BLF6G20-230PRN; BLF6G20S-230PRN

Power LDMOS transistor

Rev. 3 — 12 July 2013 Product data sheet

1. Product profile

1.1 General description

230 W LDMOS power transistor for base station applications at frequencies from 1800 MHz to 2000 MHz.

Table 1. Typical performance

RF performance at T_{case} = 25 °C in a common source class-AB production test circuit.

Mode of operation	f	V_{DS}	$P_{L(AV)}$	G_p	η_D	ACPR
	(MHz)	(V)	(W)	(dB)	(%)	(dBc)
2-carrier W-CDMA	1805 to 1880	28	65	17.5	32	−31[1]

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 7.5 dB at 0.01 % probability on CCDF per carrier; carrier spacing 5 MHz.

CAUTION

This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features and benefits

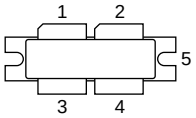
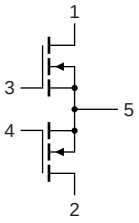
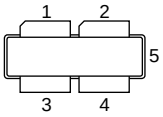
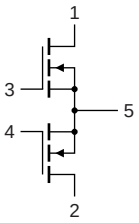
- Typical 2-carrier W-CDMA performance at frequencies of 1805 MHz and 1880 MHz, a supply voltage of 28 V and an I_{Dq} of 2000 mA:
  - Average output power = 65 W
  - Power gain = 17.5 dB
  - Efficiency = 32 %
  - ACPR = −32 dBc
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- Internally matched for ease of use
- 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
BLF6G20-230PRN (SOT539A)			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source [1]		
BLF6G20S-230PRN (SOT539B)			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source [1]		

[1] Connected to flange

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF6G20-230PRN	-	flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads	SOT539A
BLF6G20S-230PRN	-	earless flanged balanced LDMOST ceramic package; 4 leads	SOT539B

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_{case}	case temperature		-	150	°C
T_j	junction temperature		-	225	°C

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j\text{-}case)}$	thermal resistance from junction to case	T_{case} = 80 °C; $P_{L(AV)}$ = 65 W	0.38	K/W

6. Characteristics

Table 6. 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 = 1.8 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 180 mA	1.4	1.9	2.4	V
I_{DSS}	drain leakage current	V_{GS} = 0 V				
		V_{DS} = 28 V	-	-	3	μA
		V_{DS} = 60 V	-	-	5	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	-	30	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	300	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 9 A	-	12	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 6.3 A	-	0.1	0.165	Ω

7. Application information

Table 7. Application information

Mode of operation: 2-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1 to 64 PDPCH; f_1 = 1802.5 MHz; f_2 = 1807.5 MHz; f_3 = 1872.5 MHz; f_4 = 1877.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 2000 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 65 W	16.3	17.5	18.7	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 65 W	-	–11	–6.5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 65 W	29	32	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)}$ = 65 W	-	–31	–27	dBc

Table 8. Application information

Mode of operation: 1-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1 to 64 PDPCH; f_1 = 1872.5 MHz; f_2 = 1877.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 2000 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

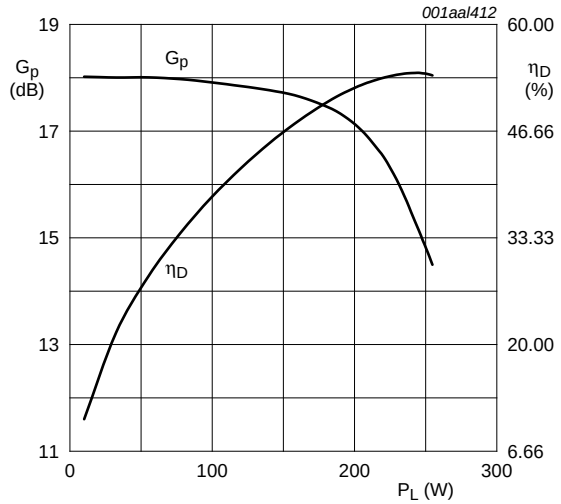
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
PAR_O	output peak-to-average ratio	$P_{L(AV)}$ = 125 W; at 0.01 % probability on CCDF	3.5	4.2	-	dB

7.1 Ruggedness in class-AB operation

The BLF6G20-230PRN and BLF6G20S-230PRN are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 28 V; I_{Dq} = 2000 mA; P_L = 230 W (CW); f = 1805 MHz.

7.2 Graphs

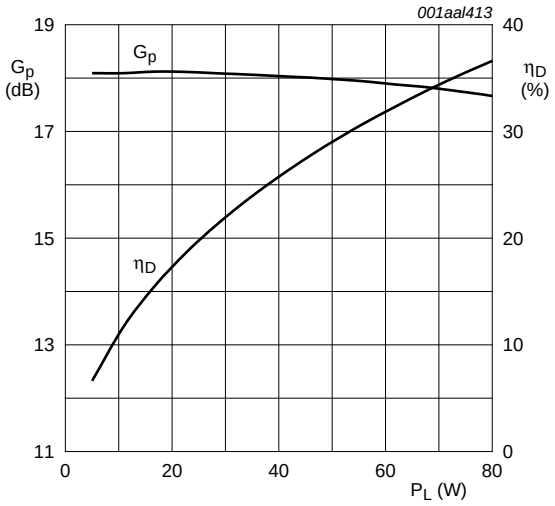
7.2.1 One tone CW



V_{DS} = 28 V; I_{Dq} = 2000 mA.

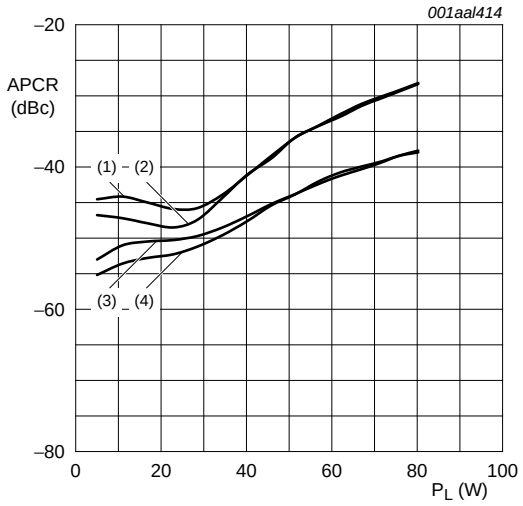
Fig 1. One-tone CW power gain and drain efficiency as functions of load power; typical values

7.2.2 2-carrier W-CDMA



V_{DS} = 28 V; I_{Dq} = 2000 mA.

Fig 2. 2-carrier W-CDMA power gain and drain efficiency as functions of load power; typical values



V_{DS} = 28 V; I_{Dq} = 2000 mA.

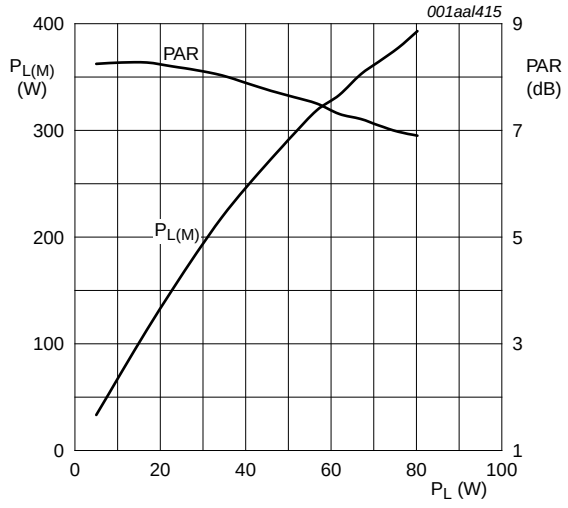
(1) f = 5 MHz low

(2) f = 5 MHz high

(3) f = 10 MHz low

(4) f = 10 MHz high

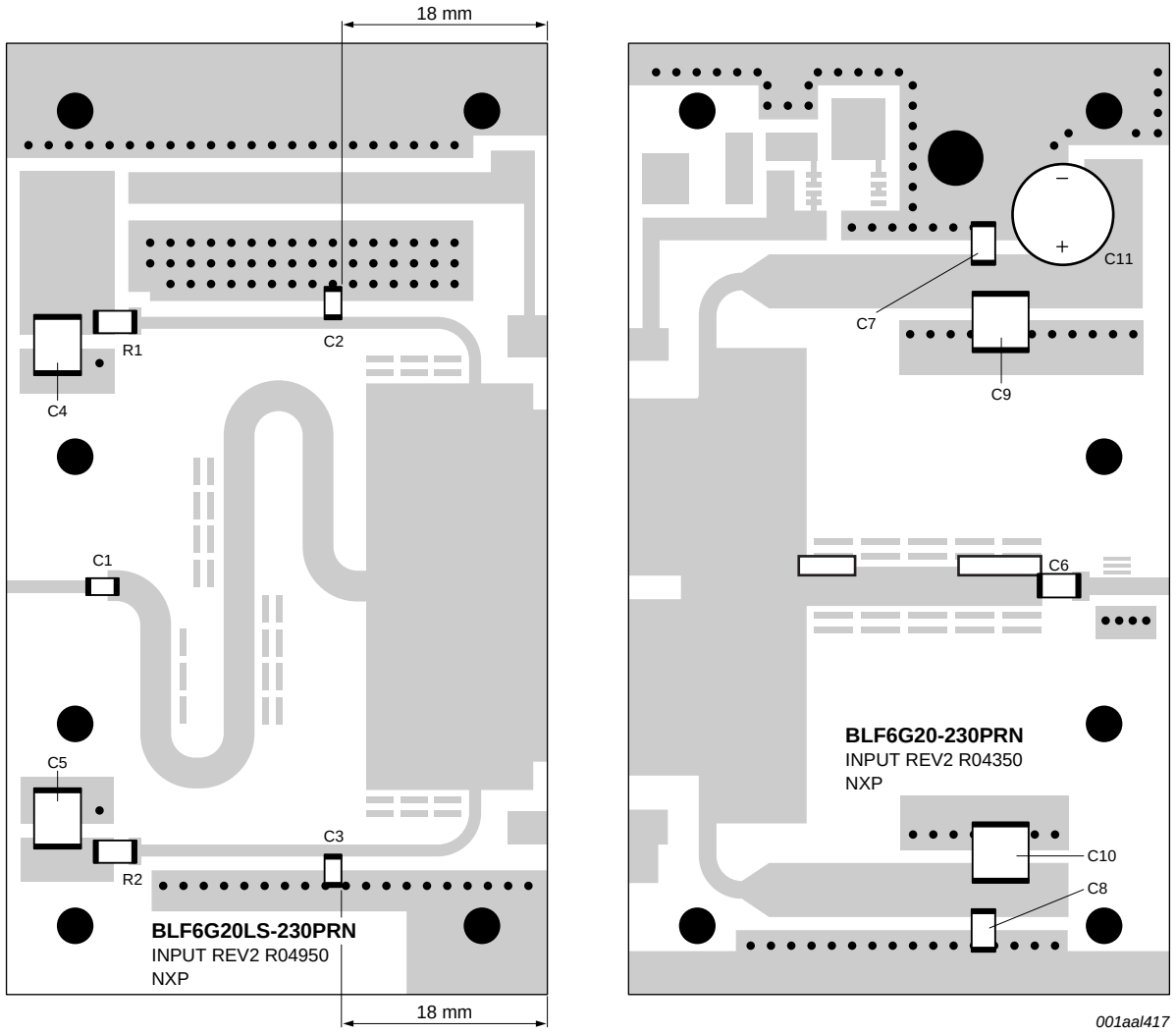
Fig 3. 2-carrier W-CDMA adjacent channel power ratio as function of load power; typical values



V_{DS} = 28 V; I_{Dq} = 2000 mA.

Fig 4. 2-carrier W-CDMA peak output power and output peak-to-average ratio as function of load power; typical values

8. Test information



See Table 9 for list of components. The drawing is not to scale.

Fig 5. Component layout

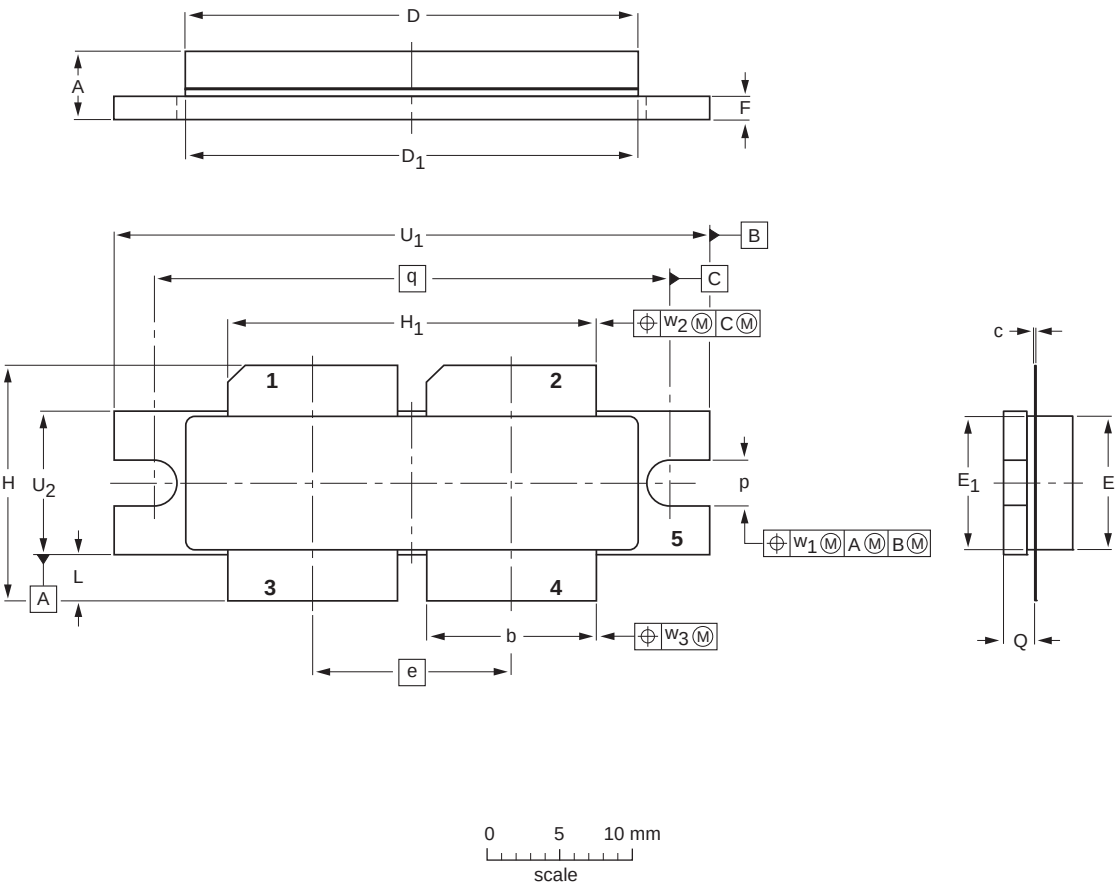
Table 9. List of components

See Figure 5 for component layout.

Component	Description	Value	Remarks
C1, C2, C3	multilayer ceramic chip capacitor	24 pF	ATC100A
C4, C5	multilayer ceramic chip capacitor	4.7 μF	TDK
C6	multilayer ceramic chip capacitor	33 pF	ATC8008
C7, C8	multilayer ceramic chip capacitor	12 pF	ATC100B
C9, C10	multilayer ceramic chip capacitor	10 μF	TDK
C11	electrolytic capacitor	220 μF/63 V	
R1, R2	SMD resistor	10 Ω	Philips 1206

9. Package outline

Flanged balanced ceramic package; 2 mounting holes; 4 leads **SOT539A**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

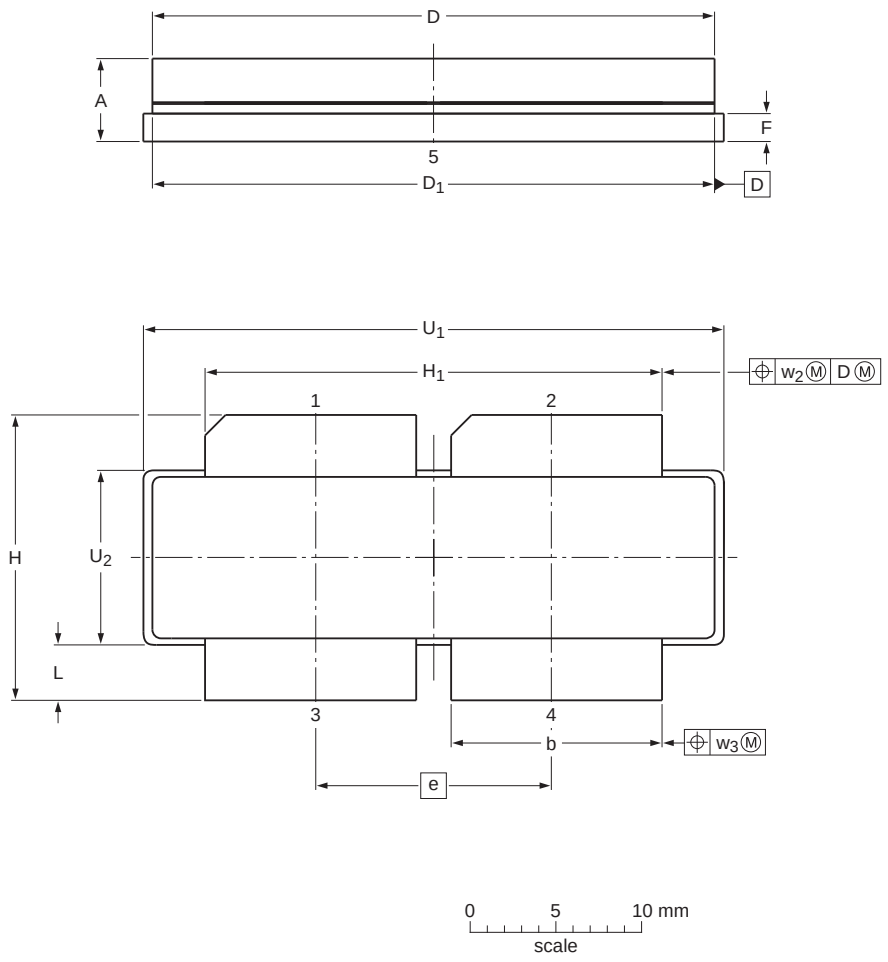
UNIT	A	b	c	D	D_1	e	E	E_1	F	H	H_1	L	p	Q	q	U_1	U_2	w_1	w_2	w_3
mm	4.7 4.2	11.81 11.56	0.18 0.10	31.55 30.94	31.52 30.96	13.72	9.50 9.30	9.53 9.27	1.75 1.50	17.12 16.10	25.53 25.27	3.48 2.97	3.30 3.05	2.26 2.01	35.56	41.28 41.02	10.29 10.03	0.25	0.51	0.25
inches	0.185 0.165	0.465 0.455	0.007 0.004	1.242 1.218	1.241 1.219	0.540	0.374 0.366	0.375 0.365	0.069 0.059	0.674 0.634	1.005 0.995	0.137 0.117	0.130 0.120	0.089 0.079	1.400	1.625 1.615	0.405 0.395	0.010	0.020	0.010

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. recommended screw pitch dimension of 1.52 inch (38.6 mm) based on M3 screw.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT539A						~~10-02-02~~ 12-05-02

Fig 6. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads **SOT539B**



Dimensions

Unit[1]		A	b	c	D	D_1	E	E_1	e	F	H	H_1	L	Q	U_1	U_2	w_2	w_3
mm	max	4.7	11.81	0.18	31.55	31.52	9.5	9.53		1.75	17.12	25.53	3.48	2.26	32.39	10.29		
	nom								13.72								0.25	0.25
	min	4.2	11.56	0.10	30.94	30.96	9.3	9.27		1.50	16.10	25.27	2.97	2.01	32.13	10.03		
inches	max	0.185	0.465	0.007	1.242	1.241	0.374	0.375		0.069	0.674	1.005	0.137	0.089	1.275	0.405		
	nom								0.54								0.01	0.01
	min	0.165	0.455	0.004	1.218	1.219	0.366	0.365		0.059	0.634	0.995	0.117	0.079	1.265	0.395		

Note
1. millimeter dimensions are derived from the original inch dimensions.

sot539b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT539B						~~12-05-02~~ 13-05-24

Fig 7. Package outline SOT539B

10. Abbreviations

Table 10. Abbreviations

Acronym	Description
3GPP	Third Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
DPCH	Dedicated Physical CHannel
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
PAR	Peak-to-Average power Ratio
PDPCH	transmission Power of the Dedicated Physical CHannel
RF	Radio Frequency
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G20-230PRN_20S-230PRN V.3	20130712	Product data sheet	-	BLF6G20-230PRN_20S-230PRN V.2
Modifications:	• The package outline Figure 7 is updated. • Translation disclaimer added to the legal text.			
BLF6G20-230PRN_20S-230PRN V.2	20100209	Product data sheet	-	BLF6G20-230PRN_1
Modifications	• Data sheet status changed to productive data sheet. • Data sheet expanded to include the BLF6G20S-230PRN transistor. • Section 12 “Legal information” export control disclaimer added.			
BLF6G20-230PRN_1	20081202	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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