FORCE TECHNOLOGIES LTD

FT1008

Picoamp Input Current
Microvolt Offset
Low Noise Op Amp

Equivalent to LT1008

Features

- Guaranteed Bias Current
  T_A = 25°C: 100pA Max
  T_A = –55°C to 125°C: 600pA Max
- Guaranteed Offset Voltage: 120µV Max
- Guaranteed Drift: 1.5µV/°C Max
- Low Noise, 0.1Hz to 10Hz: 0.5μV_{P-P}
- Guaranteed Low Supply Current: 600µA Max
- Guaranteed CMRR: 114dB Min
- Guaranteed PSRR: 114dB Min
- Guaranteed Voltage Gain with 5mA Load Current
- Available in 8-Lead PDIP and SO Packages

Applications

- Precision Instrumentation
- Charge Integrators
- Wide Dynamic Range Logarithmic Amplifiers
- Light Meters
- Low Frequency Active Filters
- Standard Cell Buffers
- Thermocouple Amplifiers

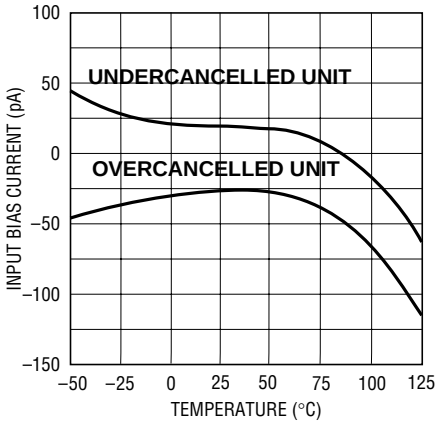
Description

The FT1008 is a universal precision operational amplifier that can be used in practically all precision applications. The FT1008 combines for the first time, picoampere bias currents (which are maintained over the full –55°C to 125°C temperature range), microvolt offset voltage (and low drift with time and temperature), low voltage and current noise, and low power dissipation. Extremely high common mode and power supply rejection ratios, and the ability to deliver 5mA load current with high voltage gain round out the FT1008's superb precision specifications.

The all around excellence of the FT1008 eliminates the necessity of the time consuming error analysis procedure of precision system design in many applications; the FT1008 can be stocked as the universal precision op amp.

The FT1008 is externally compensated with a single capacitor for additional flexibility in shaping the frequency response of the amplifier. It plugs into and upgrades all standard FT108A/FT308A applications. For an internally compensated version with even lower offset voltage but otherwise similar performance see the FT1012.

Input Bias Current vs Temperature



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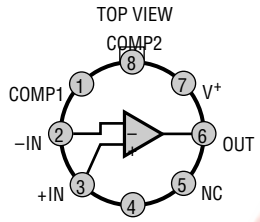
Absolute Maximum Ratings (Note 1)

Supply Voltage ..... ±20V
Differential Input Current (Note 2) ..... ±10mA
Input Voltage ..... ±20V
Output Short-Circuit Duration ..... Indefinite
Storage Temperature Range ..... –65°C to 150°C

Operating Temperature Range
FT1008M ..... –55°C to 125°C
FT1008C ..... 0°C to 70°C
FT1008I ..... –40°C to 85°C
Lead Temperature (Soldering, 10 sec) ..... 300°C

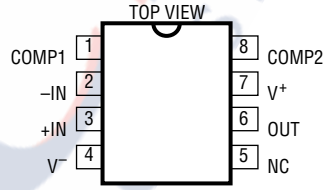
Package/Order Information



V⁻ (CASE)
H PACKAGE
8-LEAD TO-5 METAL CAN

T_{JMAX} = 150°C, θ_{JA} = 150°C/W, θ_{JC} = 45°C/W

ORDER PART NUMBER
FT1008MH
FT1008CH

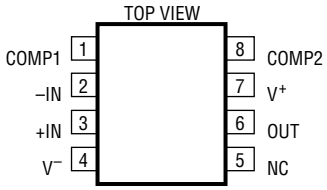


N8 PACKAGE
8-LEAD PDIP

T_{JMAX} = 150°C, θ_{JA} = 130°C/W

J8 PACKAGE 8-LEAD CERDIP
T_{JMAX} = 150°C, θ_{JA} = 100°C/W

ORDER PART NUMBER	ORDER PART NUMBER
FT1008MJ8	FT1008CN8
FT1008CJ8	FT1008IN8



S8 PACKAGE
8-LEAD PLASTIC SO

T_{JMAX} = 150°C, θ_{JA} = 190°C/W

ORDER PART NUMBER	S8 PART MARKING
FT1008S8	1008

Electrical Characteristics

V_S = ±15V, V_{CM} = 0V, T_A = 25°C, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	FT1008M/I MIN	FT1008M/I TYP	FT1008M/I MAX	FT1008C MIN	FT1008C TYP	FT1008C MAX	UNITS
V_{OS}	Input Offset Voltage			30	120		30	120	µV
		(Note 3)		40	180		40	180	µV
	Long-Term Input Offset Voltage Stability			0.3			0.3		µV/Month
I_{OS}	Input Offset Current			30	100		30	100	pA
		(Note 3)		40	150		40	150	pA
I_B	Input Bias Current			±30	±100		±30	±100	pA
		(Note 3)		±40	±150		±40	±150	pA
e_n	Input Noise Voltage	0.1Hz to 10Hz		0.5			0.5		μV_{P-P}
	Input Noise Voltage Density	f_O = 10Hz (Note 4)		17	30		17	30	$nV/\sqrt{Hz}$
		f_O = 1000Hz (Note 5)		14	22		14	22	$nV/\sqrt{Hz}$
i_n	Input Noise Current Density	f_O = 10Hz		20			20		$fA/\sqrt{Hz}$
A_{VOL}	Large-Signal Voltage Gain	V_{OUT} = ±12V, $R_L \geq$ 10k	200	2000		200	2000		V/mV
		V_{OUT} = ±10V, $R_L \geq$ 2k	120	600		120	600		V/mV

Electrical Characteristics

$V_S = \pm 15V$, $V_{CM} = 0V$, $T_A = 25°C$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	FT1008M/I MIN	FT1008M/I TYP	FT1008M/I MAX	FT1008C MIN	FT1008C TYP	FT1008C MAX	UNITS
CMRR	Common Mode Rejection Ratio	$V_{CM} = \pm 13.5V$	114	132		114	132		dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 2V$ to $\pm 20V$	114	132		114	132		dB
	Input Voltage Range		±13.5	±14		±13.5	±14		V
V_{OUT}	Output Voltage Swing	$R_L = 10k$	±13	±14		±13	±14		V
	Slew Rate	$C_F = 30pF$	0.1	0.2		0.1	0.2		V/µs
I_S	Supply Current	(Note 3)		380	600		380	600	µA

The ● indicates specifications which apply over the full operating temperature range of $-55°C \le T_A \le 125°C$ for the FT1008M, $-40°C \le T_A \le 85°C$ for the FT1008I and $0°C \le T_A \le 70°C$ for the FT1008C. $V_S = \pm 15V$, $V_{CM} = 0V$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS		FT1008M/I MIN	FT1008M/I TYP	FT1008M/I MAX	FT1008C MIN	FT1008C TYP	FT1008C MAX	UNITS
V_{OS}	Input Offset Voltage		●		50	250		40	180	µV
		(Note 3)	●		60	320		50	250	µV
	Average Temperature Coefficient of Input Offset Voltage		●		0.2	1.5		0.2	1.5	µV/°C
I_{OS}	Input Offset Current		●		60	250		40	180	pA
		(Note 3)	●		80	350		50	250	pA
	Average Temperature Coefficient of Input Offset Current		●		0.4	2.5		0.4	2.5	pA/°C
I_B	Input Bias Current		●		±80	±600		±40	±180	pA
		(Note 3)	●		±150	±800		±50	±250	pA
	Average Temperature Coefficient of Input Bias Current		●		0.6	6		0.4	2.5	pA/°C
A_{VOL}	Large-Signal Voltage Gain	$V_{OUT} = \pm 12V$, $R_L \ge 10k$	●	100	1000		150	1500		V/mV
CMRR	Common Mode Rejection Ratio	$V_{CM} = \pm 13.5V$	●	108	128		110	130		dB
PSRR	Power Supply Rejection Ratio	$V_S = \pm 2.5V$ to $\pm 20V$	●	108	126		110	128		dB
	Input Voltage Range		●	±13.5			±13.5			V
V_{OUT}	Output Voltage Swing	$R_L = 10k$	●	±13	±14		±13	±14		V
I_S	Supply Current		●		400	800		400	800	µA

(FT1008S8 only) $V_S = \pm 15V$, $V_{CM} = 0V$, $T_A = 25°C$, unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OS}	Input Offset Voltage			30	200	µV
		(Note 3)		40	250	µV
	Long-Term Input Offset Voltage Stability			0.3		µV/Month
I_{OS}	Input Offset Current			100	280	pA
		(Note 3)		120	380	pA
I_B	Input Bias Current			±100	±300	pA
		(Note 3)		±120	±400	pA
e_n	Input Noise Voltage	0.1Hz to 10Hz		0.5		μV_{P-P}
	Input Noise Voltage Density	$f_O = 10Hz$ (Note 5)		17	30	$nV/\sqrt{Hz}$
		$f_O = 1000Hz$ (Note 5)		14	22	$nV/\sqrt{Hz}$