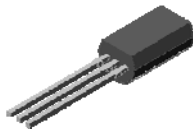
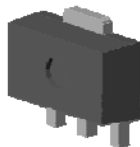

TO-92

TO-92L

SOT-89

ORDERING INFORMATION

Product	Marking	Package
SN79Lxx	79Lxx	TO-92
SN79LxxL	79Lxx	TO-92L
SN79LxxF	79Lxx	SOT-89

▲ Marking Detail Information



① Device Code

② Grade & Year & Week Code

SN79Lxxx

3 Terminal Negative Voltage Regulator [100mA]

Description

The SN79Lxxx series are three-terminal Negative regulators providing over 100mA output current with internal current limiting, thermal shutdown and safe area protection. These regulators are useful in a wide range of applications. Although they are just fixed voltage regulators, the SN79Lxxx series can be used with external components to obtain adjustable voltages and Currents. It also contains the TCE Cell to protect internal circuit from ESD damage.

Application

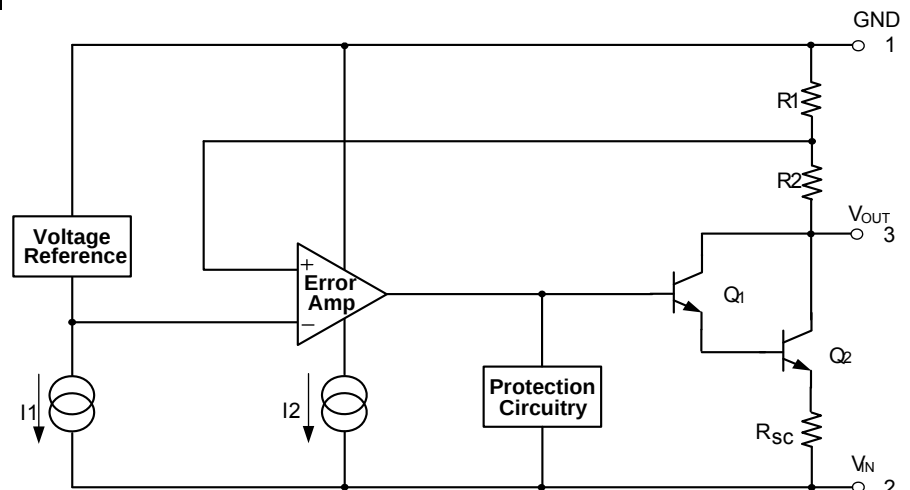
- ◆ Consumer and personal electronics
- ◆ SMPS post-regulator / dc-to-dc modules
- ◆ High-efficiency linear power supplies

Features and Benefits

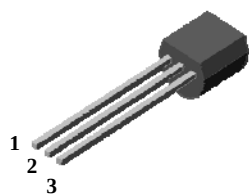
- ◆ Maximum Output Current up to 150mA
- ◆ Output Voltage : -5, -6, -8, -12, -15, -18, -24V
- ◆ Built in OVP, Short Circuit Current Limiting.
- ◆ Built in TSD Protection.
- ◆ No External Components Required.
- ◆ Ultra High level of ESD [Built in ESD Protection Cell]

MM : 500V / HBM 5KV ↑

Equivalent Circuit



◆ Pin Configuration

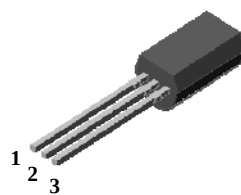


TO-92

1: GND

2: V_{IN}

3: V_{OUT}

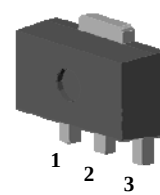


TO-92L

1: GND

2: V_{IN}

3: V_{OUT}



SOT-89

1: GND

2: V_{IN}

3: V_{OUT}

◆ Product Line-up

Product Name	V_{OUT}	Operating Temperature	Package
SN79L05	-5.0V	-40~125°C	TO-92
SN79L06	-6.0V	-40~125°C	TO-92
SN79L08	-8.0V	-40~125°C	TO-92
SN79L12	-12V	-40~125°C	TO-92
SN79L15	-15V	-40~125°C	TO-92
SN79L18	-18V	-40~125°C	TO-92
SN79L24	-24V	-40~125°C	TO-92
SN79L05L	-5.0V	-40~125°C	TO-92L
SN79L06L	-6.0V	-40~125°C	TO-92L
SN79L08L	-8.0V	-40~125°C	TO-92L
SN79L12L	-12V	-40~125°C	TO-92L
SN79L15L	-15V	-40~125°C	TO-92L
SN79L18L	-18V	-40~125°C	TO-92L
SN79L24L	-24V	-40~125°C	TO-92L
SN79L05F	-5.0V	-40~125°C	SOT-89
SN79L06F	-6.0V	-40~125°C	SOT-89
SN79L08F	-8.0V	-40~125°C	SOT-89
SN79L12F	-12V	-40~125°C	SOT-89
SN79L15F	-15V	-40~125°C	SOT-89
SN79L18F	-18V	-40~125°C	SOT-89
SN79L24F	-24V	-40~125°C	SOT-89

◆ **Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)**

Parameter		Symbol	Limits	Unit
Input Voltage		V_{IN}	-40.0 ($V_O = -24\text{V}$)	V
			-35.0 ($V_O = -12$ to -18V)	
			-30.0 ($V_O = -5$ to -8V)	
Power Dissipation	TO-92	P_d	625	mW
	TO-92L		800	mW
	SOT-89		800	mW
Junction Temperature		T_J	150	$^\circ\text{C}$
Operate Temperature Range		T_{opr}	-40 ~ +125	$^\circ\text{C}$
Storage Temperature Range		T_{stg}	-55 ~ +150	$^\circ\text{C}$

Absolute maximum ratings indicate limits beyond which damage to the component may occur. Electrical specifications do not apply when operating the device outside of its operating ratings. The maximum allowable power dissipation is a function of the maximum junction temperature, $T_{J(max)}$, the junction-to-ambient thermal resistance, θ_{JA} , and the ambient temperature, T_A .

The maximum allowable power dissipation at any ambient temperature is calculated using:

$PD(max) = (T_{J(max)} - T_A) \div \theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

◆ Electrical characteristics

($V_{IN} = -10V$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $I_{OUT} = 40mA$, $T_J = 0^\circ C \sim 125^\circ C$; unless otherwise specified)

Characteristic	Symbol	Test Condition*		SN79L05x			Unit
				Min.	Typ.	Max.	
Output Voltage**	V _O	T _J =25 °C		-4.80	-5.0	-5.20	V
Line Regulation	ΔV _{O(ΔVI)}	-7.0V ≤ V _{IN} ≤ -20.0V	T _J =25 °C	-	60	150	mV
		-8.0V ≤ V _{IN} ≤ -20.0V		-	-	100	
Load Regulation	ΔV _{O(ΔIL)}	1.0mA ≤ I _O ≤ 100mA	T _J =25 °C	-	20	60	mV
		1.0mA ≤ I _O ≤ 40mA		-	10	30	
Output Voltage	V _O	-7.0V ≤ V _{IN} ≤ -20.0V, 1.0mA ≤ I _O ≤ 40mA		-4.75	-	-5.25	V
		V _{IN} = -10V, 1.0mA ≤ I _O ≤ 70mA		-4.75	-	-5.25	
Quiescent Current	I _{QC}	T _J =25 °C		-	3.0	6.0	mV
		T _J =125 °C		-	-	5.5	
Quiescent Current Change	ΔI _{QC}	-8.0V ≤ V _{IN} ≤ -20V		-	-	1.5	mA
		1.0mA ≤ I _O ≤ 40mA		-	-	0.1	
Ripple Rejection	RR	-8.0V ≤ V _{IN} ≤ -18.0V, f=120Hz		41	49	-	dB
Dropout Voltage	V _{DROP}	T _J =25 °C		-	1.7	-	V
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz	T _A =25 °C	-	40	-	uV/ V _O
Temperature coefficient of Output voltage	ΔV _O / ΔTemp	I _O =5.0mA		-	-0.6	-	mV/°C

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

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

◆ Electrical characteristics

($V_{IN} = -11V$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $I_{OUT} = 40mA$, $T_J = 0^\circ C \sim 125^\circ C$; unless otherwise specified)

Characteristic	Symbol	Test Condition*		SN79L06x			Unit
				Min.	Typ.	Max.	
Output Voltage**	V _O	T _J =25 °C		-5.75	-6.00	-6.25	V
Line Regulation	ΔV _{O(ΔVI)}	-8.1V ≤ V _{IN} ≤ -21.0V	T _J =25 °C	-	-	150	mV
		-9.0V ≤ V _{IN} ≤ -21.0V		-	-	110	
Load Regulation	ΔV _{O(ΔIL)}	1.0mA ≤ I _O ≤ 100 mA	T _J =25 °C	-	-	70	mV
		1.0mA ≤ I _O ≤ 40 mA		-	-	35	
Output Voltage	V _O	-8.1V ≤ V _{IN} ≤ -21.0V, 1.0mA ≤ I _O ≤ 40 mA		-5.70	-	-6.30	V
		V _{IN} = -11V, 1.0mA ≤ I _O ≤ 70 mA		-5.70	-	-6.30	
Quiescent Current	I _{QC}	T _J =25 °C		-	3.0	6.0	mA
		T _J =125 °C		-	-	5.5	
Quiescent Current Change	ΔI _{QC}	-9.0V ≤ V _{IN} ≤ -20V		-	-	1.5	mA
		1.0mA ≤ I _O ≤ 40mA		-	-	0.1	
Ripple Rejection	RR	-11.0V ≤ V _{IN} ≤ -21.0V, f=120 Hz		37	47	-	dB
Dropout Voltage	V _{DROP}	T _J =25 °C		-	1.7	-	V
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz	T _A =25 °C	-	40	-	uV/ V _O
Temperature coefficient of Output voltage	ΔV _O / ΔTemp	I _O =5.0 mA		-	-0.7	-	mV/°C

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

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

◆ Electrical characteristics

($V_{IN} = -14V$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $I_{OUT} = 40mA$, $T_J = 0^\circ C \sim 125^\circ C$; unless otherwise specified)

Characteristic	Symbol	Test Condition*		SN79L08x			Unit
				Min.	Typ.	Max.	
Output Voltage**	V _O	T _J =25 °C		-7.70	-8.00	-8.30	V
Line Regulation	ΔV _{O(ΔVI)}	-10.5V ≤ V _{IN} ≤ -23.0V	T _J =25 °C	-	-	175	mV
		-12.0V ≤ V _{IN} ≤ -23.0V		-	-	125	
Load Regulation	ΔV _{O(ΔIL)}	1.0mA ≤ I _O ≤ 100mA	T _J =25 °C	-	-	80	mV
		1.0mA ≤ I _O ≤ 40mA		-	-	40	
Output Voltage	V _O	-10.5V ≤ V _{IN} ≤ -23.0V, 1.0mA ≤ I _O ≤ 40mA		-7.60	-	-8.40	V
		V _{IN} = -14V, 1.0mA ≤ I _O ≤ 70mA		-7.60	-	-8.40	
Quiescent Current	I _{QC}	T _J =25 °C		-	3.0	6.0	mA
		T _J =125 °C		-	-	5.5	
Quiescent Current Change	ΔI _{QC}	-11.7V ≤ V _{IN} ≤ -23V		-	-	1.5	mA
		1.0mA ≤ I _O ≤ 40mA		-	-	0.1	
Ripple Rejection	RR	-11.0V ≤ V _{IN} ≤ -21.0V, f=120Hz		37	45	-	dB
Dropout Voltage	V _{DROP}	T _J =25 °C		-	1.7	-	V
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz	T _A =25 °C	-	60	-	uV/ V _O
Temperature coefficient of Output voltage	ΔV _O / ΔTemp	I _O =5.0mA		-	-0.8	-	mV/°C

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

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

◆ Electrical characteristics

($V_{IN} = -19V$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $I_{OUT} = 40mA$, $T_J = 0^\circ C \sim 125^\circ C$; unless otherwise specified)

Characteristic	Symbol	Test Condition*		SN79L12x			Unit
				Min.	Typ.	Max.	
Output Voltage**	V _O	T _J =25 °C		-11.50	-12.00	-12.50	V
Line Regulation	ΔV _{O(ΔVI)}	-14.5V ≤ V _{IN} ≤ -27.0V	T _J =25 °C	-	120	250	mV
		-16.0V ≤ V _{IN} ≤ -27.0V		-	100	200	
Load Regulation	ΔV _{O(ΔIL)}	1.0mA ≤ I _O ≤ 100mA	T _J =25 °C	-	-	100	mV
		1.0mA ≤ I _O ≤ 40mA		-	-	50	
Output Voltage	V _O	-14.5V ≤ V _{IN} ≤ -27.0V, 1.0mA ≤ I _O ≤ 40mA		-11.40	-	-12.60	V
		V _{IN} = -19V, 1.0mA ≤ I _O ≤ 70mA		-11.40	-	-12.60	
Quiescent Current	I _{QC}	T _J =25 °C		-	-	6.5	mA
		T _J =125 °C		-	-	6.0	
Quiescent Current Change	ΔI _{QC}	-16.0V ≤ V _{IN} ≤ -27.0V		-	-	1.5	mA
		1.0mA ≤ I _O ≤ 40mA		-	-	0.1	
Ripple Rejection	RR	-15.0V ≤ V _{IN} ≤ -25.0V, f=120Hz		37	42	-	dB
Dropout Voltage	V _{DROP}	T _J =25 °C		-	1.7	-	V
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz	T _A =25 °C	-	80	-	uV/ V _O
Temperature coefficient of Output voltage	ΔV _O / ΔTemp	I _O =5.0mA		-	-1.0	-	mV/°C

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

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

◆ Electrical characteristics

($V_{IN} = -23V$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $I_{OUT} = 40mA$, $T_J = 0^\circ C \sim 125^\circ C$; unless otherwise specified)

Characteristic	Symbol	Test Condition*		SN79L15x			Unit
				Min.	Typ.	Max.	
Output Voltage**	V _O	T _J =25 °C		-14.40	-15.00	-15.60	V
Line Regulation	ΔV _{O(ΔVI)}	-17.5V ≤ V _{IN} ≤ -30.0V	T _J =25 °C	-	130	300	mV
		-20.0V ≤ V _{IN} ≤ -30.0V		-	110	250	
Load Regulation	ΔV _{O(ΔIL)}	1.0mA ≤ I _O ≤ 100mA	T _J =25 °C	-	-	150	mV
		1.0mA ≤ I _O ≤ 40mA		-	-	75	
Output Voltage	V _O	-17.5V ≤ V _{IN} ≤ -30.0V, 1.0mA ≤ I _O ≤ 40mA		-14.25	-	-15.75	V
		V _{IN} = -23V, 1.0mA ≤ I _O ≤ 70mA		-14.25	-	-15.75	
Quiescent Current	I _{QC}	T _J =25 °C		-	-	6.5	mA
		T _J =125 °C		-	-	6.0	
Quiescent Current Change	ΔI _{QC}	-20.0V ≤ V _{IN} ≤ -30.0V		-	-	1.5	mA
		1.0mA ≤ I _O ≤ 40mA		-	-	0.1	
Ripple Rejection	RR	-18.5V ≤ V _{IN} ≤ -28.5V, f=120Hz		34	39	-	dB
Dropout Voltage	V _{DROP}	T _J =25 °C		-	1.7	-	V
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz	T _A = 25 °C	-	90	-	uV/ V _O
Temperature coefficient of Output voltage	ΔV _O / ΔTemp	I _O =5.0mA		-	-1.3	-	mV/°C

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

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

◆ Electrical characteristics

($V_{IN} = -27V$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $I_{OUT} = 40mA$, $T_J = 0^\circ C \sim 125^\circ C$; unless otherwise specified)

Characteristic	Symbol	Test Condition*		SN79L18x			Unit
				Min.	Typ.	Max.	
Output Voltage**	V _O	T _J =25 °C		-17.30	-18.0	-18.70	V
Line Regulation	ΔV _{O(ΔVI)}	-20.7V ≤ V _{IN} ≤ -33.0V	T _J =25 °C	-	-	325	mV
		-21.0V ≤ V _{IN} ≤ -33.0V		-	-	275	
Load Regulation	ΔV _{O(ΔIL)}	1.0mA ≤ I _O ≤ 100mA	T _J =25 °C	-	-	170	mV
		1.0mA ≤ I _O ≤ 40mA		-	-	85	
Output Voltage	V _O	-20.7V ≤ V _{IN} ≤ -33.0V, 1.0mA ≤ I _O ≤ 40mA		-17.10	-	-18.90	V
		V _{IN} = -27V, 1.0mA ≤ I _O ≤ 70mA		-17.10	-	-18.90	
Quiescent Current	I _{QC}	T _J =25 °C		-	-	6.5	mA
		T _J =125 °C		-	-	6.0	
Quiescent Current Change	ΔI _{QC}	-21.0V ≤ V _{IN} ≤ -33.0V		-	-	1.5	mA
		1.0mA ≤ I _O ≤ 40mA		-	-	0.1	
Ripple Rejection	RR	-23.0V ≤ V _{IN} ≤ -33.0V, f=120Hz		33	48	-	dB
Dropout Voltage	V _{DROP}	T _J =25 °C		-	1.7	-	V
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz	T _A = 25 °C	-	150	-	uV/ V _O
Temperature coefficient of Output voltage	ΔV _O / ΔTemp	I _O =5.0mA		-	-1.5	-	mV/°C

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

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

◆ Electrical characteristics

($V_{IN} = -33V$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $I_{OUT} = 40mA$, $T_J = 0^\circ C \sim 125^\circ C$; unless otherwise specified)

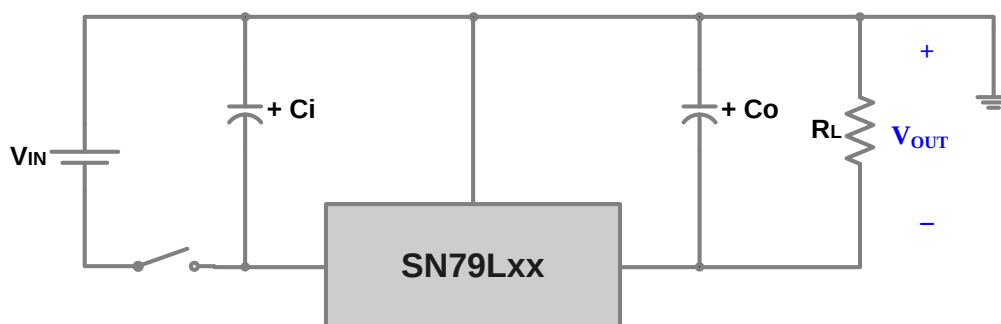
Characteristic	Symbol	Test Condition*		SN79L24x			Unit
				Min.	Typ.	Max.	
Output Voltage**	V _O	T _J =25 °C		-23.00	-24.00	-25.00	V
Line Regulation	ΔV _{O(ΔVI)}	-27.0V ≤ V _{IN} ≤ -38.0V	T _J =25 °C	-	-	350	mV
		-28.0V ≤ V _{IN} ≤ -38.0V		-	-	300	
Load Regulation	ΔV _{O(ΔIL)}	1.0mA ≤ I _O ≤ 100mA	T _J =25 °C	-	-	200	mV
		1.0mA ≤ I _O ≤ 40mA		-	-	100	
Output Voltage	V _O	-27.0V ≤ V _{IN} ≤ -38.0V, 1.0mA ≤ I _O ≤ 40mA		-22.80	-	-25.20	V
		V _{IN} = -33V, 1.0mA ≤ I _O ≤ 70mA		-22.80	-	-25.20	
Quiescent Current	I _{QC}	T _J =25 °C		-	-	6.5	mA
		T _J =125 °C		-	-	6.0	
Quiescent Current Change	ΔI _{QC}	-28.0V ≤ V _{IN} ≤ -38.0V		-	-	1.5	mA
		1.0mA ≤ I _O ≤ 40mA		-	-	0.1	
Ripple Rejection	RR	-28.0V ≤ V _{IN} ≤ -38.0V, f=120Hz		31	47	-	dB
Dropout Voltage	V _{DROP}	T _J =25 °C		-	1.7	-	V
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100kHz	T _A = 25 °C	-	200	-	uV/ V _O
Temperature coefficient of Output voltage	ΔV _O / ΔTemp	I _O =5.0mA		-	-2.0	-	mV/°C

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

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

Typical Application

Negative Fixed Output Regulator



- 1) C_{IN} should be required if regulators are located far from power supply filter
- 2) C_O improves output stability and transient response
- 3) To specify an output voltage, substitute voltage value for “xx”

Split Power Supply / OP-AMP Supply ($\pm 12V / 100mA$)

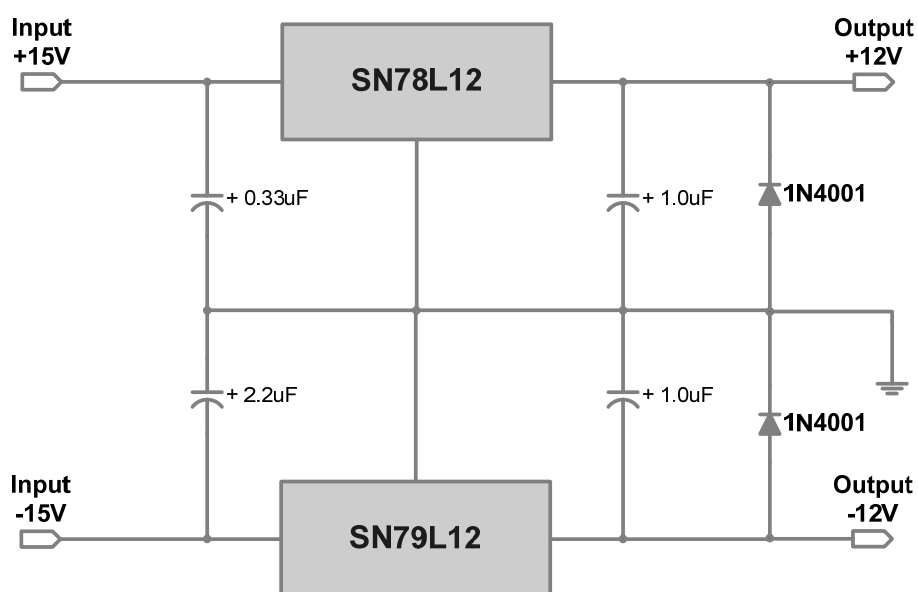


Fig.1 Quiescent Current vs. Junction Temperature

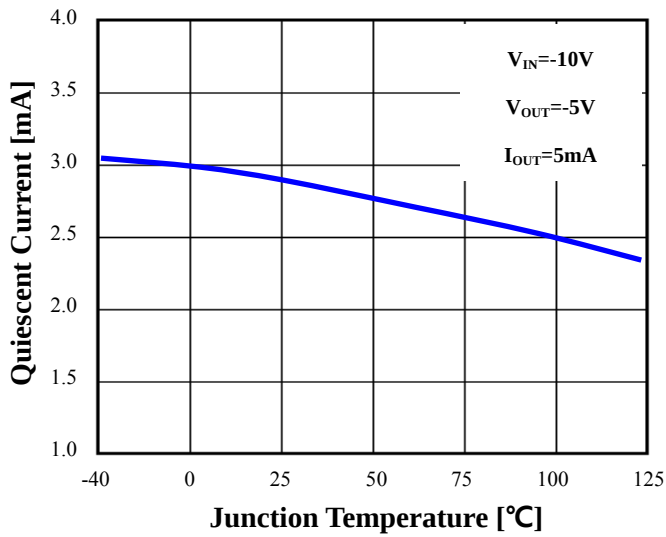


Fig.2 Output Voltage vs. Input Voltage [OVP]

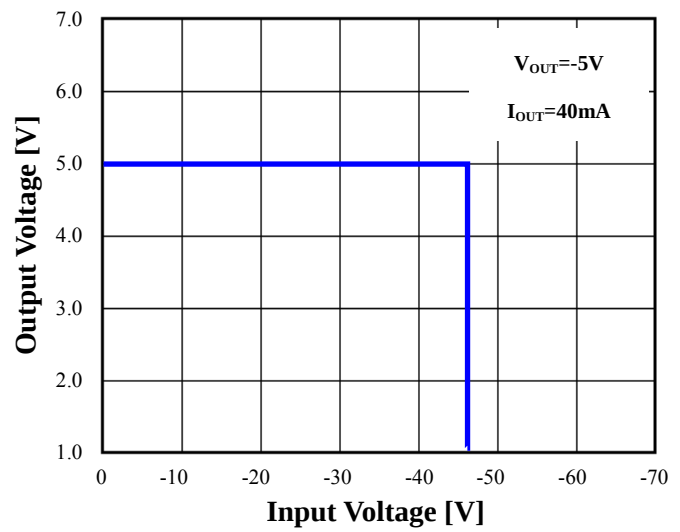


Fig.3 Output Voltage vs. Junction Temperature

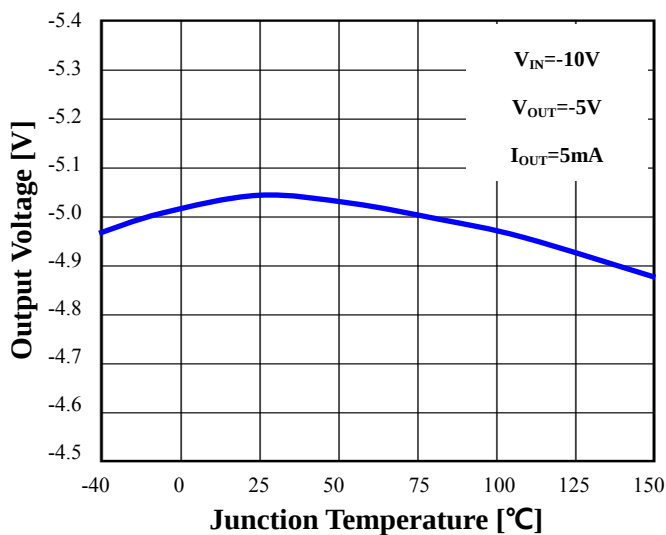


Fig.4 Dropout Voltage vs. Input Voltage

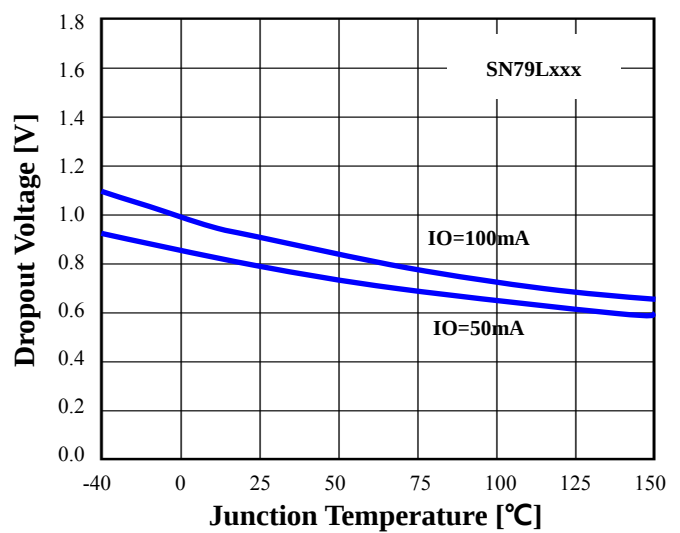


Fig.5 Line Transient Response

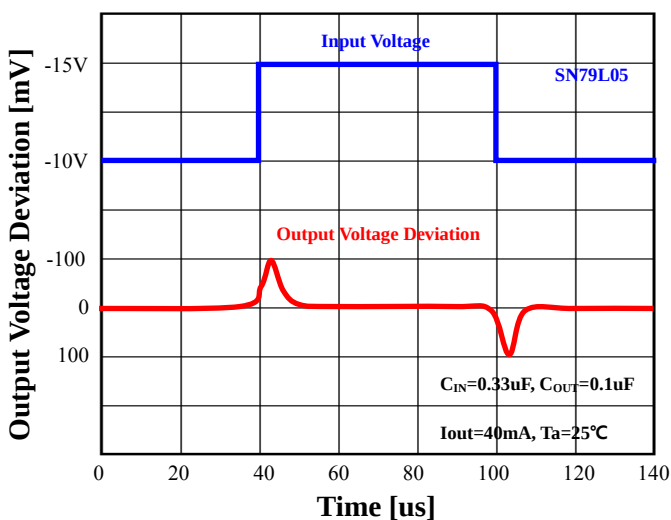
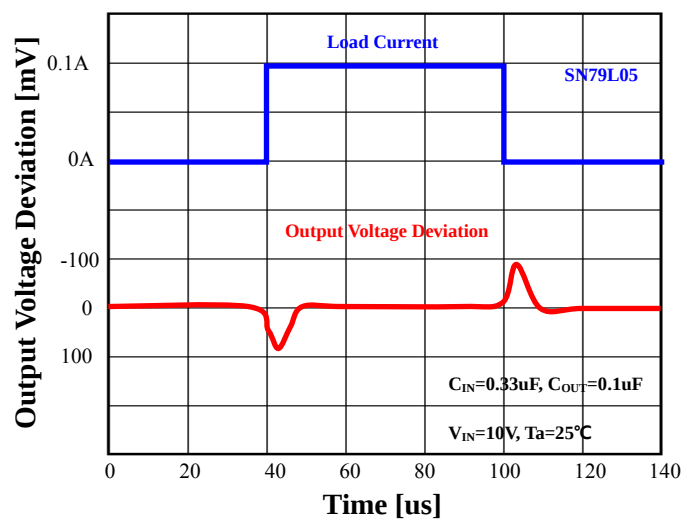
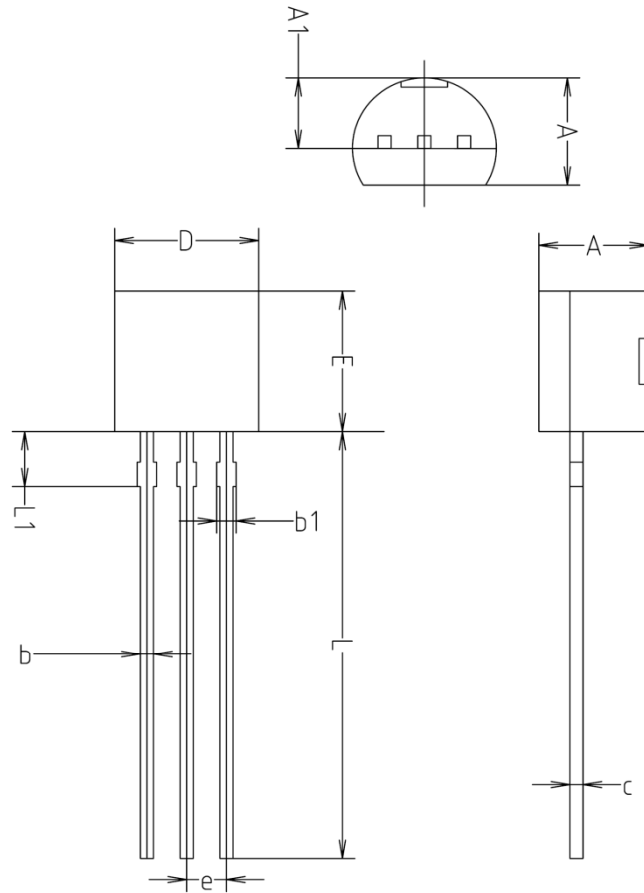


Fig.6 Load Transient Response

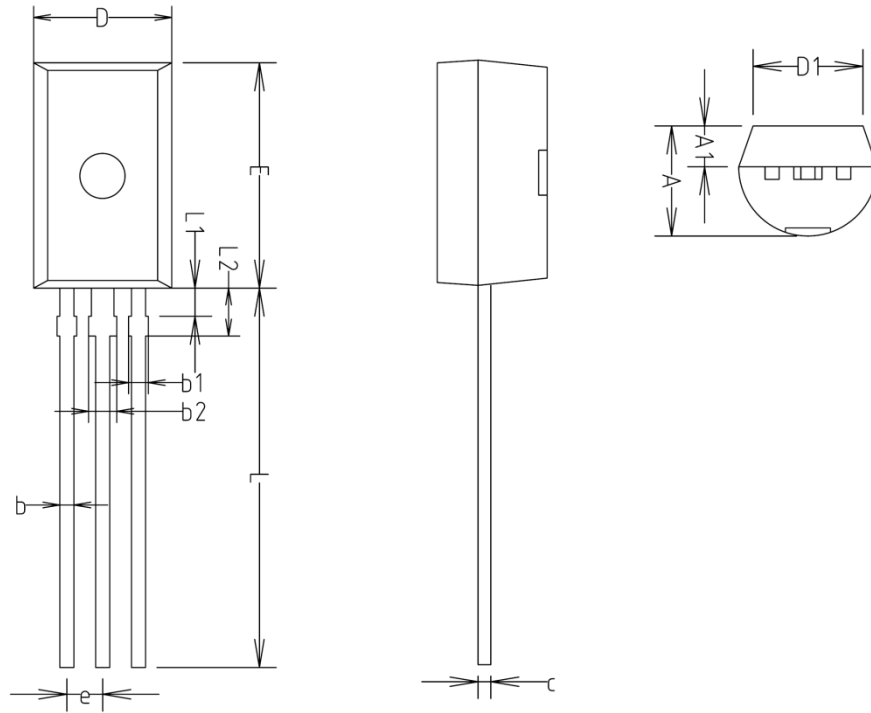


◆ TO-92 Outline Dimension (Unit : mm)



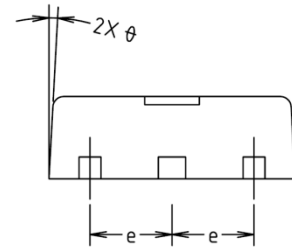
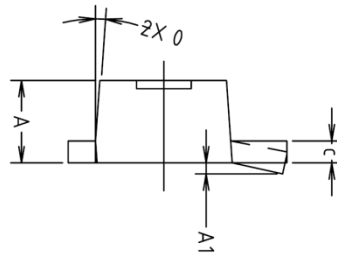
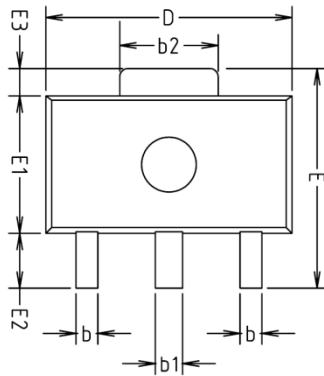
SYMBOL	MILLIMETERS(mm)		
	MINIMUM	NOMINAL	MAXIMUM
A	3.40	3.50	3.66
A1	2.46	2.51	2.59
b	0.39	0.44	0.53
b1	0.39	—	0.63
c	0.35	0.42	0.47
D	4.48	4.60	4.70
E	4.48	4.60	4.70
e	1.17	1.27	1.37
L	13.70	14.00	14.77
L1	1.55	1.70	2.15

◆ TO-92L Outline Dimension (Unit : mm)



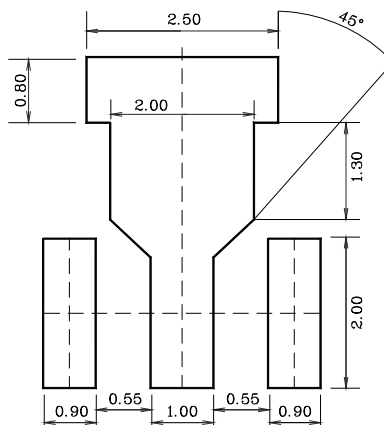
SYMBOL	MILLMETERS(mm)			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	3.70	3.90	4.10	
A1	1.25	1.45	1.65	
b	0.40	0.50	0.60	
b1	—	—	0.70	
b2	—	—	1.00	
c	0.35	0.45	0.55	
D	4.70	4.90	5.10	
D1	3.70	3.90	4.10	
E	7.80	8.00	8.20	
e	1.27 TYP			
L	13.10	13.50	13.90	
L1	0.90	1.00	1.10	
L2	1.50	1.70	1.90	

◆ SOT-89 Outline Dimension (Unit : mm)



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A	1.40	1.50	1.60	
A1	0.00	—	0.10	
b	0.38	0.42	0.48	
b1	0.48	0.52	0.58	
b2	1.79	1.82	1.87	
c	0.40	0.42	0.46	
D	4.40	4.50	4.70	
E	3.70	4.00	4.30	
E1	2.40	2.50	2.70	
E2	0.80	1.00	1.20	
E3	0.40	0.50	0.60	
e	1.50 TYP.			
θ	4° TYP.			

※ Recommend PCB solder land [Unit: mm]



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