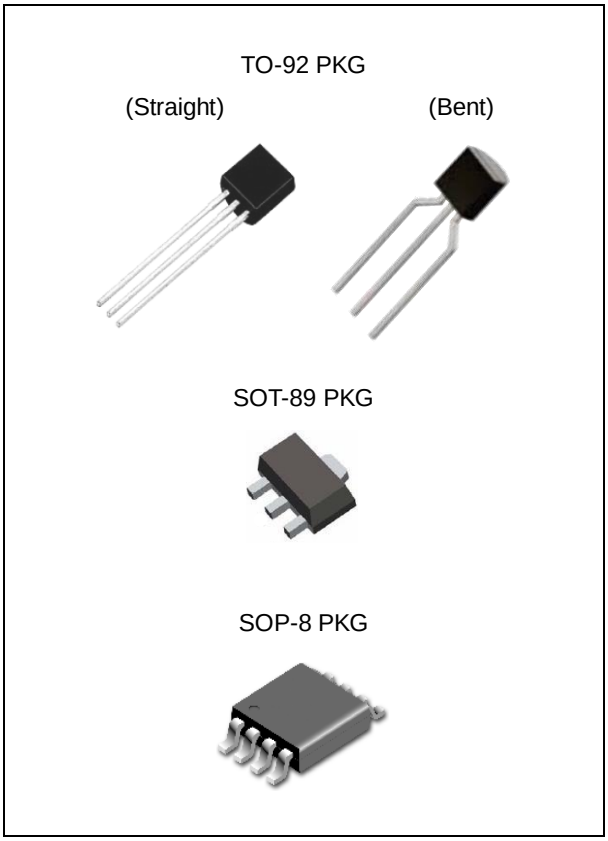
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATOR LM78LXX

FEATURES

- Output Current Up to 100mA
- No External Components
- Internal Thermal Overload Protection
- Internal Short-Circuit Limiting
- Output Voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V
- Moisture Sensitivity Level 3



DESCRIPSION

This series of fixed-voltage monolithic integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power-pass elements to make high current voltage regulators.

Each of these regulators can deliver up to 100mA of output current. The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload. Current limiting is include to limit the peak output current(250mA ~ 300mA) to a safe value. When used as a replacement for a zener diode-resistor combination, an effective improvement in output impedance can be obtained together with lower-bias current.

ORDERING INFORMATION

Device	Package
LM78LXX	TO-92 (Bulk, Straight)
LM78LXXTA	TO-92 (Taping, Bent)
LM78LXXF	SOT-89
LM78LXXD	SOP-8

XX : Output Voltage = 05, 06, 08, 09, 10, 12, 15, 18, 24

Absolute Maximum Ratings

CHARACTERISTIC		SYMBOL	MIN.	MAX.	UNIT
Input Voltage	LM78L05 ~ LM78L10	V_{IN}	-	30	V
	LM78L12 ~ LM78L18		-	35	
	LM78L24		-	40	
Maximum Power Dissipation at T_A = 25°C / TO-92		P_{DMax}	-	0.770	W
Thermal Resistance Junction-To-Ambient / TO-92		θ_{JA}	-	162	℃/W
Lead Temperature (Soldering, 10 sec)		T_{SOL}	-	260	℃
Storage Temperature Range		T_{STG}	-65	150	℃
Operating Junction Temperature Range		T_{JOPR}	-40	150	℃

Recommended Operating Conditions

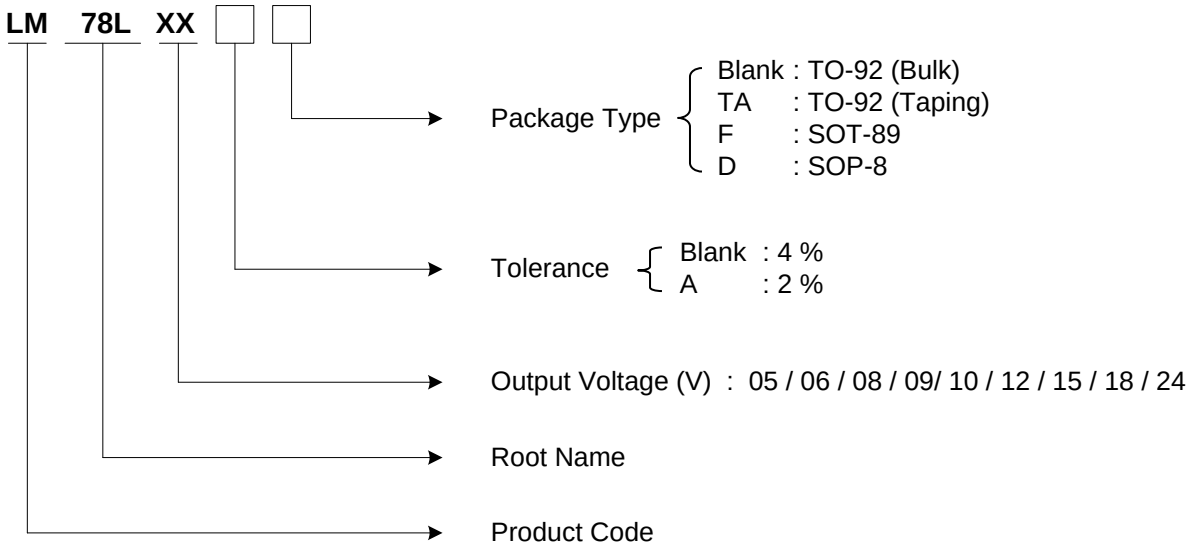
CHARACTERISTIC		SYMBOL	MIN.	MAX.	UNIT
Input Voltage	LM78L05 / A	V_{IN}	7	20	V
	LM78L06		8	20	
	LM78L08		10.5	23	
	LM78L09		11.5	24	
	LM78L10		12.5	25	
	LM78L12		14.5	27	
	LM78L15		17.5	30	
	LM78L18		20.5	33	
	LM78L24		26.5	39	
Output Current		Io	100	100	mA
Operating Virtual Junction Temperature		T_J	-40	125	℃

Ordering Information

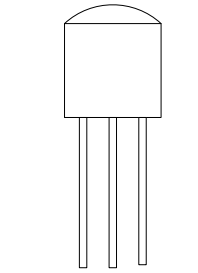
V_{OUT}	Package	Order No.	Description	Supplied As	Status
5.0V	TO-92	LM78L05	0.1A, Positive	Bulk	Active
		LM78L05A	0.1A, Positive	Bulk	Active
		LM78L05TA	0.1A, Positive	Taping	Active
		LM78L05ATA	0.1A, Positive	Taping	Active
	SOT-89	LM78L05F	0.1A, Positive	Reel	Active
	SOP-8	LM78L05D	0.1A, Positive	Reel	Active
6.0V	TO-92	LM78L06	0.1A, Positive	Bulk	Active
		LM78L06TA	0.1A, Positive	Taping	Active
	SOT-89	LM78L06F	0.1A, Positive	Reel	Active
8.0V	TO-92	LM78L08	0.1A, Positive	Bulk	Active
		LM78L08TA	0.1A, Positive	Taping	Active
	SOT-89	LM78L08F	0.1A, Positive	Reel	Active
9.0V	TO-92	LM78L09	0.1A, Positive	Bulk	Active
		LM78L09TA	0.1A, Positive	Taping	Active
	SOT-89	LM78L09F	0.1A, Positive	Reel	Active

Ordering Information (Continued)

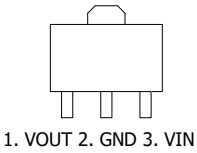
V_{OUT}	Package	Order No.	Description	Supplied As	Status
10V	TO-92	LM78L10	0.1A, Positive	Bulk	Active
		LM78L10TA	0.1A, Positive	Taping	Active
	SOT-89	LM78L10F	0.1A, Positive	Reel	Active
12V	TO-92	LM78L12	0.1A, Positive	Bulk	Active
		LM78L12TA	0.1A, Positive	Taping	Active
	SOT-89	LM78L12F	0.1A, Positive	Reel	Active
15V	TO-92	LM78L15	0.1A, Positive	Bulk	Active
		LM78L15TA	0.1A, Positive	Taping	Active
	SOT-89	LM78L15F	0.1A, Positive	Reel	Active
18V	TO-92	LM78L18	0.1A, Positive	Bulk	Active
		LM78L18TA	0.1A, Positive	Taping	Active
	SOT-89	LM78L18F	0.1A, Positive	Reel	Active
24V	TO-92	LM78L24	0.1A, Positive	Bulk	Active
		LM78L24TA	0.1A, Positive	Taping	Active
	SOT-89	LM78L24F	0.1A, Positive	Reel	Active



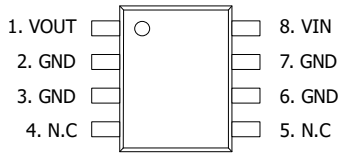
PIN CONFIGURATION



TO-92



SOT-89

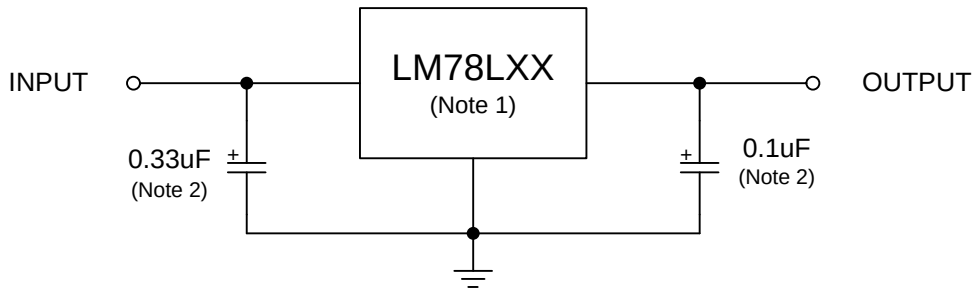


SOP-8

PIN DESCRIPTION

Pin No.	TO-92 / SOT-89 **3 LEAD**		SOP-8 **8 LEAD**	
	Name	Function	Name	Function
1	V_{OUT}	Output Voltage	V_{OUT}	Output Voltage
2	GND	Ground	GND	Ground
3	V_{IN}	Input Voltage	GND	Ground
4 / 5	-	-	N.C	Not Connected
6 / 7	-	-	GND	Ground
8	-	-	V_{IN}	Input Voltage

TYPICAL APPLICATION



Note)

1. To specify an output voltage, substitute voltage for "XX".
2. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

ELECTRICAL CHARACTERISTICS

LM78L05 (At specified virtual junction temperature, VIN = 10V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	4.8	5	5.2	V
		1mA ≤ Io ≤ 40mA 7V ≤ V_{IN} ≤ 20V	-30℃ ~ 125℃	4.75	5	5.25	
		1mA ≤ Io ≤ 70mA		4.75	5	5.25	
Line Regulation	ΔV_{LINE}	7V ≤ V_{IN} ≤ 20V	25℃		32	150	mV
		8V ≤ V_{IN} ≤ 20V			26	100	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		15	60	mV
		1mA ≤ Io ≤ 40mA			8	30	
Bias Current	I_B		25℃		3.8	6	mA
			125℃			5.5	
Bias Current Change	ΔI_B	9V ≤ V_{IN} ≤ 20V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		42		uV
Ripple Rejection	RR	8V ≤ V_{IN} ≤ 18V, f=120Hz	25℃	41	49		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L05A (At specified virtual junction temperature, VIN = 10V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	4.9	5	5.1	V
		1mA ≤ Io ≤ 40mA 7V ≤ V_{IN} ≤ 20V	-30℃ ~ 125℃	4.875	5	5.125	
		1mA ≤ Io ≤ 70mA		4.875	5	5.125	
Line Regulation	ΔV_{LINE}	7V ≤ V_{IN} ≤ 20V	25℃		32	150	mV
		8V ≤ V_{IN} ≤ 20V			26	100	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		15	60	mV
		1mA ≤ Io ≤ 40mA			8	30	
Bias Current	I_B		25℃		3.8	6	mA
			125℃			5.5	
Bias Current Change	ΔI_B	9V ≤ V_{IN} ≤ 20V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		42		uV
Ripple Rejection	RR	8V ≤ V_{IN} ≤ 18V, f=120Hz	25℃	41	49		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L06 (At specified virtual junction temperature, VIN = 11V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	5.75	6	6.25	V
		1mA ≤ Io ≤ 40mA 8V ≤ V_{IN} ≤ 20V	-30℃ ~ 125℃	5.7	6	6.3	
		1mA ≤ Io ≤ 70mA		5.7	6	6.3	
Line Regulation	ΔV_{LINE}	8V ≤ V_{IN} ≤ 20V	25℃		35	175	mV
		9V ≤ V_{IN} ≤ 20V			29	125	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		16	80	mV
		1mA ≤ Io ≤ 40mA			9	40	
Bias Current	I_B		25℃		3.9	6	mA
			125℃			5.5	
Bias Current Change	ΔI_B	9V ≤ V_{IN} ≤ 20V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		46		uV
Ripple Rejection	RR	8V ≤ V_{IN} ≤ 18V, f=120Hz	25℃	40	48		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L08 (At specified virtual junction temperature, VIN = 14V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	7.7	8	8.3	V
		1mA ≤ Io ≤ 40mA 10.5V ≤ V_{IN} ≤ 23V	-30℃ ~ 125℃	7.6	8	8.4	
		1mA ≤ Io ≤ 70mA		7.6	8	8.4	
Line Regulation	ΔV_{LINE}	10.5V ≤ V_{IN} ≤ 23V	25℃		42	175	mV
		11V ≤ V_{IN} ≤ 23V			36	125	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		18	80	mV
		1mA ≤ Io ≤ 40mA			10	40	
Bias Current	I_B		25℃		4	6	mA
			125℃			5.5	
Bias Current Change	ΔI_B	11V ≤ V_{IN} ≤ 23V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		54		uV
Ripple Rejection	RR	13V ≤ V_{IN} ≤ 23V, f=120Hz	25℃	37	46		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L09 (At specified virtual junction temperature, VIN = 16V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	8.6	9	9.4	V
		1mA ≤ Io ≤ 40mA 12V ≤ V_{IN} ≤ 24V	-30℃ ~ 125℃	8.55	9	9.45	
		1mA ≤ Io ≤ 70mA		8.55	9	9.45	
Line Regulation	ΔV_{LINE}	12V ≤ V_{IN} ≤ 24V	25℃		45	175	mV
		13V ≤ V_{IN} ≤ 24V			40	125	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		19	90	mV
		1mA ≤ Io ≤ 40mA			11	40	
Bias Current	I_B		25℃		4.1	6	mA
			125℃			5.5	
Bias Current Change	ΔI_B	13V ≤ V_{IN} ≤ 24V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		58		uV
Ripple Rejection	RR	15V ≤ V_{IN} ≤ 25V, f=120Hz	25℃	38	45		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L10 (At specified virtual junction temperature, VIN = 17V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	9.6	10	10.4	V
		1mA ≤ Io ≤ 40mA 13V ≤ V_{IN} ≤ 25V	-30℃ ~ 125℃	9.5	10	10.5	
		1mA ≤ Io ≤ 70mA		9.5	10	10.5	
Line Regulation	ΔV_{LINE}	13V ≤ V_{IN} ≤ 25V	25℃		51	175	mV
		14V ≤ V_{IN} ≤ 25V			42	125	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		20	90	mV
		1mA ≤ Io ≤ 40mA			11	40	
Bias Current	I_B		25℃		4.2	6	mA
			125℃			5.5	
Bias Current Change	ΔI_B	14V ≤ V_{IN} ≤ 25V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		62		uV
Ripple Rejection	RR	15V ≤ V_{IN} ≤ 25V, f=120Hz	25℃	37	44		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L12 (At specified virtual junction temperature, VIN = 19V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	11.5	12	12.5	V
		1mA ≤ Io ≤ 40mA 14V ≤ V_{IN} ≤ 27V	-30℃ ~ 125℃	11.4	12	12.6	
		1mA ≤ Io ≤ 70mA		11.4	12	12.6	
Line Regulation	ΔV_{LINE}	14.5V ≤ V_{IN} ≤ 27V	25℃		55	250	mV
		16V ≤ V_{IN} ≤ 27V			49	200	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		22	100	mV
		1mA ≤ Io ≤ 40mA			13	50	
Bias Current	I_B		25℃		4.3	6.5	mA
			125℃			6	
Bias Current Change	ΔI_B	16V ≤ V_{IN} ≤ 27V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		70		uV
Ripple Rejection	RR	15V ≤ V_{IN} ≤ 25V, f=120Hz	25℃	37	42		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L15 (At specified virtual junction temperature, VIN = 23V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	14.4	15	15.6	V
		1mA ≤ Io ≤ 40mA 17.5V ≤ V_{IN} ≤ 30V	-30℃ ~ 125℃	14.25	15	15.75	
		1mA ≤ Io ≤ 70mA		14.25	15	15.75	
Line Regulation	ΔV_{LINE}	17.5V ≤ V_{IN} ≤ 30V	25℃		65	300	mV
		19V ≤ V_{IN} ≤ 30V			58	250	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		25	150	mV
		1mA ≤ Io ≤ 40mA			15	75	
Bias Current	I_B		25℃		4.2	6.5	mA
			125℃			6	
Bias Current Change	ΔI_B	19V ≤ V_{IN} ≤ 30V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		82		uV
Ripple Rejection	RR	18.5V ≤ V_{IN} ≤ 28.5V, f=120Hz	25℃	34	39		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L18 (At specified virtual junction temperature, VIN = 26V, Io = 40mA (Unless otherwise noted)

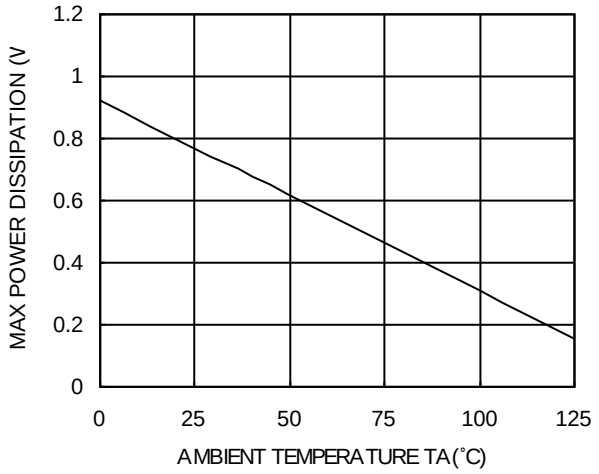
PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	17.3	18	18.7	V
		1mA ≤ Io ≤ 40mA 20.5V ≤ V_{IN} ≤ 33V	-30℃ ~ 125℃	17.1	18	18.9	
		1mA ≤ Io ≤ 70mA		17.1	18	18.9	
Line Regulation	ΔV_{LINE}	20.5V ≤ V_{IN} ≤ 33V	25℃		70	360	mV
		22V ≤ V_{IN} ≤ 33V			64	300	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		27	180	mV
		1mA ≤ Io ≤ 40mA			19	90	
Bias Current	I_B		25℃		4.7	6.5	mA
			125℃			6	
Bias Current Change	ΔI_B	22V ≤ V_{IN} ≤ 33V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		82		uV
Ripple Rejection	RR	21.5V ≤ V_{IN} ≤ 31.5V, f=120Hz	25℃	32	36		dB
Dropout Voltage	V_D		25℃		1.7		V

LM78L24 (At specified virtual junction temperature, VIN = 32V, Io = 40mA (Unless otherwise noted)

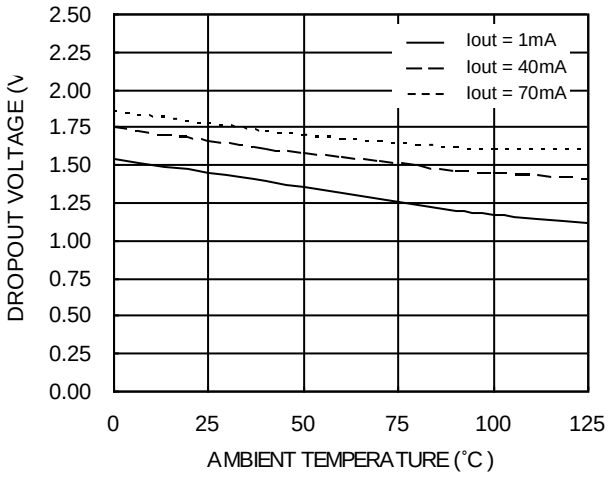
PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25℃	23	24	25	V
		1mA ≤ Io ≤ 40mA 26.5V ≤ V_{IN} ≤ 39V	-30℃ ~ 125℃	22.8	24	25.2	
		1mA ≤ Io ≤ 70mA		22.8	24	25.2	
Line Regulation	ΔV_{LINE}	26.5V ≤ V_{IN} ≤ 39V	25℃		95	480	mV
		29V ≤ V_{IN} ≤ 39V			78	400	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25℃		41	240	mV
		1mA ≤ Io ≤ 40mA			28	120	
Bias Current	I_B		25℃		4.8	6.5	mA
			125℃			6	
Bias Current Change	ΔI_B	28V ≤ V_{IN} ≤ 39V	-30℃ ~ 125℃			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25℃		82		uV
Ripple Rejection	RR	27.5V ≤ V_{IN} ≤ 37.5V, f=120Hz	25℃	30	33		dB
Dropout Voltage	V_D		25℃		1.7		V

Note 1. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.
All characteristics are measured with a 0.33uF capacitor across the input and a 0.1uF capacitor across the output.
Note 2. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

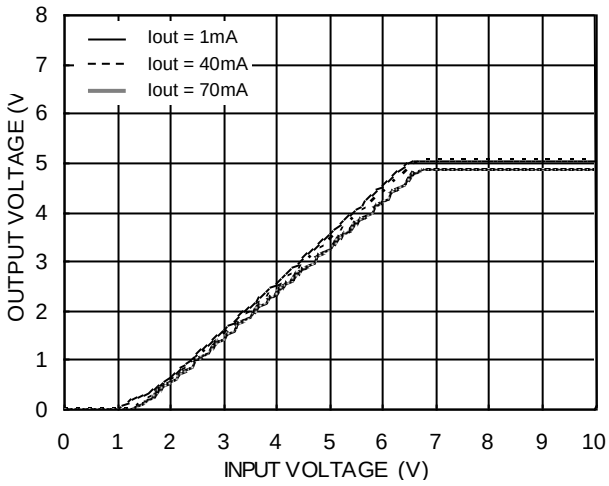
TYPICAL OPERATING CHARACTERISTICS



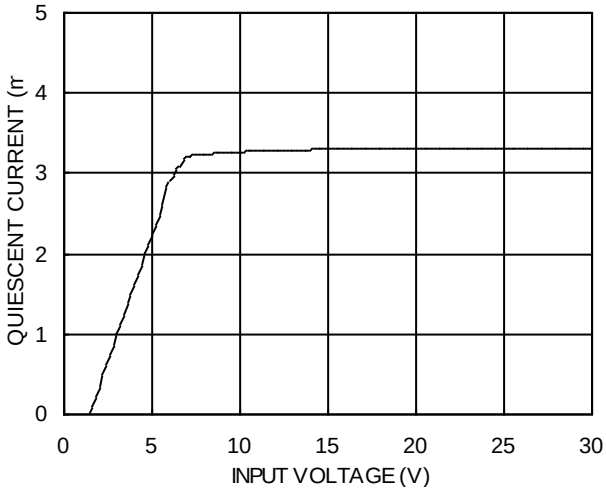
Power Dissipation vs. Ambient Temperature, TO-92



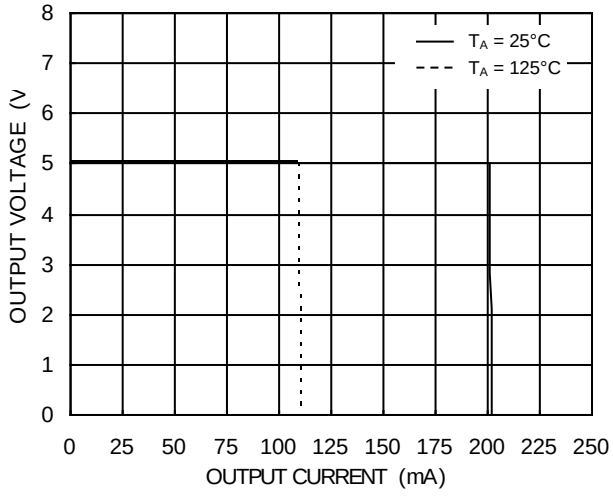
Dropout Voltage vs. Ambient Temperature



Output Voltage vs. Input Voltage



Quiescent Current vs. Input Voltage



Output Voltage vs. Output Current

3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATOR TJ78L05

FEATURES

- Output Current Up to 100mA
- No External Components
- Internal Thermal Overload Protection
- Internal Short-Circuit Limiting
- Output Voltage: 5V
- Moisture Sensitivity Level 3

SOT-89 PKG

DESCRIPTION

This series of fixed-voltage monolithic integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power-pass elements to make high current voltage regulators.

ORDERING INFORMATION

Device	Package
TJ78LXXF	SOT-89

XX : Output Voltage = 05

ABSOLUTE MAXIMUM RATINGS

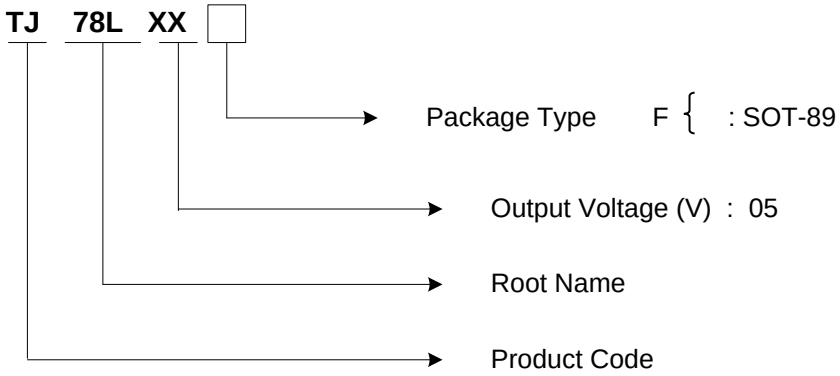
CHARACTERISTIC		SYMBOL	MIN.	MAX.	UNIT
Input Voltage	TJ78L05	V_{IN}	-	30	V
Lead Temperature (Soldering, 10 sec)		T_{SOL}	-	260	℃
Storage Temperature Range		T_{STG}	-65	150	℃
Operating Junction Temperature Range		T_{JOPR}	-40	125	℃

Recommended Operating Conditions

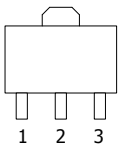
CHARACTERISTIC		SYMBOL	MIN.	MAX.	UNIT
Input Voltage	TJ78L05	V_{IN}	7	20	V
Output Current		Io	100	100	mA
Operating Virtual Junction Temperature		T_J	-40	125	℃

ORDERING INFORMATION

V_{OUT}	Package	Order No.	Description	Supplied As	Status
5.0V	SOT-89	TJ78L05F	0.1A, Positive	Reel	Active



PIN CONFIGURATION



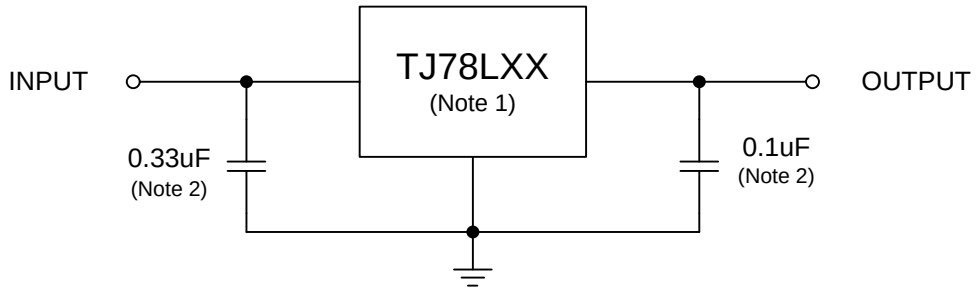
1. VOUT 2. GND 3. VIN

SOT-89

PIN DESCRIPTION

Pin No.	SOT-89 3 LEAD	
	Name	Function
1	V_{OUT}	Output Voltage
2	GND	Ground
3	V_{IN}	Input Voltage

TYPICAL APPLICATION



Note)

1. To specify an output voltage, substitute voltage for "XX".
2. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

ELECTRICAL CHARACTERISTICS

TJ78L05 (At specified virtual junction temperature, V_{IN} = 10V, Io = 40mA, T_J=+25℃ (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	1mA ≤ Io ≤ 40mA 7V ≤ V_{IN} ≤ 20V	4.8	5	5.2	V
		1mA ≤ Io ≤ 70mA	4.8	5	5.2	
Line Regulation	ΔV_{LINE}	7V ≤ V_{IN} ≤ 20V	-	-	135	mV
		8V ≤ V_{IN} ≤ 20V	-	-	90	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	-	-	54	mV
		1mA ≤ Io ≤ 40mA	-	-	27	
Quiescent Current	I_B				5.8	mA
Quiescent Current Change	ΔI_B	8V ≤ V_{IN} ≤ 20V			1.4	mA
		1mA ≤ Io ≤ 40mA			0.09	
Dropout Voltage	V_D			1.7		V

Note 1. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.
All characteristics are measured with a 0.33uF capacitor across the input and a 0.1uF capacitor across the output.

Note 2. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

TYPICAL OPERATING CHARACTERISTICS

T.B.D

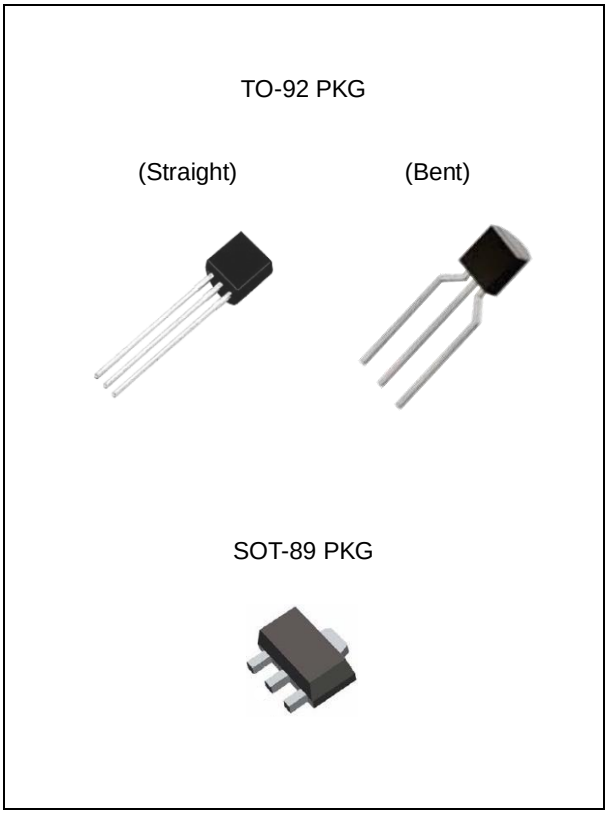
REVISION NOTICE

The description in this datasheet can be revised without any notice to describe its electrical characteristics properly.

3-TERMINAL 0.1A NEGATIVE VOLTAGE REGULATOR LM79Lxx

FEATURES

- Output Current Up to 100mA
- No External Components
- Internal Thermal Overload Protection
- Internal Short-Circuit Limiting
- Output Voltage of -5V, -6V, -8V, -9V, -12V, -15V, -18V, and -24V
- Moisture Sensitivity Level 3



DESCRIPTION

This series of fixed-voltage monolithic integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power-pass elements to make high current voltage regulators.

Each of these regulators can deliver up to 100mA of output current. The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload. When used as a replacement for a zener diode-resistor combination, an effective improvement in output impedance can be obtained together with lower-bias current.

ORDERING INFORMATION

Device	Package
LM79Lxx	TO-92 (Bulk, Straight)
LM79LxxTA	TO-92 (Taping, Bent)
LM79LxxF	SOT-89

xx: Output Voltage

ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC		SYMBOL	MIN.	MAX.	UNIT
Input Voltage	LM79L05 ~ LM79L09	V_{IN}	-	−30	V
	LM79L12 ~ LM79L18		-	−35	
	LM79L24		-	−40	
Maximum Power Dissipation at T_A = 25°C / TO-92		P_{DMax}	-	0.770	W
Thermal Resistance Junction-To-Ambient / TO-92		θ_{JA}	-	162	°C/W
Lead Temperature (Soldering, 10 sec)		T_{SOL}	-	260	°C
Storage Temperature Range		T_{STG}	−65	150	°C
Operating Junction Temperature Range		T_{JOPR}	−40	125	°C

RECOMMENDED OPERATING RATINGS

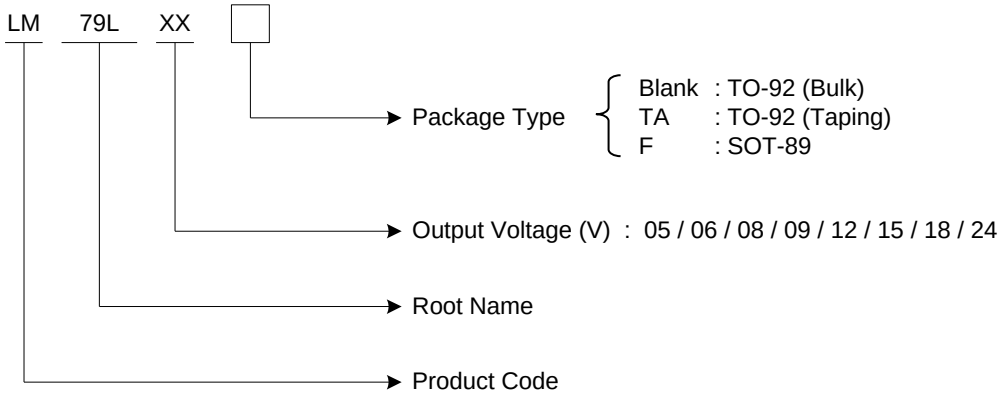
CHARACTERISTIC		SYMBOL	MIN.	MAX.	UNIT
Input Voltage	LM79L05	V_{IN}	−7	−20	V
	LM79L06		−8	−20	
	LM79L08		−10.5	−23	
	LM79L09		−11.5	−24	
	LM79L12		−14.5	−27	
	LM79L15		−17.5	−30	
	LM79L18		−20.5	−33	
	LM79L24		−27	−38	
Output Current		Io	-	100	mA
Operating Junction Temperature		T_J	−40	125	°C

ORDERING INFORMATION

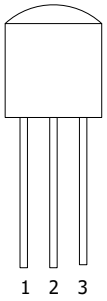
VOUT	Package	Order No.	Description	Supplied As	Status
−5.0V	TO-92	LM79L05	0.1A, Negative	Bulk	Active
		LM79L05TA	0.1A, Negative	Taping	Active
	SOT-89	LM79L05F	0.1A, Negative	Reel	Active
−6.0V	TO-92	LM79L06	0.1A, Negative	Bulk	Active
		LM79L06TA	0.1A, Negative	Taping	Active
	SOT-89	LM79L06F	0.1A, Negative	Reel	Active
−8.0V	TO-92	LM79L08	0.1A, Negative	Bulk	Active
		LM79L08TA	0.1A, Negative	Taping	Active
	SOT-89	LM79L08F	0.1A, Negative	Reel	Active
−9.0V	TO-92	LM79L09	0.1A, Negative	Bulk	Active
		LM79L09TA	0.1A, Negative	Taping	Active
	SOT-89	LM79L09F	0.1A, Negative	Reel	Active
−12V	TO-92	LM79L12	0.1A, Negative	Bulk	Active
		LM79L12TA	0.1A, Negative	Taping	Active
	SOT-89	LM79L12F	0.1A, Negative	Reel	Active
−15V	TO-92	LM79L15	0.1A, Negative	Bulk	Active
		LM79L15TA	0.1A, Negative	Taping	Active
	SOT-89	LM79L15F	0.1A, Negative	Reel	Active

ORDERING INFORMATION (Continued)

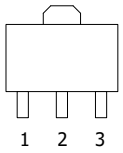
VOUT	Package	Order No.	Description	Supplied As	Status
−18V	TO-92	LM79L18	0.1A, Negative	Bulk	Active
		LM79L18TA	0.1A, Negative	Taping	Active
	SOT-89	LM79L18F	0.1A, Negative	Reel	Active
−24V	TO-92	LM79L24	0.1A, Negative	Bulk	Active
		LM79L24TA	0.1A, Negative	Taping	Active
	SOT-89	LM79L24F	0.1A, Negative	Reel	Active



PIN CONFIGURATION



TO-92

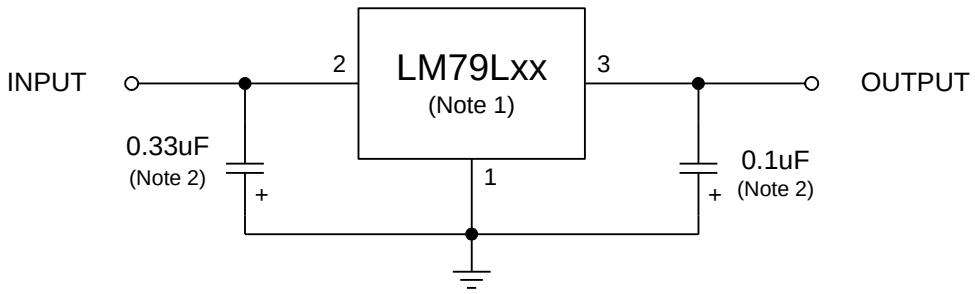


SOT-89

PIN DESCRIPTION

Pin No.	TO-92 / SOT-89	
	Name	Function
1	GND	Ground
2	V_{IN}	Input Voltage
3	V_{OUT}	Output Voltage

TYPICAL APPLICATION



Note 1. To specify an output voltage, substitute voltage for "XX".
Note 2. Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.

ELECTRICAL CHARACTERISTICS

LM79L05 (At specified virtual junction temperature, V_{IN} = -10V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25°C	-4.8	-5	-5.2	V
		1mA ≤ Io ≤ 40mA -7V ≤ V_{IN} ≤ 20V	-30°C ~ 125°C	-4.75	-5	-5.25	
		1mA ≤ Io ≤ 70mA		-4.75	-5	-5.25	
Line Regulation	ΔV_{LINE}	-7V ≤ V_{IN} ≤ -20V	25°C		32	150	mV
		-8V ≤ V_{IN} ≤ -20V			26	100	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25°C		15	60	mV
		1mA ≤ Io ≤ 40mA			8	30	
Bias Current	I_B		25°C		3.8	6	mA
			125°C			5.5	
Bias Current Change	ΔI_B	-8V ≤ V_{IN} ≤ -20V	-30°C ~ 125°C			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25°C		42		uV
Ripple Rejection	RR	-8V ≤ V_{IN} ≤ -18V, f=120Hz	25°C	41	49		dB
Dropout Voltage	V_D		25°C		1.7		V

LM79L06 (At specified virtual junction temperature, V_{IN} = -11V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25°C	-5.76	-6	-6.24	V
		1mA ≤ Io ≤ 40mA -8V ≤ V_{IN} ≤ -21V	-30°C ~ 125°C	-5.7	-6	-6.3	
		1mA ≤ Io ≤ 70mA		-5.7	-6	-6.3	
Line Regulation	ΔV_{LINE}	-8V ≤ V_{IN} ≤ -21V	25°C		50	150	mV
		-9V ≤ V_{IN} ≤ -21V			45	110	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25°C		12	70	mV
		1mA ≤ Io ≤ 40mA			5.5	35	
Bias Current	I_B		25°C			6	mA
			125°C			5.5	
Bias Current Change	ΔI_B	-9V ≤ V_{IN} ≤ -21V	-30°C ~ 125°C			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25°C		50		uV
Ripple Rejection	RR	-9V ≤ V_{IN} ≤ -19V, f=120Hz	25°C	40	48		dB
Dropout Voltage	V_D		25°C		1.7		V

LM79L08 (At specified virtual junction temperature, V_{IN} = -14V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25°C	-7.7	-8	-8.3	V
		1mA ≤ Io ≤ 40mA -10.5V ≤ V_{IN} ≤ -23V	-30°C ~ 125°C	-7.6	-8	-8.4	
		1mA ≤ Io ≤ 70mA		-7.6	-8	-8.4	
Line Regulation	ΔV_{LINE}	-10.5V ≤ V_{IN} ≤ -23V	25°C		20	175	mV
		-11V ≤ V_{IN} ≤ -23V			12	125	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25°C		18	80	mV
		1mA ≤ Io ≤ 40mA			9	42	
Bias Current	I_B		25°C			6.5	mA
			125°C			6	
Bias Current Change	ΔI_B	-11V ≤ V_{IN} ≤ -23V	-30°C ~ 125°C			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25°C		60		uV
Ripple Rejection	RR	-12V ≤ V_{IN} ≤ -23V, f=120Hz	25°C	37	46		dB
Dropout Voltage	V_D		25°C		1.7		V

LM79L09 (At specified virtual junction temperature, V_{IN} = -15V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25°C	-8.64	-9	-9.36	V
		1mA ≤ Io ≤ 40mA -11V ≤ V_{IN} ≤ -24V	-30°C ~ 125°C	-8.55	9	-9.45	
		1mA ≤ Io ≤ 70mA		-8.55	9	-9.45	
Line Regulation	ΔV_{LINE}	-11V ≤ V_{IN} ≤ -24V	25°C		80	200	mV
		-12V ≤ V_{IN} ≤ -24V			20	160	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25°C		17	90	mV
		1mA ≤ Io ≤ 40mA			8	45	
Bias Current	I_B		25°C		3.8	6.5	mA
			125°C			6	
Bias Current Change	ΔI_B	-12V ≤ V_{IN} ≤ -24V	-30°C ~ 125°C			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25°C		64		uV
Ripple Rejection	RR	-8V ≤ V_{IN} ≤ -18V, f=120Hz	25°C	40	45		dB
Dropout Voltage	V_D		25°C		1.7		V

LM79L12 (At specified virtual junction temperature, V_{IN} = -19V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25°C	-11.5	-12	-12.5	V
		1mA ≤ Io ≤ 40mA -14.5V ≤ V_{IN} ≤ -27V	-30°C ~ 125°C	-11.4	-12	-12.6	
		1mA ≤ Io ≤ 70mA		-11.4	-12	-12.6	
Line Regulation	ΔV_{LINE}	-14.5V ≤ V_{IN} ≤ -27V	25°C		50	250	mV
		-16V ≤ V_{IN} ≤ -27V			40	200	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25°C		24	100	mV
		1mA ≤ Io ≤ 40mA			15	50	
Bias Current	I_B		25°C			6.5	mA
			125°C			6	
Bias Current Change	ΔI_B	-16V ≤ V_{IN} ≤ -27V	-30°C ~ 125°C			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25°C		70		uV
Ripple Rejection	RR	-15V ≤ V_{IN} ≤ -25V, f=120Hz	25°C	37	42		dB
Dropout Voltage	V_D		25°C		1.7		V

LM79L15 (At specified virtual junction temperature, V_{IN} = -23V, Io = 40mA (Unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25°C	-14.4	-15	-15.6	V
		1mA ≤ Io ≤ 40mA -17.5V ≤ V_{IN} ≤ -30V	-30°C ~ 125°C	-14.25	-15	-15.75	
		1mA ≤ Io ≤ 70mA		-14.25	-15	-15.75	
Line Regulation	ΔV_{LINE}	-17.5V ≤ V_{IN} ≤ -30V	25°C		65	300	mV
		-20V ≤ V_{IN} ≤ -30V			58	250	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25°C		25	150	mV
		1mA ≤ Io ≤ 40mA			15	75	
Bias Current	I_B		25°C		4.2	6.5	mA
			125°C			6	
Bias Current Change	ΔI_B	-20V ≤ V_{IN} ≤ -30V	-30°C ~ 125°C			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25°C		82		uV
Ripple Rejection	RR	-18.5V ≤ V_{IN} ≤ -28.5V, f=120Hz	25°C	34	39		dB
Dropout Voltage	V_D		25°C		1.7		V

LM79L18 (At specified virtual junction temperature, V_{IN} = -26V, Io = 40mA (Unless otherwise noted)

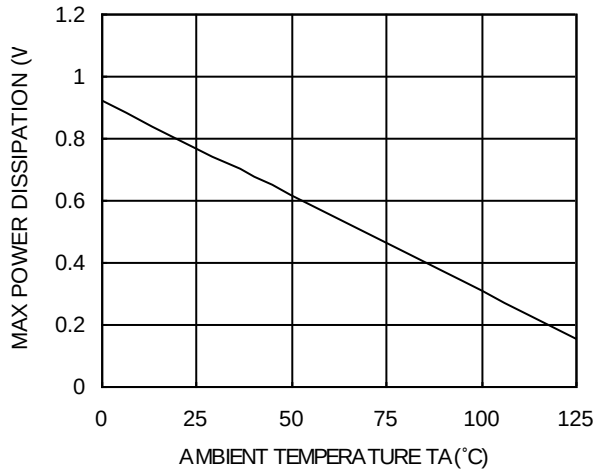
PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25°C	-17.3	-18	-18.7	V
		1mA ≤ Io ≤ 40mA -20.5V ≤ V_{IN} ≤ -33V	-30°C ~ 125°C	-17.1	-18	-18.9	
		1mA ≤ Io ≤ 70mA		-17.1	-18	-18.9	
Line Regulation	ΔV_{LINE}	-20.5V ≤ V_{IN} ≤ -33V	25°C		70	360	mV
		-22V ≤ V_{IN} ≤ -33V			64	300	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25°C		27	180	mV
		1mA ≤ Io ≤ 40mA			19	90	
Bias Current	I_B		25°C		4.7	6.5	mA
			125°C			6	
Bias Current Change	ΔI_B	-22V ≤ V_{IN} ≤ -33V	-30°C ~ 125°C			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25°C		82		uV
Ripple Rejection	RR	-23V ≤ V_{IN} ≤ -33V, f=120Hz	25°C	33	48		dB
Dropout Voltage	V_D		25°C		1.7		V

LM79L24 (At specified virtual junction temperature, V_{IN} = -32V, Io = 40mA (Unless otherwise noted)

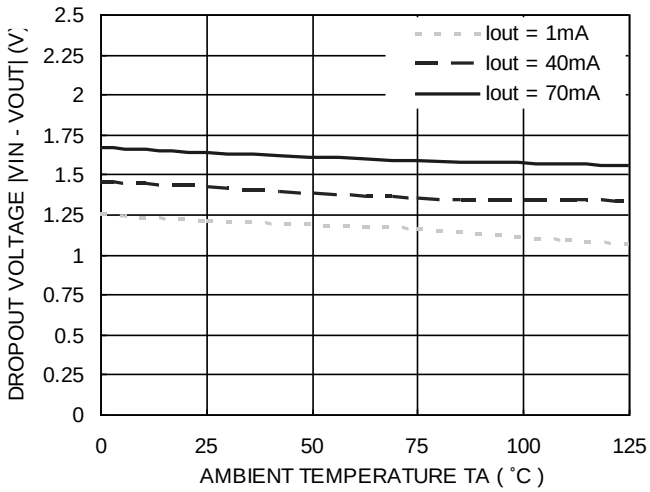
PARAMETER	SYMBOL	TEST CONDITION(Note 1)		MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}		25°C	-23	-24	-25	V
		1mA ≤ Io ≤ 40mA -27V ≤ V_{IN} ≤ -38V	-30°C ~ 125°C	-22.8	-24	-25.2	
		1mA ≤ Io ≤ 70mA		-22.8	-24	-25.2	
Line Regulation	ΔV_{LINE}	-27V ≤ V_{IN} ≤ -38V	25°C		95	480	mV
		-28V ≤ V_{IN} ≤ -38V			78	400	
Load Regulation	ΔV_{LOAD}	1mA ≤ Io ≤ 100mA	25°C		41	240	mV
		1mA ≤ Io ≤ 40mA			28	120	
Bias Current	I_B		25°C		4.8	6.5	mA
			125°C			6	
Bias Current Change	ΔI_B	-28V ≤ V_{IN} ≤ -38V	-30°C ~ 125°C			1.5	mA
		1mA ≤ Io ≤ 40mA				0.1	
Output Noise Voltage	V_N	10Hz ≤ f ≤ 100kHz	25°C		82		uV
Ripple Rejection	RR	-29V ≤ V_{IN} ≤ -35V, f=120Hz	25°C	31	47		dB
Dropout Voltage	V_D		25°C		1.7		V

Note 1. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.
All characteristics are measured with a 0.33uF capacitor across the input and a 0.1uF capacitor across the output.
Note 2. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

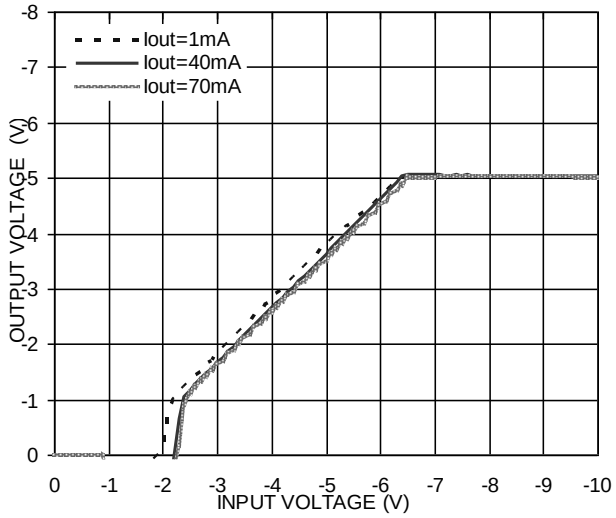
TYPICAL OPERATING CHARACTERISTICS



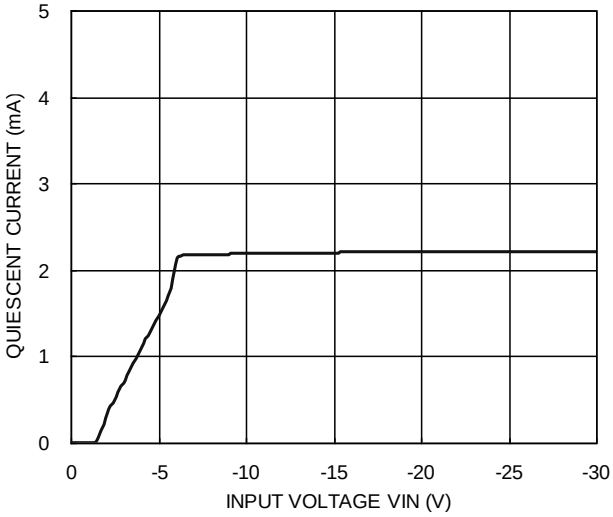
Power Dissipation vs. Ambient Temperature, TO-92



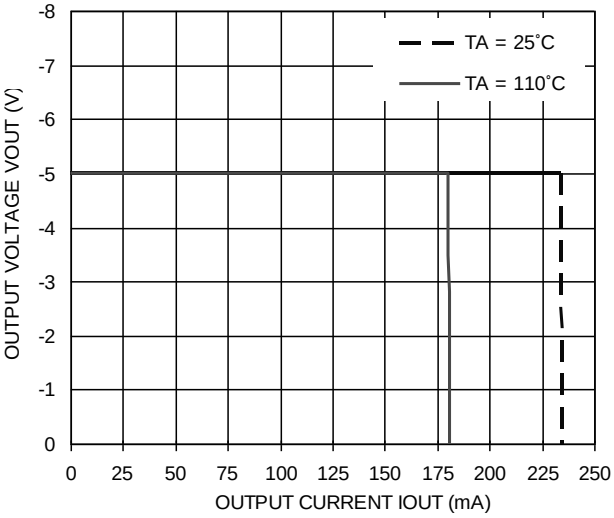
Dropout Voltage vs. Ambient Temperature



Output Voltage vs. Input Voltage



Quiescent Current vs. Input Voltage



Output Voltage vs. Output Current

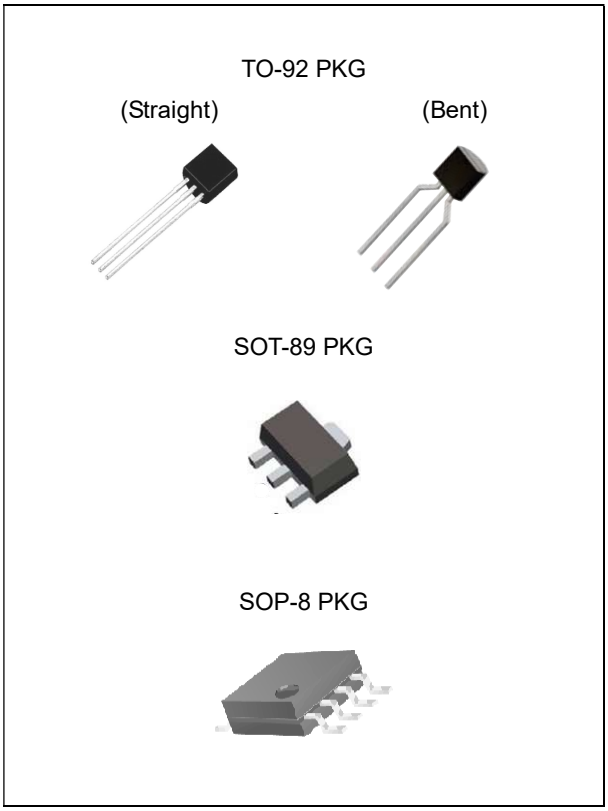
REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.

3-Terminal 100mA Positive Adjustable Regulator LM317L

FEATURES

- Output Current Excess of 100mA
- Output Adjustable Between 1.2V and 37V
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Moisture Sensitivity Level 3



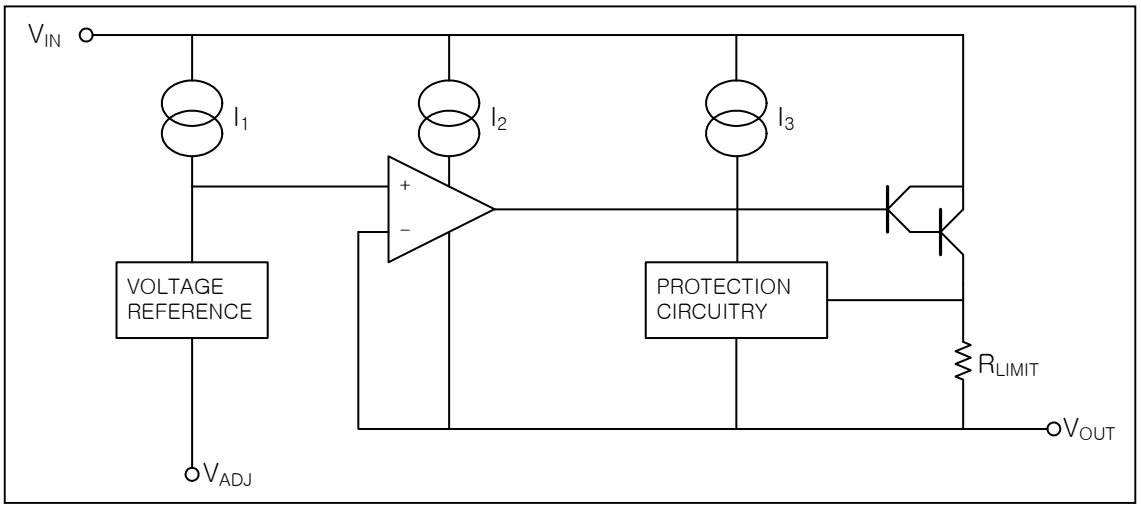
DESCRIPTION

This monolithic integrated circuit is an adjustable 3-terminal positive voltage regulator designed to supply more than 100mA of load current with an output voltage adjustable over a 1.2 to 37V. It employs internal current limiting, thermal shut-down and safe area compensation.

ORDERING INFORMATION

Device	Package
LM317L	TO-92 (Bulk, Straight)
LM317LTA	TO-92 (Tape, Bent)
LM317LF	SOT-89
LM317LD	SOP-8

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	Value	UNIT
Input-output Voltage Differential	V_I-V_O	40	V
Lead Temperature (Soldering, 10 sec)	T_{SOL}	230	℃
Power Dissipation	P_D	Internally limited	-
Operating Junction Temperature Range	T_{JOPR}	-40 ~ 125	℃
Storage Temperature Range	T_{STG}	-65 ~ 125	℃

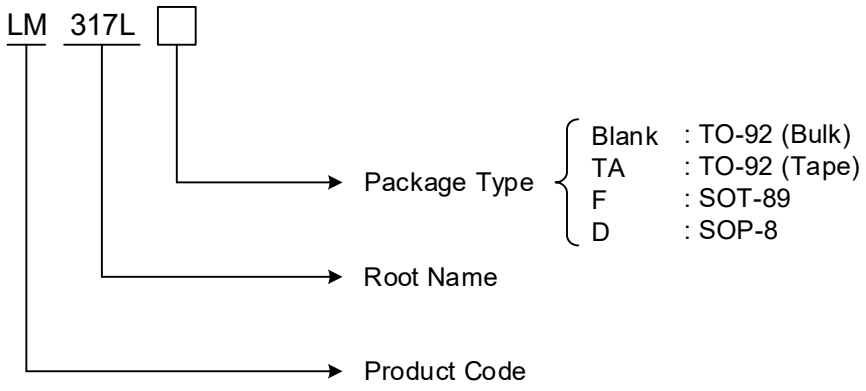
RECOMMENDED OPERATING RATINGS (V_I-V_O=5V, I_O=40mA, -40℃≤TJ≤125℃, unless otherwise specified)

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	Unit
Line Regulation	△Vo	T_A=-40 ~125℃	3V≤V_I-V_O≤40V		0.01	0.04	%/V
			3V≤V_I-V_O≤40V		0.02	0.07	%/V
Load Regulation	△Vo	TA=25℃, 10㎃≤Io≤I_{MAX}					
		V_O≤5V			10	25	mV
		V_O≥5V			0.1	0.5	%/V
		10㎃≤Io≤IMAX					
		V_O≤5V			20	80	mV
		V_O≥5V			0.3	1.7	%/V
Adjustable Pin Current	I_{ADJ}				46	100	μA
Adjustable Pin Current Change	△I_{ADJ}	3V≤V_I-V_O≤40V 10㎃≤I_O≤I_{MAX} P≤P_{MAX}			0.2	5	μA
Reference Voltage	V_{REF}	3V≤V_{IN}-V_{OUT}≤40V 10㎃≤Io≤I_{MAX} P_D≤P_{MAX}		1.20	1.25	1.30	V
Temperature Stability	ST_T				0.7		%/Vo
Minimum Load Current to Maintain Regulation	$L_{(MIN)}$	V_I-V_o=40V			3.5	10	mA
Maximum Output Current	$I_{O(MAX)}$	V_I-V_O≤5V, P_D≤P_{MAX}		100	200		mA
		V_I-V_O≤40V, P_D≤P_{MAX}, T_A=25℃		0.156	0.4		
RMS Noise, % of VOUT	e_N	T_A=25℃, 10Hz≤f≤10KHz			0.003	0.01	%/V_O
Ripple Rejection	RR	V_O=10V, f=120Hz					
		without C_{ADJ}			60		dB
		C_{ADJ}=10μF		66	75		
Long-Term Stability, T_J=T_{HIGH}	ST	TA=25℃, for end point measurements, 1000HR			0.3	1	%

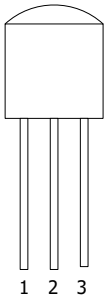
* Load and line regulation are specified at constant junction temperature. Change in VD due to heating effects must be taken into account separately. Pulse testing with low duty is used.

ORDERING INFORMATION

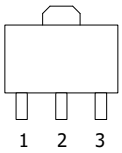
PACKAGE	ORDER NO.	DESCRIPTION	SUPPLIED AS	STATUS
TO-92	LM317L	100mA, Adjustable, Positive	Bulk	Active
TO-92	LM317LTA	100mA, Adjustable, Positive	Tape	Active
SOT-89	LM317LF	100mA, Adjustable, Positive	Reel	Active
SOP-8	LM317LD	100mA, Adjustable, Positive	Reel	Active



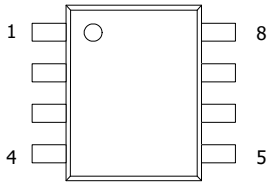
PIN CONFIGURATION



TO-92



SOT-89

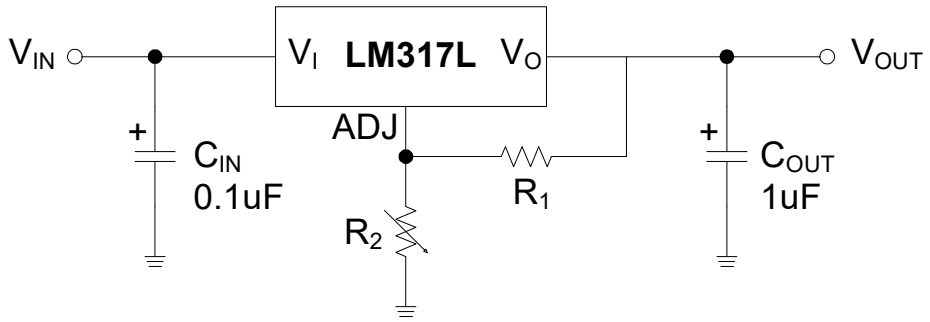


SOP-8

PIN DESCRIPTION

PIN NO.	TO-92 / SOT-89 3 LEAD		SOP-8 8LEAD	
	NAME	FUNCTION	NAME	FUNCTION
1	ADJ	Adjustable	V_{IN}	Input Voltage
2	V_{OUT}	Output Voltage	V_{OUT}	Output Voltage
3	V_{IN}	Input Voltage	V_{OUT}	Output Voltage
4	-	-	ADJ	Adjustable
5	-	-	-	N.C.
6	-	-	V_{OUT}	Output Voltage
7	-	-	V_{OUT}	Output Voltage
8	-	-	-	N.C.

TYPICAL APPLICATION



$$V_{OUT} = 1.25V(1+R_2/R_1)+I_{ADJ}R_2$$

Note 1. C_{IN} is required when regulator is located in appreciable distance from power supply filter.
Note 2. C_{OUT} is not needed for stability, however, it does improve transient response.
Note 3. I_{ADJ} is controlled to less than 100uA, the error associated with this term is negligible in most applications.

REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.

3-TERMINAL POSITIVE VOLTAGE REGULATOR LM78MXX

FEATURES

- Output current in excess of 0.5A
- No external components required
- Internal short circuit current limiting
- Output Voltage of 5V, 6V, 8V, 9V, 12V, 15V, 18V, 24V
- Internal thermal overload protection
- Output transistor safe-area compensation

DESCRIPTION

The LM78MXX series of three terminal positive regulators are available in the TO-252 package and with several fixed output voltages making them useful in a wide range of applications.

TO-252-3L PKG

PIN 1. VIN PIN 2. GND PIN 3. VOUT

ORDERING INFORMATION

Device	Package
LM78MXXRS	TO-252-3L

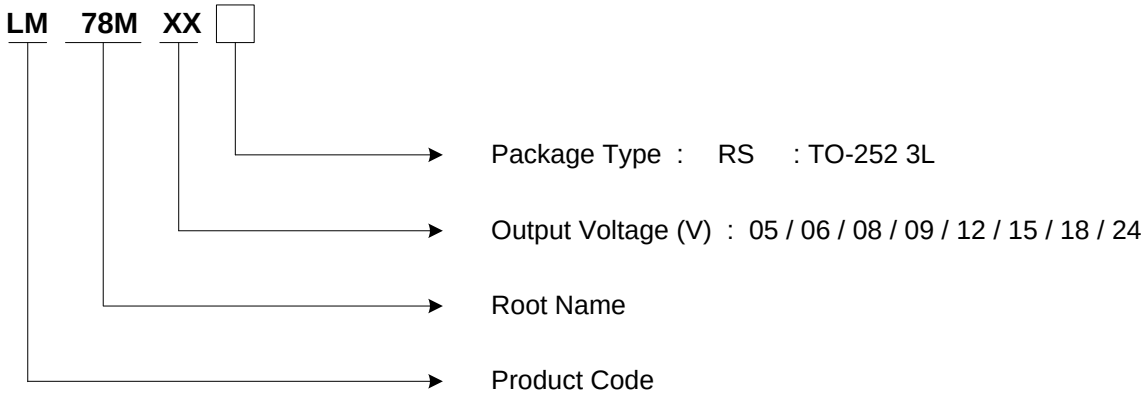
X.X : Output Voltage = 05, 06, 08, 09, 12, 15, 18, 24

Absolute Maximum Ratings

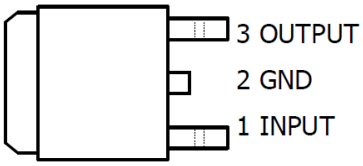
CHARACTERISTIC		SYMBOL	MIN.	MAX.	UNIT
Input Voltage	LM78M05 ~ 18	V_{IN}	-	35	V
	LM78M24	V_{IN}	-	40	
Storage Temperature Range		T_{STG}	-65	150	℃
Operating Junction Temperature Range		T_{JOPR}	-40	125	℃

Ordering Information

V_{OUT}	Package	Order No.	Description	Supplied As	Status
5.0V	TO-252-3L	LM78M05RS	0.5A, Positive	Reel	Active
6.0V	TO-252-3L	LM78M06RS	0.5A, Positive	Reel	Contact us
8.0V	TO-252-3L	LM78M08RS	0.5A, Positive	Reel	Contact us
9.0V	TO-252-3L	LM78M09RS	0.5A, Positive	Reel	Contact us
12V	TO-252-3L	LM78M12RS	0.5A, Positive	Reel	Contact us
15V	TO-252-3L	LM78M15RS	0.5A, Positive	Reel	Active
18V	TO-252-3L	LM78M18RS	0.5A, Positive	Reel	Contact us
24V	TO-252-3L	LM78M24RS	0.5A, Positive	Reel	Contact us



PIN CONFIGURATION



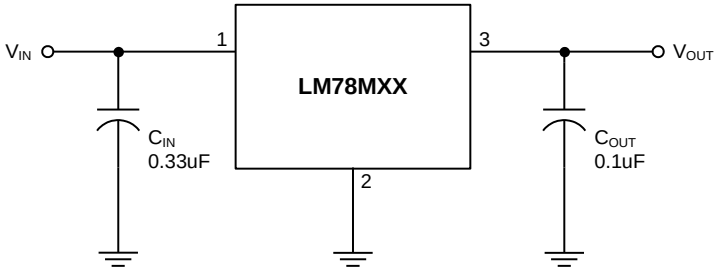
TO-252-3L

PIN DESCRIPTION

Pin No.	TO-252-3L PKG	
	Name	Function
1	VIN	Input Voltage
2	GND	Ground
3	VOUT	Output Voltage

* Heatsink surface connected to Pin 2.

Typical Applications



Note)

1. To specify an output voltage, substitute voltage for "XX".
2. C_{OUT} improves stability and transient response.

ELECTRICAL CHARACTERISTICS

LM78M05 (Vin=10V, Io=0.5A, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A =+25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	I_O=500mA	4.9	5.0	5.1	V
		5mA ≤ Io ≤ 350mA 7V ≤ V_{IN} ≤ 20V	4.8	5.0	5.2	
Line Regulation	ΔV_{LINE}	7V ≤ V_{IN} ≤ 25V, I_O=200mA	-	-	100	mV
		8V ≤ V_{IN} ≤ 25V, I_O=350mA	-	-	50	
Load Regulation	ΔV_{LOAD}	5mA ≤ Io ≤ 500mA	-	-	100	mV
		5mA ≤ Io ≤ 200mA	-	-	50	
Quiescent Current	I_Q		-	-	6.0	mA
Quiescent Current Change	ΔI_Q	8V ≤ V_{IN} ≤ 25V, I_O=200mA	-	-	0.8	mA
		5mA ≤ Io ≤ 500mA	-	-	0.5	
Dropout Voltage	V_D	0 ≤ I_O ≤ 350mA	-	2.0	2.2	V

LM78M06 (Vin=11V, Io=0.5A, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A =+25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	I_O=500mA	5.88	6.0	6.12	V
		5mA ≤ Io ≤ 350mA 8V ≤ V_{IN} ≤ 21V	5.76	6.0	6.24	
Line Regulation	ΔV_{LINE}	8V ≤ V_{IN} ≤ 25V, I_O=200mA	-	-	100	mV
		9V ≤ V_{IN} ≤ 25V, I_O=350mA	-	-	50	
Load Regulation	ΔV_{LOAD}	5mA ≤ Io ≤ 500mA	-	-	120	mV
		5mA ≤ Io ≤ 200mA	-	-	50	
Quiescent Current	I_Q		-	-	6.0	mA
Quiescent Current Change	ΔI_Q	9V ≤ V_{IN} ≤ 25V, I_O=200mA	-	-	0.8	mA
		5mA ≤ Io ≤ 500mA	-	-	0.5	
Dropout Voltage	V_D	0 ≤ I_O ≤ 350mA	-	2.0	2.2	V

LM78M08 (Vin=14V, Io=0.5A, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A =+25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	I_O=500mA	7.84	8.0	8.16	V
		5mA ≤ Io ≤ 350mA 10.5V ≤ V_{IN} ≤ 23V	7.68	8.0	8.32	
Line Regulation	ΔV_{LINE}	10.5V ≤ V_{IN} ≤ 25V, I_O=200mA	-	-	100	mV
		11V ≤ V_{IN} ≤ 25V, I_O=350mA	-	-	50	
Load Regulation	ΔV_{LOAD}	5mA ≤ Io ≤ 500mA	-	-	160	mV
		5mA ≤ Io ≤ 200mA	-	-	80	
Quiescent Current	I_Q		-	-	6.0	mA
Quiescent Current Change	ΔI_Q	10.5V ≤ V_{IN} ≤ 25V, I_O=200mA	-	-	0.8	mA
		5mA ≤ Io ≤ 500mA	-	-	0.5	
Dropout Voltage	V_D	0 ≤ I_O ≤ 350mA	-	2.0	2.2	V

LM78M09 (Vin=16V, Io=0.5A, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A =+25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	I_O=500mA	8.82	9.0	9.18	V
		5mA ≤ Io ≤ 350mA 11.5V ≤ V_{IN} ≤ 24V	8.64	9.0	9.36	
Line Regulation	ΔV_{LINE}	11.5V ≤ V_{IN} ≤ 26V, I_O=200mA	-	-	100	mV
		12V ≤ V_{IN} ≤ 26V, I_O=350mA	-	-	50	
Load Regulation	ΔV_{LOAD}	5mA ≤ Io ≤ 500mA	-	-	180	mV
		5mA ≤ Io ≤ 200mA	-	-	90	
Quiescent Current	I_Q		-	-	6.0	mA
Quiescent Current Change	ΔI_Q	11.5V ≤ V_{IN} ≤ 26V, I_O=200mA	-	-	0.8	mA
		5mA ≤ Io ≤ 500mA	-	-	0.5	
Dropout Voltage	V_D	0 ≤ I_O ≤ 350mA	-	2.0	2.2	V

LM78M12 (Vin=19V, Io=0.5A, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A =+25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	I_O=500mA	11.76	12.0	12.24	V
		5mA ≤ Io ≤ 350mA 14.5V ≤ V_{IN} ≤ 27V	11.52	12.0	12.48	
Line Regulation	ΔV_{LINE}	14.5V ≤ V_{IN} ≤ 30V, I_O=200mA	-	-	100	mV
		16V ≤ V_{IN} ≤ 30V, I_O=350mA	-	-	50	
Load Regulation	ΔV_{LOAD}	5mA ≤ Io ≤ 500mA	-	-	240	mV
		5mA ≤ Io ≤ 200mA	-	-	120	
Quiescent Current	I_Q		-	-	6.0	mA
Quiescent Current Change	ΔI_Q	14.5V ≤ V_{IN} ≤ 30V, I_O=200mA	-	-	0.8	mA
		5mA ≤ Io ≤ 500mA	-	-	0.5	
Dropout Voltage	V_D	0 ≤ I_O ≤ 350mA	-	2.0	2.2	V

LM78M15 (Vin=23V, Io=0.5A, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A =+25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	I_O=500mA	14.7	15.0	15.3	V
		5mA ≤ Io ≤ 350mA 17.5V ≤ V_{IN} ≤ 30V	14.4	15.0	15.6	
Line Regulation	ΔV_{LINE}	17.5V ≤ V_{IN} ≤ 30V, I_O=200mA	-	-	100	mV
		20V ≤ V_{IN} ≤ 30V, I_O=350mA	-	-	50	
Load Regulation	ΔV_{LOAD}	5mA ≤ Io ≤ 500mA	-	-	300	mV
		5mA ≤ Io ≤ 200mA	-	-	150	
Quiescent Current	I_Q		-	-	6.0	mA
Quiescent Current Change	ΔI_Q	17.5V ≤ V_{IN} ≤ 30V, I_O=200mA	-	-	0.8	mA
		5mA ≤ Io ≤ 500mA	-	-	0.5	
Dropout Voltage	V_D	0 ≤ I_O ≤ 350mA	-	2.0	2.2	V

LM78M18 (Vin=26V, Io=0.5A, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A =+25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	I_O=500mA	17.64	18.0	18.36	V
		5mA ≤ Io ≤ 350mA 20.5V ≤ V_{IN} ≤ 33V	17.28	18.0	18.72	
Line Regulation	ΔV_{LINE}	21V ≤ V_{IN} ≤ 33V, I_O=200mA	-	-	100	mV
		24V ≤ V_{IN} ≤ 30V, I_O=350mA	-	-	50	
Load Regulation	ΔV_{LOAD}	5mA ≤ Io ≤ 500mA	-	-	360	mV
		5mA ≤ Io ≤ 200mA	-	-	180	
Quiescent Current	I_Q		-	-	6.0	mA
Quiescent Current Change	ΔI_Q	21V ≤ V_{IN} ≤ 33V, I_O=200mA	-	-	0.8	mA
		5mA ≤ Io ≤ 500mA	-	-	0.5	
Dropout Voltage	V_D	0 ≤ I_O ≤ 350mA	-	2.0	2.2	V

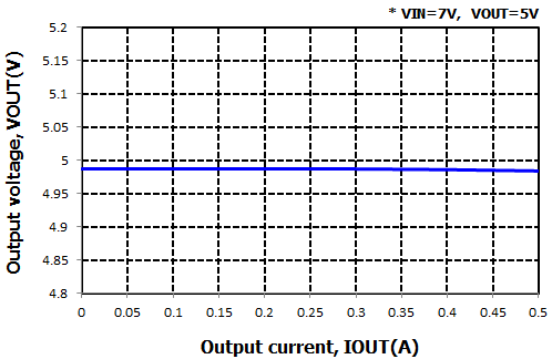
LM78M24 (Vin=33V, Io=0.5A, C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A =+25°C, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION(Note 1)	MIN.	TYP.	MAX.	UNIT
Output Voltage(Note 2)	V_{OUT}	I_O=500mA	23.52	24.0	24.48	V
		5mA ≤ Io ≤ 350mA 27V ≤ V_{IN} ≤ 38V	23.04	24.0	24.96	
Line Regulation	ΔV_{LINE}	27V ≤ V_{IN} ≤ 38V, I_O=200mA	-	-	100	mV
		28V ≤ V_{IN} ≤ 38V, I_O=350mA	-	-	50	
Load Regulation	ΔV_{LOAD}	5mA ≤ Io ≤ 500mA	-	-	480	mV
		5mA ≤ Io ≤ 200mA	-	-	240	
Quiescent Current	I_Q		-	-	6.0	mA
Quiescent Current Change	ΔI_Q	27V ≤ V_{IN} ≤ 38V, I_O=200mA	-	-	0.8	mA
		5mA ≤ Io ≤ 500mA	-	-	0.5	
Dropout Voltage	V_D	0 ≤ I_O ≤ 350mA	-	2.0	2.2	V

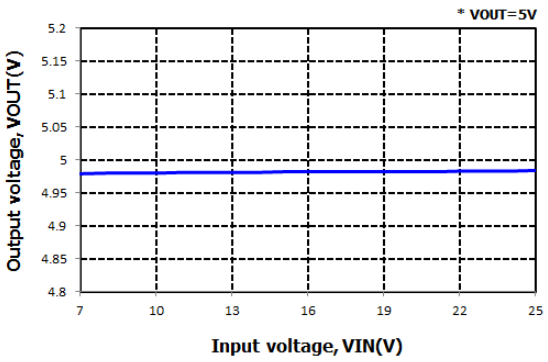
Note 1. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.
All characteristics are measured with a 0.33uF capacitor across the input and a 0.1uF capacitor across the output.
Note 2. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

TYPICAL OPERATING CHARACTERISTICS

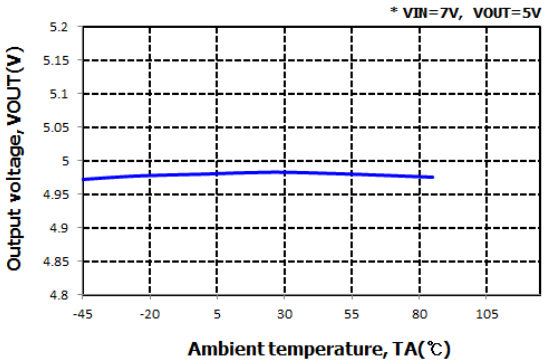
- VOUT vs. IOUT



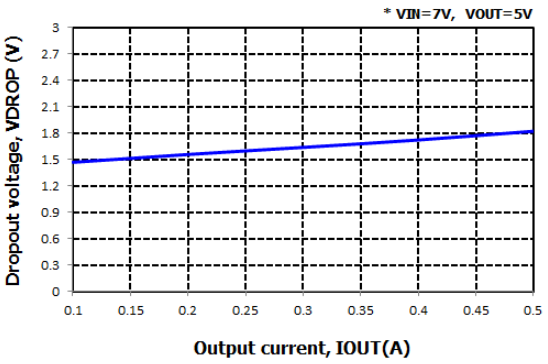
- VOUT vs. VIN



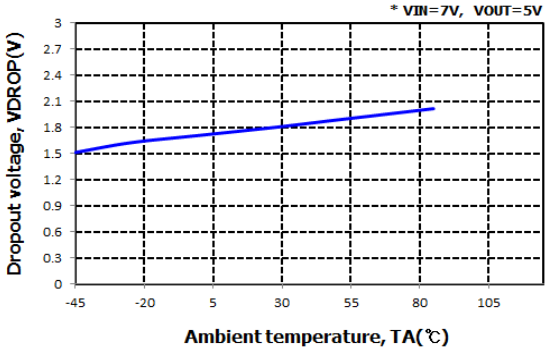
- VOUT vs. TA



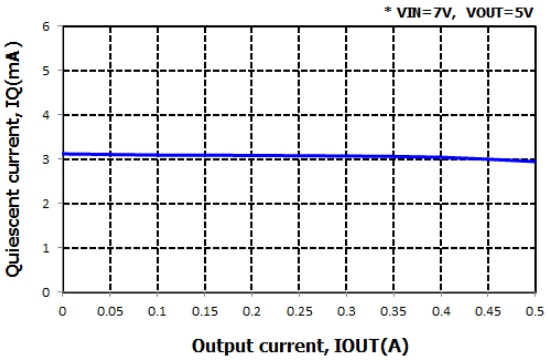
- VDROP vs. IOUT



- VDROP vs. TA

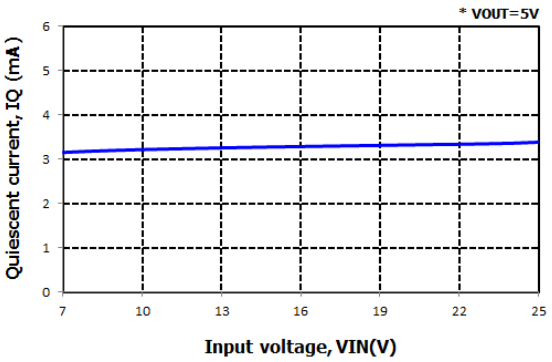


- IQ vs. IOUT

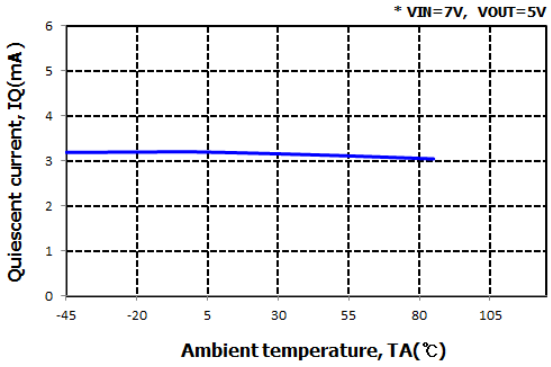


TYPICAL OPERATING CHARACTERISTICS (Continued)

- IQ vs. VIN



- IQ vs. TA



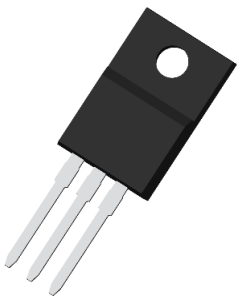
REVISION NOTICE

The description in this datasheet can be revised without any notice to describe its electrical characteristics properly.

3-Terminal 1.5A Negative Voltage Regulator LM79xxTP

FEATURES

- Output Current Up to 1.5A
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Voltage of −5V, −6V, −8V, −9V, −12V, −15V, −18V, −20V, and −24V



TO-220F-3

DESCRIPTION

This series of fixed-negative voltage monolithic integrated circuit voltage regulator is designed to complement LM79xxTP series in a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation.

Each of these regulators can deliver up to 1.5A of output current. The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and current and also as the power pass element in precision regulators.

ORDERING INFORMATION

Device	Package
LM79xxTP	TO-220F-3L

xx: Output Voltage

ABSOLUTE MAXIMUM RATINGS (Note 1)

CHARACTERISTIC		SYMBOL	MIN	MAX	UNIT
Input Voltage	All (except V_{OUT} = −24V)	V_{IN}	-	−35	V
	V_{OUT} = −24V		-	−40	
Maximum Junction Temperature		T_J	0	150	°C
Storage Temperature		T_{STG}	−65	150	°C

Note 1. Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING RATINGS (Note 2)

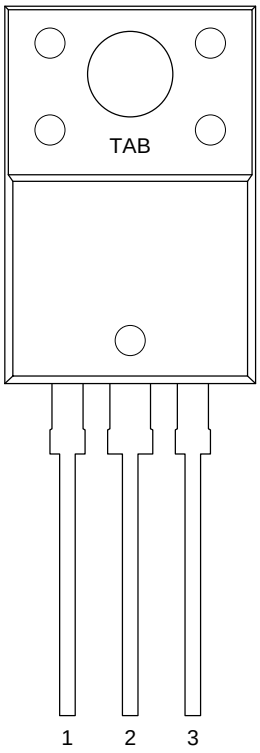
CHARACTERISTIC		SYMBOL	MIN	MAX	UNIT
Input Voltage	V_{OUT} = −5.0V	V_{IN}	−7.0	−25	V
	V_{OUT} = −6.0V		−8.0	−25	
	V_{OUT} = −8.0V		−10.5	−25	
	V_{OUT} = −9.0V		−11.5	−25	
	V_{OUT} = −12V		−14.5	−30	
	V_{OUT} = −15V		−17.5	−30	
	V_{OUT} = −18V		−21	−33	
	V_{OUT} = −20V		−23	−34	
	V_{OUT} = −24V		−27	−38	
Output Current		I_{OUT}	0	1.5	A
Operating Junction Temperature Range		T_J	0	125	°C

Note 2. The device is not guaranteed to function outside its operating ratings.

ORDERING INFORMATION

VOUT	Package	Order No.	Description	Supplied As	Status
−5.0V	TO-220F-3L	LM7905TP	1.5A, FullPAK	Tube	Contact us
−6.0V	TO-220F-3L	LM7906TP	1.5A, FullPAK	Tube	Contact us
−8.0V	TO-220F-3L	LM7908TP	1.5A, FullPAK	Tube	Contact us
−9.0V	TO-220F-3L	LM7909TP	1.5A, FullPAK	Tube	Contact us
−12V	TO-220F-3L	LM7912TP	1.5A, FullPAK	Tube	Contact us
−15V	TO-220F-3L	LM7915TP	1.5A, FullPAK	Tube	Contact us
−18V	TO-220F-3L	LM7918TP	1.5A, FullPAK	Tube	Active
−20V	TO-220F-3L	LM7920TP	1.5A, FullPAK	Tube	Contact us
−24V	TO-220F-3L	LM7924TP	1.5A, FullPAK	Tube	Active

PIN CONFIGURATION

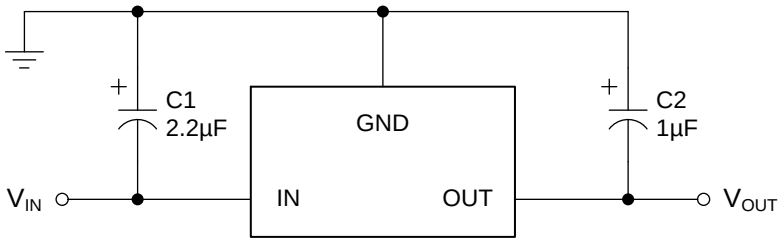


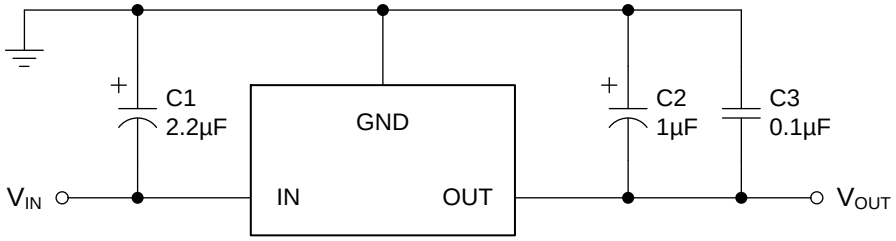
TO-220F (FullPAK)

PIN DESCRIPTION

Pin No.	Pin Name	Pin Function
1	GND	Ground
2	IN	Input Voltage
3	OUT	Output Voltage
TAB	TAB	No Connection. Electrically Isolated.

TYPICAL APPLICATION CIRCUITS





* C1 required for stability. Value given may be increased.

** C2 required for stability. Value given may be increased.

*** C3 considered improving the transient response.

ELECTRICAL CHARACTERISTICS: LM7905

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −10V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−4.80	−5.0	−5.20	V
		−20V ≤ V_{IN} ≤ −7.0V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−4.75**	**−5.0**	**−5.25**	
Line Regulation	ΔV_{LINE}	−25V ≤ V_{IN} ≤ −7.0V	-	12.5	50	mV
		−12V ≤ V_{IN} ≤ −8.0V	-	4.0	15	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	100	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	50	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−0.4**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	125	-	μV
Ripple Rejection	P_{RR}	−18V ≤ V_{IN} ≤ −8.0V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	1.5	2.0	mA
Bias Current Change	ΔI_B	−25V ≤ V_{IN} ≤ −7.0V	-	**0.15**	**0.5**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.08**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7906

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −11V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−5.75	−6.0	−6.25	V
		−21V ≤ V_{IN} ≤ −8.0V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−5.70**	**−6.0**	**−6.30**	
Line Regulation	ΔV_{LINE}	−25V ≤ V_{IN} ≤ −8.0V	-	12.5	120	mV
		−13V ≤ V_{IN} ≤ −9.0V	-	4.0	60	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	120	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	60	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−0.4**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	150	-	μV
Ripple Rejection	P_{RR}	−19V ≤ V_{IN} ≤ −9.0V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	1.5	2.0	mA
Bias Current Change	ΔI_B	−25V ≤ V_{IN} ≤ −8.0V	-	**0.15**	**1.3**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.08**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7908

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −14V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−7.70	−8.0	−8.30	V
		−23V ≤ V_{IN} ≤ −10.5V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−7.60**	**−8.0**	**−8.40**	
Line Regulation	ΔV_{LINE}	−25V ≤ V_{IN} ≤ −10.5V	-	12.5	160	mV
		−17V ≤ V_{IN} ≤ −11V	-	4.0	80	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	160	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	80	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−0.6**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	200	-	μV
Ripple Rejection	P_{RR}	−21.5V ≤ V_{IN} ≤ −11.5V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	1.5	2.0	mA
Bias Current Change	ΔI_B	−25V ≤ V_{IN} ≤ −10.5V	-	**0.15**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.08**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7909

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −15V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−8.64	−9.0	−9.36	V
		−25V ≤ V_{IN} ≤ −11.5V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−8.55**	**−9.0**	**−9.45**	
Line Regulation	ΔV_{LINE}	−25V ≤ V_{IN} ≤ −11.5V	-	12.5	180	mV
		−22V ≤ V_{IN} ≤ −14.5V	-	4.0	90	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	180	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	90	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	225	-	μV
Ripple Rejection	P_{RR}	−24V ≤ V_{IN} ≤ −12.5V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	1.5	2.0	mA
Bias Current Change	ΔI_B	−25V ≤ V_{IN} ≤ −11.5V	-	**0.15**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.08**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7912

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −19V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−11.5	−12	−12.5	V
		−27V ≤ V_{IN} ≤ −14.5V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−11.4**	**−12**	**−12.6**	
Line Regulation	ΔV_{LINE}	−30V ≤ V_{IN} ≤ −14.5V	-	5.0	80	mV
		−22V ≤ V_{IN} ≤ −16V	-	3.0	30	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	200	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	75	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−0.8**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	300	-	μV
Ripple Rejection	P_{RR}	−25V ≤ V_{IN} ≤ −15V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−30V ≤ V_{IN} ≤ −14.5V	-	**0.04**	**0.5**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7915

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −23V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−14.4	−15	−15.6	V
		−30V ≤ V_{IN} ≤ −17.5V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−14.25**	**−15**	**−15.75**	
Line Regulation	ΔV_{LINE}	−30V ≤ V_{IN} ≤ −17.5V	-	5.0	100	mV
		−26V ≤ V_{IN} ≤ −20V	-	3.0	50	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	15	200	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	5.0	75	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	375	-	μV
Ripple Rejection	P_{RR}	−28.5V ≤ V_{IN} ≤ −18.5V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−30V ≤ V_{IN} ≤ −17.5V	-	**0.04**	**0.5**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7918

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −27V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−17.3	−18	−18.7	V
		−33V ≤ V_{IN} ≤ −21V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−17.1**	**−18**	**−18.9**	
Line Regulation	ΔV_{LINE}	−33V ≤ V_{IN} ≤ −21V	-	5.0	360	mV
		−30V ≤ V_{IN} ≤ −24V	-	3.0	180	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	30	360	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	10	180	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	450	-	μV
Ripple Rejection	P_{RR}	−32V ≤ V_{IN} ≤ −22V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−33V ≤ V_{IN} ≤ −21V	-	**0.04**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7920

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −31V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−19.2	−20	−20.8	V
		−34V ≤ V_{IN} ≤ −23V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−19.0**	**−20**	**−21.0**	
Line Regulation	ΔV_{LINE}	−34V ≤ V_{IN} ≤ −23V	-	5.0	400	mV
		−31V ≤ V_{IN} ≤ −26V	-	3.0	200	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	50	400	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	15	120	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	500	-	μV
Ripple Rejection	P_{RR}	−33V ≤ V_{IN} ≤ −24V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−34V ≤ V_{IN} ≤ −23V	-	**0.04**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

ELECTRICAL CHARACTERISTICS: LM7924

Specifications with standard type face are for T_J = 25°C, and those with **boldface type** apply over full operating temperature range In the *Recommended Operating Ratings*. Conditions are V_{IN} = −33V, I_{OUT} = 500mA, C_{IN} = 2.2μF, C_{OUT} = 1μF, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS (Note 3)	MIN	TYP	MAX	UNIT
Output Voltage (Note 4)	V_{OUT}		−23.0	−24	−25.0	V
		−38V ≤ V_{IN} ≤ −27V, 5.0mA ≤ I_{OUT} ≤ 1.0A, P_D ≤ 15W	**−22.8**	**−24**	**−25.2**	
Line Regulation	ΔV_{LINE}	−38V ≤ V_{IN} ≤ −27V	-	5.0	480	mV
		−36V ≤ V_{IN} ≤ −30V	-	3.0	240	
Load Regulation	ΔV_{LOAD}	5.0mA ≤ I_{OUT} ≤ 1.5A	-	85	480	mV
		250mA ≤ I_{OUT} ≤ 750mA	-	25	240	
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T$	I_{OUT} = 5.0mA	-	**−1.0**	-	mV/°C
Output Noise Voltage	V_n	10Hz ≤ f ≤ 100kHz	-	600	-	μV
Ripple Rejection	P_{RR}	−38V ≤ V_{IN} ≤ −28V, f = 120Hz	**54**	**60**	-	dB
Dropout Voltage	V_D	I_{OUT} = 1.0A	-	1.6	-	V
Bias Current	I_B		-	2.0	3.0	mA
Bias Current Change	ΔI_B	−38V ≤ V_{IN} ≤ −27V	-	**0.04**	**1.0**	mA
		5.0mA ≤ I_{OUT} ≤ 1.0A	-	**0.06**	**0.5**	
Peak Output Current	I_{OMAX}		-	2.1	-	A

Note 3. Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

Note 4. This specification applies only for DC power dissipation permitted by absolute maximum ratings.

TYPICAL OPERATING CHARACTERISTICS

T.B.D.

ES France - Département Composants & Modules
127 rue de Buzenval BP 26 - 92380 Garches
Tél. 01 47 95 99 89
Fax. 01 47 01 16 22
e-mail : comp@es-france.com
Site Web : www.es-france.com

APPLICATION INFORMATION

T.B.D.

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REVISION NOTICE

The description in this datasheet is subject to change without any notice to describe its electrical characteristics properly.

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