Elektronische Bauelemente

SM78Lxx Series

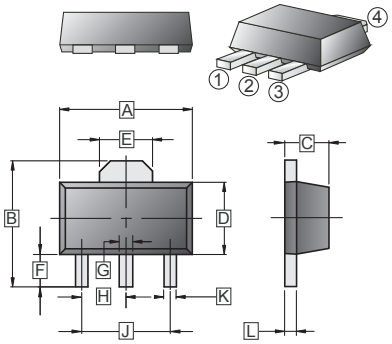
Positive Voltage Regulator

RoHS Compliant Product
A suffix of "-C" specifies halogen or lead -free

DESCRIPTION

The SM78LXX series of positive regulators are available in the SOT-89 package and with 5V, 6V, 8V, 9V, 10V, 12V, 15V and 18V fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shut-down and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 100mA output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents. SM78Lxx is characterized for operation from 0°C to +125°C.

SOT-89



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	4.40	4.60	G	0.40	0.58
B	3.94	4.25	H	1.50 TYP	
C	1.40	1.60	J	3.00 TYP	
D	2.25	2.60	K	0.32	0.52
E	1.50	1.85	L	0.35	0.44
F	0.89	1.20			

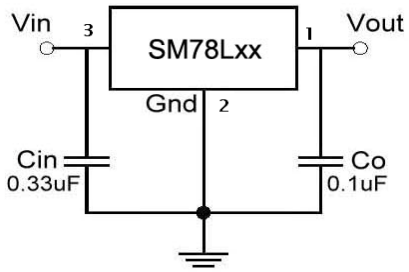
FEATURES

- Internal Short-Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components Required

PACKAGE INFORMATION

Package	MPQ	Leader Size
SOT-89	1K	7 inch

TYPICAL APPLICATION



MAXIMUM RATINGS

Parameter		Symbol	Ratings	Unit
Input Voltage	5V~9V	V_{IN}	30	V
	12V~18V		35	
Output Current		I_O	100	mA
Operating Junction Temperature Range		T_J	0~125	°C
Storage Temperature Range		Tstg	-55~150	
Power Dissipation @ T_A=25°C		P_D	500	mW

SM78L05 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, T_J =0~125°C, I_O=40mA, V_{IN}=10V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) [1]

Symbol	Test Conditions	Min	Typ	Max	Unit
V_O	V_{IN}=10V, I_O=40mA,T_J=25°C	4.8	5	5.2	V
	7V≦V_{IN}≦20V, 1mA≦I_O≦40mA	4.75	5	5.25	
	1mA≦I_O≦70mA	4.75	5	5.25	
ΔV_O(Line Regulation)	7V≦V_{IN}≦20V	-	32	150	mV
	8V≦V_{IN}≦20V, T_J =25°C	-	26	100	
ΔV_O(Load Regulation)	1mA≦I_O≦100mA, T_J =25°C	-	15	60	mV
	1mA≦I_O≦40mA, T_J =25°C	-	8	30	
I_Q	Tj=25°C	-	3.8	6.0	mA
ΔI_Q	1mA≦I_O≦40mA	-	-	0.1	mA
	8V≦V_{IN}≦20V	-	-	1.5	
V_N	10Hz≦f≦100KHz	-	42	-	μV
RR	8V≦V_{IN}≦20V, f=120Hz	41	49	-	dB
V_D	T_J =25°C	-	1.7	-	V

SM78L06 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, T_J =0~125°C, I_O=40mA, V_{IN}=11V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) [1]

Symbol	Test Conditions	Min	Typ	Max	Unit
V_O	V_{IN}=11V, I_O=40mA, T_J=25°C	5.75	6	6.25	V
	8V≦V_{IN}≦20V, 1mA≦I_O≦40mA	5.7	6	6.3	
	1mA≦I_O≦70mA	5.7	6	6.3	
V_O(Line Regulation)	8V≦V_{IN}≦20V, T_J=25°C	-	35	175	mV
	9V≦V_{IN}≦20V, T_J=25°C	-	29	125	
V_O(Load Regulation)	1mA≦I_O≦100mA, T_J=25°C	-	16	80	mV
	1mA≦I_O≦40mA, T_J=25°C	-	9	40	
I_Q	T_J=25°C	-	3.9	6.0	mA
I_Q	1mA≦I_O≦40mA	-	-	0.1	mA
	9V≦V_{IN}≦20V	-	-	1.5	
V_N	10Hz≦f≦100KHz	-	46	-	μV
RR	9V≦V_{IN}≦19V, f=120Hz	40	48	-	dB
V_D	T_J=25°C	-	1.7	-	V

SM78L08 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, T_J =0~125°C , I_O=40mA, V_{IN}=14V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) [1]

Symbol	Test Conditions	Min	Typ	Max	Unit
V_O	V_{IN}=14V, I_O=40mA, T_J=25°C	7.7	8	8.3	V
	10.5V≦V_{IN}≦23V, 1mA≦I_O≦40mA	7.6	8	8.4	
	1mA≦I_O≦70mA	7.6	8	8.4	
ΔV_O(Line Regulation)	10.5V≦V_{IN}≦23V, T_J=25°C	-	42	175	mV
	11V≦V_{IN}≦23V, T_J=25°C	-	36	125	
ΔV_O(Load Regulation)	1mA≦I_O≦100mA, T_J=25°C	-	18	80	mV
	1mA≦I_O≦40mA, T_J=25°C	-	10	40	
I_Q	T_J=25°C	-	2.0	5.5	mA
ΔI_Q	1mA≦I_O≦40mA	-	-	0.1	mA
	11V≦V_{IN}≦23V	-	-	1.5	
V_N	10Hz≦f≦100KHz	-	54	-	μV
RR	13V≦V_{IN}≦23V, f=120Hz	37	46	-	dB
V_D	T_J=25°C	-	1.7	-	V

SM78L09 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, T_J =0~125 °C, I_O=40mA, V_{IN}=16V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) [1]

Symbol	Test Conditions	Min	Typ	Max	Unit
V_O	V_{IN}=16V, I_O=40mA,Tj=25°C	8.64	9	9.36	V
	12V≦V_{IN}≦24V, 1mA≦I_O≦40mA	8.55	9	9.45	
	1mA≦I_O≦70mA	8.55	9	9.45	
ΔV_O(Line Regulation)	12V≦V_{IN}≦24V, T_J=25°C	-	45	175	mV
	13V≦V_{IN}≦24V, T_J=25°C	-	40	125	
ΔV_O(Load Regulation)	1mA≦I_O≦100mA, T_J=25°C	-	19	90	mV
	1mA≦I_O≦40mA, T_J=25°C	-	11	40	
I_Q	T_J=25°C	-	4.1	6.0	mA
ΔI_Q	1mA≦I_O≦40mA	-	-	0.1	mA
	13V≦V_{IN}≦24V	-	-	1.5	
V_N	10Hz≦f≦100KHz	-	58	-	μV
RR	15V≦V_{IN}≦25V, f=120Hz	-	45	-	dB
V_D	T_J=25°C	-	1.7	-	V

SM78L12 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, T_J =0~125 °C, I_O=40mA, V_{IN}=19V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) [1]

Symbol	Test Conditions	Min	Typ	Max	Unit
V_O	V_{IN}=19V, I_O=40mA, T_J=25°C	11.5	12	12.5	V
	14.5V≦V_{IN}≦27V, 1mA≦I_O≦40mA	11.4	12	12.6	
	1mA≦I_O≦70mA	11.4	12	12.6	
ΔV_O(Line Regulation)	14.5V≦V_{IN}≦27V, T_J=25°C	-	55	250	mV
	16V≦V_{IN}≦27V, T_J=25°C	-	49	200	
ΔV_O(Load Regulation)	1mA≦I_O≦100mA, T_J=25°C	-	22	100	mV
	1mA≦I_O≦40mA, T_J=25°C	-	13	50	
I_Q	T_J=25°C	-	4.3	6.5	mA
ΔI_Q	1mA≦I_O≦40mA	-	-	0.1	mA
	16V≦V_{IN}≦27V	-	-	1.5	
V_N	10Hz≦f≦100KHz	-	70	-	μV
RR	15V≦V_{IN}≦25V, f=120Hz	37	42	-	dB
V_D	T_J=25°C	-	1.7	-	V

SM78L15 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, T_J =0~125 °C, I_O=40mA, V_{IN}=23V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) [1]

Symbol	Test Conditions	Min	Typ	Max	Unit
V_O	V_{IN}=23V, I_O=40mA, T_J=25°C	14.4	15	15.6	V
	17.5V≦V_{IN}≦30V, 1mA≦I_O≦40mA	14.25	15	15.75	
	V_{IN}=23V, 1mA≦I_O≦70mA	14.25	15	15.75	
ΔV_O(Line Regulation)	17.5V≦V_{IN}≦30V, I_O=40mA, T_J=25°C	-	65	300	mV
	19V≦V_{IN}≦30V, I_O=40mA, T_J=25°C	-	58	250	
ΔV_O(Load Regulation)	V_{IN}=23V, 1mA≦I_O≦100mA, T_J=25°C	-	25	150	mV
	V_{IN}=23V, 1mA≦I_O≦40mA, T_J=25°C	-	15	75	
I_Q	T_J=25°C	-	4.6	6.5	mA
ΔI_Q	V_{IN}=23V, 1mA≦I_O≦40mA	-	-	0.1	mA
	19V≦V_{IN}≦30V, I_O=40mA	-	-	1.5	
V_N	10Hz≦f≦100KHz	-	82	-	μV
RR	18.5V≦V_{IN}≦28.5V, f=120Hz	34	39	-	dB
V_D	T_J=25°C	-	1.7	-	V

SM78L18 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, T_J =0~125 °C, I_O=40mA, V_{IN}=26V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) [1]

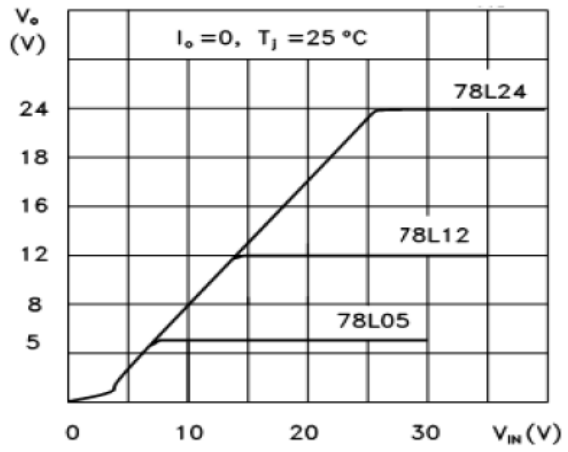
Symbol	Test Conditions	Min	Typ	Max	Unit
V_O	V_{IN}=26V, I_O=40mA, T_J =25°C	17.3	18	18.7	V
	20.5V≦V_{IN}≦33V, 1mA≦I_O≦40mA	17.1	18	18.9	
	V_{IN}=26V, 1mA≦I_O≦70mA	17.1	18	18.9	
ΔV_O(Line Regulation)	20.5V≦V_{IN}≦33V, I_O=40mA, T_J=25°C	-	70	360	mV
	20.5V≦V_{IN}≦33V, I_O=40mA, T_J=25°C	-	64	300	
ΔV_O(Load Regulation)	V_{IN}=26V, 1mA≦I_O≦100mA, T_J=25°C	-	27	180	mV
	V_{IN}=26V, 1mA≦I_O≦40mA, T_J=25°C	-	19	90	
I_Q	T_J =25°C	-	4.7	6.5	mA
ΔI_Q	V_{IN}=26V, 1mA≦I_O≦40mA	-	-	0.1	mA
	21V≦V_{IN}≦33V, I_O=40mA	-	-	1.5	
V_N	10Hz≦f≦100KHz	-	89	-	μV
RR	21.5V≦V_{IN}≦31.5V, f=120Hz	34	36	-	dB
V_D	T_J=25°C	-	1.7	-	V

Note:

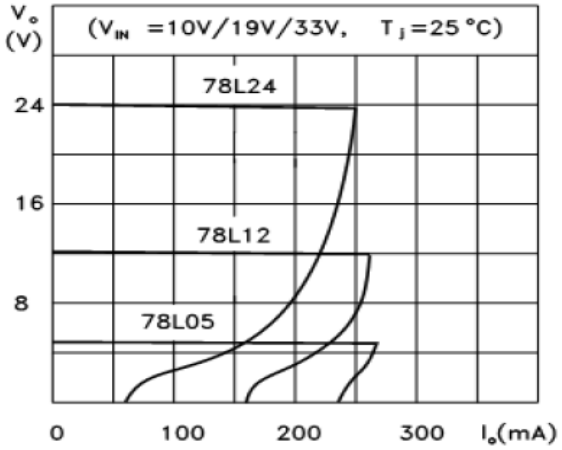
1. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators

CHARACTERISTICS CURVE

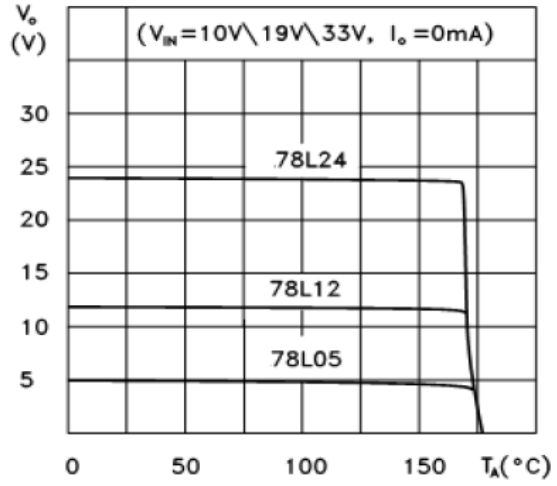
78L05/12/24 Output Characteristics



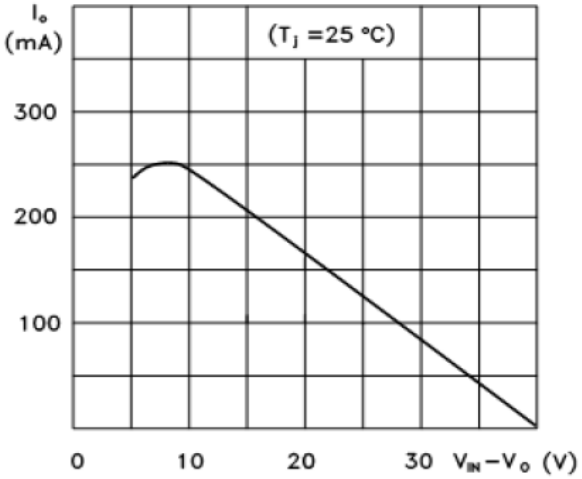
78L05/12/24 Load Characteristics



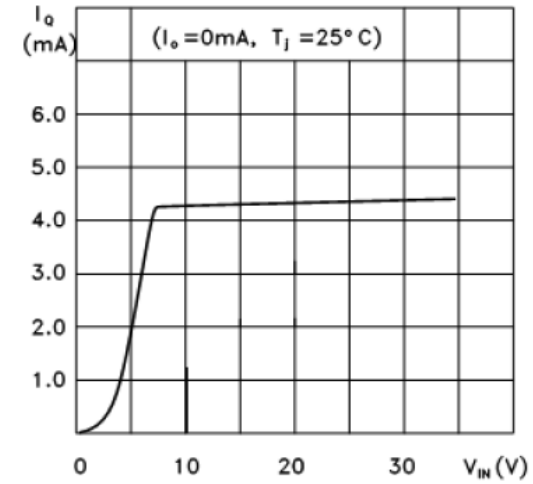
78L05/12/24 Thermal Shutdown



78L00 Series Short Circuit Output Current



78L05 Quiescent Current vs Input Voltage



PD-TA