

Bill of materials

Table 1. STDES-65ACFADP bill of materials

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
1	1	Table 2. Power board	-	Power board	ST	Not available for separate sale
2	1	Table 3. Control board	-	Control board	ST	Not available for separate sale

Table 2. Power board bill of materials

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
1	1	C7	1206 47 nF $\pm 10\%$ X7R 250 V, 1206	Ceramic capacitor	TDK	C3216X7R2E473KT020U
2	2	C4, C1	1812 0.47 μF $\pm 10\%$ 450 V, 1812	Ceramic capacitors	TDK	CGA8N4X7T2W474K230KA
3	2	C26, C21	0805 4.7 μF $\pm 10\%$ 50 V, 0805	Ceramic capacitors	TDK	C2012X7R1H475K125AC
4	2	C24, C25	SMD,6.3x7.7 mm 220 μF 25 V	E-CAP SMD	LELON	VZT221M1ETR- 0607
5	8	C6, C9, C11, C12, C31, C20, C33, C8	0402 100 nF $\pm 10\%$ 25 V X7R, 0402	Ceramic capacitors	Wuerth	885012205085
6	3	C13, C14, C15	0402 47 pF 5% 50 V, 0402	Ceramic capacitors	Wuerth	885012005059
7	1	C19	0402 10 nF $\pm 10\%$ 25 V, 0402	Ceramic capacitor	Wuerth	885012205050
8	1	C28	0402 4.7 μF $\pm 20\%$ 6.3 V, 0402	Ceramic capacitor	Wuerth	885012105008
9	1	C10	0402 100 pF $\pm 10\%$ 50 V, 0402	Ceramic capacitor	Wurth	885012205055
10	1	C29	0402 1 μF $\pm 20\%$ 10 V, 0402	Ceramic capacitor	Wuerth	885012105012
11	1	C30	0402 1 μF $\pm 10\%$ 35 V, 0402	Ceramic capacitor	TDK	C1005X5R1V105K050BC
12	1	C16	0402 220pF 5% 50V, 0402,	Ceramic capacitor	Wuerth	885012005063
13	1	C32	0402 22nF 10% 25V, 0402,	Ceramic capacitors	Wuerth	885012205052
14	1	C18	0603 47nF(473) $\pm 10\%$ 100V, 0603,	Ceramic capacitors	YAGEO	CC0603KRX7R0BB473
15	1	C22	0805 4.7 μF $\pm 20\%$ 25 V, 0805	Ceramic capacitor	Wuerth	885012107018
16	1	C46	1206 15 pF (150) $\pm 5\%$ 630 V, 1206	Ceramic capacitor	YAGEO	CC1206JKNPOCBN150

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
17	1	R1	0603 4.7 K Ω $\pm 1\%$, 0603	Resistor	YAGEO	0603WAF4701T5E
18	1	R2	0805 2.2 M Ω $\pm 1\%$, 0805	Resistor	YAGEO	RC0805FR-072M2L
19	3	R3, R4, R17	0603 20 Ω $\pm 1\%$, 0603	Resistors	YAGEO	RC0603FR-0720RL
20	1	R9	0402 220 Ω $\pm 1\%$, 0402	Resistor	YAGEO	RC0402FR-07220RL
21	1	R24	0402 100 Ω $\pm 1\%$, 0402	Resistor	YAGEO	RC0402FR-07100RL
22	5	R26, R30	0402 0 Ω $\pm 1\%$, 0402	Resistors	YAGEO	RC0402FR-070RL
23	3	R5, R6, R7, R8	0603 0.62 R $\pm 1\%$, 0603	Resistors	ROHM	UCR03EVPFLR620
24	1	R25	0603 5 mR $\pm 1\%$, 0603	Resistor	Panasonic	ERJ3LWFR005V
25	1	R10	0603 1 K Ω $\pm 1\%$, 0603	Resistor	YAGEO	RC0603FR-071KL
26	2	R14, R19	0402 47 K Ω $\pm 1\%$, 0402	Resistors	YAGEO	RC0402FR-0747KL
27	1	R13	0402 19.1K Ω $\pm 1\%$, 0402,	Resistors	YAGEO	RC0402FR-0719K1L
28	1	R15	0402 18 K Ω $\pm 1\%$, 0402	Resistor	YAGEO	RC0402FR-0718KL
29	1	R16	0402 270K Ω $\pm 1\%$, 0402,	Resistors	YAGEO	RC0402FR-07270KL
30	1	R53	0603 100 K $\pm 1\%$, 0603	Resistor	YAGEO	RC0603FR-07100KL
31	1	R20	0402 120 K Ω $\pm 1\%$, 0402	Resistor	YAGEO	RC0402FR-07120KL
32	1	R40	0603 200 Ω $\pm 1\%$, 0603	Resistor	YAGEO	RC0603FR-07200RL
33	2	R18, R23	0603 10 Ω $\pm 1\%$, 0603	Resistors	YAGEO	RC0603FR-0710RL
34	1	R21	0402 430 K Ω $\pm 1\%$, 0402	Resistor	YAGEO	RC0402FR-07430KL
35	1	R12	0402 470 K Ω $\pm 1\%$, 0402	Resistor	YAGEO	RC0402FR-07470KL
36	1	R31	0402 47 Ω $\pm 1\%$, 0402	Resistor	YAGEO	RC0402FR-0747RL
37	1	U1	MASTERGAN2, VFQFPN 9X9X1.0 31L pitch 0.6 mm	High-power density 600 V half-bridge driver with two enhancement mode GaN HEMTs	ST	MASTERGAN2
38	1	U2	STONE, QSOP36	Digital controller	ST	ST-ONE
39	1	U3	LDO40LPURY, DFN6 3x3	400 mA, 38 V low-dropout regulator with 45	ST	LDO40LPURY

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
				µA quiescent current		
40	1	D1	Z4GP208L-HF 800 V-2 A	Bridge	COMCHIP	Z4GP208L-HF
41	2	D2, D3	S1ML 1000 V - 1 A, SMA-2	Diode	Taiwan Semi	S1ML R3G
42	1	D4	ES1JFL, SOD-123FL	Diode	On Semiconductor	ES1JFL
43	1	D5	CDZVT2R6.2B 6.2 V - 100 mW, SOD-923	Zener	ROHM	CDZVT2R6.2B
44	1	D6	ESDA25P35-1U1 M, QFN-2L	High-power transient voltage suppressor	ST	ESDA25P35-1U1M
45	1	D7	ESDA25L, SOT-23-3L	Dual TRANSIL array for ESD protection	ST	ESDA25L
46	1	D8	BAT54SWFILM, SOT-323	signal diode	ST	BAT54SWFILM
47	1	J1	USB-C-MOLEX	Connector	Molex	2012670005
48	1	Q1	BC847CM SOT883_BEC_T, SOT-883	NPN transistor	Nexperia USA Inc.	BC847CM,315
49	1	Q2	STL260N4LF7, PowerFLAT 5x6	N-channel 40 V, 0.00085 ohm typ., 50 A STripFET F7 power MOSFET	ST	STL260N4LF7
50	2	LB2, LB3	206 size 6 A, 1206	Ferrite beads	Sunlord	PZ3216D190-6R0TF
51	1	T2	4 mH 1.2 A 200 mΩ	Common mode choke	Würth Elektronik	S16100016
52	1	C3	120 µF 400 V	E-CAP	Aishi	EHS2GM121L300T
53	1	C2	22 µF, 400 V	E-CAP	Aishi	ERK2GM220F160T
54	1	F1	3.15 A	Fuse	Littelfuse	39213150000
55	1	C17	220 nF 275 V _{AC}	X-CAP	SRD	MP2224K27C5R6LC
56	1	L1	10 µH 1.85 A	Inductor	Würth Elektronik	744779100
57	1	J5	I ² C programming CONN_MOLEX	CONN_MOLEX	MOLEX	90325-0006
58	1	C52	3.3 nF	Y1 capacitor	STE	Q11F1D332MN0B0S0N0

Table 3. Control board bill of materials

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
1	1	C42	0805 50 V 4.7 µF ±10% X7R, 0805	Ceramic capacitor	TDK	C2012X7R1H475K
2	1	C40	0603 1 µF ±10% 50 V X7R, 0603	Ceramic capacitor	TAIYO YUDEN	UMK107AB7105KA-T
3	1	C41	1206 22 µF ±20% 35 V, 1206	Ceramic capacitor	TDK	C3216X5R1V226M160AC
4	1	C43	0402 10 nF ±10% 25 V X7R, 0402	Ceramic capacitor	Wuerth	885012205050
5	1	C38	1210 2.2 µF ±10% 100 V, 1210	Ceramic capacitor	Walsin	1210B225K101CT
6	1	C37	0603 100 nF ±10% 100 V X7R, 0603	Ceramic capacitor	Wuerth	885012206120

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
7	1	C36	0805 22 μ F \pm 20% 25 V X5R, 0805	Ceramic capacitor	SAMSUNG	CL21A226MAQNNNE
8	1	C44	1206 100 μ F \pm 20% 25 V, 1206	Polymer solid electrolytic capacitor	KEMET	T521D107M025ATE060
9	1	D9	325 V SOD-882	Signal diode	Nexperia	BAS521LP-7
10	1	D10	200 V SOD-882	Signal diode	Nexperia	BAS21LLYL
11	1	D11	100 V SOD-882	Signal diode	NXP	BAS16LD
12	1	D12	10 V - 100 mW SOD-923	Zener diode	ROHM	CDZVT2R10B
13	1	Q5	250 V 30 Ω , SOT23	N-channel transistor	INFINEON	BSS139H6327XTSA1
14	2	Q3, Q4	100 V 12 Ω , SOT23	N-channel transistor	INFINEON	BSS169H6327XTSA1
15	1	Q6	STL90N10F7, PowerFLAT 5x6	N-channel 100 V, 0.007 ohm typ., 70 A STripFET F7 power MOSFET	ST	STL90N10F7
16	1	R39	0402 200 Ω \pm 1%, 0402	Resistor	YAGEO	RC0402FR-07200RL
17	2	R33, R37	0402 100K Ω \pm 1%, 0402,	Resistors	YAGEO	RC0402FR-07100KL
18	1	R38	0402 160K Ω \pm 1%, 0402,	Resistors	YAGEO	RC0402FR-07160KL
19	1	R36	0402 1 K Ω \pm 1%, 0402	Resistor	YAGEO	RC0402JR-071KL
20	1	R35	0402 0 Ω 1%, 0402	Resistor	YAGEO	RC0402FR-070RL
21	1	R32	0402 47 K Ω \pm 1%, 0402	Resistor	YAGEO	RC0402FR-0747KL
22	1	R34	0402 1 Ω \pm 5%, 0402	Resistor	YAGEO	AC0402JR-071RL
23	1	C39	THT 100 V 15 μ F	E-CAP	Ymin	LKMB1102A150MF

Evaluation board license agreement

Important: All information on this document is subject to this Evaluation Board License Agreement.

By using this evaluation board or kit (together with all related software, firmware, components, and documentation provided by ST, "Evaluation Board"), You ("You") are agreeing to be bound by the terms and conditions of this Evaluation Board License Agreement ("Agreement"). Do not use the Evaluation Board until You have read and agreed to this Agreement. Your use of the Evaluation Board constitutes Your acceptance of this Agreement.

LICENSE

STMicroelectronics ("ST") grants You the right to use the enclosed Evaluation Board offering limited features only to evaluate and test ST products solely for Your evaluation and testing purposes in a research and development setting. The Evaluation Board shall not be, in any case, directly or indirectly assembled as a part in any production of Yours as it is solely developed to serve evaluation purposes and has no direct function and is not a finished product. If software and/or firmware is accompanied by a separate end user license agreement ("EULA"), then such software and/or firmware shall be governed by such EULA.

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RESTRICTIONS AND WARNINGS

Before You handle or use the Evaluation Board, You must carefully review any related documentation provided by ST. Such documentation may contain important warnings. You shall comply with all such warnings and other instructions and employ reasonable safety precautions in using the Evaluation Board. Failure to do so may result in death, personal injury, or property damage. If You have any questions regarding the safe usage of the Evaluation Board, You should contact ST for guidance.

You may not sell, assign, sublicense, lease, rent or otherwise distribute the Evaluation Board for commercial purposes, in whole or in part, or use Evaluation Board in a production system, with the exception that if You are an authorized ST distributor, You may resell the Evaluation Board in compliance with the applicable terms and conditions. Except as provided in this Agreement or as explicitly permitted in the documentation of the Evaluation Board, You may not reproduce the Evaluation Board or modify,

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You shall not use the Evaluation Board in any safety critical or functional safety testing, including but not limited to testing of life supporting, military or nuclear applications. ST expressly disclaims any responsibility for such usage which shall be made at Your sole risk, even if ST has been informed in writing of such usage. Unless expressly designated in writing by ST as suitable for use in testing automotive or aerospace applications, You shall not use the Evaluation Board in such testing.

Notice applicable to Evaluation Boards according to European Regulation

For the European Regulation of the Evaluation Board, the applicable EU directives are considered, with a particular attention to the Low Voltage Directive (LVD) 2014/35/EU, the Electromagnetic Compatibility (EMC) Directive 2014/30/EU, and the Radio Equipment Directive (RED) 2014/53/EU. If the Evaluation Board is outside the scope of the foregoing Directives, then the General Product Safety Directive (GPSD) 2001/95/EC and Council Directive 93/68/EEC, amending Directive 73/23/EEC on electrical equipment designed for use within certain voltage limits, are applicable.

The Evaluation Board meets the requirements of the Restriction of Hazardous Substances (RoHS 2 or RoHS recast) Directive 2011/65/EU, Annex II, as amended by Directive 2015/863/EU.

Notice applicable to Evaluation Boards not FCC-Approved

This kit is designed to allow:

1. Product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and
2. Software developers to write software applications for use with the end product.

This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of 47 CFR, Chapter I ("FCC Rules"), the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

For Evaluation Boards annotated as FEDERAL COMMUNICATIONS COMMISSION (FCC) Part 15 Compliant

- **FCC Interference Statement for Class A Evaluation Boards:** This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
- **FCC Interference Statement for Class B Evaluation Boards:** This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
 - Reorient or relocate the receiving antenna.
 - Increase the separation between the equipment and receiver.
 - Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
 - Consult the dealer or an experienced radio/TV technician for help.
- This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

WARRANTY

ST WARRANTS THAT IT HAS THE RIGHT TO PROVIDE THE EVALUATION BOARD TO YOU. THIS WARRANTY IS PROVIDED BY ST IN LIEU OF ALL OTHER WARRANTIES, WRITTEN OR ORAL, STATUTORY, EXPRESS OR IMPLIED, INCLUDING ANY WARRANTY AS TO MERCHANTABILITY, NON-INFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, OR UNINTERRUPTED OR ERROR-FREE OPERATION, ALL OF WHICH ARE EXPRESSLY DISCLAIMED. THE EVALUATION BOARD IS PROVIDED "AS IS".

YOU WARRANT TO ST THAT YOU WILL ENSURE THE EVALUATION BOARD IS USED ONLY BY ELECTRONICS EXPERTS WHO UNDERSTAND THE DANGERS OF HANDLING AND USING SUCH ITEMS, YOU ASSUME ALL RESPONSIBILITY AND LIABILITY FOR ANY IMPROPER OR UNSAFE HANDLING OR USE OF THE EVALUATION BOARD BY YOU, YOUR EMPLOYEES, AFFILIATES, CONTRACTORS, AND DESIGNEES.

LIMITATION OF LIABILITIES

IN NO EVENT SHALL ST BE LIABLE TO YOU, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY, OR ANY OTHER LEGAL THEORY, FOR ANY INDIRECT, SPECIAL, CONSEQUENTIAL, INCIDENTAL, PUNITIVE, OR EXEMPLARY DAMAGES WITH RESPECT TO ANY MATTERS RELATING TO THIS AGREEMENT, REGARDLESS OF WHETHER ST HAS BEEN ADVISED OF THE POSSIBILITY OF THE SAME. IN NO EVENT SHALL ST'S LIABILITY ARISING OUT OF THIS AGREEMENT IN THE AGGREGATE EXCEED THE AMOUNT PAID BY YOU UNDER THIS AGREEMENT FOR THE PURCHASE OF THE EVALUATION BOARD, OR TEN UNITED STATES DOLLARS (\$10.00) IF NO PURCHASE PRICE WAS PAID.

INDEMNIFICATION

You shall, at Your expense, defend ST and its Affiliates against a claim or action brought by a third party for infringement or misappropriation of any patent, copyright, trade secret or other intellectual property right of a third party to the extent resulting from (1) Your combination of the Evaluation Board with any other component, system, software, or firmware, (2) Your modification of the Evaluation Board, or (3) Your use of the Evaluation Board in a manner not permitted under this Agreement.

You shall indemnify ST and its Affiliates against and pay any resulting costs and damages finally awarded against ST or its Affiliates or agreed to in any settlement, provided that You have sole control of the defense and settlement of the claim or action, and ST cooperates in the defense and furnishes all related evidence under its control at Your expense. ST will be entitled to participate in the defense of such claim or action and to employ counsel at its own expense.

"Affiliates" means any corporation or other entity directly or indirectly controlled by, controlling or under common control with the entity in question, for so long as such ownership exists. "Control" means the direct or indirect beneficial ownership of more than fifty (50%) percent of the stock or other equity interests entitled to vote for the election of directors or an equivalent governing body. Any such corporation or other legal entity shall be deemed to be an Affiliate of such Party only as long as such Control exists.

TERMINATION

ST may terminate this Agreement without notice if You breach this Agreement. Upon termination, You shall immediately destroy or return all copies of the software, firmware, and documentation of the Evaluation Board to ST and certify in writing to ST that You have done so.

APPLICABLE LAW AND JURISDICTION

This Agreement shall be governed, construed and enforced in accordance with the laws of Switzerland, without regard to its conflict of laws rules. The UN Convention on Contracts for the International Sale of Goods shall not apply to this Agreement. In case of dispute and in the absence of an amicable settlement, the only competent jurisdiction shall be the Courts of Geneva, Switzerland. Any breach of this Agreement by You may result in irreparable damage to ST for which ST will not have an adequate remedy at law. Accordingly, in addition to any other remedies and damages available, You acknowledge and agree that ST may immediately seek enforcement of this Agreement in any jurisdiction by means of specific performance or injunction, without any requirement to post a bond or other security.

SEVERABILITY

If any provision of this agreement is or becomes, at any time or for any reason, unenforceable or invalid, no other provision of this agreement shall be affected thereby, and the remaining provisions of this agreement shall continue with the same force and effect as if such unenforceable or invalid provisions had not been inserted in this Agreement. In addition, any unenforceable or invalid provision shall be deemed replaced by a provision that is valid and enforceable and that comes closest to expressing the intention of the unenforceable or invalid provision.

WAIVER

The waiver by either party of any breach of any provision of this Agreement shall not operate or be construed as a waiver of any other or a subsequent breach of the same or a different provision.

RELATIONSHIP OF THE PARTIES

Nothing in this Agreement shall create, or be deemed to create, any joint venture, partnership, principal-agent, employer-employee or other relationship between the Parties, except that of independent contractors. Neither Party has the authority or power to bind, to contract in the name of, or to create a liability for the other in any way or for any purpose.

SURVIVAL

Any provision of this Agreement which imposes an obligation after termination of this Agreement shall survive the termination of this Agreement.

SECTION HEADINGS

Section headings are inserted for convenience only and shall not be used to interpret this Agreement.

WASTE AND RECYCLING

The Evaluation Board is not to be disposed of as urban waste. At the end of its life cycle, differentiated waste collection must be followed. Consult the local authorities for more information on the proper disposal channels. It is mandatory to separately collect the Evaluation Board and make sure it is delivered it to the appropriate waste management and recycling centers.

As of 15 August 2018, in all the countries belonging to the European Union, the Evaluation Board is subject to the WEEE Directive 2012/19/EU requirement; therefore, it is forbidden to dispose of the Evaluation Board as undifferentiated waste or with other domestic wastes. Consult the local authorities for more information on the proper recycling centers.

Disposing of the Evaluation Board incorrectly may cause damage to the environment and may be subject to fines based on specific countries' rules.

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