BLC9G20LS-160PV

Power LDMOS transistor

Rev. 1 — 2 June 2016

AMPLEON

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 °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)

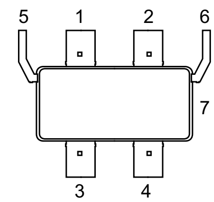
1.3 Applications

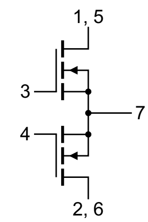
- RF power amplifiers for base stations and multi carrier applications in the 1805 MHz to 2000 MHz frequency range

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]		





aaa-007731

[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 °C; P_L = 38 W	0.310	K/W

6. Characteristics

Table 6. DC characteristics

T_j = 25 °C per section, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 0.7 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 72 mA	1.5	1.9	2.3	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 430 mA	1.7	2.1	2.5	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 32 V	-	-	1.4	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	-	14	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	140	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 72 mA	-	0.64	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 2.5 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 V; I_{Dq} = 860 mA (whole device); T_{case} = 25 °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 W	18.6	19.8	-	dB
η_D	drain efficiency	$P_{L(AV)}$ = 38 W	29.5	34.5	-	%
RL_{in}	input return loss	$P_{L(AV)}$ = 38 W	-	–10	–4	dB
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)}$ = 38 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 V; I_{Dq} = 860 mA; P_L = 120 W (CW); f = 1805 MHz.

7.2 Impedance information

Table 8. Typical impedance

Measured load-pull data; I_{Dq} = 860 mA; V_{DS} = 28 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.

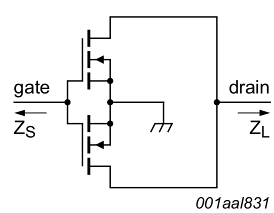
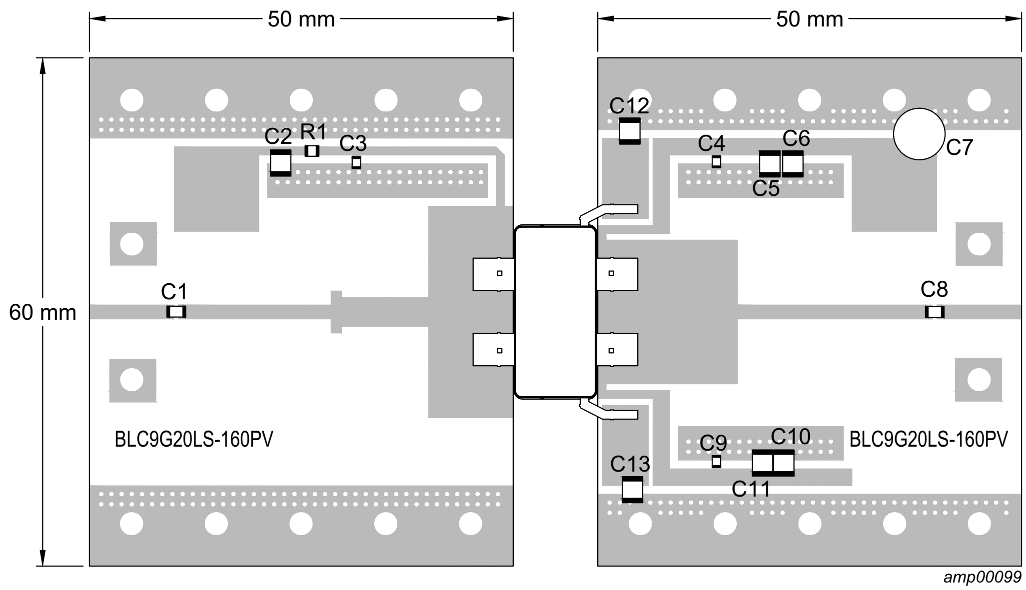


Fig 1. Definition of transistor impedance

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 V and I_{Dq} = 860 mA.

7.4 Test circuit



Printed-Circuit Board (PCB): Rogers RO4350B; thickness = 0.76 mm.

See Table 9 for list of components.

Fig 2. Component layout for test circuit

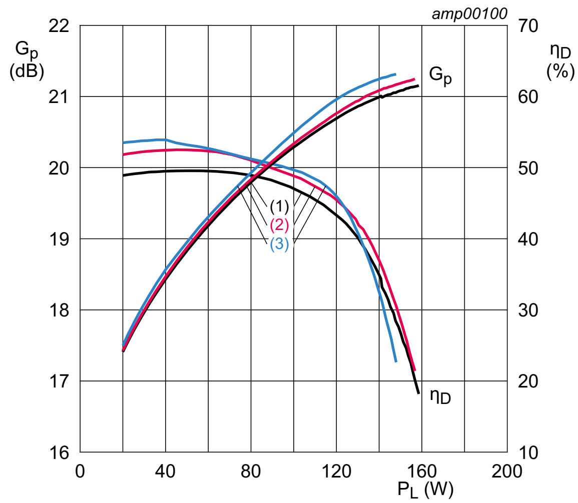
Table 9. List of components

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 μF, 72 V	Murata
C7	electrolytic capacitor	2200 μF, 50 V	
R1	chip resistor	5.1 Ω	SMD 0805

7.5 Graphical data

7.5.1 CW



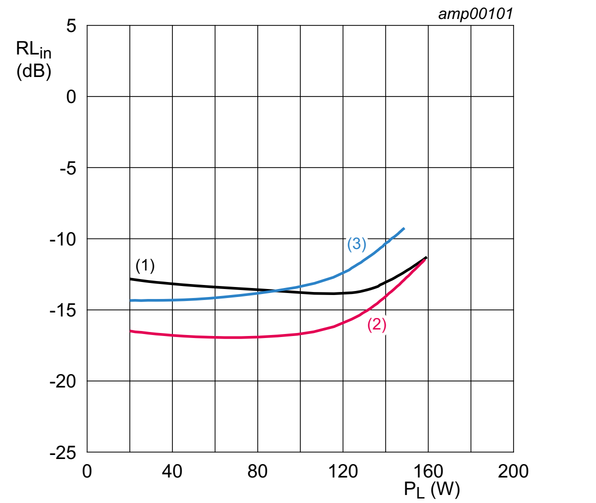
V_{DS} = 28 V; I_{Dq} = 860 mA (whole device); V_{GS} = 2.13 V.

(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

Fig 3. Power gain and drain efficiency as function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 860 mA (whole device); V_{GS} = 2.13 V.

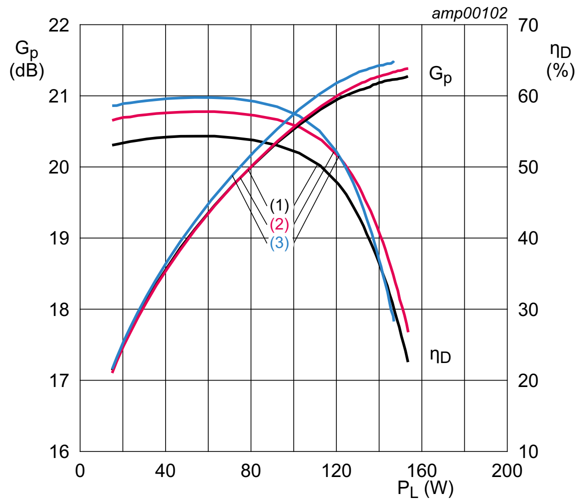
(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

Fig 4. Input return loss as a function of output power; typical values

7.5.2 CW pulsed



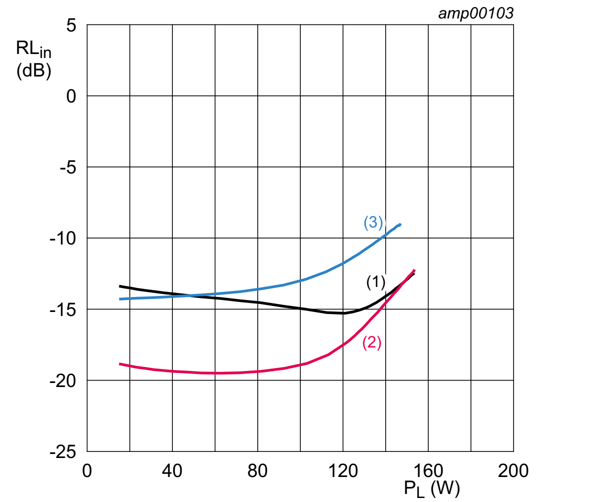
V_{DS} = 28 V; I_{Dq} = 860 mA (whole device); V_{GS} = 2.13 V.

(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

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



V_{DS} = 28 V; I_{Dq} = 860 mA (whole device); V_{GS} = 2.13 V.

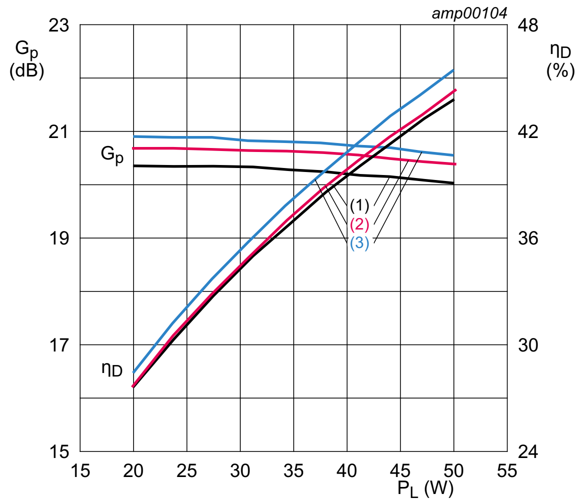
(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

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

7.5.3 1-Carrier W-CDMA



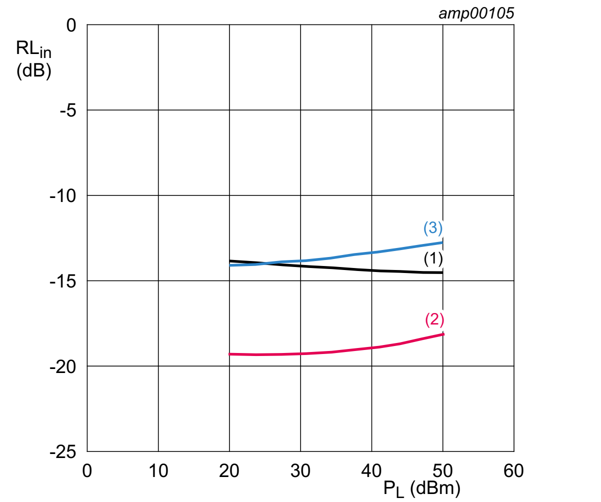
V_{DS} = 28 V; I_{Dq} = 860 mA (whole device); V_{GS} = 2.13 V.

(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

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



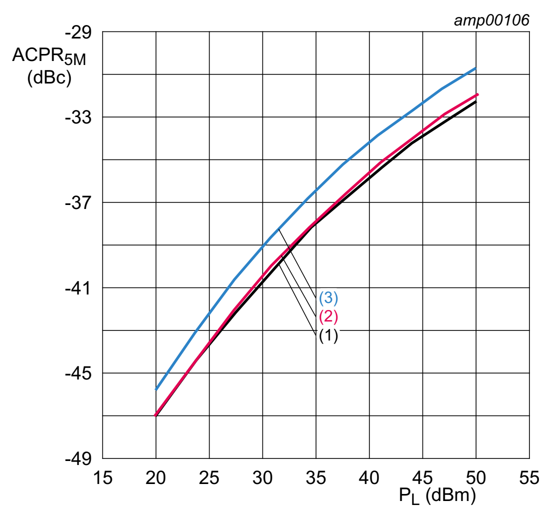
V_{DS} = 28 V; I_{Dq} = 860 mA (whole device); V_{GS} = 2.13 V.

(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

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



V_{DS} = 28 V; I_{Dq} = 860 mA (whole device); V_{GS} = 2.13 V.

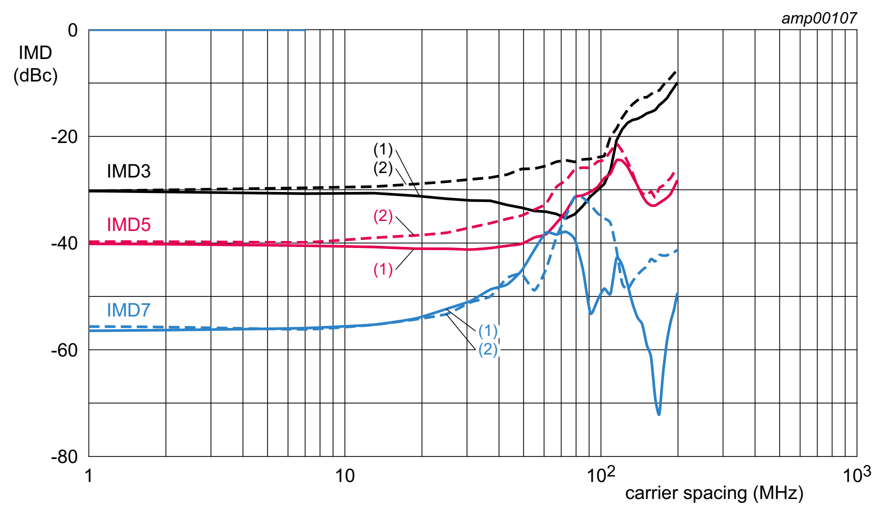
(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

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

7.5.4 2-Tone VBW



V_{DS} = 28 V; I_{Dq} = 860 mA (whole device); $V_{GS(amp)peak}$ = 2.13 V; f_c = 1842.5 MHz.

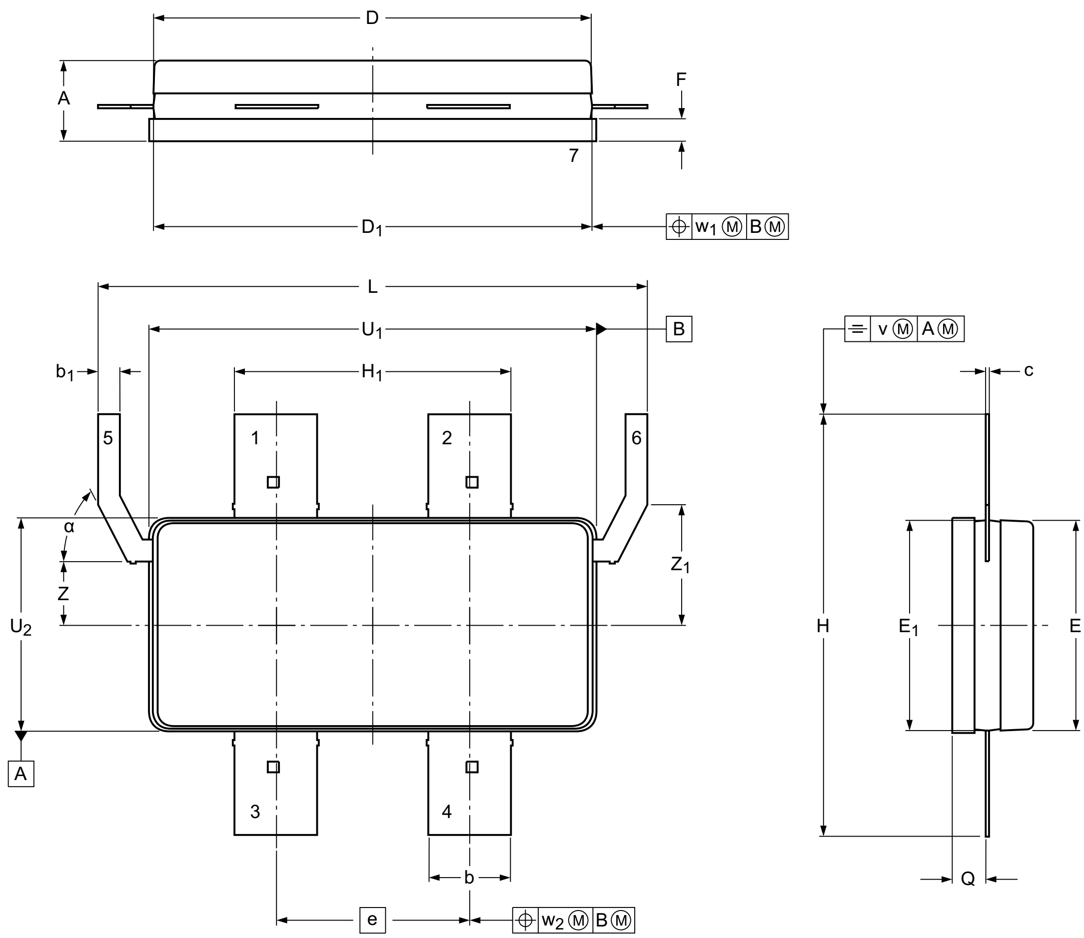
(1) IMD low

(2) IMD high

Fig 10. VBW capability in class-AB test circuit

8. Package outline

Air cavity plastic earless flanged package; 6 leads **SOT1275-1**



v	w1	w2
0.5	0.5	0.5

Dimensions (mm dimensions are derived from the original inch dimensions)

Unit		A	b	b_1	c	D	D_1	E	E_1	e	F	H	H_1	L	Q	U_1	U_2	Z	Z_1	α
mm	max	4.01	3.94	1.14	0.178	20.42	20.37	9.80	9.75		1.14	19.53	12.80	25.40	1.68	20.70	9.91	3.17	5.79	65°
	nom									8.89										
	min	3.40	3.68	0.89	0.127	20.12	20.17	9.50	9.55		0.94	19.33	12.60	25.20	1.45	20.50	9.70	2.67	5.29	61°

sot1275-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1275-1						~~14-01-13~~ 15-04-01

Fig 11. Package outline SOT1275-1

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
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
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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14. Contents

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