



FAMILY OF LOW-POWER RAIL-TO-RAIL INPUT/OUTPUT OPERATIONAL AMPLIFIERS WITH SHUTDOWN

■ DESCRIPTION

The UTC **LV2462/LV2463** are dual low-power rail-to-rail input/output op amplifiers with low supply current (500uA/op) and low voltage (2.7-6V), that can be designed into a wide range of applications. The UTC **LV2463** offers a shutdown terminal, which places the amplifier in an ultralow supply current mode ($I_{CC}=0.3\mu A/ch$).

The UTC **LV2462/LV2463** have a guaranteed 1.6 V/ μs slew rate and low supply current. rail-to-rail output and high output current make the IC's ideal for buffering analog-to-digital converters. And the input common-mode voltage range including ground and V_{CC} . Besides, they are also able to driving large capacitive loads.

Good AC performance can be provided because of 6.4MHz of bandwidth and 1.6 V/ μs of slew rate. Furthermore, low input noise voltage ($11nV/\sqrt{Hz}$) and low input offset voltage (100 μV) make good DC performance.

■ FEATURES

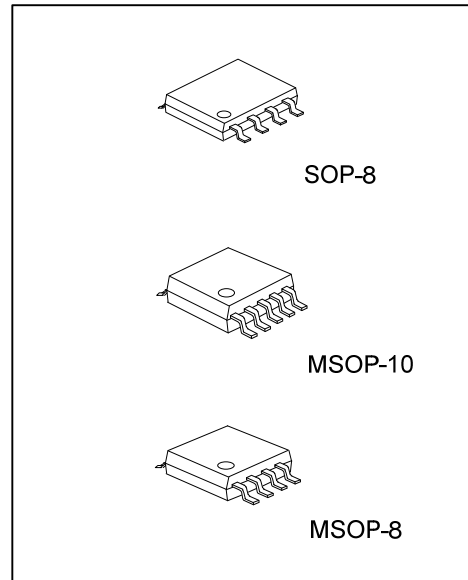
- * Rail-to-Rail Input/Output
- * Gain Bandwidth Product: 6.4 MHz
- * $\pm 48mA$ Output Drive Capability($V_{CC}=5V$)
- * Supply Current: 500 μA /channel
- * Input Offset Voltage: 100 μV

- * Input Noise Voltage: $11nV/\sqrt{Hz}$
- * Slew Rate: 1.6V/ μs
- * Universal Operational Amplifier
- * Micropower shutdown mode (LV2463)
0.3 μA /channel

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
LV2462L-S08-R	LV2462G-S08-R	SOP-8	Tape Reel
LV2462L-SM1-R	LV2462G-SM1-R	MSOP-8	Tape Reel
LV2463L-SM2-R	LV2463G-SM2-R	MSOP-10	Tape Reel

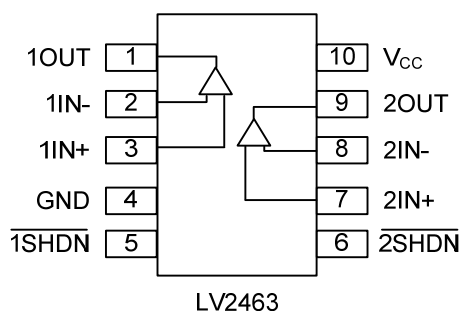
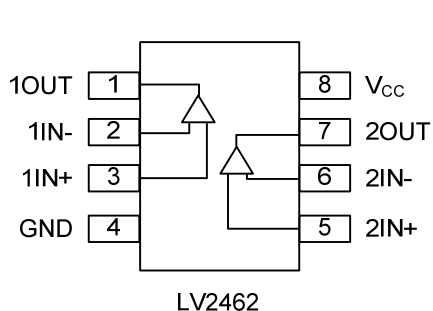
LV2462G-S08-R (1)Packing Type (2)Package Type (3)Green Package	(1) R: Tape Reel (2) SM1: MSOP-8, S08: SOP-8, SM2: MSOP-10 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

SOP-8 / MSOP-8	MSOP-10
8 7 6 5 → Date Code UTC □ □ □ □ LV2462 □ L: Lead Free G: Halogen Free □ □ □ □ → Lot Code 1 2 3 4	10 9 8 7 6 → Date Code UTC □ □ □ □ LV2463 □ L: Lead Free G: Halogen Free □ □ □ □ → Lot Code 1 2 3 4 5

PIN CONFIGURATION

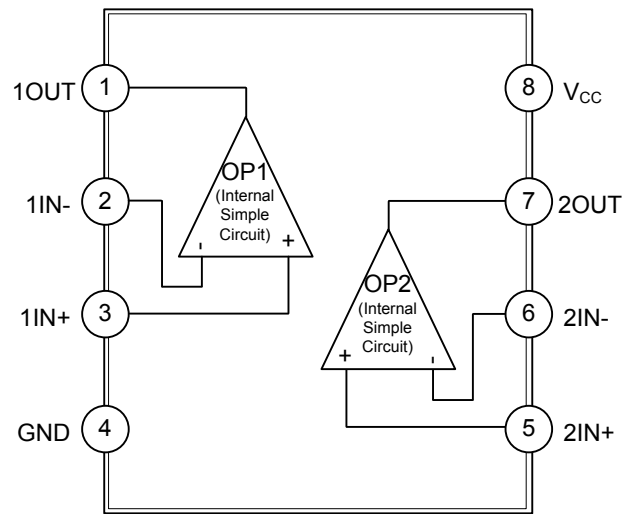


PIN DESCRIPTION

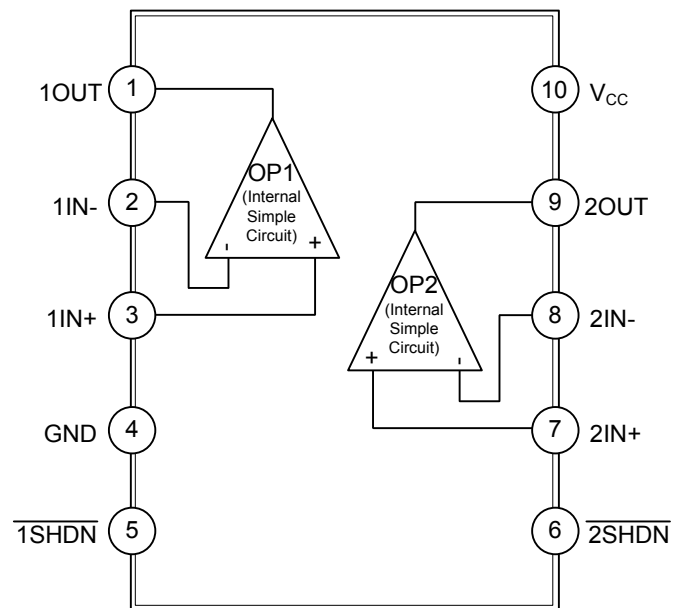
PIN NO.		PIN NAME	DESCRIPTION
LV2462	LV2463		
1	1	1OUT	Output terminal of CH1
2	2	1IN-	Negative input terminal of CH1
3	3	1IN+	Positive input terminal of CH1
4	4	GND	Ground
5	7	2IN+	Positive input terminal of CH2
6	8	2IN-	Negative input terminal of CH2
7	9	2OUT	Output terminal of CH2
8	10	V _{CC}	Supply voltage terminal
-	5	1SHDN	Shutdown1
-	6	2SHDN	Shutdown2

■ BLOCK DIAGRAM

For LV2462



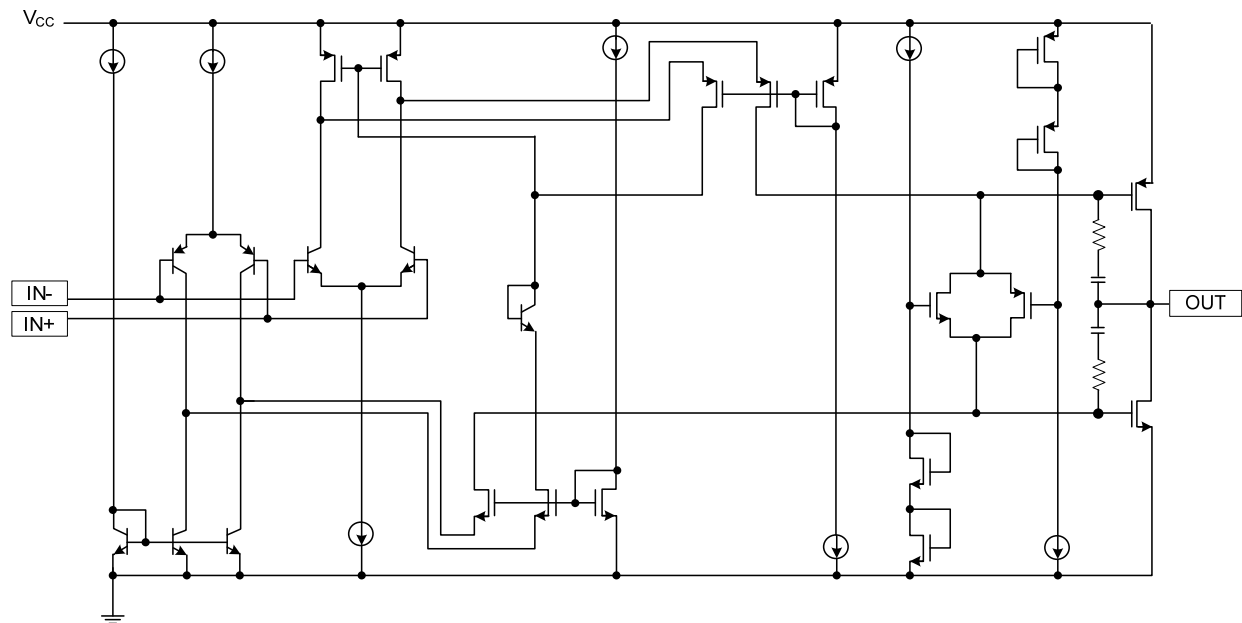
For LV2463



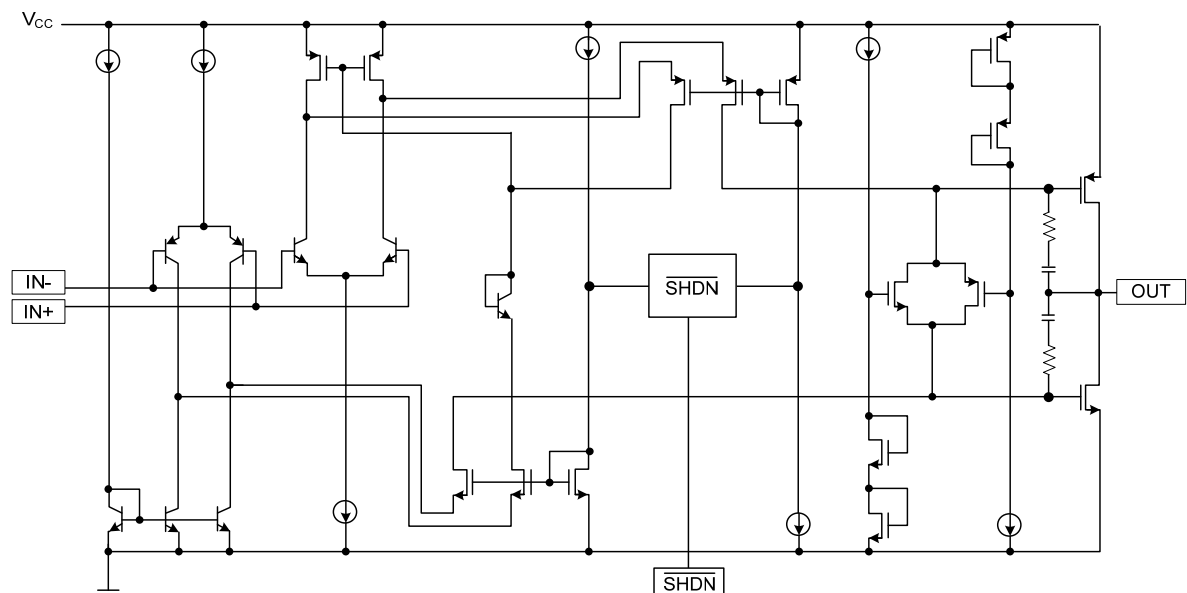
■ BLOCK DIAGRAM (Cont.)

Internal simple circuit (one channel):

For LV2462



For LV2463



■ ABSOLUTE MAXIMUM RATING ($T_A=25^{\circ}\text{C}$, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS	UNIT
Supply Voltage (Note 2)			V _{CC}	6	V
Differential Input Voltage			V _{ID}	-0.2 ~ V _{CC} +0.2	V
Output Current			I _O	±175	mA
Power Dissipation	T _A ≤25°C	SOP-8	P _D	710	mW
		MSOP-8		480	mW
		MSOP-10		485	mW
Operating Free-Air Temperature			T _A	-40 ~ +125	°C
Junction Temperature			T _J	+150	°C
Storage Temperature			T _{STG}	-60 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

2. All voltage values, except differential voltages, are with respect to GND.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-8	θ_{JA}	176	$^{\circ}\text{C/W}$
	MSOP-8		260	$^{\circ}\text{C/W}$
	MSOP-10		258	$^{\circ}\text{C/W}$
Junction to Case	SOP-8	θ_{JC}	38.5	$^{\circ}\text{C/W}$
	MSOP-8		54.5	$^{\circ}\text{C/W}$
	MSOP-10		54.1	$^{\circ}\text{C/W}$

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage	Single supply	V_{CC}	$2.7 \sim 6$	V
	Split supply		$\pm 1.35 \sim \pm 3$	V
Common-Mode Input Voltage		V_{ICR}	$0 \sim V_{CC}$	V
Operating Free-Air Temperature		T_A	$-40 \sim 125$	$^{\circ}\text{C}$
Shutdown on/off voltage level (Note 1)		$V_{IH \text{ MIN}}$	2	V
		$V_{IL \text{ MAX}}$	0.7	V

Note: Relative to voltage on the GND terminal of the device.

■ ELECTRICAL CHARACTERISTICS (T_A=25°C, unless otherwise specified)

V_{CC}=3V

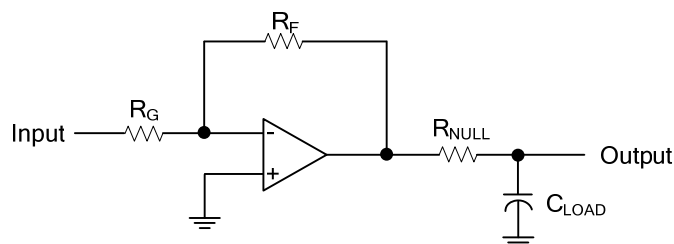
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V _{IO}	V _{CC} =3V, V _{IC} =1.5V, V _O =1.5V, R _S =50Ω		500	2000	μV
Input Offset Current	I _{IO}	V _{CC} =3V, V _{IC} =1.5V, V _O =1.5V, R _S =50Ω		2.8	7	nA
Input Bias Current	I _{IB}			4.4	14	nA
High-Level Output Voltage	V _{OH}	I _{OH} = -2.5mA		2.9		V
		I _{OH} =-10mA		2.7		V
Low-Level Output Voltage	V _{OL}	V _{IC} =1.5V, I _{OL} =2.5mA		0.1		V
		V _{IC} =1.5V, I _{OL} =10mA		0.3		V
Short-Circuit Output Current	I _{OS}	Sourcing		50		mA
		Sinking		40		mA
Output Current	I _O	Measured 1V from rail		±40		mA
Large-Signal Differential Voltage Amplification	A _{VD}	R _L =10kΩ, V _{O(PP)} =1V	90	105		dB
Differential Input Resistance	r _{I(D)}	T _A =25°C		10 ⁹		Ω
Common-Mode Input Capacitance	C _{I(C)}	f=10kHz, T _A =25°C		7		pF
Closed-Loop Output Impedance	Z _O	f=100kHz, A _V =10, T _A =25°C		33		Ω
Common-Mode Rejection Ratio	CMRR	V _{ICR} =0~3V, R _S =50Ω	66	80		dB
Supply Voltage Rejection Ratio (ΔV _{CC} /ΔV _{IO})	k _{SVR}	V _{CC} =2.7~6V, V _{IC} = V _{CC} /2, No load	80	85		dB
		V _{CC} =3~5V, V _{IC} = V _{CC} /2, No load	85	95		dB
Supply Current (Per Channels)	I _{CC}	V _O =1.5V, No load		0.5	0.575	mA
Supply current in shutdown (LV2463)	I _{CC} ($\overline{\text{SHDN}}$)	SHDN <0.7V, Per channel in shutdown		0.3		μA
OPWERAIING CHARACTERISTICS						
Slew Rate at Unity Gain	SR	V _{O(PP)} =0.8V, R _L =10kΩ, C _L =160pF	0.9	1.6		V/μs
Equivalent Input Noise Voltage	V _N	f=100Hz		16		nV/√Hz
		f=1kHz		11		
Equivalent Input Noise Current	I _N	f=1kHz		0.13		pA/√Hz
Total Harmonic Distortion Plus Noise	THD+N	V _{O(PP)} =2V, R _L =10kΩ, f=1kHz	A _V =1	0.006		%
			A _V =10	0.02		%
			A _V =100	0.08		%
Gain-Bandwidth Product		f=10 kHz, C _L =160pF, R _L =10kΩ		5.2		MHz
Setting Time	t _S	V _{(STEP)PP} =2V, R _L =10kΩ, A _V = -1, C _L =10pF	0.1%	1.47		μs
			0.01%	1.78		μs
		V _{(STEP)PP} =2V, R _L =10kΩ, A _V = -1, C _L =56pF	0.1%	1.77		μs
			0.01%	1.98		μs
Phase Margin at Unity Gain	φ _M	R _L =10kΩ, C _L =160pF		44		°
Gain Margin				7		dB

■ ELECTRICAL CHARACTERISTICS (Cont.)

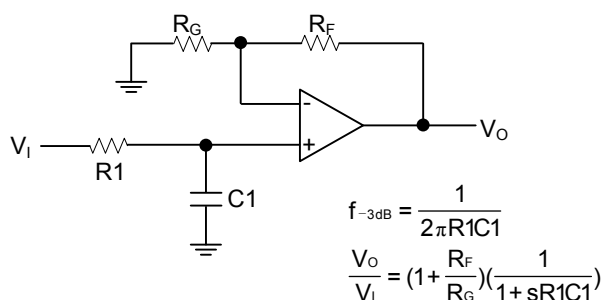
 $V_{CC}=5V$

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	$V_{CC}=5V, V_{IC}=2.5V, V_O=2.5V, R_S=50\Omega$		500	2000	μV
Input Offset Current	I_{IO}	$V_{CC}=5V, V_{IC}=2.5V, V_O=2.5V, R_S=50\Omega$		0.3	7	nA
Input Bias Current	I_{IB}	$T_A=25^\circ C$		1.3	14	nA
High-Level Output Voltage	V_{OH}	$I_{OH}=-2.5mA$		4.9		V
		$I_{OH}=-10mA$		4.8		V
Low-Level Output Voltage	V_{OL}	$V_{IC}=2.5V, I_{OL}=2.5mA$		0.1		V
		$V_{IC}=2.5V, I_{OL}=10mA$		0.2		V
Short-Circuit Output Current	I_{OS}	Sourcing		145		mA
		Sinking		100		mA
Output Current	I_O	Measured 1V from rail		± 48		mA
Large-Signal Differential Voltage Amplification	A_{VD}	$V_{IC}=2.5V, R_L=10k\Omega, V_O=1\sim 4V$	92	109		dB
Differential Input Resistance	$r_{I(D)}$	$T_A=25^\circ C$		10^9		Ω
Common-Mode Input Capacitance	$C_{I(C)}$	$f=10kHz, T_A=25^\circ C$		7		pF
Closed-Loop Output Impedance	Z_O	$f=100kHz, A_V=10, T_A=25^\circ C$		29		Ω
Common-Mode Rejection Ratio	CMRR	$V_{ICR}=0\sim 5V, R_S=50\Omega$	71	85		dB
Supply Voltage Rejection Ratio ($\Delta V_{CC}/\Delta V_{IO}$)	k_{SVR}	$V_{CC}=2.7\sim 6V, V_{IC}=V_{CC}/2, \text{No load}$	80	85		dB
		$V_{CC}=3\sim 5V, V_{IC}=V_{CC}/2, \text{No load}$	85	95		dB
Supply Current (Per Channels)	I_{CC}	$V_O=2.5V, \text{No load}$		0.55	0.65	mA
Supply current in shutdown (LV2463)	$I_{CC}(\overline{SHDN})$	SHDN < 0.7V, Per channel in shutdown		1		μA
OPWERAIING CHARACTERISTICS						
Slew Rate at Unity Gain	SR	$V_{O(PP)}=2V, C_L=160pF, R_L=10k\Omega$	0.9	1.6		V/ μs
Equivalent Input Noise Voltage	V_N	$f=100Hz$		14		nV/ $\sqrt{Hz}$
		$f=1kHz$		11		
Equivalent Input Noise Current	I_N	$f=1kHz$		0.13		pA/ $\sqrt{Hz}$
Total Harmonic Distortion Plus Noise	THD+N	$V_{O(PP)}=4V, R_L=10k\Omega, f=1kHz$	$A_V=1$	0.004		%
			$A_V=10$	0.01		%
			$A_V=100$	0.04		%
Gain-Bandwidth Product		$f=10kHz, C_L=160pF, R_L=10k\Omega$		6.4		MHz
Setting Time	t_s	$V_{(STEP)PP}=2V, R_L=10k\Omega, A_V=-1, C_L=10pF$	0.1%	1.53		μs
			0.01%	1.83		μs
		$V_{(STEP)PP}=2V, R_L=10k\Omega, A_V=-1, C_L=56pF$	0.1%	3.13		μs
			0.01%	3.33		μs
Phase Margin at Unity Gain	ϕ_M	$R_L=10k\Omega, C_L=160pF$		45		$^\circ$
Gain Margin				7		dB

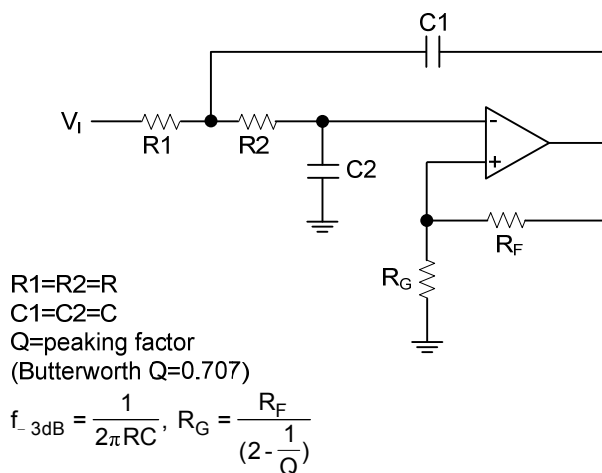
■ TYPICAL APPLICATION CIRCUIT



Driving A Capacitive Load



Single-Pole Low-Pass Filter



2-Pole Low-Pass Sallen-Key Filter

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