# BLC8G27LS-100AV

## Power LDMOS transistor

Rev. 2 — 29 September 2014 Product data sheet

# 1. Product profile

## 1.1 General description

100 W LDMOS packaged asymmetrical Doherty power transistor for base station applications at frequencies from 2496 MHz to 2690 MHz.

**Table 1. Typical performance**

*Typical RF performance at $T_{case}$ = 25 °C in the Doherty demo board.*

| Test signal | f | $V_{DS}$ | $P_{L(AV)}$ | $G_p$ | $\eta_D$ | ACPR |
|---|---|---|---|---|---|---|
| | (MHz) | (V) | (W) | (dB) | (%) | (dBc) |
| 1-carrier W-CDMA | 2520 to 2620 | 28 | 18 | 15.5 | 45 | –30 [1] |

[1] Test signal: 3GPP test model 1; 1 to 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF.

## 1.2 Features and benefits

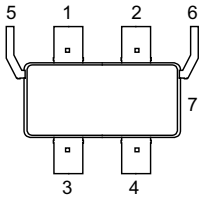
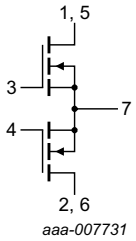
- Excellent ruggedness
- High efficiency
- Low thermal resistance providing excellent thermal stability
- Decoupling leads to enable improved video bandwidth
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- 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 amplifier for LTE base stations and multi carrier applications in the 2496 MHz to 2690 MHz frequency range

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| 1 | drain1 (main) |  |  |
| 2 | drain2 (peak) | | |
| 3 | gate1 (main) | | |
| 4 | gate2 (peak) | | |
| 5 | video decoupling (main) | | |
| 6 | video decoupling (peak) | | |
| 7 | source [1] | | |



[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BLC8G27LS-100AV | - | air cavity plastic earless flanged package; 6 leads | SOT1275-1 |

## 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 | [1] | - | 225 | °C |

[1] Continuous use at maximum temperature will affect the reliability, for details refer to the on-line MTF calculator.

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | Typ | Unit |
|---|---|---|---|---|
| $R_{th(j\text{-}case)}$ | thermal resistance from junction to case | $T_{case}$ = 80 °C; $V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA | | |
| | | $P_L$ = 18 W | 0.314 | K/W |
| | | $P_L$ = 65 W | 0.289 | K/W |

# 6. Characteristics

**Table 6. DC characteristics**

*$T_j$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Main device** | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS}$ = 0 V; $I_D$ = 0.51 mA | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS}$ = 10 V; $I_D$ = 51 mA | 1.5 | 1.9 | 2.3 | V |
| $V_{GSq}$ | gate-source quiescent voltage | $V_{DS}$ = 28 V; $I_D$ = 306 mA | 1.7 | 2.0 | 2.5 | V |
| $I_{DSS}$ | drain leakage current | $V_{GS}$ = 0 V; $V_{DS}$ = 28 V | - | - | 1.4 | µA |
| $I_{DSX}$ | drain cut-off current | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $V_{DS}$ = 10 V | - | 9.6 | - | A |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = 11 V; $V_{DS}$ = 0 V | - | - | 140 | nA |
| $g_{fs}$ | forward transconductance | $V_{DS}$ = 10 V; $I_D$ = 51 mA | - | 0.46 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $I_D$ = 1.785 A | - | 294 | 451 | mΩ |
| **Peak device** | | | | | | |
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS}$ = 0 V; $I_D$ = 0.72 mA | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS}$ = 10 V; $I_D$ = 72 mA | 1.5 | 1.9 | 2.3 | V |
| $V_{GSq}$ | gate-source quiescent voltage | $V_{DS}$ = 28 V; $I_D$ = 432 mA | 1.7 | 2.0 | 2.5 | V |
| $I_{DSS}$ | drain leakage current | $V_{GS}$ = 0 V; $V_{DS}$ = 28 V | - | - | 1.4 | µA |
| $I_{DSX}$ | drain cut-off current | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $V_{DS}$ = 10 V | - | 13.4 | - | A |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = 11 V; $V_{DS}$ = 0 V | - | - | 140 | nA |
| $g_{fs}$ | forward transconductance | $V_{DS}$ = 10 V; $I_D$ = 72 mA | - | 0.62 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $I_D$ = 2.52 A | - | 210 | 323 | mΩ |

**Table 7. RF characteristics**

*Test signal: 1-carrier W-CDMA; PAR = 7.2 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 1 to 64 DPCH; $f_1$ = 2496 MHz; $f_2$ = 2690 MHz; RF performance at $V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main); $V_{GS(amp)peak}$ = 0.8 V; $T_{case}$ = 25 °C; unless otherwise specified; in an asymmetrical Doherty production test circuit at 2496 MHz to 2690 MHz.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $G_p$ | power gain | $P_{L(AV)}$ = 17.8 W | 14.3 | 15.5 | - | dB |
| $RL_{in}$ | input return loss | $P_{L(AV)}$ = 17.8 W | - | –10 | –6 | dB |
| $\eta_D$ | drain efficiency | $P_{L(AV)}$ = 17.8 W | 39 | 44 | - | % |
| ACPR | adjacent channel power ratio | $P_{L(AV)}$ = 17.8 W | - | –31 | –25 | dBc |

**Table 8. RF characteristics**

*Test signal: 1-carrier W-CDMA; PAR = 7.2 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 1 to 64 DPCH; f = 2690 MHz; RF performance at $V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main); $V_{GS(amp)peak}$ = 0.8 V; $T_{case}$ = 25 °C; unless otherwise specified; in an asymmetrical Doherty production test circuit at 2496 MHz to 2690 MHz.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $PAR_O$ | output peak-to-average ratio | $P_{L(AV)}$ = 50 W | 3.6 | 4.2 | - | dB |
| $P_{L(M)}$ | peak output power | | 112 | 133 | - | W |

# 7. Test information

## 7.1 Ruggedness in Doherty operation

The BLC8G27LS-100AV is capable of withstanding a load mismatch corresponding to a VSWR = 10 : 1 through all phases under the following conditions: $V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main); $V_{GS(amp)peak}$ = 0.8 V; $P_L$ = 70 W (CW); f = 2496 MHz.

## 7.2 Impedance information

**Table 9. Typical impedance of main device**

*Measured load-pull data of main device; $I_{Dq}$ = 300 mA (main); $V_{DS}$ = 28 V.*

| f | $Z_S$ [1] | $Z_L$ [1] | $P_L$ [2] | $\eta_D$ [2] | $G_p$ [2] |
|---|---|---|---|---|---|
| (MHz) | (Ω) | (Ω) | (W) | (%) | (dB) |
| **Maximum power load** | | | | | |
| 2496 | 2.5 – j6.7 | 4.0 – j7.6 | 63 | 56.0 | 16.0 |
| 2600 | 3.4 – j7.0 | 4.0 – j7.6 | 61 | 55.6 | 16.7 |
| 2690 | 3.2 – j6.2 | 4.0 – j7.6 | 60 | 56.1 | 17.1 |
| **Maximum drain efficiency load** | | | | | |
| 2496 | 2.5 – j6.7 | 7.1 – j5.1 | 47.9 | 64 | 18.2 |
| 2600 | 3.4 – j7.0 | 6.5 – j4.6 | 44.3 | 63 | 19.0 |
| 2690 | 3.2 – j6.2 | 6.0 – j4.1 | 40.5 | 62 | 19.5 |

[1] $Z_S$ and $Z_L$ defined in Figure 1.

[2] at 3 dB gain compression.

**Table 10. Typical impedance of peak device**

*Measured load-pull data of peak device; $I_{Dq}$ = 400 mA (main); $V_{DS}$ = 28 V.*

| f | $Z_S$ [1] | $Z_L$ [1] | $P_L$ [2] | $\eta_D$ [2] | $G_p$ [2] |
|---|---|---|---|---|---|
| (MHz) | (Ω) | (Ω) | (W) | (%) | (dB) |
| **Maximum power load** | | | | | |
| 2496 | 2.6 – j6.4 | 2.7 – j7.1 | 83 | 55.7 | 17.8 |
| 2600 | 3.2 – j6.9 | 2.1 – j7.1 | 82 | 51.4 | 17.7 |
| 2690 | 4.3 – j7.8 | 2.1 – j7.1 | 82 | 53.2 | 18.4 |
| **Maximum drain efficiency load** | | | | | |
| 2496 | 2.6 – j6.4 | 4.0 – j5.6 | 61 | 66.6 | 19.7 |
| 2600 | 3.2 – j6.9 | 3.7 – j5.1 | 62 | 60.8 | 20.1 |
| 2690 | 4.3 – j7.8 | 3.3 – j5.4 | 61 | 60.5 | 20.6 |

[1] $Z_S$ and $Z_L$ defined in Figure 1.

[2] at 3 dB gain compression.

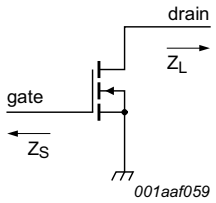



**Fig 1. Definition of transistor impedance**

## 7.3 Recommended impedances for Doherty design

**Table 11. Typical impedance of main device at 1 : 1 load**

*Measured load-pull data of main device; $I_{Dq}$ = 300 mA (main); $V_{DS}$ = 28 V.*

| f | $Z_S$ [1] | $Z_L$ [1] | $P_L$ [2] | $\eta_D$ [3] | $G_p$ [3] |
|---|---|---|---|---|---|
| **(MHz)** | **(Ω)** | **(Ω)** | **(dBm)** | **(%)** | **(dB)** |
| 2496 | 2.5 – j6.7 | 5.1 – j6.5 | 59 | 36.8 | 20.0 |
| 2600 | 3.4 – j7.0 | 5.1 – j6.5 | 56 | 38.0 | 20.5 |
| 2690 | 3.2 – j6.2 | 5.1 – j6.5 | 56 | 39.2 | 21.2 |

[1] $Z_S$ and $Z_L$ defined in Figure 1.

[2] at 3 dB gain compression.

[3] at $P_{L(AV)}$ = 42.5 dBm.

**Table 12. Typical impedance of main device at 1 : 2.5 load**

*Measured load-pull data of main device; $I_{Dq}$ = 300 mA (main); $V_{DS}$ = 28 V.*

| f | $Z_S$ [1] | $Z_L$ [1] | $P_L$ [2] | $\eta_D$ [3] | $G_p$ [3] |
|---|---|---|---|---|---|
| **(MHz)** | **(Ω)** | **(Ω)** | **(dBm)** | **(%)** | **(dB)** |
| 2496 | 2.5 – j6.7 | 11.2 – j2.7 | 31 | 52.0 | 22.2 |
| 2600 | 3.4 – j7.0 | 10.0 – j2.3 | 30 | 51.1 | 22.5 |
| 2690 | 3.2 – j6.2 | 7.5 – j0.8 | 25 | 52.2 | 22.1 |

[1] $Z_S$ and $Z_L$ defined in Figure 1.

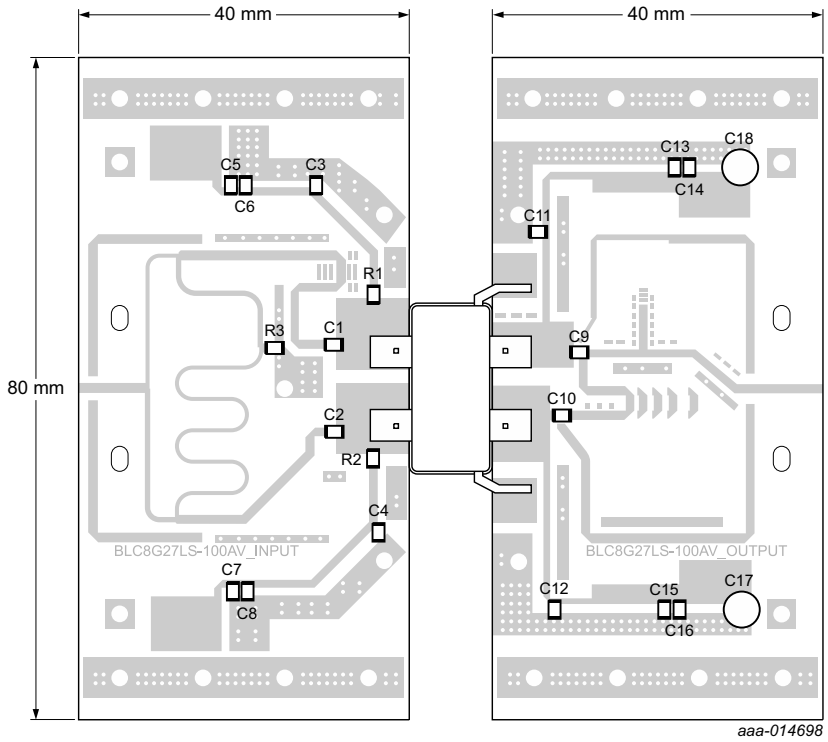
[2] at 3 dB gain compression.

[3] at $P_{L(AV)}$ = 42.5 dBm.

## 7.4 VBW in Doherty operation

The BLC8G27LS-100AV shows 130 MHz (typical) video bandwidth in Doherty demo board in 2600 MHz at $V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA and $V_{GS(amp)peak}$ = 0.8 V.

## 7.5 Test circuit




Printed-Circuit Board (PCB): Rogers RO4350B; $\varepsilon_r$ = 3.5; thickness = 0.508 mm; thickness copper plating = 35 μm.

See Table 13 for a list of components.

**Fig 2. Component layout**

**Table 13. List of components**

*See Figure 2 for component layout.*

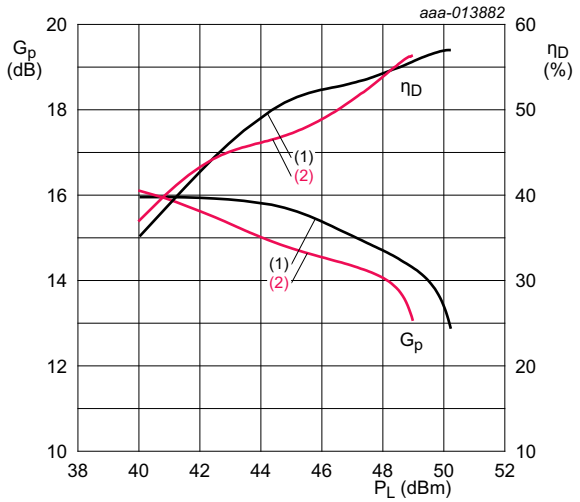
| Component | Description | Value | Remarks |
|---|---|---|---|
| C1, C2, C3, C4, C10, C11, C12 | multilayer ceramic chip capacitor | 11 pF [1] | ATC 600F |
| C9 | multilayer ceramic chip capacitor | 5.1 pF [1] | ATC 600F |
| C6, C8, C13, C15 | multilayer ceramic chip capacitor | 1 μF, 50 V [2] | Murata |
| C5, C7, C14, C16 | multilayer ceramic chip capacitor | 10 μF, 50 V [2] | Murata |
| C17, C18 | electrolytic capacitor | 470 μF, 50 V | |
| R1, R2 | SMD resistor | 9.1 Ω | SMD 0805 |
| R3 | SMD resistor | 50 Ω | SMD 0805 |

[1] American Technical Ceramics type 600F or capacitor of same quality

[2] Murata or capacitor of same quality

## 7.6 Graphical data

### 7.6.1 CW



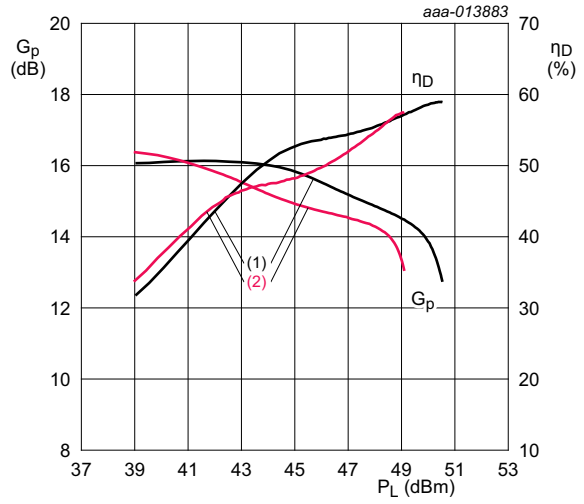

$V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main device); $V_{GS(amp)peak}$ = 0.8 V.

(1) f = 2496 MHz

(2) f = 2690 MHz

**Fig 3. Power gain and drain efficiency as function of output power; typical values**

### 7.6.2 Pulsed CW

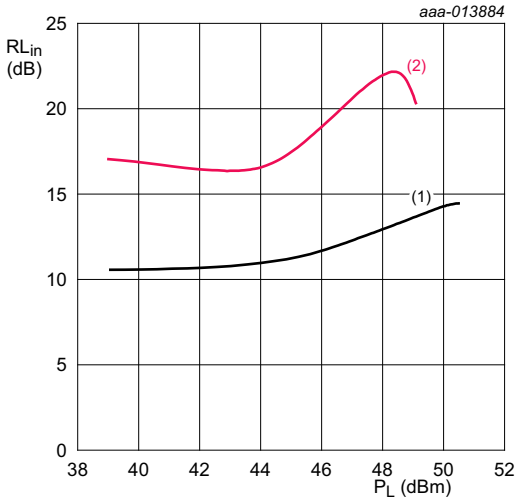



$V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main device); $V_{GS(amp)peak}$ = 0.8 V.

(1) f = 2496 MHz

(2) f = 2690 MHz

**Fig 4. Power gain and drain efficiency as function of output power; typical values**



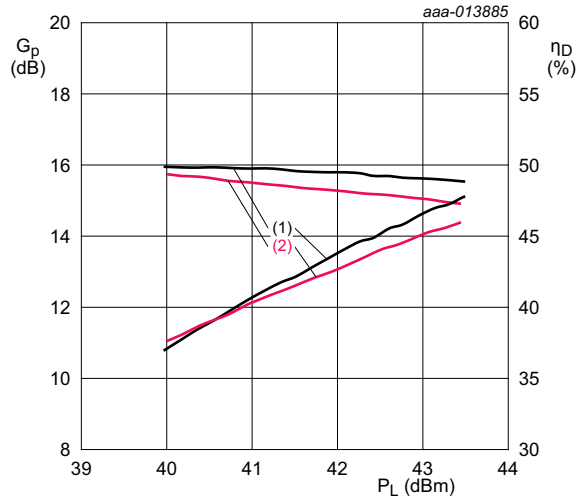

$V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main device); $V_{GS(amp)peak}$ = 0.8 V.

(1) f = 2496 MHz

(2) f = 2690 MHz

**Fig 5. Input return loss as a function of output power; typical values**

### 7.6.3 1-Carrier W-CDMA

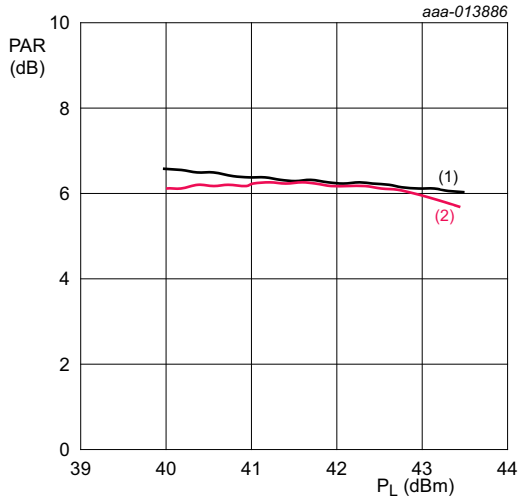



$V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main device); $V_{GS(amp)peak}$ = 0.8 V.

(1) f = 2496 MHz

(2) f = 2690 MHz

**Fig 6. Power gain and drain efficiency as function of output power; typical values**

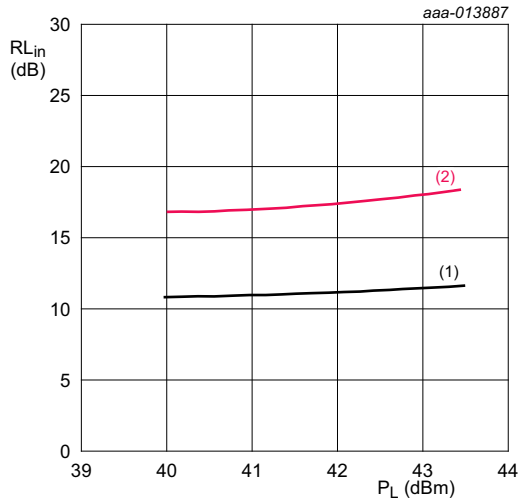



$V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main device); $V_{GS(amp)peak}$ = 0.8 V.

(1) f = 2496 MHz

(2) f = 2690 MHz

**Fig 7. Peak-to-average power ratio as a function of output power; typical values**

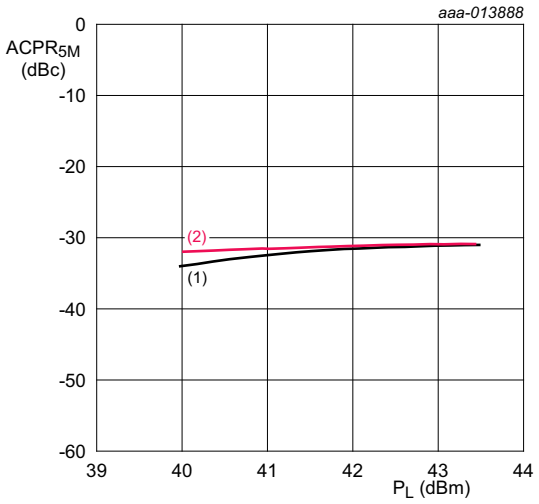



$V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main device); $V_{GS(amp)peak}$ = 0.8 V.

(1) f = 2496 MHz

(2) f = 2690 MHz

**Fig 8. Input return loss as a function of output power; typical values**



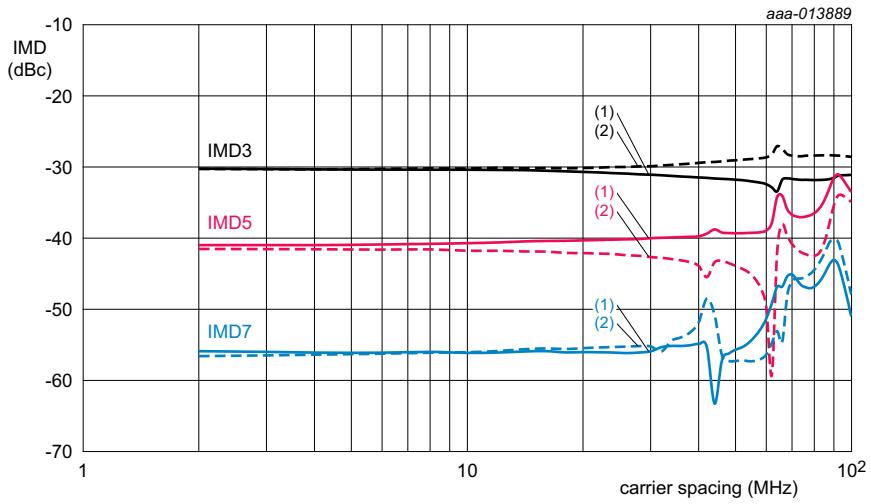

$V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main device); $V_{GS(amp)peak}$ = 0.8 V.

(1) f = 2496 MHz

(2) f = 2690 MHz

**Fig 9. Adjacent channel power ratio (5 MHz) as a function of output power; typical values**

### 7.6.4 2-Tone VBW




$V_{DS}$ = 28 V; $I_{Dq}$ = 250 mA (main device); $f_c$ = 2600 MHz.

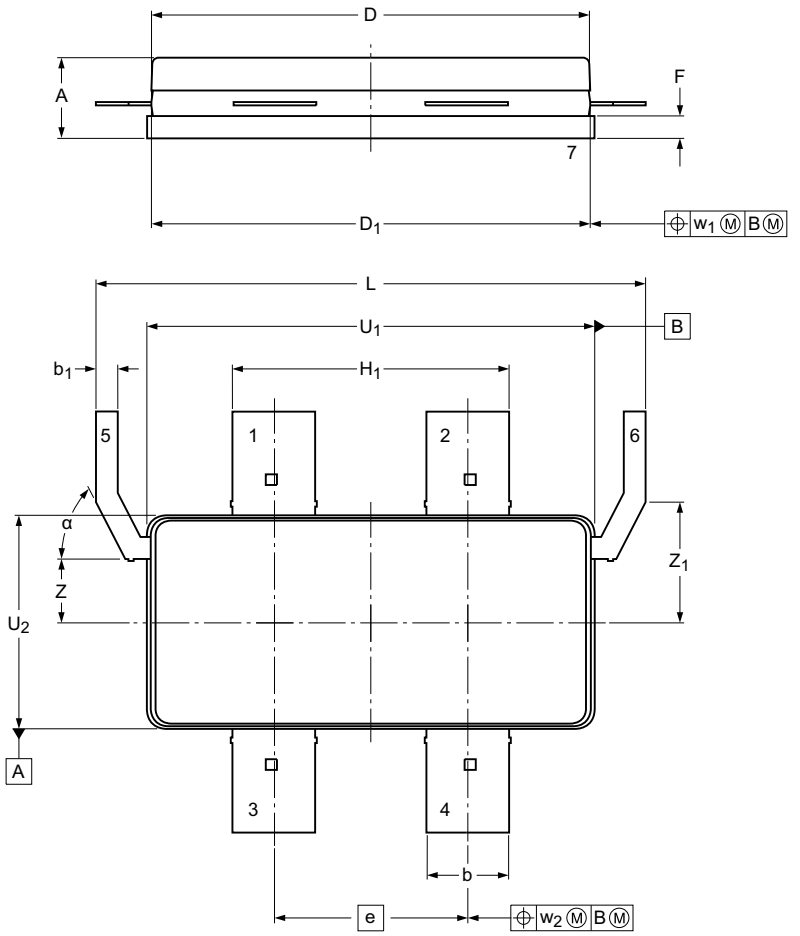
(1) IMD low

(2) IMD high

**Fig 10. VBW capability in Doherty demo board**

# 8. Package outline

**Air cavity plastic earless flanged package; 6 leads** **SOT1275-1**




| v | w1 | w2 |
|---|---|---|
| 0.5 | 0.5 | 0.5 |

Dimensions (mm dimensions are derived from the original inch dimensions)

| Unit | | A | b | $b_1$ | c | D | $D_1$ | E | $E_1$ | e | F | H | $H_1$ | L | Q | $U_1$ | $U_2$ | Z | $Z_1$ | α |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 4.01 | 3.94 | 1.14 | 0.178 | 20.42 | 20.37 | 9.80 | 9.75 | | 1.14 | 19.53 | 12.80 | 25.40 | 1.68 | 20.70 | 9.91 | 3.67 | 5.79 | 65° |
| | nom | | | | | | | | | 8.89 | | | | | | | | | | |
| | min | 3.40 | 3.68 | 0.89 | 0.127 | 20.12 | 20.17 | 9.50 | 9.55 | | 0.94 | 19.33 | 12.60 | 25.20 | 1.45 | 20.50 | 9.70 | 3.17 | 5.29 | 61° |

*sot1275-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1275-1 | | | | | | ~~13-10-08~~ 14-01-13 |

**Fig 11. Package outline SOT1275-1**

## 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 14. Abbreviations**

| Acronym | Description |
|---|---|
| 3GPP | 3rd Generation Partnership Project |
| CCDF | Complementary Cumulative Distribution Function |
| CW | Continuous Wave |
| DPCH | Dedicated Physical CHannel |
| ESD | ElectroStatic Discharge |
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| LTE | Long Term Evolution |
| MTF | Median Time to Failure |
| PAR | Peak-to-Average Ratio |
| SMD | Surface Mounted Device |
| VBW | Video BandWidth |
| VSWR | Voltage Standing Wave Ratio |
| W-CDMA | Wideband Code Division Multiple Access |

## 11. Revision history

**Table 15. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BLC8G27LS-100AV v.2 | 20140929 | Product data sheet | - | BLC8G27LS-100AV v.1 |
| Modifications: | • Section 1.1 on page 1: the frequency range has been changed.<br>• Table 1 on page 1: value $P_{L(AV)}$ changed from 17 W to 18 W<br>• Section 1.3 on page 1: the frequency range has been changed.<br>• Table 5 on page 2: table updated<br>• Section 6 on page 3: section updated<br>• Section 7 on page 4: section added | | | |
| BLC8G27LS-100AV v.1 | 20140225 | Objective data sheet | - | - |

# 12. Legal information

## 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

## 12.2 Definitions

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## 13. Contact information

For more information, please visit: **http://www.nxp.com**

For sales office addresses, please send an email to: **salesaddresses@nxp.com**

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