

# BLF6G20-75; BLF6G20LS-75

Power LDMOS transistor

Rev. 02 — 9 February 2009

Product 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  $T_{case} = 25\text{ }^{\circ}\text{C}$  in a common source class-AB production test circuit.*

Mode of operation	f (MHz)	V <sub>DS</sub> (V)	P <sub>L(AV)</sub> (W)	G <sub>p</sub> (dB)	$\eta_D$ (%)	ACPR <sub>400k</sub> (dBc)	ACPR <sub>600k</sub> (dBc)	EVM <sub>rms</sub> (%)
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

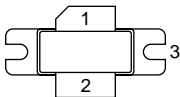
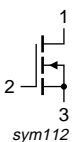
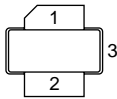
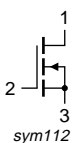
- Typical GSM EDGE performance at frequencies of 1930 MHz and 1990 MHz, a supply voltage of 28 V and an I<sub>DQ</sub> of 550 mA:
  - ◆ Average output power = 29.5 W
  - ◆ Gain = 19 dB
  - ◆ Efficiency = 37.5 %
  - ◆ ACPR<sub>400k</sub> = -61.5 dBc
  - ◆ ACPR<sub>600k</sub> = -73 dBc
  - ◆ EVM<sub>rms</sub> = 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	Graphic symbol
<b>BLF6G20-75 (SOT502A)</b>			
1	drain		
2	gate		
3	source		
<b>BLF6G20LS-75 (SOT502B)</b>			
1	drain		
2	gate		
3	source		

[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
BLF6G20LS-75	-	earless flanged LDMOST 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
$I_D$	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	Type	Typ	Unit
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C};$ $P_L = 29.5\text{ W (CW)}$	BLF6G20-75	0.9	K/W
			BLF6G20LS-75	0.75	K/W

## 6. Characteristics

**Table 6. Characteristics**

$T_j = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.5\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 100\text{ mA}$	1.4	2	2.4	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 28\text{ V}; I_D = 600\text{ mA}$	1.6	2.1	2.6	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	3	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $V_{DS} = 10\text{ V}$	14.9	18.5	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	300	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 5\text{ A}$	-	7	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V};$ $I_D = 3.5\text{ A}$	-	0.15	0.235	$\Omega$
$C_{rs}$	feedback capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V};$ $f = 1\text{ MHz}$	-	1.6	-	pF

## 7. Application information

**Table 7. Application information**

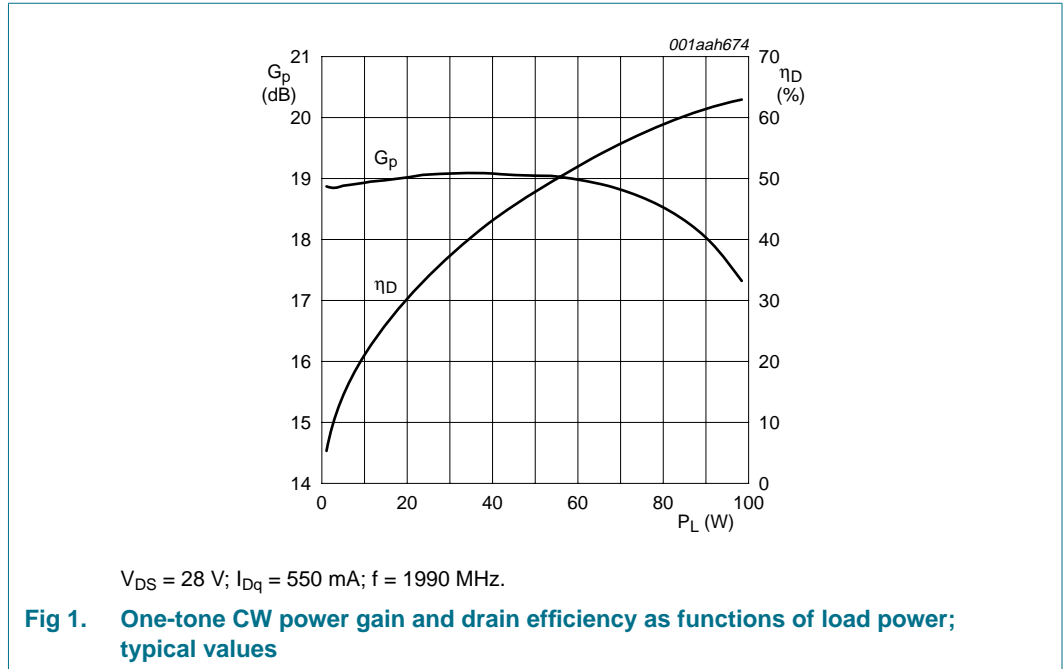
Mode of operation: GSM EDGE;  $f = 1930\text{ MHz}$  and  $1990\text{ MHz}$ ; RF performance at  $V_{DS} = 28\text{ V};$   $I_{Dq} = 550\text{ mA}; T_{case} = 25\text{ °C};$  unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(AV)}$	average output power		-	29.5	-	W
$G_p$	power gain	$P_{L(AV)} = 29.5\text{ W}$	17.5	19	-	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 29.5\text{ W}$	-	-10	-5.5	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 29.5\text{ W}$	33.5	37.5	-	%
$ACPR_{400k}$	adjacent channel power ratio (400 kHz)	$P_{L(AV)} = 29.5\text{ W}$	-	-61.5	-59.5	dBc
$ACPR_{600k}$	adjacent channel power ratio (600 kHz)	$P_{L(AV)} = 29.5\text{ W}$	-	-73	-69.5	dBc
$EVM_{rms}$	RMS EDGE signal distortion error	$P_{L(AV)} = 29.5\text{ W}$	-	1.7	3	%
$EVM_M$	peak EDGE signal distortion error	$P_{L(AV)} = 29.5\text{ W}$	-	4.8	10	%

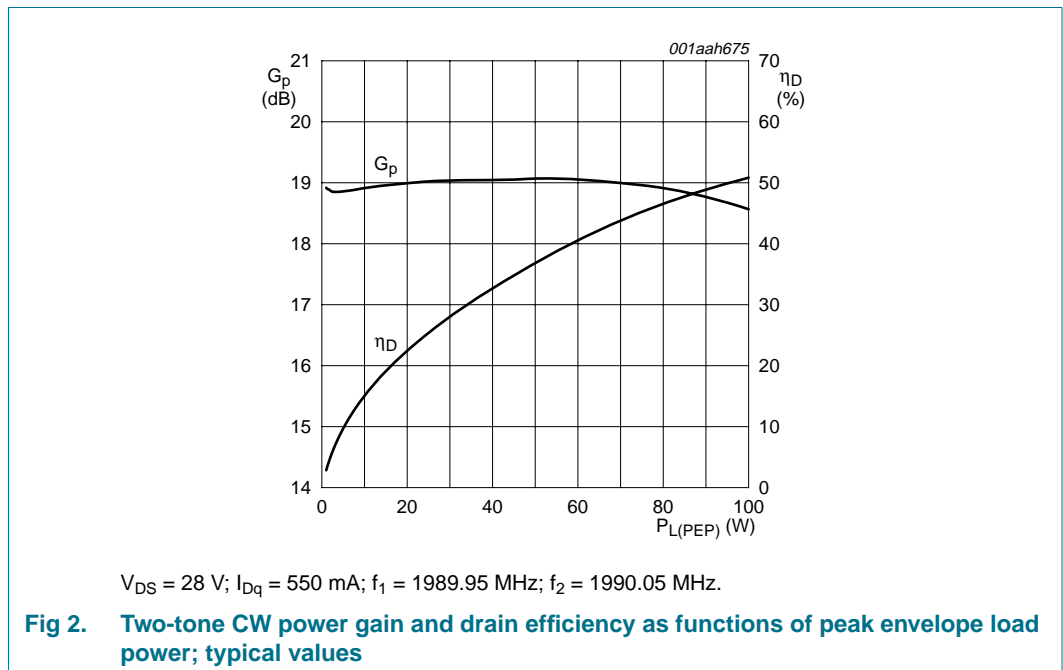
### 7.1 Ruggedness in class-AB operation

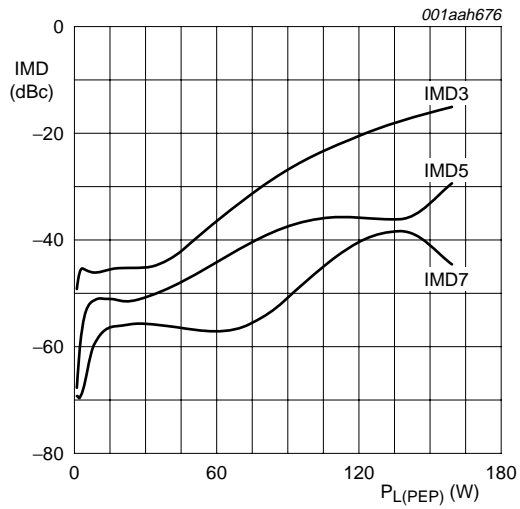
The BLF6G20-75 and BLF6G20LS-75 are capable of withstanding a load mismatch corresponding to  $VSWR = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28\text{ V}; I_{Dq} = 550\text{ mA}; P_L = 75\text{ W (CW)}; f = 1990\text{ MHz}.$

**7.2 One-tone CW**



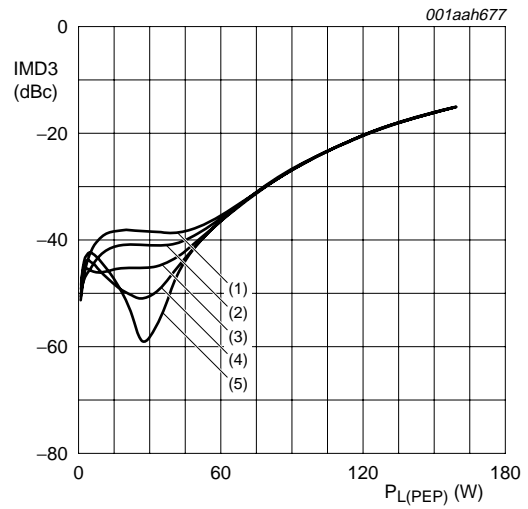
**7.3 Two-tone CW**





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

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

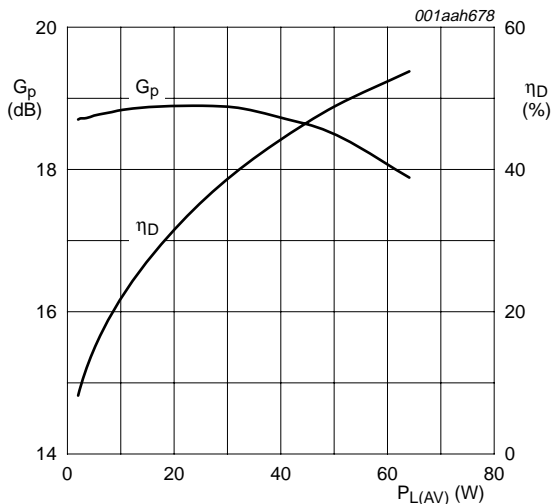


$V_{DS} = 28\text{ V}$ ;  $f_1 = 1989.95\text{ MHz}$ ;  $f_2 = 1900.05\text{ MHz}$ .

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

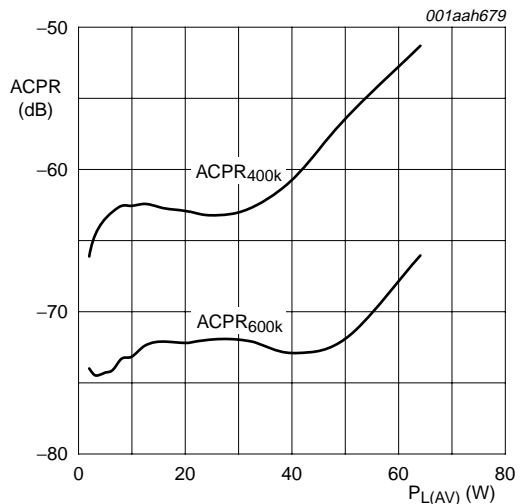
**Fig 4. Third order intermodulation distortion as a function of peak envelope load power; typical values**

7.4 GSM-EDGE



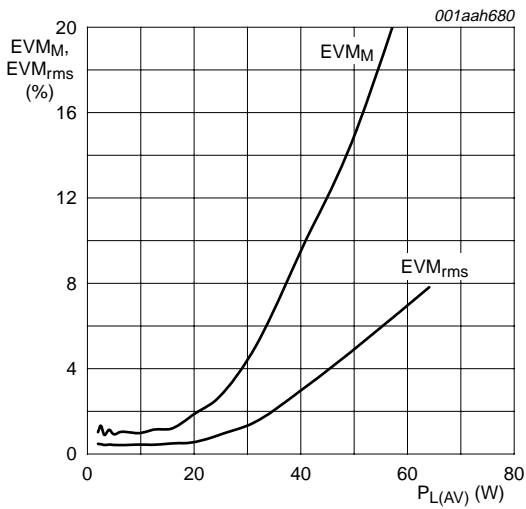
$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 550\text{ mA}$ ;  $f = 1990\text{ MHz}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ .

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



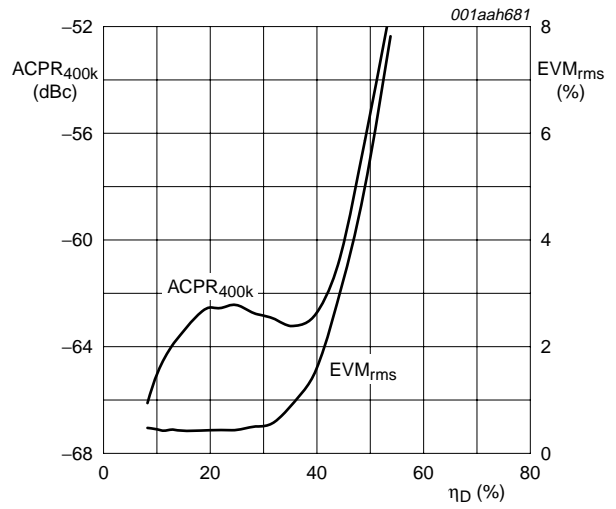
$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 550\text{ mA}$ ;  $f = 1990\text{ MHz}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ .

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



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 550\text{ mA}$ ;  $f = 1990\text{ MHz}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ .

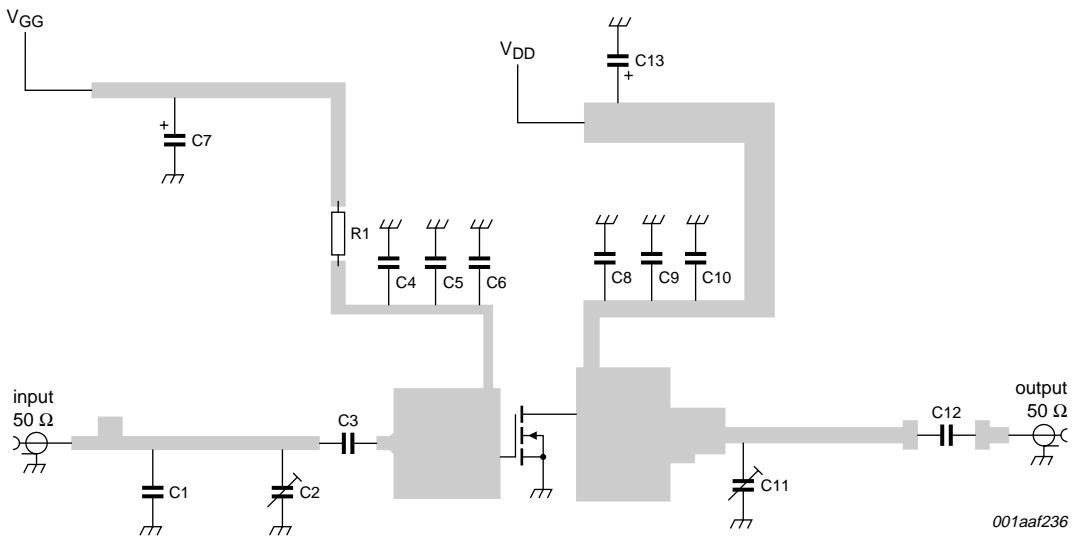
**Fig 7. GSM EDGE RMS EVM and peak EVM as functions of average load power; typical values**



$V_{DS} = 28\text{ V}$ ;  $I_{Dq} = 550\text{ mA}$ ;  $f = 1990\text{ MHz}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ .

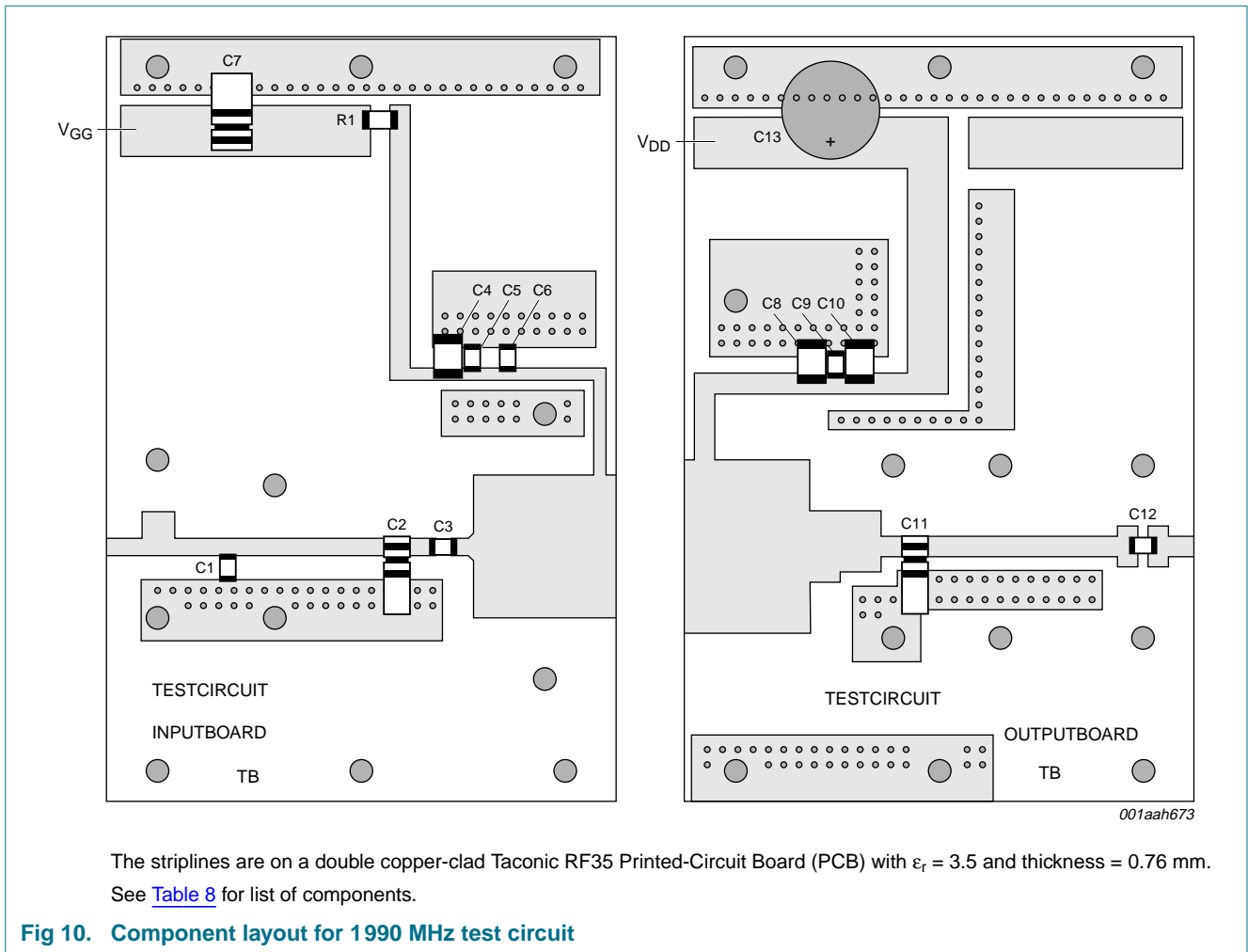
**Fig 8. GSM EDGE ACPR at 400 kHz and RMS EVM as functions of drain efficiency; typical values**

## 8. Test information



See [Table 8](#) for list of components.

**Fig 9. Test circuit for operation at 1990 MHz**



**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 $\mu$ F; 50 V	TDK C5750X7R1H106M or equivalent
C5	multilayer ceramic chip capacitor	1.5 $\mu$ F; 50 V	TDK C3225X7R1H155M or equivalent
C7	tantalum capacitor	10 $\mu$ F; 50 V	Kemet T491 series or equivalent
C12	multilayer ceramic chip capacitor	12 pF	[1]
C13	electrolytic capacitor	220 $\mu$ F; 50 V	
R1	Philips chip resistor	5.6 $\Omega$ ; 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

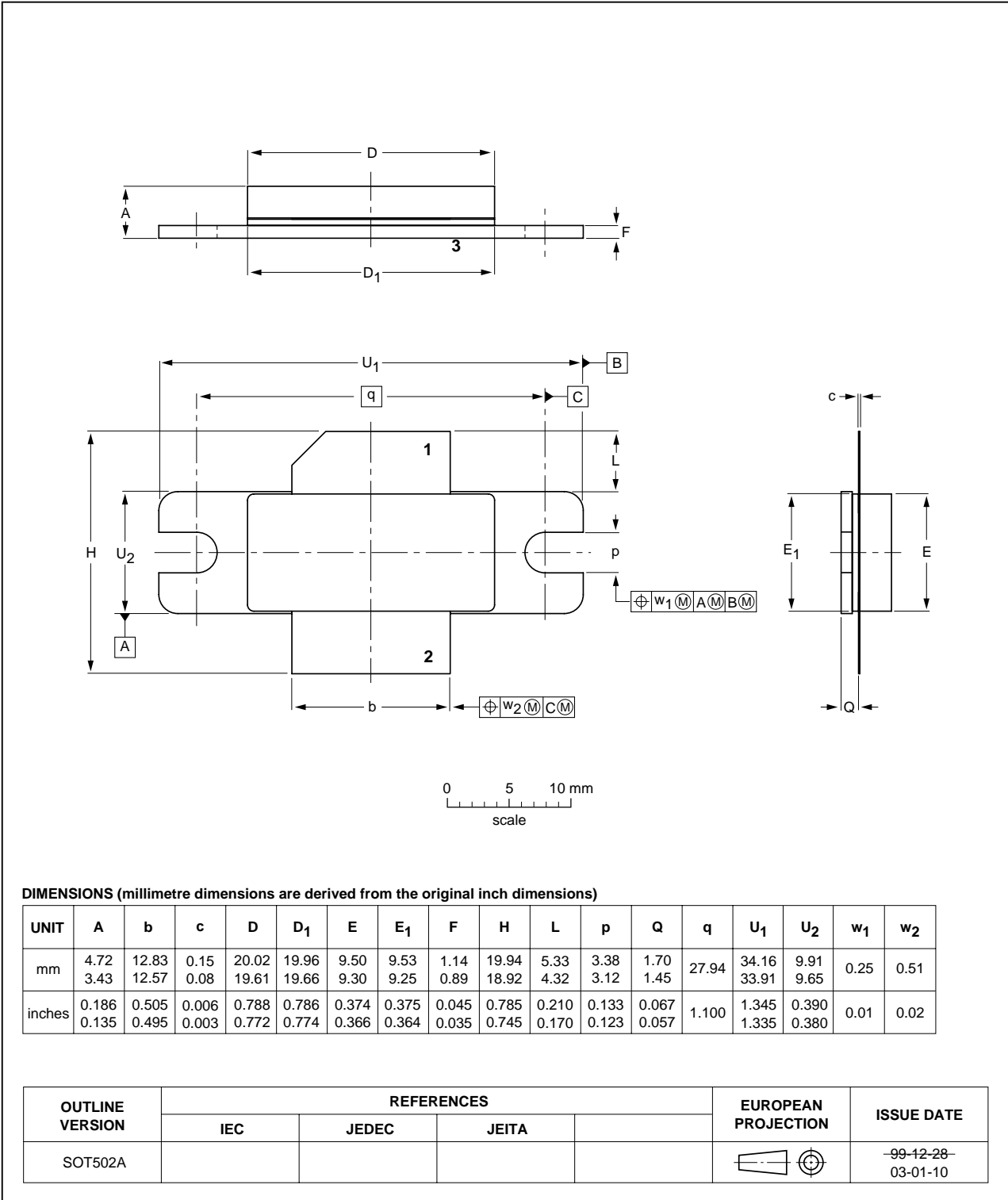


Fig 11. Package outline SOT502A



Earless flanged LDMOST ceramic package; 2 leads

SOT502B

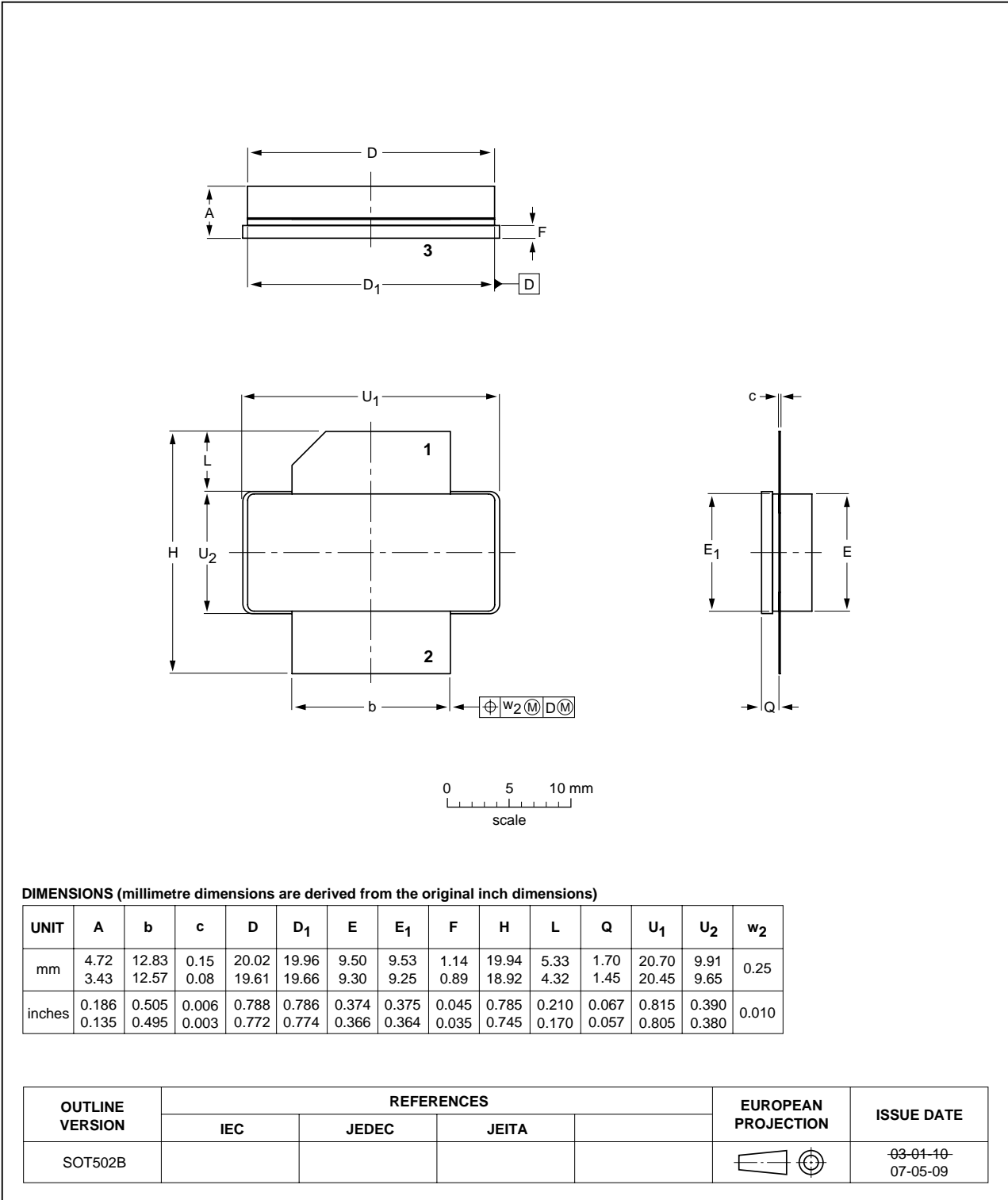


Fig 12. Package outline SOT502B

## 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_BLF6G20LS-75_2	20090209	Product data sheet	-	BLF6G20-75_1 BLF6G20LS-75_1
Modifications:				
				<ul style="list-style-type: none"> <li>The document now describes both the eared and earless version of this product: BLF6G20-75 and BLF6G20LS-75 respectively</li> <li><a href="#">Table 7 on page 3</a>: changed the minimum value for <math>\eta_D</math></li> <li><a href="#">Table 7 on page 3</a>: changed the maximum value for <math>EVM_{rms}</math></li> <li><a href="#">Table 7 on page 3</a>: changed the maximum value for <math>EVM_M</math></li> </ul>
BLF6G20-75_1	20080306	Preliminary data sheet	-	-
BLF6G20LS-75_1	20080218	Preliminary data sheet	-	-

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### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.
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[2] The term 'short data sheet' is explained in section "Definitions".

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