Ultra-Low Power 310nA, 1.7V, RRI, CMOS Input Comparators

CJCP20x Series Comparators

1 Introduction

The CJCP20x series devices are single, dual, and quad channel comparators with push-pull output that are ideal for power-sensitive, low-voltage applications. Featuring a nano-power (typical 310nA), fast 12μs propagation delay, and a wide range of supply voltages from 1.7V to 5.5V with rail-to-rail common-mode voltage range makes the CJCP20x series an ideal choice for a wide variety of portable electronics applications, such as handsets, tablets, notebooks and portable devices that have extremely power constraints and tight board space.

The output of the CJCP20x series pulls to within 0.1V of either supply rail without external pull-up circuitry, making these devices ideal for interface with both CMOS and TTL logics. All input and output pins can tolerate a continuous short-circuit fault condition to either rail. Internal hysteresis ensures clean output switching, even with slow-moving input signals.

The CJCP201 (single) is available in both SOT23-5L package. The CJCP202 (dual) is offered in SOP8 package. The quad-channel CJCP204 is offered in both SOP14 package. All devices are rated over −40°C to +85°C industrial temperature range.

2 Features

- Nanopower Operating Current (310nA) Preserves Battery Power
- Propagation Delay: 12μs (100mV Overdrive)
- Rail-to-Rail Input
- Push-Pull Output Current Drive: 30 mA Typically at 5V Supply
- Internal Hysteresis for Clean Switching
- Internal RF/EMI Filter
- Single 1.7V to 5.5V Supply Voltage Range
  Can be Powered From the Same 1.8V/2.5V/3.3V/5V System Rails
- Operating Temperature Range:
  −40°C to +85°C

3 Applications

- Handsets, Tablets and Notebooks
- Wearables and Consumer Accessories
- Portable Medical Instruments
- Alarms and Monitoring Circuits
- Level Detectors
- IR Receivers
- Multi-vibrators

4 Available Packages

PART NUMBER	PACKAGE
CJCP201-M5N	SOT23-5L
CJCP202-PAN	SOP8
CJCP204-PHN	SOP14

5 Orderable Information

MODEL	DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
CJCP201	CJCP201-M5N	SOT-23-5L	-40 ~ 85°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
CJCP202	CJCP202-PAN	SOP8	-40 ~ 85°C	RoHS & Green	Level 3 168 HR	Tape and Reel 4000 Units / Reel	Active
CJCP204	CJCP204-PHN	SOP14	-40 ~ 85°C	RoHS & Green	Level 3 168 HR	Tape and Reel 2500 Units / Reel	Active
Others	-	-	-	-	-	-	Customized

Note:

ECO PLAN: For the RoHS and Green certification standards of this product, please refer to the official report provided by SZCJ .

MSL: Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

SORT: Specifically defined as follows:

Active: Recommended for new products;

Customized: Products manufactured to meet the specific needs of customers;

Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;

NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers; Obsolete: The device has been discontinued.

6 Pin Configuration and Marking Information

6.1 Pin Configuration and Function

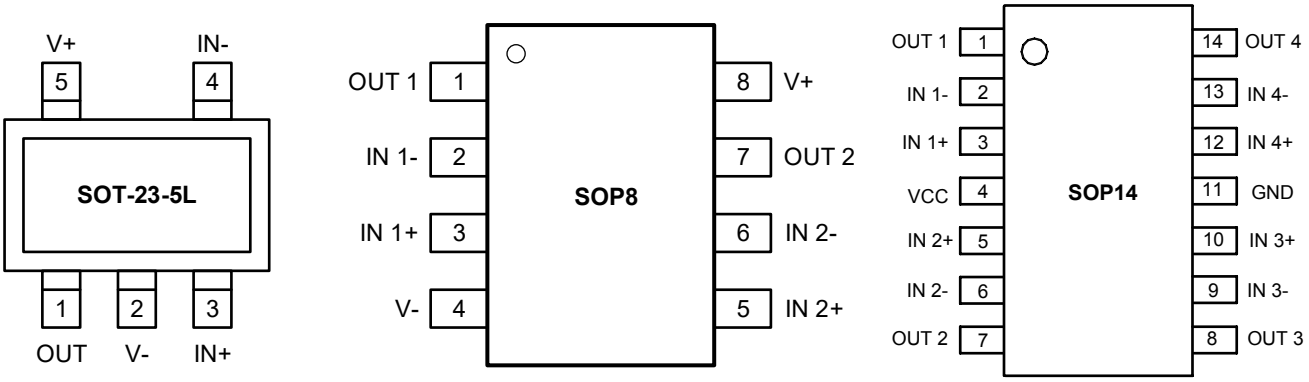
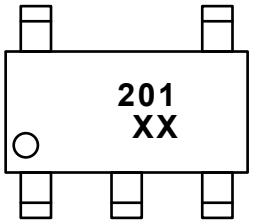


Figure 6-1. CJCP20x Series Pin Map

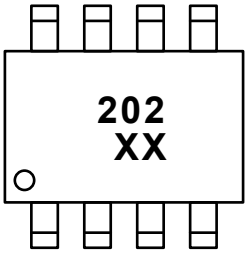
PIN NAME	CJCP201	CJCP202	CJCP204	I / O	DESCRIPTION
	SOT-23-5L	SOP8	SOP14		
OUT1	1	1	1	O	Output of the operational amplifier 1.
IN1-	4	2	2	I	Negative input of the operational amplifier 1.
IN1+	3	3	3	I	Positive input of the operational amplifier 1.
V+	5	8	4	-	Positive (highest) supply.
IN2+	-	5	5	I	Positive input of the operational amplifier 2.
IN2-	-	6	6	I	Negative input of the operational amplifier 2.
OUT2	-	7	7	O	Output of the operational amplifier 2.
OUT3	-	-	8	O	Output of the operational amplifier 3.
IN3-	-	-	9	I	Negative input of the operational amplifier 3.
IN3+	-	-	10	I	Positive input of the operational amplifier 3.
V-	2	4	11	-	Negative (lowest) supply or ground for single supply.
IN4+	-	-	12	I	Positive input of the operational amplifier 4.
IN4-	-	-	13	I	Negative input of the operational amplifier 4.
OUT4	-	-	14	O	Output of the operational amplifier 4.

6 Pin Configuration and Marking Information

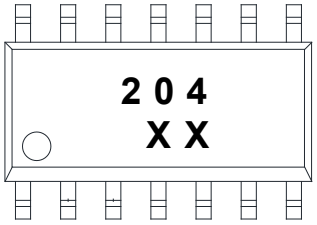
6.2 Marking Information



SOT-23-5L



SOP8



SOP14

"**20x**": Device number.

"**XX**": Code, indicates weekly record information.

7 Specifications

7.1 Absolute Maximum Ratings

(over operating ambient temperature range, unless otherwise specified)(1)

CHARACTERISTIC		SYMBOL	VALUE	UNIT
Supply voltage[(V+) - (V-)]		V_S	10	V
Signal input pins	Voltage(2)		(V-)-0.3V ~ (V+)+0.3V	V
	Current(2)		±10	mA
Output short-circuit		T_{sc}	Continuous(3)	mA
Maximum junction temperature		$T_{J\ MAX}$	150	°C
Storage temperature		T_{stg}	-65 ~ 150	°C
Soldering temperature & time		T_{solder}	260°C, 10s	-

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum rated conditions for extended periods may affect device reliability.

(2) Input pins are diode-clamped to the power-supply rails. Current limit input signals that can swing more than 0.5V beyond the supply rails to 10mA or less.

(3) Short circuits from outputs to V_S can cause excessive heating and eventual destruction. A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power supply voltage and how many amplifiers are shorted. Thermal resistance varies with the amount of PC board metal connected to the package. The specified values are for short traces connected to the leads.

7.2 Recommend Operating Conditions

(over operating ambient temperature range, unless otherwise specified)

PARAMETER		SYMBOL	MIN.	NOM.	MAX.	UNIT
Power supply range	T_A = -40 ~ 85 °C	V_S	1.7	-	5.5	V
Operating ambient temperature		T_A	-40	-	85	°C

7 Specifications

7.3 ESD Ratings

ESD RATINGS		VALUE	UNIT
Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(4)	5000	V
	Charged-device model (CDM), per JEDEC specification JESD22-C101(5)	2000	
	Machine model (MM), per JESD22-A115C	250	

(4) JEDEC document JEP155 states that 500V HBM allows safe manufacturing with a standard ESD control process.

(5) JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process.

7.4 Thermal Information

THERMAL METRIC(6)	SYMBOL	SOT-23-5L	SOP8	SOP14	UNIT
Junction-to-ambient thermal resistance	$R_{\Theta JA}$	192.3	125.0	115.7	°C/W
Reference maximum power dissipation (continuous)	$P_{D\ Ref}$	0.65	1.00	1.08	W

(6) T_A = 25°C, measured on evaluation board with 1oz. copper traces of minimum pad size, all device outputs were active.

7 Specifications

7.5 Electrical Characteristics

V_S = 5.0V, T_A = +25°C, unless otherwise noted.

Boldface limits apply over the specified temperature range, T_A = −40 to +85°C.

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
OFFSET VOLTAGE						
Input offset voltage	V_{OS}	V_{CM} = 0	-	±0.5	±3.5	mV
		T_A = −40 to +85°C	-	-	±4.0	
Offset voltage drift	V_{OS} TC	T_A = −40 to +85°C	-	±1.0	-	µV/°C
Power supply rejection ratio	PSRR	V_S = 1.7 to 5.5V, V_{CM} < (V+)−1V	65	85	-	dB
		T_A = −40 to +85°C	60	-	-	
Input hysteresis	V_{HYST}	V_{CM} = 0	-	5	-	mV
INPUT VOLTAGE						
Common-mode voltage range	V_{CM}	-	(V-)−0.1	-	(V+)+0.1	V
Common-mode rejection ratio	CMRR	V_{CM} = −0.1 to 5.5V	62	84	-	dB
		V_{CM} = 0 to 4.8V, T_A = −40 to +85°C	56	-	-	
		V_S = 1.8V, V_{CM} = −0.1 to 1.9V	60	82	-	
		V_{CM} = 0 to 1.6V, T_A = −40 to +85°C	55	-	-	
INPUT BIAS CURRENT						
Input bias current	I_B	V_{CM} = V_S/2	-	5	-	pA
		T_A = 85°C	-	150	-	
Input offset current	I_{OS}	V_{CM} = V_S/2	-	10	-	pA
INPUT IMPEDANCE						
Input resistance	R_{IN}	-	100	-	-	GΩ
Input capacitance	C_{IN}	Differential	-	2.0	-	pF
		Common mode	-	3.5	-	
OUTPUT						
High output voltage swing	V_{OH}	I_{SOURCE} = 1mA	(V+)-90	(V+)-73	-	mV
		T_A = −40 to +85°C	(V+)-120	-	-	
Low output voltage swing	V_{OL}	I_{SINK} = 1mA	-	(V-)+48	(V-)+60	mV
		T_A = −40 to +85°C	-	-	(V-)+80	
Output short-circuit current	I_{SC}	Sink current, OUT to V_S/2	30	36	-	mA
		Source current, OUT to V_S/2	-	-27	-22	
POWER SUPPLY						
Quiescent current (per comparator)	I_Q	V_S = 1.8V, V_{CM} = 0.3V	-	310	-	nA
		V_S = 1.8V, V_{CM} = 1.5V	-	380	-	
		V_S = 5.0V, V_{CM} = 0.3V	-	355	-	
		V_S = 5.0V, V_{CM} = 4.7V	-	440	670	

7 Specifications

7.5 Electrical Characteristics

V_S = 5.0V, T_A = +25°C, unless otherwise noted.

Boldface limits apply over the specified temperature range, T_A = −40 to +85°C.

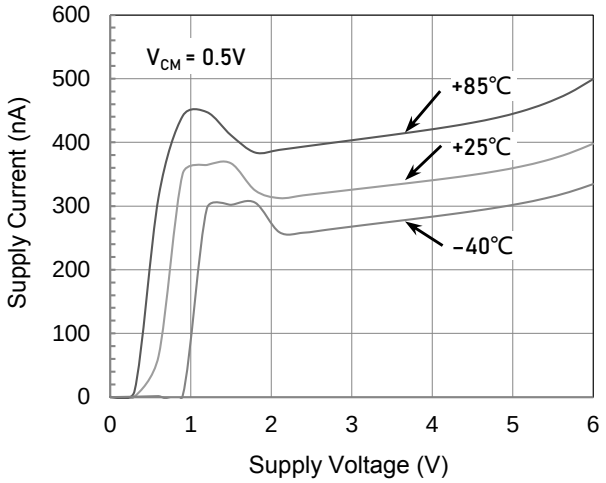
CHARACTERISTIC	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
SWITCHING CHARACTERISTICS						
Propagation delay time, Low to high	t_{PD+}	Input overdrive = 10mV, C_L = 15pF	-	16	-	µs
		Input overdrive = 100mV, C_L = 15pF	-	12	-	
Propagation delay time, High to low	t_{PD-}	Input overdrive = 10mV, C_L = 15pF	-	17	-	µs
		Input overdrive = 100mV, C_L = 15pF	-	13	-	
Rise time	t_R	Input overdrive = 10mV, C_L = 15pF	-	230	-	ns
		Input overdrive = 100mV, C_L = 15pF	-	190	-	
Fall time	t_F	Input overdrive = 10mV, C_L = 15pF	-	300	-	ns
		Input overdrive = 100mV, C_L = 15pF	-	220	-	

7 Specifications

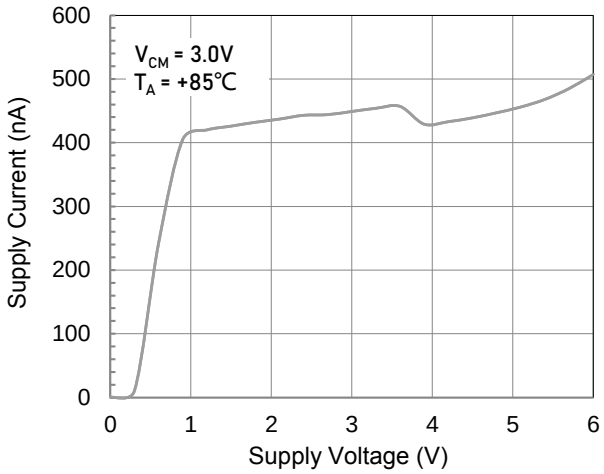
7.6 Typical Characteristics

At T_A = +25°C, V_S = 5.0V, V_{CM} = V_S/2, R_L =10kΩ, and C_L=15pF, unless otherwise noted.

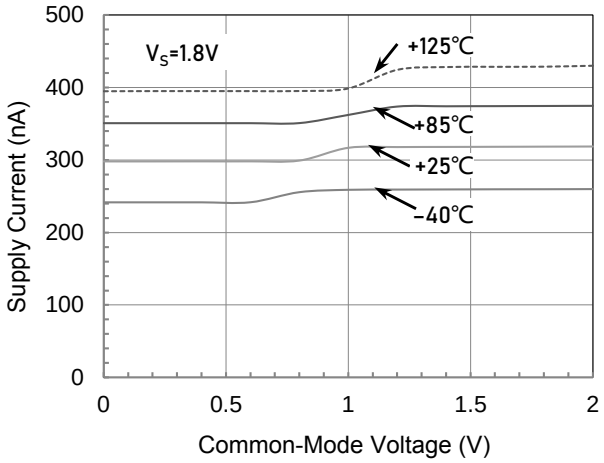
Supply Current vs. Supply Voltage



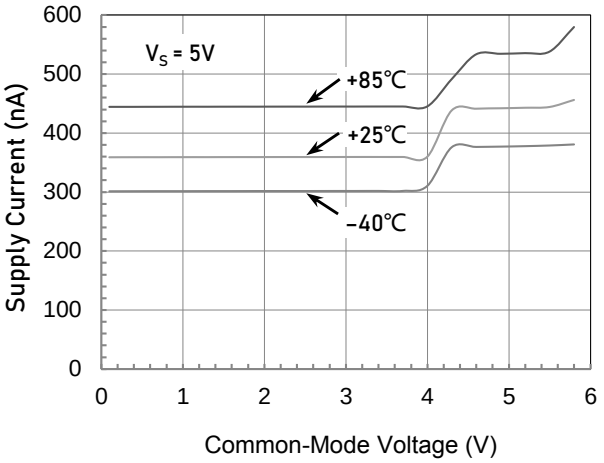
Supply Current vs. Supply Voltage



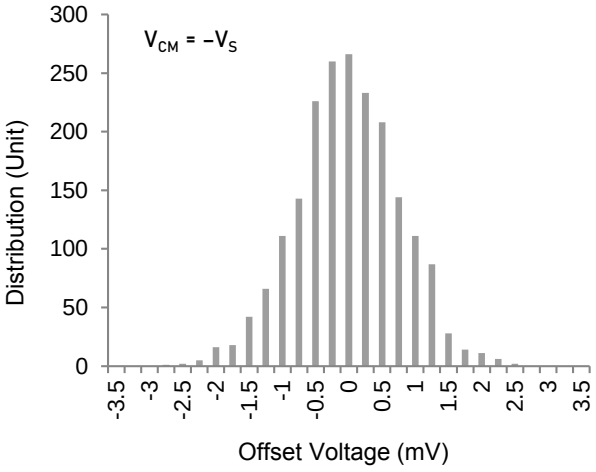
Supply Current vs. Common-Mode Input



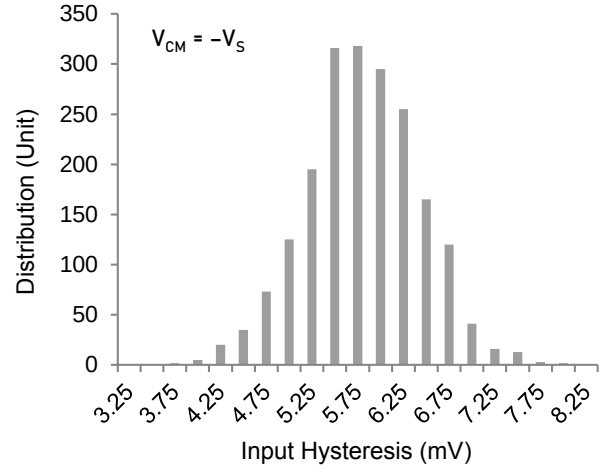
Supply Current vs. Common-Mode Input



Offset Voltage Production Distribution



Hysteresis Production Distribution

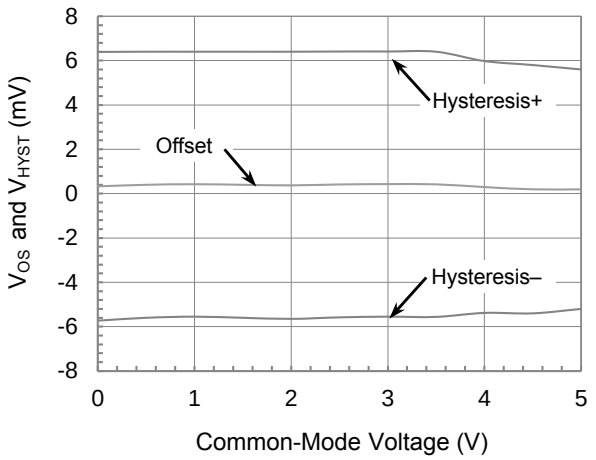


7 Specifications

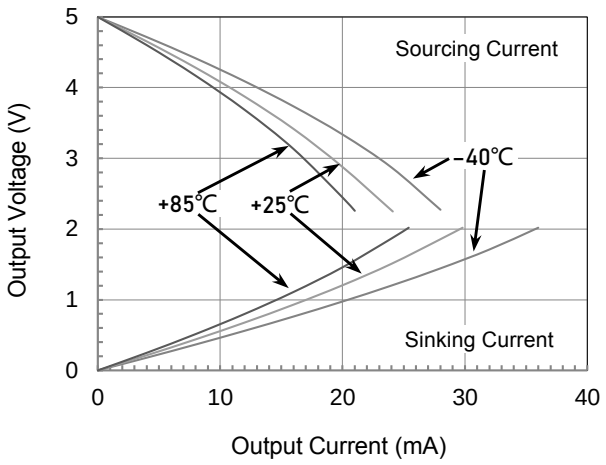
7.6 Typical Characteristics (continued)

At T_A = +25°C, V_S = 5.0V, V_{CM} = V_S/2, R_L =10kΩ, and C_L=15pF, unless otherwise noted.

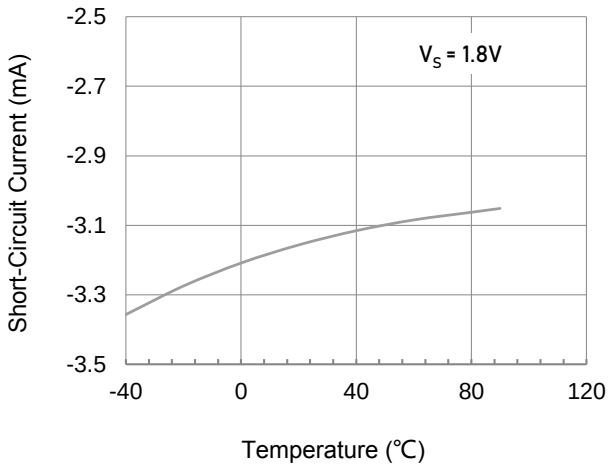
V_{OS} and V_{HYST} vs. Common-Mode Input



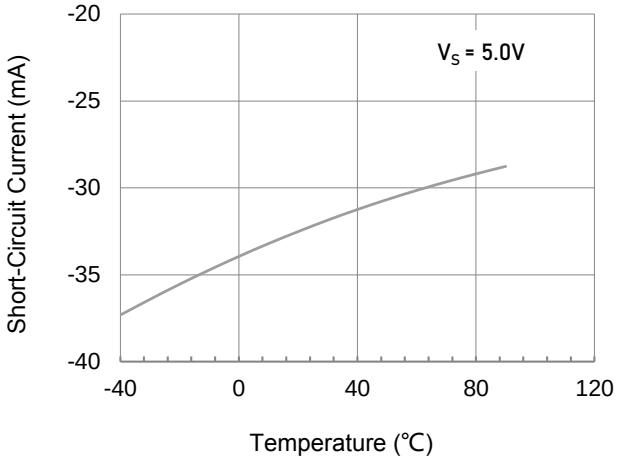
Output Voltage vs. Output Current



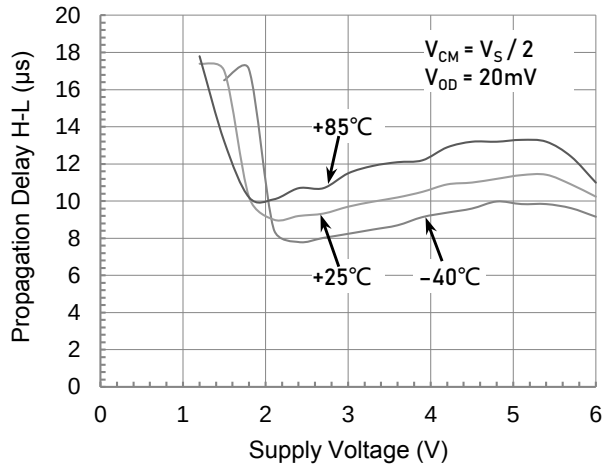
Short-Circuit Current vs. Temperature



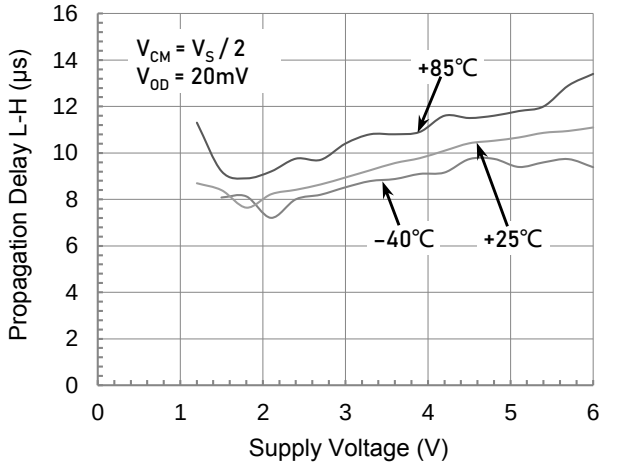
Short-Circuit Current vs. Temperature



Propagation Delay H-L (t_{PD-}) vs. Supply Voltage



Propagation Delay L-H (t_{PD+}) vs. Supply Voltage

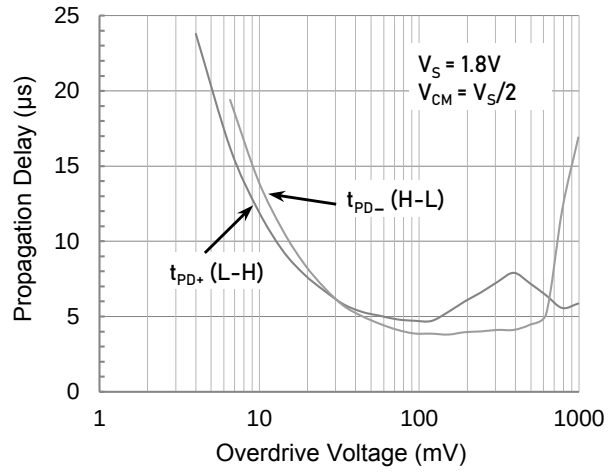


7 Specifications

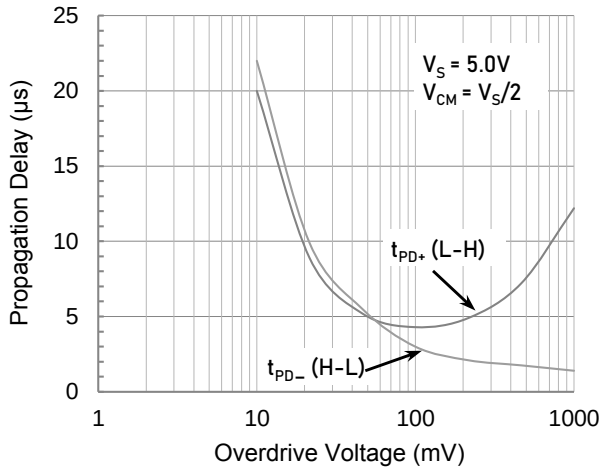
7.6 Typical Characteristics (continued)

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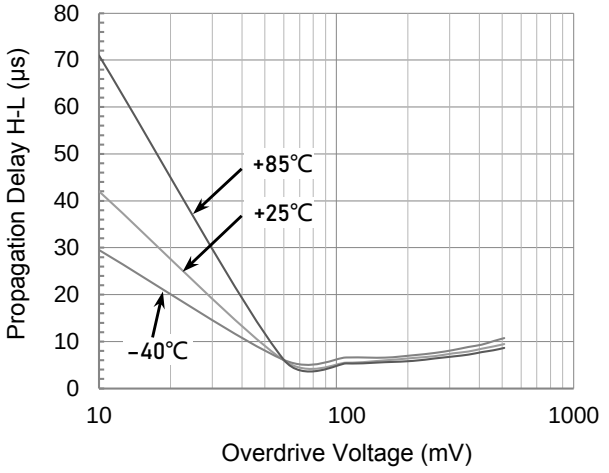
Propagation Delay vs. Input Overdrive



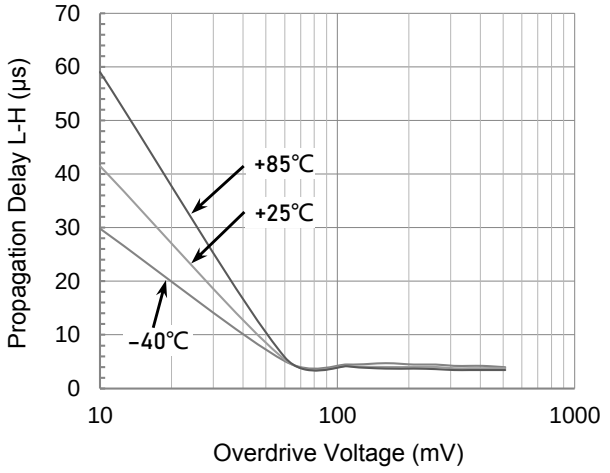
Propagation Delay vs. Input Overdrive



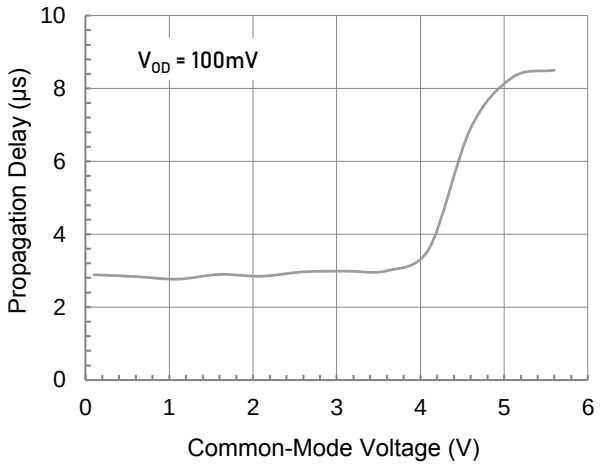
Propagation Delay H-L (t_{PD-}) vs. Input Overdrive



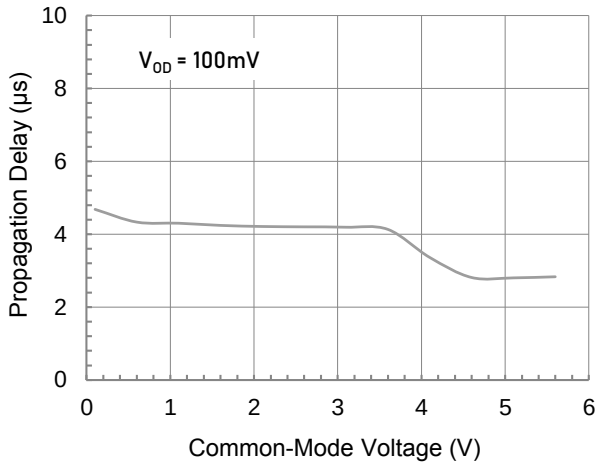
Propagation Delay L-H (t_{PD+}) vs. Input Overdrive



Propagation Delay H-L (t_{PD-}) vs. Input Common-Mode Voltage



Propagation Delay L-H (t_{PD+}) vs. Input Common-Mode Voltage

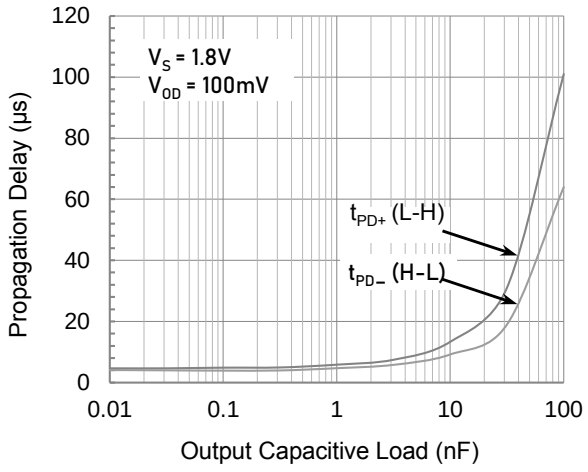


7 Specifications

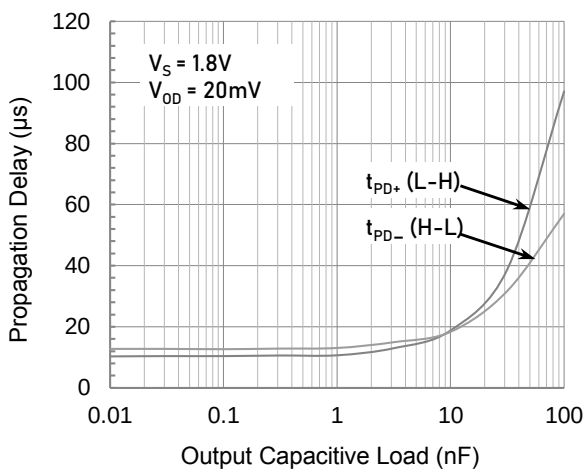
7.6 Typical Characteristics (continued)

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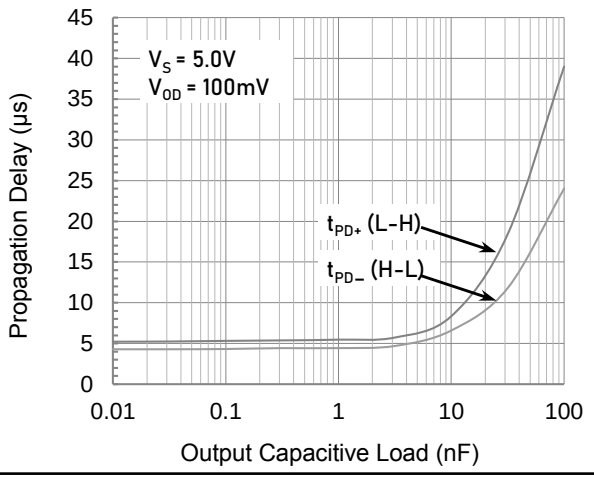
Propagation Delay vs. Capacitive Load



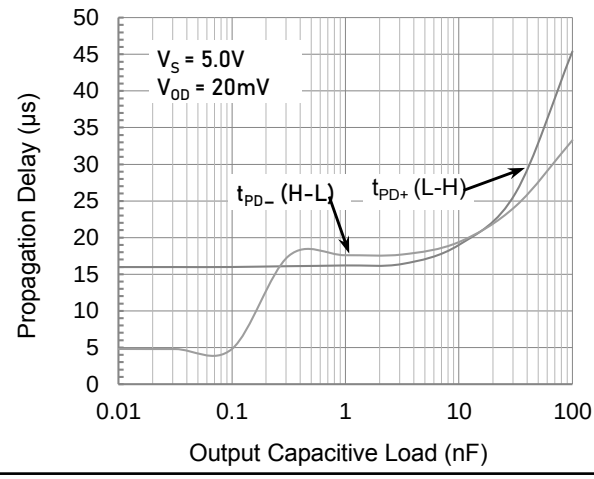
Propagation Delay vs. Capacitive Load



Propagation Delay vs. Capacitive Load



Propagation Delay vs. Capacitive Load



8 Detail Description

8.1 Description

The CJCP20x series devices are single, dual, and quad channel comparators with push-pull output that are ideal for power-sensitive, low-voltage applications. Featuring a nano-power (typical 310nA), fast 12μs propagation delay, and a wide range of supply voltages from 1.7V to 5.5V with rail-to-rail common-mode voltage range makes the CJCP20x series an ideal choice for a wide variety of portable electronics applications, such as handsets, tablets, notebooks and portable devices that have extremely power constraints and tight board space.

8.2 Feature Description

Rail-to-Rail Input

The input common-mode voltage range of the CJCP20x series comparators extends 100mV beyond the supply rails. This performance is achieved with a complementary input stage: an N-channel input differential pair in parallel with a P-channel differential pair. The N-channel pair is active for input voltages close to the positive rail, typically (V+)–1.4V to the positive supply, whereas the P-channel pair is active for inputs from 100mV below the negative supply to approximately (V+)–1.4V. There is a small transition region, typically (V+)–1.2V to (V+)–1V, in which both pairs are on. This 200mV transition region can vary up to 200mV with process variation. Thus, the transition region (both stages on) can range from (V+)–1.4V to (V+)–1.2V on the low end, up to (V+)–1V to (V+)–0.8V on the high end. Within this transition region, PSRR, CMRR, offset voltage, offset drift, and THD can be degraded compared to device operation outside this region.

Internal Hysteresis

Most high-speed comparators oscillate in the linear region because of noise or undesired parasitic feedback. This tends to occur when the voltage on one input is at or equal to the voltage on the other input. To counter the parasitic effects and noise, the devices have an internal hysteresis of 5mV.

The hysteresis in a comparator creates two trip points: one for the rising input voltage and one for the falling input voltage. The difference between the trip points is the hysteresis. The average of the trip points is the offset voltage. When the comparator's input voltages are equal, the hysteresis effectively causes one comparator input voltage to move quickly past the other, thus taking the input out of the region where oscillation occurs. Standard comparators require hysteresis to be added with external resistors. To increase hysteresis and noise margin even more add positive feedback with two resistors as a voltage divider from the output to the non-inverting input. Figure 8-1 illustrates the case where IN– is fixed and IN+ is varied. If the inputs were reversed, the figure would look the same, except the output would be inverted.

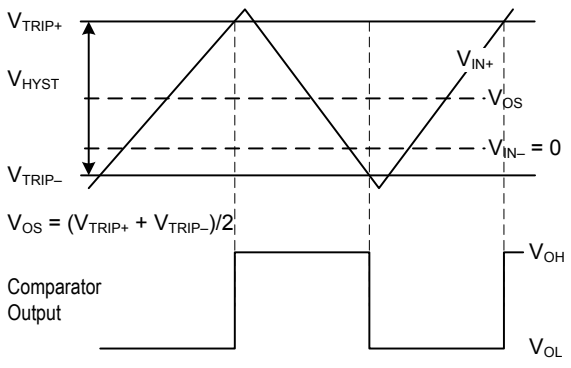


Figure 8-1. Input and Output Waveform, Non-inverting Input Varied

8 Detail Description

8.2 Feature Description (continued)

EMI Rejection

Circuit performance is often adversely affected by high frequency EMI. When the signal strength is low and transmission lines are long, an op-amp must accurately amplify the input signals. However, all op-amp pins — the non-inverting input, inverting input, positive supply, negative supply, and output pins —are susceptible to EMI signals. These high frequency signals are coupled into an op-amp by various means, such as conduction, near field radiation, or far field radiation. For example, wires and printed circuit board (PCB) traces can act as antennas and pick up high frequency EMI signals.

Amplifiers do not amplify EMI or RF signals due to their relatively low bandwidth. However, due to the nonlinearities of the input devices, op-amps can rectify these out of band signals. When these high frequency signals are rectified, they appear as a dc offset at the output.

The CJCP20x series op-amps have integrated EMI filters at their input stage. A mathematical method of measuring EMIRR is defined as follows:

$$EMIRR = 20\ log\left(V_{IN_PEAK}/\Delta V_{OS}\right)$$

9 Application and Implementation

9.1 Application Information

The output of the CJCP20x series pulls to within 0.1V of either supply rail without external pull-up circuitry, making these devices ideal for interface with both CMOS and TTL logics. All input and output pins can tolerate a continuous short-circuit fault condition to either rail. Internal hysteresis ensures clean output switching, even with slow-moving input signals.

9.2 Typical Application Circuits

Input EMI Filter and Clamp Circuit

The CJCP20x series comparator family uses CMOS transistors at the inputs which prevent phase inversion when the input pins exceed the supply voltages.

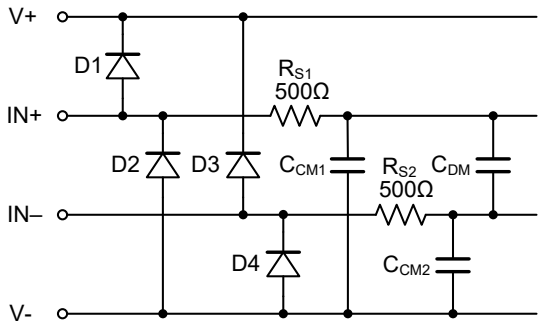


Figure 9-1. Input EMI Filter and Clamp Circuit

Figure 9-1 shows the input EMI filter and clamp circuit. The CJCP20x series op-amps have internal ESD protection diodes (D1, D2, D3, and D4) that are connected between the inputs and each supply rail. These diodes protect the input transistors in the event of electrostatic discharge and are reverse biased during normal operation. This protection scheme allows voltages as high as approximately 300mV beyond the rails to be applied at the input of either terminal without causing permanent damage. See the table of Absolute Maximum Ratings for more information.

Input-to-Output Coupling

To minimize capacitive coupling, the input and output signal traces should not be parallel. This helps reduce unwanted positive feedback.

9 Application and Implementation

9.2 Typical Application Circuits (continued)

IR Receiver AFE and Wake-up Circuit

Infrared (IR) communication is inherently immune to RF interference as long as there is a line-of-sight path between the transmitter and the receiver. It is also one of the lowest cost communication schemes. This makes it a good choice for implementing wireless communications in applications such as utility metering. These smart utility meters are hermetically sealed and use a combination of batteries and solar cells to power the system. Maintenance in the field can be costly, so minimizing system power consumption to extend battery life is desired.

A common system topology to extend battery life is to use a power efficient IR receiver analog front end (AFE) that is always on and wakes up the host only when there is a valid IR signal detected as shown in Figure 9-2. Power efficient comparators such as the CJCP20x can be used in the IR receiver AFE to increase battery life.

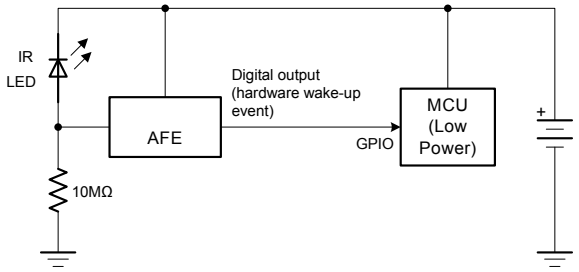


Figure 9-2. Coin Cell Battery Powered IR Receiver

The CJCP20x series device is responsible for two major tasks:

1. IR signal conditioning,
2. Host system wake-up.

The benefits of CJCP20x for this application include the following:

1. Nano quiescent supply current (310nA),
2. Low input bias current (5pA) which allows a greater load resistor value.

The CJCP20x device is constantly powered to always be ready to receive IR signals and wake up the host microcontroller (MCU) when data is received. The short working distance (approx 5cm) is suitable for a virtual-contact operation where the IR transmitter and receiver are closely placed with an optional mechanical alignment guide.

Figure 9-2 shows the IR receiver system block diagram. The host MCU is normally in the shutdown mode (during which the quiescent current is less than 1μA) except when data is being transferred.

Figure 9-3 shows the detailed circuit design. The circuit establishes a threshold through R_2 and C_1 which automatically adapts to the ambient light level. To further reduce BOM cost, this example uses an IR LED as the IR receiver. The IR LED is reverse-biased to function as a photodiode (but at a reduced sensitivity).

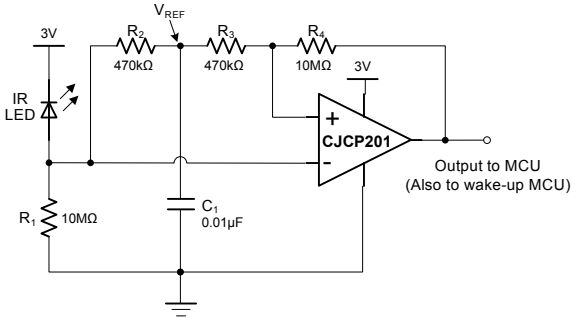


Figure 9-3. IR Receiver AFE Using CJCP201 (Push- Pull Output)

9 Application and Implementation

9.2 Typical Application Circuits (continued)

IR Receiver AFE and Wake-up Circuit (continued)

The low input bias current allows a greater load resistor value (R_1) without sacrificing linearity, which in turn helps reduce the always-on supply current.

The load resistor R_1 converts the IR light induced current into a voltage fed into the inverting input of the comparator. R_2 and C_1 establish a reference voltage V_{REF} which tracks the mean amplitude of the IR signal. The non-inverting input is connected to V_{REF} through R_3.And finally R_3 and R_4 are used to introduce additional hysteresis to keep the output free of spurious toggles.

To achieve years of operation running on a single coin cell battery, the host MCU must be put in the shutdown power state. The MCU wakes up when data is received. After the data transmission is complete, the MCU reverts to the shutdown state and the overall supply current drops back to the micro amps level.

PARAMETER	
Aggregated always-on Current	2μA
Peak Current (Wireless Radio + IR LED)	30mA
Active Duration /Frequency	30sec/30 days
CR 2032 Coin Cell Battery Capacity	240mAh
CR 2032 Lifespan (minimum)	5 years
Lead Temperature Range (Soldering 10sec)	260°C

Table 1 shows a power budget based on the following assumptions:

1. The aggregated always-on quiescent current is estimated as 2μA, which includes the CJCP201 quiescent current, divider network current, and the MCU and supporting devices current in the shutdown state.
2. Peak current during active data transmission and RF radio operation is estimated as 30mA.
3. Each active session last for 30 seconds or less for every 30 days or longer.
4. The coin cell is based on an Energizer CR2032, which is specified at 240mAh and includes a 1% annual self-discharge rate.

9.3 Power Supply Recommendations

The CJCP20x series of nano-power comparators is fully specified and ensured for operation from 1.7V to 5.5V (±0.85V to ±2.75V). In addition, and many specifications apply over the industrial temperature range of –40°C to +85°C. Parameters that vary significantly with operating voltages or temperature are illustrated in the Typical Characteristics graphs.

NOTE: Supply voltages (V+ to V–) higher than +10V can permanently damage the device.

9 Application and Implementation

9.4 Layout Guidelines

To achieve the maximum performance of the extremely high input impedance and low offset voltage of the CJCP20x series devices, care is needed in laying out the circuit board. The PCB surface must remain clean and free of moisture to avoid leakage currents between adjacent traces. Surface coating of the circuit board reduces surface moisture and provides a humidity barrier, reducing parasitic resistance on the board. The use of guard rings around the amplifier inputs further reduces leakage currents. Figure 9-4 shows proper guard ring configuration and the top view of a surface-mount layout. The guard ring does not need to be a specific width, but it should form a continuous loop around both inputs. By setting the guard ring voltage equal to the voltage at the non-inverting input, parasitic capacitance is minimized as well. For further reduction of leakage currents, components can be mounted to the PCB using Teflon standoff insulators.

Other potential sources of offset error are thermoelectric voltages on the circuit board. This voltage, also called Seebeck voltage, occurs at the junction of two dissimilar metals and is proportional to the temperature of the junction. The most common metallic junctions on a circuit board are solder-to-board trace and solder-to-component lead. If the temperature of the PCB at one end of the component is different from the temperature at the other end, the resulting Seebeck voltages are not equal, resulting in a thermal voltage error.

This thermocouple error can be reduced by using dummy components to match the thermoelectric error source. Placing the dummy component as close as possible to its partner ensures both Seebeck voltages are equal, thus canceling the thermocouple error. Maintaining a constant ambient temperature on the circuit board further reduces this error. The use of a ground plane helps distribute heat throughout the board and reduces EMI noise pickup.

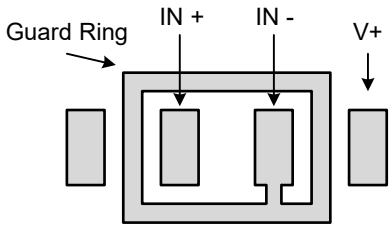
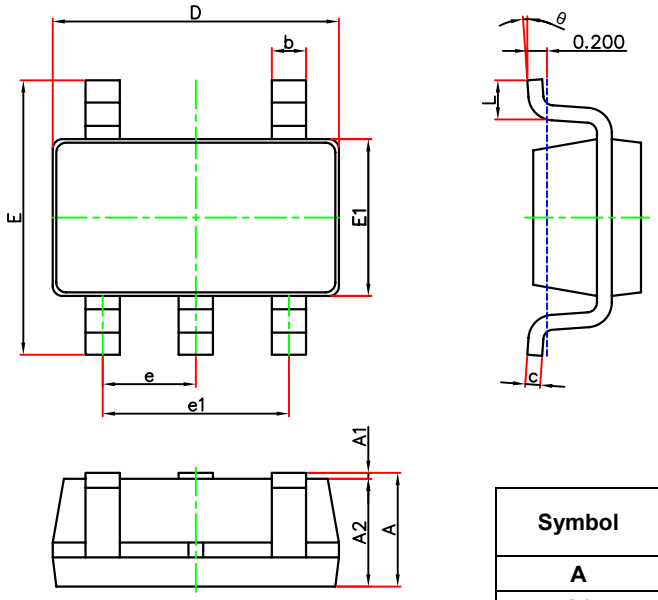


Figure 9-4. Guard Ring

10 Mechanical Information

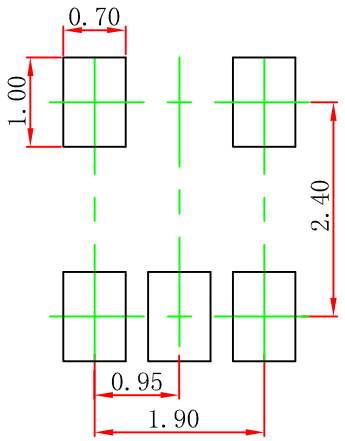
10.1 SOT-23-5L Mechanical Information

SOT-23-5L Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.000	1.200	0.039	0.047
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	2.600	3.000	0.102	0.118
E1	1.500	1.700	0.059	0.067
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT-23-5L Suggested Pad Layout



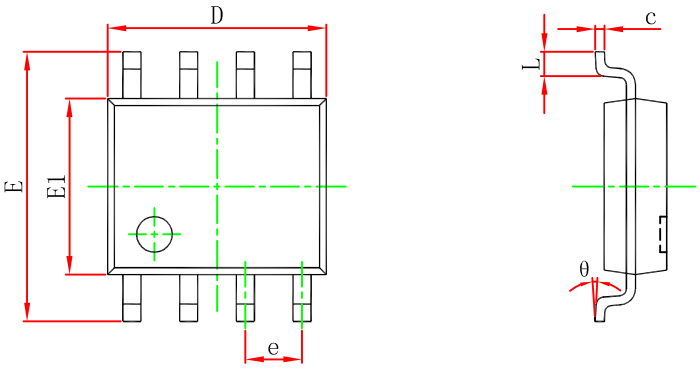
Note:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

10 Mechanical Information

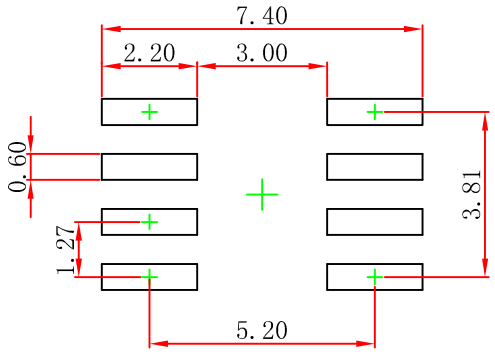
10.2 SOP8 Mechanical Information

Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	1.370	1.670	0.054	0.066
A1	0.070	0.250	0.003	0.010
A2	1.350	1.550	0.053	0.061
b	0.300	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
e	1.270（BSC）		0.050（BSC）	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOP8 Suggest Pad Layout

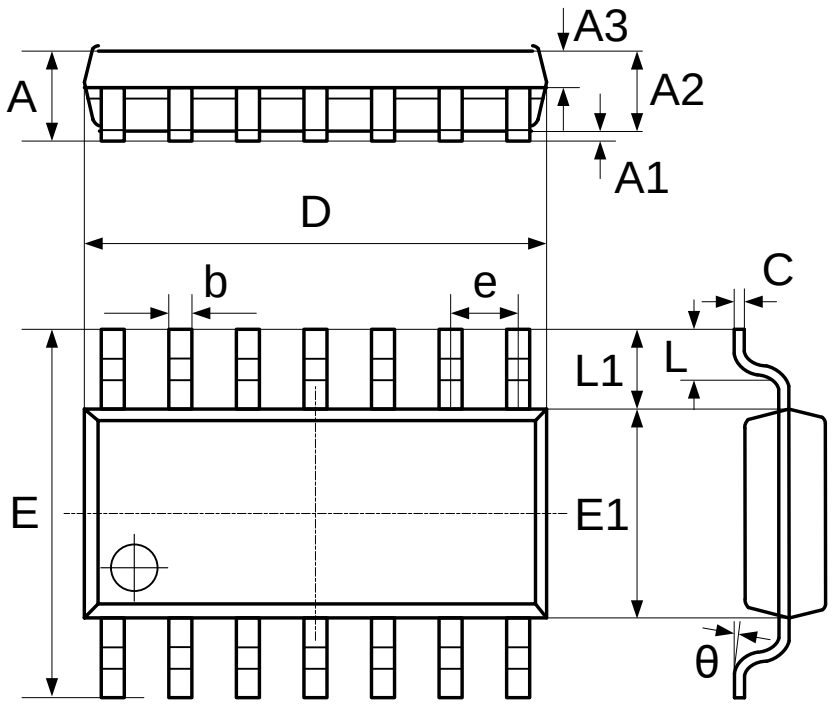


NOTE:

1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purposes only.

10 Mechanical Information

10.3 SOP14 Mechanical Information

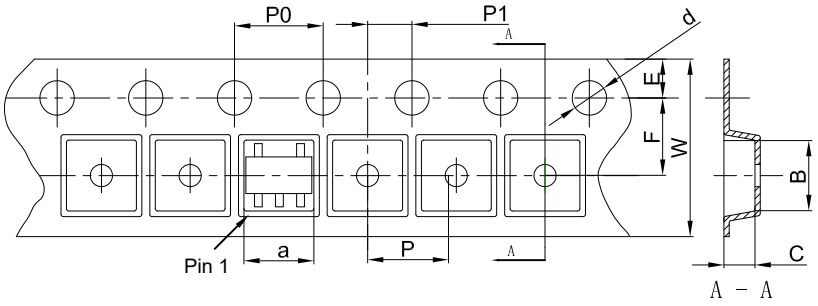


SYMBOL	DISMENSIONS IN MILLIMETERS			DISMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.450	1.650	1.850	0.057	0.065	0.073
A1	0.100	0.200	0.300	0.004	0.008	0.012
A2	1.350	1.450	1.550	0.053	0.057	0.061
A3	0.550	0.650	0.750	0.022	0.026	0.030
b	0.406 TYP.			0.016 TYP.		
C	0.203 TYP.			0.008 TYP.		
D	8.630	8.730	8.830	0.340	0.344	0.348
E	5.840	6.040	6.240	0.230	0.238	0.246
E1	3.850	3.950	4.050	0.152	0.156	0.159
e	1.270 TYP.			0.050 TYP.		
L1	1.040 REF.			0.041 REF.		
L	0.350	0.550	0.750	0.014	0.022	0.030
θ	2°	5°	8°	2°	5°	8°

11 Packaging Information

11.1 SOT-23-5L Tape and Reel Information

SOT-23-5L Tape and Reel Information

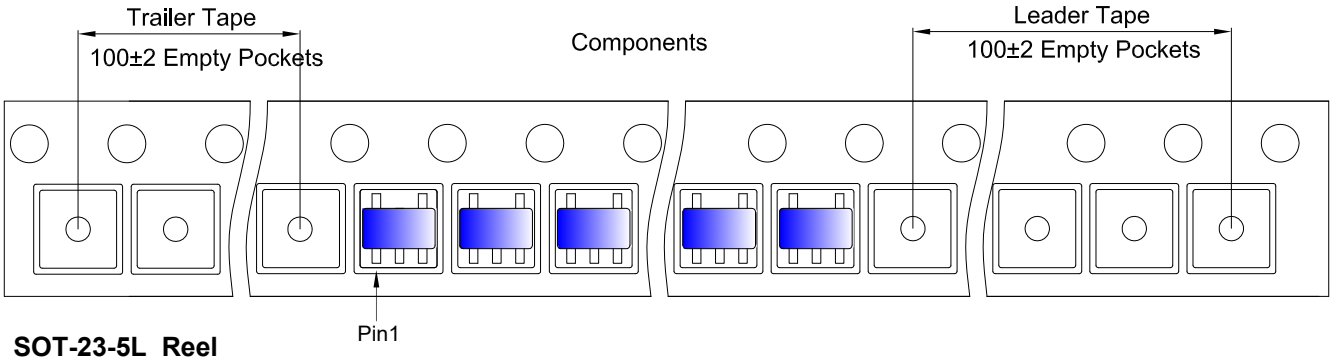


Packaging Description:

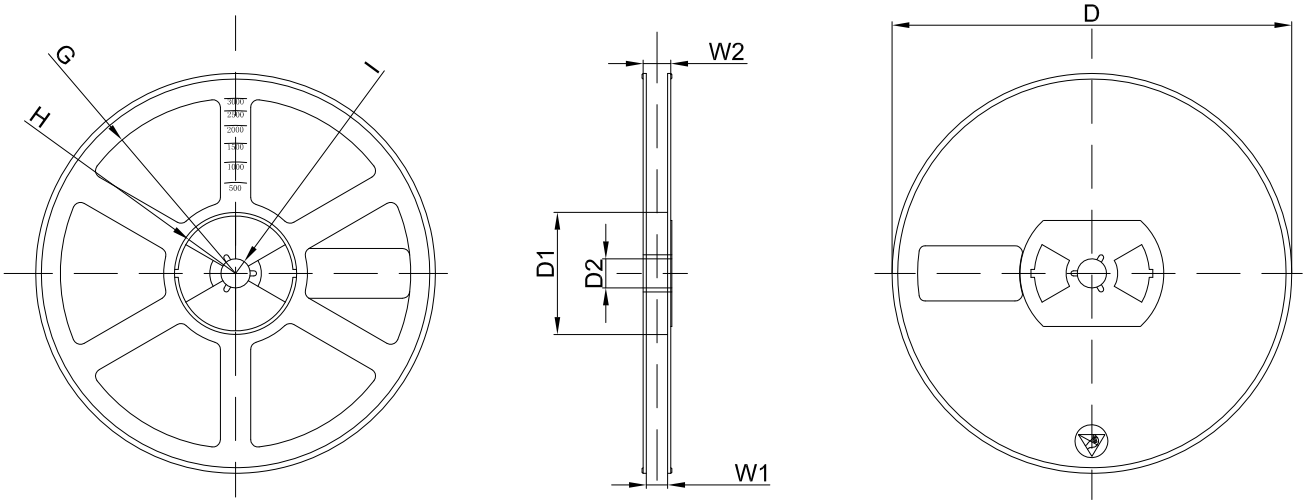
SOT-23-5L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 3,000 units per 7" or 18.0cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
SOT-23-5L	3.17	3.23	1.37	Ø1.55	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23-5L Tape Leader and Trailer



SOT-23-5L Reel



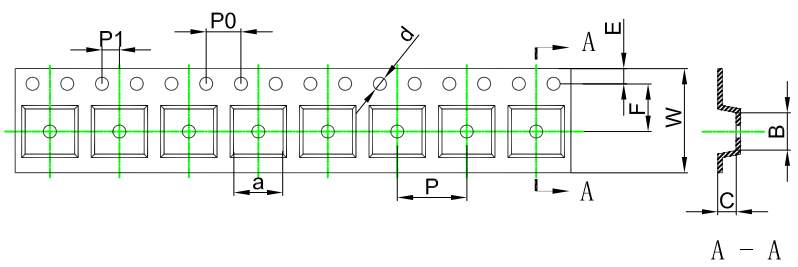
Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø180.00	60.00	13.00	R78.00	R25.60	R6.50	9.50	13.10

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3000 pcs	7 inch	30,000 pcs	203×203×195	120,000 pcs	438×438×220	

11 Packaging Information

11.2 SOP8 Tape and Reel Information

Embossed Carrier Tape



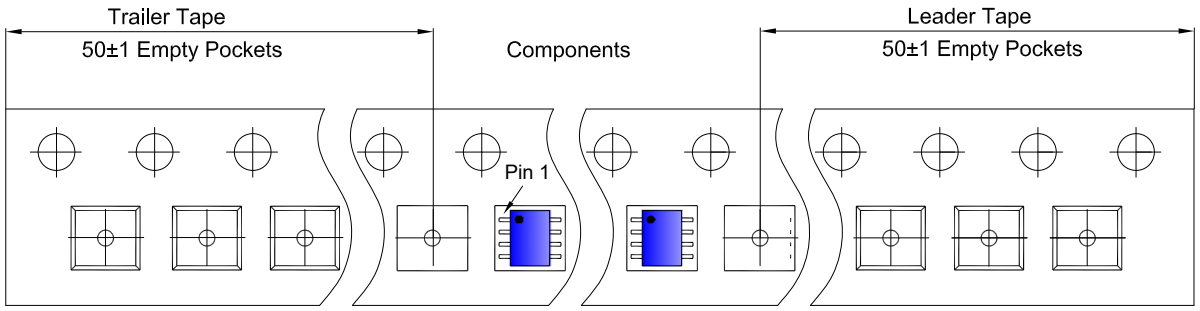
Packaging Description:

SOP8 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2,500 units per 13" or 33cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

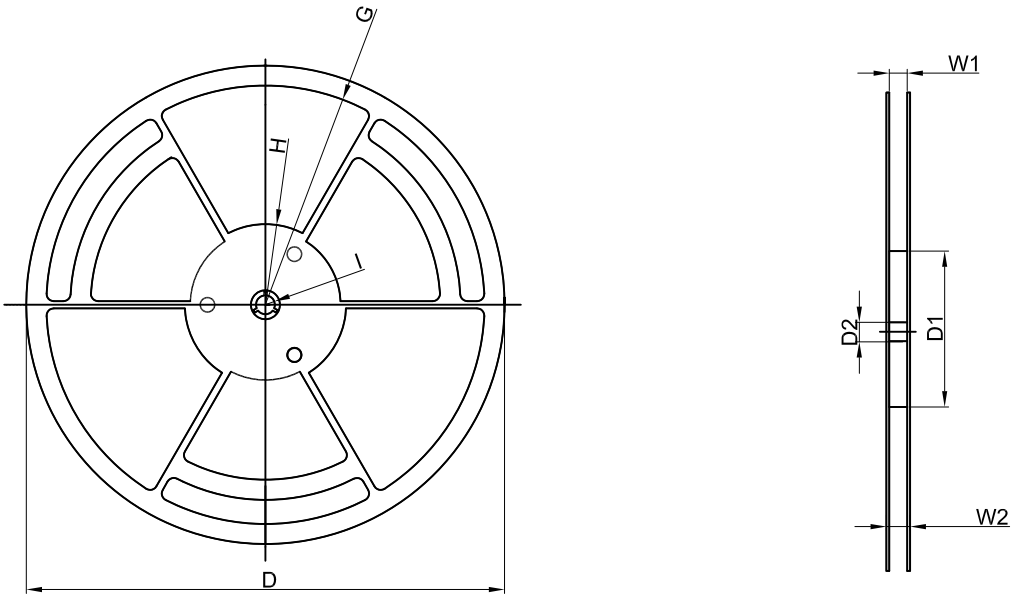
ALL DIM IN mm

Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
SOP8	6.40	5.40	2.10	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

Tape Leader and Trailer



Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
13"Dia	Ø330.00	100.00	13.00	R151.00	R56.00	R6.50	12.40	17.60

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
4,000 pcs	13 inch	8,000 pcs	360×360×65	64,000 pcs	565×380×390	

12 Notes and Revision History

12.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of SZCJ -- https: ***www.***szcjsemi.com for more details.

12.2 Notes

Electrostatic Discharge Caution



This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

12.3 Revision History

December 2024: released CJCP20x Series rev - 1.0.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. SZCJ has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses SZCJ products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. SZCJ makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

Without the written consent of SZCJ , this product shall not be used in occasions requiring high quality or high reliability, including but not limited to the following occasions: medical equipment, military facilities and aerospace. SZCJ shall not be responsible for casualties or property losses caused by abnormal use or application of this product.

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