

36V, 20V/ μ s, 3.5MHz, Operational Amplifier

General Description

The ET85932M is a newest high supply voltage amplifier with low offset, low power, and stable high-frequency response. It achieves excellent AC performance with 3.5MHz bandwidth, a 20V/ μ s slew rate, and low distortion while drawing a quiescent current of only typical 700 μ A per amplifier. The input common-mode voltage range extends to -VS, and the outputs swing rail-to-rail. The ET85932 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 ET85932M an ideal choice for industrial control, motor control and portable audio amplification, sound ports, and other consumer audio.

ET85932M is specified for the extended industrial/automotive temperature range (-40°C to +125°C). It is available in SOP8 package.

Features

- Supply Voltage: 3V to 36V
- Low Supply Current: Maximum 1000 μ A per channel (Max)
- Differential Input Voltage Range to Supply Rail, can Work as Comparator
- Input Rail to -Vs, Rail to Rail Output
- Fast Response: 3.5 MHz Bandwidth, 20V/ μ s 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

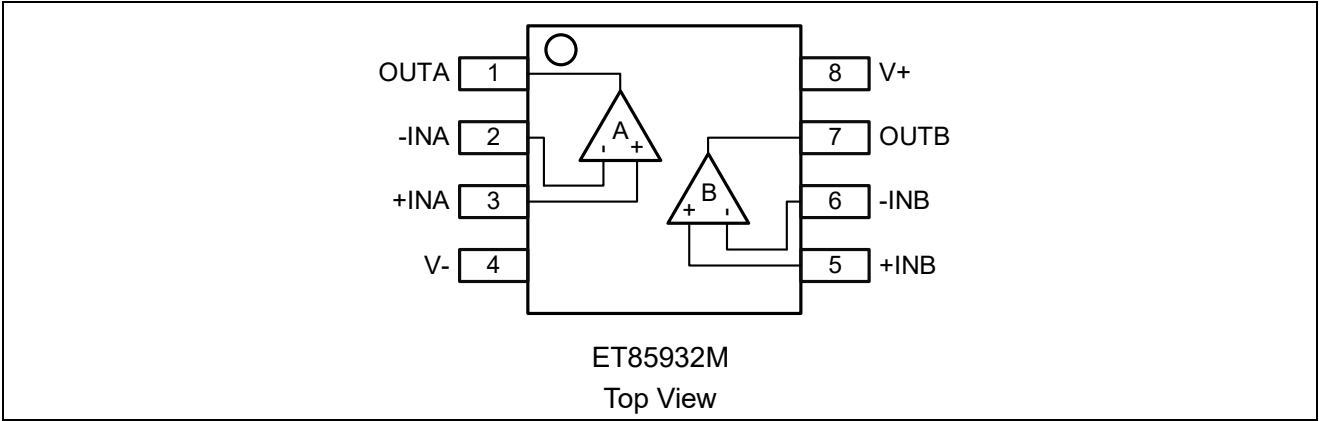
- Sensor Interface
- Motor Control
- Industrial Control
- Audio

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Device Information

Part No.	Package	Packing Option	MSL
ET85932M	SOP8	Tape and Reel, 4k/Reel	3

Pin Configuration



Pin Function

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

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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 _{θJA}	SOP8	Thermal Characteristics, Thermal Resistance, Junction-to-Air	158	°C/W

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Electrical Characteristics

All test conditions: $V_S = 30V$, $T_A = 25^\circ C$, $R_L = 10k\Omega$ 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	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			
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	

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Electrical Characteristics (Continued)

All test conditions: $V_S = 30V$, $T_A = 25^\circ C$, $R_L = 10k\Omega$ to $V_S/2$, unless otherwise noted.

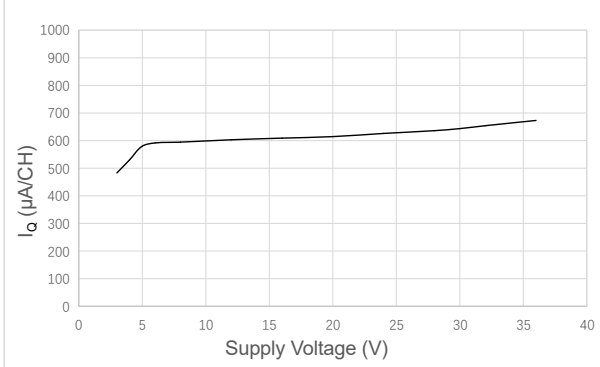
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Output Characteristics							
V _{OH}	Output Swing from Positive Rail	R _{LOAD} = 10kΩ to V _S /2			200	300	mV
			-40°C to 125°C			450	mV
		R _{LOAD} = 2kΩ to V _S /2			1.1	1.4	V
			-40°C to 125°C			2	V
V _{OL}	Output Swing from Negative Rail	R _{LOAD} = 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 =10k Ω , C _L =100pF			60		°
GM	Gain Margin	V _S = 36V, R _L =10k Ω , 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.

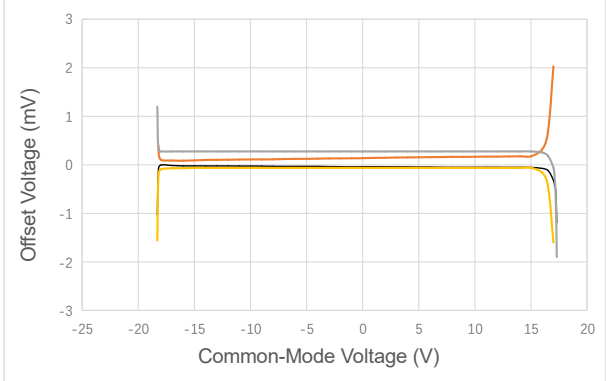
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Typical Characteristics

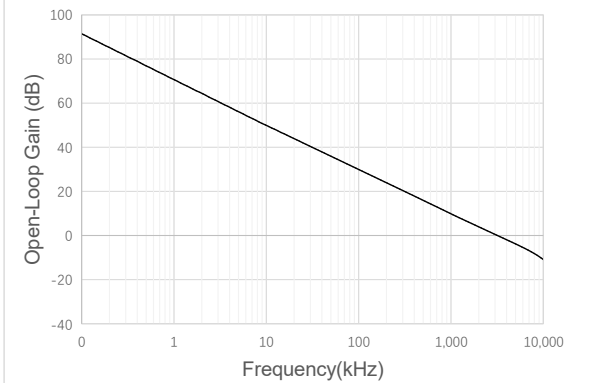
All test conditions: $V_S = \pm 15V$, $V_{CM} = 0V$, $R_L = 10k\Omega$ to $V_S/2$, unless otherwise noted.



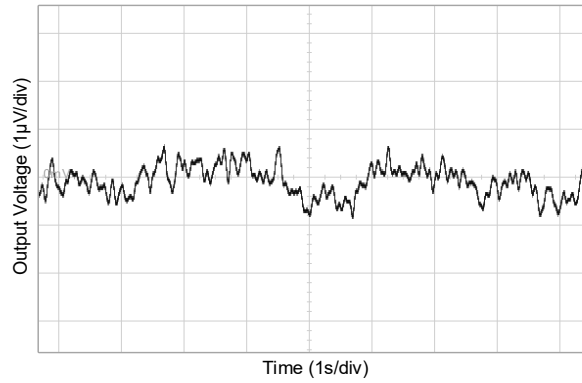
Quiescent Current vs Supply Voltage



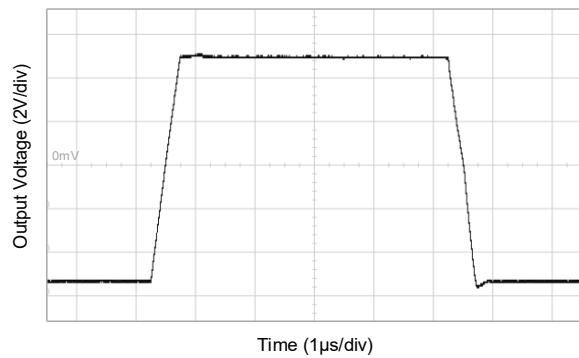
Offset Voltage vs Common-Mode Voltage ($V_S = \pm 15V$)



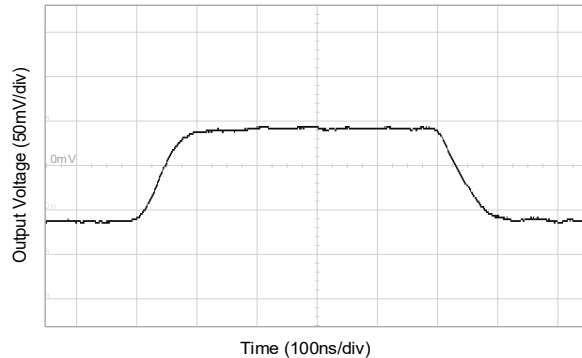
Open-Loop Gain vs Frequency ($V_S = \pm 15V$)



0.1 Hz to 10 Hz Noise



Large-Signal Step Response (10 V)

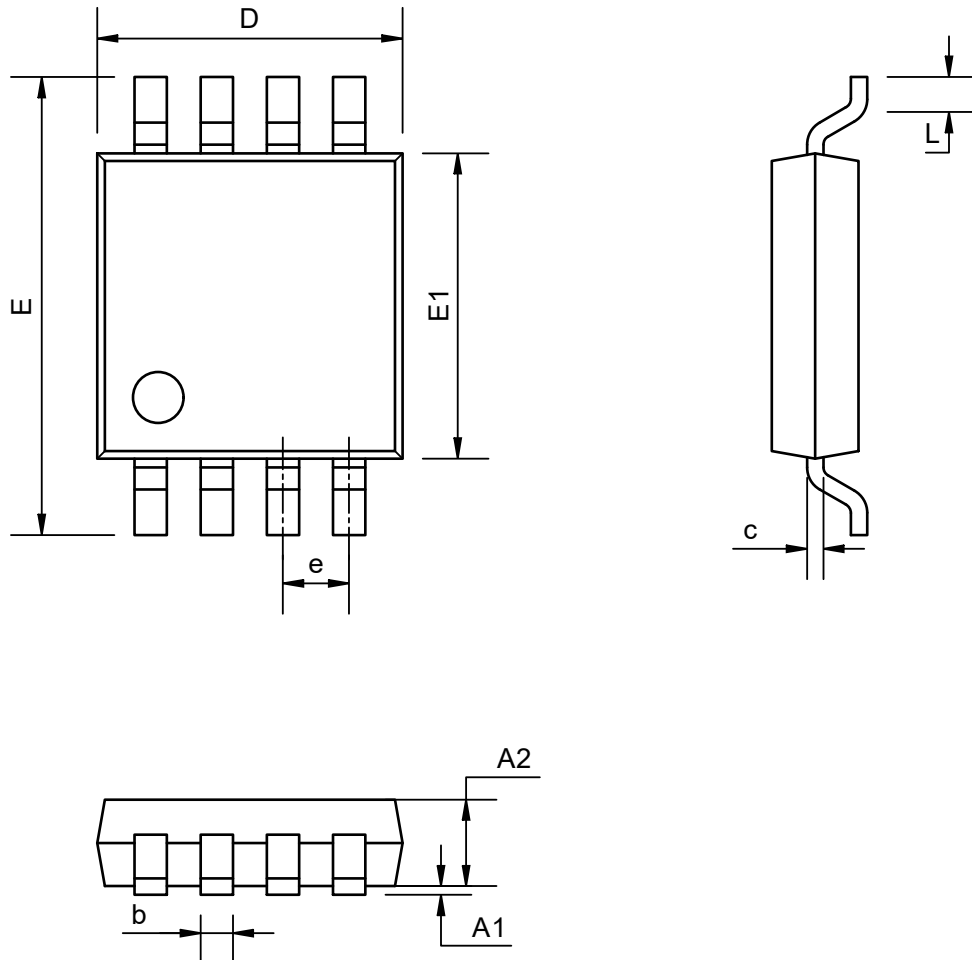


Small-Signal Step Response (100 mV)

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Package Dimension

SOP8



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A1	0.15	—	0.22
A2	1.40	1.55	1.50
b	0.40 BSC		
c	0.20	—	0.25
D	4.85	4.90	4.95
E	5.99	6.04	6.09
E1	3.85	3.90	3.95
e	1.27 BSC		
L	0.50	0.60	0.70

