Elektronische Bauelemente

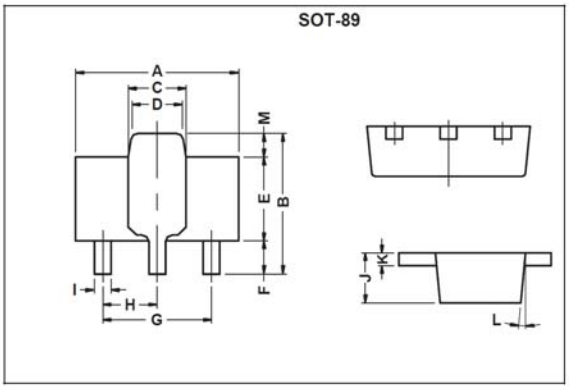
SM78Lxx-B Series

Positive Voltage Regulator

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

DESCRIPTION

The SM78LXX-B series of positive regulators are available in the SOT-89 package and with 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V 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.

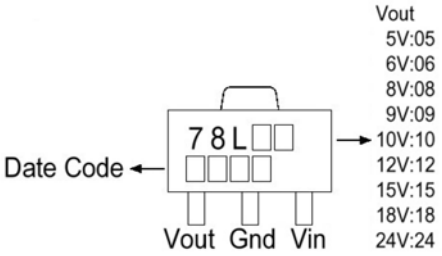


REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	4.40	4.60	G	3.00 REF.	
B	4.05	4.25	H	1.50 REF.	
C	1.50	1.70	I	0.40	0.52
D	1.30	1.50	J	1.40	1.60
E	2.40	2.60	K	0.35	0.41
F	0.89	1.20	L	5° TYP.	
			M	0.70 REF.	

FEATURES

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

MARKING



PACKAGE INFORMATION

Package	MPQ	LeaderSize
SOT-89	1K	7’ inch

MAXIMUM RATINGS

Parameter		Symbol	Ratings	Unit
Input Voltage	5V ~ 10V	V_{IN}	30	V
	12V ~ 18V	V_{IN}	35	V
	24V	V_{IN}	40	V
Output Current		I_O	100	mA
Operating Junction Temperature Range		T_J	0 ~ 125	°C
Storage Temperature Range		Tstg	-55 ~ 150	
Power Dissipation		P_D	350 *	mW

*When tested in free air condition, without heat sinking.

SM78L05-B ELECTRICAL CHARACTERISTICS

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

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=10V, I_O=40mA,Tj=25°C 7V≦V_{IN}≦20V, 1mA≦I_O≦40mA 7V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	4.75	5.0	5.25	V
ΔV_O(Line Regulation)		7V≦V_{IN}≦20V, I_O=40mA, Tj=25°C	-	18	75	mV
		8V≦V_{IN}≦20V, I_O=40mA, Tj=25°C	-	10	54	
ΔV_O(Load Regulation)		V_{IN}=10V, 1mA≦I_O≦100mA, Tj=25°C	-	20	60	mV
		V_{IN}=10V, 1mA≦I_O≦40mA, Tj=25°C	-	5	30	
I_Q		V_{IN}=10V, I_O=0mA,Tj=25°C	-	3.0	5.0	mA
ΔI_Q		V_{IN}=10V, 1mA≦I_O≦40mA	-	-	0.1	mA
		8V≦V_{IN}≦20V, I_O=40mA	-	-	1.0	
V_N		10Hz≦f≦100KHz	-	40	-	μV
RR		8V≦V_{IN}≦20V, f=120Hz, Tj=25°C, I_O=40mA	47	62	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V
$\Delta V_O/\Delta Tj$		I_O=5mA, 0°C≦Tj≦125°C	-	-0.65	-	mV/°C

SM78L06-B ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, Tj=0~125 °C, I_O=40mA, V_{IN}=12V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) (Note 1)

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=12V, I_O=40mA,Tj=25°C 8.5V≦V_{IN}≦20V, 1mA≦I_O≦40mA 8.5V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	5.70	6.0	6.30	V
ΔV_O(Line Regulation)		8.5V≦V_{IN}≦20V, I_O=40mA, Tj=25°C	-	64	175	mV
		9V≦V_{IN}≦20V, I_O=40mA, Tj=25°C	-	54	125	
ΔV_O(Load Regulation)		V_{IN}=12V, 1mA≦I_O≦100mA, Tj=25°C	-	12.8	80	mV
		V_{IN}=12V, 1mA≦I_O≦70mA, Tj=25°C	-	5.8	40	
I_Q		V_{IN}=12V, I_O=0mA,Tj=25°C	-	3.9	6.0	mA
ΔI_Q		V_{IN}=12V, 1mA≦I_O≦40mA	-	-	0.1	mA
		9V≦V_{IN}≦20V, I_O=40mA	-	-	1.5	
V_N		10Hz≦f≦100KHz	-	49	-	μV
RR		10V≦V_{IN}≦20V, Io=40mA, f=120Hz, Tj=25°C	40	46	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V
$\Delta V_O/\Delta Tj$		I_O=5mA, 0°C≦Tj≦125°C	-	0.75	-	mV/°C

SM78L08-B ELECTRICAL CHARACTERISTICS

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

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=14V, I_O=40mA,Tj=25°C 10.5V≦V_{IN}≦23V, 1mA≦I_O≦40mA 10.5V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	7.60	8.0	8.40	V
ΔV_O(Line Regulation)		10.5V≦V_{IN}≦23V, I_O=40mA, Tj=25°C	-	10	175	mV
		11V≦V_{IN}≦23V, I_O=40mA, Tj=25°C	-	8	125	
ΔV_O(Load Regulation)		V_{IN}=14V, 1mA≦I_O≦100mA, Tj=25°C	-	15	80	mV
		V_{IN}=14V, 1mA≦I_O≦70mA, Tj=25°C	-	8	40	
I_Q		V_{IN}=14V, I_O=0mA,Tj=25°C	-	2.0	5.5	mA
ΔI_Q		V_{IN}=14V, 1mA≦I_O≦40mA	-	-	0.1	mA
		11V≦V_{IN}≦23V, I_O=40mA	-	-	1.5	
V_N		10Hz≦f≦100KHz	-	49	-	μV
RR		11V≦V_{IN}≦21V, Io=40mA, f=120Hz, Tj=25°C	39	45	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V
$\Delta V_O/\Delta Tj$		I_O=5mA, 0°C≦Tj≦125°C	-	0.75	-	mV/°C

SM78L09-B ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, Tj=0~125 °C, I_O=40mA, V_{IN}=15V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) (Note 1)

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=15V, I_O=40mA,Tj=25°C 11.5V≦V_{IN}≦24V, 1mA≦I_O≦40mA 11.5V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	8.55	9.0	9.45	V
ΔV_O(Line Regulation)		11.5V≦V_{IN}≦24V, I_O=40mA, Tj=25°C	-	90	200	mV
		13V≦V_{IN}≦24V, I_O=40mA, Tj=25°C	-	100	150	
ΔV_O(Load Regulation)		V_{IN}=15V, 1mA≦I_O≦100mA, Tj=25°C	-	20	90	mV
		V_{IN}=15V, 1mA≦I_O≦40mA, Tj=25°C	-	10	45	
I_Q		V_{IN}=15V, I_O=0mA,Tj=25°C	-	2.0	6.0	mA
ΔI_Q		V_{IN}=15V, 1mA≦I_O≦40mA	-	-	0.1	mA
		13V≦V_{IN}≦24V, I_O=40mA	-	-	1.5	
V_N		10Hz≦f≦100KHz	-	49	-	μV
RR		12V≦V_{IN}≦23V, Io=40mA, f=120Hz, Tj=25°C	38	44	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V
$\Delta V_O/\Delta Tj$		I_O=5mA, 0°C≦Tj≦125°C	-	0.75	-	mV/°C

SM78L10-B ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, Tj=0~125 °C, I_O=40mA, V_{IN}=17V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) (Note 1)

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=17V, I_O=40mA,Tj=25°C 13V≦V_{IN}≦25V, 1mA≦I_O≦40mA 13V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	9.50	10.0	10.50	V
ΔV_O(Line Regulation)		13V≦V_{IN}≦25V, I_O=40mA, Tj=25°C	-	51	175	mV
		14V≦V_{IN}≦25V, I_O=40mA, Tj=25°C	-	42	125	
ΔV_O(Load Regulation)		V_{IN}=17V, 1mA≦I_O≦100mA, Tj=25°C	-	20	90	mV
		V_{IN}=17V, 1mA≦I_O≦40mA, Tj=25°C	-	11	40	
I_Q		V_{IN}=17V, I_O=0mA,Tj=25°C	-	4.2	6.0	mA
ΔI_Q		V_{IN}=17V, 1mA≦I_O≦40mA	-	-	0.1	mA
		14V≦V_{IN}≦25V, I_O=40mA	-	-	1.5	
V_N		10Hz≦f≦100KHz	-	62	-	μV
RR		15V≦V_{IN}≦25V, Io=40mA, f=120Hz, Tj=25°C	37	44	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V

SM78L12-B ELECTRICAL CHARACTERISTICS

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

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=19V, I_O=40mA,Tj=25°C 14.5V≦V_{IN}≦27V, 1mA≦I_O≦40mA 14.5V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	11.40	12.0	12.60	V
ΔV_O(Line Regulation)		14.5V≦V_{IN}≦27V, I_O=40mA, Tj=25°C	-	25	300	mV
		16V≦V_{IN}≦27V, I_O=40mA, Tj=25°C	-	20	250	
ΔV_O(Load Regulation)		V_{IN}=19V, 1mA≦I_O≦100mA, Tj=25°C	-	25	150	mV
		V_{IN}=19V, 1mA≦I_O≦40mA, Tj=25°C	-	12	75	
I_Q		V_{IN}=19V, I_O=0mA,Tj=25°C	-	2.0	6.0	mA
ΔI_Q		V_{IN}=19V, 1mA≦I_O≦40mA	-	-	0.1	mA
		16V≦V_{IN}≦27V, I_O=40mA	-	-	1.5	
V_N		10Hz≦f≦100KHz	-	80	-	μV
RR		15V≦V_{IN}≦25V, Io=40mA, f=120Hz, Tj=25°C	37	65	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V
$\Delta V_O/\Delta Tj$		I_O=5mA, 0°C≦Tj≦125°C	-	-1.0	-	mV/°C

SM78L15-B ELECTRICAL CHARACTERISTICS

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

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=23V, I_O=40mA,Tj=25°C 17.5V≦V_{IN}≦30V, 1mA≦I_O≦40mA 17.5V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	14.25	15.0	15.75	V
ΔV_O(Line Regulation)		17.5V≦V_{IN}≦30V, I_O=40mA, Tj=25°C	-	25	150	mV
		20V≦V_{IN}≦30V, I_O=40mA, Tj=25°C	-	15	75	
ΔV_O(Load Regulation)		V_{IN}=23V, 1mA≦I_O≦100mA, Tj=25°C	-	20	150	mV
		V_{IN}=23V, 1mA≦I_O≦70mA, Tj=25°C	-	25	150	
I_Q		V_{IN}=23V, I_O=0mA,Tj=25°C	-	2.2	6.5	mA
ΔI_Q		V_{IN}=23V, 1mA≦I_O≦40mA	-	-	0.1	mA
		20V≦V_{IN}≦30V, I_O=40mA	-	-	1.5	
V_N		10Hz≦f≦100KHz	-	90	-	μV
RR		18.5V≦V_{IN}≦28.5V, Io=40mA, f=120Hz, Tj=25°C	34	63	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V
$\Delta V_O/\Delta Tj$		I_O=5mA, 0°C≦Tj≦125°C	-	-1.3	-	mV/°C

SM78L18-B ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, Tj=0~125 °C, I_O=40mA, V_{IN}=27V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) (Note 1)

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=27V, I_O=40mA,Tj=25°C 21V≦V_{IN}≦33V, 1mA≦I_O≦40mA 21V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	17.10	18.0	18.9	V
ΔV_O(Line Regulation)		21V≦V_{IN}≦33V, I_O=40mA, Tj=25°C	-	145	300	mV
		22V≦V_{IN}≦33V, I_O=40mA, Tj=25°C	-	135	250	
ΔV_O(Load Regulation)		V_{IN}=27V, 1mA≦I_O≦100mA, Tj=25°C	-	30	170	mV
		V_{IN}=27V, 1mA≦I_O≦40mA, Tj=25°C	-	15	85	
I_Q		V_{IN}=27V, I_O=0mA,Tj=25°C	-	2.0	6.0	mA
ΔI_Q		V_{IN}=27V, 1mA≦I_O≦40mA	-	-	0.1	mA
		21V≦V_{IN}≦33V, I_O=40mA	-	-	1.5	
V_N		10Hz≦f≦100KHz	-	150	-	μV
RR		23V≦V_{IN}≦33V, Io=40mA, f=120Hz, Tj=25°C	34	48	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V
$\Delta V_O/\Delta Tj$		I_O=5mA, 0°C≦Tj≦125°C	-	-1.8	-	mV/°C

SM78L24-B ELECTRICAL CHARACTERISTICS

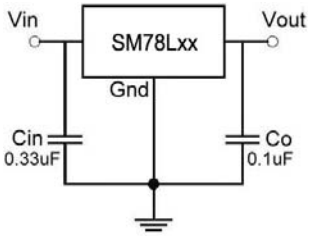
(Refer to the test circuits, Tj=0~125 °C, I_O=40mA, V_{IN}=33V, C_{IN}=0.33μF, C_O=0.1μF unless otherwise specified) (Note 1)

Symbol		Test Conditions	Min	Typ	Max	Unit
V_O	B-Rank (5%)	V_{IN}=33V, I_O=40mA,Tj=25°C 27V≦V_{IN}≦38V, 1mA≦I_O≦40mA 27V≦V_{IN}≦Vmax, 1mA≦I_O≦70mA (Note 2)	22.80	24.0	25.20	V
ΔV_O(Line Regulation)		27V≦V_{IN}≦38V, I_O=40mA, Tj=25°C	-	160	300	mV
		28V≦V_{IN}≦38V, I_O=40mA, Tj=25°C	-	150	250	
ΔV_O(Load Regulation)		V_{IN}=33V, 1mA≦I_O≦100mA, Tj=25°C	-	40	200	mV
		V_{IN}=33V, 1mA≦I_O≦40mA, Tj=25°C	-	20	100	
I_Q		V_{IN}=33V, I_O=0mA,Tj=25°C	-	2.2	6.0	mA
ΔI_Q		V_{IN}=33V, 1mA≦I_O≦40mA	-	-	0.1	mA
		27V≦V_{IN}≦38V, I_O=40mA	-	-	1.5	
V_N		10Hz≦f≦100KHz	-	200	-	μV
RR		27V≦V_{IN}≦38V, Io=40mA, f=120Hz, Tj=25°C	34	45	-	dB
V_D		Io=100mA, Tj=25°C	-	1.7	-	V
$\Delta V_O/\Delta Tj$		I_O=5mA, 0°C≦Tj≦125°C	-	-2.0	-	mV/°C

Note1: 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.

Note2: Power dissipation < 0.5W

TYPICAL APPLICATION



CHARACTERISTICS CURVE