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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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BLC8G24LS-241AV

Power LDMOS transistor

Rev. 2 — 2 December 2016

AMPLEON

Product data sheet

1. Product profile

1.1 General description

240 W LDMOS packaged asymmetric Doherty 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 an asymmetrical Doherty production test circuit. V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V, unless otherwise specified.

Test signal	f	V_{DS}	$P_{L(AV)}$	G_p	η_D	ACPR
	(MHz)	(V)	(W)	(dB)	(%)	(dBc)
1-carrier W-CDMA	2300 to 2400	28	56	15	44	–29 [1]

[1] Test signal: 3GPP test model 1; 64 DPCH; PAR = 7.2 dB at 0.01% probability on CCDF per carrier.

1.2 Features and benefits

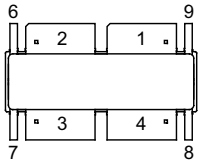
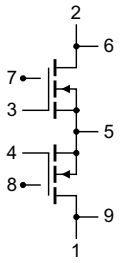
- Excellent ruggedness
- High-efficiency
- Low thermal resistance providing excellent thermal stability
- Designed for broadband operation (2300 MHz to 2400 MHz)
- Asymmetric design to achieve optimum efficiency across the band
- Lower output capacitance for improved performance in Doherty applications
- 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 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
1	drain2 (peak)		
2	drain1 (main)		
3	gate1 (main)		
4	gate2 (peak)		
5	source [1]		
6	video decoupling (main)		
7	n.c.		
8	n.c.		
9	video decoupling (peak)		

aaa-009150

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLC8G24LS-241AV	-	air cavity plastic earless flanged package; 8 leads	SOT1252-1

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
$V_{GS(amp)main}$	main amplifier gate-source voltage		–0.5	+13	V
$V_{GS(amp)peak}$	peak amplifier gate-source voltage		–0.5	+13	V
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature	[1]	-	225	°C

[1] Continuous use at maximum temperature will affect the reliability, for details refer to the online MTF calculator.

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V; T_{case} = 80 °C; P_L = 56 W	0.26	K/W

6. Characteristics

Table 6. DC characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Main device						
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 1.44 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 144 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	-	27	-	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 = 144 mA	-	1.27	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 5.04 A	-	100	166	mΩ
Peak device						
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = 0 V; I_D = 2.2 mA	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 10 V; I_D = 220 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	-	41	-	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 = 220 mA	-	1.94	-	S
$R_{DS(on)}$	drain-source on-state resistance	V_{GS} = $V_{GS(th)}$ + 3.75 V; I_D = 7.7 A	-	69	112	mΩ

Table 7. RF characteristics

Test signal: 1-carrier W-CDMA; PAR = 7.2 dB at 0.01 % probability on the CCDF; 3GPP test model 1; 1 to 64 DPCH; f_1 = 2300 MHz; f_2 = 2400 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V; T_{case} = 25 °C; unless otherwise specified; in an asymmetrical Doherty production test circuit in 2300 MHz to 2400 MHz.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G_p	power gain	$P_{L(AV)}$ = 56 W	13.3	14.5	-	dB
RL_{in}	input return loss	$P_{L(AV)}$ = 56 W	-	−10	−6	dB
η_D	drain efficiency	$P_{L(AV)}$ = 56 W	38	43	-	%
ACPR	adjacent channel power ratio	$P_{L(AV)}$ = 56 W	-	−29	−25	dBc

Table 8. RF characteristics

Test signal: pulsed CW; t_p = 100 μs; δ = 10 %; f = 2400 MHz; RF performance at V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V; T_{case} = 25 °C; unless otherwise specified; tested in an asymmetrical Doherty production test circuit in 2300 MHz to 2400 MHz.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(3dB)}$	output power at 3 dB gain compression		255	290	-	W

7. Test information

7.1 Ruggedness in class-AB operation

The BLC8G24LS-241AV 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} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V; P_L = 240 W (CW); f = 2300 MHz.

7.2 Impedance information

Table 9. Typical impedance of main device

Measured load-pull data of main device; I_{Dq} = 1000 mA; V_{DS} = 28 V. Typical values unless otherwise specified.

f	Z_S[1]	Z_L[1]	P_L[2]	η_D[2]	G_p[2]
(MHz)	(Ω)	(Ω)	(W)	(%)	(dB)
Maximum power load					
2300	1.1 – j3.5	1.6 – j4.4	171	56.20	15.2
2350	1.6 – j3.6	1.7 – j4.5	178	57.60	15.3
2400	1.9 – j4.5	1.5 – j4.6	175	55.10	16.0
Maximum drain efficiency load					
2300	1.1 – j3.5	3.1 – j3.5	127	65.50	17.1
2350	1.6 – j3.6	2.7 – j3.3	130	65.30	17.4
2400	1.9 – j4.5	2.4 – j3.5	131	64.70	18.1

[1] Z_S and Z_L defined in Figure 1.

[2] at 3 dB gain compression.

Table 10. Typical impedance of peak device

Measured load-pull data of peak device; I_{Dq} = 1230 mA; V_{DS} = 28 V. Typical values unless otherwise specified.

f	Z_S[1]	Z_L[1]	P_L[2]	η_D[2]	G_p[2]
(MHz)	(Ω)	(Ω)	(W)	(%)	(dB)
Maximum power load					
2300	1.0 – j5.3	4.0 – j4.5	252	55.30	16.5
2350	1.9 – j5.4	3.9 – j4.5	248	55.00	16.1
2400	2.1 – j6.5	4.6 – j4.5	245	53.80	16.8
Maximum drain efficiency load					
2300	1.0 – j5.3	2.7 – j2.4	190	63.90	18.3
2350	1.9 – j5.4	2.2 – j2.5	175	63.70	18.1
2400	2.1 – j6.5	2.3 – j2.7	176	63.00	18.8

[1] Z_S and Z_L defined in Figure 1.

[2] at 3 dB gain compression.

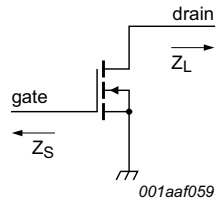
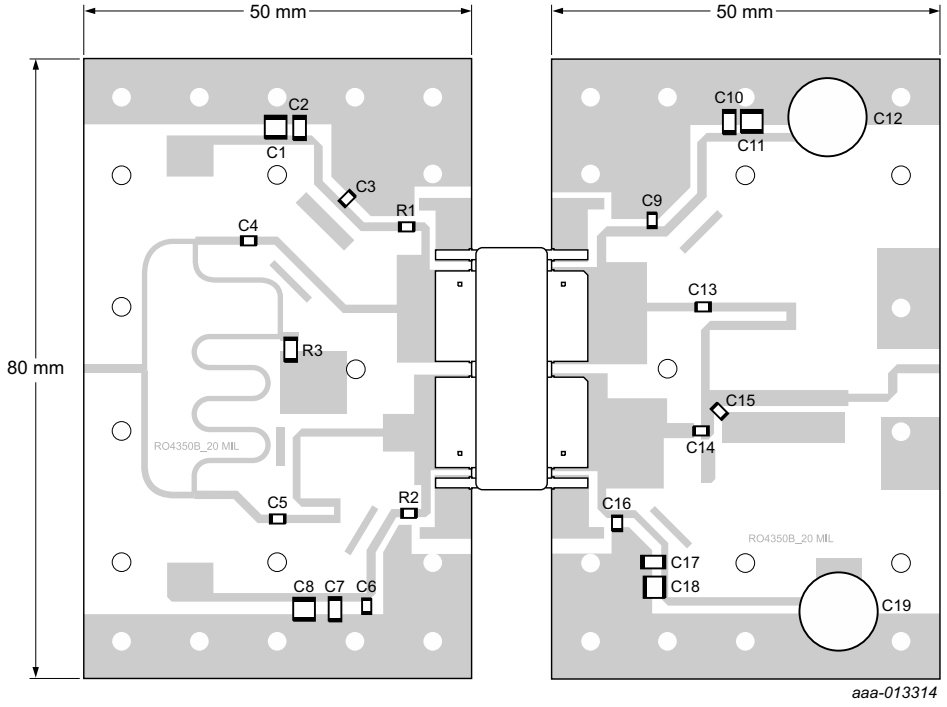


Fig 1. Definition of transistor impedance

7.3 VBW in Doherty operation

The BLC8G24LS-241AV shows 80 MHz (typical) video bandwidth in Doherty test circuit in 2.35 GHz at V_{DS} = 28 V; I_{Dq} = 500 mA and $V_{GS(amp)peak}$ = 0.30 V.

7.4 Test circuit



Printed-Circuit Board (PCB): Rogers 4350B, thickness = 0.508 mm.

See Table 11 for a list of components.

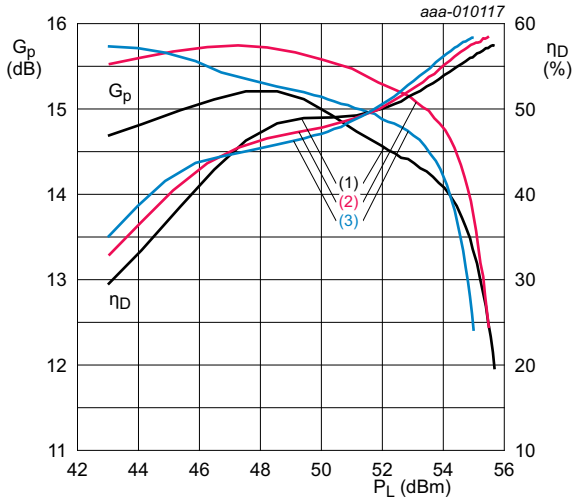
Fig 2. Component layout

Table 11. List of components
For test circuit see Figure 2.

Component	Description	Value	Remarks
C1, C8, C11, C18	multilayer ceramic chip capacitor	10 μF	Murata
C2, C7, C10, C17	multilayer ceramic chip capacitor	1 μF	Murata
C3, C4, C5, C6, C9, C13, C14, C16	multilayer ceramic chip capacitor	12 pF	ATC 800B
C12, C19	electrolytic capacitor	2200 μF, 50 V	
C15	multilayer ceramic chip capacitor	0.8 pF	ATC 600F
R1, R2	resistor	9.1 Ω	Vishay Dale: SMD 0805
R3	resistor	50 Ω	Vishay Dale: SMD 0805

7.5 Graphical data

7.5.1 Pulsed CW



V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V.

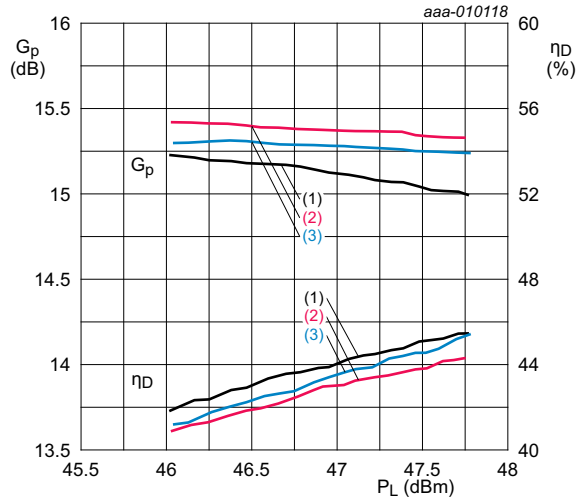
(1) f = 2300 MHz

(2) f = 2350 MHz

(3) f = 2400 MHz

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

7.5.2 1-Carrier W-CDMA



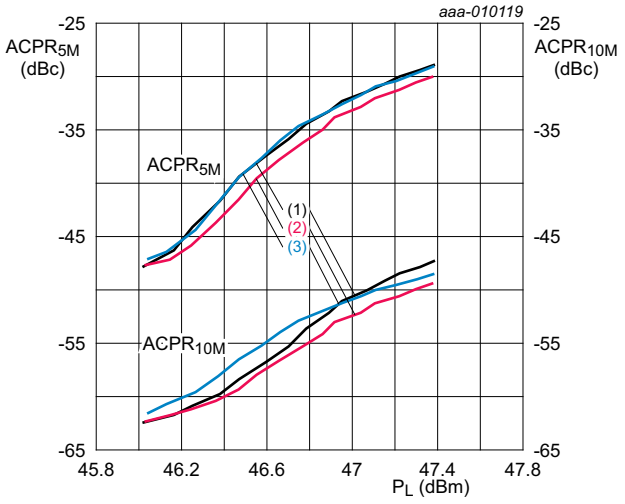
V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V.

(1) f = 2300 MHz

(2) f = 2350 MHz

(3) f = 2400 MHz

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



V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V.

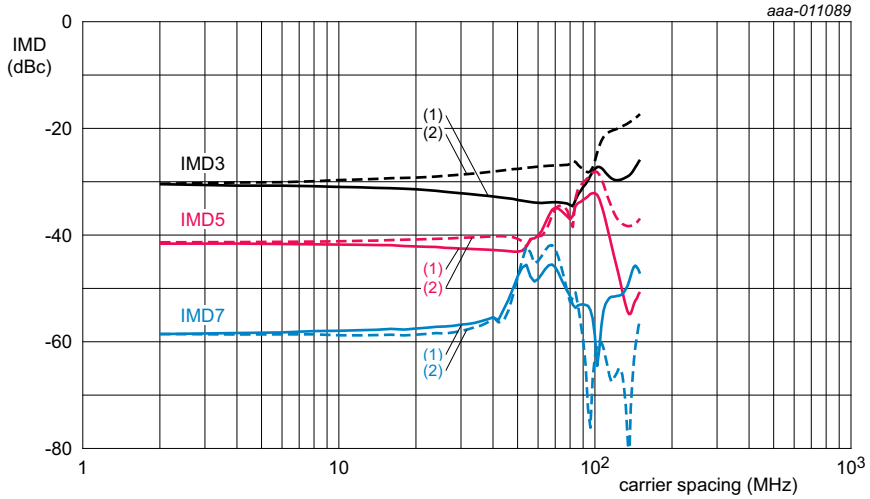
(1) f = 2300 MHz

(2) f = 2350 MHz

(3) f = 2400 MHz

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

7.5.3 2-Tone VBW



V_{DS} = 28 V; I_{Dq} = 500 mA (main); $V_{GS(amp)peak}$ = 0.30 V.

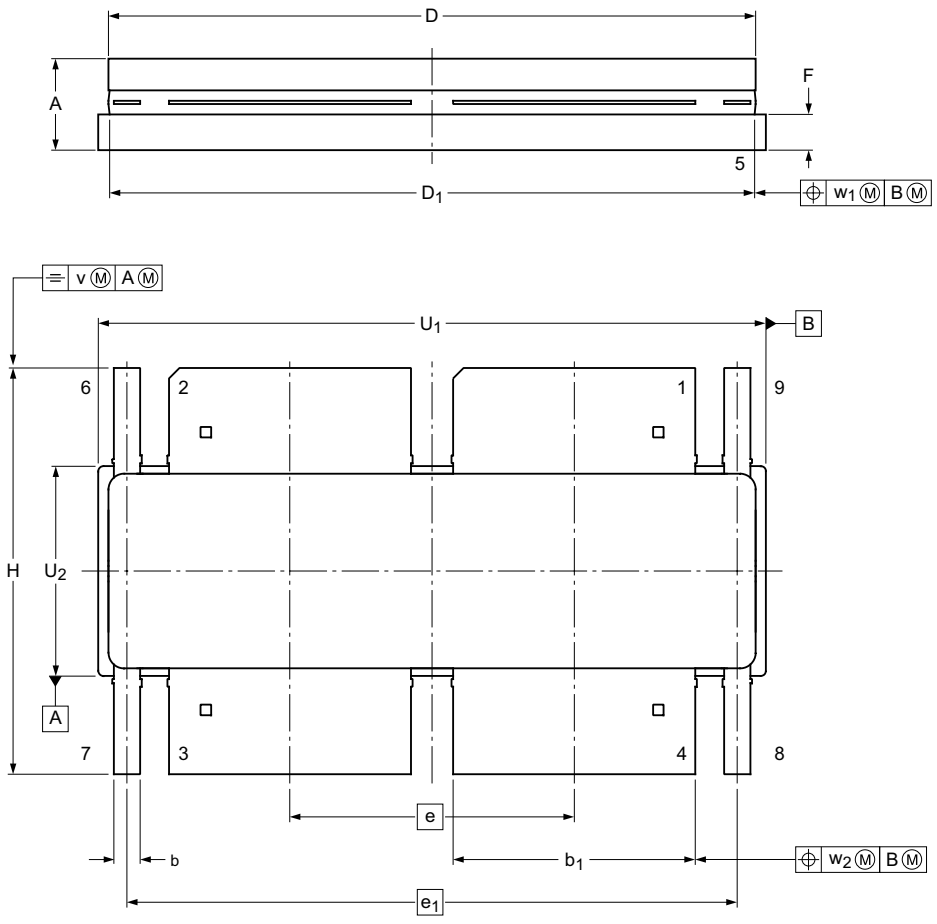
(1) IMD low

(2) IMD high

Fig 6. VBW capability in Doherty demo board

8. Package outline

Air cavity plastic earless flanged package; 8 leads **SOT1252-1**



y
0.10

Dimensions

Unit		A	b	b_1	c	D	D_1	E	E_1	e	e_1	F	H	$Q^{(1)}$	U_1	U_2	v	w_1	w_2
mm	max	4.65	1.37	11.78	0.20	31.44	31.34	9.60	9.50			1.83	19.71	2.33	32.33	10.23	0.50	0.50	0.50
	nom									13.72	29.46								
	min	4.18	1.17	11.58	0.10	31.04	31.14	9.20	9.30			1.63	19.51	2.13	32.13	10.03			

Note
1. Dimension Q is measured 0.1 mm away from the flange.
2. Ringframe and/or ringframe glue shall not overhang at the side of the flange.

sot1252-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1252-1						~~15-06-09~~ 16-10-04

Fig 7. Package outline SOT1252-1

9. Handling information

CAUTION

This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the *ANSI/ESD S20.20*, *IEC/ST 61340-5*, *JESD625-A* or equivalent standards.

Table 12. ESD sensitivity

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C2A [1]
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	2 [2]

[1] CDM classification C2A is granted to any part that passes after exposure to an ESD pulse of 500 V, but fails after exposure to an ESD pulse of 750 V.

[2] HBM classification 2 is granted to any part that passes after exposure to an ESD pulse of 2000 V, but fails after exposure to an ESD pulse of 4000 V.

10. Abbreviations

Table 13. Abbreviations

Acronym	Description
3GPP	3rd Generation Partnership Project
CCDF	Complementary Cumulative Distribution Function
CW	Continuous Wave
DPCH	Dedicated Physical CHannel
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
MTF	Median 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 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLC8G24LS-241AV v.2	20161202	Product data sheet	-	BLC8G24LS-241AV v.1
Modifications:	• Figure 7 on page 8: updated package outline drawing SOT1252-1 • Section 9 on page 9: updated Handling information			
BLC8G24LS-241AV v.1	20160209	Product 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.ampleon.com.

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14. Contents

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