

# BLC10G19LS-250WT

Power LDMOS transistor

Rev. 1 — 19 October 2017

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

250 W LDMOS power transistor for base station applications at frequencies from 1930 MHz to 1990 MHz.

**Table 1. Typical performance**

*Typical RF performance at  $T_{case} = 25\text{ °C}$  in a common source class-AB demo application.*

Test signal	f	$I_{Dq}$	$V_{DS}$	$P_{L(AV)}$	$G_p$	$\eta_D$	ACPR
	(MHz)	(mA)	(V)	(W)	(dB)	(%)	(dBc)
2-carrier W-CDMA	1930 to 1990	1400	28	60	19.3	31	-31 <a href="#">[1]</a>

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

### 1.2 Features and benefits

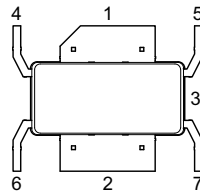
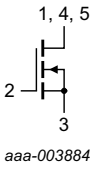
- Excellent ruggedness
- Excellent video bandwidth enabling full band operation
- High efficiency
- Low thermal resistance providing excellent thermal stability
- Designed for low memory effects providing excellent pre-distortability
- Device can operate with the supply current delivered through video leads
- 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 W-CDMA base stations and multi carrier applications in the 1930 MHz to 1990 MHz frequency range

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		
2	gate		
3	source <a href="#">[1]</a>		
4	video decoupling		
5	video decoupling		
6	n.c.		
7	n.c.		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLC10G19LS-250WT	-	Air cavity plastic earless flanged package; 6 leads	SOT1271-2

## 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	<a href="#">[1]</a>	-	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	$T_{case} = 80\text{ °C}; P_L = 60\text{ W}$	0.28	K/W

## 6. Characteristics

**Table 6. DC characteristics**

$T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 2.715\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 272\text{ mA}$	1.6	2.0	-	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 28\text{ V}; I_D = 1400\text{ mA}$	1.5	2.0	2.5	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}$	-	-	1.4	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 2.37\text{ V};$ $V_{DS} = 10\text{ V}$	-	49	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 9\text{ V}; V_{DS} = 0\text{ V}$	-	-	420	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 13.6\text{ A}$	-	29.5	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 2.37\text{ V};$ $I_D = 9.5\text{ A}$	-	0.05	-	$\Omega$

**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;  $f_1 = 1932.5\text{ MHz}; f_2 = 1937.5\text{ MHz}; f_3 = 1982.5\text{ MHz}; f_4 = 1987.5\text{ MHz};$  RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}; T_{case} = 25\text{ }^\circ\text{C};$  unless otherwise specified; in a water cooled class-AB test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 60\text{ W}$	18.2	19.3	-	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 60\text{ W}$	27	31	-	%
$RL_{in}$	input return loss	$P_{L(AV)} = 60\text{ W}$	-	-14	-10	dB
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)} = 60\text{ W}$	-	-31	-27	dBc

## 7. Test information

### 7.1 Ruggedness in class-AB operation

The BLC10G19LS-250WT is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA};$  2-carrier W-CDMA signal;  $P_L = 120\text{ W}$  average;  $f_c = 1930\text{ MHz};$  5 MHz spacing; 46 % clipping.

## 7.2 Impedance information

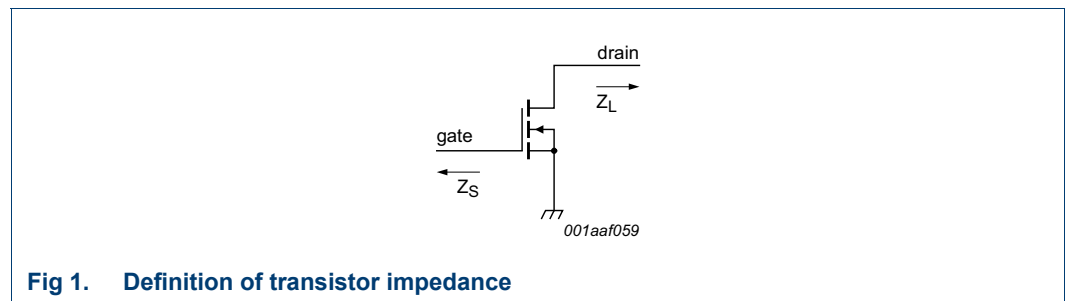
**Table 8. Typical impedance**

Measured load-pull data;  $I_{Dq} = 1400\text{ mA}$ ;  $V_{DS} = 28\text{ V}$ ; pulsed CW ( $t_p = 100\ \mu\text{s}$ ;  $\delta = 10\%$ ).

f	$Z_S$ [1]	$Z_L$ [1]	$P_L$ [2]	$\eta_D$ [2]	$G_p$ [2]
(MHz)	( $\Omega$ )	( $\Omega$ )	(W)	(%)	(dB)
<b>Maximum power load</b>					
1930	1.1 – j4.6	1.1 – j2.8	426.9	65.1	17.1
1960	1.4 – j4.5	1.1 – j2.8	423.3	66.7	17.5
1990	1.9 – j5.3	0.9 – j2.8	424.3	62.8	17.1
<b>Maximum drain efficiency load</b>					
1930	1.1 – j4.6	1.5 – j2.4	361.0	70.5	18.5
1960	1.4 – j4.5	1.6 – j2.3	347.5	71.2	19.0
1990	1.9 – j5.3	1.5 – j2.1	321.4	71.7	19.5

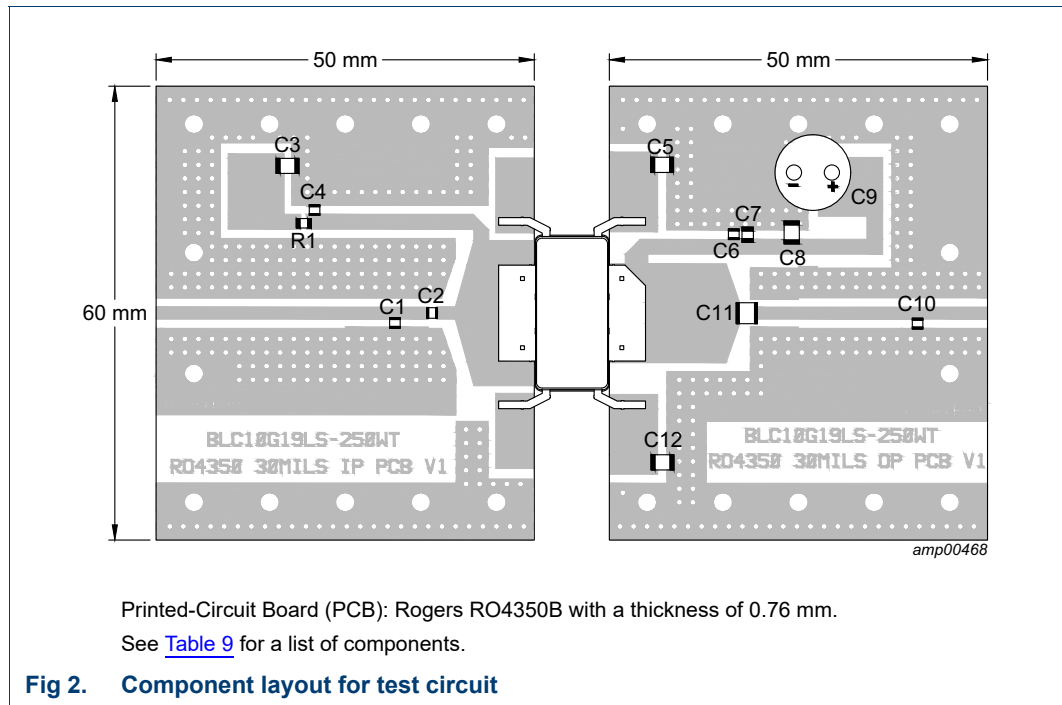
[1]  $Z_S$  and  $Z_L$  defined in [Figure 1](#).

[2] at 3 dB gain compression.



**Fig 1. Definition of transistor impedance**

7.3 Test circuit

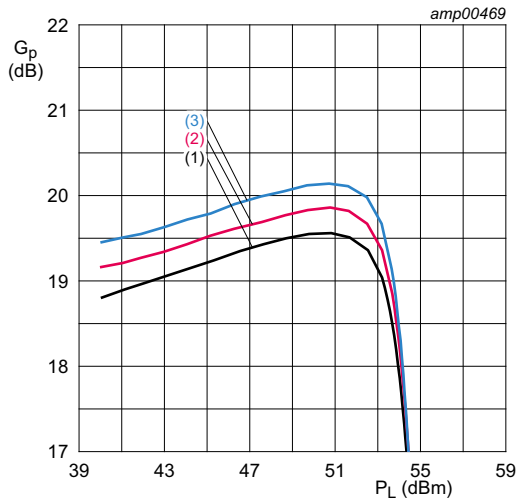


**Table 9. List of components**  
See [Figure 2](#) for component layout.

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	1.6 pF	ATC 100A
C2	multilayer ceramic chip capacitor	3.3 pF	ATC 100A
C3, C5, C8, C12	multilayer ceramic chip capacitor	4.7 $\mu$ F, 100 V	Murata
C4, C6	multilayer ceramic chip capacitor	22 pF	ATC 100A
C7	multilayer ceramic chip capacitor	100 nF	Murata
C9	electrolytic capacitor	> 470 $\mu$ F, 63 V	low ESR
C10	multilayer ceramic chip capacitor	0.5 pF	ATC 100A
C11	multilayer ceramic chip capacitor	1.4 pF	ATC 100A
R1	resistor	4.7 $\Omega$ , 1 % tolerance	SMD 0805

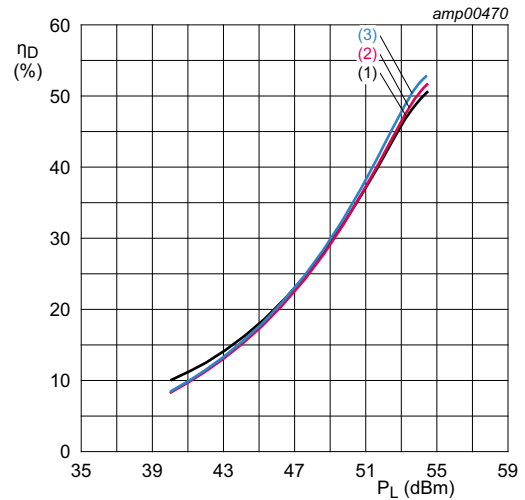
7.4 Graphical data

7.4.1 Pulsed CW



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }\%$ .  
 (1)  $f = 1930\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1990\text{ MHz}$

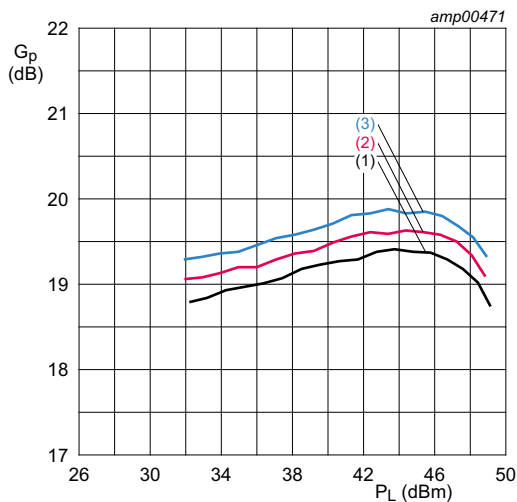
**Fig 3. Power gain as a function of output power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}; t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }\%$ .  
 (1)  $f = 1930\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1990\text{ MHz}$

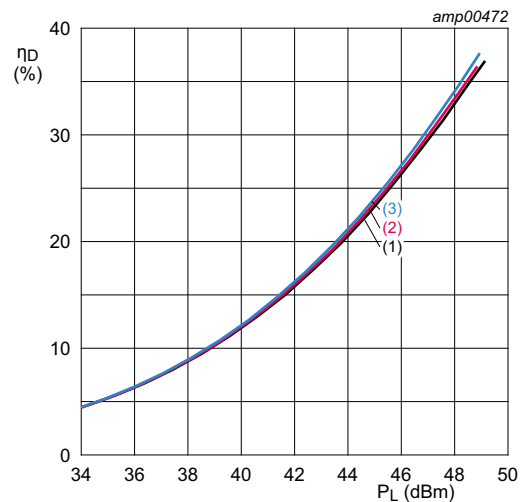
**Fig 4. Drain efficiency as a function of output power; typical values**

7.4.2 IS-95



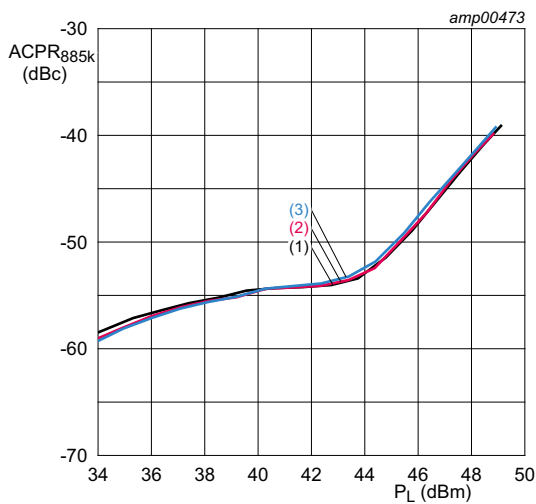
$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$   
 (1)  $f = 1935\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1985\text{ MHz}$

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



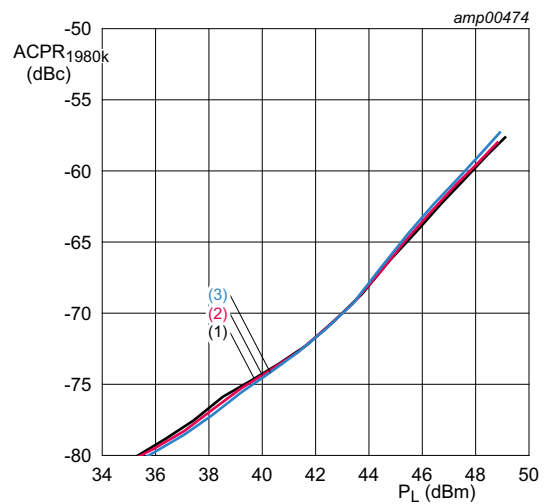
$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$   
 (1)  $f = 1935\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1985\text{ MHz}$

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



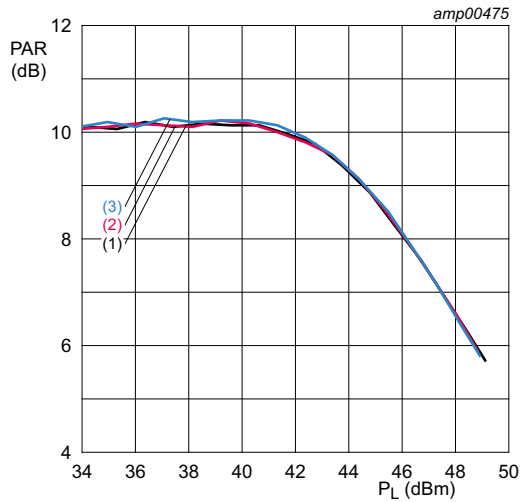
$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$   
 (1)  $f = 1935\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1985\text{ MHz}$

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



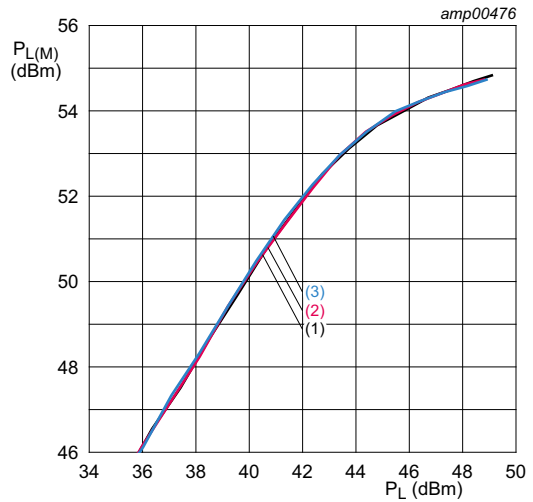
$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$   
 (1)  $f = 1935\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1985\text{ MHz}$

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



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$   
 (1)  $f = 1935\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1985\text{ MHz}$

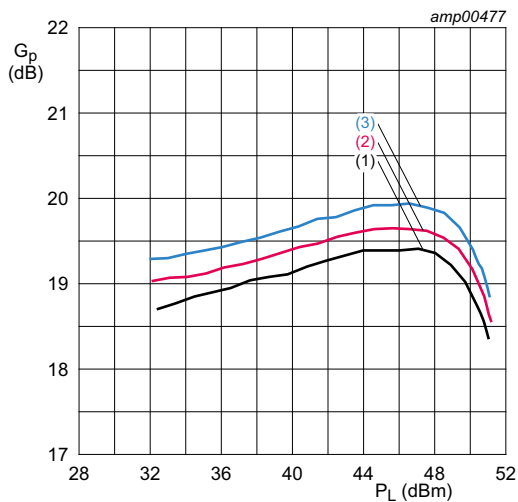
**Fig 9. Peak-to-average ratio as a function of output power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$   
 (1)  $f = 1935\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1985\text{ MHz}$

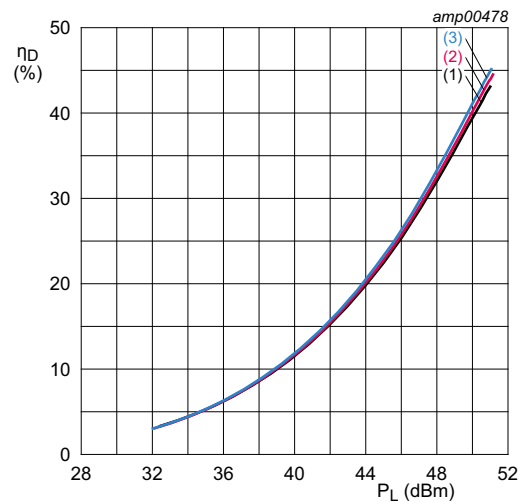
**Fig 10. Peak output power as a function of output power; typical values**

7.4.3 1-Carrier W-CDMA



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$   
 (1)  $f = 1932.5\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1987.5\text{ MHz}$

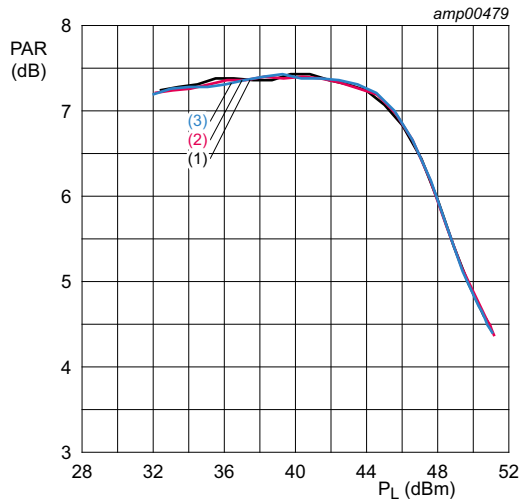
**Fig 11. Power gain as a function of output power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$   
 (1)  $f = 1932.5\text{ MHz}$   
 (2)  $f = 1960\text{ MHz}$   
 (3)  $f = 1987.5\text{ MHz}$

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

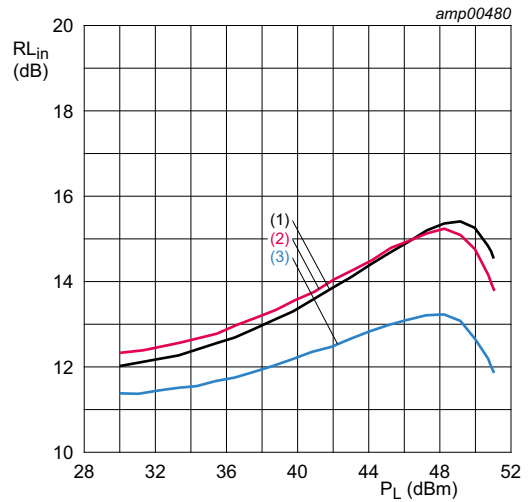




$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$

- (1)  $f = 1932.5\text{ MHz}$
- (2)  $f = 1960\text{ MHz}$
- (3)  $f = 1987.5\text{ MHz}$

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

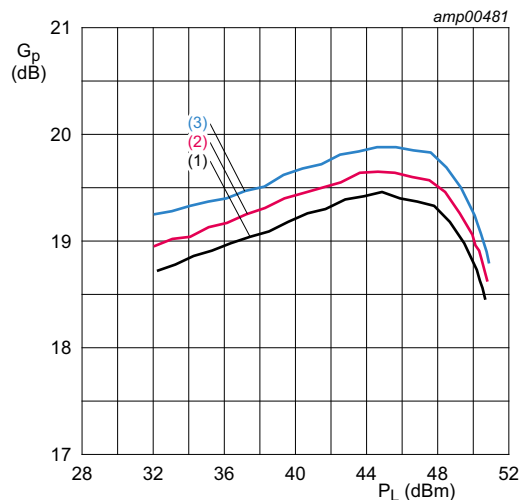


$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$

- (1)  $f = 1932.5\text{ MHz}$
- (2)  $f = 1960\text{ MHz}$
- (3)  $f = 1987.5\text{ MHz}$

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

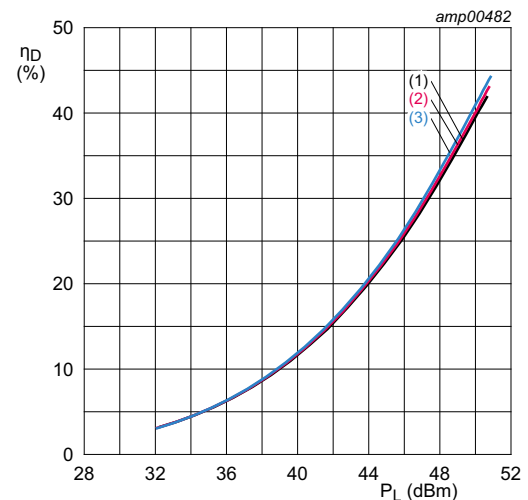
**7.4.4 2-Carrier W-CDMA**



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$

- (1)  $f = 1935\text{ MHz}$
- (2)  $f = 1960\text{ MHz}$
- (3)  $f = 1985\text{ MHz}$

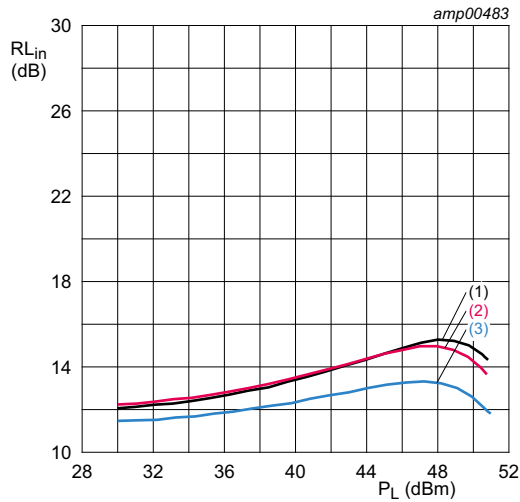
**Fig 15. Power gain as a function of output power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}.$

- (1)  $f = 1935\text{ MHz}$
- (2)  $f = 1960\text{ MHz}$
- (3)  $f = 1985\text{ MHz}$

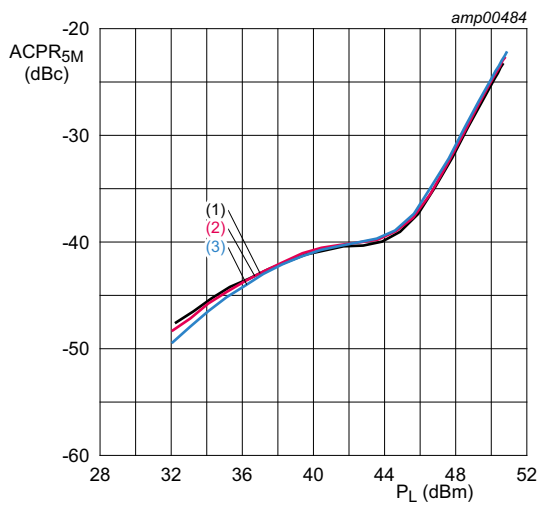
**Fig 16. Drain efficiency as a function of output power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}$ .

- (1)  $f = 1935\text{ MHz}$
- (2)  $f = 1960\text{ MHz}$
- (3)  $f = 1985\text{ MHz}$

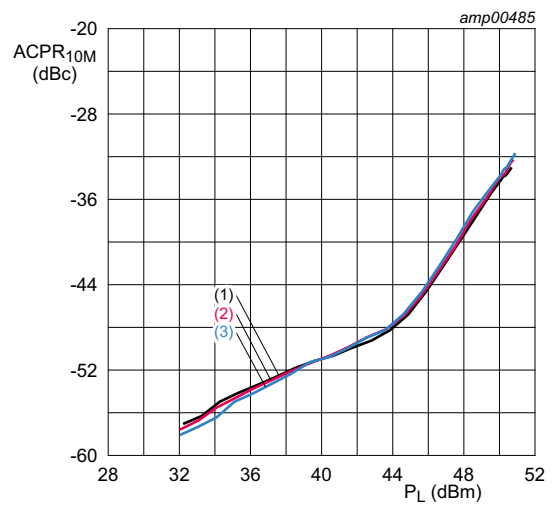
**Fig 17. Input return loss as a function of output power; typical values**



$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}$ .

- (1)  $f = 1935\text{ MHz}$
- (2)  $f = 1960\text{ MHz}$
- (3)  $f = 1985\text{ MHz}$

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

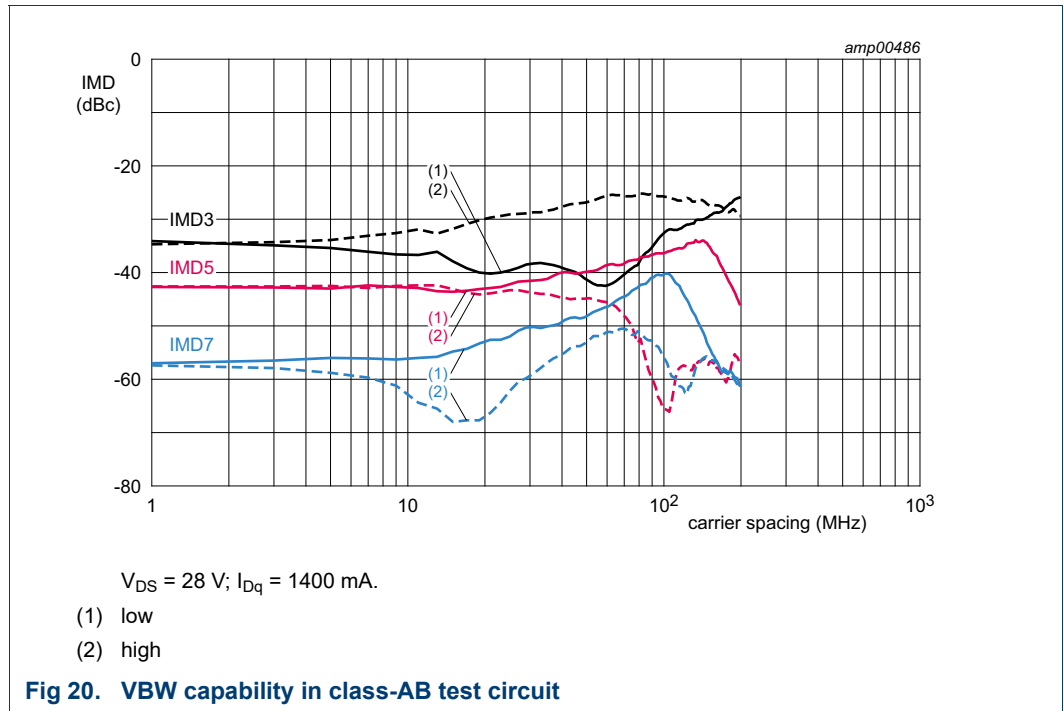


$V_{DS} = 28\text{ V}; I_{Dq} = 1400\text{ mA}$ .

- (1)  $f = 1935\text{ MHz}$
- (2)  $f = 1960\text{ MHz}$
- (3)  $f = 1985\text{ MHz}$

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

7.4.5 2-Tone VBW



8. Package outline

Air cavity plastic earless flanged package; 6 leads

SOT1271-2

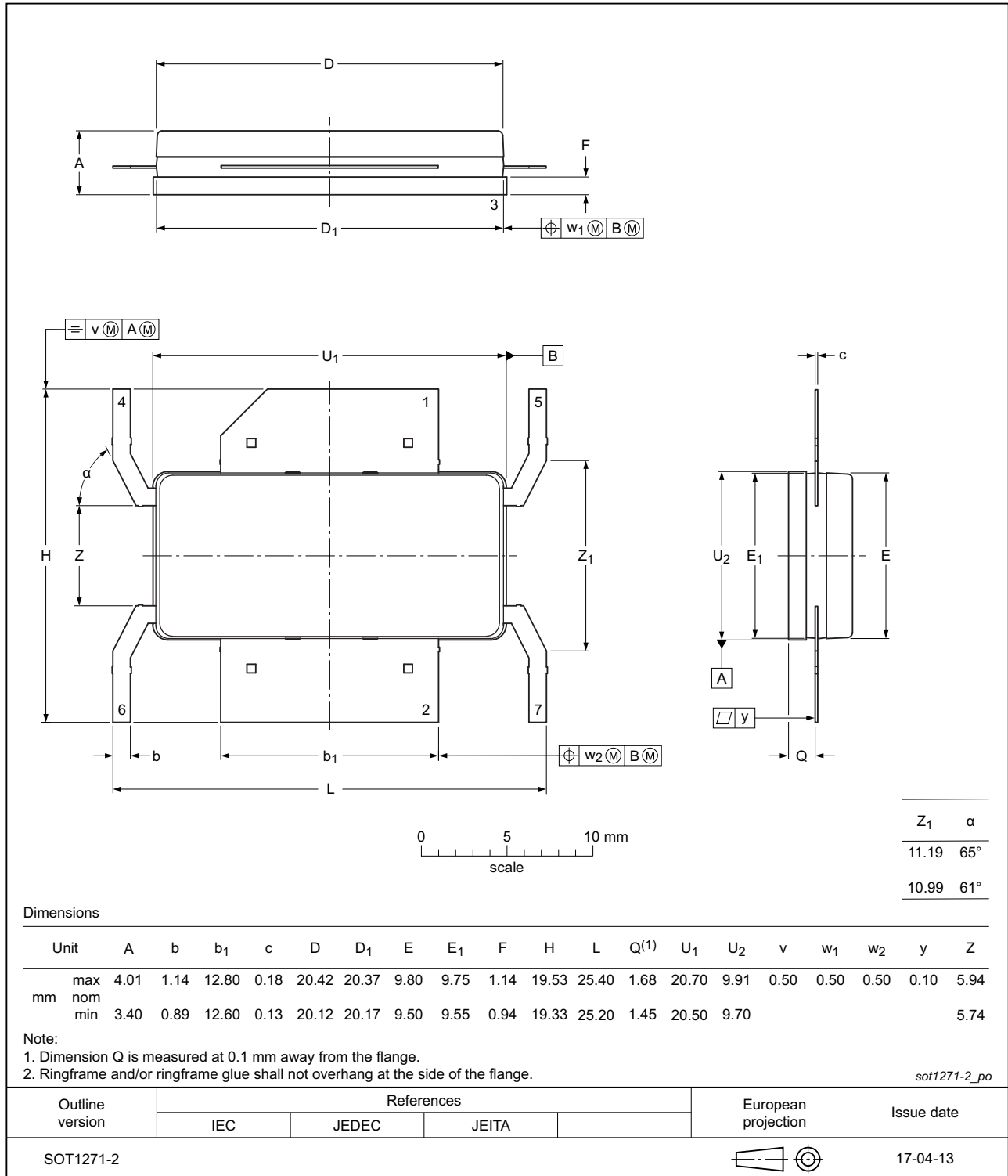



Fig 21. Package outline SOT1271-2

## 9. Handling information

CAUTION	
	<p>This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.</p> <p>Such precautions are described in the <i>ANSI/ESD S20.20</i>, <i>IEC/ST 61340-5</i>, <i>JESD625-A</i> or equivalent standards.</p>

**Table 10. ESD sensitivity**

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C3 <a href="#">[1]</a>
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	2 <a href="#">[2]</a>

- [1] CDM classification C3 is granted to any part that passes after exposure to an ESD pulse of  $\geq 1000$  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
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
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
BLC10G19LS-250WT v.1	20171019	Product 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".

[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>.

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## 13. Contact information

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