1.5MHz, RRIO, CMOS, Op Amps

DESCRIPTION

The LMV321, LMV358, LMV324 families of products offer low voltage operation and rail-to-rail input and output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth(1.5MHz) and slew rate (0.6V/us). The operational amplifiers are unity gain stable and feature an ultra-low input bias current.

The LMV321, LMV358, LMV324 has lower offset voltage, which is guaranteed not upper than 5mV at 25°C with Vs = 5V, VCM = Vs/2.

The LMV321, LMV358, LMV324 families of operational amplifiers under single supplies of 2.1V to 5.5V or dual power supplies of ±1.05V to ±2.75V. The devices are ideal for sensor interfaces, active filters and portable applications.

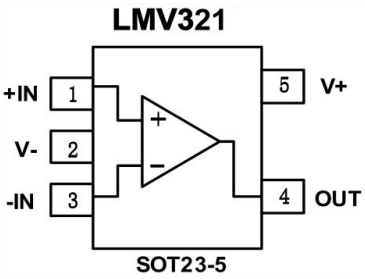
FEATURES

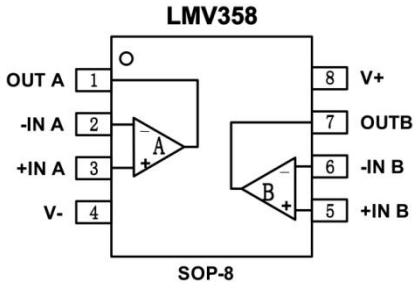
- Gain-Bandwidth Product: 1.5MHz
- Slew Rate: 0.6V/us
- Unity Gain Stable
- Rail-To-Rail Input and Output
- No Crossover Distortion
- Lower Offset Voltage: ±5mV Max
- Supply Range: +2.1V to +5.5V
- Low Supply Current: 80μA per channel
- Operating Range: -40℃ TO +125℃

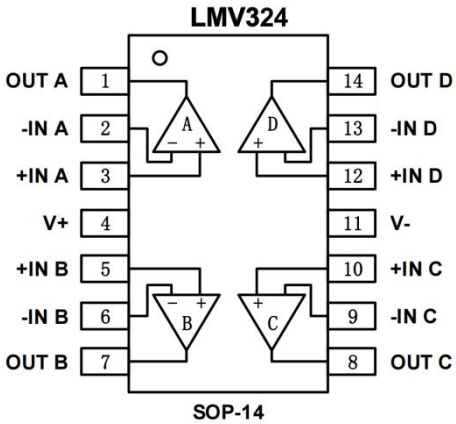
APPLICATIONS

- Sensors
- Active Filters
- Test Equipment
- Driving A/D Converters
- Photodiode Amplification

Pin Configuration







Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) (1)

PARAMETER	MIN	MAX	UNIT
Supply Voltage, Vs=(V+) - (V-)	2.1	6	V
Signal Input Voltage	(V-)-0.1	(V+)-1	V
Signal Output Voltage(2)	(V-)-0.3	(V+)+0.3	V
Signal Input Current	-10	+10	mA
Signal Output Current	-70	+70	mA
Maximum Junction Temperature		+150	℃
Storage Temperature Range	-65	+150	℃

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

Note 2: Output terminals are diode-clamped to the power-supply rails. Output signals that can swing more than 0.5V beyond the supply rails should be current-limited to ±60mA or less.

ESD Ratings

SYMBOL	PARAMETER		VALUE	UNIT
V(ESD)	Electrostatic discharge	Human-body model (HBM)	±4500	V

Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

PARAMETER		MIN	TYP	MAX	UNIT
Supply Voltage, Vs=(V+) - (V-)	Signal-supply	2.1		5.5	V
	Dual-supply	±1.05		±2.75	V
Operating Temperature Range		-40	+25	+125	℃

ELECTRICAL CHARACTERISTICS

(At T_A=+25℃, Vs=5V, R_L=10kΩ connected to Vs/2, and V_{OUT}=Vs/2, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY						
Operating Voltage Range	V_S		2.1		5.5	V
Quiescent Current/Amplifier	I_Q			80		μA
Power-Supply Rejection Ratio	PSRR	Vs=2.5V to 5.5V, V_{CM}=(V-)+0.5V	60			dB
INPUT						
Input Offset Voltage	V_{OS}	V_{CM}= V_S/2, LMV321	-5	±0.8	+5	mV
		V_{CM}= V_S/2, LMV358	-5	±0.8	+5	mV
		V_{CM}= V_S/2, LMV324	-5	±0.8	+5	mV
Input Offset Voltage Average Drift	V_{OS} TC	T_A=-40℃~+125℃		±3.8		μV/℃
Input Bias Current	I_B			±10		pA
Input Offset Current	I_{OS}			±10		pA
Common-Mode Voltage Range	V_{CM}		(V-)-0.1		(V+)-1	V
Common-Mode Rejection Ratio	CMRR	Vs= 5.5V, V_{CM}=-0.1V to 4V	56			dB
OUTPUT						
Open-Loop Voltage Gain	A_{OL}	R_L=2KΩ, V_O=0.15V to 4.85V	70			dB
		R_L=10KΩ, V_O=0.05V to 4.95V	75			dB
Output Swing From Rail		R_L=2KΩ		30		mV
		R_L=10KΩ		5		mV
Output Current Source	I_{OUT}			70		mA
FREQUENCY RESPONSE						
Slew Rate	SR			0.6		V/μs
Gain-Bandwidth Product	GBP			1.5		MHz
Phase Margin	PM			60		°
Setting Time,0.1%	ts			10		μs
Overload Recovery Time		V_{IN}·Gain≥V_S		5		μs
NOISE						
Input Voltage Noise Density	en	f = 1KHz		50		nV/√Hz
		f = 10KHz		25		nV/√Hz

TYPICAL CHARACTERISTICS

At T_A=+25℃, Vs=5V, R_L = 10kΩ connected to V_S/2, V_{OUT}=V_S/2, unless otherwise noted.

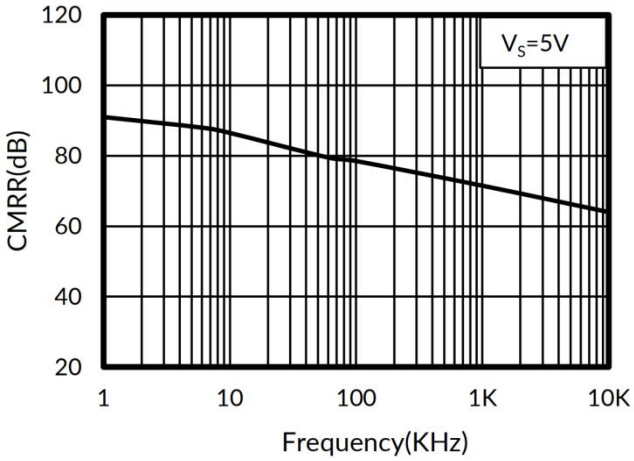


Figure 1. Common-Mode Rejection Ratio vs Frequency

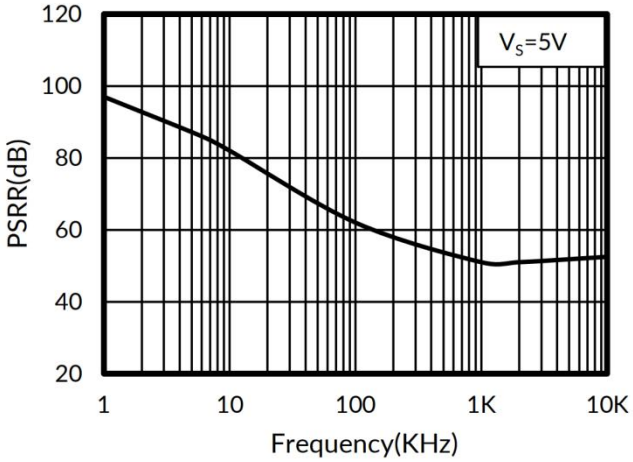


Figure 2. Power-Supply Rejection Ratio vs Frequency

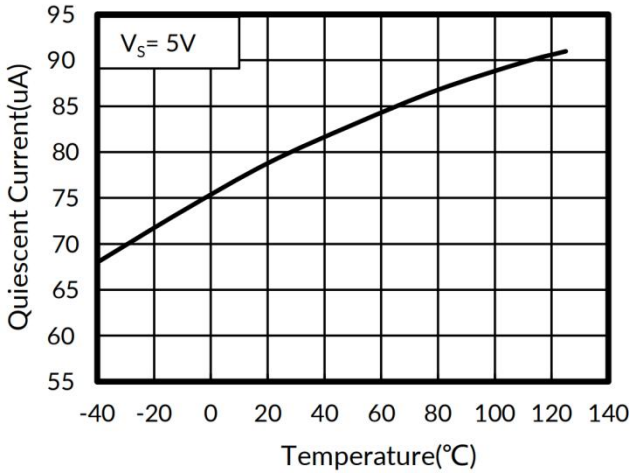


Figure 3. Quiescent Current vs Temperature

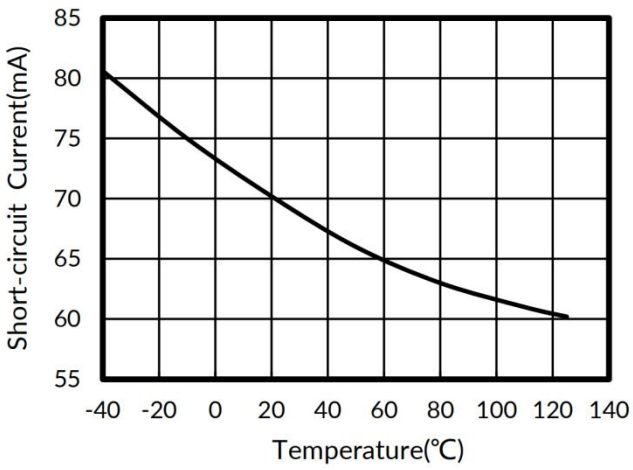


Figure 4. Short-Circuit Current vs Temperature

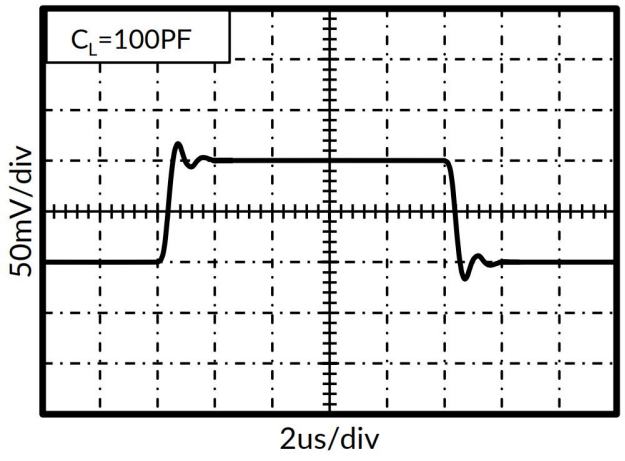


Figure 5. Small-Signal Step Response

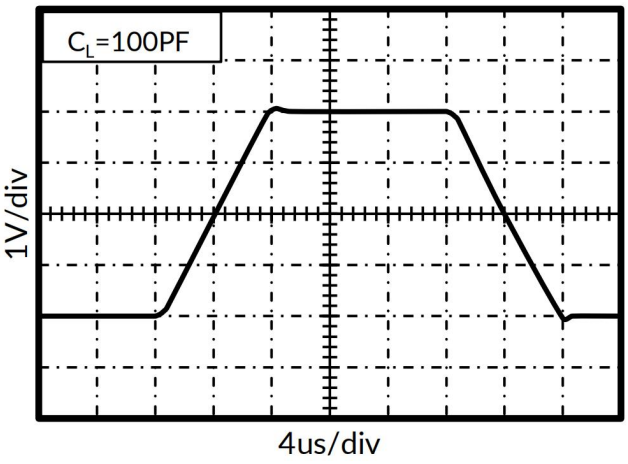


Figure 6. Large-Signal Step Response

LAYOUT

Layout Guideline

Attention to good layout practices is always recommended. Keep traces short. When possible, use a PCB ground plane with surface-mount components placed as close to the device pins as possible. Place a 0.1uF capacitor closely across the supply pins.

These guidelines should be applied throughout the analog circuit to improve performance and provide benefits such as reducing the EMI susceptibility.

Layout Example

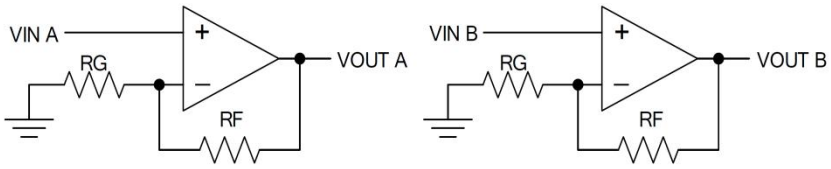


Figure 7. Schematic Representation

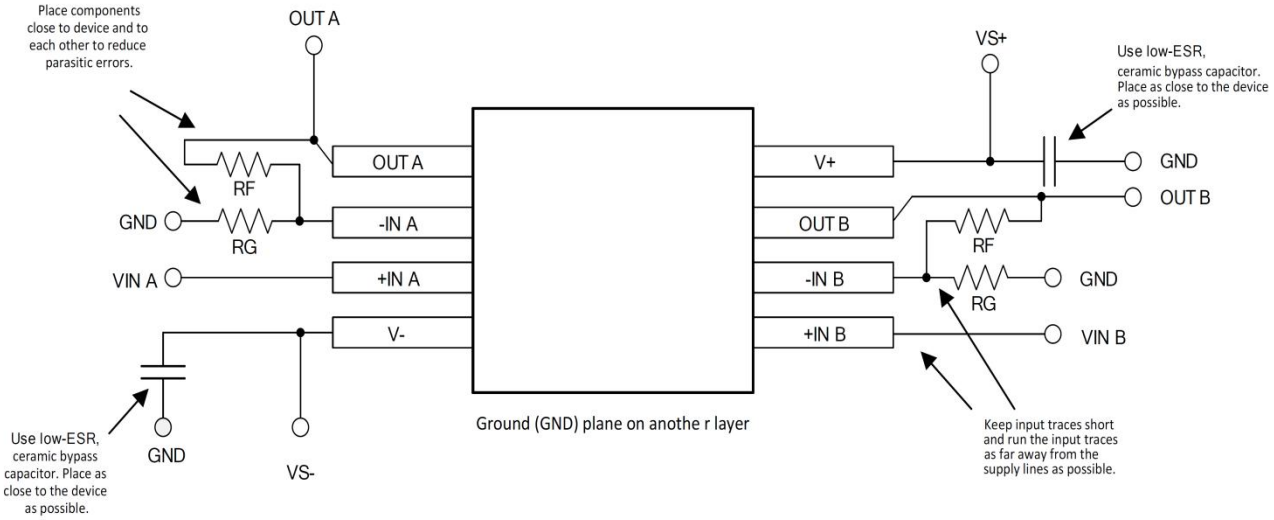
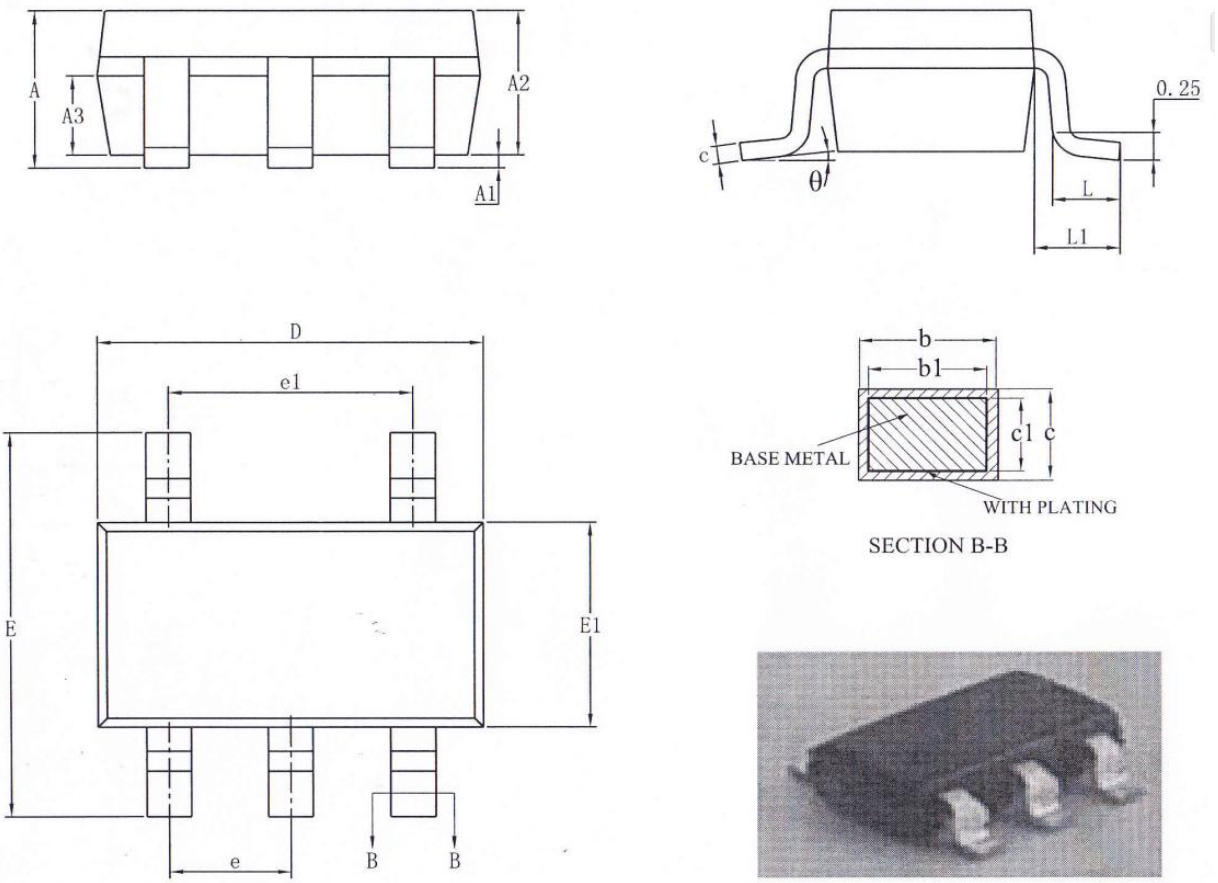


Figure 8. Layout Example

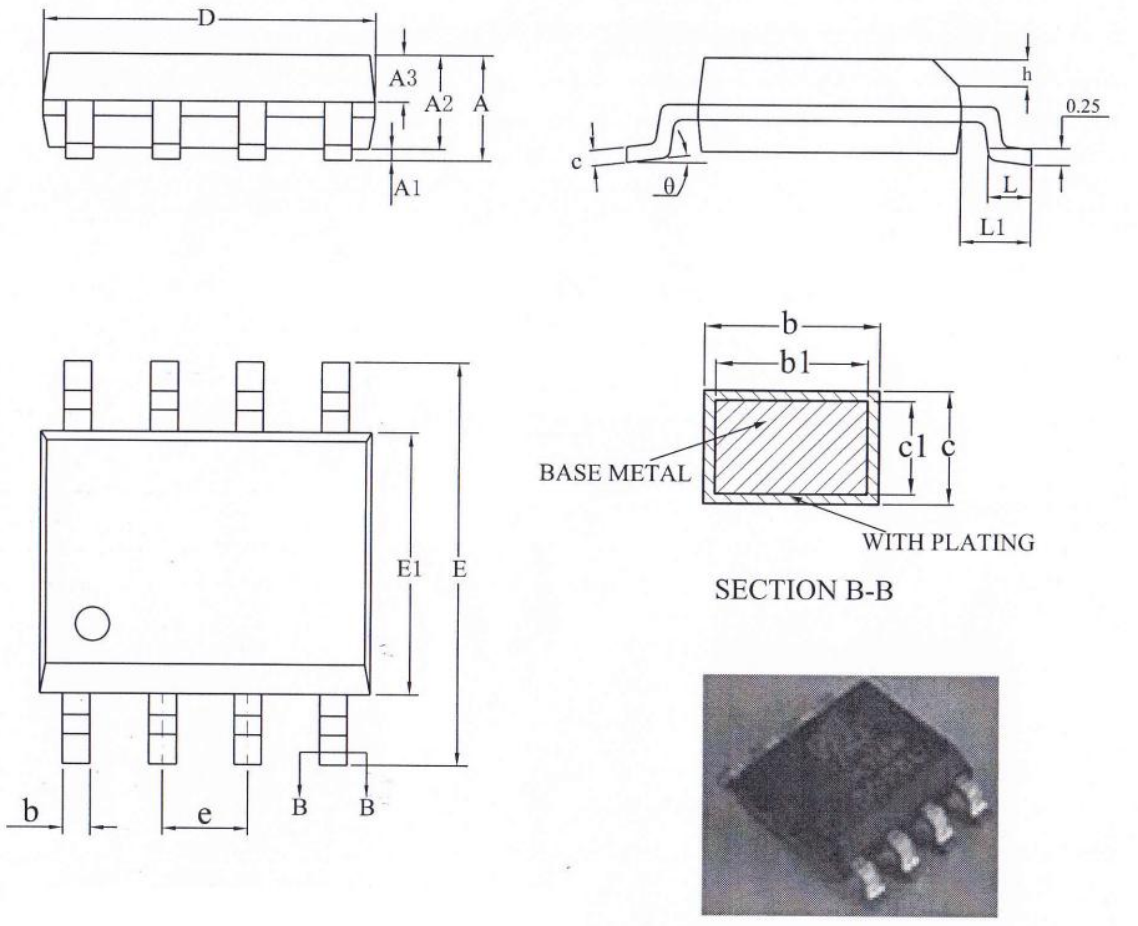
PACKAGE OUTLINE DIMENSIONS

SOT23-5



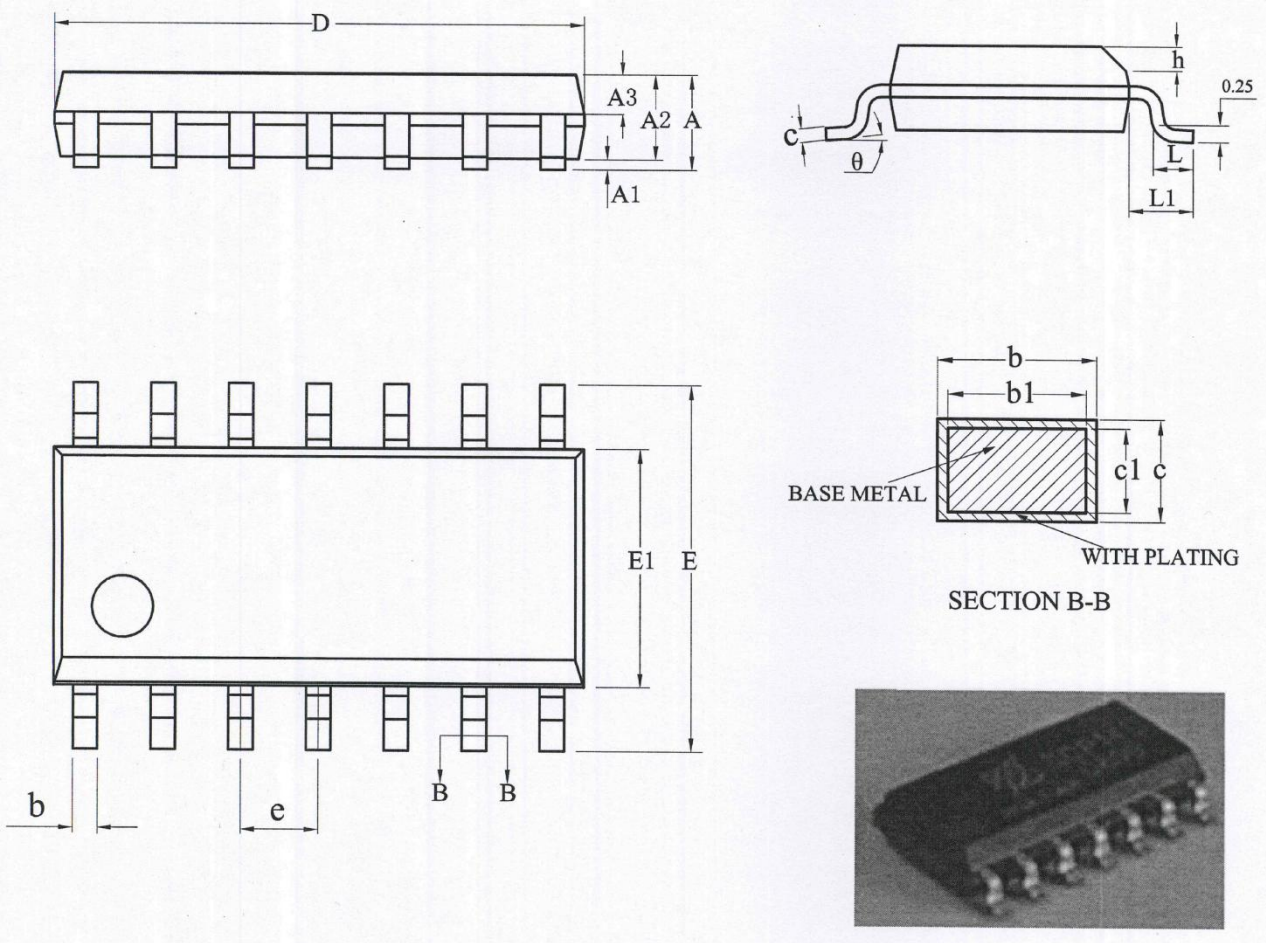
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.25
A1	0.04	—	0.10
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.33	—	0.41
b1	0.32	0.35	0.38
C	0.15	—	0.19
c1	0.14	0.15	0.16
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95BSC		
e1	1.90BSC		
L	0.30	—	0.60
L1		0.60REF	
θ	0	—	8°

SOP8



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.47
b1	0.38	0.41	0.44
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	—	0.5
L	0.50	—	0.8
L1	1.05REF		
θ	0	—	8°

SOP14



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.47
b1	0.38	0.41	0.44
C	0.20	—	0.24
c1	0.19	0.20	0.21
D	8.55	8.65	8.75
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
E	1.27BSC		
h	0.25	—	0.5
L	0.50	—	0.8
L1	1.05REF		
θ	0	—	8°