

# 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  $-5.0\text{ V}$  to  $-24\text{ V}$ , 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

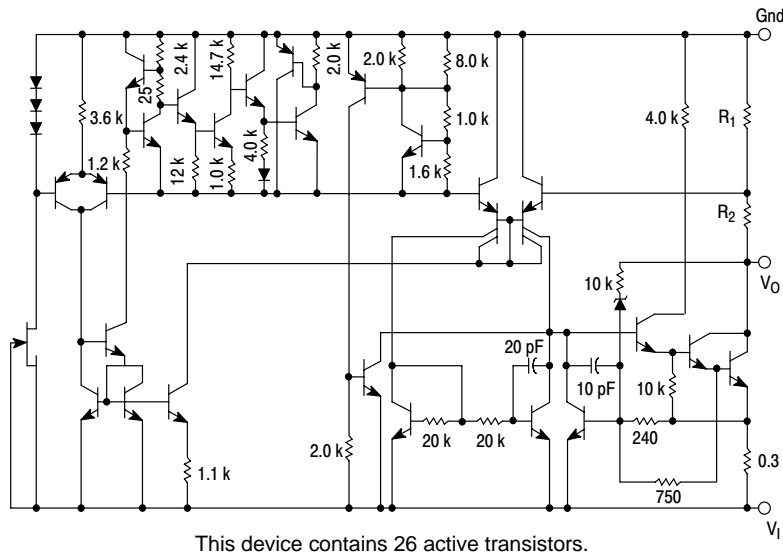


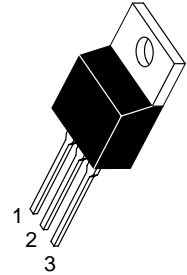
Figure 1. Representative Schematic Diagram



ON Semiconductor®

TO-220  
T SUFFIX  
CASE 221AB

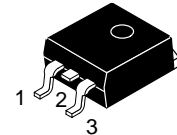
Heatsink surface  
connected to Pin 2.



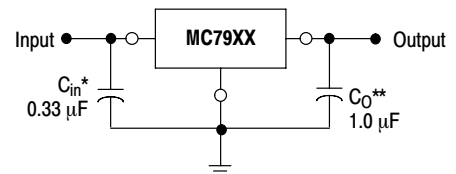
Pin 1. Ground  
2. Input  
3. Output

D<sup>2</sup>PAK  
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.

## MC7900 Series

### MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted.)

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

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 ( $V_I = -10\text{ V}$ , $I_O = 500\text{ mA}$ , $T_{low}^* < T_J < +125^\circ\text{C}$ , unless otherwise noted.)

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

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.

\* $T_{low} = -40^\circ\text{C}$  for MC7905B and  $T_{low} = 0^\circ\text{C}$  for MC7905C.

## MC7900 Series

### MC7912B, MC7912C

**ELECTRICAL CHARACTERISTICS** ( $V_I = -19\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $T_{low}^* < T_J < +125^\circ\text{C}$ , unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	-11.5	-12	-12.5	Vdc
Line Regulation (Note 4) ( $T_J = +25^\circ\text{C}$ , $I_O = 100\text{ mA}$ ) -14.5 Vdc $\geq V_I \geq -30\text{ Vdc}$ -16 Vdc $\geq V_I \geq -22\text{ Vdc}$ ( $T_J = +25^\circ\text{C}$ , $I_O = 500\text{ mA}$ ) -14.5 Vdc $\geq V_I \geq -30\text{ Vdc}$ -16 Vdc $\geq V_I \geq -22\text{ Vdc}$	$Reg_{line}$	-	13 6.0	120 60	mV
Load Regulation, $T_J = +25^\circ\text{C}$ (Note 4) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$	$Reg_{load}$	-	46 17	240 120	mV
Output Voltage -14.5 Vdc $\geq V_I \geq -27\text{ Vdc}$ , $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $P \leq 15\text{ W}$	$V_O$	-11.4	-	-12.6	Vdc
Input Bias Current ( $T_J = +25^\circ\text{C}$ )	$I_{IB}$	-	4.4	8.0	mA
Input Bias Current Change -14.5 Vdc $\geq V_I \geq -30\text{ Vdc}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$	$\Delta I_{IB}$	-	-	1.0 0.5	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	-	75	-	$\mu\text{V}$
Ripple Rejection ( $I_O = 20\text{ mA}$ , $f = 120\text{ Hz}$ )	RR	-	61	-	dB
Dropout Voltage ( $I_O = 1.0\text{ A}$ , $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	-	1.3	-	Vdc
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ mA}$ , $T_{low}^* \leq T_J \leq +125^\circ\text{C}$	$\Delta V_O / \Delta T$	-	-1.0	-	$\text{mV}/^\circ\text{C}$

### MC7912AC

**ELECTRICAL CHARACTERISTICS** ( $V_I = -19\text{ V}$ ,  $I_O = 500\text{ mA}$ ,  $T_{low}^* < T_J < +125^\circ\text{C}$ , unless otherwise noted.)

Characteristics	Symbol	Min	Typ	Max	Unit
Output Voltage ( $T_J = +25^\circ\text{C}$ )	$V_O$	-11.75	-12	-12.25	Vdc
Line Regulation (Note 4) -16 Vdc $\geq V_I \geq -22\text{ Vdc}$ ; $I_O = 1.0\text{ A}$ , $T_J = +25^\circ\text{C}$ -16 Vdc $\geq V_I \geq -22\text{ Vdc}$ ; $I_O = 1.0\text{ A}$ -14.8 Vdc $\geq V_I \geq -30\text{ Vdc}$ ; $I_O = 500\text{ mA}$ -14.5 Vdc $\geq V_I \geq -27\text{ Vdc}$ ; $I_O = 1.0\text{ A}$ , $T_J = +25^\circ\text{C}$	$Reg_{line}$	-	6.0 24 24 13	60 120 120 120	mV
Load Regulation (Note 4) $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ , $T_J = +25^\circ\text{C}$ $250\text{ mA} \leq I_O \leq 750\text{ mA}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$	$Reg_{load}$	-	46 17 35	150 75 150	mV
Output Voltage -14.8 Vdc $\geq V_I \geq -27\text{ Vdc}$ , $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ , $P \leq 15\text{ W}$	$V_O$	-11.5	-	-12.5	Vdc
Input Bias Current	$I_{IB}$	-	4.4	8.0	mA
Input Bias Current Change -15 Vdc $\geq V_I \geq -30\text{ Vdc}$ $5.0\text{ mA} \leq I_O \leq 1.0\text{ A}$ $5.0\text{ mA} \leq I_O \leq 1.5\text{ A}$ , $T_J = +25^\circ\text{C}$	$\Delta I_{IB}$	-	-	0.8 0.5 0.5	mA
Output Noise Voltage ( $T_A = +25^\circ\text{C}$ , $10\text{ Hz} \leq f \leq 100\text{ kHz}$ )	$V_n$	-	75	-	$\mu\text{V}$
Ripple Rejection ( $I_O = 20\text{ mA}$ , $f = 120\text{ Hz}$ )	RR	-	61	-	dB
Dropout Voltage ( $I_O = 1.0\text{ A}$ , $T_J = +25^\circ\text{C}$ )	$V_I - V_O$	-	1.3	-	Vdc
Average Temperature Coefficient of Output Voltage $I_O = 5.0\text{ A}$ , $T_{low}^* \leq T_J \leq +125^\circ\text{C}$	$\Delta V_O / \Delta T$	-	-1.0	-	$\text{mV}/^\circ\text{C}$

4. 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.

\* $T_{low} = -40^\circ\text{C}$  for MC7912B and  $T_{low} = 0^\circ\text{C}$  for MC7912C.

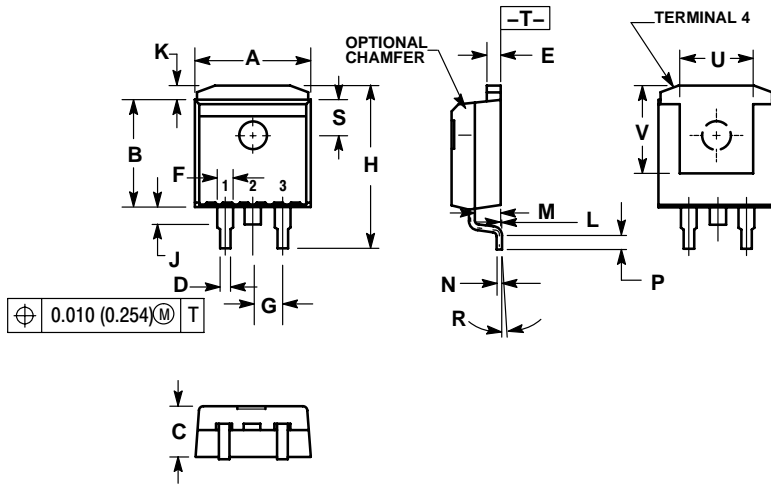
## MC7900 Series

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

# MC7900 Series

## PACKAGE DIMENSIONS

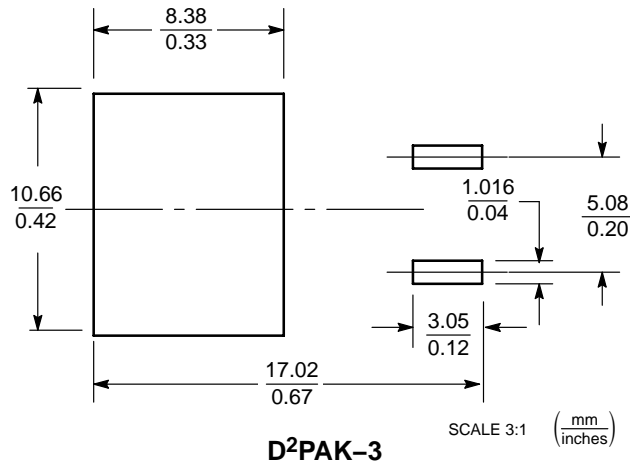
**D<sup>2</sup>PAK**  
**D2T SUFFIX**  
 PLASTIC PACKAGE  
 CASE 936-03  
 ISSUE B



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. TAB CONTOUR OPTIONAL WITHIN DIMENSIONS A AND K.
  4. DIMENSIONS U AND V ESTABLISH A MINIMUM MOUNTING SURFACE FOR TERMINAL 4.
  5. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH OR GATE PROTRUSIONS. MOLD FLASH AND GATE PROTRUSIONS NOT TO EXCEED 0.025 (0.635) MAXIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.386	0.403	9.804	10.236
B	0.356	0.368	9.042	9.347
C	0.170	0.180	4.318	4.572
D	0.026	0.036	0.660	0.914
E	0.045	0.055	1.143	1.397
F	0.051 REF		1.295 REF	
G	0.100 BSC		2.540 BSC	
H	0.539	0.579	13.691	14.707
J	0.125 MAX		3.175 MAX	
K	0.050 REF		1.270 REF	
L	0.000	0.010	0.000	0.254
M	0.088	0.102	2.235	2.591
N	0.018	0.026	0.457	0.660
P	0.058	0.078	1.473	1.981
R	5° REF		5° REF	
S	0.116 REF		2.946 REF	
U	0.200 MIN		5.080 MIN	
V	0.250 MIN		6.350 MIN	

### SOLDERING FOOTPRINT\*

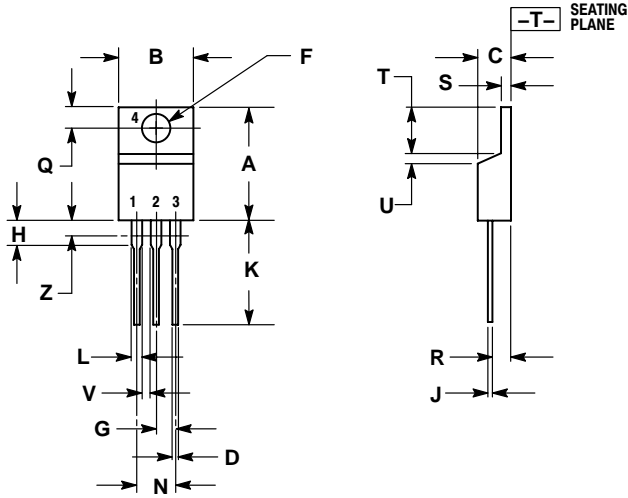


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MC7900 Series

## 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.

DIM	INCHES		MILLIMETERS	
	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