250 MHz, Rail-to-Rail Output CMOS Operational Amplifier

General Description

ET85704 offers low voltage operation, negative-rail input, rail-to-rail output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth (250 MHz) and slew rate of 180 V/us. ET85704 is unity gain stable and feature an ultra-low input bias current.

ET85704 sets an industry-leading power-to performance ratio for rail-to-rail amplifiers.ET85704 is specified at the full temperature range of −40°C to +125°C under single or dual power supplies of 2.5 V to 5.5 V.

ET85704 is available in a TSSOP14 package.

Features

- High Gain Bandwidth:250 MHz
- Rail-to-rail Output
- 1.5 mV Typical Vos
- Input Voltage Range: -0.2 V to 3.9 V with V_S = 5 V
- Supply Range:+2.5 V to +5.5 V
- Specified up to +125°C

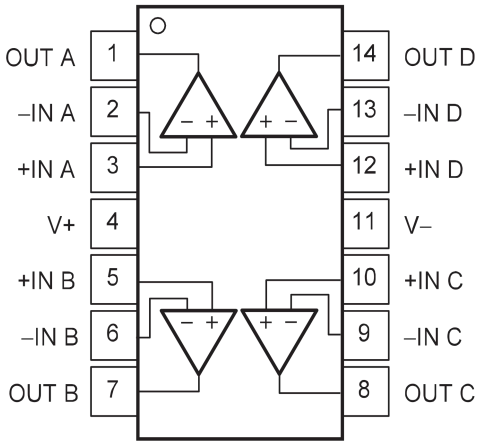
Applications

- Audio ADC Input Buffers
- Photodiode Preamp
- High-Density Systems
- Portable Systems
- Driving A/D Converters

Device information

Part No.	Package	Tape / Reel
ET85704V	TSSOP14	Tape and Reel

Pin Configuration



ET85704V
Top View

Pin Function

Pin Number	Symbol	Descriptions
1,7,8,14	OUT	Output
2,6,9,13	-IN	Inverting input
3,5,10,12	+IN	Non-inverting input
4	V+	Positive supply
11	V-	Negative 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.

Parameter	Rating	Unit
Supply Voltage	0 to 7	V
Signal input terminals Voltage(1)	(V-)-0.5 to (V+)+0.5	V
Signal input terminals Current(1)	-10 to +10	mA
ESD (Human Body Model)	±4000	V
Storage Temperature Range	-65 to +150	°C
Max Junction Temperature Range	+150	°C
Operating Temperature Range	-40 to +125	°C

Note1: Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.5 V beyond the supply rails should be current limited to 10 mA or less.

Recommended Operating Conditions

Characteristic	Symbol	Min	Max	Unit
DC Supply Voltage	V_S = (V+) - (V-)	2.5 (±1.25)	5.5 (±2.75)	V
Operating Temperature Range	T_A	-40	+125	°C

Electrical Characteristics

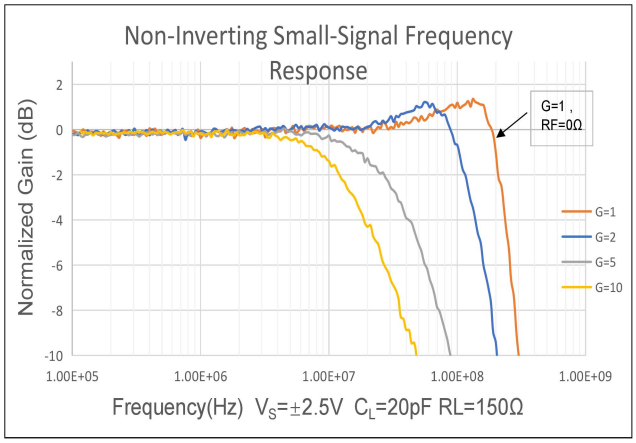
At T_A = +25°C, V_S = 5 V, G = +2, R_F = 470 Ω, and R_L = 150 Ω connected to V_S/2, and V_{CM} = V_S/2 (unless otherwise noted)

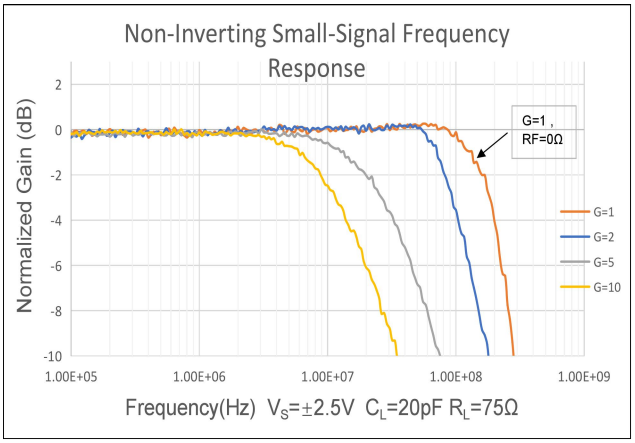
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
POWER SUPPLY						
V_S	Specified voltage range		2.5		5.5	V
I_Q	Quiescent current per amplifier			3.2	3.9	mA
PSRR	Input offset voltage vs power supply(2)	V_S = 2.5 V to 5.5 V, V_{CM} = (V-)+0.5 V	70	90		dB
INPUT						
V_{CM}	Common-mode voltage range	V_S = 5 V	-0.2		3.9	V
CMRR	Common-mode rejection ratio(2)	V_S = 5.5 V, V_{CM} = -0.2 V to 3.5 V	66	85		dB
V_{OS}	Input offset voltage	V_{CM} = V_S /2		±1.5	±7.5	mV
dV_{OS}/dT	Input offset voltage vs temperature	V_{CM} = V_S/2,T_A = –40°C to +125°C		4		µV/°C
I_B	Input bias current(2)			±1		pA
I_{OS}	Input offset current(2)			±1		pA
OUTPUT						
A_{OL}	Open-loop voltage gain	V_S = 5.0 V,R_L = 1 KΩ,V_O = V_S-0.2 V	95	110		dB
		V_S = 5.0 V,R_L = 150 Ω,V_O = V_S-0.3 V	78	85		
V_O	Voltage output swing from supply rails	R_L = 1 kΩ		20		mV
I_{OUT}	Output Current Source			85		mA
	Output Current Sink			90		mA
FREQUENCY RESPONSE						
	Small-Signal Gain-bandwidth	VOUT =100 mVpp,G=1		250		MHz
		VOUT =100 mVpp,G=2		130		MHz
		VOUT =100 mVpp,G=5		33		MHz
		VOUT =100 mVpp,G=10		15		MHz
SR	Slew rate			180		V/µs
GBP	Gain-Bandwidth Product			250		MHz
NOISE						
e_n	Input voltage noise density(2)	f = 1 MHz		8		nV/√Hz

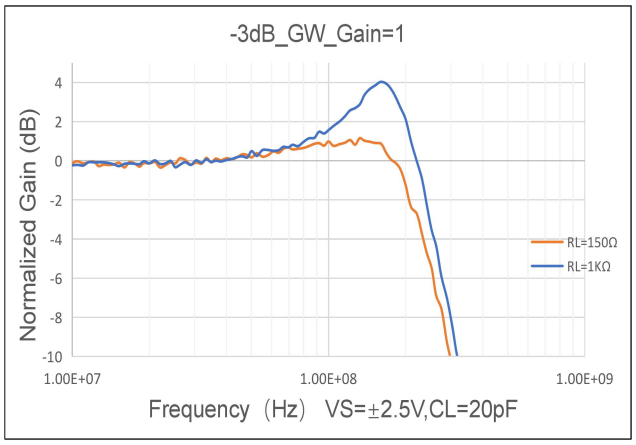
Note2: Guaranteed by design.

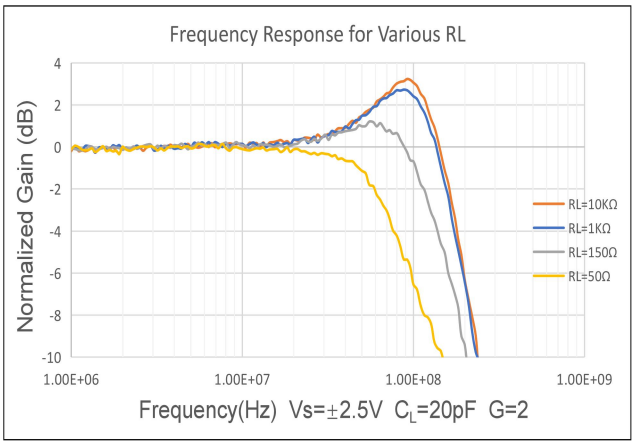
Typical Characteristics

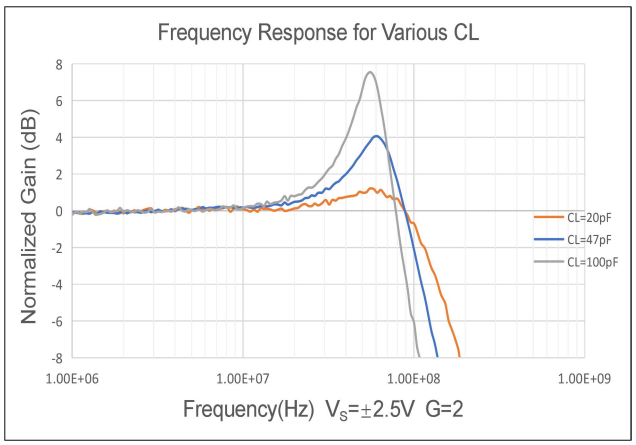
At T_A = +25°C, V_S = ± 2.5 V, G = +2, R_F = 470 Ω, and R_L = 150 Ω connected to V_S/2, and V_{CM} = V_S/2 (unless otherwise noted)





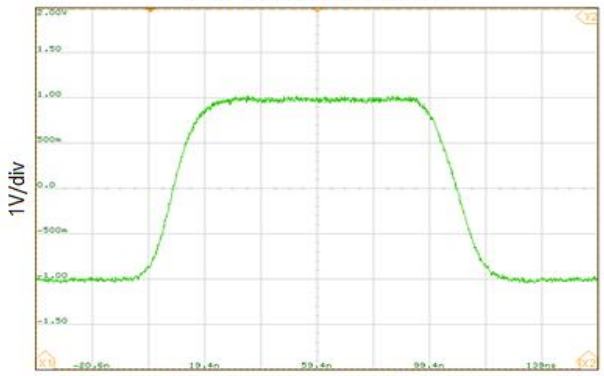




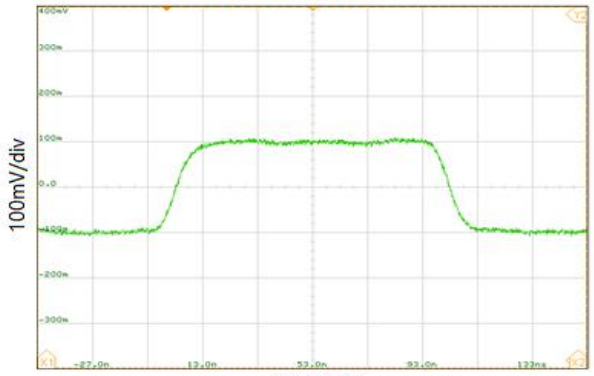


Typical Characteristics(Continued)

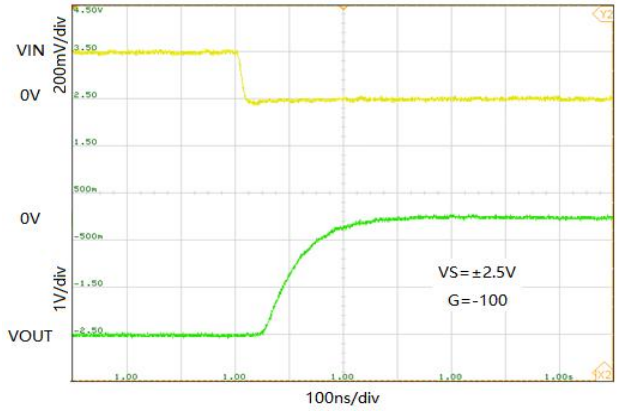
Large-Signal Step Response



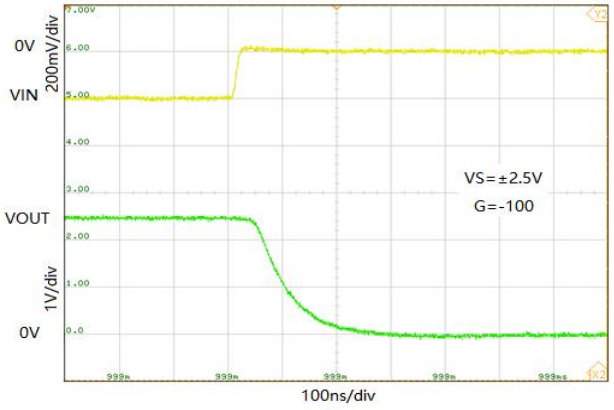
Small-Signal Step Response



Negative Overload Recovery



Posative Overload Recovery



Application Notes

ET85704 is a high speed, rail-to-rail operational amplifier that can be run from a single-supply voltage 2.5 V to 5.5 V (±1.25 V to ±2.75 V). Supply voltages higher than 7 V (absolute maximum) can permanently damage the amplifier. Good layout practice mandates use of a 0.1 uF capacitor place closely across the supply pins.

Layout Guidelines

Attention to good layout practices is always recommended. Keep traces short. When possible, use a PCB ground plane with surface-mount components placed as close to the device pins as possible. Place a 0.1uF capacitor closely across the supply pins. These guidelines should be applied throughout the analog circuit to improve performance and provide benefits such as reducing the EMI susceptibility.

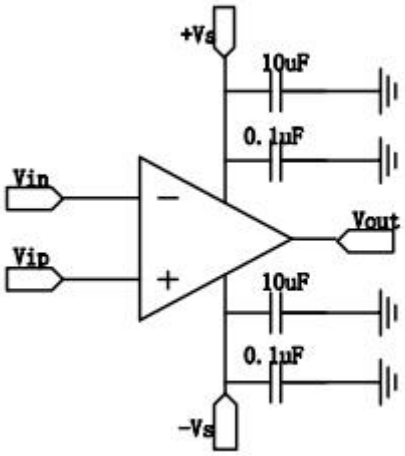
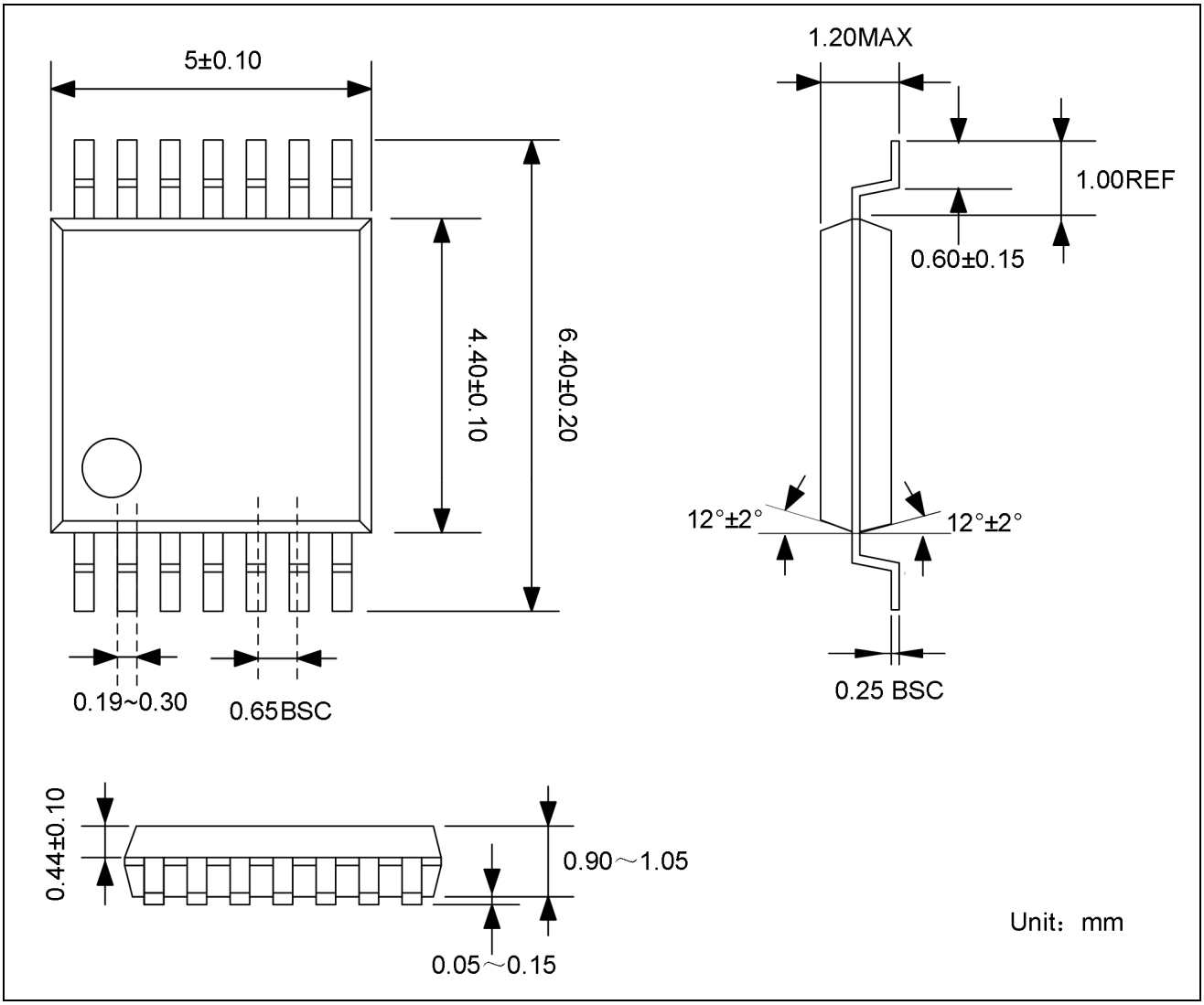


Figure1. Amplifier with Bypass Capacitors

Package Dimension

TSSOP14



Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2025-04-15	Original Version	Huyt	Wangxx	Liujy