BLF9G20LS-160V

Power LDMOS transistor

Rev. 2 — 21 May 2015 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 °C in a common source class-AB production test circuit.

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

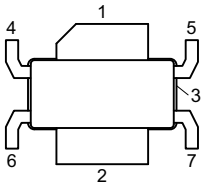
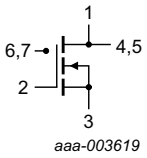
- Excellent ruggedness
- High efficiency
- Low thermal resistance providing excellent thermal stability
- Excellent broadband performance
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- Internally matched 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		
2	gate		
3	source [1]		
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	[1]	-	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 °C; P_L = 36 W; V_{DS} = 28 V; I_{Dq} = 800 mA	0.17	K/W

6. Characteristics

Table 6. DC characteristics

T_j = 25 °C, unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.5 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 154 mA	1.55	2.3	3.05	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 923 mA	1.4	2.2	3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	3.6	µA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	25	33	41.8	A
I_{GSS}	gate leakage current	V_{GS} = 9 V; V_{DS} = 0 V	-	-	360	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 154 mA	-	1.32	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 5.4 A	-	0.098	-	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 MHz; f_2 = 1812.5 MHz; f_3 = 1872.5 MHz; f_4 = 1877.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 800 mA; T_{case} = 25 °C; unless otherwise specified; in a production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 35.5 W	18.8	19.8	-	dB
η_D	drain efficiency	$P_{L(AV)}$ = 35.5 W	28.5	33.5	-	%
RL_{in}	input return loss	$P_{L(AV)}$ = 35.5 W	-	–8	–4	dB
ACPR	adjacent channel power ratio	$P_{L(AV)}$ = 35.5 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 V; I_{Dq} = 800 mA; P_L = 140 W (CW); f = 1805 MHz.

7.2 Impedance information

Table 8. Typical impedance

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

f	Z_S [1]	Z_L [1]
(MHz)	(Ω)	(Ω)
Maximum power load		
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 mA; V_{DS} = 28 V.

f	Z_S [1]	Z_L [1]
(MHz)	**(Ω)**	**(Ω)**
Maximum drain efficiency load		
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.

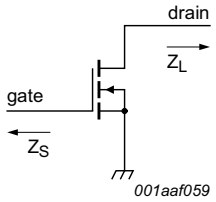
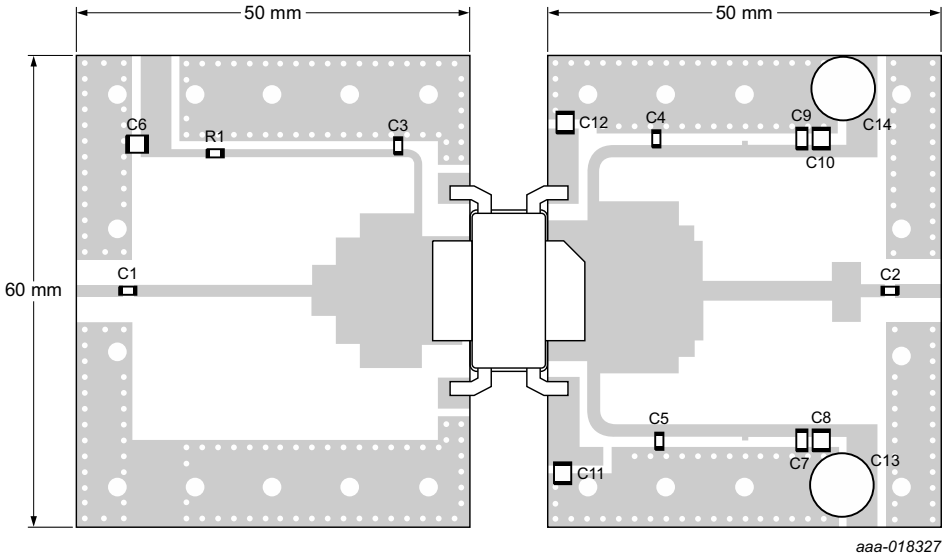


Fig 1. Definition of transistor impedance

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

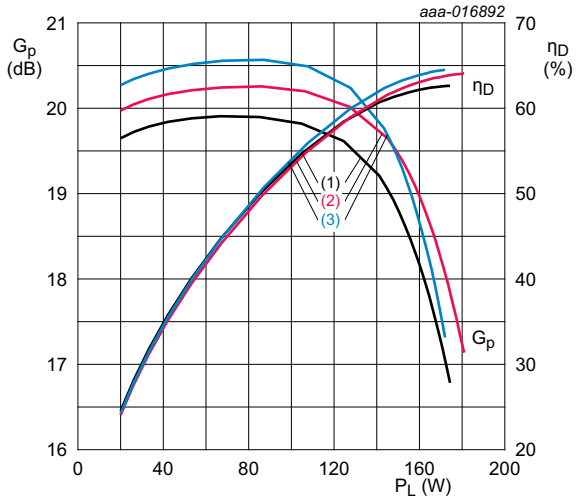
Table 9. List of components

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 μF	ATC 600F
C6, C8, C10, C11, C12	multilayer ceramic chip capacitor	10 μF, 50 V	Murata
C7, C9	multilayer ceramic chip capacitor	0.1 μF, 50 V	Murata
C13, C14	electrolytic capacitor	2200 μF, 63 V	
R1	SMD resistor	9.1 Ω, 12 W	SMD 0805

7.4 Graphical data

7.4.1 CW



V_{DS} = 28 V; I_{Dq} = 800 mA.

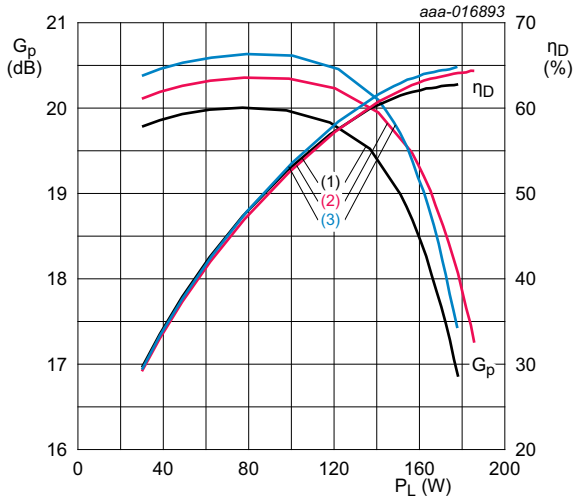
(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

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

7.4.2 Pulsed CW



V_{DS} = 28 V; I_{Dq} = 800 mA; t_p = 100 μs; δ = 10 %.

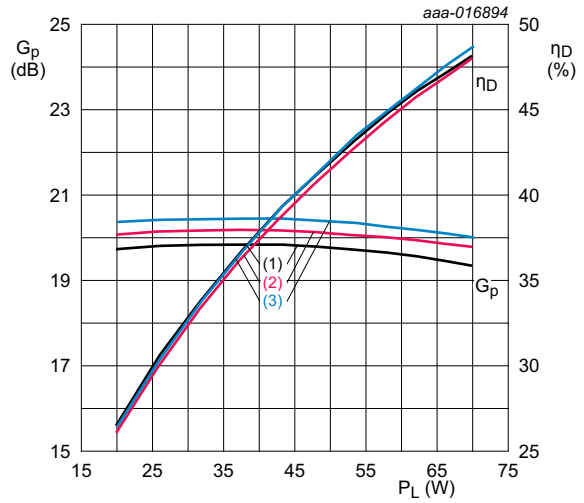
(1) f = 1805 MHz

(2) f = 1842.5 MHz

(3) f = 1880 MHz

Fig 4. Power gain and drain efficiency as function of output power; typical values

7.4.3 1-Carrier W-CDMA



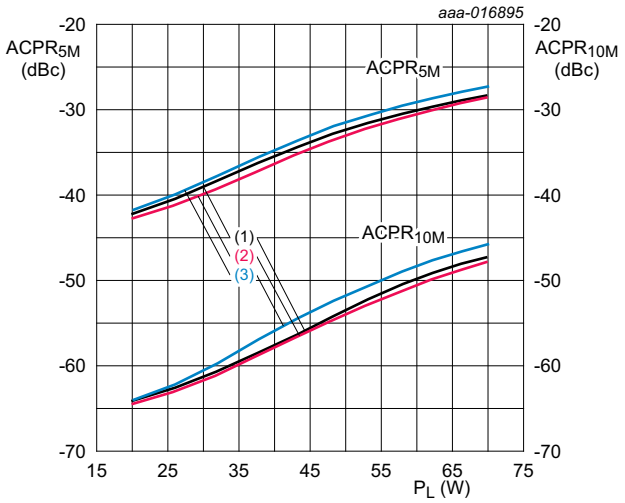
V_{DS} = 28 V; I_{Dq} = 800 mA.

(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} = 800 mA.

(1) f = 1805 MHz

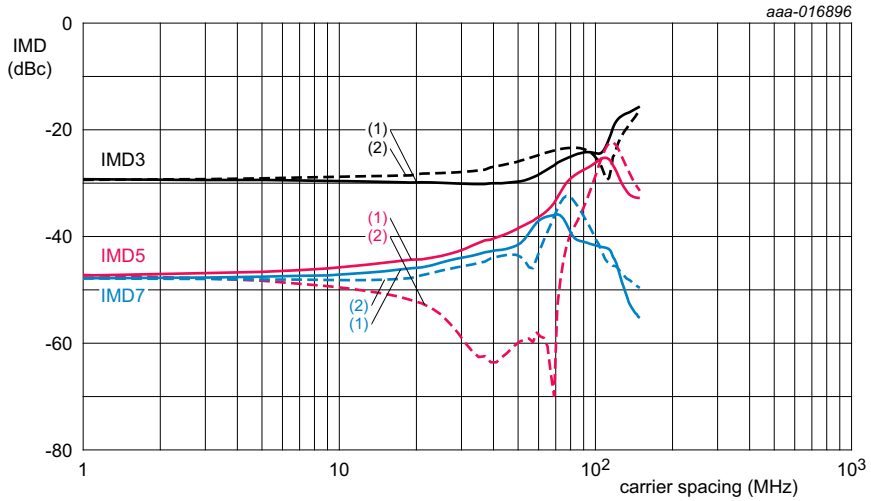
(2) f = 1842.5 MHz

(3) f = 1880 MHz

Fig 6. Adjacent channel power ratio (5 MHz) and adjacent channel power ratio (10 MHz) as function of output power; typical values

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 V and I_{Dq} = 800 mA.



V_{DS} = 28 V; I_{Dq} = 800 mA; f_c = 1840 MHz.

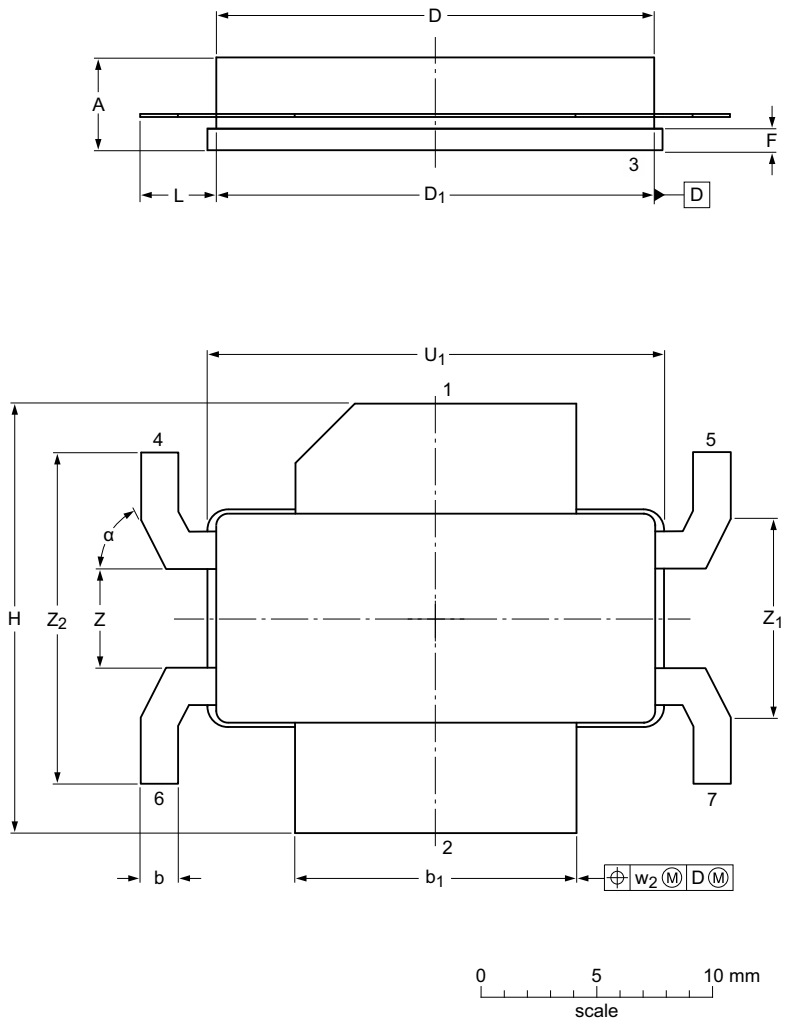
(1) IMD low

(2) IMD high

Fig 7. VBW capacity in class-AB test circuit

8. Package outline

Earless flanged LDMOST ceramic package; 6 leads **SOT1120B**



Dimensions

Unit[1]		A	b	b_1	c	D	D_1	E	E_1	F	H	L	Q[2]	U_1	U_2	w_2	y	Z	Z_1	Z_2	α
mm	max	4.75	1.83	12.83	0.18	20.02	19.96	9.53	9.53	1.14	19.94	3.56	1.70	20.70	9.91		0.10	4.60	9.53	15.52	64°
	nom															0.51					
	min	3.45	1.57	12.57	0.10	19.61	19.66	9.27	9.25	0.89	18.92	3.30	1.45	20.45	9.65			4.32	8.71	14.50	60°
inches	max	0.187	0.072	0.505	0.007	0.788	0.786	0.375	0.375	0.045	0.785	0.140	0.067	0.815	0.39		0.004	0.181	0.375	0.611	64°
	nom															0.02					
	min	0.136	0.062	0.495	0.004	0.772	0.774	0.365	0.364	0.035	0.745	0.130	0.057	0.805	0.38			0.170	0.343	0.571	60°

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

sot1120b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1120B						~~12-06-14~~ 13-10-21

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 v.2	20150521	Product data sheet	-	BLF9G20LS-160V v.1
Modifications	• Table 1 on page 1: table updated • Section 1.2 on page 1: text of the fourth bullet updated • Table 4 on page 2: table updated • Table 5 on page 2: table updated • Table 6 on page 3: table updated • Table 7 on page 3: table updated • Section 7 on page 3: section added			
BLF9G20LS-160V v.1	20141218	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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14. Contents

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