UMW TLV263x

Family of Low-power Wide Bandwidth Single Supply Operational Amplifiers

1.Description

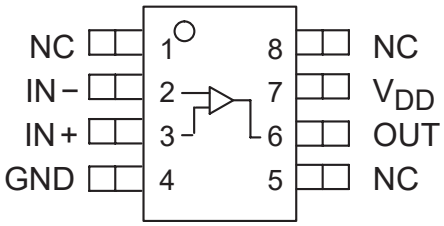
The UMW TLV263x single supply operational amplifiers provide rail-to-rail output with an input range that includes ground. The UMW TLV263x takes the minimum operating supply voltage down to 2.7V over the extended industrial temperature range (−40°C to 125°C) while adding the rail-to-rail output swing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

The UMW TLV263x also provides a 9 MHz gain-bandwidth product from only 730 μA 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.

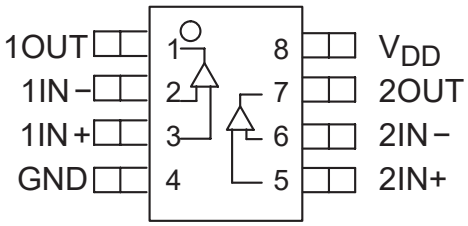
2.Features

- Rail-To-Rail Output
- V_{ICR} Includes Ground
- Gain-Bandwidth Product . . . 9 MHz
- Supply Current . . . 730μA/Channel
- Single, Duals, and Quad Versions
- Ultralow Power Down Mode
  $I_{DD(SHDN)}$=4μA/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



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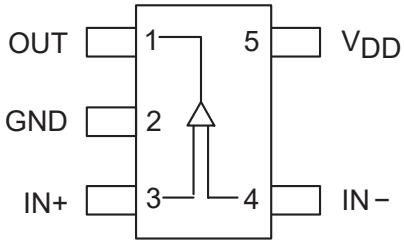
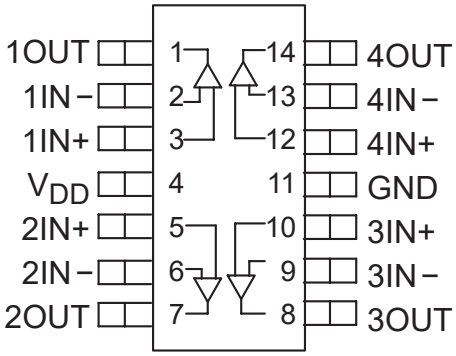
SOP-8



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)	±10mA
Output current, I_O	±40mA
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A: I-suffix	-40°C to 125°C
Maximum junction temperature, T_J	150°C
Storage temperature range, T_{STG}	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°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	°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}	$V_{IC}=V_{DD}/2$ $V_O=V_{DD}/2$		25°C		1	50	pA
				Full range			100	pA
Input bias current	I_{IB}			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 V_O=0.5V from rail	Sourcing	25°C		14		mA
			Sinking			19		mA
		V_{DD}=5V V_O=0.5V from rail	Sourcing			28		mA
			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 ($\Delta V_{DD}/\Delta V_{IO}$)	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	φm	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		fA/√Hz

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

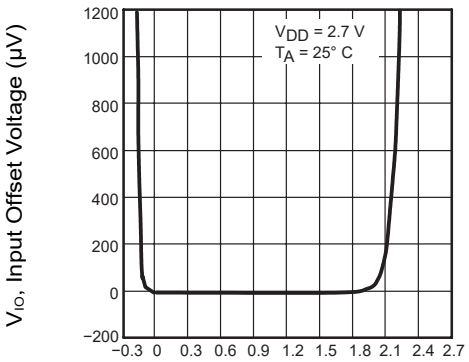


Figure 1: Input Offset Voltage vs Common-mode Input Voltage

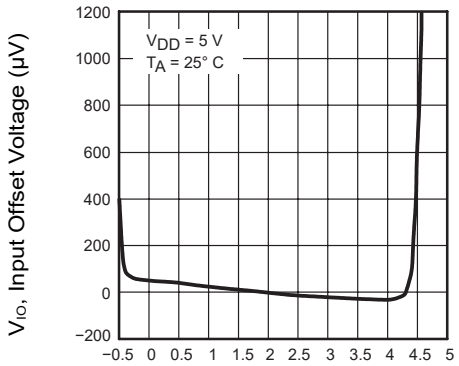


Figure 2: Input Offset Voltage vs Common-mode Input Voltage

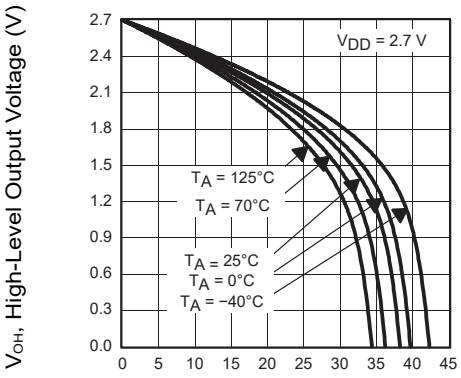


Figure 3: High-level Output Voltage vs High-level Output Current

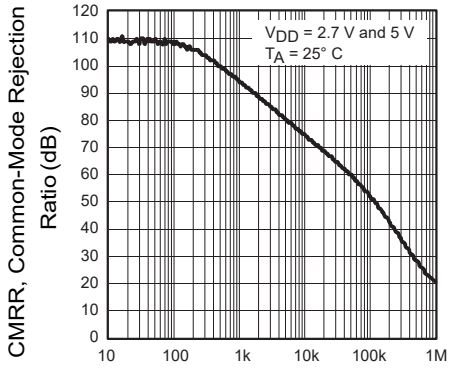


Figure 4: Common-mode Rejection Ratio vs Frequency

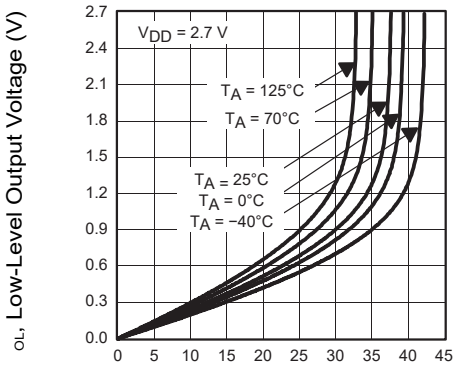


Figure 5: Low-level Output Voltage vs Low-level Output Current

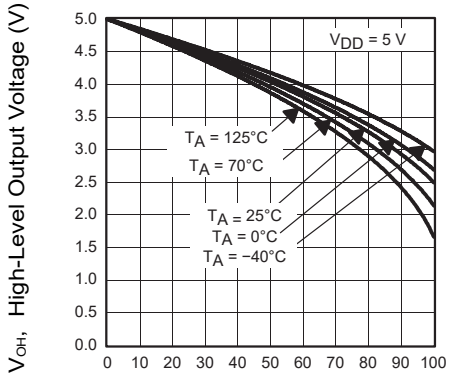
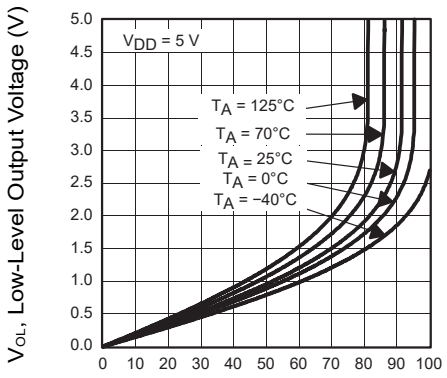


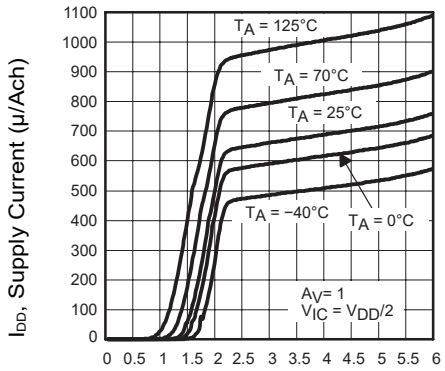
Figure 6: High-level Output Voltage vs High-level Output Current

7.2 Typical Characteristic



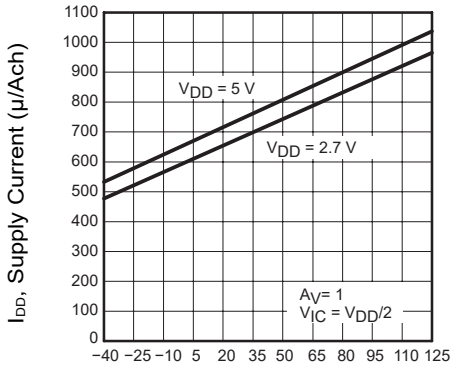
I_{OL}, Low-Level Output Current (mA)

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



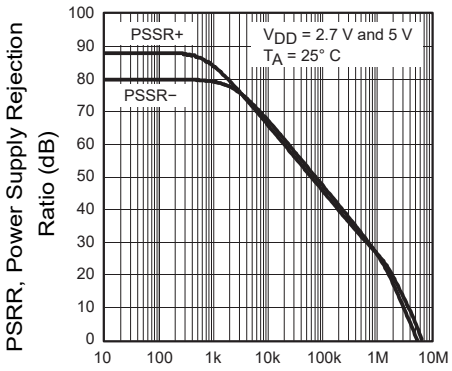
V_{DD}, Supply Voltage (V)

Figure 8: Supply Current vs Supply Voltage



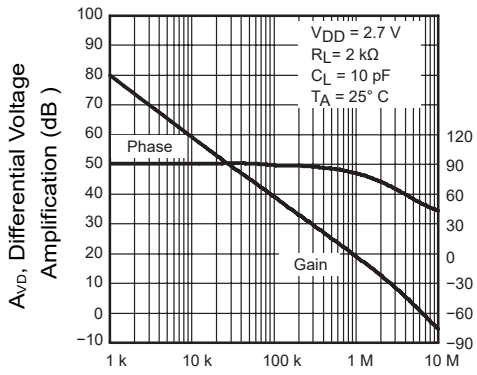
T_A, Free-Air Temperature (°C)

Figure 9: Supply Current vs Free-air Temperature



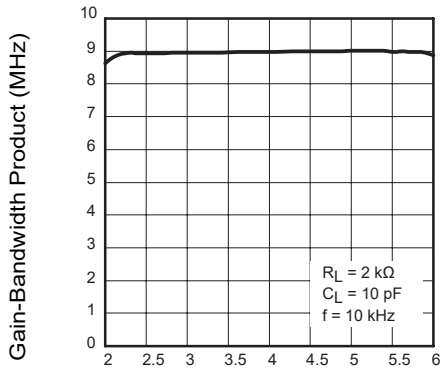
f, Frequency (Hz)

Figure 10: Power Supply Rejection Ratio vs Frequency



f, Frequency (Hz)

Figure 11: Differential Voltage Amplification And Phase vs Frequency



V_{DD}, Supply Voltage (V)

Figure 12: Gain-bandwidth Product vs Supply Voltage

7.3 Typical Characteristic

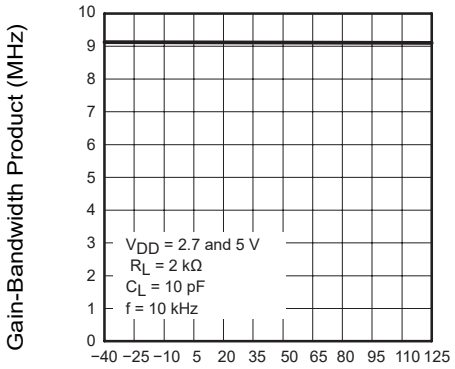


Figure 13: Gain-bandwidth Product vs Free-air Temperature

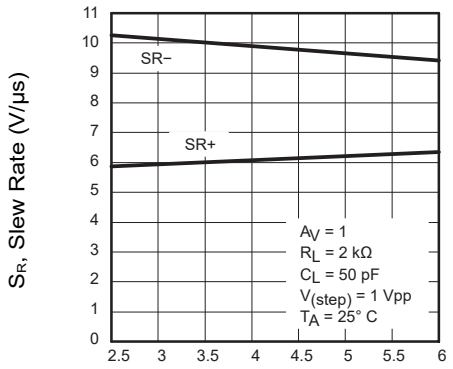


Figure 14: Slew Rate vs Supply Voltage

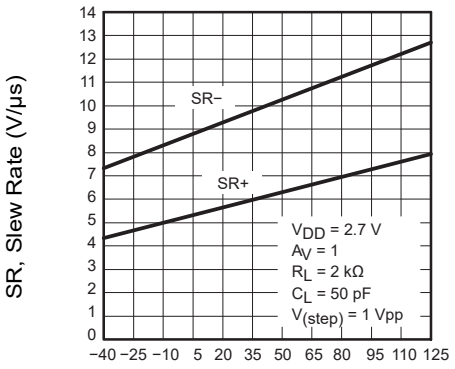


Figure 15: Slew Rate vs Free-air Temperature

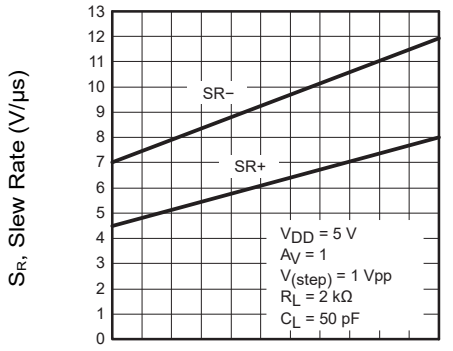


Figure 16: Slew Rate vs Free-air Temperature

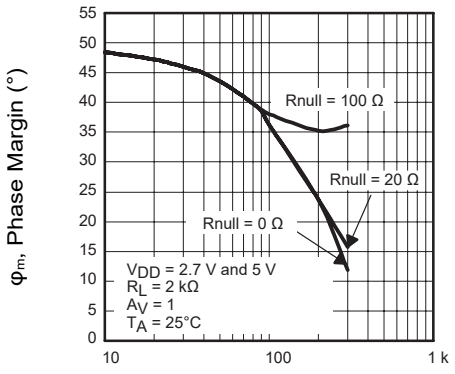


Figure 17: Phase Margin vs Load Capacitance

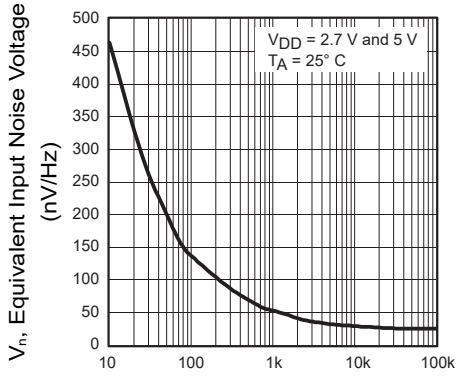


Figure 18: Equivalent Input Noise Voltage vs Frequency

7.4 Typical Characteristic

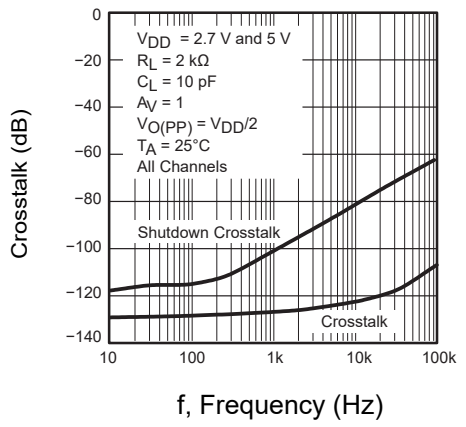


Figure 19: Crosstalk vs Frequency

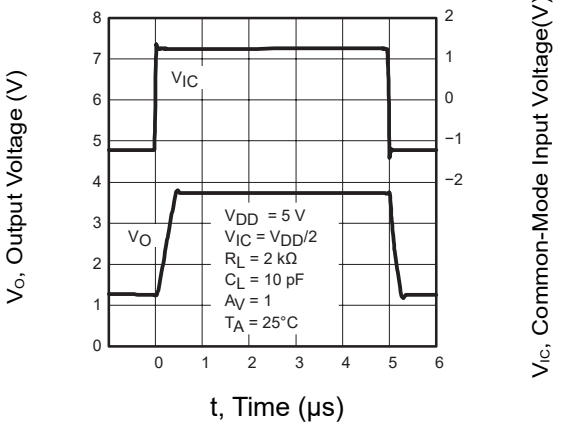


Figure 20: Voltage-follower Large-signal Pulse Response

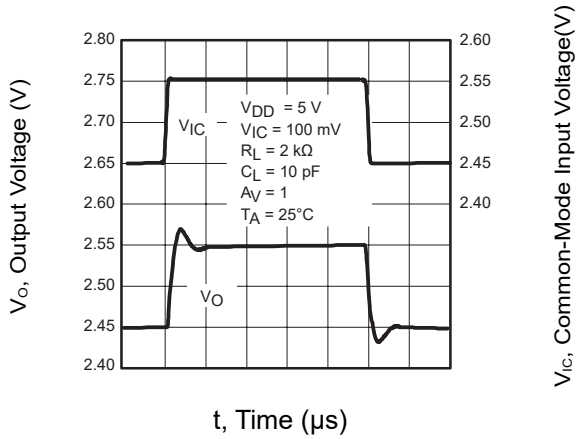


Figure 21: Voltage-follower Small-signal Pulse Response

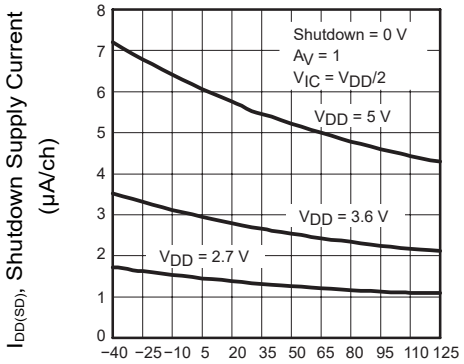


Figure 22: Shutdown Supply Current vs Free-air Temperature

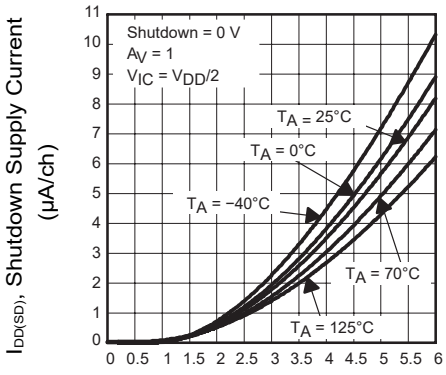


Figure 23: Vhutdown Supply Current vs Supply Voltage

7.5 Typical Characteristic

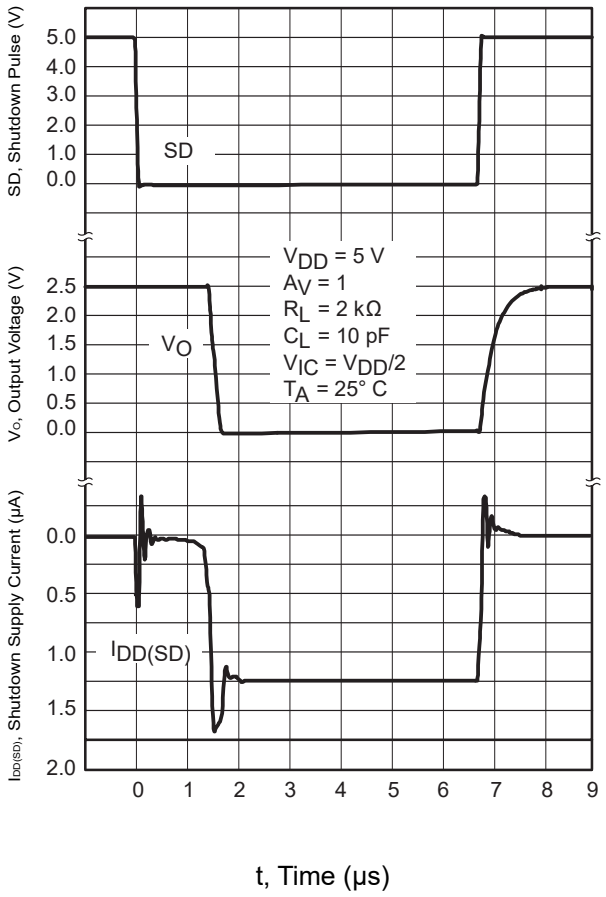
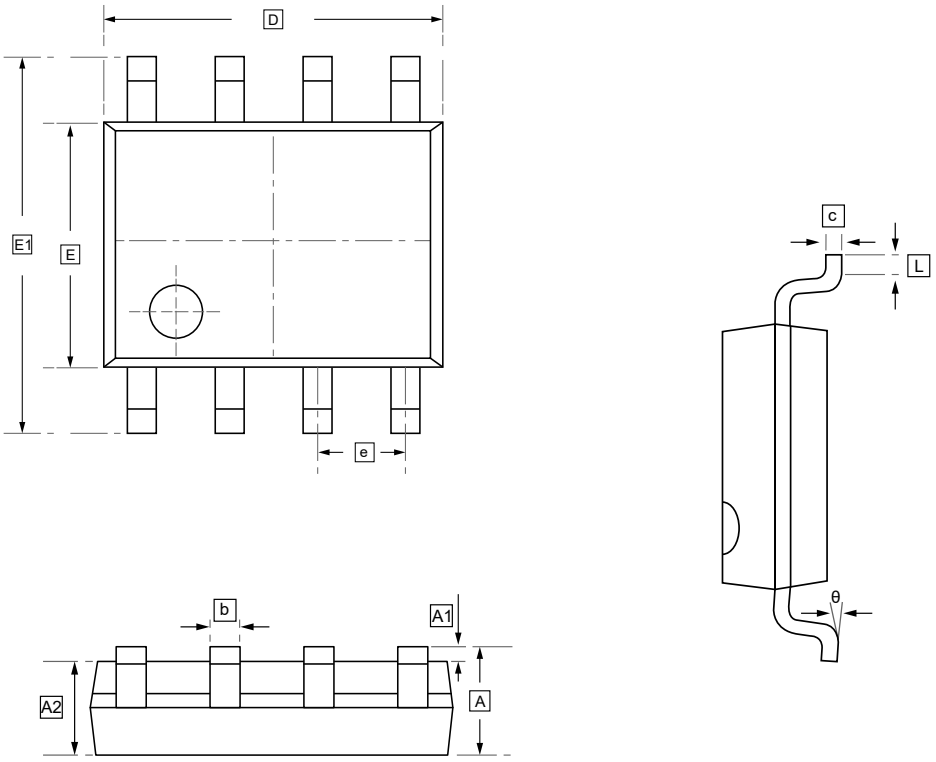


Figure 24: Shutdown Supply Current / Output Voltage vs Time

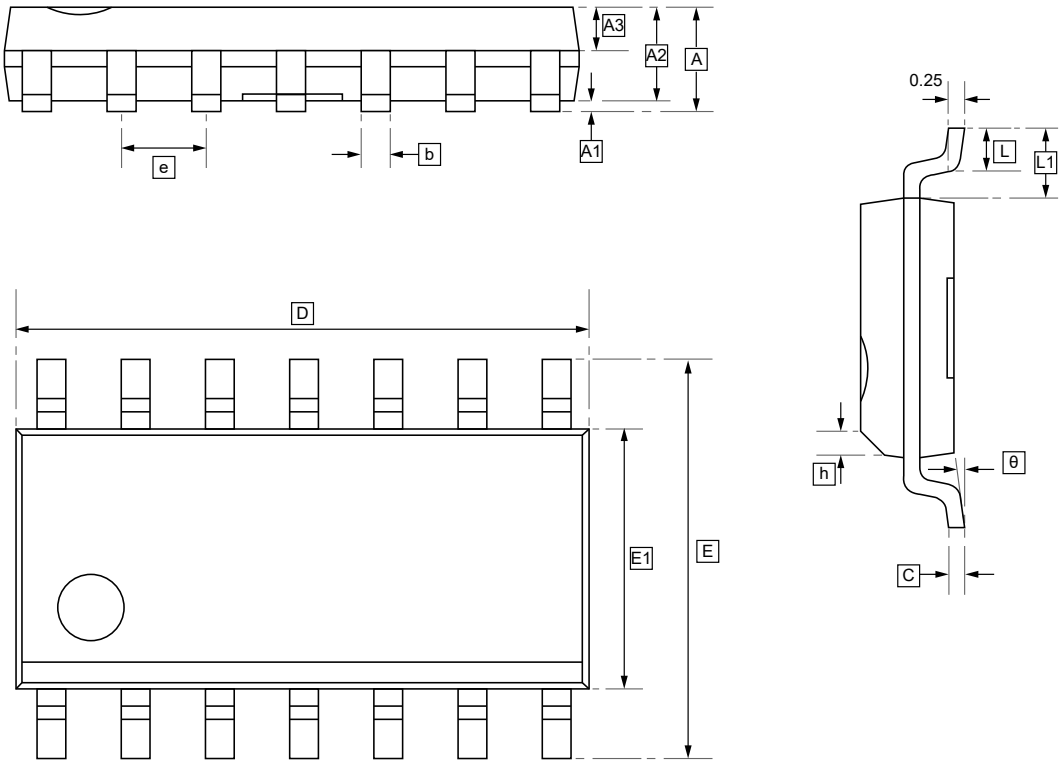
8.1 SOP-8 Package Outline Dimensions



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°

8.2 SOP-14 Package Outline Dimensions

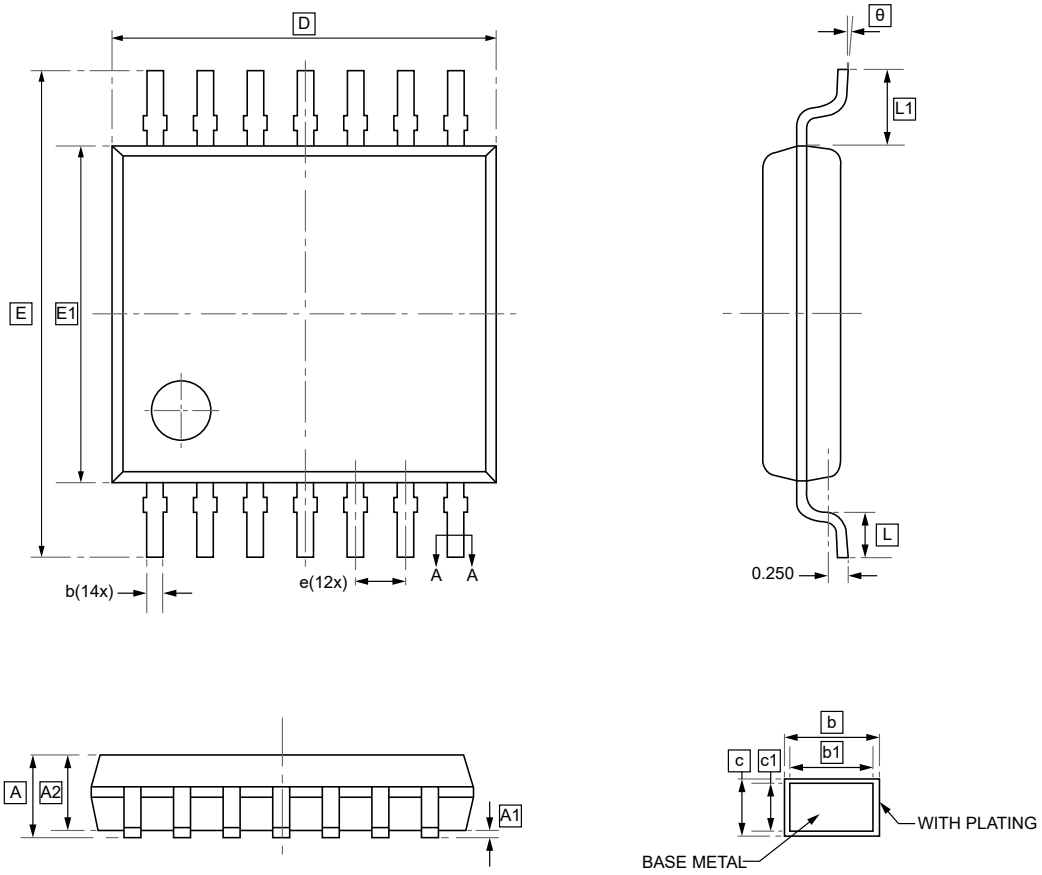


DIMENSIONS (mm are the original dimensions)

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°

8.3 TSSOP-14 Package Outline Dimensions

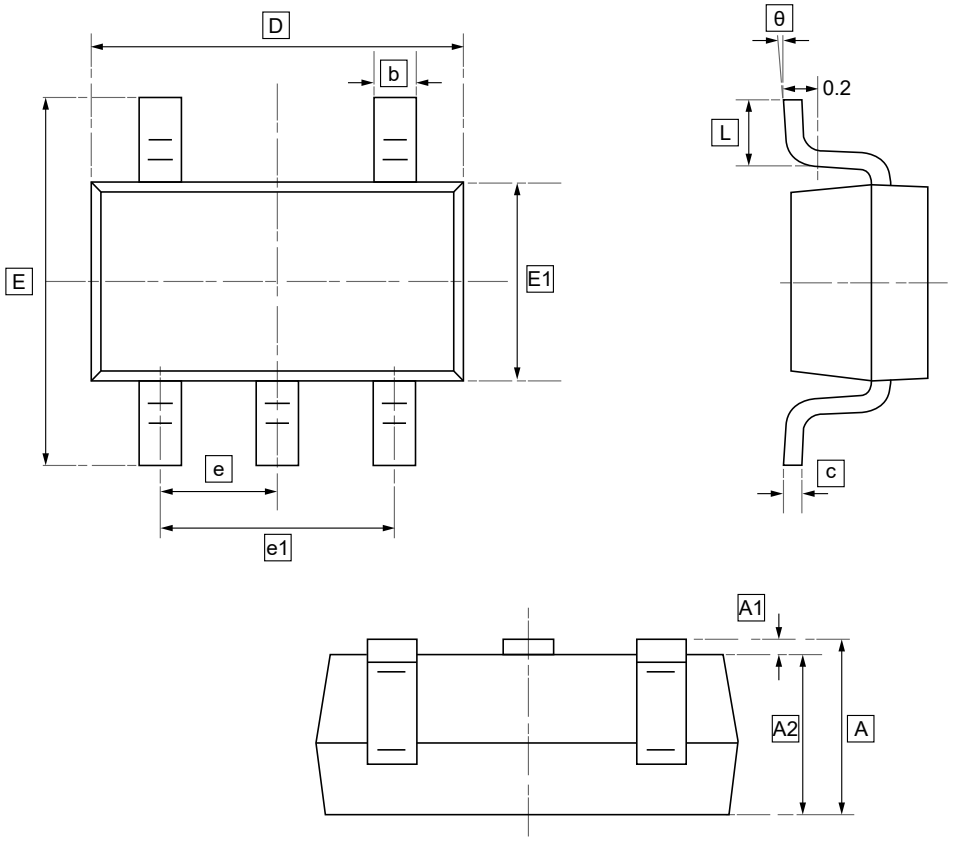


DIMENSIONS (mm are the original dimensions)

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°

8.4 SOT-23-5 Package Outline Dimensions

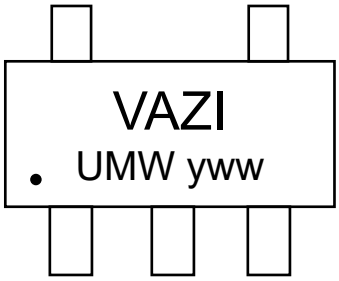


DIMENSIONS (mm are the original dimensions)

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°

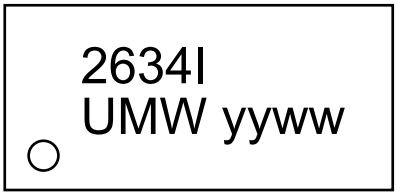
9.Ordering information

SOT23-5



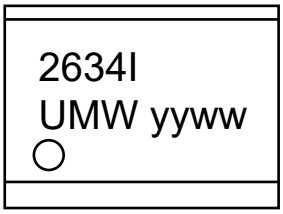
yww: Batch Code

SOP-14



yy: Year Code
ww: Week Code

TSSOP-14



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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