SGM8718A-2/SGM8718B-2
Small Size, Low Power, Low Voltage, Dual-Channel Comparators

GENERAL DESCRIPTION

The SGM8718A-2 and SGM8718B-2 are dual, micro-power, small size comparators. They are optimized for low voltage operation from 1.6V to 6.5V single supply, and support rail-to-rail input operation. The SGM8718A-2 and SGM8718B-2 consume only 4.7μA quiescent current per channel. Meanwhile, they also have a great trade-off between low power and high speed, with a low propagation delay of 300ns. This results in continuous system monitoring and quick respond to fault conditions without excessive battery power dissipation.

These devices have different output structures. The SGM8718A-2 has an open-drain output structure, which requires an external pull-up resistor to output a high level of V_S or a voltage below V_S. This enables conversion from bipolar to single-ended signals and level translation. The SGM8718B-2 has a push-pull output structure, which can easily drive LEDs, resistive or capacitive loads with the ability to source or sink current at the milliamp level.

The SGM8718A-2 and SGM8718B-2 are designed with internal hysteresis and prevent output phase reversal when the inputs are overdriven. Therefore, these comparators are capable of transforming slow-moving input signals into clear digital outputs and monitoring voltage in noisy and demanding settings.

The SGM8718A-2 and SGM8718B-2 are both available in Green SOIC-8, MSOP-8 and TDFN-2×2-8AL packages. They are rated over the -40℃ to +125℃ operating temperature range.

FEATURES

- **Supply Voltage Range: 1.6V to 6.5V**
- **Low Quiescent Current: 4.7μA/Channel (TYP)**
- **Low Propagation Delay: 300ns (TYP)**
- **Rail-to-Rail Input Common Mode Voltage**
- **Output Structure:**
  - **Open-Drain Output: SGM8718A-2**
  - **Push-Pull Output: SGM8718B-2**
- **Internal Hysteresis: 8mV (TYP)**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green SOIC-8, MSOP-8 and TDFN-2×2-8AL Packages**

APPLICATIONS

Smart Phone
Battery-Powered Equipment
Industrial Equipment
Medical Equipment
Telecom Equipment

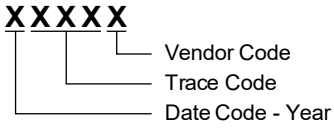
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8718A-2	SOIC-8	-40℃ to +125℃	SGM8718A-2XS8G/TR	SGM 8718A2XS8 XXXXX	Tape and Reel, 4000
	MSOP-8	-40℃ to +125℃	SGM8718A-2XMS8G/TR	SGM3DI XMS8 XXXXX	Tape and Reel, 4000
	TDFN-2×2-8AL	-40℃ to +125℃	SGM8718A-2XTDE8G/TR	3DJ XXXX	Tape and Reel, 3000
SGM8718B-2	SOIC-8	-40℃ to +125℃	SGM8718B-2XS8G/TR	SGM 8718B2XS8 XXXXX	Tape and Reel, 4000
	MSOP-8	-40℃ to +125℃	SGM8718B-2XMS8G/TR	SGM367 XMS8 XXXXX	Tape and Reel, 4000
	TDFN-2×2-8AL	-40℃ to +125℃	SGM8718B-2XTDE8G/TR	36S XXX	Tape and Reel, 3000

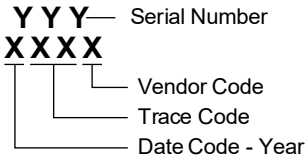
MARKING INFORMATION

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

SOIC-8/MSOP-8



TDFN-2×2-8AL



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 $-V_S$ ..... -0.3V to 7V
Voltage at Input Pins (+IN, -IN) (1) ..... $(-V_S)$ - 0.3V to 7V
Voltage at Output Pins (OUT)
SGM8718A-2 ..... $(-V_S)$ - 0.3V to 7V
SGM8718B-2 (2) ..... $(-V_S)$ - 0.3V to $(+V_S)$ + 0.3V
Current into Input Pins (+IN, -IN) (1) ..... ±10mA
Output Short-Circuit Duration (3) 10s
Package Thermal Resistance
SOIC-8, θ_{JA} ..... 151.2℃/W
SOIC-8, θ_{JB} ..... 95.3℃/W
SOIC-8, θ_{JC} ..... 93.3℃/W
MSOP-8, θ_{JA} ..... 151.7℃/W
MSOP-8, θ_{JB} ..... 99.6℃/W
MSOP-8, θ_{JC} ..... 71℃/W
TDFN-2×2-8AL, θ_{JA} ..... 77.6℃/W
TDFN-2×2-8AL, θ_{JB} ..... 45.6℃/W
TDFN-2×2-8AL, $\theta_{JC\ (TOP)}$ ..... 93.3℃/W
TDFN-2×2-8AL, $\theta_{JC\ (BOT)}$ ..... 27.1℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility (4) (5)
HBM ..... ±4000V
CDM ..... ±1000V

NOTES:

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

2. The output voltage is limited to the lower value between $(+V_S)$ + 0.3V and 7V.

3. Each package contains one comparator, which can be shorted to ground.

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

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

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range ..... 1.6V to 6.5V
Input Voltage Range ..... $(-V_S)$ - 0.1V to $(+V_S)$ + 0.2V
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

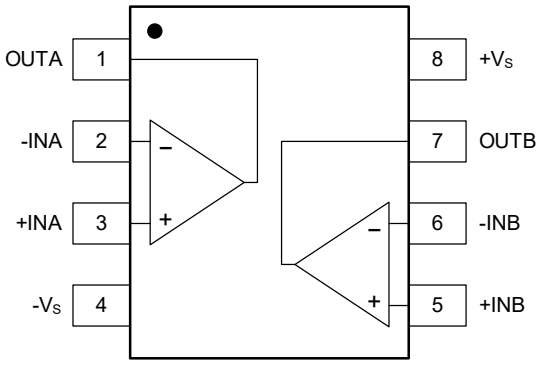
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

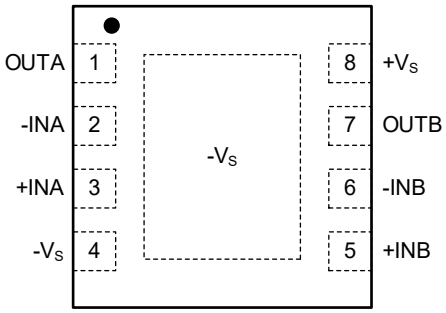
PIN CONFIGURATIONS

SGM8718-2 (TOP VIEW)



SOIC-8/MSOP-8

SGM8718-2 (TOP VIEW)



TDFN-2×2-8AL

PIN DESCRIPTION

PIN	NAME	TYPE	FUNCTION
1	OUTA	O	Output, Channel A.
2	-INA	I	Inverting Input, Channel A.
3	+INA	I	Non-Inverting Input, Channel A.
4	$-V_S$	—	Negative (Lowest) Supply or Ground (for Single-Supply Operation).
5	+INB	I	Non-Inverting Input, Channel B.
6	-INB	I	Inverting Input, Channel B.
7	OUTB	O	Output, Channel B.
8	$+V_S$	—	Positive (Highest) Supply.
Exposed Pad	$-V_S$	—	For TDFN-2×2-8AL Package. The exposed pad can be connected to $-V_S$ or left floating. Connect it to $-V_S$ plane to maximize thermal performance. Ensure that the exposed pad is exclusively connected to the $-V_S$ pin and not to any other pins.

NOTE: I = input, O = output.

ELECTRICAL CHARACTERISTICS

(V_S = 1.6V to 6.5V, V_{CM} = V_S/2, 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}		+25℃		±1.2	±7	mV
			Full			±8	
Hysteresis	V_{HYST}		+25℃		8	12.7	mV
			Full	1		15	
Input Common Mode Voltage Range	V_{CM}		Full	0		$(+V_S)$ + 0.1	V
Input Bias Current	I_B		+25℃		±5	±400	pA
			Full			4	nA
Input Offset Current	I_{OS}		+25℃		±5	±400	pA
			Full			0.5	nA
Output Voltage High (for SGM8718B-2 Only)	V_{OH}	V_S = 5V, I_{OUT} = 3mA	+25℃	4.8	4.955		V
			Full	4.7			
Output Voltage Low	V_{OL}	V_S = 5V, I_{OUT} = 3mA	+25℃		90	200	mV
			Full			300	
Open-Drain Output Leakage Current (for SGM8718A-2 Only)	I_{LKG}	V_S = 5V, V_{ID} = +0.1V (output high), $V_{PULL-UP}$ = V_S	+25℃		50	400	pA
			Full			10	nA
Common Mode Rejection Ratio	CMRR	V_S = 6.5V, 0V < V_{CM} < V_S	+25℃	56	72		dB
			Full	53			
Power Supply Rejection Ratio	PSRR	V_{CM} = 0.8V	+25℃	58	75		dB
			Full	55			
Short-Circuit Current	I_{SC}	V_S = 5V, sourcing (for SGM8718B-2 only)	+25℃	27	31		mA
			Full	18			
		V_S = 5V, sinking	+25℃	25	31		
			Full	14			
Quiescent Current/Channel	I_Q	V_{ID} = -0.1V, no load, output low	+25℃		4.7	7.5	μA
			Full			9	

SWITCHING CHARACTERISTICS (SGM8718A-2)

(V_S = 5V, V_{CM} = 2.5V, C_L = 15pF, input overdrive = 100mV, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Propagation Delay Time, High-to-Low	t_{PHL}	R_P = 4.99kΩ (1), midpoint of input to midpoint of output	+25℃		300		ns
Propagation Delay Time, Low-to-High	t_{PLH}	R_P = 4.99kΩ (1), midpoint of input to midpoint of output	+25℃		270		ns
Fall Time	t_F	80% to 20%	+25℃		5		ns
Power-Up Time (2)	t_{ON}		+25℃		18		μs

NOTES:
1. The lower limit for R_P is 650Ω.
2. When powering up, ensure that V_S is above 1.6V for a certain duration (t_{ON}) before the output begins to follow the input signal.

SWITCHING CHARACTERISTICS (SGM8718B-2)

(V_S = 5V, V_{CM} = 2.5V, C_L = 15pF, input overdrive = 100mV, typical values are at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Propagation Delay Time, High-to-Low	t_{PHL}	Midpoint of input to midpoint of output	+25℃		210		ns
Propagation Delay Time, Low-to-High	t_{PLH}	Midpoint of input to midpoint of output	+25℃		235		ns
Rise Time	t_R	20% to 80%	+25℃		5		ns
Fall Time	t_F	80% to 20%	+25℃		5		ns
Power-Up Time (1)	t_{ON}		+25℃		20		μs

NOTE:
1. When powering up, ensure that V_S is above 1.6V for a certain duration (t_{ON}) before the output begins to follow the input signal.

TIMING DIAGRAM

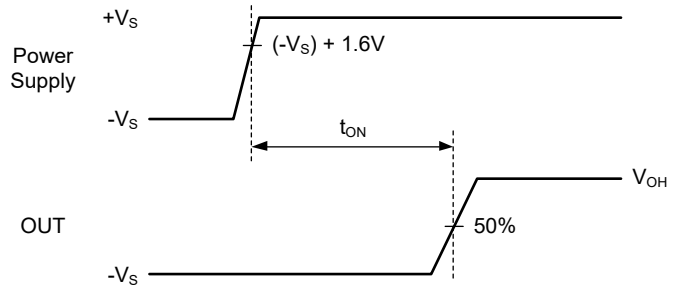


Figure 1. Power-Up Delay (Out) Diagram (Push-Pull, +IN > -IN)

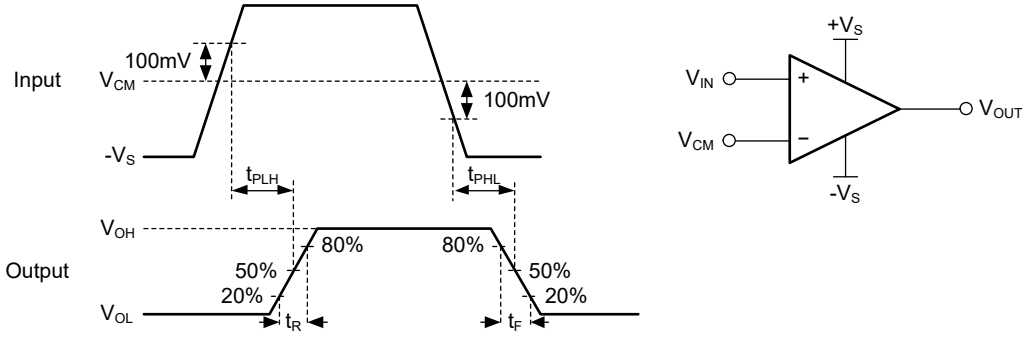
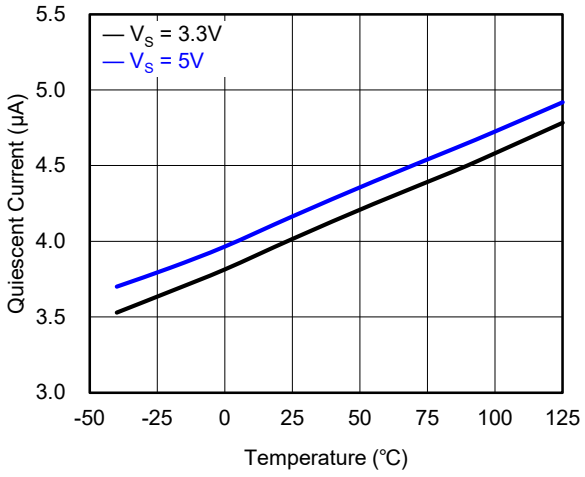


Figure 2. Propagation Delay Diagram

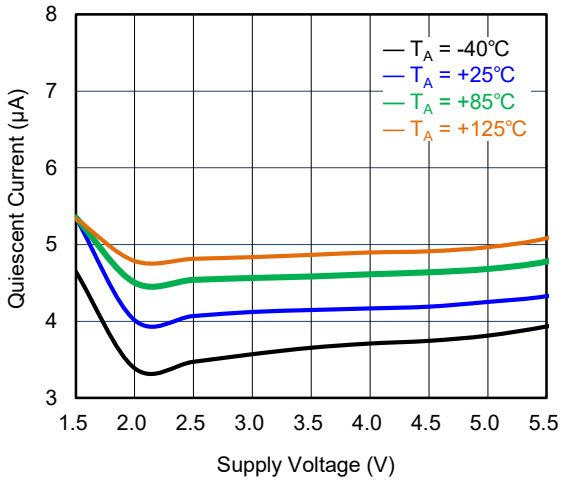
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = 5V, V_{CM} = V_S/2, unless otherwise noted.

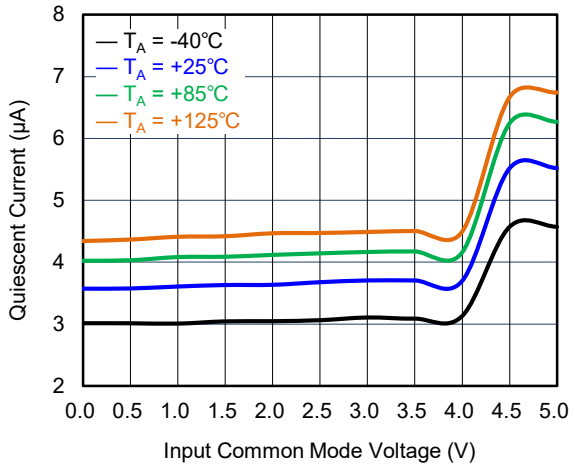
Quiescent Current vs. Temperature



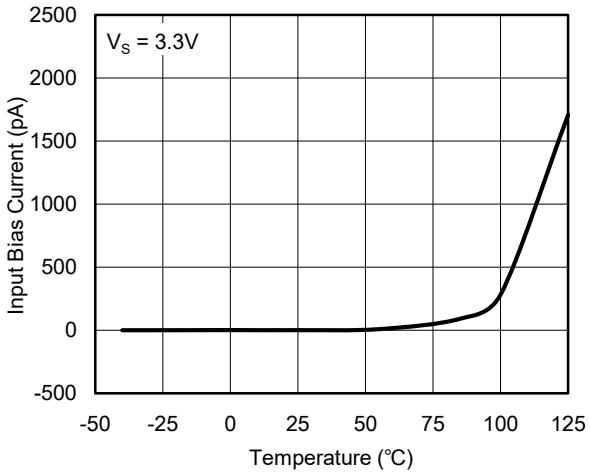
Quiescent Current vs. Supply Voltage



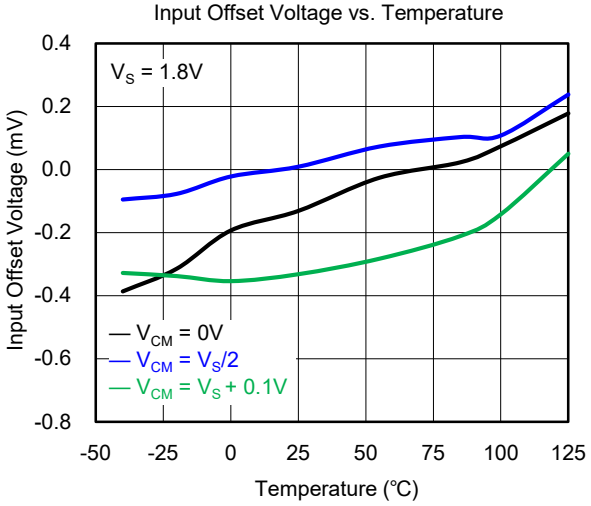
Quiescent Current vs. Input Common Mode Voltage



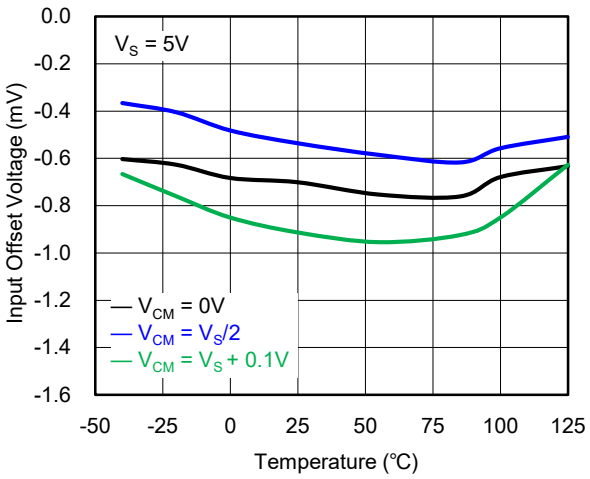
Input Bias Current vs. Temperature



Input Offset Voltage vs. Temperature



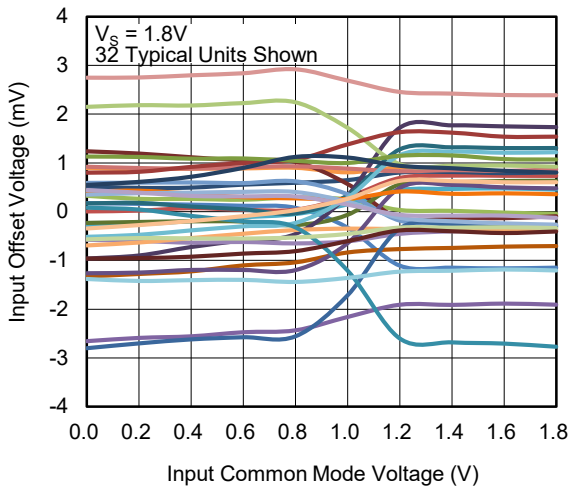
Input Offset Voltage vs. Temperature



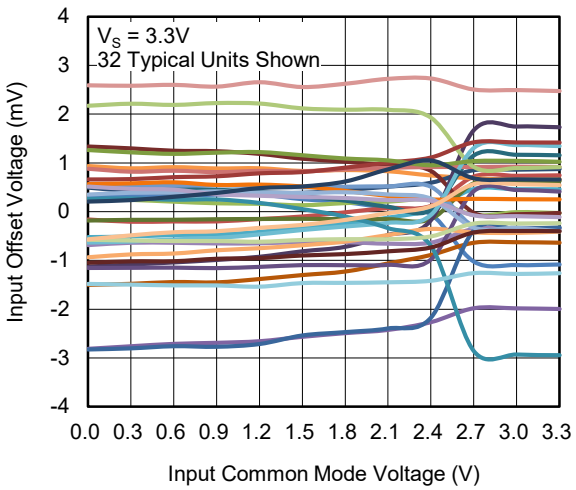
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 5V, V_{CM} = V_S/2, unless otherwise noted.

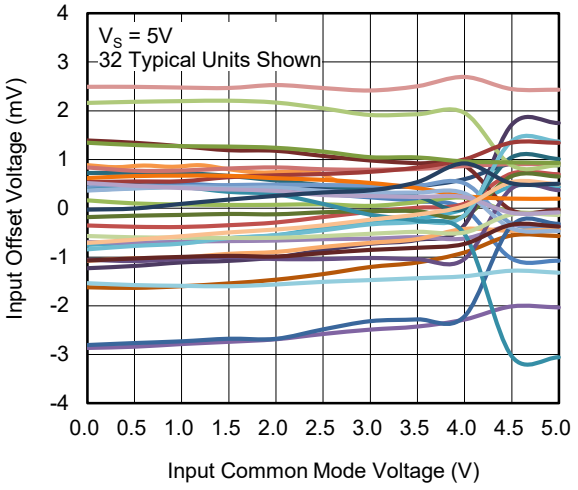
Input Offset Voltage vs. Input Common Mode Voltage



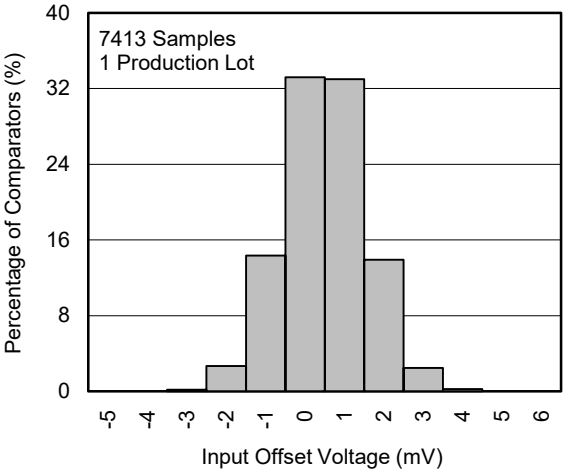
Input Offset Voltage vs. Input Common Mode Voltage



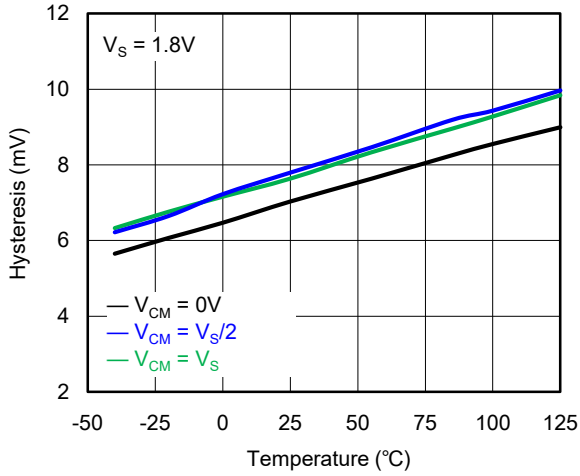
Input Offset Voltage vs. Input Common Mode Voltage



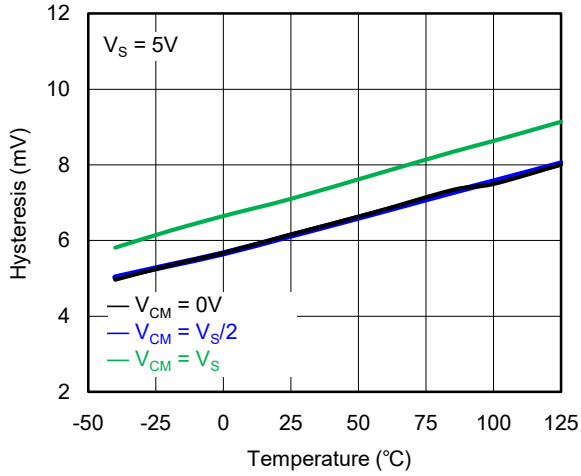
Input Offset Voltage Production Distribution



Hysteresis vs. Temperature



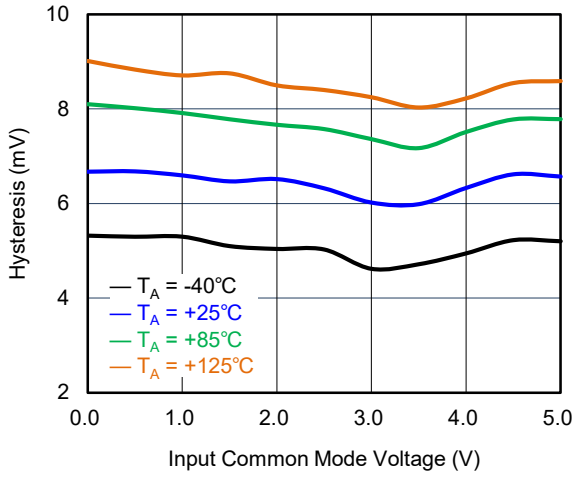
Hysteresis vs. Temperature



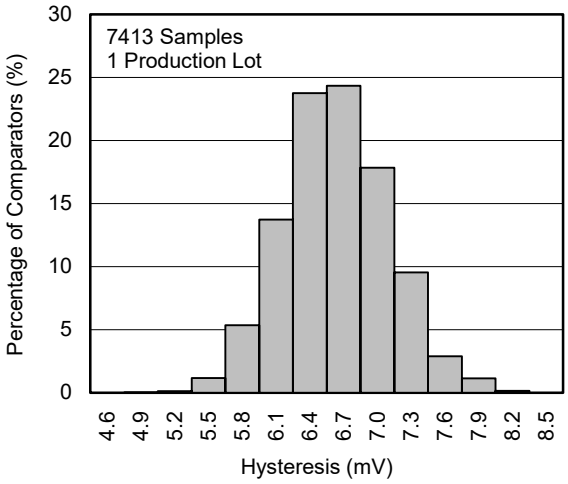
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 5V, V_{CM} = V_S/2, unless otherwise noted.

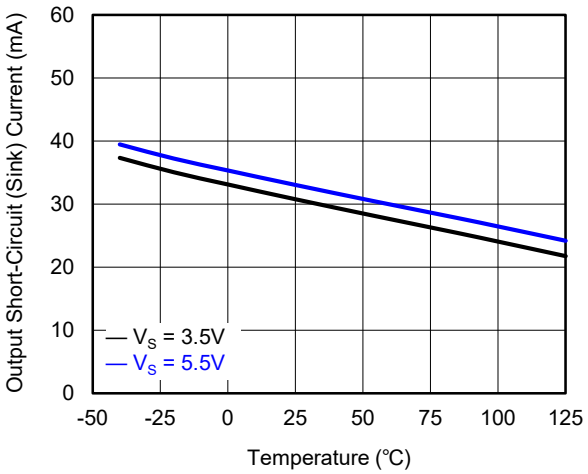
Hysteresis vs. Input Common Mode Voltage



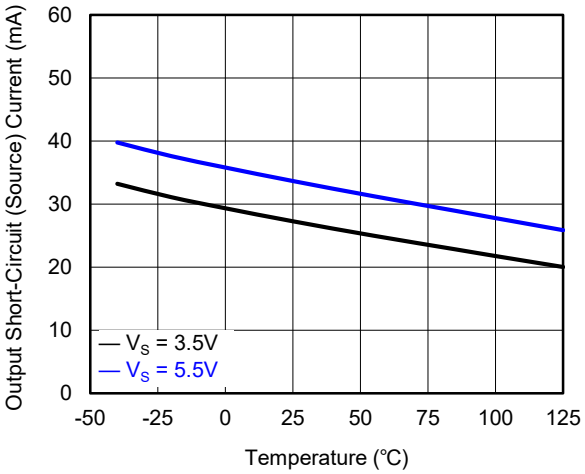
Hysteresis Production Distribution



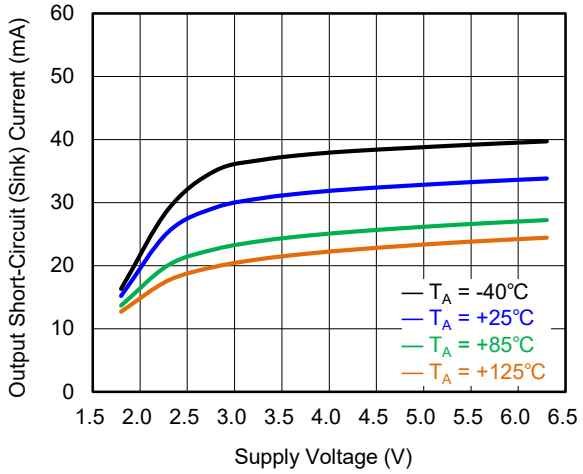
Output Short-Circuit (Sink) Current vs. Temperature



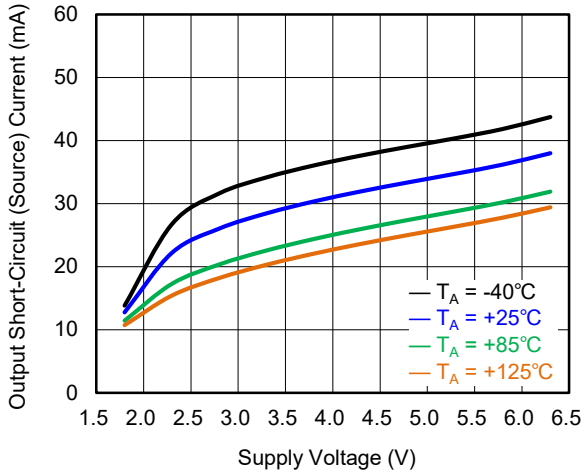
SGM8718B-2 Output Short-Circuit (Source) Current vs. Temperature



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



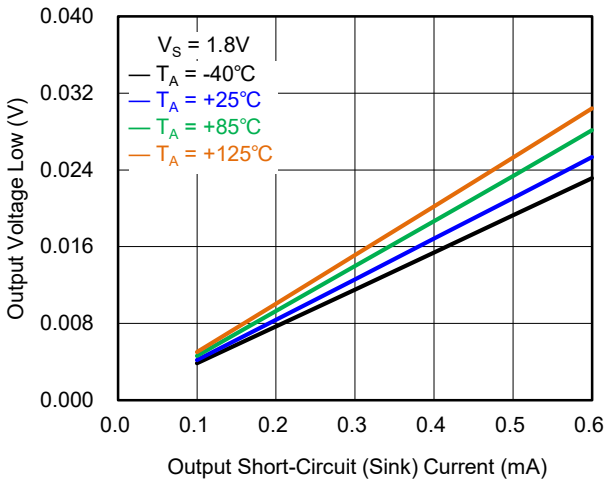
SGM8718B-2 Output Short-Circuit (Source) Current vs. Supply Voltage



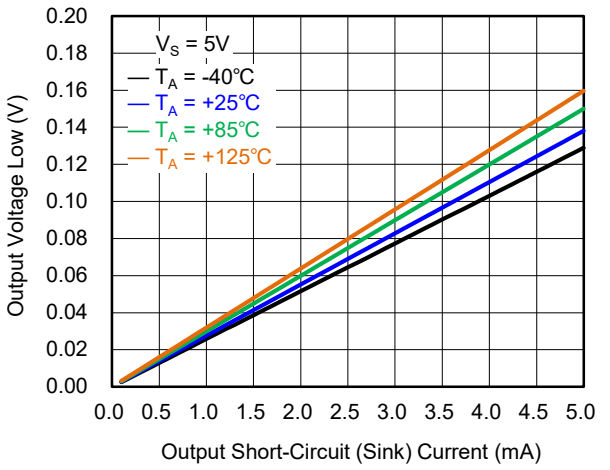
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 5V, V_{CM} = V_S/2, unless otherwise noted.

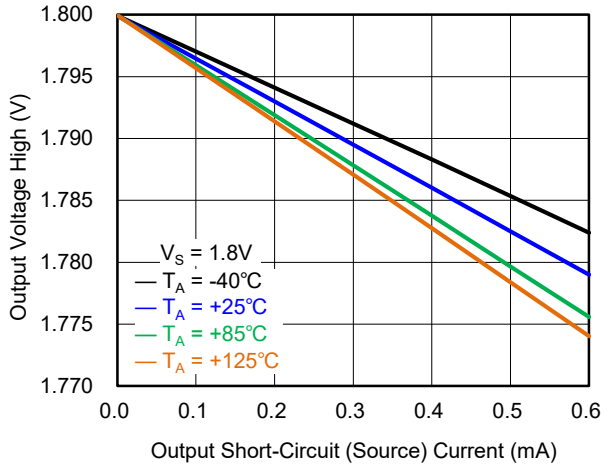
Output Voltage Low vs. Output Short-Circuit (Sink) Current



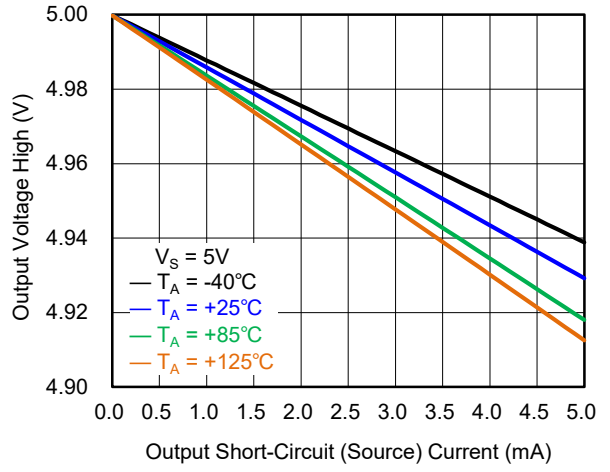
Output Voltage Low vs. Output Short-Circuit (Sink) Current



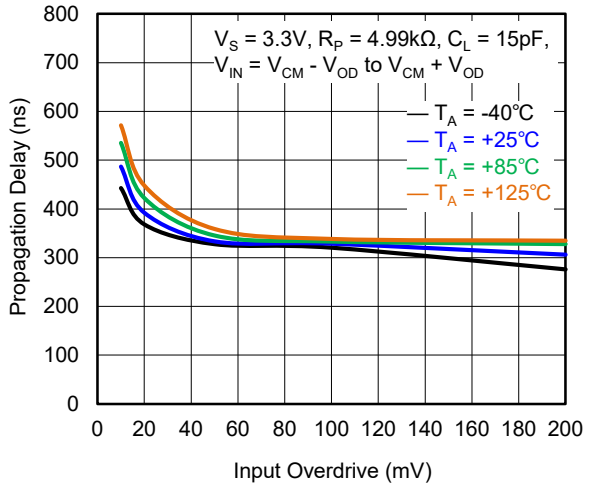
SGM8718B-2 Output Voltage High vs. Output Short-Circuit (Source) Current



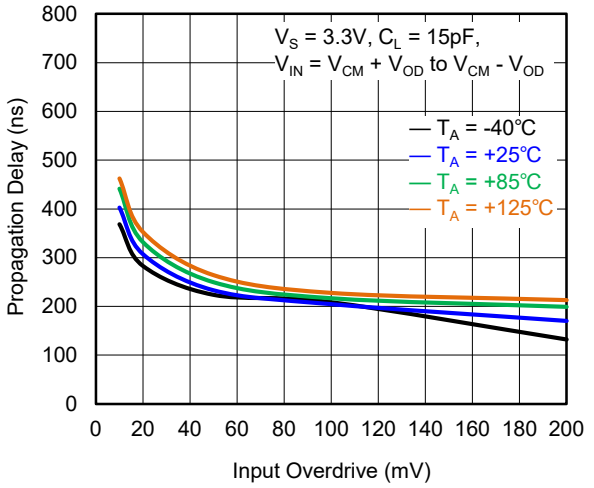
SGM8718B-2 Output Voltage High vs. Output Short-Circuit (Source) Current



SGM8718A-2 Propagation Delay (L-H) vs. Input Overdrive



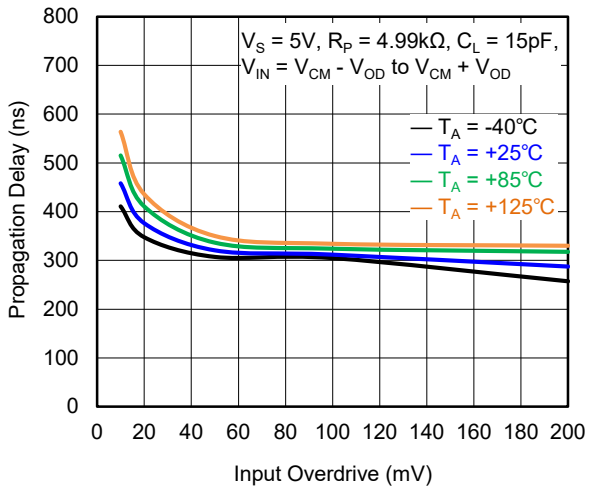
SGM8718A-2 Propagation Delay (H-L) vs. Input Overdrive



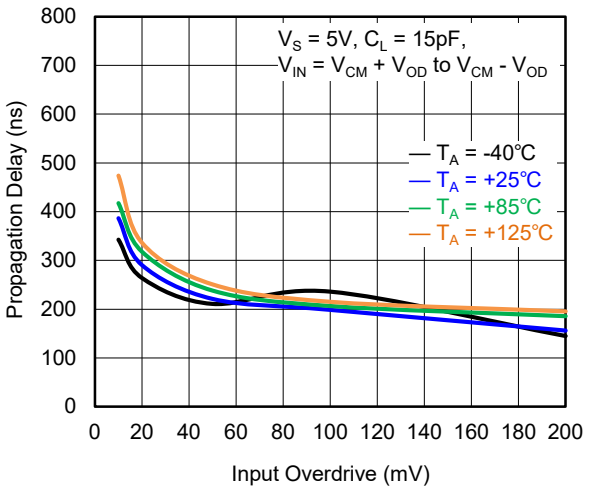
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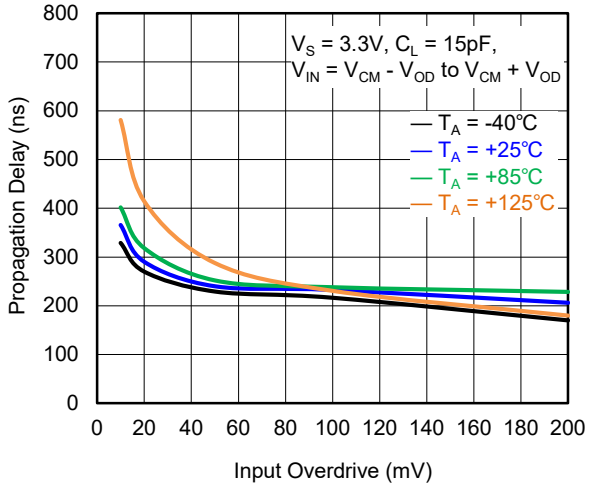
SGM8718A-2 Propagation Delay (L-H) vs. Input Overdrive



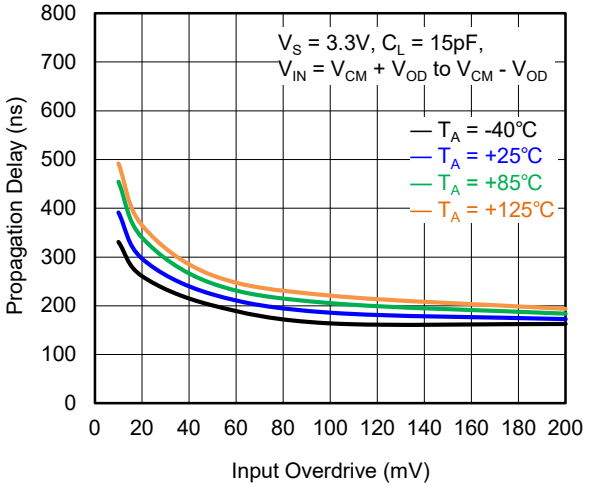
SGM8718A-2 Propagation Delay (H-L) vs. Input Overdrive



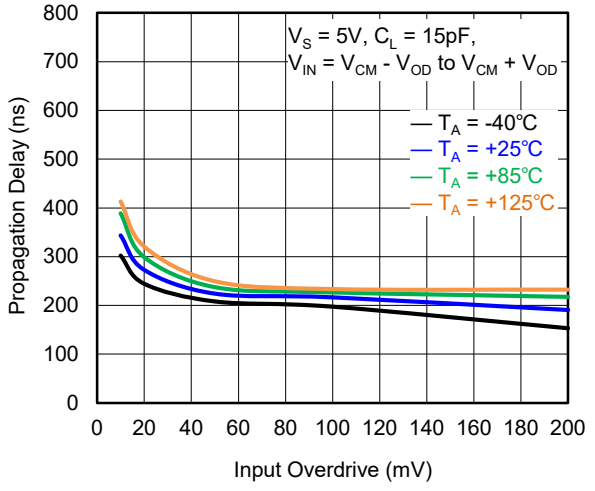
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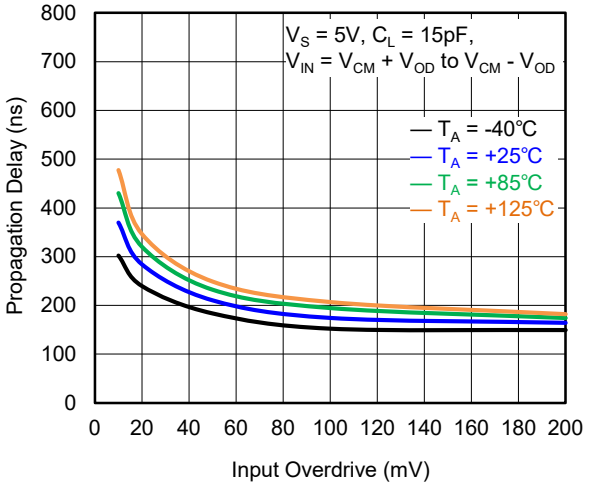
SGM8718B-2 Propagation Delay (H-L) vs. Input Overdrive



SGM8718B-2 Propagation Delay (L-H) vs. Input Overdrive



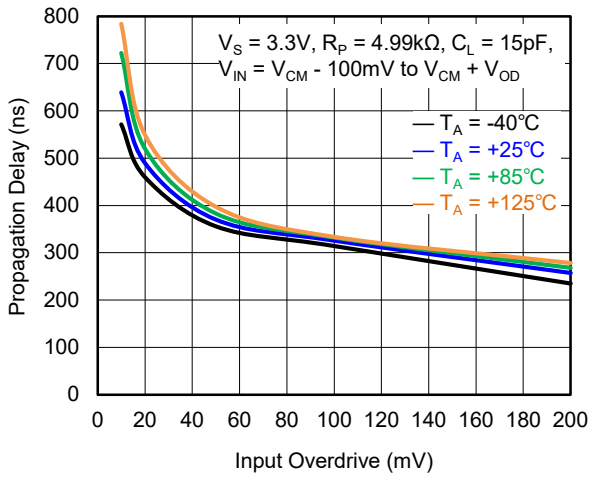
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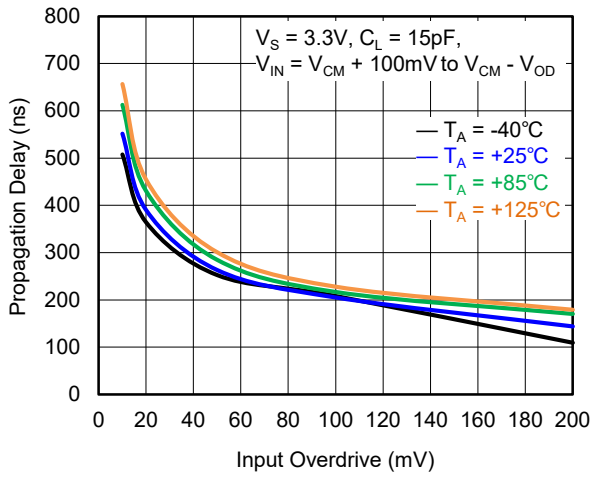
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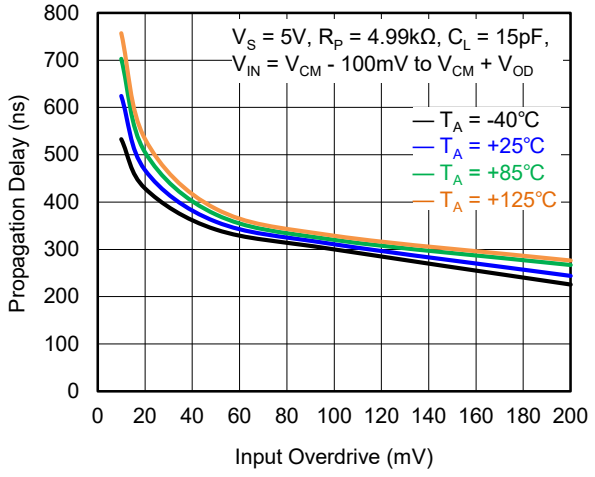
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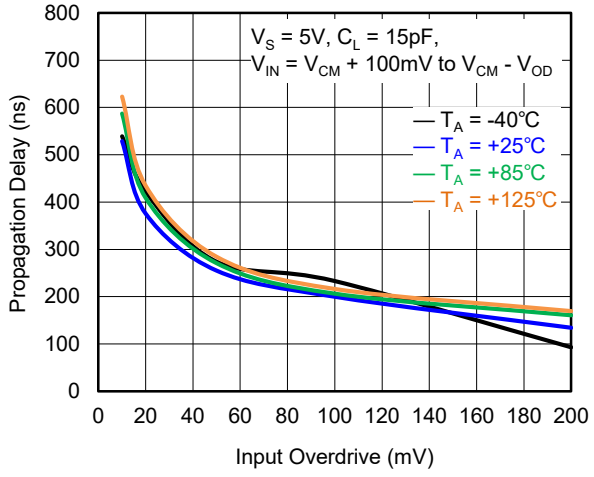
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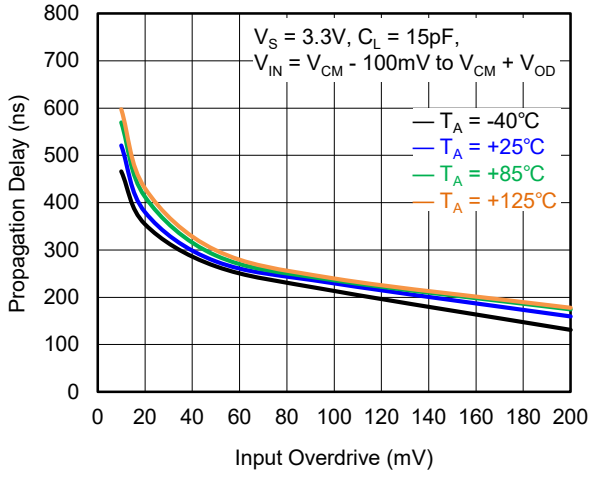
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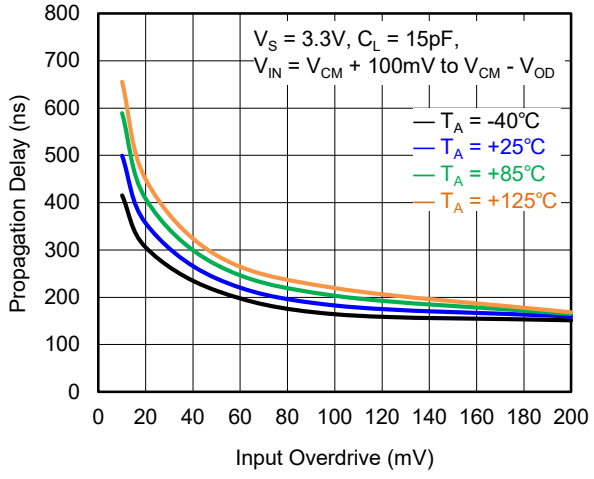
SGM8718A-2 Propagation Delay (H-L) vs. Input Overdrive



SGM8718B-2 Propagation Delay (L-H) vs. Input Overdrive



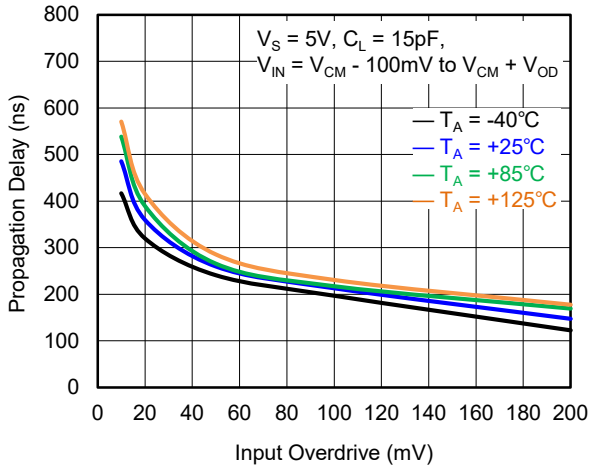
SGM8718B-2 Propagation Delay (H-L) vs. Input Overdrive



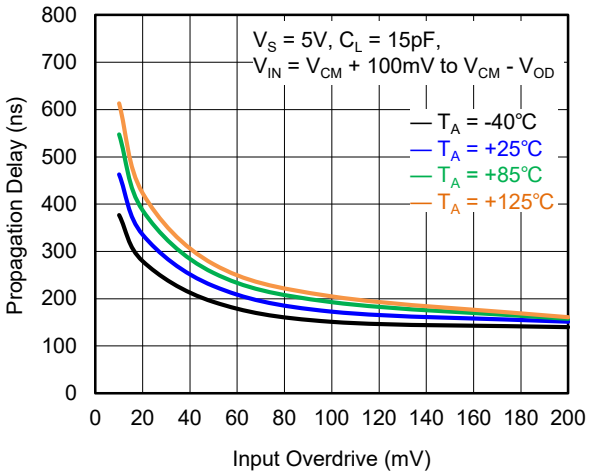
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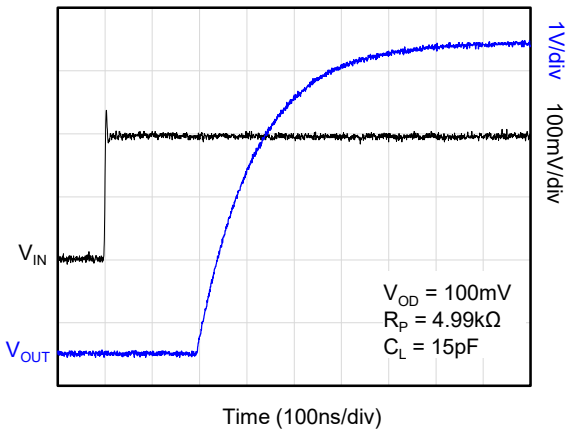
SGM8718B-2 Propagation Delay (L-H) vs. Input Overdrive



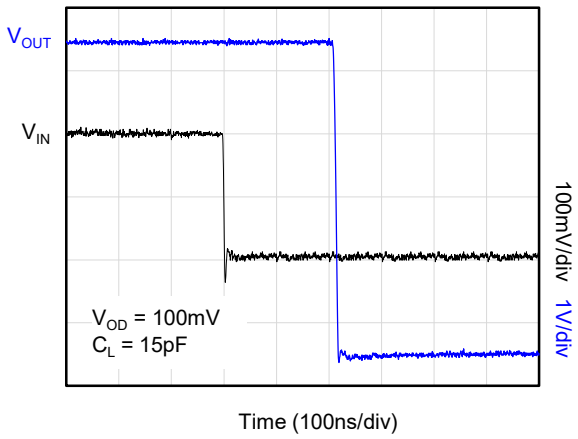
SGM8718B-2 Propagation Delay (H-L) vs. Input Overdrive



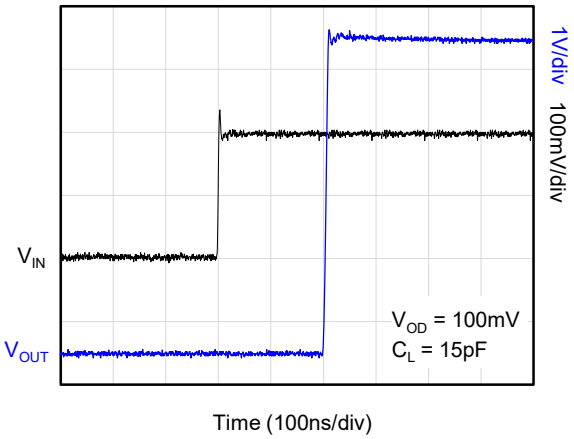
SGM8718A-2 Propagation Delay (L-H)



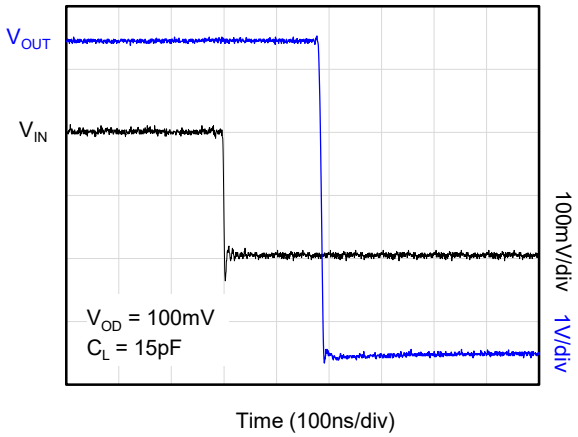
SGM8718A-2 Propagation Delay (H-L)



SGM8718B-2 Propagation Delay (L-H)

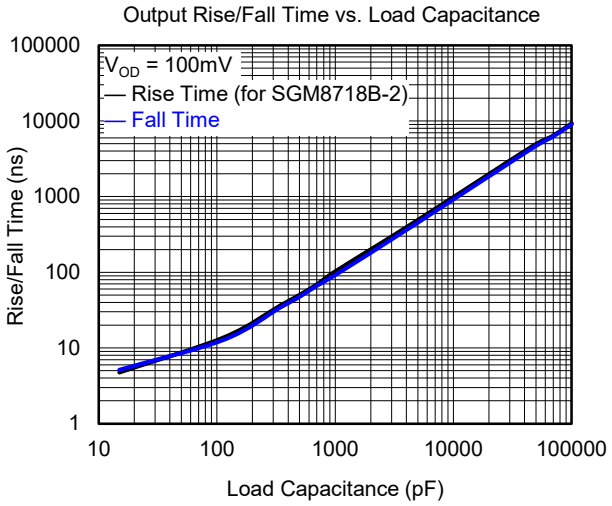


SGM8718B-2 Propagation Delay (H-L)



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At T_A = +25℃, V_S = 5V, V_{CM} = V_S/2, unless otherwise noted.



FUNCTIONAL BLOCK DIAGRAM

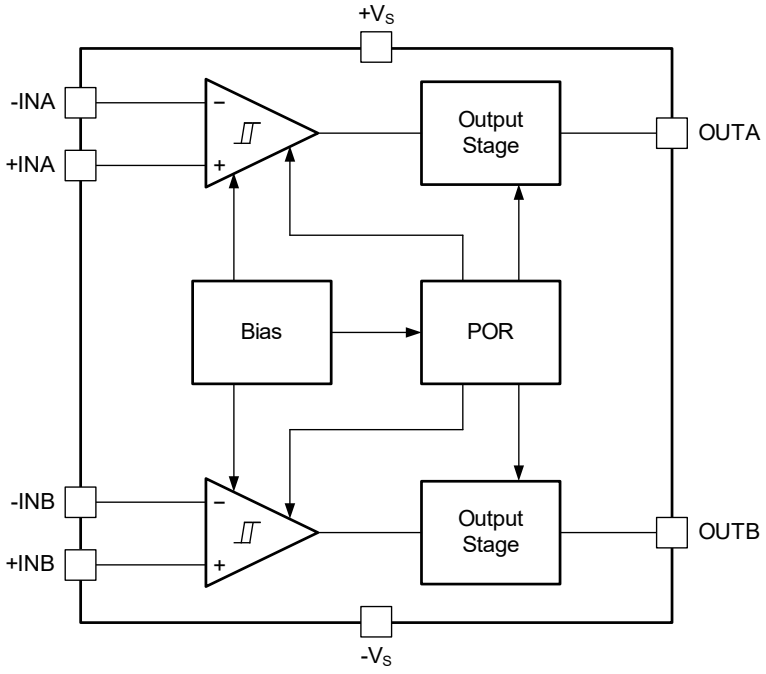


Figure 3. Block Diagram

DETAILED DESCRIPTION

The SGM8718A-2 and SGM8718B-2 are dual, micro-power, rail-to-rail input and small size comparators. They are optimized for low voltage operation from 1.6V to 6.5V single supply, consuming only 4.7μA quiescent current per channel. The output of SGM8718A-2 is open-drain and the output of SGM8718B-2 is push-pull. Both devices are packaged in space-saving packages.

The above advantages make these comparators operate well in the battery-powered system. Also, the input rail-to-rail stage can manage the input signal which is higher than the positive power supply with the internal hysteresis. The positive feedback should be taken into account for the applications of higher hysteresis.

The ability of open-drain for SGM8718A-2 is suitable for the condition of level shifting and wire-ORing. The power-budget can be reduced by the structure of push-pull for SGM8718B-2.

POR Function

The SGM8718A-2 and SGM8718B-2 integrate a power-on-reset (POR) circuit that becomes active during the rising or falling ramp of the power supply ($+V_S$). Upon activation, the POR circuit of SGM8718B-2 maintains a low output ($-V_S$). Conversely, the SGM8718A-2 maintains a high output.

Inputs

The maximum input common mode voltage range of the comparator is from $-V_S$ to ($+V_S$) + 0.1V. These comparators can operate at any differential 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. To explain, 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.

In applications where both input terminals are close to the power supply, with a large transient step occurring at one of the inputs (e.g., rapid switching from $+V_S$ to 0V), it is recommended to increase the differential input voltage for better output response.

Output

The SGM8718A-2 provides the output of open-drain, and the SGM8718B-2 provides the output stage of push-pull.

When the power supply voltage is within the normal operating range, the output of the comparator is related to the differential input (V_{ID}).

Internal Hysteresis

Both SGM8718A-2 and SGM8718B-2 have 8mV hysteresis (V_{HYST}), which helps improve the noise immunity. Figure 4 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 defined as the input offset voltage between V_{IN+} and V_{IN-}. V_{OS} is considered into the influence of the hysteresis which can affect the response of the output.

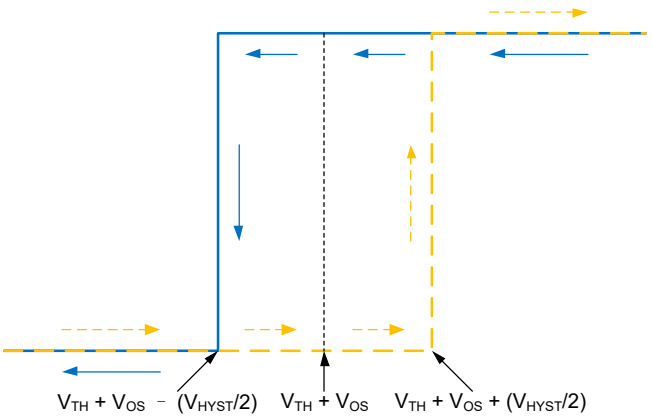


Figure 4. Hysteresis Transfer Curve

APPLICATION INFORMATION

Typical Application

Adding External Hysteresis

The effect of significant input noise is an issue that has to be taken into consideration for applications with slow moving or noisy input signals. The output will switch as the result of the input noise, although there is 8mV internal hysteresis.

Figure 5 illustrates the SGM8718B-2 inverting circuit with the external hysteresis.

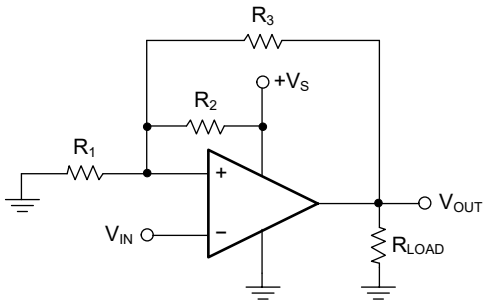


Figure 5. Inverting Configuration with Hysteresis of SGM8718B-2

The external hysteresis caused by the circuit is shown in Equation 1. In Equation 1, R_{F1} = (R_2//R_3) and R_{F2} = (R_1//R_3).

$$V_{HYS} = (+V_S)\left(\frac{R_1}{R_{F1}+R_1} - \frac{R_{F2}}{R_2+R_{F2}}\right) \quad (1)$$

Figure 6 illustrates the SGM8718B-2 non-inverting circuit with external hysteresis.

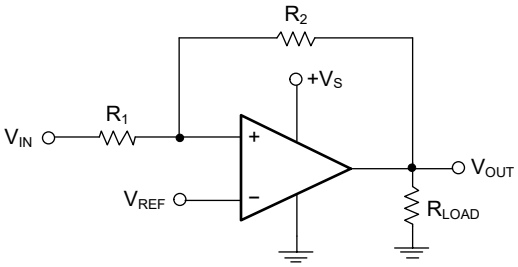


Figure 6. Non-Inverting Configuration with Hysteresis of SGM8718B-2

The external hysteresis of this circuit can be calculated using Equation 2.

$$V_{HYS} = (+V_S) \times \frac{R_1}{R_2} \quad (2)$$

Window Comparator

The application of window comparator with SGM8718A-2 is shown in Figure 7, and it is used for detecting the under-voltage or over-voltage situation. When the operating voltage of the circuit is 3.3V and R_1 = R_2 = R_3 = 10MΩ, V_{TH+} can be obtained as 2.2V and V_{TH-} as 1.1V.

As shown in Figure 8, if V_{SENSOR} < 1.1V or V_{SENSOR} > 2.2V, V_{OUT} is logic low. If 1.1V < V_{SENSOR} < 2.2V, V_{OUT} is logic high.

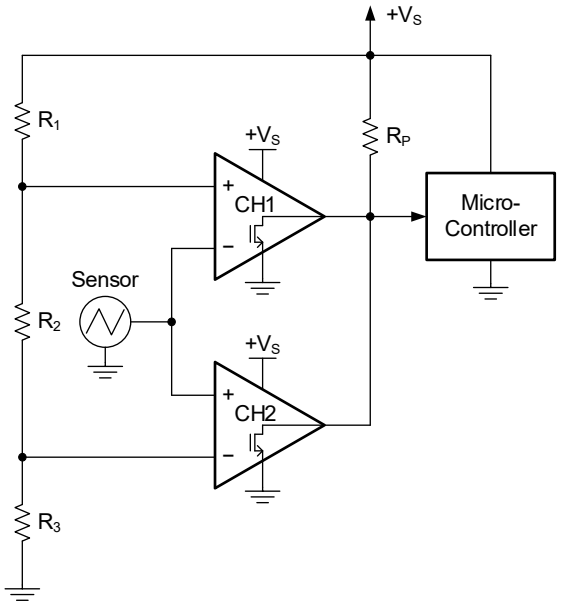


Figure 7. Window Comparator with SGM8718A-2

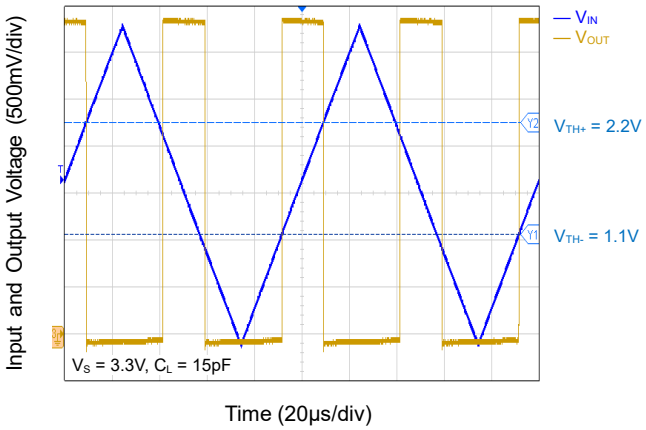


Figure 8. Window Comparator Results

APPLICATION INFORMATION (continued)

Square-Wave Oscillator

The following circuit is widely used for the applications of low-cost timing reference or clock source of the system.

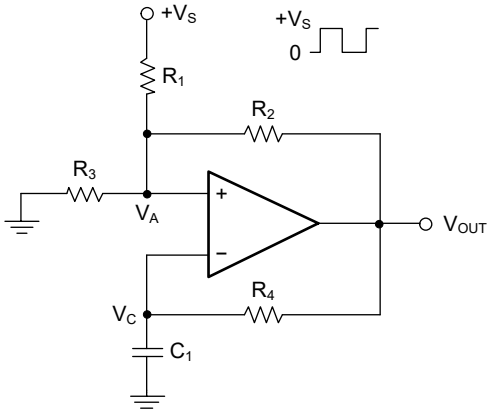


Figure 9. Square-Wave Oscillator

Design Requirements

For the circuit in Figure 9, the period of the square waveform is determined by the time constant R_4C_1. There are two parameters that limit the frequency of the square waveform, which are the propagation delay of the comparator and the capacitance of the load. For a specific oscillation frequency, the feedback resistor R_4 can be larger when considering using small capacitor as the extreme low bias current of the input.

Detailed Design Procedure

The time constant R_4C_1 determines the oscillated frequency of the circuit.

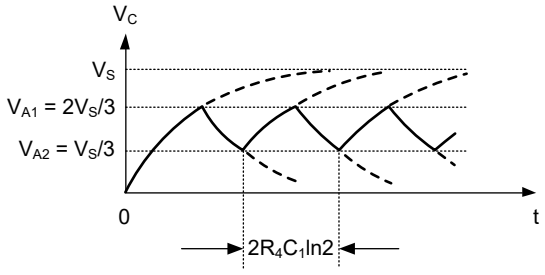


Figure 10. Square-Wave Oscillator Timing and Thresholds

To explain the operation of the circuit, first, it can be assumed that V_{OUT} is in high position. Then, the capacitor C_1 is charged by V_{OUT} at this stage until the value of V_C reaches the value of V_A. The following equation illustrates the threshold V_{A1} for the above case:

$$V_{A1} = \frac{V_S \times R_3}{R_3 + R_1 \,||\, R_2} \quad (3)$$

If $R_1 = R_2 = R_3$, then $V_{A1} = 2V_S/3$.

Once the value of $V_C > V_A$, the output of the comparator will be in low position (GND). The capacitor C_1 will discharge until the value of V_C reaches the threshold V_{A2}. The following equation illustrates the threshold V_{A2}:

$$V_{A2} = \frac{V_S \times (R_2 \,||\, R_3)}{R_1 + R_2 \,||\, R_3} \quad (4)$$

If $R_1 = R_2 = R_3$, then $V_{A2} = V_S/3$.

As the decreasing of V_C, the output will switch back to high position again. To calculate the period of oscillation, during which the value of V_C changes from $2V_S/3$ to $V_S/3$ and then goes back to $2V_S/3$ again, the equation is shown as below:

$$f = 1/(2 \times R_4 \times C_1 \times \ln 2) \quad (5)$$

Application Curve

The test outcomes of a tan oscillator are illustrated in Figure 11.

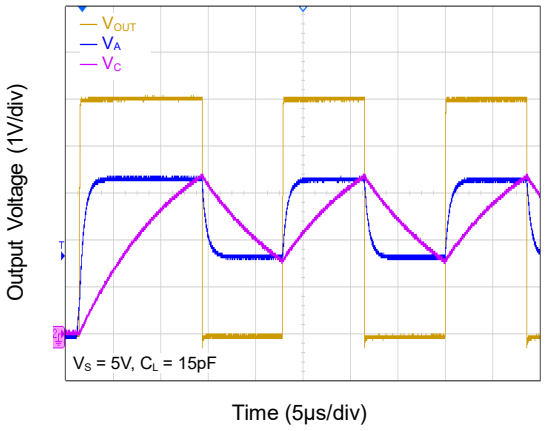


Figure 11. Square-Wave Oscillator Output Waveform

Power Supply Recommendations

The SGM8718A-2 and SGM8718B-2 can be used for both single and dual power supply modes. In Application, a 100nF bypass capacitor is recommended and should be placed as close as possible to $+V_S$ pin.

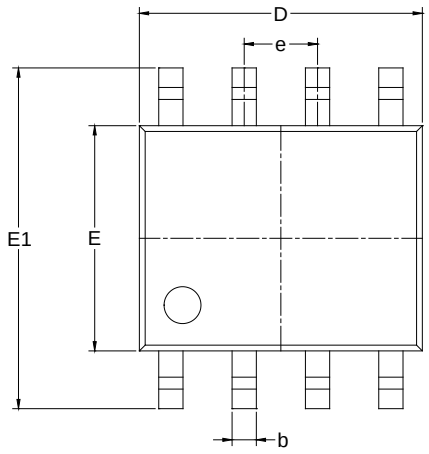
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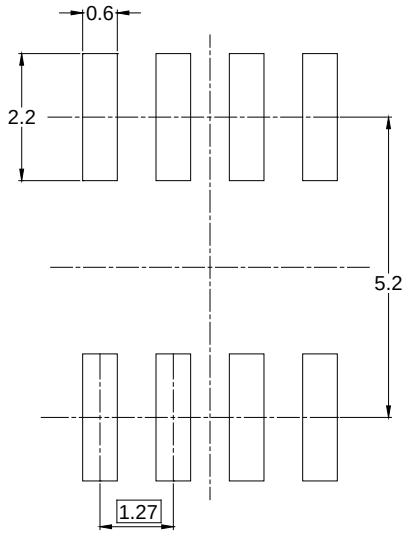
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Changed from product preview to production data	All

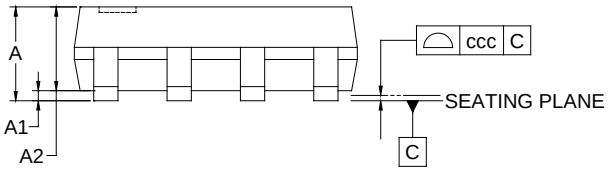
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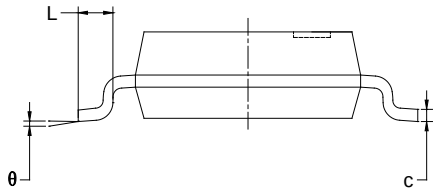
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RECOMMENDED LAND PATTERN (Unit: mm)



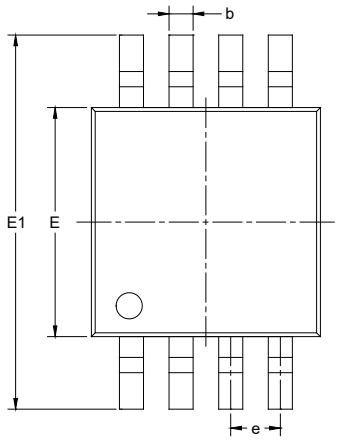


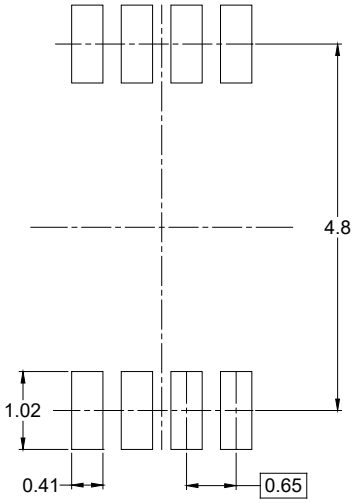
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A1	0.100	-	0.250
A2	1.350	-	1.550
b	0.330	-	0.510
c	0.170	-	0.250
D	4.700	-	5.100
E	3.800	-	4.000
E1	5.800	-	6.200
e	1.270 BSC		
L	0.400	-	1.270
θ	0°	-	8°
ccc	0.100		

NOTES:
1. This drawing is subject to change without notice.
2. This dimension does not include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15mm per side.
3. Reference JEDEC MS-012.

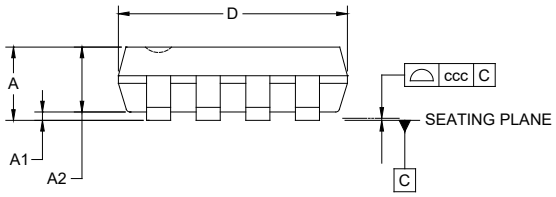
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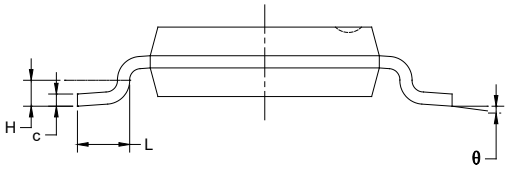
MSOP-8





RECOMMENDED LAND PATTERN (Unit: mm)



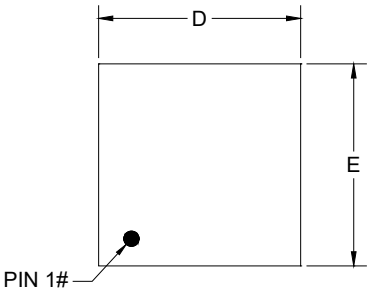


Symbol	Dimensions In Millimeters		
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A1	0.000	-	0.150
A2	0.750	-	0.950
b	0.220	-	0.380
c	0.080	-	0.230
D	2.800	-	3.200
E	2.800	-	3.200
E1	4.650	-	5.150
e	0.650 BSC		
L	0.400	-	0.800
H	0.250 TYP		
θ	0°	-	8°
ccc	0.100		

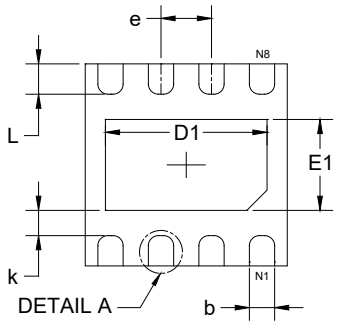
NOTES:
1. This drawing is subject to change without notice.
2. The dimensions do not include mold flashes, protrusions or gate burrs.
3. Reference JEDEC MO-187.

PACKAGE OUTLINE DIMENSIONS

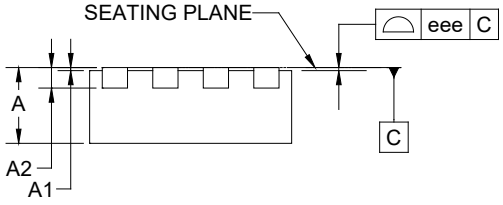
TDFN-2×2-8AL



TOP VIEW



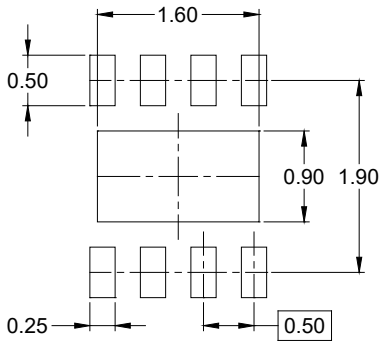
BOTTOM VIEW



SIDE VIEW



DETAIL A
ALTERNATE TERMINAL CONSTRUCTION



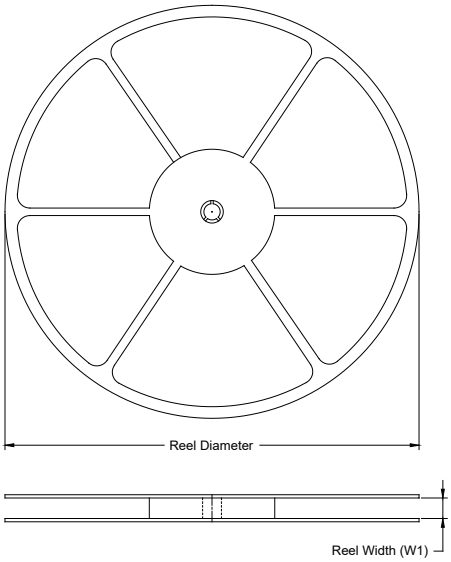
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.700	-	0.800
A1	0.000	-	0.050
A2	0.203 REF		
b	0.200	-	0.300
D	1.900	-	2.100
D1	1.450	-	1.700
E	1.900	-	2.100
E1	0.750	-	1.000
k	0.200	-	-
e	0.500 BSC		
L	0.200	-	0.400
eee	0.080		

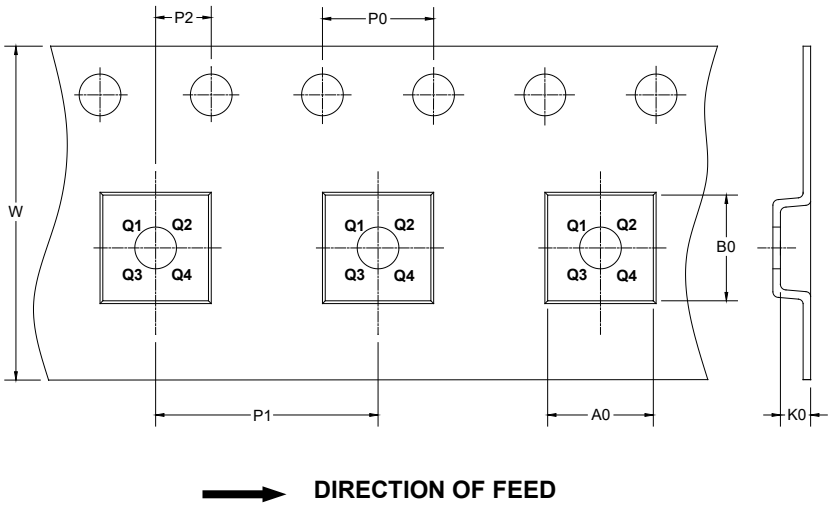
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



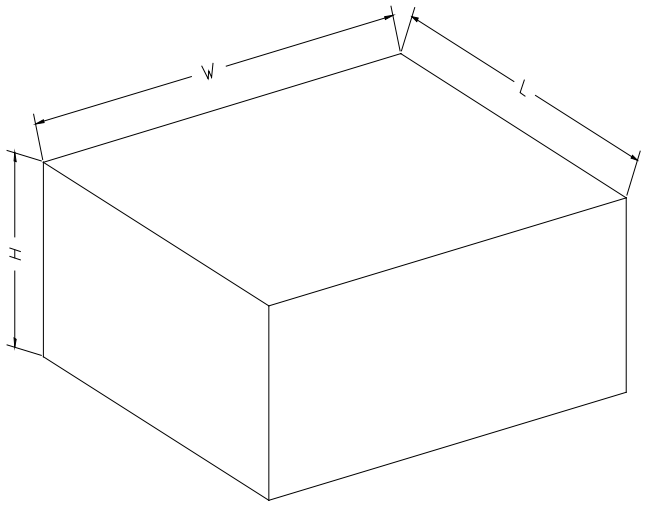
NOTE: The picture is only for reference. Please make the object as the standard.

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
SOIC-8	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
MSOP-8	13"	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1
TDFN-2×2-8AL	7"	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q2

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
13″	386	280	370	5

DD0002