

Sense Current Amplifier Monolithic IC MM1380

Outline

This IC improves on the previous sensor amp MM1089 (Dual). It is a single amp that allows current sensing regardless of the IC power supply (V_{CC}). Further, the common mode signal rejection ratio and power supply fluctuation rejection ratio have been improved, and gain is switched between 50 and 100 times.

Features

- | | |
|---|------------------------|
| (1) Common mode signal rejection ratio (CMRR1.1kHz) | 100dB typ. |
| (2) Power supply fluctuation rejection ratio (PSRR1.1kHz) | 80dB typ. |
| (3) Operating power supply voltage range | +3 ~ +24V |
| (4) Consumption current | 150 μ A typ. |
| (5) Voltage gain | 50/100 times switching |
| (6) Input equivalent offset voltage | $\pm$ 0.5mV |
| (7) Current detection | High/Low switching |
| (8) Single type | |

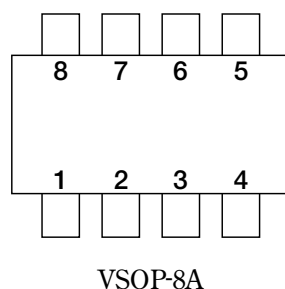
Package

VSOP-8A

Applications

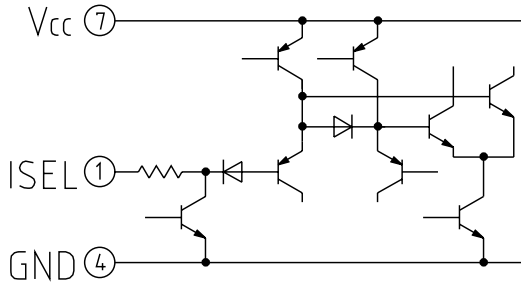
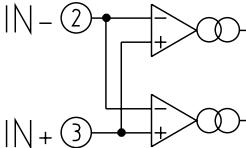
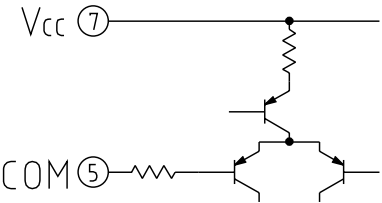
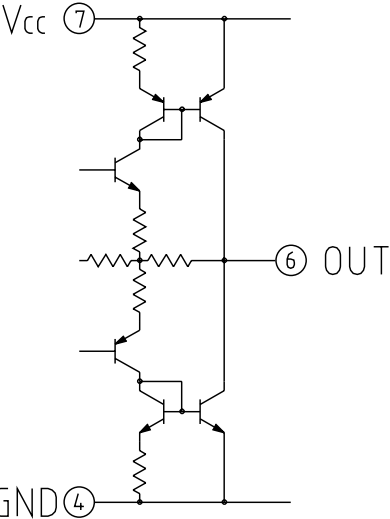
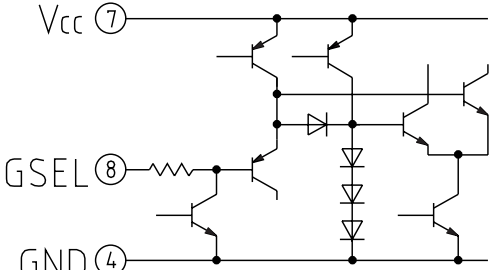
- (1) Notebook PCs
- (2) PDA

Pin Assignment

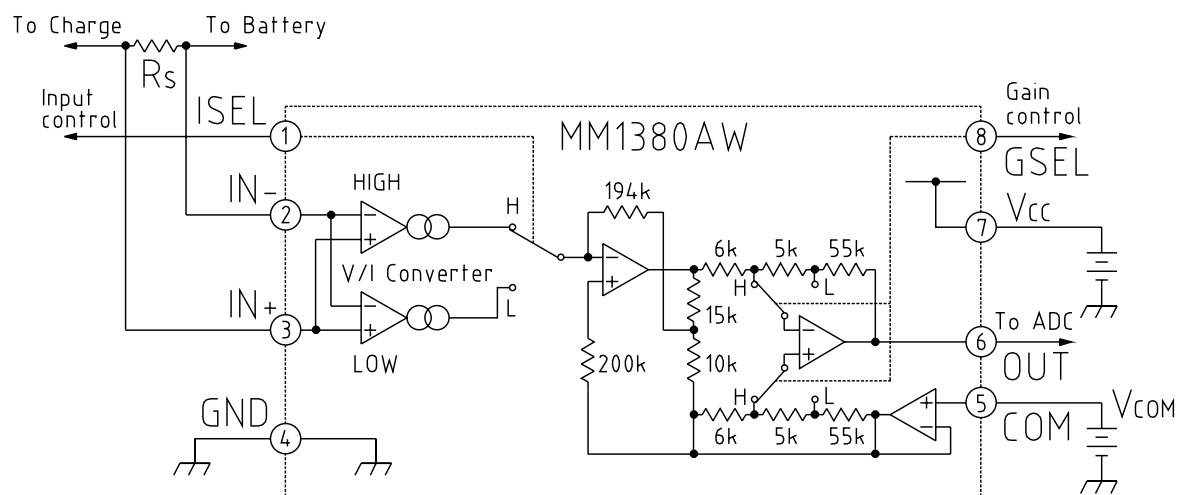


1	ISEL
2	IN-
3	IN+
4	GND
5	COM
6	OUT
7	V_{CC}
8	GSEL

Pin Description

Pin No.	Pin name	Functions	Internal equivalent circuit
1	ISEL	Input selection switch terminal Input common mode voltage range ISEL="H" : from 1.8V to 24V ISEL="L" : from -0.3V to $V_{CC}-2.4V$	
4	GND	Ground terminal	
2	IN-	Inverted input terminal	
3	IN+	Non-Inverted input terminal	
5	COM	Reference voltage input terminal	
6	OUT	Output terminal	
7	Vcc	Supply voltage terminal	
8	GSEL	Gain selection switch terminal Voltage gain GSEL="H" : $G_V=100$ GSEL="L" : $G_V=50$	

Block Diagram



Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Storage temperature	T_{STG}	-40~+125	°C
Supply voltage	$V_{CCmax.}$	-0.3~+25	V
Input terminal voltage	$V_{imax.}$	-0.3~+25	V
Allowable loss	P_d	300	mW

Recommended Operating Conditions

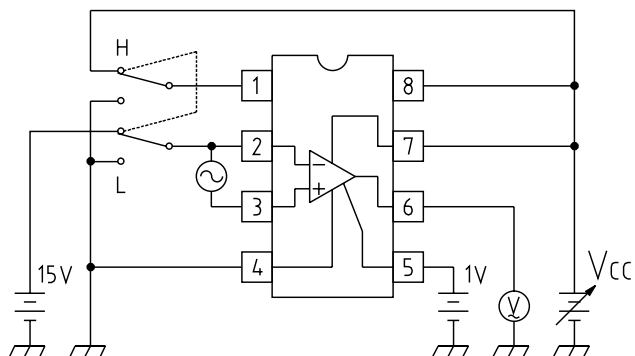
Item	Symbol	Ratings	Units
Operating temperature	T_{OPR}	-20~+85	°C
Operating voltage	V_{CC}	+3~+24	V

Electrical Characteristics (Except where otherwise indicated, Ta=25°C, Vcc=5V, Vicm=15V, Vcom=25V, Visel=5V, Vgsel=5V, RL=10kΩ)

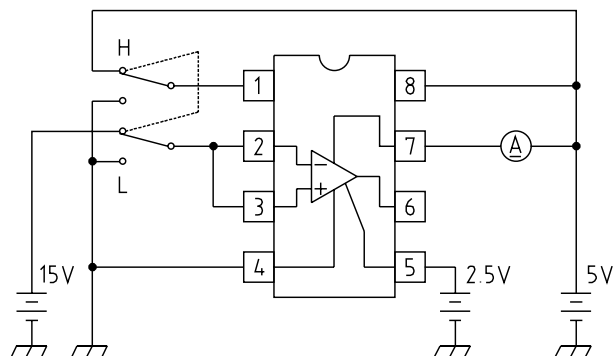
Item	Signal	Measurement conditions	Min.	Typ.	Max.	Unit
Supply voltage range	VCC	Vcom=VCC/2	3		24	V
Supply current	ICC	∠VIN=0V, RL : OPEN		150	200	μA
Voltage gain 1 (×100)	Gv1	Vgsel=5V	97	100	103	mV/mV
Voltage gain 2 (×50)	Gv2	Vgsel=0V	48.5	50	51.5	mV/mV
Input offset voltage 1 (High side)	VOFF1	∠VIN=0V, Visel=5V	−0.5		0.5	mV
Input offset voltage 2 (Low side)	VOFF2	∠VIN=0V, Visel=0V	−0.5		0.5	mV
Temperature coefficient of Voff 1	∠VOFF1	Visel=5V	−4		4	μV/°C
Temperature coefficient of Voff 2	∠VOFF2	Visel=0V	−6		6	μV/°C
Input common mode voltage range 1 (High side)	Vicm1	Visel=5V	1.8		24	V
Input common mode voltage range 2 (Low side)	Vicm2	Visel=0V	−0.3		VCC−2.4	V
Input differential voltage	Vidf		−200		200	mV
Input bias current 1 (High side)	Ib1	Visel=5V, ∠VIN=0V	0.8	1.2	1.6	μA
Input bias current 2 (Low side)	Ib2	Visel=0V, ∠VIN=0V	−0.8	−1.2	−1.6	μA
Input impedance	Zi		100			kΩ
COM terminal voltage range	Vcom	RL : OPEN	1.2		VCC−1.2	V
ISEL terminal current	Iisel	Visel=5V		1.0		μA
ISEL terminal voltage range 1 (High side)	Visel1		1.7		24	V
ISEL terminal voltage range 2 (Low side)	Visel2		0		0.5	V
GSEL terminal sink current	Igsel	Vgsel=5V		1.0		μA
GSEL terminal voltage range 1 (×100)	Vgsel1		1.7		24	V
GSEL terminal voltage range 2 (×50)	Vgsel2		0		0.5	V
Output voltage range	VOUT	RL : OPEN	0.3		VCC−0.3	V
Output source current	Isrc	VOUT=VCC−0.3V	0.5	1.0		mA
Output sink current	Isnk	VOUT=0.3V	−0.5	−1.0		mA
Cut off frequency 1 (Gv1=100)	Fc1	Vgsel=5V, VOUT=−3dB		100		kHz
Cut off frequency 2 (Gv2=50)	Fc2	Vgsel=0V, VOUT=−3dB		140		kHz
Supply voltage rejection ratio 1 (High side)	PSRR1	f=1kHz, Visel=5V	70	80		dB
Supply voltage rejection ratio 2 (Low side)	PSRR2	f=1kHz, Visel=0V	70	80		dB
Common mode rejection ratio 1 (High side)	CMRR1	f=1kHz, Visel=5V	70	80		dB
Common mode rejection ratio 2 (Low side)	CMRR2	f=1kHz, Visel=0V	70	80		dB

Measuring Circuit

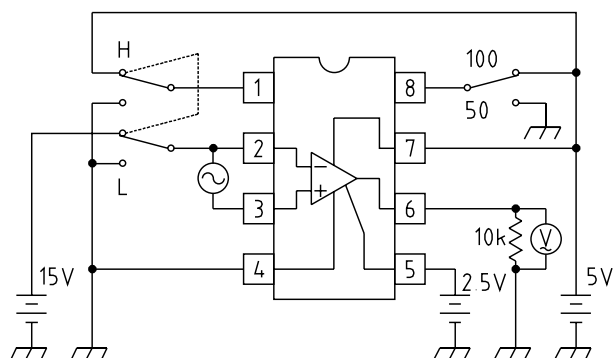
Supply voltage range



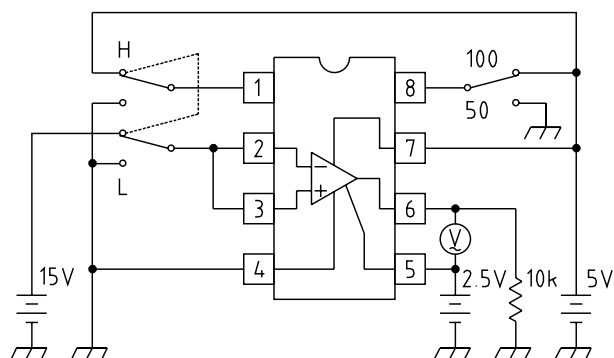
Supply current



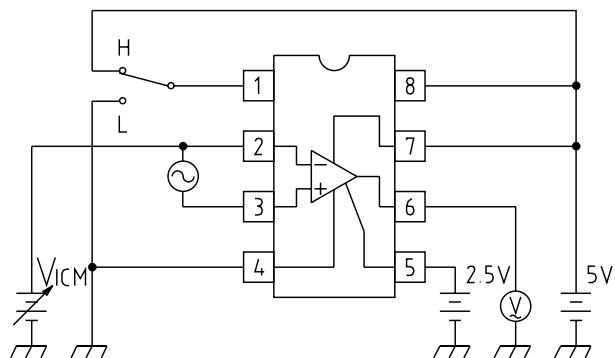
Voltage gain



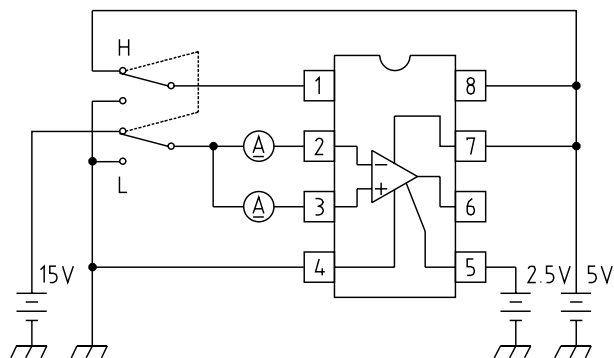
Offset voltage



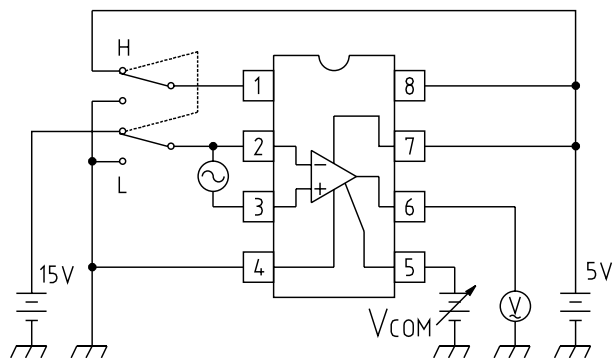
Input common mode voltage range



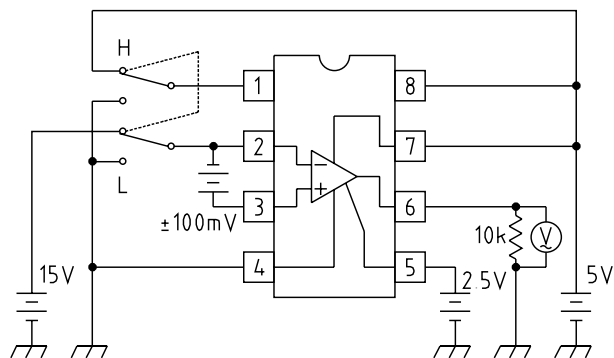
Input bias current



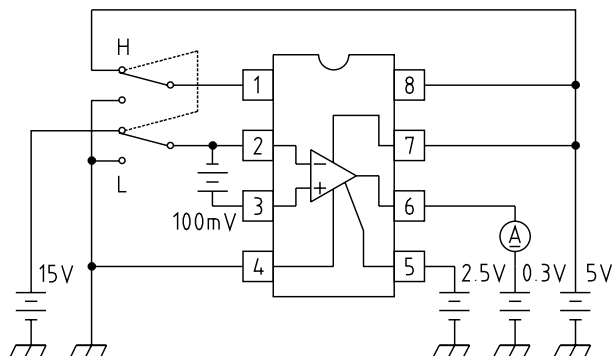
COM terminal voltage range



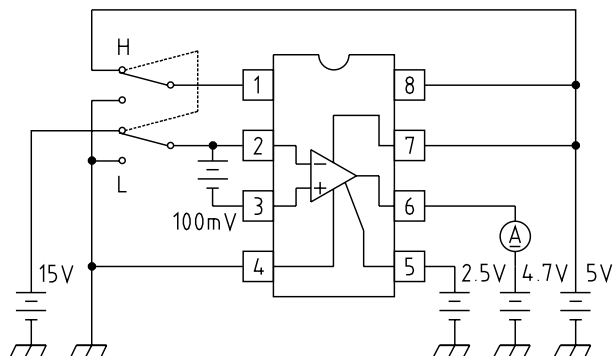
Output voltage range



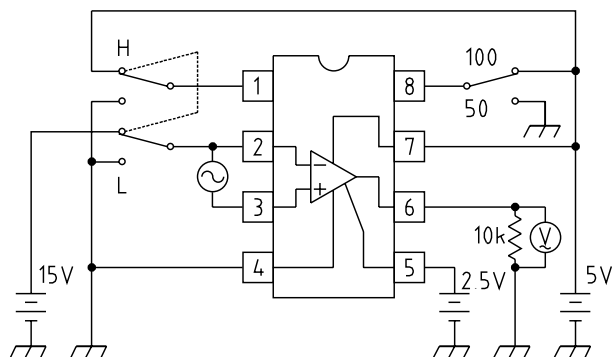
■ Output source current



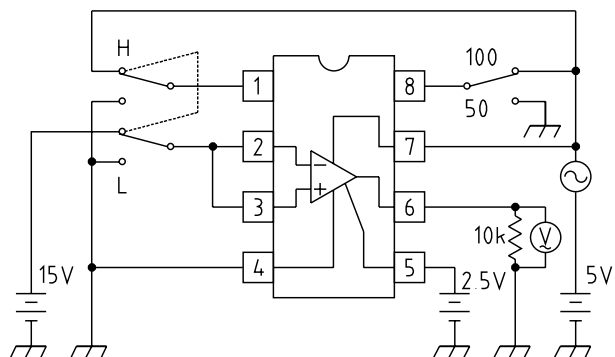
■ Output sink current



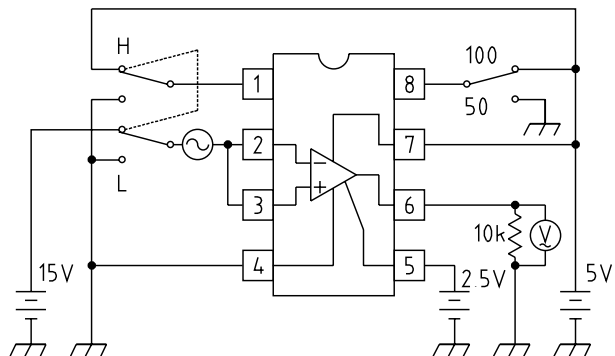
■ Cut off frequency



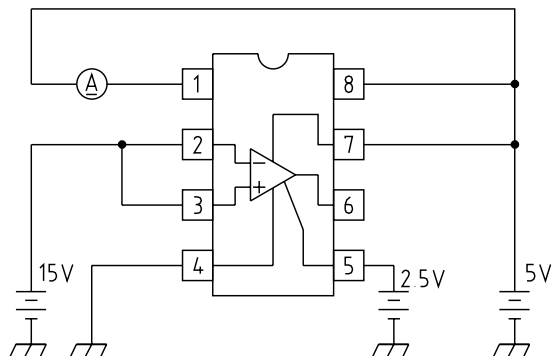
■ Supply voltage rejection ratio



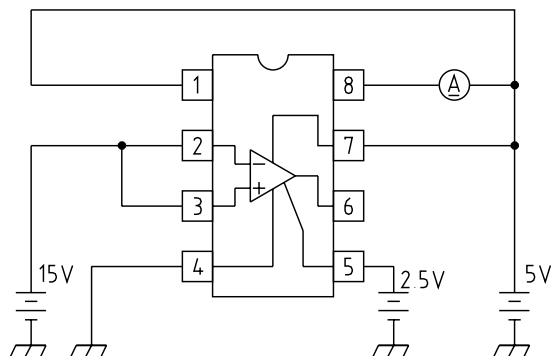
■ Common mode rejection ratio



■ ISEL terminal sink current

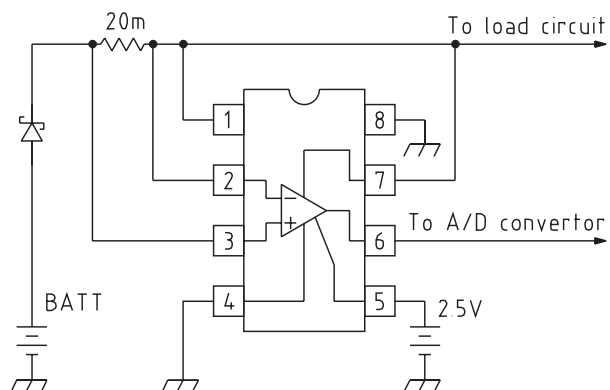


■ GSEL terminal sink current



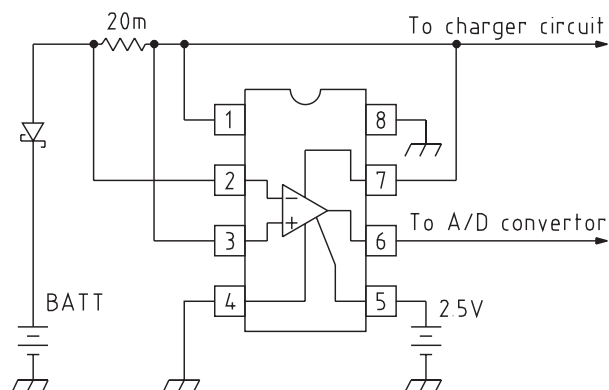
Application Circuit

Battery current sensing circuit



$$R_s = 20\text{m}\Omega, \quad G_V = 50:1\text{V/A}$$

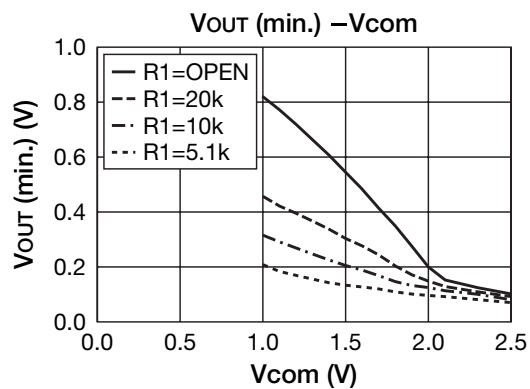
Charger current sensing circuit



$$R_s = 20\text{m}\Omega, \quad G_V = 50:1\text{V/A}$$

Characteristics

Minimum output voltage-COM terminal voltage



Input bias current-differential input voltage

