# BLF7G15LS-300P

## Power LDMOS transistor

Rev. 3 — 12 July 2013 Product data sheet

# 1. Product profile

## 1.1 General description

300 W LDMOS power transistor for base station applications at frequencies from 1450 MHz to 1550 MHz.

**Table 1. Typical performance**

*Typical RF performance at $T_{case}$ = 25 °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) | $\eta_D$ (%) | ACPR (dBc) |
|---|---|---|---|---|---|---|---|
| 2-carrier W-CDMA | 1476 to 1511 | 2600 | 28 | 85 | 18 | 31 | –32 [1] |

[1] Test signal: 3GPP test model 1; 64 DPCH; PAR = 7.5 dB at 0.01 % probability on CCDF per carrier. Carrier spacing 5 MHz.

## 1.2 Features and benefits

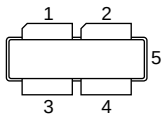
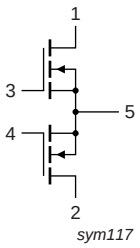
- High efficiency
- Low $R_{th}$ providing excellent thermal stability
- Designed for broadband operation (1450 MHz to 1550 MHz)
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for 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 W-CDMA base stations and multi carrier applications in the 1450 MHz to 1550 MHz frequency range

## 2. Pinning information

**Table 2. Discrete pinning**

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| 1 | drain1 |  |  |
| 2 | drain2 | | |
| 3 | gate1 | | |
| 4 | gate2 | | |
| 5 | source [1] | | |





[1] Connected to flange

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BLF7G15LS-300P | - | 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 | per section | - | 45 | 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 °C; $P_L$ = 85 W; $V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA | 0.21 | K/W |

# 6. Characteristics

**Table 6. Characteristics**

*$T_j$ = 25 °C; per section unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS}$ = 0 V; $I_D$ = 2.2 mA | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS}$ = 10 V; $I_D$ = 220 mA | 1.5 | 1.9 | 2.3 | V |
| $I_{DSS}$ | drain leakage current | $V_{GS}$ = 0 V; $V_{DS}$ = 28 V | - | - | 2.8 | μA |
| $I_{DSX}$ | drain cut-off current | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $V_{DS}$ = 10 V | 34 | 39 | - | A |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = 11 V; $V_{DS}$ = 0 V | - | - | 280 | nA |
| $g_{fs}$ | forward transconductance | $V_{DS}$ = 10 V; $I_D$ = 11.0 A | - | 16.2 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $I_D$ = 7.7 A | - | 0.065 | - | Ω |

# 7. Test information

**Table 7. Functional test information**

*Mode of operation: 2-carrier W-CDMA; PAR = 7.5 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 64 DPCH; $f_1$ = 1473.5 MHz; $f_2$ = 1478.5 MHz; $f_3$ = 1508.5 MHz; $f_4$ = 1513.5 MHz; RF performance at $V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA; $T_{case}$ = 25 °C; unless otherwise specified; in a class-AB production test circuit.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $P_{L(AV)}$ | average output power | | - | 85 | - | W |
| $G_p$ | power gain | $P_{L(AV)}$ = 85 W | 17 | 18 | - | dB |
| $RL_{in}$ | input return loss | $P_{L(AV)}$ = 85 W | - | –7 | –6 | dB |
| $\eta_D$ | drain efficiency | $P_{L(AV)}$ = 85 W | 28 | 31 | - | % |
| ACPR | adjacent channel power ratio | $P_{L(AV)}$ = 85 W | - | –32 | –28 | dBc |

**Table 8. PAR performance**

*Mode of operation: 1-carrier W-CDMA; PAR = 7.5 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 64 DPCH; $f_1$ = 1511 MHz; RF performance at $V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA; $T_{case}$ = 25 °C; unless otherwise specified; in a class-AB production test circuit.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $PAR_O$ | output peak-to-average ratio | $P_{L(AV)}$ = 130 W at 0.01 % probability on CCDF | 4.4 | 5.0 | - | dB |

## 7.1 Ruggedness in class-AB operation

The BLF7G15LS-300P is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA; $P_L$ = 100 W (CW); f = 1450 MHz to 1550 MHz.

## 7.2 Impedance information

**Table 9. Typical impedance per section (for the maximum peak power)**

*$I_{Dq}$ = 1300 mA; $V_{DS}$ = 28 V.*
*$Z_S$ and $Z_L$ defined in Figure 1.*

| f | $Z_S$ | $Z_L$ |
|---|---|---|
| (MHz) | (Ω) | (Ω) |
| 1410 | 0.65 – j2.06 | 6.3 – j2.1 |
| 1480 | 0.55 – j1.92 | 7.2 – j1.3 |
| 1560 | 0.63 – j2.14 | 6.8 + j0.26 |

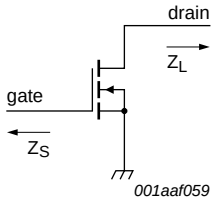
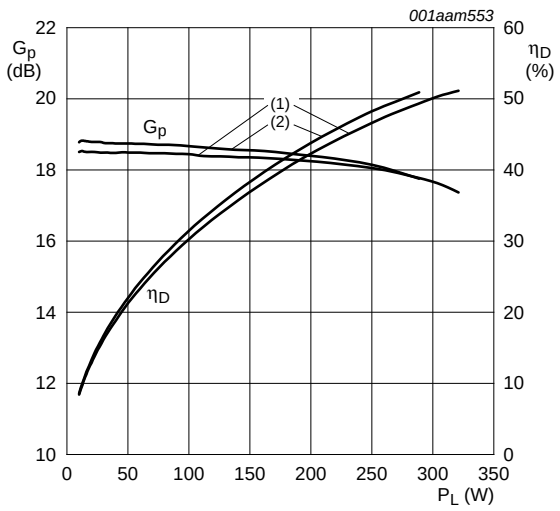



**Fig 1. Definition of transistor impedance**

## 7.3 Graphs

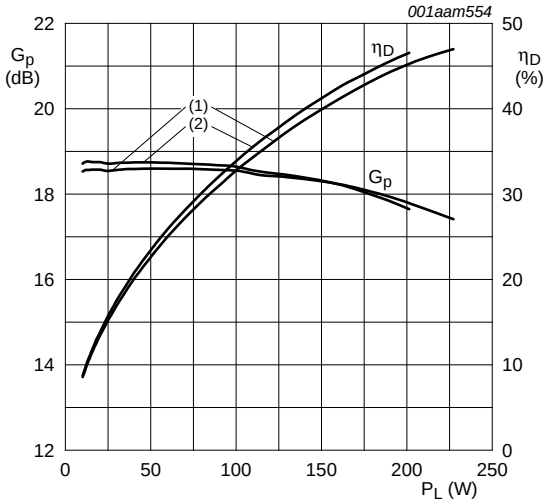



$V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA.

(1) f = 1476 MHz

(2) f = 1511 MHz

**Fig 2. One-tone CW power gain and drain efficiency as function of load power; typical values**

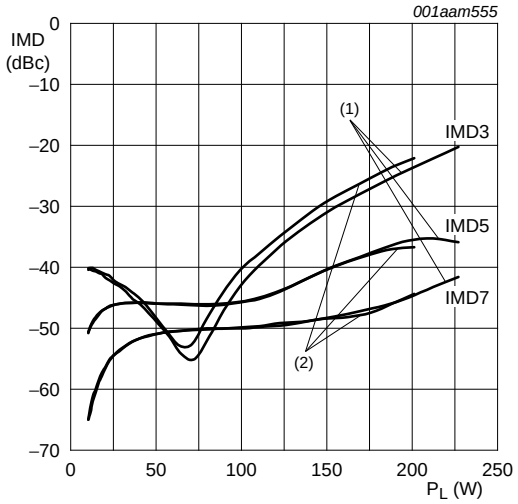



$V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA;
tone spacing 0.1 MHz.

(1) f = 1476 MHz

(2) f = 1511 MHz

**Fig 3. Two-tone CW power gain and drain efficiency as function of average load power; typical values**

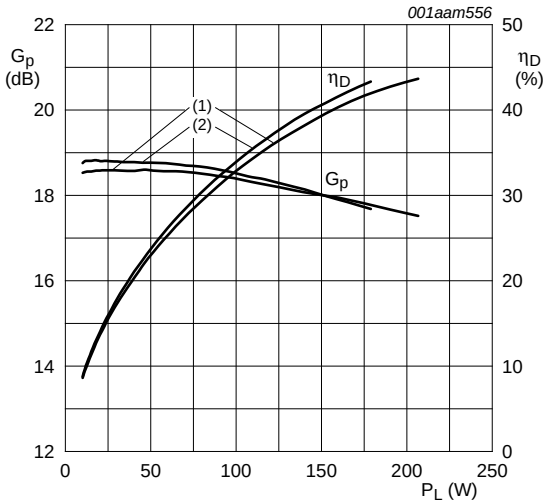



$V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA;
tone spacing 0.1 MHz.

(1) f = 1476 MHz

(2) f = 1511 MHz

**Fig 4. Two-tone intermodulation distortion as a function of average load power; typical values**

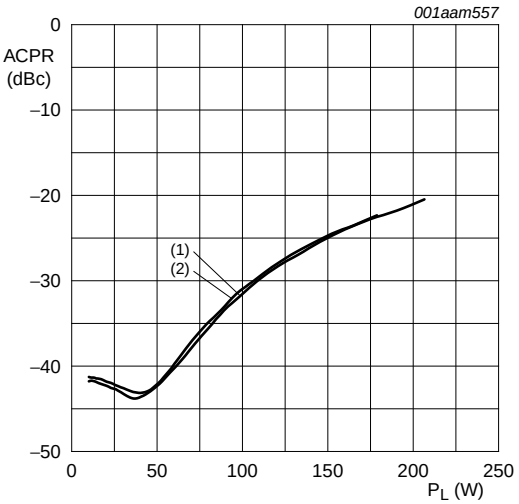



$V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA;
carrier spacing 5 MHz.

(1) f = 1476 MHz

(2) f = 1511 MHz

**Fig 5. 2-carrier W-CDMA power gain and drain efficiency as function of load power; typical values**



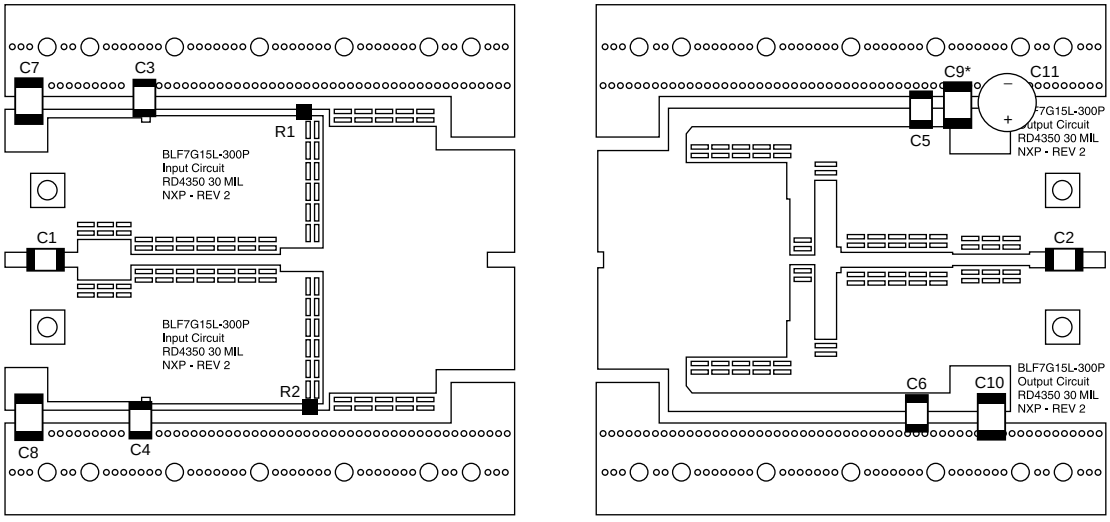

$V_{DS}$ = 28 V; $I_{Dq}$ = 2600 mA;
carrier spacing 5 MHz.

(1) f = 1476 MHz

(2) f = 1511 MHz

**Fig 6. 2-carrier W-CDMA adjacent channel power ratio as function of load power 5 MHz frequency offset; typical values**

## 7.4 Test circuit




Rogers RO4350 Printed-Circuit Board (PCB) with $\varepsilon_r$ = 3.5 and thickness = 0.765 mm (30 mil).

See Table 10 for list of components. The drawing is not to scale.

The vias can be as a reference to place components.
The above layout shows the test circuit used to measure devices in production. The RF Power and Base-Station group can provide a more appropriate application demonstration for specific customer needs.

**Fig 7. Component layout**

**Table 10. List of components**

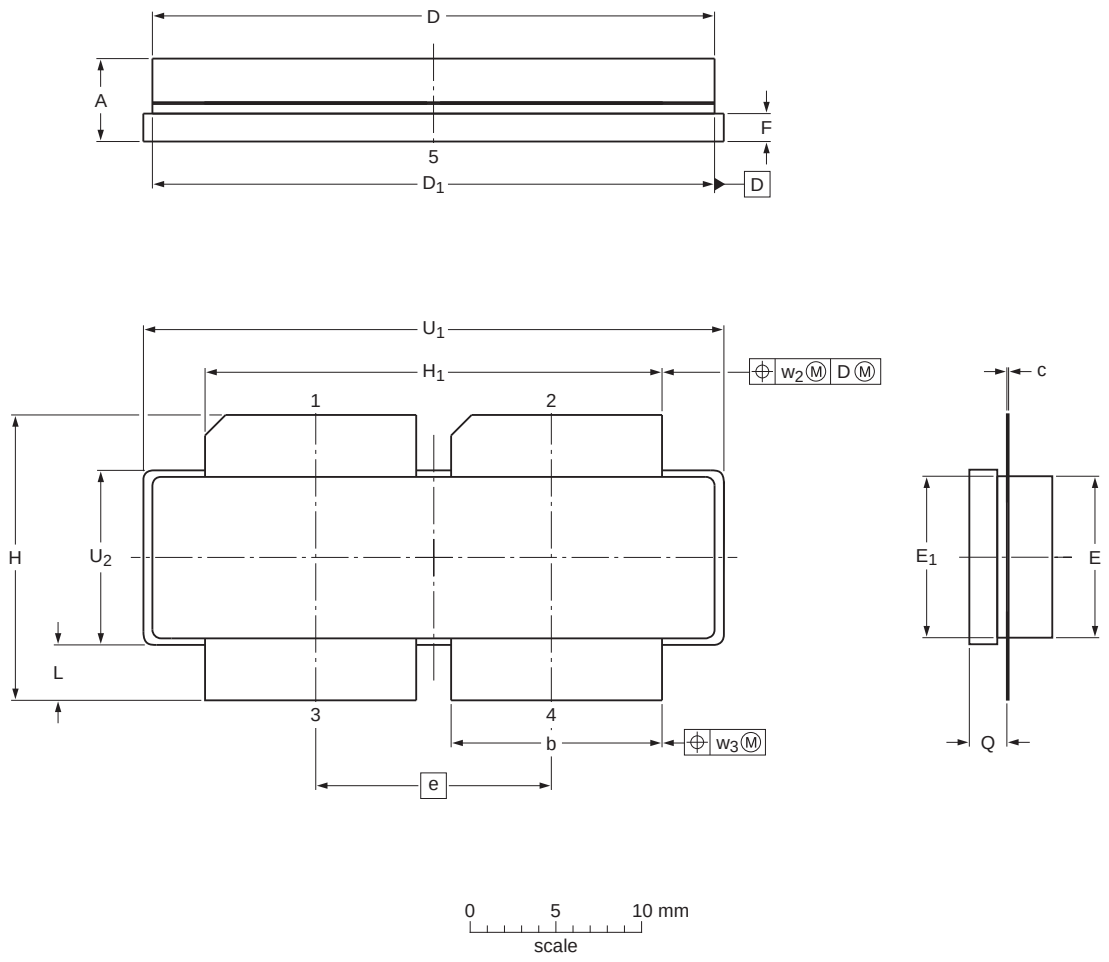
*See Figure 7 for test circuit.*

| Component | Description | Value | | Remarks |
|---|---|---|---|---|
| C1, C2 | multi layer ceramic chip capacitor | 100 pF | [1] | ATC 800B |
| C3, C4 | multi layer ceramic chip capacitor | 68 pF | [1] | ATC 800B |
| C5, C6 | multi layer ceramic chip capacitor | 47 pF | [1] | ATC 800A |
| C7, C8, C9, C10 | multi layer ceramic chip capacitor | 10 μF | | Murata |
| C11 | electrolytic capacitor | 470 μF; 63 V | | |
| R1, R2 | chip resistor | 15 Ω | | Philips 1206 |

[1] All ATC chip capacitors need to be soldered vertically.

# 8. Package outline

**Earless flanged balanced ceramic package; 4 leads** **SOT539B**




Dimensions

| Unit[1] | | A | b | c | D | $D_1$ | E | $E_1$ | e | F | H | $H_1$ | L | Q | $U_1$ | $U_2$ | $w_2$ | $w_3$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 4.7 | 11.81 | 0.18 | 31.55 | 31.52 | 9.5 | 9.53 | 13.72 | 1.75 | 17.12 | 25.53 | 3.48 | 2.26 | 32.39 | 10.29 | 0.25 | 0.25 |
| | nom | | | | | | | | | | | | | | | | | |
| | min | 4.2 | 11.56 | 0.10 | 30.94 | 30.96 | 9.3 | 9.27 | | 1.50 | 16.10 | 25.27 | 2.97 | 2.01 | 32.13 | 10.03 | | |
| inches | max | 0.185 | 0.465 | 0.007 | 1.242 | 1.241 | 0.374 | 0.375 | 0.54 | 0.069 | 0.674 | 1.005 | 0.137 | 0.089 | 1.275 | 0.405 | 0.01 | 0.01 |
| | nom | | | | | | | | | | | | | | | | | |
| | min | 0.165 | 0.455 | 0.004 | 1.218 | 1.219 | 0.366 | 0.365 | | 0.059 | 0.634 | 0.995 | 0.117 | 0.079 | 1.265 | 0.395 | | |

Note
1. millimeter dimensions are derived from the original inch dimensions.

*sot539b_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT539B | | | | | | ~~12-05-02~~ 13-05-24 |

**Fig 8. Package outline SOT539B**

## 9. Abbreviations

**Table 11. 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 |
| RF | Radio Frequency |
| VSWR | Voltage Standing Wave Ratio |
| W-CDMA | Wideband Code Division Multiple Access |

## 10. Revision history

**Table 12. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BLF7G15LS-300P v.3 | 20130712 | Product data sheet | - | BLF7G15LS-300P v.2 |
| Modifications: | • The package outline Figure 8 is updated.<br>• Translation disclaimer added to the legal text. | | | |
| BLF7G15LS-300P v.2 | 20101203 | Product data sheet | - | BLF7G15LS-300P v.1 |
| Modifications: | • Section 1.2 on page 1: list item “Excellent ruggedness” removed.<br>• Table 7 on page 3: values of $RL_{in}$ have been projected on negative scale.<br>• Section “Handling information” removed | | | |
| BLF7G15LS-300P v.1 | 20100921 | Preliminary data sheet | - | - |

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| Document status[1][2] | Product status[3] | Definition |
|---|---|---|
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## 13. Contents





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