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# BLC10G22LS-240PVT

**Power LDMOS transistor**

**Rev. 2 — 24 May 2017**

AMPLEON

**Product data sheet**

## 1. Product profile

### 1.1 General description

240 W LDMOS power transistor with enhanced video bandwidth for base station applications at frequencies from 2110 MHz to 2200 MHz.

**Table 1. Typical performance**

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

| Test signal | f | $I_{Dq}$ | $V_{DS}$ | $P_{L(AV)}$ | $G_p$ | $\eta_D$ | $ACPR_{5M}$ |
|---|---|---|---|---|---|---|---|
| | (MHz) | (mA) | (V) | (W) | (dB) | (%) | (dBc) |
| 2-carrier W-CDMA | 2110 to 2170 | 1600 | 28 | 60 | 19.7 | 30 | −30 [1] |

[1] Test signal: 3GPP test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF per carrier; 5 MHz carrier spacing.

### 1.2 Features and benefits

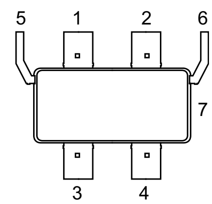
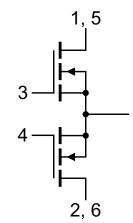
- Excellent ruggedness
- Excellent video bandwidth enabling full band operation
- High efficiency
- Low thermal resistance providing excellent thermal stability
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- RF power amplifiers for base stations and multi carrier applications in the 2110 MHz to 2200 MHz frequency range

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| 1 | drain1 |  | <br>aaa-007731 |
| 2 | drain2 | | |
| 3 | gate1 | | |
| 4 | gate2 | | |
| 5 | video decoupling | | |
| 6 | video decoupling | | |
| 7 | source [1] | | |

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BLC10G22LS-240PVT | - | 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 | | −6 | +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 online MTF calculator.

## 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; $P_L$ = 60 W | 0.35 | K/W |

# 6. 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; $I_D$ = 0.6 mA | 65 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS}$ = 10 V; $I_D$ = 149 mA | 1.5 | 2.0 | - | V |
| $V_{GSq}$ | gate-source quiescent voltage | $V_{DS}$ = 28 V; $I_D$ = 800 mA | 1.65 | 2.15 | 2.75 | V |
| $I_{DSS}$ | drain leakage current | $V_{GS}$ = 0 V; $V_{DS}$ = 32 V | - | - | 1.4 | μA |
| $I_{DSX}$ | drain cut-off current | $V_{GS}$ = $V_{GS(th)}$ + 2.37 V; $V_{DS}$ = 10 V | - | 28 | - | A |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = 9 V; $V_{DS}$ = 0 V | - | - | 140 | nA |
| $g_{fs}$ | forward transconductance | $V_{DS}$ = 20 V; $I_D$ = 7.5 A | - | 16 | - | S |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS}$ = $V_{GS(th)}$ + 3.95 V; $I_D$ = 5.3 A | - | 0.1 | - | Ω |

**Table 7. RF characteristics**
*Test signal: 2-carrier W-CDMA; 3GPP test model 1 with 64 DPCH; PAR = 8.4 dB at 0.01 % probability on the CCDF; $f_1$ = 2112.5 MHz; $f_2$ = 2117.5 MHz; $f_3$ = 2162.5 MHz; $f_4$ = 2167.5 MHz; RF performance at $V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA; $T_{case}$ = 25 °C; unless otherwise specified; in a water cooled class-AB test circuit.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $G_p$ | power gain | $P_{L(AV)}$ = 60 W | 18.5 | 19.7 | - | dB |
| $\eta_D$ | drain efficiency | $P_{L(AV)}$ = 60 W | 27 | 30 | - | % |
| $RL_{in}$ | input return loss | $P_{L(AV)}$ = 60 W | - | −14 | −10 | dB |
| $ACPR_{5M}$ | adjacent channel power ratio (5 MHz) | $P_{L(AV)}$ = 60 W | - | −30 | −26 | dBc |

# 7. Test information

## 7.1 Ruggedness in class-AB operation

The BLC10G22LS-240PVT is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA; 2-carrier W-CDMA signal; $P_L$ = 120 W average; $f_c$ = 2110 MHz; 5 MHz spacing; 46 % clipping.

## 7.2 Impedance information

**Table 8. Typical impedance**

*Measured load-pull data per section; $I_{Dq}$ = 800 mA; $V_{DS}$ = 28 V; pulsed CW ($t_p$ = 100 $\mu$s; $\delta$ = 10 %).*

| f | $Z_S$ [1] | $Z_L$ [1] | $P_L$ [2] | $\eta_D$ [2] | $G_p$ [2] |
|---|---|---|---|---|---|
| (MHz) | (Ω) | (Ω) | (W) | (%) | (dB) |
| **Maximum power load** | | | | | |
| 2110 | 4.0 – j9.8 | 2.4 – j6.2 | 201.1 | 59.1 | 16.3 |
| 2140 | 4.7 – j10.7 | 2.4 – j6.2 | 205.1 | 59.3 | 16.4 |
| 2170 | 6.0 – j10.8 | 2.2 – j6.4 | 205.3 | 60.1 | 16.7 |
| **Maximum drain efficiency load** | | | | | |
| 2110 | 4.0 – j9.8 | 3.1 – j4.4 | 164.7 | 67.8 | 18.1 |
| 2140 | 4.7 – j10.7 | 3.1 – j4.3 | 163.3 | 67.4 | 18.4 |
| 2170 | 6.0 – j10.8 | 2.8 – j4.5 | 163.0 | 67.2 | 18.4 |

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

[2] at 3 dB gain compression.

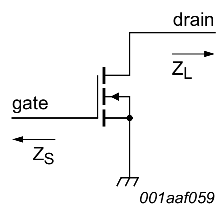
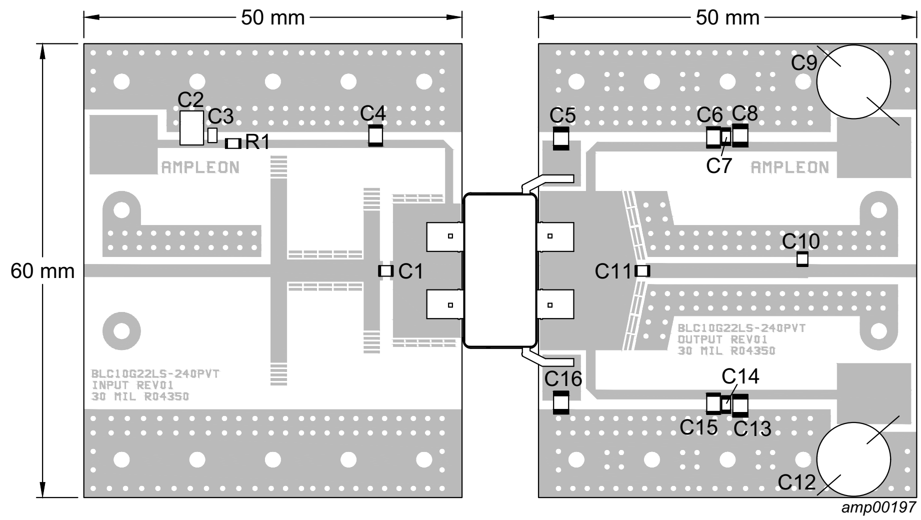



**Fig 1. Definition of transistor impedance**

## 7.3 Test circuit




Printed-Circuit Board (PCB): Rogers RO4350B with a thickness of 0.76 mm.

See Table 9 for a list of components.

**Fig 2. Component layout for test circuit**

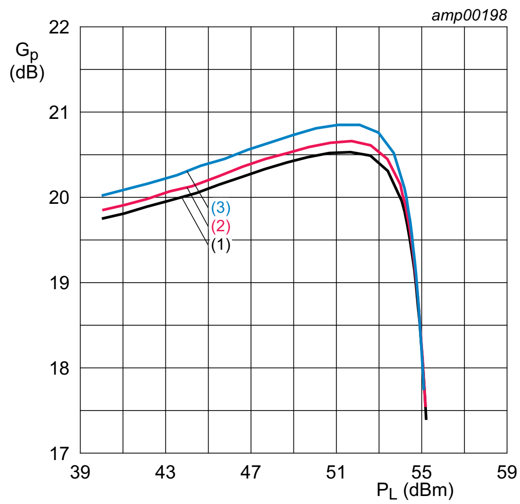
**Table 9. List of components**

*See Figure 2 for component layout.*

| Component | Description | Value | Remarks |
|---|---|---|---|
| C1 | multilayer ceramic chip capacitor | 1.3 pF | ATC 800A |
| C2 | multilayer ceramic chip capacitor | 1 μF | Murata |
| C3 | multilayer ceramic chip capacitor | 100 nF | Murata |
| C4, C6, C15 | multilayer ceramic chip capacitor | 33 pF | ATC 800B |
| C5, C8, C13, C16 | multilayer ceramic chip capacitor | 4.7 μF, 50 V | Murata |
| C7, C14 | multilayer ceramic chip capacitor | 220 nF | Murata |
| C9, C12 | electrolytic capacitor | > 470 μF, 63 V | low ESR |
| C10 | multilayer ceramic chip capacitor | 1.3 pF | ATC 800A |
| C11 | multilayer ceramic chip capacitor | 1.5 pF | ATC 800A |
| R1 | resistor | 4.7 Ω, 1 % tolerance | SMD 0805 |

## 7.4 Graphical data

### 7.4.1 Pulsed CW



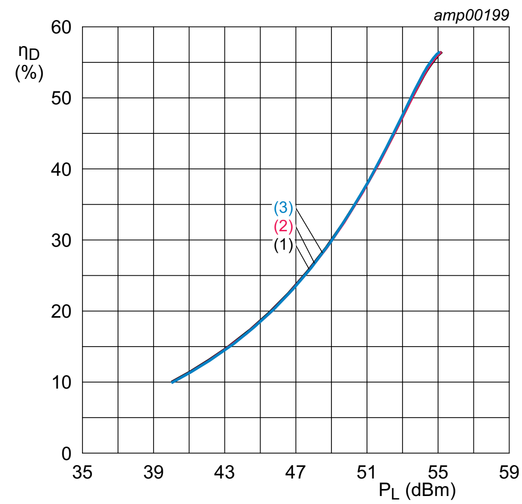

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA; $t_p$ = 100 μs; δ = 10 %.

(1) f = 2110 MHz

(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 3. Power gain as a function of output power; typical values**




$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA; $t_p$ = 100 μs; δ = 10 %.

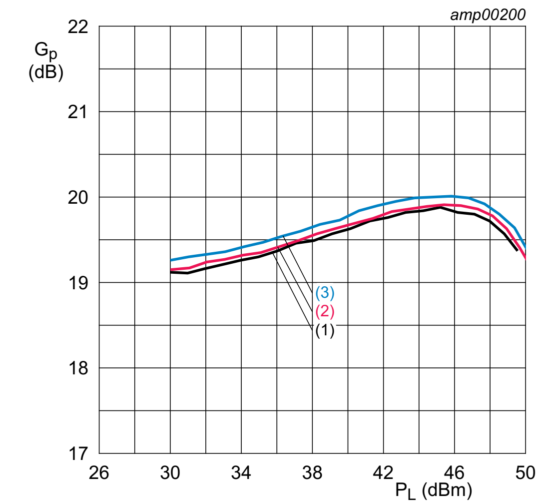
(1) f = 2110 MHz

(2) f = 2140 MHz

(3) f = 2170 MHz

**Fig 4. Drain efficiency as a function of output power; typical values**

### 7.4.2 IS-95



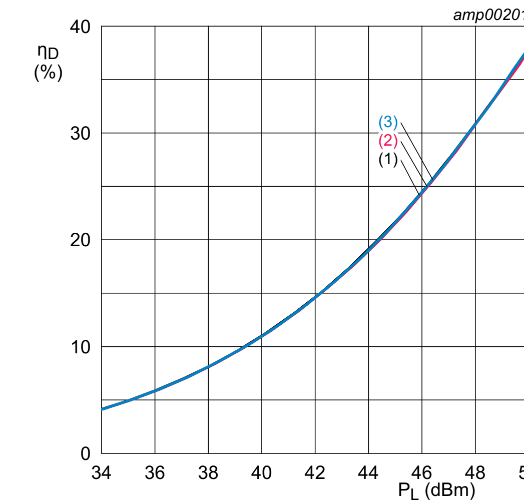

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 5. Power gain as a function of output power; typical values**



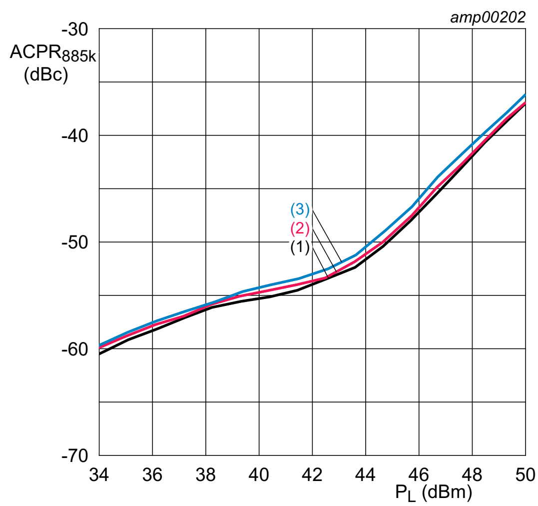

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 6. Drain efficiency as a function of output power; typical values**



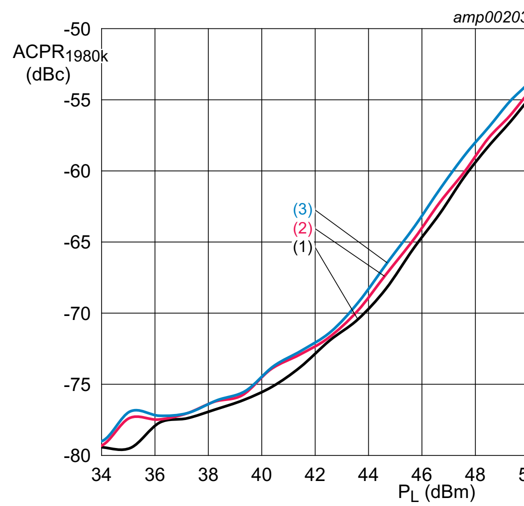

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 7. Adjacent channel power ratio (885 kHz) as a function of output power; typical values**



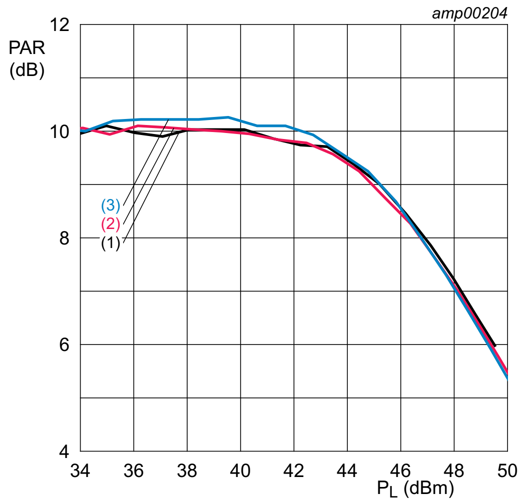

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 8. Adjacent channel power ratio (1980 kHz) as a function of output power; typical values**



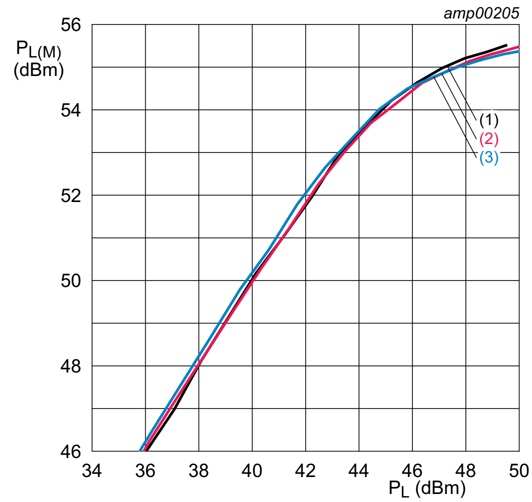

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 9. Peak-to-average ratio as a function of output power; typical values**




$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

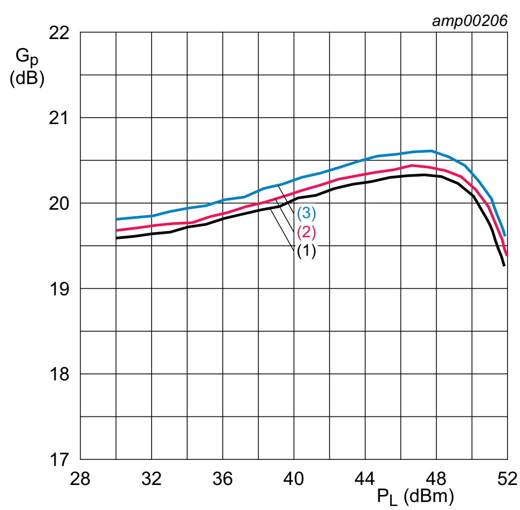
(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 10. Peak output power as a function of output power; typical values**

### 7.4.3 1-Carrier W-CDMA



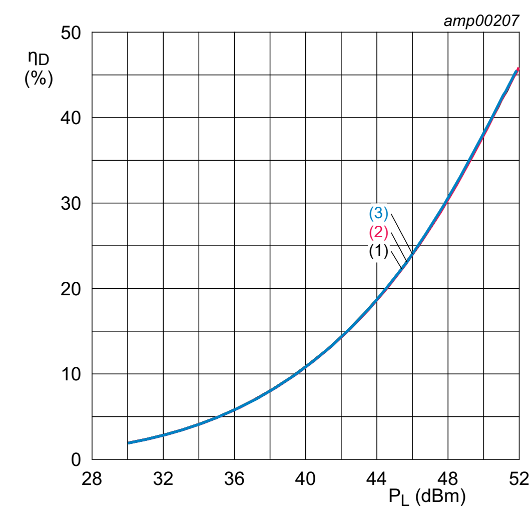

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2112.5 MHz

(2) f = 2140 MHz

(3) f = 2167.5 MHz

**Fig 11. Power gain as a function of output power; typical values**



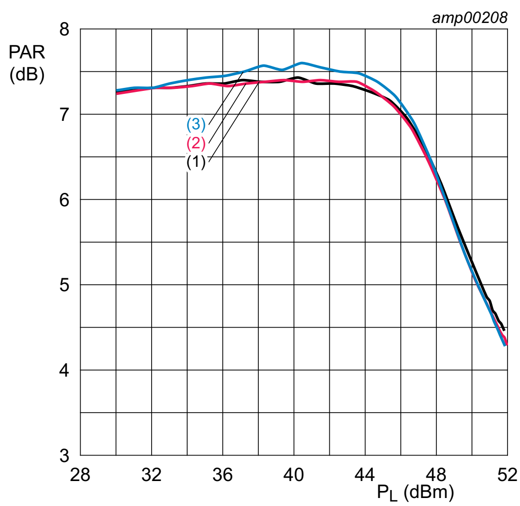

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2112.5 MHz

(2) f = 2140 MHz

(3) f = 2167.5 MHz

**Fig 12. Drain efficiency as a function of output power; typical values**



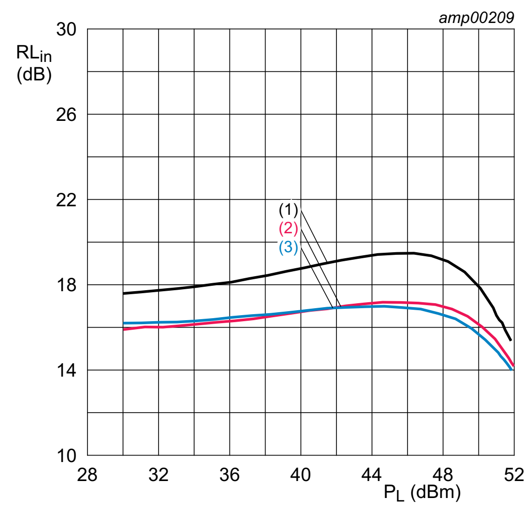

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2112.5 MHz

(2) f = 2140 MHz

(3) f = 2167.5 MHz

**Fig 13. Peak-to-average ratio as a function of output power; typical values**




$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

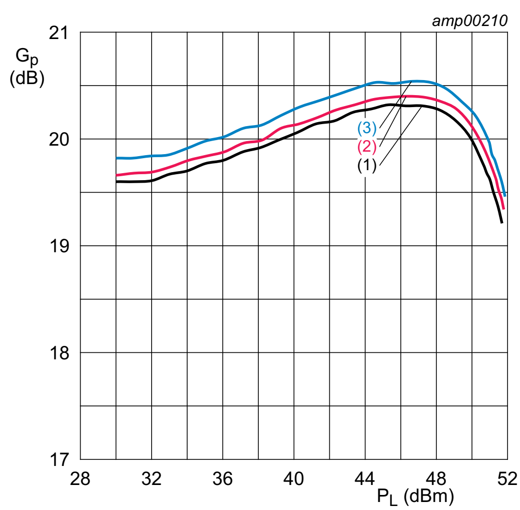
(1) f = 2112.5 MHz

(2) f = 2140 MHz

(3) f = 2167.5 MHz

**Fig 14. Input return loss as a function of output power; typical values**

### 7.4.4 2-Carrier W-CDMA



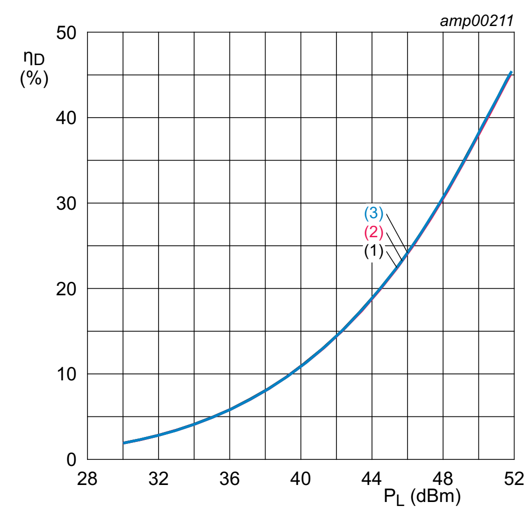

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 15. Power gain as a function of output power; typical values**



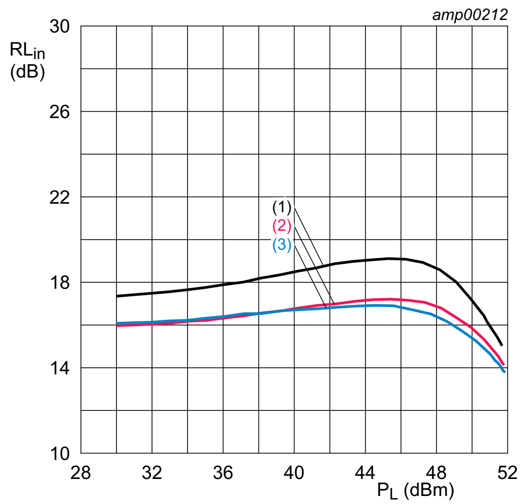

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 16. Drain efficiency as a function of output power; typical values**



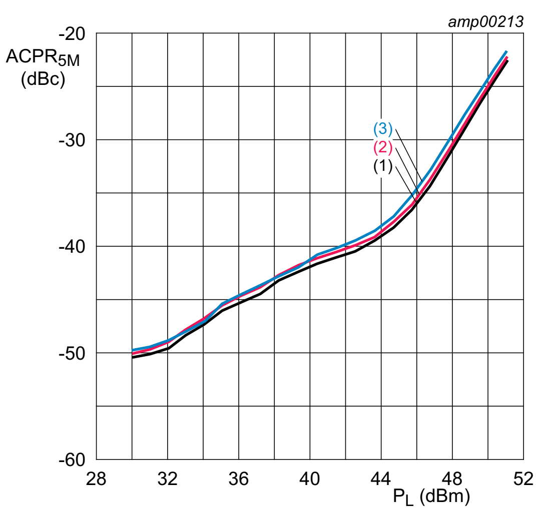

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 17. Input return loss as a function of output power; typical values**



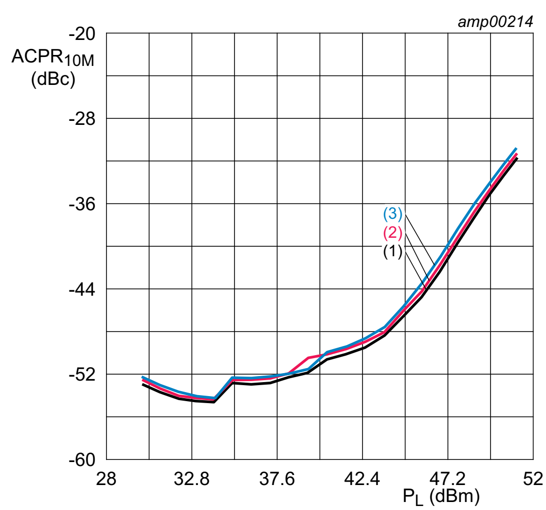

$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 18. Adjacent channel power ratio (5 MHz) as a function of output power; typical values**




$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

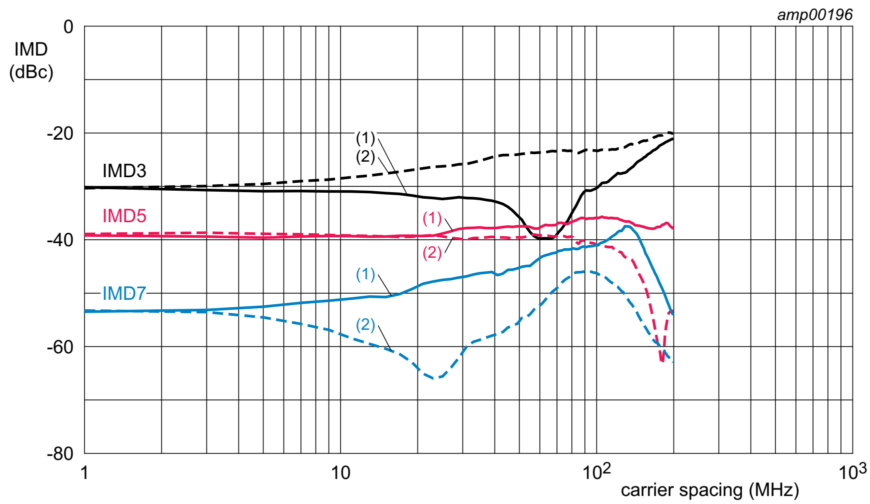
(1) f = 2115 MHz

(2) f = 2140 MHz

(3) f = 2165 MHz

**Fig 19. Adjacent channel power ratio (10 MHz) as a function of output power; typical values**

### 7.4.5 2-Tone VBW




$V_{DS}$ = 28 V; $I_{Dq}$ = 1600 mA.

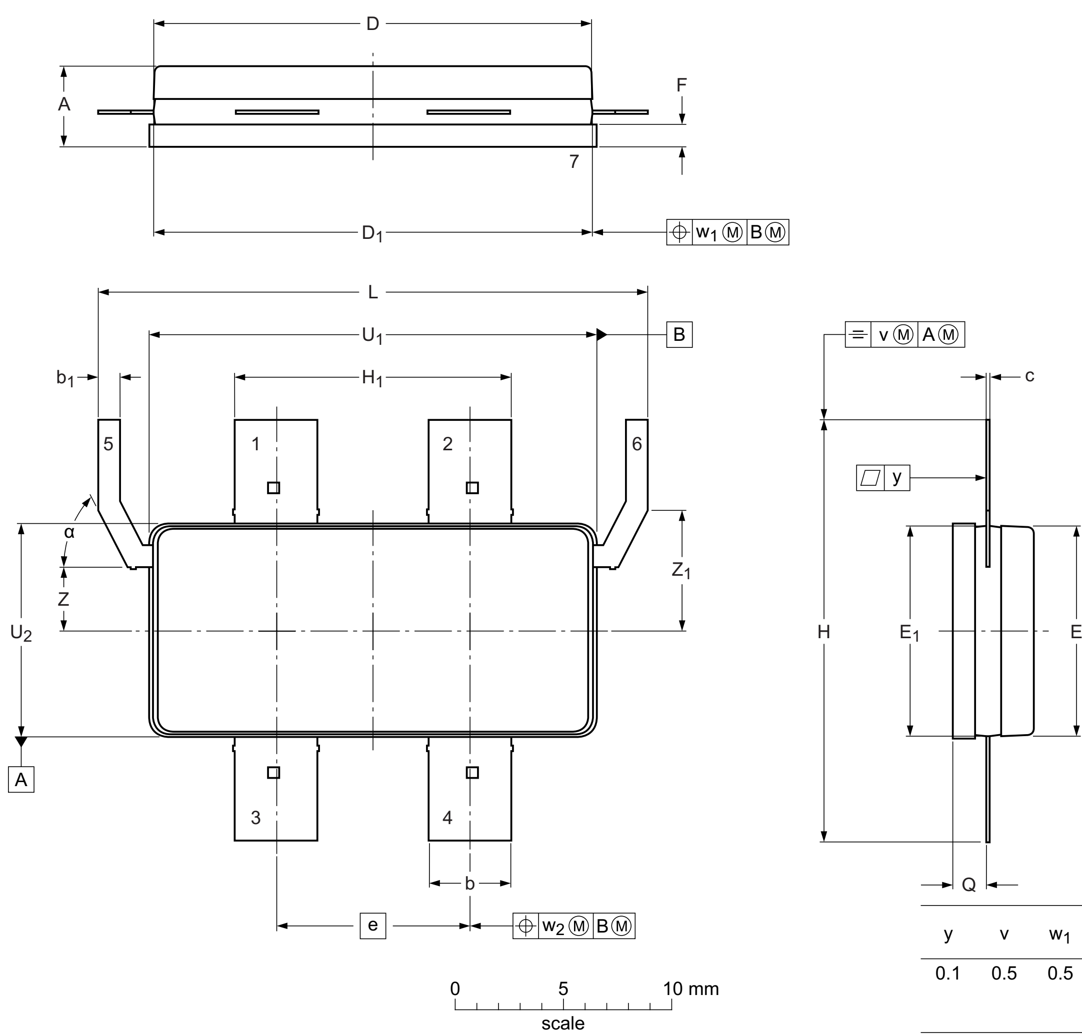
(1) low

(2) high

**Fig 20. VBW capability in class-AB test circuit**

# 8. Package outline

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




| y | v | $w_1$ | $w_2$ |
|---|---|---|---|
| 0.1 | 0.5 | 0.5 | 0.5 |

Dimensions

| Unit | | A | b | $b_1$ | c | D | $D_1$ | E | $E_1$ | e | F | H | $H_1$ | L | Q(1) | $U_1$ | $U_2$ | 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 | 3.17 | 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 | 2.67 | 5.29 | 61° |

Note
1. Dimension Q is measured 0.1 mm away from the flange.
2. Ringframe and/or ringframe glue shall not overhang at the side of the flange.

*sot1275-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1275-1 | | | | | | ~~16-11-15~~<br>17-04-13 |

**Fig 21. 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.

**Table 10. ESD sensitivity**

| ESD model | Class |
|---|---|
| Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002 | C2A [1] |
| Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001 | 2 [2] |

[1] CDM classification C2A is granted to any part that passes after exposure to an ESD pulse of 500 V, but fails after exposure to an ESD pulse of 750 V.

[2] HBM classification 2 is granted to any part that passes after exposure to an ESD pulse of 2000 V, but fails after exposure to an ESD pulse of 4000 V.

## 10. Abbreviations

**Table 11. Abbreviations**

| Acronym | Description |
|---|---|
| 3GPP | 3rd Generation Partnership Project |
| CCDF | Complementary Cumulative Distribution Function |
| CW | Continuous Wave |
| DPCH | Dedicated Physical CHannel |
| ESD | ElectroStatic Discharge |
| ESR | Equivalent Series Resistance |
| IS-95 | Interim Standard 95 |
| LDMOS | Laterally Diffused Metal Oxide Semiconductor |
| 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 12. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BLC10G22LS-240PVT v.2 | 20170524 | Product data sheet | - | BLC10G22LS-240PVT v.1 |
| Modifications: | • Table 2 on page 2: change simplified outline<br>• Table 3 on page 2: change version to SOT1275-1<br>• Figure 21 on page 12: change package outline drawing to SOT1275-1 | | | |
| BLC10G22LS-240PVT v.1 | 20170104 | Product 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.ampleon.com.

## 12.2 Definitions

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For sales office addresses, please visit: **http://www.ampleon.com/sales**

## 14. Contents





**Date of release: 24 May 2017**
**Document identifier: BLC10G22LS-240PVT**