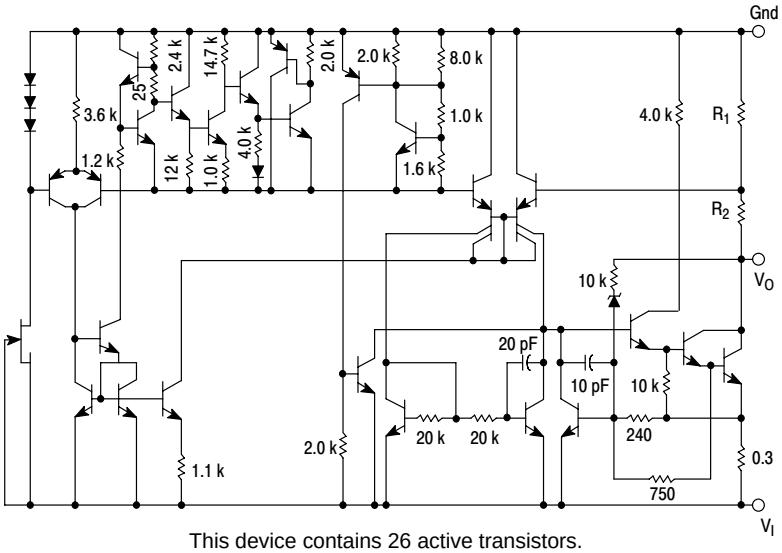
MC7900 Series

1.0 A Negative Voltage Regulators

The MC7900 series of fixed output negative voltage regulators are intended as complements to the popular MC7800 series devices. These negative regulators are available in the same seven−voltage options as the MC7800 devices. In addition, one extra voltage option commonly employed in MECL systems is also available in the negative MC7900 series.

Available in fixed output voltage options from −5.0 V to −24 V, these regulators employ current limiting, thermal shutdown, and safe−area compensation − making them remarkably rugged under most operating conditions. With adequate heatsinking they can deliver output currents in excess of 1.0 A.

- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe−Area Compensation
- Available in 2% Voltage Tolerance (See Ordering Information)
- Pb−Free Package May be Available. The G−Suffix Denotes a Pb−Free Lead Finish



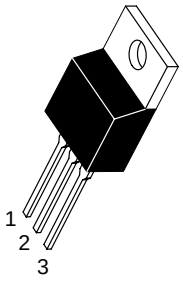
This device contains 26 active transistors.

Figure 1. Representative Schematic Diagram

ON Semiconductor®

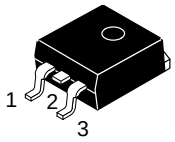
TO−220
T SUFFIX
CASE 221AB

Heatsink surface connected to Pin 2.



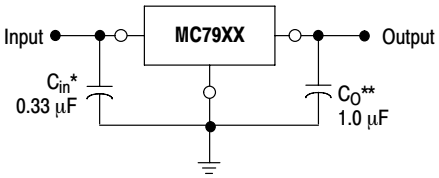
Pin 1. Ground
2. Input
3. Output

D^2PAK
D2T SUFFIX
CASE 936



Heatsink surface (shown as terminal 4 in case outline drawing) is connected to Pin 2.

STANDARD APPLICATION



A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above more negative even during the high point of the input ripple voltage.

XX, These two digits of the type number indicate nominal voltage.
* C_{in} is required if regulator is located an appreciable distance from power supply filter.
** C_O improve stability and transient response.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 11 of this data sheet.

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 14 of this data sheet.

Publication Order Number:
MC7900/D

MAXIMUM RATINGS (T_A = +25°C, unless otherwise noted.)

Rating	Symbol	Value	Unit
Input Voltage (−5.0 V ≥ V_O ≥ −18 V) (24 V)	V_I	−35 −40	Vdc
Power Dissipation Case 221A T_A = +25°C Thermal Resistance, Junction−to−Ambient Thermal Resistance, Junction−to−Case Case 936 (D^2PAK) T_A = +25°C Thermal Resistance, Junction−to−Ambient Thermal Resistance, Junction−to−Case	 P_D θ_{JA} θ_{JC} P_D θ_{JA} θ_{JC}	 Internally Limited 65 5.0 Internally Limited 70 5.0	 W °C/W °C/W W °C/W °C/W
Storage Junction Temperature Range	T_{stg}	−65 to +150	°C
Junction Temperature	T_J	+150	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

*This device series contains ESD protection and exceeds the following tests:
Human Body Model 2000 V per MIL_STD_883, Method 3015
Machine Model Method 200 V

MC7905B, MC7905C

ELECTRICAL CHARACTERISTICS (V_I = −10 V, I_O = 500 mA, Tlow* < T_J < +125°C, unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	−4.8	−5.0	−5.2	Vdc
Line Regulation (Note 1) (T_J = +25°C, I_O = 100 mA) −7.0 Vdc ≥ V_I ≥ −25 Vdc −8.0 Vdc ≥ V_I ≥ −12 Vdc (T_J = +25°C, I_O = 500 mA) −7.0 Vdc ≥ V_I ≥ −25 Vdc −8.0 Vdc ≥ V_I ≥ −12 Vdc	Reg_{line}	 − − − −	 7.0 2.0 35 8.0	 50 25 100 50	mV
Load Regulation, T_J = +25°C (Note 1) 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 − −	 11 4.0	 100 50	mV
Output Voltage −7.0 Vdc ≥ V_I ≥ −20 Vdc, 5.0 mA ≤ I_O ≤ 1.0 A, P ≤ 15 W	V_O	−4.75	−	−5.25	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	−	4.3	8.0	mA
Input Bias Current Change −7.0 Vdc ≥ V_I ≥ −25 Vdc 5.0 mA ≤ I_O ≤ 1.5 A	ΔI_{IB}	 − −	 − −	 1.3 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	−	40	−	μV
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	−	70	−	dB
Dropout Voltage I_O = 1.0 A, T_J = +25°C	V_I−V_O	 −	 1.3	 −	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, Tlow* ≤ T_J ≤ +125°C	$\Delta V_O/\Delta T$	 −	 −1.0	 −	mV/°C

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

*Tlow = −40°C for MC7905B and Tlow = 0°C for MC7905C.

MC7915B, MC7915C
ELECTRICAL CHARACTERISTICS (V_I = −23 V, I_O = 500 mA, Tlow* < T_J < +125°C, unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	−14.4	−15	−15.6	Vdc
Line Regulation (Note 5) (T_J = +25°C, I_O = 100 mA) −17.5 Vdc ≥ V_I ≥ −30 Vdc −20 Vdc ≥ V_I ≥ −26 Vdc (T_J = +25°C, I_O = 500 mA) −17.5 Vdc ≥ V_I ≥ −30 Vdc −20 Vdc ≥ V_I ≥ −26 Vdc	Reg_{line}	 – – – –	 14 6.0 57 27	 150 75 300 150	mV
Load Regulation, T_J = +25°C (Note 5) 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 – –	 68 25	 300 150	mV
Output Voltage −17.5 Vdc ≥ V_I ≥ −30 Vdc, 5.0 mA ≤ I_O ≤ 1.0 A, P ≤ 15 W	V_O	 −14.25	 –	 −15.75	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	–	4.4	8.0	mA
Input Bias Current Change −17.5 Vdc ≥ V_I ≥ −30 Vdc 5.0 mA ≤ I_O ≤ 1.5 A	ΔI_{IB}	 – –	 – –	 1.0 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	90	–	μV
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	–	60	–	dB
Dropout Voltage (I_O = 1.0 A, T_J = +25°C)	V_I−V_O	–	1.3	–	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 A, Tlow* ≤ T_J ≤ +125°C	$\Delta V_O/\Delta T$	 –	 −1.0	 –	mV/°C

MC7915AC
ELECTRICAL CHARACTERISTICS (V_I = −23 V, I_O = 500 mA, Tlow* < T_J < +125°C, unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	−14.7	−15	−15.3	Vdc
Line Regulation (Note 5) −20 Vdc ≥ V_I ≥ −26 Vdc, I_O = 1.0 A, T_J = +25°C −20 Vdc ≥ V_I ≥ −26 Vdc, I_O = 1.0 A, −17.9 Vdc ≥ V_I ≥ −30 Vdc, I_O = 500 mA −17.5 Vdc ≥ V_I ≥ −30 Vdc, I_O = 1.0 A, T_J = +25°C	Reg_{line}	 – – – –	 27 57 57 57	 75 150 150 150	mV
Load Regulation (Note 5) 5.0 mA ≤ I_O ≤ 1.5 A, T_J = +25°C 250 mA ≤ I_O ≤ 750 mA 5.0 mA ≤ I_O ≤ 1.0 A	Reg_{load}	 – – –	 68 25 40	 150 75 150	mV
Output Voltage −17.9 Vdc ≥ V_I ≥ −30 Vdc, 5.0 mA ≤ I_O ≤ 1.0 A, P ≤ 15 W	V_O	 −14.4	 –	 −15.6	Vdc
Input Bias Current	I_{IB}	–	4.4	8.0	mA
Input Bias Current Change −17.5 Vdc ≥ V_I ≥ −30 Vdc 5.0 mA ≤ I_O ≤ 1.0 A 5.0 mA ≤ I_O ≤ 1.5 A, T_J = +25°C	ΔI_{IB}	 – – –	 – – –	 0.8 0.5 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	–	90	–	μV
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	–	60	–	dB
Dropout Voltage (I_O = 1.0 A, T_J = +25°C)	V_I−V_O	–	1.3	–	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, Tlow* ≤ T_J ≤ +125°C	$\Delta V_O/\Delta T$	 –	 −1.0	 –	mV/°C

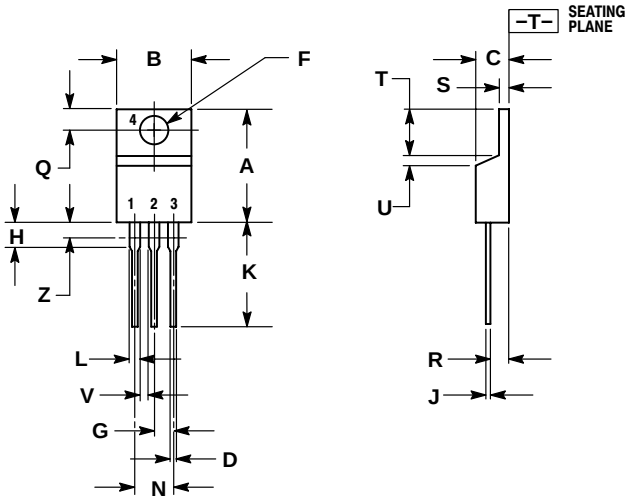
5. Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty cycle is used.

*Tlow = −40°C for MC7915B and Tlow = 0°C for MC7915C.

Device	Nominal Output Voltage	Output Voltage Tolerance	Package	Operating Temperature Range	Shipping†
MC7912ACD2T	−12 V	2%	D^2PAK	T_J = 0°C to +125°C	50 Units/Rail
MC7912ACD2TG			D^2PAK (Pb−Free)		50 Units/Rail
MC7912ACD2TR4			D^2PAK		800 Tape & Reel
MC7912ACD2TR4G			D^2PAK (Pb−Free)		800 Tape & Reel
MC7912ACT			TO−220		50 Units/Rail
MC7912ACTG			TO−220 (Pb−Free)		50 Units/Rail
MC7912BD2T		4%	D^2PAK	T_J = −40°C to +125°C	50 Units/Rail
MC7912BD2TG			D^2PAK (Pb−Free)		50 Units/Rail
MC7912BD2TR4			D^2PAK		800 Tape & Reel
MC7912BD2TR4G			D^2PAK (Pb−Free)		800 Tape & Reel
MC7912BT			TO−220		50 Units/Rail
MC7912BTG			TO−220 (Pb−Free)		50 Units/Rail
MC7912CD2T			D^2PAK	T_J = 0°C to +125°C	50 Units/Rail
MC7912CD2TG			D^2PAK (Pb−Free)		50 Units/Rail
MC7912CD2TR4			D^2PAK		800 Tape & Reel
MC7912CD2TR4G			D^2PAK (Pb−Free)		800 Tape & Reel
MC7912CT			TO−220		50 Units/Rail
MC7912CTG			TO−220 (Pb−Free)		50 Units/Rail
MC7915ACD2T	− 15 V	2%	D^2PAK	T_J = 0°C to +125°C	50 Units/Rail
MC7915ACD2TG			D^2PAK (Pb−Free)		50 Units/Rail
MC7915ACT			TO−220		50 Units/Rail
MC7915ACTG			TO−220 (Pb−Free)		50 Units/Rail
MC7915BD2T		4%	D^2PAK	T_J = −40°C to +125°C	50 Units/Rail
MC7915BD2TG			D^2PAK (Pb−Free)		50 Units/Rail
MC7915BT			TO−220		50 Units/Rail
MC7915BTG			TO−220 (Pb−Free)		50 Units/Rail
MC7915CD2T			D^2PAK	T_J = 0°C to +125°C	50 Units/Rail
MC7915CD2TG			D^2PAK (Pb−Free)		50 Units/Rail
MC7915CD2TR4			D^2PAK		800 Tape & Reel
MC7915CD2TR4G			D^2PAK (Pb−Free)		800 Tape & Reel
MC7915CT			TO−220		50 Units/Rail
MC7915CTG			TO−220 (Pb−Free)		50 Units/Rail

PACKAGE DIMENSIONS

TO−220, SINGLE GAUGE
T SUFFIX
CASE 221AB−01
ISSUE O



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.020	0.055	0.508	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04