

BLF8G20LS-220

Power LDMOS transistor

Rev. 3 — 1 September 2015

AMPLEON

Product data sheet

1. Product profile

1.1 General description

220 W LDMOS power transistor 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 (MHz)	I_{DQ} (mA)	V_{DS} (V)	$P_{L(AV)}$ (W)	G_p (dB)	η_D (%)	ACPR (dBc)
2-carrier W-CDMA	1805 to 1880	1600	28	55	18.9	34	-31 [1]

[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

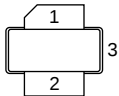
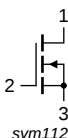
- Excellent ruggedness
- High efficiency
- Low R_{th} providing excellent thermal stability
- Designed for broadband operation
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for W-CDMA 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		
2	gate		
3	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF8G20LS-220	-	earless flanged ceramic package; 2 leads	SOT502B

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		-0.5	+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.

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}$; $P_L = 55\text{ W}$; $V_{DS} = 28\text{ V}$; $I_{Dq} = 1600\text{ mA}$	0.27	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	$V_{GS} = 0\text{ V}$; $I_D = 2.7\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 270\text{ mA}$	1.5	1.9	2.3	V
V_{GSq}	gate-source quiescent voltage	$V_{DS} = 28\text{ V}$; $I_D = 1.6\text{ A}$	1.7	2.1	2.5	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}$; $V_{DS} = 28\text{ V}$	-	-	4.2	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $V_{DS} = 10\text{ V}$	-	50.6	-	A
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}$; $V_{DS} = 0\text{ V}$	-	-	420	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}$; $I_D = 13.5\text{ A}$	-	19.6	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 9.45\text{ A}$	-	0.057	-	Ω

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 $V_{DS} = 28\text{ V}$; $I_{Dq} = 1600\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified; in a production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)} = 55\text{ W}$	17.8	18.9	-	dB
η_D	drain efficiency	$P_{L(AV)} = 55\text{ W}$	29	34	-	%
RL_{in}	input return loss	$P_{L(AV)} = 55\text{ W}$	-	-15.5	-7	dB
ACPR	adjacent channel power ratio	$P_{L(AV)} = 55\text{ W}$	-	-31	-26	dBc

7. Test information

7.1 Ruggedness in class-AB operation

The BLF8G20LS-220 is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 28\text{ V}$; $I_{Dq} = 1600\text{ mA}$; $P_L = 200\text{ W}$ (CW); $f = 1805\text{ MHz}$.

7.2 Impedance information

Table 8. Typical impedance

Measured load-pull data; $I_{Dq} = 1600\text{ mA}$; $V_{DS} = 28\text{ V}$.

f (MHz)	Z_S ^[1] (Ω)	Z_L ^[1] (Ω)
1805	1.38 – j3.45	0.90 – j2.50
1843	1.43 – j3.63	0.82 – j2.37
1880	1.38 – j3.56	0.90 – j2.60

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

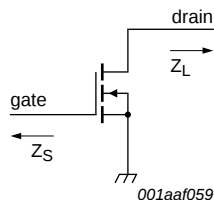


Fig 1. Definition of transistor impedance

7.3 Test circuit

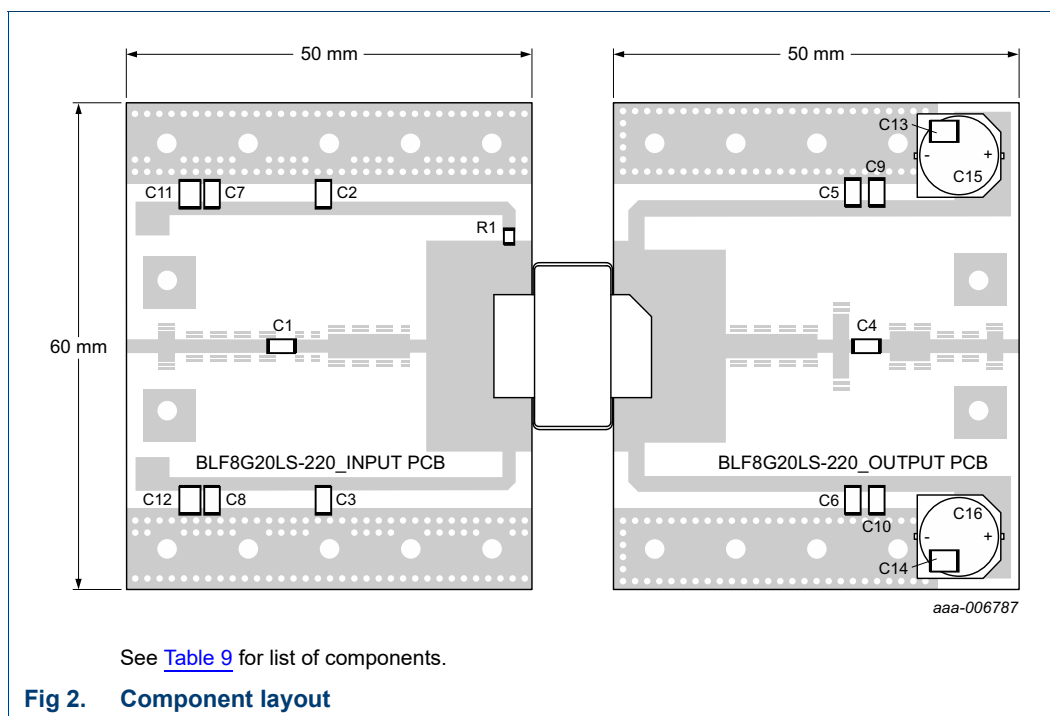


Fig 2. Component layout

Table 9. List of components

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

The used PCB material is Rogers RO4350B with a thickness of 0.76 mm.

Component	Description	Value	Remarks
C1, C2, C3, C4, C5, C6	multilayer ceramic chip capacitor	33 pF	[1] ATC100B
C7, C8, C9, C10	multilayer ceramic chip capacitor	1 μ F	[2] TDK
C11, C12, C13, C14	multilayer ceramic chip capacitor	10 μ F	[3] Murata
C15, C16	multilayer ceramic chip capacitor	470 μ F, 63 V	
R1	chip resistor	9.1 Ω	SMD 0805

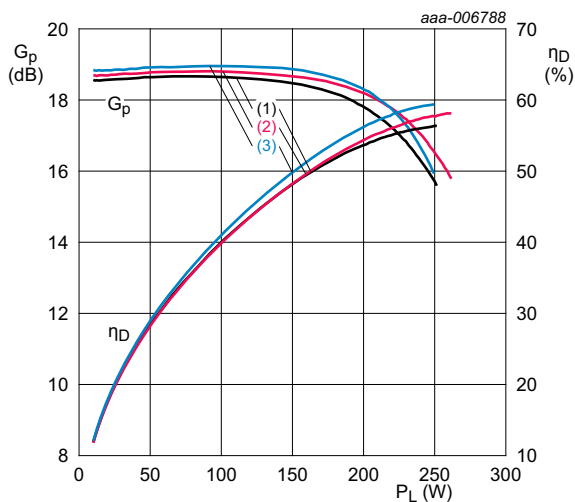
[1] American Technical Ceramics type 100B or capacitor of same quality.

[2] TDK or capacitor of same quality.

[3] Murata or capacitor of same quality.

7.4 Graphical data

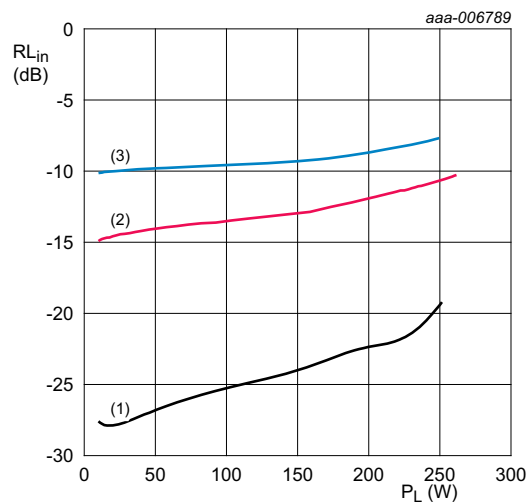
7.4.1 CW pulse



$V_{DS} = 28$ V; $I_{DQ} = 1600$ mA; $t_p = 100$ μ s; $\delta = 10$ %.

- (1) $f = 1805$ MHz
- (2) $f = 1843$ MHz
- (3) $f = 1880$ MHz

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

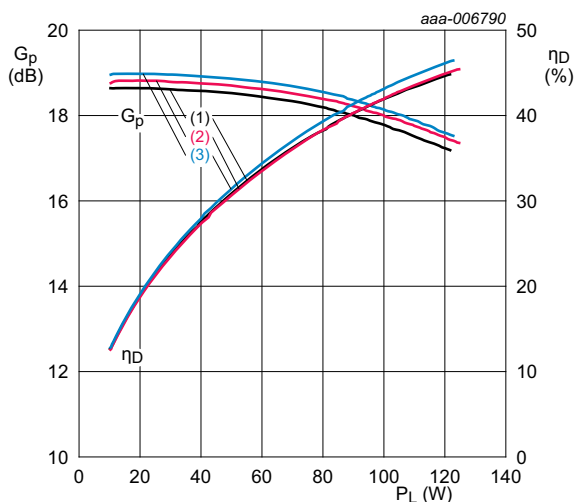


$V_{DS} = 28$ V; $I_{DQ} = 1600$ mA; $t_p = 100$ μ s; $\delta = 10$ %.

- (1) $f = 1805$ MHz
- (2) $f = 1843$ MHz
- (3) $f = 1880$ MHz

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

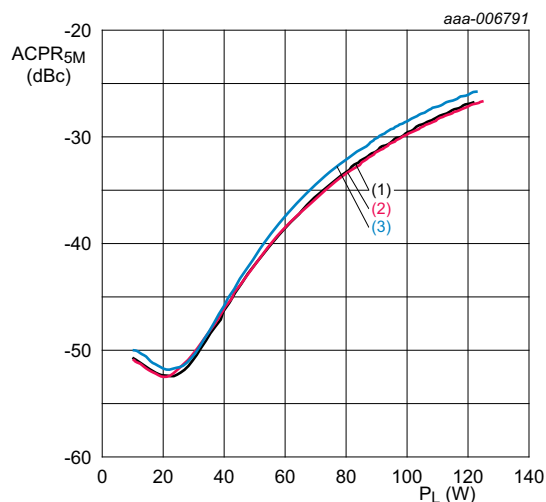
7.4.2 1-Carrier W-CDMA



$V_{DS} = 28 \text{ V}$; $I_{Dq} = 1600 \text{ mA}$.

- (1) $f = 1805 \text{ MHz}$
- (2) $f = 1843 \text{ MHz}$
- (3) $f = 1880 \text{ MHz}$

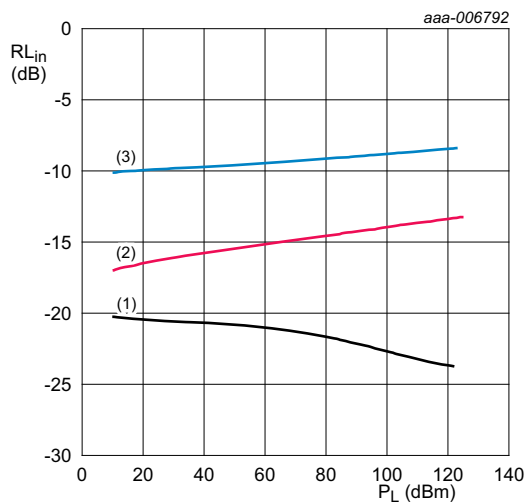
Fig 5. Power gain and drain efficiency as function of output power; typical values



$V_{DS} = 28 \text{ V}$; $I_{Dq} = 1600 \text{ mA}$.

- (1) $f = 1805 \text{ MHz}$
- (2) $f = 1843 \text{ MHz}$
- (3) $f = 1880 \text{ MHz}$

Fig 6. Adjacent channel power ratio (5 MHz) as a function of output power; typical values

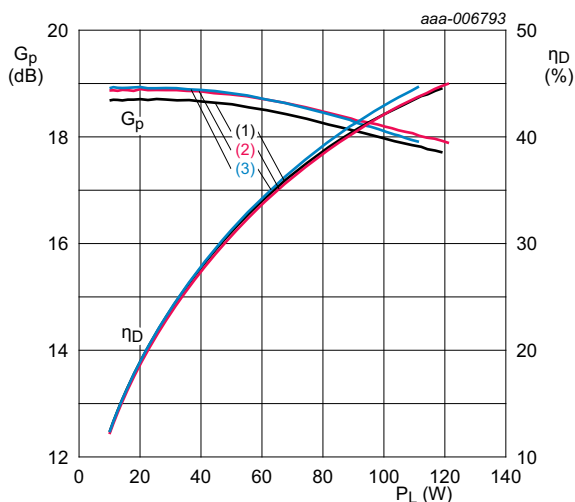


$V_{DS} = 28 \text{ V}$; $I_{Dq} = 1600 \text{ mA}$.

- (1) $f = 1805 \text{ MHz}$
- (2) $f = 1843 \text{ MHz}$
- (3) $f = 1880 \text{ MHz}$

Fig 7. Input return loss as a function of output power; typical values

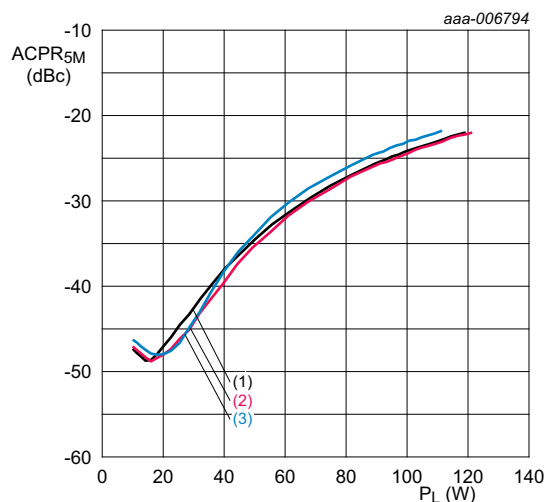
7.4.3 2-Carrier W-CDMA



$V_{DS} = 28 \text{ V}$; $I_{DQ} = 1600 \text{ mA}$; $f = 5 \text{ MHz}$; $\delta = 46 \%$.

- (1) $f = 1810 \text{ MHz}$
- (2) $f = 1843 \text{ MHz}$
- (3) $f = 1877.5 \text{ MHz}$

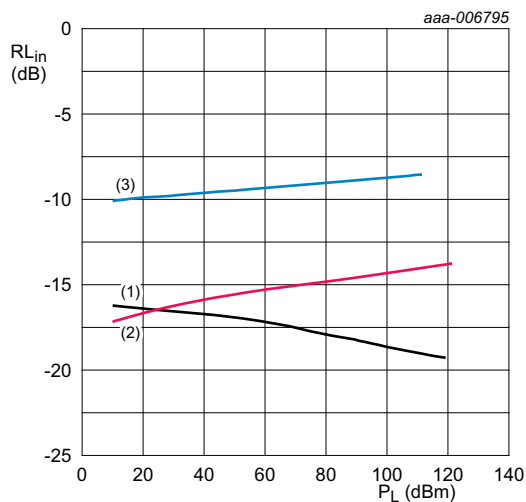
Fig 8. Power gain and drain efficiency as function of output power; typical values



$V_{DS} = 28 \text{ V}$; $I_{DQ} = 1600 \text{ mA}$; $f = 5 \text{ MHz}$; $\delta = 46 \%$.

- (1) $f = 1810 \text{ MHz}$
- (2) $f = 1843 \text{ MHz}$
- (3) $f = 1877.5 \text{ MHz}$

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



$V_{DS} = 28 \text{ V}$; $I_{DQ} = 1600 \text{ mA}$; $f = 5 \text{ MHz}$; $\delta = 46 \%$.

- (1) $f = 1810 \text{ MHz}$
- (2) $f = 1843 \text{ MHz}$
- (3) $f = 1877.5 \text{ MHz}$

Fig 10. Input return loss as a function of output power; typical values

8. Package outline

Earless flanged ceramic package; 2 leads

SOT502B

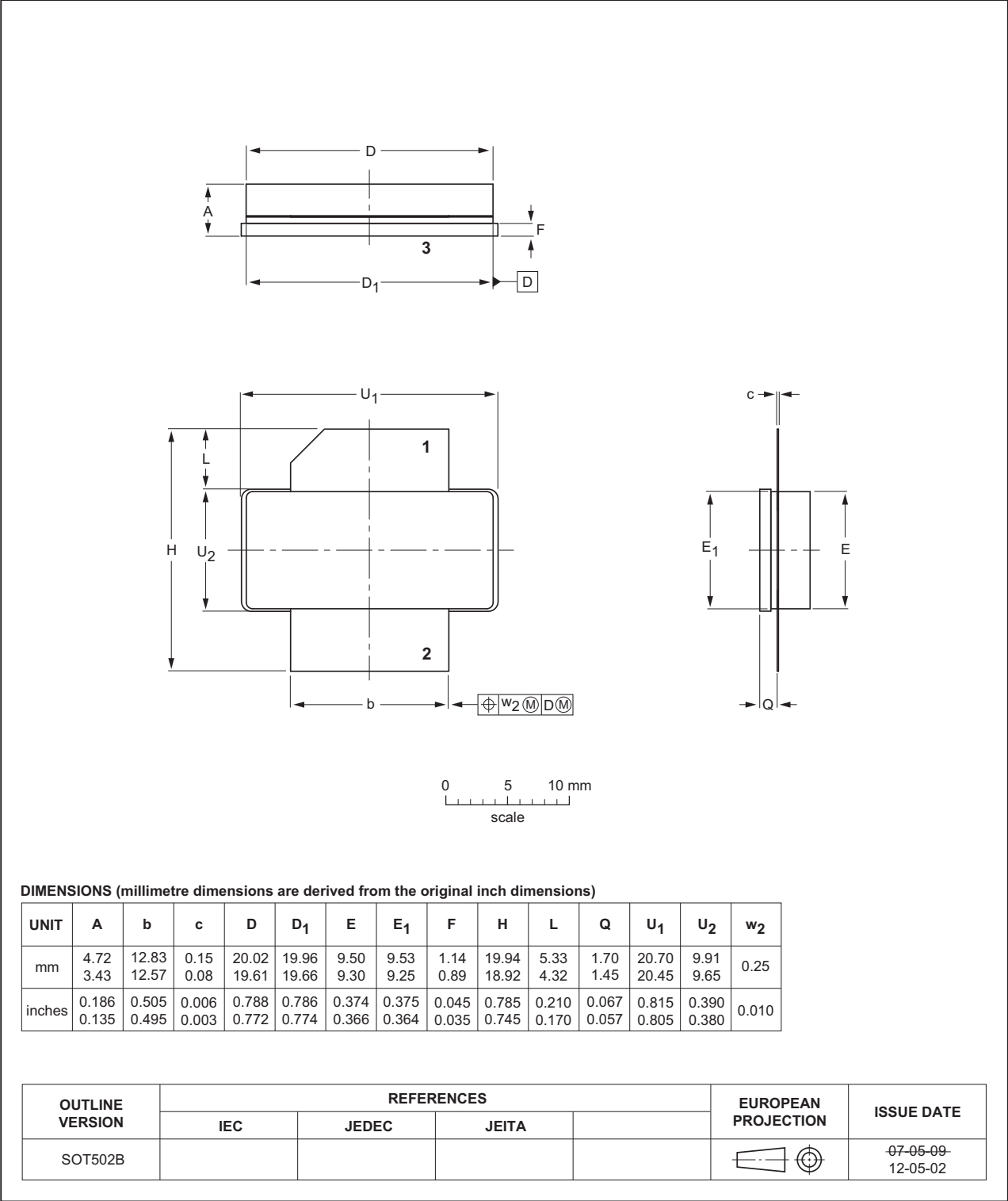


Fig 11. Package outline SOT502B

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
PAR	Peak-to-Average Ratio
SMD	Surface Mounted Device
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
BLF8G20LS-220#3	20150901	Product data sheet		BLF8G20LS-220 v.2
Modifications:	- The format of this document has been redesigned to comply with the new identity guidelines of Ampleon. - Legal texts have been adapted to the new company name where appropriate.			
BLF8G20LS-220 v.2	20130530	Product data sheet	-	BLF8G20LS-220 v.1
BLF8G20LS-220 v.1	20130307	Objective 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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