

BLF640

Broadband power LDMOS transistor

Rev. 3 — 1 September 2015

AMPLEON

Product data sheet

1. Product profile

1.1 General description

10 W LDMOS power transistor for applications at frequencies from HF to 2200 MHz

Table 1. Typical performance

$I_{DQ} = 100 \text{ mA}$; $T_{case} = 25 \text{ }^\circ\text{C}$ in a common source class-AB production test circuit.

| Test signal | f (MHz) | V _{DS} (V) | P _{L(AV)} (W) | G _p (dB) | η_D (%) | ACPR (dBc) |
|------------------|--------------|------------------------|---------------------------|------------------------|-----------------|-------------------------|
| 2-carrier W-CDMA | 2110 to 2170 | 28 | 0.7 | 18.5 | 15 | -50 [1] |
| 1-carrier W-CDMA | 2110 to 2170 | 28 | 2 | 19.3 | 31 | -39 [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

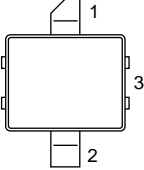
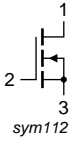
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- No internal matching for broadband operation
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for applications in the HF to 2200 MHz frequency range
- Broadcast drivers

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|-------------|---|---|
| 1 | drain |  |  sym112 |
| 2 | gate | | |
| 3 | source | | |

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| BLF640 | - | ceramic surface-mounted package; 2 leads | SOT538A |

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 | | - | 225 | °C |

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Typ | Unit |
|------------------|--|--|---------|------|
| $R_{th(j-case)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C}; P_{L(AV)} = 11\text{ W}$ | [1] 3.2 | K/W |

[1] Thermal resistance is determined under specified RF operating conditions

6. 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 | $V_{GS} = 0\text{ V}; I_D = 0.5\text{ mA}$ | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS} = 10\text{ V}; I_D = 18\text{ mA}$ | 1.4 | 1.9 | 2.4 | V |
| I_{DSS} | drain leakage current | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$ | - | - | 1.5 | μA |
| I_{DSX} | drain cut-off current | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$ | - | 3.1 | - | A |
| I_{GSS} | gate leakage current | $V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$ | - | - | 150 | nA |
| g_{fs} | forward transconductance | $V_{DS} = 10\text{ V}; I_D = 0.9\text{ A}$ | - | 0.5 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 0.625\text{ A}$ | - | 0.4 | - | Ω |

Table 7. AC characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------|----------------------|---|-----|-----|-----|------|
| C_{rs} | feedback capacitance | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}; f = 1\text{ MHz}$ | - | 0.5 | - | pF |

Table 8. RF characteristics

PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1-64 PDPCH; RF performance at $V_{DS} = 28\text{ V}; I_{Dq} = 100\text{ mA}; T_{case} = 25\text{ °C}$; unless otherwise specified; in a class-AB production test circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------------|------------------------------|--|------|------|-----|------|
| Test signal: 2-carrier W-CDMA | | $f_1 = 2112.5\text{ MHz}; f_2 = 2117.5\text{ MHz}; f_3 = 2162.5\text{ MHz}; f_4 = 2167.5\text{ MHz}$ | | | | |
| G_p | power gain | $P_{L(AV)} = 0.7\text{ W}$ | - | 18.5 | - | dB |
| η_D | drain efficiency | $P_{L(AV)} = 0.7\text{ W}$ | - | 15 | - | % |
| ACPR | adjacent channel power ratio | $P_{L(AV)} = 0.7\text{ W}$ | - | -50 | - | dBc |
| Test signal: 1-carrier W-CDMA | | $f_1 = 2112.5\text{ MHz}; f_2 = 2167.5\text{ MHz}$ | | | | |
| G_p | power gain | $P_{L(AV)} = 2\text{ W}$ | 17.3 | 19.3 | - | dB |
| η_D | drain efficiency | $P_{L(AV)} = 2\text{ W}$ | 29 | 31 | - | % |
| ACPR | adjacent channel power ratio | $P_{L(AV)} = 2\text{ W}$ | - | -39 | -36 | dBc |

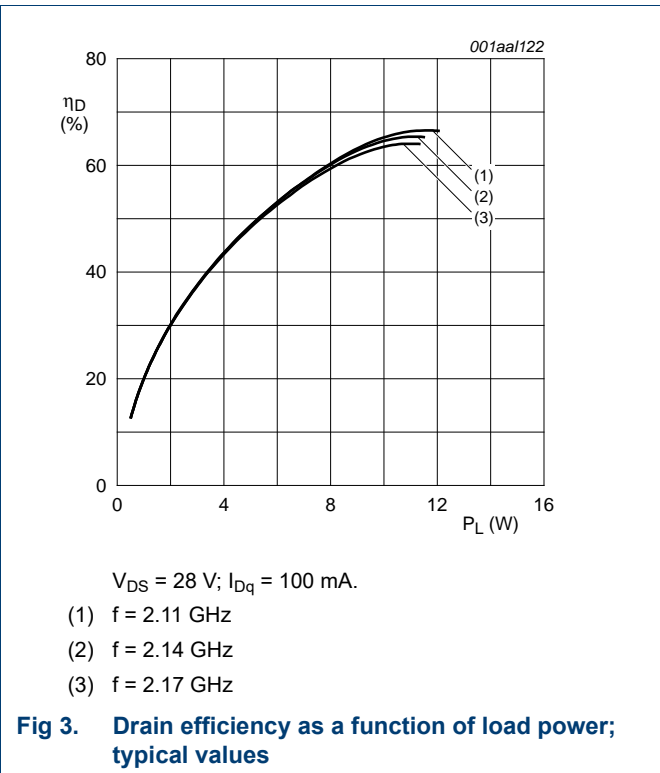
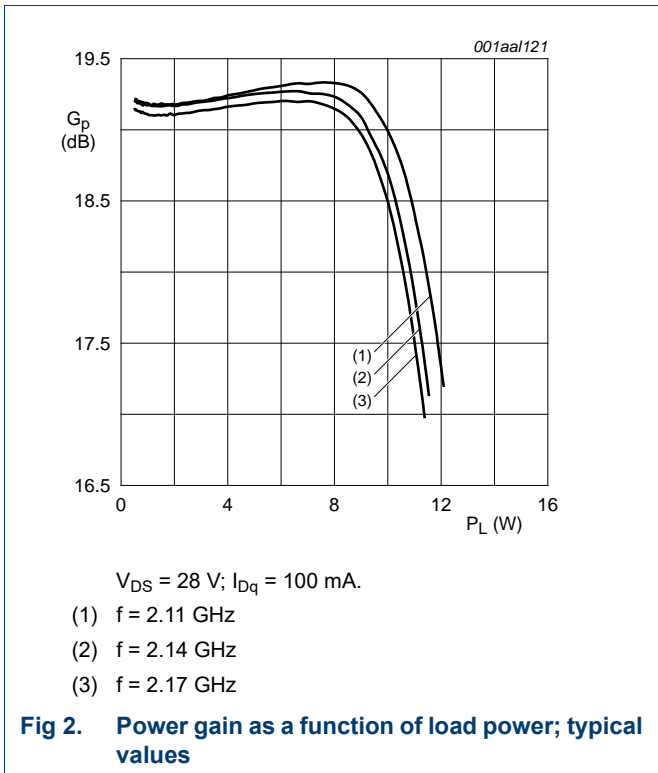
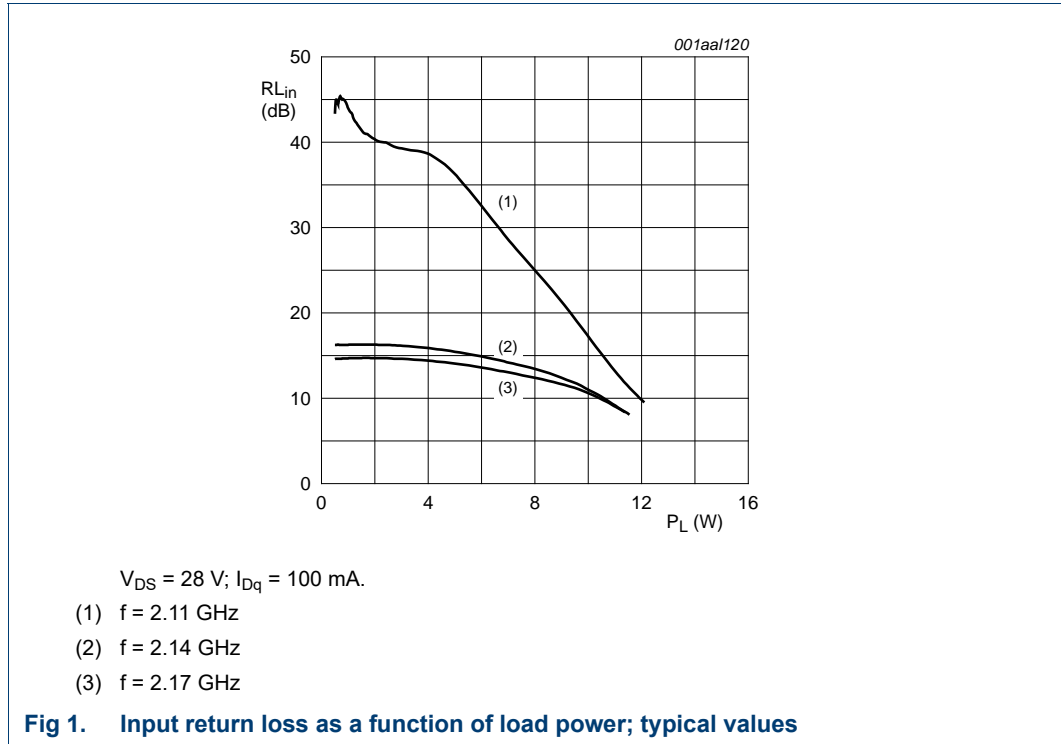
7. Test information

7.1 Ruggedness in class-AB operation

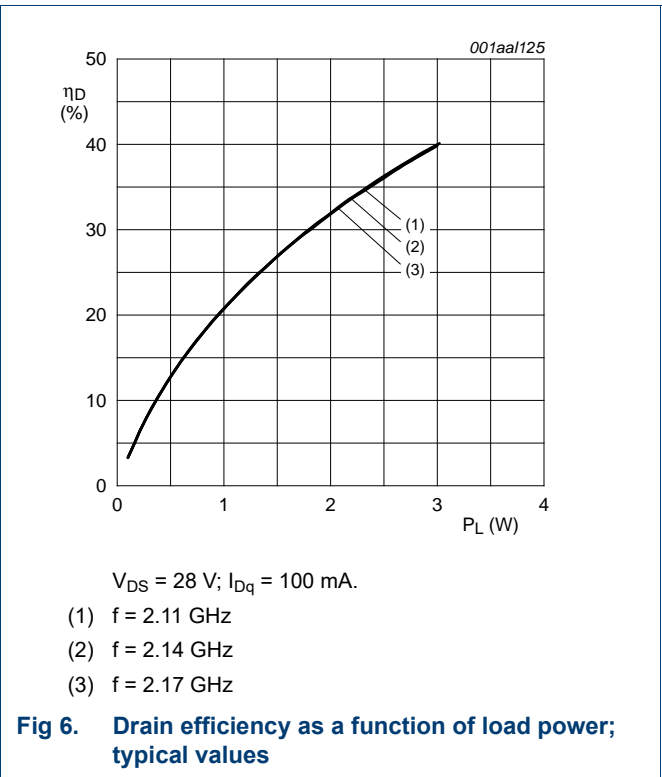
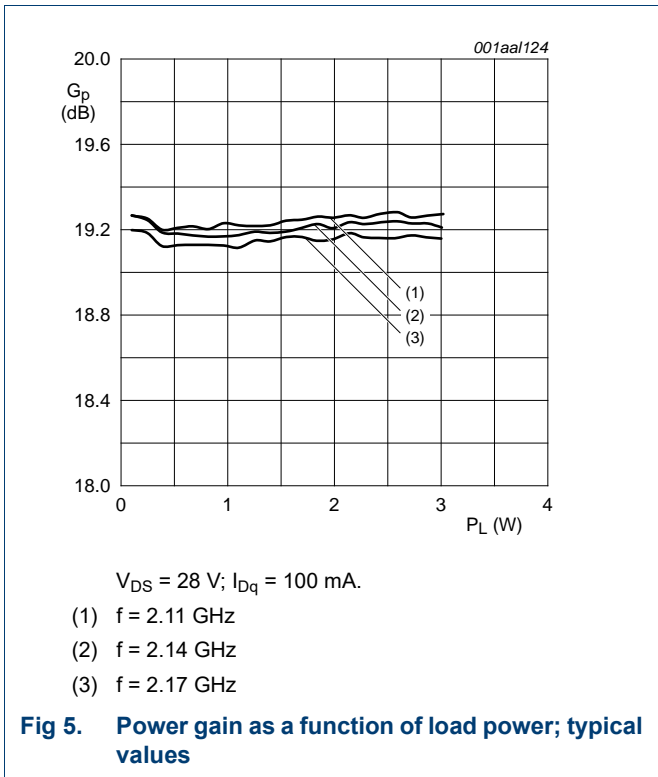
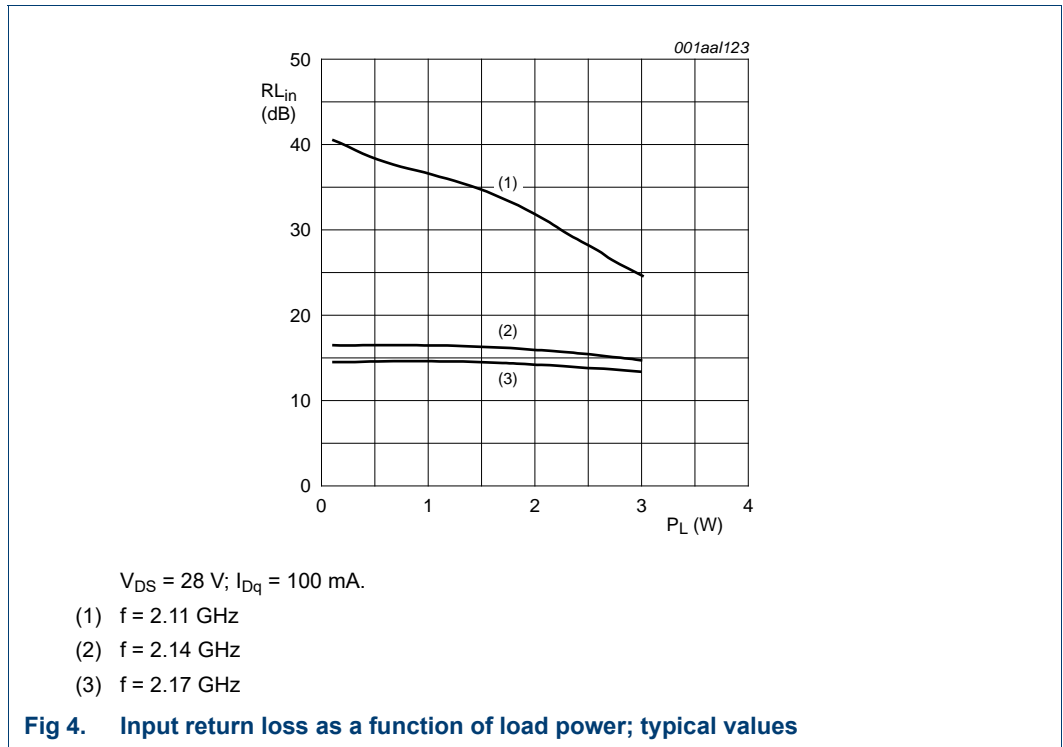
The BLF640 is capable of withstanding a load mismatch corresponding to $VSWR = 10 : 1$ through all phases under the following conditions: $V_{DS} = 28\text{ V}; f = 2140\text{ MHz}$ at $P_L = 10\text{ W}$.

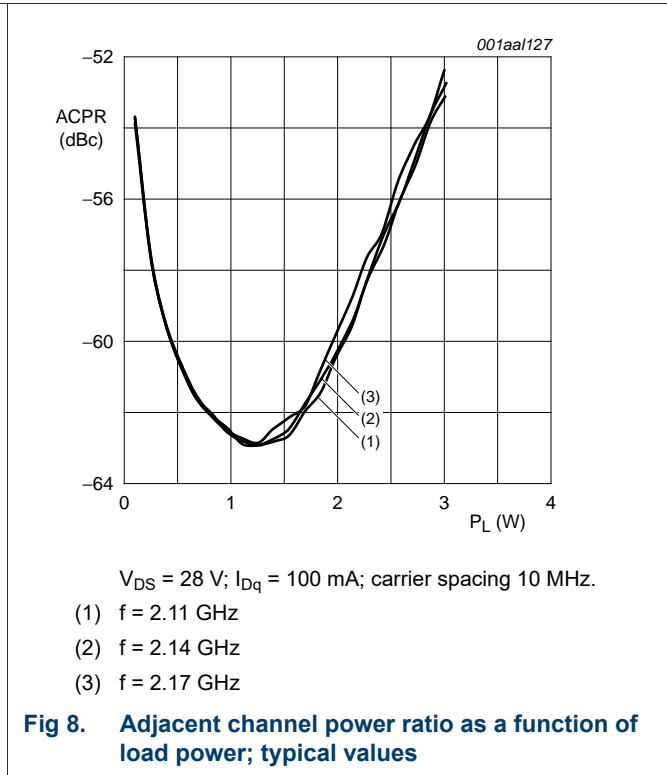
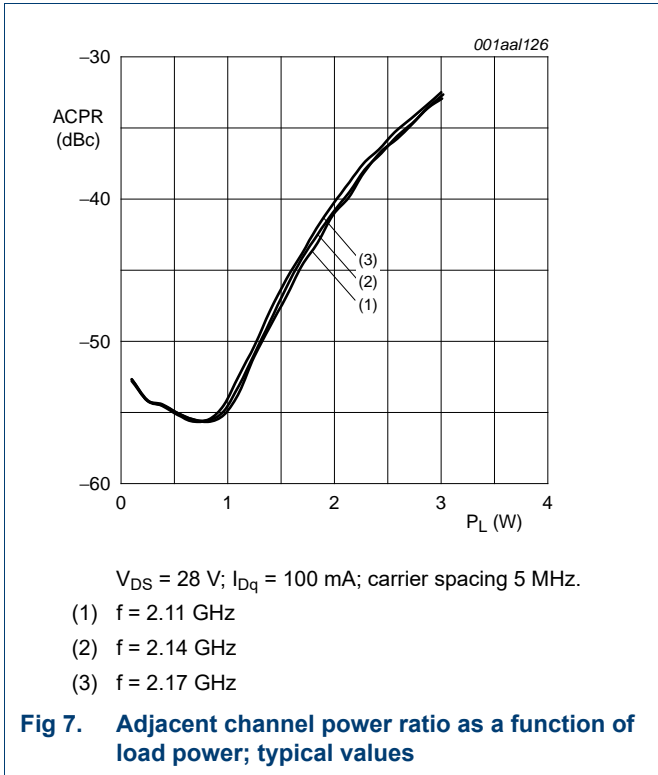
7.2 Graphical data

7.2.1 CW

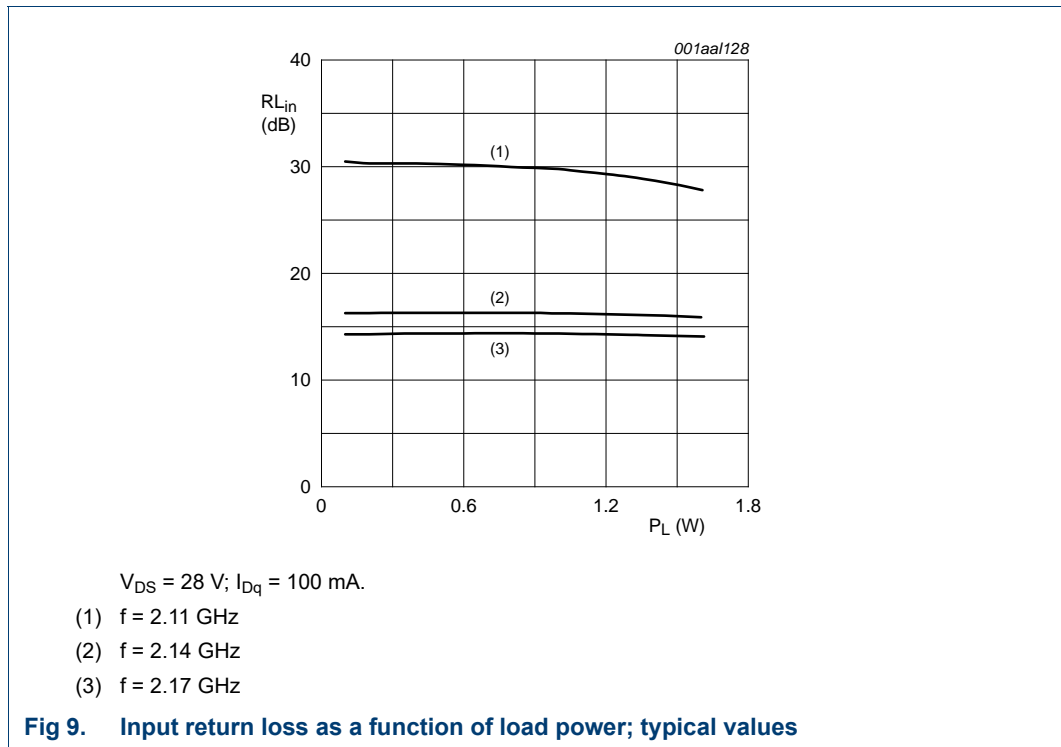


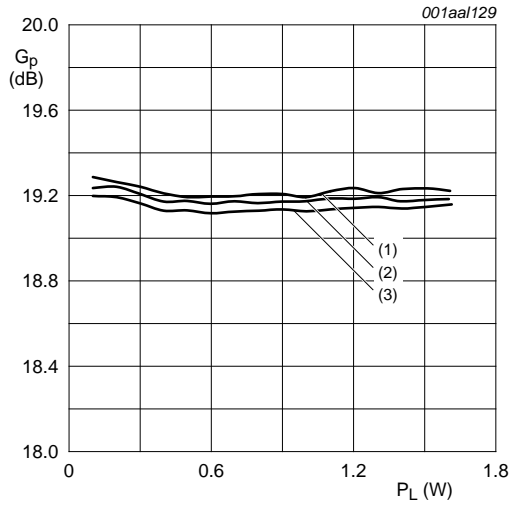
7.2.2 1-Carrier W-CDMA





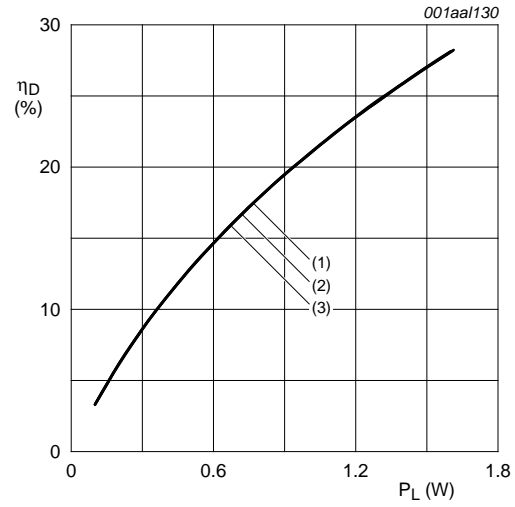
7.2.3 2-Carrier W-CDMA





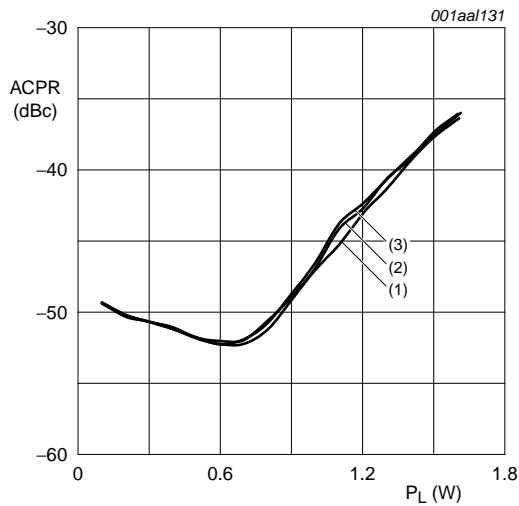
$V_{DS} = 28\text{ V}; I_{Dq} = 100\text{ mA}.$
 (1) $f = 2.11\text{ GHz}$
 (2) $f = 2.14\text{ GHz}$
 (3) $f = 2.17\text{ GHz}$

Fig 10. Power gain as a function of load power; typical values



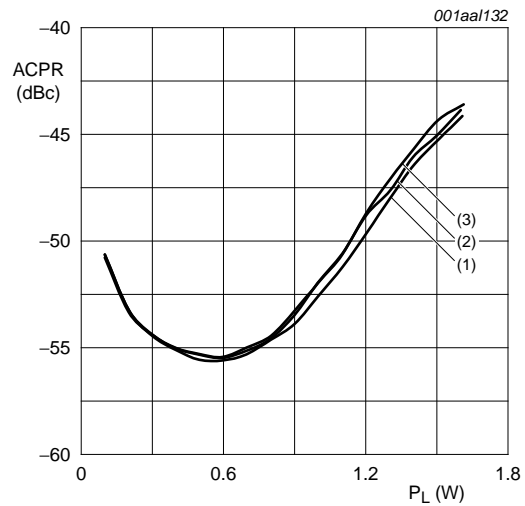
$V_{DS} = 28\text{ V}; I_{Dq} = 100\text{ mA}.$
 (1) $f = 2.11\text{ GHz}$
 (2) $f = 2.14\text{ GHz}$
 (3) $f = 2.17\text{ GHz}$

Fig 11. Drain efficiency as a function of load power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 100\text{ mA};$ carrier spacing 5 MHz.
 (1) $f = 2.11\text{ GHz}$
 (2) $f = 2.14\text{ GHz}$
 (3) $f = 2.17\text{ GHz}$

Fig 12. Adjacent channel power ratio as a function of load power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 100\text{ mA};$ carrier spacing 10 MHz.
 (1) $f = 2.11\text{ GHz}$
 (2) $f = 2.14\text{ GHz}$
 (3) $f = 2.17\text{ GHz}$

Fig 13. Adjacent channel power ratio as a function of load power; typical values

8. Package outline

Ceramic surface-mounted package; 2 leads

SOT538A

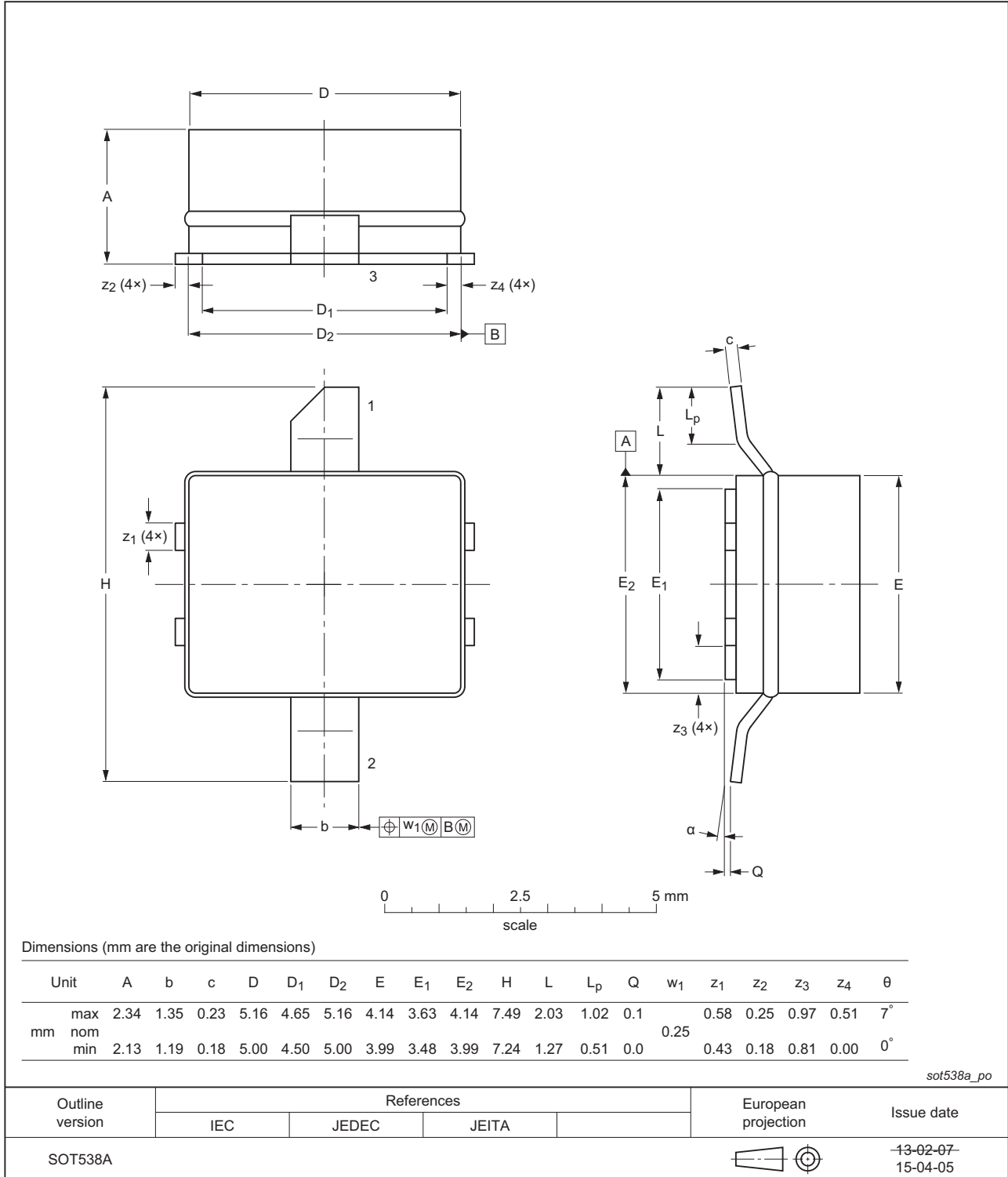


Fig 14. Package outline SOT538A

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 9. Abbreviations

| Acronym | Description |
|---------|--|
| 3GPP | 3rd Generation Partnership Project |
| CCDF | Complementary Cumulative Distribution Function |
| CW | Continuous Wave |
| DPCH | Dedicated Physical CHannel |
| ESD | ElectroStatic Discharge |
| HF | High Frequency |
| LDMOS | Laterally Diffused Metal Oxide Semiconductor |
| PAR | Peak-to-Average Ratio |
| PDPCH | transmission Power of the Dedicated Physical CHannel |
| PHS | Personal Handy-phone System |
| 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 |
|----------------|--|--------------------|---------------|------------|
| BLF640#3 | 20150901 | Product data sheet | - | BLF640 v.2 |
| Modifications: | <ul style="list-style-type: none"> The format of this document has been redesigned to comply with the new identity guidelines of Ampleon. Legal texts have been adapted to the new company name where appropriate. | | | |
| BLF640 v.2 | 20130411 | Product data sheet | - | BLF640 v.1 |
| BLF640 v.1 | 20121207 | Product data sheet | - | - |

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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".

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