

# BLF6G20-180PN

Power LDMOS transistor

Rev. 03 — 30 March 2009

Product data sheet

## 1. Product profile

### 1.1 General description

180 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)	$V_{DS}$ (V)	$P_{L(AV)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	ACPR (dBc)
2-carrier W-CDMA	1805 to 1880	32	50	18	29.5	-35 <sup>[1]</sup>

[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

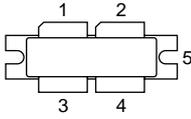
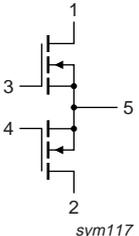
- Typical 2-carrier W-CDMA performance at frequencies of 1805 MHz and 1880 MHz, a supply voltage of 32 V and an  $I_{DQ}$  of 1600 mA:
  - ◆ Average output power = 50 W
  - ◆ Power gain = 18 dB (typ)
  - ◆ Efficiency = 29.5 %
  - ◆ ACPR = -35 dBc
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1800 MHz to 2000 MHz)
- Internally matched for ease of use
- Qualified up to a supply voltage of 32 V
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

**1.3 Applications**

- RF power amplifiers for W-CDMA base stations and multicarrier applications in the 1800 MHz to 2000 MHz frequency range

**2. Pinning information**

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	drain1		 <p style="text-align: right; font-size: small;">sym117</p>
2	drain2		
3	gate1		
4	gate2		
5	source		

[1] Connected to flange.

**3. Ordering information**

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLF6G20-180PN	-	flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads	SOT539A

**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
$R_{th(j-case)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_{L(AV)} = 50\text{ W}$	0.45	K/W

## 6. Characteristics

**Table 6. Characteristics**

$T_j = 25\text{ °C}$  per section; 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	$V_{DS} = 10\text{ V}; I_D = 144\text{ mA}$	1.575	1.9	2.3	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 32\text{ V}; I_D = 800\text{ mA}$	1.725	2.1	2.45	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}$				
		$V_{DS} = 28\text{ V}$	-	-	3	$\mu\text{A}$
		$V_{DS} = 60\text{ V}$	-	-	5	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	-	25	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	300	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 7.2\text{ A}$	-	10	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 5\text{ A}$	-	0.1	0.165	$\Omega$

## 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;  $f_1 = 1802.5\text{ MHz}; f_2 = 1807.5\text{ MHz}; f_3 = 1872.5\text{ MHz}; f_4 = 1877.5\text{ MHz}$ ; RF performance at  $V_{DS} = 32\text{ V}; I_{Dq} = 1600\text{ mA}; T_{case} = 25\text{ °C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 50\text{ W}$	16.8	18	19.2	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 50\text{ W}$	-	-10	-6.5	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 50\text{ W}$	26	29.5	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)} = 50\text{ W}$	-	-35	-33	dBc

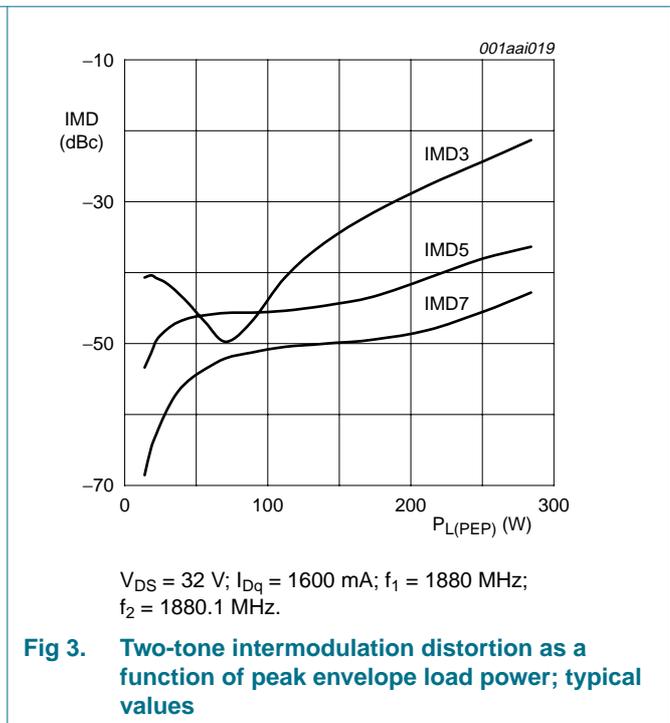
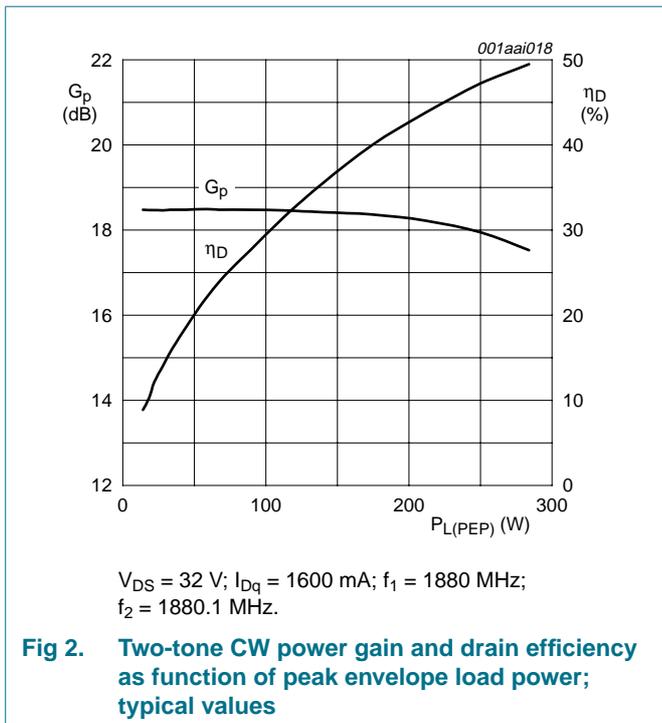
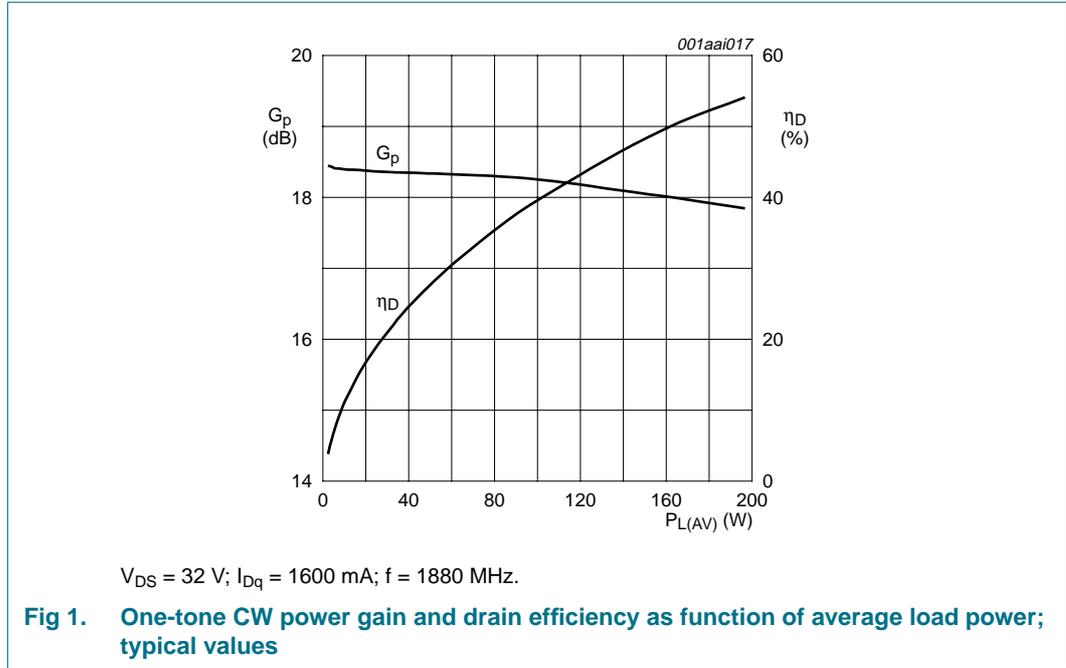
**Table 8. Application information**

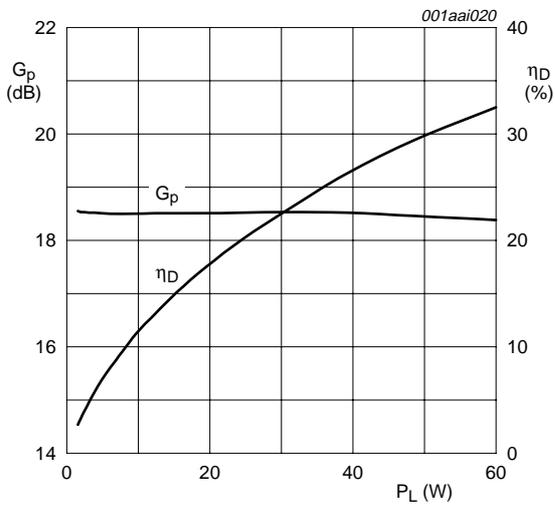
Mode of operation: 1-carrier W-CDMA; PAR 7.5 dB at 0.01 % probability on CCDF; 3GPP test model 1; 1 to 64 PDPCH;  $f_1 = 1872.5\text{ MHz}; f_2 = 1877.5\text{ MHz}$ ; RF performance at  $V_{DS} = 32\text{ V}; I_{Dq} = 1600\text{ mA}; T_{case} = 25\text{ °C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$PAR_O$	output peak-to-average ratio	$P_{L(AV)} = 115\text{ W};$ at 0.01 % probability on CCDF	4.1	4.3	-	dB

**7.1 Ruggedness in class-AB operation**

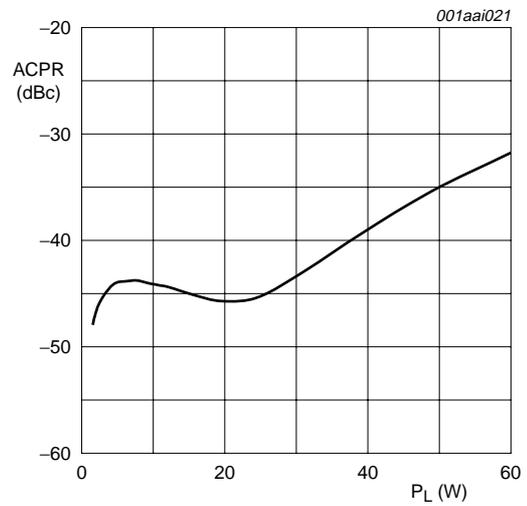
The BLF6G20-180PN is capable of withstanding a load mismatch corresponding to  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 28 \text{ V}$ ;  $I_{Dq} = 1600 \text{ mA}$ ;  $P_L = 180 \text{ W (CW)}$ ;  $f = 1880 \text{ MHz}$ .





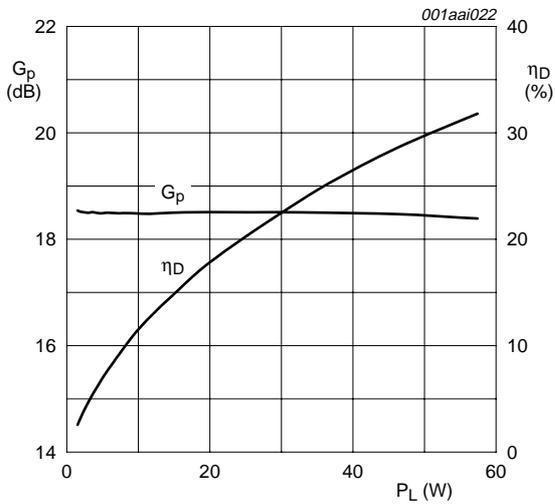
$V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 1600\text{ mA}$ ;  $f_1 = 1872.5\text{ MHz}$ ;  $f_2 = 1877.5\text{ MHz}$ ; carrier spacing 5 MHz.

**Fig 4. 2-carrier W-CDMA power gain and drain efficiency as function of load power; typical values**



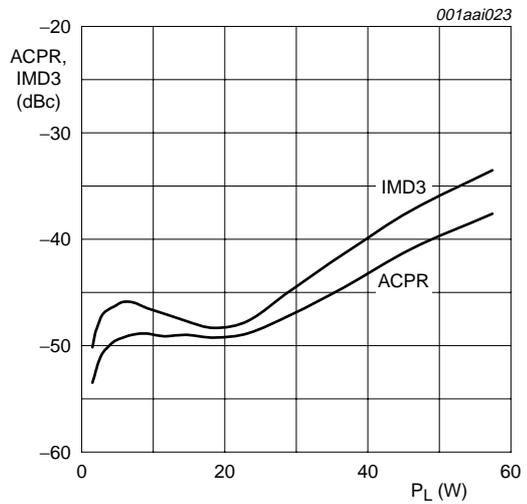
$V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 1600\text{ mA}$ ;  $f_1 = 1872.5\text{ MHz}$ ;  $f_2 = 1877.5\text{ MHz}$ ; carrier spacing 5 MHz.

**Fig 5. 2-carrier W-CDMA adjacent channel power ratio as a function of load power; typical values**



$V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 1600\text{ mA}$ ;  $f_1 = 1867.5\text{ MHz}$ ;  $f_2 = 1877.5\text{ MHz}$ ; carrier spacing 10 MHz.

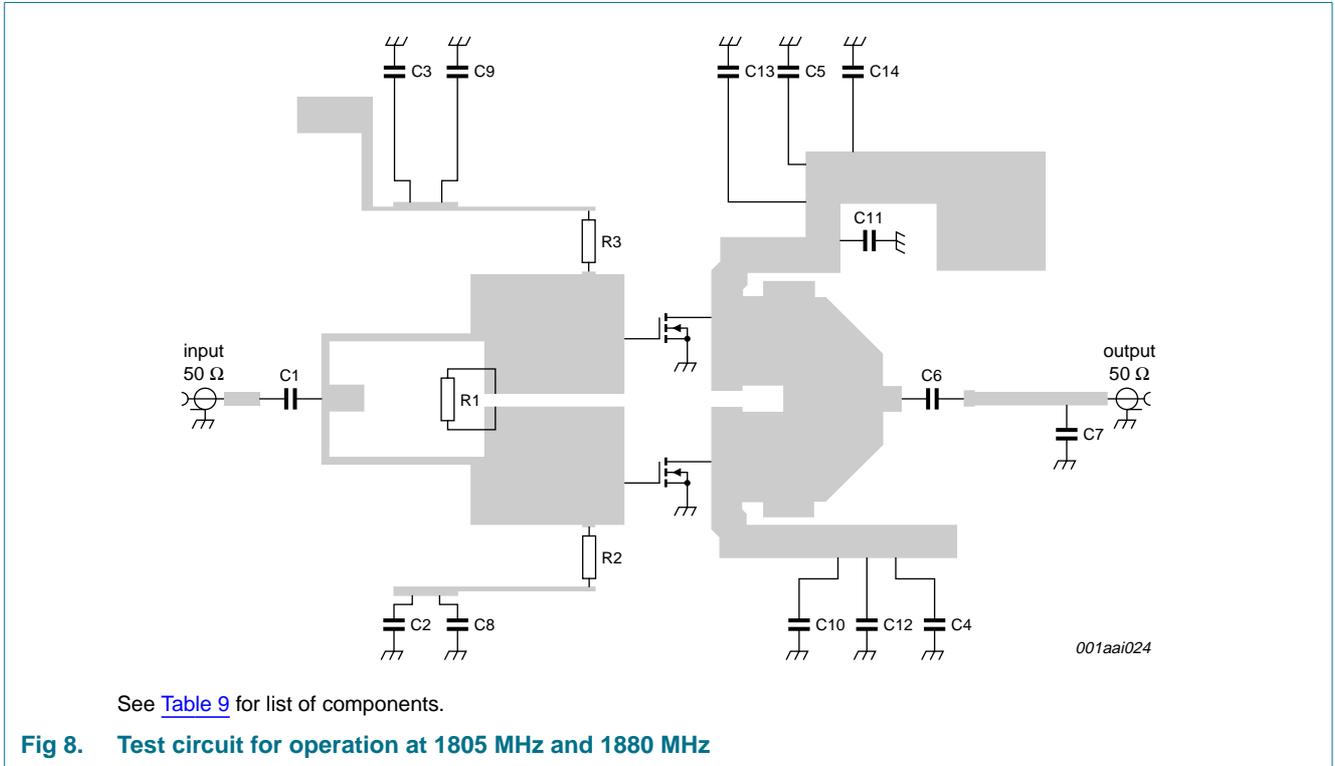
**Fig 6. 2-carrier W-CDMA power gain and drain efficiency as function of load power; typical values**

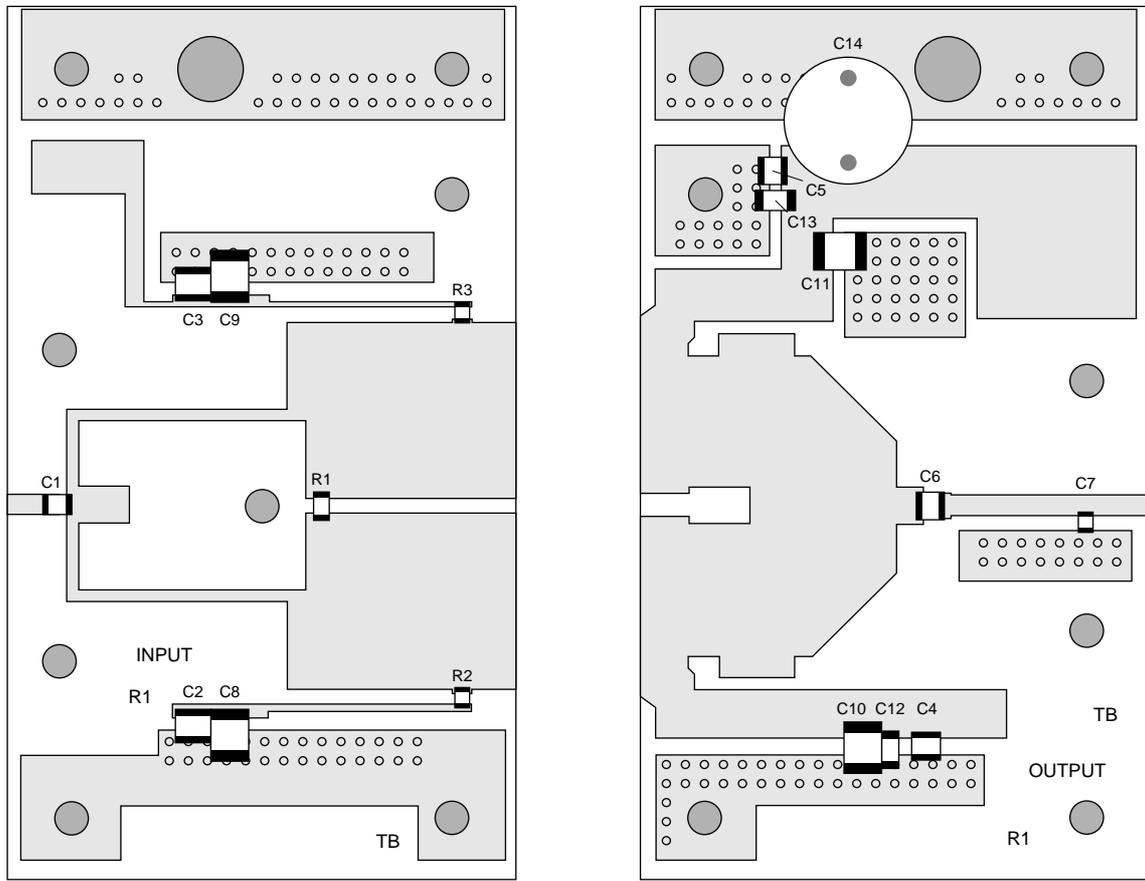


$V_{DS} = 32\text{ V}$ ;  $I_{DQ} = 1600\text{ mA}$ ;  $f_1 = 1867.5\text{ MHz}$ ;  $f_2 = 1877.5\text{ MHz}$ ; carrier spacing 10 MHz.

**Fig 7. 2-carrier W-CDMA adjacent channel power ratio and third order intermodulation distortion as function of load power; typical values**

**8. Test information**





001aa1025

Striplines are on a double copper-clad Rogers R04350 Printed-Circuit Board (PCB) with  $\epsilon_r = 3.5$  and thickness = 0.76 mm. See [Table 9](#) for list of components.

**Fig 9. Component layout for 1805 MHz and 1880 MHz test circuit**

**Table 9. List of components**

For test circuit, see [Figure 8](#) and [Figure 9](#).

Component	Description	Value	Remarks
C1	ATC multilayer ceramic chip capacitor	6.2 pF	[1]
C2, C3	ATC multilayer ceramic chip capacitor	16 pF	[1]
C4, C5, C6	ATC multilayer ceramic chip capacitor	18 pF	[2]
C7	ATC multilayer ceramic chip capacitor	1.1 pF	[3]
C8, C9, C10, C11	TDK multilayer ceramic chip capacitor	4.7 $\mu$ F	
C12, C13	AVX multilayer ceramic chip capacitor	220 nF	
C14	electrolytic capacitor	100 $\mu$ F; 63 V	[2]
R1	chip resistor	33 $\Omega$	
R2, R3	chip resistor	8.2 $\Omega$	

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

[2] American Technical Ceramics type 180R or capacitor of same quality.

[3] American Technical Ceramics type 100A or capacitor of same quality.

9. Package outline

Flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads

SOT539A

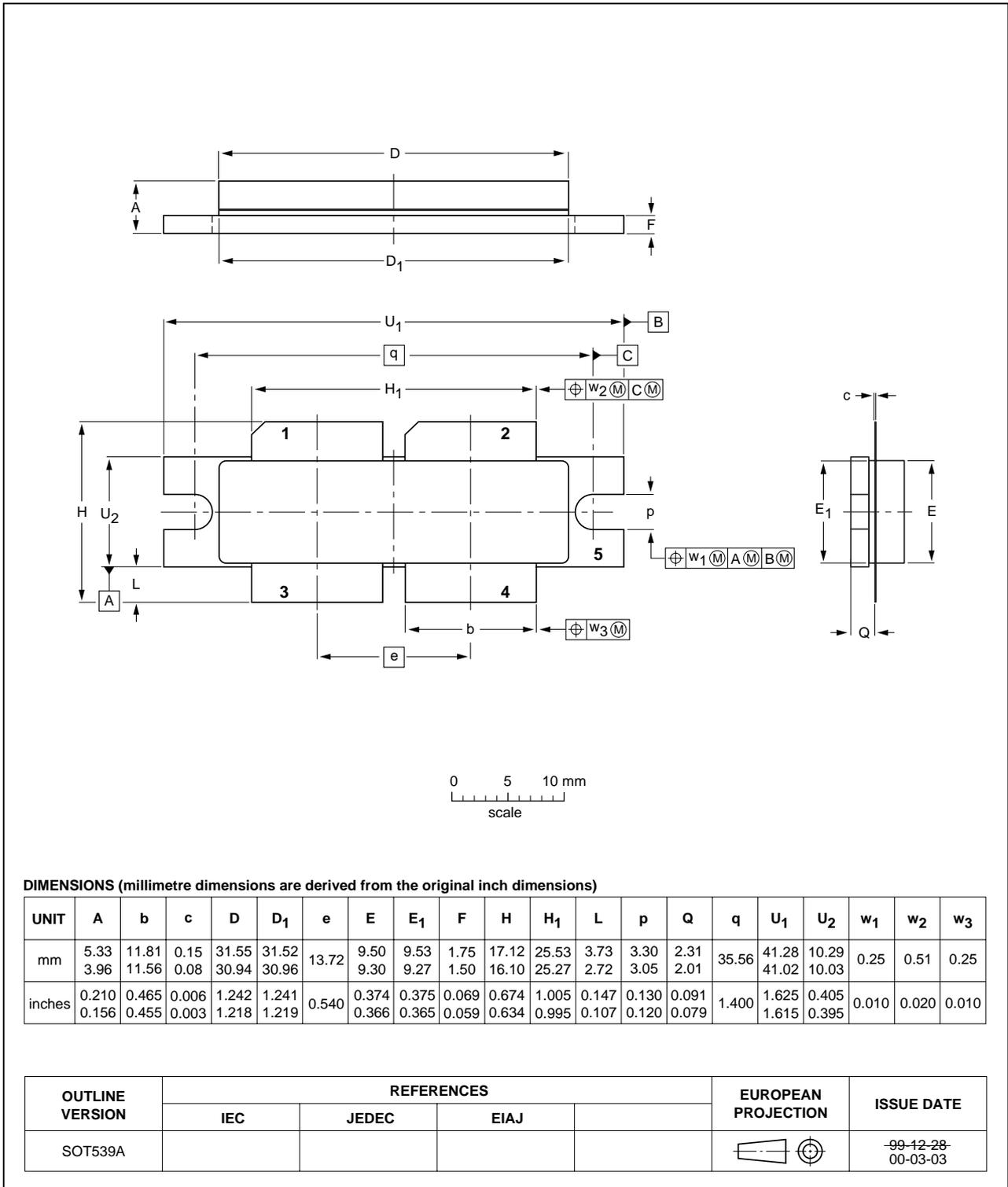


Fig 10. Package outline SOT539A



## 10. Abbreviations

**Table 10. Abbreviations**

Acronym	Description
3GPP	3rd Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
IMD	InterModulation Distortion
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
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
BLF6G20-180PN_3	20090330	Product data sheet	-	BLF6G20-180PN_2
BLF6G20-180PN_2	20090121	Preliminary data sheet	-	BLF6G20-180PN_1
Modifications:	<ul style="list-style-type: none"> <li>Table 7 on page 3: Maximum adjacent channel power ratio changed</li> <li>Table 8 on page 3: Minimum output peak-to-average ratio changed</li> </ul>			
BLF6G20-180PN_1	20080428	Objective 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.
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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Date of release: 30 March 2009

Document identifier: BLF6G20-180PN\_3