40 V, 12 MHz, Zero-Drift Op Amp

General Description

ET85911 is the newest high supply voltage amplifier with 15 μV low offset, low noise, and stable high-frequency response. It incorporates ETEK's proprietary and patented design techniques to achieve excellent AC performance with 12 MHz bandwidth, 12 V/μs slew rate, and low distortion while drawing only 2000 μA of quiescent current per amplifier. The input common-mode voltage range extends to V-, and the outputs swing rail-to-rail.

ET85911 has an over-temperature protection feature to guarantee chip safety. The output of ET85911 will enter high impendence when the die temperature reaches around 170°C and will recover the function when the die temperature is down to around 150°C. The product has a very small power temperature coefficient, which is helpful for temperature-sensitive applications.

Features

- Supply Range: 4.5 V ~ 40 V or ±2.25 V ~ ±20 V
- Offset Voltage: ±15 μV Maximum
- Input Rail to -V_S, Rail to Rail Output
- Gain Bandwidth: 12 MHz
- Slew Rate: 12 V/μs
- Over-Temperature Protection
- Low Noise: 6 nV/√Hz at 1 kHz
- 2 kV HBM, 1 kV CDM
- -40°C to 125°C Operation Temperature Range

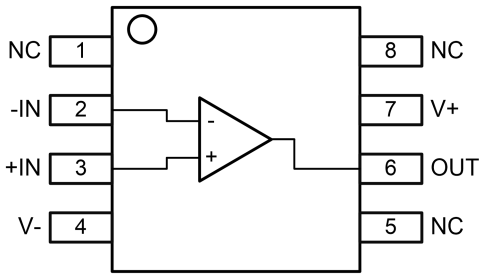
Applications

- Instrumentation
- Active Filters, ASIC Input or Output Amplifier
- Sensor Interface
- Motor Control
- Industrial Control
- Low noise power supply

Device information

Part No.	Package	Tape / Reel
ET85911M	SOP8	Tape and Reel

Pin Configuration



ET85911M

Top View

Pin Function

Pin Number	Symbol	Descriptions
ET85911M		
2	-IN	Inverting input
3	+IN	Non-inverting input
4	V-	Negative supply
6	OUT	Output
7	V+	Positive supply
1,5,8	NC	NC

Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are only stress ratings, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions are not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

Symbol	Rating	Value	Unit
V_S	Supply Voltage: (V+) - (V-)	0 ~ 42	V
V_{IN}	Signal input terminals Voltage	(V-) -0.3 ~ 42	V
V_{ID}	Differential Input Voltage	(V-) - (V+) ~ (V+) - (V-)	V
V_{OUT}	Output Voltage	(V-) - 0.3 ~ (V+) + 0.3	V
I_{IN}	Input Current: +IN, -IN (1)	-10 ~ +10	mA
I_{SC}	Output Short-Circuit Duration(2)	Infinite	
$T_{J(MAX)}$	Maximum Junction Temperature	+150	°C
T_A	Operating Temperature Range	-40 ~ +125	°C
T_{STG}	Storage Temperature	-65 ~ +150	°C
V_{ESD}	HBM Max Capability(Human Body Model)	±2000	V
	CDM Max Capability(Charged Device Model)	±1000	V

Note1: The inputs are protected by ESD protection diodes to the negative power supply. If the input extends more than 300 mV beyond the negative power supply, the input current should be limited to less than 10 mA.
Note2: A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power supply voltage and how many amplifiers are shorted. Thermal resistance varies with the amount of PC board metal connected to the package. The specified values are for short traces connected to the leads.

Recommended Operating Conditions

Symbol	Characteristic	Value	Unit
V_S	Supply Voltage: (V+) - (V-)	4.5 (±2.25) ~ 40 (±20)	V
T_A	Operating Temperature Range	-40 ~ +125	°C

Electrical Characteristics

All test condition is V_S = 30 V, T_A = 25°C, R_L = 10 kΩ, unless otherwise noted.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Power Supply							
V_S	Supply Voltage Range			4.5		40	V
I_Q	Quiescent Current per Amplifier	V_S = 40 V			2.4	3	mA
		V_S = 30 V			2	2.5	mA
			-40°C to 125°C			2.7	
		V_S = 5 V			1.9	2.4	mA
			-40°C to 125°C			2.6	
PSRR	Power Supply Rejection Ratio	V_S = 4.5 V to 36 V		135	155		dB
			-40°C to 125°C	130			
Input Characteristics							
V_{OS}	Input Offset Voltage	V_S = 40 V, V_{CM} = 20 V		-15		15	μV
		V_S = 30 V, V_{CM} = 15 V		-15		15	
			-40°C to 125°C	-25		25	
		V_S = 5 V, V_{CM} = 2.5 V		-15		15	
			-40°C to 125°C	-25		25	
dV_{OS}/dT	V_{OS} VS Temperature	-40°C to 125°C			0.05	0.15	μV/°C
I_B	Input Bias Current				10		pA
		-40°C to 125°C			100		
I_{OS}	Input Offset Current				100		pA
I_{IN}	Different Input Current	V_S = 36 V, V_{ID} = 36 V				100	μA
			-40°C to 125°C			120	
C_{IN}	Input Capacitance	Differential Mode			5		pF
		Common Mode			2.5		
A_{OL}	Open-loop Voltage Gain	R_L = 10 kΩ, V_{OUT} = 0.5 V to 29.5 V		135	155		dB
			-40°C to 125°C	130			
V_{CM}	Common-mode Input Voltage Range			(V-)		(V+) -1.5	V
CMRR	Common-mode Rejection Ratio	V_{CM} = 0 V to 28.5 V		135	155		dB
			-40°C to 125°C	130			

Electrical Characteristics (Continued)

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Output Characteristics							
V_{OH}	Output Swing from Positive Rail	R_L = 100 kΩ to V_S/2			12	25	mV
			-40°C to 125°C			40	
		R_L = 10 kΩ to V_S/2			80	120	
			-40°C to 125°C			200	
		R_L = 2 kΩ to V_S/2			370	500	
			-40°C to 125°C			750	
V_{OL}	Output Swing from Negative Rail	R_L = 100 kΩ to V_S/2			5	25	mV
			-40°C to 125°C			30	
		R_L = 10 kΩ to V_S/2			30	80	
			-40°C to 125°C			105	
		R_L = 2 kΩ to V_S/2			140	300	
			-40°C to 125°C			500	
I_{SC}	Output Short-Circuit Current	Source		70	95		mA
			-40°C to 125°C	50			
		Sink		130	150		
			-40°C to 125°C	85			
AC Specifications							
GBP	Gain-Bandwidth Product				12		MHz
SR	Slew Rate	G = 1, 10 V step		8	12		V/μs
			-40°C to 125°C	7			
t_{OR}	Overload Recovery				500		ns
t_S	Settling Time, 0.1%[3]	G = 1, 10 V step			5		μs
	Settling Time, 0.01%[3]				7		
PM	Phase Margin	R_L=10 kΩ, C_L=50 pF			60		°
GM	Gain Margin[3]	R_L=10 kΩ, C_L=50 pF			10		dB

Electrical Characteristics (Continued)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Noise Performance						
E_N	Input Voltage Noise	f = 0.1 Hz to 10 Hz		0.1		μV_{PP}
e_N	Input Voltage Noise Density	f = 0.1 kHz		6		nV/√Hz
		f = 1 kHz		6		nV/√Hz
		f = 10 kHz		7		nV/√Hz
i_N	Input Current Noise(3)	f = 10 kHz		200		fA/√Hz
THD+N	Total Harmonic Distortion and Noise	f = 1 kHz, G = 1, R_L = 10 kΩ, V_{OUT} = 6 V_{RMS}		0.0002		%

Note3: Guaranteed by design.

Functional Description

Overview

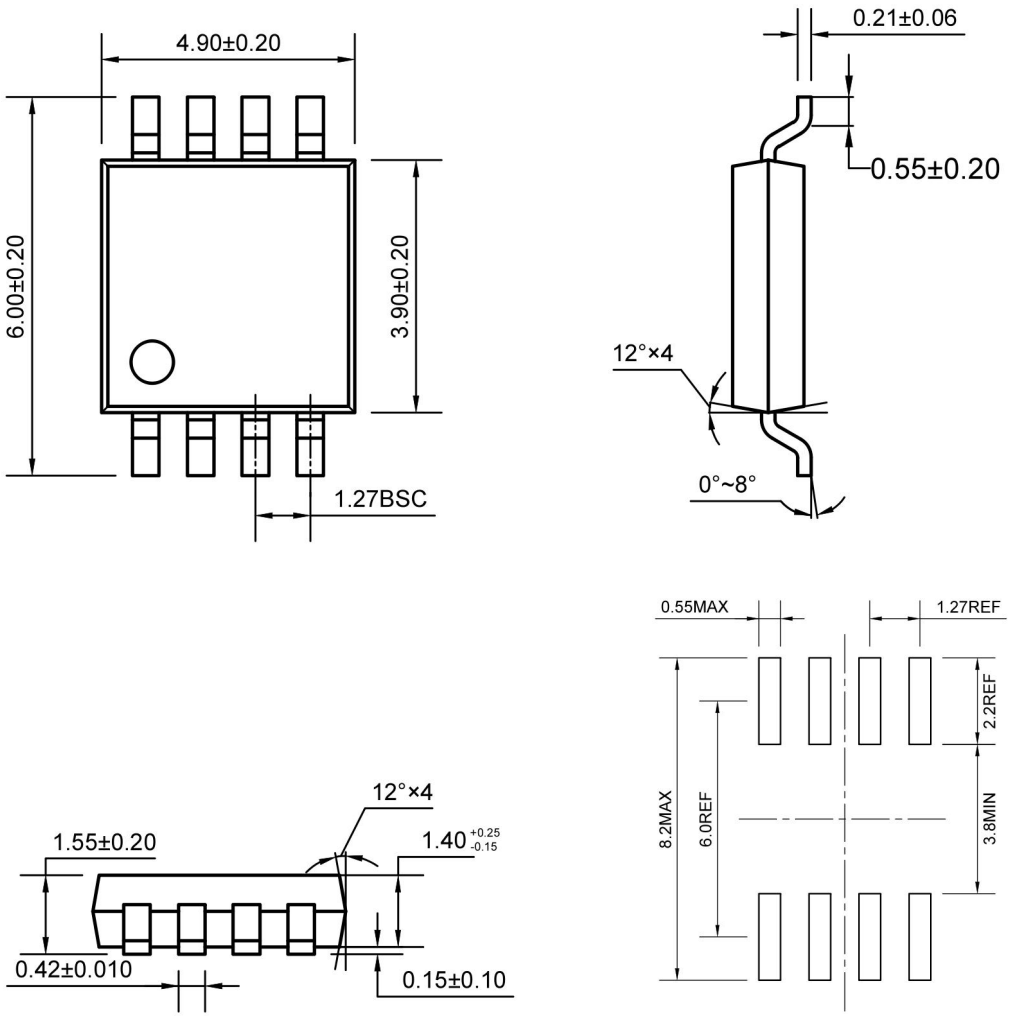
ET85911 can operate on a single-supply voltage (4.5 V to 40 V), or a split-supply voltage (±2.25 V to ±20 V), making them highly versatile and easy to use. The power-supply pins should have local bypass ceramic capacitors (typically 0.01 μF to 0.1 μF).

Power Supply Recommendations

Place 0.1 μF bypass capacitors close to the power supply pins for reducing coupling errors from the noisy or high impedance power supplies.

Package Dimension

SOP8



Recommended Land Pattern

Unit: mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2024-8-7	Preliminary Version	Huyt	Tangyx	Liujy