1 MHz Bandwidth Low Power Op Amp

Features

- 1 MHz Gain Bandwidth Product (typ.)
- Rail-to-Rail Input/Output
- Supply Voltage: 1.8V to 5.5V
- Supply Current: I_Q = 100 μA (typ.)
- 90° Phase Margin (typ.)
- Temperature Range:
  -Industrial: -40°C to +85°C
- Available in Single, Dual and Quad Packages

Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
LMV932N	DIP-8	LMV932,V932	TUBE	2000pcs/Box
LMV932M/TR	SOP-8	LMV932,V932	REEL	2500pcs/Reel
LMV932MM/TR	MSOP-8	LMV932,V932	REEL	3000pcs/Reel

Description

LMV932 operational amplifiers (op amps) is specifically designed for general-purpose applications. This family has a 1 MHz gain bandwidth product and 90° phase margin (typ.). It also maintains 45° phase margin (typ.) with 500 pF capacitive load. This family operates from a single supply voltage as low as 1.8V, while drawing 100 µA (typ.) quiescent current. Additionally, the LM932 supports rail-to-rail input and output swing with a common mode input voltage range of V_{DD} + 300 mV to V_{SS} - 300 mV. This family of operational amplifiers is designed with Microchip's advanced CMOS process.

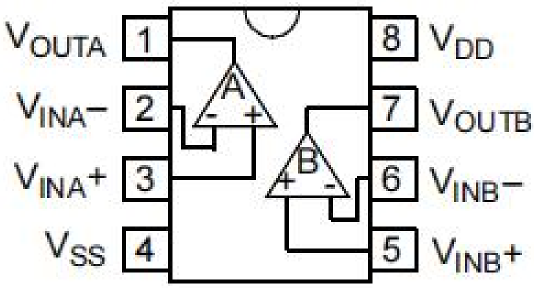
The LMV932 family is available in the industrial and extended temperature ranges. It also has a power supply range of 1.8V to 5.5V.

Applications

- Automotive
- Portable Equipment
- Photodiode Pre-amps
- Analog Filters
- Notebooks and PDAs
- Battery-Powered Systems

Package Types

LMV932

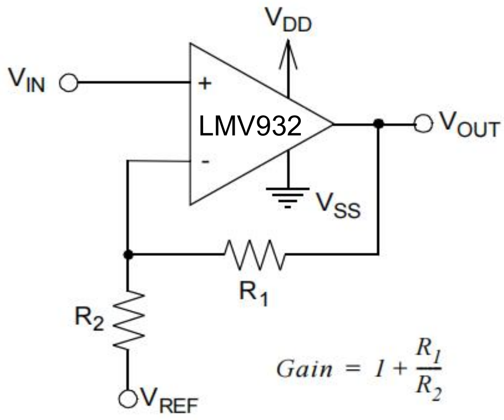


DIP-8/SOP-8/MSOP-8

PIN FUNCTION TABLE

Name	Function
V_{INA}+, V_{INB}+	Non-inverting Inputs
V_{INA}–, V_{INB}–	Inverting Inputs
V_{DD}	Positive Power Supply
V_{SS}	Negative Power Supply
V_{OUTA}, V_{OUTB}	Outputs

Typical Application



Absolute Maximum Ratings

Condition		Min	Max
V_{DD} - V_{SS}		7.0V	
All Inputs and Outputs		V_{SS}-0.3V	V_{DD}+0.3V
Difference Input Voltage		∣ V_{DD}-V_{SS} ∣	
Output Short Circuit Current		continuous	
Current at Input Pins		-2mA	+2mA
Current at Output and Supply Pins		-30mA	+30mA
Storage Temperature		-65°C	+150°C
Maximum Junction Temperature (T_J)		-	+150°C
Lead Temperature (Soldering, 10 seconds)		-	260°C
ESD Protection On All Pins	HBM	≥4KV	
	MM	200V	

Notice: Stresses above those listed under “Maximum Rat- ings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Expo- sure to maximum rating conditions for extended periods may affect device reliability.

DC ELECTRICAL SPECIFICATIONS

Electrical Characteristics:

Unless otherwise indicated, T_A = +25°C, V_{DD} = +1.8V to +5.5V, V_{SS} = GND, V_{CM} = V_{DD}/2, RL = 10 kΩ to V_{DD}/2, and V_{OUT} ~ V_{DD}/2.

Parameters	Sym	Min	Typ	Max	Units	Conditions
Input Offset						
Input Offset Voltage	VOS	-7.0	—	+7.0	mV	V_{CM} = V_{SS}
Input Offset Drift with Temperature	$\Delta V_{OS}/\Delta T_A$	—	±2.0	—	µV/°C	T_A= -40°C to +125°C, V_{CM} = V_{SS}
Power Supply Rejection	PSRR	—	86	—	dB	V_{CM} = V_{SS}
Input Bias Current and Impedance						
Input Bias Current:	I_B	—	±1.0	—	pA	
Industrial Temperature	I_B	—	19	—	pA	TA = +85°C
Extended Temperature	I_B	—	1100	—	pA	TA = +125°C
Input Offset Current	I_{OS}	—	±1.0	—	pA	
Common Mode Input Impedance	Z_{CM}	—	10^{13}||6	—	Ω||pF	
Differential Input Impedance	Z_{DIFF}	—	10^{13}||3	—	Ω||pF	
Common Mode						
Common Mode Input Range	V_{CMR}	V_{SS}-0.3	—	V_{DD}+0.3	V	
Common Mode Rejection Ratio	CMRR	60	76	—	dB	V_{CM} = -0.3V to 5.3V, V_{DD}= 5V
Open-Loop Gain						
DC Open-Loop Gain (large signal)	A_{OL}	88	112	—	dB	V_{OUT} = 0.3V to V_{DD} - 0.3V, V_{CM} = V_{SS}
Output						
Maximum Output Voltage Swing	V_{OL}, V_{OH}	VSS + 25	—	V_{DD} - 25	mV	V_{DD} = 5.5V
Output Short-Circuit Current	I_{SC}	— —	±6 ±23	— —	mA mA	V_{DD} = 1.8V V_{DD} = 5.5V
Power Supply						
Supply Voltage	V_{DD}	1.8	—	5.5	V	
Quiescent Current per Amplifier	I_Q	50	100	170	µA	I_O=0,V_{DD} =5.5V, V_{CM}=5V

AC ELECTRICAL SPECIFICATIONS

Electrical Characteristics:

Unless otherwise indicated, T_A = +25°C, V_{DD} = +1.8 to 5.5V, V_{SS} = GND, V_{CM} = V_{DD}/2, V_{OUT} ≈ V_{DD}/2, R_L = 10 kΩ to V_{DD}/2, and C_L = 60 pF.

Parameters	Sym	Min	Typ	Max	Units	Conditions
AC Response						
Gain Bandwidth Product	GBWP	—	1.0	—	MHz	
Phase Margin	PM	—	90	—	°	G = +1
Slew Rate	SR	—	0.6	—	V/µs	
Noise						
Input Noise Voltage	Eni	—	6.1	—	µVp-p	f = 0.1 Hz to 10 Hz
Input Noise Voltage Density	eni	—	28	—	nV/√Hz	f = 1 kHz
Input Noise Current Density	ini	—	0.6	—	fA/√Hz	f = 1 kHz

TYPICAL PERFORMANCE CURVES

Unless otherwise indicated, TA = +25°C, VDD = +1.8V to +5.5V, VSS = GND, VCM = VDD/2, VOUT ≈ VDD/2, RL = 10 kΩ to VDD/2, and C_L = 60 pF.

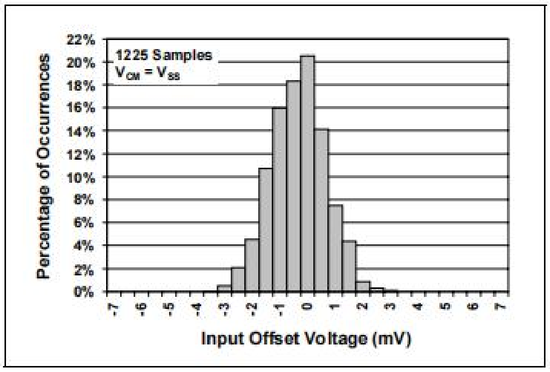


FIGURE 2-1: Input Offset Voltage Histogram.

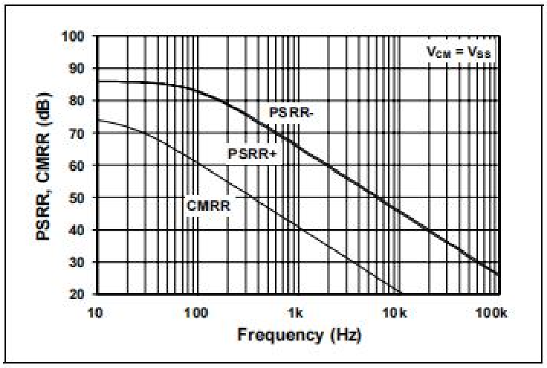


FIGURE 2-2: PSRR, CMRR vs. Frequency.

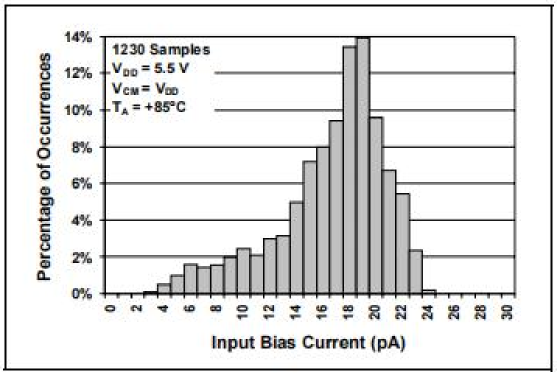


FIGURE 2-3: Input Bias Current at +85°C Histogram.

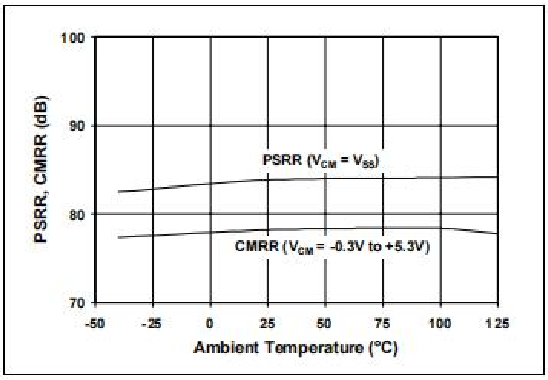


FIGURE 2-4: CMRR, PSRR vs. Ambient Temperature.

Note: Unless otherwise indicated, TA = +25°C, VDD = +1.8V to +5.5V, VSS = GND, VCM = VDD/2, VOUT ≈ VDD/2, RL = 10 kΩ to VDD/2, and C_L = 60 pF.

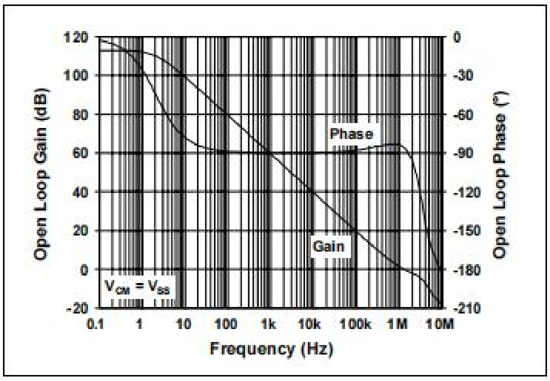


FIGURE 2-5: Open-Loop Gain, Phase vs. Frequency.

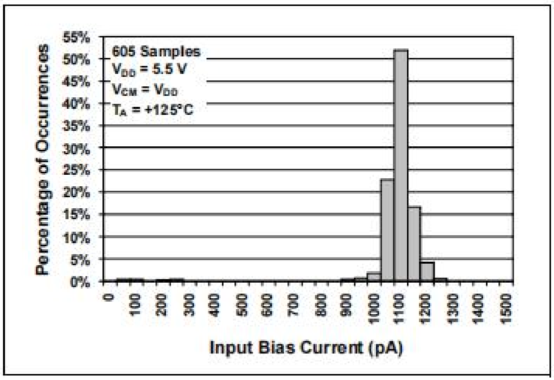


FIGURE 2-6: Input Bias Current at +125°C Histogram.

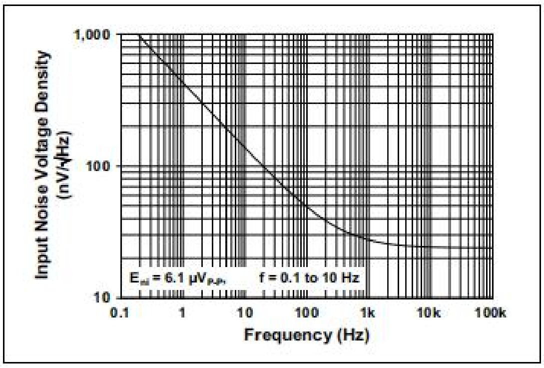


FIGURE 2-7: Input Noise Voltage Density vs. Frequency.

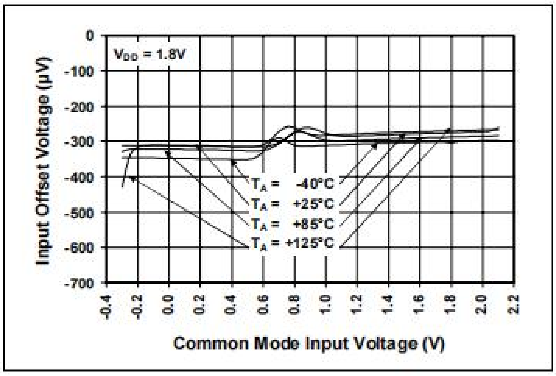


FIGURE 2-8: Input Offset Voltage vs. Common Mode Input Voltage at VDD = 1.8V.

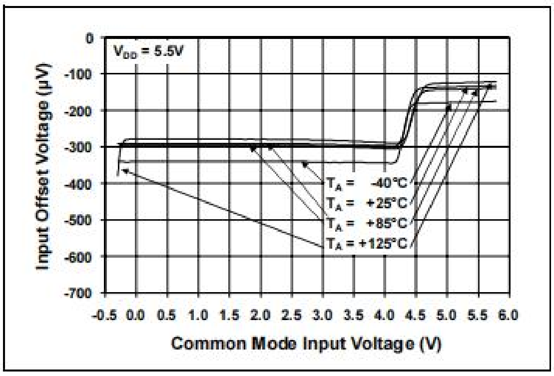


FIGURE 2-9: Input Offset Voltage vs. Common Mode Input Voltage at VDD = 5.5V.

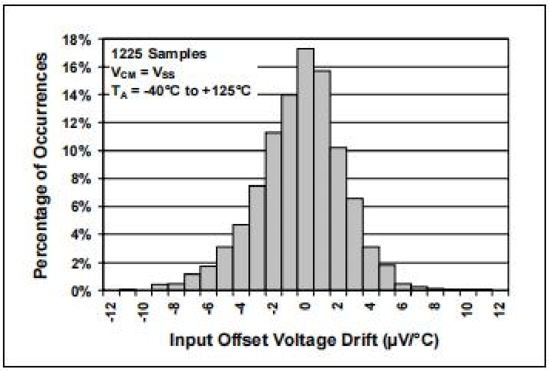


FIGURE 2-10: Input Offset Voltage Drift Histogram.

Note: Unless otherwise indicated, TA = +25°C, VDD = +1.8V to +5.5V, VSS = GND, VCM = VDD/2, VOUT ≈ VDD/2, RL = 10 kΩ to VDD/2, and C_L = 60 pF.

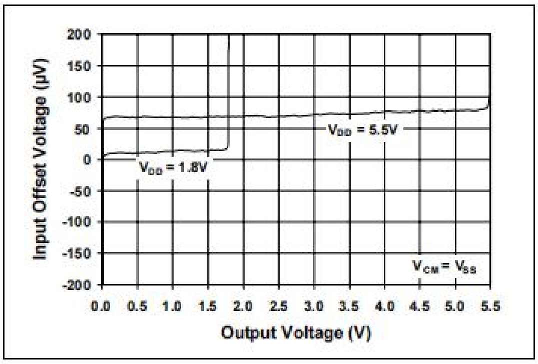


FIGURE 2-11: Input Offset Voltage vs. Output Voltage.

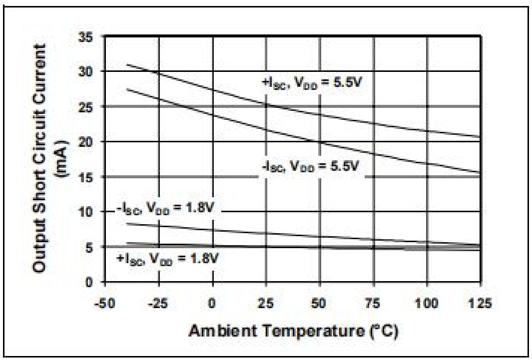


FIGURE 2-12: Output Short-Circuit Current vs. Ambient Temperature.

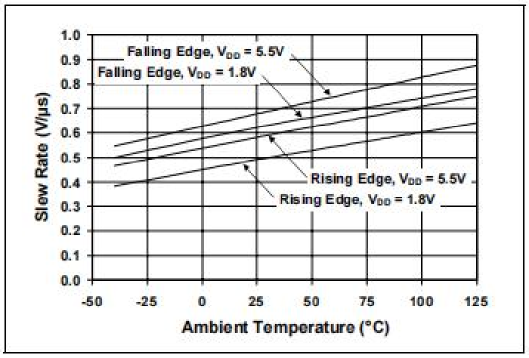


FIGURE 2-13: Slew Rate vs. Ambient Temperature.

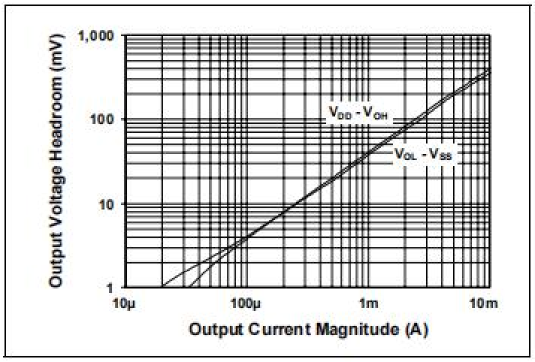


FIGURE 2-14: Output Voltage Headroom vs. Output Current Magnitude.

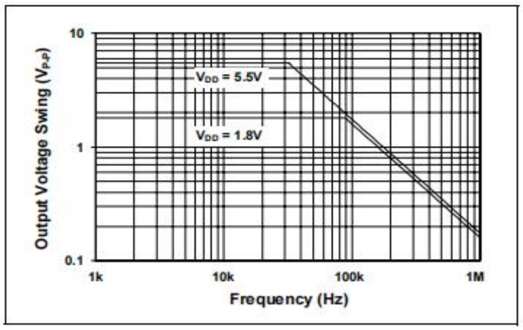


FIGURE 2-15: Output Voltage Swing vs. Frequency

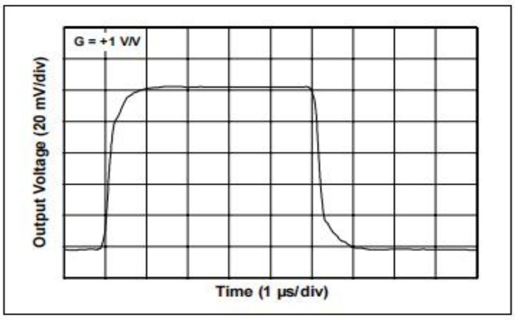


FIGURE 2-16: Small Signal Non-Inverting Pulse Response.

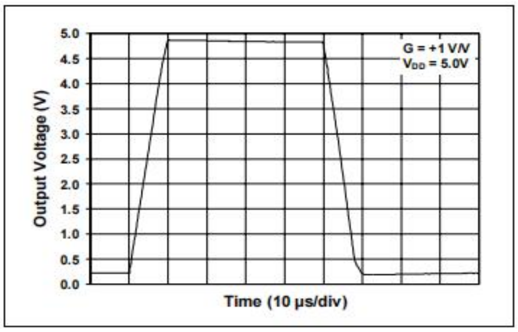


FIGURE 2-17: Large Signal Non-Inverting Pulse Response.

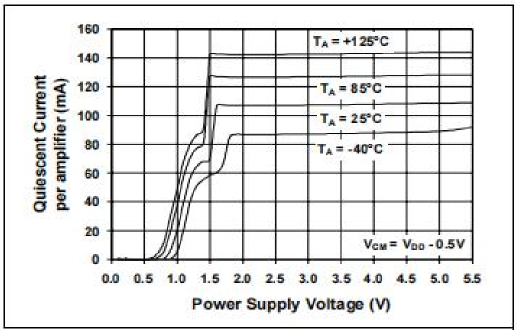
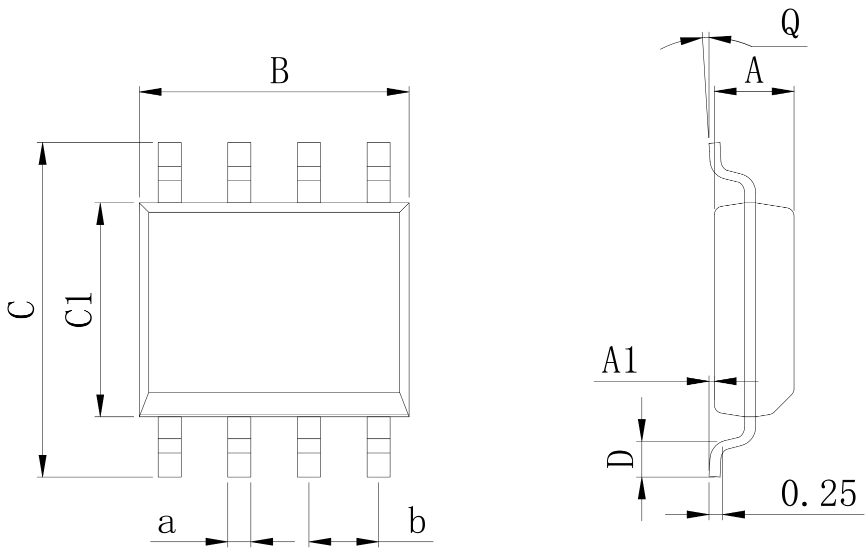


FIGURE 2-18: Quiescent Current vs. Power Supply Voltage.

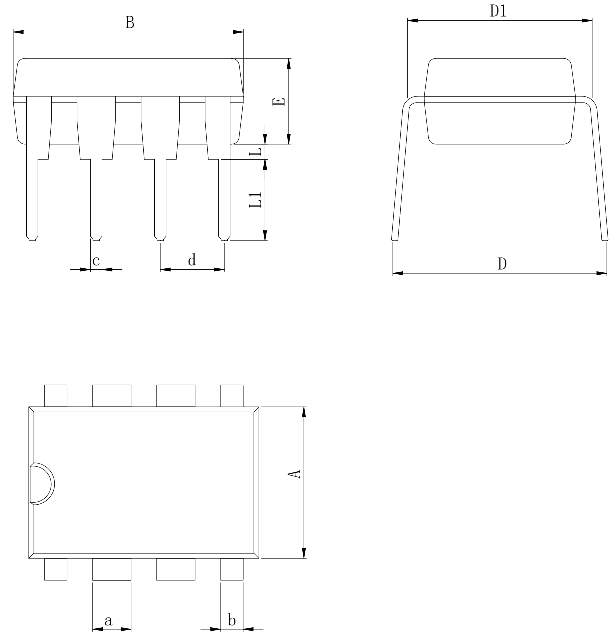
Physical Dimensions

SOP-8



Dimensions In Millimeters(SOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

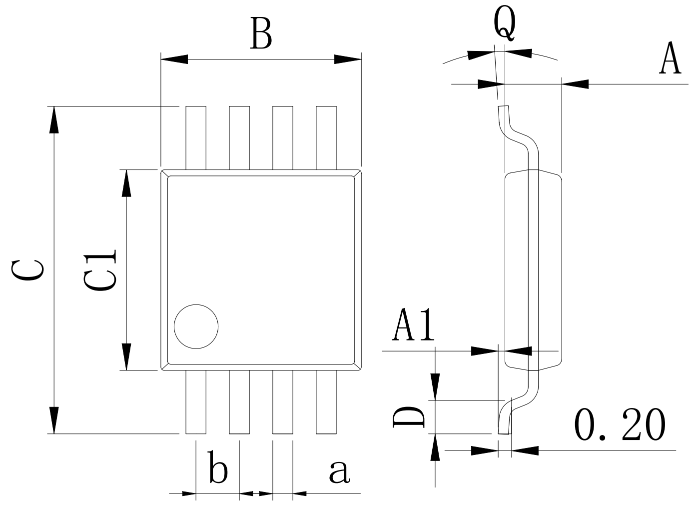
DIP-8



Dimensions In Millimeters(DIP-8)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	9.00	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	9.50	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

Physical Dimensions

MSOP-8



Dimensions In Millimeters(MSOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.80	0.05	2.90	4.75	2.90	0.35	0°	0.25	0.65 BSC
Max:	0.90	0.20	3.10	5.05	3.10	0.75	8°	0.35	

Revision History

DATE	REVISION	PAGE
2014-6-8	New	1-12
2023-8-28	Update encapsulation type、Updated DIP-8 dimension	1、9
2024-11-1	Add a model marking name、Update Lead Temperature	1、3

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