

AN1833, AN1833S

Low Noise, High Slew Rate Operational Amplifiers

■ Outline

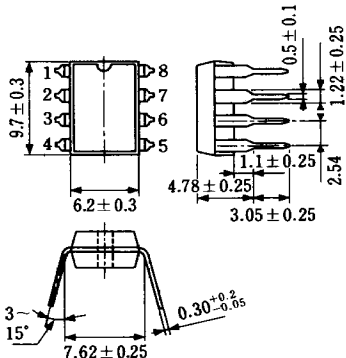
The AN1833 and the AN1833S are low noise, high slew rate type dual operational amplifiers with phase compensation circuits built-in. They have wide band and high stability, and suited for application to various electronic circuits such as active filters and audio preamplifiers.

■ 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

AN1833

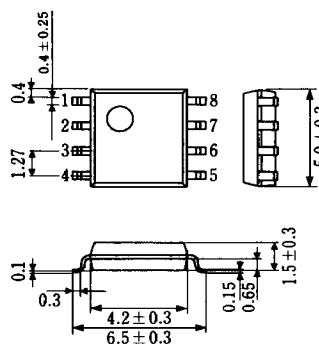
Unit : mm



8-Lead DIL Plastic Package

AN1833S

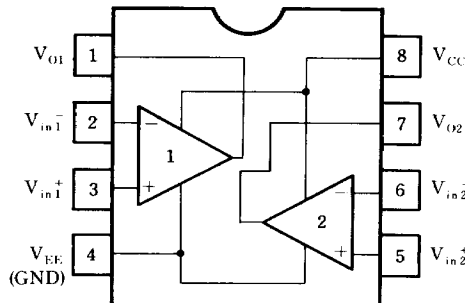
Unit : mm



8-Lead PANAFLAT Package(SO-8D)

■ Block Diagram

AN1833
AN1833S



■ 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}

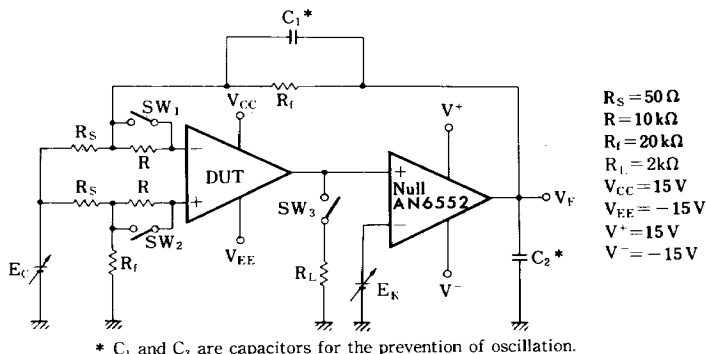
■ Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

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}	$-20 \sim +75$	$^\circ\text{C}$
Storage Temperature	AN1833	T_{stg}	$-55 \sim +150$	$^\circ\text{C}$
	AN1833S		$-55 \sim +125$	

■ Electrical Characteristics ($V_{CC} = 15\text{V}$, $V_{EE} = -15\text{V}$, $T_a = 25^\circ\text{C}$)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Input Offset Voltage	$V_{I(offset)}$	1	$R_s \leq 10\text{k}\Omega$		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	$R_L \geq 10\text{k}\Omega$	± 12	± 13.5		V
Maximum Output Voltage	$V_{O(max.)}$	2	$R_L \geq 2\text{k}\Omega$	± 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	$R_L = \infty$		150	240	mW
Slew Rate	SR	5	$R_L \geq 2\text{k}\Omega$		6		V/ μs
Unity-gain Band Width	$f_{(T)}$	6	$A_v = 1$		7		MHz
Equivalent Input Noise Voltage	V_{ni}	7	$R_s = 1\text{k}\Omega$, DIN/AUDIO		0.9		μV_{rms}

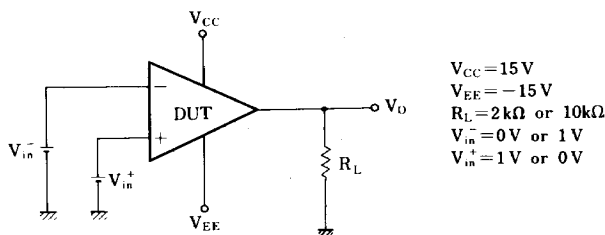
Test Circuit 1 ($V_{I(offset)}$, I_{IO} , I_{Bias} , G_V , CMR , SVR)



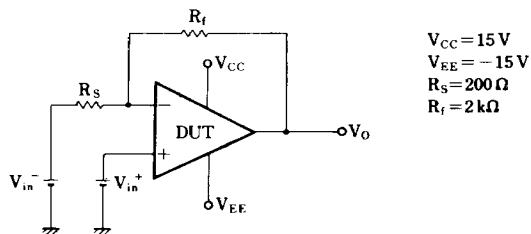
Item	Measurement Conditions
Input Offset Voltage	V_{F1} is measured with the SW_1 , SW_2 and SW_3 set to OFF and $E_C = E_K = 0V$. Can be given by $V_{I(offset)} = \frac{V_{F1}}{400} (V)$
Input Offset Current	V_{F2} is measured with the SW_1 and SW_2 set to ON, the SW_3 set to OFF and $E_C = E_K = 0V$. 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 ($V_{O(max)}$)

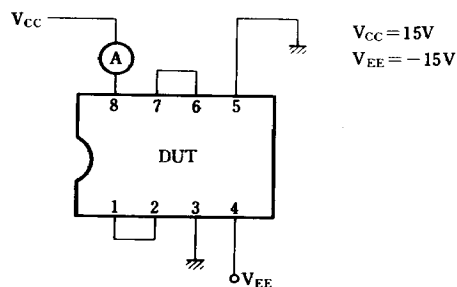


Test Circuit 3 (V_{CM})

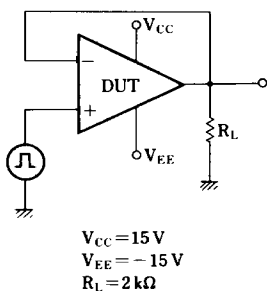


Note) Apply a voltage of $|V_{in+}| > 12V$ and check $V_O = V_{in+} + \frac{R_f}{R_s}(V_{in+} - V_{in-})$

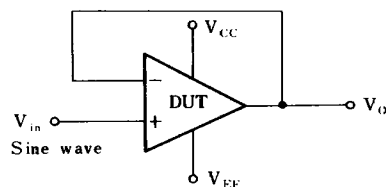
Test Circuit 4 (P_C)



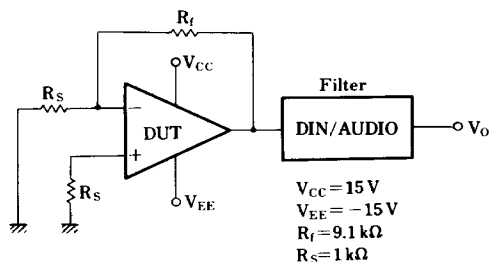
Test Circuit 5 (SR)



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

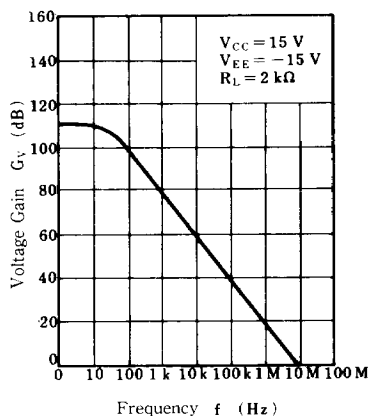


Test Circuit 7 (V_{ni})

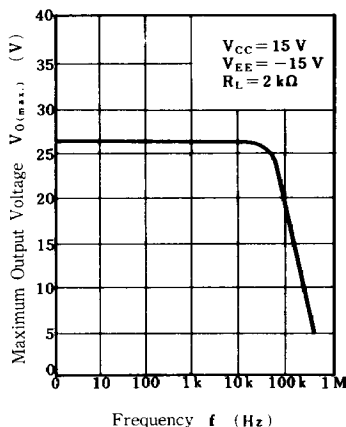


Note) A noise voltage referred to Input: $V_{ni} = \frac{V_O}{(1 + R_f/R_s)}$ (V) is given.

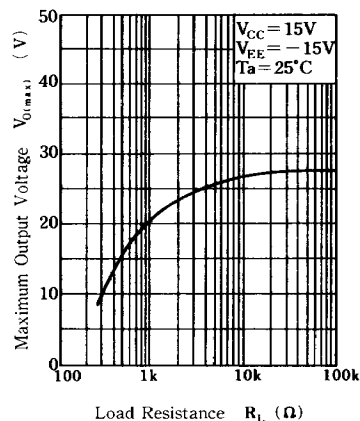
$G_V - f$



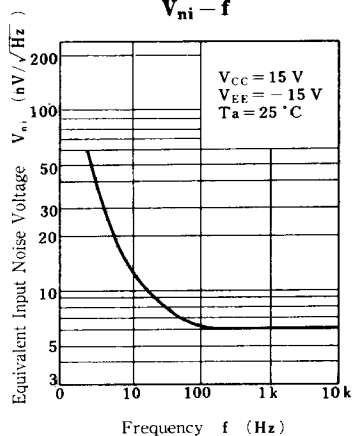
$V_{O(max.)} - f$



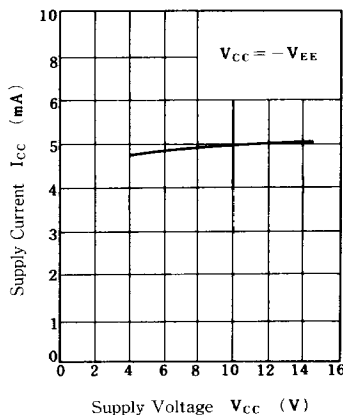
$V_{O(max.)} - R_L$



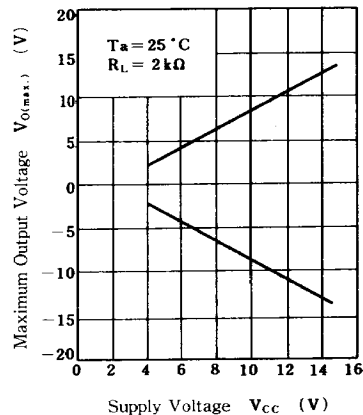
$V_{ni} - f$



$I_{CC} - V_{CC}$



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



Application Circuit

RIAA Amplifier

