



3-Terminal Negative voltage Regulators

DESCRIPTION

These voltage regulators are designed as fixed negative voltage regulators for a wide variety of applications including local, on-card regulation. Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

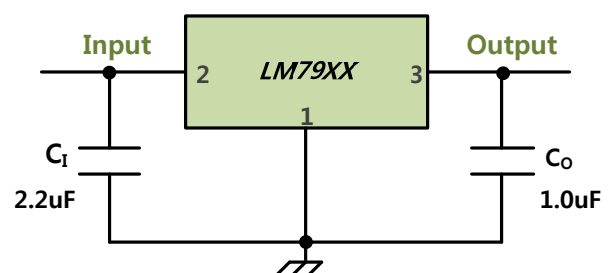
FEATURES

- Output current in excess of 1.0A
- No external components required
- Output Voltages (-5V, -6V, -8V, -9V, -10V, -12V, -15V, -18V)
- Internal Thermal shutdown and SOA protection
- Output voltage offered in 4% Tolerance
- Pb-Free Packages are available
- High ESD Level (HBM>8000V, MM>800V)

TYPICAL APPLICATION

The input voltage must remain typically 2.0V above the output voltage even during the low point on the ripple voltage.

- * C_i is required if regulator is located an appreciable Distance from power filter.
- * C_o improves transient response.
Values of $\leq 1.0 \mu\text{F}$ could cause instability.



1.0A ,Negative voltage Regulators



Maximum Ratings (T_A=25 °C, unless otherwise noted)

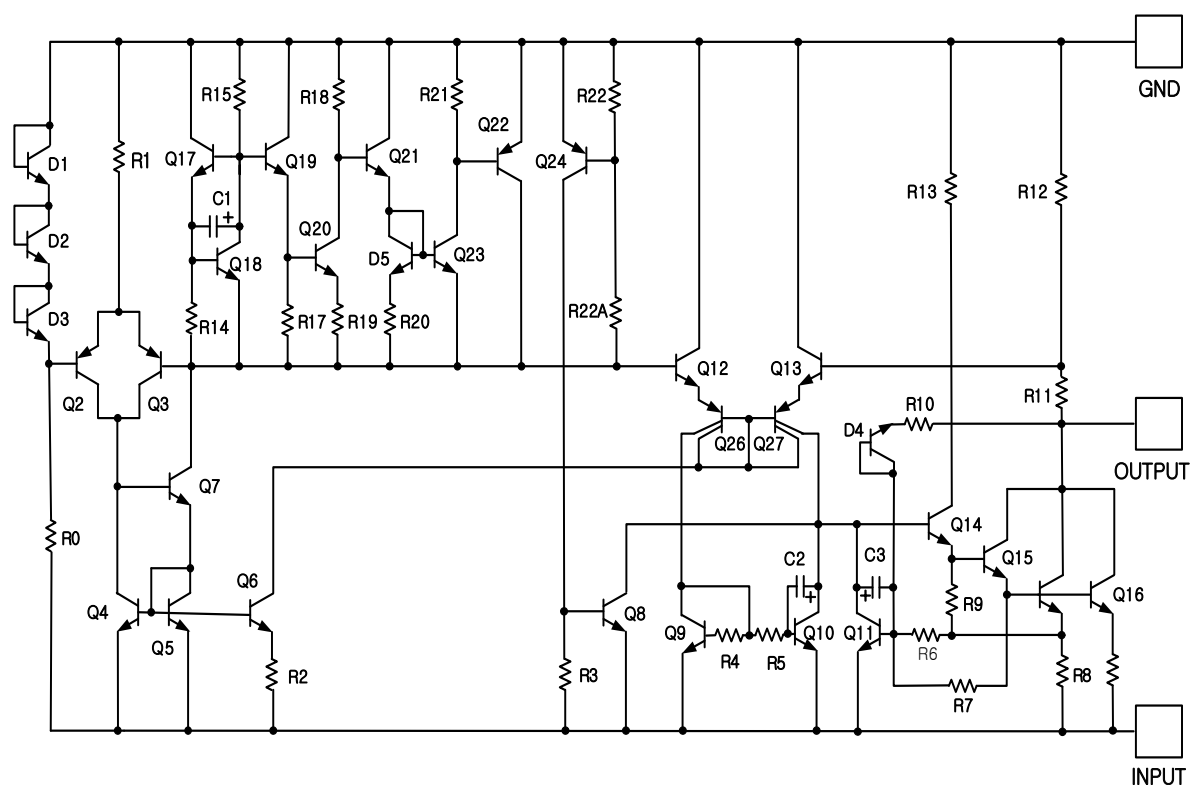
Rating		Symbol	Value			Unit
			TO-220F	TO-220	TO-252	
Input Voltage	-5V ~ -18V	VI	-35			V
	-24V		-40			
Power Dissipation		PD	2	2	1.3	W
Thermal Resistance of Junction to Ambient		RθJA	65	65	92	°C/W
Thermal Resistance of Junction to Case		RθJC	5	5	5	°C/W
Storage Temperature		TSTG	-55 ~ 125			°C
Junction Temperature		TJ	+ 150			°C
Operating Temperature		TOPR	-40 ~ 125			°C

Stresses exceeding Maximum ratings may damage the device. Maximum ratings are stress ratings. Functional operation above the recommended operating conditions is not implied.

Extended exposure to stresses the above the recommended operating conditions may affect device reliability.

$PD(max) = (TJ(max) - TA) \div \theta JA$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

Representative Schematic of LM79XX



REV. 03



Ordering Information

Part No	Package	Packing	Finish	Halogen	Packing Unit	Remark
LM79XXRTRL	TO-252	Reel & Tape	Sn	Free	2,500ea	XX : Output Voltage option *
LM79XXFTL	TO-220F	Tube	Sn	Free	5,000ea	XX : Output Voltage option *
LM79XXTL	TO-220	Tube	Sn	Free	5,000ea	XX : Output Voltage option *

* Voltage option (XX) : -5V(05), -6V(06), -8V(08), -9V(09), -10V(10), -12V(12), -15V(15), -18V(18), -24V(24)

Package Outline



TO-220



TO-220F



TO-252

PIN INFO.

1. GND PIN

2. INPUT PIN

3. OUTPUT PIN



Electrical characteristics

***Note 1** Line and Load regulation are specified at constant junction temperature. Changes of V_O due to heating effects must be taken into account separately. Pulse testing with low duty circle is used.

Electrical characteristics (LM7905)

($T_J = 0$ to 125°C , $V_{IN}=10\text{V}$, $I_O=500\text{ mA}$, $C_I=2.2\text{ }\mu\text{F}$, $C_O=1.0\text{ }\mu\text{F}$, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V_O	$T_J=25^\circ\text{C}$	-4.8	-5.0	-5.2	V
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$, $P_D \leq 15\text{W}$ $-7.0\text{V} \geq V_{IN} \geq -20.0\text{V}$	-4.75	-5.0	-5.25	
Line regulation ($T_J=25^\circ\text{C}$) (Note 1)	Regline	$-7.0\text{V} \geq V_{IN} \geq -25.0\text{V}$			100	mV
		$-8.0\text{V} \geq V_{IN} \geq -12.0\text{V}$			50	
Load regulation ($T_J=25^\circ\text{C}$) (Note 1)	Regload	$5.0\text{ mA} \leq I_O \leq 1.5\text{A}$			100	mV
		$250\text{ mA} \leq I_O \leq 750\text{ mA}$			50	
Quiescent current	I_Q	$T_J=25^\circ\text{C}$			6.0	mA
Quiescent current change	ΔI_Q	$5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$			0.5	mA
		$-8.0\text{V} \geq V_{IN} \geq -25.0\text{V}$			0.8	
Output Voltage Drift	$\Delta V_O/\Delta T$	$I_O = 5.0\text{ mA}$		-0.4		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$10\text{ Hz} \leq f \leq 100\text{ KHz}$, $T_A=25^\circ\text{C}$		40		$\mu\text{V}/V_O$
Ripple rejection	RR	$-8.0\text{V} \geq V_{IN} \geq -18.0\text{V}$, $f=120\text{ Hz}$	54	60		dB
Dropout voltage	V_{DROP}	$I_O = 1.0\text{A}$, $T_J=25^\circ\text{C}$		1.3		V
Short circuit current limit	ISC	$V_{IN} = -35\text{V}$, $T_A=25^\circ\text{C}$		500		mA
Peak output current	IPK	$T_J=25^\circ\text{C}$		2.2		A

Electrical characteristics (LM7906)

($T_J = 0$ to 125°C , $V_{IN}=11\text{V}$, $I_O=500\text{ mA}$, $C_I=2.2\text{ }\mu\text{F}$, $C_O=1.0\text{ }\mu\text{F}$, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V_O	$T_J=25^\circ\text{C}$	-5.75	-6.0	-6.25	V
		$5.0\text{mA} \leq I_O \leq 1.0\text{A}$, $P_D \leq 15\text{W}$ $-8.0\text{V} \geq V_{IN} \geq -21.0\text{V}$	-5.7	-6.0	-6.3	
Line regulation ($T_J=25^\circ\text{C}$) (Note 1)	Regline	$-8.0\text{V} \geq V_{IN} \geq -25.0\text{V}$			120	mV
		$-9.0\text{V} \geq V_{IN} \geq -13.0\text{V}$			60	
Load regulation ($T_J=25^\circ\text{C}$) (Note 1)	Regload	$5.0\text{ mA} \leq I_O \leq 1.5\text{A}$			120	mV
		$250\text{ mA} \leq I_O \leq 750\text{ mA}$			60	
Quiescent current	I_Q	$T_J=25^\circ\text{C}$			6.0	mA
Quiescent current change	ΔI_Q	$5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$			0.5	mA
		$-8.0\text{V} \geq V_{IN} \geq -25.0\text{V}$			1.3	
Output Voltage Drift	$\Delta V_O/\Delta T$	$I_O = 5.0\text{ mA}$		-0.5		mV/ $^\circ\text{C}$
Output noise voltage	V_N	$10\text{ Hz} \leq f \leq 100\text{ KHz}$, $T_A=25^\circ\text{C}$		130		$\mu\text{V}/V_O$
Ripple rejection	RR	$-9.0\text{V} \geq V_{IN} \geq -19.0\text{V}$, $f=120\text{ Hz}$	54	60		dB
Dropout voltage	V_{DROP}	$I_O = 1.0\text{A}$, $T_J=25^\circ\text{C}$		1.3		V
Short circuit current limit	ISC	$V_{IN} = -35\text{V}$, $T_A=25^\circ\text{C}$		500		mA
Peak output current	IPK	$T_J=25^\circ\text{C}$		2.2		A



Electrical characteristics (LM7908)

(T_J = 0 to 125 °C, V_{IN}=14V, I_O=500 mA, C_I=2.2 μF, C_O=1.0 μF, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V _O	T _J =25°C	-7.7	-8.0	-8.3	V
		5.0mA ≤ I _O ≤ 1.0A, PD≤15W -10.5V ≥ V _{IN} ≥ -23.0V	-7.6	-8.0	-8.4	
Line regulation (T _J =25°C) (Note 1)	Regline	-10.5V ≥ V _{IN} ≥ -25.0V -11.5V ≥ V _{IN} ≥ -17.0V			160	mV
					80	
Load regulation (T _J =25°C) (Note 1)	Regload	5.0 mA ≤ I _O ≤ 1.5A 250 mA ≤ I _O ≤ 750 mA			160	mV
					80	
Quiescent current	I _Q	T _J =25°C			6.0	mA
Quiescent current change	Δ I _Q	5.0 mA ≤ I _O ≤ 1.0 A -10.5V ≥ V _{IN} ≥ -25.0V			0.5	mA
					1.0	
Output Voltage Drift	ΔV _O /ΔT	I _O = 5.0 mA		-0.6		mV/°C
Output noise voltage	V _N	10 Hz ≤ f ≤ 100 KHz, T _A =25°C		175		μV/V _O
Ripple rejection	RR	-11.5V ≥ V _{IN} ≥ -21.5V, f=120 Hz	54	60		dB
Dropout voltage	V _{DROP}	I _O = 1.0A, T _J =25°C		1.3		V
Short circuit current limit	I _{SC}	V _{IN} = -35V, T _A =25°C		500		mA
Peak output current	I _{PK}	T _J =25°C		2.2		A

Electrical characteristics (LM7909)

(T_J = 0 to 125 °C, V_{IN}=15V, I_O=500 mA, C_I=2.2 μF, C_O=1.0 μF, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V _O	T _J =25°C	-8.65	-9.0	-9.35	V
		5.0mA ≤ I _O ≤ 1.0A, PD≤15W -11.5V ≥ V _{IN} ≥ -24.0V	-8.6	-9.0	-9.4	
Line regulation (T _J =25°C) (Note 1)	Regline	-11.5V ≥ V _{IN} ≥ -25.0V -12.0V ≥ V _{IN} ≥ -17.0V			180	mV
					90	
Load regulation (T _J =25°C) (Note 1)	Regload	5.0 mA ≤ I _O ≤ 1.5A 250 mA ≤ I _O ≤ 750 mA			180	mV
					90	
Quiescent current	I _Q	T _J =25°C			6.0	mA
Quiescent current change	Δ I _Q	5.0 mA ≤ I _O ≤ 1.0 A -11.5V ≥ V _{IN} ≥ -26.0V			0.5	mA
					1.0	
Output Voltage Drift	ΔV _O /ΔT	I _O = 5.0 mA		-0.6		mV/°C
Output noise voltage	V _N	10 Hz ≤ f ≤ 100 KHz, T _A =25°C		175		μV/V _O
Ripple rejection	RR	-13.0V ≥ V _{IN} ≥ -23.0V, f=120 Hz	54	60		dB
Dropout voltage	V _{DROP}	I _O = 1.0A, T _J =25°C		1.3		V
Short circuit current limit	I _{SC}	V _{IN} = -35V, T _A =25°C		500		mA
Peak output current	I _{PK}	T _J =25°C		2.2		A



Electrical characteristics (LM7910)

(T_J = 0 to 125 °C, V_{IN}=16V, I_O=500 mA, C_I=2.2 μF, C_O=1.0 μF, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V _O	T _J =25°C	-9.6	-10.0	-10.4	V
		5.0mA ≤ I _O ≤ 1.0A, PD≤15W -12.5V ≥ V _{IN} ≥ -25.0V	-9.5	-10.0	-10.5	
Line regulation (T _J =25°C) (Note 1)	Regline	-12.5V ≥ V _{IN} ≥ -25.0V -13.0V ≥ V _{IN} ≥ -25.0V			200	mV
					100	
Load regulation (T _J =25°C) (Note 1)	Regload	5.0 mA ≤ I _O ≤ 1.5A 250 mA ≤ I _O ≤ 750 mA			200	mV
					100	
Quiescent current	I _Q	T _J =25°C			6.0	mA
Quiescent current change	Δ I _Q	5.0 mA ≤ I _O ≤ 1.0 A -12.5V ≥ V _{IN} ≥ -29.0V			0.5	mA
					1.0	
Output Voltage Drift	ΔV _O /ΔT	I _O = 5.0 mA		-1.0		mV/°C
Output noise voltage	V _N	10 Hz ≤ f ≤ 100 KHz, T _A =25°C		280		μV/V _O
Ripple rejection	RR	-13.0V ≥ V _{IN} ≥ -23.0V, f=120 Hz	54	60		dB
Dropout voltage	V _{DROP}	I _O = 1.0A, T _J =25°C		2.0		V
Short circuit current limit	I _{SC}	V _{IN} = -35V, T _A =25°C		500		mA
Peak output current	I _{PK}	T _J =25°C		2.2		A

Electrical characteristics (LM7912)

(T_J = 0 to 125 °C, V_{IN}=19V, I_O=500 mA, C_I=2.2 μF, C_O=1.0 μF, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V _O	T _J =25°C	-11.5	-12.0	-12.5	V
		5.0mA ≤ I _O ≤ 1.0A, PD≤15W -14.5V ≥ V _{IN} ≥ -27.0V	-11.4	-12.0	-12.6	
Line regulation (T _J =25°C) (Note 1)	Regline	-14.5V ≥ V _{IN} ≥ -30.0V -16.0V ≥ V _{IN} ≥ -22.0V			240	mV
					120	
Load regulation (T _J =25°C) (Note 1)	Regload	5.0 mA ≤ I _O ≤ 1.5A 250 mA ≤ I _O ≤ 750 mA			240	mV
					120	
Quiescent current	I _Q	T _J =25°C			6.0	mA
Quiescent current change	Δ I _Q	5.0 mA ≤ I _O ≤ 1.0 A -14.5V ≥ V _{IN} ≥ -30.0V			0.5	mA
					1.0	
Output Voltage Drift	ΔV _O /ΔT	I _O = 5.0 mA		-0.8		mV/°C
Output noise voltage	V _N	10 Hz ≤ f ≤ 100 KHz, T _A =25°C		200		μV/V _O
Ripple rejection	RR	-15.0V ≥ V _{IN} ≥ -25.0V, f=120 Hz	54	60		dB
Dropout voltage	V _{DROP}	I _O = 1.0A, T _J =25°C		1.3		V
Short circuit current limit	I _{SC}	V _{IN} = -35V, T _A =25°C		500		mA
Peak output current	I _{PK}	T _J =25°C		2.2		A



Electrical characteristics (LM7915)

(T_J = 0 to 125 °C, V_{IN}=23V, I_O=500 mA, C_I=2.2 μF, C_O=1.0 μF, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V _O	T _J =25°C	-14.4	-15.0	-15.6	V
		5.0mA ≤ I _O ≤ 1.0A, P _D ≤15W -17.5V ≥ V _{IN} ≥ -30.0V	-14.25	-15.0	-15.75	
Line regulation (T _J =25°C) (Note 1)	Regline	-17.5V ≥ V _{IN} ≥ -30.0V -20.0V ≥ V _{IN} ≥ -26.0V			300	mV
					150	
Load regulation (T _J =25°C) (Note 1)	Regload	5.0 mA ≤ I _O ≤ 1.5A 250 mA ≤ I _O ≤ 750 mA			300	mV
					150	
Quiescent current	I _Q	T _J =25°C			6.0	mA
Quiescent current change	Δ I _Q	5.0 mA ≤ I _O ≤ 1.0 A -17.5V ≥ V _{IN} ≥ -30.0V			0.5	mA
					1.0	
Output Voltage Drift	ΔV _O /ΔT	I _O = 5.0 mA		-0.9		mV/°C
Output noise voltage	V _N	10 Hz ≤ f ≤ 100 KHz, T _A =25°C		250		μV/V _O
Ripple rejection	RR	-18.5V ≥ V _{IN} ≥ -28.5V, f=120 Hz	54	60		dB
Dropout voltage	V _{DROP}	I _O = 1.0A, T _J =25°C		1.3		V
Short circuit current limit	I _{SC}	V _{IN} = -35V, T _A =25°C		500		mA
Peak output current	I _{PK}	T _J =25°C		2.2		A

Electrical characteristics (LM7918)

(T_J = 0 to 125 °C, V_{IN}=27V, I_O=500 mA, C_I=2.2 μF, C_O=1.0 μF, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V _O	T _J =25°C	-17.3	-18.0	-18.7	V
		5.0mA ≤ I _O ≤ 1.0A, P _D ≤15W -21.0V ≥ V _{IN} ≥ -33.0V	-17.1	-18.0	-18.9	
Line regulation (T _J =25°C) (Note 1)	Regline	-21.0V ≥ V _{IN} ≥ -33.0V -24.0V ≥ V _{IN} ≥ -30.0V			360	mV
					180	
Load regulation (T _J =25°C) (Note 1)	Regload	5.0 mA ≤ I _O ≤ 1.5A 250 mA ≤ I _O ≤ 750 mA			360	mV
					180	
Quiescent current	I _Q	T _J =25°C			6.0	mA
Quiescent current change	Δ I _Q	5.0 mA ≤ I _O ≤ 1.0 A -21.0V ≥ V _{IN} ≥ -33.0V			0.5	mA
					1.0	
Output Voltage Drift	ΔV _O /ΔT	I _O = 5.0 mA		-1.0		mV/°C
Output noise voltage	V _N	10 Hz ≤ f ≤ 100 KHz, T _A =25°C		300		μV/V _O
Ripple rejection	RR	-22.0V ≥ V _{IN} ≥ -32.0V, f=120 Hz	54	60		dB
Dropout voltage	V _{DROP}	I _O = 1.0A, T _J =25°C		1.3		V
Short circuit current limit	I _{SC}	V _{IN} = -35V, T _A =25°C		500		mA
Peak output current	I _{PK}	T _J =25°C		2.2		A



Electrical characteristics (LM7924)

(T_J = 0 to 125 °C, V_{IN}=33V, I_O=500 mA, C_I=2.2 μF, C_O=1.0 μF, unless otherwise noted)

Characteristic	Symbol	Condition	Min	Typ	Max	Unit
Output voltage	V _O	T _J =25°C	-23.0	-24.0	-25.0	V
		5.0mA ≤ I _O ≤ 1.0A, PD≤15W -27.0V ≥ V _{IN} ≥ -38.0V	-22.8	-24.0	-25.25	
Line regulation (T _J =25°C) (Note 1)	Regline	-27.0V ≥ V _{IN} ≥ -38.0V -30.0V ≥ V _{IN} ≥ -36.0V			480	mV
					180	
Load regulation (T _J =25°C) (Note 1)	Regload	5.0 mA ≤ I _O ≤ 1.5A 250 mA ≤ I _O ≤ 750 mA			480	mV
					240	
Quiescent current	I _Q	T _J =25°C			6.0	mA
Quiescent current change	Δ I _Q	5.0 mA ≤ I _O ≤ 1.0 A -27.0V ≥ V _{IN} ≥ -38.0V			0.5	mA
					1.0	
Output Voltage Drift	ΔV _O /ΔT	I _O = 5.0 mA		-1.0		mV/°C
Output noise voltage	V _N	10 Hz ≤ f ≤ 100 KHz, T _A =25°C		400		μV/V _O
Ripple rejection	RR	-28.0V ≥ V _{IN} ≥ -38.0V, f=120 Hz	54	60		dB
Dropout voltage	V _{DROP}	I _O = 1.0A, T _J =25°C		1.3		V
Short circuit current limit	I _{SC}	V _{IN} = -35V, T _A =25°C		500		mA
Peak output current	I _{PK}	T _J =25°C		2.2		A



Typical Performance Characteristics

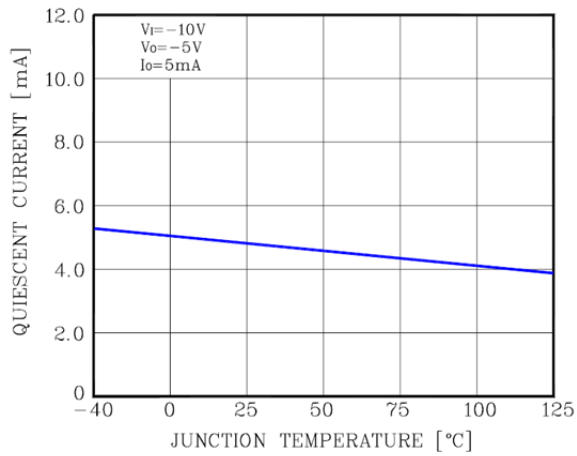


Figure 1. Quiescent Current

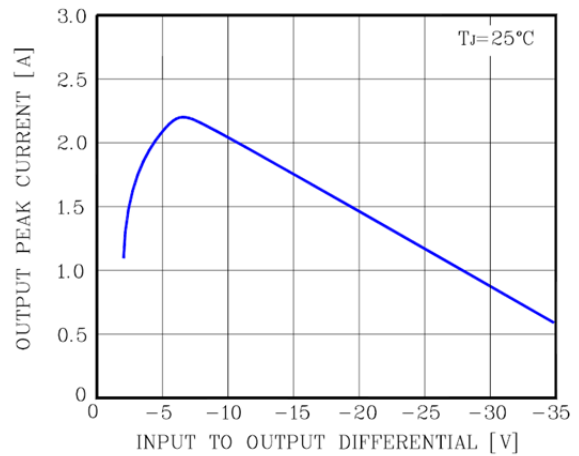


Figure 2. Output Peak Current

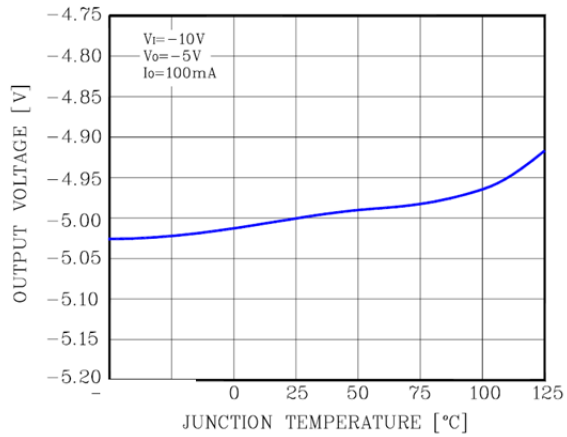


Figure 3. Output Voltage

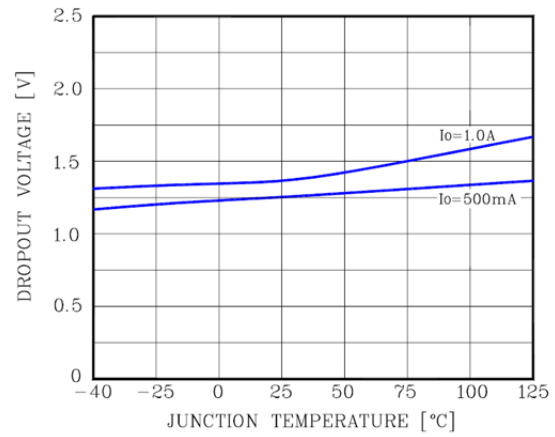


Figure 4. Dropout Voltage



Typical Applications

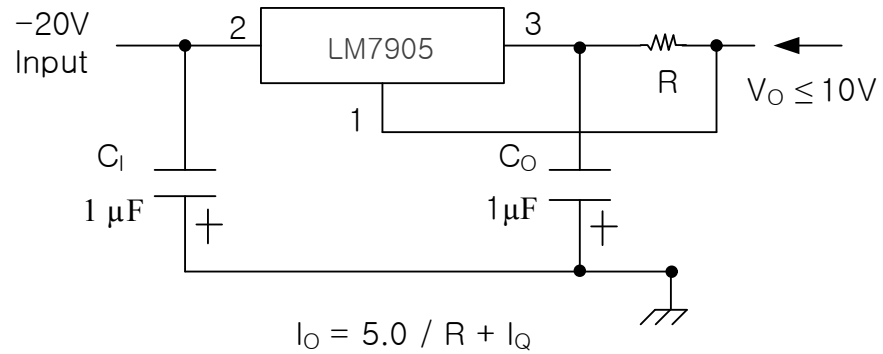


Figure 4-1 Constant Current Regulator

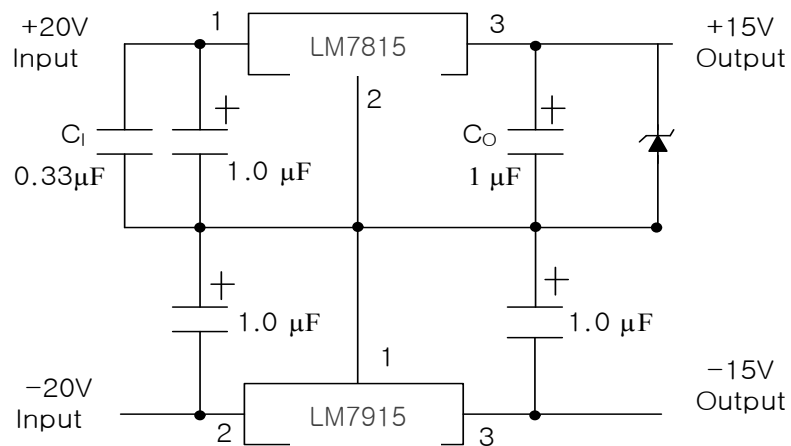
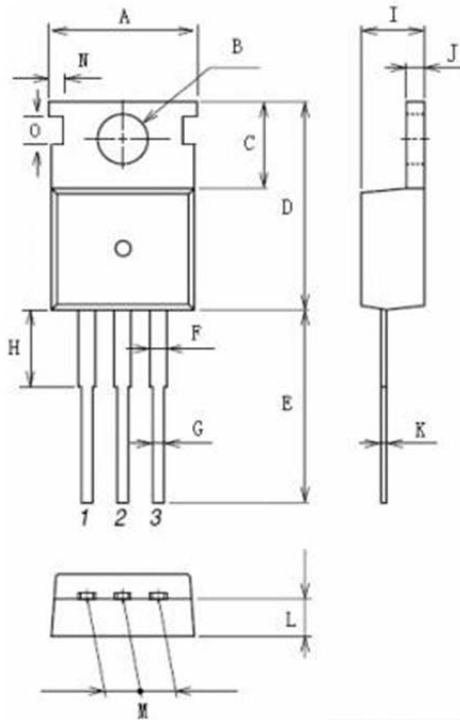


Figure 4-2 Operation Amplifier Supply (±15V @ 1.0A)



Package Dimensions

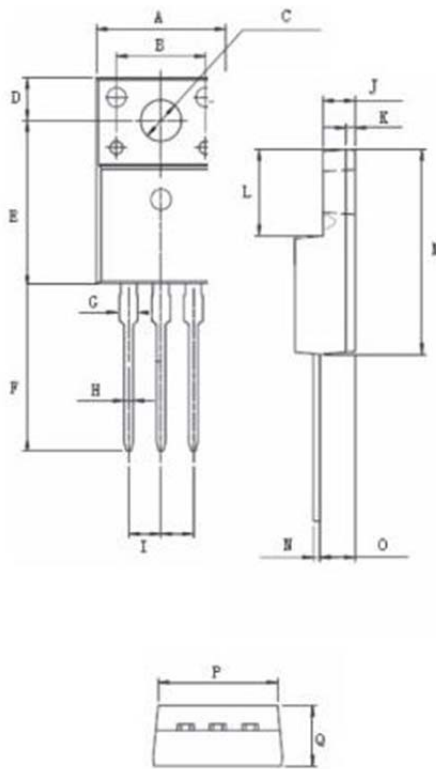
TO-220 Dual Gauge



Unit: mm

Item	Min	Max
A	9.85	10.15
B	3.60	3.70
C	6.35	6.55
D	15.55	15.95
E	12.85	13.15
F	1.17	1.37
G	0.70	0.90
H	2.30	2.70
I	4.40	4.60
J	1.20	1.40
K	0.40	0.60
L	2.23	2.53
M	4.98	5.18
N	0.55	0.75
O	1.62	1.82

TO-220F



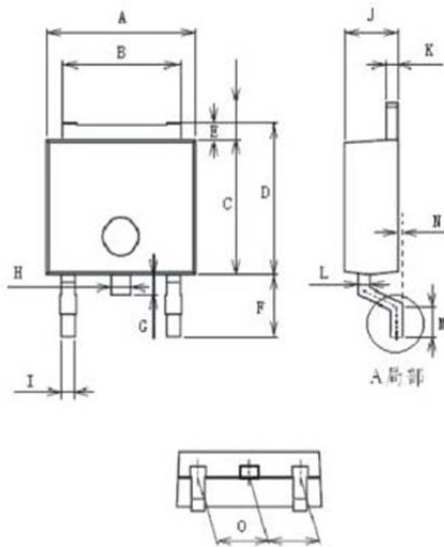
Unit: mm

Item	Min	Max
A	9.92	10.32
B	6.90	7.10
C	3.35	3.55
D	3.25	3.35
E	12.35	12.75
F	12.80	13.20
G	1.22	1.42
H	0.70	0.90
I	2.45Typical	
J	2.45	2.65
K	0.60	0.80
L	6.57	6.77
M	15.80	16.00
N	0.40	0.60
O	2.62	2.92
P	9.20	9.40
Q	4.62	4.80



Package Dimensions

TO-252



Unit: mm

Item	Min	Max
A	6.40	6.70
B	5.20	5.40
C	6.00	6.30
D	6.55	6.85
E	0.45	0.60
F	3.07	3.35
G	0.85	1.05
H	0.75	0.95
I	0.55	0.75
J	2.20	2.40
K	0.43	0.58
L	0.43	0.58
M	0.90	1.10
N	0.90	1.10
O	2.20	2.40



Revision History

No	Date	Contents
1	2015-01-30	Initial Brief Datasheet Release
2	2015-06-22	ESD Level Update
3	2016-11-07	Power Dissipation Update



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