AT78L00

100mA Positive Voltage Regulator

Immense Advance Tech.

FEATURES

- Internal Short-Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components Required
- Output Current Up to 100mA
- Output Voltage Tolerances of 3%
- Available in TO-92 and SOT-89-3L Package
- Direct replacement for LM78L00, µA78L00 and AN78L00 Series.

APPLICATION

- Bias Supply for Analog Circuits
- Instrumentation and Audio Systems
- Logic Systems
- Others too numerous to mention

DESCRIPTION

The AT78L00 series of three terminal positive regulators is available with several fixed output voltages making them useful in a wide range of applications. When used as a zener diode/resistor combination replacement, the AT78L00 usually results in an effective output impedance improvement of two orders of magnitude, and lower quiescent current. These regulators can provide local on card regulation, eliminating the distribution problems associated with single point regulation. The voltages available allow the AT78L00 to be used in logic systems, instrumentation, HiFi, and other solid state electronic equipment.

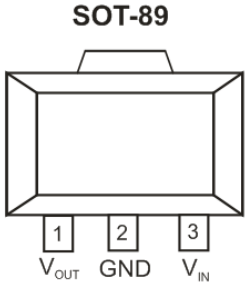
The AT78L00 is available in the plastic TO-92 package and SOT-89-3L package. With adequate heat sinking the regulator can deliver 100mA output current. Current limiting is included to limit the peak output current to a safe value. Safe area protection for the output transistors is provided to limit internal power dissipation. If internal power dissipation becomes too high for the heat sinking provided, the thermal shutdown circuit takes over preventing the IC from overheating.

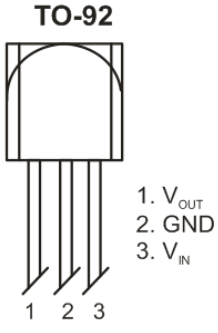
ORDER INFORMATION

AT 78L- 00 KG R

- AT: IAT
- 78L: Circuit Type
- 00: Output Voltage:
  - 05 : 5.0V,06 : 6.0V
  - 08：8.0V, 09：9.0V
  - 10 : 10.0V, 12 : 12.0V
  - 15 : 15.0V,18 : 18.0V
  - 24 : 24.0V
- KG: KG:SOT-89-3L, TD:TO-92
- R: Shipping: R: Tape & Reel, T: Tube

PIN CONFIGURATIONS (TOP VIEW)

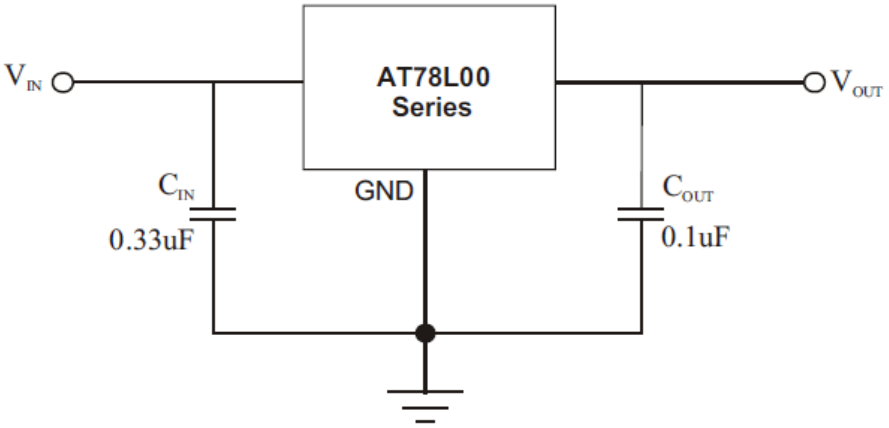




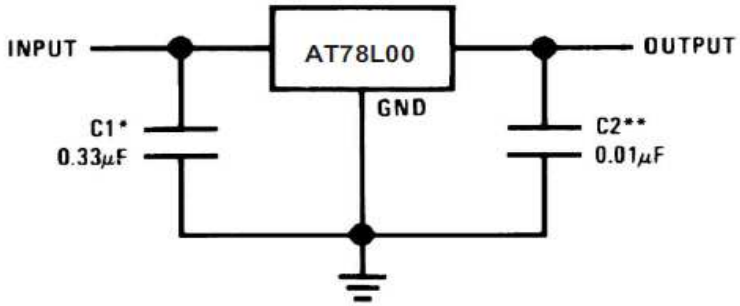
PIN DESCRIPTIONS

Pin Name	Pin Description
GND	Reference ground.
V_{OUT}	The pin is the power output of the device.
V_{IN}	Input voltage.

TYPICAL APPLICATION CIRCUITS

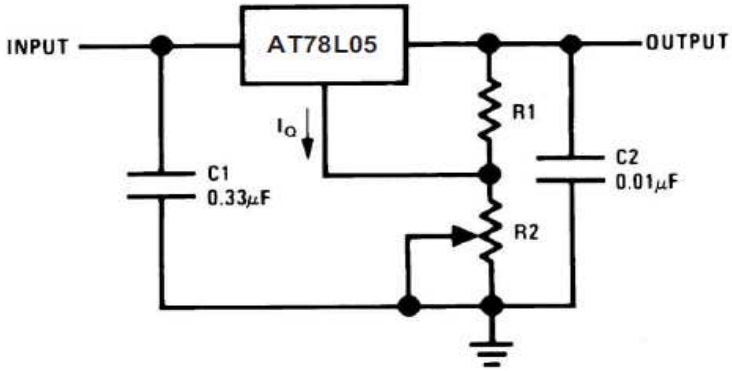


Fixed Output Regulator



*Required if the regulator is located more than 3" from the power supply filter.
**See (Note 4) in the electrical characteristics table.

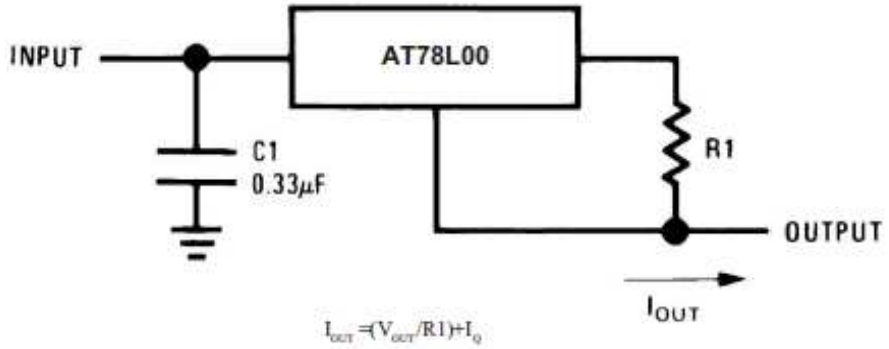
Adjustable Output Regulator



$V_{OUT}=5V+(5V/R1+I_Q)R2$
$5V/R1 > 3\ I_Q$, load regulation $(L_r)\approx$〔(R1+R2)/R1〕(L_r of AT78L05)

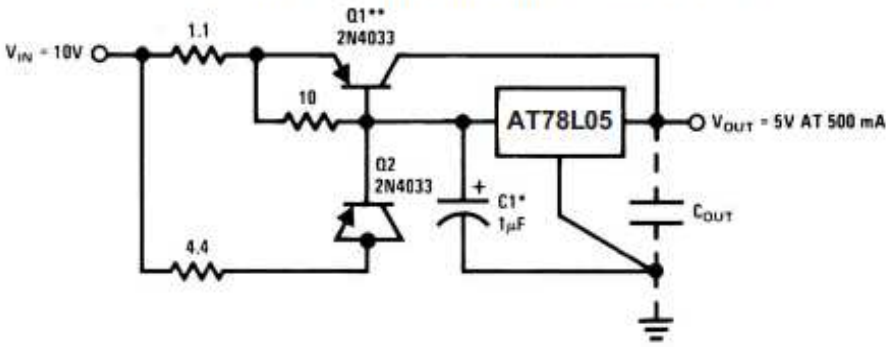
TYPICAL APPLICATION CIRCUITS(CONTINUED)

Current Regulator



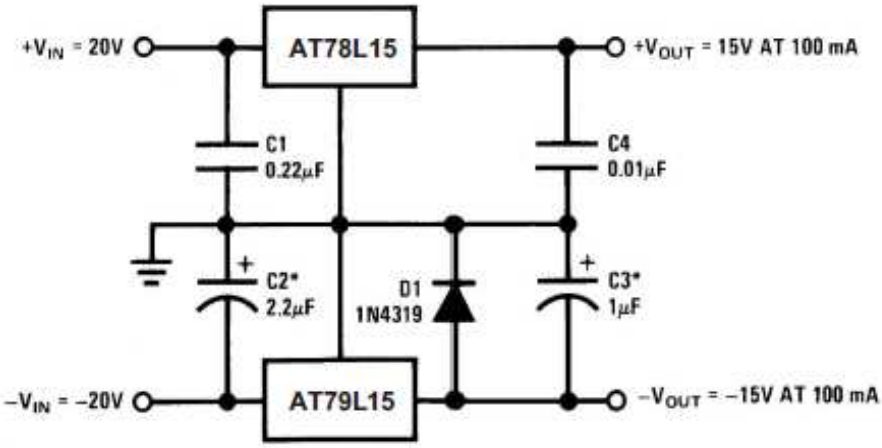
$I_{OUT} = (V_{OUT}/R1) + I_Q$

5V, 500mA Regulator with Short Circuit Protection



*Solid tantalum.
**Heat sink Q1.

±15V, 100mA Dual Power Supply



*Solid tantalum.

ABSOLUTE MAXIMUM RATING

Parameter		Symbol	Range	Unit
Input Voltage	AT78L05~AT78L10	V_{IN}	30	V
	AT78L12~AT78L18		35	
	AT78L24		40	
Output Current		I_{OUT}	100	mA
Operating junctions Temperature Range		T_J	500	℃
Storage Temperature Range		T_{STG}	-55 to +150	℃
Lead Temperature (Soldering, 5 sec)		T_{LEAD}	260	℃/W
Thermal Resistance Junction to Case	TO-92	$R_{\theta JC}$	160	℃
	SOT-89-3L		156(Note1)	

ELECTRICAL CHARACTERISTICS

Limits in standard typeface are for T_J=25℃

AT78L05(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =10V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		4.85	5.0	5.15	V
		7V ≤ V_{IN} ≤ 20V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	4.80	—	5.20	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	4.80	—	5.20	
Line Regulation	$\triangle V_{OUT}$	7V ≤ V_{IN} ≤ 20V	—	—	140	mV
		8V ≤ V_{IN} ≤ 20V		—	95	
Line Regulation	$\triangle V_{OUT}$	1mA ≤ I_{OUT} ≤ 100mA	—	—	60	mV
		1mA ≤ I_{OUT} ≤ 40mA	—	—	30	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	3.0	5.8	mA
Quiescent Current Change	$\triangle I_Q$	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		8V ≤ V_{IN} ≤ 20V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	40	—	μV
Ripple Rejection	RR	8V ≤ V_{IN} ≤ 20V, f=120Hz,	—	62	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V

ELECTRICAL CHARACTERISTICS(CONTINUED)

AT78L06(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =11V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		5.82	6.0	6.18	V
		8.5V ≤ V_{IN} ≤ 20V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	5.76	—	6.24	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	5.76	—	6.24	
Line Regulation	$\triangle V_{OUT}$	8.5V ≤ V_{IN} ≤ 20V	—	—	149	mV
		9V ≤ V_{IN} ≤ 20V		—	104	
Line Regulation	$\triangle V_{OUT}$	1mA ≤ I_{OUT} ≤ 100mA	—	—	80	mV
		1mA ≤ I_{OUT} ≤ 70mA	—	—	40	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	—	6.0	mA
Quiescent Current Change	$\triangle I_Q$	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		9V ≤ V_{IN} ≤ 20V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	49	—	μV
Ripple Rejection	RR	10V ≤ V_{IN} ≤ 20V, f=120Hz,	—	46	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V

AT78L08(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =14V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		7.76	8.0	8.24	V
		10.5V ≤ V_{IN} ≤ 23V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	7.68	—	8.32	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	7.68	—	8.32	
Line Regulation	$\triangle V_{OUT}$	10.5V ≤ V_{IN} ≤ 23V	—	—	175	mV
		11V ≤ V_{IN} ≤ 23V		—	125	
Line Regulation	$\triangle V_{OUT}$	1mA ≤ I_{OUT} ≤ 100mA	—	—	80	mV
		1mA ≤ I_{OUT} ≤ 70mA	—	—	40	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	—	5.8	mA
Quiescent Current Change	$\triangle I_Q$	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		11V ≤ V_{IN} ≤ 23V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	49	—	μV
Ripple Rejection	RR	11V ≤ V_{IN} ≤ 21V, f=120Hz,	—	45	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V
Average Output Voltage Tempco	$\triangle V_{OUT}/\triangle T_J$	I_{OUT}= 5mA	—	-0.8	—	mV/℃

ELECTRICAL CHARACTERISTICS(CONTINUED)

Limits in standard typeface are for T_J=25℃

AT78L09(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =15V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		8.73	9.0	9.27	V
		11.5V ≤ V_{IN} ≤ 20V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	8.62	—	9.38	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	8.62	—	9.38	
Line Regulation	△V_{OUT}	11.5V ≤ V_{IN} ≤ 24V	—	—	200	mV
		13V ≤ V_{IN} ≤ 24V		—	150	
Line Regulation	△V_{OUT}	1mA ≤ I_{OUT} ≤ 100mA	—	—	90	mV
		1mA ≤ I_{OUT} ≤ 40mA	—	—	45	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	—	6.0	mA
Quiescent Current Change	△I_Q	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		13V ≤ V_{IN} ≤ 24V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	49	—	μV
Ripple Rejection	RR	12V ≤ V_{IN} ≤ 23V, f=120Hz,	—	44	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V

AT78L10(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =17V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		9.70	10.0	10.30	V
		13V ≤ V_{IN} ≤ 25V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	9.60	—	10.40	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	9.60	—	10.40	
Line Regulation	△V_{OUT}	13V ≤ V_{IN} ≤ 25V	—	—	175	mV
		14V ≤ V_{IN} ≤ 25V		—	125	
Line Regulation	△V_{OUT}	1mA ≤ I_{OUT} ≤ 100mA	—	—	90	mV
		1mA ≤ I_{OUT} ≤ 40mA	—	—	40	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	—	6.0	mA
Quiescent Current Change	△I_Q	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		14V ≤ V_{IN} ≤ 25V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	62	—	μV
Ripple Rejection	RR	15V ≤ V_{IN} ≤ 25V, f=120Hz,	—	44	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V

ELECTRICAL CHARACTERISTICS(CONTINUED)

Limits in standard typeface are for T_J=25℃ .

AT78L12(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =19V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		11.64	12.0	12.36	V
		14.5V ≤ V_{IN} ≤ 27V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	11.52	—	12.48	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	11.52	—	12.48	
Line Regulation	△V_{OUT}	14.5V ≤ V_{IN} ≤ 27V	—	—	300	mV
		16V ≤ V_{IN} ≤ 27V		—	250	
Line Regulation	△V_{OUT}	1mA ≤ I_{OUT} ≤ 100mA	—	—	150	mV
		1mA ≤ I_{OUT} ≤ 40mA	—	—	75	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	—	6.3	mA
Quiescent Current Change	△I_Q	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		16V ≤ V_{IN} ≤ 27V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	80	—	μV
Ripple Rejection	RR	15V ≤ V_{IN} ≤ 25V, f=120Hz,	—	65	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V

AT78L15(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =23V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		14.55	15.0	15.45	V
		17.5V ≤ V_{IN} ≤ 30V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	14.40	—	15.60	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	14.40	—	15.60	
Line Regulation	△V_{OUT}	17.5V ≤ V_{IN} ≤ 30V	—	—	275	mV
		20V ≤ V_{IN} ≤ 30V		—	225	
Line Regulation	△V_{OUT}	1mA ≤ I_{OUT} ≤ 100mA	—	—	150	mV
		1mA ≤ I_{OUT} ≤ 70mA	—	—	150	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	—	6.5	mA
Quiescent Current Change	△I_Q	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		20V ≤ V_{IN} ≤ 30V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	90	—	μV
Ripple Rejection	RR	18.5V ≤ V_{IN} ≤ 28.5V, f=120Hz,	—	63	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V

ELECTRICAL CHARACTERISTICS(CONTINUED)

Limits in standard typeface are for T_J=25℃ .

AT78L18(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =27V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		17.46	18.0	18.54	V
		21V ≤ V_{IN} ≤ 33V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	17.28	—	18.72	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	17.28	—	18.72	
Line Regulation	△V_{OUT}	21V ≤ V_{IN} ≤ 33V	—	—	300	mV
		22V ≤ V_{IN} ≤ 33V		—	253	
Line Regulation	△V_{OUT}	1mA ≤ I_{OUT} ≤ 100mA	—	—	170	mV
		1mA ≤ I_{OUT} ≤ 40mA	—	—	85	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	—	6.0	mA
Quiescent Current Change	△I_Q	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		21V ≤ V_{IN} ≤ 33V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	150	—	μV
Ripple Rejection	RR	23V ≤ V_{IN} ≤ 33V, f=120Hz,	—	48	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V

AT78L24(Refer to the test circuits,I_{OUT} = 40mA,V_{IN} =33V,C_{IN}=0.33μF,C_{OUT}=0.1μF unless otherwise specified) (Note 2)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		23.28	24.0	24.72	V
		27V ≤ V_{IN} ≤ 38V,1mA ≤ I_{OUT} ≤ 40mA(Note3)	23.04	—	24.96	
		1mA ≤ I_{OUT} ≤ 70mA(Note 3)	23.04	—	24.96	
Line Regulation	△V_{OUT}	27V ≤ V_{IN} ≤ 38V	—	—	300	mV
		28V ≤ V_{IN} ≤ 38V		—	320	
Line Regulation	△V_{OUT}	1mA ≤ I_{OUT} ≤ 100mA	—	—	200	mV
		1mA ≤ I_{OUT} ≤ 70mA	—	—	100	
Quiescent Current	I_Q	I_{OUT}= 0mA	—	—	6.3	mA
Quiescent Current Change	△I_Q	1mA ≤ I_{OUT} ≤ 40mA	—	—	0.1	mA
		27V ≤ V_{IN} ≤ 38V	—	—	1.5	
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100KHz(Note 4)	—	200	—	μV
Ripple Rejection	RR	27V ≤ V_{IN} ≤ 38V, f=120Hz,	—	45	—	dB
Dropout Voltage (Note1)	VD	I_{OUT}= 100mA	—	1.7	—	V

Note 1: When tested in free air condition, without heat sinking.

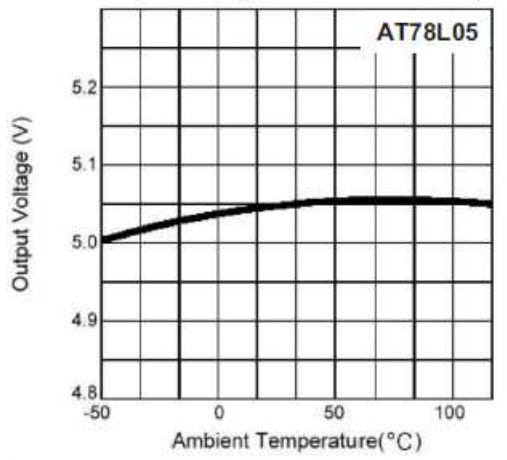
Note 2: The Maximum steady state usable output current is dependent on input voltage, heat sinking, lead length of the package and copper of PCB.
The data above represent pulse test conditions with junction temperatures specified at the initiation of test.

Note 3: Power dissipation < 0.5W

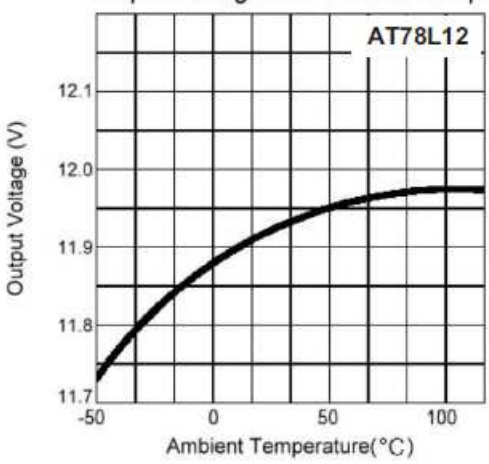
Note 4: Recommended minimum load capacitance of 0.01μF to limit high frequency noise.

TYPICAL OPERATING CHARACTERISTICS

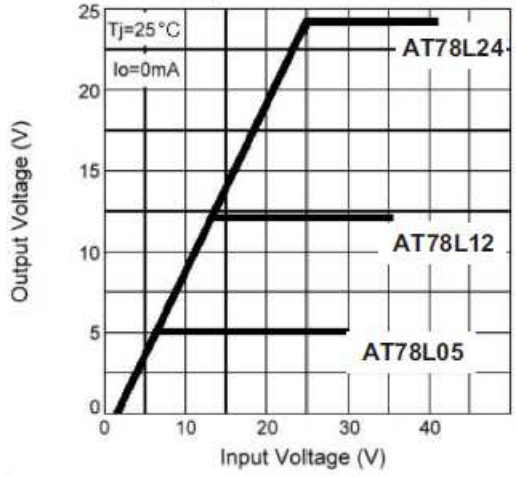
Output Voltage vs. Ambient Temp.



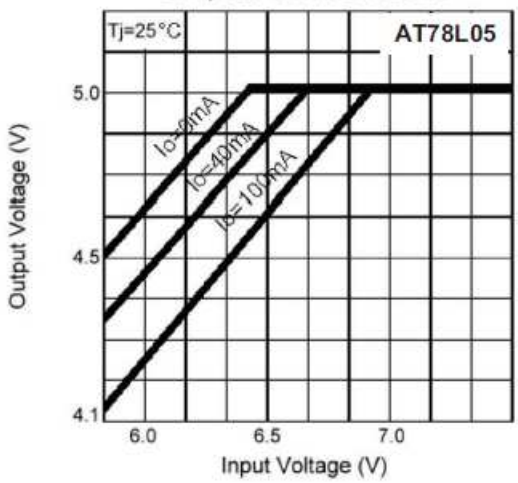
Output Voltage vs. Ambient Temp.



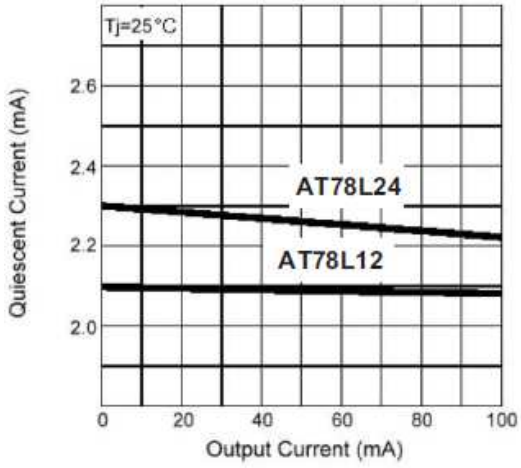
Output Characteristics



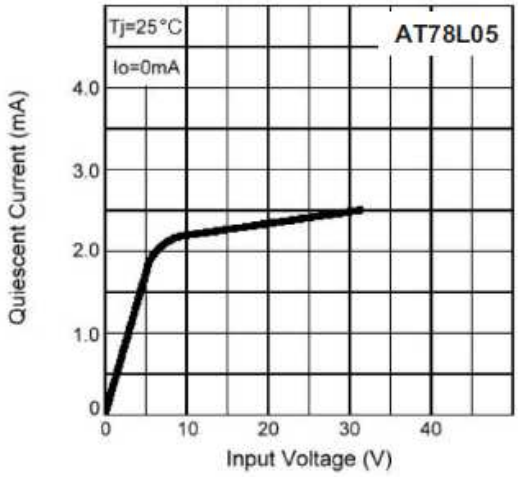
Dropout Characteristics



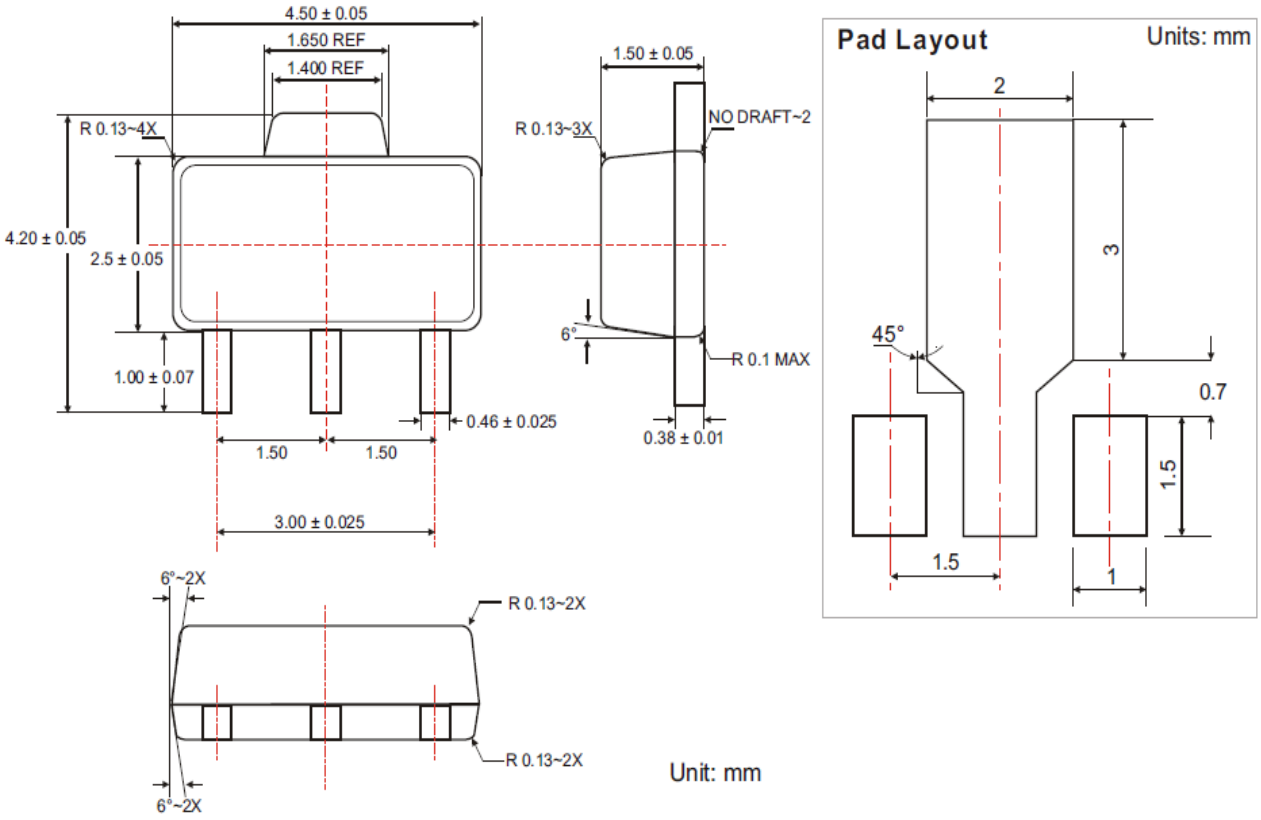
Quiescent Current vs. Output Current



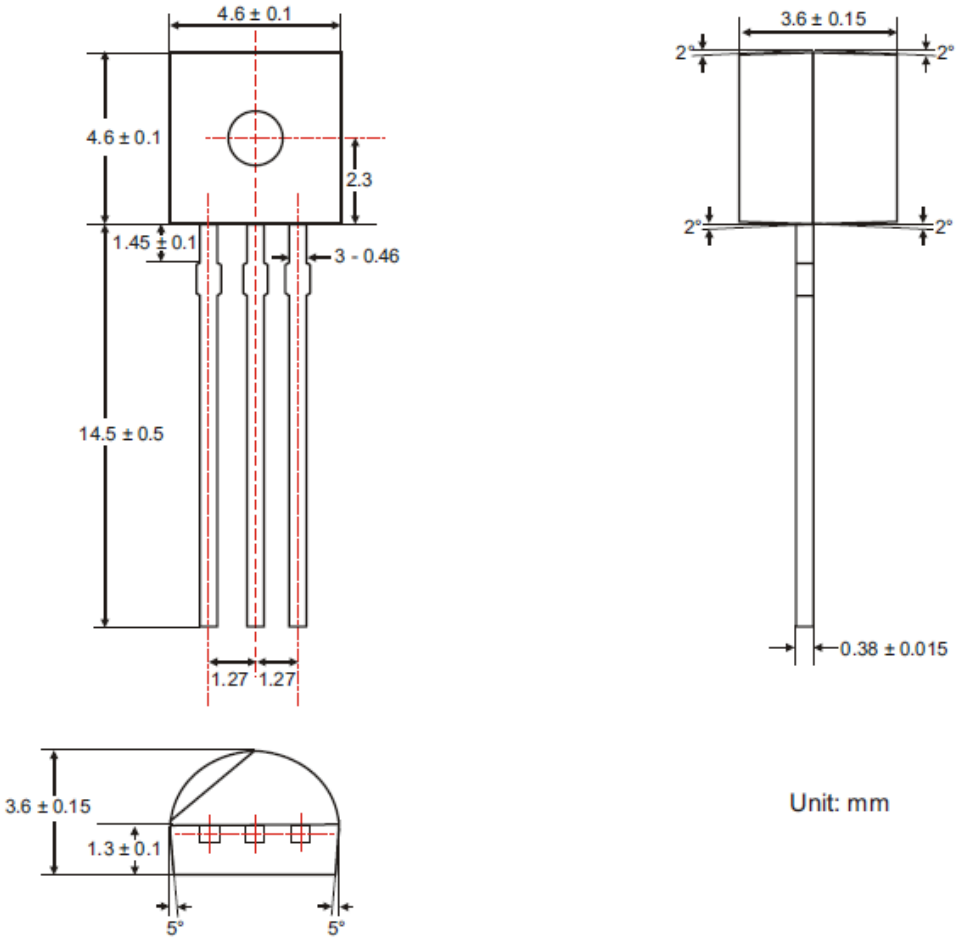
Quiescent Current vs. Input Voltage



PACKAGE OUTLINE DIMENSIONS
SOT-89 PACKAGE OUTLINE DIMENSIONS



PACKAGE OUTLINE DIMENSIONS
TO-92 PACKAGE OUTLINE DIMENSIONS



Unit: mm

Note :

Information provided by IAT is believed to be accurate and reliable. However, we cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in an IAT product; nor for any infringement of patents or other rights of third parties that may result from its use. We reserve the right to change the circuitry and specifications without notice.

Life Support Policy: IAT does not authorize any IAT product for use in life support devices and/or systems. Life support devices or systems are devices or systems which, (I) are intended for surgical implant into the body or (II) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user. Typical numbers are at 25℃ and represent the most likely norm.