BLF7G27L-135

Power LDMOS transistor

Rev. 2 — 26 March 2012 Product data sheet

1. Product profile

1.1 General description

135 W LDMOS power transistor for base station applications at frequencies from 2600 MHz to 2700 MHz.

Table 1. Typical performance

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

Mode of operation	f	I_{Dq}	V_{DS}	$P_{L(AV)}$	G_p	η_D	$ACPR_{5M}$
	(MHz)	(mA)	(V)	(W)	(dB)	(%)	(dBc)
2-carrier W-CDMA	2600 to 2700	1300	28	35	16.5	27.5	–29 [1]

[1] Test signal: 3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF. carrier spacing 5 MHz; channel bandwidth is 3.84 MHz.

1.2 Features and benefits

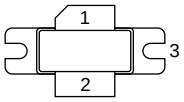
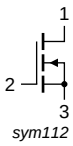
- Excellent ruggedness
- High efficiency
- Low R_{th} providing excellent thermal stability
- Designed for low memory effects providing excellent digital pre-distortion capability
- Internally matched for ease of use
- Integrated ESD protection
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

1.3 Applications

- RF power amplifiers for W-CDMA base stations and multi carrier applications in the 2600 MHz to 2700 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description		Simplified outline	Graphic symbol
1	drain			
2	gate			
3	source	[1]		

sym112

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLF7G27L-135	-	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			-	28	A
T_{stg}	storage temperature			–65	+150	°C
T_j	junction temperature		[1]	-	+200	°C

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

5. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage		-	32	V
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 °C; P_L = 35 W	0.28	K/W

7. Characteristics

Table 7. 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 = 1 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 216 mA	1.5	1.8	2.3	V
I_{DSS}	drain leakage current	V_{GS} = 0 V; V_{DS} = 28 V	-	-	5	μA
I_{DSX}	drain cut-off current	V_{GS} = $V_{GS(th)}$ + 3.75 V; V_{DS} = 10 V	34.2	40.5	-	A
I_{GSS}	gate leakage current	V_{GS} = 11 V; V_{DS} = 0 V	-	-	500	nA
g_{fs}	forward transconductance	V_{DS} = 10 V; I_D = 216 mA	-	1.87	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 7.56 A	-	0.07	-	Ω

8. Test information

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

Table 8. Functional test information

Mode of operation: 2-carrier W-CDMA, 3GPP; test model 1; 64 DPCH;. PAR = 8.4 dB at 0.01 % probability on the CCDF, carrier spacing 5 MHz; f_1 = 2627.5 MHz; f_2 = 2687.5 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 1300 mA; T_{case} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$P_{L(AV)}$	average output power			-	35	-	W
G_p	power gain	$P_{L(AV)}$ = 35 W		15.3	16.5	17.7	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 35 W		-	–16	–9.5	dB
η_D	drain efficiency	$P_{L(AV)}$ = 35 W		24.0	27.5	-	%
$ACPR_{5M}$	adjacent channel power ratio (5 MHz)	$P_{L(AV)}$ = 35 W		-	–29	–26	dBc
$ACPR_{10M}$	adjacent channel power ratio (10 MHz)	$P_{L(AV)}$ = 35 W		-	–39	–31	dBc
$P_{L(M)}$	peak output power	$P_{L(AV)}$ = 70 W	[1]	184	195	210	W
PAR	peak-to-average ratio	$P_{L(AV)}$ = 70 W	[1]	4.1	4.45	4.9	dB

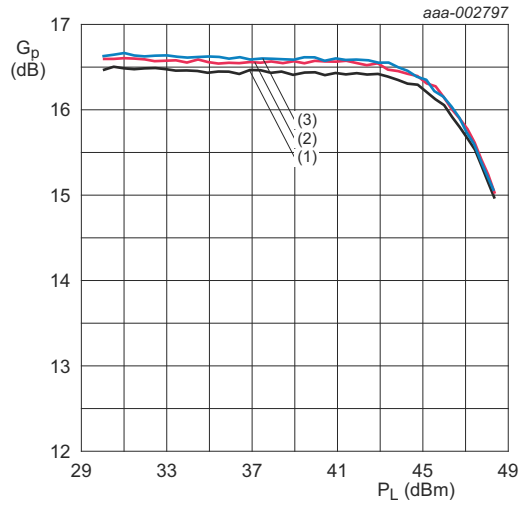
[1] Mode of operation: 1-carrier W-CDMA, 3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF; channel bandwidth is 3.84 MHz; f = 2687.5 MHz. Rohde&Schwarz FSU spectrum analyzer, CCDF method.

8.1 Ruggedness in class-AB operation

The BLF7G27L-135 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} = 1300 mA; P_L = 135 W (CW); f = 2600 MHz.

8.2 Single carrier IS-95

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.



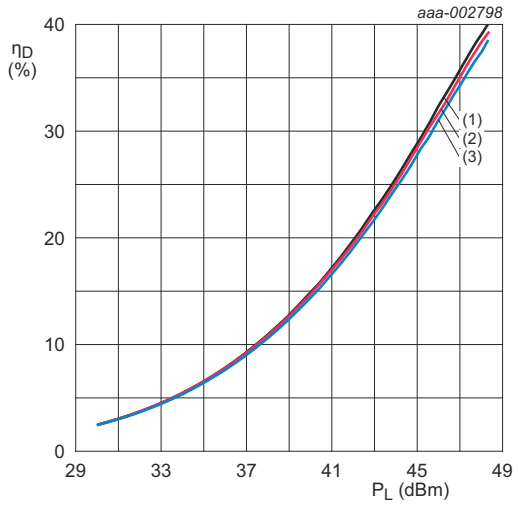
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 1. Single carrier IS-95 power gain as a function of average output power; typical values



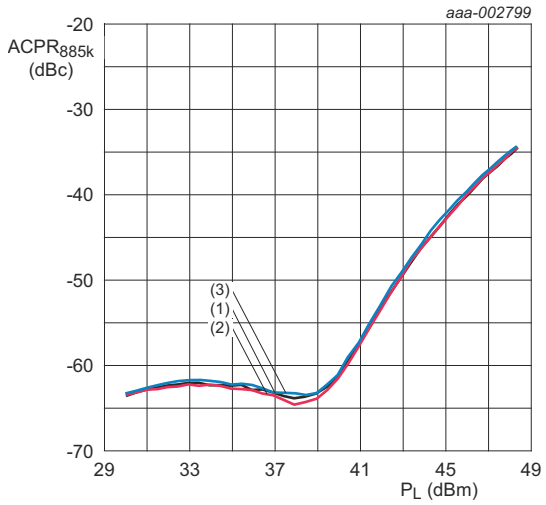
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 2. Single carrier IS-95 drain efficiency as a function of average output power; typical values



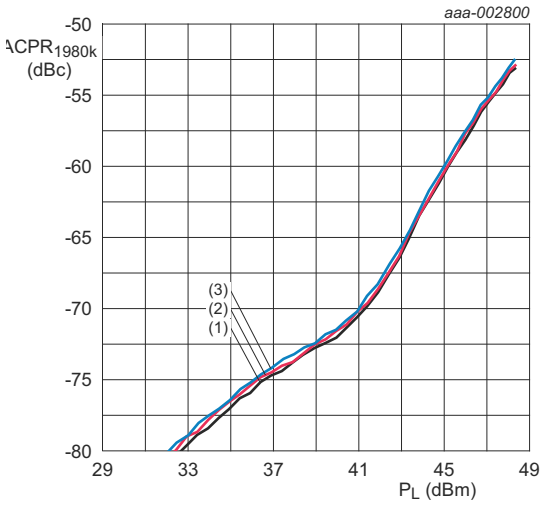
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 3. Single carrier IS-95 ACPR at 885 kHz as a function of average output power; typical values



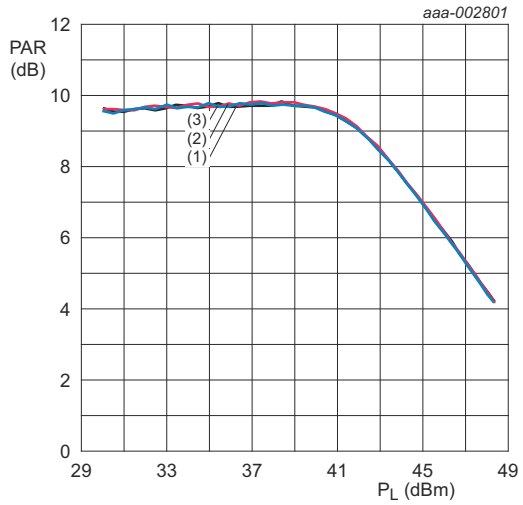
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 4. Single carrier IS-95 ACPR at 1980 kHz as a function of average output power; typical values



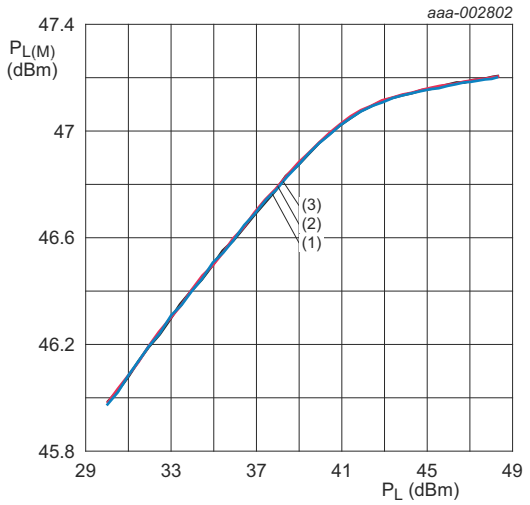
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 5. Single carrier IS-95 peak-to-average power ratio as a function of average output power; typical values



V_{DS} = 28 V; I_{Dq} = 1300 mA.

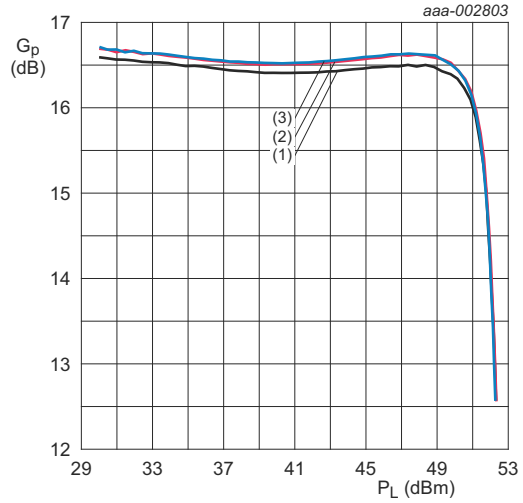
(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 6. Single carrier IS-95 peak output power as a function of average output power; typical values

8.3 Pulsed CW



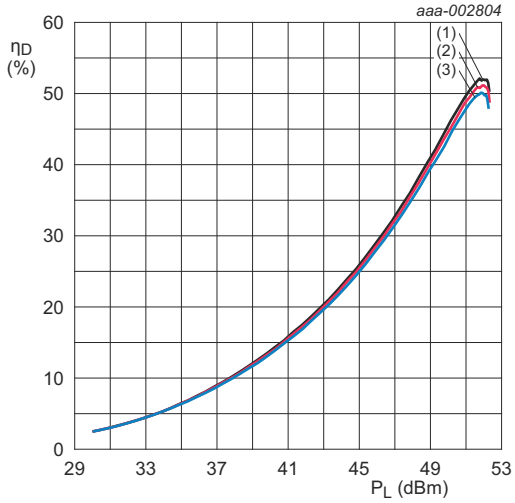
V_{DS} = 28 V; I_{Dq} = 1300 mA; t_p = 100 µs; δ = 10 %.

(1) f = 2620 MHz

(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 7. Pulsed CW power gain as a function of output power; typical values



V_{DS} = 28 V; I_{Dq} = 1300 mA; t_p = 100 µs; δ = 10 %.

(1) f = 2620 MHz

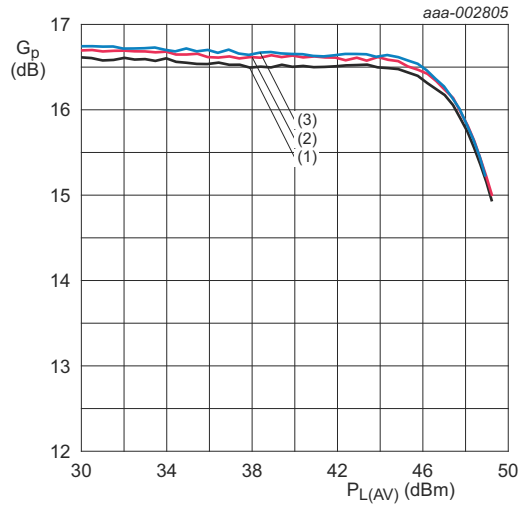
(2) f = 2655 MHz

(3) f = 2690 MHz

Fig 8. Pulsed CW drain efficiency as a function of output power; typical values

8.4 Single carrier W-CDMA

3GPP; test model 1; 64 DPCH; PAR = 7.2 dB at 0.01 % probability on CCDF. Channel bandwidth is 3.84 MHz.



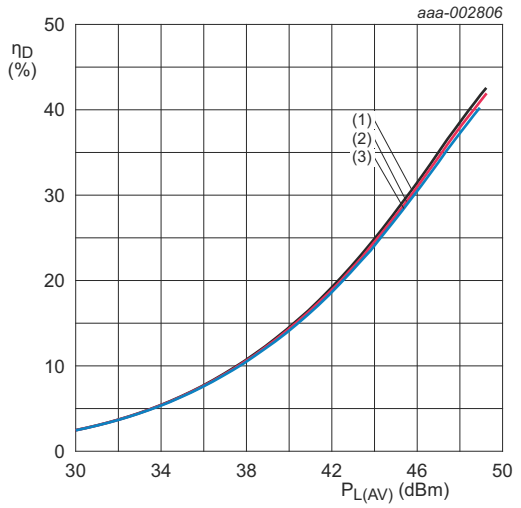
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2627.5 MHz

(2) f = 2655 MHz

(3) f = 2682.5 MHz

Fig 9. Single carrier W-CDMA power gain as a function of average output power; typical values



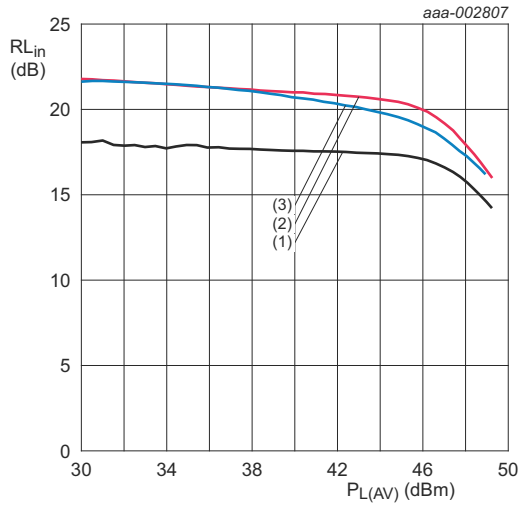
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2627.5 MHz

(2) f = 2655 MHz

(3) f = 2682.5 MHz

Fig 10. Single carrier W-CDMA drain efficiency as a function of average output power; typical values



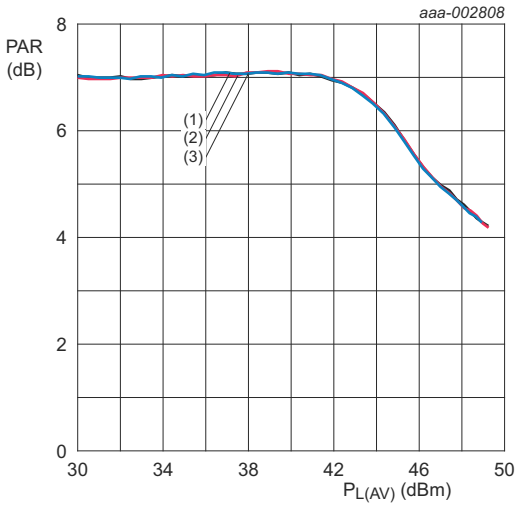
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2627.5 MHz

(2) f = 2655 MHz

(3) f = 2682.5 MHz

Fig 11. Single carrier W-CDMA input return loss as a function of average output power; typical values



V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2627.5 MHz

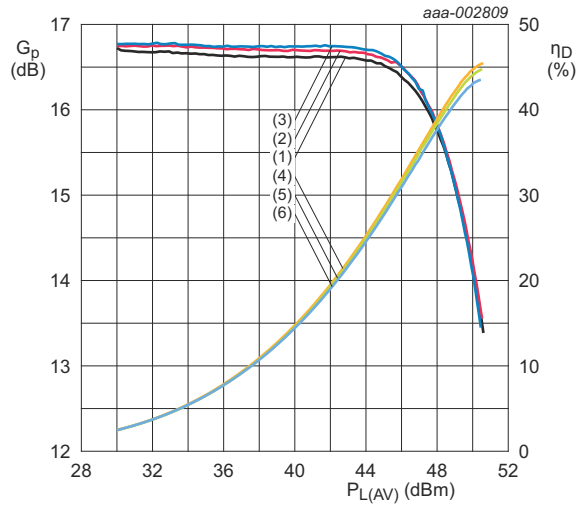
(2) f = 2655 MHz

(3) f = 2682.5 MHz

Fig 12. Single carrier W-CDMA peak-to-average power ratio as a function of average output power; typical values

8.5 Two carrier W-CDMA

3GPP; test model 1; 64 DPCH; PAR = 8.4 dB at 0.01 % probability on CCDF. Carrier spacing is 5 MHz.



V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) G_p at f = 2625 MHz

(2) G_p at f = 2650 MHz

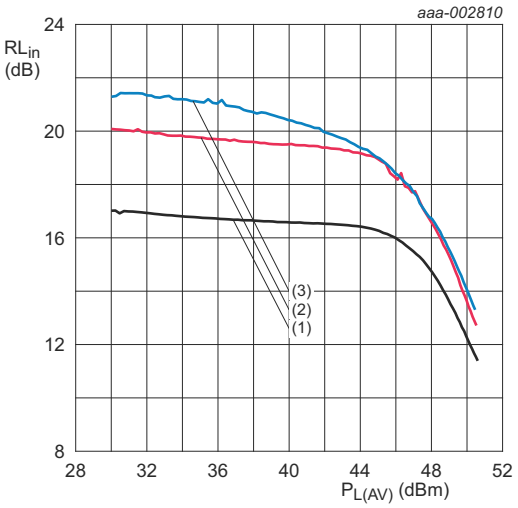
(3) G_p at f = 2685 MHz

(4) η_D at f = 2625 MHz

(5) η_D at f = 2650 MHz

(6) η_D at f = 2685 MHz

Fig 13. Two carrier W-CDMA power gain and drain efficiency as function of average output power; typical values



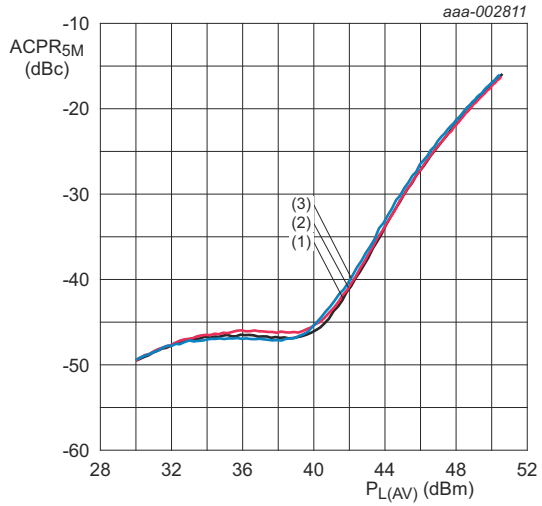
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2625 MHz

(2) f = 2650 MHz

(3) f = 2685 MHz

Fig 14. Two carrier W-CDMA input return loss as a function of average output power; typical values



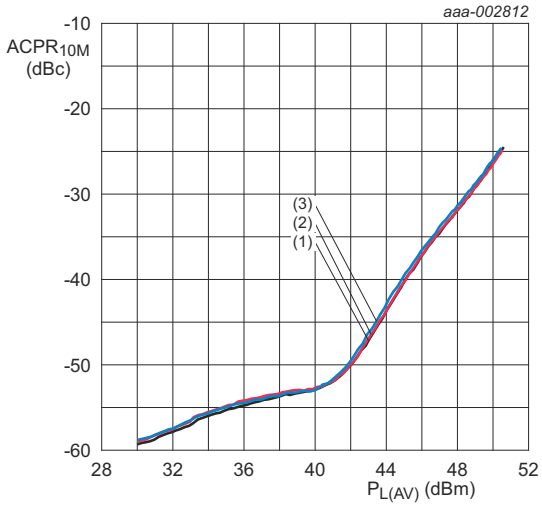
V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2625 MHz

(2) f = 2650 MHz

(3) f = 2685 MHz

Fig 15. Two carrier W-CDMA ACPR at 5 MHz as a function of average output power; typical values



V_{DS} = 28 V; I_{Dq} = 1300 mA.

(1) f = 2625 MHz

(2) f = 2650 MHz

(3) f = 2685 MHz

Fig 16. Two carrier W-CDMA ACPR at 10 MHz as a function of average output power; typical values

8.6 Impedance information

Table 9. Typical impedance

Measured load-pull data. Typical values per section.
Z_S and Z_L defined in Figure 17.

f	Z_S	Z_L
(MHz)	(Ω)	(Ω)
2500	1.8 – j3.2	1.42 – j3.19
2600	2.0 – j3.8	1.32 – j3.10
2700	3.4 – j4.1	1.17 – j3.10

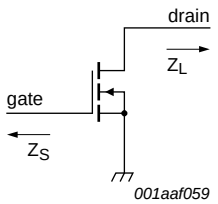
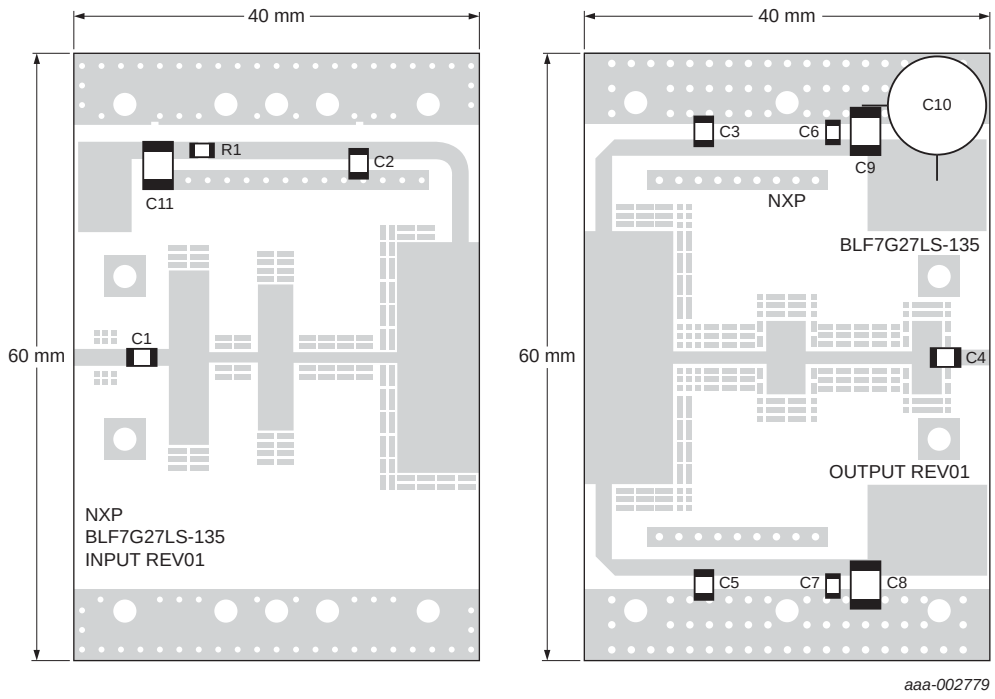


Fig 17. Definition of transistor impedance

8.7 Test circuit



Striplines are on a Taconics RF35 Printed-Circuit Board (PCB) with ε_r = 3.5 and thickness = 0.76 mm and thickness copper plating = 35 μm.

See Table 10 for list of components.

Fig 18. Component layout for test circuit

Table 10. List of components

For test circuit, see Figure 18.

Component	Description	Value		Remarks
C1, C2, C3, C4, C5	multilayer ceramic chip capacitor	24 pF	[1]	
C6, C7	multilayer ceramic chip capacitor	100 nF; SMD 0805	[2]	
C8, C9	multilayer ceramic chip capacitor	10 nF	[3]	
C10	electrolytic capacitor	220 μF, 63 V		
C11	multilayer ceramic chip capacitor	1 μF	[2]	
R1	chip resistor	2.2 Ω; SMD 0805		

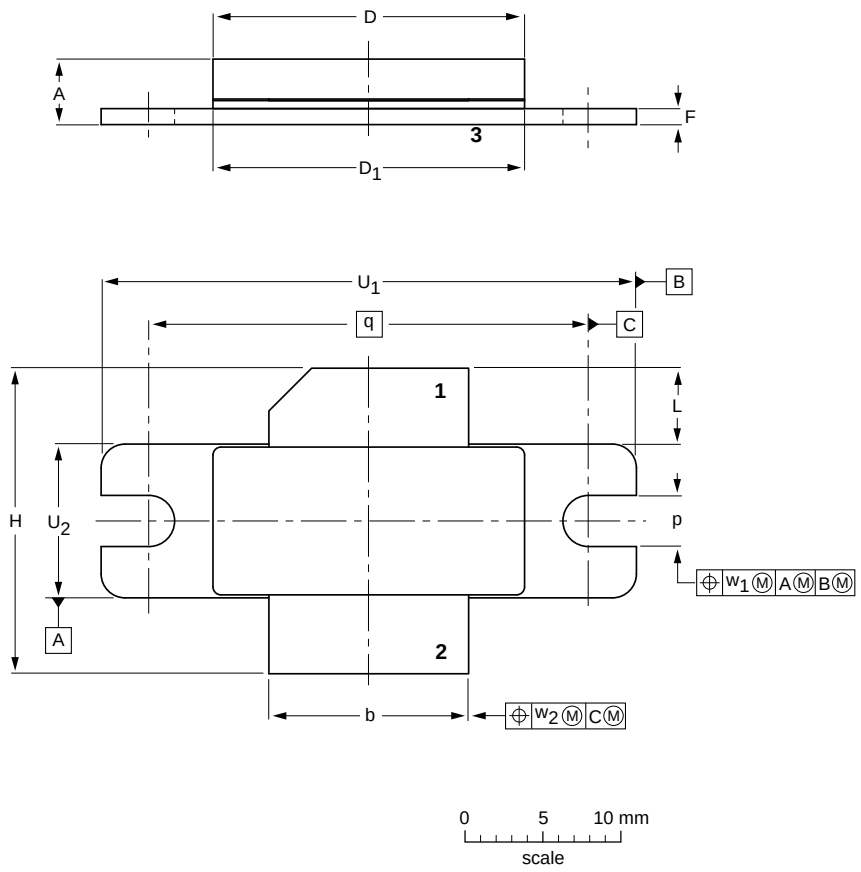
[1] American technical ceramics type 800B or capacitor of same quality.

[2] Murata or capacitor of same quality.

[3] Vishay BCcomponents 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 19. Package outline SOT502A

10. Abbreviations

Table 11. Abbreviations

Acronym	Description
3GPP	Third Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
ESD	ElectroStatic Discharge
IS-95	Interim Standard 95
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LDMOST	Laterally Diffused Metal Oxide Semiconductor Transistor
MTF	Median Time to Failure
PAR	Peak-to-Average Ratio
RF	Radio Frequency
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

11. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLF7G27L-135 v.2	20120326	Product data sheet	-	BLF7G27L-135 v.1
Modifications:	• Table 1 on page 1: ‘mode of operation’ has been changed and the values accordingly. • Table 4 on page 2: added table note. • Section 5 on page 2: section has been added. • Table 8 on page 3: several values and conditions have been changed. • Section 8.2 on page 4: graphs have been changed. • Section 8.3 on page 6: graphs have been changed. • Section 8.4 on page 7: graphs have been changed. • Section 8.5 on page 9: section has been added.			
BLF7G27L-135 v.1	20111101	Objective 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".

[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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13. Contact information

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