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EVK2160A
USER GUIDE

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Using the EVK2160A:

This kit is for the evaluation and development of applications using the AT42QT2160-MMU ('*QT2160*') 16 Key QMatrix^{TM} Integrated Circuit (IC). In this example, the QT2160 is shown working in a battery powered 'Standalone' mode, but can connected to a PC and/or User application by simple modifications to the EVK2160A Evaluation Board.
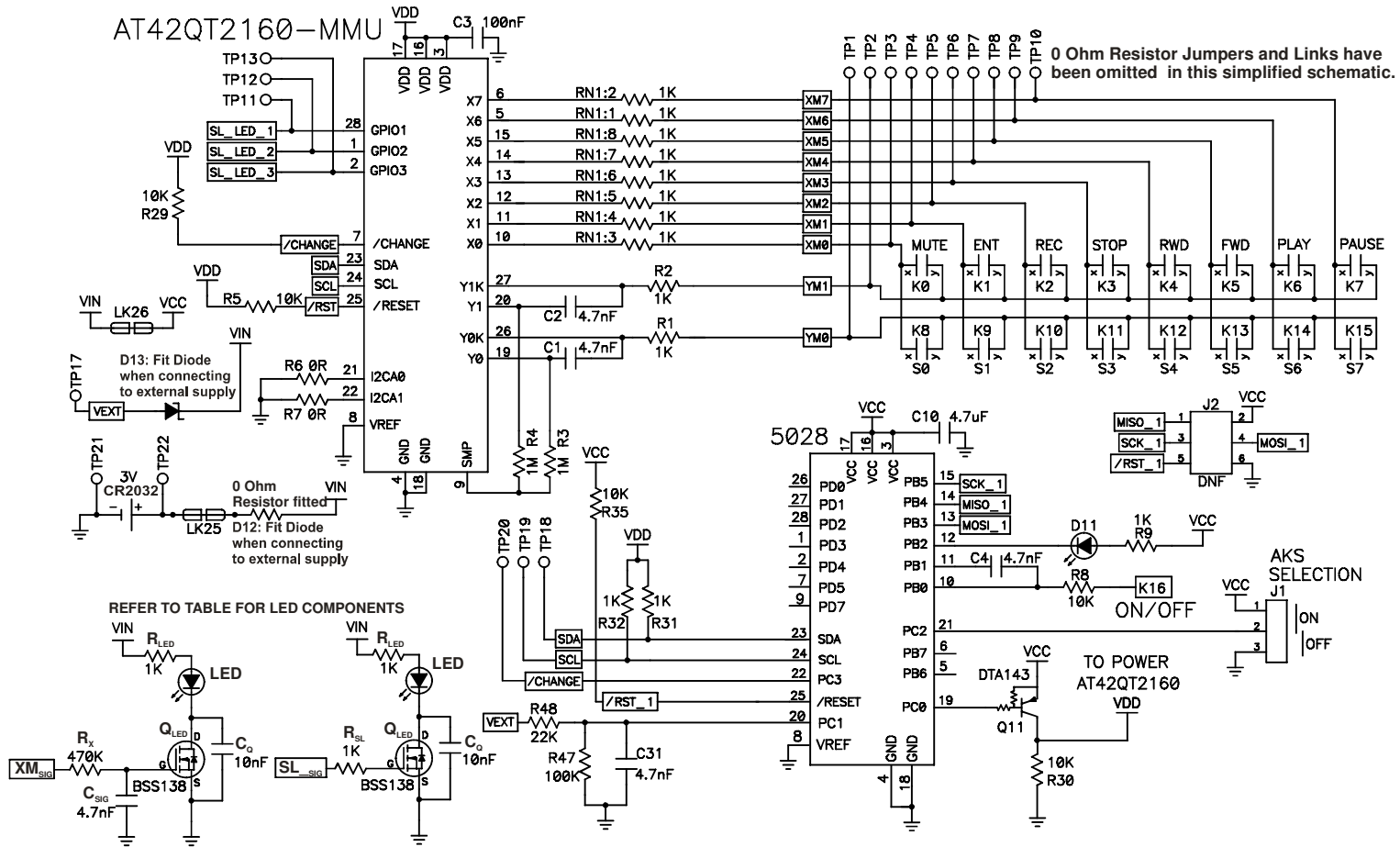
In this example, the QT2160 is configured with 8 individual keys plus 8 keys configured as a slider.

Please refer to the QT2160 datasheet available at www.atmel.com for full details.

- Ensure the EVK2160A Evaluation Board is securely located in the clear molded case.
- Insert the CR2032 3V battery provided into the battery holder on the EVK2160A. *Ensure that the battery has the correct orientation (negative (-) side to board) or the EVK2160A will not work.*
- The 12 LEDs will illuminate in sequence, then extinguish.
- Touch and hold the ON/OFF symbol - LED (D11) will illuminate indicating power to the QT2160. Remove touch from the ON/OFF symbol.
- Touch any of the 8 key(s) on the EVK2160A and the corresponding LED(s) will illuminate. *(The number of LED(s) illuminated will depend on the AKS^{TM} setting at J1)*
- Touch and/or slide up on the slider area and the corresponding 3 LED(s) will illuminate at different intensities (using QT2160's PWM capabilities) dependant on the last reported touched position.
- Touch and hold the ON/OFF symbol - The LED (D11) will extinguish to indicating power to the QT2160 has been removed. Remove touch from the ON/OFF symbol.
- The EVK2160A will power off after approximately 3 minutes of inactivity.

AT42QT2160-MMU

0 Ohm Resistor Jumpers and Links have been omitted in this simplified schematic.

TP13 TP12 TP11

C3 100nF

Pin	Signal		Net	RN	Value	XM
6	X7			RN1:2	1K	XM7
5	X6			RN1:1	1K	XM6
15	X5			RN1:8	1K	XM5
14	X4			RN1:7	1K	XM4
13	X3			RN1:6	1K	XM3
12	X2			RN1:5	1K	XM2
11	X1			RN1:4	1K	XM1
10	X0			RN1:3	1K	XM0

GPIO1 28
GPIO2 1
GPIO3 2

SL_LED_1
SL_LED_2
SL_LED_3

VDD

10K
R29

/CHANGE 7   /CHANGE
SDA 23   SDA
SCL 24   SCL
/RST 25   /RESET

VDD
R5 10K

VIN LK26 VCC

D13: Fit Diode when connecting to external supply
VEXT

TP17

R6 0R 21   I2CA0
R7 0R 22   I2CA1
8   VREF

TP21 TP22
3V CR2032

0 Ohm Resistor fitted
LK25

D12: Fit Diode when connecting to external supply

VIN

GND 4
GND 18
SMP 9

Y1K 27
Y1 20
Y0K 26
Y0 19

C2 4.7nF
R2 1K
C1 4.7nF
R1 1K

1M R4   1M R3

YM1
YM0

VCC
10K R35

VDD
1K R32   1K R31

TP20 TP19 TP18

SDA
SCL
/CHANGE
/RST_1

	MUTE	ENT	REC	STOP	RWD	FWD	PLAY	PAUSE
	K0	K1	K2	K3	K4	K5	K6	K7
	K8	K9	K10	K11	K12	K13	K14	K15
	S0	S1	S2	S3	S4	S5	S6	S7

5028

Pin	Signal		Signal	Pin
26	PD0		PB5	15
27	PD1		PB4	14
28	PD2		PB3	13
1	PD3		PB2	12
2	PD4		PB1	11
7	PD5		PB0	10
9	PD7			
23	SDA		PC2	21
24	SCL		PB7	6
22	PC3		PB6	5
25	/RESET		PC0	19
20	PC1			
8	VREF			

VCC
C10 4.7uF

VCC VCC VCC

SCK_1
MISO_1
MOSI_1

D11   1K R9   VCC
C4 4.7nF
R8 10K   K16
ON/OFF

MISO_1   J2   VCC
SCK_1
/RST_1   MOSI_1
DNF

AKS SELECTION
J1
ON
OFF

VCC

GND 4
GND 18

VEXT
R48 22K
R47 100K
C31 4.7nF

DTA143
VCC
Q11
10K R30

TO POWER AT42QT2160
VDD

REFER TO TABLE FOR LED COMPONENTS

VIN R_{LED} 1K   LED
R_X 470K
Q_{LED} BSS138
C_Q 10nF
C_{SIG} 4.7nF
XM_{SIG}

VIN R_{LED} 1K   LED
R_{SL} 1K
Q_{LED} BSS138
C_Q 10nF
SL_{SIG}

LED Component Details:

SL$_{SIG}$	XM$_{SIG}$	R$_{SL}$	R$_X$	Q$_{LED}$	C$_Q$	LED	R$_{LED}$	C$_{SIG}$
SL_LED_1		R38	-	Q8	C26	D8	R40	-
SL_LED_2		R41	-	Q9	C27	D9	R43	-
SL_LED_3		R44	-	Q10	C29	D9	R46	-
	XM0	-	RN2:3	Q0	C22	D0	RN3:5	C21
	XM1	-	RN2:4	Q1	C24	D1	RN3:4	C23
	XM2	-	RN2:5	Q2	C17	D2	RN3:6	C18
	XM3	-	RN2:6	Q3	C19	D3	RN3:3	C20
	XM4	-	RN2:7	Q4	C14	D4	RN3:7	C13
	XM5	-	RN2:8	Q5	C15	D5	RN3:2	C16
	XM6	-	RN2:1	Q6	C6	D6	RN3:8	C11
	XM7	-	RN2:2	Q7	C7	D7	RN3:1	C12

5028:

- Provides On/Off QTouch^{TM} button, including auto power-off
- Determines whether connected to USB port/external I2C
- Sets the QT2160 through I2C: Default AT42QT2160 values (refer to datasheet) except:

Address	Value	Address	Value	Address	Value
10	0x01	22…29	0x02	70	0x00
18	0x00	30…37	0x01 or 0x00	73	0x1C
20	0xA8	38…53	0x1E	75	0x10
21	0x00	54…69	0x20	76	0x00

AKS^{TM} Mode:

On the EVK2160A, AKS^{TM} is a global setting for the 8 individual keys. The AKS^{TM} mode is changed by moving the 2-way link fitted to J1 as indicated.

- If set to 'On' (link on Pins 1 and 2): When touching multiple keys, only the LED associated with the key with the strongest signal is lit.
- If set to 'Off' (link on Pins 2 and 3): When touching multiple keys, all associated LEDs will be lit.

External Keyboard/Electrodes:

The EVK2160A can be connected to User electrodes, using pads X0-X7 and Y0, Y1, and cutting the associated 10 tracks adjacent to keys K8-K15. Slide the EVK2160A out of the molded case to access the component side of the board.

Input/Output:

The EVK2160A can be connected to User applications through I2C, using /CHG, SCL, SDA pads.

Three dedicated General Purpose Inputs/Outputs (GPIO's) are available at the pads connected to Pins 1, 2 and 28 of the QT2160.

Power Supply:

An external power supply can be used instead of the supplied battery, but ensure that Schottky diodes are fitted to D12 and D13 to prevent cross powering of USB and battery sources.

It is advised to remove the battery when using an external power supply.

Troubleshooting:

Problem	Potential Solution
EVK2160A does not work	If the Power LED is off, the Auto Power off timeout may have been exceeded. Touch ON/OFF to restore power. If using a battery, check that the negative (-) side is facing the board. Check/replace battery. If using an external power supply, check that the correct connections have been made, and D12 and D13 have been fitted correctly.
LED(s) stuck on	Ensure the EVK2160A Evaluation Board is mechanically stable. Movements relative to its surrounding can affect key reference values.
LED(s) Flash/Erratic behaviour	Check battery condition. Old batteries can cause voltage drops which will affect the performance of the QT2160. Do not touch any of the tracks close to the QT2160 (on either side of the PCB), as this will affect the capacative signals.

EVK2160A Kit Contents:

1x EVK2160A Assembly (EVK2160A Evaluation Board in molded box)		
1x CR2032 Battery, 3V, 235mAh		
2x Sample AT42QT2160-MMU ICs		
1x EVK2160A User Guide	✓	
Packed by:		*Dated:*

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REV 103.0708