AN1741 (AN6570), AN1741S (AN6570S), AN6573

Single Operational Amplifiers

■ Outline

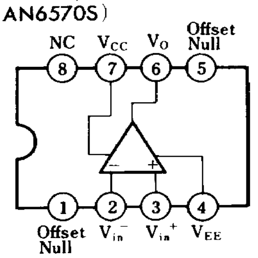
The AN1741 (AN6570), the AN1741S (AN6570S), and the AN6573 are single type operational amplifier with a phase compensation circuit built-in and also an output short-circuit protection circuit built-in, so that they are highly stable and can be used widely in various electronic circuits.

■ Features

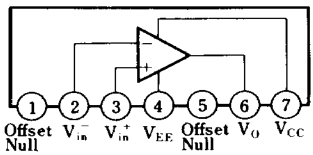
- Phase compensation circuit
- High common mode input range, no latch-up
- Short circuit protection
- Low input offset voltage : $V_{I(offset)}=0.5$ mV typ.
- Low input offset current : $I_{IO}=10$ nA typ.
- Offset nulling circuit

■ Block Diagrams

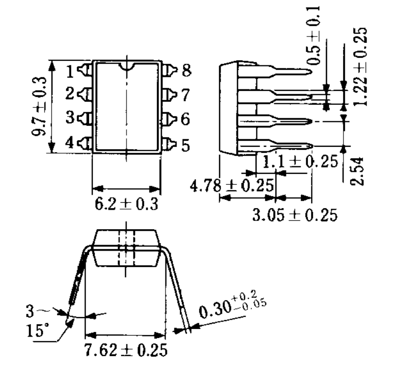
AN1741 (AN6570)
AN1741S (AN6570S)



AN6573

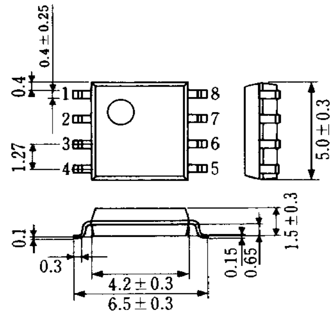


AN1741 (AN6570) Unit : mm



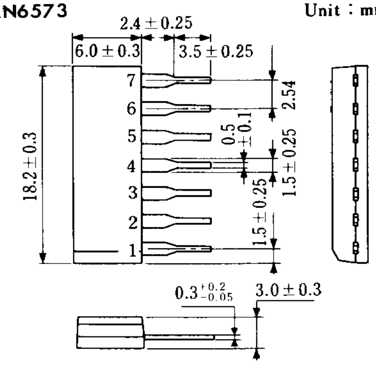
8-Lead DIL Plastic Package

AN1741S (AN6570S) Unit : mm



8-Lead PANAFLAT Package(SO-8D)

AN6573 Unit : mm



7-Lead SIL Plastic Package

Panasonic

■ Pin

<AN1741 (AN6570), AN1741S (AN6570S)>

Pin No.	Pin Name
1	Offset Null
2	Invert Input
3	Non Invert Input
4	V_{EE}
5	Offset Null
6	Output
7	V_{CC}
8	NC

<AN6573>

Pin No.	Pin Name
1	Offset Null
2	Invert Input
3	Non Invert Input
4	V_{EE}
5	Offset Null
6	Output
7	V_{CC}

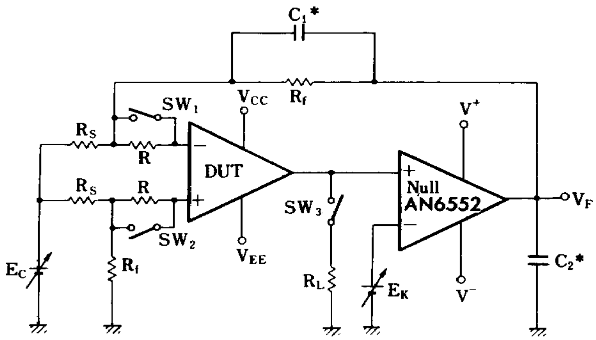
■ Absolute Maximum Ratings (Ta = 25℃)

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	AN1741 (AN6570), AN6573	P_D	500	mW
	AN1741S (AN6570S)		360	
Operating Ambient Temperature		T_{opr}	−20 ~ +75	℃
Storage Temperature	AN1741 (AN6570), AN6573	T_{stg}	−55 ~ +150	℃
	AN1741S (AN6570S)		−55 ~ +125	

■ Electrical Characteristics (V_{CC} = 15V, V_{EE} = −15V, Ta = 25℃)

Item	Symbol	Test Circuit	Condition	min.	typ.	max.	Unit
Input Offset Voltage	$V_{I(offset)}$	1	$R_S \leqq 10k\Omega$		0.5	4	mV
Input Offset Current	I_{IO}	1			10	100	nA
Input Bias Current	I_{Bias}	1			50	250	nA
Voltage Gain	G_V	1	$R_L \geqq 2k\Omega$, $V_O = \pm 10V$	86	106		dB
Maximum Output Voltage	$V_{O(max.)}$	2	$R_L \geqq 10k\Omega$	±12	±14		V
		2	$R_L \geqq 2k\Omega$	±10	±13		V
Common-Mode Input Voltage Width	V_{CM}	3		±12	±13		V
Common-Mode Rejection Ratio	CMR	1	$R_S \leqq 10k\Omega$	70	90		dB
Supply Voltage Rejection Ratio	SVR	1	$R_S \leqq 10k\Omega$		30	150	μV/V
Supply Current	I_{CC}	4	$R_L = \infty$			2.8	mA
Power Consumption	P_C	4	$R_L = \infty$			85	mW
Output Short-Circuit Current	$I_{O(short)}$	2			±20		mA
Slew Rate	SR	5			0.7		V/μs

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



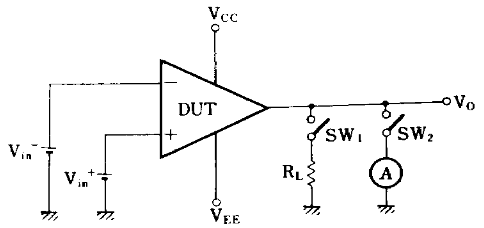
$R_S = 50\,\Omega$
$R = 10\,k\Omega$
$R_f = 20\,k\Omega$
$V_{CC} = 15\,V$
$V_{EE} = -15\,V$
$V^+ = 15\,V$
$V^- = -15\,V$

* C_1 and C_2 are capacitors for the prevention of oscillation.

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 $I_{IO} = \frac{\mid V_{F2} - V_{F1} \mid}{4 \times 10^6}$ (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. $I_{Bias} = \frac{\mid V_{F3} - V_{F4} \mid}{8 \times 10^6}$ (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_F'$_5$ is measured with $E_K = -10V$. Can be given by $G_V = 20\log\left(\frac{8000}{\mid V_{F5} - V_F'_5 \mid}\right)$
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 $CMR = 20\log\left(\frac{4000}{\mid V_{F6} - V_F'_6 \mid}\right)$
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 $SVR(+) = \frac{\mid V_{F7} - V_{F2} \mid}{2 \times 10^3}$
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 $SVR(-) = \frac{\mid V_{F8} - V_{F2} \mid}{2 \times 10^3}$

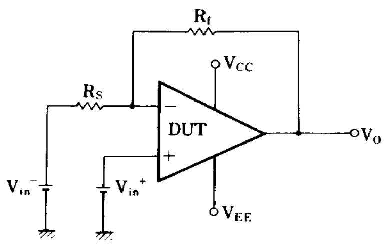
Note) When not specified in the above table, $V_{CC} = 15V$ and $V_{EE} = -15V$.

Test Circuit 2 ($V_{O(max.)}$, $I_{O(short)}$)



$V_{CC}=15V$
$V_{EE}=-15V$
$R_L=2k\Omega$ or $10k\Omega$
$V_{O(max.)}$: SW_1 : ON, SW_2 : OFF
$I_{O(short)}$: SW_1 : OFF, SW_2 : ON

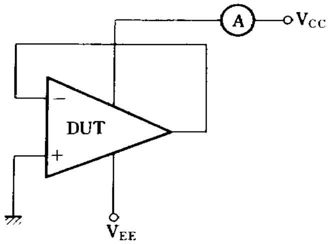
Test Circuit 3 (V_{CM})



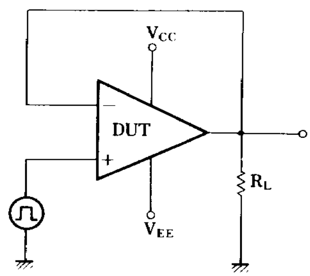
$V_{CC}=15V$
$V_{EE}=-15V$
$R_S=200\Omega$
$R_f=2k\Omega$

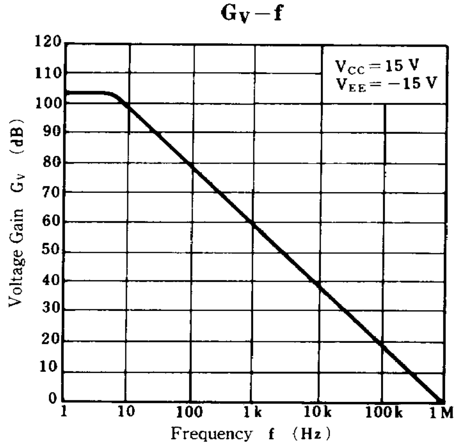
Note) Apply a voltage of $|V_{in}^+|>12V$ and check $V_o=V_{in}^+ + \frac{R_f}{R_s}(V_{in}^+ - V_{in}^-)$

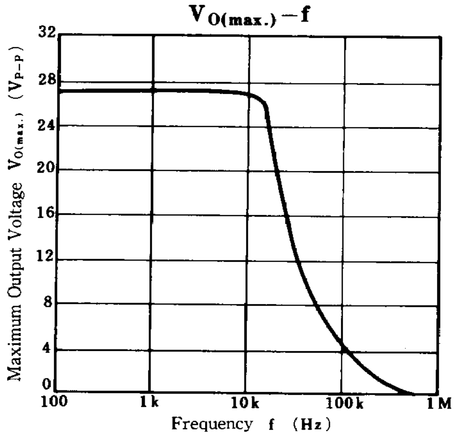
Test Circuit 4 (I_{CC}, P_C)

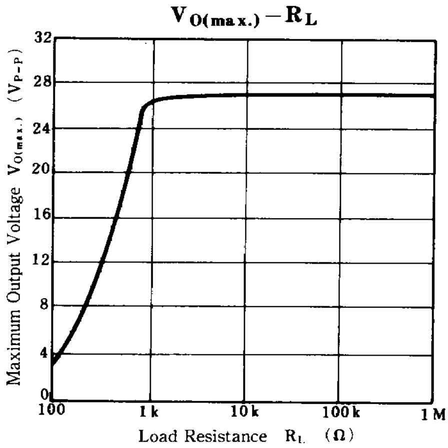


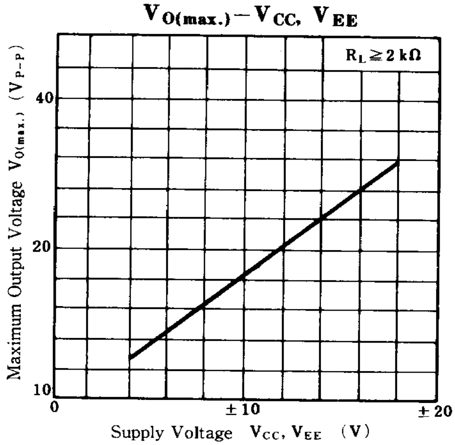
Test Circuit 5 (SR)

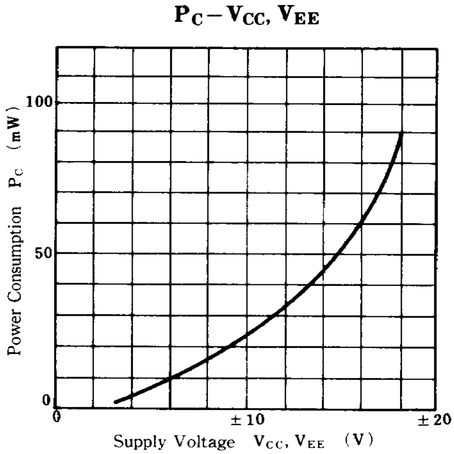


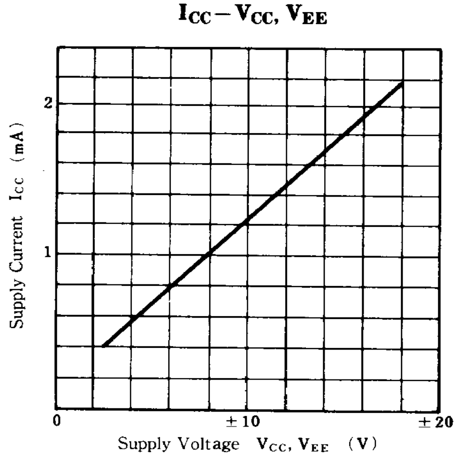

$G_V - f$
$V_{CC} = 15$ V
$V_{EE} = -15$ V
Voltage Gain G_V (dB)
Frequency f (Hz)
120
110
100
90
80
70
60
50
40
30
20
10
0
1
10
100
1 k
10 k
100 k
1 M

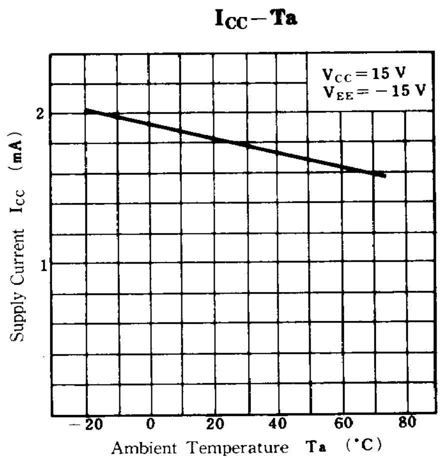

$V_{O(max.)} - f$
Maximum Output Voltage $V_{O(max.)}$ (V_{P-P})
Frequency f (Hz)
32
28
24
20
16
12
8
4
0
100
1 k
10 k
100 k
1 M

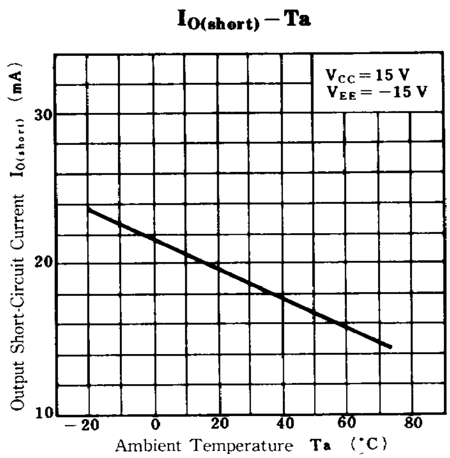

$V_{O(max.)} - R_L$
Maximum Output Voltage $V_{O(max.)}$ (V_{P-P})
Load Resistance R_L (Ω)
32
28
24
20
16
12
8
4
0
100
1 k
10 k
100 k
1 M

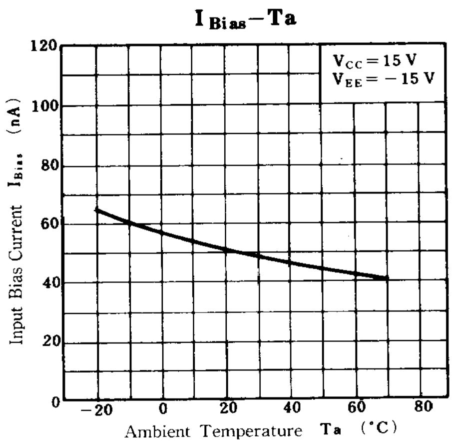

$V_{O(max.)} - V_{CC}, V_{EE}$
$R_L \geqq 2$ kΩ
Maximum Output Voltage $V_{O(max.)}$ (V_{P-P})
Supply Voltage V_{CC}, V_{EE} (V)
40
20
10
0
±10
±20


$P_C - V_{CC}, V_{EE}$
Power Consumption P_C (mW)
Supply Voltage V_{CC}, V_{EE} (V)
100
50
0
0
±10
±20


$I_{CC} - V_{CC}, V_{EE}$
Supply Current I_{CC} (mA)
Supply Voltage V_{CC}, V_{EE} (V)
2
1
0
±10
±20







■ Application Circuit

Differential Amplifier