

# BLP9G0722-20; BLP9G0722-20G

Power LDMOS transistor

Rev. 3 — 26 February 2018

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

20 W plastic LDMOS power transistor for base station applications at frequencies from 100 MHz to 2700 MHz.

**Table 1. Application performance (multiple frequencies)**

Typical RF performance at  $T_{case} = 25\text{ }^{\circ}\text{C}$ ;  $I_{DQ} = 180\text{ mA}$ ; in a class-AB demo board, tested on gull wing lead device.

Test signal	f	$I_{DQ}$	$V_{DS}$	$P_{L(AV)}$	$G_p$	$\eta_D$	$ACPR_{5M}$
	(MHz)	(mA)	(V)	(dBm)	(dB)	(%)	(dBc)
1-carrier W-CDMA	400 to 430	180	28	35	25.5	24	-45 [1]
	728 to 768	180	28	35	23	22	-45 [1]
	1805 to 1880	180	28	35	19	21	-45 [1]
	2110 to 2170	180	28	35	18	21	-45 [1]
	2300 to 2400	180	28	35	17.3	21	-45 [1]
	2570 to 2620	180	28	35	16	20	-45 [1]

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

### 1.2 Features and benefits

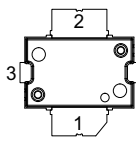
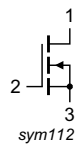
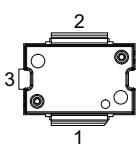
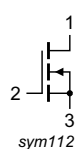
- High efficiency
- Excellent ruggedness
- Designed for broadband operation
- Excellent thermal stability
- High power gain
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- FDD/TDD LTE
- GSM EDGE
- CDMA
- W-CDMA
- MC-GSM
- WiMAX

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLP9G0722-20 (SOT1482-1)			
1	drain		 sym112
2	gate		
3	source <a href="#">[1]</a>		
BLP9G0722-20G (SOT1483-1)			
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
BLP9G0722-20	-	plastic; heatsink small outline package; 2 leads (flat)	SOT1482-1
BLP9G0722-20G	-	plastic; heatsink small outline package; 2 leads	SOT1483-1

## 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		-5	+13	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	225	°C

## 5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}$ ; $P_L = 3\text{ W}$	1.1	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	$V_{GS} = 0\text{ V}$ ; $I_D = 0.3\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$ ; $I_D = 30\text{ mA}$	1.5	2.0	-	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 28\text{ V}$ ; $I_D = 180\text{ mA}$	1.6	2.1	2.6	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	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$	-	6	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	-	140	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}$ ; $I_D = 30\text{ mA}$	-	300	-	mS
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $I_D = 1.05\text{ A}$	-	500	-	m $\Omega$

**Table 7. RF characteristics**

A derivative functional RF test is performed in production. The performance as mentioned below is verified by design and characterization in a class AB production board.

Test signal: pulsed CW;  $\delta = 10\%$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 180\text{ mA}$ ;  $T_{case} = 25\text{ }^{\circ}\text{C}$ ;  
 $f = 1842.5\text{ MHz}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 35\text{ dBm}$	17	19	-	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 35\text{ dBm}$	18	22	-	%
$RL_{in}$	input return loss	$P_{L(AV)} = 35\text{ dBm}$	-	-10	-6	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		42.5	43.9	-	dBm
$P_{L(3dB)}$	output power at 3 dB gain compression		43	44.3	-	dBm

## 7. Test information

### 7.1 Ruggedness in Doherty operation

The BLP9G0722-20 and BLP9G0722-20G are capable of withstanding a load mismatch corresponding to a VSWR = 10 : 1 through all phases under the following conditions:  
 $V_{DS} = 28\text{ V}$ ;  $P_L = 20\text{ W}$  (CW);  $f = 728\text{ MHz}$  and  $1805\text{ MHz}$  on development board.

### 7.2 Impedance information

**Table 8. Typical impedance of BLP9G0722-20G**

Measured load-pull data;  $I_{Dq} = 180\text{ mA}$ ;  $V_{DS} = 28\text{ V}$ .

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>					
740	$0.5 + j0.1$	$10.6 - j1.0$	37	55.1	22.8
880	$0.6 - j1.4$	$3.8 + j2.0$	49	70.9	22.8
1810	$1.6 - j5.5$	$3.4 - j1.0$	43	62.2	19.0

**Table 8. Typical impedance of BLP9G0722-20G ...continued**

Measured load-pull data;  $I_{DQ} = 180 \text{ mA}$ ;  $V_{DS} = 28 \text{ V}$ .

f	$Z_S$ [1]	$Z_L$ [1]	$P_L$ [2]	$\eta_D$ [2]	$G_p$ [2]
(MHz)	( $\Omega$ )	( $\Omega$ )	(W)	(%)	(dB)
1840	1.3 – j5.8	3.0 – j1.2	43	62.7	19.1
1880	1.3 – j6.2	2.6 – j1.5	42	61.2	18.7
2110	5.3 – j9.6	2.6 – j2.5	41	58.2	17.7
2170	6.2 – j8.1	2.6 – j2.5	41	60.4	18.2
<b>Maximum drain efficiency load</b>					
740	0.5 + j0.1	6.0 + j10.0	20	74.1	24.8
880	0.6 – j1.4	3.7 + j5.9	26	82.7	24.7
1810	1.6 – j5.5	1.9 + j0.2	31	70.9	20.9
1840	1.3 – j5.8	1.7 + j0.0	29	69.8	21.3
1880	1.3 – j6.2	1.6 – j0.2	28	69.8	21.3
2110	5.3 – j9.6	1.7 – j1.5	32	65.6	19.5
2170	6.2 – j8.1	1.6 – j1.7	30	65.9	20.2

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

[2] at 3 dB gain compression.

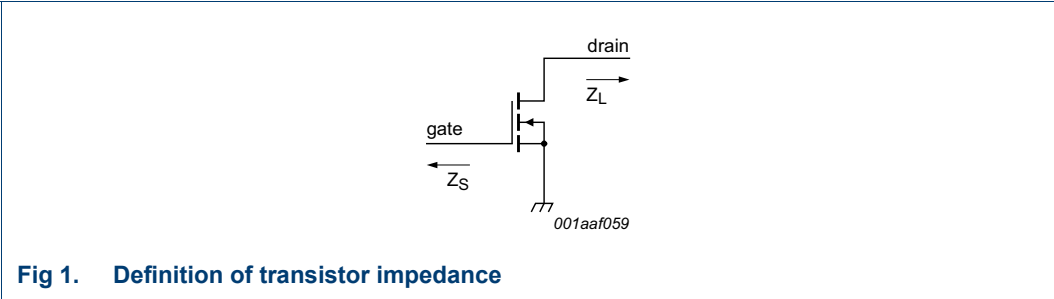
**Table 9. Typical impedance of BLP9G0722-20**

Measured load-pull data;  $I_{DQ} = 180 \text{ mA}$ ;  $V_{DS} = 28 \text{ V}$ .

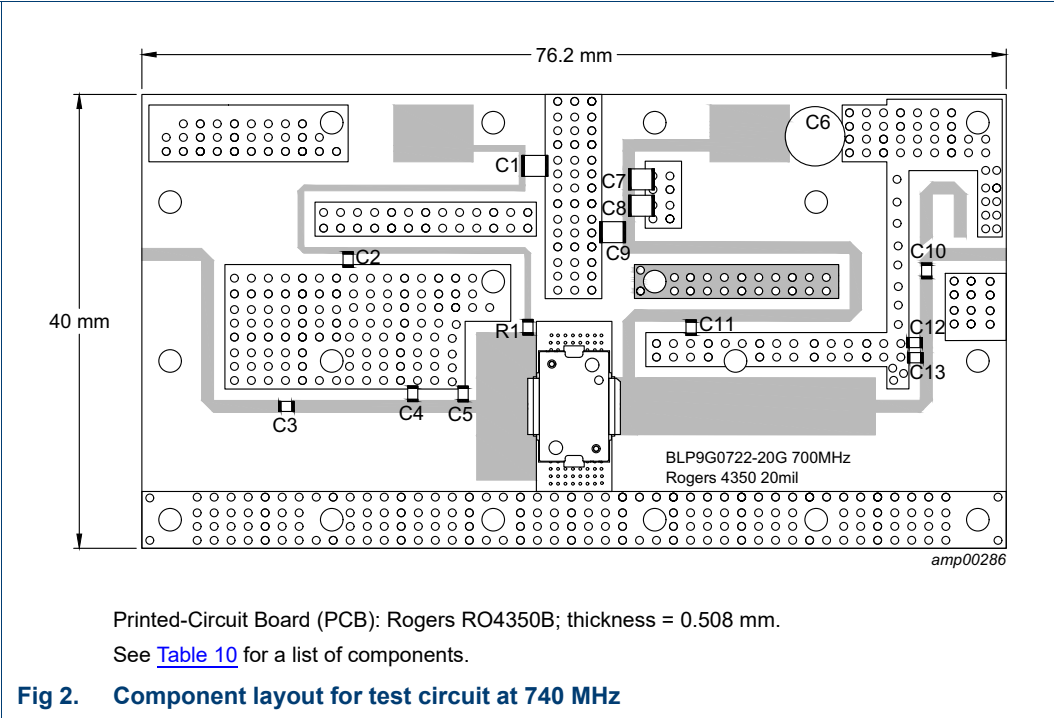
f	$Z_S$ [1]	$Z_L$ [1]	$P_L$ [2]	$\eta_D$ [2]	$G_p$ [2]
(MHz)	( $\Omega$ )	( $\Omega$ )	(W)	(%)	(dB)
<b>Maximum power load</b>					
740	0.6 + j0.6	10.6 – j1.0	39	56.8	22.7
880	0.6 – j0.7	4.0 + j1.6	51	70.9	22.1
1810	1.8 – j5.4	3.0 – j1.2	44	60.9	19.1
1840	1.6 – j5.8	3.0 – j1.2	44	62.6	19.6
1880	1.8 – j6.1	2.9 – j1.6	44	60.9	19.1
2110	7.3 – j8.2	2.6 – j2.5	41	57.7	17.8
2170	8.7 – j6.8	2.6 – j2.5	43	62.1	18.7
<b>Maximum drain efficiency load</b>					
740	0.6 + j0.6	6.0 + j10.0	22	77.0	24.6
880	0.6 – j0.7	3.7 + j5.9	26	85.3	24.4
1810	1.8 – j5.4	1.9 + j0.0	33	69.4	20.9
1840	1.6 – j5.8	1.9 + j0.0	31	69.4	21.7
1880	1.8 – j6.1	1.8 – j0.2	32	70.7	21.6
2110	7.3 – j8.2	1.5 – j1.4	30	65.3	19.9
2170	8.7 – j6.8	1.4 – j1.6	29	69.3	21.3

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

[2] at 3 dB gain compression.

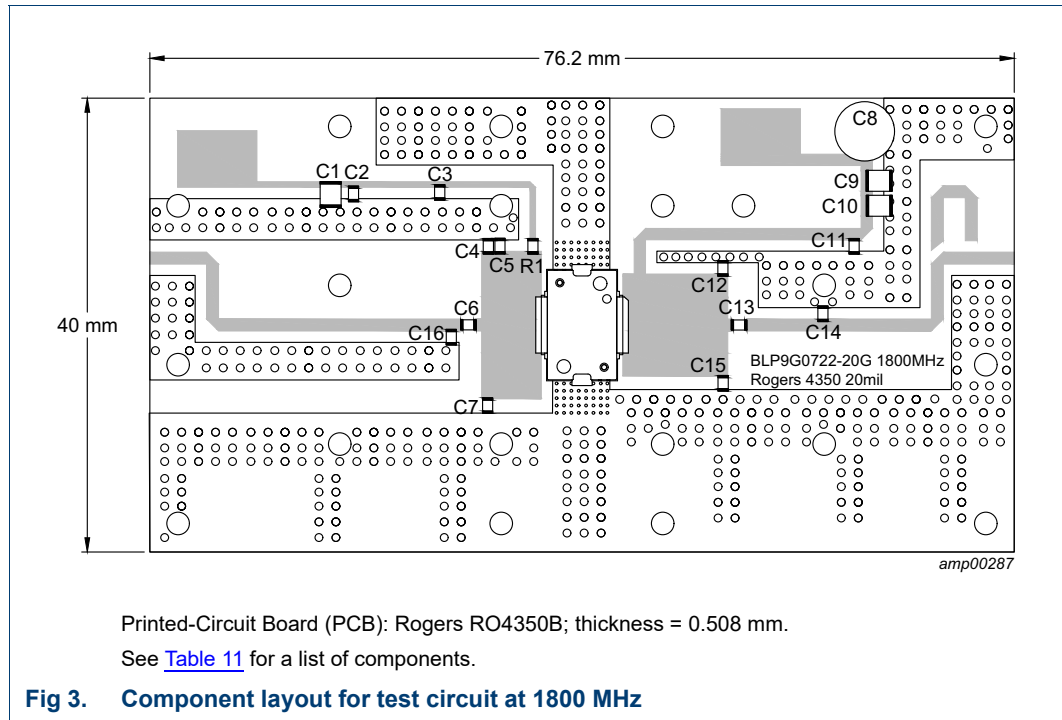


### 7.3 Test circuit



**Table 10. List of components**  
See [Figure 2](#) for component layout.

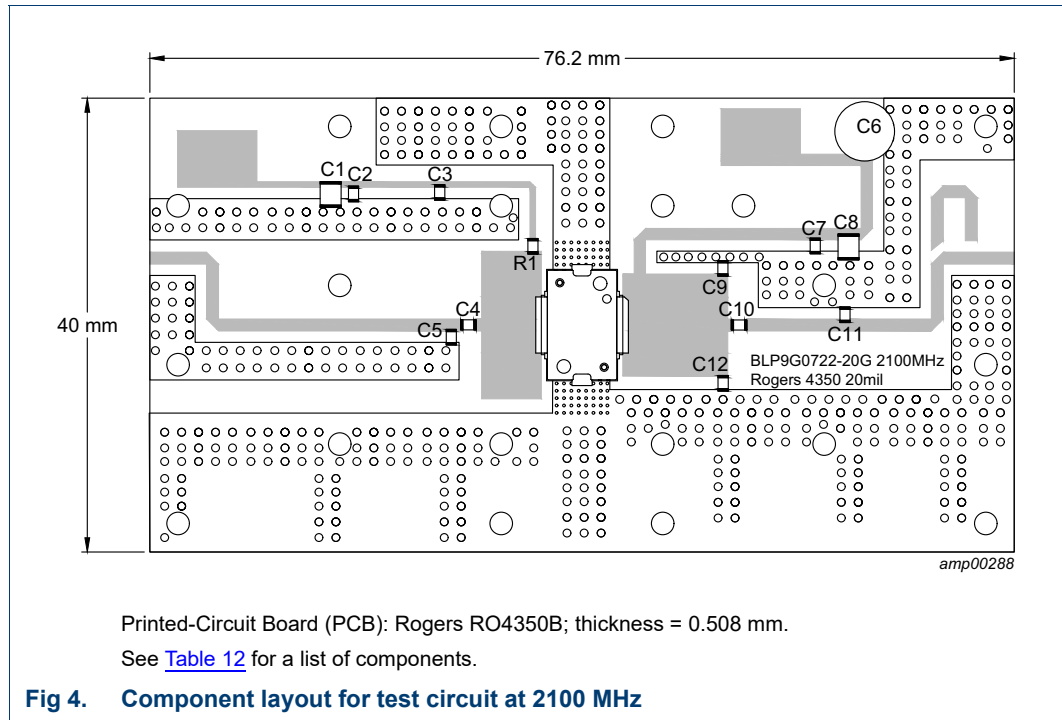
Component	Description	Value	Remarks
C1, C7, C8, C9	multilayer ceramic chip capacitor	10 $\mu$ F, 50 V	Murata
C2, C3, C10, C11	multilayer ceramic chip capacitor	36 pF	ATC 600F
C4, C5	multilayer ceramic chip capacitor	15 pF	ATC 600F
C6	electrolytic capacitor	2200 $\mu$ F, 50 V	
C12	multilayer ceramic chip capacitor	5.6 pF	ATC 600F
C13	multilayer ceramic chip capacitor	0.2 pF	ATC 600F
R1	resistor	5.1 $\Omega$	SMD 0805



**Table 11. List of components**

See [Figure 3](#) for component layout.

Component	Description	Value	Remarks
C1, C9, C10	multilayer ceramic chip capacitor	10 $\mu$ F, 50 V	Murata
C2, C3, C11, C13	multilayer ceramic chip capacitor	12 pF	ATC 600F
C4, C5	multilayer ceramic chip capacitor	0.8 pF	ATC 600F
C6	multilayer ceramic chip capacitor	6.2 pF	ATC 600F
C7	multilayer ceramic chip capacitor	2 pF	ATC 600F
C8	electrolytic capacitor	2200 $\mu$ F, 50 V	
C12, C15	multilayer ceramic chip capacitor	0.3 pF	ATC 600F
C14	multilayer ceramic chip capacitor	2.2 pF	ATC 600F
C16	multilayer ceramic chip capacitor	0.3 pF	ATC 600F
R1	resistor	5.1 $\Omega$	SMD 0805



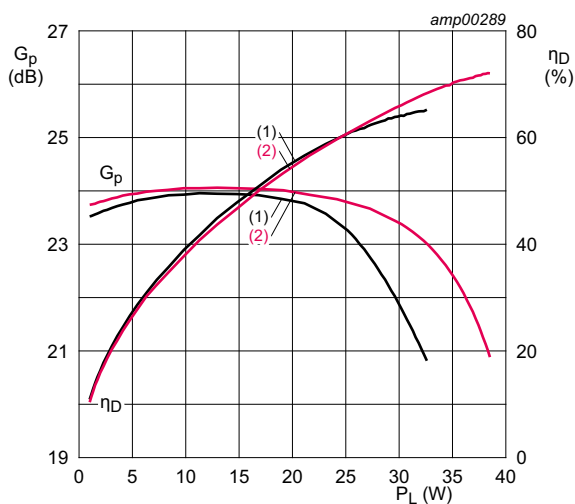
**Table 12. List of components**

See [Figure 4](#) for component layout.

Component	Description	Value	Remarks
C1, C8	multilayer ceramic chip capacitor	10 $\mu$ F, 50 V	Murata
C2, C7, C10	multilayer ceramic chip capacitor	12 pF	ATC 600F
C3	multilayer ceramic chip capacitor	62 pF	ATC 600F
C4	multilayer ceramic chip capacitor	5.6 pF	ATC 600F
C5	multilayer ceramic chip capacitor	0.5 pF	ATC 600F
C6	electrolytic capacitor	2200 $\mu$ F, 50 V	
C9	multilayer ceramic chip capacitor	2.2 pF	ATC 600F
C11	multilayer ceramic chip capacitor	1.2 pF	ATC 600F
C12	multilayer ceramic chip capacitor	1.8 pF	ATC 600F
R1	resistor	5.1 $\Omega$	SMD 0805

## 7.4 Graphical data

### 7.4.1 CW

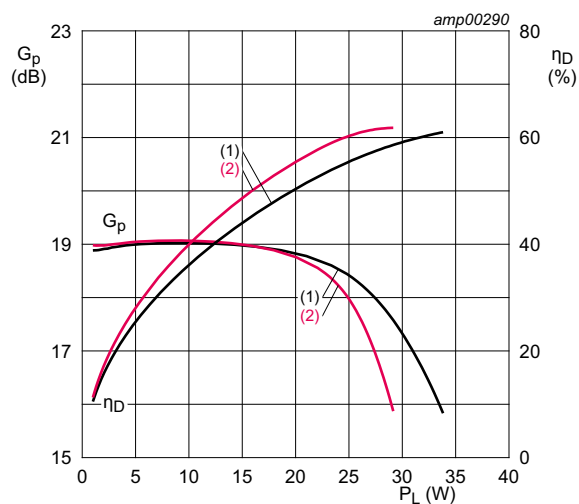


$V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 180 \text{ mA}$ .

(1)  $f = 728 \text{ MHz}$

(2)  $f = 768 \text{ MHz}$

**Fig 5. Power gain and drain efficiency as function of output power; typical values**

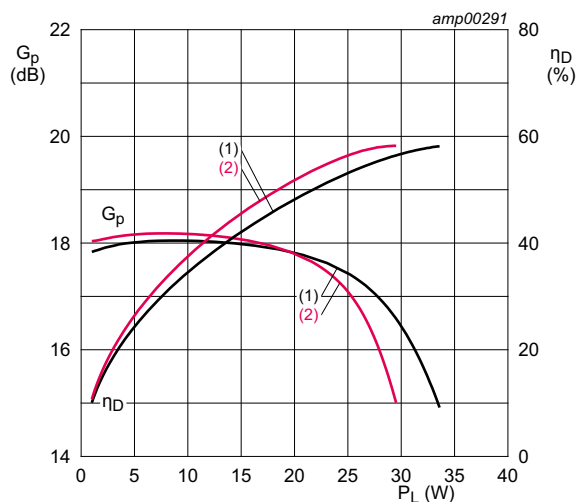


$V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 180 \text{ mA}$ .

(1)  $f = 1805 \text{ MHz}$

(2)  $f = 1880 \text{ MHz}$

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



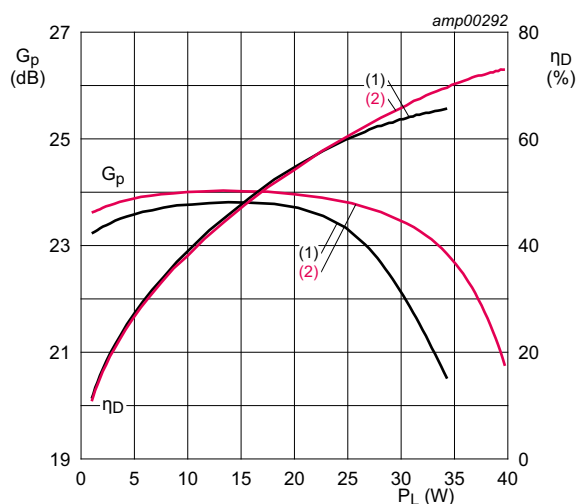
$V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 180 \text{ mA}$ .

(1)  $f = 2110 \text{ MHz}$

(2)  $f = 2170 \text{ MHz}$

**Fig 7. Power gain and drain efficiency as function of output power; typical values**

### 7.4.2 Pulsed CW

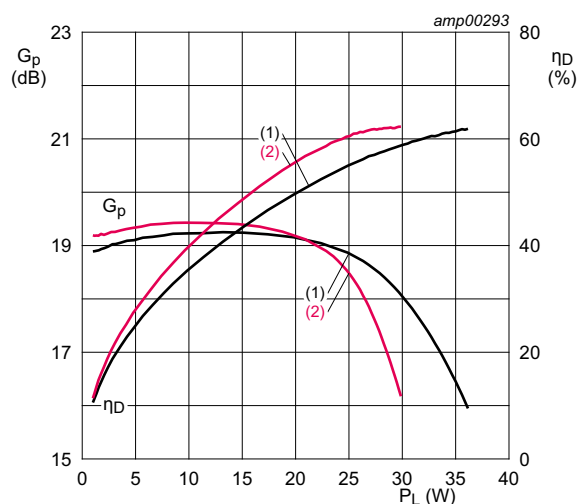


$V_{DS} = 28$  V;  $I_{DQ} = 180$  mA.

(1)  $f = 728$  MHz

(2)  $f = 768$  MHz

**Fig 8. Power gain and drain efficiency as function of output power; typical values**

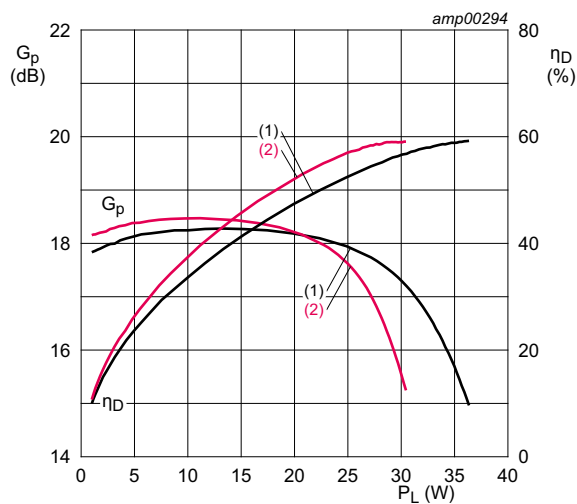


$V_{DS} = 28$  V;  $I_{DQ} = 180$  mA.

(1)  $f = 1805$  MHz

(2)  $f = 1880$  MHz

**Fig 9. Power gain and drain efficiency as function of output power; typical values**



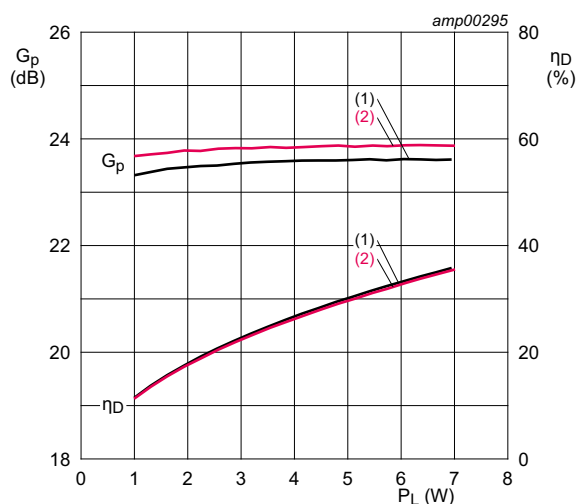
$V_{DS} = 28$  V;  $I_{DQ} = 180$  mA.

(1)  $f = 2110$  MHz

(2)  $f = 2170$  MHz

**Fig 10. Power gain and drain efficiency as function of output power; typical values**

### 7.4.3 1-Carrier W-CDMA

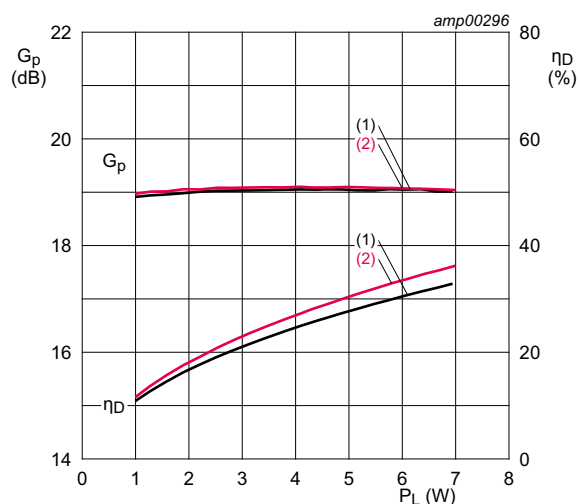


$V_{DS} = 28$  V;  $I_{Dq} = 180$  mA.

(1)  $f = 728$  MHz

(2)  $f = 768$  MHz

**Fig 11. Power gain and drain efficiency as function of output power; typical values**

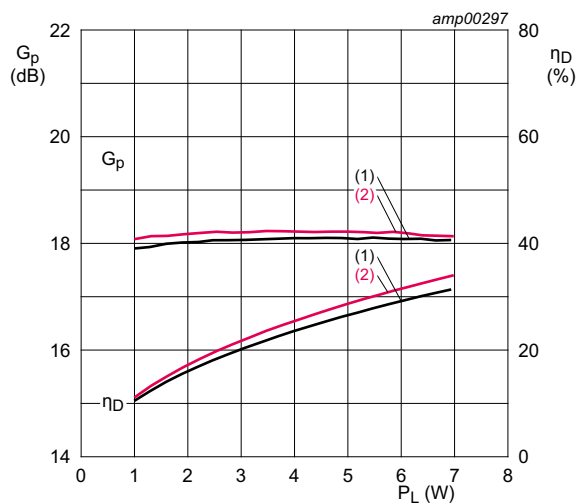


$V_{DS} = 28$  V;  $I_{Dq} = 180$  mA.

(1)  $f = 1805$  MHz

(2)  $f = 1880$  MHz

**Fig 12. Power gain and drain efficiency as function of output power; typical values**

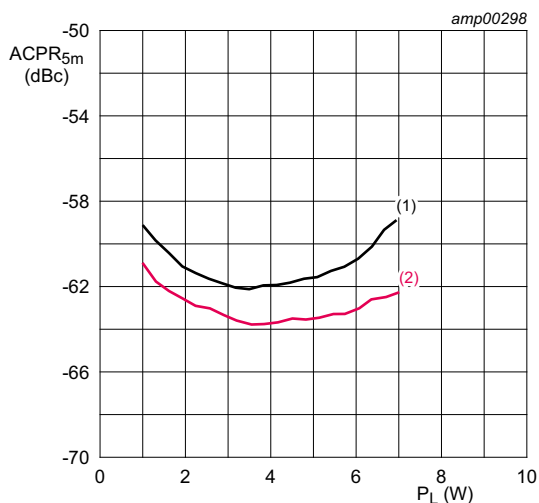


$V_{DS} = 28$  V;  $I_{Dq} = 180$  mA.

(1)  $f = 2110$  MHz

(2)  $f = 2170$  MHz

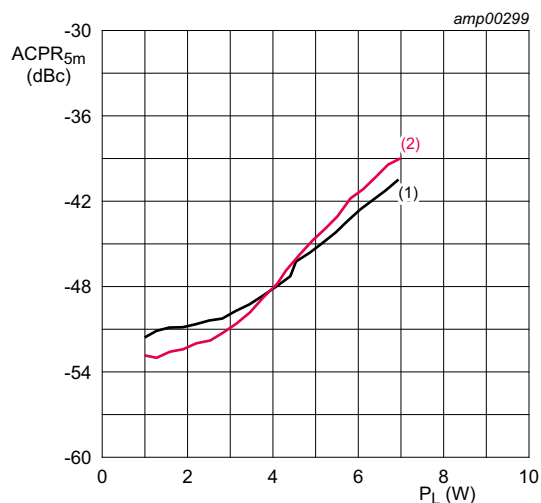
**Fig 13. Power gain and drain efficiency as function of output power; typical values**



$V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 180 \text{ mA}$ .

- (1)  $f = 728 \text{ MHz}$
- (2)  $f = 768 \text{ MHz}$

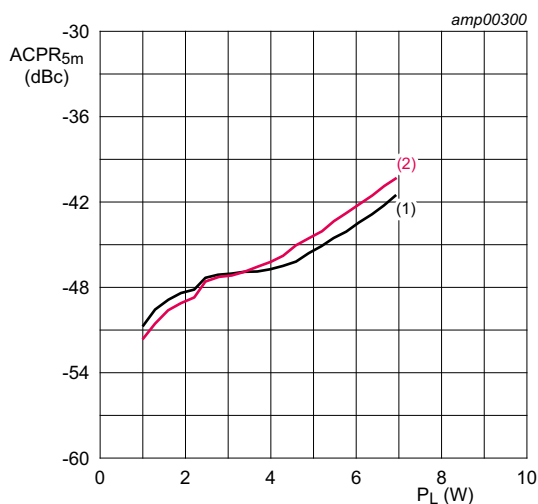
**Fig 14. Adjacent channel power ratio (5 MHz) as a function of output power; typical values**



$V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 180 \text{ mA}$ .

- (1)  $f = 1805 \text{ MHz}$
- (2)  $f = 1880 \text{ MHz}$

**Fig 15. Adjacent channel power ratio (5 MHz) as a function of output power; typical values**



$V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 180 \text{ mA}$ .

- (1)  $f = 2110 \text{ MHz}$
- (2)  $f = 2170 \text{ MHz}$

**Fig 16. Adjacent channel power ratio (5 MHz) as a function of output power; typical values**

8. Package outline

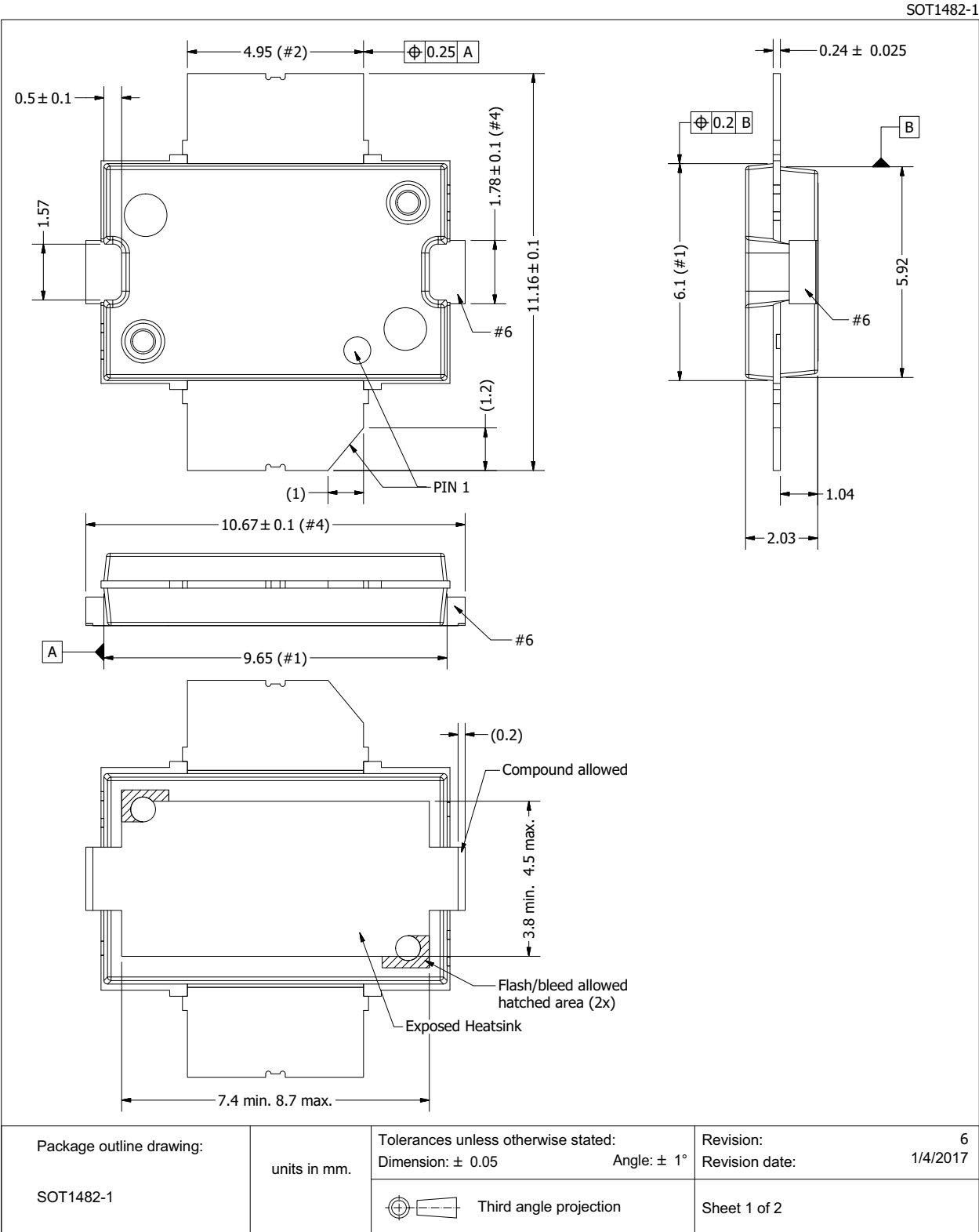


Fig 17. Package outline SOT1482-1 (sheet 1 of 2)

SOT1482-1

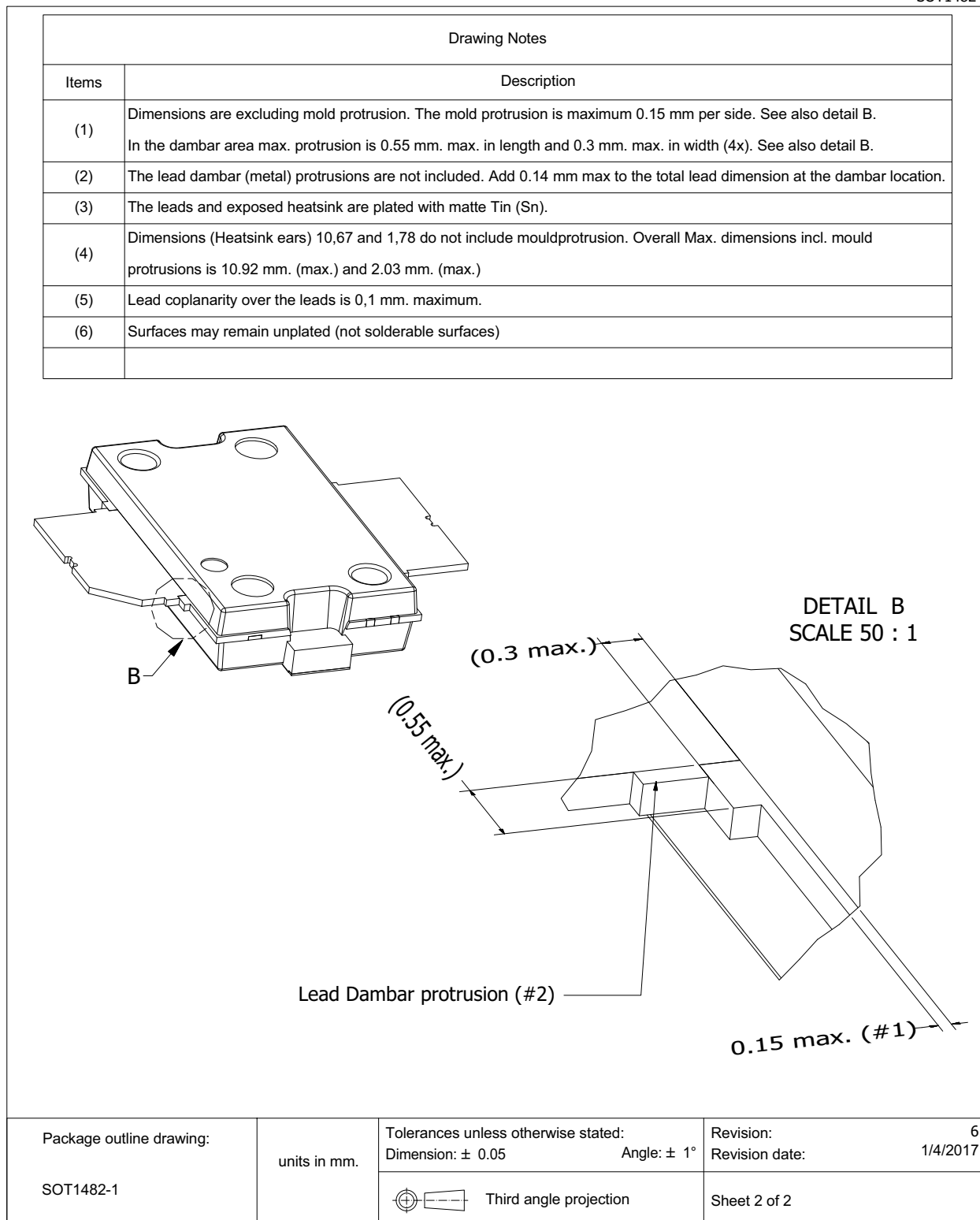


Fig 18. Package outline SOT1482-1 (sheet 2 of 2)

SOT1483-1

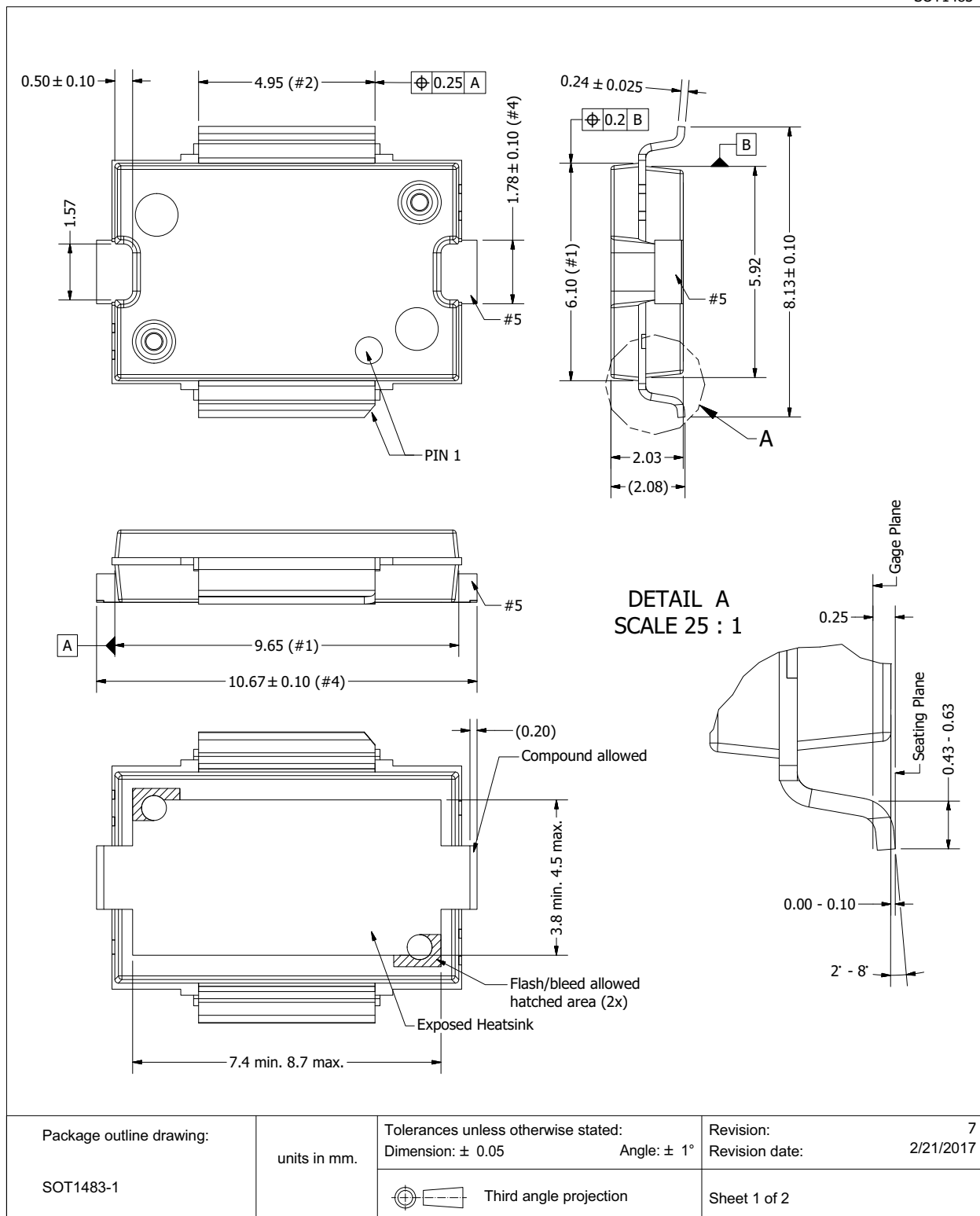
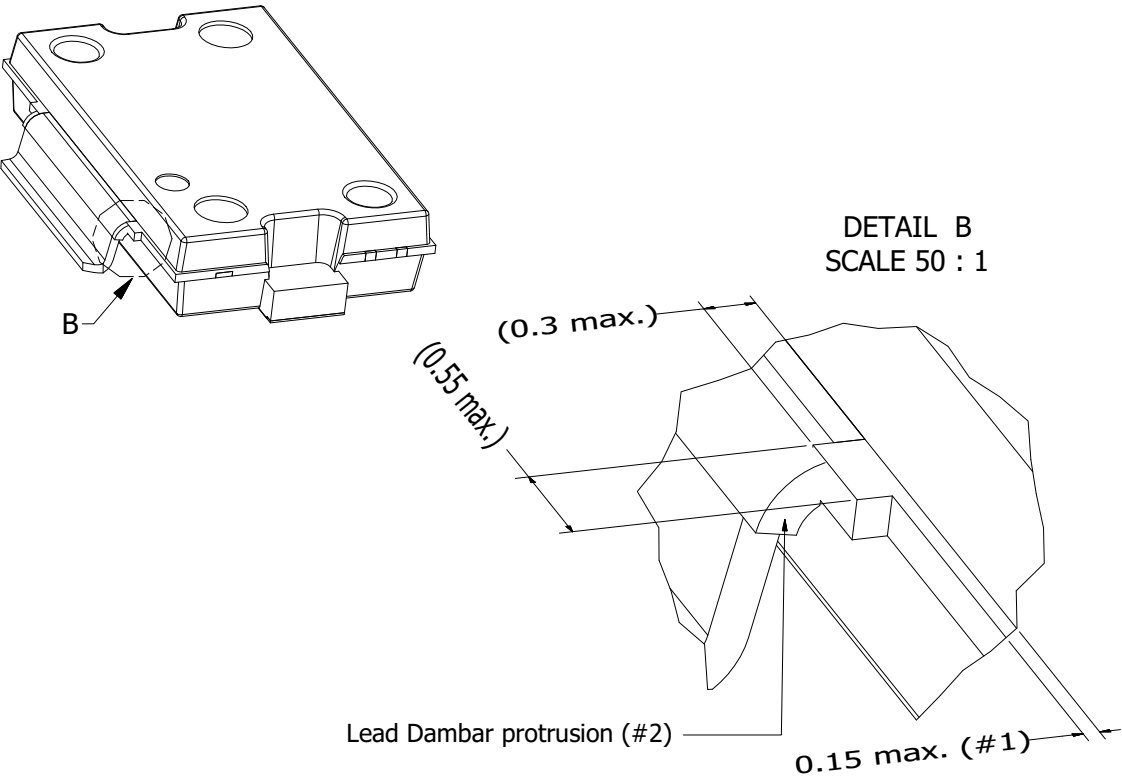


Fig 19. Package outline SOT1483-1 (sheet 1 of 2)

SOT1483-1

Drawing Notes	
Items	Description
(1)	Dimensions are excluding mold protrusion. The mold protrusion is maximum 0.15 mm per side. See also detail B. In the dambar area max. protrusion is 0.55mm max. in lenght and 0.3 mm max. in width (4x) See also detail B.
(2)	The lead dambar (metal) protrusions are not included. Add 0.14 mm max to the total lead dimension at the dambar location.
(3)	The leads and exposed heatsink are plated with matte Tin (Sn).
(4)	Dimensions (Heatsink ears) 10,67 and 1,78 do not include mouldprotrusion. Overall Max. dimensions incl. mould protrusions is 10,92 mm. (max.) and 2,03 mm. (max.).
(5)	Surfaces may remain unplated (not solderable surfaces).




Package outline drawing:	units in mm.	Tolerances unless otherwise stated: Dimension: $\pm 0.05$ Angle: $\pm 1^\circ$	Revision: 7 Revision date: 2/21/2017
SOT1483-1		 Third angle projection	Sheet 2 of 2

Fig 20. Package outline SOT1483-1 (sheet 2 of 2)

## 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 13. ESD sensitivity**

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C2A <a href="#">[1]</a>
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	2 <a href="#">[2]</a>

[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 14. Abbreviations**

Acronym	Description
3GPP	3rd Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CDMA	Code Division Multiple Access
CW	Continuous Wave
DCPH	Dedicated Physical CHannel
EDGE	Enhanced Data rates for GSM Evolution
ESD	ElectroStatic Discharge
FDD	Frequency Division Duplex
GSM	Global System for Mobile Communication
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LTE	Long Term Evolution
MC-GSM	Multi Carrier GSM
MTF	Median Time to Failure
PAR	Peak-to-Average Ratio
SMD	Surface Mounted Device
TDD	Time Division Duplex
W-CDMA	Wideband Code Division Multiple Access
WiMAX	Worldwide Interoperability for Microwave Access

## 11. Revision history

Table 15. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLP9G0722-20_9G0722-20G v.3	20180226	Product data sheet	-	BLP9G0722-20_9G0722-20G v.2
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Section 1.1 on page 1</a>: changed “400 MHz” to “100 MHz”</li> </ul>			
BLP9G0722-20_9G0722-20G v.2	20170801	Product data sheet	-	BLP9G0722-20_9G0722-20G v.1
BLP9G0722-20_9G0722-20G v.1	20170606	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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Date of release: 26 February 2018

Document identifier: BLP9G0722-20\_9G0722-20G