BLF7G24L-160P; BLF7G24LS-160P

Power LDMOS transistor

Rev. 5 — 12 July 2013 Product data sheet

1. Product profile

1.1 General description

160 W LDMOS power transistor for base station applications at frequencies from 2300 MHz to 2400 MHz.

Table 1. Typical performance

Typical RF performance at T_{case} = 25 °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)	η_D (%)	$ACPR_{885k}$ (dBc)
IS-95	2300 to 2400	1200	28	30	18.5	27.5	–45.5[1]

[1] Single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13). PAR = 9.7 dB at 0.01 % probability on the CCDF. Channel bandwidth is 1.2288 MHz.

1.2 Features and benefits

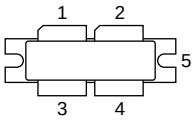
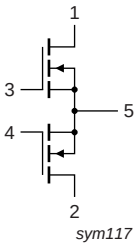
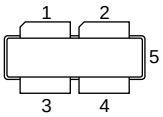
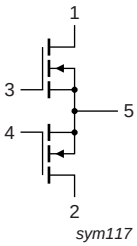
- Excellent ruggedness
- High efficiency
- Low R_{th} providing excellent thermal stability
- Designed for broadband operation (2300 MHz to 2400 MHz)
- Lower output capacitance for improved performance in Doherty applications
- Designed for low memory effects providing excellent pre-distortability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for base stations and multi carrier applications in the 2300 MHz to 2400 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
BLF7G24L-160P (SOT539A)			
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source [1]		
BLF7G24LS-160P (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
BLF7G24L-160P	-	flanged balanced ceramic package; 2 mounting holes; 4 leads	SOT539A
BLF7G24LS-160P	-	earless flanged balanced 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_j	junction temperature		-	200	°C

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	T_{case} = 80 °C; P_L = 30 W; V_{DS} = 28 V; I_{Dq} = 1200 mA	0.2	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 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 102 mA	1.5	1.9	2.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	2.8	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	-	19	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	280	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 3.57 A	-	6.9	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 3.57 A	-	0.15	0.23	Ω

7. Test information

Remark: All testing performed in a class-AB production test circuit.

Table 7. Functional test information

Test signal: single carrier IS-95 with pilot, paging, sync and 6 traffic channels (Walsh codes 8 - 13). PAR = 9.7 dB at 0.01 % probability on the CCDF, channel bandwidth is 1.2288 MHz; f_1 = 2300 MHz; f_2 = 2400 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 1200 mA; T_{case} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 30 W	17.8	18.5	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 30 W	-	–13.5	–9	dB
η_D	drain efficiency	$P_{L(AV)}$ = 30 W	25	27.5	-	%
$ACPR_{885k}$	adjacent channel power ratio (885 kHz)	$P_{L(AV)}$ = 30 W	-	–45.5	–41.5	dBc

7.1 Ruggedness in class-AB operation

The BLF7G24L-160P and BLF7G24LS-160P 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} = 1200 mA; P_L = 160 W; f = 2300 MHz.

7.2 Impedance information

Table 8. Typical impedance

Measured load-pull data. Typical values per section.
I_{Dq} = 600 mA; main transistor V_{DS} = 28 V. Z_S and Z_L defined in Figure 1.

f (MHz)	Z_S (Ω)	Z_L (Ω)
2300	2.5 – j5.9	3.1 – j4.3
2400	4.6 – j7.2	2.9 – j4.2

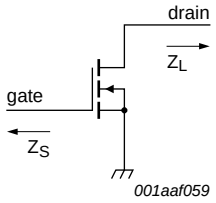
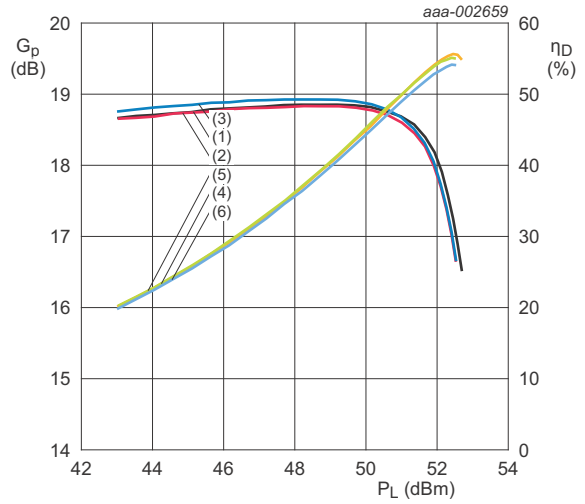


Fig 1. Definition of transistor impedance

7.3 Graphs

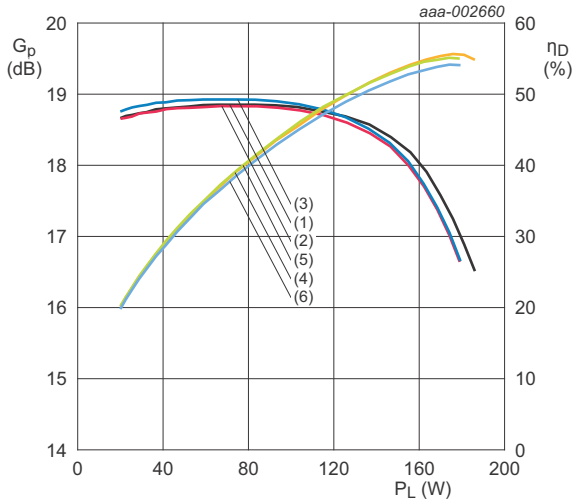
7.3.1 Pulsed CW



V_{DS} = 28 V; I_{Dq} = 1200 mA; δ = 10 %; t_p = 0.10 ms.

(1) G_p at f = 2300 MHz
(2) G_p at f = 2350 MHz
(3) G_p at f = 2400 MHz
(4) η_D at f = 2300 MHz
(5) η_D at f = 2350 MHz
(6) η_D at f = 2400 MHz

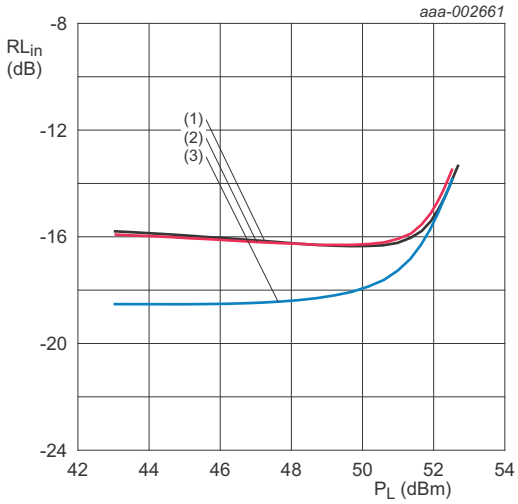
Fig 2. Power gain and drain efficiency of pulsed CW as function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 1200 mA; δ = 10 %; t_p = 0.10 ms.

(1) G_p at f = 2300 MHz
(2) G_p at f = 2350 MHz
(3) G_p at f = 2400 MHz
(4) η_D at f = 2300 MHz
(5) η_D at f = 2350 MHz
(6) η_D at f = 2400 MHz

Fig 3. Power gain and drain efficiency of pulsed CW as function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 1200 mA; δ = 10 %; t_p = 0.10 ms.

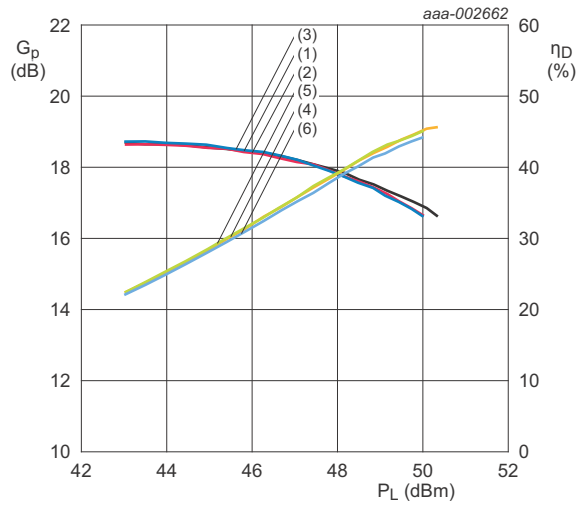
(1) f = 2300 MHz

(2) f = 2350 MHz

(3) f = 2400 MHz

Fig 4. Input return loss of pulsed CW as a function of output power; typical values

7.3.2 IS-95



V_{DS} = 28 V; I_{Dq} = 1200 mA.

(1) G_p at f = 2300 MHz

(2) G_p at f = 2350 MHz

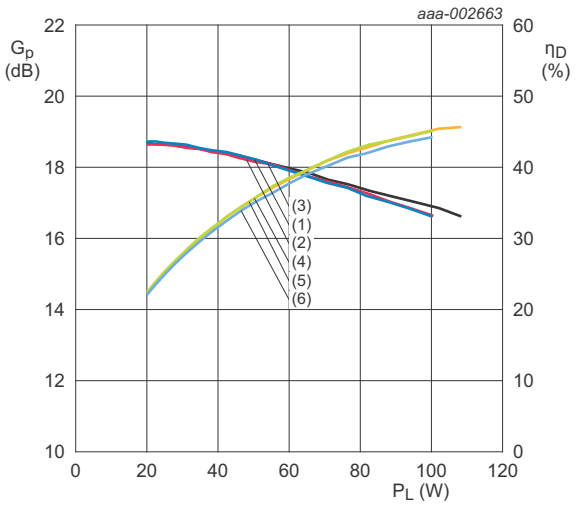
(3) G_p at f = 2400 MHz

(4) η_D at f = 2300 MHz

(5) η_D at f = 2350 MHz

(6) η_D at f = 2400 MHz

Fig 5. Power gain and drain efficiency of IS-95 as function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 1200 mA.

(1) G_p at f = 2300 MHz

(2) G_p at f = 2350 MHz

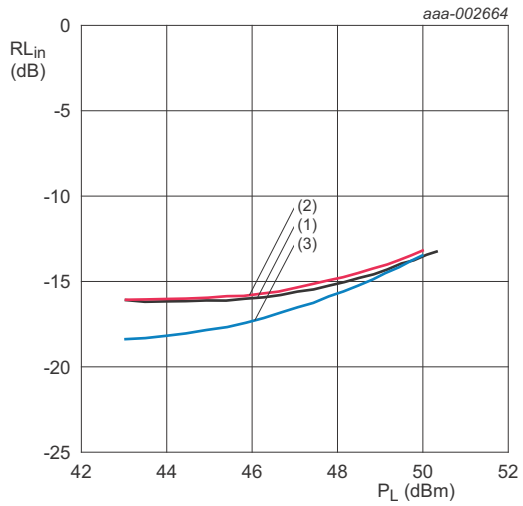
(3) G_p at f = 2400 MHz

(4) η_D at f = 2300 MHz

(5) η_D at f = 2350 MHz

(6) η_D at f = 2400 MHz

Fig 6. Power gain and drain efficiency of IS-95 as function of output power; typical values



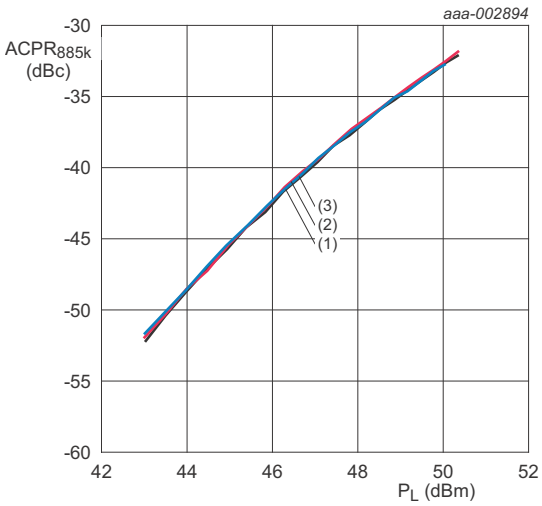
V_{DS} = 28 V; I_{Dq} = 1200 mA.

(1) f = 2300 MHz

(2) f = 2350 MHz

(3) f = 2400 MHz

Fig 7. Input return loss of IS-95 as a function of output power; typical values



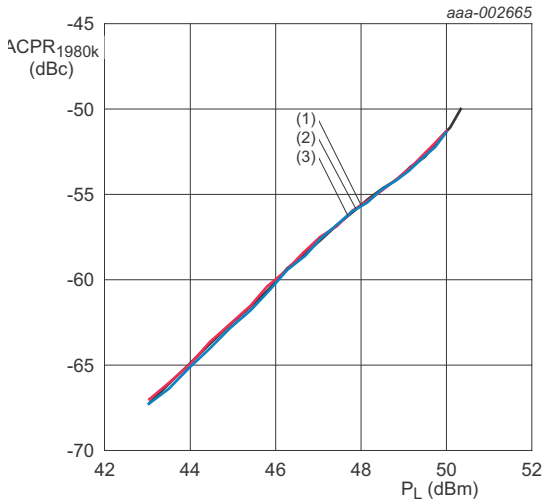
V_{DS} = 28 V; I_{Dq} = 1200 mA.

(1) f = 2300 MHz

(2) f = 2350 MHz

(3) f = 2400 MHz

Fig 8. Adjacent channel power ratio (885 kHz) of IS-95 as a function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 1200 mA.

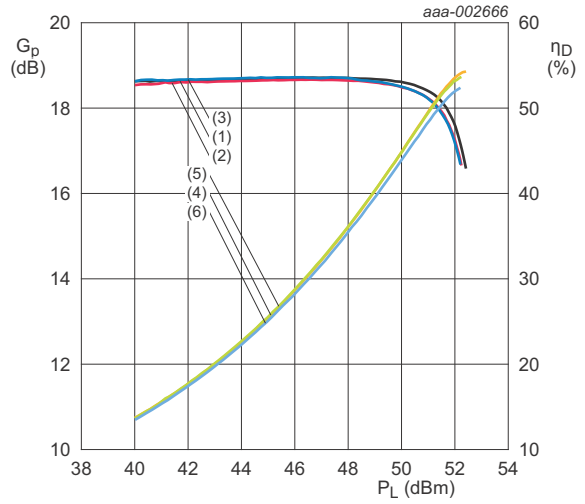
(1) f = 2300 MHz

(2) f = 2350 MHz

(3) f = 2400 MHz

Fig 9. Adjacent channel power ratio (1980 kHz) of IS-95 as a function of output power; typical values

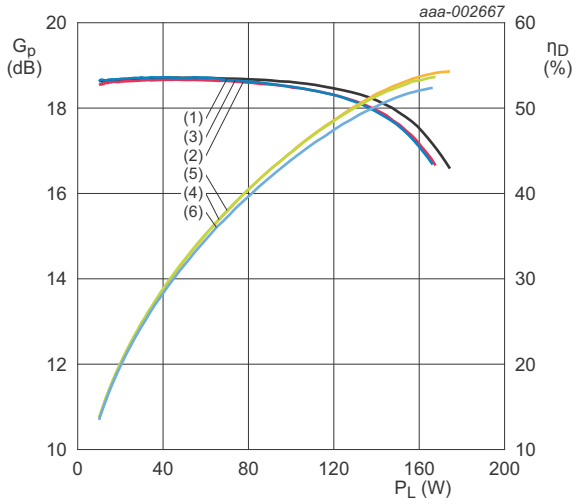
7.3.3 CW



V_{DS} = 28 V; I_{Dq} = 1200 mA.

(1) G_p at f = 2300 MHz
(2) G_p at f = 2350 MHz
(3) G_p at f = 2400 MHz
(4) η_D at f = 2300 MHz
(5) η_D at f = 2350 MHz
(6) η_D at f = 2400 MHz

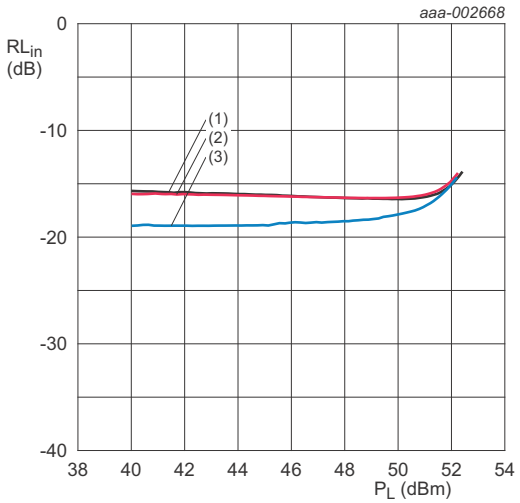
Fig 10. Power gain and drain efficiency of CW as function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 1200 mA.

(1) G_p at f = 2300 MHz
(2) G_p at f = 2350 MHz
(3) G_p at f = 2400 MHz
(4) η_D at f = 2300 MHz
(5) η_D at f = 2350 MHz
(6) η_D at f = 2400 MHz

Fig 11. Power gain and drain efficiency of CW as function of output power; typical values

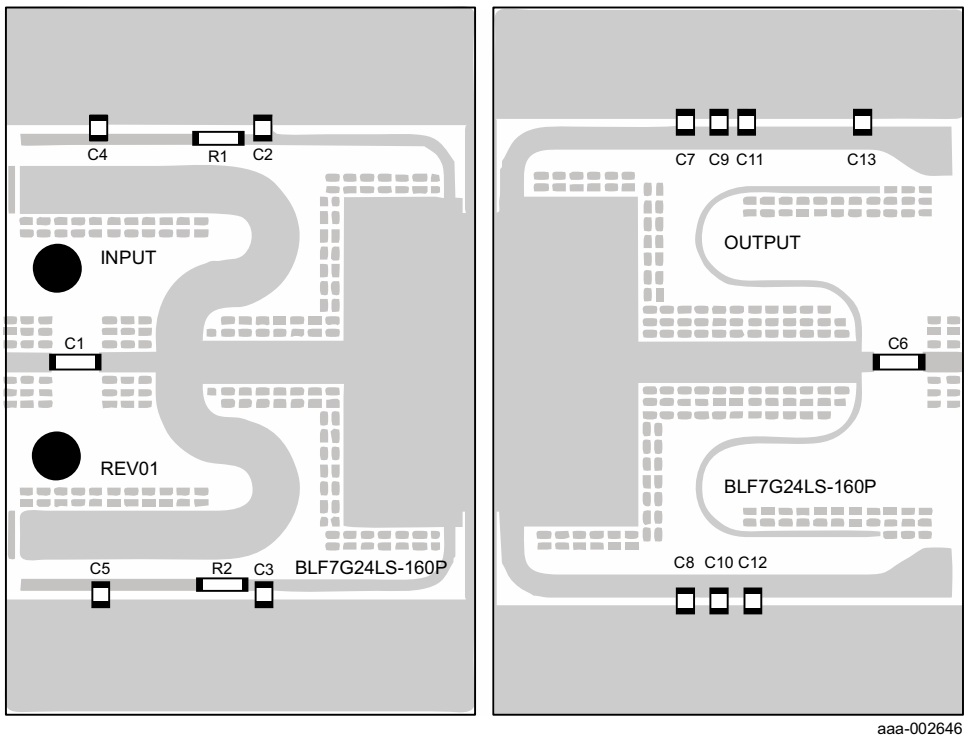


V_{DS} = 28 V; I_{Dq} = 1200 mA.

(1) f = 2300 MHz
(2) f = 2350 MHz
(3) f = 2400 MHz

Fig 12. Input return loss of CW as a function of output power; typical values

7.4 Test circuit



See Table 9 for a list of components.

Fig 13. Component layout for test circuit

Table 9. List of components

For test circuit, see Figure 13.

Component	Description	Value	Remarks
C1, C6	multilayer ceramic chip capacitor	7.5 pF	[1]
C2, C3, C7, C8	multilayer ceramic chip capacitor	16 pF	[2]
C4, C5, C9, C10	multilayer ceramic chip capacitor	20 nF	[1]
C11, C12	multilayer ceramic chip capacitor	10 μF	[3]
C13	electrolytic capacitor	220 μF; 63 V	
R1, R2	chip resistor	2 Ω; SMD 805	

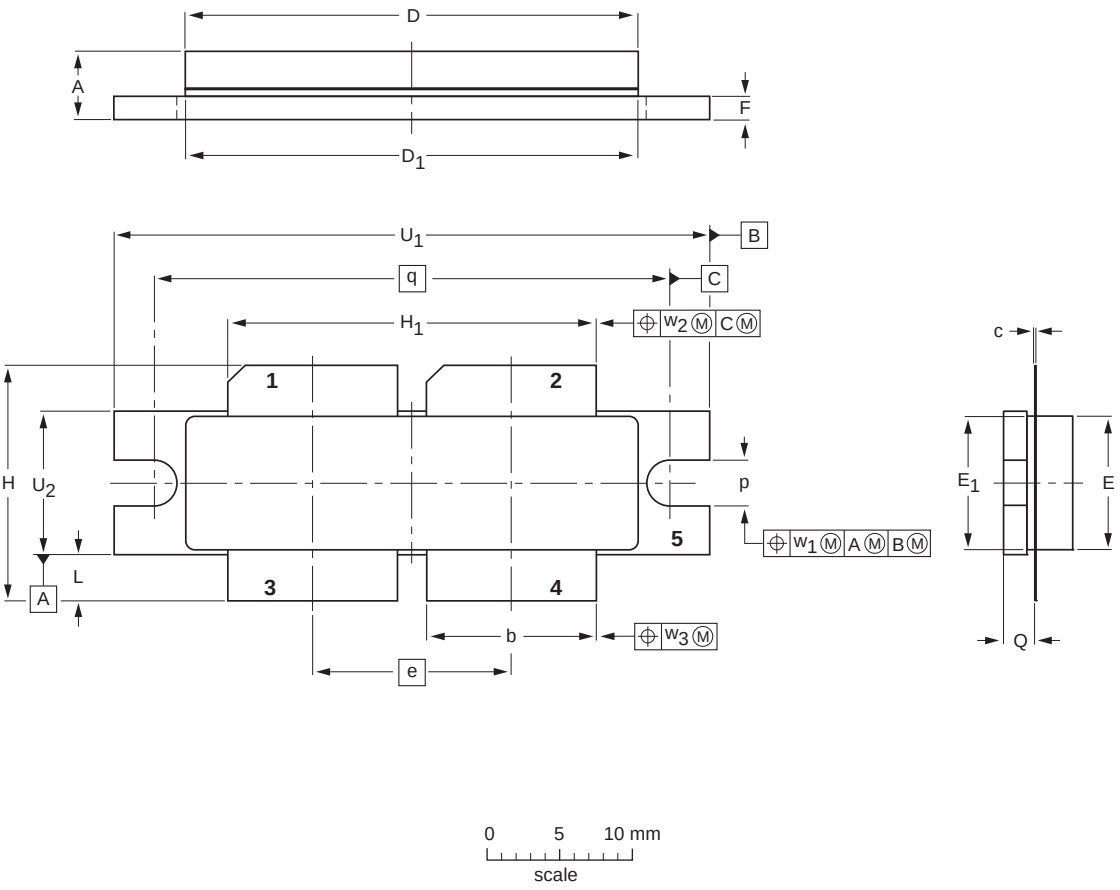
[1] American technical ceramics type 100B or capacitor of same quality.

[2] American technical ceramics type 100A or capacitor of same quality.

[3] TDK or capacitor of same quality.

8. Package outline

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



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

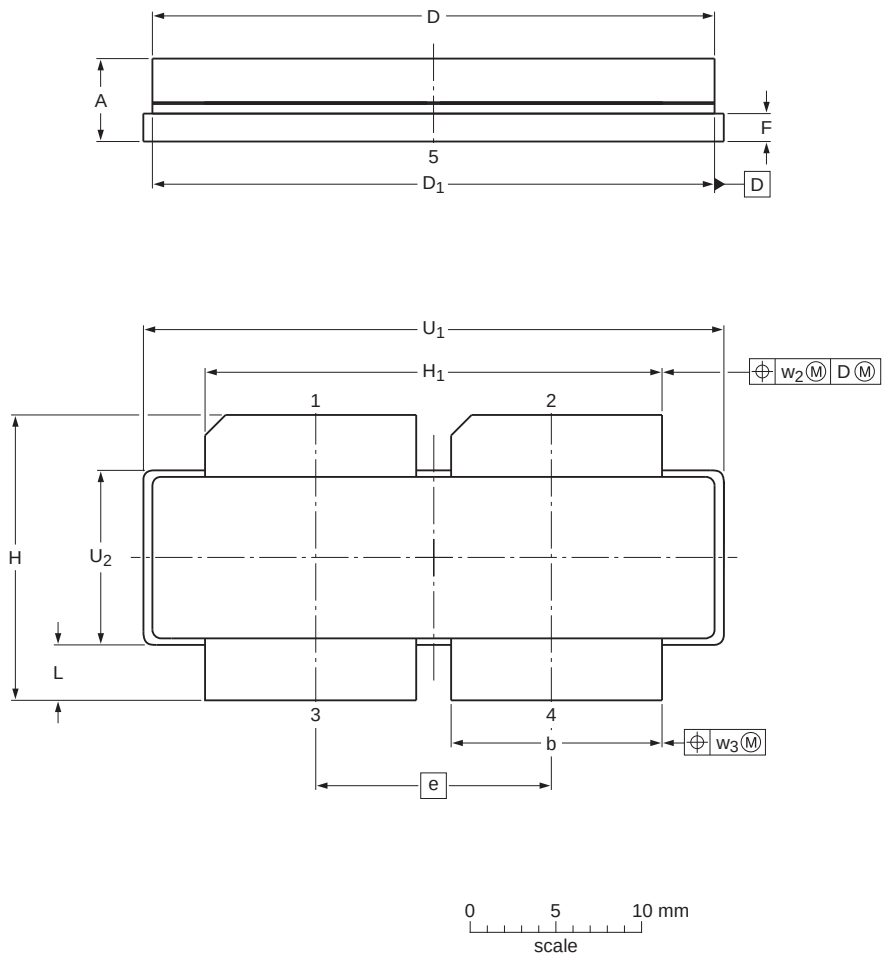
UNIT	A	b	c	D	D_1	e	E	E_1	F	H	H_1	L	p	Q	q	U_1	U_2	w_1	w_2	w_3
mm	4.7 4.2	11.81 11.56	0.18 0.10	31.55 30.94	31.52 30.96	13.72	9.50 9.30	9.53 9.27	1.75 1.50	17.12 16.10	25.53 25.27	3.48 2.97	3.30 3.05	2.26 2.01	35.56	41.28 41.02	10.29 10.03	0.25	0.51	0.25
inches	0.185 0.165	0.465 0.455	0.007 0.004	1.242 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 14. 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	13.72	1.75	17.12	25.53	3.48	2.26	32.39	10.29	0.25	0.25
	nom																	
	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	0.54	0.069	0.674	1.005	0.137	0.089	1.275	0.405	0.01	0.01
	nom																	
	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 15. Package outline SOT539B

9. Abbreviations

Table 10. Abbreviations

Acronym	Description
CCDF	Complementary Cumulative Distribution Function
IS-95	Interim Standard 95
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal Oxide Semiconductor
PAR	Peak-to-Average Ratio
RF	Radio Frequency
VSWR	Voltage Standing Wave Ratio

10. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF7G24L-160P_7G24LS-160P v.5	20130712	Product data sheet	-	BLF7G24L-160P_7G24LS-160P v.4
Modifications:	• The package outline Figure 15 is updated.			
BLF7G24L-160P_7G24LS-160P v.4	20120725	Product data sheet	-	BLF7G24L-160P_7G24LS-160P v.3
Modifications:	• The status of this document has been changed to Product data sheet • Table 6 on page 3: added max. value $R_{DS(on)}$. • Table 7 on page 3: modified max. value of RL_{in}.			
BLF7G24L-160P_7G24LS-160P v.3	20120420	Preliminary data sheet	-	BLF7G24L-160P_7G24LS-160P v.2
BLF7G24L-160P_7G24LS-160P v.2	20120301	Objective data sheet	-	BLF7G24L-160P_7G24LS-160P v.1
BLF7G24L-160P_7G24LS-160P v.1	20120210	Objective data sheet	-	-

11. Legal information

11.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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12. Contact information

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13. Contents

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