# Dual ground sense operational amplifier

## BA10358 / BA10358F / BA10358FV / BA10358N

The BA10358, BA10358F, BA10358FV, and BA10358N are monolithic ICs with two independent built-in operational amplifiers featuring high gain and frequency compensation.
These products offer a particularly wide range of operating voltages, from 3 to 32V (when using a single power supply). Current dissipation is low and remains constant regardless of the power supply voltage. Available packages include an 8-pin DIP (BA10358), an 8-pin SOP (BA10358F), an 8-pin SSOP-B (BA10358FV), and an 8-pin SIP (BA10358N).

●Features

1) Can be driven with a single power supply.
2) Extremely low current dissipation.
3) Level is compatible with any kind of logic circuit.
4) Operating voltage range is 3 to 32V for single power supply, ±1.5 to ±16V for dual power supply.
5) High DC voltage gain.
6) Wide frequency response.
7) Pin assignments is the same as the general-purpose 4558 model.
8) Compatible with model 358 operation amplifiers of other manufacturers.

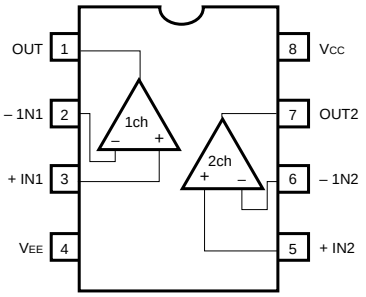
●Absolute maximum ratings

| Parameter | Symbol | Limits | | | | Unit |
|---|---|---|---|---|---|---|
| | | BA10358 | BA10358F | BA10358FV | BA10358N | |
| Power supply voltage | $V_{CC}$ | 32 (± 16) | 32 (± 16) | 32 (± 16) | 32 (± 16) | V |
| Power dissipation | Pd | 800* | 550* | 350* | 900* | mW |
| Differential input voltage | $V_{ID}$ | ± $V_{CC}$ | ± $V_{CC}$ | ± $V_{CC}$ | ± $V_{CC}$ | V |
| Common-mode input voltage | $V_I$ | – 0.3 ~ $V_{CC}$ | – 0.3 ~ $V_{CC}$ | – 0.3 ~ $V_{CC}$ | – 0.3 ~ $V_{CC}$ | V |
| Operating temperature | Topr | – 40 ~ +85 | – 40 ~ +85 | – 40 ~ +85 | – 40 ~ +85 | °C |
| Storage temperature | Tstg | – 55 ~ +125 | – 55 ~ +125 | – 55 ~ +125 | – 55 ~ +125 | °C |

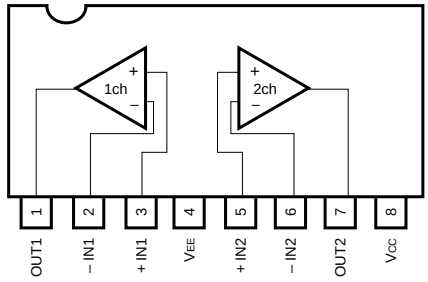
* Refer to the Pd characteristic diagram.
The values for the BA10358F are those when it is mounted on a glass epoxy board (50mm × 50mm × 1.6mm).
The values for the BA10358FV are those when it is mounted on a glass epoxy board (70mm × 70mm × 1.6mm).

●Block diagram

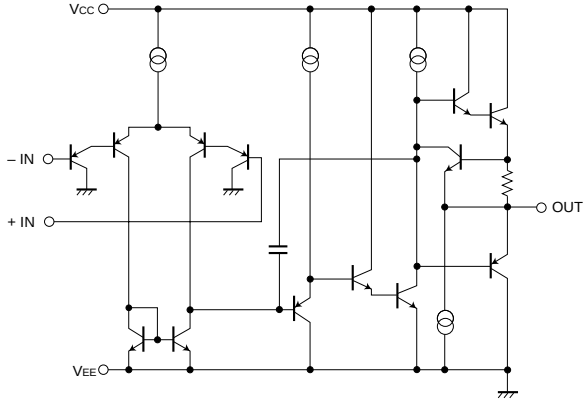
**BA10358 / BA10358F / BA10358FV**




**BA10358N**




●Internal circuit configuration (diagram shows only one channel)



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

| Parameter | | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|---|
| Input offset voltage | | $V_{IO}$ | — | 2 | 7 | mV | $R_S$ = 50Ω |
| Input offset current | | $I_{IO}$ | — | 5 | 50 | nA | — |
| Input bias current | | $I_B$ | — | 45 | 250 | nA | — |
| High-amplitude voltage gain | | $A_V$ | 25 | 100 | — | V / mV | $R_L \geqq$ 2kΩ, $V_{CC}$ = 15V |
| Common-mode input voltage | | $V_{ICM}$ | 0 | — | $V_{CC}$ – 1.5 | V | — |
| Output voltage | | $V_O$ | 0 | — | $V_{CC}$ – 1.5 | V | $R_L$ = 2kΩ |
| Common-mode rejection ratio | | CMRR | 65 | 80 | — | dB | — |
| Power supply voltage rejection ratio | | PSRR | 65 | 100 | — | dB | $R_S$ = 50Ω |
| Quiescent current | | $I_Q$ | — | 0.7 | 1.2 | mA | $R_L$ = ∞, on All Op - Amps |
| Channel separation | | CS | — | 120 | — | dB | f = 1 kHz input conversion |
| Maximum output current | source | $I_{source}$ | 10 | 20 | — | mA | $V_{IN^+}$ = 1V, $V_{IN^-}$ = 0V, $V_O$ = 0V |
| | sink | $I_{sink}$ | 10 | 20 | — | mA | $V_{IN^-}$ = 1V, $V_{IN^+}$ = 0V, $V_O$ = $V_{CC}$ |

●Electrical characteristic curves

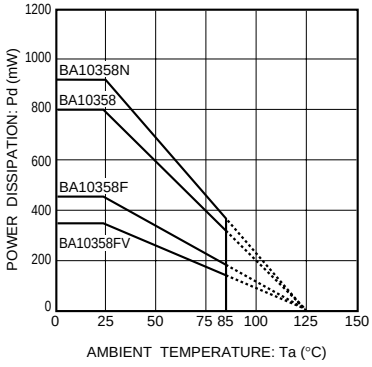



Fig. 1 Power dissipation vs. ambient temperature

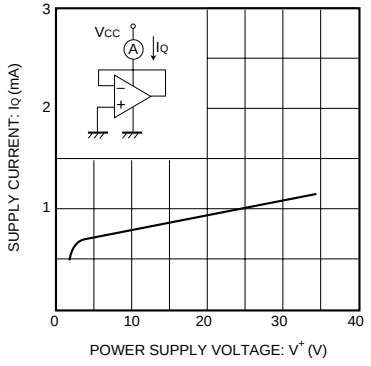



Fig. 2 Quiescent current vs. power supply voltage

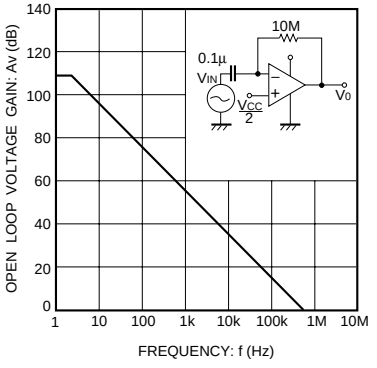



Fig. 3 Open loop voltage gain vs. frequency

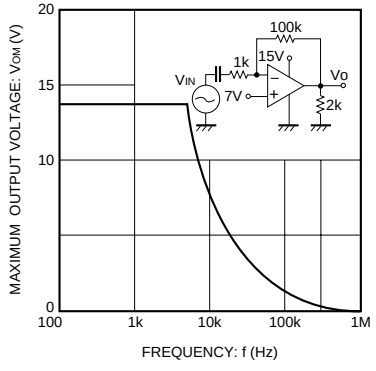



Fig. 4 Maximum output voltage vs.frequency

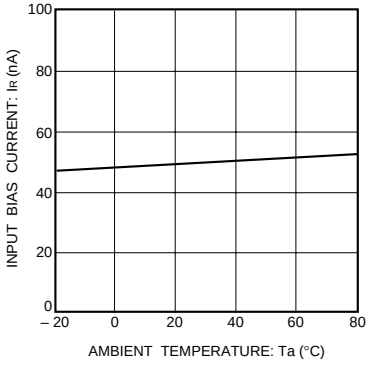



Fig. 5 Input bias current vs. ambient temperature

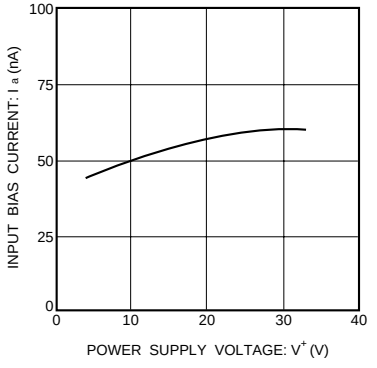



Fig. 6 Input bias current vs. power supply voltage

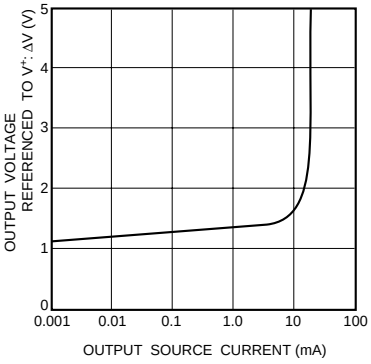



Fig. 7 Voltage difference during power supply output vs. output source current

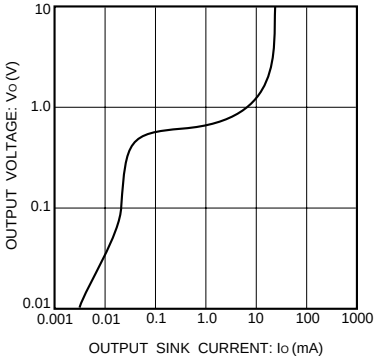



Fig. 8 Output voltage vs. output sink current

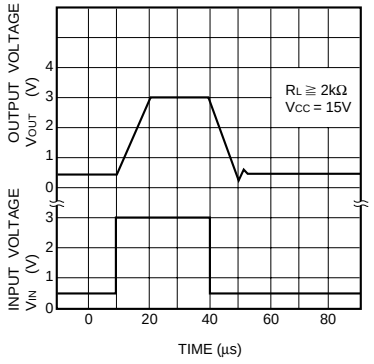



Fig. 9 Output response characteristics

●Operation notes

(1) Handling unused circuits

If there are any circuits which are not being used, we recommend making connections as shown in Figure 10, with the non-inverted input pin connected to the potential within the in-phase input voltage range ($V_{ICM}$).

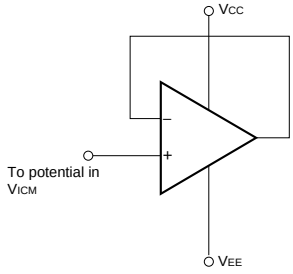
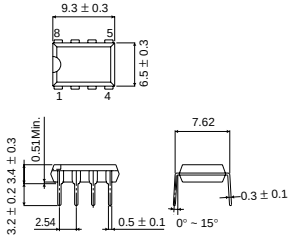



Fig. 10 Handling unused circuits

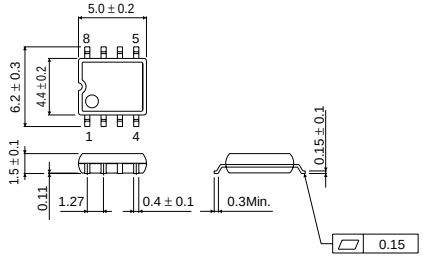
●External dimensions (Units: mm)

BA10358



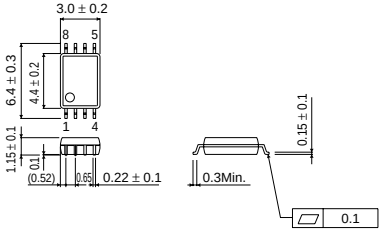

DIP8

BA10358F



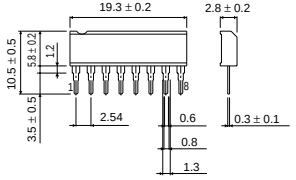

SOP8

BA10358FV




SSOP-B8

BA10358N




SIP8