

# BLF6G27-45; BLF6G27S-45

WiMAX power LDMOS transistor

Rev. 5 — 1 September 2015

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

45 W LDMOS power transistor for base station applications at frequencies from 2500 MHz to 2700 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<br>(MHz)   | $V_{DS}$<br>(V) | $P_{L(AV)}$<br>(W) | $G_p$<br>(dB) | $\eta_D$<br>(%) | ACPR <sub>885k</sub><br>(dBc) | ACPR <sub>1980k</sub><br>(dBc) |
|---------------------------------|--------------|-----------------|--------------------|---------------|-----------------|-------------------------------|--------------------------------|
| 1-carrier N-CDMA <sup>[1]</sup> | 2500 to 2700 | 28              | 7                  | 18            | 24              | -49 <sup>[2]</sup>            | -64 <sup>[2]</sup>             |

[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 and benefits

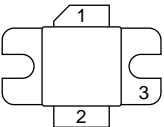
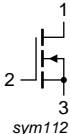
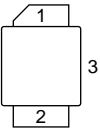
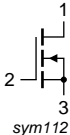
- Typical 1-carrier N-CDMA performance (single carrier N-CDMA with pilot, paging, sync and 6 traffic channels [Walsh codes 8 - 13]. PAR = 9.7 dB at 0.01 % probability on CCDF. Channel bandwidth is 1.23 MHz), a supply voltage of 28 V and an  $I_{Dq}$  of 350 mA:
- Qualified up to a maximum  $V_{DS}$  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 2500 MHz to 2700 MHz frequency range

## 2. Pinning information

Table 2. Pinning

| Pin                          | Description | Simplified outline  | Graphic symbol   |
|------------------------------|-------------|---|--|
| <b>BLF6G27-45 (SOT608A)</b>  |             |   |  |
| 1                            | drain       |  | <br>sym112  |
| 2                            | gate        |   |  |
| 3                            | source      |   |  |
| <b>BLF6G27S-45 (SOT608B)</b> |             |   |  |
| 1                            | drain       |  | <br>sym112 |
| 2                            | gate        |   |  |
| 3                            | source      |   |  |

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| BLF6G27-45  | -       | flanged ceramic package; 2 mounting holes; 2 leads | SOT608A |
| BLF6G27S-45 | -       | ceramic earless flanged package; 2 leads           | SOT608B |

## 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        |            | -    | 20   | 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 | $T_{case} = 80\text{ °C};$<br>$P_L = 34\text{ W (CW)}$ | BLF6G27-45  | 1.7 | K/W  |
|                  |  |  | BLF6G27S-45 | 1.7 | 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   | $V_{GS} = 0\text{ V}; I_D = 0.5\text{ mA}$                         | 65  | -    | -     | V             |
| $V_{GS(th)}$  | gate-source threshold voltage    | $V_{DS} = 10\text{ V}; I_D = 60\text{ mA}$                         | 1.4 | 1.9  | 2.4   | V             |
| $I_{DSS}$     | drain leakage current            | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$                        | -   | -    | 1.4   | $\mu\text{A}$ |
| $I_{DSX}$     | drain cut-off current            | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$<br>$V_{DS} = 10\text{ V}$   | 8.8 | 10.4 | -     | A             |
| $I_{GSS}$     | gate leakage current             | $V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$                        | -   | -    | 140   | nA            |
| $g_{fs}$      | forward transconductance         | $V_{DS} = 10\text{ V}; I_D = 2.5\text{ A}$                         | -   | 4.3  | -     | S             |
| $R_{DS(on)}$  | drain-source on-state resistance | $V_{GS} = V_{GS(th)} + 3.75\text{ V};$<br>$I_D = 2.1\text{ A}$     | -   | 0.24 | 0.385 | $\Omega$      |
| $C_{rs}$      | feedback capacitance             | $V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$<br>$f = 1\text{ MHz}$ | -   | 1.1  | -     | 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 = 1.23 MHz;  $f = 2700\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 350\text{ mA}; T_{case} = 25\text{ °C}$ ; unless otherwise specified; in a class-AB production circuit.

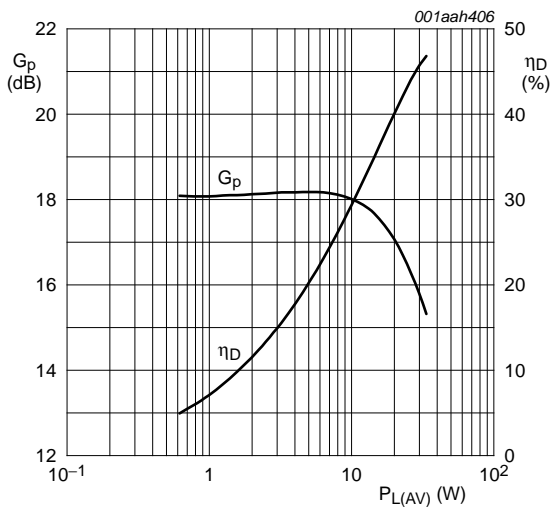
| Symbol         | Parameter                               | Conditions               | Min  | Typ | Max | Unit |
|----------------|---|--------------------------|------|-----|-----|------|
| $P_{L(AV)}$    | average output power                    |                          | -    | 7   | -   | W    |
| $G_p$          | power gain                              | $P_{L(AV)} = 7\text{ W}$ | 16.5 | 18  | -   | dB   |
| $RL_{in}$      | input return loss                       | $P_{L(AV)} = 7\text{ W}$ | -    | -10 | -5  | dB   |
| $\eta_D$       | drain efficiency                        | $P_{L(AV)} = 7\text{ W}$ | 22   | 24  | -   | %    |
| $ACPR_{885k}$  | adjacent channel power ratio (885 kHz)  | $P_{L(AV)} = 7\text{ W}$ | [1]  | -49 | -46 | dBc  |
| $ACPR_{1980k}$ | adjacent channel power ratio (1980 kHz) | $P_{L(AV)} = 7\text{ W}$ | [1]  | -64 | -61 | dBc  |

[1] Measured within 30 kHz bandwidth.

### 7.1 Ruggedness in class-AB operation

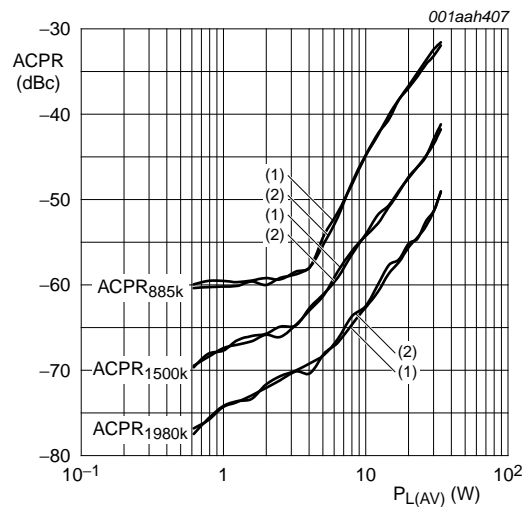
The BLF6G27-45 and BLF6G27S-45 are capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 350\text{ mA}; P_L = 45\text{ W (CW)}; f = 2600\text{ MHz}$ .

7.2 Single carrier N-CDMA performance



$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA;  $f = 2600$  MHz; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; channel bandwidth = 1.23 MHz; instantaneous bandwidth = 30 kHz.

Fig 1. Power gain and drain efficiency as functions of average load power; typical values

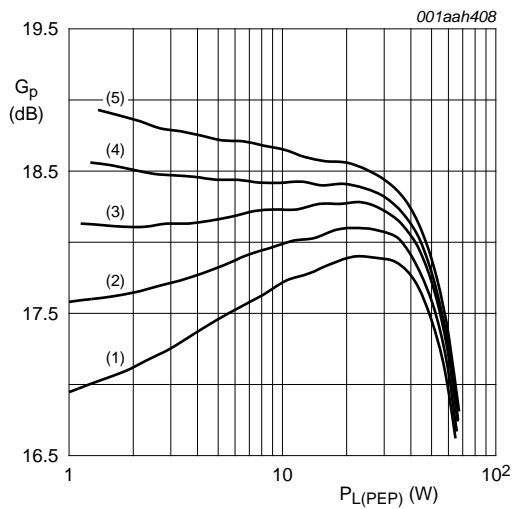


$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA;  $f = 2600$  MHz; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; channel bandwidth = 1.23 MHz; instantaneous bandwidth = 30 kHz.

- (1) Low frequency component
- (2) High frequency component

Fig 2. Adjacent channel power ratio as function of average load power; typical values

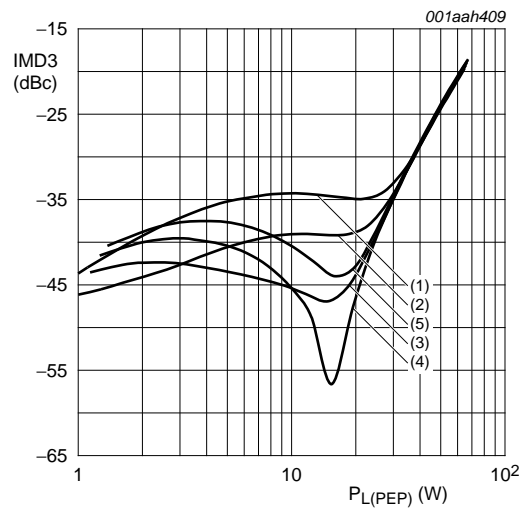
7.3 Two-tone



$V_{DS} = 28$  V;  $f_1 = 2598.75$  MHz;  $f_2 = 2601.25$  MHz; 2.5 MHz tone spacing.

- (1)  $I_{Dq} = 250$  mA
- (2)  $I_{Dq} = 300$  mA
- (3)  $I_{Dq} = 350$  mA
- (4)  $I_{Dq} = 400$  mA
- (5)  $I_{Dq} = 500$  mA

Fig 3. Power gain as function of peak envelope load power; typical values



$V_{DS} = 28$  V;  $f_1 = 2598.75$  MHz;  $f_2 = 2601.25$  MHz; 2.5 MHz tone spacing.

- (1)  $I_{Dq} = 250$  mA
- (2)  $I_{Dq} = 300$  mA
- (3)  $I_{Dq} = 350$  mA
- (4)  $I_{Dq} = 400$  mA
- (5)  $I_{Dq} = 500$  mA

Fig 4. Third order intermodulation distortion as function of peak envelope load power; typical values

7.4 Continuous wave

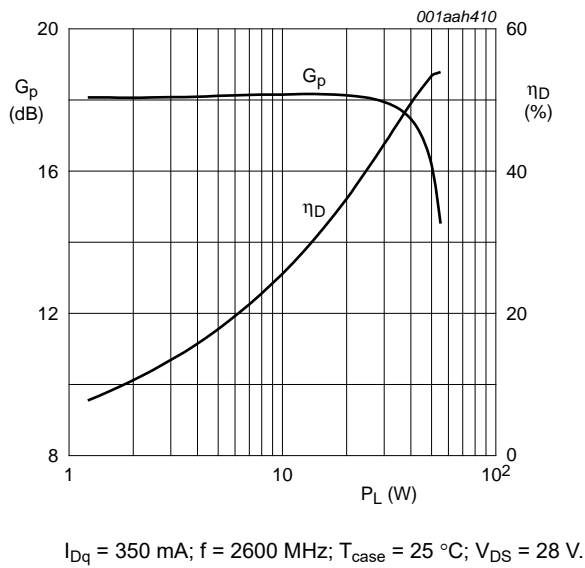


Fig 5. Power gain and drain efficiency as functions of CW load power; typical values

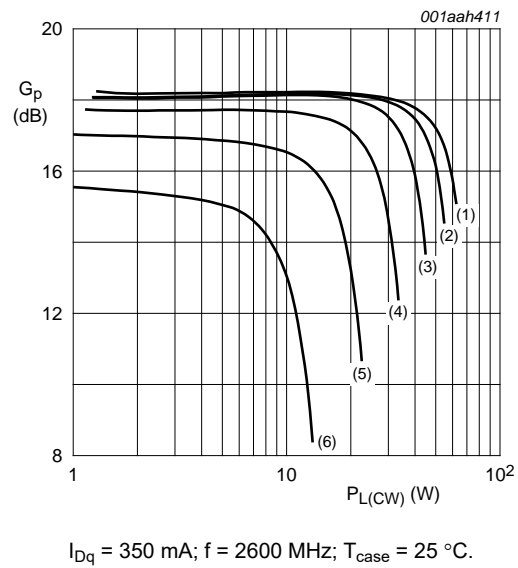
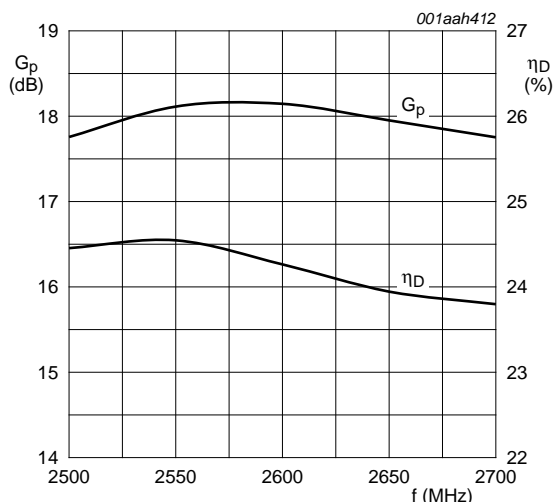


Fig 6. Power gain as function of CW load power; typical values

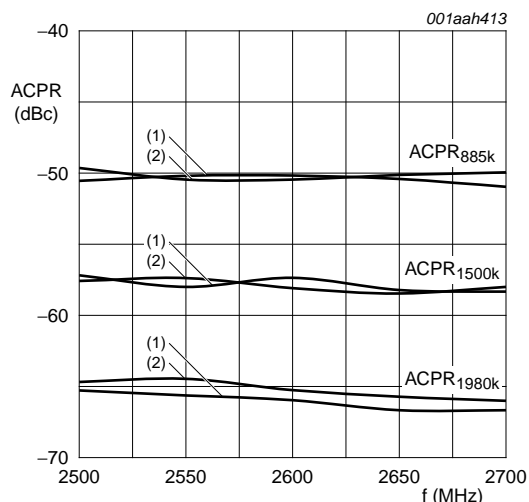
- (1)  $V_{DS} = 32 \text{ V}$
- (2)  $V_{DS} = 28 \text{ V}$
- (3)  $V_{DS} = 24 \text{ V}$
- (4)  $V_{DS} = 20 \text{ V}$
- (5)  $V_{DS} = 16 \text{ V}$
- (6)  $V_{DS} = 12 \text{ V}$

7.5 Single carrier N-CDMA broadband performance at 7 W average



$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; instantaneous bandwidth = 30 kHz.

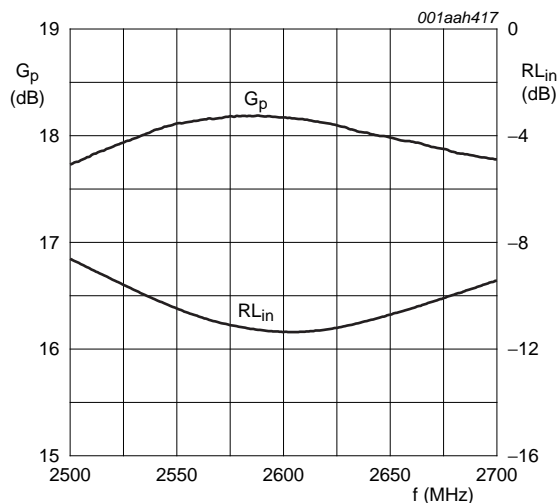
Fig 7. Power gain and drain efficiency as functions of frequency; typical values



$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; instantaneous bandwidth = 30 kHz.

- (1) Low frequency component
- (2) High frequency component

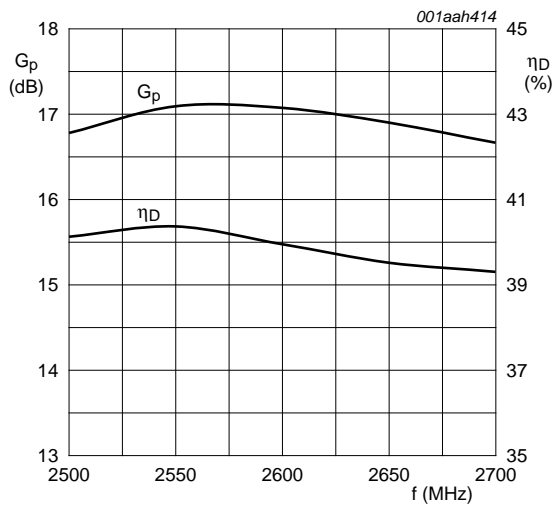
Fig 8. Adjacent channel power ratio as function of frequency; typical values



$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA; single carrier N-CDMA; PAR = 9.7 dB at 0.01 % probability; instantaneous bandwidth = 30 kHz.

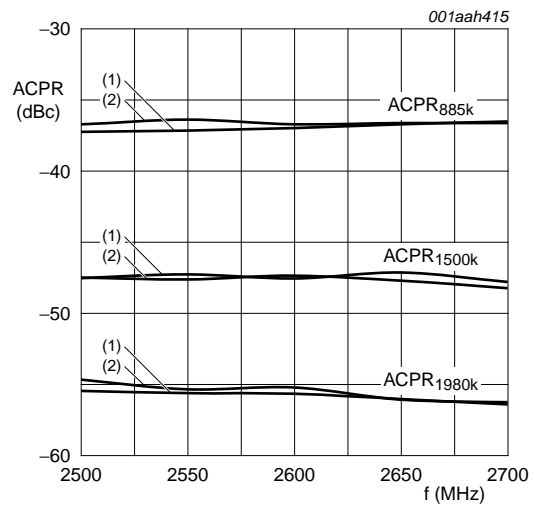
Fig 9. Power gain and input return loss as functions of frequency

7.6 Single carrier N-CDMA broadband performance at 20 W average



$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA; single carrier N-CDMA;  
 PAR = 9.7 dB at 0.01 % probability;  
 instantaneous bandwidth = 30 kHz.

Fig 10. Power gain and drain efficiency as functions of frequency; typical values



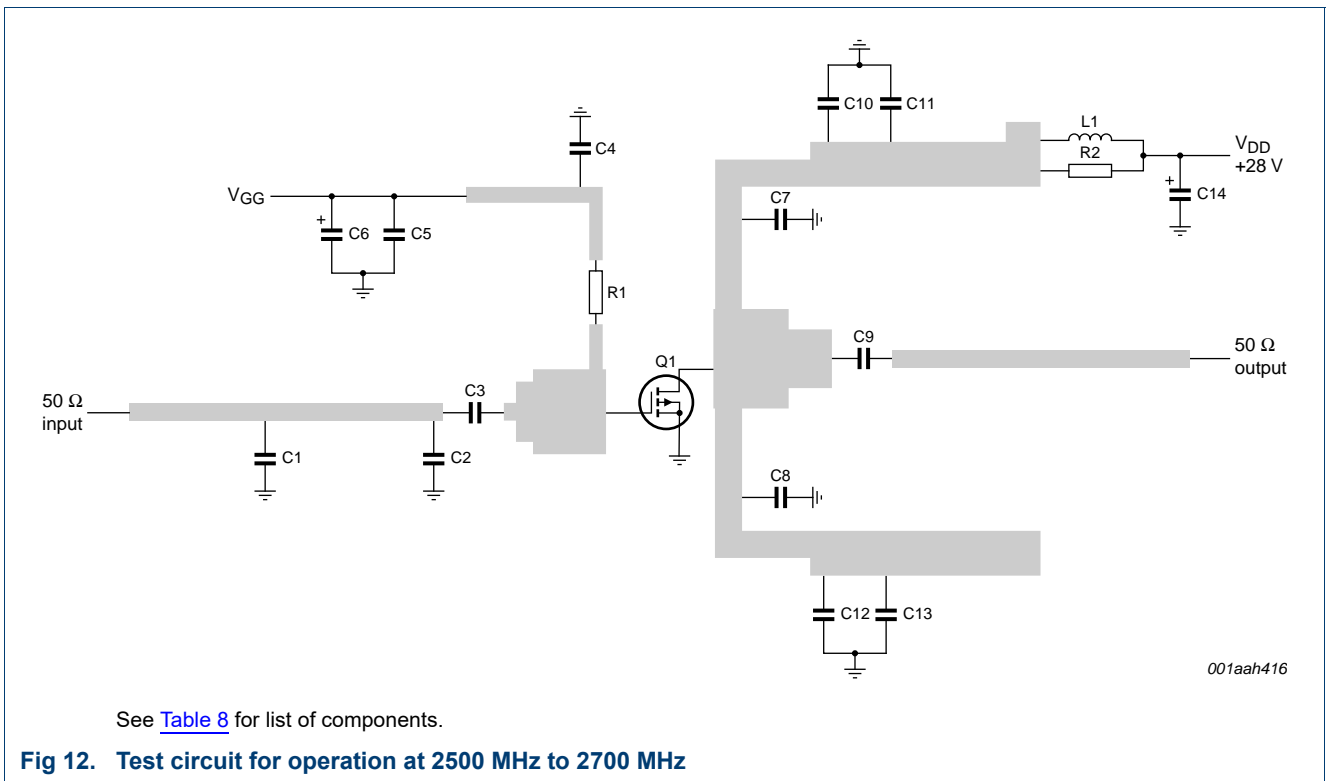
$V_{DS} = 28$  V;  $I_{Dq} = 350$  mA; single carrier N-CDMA;  
 PAR = 9.7 dB at 0.01 % probability;  
 instantaneous bandwidth = 30 kHz.

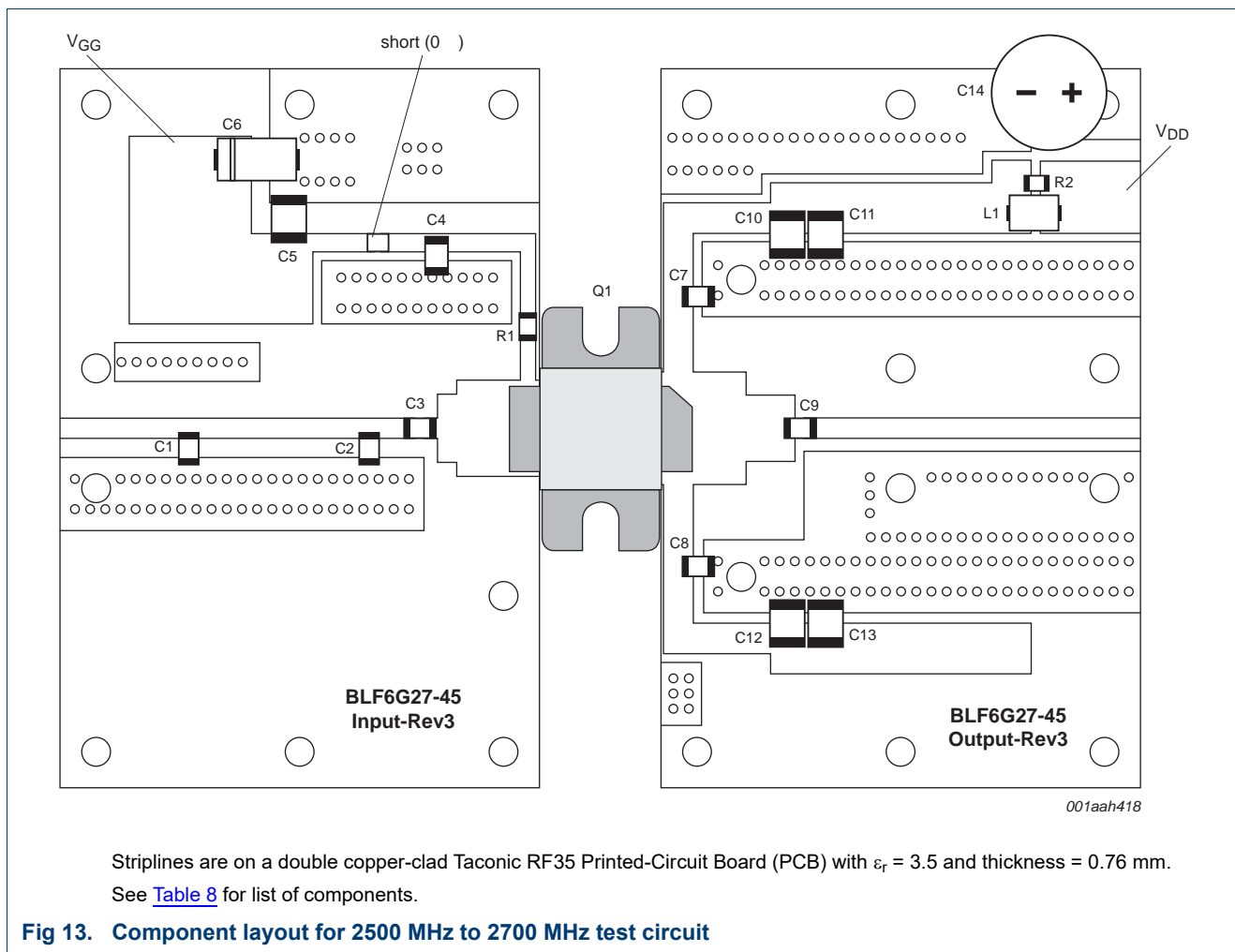
- (1) Low frequency component
- (2) High frequency component

Fig 11. Adjacent channel power ratio as function of frequency; typical values



8. Test information





**Table 8. List of components**  
For test circuit, see [Figure 12](#) and [Figure 13](#).

| Component              | Description                       | Value             | Remarks                                  |
|------------------------|-----------------------------------|-------------------|--|
| C1                     | multilayer ceramic chip capacitor | 0.3 pF            | [1]                                      |
| C2                     | multilayer ceramic chip capacitor | 0.5 pF            | [1]                                      |
| C3, C4, C7, C8         | multilayer ceramic chip capacitor | 11 pF             | [1]                                      |
| C5, C10, C11, C12, C13 | multilayer ceramic chip capacitor | 4.7 $\mu$ F       | C4532X7R1H475M                           |
| C6                     | tantalum capacitor                | 10 $\mu$ F; 35 V  | Kemet (Farnell)                          |
| C9                     | multilayer ceramic chip capacitor | 8.2 pF            |  |
| C14                    | electrolytic capacitor            | 470 $\mu$ F; 63 V |  |
| L1                     | ferrite SMD bead                  | -                 | Ferroxcube BDS 3/3/4.6-4S2 or equivalent |
| R1                     | resistor                          | 22 $\Omega$       | package 0603                             |
| R2                     | resistor                          | 12 $\Omega$       | package 1206                             |
| Q1                     | BLF6G27-45 or BLF6G27S-45         | -                 |  |

[1] American Technical Ceramics type 100B or capacitor of same quality.

Table 9. Measured test circuit impedances

| <b>f</b><br><b>(GHz)</b> | <b>Z<sub>i</sub></b><br><b>(Ω)</b> | <b>Z<sub>o</sub></b><br><b>(Ω)</b> |
|--------------------------|------------------------------------|------------------------------------|
| 2.50                     | 11.1 – j11.0                       | 18.4 – j9.1                        |
| 2.55                     | 10.6 – j10.8                       | 16.9 – j9.2                        |
| 2.60                     | 10.1 – j10.5                       | 15.6 – j9.2                        |
| 2.65                     | 9.6 – j10.2                        | 14.4 – j9.1                        |
| 2.70                     | 9.1 – j9.8                         | 13.3 – j8.9                        |

9. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT608A

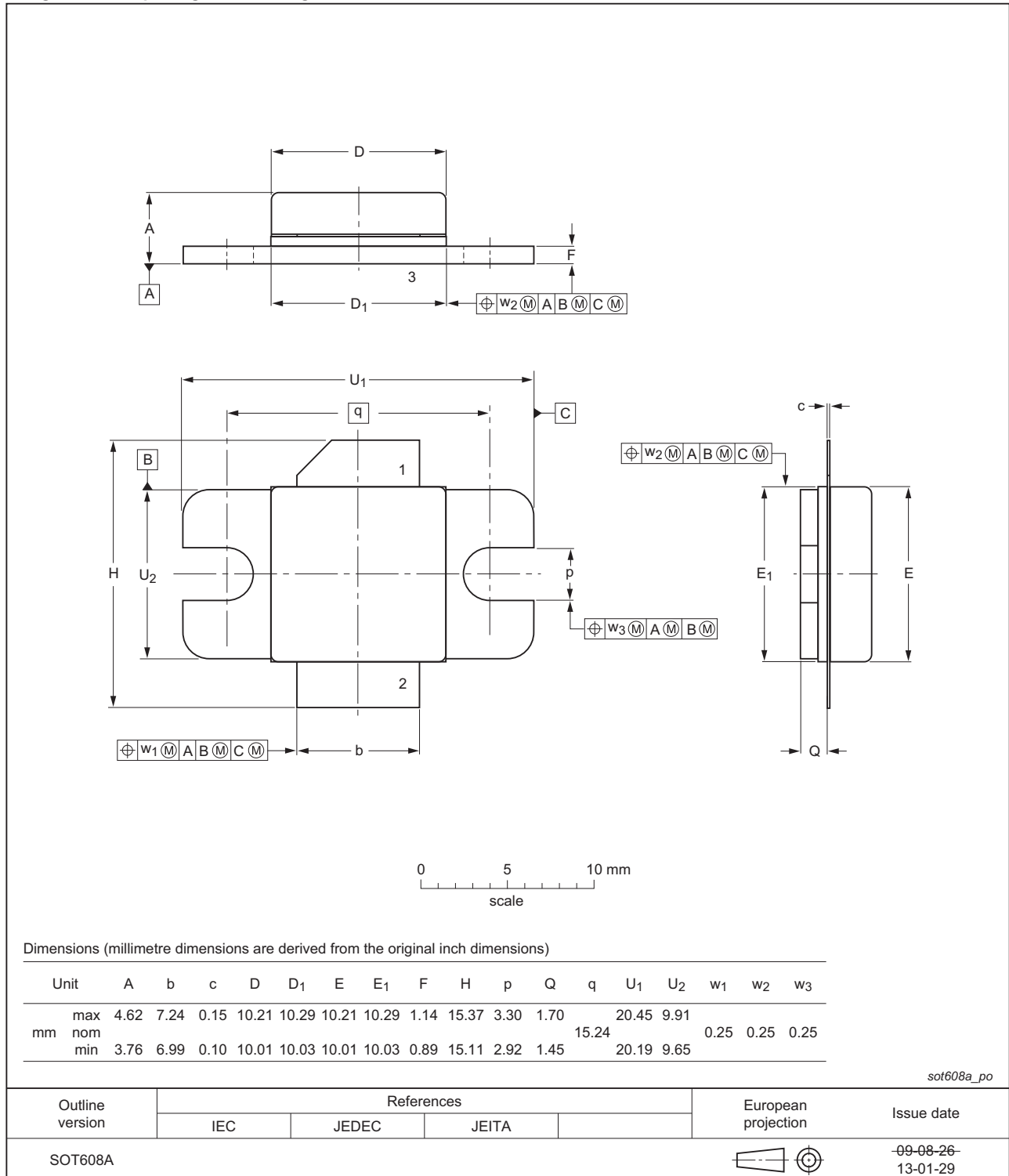


Fig 14. Package outline SOT608A

Ceramic earless flanged package; 2 leads

SOT608B

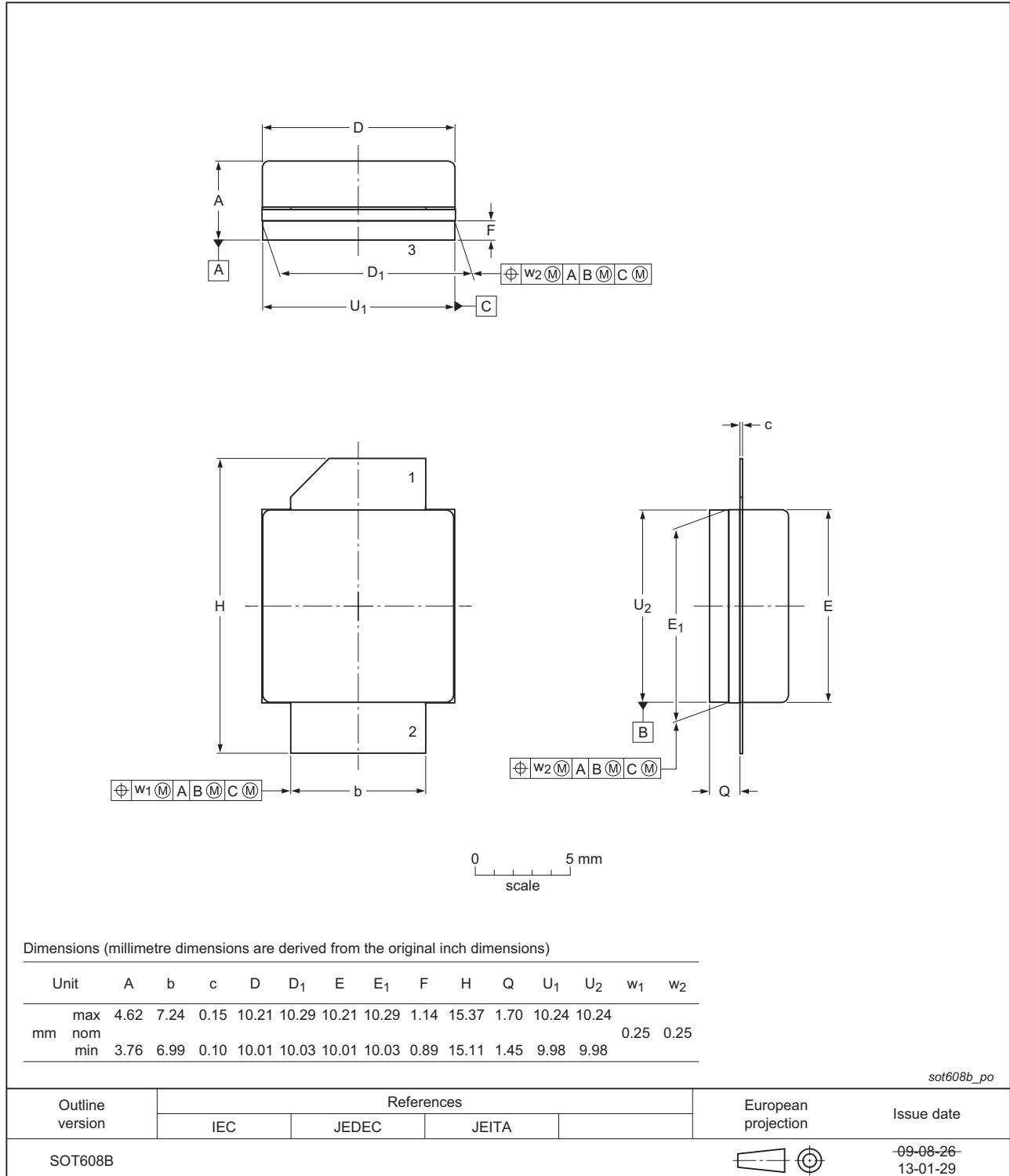


Fig 15. Package outline SOT608B

## 10. Abbreviations

Table 10. Abbreviations

| Acronym | Description                                     |
|---------|---|
| CCDF    | Complementary Cumulative Distribution Function  |
| CW      | Continuous Wave                                 |
| LDMOS   | Laterally Diffused Metal-Oxide Semiconductor    |
| N-CDMA  | Narrowband Code Division Multiple Access        |
| PAR     | Peak-to-Average power Ratio                     |
| RF      | Radio Frequency                                 |
| SMD     | Surface Mounted Device                          |
| VSWR    | Voltage Standing-Wave Ratio                     |
| WiMAX   | Worldwide Interoperability for Microwave Access |

## 11. Revision history

Table 11. Revision history

| Document ID                | Release date   | Data sheet status      | Change notice | Supersedes                 |
|----------------------------|--|------------------------|---------------|----------------------------|
| BLF6G27-45_BLF6G27S-45#5   | 20150901   | Product data sheet     | -             | BLF6G27-45_BLF6G27S-45 v.4 |
| Modifications:             | <ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul> |                        |               |                            |
| BLF6G27-45_BLF6G27S-45 v.4 | 20130307   | Product data sheet     | -             | BLF6G27-45_BLF6G27S-45_3   |
| BLF6G27-45_BLF6G27S-45_3   | 20081215   | Product data sheet     | -             | BLF6G27-45_BLF6G27S-45_2   |
| BLF6G27-45_BLF6G27S-45_2   | 20080207   | Preliminary data sheet |               | BLF6G27-45_BLF6G27S-45_1   |
| BLF6G27-45_BLF6G27S-45_1   | 20080129   | Preliminary data sheet |               |                            |

## 12. Legal information

### 12.1 Data sheet status

| 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.                                     |

[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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14. 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** . . . . . 2

5 **Thermal characteristics** . . . . . 3

6 **Characteristics** . . . . . 3

7 **Application information** . . . . . 3

7.1 Ruggedness in class-AB operation . . . . . 3

7.2 Single carrier N-CDMA performance . . . . . 4

7.3 Two-tone . . . . . 5

7.4 Continuous wave . . . . . 6

7.5 Single carrier N-CDMA broadband performance at 7 W average . . . . . 7

7.6 Single carrier N-CDMA broadband performance at 20 W average . . . . . 8

8 **Test information** . . . . . 9

9 **Package outline** . . . . . 12

10 **Abbreviations** . . . . . 14

11 **Revision history** . . . . . 14

12 **Legal information** . . . . . 15

12.1 Data sheet status . . . . . 15

12.2 Definitions . . . . . 15

12.3 Disclaimers . . . . . 15

12.4 Trademarks . . . . . 16

13 **Contact information** . . . . . 16

14 **Contents** . . . . . 17

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