

# BLF7G24L-140; BLF7G24LS-140

Power LDMOS transistor

Rev. 3 — 1 August 2011

Product data sheet

## 1. Product profile

### 1.1 General description

140 W LDMOS power transistor for base station applications at frequencies from 2300 MHz to 2400 MHz.

**Table 1. Typical performance**

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

| Mode of operation | f<br>(MHz)   | $I_{Dq}$<br>(mA) | $V_{DS}$<br>(V) | $P_{L(AV)}$<br>(W) | $G_p$<br>(dB) | $\eta_D$<br>(%) | ACPR <sub>885k</sub><br>(dBc) | ACPR <sub>5M</sub><br>(dBc) |
|-------------------|--------------|------------------|-----------------|--------------------|---------------|-----------------|-------------------------------|-----------------------------|
| IS-95             | 2300 to 2400 | 1300             | 28              | 30                 | 18.5          | 26.5            | -45 <sup>[1]</sup>            |                             |
| 1 carrier W-CDMA  | 2300 to 2400 | 1300             | 28              | 50                 | 18.5          | 33              | -                             | -35 <sup>[2]</sup>          |

[1] Single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13). PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz.

[2] 3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF. Channel bandwidth is 3.84 MHz.

### 1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low  $R_{th}$  providing excellent thermal stability
- Designed for low memory effects providing excellent digital pre-distortion capability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

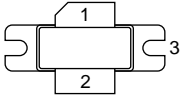
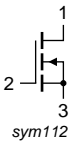
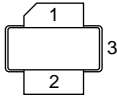
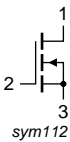
### 1.3 Applications

- RF power amplifiers for base stations and multi carrier applications in the 2300 MHz to 2400 MHz frequency range



## 2. Pinning information

Table 2. Pinning

| Pin                            | Description | Simplified outline  | Graphic symbol  |
|--------------------------------|-------------|---|---|
| <b>BLF7G24L-140 (SOT502A)</b>  |             |   |   |
| 1                              | drain       |  |  |
| 2                              | gate        |   |   |
| 3                              | source      |   |   |
| <b>BLF7G24LS-140 (SOT502B)</b> |             |   |   |
| 1                              | drain       |  |  |
| 2                              | gate        |   |   |
| 3                              | source      |   |   |

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

| Type number   | Package |   |         |
|---------------|---------|---|---------|
|               | Name    | Description   | Version |
| BLF7G24L-140  | -       | flanged LDMOST ceramic package; 2 mounting holes; 2 leads | SOT502A |
| BLF7G24LS-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        |            | -    | 28   | 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 | $T_{case} = 80\text{ °C}; P_L = 125\text{ W}$ | 0.28 | K/W  |

## 6. Characteristics

**Table 6. Characteristics**

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

| Symbol        | Parameter                        | Conditions   | Min | Typ  | Max | Unit             |
|---------------|----------------------------------|--|-----|------|-----|------------------|
| $V_{(BR)DSS}$ | drain-source breakdown voltage   | $V_{GS} = 0\text{ V}; I_D = 1\text{ mA}$                         | 65  | -    | -   | V                |
| $V_{GS(th)}$  | gate-source threshold voltage    | $V_{DS} = 10\text{ V}; I_D = 216\text{ mA}$                      | 1.5 | 1.8  | 2.3 | 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>$V_{DS} = 10\text{ V}$ | 34  | 42   | -   | A                |
| $I_{GSS}$     | gate leakage current             | $V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$                      | -   | -    | 500 | nA               |
| $g_{fs}$      | forward transconductance         | $V_{DS} = 10\text{ V}; I_D = 216\text{ mA}$                      | -   | 1.87 | -   | S                |
| $R_{DS(on)}$  | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$<br>$I_D = 7.56\text{ A}$  | -   | 69   | -   | $\text{m}\Omega$ |

## 7. Test information

**Remark:** All testing performed in a class-AB production test circuit.

**Table 7. Functional test information**

Mode of operation: 1-carrier N-CDMA, single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13). PAR = 9.7 dB at 0.01 % probability on the CCDF, channel bandwidth is 1.2288 MHz;  $f_1 = 2300\text{ MHz}; f_2 = 2400\text{ MHz};$  RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA};$   $T_{case} = 25\text{ °C};$  unless otherwise specified.

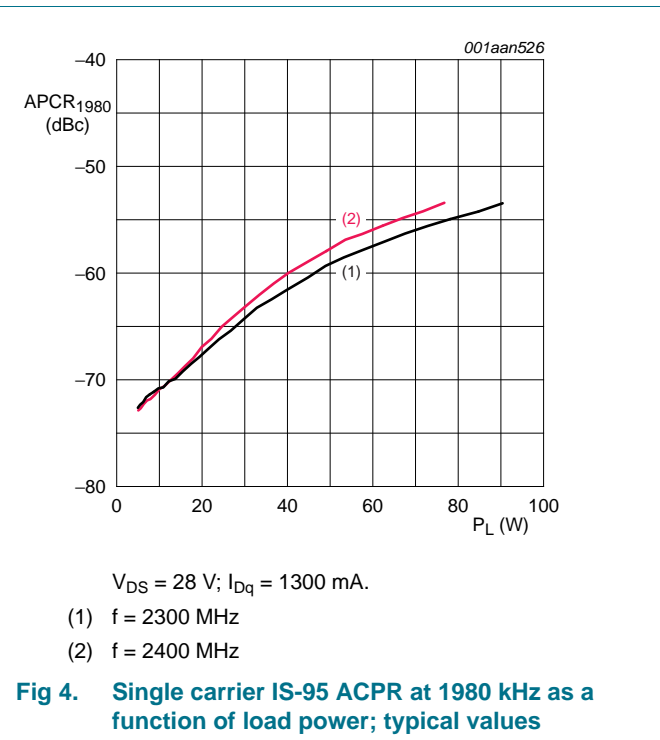
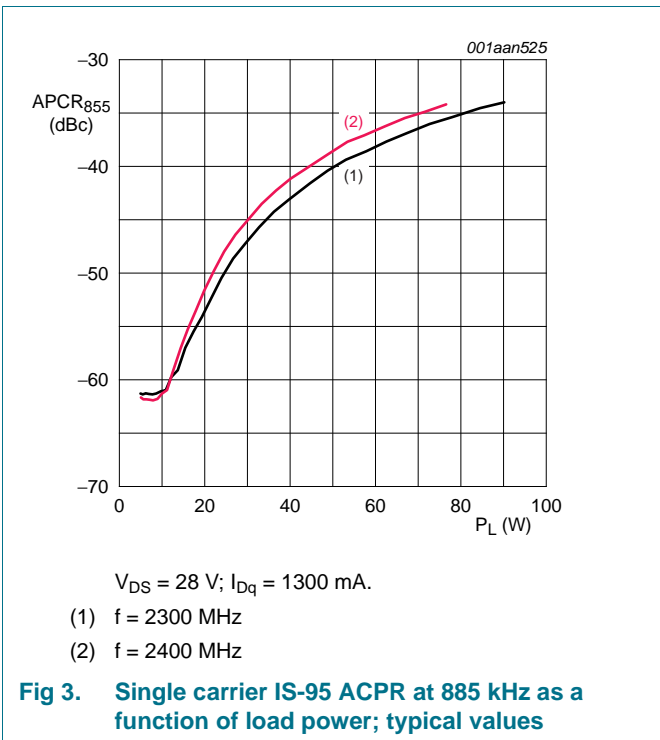
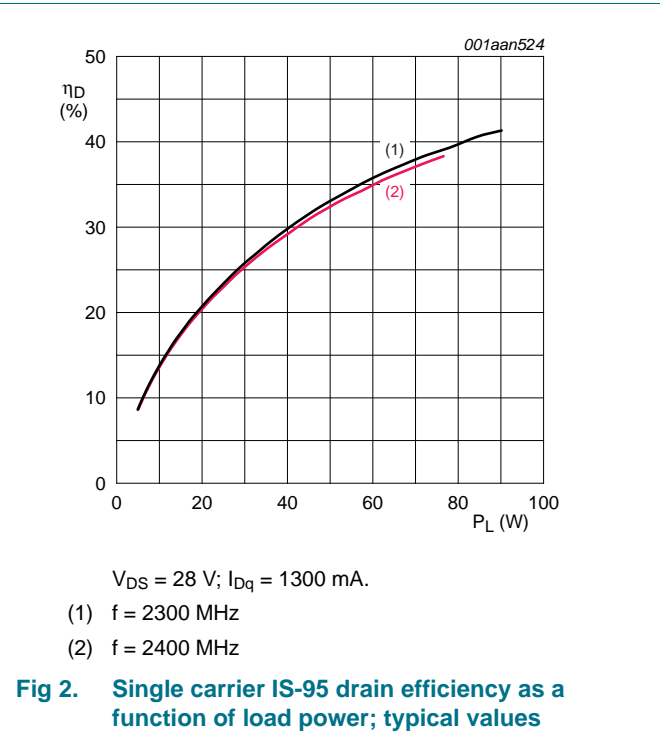
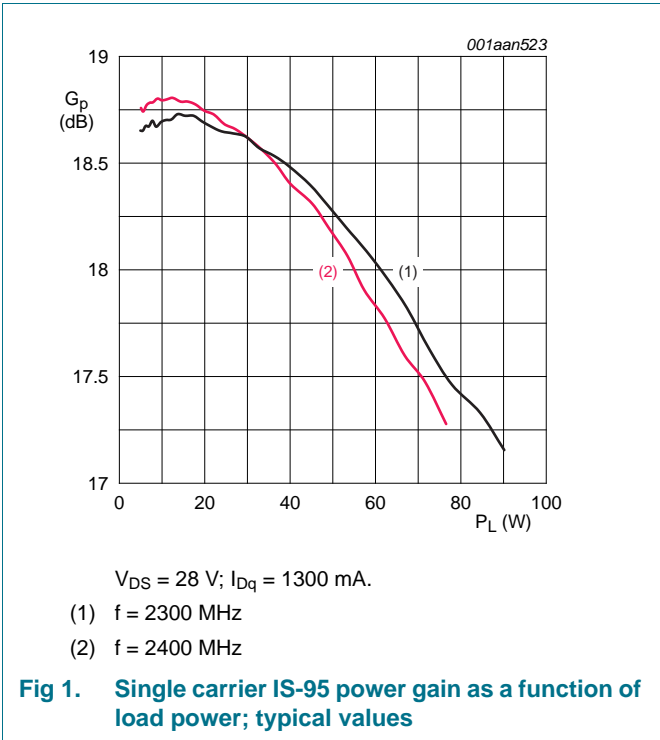
| Symbol        | Parameter                              | Conditions | Min  | Typ  | Max | Unit |
|---------------|--|------------|------|------|-----|------|
| $P_{L(AV)}$   | average output power                   |            | -    | 30   | -   | W    |
| $G_p$         | power gain                             |            | 17.5 | 18.5 | -   | dB   |
| $RL_{in}$     | input return loss                      |            | -    | -12  | -   | dB   |
| $\eta_D$      | drain efficiency                       |            | 23   | 26.5 | -   | %    |
| $ACPR_{885k}$ | adjacent channel power ratio (885 kHz) |            | -    | -45  | -40 | dBc  |

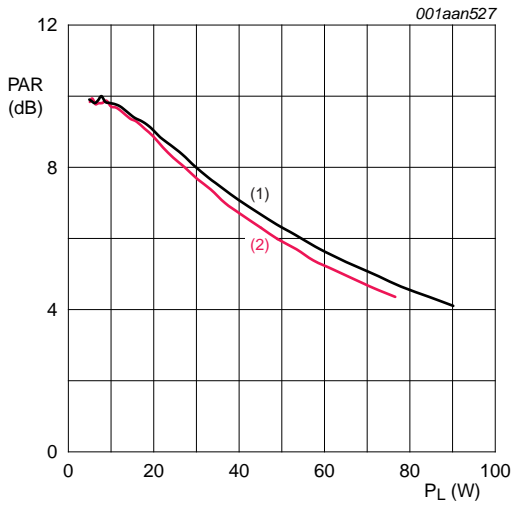
### 7.1 Ruggedness in class-AB operation

The BLF7G24L-140 and BLF7G24LS-140 are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}; P_L = 140\text{ W (CW)}; f = 2300\text{ MHz}.$

**7.2 Single carrier IS-95**

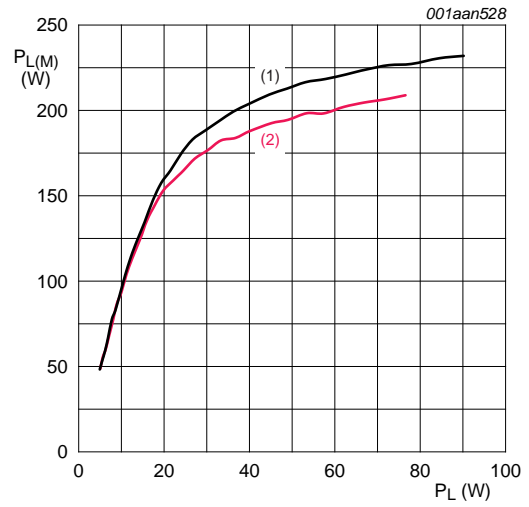
Single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13).  
 PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz





$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2300\text{ MHz}$   
 (2)  $f = 2400\text{ MHz}$

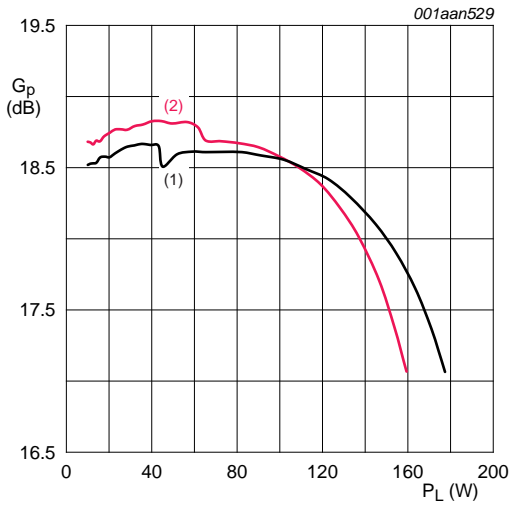
**Fig 5. Single carrier IS-95 peak-to-average power ratio as a function of load power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2300\text{ MHz}$   
 (2)  $f = 2400\text{ MHz}$

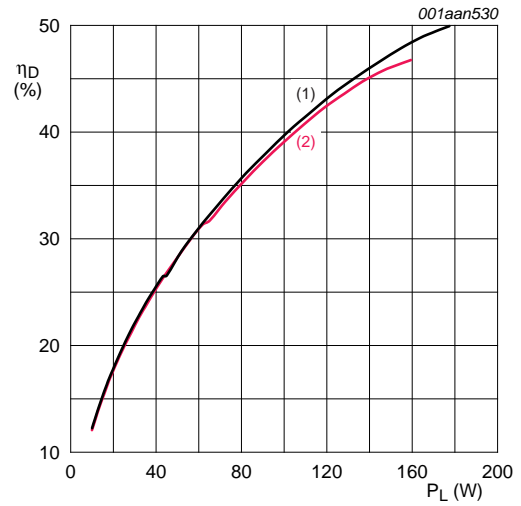
**Fig 6. Single carrier IS-95 peak power as a function of load power; typical values**

## 7.3 Pulsed CW



- $V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}.$
- (1)  $f = 2300\text{ MHz}$
  - (2)  $f = 2400\text{ MHz}$

**Fig 7. Pulsed CW power gain as a function of load power; typical values**

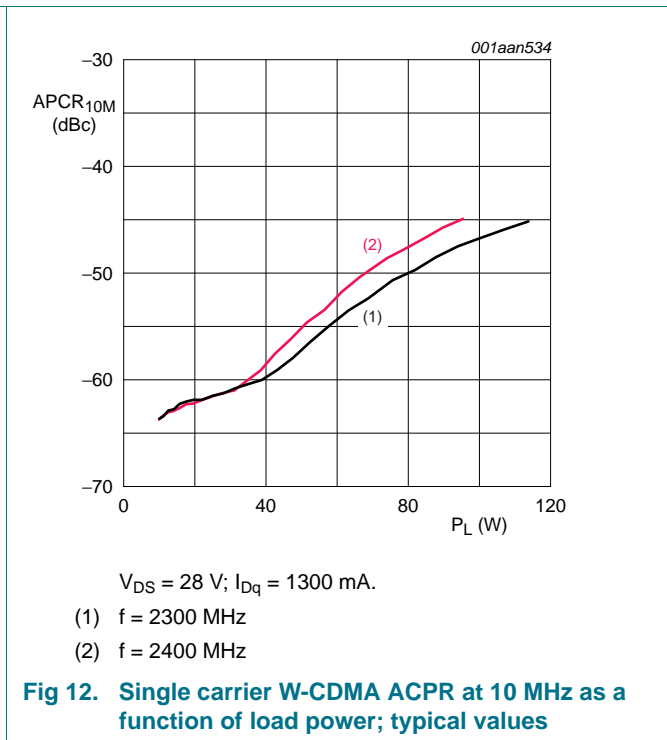
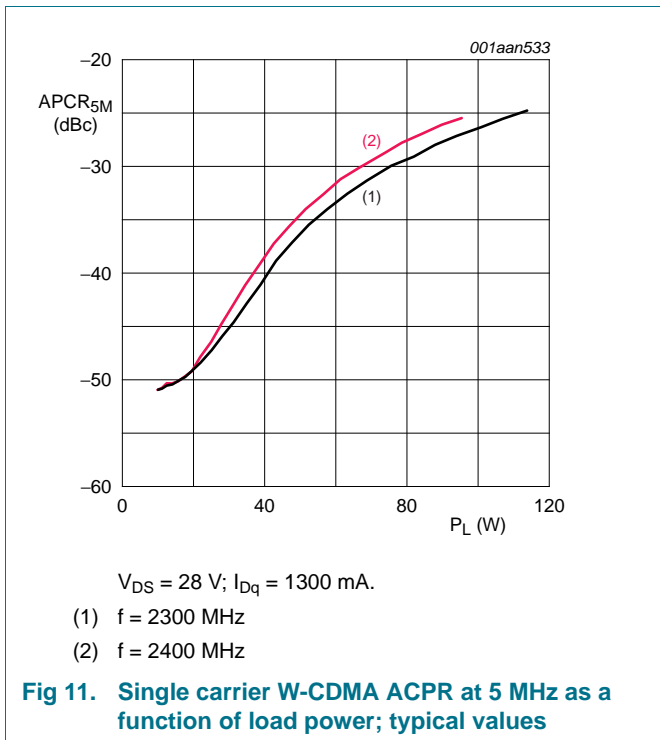
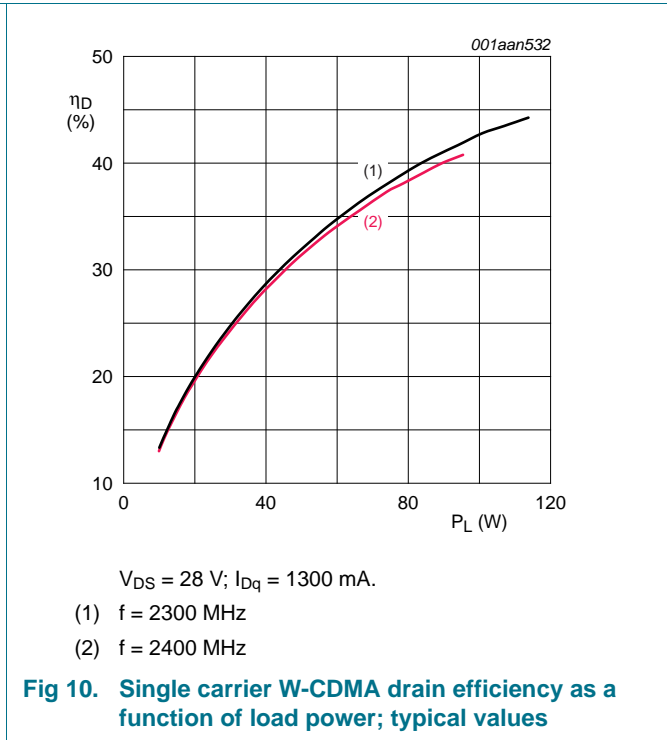
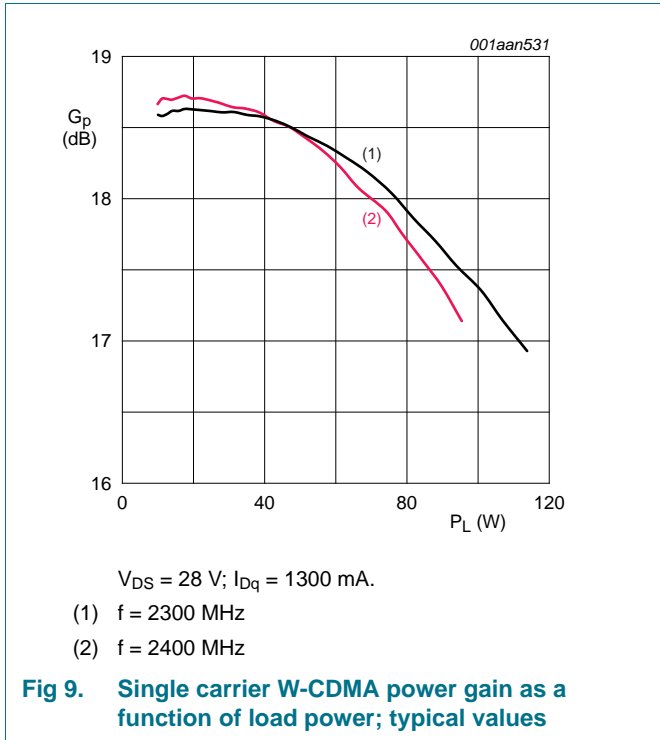


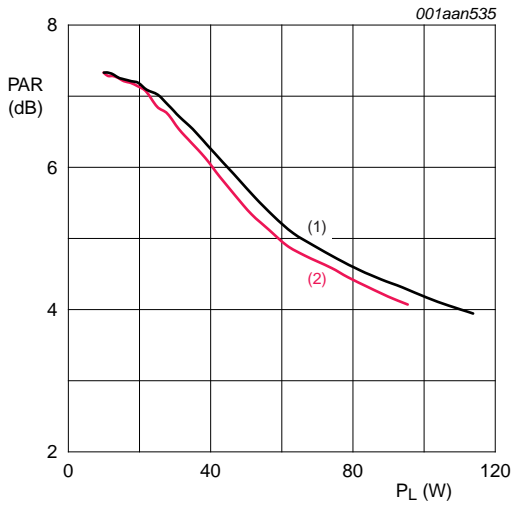
- $V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}.$
- (1)  $f = 2300\text{ MHz}$
  - (2)  $f = 2400\text{ MHz}$

**Fig 8. Pulsed CW drain efficiency as a function of load power; typical values**

**7.4 Single carrier W-CDMA**

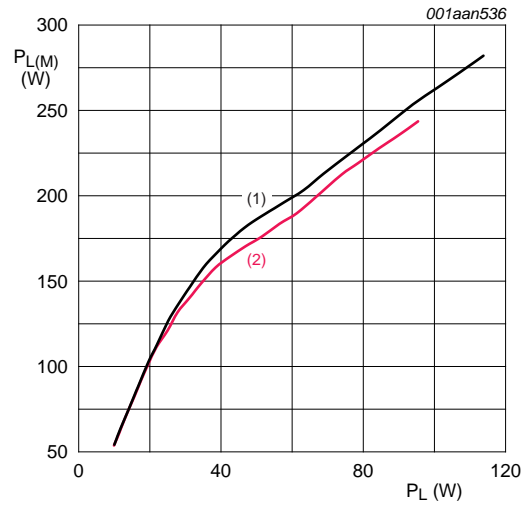
3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF. Channel bandwidth is 3.84 MHz.





$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2300\text{ MHz}$   
 (2)  $f = 2400\text{ MHz}$

**Fig 13. Single carrier W-CDMA peak-to-average power ratio as a function of load power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1300\text{ mA}$ .  
 (1)  $f = 2300\text{ MHz}$   
 (2)  $f = 2400\text{ MHz}$

**Fig 14. Single carrier W-CDMA peak output power as a function of load power; typical values**



8. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads

SOT502A

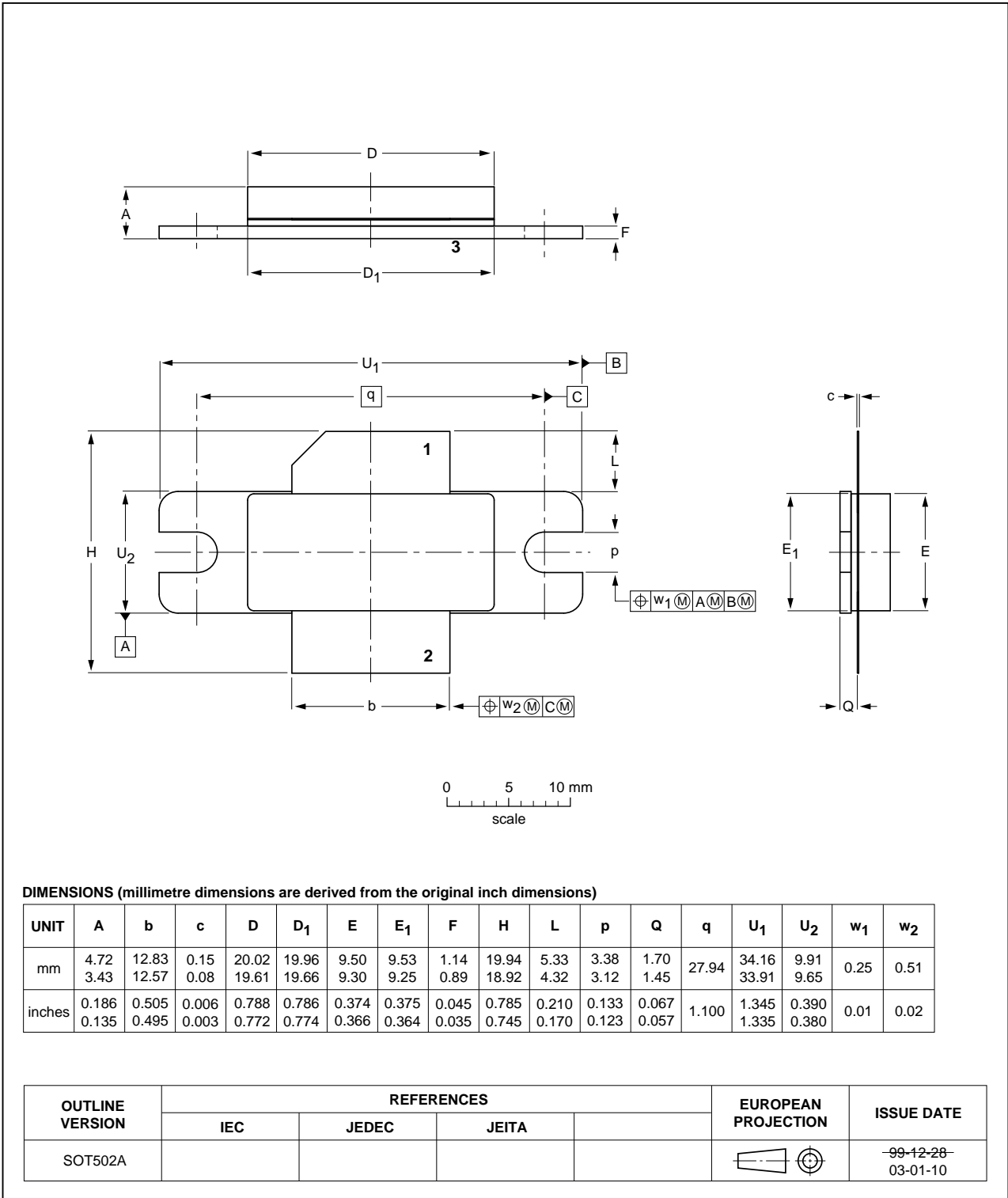


Fig 15. Package outline SOT502A

Earless flanged LDMOST ceramic package; 2 leads

SOT502B

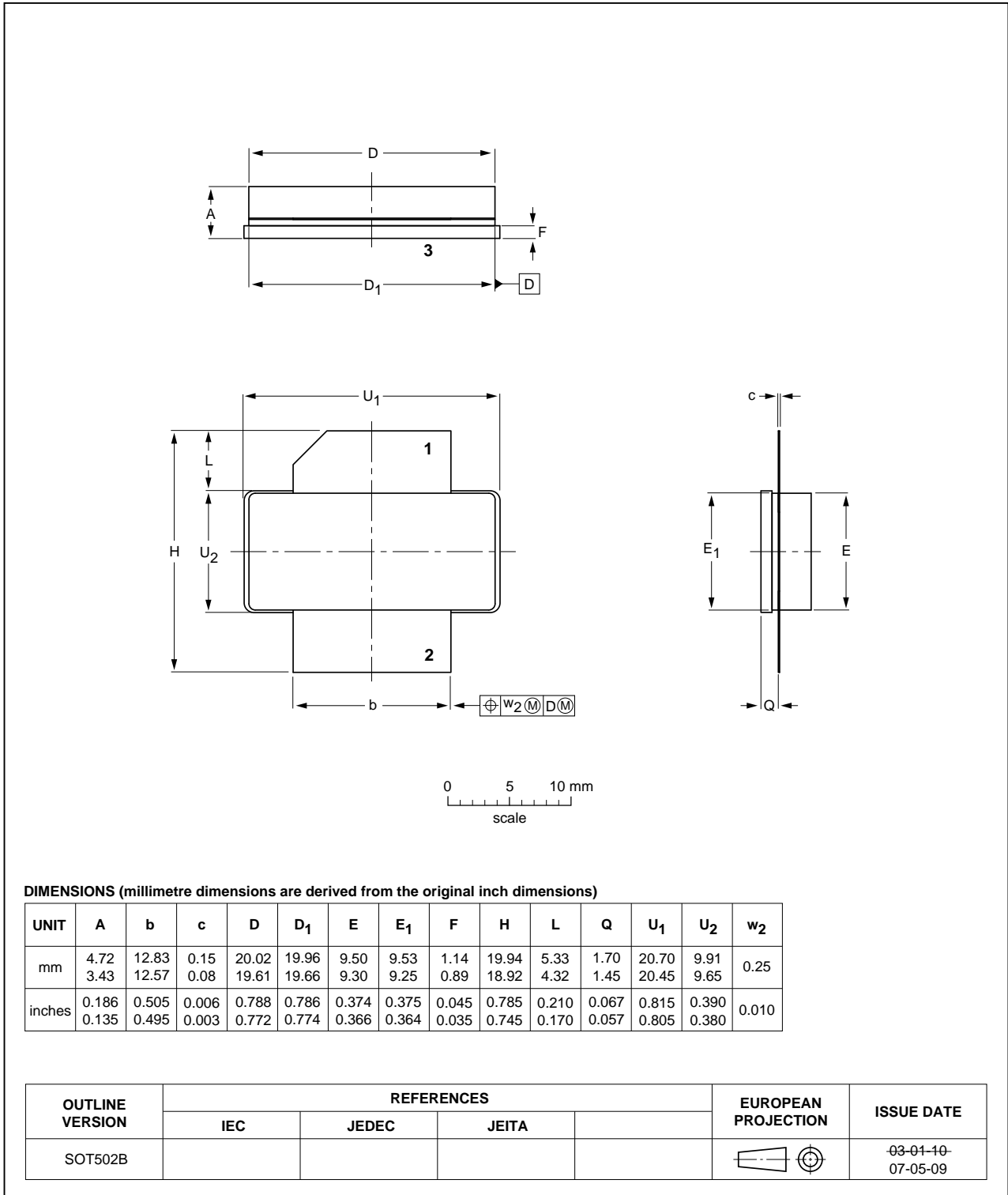


Fig 16. Package outline SOT502B

## 9. Abbreviations

**Table 8. Abbreviations**

| Acronym | Description   |
|---------|---|
| 3GPP    | Third Generation Partnership Project                    |
| CCDF    | Complementary Cumulative Distribution Function          |
| CW      | Continuous Wave   |
| DPCH    | Dedicated Physical CHannel                              |
| IS-95   | Interim Standard 95                                     |
| ESD     | ElectroStatic Discharge                                 |
| LDMOS   | Laterally Diffused Metal Oxide Semiconductor            |
| LDMOST  | Laterally Diffused Metal Oxide Semiconductor Transistor |
| N-CDMA  | Narrowband Code Division Multiple Access                |
| 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 9. Revision history**

| Document ID                 | Release date   | Data sheet status      | Change notice | Supersedes                  |
|-----------------------------|--|------------------------|---------------|-----------------------------|
| BLF7G24L-140_7G24LS-140 v.3 | 20110801   | Product data sheet     | -             | BLF7G24L-140_7G24LS-140 v.2 |
| Modifications:              | <ul style="list-style-type: none"> <li>The status of this data sheet has been changed to Product data sheet</li> </ul> |                        |               |                             |
| BLF7G24L-140_7G24LS-140 v.2 | 20110405   | Preliminary data sheet | -             | BLF7G24L-140_7G24LS-140 v.1 |
| BLF7G24L-140_7G24LS-140 v.1 | 20100805   | Objective data sheet   | -             | -                           |

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| 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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