

# KwikStik-K40

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## User's Manual

Rev. 1

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# 1 KwikStik Overview

The Kinetis KwikStik is a cost-effective development tool for the Kinetis family of MCUs. It features the Kinetis K40 low-power microcontroller based on the ARM® Cortex™-M4 architecture with USB 2.0 full-speed OTG and segment LCD display controllers. The K40X256 includes 256Kbytes of program flash storage and an additional 256Kbytes of FlexMemory non-volatile storage that can be used as additional program flash memory, data flash, or variable size/endurance EEPROM.

The KwikStik includes a SEGGER J-Link™ on-board debug interface that can be used to program the on-board K40X256 MCU or an external Kinetis MCU.

The KwikStik can function either as a standalone development tool or as a controller module in the Freescale Tower System ([freescale.com/tower](http://freescale.com/tower)). It can also be combined with other Freescale Tower peripheral modules to create development platforms for a wide variety of applications. Figure 1 provides an overview of the Freescale Tower System.

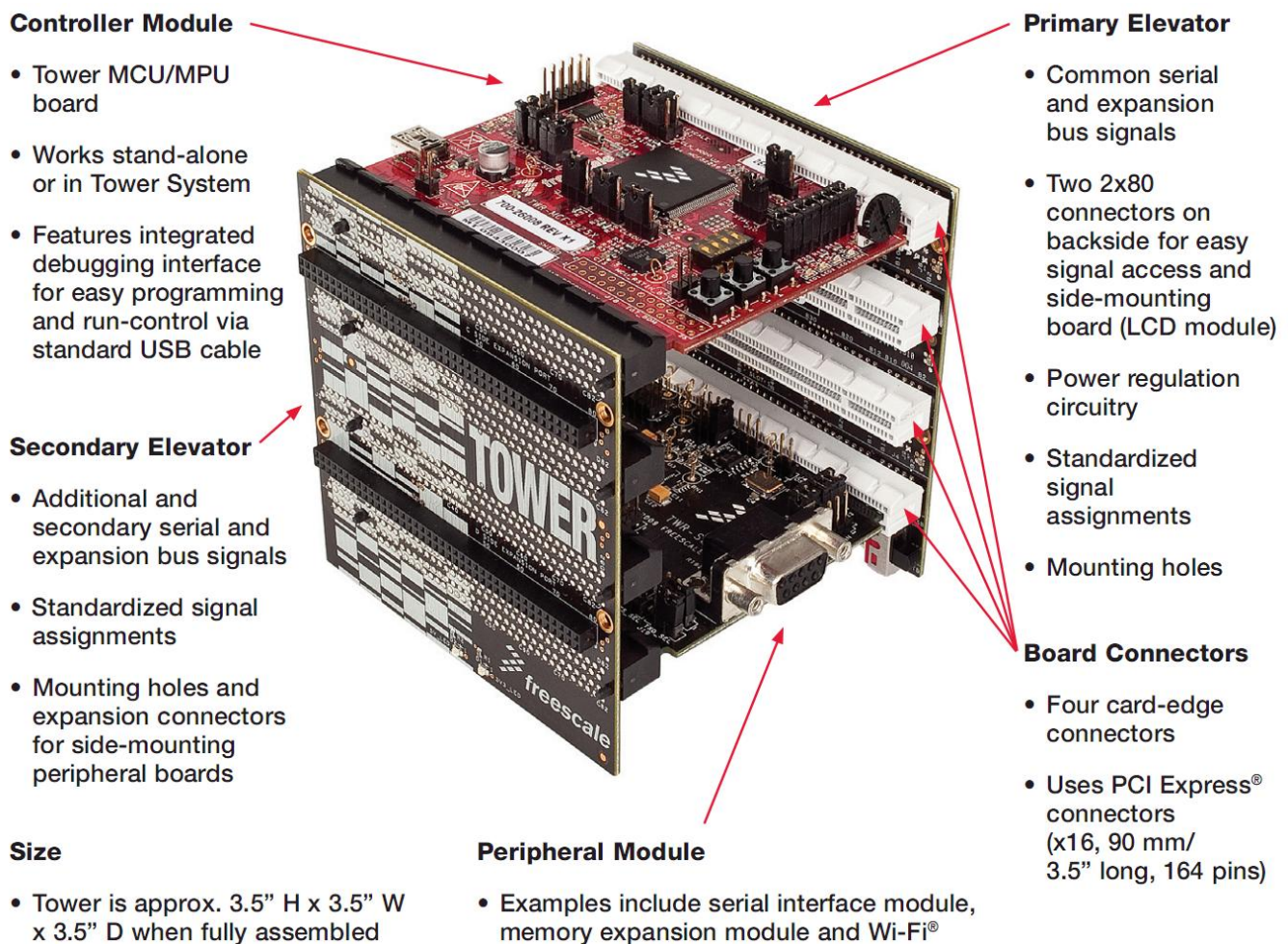


Figure 1. Freescale Tower System Overview

## 1.1 Contents

The KwikStik contents include:

- KwikStik board assembly
- Flexible silicone enclosure
- 3ft micro USB cable
- Getting started DVD
- Quick Start Guide

## 1.2 Features

Figure 2 and Figure 3 show the KwikStik with some of the key features called out. The following list summarizes the features of the KwikStik:

- LCD Display with 306 segments
- Buzzer
- 3.5 mm Audio Output Jack
- Omni-directional Microphone
- On-Board SEGGER J-Link debugger with USB connector
- Infrared Communications
- Micro SD Card slot
- Capacitive Touch Sensing Interface
- General purpose Tower Plug-in (TWRPI) socket
- 2 Micro USB connectors
- Manganese Lithium Rechargeable Battery for use with K40 low-power modes
- Tower Compatible module
- Flexible Plastic Enclosure

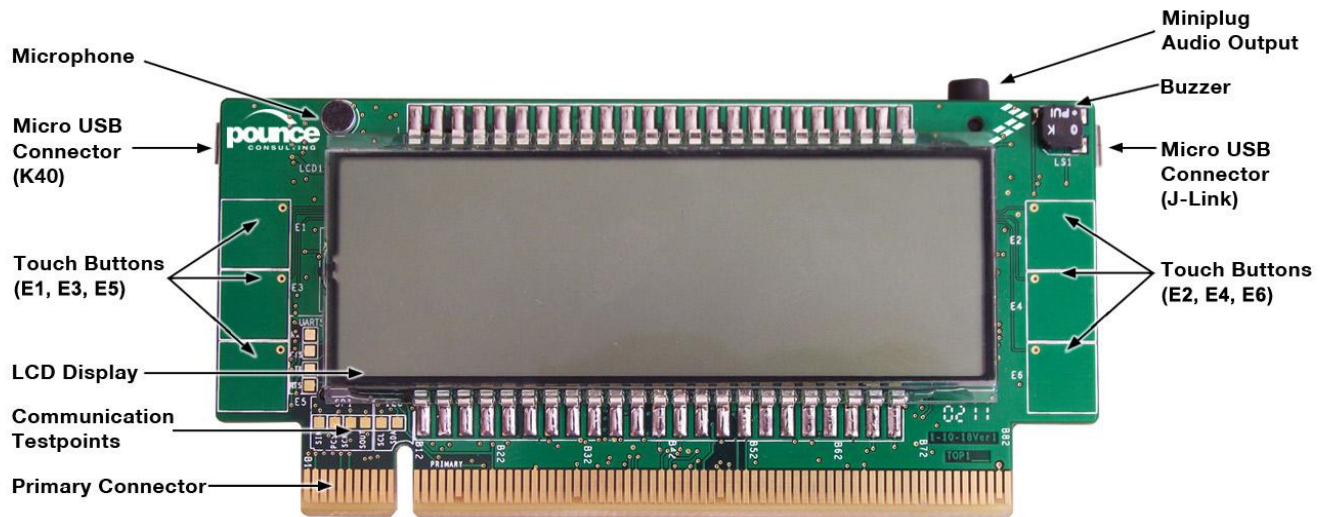


Figure 2. Callouts on front side of the KwikStik



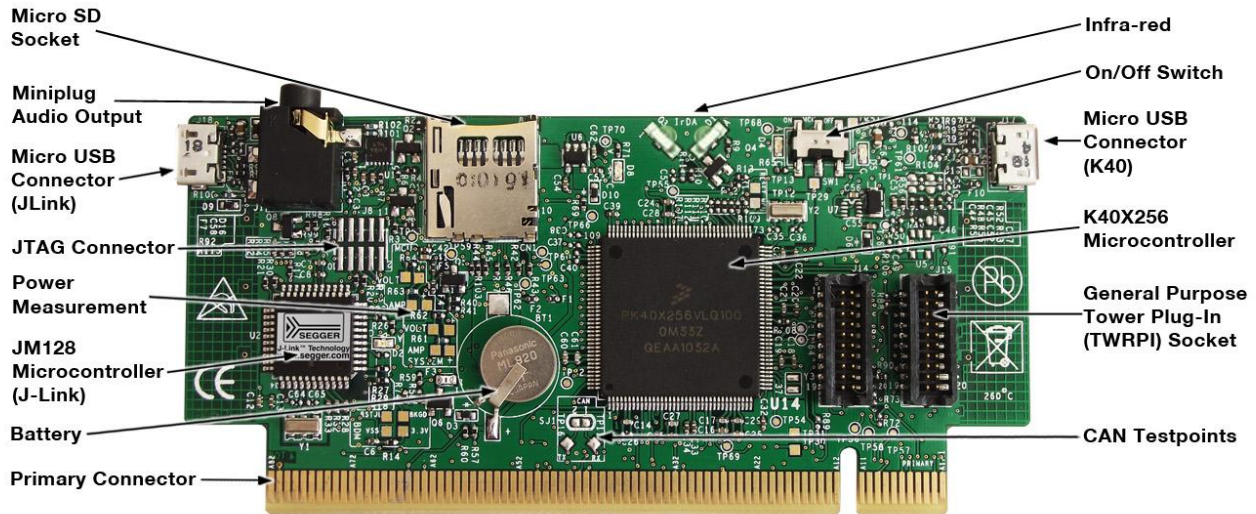


Figure 3. Callouts on back side of the KwikStik

## 1.3 Getting Started

Follow the Quick Start Guide found printed in the KwikStik box or the interactive DVD for the list of recommended steps for getting started. Refer to section 5, “Demo Applications” for information on how to run the pre-programmed demonstrations.

## 1.4 Reference Documents

The documents listed below should be referenced for more information on the Kinetis family, Tower System, and MCU Modules. These can be found in the documentation section of [freescale.com/KwikStik](http://freescale.com/KwikStik) or [freescale.com/kinetis](http://freescale.com/kinetis).

- *Quick Start Guide*
- *Schematics*
- *Design Package*
- *Kinetis K40 Family Product Brief*
- *Kinetis K40 Family Reference Manual*
- *Kinetis Quick Reference User Guide (QRUG)*

## 2 Hardware Description

The KwikStik development board features the MK40X256VLQ100—an ARM Cortex-M4 based microcontroller with segment LCD and USB 2.0 full-speed OTG controllers in a 144 LQFP package with a maximum core operating frequency of 100MHz.

An on-board SEGGER J-Link debug circuit provides a JTAG and SWD interface and a power supply input through a single USB micro-B connector. Figure 4 shows a block diagram of the KwikStik. The following sections describe the hardware in more detail.

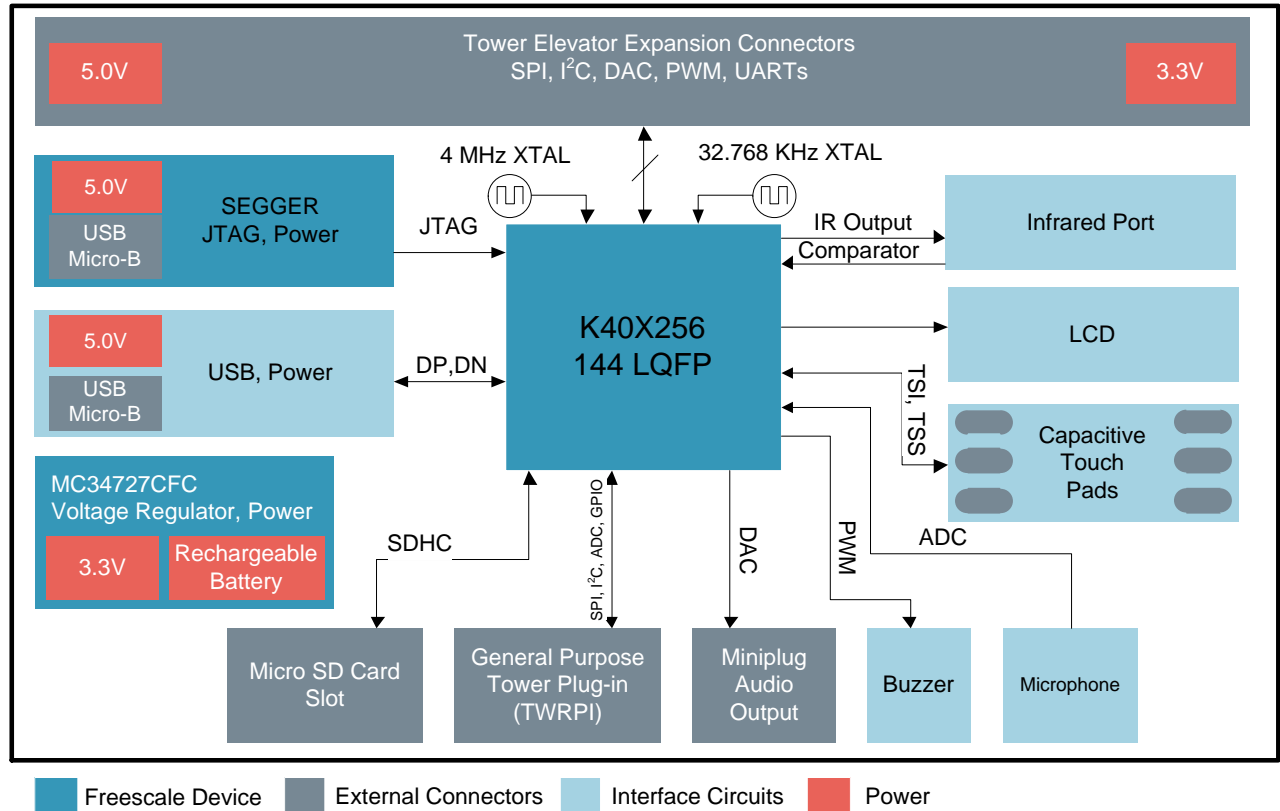


Figure 4. KwikStik Block Diagram

## 2.1 K40X256 Microcontroller

The KwikStik features the MK40X256VLQ100. The K40 microcontroller family is part of the Kinetis portfolio of devices built around an ARM Cortex-M4 core. Refer to the *K40 Family Product Brief* and the *K40 Family Reference Manual* for comprehensive information on the MK40X256VLQ100 device. The key features are listed here:

- 32-bit ARM Cortex-M4 core with DSP instructions
- 100MHz maximum core operating frequency
- 144 LQFP, 20mm x 20mm, 0.5mm pitch package
- 1.71V – 3.6V operating voltage input range
- 256 Kbytes of program flash, 64 Kbytes of static RAM
- FlexMemory consisting of 256 Kbytes of FlexNVM (non-volatile flash memory that can be used as program flash, data flash, backup EEPROM of variable endurance and size) and 4 Kbytes of FlexRAM (RAM memory that can be used as traditional RAM, as high-endurance EEPROM storage, or flash programming acceleration RAM)
- External bus interface
- Power management controller with 10 different power modes
- Multi-purpose clock generator with PLL and FLL operation modes
- 16-bit SAR ADC, 12-bit DAC
- High-speed analog comparator with 6-bit DAC
- Programmable voltage reference
- USB full-speed/low-speed OTG/Host/Device controller with device charge detect

- SPI, I<sup>2</sup>C (w/ SMBUS support), UART (w/ ISO7816 and IrDA), CAN, I<sup>2</sup>S
- SD Host Controller (SDHC)
- GPIO with pin interrupt support, DMA request capability, digital glitch filtering
- Capacitive touch sensing inputs (TSI)
- LCD display driver supporting 3V and 5V glass, configurable frontplane and backplane pins, and segment failure detection
- Debug interfaces: JTAG, cJTAG, SWD
- Trace: TPIO, FPB, DWT, ITM, ETM, ETB

## 2.2 Clocking

The Kinetis MCUs start up from an internal digitally controlled oscillator (DCO). Software can enable one or two external oscillators if desired. The external oscillator for the Multipurpose Clock Generator (MCG) module can range from 32.768 kHz up to a 32 MHz crystal or ceramic resonator. The external oscillator for the Real Time Clock (RTC) module accepts a 32.768 kHz crystal.

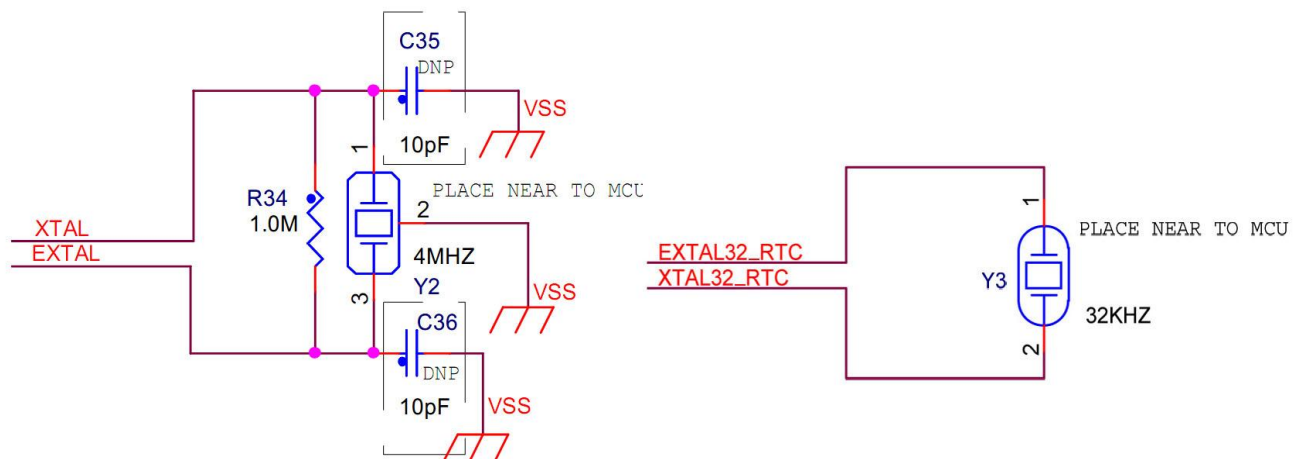


Figure 5. External clock source circuitry

The clocking circuitry on the KwikStik is shown on sheet 7 of the schematics and in Figure 5. A 4.0 MHz ceramic resonator with built-in load capacitors is the default external source for the MCG oscillator inputs (XTAL/EXTAL\_MAIN). A 32.768 KHz crystal is connected to the RTC oscillator inputs by default.

## 2.3 System Power

The main power source for the KwikStik comes from either one of the two Micro USB ports. When plugged in, power for the system is derived from a Freescale MC34727CFR2 3.3V regulator.

When installed into a Tower System, the KwikStik can be powered from either an on-board source or from another source in the assembled Tower System.

Switching the ON/OFF switch to the OFF position will cut power supply to the K40X256 MCU. The JM128 will remain powered even if the switch is in the OFF position, enabling the KwikStik for external programming. Refer to section 2.4, “Debug Interface” for information on how to use the on board SEGGER J-link debug interface. Refer to Figure 6 for location and correct usage of the ON/OFF switch.



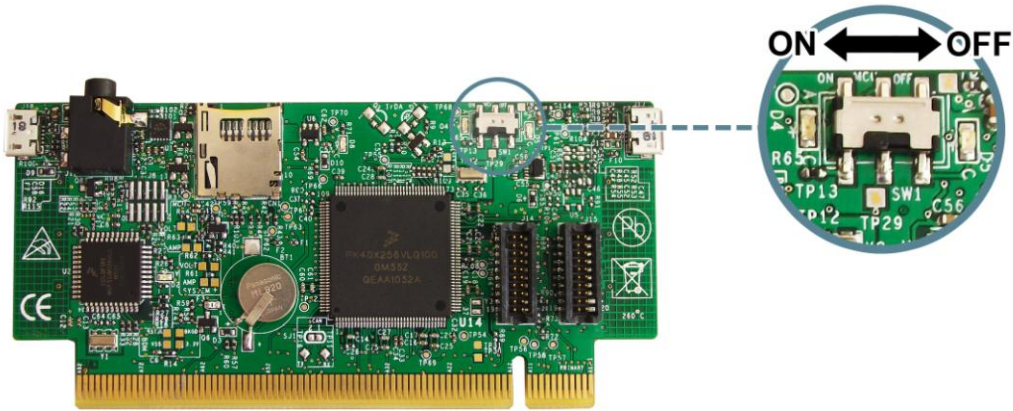


Figure 6. KwikStik ON/OFF switch positioning.

An MgLi rechargeable battery is available to test low power capabilities of the K40X256. This battery is recharged whenever USB power is available.

## 2.4 Debug Interface

An MCF51JM128VLD based SEGGER J-Link circuit provides a JTAG and Serial Wire Debug (SWD) interface to program the on-board K40X256 MCU or an external Kinetis MCU.

### 2.4.1 Programming an on-board MCU

A JTAG debug interface from the JM128 to the K40X256 allows programming through a USB connection. A standard USB A male to Micro-B male cable (provided) can be used for debugging via the USB connector, J18. Drivers for the J-Link interface are provided on the KwikStik DVD and are also available from SEGGER here: <http://www.segger.com/cms/jlink-software.html>.

**Note:** The ON/OFF switch, SW1, needs to be in the ON position in order to provide power to the K40X256. A green led, D4, will indicate when the switch is turned to ON.

### 2.4.2 Programming an external Kinetis MCU

The Cortex Debug connector is a 10-pin (0.05") connector providing access to the SWD, SWV, JTAG, cJTAG, and EzPort signals available on the K40 device. The pinout and K40 pin connections to the debug connector, J8, is shown in Table 1.

**Note:** The ON/OFF switch, SW1, needs to be in the OFF position in order to provide ground to the Cortex Debug connector.

Table 1. Cortex Debug Connector Pinout

Pin	Function	TWR-K40X256 Connection
1	VTref	3.3V MCU supply (P3V3_MCU)
2	TMS / SWDIO	PTA3/SCIO_RTS_b/FTM0_CH0/JTAG_MS/SWD_DIO
3	GND	GND
4	TCK / SWCLK	PTA0/SCIO_CTS_b/FTM0_CH5/JTAG_CLK/SWD_CLK/EZP_CLK
5	GND	GND

Pin	Function	TWR-K40X256 Connection
6	TDO / SWO	PTA2/SCI0_TX/FTM0_CH7/JTAG_DO/TRACE_SWO/EZP_DO
7	Key	—
8	TDI	PTA1/SCI0_RX/FTM0_CH6/JTAG_DI/EZP_DI
9	GNDDetect	PTA4/FTM0_CH1/MS/NMI_b/EZP_CS_b
10	nRESET	RESET_b

**Note:** J8 is not populated by default. In order to target an off-board Kinetis device the user will need to solder on a connector and use a ribbon cable to connect to the external device. J8 can be populated with a 10-position (2x5), .05" pitch surface-mount header such as the Samtec FTSH-105-01-F-DV or compatible. Possible ribbon cables include the Samtec FFSD-05-D-06.00-01-N (6") or FFSD-05-D-12.00-01-N (12"). The ON/OFF switch of the KwikStik will need to be in the OFF position to turn off the on-board K40X256 and to provide ground to the cortex debug connector.

## 2.5 Infrared Port

An infrared transmit and receive interface is implemented as shown in Figure 7 below. The IR\_TX pin drives an infrared diode by switching Q4. The receiver uses an infrared phototransistor connected to an on-chip analog comparator through an optional low-pass filter. Internal to the K40 device, the output of the analog comparator can be routed to a UART module for easier processing of the incoming data stream.

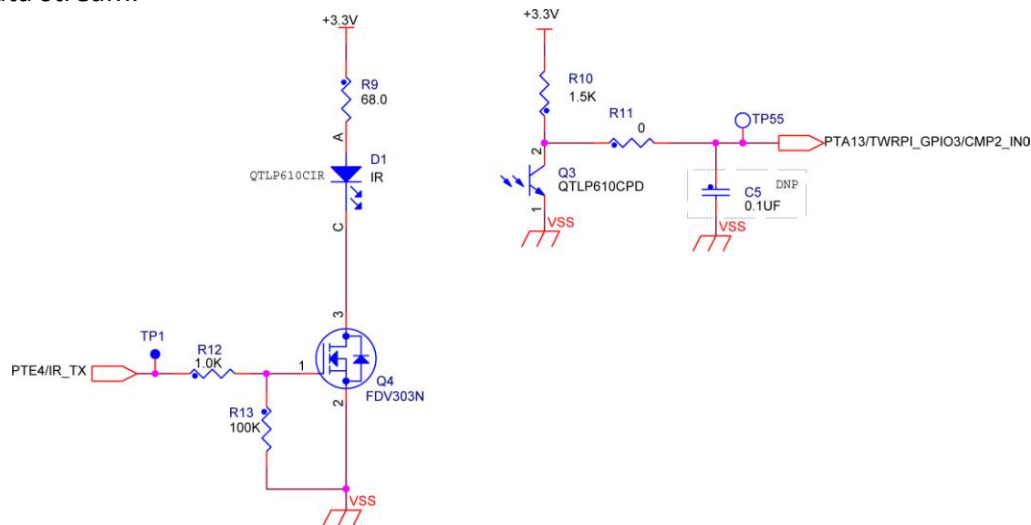


Figure 7. Infrared Port Implementation

## 2.6 General Purpose Tower Plug-in (TWRPI) Socket

The KwikStik features a socket that can accept a variety of different Tower Plug-in modules featuring sensors, RF transceivers, and more. The General Purpose TWRPI socket provides access to I2C, SPI, IRQs, GPIOs, timers, analog conversion signals, TWRPI ID signals, reset, and voltage supplies. The pinout for the TWRPI Socket is defined in Table 2.

Refer to Table 4 “I/O Connectors and Pin Usage Table” for the specific K40 pin connections to the General Purpose TWRPI socket.

Table 2. General Purpose TWRPI socket pinout

Left-side 2x10 Connector		Right-side 2x10 Connector	
Pin	Description	Pin	Description
1	5V VCC	1	GND
2	3.3 V VCC	2	GND
3	GND	3	I2C: SCL
4	3.3V VDDA	4	I2C: SDA
5	VSS (Analog GND)	5	GND
6	VSS (Analog GND)	6	GND
7	VSS (Analog GND)	7	GND
8	ADC: Analog 0	8	GND
9	ADC: Analog 1	9	SPI: MISO
10	VSS (Analog GND)	10	SPI: MOSI
11	VSS (Analog GND)	11	SPI: SS
12	ADC: Analog 2	12	SPI: CLK
13	VSS (Analog GND)	13	GND
14	VSS (Analog GND)	14	GND
15	GND	15	GPIO: GPIO0/IRQ
16	GND	16	GPIO: GPIO1/IRQ
17	ADC: TWRPI ID 0	17	GPIO: GPIO2
18	ADC: TWRPI ID 1	18	GPIO: GPIO3
19	GND	19	GPIO: GPIO4/Timer
20	Reset	20	GPIO: GPIO5/Timer

## 2.7 Touch Interface

The capacitive touch sensing interface of the KwikStik implements the TSI module of the K40X256 as well as the Freescale TSS touch sensing software suite ([freescale.com/touch](http://freescale.com/touch)).

There are six individual electrodes on-board the KwikStik that simulate buttons. Touch Sensing Software (TSS) can be implemented for all of the electrodes. Additionally, two of these signals (E1 and E2) can use the TSI module.

The touch sensing input (TSI) module of the Kinetis MCUs provides capacitive touch sensing detection with high sensitivity and enhanced robustness. Each TSI pin implements the capacitive measurement of an electrode. In order to use TSI on E1 and E2, the pull-up resistors R107 and R108 must be removed (they are not populated by default).

The Xtrinsic Touch Sensing Software (TSS) transforms Freescale MCUs into touch sensors, giving designers the flexibility to select from more than 650 Freescale MCUs to add cost-effective touch sensing functionality to their human-machine interface (HMI) designs.

Refer to Table 4 “I/O Connectors and Pin Usage Table” for the TSI and TSS signal connection details.

## 2.8 Segment LCD

An LCD Display containing 306 segments is mounted on the front side of the KwikStik. The segments are driven by 39 front-plane and 8 back-plane signals from the K40X256 MCU (LCD\_P1 – LCD\_P47). The front-plane and back-plane signals are mapped according to Figure 8 and Figure 9.

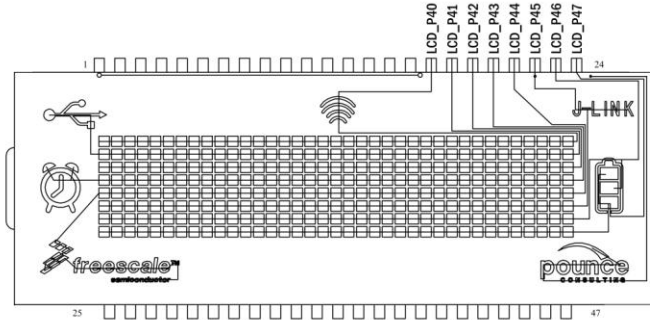


Figure 8. LCD Back-plane signals

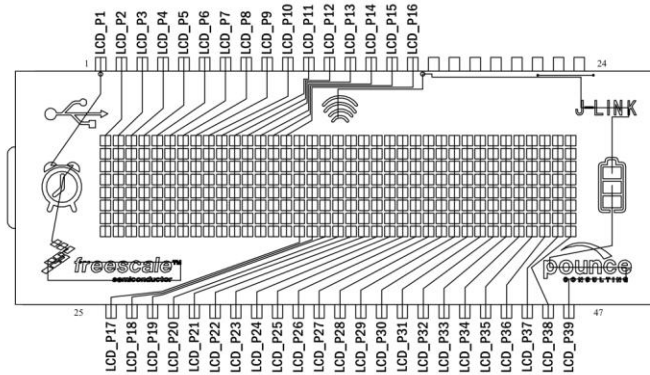


Figure 9. LCD Front-plane signals

## 2.9 Audio Input

The KwikStik features audio input capabilities through an on-board electric omnidirectional microphone that can be sampled using the K40 ADC module.

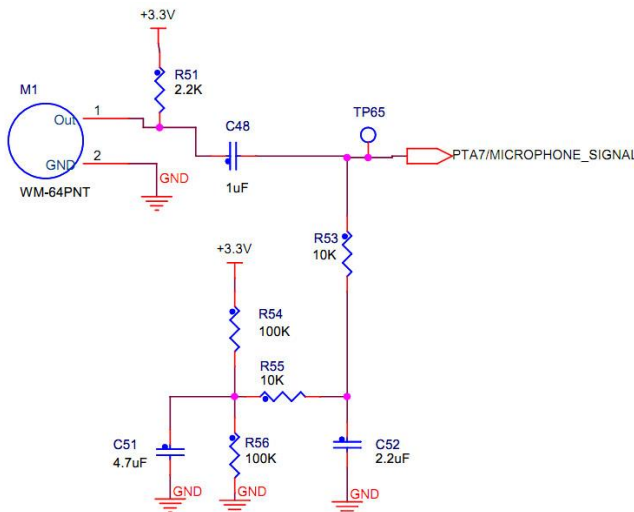


Figure 10. Microphone circuit

## 2.10 Audio Output

Audio output options include a 3.5 mm miniplug connector that can be used with headphones or external speakers. The audio power amplifier includes 16 step up/down digital volume control pins, which can be controlled through GPIO pins on the K40 (VOLUME\_UP, VOLUME\_DOWN). AUDIO\_AMP\_ON needs to be on to enable the amplifier

Refer to Table 4 “I/O Connectors and Pin Usage Table” for the audio output signal connection details.

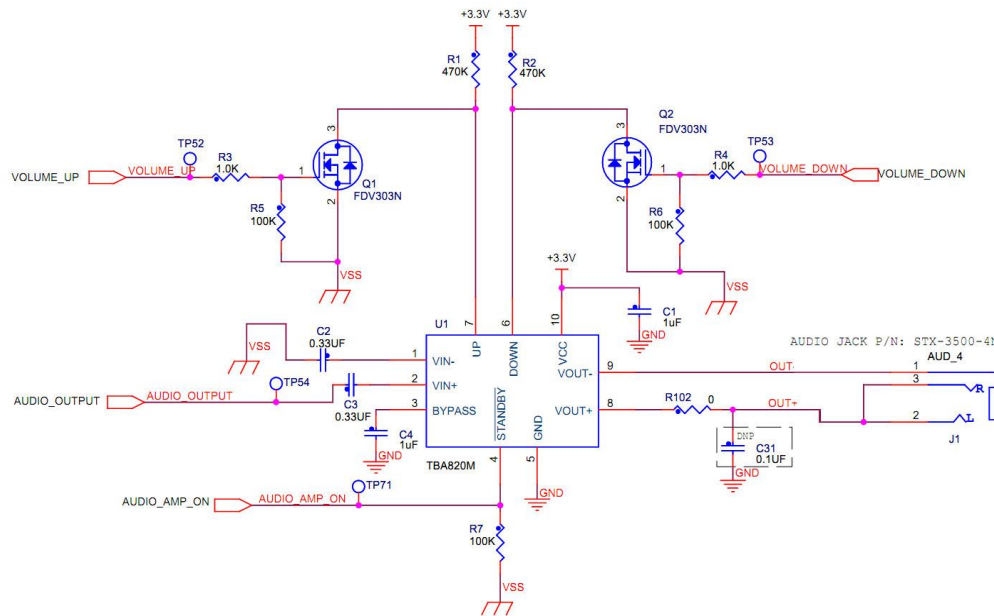


Figure 11. Miniplug output circuit

The piezo-electric buzzer (LS1) can be driven with PWM modulated signals from the K40 TPM module. R100 limits the current consumption of the buzzer (100 mA MAX) to 30mA.

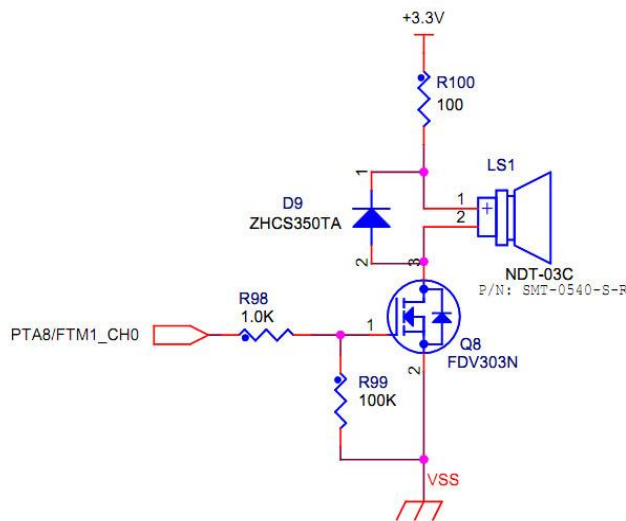


Figure 12. Buzzer Circuit



## 2.11 USB

The K40X256 features a USB full-speed/low-speed OTG/Host/Device controller with built-in transceiver. The KwikStik features a USB device connection to the K40X256 USB module through the micro usb connector J17.

## 2.12 Micro Secure Digital Card Slot

A Micro Secure Digital (Micro-SD) card slot is available on the KwikStik connected to the SD Host Controller (SDHC) signals of the K40 MCU. Refer to Table 4 “I/O Connectors and Pin Usage Table” for the SDHC signal connection details.

## 2.13 Communication Testpoints

Testpoints to access serial SPI, I2C, UART and CAN modules of the K40X256 are available on the KwikStik. The available signal pinouts are described in Table 3

Table 3. Communication Testpoints Usage Table

Module	Connection	Port Pin	Pin Function
UART5	UART Receive Data	PTE9	UART5_RX
	UART Clear to Send	PTE10	UART5_CTS_b
	UART Transmit Data	PTE8	UART5_TX
	UART Request to Send	PTE7	UART3_RTS_b
SPI	SPI Serial Data IN	PTA17	SPI0_SIN
	SPI Peripheral Chip Select	PTA14	SPI0_PCS0
	SPI Serial Data OUT	PTA16	SPI0_SOUT
	SPI Serial Clock	PTA15	SPI0_SCK
I2C	I2C Serial Clock Line	PTE1	I2C1_SCL
	I2C Serial Data Line	PTE0	I2C1_SDA
CAN	CAN Receive Pin	PTE25	CAN1_RX
	CAN Transmit Pin	PTE24	CAN1_TX

## 2.14 Power Consumption Measuring

A series of test points are available that allow measuring of the KwikStik’s current consumption. Two separate circuits allow current consumption measurement of the entire system or of the K40X256 MCU. Both circuits include an Amp Meter and a Volt Meter. For the Volt Meter, test points allow measurement of voltage consumption of a 1 ohm precision resistor, from which the current consumption can be calculated. Usage of the Amp Meter requires the removal of the 0 ohm resistor in order to directly measure current consumption on the corresponding test points.

Refer to Figure 13 for location of testpoints and resistors of the power consumption measuring circuit.

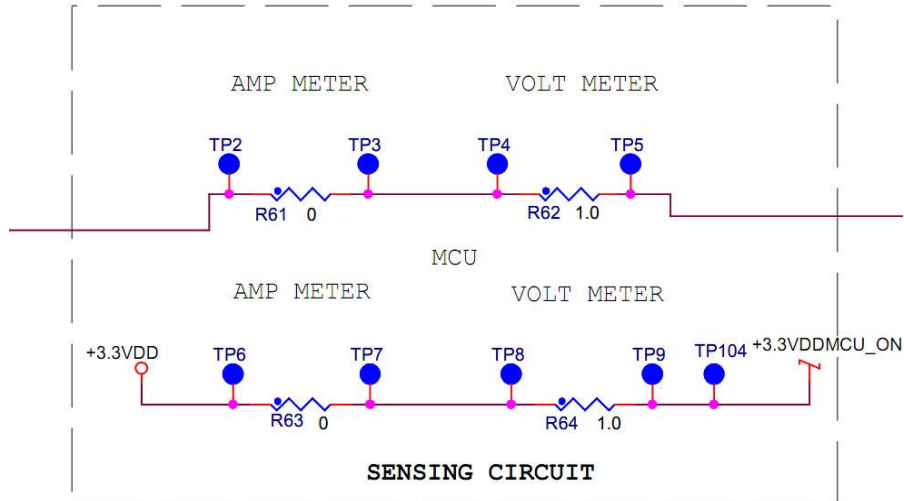


Figure 13. Power Consumption Measuring Circuit

**Note:** R62 and R64 are populated with 0 Ohm resistors by default. In order to use the volt meter, they will need to be replaced by 1 Ohm resistors.

### 3 Input/Output Connectors and Pin Usage Table

The following table provides details on which K40X256 pins are using to communicate with the the I/O interfaces onboard the KwikStik.

**Note:** Some port pins are used in multiple interfaces on-board and many are potentially connected to off-board resources via the Primary and Secondary Connectors. Take care to avoid attempted simultaneous usage of mutually exclusive features.

Table 4. I/O Connectors and Pin Usage Table

Feature	Connection	Port Pin	Pin Function
Audio Jack Output	Audio Amp On	PTE28	PTE28
	Audio Output	DAC1_OUT	DAC1_OUT
	Volume Up	PTD10	PTD10
	Volume Down	PTD11	PTD11
Buzzer	Audio Out	PTA8	FTM1_CH0
Microphone	Microphone input	PTA7	ADC0_SE10
SD Card Slot	SD Clock	PTE2	SDHC0_DCLK
	SD Command	PTE3	SDHC0_CMD
	SD Data0	PTD12	SDHC0_D4
	SD Data1	PTD13	SDHC0_D5
	SD Data2	PTD14	SDHC0_D6
	SD Data3	PTD15	SDHC0_D7
	SD Card Detect	PTE27	PTE27

	SD Card On	PTE6	PTE6
Infrared Port	IR Transmit	PTE4	IR_TX
	IR Receive	PTA13	CMP2_IN0
Touch Pads	E1 / Touch	PTB0	TSIO_CH0
	E2 / Touch	PTA4	TSIO_CH5
	E3 / Touch	PTA24	PTA24
	E4 / Touch	PTA25	PTA25
	E5 / Touch	PTA26	PTA26
	E6 / Touch	PTA27	PTA27
General Purpose TWRPI Socket	TWRPI AN0 (J8 Pin 8)	—	ADC0_DP0/ADC1_DP3
	TWRPI AN1 (J8 Pin 9)	—	ADC0_DM0/ADC1_DM3
	TWRPI AN2 (J8 Pin 12)	—	ADC1_DP0/ADC0_DP3
	TWRPI ID0 (J8 Pin 17)	—	ADC0_DP1
	TWRPI ID1 (J8 Pin 18)	—	ADC0_DM1
	TWRPI I2C SCL (J9 Pin 3)	PTC10	I2C1_SCL
	TWRPI I2C SDA (J9 Pin 4)	PTC11	I2C1_SDA
	TWRPI SPI MISO (J9 Pin 9)	PTB23	SPI2_SIN
	TWRPI SPI MOSI (J9 Pin 10)	PTB22	SPI2_SOUT
	TWRPI SPI SS (J9 Pin 11)	PTB20	SPI2_PCS0
	TWRPI SPI CLK (J9 Pin 12)	PTB21	SPI2_SCK
	TWRPI GPIO0 (J9 Pin 15)	PTC12	PTC12
	TWRPI GPIO1 (J9 Pin 16)	PTB9	PTB9
	TWRPI GPIO2 (J9 Pin 17)	PTB10	PTB10
	TWRPI GPIO3 (J9 Pin 18)	PTC5	PTC5
TWRPI GPIO4 (J9 Pin 19)	PTA5	PTA5	

## 4 Tower Elevator Connections

The KwikStik features an expansion card-edge connector that interfaces to the Primary Elevator board in a Tower system. Table 5 provides the pinout for the Primary Connector.

Table 5. KwikStik Primary Connector Pinout

Pin #	Side B		Pin #	Side A	
	Name	Usage		Name	Usage
B1	<b>5V</b>	<b>5.0V Power</b>	A1	<b>5V</b>	<b>5.0V Power</b>
B2	<b>GND</b>	<b>Ground</b>	A2	<b>GND</b>	<b>Ground</b>
B3	<b>3.3V</b>		A3	<b>3.3V</b>	
B4	ELE_PS_SENSE		A4	<b>3.3V</b>	
B5	<b>GND</b>	<b>Ground</b>	A5	<b>GND</b>	<b>Ground</b>
B6	<b>GND</b>	<b>Ground</b>	A6	<b>GND</b>	<b>Ground</b>
B7	SDHC_CLK / SPI1_CLK		A7	SCL0	
B8	SDHC_D3 / SPI1_CS1_b		A8	SDA0	
B9	SDHC_D3 / SPI1_CS0_b		A9	GPIO9 / CTS1	PTE10/UART_CTS
B10	SDHC_CMD / SPI1_MOSI		A10	GPIO8 / SDHC_D2	
B11	SDHC_D0 / SPI1_MISO		A11	GPIO7 / SD_WP_DET	
B12	ETH_COL		A12	ETH_CRS	
B13	ETH_RXER		A13	ETH_MDC	

Pin #	Side B		Pin #	Side A	
	Name	Usage		Name	Usage
B14	ETH_TXCLK		A14	ETH_MDIO	
B15	ETH_TXEN		A15	ETH_RXCLK	
B16	ETH_TXER		A16	ETH_RXDV	
B17	ETH_TXD3		A17	ETH_RXD3	
B18	ETH_TXD2		A18	ETH_RXD2	
B19	ETH_TXD1		A19	ETH_RXD1	
B20	ETH_TXD0		A20	ETH_RXD0	
B21	GPIO1 / RTS1	PTE7/UART_RTS	A21	SSI_MCLK	
B22	GPIO2 / SDHC_D1		A22	SSI_BCLK	
B23	GPIO3		A23	SSI_FS	
B24	CLKIN0		A24	SSI_RXD	
B25	CLKOUT1		A25	SSI_TXD	
B26	<b>GND</b>	<b>Ground</b>	A26	<b>GND</b>	<b>Ground</b>
B27	AN7		A27	AN3	
B28	AN6		A28	AN2	
B29	AN5		A29	AN1	
B30	AN4		A30	AN0	
B31	<b>GND</b>	<b>Ground</b>	A31	<b>GND</b>	<b>Ground</b>
B32	DAC1		A32	DAC0	DAC0_OUT
B33	TMR3		A33	TMR1	
B34	TMR2		A34	TMR0	
B35	GPIO4		A35	GPIO6	
B36	<b>3.3V</b>		A36	<b>3.3V</b>	
B37	PWM7	PTA8/FTM1_CH0	A37	PWM3	
B38	PWM6	PTA9/FTM1_CH1	A38	PWM2	
B39	PWM5		A39	PWM1	
B40	PWM4		A40	PWM0	
B41	CANRX0	PTE25/CAN1_RX	A41	RXD0	
B42	CANTX0	PTE24/CAN1_TX	A42	TXD0	
B43	1WIRE		A43	RXD1	PTE9/UART_RX
B44	SPI0_MISO	PTA17/SPI0_SIN	A44	TXD1	PTE8/UART_TX
B45	SPI0_MOSI	PTA16/SPI0_SOUT	A45	VSS	
B46	SPI0_CS0_b	PTA14/SPI0_PCS0	A46	VDDA	
B47	SPI0_CS1_b		A47	VREFA1	
B48	SPI0_CLK	PTA15/SPI0_SCK	A48	VREFA2	
B49	<b>GND</b>	<b>Ground</b>	A49	<b>GND</b>	<b>Ground</b>
B50	SCL1	PTE1/I2C1_SCL	A50	GPIO14	
B51	SDA1	PTE0/I2C1_SDA	A51	GPIO15	
B52	GPIO5 / SD_CARD_DET	PTA16	A52	GPIO16	
B53	USB0_DP_PDOWN		A53	GPIO17	
B54	USB0_DM_PDOWN		A54	USB0_DM	
B55	IRQ_H		A55	USB0_DP	
B56	IRQ_G		A56	USB0_ID	
B57	IRQ_F		A57	USB0_VBUS	
B58	IRQ_E		A58	TMR7	
B59	IRQ_D		A59	TMR6	
B60	IRQ_C		A60	TMR5	
B61	IRQ_B		A61	TMR4	
B62	IRQ_A		A62	RSTIN_b	
B63	EBI_ALE / EBI_CS1_b		A63	RSTOUT_b	PTA9/FTM1_CH1
B64	EBI_CS0_b		A64	CLKOUT0	
B65	<b>GND</b>	<b>Ground</b>	A65	<b>GND</b>	<b>Ground</b>
B66	EBI_AD15		A66	EBI_AD14	
B67	EBI_AD16		A67	EBI_AD13	
B68	EBI_AD17		A68	EBI_AD12	
B69	EBI_AD18		A69	EBI_AD11	
B70	EBI_AD19		A70	EBI_AD10	
B71	EBI_R/W_b		A71	EBI_AD9	

Pin #	Side B		Pin #	Side A	
	Name	Usage		Name	Usage
B72	EBI_OE_b		A72	EBI_AD8	
B73	EBI_D7		A73	EBI_AD7	
B74	EBI_D6		A74	EBI_AD6	
B75	EBI_D5		A75	EBI_AD5	
B76	EBI_D4		A76	EBI_AD4	
B77	EBI_D3		A77	EBI_AD3	
B78	EBI_D2		A78	EBI_AD2	
B79	EBI_D1		A79	EBI_AD1	
B80	EBI_D0		A80	EBI_AD0	
B81	<b>GND</b>	<b>Ground</b>	A81	<b>GND</b>	<b>Ground</b>
B82	<b>3.3V</b>		A82	<b>3.3V</b>	

## 5 Demo Applications

The demo applications highlight some of the features of the K40X256 MCU and the KwikStik evaluation and development board. All of the applications run under the Freescale MQX™ RTOS.

When the board is plugged in and powered on, a menu will allow selection of one of the applications. Use the top left and right electrodes (E1, E2) to navigate through the available options. To select an application, use either one of the bottom electrodes (E5, E6).

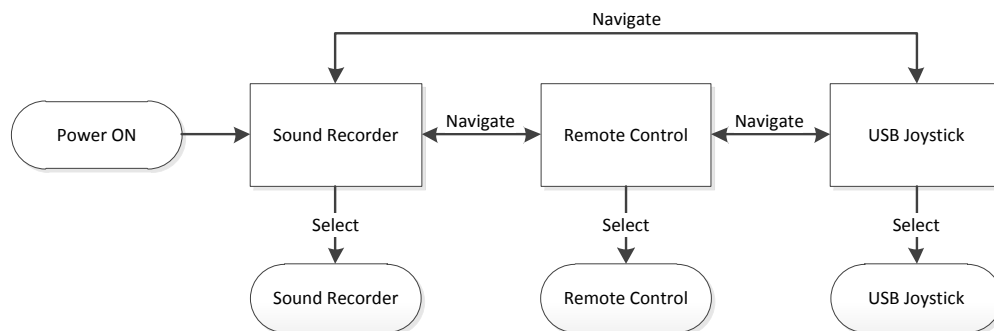


Figure 14. Main menu navigation flow diagram for demo applications

### 5.1 Sound Recorder

Raw sound data can be recorded from the microphone, stored in the K40 internal memory, and reproduced using the audio output mini-plug connector. A pair of headphones or external speakers connected to the audio output jack of the KwikStik is required for this demo application.

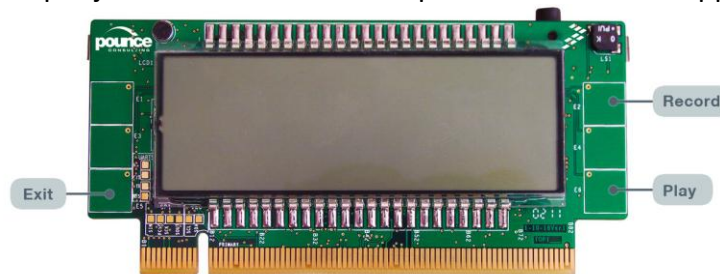


Figure 15. Sound recorder demo application electrode layout



## 5.2 Remote Control

The remote control application uses the infrared transmitter to send SIRC protocol commands that can control most Sony televisions. Commands for Power (E2), Channel Up (E4), and Channel Down (E6) are pre-stored and can be transmitted by pressing the corresponding electrode.

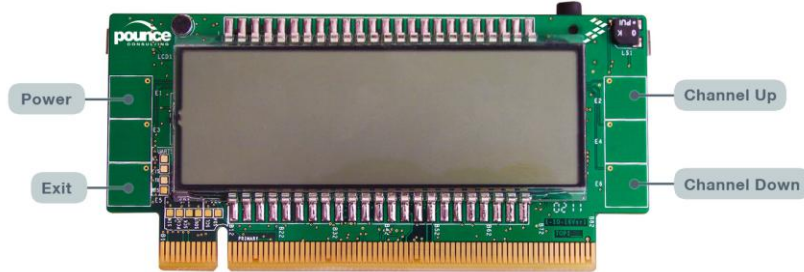


Figure 16. Remote Control demo application electrode layout

## 5.3 USB Joystick

The KwikStik can be used as a USB joystick device when running this application. When this application is selected the K40X256 will be enumerated as “MQX Joystick” on the PC. Use the touch-sensing electrodes to send button commands to the PC.

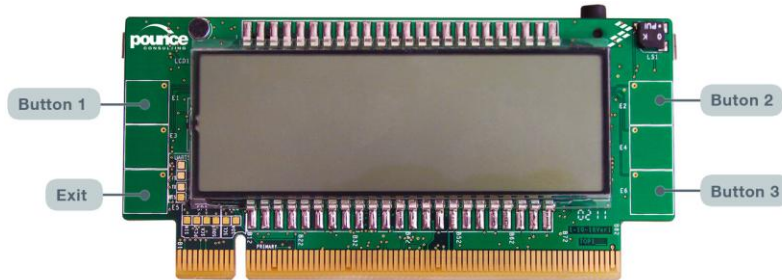


Figure 17. USB Joystick demo application electrode layout

To test the Joystick demo application, use the Joystick properties dialog on a PC running Windows. Refer to Figure 18 for step by step procedure to access the test application in Windows 7. For other operating systems, refer to the corresponding joystick testing application.

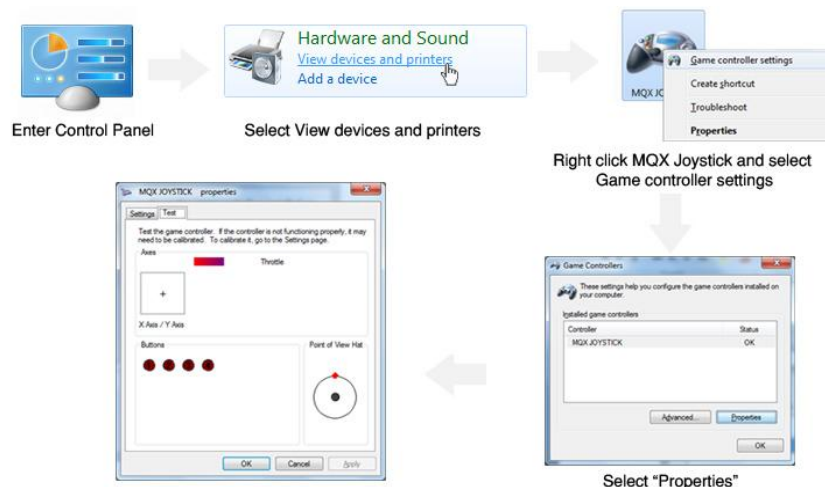


Figure 18. Procedure to access Joystick properties dialog in Windows 7