# BLF647P; BLF647PS

## Broadband power LDMOS transistor

Rev. 1 — 3 August 2012 Objective data sheet

## 1. Product profile

### 1.1 General description

A 200 W LDMOS RF power transistor for broadcast transmitter and industrial applications. The transistor is suitable for the frequency range HF to 1500 MHz. The excellent ruggedness and broadband performance of this device makes it ideal for digital applications.

**Table 1. Application information**

*RF performance at $T_h$ = 25 °C in a common source test circuit.*

| Test signal | f (MHz) | $V_{DS}$ (V) | $P_{L(AV)}$ (W) | $P_{L(M)}$ (W) | $G_p$ (dB) | $\eta_D$ (%) | IMD3 (dBc) |
|---|---|---|---|---|---|---|---|
| Pulsed, class-B | 1300 | 32 | - | 200 | 18 | 70 | - |
| CW, class-B | 1300 | 32 | 200 | - | 18 | 70 | - |
| 2-tone, class-AB | $f_1$ = 1299.95; $f_2$ = 1300.05 | 32 | 75 | - | 19 | 48 | –31 |

### 1.2 Features and benefits

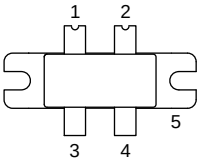
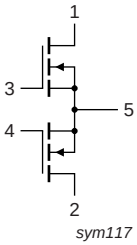
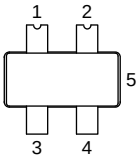
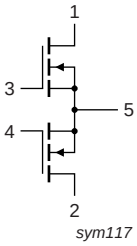
- Pulsed performance at 1300 MHz, a $V_{DS}$ of 32 V and an $I_{Dq}$ = 0.01 A:
  - Peak output power = 200 W
  - Power gain = 18 dB
  - Drain efficiency = 70 %
- CW performance at 1300 MHz, a $V_{DS}$ of 32 V and an $I_{Dq}$ = 0.01 A:
  - Average output power = 200 W
  - Power gain = 18 dB
  - Drain efficiency = 70 %
- 2-tone performance at 1300 MHz, a $V_{DS}$ of 32 V and an $I_{Dq}$ = 0.7 A:
  - Average output power = 75 W
  - Power gain = 19 dB
  - Drain efficiency = 48 %
  - Intermodulation distortion = –31 dBc
- Integrated ESD protection
- Excellent ruggedness
- High power gain
- High efficiency
- Excellent reliability
- Easy power control
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- Communication transmitter applications in the HF to 1500 MHz frequency range
- Industrial applications in the HF to 1400 MHz frequency range

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| **BLF647P (SOT1121A)** | | | | |
| 1 | drain1 | |  |  |
| 2 | drain2 | | | |
| 3 | gate1 | | | |
| 4 | gate2 | | | |
| 5 | source | [1] | | |
| **BLF647PS (SOT1121B)** | | | | |
| 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 |
| BLF647P | - | flanged LDMOST ceramic package; 2 mounting holes; 4 leads | SOT1121A |
| BLF647PS | - | earless flanged ceramic package; 4 leads | SOT1121B |

# 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 | +11 | V |
| $T_{stg}$ | 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; $P_L$ = 200 W | [1] | 0.32 | K/W |

[1] $R_{th(j-c)}$ is measured under RF conditions.

# 6. Characteristics

## 6.1 DC characteristics

**Table 6. DC 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; $I_D$ = 0.5 mA | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS}$ = 32 V; $I_D$ = 50 mA | 1.4 | 1.9 | 2.4 | V |
| $V_{GSq}$ | gate-source quiescent voltage | $V_{DS}$ = 32 V; $I_{Dq}$ = 250 mA | 1.5 | 2.0 | 2.5 | V |
| $I_{DSS}$ | drain leakage current | $V_{GS}$ = 0 V; $V_{DS}$ = 32 V | - | - | 1.4 | μA |
| $I_{DSX}$ | drain cut-off current | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $V_{DS}$ = 10 V | 20 | 22 | - | A |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = ±10 V; $V_{DS}$ = 0 V | - | - | 50 | nA |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $I_D$ = 1.75 A | - | 140 | - | mΩ |

## 6.2 AC characteristics

**Table 7. AC characteristics**

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $C_{iss}$ | input capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 32 V; f = 1 MHz | - | 78 | - | pF |
| $C_{oss}$ | output capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 32 V; f = 1 MHz | - | 30 | - | pF |
| $C_{rs}$ | feedback capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 32 V; f = 1 MHz | - | 1.3 | - | pF |

## 6.3 RF characteristics

**Table 8. RF characteristics**

*Test signal: CW; f = 1300 MHz; RF performance at $V_{DS}$ = 32 V; $I_{Dq}$ = 10 mA; $T_{case}$ = 25 °C; unless otherwise specified; in a class-AB production test circuit.*

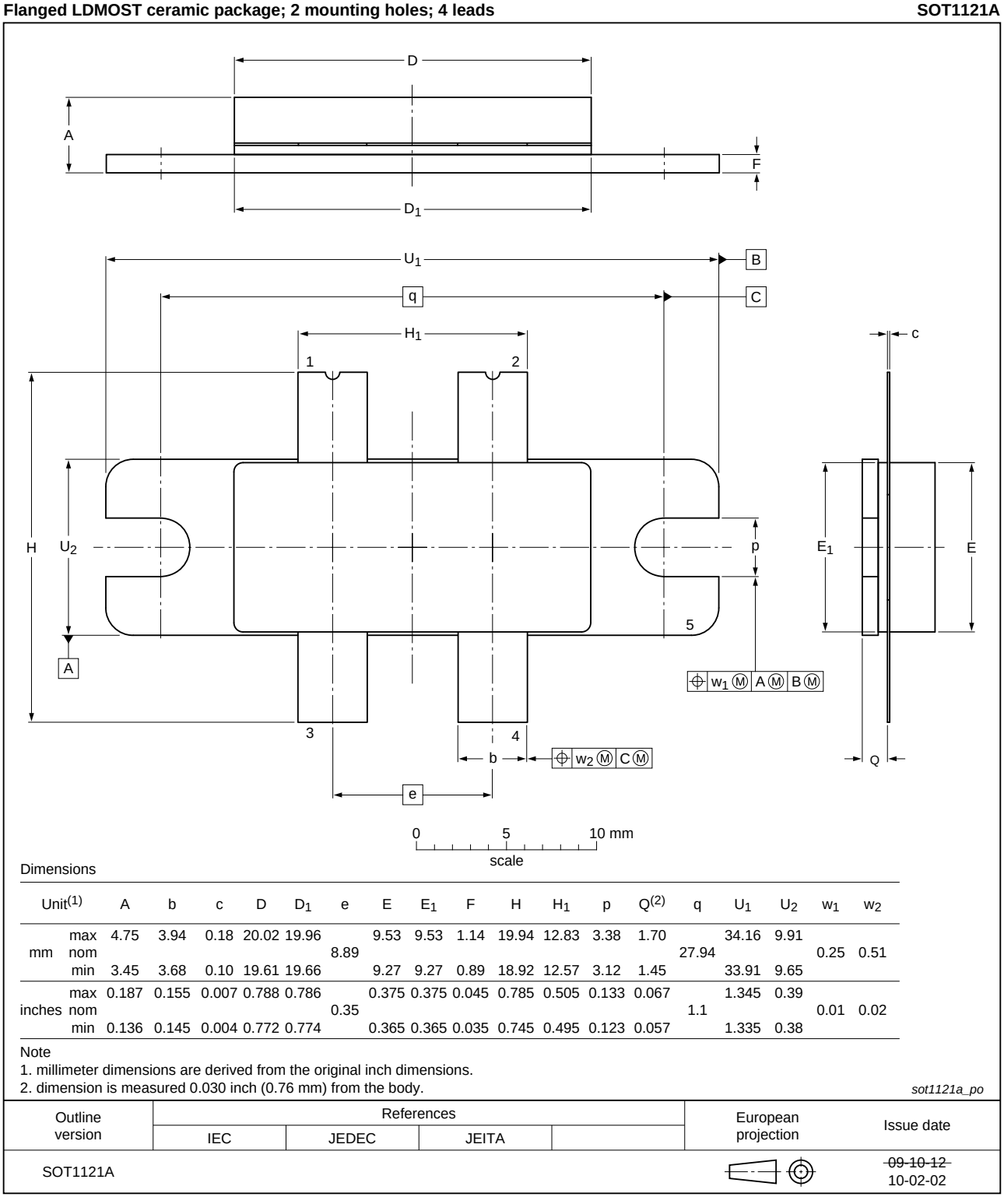
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $G_p$ | power gain | $P_L$ = 200 W | 17 | 18 | - | dB |
| $\eta_D$ | drain efficiency | $P_L$ = 200 W | 66 | 70 | - | % |

## 6.4 Ruggedness in class-AB operation

The BLF647P and the BLF647PS are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS}$ = 32 V; f = 1300 MHz at rated load power.

# 7. Package outline

**Flanged LDMOST ceramic package; 2 mounting holes; 4 leads** **SOT1121A**




Dimensions

| Unit[1] | | A | b | c | D | D1 | e | E | E1 | F | H | H1 | p | Q[2] | q | U1 | U2 | w1 | w2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 4.75 | 3.94 | 0.18 | 20.02 | 19.96 | | 9.53 | 9.53 | 1.14 | 19.94 | 12.83 | 3.38 | 1.70 | | 34.16 | 9.91 | | |
| | nom | | | | | | 8.89 | | | | | | | | 27.94 | | | 0.25 | 0.51 |
| | min | 3.45 | 3.68 | 0.10 | 19.61 | 19.66 | | 9.27 | 9.27 | 0.89 | 18.92 | 12.57 | 3.12 | 1.45 | | 33.91 | 9.65 | | |
| inches | max | 0.187 | 0.155 | 0.007 | 0.788 | 0.786 | | 0.375 | 0.375 | 0.045 | 0.785 | 0.505 | 0.133 | 0.067 | | 1.345 | 0.39 | | |
| | nom | | | | | | 0.35 | | | | | | | | 1.1 | | | 0.01 | 0.02 |
| | min | 0.136 | 0.145 | 0.004 | 0.772 | 0.774 | | 0.365 | 0.365 | 0.035 | 0.745 | 0.495 | 0.123 | 0.057 | | 1.335 | 0.38 | | |

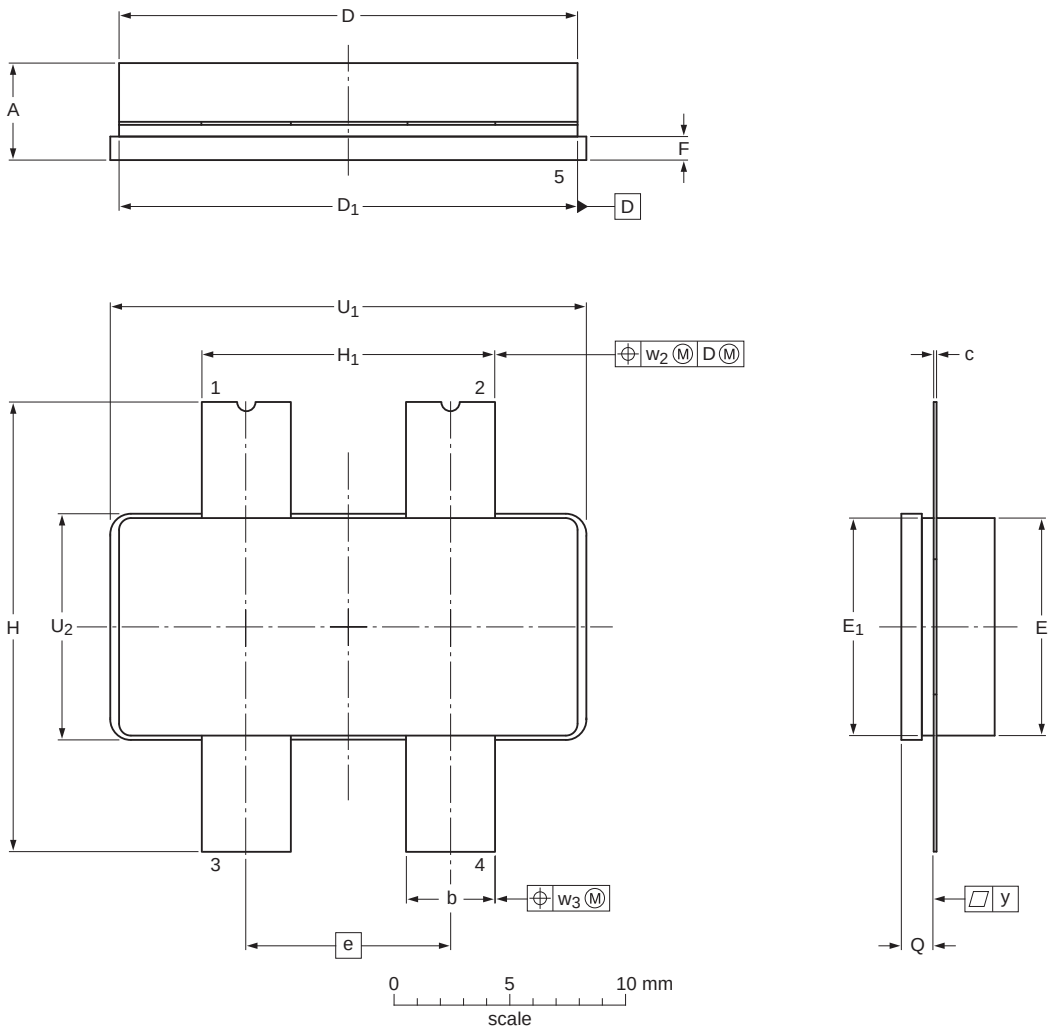
Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

*sot1121a_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1121A | | | | | | ~~09-10-12~~ 10-02-02 |

**Fig 1. Package outline SOT1121A**

**Earless flanged ceramic package; 4 leads** **SOT1121B**




Dimensions

| Unit[1] | | A | b | c | D | $D_1$ | e | E | $E_1$ | F | H | $H_1$ | Q | $U_1$ | $U_2$ | $w_2$ | $w_3$ | y |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 4.75 | 3.94 | 0.18 | 20.02 | 19.96 | | 9.53 | 9.53 | 1.14 | 19.94 | 12.83 | 1.70 | 20.70 | 9.91 | 0.51 | 0.25 | 0.25 |
| | nom | | | | | | 8.89 | | | | | | | | | | | |
| | min | 3.45 | 3.68 | 0.08 | 19.61 | 19.66 | | 9.27 | 9.27 | 0.89 | 18.92 | 12.57 | 1.45 | 20.45 | 9.65 | | | |
| inches | max | 0.187 | 0.155 | 0.007 | 0.788 | 0.786 | | 0.375 | 0.375 | 0.045 | 0.785 | 0.505 | 0.067 | 0.815 | 0.39 | 0.02 | 0.01 | 0.01 |
| | nom | | | | | | 0.35 | | | | | | | | | | | |
| | min | 0.136 | 0.145 | 0.003 | 0.772 | 0.774 | | 0.365 | 0.365 | 0.035 | 0.745 | 0.495 | 0.057 | 0.805 | 0.38 | | | |

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

*sot1121b_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1121B | | | | | | ~~09-12-14~~ 12-06-07 |

**Fig 2. Package outline SOT1121B**

## 8. Abbreviations

Table 9. Abbreviations

| Acronym | Description |
|---|---|
| CW | Continuous Waveform |
| ESD | ElectroStatic Discharge |
| HF | High Frequency |
| LDMOS | Laterally Diffused Metal Oxide Semiconductor |
| LDMOST | Laterally Diffused Metal-Oxide Semiconductor Transistor |
| VSWR | Voltage Standing-Wave Ratio |

## 9. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BLF647P_BLF647PS v.1 | 20120803 | Objective data sheet | - | - |

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|---|---|---|
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## 12. Contents


| | | |
|---|---|---|
| **1** | **Product profile** | **1** |
| 1.1 | General description | 1 |
| 1.2 | Features and benefits | 1 |
| 1.3 | Applications | 2 |
| **2** | **Pinning information** | **2** |
| **3** | **Ordering information** | **2** |
| **4** | **Limiting values** | **3** |
| **5** | **Thermal characteristics** | **3** |
| **6** | **Characteristics** | **3** |
| 6.1 | DC characteristics | 3 |
| 6.2 | AC characteristics | 3 |
| 6.3 | RF characteristics | 4 |
| 6.4 | Ruggedness in class-AB operation | 4 |
| **7** | **Package outline** | **5** |
| **8** | **Abbreviations** | **7** |
| **9** | **Revision history** | **7** |
| **10** | **Legal information** | **8** |
| 10.1 | Data sheet status | 8 |
| 10.2 | Definitions | 8 |
| 10.3 | Disclaimers | 8 |
| 10.4 | Trademarks | 9 |
| **11** | **Contact information** | **9** |
| **12** | **Contents** | **10** |




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