

BLC9G20LS-160PV

Power LDMOS transistor

Rev. 3 — 24 May 2017

AMMPLÉON

Product data sheet

1. Product profile

1.1 General description

160 W LDMOS power transistor with enhanced video bandwidth for base station applications at frequencies from 1805 MHz to 2000 MHz.

Table 1. Typical performance

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

Test signal	f	I_{DQ}	V_{DS}	$P_{L(AV)}$	G_p	η_D	$ACPR_{5M}$
	(MHz)	(mA)	(V)	(W)	(dB)	(%)	(dBc)
1-carrier W-CDMA	1805 to 1880	860	28	38	20	38	-35 [1]

[1] Test signal: 3GPP test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF per carrier; 5 MHz carrier spacing.

1.2 Features and benefits

- Excellent ruggedness
- High efficiency
- Low thermal resistance providing excellent thermal stability
- Decoupling leads to enable enhanced video bandwidth performance (70 MHz typical)
- Designed for broadband operation (1805 MHz to 2000 MHz)
- 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 amplifiers for base stations and multi carrier applications in the 1805 MHz to 2000 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain1		
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
BLC9G20LS-160PV	-	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	$T_{case} = 80\text{ °C}; P_L = 38\text{ W}$	0.310	K/W

6. Characteristics

Table 6. DC characteristics

$T_j = 25\text{ °C}$ per section, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.7\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 72\text{ mA}$	1.5	1.9	2.3	V
V_{GSq}	gate-source quiescent voltage	$V_{DS} = 28\text{ V}; I_D = 430\text{ mA}$	1.7	2.1	2.5	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 32\text{ V}$	-	-	1.4	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	-	14	-	A
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	140	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 72\text{ mA}$	-	0.64	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 2.5\text{ A}$	-	0.18	-	Ω

Table 7. RF characteristics

Test signal: 1-carrier W-CDMA; 3GPP test model 1 with 64 DPCH; PAR = 7.2 dB at 0.01 % probability on the CCDF; RF performance at $V_{DS} = 28\text{ V}; I_{Dq} = 860\text{ mA}$ (whole device);

$T_{case} = 25\text{ °C}$; unless otherwise specified; in a water cooled class-AB test circuit at frequencies from 1805 MHz to 1880 MHz.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)} = 38\text{ W}$	18.6	19.8	-	dB
η_D	drain efficiency	$P_{L(AV)} = 38\text{ W}$	29.5	34.5	-	%
RL_{in}	input return loss	$P_{L(AV)} = 38\text{ W}$	-	-10	-4	dB
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)} = 38\text{ W}$	-	-30	-25	dBc

7. Test information

7.1 Ruggedness in class-AB operation

The BLC9G20LS-160PV is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $I_{Dq} = 860\text{ mA}$; $P_L = 120\text{ W (CW)}$; $f = 1805\text{ MHz}$.

7.2 Impedance information

Table 8. Typical impedance

Measured load-pull data; $I_{Dq} = 860\text{ mA}$; $V_{DS} = 28\text{ V}$. Typical values unless otherwise specified.

f (MHz)	Z_S [1] (Ω)	Z_L [1] (Ω)	P_L [1] (W)	η_D [2] (%)	G_p [2] (dB)
Maximum power load					
1805	1.0 – j3.7	1.2 – j3.6	189	60.5	16.3
1843	1.4 – j4.3	1.2 – j3.6	189	61.4	16.4
1880	1.5 – j5.0	0.9 – j3.7	189	55.3	16.0
Maximum drain efficiency load					
1805	1.0 – j3.7	2.0 – j2.5	127	68.9	18.4
1843	1.4 – j4.3	1.8 – j2.3	120	68.8	18.5
1880	1.5 – j5.0	1.7 – j2.5	126	67.4	18.6

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

[2] at 3 dB gain compression.

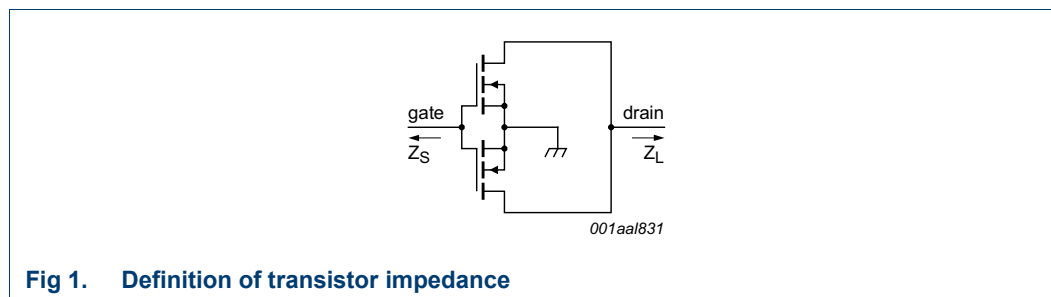


Fig 1. Definition of transistor impedance

7.3 VBW in class-AB operation

The BLC9G20LS-160PV shows 70 MHz (typical) video bandwidth in a class-AB test circuit in 1842.5 MHz band at $V_{DS} = 28\text{ V}$ and $I_{Dq} = 860\text{ mA}$.

7.4 Test circuit

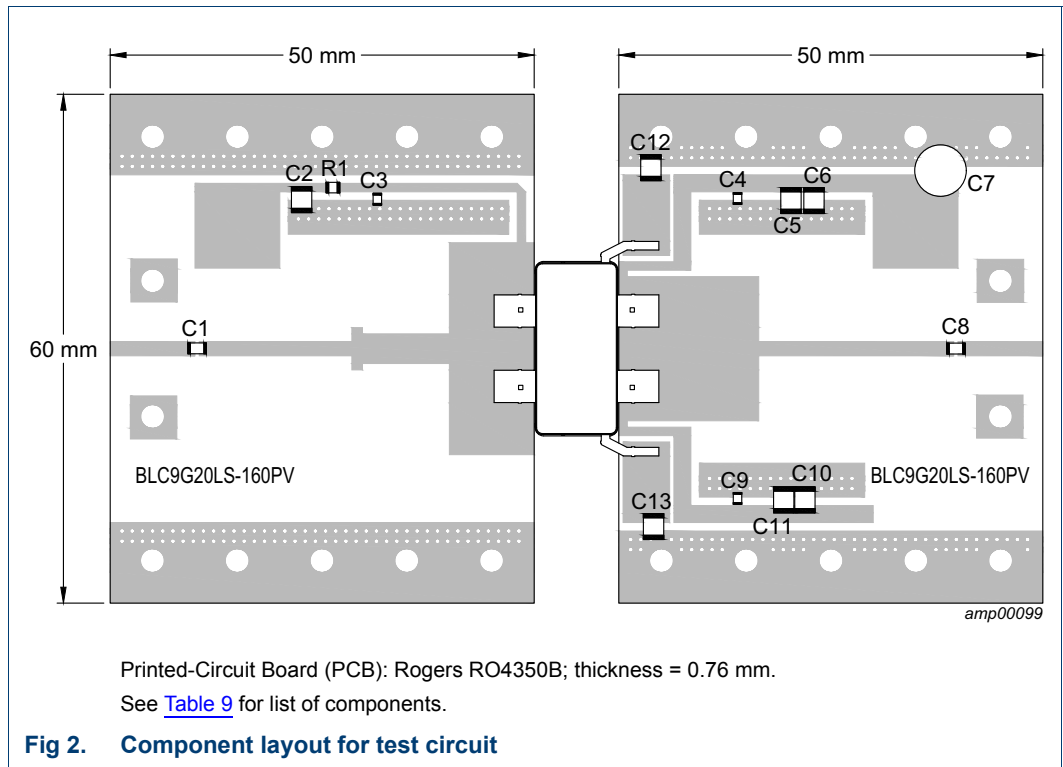


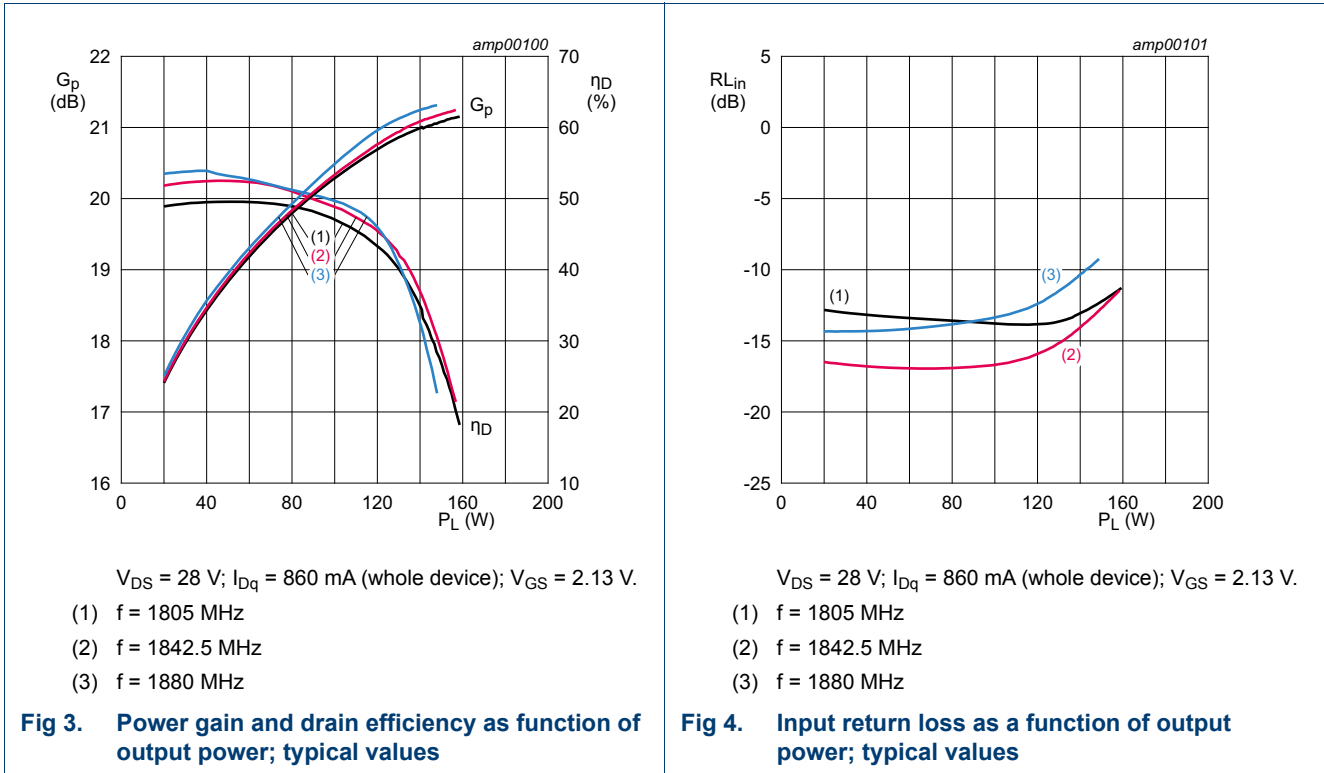
Table 9. List of components

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

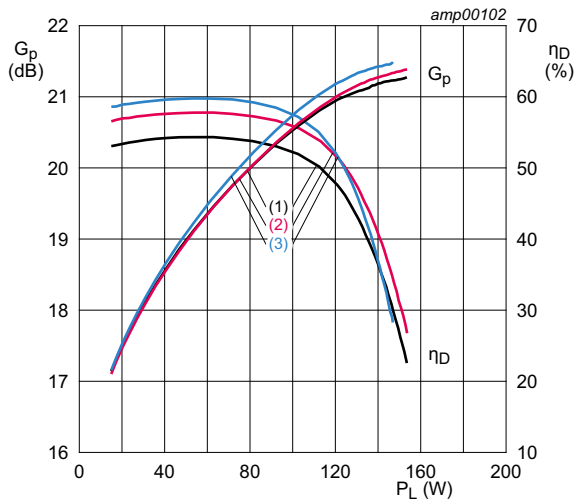
Component	Description	Value	Remarks
C1, C3, C4, C8, C9	multilayer ceramic chip capacitor	36 pF	ATC600F
C2, C5, C6, C10, C11, C12, C13	multilayer ceramic chip capacitor	4.7 μ F, 72 V	Murata
C7	electrolytic capacitor	2200 μ F, 50 V	
R1	chip resistor	5.1 Ω	SMD 0805

7.5 Graphical data

7.5.1 CW

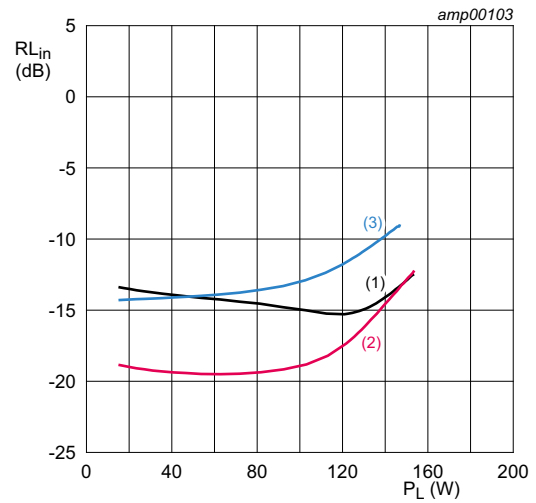


7.5.2 CW pulsed



$V_{DS} = 28\text{ V}; I_{Dq} = 860\text{ mA (whole device)}; V_{GS} = 2.13\text{ V}.$
 (1) $f = 1805\text{ MHz}$
 (2) $f = 1842.5\text{ MHz}$
 (3) $f = 1880\text{ MHz}$

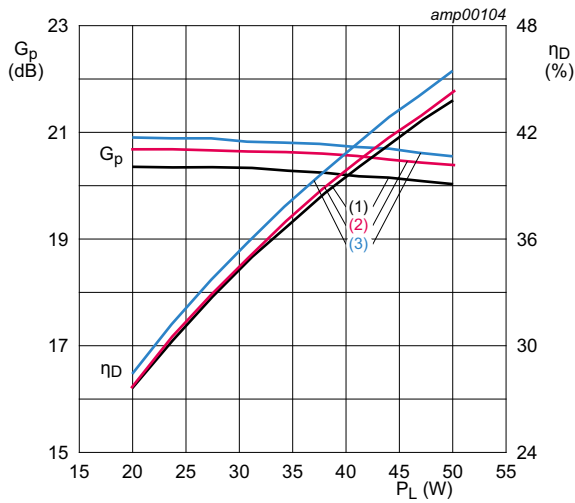
Fig 5. Power gain and drain efficiency as function of output power; typical values



$V_{DS} = 28\text{ V}; I_{Dq} = 860\text{ mA (whole device)}; V_{GS} = 2.13\text{ V}.$
 (1) $f = 1805\text{ MHz}$
 (2) $f = 1842.5\text{ MHz}$
 (3) $f = 1880\text{ MHz}$

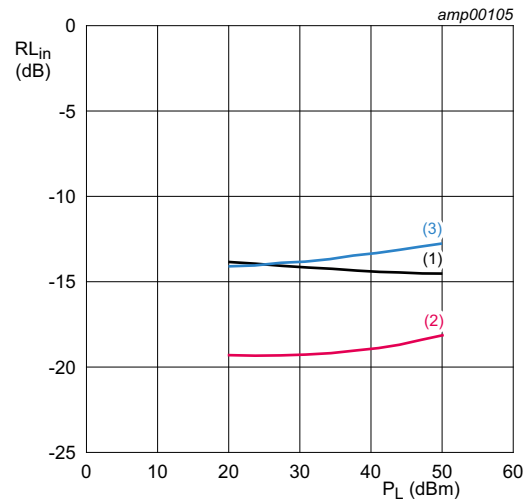
Fig 6. Input return loss as a function of output power; typical values

7.5.3 1-Carrier W-CDMA



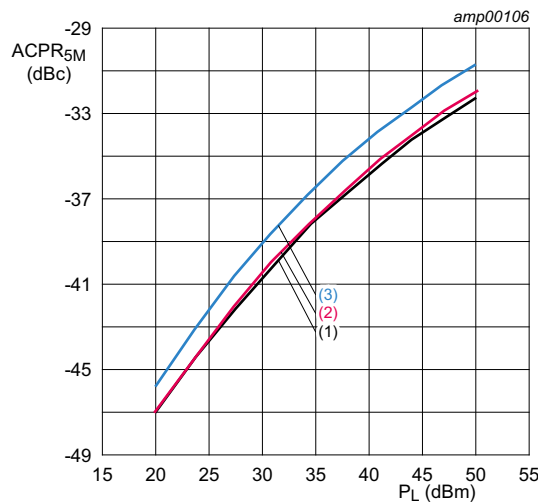
$V_{DS} = 28\text{ V}$; $I_{Dq} = 860\text{ mA}$ (whole device); $V_{GS} = 2.13\text{ V}$.
 (1) $f = 1805\text{ MHz}$
 (2) $f = 1842.5\text{ MHz}$
 (3) $f = 1880\text{ MHz}$

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



$V_{DS} = 28\text{ V}$; $I_{Dq} = 860\text{ mA}$ (whole device); $V_{GS} = 2.13\text{ V}$.
 (1) $f = 1805\text{ MHz}$
 (2) $f = 1842.5\text{ MHz}$
 (3) $f = 1880\text{ MHz}$

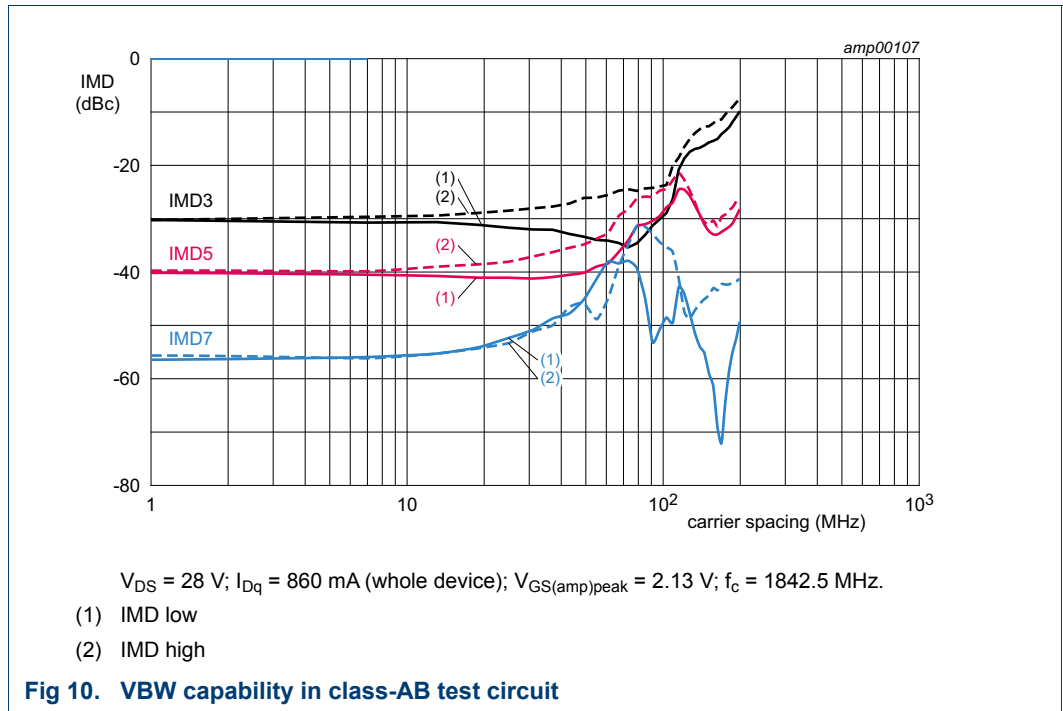
Fig 8. Input return loss as a function of output power; typical values



$V_{DS} = 28\text{ V}$; $I_{Dq} = 860\text{ mA}$ (whole device); $V_{GS} = 2.13\text{ V}$.
 (1) $f = 1805\text{ MHz}$
 (2) $f = 1842.5\text{ MHz}$
 (3) $f = 1880\text{ MHz}$

Fig 9. Adjacent channel power ratio (5 MHz) as a function of output power; typical values

7.5.4 2-Tone VBW



8. Package outline

Air cavity plastic earless flanged package; 6 leads

SOT1275-1

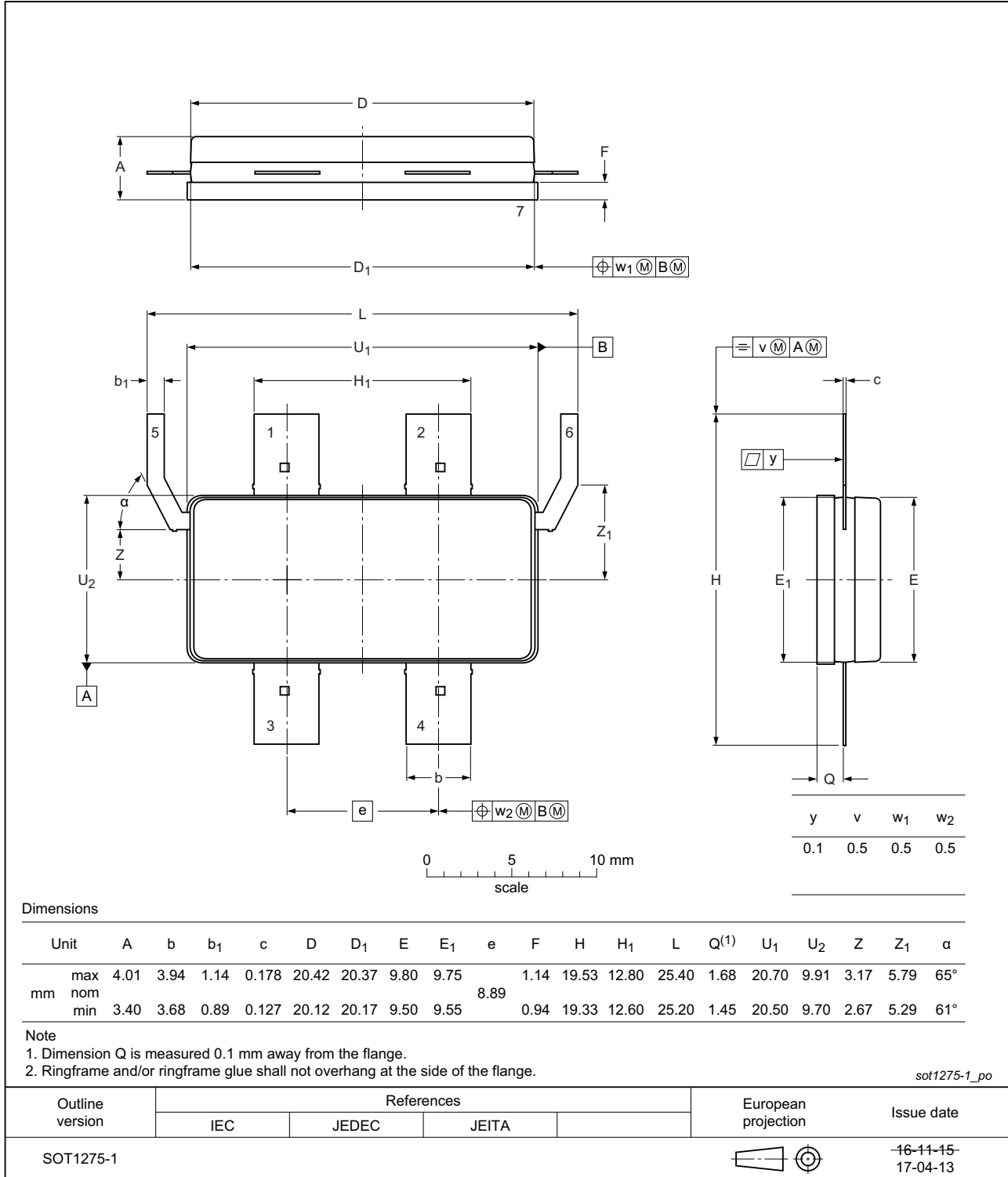


Fig 11. Package outline SOT1275-1

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	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
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
BLC9G20LS-160PV v.3	20170524	Product data sheet	-	BLC9G20LS-160PV v.2
Modifications:	<ul style="list-style-type: none"> • Figure 11 on page 10: updated package outline drawing SOT1275-1 			
BLC9G20LS-160PV v.2	20161220	Product data sheet	-	BLC9G20LS-160PV v.1
BLC9G20LS-160PV v.1	20160602	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".

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