LMV331A and LMV393A Comparators

1 Introduction

The LMV331A and LMV393A with open-drain output offer the ultimate combination of high speed (100ns propagation delay) and very low power consumption (37μA), and feature such as rail-to-rail inputs, low offset voltage (typically 1mV), large output drive current, and a wide range of supply voltages from 1.8V to 5.5V. The devices are very easy to implement in a wide variety of applications where require critical response time, power-sensitive, low-voltage, and/or tight board space.

Advantages of the LMV331A/393A also include the added benefit of internal hysteresis provide noise immunity, preventing output oscillations even with slow-moving input signals. Designed with the most modern techniques, the LMV331A/393A achieve superior performance over BiCMOS or bipolar versions on the market.

The LMV331A(single) is available in SOT-23-5L package. The LMV393A (dual) is offered in SOP8 package. Both devices are rated over −40°C to +125°C industrial temperature range.

2 Features

- Fast 100ns Propagation Delay (100mV Overdrive)
- Micro-Power:
  Operating Current (37μA) Preserves Battery Power
- Single 1.8V to 5.5V Supply Voltage Range
  Can be Powered From the Same 1.8V/2.5V/3.3V/5V System Rails
- Rail-to-Rail Input
- Internal RF/EMI Filter
- Operating Temperature Range:
  −40°C to +125°C

3 Applications

- Consumer Accessories
- Portable and Battery-Powered Devices
- Alarms and Monitoring Circuits
- Threshold Detectors and Discriminators
- Logic Level Shifting or Translation
- Zero-Crossing Detectors
- Window Comparators
- IR Receivers
- Line Receivers

4 Available Packages

PART NUMBER	PACKAGE
LMV331A-M5N	SOT-23-5L
LMV393A-PAN	SOP8

5 Orderable Information

MODEL	DEVICE	PACKAGE	OP TEMP	ECO PLAN	MSL	PACKING OPTION	SORT
LMV331A	LMV331A-M5N	SOT-23-5L	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 3000 Units / Reel	Active
LMV393A	LMV393A-PAN	SOP8	-40 ~ 125°C	RoHS & Green	Level 3 168 HR	Tape and Reel 4000 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 JSCJ.

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

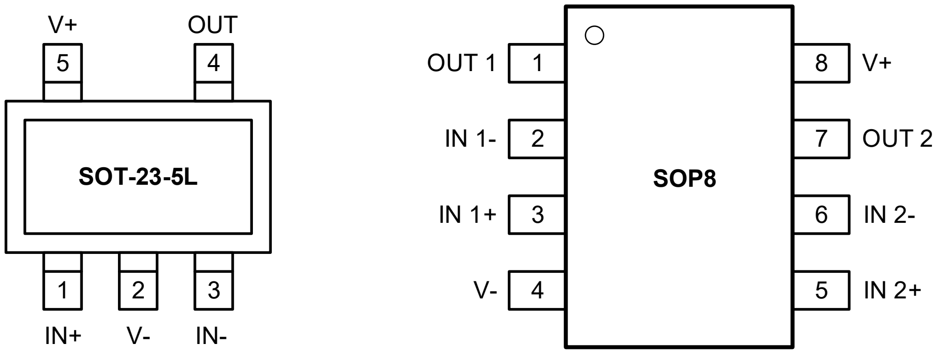
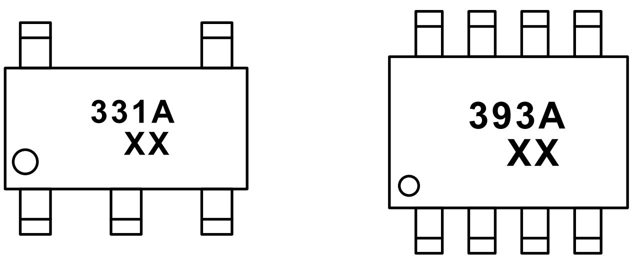


Figure 6-1. LMV331A and LMV393A Pin Map

PIN NAME	LMV331A SOT-23-5L	LMV393A SOP8	I / O	DESCRIPTION
OUT 1	4	1	O	Output of the operational amplifier 1.
IN 1-	3	2	I	Negative input of the operational amplifier 1.
IN 1+	1	3	I	Positive input of the operational amplifier 1.
V+	5	8	-	Positive (highest) supply.
IN 2+	-	5	I	Positive input of the operational amplifier 2.
IN 2-	-	6	I	Negative input of the operational amplifier 2.
OUT 2	-	4	O	Output of the operational amplifier 2.
V-	2	4	-	Negative (lowest) supply or ground for single supply.

6.2 Marking Information



"**331A and 393A**": 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 ~ 125°C	V_S	1.8	-	5.5	V
Operating ambient temperature		T_A	-40	-	125	°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	UNIT
Junction-to-ambient thermal resistance	$R_{\Theta JA}$	192.3	125.0	℃/W
Reference maximum power dissipation (continuous)	$P_{D\ Ref}$	0.65	1.00	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 +125 °C.

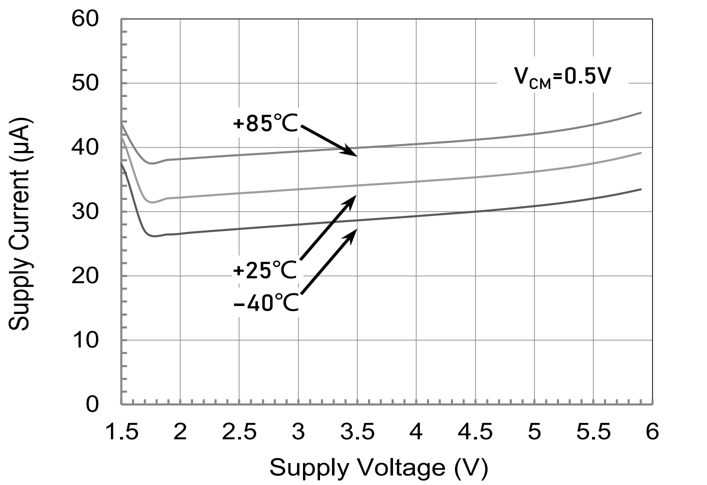
CHARACTERISTIC	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
OFFSET VOLTAGE						
Input offset voltage	V_{OS}	V_{CM} = 0	-	±1	±5	mV
Offset voltage drift	V_{OS} TC	T_A = −40 to +125°C	-	±2	-	μV/°C
Power supply rejection ratio	PSRR	V_S = 1.8 to 5.5V, V_{CM} < (V+)−1V	70	82	-	dB
		T_A = −40 to +125℃	66	-	-	
Input hysteresis	Hyst	V_{CM} = 0	-	3	-	mV
INPUT VOLTAGE						
Common-mode voltage range	V_{CM}	T_A = −40 to +85°C	(V-)−0.1	-	(V+)+0.1	V
		T_A = −40 to +125°C	(V-)+0.1	-	(V+)-0.1	
Common-mode rejection ratio	CMRR	V_S = 5.5V, V_{CM} = −0.1 to 5.5V	61	78	-	dB
		V_{CM} = 0 to 5.3V, T_A = −40 to +125℃	58	-	-	
		V_S = 1.8V, V_{CM} = −0.1 to 1.8V	58	77	-	
		V_{CM} = 0 to 1.6V, T_A = −40 to +125℃	55	-	-	
INPUT BIAS CURRENT						
Input bias current	I_B	V_{CM} = V+/2	-	5	30	pA
		T_A = −40 to +125°C	-	-	800	
Input offset current	I_{OS}	V_{CM} = V+/2	-	10	50	pA
		T_A = −40 to +125°C	-	-	1000	
INPUT IMPEDANCE						
Input resistance	R_{IN}	-	100	-	-	GΩ
Input capacitance	C_{IN}	Differential	-	2.0	-	pF
		Common mode	-	3.5	-	
OUTPUT						
Low output voltage swing	V_{OL}	I_{SINK} = 1mA	-	50	80	mV
		T_A = −40 to +125°C	-	-	90	
Output short-circuit current	I_{SC}	Sink current	-	-30	-25	mA
POWER SUPPLY						
Quiescent current (per comparator)	I_Q	V_S = 1.8V, V_{CM} = 0.5V, I_O = 0	-	32	40	μA
		T_A = −40 to +125°C	-	-	50	
		V_S = 5.5V, V_{CM} = 0.5V, I_O = 0	-	37	45	
		T_A = −40 to +125°C	-	-	60	
SWITCHING CHARACTERISTICS						
Propagation delay time, High to low	t_{PD}	Input overdrive = 20mV, C_L = 15pF	-	240	-	ns
		Input overdrive = 100mV, C_L = 15pF	-	100	-	
Fall time	t_F	Input overdrive = 20mV, C_L = 15pF	-	20	-	ns
		Input overdrive = 100mV, C_L = 15pF	-	10	-	

7 Specifications

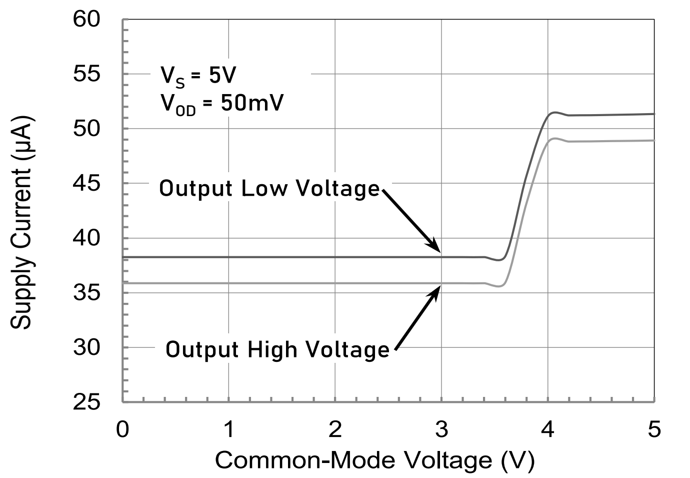
7.6 Typical Characteristics

(At T_A = +25°C, V_S = ±2.5V, V_{CM} = V_S/2, and R_L = 10kΩ connected to V_S/2, and C_L = 15pF, unless otherwise specified)

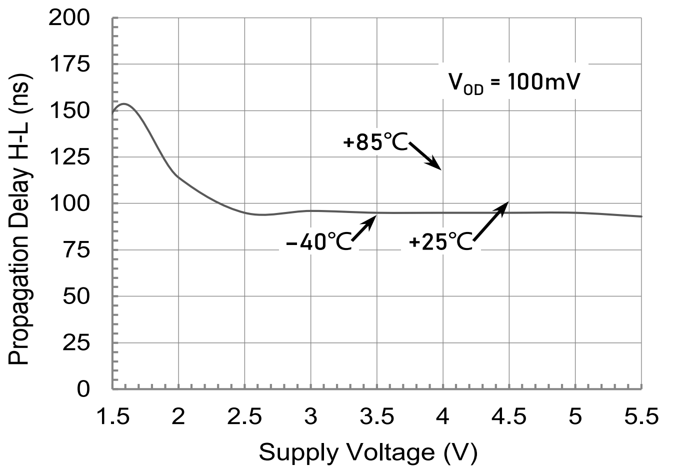
Supply Current vs. Supply Voltage



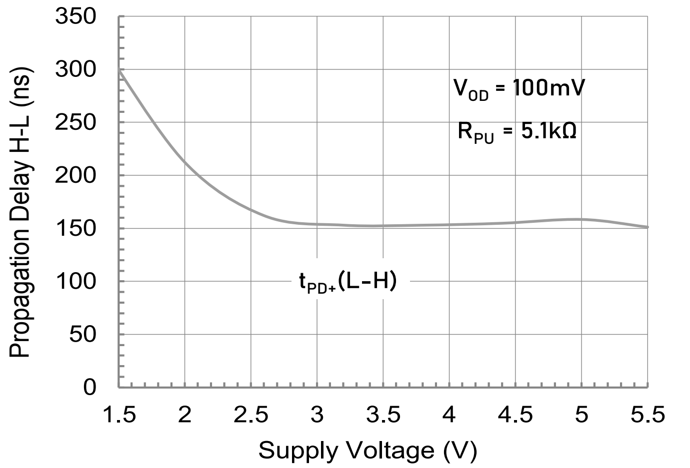
Supply Current vs. Common-Mode Input



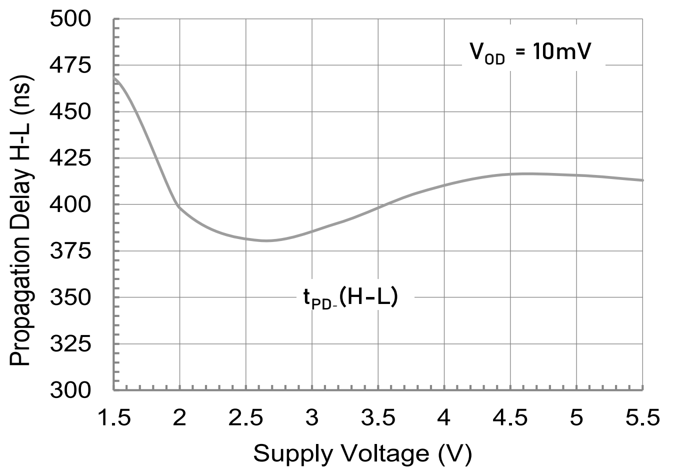
Propagation Delay (t_{PHL}) vs. Supply Voltage



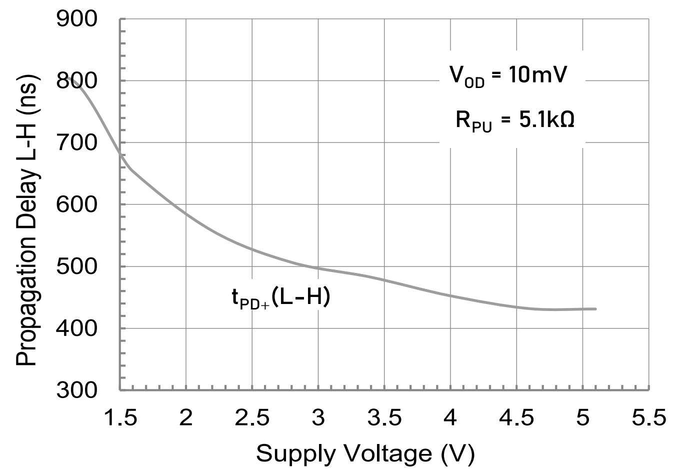
Propagation Delay (t_{PLH}) vs. Supply Voltage



Propagation Delay (t_{PHL}) vs. Supply Voltage



Propagation Delay (t_{PLH}) vs. Supply Voltage

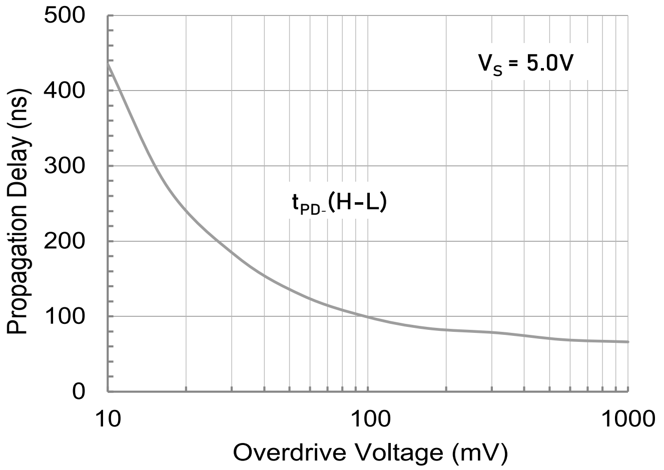


7 Specifications

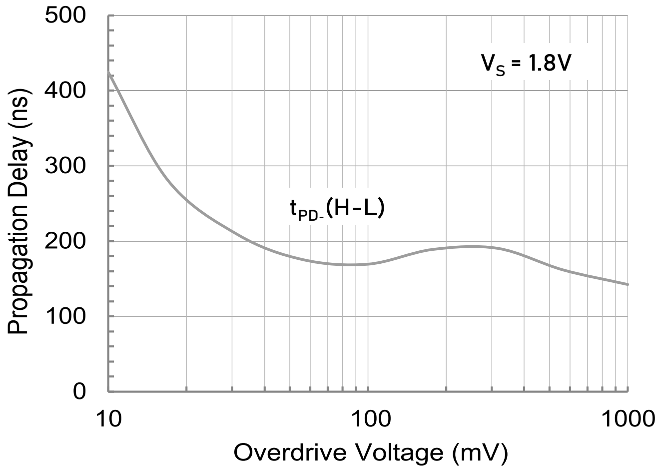
7.6 Typical Characteristics (continued)

(At T_A = +25°C, V_S = ±2.5V, V_{CM} = V_S/2, and R_L = 10kΩ connected to V_S/2, and C_L = 15pF, unless otherwise specified)

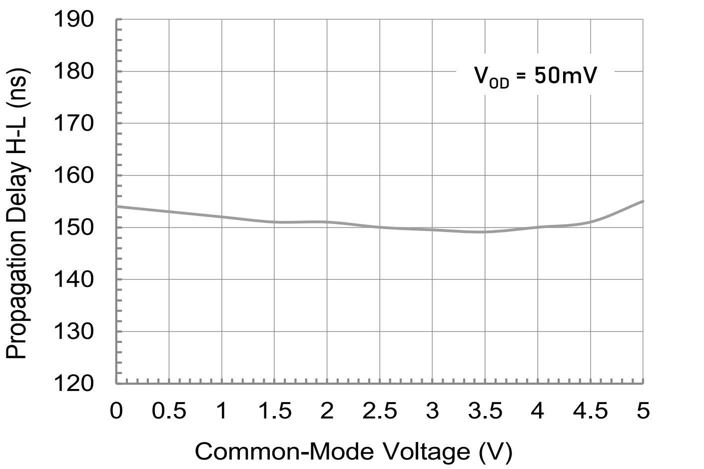
Propagation Delay (t_{PHL}) vs. Input Overdrive



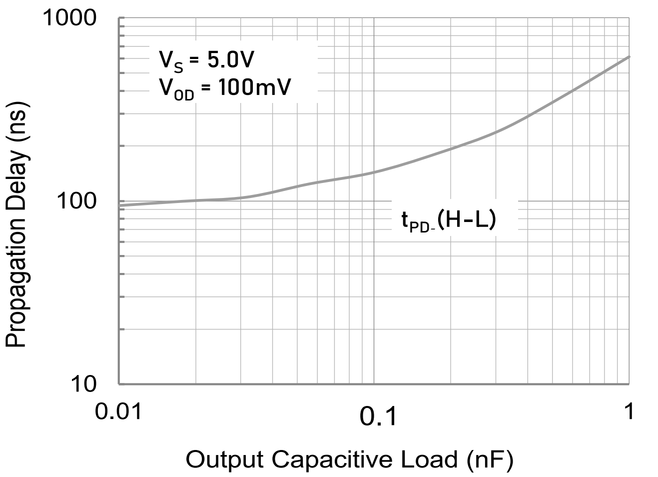
Propagation Delay (t_{PHL}) vs. Input Overdrive



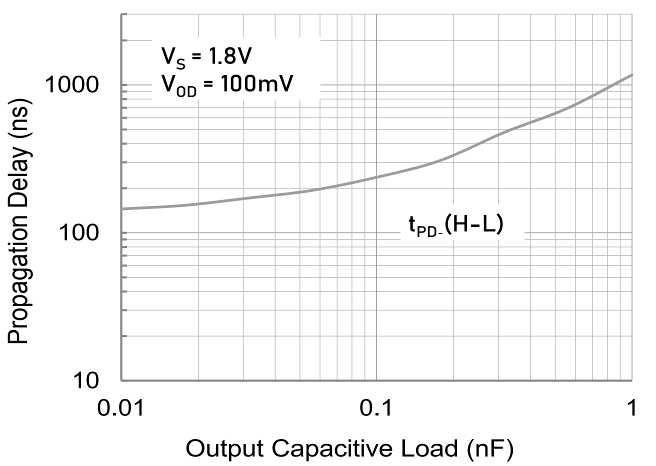
Propagation Delay (t_{PHL}) vs. Input Common-Mode



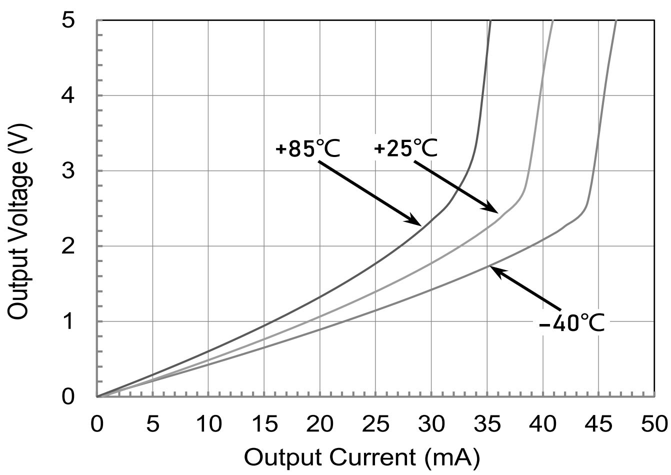
Propagation Delay (t_{PHL}) vs. Capacitive Load



Propagation Delay (t_{PHL}) vs. Capacitive Load



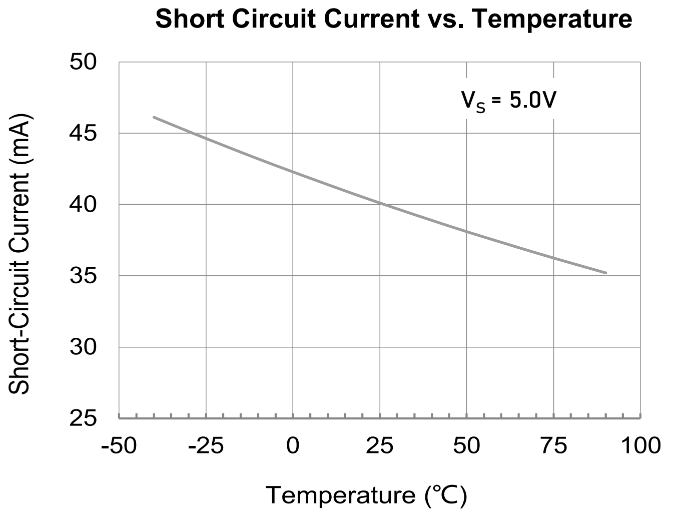
Output Voltage vs. Output Sinking Current

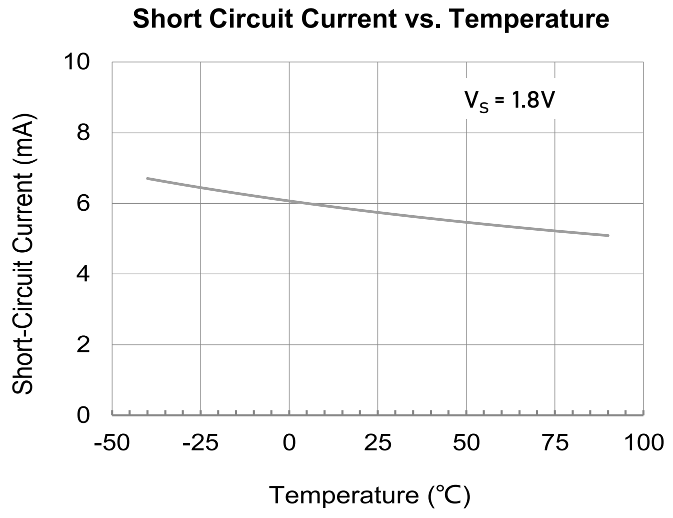


7 Specifications

7.6 Typical Characteristics (continued)

(At T_A = +25°C, V_S = ±2.5V, V_{CM} = V_S/2, and R_L = 10kΩ connected to V_S/2, and C_L = 15pF, unless otherwise specified)





8 Detail Description

8.1 Description

The LMV331A and LMV393A family of comparators have the ability to operate up to 5V on the supply pin. This standard device has proven ubiquity and versatility across a wide range of applications. This is due to it's low I_Q and fast response.

The open-drain output allows the user to configure the output's logic low voltage (V_{OL}) and can be utilized to enable the comparator to be used in AND functionality.

8.2 Feature Description

Rail-to-Rail Input

The input common-mode voltage range of the LMV331A and LMV393A family 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 3mV.

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.

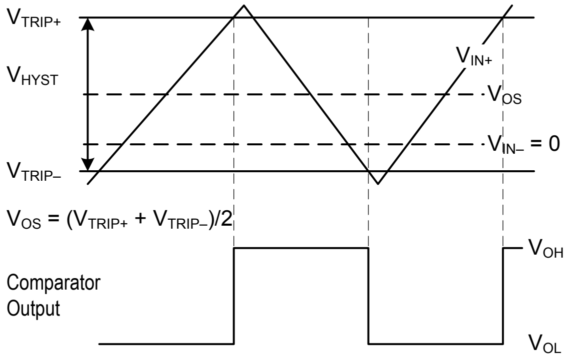


Figure 8-1. Input and Output Waveform, Non-inverting Input Varied

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 LMV331A and LMV393A op-amps have integrated EMI filters at their input stage. A mathematical method of measuring EMIRR is defined as follows:

$$EMIRR = 20\ log(V_{IN\_PEAK}/\Delta V_{OS})$$

9 Application and Implementation

9.1 Application Information

LMV331A and LMV393A will typically be used to compare a single signal to a reference or two signals against each other. Many users take advantage of the open drain output to drive the comparison logic output to a logic voltage level to an MCU or logic device. The wide supply range and high voltage capability makes LMV331A and LMV393A optimal for level shifting to a higher or lower voltage.

9.2 Typical Application Circuits

Input EMI Filter and Clamp Circuit

The LTC331A/LTC393A comparator family uses CMOS transistors at the inputs which prevent phase inversion when the input pins exceed the supply voltages.

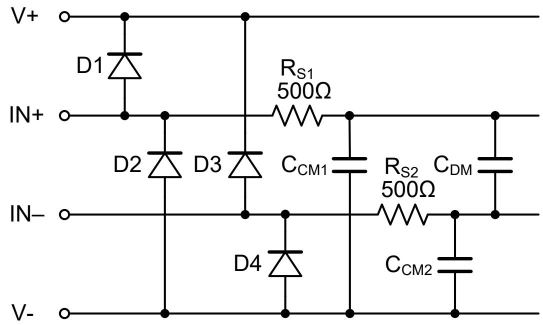


Figure 9-1. Input EMI Filter and Clamp Circuit

Figure 9-1 shows the input EMI filter and clamp circuit. The LMV331A/393A 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. 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.

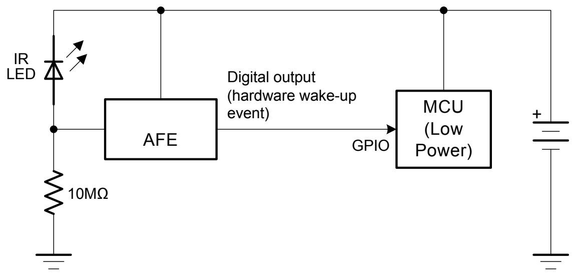


Figure 9-2. Coin Cell Battery Powered IR Receiver

Power efficient comparators such as the LMV331A and LMV393A can be used in the IR receiver AFE to increase battery life. The LMV331/393A device is responsible for two major tasks:

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

The LMV331/393A 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 1 μA) 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).

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.

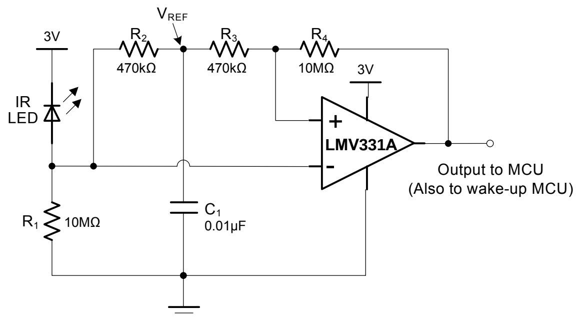


Figure 9-3. IR Receiver AFE Using LMV331A

9 Application and Implementation

9.2 Typical Application Circuits (continued)

Use Window Comparator to Detect Under-voltage and Over-voltage

Window comparators are commonly used to detect undervoltage (UV) and overvoltage (OV) conditions. Figure 9-4 shows a simple window comparator circuit.

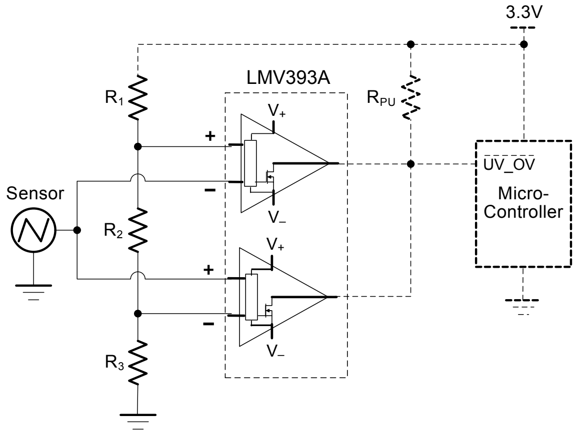


Figure 9-4. Window Comparator

For this design, follow these design requirements:

- Alert (logic low output) when an input signal is less than 1.1V
- Alert (logic low output) when an input signal is greater than 2.2V
- Alert signal is active low
- Operate from a 3.3V power supply

Configure the circuit as shown in Figure 9-4. Connect V+ to a 3.3V power supply and V– to ground. Make R_1, R_2 and R_3 each 10MΩ resistors. These three resistors are used to create the positive and negative thresholds for the window comparator (V_{TH+} and V_{TH-}). With each resistor being equal, V_{TH+} is 2.2V and V_{TH-} is 1.1V. Large resistor values such as 10MΩ are used to minimize power consumption. The sensor output voltage is applied to the inverting and non-inverting inputs of the 2-channel LMV393A's. The LMV393A is used for its open-drain output configuration. Using the LMV393A allows the two comparator outputs to be Wire-ORed together. The respective comparator outputs will be low when the sensor is less than 1.1V or greater than 2.2V. V_{OUT} will be high when the sensor is in the range of 1.1V to 2.2V. See the application curve in Figure 9-5.

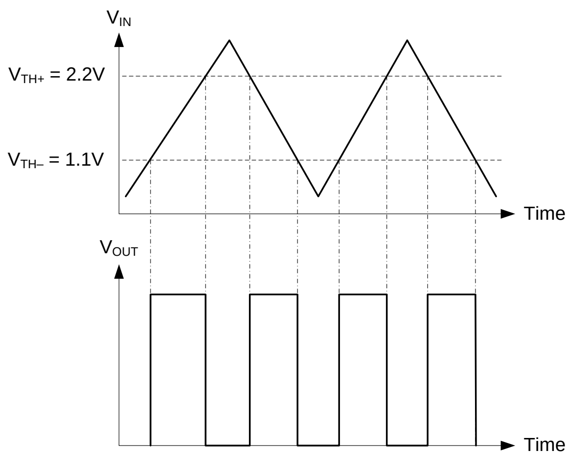


Figure 9-5. Window Comparator Results

9 Application and Implementation

9.3 Power Supply Recommendations

The LTC331/LTC393A micro-power comparators of open-drain output are fully specified and ensured for operation from 1.8V to 5.5V and offers an excellent speed-to-power combination with a propagation delay of 100ns and a quiescent supply current of 37μA. This combination of fast response time at micro-power enables power conscious systems to monitor and respond quickly to fault conditions.

Amplifiers do not amplify EMI or RF signals due to their relatively low bandwidth. In addition, and many specifications apply over the industrial temperature range of –40°C to +125°C.

Parameters that vary significantly with operating voltages or temperature are illustrated in the Typical Characteristics graphs.

9.4 Layout Guidelines

To achieve the maximum performance of the extremely high input impedance and low offset voltage of the LMV331A/393A 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 9-6 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.

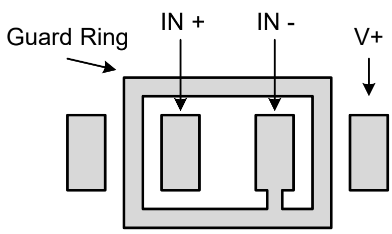
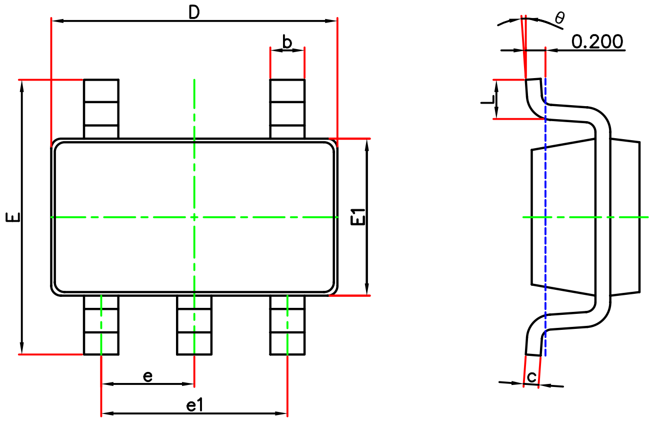


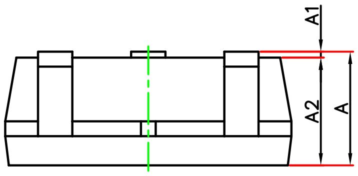
Figure 9-6. Guard Ring

10 Mechanical Information

10.1 SOT-23-5L Mechanical Information

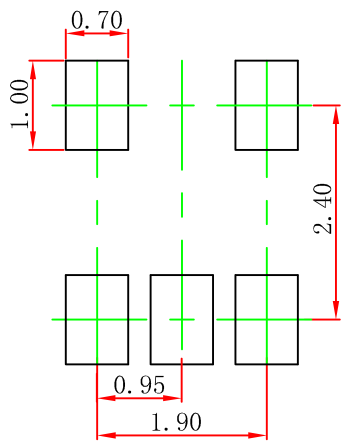
SOT-23-5L Outline Dimensions





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



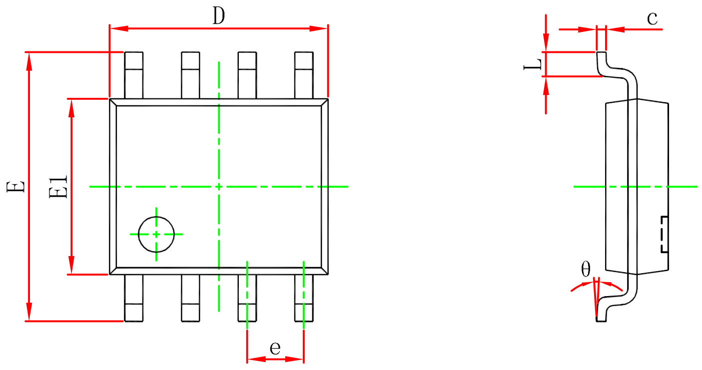
Note:

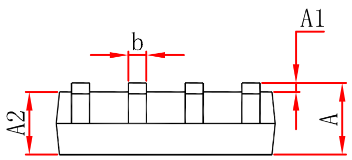
1. Controlling dimension: in millimeters.
2. General tolerance: ±0.05mm.
3. The pad layout is for reference purpose only.

10 Mechanical Information

10.2 SOP8 Mechanical Information

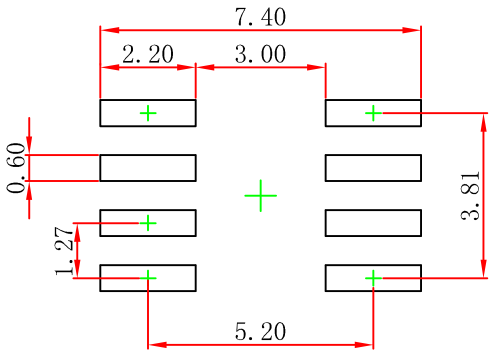
Outline Dimensions





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



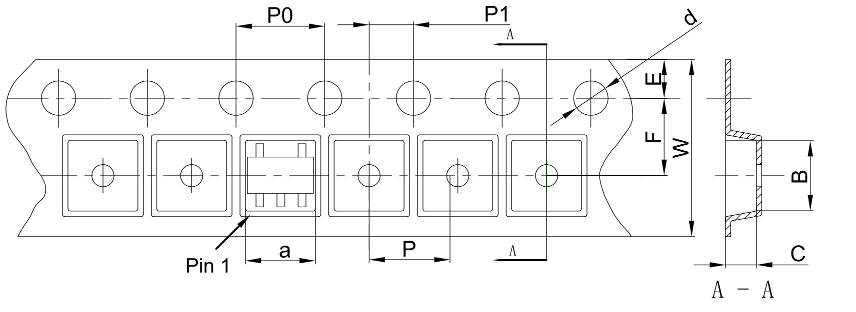
NOTE:

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

11 Packaging Information

11.1 SOT-23-5L Tape and Reel Information

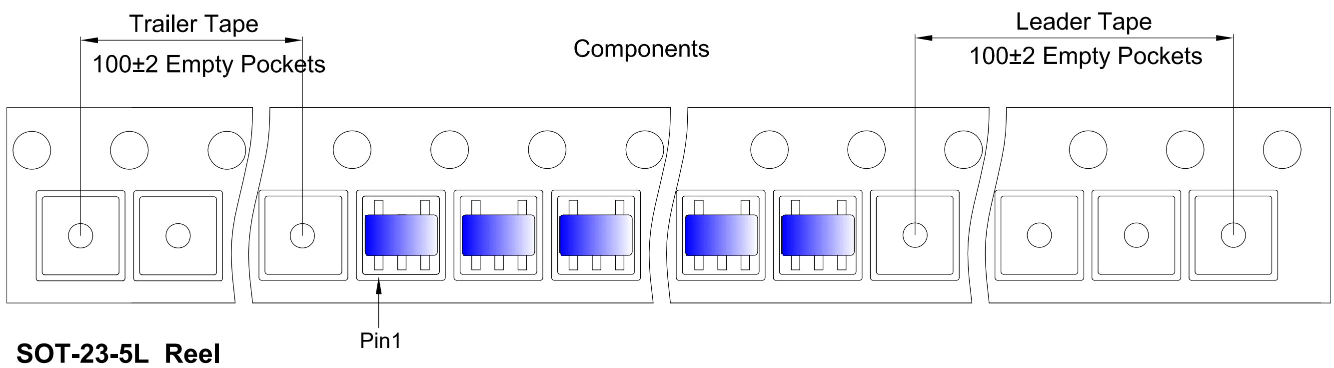
SOT-23-5L Tape and Reel Information



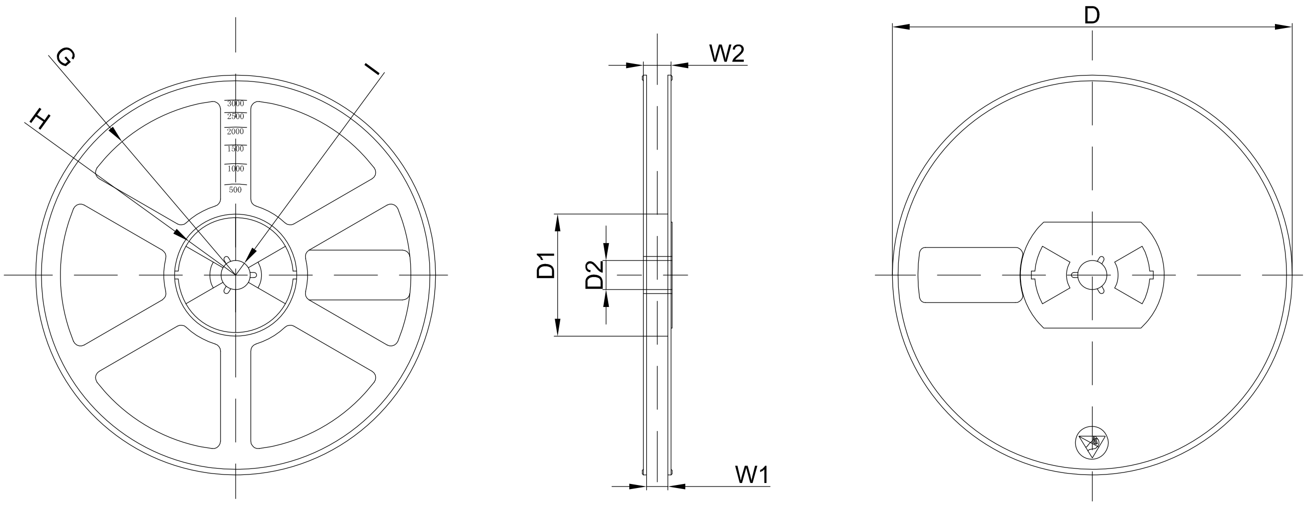
Packaging Description:
SOT-23-5L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. 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



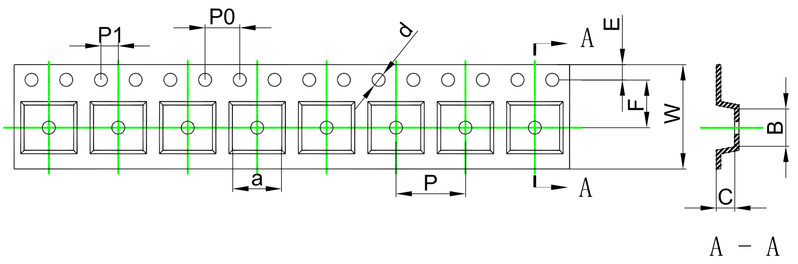
Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
7"Dia	Ø180.00	60.00	13.00	R78.00	R25.60	R6.50	9.50	13.10

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

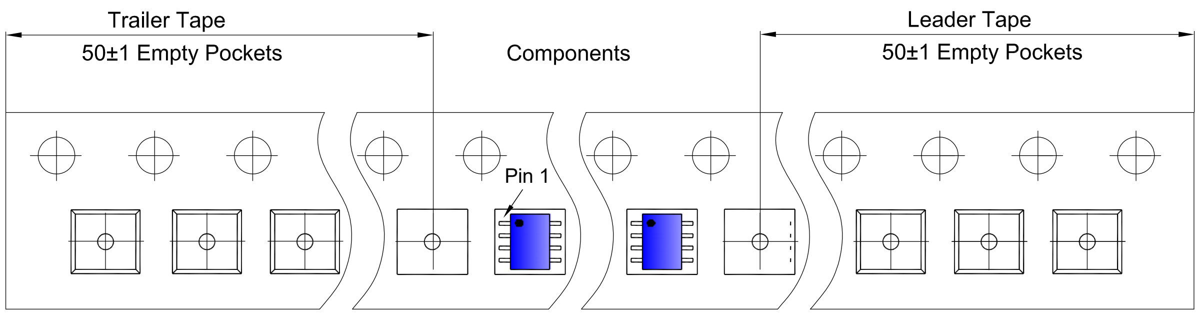
Embossed Carrier Tape



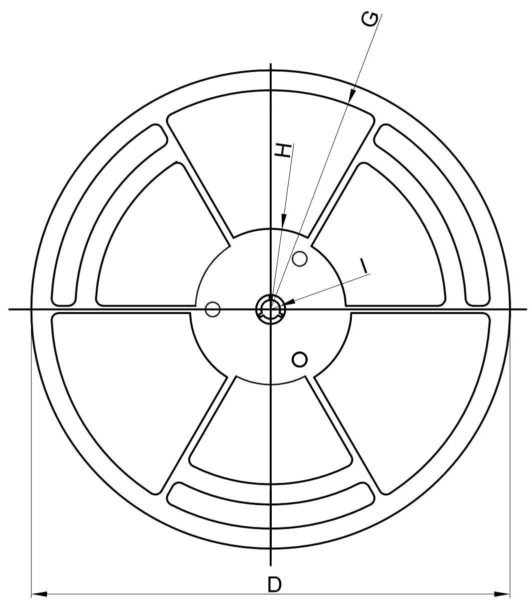
Packaging Description:
SOP8 parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. 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

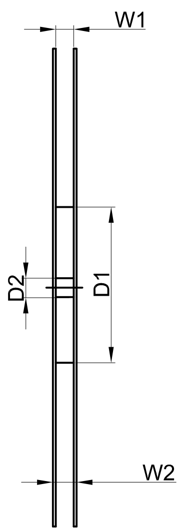
Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
SOP8	6.40	5.40	2.10	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

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 JSCJ -- https: ***www.jscj-elec.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 LMV331A and LMV393A rev - 1.0.

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

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