

# BLC9H10XS-300P

Power LDMOS transistor

Rev. 1 — 29 May 2018

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

300 W LDMOS power transistor for base station applications at frequencies from 600 MHz to 960 MHz.

**Table 1. Typical performance**

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

Test signal	f	$I_{DQ}$	$V_{DS}$	$P_{L(AV)}$	$G_p$	$\eta_D$	ACPR
	(MHz)	(mA)	(V)	(W)	(dB)	(%)	(dBc)
1-carrier W-CDMA	925 to 960	1000	48	60	21	34	-47 [1]

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

### 1.2 Features and benefits

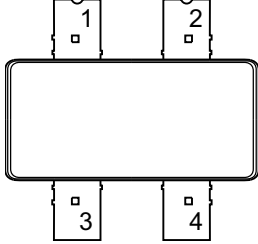
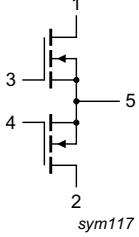
- 50 V operation voltage
- Excellent ruggedness
- High efficiency
- Low thermal resistance providing excellent thermal stability
- Designed for broadband operation
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for ease of use
- Integrated ESD protection
- For RoHS compliance see the product details on the Ampleon website

### 1.3 Applications

- RF power amplifier for W-CDMA base stations and multi carrier applications in the 600 MHz to 960 MHz frequency range

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source <sup>[1]</sup>		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLC9H10XS-300P	-	air cavity plastic earless flanged package; 4 leads	SOT1273-1

## 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		-	108	V
$V_{GS}$	gate-source voltage		-0.5	+11	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		<sup>[1]</sup> -	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	$V_{DS} = 48\text{ V}; I_{Dq} = 1000\text{ mA}; T_{case} = 80\text{ °C}$		
		$P_L = 60\text{ W}$	0.248	k/W
		$P_L = 90\text{ W}$	0.255	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	$V_{GS} = 0\text{ V}; I_D = 2.7\text{ mA}$	108	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 100\text{ mA}$	1.5	2	2.5	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 48\text{ V}; I_D = 1.2\text{ A}$	-	2.2	-	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 48\text{ V}$	-	-	1.4	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	-	16	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	140	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 5\text{ A}$	-	6.7	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 3.5\text{ A}$	-	0.24	-	$\Omega$

**Table 7. RF characteristics**

Test signal: 1-carrier W-CDMA; PAR = 7.2 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 927.5\text{ MHz}; f_3 = 957.5\text{ MHz}$ ; RF performance at  $V_{DS} = 48\text{ V}; I_{Dq} = 1000\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a class-AB production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 60\text{ W}$	19.8	21	-	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 60\text{ W}$	27	34	-	%
$RL_{in}$	input return loss	$P_{L(AV)} = 60\text{ W}$	-	-21	-13	dB
ACPR	adjacent channel power ratio	$P_{L(AV)} = 60\text{ W}$	-	-47	-39	dBc

**Table 8. RF characteristics**

Test signal: pulsed CW;  $t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }%; f = 960\text{ MHz}$ ; RF performance at  $V_{DS} = 48\text{ V}; I_{Dq} = 1000\text{ mA}; T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a class-AB production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(3dB)}$	output power at 3 dB gain compression		300	340	-	W

## 7. Test information

### 7.1 Ruggedness in Doherty operation

The BLC9H10XS-300P is capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 48\text{ V}; I_{Dq} = 1000\text{ mA}; P_L = 240\text{ W (CW)}; f = 925\text{ MHz}$ ; tested on the common-source class-AB development test circuit.

## 7.2 Impedance information

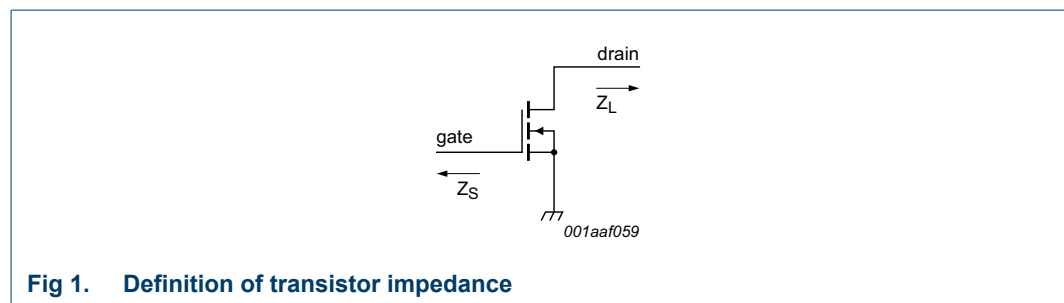
**Table 9. Typical impedance of maximum power and drain efficiency**

Measured load-pull data (half section);  $I_{DQ} = 600 \text{ mA}$ ;  $V_{DS} = 50 \text{ V}$ ; typical values unless otherwise specified.

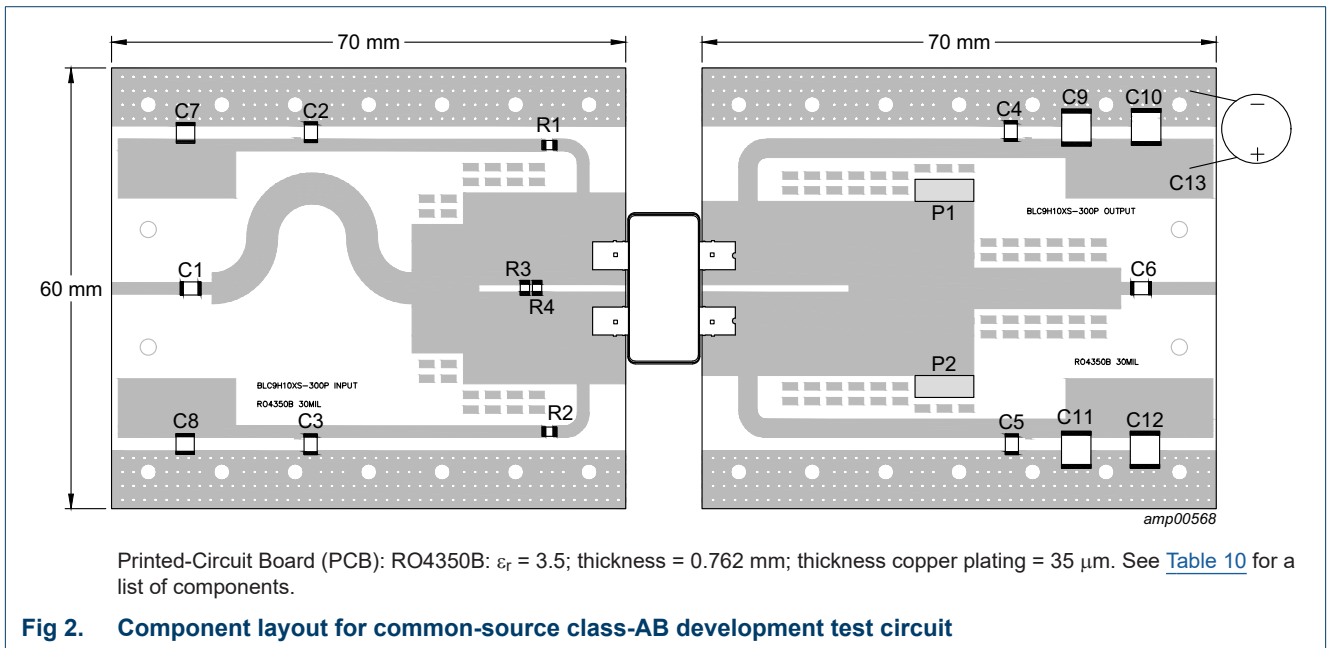
f (MHz)	$Z_S$ [1] ( $\Omega$ )	$Z_L$ [1] ( $\Omega$ )	$P_L$ (W)	$\eta_D$ (%)	$G_p$ [2] (dB)
<b>Maximum power load</b>					
920	$6.1 - j3.1$	$2.6 + j0.6$	219	64.9	20.7
942	$5.9 - j4.3$	$2.7 + j0.3$	224	63.9	20.4
960	$6.1 - j4.0$	$2.7 + j0.3$	224	64.6	20.4
<b>Maximum drain efficiency load</b>					
920	$6.1 - j3.1$	$2.1 + j2.6$	145	75.2	23.3
942	$5.9 - j4.3$	$1.9 + j2.4$	141	76.2	23.2
960	$6.1 - j4.0$	$1.9 + j2.4$	135	75.7	23.3

[1]  $Z_S$  and  $Z_L$  defined in Figure 1.

[2] 8.0 dB power back off from 3 dB gain compression points.



7.3 Test circuit



**Table 10. List of components**

See [Figure 2](#) for component layout.

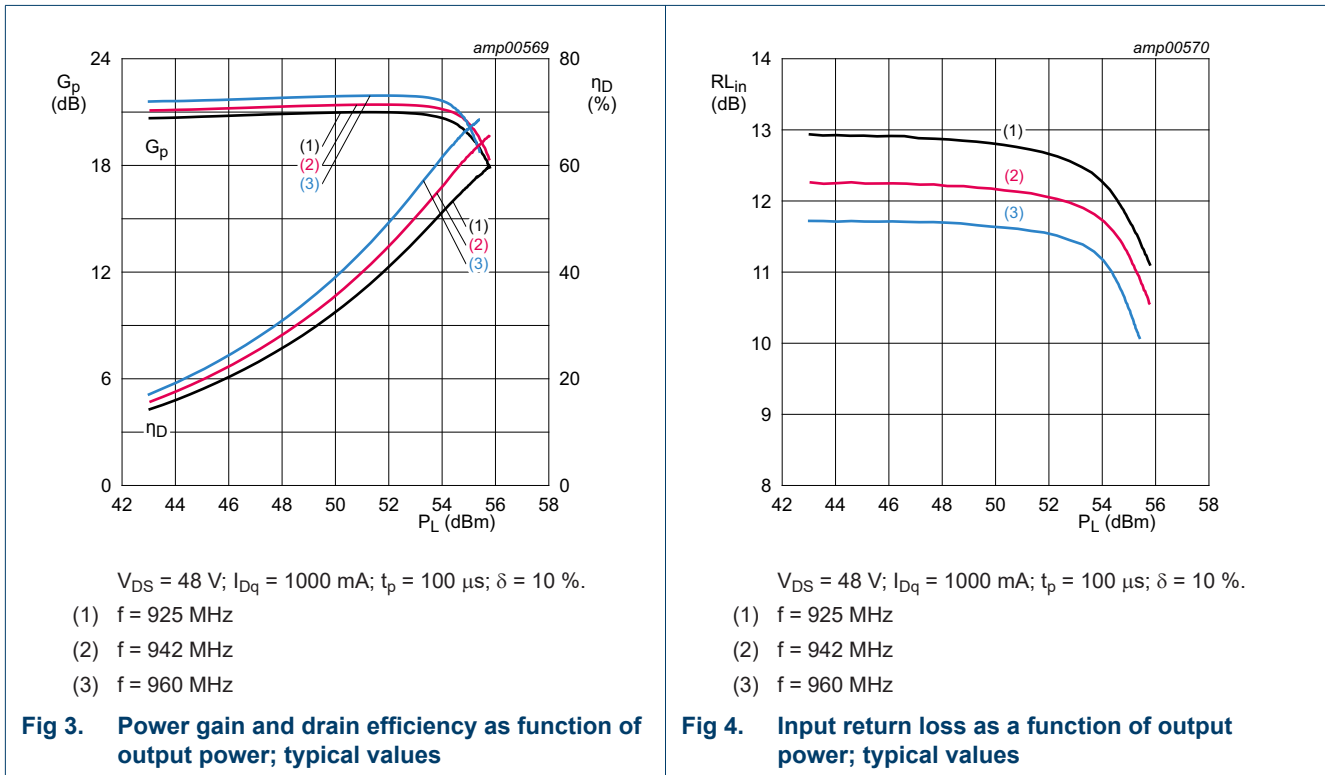
Component	Description	Value	Remarks
C1, C2, C3, C4, C5, C6	multilayer ceramic chip capacitor	43 pF	ATC 800B
C7, C8	multilayer ceramic chip capacitor	1 $\mu\text{F}$ , 50 V	[1]
C9, C10, C11, C12	multilayer ceramic chip capacitor	10 $\mu\text{F}$ , 100 V	[1]
C13	electrolytic capacitor	1000 $\mu\text{F}$ , 100 V	
R1, R2, R3, R4	chip resistor	9.1 $\Omega$	SMD 0805
P1, P2	copper foil		

[1] Murata or capacitor of same quality

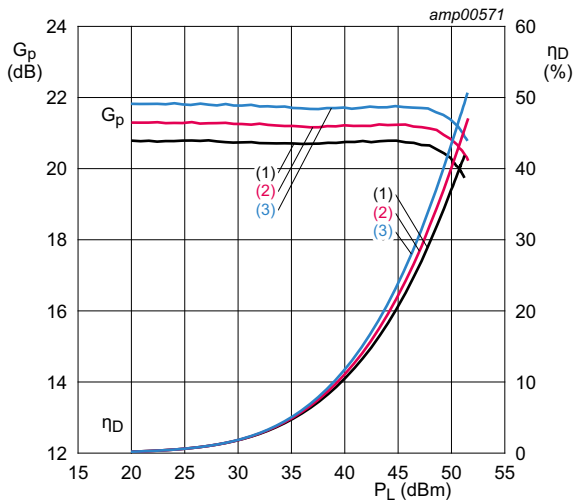
7.4 Graphical data

All data are measured on the common-source class-AB development test circuit.

7.4.1 Pulsed CW

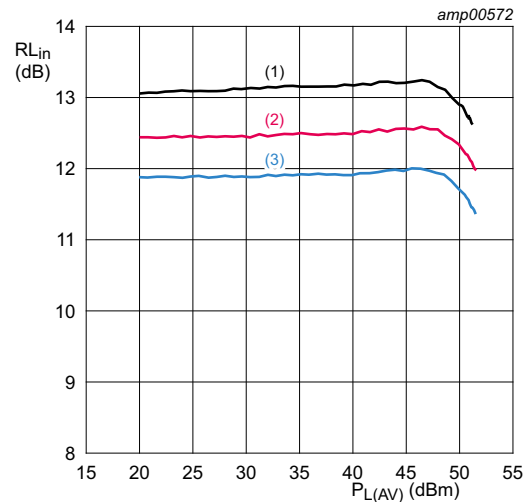


7.4.2 1-Carrier W-CDMA



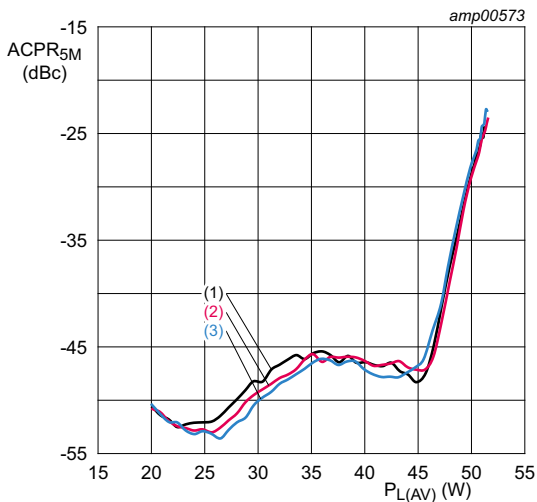
$V_{DS} = 48\text{ V}$ ;  $I_{Dq} = 1000\text{ mA}$ ; 46 % clipping.  
 (1)  $f = 925\text{ MHz}$   
 (2)  $f = 942\text{ MHz}$   
 (3)  $f = 960\text{ MHz}$

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



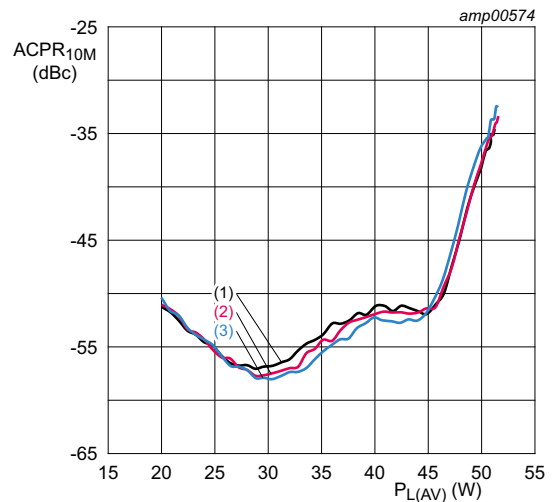
$V_{DS} = 48\text{ V}$ ;  $I_{Dq} = 1000\text{ mA}$ ; 46 % clipping.  
 (1)  $f = 925\text{ MHz}$   
 (2)  $f = 942\text{ MHz}$   
 (3)  $f = 960\text{ MHz}$

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



$V_{DS} = 48\text{ V}$ ;  $I_{Dq} = 1000\text{ mA}$ ; 46 % clipping.  
 (1)  $f = 925\text{ MHz}$   
 (2)  $f = 942\text{ MHz}$   
 (3)  $f = 960\text{ MHz}$

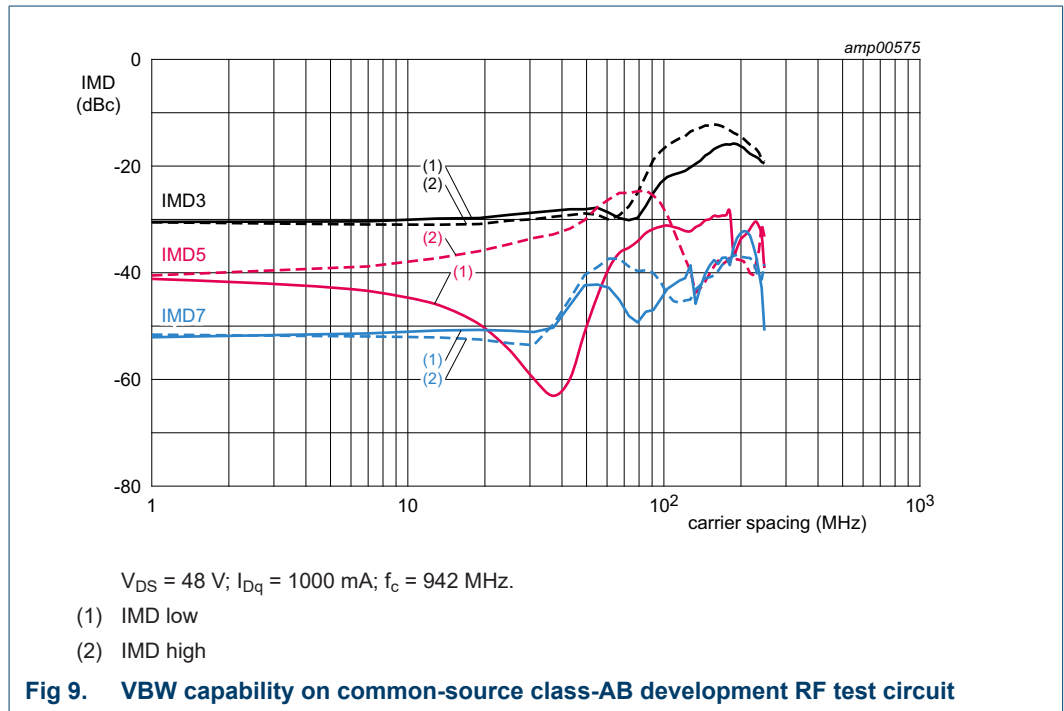
**Fig 7. Adjacent channel power ratio (5 MHz) as a function of output power; typical values**



$V_{DS} = 48\text{ V}$ ;  $I_{Dq} = 1000\text{ mA}$ ; 46 % clipping.  
 (1)  $f = 925\text{ MHz}$   
 (2)  $f = 942\text{ MHz}$   
 (3)  $f = 960\text{ MHz}$

**Fig 8. Adjacent channel power ratio (10 MHz) as a function of output power; typical values**

7.4.3 2-Tone VBW





8. Package outline

Air cavity plastic earless flanged package; 4 leads

SOT1273-1

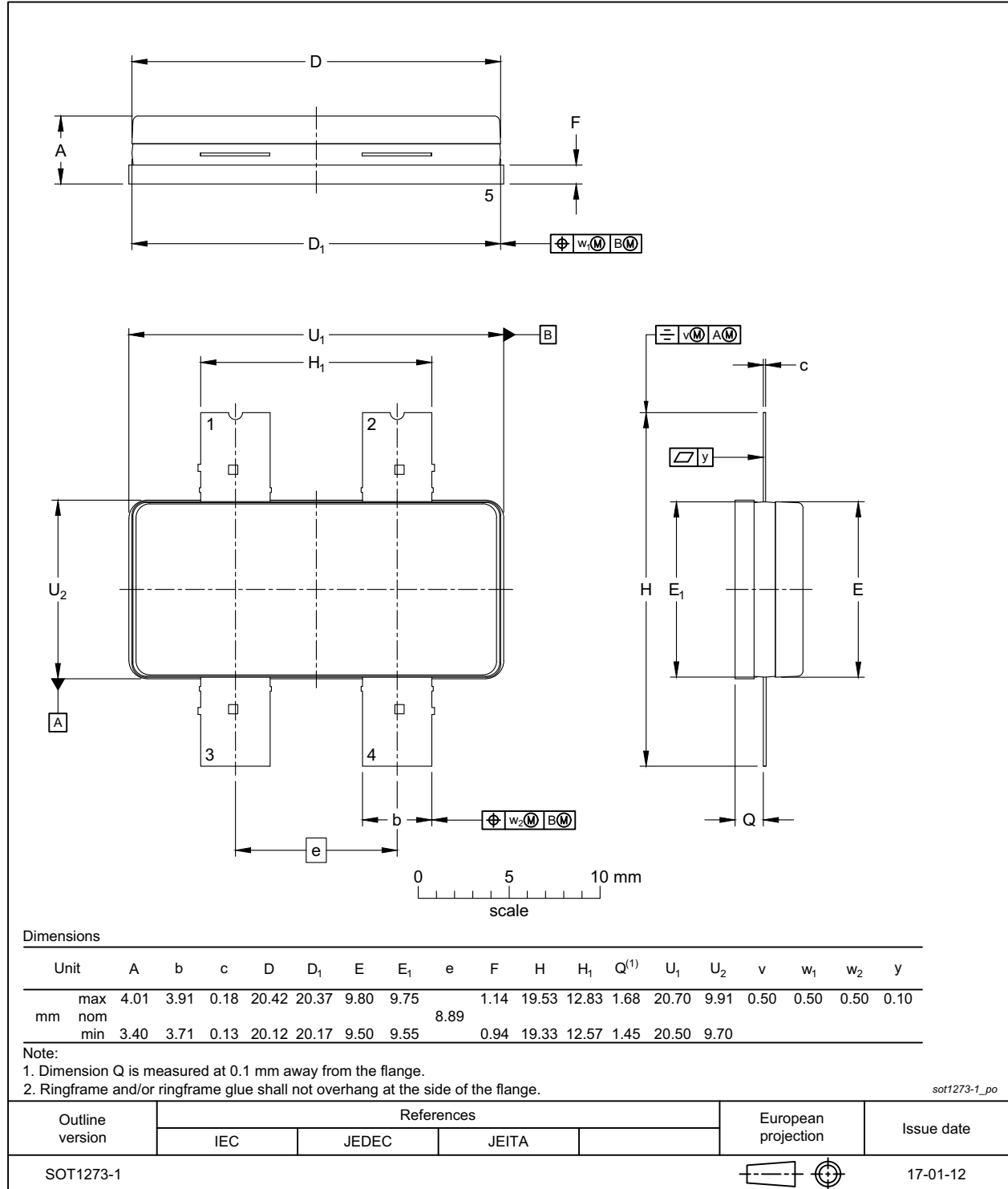



Fig 10. Package outline SOT1273-1

## 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 11. ESD sensitivity**

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C2B <sup>[1]</sup>
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	2 <sup>[2]</sup>

[1] CDM classification C2B is granted to any part that passes 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.

## 10. Abbreviations

**Table 12. 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
RoHS	Restriction of Hazardous Substances
SMD	Surface Mounted Device
VBW	Video Bandwidth
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

## 11. Revision history

**Table 13. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLC9H10XS-300P v.1	20180529	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.

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

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