

ML6201 Series Positive Voltage Regulator

❖ Application

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

❖ Features

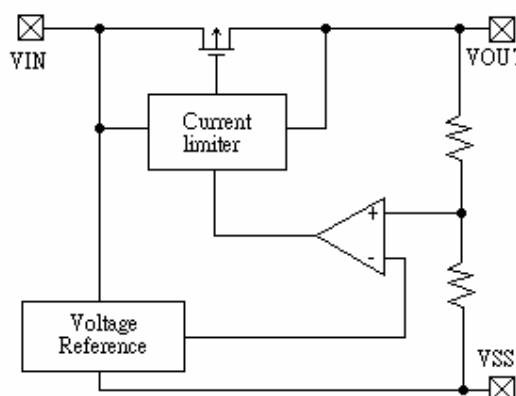
- CMOS Low Power Consumption :
Typical 3.3uA at $V_{out}=5.0V$
- Output Voltage Range : 1.1V to 6.0V in 0.1V increments
- Highly Accurate:
Output Voltage $\pm 3\%$ for 1.1V to 1.9V
Output Voltage $\pm 2\%$ for 2.0V to 6.0V
- Maximum Output Current: 250mA
(within the maximum power dissipation, $V_{out}=5.0V$)
- 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.

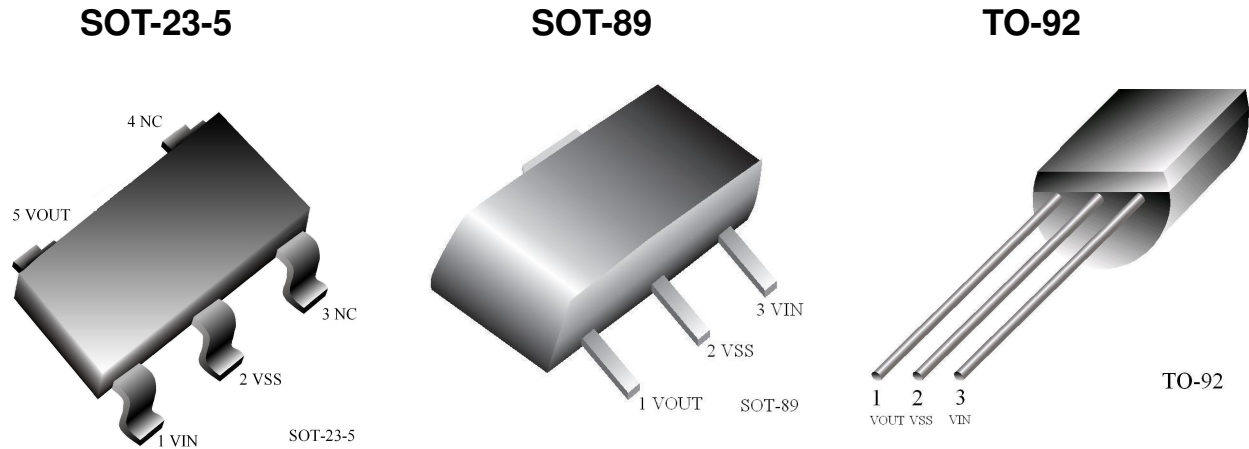
❖ Block Diagram



❖ 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

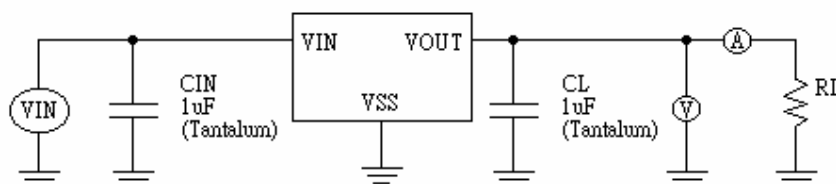
❖ Standard Circuit

Note on Use

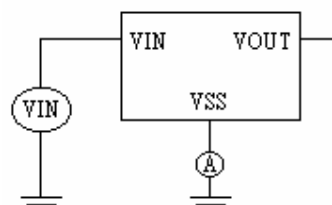
- Oscillation may occur as a result of the impedance present between the power supply and the IC's input. Please use a capacitor (CIN) of at least 1uF, when the impedance is 10 ohm or more.
With a large output current, Voltage output can be stabilised by increasing capacitor (CIN) size. If CIN is small 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 $P_d / (V_{IN} - V_{OUT})$ 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	ΔV_{OUT}	$V_{IN}=6.0V, 1mA \leq I_{OUT} \leq 100mA$		40	80	mV	1
Input –Output	V_{dif1}	$I_{OUT}=100mA$		120	400	mV	1
Voltage Differential (Note 3)	V_{dif2}	$I_{OUT}=200mA$		380	750	mV	1
Supply Current	I_{SS}	$V_{IN}=6.0V$		3.3	4.5	μA	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	ΔV_{OUT}	$V_{IN}=5.0V, 1mA \leq I_{OUT} \leq 100mA$		45	90	mV	1
Input –Output	V_{dif1}	$I_{OUT}=90mA$		170	400	mV	1
Voltage Differential (Note 3)	V_{dif2}	$I_{OUT}=180mA$		400	750	mV	1
Supply Current	I_{SS}	$V_{IN}=5.0V$		3.0	4.5	μA	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	ΔV_{OUT}	$V_{IN}=4.0V, 1mA \leq I_{OUT} \leq 80mA$		45	90	mV	1
Input –Output	V_{dif1}	$I_{OUT}=80mA$		180	450	mV	1
Voltage Differential (Note 3)	V_{dif2}	$I_{OUT}=150mA$		400	850	mV	1
Supply Current	I_{SS}	$V_{IN}=4.0V$		2.8	4.5	μA	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	ΔV_{OUT}	$V_{IN}=3.0V, 1mA \leq I_{OUT} \leq 60mA$		45	90	mV	1
Input –Output	V_{dif1}	$I_{OUT}=60mA$		180	450	mV	1
Voltage Differential (Note 3)	V_{dif2}	$I_{OUT}=100mA$		400	850	mV	1
Supply Current	I_{SS}	$V_{IN}=3.0V$		2.5	4.5	μA	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*

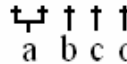
Part Number	Output voltage				Max Output Current		Load Stability			I-O Voltage Differential		
	V _{OUT} (V)				I _{OUT max} (mA)		Δ V _{OUT} (mV)			V _{diff} (mV)		
	Conditions	MIN.	TYP.	MAX.	Conditions	MIN.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.
ML6201P113	I _{OUT} =40mA V _{IN} =V _{OUT} (T)+1V	1.067	1.100	1.133	V _{IN} =V _{OUT} (T)+1V V _{OUT} (E)≥ V _{OUT} (T)*0.9	80	V _{IN} =V _{OUT} (T)+1V 1mA<I _{OUT} <40mA	45	90	I _{OUT} =20mA	250	450
ML6201P123		1.164	1.200	1.236								
ML6201P133		1.261	1.300	1.339								
ML6201P143		1.358	1.400	1.442						I _{OUT} =30mA	250	450
ML6201P153		1.455	1.500	1.545								
ML6201P163		1.552	1.600	1.648								
ML6201P173		1.649	1.700	1.751						I _{OUT} =40mA	250	450
ML6201P183		1.746	1.800	1.854								
ML6201P193		1.843	1.900	1.957								
ML6201P202		1.960	2.000	2.040	V _{IN} =V _{OUT} (T)+1V V _{OUT} (E)≥ V _{OUT} (T)*0.9	100	V _{IN} =V _{OUT} (T)+1V 1mA≤I _{OUT} ≤60mA	45	90	I _{OUT} =60mA	180	450
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	V _{IN} =V _{OUT} (T)+1V V _{OUT} (E)≥ V _{OUT} (T)*0.9	150	V _{IN} =V _{OUT} (T)+1V 1mA≤I _{OUT} ≤80mA	45	90	I _{OUT} =80mA	180	450
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	V _{IN} =V _{OUT} (T)+1V V _{OUT} (E)≥ V _{OUT} (T)*0.9	200	V _{IN} =V _{OUT} (T)+1V 1mA≤I _{OUT} ≤100mA	45	90	I _{OUT} =90mA	170	400
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	V _{IN} =V _{OUT} (T)+1V V _{OUT} (E)≥ V _{OUT} (T)*0.9	250	V _{IN} =V _{OUT} (T)+1V 1mA≤I _{OUT} ≤100mA	40	80	I _{OUT} =100mA	120	400
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								



Part Number	I-O Voltage Differential			Supply Current			Input Stability			Input Voltage							
	V _{diff2} (mV)			I _{SS} (uA)			Δ V _{OUT} /(Δ V _{IN} *V _{OUT}) (% V)			V _{IN} (V)							
	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.	MAX.							
ML6201P113	IOUT=40mA	450	850	V _{IN} =V _{OUT} (T)+1V	2.0	4.5	I _{OUT} =40mA V _{OUT} (T)+1V≤V _{IN} ≤10V	0.2	0.4	10							
ML6201P123																	
ML6201P133	IOUT=60mA	450	850														
ML6201P143																	
ML6201P153																	
ML6201P163																	
ML6201P173	IOUT=80mA	450	850														
ML6201P183																	
ML6201P193																	
ML6201P202	I _{OUT} =100mA	400	850		2.5	4.5											
ML6201P212																	
ML6201P222																	
ML6201P232																	
ML6201P242																	
ML6201P252																	
ML6201P262																	
ML6201P272																	
ML6201P282																	
ML6201P292																	
ML6201P302	I _{OUT} =150mA	400	850		2.8	4.5											
ML6201P312																	
ML6201P322																	
ML6201P332																	
ML6201P342																	
ML6201P352																	
ML6201P362																	
ML6201P372																	
ML6201P382																	
ML6201P392																	
ML6201P402	I _{OUT} =180mA	400	750		3.0	4.5		0.2	0.3								
ML6201P412																	
ML6201P422																	
ML6201P432																	
ML6201P442																	
ML6201P452																	
ML6201P462																	
ML6201P472																	
ML6201P482																	
ML6201P492																	
ML6201P502	I _{OUT} =200mA	380	750		3.3	4.5											
ML6201P512																	
ML6201P522																	
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ML6201P592																	
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❖ Ordering Information

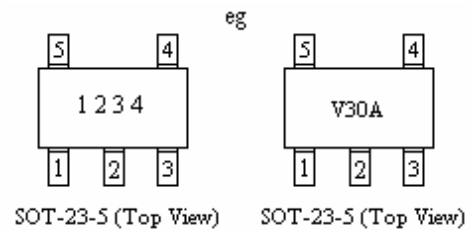
Designator	Description
a	Output Voltage eg. 30=3.0V 50=5.0V
b	Output Voltage Accuracy 2 = $\pm 2.0\%$ 3 = $\pm 3.0\%$
c	Package Type M = SOT-23-5 P = SOT-89 T = TO-92
d	Device Orientation R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape (Orientation of Device : Left) B = Bag (TO-92)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

ML6201P x x x x x G

a b c d

❖ Marking

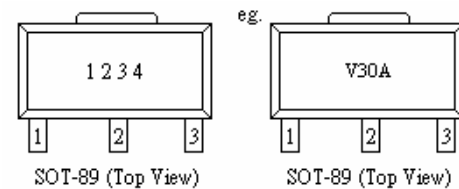
SOT-23-5 :

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



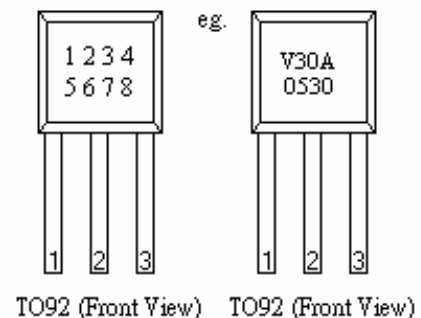
SOT-89 :

Designator	Description
1	Type V = Positive Voltage Regulator
2,3	Output Voltage eg. 30 = 3.0V
4	Output Voltage Accuracy 2 = $\pm 2.0\%$ 3 = $\pm 3.0\%$
5	Internal Code



TO-92 :

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



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