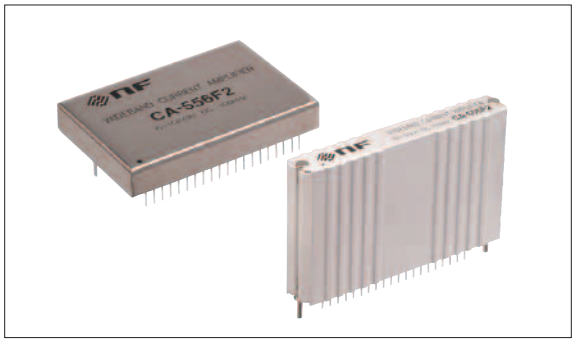
WIDEBAND CURRENT AMPLIFIER

CA-550 Series / CA-650 Series



CA-550 Series and CA-650 Series are low noise wideband current amplifiers (current to voltage converter) with a high gain.
There are the following 9 types depending on the gain and package type.
CA-550 Series is in a static-shielded 40-pin dual inline package. Low-profile mount is available.
CA-650 Series is in a static-shielded 20-pin single inline package. This series is suitable for space-saving, multi- channel and high-density mounting.

Model	CA-653F2	CA-554F2 CA-654F2	CA-555F2 CA-655F2	CA-556F2 CA-656F2	CA-557F2 CA-657F2
Gain (V/A)	1 M	10 M	100 M	1 G	10 G
Frequency Response	DC to 1 MHz	DC to 500 kHz	DC to 250 kHz	DC to 100 kHz	DC to 20 kHz
Equivalent Input Noise Current Density	150 fA/√Hz (typ.)	45 fA/√Hz (typ.)	15 fA/√Hz (typ.)	6 fA/√Hz (typ.)	2.5 fA/√Hz (typ.)

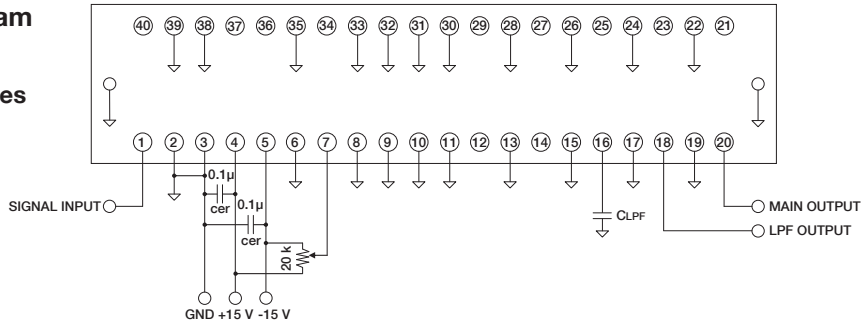
Maximum Absolute Rating: Power supply voltage (±Vs) ±18 V, Max. Input current ±30 mA, Max. input voltage at offset adjustment terminal ±Vs
Electrical Characteristics: Unless otherwise specified, power supply ±15 V, temperature 23°C ±5°C, and output load R_L=1 MΩ

Model		CA-653F2	CA-554F2 CA-654F2	CA-555F2 CA-655F2	CA-556F2 CA-656F2	CA-557F2 CA-657F2
Input Section						
Input type		DC coupling unbalanced, single-ended input				
Maximum input current		±10 μA	±1 μA	±100 nA	±10 nA	±1 nA
Input impedance *1		400 Ω	1 kΩ	3 kΩ	10 kΩ	30 kΩ
Recommended signal source resistance		100 kΩ or more	1 MΩ or more	10 MΩ or more	100 MΩ or more	1 GΩ or more
Input bias current *2		1 pA (typ.)				
Equivalent input noise current density *3		150 fA/√Hz (typ.)	45 fA/√Hz (typ.)	15 fA/√Hz (typ.)	6 fA/√Hz (typ.)	2.5 fA/√Hz (typ.)
Output Section						
Output type		DC coupling unbalanced, single-ended output				
Maximum output voltage *4		±10 V				
Maximum output current *4		±5 mA				
Output impedance *1		50 Ω±10%				
Output offset voltage *5		±3 mV			±5 mV	±15 mV
Output offset voltage adjustment range *5 *6		±15 mV *7				±20 mV *7
Amplification Section						
Gain (V/A) *8		1×10^6 (1 M) ±1%	1×10^7 (10 M) ±1%	1×10^8 (100 M) ±1%	1×10^9 (1 G) ±1%	1×10^{10} (10 G) ±1%
Output gain flatness (when setting fc 0, within ±0.5 dB) *9		DC to 100 kHz	DC to 50 kHz	DC to 25 kHz	DC to 10 kHz	DC to 2 kHz
$^{+0.5}_{-3}$ dB Frequency response (Cs=10 pF) *10		DC to 1 MHz	DC to 500 kHz	DC to 250 kHz	DC to 100 kHz	DC to 20 kHz
Polarity		Non-inverting				
Low pass filter output (Cut-off frequency setting: -3 dB)		100 kHz *11 *12	10 kHz *11 *12			1 kHz *11 *12
Others						
Operating power supply voltage range		±15 V ±1 V				
Quiescent current (with no signal)		±40 mA or less, ±32 mA (typ.)			±40 mA or less, ±27 mA (typ.)	
Performance guarantee temperature range		23°C ±5°C				
Temperature and humidity range	Operation	-20°C to 60°C 10 % to 90 % RH				
	Storage	-30°C to 80°C 10 % to 80 % RH				
RoHS		Directive 2011/65/EU				
Dimensions (mm)	CA-550 series (DIP)	59 (W) × 39 (D) × 10 (H)				
	CA-650 series (SIP)	66.7 (W) × 10.5 (D) × 40.8 (H)				
Weight		Approx. 40 g				

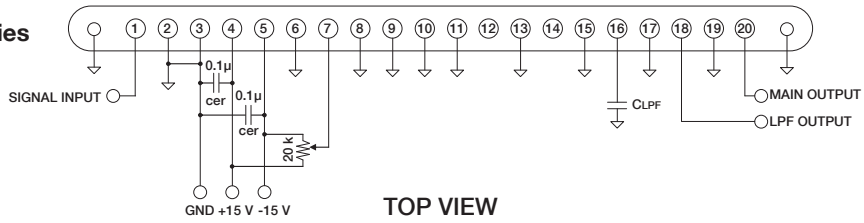
*1 Nominal values when f = 1 kHz, when f = 100 Hz for CA-557F2 and CA-657F2 *2 The input bias current approximately doubles as the temperature increases by +7 °C
*3 Measured with a Keysight 89410A equivalent when f = 1 kHz, when f = 100 Hz for CA-557F2 and CA-657F2 *4 Tolerance for distortion (THD) at 1 kHz is 0.3 % or less, and that at 100 Hz for CA-557F2 and CA-657F2 is 0.3 % or less *5 Input is opened. *6 Nominal values *7 Adjustment by using an external variable resistor *8 Measured with DC
*9 Reference frequency: f=10 Hz , f=1 Hz for CA-557F2 and CA-657F2 *10 "Cs" is an added input capacitance between input and GND. *11 Possible to change by using an external capacitor *12 Pin-16 is opened.

Basic connection diagram

● CA-550 Series



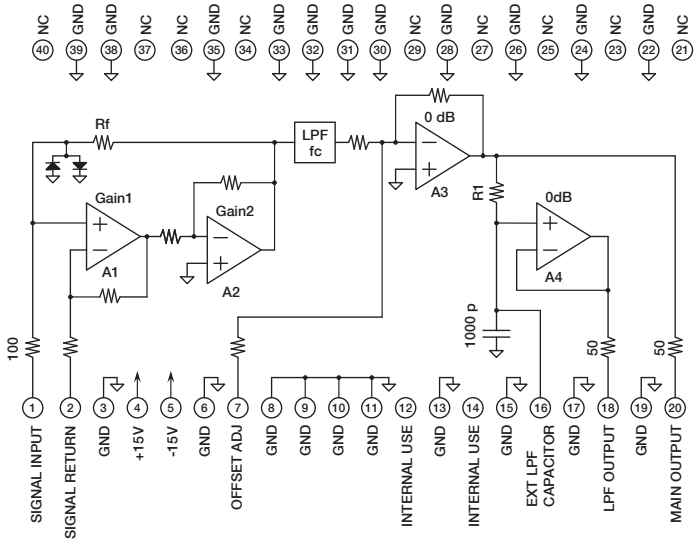
● CA-650 Series



TOP VIEW

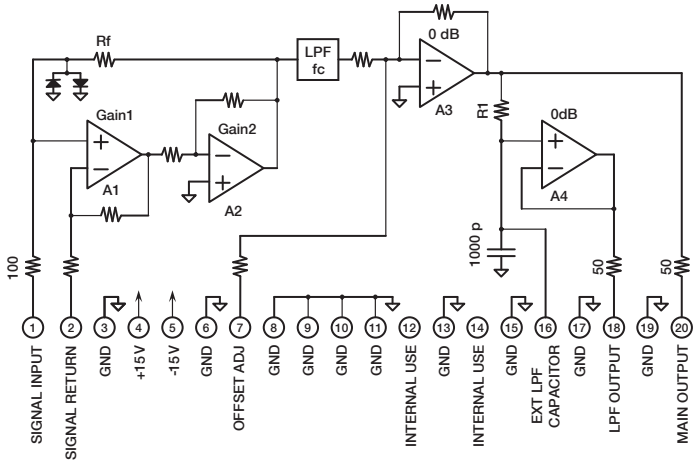
Block diagram

● CA-550 Series



Model	Rf	Gain1	Gain	fc	R1
554F2	10 MΩ	60 dB	20 dB	800 kHz	15.8 kΩ
555F2	100 MΩ	60 dB	30 dB	400 kHz	15.8 kΩ
556F2	1 GΩ	60 dB	40 dB	150 kHz	15.8 kΩ
557F2	10GΩ	60 dB	50 dB	40 kHz	158 kΩ

● CA-650 Series



Model	Rf	Gain1	Gain2	fc	R1
653F2	1 MΩ	50 dB	20 dB	1.2 MHz	1.58 kΩ
654F2	10 MΩ	60 dB	20 dB	800 kHz	15.8 kΩ
655F2	100 MΩ	60 dB	30 dB	400 kHz	15.8 kΩ
656F2	1 GΩ	60 dB	40 dB	150 kHz	15.8 kΩ
657F2	10GΩ	60 dB	50 dB	40 kHz	158 kΩ

Equation of external capacitor (EXT LPF CAPACITOR)

● CA-653F2

$$C_{LPF}\ [pF] = \frac{10^8}{Fc\ [Hz]} - 1000 \quad (Fc \le 100\ kHz)$$

● CA-554F2/555F2/556F2
CA-654F2/655F2/656F2

$$C_{LPF}\ [pF] = \frac{10^7}{Fc\ [Hz]} - 1000 \quad (Fc \le 10\ kHz)$$

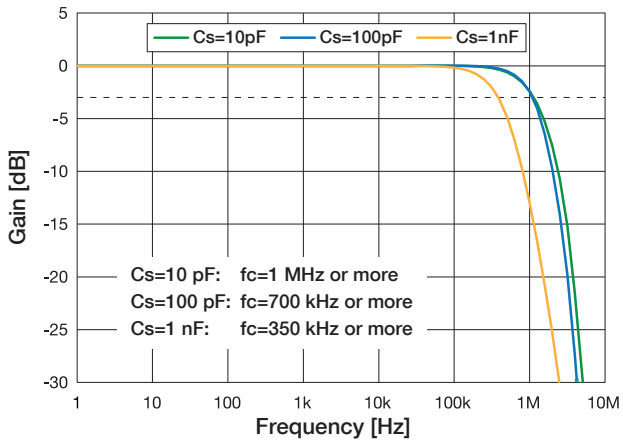
● CA-557F2/657F2

$$C_{LPF}\ [pF] = \frac{10^6}{Fc\ [Hz]} - 1000 \quad (Fc \le 1\ kHz)$$

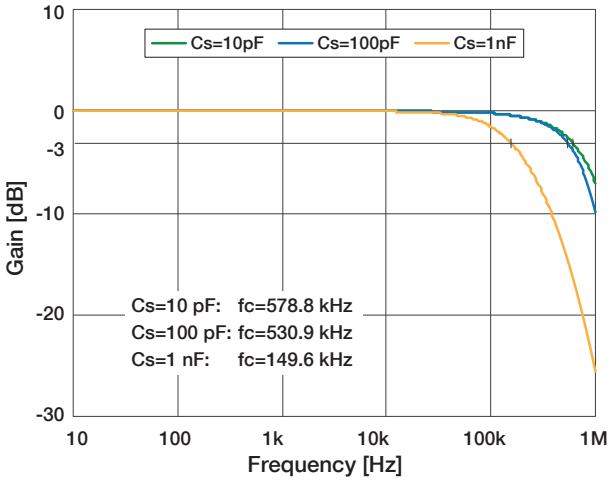
Characteristics

Frequency Response

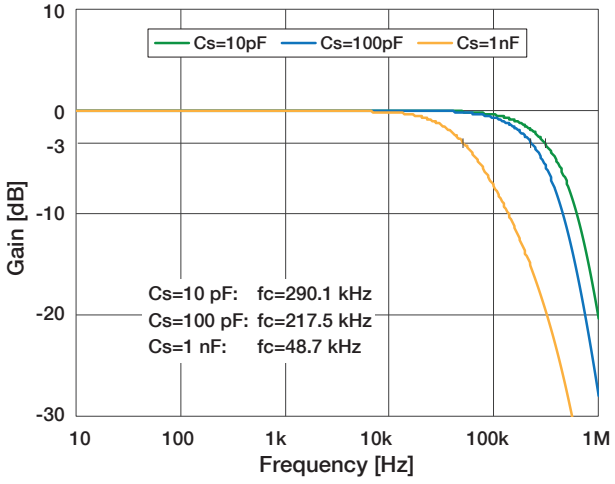
CA-653F2 (1 M V/A)



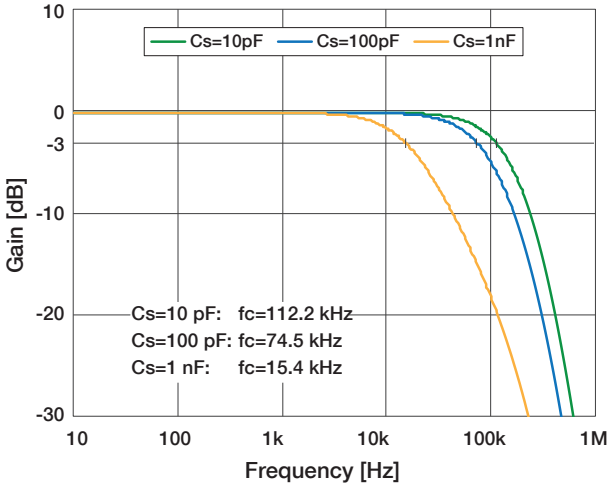
CA-554F2/CA-654F2 (10 M V/A)



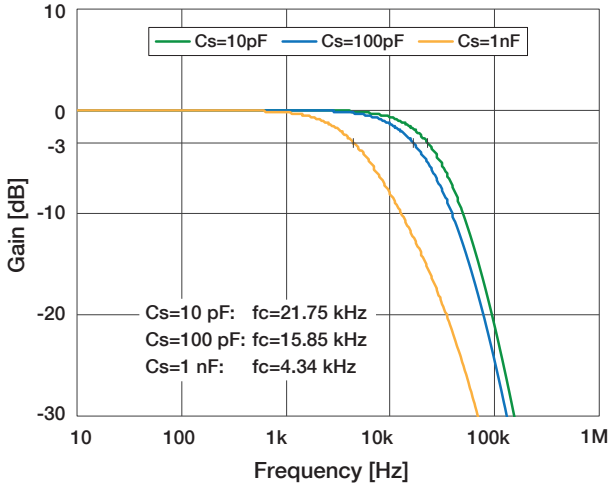
CA-555F2/CA-655F2 (100 M V/A)



CA-556F2/CA-656F2 (1 G V/A)



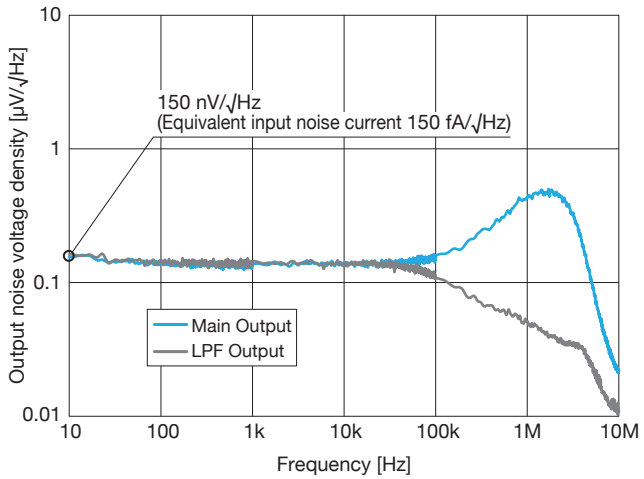
CA-557F2/CA-657F2 (10 G V/A)



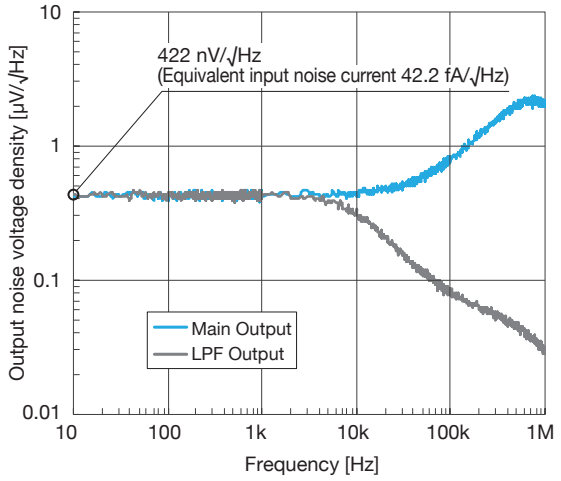
Characteristics

Output Noise Voltage Density

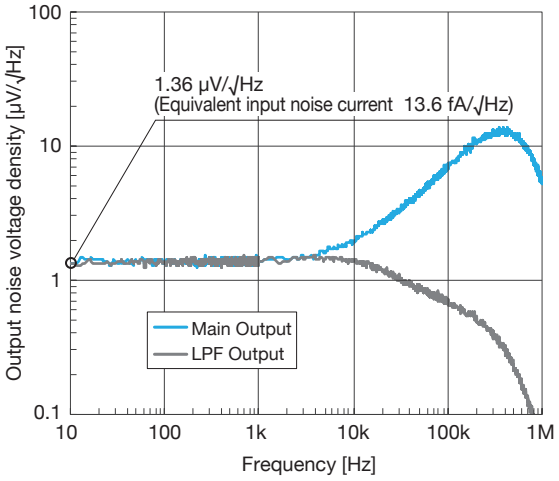
CA-653F2 (1 M V/A)



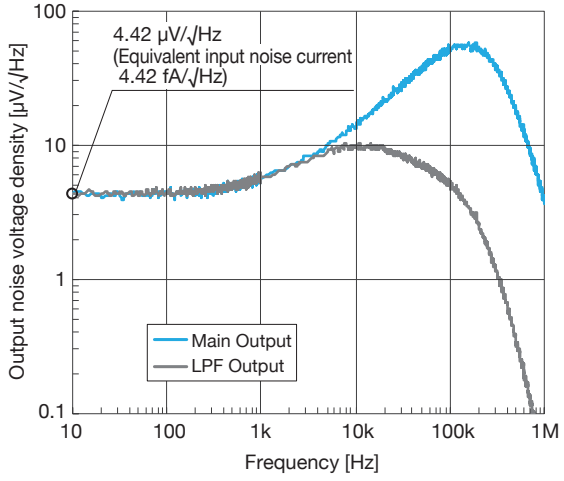
CA-554F2/CA-654F2 (10 M V/A)



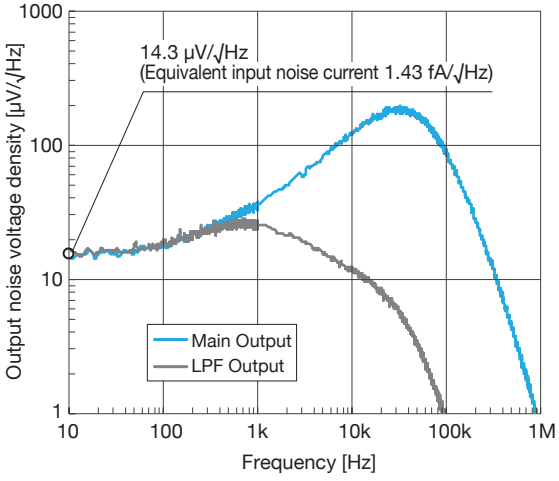
CA-555F2/CA-655F2 (100 M V/A)



CA-556F2/CA-656F2 (1 G V/A)



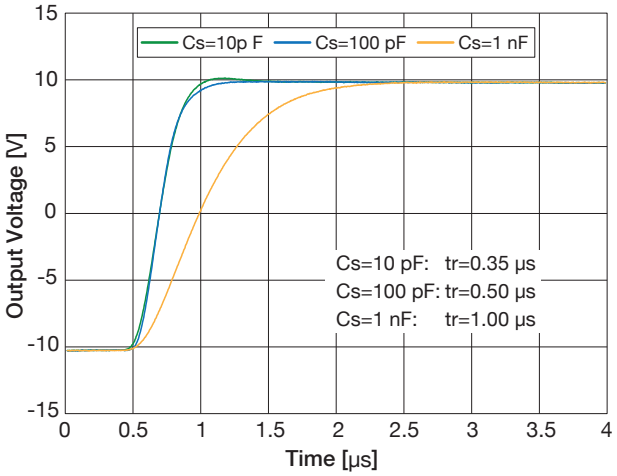
CA-557F2/CA-657F2 (10 G V/A)



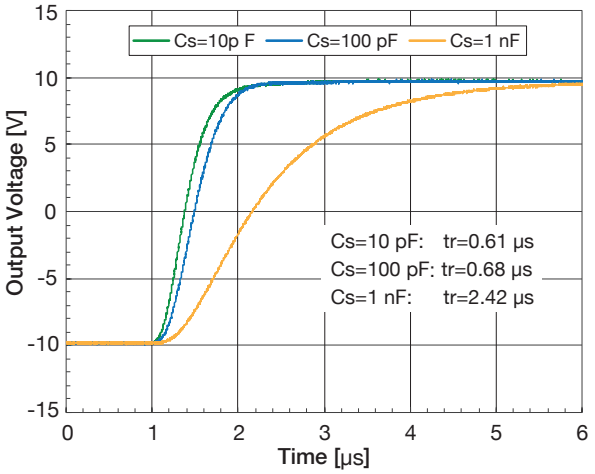
Characteristics

Pulse Response

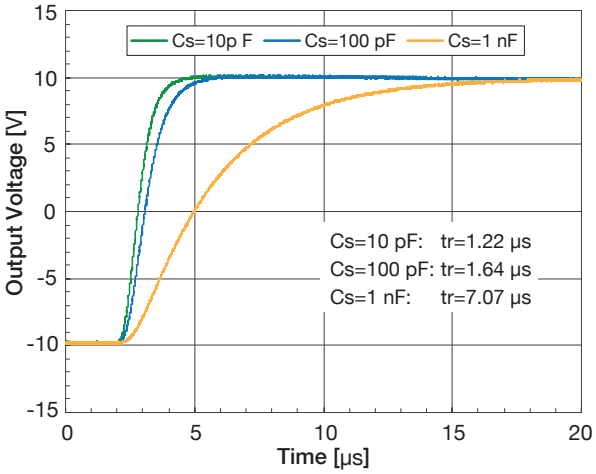
CA-653F2 (1 M V/A)



CA-554F2/CA-654F2 (10 M V/A)



CA-555F2/CA-655F2 (100 M V/A)



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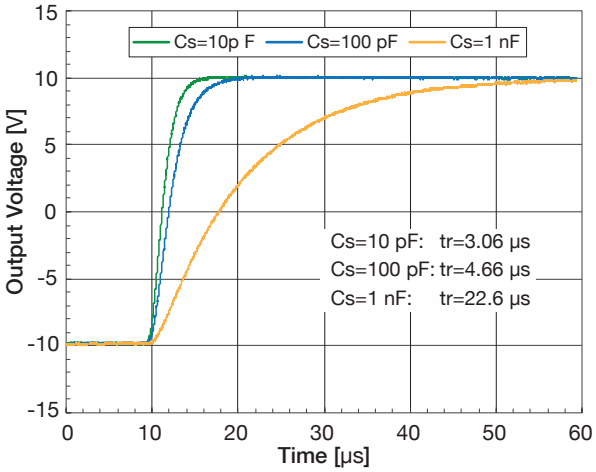

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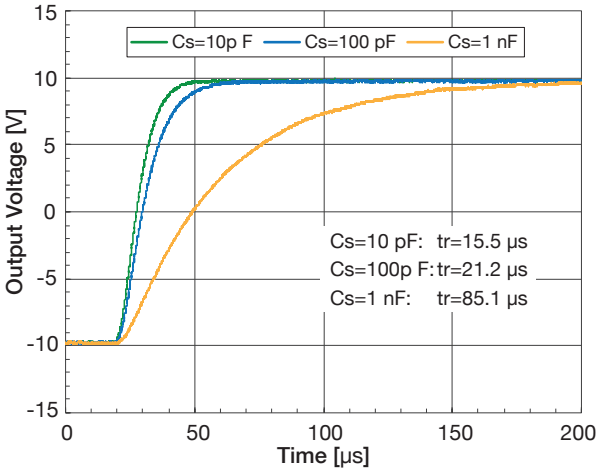
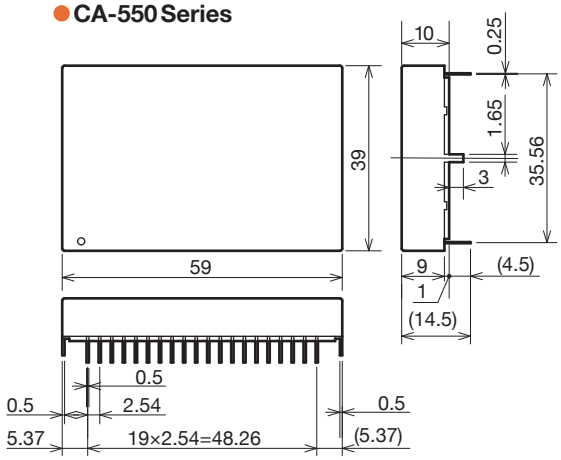
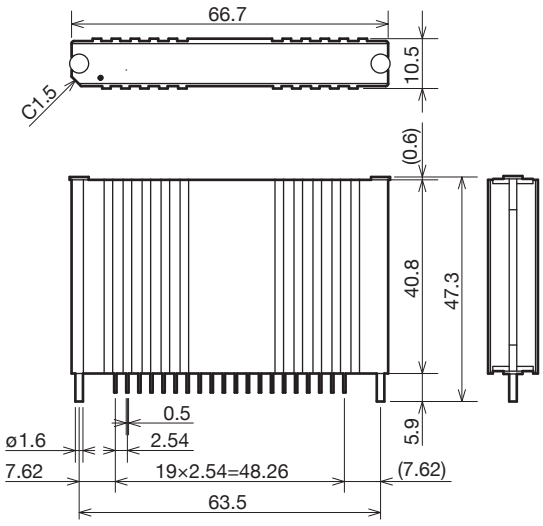


Dimensions

● CA-550 Series



● CA-650 Series



Evaluation kit

PA-001-2179 for both CA-550 series and CA-650 series

The kit to evaluate characteristics before mounting on the printed circuit board.

DIP

SIP

1. Current input
2. Main output
3. Power input (HR10-7R-4P connector)
4. Power input (terminal block)
5. LPF output
6. LPF cut-off frequency setting switch
7. Offset voltage adjusting variable resistor

* Terminals and switches on the evaluation kit

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