LMV331

General-purpose low voltage comparator

Features

- Supply operation from 2.7 to 5 V
- Low current consumption: 20 µA
- Input common mode range includes ground
- Wide temperature range: -40°C to +85°C
- Low output saturation voltage
- Propagation delay: 200 ns
- Open drain output
- ESD tolerance: 2 kV HBM/200 V MM
- SMD packages: SC70-5 and SOT23-5

Applications

- Mobile phones
- Notebooks and PDAs
- Battery supplied electronics
- General-purpose portable devices
- General-purpose low voltage applications

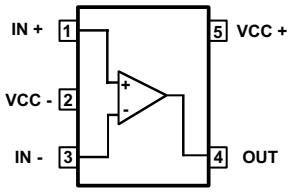
Description

The LMV331 is a single and low voltage version of industry standard LM339 and LM393. It can operate with a supply voltage ranging from 2.7 to 5 V, and exhibits a lower current consumption than its predecessors LM339 and LM393. This device is a perfect choice for low-voltage applications.

The device is available in both SOT23-5 and SC70-5 packages, making it ideal for applications where space saving is a constraint. The SC70-5 package is approximately half the size of the SOT23-5.

LMV331
SOT23-5 / SC70-5

Pin connections (top view)



The LMV331 is designed to operate in the temperature range of -40°C to +85°C. It is suitable for a variety of applications, ranging from industrial to automotive.

1 Absolute maximum ratings and operating conditions

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage(1)	5.5	V
V_{ID}	Differential input voltage(2)	± 5.5	V
V_{IN}	Input voltage range	(V_{CC}-) - 0.3 to (V_{CC}+) + 0.3	V
R_{thja}	Thermal resistance junction to ambient(3) SC70-5 SOT23-5	 205 250	°C/W
R_{thjc}	Thermal resistance junction to case (3) SC70-5 SOT23-5	 172 81	°C/W
T_{stg}	Storage temperature	-65 to +150	°C
T_j	Junction temperature	150	°C
T_{LEAD}	Lead temperature (soldering 10 seconds)	260	°C
ESD	Human body model (HBM)(4)	2000	V
	Machine model (MM)(5)	200	
	Charged device model (CDM)(6)	1500	
	Latch-up immunity	200	mA

1. All voltage values, except differential voltage, are referenced to V_{cc}-.
2. The magnitude of input and output voltages must never exceed the supply rail ±0.3 V.
3. Short-circuits can cause excessive heating. These values are typical.
4. Human body model: a 100 pF capacitor is charged to the specified voltage, then discharged through a 1.5 kΩ resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.
5. Machine model: a 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5 Ω). This is done for all couples of connected pin combinations while the other pins are floating.
6. Charged device model: all pins and package are charged together to the specified voltage and then discharged directly to ground through only one pin. This is done for all pins.

Table 2. Operating conditions

Symbol	Parameter	Value	Unit
T_{oper}	Operating temperature range	-40 to +85	°C
V_{CC}	Supply voltage -40°C < T_{amb} < +85°C	2.7 to 5.0	V

2 Electrical characteristics

Table 3. V_{CC}^+ = +2.7 V, V_{CC}^- = 0 V, T_{amb} = +25° C, full V_{ICM} range (unless otherwise specified)(1)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{IO}	Input offset voltage			1	7	mV
ΔV_{IO}	Input offset voltage drift	-40°C < T_{amb} < +85°C		5		µV/°C
I_{IB}	Input bias current(2)	-40°C < T_{amb} < +85°C		25	250 400	nA
I_{IO}	Input offset current(2)	-40°C < T_{amb} < +85°C		1	50 150	nA
V_{ICM}	Common mode input voltage			-0.1		V
				2.0		
V_{OL}	Output voltage low	I_{SINK} = 1 mA		20		mV
I_{SINK}	Output sink current	V_{OUT} = 1.5 V	5	47		mA
I_{CC}	Supply current	No load, output high, V_{ICM} = 0 V		20	100	µA
I_{OH}	Output current leakage	-40°C < T_{amb} < +85°C		0.003	1	µA
TP_{HL}	Propagation delay High to low output level	V_{ICM} = 0 V, R_L = 5.1 kΩ, C_L = 50 pF Overdrive = 10 mV Overdrive = 100 mV		 300 200		ns
TP_{LH}	Propagation delay Low to high output level	V_{ICM} = 0 V, R_L = 5.1 kΩ, C_L = 50 pF Overdrive = 10 mV Overdrive = 100 mV		 550 400		ns

1. All values over the temperature range are guaranteed through correlation and simulation. No production tests have been performed at the temperature range limits.
2. Maximum values include unavoidable inaccuracies of the industrial tests.

Table 4. V_{CC}^+ = +5 V, V_{CC}^- = 0 V, T_{amb} = +25°C, full V_{ICM} range (unless otherwise specified)(1)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{IO}	Input offset voltage	-40°C < T_{amb} < +85°C		1	7 9	mV
ΔV_{IO}	Input offset voltage drift	-40°C < T_{amb} < +85°C		5		µV/°C
I_{IB}	Input bias current(2)	-40°C < T_{amb} < +85°C		25	250 400	nA
I_{IO}	Input offset current(2)	-40°C < T_{amb} < +85°C		2	50 150	nA
V_{ICM}	Common mode input voltage			-0.1		V
				4.2		
A_V	Voltage gain		20	50		V/mV
V_{OL}	Output voltage low	I_{SINK} < 4 mA -40°C < T_{amb} < +85°C		50	400 700	mV
I_{SINK}	Output sink current	V_{OUT} < 1.5 V	10	93		mA
I_{CC}	Supply current	No load, output high, V_{ICM} = 0 V -40°C < T_{amb} < +85°C		25	120 150	µA
I_{OH}	Output current leakage	-40°C < T_{amb} < +85°C		0.003	1	µA
TP_{HL}	Propagation delay High to low output level	V_{ICM} = 0 V, R_L = 5.1 kΩ, C_L = 50 pF Overdrive = 10 mV Overdrive = 100 mV		 375 275		ns
TP_{LH}	Propagation delay Low to high output level	V_{ICM} = 0 V, R_L = 5.1 kΩ, C_L = 50 pF Overdrive = 10 mV Overdrive = 100 mV		 550 425		ns

1. All values over the temperature range are guaranteed through correlation and simulation. No production tests have been performed at the temperature range limits.
2. Maximum values include unavoidable inaccuracies of the industrial tests.

Figure 1. Supply current versus supply voltage with output high

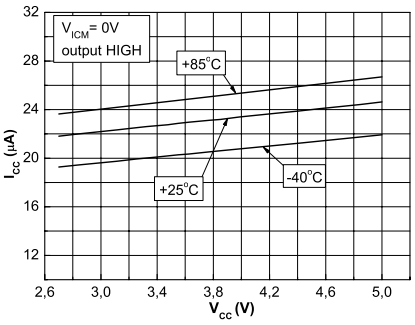


Figure 2. Supply current versus supply voltage with output low

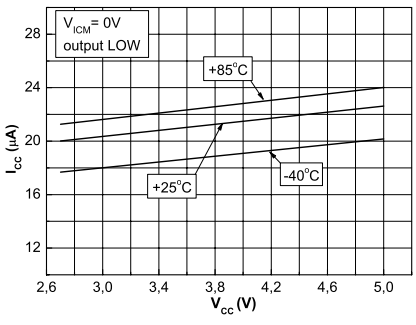


Figure 3. Output voltage versus output current at 5 V supply

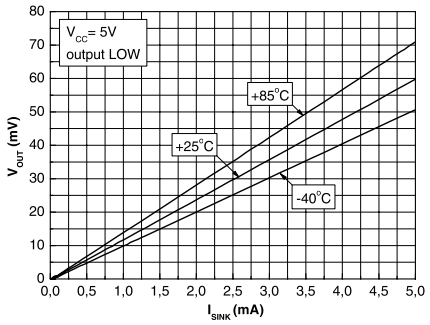


Figure 4. Output voltage versus output current at 2.7 V supply

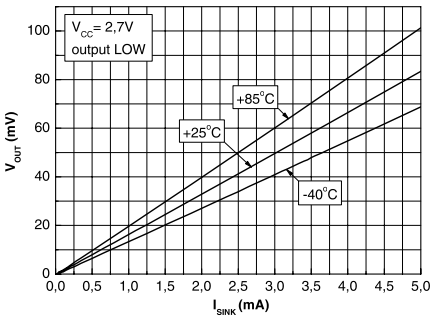


Figure 5. Input bias current versus supply voltage

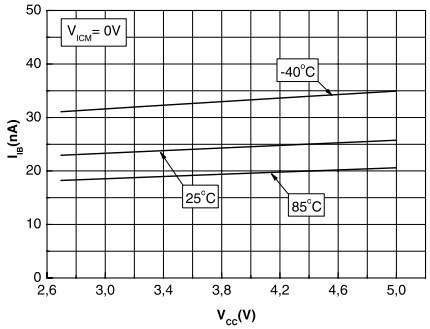


Figure 6. Response time versus overdrive with negative transition, V_{CC} = 5 V

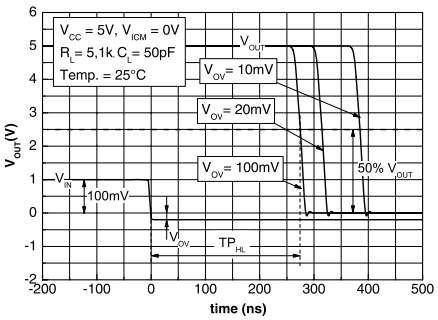


Figure 7. Response time versus overdrive with positive transition, V_{CC} = 5 V

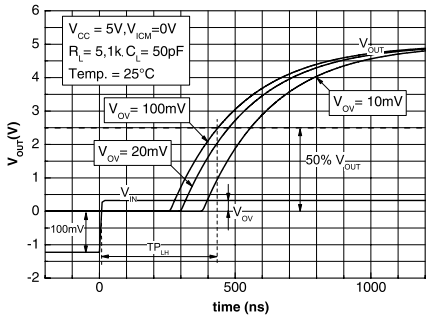


Figure 8. Response time versus overdrive with negative transition, V_{CC} = 2.7 V

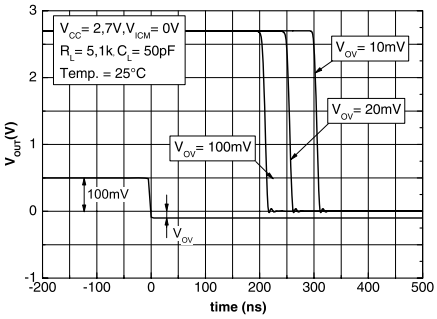
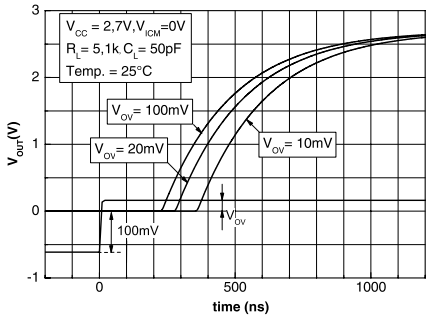


Figure 9. Response time versus overdrive with positive transition, V_{CC} = 2.7 V



3 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

3.1 SOT23-5 package

Figure 10. SOT23-5 package mechanical drawing

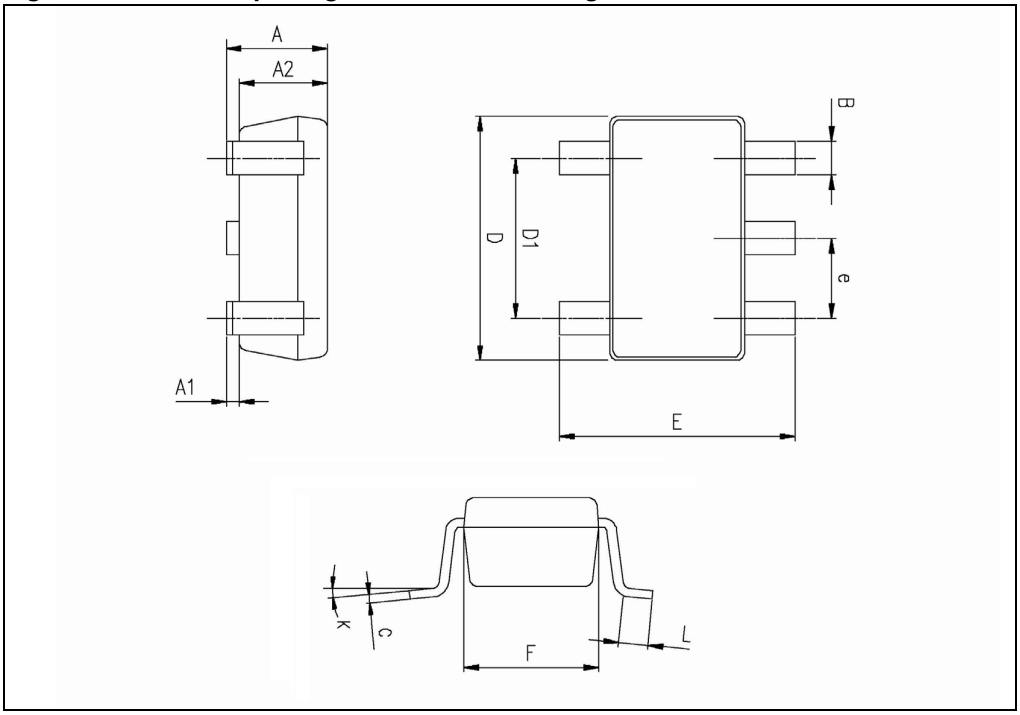


Table 5. SOT23-5 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90	1.20	1.45	0.035	0.047	0.057
A1			0.15			0.006
A2	0.90	1.05	1.30	0.035	0.041	0.051
B	0.35	0.40	0.50	0.013	0.015	0.019
C	0.09	0.15	0.20	0.003	0.006	0.008
D	2.80	2.90	3.00	0.110	0.114	0.118
D1		1.90			0.075	
e		0.95			0.037	
E	2.60	2.80	3.00	0.102	0.110	0.118
F	1.50	1.60	1.75	0.059	0.063	0.069
L	0.10	0.35	0.60	0.004	0.013	0.023
K	0 degrees		10 degrees			

3.2 SC70-5 (SOT323-5) package

Figure 11. SC70-5 (SOT323-5) package mechanical drawing

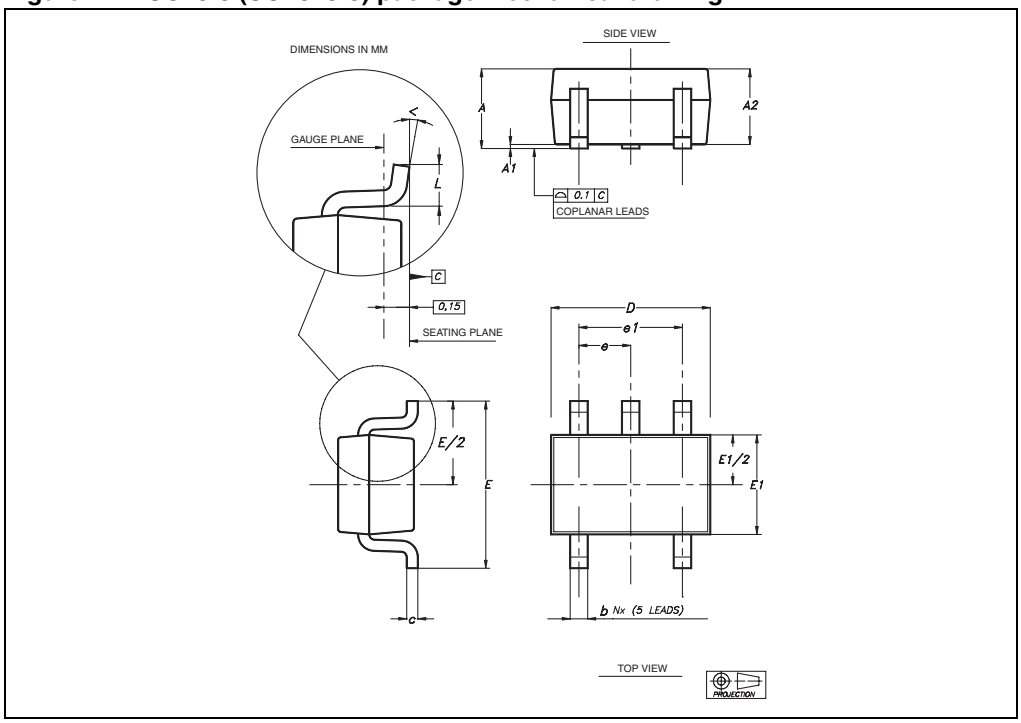


Table 6. SC70-5 (or SOT323-5) package mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	Min	Typ	Max	Min	Typ	Max
A	0.80		1.10	0.315		0.043
A1			0.10			0.004
A2	0.80	0.90	1.00	0.315	0.035	0.039
b	0.15		0.30	0.006		0.012
c	0.10		0.22	0.004		0.009
D	1.80	2.00	2.20	0.071	0.079	0.087
E	1.80	2.10	2.40	0.071	0.083	0.094
E1	1.15	1.25	1.35	0.045	0.049	0.053
e		0.65			0.025	
e1		1.30			0.051	
L	0.26	0.36	0.46	0.010	0.014	0.018
<	0°		8°			

4 Ordering information

Table 7. Order codes

Part number	Temperature range	Package	Packaging	Marking
LMV331ILT	-40°C, +85°C	SOT23-5	Tape & reel	K503
LMV331ICT		SC70-5	Tape & reel	K50

5 Revision history

Date	Revision	Changes
08-Dec-2009	1	Initial release.
03-May-2010	2	Corrected Icc unit in *Figure 1* and *Figure 2*.

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