



**THE DATASHEET OF
B10H0710N40DYZ**



B10H0710N40D

LDMOS 2-stage integrated Doherty MMIC

Rev. 1 — 11 September 2023

AMPLEON

Product data sheet

1. Product profile

1.1 General description

The B10H0710N40D is a dual section 2-stage fully integrated Doherty MMIC solution using Ampleon's state of the art 50 V LDMOS technology. The carrier and peaking device, input splitter, output combiner and pre-match are integrated in each section. This multiband device is perfectly suited as general purpose driver in the frequency range 700 MHz to 1 GHz. Available in LGA outline.

Table 1. Application performance

Typical RF performance at $T_{case} = 25\text{ °C}$; $I_{DQ} = 72\text{ mA}$ (carrier and peaking);

$V_{GSq(peaking)} = V_{GSq(carrier)} - 0.5\text{ V}$. Test signal: 1-carrier LTE 20 MHz measured in an Ampleon quad-combined application circuit at $f = 845\text{ MHz}$.

Test signal	f	V _{DS}	P _{L(AV)}	G _p	η _D
	(MHz)	(V)	(W)	(dB)	(%)
1-carrier LTE 20 MHz PAR = 7.6 dB	845	48	2.512	30.3	28.1

1.2 Features and benefits

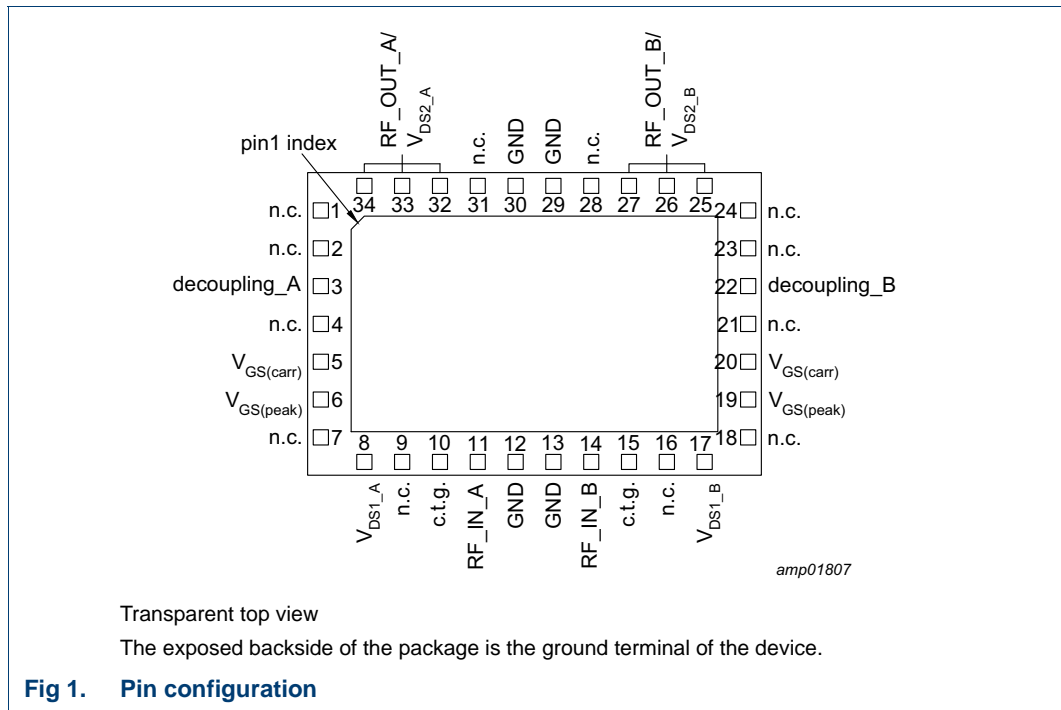
- Integrated input splitter
- Integrated output combiner
- Source impedance 50 Ω
- Pre-matched output
- No output circulator needed thanks to quad-combined configuration
- High linearity
- Designed for large RF and instantaneous bandwidth operation
- Independent control of carrier and peaking bias
- Integrated ESD protection
- High power gain
- For RoHS compliance see the product details on the Ampleon website

1.3 Applications

- 4G/5G macrocell base station driver
- 4G/5G microcell base station

2. Pinning information

2.1 Pinning



2.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
n.c.	1	not connected
n.c.	2	not connected
decoupling_A	3	video-lead for decoupling of section A
n.c.	4	not connected
$V_{GS(carr)}$	5	gate-source voltage of carrier [1]
$V_{GS(peak)}$	6	gate-source voltage of peaking [2]
n.c.	7	not connected
V_{DS1_A}	8	drain-source voltage of driver stages of section A
n.c.	9	not connected
c.t.g.	10	connect to ground
RF_IN_A	11	RF input of section A
GND	12	ground
GND	13	ground
RF_IN_B	14	RF input of section B
c.t.g.	15	connected to ground
n.c.	16	not connected
V_{DS1_B}	17	drain-source voltage of driver stages of section B

Table 2. Pin description ...continued

Symbol	Pin	Description
n.c.	18	not connected
$V_{GS(peak)}$	19	gate-source voltage of peaking [2]
$V_{GS(carr)}$	20	gate-source voltage of carrier [1]
n.c.	21	not connected
decoupling_B	22	video-lead for decoupling of section B
n.c.	23	not connected
n.c.	24	not connected
RF_OUT_B/ V_{DS2_B}	25, 26, 27	RF output and drain-source voltage of final stages of section B
n.c.	28	not connected
GND	29	ground
GND	30	ground
n.c.	31	not connected
RF_OUT_A/ V_{DS2_A}	32, 33, 34	RF output and drain-source voltage of final stages of section A

[1] Pins connected together.

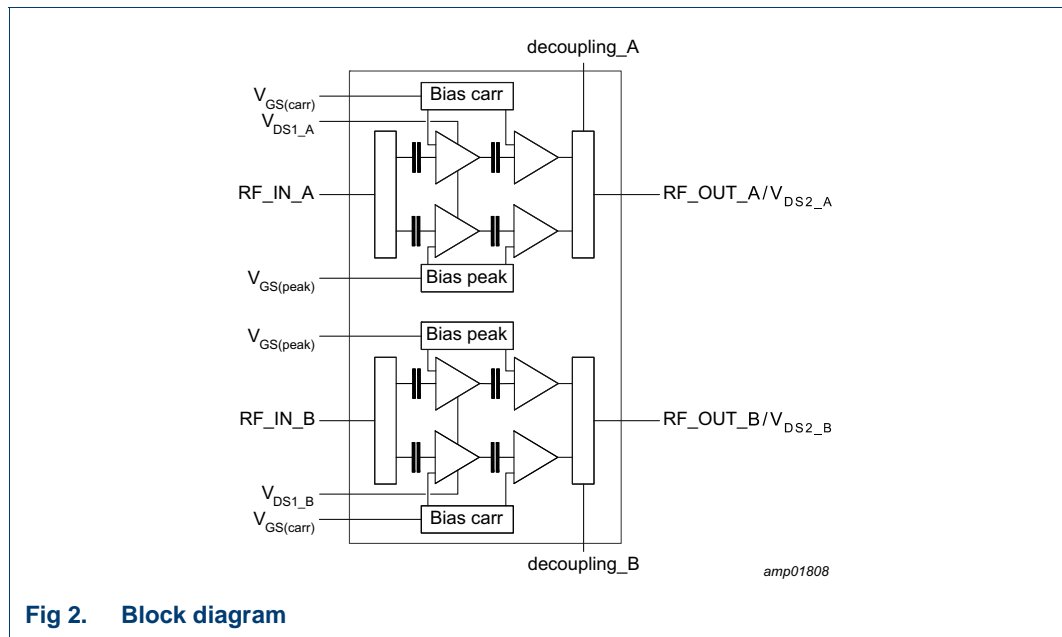
[2] Pins connected together.

3. Ordering information

Table 3. Ordering information

Package name	Orderable part number	12NC	Packing description	Min. orderable quantity (pieces)
LGA-12x8-34-2	B10H0710N40DX	9349 606 85525	TR13; 3000-fold; 24 mm; dry pack	3000
	B10H0710N40DYZ	9349 606 85535	TR7; 500-fold; 24 mm; dry pack	500

4. Block diagram



5. 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		-	110	V
V_{GS}	gate-source voltage		-6	+11	V
T_{stg}	storage temperature		-55	+125	°C
T_j	junction temperature		[1]	225	°C
T_{case}	case temperature		[1]	125	°C

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

6. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain source voltage	$T_{case} = -40\text{ °C to }+120\text{ °C}$	40	52	V
T_{case}	case temperature		-40	+120	°C
$P_{i(M)}$	peak input power	$T_{case} = 25\text{ °C}; VSWR = 1 : 1;$ $V_{DS} = V_{DS}(\text{max});$ pulsed CW power sweep measurement ($\delta = 10\%$; $t_p = 100\text{ }\mu\text{s}$).	-	19	dBm

7. Thermal characteristics

Table 6. Thermal characteristics

Measured for total device.

Symbol	Parameter	Conditions	Value	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_{case} = 90\text{ °C}; P_L = 2.512\text{ W}$	4.1	K/W

[1] When operated with a 1-carrier W-CDMA with PAR = 9.9 dB.

8. Characteristics

Table 7. DC characteristics

$T_{case} = 25\text{ °C}$.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Carrier						
V_{GSq}	gate-source quiescent voltage	$V_{DS} = 48\text{ V}; I_D = 70\text{ mA}$	1.65	2.0	2.65	V
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	120	nA
Peaking						
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	120	nA
Final stages						
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 105\text{ V}$	-	-	1.4	μA
Driver stages						
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 105\text{ V}$	-	-	1.4	μA

Table 8. RF characteristics

Typical RF performance at $T_{case} = 25\text{ °C}; V_{DS} = 48\text{ V}; I_{Dq} = 70\text{ mA}$ (carrier); $f = 848\text{ MHz}$;

$V_{GSq(peaking)} = V_{GSq(carrier)} - 0.5\text{ V}; P_{L(AV)} = 34\text{ dBm}$; unless otherwise specified, measured in an Ampleon combined production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Test signal: pulsed CW [1]						
G_p	power gain	$P_L = 2.51\text{ W}$ (34 dBm)	27	31	35	dB
η_D	drain efficiency	$P_L = 2.51\text{ W}$ (34 dBm)	20	25	-	%
		$P_L = P_{L(1dB)}$	50	54	-	%
RL_{in}	input return loss	$P_L = 2.51\text{ W}$ (34 dBm)	-	-20	-10	dB
$P_{L(1dB)}$	output power at 1 dB gain compression	$P_L = P_{L(1dB)}$	46.5	47.0	-	dBm

[1] Pulsed CW power sweep measurement ($\delta = 10\%$, $t_p = 100\text{ }\mu\text{s}$).

9. Application information

9.1 Typical performance

Table 9. Typical performance

$T_{case} = 25\text{ °C}$; $V_{DS} = 48\text{ V}$; $I_{Dq} = 72\text{ mA}$; $V_{GSq(peak)} = V_{GSq(carrier)} - 0.5\text{ V}$. Test signal: 1-carrier W-CDMA; PAR = 9.9 dB; measured at 730 MHz to 960 MHz frequency band in an Ampleon quad-combined application circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_{L(1dB)}$	output power at 1 dB gain compression	f = 845 MHz [1]	-	47.4	-	dBm
$P_{L(3dB)}$	output power at 3 dB gain compression	f = 845 MHz [1]	-	48.0	-	dBm
$\varphi_{s21}/\varphi_{s21(norm)}$	normalized phase response	at 1 dB compression point; f = 845 MHz [2]	-	-9.3	-	°
η_D	drain efficiency	$P_{L(AV)} = 34\text{ dBm}$; f = 845 MHz	-	28.1	-	%
G_p	power gain	$P_{L(AV)} = 34\text{ dBm}$; f = 845 MHz	-	30.5	-	dB
B_{video}	video bandwidth	$P_{L(AV)} = 37.5\text{ dBm}$ set to obtain IMD3 = -30 dBc; 2-tone CW; f = 845 MHz	-	161	-	MHz
G_{flat}	gain flatness	$P_{L(AV)} = 34\text{ dBm}$; f = 730 MHz to 960 MHz	-	0.3	-	dB
ACPR _{5M}	adjacent channel power ratio (5 MHz)	$P_{L(AV)} = 34\text{ dBm}$; f = 845 MHz	-	-37.3	-	dBc
$\Delta G/\Delta T$	gain variation with temperature	f = 845 MHz [3]	-	0.05	-	dB/°C
K	Rollett stability factor	$T_{case} = -40\text{ °C}$; f = 0.1 GHz to 3 GHz [3]	-	>1	-	

[1] Pulsed CW power sweep measurement ($t_p = 100\text{ }\mu\text{s}$; $\delta = 10\text{ %}$).

[2] 25 ms CW power sweep measurement.

[3] Small-signal s-parameters.

9.2 Component layout

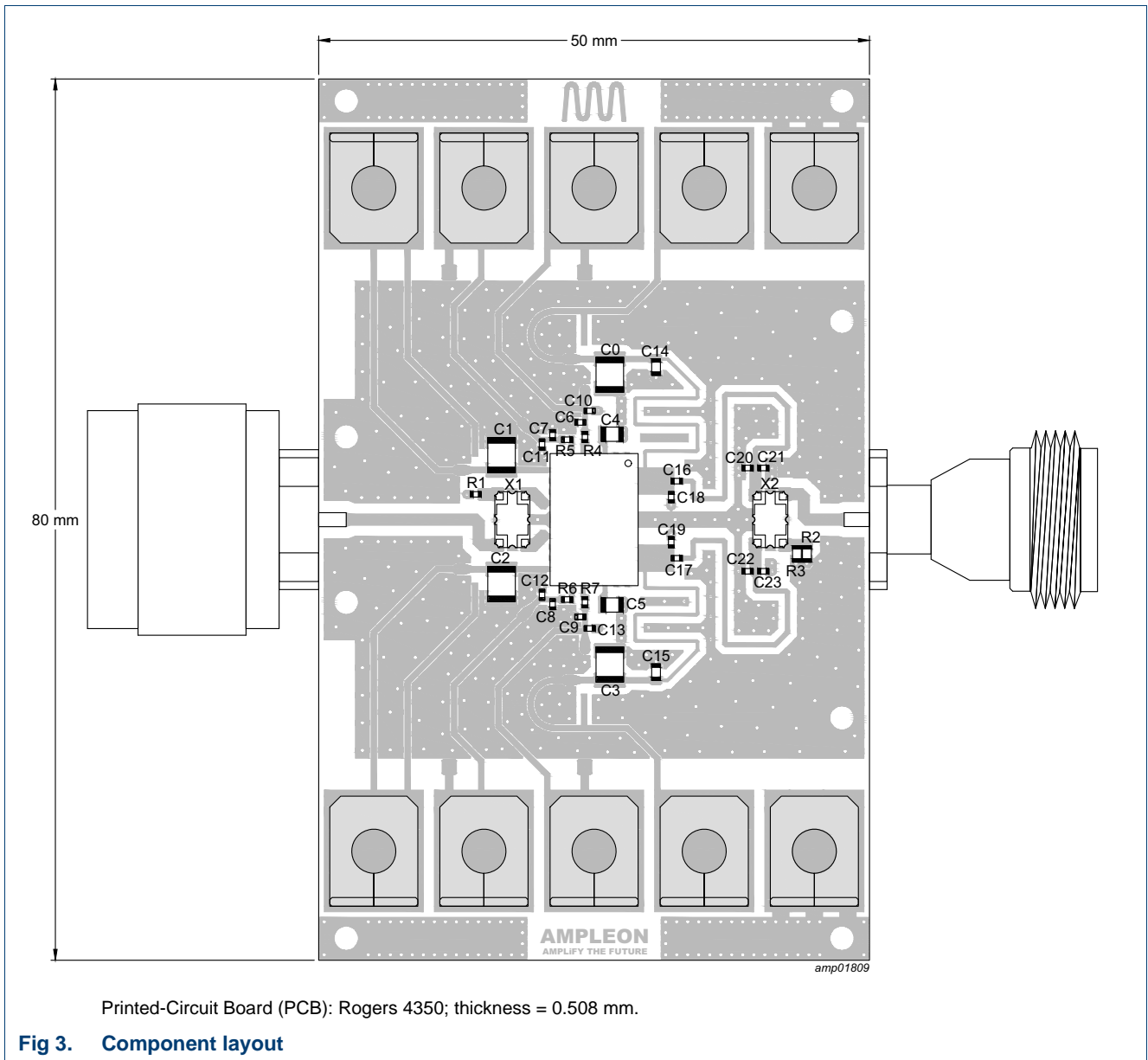


Fig 3. Component layout

Table 10. Demo test circuit list of components

See Figure 3 for component layout.

Component	Description	Value	Remarks
C0, C1, C2, C3	multilayer ceramic chip capacitor	10 μ F, 100 V	Murata: GRM32EC72A106KE05K
C4, C5	multilayer ceramic chip capacitor	1 μ F, 100 V	Murata: CGA4J3X7S2A105K125AB
C6, C7, C8, C9	multilayer ceramic chip capacitor	100 nF, 6.3 V	Murata: GRM155R70J104KA01D
C10, C11, C12, C13	multilayer ceramic chip capacitor	4.7 μ F, 6.3 V	Murata: GCJ188C70J475ME02D
C14, C15	multilayer ceramic chip capacitor	51 pF, 250 V	Murata: GQM1875C2E510FB12D
C16, C17	multilayer ceramic chip capacitor	6.2 pF, 200 V	Murata: GQM1555C2D6R2BB01D
C18, C19	multilayer ceramic chip capacitor	2 pF, 200 V	Murata: GQM1555C2D2R0BB01D

Table 10. Demo test circuit list of components ...continued
See [Figure 3](#) for component layout.

Component	Description	Value	Remarks
C20, C21, C22, C23	multilayer ceramic chip capacitor	1.5 pF, 200 V	Murata: GQM1555C2D1R5BB01D
R1	resistor	50 Ω, ±1 %, 100 mW	Vishay: FC0402E50R0BST1
R2, R3	resistor	100 Ω, ±1 %, 200 mW	Multicomp Pro: MP001293
R4, R5, R6, R7	resistor	0 Ω, ±1 %, 100 mW	Multicomp Pro: MCSR06X000PTL
X1, X2	hybrid coupler	600 MHz – 1000 MHz, 25 W	Anaren: X3C07F1-03S
J1	N coaxial panel connector male		Radiall: R161.438.200
J2	N coaxial panel connector female		Huber & Suhner: 23_N-50-0-16/133_NE

9.3 Recommendations

It is mandatory to use the B10H0710N40D in quad-combined configuration.

9.4 Ruggedness in a Doherty operation

9.4.1 Output mismatch ruggedness

The B10H0710N40D is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: $V_{DS} = 52$ V; $I_{Dq} = 70$ mA (carrier); $V_{GSq(peak)} = V_{GSq(carrier)} - 0.5$ V; P_i corresponding to $P_{L(1dB)} - 9$ dB under $Z_S = 50$ Ω load; $f = 730$ MHz (1-carrier W-CDMA); $T_{case} = 25$ °C.

9.4.2 Wideband noise ruggedness

The B10H0710N40D is capable of withstanding an AWGN (Additive White Gaussian Noise) with 11.2 dB PAR, OBW (Occupied BandWidth) of 900 MHz, under the following conditions: $V_{DS} = 52$ V; $I_{Dq} = 70$ mA (carrier); $V_{GSq(peak)} = V_{GSq(carrier)} - 0.5$ V; 3 dB P_{out} overdrive from $P_{L(AV)} = 34$ dBm; $f = 845$ MHz; $T_{case} = 25$ °C.

9.5 Impedance information

Table 11. Typical impedance for optimum Doherty operation

Measured load-pull data per section; test signal: pulsed CW; $T_{case} = 25$ °C; $V_{DS} = 48$ V; $I_{Dq} = 35$ mA (carrier); $V_{GSq(peak)} = V_{GSq(carrier)} - 0.5$ V; $t_p = 100$ μs; $\delta = 10$ %.

f (MHz)	tuned for optimum Doherty operation				
	Z_L (Ω)	$P_{L(1dB)}$ (dBm)	$G_{p(max)}$ (dB)	η_{add} [1] (%)	η_{add} [2] (%)
729	33.30 – 6.50j	44.46	31.82	27.07	55.88
758	32.98 – 2.60j	44.55	32.20	28.22	56.88
803	32.91 – 0.13j	44.49	32.53	28.63	56.56
840	34.34 + 3.31j	44.31	32.62	27.69	56.18
900	33.62 + 5.03j	44.14	32.23	26.35	55.49
960	34.54 + 11.68j	43.82	31.92	26.60	56.98

[1] At 31 dBm.

[2] At $P_{L(1dB)}$.

10. Package outline

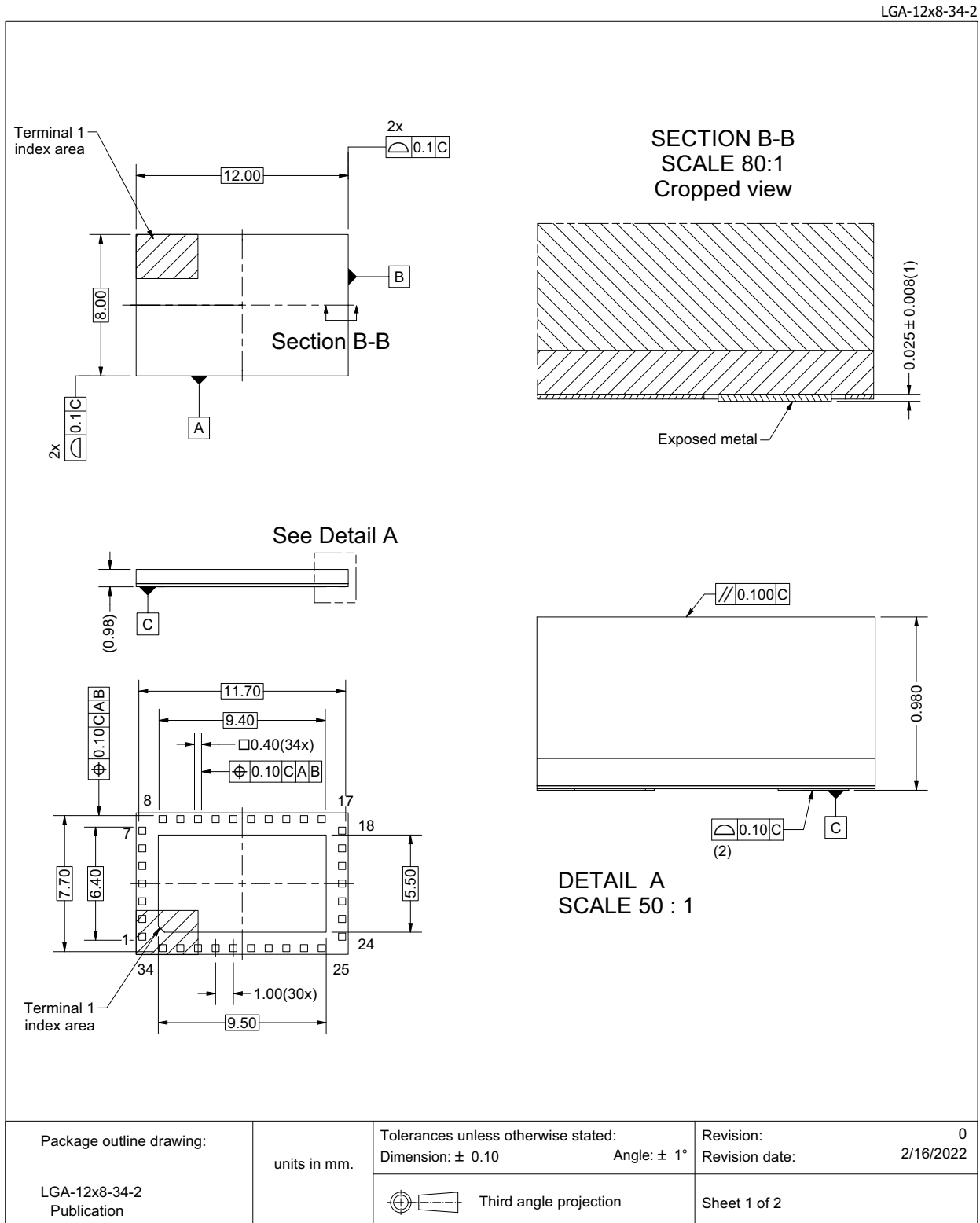


Fig 4. Package outline LGA-12x8-34-2 (sheet 1 of 2)

11. 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	C1 [1]
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	1C [2]

[1] CDM classification C1 is granted to any part that passes after exposure to an ESD pulse of 250 V.

[2] HBM classification 1C is granted to any part that passes after exposure to an ESD pulse of 1000 V.

12. Abbreviations

Table 13. Abbreviations

Acronym	Description
4G	Fourth Generation
5G	Fifth Generation
CW	Continuous Wave
ESD	ElectroStatic Discharge
LDMOS	Laterally Diffused Metal Oxide Semiconductor
LTE	Long Term Evolution
MMIC	Monolithic Microwave Integrated Circuit
MTF	Median Time to Failure
PAR	Peak-to-Average power Ratio
RoHS	Restriction of Hazardous Substances
VSWR	Voltage Standing Wave Ratio
W-CDMA	Wideband Code Division Multiple Access

13. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
B10H0710N40D v.1	20230911	Product data sheet	-	-

14. Legal information

14.1 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>.

14.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Ampleon does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Ampleon sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Ampleon and its customer, unless Ampleon and customer have explicitly agreed otherwise in writing. An agreement according to which the functions and qualities of Ampleon products exceed those described in the Product data sheet is invalid.

Right to make changes — Ampleon reserves the right to change information including but without limitation specifications and product descriptions published in this document at any time and without notice. This document supersedes and replaces all information regarding these products supplied prior to the publication hereof.

Suitability for use — Ampleon products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an Ampleon product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Insofar as a customer or another party nevertheless uses Ampleon products unlawfully for such purposes, Ampleon and its suppliers are not liable for any damages.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Ampleon makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Ampleon products, and Ampleon is not liable for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Ampleon product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers shall provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Ampleon is not liable related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for and shall do all necessary testing for the customer's applications and products using Ampleon products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Ampleon is not liable in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not guaranteed. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — Ampleon products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.ampleon.com/terms>, unless otherwise agreed in a valid written individual agreement. In the event of signing an individual agreement the terms and conditions of the respective agreement shall apply. Ampleon hereby expressly objects to and rejects the validity of customer's terms and conditions regarding the purchase of Ampleon products by customer.

14.3 Disclaimers

Maturity — After the relevant product(s) have passed the Release Gate in Ampleon's release process, Ampleon will confirm the final version in writing.

Limited warranty and liability — Ampleon uses its best efforts to keep the information in this document accurate and reliable. However, Ampleon gives no representations or warranties, expressed or implied, as to the accuracy or completeness of such information and assumes no liability for the consequences of the use of such information. Ampleon is not liable for content provided by an external information source.

In no event and irrespective of the legal basis (contract, tort (including negligence) statutory liability, misrepresentation, indemnity or any other area of law) shall Ampleon be liable for any indirect, incidental, punitive, special or consequential damages (including but without limitation loss of profit or revenue, loss of use or loss of production, loss of data, cost of capital, cost of substitute goods, property damage external to the Ampleon products and any damage, expenditure or loss arising out of such damage, business interruption, costs related to the removal or replacement of any products or rework charges) or any of the foregoing suffered by any third party.

Notwithstanding any damages that customer might incur for any reason whatsoever, Ampleon's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of Ampleon.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific Ampleon product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Ampleon is not liable for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer breaches this and uses the products for design and use in automotive applications in accordance with automotive specifications and standards, (a) Ampleon gives no warranty, representation

or other guarantees of any kind with respect to such automotive applications, use and specifications, and (b) such use is solely and exclusively at customer's own risk, and (c) customer fully indemnifies Ampleon against any and all liability, damages or failed product claims, including against third parties, arising out of customer's design and use of the product for automotive applications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

14.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

15. Contact information

For more information, please visit: <http://www.ampleon.com>

For sales office addresses, please visit: <http://www.ampleon.com/sales>

16. Contents

1 **Product profile** 1

1.1 General description 1

1.2 Features and benefits 1

1.3 Applications 1

2 **Pinning information** 2

2.1 Pinning 2

2.2 Pin description 2

3 **Ordering information** 3

4 **Block diagram** 4

5 **Limiting values** 4

6 **Recommended operating conditions** 4

7 **Thermal characteristics** 5

8 **Characteristics** 5

9 **Application information** 6

9.1 Typical performance 6

9.2 Component layout 7

9.3 Recommendations 8

9.4 Ruggedness in a Doherty operation 8

9.4.1 Output mismatch ruggedness 8

9.4.2 Wideband noise ruggedness 8

9.5 Impedance information 8

10 **Package outline** 9

11 **Handling information** 11

12 **Abbreviations** 11

13 **Revision history** 11

14 **Legal information** 12

14.1 Data sheet status 12

14.2 Definitions 12

14.3 Disclaimers 12

14.4 Trademarks 13

15 **Contact information** 13

16 **Contents** 14

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© Ampleon Netherlands B.V. 2023. All rights reserved.

For more information, please visit: <http://www.ampleon.com>
 For sales office addresses, please visit: <http://www.ampleon.com/sales>

Date of release: 11 September 2023
 Document identifier: B10H0710N40D

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View B10H0710N40DYZ on WIN SOURCE](#)

 [Ampleon USA Inc. Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management