

# BLF8G22LS-160BV

Power LDMOS transistor

Rev. 1 — 25 June 2012

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 2000 MHz to 2200 MHz.

**Table 1. Typical performance**

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

Test signal	f (MHz)	$I_{Dq}$ (mA)	$V_{DS}$ (V)	$P_{L(AV)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	ACPR (dBc)
2-carrier W-CDMA	2110 to 2170	1300	32	55	18.0	32	-31 <sup>[1]</sup>

[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  $R_{th}$  providing excellent thermal stability
- Decoupling leads to enable improved video bandwidth (100 MHz typical)
- 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
- Integrated current sense
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

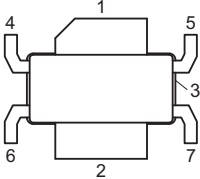
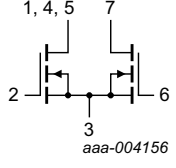
### 1.3 Applications

- RF power amplifier for W-CDMA base stations and multi carrier applications in the 2000 MHz to 2200 MHz frequency range



## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	drain		
2	gate		
3	source <a href="#">[1]</a>		
4,5	video decoupling		
6	sense gate		
7	sense drain		

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
BLF8G22LS-160BV	-	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		-0.5	+13	V
$V_{GS(sense)}$	sense gate-source voltage		-0.5	+9	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C
$T_{case}$	case temperature		<a href="#">[1]</a> -	150	°C

[1] Continuous use at maximum temperature will affect MTTF.

## 5. Recommended operating conditions

**Table 5. Operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{case}$	case temperature		-40	-	+125	°C

## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 80\text{ °C}; P_L = 55\text{ W}$	0.27	K/W

## 7. Characteristics

**Table 7. Characteristics**

$T_j = 25\text{ }^\circ\text{C}$ ; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ ; $I_D = 2.16\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$ ; $I_D = 216\text{ mA}$	1.5	1.9	2.3	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 28\text{ V}$	-	-	4.5	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $V_{DS} = 10\text{ V}$	-	40	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	-	450	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}$ ; $I_D = 10.8\text{ A}$	-	16	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $I_D = 7.56\text{ A}$	-	0.06	-	$\Omega$
$I_{Dq}$	quiescent drain current	main transistor: $V_{DS} = 32\text{ V}$ sense transistor: $I_{DS} = 23.4\text{ mA}$ ; $V_{DS} = 30.4\text{ V}$	1175	1300	1425	mA

## 8. Test information

**Table 8. Application information**

Test signal: 2-carrier W-CDMA; PAR 8.4 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f_1 = 2112.5\text{ MHz}$ ;  $f_2 = 2117.5\text{ MHz}$ ;  $f_3 = 2162.5\text{ MHz}$ ;  $f_4 = 2167.5\text{ MHz}$ ; RF performance at  $V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 1300\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$P_{L(AV)} = 55\text{ W}$	16.8	18.0	19.7	dB
$RL_{in}$	input return loss	$P_{L(AV)} = 55\text{ W}$	-	-13	-7	dB
$\eta_D$	drain efficiency	$P_{L(AV)} = 55\text{ W}$	29	32	-	%
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)} = 55\text{ W}$	-	-31	-28	dBc

**Table 9. Application information**

Mode of operation: 1-carrier W-CDMA; PAR 7.2 dB at 0.01 % probability on CCDF; 3GPP test model 1; 64 DPCH;  $f = 2167.5\text{ MHz}$ ; RF performance at  $V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 1300\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ; 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	3.9	4.3	-	dB
$P_{L(M)}$	peak output power		290	310	-	W

### 8.1 Ruggedness in class-AB operation

The BLF8G22LS-160BV is capable to withstand a load mismatch corresponding to  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 1300\text{ mA}$ ;  $P_L = 160\text{ W}$ ;  $f = 2110\text{ MHz}$ .

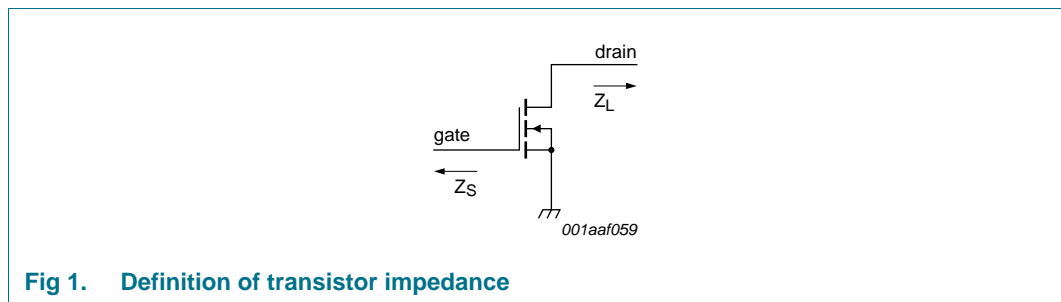
**8.2 Impedance information**

**Table 10. Typical impedance**

$I_{Dq} = 1300\text{ mA}$ ; main transistor  $V_{DS} = 32\text{ V}$ .

f (MHz)	$Z_S$ [1] ( $\Omega$ )	$Z_L$ [1] ( $\Omega$ )
2110	2.2 – j4.6	1.4 – j2.8
2140	2.1 – j4.5	1.4 – j2.6
2170	2.1 – j4.3	1.3 – j2.4

[1]  $Z_S$  and  $Z_L$  defined in [Figure 1](#).

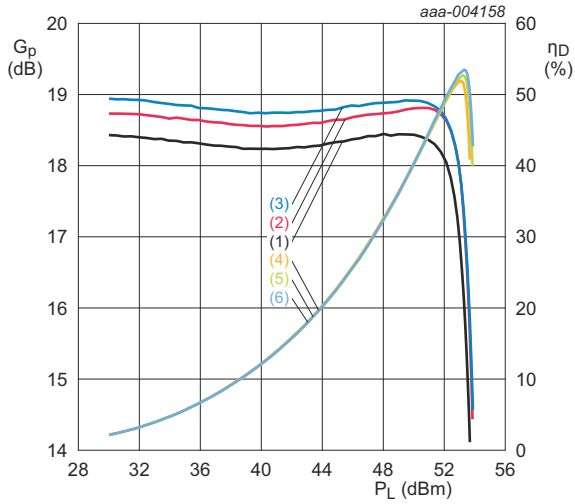


**Fig 1. Definition of transistor impedance**

**8.3 VBW in class-AB operation**

The BLF8G22LS-160BV shows 100 MHz (typical) video bandwidth in class-AB test circuit in 2.1 GHz band at 32 V and 1.3 A.

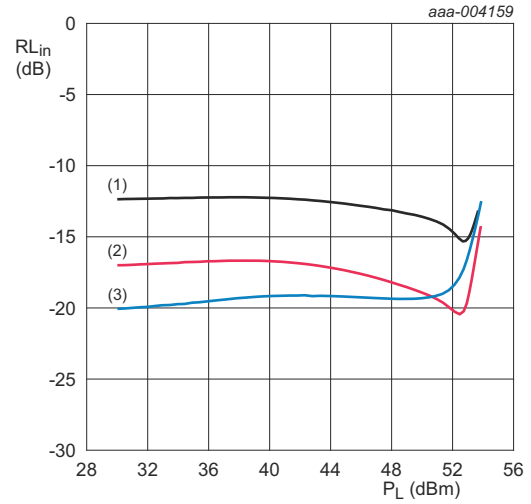
8.4 CW pulse



$V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 1300\text{ mA}$ .

- (1)  $G_p$  at  $f = 2110\text{ MHz}$
- (2)  $G_p$  at  $f = 2140\text{ MHz}$
- (3)  $G_p$  at  $f = 2170\text{ MHz}$
- (4)  $\eta_D$  at  $f = 2110\text{ MHz}$
- (5)  $\eta_D$  at  $f = 2140\text{ MHz}$
- (6)  $\eta_D$  at  $f = 2170\text{ MHz}$

Fig 2. Power gain and drain efficiency as function of load power; typical values

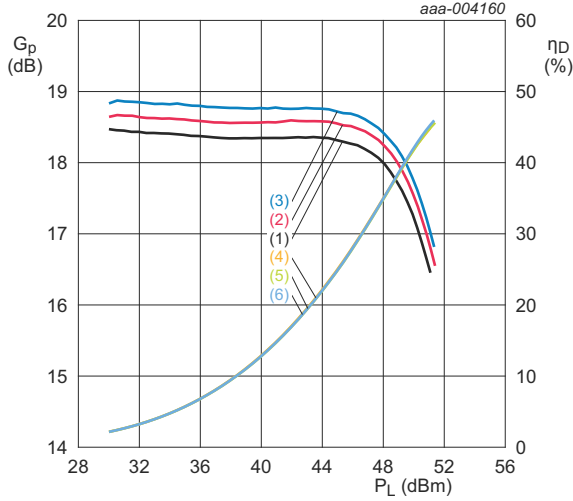


$V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 1300\text{ mA}$ .

- (1)  $f = 2110\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2170\text{ MHz}$

Fig 3. Input return loss as a function of load power; typical values

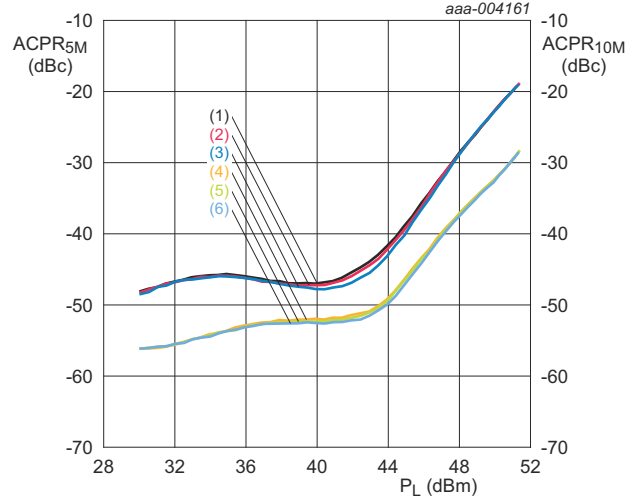
8.5 2-carrier W-CDMA



$V_{DS} = 32\text{ V}; I_{Dq} = 1300\text{ mA}$ .

- (1)  $G_p$  at  $f = 2115\text{ MHz}$
- (2)  $G_p$  at  $f = 2140\text{ MHz}$
- (3)  $G_p$  at  $f = 2165\text{ MHz}$
- (4)  $\eta_D$  at  $f = 2115\text{ MHz}$
- (5)  $\eta_D$  at  $f = 2140\text{ MHz}$
- (6)  $\eta_D$  at  $f = 2165\text{ MHz}$

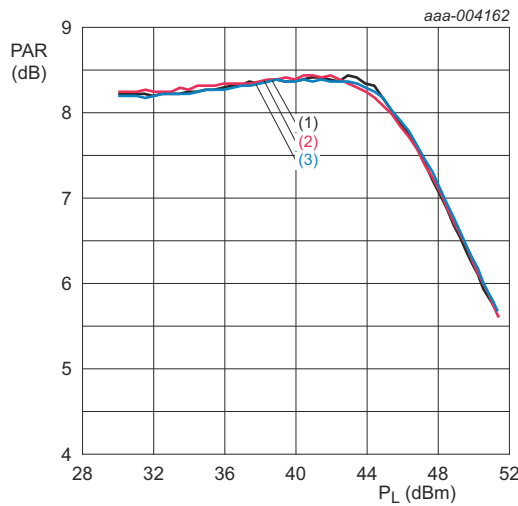
Fig 4. Power gain and drain efficiency as function of load power; typical values



$V_{DS} = 32\text{ V}; V_{GS} = 32\text{ V}; f = 5\text{ MHz}; \delta = 46\%$ .

- (1) ACPR<sub>5M</sub> at  $f = 2115\text{ MHz}$
- (2) ACPR<sub>5M</sub> at  $f = 2140\text{ MHz}$
- (3) ACPR<sub>5M</sub> at  $f = 2165\text{ MHz}$
- (4) ACPR<sub>10M</sub> at  $f = 2115\text{ MHz}$
- (5) ACPR<sub>10M</sub> at  $f = 2140\text{ MHz}$
- (6) ACPR<sub>10M</sub> at  $f = 2165\text{ MHz}$

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

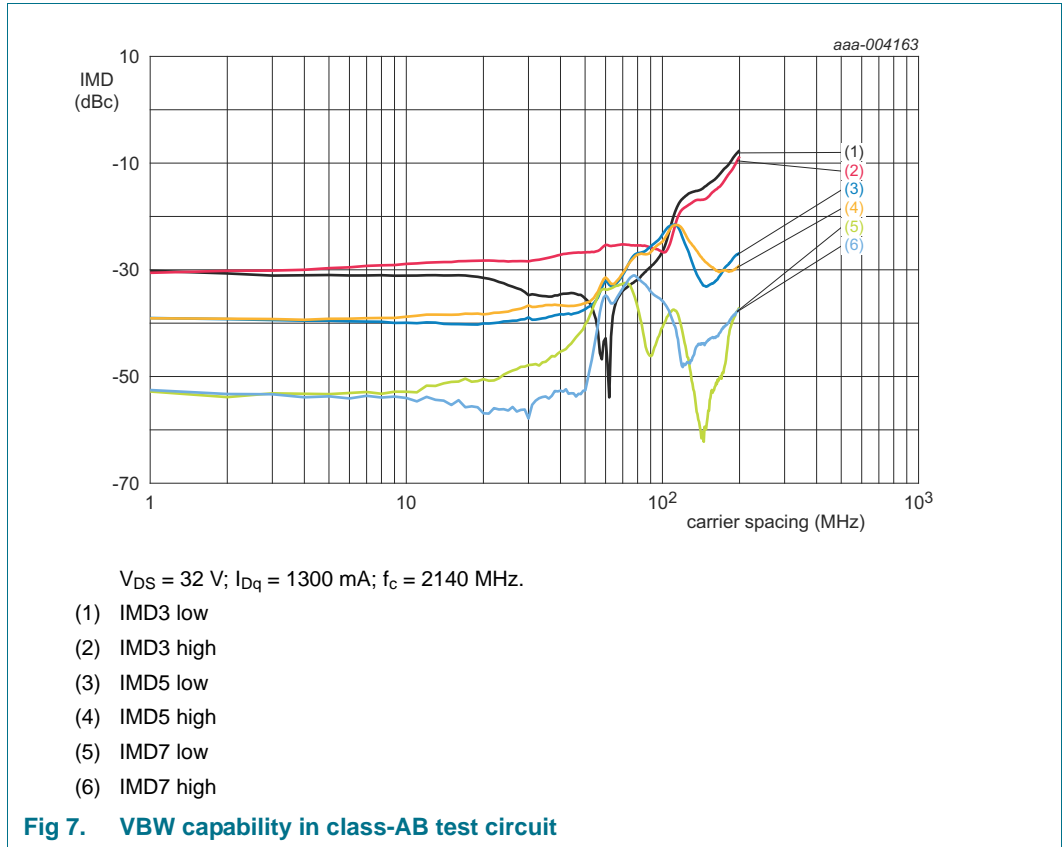


$V_{DS} = 32\text{ V}; I_{Dq} = 1300\text{ mA}$ .

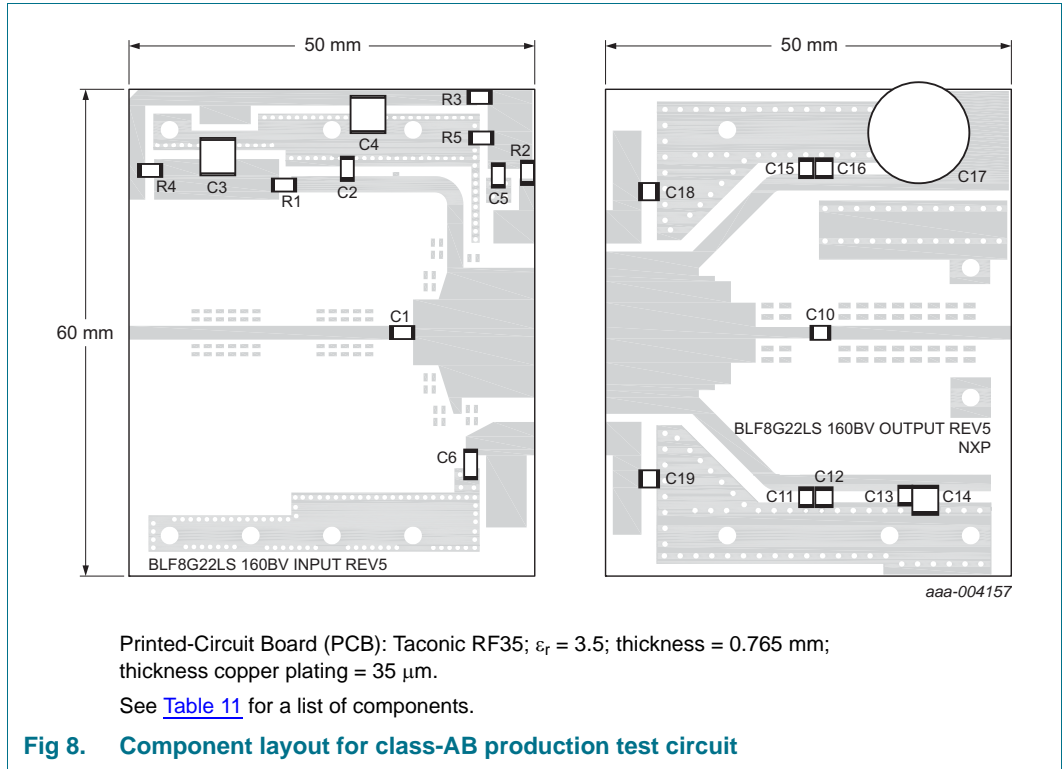
- (1)  $f = 2115\text{ MHz}$
- (2)  $f = 2140\text{ MHz}$
- (3)  $f = 2165\text{ MHz}$

Fig 6. Peak to average power ratio as a function of load power; typical values

**8.6 2-tone VBW**



**8.7 Test circuit**



**Table 11. List of components**

For test circuit see [\[8\]](#).

Component	Description	Value	Remarks
C1, C2, C10, C11, C13, C15	multilayer ceramic chip capacitor	12 pF	<a href="#">[1]</a> ATC100B
C5, C6	multilayer ceramic chip capacitor	120 pF	<a href="#">[1]</a> ATC100B
C3, C4, C12, C16, C18, C19	multilayer ceramic chip capacitor	4.7 $\mu\text{F}$ , 50 V	<a href="#">[2]</a> Murata
C14	multilayer ceramic chip capacitor	4.7 $\mu\text{F}$ , 100 V	<a href="#">[3]</a> TDK
C15	electrolytic capacitor	470 $\mu\text{F}$ , 63 V	
R1	SMD resistor	4.7 $\Omega$	Philips 1206
R2	SMD resistor	470 $\Omega$	Philips 1206
R3	SMD resistor	820 $\Omega$	Philips 1206
R4	SMD resistor	12 $\Omega$	Philips 1206
R5	SMD resistor	2200 $\Omega$	Philips 1206

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

[2] Murata or capacitor of same quality.

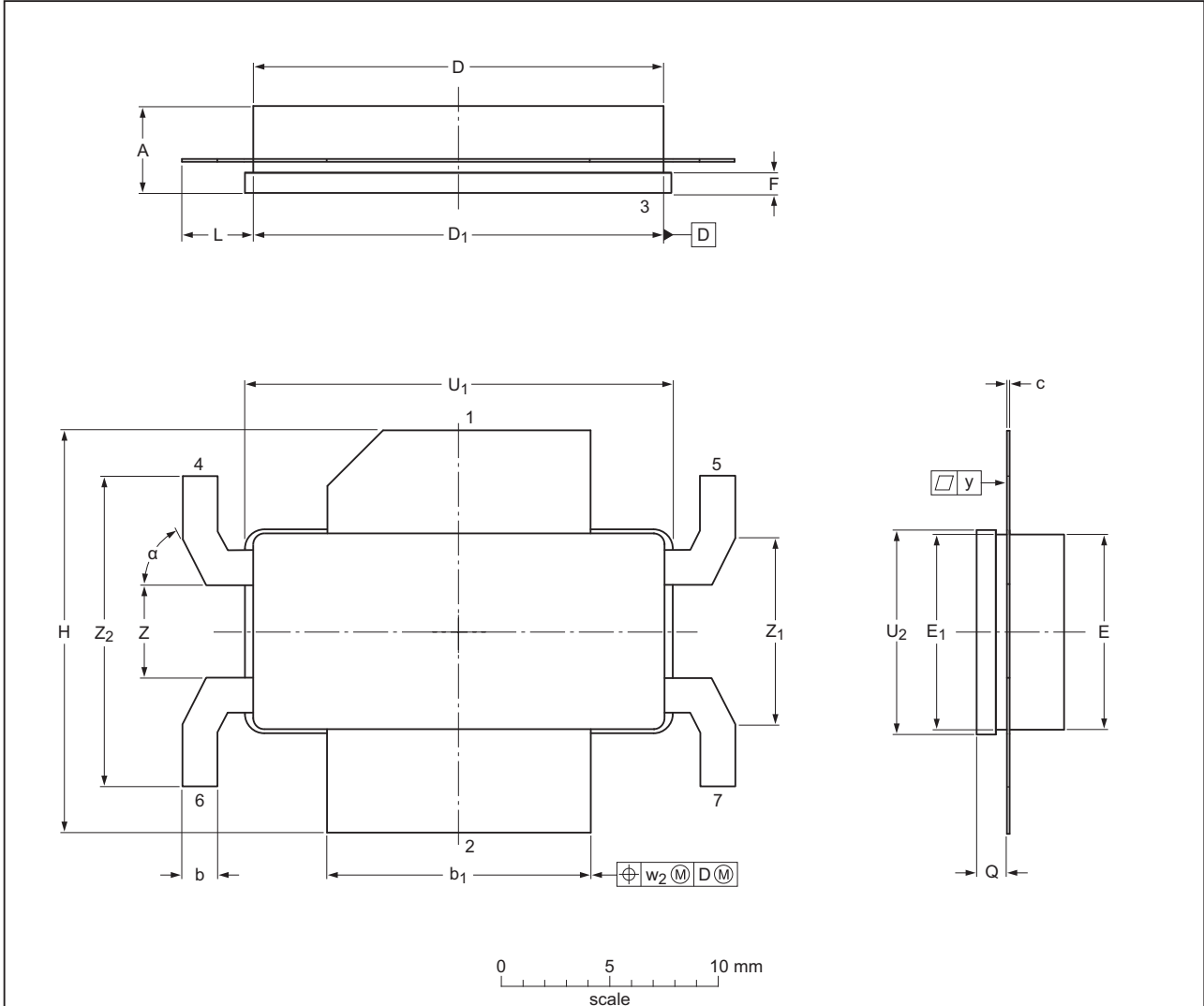
[3] TDK or capacitor of same quality.



**9. Package outline**

Earless flanged LDMOST ceramic package; 6 leads

SOT1120B



Dimensions

Unit <sup>(1)</sup>	A	b	b <sub>1</sub>	c	D	D <sub>1</sub>	E	E <sub>1</sub>	F	H	L	Q <sup>(2)</sup>	U <sub>1</sub>	U <sub>2</sub>	w <sub>2</sub>	y	Z	Z <sub>1</sub>	Z <sub>2</sub>	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	0.51	0.15	4.60	9.53	15.52	64°						
	nom																										
	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	0.02	0.0059	0.181	0.375	0.611	64°						
	nom																										
	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					12-04-11 12-06-14

**Fig 9. Package outline SOT1120B**

## 10. Abbreviations

**Table 12. Abbreviations**

Acronym	Description
3GPP	Third Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
DPCH	Dedicated Physical CHannel
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Laterally Diffused Metal Oxide Semiconductor Transistor
MTTF	Mean 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 13. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF8G22LS-160BV v.1	20120625	Product data sheet	-	-

## 12. Legal information

### 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.
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