



### ■ Absolute Maximum Ratings

Parameter	Symbol	Range	Unit
Supply voltage *2	$V_{CC}$	35	V
Supply current *3	$I_{CC}$	—	mA
Power dissipation *4	$P_D$	—	mW
Operating ambient temperature *1	$T_{opr}$	-30 to +85	°C
Storage temperature *1	$T_{stg}$	-55 to +150	°C

Note) 1. \*1: Except for the operating ambient temperature and storage temperature, all ratings are for  $T_a = 25^\circ\text{C}$ .

\*2: When  $V_{CC}$  of 35 V is applied, the overvoltage protection of ASO protection circuit may shut off the output.

\*3: Since this IC has incorporated a current limiter, the current value does not exceed the rating.

\*4: When  $T_j$  exceeds  $150^\circ\text{C}$  (designed value), the internal circuit cuts off the output. Note that the relationship between IC power dissipation and the ambient temperature must follow the derating curve.

2. This IC is not suitable for car electronics equipment.

### ■ Electrical Characteristics at $T_a = 25^\circ\text{C}$

#### • AN78M05NSP (5 V type)

The specified condition  $T_j = 25^\circ\text{C}$  means that the test should be carried out within so short a test time (within 10 ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.

Unless otherwise specified,  $V_1 = 10\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_1 = 0.33\ \mu\text{F}$  and  $C_O = 0.1\ \mu\text{F}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	$V_{O1}$	$T_j = 25^\circ\text{C}$	4.8	5	5.2	V
Output voltage tolerance	$V_{O2}$	$V_1 = 7.5\text{ V to }20\text{ V}$ , $I_O = 5\text{ mA to }350\text{ mA}$ $T_j = 25^\circ\text{C}$	4.75	—	5.25	V
Line regulation 1	$REG_{IN1}$	$V_1 = 7.5\text{ V to }25\text{ V}$ , $T_j = 25^\circ\text{C}$	—	3	100	mV
Line regulation 2	$REG_{IN2}$	$V_1 = 8\text{ V to }25\text{ V}$ , $T_j = 25^\circ\text{C}$	—	1	50	mV
Load regulation 1	$REG_{L1}$	$I_O = 5\text{ mA to }500\text{ mA}$ , $T_j = 25^\circ\text{C}$	—	20	100	mV
Load regulation 2	$REG_{L2}$	$I_O = 5\text{ mA to }200\text{ mA}$ , $T_j = 25^\circ\text{C}$	—	10	50	mV
Bias current	$I_{Bias}$	$T_j = 25^\circ\text{C}$	—	4	6	mA
Bias current fluctuation to input	$\Delta I_{Bias(IN)}$	$V_1 = 8\text{ V to }25\text{ V}$ , $T_j = 25^\circ\text{C}$	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{Bias(L)}$	$I_O = 5\text{ mA to }350\text{ mA}$ , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Ripple rejection ratio	RR	$V_1 = 8\text{ V to }18\text{ V}$ , $I_O = 100\text{ mA}$ , $f = 120\text{ Hz}$	62	—	—	dB

#### • Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output noise voltage	$V_{NO}$	$f = 10\text{ Hz to }100\text{ kHz}$	—	40	—	$\mu\text{V}$
Minimum input/output voltage difference	$V_{DIF(min)}$	$I_O = 500\text{ mA}$ , $T_j = 25^\circ\text{C}$	—	2	—	V
Output short-circuit current	$I_{O(Short)}$	$V_1 = 35\text{ V}$ , $T_j = 25^\circ\text{C}$	—	300	—	mA
Peak output current	$I_{O(Peak)}$	$T_j = 25^\circ\text{C}$	—	1000	—	mA
Output voltage temperature coefficient	$\Delta V_O / T_a$	$I_O = 5\text{ mA}$ , $T_j = 0^\circ\text{C to }125^\circ\text{C}$	—	-0.5	—	$\text{mV}/^\circ\text{C}$
Thermal protection operating temperature	$T_{j(TH)}$	$I_O = 5\text{ mA}$	—	150	—	°C

■ Electrical Characteristics at  $T_a = 25^\circ\text{C}$  (continued)

• AN78M09NSP (9 V type)

The specified condition  $T_j = 25^\circ\text{C}$  means that the test should be carried out within so short a test time (within 10 ms) that the characteristic value drift due to the chip junction temperature rise can be ignored.

Unless otherwise specified,  $V_I = 15\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$  and  $C_O = 0.1\text{ }\mu\text{F}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output voltage	$V_{O1}$	$T_j = 25^\circ\text{C}$	8.65	9	9.35	V
Output voltage tolerance	$V_{O2}$	$V_I = 11.5\text{ V to }24\text{ V}$ , $I_O = 5\text{ mA to }350\text{ mA}$ $T_j = 25^\circ\text{C}$	8.55	—	9.45	V
Line regulation 1	$\text{REG}_{\text{IN1}}$	$V_I = 11.5\text{ V to }25\text{ V}$ , $T_j = 25^\circ\text{C}$	—	7	100	mV
Line regulation 2	$\text{REG}_{\text{IN2}}$	$V_I = 12\text{ V to }25\text{ V}$ , $T_j = 25^\circ\text{C}$	—	2	50	mV
Load regulation 1	$\text{REG}_{\text{L1}}$	$I_O = 5\text{ mA to }500\text{ mA}$ , $T_j = 25^\circ\text{C}$	—	25	180	mV
Load regulation 2	$\text{REG}_{\text{L2}}$	$I_O = 5\text{ mA to }200\text{ mA}$ , $T_j = 25^\circ\text{C}$	—	10	90	mV
Bias current	$I_{\text{Bias}}$	$T_j = 25^\circ\text{C}$	—	4.1	6	mA
Bias current fluctuation to input	$\Delta I_{\text{Bias(IN)}}$	$V_I = 12\text{ V to }25\text{ V}$ , $T_j = 25^\circ\text{C}$	—	—	0.8	mA
Bias current fluctuation to load	$\Delta I_{\text{Bias(L)}}$	$I_O = 5\text{ mA to }350\text{ mA}$ , $T_j = 25^\circ\text{C}$	—	—	0.5	mA
Ripple rejection ratio	RR	$V_I = 12\text{ V to }22\text{ V}$ , $I_O = 100\text{ mA}$ , $f = 120\text{ Hz}$	56	—	—	dB

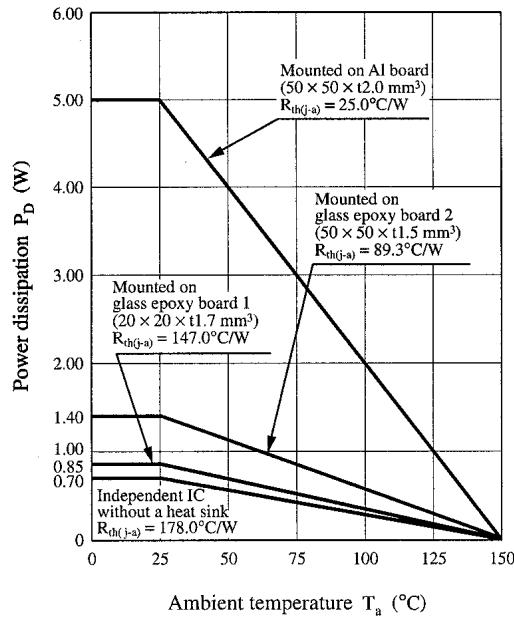
• Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output noise voltage	$V_{\text{NO}}$	$f = 10\text{ Hz to }100\text{ kHz}$	—	60	—	$\mu\text{V}$
Minimum input/output voltage difference	$V_{\text{DIF(min)}}$	$I_O = 500\text{ mA}$ , $T_j = 25^\circ\text{C}$	—	2	—	V
output short-circuit current	$I_{\text{O(Short)}}$	$V_I = 35\text{ V}$ , $T_j = 25^\circ\text{C}$	—	300	—	mA
Peak output current	$I_{\text{O(Peak)}}$	$T_j = 25^\circ\text{C}$	—	1 000	—	mA
Output voltage temperature coefficient	$\Delta V_O / T_a$	$I_O = 5\text{ mA}$ , $T_j = 0^\circ\text{C to }125^\circ\text{C}$	—	-0.5	—	$\text{mV}/^\circ\text{C}$
Thermal protection operating temperature	$T_{\text{j(TH)}}$	$I_O = 5\text{ mA}$	—	150	—	$^\circ\text{C}$

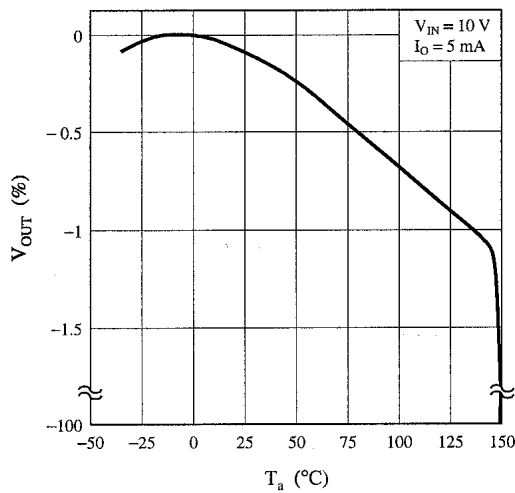
■ Application Notes

1.  $P_D - T_a$  curves of SP-3SU  $P_D \approx \frac{3}{4} T_a$

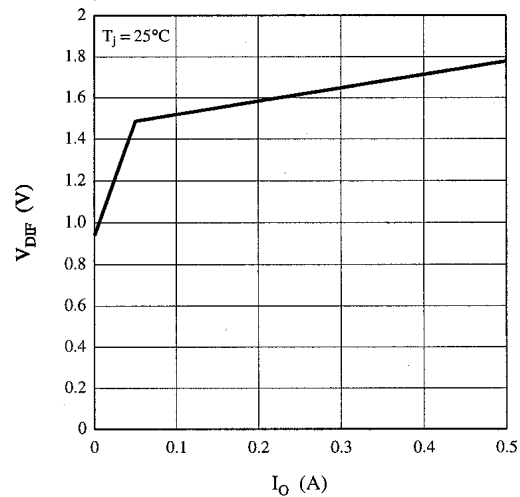


2. Main Characteristics

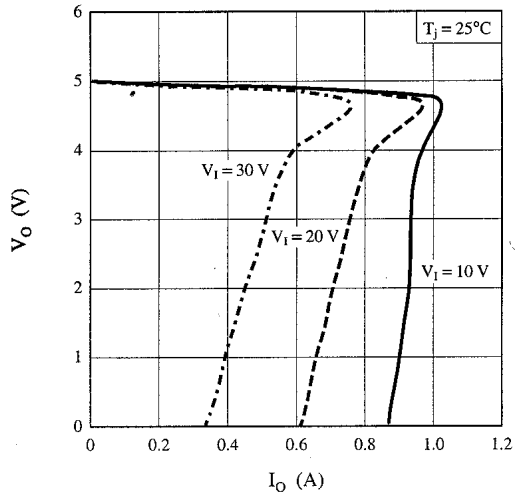
Output voltage temperature characteristic



Minimum input/output voltage difference vs. load current characteristic



Current limit characteristics



Ripple rejection ratio vs. frequency characteristic

