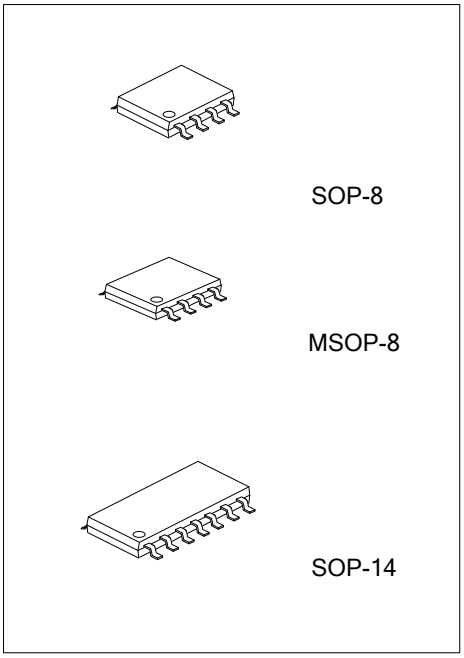
FAMILY OF LOW-POWER RAIL-TO-RAIL INPUT/OUTPUT OPERATIONAL AMPLIFIERS



■ DESCRIPTION

The UTC **V2462/2464** are dual/quad 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 **V2462/2464** have a guaranteed 1.6 V/μs slew rate and low supply current. rail-to-rail output and high output current make the I_{CS} ideal for buffering analog-to-digital converters. And the input common-mode voltage range including ground and V_{DD}. 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/√Hz) and low input offset voltage (100μV) make good DC performance.

■ FEATURES

* Rail-to-Rail Output Swing
* Gain Bandwidth Product 6.4 MHz
* ±80mA Output Drive Capability
* Supply Current 500μA/channel
* Input Offset Voltage 100μV
* Input Noise Voltage 11nV/√Hz
* Slew Rate 1.6V/μs
* Universal Operational Amplifier EVM
* Available in Q-Temp Automotive
* HighRel Automotive Applications
  Configuration Control/Print Support
  Qualification to Automotive Standards

■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
V2462L-S08-R	V2462G-S08-R	SOP-8	Tape Reel
V2462L-S08-T	V2462G-S08-T	SOP-8	Tube
V2462L-SM1-R	V2462G-SM1-R	MSOP-8	Tape Reel
V2462L-SM1-T	V2462G-SM1-T	MSOP-8	Tube
V2464L-S14-R	V2464G-S14-R	SOP-14	Tape Reel
V2464L-S14-T	V2464G-S14-T	SOP-14	Tube

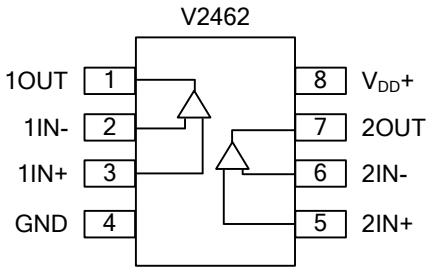
V2462L-S08-R
(1)Packing Type
(2)Package Type
(3)Lead Free

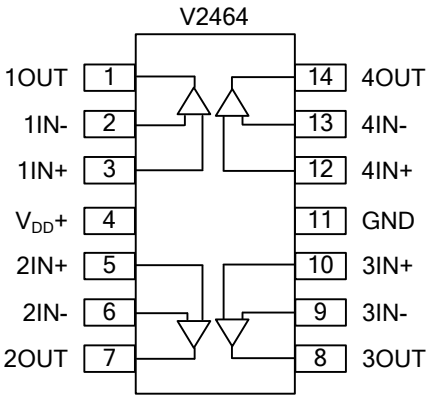
(1) R: Tape Reel, T: Tube

(2) SM1: MSOP-8, S08: SOP-8, S14: SOP-14

(3) G: Halogen Free, L: Lead Free

■ PIN CONFIGURATION





■ PIN DESCRIPTION

UTC V2462:

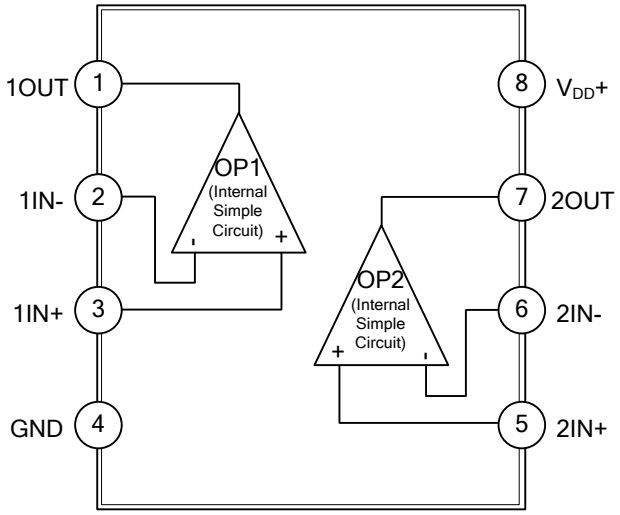
PIN NO.	PIN NAME	DESCRIPTION
1	1OUT	Output terminal of CH1
2	1IN-	Negative input terminal of CH1
3	1IN+	Positive input terminal of CH1
4	GND	Ground
5	2IN+	Positive input terminal of CH2
6	2IN-	Negative input terminal of CH2
7	2OUT	Output terminal of CH2
8	V_{DD}+	Supply voltage terminal

UTC V2464:

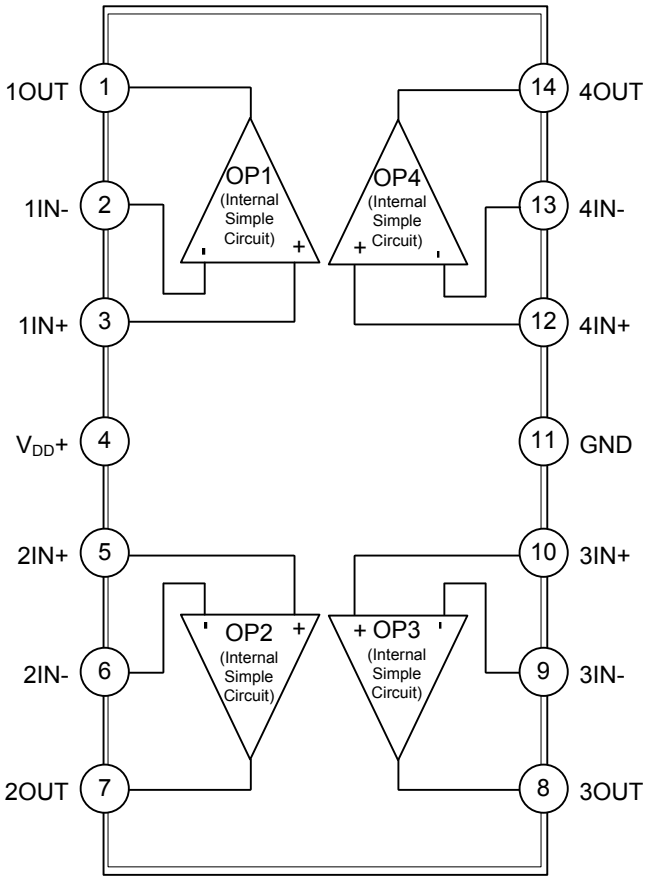
PIN NO.	PIN NAME	DESCRIPTION
1	1OUT	Output terminal of CH1
2	1IN-	Negative input terminal of CH1
3	1IN+	Positive input terminal of CH1
4	V_{DD}+	Supply voltage terminal
5	2IN+	Positive input terminal of CH2
6	2IN-	Negative input terminal of CH2
7	2OUT	Output terminal of CH2
8	3OUT	Output terminal of CH3
9	3IN-	Negative input terminal of CH3
10	3IN+	Positive input terminal of CH3
11	GND	Ground
12	4IN+	Positive input terminal of CH4
13	4IN-	Negative input terminal of CH4
14	4OUT	Output terminal of CH4

■ BLOCK DIAGRAM

V2462

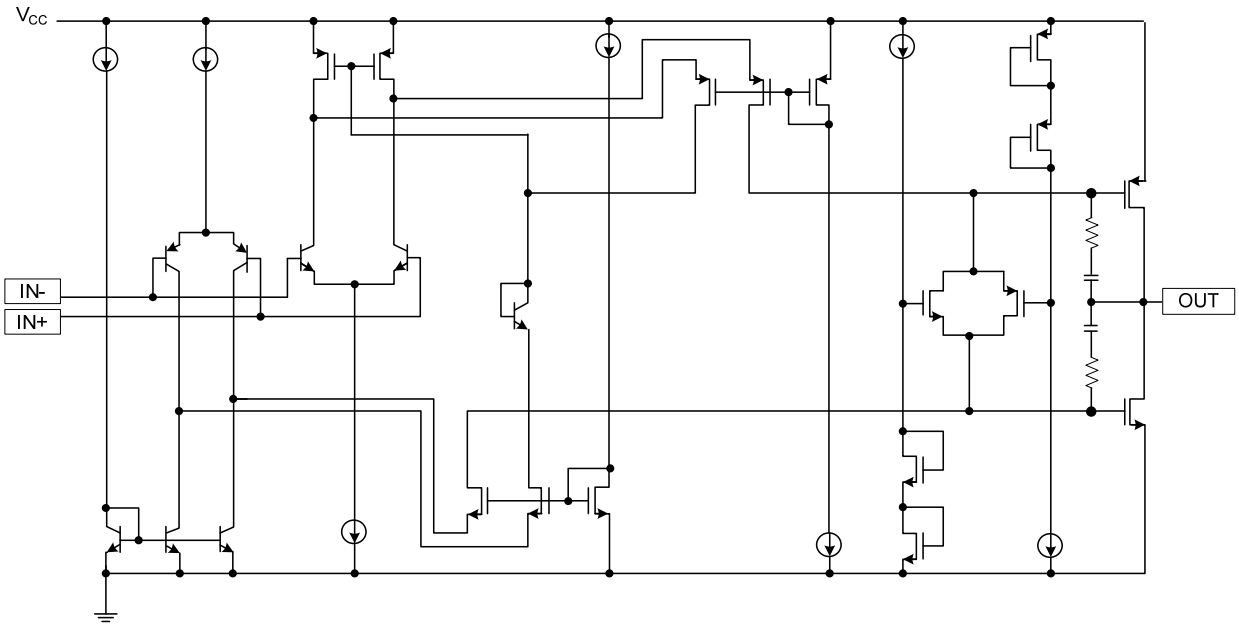


V2464



■ BLOCK DIAGRAM(Cont.)

Internal simple circuit (one channel):



■ ABSOLUTE MAXIMUM RATING (T_A=25°C, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS	UNIT
Supply Voltage (Note 1)			V_{DD}	6	V
Differential Input Voltage			V_{ID}	-0.2~V_{DD}+0.2	V
Output Current			I_O	±175	mA
Power Dissipation	T_A ≤ 25 °C	SOP-8/MSOP-8	P_D	710	mW
		SOP-14		1022	
	T_A < 125 °C	SOP-8/MSOP-8		142	
		SOP-14		204.4	
Operating Free-Air Temperature			T_A	-40~125	°C
Junction Temperature			T_J	150	°C
Storage Temperature			T_{STG}	-60~150	°C

Notes: 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.

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

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	SOP-8/MSOP-8	θ_{JA}	176	°C/W
	SOP-14		122.6	°C/W
Junction to Case	SOP-8/MSOP-8	θ_{JC}	38.3	°C/W
	SOP-14		26.9	°C/W

■ RECOMMENDED OPWRAING CONDITIONS

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage	Single supply	V_{DD}	2.7 ~ 6	V
	Split supply		±1.35 ~ ±3	V
Common-Mode Input Voltage		V_{ICR}	0 ~ V_{DD}	V
Operating Free-Air Temperature		T_A	-40 ~ 125	°C

Note: 1. Relative to voltage on the GND terminal of the device.

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

V_{DD}=3V

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	V_{DD}=3V, V_{IC}=1.5V, V_O=1.5V, R_S=50Ω	T_A=25°C		500	2000	μV
			(Note 1)			2200	
Input Offset Current	I_{IO}	V_{DD}=3V, V_{IC}=1.5V, V_O=1.5V, R_S=50Ω	T_A=25°C		2.8	7	nA
			(Note 1)			75	
Input Bias Current	I_{IB}		T_A=25°C		4.4	14	nA
			(Note 1)			75	
High-Level Output Voltage	V_{OH}	I_{OH}= -2.5mA	T_A=25°C		2.9		V
			(Note 1)	2.8			
		I_{OH}=-10mA	T_A=25°C		2.7		
			(Note 1)	2.5			
Low-Level Output Voltage	V_{OL}	V_{IC}=1.5V, I_{OL}=2.5mA	T_A=25°C		0.1		V
			(Note 1)			0.2	
		V_{IC}=1.5V, I_{OL}=10mA	T_A=25°C		0.3		
			(Note 1)			0.5	
Short-Circuit Output Current	I_{OS}	Sourcing	T_A=25°C		50		mA
			(Note 1)	20			
		Sinking	T_A=25°C		40		
			(Note 1)	20			

■ ELECTRICAL CHARACTERISTICS(Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Output Current	I_O	Measured 1V form rail, T_A=25°C			±40		mA
Large-Signal Differential Voltage Amplification	A_{VD}	R_L=10kΩ, $V_{O(PP)}$=1V	T_A=25°C	90	105		dB
			(Note 1)	89			
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	T_A=25°C	66	80		dB
			(Note 1)	60			
Supply Voltage Rejection Ratio ($\Delta V_{DD}/\Delta V_{IO}$)	k_{SVR}	V_{DD}=2.7~6V, V_{IC}=V_{DD}/2, No load	T_A=25°C	80	85		dB
			(Note 1)	75			
		V_{DD}=3~5V, V_{IC}=V_{DD}/2, No load	T_A=25°C	85	95		
			(Note 1)	80			
Supply Current (Per Channels)	I_{DD}	V_O=1.5V, No load	T_A=25°C		0.5	0.575	mA
			(Note 1)			0.9	

Note: 1. T_A= -40°C~125°C.

V_{DD}=5V

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Offset Voltage	V_{IO}	V_{DD}=5V, V_{IC}=2.5V, V_O=2.5V, R_S=50Ω	T_A=25°C		500	2000	μV
			(Note 1)			2200	
Input Offset Current	I_{IO}	V_{DD}=5V, V_{IC}=2.5V, V_O=2.5V, R_S=50Ω	T_A=25°C		0.3	7	nA
			(Note 1)			60	
Input Bias Current	I_{IB}	T_A=25°C			1.3	14	nA
		(Note 1)				60	
High-Level Output Voltage	V_{OH}	I_{OH}=-2.5mA	T_A=25°C		4.9		V
			(Note 1)	4.8			
		I_{OH}=-10mA	T_A=25°C		4.8		
			(Note 1)	4.7			
Low-Level Output Voltage	V_{OL}	V_{IC}=2.5V, I_{OL}=2.5mA	T_A=25°C		0.1		V
			(Note 1)			0.2	
		V_{IC}=2.5V, I_{OL}=10mA	T_A=25°C		0.2		
			(Note 1)			0.3	
Short-Circuit Output Current	I_{OS}	Sourcing	T_A=25°C		145		mA
			(Note 1)	60			
		Sinking	T_A=25°C		100		
			(Note 1)	60			
Output Current	I_O	Measured 1V form rail			±48		mA
Large-Signal Differential Voltage Amplification	A_{VD}	V_{IC}=2.5V, R_L=10kΩ, V_O=1~4V	T_A=25°C	92	109		dB
			(Note 1)	90			
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			29		Ω
Common-Mode Rejection Ratio	CMRR	V_{ICR}=0~5V, R_S=50Ω	T_A=25°C	71	85		dB
			(Note 1)	60			
Supply Voltage Rejection Ratio ($\Delta V_{DD}/\Delta V_{IO}$)	k_{SVR}	V_{DD}=2.7~6V, V_{IC}=V_{DD}/2, No load	T_A=25°C	80	85		dB
			(Note 1)	75			
		V_{DD}=3~5V, V_{IC}=V_{DD}/2, No load	T_A=25°C	85	95		
			(Note 1)	80			
Supply Current (Per Channels)	I_{DD}	V_O=2.5V, No load	T_A=25°C		0.55	0.65	mA
			(Note 1)			1	

Note: 1. T_A= -40°C~125°C.

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

V_{DD}=3V

PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Slew Rate at Unity Gain	SR	$V_{O(PP)}$=0.8V, R_L=10kΩ, C_L=160pF	T_A=25°C	0.9	1.6		V/μs
			(Note 1)	0.8			
Equivalent Input Noise Voltage	V_N	f=100Hz			16		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	$V_{O(PP)}$=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		
		$V_{(STEP)PP}$=2V,R_L=10kΩ A_V= -1, C_L=56pF,	0.1%		1.77		
			0.01%		1.98		
Phase Margin at Unity Gain	φ_M	R_L=10kΩ, C_L=160pF			44°		
Gain Margin					7		dB

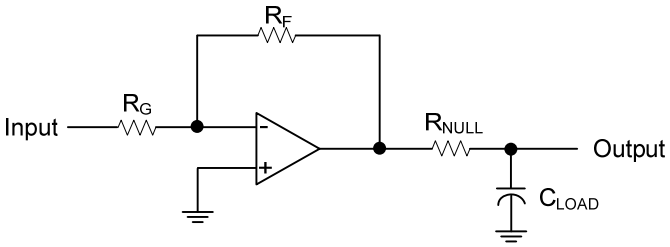
Note: 1. T_A=-40°C~125°C.

V_{DD}=5V

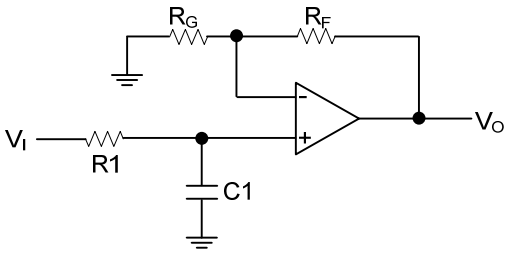
PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Slew Rate at Unity Gain	SR	$V_{O(PP)}$=2V,C_L=160pF, R_L=10 kΩ	T_A=25°C	0.9	1.6		V/μs
			(Note 1)	0.8			
Equivalent Input Noise Voltage	V_N	f=100Hz			14		nV/ $\sqrt{Hz}$
		f=1kHz			11		
Equivalent Input Noise Current	I_N	f=1kHz			0.13		pA/ $\sqrt{Hz}$
Total Harmonic Distortion Plus Noise	THD+N	$V_{O(PP)}$=4V, R_L=10kΩ, f=1kHz	A_V=1		0.004		%
			A_V=10		0.01		
			A_V=100		0.04		
Gain-Bandwidth Product		f=10 kHz, C_L=160pF, R_L=10kΩ			6.4		MHz
Setting Time	t_S	$V_{(STEP)PP}$=2V,R_L=10kΩ, A_V= -1, C_L=10pF	0.1%		1.53		μs
			0.01%		1.83		
		$V_{(STEP)PP}$=2V,R_L=10kΩ, A_V= -1, C_L=56pF	0.1%		3.13		
			0.01%		3.33		
Phase Margin at Unity Gain	φ_M	R_L=10kΩ, C_L=160pF			45°		
Gain Margin					7		dB

Note: 1. T_A= -40°C~125°C.

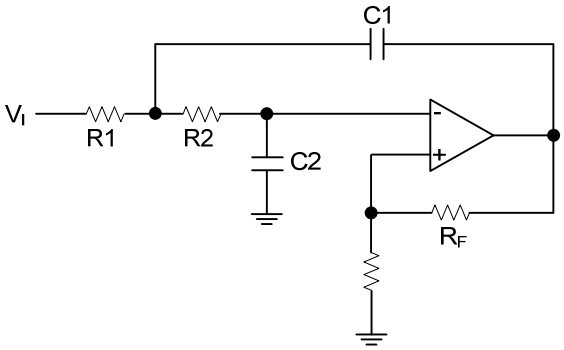
■ TYPICAL APPLICATION CIRCUIT



Driving a capacitive Load



Single-Pole Low-Pass Filter



2-Pole Low-Pass Sallen-Key Filter