | Voltage Standing Wave Ratio                             |
| W-CDMA  | Wideband Code Division Multiple Access                  |

## 11. Revision history

Table 10. Revision history

| Document ID     | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| BLF6G20LS-140_1 | 20090227     | Product 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.                                     |

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[2] The term 'short data sheet' is explained in section "Definitions".

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