

# BLL6G1214L-250

LDMOS L-band radar power transistor

Rev. 3 — 28 January 2016

AMMPLÉON

Product data sheet

## 1. Product profile

### 1.1 General description

250 W LDMOS power transistor intended for L-band radar applications in the 1.2 GHz to 1.4 GHz range.

**Table 1. Test information**

Typical RF performance at  $T_{case} = 25\text{ °C}$ ;  $t_p = 1\text{ ms}$ ;  $\delta = 10\%$ ;  $I_{Dq} = 150\text{ mA}$ ; in a class-AB production test circuit.

Test signal	f (GHz)	V <sub>DS</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	η <sub>D</sub> (%)	t <sub>r</sub> (ns)	t <sub>f</sub> (ns)
pulsed RF	1.2 to 1.4	36	250	15	45	15	5

### 1.2 Features and benefits

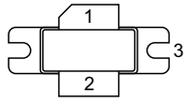
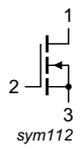
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1.2 GHz to 1.4 GHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- L-band power amplifiers for radar applications in the 1.2 GHz to 1.4 GHz frequency range

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		 sym112
2	gate		
3	source <a href="#">[1]</a>		

[1] Connected to flange

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLL6G1214L-250	-	flanged ceramic package; 2 mounting holes; 2 leads	SOT502A

## 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		-	89	V
$V_{GS}$	gate-source voltage		-0.5	+11	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C

## 5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 85\text{ °C}; P_L = 250\text{ W}$	0.244	K/W
$Z_{th(j-c)}$	transient thermal impedance from junction to case	$T_{case} = 85\text{ °C}; P_L = 250\text{ W}$ <a href="#">[1]</a>		
		$t_p = 1000\text{ }\mu\text{s}; \delta = 10\text{ %}$	0.124	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ %}$	0.059	K/W
		$t_p = 200\text{ }\mu\text{s}; \delta = 10\text{ %}$	0.077	K/W
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ %}$	0.088	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ %}$	0.078	K/W

[1]  $Z_{th(j-c)}$  values are calculated from results obtained with ANSYS simulations and confirmed with IR measurements during development stage. During production: guaranteed by design.

## 6. Characteristics

**Table 6. DC Characteristics**

$T_j = 25\text{ }^\circ\text{C}$

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 3.36\text{ mA}$	91.5	-	105.5	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 20\text{ V}; I_D = 336\text{ mA}$	1.4	1.9	2.4	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 42\text{ V}$	-	-	4.2	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	50	59	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	420	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 336\text{ mA}$	51.6	-	-	mS
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 11.7\text{ A}$	-	-	127	$\text{m}\Omega$

**Table 7. AC Characteristics**

$T_j = 25\text{ }^\circ\text{C}$

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 40\text{ V}; f = 1\text{ MHz}$	-	285	-	pF
$C_{oss}$	output capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 40\text{ V}; f = 1\text{ MHz}$	-	90	-	pF
$C_{rss}$	reverse transfer capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 40\text{ V}; f = 1\text{ MHz}$	-	3	-	pF

**Table 8. RF characteristics**

Test signal: pulsed RF;  $t_p = 1\text{ ms}$ ;  $\delta = 10\%$ ; RF performance at  $V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified, in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_L$	output power		250	-	-	W
$f_{range}$	frequency range		1200	-	1400	MHz
$t_p$	pulse duration	$\delta = 10\%$	-	-	1	ms
		$\delta = 20\%$	-	-	100	$\mu\text{s}$
$\eta_D$	drain efficiency		42	45	-	%
$t_r$	rise time	$P_L = 250\text{ W}$	[1]	-	200	ns
$t_f$	fall time	$P_L = 250\text{ W}$	[1]	-	200	ns
$G_p$	power gain		13	15	-	dB
$P_{droop(pulse)}$	pulse droop power		-	-	0.6	dB
$RL_{in}$	input return loss		-	-	-7	dB

[1] The rise and fall time of the input circuit will be 5 ns maximum.

## 7. Test information

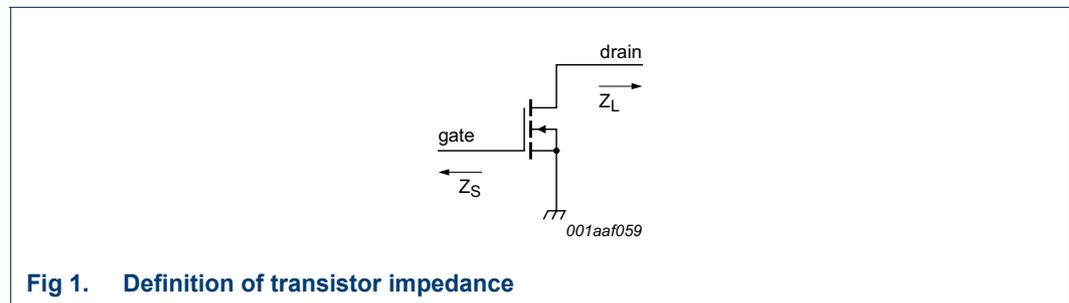
### 7.1 Ruggedness in class-AB operation

The BLL6G1214L-250 is capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 36\text{ V}$ ;  $I_{Dq} = 150\text{ mA}$ ;  $P_L = 250\text{ W}$ ;  $t_p = 1\text{ ms}$ ;  $\delta = 10\%$ .

### 7.2 Impedance information

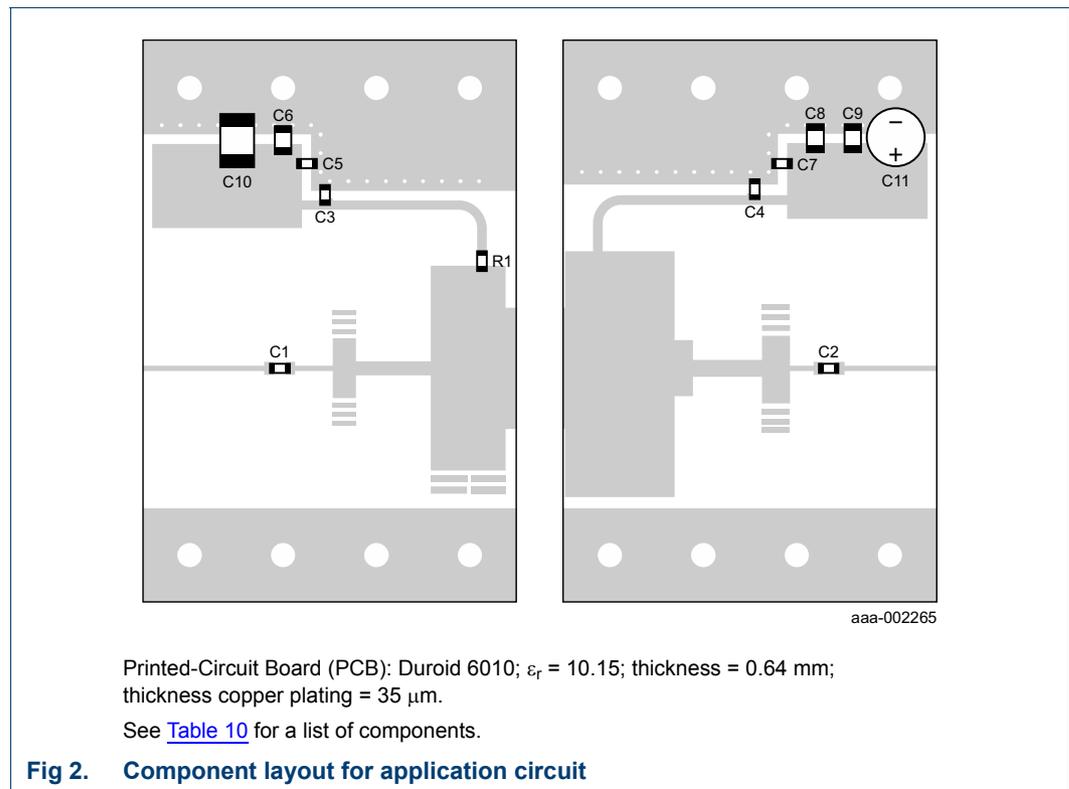
**Table 9. Typical impedance**  
*Typical values unless otherwise specified.*

f (GHz)	Z <sub>S</sub> (Ω)	Z <sub>L</sub> (Ω)
1.2	1.077 – j2.78	1.288 – j1.014
1.3	1.352 – j2.949	1.139 – j1.086
1.4	1.881 – j2.640	1.038 – j1.132



**Fig 1. Definition of transistor impedance**

### 7.3 Circuit information



Printed-Circuit Board (PCB): Duroid 6010;  $\epsilon_r = 10.15$ ; thickness = 0.64 mm;  
 thickness copper plating = 35 μm.

See [Table 10](#) for a list of components.

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

**Table 10. List of components**

For test circuit see [Figure 2](#).

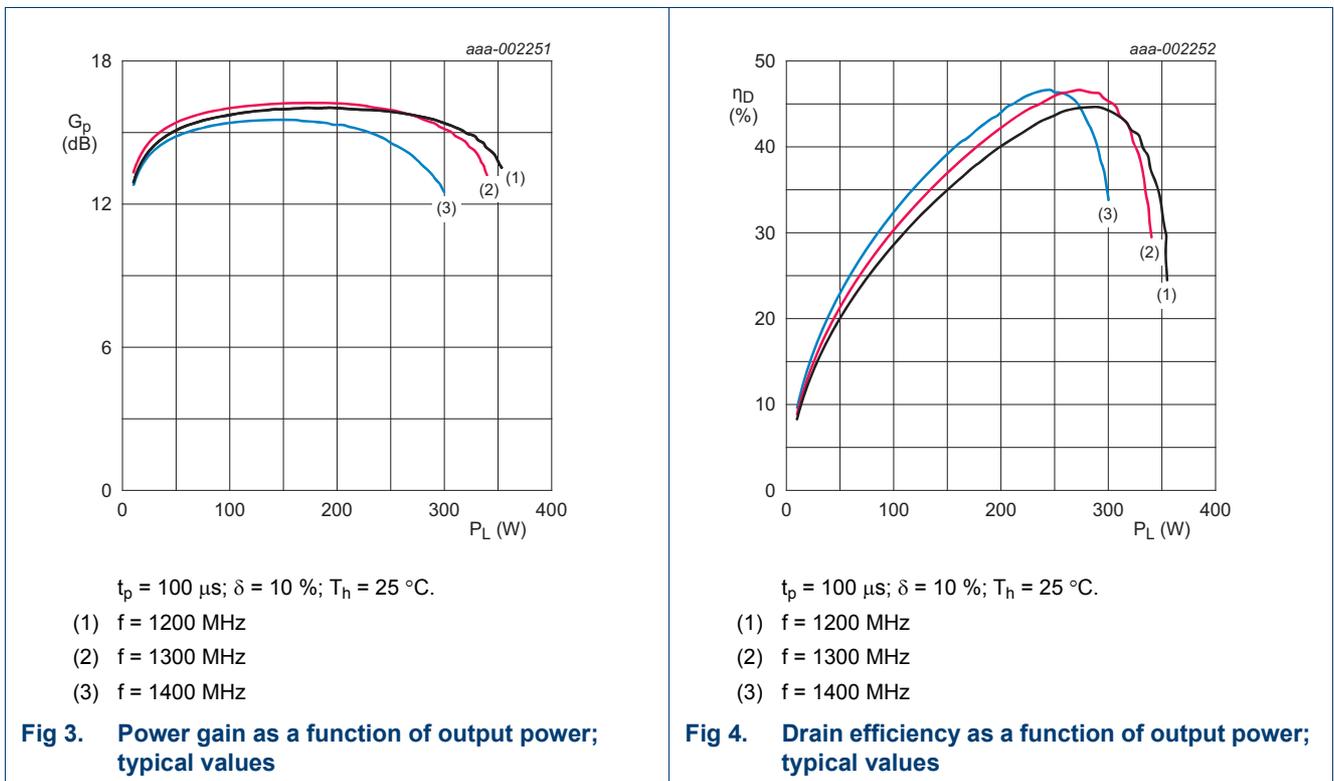
Component	Description	Value	Remarks
C1, C2, C3, C4, C7	multilayer ceramic chip capacitor	56 pF	[1]
C5, C8	multilayer ceramic chip capacitor	200 pF	[2]
C6, C9	multilayer ceramic chip capacitor	1 nF	[3]
C10	multilayer ceramic chip capacitor	10 μF, 20 V	
C11	electrolytic capacitor	22 μF, 63 V	
R1	resistor	10 Ω	SMD 0603

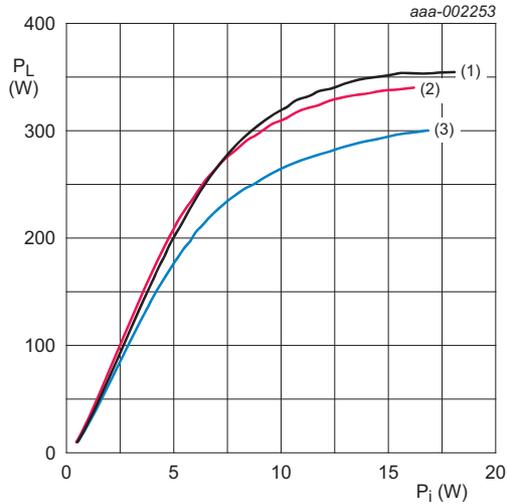
[1] American Technical Ceramics type 100A or capacitor of same quality.

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

[3] American Technical Ceramics type 700A or capacitor of same quality.

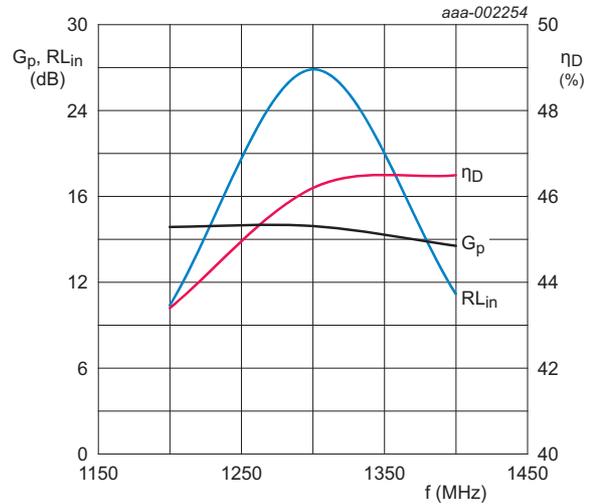
### 7.4 Graphical data





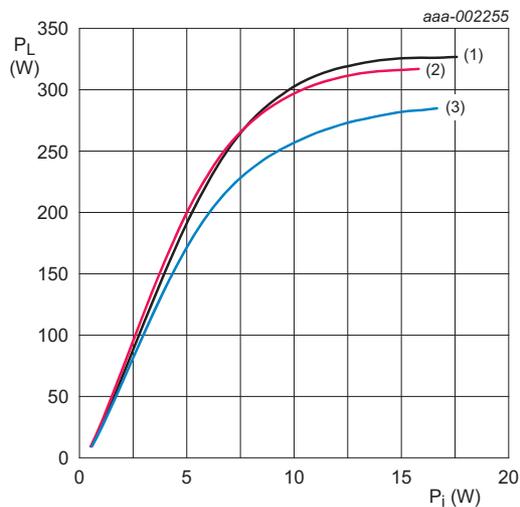
- $t_p = 100 \mu s$ ;  $\delta = 10 \%$ ;  $T_h = 25 \text{ }^\circ\text{C}$ .
- (1)  $f = 1200 \text{ MHz}$
  - (2)  $f = 1300 \text{ MHz}$
  - (3)  $f = 1400 \text{ MHz}$

Fig 5. Output power as a function of input power; typical values



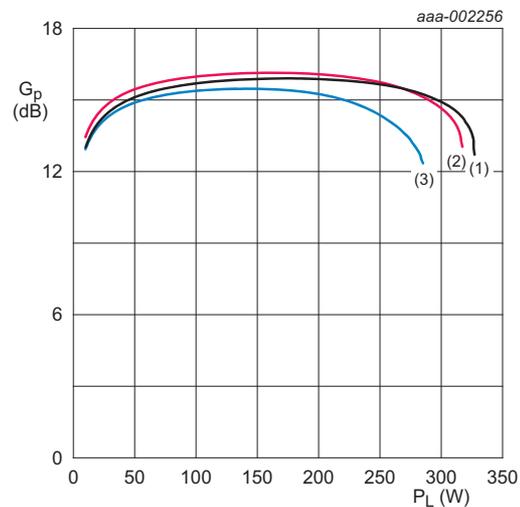
$P_L = 250 \text{ W}$ ;  $t_p = 100 \mu s$ ;  $\delta = 10 \%$ ;  $T_h = 25 \text{ }^\circ\text{C}$ .

Fig 6. Power gain, input return loss and drain efficiency as function of frequency; typical values



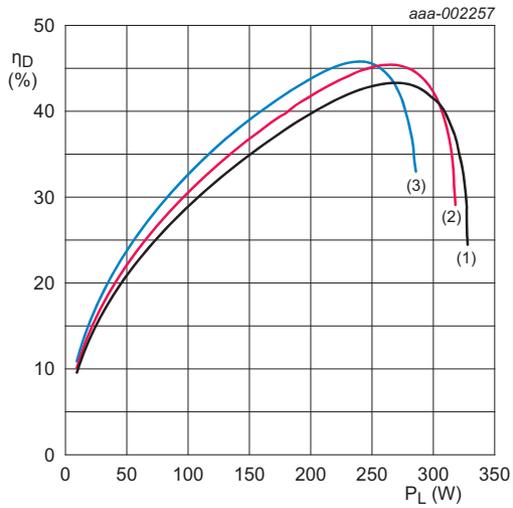
- $t_p = 1 \text{ ms}$ ;  $\delta = 10 \%$ ;  $T_h = 25 \text{ }^\circ\text{C}$ .
- (1)  $f = 1200 \text{ MHz}$
  - (2)  $f = 1300 \text{ MHz}$
  - (3)  $f = 1400 \text{ MHz}$

Fig 7. Output power as a function of input power; typical values



- $t_p = 1 \text{ ms}$ ;  $\delta = 10 \%$ ;  $T_h = 25 \text{ }^\circ\text{C}$ .
- (1)  $f = 1200 \text{ MHz}$
  - (2)  $f = 1300 \text{ MHz}$
  - (3)  $f = 1400 \text{ MHz}$

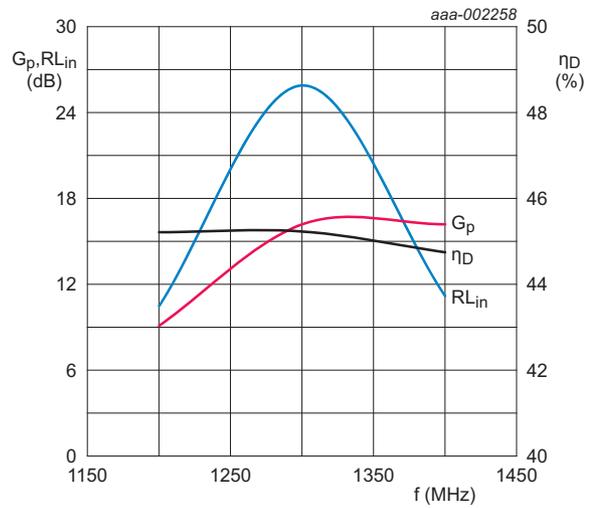
Fig 8. Power gain as a function of output power; typical values



$t_p = 1 \text{ ms}$ ;  $\delta = 10 \%$ ;  $T_h = 25 \text{ }^\circ\text{C}$ .

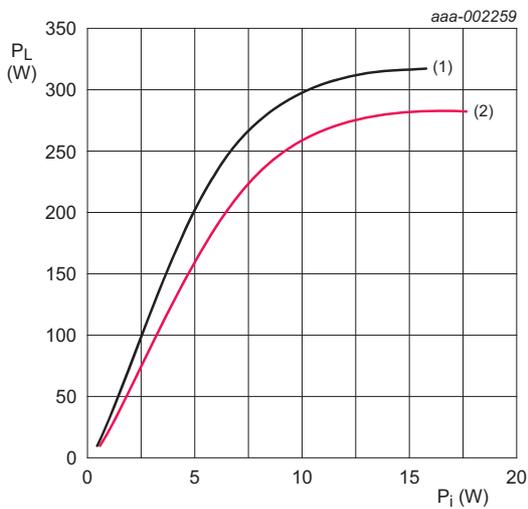
- (1)  $f = 1200 \text{ MHz}$
- (2)  $f = 1300 \text{ MHz}$
- (3)  $f = 1400 \text{ MHz}$

**Fig 9. Drain efficiency as a function of output power; typical values**



$P_L = 250 \text{ W}$ ;  $t_p = 1 \text{ ms}$ ;  $\delta = 10 \%$ ;  $T_h = 25 \text{ }^\circ\text{C}$ .

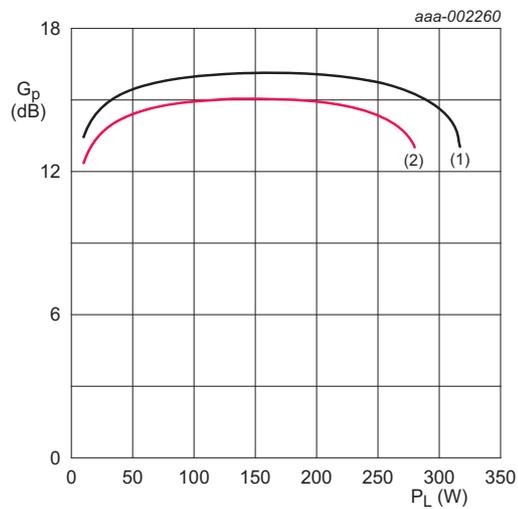
**Fig 10. Power gain, input return loss and drain efficiency as function of frequency; typical values**



$f = 1300 \text{ MHz}$ ;  $t_p = 1 \text{ ms}$ ;  $\delta = 10 \%$ .

- (1)  $T_h = 25 \text{ }^\circ\text{C}$
- (2)  $T_h = 85 \text{ }^\circ\text{C}$

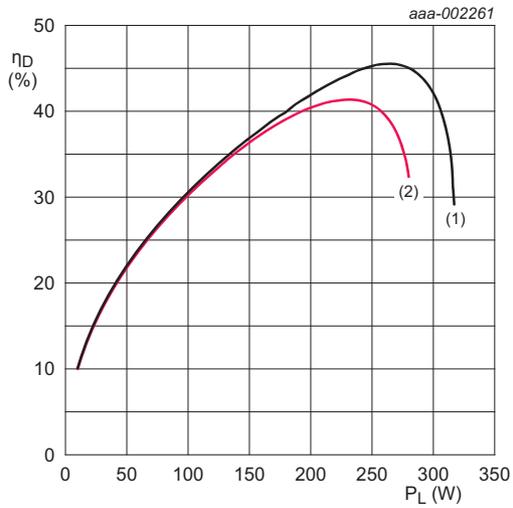
**Fig 11. Output power as a function of input power; typical values**



$f = 1300 \text{ MHz}$ ;  $t_p = 1 \text{ ms}$ ;  $\delta = 10 \%$ .

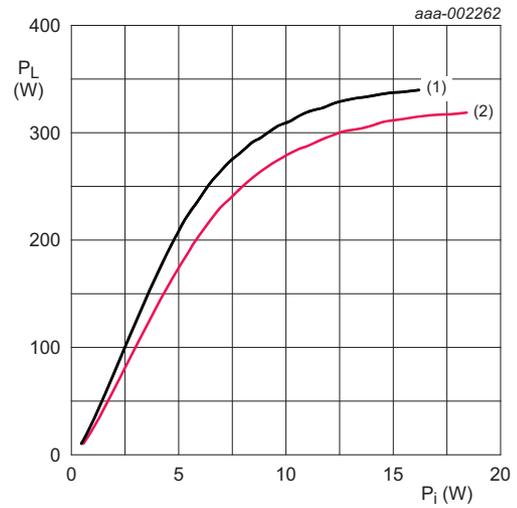
- (1)  $T_h = 25 \text{ }^\circ\text{C}$
- (2)  $T_h = 85 \text{ }^\circ\text{C}$

**Fig 12. Power gain as a function of output power; typical values**



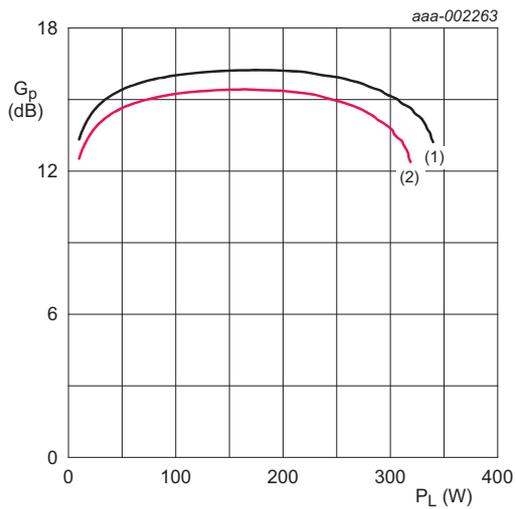
$f = 1300\text{ MHz}; t_p = 1\text{ ms}; \delta = 10\%$ .  
 (1)  $T_h = 25^\circ\text{C}$   
 (2)  $T_h = 85^\circ\text{C}$

**Fig 13. Drain efficiency as a function of output power; typical values**



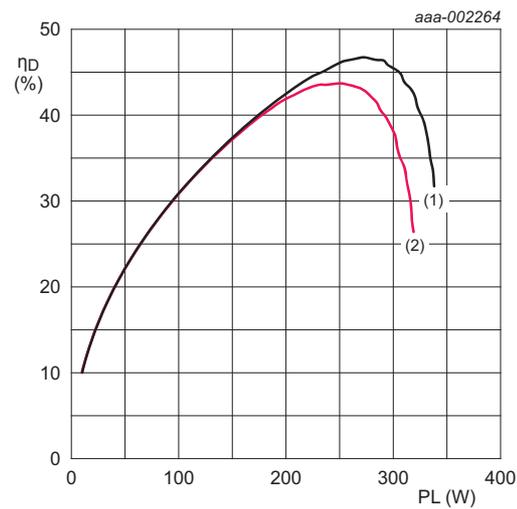
$f = 1300\text{ MHz}; t_p = 100\ \mu\text{s}; \delta = 10\%$ .  
 (1)  $T_h = 25^\circ\text{C}$   
 (2)  $T_h = 85^\circ\text{C}$

**Fig 14. Output power as a function of input power; typical values**



$f = 1300\text{ MHz}; t_p = 1\text{ ms}; \delta = 10\%$ .  
 (1)  $T_h = 25^\circ\text{C}$   
 (2)  $T_h = 85^\circ\text{C}$

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



$f = 1300\text{ MHz}; t_p = 100\ \mu\text{s}; \delta = 10\%$ .  
 (1)  $T_h = 25^\circ\text{C}$   
 (2)  $T_h = 85^\circ\text{C}$

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

8. Package outline

Flanged ceramic package; 2 mounting holes; 2 leads

SOT502A

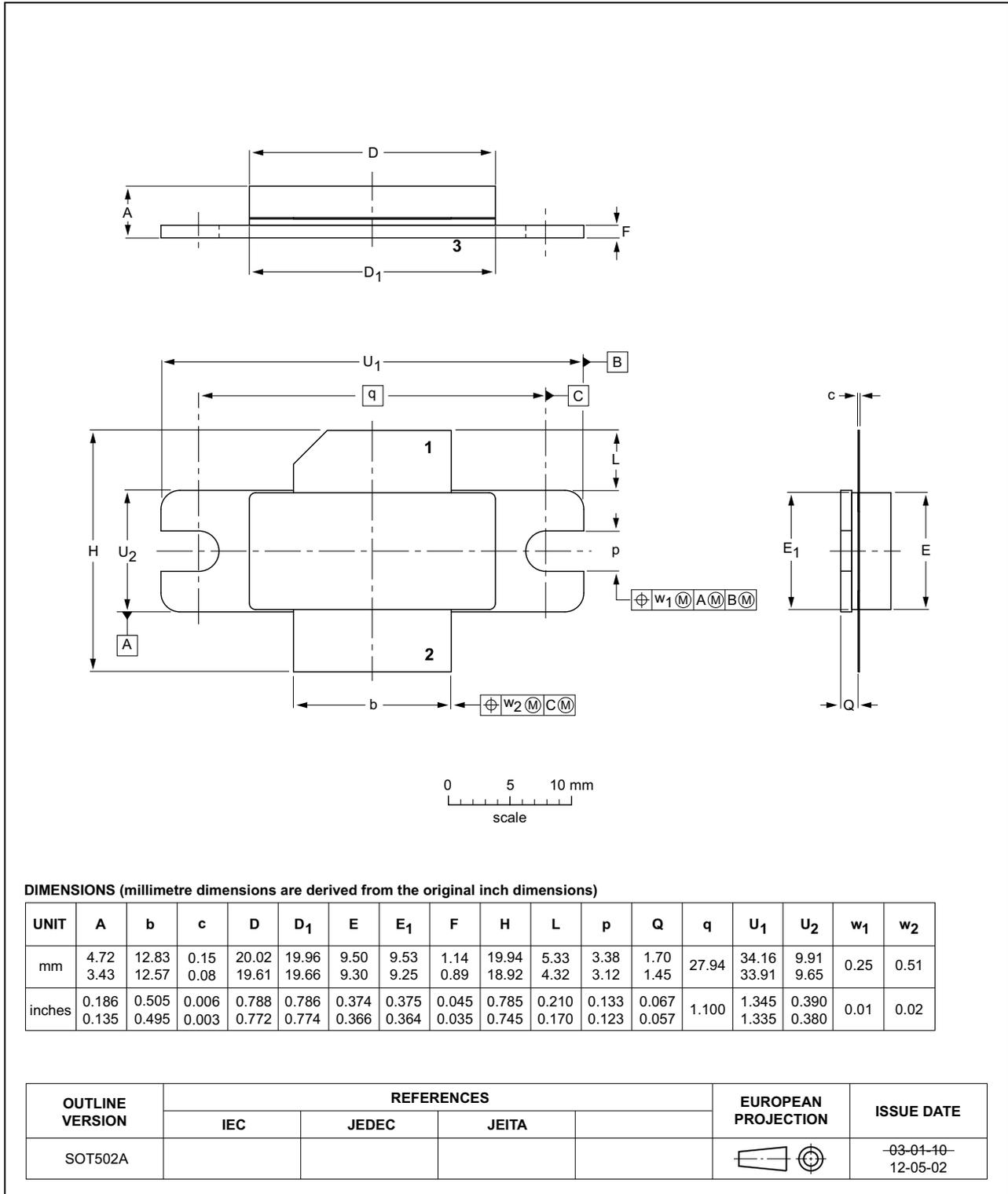


Fig 17. Package outline SOT502A

## 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>

## 10. Abbreviations

Table 11. Abbreviations

Acronym	Description
ESD	ElectroStatic Discharge
IR	InfraRed
L-band	Long wave band
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
SMD	Surface Mounted Device
VSWR	Voltage Standing-Wave Ratio

## 11. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLL6G1214L-250 v.3	20160128	Product data sheet	-	BLL6G1214L-250_1214LS-250 v.2
Modifications	<ul style="list-style-type: none"> <li>The document now describes only the eared version of this product: BLL6G1214L-250</li> </ul>			
BLL6G1214L-250_1214LS-250 v.2	20130624	Product data sheet	-	BLL6G1214L-250 v.1
BLL6G1214L-250 v.1	20120216	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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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

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Date of release: 28 January 2016  
 Document identifier: BLL6G1214L-250