General Purpose, 1.8V, RRI, Open-drain Output Comparators

General Description

The LMV331/393 is single/dual channel comparator with open-drain output offer the ultimate combination of high speed (100 ns propagation delay) and very low power consumption (37 μA), and feature such as rail-to-rail inputs, low offset voltage (typically 1 mV), large output drive current, and a wide range of supply voltages from 1.8 V to 5.5 V. The devices are very easy to implement in a wide variety of applications where require critical response time, power-sensitive, low voltage, and tight board space.

Advantages of the LMV331/393 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 LMV331/393 achieve superior performance over BiCMOS or bipolar versions on the market.

The LMV331 (single) is available in SOT23-5 package. The LMV393 (dual) is offered in SOP8 package. All devices are rated over -40 °C to +125 °C industrial temperature range.

Features

- Micro-power Operating Current (37 μA) Preserves Battery Power
- Fast 100 ns Propagation Delay (100 mV Overdrive)
- Single 1.8 V to 5.5 V Supply Voltage Range
  - Can be Powered From the Same 1.8 V / 2.5 V / 3.3 V / 5 V System Rails
- Rail-to-Rail Input
- Open-Drain Output Current Drive: 30 mA Typically at 5V Supply
- Internal Hysteresis for Clean Switching
- Internal RF/EMI Filter
- Operating Temperature Range: -40 °C to +125 °C

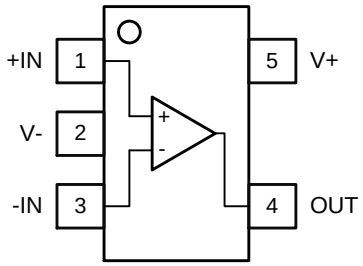
Applications

- 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

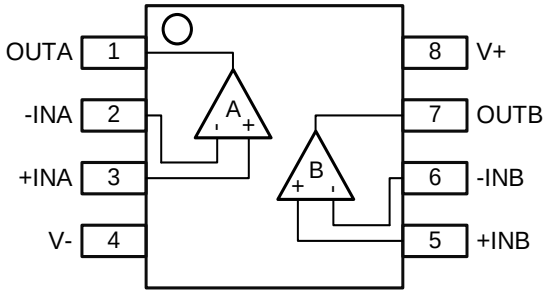
Device information

Part No.	Package	Packing Option	MSL
LMV331E	SOT23-5	Tape and Reel , 3K	3
LMV393M	SOP8	Tape and Reel , 4K	3

Pin Configurations



LMV331E



LMV393M

Pin Function

Symbol	Descriptions
-INx	Inverting input
+INx	Non-inverting input
V+	Positive supply
V-	Negative supply
OUTx	Output

Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are only stress ratings, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions are not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

Symbol	Parameter	Value	Unit
V_S	Supply Voltage	0 to 7	V
V_{IN}	Signal input terminals Voltage	(V-)-0.3 to (V+)+0.3	V
I_{IN}	Signal input terminals Current	-10 to +10	mA
V_{ESD}	ESD (Human Body Model)	±2000	V
	ESD (Charged device model)	±1000	V
T_{STG}	Storage Temperature Range	-65 to +150	°C
$T_{J(MAX)}$	Max Junction Temperature Range	+150	°C
T_A	Operating Temperature Range	-40 to +125	°C

Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V_S	Supply Voltage: (V+) - (V-)	1.8 to 5.5	V
T_A	Operating Temperature Range	-40 to +125	°C

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SOT23-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	220	°C/W
	SOP8		125	°C/W

Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
OFFSET VOLTAGE						
V_{OS}	Input offset voltage	V_{CM} = 0V		±1	±5	mV
$\Delta V_{OS}/\Delta T$	Input offset voltage vs temperature	T_A = -40°C to +125°C		±2		µV/°C
PSRR	Input offset voltage vs power supply	V_S = 1.8 to 5.5V, V_{CM} < [(V+) - 1V]	60	82		dB
		T_A = -40°C to +125°C	50			
Hyst	Input hysteresis	V_{CM} = 0V		3		mV
INPUT VOLTAGE RANGE						
V_{CM}	Common-mode voltage range	T_A = -40°C to +85°C	(V-)-0.1		(V+)+0.1	V
		T_A = -40°C to +125°C	(V-)+0.1		(V+)-0.1	V
CMRR	Common-mode rejection ratio	V_S = 5.5V, -0.1V < V_{CM} < 5.5V	61	78		dB
		V_S = 5.5V, 0V < V_{CM} < 5.3V, T_A = -40°C to +125°C	58			
		V_S = 1.8V, -0.1V < V_{CM} < 1.8V	55	77		
		V_S = 1.8V, 0V < V_{CM} < 1.6V, T_A = -40°C to +125°C	50			
INPUT BIAS CURRENT						
I_B	Input bias current(1)	V_{CM} = (V+)/2		5	30	pA
		T_A = -40°C to +125°C			800	
I_{OS}	Input offset current(1)	V_{CM} = (V+)/2		10	50	pA
		T_A = -40°C to +125°C			1000	
INPUT CAPACITANCE						
C_{ID}	Differential			2		pF
C_{IC}	Common-mode			3.5		pF
OUTPUT						
V_{OL}	Voltage swing from (V-)	V_S = 5.0V,I_{SINK} = 1mA		50	80	mV
		T_A = -40°C to +125°C			90	
I_{SC}	Short-circuit current	Sinking	25	30		mA

Electrical Characteristics (Continued)

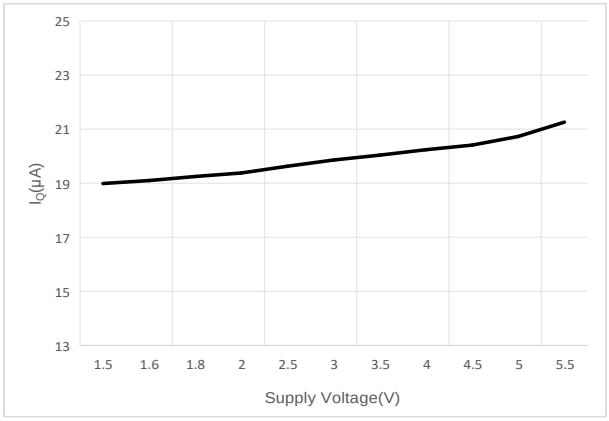
V_S = 5.0V, T_A = +25°C, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
POWER SUPPLY						
V_S	Specified voltage range		1.8		5.5	V
I_Q	Quiescent current (per comparator)	V_S = 1.8V, V_{CM} = 0.5V, I_O = 0		32	40	µA
		T_A = -40°C to +125°C			50	
		V_S = 5.5V, V_{CM} = 0.5V, I_O = 0		37	45	
		T_A = -40°C to +125°C			60	
SWITCHING CHARACTERISTICS						
T_{PD}	Propagation delay time high-to-low	V_{OD} = 20 mV, C_L = 15 pF		240		ns
		V_{OD} = 100 mV, C_L = 15 pF		100		
T_{FALL}	Fall time	V_{OD} = 20 mV, C_L = 15 pF		20		ns
		V_{OD} = 100 mV, C_L = 15 pF		10		

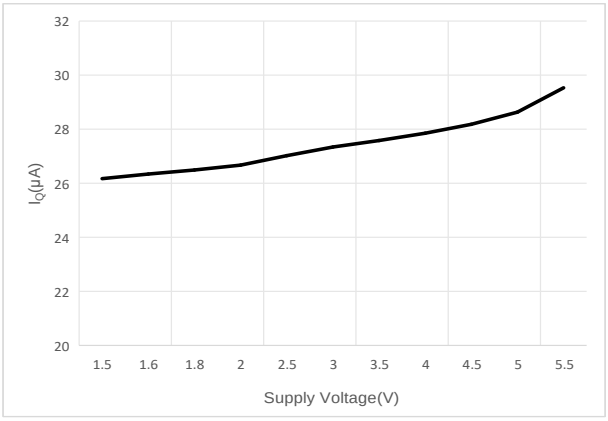
Note1:Guaranteed by design.

Typical Characteristics

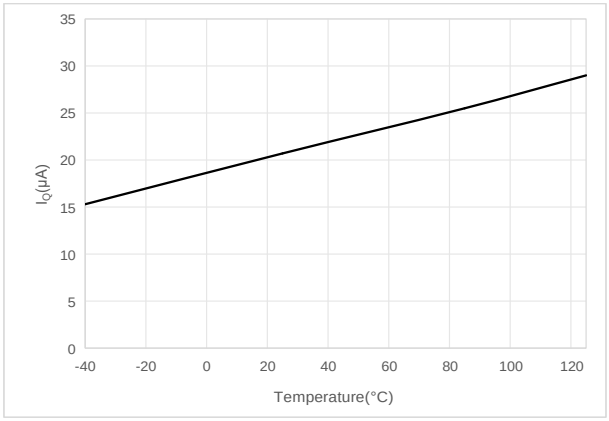
V_S = 5.0V, T_A = +25°C, unless otherwise noted.



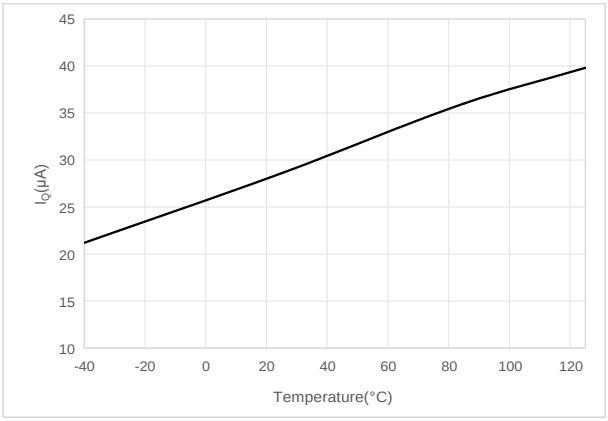
Supply Current vs Supply Voltage
Output High



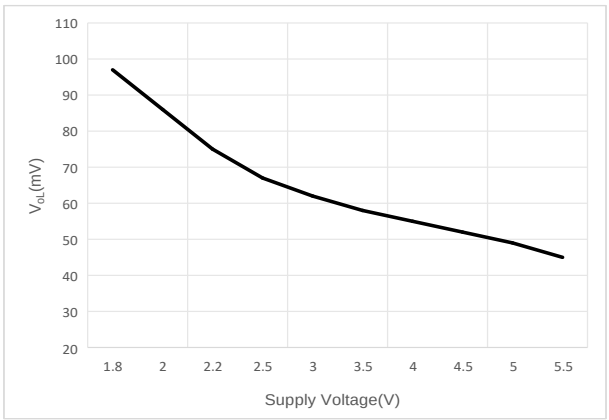
Supply Current vs Supply Voltage
Output Low



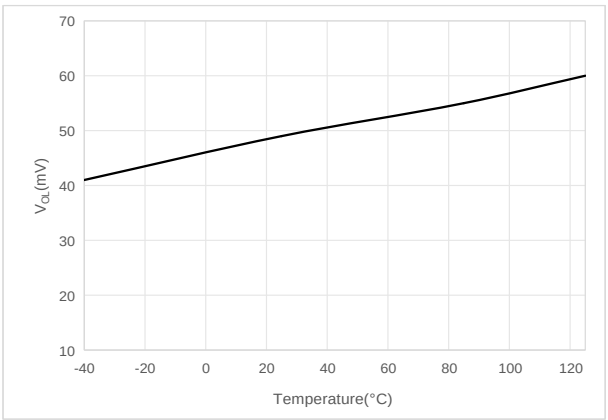
Supply Current vs Temperature
Output High



Supply Current vs Temperature
Output Low



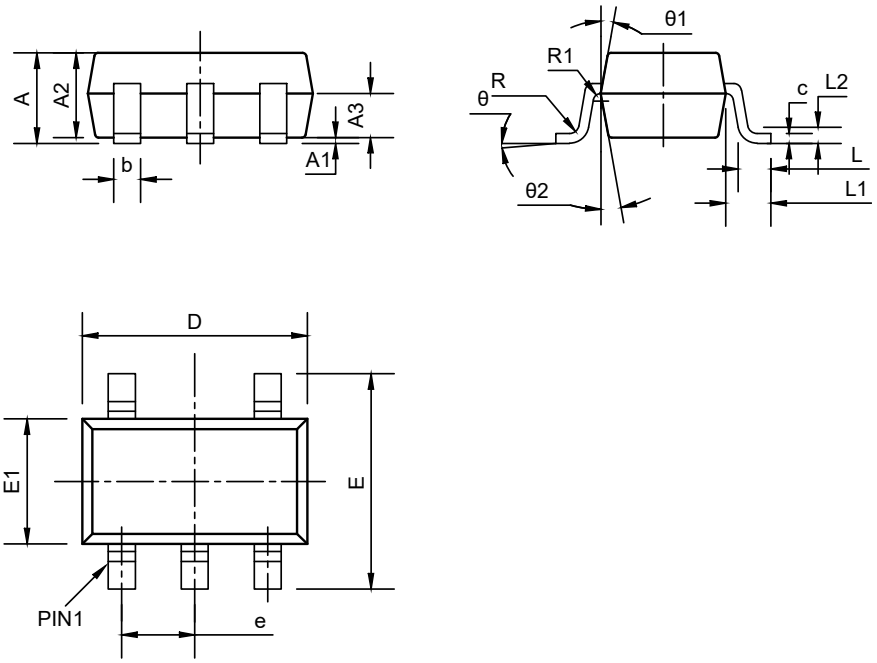
Voltage swing from (V-) vs Supply Voltage



Voltage swing from (V-) vs Temperature

Package Dimension

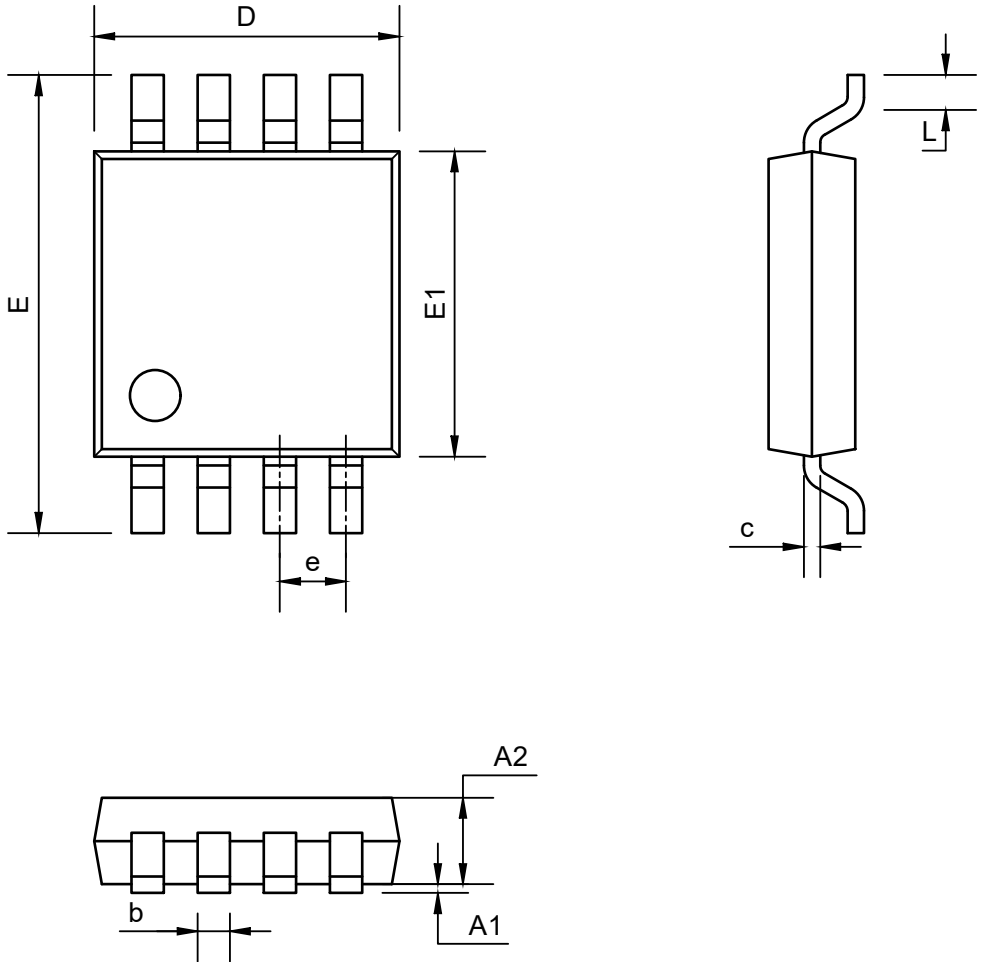
SOT23-5



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	-	-	1.25
A1	0	-	0.15
A2	1	1.1	1.2
A3	0.6	0.65	0.7
b	0.36	-	0.5
c	0.14	-	0.2
D	2.82	2.92	3.02
E	2.6	2.8	3
E1	1.5	1.6	1.7
e	0.9	0.95	1
L	0.35	0.45	0.6
L1	0.59REF		
L2	0.25BSC		
R	0.1	-	-
R1	0.1	-	0.2
θ	0°	-	8°
θ1	3°	5°	7°
θ2	6°	-	14°

SOP8

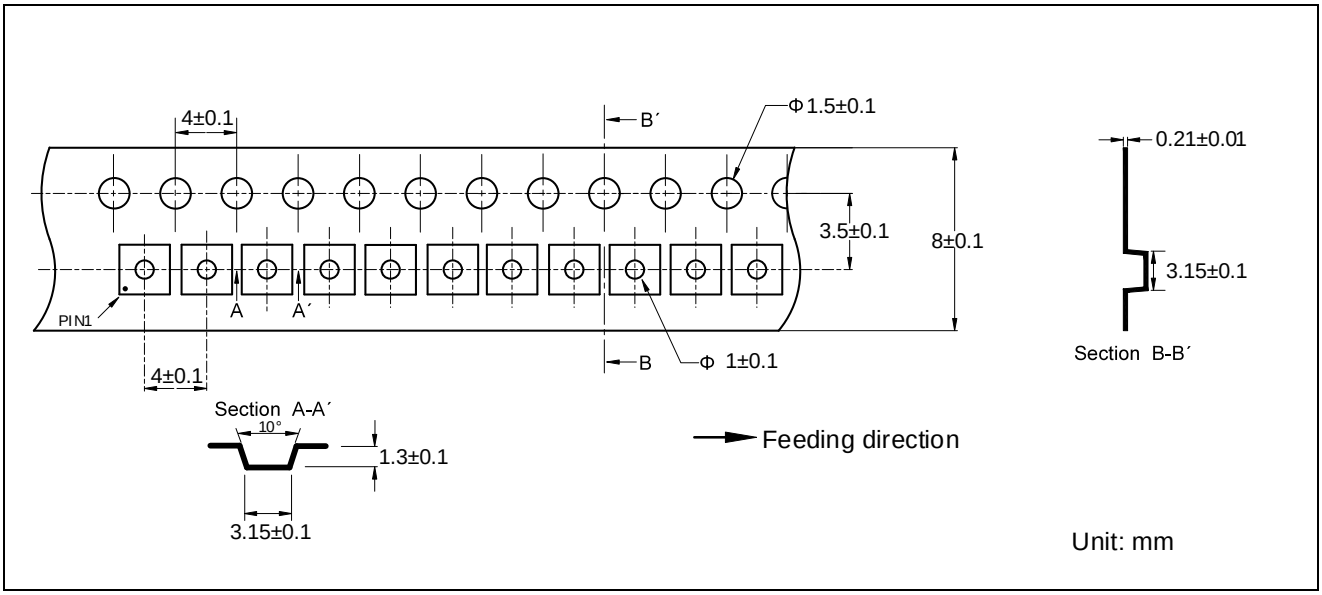


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

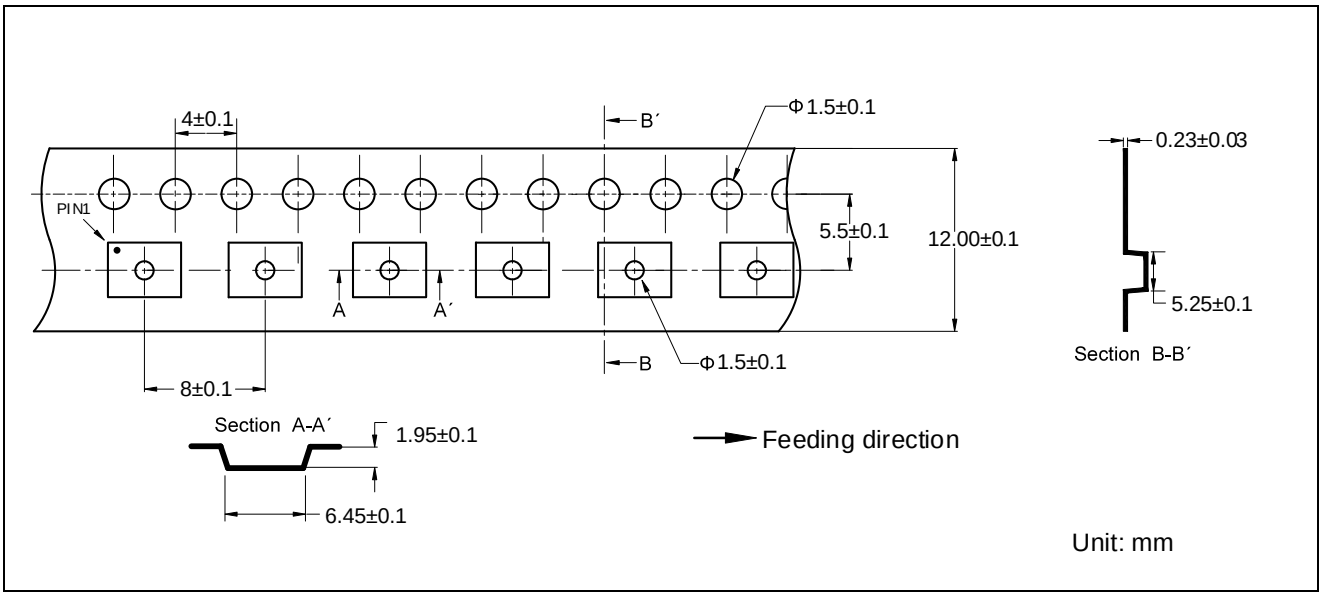
SYMBOL	MIN	NOM	MAX
A1	0.15	—	0.22
A2	1.40	1.55	1.50
b		0.40 BSC	
c	0.20	—	0.25
D	4.85	4.90	4.95
E	5.99	6.04	6.09
E1	3.85	3.90	3.95
e		1.27 BSC	
L	0.50	0.60	0.70

Tape Information

SOT23-5

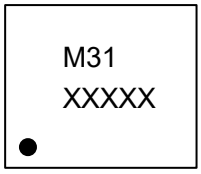


SOP8



Marking Information

LMV331

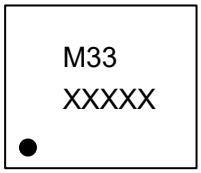


M31 - Part Number

XXXXX - Tracking Number

Note：X (Tracking Number) is variable, according to the wafer lot number.

LMV393



M33 - Part Number

XXXXX - Tracking Number

Note：X (Tracking Number) is variable, according to the wafer lot number.

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2024-2-23	Original Version	Jiangqp,Huyt	Shibo	Liujy