

Bill of materials

Table 1. STDES-6KWHVDCDC bill of materials

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
1	4	D5, D6, D7, D8	STPSC40H12CW L, TO-247 LL 1200 V 40 A	1200 V power Schottky silicon carbide diode	ST	STPSC40H12CWL
2	2	Q1, Q4	2STR2160 SOT-23 60V 1A	Low voltage fast- switching PNP power transistor	ST	2STR2160
3	4	Q2, Q3, Q5, Q6	STW40N95DK5 TO-247 950V 38 A	N-channel 950 V, 120 mΩ, 38 A	ST	STW40N95DK5
4	1	Q7	SCT50N120 HIP247 1200 V 65 A	Silicon carbide Power MOSFET 1200 V, 59 mΩ, 65 A	ST	SCT50N120
5	1	Q8	STW75N60DM6 TO-247 600 V 72A	N-channel 600 V, 32 mΩ, 72 A	ST	STW75N60DM6
6	1	Q9	2STR1160 SOT-23 60 V 1A	Low voltage fast- switching NPN power transistor	ST	2STR1160
7	2	D10, D13	STPS1L40A SMA 40 V 1A	40 V, 1 A low drop power Schottky rectifier	ST	STPS1L40A
8	1	U5	TS912ID SO-8	Low power with CMOS inputs	ST	TS912ID
9	2	U1, U4	PM8834TR MINI SO8	4 A dual low-side MOSFET driver	ST	PM8834TR
10	1	U6	L5972D SO-8	2A switch step down switching regulator	ST	L5972D
11	1	U7	L7805ACD2T-TR D2PAK	Positive voltage regulator ICs	ST	L7805ACD2T-TR
12	1	U8	STM32G474RET6 LQFP64	Mainstream Arm Cortex-M4 MCU	ST	STM32G474RET6
13	1	U9	LD1117S33TR SOT-223	Adjustable and fixed low drop positive voltage regulator	ST	LD1117S33TR
14	6	C1,C8, C44,C45,C58,C60	100nF SMD 0805 25 V ±10%	Ceramic Capacitor, X7R	Any	Any
15	2	C2, C3	330uF 10mm Pitch, Through Hole 450 VDC ±20%	Electrolytic Capacitor	EPCOS(TDK)	B43647B5337M057
16	2	C4, C5	1uF 15mm Pitch, Through hole 450 VDC ±5%	Film Capacitor	EPCOS(TDK)	B32672Z4105J000

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
17	2	C6,C11	10uF SMD 0805 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
18	8	C7,C10,C34,C35, C38,C41,C43,C59	1uF SMD 0805 25 V ±10%	Ceramic Capacitor, X7R	Any	Any
19	2	C9, C18	10uF SMD 1206 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
20	1	C12	680pF SMD 0805 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
21	5	C13, C14, C15, C16, C17	5.6nF 15mm Pitch, Through hole 700 VAC ±10%	Film Capacitor	EPCOS(TDK)	B32672L8562K000
22	1	C19	10nF SMD 0805 50V ±10%	Ceramic Capacitor, X7R	Any	Any
23	6	C20, C21, C22, C23, C61, C62	470uF 10mm Pitch, Through Hole 450 VDC ±20%	Electrolytic Capacitor	Any	Any
24	2	C24, C25	2.2uF 22.5mm Pitch, Through hole 630 VDC ±10%	Film Capacitor	EPCOS(TDK)	R71PN422050H6K
25	1	C26	220nF SMD 0805 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
26	1	C27	100nF SMD 0805 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
27	2	C32, C33	100pF SMD 0805 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
28	6	C28,C29,C30, C31.C48,C63	1nF SMD 0805 25 V ±10%	Ceramic Capacitor, X7R	Any	Any
29	1	C36	22uF 2.54mm Pitch,Through Hole 100 V ±20%	Electrolytic Capacitor	Nichicon	UVR2A220MED
30	1	C37	1uF SMD 0805 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
31	1	C39	220pF SMD 0805 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
32	1	C40	22nF SMD 0805 50 V ±10%	Ceramic Capacitor, X7R	Any	Any
33	1	C42	100uF 2.54mm Pitch,Through Hole 35 V ±20%	Electrolytic Capacitor	Nichicon	UHV1V101MED
34	6	C46, C52, C53, C55, C56, C57	4.7uF SMD 0805 10V ±10%	Ceramic Capacitor, X7R	Any	Any
35	2	C51, C54	22uF 2mm Pitch, Through Hole 63 V ±20%	Electrolytic Capacitor	Panasonic Electronic Components	ECA-1JM220
36	3	D1, D3, D4	LL4148 SOD-80 75V 300mA	Small Signal Fast Switching Diodes	Vishay Semiconductors	LL4148-GS08
37	1	D2	24V Zener SOD27 24V 500mW	Zener diode	Nexperia USA Inc.	NZX24A,133
38	3	D9, D11, D12	LED SMD 0805	LED	Any	Any

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
39	1	D14	1N4148 DO-35 100 V 200 mA	Small Signal Fast Switching Diodes	Onsemi	1N4148TA
40	1	F1	15A 37mm Pitch, Through Hole 15 A	15 A fuse	Any	Any
41	2	DC FANS	CFM-6015V-154-3 62	DC Fans 60mm, 12Vdc 2.22W 30.4CFM	CUI Devices	CFM-6015V-154-362
42	1	FB1	Ferrite Bead SMD 0805 250mA ±25%	470 Ohms @ 100 MHz	Any	Any
43	4	HS1, HS2, HS3, HS5	CR201-75AE 75mm Pitch, Through Hole	Heat Sink	Ohmite	CR201-75AE
44	1	HS4	CR101-50AE 50mm Pitch, Through Hole	Heat Sink	Ohmite	CR101-50AE
45	1	J1	800 VIN 10mm Pitch, Through Hole	Terminal block 2POS 10mm	Any	Any
46	1	J2	OP+ 5.08mm Pitch, Through Hole	Terminal block 3POS 5mm	Any	Any
47	1	J8	OP- 5.08mm Pitch, Through Hole	Terminal block 3POS 5mm	Any	Any
48	1	J3	AUX 24 2.54mm Pitch, Through Hole	Terminal block 2POS 2.54mm	Phoenix Contact	1725656
49	1	J4	Program connector 2.54mm Pitch, Through Hole	Female header strip 5 pin 2.54mm	Any	Any
50	1	J5	CAN 3.5mm Pitch, Through Hole	Terminal block 3POS 3.5mm	Any	Any
51	2	J6, J7	Fan connectors 2.54mm Pitch, Through Hole	Male header strip 2 pin 2.54mm	Any	Any
52	1	L1	ETD49 Through Hole	LLC Choke (refer to TN1438)	-	-
53	2	L2, L3	ETD59/EE70 Through Hole	LLC Transformer (refer to TN1438)	-	-
54	1	L4	100uH SMD 450mA ±30%	Fixed Inductor	Bourns Inc.	SRR5028-101Y
55	2	R16,R22	0E SMD 1206 1/4 W ±5%	Thick Film Resistor	Any	Any
56	1	R1	100E SMD 1206 1/4 W ±5%	Thick Film Resistor	Any	Any
57	1	R2	100E SMD 0805 1/8 W ±1%	Thick Film Resistor	Any	Any
58	9	R14, R15, R17, R21, R23, R30, R31, R54, R55	10K SMD 0805 1/8 W ±1%	Thick Film Resistor	Any	Any

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
59	2	R3, R26	3.3E SMD 0805 1/10 W ±5%	Thick Film Resistor	Any	Any
60	7	R4, R5, R33, R34, R63, R65, R66	100K SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
61	3	R6, R18, R24	470E SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
62	2	R7, R8	2M Through Hole 1 W ±5%	Metal Oxide Resistors	YAGEO	RSF1WSJT-52-1M
63	2	R9, R27	6.8E SMD 1206 1/4 W ±5%	Thick Film Resistor	Any	Any
64	7	R10, R11, R19, R20,R45,R46, R68	47K SMD 0805 1/4 W ±0.5%	Thick Film Resistor	Any	Any
65	4	R12, R13, R28, R29	4.7E SMD 1206 1/4 W ±5%	Thick Film Resistor	Any	Any
66	7	R25,R41, R47, R48, R56, R59, R62	1K SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
67	1	R32	1E SMD 0805 1/10 W ±5%	Thick Film Resistor	Any	Any
68	5	R35,R36, R79, R80, R81	1M Through Hole 1 W ±5%	Metal Oxide Resistors	YAGEO	RSF1WSJT-52-1M
69	2	R84,R85	100E SMD 1206 1/4 W ±1%	Thick Film Resistor	Any	Any
70	2	R82,R83	DNM SMD 1206	Thick Film Resistor	Any	Any
71	4	R37, R38, R39, R40	1M SMD 1206 1/4 W ±1%	Thick Film Resistor	Any	Any
72	1	R42	DNM SMD 0805	Thick Film Resistor	Any	Any
73	3	R43, R44, R49	0.033E SMD 2512 3W ±0.1%	Thick Film Resistor	Any	Any
74	2	R51,R53	22K SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
75	2	R50, R52	470K SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
76	3	R57, R58, R60	220E SMD 0805 1/10 W ±5%	Thick Film Resistor	Any	Any
77	2	R61, R75	4.7K SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
78	1	R64	3.3k SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
79	5	R67, R74, R77, R86, R87	33k SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
80	1	R69	10E SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
81	4	R72, R73, R76, R78	22E SMD 0805 1/8 W ±5%	Thick Film Resistor	Any	Any
82	4	SW1, SW2, SW3, SW5	Push Button Through Hole 24V 0.05A	Tactile Switch SPST-NO	TE Connectivity ALCOSWITCH Switches	FSM10JH

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
83	1	SW4	Dip switch SMD	3 Way DIP Switch	Any	Any
84	3	T1, T2, T3	PH9400-ANL SMD	1.21mH 5kV Iso 1:1:1 pulse transformer	Pulse Electronics	PH9400.111ANLT
85	1	T4	CST2-100LC SMD	Current Transformers CST2 1:100 20A 2KuH	Coilcraft	CST2-100LC
86	2	TH1, TH2	10k Through Hole	Thermistor	Any	Any
87	2	U2 , U3	SFH617A SMD	Optocoupler	Vishay Semiconductors	SFH617A-1X007T
88	1	U10	SN65HVD231 SOIC	CAN Transceiver	Texas Instruments	SN65HVD231

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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The Evaluation Board offers limited features allowing You only to evaluate and test the ST products. The Evaluation Board is not intended for consumer or household use. You are not authorized to use the Evaluation Board in any production system, and it may not be offered for sale or lease, or sold, leased or otherwise distributed for commercial purposes. If the Evaluation Board is incorporated in an evaluation system, the evaluation system may be used by You solely for Your evaluation and testing purposes. Such evaluation system may not be offered for sale or lease or sold, leased or otherwise distributed for commercial purposes and must be accompanied by a conspicuous notice as follows: "This device is not, and may not be, offered for sale or lease, or sold or leased or otherwise distributed for commercial purposes".

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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,

reverse engineer, de-compile or disassemble its software and/or firmware, in whole or in part.

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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