UMW LMV61x

Single, Dual, and Quad, 1.4-MHz, Low-Power General-Purpose 1.8-V Operational Amplifiers

1.Description

The LMV61x devices are single, dual, and quad low voltage, low-power operational amplifiers (op amps).They are designed specifically for low-voltage, general-purpose applications. Other important product characteristics are, rail-to-rail input or output, low supply voltage of 1.8 V and wide temperature range. The LMV61x input common mode extends 200 mV beyond the supplies and the output can swing rail-to-rail unloaded and within 30 mV with 2-kΩ load at 1.8-V supply. The LMV61x achieves a gain bandwidth of 1.4 MHz while drawing 100-µA (typical) quiescent current.

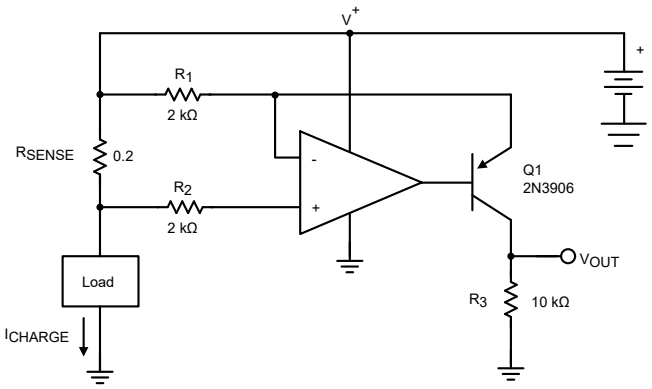
2.Features

- Supply Values: 1.8 V (Typical)
- Ensured 1.8-V, 2.7-V, and 5-V Specifications
- Output Swing:
  - 80mV From Rail With 600-Ω Load
  - 30mV From Rail With 2-kΩ Load
- V_{CM}=200mV Beyond Rails
- 100-µA Supply Current (Per Channel)
- 1.4-MHz Gain Bandwidth Product
- Maximum VOS = 4 mV
- Temperature Range: -40°C to 125°C

3.Applications

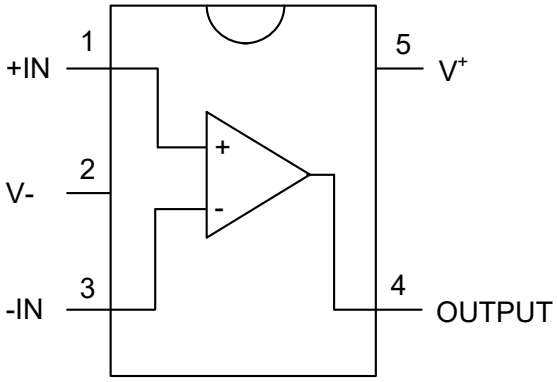
- Consumer Communication
- Consumer Computing
- PDAs
- Audio Pre-Amplifiers
- Portable or Battery-Powered Electronic Equipment
- Supply Current Monitoring
- Battery Monitoring

4.Typical Application



$$V_{OUT}=\frac{R_{SENSE}\cdot R3}{R1}\cdot I_{Charge}=1\Omega\cdot I_{Charge}$$

5.Pin Configuration and Functions

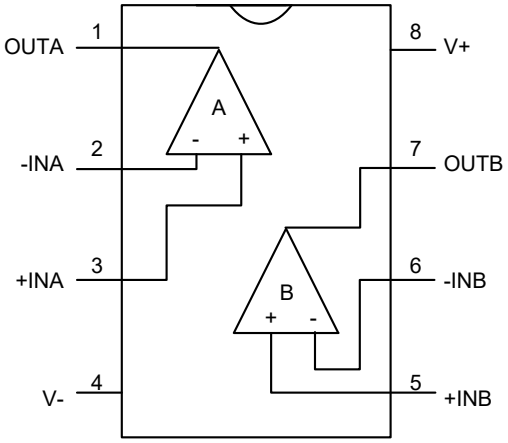


DCK and DBV Packages
5-Pin SC70 and SOT-23
Top View

Pin Functions – LMV611

Pin		Type(1)	Description
No.	Name		
1	+IN	I	Noninverting input
2	V-	P	Negative supply input
3	-IN	I	Inverting input
4	OUTPUT	O	Output
5	V+	P	Positive supply input

(1) I=Input, O=Output, and P=Power

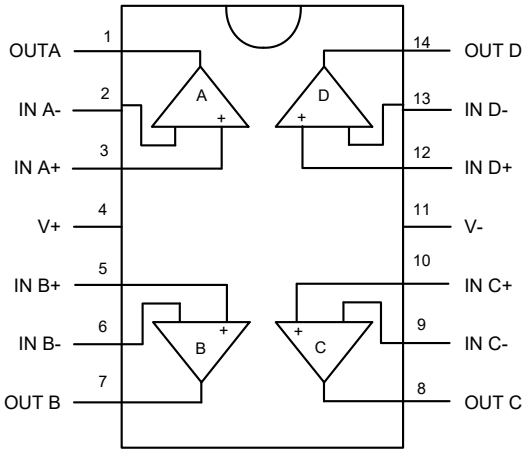


DGK and D Packages
8-Pin SOP Top View

Pin Functions – LMV611

Pin		Type(1)	Description
No.	Name		
1	OUTA	O	Output A
2	-INA	I	Inverting input A
3	+INA	I	Noninverting input A
4	V-	P	Negative supply input
5	+INB	I	Noninverting input B
6	-INB	I	Inverting input B
7	OUTB	O	Output B
8	V+	P	Positive supply input

(1) I=Input, O=Output, and P=Power



PW and D Packages
14-Pin TSSOP and SOP
Top View

Pin Functions – LMV611

Pin		Type(1)	Description
No.	Name		
1	OUTA	O	Output A
2	INA-	I	Inverting input A
3	INA+	I	Noninverting input A
4	V+	P	Negative supply input
5	INB+	I	Noninverting input B
6	INB-	I	Inverting input B
7	OUTB	O	Output B
8	OUTC	O	Output C
9	INC-	I	Inverting input C
10	INC+	I	Noninverting input C
11	V-	P	Negative supply input
12	IND+	I	Noninverting input
13	IND-	I	DInverting input D
14	OUTD	O	Output D

(1) I=Input, O=Output, and P=Power

5.Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)(2)(3)

Parameter	Symbol	Min	Max	Units
Differential input voltage		±Supply voltage		
Supply voltage	V+-V-		6	V
Voltage at input or output pin		V-0.3	V+0.3	V
Junction temperature	T_{JMAX}		150	°C
Storage temperature	T_{STG}	-65	150	°C

Notes:

(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) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.

6.ESD Ratings

Parameter		Symbol	Value	Units
Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	V_{ESD}	±2000	V
	Machine model (MM)(2)		±200	V

7.Recommended Operating Conditions

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

Parameter	Min	Max	Units
Supply voltage	1.8	5.5	V
Temperature	-40	125	°C

8.Thermal Information

Parameter	Symbol	LMV611		LMV612	LMV614		Units
		DBV (SOT-23)	DCK (SC70)	D (SOP)	D (SOP)	PW (TSSOP)	
		5 Pins	5 Pins	8 Pins	14 Pins	14 Pins	
Junction-to-ambient thermal resistance	$R_{\theta JA}$	197.2	285.9	125.9	94.4	124.8	°C/W
Junction-to-case: (top) thermal resistance	$R_{\theta JC(top)}$	156.7	115.9	70.2	52.5	51.4	°C/W
Junction-to-board thermal resistance	$R_{\theta JB}$	55.6	63.7	66.5	48.9	67.2	°C/W
Junction-to-top characterization parameter	ψ_{JT}	41.4	4.5	19.8	14.3	6.6	°C/W
Junction-to-board characterization parameter	ψ_{JB}	55	62.9	65.9	48.6	66.6	°C/W
Junction-to-case (bottom) thermal resistance	$R_{\theta JC(bot)}$	-	-	-	-	-	°C/W

9.1 Electrical Characteristics – 1.8V(DC)

All limits ensured for T_J=25°C, V+=1.8V, V-=0V, V_{CM}=V+/2, V_O=V+/2, and R_L>1MΩ (unless otherwise noted).(1)

Parameter	Symbol	Conditions		Min(2)	Typ(3)	Max(2)	Units
Input offset voltage	V_{OS}	LMV611 (single)			1	4	mV
		LMV612 (dual) and LMV614 (quad)			1	5.5	mV
Input offset voltage average drift	TCV_{OS}				5.5		μV/°C
Input bias current	I_B				15		nA
Input offset current	I_{OS}				13		nA
Supply current (per channel)	I_S				103	185	μA
Common-mode rejection ratio	CMRR	LMV611, 0V≤V_{CM}≤0.6 V, 1.4V≤V_{CM}≤1.8V (4)		60	78		dB
		LMV612 and LMV614 0V≤V_{CM}≤0.6 V, 1.4V≤V_{CM}≤1.8V (4)		55	76		
		-0.2V≤V_{CM}≤0V, 1.8V≤V_{CM}≤2V		50	72		
Power supply rejection ratio	PSSR	1.8V≤V+≤5V			100		
Input common-mode voltage	CMVR	For CMRR range ≥50dB	V-, T_A=25°C	V^--0.2	-0.2		V
			V+, T_A=25°C		2.1	V^++0.2	
			T_A=-40°C to 85°C	V-		V+	
			T_A=125°C	V^-+0.2		V^+-0.2	
Large signal voltage gain LMV611 (single)	A_V	R_L=600Ω to 0.9V, V_O=0.2V to 1.6V, V_{CM}=0.5V		77	101		dB
		R_L=2kΩ to 0.9V, V_O=0.2V to 1.6V, V_{CM}=0.5V		80	105		
Large signal voltage gain LMV612 (dual) and LMV614 (quad)		R_L=600Ω to 0.9V, V_O=0.2V to 1.6V, V_{CM}=0.5V		75	90		
		R_L=2kΩ to 0.9V, V_O=0.2V to 1.6V, V_{CM}=0.5V		78	100		

Parameter	Symbol	Conditions	Min(2)	Typ(3)	Max(2)	Units
Output swing	V_O	R_L=600Ω to 0.9V	1.65	1.72		V
		V_{IN}=±100mV		0.077	0.105	V
		R_L=2kΩ to 0.9V	1.75	1.77		V
		V_{IN}=±100mV		0.024	0.035	V
Output short-circuit current (5)	I_O	Sourcing, V_O=0V V_{IN}=100mV		8		mA
		Sourcing, V_O=1.8V V_{IN}=-100mV		9		mA

Notes:

(1) Electrical characteristics values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device such that TJ = TA. No assurance of parametric performance is indicated in the electrical tables under conditions of internal self-heating where TJ > TA. See Application and Implementation for information of temperature derating of the device. Absolute Maximum Ratings indicated junction temperature limits beyond which the device may be permanently degraded, either mechanically or electrically.

(2) All limits are specified by testing or statistical analysis.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may varyover time and also depends on the application and configuration. The typical values are not tested and are not ensured on shipped production material.

(4) For specified temperature ranges, see Input common mode voltage specifications.

(5) Applies to both single-supply and split-supply operation. Continuous short circuit operation at elevated ambient temperature can result in exceeding the maximum allowed junction temperature of 150°C. Output currents in excess of 45 mA over long term may adversely affect reliability

9.2 Electrical Characteristics – 1.8V(AC)

All limits ensured for T_J=25°C, V+=1.8V, V-=0V, V_{CM}=V+/2, V_O=V+/2, and R_L>1MΩ (unless otherwise noted).(1)

Parameter	Symbol	Conditions	Min(2)	Typ(3)	Max(2)	Units
Slew rate (4)	SR			0.35		V/μs
Gain-bandwidth product	GBW			1.4		MHz
Phase margin	Φ_m			67		°C
Gain margin	G_m			7		dB
Input-referred voltage noise	e_n	f=10kHz, V_{CM}=0.5V		60		nV/√Hz
Input-referred current noise	i_n	f=10kHz		0.08		pA/√Hz
Total harmonic distortion	THD	f=1kHz, A_V=+1, R_L=600Ω, VIN=1V_{PP}		0.023		%
Amp-to-amp isolation (5)				123		dB

Notes:

(1) Electrical characteristics values apply only for factory testing conditions at the temperature indicated. Factory testing conditi-ons result in very limited self-heating of the device such that T_J=T_A. No assurance of parametric performance is indicated in the electrical tables under conditions of internal self-heating where T_J>T_A. See Application and Implementation for information of temperature derating of the device. Absolute Maximum Ratings indicated junction temperature limits beyond which the device may be permanently degraded, either mechanically or electrically.

(2) All limits are specified by testing or statistical analysis.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and also depends on the application and configuration. The typical values are not tested and are not ensured on shipped mproduction material.

(4) Connected as voltage follower with input step from V- to V+. Number specified is the slower of the positive and negative slew rates.

(5) Input-referred, R_L=100kΩ connected to V+/ 2. Each amp excited in turn with 1 kHz to produce V_O=3V_{PP} (for supply voltages <3V, V_O=V+).

9.3 Electrical Characteristics – 2.7V(DC)

All limits ensured for T_J=25°C, V+=2.7V, V-=0V, V_{CM}=V+/2, V_O=V+/2, and R_L>1MΩ (unless otherwise noted).(1)

Parameter	Symbol	Conditions	Min(2)	Typ(3)	Max(2)	Units
Input offset voltage	V_{OS}	LMV611 (single)		1	4	mV
		LMV612 (dual) and LMV614 (quad)		1	5.5	mV
Input offset voltage average drift	TCV_{OS}			5.5		μV/°C
Input bias current	I_B			15		nA
Input offset current	I_{OS}			8		nA
Supply current (per channel)	I_S			105	190	μA
Common-mode rejection ratio	CMRR	LMV611, 0V≤V_{CM}≤1.5V, 2.3V≤V_{CM}≤2.7V (4)	60	81		dB
		LMV612 and LMV614 0V≤V_{CM}≤1.5V, 2.3V≤V_{CM}≤2.7V (4)	55	80		
		-0.2V≤V_{CM}≤0V, 2.7V≤V_{CM}≤2.9V	50	74		
Power supply rejection ratio	PSSR	1.8V≤V+≤5V, V_{CM}=0.5V		100		

Notes:

(1) Electrical characteristics values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device such that T_J=T_A. No assurance of parametric performance is indicated in the electrical tables under conditions of internal self-heating where T_J>T_A. See Application and Implementation for information of temperature derating of the device. Absolute Maximum Ratings indicated junction temperature limits beyond which the device may be permanently degraded, either mechanically or electrically.

(2) All limits are specified by testing or statistical analysis.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and also depends on the application and configuration. The typical values are not tested and are not ensured on shipped production material.

(4) For specified temperature ranges, see input common mode voltage specifications.

9.4 Electrical Characteristics – 2.7V(DC)

All limits ensured for T_J=25°C, V+=2.7V, V-=0V, V_{CM}=V+/2, V_O=V+/2, and R_L>1MΩ (unless otherwise noted).(1)

Parameter	Symbol	Conditions		Min(2)	Typ(3)	Max(2)	Units
Input common-mode voltage	V_{CM}	For CMRR range ≥50dB	V-, T_A=25°C	V⁻-0.2	-0.2	V⁺+0.2	V
			V+, T_A=25°C		3	V+	V
			T_A=-40°C to 85°C	V-		V⁺-0.2	V
			T_A=125°C	V⁻+0.2			V
Large signal voltage gain LMV611 (single)	A_V	R_L=600Ω to 1.35V V_O=0.2V to 2.5V		87	104		dB
		R_L=2kΩ to 1.35V V_O=0.2V to 2.5V		92	110		
Large signal voltage gain LMV612 (dual) and LMV614 (quad)		R_L=600Ω to 1.35V V_O=0.2V to 2.5V		78	90		
		R_L=2kΩ to 1.35V V_O=0.2V to 2.5V		81	100		
Output swing	V_O	R_L=600Ω to 1.35V		2.55	2.62		V
		V_{IN}=±100mV			0.083	0.11	
		R_L=2kΩ to 1.35V		2.65	2.675		
		V_{IN}=±100mV			0.025	0.04	
Output short-circuit current (5)	I_O	Sourcing, V_O=0V V_{IN}=100mV			30		mA
		Sourcing, V_O=0V V_{IN}=-100mV			25		

Notes:

(5) Applies to both single-supply and split-supply operation. Continuous short circuit operation at elevated ambient temperature can result in exceeding the maximum allowed junction temperature of 150°C. Output currents in excess of 45 mA over long term may adversely affect reliability

9.5 Electrical Characteristics – 2.7V(AC)

All limits ensured for T_J=25°C, V+=2.7V, V-=0V, V_{CM}=1V, V_O=1.35V, and R_L>1MΩ (unless otherwise noted).(1)

Parameter	Symbol	Conditions	Min(2)	Typ(3)	Max(2)	Units
Slew rate (4)	SR			0.4		V/μs
Gain-bandwidth product	GBW			1.4		MHz
Phase margin	Φ_m			70		°C
Gain margin	G_m			7.5		dB
Input-referred voltage noise	e_n	f=10kHz, V_{CM}=0.5V		57		nV/√Hz
Input-referred current noise	i_n	f=10kHz		0.08		pA/√Hz
Total harmonic distortion	THD	f=1kHz, A_V=+1, R_L=600Ω, VIN=1V_{PP}		0.022		%
Amp-to-amp isolation (5)				123		dB

Notes:

(1) Electrical characteristics values apply only for factory testing conditions at the temperature indicated. Factory testing conditions result in very limited self-heating of the device such that T_J=T_A. No assurance of parametric performance is indicated in the electrical tables under conditions of internal self-heating where T_J>T_A. See Application and Implementation for information of temperature derating of the device. Absolute Maximum Ratings indicated junction temperature limits beyond which the device may be permanently degraded, either mechanically or electrically.

(2) All limits are specified by testing or statistical analysis.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and also depends on the application and configuration. The typical values are not tested and are not ensured on shipped mproduction material.

(4) Connected as voltage follower with input step from V- to V+. Number specified is the slower of the positive and negative slew rates.

(5) Input-referred, R_L=100kΩ connected to V+/ 2. Each amp excited in turn with 1 kHz to produce V_O=3V_{PP} (for supply voltages <3V, V_O=V+).

9.6 Electrical Characteristics – 5V(DC)

All limits ensured for T_J=25°C, V+=5V, V-=0V, V_{CM}=V+/2, V_O=V+/2, and R_L>1MΩ (unless otherwise noted).(1)

Parameter	Symbol	Conditions		Min(2)	Typ(3)	Max(2)	Units
Input offset voltage	V_{OS}	LMV611 (single)			1	4	mV
		LMV612 (dual) and LMV614 (quad)			1	5.5	mV
Input offset voltage average drift	TCV_{OS}				5.5		μV/°C
Input bias current	I_B				14	35	nA
Input offset current	I_{OS}				9		nA
Supply current (per channel)	I_S				116	210	μA
Common-mode rejection ratio	CMRR	0V≤V_{CM}≤3.8V, 4.6V≤V_{CM}≤5V (4)		60	86		dB
		-0.2V≤V_{CM}≤0V, 5V≤V_{CM}≤5.2V		50	78		
Power supply rejection ratio	PSSR	1.8V≤V+≤5V, V_{CM}≤0.5V			100		
Input common-mode voltage	CMVR	For CMRR range ≥50dB	V-, T_A=25°C	V-0.2	-0.2		V
			V+, T_A=25°C		5.3	V+0.2	
			T_A=-40°C to 85°C	V-		V+	
			T_A=125°C	V-+0.3		V+-0.3	
Large signal voltage gain LMV611 (single)	A_V	R_L=600Ω to 2.5V V_O=0.2V to 4.8V		88	102		dB
		R_L=2kΩ to 2.5V V_O=0.2V to 4.8V		94	113		
Large signal voltage gain LMV612 (dual) and LMV614 (quad)		R_L=600Ω to 2.5V V_O=0.2V to 4.8V		81	90		
		R_L=2kΩ to 2.5V V_O=0.2V to 4.8V		85	100		

Parameter	Symbol	Conditions	Min(2)	Typ(3)	Max(2)	Units
Output swing	V_O	R_L=600Ω to 2.5V	4.855	4.89		V
		V_{IN}=±100mV		0.12	0.16	V
		R_L=2kΩ to 2.5V	4.945	4.967		V
		V_{IN}=±100mV		0.037	0.065	V
Output short-circuit current (5)	I_O	LMV611, Sourcing, V_O=0V V_{IN}=100mV		100		mA
		Sinking, V_O=5V V_{IN}=-100mV		65		mA

Notes:

(1) Electrical characteristics values apply only for factory testing conditions at the temperature indicated. Factory testing conditi-ons result in very limited self-heating of the device such that TJ = TA. No assurance of parametric performance is indicated in the electrical tables under conditions of internal self-heating where TJ > TA. See Application and Implementation for information of temperature derating of the device. Absolute Maximum Ratings indicated junction temperature limits beyond which the device may be permanently degraded, either mechanically or electrically.

(2) All limits are specified by testing or statistical analysis.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may varyover time and also depends on the application and configuration. The typical values are not tested and are not ensured on shipped production material.

(4) For specified temperature ranges, see Input common mode voltage specifications.

(5) Applies to both single-supply and split-supply operation. Continuous short circuit operation at elevated ambient temperature can result in exceeding the maximum allowed junction temperature of 150°C. Output currents in excess of 45 mA over long term may adversely affect reliability

9.7 Electrical Characteristics – 5V(AC)

All limits ensured for T_J=25°C, V+=5V, V-=0V, V_{CM}=V+/ 2, V_O=2.5V, and R_L>1MΩ (unless otherwise noted).(1)

Parameter	Symbol	Conditions	Min(2)	Typ(3)	Max(2)	Units
Slew rate (4)	SR			0.42		V/μs
Gain-bandwidth product	GBW			1.5		MHz
Phase margin	Φ_m			71		°C
Gain margin	G_m			8		dB
Input-referred voltage noise	e_n	f=10kHz, V_{CM}=1V		50		nV/√Hz
Input-referred current noise	i_n	f=10kHz		0.08		pA/√Hz
Total harmonic distortion	THD	f=1kHz, A_V=+1, R_L=600Ω, V_O=1V_{PP}		0.022		%
Amp-to-amp isolation (5)				123		dB

Notes:

(1) Electrical characteristics values apply only for factory testing conditions at the temperature indicated. Factory testing conditi-ons result in very limited self-heating of the device such that T_J=T_A. No assurance of parametric performance is indicated in the electrical tables under conditions of internal self-heating where T_J>T_A. See Application and Implementation for information of temperature derating of the device. Absolute Maximum Ratings indicated junction temperature limits beyond which the device may be permanently degraded, either mechanically or electrically.

(2) All limits are specified by testing or statistical analysis.

(3) Typical values represent the most likely parametric norm as determined at the time of characterization. Actual typical values may vary over time and also depends on the application and configuration. The typical values are not tested and are not ensured on shipped mproduction material.

(4) Connected as voltage follower with input step from V- to V+. Number specified is the slower of the positive and negative slew rates.

(5) Input-referred, R_L=100kΩ connected to V+/ 2. Each amp excited in turn with 1 kHz to produce V_O=3V_{PP} (for supply voltages <3V, V_O=V+).

10.1 Typical characteristic

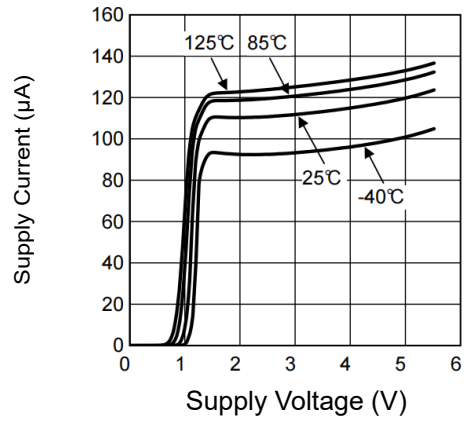


Figure 1: Supply Current vs Supply Voltage (LMV611)

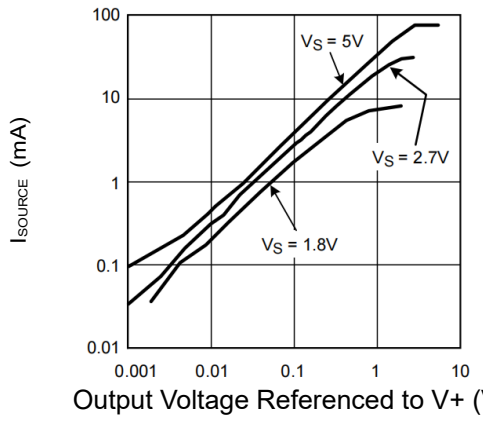


Figure 2: Sourcing Current vs Output Voltage

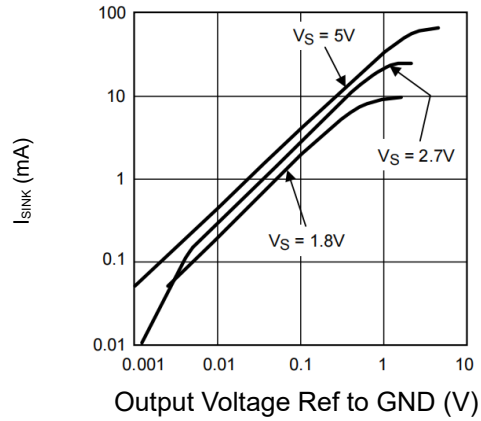


Figure 3: Sinking Current vs Output Voltage

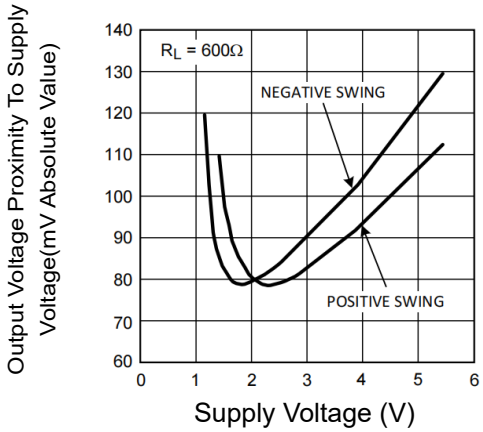


Figure 4: Output Voltage Swing vs Supply Voltage

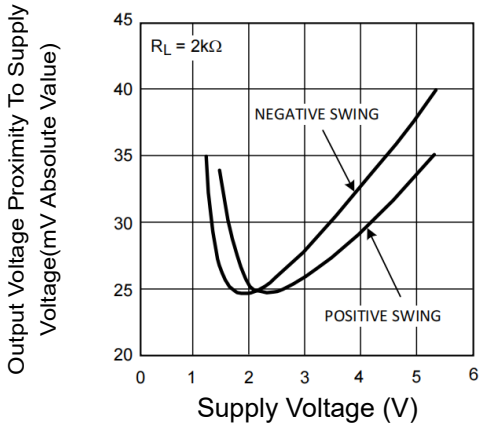


Figure 5: Output Voltage Swing vs Supply Voltage

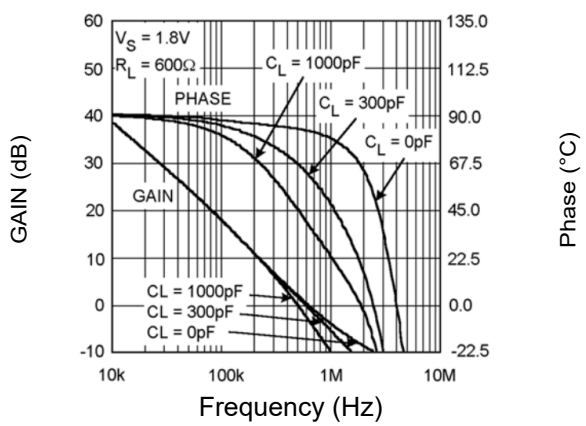


Figure 6: Gain and Phase vs Frequency

10.2 Typical characteristic

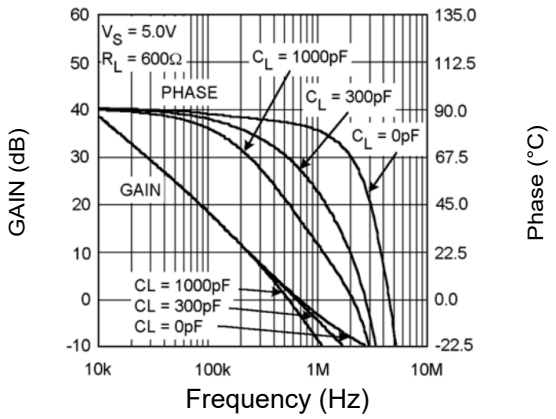


Figure 7: Gain and Phase vs Frequency

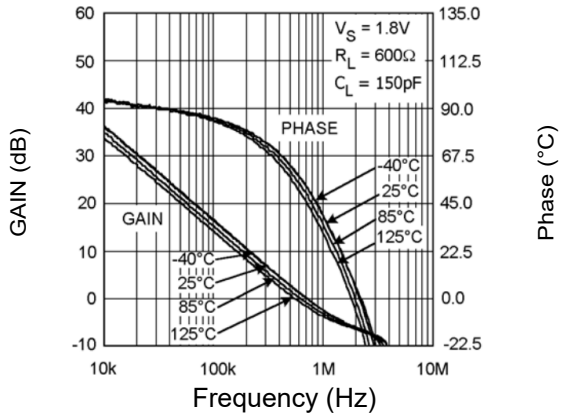


Figure 8: Gain and Phase vs Frequency

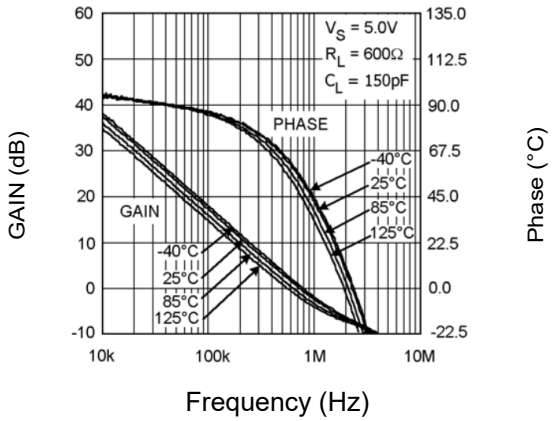


Figure 9: Gain and Phase vs Frequency

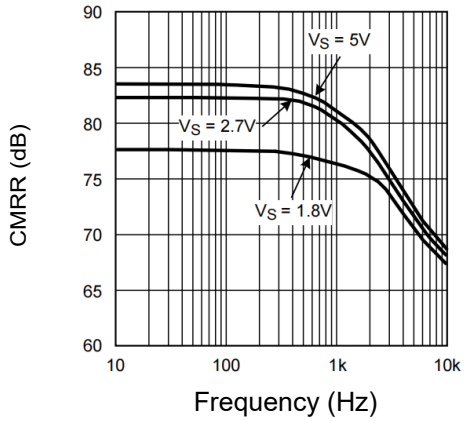


Figure 10: CMRR vs Frequency

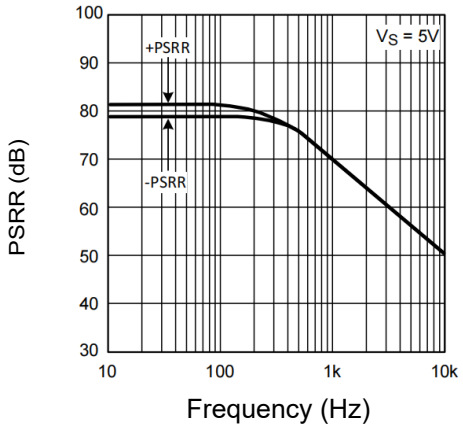


Figure 11: PSRR vs Frequency

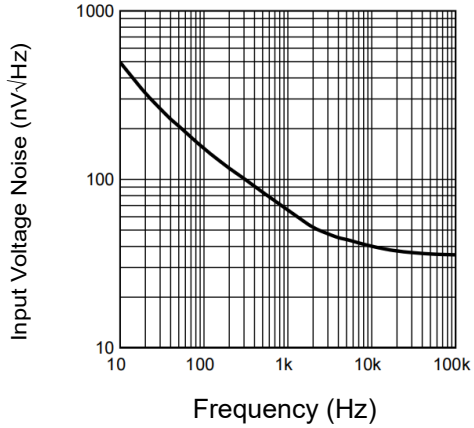


Figure 12: Input Voltage Noise vs Frequency

10.3 Typical characteristic

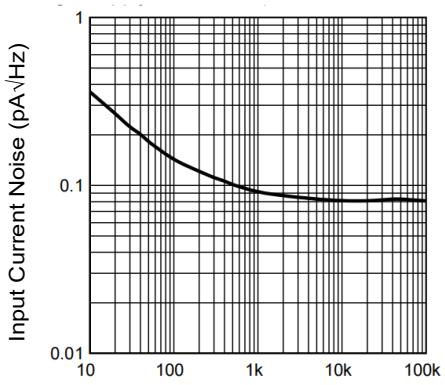


Figure 13: Input Current Noise vs Frequency

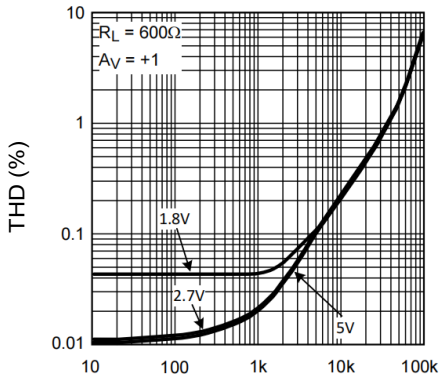


Figure 14: THD vs Frequency

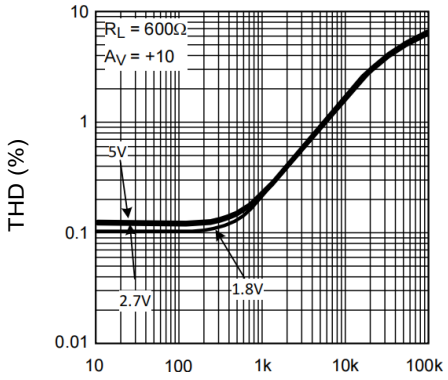


Figure 15: THD vs Frequency

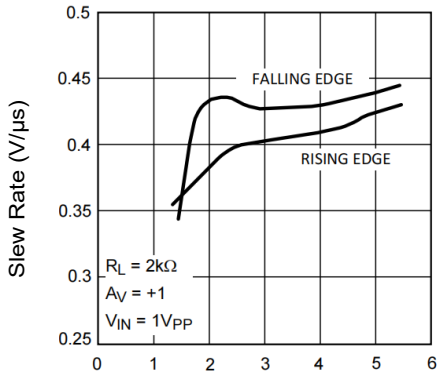


Figure 16: Slew Rate vs Supply Voltage

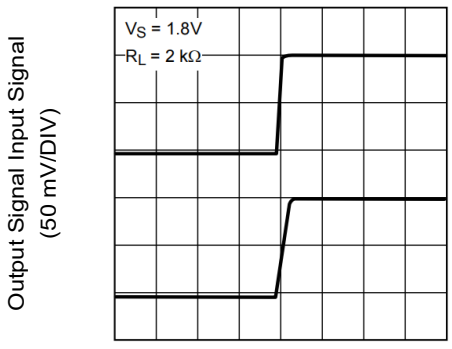


Figure 17: Small Signal Noninverting Response

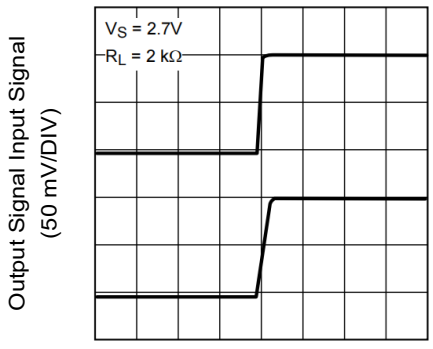


Figure 18: Small Signal Noninverting Response

10.4 Typical characteristic

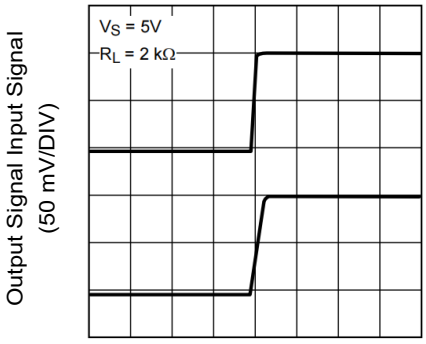


Figure 19: Small Signal Noninverting Response

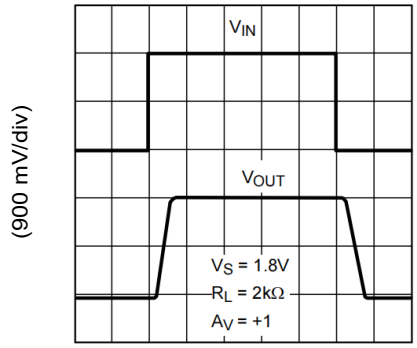


Figure 20: Large Signal Noninverting Response

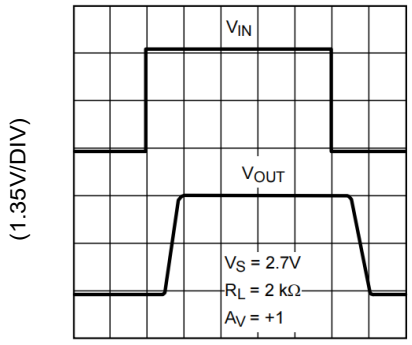


Figure 21: Large Signal Noninverting Response

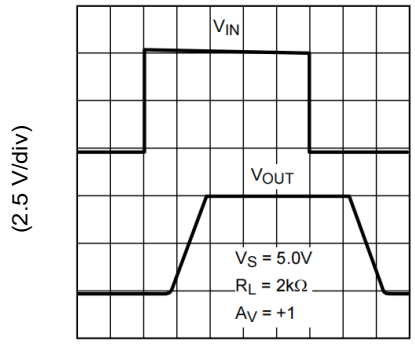


Figure 22: Large Signal Noninverting Response

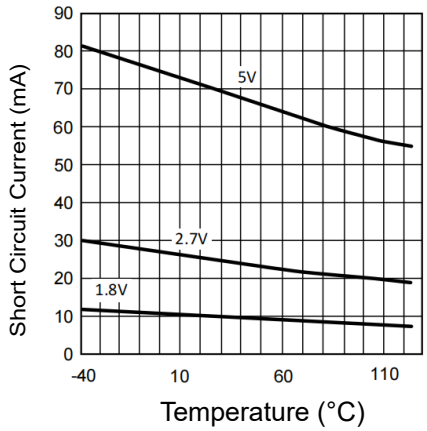


Figure 23: Short-Circuit Current vs Temperature (Sinking)

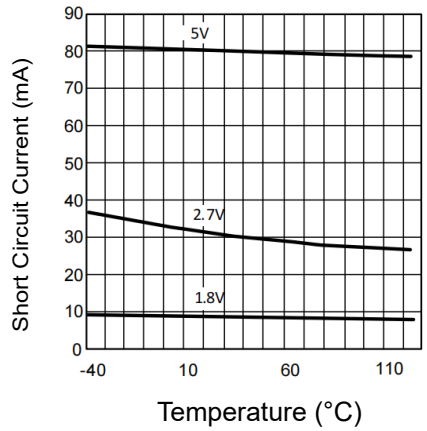


Figure 24: Short-Circuit Current vs Temperature (Sourcing)

10.5 Typical characteristic

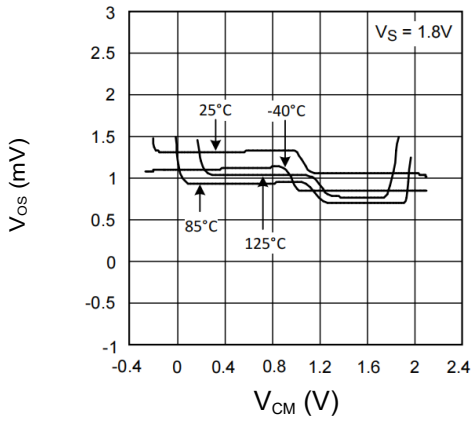


Figure 25: Offset Voltage vs Common-Mode Range

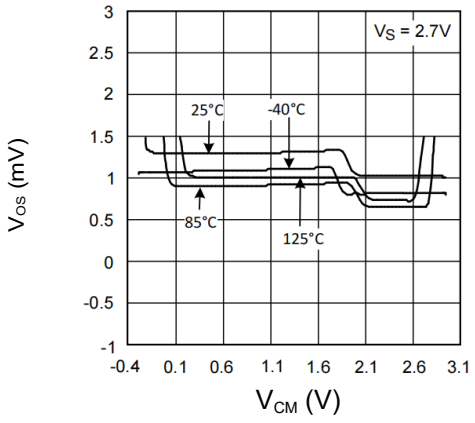


Figure 26: Offset Voltage vs Common-Mode Range

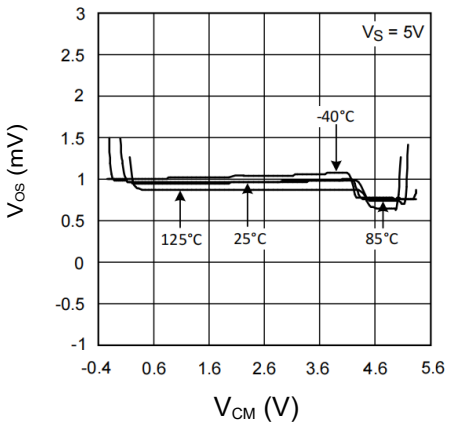
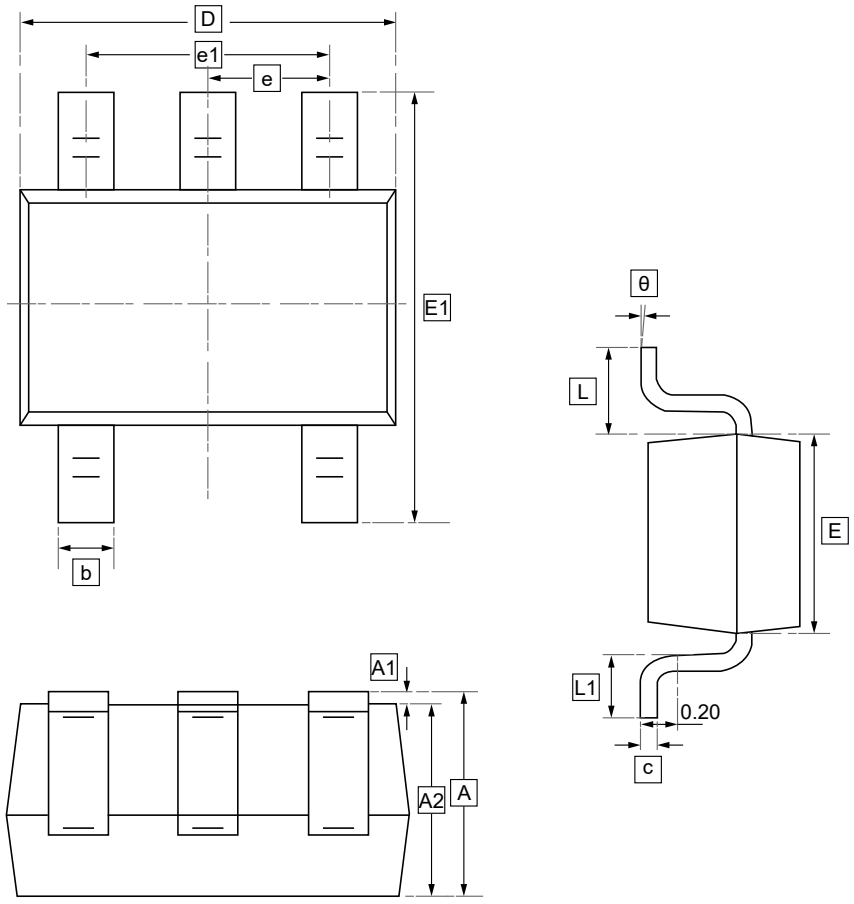


Figure 27: Offset Voltage vs Common-Mode Range

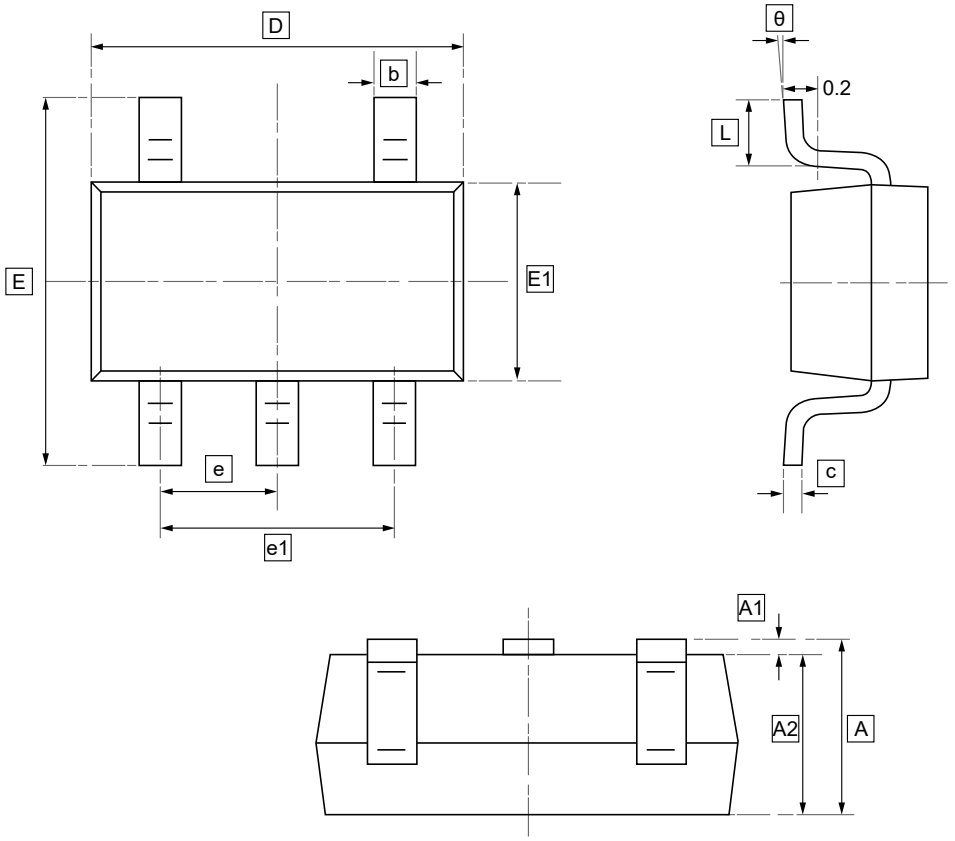
11.1 SC70-5 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E	E1	e	e1	L	θ
Min	0.90	0.00	0.90	0.15	0.08	1.80	1.15	2.15	0.65	1.20	0.26	7°
Max	1.10	0.10	1.00	0.35	0.15	2.25	1.35	2.45	TYP	1.40	0.46	REF.

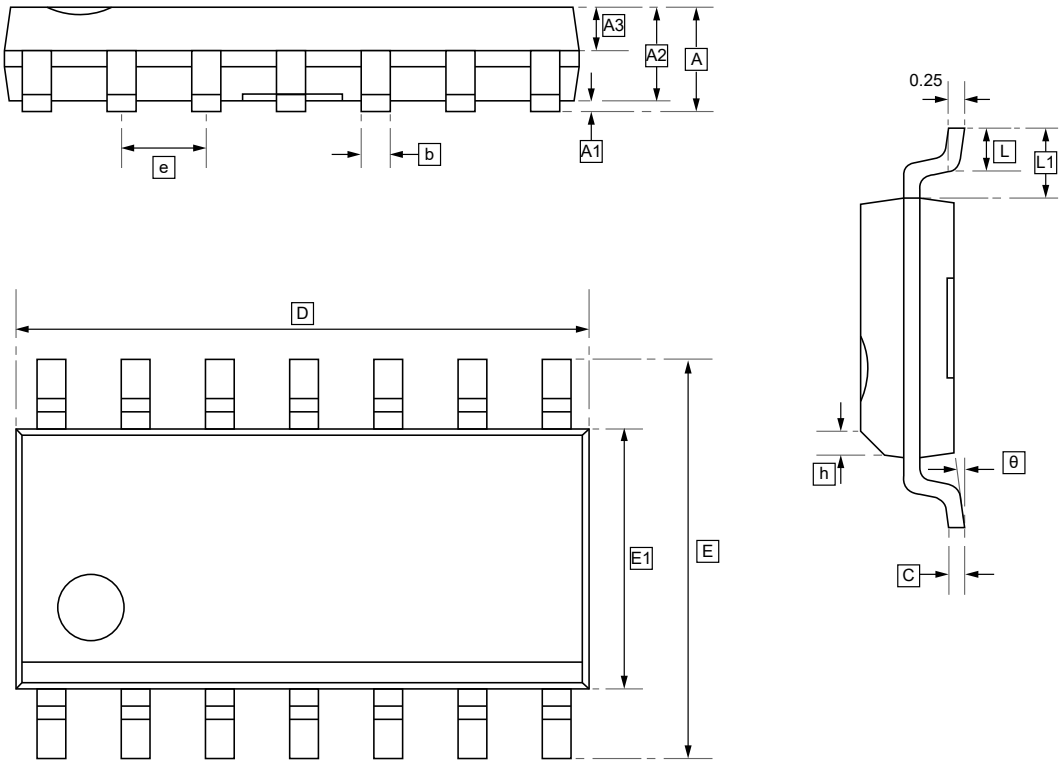
11.2 SOT23-5 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E1	E	e	e1	L	θ
Min	1.050	0.000	1.050	0.300	0.100	2.820	1.500	2.650	0.950	1.800	0.300	0°
Max	1.250	0.100	1.150	0.500	0.200	3.020	1.700	2.950	BSC	2.000	0.600	8°

11.3 SOP-14 Package Outline Dimensions

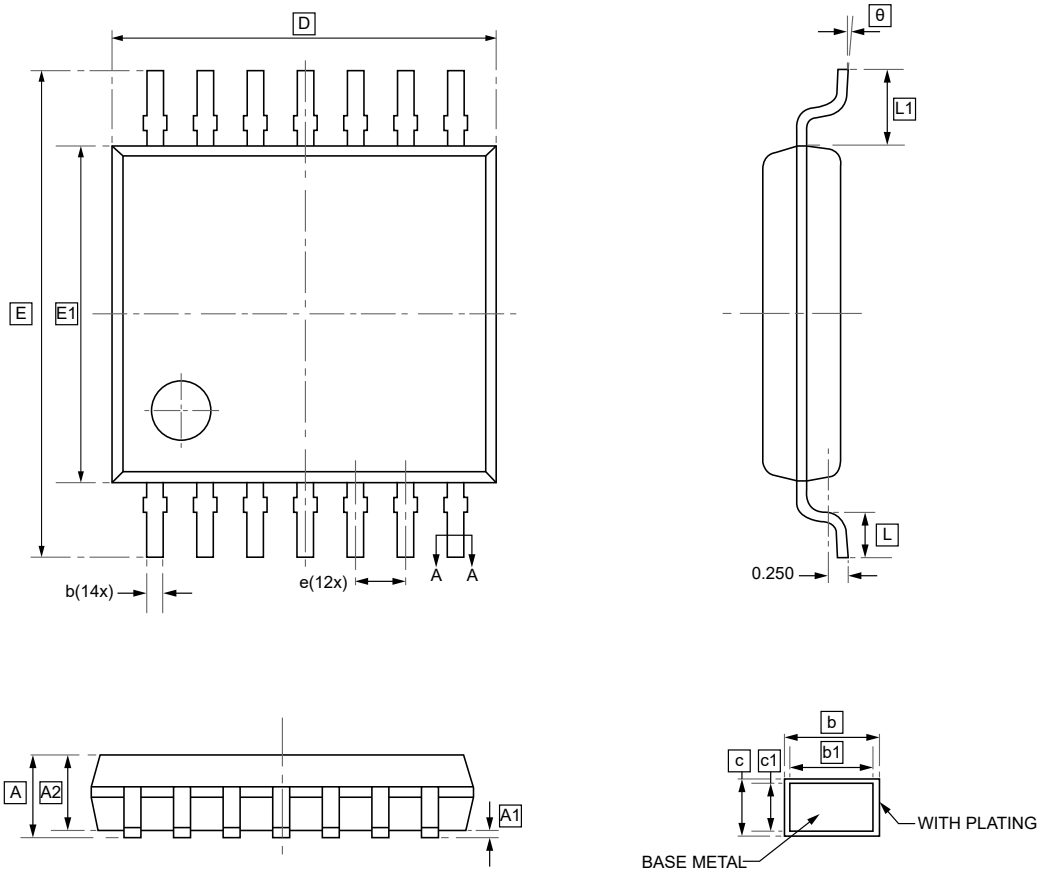


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	b	C	D	E	E1	e	h	L
Min	-	0.05	1.35	0.65	0.203	0.17	8.45	5.80	3.80	1.24	0.25	0.40
Max	1.75	0.25	1.55	0.75	0.305	0.25	8.85	6.20	4.00	1.30	0.50	0.80

Symbol	L1	θ
Min	1.00	0°
Max	1.10	8°

11.4 TSSOP-14 Package Outline Dimensions

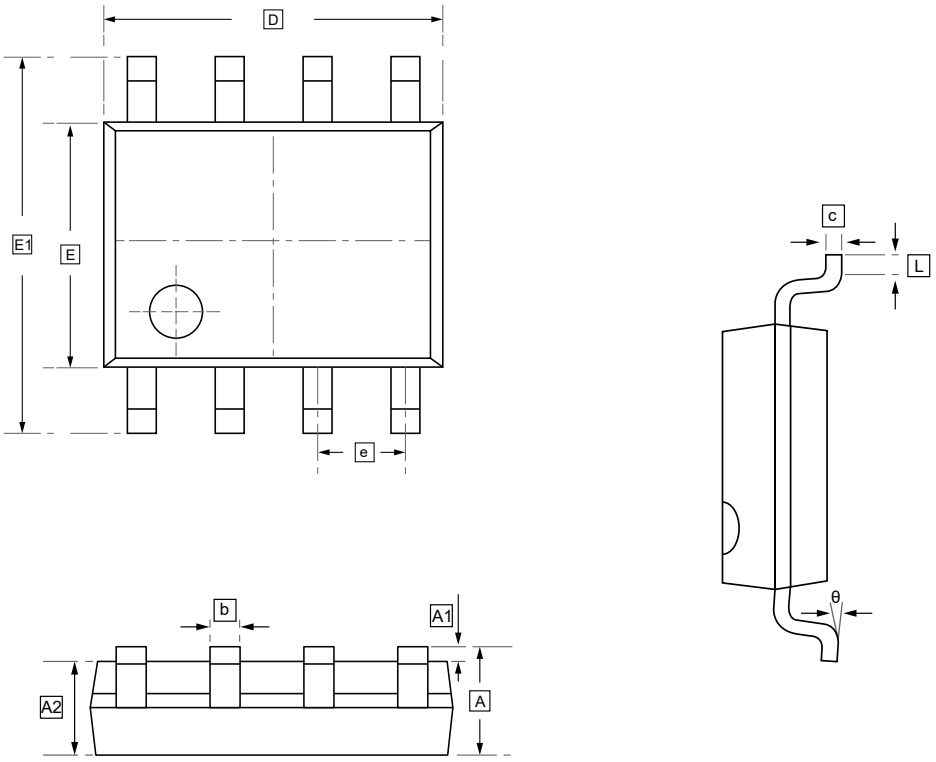


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	b1	c	c1	D	E	E1	e	L1
Min	-	0.05	0.90	0.20	0.19	0.13	0.120	4.90	6.20	4.30	0.65	0.85
Max	1.20	0.15	1.05	0.28	0.25	0.17	0.14	5.10	6.60	4.50	BSC	1.15

Symbol	L	θ
Min	0.45	0°
Max	0.75	8°

11.5 SOP-8 Package Outline Dimensions

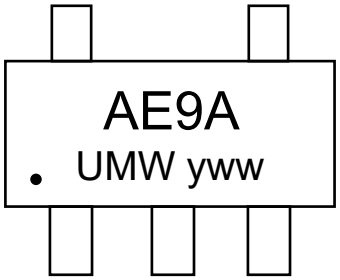


DIMENSIONS (mm are the original dimensions)

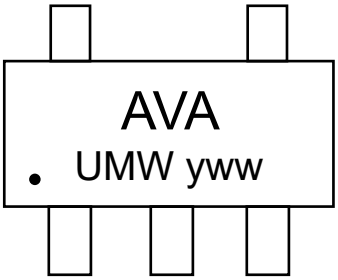
Symbol	A	A1	A2	b	c	D	E	E1	e	L	θ
Min	1.350	0.000	1.350	0.330	0.170	4.700	3.800	5.800	1.270	0.400	0°
Max	1.750	0.100	1.550	0.510	0.250	5.100	4.000	6.200	BSC	1.270	8°

12.Ordering information

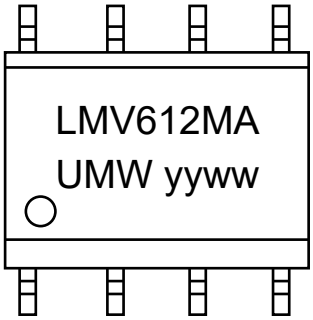
SOT23-5



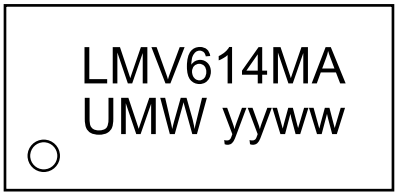
SC70-5



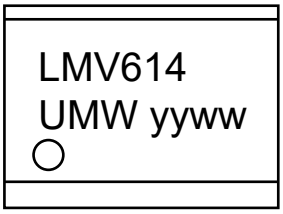
SOP-8



SOP-14



TSSOP-14



y: Year Code
yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW LMV611MF	AE9A	SOT23-5	3000	Tape and reel
UMW LMV611MG	AVA	SC70-5	3000	Tape and reel
UMW LMV612MAX	LMV612MA	SOP-8	2500	Tape and reel
UMW LMV614MAX	LMV614MA	SOP-14	2500	Tape and reel
UMW LMV614MTX	LMV614	TSSOP-14	4000	Tape and reel

13.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

When applying our products, please do not exceed the maximum rated values, as this may affect the reliability of the entire system. Under certain conditions, any semiconductor product may experience faults or failures. Buyers are responsible for adhering to safety standards and implementing safety measures during system design, prototyping, and manufacturing when using our products to prevent potential failure risks that could lead to personal injury or property damage.

Unless explicitly stated in writing, UMW products are not intended for use in medical, life-saving, or life-sustaining applications, nor for any other applications where product failure could result in personal injury or death. If customers use or sell the product for such applications without explicit authorization, they assume all associated risks.

When reselling, applying, or exporting, please comply with export control laws and regulations of China, the United States, the United Kingdom, the European Union, and other relevant countries, regions, and international organizations.

This document and any actions by UMW do not grant any intellectual property rights, whether express or implied, by estoppel or otherwise. The product names and marks mentioned herein may be trademarks of their respective owners.