Preservo amplifier for CD players

BA6377K

The BA6377K is a preservo amplifier that generates RF, focus error and tracking error signals from the signals output by current output optical pickups. Using this IC in combination with the ROHM's DSP can significantly reduce the number of attached components for CD player servos and signal processing circuits.

●Applications

CD players

●Features

1) Internal focus search sequence, for better playability.
2) Internal disk defect detector.
3) Internal auto asymmetry circuit.
4) Internal APC circuit.
5) Internal focus protection against disk defects.

●Absolute maximum ratings (Ta = 25°C)

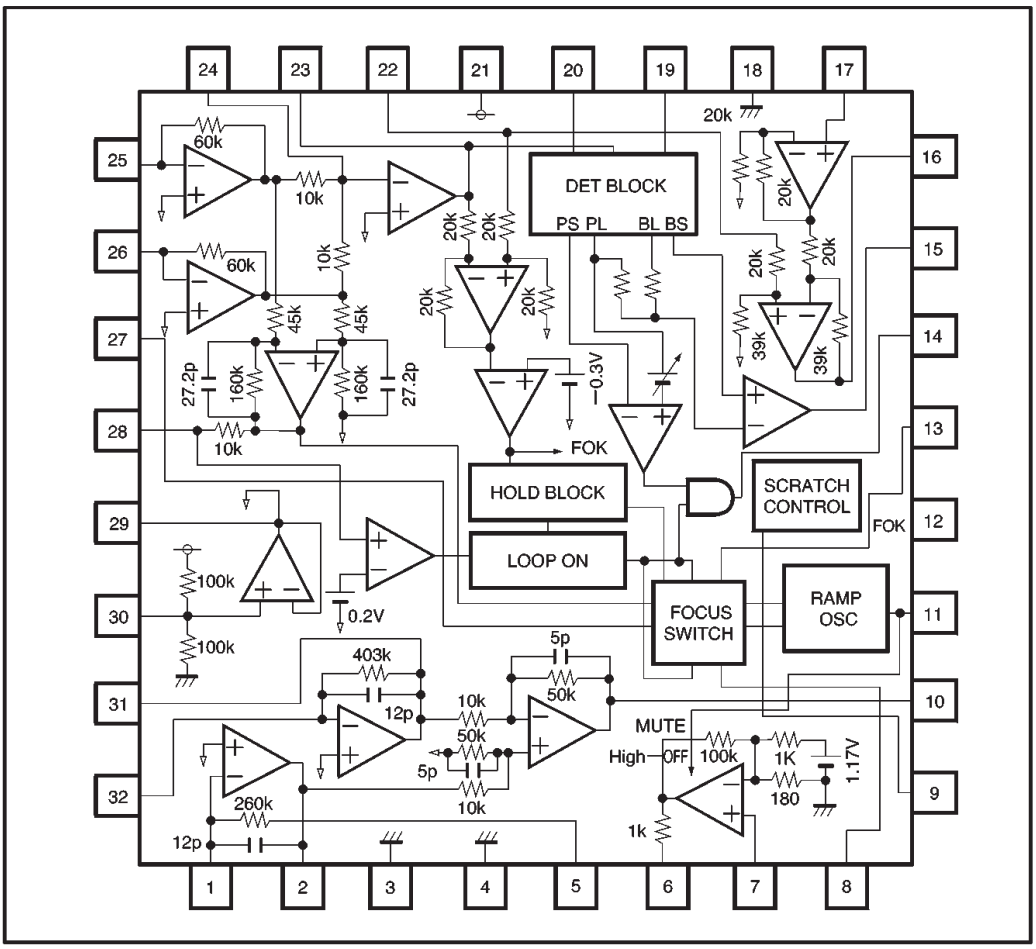
Parameter	Symbol	Limits	Unit
Power supply voltage	V_{CC}	9	V
Power dissipation	Pd	400*	mW
Operating temperature	Topr	−25～+75	℃
Storage temperature	Tstg	−55～+125	℃

* Reduced by 4.0 mW for each increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply voltage	V_{CC}	3.3	5.0	5.5	V

●Block diagram



●Pin descriptions

Pin No.	Pin name	Function
1	F	FI-V amplifier current input
2	FO	FI-V amplifier output
3	AGND	Analog ground
4	DGND	Digital ground
5	FI	FI-V amplifier gain adjustment feedback
6	LD	APC amplifier output
7	PD	APC amplifier input
8	R / H	Attached ramp wave/loop-off capacitor
9	SC	Attached scratch depth adjustment resistor
10	TE	Tracking error output
11	FON	Focus-on control
12	FOK	Focus OK comparator output
13	FE	Focus error output
14	DEFECT	Defect signal output
15	MIRR	Mirror signal output
16	EFM	EFM signal output

Pin No.	Pin name	Function
17	ASY	Auto asymmetry control input
18	DETGND	Detector ground
19	BLH	Attached bottom-long capacitor
20	PLH	Attached peak-long capacitor
21	Vcc	Power supply
22	RFI	RF output capacity coupled reinput
23	RFO	RF summing amplifier output
24	RF−	RF summing amplifier feedback input
25	BD	(B+D) I-V amplifier current input
26	AC	(A+C) I-V amplifier current input
27	FEB	Focus error bias input
28	FEC	Attached focus error low-bias capacitor
29	VBO	Bias amplifier output
30	VBI	Bias amplifier input
31	EO	EI-V amplifier output
32	E	EI-V amplifier current input

●Electrical characteristics (unless otherwise noted, Ta = 25°C, V_{CC} = 5V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Quiescent current	I_Q	—	9.5	13.5	mA	—
〈Bias amplifier〉						
Bias voltage	V_B	2.30	2.50	2.70	V	—
Maximum output (HIGH)	I_{OH}	5.0	—	—	mA	Maximum bias differential = 200 mV
Maximum output (LOW)	I_{OL}	5.0	—	—	mA	Maximum bias differential = 200 mV
〈RF amplifier〉						
Output offset voltage	V_{OFRF}	−110	—	160	mV	—
Voltage gain	G_{RF}	27	30	33	dB	V7=1.5V, SG4=30mV$_{P-P}$, 1kHz
Maximum output amplitude (HIGH)	V_{OHRF}	2.00	2.30	—	V	Simultaneous input of AC and BD V8=1/2V_{CC}±0.2V
Maximum output amplitude (LOW)	V_{OLRF}	—	−0.6	−0.3	V	
〈FE amplifier〉						
Output offset voltage	V_{OFFE}	−100	—	100	mV	—
Voltage gain (AC)	G_{FEAC}	29.5	32.5	35.5	dB	SG4=30mV$_{P-P}$, 1kHz
Voltage gain (BD)	G_{FEBD}	29.5	32.5	35.5	dB	SG4=30mV$_{P-P}$, 1kHz
Voltage gain differential	ΔG_{FE}	−3	0	3	dB	—
Maximum output amplitude (HIGH)	V_{OHTE}	2.00	2.30	—	V	Separate measurement of inputs AC and BD V8=1/2V_{CC}±0.2V
Maximum output amplitude (LOW)	V_{OLTE}	—	−2.30	−2.00	V	
〈TE amplifier〉						
Output offset voltage	V_{OFTE}	−60	—	60	mV	—
Voltage gain (E)	G_{TEE}	11	14	17	dB	SG1=100mV$_{P-P}$, 1kHz
Voltage gain (F)	G_{TEF}	11	14	17	dB	SG1=100mV$_{P-P}$, 1kHz
Voltage gain differential	ΔG_{TE}	−3	0	3	dB	—
Maximum output amplitude (HIGH)	V_{OHTE}	2.00	2.30	—	V	Separate measurement of inputs E and F V1=1/2V_{CC}±0.8V
Maximum output amplitude (LOW)	V_{OLTE}	—	−2.30	−2.00	V	
〈FOK comparator〉						Pin 22 input
Threshold voltage	V_{THFK}	0.2	0.3	0.4	V	Bias reference
Output high level voltage	V_{OHFK}	4.5	—	—	V	V6=1/2V_{CC}−0.4V
Output low level voltage	V_{OLFK}	—	—	0.6	V	V6=1/2V_{CC}−0.2V
Maximum operating frequency	F_{MXFK}	45	—	—	kHz	—
〈Asymmetry amplifier)						
Output offset voltage	V_{OFAS}	−60	—	60	mV	—
Voltage gain (1)	G_{1AS}	3	6	9	dB	Pin 22 input, 100mV$_{P-P}$, 1kHz
Voltage gain (2)	G_{2AS}	8.5	11.5	14.5	dB	Pin 17 input, 100mV$_{P-P}$, 1kHz
Maximum output amplitude (HIGH)	V_{OHAS}	1.30	1.60	—	V	Pin 22 or 17 input V5=1/2V_{CC}±0.8V V6=1/2V_{CC}±1.2V
Maximum output amplitude (LOW)	V_{OLAS}	—	−1.4	−1.0	V	
〈APC amplifier〉						
Output voltage (1)	V_{O1AP}	4.0	4.5	—	V	Pin 7 input 220 mV
Output voltage (2)	V_{O2AP}	—	0.9	1.5	V	Pin 7 input 160 mV
Maximum output amplitude (HIGH)	V_{OHAP}	4.2	4.5	—	V	Pin 7 input 300 mV
Maximum output amplitude (LOW)	V_{OLAP}	—	1.9	2.2	V	Pin 7 input 0V with 0.8mA flowing through Pin 6

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
〈Mirror detector〉						
Output high level voltage	V_{OHMR}	4.5	—	—	V	—
Output low level voltage	V_{OLMR}	—	—	0.5	V	—
Minimum operating frequency	F_{MNMR}	—	—	600	Hz	Pin 23=1.5V_{P-P}
Maximum operating frequency	F_{MXMR}	30	—	—	kHz	Pin 23=1.5V_{P-P}
Minimum operating input voltage	V_{MNMR}	—	—	0.2	V_{P-P}	Pin 23=1kHz
Maximum operating input voltage	V_{MXMR}	1.8	—	—	V_{P-P}	Pin 23=1kHz
〈Defect detector〉						
Output high level voltage	V_{OHDF}	4.5	—	—	V	—
Output low level voltage	V_{OLDF}	—	—	0.5	V	—
Minimum operating frequency	F_{MNDF}	—	—	1	kHz	Pin 23=1.5V_{P-P}
Maximum operating frequency	F_{MXDF}	2	—	—	kHz	Pin 23=1.5V_{P-P}
Minimum operating input voltage	V_{MNDF}	—	—	0.5	V_{P-P}	Pin 23=1kHz
Maximum operating input voltage	V_{MXDF}	1.8	—	—	V_{P-P}	Pin 23=1kHz
Pin 9 voltage	V9	0.95	1.20	1.45	V	—
〈Ramp generator circuit〉						
Capacitance charging current	I_{SIRA}	−3.45	−2.50	−1.85	μA	—
Capacitance discharging current	I_{SORA}	20.0	27.0	34.0	μA	—
High level limit voltage	V_{LHRA}	0.24	0.44	0.64	V	Bias reference
Low level limit voltage	V_{LLRA}	−0.64	−0.44	−0.24	V	Bias reference
〈FON pin〉						
Sink current	I_{IFON}	18.0	27.0	36.0	μA	—
Input threshold voltage	V_{THFO}	1.30	1.65	2.00	V	—
〈Loop on〉						
Loop off delay time	t_{OFLO}	3.8	5.5	8.5	msec	—

* When FON is LOW, pin 8 voltage is 1/2 Vcc.
* The ramp wave begins at the bottom.
* The loop will not turn on when the ramp wave is at the bottom.
* Pin 8 is charged rapidly when the loop turns on.

●Measurement circuit

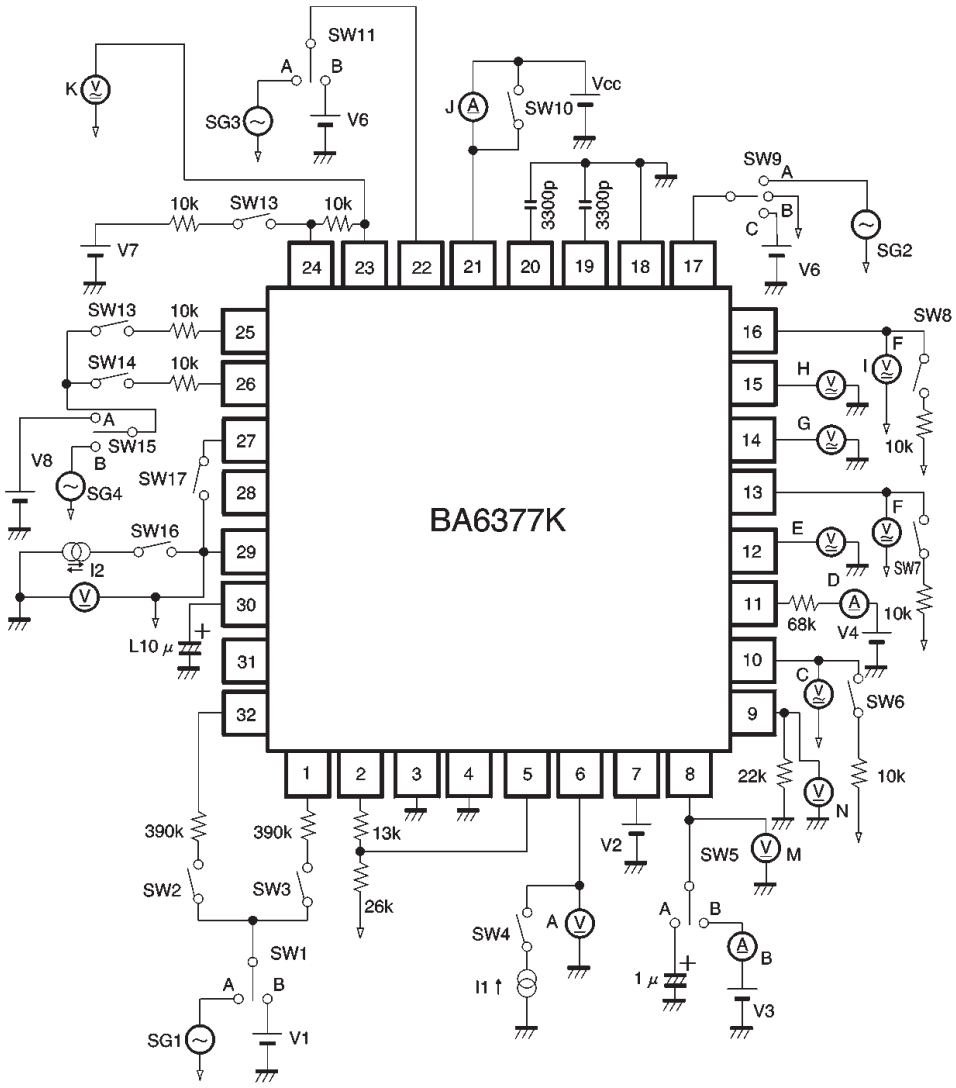


Fig.1

●Circuit operation

Focus search sequence operations

When the loop turns on

The focus loop turns on when the fall of FEC is detected while FOK is at the HIGH level.

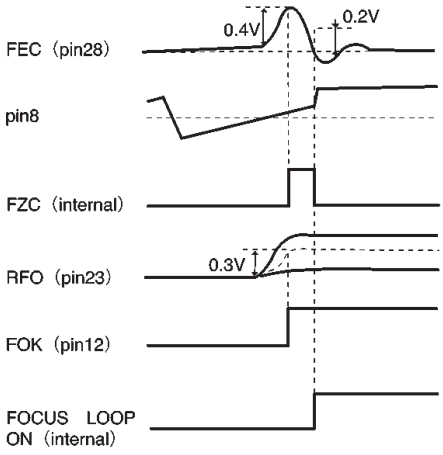


Fig.2

When the loop turns off

The focus loop turns off after the elapse of a delay (T[S], see below) after FOK changes to the LOW state.

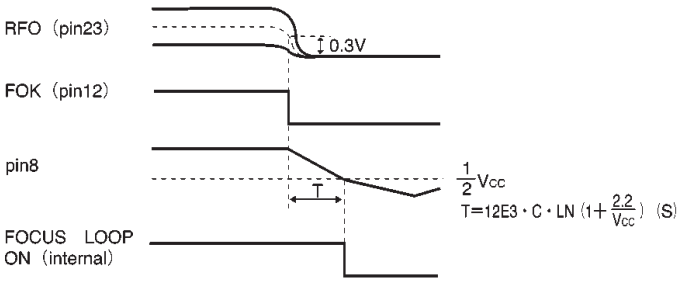


Fig.3

●Application example

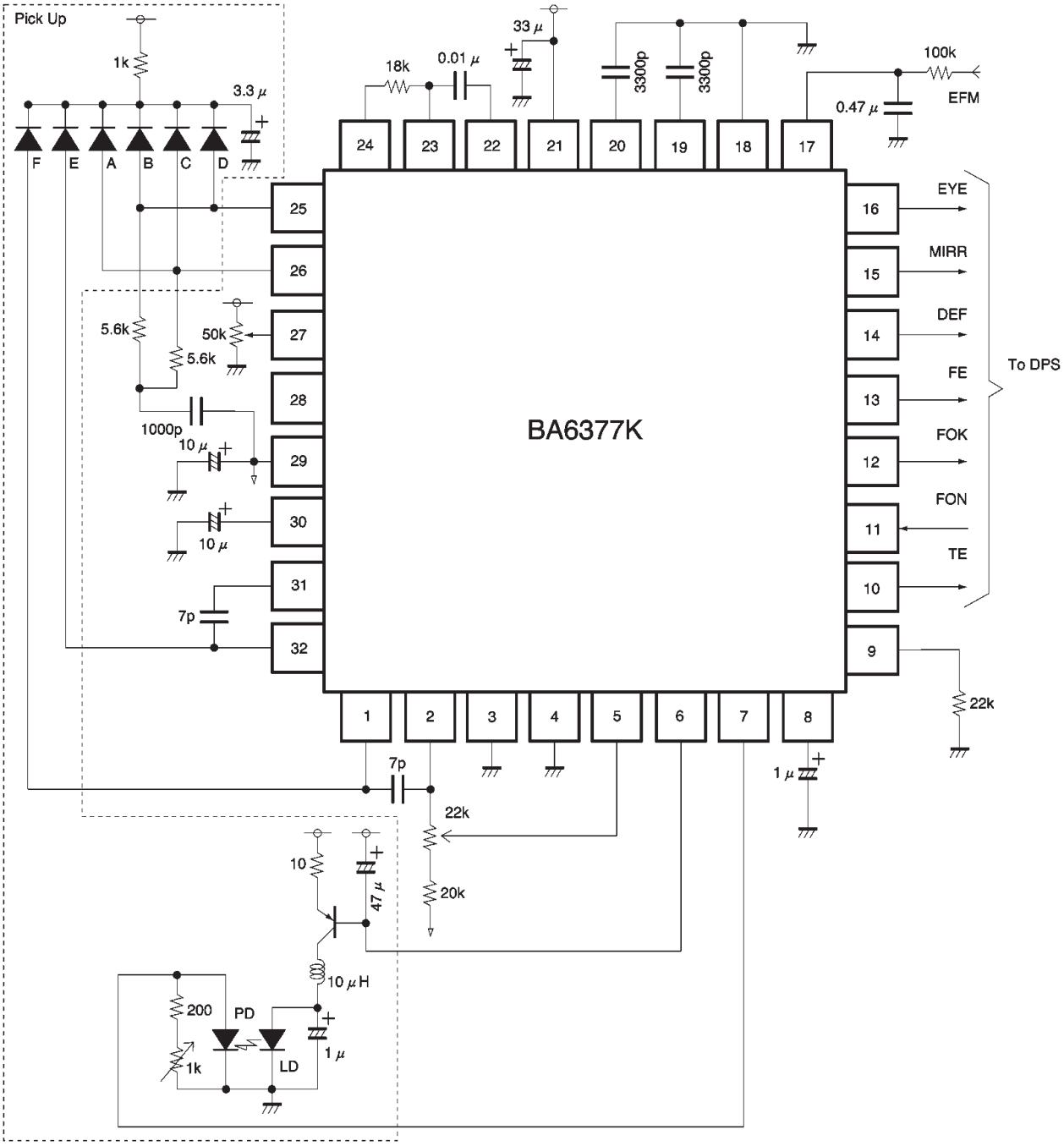


Fig.4

●Electrical characteristic curves

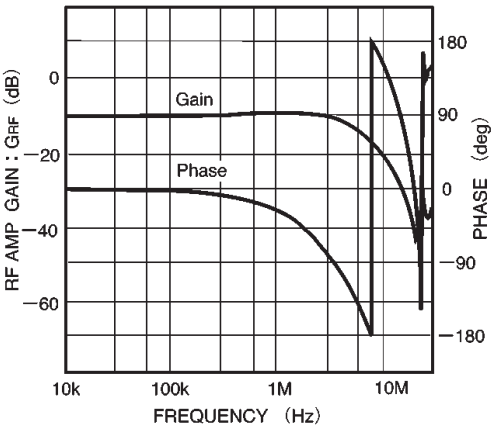


Fig. 5 Radio frequency amplifier frequency characteristics

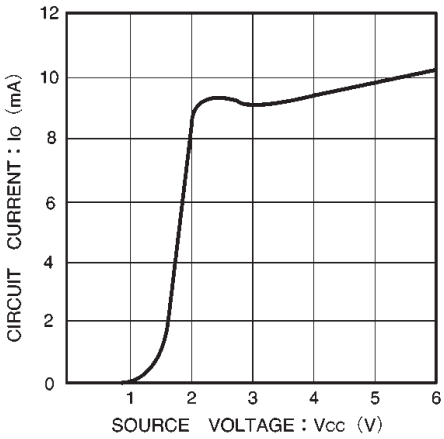


Fig. 6 Power supply voltage vs. suppiy current

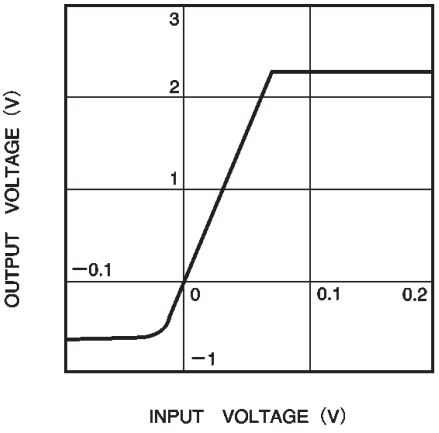


Fig. 7 RF amplifier I/O characteristics

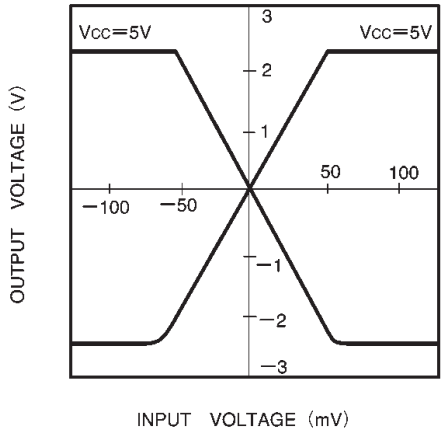


Fig. 8 FE amplifier I/O characteristics

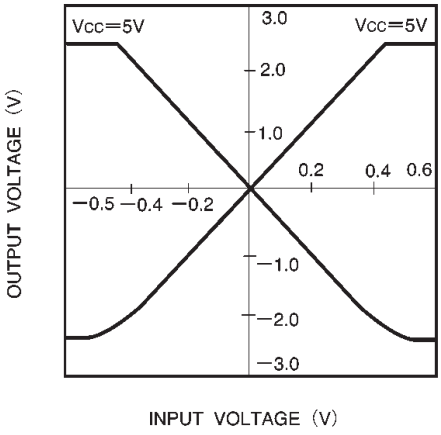


Fig. 9 TE amplifier I/O characteristics

●External dimensions (Units: mm)