ML6201 Series Positive Voltage Regulator

❖ *Application*

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

❖ *Features*

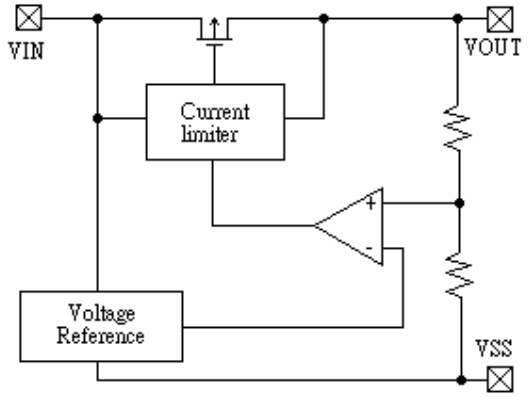
- CMOS Low Power Consumption : Typical 3.3uA at Vout=5.0V
- Output Voltage Range : 1.1V to 6.0V in 0.1V increments
- Highly Accurate: Output Voltage ± 3% for 1.1V to 1.9V Output Voltage ± 2% for 2.0V to 6.0V
- Maximum Output Current: 250mA (within the maximum power dissipation, Vout=5.0V)
- Small Input-Output 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*

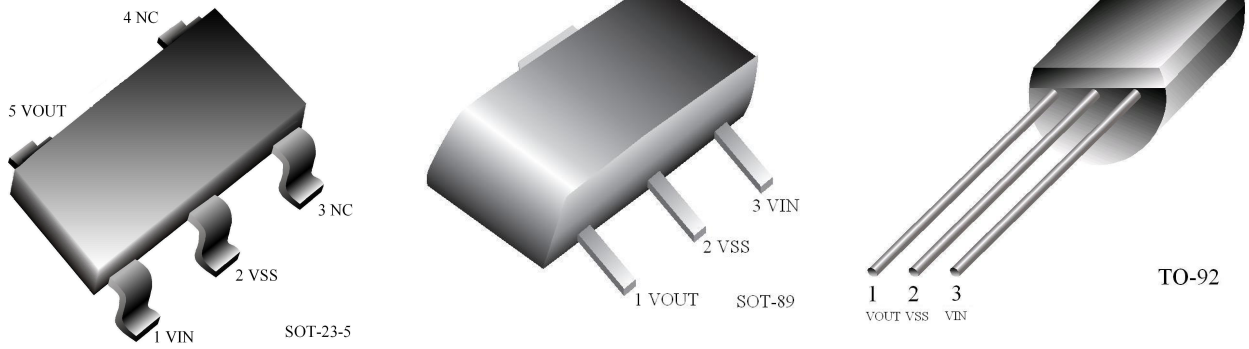


❖ *Absolute Maximum Ratings*

Parameter		Symbol	Ratings	Units
Input Voltage		V_{IN}	10	V
Output Current		I_{OUT}	500	mA
Output Voltage		V_{OUT}	V_{SS}-0.3 ~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*

SOT-23-5 **SOT-89** **TO-92**



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*

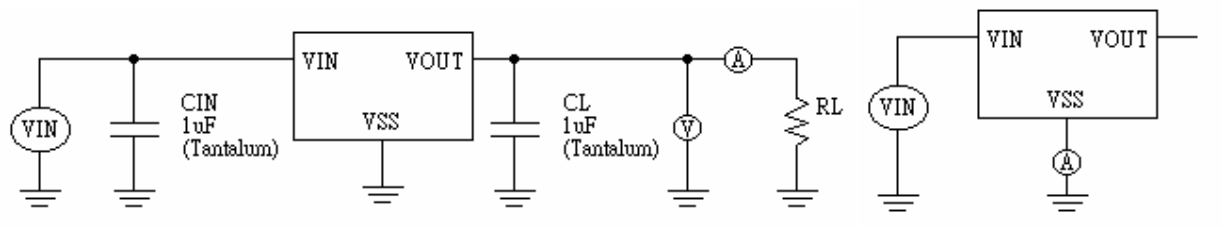
Note on Use

1. 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.

2. 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 VOUT(T)=5.0V(Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	VOUT(E) (Note 2)	IOUT=40mA VIN=6.0V	4.900	5.000	5.100	V	1
Maximum Output Current	IOUT max	VIN=6.0V, VOUT(E) ≥4.5V	250			mA	1
Load Stability	ΔVOUT	VIN=6.0V, 1mA≤IOUT≤100mA		40	80	mV	1
Input –Output Voltage Differential (Note 3)	Vdif1	IOUT=100mA		120	400	mV	1
	Vdif2	IOUT=200mA		380	750	mV	1
Supply Current	ISS	VIN=6.0V		3.3	4.5	uA	2
Input Stability	$\frac{\Delta VOUT}{\Delta VIN * VOUT}$	IOUT=40mA 6.0V≤VIN≤10.0V		0.2	0.3	%V	1
Input Voltage	VIN				10	V	-

ML6201P402 VOUT(T)=4.0V(Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	VOUT(E) (Note 2)	IOUT=40mA VIN=5.0V	3.920	4.000	4.080	V	1
Maximum Output Current	IOUT max	VIN=5.0V, VOUT(E) ≥3.6V	200			mA	1
Load Stability	ΔVOUT	VIN=5.0V, 1mA≤IOUT≤100mA		45	90	mV	1
Input –Output Voltage Differential (Note 3)	Vdif1	IOUT=90mA		170	400	mV	1
	Vdif2	IOUT=180mA		400	750	mV	1
Supply Current	ISS	VIN=5.0V		3.0	4.5	uA	2
Input Stability	$\frac{\Delta VOUT}{\Delta VIN * VOUT}$	IOUT=40mA 5.0V≤VIN≤10.0V		0.2	0.3	%V	1
Input Voltage	VIN				10	V	-

ML6201P302 VOUT(T)=3.0V(Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	VOUT(E) (Note 2)	IOUT=40mA VIN=4.0V	2.940	3.000	3.060	V	1
Maximum Output Current	IOUT max	VIN=4.0V, VOUT(E) ≥2.7V	150			mA	1
Load Stability	ΔVOUT	VIN=4.0V, 1mA≤IOUT≤80mA		45	90	mV	1
Input –Output Voltage Differential (Note 3)	Vdif1	IOUT=80mA		180	450	mV	1
	Vdif2	IOUT=150mA		400	850	mV	1
Supply Current	ISS	VIN=4.0V		2.8	4.5	uA	2
Input Stability	$\frac{\Delta VOUT}{\Delta VIN * VOUT}$	IOUT=40mA 4.0V≤VIN≤10.0V		0.2	0.3	%V	1
Input Voltage	VIN				10	V	-

ML6201P202 VOUT(T)=2.0V(Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	VOUT(E) (Note 2)	IOUT=40mA VIN=3.0V	1.960	2.000	2.040	V	1
Maximum Output Current	IOUT max	VIN=3.0V, VOUT(E) ≥1.8V	100			mA	1
Load Stability	ΔVOUT	VIN=3.0V, 1mA≤IOUT≤60mA		45	90	mV	1
Input –Output Voltage Differential (Note 3)	Vdif1	IOUT=60mA		180	450	mV	1
	Vdif2	IOUT=100mA		400	850	mV	1
Supply Current	ISS	VIN=3.0V		2.5	4.5	uA	2
Input Stability	$\frac{\Delta VOUT}{\Delta VIN * VOUT}$	IOUT=40mA 3.0V≤VIN≤10.0V		0.2	0.3	%V	1
Input Voltage	VIN				10	V	-

Note : 1. VOUT(T) = Specified Output Voltage.

2. VOUT(E) = Effective Output Voltage (i.e. the output voltage when (VOUT(T)+1.0V) is provided at the VIN pin while maintaining a certain IOUT value).

3. Vdif = VIN1(Note 4) – VOUT(E)
4. VIN1 = The input voltage at the time 98% of VOUT (E) is output (input voltage has been gradually reduced).

❖ *Electrical Characteristics by Output Voltage*

Part Number	Output voltage V_{OUT}(V)				Max Output Current $I_{OUT\ max}$(mA)		Load Stability ΔV_{OUT}(mV)			I-O Voltage Differential V_{dif1}(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	VIN=VOUT(T)+1V 1mA<IOUT<40mA	45	90	IOUT=20mA	250	450
ML6201P123		1.164	1.200	1.236								
ML6201P133		1.261	1.300	1.339						IOUT=30mA	250	450
ML6201P143		1.358	1.400	1.442								
ML6201P153		1.455	1.500	1.545								
ML6201P163		1.552	1.600	1.648								
ML6201P173		1.649	1.700	1.751						IOUT=40mA	250	450
ML6201P183		1.746	1.800	1.854								
ML6201P193		1.843	1.900	1.957								
ML6201P202		1.960	2.000	2.040		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		150	V_{IN}= V_{OUT}(T)+1V 1mA≤I_{OUT}≤80mA	45	90	I_{OUT}=80mA	180	450
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		200	V_{IN}=V_{OUT}(T)+1V 1mA≤I_{OUT}≤100mA	45	90	I_{OUT}=90mA	170	400
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		250	V_{IN}=V_{OUT}+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_{dif2}(mV)			I_{SS}(uA)			$\Delta V_{OUT}/(\Delta V_{IN}*V_{OUT})$ (%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 $V_{OUT}(T)+1V \leq V_{IN} \leq 10V$	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		0.2	0.3	
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				
ML6201P412										
ML6201P422										
ML6201P432										
ML6201P442										
ML6201P452										
ML6201P462										
ML6201P472										
ML6201P482										
ML6201P492										
ML6201P502	I_{OUT}=200mA	380	750		3.3	4.5				
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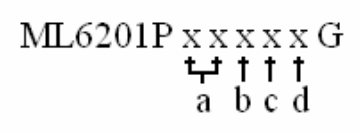
ML6201P562										
ML6201P572										
ML6201P582										
ML6201P592										
ML6201P602										

❖ *Ordering Information*

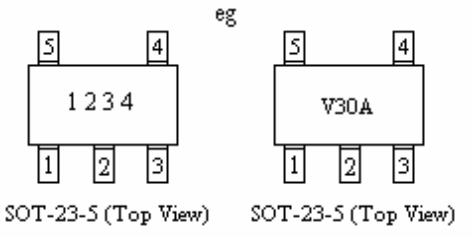
Designator	Description
a	**Output Voltage** eg. 30=3.0V 50=5.0V
b	**Output Voltage Accuracy** 2 = ± 2.0% 3 = ± 3.0%
c	**Package Type** M = SOT-23-5 P = SOT-89 T = TO-92
d	**Device Orientation** R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape (Orientation of Device : Left) B = Bag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



❖ *Marking*

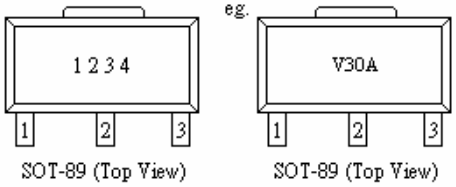
SOT-23-5 :

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 = ± 2.0% 3 = ± 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 = ± 2.0% 3 = ± 3.0%
5	**Internal code**
6, 7	**Year Code** eg. 05 = Year 2005
8, 9	**Week Code** eg. 30 = Week 30