

# BLF9G20LS-160V

Power LDMOS transistor

Rev. 3 — 1 September 2015

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

160 W LDMOS power transistor with improved video bandwidth for base station applications at frequencies from 1800 MHz to 2000 MHz.

**Table 1. Typical performance**

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

Test signal	f	$I_{DQ}$	$V_{DS}$	$P_{L(AV)}$	$G_p$	$\eta_D$	ACPR
	(MHz)	(mA)	(V)	(W)	(dB)	(%)	(dBc)
2-carrier W-CDMA	1805 to 1880	800	28	35.5	19.8	33.5	-28 <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

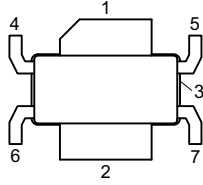
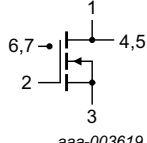
- Excellent ruggedness
- High efficiency
- Low thermal resistance providing excellent thermal stability
- Excellent broadband performance
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- Internally matched 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 multi systems base stations and multi carrier applications in the 1800 MHz to 2000 MHz frequency range

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		 aaa-003619
2	gate		
3	source <a href="#">[1]</a>		
4	decoupling lead		
5	decoupling lead		
6	n.c.		
7	n.c.		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF9G20LS-160V	-	earless flanged LDMOST ceramic package; 6 leads	SOT1120B

## 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	<a href="#">[1]</a>	-	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
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_L = 36\text{ W}; V_{DS} = 28\text{ V}; I_{Dq} = 800\text{ mA}$	0.17	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	$V_{GS} = 0\text{ V}; I_D = 1.5\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 154\text{ mA}$	1.55	2.3	3.05	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 28\text{ V}; I_D = 923\text{ mA}$	1.4	2.2	3	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	3.6	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	25	33	41.8	A
$I_{GSS}$	gate leakage current	$V_{GS} = 9\text{ V}; V_{DS} = 0\text{ V}$	-	-	360	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 154\text{ mA}$	-	1.32	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 5.4\text{ A}$	-	0.098	-	$\Omega$

**Table 7. RF characteristics**

Test signal: 2-carrier W-CDMA; PAR = 8.4 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 1807.5\text{ MHz}; f_2 = 1812.5\text{ MHz}; f_3 = 1872.5\text{ MHz}; f_4 = 1877.5\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V}; I_{Dq} = 800\text{ mA}; T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 35.5\text{ W}$	18.8	19.8	-	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 35.5\text{ W}$	28.5	33.5	-	%
$RL_{in}$	input return loss	$P_{L(AV)} = 35.5\text{ W}$	-	-8	-4	dB
ACPR	adjacent channel power ratio	$P_{L(AV)} = 35.5\text{ W}$	-	-28	-23	dBc

## 7. Test information

### 7.1 Ruggedness in class-AB operation

The BLF9G20LS-160V is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 800\text{ mA}; P_L = 140\text{ W (CW)}; f = 1805\text{ MHz}$ .

### 7.2 Impedance information

**Table 8. Typical impedance**

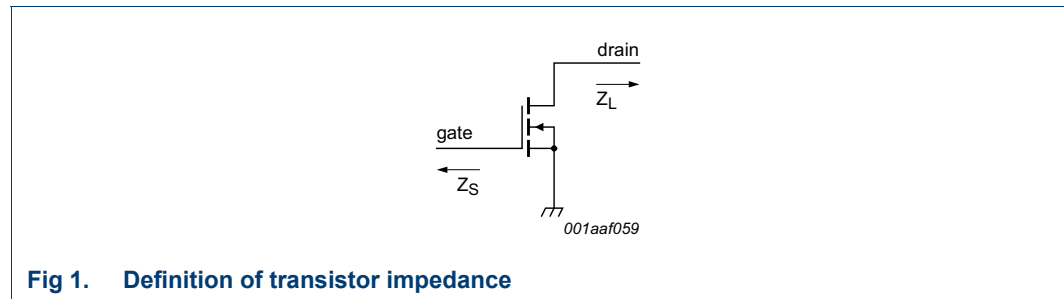
Measured load-pull data;  $I_{Dq} = 800\text{ mA}; V_{DS} = 28\text{ V}$ .

f	$Z_S$ [1]	$Z_L$ [1]
(MHz)	( $\Omega$ )	( $\Omega$ )
<b>Maximum power load</b>		
1805	0.91 – j3.39	1.11 – j3.69
1842.5	1.16 – j3.80	1.13 – j3.72
1880	1.25 – j3.95	1.16 – j3.80

**Table 8. Typical impedance ...continued**  
 Measured load-pull data;  $I_{DQ} = 800 \text{ mA}$ ;  $V_{DS} = 28 \text{ V}$ .

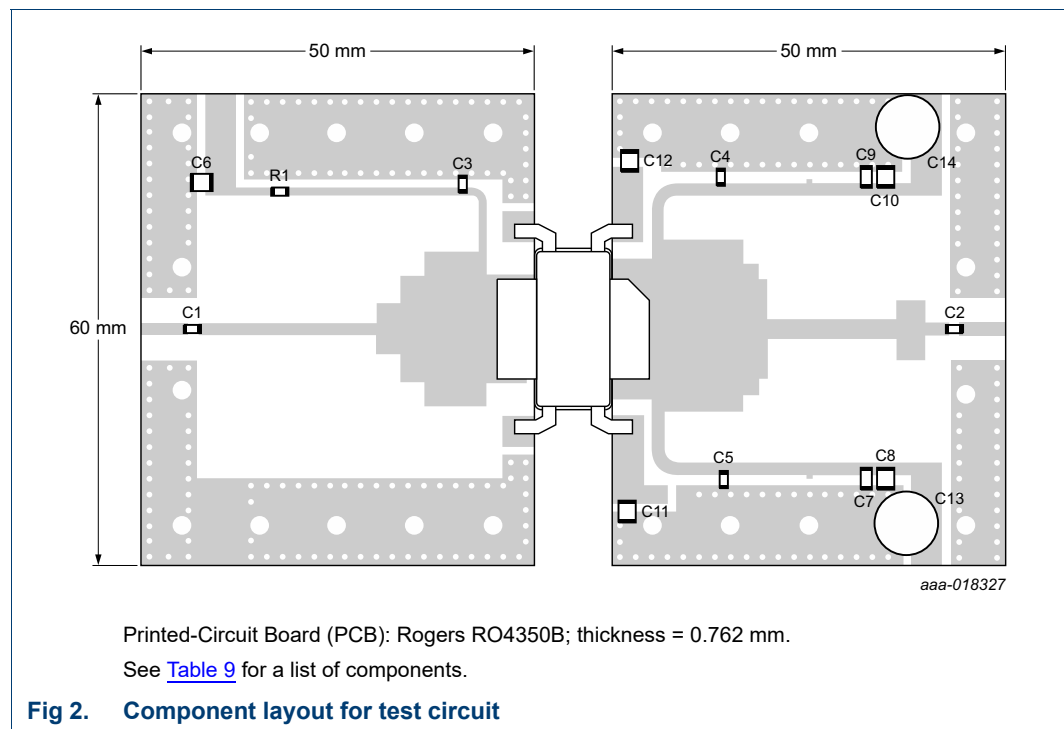
f (MHz)	$Z_S$ [1] ( $\Omega$ )	$Z_L$ [1] ( $\Omega$ )
<b>Maximum drain efficiency load</b>		
1805	$0.91 - j3.39$	$2.19 - j2.64$
1842.5	$1.16 - j3.80$	$2.08 - j2.55$
1880	$1.25 - j3.95$	$1.88 - j2.67$

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



**Fig 1. Definition of transistor impedance**

### 7.3 Test circuit



Printed-Circuit Board (PCB): Rogers RO4350B; thickness = 0.762 mm.  
 See [Table 9](#) for a list of components.

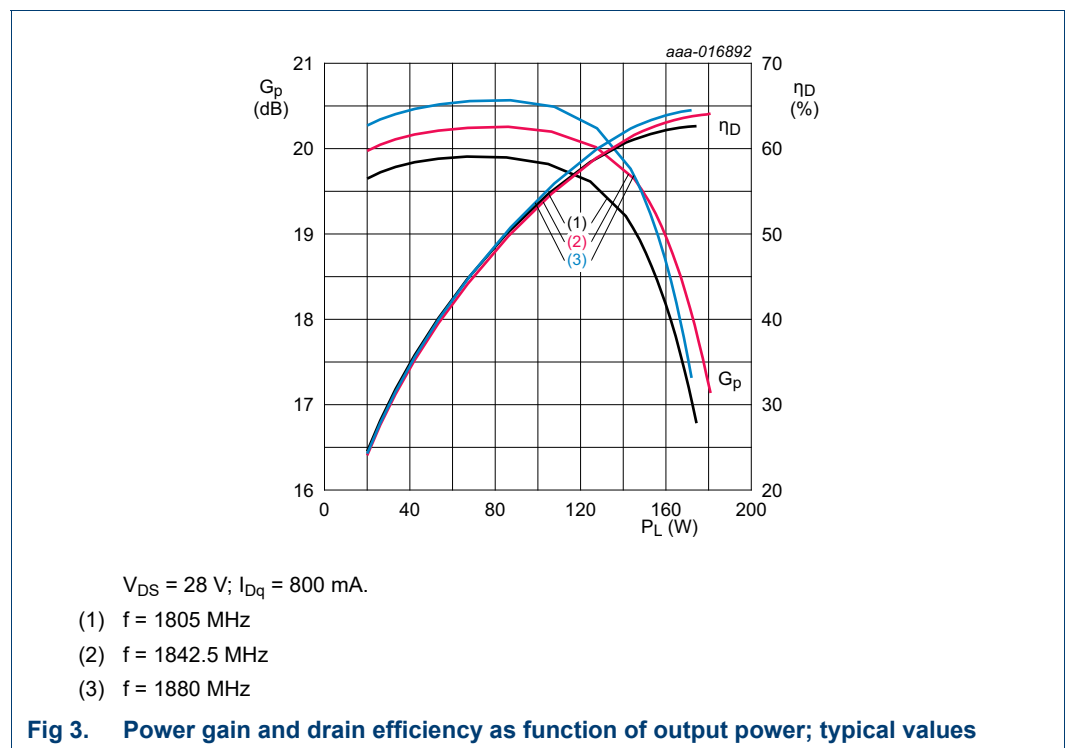
**Fig 2. Component layout for test circuit**

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

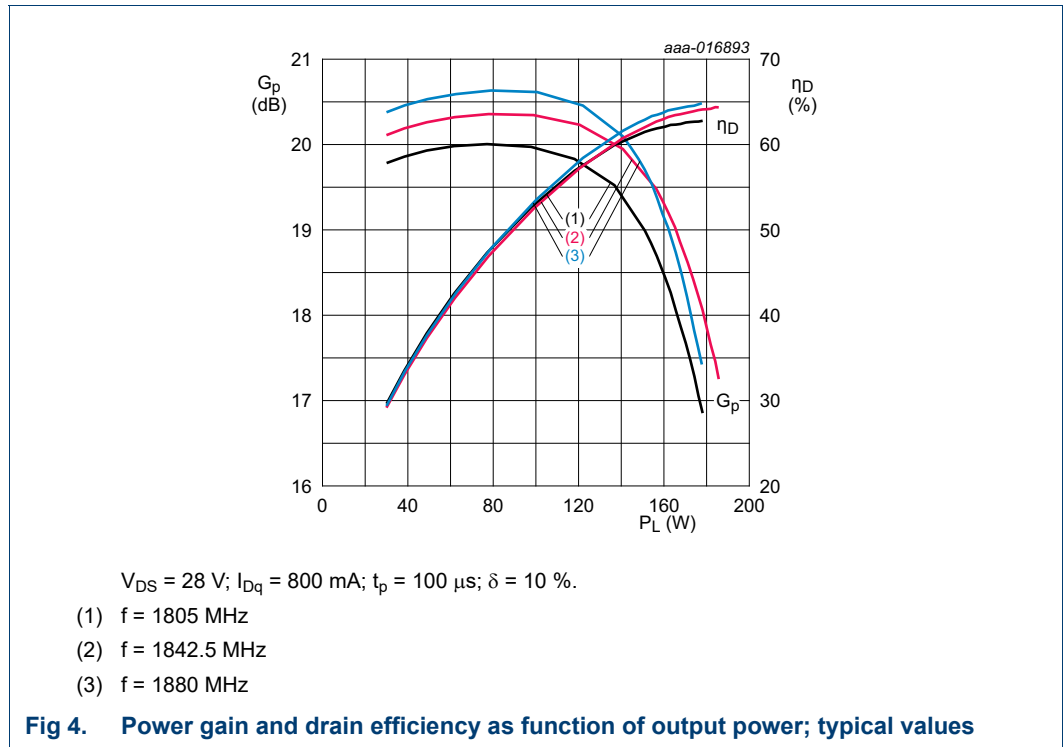
Component	Description	Value	Remarks
C1, C2	multilayer ceramic chip capacitor	20 pF	ATC 800B
C3, C4, C5	multilayer ceramic chip capacitor	20 $\mu$ F	ATC 600F
C6, C8, C10, C11, C12	multilayer ceramic chip capacitor	10 $\mu$ F, 50 V	Murata
C7, C9	multilayer ceramic chip capacitor	0.1 $\mu$ F, 50 V	Murata
C13, C14	electrolytic capacitor	2200 $\mu$ F, 63 V	
R1	SMD resistor	9.1 $\Omega$ , 12 W	SMD 0805

## 7.4 Graphical data

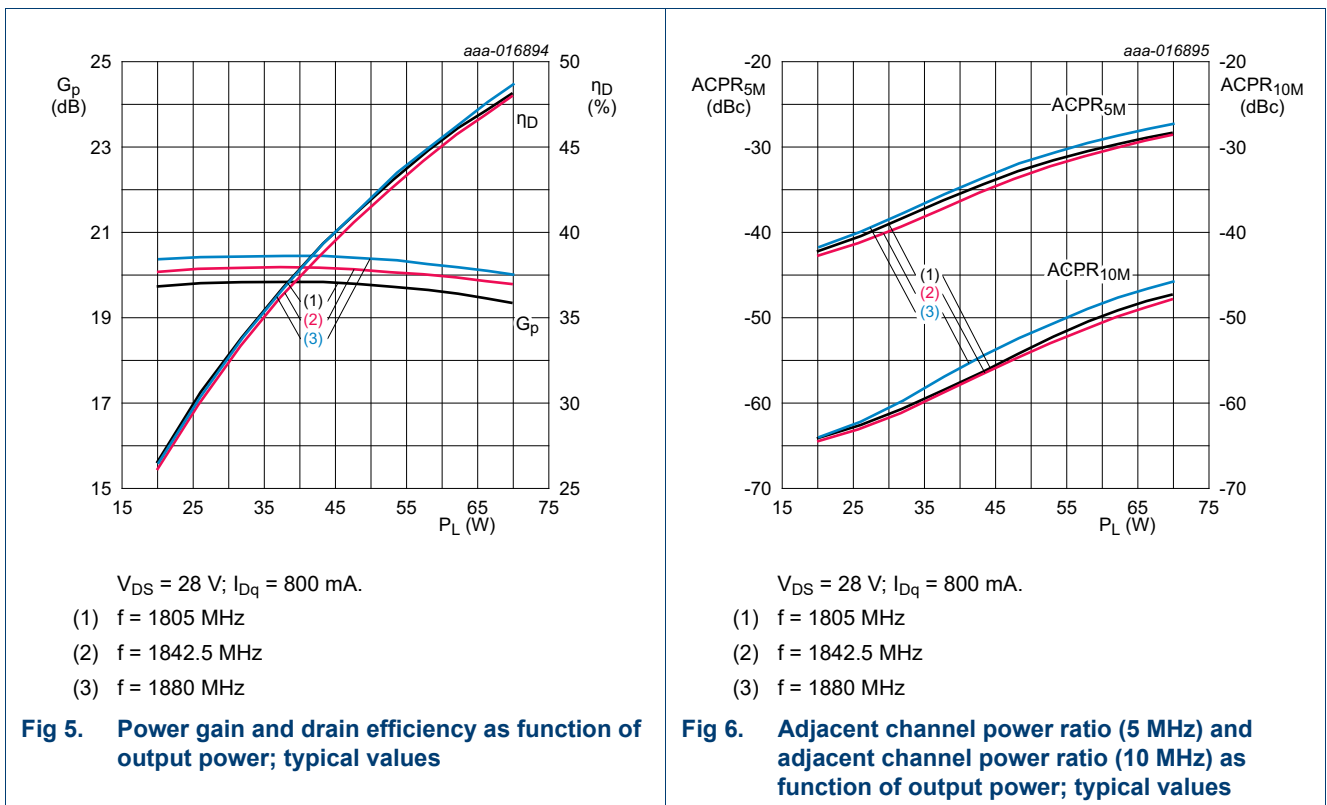
### 7.4.1 CW



7.4.2 Pulsed CW

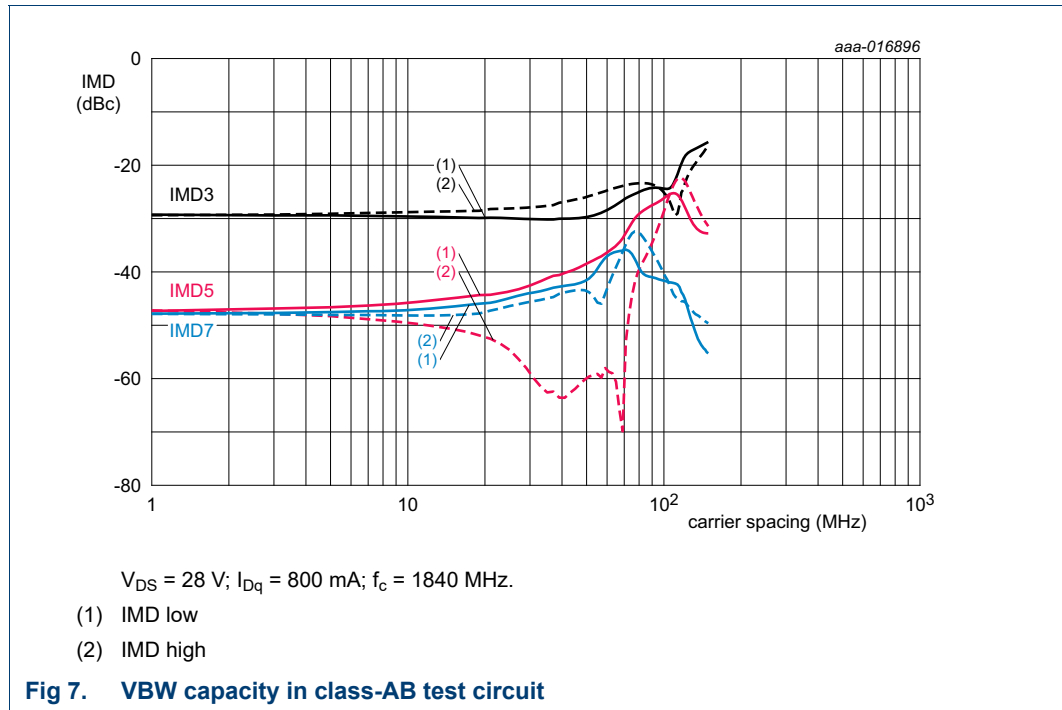


7.4.3 1-Carrier W-CDMA



7.4.4 2-Tone VBW

The BLF9G20LS-160V has a video bandwidth of 110 MHz (typical) when measured in a class-AB test circuit operating at a center frequency of 1840 MHz for  $V_{DS} = 28\text{ V}$  and  $I_{Dq} = 800\text{ mA}$ .



### 8. Package outline

Earless flanged LDMOST ceramic package; 6 leads

SOT1120B

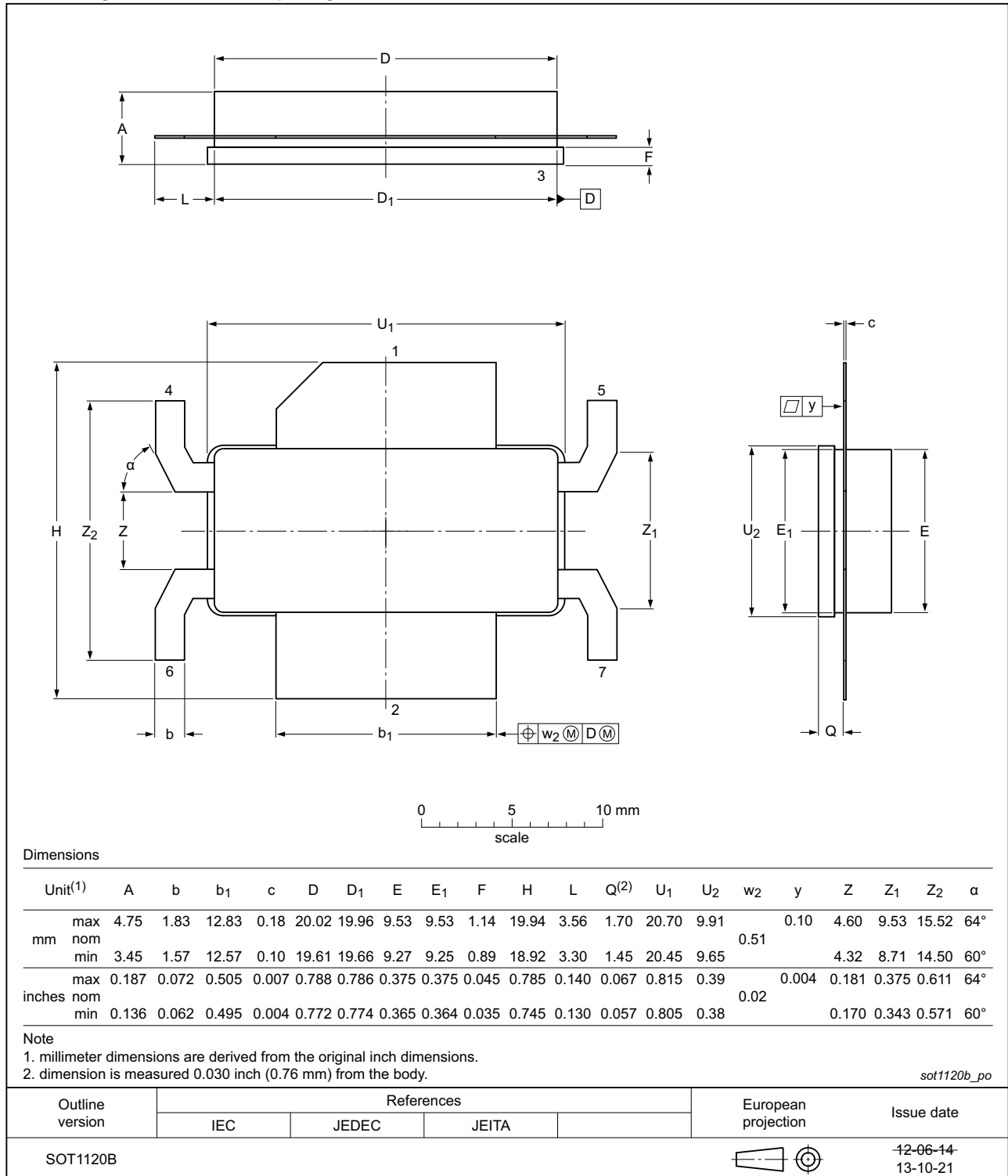


Fig 8. Package outline SOT1120B



## 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 10. 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
LDMOST	Laterally Diffused Metal Oxide Semiconductor Transistor
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 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF9G20LS-160V#3	20150901	Product data sheet		BLF9G20LS-160V v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
BLF9G20LS-160V v.2	20150521	Product data sheet	-	BLF9G20LS-160V v.1
BLF9G20LS-160V v.1	20141218	Objective 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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