BLF6G20-75

Power LDMOS transistor

Rev. 01 — 6 March 2008 Preliminary data sheet

1. Product profile

1.1 General description

75 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 (MHz)	V_{DS} (V)	$P_{L(AV)}$ (W)	G_p (dB)	η_D (%)	$ACPR_{400k}$ (dBc)	$ACPR_{600k}$ (dBc)	EVM_{rms} (%)
CW	1930 to 1990	28	63	19	52	-	-	-
GSM EDGE	1930 to 1990	28	29.5	19	37.5	–61.5	–73	1.7

CAUTION

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

1.2 Features

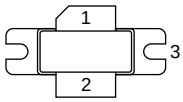
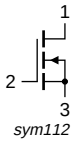
- Typical GSM EDGE performance at frequencies of 1930 MHz and 1990 MHz, a supply voltage of 28 V and an I_{Dq} of 550 mA:
  - Average output power = 29.5 W
  - Gain = 19 dB
  - Efficiency = 37.5 %
  - $ACPR_{400k}$ = –61.5 dBc
  - $ACPR_{600k}$ = –73 dBc
  - EVM_{rms} = 1.7 %
- Easy power control
- Integrated 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 GSM, GSM EDGE, W-CDMA and 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	Symbol
1	drain		
2	gate		
3	source [1]		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF6G20-75	-	flanged LDMOST ceramic package; 2 mounting holes; 2 leads	SOT502A

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
I_D	drain current		-	18	A
T_{stg}	storage temperature		–65	+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 = 29.5 W (CW)	0.9	K/W

6. Characteristics

Table 6. 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 = 0.5 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 100 mA	1.4	2	2.4	V
V_{GSq}	gate-source quiescent voltage	V_{DS} = 28 V; I_D = 600 mA	1.6	2.1	2.6	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	3	µA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	14.9	18.5	-	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 = 5 A	-	7	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 3.5 A	-	0.15	0.235	Ω
C_{rs}	feedback capacitance	V_{GS} = 0 V; V_{DS} = 28 V; f = 1 MHz	-	1.6	-	pF

7. Application information

Table 7. Application information

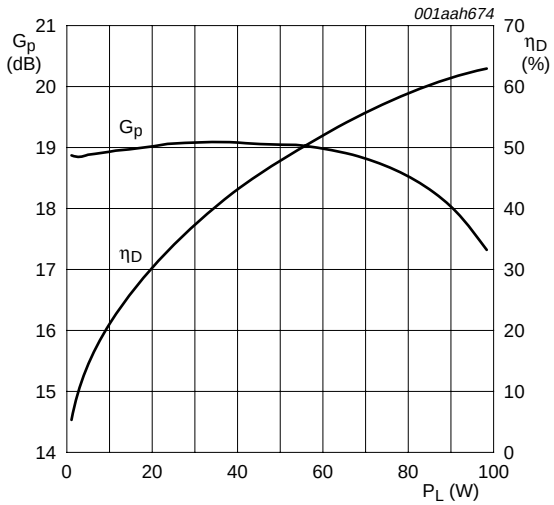
Mode of operation: GSM EDGE; f = 1930 MHz and 1990 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 550 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	29.5	-	W
G_p	power gain	$P_{L(AV)}$ = 29.5 W	17.5	19	-	dB
IRL	input return loss	$P_{L(AV)}$ = 29.5 W	-	–10	–6.5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 29.5 W	34.5	37.5	-	%
$ACPR_{400k}$	adjacent channel power ratio (400 kHz)	$P_{L(AV)}$ = 29.5 W	-	–61.5	–59.5	dBc
$ACPR_{600k}$	adjacent channel power ratio (600 kHz)	$P_{L(AV)}$ = 29.5 W	-	–73	–69.5	dBc
EVM_{rms}	RMS EDGE signal distortion error	$P_{L(AV)}$ = 29.5 W	-	1.7	2.7	%
EVM_M	peak EDGE signal distortion error	$P_{L(AV)}$ = 29.5 W	-	4.8	9	%

7.1 Ruggedness in class-AB operation

The BLF6G20-75 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} = 550 mA; P_L = 75 W (CW); f = 1990 MHz.

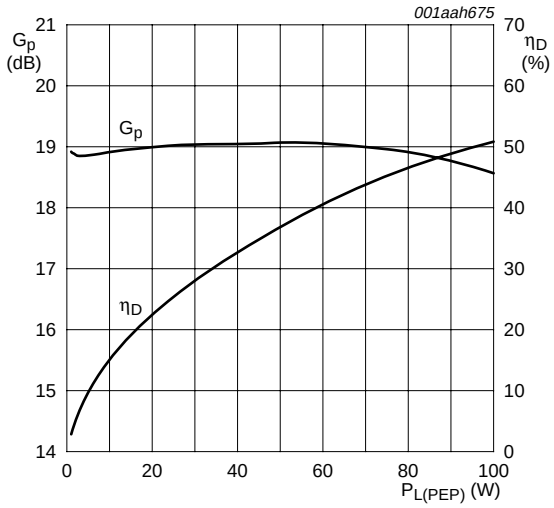
7.2 One-tone CW



V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz.

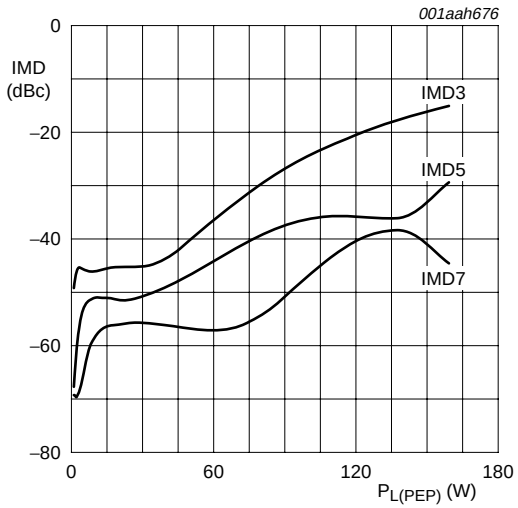
Fig 1. One-tone CW power gain and drain efficiency as functions of load power; typical values

7.3 Two-tone CW



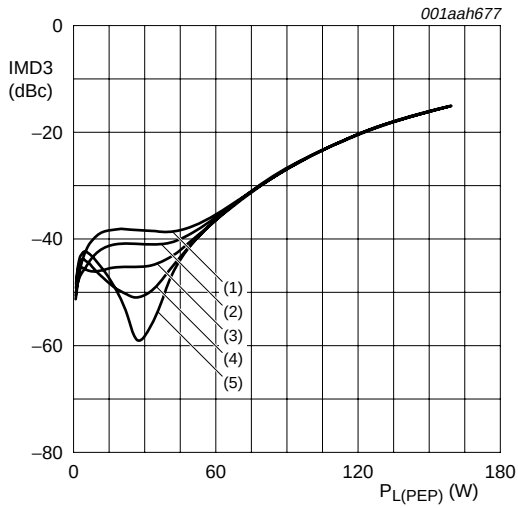
V_{DS} = 28 V; I_{Dq} = 550 mA; f_1 = 1989.95 MHz; f_2 = 1990.05 MHz.

Fig 2. Two-tone CW power gain and drain efficiency as functions of peak envelope load power; typical values



V_{DS} = 28 V; I_{Dq} = 550 mA; f_1 = 1989.95 MHz; f_2 = 1900.05 MHz.

Fig 3. Two-tone CW intermodulation distortion as function of peak envelope load power; typical values

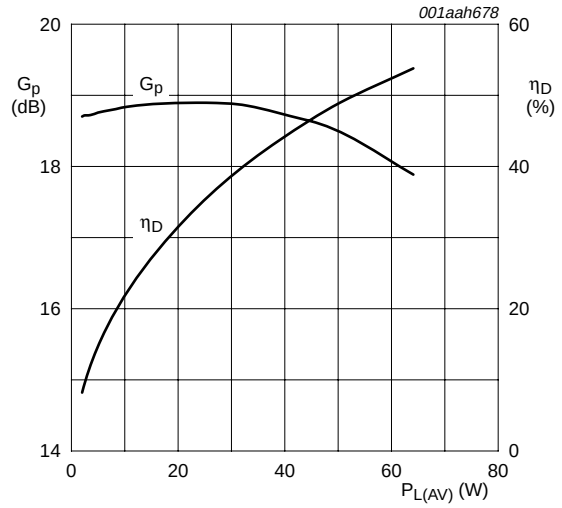


V_{DS} = 28 V; f_1 = 1989.95 MHz; f_2 = 1900.05 MHz.

(1) 450 MHz
(2) 500 MHz
(3) 550 MHz
(4) 600 MHz
(5) 650 MHz

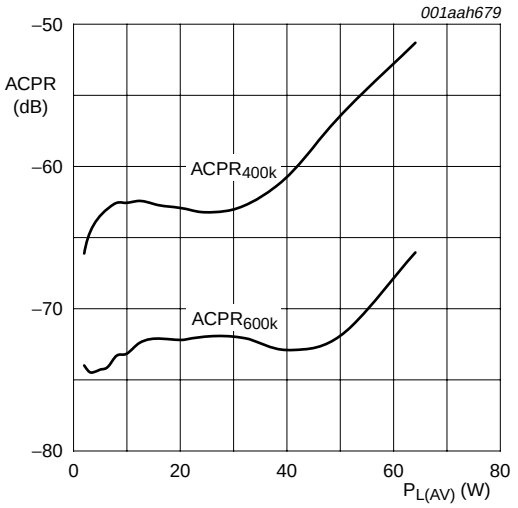
Fig 4. Third order intermodulation distortion as a function of peak envelope load power; typical values

7.4 GSM-EDGE



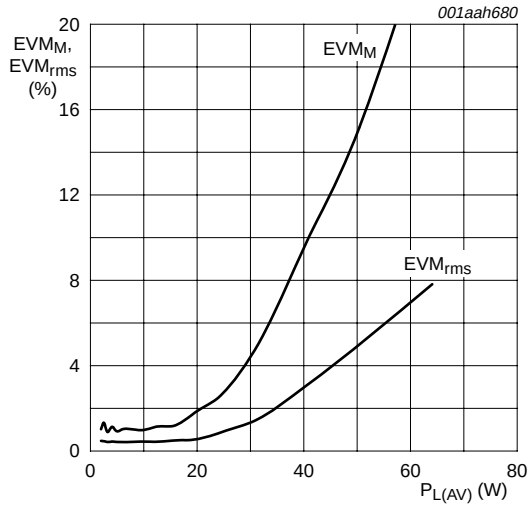
V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz; T_{case} = 25 °C.

Fig 5. GSM-EDGE power gain and drain efficiency as functions of average load power; typical values



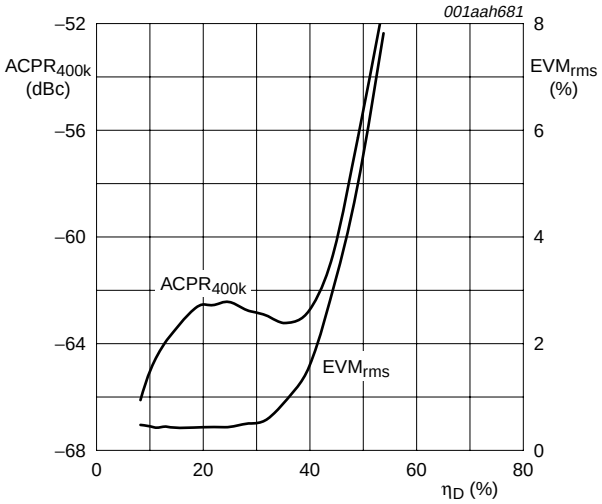
V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz; T_{case} = 25 °C.

Fig 6. GSM-EDGE ACPR at 400 kHz and at 600 kHz as functions of average load power; typical values



V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz; T_{case} = 25 °C.

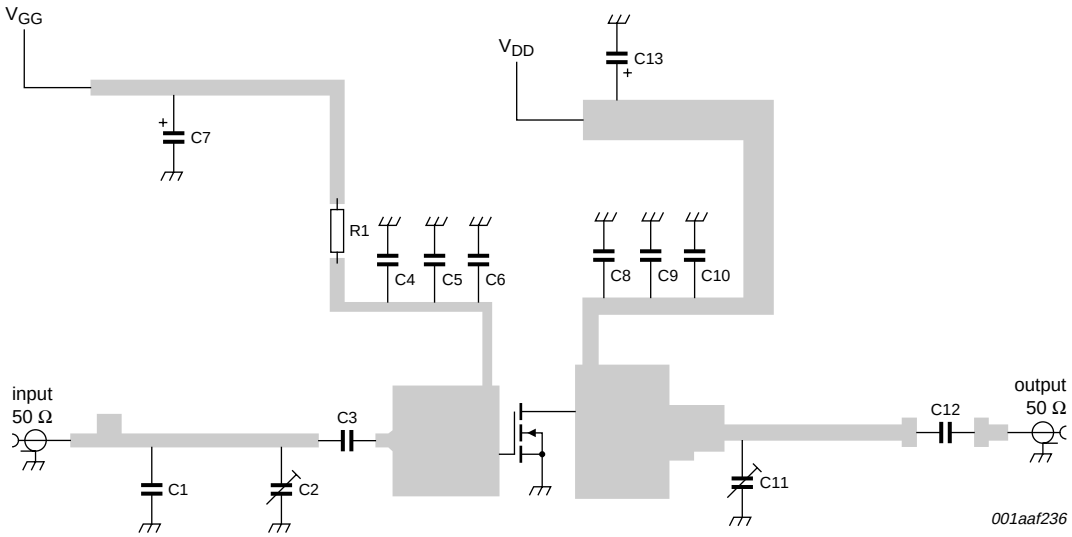
Fig 7. GSM EDGE RMS EVM and peak EVM as functions of average load power; typical values



V_{DS} = 28 V; I_{Dq} = 550 mA; f = 1990 MHz; T_{case} = 25 °C.

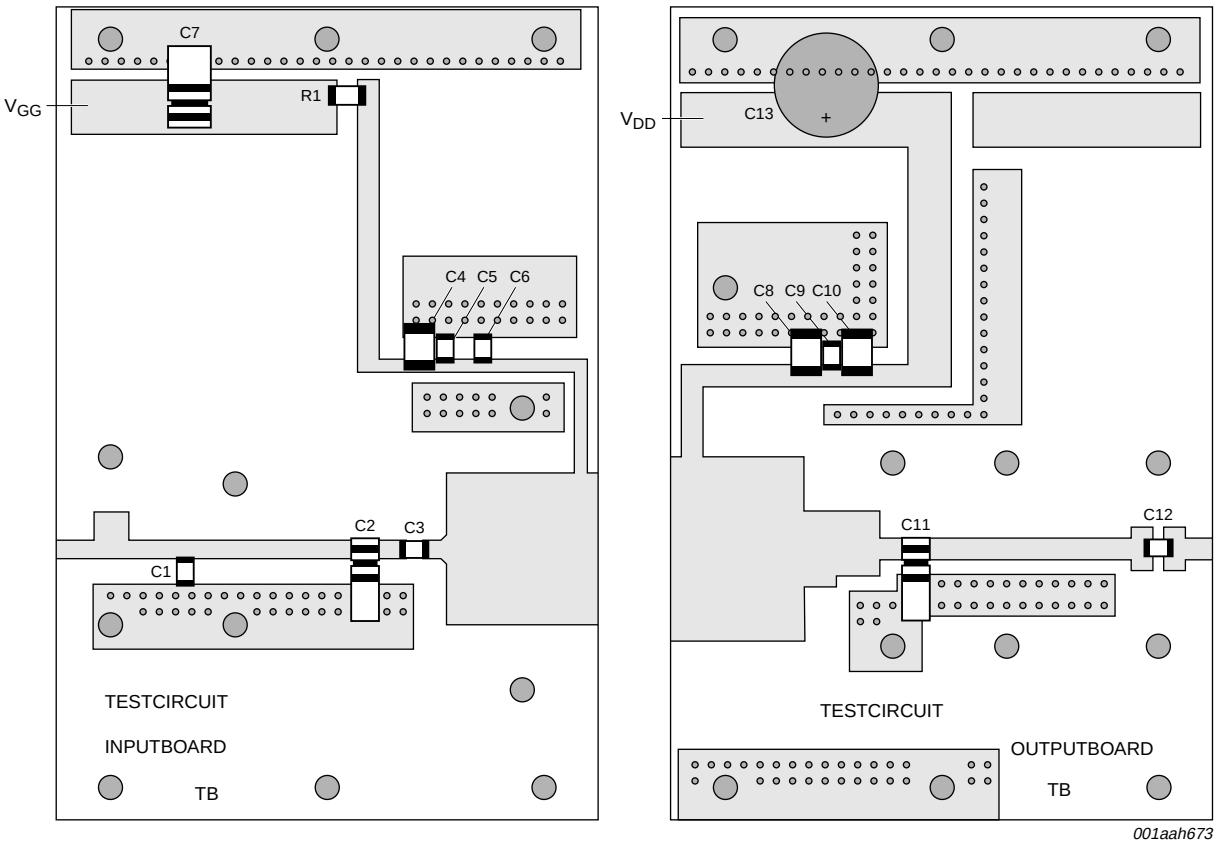
Fig 8. GSM EDGE ACPR at 400 kHz and RMS EVM as functions of drain efficiency; typical values

8. Test information



See Table 8 for list of components.

Fig 9. Test circuit for operation at 1990 MHz



The striplines are on a double copper-clad Taconic RF35 Printed-Circuit Board (PCB) with ε_r = 3.5 and thickness = 0.76 mm.

See Table 8 for list of components.

Fig 10. Component layout for 1990 MHz test circuit

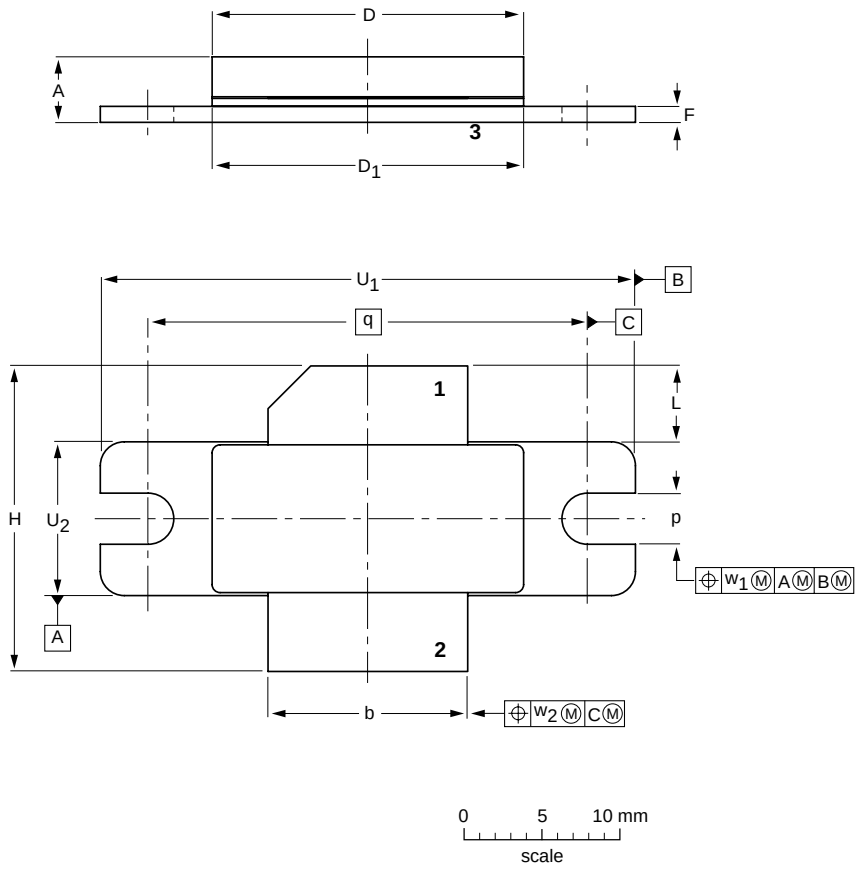
Table 8. List of components (see Figure 9 and Figure 10)

Component	Description	Value		Remarks
C1	multilayer ceramic chip capacitor	1 pF	[1]	
C2, C11	gigahertz trimmer	0.6 pF to 4.5 pF		Temex AT SM270 or equivalent
C3, C6, C9	multilayer ceramic chip capacitor	12 pF	[1]	
C4, C8, C10	multilayer ceramic chip capacitor	10 µF; 50 V		TDK C5750X7R1H106M or equivalent
C5	multilayer ceramic chip capacitor	1.5 µF; 50 V		TDK C3225X7R1H155M or equivalent
C7	tantalum capacitor	10 µF; 50 V		Kemet T491 series or equivalent
C12	multilayer ceramic chip capacitor	12 pF	[1]	
C13	electrolytic capacitor	220 µF; 50 V		
R1	Philips chip resistor	5.6 Ω; 1206		

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

9. Package outline

Flanged LDMOST ceramic package; 2 mounting holes; 2 leads **SOT502A**



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

UNIT	A	b	c	D	D_1	E	E_1	F	H	L	p	Q	q	U_1	U_2	w_1	w_2
mm	4.72 3.43	12.83 12.57	0.15 0.08	20.02 19.61	19.96 19.66	9.50 9.30	9.53 9.25	1.14 0.89	19.94 18.92	5.33 4.32	3.38 3.12	1.70 1.45	27.94	34.16 33.91	9.91 9.65	0.25	0.51
inches	0.186 0.135	0.505 0.495	0.006 0.003	0.788 0.772	0.786 0.774	0.374 0.366	0.375 0.364	0.045 0.035	0.785 0.745	0.210 0.170	0.133 0.123	0.067 0.057	1.100	1.345 1.335	0.390 0.380	0.01	0.02

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT502A						~~99-12-28~~ 03-01-10

Fig 11. Package outline SOT502A

10. Abbreviations

Table 9. Abbreviations

Acronym	Description
CDMA	Code Division Multiple Access
CW	Continuous Wave
EDGE	Enhanced Data rates for GSM Evolution
EVM	Error Vector Magnitude
GSM	Global System for Mobile communications
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
RMS	Root Mean Square
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF6G20-75_1	20080306	Preliminary 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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