

Bill of materials

Table 1. STDES-EMETER1PV1 bill of materials

Item	Q.ty	Ref.	Value	Description	Manufacturer	Part Number
1	1	U1	M24M01-R, SO-8	1-Mbit serial I ² C bus EEPROM	ST	M24M01-R
2	2	U2, U6	LDK220U33R, SOT-89	200 mA low quiescent current and low noise LDO	ST	LDK220U33R
3	1	U	STM32L433VCT6, LQFP100	Ultra-low-power with FPU ARM Cortex-M4 MCU 80 MHz with 256 Kbytes Flash, LCD, USB	ST	STM32L433VCT6
4	2	Q6, Q10	STS6P3LLH6, SMA	P-channel 30 V, 0.024 Ohm typ., 6 A, STripFET VI DeepGATE Power MOSFET in SO-8 package	ST	STS6P3LLH6
5	3	Q7, Q8, Q9	2STR1215, SOT-23	Low voltage fast-switching NPN power transistor	ST	2STR1215
6	1	Q11	2STR2230, SOT-23	Low voltage fast-switching PNP power transistor	ST	2STR2230
7	1	U5	ALTAIR04-900, SO16N	Off-line all-primary-sensing switching regulator	ST	ALTAIR04-900
8	1	U8	STPM33, QFN32L 5x5x1	ASSP for metering applications with up to four independent 24-bit 2 nd order sigma-delta ADCs, 4 MHz OSF and 2 embedded PGLNA	ST	STPM33
9	1	U10	STBB1-AXX, DFN10 3x3	High efficiency single inductor dual mode	ST	STBB1-AXX

Item	Q.ty	Ref.	Value	Description	Manufacturer	Part Number
				buck-boost DC-DC converter with 2.3 A switches peak curren		
10	2	D7, D15	STPS1L60A, SMA	1 A 60 V Power Schottky Rectifier	ST	STPS1L60A
11	1	D8	P6KE200A, SMA	600 W TVS in DO-15	ST	P6KE200A
12	1	D9	STTH108, SMA	800 V, 1 A ultra-fast diode	ST	STTH108
13	2	D14,D16	STPS1150, DO-41	150 V power Schottky rectifier	ST	STPS1150
14	2	C1, C26	10 nF, SMD0805, 10 V	Capacitors	Any	Any
15	1	C2	4.7 µF, SMD0805, 10 V	Capacitor	Any	Any
16	6	C3, C4, C5, C6, C7, C15	0.1 µF, SMD0805, 6.3 V	Capacitors	Any	Any
17	2	C8, C11	6.8 pF, SMD0805, 10 V	Capacitors	Any	Any
18	4	C9, C10, C19, C20	1 µF, SMD0805, 10 V	Capacitors	Any	Any
19	1	C14	1 µF, SMD0805, 10 V	Capacitor	Any	Any
20	3	C21, C22, C62	10 nF/0402, SMD0805, 10 V	Capacitors	Any	Any
21	2	C23, C65	100 nF, SMD0805, 10 V	Capacitors	Any	Any
22	1	C24	1000 µF, Ø10x20 - pitch 5, 10 V	Capacitor	Any	Any
23	1	C25	2.2 µF, Ø6,3x10 - pitch 2,5, 10 V	Capacitor	Any	Any
24	3	C27, C51, C52	10 nF, SMD0603, 25 V	Capacitors	Any	Any
25	11	C28, C31, C33, C35, C37, C39, C40, C42, C43, C46, C50	150 pF, SMD0402, 25 V	Capacitors	Any	Any
26	6	C29, C34, C38, C44, C47, C49	100 nF, SMD0402, 50 V	Capacitors	Any	Any
27	1	C30	4.7 µF, SMD0603, 16 V	Capacitor	Any	Any
28	1	C32	100 µF, SMD1206, 25 V	Capacitor	Any	Any
29	2	C36, C45	15 pF, SMD0402, 10 V	Capacitors	Any	Any
30	1	C41	1 µF, SMD0603, 10 V	Capacitor	Any	Any

Item	Q.ty	Ref.	Value	Description	Manufacturer	Part Number
31	1	C48	22 nF, SMD0603, 25 V	Capacitor	Any	Any
32	1	C53	4.7nF, SMD0805, 25 V,	Capacitor	Any	Any
33	1	C54	47 µF, THT Ø12.5x25 - pitch 5, 25 V	Capacitor	Any	Any
34	1	C55	5 F, THT Ø10x20 - pitch 5, 400 V	Capacitor	Any	Any
35	3	C57, C61, C63	470 µF, THT, lead spacing 7.5 mm, 5 V	Capacitors	Any	Any
36	1	C58	2.2 nF, SMD0805, 220 V	Capacitor	Any	Any
37	1	C59	470 nF, SMD0805, 50 V	Capacitor	Any	Any
38	1	C60	1 nF, THT Ø8x11.5 - pitch 3.5, 50 V	Capacitor	Any	Any
39	1	C66	22 nF/X2, THT, lead spacing 15 mm (18 mm x 7 mm x 12.5 mm), 50 V	Capacitor	Any	Any
40	1	C68	22 µF, THT, 10 V	Capacitor	Any	Any
41	2	D12, D23	SMD0805	Green LEDs	Any	Any
42	1	D13	7 V, THT	Diode	Any	Any
43	2	D21, D22	THT	Diodes	Any	Any
44	1	D24	SOD323, THT, Pitch 2.54 mm	10 V general purpose signal Schottky diode	ST	BAT60
45	1	J1	CR2032	Jumper	Any	Any
46	1	J2	7X2, THT 2.54 mm pitch	Header	Any	Any
47	1	J3	CON2, THT 2.54 mm pitch	Connector	Any	Any
48	1	J9	CON1_NEUTRAL, single pin THT	Connector	Any	Any
49	1	J10	CON1_PHASE, Single Pin THT,	Connector	Any	Any
50	2	J11, J12	CON1, single pin THT	Connectors	Any	Any
51	1	J13	CON22, 20 pin THT	LCD connector	Any	Any
52	1	J16	ER-14250, THT	Battery connector	Any	Any
53	1	J21	SWD, THT 2.54 mm pitch	Connector	Any	Any
54	1	J24	3X2, THT	Header	Any	Any
55	1	J25	REALY_CON, THT 2.54 mm pitch	Connector	Any	Any
56	2	L1, R74	470E, SMD1206	Inductors	Any	Any

Item	Q.ty	Ref.	Value	Description	Manufacturer	Part Number
57	5	L2, L3, L4, L6, L7	1500E, SMD0603	Inductors	Any	Any
58	1	L5	2 pin, 2.54 mm	Inductor	Any	Any
59	1	L8	1mH, 1000 μ H \pm 10% SMD 1005	Fixed inductor	Any	Any
60	4	L11, L12, L13, L14	10 μ H, SMD0805	Fixed inductors	Any	Any
61	1	L20	470 μ H, SMD 6.3 x 6.3 x 3.0 mm	Inductor	Any	Any
62	1	L21	CM, THT	Inductor	Any	Any
63	1	L22	2.2 μ H, SMD	Inductor	EPCOS	B82721-K2701
64	2	NTC1,NTC2	16E, 2.4 W, 16 Ohms 2.9 amps 1207 k	Inrush current limiters	TDK	B57236S0160M000V9
65	1	PD1	TX, THT	TX THT	Any	Any
66	1	PQ1	RX, THT	RX THT	Any	Any
67	1	RV1	460 V, THT, diameter 14 mm	THT	Any	Any
68	12	R1, R2, R3, R7, R41, R42, R43, R44, R72, R86, R87, R88	10 K, SMD0805	Resistors	Any	Any
69	1	R4	6.8 M, 1 W, SMD1206	Resistor	Any	Any
70	2	R5, R6	4.7 K, SMD0805	Resistors	Any	Any
71	1	R8	33 K, SMD0805	Resistor	Any	Any
72	21	R10, R33, R34, R35, R36, R37, R38, R40, R46, R63, R91, R94, R95, R97, R99, R100, R101, R102, R103, R104, R105	0, SMD0402	Resistors	Any	Any
73	1	R11	100 E, 1 W, THT	Resistor	Any	Any
74	14	R13, R15, R16, R17, R22, R24, R25, R26, R49, R64, R67, R68, R71, R92	0 E, SMD0805	Resistors	Any	Any
75	1	R18	51 K, SMD1206	Resistor	Any	Any
76	1	R27	1.3E, SMD1206	Resistor	Any	Any
77	12	R28, R32, R48, R57, R59, R62, R66, R70, R75, R77, R108, R109	1 K, SMD0805	Resistors	Any	Any
78	2	R29, R30	8.2 K, SMD0805	Resistors	Any	Any
79	4	R31, R45, R50, R56	100E, SMD0805	Resistors	Any	Any
80	1	R39	50 K, SMD0805	Resistor	Any	Any

Item	Q.ty	Ref.	Value	Description	Manufacturer	Part Number
81	1	R47	1ME, SMD0603	Resistor	Any	Any
82	1	R51	100K, SMD0805	Resistor	Any	Any
83	3	R52, R53, R54	270 K, SMD0204	Resistors	Any	Any
84	1	R55	470, SMD0207	Resistor	Any	Any
85	1	R58	22 K, SMD0805	Resistor	Any	Any
86	1	R60	THT	Resistor	Isabellenhuette Heusler GmbH & Co. KG	BKW-M-R0003-5.0
87	1	R61	6E, SMD0603	Resistor	Any	Any
88	1	R65	560K, SMD0805	Resistor	Any	Any
89	3	R80, R82, R84	1M/0402, SMD0805	Resistors	Any	Any
90	3	R81, R83, R85	0E/0402, SMD0805	Resistors	Any	Any
91	1	R96	510E, SMD0805,	Resistor	Any	Any
92	1	R106	220E, SMD0805	Resistor	Any	Any
93	1	SW1	THT	Top cover open switch	Any	Any
94	1	SW2	THT	Terminal cover open switch	Any	Any
95	1	SW3	THT	Up and down switch	Any	Any
96	1	SW4	MD_RESET SW, THT	Reset switch	Any	Any
97	1	SW5	THT	Open module switch	Any	Any
98	1	TP1	THT	Test point	Any	Any
99	1	T1	EE 16 N87, vertical	Bobbin coil	Any	Any
100	1	Y1	32.768 KHz, THT	THT	Any	Any
101	1	Y3	16 MHz, THT, pitch 5 mm	THT	Any	Any
102	2	U4, U9	DBLS208GRD	Bridge rectifier	Taiwan Semiconductor	DBLS208GRD
103	1	U7	AH180	Board mount Hall effect magnetic sensor	Diodes Incorporated	AH180

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.

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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,

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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