SGM8717
Nano-Power, 4-Bump WLCSP, Small-Size Comparator

GENERAL DESCRIPTION

The SGM8717 is a single and small-size comparator. The minimum operating voltage of this chip can be as low as 1.4V, and its power consumption reaches the nano-power level.

The SGM8717 has a wide input voltage range. This range is independent of its supply voltage. It allows the device to be directly connected to active sources, even when the device is unpowered.

The SGM8717 has an open-drain output structure, which requires an external pull-up resistor to output a voltage higher or lower than +Vs.

The SGM8717 is available in a Green WLCSP-0.69×0.69-4B package. It is specified over the operating temperature range of -40℃ to +125℃.

FEATURES

- **Wide Supply Voltage Range: 1.4V to 5.5V**
- **Quiescent Current: 370nA (TYP)**
- **Low Propagation Delay: 3.5μs (TYP)**
- **Open-Drain Output**
- **Independent Input Voltage Range up to 5.6V**
- **Internal Hysteresis: 12mV (TYP)**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green WLCSP-0.69×0.69-4B Package**

APPLICATIONS

Battery Powered Equipment
Industrial Equipment
Medical Equipment
Telecom Equipment
Wireless Equipment

TYPICAL APPLICATION

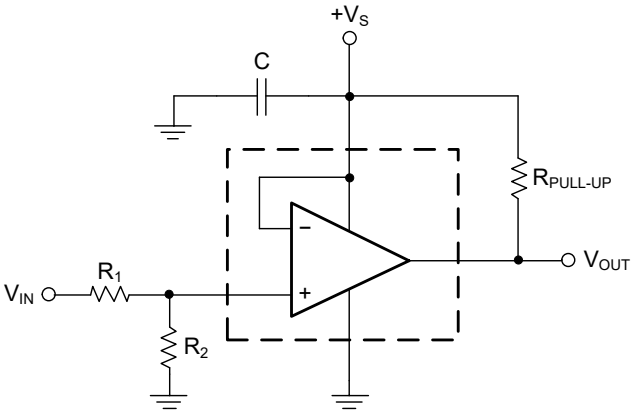


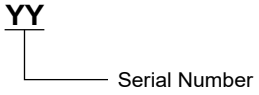
Figure 1. Typical Application Circuit

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8717	WLCSP-0.69×0.69-4B	-40℃ to +125℃	SGM8717XG/TR	00	Tape and Reel, 5000

MARKING INFORMATION

NOTE: Fixed character for 00.



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

Supply Voltage Range, V_S = (+V_S) - (-V_S) ..... -0.3V to 6V
Input (IN) to (-V_S) (1) ..... -0.3V to 6V
Current into Input (IN) ..... ±10mA
Output (OUT) to (-V_S) ..... -0.3V to 6V
Output Short-Circuit Duration (2) 10s
Package Thermal Resistance
WLCSP-0.69×0.69-4B, θ_{JA} ..... 310.9℃/W
WLCSP-0.69×0.69-4B, θ_{JB} ..... 109.5℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility (3) (4)
HBM ..... ±8000V
CDM ..... ±1000V

NOTES:

1. Voltage at the input pin can be (-V_S) - 0.3V, and current of the input signal should be limited within the range of 10mA.

2. Short-circuit to ground, one comparator per package.

3. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.

4. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range, V_S = (+V_S) - (-V_S) ..... 1.4V to 5.5V
Open-Drain Pull-Up Voltage, $V_{PULL-UP}$ 5.5V
Operating 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

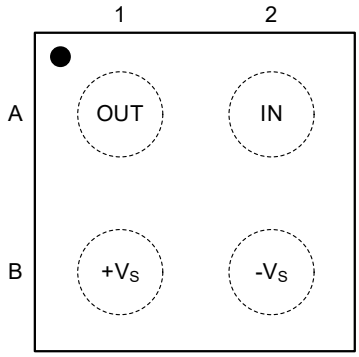
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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 CONFIGURATION

(TOP VIEW)



WLCSP-0.69×0.69-4B

PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
A1	OUT	O	Output of Comparator. OUT is open-drain structure.
A2	IN	I	Non-Inverting Input of Comparator.
B1	$+V_S$	P	Positive (Highest) Power Supply. The $+V_S$ pin is connected to the inverting input of comparator internally, so $+V_S$ is also used as an external reference voltage of comparator.
B2	$-V_S$	P	Negative (Lowest) Power Supply.

NOTE: I = input, O = output, P = power.

ELECTRICAL CHARACTERISTICS

(V_S = 3.3V, $V_{PULL-UP}$ = +V_S, voltage at the IN pin is with respect to (-V_S), Full = -40℃ to +125℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Offset Voltage	V_{OS}	V_S = 1.4V to 5.5V	+25℃		±1	±9.1	mV
			Full			±10	
Input Offset Voltage Drift	$\Delta V_{OS}/\Delta T$		Full		±3		μV/℃
Input Hysteresis Voltage	V_{HYST}	V_S = 1.4V to 5.5V	+25℃	5	12	17.5	mV
			Full	2		21	
Input Voltage Range (1)	V_{IN}		Full	0		5.6	V
Input Bias Current	I_B	V_{IN} = 5.6V, positive value indicates current flowing into the IN pin	+25℃		30	400	pA
			Full			10	nA
Input Leakage Current	I_{LEAK}	V_{IN} = 5.6V, V_S = 0V, positive value indicates current flowing into the IN pin	+25℃		30	400	pA
			Full			15	nA
Input Capacitance	C_{IN}		+25℃		3.5		pF
Output Voltage Low	V_{OL}	I_{SINK} = 200μA, measured relative to -V_S	+25℃		10	50	mV
			Full			100	
		I_{SINK} = 2mA, measured relative to -V_S	+25℃		100	200	
			Full			300	
Output Short-Circuit Current	I_{SINK}	V_S = 5V	+25℃	38	42		mA
			Full	28			
Output Leakage Current	I_{LKG}	V_{IN} = (+V_S) + 0.1V (output high), $V_{PULL-UP}$ = +V_S	+25℃		50	350	pA
			Full			16	nA
Power Supply Voltage	V_S		Full	1.4		5.5	V
Power Supply Rejection Ratio	PSRR	V_S = 1.4V to 5.5V	+25℃	61	75		dB
			Full	60			
Quiescent Current	I_Q	V_{IN} = (+V_S) - 0.1V (output low), no load	+25℃		370	530	nA
			Full			700	

NOTE: 1. Over operating supply voltage range (V_S): 1.4V to 5.5V.

SWITCHING CHARACTERISTICS

(V_S = 3.3V, C_L = 15pF, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Propagation Delay, High-to-Low (1)	t_{PHL}	Input overdrive = -100mV	+25℃		3.5		μs
Propagation Delay, Low-to-High (1)	t_{PLH}	Input overdrive = +100mV, $R_{PULL-UP}$ = 4.99kΩ	+25℃		3		μs
Output Fall Time	t_F	80% to 20%	+25℃		4		ns
Power-Up Time (2)	t_{ON}		+25℃		500		μs

NOTES:

1. The terms high-to-low and low-to-high describe the changes occurring at the input.

2. When powering up, ensure that V_S is above 1.4V for 500μs before the output is in a correct state.

TIMING DIAGRAM

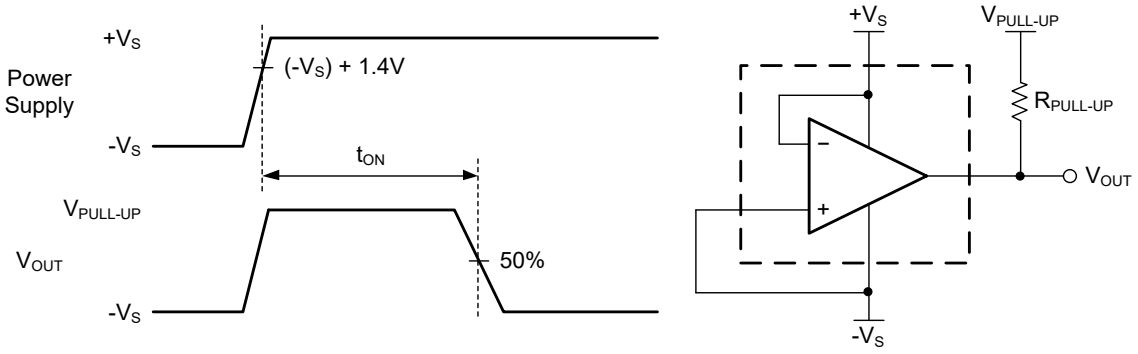


Figure 2. Power-Up Delay (Out) Diagram

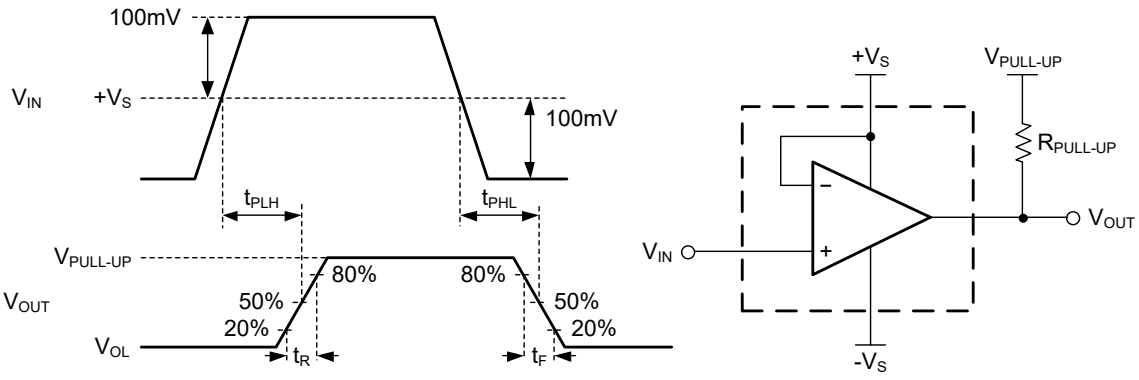
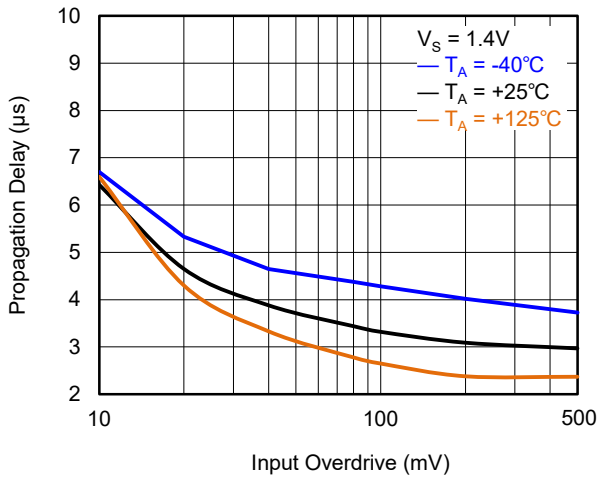


Figure 3. Propagation Delay Diagram

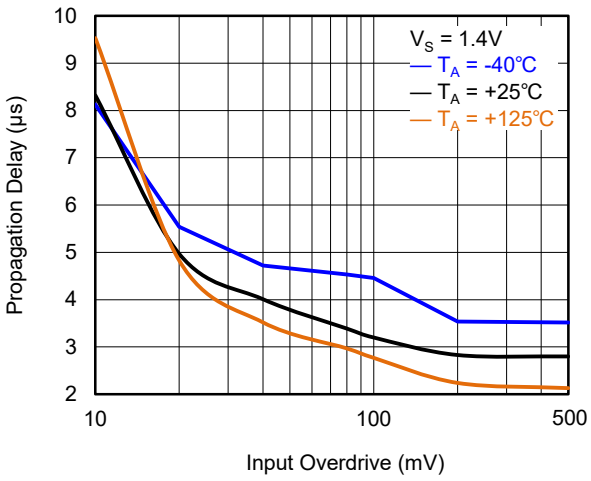
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = 3.3V, $R_{PULL-UP}$ = 4.99kΩ, C_L = 15pF, unless otherwise noted.

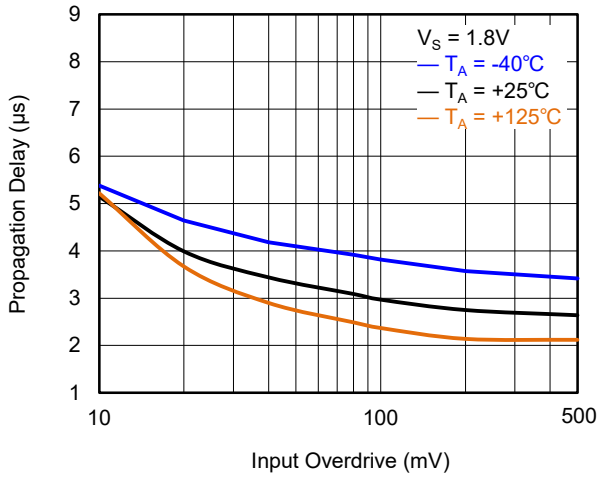
Propagation Delay (L-H) vs. Input Overdrive



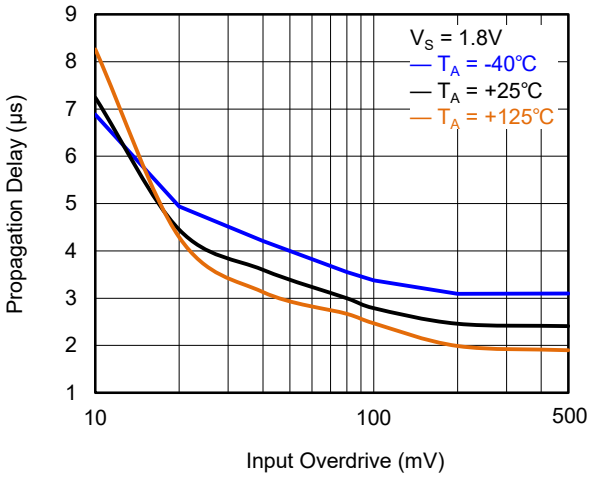
Propagation Delay (H-L) vs. Input Overdrive



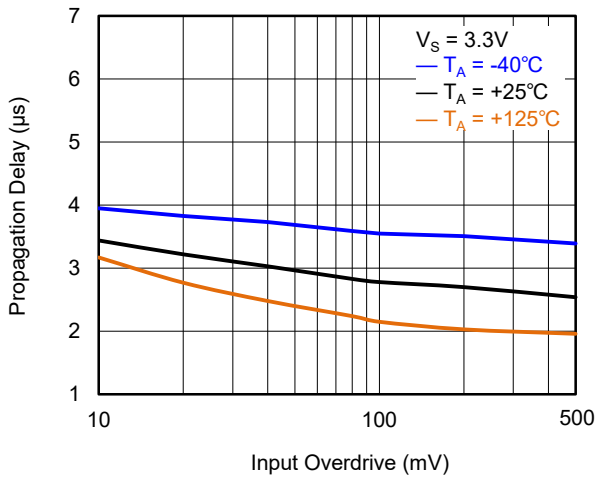
Propagation Delay (L-H) vs. Input Overdrive



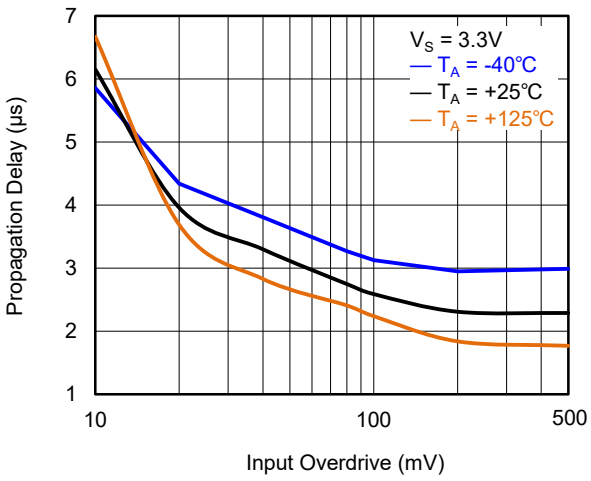
Propagation Delay (H-L) vs. Input Overdrive



Propagation Delay (L-H) vs. Input Overdrive



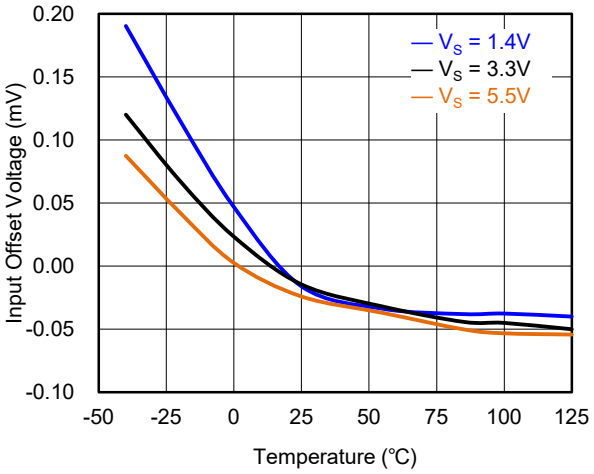
Propagation Delay (H-L) vs. Input Overdrive



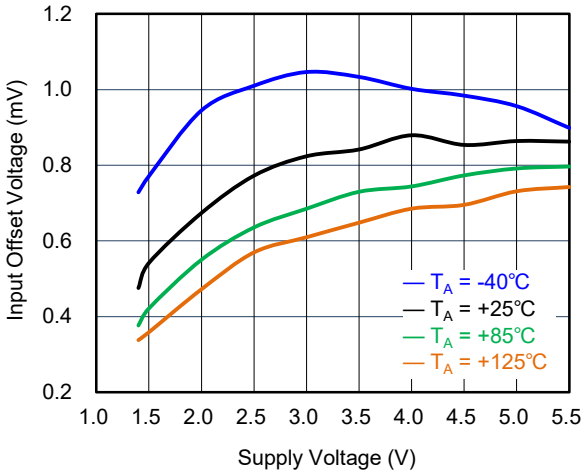
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 3.3V, $R_{PULL-UP}$ = 4.99kΩ, C_L = 15pF, unless otherwise noted.

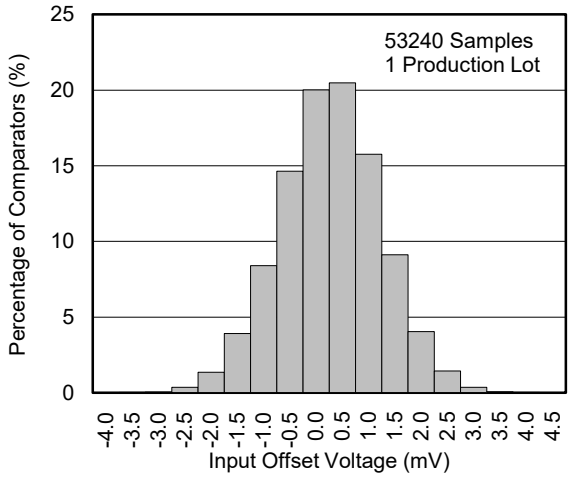
Input Offset Voltage vs. Temperature



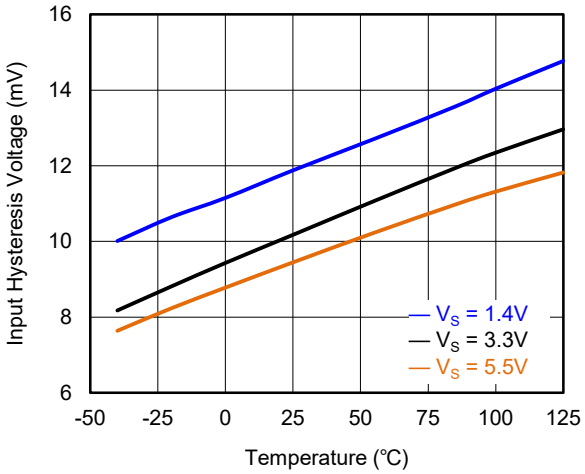
Input Offset Voltage vs. Supply Voltage



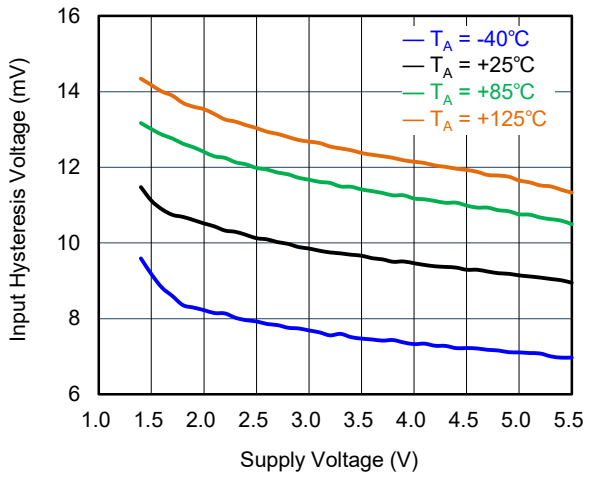
Input Offset Voltage Production Distribution



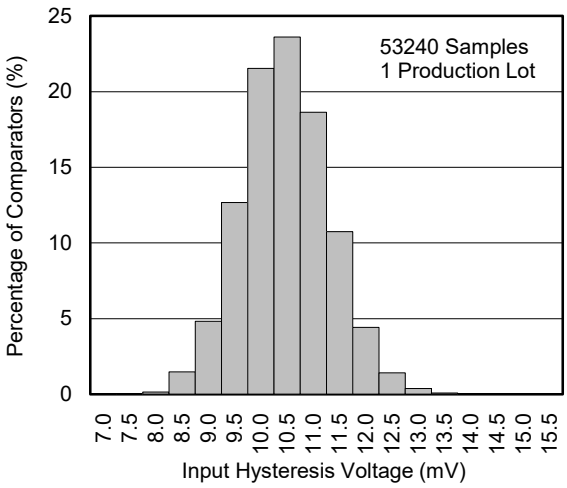
Input Hysteresis Voltage vs. Temperature



Input Hysteresis Voltage vs. Supply Voltage



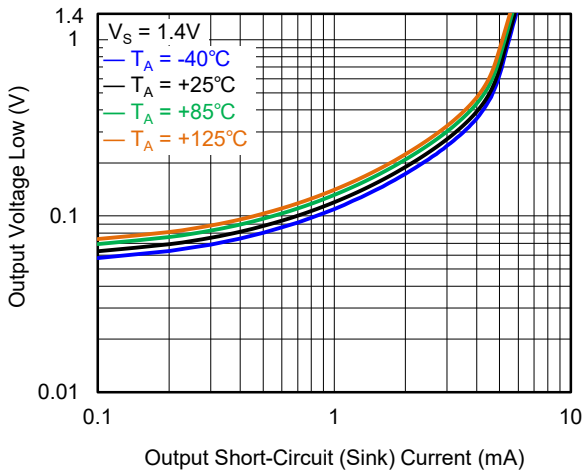
Input Hysteresis Voltage Production Distribution



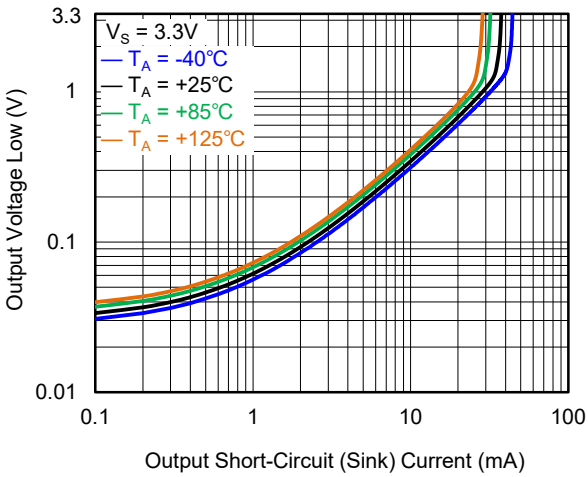
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 3.3V, $R_{PULL-UP}$ = 4.99kΩ, C_L = 15pF, unless otherwise noted.

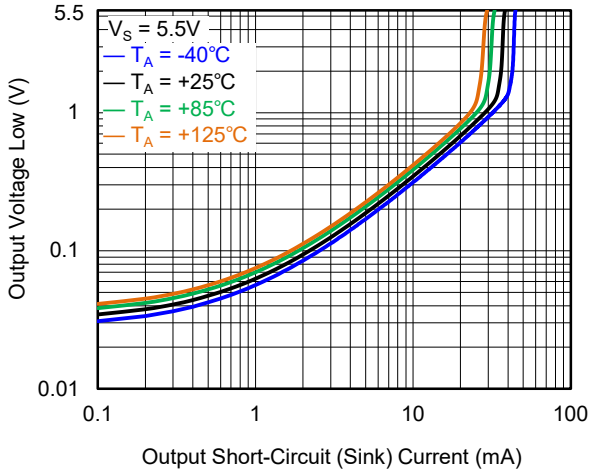
Output Voltage Low vs. Output Short-Circuit (Sink) Current



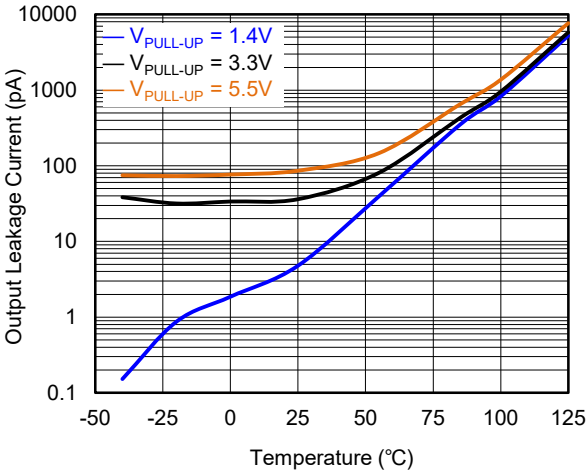
Output Voltage Low vs. Output Short-Circuit (Sink) Current



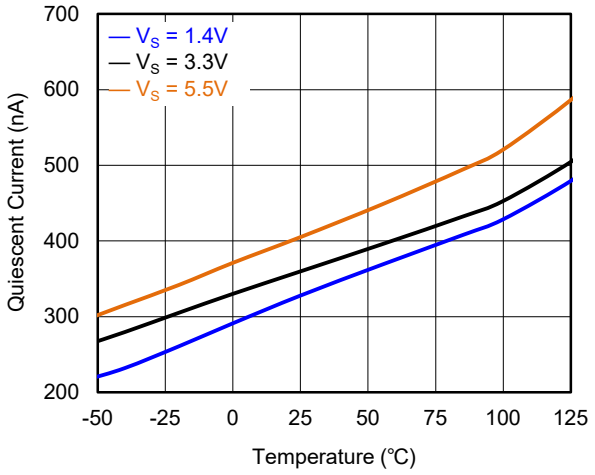
Output Voltage Low vs. Output Short-Circuit (Sink) Current



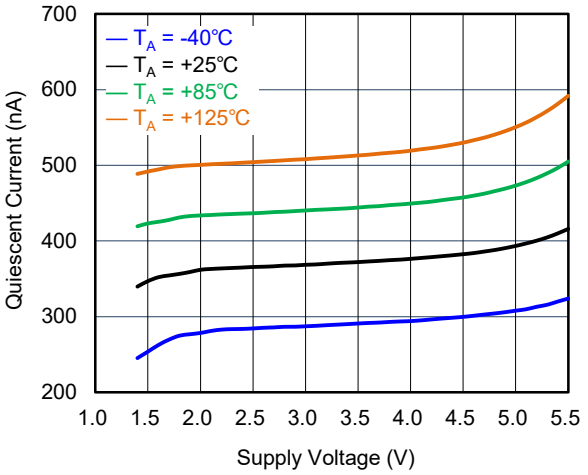
Output Leakage Current vs. Temperature



Quiescent Current vs. Temperature

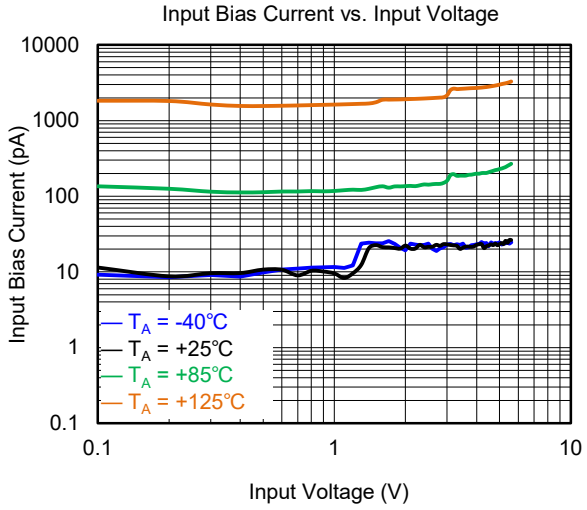


Quiescent Current vs. Supply Voltage



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 3.3V, $R_{PULL-UP}$ = 4.99kΩ, C_L = 15pF, unless otherwise noted.



FUNCTIONAL BLOCK DIAGRAM

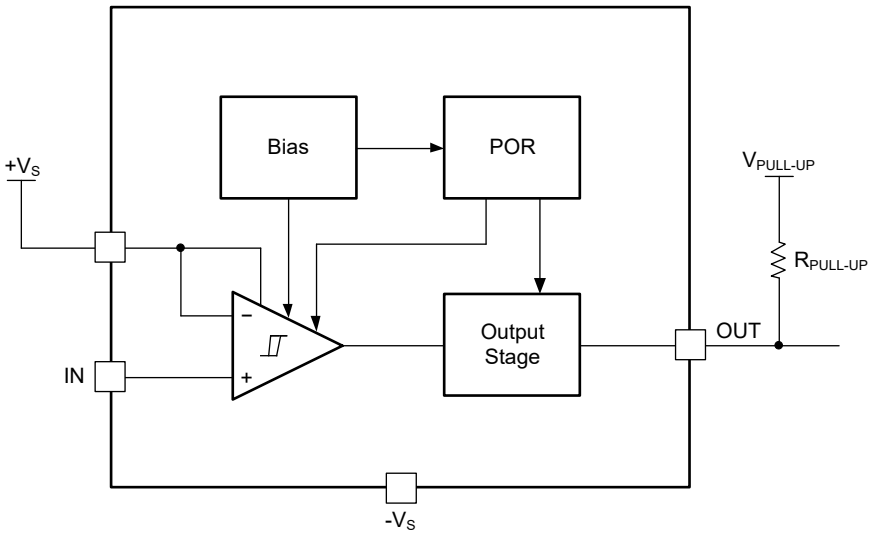


Figure 4. Block Diagram

DETAILED DESCRIPTION

The SGM8717 is a single and small-size comparator. The minimum operating voltage of this chip can be as low as 1.4V, and its power consumption reaches the nano-power level.

POR Function

The SGM8717 integrates a power-on-reset (POR) circuit. During power-up or power-down, when the supply voltage is between V_{POR} and the minimum operating voltage, the POR circuit will operate and keep the output high-impedance (logical high).

Inputs

The SGM8717 has a wide input voltage range. This range is independent of its supply voltage. The comparator can operate at any input voltage within these limits. To protect the inputs of the comparator from going out of range, the internal diode connected to $-V_S$ is taken into account. The internal diode will be forward biased if the input voltage is below $-V_S$ and the input bias current of the comparator will increase exponentially in this situation.

Internal Hysteresis

SGM8717 has an internal hysteresis (V_{HYST}), which helps improve the noise immunity. Figure 5 shows the relationship among V_{TH}, V_{OS}, and V_{HYST}. V_{TH} is the trip voltage or set voltage of the comparator. V_{OS} is the input offset voltage between IN and $+V_S$. V_{OS} takes into account the influence of the hysteresis, which can affect the response of the output.

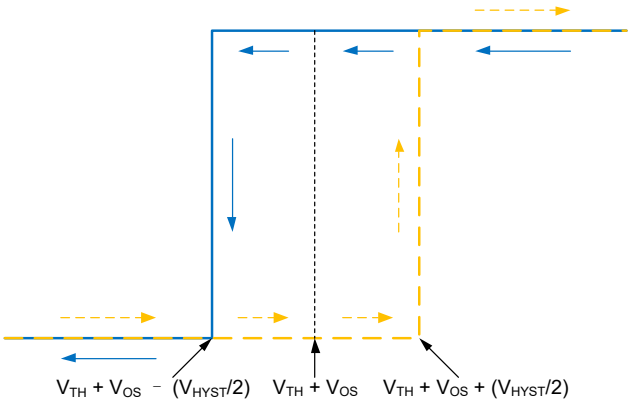


Figure 5. Hysteresis Transfer Curve

Output

The SGM8717 provides the output of open-drain. The output level can be pulled up to 5.5V from an external source, independent of the supply voltage.

APPLICATION INFORMATION

The SGM8717 can be used for under-voltage detection, with the specific circuit shown in Figure 6. Inside the SGM8717, the inverting input is connected to $+V_S$. When the external voltage V_{IN} drops to a certain extent, the input voltage of the SGM8717 becomes lower than $+V_S$, and the comparator outputs a low level.

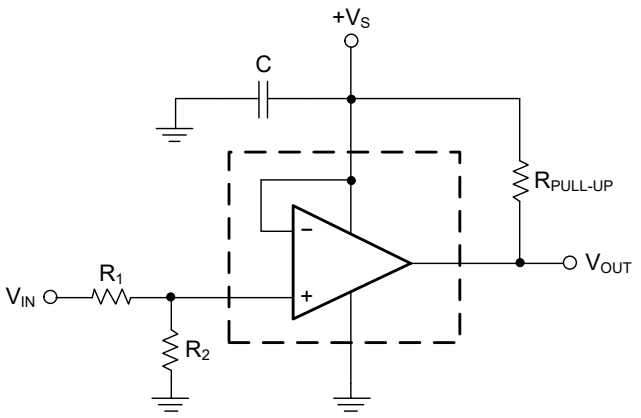


Figure 6. Under-Voltage Detection

Layout Recommendations

In single power supply applications, a 100nF bypass capacitor is recommended and should be placed as close as possible to the $+V_S$ pin. In dual-supply applications, it is recommended to place 100nF capacitors between supply lines and GND as close as possible.

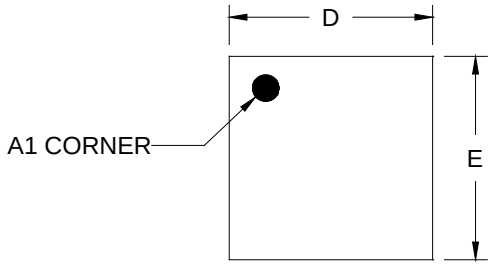
REVISION HISTORY

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

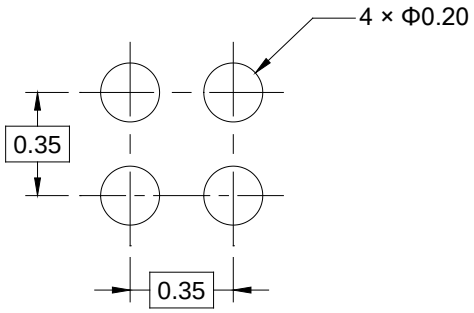
Changes from Original to REV.A (APRIL 2026)	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

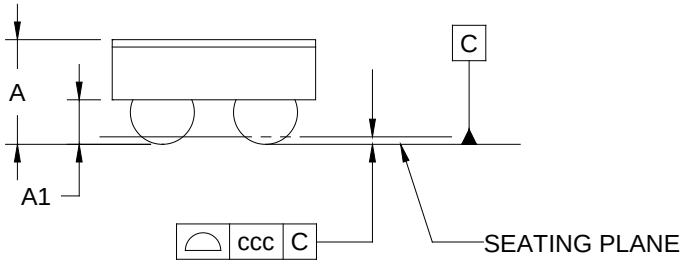
WLCSP-0.69×0.69-4B



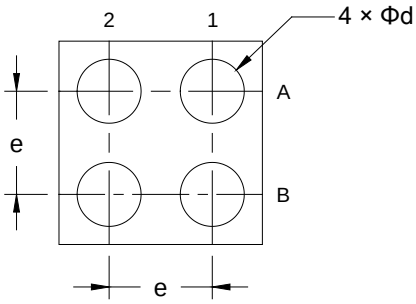
TOP VIEW



RECOMMENDED LAND PATTERN (Unit: mm)



SIDE VIEW



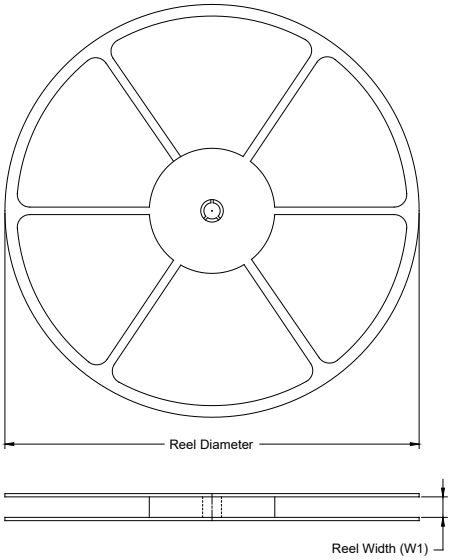
BOTTOM VIEW

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	0.400
A1	0.131	-	0.171
D	0.660	-	0.720
E	0.660	-	0.720
d	0.187	-	0.247
e	0.350 BSC		
ccc	0.050		

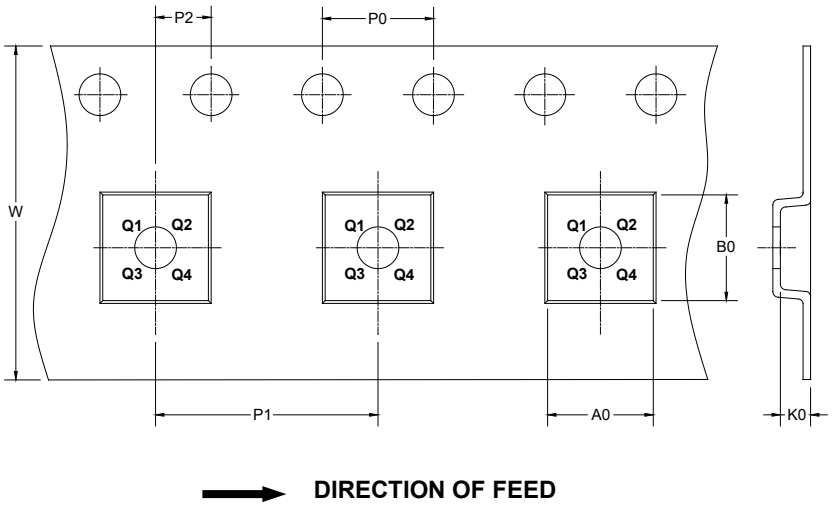
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



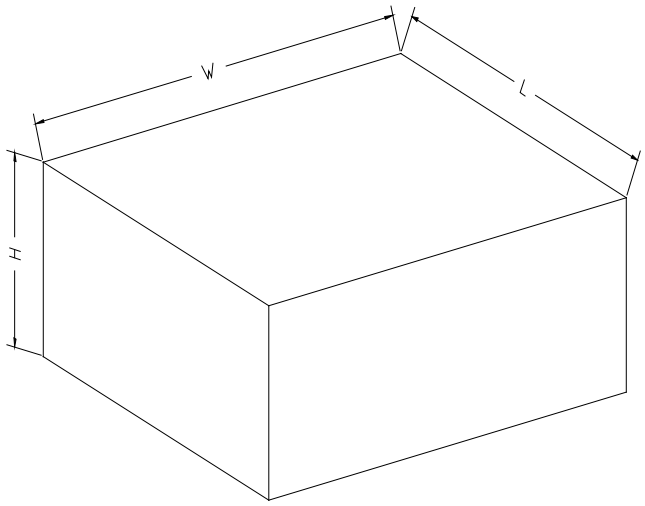
NOTE: The picture is only for reference. Please make the object as the standard.

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
WLCSP-0.69×0.69-4B	7"	9.5	0.77	0.79	0.44	4.0	4.0	2.0	8.0	Q1

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