

## Features

- 3-terminal regulators
- Output current up to 100mA
- No external components
- Internal thermal overload protection

## Applications

- TFT flat panel backlighting
  - AC/DC LED lamp
  - LED traffic light
  - T5, T8 LED line bar
  - MR-16 lamp
- Signage or decorative LED lamp

## Package Pin Out



## General Description

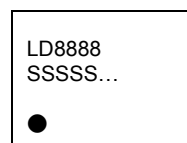
This series of fixed voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power-pass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

Part No.	Output	Package	Packing Options	
			Bag (BG)	Tape & Reel (TR)
LD6905	-5V	TO-92	LD6905T1-TU	LD6905T1-TR
LD6906	-6V		LD6906T1-TU	LD6906T1-TR
LD6908	-8V		LD6908T1-TU	LD6908T1-TR
LD6909	-9V		LD6909T1-TU	LD6909T1-TR
LD6912	-12V		LD6912T1-TU	LD6912T1-TR
LD6915	-15V		LD6915T1-TU	LD6915T1-TR
LD6918	-18V		LD6918T1-TU	LD6918T1-TR
LD6924	-24V		LD6924T1-TU	LD6924T1-TR

- Package material default is "Green" package.

## Product Marking



- ◇ Line 1 – "LD" is a fixed character  
8888: product name
- ◇ Line 2 – SSSSS...: lot number

## Absolute Maximum Ratings

Parameter	LD6905 ~ LD6909	LD6912 ~ LD6918	LD6924	Units
Input voltage	-30	-35	-40	V
Operating free-air, case, or virtual junction temperature range	0~150			°C
Storage temperature range	-65~150			°C
Lead temperature (1.6mm aside from the case,10 seconds)	260			°C

The values beyond the boundaries of absolute maximum rating may cause the damage to the device. Functional operation in this context is not implied. Continuous use of the device at the absolute rating level might influence device reliability. All voltages have their reference to device ground.

## Recommended operating conditions

Parameter	Symbol	Device Name	Min	Max	Unit
Input Voltage	$V_{IN}$	LD6905	-7	-20	V
		LD6906	-8	-20	V
		LD6908	-10.5	-23	V
		LD6909	-11.5	-24	V
		LD6912	-14.5	-27	V
		LD6915	-17.5	-30	V
		LD6918	-20.5	-33	V
		LD6924	-27	-38	V
Output Current	$I_{OUT}$	–	–	100	mA
Operating virtual junction temperature	$T_J$	–	0	125	°C

## Electrical Characteristics

LD6905 is working under  $V_{IN}=-10V$ ,  $I_{OUT}=40mA$ , at specified virtual junction temperature, unless specified.

Parameter	Symbol	Conditions <sup>*1</sup>	$T_J$	Min	Typ.	Max	Unit
Output voltage <sup>*2</sup>	$V_{OUT}$	–	25°C	-4.8	-5	-5.2	V
		$I_{OUT}=1\sim 40mA$ , $V_{IN}=-7\sim -20V$	0~+125°C	-4.75	–	-5.25	
		$I_{OUT}=1\sim 70mA$		-4.75	–	-5.25	
Input line regulation	$V_{LINEREG}$	$V_{IN}=-7\sim -20V$	25°C	–	15	150	mV
		$V_{IN}=-8\sim -20V$		–	12	100	
Ripple rejection	$G_{RIPPLE}$	$V_{IN}=-8\sim -18V$ , $f=120Hz$	25°C	41	49	–	dB
Output load regulation	$V_{LOADREG}$	$I_{OUT}=1\sim 100mA$	25°C	–	20	60	mV
		$I_{OUT}=1\sim 40mA$		–	10	30	
Output noise voltage	$V_{NOISE}$	$f=10\sim 100Hz$	25°C	–	40	–	µV
Dropout voltage	$V_{DROP}$	–	25°C	–	1.7	–	V
Bias current	$I_{BIAS}$	–	25°C	–	–	6	mA
			125°C	–	–	5.5	
Bias current change	$\Delta I_{BIAS}$	$V_{IN}=-8\sim -20V$	0~+125°C	–	–	1.5	mA
				$I_{OUT}=1\sim 40mA$	–	–	

Notes:

\*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 0.33µF capacitor across the input and a 0.1µF capacitor across the output.

\*2. This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Electrical Characteristics (Cont')

LD6906 is working under  $V_{IN}=-11V$ ,  $I_{OUT}=40mA$ , at specified virtual junction temperature, unless specified.

Parameter	Symbol	Conditions <sup>*1</sup>	T <sub>J</sub>	Min	Typ.	Max	Unit
Output voltage <sup>*2</sup>	V <sub>OUT</sub>	–	25°C	-5.75	-6	-6.25	V
		I <sub>OUT</sub> =1~40mA, V <sub>IN</sub> =-8~-20V	0~+125°C	-5.7	–	-6.3	
		I <sub>OUT</sub> =1~70mA		-5.7	–	-6.3	
Input line regulation	V <sub>LINEREG</sub>	V <sub>IN</sub> =-8~-20V	25°C	–	20	175	mV
		V <sub>IN</sub> =-9~-20V		–	15	125	
Ripple rejection	G <sub>RIPPLE</sub>	V <sub>IN</sub> =-9~-19V, f=120Hz	25°C	40	48	–	dB
Output load regulation	V <sub>LOADREG</sub>	I <sub>OUT</sub> =1~100mA	25°C	–	21	80	mV
		I <sub>OUT</sub> =1~40mA		–	11	40	
Output noise voltage	V <sub>NOISE</sub>	f=10~100Hz	25°C	–	44	–	μV
Dropout voltage	V <sub>DROP</sub>	–	25°C	–	1.7	–	V
Bias current	I <sub>BIAS</sub>	–	25°C	–	–	6	mA
			125°C	–	–	5.5	
Bias current change	ΔI <sub>BIAS</sub>	V <sub>IN</sub> =-9~-20V	0~+125°C	–	–	1.5	mA
		I <sub>OUT</sub> =1~40mA		–	–	0.1	

Notes:

- \*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 0.33μF capacitor across the input and a 0.1μF capacitor across the output.
- \*2. This specification applies only for dc power dissipation permitted by absolute maximum ratings.

LD6908 is working under  $V_{IN}=-14V$ ,  $I_{OUT}=40mA$ , at specified virtual junction temperature, unless specified.

Parameter	Symbol	Conditions <sup>*1</sup>	T <sub>J</sub>	Min	Typ.	Max	Unit
Output voltage <sup>*2</sup>	V <sub>OUT</sub>	–	25°C	-7.7	-8	-8.3	V
		I <sub>OUT</sub> =1~40mA, V <sub>IN</sub> =-10.5~-23V	0~+125°C	-7.6	–	-8.4	
		I <sub>OUT</sub> =1~70mA		-7.6	–	-8.4	
Input line regulation	V <sub>LINEREG</sub>	V <sub>IN</sub> =-10.5~-23V	25°C	–	42	175	mV
		V <sub>IN</sub> =-11~-23V		–	36	125	
Ripple rejection	G <sub>RIPPLE</sub>	V <sub>IN</sub> =-11~-21V, f=120Hz	25°C	37	46	–	dB
Output load regulation	V <sub>LOADREG</sub>	I <sub>OUT</sub> =1~100mA	25°C	–	30	100	mV
		I <sub>OUT</sub> =1~40mA		–	15	50	
Output noise voltage	V <sub>NOISE</sub>	f=10~100Hz	25°C	–	54	–	μV
Dropout voltage	V <sub>DROP</sub>	–	25°C	–	1.7	–	V
Bias current	I <sub>BIAS</sub>	–	25°C	–	–	6	mA
			125°C	–	–	5.5	
Bias current change	ΔI <sub>BIAS</sub>	V <sub>IN</sub> =-11~-23V	0~+125°C	–	–	1.5	mA
		I <sub>OUT</sub> =1~40mA		–	–	0.1	

Notes:

- \*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 0.33μF capacitor across the input and a 0.1μF capacitor across the output.
- \*2. This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Electrical Characteristics (Cont')

LD6909 is working under  $V_{IN}=-15V$ ,  $I_{OUT}=40mA$ , at specified virtual junction temperature, unless specified.

Parameter	Symbol	Conditions <sup>*1</sup>	T <sub>J</sub>	Min	Typ.	Max	Unit
Output voltage <sup>*2</sup>	V <sub>OUT</sub>	–	25°C	-8.6	-9	-9.4	V
		I <sub>OUT</sub> =1~40mA, V <sub>IN</sub> =-11.5~-24V	0~+125°C	-8.55	–	-9.45	
		I <sub>OUT</sub> =1~70mA		-8.55	–	-9.45	
Input line regulation	V <sub>LINEREG</sub>	V <sub>IN</sub> =-11.5~-24V	25°C	–	42	200	mV
		V <sub>IN</sub> =-12~-24V		–	36	150	
Ripple rejection	G <sub>RIPPLE</sub>	V <sub>IN</sub> =-12~-22V, f=120Hz	25°C	37	46	–	dB
Output load regulation	V <sub>LOADREG</sub>	I <sub>OUT</sub> =1~100mA	25°C	–	30	100	mV
		I <sub>OUT</sub> =1~40mA		–	15	50	
Output noise voltage	V <sub>NOISE</sub>	f=10~100Hz	25°C	–	54	–	μV
Dropout voltage	V <sub>DROP</sub>	–	25°C	–	1.7	–	V
Bias current	I <sub>BIAS</sub>	–	25°C	–	–	6	mA
			125°C	–	–	5.5	
Bias current change	ΔI <sub>BIAS</sub>	V <sub>IN</sub> =-12~-24V	0~+125°C	–	–	1.5	mA
		I <sub>OUT</sub> =1~40mA		–	–	0.1	

Notes:

- \*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 0.33μF capacitor across the input and a 0.1μF capacitor across the output.
- \*2. This specification applies only for dc power dissipation permitted by absolute maximum ratings.

LD6912 is working under  $V_{IN}=-19V$ ,  $I_{OUT}=40mA$ , at specified virtual junction temperature, unless specified.

Parameter	Symbol	Conditions <sup>*1</sup>	T <sub>J</sub>	Min	Typ.	Max	Unit
Output voltage <sup>*2</sup>	V <sub>OUT</sub>	–	25°C	-11.5	-12	-12.5	V
		I <sub>OUT</sub> =1~40mA, V <sub>IN</sub> =-14.5~-27V	0~+125°C	-11.4	–	-12.6	
		I <sub>OUT</sub> =1~70mA		-11.4	–	-12.6	
Input line regulation	V <sub>LINEREG</sub>	V <sub>IN</sub> =-14.5~-27V	25°C	–	50	250	mV
		V <sub>IN</sub> =-16~-27V		–	40	200	
Ripple rejection	G <sub>RIPPLE</sub>	V <sub>IN</sub> =-15~-25V, f=120Hz	25°C	37	42	–	dB
Output load regulation	V <sub>LOADREG</sub>	I <sub>OUT</sub> =1~100mA	25°C	–	24	100	mV
		I <sub>OUT</sub> =1~40mA		–	15	50	
Output noise voltage	V <sub>NOISE</sub>	f=10~100Hz	25°C	–	80	–	μV
Dropout voltage	V <sub>DROP</sub>	–	25°C	–	1.7	–	V
Bias current	I <sub>BIAS</sub>	–	25°C	–	–	6.5	mA
			125°C	–	–	6	
Bias current change	ΔI <sub>BIAS</sub>	V <sub>IN</sub> =-16~-27V	0~+125°C	–	–	1.5	mA
		I <sub>OUT</sub> =1~40mA		–	–	0.1	

Notes:

- \*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 0.33μF capacitor across the input and a 0.1μF capacitor across the output.
- \*2. This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Electrical Characteristics (Cont')

LD6915 is working under  $V_{IN}=-23V$ ,  $I_{OUT}=40mA$ , at specified virtual junction temperature, unless specified.

Parameter	Symbol	Conditions <sup>*1</sup>	T <sub>J</sub>	Min	Typ.	Max	Unit
Output voltage <sup>*2</sup>	V <sub>OUT</sub>	–	25°C	-14.4	-15	-15.6	V
		I <sub>OUT</sub> =1~40mA, V <sub>IN</sub> =-17.5~-30V	0~+125°C	-14.25	–	-15.75	
		I <sub>OUT</sub> =1~70mA		-14.25	–	-15.75	
Input line regulation	V <sub>LINEREG</sub>	V <sub>IN</sub> =-17.5~-30V	25°C	–	65	300	mV
		V <sub>IN</sub> =-20~-30V		–	50	250	
Ripple rejection	G <sub>RIPPLE</sub>	V <sub>IN</sub> =-18.5~-28.5V, f=120Hz	25°C	34	39	–	dB
Output load regulation	V <sub>LOADREG</sub>	I <sub>OUT</sub> =1~100mA	25°C	–	25	150	mV
		I <sub>OUT</sub> =1~40mA		–	15	75	
Output noise voltage	V <sub>NOISE</sub>	f=10~100Hz	25°C	–	90	–	μV
Dropout voltage	V <sub>DROP</sub>	–	25°C	–	1.7	–	V
Bias current	I <sub>BIAS</sub>	–	25°C	–	–	6.5	mA
			125°C	–	–	6	
Bias current change	ΔI <sub>BIAS</sub>	V <sub>IN</sub> =-20~-30V	0~+125°C	–	–	1.5	mA
		I <sub>OUT</sub> =1~40mA		–	–	0.1	

Notes:

- \*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 0.33μF capacitor across the input and a 0.1μF capacitor across the output.
- \*2. This specification applies only for dc power dissipation permitted by absolute maximum ratings.

LD6918 is working under  $V_{IN}=-26V$ ,  $I_{OUT}=40mA$ , at specified virtual junction temperature, unless specified.

Parameter	Symbol	Conditions <sup>*1</sup>	T <sub>J</sub>	Min	Typ.	Max	Unit
Output voltage <sup>*2</sup>	V <sub>OUT</sub>	–	25°C	-17.3	-18	-18.7	V
		I <sub>OUT</sub> =1~40mA, V <sub>IN</sub> =-20.5~-33V	0~+125°C	-17.1	–	-18.9	
		I <sub>OUT</sub> =1~70mA		-17.1	–	-18.9	
Input line regulation	V <sub>LINEREG</sub>	V <sub>IN</sub> =-20.5~-33V	25°C	–	70	325	mV
		V <sub>IN</sub> =-21~-33V		–	60	270	
Ripple rejection	G <sub>RIPPLE</sub>	V <sub>IN</sub> =-23~-33V, f=120Hz	25°C	33	48	–	dB
Output load regulation	V <sub>LOADREG</sub>	I <sub>OUT</sub> =1~100mA	25°C	–	27	180	mV
		I <sub>OUT</sub> =1~40mA		–	19	85	
Output noise voltage	V <sub>NOISE</sub>	f=10~100Hz	25°C	–	150	–	μV
Dropout voltage	V <sub>DROP</sub>	–	25°C	–	1.7	–	V
Bias current	I <sub>BIAS</sub>	–	25°C	–	–	6.5	mA
			125°C	–	–	6	
Bias current change	ΔI <sub>BIAS</sub>	V <sub>IN</sub> =-21~-33V	0~+125°C	–	–	1.5	mA
		I <sub>OUT</sub> =1~40mA		–	–	0.1	

Notes:

- \*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 0.33μF capacitor across the input and a 0.1μF capacitor across the output.
- \*2. This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Electrical Characteristics (Cont')

LD6924 is working under  $V_{IN}=-33V$ ,  $I_{OUT}=40mA$ , at specified virtual junction temperature, unless specified.

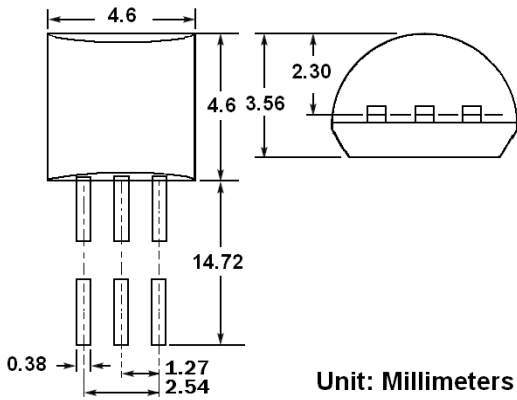
Parameter	Symbol	Conditions <sup>*1</sup>	T <sub>J</sub>	Min	Typ.	Max	Unit
Output voltage <sup>*2</sup>	V <sub>OUT</sub>	–	25°C	-23	-24	-25	V
		I <sub>OUT</sub> =1~40mA, V <sub>IN</sub> =-27~-38V	0~+125°C	-22.8	–	-25.2	
		I <sub>OUT</sub> =1~70mA		-22.8	–	-25.2	
Input line regulation	V <sub>LINEREG</sub>	V <sub>IN</sub> =-27~-39V	25°C	–	90	350	mV
		V <sub>IN</sub> =-28~-389V		–	75	300	
Ripple rejection	G <sub>RIPPLE</sub>	V <sub>IN</sub> =-29~-35V, f=120Hz	25°C	31	47	–	dB
Output load regulation	V <sub>LOADREG</sub>	I <sub>OUT</sub> =1~100mA	25°C	–	40	200	mV
		I <sub>OUT</sub> =1~40mA		–	25	100	
Output noise voltage	V <sub>NOISE</sub>	f=10~100Hz	25°C	–	200	–	μV
Dropout voltage	V <sub>DROP</sub>	–	25°C	–	1.7	–	V
Bias current	I <sub>BIAS</sub>	–	25°C	–	–	6.5	mA
			125°C	–	–	6	
Bias current change	ΔI <sub>BIAS</sub>	V <sub>IN</sub> =-28~-38V	0~+125°C	–	–	1.5	mA
		I <sub>OUT</sub> =1~40mA		–	–	0.1	

Notes:

- \*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 0.33μF capacitor across the input and a 0.1μF capacitor across the output.
- \*2. This specification applies only for dc power dissipation permitted by absolute maximum ratings.

## Package Outline

### TO-92:



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