

# TPS3703Q1-A4120EVM User's Guide

This user's guide describes the operational use of the TPS3703Q1-A4120EVM evaluation module (EVM) as a reference design for engineering demonstration and evaluation of the [TPS3703-Q1](#), a low-power, overvoltage and undervoltage monitor. Included in this user's guide are setup instructions, a schematic diagram, printed-circuit board (PCB) layout drawings, and a bill of materials for the EVM.

## Contents

1	Introduction .....	2
2	Hardware.....	3
	2.1 EVM Connectors .....	3
	2.2 Components .....	3
3	Operation .....	4
	3.1 Input Power (VDD).....	4
	3.2 Sense.....	4
	3.3 RESET .....	4
	3.4 CT .....	4
	3.5 LATCH .....	4
	3.6 Manual Reset.....	4
4	Setup and Test .....	5
5	PCB Layout.....	6
6	Schematic.....	7
7	Bill of Materials .....	7

## List of Figures

1	Top Layer Routing .....	6
2	Bottom Layer Routing .....	6
3	TPS3703Q1-A4120EVM Schematic .....	7

## List of Tables

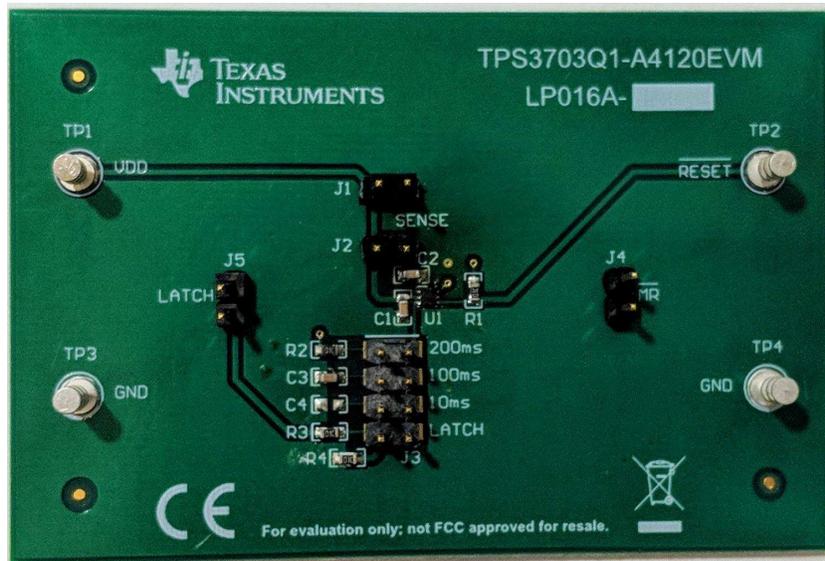
1	Test Points.....	3
2	Jumpers .....	3
3	Passive Components.....	3
4	Bill of Materials .....	7

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## 1 Introduction

The TPS3703Q1-A4120EVM helps design engineers to evaluate the operation and performance of the TPS3703-Q1 family of overvoltage and undervoltage monitors for possible use in their own circuit applications. This particular EVM configuration contains the TPS3703A4120DSERQ1, an overvoltage and undervoltage supervisor designed to monitor 1.2 V with a 4% tolerance. The family of TPS3703-Q1 provides fixed thresholds from 500 mV to 5 V and tolerance options from 3% to 7% in a small 6-pin WSON package with an open-drain output. The TPS3703-Q1 includes a CT pin that is used to select between two fixed reset time delays designed into each device, or an adjustable reset time delay by connecting a capacitor to ground. A separate available SENSE input pin allows the redundancy sought by safety-critical and high-reliability systems. Lastly, the device provides a manual reset that allows a hard reset and a latch feature for certain desired applications.



## 2 Hardware

This section describes the connectors on the EVM, as well as how to properly connect, set up, and use the TPS3703Q1-A4120EVM.

### 2.1 EVM Connectors

#### 2.1.1 Test Points

Table 1 lists the test points on the EVM and their functional descriptions.

**Table 1. Test Points**

Test Point Number	Silkscreen Label	Function	Description
TP1	VDD	Connection to VDD pin of TPS3703-Q1	Allows the user to provide voltage supply to the device
TP2	RESET	Connection to RESET pin of TPS3703-Q1	Allows the user to measure the RESET pin
TP3	GND	Connection to ground pin of TPS3703-Q1	Allows the user to connect to ground to provide voltage and take measurements.
TP4	GND	Connection to ground pin of TPS3703-Q1	Allows the user to connect to ground to provide voltage and take measurements.

#### 2.1.2 Jumpers

Table 2 lists the jumpers on the EVM and their functional descriptions.

**Table 2. Jumpers**

Test Point Number	Default Connection	Function	Description
J1	Closed	Reset pullup resistor to VDD connection	Allows the user to provide onboard or external supply voltage for the RESET pullup resistor
J2	Open	Sense pin to VDD connection	Allows the user to have monitor onboard supply voltage or an external sense voltage
J3	Closed, Position 7-8	CT Pin to adjustable or fixed reset delays	Allows the user to evaluate fixed or adjustable reset delays
J4	Open	Manual reset pin to GND	Allows the user to hard reset the device
J5	Open	CT Latch to VDD connection	Allows the user to reset Latch function by pulling CT pin to VDD

## 2.2 Components

### 2.2.1 Passives

Table 3 lists the passive components on the EVM and their functional descriptions.

**Table 3. Passive Components**

Test Point Number	Value	Description
C1	1.0 $\mu$ F	Input decoupling bypass capacitor for the VDD pin
C2	0.01 $\mu$ F	Bypass capacitor for sense voltage. Good for noisy applications to reduce sensitivity to transient voltages
C3	0.033 $\mu$ F	Timing capacitor for 100-ms reset delay
C4	DNP	Not populated to leave CT pin open for 10-ms reset delay. User can install capacitor for desired reset delay.
R1	10 k $\Omega$	Reset pullup resistor. Open-drain output requires a pullup voltage.

**Table 3. Passive Components (continued)**

Test Point Number	Value	Description
R2	10 k $\Omega$	CT pullup resistor to VDD. CT pullup to VDD voltage causes 200-ms reset delay
R3	10 k $\Omega$	CT pullup resistor to VDD. CT pullup to VDD voltage cause the latch to reset.
R4	10 k $\Omega$	CT pulldown resistor to GND. CT pull to GND causes latch on reset.

### 3 Operation

This section describes the functionality and operation of the TPS3703Q1-A4120EVM. See the [TPS3703-Q1](#) data sheet for more information.

#### 3.1 Input Power (VDD)

The VDD supply is connected through the TP1 test point. Apply a supply voltage to provide input power to the device through TP1 and the common ground to test point TP3 or TP4. The supply voltage range is between 1.7 V and 5.5 V. This device has a 6-V absolute maximum rating on the VDD pin.

#### 3.2 Sense

The SENSE pin is the input for the monitored supply voltage rail. When the SENSE voltage goes above the overvoltage threshold or below the undervoltage threshold, the  $\overline{\text{RESET}}$  pin is driven low. If VDD is the desired monitored voltage, install a shunt on jumper J2. If an independent voltage is being used, uninstall the shunt on jumper J2 and apply the voltage on pin 1 of J2 where the silkscreen SENSE is labeled.

#### 3.3 $\overline{\text{RESET}}$

The  $\overline{\text{RESET}}$  pin is an active-low, open-drain, overvoltage and undervoltage output. This pin goes low when the SENSE voltage rises above the internally overvoltage threshold (VIT+) or below the undervoltage threshold (VIT-). This pin is connected to a pullup resistor connected through jumper J1 to VDD. To pull up to a desired external voltage, disconnect J1 and apply a pullup voltage to pin 2 of jumper J1.

#### 3.4 CT

The CT pin is for programming capacitor time delay. The CT pin offers two fixed time delays by either connecting the CT pin to the VDD or by leaving the CT pin floating. Delay time can be programmed by connecting an external capacitor reference to ground. The TPS3703Q1-A4120EVM provides easy access to adjusting the reset time delay by installing a shunt on jumper J3. The provided reset delays include the two fixed times as well as a capacitor adjusted for a 10-ms reset delay. Users can also install a capacitor for a desired reset delay.

#### 3.5 LATCH

The  $\overline{\text{RESET}}$  pin can be latched when the CT pin is connected to GND with a pulldown resistor. Installed a shunt on pin 1-2 on jumper J3 for the device to be in latch operation. During latch operation, when the  $\overline{\text{RESET}}$  pin is driven low, the pin will stay low regardless of the sense voltage. If the  $\overline{\text{RESET}}$  is latched on start-up, it will also stay low regardless of sense voltage. To unlatch the device, install a shunt on jumper J5. This will provide a voltage to the CT pin that is greater than the CT pin comparator threshold voltage, VCT. To go back into latch operation, disconnect J5 while keeping a shunt installed on pin 1-2 on J3.

#### 3.6 Manual Reset

The manual reset pin is used to assert a reset signal in the  $\overline{\text{RESET}}$  pin regardless of sense voltage. Install a shunt on jumper J4 to connect the MR to GND. This will pull the pin lower than the MR logic low (VMR\_L) to assert a reset signal. After the  $\overline{\text{MR}}$  pin is deasserted, the output goes high after the reset delay time (tD) expires. MR can be left floating when not in use.

## 4 Setup and Test

This section describes a typical setup and test procedure of the TPS3703Q1-A4120EVM. For more detail applications, see the Application Section on the [TPS3703-Q1](#) data sheet for more information.

1. Set the input power supply voltage to 0 V.
2. Connect the ground lead from the power supply to TP3 (GND).
3. Connect the positive voltage lead from the power supply to TP1 (VDD).
4. Connect SENSE to VCC using jumper J2, or connect it to a separate power supply. For this variant of TPS3703-Q1, an external voltage supply is required for the device to be in overvoltage and undervoltage conditions.
5. Connect R1 to VCC using jumper J1, or connect it to a separate power supply.
6. Connect CT to the desired reset delay or latch operation using jumper J3. CT can be left open for a 10-ms reset delay.
7. Connect a voltmeter or scope across TP2 ( $\overline{\text{RESET}}$ ) and TP4 (GND).
8. Vary the input power-supply voltage as desired. The recommended supply voltage range is between 1.7 V and 5.5 V.
9. Vary the monitored SENSE voltage as necessary for test purposes. For this variant of TPS3703-Q1, the supervisor is designed to monitor 1.2 V with a 4% tolerance. This means typical overvoltage and undervoltage conditions are 1.248 V and 1.152 V respectively.
10. Connect  $\overline{\text{MR}}$  to GND using jumper J4 to assert a reset signal.
11. For latch operation, pull down the CT pin by using jumper J4 pins 1-2. To unlatch the device, pull up the CT pin by using jumper J5.

5 PCB Layout

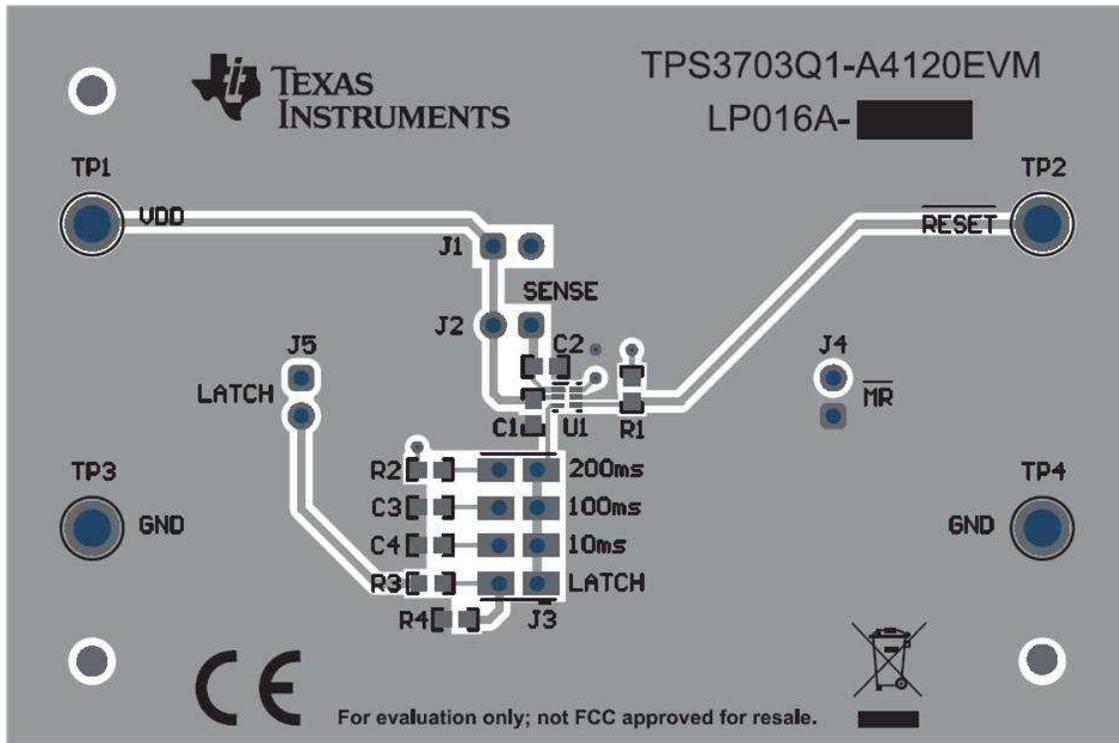


Figure 1. Top Layer Routing

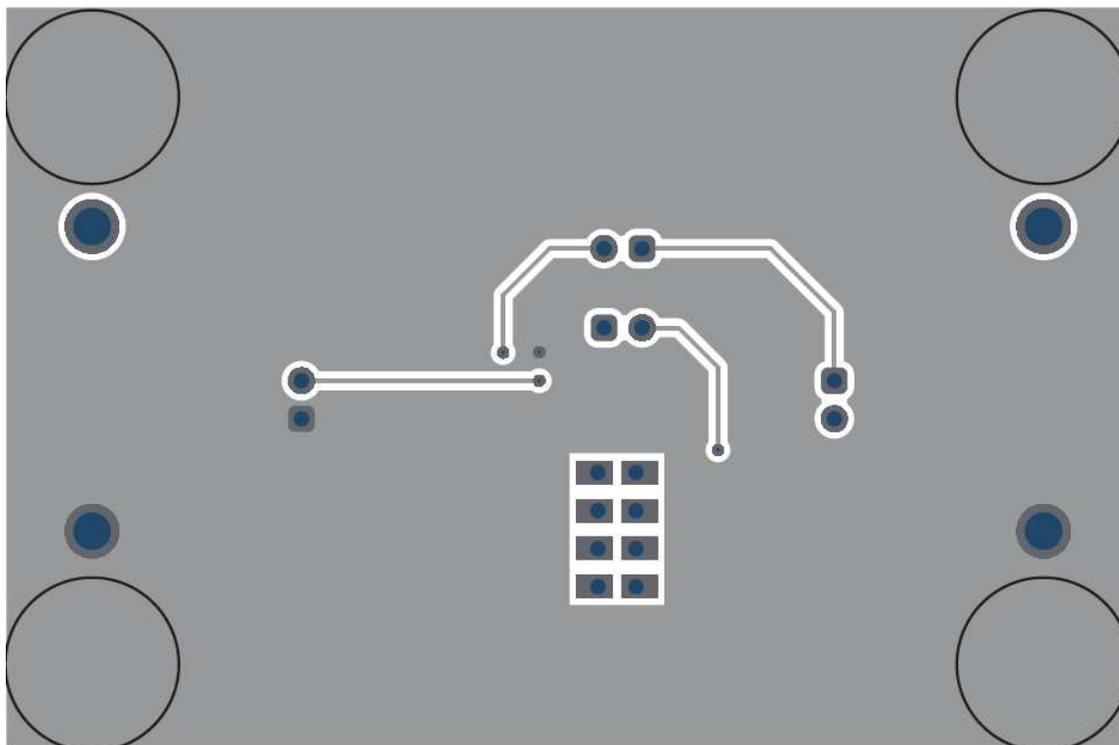


Figure 2. Bottom Layer Routing

## 6 Schematic

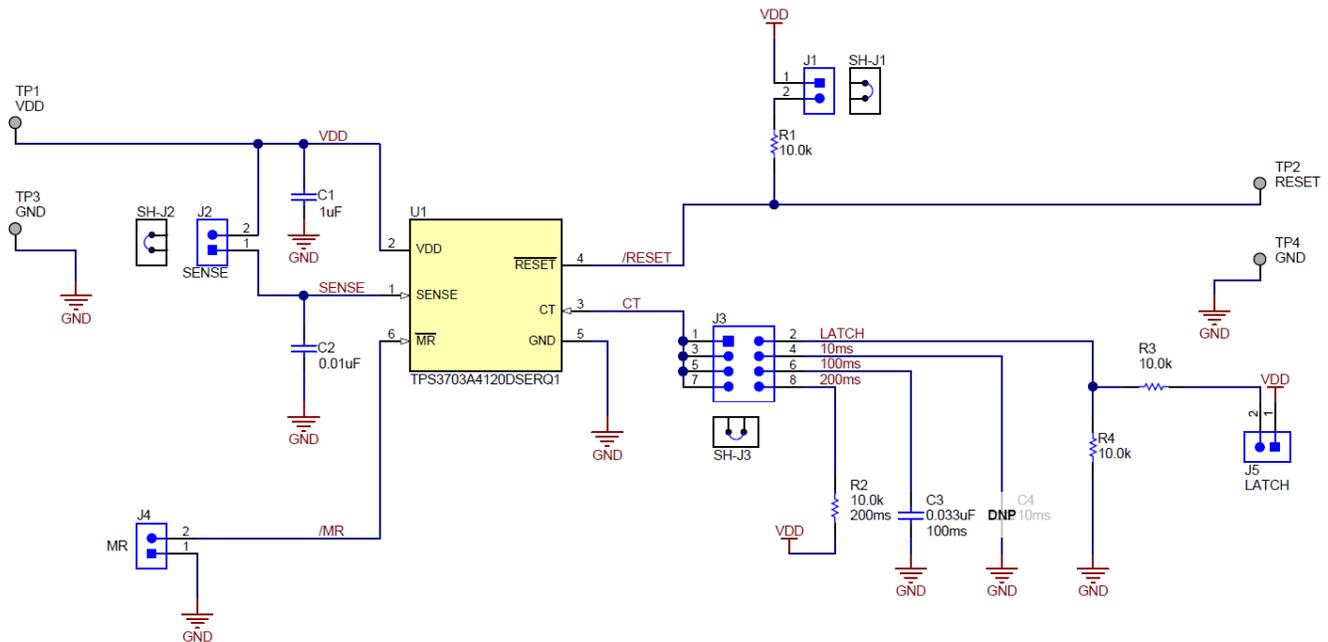


Figure 3. TPS3703Q1-A4120EVM Schematic

## 7 Bill of Materials

Table 4. Bill of Materials

Designator	Quantity	Value	Description	Size (Package Reference)	Part Number	Manufacturer
!PCB	1		Printed-Circuit Board		LP016	Any
C1	1	1 uF	CAP, CERM, 1 uF, 16 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	0603	GCM188R71C105KA64D	MuRata
C2	1	0.01 uF	CAP, CERM, 0.01 uF, 50 V, +/- 10%, X7R, AEC-Q200 Grade 1, 0603	0603	GCM188R71H103KA37D	MuRata
C3	1	0.033 uF	CAP, CERM, 0.033 uF, 16 V, +/- 10%, X7R, 0603	0603	GRM188R71C333KA01D	MuRata
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M
J1, J2, J4, J5	4		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec
J3	1		Header, 100mil, 4x2, Gold, TH	4x2 Header	5-146256-4	TE Connectivity
R1, R2, R3, R4	4	10.0k	RES, 10.0 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	0603	CRCW060310K0FKEA	Vishay-Dale
SH-J1, SH-J2, SH-J3	3	1x2	Shunt, 100mil, Gold plated, Black	Shunt	SNT-100-BK-G	Samtec
TP1, TP2, TP3, TP4	4		Terminal, Turret, TH, Triple	Turret	1598-2	Keystone
U1	1		Automotive High-Accuracy Window Supervisor With Reset Time Delay and Manual Reset	DSE0006A (WSON-6)	TPS3703A4120DSERQ1	Texas Instruments
C4	0	0.033 uF	CAP, CERM, 0.033 uF, 16 V, +/- 10%, X7R, 0603	0603	GRM188R71C333KA01D	MuRata
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A

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