

## ML6201 Series Positive Voltage Regulator

### ❖ Application

- ◆ Battery Powered Equipment
- ◆ Palmtops
- ◆ Portable Cameras and Video Recorders
- ◆ Reference Voltage Sources

### ❖ Features

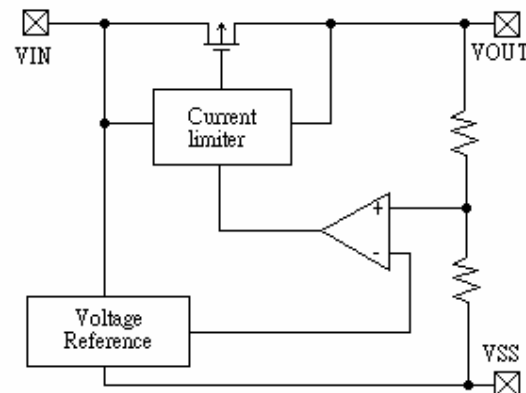
- CMOS Low Power Consumption :  
Typical 3.3uA at  $V_{out}=5.0V$
- Output Voltage Range : 1.1V to 6.0V in 0.1V increments
- Highly Accurate:  
Output Voltage  $\pm 3\%$  for 1.1V to 1.9V  
Output Voltage  $\pm 2\%$  for 2.0V to 6.0V
- Maximum Output Current: 250mA  
(within the maximum power dissipation,  $V_{out}=5.0V$ )
- Small Input-Output Voltage Differential:  
0.16V at 100mA and 0.4V at 200mA
- Input stability: Typ. 0.2%/V
- Package Available:  
SOT-23-5 (250mW), SOT-89 (500mW) &  
TO-92 (300mW)

### ❖ General Description

The ML6201 is a group of positive voltage output, three-pin regulator which provides high output current even when the input/output voltage differential is small.

The ML6201 consists of a high-precision voltage reference, an error correction circuit, and a current limited output driver.

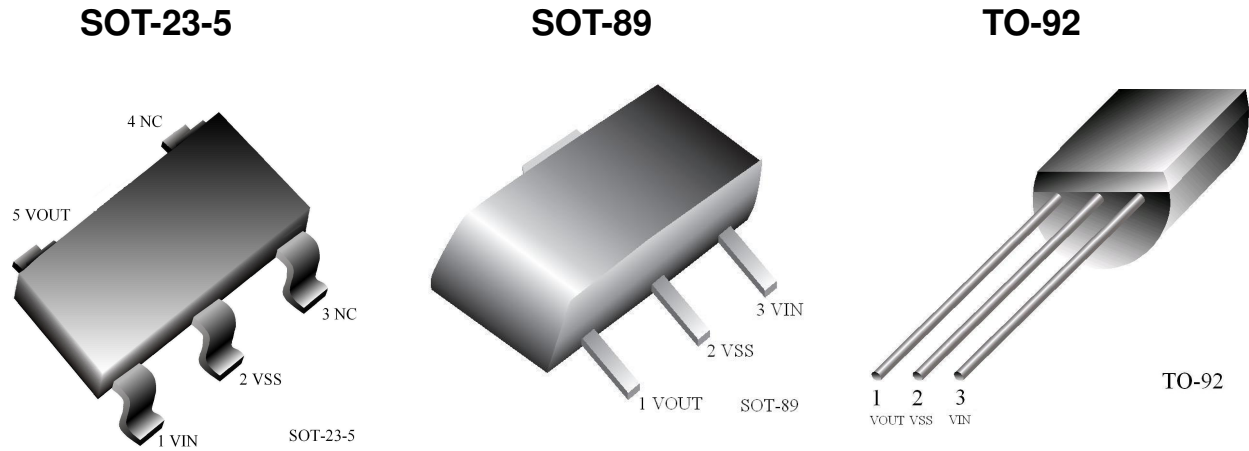
### ❖ Block Diagram



### ❖ Absolute Maximum Ratings

Parameter		Symbol	Ratings	Units
Input Voltage		$V_{IN}$	10	V
Output Current		$I_{OUT}$	500	mA
Output Voltage		$V_{OUT}$	$V_{SS}-0.3 \sim V_{IN}+0.3$	V
Continuous Total Power Dissipation	SOT-23-5	$P_d$	250	mW
	SOT-89		500	
	TO-92		300	
Operating Ambient Temperature		$T_{opr}$	-40 ~ +70	°C
Storage Temperature		$T_{stg}$	-40 ~ +70	°C

❖ *Pin Configuration*



Package Pin Number			Pin Name	Function
SOT-23-5	SOT-89	TO-92		
5	1	1	VOUT	Output
2	2	2	VSS	Ground
1	3	3	VIN	Power Input
3			(NC)	No Connection
4			(NC)	No Connection

❖ *Standard Circuit*

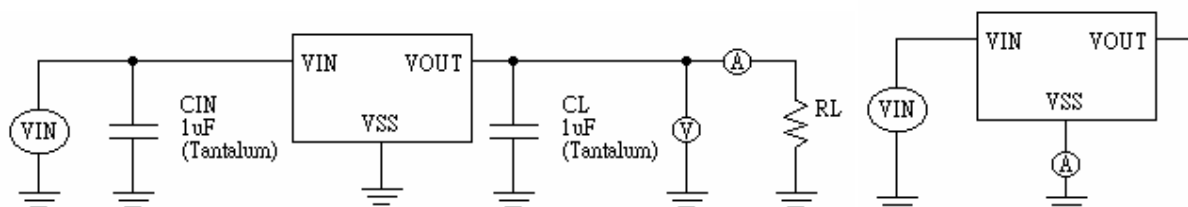
**Note on Use**

- Oscillation may occur as a result of the impedance present between the power supply and the IC's input. Please use a capacitor (CIN) of at least 1uF, when the impedance is 10 ohm or more. With a large output current, Voltage output can be stabilised by increasing capacitor (CIN) size. If CIN is small and capacitor (CL) size is increased, oscillation may occur. In such cases, Voltage output can be stabilised by either increasing the size of CIN or decreasing the size of CL.
- Please ensure that output current (IOUT) is less than  $Pd / (VIN - VOUT)$  and does not exceed the stipulated Continuous Total Power Dissipation value (Pd).

❖ *Test Circuit*

Test Circuit 1

Test Circuit 2



❖ **Electrical Characteristic****ML6201P502  $V_{OUT}(T)=5.0V$ (Note 1)**

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	$V_{OUT}(E)$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=6.0V$	4.900	5.000	5.100	V	1
Maximum Output Current	$I_{OUT\ max}$	$V_{IN}=6.0V, V_{OUT}(E) \geq 4.5V$	250			mA	1
Load Stability	$\Delta V_{OUT}$	$V_{IN}=6.0V, 1mA \leq I_{OUT} \leq 100mA$		40	80	mV	1
Input –Output Voltage Differential (Note 3)	$V_{dif1}$	$I_{OUT}=100mA$		120	400	mV	1
	$V_{dif2}$	$I_{OUT}=200mA$		380	750	mV	1
Supply Current	$I_{SS}$	$V_{IN}=6.0V$		3.3	4.5	$\mu A$	2
Input Stability	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $6.0V \leq V_{IN} \leq 10.0V$		0.2	0.3	%V	1
Input Voltage	$V_{IN}$				10	V	-

**ML6201P402  $V_{OUT}(T)=4.0V$ (Note 1)**

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	$V_{OUT}(E)$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=5.0V$	3.920	4.000	4.080	V	1
Maximum Output Current	$I_{OUT\ max}$	$V_{IN}=5.0V, V_{OUT}(E) \geq 3.6V$	200			mA	1
Load Stability	$\Delta V_{OUT}$	$V_{IN}=5.0V, 1mA \leq I_{OUT} \leq 100mA$		45	90	mV	1
Input –Output Voltage Differential (Note 3)	$V_{dif1}$	$I_{OUT}=90mA$		170	400	mV	1
	$V_{dif2}$	$I_{OUT}=180mA$		400	750	mV	1
Supply Current	$I_{SS}$	$V_{IN}=5.0V$		3.0	4.5	$\mu A$	2
Input Stability	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $5.0V \leq V_{IN} \leq 10.0V$		0.2	0.3	%V	1
Input Voltage	$V_{IN}$				10	V	-

**ML6201P302  $V_{OUT}(T)=3.0V$ (Note 1)**

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	$V_{OUT}(E)$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=4.0V$	2.940	3.000	3.060	V	1
Maximum Output Current	$I_{OUT\ max}$	$V_{IN}=4.0V, V_{OUT}(E) \geq 2.7V$	150			mA	1
Load Stability	$\Delta V_{OUT}$	$V_{IN}=4.0V, 1mA \leq I_{OUT} \leq 80mA$		45	90	mV	1
Input –Output Voltage Differential (Note 3)	$V_{dif1}$	$I_{OUT}=80mA$		180	450	mV	1
	$V_{dif2}$	$I_{OUT}=150mA$		400	850	mV	1
Supply Current	$I_{SS}$	$V_{IN}=4.0V$		2.8	4.5	$\mu A$	2
Input Stability	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $4.0V \leq V_{IN} \leq 10.0V$		0.2	0.3	%V	1
Input Voltage	$V_{IN}$				10	V	-

**ML6201P202  $V_{OUT}(T)=2.0V$ (Note 1)**

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	$V_{OUT}(E)$ (Note 2)	$I_{OUT}=40mA$ $V_{IN}=3.0V$	1.960	2.000	2.040	V	1
Maximum Output Current	$I_{OUT\ max}$	$V_{IN}=3.0V, V_{OUT}(E) \geq 1.8V$	100			mA	1
Load Stability	$\Delta V_{OUT}$	$V_{IN}=3.0V, 1mA \leq I_{OUT} \leq 60mA$		45	90	mV	1
Input –Output Voltage Differential (Note 3)	$V_{dif1}$	$I_{OUT}=60mA$		180	450	mV	1
	$V_{dif2}$	$I_{OUT}=100mA$		400	850	mV	1
Supply Current	$I_{SS}$	$V_{IN}=3.0V$		2.5	4.5	$\mu A$	2
Input Stability	$\frac{\Delta V_{OUT}}{\Delta V_{IN} * V_{OUT}}$	$I_{OUT}=40mA$ $3.0V \leq V_{IN} \leq 10.0V$		0.2	0.3	%V	1
Input Voltage	$V_{IN}$				10	V	-

Note : 1.  $V_{OUT}(T)$  = Specified Output Voltage.

2.  $V_{OUT}(E)$  = Effective Output Voltage (i.e. the output voltage when ( $V_{OUT}(T)+1.0V$ ) is provided at the  $V_{IN}$  pin while maintaining a certain  $I_{OUT}$  value).

3.  $V_{dif}$  =  $V_{IN1}(\text{Note 4}) - V_{OUT}(E)$

4.  $V_{IN1}$  = The input voltage at the time 98% of  $V_{OUT}(E)$  is output (input voltage has been gradually reduced).



❖ *Electrical Characteristics by Output Voltage*

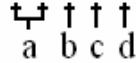
Part Number	Output voltage				Max Output Current		Load Stability			I-O Voltage Differential						
	V <sub>OUT</sub> (V)				I <sub>OUT max</sub> (mA)		Δ V <sub>OUT</sub> (mV)			V <sub>diff</sub> (mV)						
	Conditions	MIN.	TYP.	MAX.	Conditions	MIN.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.				
ML6201P113	I <sub>OUT</sub> =40mA V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V	1.067	1.100	1.133	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V V <sub>OUT</sub> (E)≥ V <sub>OUT</sub> (T)*0.9	80	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V 1mA<I <sub>OUT</sub> <40mA	45	90	I <sub>OUT</sub> =20mA	250	450				
ML6201P123		1.164	1.200	1.236						I <sub>OUT</sub> =30mA	250	450				
ML6201P133		1.261	1.300	1.339							I <sub>OUT</sub> =40mA	250	450			
ML6201P143		1.358	1.400	1.442								250	450			
ML6201P153		1.455	1.500	1.545						100	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V 1mA≤I <sub>OUT</sub> ≤60mA	45	90	I <sub>OUT</sub> =60mA	180	450
ML6201P163		1.552	1.600	1.648												
ML6201P173		1.649	1.700	1.751												
ML6201P183		1.746	1.800	1.854												
ML6201P193		1.843	1.900	1.957												
ML6201P202		1.960	2.000	2.040												
ML6201P212		2.058	2.100	2.142												
ML6201P222		2.156	2.200	2.244												
ML6201P232		2.254	2.300	2.346												
ML6201P242		2.352	2.400	2.448												
ML6201P252		2.450	2.500	2.550												
ML6201P262		2.548	2.600	2.652												
ML6201P272		2.646	2.700	2.754												
ML6201P282		2.744	2.800	2.856												
ML6201P292		2.842	2.900	2.958												
ML6201P302		2.940	3.000	3.060												
ML6201P312		3.038	3.100	3.162												
ML6201P322		3.136	3.200	3.264												
ML6201P332		3.234	3.300	3.366												
ML6201P342		3.332	3.400	3.468												
ML6201P352		3.430	3.500	3.570												
ML6201P362		3.528	3.600	3.672												
ML6201P372		3.626	3.700	3.774												
ML6201P382		3.724	3.800	3.876												
ML6201P392		3.822	3.900	3.978												
ML6201P402		3.920	4.000	4.080												
ML6201P412		4.018	4.100	4.182												
ML6201P422		4.116	4.200	4.284												
ML6201P432		4.214	4.300	4.386												
ML6201P442		4.312	4.400	4.488												
ML6201P452		4.410	4.500	4.590												
ML6201P462		4.508	4.600	4.692												
ML6201P472		4.606	4.700	4.794												
ML6201P482		4.704	4.800	4.896												
ML6201P492		4.802	4.900	4.998												
ML6201P502		4.900	5.000	5.100												
ML6201P512		4.998	5.100	5.202												
ML6201P522		5.096	5.200	5.304												
ML6201P532		5.194	5.300	5.406												
ML6201P542		5.292	5.400	5.508												
ML6201P552		5.390	5.500	5.610												
ML6201P562		5.488	5.600	5.712												
ML6201P572		5.586	5.700	5.814												
ML6201P582		5.684	5.800	5.916												
ML6201P592		5.782	5.900	6.018												
ML6201P602		5.880	6.000	6.120												
								200	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V 1mA≤I <sub>OUT</sub> ≤100mA	45	90	I <sub>OUT</sub> =90mA	170	400		
								250	V <sub>IN</sub> =V <sub>OUT</sub> +1V 1mA≤I <sub>OUT</sub> ≤100mA	40	80	I <sub>OUT</sub> =100mA	120	400		



Part Number	I-O Voltage Differential			Supply Current			Input Stability			Input Voltage
	V <sub>diff2</sub> (mV)			I <sub>SS</sub> (uA)			Δ V <sub>OUT</sub> /(Δ V <sub>IN</sub> *V <sub>OUT</sub> ) (%V)			V <sub>IN</sub> (V)
	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.	MAX.
ML6201P113	I <sub>OUT</sub> =40mA	450	850	V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V	2.0	4.5	I <sub>OUT</sub> =40mA V <sub>OUT</sub> (T)+1V ≤ V <sub>IN</sub> ≤ 10V	0.2	0.4	10
ML6201P123										
ML6201P133										
ML6201P143	I <sub>OUT</sub> =60mA	450	850							
ML6201P153										
ML6201P163										
ML6201P173	I <sub>OUT</sub> =80mA	450	850							
ML6201P183										
ML6201P193										
ML6201P202	I <sub>OUT</sub> =100mA	400	850							
ML6201P212										
ML6201P222										
ML6201P232										
ML6201P242										
ML6201P252										
ML6201P262										
ML6201P272										
ML6201P282										
ML6201P292										
ML6201P302	I <sub>OUT</sub> =150mA	400	850							
ML6201P312										
ML6201P322										
ML6201P332										
ML6201P342										
ML6201P352										
ML6201P362										
ML6201P372										
ML6201P382										
ML6201P392										
ML6201P402	I <sub>OUT</sub> =180mA	400	750							
ML6201P412										
ML6201P422										
ML6201P432										
ML6201P442										
ML6201P452										
ML6201P462										
ML6201P472										
ML6201P482										
ML6201P492										
ML6201P502	I <sub>OUT</sub> =200mA	380	750							
ML6201P512										
ML6201P522										
ML6201P532										
ML6201P542										
ML6201P552										
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ML6201P572										
ML6201P582										
ML6201P592										
ML6201P602										

❖ **Ordering Information**

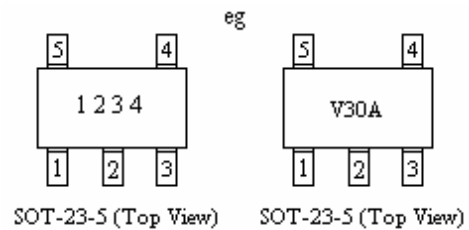
Designator	Description
a	<b>Output Voltage</b> eg. 30=3.0V 50=5.0V
b	<b>Output Voltage Accuracy</b> 2 = ± 2.0% 3 = ± 3.0%
c	<b>Package Type</b> M = SOT-23-5 P = SOT-89 T = TO-92
d	<b>Device Orientation</b> R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape (Orientation of Device : Left) B = Bag (TO-92) H = Paper Tape (TO-92)
G	G = Lead Free Part

ML6201P x x x x x G  


❖ **Marking**

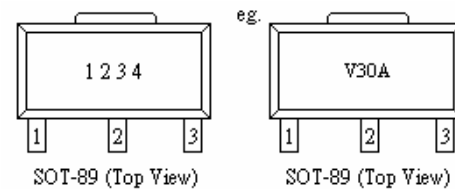
**SOT-23-5 :**

Designator	Description
1	<b>Type</b> V = Positive Voltage Regulator
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Internal Code</b>



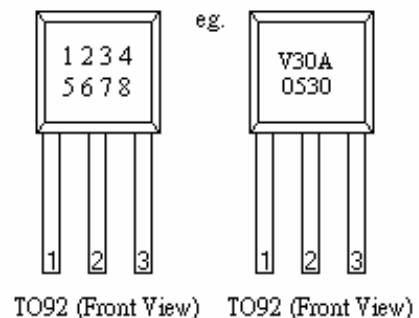
**SOT-89 :**

Designator	Description
1	<b>Type</b> V = Positive Voltage Regulator
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Output Voltage Accuracy</b> 2 = ± 2.0% 3 = ± 3.0%
5	<b>Internal Code</b>



**TO-92 :**

Designator	Description
1	<b>Type</b> V = Positive Voltage Regulator
2,3	<b>Output Voltage</b> eg. 30 = 3.0V
4	<b>Output Voltage Accuracy</b> 2 = ± 2.0% 3 = ± 3.0%
5	<b>Internal code</b>
6, 7	<b>Year Code</b> eg. 05 = Year 2005
8, 9	<b>Week Code</b> eg. 30 = Week 30



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