

1. Description

The UMW TLV263x single supply operational amplifiers provide rail-to-rail output with an input range that includes ground. The UMW TLV263x takes the minimum operating supply voltage down to 2.7V over the extended industrial temperature range (–40°C to 125°C) while adding the rail-to-rail output swing feature.

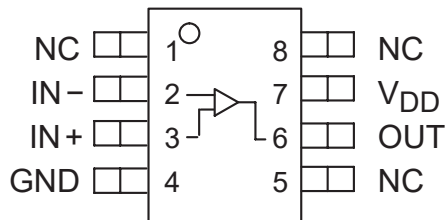
The UMW TLV263x also provides a 9 MHz gain-bandwidth product from only 730 μ A of supply current. The maximum recommended supply voltage is 5.5 V, which, when coupled with a 2.7-V minimum, allows the devices to be operated from lithium ion cells. The combination of wide bandwidth, low noise, and low distortion makes it ideal for high speed and high resolution data converter applications. The ground input range allows it to directly interface to ground rail referred systems.

2. Features

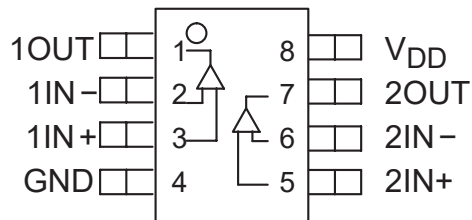
- Rail-To-Rail Output
- V_{ICR} Includes Ground
- Gain-Bandwidth Product . . . 9 MHz
- Supply Current . . . 730 μ A/Channel
- Single, Duals, and Quad Versions
- Ultralow Power Down Mode
 $I_{DD(SHDN)}=4\mu\text{A/Channel}$
- Specified Temperature Range
–40°C to 125°C . . . Industrial Grade
- Supply Voltage Range . . . 2.7 V to 5.5 V



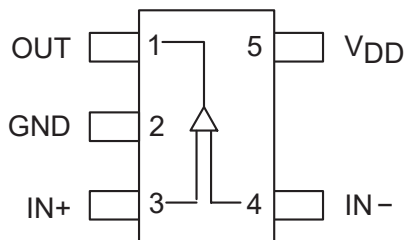
3. Pinning information



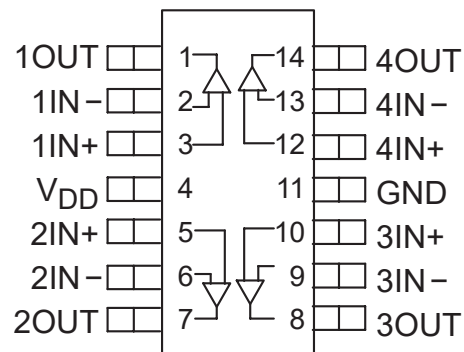
TLV2631
SOP-8



TLV2632
SOP-8



TLV2631
SOT23-5



TLV2634
TSSOP-14/SOP-14



4. Absolute Maximum Ratings

Parameter	Value
Supply voltage, V_{DD}	6V
Differential input voltage, V_{ID}	$\pm V_{DD}$
Input voltage range, V_I	GND to $V_{DD} - 1V$
Input current, I_I (any input)	$\pm 10mA$
Output current, I_O	$\pm 40mA$
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : I-suffix	$-40^{\circ}C$ to $125^{\circ}C$
Maximum junction temperature, T_J	$150^{\circ}C$
Storage temperature range, T_{STG}	$-65^{\circ}C$ to $150^{\circ}C$
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	$260^{\circ}C$

5. Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply voltage, V_{DD}	Single supply	2.7	5.5	V
	Split supply	± 1.35	± 2.75	V
Common-mode input voltage range, V_{ICR}		GND	$V_{DD} - 1$	V
Operating free-air temperature, T_A	I-suffix	-40	125	$^{\circ}C$
Relative to GND	V_{IL}		0.4	V
	V_{IH}	2		V



6. Electrical Characteristics ($V_{DD}=2.7V, 5V$)

Parameter	Symbol	Conditions		T _A	Min	Typ	Max	Units
dc performance								
Input offset voltage	V _{IO}	V _{IC} =V _{DD} /2 V=V/2		25°C		250	3500	μV
				Full range			4500	μV
			TLV2634	25°C		250	4200	μV
				Full range			5200	μV
Temperature coefficient of input offset voltage	αV _{IO}			25°C		3		μV/°C
Common-mode rejection ratio	CMRR	V _{IC} =GND to V _{DD} -1V	V _{DD} =2.7V	25°C	76	100		dB
				Full range	67			dB
			V _{DD} =5V	25°C	77	100		dB
				Full range	74			dB
Large-signal differential voltage amplification	A _{VD}	R _L =2kΩ V _{O(PP)} =V _{DD} -1V		25°C	90	100		dB
				Full range	82			dB
input characteristics								
Input offset current	I _{IO}	V _{IC} =V _{DD} /2		25°C		1	50	pA
				Full range			100	pA
Input bias current	I _{IB}	V _O =V _{DD} /2		25°C		1	50	pA
				Full range			200	pA
Differential input resistance				25°C		1000		GΩ
Common-mode input capacitance		f=1kHz		25°C		12		pF



Parameter	Symbol	Conditions	T_A	Min	Typ	Max	Units
Output characteristics							
High-level output voltage	V_{OH}	$V_{IC}=V_{DD}/2$ $I_{OH}=-1mA$	$V_{DD}=2.7V$	25°C	2.6	2.67	V
				Full range	2.55		V
			$V_{DD}=5V$	25°C	4.92	4.98	V
				Full range	4.9		V
		$V_{IC}=V_{DD}/2$ $I_{OH}=-10mA$	$V_{DD}=2.7V$	25°C	2.25	2.43	V
				Full range	2.15		V
			$V_{DD}=5V$	25°C	4.7	4.8	V
				Full range	4.65		V
Low-level output voltage	V_{OL}	$V_{IC}=V_{DD}/2$ $I_{OH}=1mA$	$V_{DD}=2.7V$	25°C		0.03	0.1 mV
				Full range		0.15	mV
			$V_{DD}=5V$	25°C		0.025	0.08 mV
				Full range		0.1	mV
		$V_{IC}=V_{DD}/2$ $I_{OH}=10mA$	$V_{DD}=2.7V$	25°C		0.26	0.45 mV
				Full range		0.47	mV
			$V_{DD}=5V$	25°C		0.2	0.3 mV
				Full range		0.35	mV
Output current	I_O	$V_{DD}=2.7V$	Sourcing	25°C		14	mA
		$V_O=0.5V$ from rail	Sinking			19	mA
		$V_{DD}=5V$	Sourcing			28	mA
		$V_O=0.5V$ from rail	Sinking			28	mA
Short-circuit output current	I_{OS}	Sourcing	$V_{DD}=2.7V$	25°C		50	mA
			$V_{DD}=5V$			95	mA
		Sinking	$V_{DD}=2.7V$			50	mA
			$V_{DD}=5V$			95	mA



Parameter	Symbol	Conditions		T _A	Min	Typ	Max	Units
Power supply								
Supply current (per channel)	I _{DD}	V _O =V _{DD} /2	SHDN=V _{DD}	25°C		730	1000	μA
				Full range			1350	μA
Supply voltage rejection ratio (ΔV _{DD} /ΔV _{IO})	PSRR	V _{DD} =2.7V to 5.5V V _{IC} =V _{DD} /2	No load	25°C	70	90		dB
				Full range	65			dB
Dynamic performance								
Gain-bandwidth product	GBWP	R _L =2kΩ, C _L =10pF, f=10kHz				9		MHz
Positive slew rate at unity gain	SR+	R _L =2kΩ, C _L =50pF	V _{DD} =2.7V V _{O(PP)} =1.7V	25°C		6		V/μs
			V _{DD} =5V V _{O(PP)} =3.5V			6		V/μs
Negative slew rate at unity gain	SR-	R _L =2kΩ, C _L =50pF	V _{DD} =2.7V V _{O(PP)} =1.7V			10		V/μs
			V _{DD} =5V V _{O(PP)} =3.5V			9.5		V/μs
Phase margin	φ _m	R _L =2kΩ, C _L =10pF				50		°
Gain margin						20		dB
Noise/distortion performance								
Total harmonic distortion plus noise	THD+N	V _{O(PP)} =V _{DD} /2 R _L =2kΩ, f=10kHz	A _V =1	25°C		0.003%		
			A _V =10			0.02%		
			A _V =100			0.095%		
Equivalent input noise voltage	V _n	f=1kHz				50		nV/√Hz
		f=10kHz				30		nV/√Hz
Equivalent input noise current	I _n	f=1kHz					0.9	



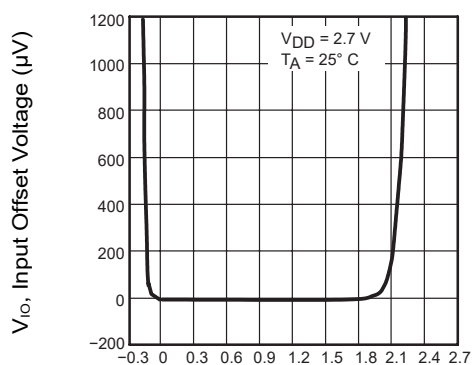
Parameter	Symbol	Conditions		T _A	Min	Typ	Max	Units
Shutdown characteristics								
Supply current, per channel in shutdown mode (TLV2630, TLV2633, TLV2635)	I _{DD(SHDN)}	SHDN=0.4V		25°C			17	μA
				Full range			19	μA
Amplifier turn on time‡		R _L =2kΩ C _L =10pF	V _{DD} =2.7V			4.5		μs
			V _{DD} =5V			1.5		μs
Amplifier turn off time‡						200		ns

† Full range is -40°C to 125°C for the I-suffix.

‡ Disable time and enable time are defined as the interval between application of the logic signal to SHDN and the point at which the supply current has reached half its final value.

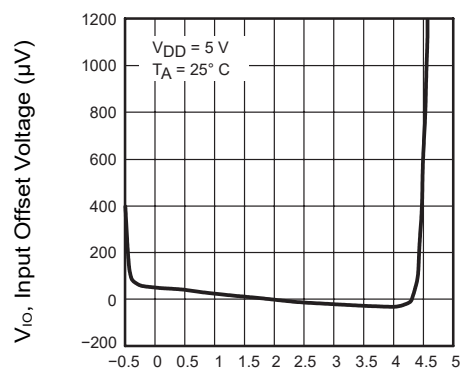


7.1 Typical Characteristic



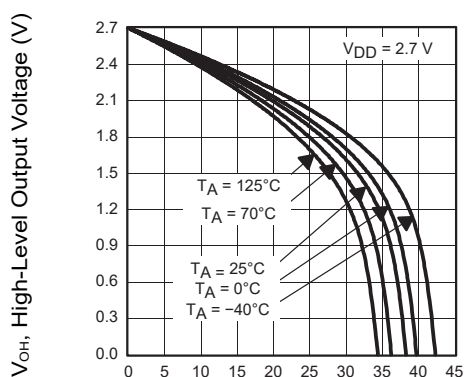
V_{ICR} , Common-Mode Input Voltage (V)

Figure 1: Input Offset Voltage vs Common-mode Input Voltage



V_{ICR} , Common-Mode Input Voltage (V)

Figure 2: Input Offset Voltage vs Common-mode Input Voltage



I_{OH} , High-Level Output Current (mA)

Figure 3: High-level Output Voltage vs High-level Output Current

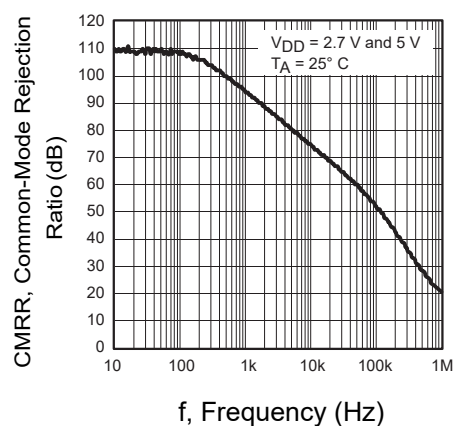
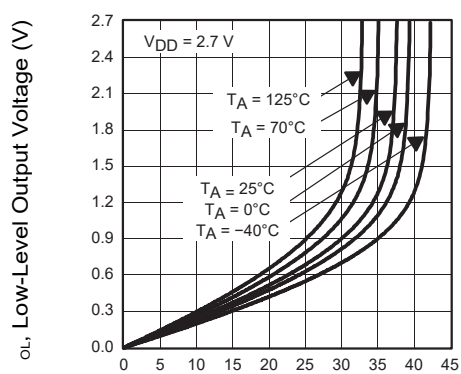
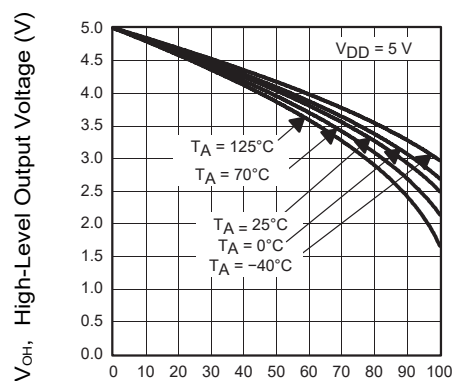


Figure 4: Common-mode Rejection Ratio vs Frequency



I_{OL} , Low-Level Output Current (mA)

Figure 5: Low-level Output Voltage vs Low-level Output Current



I_{OH} , High-Level Output Current (mA)

Figure 6: High-level Output Voltage vs High-level Output Current



7.2 Typical Characteristic

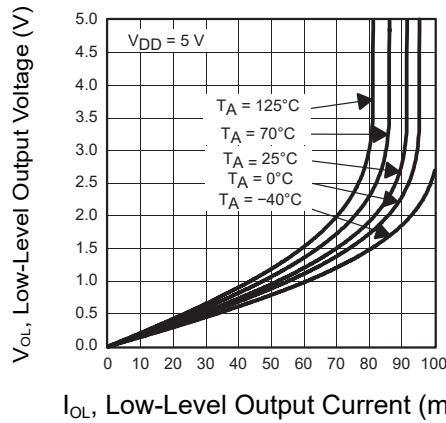


Figure 7: Low-level Output Voltage vs Low-level Output Current

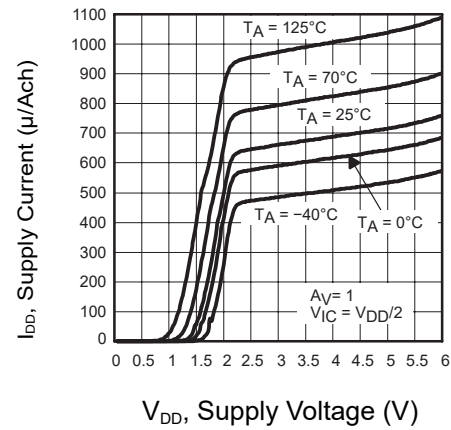


Figure 8: Supply Current vs Supply Voltage

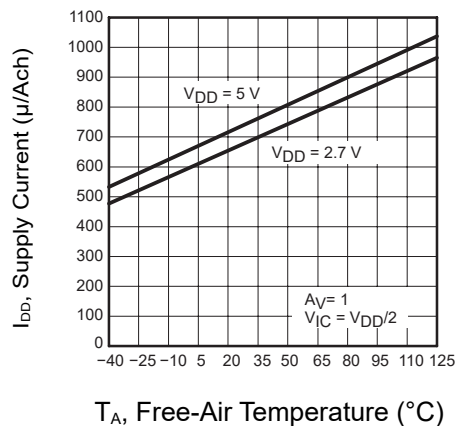


Figure 9: Supply Current vs Free-air Temperature

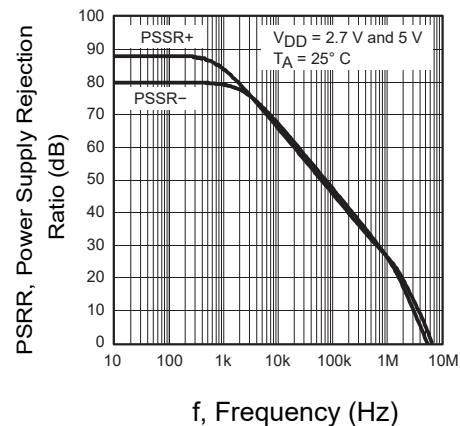


Figure 10: Power Supply Rejection Ratio vs Frequency

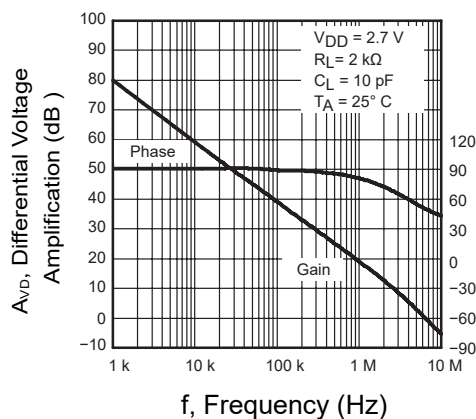


Figure 11: Differential Voltage Amplification And Phase vs Frequency

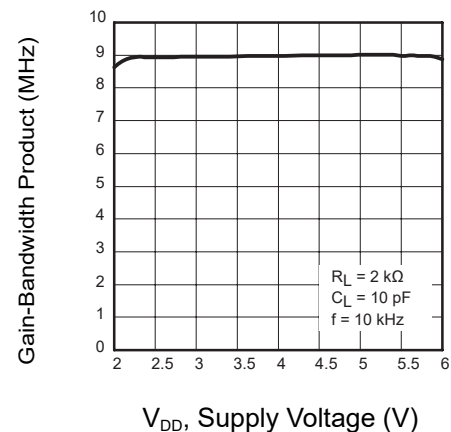
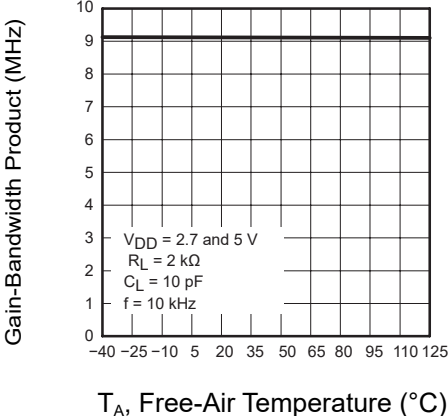
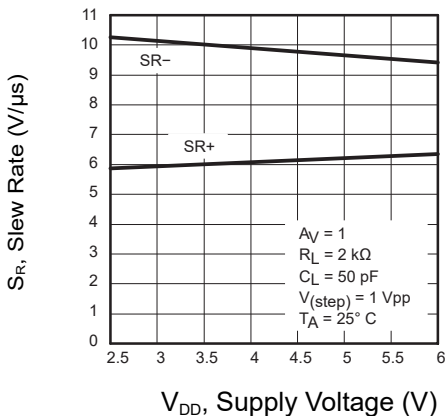
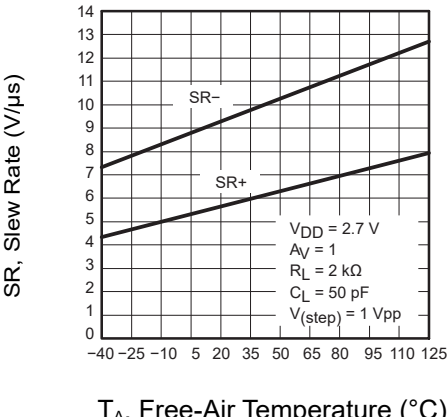
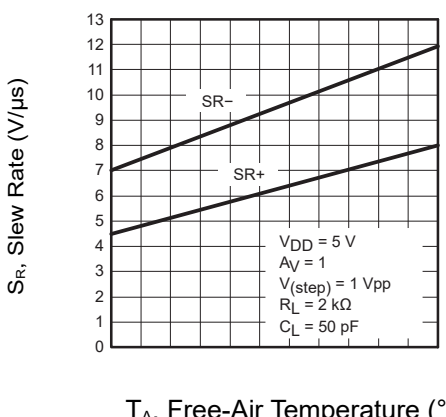
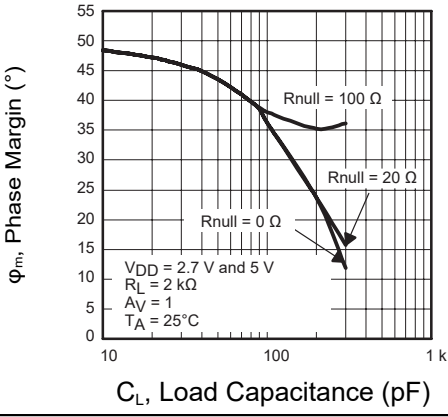
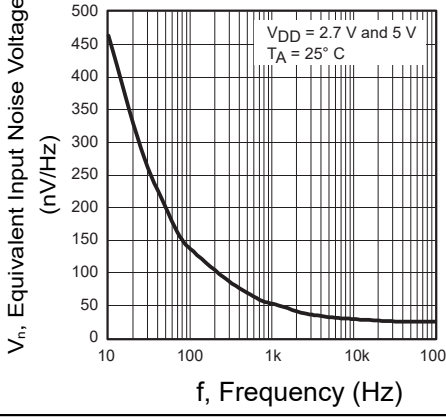


Figure 12: Gain-bandwidth Product vs Supply Voltage



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7.3 Typical Characteristic

 Gain-Bandwidth Product (MHz) T_A, Free-Air Temperature ($^{\circ}\text{C}$) Figure 13: Gain-bandwidth Product vs Free-air Temperature	 S_R, Slew Rate ($\text{V}/\mu\text{s}$) V_{DD}, Supply Voltage (V) Figure 14: Slew Rate vs Supply Voltage
 S_R, Slew Rate ($\text{V}/\mu\text{s}$) T_A, Free-Air Temperature ($^{\circ}\text{C}$) Figure 15: Slew Rate vs Free-air Temperature	 S_R, Slew Rate ($\text{V}/\mu\text{s}$) T_A, Free-Air Temperature ($^{\circ}\text{C}$) Figure 16: Slew Rate vs Free-air Temperature
 ϕ_m, Phase Margin ($^{\circ}$) C_L, Load Capacitance (pF) Figure 17: Phase Margin vs Load Capacitance	 V_n, Equivalent Input Noise Voltage (nV/Hz) f, Frequency (Hz) Figure 18: Equivalent Input Noise Voltage vs Frequency



7.4 Typical Characteristic

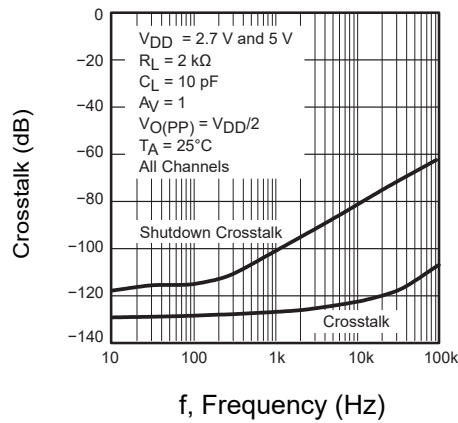


Figure 19: Crosstalk vs Frequency

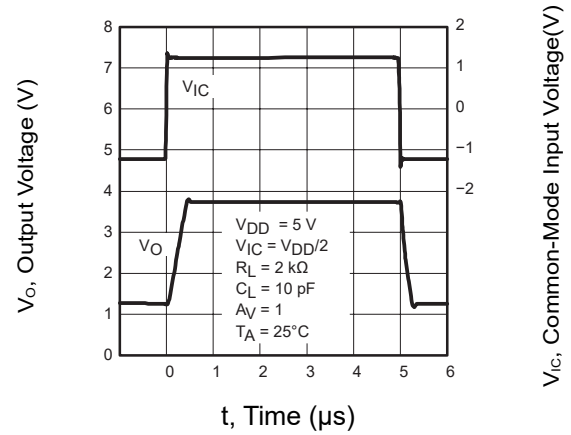
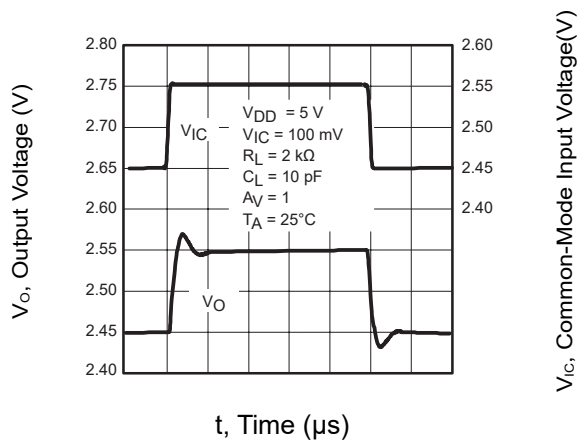
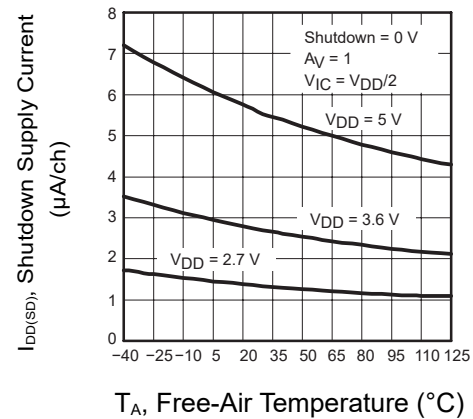
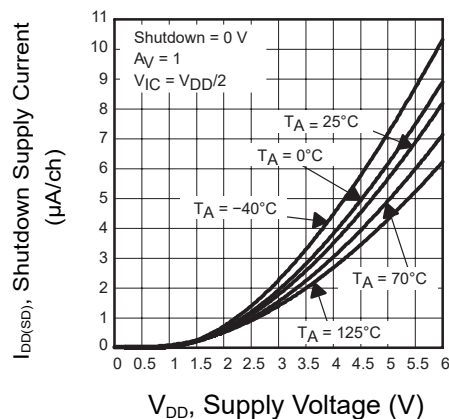
Figure 20: Voltage-follower Large-signal
Pulse ResponseFigure 21: Voltage-follower Small-signal
Pulse ResponseFigure 22: Shutdown Supply Current vs
Free-air Temperature

Figure 23: Shutdown Supply Current vs Supply Voltage



7.5 Typical Characteristic

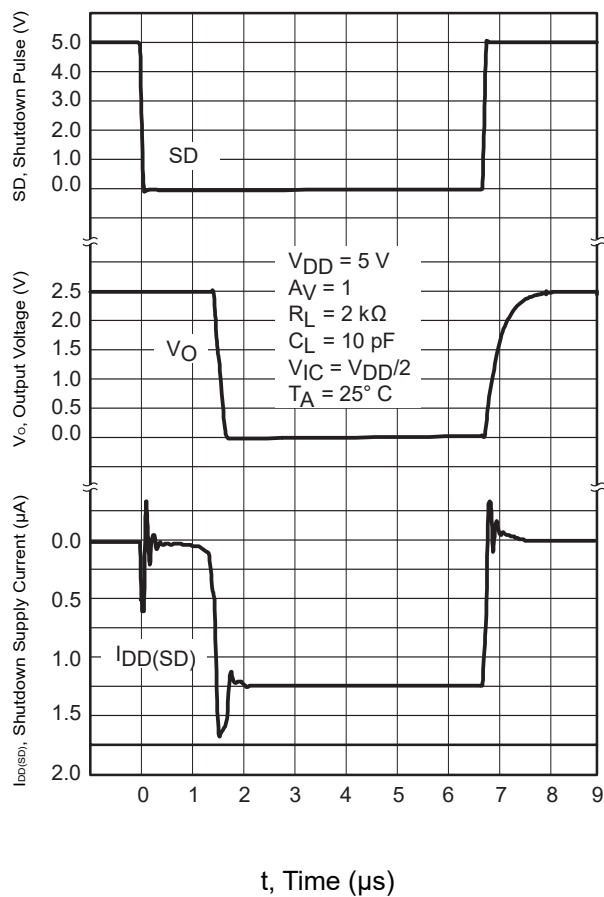
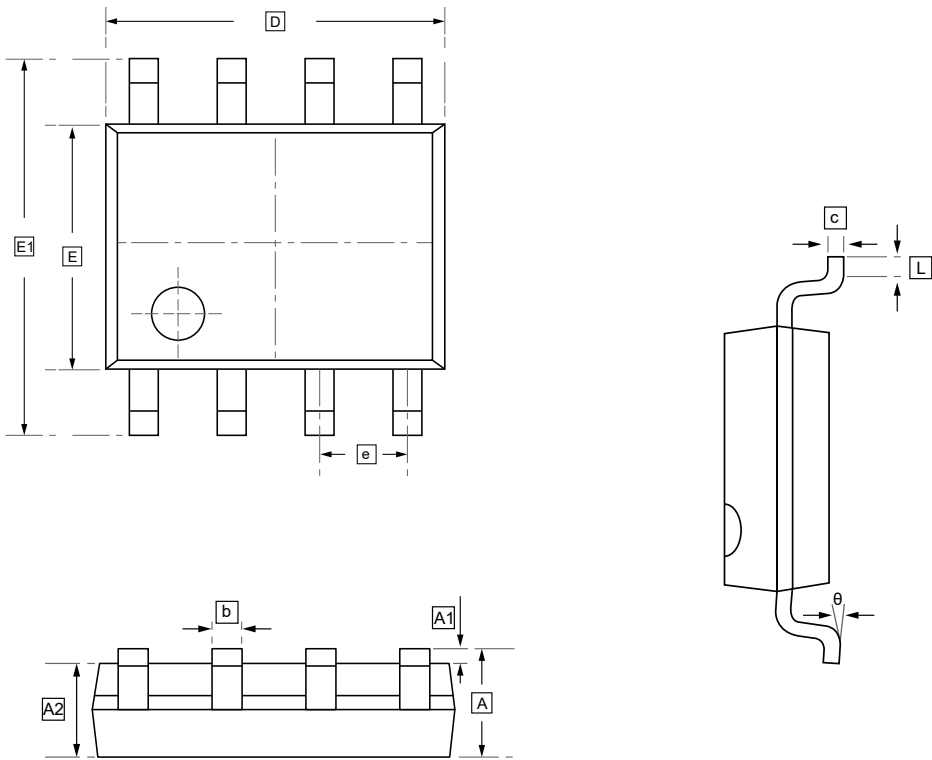


Figure 24: Shutdown Supply Current / Output Voltage vs Time



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8.1 SOP-8 Package Outline Dimensions



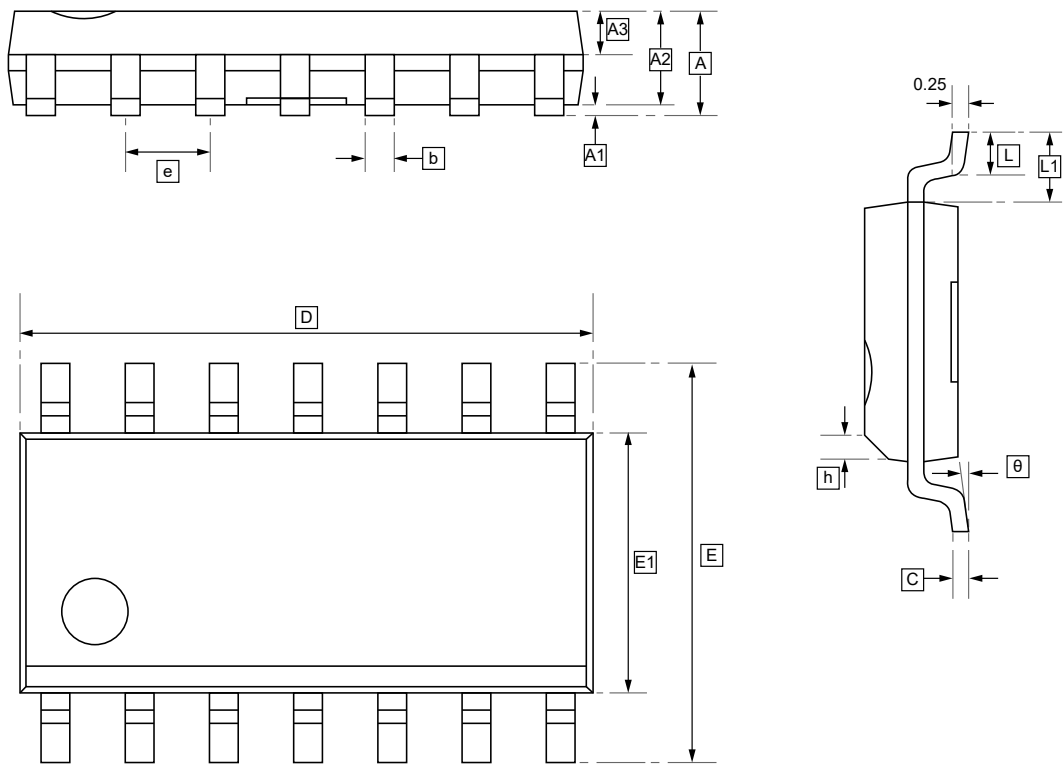
DIMENSIONS (mm are the original dimensions)

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°



Family of Low-power Wide Bandwidth Single
Supply Operational Amplifiers

8.2 SOP-14 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

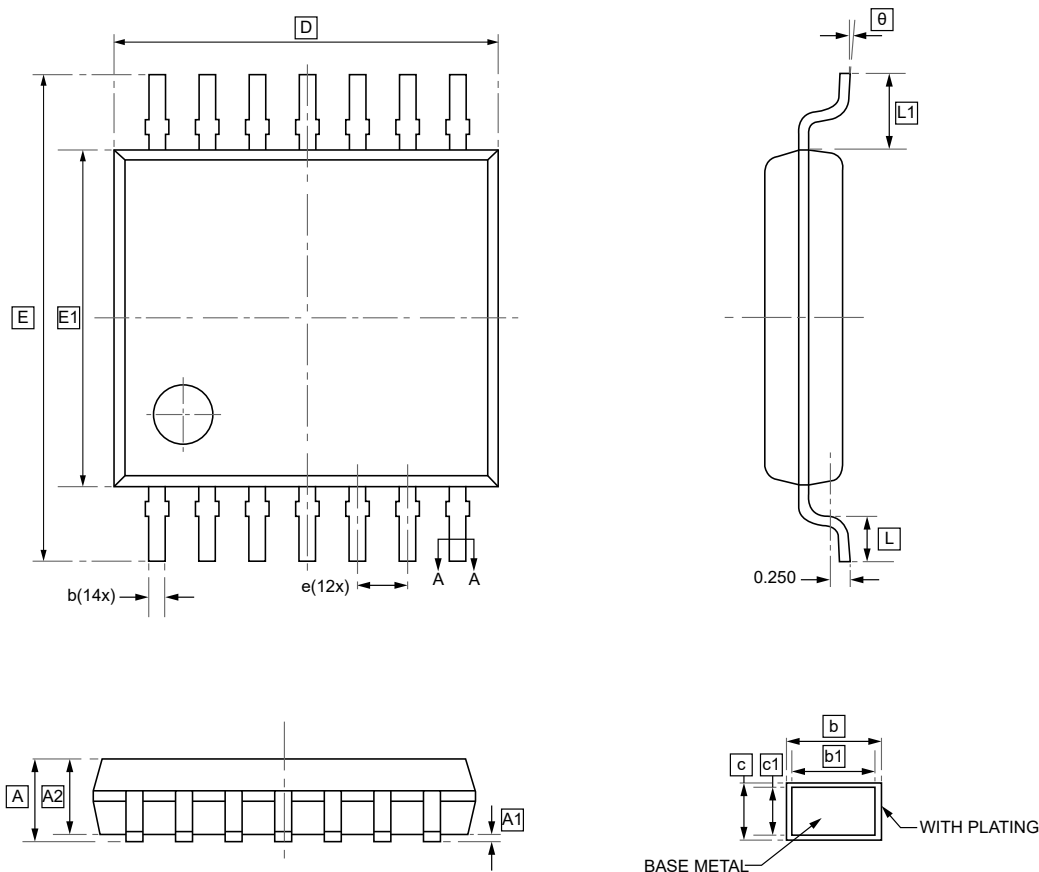
Symbol	A	A1	A2	A3	b	C	D	E	E1	e	h	L
Min	-	0.05	1.35	0.65	0.203	0.17	8.45	5.80	3.80	1.24	0.25	0.40
Max	1.75	0.25	1.55	0.75	0.305	0.25	8.85	6.20	4.00	1.30	0.50	0.80

Symbol	L1	θ
Min	1.00	0°
Max	1.10	8°



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8.3 TSSOP-14 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

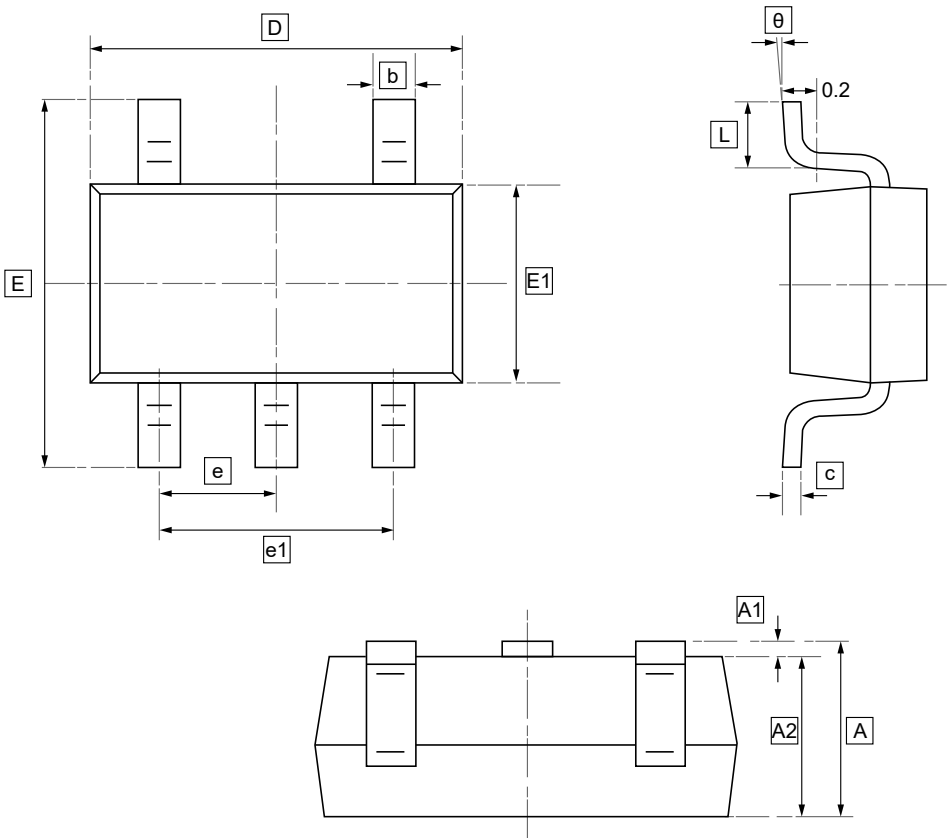
Symbol	A	A1	A2	b	b1	c	c1	D	E	E1	e	L1
Min	-	0.05	0.90	0.20	0.19	0.13	0.120	4.90	6.20	4.30	0.65	0.85
Max	1.20	0.15	1.05	0.28	0.25	0.17	0.14	5.10	6.60	4.50	BSC	1.15

Symbol	L	θ
Min	0.45	0°
Max	0.75	8°



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8.4 SOT-23-5 Package Outline Dimensions

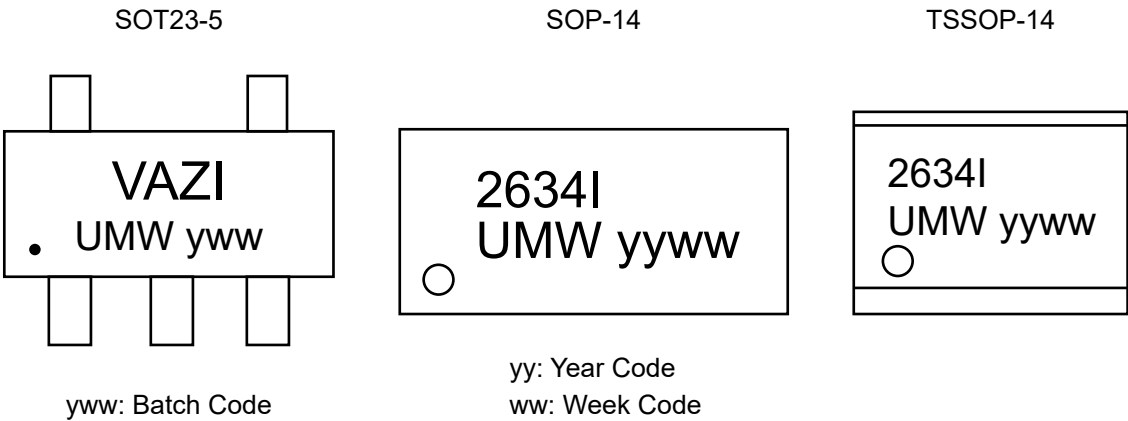


DIMENSIONS (mm are the original dimensions)

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°



9.Ordering information



Order Code	Marking	Package	Base QTY	Delivery Mode
UMW TLV2631IDBVT	VAZI	SOT23-5	3000	Tape and reel
UMW TLV2631IDBVR	VAZI	SOT23-5	3000	Tape and reel
UMW TLV2631ID	TLV2631	SOP-8	2500	Tape and reel
UMW TLV2632IDR	2632I	SOP-8	2500	Tape and reel
UMW TLV2634ID	2634I	SOP-14	2500	Tape and reel
UMW TLV2634IPW	2634I	TSSOP-14	4000	Tape and reel
UMW TLV2634IPWR	2634I	TSSOP-14	4000	Tape and reel



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