UMW AD8515

1.8 V Low Power CMOS Rail-to-Rail Input/Output Operational Amplifier

1.Description

The AD8515 is a rail-to-rail amplifier that can operate from a single-supply voltage as low as 1.8 V. The AD8515 single amplifier, available in 5-lead SOT-23 and 5-lead SC70 packages, is small enough to be placed next to sensors, reducing external noise pickup.The AD8515 is a rail-to-rail input and output amplifier with a gain bandwidth of 5 MHz and typical offset voltage of 1 mV from a 1.8 V supply. The low supply current makes these parts ideal for battery-powered applications. The 2.7 V/μs slew rate makes the AD8515 a good match for driving ASIC inputs such as voice codecs.

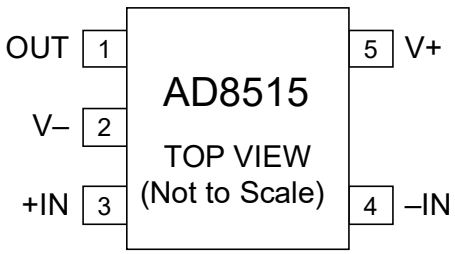
2.Features

- Single-supply operation: 1.8 V to 5 V
- Offset voltage: 6 mV maximum
- Space-saving SOT23-5 and SC70-5 packages
- Slew rate: 2.7 V/μs
- Bandwidth: 5 MHz
- Rail-to-rail input and output swing
- Low input bias current: 2 pA typical
- Low supply current @ 1.8V:450 μA maximum

3.Applications

- Portable communications
- Portable phones
- Sensor interfaces
- Laser scanners
- PCMCIA cards
- Battery-powered devices
- New generation phones
- Personal digital assistants

4.Pinning information



SOT23-5/SC70-5

5.Absolute Maximum Ratings T_A= 25°C

T_A=25°C, unless otherwise noted.

Parameter	Rating
supply Voltage	6 V
Input Voltage	GND to V_S
Differential input Voltage	±6 V or ±V_S
Output Short-Circuit Duration to GND	Observe derating curves
Storage Temperature Range KS and RJ Packages	-65°C to +150°C
Operating Temperature Range AD8515	-40°C to +125°C
Junction Temperature Range KS and RJ Packages	-65°C to +150°C
LeadTemperature (Soldering, 60 sec)	300°C

6.1 Electrical Characteristics

V_S=1.8 V, V_{CM}=V_S/2, T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Characteristics						
Offset Voltage	V_{OS}	V_{CM}=V_S/2		1	6	mV
		−40°C<T_A<+125°C			8	mV
Input Bias Current	I_S	V_S=1.8V		2	30	pA
		−40°C<T_A<+85°C			600	pA
		−40°C<T_A<+125°C			8	nA
Input Offset Current	I_{OS}			1	10	pA
		−40°C<T_A<+125°C			500	pA
Input Voltage Range			0		1.8	V
Common-Mode Rejection Ratio	CMRR	0V≤V_{CM}≤1.8V	50			dB
		−40°C<T_A<+125°C	47			dB
Large Signal Voltage Gain	A_{VO}	R_L=100kΩ, 0.3V≤V_{OUT}≤1.5V	110	400		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			4		μV/°C
Output Characteristics						
Output Voltage High	V_{OH}	I_L=100μA, −40°C<T_A<+125°C	1.79			V
Output Voltage Low	V_{OL}	I_L=750μA, −40°C<T_A<+125°C	1.77			V
		I_L=100μA, −40°C<T_A<+125°C			10	mV
		I_L=750μA, −40°C<T_A<+125°C			30	mV
Short-Circuit Limit	I_{SC}			20		mA
Power Supply						
Supply Current/Amplifier	I_{SY}	V_{OUT}=V_S/2		325	450	μA
		–40°C<T_A<+125°C			500	μA
Dynamic Performance						
Slew Rate	SR	R_L=10kΩ		2.7		V/μs
Gain Bandwidth Product	GBP			5		MHz

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Noise Performance						
Voltage Noise Density	e_n	f=1kHz		22		nV/√Hz
		f=10kHz		20		nV/√Hz
Current Noise Density	i_n	f=1kHz		0.05		pA/√Hz

6.2 Electrical Characteristics

V_S=3V, V_{CM}=V_S/2, T_A = 25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Characteristics						
Offset Voltage	V_{OS}	V_{CM}=V_S/2		1	6	mV
		−40°C<T_A<+125°C			8	mV
Input Bias Current	I_S	V_S=3V		2	30	pA
		−40°C<T_A<+85°C			600	pA
		−40°C<T_A<+125°C			8	nA
Input Offset Current	I_{OS}			1	10	pA
		−40°C<T_A<+125°C			500	pA
Input Voltage Range			0		3	V
Common-Mode Rejection Ratio	CMRR	0V≤V_{CM}≤3V	54			dB
		−40°C<T_A<+125°C	50			dB
Large Signal Voltage Gain	A_{VO}	R_L=100kΩ, 0.3V≤V_{OUT}≤2.7V	250	1000		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			4		μV/°C
Output Characteristics						
Output Voltage High	V_{OH}	I_L=100μA, −40°C<T_A<+125°C	2.99			V
Output Voltage Low	V_{OL}	I_L=750μA, −40°C<T_A<+125°C	2.98			V
		I_L=100μA, −40°C<T_A<+125°C			10	mV
		I_L=750μA, −40°C<T_A<+125°C			20	mV
Power Supply						
Power Supply Rejection Ratio	PSRR	V_S=1.8V to 5V	65	85		dB
		–40°C<T_A<+125°C	57	80		dB
Supply Current/Amplifier	I_{SY}	V_{OUT}=V_S/2		350	450	μA
		–40°C<T_A<+125°C			500	μA
Dynamic Performance						
Slew Rate	SR	R_L=10kΩ		2.7		V/μs
Gain Bandwidth Product	GBP			5		MHz

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Noise Performance						
Voltage Noise Density	e_n	f=1kHz		22		nV/√Hz
		f=10kHz		20		nV/√Hz
Current Noise Density	i_n	f=1kHz		0.05		pA/√Hz

6.3 Electrical Characteristics

V_S=5V, V_{CM}=V_S/2, T_A=25°C, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Characteristics						
Offset Voltage	V_{OS}	V_{CM}=V_S/2		1	6	mV
		−40°C<T_A<+125°C			8	mV
Input Bias Current	I_S	V_S=5V		5	30	pA
		−40°C<T_A<+85°C			600	pA
		−40°C<T_A<+125°C			8	nA
Input Offset Current	I_{OS}			1	10	pA
		−40°C<T_A<+125°C			500	pA
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	0V≤V_{CM}≤5V	60	75		dB
		−40°C<T_A<+125°C	54			dB
Large Signal Voltage Gain	A_{VO}	R_L=100kΩ, 0.3V≤V_{OUT}≤4.7V	450	2000		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			4		μV/°C
Output Characteristics						
Output Voltage High	V_{OH}	I_L=100μA, −40°C<T_A<+125°C	4.99			V
Output Voltage Low	V_{OL}	I_L=750μA, −40°C<T_A<+125°C	4.98			V
		I_L=100μA, −40°C<T_A<+125°C			10	mV
		I_L=750μA, −40°C<T_A<+125°C			20	mV
Power Supply						
Power Supply Rejection Ratio	PSRR	V_S=1.8V to 5V	65	85		dB
		–40°C<T_A<+125°C	57	80		dB
Supply Current/Amplifier	I_{SY}	V_{OUT}=V_S/2		410	550	μA
		–40°C<T_A<+125°C			600	μA
Dynamic Performance						
Slew Rate	SR	R_L=10kΩ		2.7		V/μs
Gain Bandwidth Product	GBP			5		MHz

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Noise Performance						
Voltage Noise Density	e_n	f=1kHz		22		nV/√Hz
		f=10kHz		20		nV/√Hz
Current Noise Density	i_n	f=1kHz		0.05		pA/√Hz

7.1 Typical Characteristic

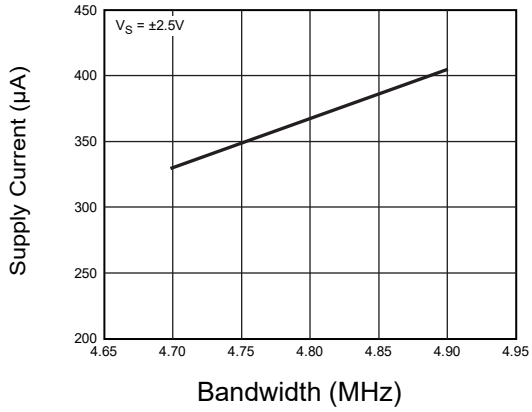


Figure 1: Supply Current vs. Bandwidth

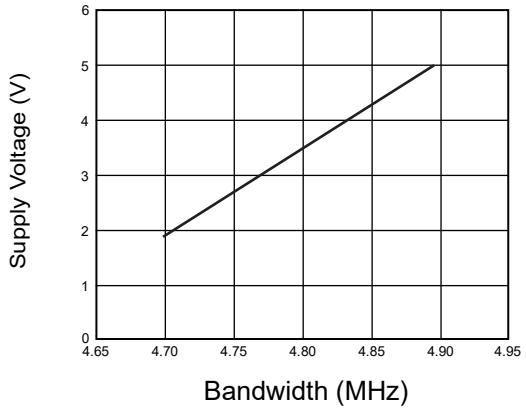


Figure 2: Supply Voltage vs. Bandwidth

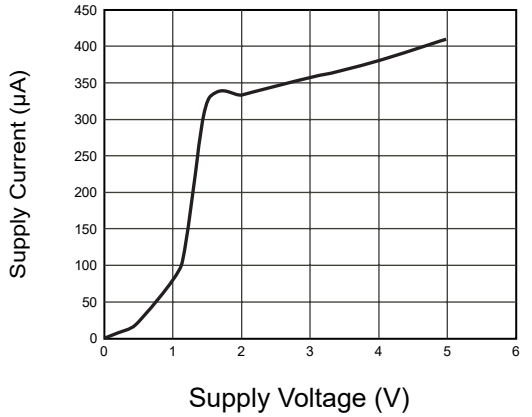


Figure 3: Supply Current vs. Supply Voltage

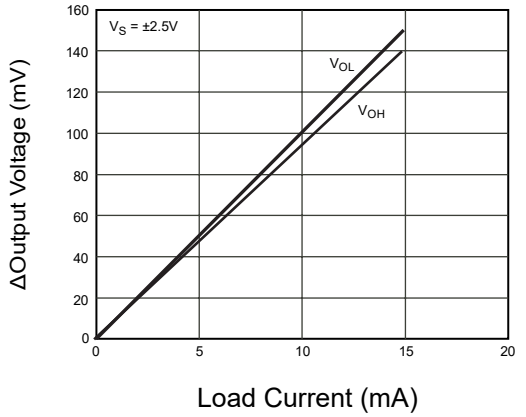


Figure 4: Output Voltage to Supply Rail vs. Load Current

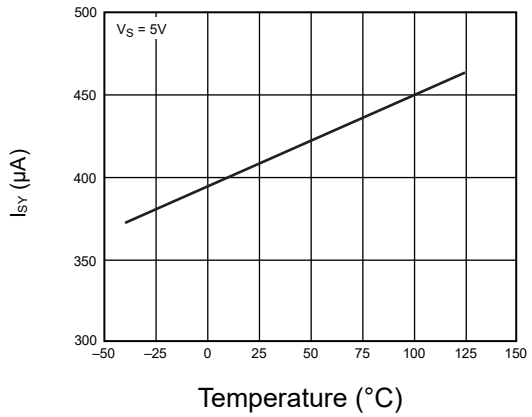


Figure 5: I_{SY} vs. Temperature

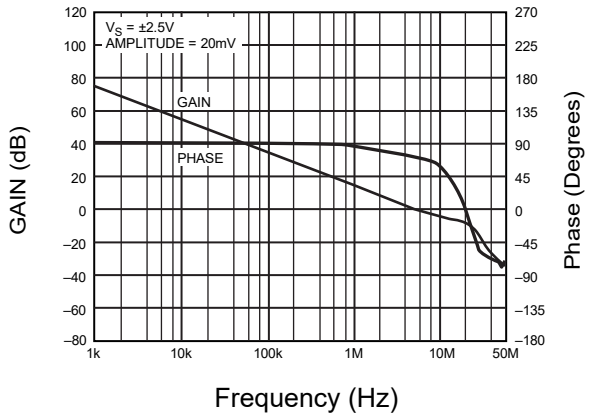


Figure 6: Gain and Phase vs. Frequency

7.2 Typical Characteristic

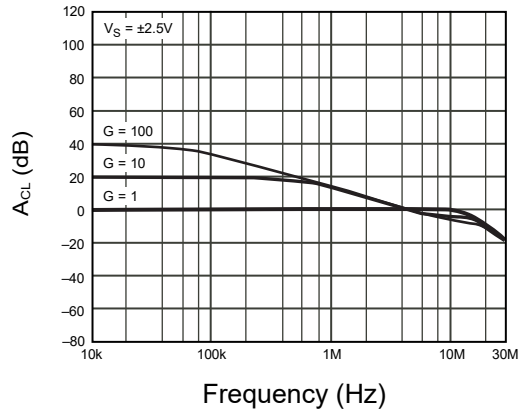


Figure 7: A_{CL} vs. Frequency

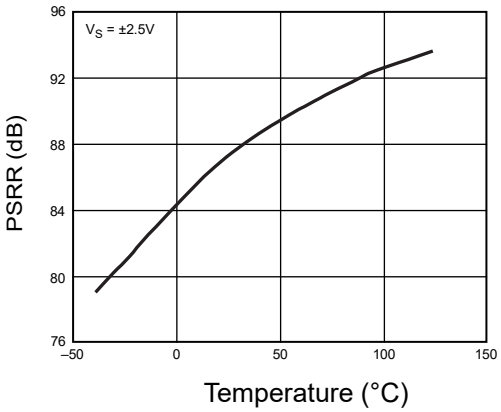


Figure 8: PSRR vs. Temperature

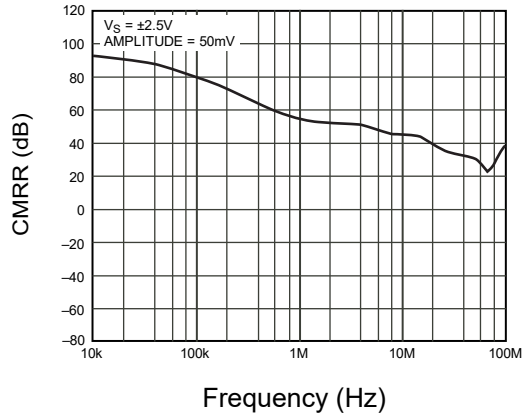


Figure 9: CMRR vs. Frequency

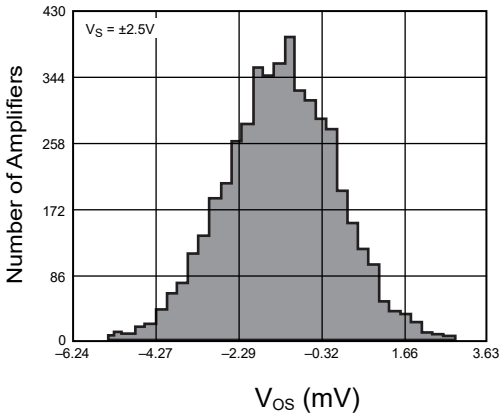


Figure 10: V_{OS} Distribution

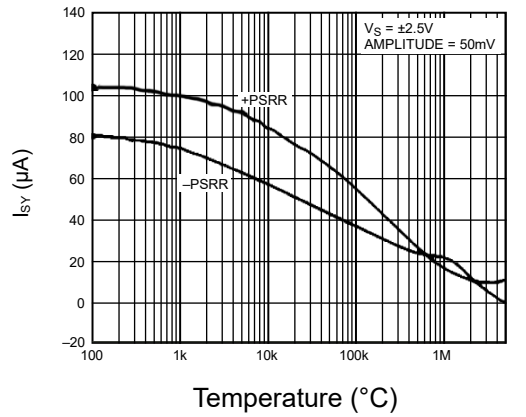


Figure 11: PSRR vs. Frequency

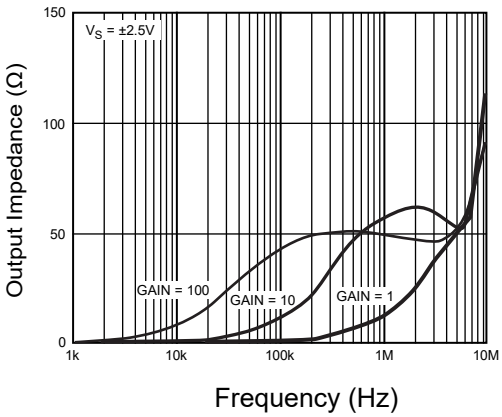


Figure 12: Output Impedance vs. Frequency

7.3 Typical Characteristic

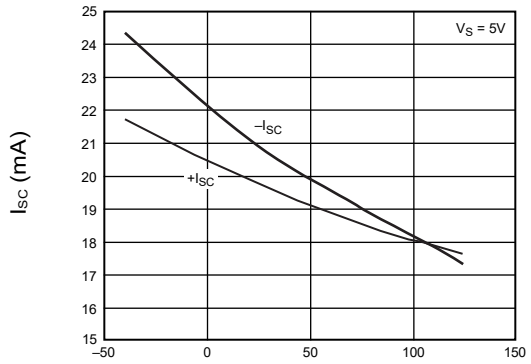


Figure 13: I_{SC} vs. Temperature

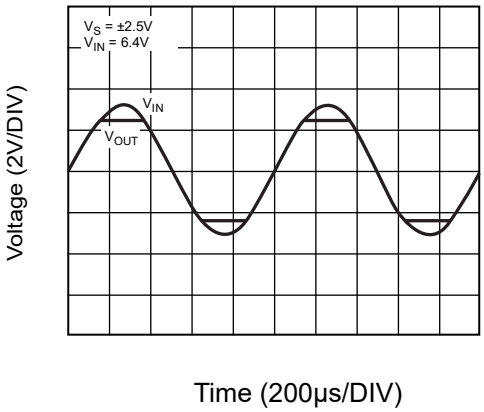


Figure 14: No Phase Reversal

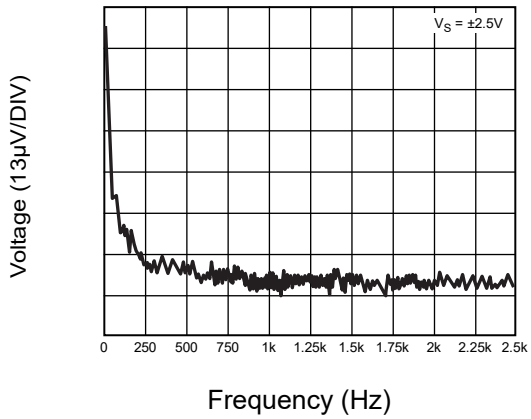


Figure 15: Voltage Noise Density

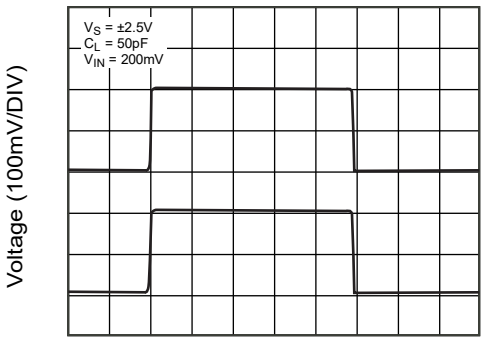


Figure 16: Small Signal Transient Response

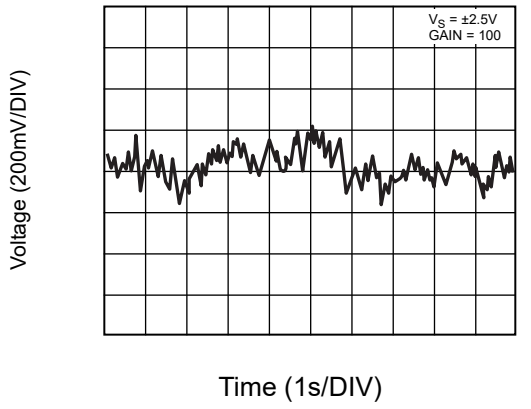


Figure 17: Input Voltage Noise

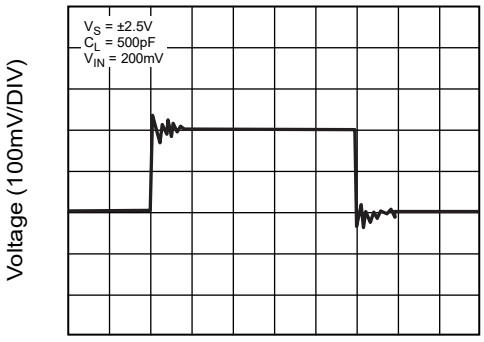


Figure 18: Small Signal Transient Response

7.4 Typical Characteristic

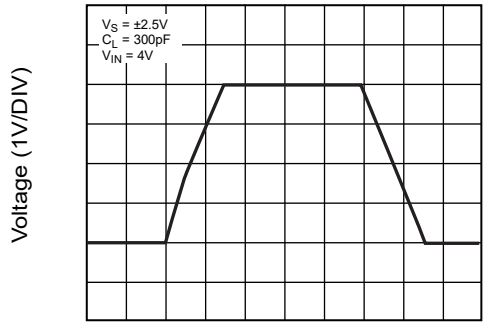


Figure 19: Large Signal Transient Response

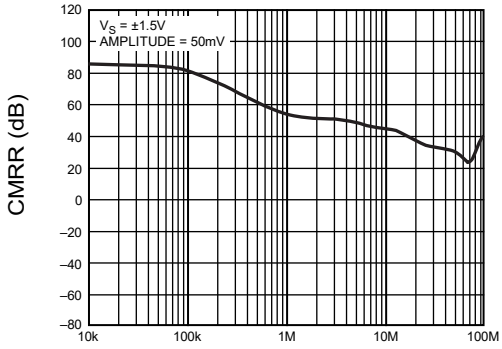


Figure 20: CMRR vs. Frequency

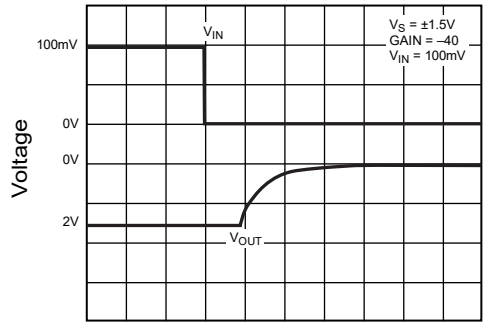


Figure 21: Saturation Recovery

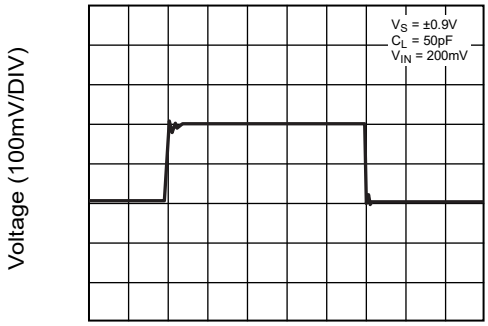


Figure 22: Small Signal Transient Response

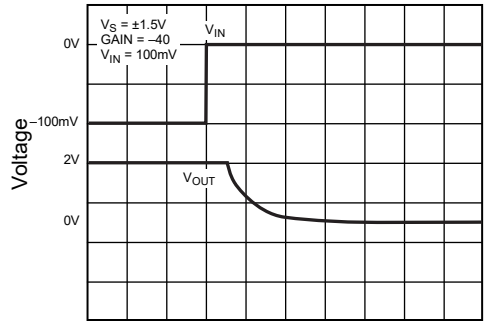


Figure 23: Saturation Recovery

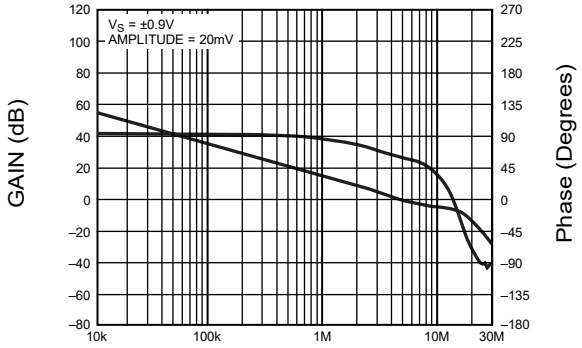


Figure 24: Gain and Phase vs. Frequency

7.5 Typical Characteristic

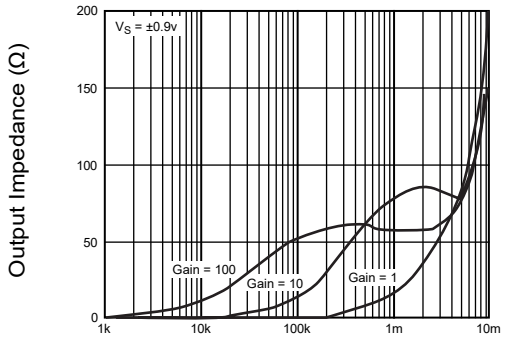


Figure 25: Output Impedance vs. Frequency

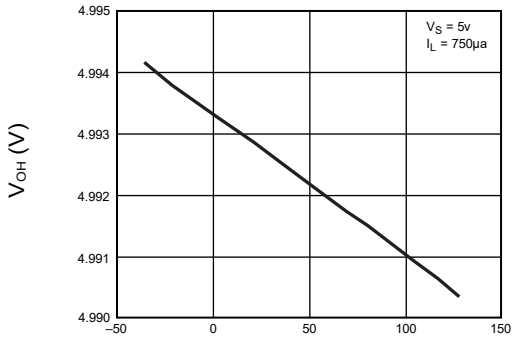


Figure 26: V_{OH} vs. Temperature

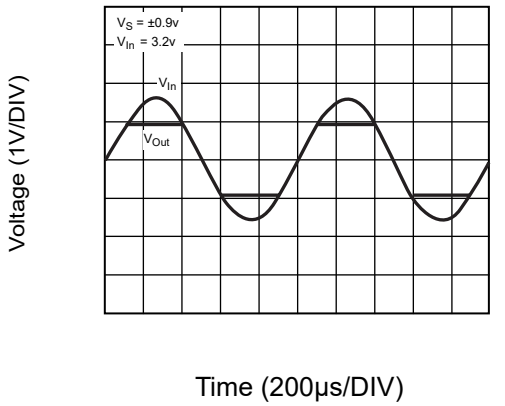


Figure 27: No Phase Reversal

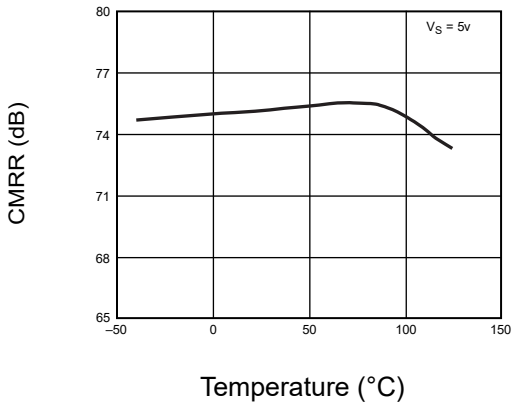


Figure 28: CMRR vs. Temperature

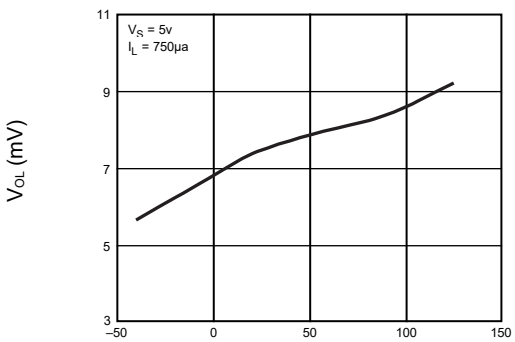
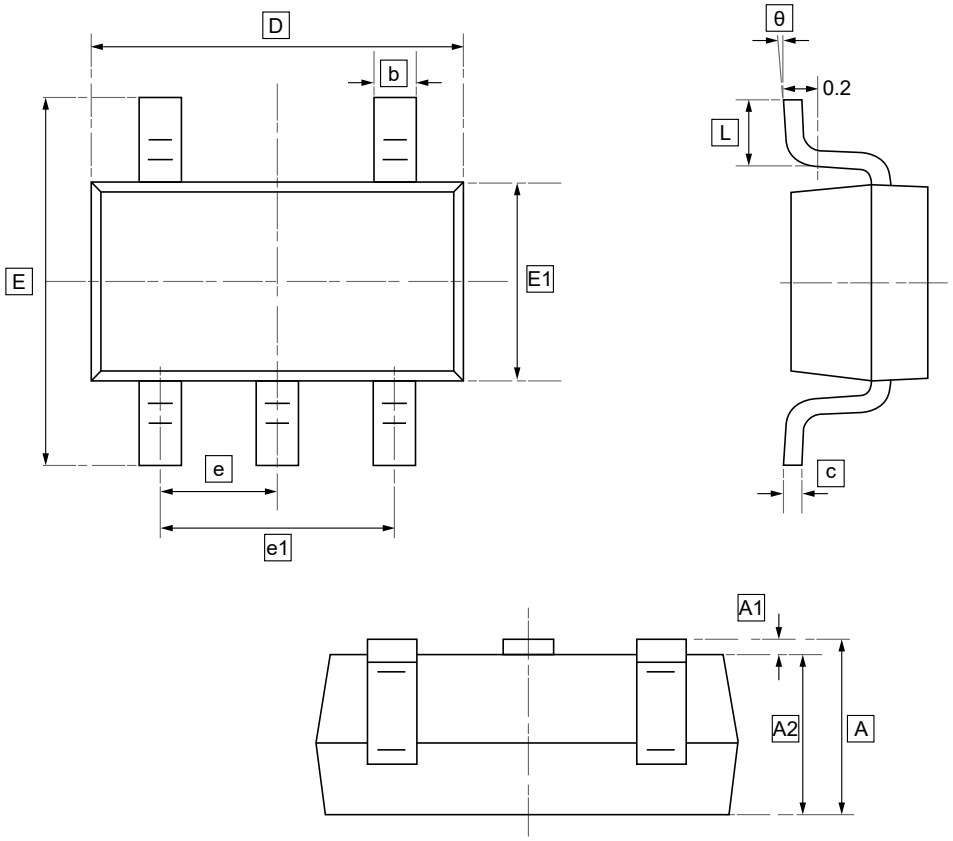


Figure 29: V_{OL} vs. Temperature

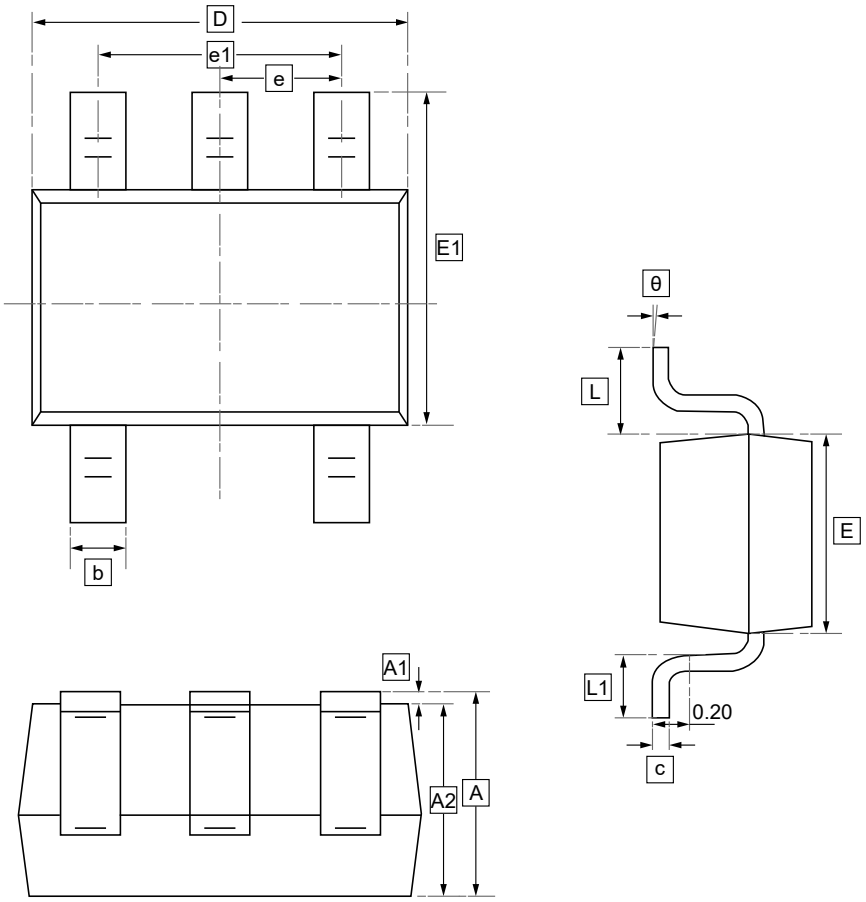
8.1SOT23-5 Package Outline Dimensions



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°

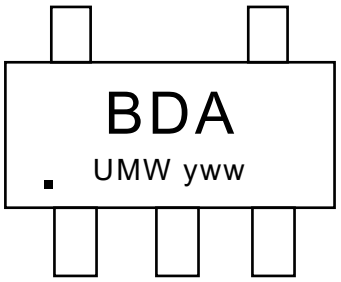
8.2SC70-5 Package Outline Dimensions



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	2.05	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.

9.Ordering information



y: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW AD8515ARTZ	BDA	SOT23-5	3000	Tape and reel
UMW AD8515ART	BDA	SOT23-5	3000	Tape and reel
UMW AD8515AKSZ	BDA	SC70-5	3000	Tape and reel

10.Disclaimer

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