

### GENERAL DESCRIPTION

The SGM880xQ is a high accuracy voltage detector with very low supply current. It can be used under CMOS-based 36V input conditions and the absolute maximum voltage of supply voltage can come up to 45V, which can prevent circuit breakdown caused by transient over-voltage pulses. This device has a simple structure with a voltage reference, a comparator with hysteresis, a series of resistor divider and an N-channel output transistor.

The SGM880xQ has very low supply current. It can monitor voltage rails ranging from 2.3V to 12V with  $\pm 0.7\%$  accuracy. The output pin (DOUT) is an N-channel active-low open-drain output.

The device is AEC-Q100 qualified (Automotive Electronics Council (AEC) standard Q100 Grade 1) and it is suitable for automotive applications.

The SGM880xQ is available in a Green SOT-23-5 package. Use of this package achieves high-density mounting on boards.

### APPLICATIONS

- Automotive Applications
- Voltage Monitoring for Electronic Control
- EV Inverter
- Battery Charge Control

### TYPICAL APPLICATIONS

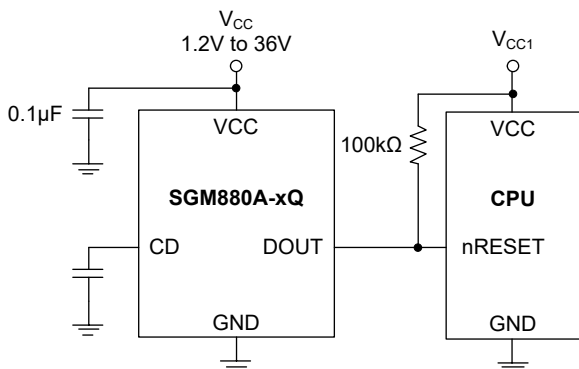


Figure 1. SGM880A-xQ Typical Application Circuit

### FEATURES

- AEC-Q100 Qualified for Automotive Applications Device Temperature Grade 1  
 $T_A = -40^\circ\text{C}$  to  $+125^\circ\text{C}$
- Operating Voltage Range:
  - ◆ SGM880A-xQ: 1.2V to 36V
  - ◆ SGM880E-xQ: 2.2V to 36V
- Low Supply Current
  - ◆ SGM880A-xQ: 3.0µA (TYP)
  - ◆ SGM880E-xQ: 2.3µA (TYP)
- Detector Threshold Range: 2.3V to 5.0V (0.1V Increments), 5.0V to 12.0V (0.25V Increments)
- Detector Threshold Accuracy:  $\pm 0.7\%$  at  $+25^\circ\text{C}$
- Voltage Detection Type:
  - ◆ SGM880A-xQ: with CD Pin Type
  - ◆ SGM880E-xQ: with SENSE Pin Type
- Detector Threshold Temperature Coefficient: 40ppm/ $^\circ\text{C}$
- Release Output Delay Time (SGM880A-xQ Only)
  - ◆ 90ms at  $C_D = 0.01\mu\text{F}$
  - ◆  $\pm 39\%$  Accuracy
- Open-Drain Output
- Available in a Green SOT-23-5 Package

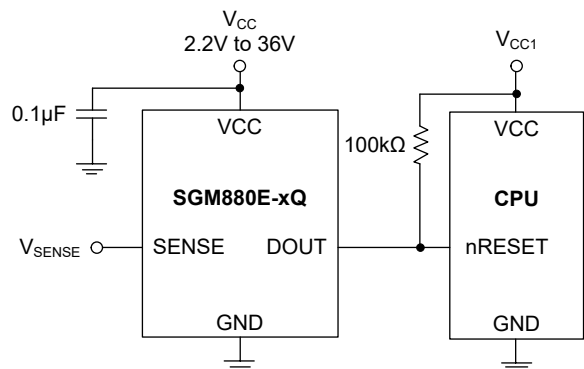


Figure 2. SGM880E-xQ Typical Application Circuit

## PACKAGE/ORDERING INFORMATION

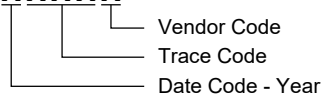
MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM880A-2.3Q	SOT-23-5	-40°C to +125°C	SGM880A-2.3QN5G/TR	11J XXXXX	Tape and Reel, 3000
SGM880A-2.5Q	SOT-23-5	-40°C to +125°C	SGM880A-2.5QN5G/TR	11L XXXXX	Tape and Reel, 3000
SGM880A-3.0Q	SOT-23-5	-40°C to +125°C	SGM880A-3.0QN5G/TR	11Q XXXXX	Tape and Reel, 3000
SGM880A-4.3Q	SOT-23-5	-40°C to +125°C	SGM880A-4.3QN5G/TR	123 XXXXX	Tape and Reel, 3000
SGM880A-4.6Q	SOT-23-5	-40°C to +125°C	SGM880A-4.6QN5G/TR	126 XXXXX	Tape and Reel, 3000
SGM880A-5.0Q	SOT-23-5	-40°C to +125°C	SGM880A-5.0QN5G/TR	12A XXXXX	Tape and Reel, 3000
SGM880A-5.5Q	SOT-23-5	-40°C to +125°C	SGM880A-5.5QN5G/TR	118 XXXXX	Tape and Reel, 3000
SGM880A-7.5Q	SOT-23-5	-40°C to +125°C	SGM880A-7.5QN5G/TR	12J XXXXX	Tape and Reel, 3000
SGM880A-9.0Q	SOT-23-5	-40°C to +125°C	SGM880A-9.0QN5G/TR	11B XXXXX	Tape and Reel, 3000
SGM880A-11.5Q	SOT-23-5	-40°C to +125°C	SGM880A-11.5QN5G/TR	11A XXXXX	Tape and Reel, 3000
SGM880A-12.0Q	SOT-23-5	-40°C to +125°C	SGM880A-12.0QN5G/TR	119 XXXXX	Tape and Reel, 3000
SGM880E-2.3Q	SOT-23-5	-40°C to +125°C	SGM880E-2.3QN5G/TR	132 XXXXX	Tape and Reel, 3000
SGM880E-2.5Q	SOT-23-5	-40°C to +125°C	SGM880E-2.5QN5G/TR	134 XXXXX	Tape and Reel, 3000
SGM880E-3.0Q	SOT-23-5	-40°C to +125°C	SGM880E-3.0QN5G/TR	139 XXXXX	Tape and Reel, 3000
SGM880E-4.3Q	SOT-23-5	-40°C to +125°C	SGM880E-4.3QN5G/TR	13M XXXXX	Tape and Reel, 3000
SGM880E-4.6Q	SOT-23-5	-40°C to +125°C	SGM880E-4.6QN5G/TR	13P XXXXX	Tape and Reel, 3000
SGM880E-5.0Q	SOT-23-5	-40°C to +125°C	SGM880E-5.0QN5G/TR	13T XXXXX	Tape and Reel, 3000
SGM880E-5.5Q	SOT-23-5	-40°C to +125°C	SGM880E-5.5QN5G/TR	12S XXXXX	Tape and Reel, 3000
SGM880E-7.5Q	SOT-23-5	-40°C to +125°C	SGM880E-7.5QN5G/TR	142 XXXXX	Tape and Reel, 3000
SGM880E-9.0Q	SOT-23-5	-40°C to +125°C	SGM880E-9.0QN5G/TR	148 XXXXX	Tape and Reel, 3000
SGM880E-11.5Q	SOT-23-5	-40°C to +125°C	SGM880E-11.5QN5G/TR	12T XXXXX	Tape and Reel, 3000
SGM880E-12.0Q	SOT-23-5	-40°C to +125°C	SGM880E-12.0QN5G/TR	131 XXXXX	Tape and Reel, 3000

NOTE: For more models not listed above, please contact your local SGMICRO sales representatives.

## MARKING INFORMATION

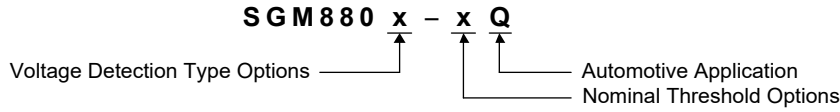
NOTE: XXXXX = Date Code, Trace Code and Vendor Code.

**XXXXX**



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

DEVICE NAMING DESCRIPTION



Voltage Detection Type Options							
A	CD Pin Type			E	SENSE Pin Type		
Nominal Monitor Threshold Voltage Options							
2.3	2.3V	3.7	3.7V	5.25	5.25V	8.75	8.75V
2.4	2.4V	3.8	3.8V	5.5	5.5V	9.0	9.0V
2.5	2.5V	3.9	3.9V	5.75	5.75V	9.25	9.25V
2.6	2.6V	4.0	4.0V	6.0	6.0V	9.5	9.5V
2.7	2.7V	4.1	4.1V	6.25	6.25V	9.75	9.75V
2.8	2.8V	4.2	4.2V	6.5	6.5V	10.0	10.0V
2.9	2.9V	4.3	4.3V	6.75	6.75V	10.25	10.25V
3.0	3.0V	4.4	4.4V	7.0	7.0V	10.5	10.5V
3.1	3.1V	4.5	4.5V	7.25	7.25V	10.75	10.75V
3.2	3.2V	4.6	4.6V	7.5	7.5V	11.0	11.0V
3.3	3.3V	4.7	4.7V	7.75	7.75V	11.25	11.25V
3.4	3.4V	4.8	4.8V	8.0	8.0V	11.5	11.5V
3.5	3.5V	4.9	4.9V	8.25	8.25V	11.75	11.75V
3.6	3.6V	5.0	5.0V	8.5	8.5V	12.0	12.0V

ABSOLUTE MAXIMUM RATINGS

Supply Voltage Range,  $V_{CC}$

SGM880A-xQ ..... -0.3V to 45V

SGM880E-xQ ..... -0.3V to 45V

DOUT Pin Output Voltage,  $V_{DOUT}$  ..... -0.3V to 7V

CD Pin Output Voltage,  $V_{CD}$  (SGM880A-xQ) ..... -0.3V to 7V

SENSE Pin Input Voltage,  $V_{SENSE}$  (SGM880E-xQ) ..... -0.3V to 50V

DOUT Pin Output Current,  $I_{DOUT}$  ..... 20mA

Package Thermal Resistance

SOT-23-5,  $\theta_{JA}$  ..... 142.6°C/W

SOT-23-5,  $\theta_{JB}$  ..... 30.3°C/W

SOT-23-5,  $\theta_{JC}$  ..... 55.0°C/W

Junction Temperature ..... +150°C

Storage Temperature Range ..... -65°C to +150°C

Lead Temperature (Soldering, 10s) ..... +260°C

ESD Susceptibility <sup>(1)(2)</sup>

HBM ..... ±4000V

CDM ..... ±1000V

NOTES:

1. For human body model (HBM), all pins comply with AEC-Q100-002 specification.
2. For charged device model (CDM), all pins comply with AEC-Q100-011 specification.

RECOMMENDED OPERATING CONDITIONS

Operating Voltage Range,  $V_{CC}$

SGM880A-xQ ..... 1.2V to 36V

SGM880E-xQ ..... 2.2V to 36V

SENSE Pin Voltage,  $V_{SENSE}$  (SGM880E-xQ) ..... 0V to 36V

Operating Temperature Range ..... -40°C to +125°C

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

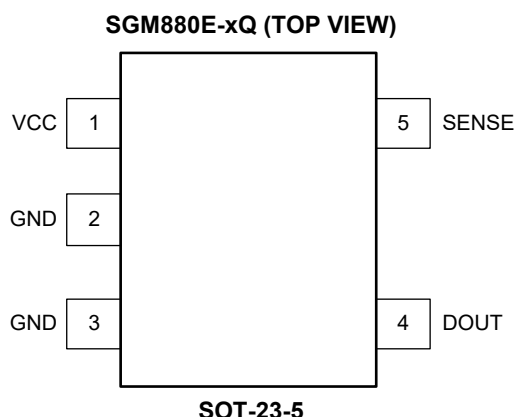
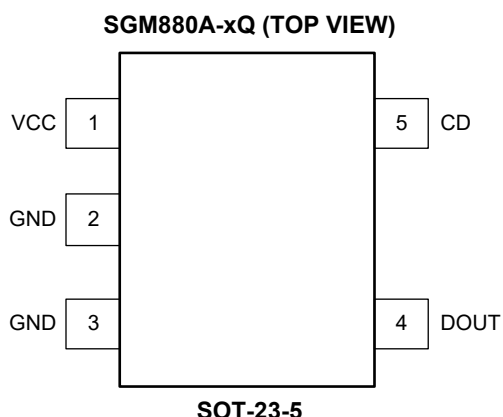
ESD SENSITIVITY CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

**PIN CONFIGURATIONS**



**PIN DESCRIPTION**

PIN	NAME	FUNCTION
1	VCC	Input Supply Voltage Pin.
2, 3	GND	Ground. The GND pins must be wired to the GND plane when mounted on board.
4	DOUT	Active-Low Open-Drain Output Pin.
5	CD	Release Output Delay Set Pin (SGM880A-xQ).
	SENSE	Voltage SENSE Pin (SGM880E-xQ).

## ELECTRICAL CHARACTERISTICS

(Pull up to 5V with a 100kΩ resistor,  $T_A = -40^\circ\text{C}$  to  $+125^\circ\text{C}$ , typical values are measured at  $T_A = +25^\circ\text{C}$ , unless otherwise noted.)

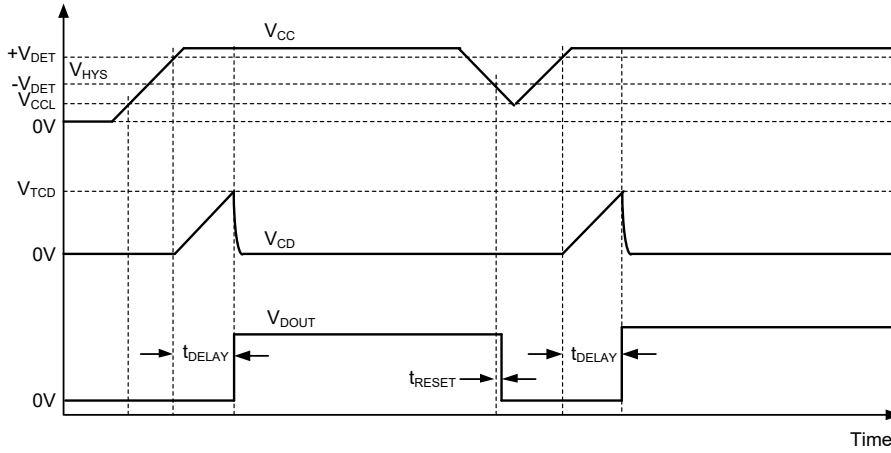
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>SGM880A-xQ</b>						
Detector Threshold	$-V_{\text{DET}}$	VCC pin, $T_A = +25^\circ\text{C}$	-0.7		0.7	%
		VCC pin, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-1.5		1.5	
		VCC pin, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$	-2.0		1.5	
Detector Threshold Hysteresis	$V_{\text{HYS}}$		3.9	5.2	6.5	%
Supply Current	$I_{\text{SS}}$	$V_{\text{CC}} = 13.2\text{V}$		3.0	5.5	$\mu\text{A}$
Minimum Operating Voltage <sup>(1)</sup>	$V_{\text{CCL}}$	VCC pin, $T_A = +25^\circ\text{C}$			1.05	V
		VCC pin, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$			1.2	
Output Current (N-ch. Driver Output Pin)	$I_{\text{DOUT}}$	$V_{\text{CC}} = 1.5\text{V}$ , $V_{\text{DOUT}} = 0.05\text{V}$	400			$\mu\text{A}$
DOUT Low-Level Voltage	$V_{\text{OL}}$	$V_{\text{CC}} = 2.2\text{V}$ , $I_{\text{SINK}} = 3.5\text{mA}$			0.3	V
N-ch. Driver Leakage Current	$I_{\text{LEAK}}$	$V_{\text{CC}} = 36\text{V}$ , $V_{\text{DOUT}} = 6\text{V}$			0.3	$\mu\text{A}$
Release Output Delay Time	$t_{\text{DELAY}}$	$V_{\text{CC}} = 2.1\text{V}$ to $-V_{\text{DET}} + 2\text{V}$ , $C_{\text{D}} = 0.01\mu\text{F}$ , $T_A = +25^\circ\text{C}$	65	90	115	ms
		$V_{\text{CC}} = 2.1\text{V}$ to $-V_{\text{DET}} + 2\text{V}$ , $C_{\text{D}} = 0.01\mu\text{F}$ , $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$	55	90	125	
Detect Output Delay Time	$t_{\text{RESET}}$	$V_{\text{CC}} = -V_{\text{DET}} + 2\text{V}$ to $2.1\text{V}$ , $-V_{\text{DET}} = 2.3\text{V}$		26		$\mu\text{s}$
		$V_{\text{CC}} = -V_{\text{DET}} + 2\text{V}$ to $2.1\text{V}$ , $-V_{\text{DET}} = 5.5\text{V}$		18		
		$V_{\text{CC}} = -V_{\text{DET}} + 2\text{V}$ to $2.1\text{V}$ , $-V_{\text{DET}} = 12\text{V}$		16		
<b>SGM880E-xQ</b>						
Detector Threshold	$-V_{\text{DET}}$	SENSE Pin, $V_{\text{CC}} = 6\text{V}$ , $T_A = +25^\circ\text{C}$	-0.7		0.7	%
		SENSE Pin, $V_{\text{CC}} = 6\text{V}$ , $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$	-1.5		1.5	
		SENSE Pin, $V_{\text{CC}} = 6\text{V}$ , $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$	-2.0		1.5	
Detector Threshold Hysteresis	$V_{\text{HYS}}$		3.9	5.2	6.5	%
Supply Current	$I_{\text{SS}}$	$V_{\text{CC}} = 6\text{V}$		2.0	5.0	$\mu\text{A}$
		$V_{\text{CC}} = 36\text{V}$		2.3	5.5	
Under-Voltage Lockout <sup>(2)</sup>	$V_{\text{UVLO}}$				2.2	V
SENSE Resistance	$R_{\text{SENSE}}$		4.5		45	$\text{M}\Omega$
Output Current (N-ch. Driver Output Pin)	$I_{\text{DOUT}}$	$V_{\text{SENSE}} < -V_{\text{DET}}$ , $V_{\text{CC}} = 2.1\text{V}$ , $V_{\text{DOUT}} = 0.05\text{V}$	600			$\mu\text{A}$
DOUT Low-Level Voltage	$V_{\text{OL}}$	$V_{\text{CC}} = 2.2\text{V}$ , $I_{\text{SINK}} = 3.5\text{mA}$			0.3	V
N-ch. Driver Leakage Current	$I_{\text{LEAK}}$	$V_{\text{CC}} = 6\text{V}$ , $V_{\text{SENSE}} = 36\text{V}$ , $V_{\text{DOUT}} = 6\text{V}$			0.3	$\mu\text{A}$
Release Output Delay Time	$t_{\text{DELAY}}$	$V_{\text{CC}} = 6\text{V}$ , $V_{\text{SENSE}} = 2.1\text{V}$ to $-V_{\text{DET}} + 2\text{V}$ , $-V_{\text{DET}} = 2.3\text{V}$		16		$\mu\text{s}$
		$V_{\text{CC}} = 6\text{V}$ , $V_{\text{SENSE}} = 2.1\text{V}$ to $-V_{\text{DET}} + 2\text{V}$ , $-V_{\text{DET}} = 5.5\text{V}$		20		
		$V_{\text{CC}} = 6\text{V}$ , $V_{\text{SENSE}} = 2.1\text{V}$ to $-V_{\text{DET}} + 2\text{V}$ , $-V_{\text{DET}} = 12\text{V}$		19		
Detect Output Delay Time	$t_{\text{RESET}}$	$V_{\text{CC}} = 6\text{V}$ , $V_{\text{SENSE}} = -V_{\text{DET}} + 2\text{V}$ to $2.1\text{V}$ , $-V_{\text{DET}} = 2.3\text{V}$		26		$\mu\text{s}$
		$V_{\text{CC}} = 6\text{V}$ , $V_{\text{SENSE}} = -V_{\text{DET}} + 2\text{V}$ to $2.1\text{V}$ , $-V_{\text{DET}} = 5.5\text{V}$		16		
		$V_{\text{CC}} = 6\text{V}$ , $V_{\text{SENSE}} = -V_{\text{DET}} + 2\text{V}$ to $2.1\text{V}$ , $-V_{\text{DET}} = 12\text{V}$		15		

## NOTES:

- The value is the minimum operating voltage when the output voltage is 0.1V or less at detection.
- During power-on,  $V_{\text{CC}}$  must exceed  $V_{\text{UVLO}}$  for at least 2ms to finish the startup procedure.

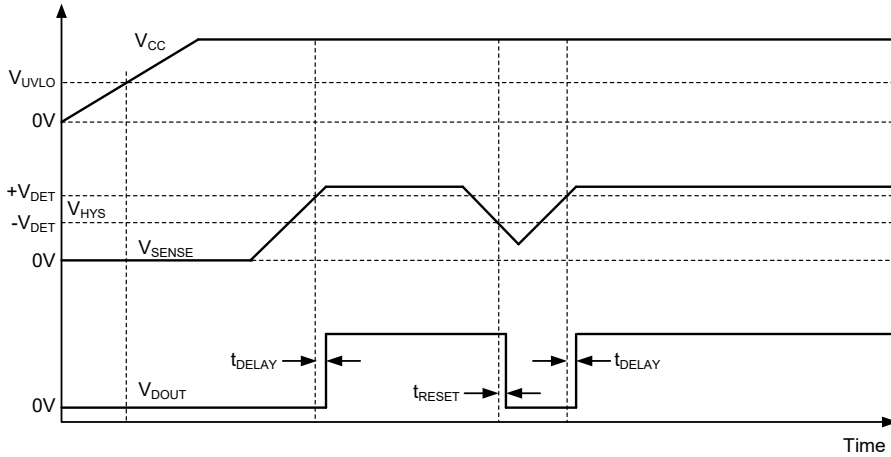
**ELECTRICAL CHARACTERISTICS (continued)**

**Timing Diagram**



NOTE: DOUT is pulled up to VCC through a 100kΩ resistor.

**Figure 3. SGM880A-xQ Timing Diagram**



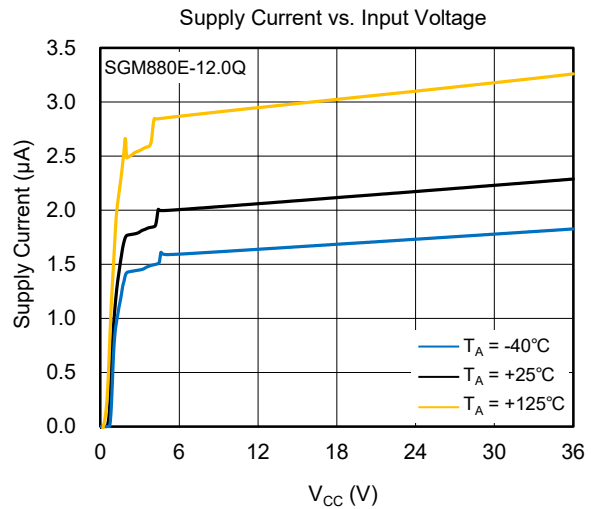
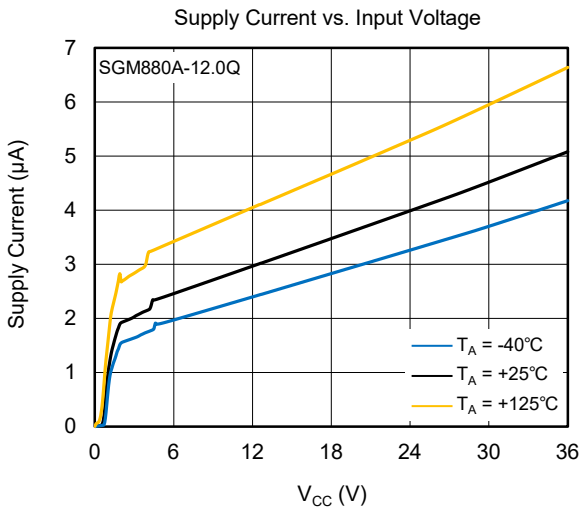
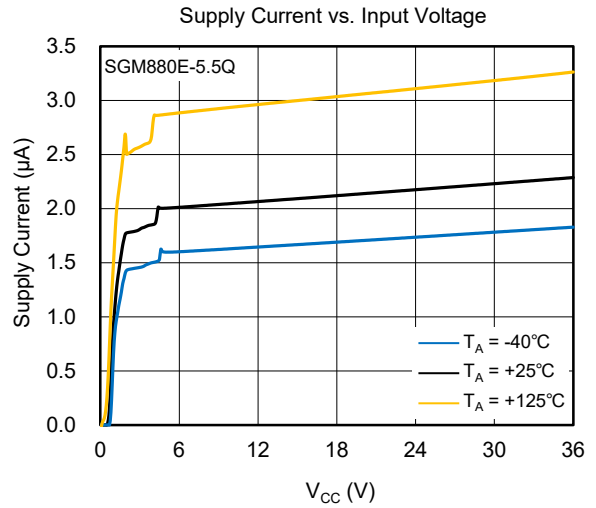
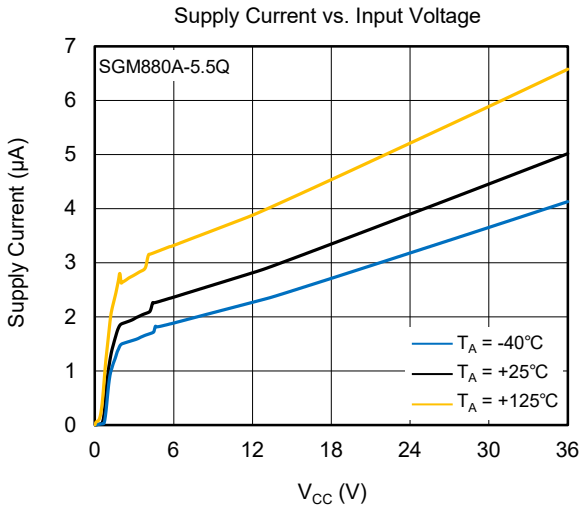
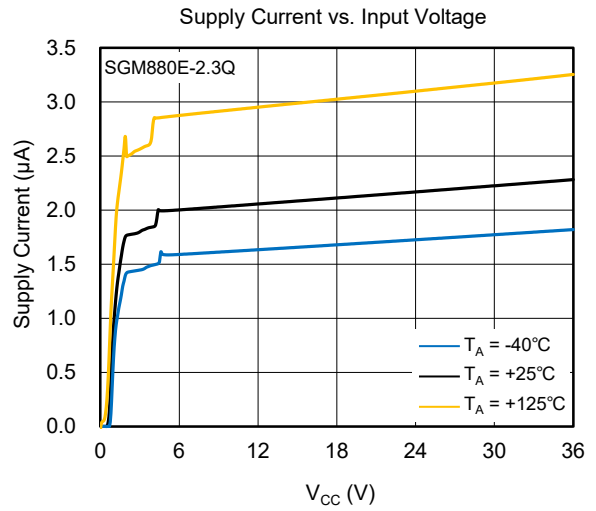
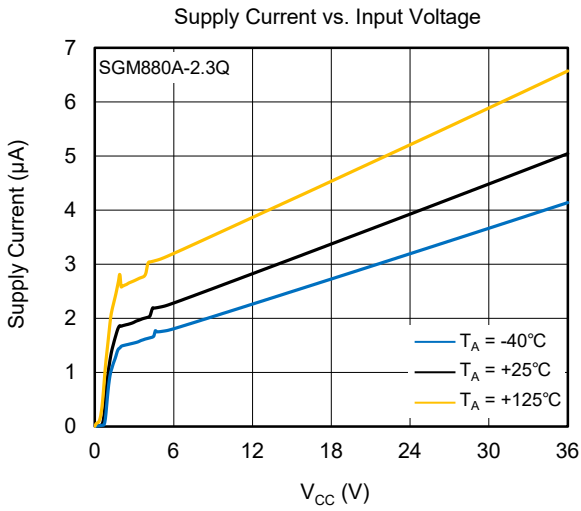
NOTE: DOUT is pulled up to VCC through a 100kΩ resistor.

**Figure 4. SGM880E-xQ Timing Diagram**

**Voltage Chart**

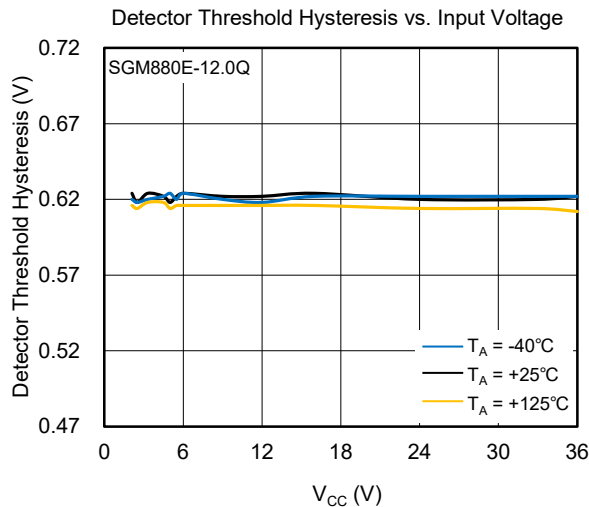
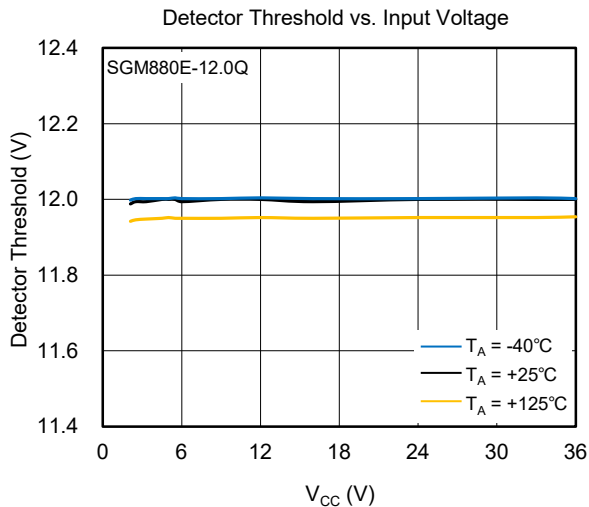
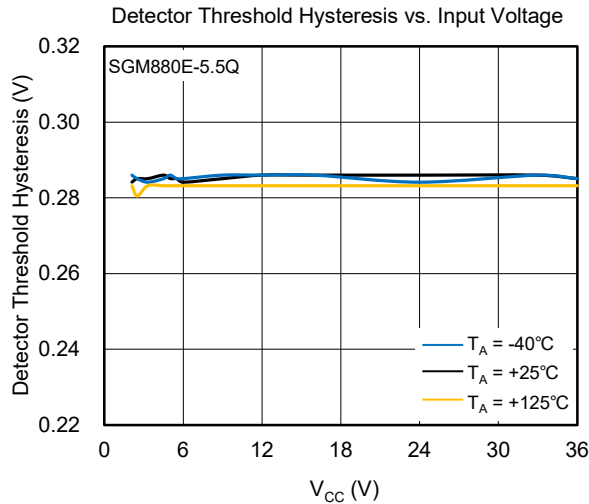
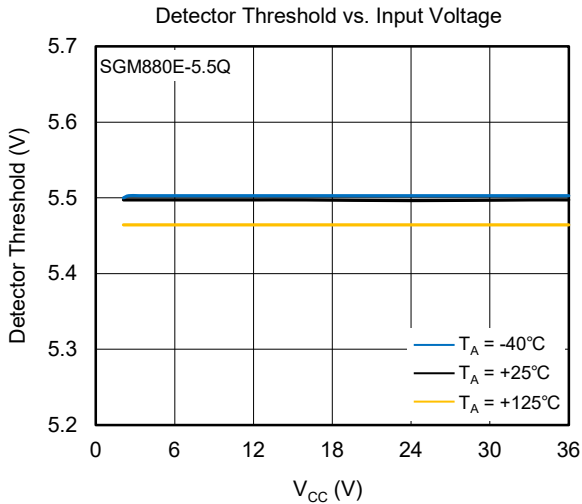
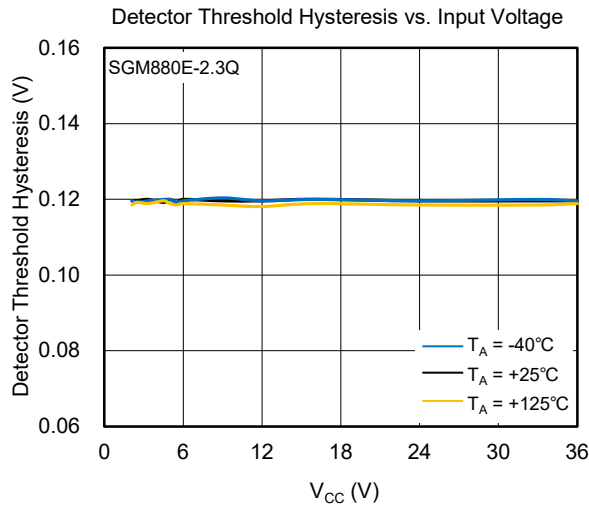
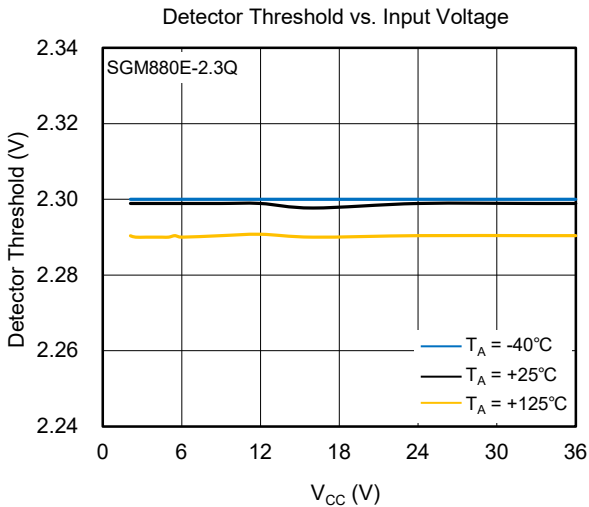
PRODUCT NAME	-V <sub>DET</sub> (V), T <sub>A</sub> = +25°C			-V <sub>DET</sub> (V), T <sub>A</sub> = -40°C to +125°C		
	MIN	TYP	MAX	MIN	TYP	MAX
SGM880A/E-2.3Q	2.284	2.300	2.316	2.254	2.300	2.335
SGM880A/E-2.5Q	2.483	2.500	2.518	2.450	2.500	2.538
SGM880A/E-3.0Q	2.979	3.000	3.021	2.940	3.000	3.045
SGM880A/E-4.3Q	4.270	4.300	4.330	4.214	4.300	4.365
SGM880A/E-4.6Q	4.568	4.600	4.632	4.508	4.600	4.669
SGM880A/E-5.0Q	4.965	5.000	5.035	4.900	5.000	5.075
SGM880A/E-5.5Q	5.462	5.500	5.539	5.390	5.500	5.583
SGM880A/E-7.5Q	7.448	7.500	7.553	7.350	7.500	7.613
SGM880A/E-9.0Q	8.937	9.000	9.063	8.820	9.000	9.135
SGM880A/E-11.5Q	11.420	11.500	11.581	11.270	11.500	11.673
SGM880A/E-12.0Q	11.916	12.000	12.084	11.760	12.000	12.180

**TYPICAL PERFORMANCE CHARACTERISTICS**



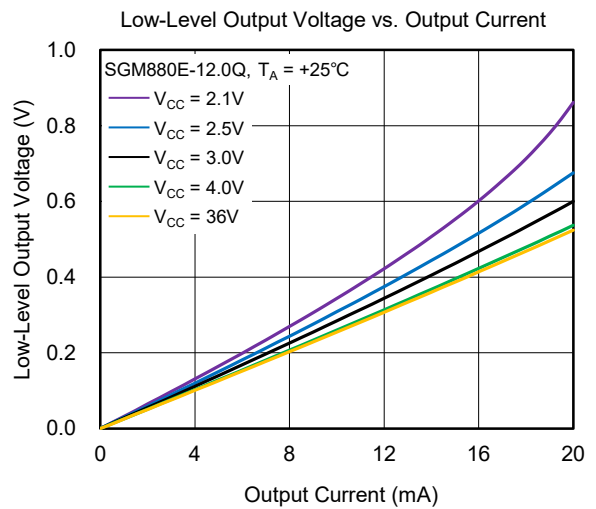
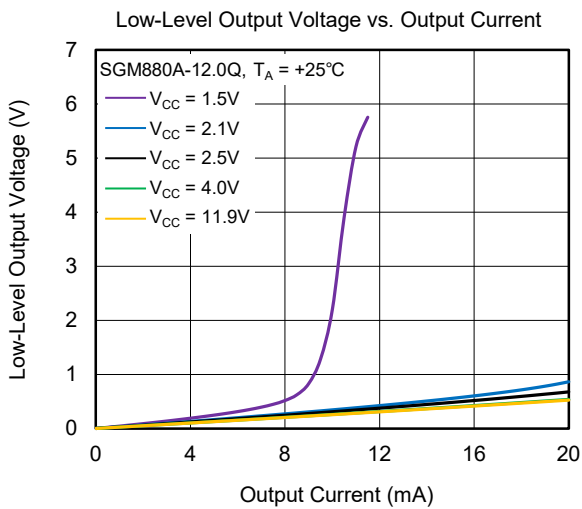
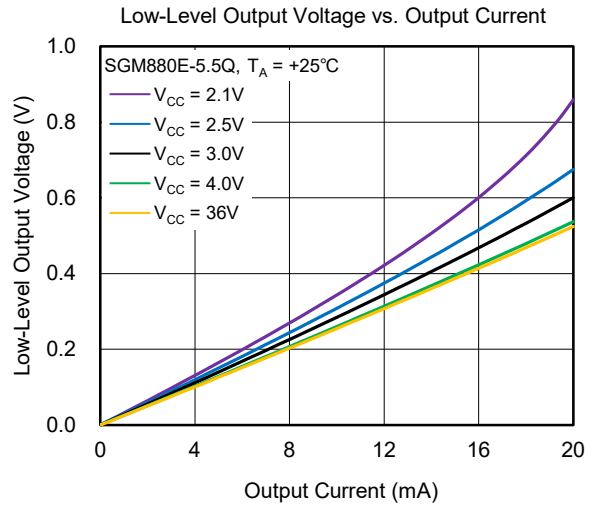
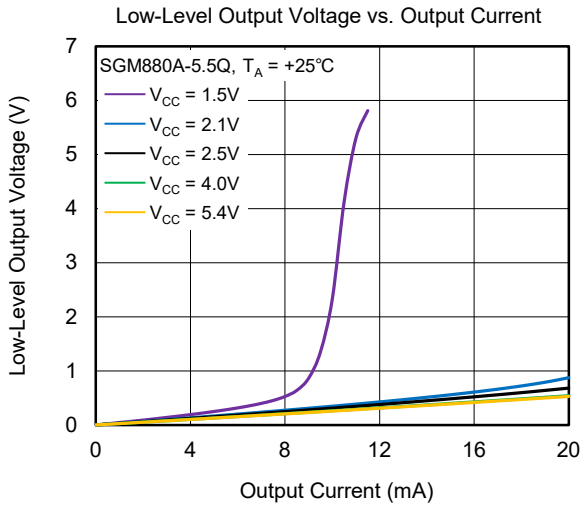
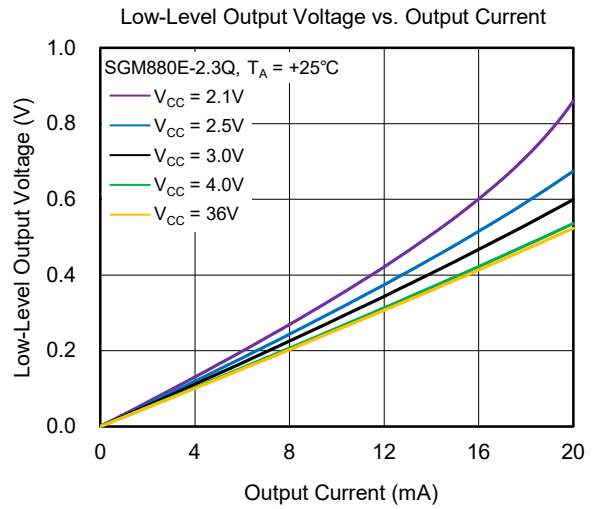
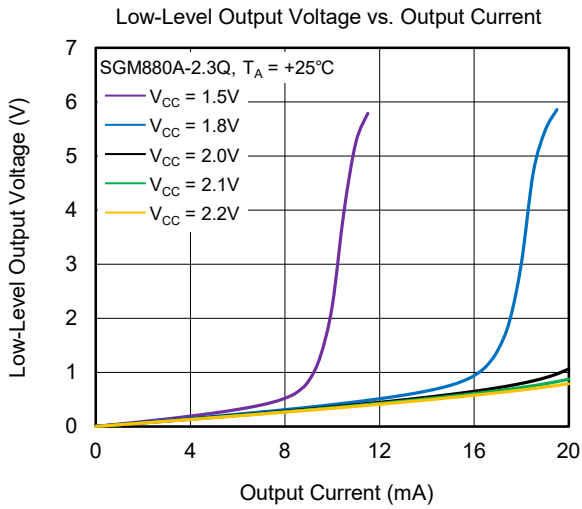
# SGM880xQ 36V Input Voltage Detector with Delay Function for Automotive Applications

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)

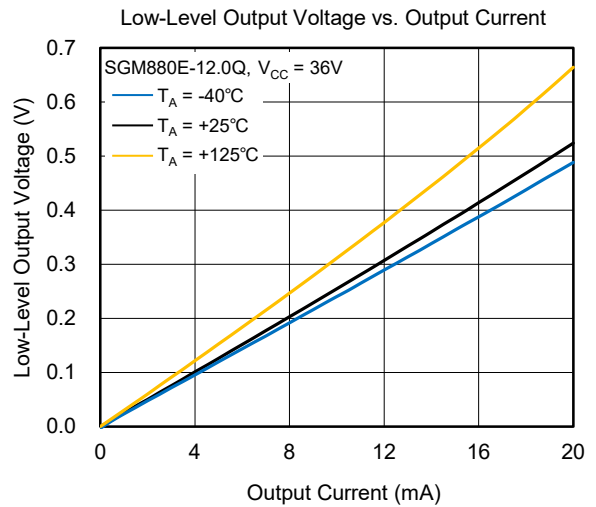
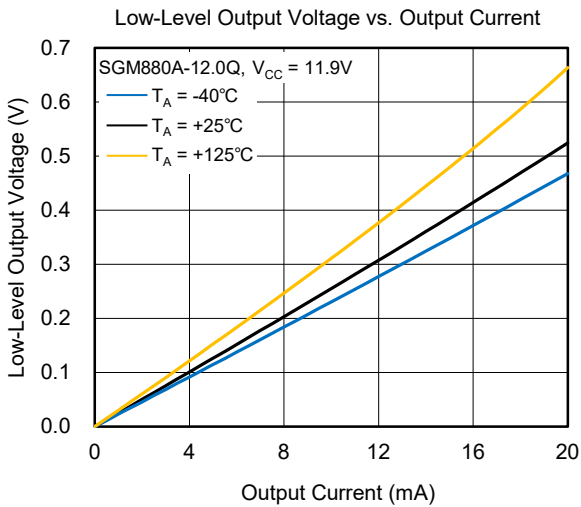
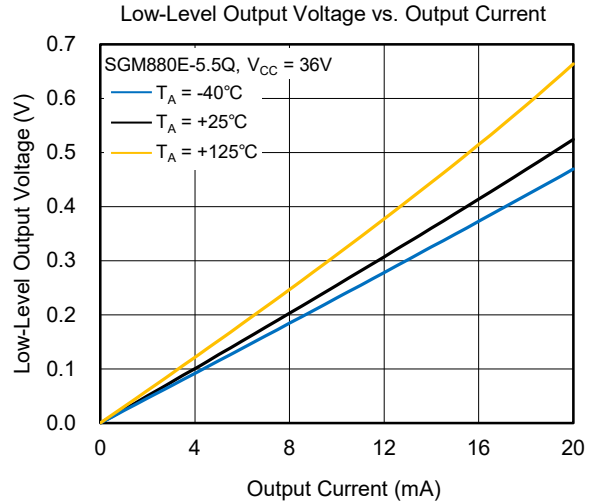
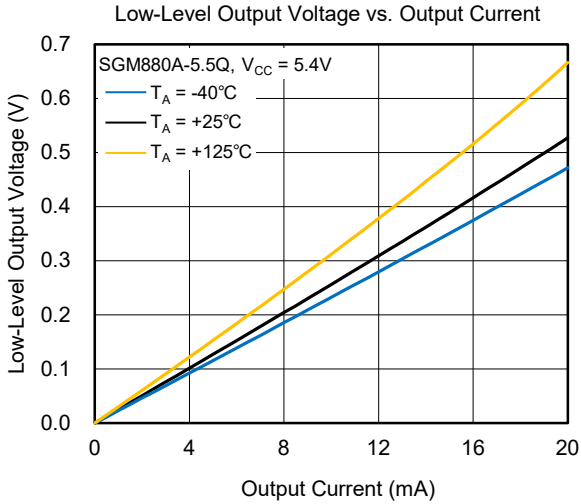
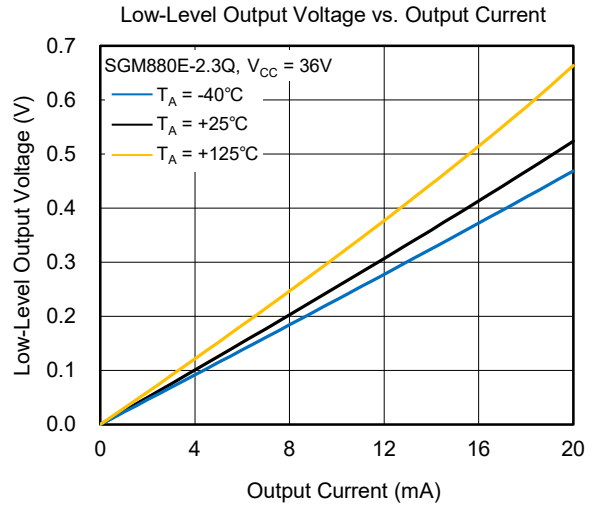
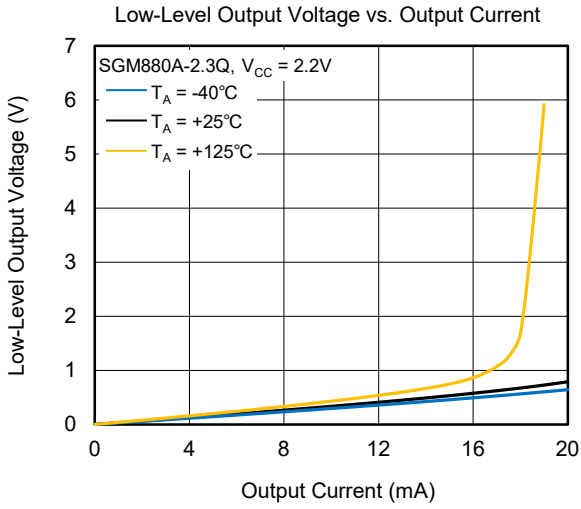




**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

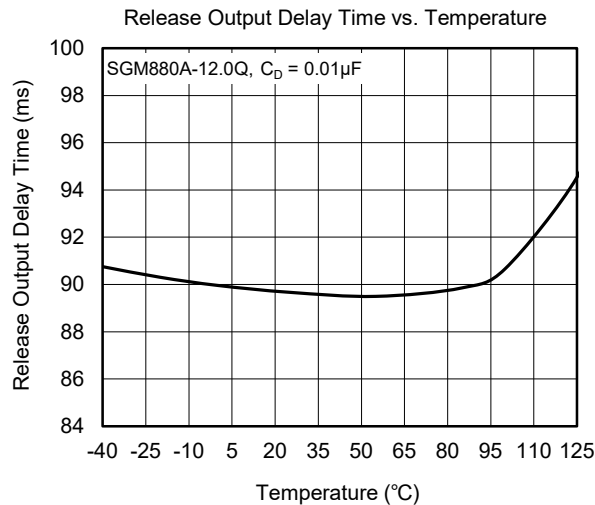
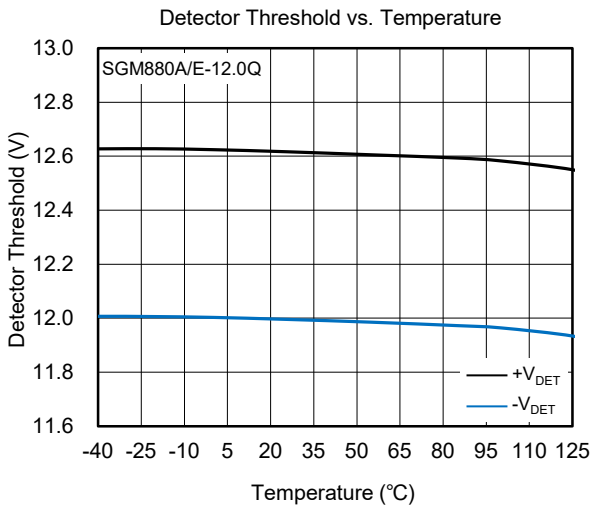
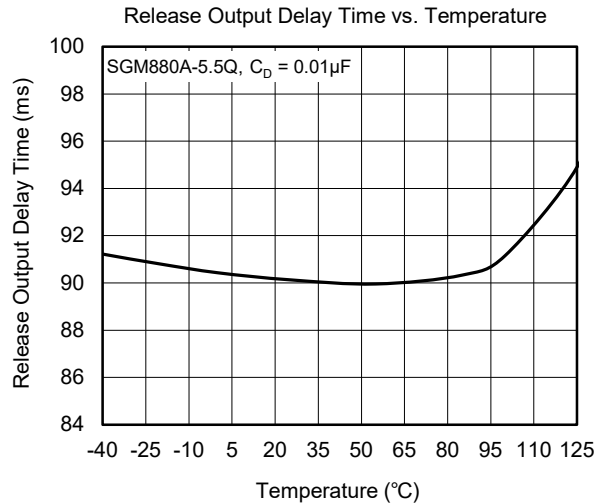
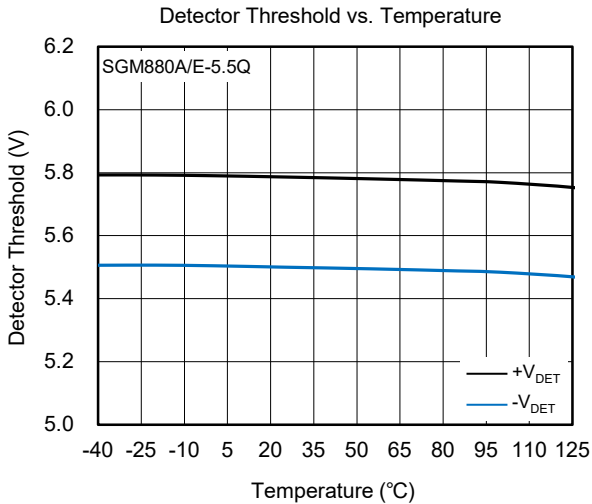
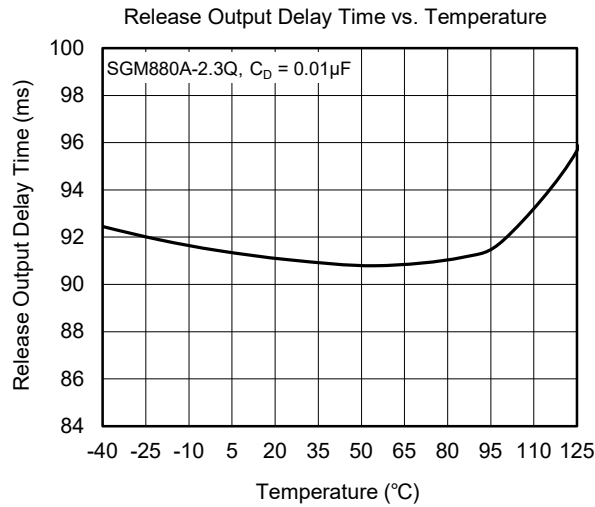
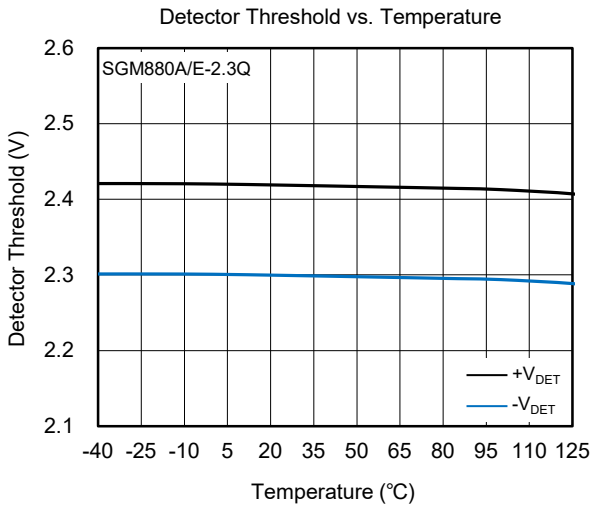


**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**

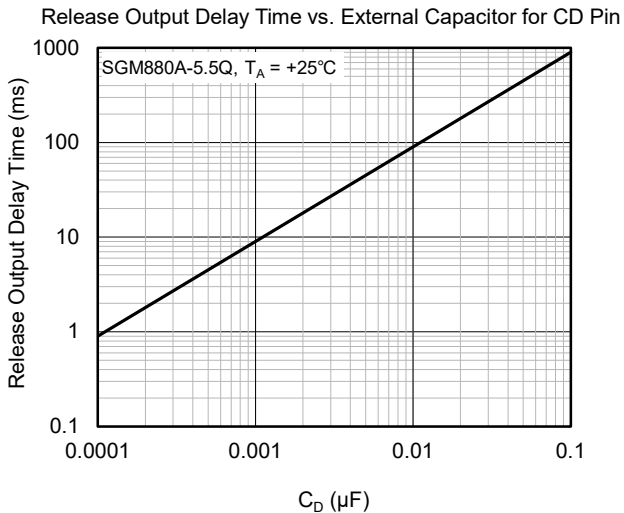


# SGM880xQ 36V Input Voltage Detector with Delay Function for Automotive Applications

## TYPICAL PERFORMANCE CHARACTERISTICS (continued)



**TYPICAL PERFORMANCE CHARACTERISTICS (continued)**



**FUNCTIONAL BLOCK DIAGRAMS**

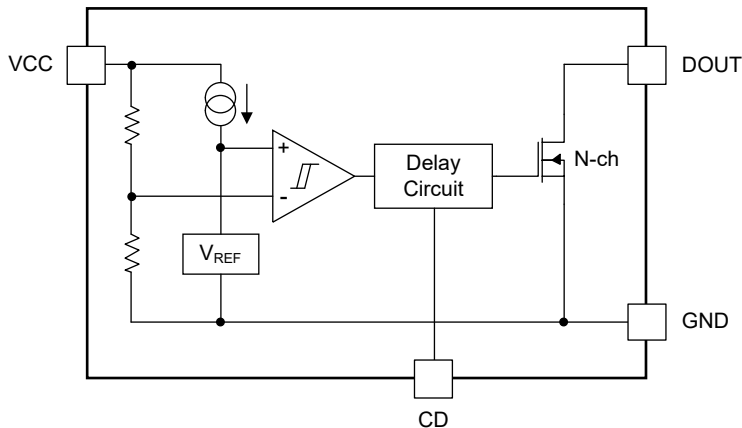


Figure 5. SGM880A-xQ Functional Block Diagram

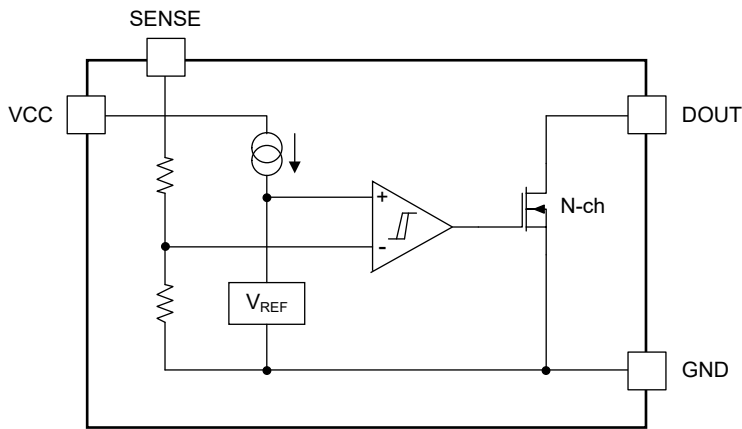


Figure 6. SGM880E-xQ Functional Block Diagram

DETAILED DESCRIPTION

Operation Diagram and Description

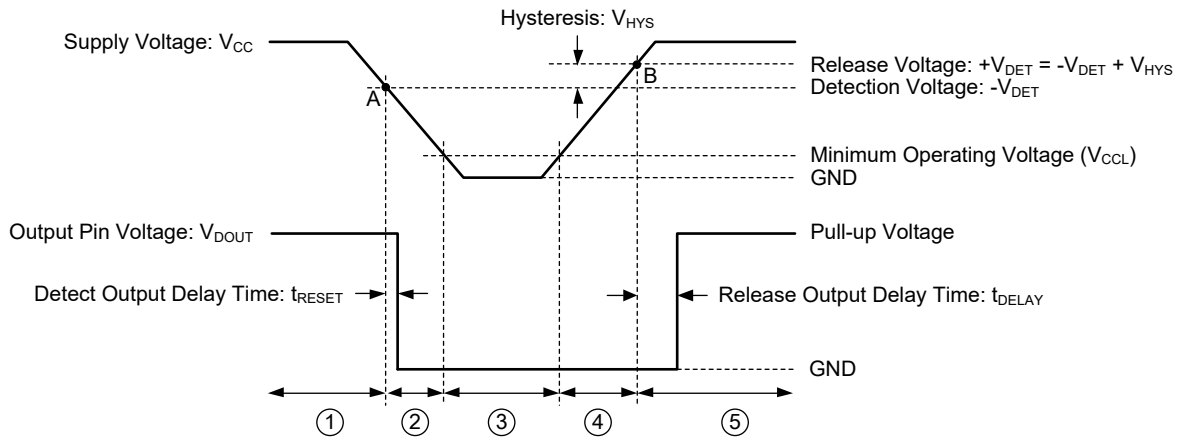


Figure 7. SGM880A-xQ Diagram

Table 1. Description of Figure 7

Operating Conditions	Comparator Input Condition	Comparator Output	Output Tr. (N-ch)
①	$V_{CC} > -V_{DET}$	L	Off
②	$V_{CCL} < V_{CC} < -V_{DET}$	H	On
③	$V_{CC} < V_{CCL}$	—	—
④	$V_{CCL} < V_{CC} < +V_{DET}$	H	On
⑤	$V_{CC} > +V_{DET}$	L	Off

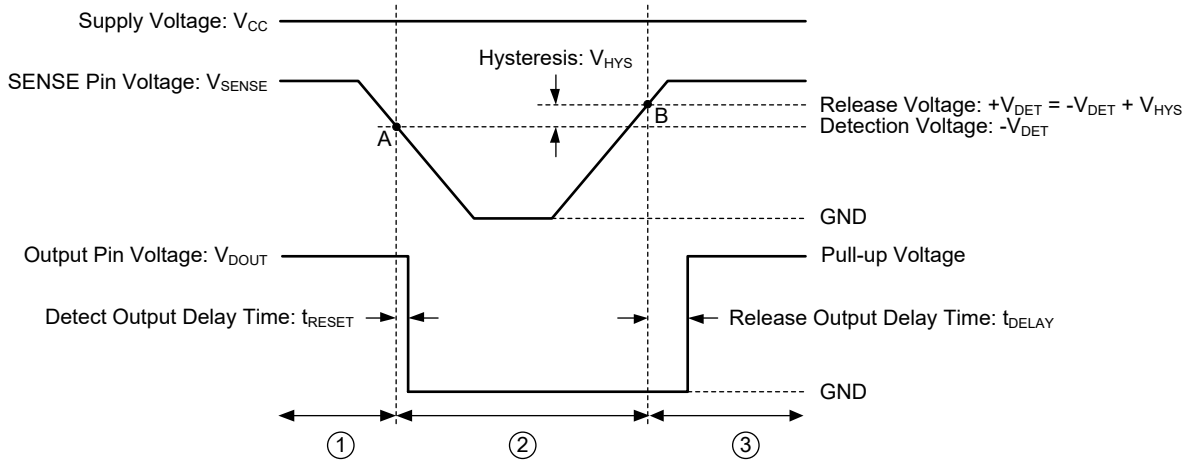


Figure 8. SGM880E-xQ Diagram

Table 2. Description of Figure 8

Operating Conditions	Comparator Input Condition	Comparator Output	Output Tr. (N-ch)
①	$V_{SENSE} > -V_{DET}$	L	Off
②	After $V_{SENSE} < -V_{DET}$ , $V_{SENSE} < +V_{DET}$	H	On
③	$V_{SENSE} > +V_{DET}$	L	Off

DETAILED DESCRIPTION (continued)

Operating Conditions

SGM880A-xQ

- ① DOUT voltage is equal to the voltage rail pulled up to.
- ② At A point,  $V_{CC} \leq -V_{DET}$  and DOUT turns low after detected output delay time ( $t_{RESET}$ ).
- ③ DOUT keeps floating if  $V_{CC}$  maintains a value lower than the minimum operating voltage ( $V_{CCL}$ ).
- ④ DOUT keeps low if  $V_{CC}$  does not increase above  $+V_{DET}$ .
- ⑤ At B point,  $V_{CC} > +V_{DET}$  and DOUT turns high after released output delay time ( $t_{DELAY}$ ). After that, DOUT is equal to the voltage rail pulled up to.

Note that the DOUT pin should be pulled up to an external voltage level, and hysteresis ( $V_{HYS}$ ) is the voltage difference between  $+V_{DET}$  and  $-V_{DET}$ .

SGM880E-xQ

- ①  $V_{CC} > V_{UVLO}$  and  $V_{SENSE} > +V_{DET}$ , DOUT is equal to the voltage rail pulled up to.
- ② At A point,  $V_{SENSE} \leq -V_{DET}$  and DOUT turns low after detected output delay time ( $t_{RESET}$ ).
- ③ At B point,  $V_{SENSE} > +V_{DET}$  and DOUT turns high after released output delay time ( $t_{DELAY}$ ). After that, DOUT is equal to the voltage rail pulled up to.

Note that the DOUT pin should be pulled up to an external voltage level, and hysteresis ( $V_{HYS}$ ) is the voltage difference between  $+V_{DET}$  and  $-V_{DET}$ .

Power Sequence

The SGM880A-xQ monitors the VCC pin voltage and the SGM880E-xQ monitors the SENSE pin voltage. Either the VCC pin or the SENSE pin is powered up first is allowed for SGM880xQ.

When the VCC pin voltage of SGM880A-xQ or the SENSE pin voltage of SGM880E-xQ is larger than the released threshold  $+V_{DET}$ , the DOUT pin goes high

soon. It should be noted that the SENSE pin voltage can be higher than the VCC pin voltage.

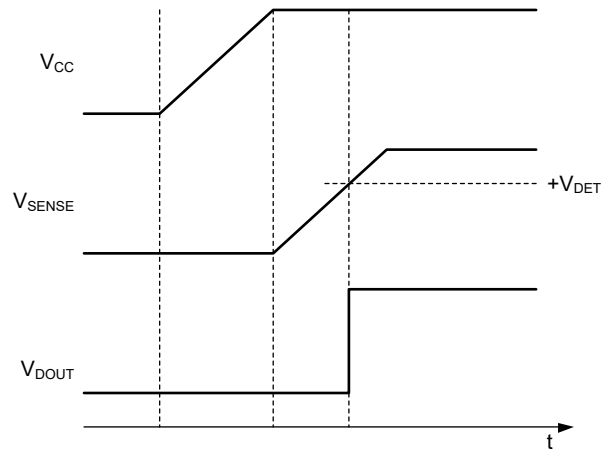


Figure 9. Power-On Timing Diagram

Glitch Detection by VCC, SENSE Pins

Figure 10 and Figure 11 show the relationship between pulse width and overdrive voltage for SGM880A-xQ and SGM880E-xQ, respectively. The overdrive voltage is defined as how deep the VCC/SENSE pin voltage is below  $-V_{DET}$  and the pulse width is defined as the minimum one that a pulse with wider width will result in an active-low DOUT (See Figure 12).

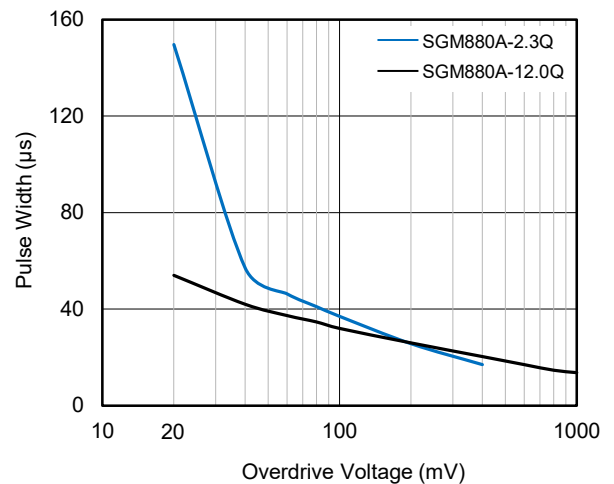


Figure 10. SGM880A-xQ Pulse Width vs. Overdrive Voltage

DETAILED DESCRIPTION (continued)

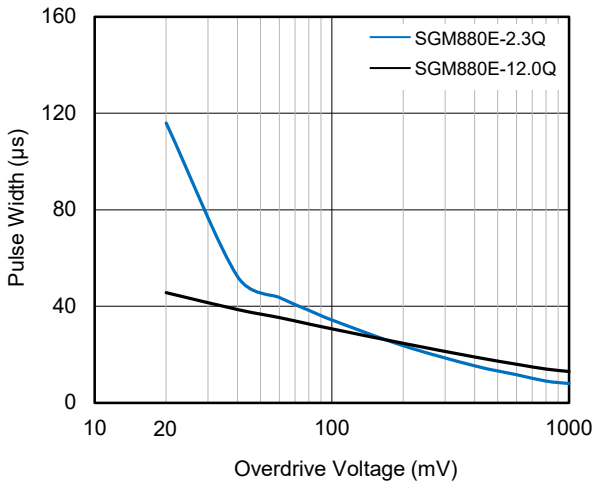


Figure 11. SGM880E-xQ Pulse Width vs. Overdrive Voltage

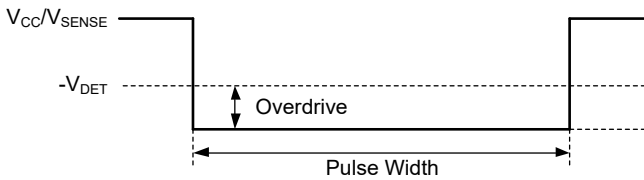


Figure 12. V<sub>CC</sub>/V<sub>SENSE</sub> Input Waveform

Timing Chart

When V<sub>CC</sub> rises above +V<sub>DET</sub>, the SGM880A-xQ begins to charge the capacitor placed at CD pin and the CD pin voltage (V<sub>CD</sub>) starts to increase. DOUT continues to be low until V<sub>CD</sub> reaches its threshold voltage (V<sub>TCD</sub>). After that, DOUT changes from the detected state to released state and the CD capacitor is discharged.

When V<sub>CC</sub> falls below -V<sub>DET</sub>, the SGM880A-xQ turns from released state to detected state in detect output delay time (t<sub>RESET</sub>) without any action on the CD pin.

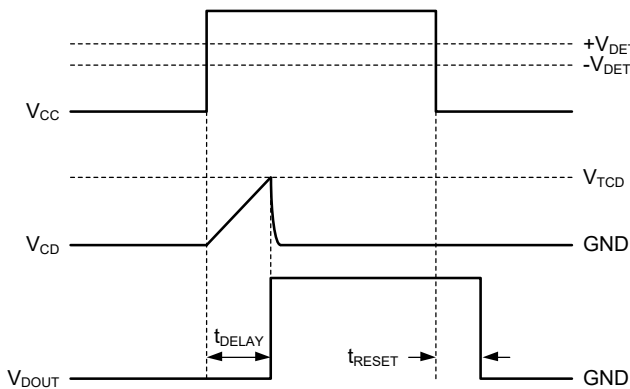


Figure 13. Delay Timing Diagram

Release Output Delay Time (t<sub>DELAY</sub>)

In Figure 14, a pulse shifted from 2.1V to -V<sub>DET</sub> + 2V is applied on the VCC pin, where the DOUT pin is pulled up to a voltage rail of 5V with a resistor of 100kΩ. The release output delay time (t<sub>DELAY</sub>) is defined as from the moment V<sub>CC</sub> changes from 2.1V to -V<sub>DET</sub> + 2V to the moment DOUT increases to 2.5V.

Hence, t<sub>DELAY</sub> can be calculated as Equation 1

$$t_{DELAY} (s) = 9.0 \times 10^6 \times C_D (F) \quad (1)$$

where: C<sub>D</sub> (F) is the CD pin capacitance.

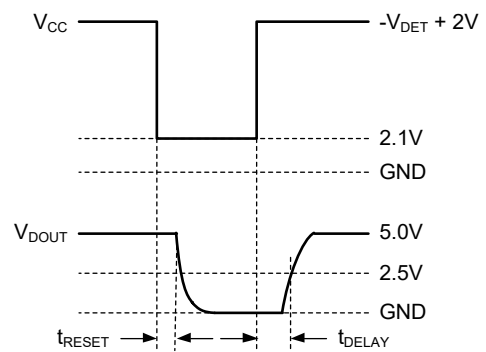


Figure 14. Release Output Delay Time (t<sub>DELAY</sub>)

Connecting Resistors to the Input Pin

Two common application diagrams with a series resistor at the input pin are illustrated in Figure 15 and Figure 16. If a resistor (R<sub>1</sub>) is placed between the supply source and the VCC pin of SGM880xQ, the actual VCC pin voltage should be carefully considered. The real difference between the supply source voltage and VCC pin voltage is equal to the product of the VCC pin consumption current (I<sub>CC</sub>) and resistance of R<sub>1</sub>. Note that I<sub>CC</sub> is much more higher when SGM880xQ changes from detected state to released state. As a result, the device may go back to detected state again once the VCC pin voltage drops below -V<sub>DET</sub> due to higher I<sub>CC</sub>.

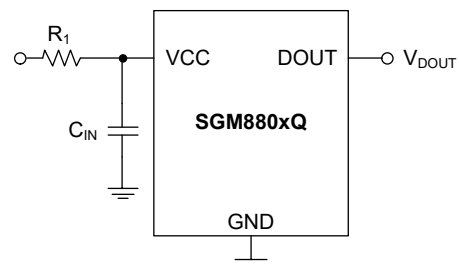


Figure 15. Connecting Series Resistor at VCC Pin

APPLICATION INFORMATION

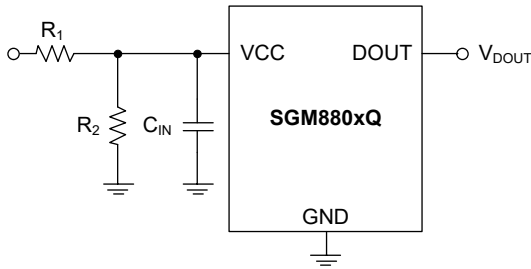


Figure 16. Connecting Resistor Divider at VCC Pin

If the VCC pin voltage slowly rises above the released threshold with large  $R_1$ ,  $V_{DOUT}$  may ceaselessly be released and detected because of the above process.

It is recommended using  $R_1 < 100k\Omega$  and  $C_{IN} > 0.1\mu F$ . Furthermore, the temperature effect and capacitance DC voltage characteristic should also be considered.

Using Different Input Voltages between SGM880xQ and CPU

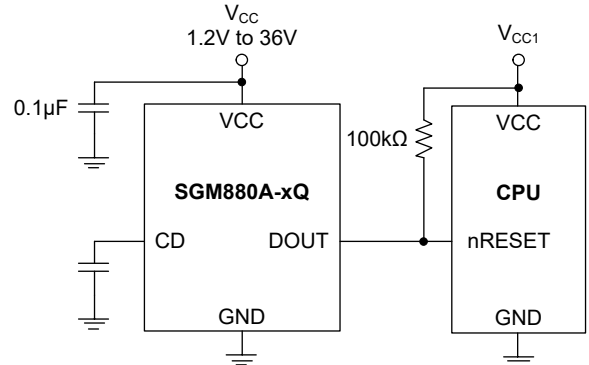


Figure 17. SGM880A-xQ Typical Application Circuit

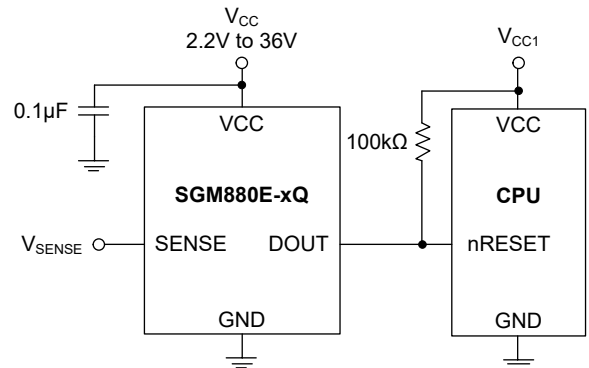


Figure 18. SGM880E-xQ Typical Application Circuit

REVISION HISTORY

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

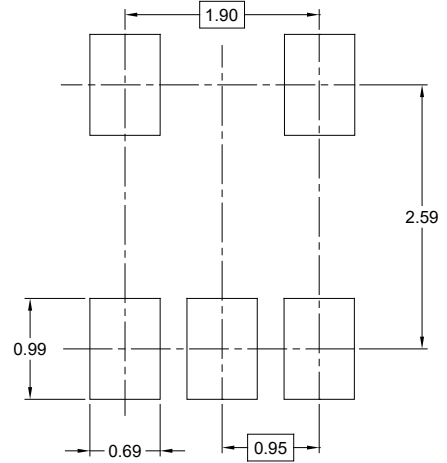
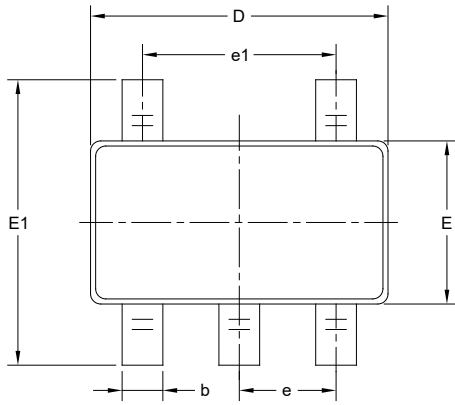
Changes from Original (OCTOBER 2024) to REV.A	Page
Changed from product preview to production data.....	All



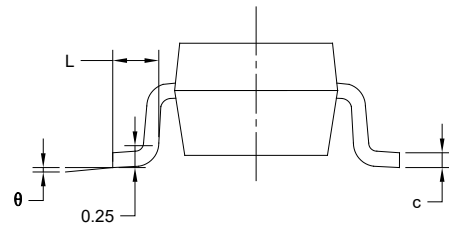
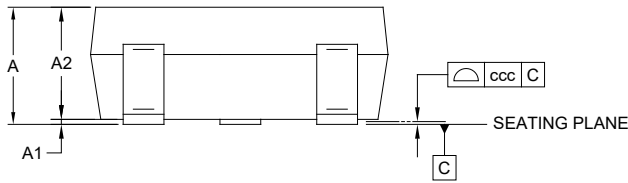
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	1.450
A1	0.000	-	0.150
A2	0.900	-	1.300
b	0.300	-	0.500
c	0.080	-	0.220
D	2.750	-	3.050
E	1.450	-	1.750
E1	2.600	-	3.000
e	0.950 BSC		
e1	1.900 BSC		
L	0.300	-	0.600
$\theta$	0°	-	8°
ccc	0.100		

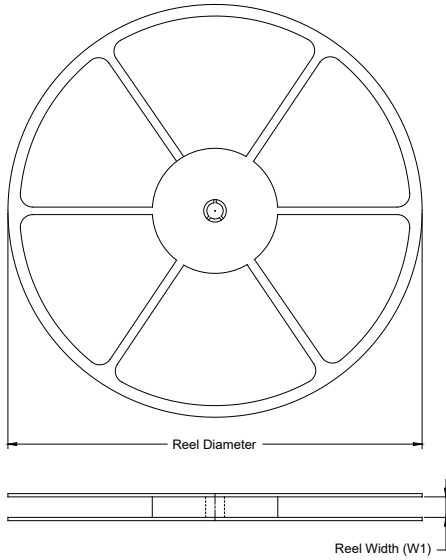
NOTES:

1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-178.

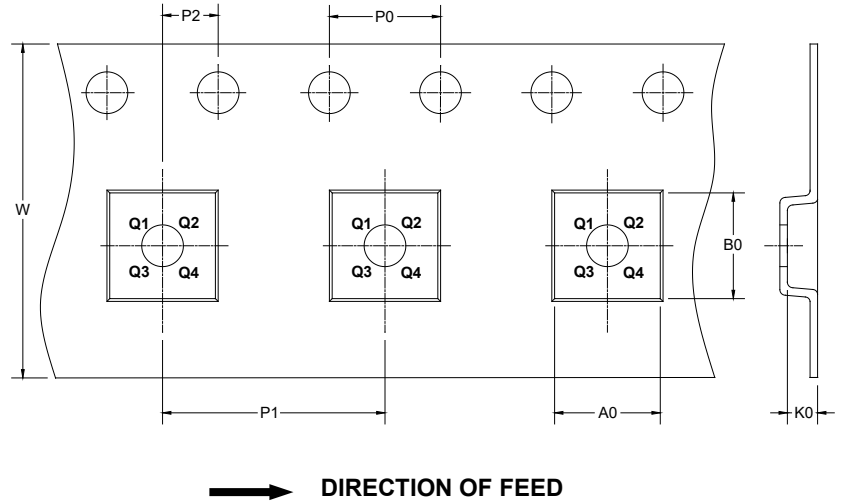
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

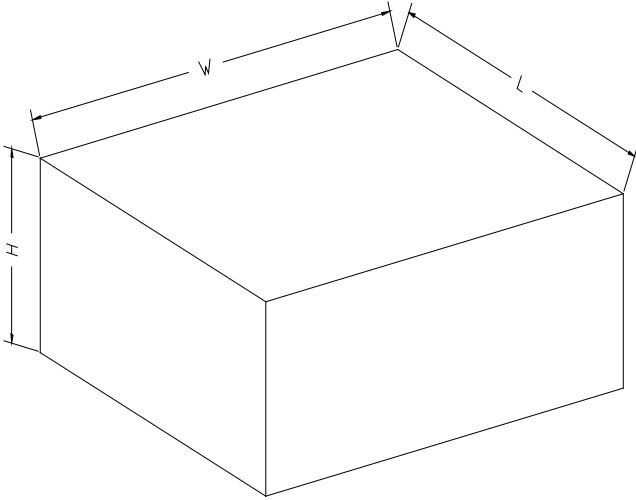
### KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3

DD0001

# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7" (Option)	368	227	224	8
7"	442	410	224	18

D00002