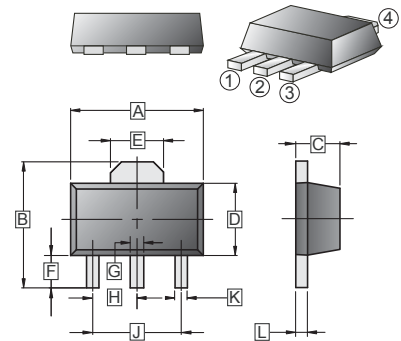


RoHS Compliant Product
A suffix of "-C" specifies halogen or lead -free

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			

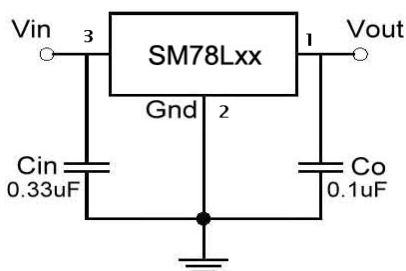
FEATURES

- 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	VIN	30	V
	12V~18V		35	
Output Current		Io	100	mA
Operating Junction Temperature Range		TJ	0~125	°C
Storage Temperature Range		Tstg	-55~150	
Power Dissipation @ TA=25°C		PD	500	mW

SM78L05 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, $T_J = 0 \sim 125^\circ\text{C}$, $I_O = 40\text{mA}$, $V_{IN} = 10\text{V}$, $C_{IN} = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$ unless otherwise specified) ¹

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

SM78L06 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, $T_J = 0 \sim 125^\circ\text{C}$, $I_O = 40\text{mA}$, $V_{IN} = 11\text{V}$, $C_{IN} = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$ unless otherwise specified) ¹

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

SM78L08 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, $T_J = 0 \sim 125^\circ\text{C}$, $I_O = 40\text{mA}$, $V_{IN} = 14\text{V}$, $C_{IN} = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$ unless otherwise specified) ¹

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

SM78L09 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, $T_J = 0 \sim 125^\circ\text{C}$, $I_O = 40\text{mA}$, $V_{IN} = 16\text{V}$, $C_{IN} = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$ unless otherwise specified) ¹

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

SM78L12 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, $T_J = 0 \sim 125^\circ\text{C}$, $I_O = 40\text{mA}$, $V_{IN} = 19\text{V}$, $C_{IN} = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$ unless otherwise specified) ¹

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

SM78L15 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, $T_J = 0 \sim 125^\circ\text{C}$, $I_O = 40\text{mA}$, $V_{IN} = 23\text{V}$, $C_{IN} = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$ unless otherwise specified) ¹

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

SM78L18 ELECTRICAL CHARACTERISTICS

(Refer to the test circuits, $T_J = 0 \sim 125^\circ\text{C}$, $I_O = 40\text{mA}$, $V_{IN} = 26\text{V}$, $C_{IN} = 0.33\mu\text{F}$, $C_O = 0.1\mu\text{F}$ unless otherwise specified) ¹

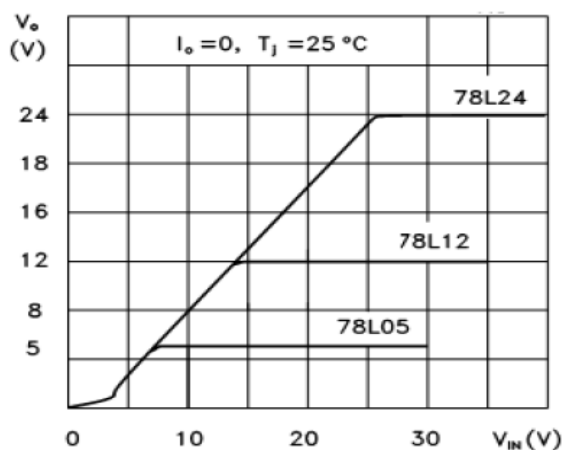
Symbol	Test Conditions	Min	Typ	Max	Unit
V_O	$V_{IN} = 26\text{V}$, $I_O = 40\text{mA}$, $T_J = 25^\circ\text{C}$	17.3	18	18.7	V
	$20.5\text{V} \leq V_{IN} \leq 33\text{V}$, $1\text{mA} \leq I_O \leq 40\text{mA}$	17.1	18	18.9	
	$V_{IN} = 26\text{V}$, $1\text{mA} \leq I_O \leq 70\text{mA}$	17.1	18	18.9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

Note:

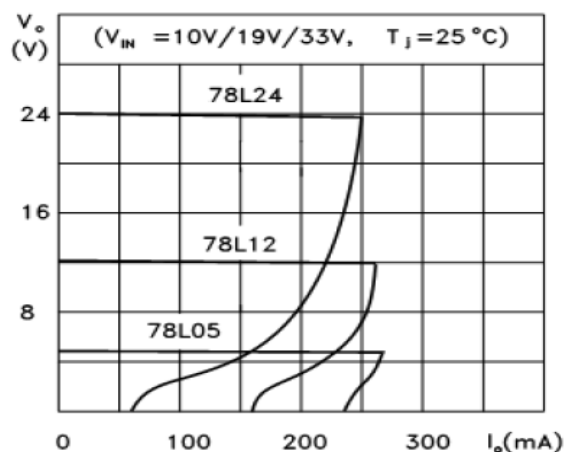
1. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators

CHARACTERISTICS CURVE

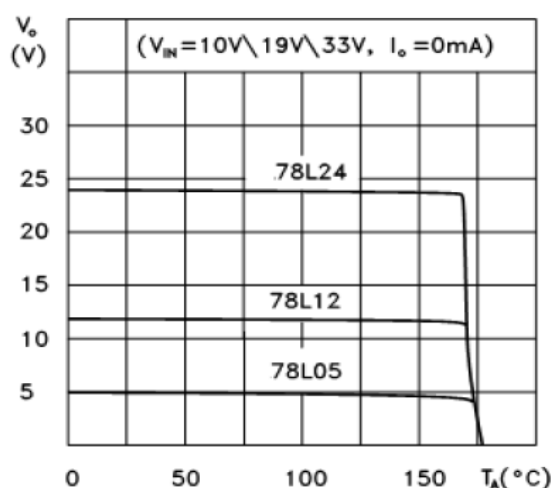
78L05/12/24 Output Characteristics



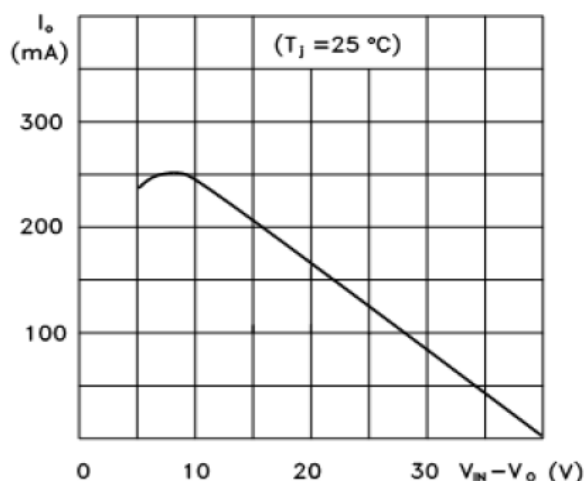
78L05/12/24 Load Characteristics



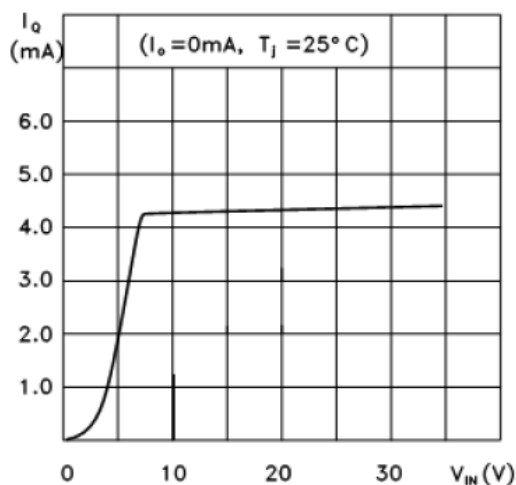
78L05/12/24 Thermal Shutdown



78L00 Series Short Circuit Output Current



78L05 Quiescent Current vs Input Voltage



PD-TA

