

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Features

- Qualified for Automotive Applications
- AEC-Q100 Grade 1: $T_A = -40^{\circ}\text{C}$ to 125°C
- Precision Low Voltage Monitoring
- 200-ms or 5-ms Reset Timeout
- Watchdog Timer with 1.6-sec or 0.2-sec Timeout
- Manual Reset Input
- Reset Output Stage
- Push-Pull Active-Low
- Low-Power Consumption: $2.2\ \mu\text{A}$
- Guaranteed Reset Output valid to $V_{CC} = 1\ \text{V}$
- Power Supply Glitch Immunity
- SOT23-5 Package

Applications

- Infotainment
- BCM
- LIDAR
- T-box
- Cabin

Description

The TPV682xQ is an auto-grade supervisory circuit that monitors power supply voltage levels and provides a power-on reset signal.

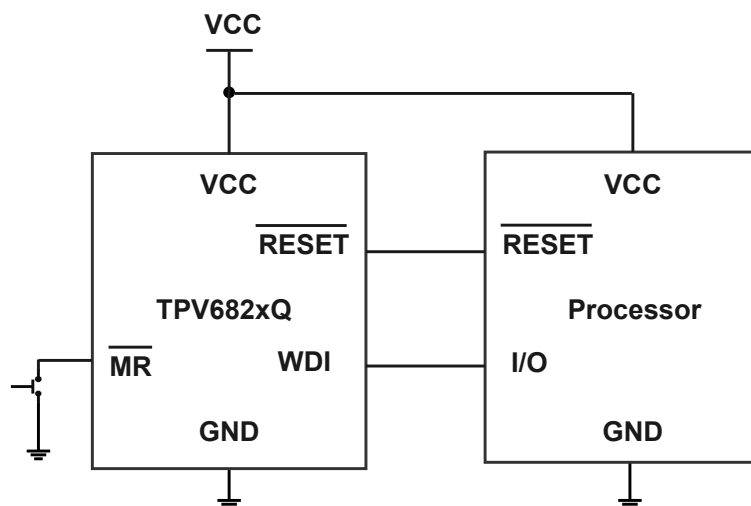
It also has an on-chip watchdog timer, which can give out a reset signal if the microprocessor fails to strobe the watchdog timer within a preset timeout period.

A reset signal can also be asserted by an external manual reset input.

The reset timeout period is fixed at 200 ms (TPV6823Q) or 5 ms (TPV6820Q) typically, the watchdog timeout period is fixed at 1.6 sec (TPV6823Q) or 0.2 sec (TPV6820Q) typically.

The TPV682xQ is available in the SOT23-5 package and typically consumes only $2.2\ \mu\text{A}$, suitable for use in low-power and portable applications.

Typical Application Circuit



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Manual Reset****Table of Contents**

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**Auto Grade Low-Voltage Supervisory Circuit with Watchdog and
Manual Reset****Product Family Table**

Order Number	Threshold Voltage (V)	Marking Information	Package
TPV6823VQ-S5TR-S ⁽¹⁾	1.58	Q3V	SOT23-5
TPV6823WQ-S5TR-S ⁽¹⁾	1.67	Q3W	SOT23-5
TPV6823YQ-S5TR-S ⁽¹⁾	2.19	Q3Y	SOT23-5
TPV6823ZQ-S5TR-S ⁽¹⁾	2.32	Q3Z	SOT23-5
TPV6823RQ-S5TR-S ⁽¹⁾	2.63	Q3R	SOT23-5
TPV6820SQ-S5TR-S	2.93	Q0S	SOT23-5
TPV6823SQ-S5TR-S	2.93	Q3S	SOT23-5
TPV6823TQ-S5TR-S ⁽¹⁾	3.08	Q3T	SOT23-5
TPV6823MQ-S5TR-S ⁽¹⁾	4.38	Q3M	SOT23-5
TPV6823LQ-S5TR-S ⁽¹⁾	4.63	Q3L	SOT23-5

(1) For future products, contact the 3PEAK factory for more information and samples.

Revision History

Date	Revision	Notes
2025-01-05	Rev.A.0	Initial release

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Pin Configuration and Functions

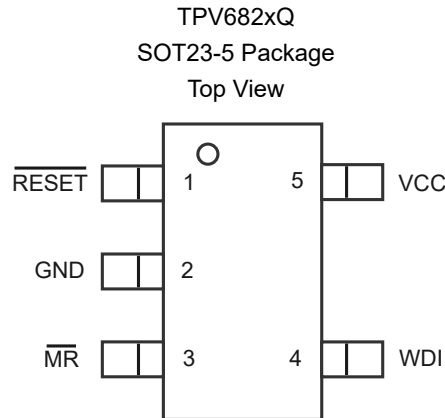


Table 1. Pin Functions: TPV6823

Pin		I/O	Description
NO.	Name		
1	$\overline{\text{RESET}}$	O	Active-Low Reset Push-Pull Output Stage. Asserted whenever V_{CC} is below the reset threshold, V_{TH} .
2	GND	-	Ground.
3	$\overline{\text{MR}}$	I	Manual Reset Input. This is an active-low input, which, when forced low for at least 1 μs , generates a reset. It features a 50-k Ω internal pull-up.
4	WDI	I	Watchdog Input. The watchdog input generates a reset if the voltage on the pin remains low or high for the duration of the watchdog timeout. The timer is cleared if a logic transition occurs on this pin or if a reset is generated.
5	VCC	–	Power Supply Voltage Monitored.

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset**Specifications****Absolute Maximum Ratings**

Parameter		Min	Max	Unit
V _{CC}	Input Voltage	-0.3	6	V
V _{MR} , V _{RESET} , V _{WDI}	$\overline{\text{MR}}$, $\overline{\text{RESET}}$, WDI Voltage	-0.3	6	V
Output Current	$\overline{\text{RESET}}$		20	mA
T _J	Maximum Junction Temperature	-40	150	°C
T _{STG}	Storage Temperature Range	-65	150	°C
T _L	Lead Temperature (Soldering 10 sec)		260	°C

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

ESD, Electrostatic Discharge Protection

Parameter		Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	4	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002 ⁽²⁾	2	kV

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

Recommended Operating Conditions

Parameter		Min	Typ	Max	Unit
V _{CC}	Supply Voltage	1		5.5	V
V _{IH}	High-level input voltage at $\overline{\text{MR}}$ and WDI	0.7 × V _{CC}			V
V _{IL}	Low-level input voltage at $\overline{\text{MR}}$ and WDI			0.3 × V _{CC}	V
T _J	Junction Temperature	-40		125	°C

Thermal Information

Package Type	θ _{JA}	θ _{JC}	Unit
SOT23-5	128	67	°C/W

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Electrical Characteristics

All test conditions: $V_{CC} = 1.53 \text{ V to } 5.5 \text{ V}$, $T_A = -40^\circ\text{C to } +125^\circ\text{C}$, unless otherwise noted.

Parameter			Conditions	Min	Typ	Max	Unit	
Supply Voltage and Current								
V _{CC}	VCC Operating Voltage Range			1		5.5	V	
I _{CC}	Supply Current		WDI and MR unconnected (VCC = 1.8 V)		2.2	10	μA	
			WDI and MR unconnected (VCC = 5 V)		6	15	μA	
V _{TH}	Reset Threshold Voltage	TPV682xVQ		1.51	1.58	1.63	V	
		TPV682xWQ		1.62	1.67	1.71	V	
		TPV682xYQ		2.12	2.19	2.28	V	
		TPV682xZQ		2.25	2.32	2.38	V	
		TPV682xRQ		2.55	2.63	2.70	V	
		TPV682xSQ		2.85	2.93	3.00	V	
		TPV682xTQ		3.00	3.08	3.15	V	
		TPV682xMQ		4.25	4.38	4.5	V	
		TPV682xLQ		4.5	4.63	4.75	V	
	Reset Threshold Temperature Coefficient				60		ppm/°C	
V _{HYS}	Reset Threshold Hysteresis				10 x V _{TH}		mV	
t _{RD}	VCC To Reset Delay		V _{TH} – V _{CC} = 100 mV			20		μs
t _{RP}	Reset Timeout Period		TPV6820Q		3.5	5	7	ms
			TPV6823Q		140	200	280	ms
V _{OL}	Reset Output Voltage Low (Push-Pull)		V _{CC} ≥ 1 V, I _{SINK} = 50 μA				0.3	V
V _{OH}	Reset Output Voltage High (Push-Pull Only)		V _{CC} ≥ 1.8 V, I _{SOURCE} = 200 μA		0.8 × V _{CC}			V
MR Pin								
V _{IL_MR}	Input Threshold Voltage Low for MR					0.3 × V _{CC}		V
V _{IH_MR}	Input Threshold Voltage High for MR			0.7 × V _{CC}				V
t _{PW_MR}	MR Input Pulse Width			1				μs
t _{GR_MR}	MR Glitch Rejection				100			ns
t _{d_MR}	MR to Reset Delay				450			ns
R _{PU_MR}	MR Pull-Up Resistance				50			kΩ
WDI Pin								
t _{WD}	Watchdog Timeout Period		TPV6820Q		0.14	0.2	0.28	s

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Parameter		Conditions	Min	Typ	Max	Unit
		TPV6823Q	1.12	1.6	2.4	s
t_{PW_WD}	WDI Pulse Width 50 ns		50			ns
V_{IL_WD}	WDI Input Threshold VIL				$0.3 \times V_{CC}$	V
V_{IH_WD}	WDI Input Threshold VIH		$0.7 \times V_{CC}$			V
I_{WDI}	WDI Input Current	$V_{WDI} = V_{CC}$		20		μA
		$V_{WDI} = 0$		-15		μA

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Typical Performance Characteristics

All test conditions: $V_{CC} = 3.3\text{ V}$, $T_A = +25^\circ\text{C}$, unless otherwise noted.

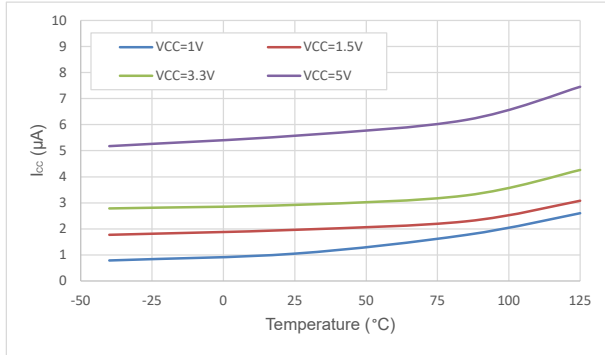


Figure 1. Supply Current vs. Temperature

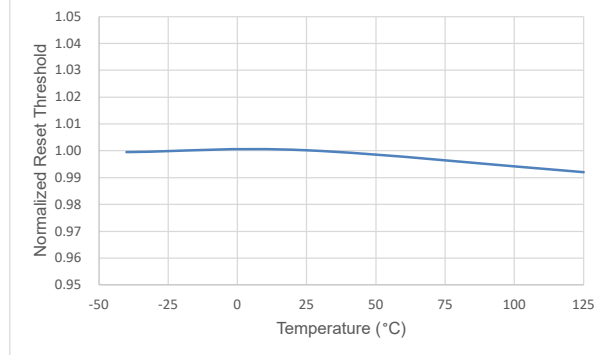


Figure 2. Normalized Reset Threshold vs. Temperature

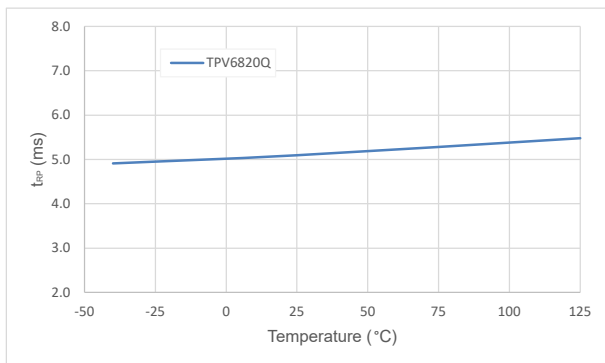


Figure 3. TPV6820Q Reset Timeout Period vs. Temperature

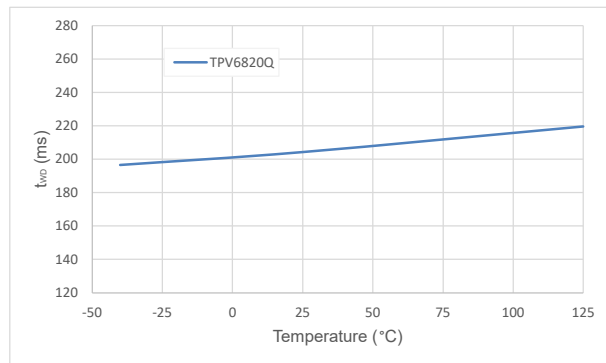


Figure 4. TPV6820Q Watchdog Timeout Period vs. Temperature

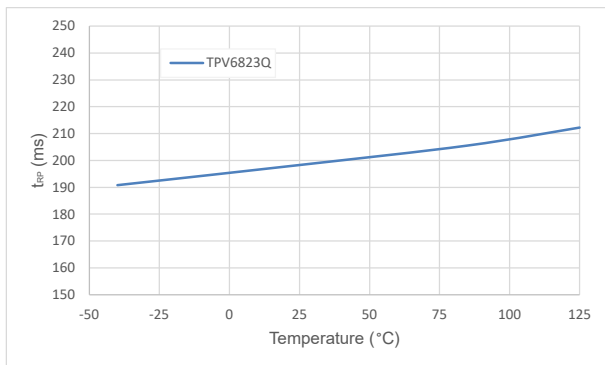


Figure 5. TPV6823Q Reset Timeout Period vs. Temperature

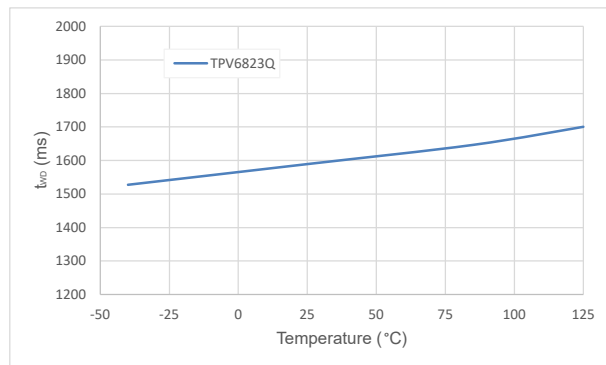


Figure 6. TPV6823Q Watchdog Timeout Period vs. Temperature

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

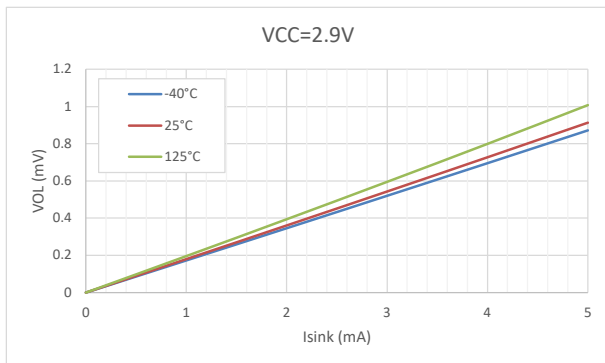


Figure 7. Voltage Output Low vs. I_{SINK}

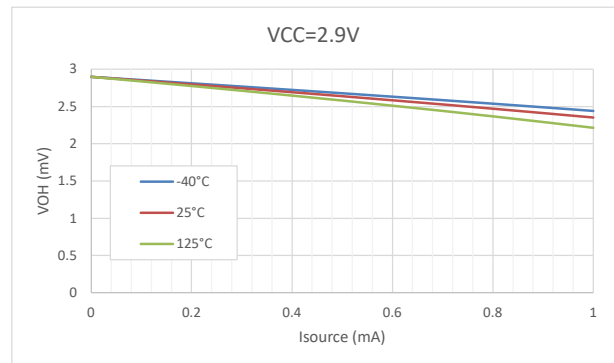


Figure 8. Voltage Output High vs. I_{SOURCE}

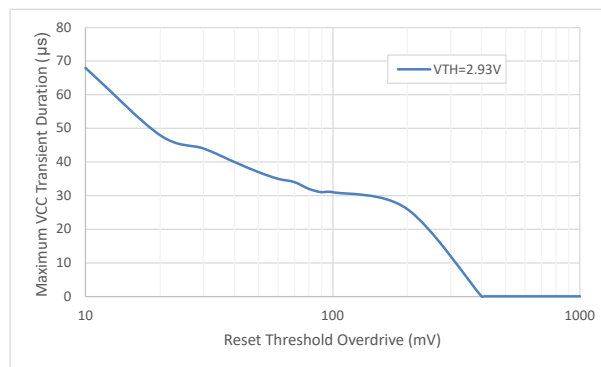


Figure 9. Maximum VCC Transient Duration vs. Reset Threshold Overdrive

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Detailed Description

Overview

The TPV682xQ provides supply voltage supervision as well as manual reset and watchdog functions.

A reset signal is asserted when the supply voltage is below a preset threshold. In addition, the TPV682xQ allows supply voltage stabilization with a fixed timeout before the reset de-asserts after the supply voltage rises above the threshold.

A watchdog timer detects if the microprocessor code breaks down or becomes stuck in an infinite loop. If this happens, the watchdog timer asserts a reset pulse, which restarts the microprocessor in a known state.

A manual reset input is available to reset the microprocessor, for example, by using an external push-button.

Functional Block Diagram

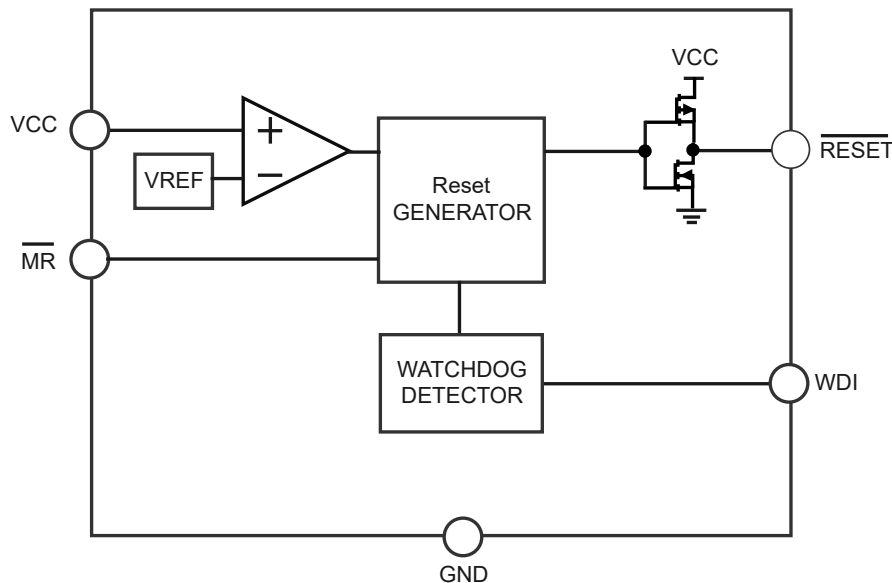


Figure 10. Functional Block Diagram

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Feature Description

Reset Output

The TPV682xQ features an active-low push-pull output. For active-low output, the reset signal is guaranteed to be logic low for V_{CC} down to 1 V. The reset output is asserted when V_{CC} is below the reset threshold (V_{TH}), when $\overline{MR}$ is driven low, or when WDI is not serviced within the watchdog timeout period (t_{WD}). Reset remains asserted for the duration of the reset active timeout period (t_{RP}) after V_{CC} rises above the reset threshold, after $\overline{MR}$ transitions from low to high, or after the watchdog timer times out. Figure 11 shows the reset outputs.

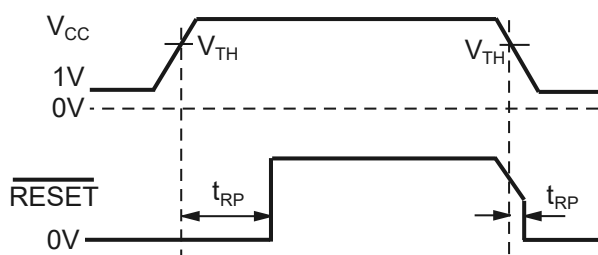


Figure 11. Reset Timing Diagram

Manual Reset Input

The TPV682xQ features a manual reset input ($\overline{MR}$), which, when driven low, asserts the reset output. When $\overline{MR}$ transitions from low to high, reset remains asserted for the duration of the reset active timeout period before de-asserting.

The $\overline{MR}$ input has an internal pull-up resistor so that the input is always high when unconnected. Noise immunity is provided on the $\overline{MR}$ input. Fast and negative-going transients are ignored. A 0.1- μ F capacitor between $\overline{MR}$ and ground provides additional noise immunity.

Watchdog Input

The TPV682xQ features a watchdog timer, which monitors microprocessor activity. A timer circuit is cleared with every low-to-high or high-to-low logic transition on the watchdog input pin (WDI). If the timer counts through the preset watchdog timeout period (t_{WD}), reset is asserted. The microprocessor is required to toggle the WDI pin to avoid being reset.

In addition to logic transitions on WDI, the watchdog timer is also cleared by a reset assertion due to an under-voltage condition on V_{CC} or $\overline{MR}$ being pulled low. When the reset is asserted, the watchdog timer is cleared and does not begin counting again until reset de-asserts. The watchdog timer can be disabled by leaving WDI floating or by three-stating the WDI driver.

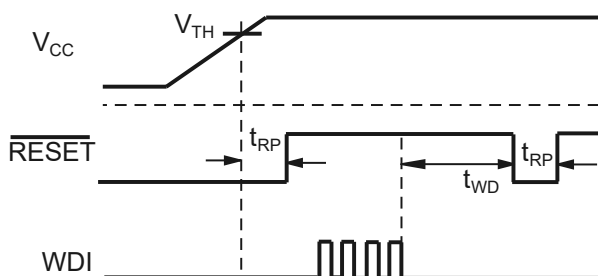


Figure 12. Watchdog Timing Diagram

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Application and Implementation

Note

Information in the following application sections is not part of the 3PEAK's component specification and 3PEAK does not warrant its accuracy or completeness. 3PEAK's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

Application Information

The TPV682xQ is a supervisory circuit that monitors power supply voltage levels and provides a power-on reset signal.

It also has an on-chip watchdog timer, which can output a reset signal if the microprocessor fails to strobe the watchdog timer within a preset timeout period.

Typical Application

The following figure shows the typical application schematic.

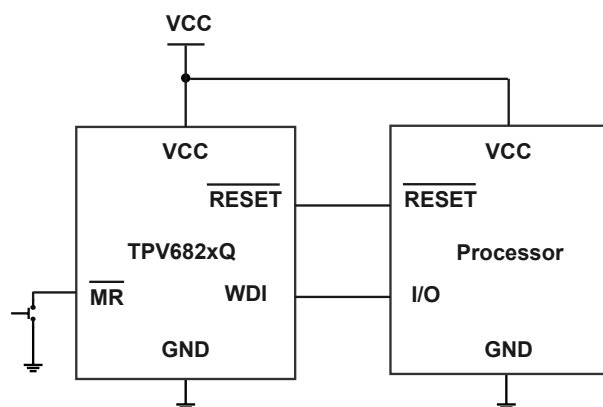
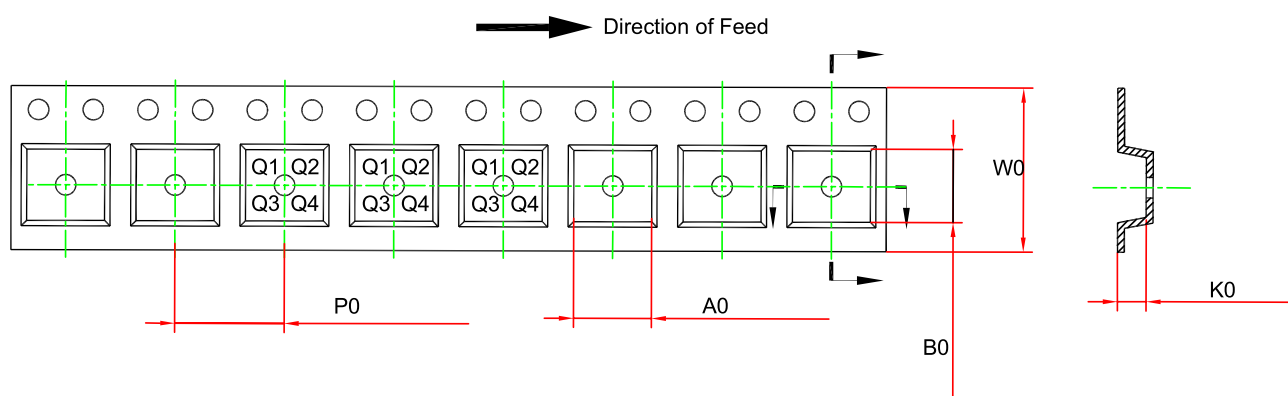
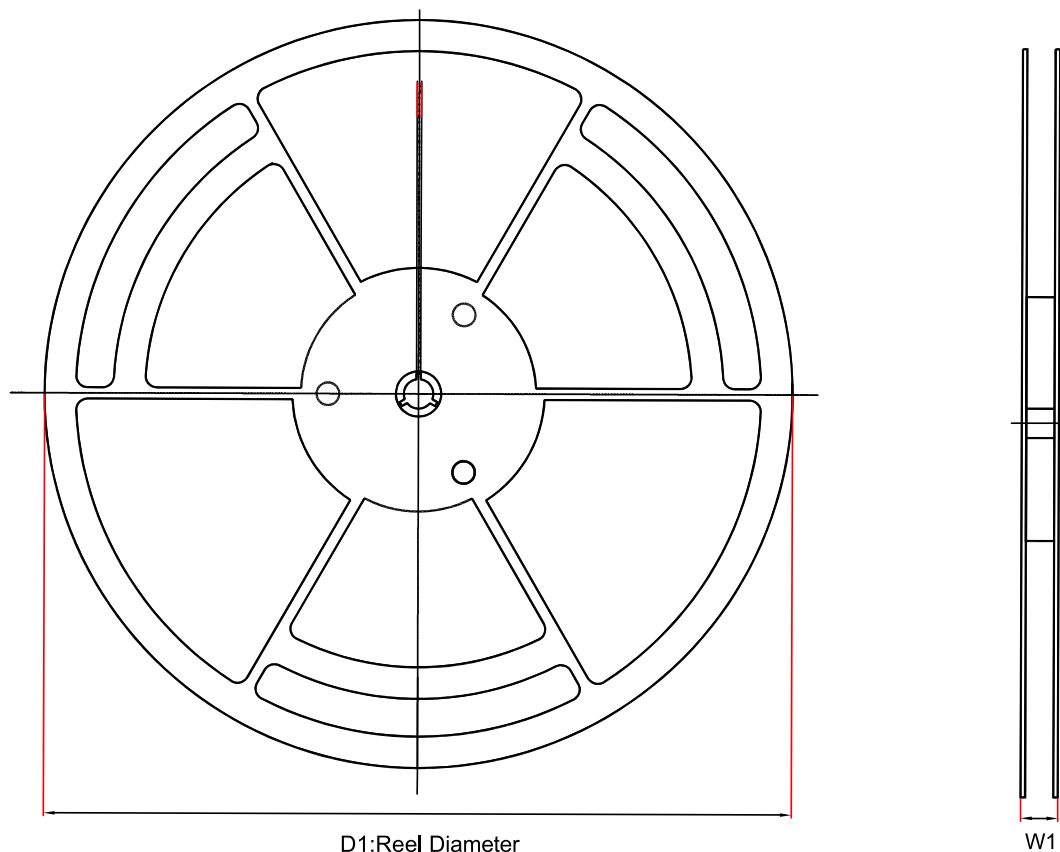


Figure 13. Typical Application Circuit

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Tape and Reel Information



Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPV6823VQ-S5TR-S ⁽¹⁾	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPV6823WQ-S5TR-S ⁽¹⁾	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPV6823YQ-S5TR-S ⁽¹⁾	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3

**Auto Grade Low-Voltage Supervisory Circuit with Watchdog and
Manual Reset**

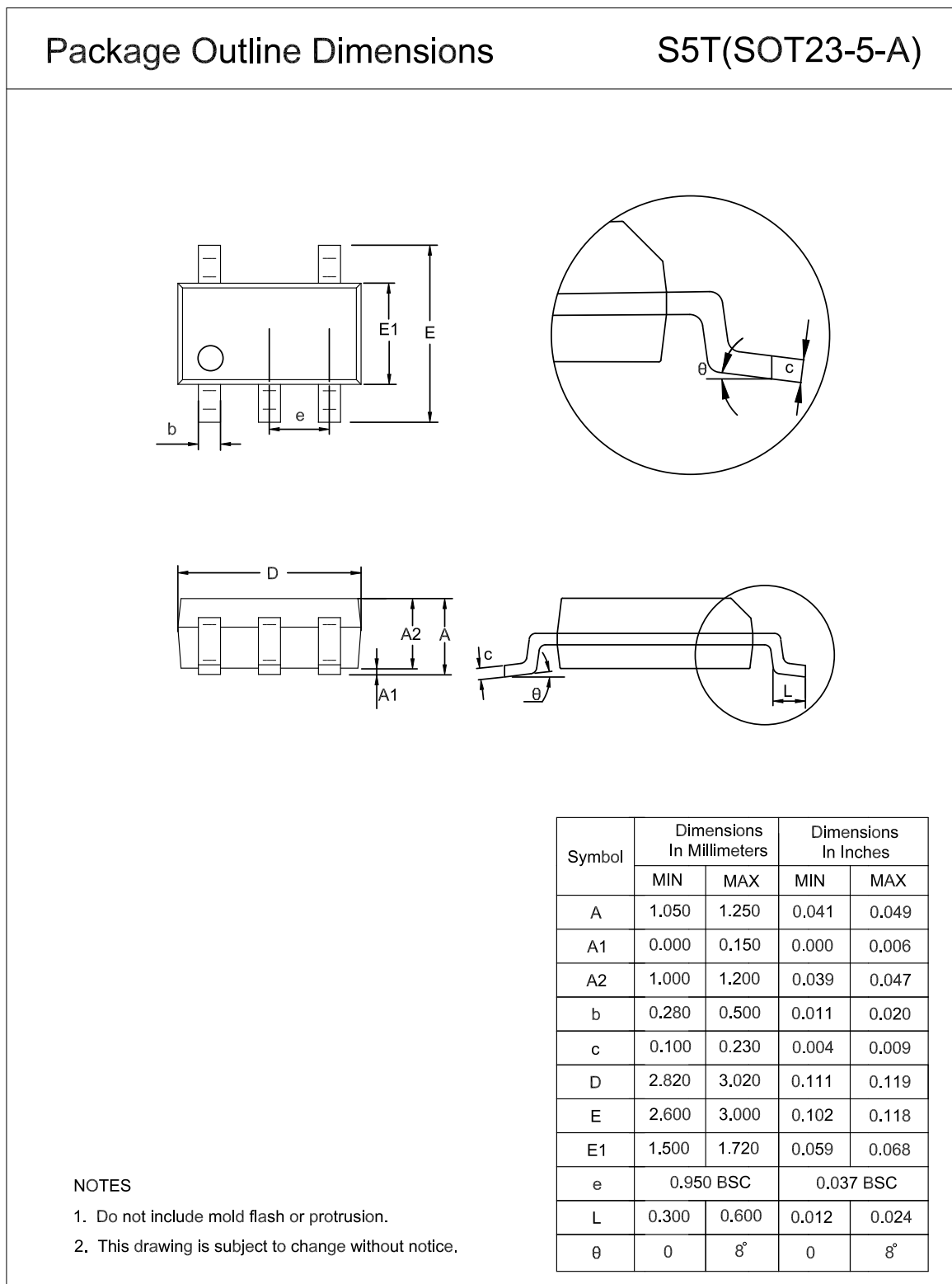
Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPV6823ZQ-S5TR-S ⁽¹⁾	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPV6823RQ-S5TR-S ⁽¹⁾	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPV6820SQ-S5TR-S	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPV6823SQ-S5TR-S	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPV6823TQ-S5TR-S ⁽¹⁾	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPV6823MQ-S5TR-S ⁽¹⁾	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3
TPV6823LQ-S5TR-S ⁽¹⁾	SOT23-5	180	12	3.3	3.25	1.4	4	8	Q3

(1) For future products, contact the 3PEAK factory for more information and samples.

Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset

Package Outline Dimensions

SOT23-5



Auto Grade Low-Voltage Supervisory Circuit with Watchdog and Manual Reset**Order Information**

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPV6823VQ-S5TR-S ⁽¹⁾	-40°C to 125°C	SOT23-5	Q3V	1	Tape and Reel, 3,000	Green
TPV6823WQ-S5TR-S ⁽¹⁾	-40°C to 125°C	SOT23-5	Q3W	1	Tape and Reel, 3,000	Green
TPV6823YQ-S5TR-S ⁽¹⁾	-40°C to 125°C	SOT23-5	Q3Y	1	Tape and Reel, 3,000	Green
TPV6823ZQ-S5TR-S ⁽¹⁾	-40°C to 125°C	SOT23-5	Q3Z	1	Tape and Reel, 3,000	Green
TPV6823RQ-S5TR-S ⁽¹⁾	-40°C to 125°C	SOT23-5	Q3R	1	Tape and Reel, 3,000	Green
TPV6820SQ-S5TR-S	-40°C to 125°C	SOT23-5	Q0S	1	Tape and Reel, 3,000	Green
TPV6823SQ-S5TR-S	-40°C to 125°C	SOT23-5	Q3S	1	Tape and Reel, 3,000	Green
TPV6823TQ-S5TR-S ⁽¹⁾	-40°C to 125°C	SOT23-5	Q3T	1	Tape and Reel, 3,000	Green
TPV6823MQ-S5TR-S ⁽¹⁾	-40°C to 125°C	SOT23-5	Q3M	1	Tape and Reel, 3,000	Green
TPV6823LQ-S5TR-S ⁽¹⁾	-40°C to 125°C	SOT23-5	Q3L	1	Tape and Reel, 3,000	Green

(1) For future products, contact the 3PEAK factory for more information and samples.

Green: 3PEAK defines "Green" to mean RoHS compatible and free of halogen substances.

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Manual Reset****IMPORTANT NOTICE AND DISCLAIMER**

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