

AN1833, AN1833S

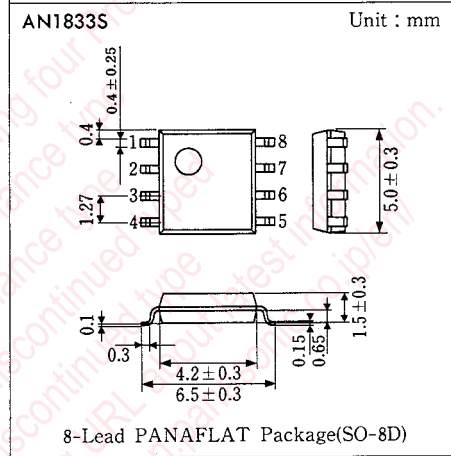
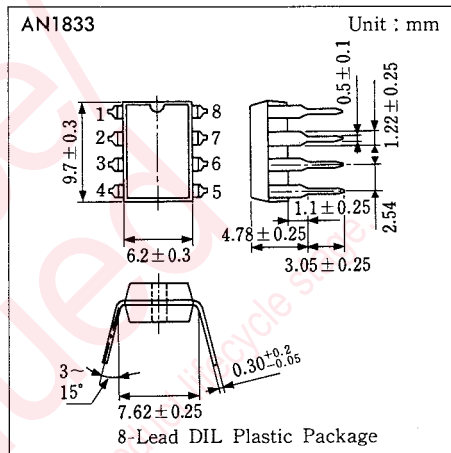
Low Noise, High Slew Rate Operational Amplifiers

Outline

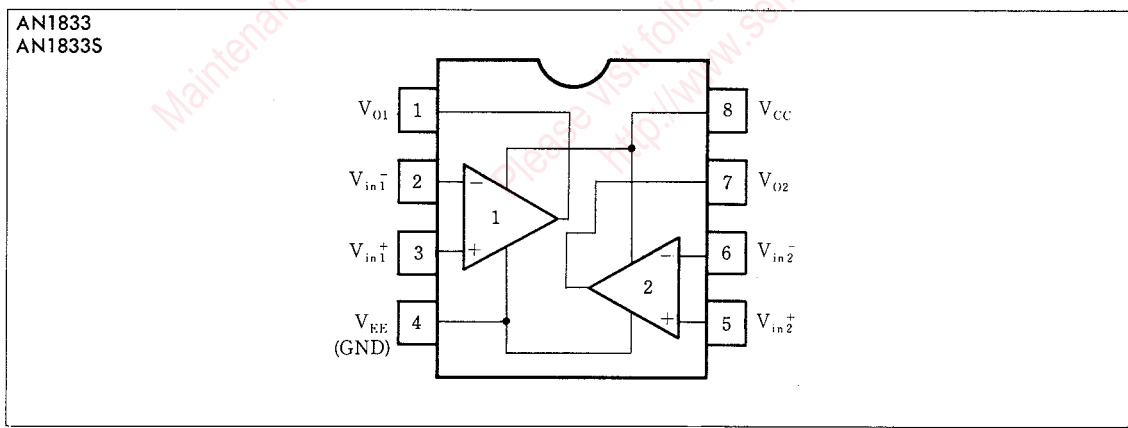
The AN1833 and the AN1833S are low noise, high slew rate type dual operational amplifiers with phase compensation circuits built-in. They have wide band and high stability, and suited for application to various electronic circuits such as active filters and audio preamplifiers.

Features

- Phase compensation circuit
- High gain : $G_v = 110\text{dB}$ typ.
- Low noise : $V_{ni} = 0.9\mu\text{Vrms}$ typ.
- High slew rate : $SR = 6\text{V}/\mu\text{s}$ typ.
- High stability



Block Diagram



■ Pin

Pin No.	Pin Name
1	Ch. 1 Output
2	Ch. 1 Invert Input
3	Ch. 1 Non Invert Input
4	V _{EE} (GND)
5	Ch. 2 Non Invert Input
6	Ch. 2 Invert Input
7	Ch. 2 Output
8	V _{CC}

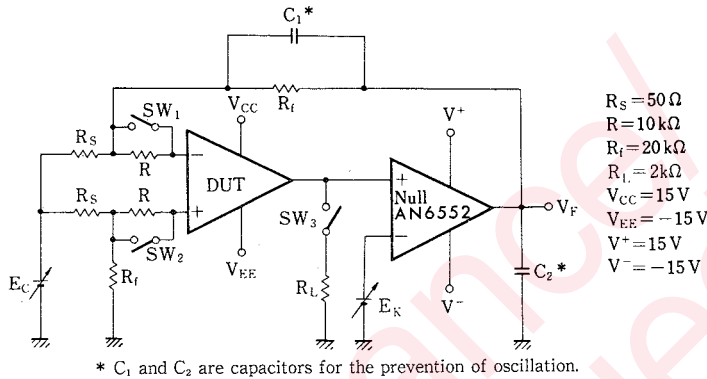
■ Absolute Maximum Ratings (T_a = 25°C)

Item		Symbol	Rating	Unit
Voltage	Supply Voltage	V _{CC}	±18	V
	Differential Input Voltage	V _{ID}	±30	V
	Common-Mode Input Voltage	V _{ICM}	±15	V
Power Dissipation	AN1833	P _D	500	mW
	AN1833S		360	
Operating Ambient Temperature		T _{opr}	-20 ~ +75	°C
Storage Temperature	AN1833	T _{stg}	-55 ~ +150	°C
	AN1833S		-55 ~ +125	

■ Electrical Characteristics (V_{CC} = 15V, V_{EE} = -15V, T_a = 25°C)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Input Offset Voltage	V _{I(offset)}	1	R _S ≤ 10kΩ		0.3	5	mV
Input Offset Current	I _{IO}	1			5	200	nA
Input Bias Current	I _{Bias}	1			300	1000	nA
Voltage Gain	G _V	1		90	110		dB
Maximum Output Voltage	V _{O(max.)}	2	R _L ≥ 10kΩ	±12	±13.5		V
Maximum Output Voltage	V _{O(max.)}	2	R _L ≥ 2kΩ	±10	±13.4		V
Common-Mode Input Voltage Width	V _{CM}	3		±12	±14		V
Common-Mode Rejection Ratio	CMR	1		80	100		dB
Supply Voltage Rejection Ratio	SVR	1			10	100	dB
Power Consumption	P _C	4	R _L = ∞		150	240	mW
Slew Rate	SR	5	R _L ≥ 2kΩ		6		V/μs
Unity-gain Band Width	f _(T)	6	A _V = 1		7		MHz
Equivalent Input Noise Voltage	V _{ni}	7	R _S = 1kΩ, DIN/AUDIO		0.9		μV _{rms}

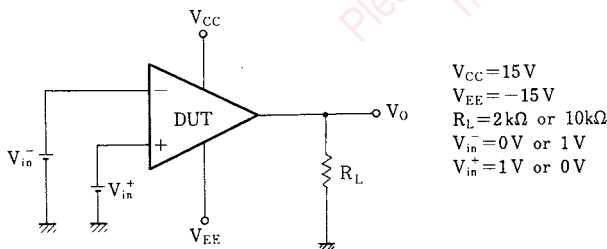
Test Circuit 1 ($V_{I(offset)}$, I_{IO} , I_{Bias} , G_V , CMR , SVR)



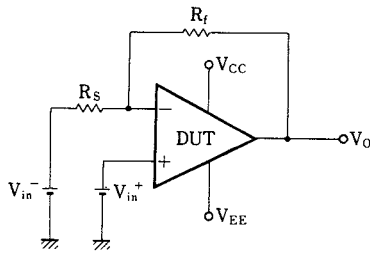
Item	Measurement Conditions
Input Offset Voltage	V_{F1} is measured with the SW_1 , SW_2 and SW_3 set to OFF and $E_C = E_K = 0V$. Can be given by $V_{I(offset)} = \frac{V_{F1}}{400} (V)$
Input Offset Current	V_{F2} is measured with the SW_1 and SW_2 set to ON, the SW_3 set to OFF and $E_C = E_K = 0V$. Can be given by $I_{IO} = \frac{ V_{F2} - V_{F1} }{4 \times 10^6} (A)$
Input Bias Current	V_{F3} is measured with the SW_3 set to OFF, $E_C = E_K = 0V$, the SW_1 set to ON and the SW_2 set to OFF. V_{F4} is measured with the SW_1 and SW_2 reversed. Can be given by $I_{Bias} = \frac{ V_{F3} - V_{F4} }{8 \times 10^6} (A)$
Voltage Gain	V_{F5} is measured with the SW_1 , SW_2 and SW_3 set to ON, $E_C = 0V$ and $E_K = 10V$. V_{F5}' is measured with $E_K = -10V$. Can be given by $G_V = 20 \log \left(\frac{8000}{ V_{F5} - V_{F5}' } \right)$
Common-Mode Rejection Ratio	V_{F6} is measured with both the SW_1 and SW_2 set to ON, the SW_3 set to OFF, $E_K = 0V$ and $E_C = 5V$. V_{F6}' is measured with $E_C = -5V$. Can be given by $CMR = 20 \log \left(\frac{4000}{ V_{F6} - V_{F6}' } \right)$
Supply Voltage Rejection Ratio I	V_{F7} is measured with both the SW_1 and SW_2 set to ON, the SW_3 set to OFF, $E_K = E_C = 0V$ and $V_{CC} = 10V$. Can be given by $SVR(+)= \frac{ V_{F7} - V_{F2} }{2 \times 10^3}$
Supply Voltage Rejection Ratio II	V_{F8} is measured with both the SW_1 and SW_2 set to ON, the SW_3 set to OFF, $E_K = E_C = 0V$ and $V_{EE} = -10V$. Can be given by $SVR(-)= \frac{ V_{F8} - V_{F2} }{2 \times 10^3}$

Note) When not specified in the above table, $V_{CC} = 15V$ and $V_{EE} = -15V$.

Test Circuit 2 ($V_{O(max)}$)



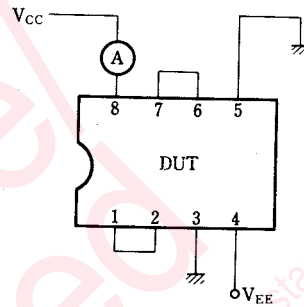
Test Circuit 3 (V_{CM})



$V_{CC}=15V$
 $V_{EE}=-15V$
 $R_S=200\Omega$
 $R_f=2k\Omega$

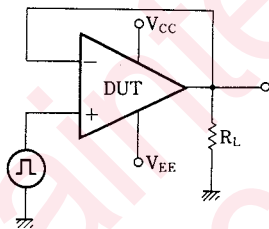
Note) Apply a voltage of $|V_{in^+}| > 12V$ and check $V_o = V_{in^+} + \frac{R_f}{R_s}(V_{in^+} - V_{in^-})$

Test Circuit 4 (P_C)



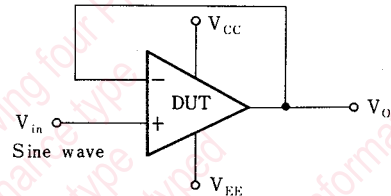
$V_{CC}=15V$
 $V_{EE}=-15V$

Test Circuit 5 (SR)

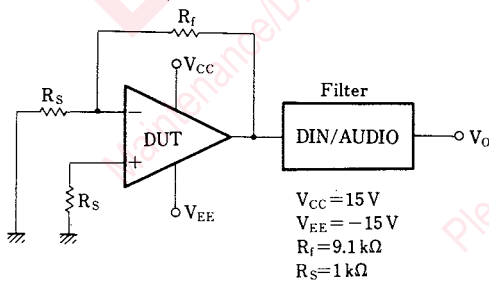


$V_{CC}=15V$
 $V_{EE}=-15V$
 $R_L=2k\Omega$

Test Circuit 6 ($f_{(T)}$)



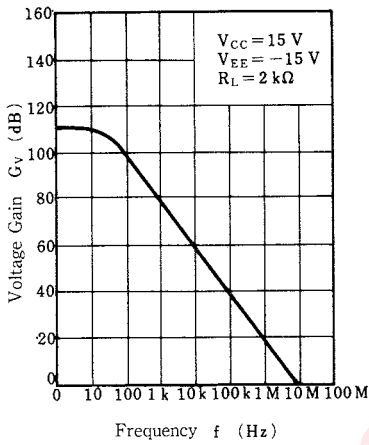
Test Circuit 7 (V_{ni})



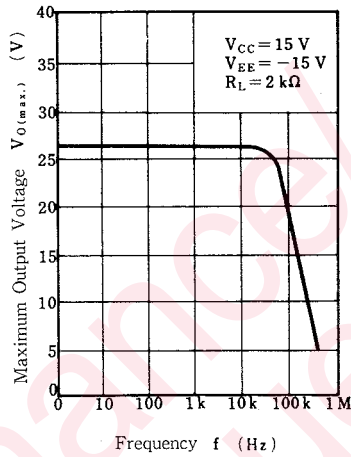
$V_{CC}=15V$
 $V_{EE}=-15V$
 $R_f=9.1k\Omega$
 $R_S=1k\Omega$

Note) A noise voltage referred to Input: $V_{ni} = \frac{V_o}{(1 + R_f/R_s)}$ (V) is given.

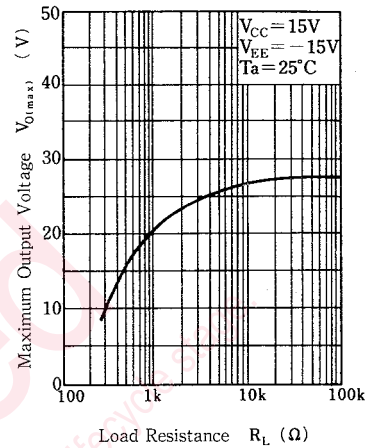
$G_v - f$



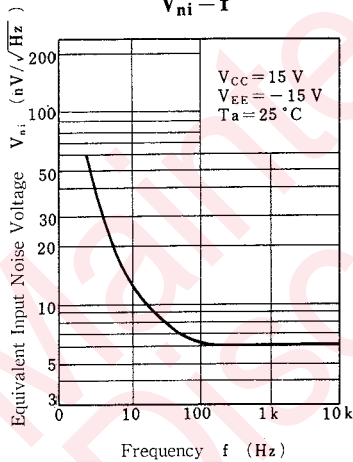
$V_{O(max.)} - f$



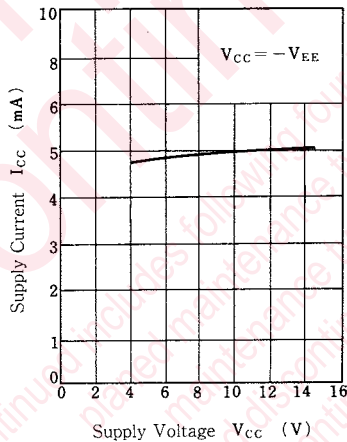
$V_{O(max.)} - R_L$



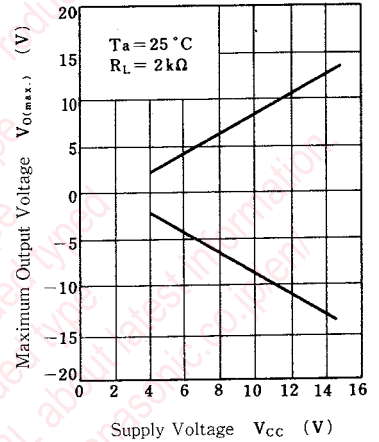
$V_{ni} - f$



$I_{CC} - V_{CC}$

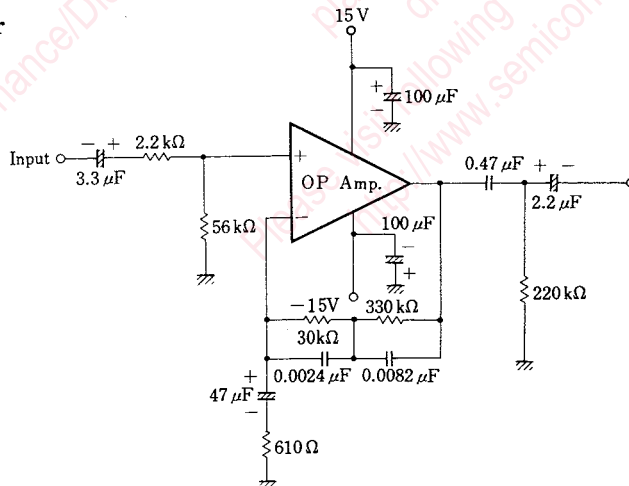


$V_{O(max.)} - V_{CC}$



Application Circuit

RIAA Amplifier



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