SGM890B/SGM891B
Voltage Detector with Separated Sense Pin and Delay Capacitor Pin

GENERAL DESCRIPTION

The SGM890B and SGM891B are low power consumption voltage detectors with high accuracy detection. These miniature devices offer tremendous flexibility with an adjustable threshold that is available from 0.8V to 5V with 0.1V increments. The SGM890B has an external capacitor-adjustable time delay. These devices are ideal for use in power-supply sequencing, reset sequencing, and power-switching applications.

The sense pin (VSEN) is separated from the power supply pin, so it allows the IC to monitor the other power supply.

The SGM890B and SGM891B can maintain the state of detection even when the monitored power supply voltage drops to 0V, due to the separated power supply.

Moreover, SGM890B's release delay time can be adjusted by the external capacitor which is connected to the C_D pin. Consequently delay time can be set to more than 1s when the delay capacitor (C_D) is 1μF. The VOUT pin is available in an N-channel open-drain output with active-low reset.

The SGM890B and SGM891B are available in a Green SOT-23-5 package. They are specified over the -40℃ to +125℃ operating temperature range.

FEATURES

- **High Accuracy Detection: ±1% (TYP)**
- **Low Power Consumption: 0.3μA (TYP) at V_{IN} = 1V**
- **Detection Voltage Range: 0.8V to 5V (0.1V Increments)**
- **Operating Voltage Range: 1V to 6V**
- **Detection Voltage Temperature Coefficient: ±40ppm/℃ (TYP)**
- **N-Channel Open-Drain Output**
- **Pin Function:**
  Power Supply Separation
  Adjustable Release Delay Time (SGM890B Only)
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green SOT-23-5 Package**

APPLICATIONS

Microprocessor Reset Circuitry
Charge Voltage Monitors
Memory Battery Back-Up Switch Circuits
Power Failure Detection Circuits

TYPICAL APPLICATION

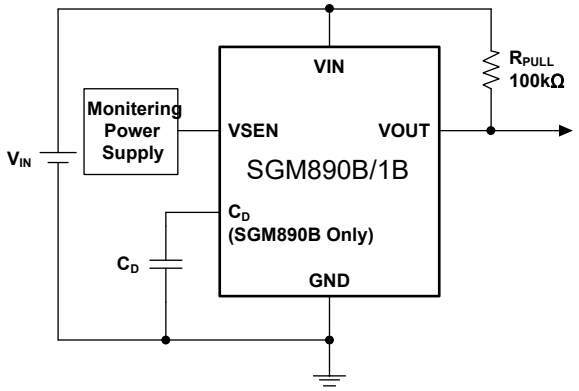


Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	DETECTION VOLTAGE (V)	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM890B-0.8	0.8	SOT-23-5	-40℃ to +125℃	SGM890B-0.8XN5G/TR	R60XX	Tape and Reel, 3000
SGM890B-0.9	0.9	SOT-23-5	-40℃ to +125℃	SGM890B-0.9XN5G/TR	SZZXX	Tape and Reel, 3000
SGM890B-1.0	1.0	SOT-23-5	-40℃ to +125℃	SGM890B-1.0XN5G/TR	SYTXX	Tape and Reel, 3000
SGM890B-1.1	1.1	SOT-23-5	-40℃ to +125℃	SGM890B-1.1XN5G/TR	G0GXX	Tape and Reel, 3000
SGM890B-1.2	1.2	SOT-23-5	-40℃ to +125℃	SGM890B-1.2XN5G/TR	G0HXX	Tape and Reel, 3000
SGM890B-1.3	1.3	SOT-23-5	-40℃ to +125℃	SGM890B-1.3XN5G/TR	G0IXX	Tape and Reel, 3000
SGM890B-1.4	1.4	SOT-23-5	-40℃ to +125℃	SGM890B-1.4XN5G/TR	CH4XX	Tape and Reel, 3000
SGM890B-1.5	1.5	SOT-23-5	-40℃ to +125℃	SGM890B-1.5XN5G/TR	G0JXX	Tape and Reel, 3000
SGM890B-1.6	1.6	SOT-23-5	-40℃ to +125℃	SGM890B-1.6XN5G/TR	R61XX	Tape and Reel, 3000
SGM890B-1.7	1.7	SOT-23-5	-40℃ to +125℃	SGM890B-1.7XN5G/TR	G0KXX	Tape and Reel, 3000
SGM890B-1.8	1.8	SOT-23-5	-40℃ to +125℃	SGM890B-1.8XN5G/TR	SYSXX	Tape and Reel, 3000
SGM890B-1.9	1.9	SOT-23-5	-40℃ to +125℃	SGM890B-1.9XN5G/TR	G0LXX	Tape and Reel, 3000
SGM890B-2.0	2.0	SOT-23-5	-40℃ to +125℃	SGM890B-2.0XN5G/TR	G0MXX	Tape and Reel, 3000
SGM890B-2.1	2.1	SOT-23-5	-40℃ to +125℃	SGM890B-2.1XN5G/TR	G0NXX	Tape and Reel, 3000
SGM890B-2.2	2.2	SOT-23-5	-40℃ to +125℃	SGM890B-2.2XN5G/TR	G0PXX	Tape and Reel, 3000
SGM890B-2.3	2.3	SOT-23-5	-40℃ to +125℃	SGM890B-2.3XN5G/TR	G0QXX	Tape and Reel, 3000
SGM890B-2.4	2.4	SOT-23-5	-40℃ to +125℃	SGM890B-2.4XN5G/TR	CI1XX	Tape and Reel, 3000
SGM890B-2.5	2.5	SOT-23-5	-40℃ to +125℃	SGM890B-2.5XN5G/TR	SYRXX	Tape and Reel, 3000
SGM890B-2.6	2.6	SOT-23-5	-40℃ to +125℃	SGM890B-2.6XN5G/TR	G0RXX	Tape and Reel, 3000
SGM890B-2.7	2.7	SOT-23-5	-40℃ to +125℃	SGM890B-2.7XN5G/TR	SYQXX	Tape and Reel, 3000
SGM890B-2.8	2.8	SOT-23-5	-40℃ to +125℃	SGM890B-2.8XN5G/TR	RCAXX	Tape and Reel, 3000
SGM890B-2.9	2.9	SOT-23-5	-40℃ to +125℃	SGM890B-2.9XN5G/TR	R62XX	Tape and Reel, 3000
SGM890B-3.0	3.0	SOT-23-5	-40℃ to +125℃	SGM890B-3.0XN5G/TR	R63XX	Tape and Reel, 3000
SGM890B-3.1	3.1	SOT-23-5	-40℃ to +125℃	SGM890B-3.1XN5G/TR	G0SXX	Tape and Reel, 3000
SGM890B-3.2	3.2	SOT-23-5	-40℃ to +125℃	SGM890B-3.2XN5G/TR	G0TXX	Tape and Reel, 3000
SGM890B-3.3	3.3	SOT-23-5	-40℃ to +125℃	SGM890B-3.3XN5G/TR	R64XX	Tape and Reel, 3000

PACKAGE/ORDERING INFORMATION (continued)

MODEL	DETECTION VOLTAGE (V)	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM890B-3.4	3.4	SOT-23-5	-40℃ to +125℃	SGM890B-3.4XN5G/TR	G0UXX	Tape and Reel, 3000
SGM890B-3.5	3.5	SOT-23-5	-40℃ to +125℃	SGM890B-3.5XN5G/TR	G0VXX	Tape and Reel, 3000
SGM890B-3.6	3.6	SOT-23-5	-40℃ to +125℃	SGM890B-3.6XN5G/TR	G0WXX	Tape and Reel, 3000
SGM890B-3.7	3.7	SOT-23-5	-40℃ to +125℃	SGM890B-3.7XN5G/TR	G0XXX	Tape and Reel, 3000
SGM890B-3.8	3.8	SOT-23-5	-40℃ to +125℃	SGM890B-3.8XN5G/TR	G0YXX	Tape and Reel, 3000
SGM890B-3.9	3.9	SOT-23-5	-40℃ to +125℃	SGM890B-3.9XN5G/TR	SYPXX	Tape and Reel, 3000
SGM890B-4.0	4.0	SOT-23-5	-40℃ to +125℃	SGM890B-4.0XN5G/TR	G0ZXX	Tape and Reel, 3000
SGM890B-4.1	4.1	SOT-23-5	-40℃ to +125℃	SGM890B-4.1XN5G/TR	G1GXX	Tape and Reel, 3000
SGM890B-4.2	4.2	SOT-23-5	-40℃ to +125℃	SGM890B-4.2XN5G/TR	G1HXX	Tape and Reel, 3000
SGM890B-4.3	4.3	SOT-23-5	-40℃ to +125℃	SGM890B-4.3XN5G/TR	G1IXX	Tape and Reel, 3000
SGM890B-4.4	4.4	SOT-23-5	-40℃ to +125℃	SGM890B-4.4XN5G/TR	G1JXX	Tape and Reel, 3000
SGM890B-4.5	4.5	SOT-23-5	-40℃ to +125℃	SGM890B-4.5XN5G/TR	G1KXX	Tape and Reel, 3000
SGM890B-4.6	4.6	SOT-23-5	-40℃ to +125℃	SGM890B-4.6XN5G/TR	SYNXX	Tape and Reel, 3000
SGM890B-4.7	4.7	SOT-23-5	-40℃ to +125℃	SGM890B-4.7XN5G/TR	G1LXX	Tape and Reel, 3000
SGM890B-4.8	4.8	SOT-23-5	-40℃ to +125℃	SGM890B-4.8XN5G/TR	G1MXX	Tape and Reel, 3000
SGM890B-4.9	4.9	SOT-23-5	-40℃ to +125℃	SGM890B-4.9XN5G/TR	G1NXX	Tape and Reel, 3000
SGM890B-5.0	5.0	SOT-23-5	-40℃ to +125℃	SGM890B-5.0XN5G/TR	R65XX	Tape and Reel, 3000
SGM891B-0.8	0.8	SOT-23-5	-40℃ to +125℃	SGM891B-0.8XN5G/TR	G1PXX	Tape and Reel, 3000
SGM891B-0.9	0.9	SOT-23-5	-40℃ to +125℃	SGM891B-0.9XN5G/TR	G1QXX	Tape and Reel, 3000
SGM891B-1.0	1.0	SOT-23-5	-40℃ to +125℃	SGM891B-1.0XN5G/TR	SZJXX	Tape and Reel, 3000
SGM891B-1.1	1.1	SOT-23-5	-40℃ to +125℃	SGM891B-1.1XN5G/TR	G1SXX	Tape and Reel, 3000
SGM891B-1.2	1.2	SOT-23-5	-40℃ to +125℃	SGM891B-1.2XN5G/TR	G1TXX	Tape and Reel, 3000
SGM891B-1.3	1.3	SOT-23-5	-40℃ to +125℃	SGM891B-1.3XN5G/TR	G1UXX	Tape and Reel, 3000
SGM891B-1.4	1.4	SOT-23-5	-40℃ to +125℃	SGM891B-1.4XN5G/TR	CH5XX	Tape and Reel, 3000
SGM891B-1.5	1.5	SOT-23-5	-40℃ to +125℃	SGM891B-1.5XN5G/TR	G1VXX	Tape and Reel, 3000
SGM891B-1.6	1.6	SOT-23-5	-40℃ to +125℃	SGM891B-1.6XN5G/TR	SZIXX	Tape and Reel, 3000

PACKAGE/ORDERING INFORMATION (continued)

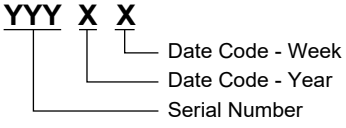
MODEL	DETECTION VOLTAGE (V)	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM891B-1.7	1.7	SOT-23-5	-40℃ to +125℃	SGM891B-1.7XN5G/TR	G1WXX	Tape and Reel, 3000
SGM891B-1.8	1.8	SOT-23-5	-40℃ to +125℃	SGM891B-1.8XN5G/TR	SZHXX	Tape and Reel, 3000
SGM891B-1.9	1.9	SOT-23-5	-40℃ to +125℃	SGM891B-1.9XN5G/TR	G1XXX	Tape and Reel, 3000
SGM891B-2.0	2.0	SOT-23-5	-40℃ to +125℃	SGM891B-2.0XN5G/TR	G1YXX	Tape and Reel, 3000
SGM891B-2.1	2.1	SOT-23-5	-40℃ to +125℃	SGM891B-2.1XN5G/TR	G1ZXX	Tape and Reel, 3000
SGM891B-2.2	2.2	SOT-23-5	-40℃ to +125℃	SGM891B-2.2XN5G/TR	G2GXX	Tape and Reel, 3000
SGM891B-2.3	2.3	SOT-23-5	-40℃ to +125℃	SGM891B-2.3XN5G/TR	G2HXX	Tape and Reel, 3000
SGM891B-2.4	2.4	SOT-23-5	-40℃ to +125℃	SGM891B-2.4XN5G/TR	G2IXX	Tape and Reel, 3000
SGM891B-2.5	2.5	SOT-23-5	-40℃ to +125℃	SGM891B-2.5XN5G/TR	SZGXX	Tape and Reel, 3000
SGM891B-2.6	2.6	SOT-23-5	-40℃ to +125℃	SGM891B-2.6XN5G/TR	G2JXX	Tape and Reel, 3000
SGM891B-2.7	2.7	SOT-23-5	-40℃ to +125℃	SGM891B-2.7XN5G/TR	SYZXX	Tape and Reel, 3000
SGM891B-2.8	2.8	SOT-23-5	-40℃ to +125℃	SGM891B-2.8XN5G/TR	G2KXX	Tape and Reel, 3000
SGM891B-2.9	2.9	SOT-23-5	-40℃ to +125℃	SGM891B-2.9XN5G/TR	G2LXX	Tape and Reel, 3000
SGM891B-3.0	3.0	SOT-23-5	-40℃ to +125℃	SGM891B-3.0XN5G/TR	SYYXX	Tape and Reel, 3000
SGM891B-3.1	3.1	SOT-23-5	-40℃ to +125℃	SGM891B-3.1XN5G/TR	G2MXX	Tape and Reel, 3000
SGM891B-3.2	3.2	SOT-23-5	-40℃ to +125℃	SGM891B-3.2XN5G/TR	G2NXX	Tape and Reel, 3000
SGM891B-3.3	3.3	SOT-23-5	-40℃ to +125℃	SGM891B-3.3XN5G/TR	SYXXX	Tape and Reel, 3000
SGM891B-3.4	3.4	SOT-23-5	-40℃ to +125℃	SGM891B-3.4XN5G/TR	G2PXX	Tape and Reel, 3000
SGM891B-3.5	3.5	SOT-23-5	-40℃ to +125℃	SGM891B-3.5XN5G/TR	G2QXX	Tape and Reel, 3000
SGM891B-3.6	3.6	SOT-23-5	-40℃ to +125℃	SGM891B-3.6XN5G/TR	G2RXX	Tape and Reel, 3000
SGM891B-3.7	3.7	SOT-23-5	-40℃ to +125℃	SGM891B-3.7XN5G/TR	G2SXX	Tape and Reel, 3000
SGM891B-3.8	3.8	SOT-23-5	-40℃ to +125℃	SGM891B-3.8XN5G/TR	G2TXX	Tape and Reel, 3000
SGM891B-3.9	3.9	SOT-23-5	-40℃ to +125℃	SGM891B-3.9XN5G/TR	SYWXX	Tape and Reel, 3000
SGM891B-4.0	4.0	SOT-23-5	-40℃ to +125℃	SGM891B-4.0XN5G/TR	G2UXX	Tape and Reel, 3000
SGM891B-4.1	4.1	SOT-23-5	-40℃ to +125℃	SGM891B-4.1XN5G/TR	G2VXX	Tape and Reel, 3000
SGM891B-4.2	4.2	SOT-23-5	-40℃ to +125℃	SGM891B-4.2XN5G/TR	G2WXX	Tape and Reel, 3000

PACKAGE/ORDERING INFORMATION (continued)

MODEL	DETECTION VOLTAGE (V)	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM891B-4.3	4.3	SOT-23-5	-40℃ to +125℃	SGM891B-4.3XN5G/TR	G2XXX	Tape and Reel, 3000
SGM891B-4.4	4.4	SOT-23-5	-40℃ to +125℃	SGM891B-4.4XN5G/TR	G2YXX	Tape and Reel, 3000
SGM891B-4.5	4.5	SOT-23-5	-40℃ to +125℃	SGM891B-4.5XN5G/TR	G2ZXX	Tape and Reel, 3000
SGM891B-4.6	4.6	SOT-23-5	-40℃ to +125℃	SGM891B-4.6XN5G/TR	SYVXX	Tape and Reel, 3000
SGM891B-4.7	4.7	SOT-23-5	-40℃ to +125℃	SGM891B-4.7XN5G/TR	G3GXX	Tape and Reel, 3000
SGM891B-4.8	4.8	SOT-23-5	-40℃ to +125℃	SGM891B-4.8XN5G/TR	G3HXX	Tape and Reel, 3000
SGM891B-4.9	4.9	SOT-23-5	-40℃ to +125℃	SGM891B-4.9XN5G/TR	G3IXX	Tape and Reel, 3000
SGM891B-5.0	5.0	SOT-23-5	-40℃ to +125℃	SGM891B-5.0XN5G/TR	SYUXX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date Code.



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.

ABSOLUTE MAXIMUM RATINGS

Input Voltage Range, V_{IN} ..... GND - 0.3V to 7V
Output Current, I_{OUT} 30mA
Output Voltage Range, V_{OUT} ..... GND - 0.3V to 7V
VSEN Pin Voltage Range, V_{SEN} ..... GND - 0.3V to 7V
C_D Pin Voltage Range, V_{CD} ..... GND - 0.3V to V_{IN} + 0.3V
C_D Pin Current, I_{CD} 5mA
Package Thermal Resistance
SOT-23-5, θ_{JA} ..... 246℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 4000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Operating Junction Temperature Range ..... -40℃ to +125℃
Operating Ambient Temperature Range ..... -40℃ to +125℃

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.

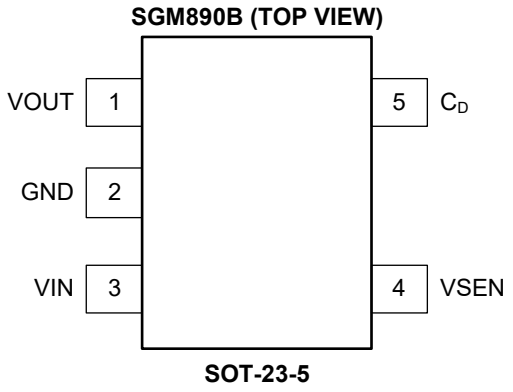
ESD SENSITIVITY CAUTION

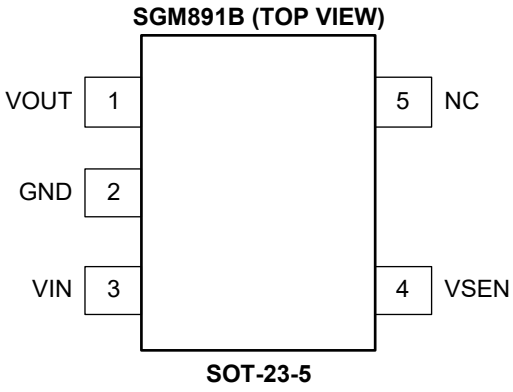
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the 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
	SGM890B	SGM891B	
1	VOUT	VOUT	Output (Detect 'L') Pin.
2	GND	GND	Ground.
3	VIN	VIN	Input Pin.
4	VSEN	VSEN	Sense Pin.
5	C_D	-	Delay Capacitor Pin (SGM890B only).
	-	NC	No connection.

ELECTRICAL CHARACTERISTICS

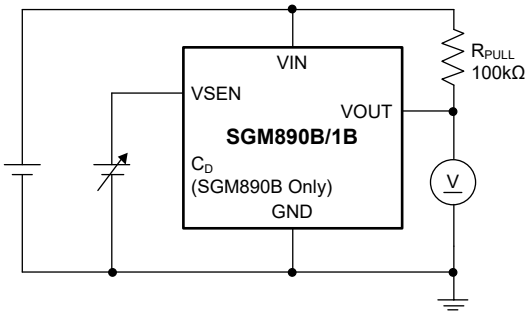
(T_J = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Operating Voltage	V_{IN}	V_{DET} = 0.8V to 5V, T_J = -40℃ to +125℃		1		6	V
Detection Voltage	V_{DET}	V_{IN} = 1V to 6V, Test Circuit 1	T_J = +25℃	E-1			V
			T_J = -40℃ to +125℃	E-2			
Hysteresis Voltage	V_{HYS}	V_{IN} = 1V to 6V, Test Circuit 1	SGM890B	E-3			V
			SGM891B	E-4			
Detection Voltage Line Regulation	$\Delta V_{DET}/(\Delta V_{IN} \times V_{DET})$	V_{IN} = 1V to 6V, Test Circuit 1			±0.03		%/V
Detection Voltage Temperature Coefficient	$\Delta V_{DET}/(\Delta T_J \times V_{DET})$	T_J = -40℃ to +125℃, Test Circuit 1			±40	±150	ppm/℃
Supply Current	I_{CC}	Test Circuit 2	V_{IN} = 1V		0.3	0.6	μA
			V_{IN} = 3V		0.5	1.0	
			V_{IN} = 6V		0.7	1.3	
Output Current	I_{OUT}	V_{SEN} = 0V, V_{DS_NCH} = 0.5V, Test Circuit 3	V_{IN} = 1V	0.2	0.8		mA
			V_{IN} = 2V	9.0	12.0		
			V_{IN} = 3V	13.0	17.5		
			V_{IN} = 4V	15.0	20.5		
			V_{IN} = 5V	16.0	22.0		
			V_{IN} = 6V	16.5	23.0		
Leakage Current	I_{LEAK}	V_{IN} = V_{SEN} = V_{OUT} = 6V, C_D: Open, Test Circuit 3			0.02	1.50	μA
Sense Resistance	R_{SEN}	V_{SEN} = 5V, V_{IN} = 0V, Test Circuit 4		23.0	26.5	30.0	MΩ
Delay Resistance	R_{DELAY}	V_{SEN} = 6V, V_{IN} = 5V, V_{CD} = 0V, Test Circuit 5		1.7	2.2	2.6	MΩ
SGM890B Only							
Delay Capacitance Pin Sink Current	I_{CD}	V_{CD} = 0.5V, V_{IN} = 1V, Test Circuit 5		110	230	350	μA
Delay Capacitance Pin Threshold Voltage	V_{TCD}	V_{SEN} = 6V, Test Circuit 6	V_{IN} = 1V	0.4	0.5	0.7	V
			V_{IN} = 6V	2.9	3.0	3.2	
Detection Delay Time	t_{DET0}	V_{IN} = 6V, V_{SEN} = 6V to 0V, C_D: Open, Test Circuit 7			30	70	μs
Release Delay Time	t_{DR0}	V_{IN} = 6V, V_{SEN} = 0V to 6V, C_D: Open, Test Circuit 7			85	180	μs

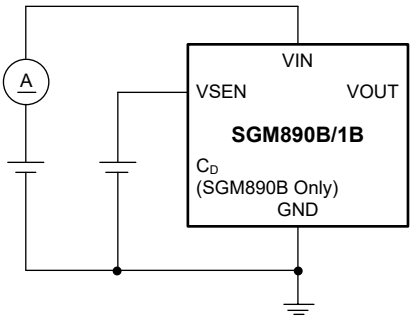
VOLTAGE CHART

Symbol	E-1		E-2		E-3			E-4		
Conditions	T_J = +25℃		T_J = -40℃ to +125℃		T_J = +25℃			T_J = +25℃		
	SGM890B/SGM891B		SGM890B/SGM891B		SGM890B Only			SGM891B Only		
Nominal Voltage (V)	V_{DET} (V), 1% Accuracy		V_{DET} (V), 2% Accuracy		V_{HYS} (V)			V_{HYS} (V)		
	MIN	MAX	MIN	MAX	MIN	TYP	MAX	MIN	TYP	MAX
0.8	0.792	0.808	0.784	0.816	0.024	0.040	0.056		0.004	0.007
0.9	0.891	0.909	0.882	0.918	0.027	0.045	0.063		0.004	0.008
1.0	0.990	1.010	0.980	1.020	0.030	0.050	0.070		0.005	0.009
1.1	1.089	1.111	1.078	1.122	0.033	0.055	0.077		0.006	0.010
1.2	1.188	1.212	1.176	1.224	0.036	0.060	0.084		0.006	0.011
1.3	1.287	1.313	1.274	1.326	0.039	0.065	0.091		0.006	0.012
1.4	1.386	1.414	1.372	1.428	0.042	0.070	0.098		0.007	0.013
1.5	1.485	1.515	1.470	1.530	0.045	0.075	0.105		0.008	0.014
1.6	1.584	1.616	1.568	1.632	0.048	0.080	0.112		0.008	0.015
1.7	1.683	1.717	1.666	1.734	0.051	0.085	0.119		0.008	0.016
1.8	1.782	1.818	1.764	1.836	0.054	0.090	0.126		0.009	0.016
1.9	1.881	1.919	1.862	1.938	0.057	0.095	0.133		0.010	0.017
2.0	1.980	2.020	1.960	2.040	0.060	0.100	0.140		0.010	0.018
2.1	2.079	2.121	2.058	2.142	0.064	0.105	0.146		0.011	0.019
2.2	2.178	2.222	2.156	2.244	0.067	0.110	0.153		0.011	0.020
2.3	2.277	2.323	2.254	2.346	0.070	0.115	0.160		0.011	0.021
2.4	2.376	2.424	2.352	2.448	0.073	0.120	0.167		0.012	0.022
2.5	2.475	2.525	2.450	2.550	0.076	0.125	0.174		0.125	0.034
2.6	2.574	2.626	2.548	2.652	0.079	0.130	0.181		0.013	0.024
2.7	2.673	2.727	2.646	2.754	0.082	0.135	0.188		0.014	0.025
2.8	2.772	2.828	2.744	2.856	0.085	0.140	0.195		0.014	0.026
2.9	2.871	2.929	2.842	2.958	0.088	0.145	0.202	0	0.015	0.027
3.0	2.970	3.030	2.940	3.060	0.091	0.150	0.209		0.015	0.027
3.1	3.069	3.131	3.038	3.162	0.094	0.155	0.216		0.015	0.028
3.2	3.168	3.232	3.136	3.264	0.097	0.160	0.223		0.016	0.029
3.3	3.267	3.333	3.234	3.366	0.100	0.165	0.230		0.017	0.030
3.4	3.366	3.434	3.332	3.468	0.103	0.170	0.237		0.017	0.031
3.5	3.465	3.535	3.430	3.570	0.106	0.175	0.244		0.018	0.032
3.6	3.564	3.636	3.528	3.672	0.109	0.180	0.251		0.018	0.033
3.7	3.663	3.737	3.626	3.774	0.112	0.185	0.258		0.019	0.034
3.8	3.762	3.838	3.724	3.876	0.115	0.190	0.265		0.019	0.035
3.9	3.861	3.939	3.822	3.978	0.118	0.195	0.272		0.019	0.036
4.0	3.960	4.040	3.920	4.080	0.121	0.200	0.279		0.020	0.037
4.1	4.059	4.141	4.018	4.182	0.124	0.205	0.286		0.021	0.037
4.2	4.158	4.242	4.116	4.284	0.127	0.210	0.293		0.021	0.038
4.3	4.257	4.343	4.214	4.386	0.130	0.215	0.300		0.021	0.039
4.4	4.356	4.444	4.312	4.488	0.133	0.220	0.307		0.022	0.040
4.5	4.455	4.545	4.410	4.590	0.136	0.225	0.314		0.023	0.041
4.6	4.554	4.646	4.508	4.692	0.139	0.230	0.321		0.023	0.042
4.7	4.653	4.747	4.606	4.794	0.142	0.235	0.328		0.024	0.043
4.8	4.752	4.848	4.704	4.896	0.145	0.240	0.335		0.024	0.044
4.9	4.851	4.949	4.802	4.998	0.148	0.245	0.342		0.024	0.045
5.0	4.950	5.050	4.900	5.100	0.151	0.250	0.349		0.025	0.046

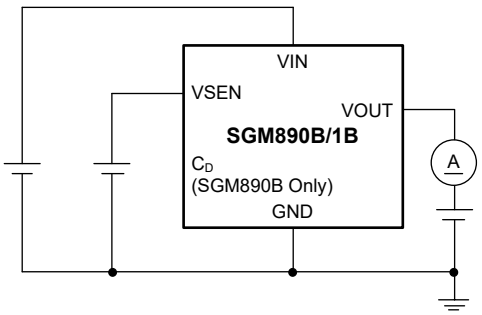
TEST CIRCUITS



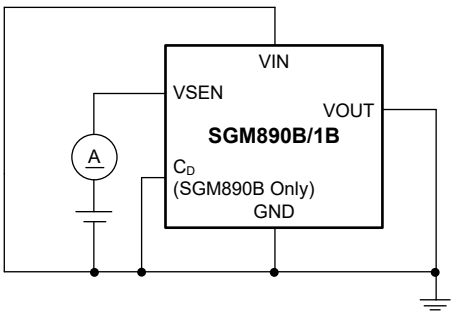
Test Circuit 1



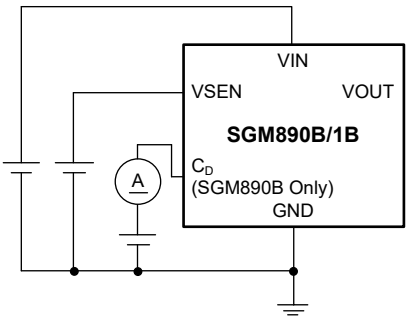
Test Circuit 2



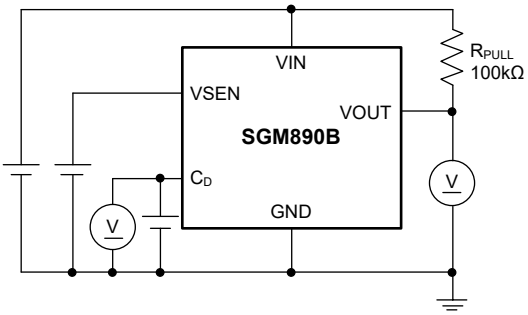
Test Circuit 3



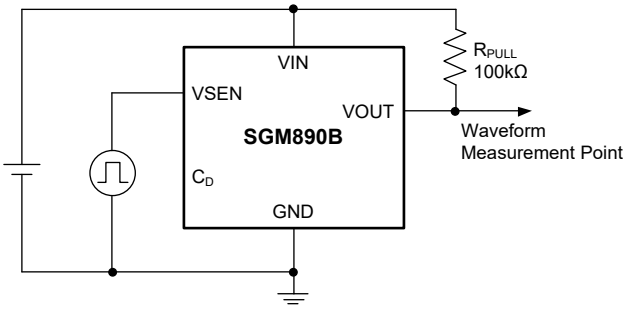
Test Circuit 4



Test Circuit 5



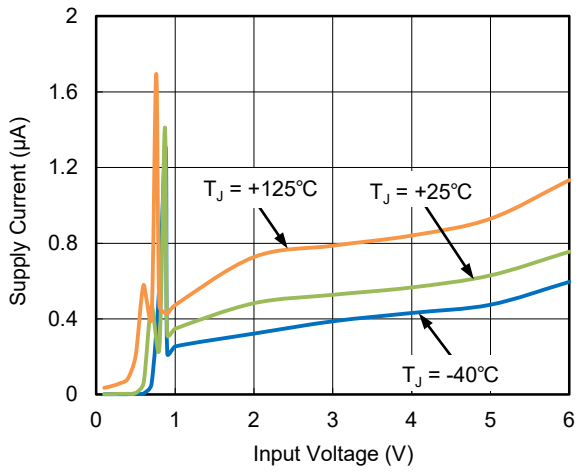
Test Circuit 6



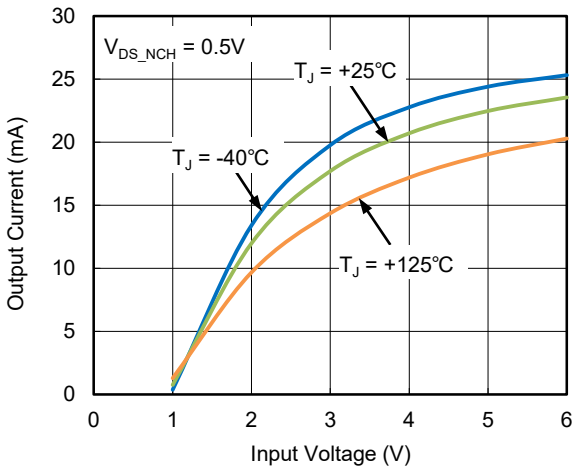
Test Circuit 7

TYPICAL PERFORMANCE CHARACTERISTICS

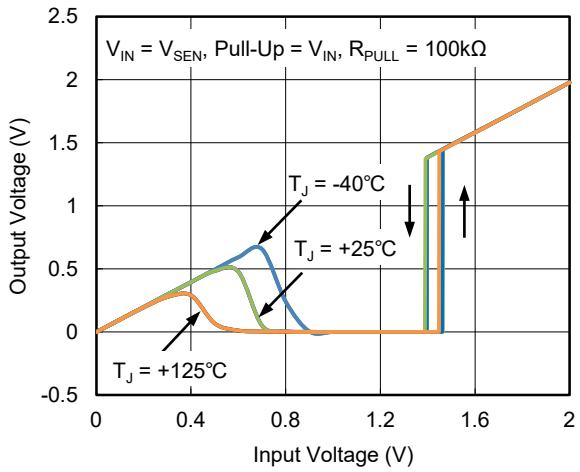
Supply Current vs. Input Voltage



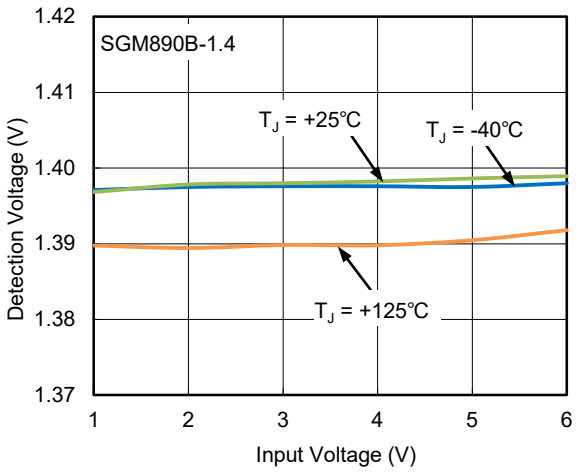
Output Current vs. Input Voltage



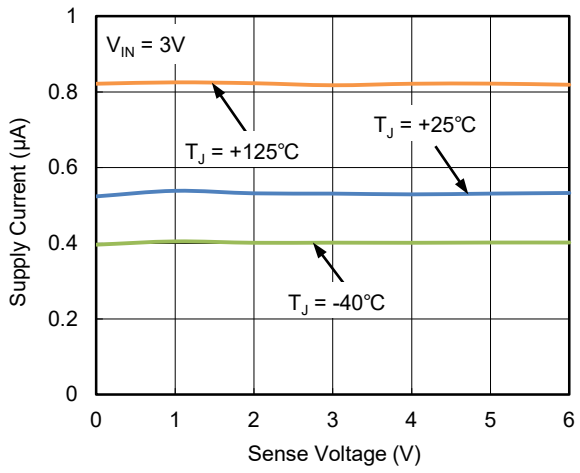
Output Voltage vs. Input Voltage



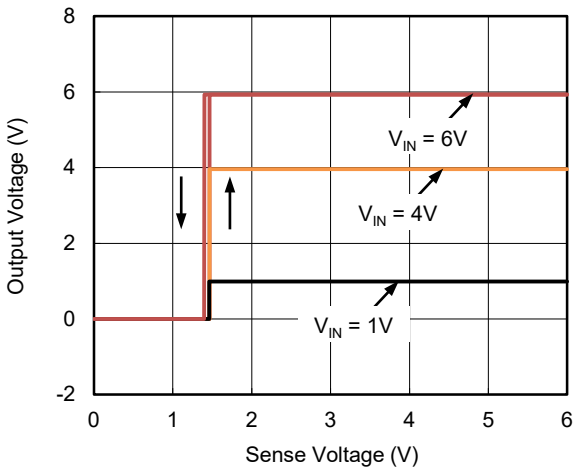
Detection Voltage vs. Input Voltage



Supply Current vs. Sense Voltage

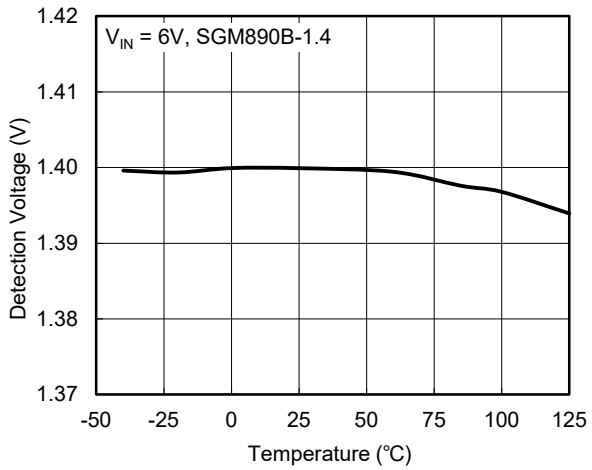


Output Voltage vs. Sense Voltage

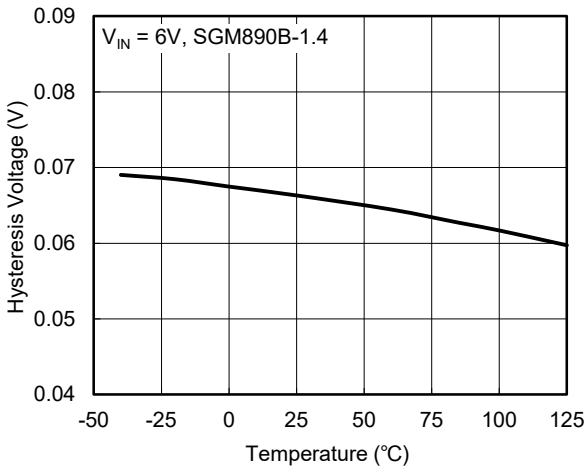


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

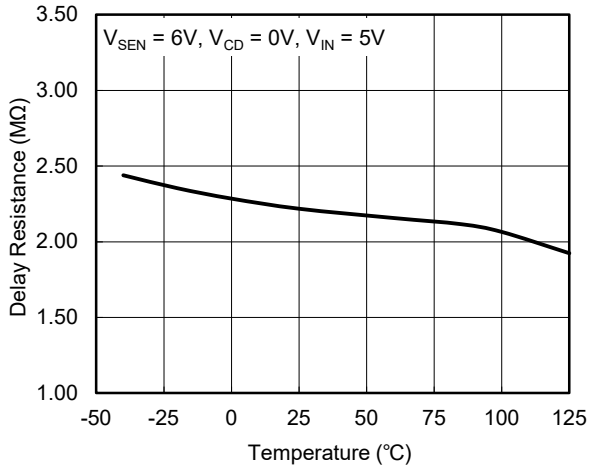
Detection Voltage vs. Temperature



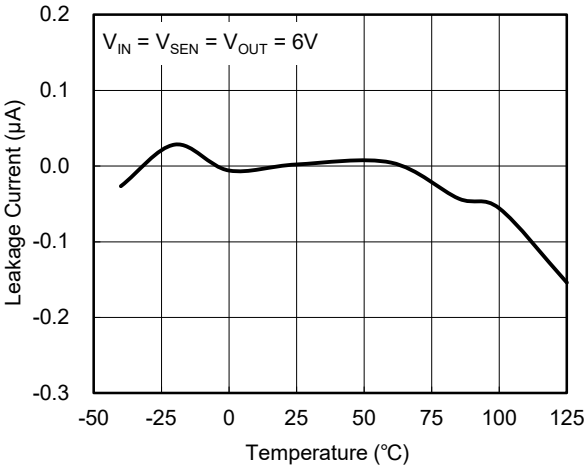
Hysteresis Voltage vs. Temperature



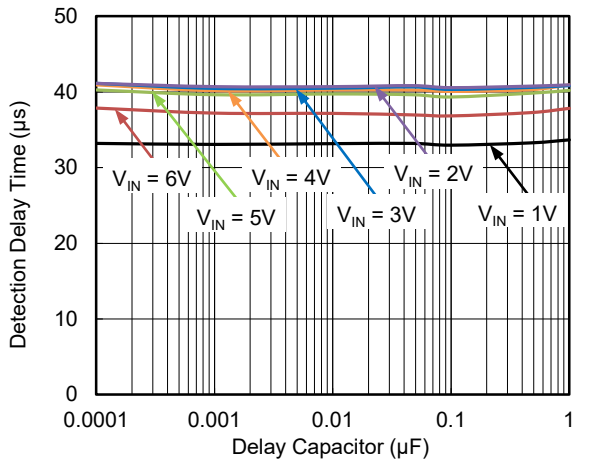
Delay Resistance vs. Temperature



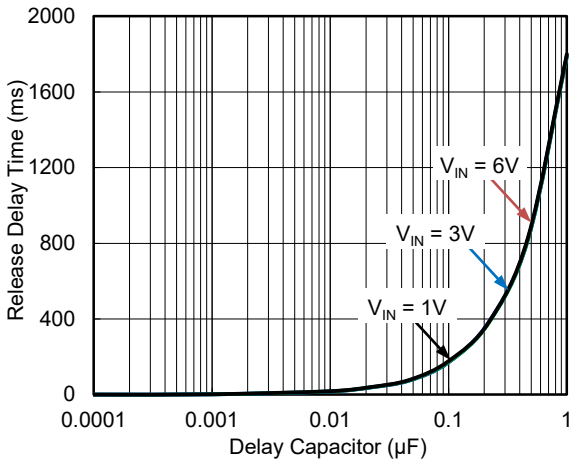
Leakage Current vs. Temperature



Detection Delay Time vs. Delay Capacitance



Release Delay Time vs. Delay Capacitance



FUNCTIONAL BLOCK DIAGRAMS

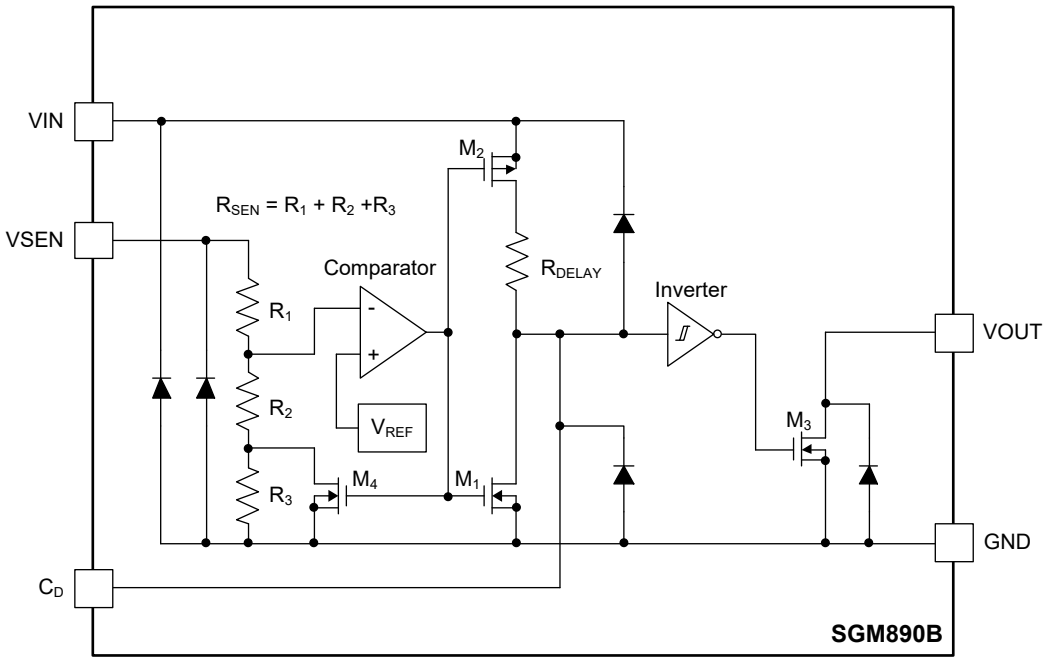


Figure 2. SGM890B Block Diagram

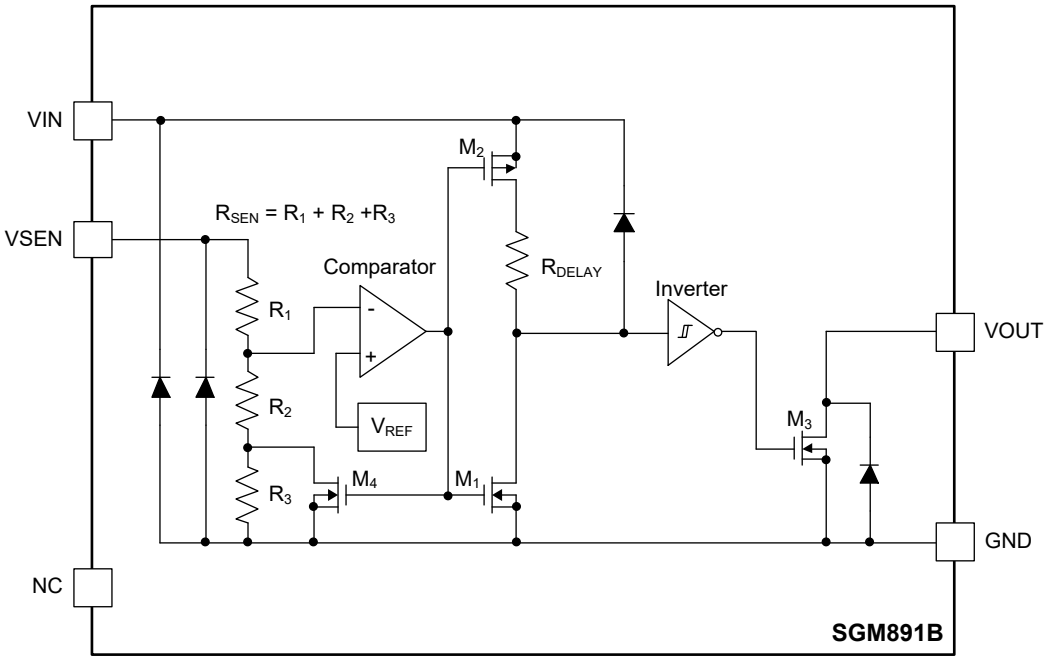


Figure 3. SGM891B Block Diagram

NOTE: Diodes inside the circuits are ESD protection diodes and parasitic diodes.

DETAILED DESCRIPTION

A typical circuit example is shown in Figure 4, and the timing chart of Figure 4 is shown in Figure 5.

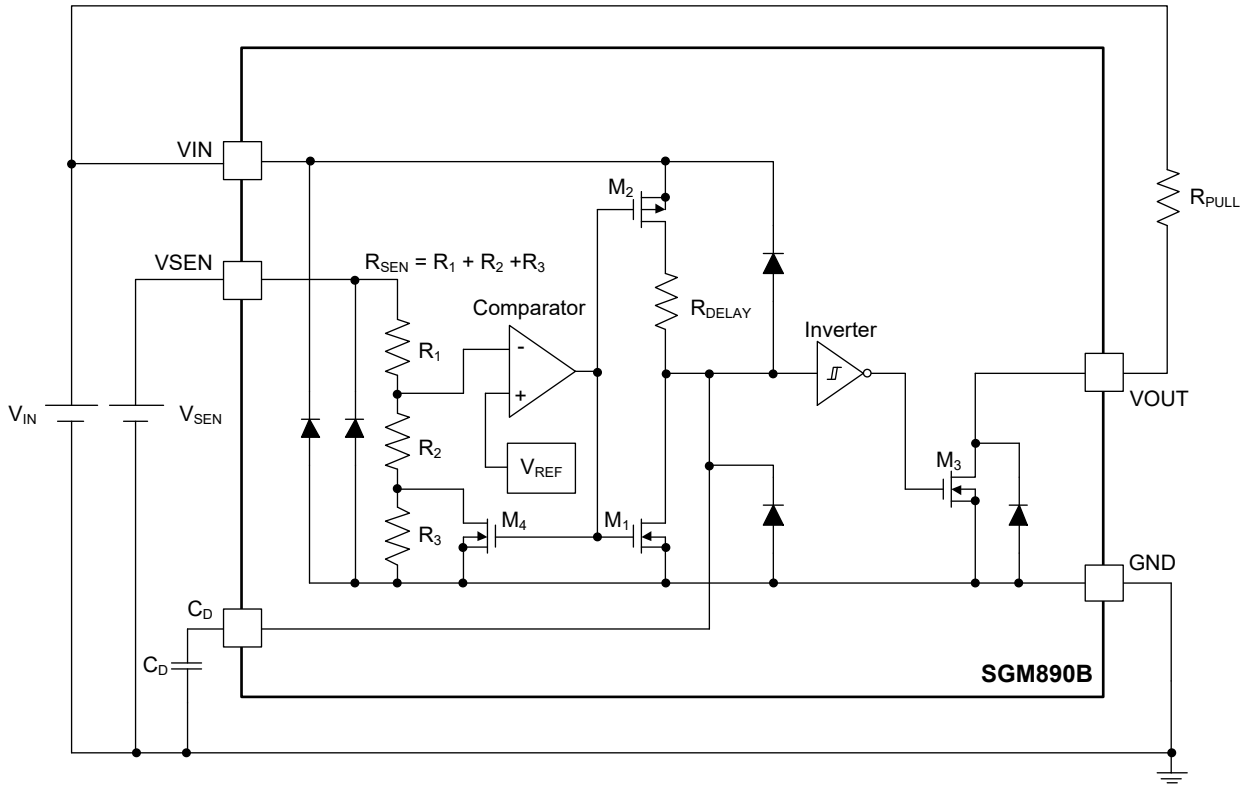


Figure 4. Typical Application Circuit Example of SGM890B

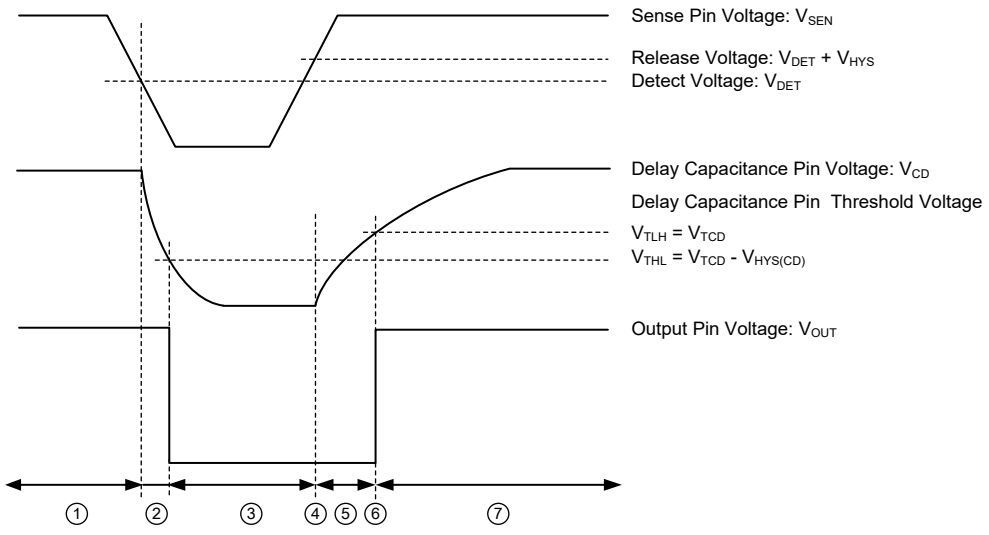


Figure 5. The Timing Chart of Figure 4

DETAILED DESCRIPTION (continued)

The V_{OUT} transition, the delay capacitance (C_D) charge and discharge are determined by the status of power supply and VSEN. Figure 5 shows the timing chart. It may go through seven processes, and below words are shown as the description of the sequence.

① Default Status before V_{IN} Falling

In original state, the delay capacitance is charged full and reaches the power supply input voltage (V_{IN}: 1V MIN, 6V MAX).

The sense pin is applied sufficiently high voltage (6V MAX). While the sense pin voltage (V_{SEN}) starts dropping to reach the detection voltage (V_{DET}) (V_{SEN} > V_{DET}), the output voltage (V_{OUT}) keeps the high level (= V_{IN}).

NOTE: If a pull-up resistor of the SGM89XB series is connected to added power supply different from the input voltage pin, the voltage where the pull-up resistor is connected will be selected as high level.

② Triggered V_{DET} while V_{SEN} Falling

When the sense pin voltage goes down and becomes equal to the detection voltage (V_{SEN} = V_{DET}), an N-channel transistor (M_1) for the delay capacitance discharge is turned on, and starts to discharge the delay capacitance.

An inverter operates as a comparator (rising logic threshold: V_{TLH} = V_{TCD}, falling logic threshold: V_{THL} = V_{TCD} - $V_{HYS(CD)}$). When the C_D pin voltage reaches the C_D pin falling logic threshold voltage (= V_{TCD} - $V_{HYS(CD)}$), the inverter will be inverted, and the output voltage changes into the low level (= GND). The detection delay time (t_{DET}) is defined as time which ranges from V_{SEN} = V_{DET} to the V_{OUT} of low level (especially, when the C_D pin is not connected: t_{DET0}).

③ V_{OUT} Keeps Low until V_{SEN} Rises

The delay capacitance is discharged to the ground voltage (= GND) level, when the sense pin voltage keeps below the detection voltage. Then, the output voltage maintains the low level until the sense pin voltage increases again to reach the release voltage (V_{SEN} < V_{DET} + V_{HYS}).

④ V_{SEN} Rising up to V_{DET} + V_{HYS}

The N-channel transistor (M_1) for the delay capacitance discharge will be turned off, and the delay capacitance will be charged via a delay resistor (R_{DELAY}), when the sense pin voltage continues to increase up to the release voltage level (V_{SEN} = V_{DET} + V_{HYS}).

⑤ C_D is Charged when V_{SEN} Keeps High

While the C_D pin voltage rises to reach the rising logic threshold voltage (= V_{TCD}) with the sense pin voltage equal to the release voltage or higher, the C_D pin will be charged by the time constant of the RC series circuits. Assuming the time to the release delay time (t_{DR}), it can be given by the Equation 1.

$$t_{DR} = R_{DELAY} \times C_D \times 0.79 \quad (1)$$

where R_{DELAY} is 2.2MΩ (TYP).

As an example, presuming that the delay capacitance is 0.68μF, t_{DR} is:

$$2.2 \times 10^{6} \times 0.68 \times 10^{-6} \times 0.79 = 1182 \text{ (ms)}$$

Note that the release delay time may be remarkably short when the delay capacitance is not discharged to the ground (= GND) level because time described in ③ is short.

⑥ V_{OUT} Goes High when C_D is Charged Full

When the C_D pin voltage reaches the C_D pin rising logic threshold voltage (= V_{TCD}), the inverter will be inverted. As a result, the output voltage changes into the high (= V_{IN}) level. The release delay time (t_{DR0}) is defined as time which ranges from V_{SEN} = V_{DET} + V_{HYS} to the V_{OUT} of high level with unconnected C_D pin.

⑦ V_{OUT} Keeps High when V_{SEN} > V_{DET}

The C_D pin is charged until the C_D pin voltage becomes the input voltage level, when the sense pin voltage is higher than the detection voltage (V_{SEN} > V_{DET}). Therefore, the output voltage maintains the high (= V_{IN}) level.

DETAILED DESCRIPTION (continued)

The V_{OUT} status is determined by the V_{SEN} and V_{CD}. A summary table of transitions about V_{OUT} is shown below.

Table 1. Function Chart

V_{SEN}	V_{CD}	Transition of V_{OUT} Condition (1)		
		①	⇒	②
L	L	L	⇒	L
	H			
	L	H		
	H			
H	L	L	⇒	L
	H		⇒	H
	L	H	⇒	
	H			

NOTE:
1. V_{OUT} transits from condition ① to ② because of the combination of V_{SEN}, V_{CD} and V_{IN}. V_{IN} should exceed the lowest operation voltage.

Examples:
1. V_{OUT} ranges from 'L' to 'H' in the case of V_{SEN} = 'H' ($V_{SEN} \geq V_{DET} + V_{HYS}$), V_{CD} = 'H' ($V_{CD} \geq V_{TCD}$) while V_{OUT} is 'L'.

2. V_{OUT} maintains 'H' when V_{CD} ranges from 'H' to 'L' ($V_{CD} \leq V_{TCD} - V_{HYS(CD)}$), V_{SEN} = 'H' and V_{CD} = 'L' when V_{OUT} becomes 'H' in ex.1.

The release delay time is adjustable by the external capacitor which is connected to C_D. The t_{DR} values for common ideal capacitors are shown below.

Table 2. Release Delay Time Chart (1) (2)

Delay Capacitance (C_D) (μF)	Release Delay Time (t_{DR}) (TYP) (ms)
0.010	17.4
0.022	38.2
0.047	81.7
0.100	174
0.220	382
0.470	817
1.000	1740

NOTES:
1. The release delay time values above are calculated by the Equation 1.
2. The release delay time is influenced by the delay capacitance.

APPLICATION INIFORMATION

1. Do not exceed the absolute conditions, and use this IC within the stated maximum ratings. For temporary transitional voltage drop or voltage rising phenomenon, the IC may fail if the rated value is exceeded.

2. The power supply input pin voltage drops by the resistance between power supply and the VIN pin, and by through current at operation of the IC. At this time, the operation may be wrong if the power supply input pin voltage falls below the minimum operating voltage range.

3. Be sure to separate the VIN pin and the sense pin, and to apply the voltage over 1V to the VIN pin, when the setting voltage is less than 1V.

4. Note that a rapid and high fluctuation of the power supply input pin voltage may cause a wrong operation. Power supply noise may cause operational function errors, and a coupled capacitor may alleviate this phenomenon.

5. When there is a possibility of which the power supply input pin voltage falls rapidly (e.g.: 6V to 0V) at release operation with the delay capacitance pin (C_D) connected to a capacitor, use a Schottky barrier diode connected between the VIN pin and the C_D pin as the Figure 6 shown below.

6. In N-channel open-drain output, V_{OUT} voltage at detection and release is determined by resistance of a pull-up resistor connected at the VOUT pin. Please choose proper resistance values with reference to Figure 7.

During detection, the formula is given as:

$$V_{OUT} = V_{PULL}/(1 + R_{PULL}/R_{ON}) \quad (2)$$

where:
V_{PULL} is the pull-up voltage.
R_{ON} (1) is the on-resistance of N-channel driver M_3 that can be calculated as V_{DS_NCH}/I_{OUT} from electrical characteristics.

For example, when R_{ON} (2) = $0.5/0.8 \times 10^{-3}$ = 625Ω (MIN) at V_{IN} = 1V, V_{PULL} = 3V and $V_{OUT} \le 0.1V$ at detection, R_{PULL} can be calculated as follows:

$R_{PULL} = (V_{PULL}/V_{OUT} - 1) \times R_{ON} = (3/0.1 - 1) \times 625 \approx 18k\Omega$

In this case, R_{PULL} should be selected higher or equal to 18kΩ in order to keep the output voltage less than 0.1V during detection.

NOTES:
1. R_{ON} is bigger when V_{IN} is smaller.
2. For calculation, minimum V_{IN} should be chosen among the input voltage range.

During releasing, the formula is given as:

$$V_{OUT} = V_{PULL}/(1 + R_{PULL}/R_{OFF}) \quad (3)$$

where:
V_{PULL} is the pull-up voltage.
R_{OFF} is the off-resistance of N-channel driver M_3 that is 15MΩ (MIN) when the driver is off (as to V_{OUT}/I_{LEAK}).

For example, when V_{PULL} = 6V and $V_{OUT} \ge 5.99V$, R_{PULL} can be calculated as follows:

$R_{PULL} = (V_{PULL}/V_{OUT} - 1) \times R_{OFF} = (6/5.99 - 1) \times 15 \times 10^6 \approx 25k\Omega$

It is recommended to select the R_{PULL} smaller or equal to 25kΩ so that the output voltage can be higher than 5.99V during releasing.

7. SGMICRO attaches importance to improving the products and their reliability. We require users to incorporate fail-safe designs and post-aging protection treatment in their systems.

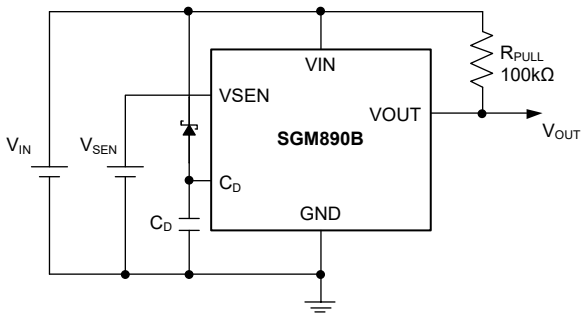
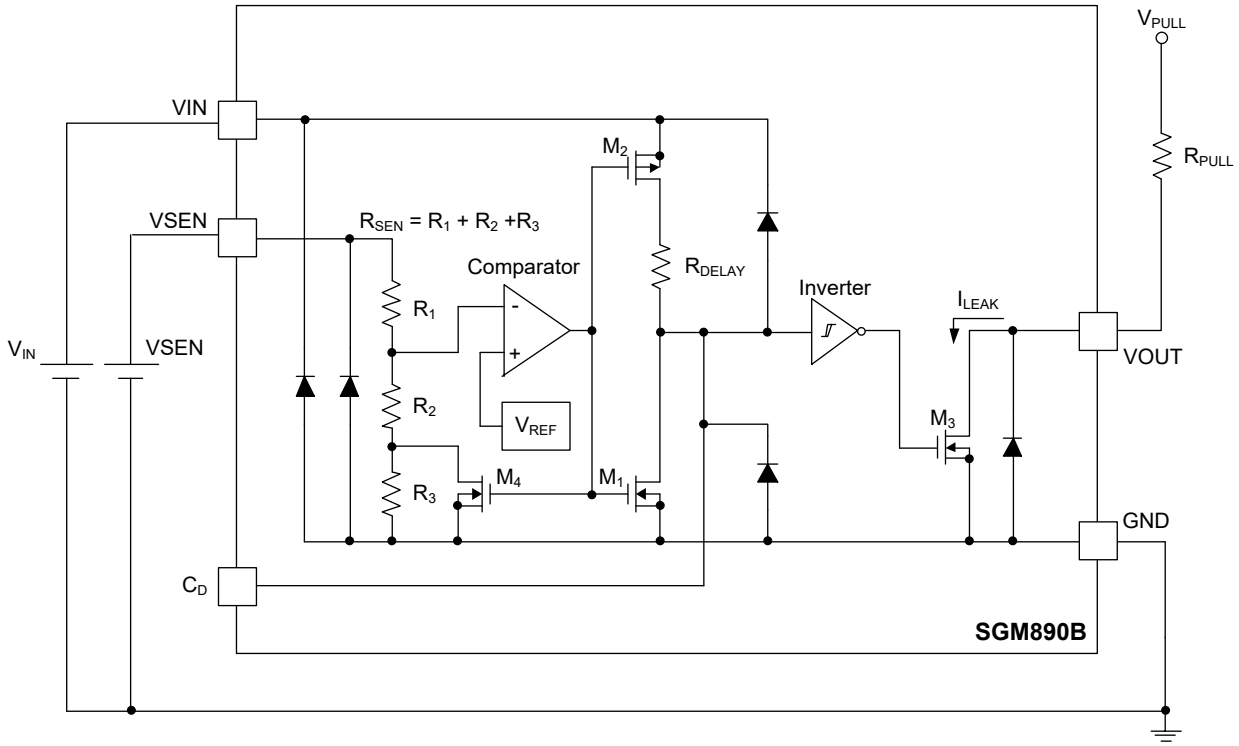


Figure 6. Circuit Example with the Delay Capacitance Pin (C_D) Connected to a Schottky Barrier Diode (SGM890B)

NOTE: $R_{OFF} = V_{OUT}/I_{LEAK}$.

APPLICATION INFORMATION (continued)



NOTE: $R_{OFF} = V_{OUT}/I_{LEAK}$.

Figure 7. Circuit Example of SGM890B

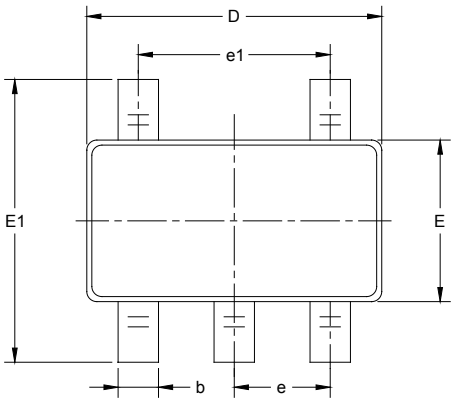
REVISION HISTORY

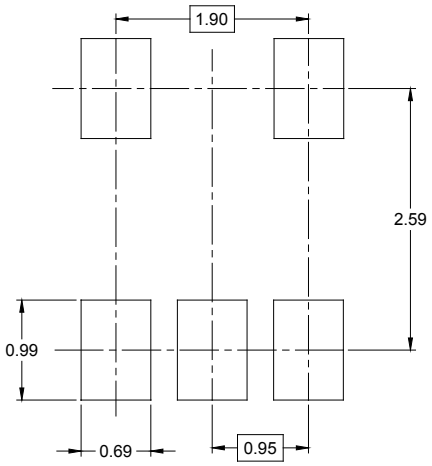
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (JUNE 2021) to REV.A	Page
Changed from product preview to production data	All

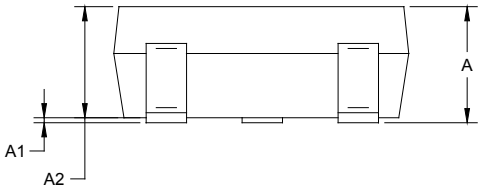
PACKAGE OUTLINE DIMENSIONS

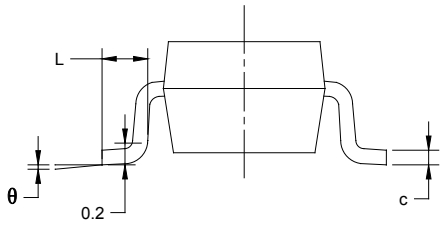
SOT-23-5





RECOMMENDED LAND PATTERN (Unit: mm)

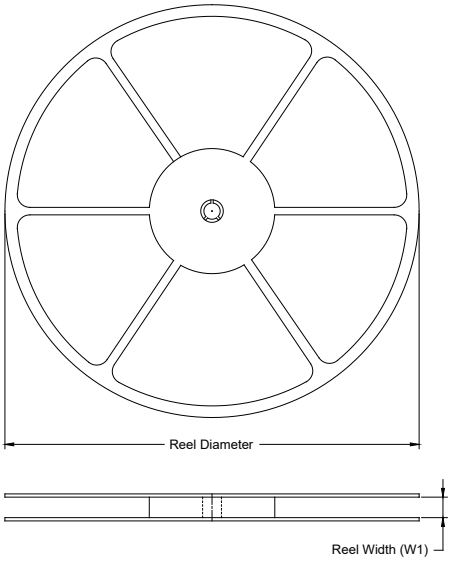




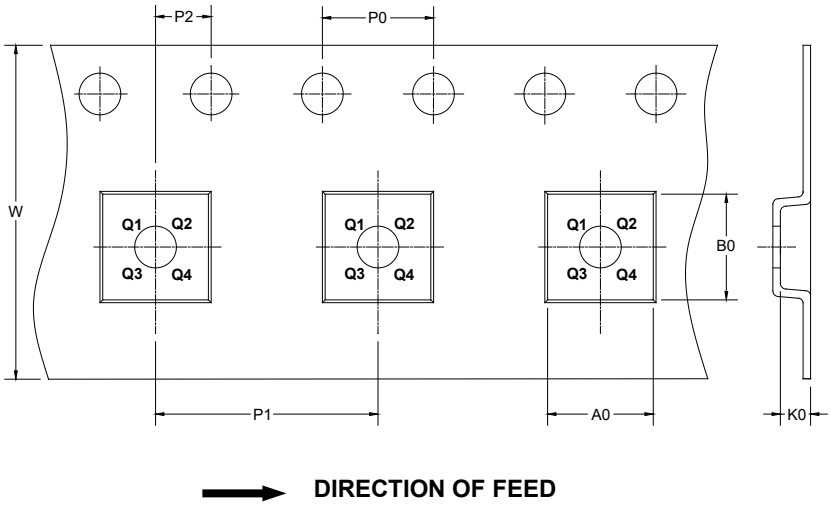
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



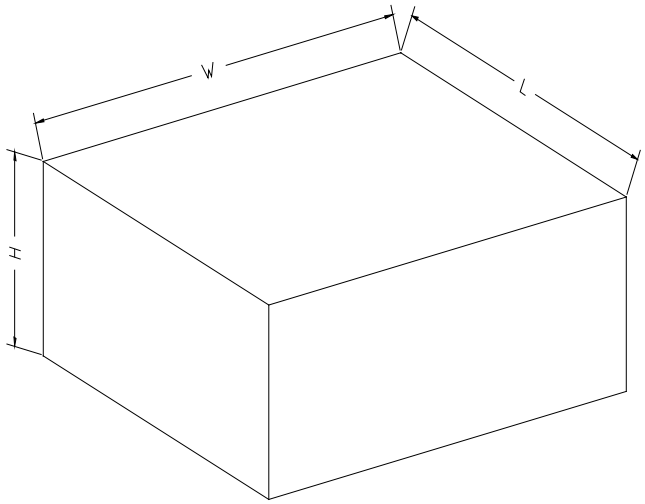
NOTE: The picture is only for reference. Please make the object as the standard.

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

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

DD0002