SGM8720-2
Micro Power, Dual-Channel Comparator within Precision Reference

GENERAL DESCRIPTION

The SGM8720-2 series is a dual-channel, low-power comparator in a compact package.

The device is designed with precision hysteresis, which enables the comparator to effectively suppress interference pulses on the input signal and transform input signals into clear digital outputs. The INx inputs of the SGM8720-2 can be adjusted via external resistors.

The SGM8720-2 series consumes only 2μA (TYP) quiescent current.

The SGM8720-2 series is available in a Green UTDFN-1.45×1-6AL package. It is rated over the -40℃ to +125℃ operating temperature range.

FEATURES

- **Wide Supply Voltage Range: 1.6V to 5.5V**
- **Two-Channel Detectors in Small Packages**
- **High Threshold Accuracy: 1% over Temperature**
- **Internal Precision Hysteresis: 60mV (TYP)**
- **Ultra-Low Quiescent Current: 2μA (TYP)**
- **Different Output Structures**
  - **Push-Pull Output: SGM8720A-2**
  - **Open-Drain Output: SGM8720B-2**
- **Available in a Green UTDFN-1.45×1-6AL Package**

APPLICATIONS

Electricity Meters
Thermostats
Cordless Power Tools
Circuit Breakers

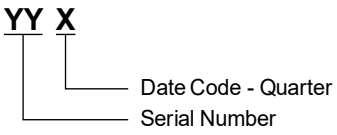
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8720A-2	UTDFN-1.45×1-6AL	-40℃ to +125℃	SGM8720A-2XUDL6G/TR	23X	Tape and Reel, 5000
SGM8720B-2	UTDFN-1.45×1-6AL	-40℃ to +125℃	SGM8720B-2XUDL6G/TR	24X	Tape and Reel, 5000

MARKING INFORMATION

NOTE: X = Date Code.

UTDFN-1.45×1-6AL



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

Voltage
- V_S ..... -0.3V to 7V
- OUTA, OUTB (SGM8720A-2) ..... -0.3V to $(+V_S)$ + 0.3V
- OUTA, OUTB (SGM8720B-2) ..... -0.3V to 7V
- INA, INB ..... -0.3V to 7V

Current
- INA, INB (1) 10mA
- OUTA, OUTB ..... ±20mA

Package Thermal Resistance
- UTDFN-1.45×1-6AL, θ_{JA} ..... 167.9℃/W
- UTDFN-1.45×1-6AL, θ_{JB} ..... 59.2℃/W
- UTDFN-1.45×1-6AL, θ_{JC} ..... 128℃/W

Junction Temperature ..... +150℃

Storage Temperature Range ..... -65℃ to +150℃

Lead Temperature (Soldering, 10s) ..... +260℃

ESD Susceptibility (2) (3)

HBM ..... ±7000V

CDM ..... ±1000V

NOTES:

1. A clamping diode is added between the input and negative power supply. The voltage at input pins can be $(-V_S)$ - 0.3V, and the current of the input signal should be limited within the range of 10mA.

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

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

RECOMMENDED OPERATING CONDITIONS

Power Supply Voltage ..... 1.6V to 5.5V

Input Voltage, INA, INB ..... 0V to 5.5V

Output Voltage, OUTA, OUTB
- SGM8720A-2 ..... 0V to $(+V_S)$ + 0.3V
- SGM8720B-2 ..... 0V to 5.5V

Current, OUTA, OUTB ..... -5mA to 5mA

Input Capacitor, C_{IN} ..... 0.1μF (TYP)

Operating Temperature Range (4) ..... -40℃ to +125℃

NOTE:

4. For low-power devices, the junction temperature rise above the ambient temperature is negligible; therefore, the junction temperature is considered equal to the ambient temperature ($T_J = T_A$).

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

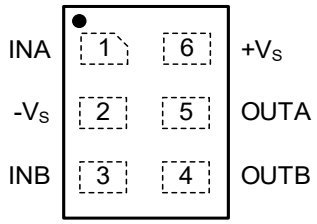
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

SGM8720-2 (TOP VIEW)



UTDFN-1.45×1-6AL

PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1	INA	I	Signal Input.
2	-V_S	—	Negative Power Supply.
3	INB	I	Signal Input.
4	OUTB	O	Output for INB.
5	OUTA	O	Output for INA.
6	+V_S	I	Positive Power Supply.

NOTE: I = Input, O = Output.

ELECTRICAL CHARACTERISTICS

(1.6V ≤ V_S ≤ 5.5V, Full = -40℃ to +125℃, typical values are measured at V_S = 3.3V and T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Supply Range	V_S		Full	1.6		5.5	V
Power-On Reset Voltage (1)	V_{POR}	V_{OL_MAX} = 0.2V, I_{OL} = 15μA	Full			0.8	V
Supply Current (into +V_S Pin)	I_{DD}	No load	+25℃		2	3	μA
			Full			4	
Positive-Going Input Threshold Voltage	V_{IT+}	V_{INx} rising	+25℃		1.194		V
			Full	-1%		1%	
Negative-Going Input Threshold Voltage	V_{IT-}	V_{INx} falling	+25℃		1.134		V
			Full	-1%		1%	
Input Hysteresis Voltage	V_{HYS}		+25℃		60		mV
Input Current	I_{INx}	V_{INx} = 0V or +V_S	+25℃		±80	±300	pA
			Full			19	nA
Output Voltage Swing from -V_S	V_{OL}	V_S ≥ 1.6V, I_{SINK} = 0.4mA	Full		17	50	mV
		V_S ≥ 2.7V, I_{SINK} = 2mA	Full		60	100	
		V_S ≥ 4.5V, I_{SINK} = 3.2mA	Full		80	150	
Output Voltage Swing from +V_S (SGM8720A-2)	V_{OH}	V_S ≥ 1.6V, I_{SOURCE} = 0.4mA	Full		40	100	mV
		V_S ≥ 2.7V, I_{SOURCE} = 2mA	Full		95	200	
		V_S ≥ 4.5V, I_{SOURCE} = 3.2mA	Full		98	200	
Open-Drain Output Leakage Current (SGM8720B-2)	I_{LKG}	High impedance, V_{INx} = V_{OUTx} = 5.5V	+25℃		±300	±600	pA
			Full			60	nA

NOTE:

1. Outputs are undetermined below V_{POR}.

TIMING REQUIREMENTS

(Typical values are at T_A = +25℃ and V_S = 3.3V. INx transitions between 0V and 1.3V, unless otherwise noted.)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS
INx (Rising) to OUTx Propagation Delay	t_{PD_R}		5.2		μs
INx (Falling) to OUTx Propagation Delay	t_{PD_F}		5.2		μs
Startup Delay (1)	t_{SD}		340		μs

NOTE:

1. During power-on or when a V_S transient is below V_{S_MIN}, the outputs reflect the input conditions 340μs after V_S transitions through V_{S_MIN}.

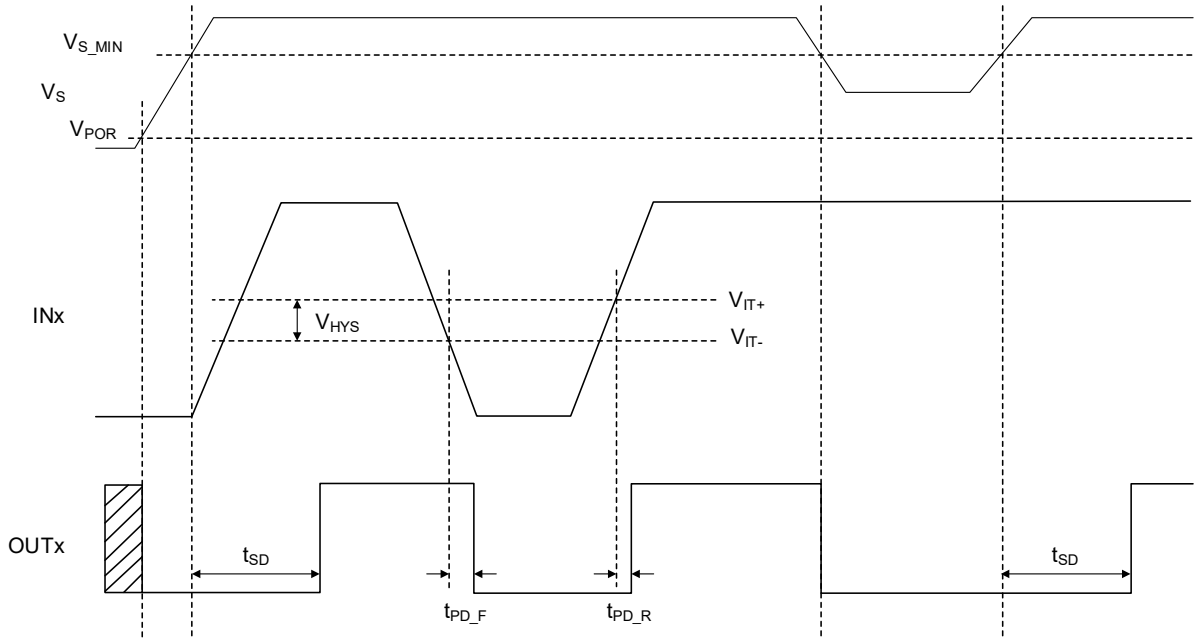
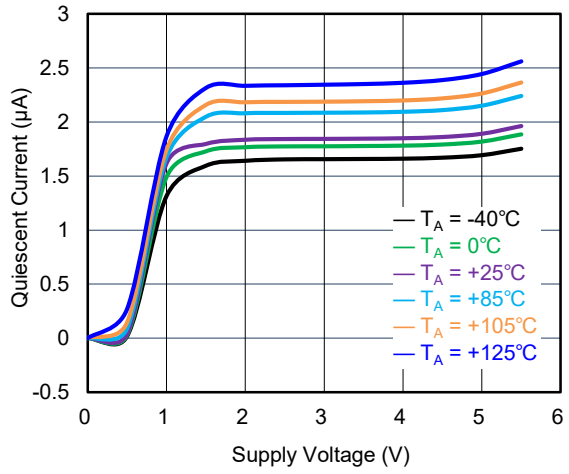


Figure 1. Timing Diagram

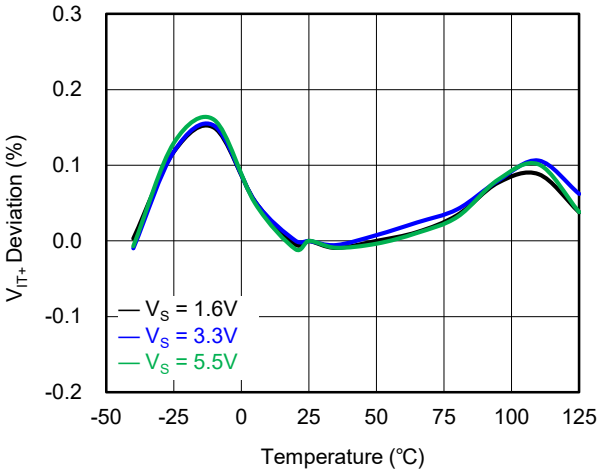
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃ with a 0.1μF capacitor close to +V_S, unless otherwise noted.

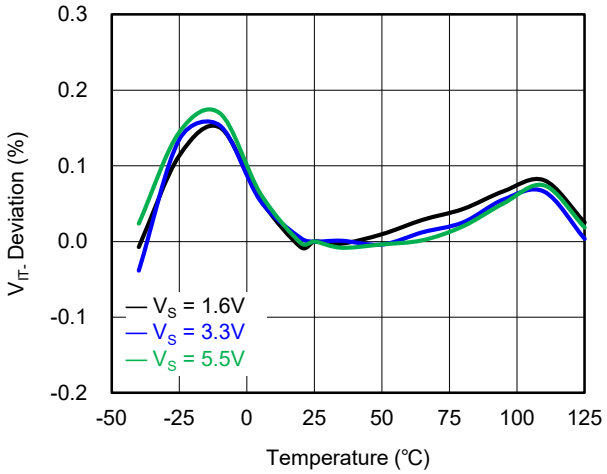
Quiescent Current vs. Supply Voltage



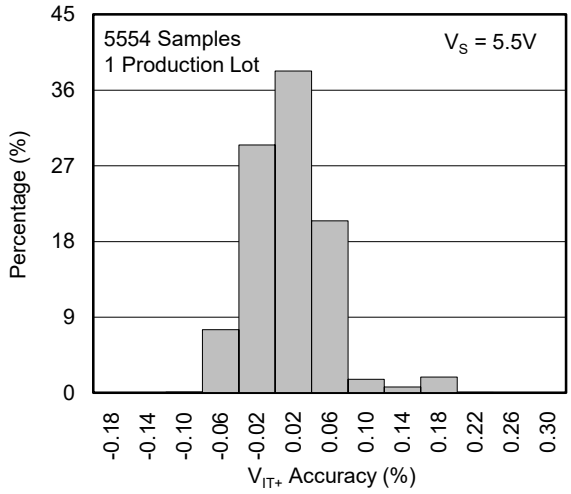
V_{IT+} Deviation vs. Temperature



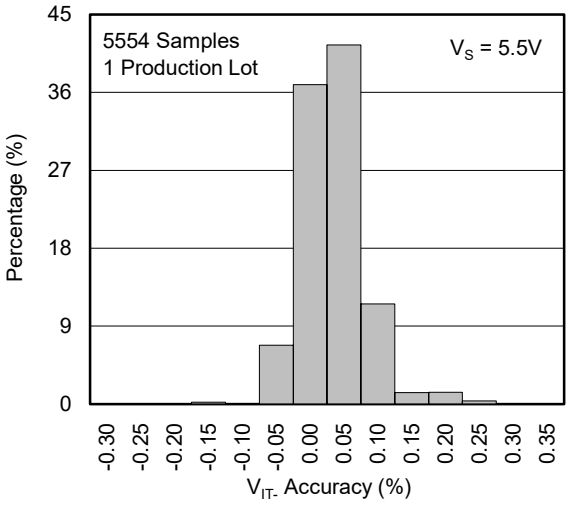
V_{IT-} Deviation vs. Temperature



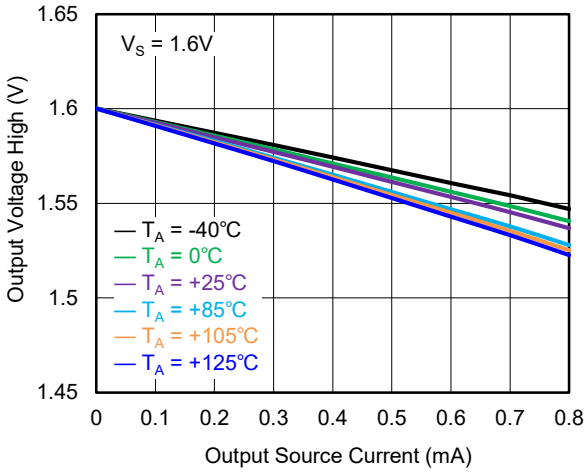
INx Threshold (V_{IT+})



INx Threshold (V_{IT-})



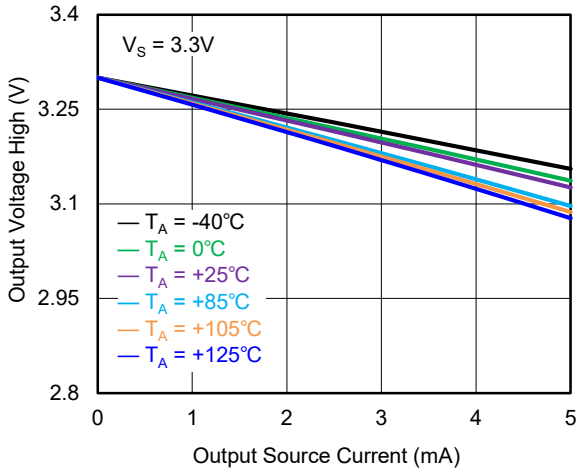
Output Voltage High vs. Output Source Current



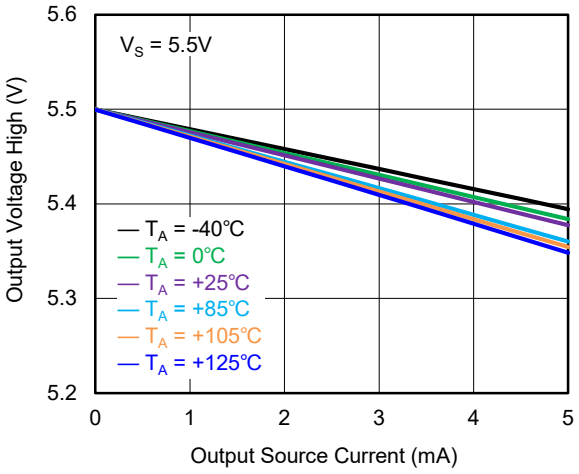
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃ with a 0.1μF capacitor close to +V_S, unless otherwise noted.

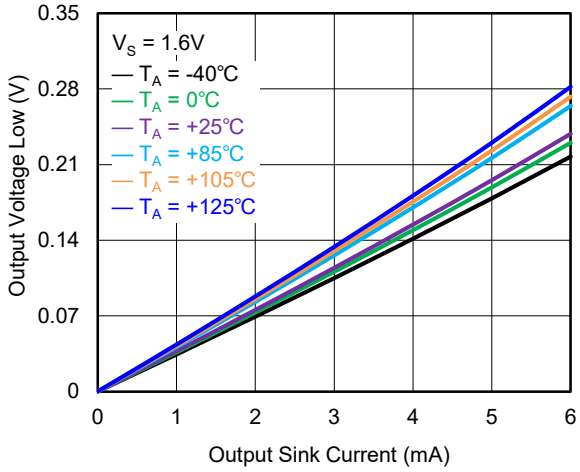
Output Voltage High vs. Output Source Current



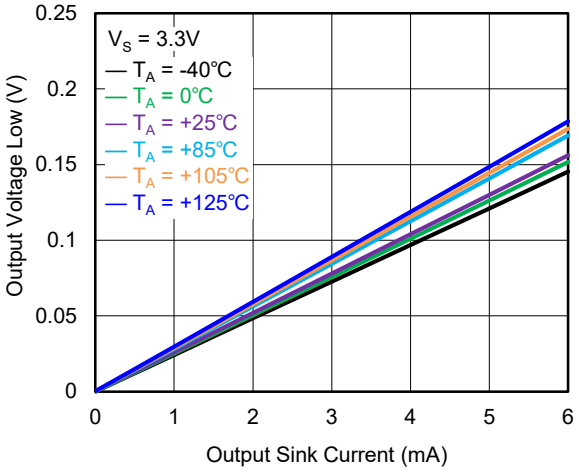
Output Voltage High vs. Output Source Current



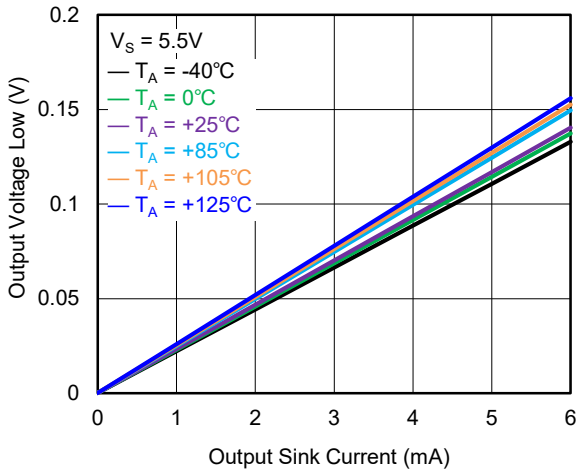
Output Voltage Low vs. Output Sink Current



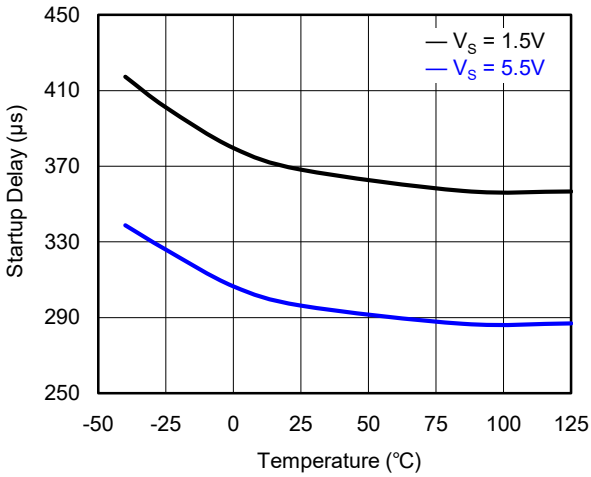
Output Voltage Low vs. Output Sink Current



Output Voltage Low vs. Output Sink Current



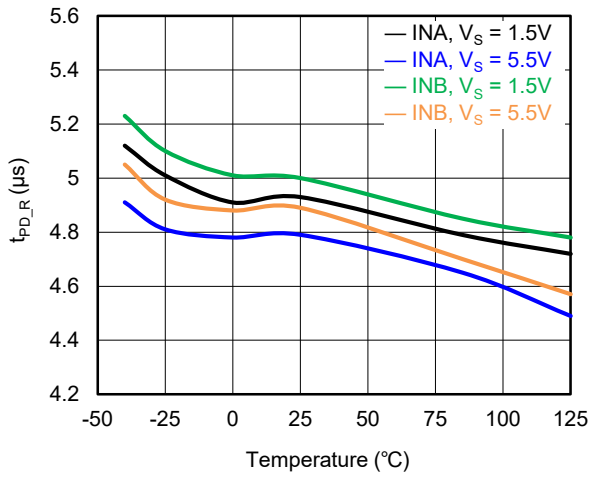
Startup Delay



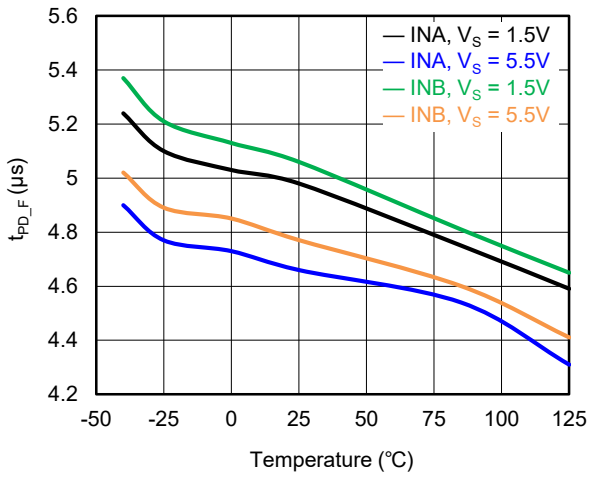
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃ with a 0.1μF capacitor close to +V_S, unless otherwise noted.

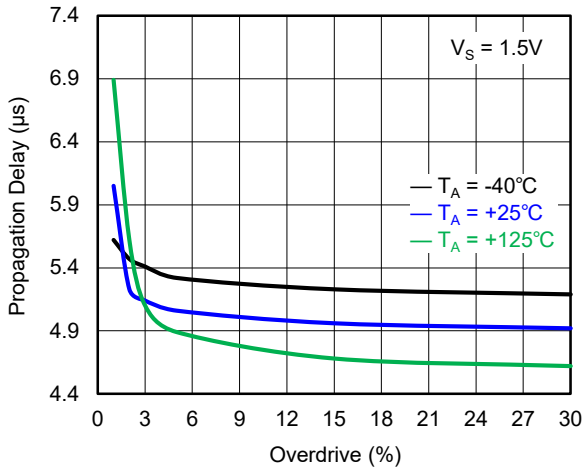
Propagation Delay from INx High to Output High



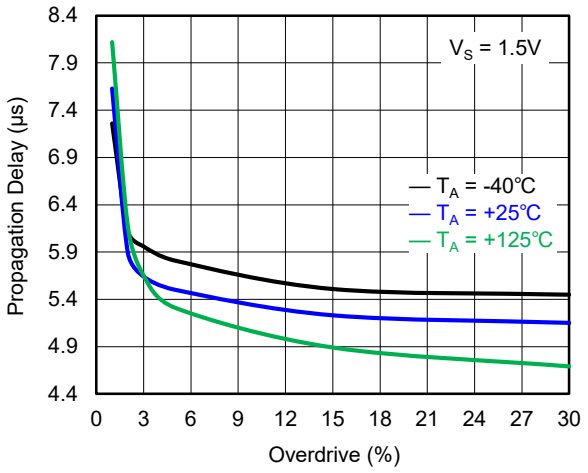
Propagation Delay from INx Low to Output Low



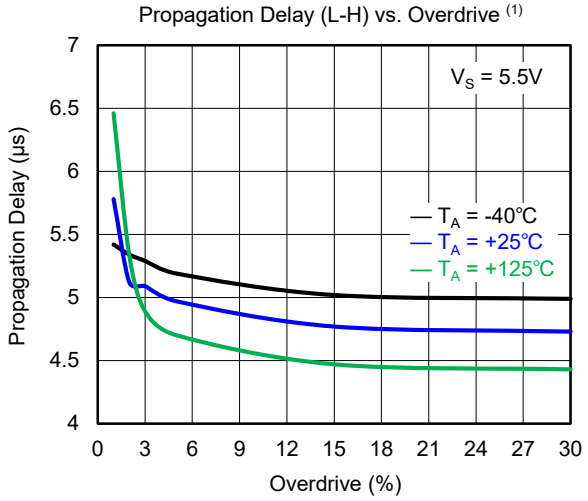
Propagation Delay (L-H) vs. Overdrive (1)



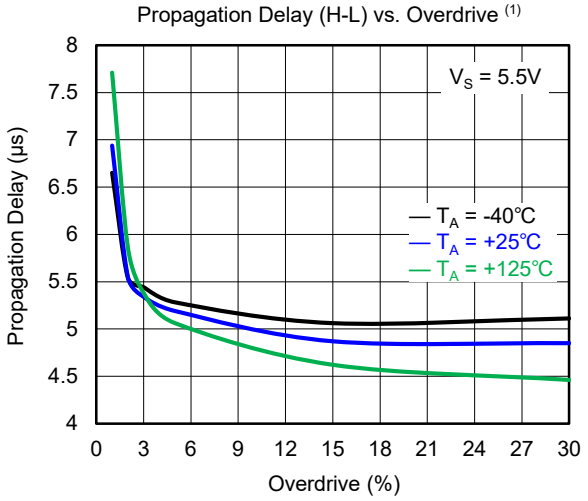
Propagation Delay (H-L) vs. Overdrive (1)



Propagation Delay (L-H) vs. Overdrive (1)



Propagation Delay (H-L) vs. Overdrive (1)



NOTE: 1. Overdrive = $|(V_{INX}/V_{IT} - 1) \times 100\%|$.

FUNCTIONAL BLOCK DIAGRAMS

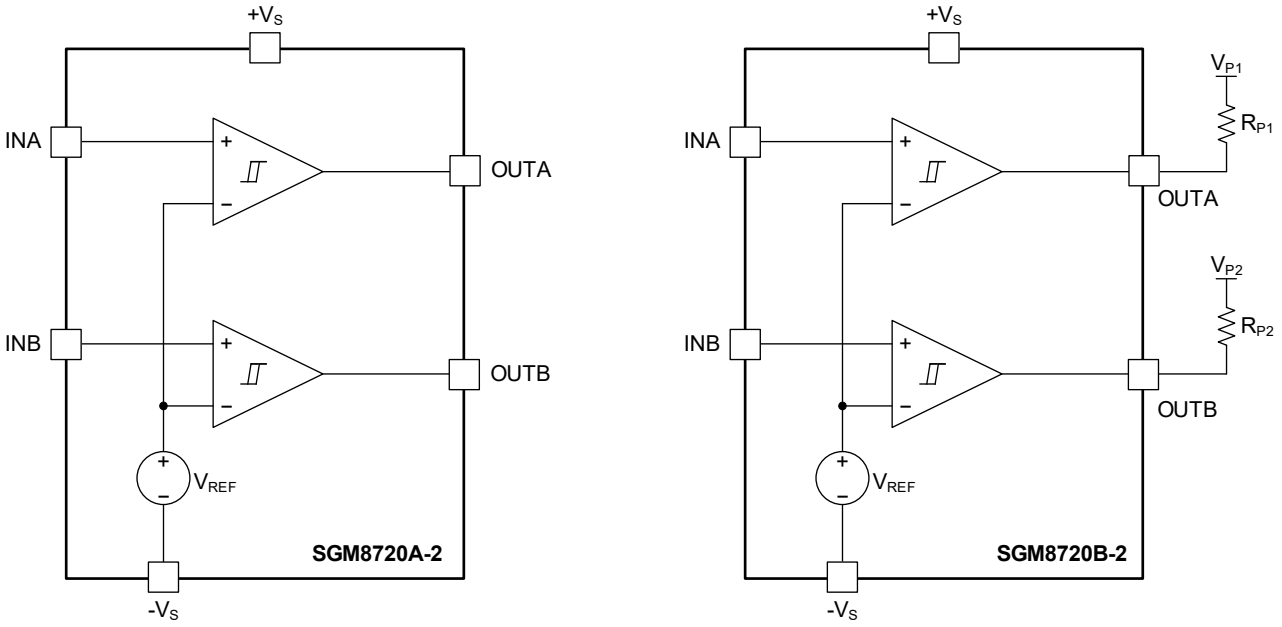


Figure 2. Block Diagram

DETAILED DESCRIPTION

Feature Description

The SGM8720-2 series is a dual-channel, low-power comparator in a compact package. The device integrates a high-precision reference and features 60mV (TYP) of internal hysteresis.

Device Functional Modes

If $+V_S$ is below V_{POR}, OUTA and OUTB are undefined and must not be relied upon for proper system operation.

Inputs (INA, INB)

INx supports 0V to 5.5V input range independent of supply voltage (including $+V_S$ = 0V). For noisy environments, a 1nF to 100nF bypass capacitor from INx to $-V_S$ is recommended.

The SGM8720-2 series is a dual-channel comparator. The device integrates a high-precision reference and features 60mV (TYP) of internal hysteresis. The comparator is trimmed so that V_{IT+} and V_{IT-} are the rising and falling thresholds, respectively. Consequently, OUTx is active low below V_{IT-} and active high above V_{IT+}. Threshold overdrive is defined as the amount by which V_{INA} or V_{INB} exceeds the specified threshold. The smaller this overdrive, the slower the OUTA or OUTB response.

Outputs (OUTA, OUTB)

The SGM8720A-2 provides the output stage of push-pull. The SGM8720B-2 provides the output of open-drain. With a single supply, the SGM8720B-2 supports pull-up voltage up to 5.5V, independent of the supply voltage.

Internal Hysteresis

Both SGM8720A-2 and SGM8720B-2 have 60mV hysteresis (V_{HYS}), which helps improve the noise immunity. Figure 3 shows the relationship among V_{IT-}, V_{IT+} and V_{HYS}. OUTx goes low when INx drops below V_{IT-}, and goes high when INx exceeds V_{IT+}.

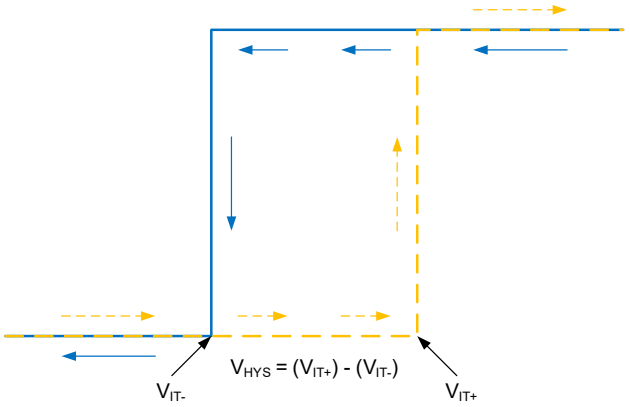


Figure 3. Hysteresis Transfer Curve

APPLICATION INFORMATION

Typical Applications

Monitoring Two Separate Rails

The SGM8720-2 monitors two independent rails for over-voltage. Figure 4 shows the application circuit using the SGM8720A-2. Taking INA and OUTA as an example, the comparator output is high when V_1 is greater than $V_{IT+} \times (R_2 + R_1)/R_2$, and is low when V_1 is less than $V_{IT-} \times (R_2 + R_1)/R_2$. With R_1 = 1.2MΩ, R_2 = 300kΩ, R_3 = 910kΩ, R_4 = 412kΩ and $+V_S$ = 3.3V, the test waveform of the SGM8720A-2 is illustrated in Figure 5.

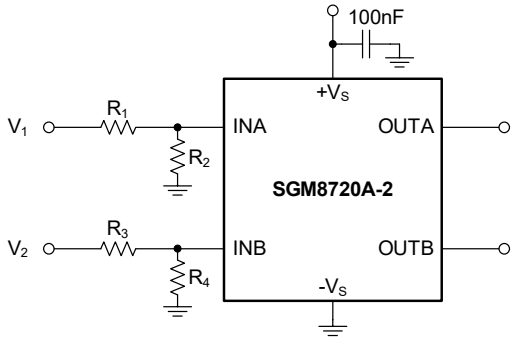


Figure 4. Monitoring Two Separate Rails Schematic with SGM8720A-2

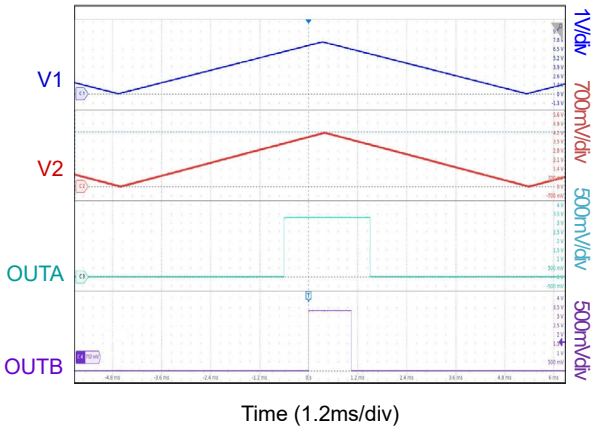


Figure 5. Monitoring Two Separate Rails Waveform with SGM8720A-2

Early Warning Detection

The SGM8720-2 series can be used for early warning detection. Figure 6 shows the application circuit using the SGM8720A-2. $V_{INA} = V_{IN} \times (R_2 + R_3)/(R_1 + R_2 + R_3)$, $V_{INB} = V_{IN} \times R_3/(R_1 + R_2 + R_3)$. When V_{INx} exceeds V_{IT+}, OUTx is driven high; when V_{INx} falls below V_{IT-}, OUTx is driven low. With R_1 = 1.8MΩ, R_2 = 56kΩ, and R_3 = 820kΩ, the test waveform of the SGM8720A-2 is illustrated in Figure 7.

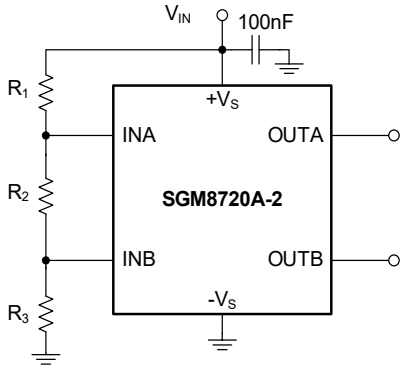


Figure 6. Early Warning Detection Schematic with SGM8720A-2

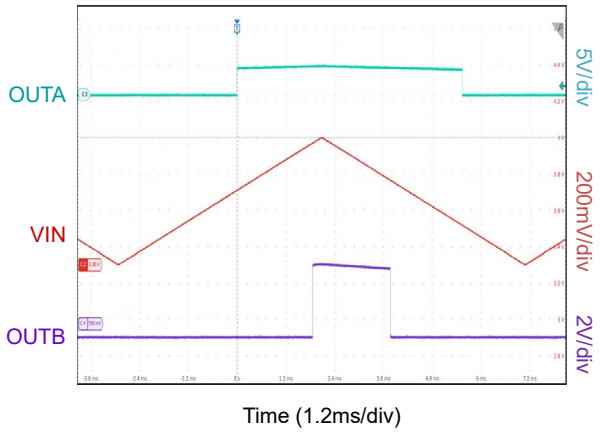


Figure 7. Early Warning Detection with SGM8720A-2

Power Supply Recommendations

The $+V_S$ pin of SGM8720-2 has a 7V absolute maximum rating. Designers must implement adequate protection against supply-line voltage spikes surpassing 7V.

In application, a 100nF bypass capacitor or greater capacitor is needed and should be placed as close as possible to $+V_S$ pin. Route the $+V_S$ supply trace as short as possible.

If INx > 0V before $+V_S$, and the INx is greater than V_{IT-}, OUTx may erroneously go high. Correct the output by reducing INx to below V_{IT-} or powering INx after $+V_S$.

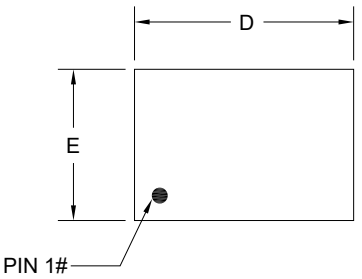
REVISION HISTORY

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

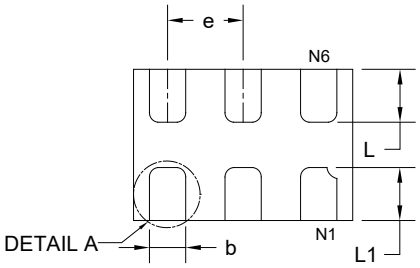
Changes from Original to REV.A (NOVEMBER 2026)	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

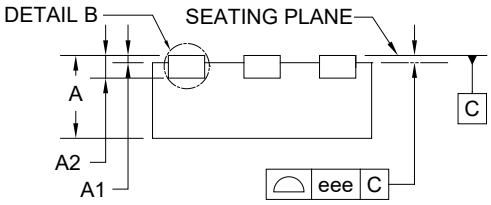
UTDFN-1.45×1-6AL



TOP VIEW



BOTTOM VIEW



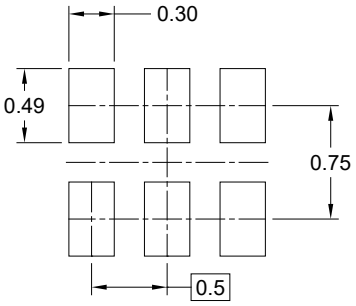
SIDE VIEW



DETAIL A
ALTERNATE TERMINAL CONSTRUCTION



DETAIL B
ALTERNATE CONSTRUCTION



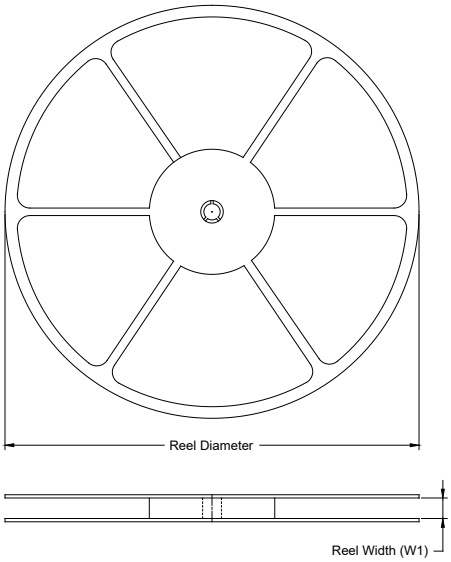
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.450	-	0.600
A1	-0.004	-	0.050
A2	0.150 REF		
b	0.150	-	0.300
D	1.374	-	1.526
E	0.924	-	1.076
e	0.500 BSC		
L	0.250	-	0.450
L1	0.250	-	0.500
L2	0.000	-	0.100
eee	0.050		

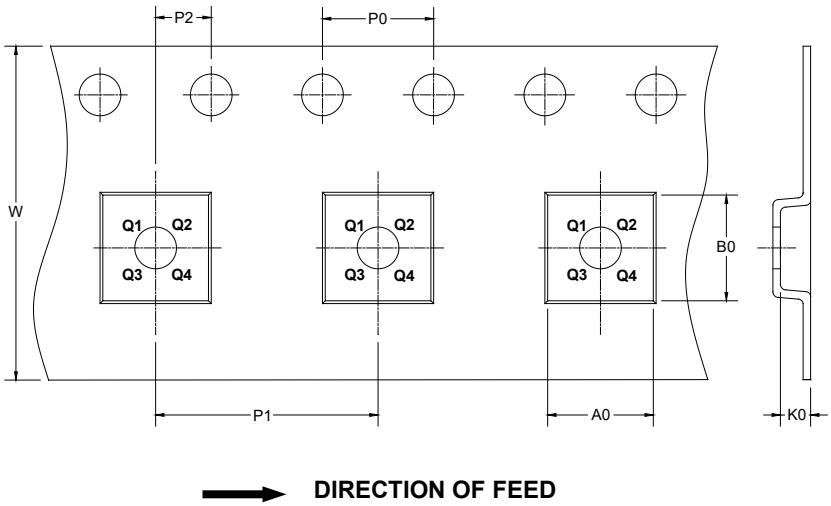
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



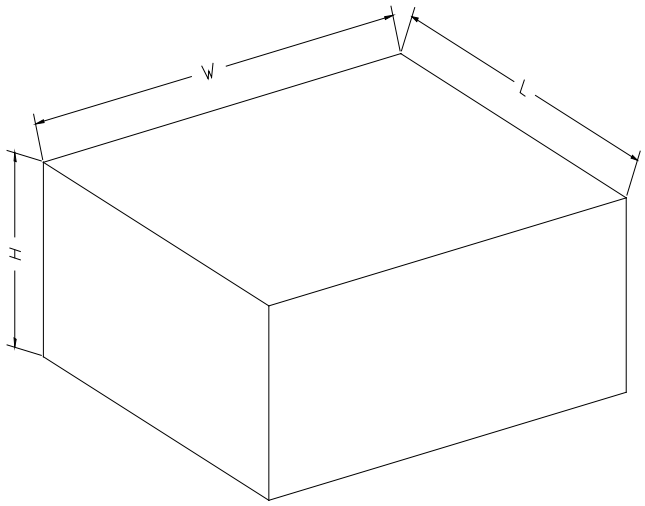
NOTE: The picture is only for reference. Please make the object as the standard.

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
UTDFN-1.45×1-6AL	7"	9.5	1.15	1.60	0.75	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