



## General Description

HAP2204R series are a set of Low Dropout Linear Regulator ICs implemented in CMOS technology. They can withstand voltage 22V. And they are available with lowvoltage drop and low quiescent current,widely used in audio, video and communication appliances.

## Features

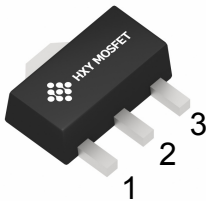
- Low Power Consumption
- Low Voltage Drop
- Low Temperature Coefficient
- Withstanding Voltage 22V
- Quiescent Current 1.5 $\mu$ A
- Output Voltage Accuracy: tolerance  $\pm$ 2%
- High output current: 300mA

## Application

- Battery-powered Equipments
- Communication Equipments
- Audio/Video Equipments

## Pin Configuration And Descriptions

SOT-89



No.	Name	Functions Description
1	V <sub>IN</sub>	Input
2	GND	Ground
3	V <sub>OUT</sub>	Output

## Order Information

Orderable Device	Package	Output Voltage	Packing Option
HAP2204R-3.0TRG1	SOT-89	3.0V	3000/Reel
HAP2204R-3.3TRG1	SOT-89	3.3V	3000/Reel
HAP2204R-5.0TRG1	SOT-89	5.0V	3000/Reel



## Absolute Maximum Ratings

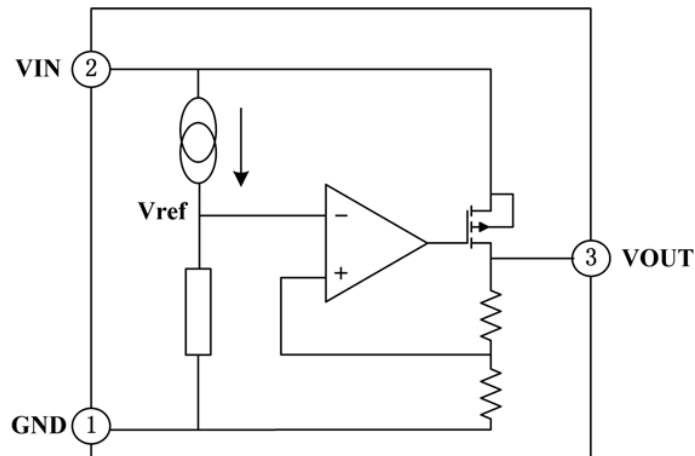
Description	Symbol	Value Range	Unit
Limit Power Voltage	$V_{IN}$	-0.3~+25	V
Storage Temperature Range	$T_{STG}$	-50~+125	°C
Operating Free-air Temperature Range	$T_A$	-40~+85	°C

Note: Stresses greater than those listed under “Absolute Maximum Ratings” cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

## Heat Dissipation

Description	Symbol	Package	Value Range	Unit
Thermal resistance	$J_A$	SOT-89	200	°C/W
Power dissipation	$P_W$	SOT-89	500	mW

## Block Diagram





### DC Characteristics (unless otherwise noted $T_A = 25^\circ\text{C}$ )

( $V_{IN} = V_{OUT} + 2.0\text{V}$ ,  $C_{IN} = C_L = 10\mu\text{F}$ ,  $T_A = 25^\circ\text{C}$ , unless otherwise noted)

#### Series +3.0V OUTPUT

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	$V_{OUT}$	$V_{IN} = V_{OUT} + 2.0\text{V}$ , $I_{OUT} = 10\text{mA}$	2.94	3.00	3.06	V
Output Current	$I_{OUT}$	$V_{IN} = V_{OUT} + 2.0\text{V}$	300			mA
Load Regulation	$\Delta V_{OUT}$	$V_{IN} = V_{OUT} + 2.0\text{V}$ $1\text{mA} \leq I_{OUT} \leq 50\text{mA}$		37	100	mV
Voltage Drop	$V_{DIF}$	$I_{OUT} = 1\text{mA}$ , $\Delta V_{OUT} = 2\%$		210	300	mV
Quiescent Current	$I_{SS}$	No Load		1.5	3.0	$\mu\text{A}$
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}} \cdot \frac{\Delta V_{IN}}{\Delta V_{IN}}$	$V_{OUT} + 1.0\text{V} \leq V_{IN} \leq 30\text{V}$ , $I_{OUT} = 1\text{mA}$			0.2	%/V
Input Voltage	$V_{IN}$				22	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_A} \cdot V_{OUT}$	$V_{IN} = V_{OUT} + 2.0\text{V}$ , $I_{OUT} = 10\text{mA}$ , $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$		100		ppm/ $^\circ\text{C}$
Output Short Circuit Current	$I_{lim}$	$V_{OUT} = 0\text{V}$		400		mA

Note: When  $V_{IN} = V_{OUT} + 2.0\text{V}$ , as the output voltage declined 2%, the  $V_{DIF} = V_{IN} - V_{OUT}$ .

#### Series +3.3V OUTPUT

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	$V_{OUT}$	$V_{IN} = V_{OUT} + 2.0\text{V}$ , $I_{OUT} = 10\text{mA}$	3.234	3.30	3.366	V
Output Current	$I_{OUT}$	$V_{IN} = V_{OUT} + 2.0\text{V}$	300			mA
Load Regulation	$\Delta V_{OUT}$	$V_{IN} = V_{OUT} + 2.0\text{V}$ $1\text{mA} \leq I_{OUT} \leq 50\text{mA}$		37	100	mV
Voltage Drop	$V_{DIF}$	$I_{OUT} = 1\text{mA}$ , $\Delta V_{OUT} = 2\%$		195	300	mV
Quiescent Current	$I_{SS}$	No Load		1.5	3.0	$\mu\text{A}$
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}} \cdot \frac{\Delta V_{IN}}{\Delta V_{IN}}$	$V_{OUT} + 1.0\text{V} \leq V_{IN} \leq 30\text{V}$ , $I_{OUT} = 1\text{mA}$			0.2	%/V
Input Voltage	$V_{IN}$				22	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_A} \cdot V_{OUT}$	$V_{IN} = V_{OUT} + 2.0\text{V}$ , $I_{OUT} = 10\text{mA}$ , $-40^\circ\text{C} \leq T_A \leq 85^\circ\text{C}$		100		ppm/ $^\circ\text{C}$
Output Short Circuit Current	$I_{lim}$	$V_{OUT} = 0\text{V}$		400		mA

Note: When  $V_{IN} = V_{OUT} + 2.0\text{V}$ , as the output voltage declined 2%, the  $V_{DIF} = V_{IN} - V_{OUT}$ .



### Series +5.0V OUTPUT

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Output Voltage	$V_{OUT}$	$V_{IN}=V_{OUT}+2.0V,$ $I_{OUT}=10mA$	4.9	5.0	5.1	V
Output Current	$I_{OUT}$	$V_{IN}=V_{OUT}+2.0V$	300			mA
Load Regulation	$\Delta V_{OUT}$	$V_{IN}=V_{OUT}+2.0V$ $1mA \leq I_{OUT} \leq 50mA$		37	100	mV
Voltage Drop	$V_{DIF}$	$I_{OUT}=1mA, \Delta V_{OUT}=2\%$		170	300	mV
Quiescent Current	$I_{SS}$	No Load		1.5	3.0	uA
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT}} \cdot \frac{\Delta V_{IN}}{\Delta V_{IN}}$	$V_{OUT}+1.0V \leq V_{IN} \leq 30V,$ $I_{OUT}=1mA$			0.2	%/V
Input Voltage	$V_{IN}$				22	V
Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_A} \cdot V_{OUT}$	$V_{IN}=V_{OUT}+2.0V,$ $I_{OUT}=10mA,$ $-40^\circ C \leq T_A \leq 85^\circ C$		100		ppm/ $^\circ C$
Output Short Circuit Current	$I_{lim}$	$V_{OUT}=0V$		400		mA

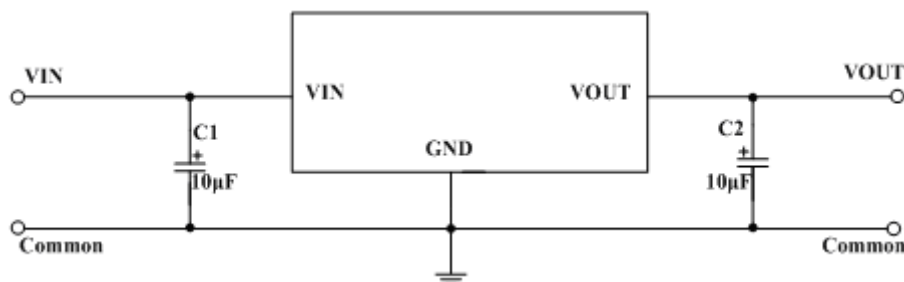
Note: When  $V_{IN}=V_{OUT}+2.0V$ , as the output voltage declined 2%, the  $V_{DIF}=V_{IN}-V_{OUT}$ .

## Function Description

HAP2204R series are linear voltage regulator ICs withstanding 22V voltage. The series IC consists of a voltage reference, an error amplifier, a current limiter and a phase compensation circuit plus a driver transistor. The output stabilization capacitor is also compatible with low ESR ceramic capacitors. The over current protection circuit and the over voltage protection circuit are built-in. The protection circuit will operate when the output current or input voltage reaches limit level.

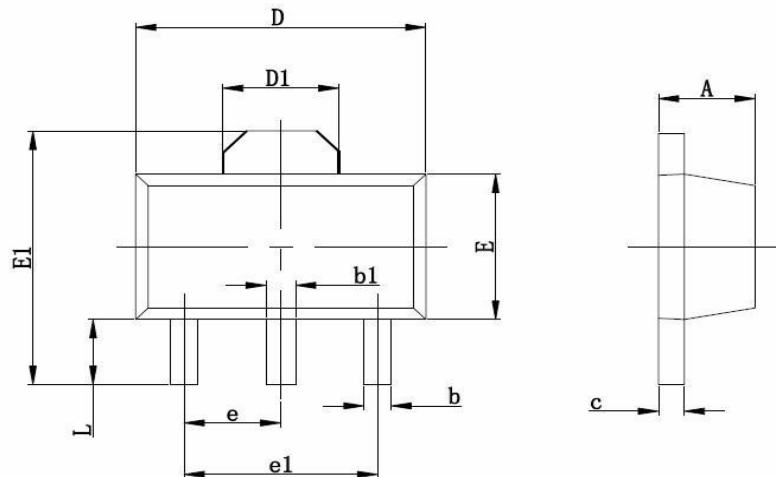
## Application Circuit

### Basic Circuits





### SOT-89 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047



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