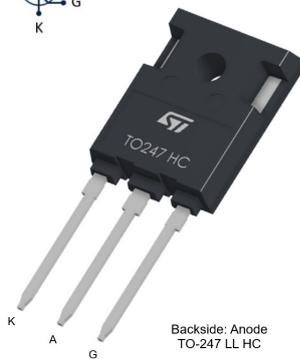
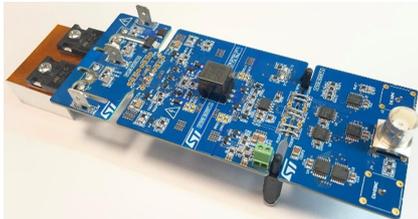


Half bridge dual SCR control board



Features

- Two 1200 V SCRs connected in Half bridge
- High creepage and clearance to allow operation up to 840 V_{RMS}
- Insulated gate driver included
- Ready to test controlled half bridge or AC Switch
- Direct connection to STM32 interface

Applications

- AC/DC Active Inrush current limitation
- EV charging - DC fast charging stations
- Energy Distribution
- Industrial Power Supply
- PFC converter - Single phase input
- Power Distribution Solid-State Relay
- Single Phase AC Motor

Description

The **STDES-LEG001V1** is a ready to use reference design that features a half bridge made of 2 x 1200 V thyristor. The reference design allows to evaluate SCR ranging from 50 A to 130 A package in high creepage TO-247 package in industrial AC applications.

The reference design includes a driving circuit featuring a single pulse transformer to drive the low and high side SCR.

The key product **TN8050H-12WL** is an industrial qualified 80 A, 1200 V thyristor assembled in high creepage TO247package. Lower (50 A) and higher current ratings (130 A) can also be mounted on that board.

It offers higher specified noise immunity of 2000 V/ μ s and overvoltage robustness V_{DSM} up to 1400 V. It also has optimized thermal management.

Product summary

STDES-LEG001V1

Key product

TN5050H-12WL

TN8050H-12WL

TN13050H-12WL

1 Getting started

Figure 1. Pictograms



Danger: Use the *STDES-LEG001V1* board only after applying a fire-resistant cover. The cover is not included in the board package.

There is a danger of serious personal injury, property damage, or death due to electrical shock and burn hazards if the kit or components are improperly used or installed incorrectly.

Warning: The kit is not electrically isolated from the high-voltage supply AC-DC input. The evaluation board is directly linked to the mains voltage. No insulation is ensured between the accessible parts and the high voltage. All measurement equipment must be isolated from the mains before powering the board.

When using an oscilloscope with the evaluation board, it must be isolated from the AC line. This prevents shock from occurring as a result of touching any single point in the circuit, but does Not prevent shock when touching two or more points in the circuit.

Caution: During assembly, testing, and operation, the evaluation board poses several inherent hazards, including bare wires, moving or rotating parts and hot surfaces. All operations involving transportation, installation, use, and maintenance must be performed by skilled technical personnel who are familiar with the installation, use, and maintenance of power electronic systems.

The board has to be connected directly on the mains. Non-isolated parts at high-voltage levels are present on both sides of the PCB.

The high current flowing through the two SCRs generates heat: the board temperature can reach up to 150 °C at full power. Be aware that, due to the thermal inertia, the board could remain hot even after the current has ceased to low.

Workarea safety:

- The work area must be clean and tidy
- Do not work alone when boards are powered
- Protect the area against any unauthorized access by putting suitable barriers and signs
- A system architecture that supplies power to the evaluation board must be equipped with additional control and protective devices in accordance with the applicable safety requirements (that is, compliance with technical equipment and accident prevention rules).

Electrical safety:

- Remove the power supply from the evaluation board and electrical loads before performing any electrical measurement
- Arrange measurement setup, wiring, and configuration, paying attention to the high voltage section
- Once the setup is complete, power the board. Fuse protection is not included with this evaluation board.

Danger: Do not touch the evaluation board when it is powered or immediately after it has been disconnected from the voltage supply as several parts and power terminals containing potentially energized capacitors need time to discharge, and heat-sink and transformers may still be very hot.

Personal safety:

- Always wear suitable personal protective equipment, such as insulating gloves and safety glasses
- Take adequate precautions and install the board to prevent accidental touch
- Use protective shields, such as an insulating box with interlocks.

2 Pinout and recommendation

Figure 2. STDES-LEG001V1 top view

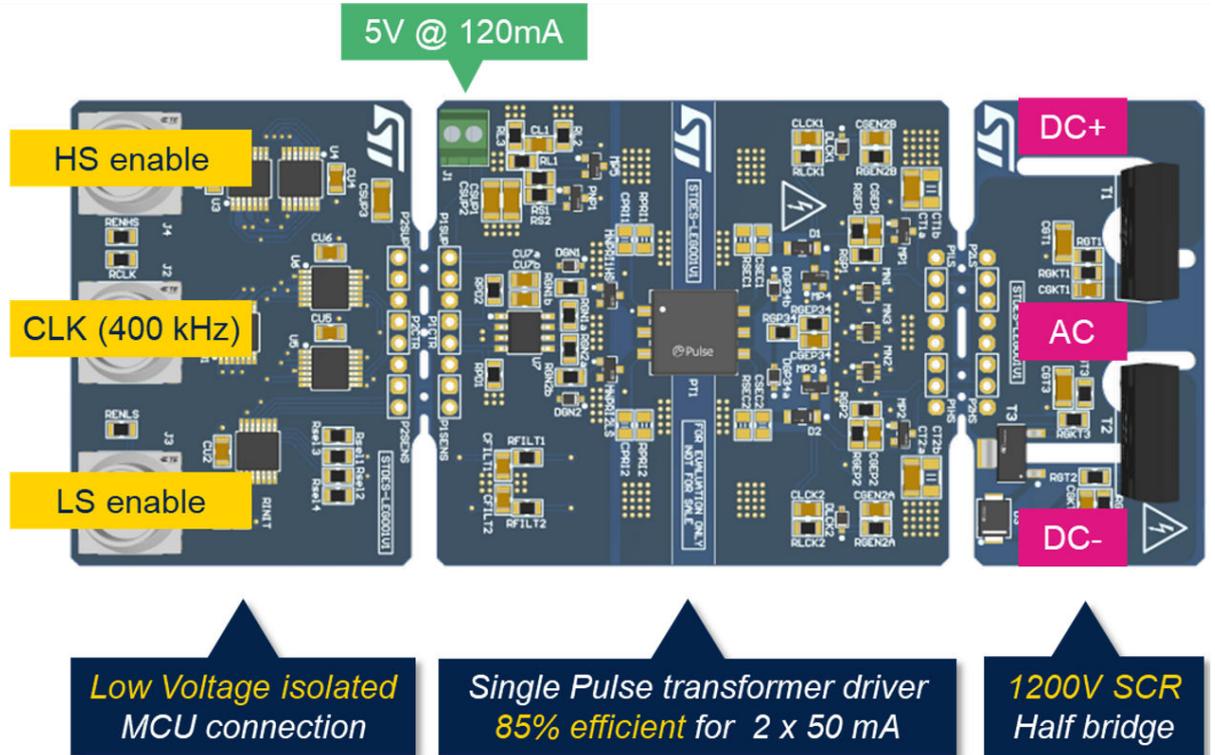
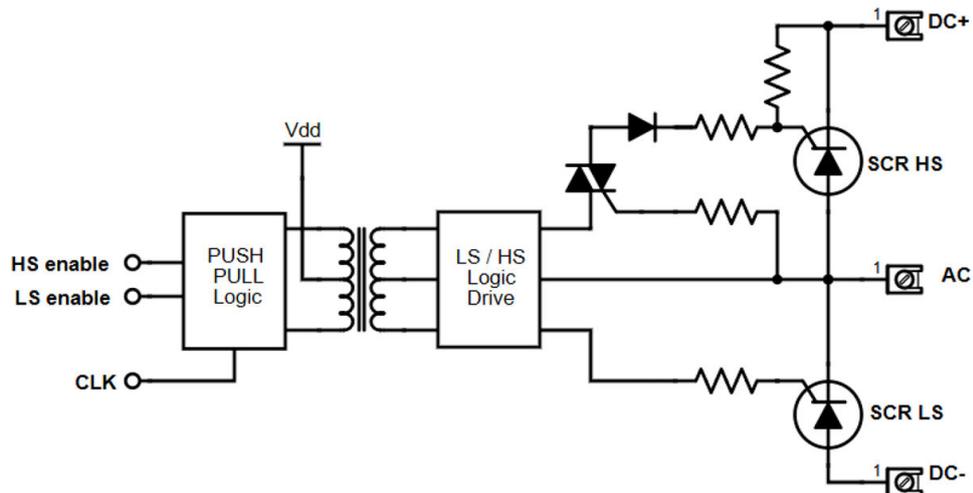
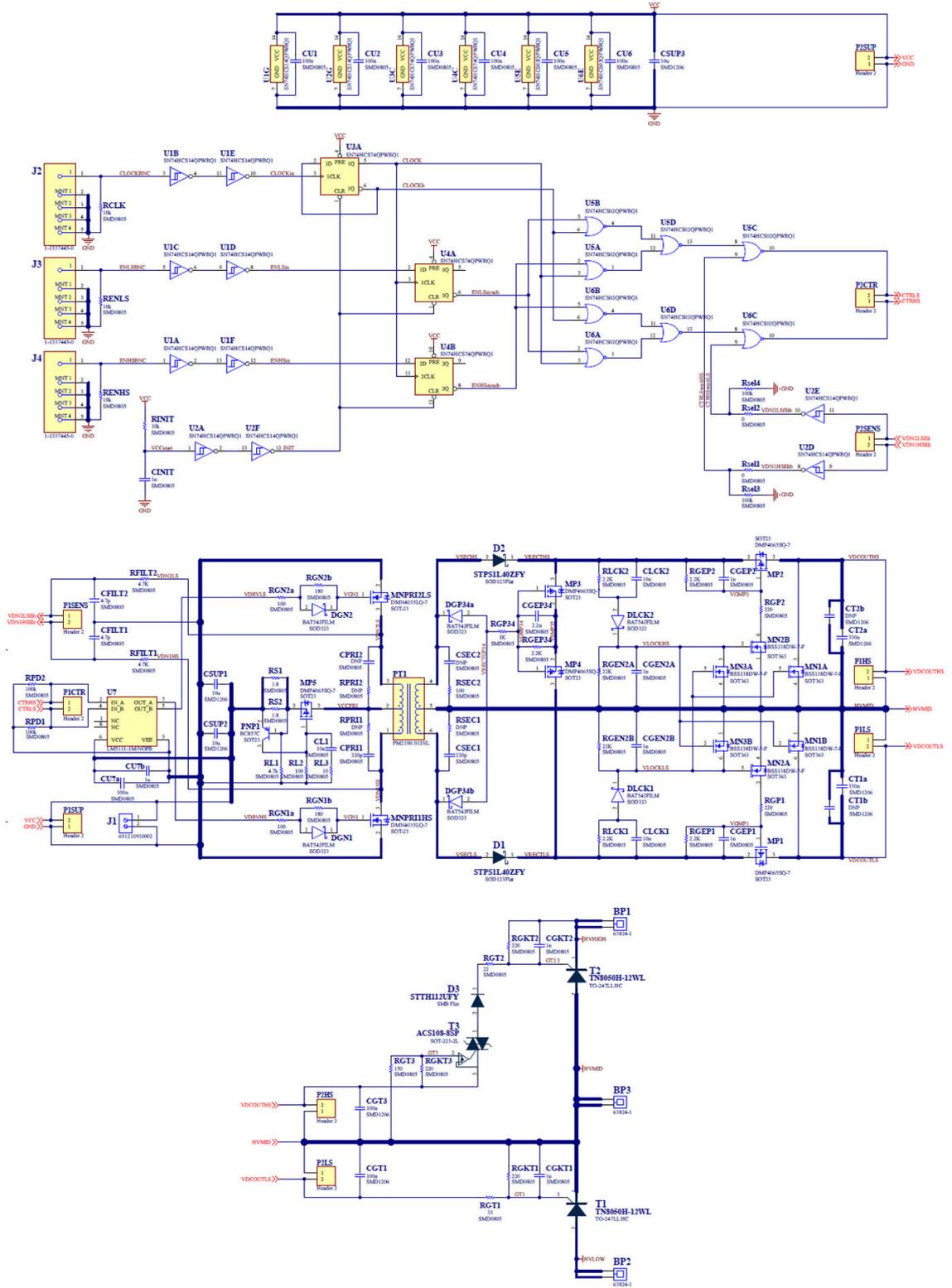


Figure 3. STDES-LEG001V1 bloc diagram



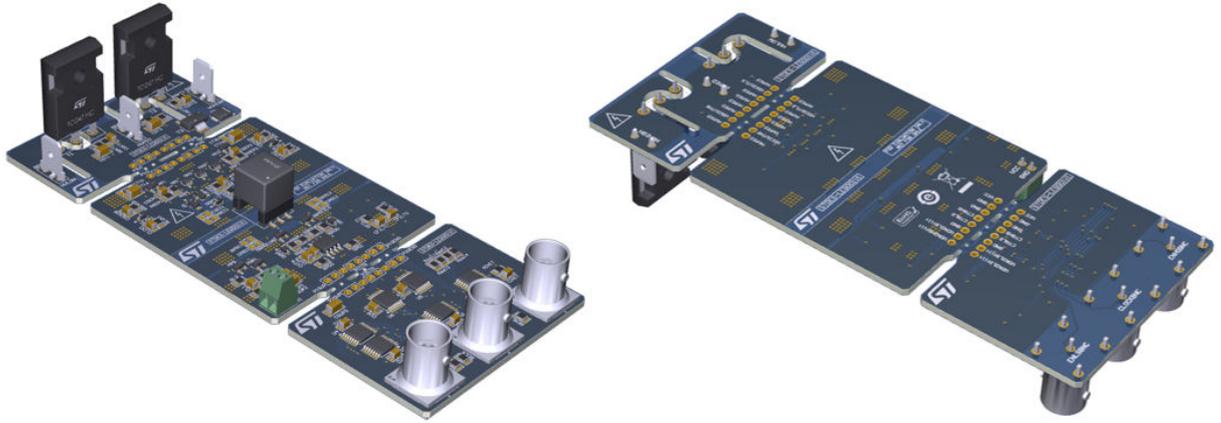
3 Schematics

Figure 4. STDES-LEG001V schematic (1)



5 3D views

Figure 6. STDES-LEG001V1 3D views



6 BOM

Item	Qty.	Ref.	Part / Value	Description	Manufacturer	Order code
Sheet 2						
Sh1_1	2	CFILT1, CFILT2	4.7 pF, 100 V, C0G, 0.25 pF, AEC-Q200, SMD 0805	Capacitor	Any	Any
Sh1_2	4	CGEN2A, CGEN2B, CGEP1, CGEP2	1 nF, 250 V, C0G, 5 %, AEC-Q200, SMD 0805	Capacitor	Any	Any
Sh1_3	1	CGEP34	2.2 nF, 250 V, C0G, 5 %, AEC-Q200, SMD 0805	Capacitor	Any	Any
Sh1_4	3	CL1, CLCK1, CLCK2	10 nF, 250 V, C0G, 5 %, AEC-Q200, SMD 0805	Capacitor	Any	Any
Sh1_5	4	CPRI1, CPRI2, CSEC1, CSEC2 N.A.	220 pF, 450 V, C0G, 5 %, AEC-Q200, SMD 0805	Capacitor	N.A.	N.A.
Sh1_6	2	CSUP1, CSUP2	10 µF, 50 V, X7R, 10 %, AEC-Q200, SMD 1206	Capacitor	Any	Any
Sh1_7	2	CT1a, CT2a	330 nF, 100 V, X8R, 10 %, AEC-Q200, SMD 1206	Capacitor	Any	Any
Sh1_8	2	CT1b, CT2b N.A.	100 nF, 100 V, C0G, 5 %, AEC-Q200, SMD 1206	Capacitor	N.A.	N.A.
Sh1_9	1	CU7a	100 nF, 100 V, X7R, 10 %, AEC-Q200, SMD 0805	Capacitor	Any	Any
Sh1_10	1	CU7b	1 µF, 50 V, X7R, 10 %, AEC-Q200, SMD 0805	Capacitor	Any	Any
Sh1_11	2	D1, D2	STPS1L40ZFY, 40 V, 1 A, AEC-Q101, SOD-123FL	Power Schottky rectifier	STMicroelectronics	STPS1L40ZFY
Sh1_12	6	DGN1, DGN2, DGP34a, DGP34b, DLCK1, DLCK2	BAT54JFILM, 40 V, 300 mA, SOD-323	Small signal Schottky diode	STMicroelectronics	BAT54JFILM
Sh1_13	1	J1	Header, 2 ways, 2.54 mm pitch, 150 V, 6 A, 18 AWG, through hole	Connector	Any	Any
Sh1_14	3	MN1, MN2, MN3	MOSFET N-ch, dual, 50 V, 200 mA, 200 mW, 3.5 Ω, AEC-Q101, SOT-363	Transistor	Any	Any
Sh1_15	2	MNPRI1HS, MNPRI2LS	MOSFET N-ch, 40 V, 4.6 A, 700 mW, 42 mΩ, AEC-Q101, SOT-23-3	Transistor	Any	Any

Item	Qty.	Ref.	Part / Value	Description	Manufacturer	Order code
Sh1_16	5	MP1, MP2, MP3, MP4, MP5	MOSFET P-ch, 40 V, 3.4 A, 700 mW, 80 mΩ, AEC-Q101, SOT-23-3	Transistor	Any	Any
Sh1_17	1	PNP1	BJT PNP, 45 V, 100 mA, 300 mW, hFE>400, AEC-Q101, SOT-23-3	Transistor	Any	Any
Sh1_18	1	PT1	Transformer, 5 kVrms isolation, push-pull, 1CT: 1CT, ET > 66 V.μs, AEC-Q200, SMD	Power transformers	PULSE ELECTRONICS	PM2190.011NL/ PH9185.011NL
Sh1_19	3	RFILT1, RFILT2, RL1	4.7 kΩ, 150 V, 0.125 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_20	2	RGEN2A, RGEN2B	22 kΩ, 150 V, 0.125 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_21	5	RGEP1, RGEP2, RGEP34, RLCK1, RLCK2	2.2 kΩ, 150 V, 0.125 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_22	3	RGN1a, RGN2a, RL2	100 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_23	4	RPRI1, RPRI2, RSEC1, RSEC2 N.A.	100 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	N.A.	N.A.
Sh1_24	2	RGN1b, RGN2b	180 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_25	2	RGP1, RGP2	220 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_26	1	RGP34	1 kΩ, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_27	1	RL3	10 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_28	2	RPD1, RPD2	100 kΩ, 150 V, 0.125 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_29	2	RS1, RS2	1.8 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh1_30	1	U7	MOSFET gate drivers, dual, 3.5 V to 14 V, 2-ch, 3.5 V UVLO, 125 °C, SO-8	Analog IC	Any	Any
Sheet 2						
Sh2_1	3	BP1, BP2, BP3	TAB, FASTON, 6.35 mm, through Hole	Power connector	Any	Any
Sh2_2	2	CGKT1, CGKT2	1 nF, 250 V, C0G, 5 %, AEC-Q200, SMD 0805	Capacitor	Any	Any

Item	Qty.	Ref.	Part / Value	Description	Manufacturer	Order code
Sh2_3	2	CGT1, CGT3	100 nF, 100 V, COG, 5 %, AEC-Q200, SMD 1206	Capacitor	Any	Any
Sh2_4	1	D3	STTH112UFY, 1200 V, 1 A, AEC-Q101, SMB flat	Ultrafast high-voltage rectifier	ST	STTH110UFY
Sh2_5	3	RGKT1, RGKT2, RGKT3	220 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh2_6	1	RGT1	33 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh2_7	1	RGT2	22 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh2_8	1	RGT3	150 Ω, 150 V, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh2_9	2	T1, T2	TN8050H-12WL, 800 V at 150 °C, 1200 V at 125 °C, 80 A, 50 mA I _{GT} , TO-247LL HC	Industrial grade thyristor	STMicroelectronics	TN8050H-12WL
Sh2_10	1	T3	ACS108-8SP, 800 V, 0.8 A, 10 mA I _{GT} , 150 °C, SOT-223-2L	Overvoltage protected AC switch	STMicroelectronics	ACS108-8SP
Sheet 3						
Sh3_1	1	CINIT	1 nF, 250 V, COG, 5 %, AEC-Q200, SMD 0805	Capacitor	Any	Any
Sh3_2	1	CSUP3	10 μF, 50 V, X7R, 10 %, AEC-Q200, SMD 1206	Capacitor	Any	Any
Sh3_3	6	CU1, CU2, CU3, CU4, CU5, CU6	100 nF, 100 V, X7R, 10 %, AEC-Q200, SMD 0805	Capacitor	Any	Any
Sh3_4	3	J2, J3, J4	Coaxial BNC, 50 Ω, through Hole	Connector	Any	Any
Sh3_5	4	RCLK, RENHS, RENLS, RINIT	10 kΩ, 150 V, 0.125 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh3_6	2	Rsel1, Rsel2	0 Ω, 6 A, 0.5 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh3_7	2	Rsel3, Rsel4	100 kΩ, 150 V, 0.125 W, 1 %, AEC-Q200, SMD 0805	Resistor	Any	Any
Sh3_8	2	U1, U2	Inverters, 2 V to 6 V, 6-ch, Schmitt-trigger inputs, 125 °C, AEC-Q100, TSSOP-14	Digital IC	Any	Any
Sh3_9	2	U3, U4	D Flip-Flop, 2 V to 6 V, 2-ch, Schmitt-trigger inputs, 125 °C, AEC-Q100, TSSOP-14	Digital IC	Any	Any
Sh3_10	2	U5, U6	NOR gate, 2 V to 6 V, 4-ch, 2-input, Schmitt-trigger inputs, 125°C, AEC-Q100, TSSOP-14	Digital IC	Any	Any

Revision history

Table 1. Document revision history

Date	Revision	Changes
27-Feb-2026	1	Initial release.

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