SGM8779-2
High Voltage, 2.4μA Ultra-Low Current, High Precision, Dual Differential Comparator

GENERAL DESCRIPTION

The SGM8779-2 series is a dual, rail-to-rail input and output, micro-power and high precision voltage comparator optimized for high voltage operation. The device can operate from 1.65V to 40V single supply or from ±0.85V to ±20V dual power supplies. The SGM8779-2 series supports rail-to-rail input while input signal range is from $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V and input common mode voltage range is from $(-V_S)$ - 0.1V to $(+V_S)$ + 0.1V. The SGM8779-2 series consumes only 2.4μA low supply current.

The SGM8779-2 series features low input offset voltage of ±2.2mV (MAX). It is suitable for applications requiring precision.

The SGM8779-2 series supports open-drain or push-pull output. The SGM8779A-2 has an open-drain output structure that needs external pull-up resistor. The SGM8779B-2 has a push-pull output structure, which is capable of sinking and sourcing milliamps of current when driving loads.

The SGM8779-2 series is available in a Green SOIC-8 package. It is rated over the -40℃ to +125℃ operating temperature range.

FEATURES

- **Wide Supply Ranges**
  Single Supply: 1.65V to 40V
  Dual Supplies: ±0.85V to ±20V
- **Ultra-Low Supply Current: 2.4μA (TYP)**
- **Low Input Offset Voltage: ±2.2mV (MAX) at +25℃**
- **Low Input Bias Current: ±200pA (MAX)**
- **Rail-to-Rail Input and Output**
- **Internal Hysteresis: ±2.5mV (TYP)**
- **Common Mode Rejection Ratio: 105dB (TYP)**
- **Power Supply Rejection Ratio: 105dB (TYP)**
- **Open-Drain Output: SGM8779A-2**
- **Push-Pull Output: SGM8779B-2**
- **Support CMOS or TTL Logic**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in a Green SOIC-8 Package**

APPLICATIONS

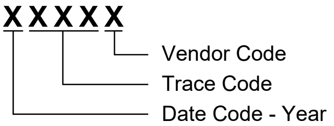
Power System Monitor
Medical Equipment
Industrial Application
Battery Management System

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8779A-2 (Open-Drain)	SOIC-8	-40℃ to +125℃	SGM8779A-2XS8G/TR	SGM 8779A2XS8 XXXXX	Tape and Reel, 4000
SGM8779B-2 (Push-Pull)	SOIC-8	-40℃ to +125℃	SGM8779B-2XS8G/TR	SGM 8779B2XS8 XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor 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

Supply Voltage, $+V_S$ to $-V_S$ 42V
Differential Input Voltage, $|V_{ID}|$ 42V
Input/Output Voltage Range........ $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Junction Temperature .... +150℃
Storage Temperature Range.......... -65℃ to +150℃
Lead Temperature (Soldering, 10s) .... +260℃
ESD Susceptibility
HBM (SGM8779A -2).......... 2000V
HBM (SGM8779B-2).......... 8000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Power Supply Range .... 1.65V to 40V
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

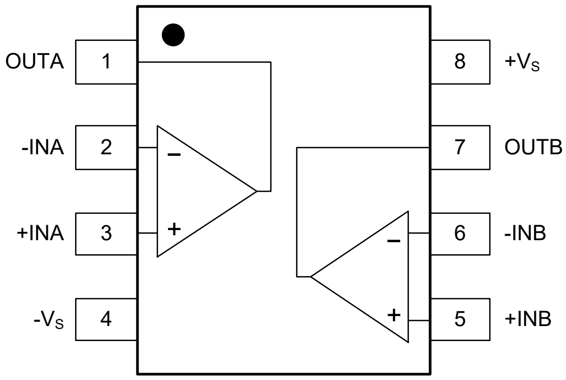
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

SGM8779A/B-2 (TOP VIEW)



SOIC-8

ELECTRICAL CHARACTERISTICS (SGM8779A-2)

(V_S = 1.65V to 40V, 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_{CM} = 0V	+25℃		±0.8	±2.2	mV
			Full			±2.5	
Input Bias Current	I_B	V_{CM} = 0V	+25℃		±10	±200	pA
			Full			6000	
Input Offset Current	I_{OS}	V_{CM} = 0V	+25℃		±10	±200	pA
			Full			2000	
Input Common Mode Voltage Range [1]	V_{CM}		Full	$(-V_S)$ - 0.1		$(+V_S)$ + 0.1	V
Common Mode Rejection Ratio	CMRR	V_S = ±20V, V_{CM} = $(-V_S)$ to $(+V_S)$	+25℃	93	105		dB
			Full	90			
Power Supply Rejection Ratio	PSRR		+25℃	93	105		dB
			Full	90			
Low-Level Output Voltage	V_{OL}	V_S = 1.65V, I_{OL} = -8mA, V_{ID} = -0.2V	+25℃		260	370	mV
			Full			520	
		V_S = 5V to 40V, I_{OL} = -8mA, V_{ID} = -0.2V	+25℃		140	180	
			Full			300	
Output Short-Circuit Current	I_{SINK}	V_S = 1.65V, V_{OL} = $(-V_S)$ + 1.5V, V_{ID} = -0.2V	+25℃	9	13		mA
		V_S = 5V to 40V, V_{OL} = $(-V_S)$ + 1.5V, V_{ID} = -0.2V	+25℃	51	62		
High-Level Output Current	I_{OH}	V_{OH} - $(-V_S)$ = 2.8V, V_{ID} = 0.2V	+25℃		40	75	nA
			Full			100	
		V_{OH} - $(-V_S)$ = 36V, V_{ID} = 0.2V	+25℃		40	85	
			Full			120	
Supply Current	I_S	I_{OUT} = 0A	+25℃		2.4	2.6	μA
			Full			4	
Input Hysteresis Voltage	V_{HYS}		+25℃	0.8	2.5	3.8	mV
			Full			4.9	

NOTE:
1. Any input voltage should not be lower than $(-V_S)$ - 0.3V. The maximum input common mode voltage is $(+V_S)$ + 0.1V.

ELECTRICAL CHARACTERISTICS (SGM8779B-2)

(V_S = 1.65V to 40V, 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_{CM} = 0V	+25℃		±0.8	±2.2	mV
			Full			±2.5	
Input Bias Current	I_B	V_{CM} = 0V	+25℃		±10	±200	pA
			Full			6000	
Input Offset Current	I_{OS}	V_{CM} = 0V	+25℃		±10	±200	pA
			Full			2000	
Input Common Mode Voltage Range (1)	V_{CM}		Full	$(-V_S)$ - 0.1		$(+V_S)$ + 0.1	V
Common Mode Rejection Ratio	CMRR	V_S = ±20V, V_{CM} = $(-V_S)$ to $(+V_S)$	+25℃	93	105		dB
			Full	90			
Power Supply Rejection Ratio	PSRR		+25℃	93	105		dB
			Full	90			
Low-Level Output Voltage	V_{OL}	V_S = 1.65V, I_{OL} = -8mA, V_{ID} = -0.2V	+25℃		260	370	mV
			Full			520	
		V_S = 5V to 40V, I_{OL} = -8mA, V_{ID} = -0.2V	+25℃		140	180	
			Full			300	
High-Level Output Voltage	V_{OH}	V_S = 1.65V, I_{OH} = 8mA, V_{ID} = 0.2V	+25℃		560	850	mV
			Full			1200	
		V_S = 5V to 40V, I_{OH} = 8mA, V_{ID} = 0.2V	+25℃		420	600	
			Full			900	
Output Short-Circuit Current	I_{SINK}	V_S = 1.65V, V_{OL} = $(-V_S)$ + 1.5V, V_{ID} = -0.2V	+25℃	9	13		mA
		V_S = 5V to 40V, V_{OL} = $(-V_S)$ + 1.5V, V_{ID} = -0.2V	+25℃	51	62		
Output Short-Circuit Current (2)	I_{SOURCE}	V_S = 1.65V, V_{OL} = $(+V_S)$ - 1.5V, V_{ID} = 0.2V	+25℃	9	16		mA
		V_S = 5V to 40V, V_{OL} = $(+V_S)$ - 1.5V, V_{ID} = 0.2V	+25℃	16	24		
Supply Current	I_S	I_{OUT} = 0A	+25℃		2.4	2.6	μA
			Full			4	
Input Hysteresis Voltage	V_{HYS}		+25℃	0.8	2.5	3.8	mV
			Full			4.9	

NOTES:
1. Any input voltage should not be lower than $(-V_S)$ - 0.3V. The maximum input common mode voltage is $(+V_S)$ + 0.1V.
2. When the output is short-circuited to either $(-V_S)$ or $(+V_S)$, continuous shorting at high supply voltages may cause significant overheating. This can elevate the junction temperature beyond its maximum limit, potentially resulting in irreversible damage to the device.

SWITCHING CHARACTERISTICS (SGM8779A-2)

(V_S = 5V, V_{CM} = 0V or (+V_S), C_L = 15pF, Full = -40℃ to +125℃, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX (1)	UNITS
Propagation Delay	t_{PLH}	V_{OD} = 20mV, R_{PULL} = 4.7kΩ	+25℃		3.5	5.5	μs
			Full			6.5	
		V_{OD} = 100mV, R_{PULL} = 4.7kΩ	+25℃		2.5	4	
			Full			5	
	t_{PHL}	V_{OD} = 20mV	+25℃		3	4.5	
			Full			5	
		V_{OD} = 100mV	+25℃		2	3	
			Full			3.5	
Propagation Delay Mismatch	t_{SKEW}	V_{OD} = 20mV or 100mV, R_{PULL} = 4.7kΩ	Full		650	1500	ns
Maximum Toggle Frequency	f_{MAX}	V_{CM} = 0V, R_{PULL} = 4.7kΩ	+25℃		250		kHz

NOTE:
1. Specified by design and characterization, not production tested.

SWITCHING CHARACTERISTICS (SGM8779B-2)

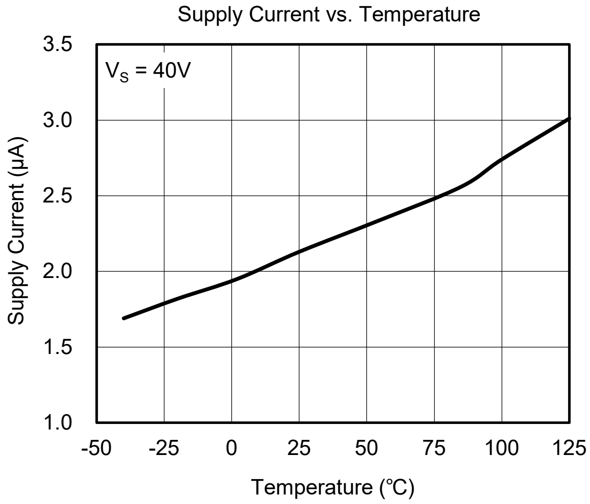
(V_S = 5V, V_{CM} = 0V or (+V_S), C_L = 15pF, Full = -40℃ to +125℃, typical values are at T_A = +25℃, unless otherwise noted.)

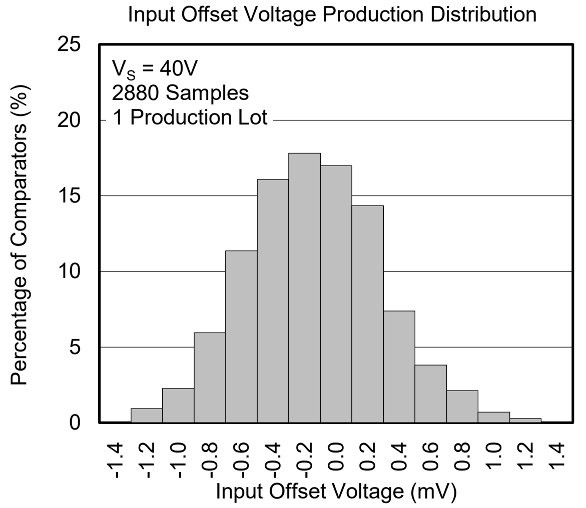
PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX (1)	UNITS
Propagation Delay	t_{PLH}	V_{OD} = 20mV	+25℃		3.5	5.5	μs
			Full			7	
		V_{OD} = 100mV	+25℃		2.5	4	
			Full			5.5	
	t_{PHL}	V_{OD} = 20mV	+25℃		3	4.5	
			Full			5.5	
		V_{OD} = 100mV	+25℃		2	3	
			Full			4.5	
Propagation Delay Mismatch	t_{SKEW}	V_{OD} = 20mV or 100mV	Full		500	1150	ns
Maximum Toggle Frequency	f_{MAX}	V_{CM} = 0V	+25℃		250		kHz

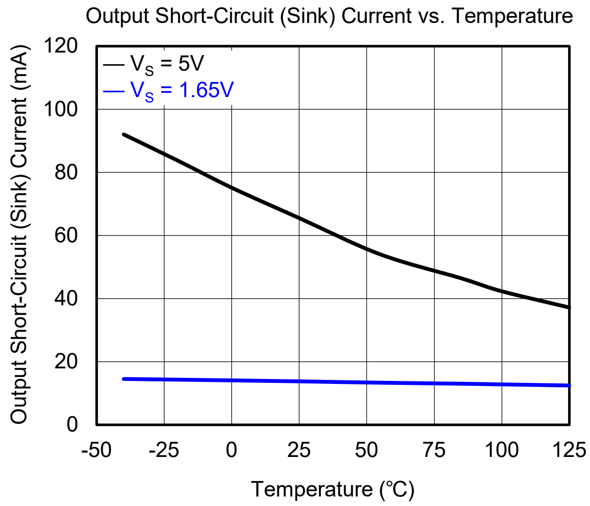
NOTE:
1. Specified by design and characterization, not production tested.

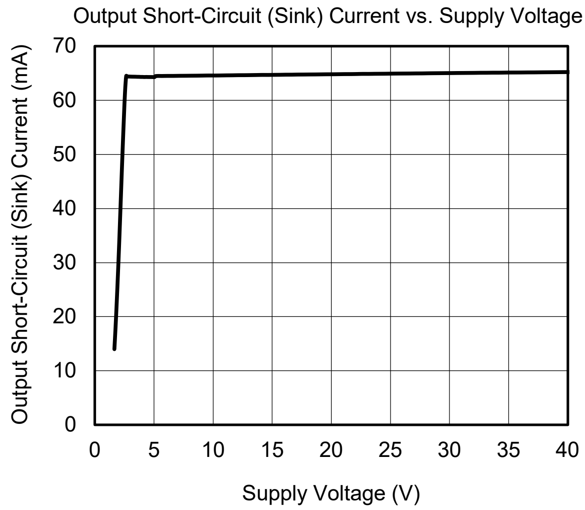
TYPICAL PERFORMANCE CHARACTERISTICS

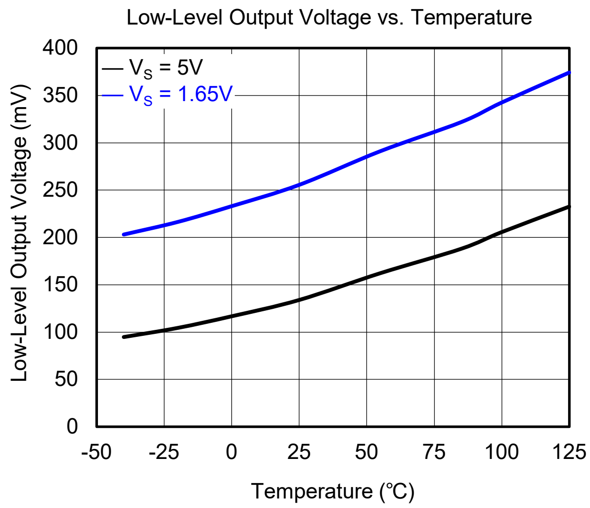
Performance measured with the SGM8779A/B-2 at T_A = +25℃, unless otherwise noted.

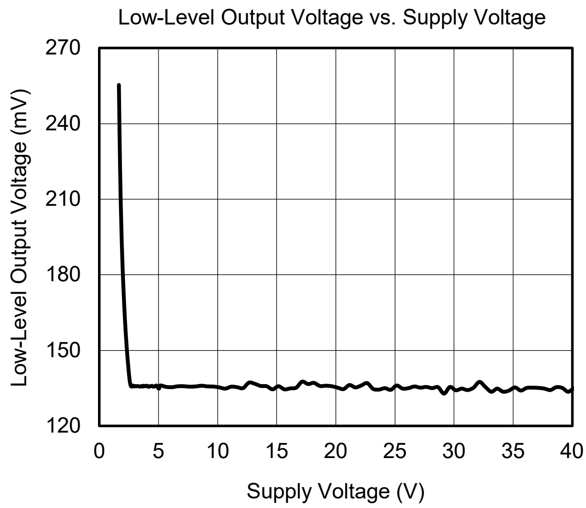






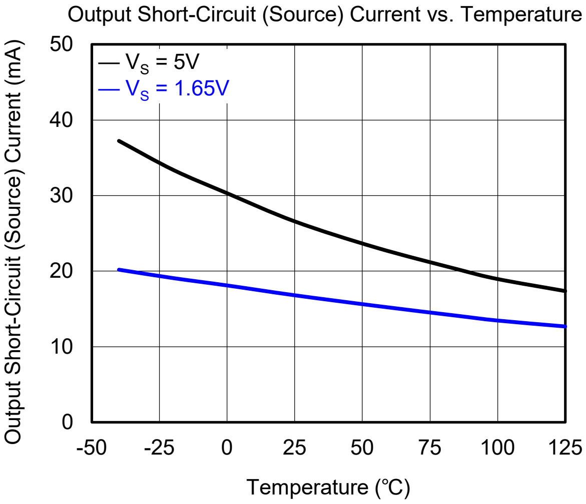


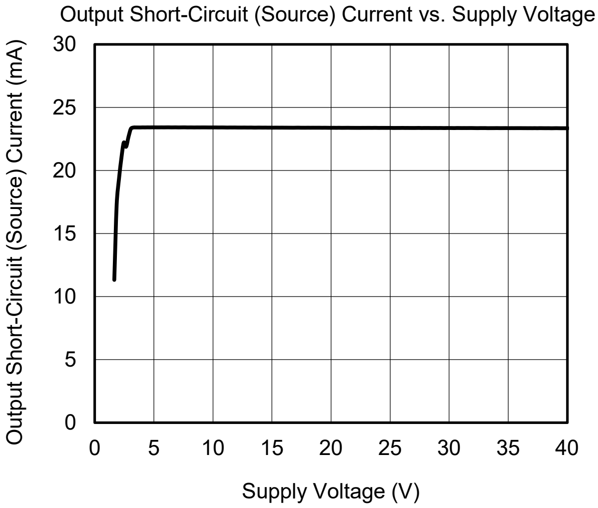


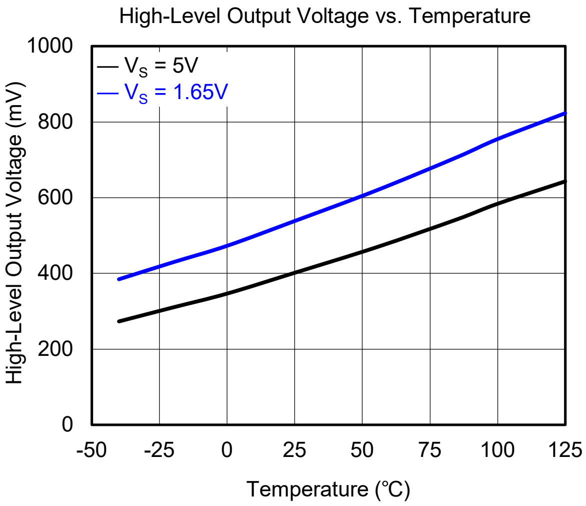


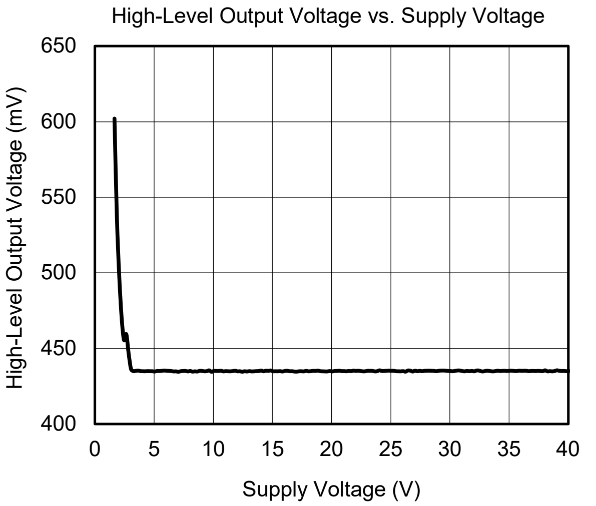
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Performance measured with the SGM8779B-2 at T_A = +25℃, unless otherwise noted.





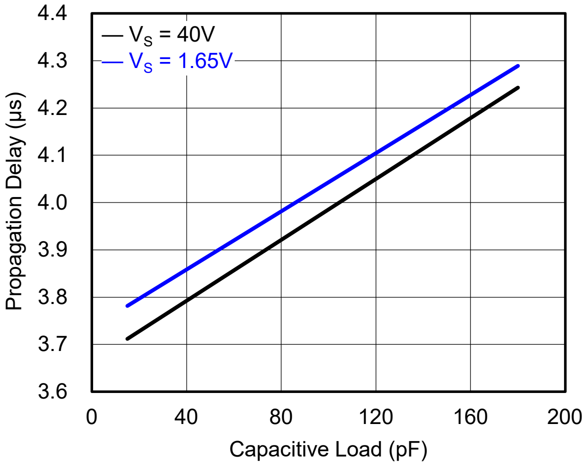




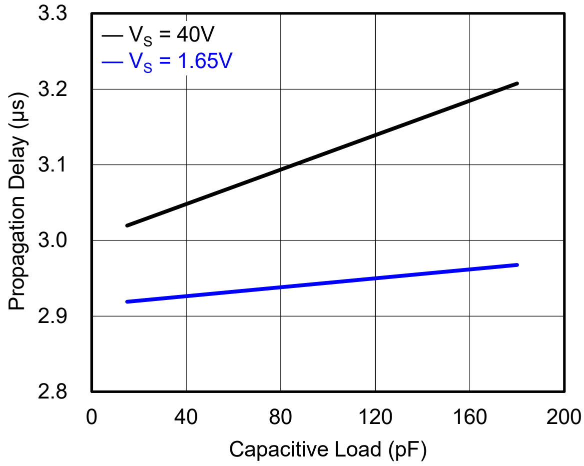
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Performance measured with the SGM8779A-2 at T_A = +25℃, unless otherwise noted.

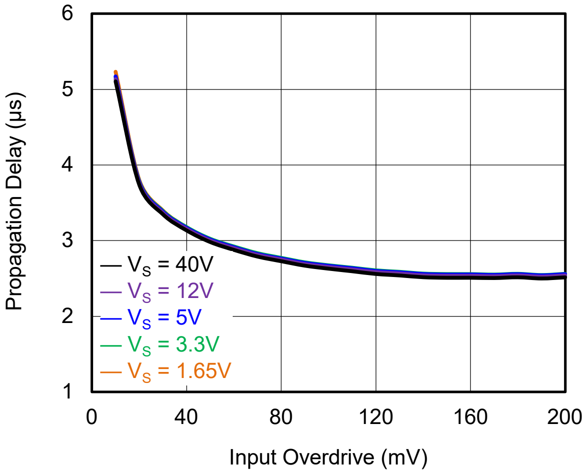
Propagation Delay (L-H) vs. Capacitive Load



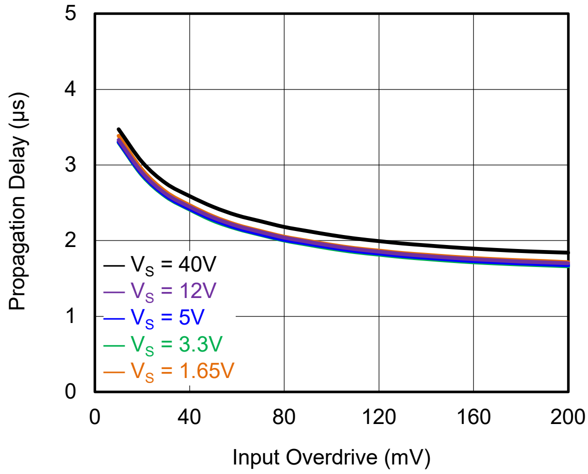
Propagation Delay (H-L) vs. Capacitive Load



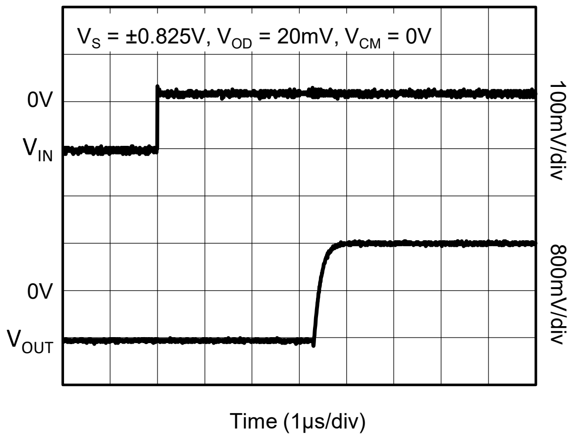
Propagation Delay (L-H) vs. Input Overdrive



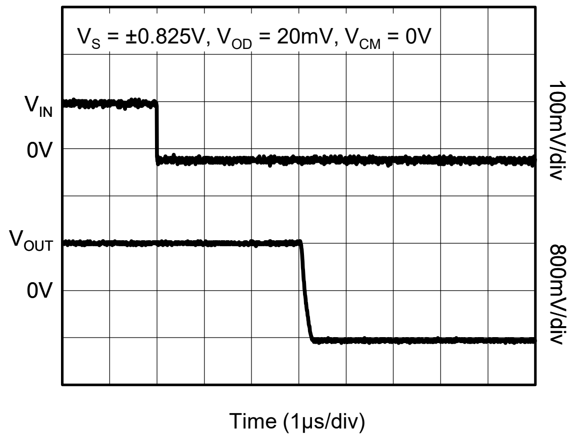
Propagation Delay (H-L) vs. Input Overdrive



Propagation Delay (L-H)



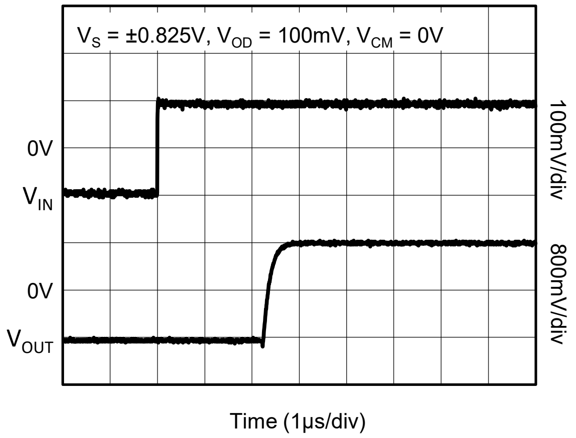
Propagation Delay (H-L)



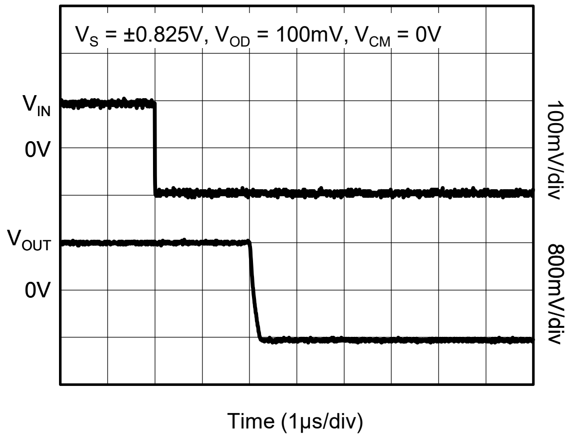
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Performance measured with the SGM8779A-2 at T_A = +25℃, unless otherwise noted.

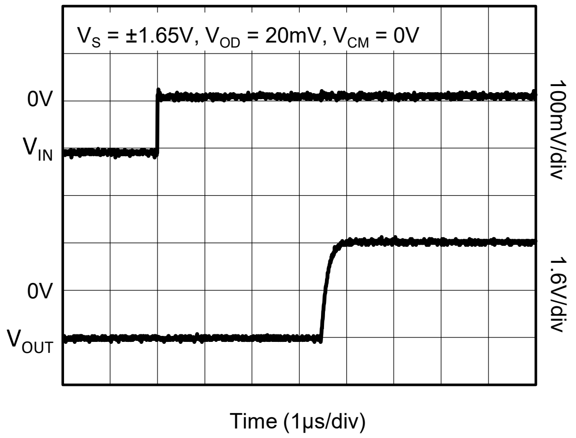
Propagation Delay (L-H)



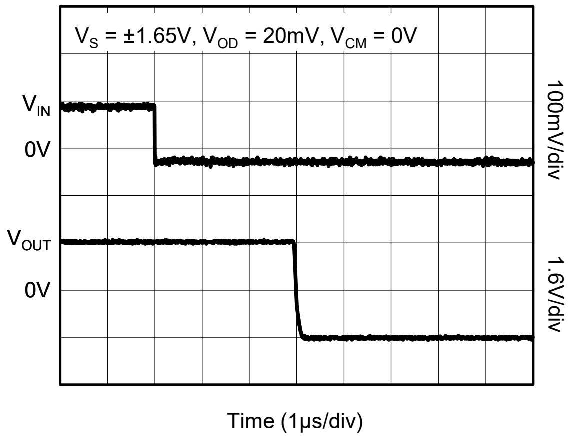
Propagation Delay (H-L)



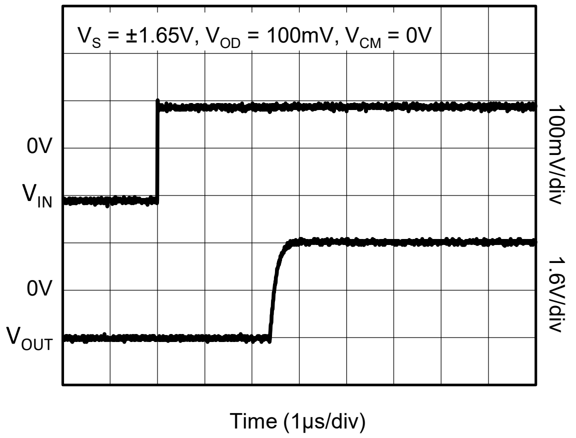
Propagation Delay (L-H)



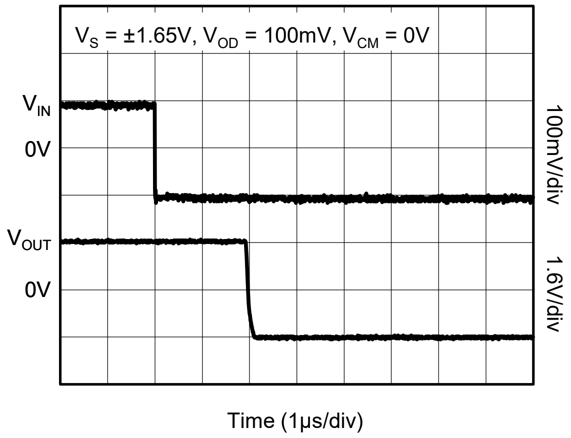
Propagation Delay (H-L)



Propagation Delay (L-H)



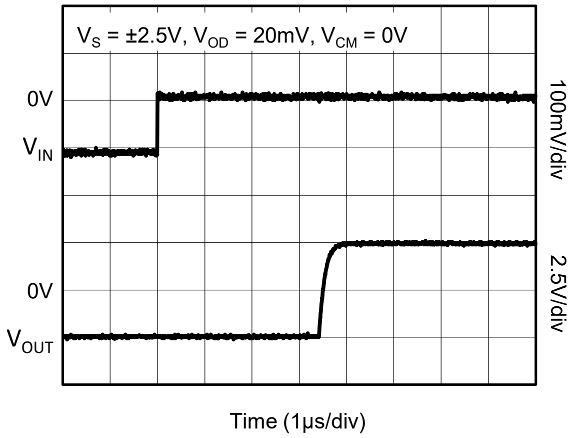
Propagation Delay (H-L)



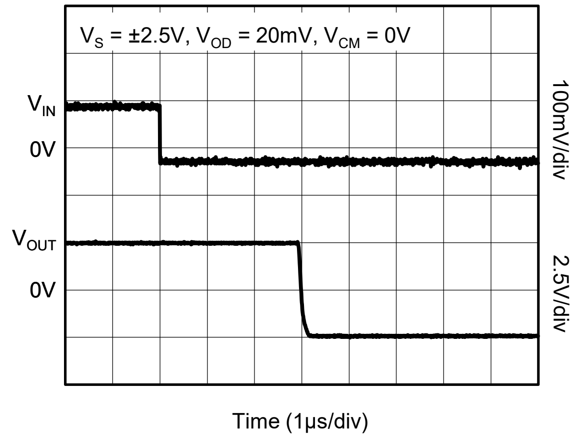
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Performance measured with the SGM8779A-2 at T_A = +25℃, unless otherwise noted.

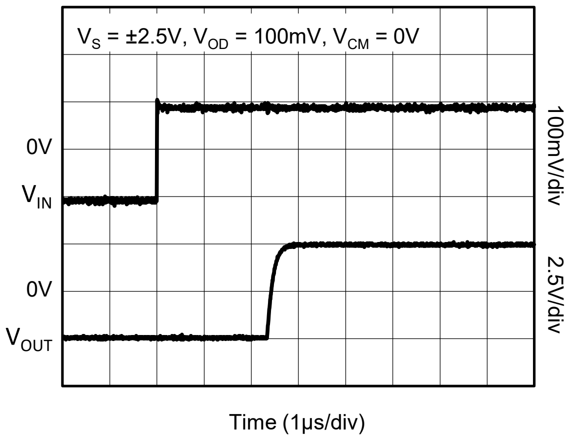
Propagation Delay (L-H)



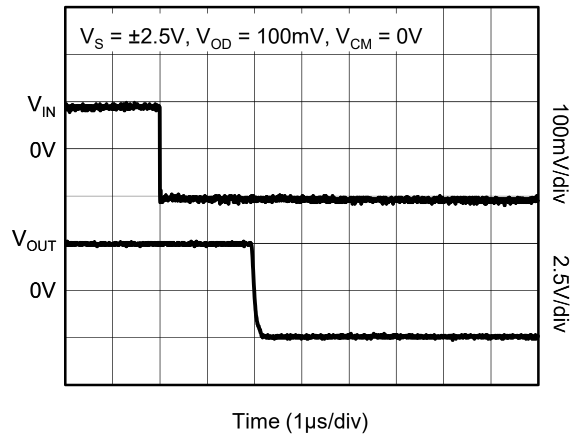
Propagation Delay (H-L)



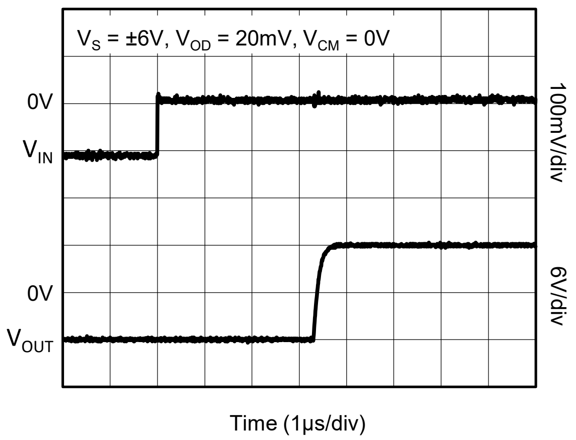
Propagation Delay (L-H)



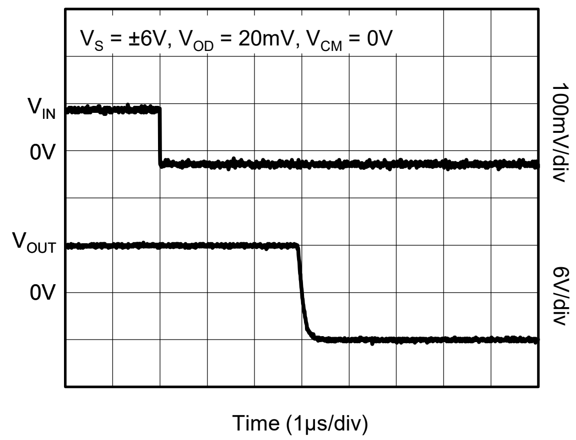
Propagation Delay (H-L)



Propagation Delay (L-H)

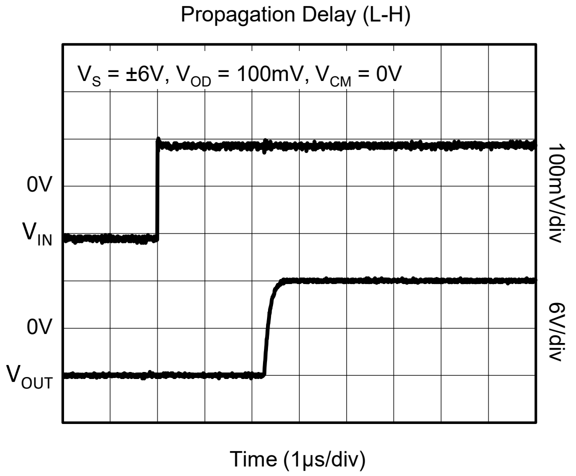


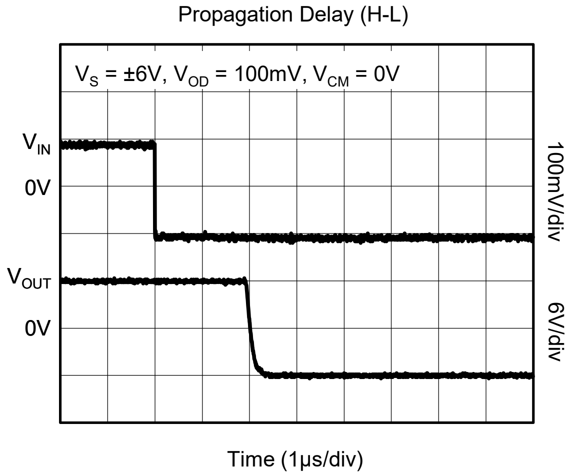
Propagation Delay (H-L)

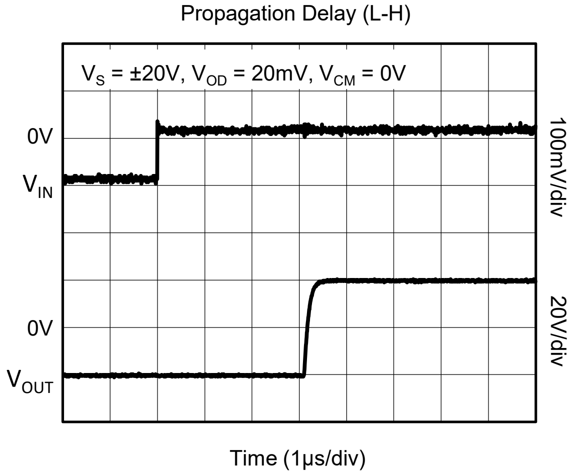


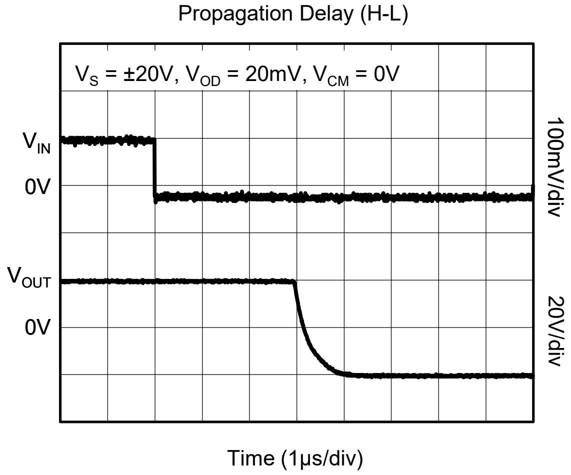
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

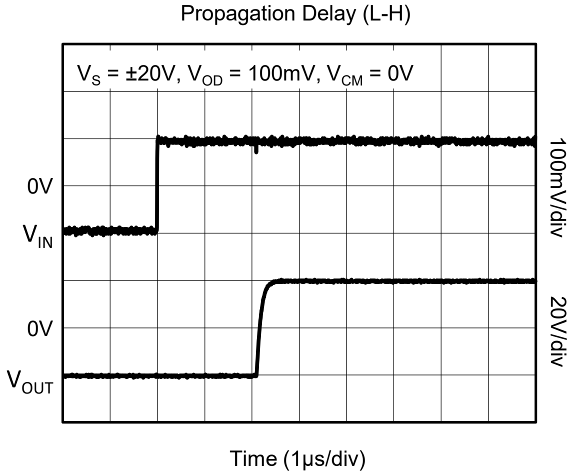
Performance measured with the SGM8779A-2 at T_A = +25℃, unless otherwise noted.

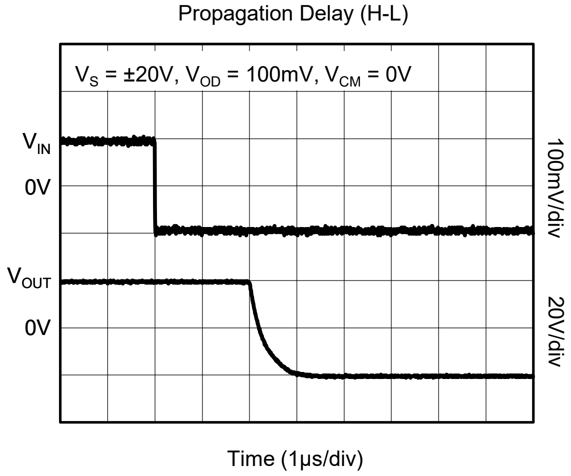








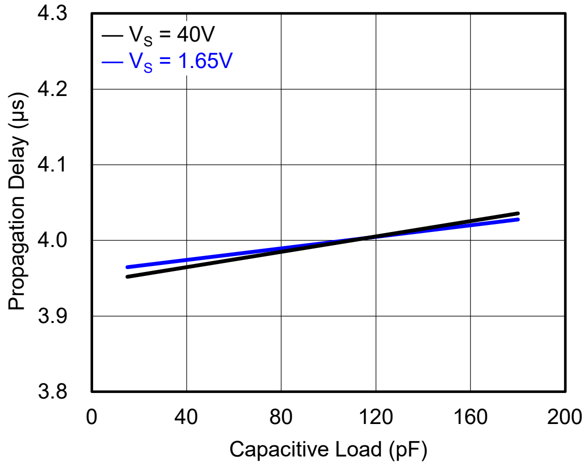




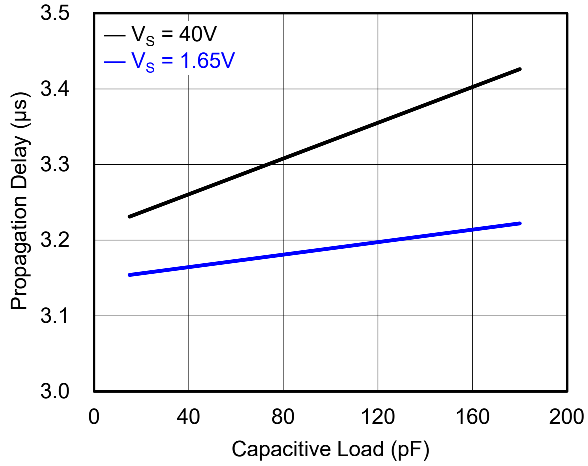
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Performance measured with the SGM8779B-2 at T_A = +25℃, unless otherwise noted.

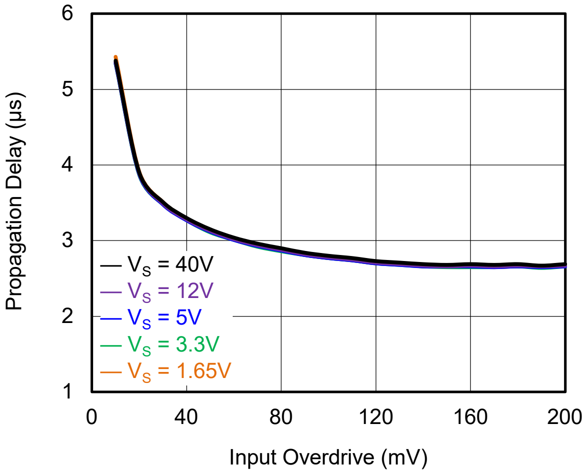
Propagation Delay (L-H) vs. Capacitive Load



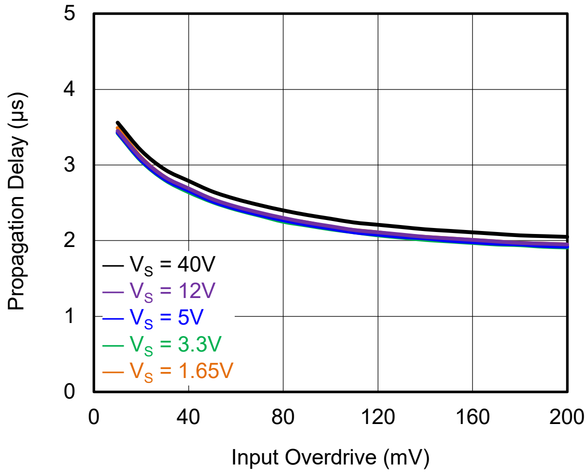
Propagation Delay (H-L) vs. Capacitive Load



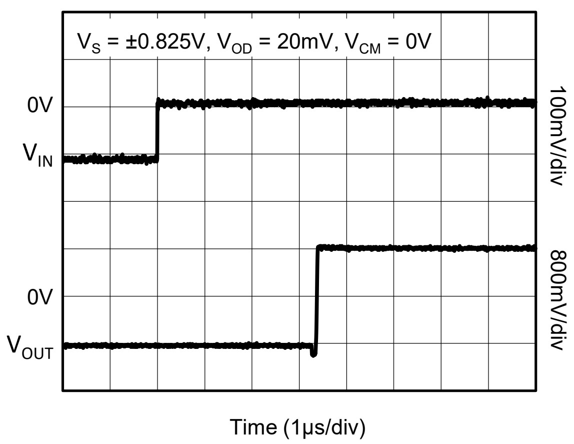
Propagation Delay (L-H) vs. Input Overdrive



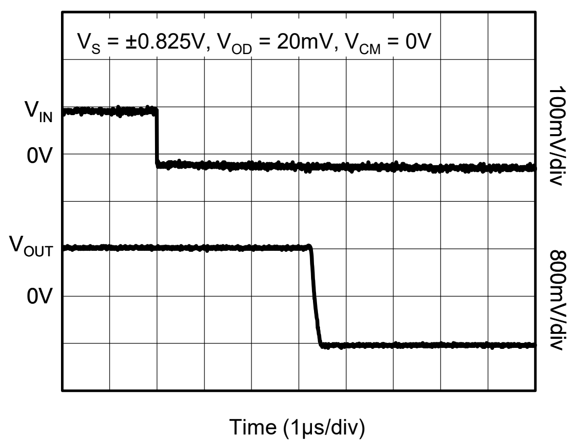
Propagation Delay (H-L) vs. Input Overdrive



Propagation Delay (L-H)



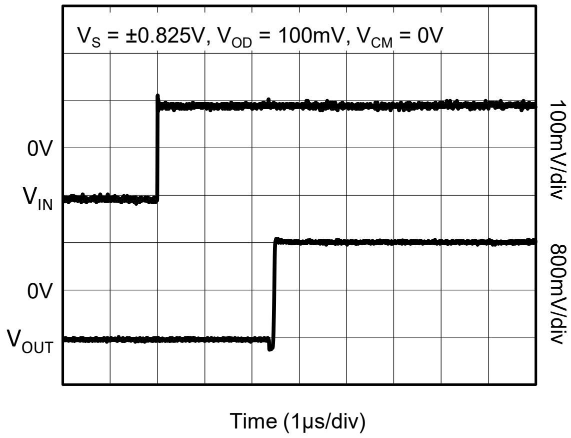
Propagation Delay (H-L)



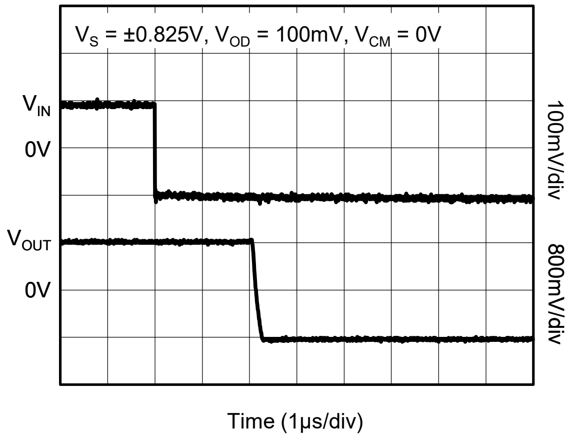
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Performance measured with the SGM8779B-2 at T_A = +25℃, unless otherwise noted.

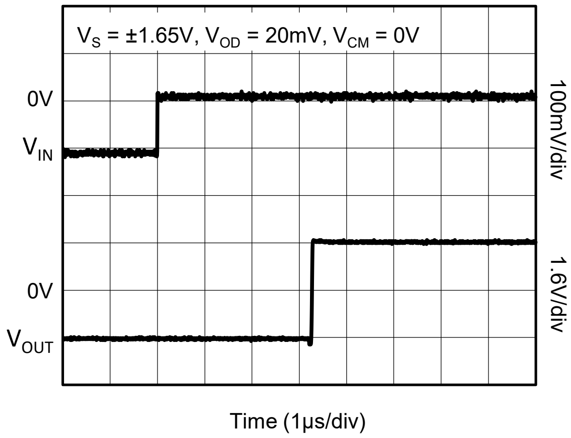
Propagation Delay (L-H)



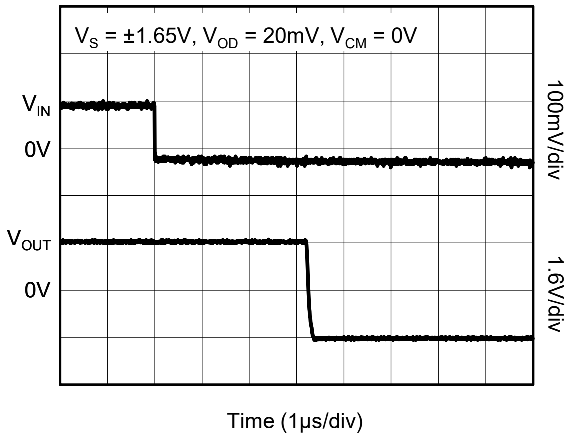
Propagation Delay (H-L)



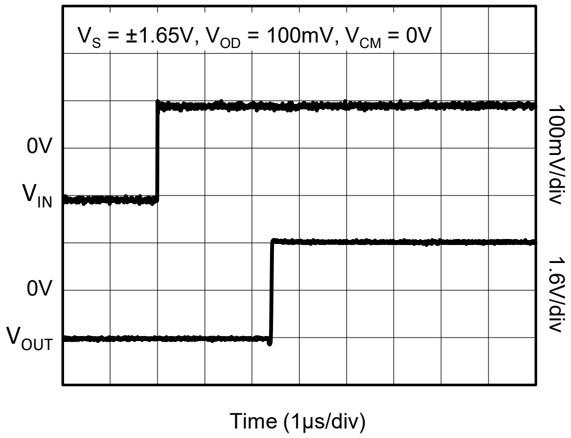
Propagation Delay (L-H)



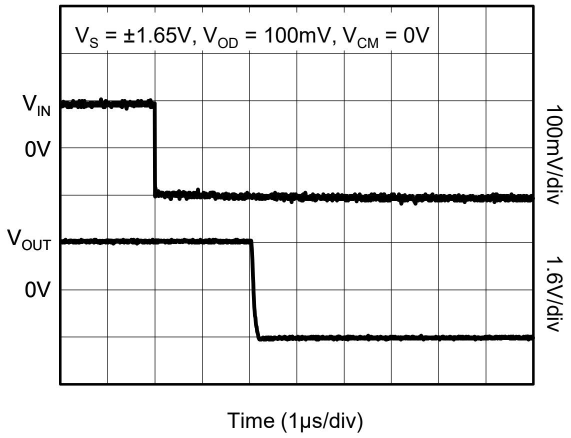
Propagation Delay (H-L)



Propagation Delay (L-H)



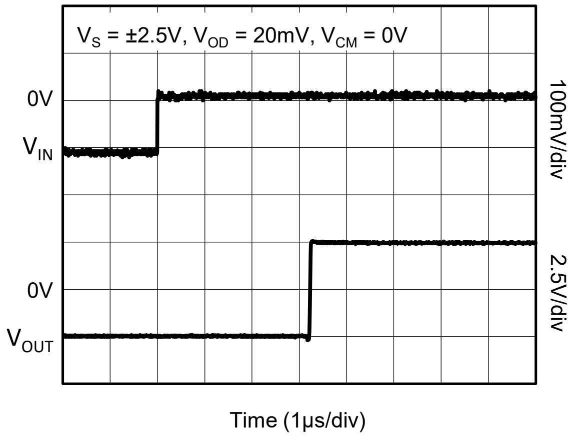
Propagation Delay (H-L)



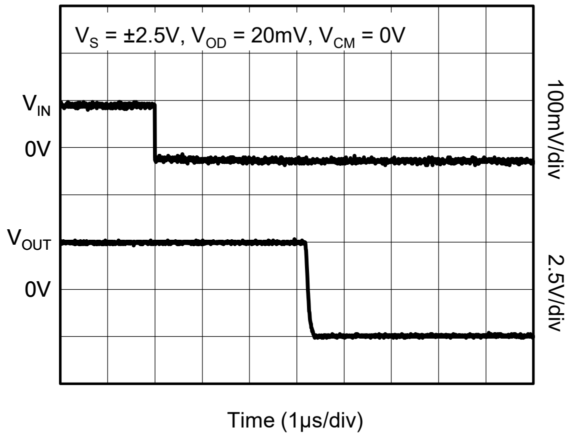
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Performance measured with the SGM8779B-2 at T_A = +25℃, unless otherwise noted.

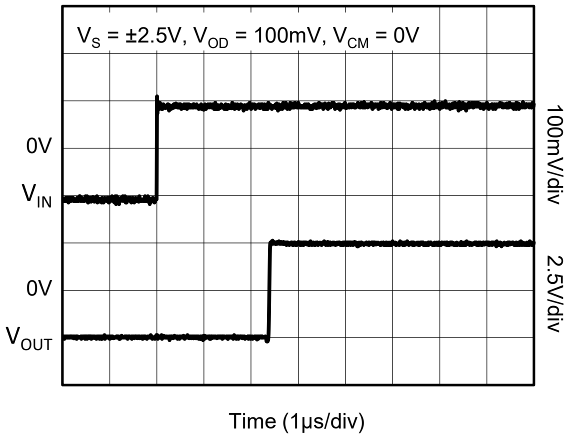
Propagation Delay (L-H)



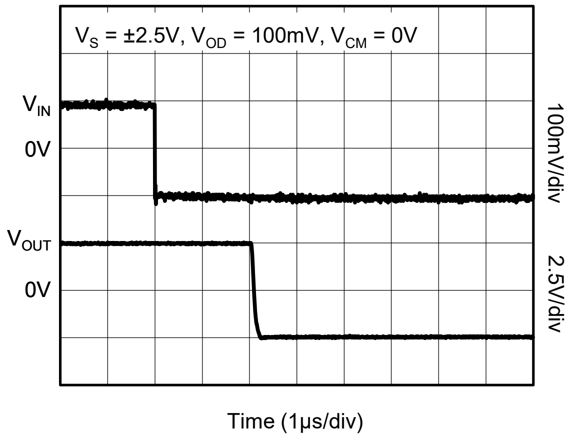
Propagation Delay (H-L)



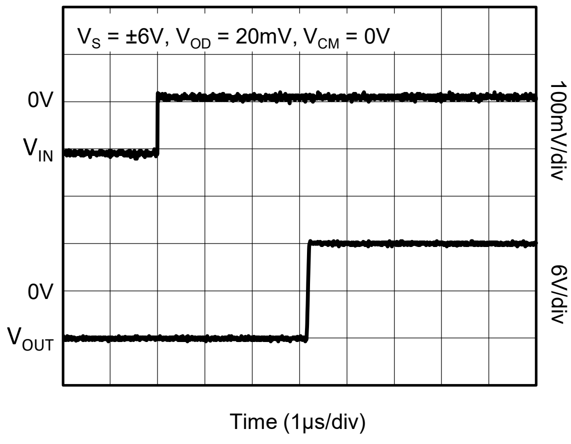
Propagation Delay (L-H)



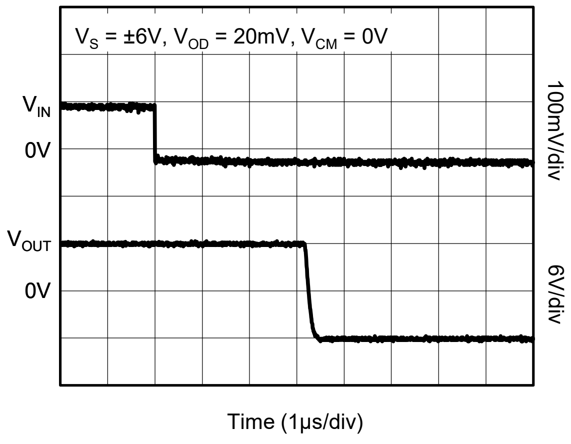
Propagation Delay (H-L)



Propagation Delay (L-H)



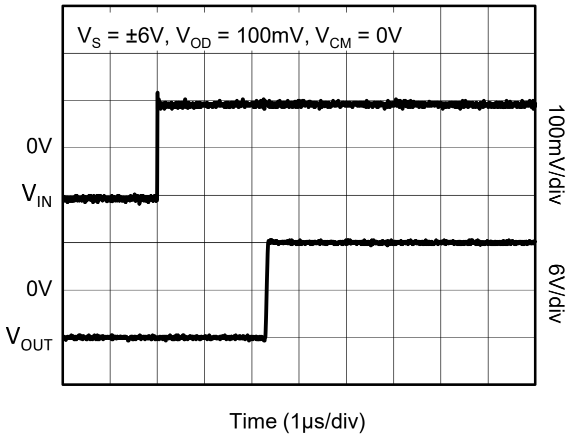
Propagation Delay (H-L)



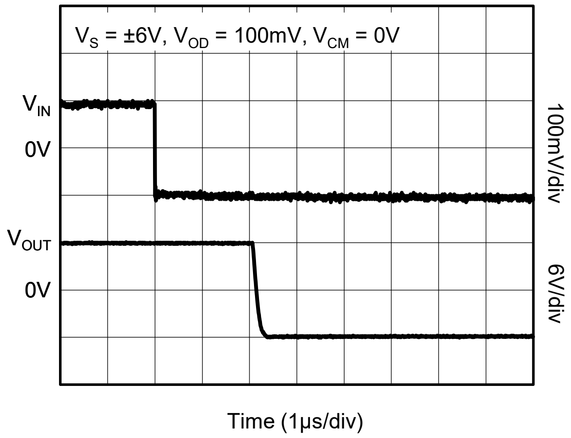
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Performance measured with the SGM8779B-2 at T_A = +25℃, unless otherwise noted.

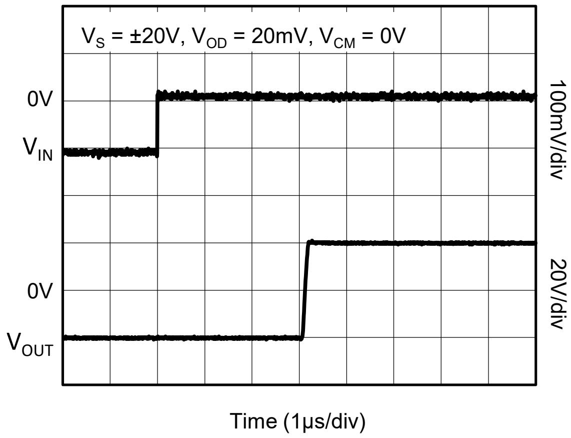
Propagation Delay (L-H)



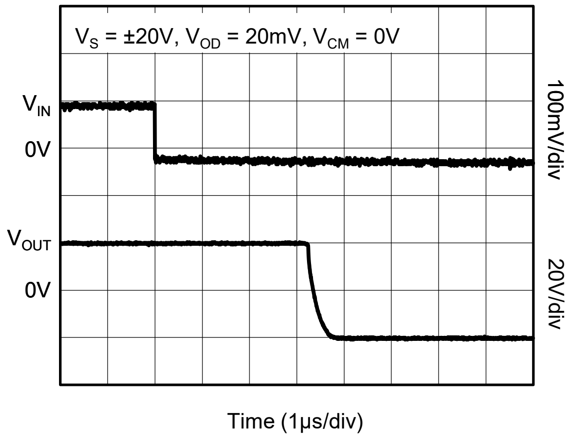
Propagation Delay (H-L)



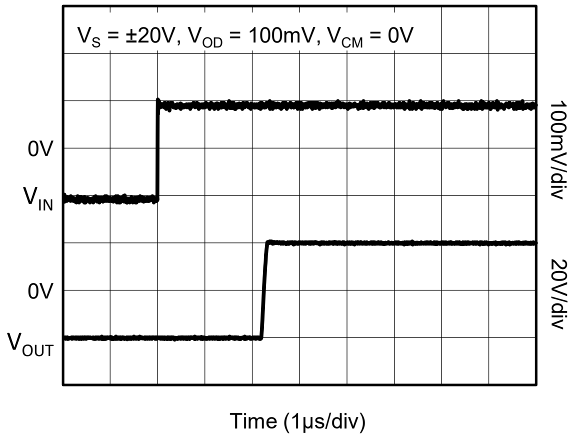
Propagation Delay (L-H)



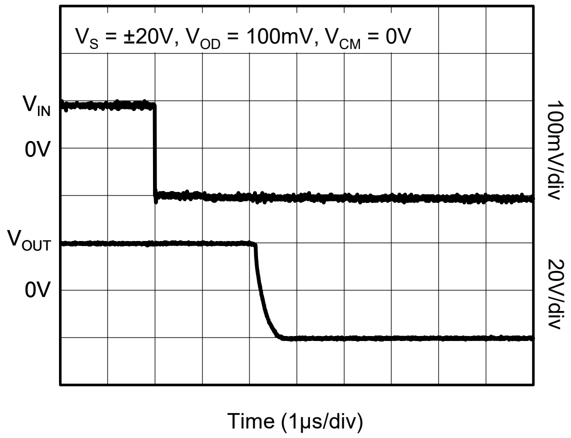
Propagation Delay (H-L)



Propagation Delay (L-H)



Propagation Delay (H-L)



DETAILED DESCRIPTION

The SGM8779-2 series is a dual, rail-to-rail input, high precision, low power comparator. The wide input voltage range and power supply range make the device a good choice for industrial equipment. The SGM8779A-2 has an open-drain output structure that needs external pull-up resistor. The SGM8779B-2 has a push-pull output structure without external circuits. The SGM8779-2 can be compatible with CMOS and TTL logics.

Output Structure

In Figure 1, the SGM8779A-2 has a current-driven open-drain output stage. When output is changed from logic high to low, the changed sink current pulls output pin to logic low. Beginning this transition, larger sink current is used to create a high slew rate transit from high to low. Once the output voltage reaches V_{OL}, it will reduce the sink current to a just right value to maintain the V_{OL} static condition. In Figure 2, the SGM8779B-2 has a current-driven push-pull output stage. In addition to the above capability of sinking current, it is also capable of sourcing current when driving loads. This current-driven output stage will significantly reduce the power consumption in application system.

If low slew rate transition is needed in system design, adjusting the load capacitance will change the slew rate. The heavier capacitive load will slow down the output voltage transition. This feature will be used to reduce the interference generated by fast edge of transition between 1 and 0 in noise-sensitive system.

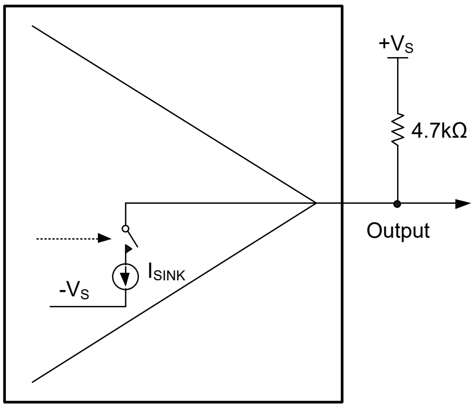


Figure 1. SGM8779A-2 Open-Drain Output Structure

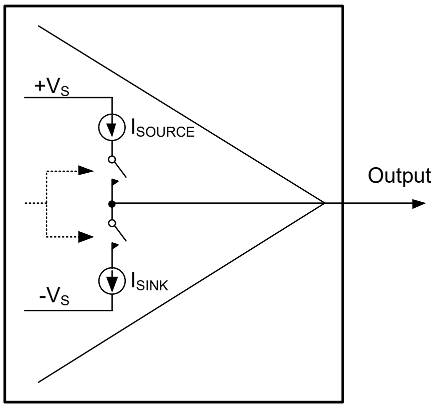


Figure 2. SGM8779B-2 Push-Pull Output Structure

APPLICATION INFORMATION

Layout and Bypassing

Good power supply decoupling, layout and grounding are very important for SGM8779-2 to realize the full high-speed capabilities in system, following skills will be used:

- A 0.1μF to 4.7μF range ceramic capacitor is used to provide good power supply decoupling. This ceramic capacitor must be placed as close to $+V_S$ pin as possible.
- For grounding, unbroken and low-inductance ground plane is a good choice.
- For Layout, use short PCB trace to avoid unwanted parasitic feedback around the comparator. SGM8779-2 must be soldered directly to the PCB and the socket is not recommended.

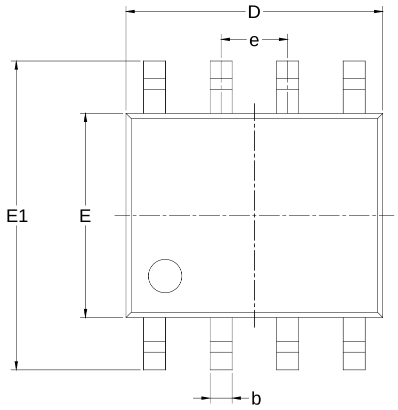
REVISION HISTORY

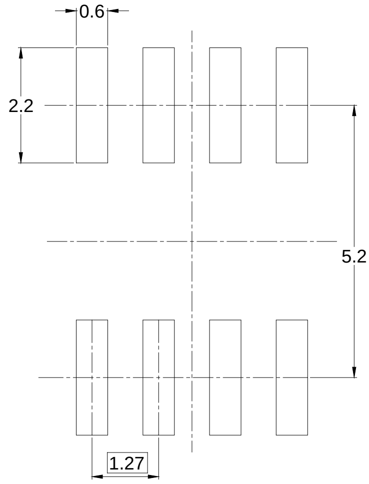
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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

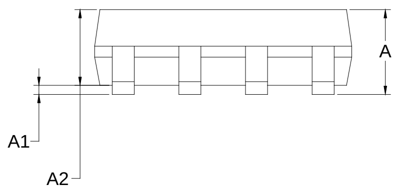
PACKAGE OUTLINE DIMENSIONS

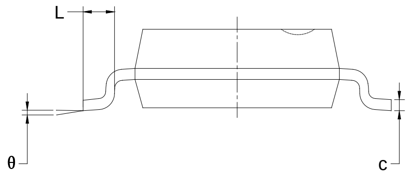
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)



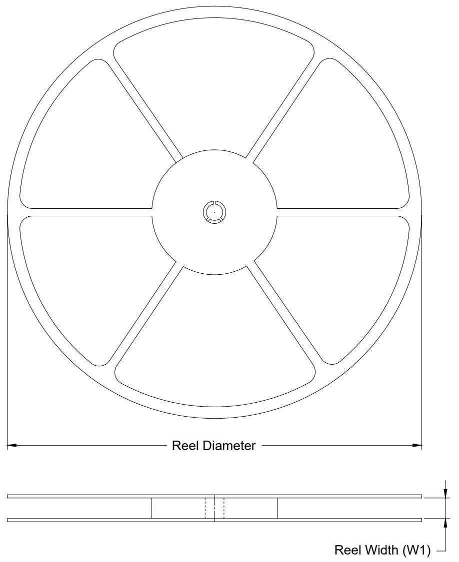


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

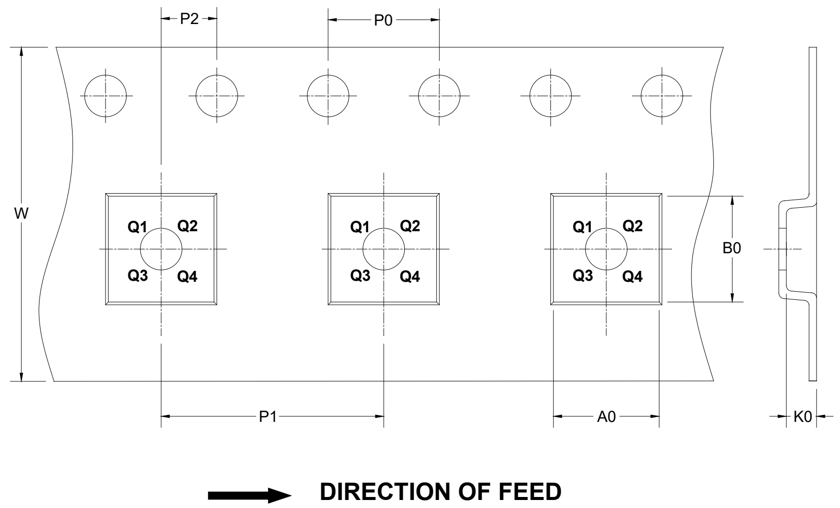
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



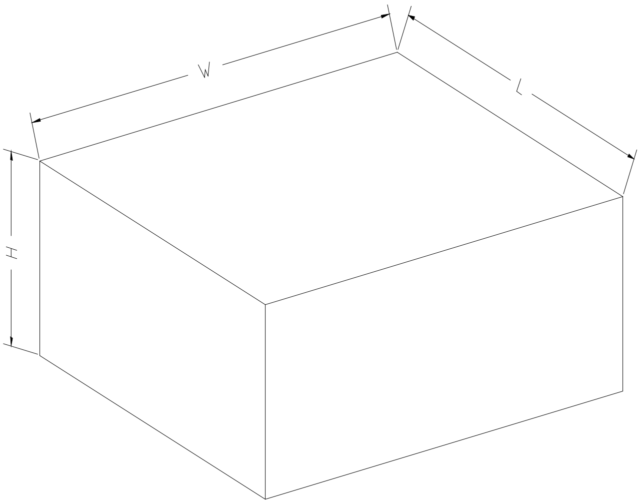
NOTE: The picture is only for reference. Please make the object as the standard.

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
SOIC-8	13″	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	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
13″	386	280	370	5

DD0002