UJA1169A evaluation boards

Rev. 1 — 19 April 2022

User manual

Revision history					
Rev	Date	Description			
v.1	20220419	Initial version			

IMPORTANT NOT	ICE
For engineering d	levelopment or evaluation purposes only
	NXP provides the product under the following conditions: This evaluation kit is for use of ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY. It is provided as a sample IC pre- soldered to a printed-circuit board to make it easier to access inputs, outputs and supply terminals. This evaluation board may be used with any development system or other source of I/O signals by connecting it to the host MCU computer board via off-the-shelf cables. This evaluation board is not a Reference Design and is not intended to represent a final design recommendation for any particular application. Final device in an application heavily depends on proper printed-circuit board layout and heat sinking design as well as attention to supply filtering, transient suppression, and I/O signal quality. The product provided may not be complete in terms of required design, marketing, and or manufacturing related protective considerations, including product. Due to the open construction of the product, it is the responsibility of the user to take all appropriate precautions for electric discharge. In order to minimize risks associated with the customers' applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards. For any safety concerns, contact NXP sales and technical support services.



1 Introduction

This document is the user guide for the UJA1169A evaluation boards. It is intended for engineers involved in the evaluation, design, implementation and validation of the UJA1169A product family. This guide discusses power supply requirements and the MCU and CAN bus interfaces, and describes how to connect the boards into an ECU/CAN network.

The UJA1169A evaluation boards are designed to facilitate the testing and evaluation of UJA1169A product features in a variety of microcontroller IO interface environments. All MCU interface signals can be accessed in two ways: at a header row on the top side and also at header rows on the bottom side that can be plugged directly into many NXP MCU evaluation boards. The UJA1169A evaluation boards are designed to be compatible with the S32K1xx evaluation board series from NXP and to support the use of standard software development tools and drivers.

The UJA1169A evaluation board family consists of three variant boards as detailed in <u>Table 1</u>. The entire UJA1169A product family can be evaluated using these three boards, and not just the onboard devices. For example, the UJA1169AF-EVB board (with a UJA1169ATK/F device) can be used to evaluate the UJA1169ATK by setting bit CPNC = 0 in the CAN control register. In the same way, the UJA1169ATK/X and UJA1169ATK/3 devices can be evaluated using the the UJA1169AXF-EVB and UJA1169AF3-EVB boards, respectively.

 Table 1. UJA1169A evaluation boards and device overview

		Мо	des		Su	oplie	s	1	1	Hos inte	t rface	Ad	ditio	nal	featu	ures	1	Package
Evaluation board	On-board device	Normal + Standby modes	Sleep mode	Reset mode	V1: 5 V, µC only	V1: 5 V, µC and CAN	V1: 3.3 V, µC only	V2: 5 V, CAN + onboard loads	VEXT: 5 V, external loads	SPI: for control and diagnosis	RSTN: reset pin	Watchdog	Local WAKE pin	Limp pin	Non-volatile memory	CAN partial networking	CAN FD passive	HVSON20
UJA1169AF-EVB	UJA1169ATK/F	•	•	•	•			•		•	•	•	•	•	•	•	•	•
UJA1169AXF-EVB	UJA11692ATK/X/F	•	•	•		•			•	•	•	•	•	•	•	•	•	•
UJA1169AF3-EVB	UJA1169ATK/F/3	•	•	•			•	•		•	•	•	•	•	•	•	•	•

2 Overview of boards

Top and bottom views of the UJA1169AXF-EVB board are illustrated in <u>Figure 1</u>. Unless otherwise stated, the information in this section applies to all UJA1169A evaluation boards.

Board dimensions are 58.5 mm × 81.1 mm. Only components needed to support basic UJA1169A functionality are included. All boards contain circuitry for reverse polarity-protected battery supply, status LEDs for BAT, V1, V2/VEXT and LIMP signals, external PNP transistor for thermal management, local wake-up and CAN bus termination. The boards also provide several header rows (2.54 mm pitch) for connecting MCU interface and application signals. The headers on the bottom are compatible with the Arduino Uno pinout order, allowing the board to be connected directly to a variety of NXP MCU evaluation boards.



2.1 Ground connections

All ground pins are connected to the ground plane.

Table	2.	Ground connections	
-	-		_

round connections	
2-02	
3-07/12	
1-13	
5-11/13	
5-02/03	
9-02	

2.2 Power supply connections

2.2.1 Battery connections

An external power supply must be connected to either power jack J6 or 2-pin header J2, as illustrated in <u>Figure 2</u>.

Table 3. BAT/VIN connections

UJA1169A	UJA1169Ax-EVB
BAT (pin 14)	J2-01 or J6-01: connect to 12 V battery supply; pin BAT on the device is connected via Schottky diode D1. J5-01 and J5-15: pin VIN on the UJA1169Ax-EVB board is connected, by default, to the battery supply via jumper J8; remove jumper J8 to disconnect VIN on J5 from the battery supply.

Both supply circuits are routed via polarity protection Schottky diode D1 in order to block reverse currents. Decoupling capacitors C1 and C2 are provided to stabilize the input voltage and remove noise on the battery connection.

Green LED D2 lights up once the 12 V power supply has been connected.

By default, the UJA1169Ax-EVB evaluation board battery supply is routed to the MCU board via pin VIN on the Arduino connector, allowing the supply to the entire module to be managed via the UJA1169Ax-EVB board. This feature can be disabled by removing jumper J8, disconnecting the battery supply from pin VIN.

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2.2.2 V1/PNP connections

The V1 supply voltage is generated by the internal 5 V or 3.3 V regulator, depending on the UJA1169A variant, and is intended to supply the external microcontroller. It also determines the IO reference level.

The V1 output voltage can be accessed at pin 8 on connector J3. Decoupling capacitor C8 is provided to stabilize the output voltage and remove noise. LED D5, connected via resistor R9, indicates the status of V1 (on when V1 active). Jumper J7 can be used to connect V1 to J5-03 if needed as an MCU IO reference voltage. PNP pins can be accessed at connector J9 (see Figure 7).

UJA1169A	UJA1169Ax-EVB
V1 (pin 5)	J3-08 provides 3.3 V (UJA1169AF3-EVB only) or 5 V for MCU supply J5-03: pin V1 is connected to the IOREF signal on header J5 via jumper J7, e.g. for the MCU IO supply
VEXCTRL (pin 15)	TP4
VEXCC (pin 6)	J9-01: connected to the collector of the onboard PNP transistor
PNP	UJA1169Ax-EVB
B (pin 4)	J9-03: connected to the base of the onboard PNP transistor
C (pin 5)	J9-01: connected to the collector of the onboard PNP transistor
E (pin 1,2,3)	J9-04: connected indirectly via R4, 0 Ω to emitter of the onboard PNP transistor

 Table 4. V1/PNP connections

The internal V1 voltage regulator on the UJA1169A can deliver up to 250 mA without the need for an external PNP transistor. However, if critical thermal requirements need to be satisfied, it is possible to connect one or more external PNP transistors to share the total V1 load current, and therefore also share the thermal dissipation. The PNP transistor switches on when the load current exceeds the selected PNP activation threshold, $I_{th(act)PNP}$, while the battery supply voltage is above the PNP activation threshold, $V_{th(act)PNP}$. The main regulation loop inside the UJA1169A continues to handle

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all dynamic load changes within the package while the external PNP delivers additional supply current to the application.

Detailed information on the functionality and operation of the UJA1169A can be found in the data sheet and application hints (see Section 7).

2.2.2.1 UJA1169A with one PNP

By default, all UJA1169Ax-EVB boards are delivered with an onboard PNP (e.g. PHPT61003PY from Nexperia). A simplified circuit diagram is shown in Figure 3.

Shunt resistor R13 is used to limit the current delivered by the external PNP transistor and to protect the PNP transistor against a V1 short-circuit to GND.

Pull-up resistor R15 is used to pull up the PNP base voltage to prevent it floating (e.g. if R10 has been removed) and therefore ensure that the PNP is turned OFF.

Filter capacitor C9 is needed to protect V1 against an overvoltage during RF-injection on the battery line. For EMI optimization, C9 is placed close to the PNP emitter.

R4 and R10 are provided to allow the PNP to be easily disconnected.





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2.2.2.2 UJA1169A without an external PNP

As already discussed, the UJA1169Ax-EVB can operate using only the V1 regulator in applications where thermal considerations are not critical. For this option, resistors R4 and R10 must be removed, as illustrated in Figure 5 and Figure 6.





2.2.2.3 UJA1169Ax-EVB with multiple external PNPs

If thermal dissipation is so high that it needs to be distributed over a number of components, multiple PNPs can be connected in parallel. A single onboard PNP is included. Additional PNPs can be connected via header J9, as illustrated in Figure 7.

An emitter resistor is needed for each PNP to balance the current between the devices (e.g. 10 Ω). Make sure the resistor selected can handle the expected power dissipation.

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2.2.3 V2/VEXT connection

UJA1169A devices contain a second on-chip 5 V regulator. On the UJA1169ATK, UJA1169ATK/F, UJA1169ATK/3 and UJA1169ATK/F/3 variants, this regulator (V2) supplies the internal CAN transceiver and/or additional onboard hardware. On the UJA1169ATK/X and UJA1169ATK/X/F variants, the second regulator (VEXT) is intended to supply off-board components such as sensors.

Both V2 and VEXT can deliver up to 100 mA. A decoupling capacitor (C10) is connected between the pin and ground on the board. LED D6 lights up when the V2/VEXT output is active.

The V2 (UJA1169AF-EVB and UJA1169AF3-EVB) or VEXT (UJA1169AXF-EVB) output voltage is accessible on connector J3 (pin 10).

Table 5. VEXT connection

UJA1169A	UJA1169Ax-EVB
V2/VEXT (pin 13)	J3-10: provides 5 V supply for internal ECU/external loads



2.3 CAN communication circuitry

The UJA1169Ax-EVB evaluation boards contain typical CAN communication circuitry. The CANH and CANL bus signals are output on connector J1.

Table 6	CAN	bus	line	connections

UJA1169A	UJA1169Ax-EVB
CANH (pin 18)	J1-01: connect to HIGH-level CAN bus line
CANL (pin 17)	J1-02: connect to LOW-level CAN bus line

Equipped with termination resistors R2 and R3, the UJA1169Ax-EVB evaluation boards are configured to be used as termination nodes in a CAN network. If the CAN network is already terminated at both ends, it is recommended to remove R2 and R3 or replace them with higher value resistors to ensure that the impedance on the bus meets the CAN bus load specification, typically 60 Ω .



2.4 Wake-up options

All UJA1169A variants support a Sleep mode for use in energy-sensitive applications. Once in Sleep mode, the device will remain in this low-power mode until a wake-up request is received. A wake-up event can be triggered remotely via a standard pattern or dedicated wake-up frame on the CAN bus, or locally via the WAKE pin (details of wake-up functionality can be found in the data sheet and application hints; see <u>Section 7</u>).

Table 7. WAKE connections

UJA1169A	UJA1169Ax-EVB
WAKE (pin 12)	J3-11: connect to wake-up signal

All three UJA1169A evaluation boards feature local wake-up test circuitry. The WAKE pin is pulled HIGH by default via 10 k Ω resistors R6 and R7. When switch SW1 is pressed, the WAKE pin is pulled LOW. To test local wake-up functionality, local wake-up must first be enabled via the UJA1169A register map (as described in the UJA1169A data sheet [1]).

Regulator V1 on the UJA1169A is intended to supply the MCU. V1 is off in Sleep mode and switches on automatically when a wake-up event is detected.

The WAKE pin can be accessed via header J3 on the top of the board.



2.5 LIMP output

The LIMP pin can be accessed on top-side connector J3. It is targeted at applications that need a 'limp home' feature in the event of serious ECU failure. LIMP is an open-drain low-side output. It can be biased to an application-specific voltage level, such as via a pull-up resistor to BAT in the evaluation setup.

Red LED D4, connected in series with resistor R5, turns on when LIMP is triggered.

Table 8. VEXT connection

UJA1169A	UJA1169Ax-EVB				
LIMP (pin 11)	J3-14: connect to limp home signal				



2.6 MCU interface

The digital interface pins are located on the top side connector J3, as well as on the bottom side connector J4. Two of these pins, TXD and RXD, are used for CAN data communication with the MCU. The remaining four pins are used for SPI communication with the MCU.

A bidirectional reset signal (connected to the RSTN pin on the UJA1169A) is also accessible on J3 and J5.

UJA1169A	UJA1169Ax-EVB
TXD (pin 2)	J3-01 or J4-18
RXD (pin 7)	J3-02 or J4-20
SDO (pin 9)	J3-03 or J4-09
SDI (pin 3)	J3-04 or J4-07
SCK (pin 10)	J3-05 or J4-11
SCSN (pin 20)	J3-06 or J4-05





2.7 Reset connection

The reset connection is a bidirectional signal between the RSTN pin on the SBC and the MCU. It is used to initiate a system reset.

A 10 k Ω pull-up resistor is connected between RSTN and V1 on the evaluation boards. A reset event is triggered by a LOW level on RSTN. Details of reset functionality can be found in the UJA1169A data sheet [1] and application hints [2].

Table 10. RSTN connection

UJA1169A	UJA1169Ax-EVB
RSTN (pin 8)	J3-09 or J5-05: connect MCU reset signal



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3 Connecting the UJA1169Ax-EVB into a CAN network

The following conditions must be met before powering up the system with a 12 V supply.

- Connect all boards in the ECU to a common GND
- Connect SPI pins to the MCU SPI master:
 - SDO (J3-03, J4-09) → MISO
 - SDI (J3-04, J4-07) \rightarrow MOSI
 - SCK (J3-05, J4-11) → SCK
 - SCSN (J3-06, J4-05) → CS
- Connect TXD/RXD (J3-01/J3-02, J4-18/J4-20) pins to the MCU CAN controller TXD/ RXD pins
- Connect RSTN (J3-09/J5-05) to the MCU CAN controller reset pin
- Connect CANH and CANL (J1-01/J1-02) to the CAN bus twisted-pair cables
- Connect V1(J3-08, J5-03) to the MCU supply unit
- For the UJA1169AXF-EVB, connect VEXT (J3-10) to the peripheral loads that need a 5 V supply (optional)

Once the above steps have been completed, the ECU/EVB can be powered up using an external battery supply. The UJA1169A starts up in Forced Normal mode (if MTP is not configured) or Standby mode (if MTP configured), awaiting commands from the MCU via the SPI interface.

An example showing how to connect the UJA1169AXF-EVB between an MCU and the CAN bus is shown in <u>Figure 15</u>.



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4 Schematic diagrams



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5 Bills of Materials

Table 11. Bill of Materials - UJA1169AF-EVB

NXP does not assume liability, endorse, or warrant components from external manufacturers referenced in circuit drawings or tables. While NXP offers component recommendations in this configuration, it is the responsibility of the customer to validate their application.

FOI CITICA	rcomponents	, it is vital to use the	e manulaciulei lisieu.			
ltem number	Quantity	Schematic label	Value	Description	Part number	Manufacturer name
Active co	mponents					
1	1	U1	UJA1169ATK/F	IC SBC XCVR CAN 5 V AEC-Q100 HVSON20	UJA1169ATK/X	NXP SEMICONDUCTORS
Capacito	rs			·		
2	1	C1	100 µF	CAP ALEL 100 µF 25 V 20 % SMT	UWX1E101MCL1GB	NICHICON
3	1	C2	0.1 µF	CAP CER 0.1 µF 25 V 10 % X7R AEC-Q200 0603	CGA3E2X7R1E104K080AA	трк
4	1	C4	4700 pF	CAP CER 4700 pF 50 V 5 % C0G AEC-Q200 0603	CGA3E2C0G1H472J080AA	трк
5	2	C5, C6	51 pF	not populated	1	1
6	1	C7, C9	0.01 µF	CAP CER 0.01 µF 50 V 10 % X7R AEC-Q200 0603	CGA3E2X7R1H103K080AA	трк
7	1	C8, C10	6.8 µF	CAP CER 6.8 µF 16 V 10 % X7S AEC-Q200 0805	CGA4J1X7S1C685K125AC	ток
Diodes		1	1		1	1
8	1	D1	SCH/30 V	DIODE SCH PWR RECT 2A 30 V AEC-Q101 SOD123F	PMEG3020EH,115	NEXPERIA
9	1	D2, D5, D6	LED/GRN	LED BRIGHT GRN SGL 30 mA 0603	150060VS75000	WURTH ELEKTRONIK EISOS GMBH & CO. KG
10	1	D3	ESD Prot./24 V	DIODE BIDIR CAN BUS ESD PROTECTION 200 W 24 V AEC-Q 101 SOT23	PESD1CAN,215	NEXPERIA
11	1	D4	LED/RED	LED BRIGHT RED CLEAR SGL 2 V 20 mA SMT 0603	150060RS75000	WURTH ELEKTRONIK EISOS GMBH & CO. KG
Inductors	5			1		
12	1	L1	100 µH	IND CHK 100 µH 150 mA -30/+50 % AEC-Q200 1812	B82789C0104N002	EPCOS
Resistors	5			· ·	1	
13	2	R1, R8, R9	1 kQ	RES ME 1 kQ 1/10 W 5 % AEC-Q200 0603	CRCW06031K00JNEA	VISHAY INTERTECHNOLOGY (preferred)
	-	,			ERJ-3GEYJ103V	PANASONIC (alternative)
					RK73B1JTTD102J	KOA SPEER (alternative)
14	2	B2 B3	62.0	RES ME 62 Q 1/4W 5 % AEC-Q200 1206	CRCW120662R0.INEA	
15	1	R4 0 Ω	0.0	RES ME ZERO O 1/4 W 1206	ER L8GEY0R00V	
10					CR1206 I/000ELE	BOURNS (alternative)
					CR12064W000T	
					WR12X000 DTI	
10	2	D5 D6 D7 D44	40.00			
10	3	K5, K0, K7, K14	10 K12	RES MF 10 K2 1/10 W 5 % AEC-Q200 0603	ERJ-3GE 13 103V	KOA SEEER (alternative)
47	4	P 40				
17	1	RIU	0 12	RES MF ZERO Ω 1/10 W AEC-Q200 0603	ERJ-3GETURUUV	
10			1.0.0		CRCW06030000Z0EA	
18	1	R13	1.6 Ω	RES MF 1.6 Ω 3/4 W 1 % AEC-Q200 1206	CRCW12061R60FKEAHP	
19	1	R15	100 κΩ	RES MF 100K 1/10 W 5 % 0603	CR0603-JW-104ELF	BOURNS (preferred)
					RK73B1J11D104J	KOA SPEER (alternative)
					0603104J	LIKET CORPORATION (alternative)
					ERJ3GEYJ104V	PANASONIC (alternative)
					RC-0603-104JT	SKYMOS
					CR0603-10W-104JSNT	VENKEL COMPANY (alternative)
					CR0603-10W-104JT	VENKEL COMPANY (alternative)
					CRCW0603100KJNEC	VISHAY INTERTECHNOLOGY (alternative)
					WR06X104JTL	WALSIN TECHNOLOGY CORP (alternative)
Switches	, Connectors,	Jumpers, and Test	Points	T		
20	1	J1	HDR_1X2	HDR 1X2 TH 200 MIL SP 338H SN 100L	TSW-202-07-T-S	SAMTEC
21	2	J2, J7, J8	HDR_1X2	HDR 1X2 TH 100 MIL SP 338H SN 100L	TSW-102-07-T-S	SAMTEC
22	1	J3	HDR_1x14	HDR 1X14 TH 100 MIL SP 350H AU 118L	61301411121	WURTH ELEKTRONIK EISOS GMBH & CO. KG
23	1	J4	HDR_2X10	HDR 2X10 TH 100 MIL CTR 428H AU 110L	TSW-110-14-G-D	SAMTEC
24	1	J5	HDR_2X8	HDR 2X8 TH 100 MIL CTR 433H AU 110L	TSW-108-14-G-D	SAMTEC
25	1	J6	CON 3	CON 3 PWR JACK RA TH 295H NI 98L	PJ-051A	CULINC
26	1	J9	HDR_1X4	not populated		
27	1	SW1	SPST_SWITCH	SW SPST PB TACT 50MA 12 V TH	430186070716	WURTH ELEKTRONIK EISOS GMBH & CO. KG
28	2	TP1, TP2	TEST_040	TEST POINT BLACK 40 MIL DRILL 180 MIL TH 109L	5001	KEYSTONE ELECTRONICS (preferred)
					TP-105-01-00	COMPONENTS CORPORATION (alternative)
					151-203-RC	KOBICONN (alternative)
29	13	TP4	TPAD 059	TEST POINT PAD 59 MIL DIA SMT, NO PART TO ORDER	-	-

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Table 12. Bill of Materials - UJA1169AF3-EVB

NXP does not assume liability, endorse, or warrant components from external manufacturers referenced in circuit drawings or tables. While NXP offers component recommendations in this configuration, it is the responsibility of the customer to validate their application. For critical components, it is vital to use the manufacturer listed.

ltem number	Quantity	Schematic label	Value	Description	Part number	Manufacturer name
Active co	mponents	1	1	1	1	1
1	1	U1	UJA1169ATK/F/3	IC SBC XCVR CAN 3.3 V AEC-Q100 HVSON20	UJA1169ATK/X	NXP SEMICONDUCTORS
Capacito	rs	1				
2	1	C1	100 µF	CAP ALEL 100 µF 25 V 20 % SMT	UWX1E101MCL1GB	NICHICON
3	1	C2	0.1 µF	CAP CER 0.1 µF 25 V 10 % X7R AEC-Q200 0603	CGA3E2X7R1E104K080AA	ТДК
4	1	C4	4700 pF	CAP CER 4700 pF 50 V 5 % C0G AEC-Q200 0603	CGA3E2C0G1H472J080AA	TDK
5	2	C5. C6	51 pF	not populated		
6	1	C7. C9	0.01 µF	CAP CER 0.01 µF 50 V 10 % X7R AEC-Q200 0603	CGA3E2X7R1H103K080AA	ТДК
7	1	C8. C10	6.8 uF	CAP CER 6.8 µF 16 V 10 % X7S AEC-Q200 0805	CGA4J1X7S1C685K125AC	ТОК
Diodes						
8	1	D1	SCH/30 V	DIODE SCH PWR RECT 2A 30 V AEC-Q101 SQD123E	PMEG3020EH.115	NEXPERIA
9	1	D2 D5 D6	LED/GRN	LED BRIGHT GBN SGL 30 mA 0603	150060VS75000	WURTH ELEKTRONIK EISOS GMBH & CO. KG
10	1	D3	ESD Prot /24 V	DIODE BIDIR CAN BUS ESD PROTECTION 200 W 24 V AEC-O	PESDICAN 215	NEXPERIA
	·			101 SOT23		
11	1	D4	LED/RED	LED BRIGHT RED CLEAR SGL 2 V 20 mA SMT 0603	150060RS75000	WURTH ELEKTRONIK EISOS GMBH & CO. KG
Inductors	;	T	1		1	
12	1	L1	100 µH	IND CHK 100 µH 150 mA -30/+50 % AEC-Q200 1812	B82789C0104N002	EPCOS
Resistors	5					
13	2	R1, R8, R9	1 kΩ	RES MF 1 kΩ 1/10 W 5 % AEC-Q200 0603	CRCW06031K00JNEA	VISHAY INTERTECHNOLOGY (preferred)
					ERJ-3GEYJ103V	PANASONIC (alternative)
					RK73B1JTTD102J	KOA SPEER (alternative)
14	2	R2, R3	62 Ω	RES MF 62 Ω 1/4W 5 % AEC-Q200 1206	CRCW120662R0JNEA	VISHAY INTERTECHNOLOGY
15	1	R4	0 Ω	RES MF ZERO Ω 1/4 W 1206	ERJ-8GEY0R00V	PANASONIC (preferred)
				CR1206J/000ELF	BOURNS (alternative)	
					CR12064W000T	VENKEL COMPANY (alternative)
					WR12X000 PTL	WALSIN TECHNOLOGY CORP (alternative)
16	3	R5, R6, R7, R14	10 kΩ	RES MF 10 kΩ 1/10 W 5 % AEC-Q200 0603	ERJ-3GEYJ103V	PANASONIC (preferred)
					RK73B1JTTD103J	KOA SPEER (alternative)
17	1	R10	0 Ω	RES MF ZERO Ω 1/10 W AEC-Q200 0603	ERJ-3GEY0R00V	PANASONIC (preferred)
					CRCW06030000Z0EA	VISHAY INTERTECHNOLOGY (alternative)
18	1	R13	1.6 Ω	RES MF 1.6 Ω 3/4 W 1 % AEC-Q200 1206	CRCW12061R60FKEAHP	VISHAY INTERTECHNOLOGY
19	1	R15	100 kΩ	RES MF 100K 1/10 W 5 % 0603	CR0603-JW-104ELF	BOURNS (preferred)
					RK73B1JTTD104J	KOA SPEER (alternative)
					0603104J	LIKET CORPORATION (alternative)
					ERJ3GEYJ104V	PANASONIC (alternative)
					RC-0603-104JT	SKYMOS
					CR0603-10W-104JSNT	VENKEL COMPANY (alternative)
					CR0603-10W-104JT	VENKEL COMPANY (alternative)
					CRCW0603100KJNEC	VISHAY INTERTECHNOLOGY (alternative)
					WR06X104JTL	WALSIN TECHNOLOGY CORP (alternative)
Switches	, Connectors,	Jumpers, and Test	Points	1	1	
20	1	J1	HDR_1X2	HDR 1X2 TH 200 MIL SP 338H SN 100L	TSW-202-07-T-S	SAMTEC
21	2	J2, J7, J8	HDR_1X2	HDR 1X2 TH 100 MIL SP 338H SN 100L	TSW-102-07-T-S	SAMTEC
22	1	J3	HDR_1x14	HDR 1X14 TH 100 MIL SP 350H AU 118L	61301411121	WURTH ELEKTRONIK EISOS GMBH & CO. KG
23	1	J4	HDR_2X10	HDR 2X10 TH 100 MIL CTR 428H AU 110L	TSW-110-14-G-D	SAMTEC
24	1	J5	HDR_2X8	HDR 2X8 TH 100 MIL CTR 433H AU 110L	TSW-108-14-G-D	SAMTEC
25	1	J6	CON 3	CON 3 PWR JACK RA TH 295H NI 98L	PJ-051A	CULINC
26	1	J9	HDR 1X4	not populated		
27	1	SW1	SPST SWITCH	SW SPST PB TACT 50MA 12 V TH	430186070716	WURTH ELEKTRONIK EISOS GMBH & CO KG
28	2	TP1, TP2	TEST 040	TEST POINT BLACK 40 MIL DRILL 180 MIL TH 109L	5001	KEYSTONE ELECTRONICS (preferred)
					TP-105-01-00	COMPONENTS CORPORATION (alternative)
					151-203-RC	KOBICONN (alternative)
29	13	TP4	TPAD_059	TEST POINT PAD 59 MIL DIA SMT, NO PART TO ORDER	-	

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Table 13. Bill of Materials - UJA1169AXF-EVB

NXP does not assume liability, endorse, or warrant components from external manufacturers referenced in circuit drawings or tables. While NXP offers component recommendations in this configuration, it is the responsibility of the customer to validate their application. For critical components, it is vital to use the manufacturer listed.

ltem number	Quantity	Schematic label	Value	Description	Part number	Manufacturer name
Active co	omponents	1	1			1
1	1	U1	UJA1169ATK/X/F	IC SBC XCVR CAN 3.3 V/5 V AEC-Q100 HVSON20	UJA1169ATK/X	NXP SEMICONDUCTORS
Capacito	rs	1	1		T	1
2	1	C1	100 µF	CAP ALEL 100 µF 25 V 20 % SMT	UWX1E101MCL1GB	NICHICON
3	1	C2	0.1 µF	CAP CER 0.1 µF 25 V 10 % X7R AEC-Q200 0603	CGA3E2X7R1E104K080AA	TDK
4	1	C4	4700 pF	CAP CER 4700 pF 50 V 5 % C0G AEC-Q200 0603	CGA3E2C0G1H472J080AA	TDK
5	2	C5, C6	51 pF	not populated		
6	1	C7, C9	0.01 µF	CAP CER 0.01 µF 50 V 10 % X7R AEC-Q200 0603	CGA3E2X7R1H103K080AA	TDK
7	1	C8, C10	6.8 µF	CAP CER 6.8 µF 16 V 10 % X7S AEC-Q200 0805	CGA4J1X7S1C685K125AC	ТДК
Diodes						
8	1	D1	SCH/30 V	DIODE SCH PWR RECT 2A 30 V AEC-Q101 SOD123F	PMEG3020EH,115	NEXPERIA
9	1	D2, D5, D6	LED/GRN	LED BRIGHT GRN SGL 30 mA 0603	150060VS75000	WURTH ELEKTRONIK EISOS GMBH & CO. KG
10	1	D3	ESD Prot./24 V	DIODE BIDIR CAN BUS ESD PROTECTION 200 W 24 V AEC-Q 101 SOT23	PESD1CAN,215	NEXPERIA
11	1	D4	LED/RED	LED BRIGHT RED CLEAR SGL 2 V 20 mA SMT 0603	150060RS75000	WURTH ELEKTRONIK EISOS GMBH & CO. KG
Inductors	5]
12	1	L1	100 µH	IND CHK 100 µH 150 mA -30/+50 % AEC-Q200 1812	B82789C0104N002	EPCOS
Resistor	5	1	1			1
13	2	R1, R8, R9	1 kΩ	RES MF 1 kΩ 1/10 W 5 % AEC-Q200 0603	CRCW06031K00JNEA	VISHAY INTERTECHNOLOGY (preferred)
					ERJ-3GEYJ103V	PANASONIC (alternative)
					RK73B1JTTD102J	KOA SPEER (alternative)
14	2	R2, R3	62 Ω	RES MF 62 Ω 1/4W 5 % AEC-Q200 1206	CRCW120662R0JNEA	VISHAY INTERTECHNOLOGY
15	1	R4	0 Ω	RES MF ZERO Ω 1/4 W 1206	ERJ-8GEY0R00V	PANASONIC (preferred)
					CR1206J/000ELF	BOURNS (alternative)
					CR12064W000T	VENKEL COMPANY (alternative)
					WR12X000 PTI	WALSIN TECHNOLOGY CORP (alternative)
16	3	R5 R6 R7 R14	10 kO	RES ME 10 k0 1/10 W 5 % AEC-0200 0603	FR L3GEV 1103V	PANASONIC (preferred)
10	5	10, 10, 10, 11, 114	10 K12	NES WIT TO N22 1/10 W 3 // AEC-Q200 0003	PK73B1 ITTD1031	KOA SPEEP (alternative)
17	1	B10	0.0	PES ME ZERO, O 1/10 W/ AEC O200 0602	EB 1 2 CEV0B001/	PANASONIC (preferred)
17	1	RIU	0.12	RES WF ZERO 12 1/10 W AEC-0200 0003	CRCW0603000070EA	
40	4	D42	100		CRCW0003000020EA	
10	1	RIJ	1.0 12	RES MF 1.0 Ω 3/4 W 1 % AEC-Q200 1200		
19	1	K15	100 KΩ	RES MF 100K 1/10 W 5 % 0603	CR0603-JW-104ELF	BOURNS (preterred)
					RK73B1J11D104J	KOA SPEER (alternative)
					0603104J	LIKET CORPORATION (alternative)
					ERJ3GEYJ104V	PANASONIC (alternative)
					RC-0603-104JT	SKYMOS
					CR0603-10W-104JSNT	VENKEL COMPANY (alternative)
					CR0603-10W-104JT	VENKEL COMPANY (alternative)
					CRCW0603100KJNEC	VISHAY INTERTECHNOLOGY (alternative)
					WR06X104JTL	WALSIN TECHNOLOGY CORP (alternative)
Switches	, Connectors,	, Jumpers, and Test	Points			
20	1	J1	HDR_1X2	HDR 1X2 TH 200 MIL SP 338H SN 100L	TSW-202-07-T-S	SAMTEC
21	2	J2, J7, J8	HDR_1X2	HDR 1X2 TH 100 MIL SP 338H SN 100L	TSW-102-07-T-S	SAMTEC
22	1	J3	HDR_1x14	HDR 1X14 TH 100 MIL SP 350H AU 118L	61301411121	WURTH ELEKTRONIK EISOS GMBH & CO. KG
23	1	J4	HDR_2X10	HDR 2X10 TH 100 MIL CTR 428H AU 110L	TSW-110-14-G-D	SAMTEC 4
24	1	J5	HDR_2X8	HDR 2X8 TH 100 MIL CTR 433H AU 110L	TSW-108-14-G-D	SAMTEC
25	1	J6	CON 3	CON 3 PWR JACK RA TH 295H NI 98L	PJ-051A	CUI INC
26	1	J9	HDR_1X4	not populated		,
27	1	SW1	SPST_SWITCH	SW SPST PB TACT 50MA 12 V TH	430186070716	WURTH ELEKTRONIK EISOS GMBH & CO. KG
28	2	TP1, TP2	TEST_040	TEST POINT BLACK 40 MIL DRILL 180 MIL TH 109L	5001	KEYSTONE ELECTRONICS (preferred)
					TP-105-01-00	COMPONENTS CORPORATION (alternative)
					151-203-RC	KOBICONN (alternative)
29	13	TP4	TPAD_059	TEST POINT PAD 59 MIL DIA SMT, NO PART TO ORDER	-	-

6 FlexGUI: interactive register control via USB

When the UJA1169Ax-EVB is plugged onto a suitable microcontroller evaluation board, the microcontroller board can be used as a USB/SPI interface between the UJA1169Ax-EVB and a PC. After installing the FlexGUI application on a Windows PC (see <u>Section 6.3</u>), the contents of the SBC registers can be viewed and/or changed interactively.

FlexGUI for UJA1169Ax-EVB currently supports the following evaluation board:

• S32K144EVB, Rev. B (Figure 19)

See <u>www.nxp.com</u> for more information about this board.



6.1 FlexGUI software package overview

The FlexGUI SW package for the UJA1169A evaluation boards can be downloaded from <u>www.nxp.com</u>. It includes:

- the flexGUI PC installer (see also <u>Section 6.3</u>)
- FlexGUI firmware for all supported microcontroller boards (see also Section 6.2.1)

6.2 Preparations for using the S32K144EVB as a USB interface

The FlexGUI firmware must be loaded into the S32K144EVB before connecting the UJA1169Ax-EVB. Note that the jumper settings for firmware programming are different to those for FlexGUI usage.

6.2.1 FlexGUI firmware installation on S32K144EVB

Firmware programming in the S32K144EVB is straightforward:

- 1. Confirm that the jumpers are in the correct position for firmware programming (Figure 20)
- 2. Connect the board to the PC with a USB cable (Figure 21)
- 3. Wait until the PC has launched new drive 'EVB-S32K144' (Figure 22)
- 4. Copy the firmware file to that drive (Figure 22)

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6.2.2 HW setup for FlexGUI operation

The watchdog in the SBC must be off while the FlexGUI is running. The watchdog is always off in Forced Normal mode and off by default in Software Development mode (a sample script for switching the device to Software Development mode via the FlexGUI is included in <u>Section 6.4.6</u>).

A system reset is generated after programming the MTPNV memory, after which the connection between the FlexGUI and the board will need to be re-established (see <u>Section 6.4.2</u>). If the reconnection fails, try again after a power-off/wait-3-seconds/power-on sequence on the UJA1169Ax-EVB.

Once the FlexGUI firmware has been installed on the microcontroller board, the jumpers on the boards need to be set as illustrated in <u>Figure 23</u> before plugging the UJA1169Ax-EVB into the microcontroller board. The resulting supply and data line interconnections between the boards are shown in <u>Figure 24</u>. Note that only the relevant header interconnections are shown in the schematics extract in <u>Figure 24</u>. See the full board schematics for further details.



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A 12 V power supply must be connected to header J2 or to jack J6 on the UJA1169A-

EVB (see also <u>Figure 19</u>). It supplies the BAT pin of the SBC via a polarity protection diode.

The 3.3 V or 5 V output from the SBC is routed to the microcontroller board via jumper J7, where it supplies the main MCU.

The SPI signals are routed directly between the SBC and the main MCU via header J4 and its counterpart J2.

The RSTN signal on the SBC is connected to the reset input on the main MCU. When terminals 2 and 3 of header J104 are connected with a jumper, pushbutton SW5 on the MCU board allows the RSTN signal to be pulled LOW manually. This function could be used, for example, when restoring the MTPNV register factory preset values.

The USB MCU is powered via the USB interface. The signals between main MCU and USB MCU are passed through level shifters that serve as a bridge between the two supply domains.

6.3 Installing the FlexGUI on a PC

Double-click on file NXP_UJA1169Ax_GUI-1.0.0.msi to begin the installation.

6.4 Using the FlexGUI

6.4.1 Starting the FlexGUI application

FlexGUI can be started via the Windows Start menu or the shortcut symbol on the desktop (Figure 25).

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During start-up, the FlexGUI launch window (Figure 26) displays a list of the evaluation boards covered by this FlexGUI installation.

Select the appropriate board and click **OK**. A temporary pop-up window indicates the status while the FlexGUI configuration is being loaded (Figure 27). Once loading is complete, the FlexGUI start-up window is displayed (Figure 28). The red text in the lower left corner of the window indicates that the application has not yet established a logical connection to the board. Section 6.4.2 explains how to establish a connection.

GUI Launcher – □ × a kit, on board device(s), target MCU and USB interface. ad Device(s) JJA1169AF-EVB JJA1169AXF-EVB JJA1169AXF V UJA1169AXF V UJA1169AXF V UJA1169AXF V UJA1169AXF SEC evaluation. dvanced Settings re Set production = & Adjust loaded tabs, etc. at MCU S32K144EVB = î Check your HW setup. nterface usb_cdc • î Check used firmware. plication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again
a kit, on board device(s), target MCU and USB interface.
dd Device(s) JJA1169AF-EVB JJA1169AXF-EVB UJA1169AXF ► ☑ UJA1169AXF ► ☑ UJA1169AXF ► ☑ UJA1169AXF SBC evaluation. dvanced Settings re Set production ♥ ♣ Adjust loaded tabs, etc. et MCU S32K144EVB ♥ î Check your HW setup. nterface usb_cdc ♥ î Check used firmware. poplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again
JJA1169AF-EVB JJA1169AXF-EVB JJA1169AXF VUJA1169AXF VUJA1169AXF VUJA1169AXF VUJA1169AXF VUJA1169AXF SBC evaluation. dvanced Settings re Set production & Adjust loaded tabs, etc. et MCU S32K144EVB • 0 Check your HW setup. Interface usb_cdc • 0 Check used firmware. opplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
JJA1169AF-EVB JJA1169AXF-EVB UJA1169AXF ♥ UJA1169AXF ♥ UJA1169AXF WUJA1169AXF SBC evaluation. for UJA1169AXF SBC evaluation. dvanced Settings re Set production ♥ Adjust loaded tabs, etc. et MCU S32K144EVB ♥ î Check your HW setup. nterface usb_cdc ♥ î Check used firmware. opplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
JAI 109AK5-EVB UJA1169AXF VUJA1169AXF VUJA1169AXF VUJA1169AXF VUJA1169AXF SBC evaluation. for UJA1169AXF SBC evaluation. dvanced Settings re Set production • & Adjust loaded tabs, etc. et MCU S32K144EVB • • • Check your HW setup. nterface usb_cdc • • • Check used firmware. poplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
PUJA1169AXF ▶ ♥ UJA1169AXF Ideal for UJA1169AXF SBC evaluation. dvanced Settings re Set production et MCU S32K144EVB Image: Size Size Size Size Size Size Size Size
▶ ✓ UJA1169AXF for UJA1169AXF SBC evaluation. dvanced Settings re Set production dvanced Settings re Set production et MCU S32K144EVB S32K144EVB ① Check your HW setup. nterface usb_cdc opplication Mode vord provide secret keyword Elevate ch Privileges BASIC e this configuration and do not ask again
for UJA1169AXF SBC evaluation. dvanced Settings re Set production • & Adjust loaded tabs, etc. et MCU S32K144EVB • • • Check your HW setup. Interface usb_cdc • • • Check used firmware. opplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
for UJA1169AXF SBC evaluation. dvanced Settings re Set production • & Adjust loaded tabs, etc. et MCU S32K144EVB • • • Check your HW setup. Interface usb_cdc • • • Check used firmware. opplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
for UJA1169AXF SBC evaluation. dvanced Settings re Set production • Adjust loaded tabs, etc. et MCU S32K144EVB • 1 Check your HW setup. Interface usb_cdc • 1 Check used firmware. application Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
for UJA1169AXF SBC evaluation. dvanced Settings re Set production & Adjust loaded tabs, etc. et MCU S32K144EVB • 1 Check your HW setup. Interface usb_cdc • 1 Check used firmware. opplication Mode word provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
for UJA1169AXF SBC evaluation. dvanced Settings re Set production • & Adjust loaded tabs, etc. et MCU S32K144EVB • 1 Check your HW setup. Interface usb_cdc • 1 Check used firmware. opplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
for UJA1169AXF SBC evaluation. dvanced Settings re Set production • Adjust loaded tabs, etc. et MCU S32K144EVB • 1 Check your HW setup. Interface usb_cdc • 1 Check used firmware. oplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
for UJA1169AXF SBC evaluation. dvanced Settings re Set production · & Adjust loaded tabs, etc. et MCU S32K144EVB · · · Check your HW setup. Interface usb_cdc · · · Check used firmware. opplication Mode vord provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
dvanced Settings re Set production • Adjust loaded tabs, etc. et MCU S32K144EVB • Oceck your HW setup. Interface usb_cdc • Oceck used firmware. Interface provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
re Set production Adjust loaded tabs, etc. et MCU S32K144EVB A Check your HW setup. Interface usb_cdc C Check used firmware. opplication Mode word provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
et MCU S32K144EVB
nterface usb_cdc Check used firmware. pplication Mode vord provide secret keyword Elevate ch Privileges BASIC e this configuration and do not ask again OK Cancel
pplication Mode word provide secret keyword Elevate th Privileges BASIC e this configuration and do not ask again OK Cancel
vord provide secret keyword Elevate ch Privileges BASIC e this configuration and do not ask again OK Cancel
e this configuration and do not ask again OK Cancel
e this configuration and do not ask again OK Cancel
e this configuration and do not ask again OK Cancel
OK Cancel
aaa-045703
indow - EVB selection
rindow - EVB selection

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- UJA1169AXF-EVB			- a ×
File Help			
e Port - Search Start			
Filter messages 🔹 🖌 📕 🥌	Script editor @ UJA1169AXEV1		
	Single Device Daisy Chain	Commands:	Results:
	Device: UJA1169AXF +		
	Alias: - No values		
	 Digital pins 		
	 Analog pins 		
	 Communication 		
	 Registers 		
	 Mode Generator 		
	 Miscellaneous 		
UJA1169AXF Pins			
Mode			
Switch Mode: user-mode - Apply			
Current Moder user-mode Poll			
Routing: SPI -			
▼ SPI0			
Bust SPI			
Bit Rate [kbit/s]: 2000			
		🖸 🗠 💾 🖿 🚽 🔞	💾 🖿 🍯
MCU: 532K144EV8 States DISCONNECTED Firmware	e: N/A		Application: NXP_UJA11694x_GUI 1.0.0 FlexGUI: 1.7.0 Build: Wed Sep 22 10:08:85 CEST 2021 🖉
			aaa-045704
Figure 28 Flex	GIII start-up w	indow: boards not vet connec	tod
i igure 20. Tiex	Sol start-up w	nuow, boards not yet connec	

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6.4.2 Establishing a connection between the FlexGUI and the hardware

To establish a connection between the FlexGUI and the hardware, a battery supply must first be provided for the UJA1169Ax-EVB (see Figure 19) before connecting the microcontroller board to the PC using a USB cable. Note that it may take a few seconds for the PC operating system to detect the connection and locate the appropriate USB driver.

Once the connection has been established, a communication session can be started over the USB link:

- Click the **Search** button to detect all available serial connections.
- Identify and select the COM port of the board. It is usually the last item on the list if no other USB cables were connected to the PC since the board was plugged in.
- Click **Start** to enable the connection.

The text in the lower left corner of the window should turn from red to green, to indicate that the session has started successfully (Figure 29). The FlexGUI functionality can now be accessed, as discussed in the following sections.

Help					- 0
COMA - Search Stee					
come - search stop					
messages 🔹 🖣 🛄 🛅 🕅	Script editor • UJA	1169AXEV1			
	Single Device Daisy Chu		Commands:	Results	
	Device: UJA1	169AXF +			
	Alias: - No	values			
	 Digital pins 				
	 Analog pins 				
	 Communication 				
	 Registers Mode 				
	 Generator 				
	Miscellaneous				
694XF Pins					
Mada una mada a Anata					
n Mode: User-mode * Apply					
nt Mode: user-mode Poll					
g: SPI 👻					
10					
SPI					
æ [kbit/s]: 2000					
			o 🗠 💾 🖿 🗕 🍕 🕑	😬 🖿 🖌	
32K144EV8 States CONNECTED Firmwares 1	1.0.0/1.1.0			Application: NXP UJA1169Ax GUI 1.0.	FlexGUI: 1.7.0 Build: Wed Sep 22 10:08:35 CEST
				.,	0

Figure 29. FlexGUI, USB connection to MCU board established

If FlexGUI shuts down during a connection attempt, there may be a conflict due to an obsolete jssc (java simple serial connector) library in the user cache. This problem can be solved by removing that library from the cache, e.g. with the command:

del "%USERPROFILE%\.jssc\windows\jSSC-2.8_x86_64.dll".

When this command is executed (e.g. by double-clicking on a text file that includes this line and has a file extension .cmd), the obsolete library is removed from the cache and a later version of the library is cached the next time FlexGUI starts up.

6.4.3 SPI speed selection

The SPI speed (frequency) can be specified in the lower-left section of the FlexGUI window (if that section of the window is not visible, click the slider symbol under the 'File' menu).

6.4.4 Interactive control of the RGB LED on the microcontroller board

Select the **Pins** tab in the FlexGUI window to access the drop-down window shown in Figure 30. This window contains selection boxes for the microcontroller pins that control the red, green and blue color components of the RGB LED on the microcontroller board. A 'Low' value selects a component; a 'High' value turns it off.

	UJA1169AF3 Pins	
	RedLED:	No valu 🔻
	BlueLED:	No valu 🔻
	GreenLED:	No valu 🔻
		Low
		High
		aaa-045709
Figure 30. Interactive cont	rol of the RGB LE	D on the microcontroller board

6.4.5 Register map

When the FlexGUI window opens, the 'Script editor' tab is selected by default. Click on the tab to the right to display the register map of the selected board. Device registers can be read or written to interactively via this window.

UJA1169A evaluation boards

- INAMEDAVE EVD										- a x
File Help										0 11
COM4 • Search Stop										
Filter messages 🔹 👻 💶 💾 🔶	Script editor UJA1169AXEV	1								
	👹 Register map									
	▼ Primary control	Write Read Conv. Reset	Clear Add to Script							
	Watchdog control									
	Mode control		W 0x44	WMC[2]	MMC[1]	WMC[0]	RESERVED	NWP[3]	NW9[2]	NWP[1]
	Fail-safe control			NWP[0]						
	Main status	watchoog control 0.000		WMC[2]	WMC[1]	WMC[0]	RESERVED	NWP[3]	NWP[2]	NWP[1]
	System event enable		R 0x0	NWP[0]						
	Watchdog status									
	Lock control									
	 Regulator control 									
	Transceiver control									
	WAKE pin control									
	Event capture									
	 MTPNV and ID Registers 									
IIIa1169AXE Pins										
Mode										
Switch Mode: user-mode * Apply										
Current Mode: user-mode Poll										
Routing: SPI +										
- S20										
Run SPI										
Rit Rate Biblif(2) 2000										
ne rate feature										
	HIGH [1] Bit Button									
	LOW [0] Bit Button				4 1					
MCU: S32K144EVB States CONNECTED Firmwares 1/	0.0/1.1.0				1/	Application	NXP_UJA1169Ax GL	JI 1.0.0 FlexGUI: 1.7.0	Build: Wed Sep 22	10:08:35 CEST 2021
							-			222-04571
										uuu-040771
Figure 31. Reg	ister map ta	ab								

The registers are divided into groups. A register group can be selected in the left column. If option **Tree View** is selected, a single register may be selected (Tree View is selected via the FlexGUI pop up window accessed under File/Settings; see <u>Figure 32</u>).

▶ FlexGUI Settings			_		×
Kit/Device Loader Logs	Register Map	abs			
User Interface					
Navigator View:	 Tree View List View 	Display register sets and register groups in tree for Display only register sets in list form.	rm.		
Registers Per Page:	8	Number of registers to be displayed on single pag	e.		
Sort By Address:		All visible registers will be sorted by address.			
Bit Buttons Bit Buttons Per Line:	8	Number of bit buttons to be displayed per line. Not guaranteed in case of insufficient screen space	ce.		
Uniform Buttons:	\checkmark	All bit buttons will use the same fixed width.			
Button Width:	110	Bit button width in pixels.			
Show Bit Position:	\checkmark	Display position in related bit group, e.g. [X:Y].			
Apply Discard De	faults				
nure 32 Register	man display s	ettings		aa	a-04162
Juie 02. Register	map display s	stango			

The contents of the selected register, or register group, is displayed in the main window. Register data can be edited in the top row in preparation for writing to the register. When option **Use Register Init Value** is selected, the editor is initialized with the default values at start-up and reset (Figure 33). If this option is not selected, all bits will be 0 at start-up and reset.

Actual register contents from a prior read access is shown in the bottom row.

it/Device Loader Logs Regis	ter Map	Tabs
Jser Interface		
Show Control Toolbar	\checkmark	If enabled, tab will show control toolbar with buttons for read, write and polling of its state as well as specific ones to given tab.
Behavior		
Use Register Init Value:		If enabled, tab will use register init value for configuration items as default one for GUI startup or reset (start/stop connection).
Auto-Copy Read To Write:		If enabled, read out value is automatically copied to write selection counterpart.
Auto-Run Read After Write:		If enabled, write to register automatically initiates read of the same register after completion. This option applies only for r/w registers.
Discord Defaults		
Discovel Defaulte		

Register data is displayed in three formats:

- · As a single hexadecimal value for the entire register
- In text format, when clicking on the question mark symbol
- A color-coded button is provided for each register bit:
 - red = 0

```
– green = 1
```

When the bit buttons do not fit on a single row (as in <u>Figure 31</u>), try de-selecting checkbox **Uniform Buttons** (see <u>Figure 32</u>). The width of the buttons is then minimized to fit the bit names (<u>Figure 34</u>).

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···· UJA1169AXF-EVB	-
File Help	
COM4 - Search Stop	
	3 Script editor • UIA1169AXHV1
	Register map
	Primary Control Write Read Copy Reset Clear Add to Script
	Watchdog control 0.00 S R 0.00 WINCER WINCER WINCER WINCER WINCER WINCER WINCER WINCER
	Main status
	System event enable
	Watchdog status
	Memory
	Lock control
	Neguarov control
	VARE on control
	Event capture
	MTPNV and ID Registers
UJA1169AXF Pins	
Mode	
Switch Mode: user-mode - Apply	
Current Mode: user-mode Poll	
Routing: SPI -	
- S20	
Ren SPI	
Bit Pate Mult/c2 2000	
Dir raine (contras)	
	HIGH [1] Bit Button
	LOW [0] Et Button
MCU: S32K144EVB State: CONNECTED Firmware: 1.0.0.	1.1.0 Application: NOP-UJA11698x GUI 1.0.0 FlexGUI: 1.7.0 Build: Wed Sep 22 100883 CEST 2021 🐼
	aaa-045712
Eiguro 24 Baria	ter man with option "Uniform Puttons" not colocted
Figure 34. Regis	ater map with option onnorm buttons not selected.

If there are more registers in a group than can be displayed on-screen, the registers are distributed over two or more pages and the active page can be selected at the bottom of the main window. The user can also choose the maximum number of registers displayed via control field **Registers Per Page** (see Figure 32). Figure 35 shows an example Register map view displaying the second page of the Transceiver control register group with 11 registers per page.



For each register, read and write operations can be triggered using the **R** and **W** buttons.

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Multiple registers can be selected using the check boxes to the left of the register names. The selected registers will be included in later multi-registers operations. Four associated buttons are provided:

- Write and read operations can be triggered with the Write and Read buttons.
- The **Copy** button can be used to copy data from the 'read' row(s) to the selected 'write' row(s).
- Clicking the **Reset** button undoes changes made to the 'write' row(s) since the most recently executed write action(s) on the associated register(s). If a register has not been previously written to, the selected rows are reinitialized (with the default values as selected via the **Use Register Init Value** checkbox; see Figure 33).

For each register, an 'OK' (\checkmark) or 'pencil' (\checkmark) symbol is displayed to the left of the W/R buttons. The \checkmark symbol indicates that the data currently in the editable text field matches the data previously written to the register (or the default initialization values if no previous write operation was executed). A \checkmark symbol indicates that the data in the editable text field differs from the data previously written to the register (or from the default values).

6.4.6 Working with the script editor

Selecting tab 'Script editor' opens a tool for creating, executing, loading and saving command sequences ('scripts') used for reading from or writing to registers. RGB LED settings (see <u>Section 6.4.4</u>) can also be included in such scripts.

••• UJA1169AXF-EVB			- a ×
COM4 • Search Stop			
Filter messages 🔹 🐨 📕 💾 🖣	Script editor • UJA1169AXEV1		
	Single Device Daisy Chain	Commands:	Results:
	Device: UJA1169AXF +	SET_REG:UJA1169AXF:Primary control:Mode control:0x07	
	Alias: - No values		
	Digital pins		
	 Analog pins 		
	 Communication 		
	▼ Registers		
	Operation: Write +		
	Set: Primary control +		
	Name/Address: Mode control +		
	Value: 0x07		
	Mark		
UJA1169AXF Pins			
Mode			
Switch Mode: user-mode * Apply			
Current Moder user-mode Poll			
Routing: SPI +			
▼ SPI0			
Bus: SPI			
Bit Rate [kbit/s] 2000			
	Mode		
	Generator Mircellaneour	🖸 🗠 💾 📥 🖌 🔞	💾 🖿 🥑
MCU: S32K144EV8 States CONNECTED Firmwares 1	.0.0/1.1.0		Application: NXP UJA1169Ax GUI 1.0.0 FlexGUI: 1.7.0 Build: Wed Sep 22 1008/35 CEST 2021
			444-040714

Figure 36. Script editor window

The commands available for the UJA1169Ax-EVB are listed in <u>Table 14</u>. Parameters need to be separated with a colon . Commands can be typed directly into the 'Commands' window, or constructed step by step using the selector tools in the left column. A script can also be loaded from a file.

Once a script is complete, it can be saved to a file and/or executed once by clicking on the corresponding button (\blacksquare and/or \blacktriangleright). Help text is displayed when the mouse pointer is hovered above these buttons.

Script execution is logged in the 'Results' window.

If the infinity option (∞) is selected when the script is executed, it runs continuously in a loop. The \blacktriangleright button changes to \clubsuit when a script is running. Execution continues until halted by clicking the \clubsuit icon. The ∞ option should not be used when the script includes a PAUSE command. If this happens by accident, it may be necessary to abort the FlexGUI application with the help of Windows Task Manager.

	•				
Command	Parameter 1	Parameter 2	Parameter 3	Parameter 4	Purpose
SET_REG	device name	register group	register name	value	write to a register
GET_REG	device name	register group	register name	n/a	read from a register
SET_DPIN	device name	MCU pin name	pin value	n/a	control RGB LED
PAUSE ^[1]	message text	n/a	n/a	n/a	wait for user
11	comment text	n/a	n/a	n/a	comment

 Table 14. Syntax for script editor commands

[1] The PAUSE command should not be used when the auto-repeat option (∞) has been selected.

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Example script using all available commands:

// This is an example script for UJA1169AXF-EVB // For UJA1169AF-EVB/UJA1169AF3-EVB replace "UJA1169AXF" with applicable device name // Do not run this script with the auto-repeat option,

// because the script includes a PAUSE command

// write value 0x07 to Mode-control register SET_REG:UJA1169AXF:Primary control:Mode control:0x07

// read Global event status register
GET_REG:UJA1169AXF:Event capture:Global event status

// turn on red LED
SET_DPIN:UJA1169AXF:RedLED:LOW

// give user time to identify the current LED color $\tt PAUSE:RGB$ LED will change from red to green

// turn off red LED & turn on green LED
SET_DPIN:UJA1169AXF:RedLED:HIGH
SET_DPIN:UJA1169AXF:GreenLED:LOW

Example script that programs the SBC for Software Development mode:

// Script for programming UJA1169AXF SBC MTPNV registers to Software Development mode // For UJA1169AF-EVB/UJA1169AF3-EVB replace "UJA1169AXF" with applicable device name // Read MTPNV status register GET_REG:UJA1169AXF:MTPNV and ID Registers:MTPNV status // The user can now check if device is ready for programming PAUSE:Only if MTPNV status value was an odd number, programming can be successful // Set default reset length to maximum and no auto-start of VEXT SET_REG:UJA1169AXF:MTPNV and ID Registers:Start-up control:0x00 // Set Software Development mode, allow Sleep mode and set max reset threshold as default SET_REG:UJA1169AXF:MTPNV and ID Registers:SBC configuration control:0x04 // Enter the CRC code that fits to above selections SET_REG:UJA1169AXF:MTPNV and ID Registers:MTPNV CRC control:0xFB

A tool is provided as an attachment to this document to calculate the CRC (see last two lines in above script).

A system reset is generated after programming the MTPNV memory, after which the connection between the FlexGUI and the board will need to be re-established (see <u>Section 6.4.2</u>). If the reconnection fails, try again after a power-off/wait-3-seconds/power-on sequence on the UJA1169Ax-EVB.

6.4.7 Logging read and write operations

Each executed read or write access is logged in the upper left corner of the FlexGUI window. The logged data can be saved to a log file at any time.

A number of **Log Level** filter options are available to tailor the logged data to the needs of the user (see Figure 37). When 'FINEST' is selected, all bits of signals SDI ('out') and SDO ('in') are displayed for each SPI transfer (see script execution example in Figure 38).

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Priexoon settings					^
it/Device Loader	ogs	Register Map	Tabs	s	
User Interface					
				Legend:	
				SEVERE fatal, non-recoverable events	
				WARNING suspicious, recoverable events	
Log Level:	1	NFO	•	INFO standard events (register/pin read/write)	
				FINE verbose variant of above (data frames, crc, etc.)	
				FINEST processing output with finest details	
				FINEST \supset FINE \supset INFO \supset WARNING \supset Severe	
Message Limit:	5	00	•	Limit for number of cached messages. More items take more memory.	
Log Pin Polling:	\checkmark			Display logs in case of polling on value of input pins.	
Apply Discard	Defa	ults			
					- 044

File Help			
COM4 • Search Stop			
lter messages 🔹 🔹 😽 💾 🔶	Script editor UJA1169AXEV1		
4> out [0x0207]0b 00000010 00000111] 4> in [0x0207]0b 00000010 00000111]	Single Device Daisy Chain Device: UJA1169AXF +	Commands: // This is an example script	Recults: // This is an example script
sout [0xC100]06 11000001 0000000] in [0xC101]06 11000001 00000000] in [0xC101]06 11000001 00000001] St UL411694XE [Stohe] event status 0x6018:0x01	Alias: No values	// Do not run this script with the auto-repeat option, // because the script includes a PAUSE command // write value 0x07 to Mode-control register	// Do not run this script with the auto-repeat option, // because the script includes a PAUSE command
15-ULATMEADE (Dickal cent statuscoof) (5 club) 10-ULATMEADE (BackED) W 0 17-ULATMEADE (BackED) W 0 18-ULATMEADE (BreekED) W 0	Analog pins Communication Registers	SET_REGUIA1169AXFPrimary control:Mode control:0x07 // read Global event status register GET_REGUIA1169AXFEvent capture:Global event status	// write value 0x07 to Mode-control register OK write reg. Mode control ± 0x07
	Operation: Write * Set: Primary control	// turn on red LED SET_DPIN:UJA11694XF:RedLED:LOW // olve user time to identify the current LED color	// read Global event status register OK read reg. Global event status = 0x01
	Name/Address: Mode control * Value: 0x07 Mask:	PAUSERG8 LED will change from red to green // turn off red LED & turn on green LED SET_DPINcULA1169AXER.edLED.HIGH	// turn on red LED OK set RedLED digital pin = LOW
		SET_DRIVLIA1169A35GreenEIDLDW	// give user time to identify the current LED color OK pause script execution, confirm the dialog to continue
JJA1169AXF Pins Mode			// turn off red LED & turn on green LED OK set RedLED digital pin = HIGH OK set GreenLED digital pin = LOW
Switch Mode: User-mode Poll Current Mode: user-mode Poll Routing: SPI			
SND But: SPI Bit: Rade [kbit/s]: 2000			
	Mode		
	Generator Microllaneour		
CIL SECURITY States COMMECTED Elementers 11	00/10		Applications NYD UIA1160As GUI 100 EleveRits 170 Public West See 22 100925 CEST
ICU: 532K144EVB State: CONNECTED Firmwares 1.4	0.0/1.1.0		Application: NXP_UIA11690x_GUI 1.0.0 Flex/GUI: 1.7.0 Build: Wed Sep 22 100835 CEST aaa-04

If the log window is not displayed, click on the slider symbol under the 'File' menu.

6.4.8 Restrictions on using SBC in Sleep mode

After executing a Sleep mode command successfully, the SBC turns off the output on V1 supplying the microcontroller. As a result, the connection between the GUI and the SBC will be lost after a short delay. This needs to be taken into account when testing the Sleep mode command using the Register map tab or when executing scripts that include a Sleep mode command.

To resume GUI operation after the SBC has entered Sleep mode, the SBC must be woken up via an enabled wake source (CAN and/or WAKE pin). The GUI then needs to re-connect to the board.

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7 References

- UJA1169A data sheet Mini high-speed CAN system basis chip: <u>https://www.nxp.com/docs/en/data-sheet/UJA1169A.pdf</u>
 Mini high-speed CAN system basis chip: <u>https://www.nxp.com/docs/en/data-sheet/UJA1169A.pdf</u>
- [2] AH1902 application Mini high speed CAN system basis chips UJA116xA, available from NXP hints Semiconductors