LMC7211-N Tiny CMOS Comparator with Rail-to-Rail Input and Push-Pull Output

1 Features

- Tiny SOT 23-5 package saves space
- Package is less than 1.43mm thick
- Specified specs at 2.7V, 5V, 15V supplies
- Typical supply current 7µA at 5V
- Response time of 420ns at 5V
- Push-pull output
- Input common-mode range beyond V− and V+
- Low input current

2 Applications

- Battery powered products
- Notebooks and PDAs
- PCMCIA cards
- Mobile communications
- Alarm and security circuits
- Direct sensor interface
- Replaces amplifiers used as comparators with better performance and lower current

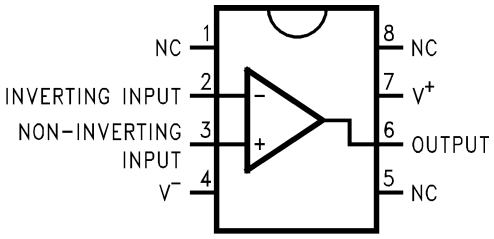
3 Description

The LMC7211-N is a micropower CMOS comparator available in the space saving SOT23-5 package. This makes the comparator designed for space and weight critical designs. The LMC7211-N is supplied in two offset voltage grades, 5mV and 15mV.

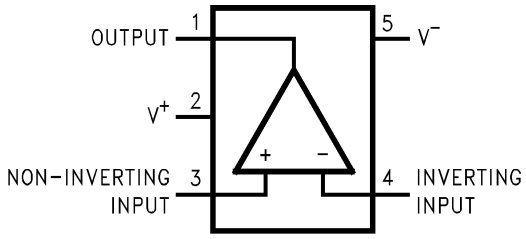
The main benefits of the tiny package are most apparent in small portable electronic devices, such as mobile phones, pagers, notebook computers, personal digital assistants, and PCMCIA cards. The rail-to-rail input voltage makes the LMC7211-N a good choice for sensor interfacing, such as light detector circuits, optical and magnetic sensors, and alarm and status circuits.

The tiny comparator's outside dimensions (length x width x height) of 3.05mm × 3.00mm × 1.43mm allow the device to fit into tight spaces on PC boards.

See the LMC7221 for a comparator with an open-drain output.



8-Pin SOIC-8 Top View



5-Pin SOT23-5 Top View

Table of Contents

4 Specifications

4.1 Absolute Maximum Ratings

(1)

ESD Tolerance (2)		2kV
Differential Input Voltage		(V_{CC}) +0.3V to $(-V_{CC})$−0.3V
Voltage at Input/Output Pin		(V_{CC}) + 0.3V to $(-V_{CC})$−0.3V
Supply Voltage (V^+–V^-)		16V
Current at Input Pin (3)		±5mA
Current at Output Pin(4) (5)		±30mA
Current at Power Supply Pin		40mA
Lead Temperature	(soldering, 10 sec)	260°C
Storage Temperature Range		−65°C to +150°C
Junction Temperature(6)		150°C

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device can occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not specified. For specified specifications and the test conditions, see the Electrical Characteristics.
(2) Human body model, 1.5kΩ in series with 100pF.
(3) Limiting input pin current is only necessary for input voltages that exceed absolute maximum input voltage rating.
(4) Applies to both single-supply and split-supply operation. Continuous short circuit operation at elevated ambient temperature can result in exceeding the maximum allowed junction temperature of 150°C. Output currents in excess of ±30mA over long term can adversely affect reliability.
(5) Do not short circuit output to V+, when V+ is greater than 1V or reliability is adversely affected.
(6) The maximum power dissipation is a function of $T_{J(max)}$, θ_{JA}, and T_A. The maximum allowable power dissipation at any ambient temperature is $P_D = (T_{J(max)} - T_A)/\theta_{JA}$.All numbers apply for packages soldered directly into a PC board.

4.2 Operating Ratings

(1)

Supply Voltage			$2.7 \le V_{CC} \le 15V$
Junction Temperature Range (LMC7211-NAI, LMC7211-NBI)			$-40°C \le T_J \le +85°C$
Thermal Resistance (θ_{JA})	SO-8 Package	8-Pin Surface Mount	136°C/W
	M05A Package	5-Pin Surface Mount	203°C/W

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device can occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not specified. For specified specifications and the test conditions, see the Electrical Characteristics.

4.3 2.7V Electrical Characteristics

Unless otherwise specified, all limits specified for T_J = 25°C, V^+ = 2.7V, V^- = 0V, $V_{CM} = V_O$ = V+/2. **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Typ (1)	LMC7211-NAI Limit(2)	LMC7211-NBI Limit(2)	Units
V_{OS}	Input Offset Voltage		3	5 **8**	15 **18**	mV max
TCV_{OS}	Input Offset Voltage Temperature Drift		1.0			µV/°C
I_B	Input Current		0.04			pA
I_{OS}	Input Offset Current		0.02			pA
CMRR	Common Mode Rejection Ratio	$0V \le V_{CM} \le 2.7V$	75			dB
PSRR	Power Supply Rejection Ratio	$2.7V \le V^+ \le 15V$	80			dB
A_V	Voltage Gain		100			dB

Unless otherwise specified, all limits specified for T_J = 25°C, V^+ = 2.7V, V^- = 0V, V_{CM} = V_O = V+/2. **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Typ (1)	LMC7211-NAI Limit(2)	LMC7211-NBI Limit(2)	Units
CMVR	Input Common-Mode Voltage Range	CMRR > 55dB	3.0	2.9 **2.7**	2.9 **2.7**	V min
		CMRR > 55dB	−0.3	−0.2 **0.0**	−0.2 **0.0**	V max
V_{OH}	Output Voltage High	I_{load} = 2.5mA	2.5	2.4 **2.3**	2.4 **2.3**	V min
V_{OL}	Output Voltage Low	I_{load} = 2.5mA	0.2	0.3 **0.4**	0.3 **0.4**	V max
I_S	Supply Current	V_{OUT} = Low	7	12 **14**	12 **14**	µA max

(1) Typical values represent the most likely parametric norm.
(2) All limits are specified by testing or statistical analysis.

4.4 5.0V and 15.0V Electrical Characteristics

Unless otherwise specified, all limits specified for T_J = 25°C, V^+ = 5.0V and 15V, V^- = 0V, V_{CM} = V_O = V^+/2. **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Typ (1)	LMC7211-NAI Limit(2)	LMC7211-NBI Limit(2)	Units
V_{OS}	Input Offset Voltage		3	5 **8**	15 **18**	mV max
TCV_{OS}	Input Offset Voltage Temperature Drift	V^+ = 5V	1.0			µV/°C
		V^+ = 15V	4.0			
I_B	Input Current		0.04			pA
I_{OS}	Input Offset Current		0.02			pA
CMRR	Common Mode Rejection Ration	V+ = 5.0V	75			dB
		V+ = 15.0V	82			dB
PSRR	Power Supply Rejection Ratio	5V ≤ V^+ ≤ 10V	80			dB
A_V	Voltage Gain		100			dB
CMVR	Input Common-Mode Voltage Range	V+ = 5.0V CMRR > 55dB	5.3	5.2 **5.0**	5.2 **5.0**	V min
		V+ = 5.0V CMRR > 55dB	−0.3	−0.2 **0.0**	−0.2 **0.0**	V max
		V+ = 15.0V CMRR > 55dB	15.3	15.2 **15.0**	15.2 **15.0**	V min
		V+ = 15.0V CMRR > 55dB	−0.3	−0.2 **0.0**	−0.2 **0.0**	V max
V_{OH}	Output Voltage High	V+ = 5V I_{load} = 5mA	4.8	4.6 **4.45**	4.6 **4.45**	V min
		V+ = 15V I_{load} = 5mA	14.8	14.6 **14.45**	14.6 **14.45**	V min
V_{OL}	Output Voltage Low	V+ = 5V I_{load} = 5mA	0.2	0.40 **0.55**	0.40 **0.55**	V max
		V+ = 15V I_{load} = 5mA	0.2	0.40 **0.55**	0.40 **0.55**	V max
I_S	Supply Current	V_{OUT} = Low	7	14 **18**	14 **18**	µA max

Unless otherwise specified, all limits specified for T_J = 25°C, V^+ = 5.0V and 15V, V^- = 0V, V_{CM} = V_O = V^+/2. **Boldface** limits apply at the temperature extremes.

Symbol	Parameter	Conditions	Typ (1)	LMC7211-NAI Limit(2)	LMC7211-NBI Limit(2)	Units
I_{SC}	Short Circuit Current	Sourcing	30			mA
		Sinking (3)	45			mA

(1) Typical values represent the most likely parametric norm.
(2) All limits are specified by testing or statistical analysis.
(3) Do not short circuit output to V+, when V+ is greater than 12V or reliability is adversely affected.

4.5 AC Electrical Characteristics

Unless otherwise specified, all limits specified for T_J = 25°C, V^+ = 5V, V^- = 0V, V_{CM} = V_O = V^+/2. **Boldface** limits apply at the temperature extreme.

Symbol	Parameter	Conditions		Typ (1)	LMC7211-NAI Limit(2)	LMC7211-NBI Limit(2)	Units
t_{rise}	Rise Time	f = 10kHz, Cl = 50pF, Overdrive = 10mV (3)		15			ns
t_{fall}	Fall Time	f = 10kHz, Cl = 50pF, Overdrive = 10mV (3)		15			ns
t_{PHL}	Propagation Delay (High to Low)	f = 10kHz, Cl = 50pF (3)	10mV	900			ns
			100mV	450			
t_{PLH}	Propagation Delay (Low to High)	f = 10kHz, Cl = 50p(3)	10mV	900			ns
			100mV	420			

(1) Typical values represent the most likely parametric norm.
(2) All limits are specified by testing or statistical analysis.
(3) C_L includes the probe and jig capacitance.

4.6 Typical Characteristics

T_A = 25°C, V_S = 12V, R_{PULLUP} = 2.5k, C_L = 20pF, V_{CM} = 0V, $V_{UNDERDRIVE}$ = 100mV, $V_{OVERDRIVE}$ = 100mV unless otherwise noted.

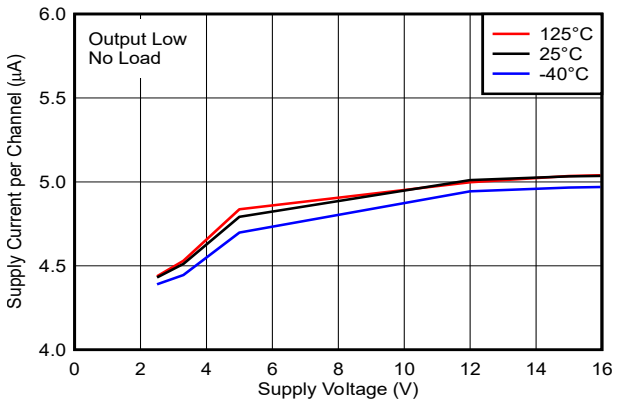


Figure 4-1. Supply Current per Channel vs. Supply Voltage, Output Low

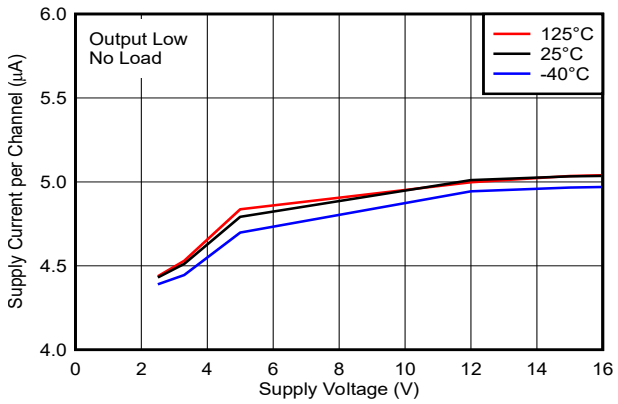


Figure 4-2. Supply Current per Channel vs. Supply Voltage, Output High

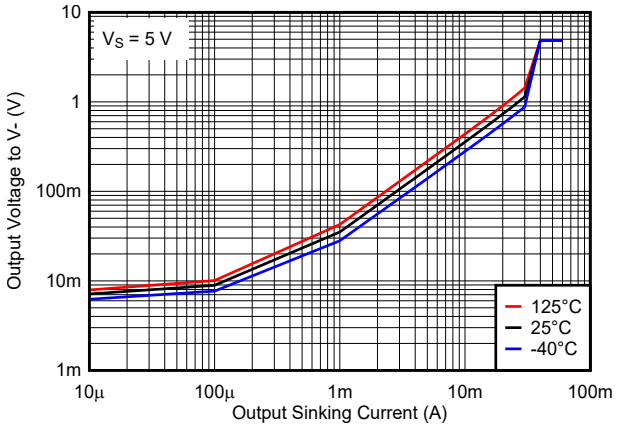


Figure 4-3. Output Voltage vs. Output Sinking Current, 5V

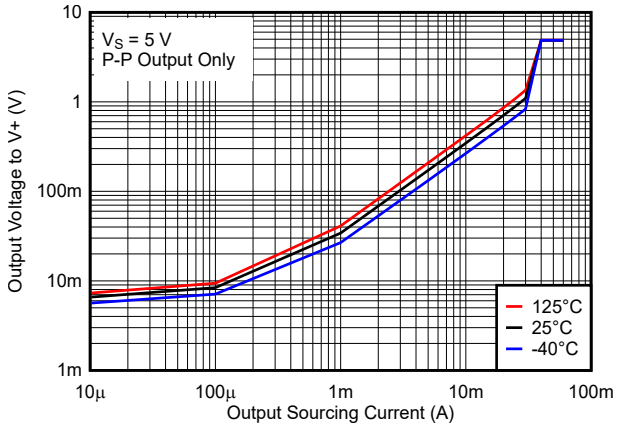


Figure 4-4. Output Voltage vs. Output Sourcing Current, 5V

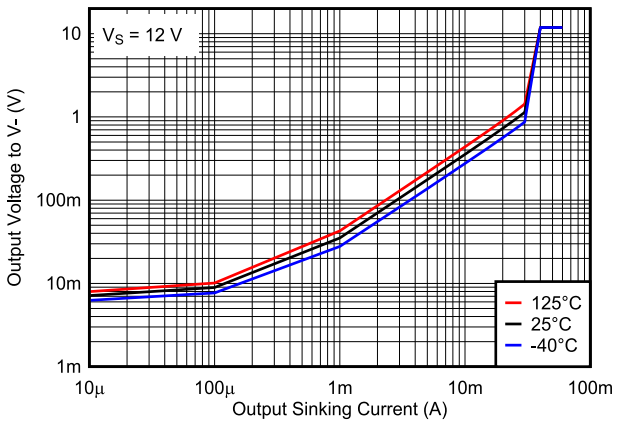


Figure 4-5. Output Voltage vs. Output Sinking Current, 12V

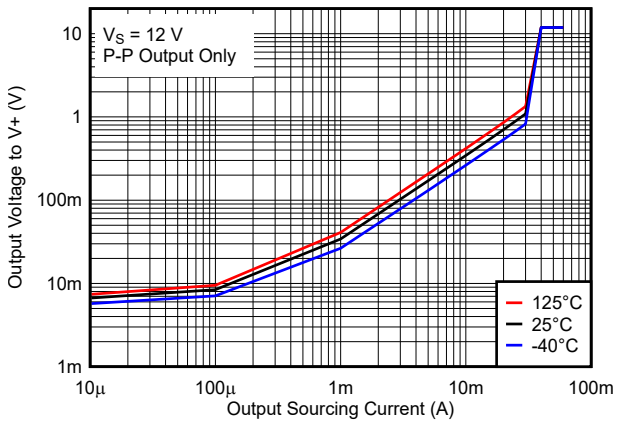


Figure 4-6. Output Voltage vs. Output Sourcing Current, 12V

4.6 Typical Characteristics (continued)

T_A = 25°C, V_S = 12V, R_{PULLUP} = 2.5k, C_L = 20pF, V_{CM} = 0V, $V_{UNDERDRIVE}$ = 100mV, $V_{OVERDRIVE}$ = 100mV unless otherwise noted.

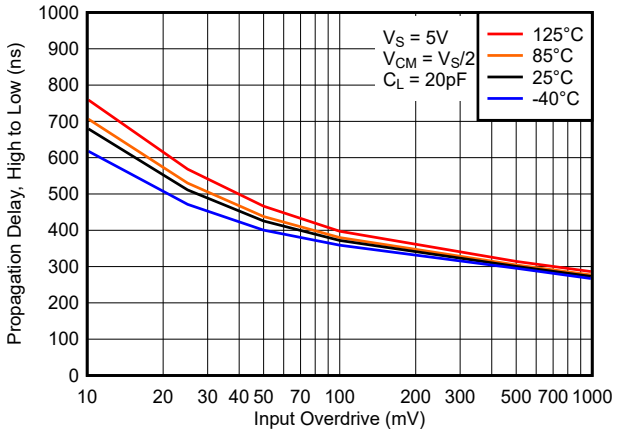


Figure 4-7. Propagation Delay, High to Low, 5V

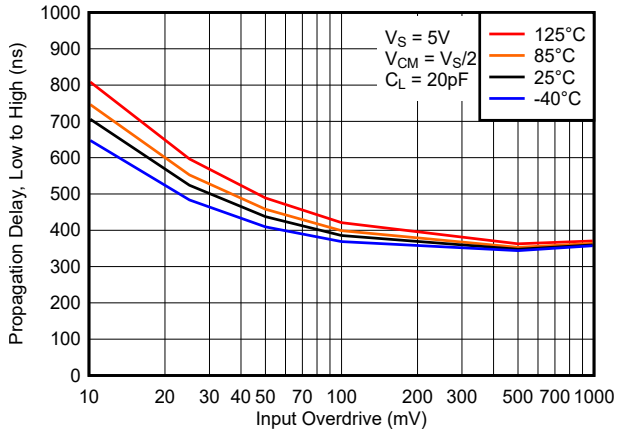


Figure 4-8. Propagation Delay, Low to High, 5V

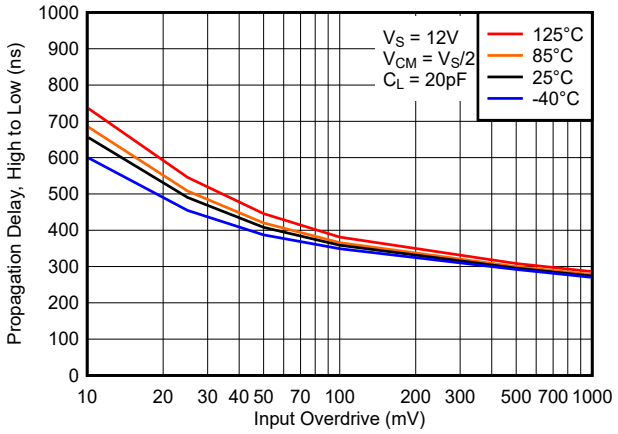


Figure 4-9. Propagation Delay, High to Low, 12V

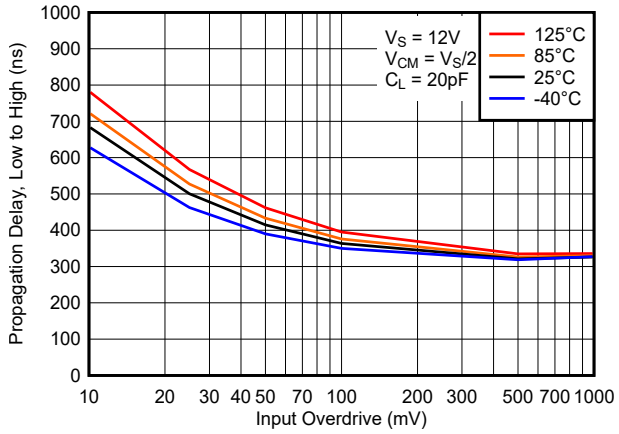


Figure 4-10. Propagation Delay, Low to High, 12V

5 Application Information

5.1 Benefits of the LMC7211-N Tiny Comparator

Size. The small footprint of the SOT 23-5 packaged tiny comparator, (0.120 x 0.118 inches, 3.05 x 3.00mm) saves space on printed circuit boards, and enables the design of smaller electronic products. Because smaller electronics are easier to carry, many customers prefer smaller and lighter products.

Height. The height (0.056 inches, 1.43mm) of the tiny comparator makes the use in PCMCIA type III cards possible.

Simplified Board Layout. The tiny comparator can simplify board layout in several ways. First, by placing a comparator where comparators are needed, instead of routing signals to a dual or quad device, long pc traces can be avoided.

By using multiple tiny comparators instead of duals or quads, complex signal routing and possibly crosstalk can be reduced.

Low Supply Current. The typical 7µA supply current of the LMC7211-N extends battery life in portable applications, and can allow the reduction of the size of batteries in some applications.

Wide Voltage Range. The LMC7211-N is characterized at 15V, 5V and 2.7V. Performance data is provided at these popular voltages. This wide voltage range makes the LMC7211-N a good choice for devices where the voltage can vary over the life of the batteries.

Digital Outputs Representing Signal Level. Comparators provide a high or low digital output depending on the voltage levels of the (+) and (−) inputs. This makes comparators useful for interfacing analog signals to microprocessors and other digital circuits. The LMC7211-N can be thought of as a one-bit a/d converter.

Push-Pull Output. The push-pull output of the LMC7211-N is capable of both sourcing and sinking milliamp level currents even at a 2.7V supply. This can allow the LMC7211-N to drive multiple logic gates.

Driving LEDs (Light Emitting Diodes). With a 5V power supply, the LMC7211-N's output sinking current can drive small, high efficiency LEDs for indicator and test point circuits. The small size of the tiny package makes finding space to add this feature to even compact designs easy.

Input range to Beyond Rail to Rail. The input common mode range of the LMC7211-N is slightly larger than the actual power supply range. This wide input range means that the comparator can be used to sense signals close to the power supply rails. This wide input range can make design easier by eliminating voltage dividers, amplifiers, and other front end circuits previously used to match signals to the limited input range of earlier comparators. This is useful to power supply monitoring circuits which need to sense their own power supply, and compare the power design to a reference voltage which is close to the power supply voltage. The wide input range can also be useful for sensing the voltage drop across a current sense resistor for battery chargers.

Zero Crossing Detector. Since the LMC7211-N's common mode input range extends below ground even when powered by a single positive supply, the device can be used with large input resistors as a zero crossing detector.

Low Input Currents and High Input Impedance. These characteristics allow the LMC7211-N to be used to sense high impedance signals from sensors. The characteristics also makes using the LMC7211-N in timing circuits built with large value resistors possible. This can reduce the power dissipation of timing circuits. For very long timing circuits, using high value resistors can reduce the size and cost of large value capacitors for the same R-C time constant.

Direct Sensor Interfacing. The wide input voltage range and high impedance of the LMC7211-N can make directly interfacing to a sensor without the use of amplifiers or bias circuits possible. In circuits with sensors which can produce outputs in the tens to hundreds of millivolts, the LMC7211-N can compare the sensor signal with an appropriately small reference voltage. This can be done close to ground or the positive supply rail. Direct sensor interfacing can eliminate the need for an amplifier for the sensor signal. Eliminating the amplifier can save cost, space, and design time.

5.2 Low Voltage Operation

Comparators are the common devices by which analog signals interface with digital circuits. The LMC7211-N has been designed to operate at supply voltages of 2.7V without sacrificing performance to meet the demands of 3V digital systems.

At supply voltages of 2.7V, the common-mode voltage range extends 200mV (specified) below the negative supply. This feature, in addition to the comparator being able to sense signals near the positive rail, is extremely useful in low voltage applications.

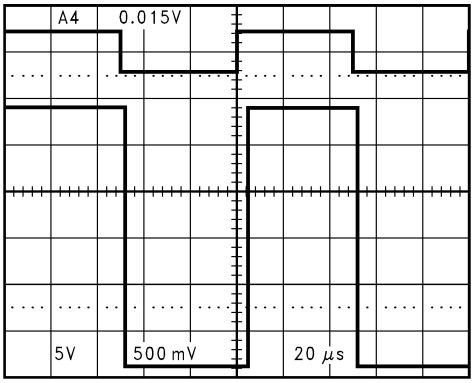


Figure 5-1. Even at Low-Supply Voltage of 2.7V, an Input Signal which Exceeds the Supply Voltages Produces No Phase Inversion at the Output

At V^+ = 2.7V propagation delays are t_{PLH} = 420ns and t_{PHL} = 450ns with overdrives of 100 mV.

Please refer to the performance curves for more extensive characterization.

5.3 Output Short Circuit Current

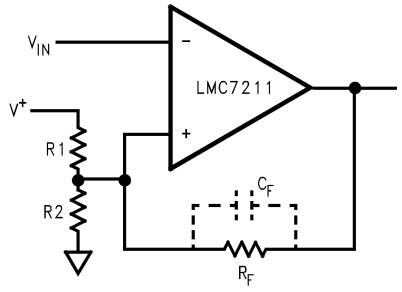
The LMC7211-N has short circuit protection of 40 mA. However, it is not designed to withstand continuous short circuits, transient voltage or current spikes, or shorts to any voltage beyond the supplies. A resistor in series with the output should reduce the effect of shorts. For outputs which send signals off PC boards additional protection devices, such as diodes to the supply rails, and varistors may be used.

5.4 Hysteresis

If the input signal is very slow or very noisy, the comparator output can trip several times as the input signal passes through the threshold. Using positive feedback to add hysteresis to the switching can reduce or eliminate this problem. The positive feedback can be added by a high value resistor (R_F). This results in two switching thresholds, one for increasing signals and one for decreasing signals. A capacitor can be added across R_F to increase the switching speed and provide more short term hysteresis. This can result in greater noise immunity for the circuit.

See Figure 5-2, Figure 5-3 and Figure 5-4.

Note that very heavy loading of the comparator output, such as LED drive or bipolar logic gates, changes the output voltage and shift the voltage thresholds.



$R_F \gg R_1$ and $R_F \gg R_2$

Figure 5-2. Positive Feedback for Hysteresis

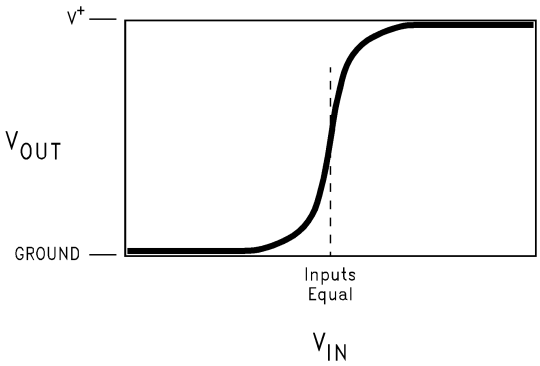


Figure 5-3. Without Positive Feedback (No Hysteresis)

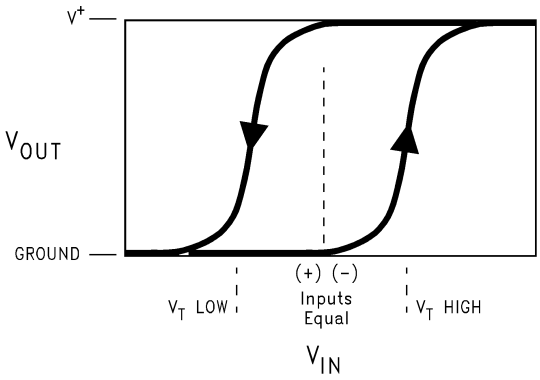


Figure 5-4. With Positive Feedback (Hysteresis or Memory)

5.5 Input Protection

If input signals are likely to exceed the common mode range of the LMC7211-N, or signals can be present when power is off, damage to the LMC7211-N can occur. Large value (100kΩ to MΩ) input resistors can reduce the likelihood of damage by limiting the input currents. Since the LMC7211-N has very low input leakage currents, the effect on accuracy is small. Additional protection can require the use of diodes, as shown in Figure 5-5. Note that diode leakage current can affect accuracy during normal operation. The R-C time constant of R_{IN} and the diode capacitance can also slow response time.

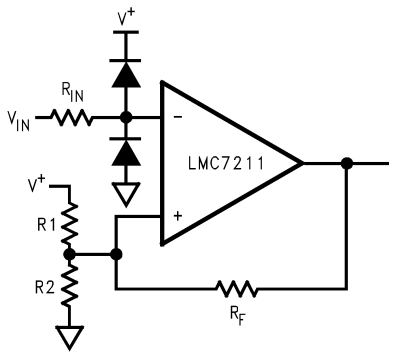


Figure 5-5.

5.6 Layout Considerations

The LMC7211-N is not an especially fast comparator, so high speed design practices are not required. The LMC7211-N is capable of operating with very high impedance inputs, so take precautions to reduce noise pickup with high impedance (~ 100kΩ and greater) designs and in electrically noisy environments.

Keeping high value resistors close to the LMC7211-N and minimizing the size of the input nodes is a good practice. With multilayer designs, try to avoid long loops which can act as inductors (coils). Sensors that are not close to the comparator can need twisted pair or shielded connections to reduce noise.

5.7 Open Drain Output, Dual Versions

The LMC7221 is a comparator similar to the LMC7211-N, but with an open drain output which allows the output voltage to be different (higher or lower) than the supply voltage. The open drain output is like the open collector output of a logic gate. This makes the LMC7221 very useful for mixed voltage systems. Many systems have different voltages for the analog and microprocessor sections. Please see the LMC7221 data sheet for details.

The performance of the LMC7211-N is available in dual devices. Please see the LMC6762 data sheet for details on a dual push-pull output device. For a dual device with open drain outputs, please see the LMC6772 data sheet.

Rail-to-Rail Input Low Power Comparators—

Push-Pull Output		
LMC7211-N	SOT23-5, SO-8	Single
LMC6762	SO-8,	Dual

Open Drain Output		
LMC7221	SOT23-5, SO-8	Single
LMC6772	SO-8, DIP	Dual

5.8 Additional SOT23-5 Tiny Devices

National Semiconductor has additional parts available in the space saving SOT23 Tiny package, including amplifiers, voltage references, and voltage regulators. These devices include—

LMC7101 1 MHz gain-bandwidth rail-to-rail input and output amplifier—high input impedance and high gain 700 µA typical current 2.7V, 3V, 5V and 15V specifications.

LMC7111 Low power 50 kHz gain-bandwidth rail-to-rail input and output amplifier with 25 µA typical current specified at 2.7V, 3.0V, 3.3V, 5V and 10V.

LM7131 Tiny Video amp with 70 MHz gain bandwidth 3V, 5V and ±5V specifications.

LP2980 Micropower SOT 50 mA Ultra Low-Dropout Regulator.

LM4040 Precision micropower shunt voltage reference. Fixed voltages of 2.500V, 4.096V, 5.000V, 8.192V and 10.000V.

LM4041 Precision micropower shut voltage reference 1.225V and adjustable.

LM385 Low current voltage reference. Fixed Voltages of 1.2V and 2.5V.

Contact your National Semiconductor representative for the latest information.

5.9 Spice Macromodel

A Spice Macromodel is available for the LMC7211-N comparator on the National Semiconductor Amplifier Macromodel disk. Contact your National Semiconductor representative to obtain the latest version.

6 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

6.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

6.2 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

6.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

6.4 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments 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 very small parametric changes could cause the device not to meet its published specifications.

6.5 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

7 Revision History

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

Changes from Revision F (January 2013) to Revision G (December 2025)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document	1

8 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LMC7211AIM	Obsolete	Production	SOIC (D) | 8	-	-	Call TI	Call TI	-40 to 85	LMC72 11AIM
LMC7211AIM/NOPB	Active	Production	SOIC (D) | 8	95 | TUBE	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11AIM
LMC7211AIM/NOPB.A	Active	Production	SOIC (D) | 8	95 | TUBE	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11AIM
LMC7211AIM/NOPB.B	Active	Production	SOIC (D) | 8	95 | TUBE	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11AIM
LMC7211AIM5	Obsolete	Production	SOT-23 (DBV) | 5	-	-	Call TI	Call TI	-40 to 85	C00A
LMC7211AIM5/NOPB	Obsolete	Production	SOT-23 (DBV) | 5	-	-	Call TI	Call TI	-40 to 85	C00A
LMC7211AIM5X	Obsolete	Production	SOT-23 (DBV) | 5	-	-	Call TI	Call TI	-40 to 85	C00A
LMC7211AIM5X/NOPB	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 85	C00A
LMC7211AIM5X/NOPB.A	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C00A
LMC7211AIM5X/NOPB.B	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	-	Call TI	Call TI	-40 to 85	
LMC7211AIMX/NOPB	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11AIM
LMC7211AIMX/NOPB.A	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11AIM
LMC7211AIMX/NOPB.B	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11AIM
LMC7211BIM	Obsolete	Production	SOIC (D) | 8	-	-	Call TI	Call TI	-40 to 85	LMC72 11BIM
LMC7211BIM/NOPB	Active	Production	SOIC (D) | 8	95 | TUBE	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11BIM
LMC7211BIM/NOPB.A	Active	Production	SOIC (D) | 8	95 | TUBE	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11BIM
LMC7211BIM/NOPB.B	Active	Production	SOIC (D) | 8	95 | TUBE	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11BIM
LMC7211BIM5/NOPB	Obsolete	Production	SOT-23 (DBV) | 5	-	-	Call TI	Call TI	-40 to 85	C00B
LMC7211BIM5X/NOPB	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 85	C00B
LMC7211BIM5X/NOPB.A	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	C00B
LMC7211BIM5X/NOPB.B	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	-	Call TI	Call TI	-40 to 85	

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LMC7211BIMX/NOPB	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11BIM
LMC7211BIMX/NOPB.A	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11BIM
LMC7211BIMX/NOPB.B	Active	Production	SOIC (D) | 8	2500 | LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	LMC72 11BIM

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

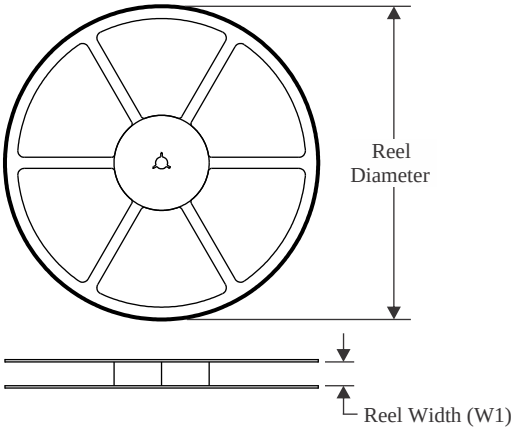
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

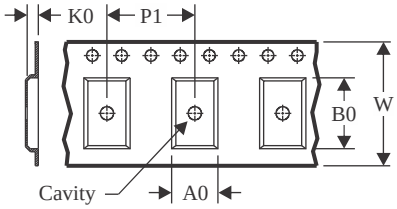
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

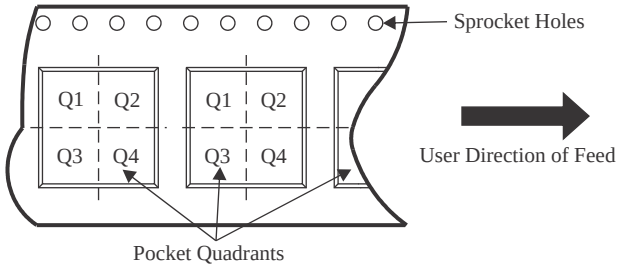


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

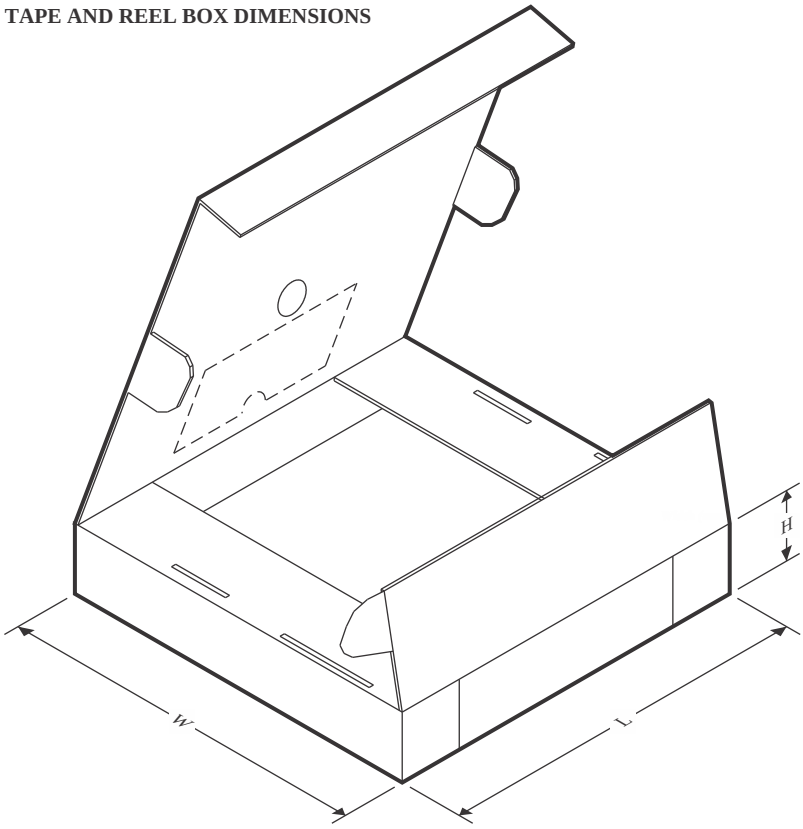
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LMC7211AIM5X/NOPB	SOT-23	DBV	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
LMC7211AIMX/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1
LMC7211BIM5X/NOPB	SOT-23	DBV	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
LMC7211BIMX/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1

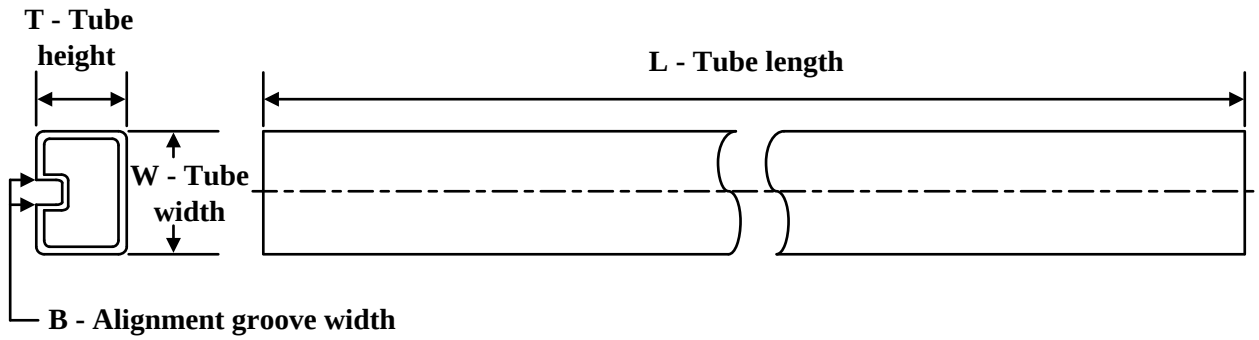
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LMC7211AIM5X/NOPB	SOT-23	DBV	5	3000	180.0	180.0	18.0
LMC7211AIMX/NOPB	SOIC	D	8	2500	367.0	367.0	35.0
LMC7211BIM5X/NOPB	SOT-23	DBV	5	3000	180.0	180.0	18.0
LMC7211BIMX/NOPB	SOIC	D	8	2500	367.0	367.0	35.0

TUBE



*All dimensions are nominal

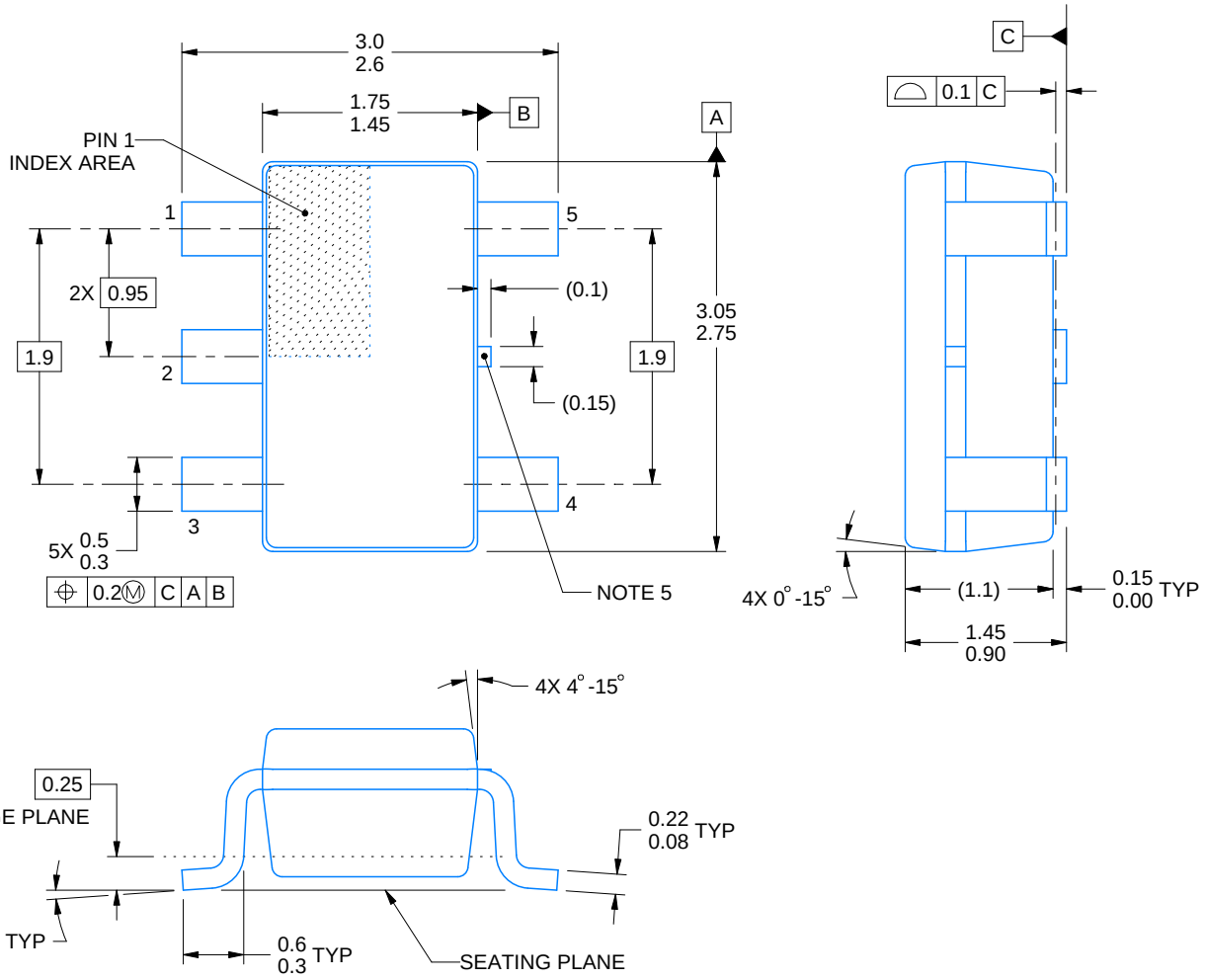
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
LMC7211AIM/NOPB	D	SOIC	8	95	495	8	4064	3.05
LMC7211AIM/NOPB.A	D	SOIC	8	95	495	8	4064	3.05
LMC7211AIM/NOPB.B	D	SOIC	8	95	495	8	4064	3.05
LMC7211BIM/NOPB	D	SOIC	8	95	495	8	4064	3.05
LMC7211BIM/NOPB.A	D	SOIC	8	95	495	8	4064	3.05
LMC7211BIM/NOPB.B	D	SOIC	8	95	495	8	4064	3.05

PACKAGE OUTLINE

DBV0005A

SOT-23 - 1.45 mm max height

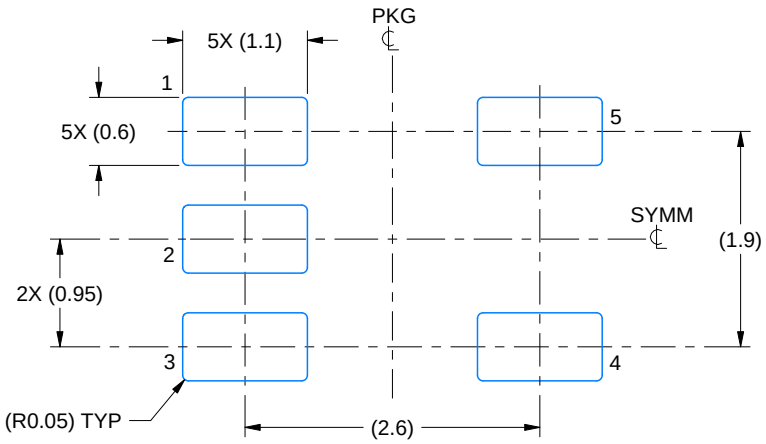
SMALL OUTLINE TRANSISTOR



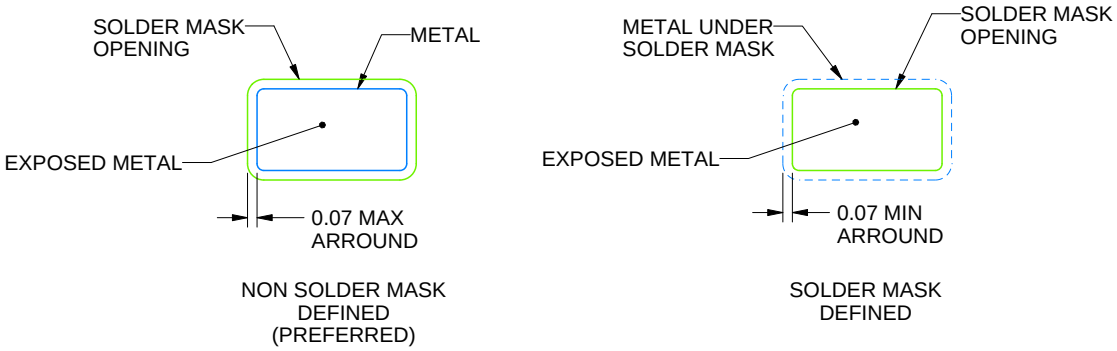
4214839/K 08/2024

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Refernce JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
5. Support pin may differ or may not be present.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X

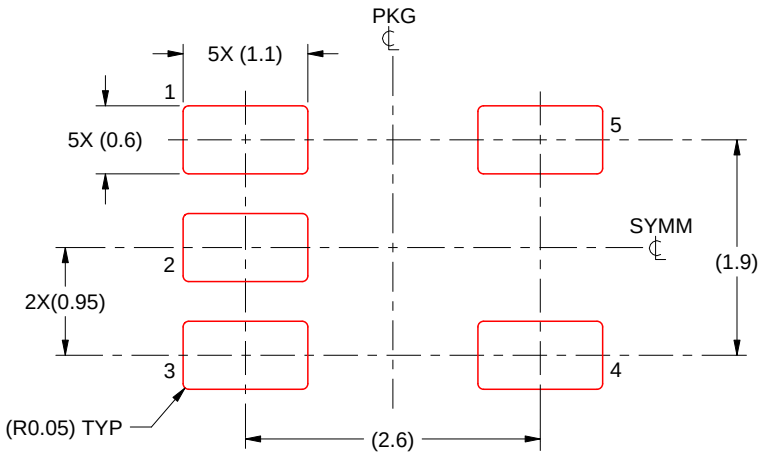


SOLDER MASK DETAILS

4214839/K 08/2024

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

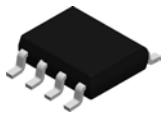


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

4214839/K 08/2024

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

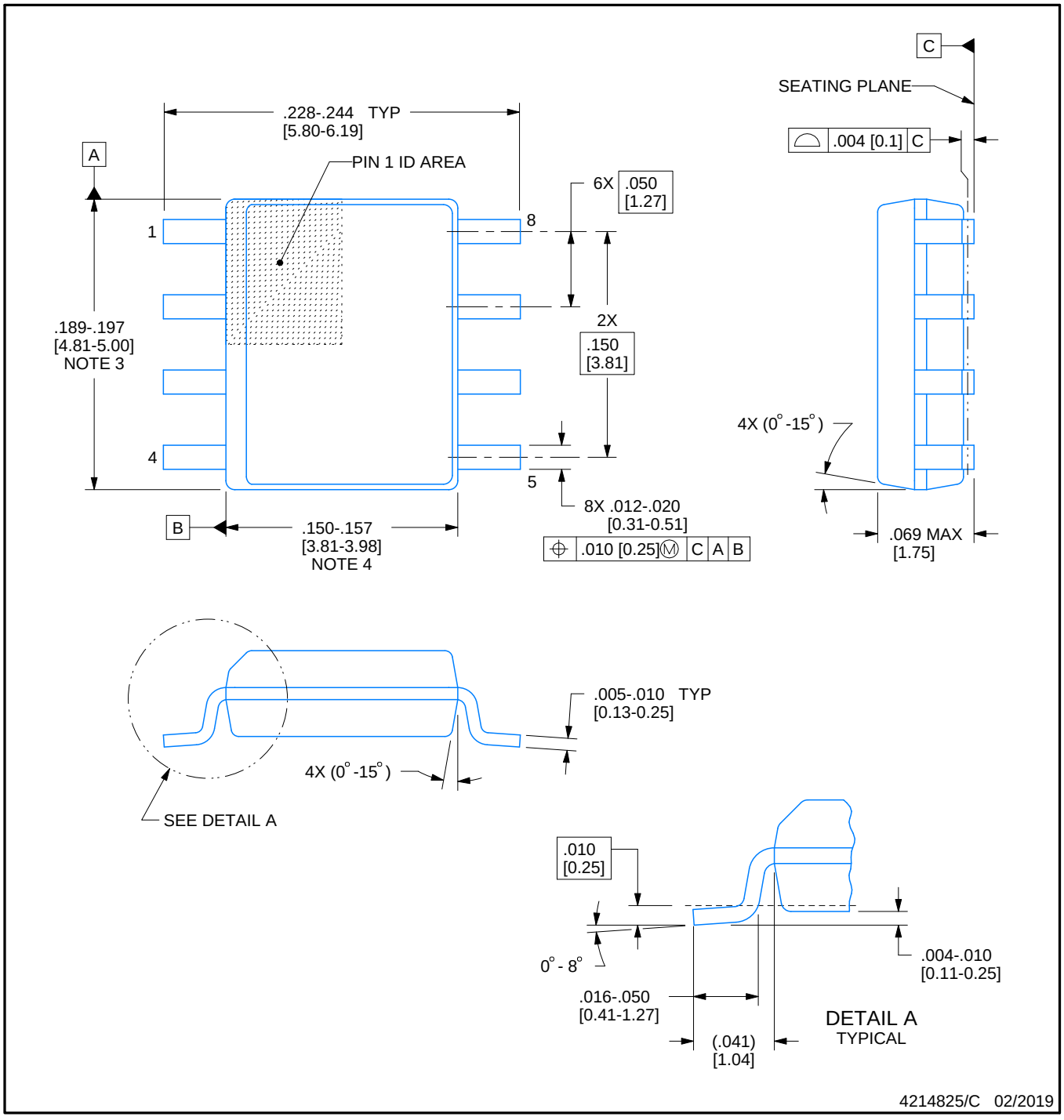


PACKAGE OUTLINE

D0008A

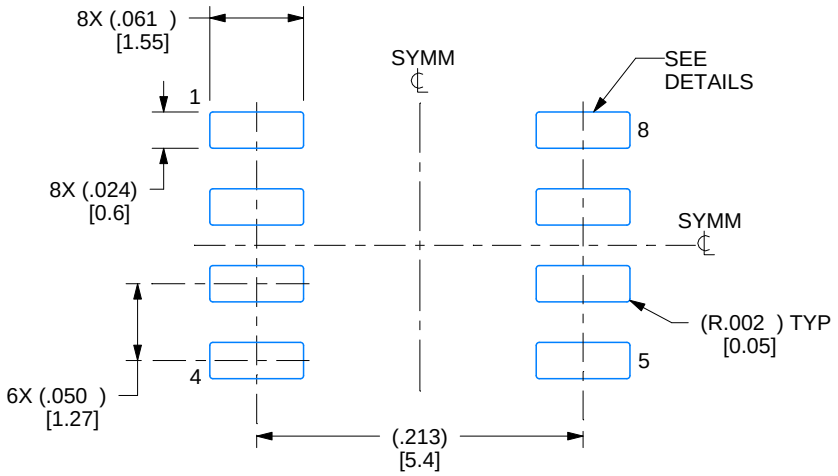
SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

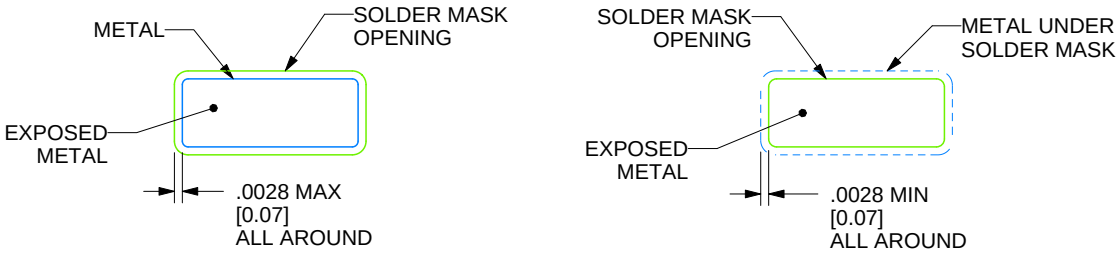


NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

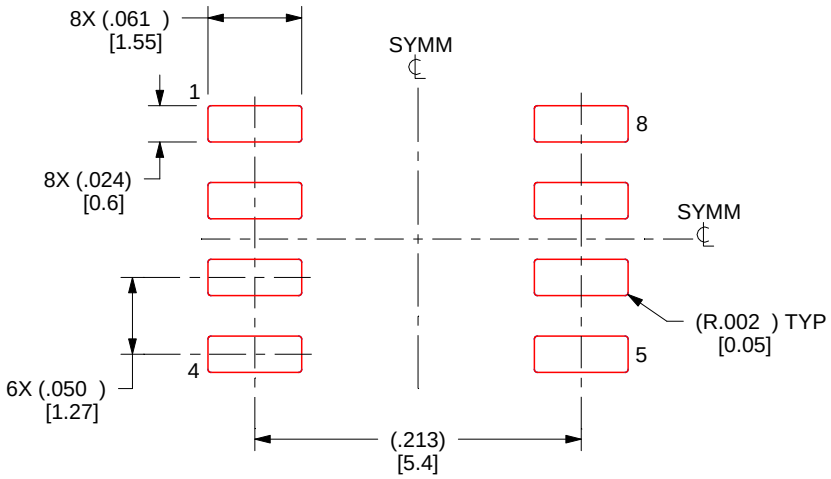
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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