

Table 1: STEVAL-PTOOL2V1 bill of materials

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
1	7	C1, C2, C3, C12, C16, C18, C20	100 nF/10 V/ X7R 0603	SMT Ceramic Capacitor	Würth Elektronik	885012206020 or equivalent
2	4	C4, C7, C11, C36	1 µF/50 V/X5R 0805	SMT ceramic capacitor	Würth Elektronik	885012207103 or equivalent
3	3	C5, C24, C39	100 nF/20 V/ X7R 0603	SMT Ceramic Capacitor	Würth Elektronik	885012206071 or equivalent
4	2	C6, C32	220 nF/20 V/ X7R 0603	SMT ceramic capacitor	Würth Elektronik	885012206073 or equivalent
5	1	C8	100 nF/100 V 1210	SMT Ceramic Capacitor	TDK	CGA6M3X7R2E104M200AE or equivalent
6	2	C9, C45	4.7 nF/10 V 0603	SMT Ceramic Capacitor	Würth Elektronik	885012206012 or equivalent
7	1	C10	47 nF/20 V/X7R 0603	SMT Ceramic Capacitor	Würth Elektronik	885012206069 or equivalent
8	1	C13	4.7 µF/10 V/ X7R0805	SMT Ceramic Capacitor	Würth Elektronik	885012207025 or equivalent
9	1	C14	33 pF/10 V/NPO 0603	SMT Ceramic Capacitor	Würth Elektronik	885012006005 or equivalent
10	6	C15, C33, C42, C43, C46, C47	N.M. 0603	SMT ceramic capacitor (not mounted)	Any	
11	1	C17	2.2 nF/10 V/X7R 0603	SMT Ceramic Capacitor	Würth Elektronik	885012206010 or Equivalent
12	1	C19	220 µF/100 V Diam. 12.5mm p. 5mm 100V	THT Electrolytic Capacitor	Panasonic	EEUFS2A221B or equivalent
13	3	C21, C22, C23	100pF/10V/ X7R0603	SMT Ceramic Capacitor	Würth Elektronik	885012206003 or equivalent
14	2	C28, C29	1 µF/100V 1210	SMT ceramic capacitor	KEMET	C1210C105K1RACAUTO
15	1	C30	1nF/100V/X7R 0805	SMT ceramic capacitor	Würth Elektronik	885012207116 or equivalent
16	1	C31	22 µF/20V 5x5.4 mm 20V	SMT Aluminum Elect. Capacitor	Würth Elektronik	865090442004 or equivalent
17	1	C34	1nF/10V/X7R 0603	SMT ceramic capacitor	Würth Elektronik	885012206008 or equivalent
18	1	C35	1 nF/50 V/X7R 0603	SMT ceramic capacitor	Würth Elektronik	885012206083 or equivalent
19	1	C37	100 nF/50 V/ X7R0805	SMT ceramic capacitor	Würth Elektronik	885012207098 or equivalent
20	1	C38	68 µF/20 V D / E 20V	Low ESR series of robust MnO2 solid electrolyte capacitors	AVX	TPS Series or equivalent
21	1	C40	10 µF/10 V/X7R 1206	SMT Ceramic Capacitor	Würth Elektronik	885012208018 or equivalent
22	1	C41	3.3 nF/10 V/X7R 0603	SMT ceramic capacitor	Würth Elektronik	885012206011 or equivalent
23	1	C44	1 nF/10 V/NPO 0603	SMT ceramic capacitor		

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
24	3	D1, D4, D7	STPS1H100MF STmite flat (DO222-AA)	High voltage power Schottky rectifier	ST	STPS1H100MF
			N.M. SMA	High efficiency ultrafast diode (not mounted)	ST	STTH102A
25	2	D22, D23	STTH102A SMA	High efficiency ultrafast diode	ST	STTH102A
26	6	D2, D3, D5, D6, D8, D9	BAT54J SOD-323	40 V, 300 mA Small signal Schottky SMT Diode	ST	BAT54JFILM
27	8	D10, D11, D12, D16, D17, D18, D24, D25	BAT30 SOD-523	30 V, 300 mA small signal Schottky SMT diode	ST	BAT30KFILM
28	3	D13, D14, D15	BZT585B3V3T SOD523	Surface mount precision Zener diode	Diodes Incorporated	BZX585B3V3T or equivalent
29	1	D19	BZT585B15T SOD523	Surface mount precision Zener diode	Diodes Incorporated	BZT585B15T or equivalent
30	1	D20	BAT46JFILM SOD-323	100 V, 150 mA small signal Schottky diode	ST	BAT46JFILM
31	1	D21	BAT41Z SOD-123	100 V, 200 mA low capacitance small signal Schottky diode	ST	BAT41ZFILM
32	1	JP1	OPEN Soldering pads	SMT jumper	Any	
33	3	JP2, JP3, JP4	CLOSE 2-3 Soldering pads	SMT jumper	Any	
34	3	J1, J9, J11	N.M. 1x3 pins	Strip connector 3 pos, 2.54 mm (not mounted)	Würth Elektronik	61300311121 or equivalent
35	1	J2	STRIP 1x5 1x5 pins	Strip connector 5 pos, 2.54 mm	Würth Elektronik	61300511121 or equivalent
36	1	J3	N.M. 1x2 pins	Strip connector 2 pos, 2.54 mm (not mounted)	Würth Elektronik	61300211121 or equivalent
37	2	J4, J5	N.M. Dim. 6.2x6.5 mm	Solder Pad (not mounted)	Any	
38	3	J6, J7, J8	N.M. Dim. 6.2x6.5 mm	Solder Pad (not mounted)	Any	
39	1	J10	STRIP 2x10 2x10 pins	Strip connector 2x10, pitch 2.54 mm	Würth Elektronik	61302021121 or Equivalent
40	1	L1	270uH	Wire Wound Ferrite Inductor for Power Lines	Murata	#B966BS-271M=P3 or Equivalent
41	1	NTC1	10 k ±1% 0603	NTC Thermistor	Murata	NCP18XH103F03RB or Equivalent
42	2	Net1, Net2	N.M.	(not mounted)	Any	

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
43	6	Q1, Q2, Q3, Q4, Q5, Q6	STL130N8F7	N-channel 80 V, 3.0 mOhm typ., 120 A STripFET F7 power MOSFET	ST	STL130N8F7
			STL130N8F7	Automotive-grade N-channel 80 V, 3.15 mOhm typ., 130 A STripFET F7 Power MOSFET		STL135N8F7AG
44	1	Q7	BSS123W SOT-323	SIPMOS small signal transistor	DIODES incorporated	BSS123W-7-F or equivalent
45	1	Q8	STN3P10F6 SOT-223	P-channel -100 V, 0.136 O typ., -3 A STripFET F6 Power MOSFET	ST	STN3P10F6
46	3	R1, R7, R15	27 R 0805	SMT resistor	Any	
47	6	R2, R4, R8, R10, R17, R20	4.7 R 0805	SMT Resistor	Any	
48	6	R3, R6, R9, R12, R18, R22	22 R 0805	SMT Resistor	Any	
49	1	R5	0 R 0603	SMT Resistor	Any	
50	8	R11, R14, R27, R28, R44, R68, R69, R70	0 R 0603	SMT resistor	Any	
51	6	R13, R34, R35, R36, R55, R62	1 k 0603	SMT resistor	Any	
52	1	R16	47 k 0603	SMT Resistor	Any	
53	7	R19, R23, R37, R38, R39, R43, R63	N.M. 0603	SMT resistor (not mounted)	Any	
54	2	R21, R26	3 k 0603	SMT Resistor	Any	
55	1	R24	51 k 0603	SMT Resistor	Any	
56	1	R25	3 mOhm-3 W ±1% 2512	Power Metal Strip Resistors, Very High Power (to 3 W), Low Value	Vishay	WSLP25123L000FEA or equivalent
57	1	R29	33 k 0603	SMT Resistor	Any	
58	1	R30	10 M 0603	SMT Resistor	Any	
59	6	R31, R32, R33, R48, R49, R51	10 k 0603	SMT resistor	Any	
60	5	R40, R41, R42, R58, R59	1.5 k 0603	SMT resistor	Any	
61	1	R45	100 k 0603	SMT resistor	Any	

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
62	1	R46	0 R 0805	SMT resistor	Any	
63	1	R47	12 k 0603	SMT resistor	Any	
64	1	R50	10 k 1210	SMT resistor	Any	
65	1	R52	9.1 k 0603	SMT resistor	Any	
66	1	R53	82 k 0603	SMT resistor	Any	
67	1	R54	2.7 k 0603	SMT resistor	Any	
68	2	R56, R57	100 R 0603	SMT resistor	Any	
69	2	R60, R61	6.8 k 0603	SMT resistor	Any	
70	1	R64	4.7 k 0603	SMT Resistor	Any	
71	3	R65, R66, R67	33 k 0805	SMT resistor	Any	
72	1	R71	91 k 0805	SMT resistor	Any	
73	1	R72	3.9 k 0603	SMT resistor	Any	
74	1	SW1	JS102011JCQN	SMT sub-miniature slide switches	C&K	JS102011JCQN or equivalent
75	1	SW2	KSC7xxJ	KSC series sealed tactile switch for SMT	C&K	KSC701J LFS / LFG or equivalent
76	14	TP1, TP2, TP5, TP7, TP9, TP10, TP11, TP12, TP14, TP17, TP18, TP19, TP20, TP21	N.M. Copper pad	50 mils SMD pad (not mounted)	Any	
77	3	TP3, TP8, TP16	N.M. Copper Pad	Test point - PCB 1 mm diameter (not mounted)	Any	
78	1	TP4	N.M. Copper Pad	Test point - PCB 1 mm diameter (not mounted)	Any	
79	1	TP6	N.M. Copper Pad	Test point - PCB 1 mm diameter (not mounted)	Any	
80	1	TP13	N.M. Copper Pad	Test point - PCB 1 mm diameter (not mounted)	Any	
81	1	TP15	N.M. Copper Pad	Test point - PCB 1 mm diameter (not mounted)	Any	
82	1	TP22	N.M. Copper Pad	Test point - PCB 1 mm diameter (not mounted)	Any	
83	1	TR1	100 k 3386P	Trimming potentiometer	Bourns	3386P-1-104-LF or Equivalent
84	1	U1	STSPIN32F0252 TQFP64-10x10x1	250 V three-phase controller with ARM Cortex MCU-1 A capability	ST	STSPIN32F0252TR

Item	Q.ty	Ref.	Part/Value	Description	Manufacturer	Order code
85	1	U2	TSV912 MiniSO8	Dual rail-to-rail input/output 8 MHz operational amplifiers	ST	TSV912IST / TSV912IYST
86	1	U3	TS861 SOT23-5	Rail-to-rail micropower BiCMOS comparators	ST	TS861
87	1	U4	VIPer013 SSOP10	Energy saving off-line high voltage converter	ST	VIPER013BLS/VIPER013BTR
88	1	U5	LD1117S33CTR SOT-223	800 mA, 3.3 V adjustable and fixed low drop positive voltage regulator	ST	LD1117S33CTR
89	4		M3x10mm	M3 conical head screw	Any	
90	4		M3 Nut	M3 nut	Any	
91	4		sp. 1.19 mm	Flat washers	Keystone	3162 or equivalent
92	1		54x54x10 mm	Heat sink	ATS	ATS-CPX054054010-125- C2-R0 or equivalent
93	1		diam. 1.6 (0.8) 36 mm	Shrink tube	Any	
94	1		40x50mm 40x50mm thickness.0, 5 mm.	Thermal interface sheet, 3.2 W/m-K, 150x150 mm	Any	
95	1		56.5x80 mm	PCB	Any	

STMicroelectronics**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.

EVALUATION BOARD STATUS

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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Title to the Evaluation Board remains with ST and/or its licensors. You may not remove any copyright or other proprietary rights notices without prior written authorization from ST. You may make one copy of the software and/or firmware of the Evaluation Board for back up or archival purposes provided that You reproduce and apply to such copy any copyright or other proprietary rights notices included on or embedded in the software and/or firmware. You agree to prevent any unauthorized copying in whole or in part of the Evaluation Board.

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 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.