

BLF6G38-10; BLF6G38-10G

WiMAX power LDMOS transistor

Rev. 01 — 3 February 2009

Product data sheet

1. Product profile

1.1 General description

10 W LDMOS power transistor for base station applications at frequencies from 3400 MHz to 3600 MHz.

Table 1. Typical performance

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

| Mode of operation | f (MHz) | V _{DS} (V) | P _{L(AV)} (W) | G _p (dB) | η_D (%) | ACPR _{885k} (dBc) | ACPR _{1980k} (dBc) |
|---------------------------------|--------------|------------------------|---------------------------|------------------------|-----------------|-------------------------------|--------------------------------|
| 1-carrier N-CDMA ^[1] | 3400 to 3600 | 28 | 2 | 14 | 20 | -49 ^[2] | -64 ^[2] |

[1] Single carrier N-CDMA with pilot, paging sync and 6 traffic channels (Walsh codes 8 - 13). PAR = 9.7 dB at 0.01 % probability on CCDF. Channel bandwidth is 1.23 MHz.

[2] Measured within 30 kHz bandwidth.

CAUTION



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

1.2 Features

- Typical 1-carrier N-CDMA performance (Single carrier N-CDMA with pilot, paging, sync and 6 traffic channels [Walsh codes 8 - 13]. PAR = 9.7 dB at 0.01 % probability on CCDF. Channel bandwidth is 1.23 MHz), a supply voltage of 28 V and an I_{Dq} of 130 mA:
- Qualified up to a maximum V_{DS} operation of 32 V
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation
- Internally matched for ease of use
- Low gold plating thickness on leads
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for base stations and multi carrier applications in the 3400 MHz to 3600 MHz frequency range

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|------------------------------|-------------|--------------------|----------------|
| BLF6G38-10 (SOT975B) | | | |
| 1 | drain | | |
| 2 | gate | | |
| 3 | source | | |
| BLF6G38-10G (SOT975C) | | | |
| 1 | drain | | |
| 2 | gate | | |
| 3 | source | | |

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

| Type number | Package | | Version |
|-------------|---------|--|---------|
| | Name | Description | |
| BLF6G38-10 | - | earless flanged ceramic package; 2 leads | SOT975B |
| BLF6G38-10G | - | earless flanged ceramic package; 2 leads | SOT975C |

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 | | - | 3.1 | A |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| T_j | junction temperature | | - | 200 | °C |

5. Thermal characteristics

Table 5. Thermal characteristics

| Symbol | Parameter | Conditions | Type | Typ | Unit |
|------------------|--|--|-------------|-----|------|
| $R_{th(j-case)}$ | thermal resistance from junction to case | $T_{case} = 80\text{ °C};$ $P_L = 10\text{ W (CW)}$ | BLF6G38-10 | 4.0 | K/W |
| | | | BLF6G38-10G | 4.0 | K/W |

6. Characteristics

Table 6. Characteristics

$T_j = 25\text{ °C}$ per section; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|----------------------------------|--|-----|-----|------|------------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS} = 0\text{ V}; I_D = 0.18\text{ mA}$ | 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 | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$ | - | - | 1.4 | μA |
| I_{DSX} | drain cut-off current | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $V_{DS} = 10\text{ V}$ | 2.7 | - | - | A |
| I_{GSS} | gate leakage current | $V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$ | - | - | 140 | nA |
| g_{fs} | forward transconductance | $V_{DS} = 10\text{ V}; I_D = 0.9\text{ A}$ | 0.8 | - | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $I_D = 0.6\text{ A}$ | 328 | - | 1256 | $\text{m}\Omega$ |
| C_{rs} | feedback capacitance | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$ $f = 1\text{ MHz}$ | - | 3.6 | - | pF |

7. Application information

Table 7. Application information

Mode of operation: Single carrier N-CDMA with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13). PAR 9.7 dB at 0.01 % probability on CCDF; Channel Bandwidth is 1.23 MHz; $f_1 = 3400$ MHz; $f_2 = 3500$ MHz; $f_3 = 3600$ MHz; RF performance at $V_{DS} = 28$ V; $I_{Dq} = 130$ mA; $T_{case} = 25$ °C; unless otherwise specified; in a class-AB production circuit.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|---|-----------------------|-----|-----|-----|------|
| $P_{L(AV)}$ | average output power | | - | 2 | - | W |
| G_p | power gain | $P_{L(AV)} = 2$ W | 13 | 14 | - | dB |
| RL_{in} | input return loss | $P_{L(AV)} = 2$ W | - | -10 | - | dB |
| η_D | drain efficiency | $P_{L(AV)} = 2$ W | 18 | 20 | - | % |
| $ACPR_{885k}$ | adjacent channel power ratio (885 kHz) | $P_{L(AV)} = 2$ W [1] | - | -49 | -46 | dBc |
| $ACPR_{1980k}$ | adjacent channel power ratio (1980 kHz) | $P_{L(AV)} = 2$ W [1] | - | -64 | -61 | dBc |

[1] Measured within 30 kHz bandwidth.

7.1 Ruggedness in class-AB operation

The BLF6G38-10 and BLF6G38-10G are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 28$ V; $I_{Dq} = 130$ mA; $P_L = P_{L(1dB)}$; $f = 3600$ MHz.

7.2 NXP WiMAX signal

7.2.1 WiMAX signal description

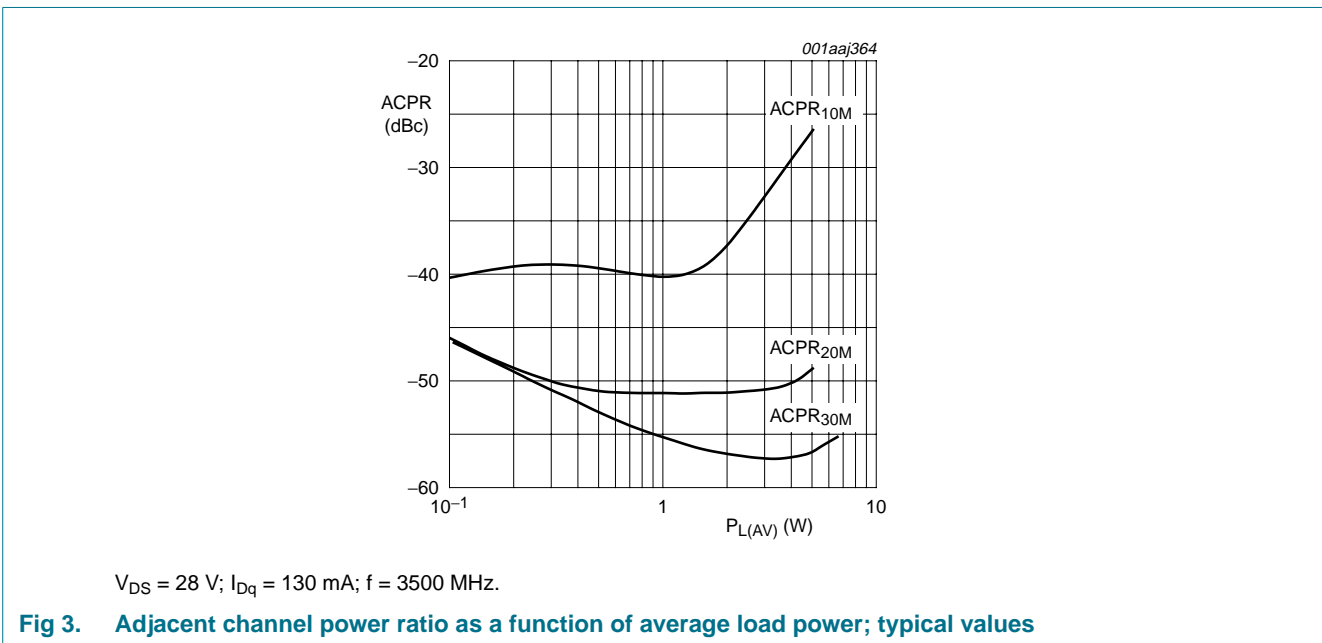
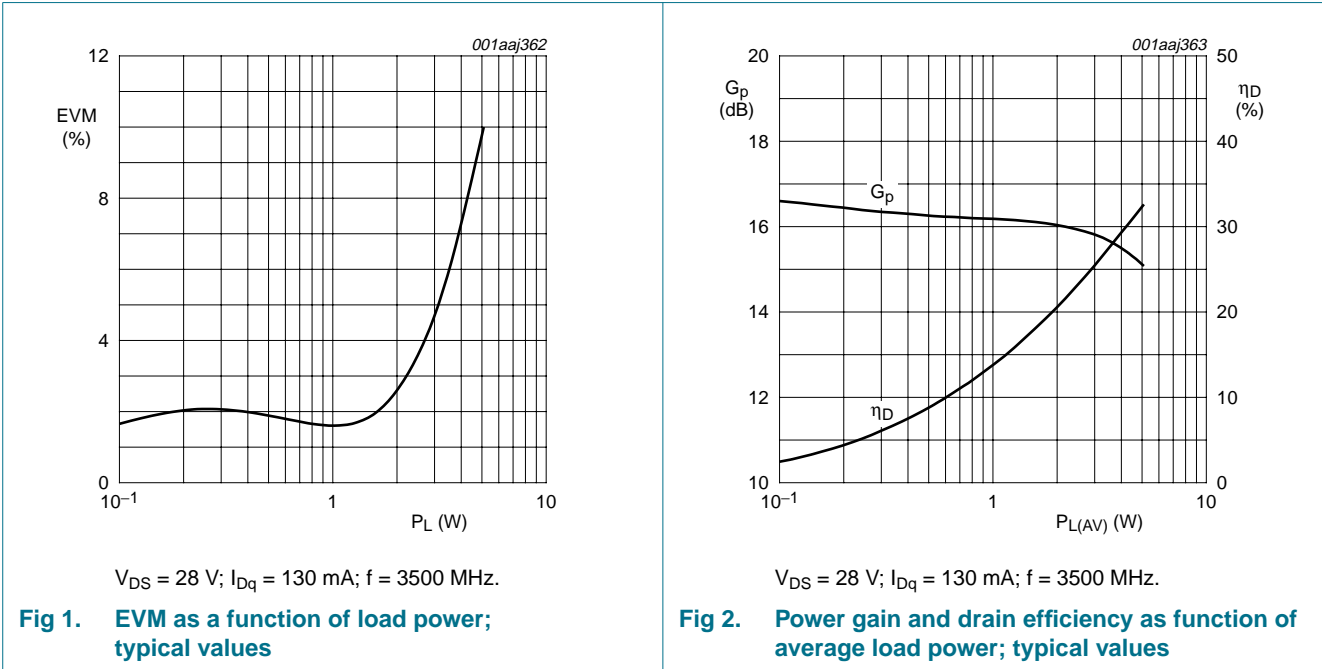
frame duration = 5 ms; bandwidth = 10 MHz; sequency = 1 frame;
 frequency band = WCS; sampling rate = 11.2 MHz; $n = 8 / 7$; $G = T_g / T_b = 1 / 8$;
 FFT = 1024; zone type = PUSC; $\delta = 97.7$ %; number of symbols = 46;
 number of subchannels = 30; PAR = 9.5 dB.

Preamble: 1 symbol \times 30 subchannels; $P_L = P_{L(nom)} + 3.86$ dB.

Table 8. Frame structure

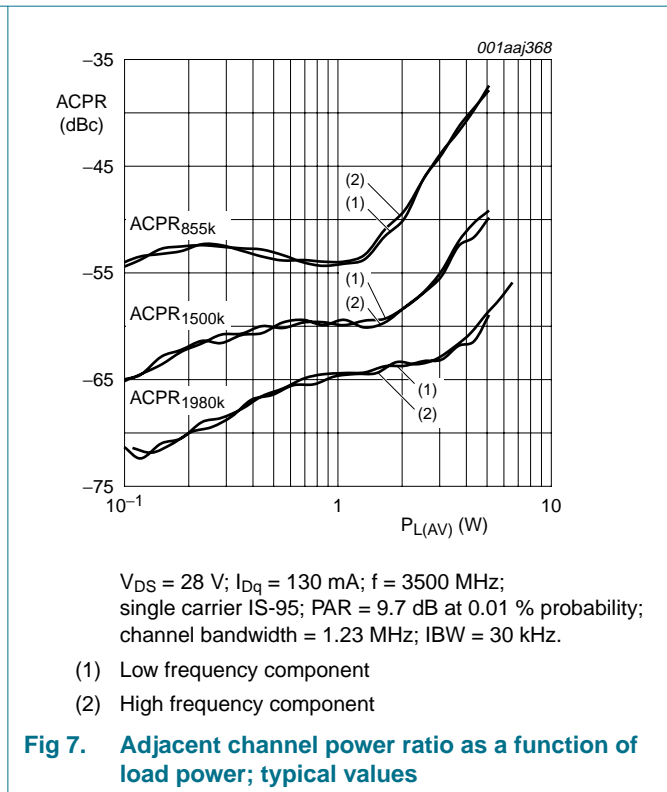
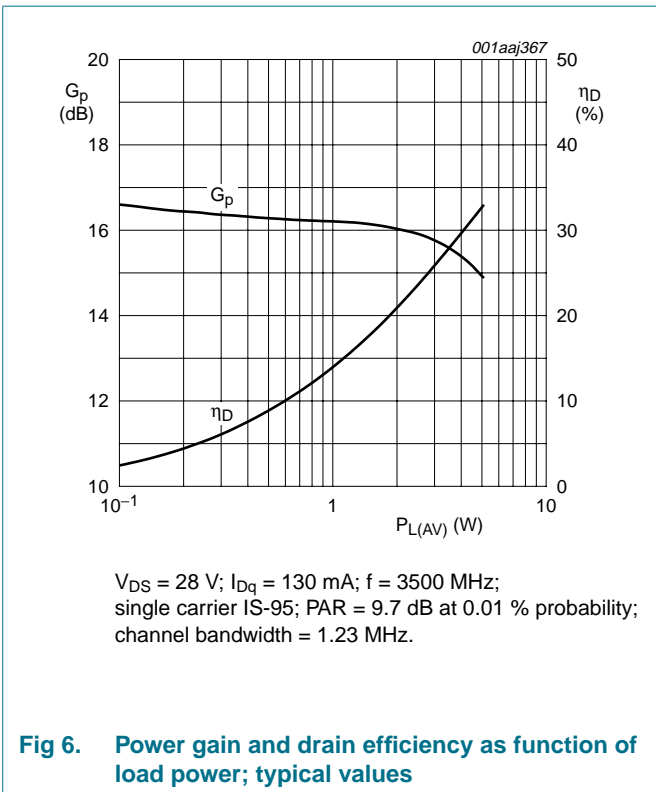
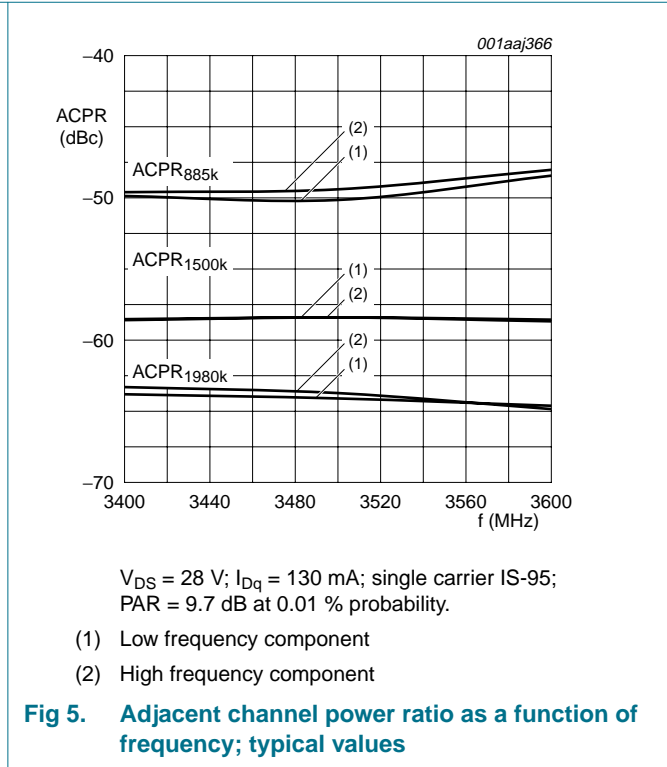
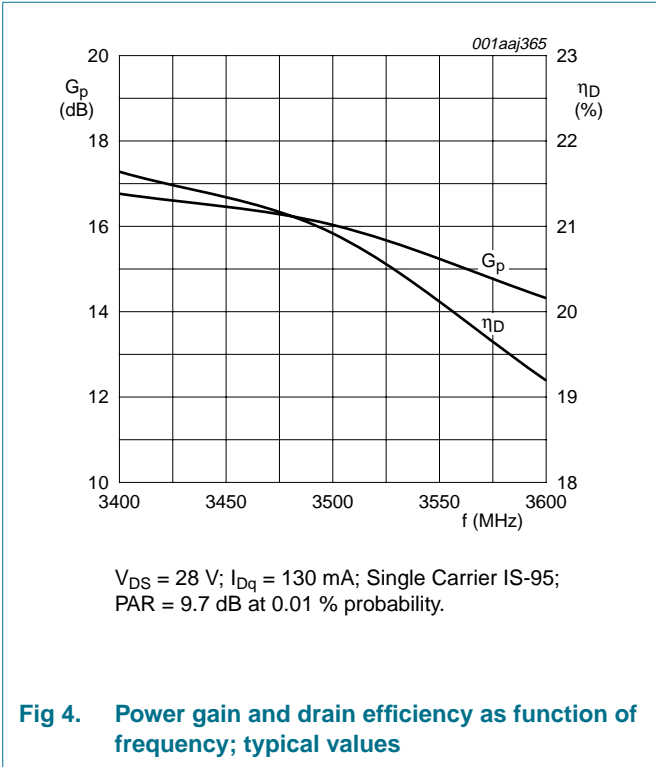
| Frame contents | Modulation technique | Data length |
|--|----------------------|-------------|
| Zone 0 FCH 2 symbols \times 4 subchannels | QPSK1/2 | 3 bit |
| Zone 0 data 2 symbols \times 26 subchannels | 64QAM3/4 | 692 bit |
| Zone 0 data 44 symbols \times 30 subchannels | 64QAM3/4 | 10000 bit |

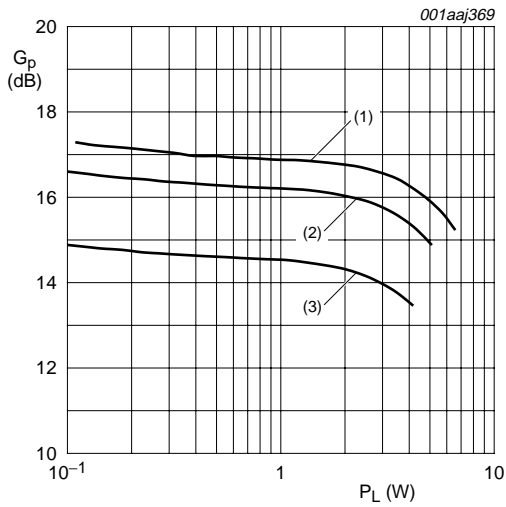
7.2.2 Graphs



7.3 Single carrier NA IS-95 broadband performance at 2 W average

7.3.1 Graphs

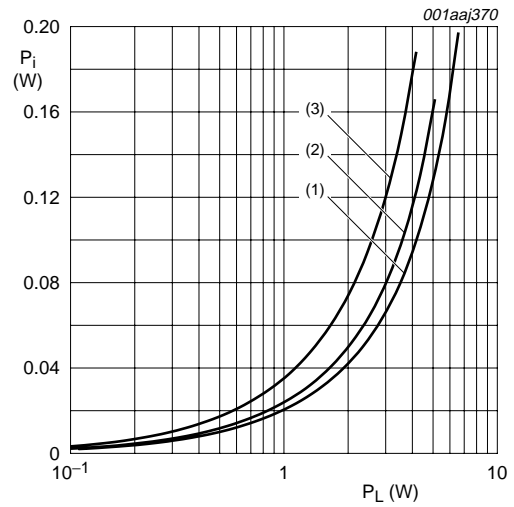




$V_{DS} = 28$ V; $I_{Dq} = 130$ mA; single carrier IS-95;
 PAR = 9.7 dB at 0.01 % probability;
 channel bandwidth = 1.23 MHz.

- (1) $f = 3400$ MHz
- (2) $f = 3500$ MHz
- (3) $f = 3600$ MHz

Fig 8. Power gain as a function of load power; typical values

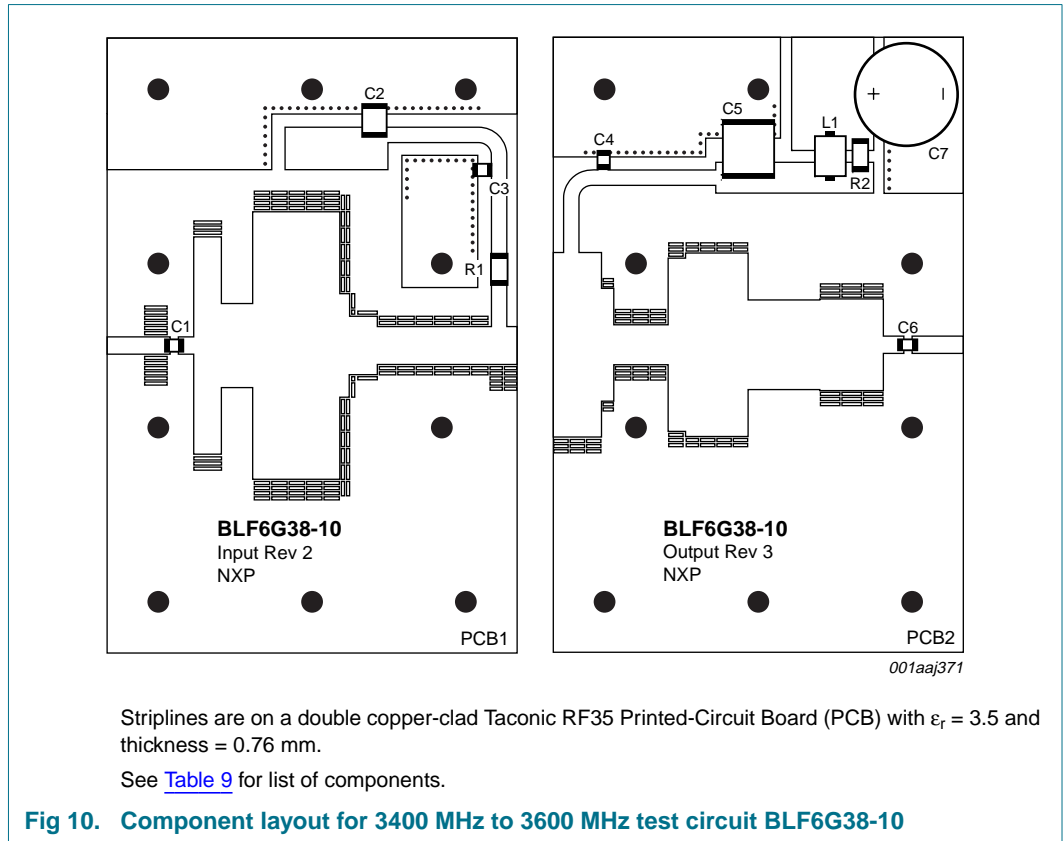


$V_{DS} = 28$ V; $I_{Dq} = 130$ mA; single carrier IS-95;
 PAR = 9.7 dB at 0.01 % probability;
 channel bandwidth = 1.23 MHz.

- (1) $f = 3400$ MHz
- (2) $f = 3500$ MHz
- (3) $f = 3600$ MHz

Fig 9. Input power as a function of load power; typical values

8. Test information



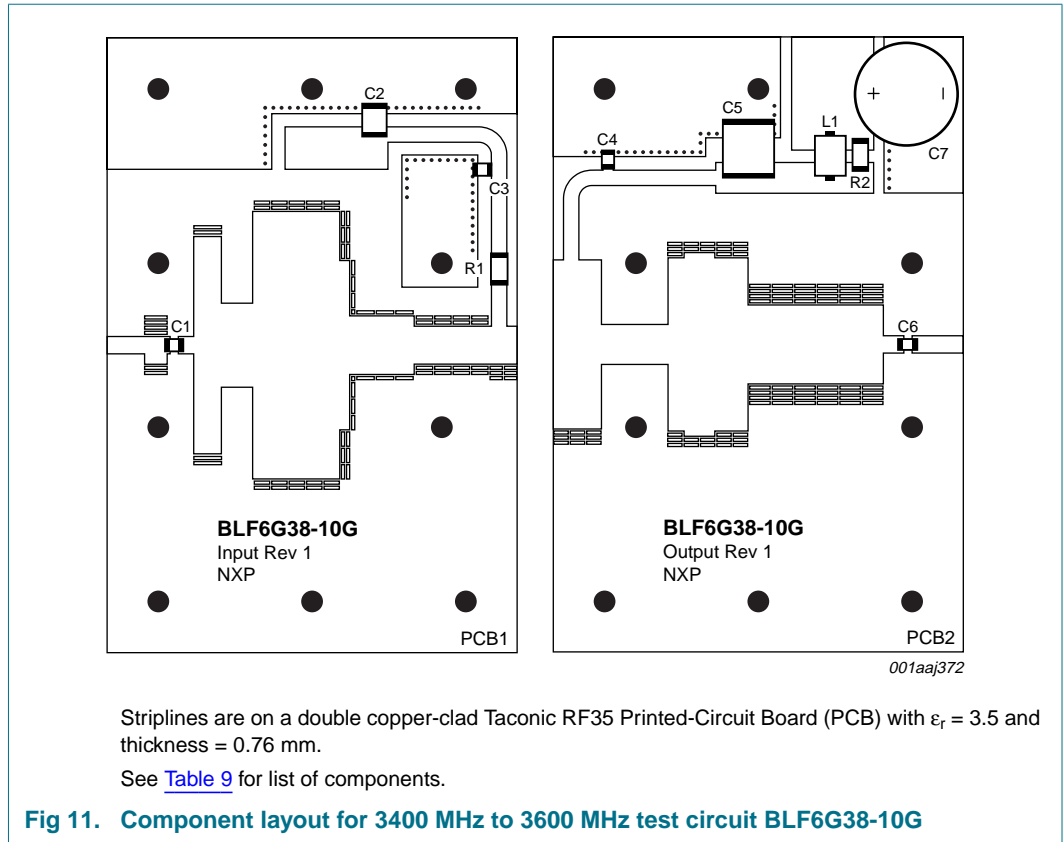


Table 9. List of components

For test circuit, see [Figure 10](#) and [Figure 11](#).

| Component | Description | Value | Remarks |
|------------|-----------------------------------|-------------------|-----------------|
| C1, C3, C6 | multilayer ceramic chip capacitor | 20 pF | ATC 100A |
| C2 | multilayer ceramic chip capacitor | 1.5 μ F | TDK |
| C4 | multilayer ceramic chip capacitor | 6.8 μ F | ATC 100A |
| C5 | multilayer ceramic chip capacitor | 10 μ F; 50 V | TDK |
| C7 | electrolytic capacitor | 220 μ F; 63 V | Elco |
| L1 | ferrite SMD bead | - | Ferroxcube bead |
| R1, R2 | SMD resistor | 8.2 Ω | Thin film |

Table 10. Measured test circuit impedances

| f (GHz) | Z _i (Ω) | Z _o (Ω) |
|--------------------|-----------------------|-----------------------|
| BLF6G38-10 | | |
| 3.40 | 12.61 - j23.96 | 5.21 - j6.31 |
| 3.45 | 14.16 - j22.23 | 5.47 - j6.01 |
| 3.50 | 16.00 - j21.74 | 5.72 - j5.87 |
| 3.55 | 17.43 - j22.91 | 5.90 - j5.91 |
| 3.60 | 17.11 - j25.43 | 5.92 - j6.09 |
| BLF6G38-10G | | |
| 3.40 | 19.33 - j22.54 | 4.71 - j7.09 |
| 3.45 | 21.20 - j21.65 | 4.75 - j6.82 |
| 3.50 | 23.02 - j22.41 | 4.72 - j6.65 |
| 3.55 | 23.70 - j24.95 | 4.60 - j6.55 |
| 3.60 | 21.98 - j28.26 | 4.36 - j6.47 |

9. Package outline

Earless flanged ceramic package; 2 leads

SOT975B

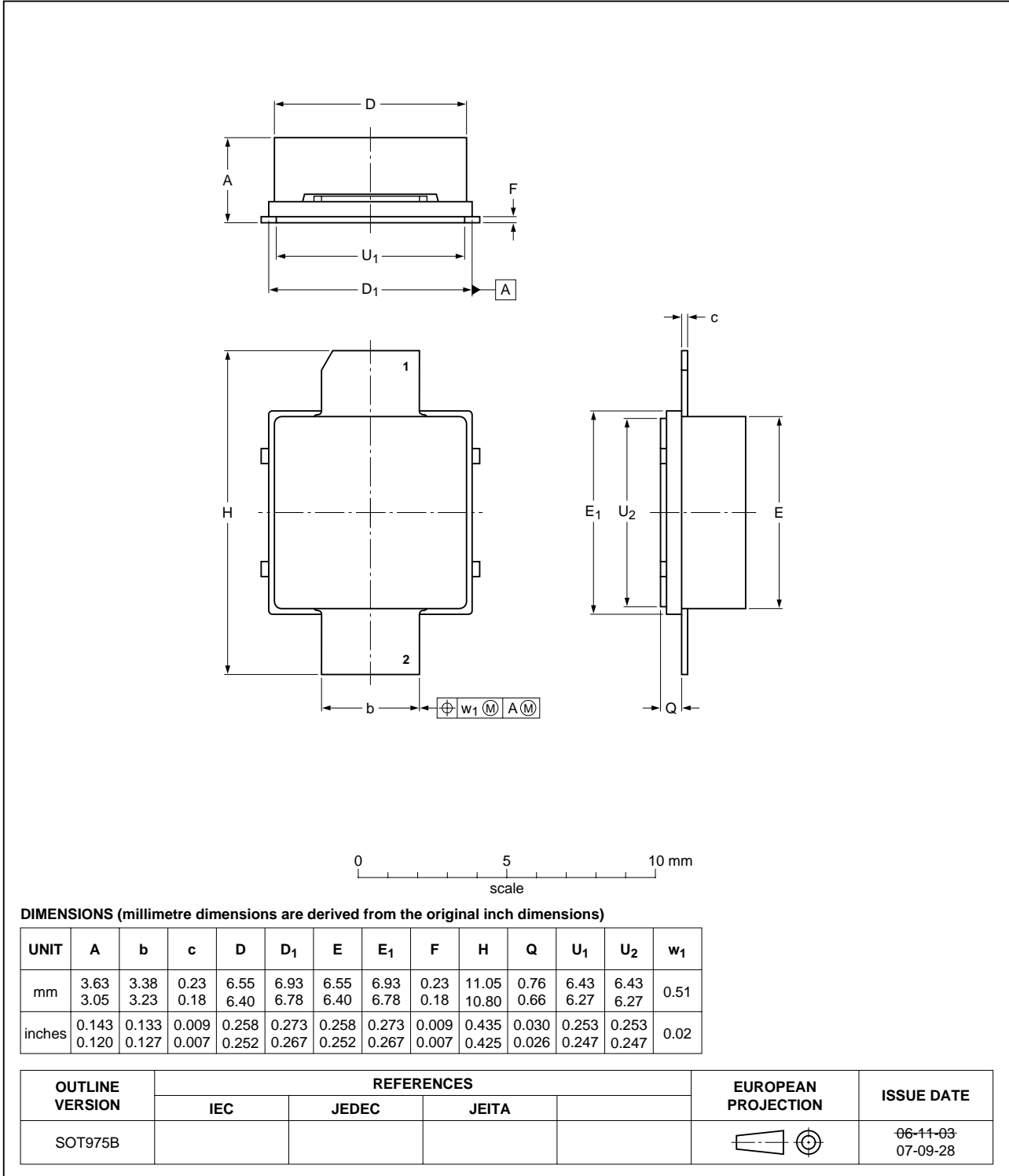


Fig 12. Package outline SOT975B

Earless flanged ceramic package; 2 leads

SOT975C

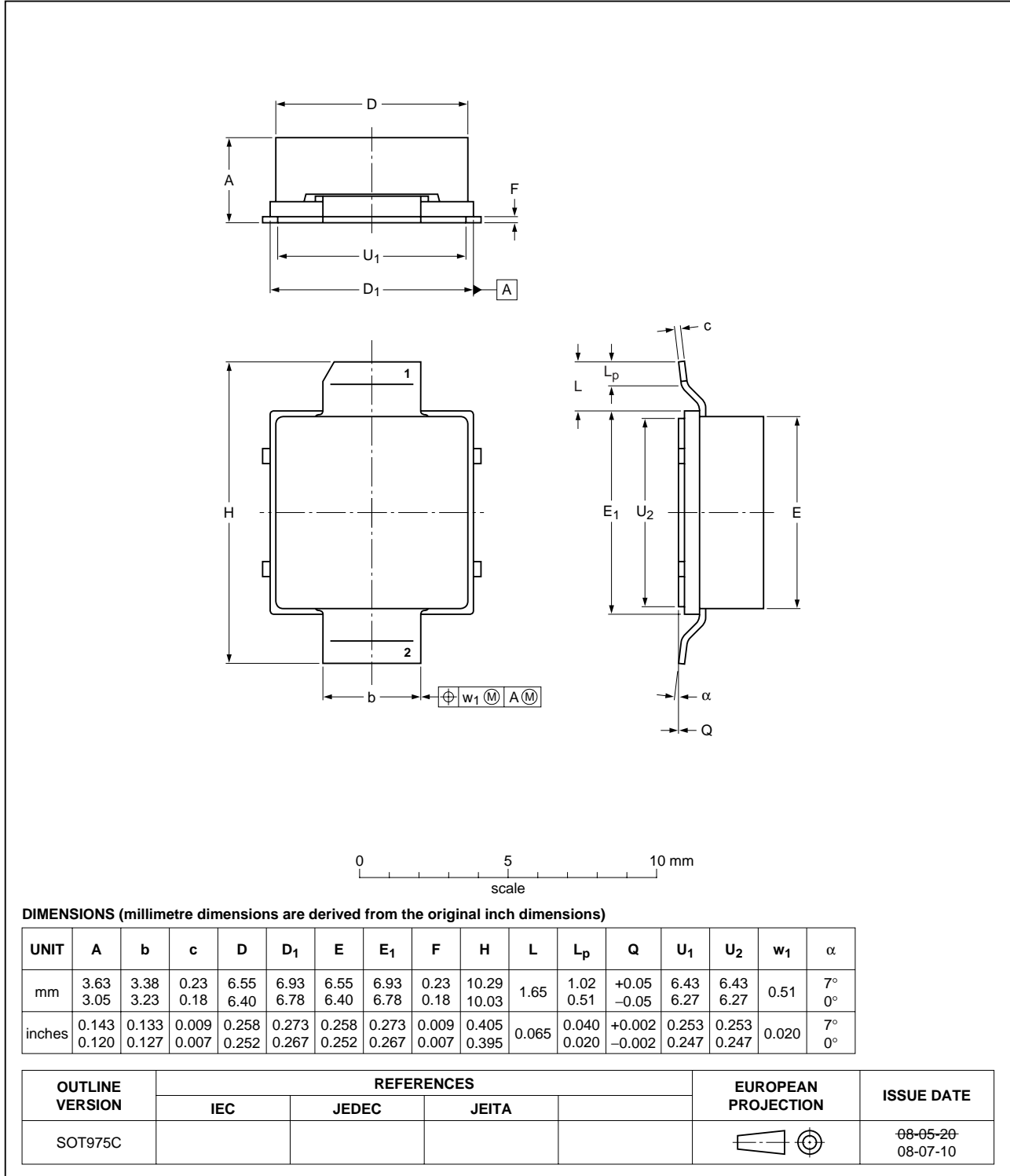


Fig 13. Package outline SOT975C

10. Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|---|
| CCDF | Complementary Cumulative Distribution Function |
| CW | Continuous Wave |
| EVM | Error Vector Magnitude |
| FCH | Frame control Header |
| FFT | Fast Fourier Transform |
| IBW | Instantaneous BandWidth |
| IS-95 | Interim Standard 95 |
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| NA | North American |
| N-CDMA | Narrowband Code Division Multiple Access |
| PAR | Peak-to-Average power Ratio |
| PUSC | Partial Usage of SubChannels |
| RF | Radio Frequency |
| SMD | Surface Mounted Device |
| VSWR | Voltage Standing-Wave Ratio |
| WCS | Wireless Communications Service |
| WiMAX | Worldwide Interoperability for Microwave Access |

11. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------------|--------------|--------------------|---------------|------------|
| BLF6G38-10_BLF6G38-10G_1 | 20090203 | Product data sheet | - | - |

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| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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