Figure 1. Physical Photos of AT1881

FEATURES

- Supply Voltage: 4.5V to 36V
- Offset Voltage: ±15μV Maximum
- Differential Input Voltage Range to Supply Rail, can Work as Comparator
- Input Rail to –VS, Rail to Rail Output
- Bandwidth: 12MHz
- Slew Rate: 12V/μs
- Over-Temperature Protection
- Low Noise: 6nV/√Hz at 1kHz
- 2KV HBM, 1KV CDM
- –40°C to 125°C Operation Temperature Range

APPLICATIONS

- Instrumentation
- Active Filters, ASIC Input or Output Amplifier
- Sensor Interface
- Motor Control
- Industrial Control
- Low noise power supply

DESCRIPTION

The AT188X series amplifiers are newest high supply voltage amplifiers with 15μV low offset, low noise and stable high frequency response. They incorporate 3PEAK's proprietary and patented design techniques to achieve very good AC performance with 12MHz bandwidth, 12V/μs slew rate and low distortion while drawing only 2000μA of quiescent current per amplifier. The input common-mode voltage range extends to V–, and the outputs swing rail-to-rail.

The AT188X has over-temperature protection feature to guarantee the chip safe. The output of AT188X will enter high impendence when die temperature reach around 170°C and will recover the function when the die temperature down to around 150°C. The product has very small temperature coefficient of power which is helpful for temperature sensitive application.

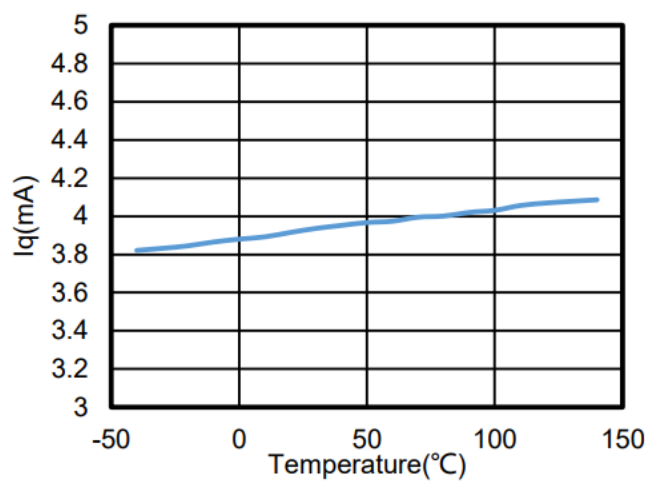


Figure 2.

PIN CONFIGURATIONS

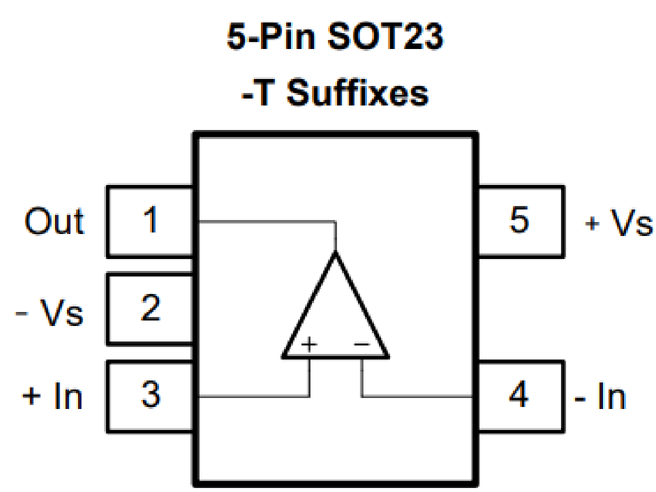


Figure 3. Pin Configurations

1161 Ringwood Ct, #110, San Jose, CA 95131, U. S. A. Tel.: (408) 748-9100, Fax: (408) 770-9187 www.analogtechnologies.com
 Email: staff@analogti.com/sales@analogti.com

ABSOLUTE MAXIMUM RATINGS NOTE 1

Table 1.

Parameter	Rating
Supply Voltage, $(+V_S)-(-V_S)$	40V
Input Voltage	$(-V_S)$ – 0.3 to 40 V
Differential Input Voltage	$(-V_S)$ - $(+V_S)$ to $(+V_S)$ - $(-V_S)$
Input Current: +IN, –IN Note 2	±10mA
Output Voltage	$(-V_S)$ – 0.3 to $(+V_S)$ + 0.3
Output Short-Circuit Duration Note 3	Infinite
Maximum Junction Temperature	150°C
Operating Temperature Range	–40 to 125°C
Storage Temperature Range	–65 to 150°C
Lead Temperature (Soldering, 10 sec)	260°C

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: The inputs are protected by ESD protection diodes to negative power supply. If the input extends more than 300mV beyond

the negative power supply, the input current should be limited to less than 10mA.

Note 3: A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power

supply voltage and how many amplifiers are shorted. Thermal resistance varies with the amount of PC board metal connected to the

package. The specified values are for short traces connected to the leads.

ESD AND LATCH UP RATING

Table 2.

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001	2	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002	1	kV
LU	Latch Up	JESD 78, 25°C	500	mA
		JESD 78, 125°C	200	mA

THERMAL INFORMATION

Table 3.

Package Type	θ_{JA}	θ_{JC}	Unit
5-Pin SOT23	250	81	°C/W

ELECTRICAL CHARACTERISTICS

All test condition is VS = 30V, TA = 25°C, RL = 10kΩ, unless otherwise noted.

Table 4.

Parameter	Symbol	Test Conditions	T_A	Min.	Typ.	Max.	Unit
POWER SUPPLY							
Supply Voltage Range	V_S			4.5		36	V
Quiescent Current/Amplifier	I_Q	V_S = 30V			2	2.5	mA
			-40°C to 125°C			2.7	
		V_S = 5V			1.9	2.4	
			-40°C to 125°C			2.6	
Power-Supply Rejection Ratio	PSRR	V_S = 4.5V to 36V		135	155		dB
			−40°C ~ 125°C	130			
INPUT							
Input Offset Voltage	V_{OS}	V_S = 30V, V_{CM} = 15V		−15		15	μV
			−40°C ~ 125°C	−25		25	
		V_S = 5V, V_{CM} = 2.5V		−15		15	
			−40°C ~ 125°C	−25		25	
Input Offset Voltage Drift	Vos TC		−40°C ~ 125°C		0.05	0.15	μV/°C
Input Bias Current	I_B				10		pA
			−40°C ~ 125°C		100		
Input Offset Current	I_{OS}				100		pA
Different Input Current	I_{IN}	V_S = 36V, V_{ID} = 36V				100	μA
			−40°C ~ 125°C			120	
Input Capacitance	C_{IN}	Differential Mode			5		pF
		Common Mode			2.5		

Parameter	Symbol	Test Conditions	T_A	Min.	Typ.	Max.	Unit
Open-loop Voltage Gain	A_V	RLOAD = 10kΩ, V_{OUT} = 0.5V to 29.5V		135	155		dB
			−40°C ~ 125°C	130			
Common-Mode Input Voltage Range	V_{cm}			V−		(V+) −1.5V	V
Common-Mode Rejection Ratio	CMRR	V_{cm} = 0V to 28.5V		135	155		dB
			−40°C ~ 125°C	130			
OUTPUT							
Output Swing from Positive Rail		R_{LOAD} =100kΩ to $V_S/2$			12	25	mV
			−40°C ~ 85°C			35	
			−40°C ~ 125°C			40	
		R_{LOAD} = 10kΩ to $V_S/2$			80	120	
			−40°C ~ 85°C			170	
			−40°C ~ 125°C			200	
		R_{LOAD} = 2kΩ to $V_S/2$			370	500	
			−40°C ~ 85°C			700	
			−40°C ~ 125°C			750	
Output Swing from Negative Rail		R_{LOAD} =100kΩ to $V_S/2$			5	25	mV
			−40°C ~ 85°C			30	
			−40°C ~ 125°C			30	
		R_{LOAD} = 10kΩ to $V_S/2$			30	80	
			−40°C ~ 85°C			95	
			−40°C ~ 125°C			105	
		R_{LOAD} = 2kΩ to $V_S/2$			140	300	
			−40°C ~ 85°C			450	
			−40°C ~ 125°C			500	
Output Short-Circuit Current	I_{SC}	Source		70	95		mA
			−40°C ~ 85°C	55			
			−40°C ~ 125°C	50			
		Sink		130	150		
			−40°C ~ 85°C	100			

Parameter	Symbol	Test Conditions	T_A	Min.	Typ.	Max.	Unit
			−40°C ~ 125°C	85			
FREQUENCY RESPONSE							
Slew Rate	SR	G = 1, 10V step		8	12		V/μs
			−40°C ~ 125°C	7			
Gain-Bandwidth Product	GBW				12		MHz
Overload Recovery	t_{OR}				500		ns
Setting Time, 0.1%	t_s	G = 1, 10V step			5		μs
Setting Time, 0.01%					7		
Phase Margin	PM	R_L=10K, C_L= 50pF			60		°
Gain Margin	GM	R_L=10K, C_L= 50pF			10		dB
NOISE							
Input Voltage Noise	E_N	f = 0.1Hz to 10Hz			0.1		$μV_{P-P}$
Input Voltage Noise Density	e_n	f = 0.1KHz			6		nV/√Hz
		f = 1KHz			6		
		f = 10KHz			7		
Input Current Noise	i_N	f = 10KHz			200		fA/√Hz
Total Harmonic Distortion and Noise	THD+N	f = 1kHz, G =1, R_L = 10kΩ, V_{OUT} = $6V_{RMS}$			0.0002		%

TYPICAL CHARACTERISTICS

VS = ±15V, VCM = 0V, RL = 10kΩ, unless otherwise specified

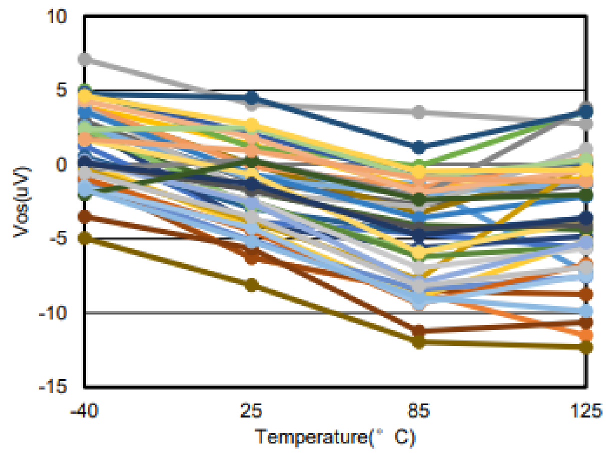


Figure 4. VOS at 30V VS, 15V VCM vs. Temperature, 40pcs

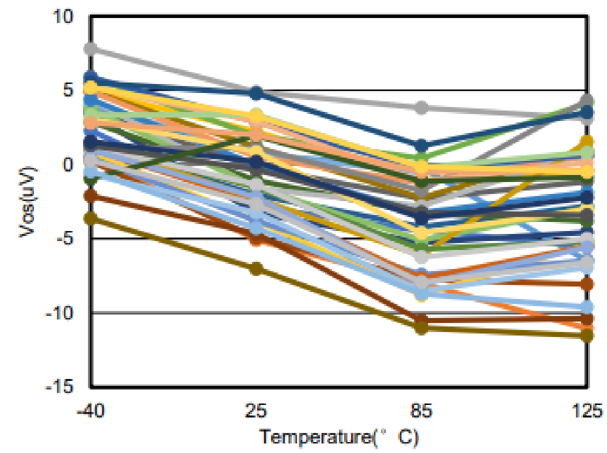


Figure 5. VOS at 5V VS, 2.5V VCM vs. Temperature, 40pcs

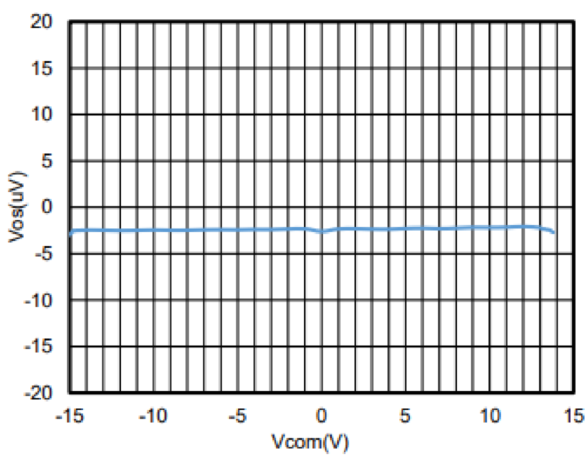


Figure 6. Offset Voltage vs. Common Mode Voltage

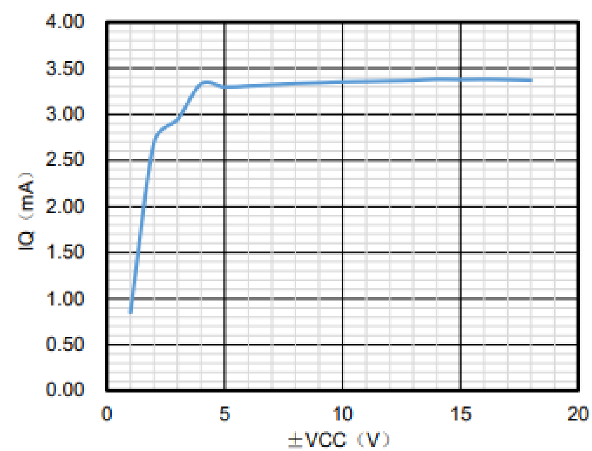


Figure 7. Iq vs. Supply Voltage

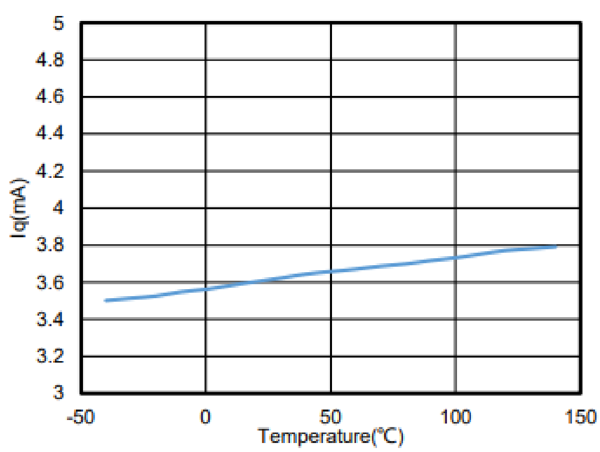


Figure 8. Iq vs. Temperature, +-2.5V Supply, AT1882

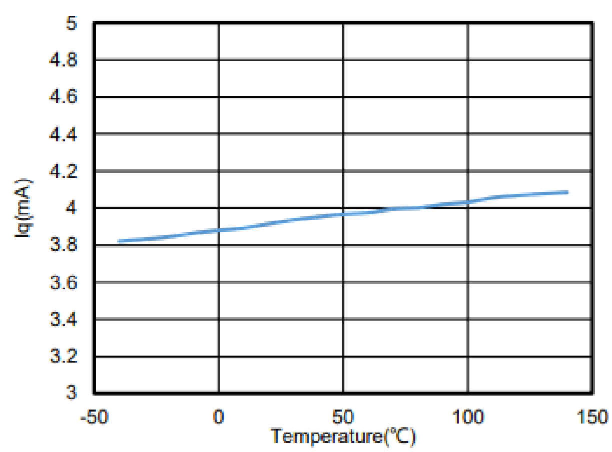


Figure 9. Iq vs. Temperature, +-15V Supply, AT1882

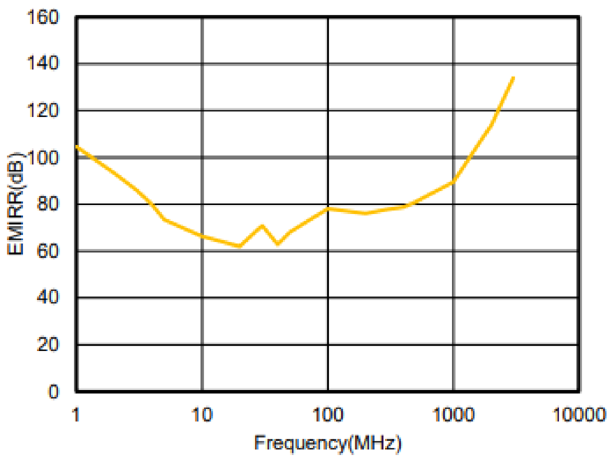


Figure 10. EMIRR vs. Frequency

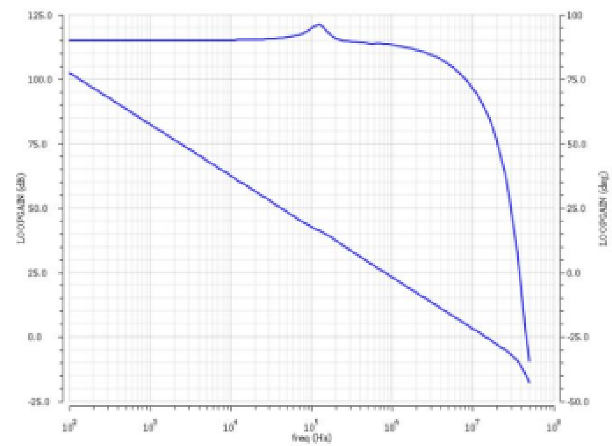


Figure 11. Open Loop Gain and Phase vs. Frequency

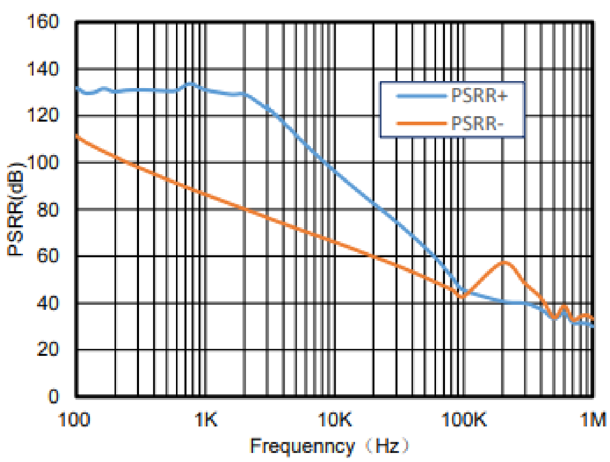


Figure 12. PSRR vs. Frequency

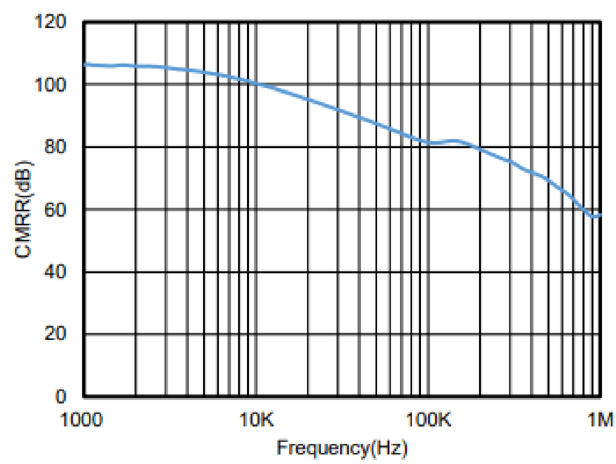
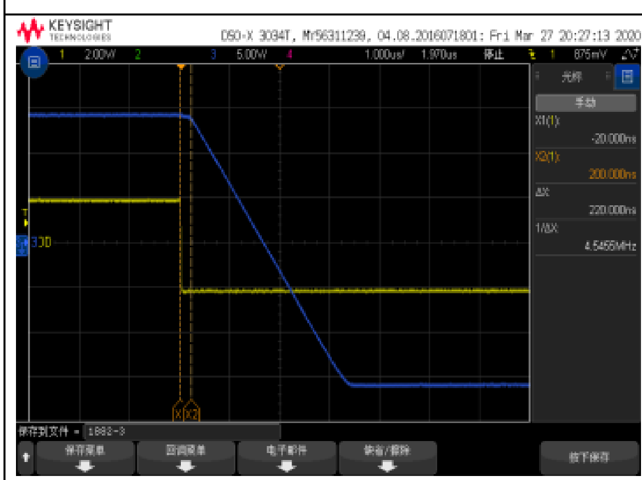


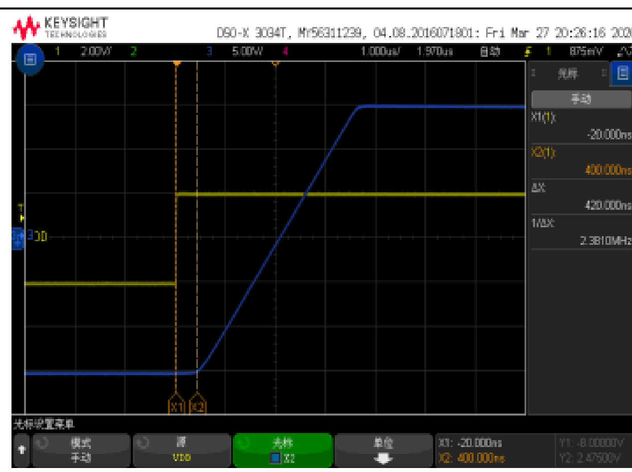
Figure 13. CMRR vs. Frequency



Time: 2us/div, Measure Time: 220ns

R_L=2K, C_L=100pF, G=10

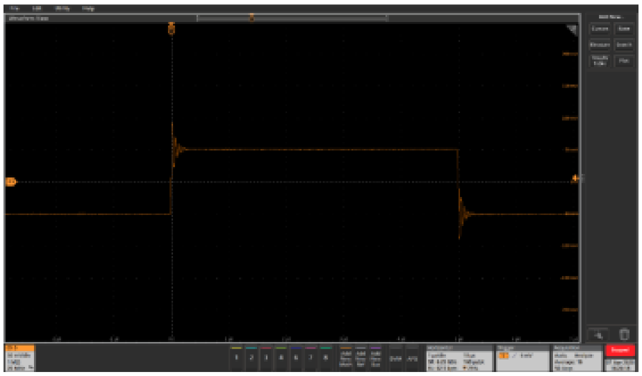
Figure 14. Positive Overload Recovery



Time: 2us/div, Measure Time: 420ns

R_L=2K, C_L=100pF, G=10

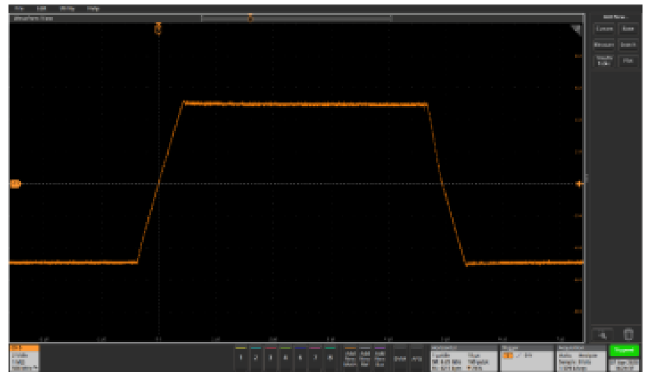
Figure 15. Negative Overload Recovery



Voltage: 50mV/div, Time: 2us/div

R_L=2K, C_L=100pF, G=1

Figure 16. 100mV Signal Step Response



Voltage: 2V/div, Time: 2μs/div

R_L=2K, C_L=100pF, G=1

Figure 17. 10V Signal Step Response

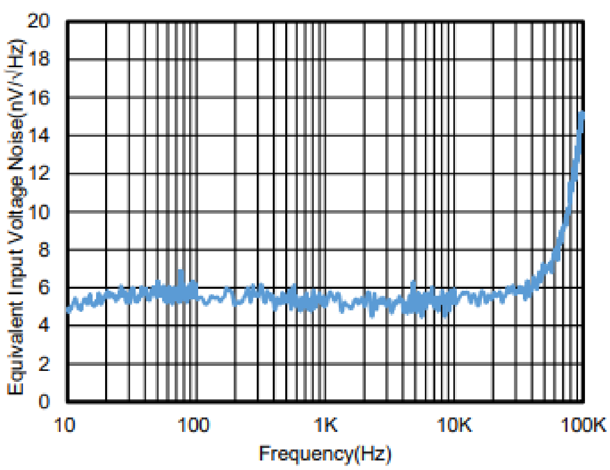


Figure 18. Voltage Noise Spectral Density vs. Frequency

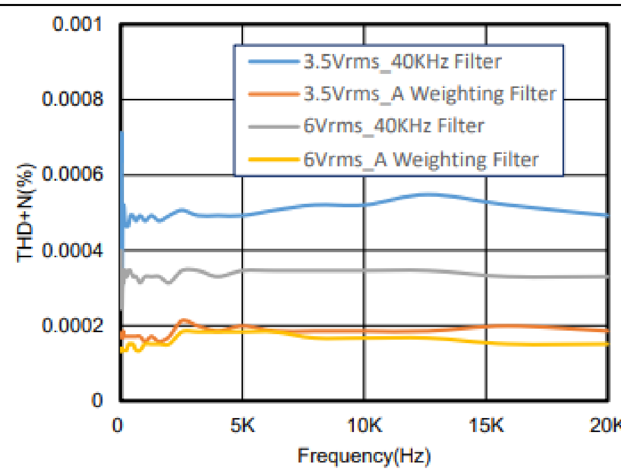


Figure 19. THD+N vs. Frequency

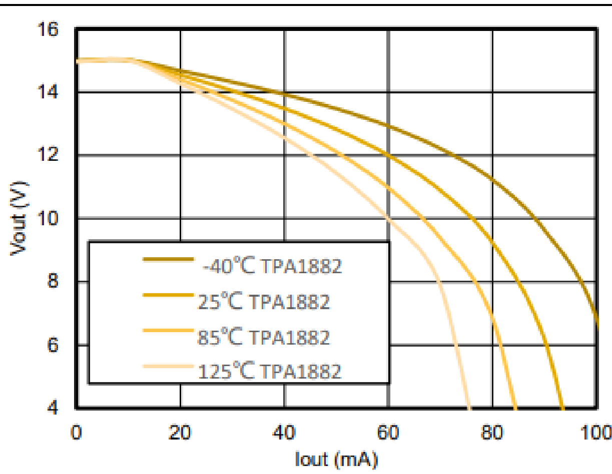


Figure 20. VOUT vs. IOUT, Source

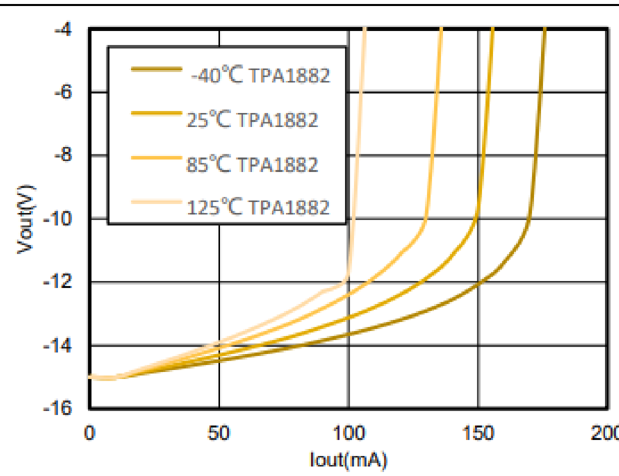
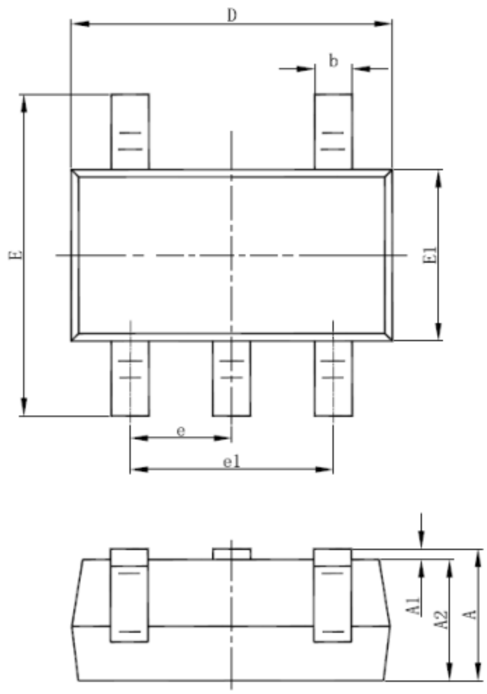
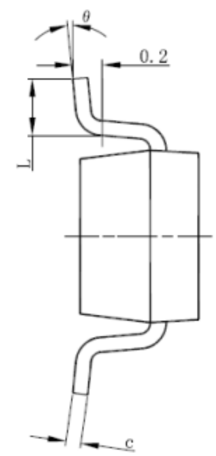


Figure 21. VOUT vs. IOUT, Sink

OUTLINE DIMENSIONS

SOT23-5





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

ORDERING INFORMATION

Table 5. Ordering Information

Part Number	Buy Now
AT1881	* *

*: both and are our online store icons. Our products can be ordered from either one of them with the same pricing and delivery time.

NOTICE

1. It is important to carefully read and follow the warnings, cautions, and product-specific notes provided with electronic components. These instructions are designed to ensure the safe and proper use of the component and to prevent damage to the component or surrounding equipment. Failure to follow these instructions could result in malfunction or failure of the component, damage to surrounding equipment, or even injury or harm to individuals. Always take the necessary precautions and seek professional assistance if unsure about proper use or handling of electronic components.
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