36V, 20V/μs, 3.5MHz, Operational Amplifier

General Description

The ET85934M is a newest high supply voltage amplifier with low offset, low power, and stable high-frequency response. It achieve excellent AC performance with 3.5MHz bandwidth, a 20V/μs slew rate, and low distortion while drawing a quiescent current of only typical 700μA per amplifier. The input common-mode voltage range extends to -VS, and the outputs swing rail-to-rail. The ET85934M can be used as plug-in replacements for commercially available op-amps to reduce power consumption, extend input/output range, and improve performance.

The combination of features makes the ET85934M an ideal choice for industrial control, motor control and portable audio amplification, sound ports, and other consumer audio.

ET85934M is specified for the extended industrial/automotive temperature range (-40°C to +125°C). It is available in SOP14 package.

Features

- Supply Voltage: 3V to 36V
- Low Supply Current: Maximum 1000μA per channel (Max)
- Differential Input Voltage Range to Supply Rail, can Work as Comparator
- Input Rail to -V_S, Rail to Rail Output
- Fast Response: 3.5 MHz Bandwidth, 20V/μs Slew Rate, 100ns Overload Recovery
- Low Offset Voltage:
  - ±2mV Maximum at 25°C
  - ±3mV Maximum at -40°C to 125°C
- Very Low THD+N: 0.0005% at Gain = 1, 1kHz
- 2kV HBM, 1kV CDM, 150mA Latch Up
- Operation Temperature Range: -40°C to 125°C

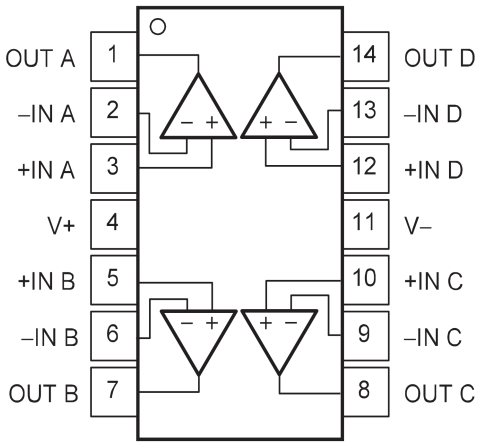
Applications

- Sensor Interface
- Motor Control
- Industrial Control
- Audio

Device Information

Part No.	Package	Packing Option	Marking	MSL
ET85934M	SOP14	Tube , 50	594M XXXXX	3

Pin Configuration



ET85934M

Top View

Pin Function

Symbol	Descriptions
OUTx	Output
V-	Negative supply
+INx	Non-inverting input
-INx	Inverting input
V+	Positive supply

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	Parameter	Value	Unit
V_S	Supply Voltage, V+ to V-	0 to 40	V
V_{IN}	Common-mode Input Terminals Voltage	($-V_S$) -0.3 to ($+V_S$) +0.3	V
	Differential Input Terminals Voltage	($+V_S$) - ($-V_S$)	V
I_{IN}	Signal input terminals Current	-10 to +10	mA
$T_{J(MAX)}$	Maximum Junction Temperature	+150	°C
T_{STG}	Storage Temperature	-65 to +150	°C
V_{ESD}	Human body model (HBM), per ANSI/ESDA/JEDECJS-001(1)	2000	V
	Charged device model (CDM), per JEDEC specification JESD22-C101(2)	1000	V

Note1: JEDEC document JEP155 states that 500V HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500V HBM is possible if necessary precautions are taken.
Note2: JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 250V CDM is possible if necessary precautions are taken.

Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V_S	Supply Voltage: (V+) - (V-)	3(±1.5) to 36(±18)	V
T_A	Operating Temperature Range	-40 to +125	°C

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SOP14	Thermal Characteristics, Thermal Resistance, Junction-to-Air	108	°C/W

Electrical Characteristics

All test conditions: V_S = 30V, T_A = 25°C, R_L = 10kΩ to V_S/2, unless otherwise noted.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Power Supply							
V_S	Supply Voltage Range			3		36	V
I_Q	Quiescent Current per Amplifier	V_S = 30V			700	1000	μA
		V_S = 30V, T_A = -40°C to 125°C				1200	
		V_S = 5V			600	850	
		V_S = 5V, T_A = -40°C to 125°C				1000	
PSRR	Power Supply Rejection Ratio	V_S = 3V to 36V		95	120		dB
		V_S = 3V to 36V, T_A = -40°C to 125°C		90			
Input Characteristics							
V_{OS}	Input offset voltage	V_S = 30V, V_{CM} = 0V to 28V		-2	0.1	2	mV
			-40°C to 125°C	-3		3	
		V_S = 5V, V_{CM} = 2.5V		-2	0.1	2	
			-40°C to 125°C	-3		3	
dV_{OS}/dT	V_{OS} vs temperature	T_A = -40°C to 125°C			2		μV/°C
I_B	Input Bias Current[3]				50		pA
		T_A = -40°C to 125°C			2000		
I_{OS}	Input Offset Current[3]				50		pA
I_{IN}	Different Input Current[3]	V_S = 36V, V_{ID} = 36V			10		nA
			-40°C to 125°C		100		
C_{IN}	Input Capacitance	Differential Mode			2.5		pF
		Common Mode			5		
A_{OL}	Open-loop Voltage Gain			105	120		dB
V_{CM}	Common-mode Input voltage range			($-V_S$)		($+V_S$)-2	V
CMRR	Common-mode rejection ratio	V_{CM} = 0V to 27V		105	130		dB

Electrical Characteristics (Continued)

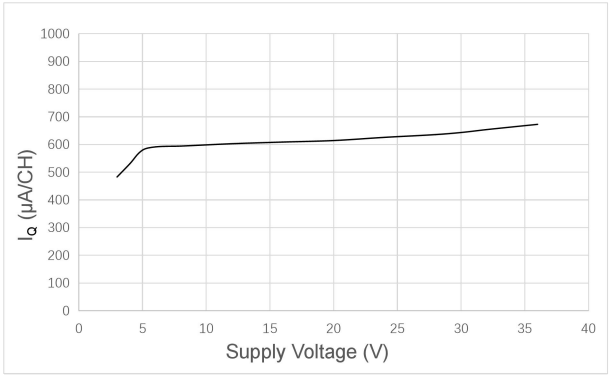
All test conditions: V_S = 30V, T_A = 25°C, R_L = 10kΩ to V_S/2, unless otherwise noted.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Output Characteristics							
V_{OH}	Output Swing from Positive Rail	R_{LOAD} = 10kΩ to V_S/2			200	300	mV
			-40°C to 125°C			450	mV
		R_{LOAD} = 2kΩ to V_S/2			1.1	1.4	V
			-40°C to 125°C			2	V
V_{OL}	Output Swing from Negative Rail	R_{LOAD} = 10kΩ to V_S/2			200	300	mV
			-40°C to 125°C			450	mV
		R_{LOAD} = 2kΩ to V_S/2			0.8	1	V
			-40°C to 125°C			1.6	V
I_{SC}	Output Short-Circuit Current			25	32		mA
		T_A = -40°C to 125°C		15			
AC Specifications							
GBP	Gain-Bandwidth Product				3.5		MHz
SR	Slew Rate	G = 1, 10V step			20		V/μs
t_{OR}	Overload Recovery				100		ns
t_S	Settling Time, 0.1%(3)	G = -1, 10V step			0.8		μs
	Settling Time, 0.01%(3)				1		
PM	Phase Margin	V_S = 36V, R_L=10kΩ, C_L=100pF			60		°
GM	Gain Margin	V_S = 36V, R_L=10kΩ, C_L=100pF			15		dB
Noise Performance							
E_N	Input Voltage Noise	f = 0.1Hz to 10Hz			1.7		μV_{RMS}
e_N	Input Voltage Noise Density	f = 1kHz			30		nV/√Hz
i_N	Input Current Noise(3)	f = 1kHz			2		fA/√Hz
THD+N	Total Harmonic Distortion and Noise	f = 1kHz, G = 1, R_L = 10kΩ, V_{OUT} = 6V_{RMS}			0.0005		%

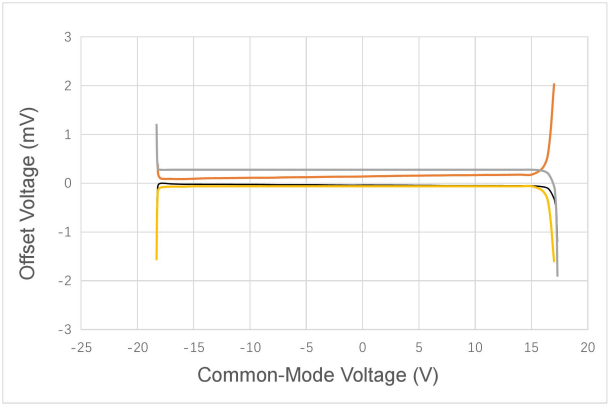
Note3: Guaranteed by design.

Typical Characteristics

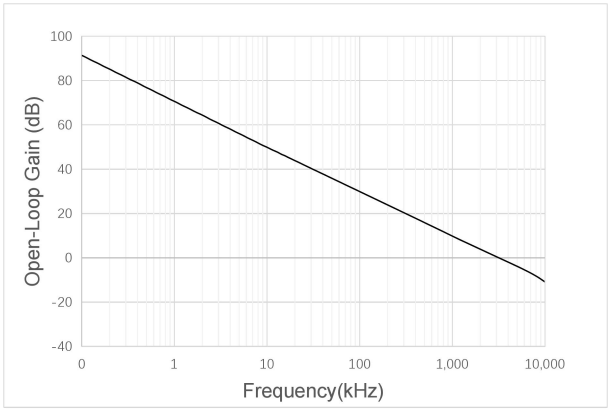
All test conditions: V_S = ±15V, V_{CM} = 0V, R_L = 10kΩ to V_S/2, unless otherwise noted.



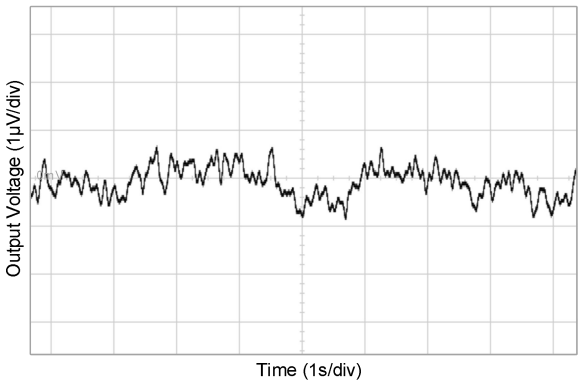
Quiescent Current vs Supply Voltage



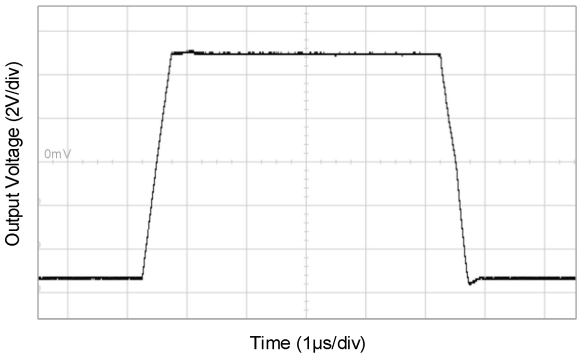
Offset Voltage vs Common-Mode Voltage (V_S=±15V)



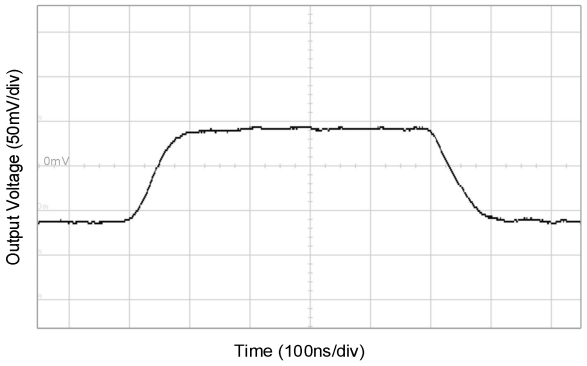
Open-Loop Gain vs Frequency (V_S = ±15V)



0.1 Hz to 10 Hz Noise



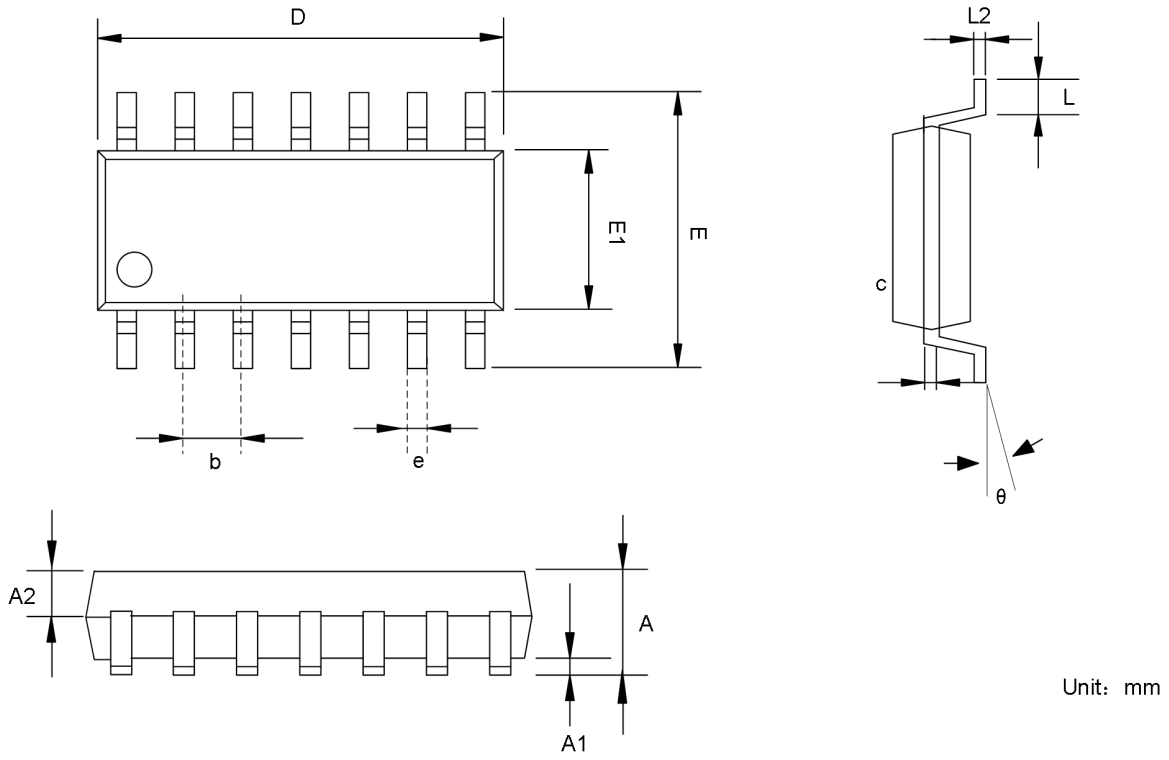
Large-Signal Step Response (10 V)



Small-Signal Step Response (100 mV)

Package Dimension

SOP14



Unit：mm

COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	MAX
A	1.40	1.50
A1	0.10	0.20
A2	0.65	0.75
b	1.270	
c	0.203	
D	8.48	8.58
E	6.05	6.25
E1	3.75	3.85
e	0.406	
L	0.40	0.70
L2	0.203	
θ	0°	8°

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2025-08-12	Original Version	Huyt	Chenh	Liujy