



## UCM101

Preliminary

LINEAR INTEGRATED CIRCUIT

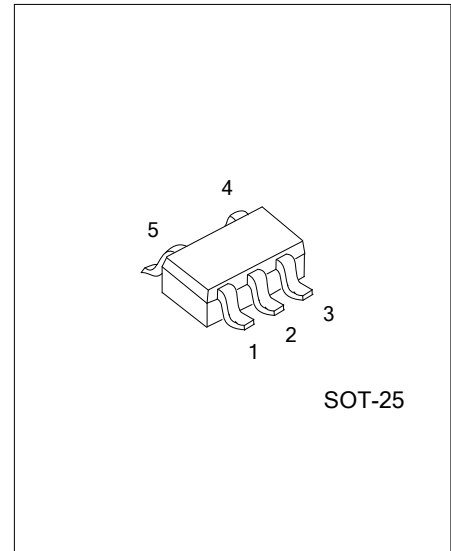
### BIDIRECTIONAL PRECISION HIGH-SIDE CURRENT MONITOR

#### DESCRIPTION

The UTC **UCM101** is a bidirectional precision high-side current sense monitor. It uses UTC's advanced technology to provide customers with a minimum operating current, high accuracy, high side voltage and a fixed gain of 10, etc.

The UTC **UCM101**'s output voltage is proportional to the differential input voltage. Direction of current flow is indicated by the Flag pin.

The UTC **UCM101** is suitable for widely voltage range applications and portable battery equipment.



#### FEATURES

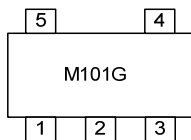
- \* Low operating current
- \* High side voltage (2.7~20V)
- \* A fixed gain of 10
- \* High accuracy (typ=1%)

#### ORDERING INFORMATION

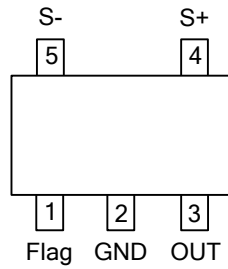
Ordering Number	Package	Packing
UCM101G-AF5-R	SOT-25	Tape Reel

<p>UCM101G-AF5-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) AF5: SOT-25</li> <li>(3) G: Halogen Free and Lead Free</li> </ul>
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#### MARKING



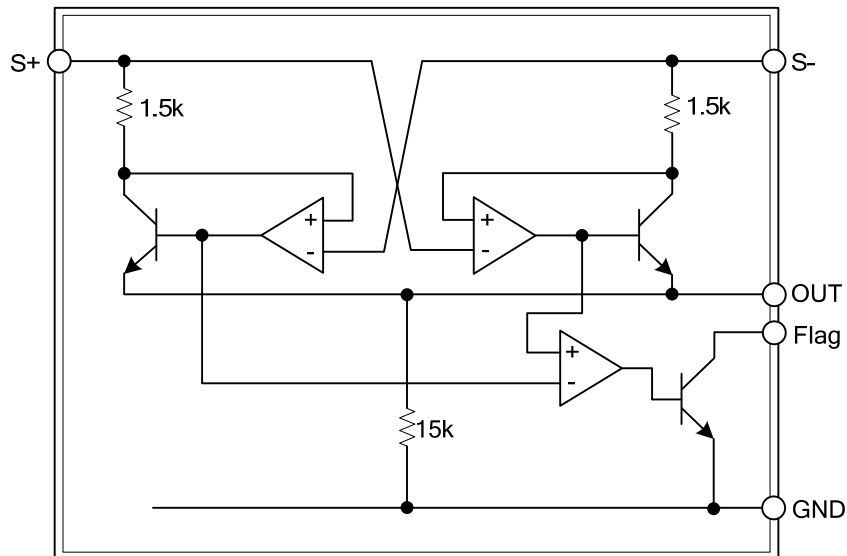
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	Flag	This is the current direction pin. It is open collector and allows the logic high level to be set independent of $V_{S+}$ voltage. Low indicates $V_{S+}$ is greater than $V_{S-}$ .
2	GND	Ground pin
3	OUT	Output voltage pin
4	S+	This is the positive input of the current monitor. It also acts as the supply voltage pin providing current for internal circuitry. The current through this pin varies with differential sense voltage
5	S-	This is the negative input of the current monitor. The current through this pin varies with differential sense voltage

■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Voltage on $V_{S-}$ and $V_{S+}$		-0.6~20	V
Voltage on all Other Pins		-0.6~( $V_{S+}$ or $V_{S-}$ )+0.6	V
$V_{sense} [(V_{S+}) - (V_{S-})]$		+/-6	V
Package Power Dissipation	$P_D$	300	mW
at $T_A=25^\circ\text{C}$ (De-rate to zero at $150^\circ\text{C}$ )			
Operating Temperature	$T_A$	-40~125	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-55~150	$^\circ\text{C}$
Maximum Junction Temperature	$T_J$	150	$^\circ\text{C}$

Note: 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.

### ■ RECOMMENDED OPERATING CONDITIONS

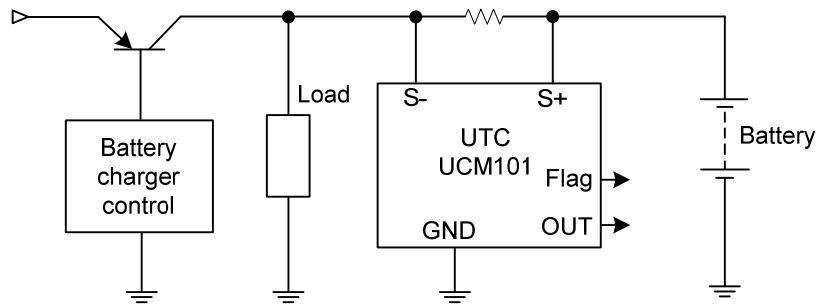
PARAMETER	SYMBOL	RATINGS	UNIT
Common-Mode Sense Input Range	$V_{S\pm}$	2.7~20	V
Current Direction Flag Output	Flag	0~ $V_{S\pm}$	V
Differential Sense Input Voltage Range	$V_{SENSE}$	0~ $\pm 0.8$	V
Output Voltage Range	$V_{OUT}$	0~ $V_{S\pm}-1.5$	V
Ambient Temperature Range	$T_A$	-40~125	$^\circ\text{C}$

### ■ ELECTRICAL CHARACTERISTICS (Test conditions $T_A=25^\circ\text{C}$ , $V_{S+}=10\text{V}$ , $V_{SENSE}=100\text{mV}$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Ground Pin Current	$I_Q$		15	35	50	$\mu\text{A}$
$V_{S+}$ Input Current	$I_{S+}$	$V_{SENSE}=0\text{V}$	10	17	24	$\mu\text{A}$
$V_{S-}$ Input Current	$I_{S-}$	$V_{SENSE}=0\text{V}$	10	17	24	$\mu\text{A}$
Output Voltage	$V_{OUT}$	$V_{SENSE}=+150\text{mV}$	1.55	1.5	1.45	V
		$V_{SENSE}=+100\text{mV}$	1.02	1	0.98	V
		Flag High $V_{SENSE}=+30\text{mV}$	309	300	291	mV
		$V_{SENSE}=0\text{V}$	0		15	mV
		Flag Low $V_{SENSE}=-30\text{mV}$	285	300	315	mV
		$V_{SENSE}=-100\text{mV}$	0.95	1	1.05	V
$V_{SENSE}=-150\text{mV}$	1.42	1.50	1.58	V		
$V_{OUT}$ Variation with Temperature	$V_{OUT} TC$	$V_{SENSE}=\pm 100\text{mV}$		30		ppm/ $^\circ\text{C}$
$V_{OUT}/V_{SENSE}$	Gain			10		
Total Output Error (Gain + Offset)	Accuracy	$V_{SENSE}=100\text{mV}$			$\pm 2$	%
		$V_{SENSE}=-100\text{mV}$			$\pm 5$	%
Bandwidth	BW	$V_{SENSE(DC)}=100\text{mV}$ $V_{SENSE(AC)}=63\text{mV}_{PP}$		300		kHz
$V_{S+}$ Common Mode Rejection Ratio	CMRR	$V_{IN}=2.7\sim 20\text{V}$		60		dB
Flag Trip Point	Flag TP	Referred to $V_{SENSE}$	-2.5		+2.5	mV
Flag Low Output Voltage	$V_{FL}$	$I_{SINK}=100\mu\text{A}$		60	200	mV
Flag High Leakage Current	$I_{FH}$	$V_{OH}=5\text{V}$			1	$\mu\text{A}$

## APPLICATION INFORMATION

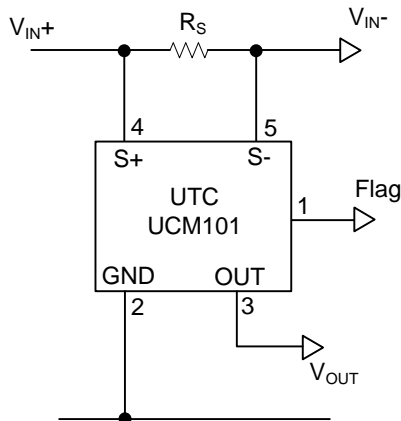
A common application for micro-power current monitors is measuring the discharge current of a rechargeable lithium ion/polymer battery. The UTC **UCM101** enables measuring both the charge and discharge current into the battery and with its wide operating voltage of 2.5~20V enables it to measure the currents in to/ out of up to 4 cells connected in series.



When choosing appropriate values for  $R_{SENSE}$  a compromise must be reached between in-line signal loss (including potential power dissipation effects) and small signal accuracy.

Higher values for  $R_{SENSE}$  gives better accuracy at low load currents by reducing the inaccuracies due to internal offsets. For best operation the UTC **UCM101** has been designed to operate with  $V_{SENSE}$  of the order of 50mV~150mV.

## TYPICAL APPLICATION CIRCUIT



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