

UM11884

EVBMA777T; EVBMA8420T user manual

Rev. 1 — 6 June 2024

User manual

Document information

Information	Content
Keywords	MC33777A, BMA8420, EVBMA777T, EVBMA8420T
Abstract	This user manual targets the EVBMA777T; EVBMA8420T board. The EVBMA777T; EVBMA8420T is an evaluation board for the MC33777A; BMA8420 (battery junction box IC).



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2 Introduction

The user manual describes the EVBMA777T and the EVBMA8420T. The evaluation board embeds one MC33777A or one BMA8420 battery junction box controller IC.

The NXP analog product development boards provide an easy-to-use platform for evaluating NXP products.

These development boards support a range of analog, mixed-signal, and power solutions. These boards incorporate monolithic ICs and system-in-package devices that use high-volume technology. NXP products offer reduced component counts, lower costs, and improved performance in powering state-of-the-art systems.

3 Getting ready

3.1 Kit contents

- EVBMA777T; EVBMA8420T in an antistatic bag
- One electrical transport protocol link (ETPL) communication cable
- One power supply cable
- Four two-position connectors
- Two twelve-position connectors

3.2 Extra hardware

- Mandatory +24 V and +100 mA power supply
- Optional voltage sources (to test the measurements)
- Optional power resistors (to test the pyrotechnic switch controller)
- Optional negative temperature coefficient (NTC) resistor (to test temperature measurement)

4 Getting to know the hardware

4.1 Board description

The EVBMA777T; EVBMA8420T allows the user to exercise all the functions of the MC33777A; BMA8420 battery junction box controller IC. Most pins of the MC33777A; BMA8420 are accessible via a connector. The user can configure the IC to evaluate all use cases.

4.2 Board features

The main features of the EVBMA777T; EVBMA8420T are:

- Isolated power supply
- ETPL communication
- LED indicator for supply voltages and operation modes
- Four current measurement inputs
- Two external temperature measurement channels
- All input and outputs of the MC33777A; BMA8420 are accessible with connectors
- Energy reservoir capacitor for pyrotechnic switch control
- EEPROM connected to the MC33777A; BMA8420 in I²C

4.3 Connectors

The EVBMA777T; EVBMA8420T has multiple connectors for interfacing a power supply, a controller, or external instruments.

[Figure 1](#) shows the location of the connectors.

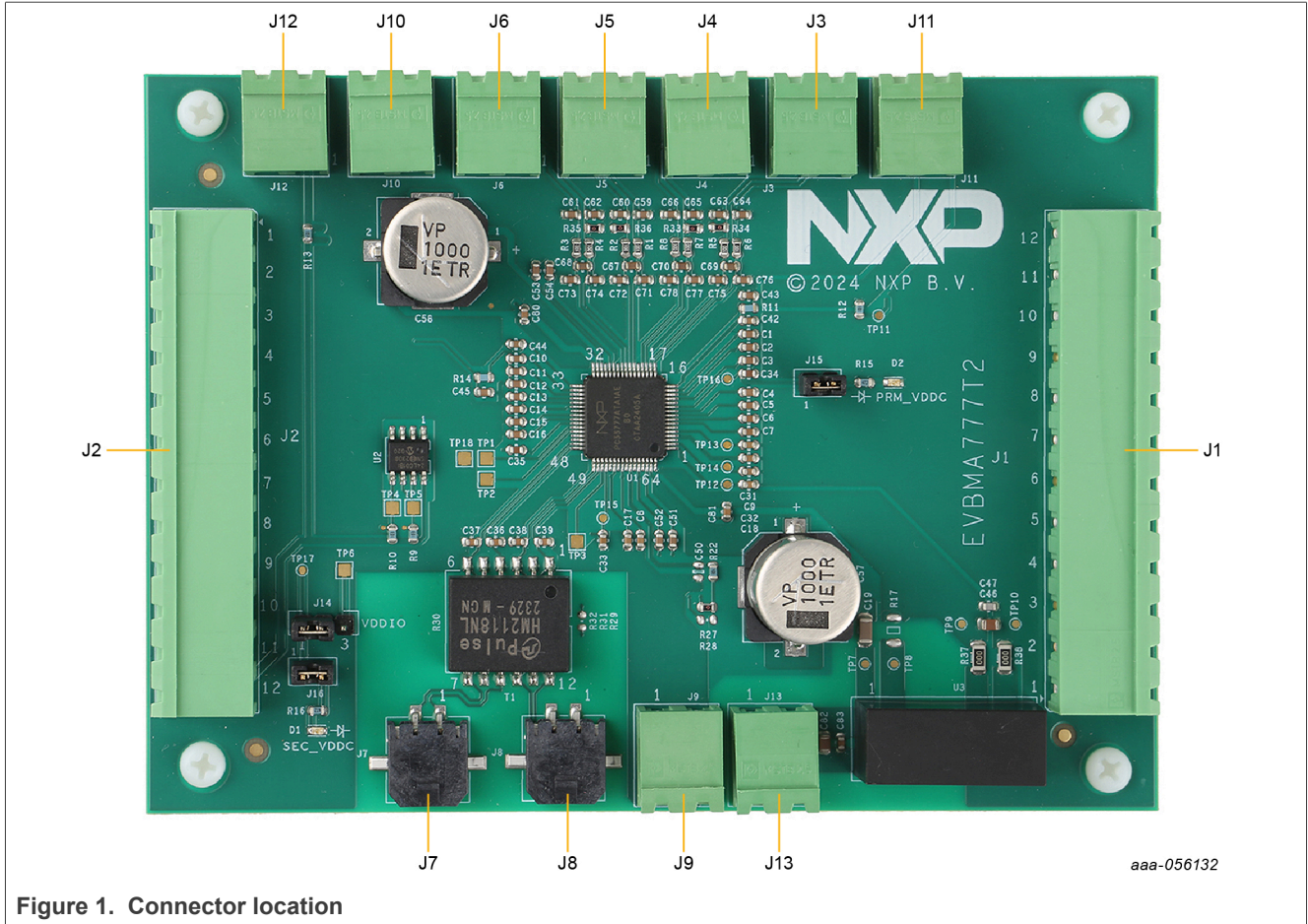


Figure 1. Connector location

Table 1 lists the connectors.

Table 1. Connector description

Pin	Connection	Description
Power supply (J13)		
J13.1	24V+	positive power supply terminal
J13.2	24V-	power supply isolated ground
ETPL communication (J7)		
J7.1	TPL1P	ETPL positive input/output from/to lower node
J7.2	TPL1N	ETPL negative input/output from/to lower node
ETPL communication (J8)		
J8.1	TPL2P	ETPL positive input/output from/to upper node
J8.2	TPL2N	ETPL negative input/output from/to upper node
Primary ISENSE inputs (J3)		
J3.1	PRM_ISENSEP	primary positive current measurement input
J3.2	PRM_ISENSEN	primary negative current measurement input
Secondary ISENSE inputs (J4)		

Table 1. Connector description...continued

Pin	Connection	Description
J4.1	SEC_ISENSEP	secondary positive current measurement input
J4.2	SEC_ISENSEN	secondary negative current measurement input
Primary VISENSE inputs (J5)		
J5.1	PRM_VISENSEP	primary positive current/voltage measurement input
J5.2	PRM_VISENSEN	primary negative current/voltage measurement input
Secondary VISENSE inputs (J6)		
J6.1	SEC_VISENSEP	secondary positive current/voltage measurement input
J6.2	SEC_VISENSEN	secondary negative current/voltage measurement input
Primary external temperature measurement (J11)		
J11.1	PRM_IO7	primary external NTC terminal
J11.2	GND	primary external NTC terminal
Secondary external temperature measurement (J12)		
J12.1	SEC_IO7	secondary external NTC terminal
J12.2	GND	secondary external NTC terminal
Primary I/O and reference voltage (J1)		
J1.1	PRM_IO6	primary input/output 6
J1.2	PRM_IO5	primary input/output 5
J1.3	GND	ground
J1.4	PRM_IO4	primary input/output 4
J1.5	PRM_IO3	primary input/output 3
J1.6	GND	ground
J1.7	PRM_IO2	primary input/output 2
J1.8	PRM_IO1	primary input/output 1
J1.9	GND	ground
J1.10	PRM_IO0	primary input/output 0
J1.11	PRM_VREF2V5	primary 2.5 V reference
J1.12	PRM_VREF5V0	primary 5 V reference

Table 1. Connector description...continued

Pin	Connection	Description
Secondary I/O and reference voltage (J2)		
J2.1	SEC_IO6	secondary input/output 6
J2.2	SEC_IO5	secondary input/output 5
J2.3	GND	ground
J2.4	SEC_IO4	secondary input/output 4
J2.5	SEC_IO3	secondary input/output 3
J2.6	GND	ground
J2.7	SEC_IO2	secondary input/output 2
J2.8	SEC_IO1	secondary input/output 1
J2.9	GND	ground
J2.10	SEC_IO0	secondary input/output 0
J2.11	SEC_VREF2V5	secondary 2.5 V reference
J2.12	SEC_VREF5V0	secondary 5 V reference
Primary pyrotechnic switch controller (J9)		
J9.1	PRM_PSCHS	primary high side output of PSC
J9.2	PRM_PSCLS	primary low side output of PSC
Secondary pyrotechnic switch controller (J10)		
J10.1	SEC_PSCHS	secondary high side output of PSC
J10.2	SEC_PSCLS	secondary low side output of PSC

[Table 2](#) lists the reference of all connectors and their mating part number.

Table 2. Connector part number

Connector	Manufacturer	Part number	Mating connector
J1, J2	Phoenix	1754630	1757116
J7, J8	Molex	43650-0213	43645-0200
J3, J4, J5, J6, J9, J10, J11, J12, J13	Phoenix	1754436	1757019

4.4 Test points

The EVBMA777T; EVBMA8420T offers multiple test points to access signals close to the MC33777A; BMA8420.

[Figure 2](#) shows the location of the test points.

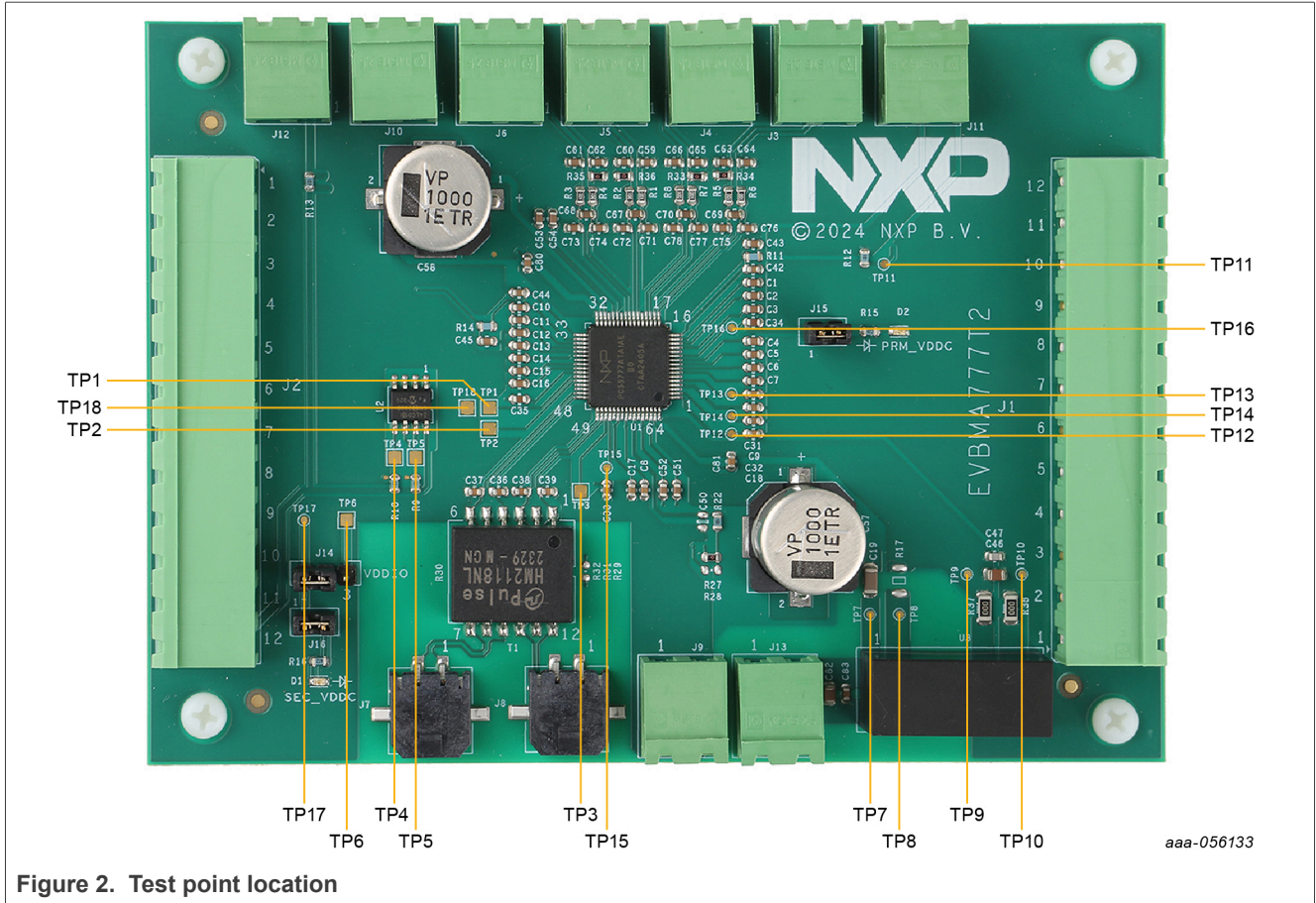


Table 3 lists the test points.

Table 3. Test point description

Test point	Signal	Description
TP1	GPIO0	
TP2	GPIO1	
TP3	GPIO4	
TP4	GPIO3_SDA	I ² C data line to the external EEPROM
TP5	GPIO2_SCL	I ² C clock line to the external EEPROM
TP6	-	VDDIO alternative voltage
TP7	24V-	power supply isolated ground
TP8	24V+	positive power supply terminal
TP9	VBAT	
TP10	GND	
TP11	PRM_VREF5V0	
TP12	SEC_VREF5V0	
TP13	PRM_VDDA	
TP14	SEC_VDDA	

Table 3. Test point description...continued

Test point	Signal	Description
TP15	VDDIO	
TP16	PRM_VDDC	
TP17	SEC_VDDC	
TP18	GND	

4.5 Jumpers

The EVBMA777T; EVBMA8420T has jumpers to configure MC33777A; BMA8420 signals.

Figure 3 shows the location of the jumpers.



Figure 3. Jumper location

J15 connects an LED to PRM_VDDC of the MC33777A; BMA8420. The LED signals that the device is in active mode. Removing the jumper disables the feature.

J16 connects an LED to SEC_VDDC of the MC33777A; BMA8420. The LED signals that the device is in active mode. Removing the jumper disables the feature.

J14 connects by default VDDIO to SEC_VDDC (jumper between pin 1 and pin 2). The user can power VDDIO with another voltage by moving the jumper (between pin 2 and pin 3) and by applying a voltage on TP6.

4.6 Power supply

The EVBMA777T; EVBMA8420T integrates an isolated DC-DC converter (TMR 4-2415, from Traco). It generates an isolated supply voltage for the MC33777A; BMA8420 (V_{BAT}). The user must connect a power supply to J13 with characteristics shown in [Table 4](#).

Table 4. Power supply

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage	TMR 4-2415 active	18	24	36	V
I_{CC}	supply current	TMR 4-2415 active; MC33777A; BMA8420 fully operational	200	-	-	mA

4.7 Temperature measurement (IO7)

The EVBMA777T; EVBMA8420T dedicates two IOs for temperature measurement with an external NTC resistor. The board includes the associated circuitry (antialiasing filter, voltage reference).

The user can connect an NTC resistor on J11 or J12 to measure a temperature on PRM_IO7 or SEC_IO7 of the MC33777A; BMA8420.

Table 5. Temperature measurement characteristic

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{NTC(ext)}$	external NTC resistor	$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	10	-	k Ω
R_{div}	divider resistor	high-side voltage	-	10	-	k Ω

4.8 Current measurement (ISENSE, VISENSE)

The MC33777A; BMA8420 offers four current measurement inputs (PRM_ISENSE, SEC_ISENSE, PRM_VISENSE, and SEC_VISENSE).

[Figure 4](#) describes the ISENSE/VISENSE input circuitry.

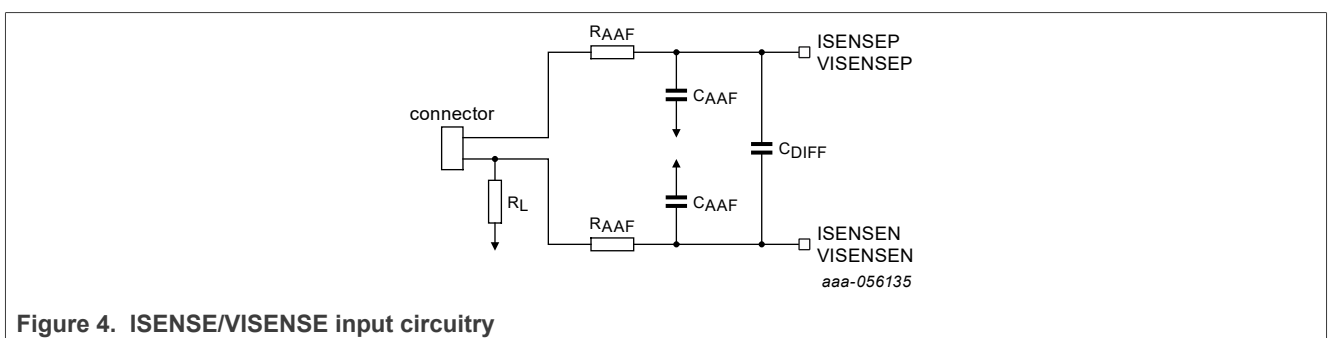


Figure 4. ISENSE/VISENSE input circuitry

The current measurement lines are linked to connectors (see [Section 4.3](#)) and embed the recommended filters for current measurement (C_{AAF} , R_{AAF} , and C_{DIFF}).

A 0 Ω resistor (R_L) links the negative measurement line to the ground. The user can remove this resistor but must ensure that the common mode voltage meets the MC33777A; BMA8420 specifications.

The user can connect the EVBMA777T; EVBMA8420T to various instruments (voltage source, current source in series with a shunt resistor, and so forth).

4.9 Inputs/outputs (IO)

All primary and secondary IOs are accessible with connectors (see [Section 4.3](#)). As these pins have several functions (analog measurement, digital input, digital output, and so forth), there is no circuitry on the EVBMA777T; EVBMA8420T. It only embeds capacitors for electrostatic discharge (ESD) protection.

The user has to provide external circuitry depending on the use case to evaluate.

4.10 Pyrotechnic switch control (PSC)

The EVBMA777T; EVBMA8420T embeds circuitry to test the pyrotechnic switch controller.

For each channel, a 1 mF capacitor acts as an energy reservoir (MAL215099614E3).

The resistor R22 (linked to PSC_CFG) configures the capacitor charge current. By default, R1 = 300 kΩ and the charge current equals 60 mA.

Each driver output (PRM_PSC and SEC_PSC) is linked to a connector (see [Section 4.3](#)). A real pyrotechnic switch or a power resistor can be connected to evaluate the feature.

4.11 Communication

The MC33777A; BMA8420 provides two ETPL communication ports accessible on connectors (see [Section 4.3](#)).

The user can link any port to a controller or other NXP devices. A transformer isolates the EVBMA777T; EVBMA8420T from other devices.

5 References

NXP Semiconductors provides online resources for this evaluation board and its supported devices on <http://www.nxp.com>.

The information page for the MC33777A is <http://nxp.com/mc33777>. The information page for the BMA8420 is <http://nxp.com/bma8420>. These pages provide overview information, documentation, software and tools, parametrics, ordering information and a getting started tab.

6 Revision history

Table 6. Revision history

Document ID	Release date	Description
UM11884 v.1	6 June 2024	• Initial version

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