μA7900 SERIES

3-TERMINAL NEGATIVE VOLTAGE REGULATORS

FAIRCHILD LINEAR INTEGRATED CIRCUITS

GENERAL DESCRIPTION — The μA7900 series of monolithic 3-Terminal Negative Regulators is manufactured using the Fairchild Planar* epitaxial process. These negative regulators are intended as complements to the popular μA7800 series of positive voltage regulators, and they are available in the same voltage options from −5 to −24 V. The 7900s employ internal current limiting, safe-area protection, and thermal shutdown, making them virtually indestructible.

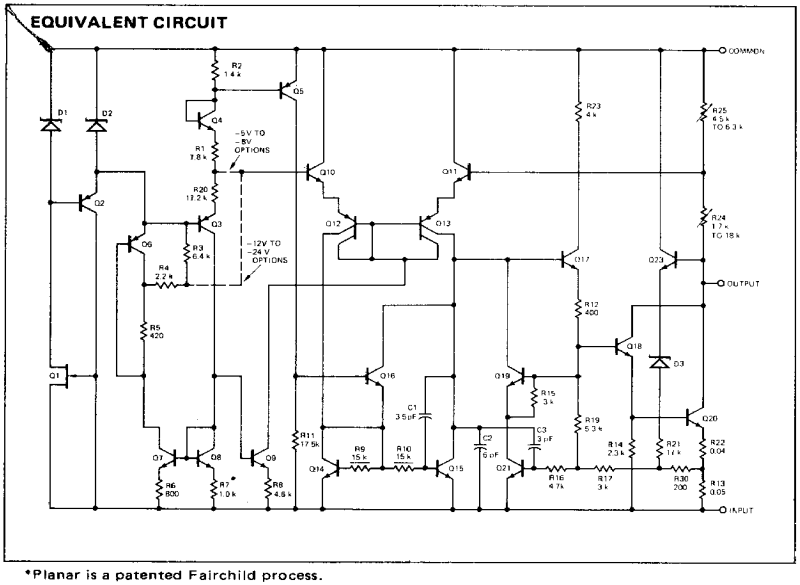
- **OUTPUT CURRENT IN EXCESS OF 1 A**
- **INTERNAL THERMAL OVERLOAD PROTECTION**
- **INTERNAL SHORT CIRCUIT CURRENT LIMITING**
- **OUTPUT TRANSISTOR SAFE AREA COMPENSATION**
- **AVAILABLE IN THE TO-220 AND THE TO-3 PACKAGE**
- **OUTPUT VOLTAGES ARE 5, 6, 8, 12, 15, 18 AND 24 V**

ABSOLUTE MAXIMUM RATINGS

Input Voltage	
(5 V through 18 V)	−35 V
(24 V)	−40 V
Internal Power Dissipation	Internally Limited
Storage Temperature Range	
TO-3 (Al. or Steel)	−65°C to +150°C
TO-220	−55°C to +150°C
Operating Junction Temperature Range	
Military (μA7900)	−55°C to +150°C
Commercial (μA7900C)	0°C to +150°C
Lead Temperature	
TO-3 (Soldering, 60 s)	300°C
TO-220 (Soldering, 10 s)	230°C

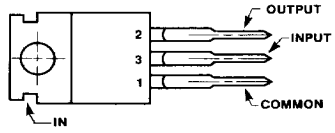
NOTE: The convention for Negative Regulators is the Algebraic value, thus −15 is less than −10 V.

EQUIVALENT CIRCUIT



*Planar is a patented Fairchild process.

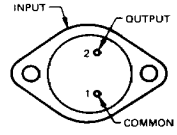
CONNECTION DIAGRAMS
TO-220 PACKAGE
(TOP VIEW)



ORDER INFORMATION

OUTPUT VOLTAGE	TYPE	PART NO.
−5 V	μA7905C	μA7905UC
−6 V	μA7906C	μA7906UC
−8 V	μA7908C	μA7908UC
−12 V	μA7912C	μA7912UC
−15 V	μA7915C	μA7915UC
−18 V	μA7918C	μA7918UC
−24 V	μA7924C	μA7924UC

TO-3 PACKAGE
(TOP VIEW)



ORDER INFORMATION

OUTPUT VOLTAGE	TYPE	PART NO.
−5 V	μA7905	μA7905KM
−6 V	μA7906	μA7906KM
−8 V	μA7908	μA7908KM
−12 V	μA7912	μA7912KM
−15 V	μA7915	μA7915KM
−18 V	μA7918	μA7918KM
−24 V	μA7924	μA7924KM
−5 V	μA7905C	μA7905KC
−6 V	μA7906C	μA7908KC
−8 V	μA7908C	μA7908KC
−12 V	μA7912C	μA7912KC
−15 V	μA7915C	μA7915KC
−18 V	μA7918C	μA7918KC
−24 V	μA7924C	μA7924KC

μA7908

ELECTRICAL CHARACTERISTICS: $V_{IN} = -14$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu$F, $C_{OUT} = 1\,\mu$F, $-55°C \leq T_J \leq 150°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−7.7	−8.0	−8.3	V
Line Regulation		$T_J = 25°C$	$-10.5\text{ V} \leq V_{IN} \leq -25\text{ V}$		6.0	80	mV
			$-11\text{ V} \leq V_{IN} \leq -17\text{ V}$		2.0	40	mV
Load Regulation		$T_J = 25°C$	$5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$		12	80	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$		4.0	40	mV
Output Voltage		$-11.5\text{ V} \leq V_{IN} \leq -23\text{ V}$ $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ $p \leq 15\text{ W}$		−7.6	5/6	−8.4	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-11.5\text{ V} \leq V_{IN} \leq -25\text{ V}$				1.0	mA
	with load	$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$			25	80	$\mu V/V_{OUT}$
Ripple Rejection		$f = 120\text{ Hz}$, $-11.5\text{ V} \leq V_{IN} \leq -21.5\text{ V}$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\text{ A}$, $T_J = 25°C$			1.1	2.3	V
Peak Output Current		$T_J = 25°C$		1.3	2.1	3.3	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\text{ mA}$, $-55°C \leq T_J \leq 150°C$				0.3	$mV/°C/V_{OUT}$
Short Circuit Current		$V_{IN} = -35\text{ V}$, $T_J = 25°C$				1.2	A

μA7908C

ELECTRICAL CHARACTERISTICS: $V_{IN} = -14$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu$F, $C_{OUT} = 1\,\mu$F, $0°C \leq T_J \leq 125°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−7.7	−8.0	−8.3	V
Line Regulation		$T_J = 25°C$	$-10.5\text{ V} \leq V_{IN} \leq -25\text{ V}$		6.0	160	mV
			$-11\text{ V} \leq V_{IN} \leq -17\text{ V}$		2.0	80	mV
Load Regulation		$T_J = 25°C$	$5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$		12	160	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$		4.0	80	mV
Output Voltage		$-10.5\text{ V} \leq V_{IN} \leq -23\text{ V}$ $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ $p \leq 15\text{ W}$		−7.6	5/8	−8.4	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-10.5\text{ V} \leq V_{IN} \leq -25\text{ V}$				1.0	mA
	with load	$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$			200		μV
Ripple Rejection		$f = 120\text{ Hz}$, $-11.5\text{ V} \leq V_{IN} \leq -21.5\text{ V}$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\text{ A}$, $T_J = 25°C$			1.1		V
Peak Output Current		$T_J = 25°C$			2.1		A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\text{ mA}$, $0°C \leq T_J \leq 125°C$			−0.6		mV/°C

NOTE:
1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA7912

ELECTRICAL CHARACTERISTICS: $V_{IN} = -19$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu F$, $C_{OUT} = 1\,\mu F$, $-55°C \leq T_J \leq 150°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−11.5	−12.0	−12.5	V
Line Regulation		$T_J = 25°C$	$-14.5\ V \leq V_{IN} \leq -30\ V$		10	120	mV
			$-16\ V \leq V_{IN} \leq -22\ V$		3.0	60	mV
Load Regulation		$T_J = 25°C$	$5\ mA \leq I_{OUT} \leq 1.5\ A$		12	120	mV
			$250\ mA \leq I_{OUT} \leq 750\ mA$		4.0	60	mV
Output Voltage		$-15.5\ V \leq V_{IN} \leq -27\ V$ $5\ mA \leq I_{OUT} \leq 1.0\ A$ $p \leq 15\ W$		−11.4	−12.0	−12.6	V
Quiescent Current		$T_J = 25°C$			1.5	3.0	mA
Quiescent Current Change	with line	$-15\ V \leq V_{IN} \leq -30\ V$				1.0	mA
	with load	$5\ mA \leq I_{OUT} \leq 1.0\ A$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			125	80	$\mu V/V_{OUT}$
Ripple Rejection		$f = 120\ Hz$, $-15\ V \leq V_{IN} \leq -25\ V$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\ A$, $T_J = 25°C$			1.1	2.3	V
Peak Output Current		$T_J = 25°C$		1.3	2.1	3.3	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$, $-55°C \leq T_J \leq 150°C$				0.3	$mV/°C/V_{OUT}$
Short Circuit Current		$V_{IN} = -35\ V$, $T_J = 25°C$				1.2	A

μA7912C

ELECTRICAL CHARACTERISTICS: $V_{IN} = -19$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu F$, $C_{OUT} = 1\,\mu F$, $0°C \leq T_J \leq 125°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−11.5	−12.0	−12.5	V
Line Regulation		$T_J = 25°C$	$-14.5\ V \leq V_{IN} \leq -30\ V$		10	240	mV
			$-16\ V \leq V_{IN} \leq -22\ V$		3.0	120	mV
Load Regulation		$T_J = 25°C$	$5\ mA \leq I_{OUT} \leq 1.5\ A$		12	240	mV
			$250\ mA \leq I_{OUT} \leq 750\ mA$		4.0	120	mV
Output Voltage		$-14.5\ V \leq V_{IN} \leq -27\ V$ $5\ mA \leq I_{OUT} \leq 1.0\ A$ $p \leq 15\ W$		−11.4	−12.0	−12.6	V
Quiescent Current		$T_J = 25°C$			1.5	3.0	mA
Quiescent Current Change	with line	$-14.5\ V \leq V_{IN} \leq -30\ V$				1.0	mA
	with load	$5\ mA \leq I_{OUT} \leq 1.0\ A$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			300		μV
Ripple Rejection		$f = 120\ Hz$, $-15\ V \leq V_{IN} \leq -25\ V$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\ A$, $T_J = 25°C$			1.1		V
Peak Output Current		$T_J = 25°C$			2.1		A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$, $0°C \leq T_J \leq 125°C$			−0.8		mV/°C

NOTE:

1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA7905

ELECTRICAL CHARACTERISTICS: $V_{IN} = -10$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu F$, $C_{OUT} = 1\,\mu F$, $-55°C \leq T_J \leq 150°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−4.8	−5.0	−5.2	V
Line Regulation		$T_J = 25°C$	$-7\text{ V} \leq V_{IN} \leq -25\text{ V}$		3	50	mV
			$-8\text{ V} \leq V_{IN} \leq -12\text{ V}$		1	25	mV
Load Regulation		$T_J = 25°C$	$5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$		15	50	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$		5	25	mV
Output Voltage		$-8.0\text{ V} \leq V_{IN} \leq -20\text{ V}$ $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ $p \leq 15\text{ W}$		−4.70	6%	−5.30	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-8\text{ V} \leq V_{IN} \leq -25\text{ V}$				1.3	mA
	with load	$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$			25	80	$\mu V/V_{OUT}$
Ripple Rejection		$f = 120\text{ Hz}$, $-8\text{ V} \leq V_{IN} \leq -18\text{ V}$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\text{ A}$, $T_J = 25°C$			1.1	2.3	V
Peak Output Current		$T_J = 25°C$		1.3	2.1	3.3	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\text{ mA}$, $-55°C \leq T_J \leq 150°C$				0.3	$mV/°C/V_{OUT}$
Short Circuit Current		$V_{IN} = -35\text{ V}$, $T_J = 25°C$				1.2	A

μA7905C

ELECTRICAL CHARACTERISTICS: $V_{IN} = -10$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu F$, $C_{OUT} = 1\,\mu F$, $0°C \leq T_J \leq 125°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−4.8	−5.0	−5.2	V
Line Regulation		$T_J = 25°C$	$-7\text{ V} \leq V_{IN} \leq -25\text{ V}$		3.0	100	mV
			$-8\text{ V} \leq V_{IN} \leq -12\text{ V}$		1.0	50	mV
Load Regulation		$T_J = 25°C$	$5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$		15	100	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$		5.0	50	mV
Output Voltage		$-7\text{ V} \leq V_{IN} \leq -20\text{ V}$ $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ $p \leq 15\text{ W}$		−4.75	5%	−5.25	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-7\text{ V} \leq V_{IN} \leq -25\text{ V}$				1.3	mA
	with load	$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$			125		μV
Ripple Rejection		$f = 120\text{ Hz}$, $-8\text{ V} \leq V_{IN} \leq -18\text{ V}$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\text{ A}$, $T_J = 25°C$			1.1		V
Peak Output Current		$T_J = 25°C$			2.1		A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\text{ mA}$, $0°C \leq T_J \leq 125°C$			−0.4		mV/°C

NOTE:
1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA7906

ELECTRICAL CHARACTERISTICS: $V_{IN} = -11$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu$F, $C_{OUT} = 1\,\mu$F, $-55°C \leq T_J \leq 150°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−5.75	−6.0	−6.25	V
Line Regulation		$T_J = 25°C$	$-8\text{ V} \leq V_{IN} \leq -25\text{ V}$		5.0	60	mV
			$-9\text{ V} \leq V_{IN} \leq -13\text{ V}$		1.5	30	mV
Load Regulation		$T_J = 25°C$	$5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$		14	60	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$		4.0	30	mV
Output Voltage		$-9\text{ V} \leq V_{IN} \leq -21\text{ V}$ $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ $p \leq 15\text{ W}$		−5.65	−6.0	−6.35	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-9\text{ V} \leq V_{IN} \leq -25\text{ V}$				1.3	mA
	with load	$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$			25	80	$\mu V/V_{OUT}$
Ripple Rejection		$f = 120\text{ Hz}$, $-9\text{ V} \leq V_{IN} \leq -19\text{ V}$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\text{ A}$, $T_J = 25°C$			1.1	2.3	V
Peak Output Current		$T_J = 25°C$		1.3	2.1	3.3	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\text{ mA}$, $-55°C \leq T_J \leq +150°C$				0.3	$mV/°C/V_{OUT}$
Short Circuit Current		$V_{IN} = -35\text{ V}$, $T_J = 25°C$				1.2	A

μA7906C

ELECTRICAL CHARACTERISTICS: $V_{IN} = -11$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu$F, $C_{OUT} = 1\,\mu$F, $0°C \leq T_J \leq 125°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−5.75	−6.0	−6.25	V
Line Regulation		$T_J = 25°C$	$-8\text{ V} \leq V_{IN} \leq -25\text{ V}$		5.0	120	mV
			$-9\text{ V} \leq V_{IN} \leq -13\text{ V}$		1.5	60	mV
Load Regulation		$T_J = 25°C$	$5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$		14	120	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$		4.0	60	mV
Output Voltage		$-8\text{ V} \leq V_{IN} \leq -21\text{ V}$ $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ $p \leq 15\text{ W}$		−5.7		−6.3	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-8\text{ V} \leq V_{IN} \leq -25\text{ V}$				1.3	mA
	with load	$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$			150		μV
Ripple Rejection		$f = 120\text{ Hz}$, $-9\text{ V} \leq V_{IN} \leq -19\text{ V}$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\text{ A}$, $T_J = 25°C$			1.1		V
Peak Output Current		$T_J = 25°C$			2.1		A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\text{ mA}$, $0°C \leq V_{IN} \leq 125°C$			−0.4		mV/°C

NOTE:

1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA7915

ELECTRICAL CHARACTERISTICS: $V_{IN} = -23$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, $-55°C \leq T_J \leq 150°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−14.4	−15.0	−15.6	V
Line Regulation		$T_J = 25°C$	$-17.5\ V \leq V_{IN} \leq -30\ V$		1	150	mV
			$-20\ V \leq V_{IN} \leq -26\ V$		3.0	75	mV
Load Regulation		$T_J = 25°C$	$5\ mA \leq I_{OUT} \leq 1.5\ A$		12	150	mV
			$250\ mA \leq I_{OUT} \leq 750\ mA$		4.0	75	mV
Output Voltage		$-18.5\ V \leq V_{IN} \leq -30\ V$ $5\ mA \leq I_{OUT} \leq 1.0\ A$ $p \leq 15\ W$		−14.25	5%	−15.75	V
Quiescent Current		$T_J = 25°C$			1.5	3.0	mA
Quiescent Current Change	with line	$-18.5\ V \leq V_{IN} \leq -30\ V$				1.0	mA
	with load	$5\ mA \leq I_{OUT} \leq 1.0\ A$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			25	80	μA/V_{OUT}
Ripple Rejection		$f = 120\ Hz$, $-18.5\ V \leq V_{IN} \leq -28.5\ V$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\ A$, $T_J = 25°C$			1.1	2.3	V
Peak Output Current		$T_J = 25°C$		1.3	2.1	3.3	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$, $-55°C \leq T_J \leq 150°C$			−1.0	1.3	mV/°C/V_{OUT}
Short Circuit Current		$V_{IN} = -35\ V$, $T_J = 25°C$				1.2	A

μA7915C

ELECTRICAL CHARACTERISTICS: $V_{IN} = -23$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, $0°C \leq T_J \leq 125°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−14.4	−15.0	−15.6	V
Line Regulation		$T_J = 25°C$	$-17.5\ V \leq V_{IN} \leq -30\ V$		11	300	mV
			$-20\ V \leq V_{IN} \leq -26\ V$		3.0	150	mV
Load Regulation		$T_J = 25°C$	$5\ mA \leq I_{OUT} \leq 1.5\ A$		12	300	mV
			$250\ mA \leq I_{OUT} \leq 750\ mA$		4.0	150	mV
Output Voltage		$-17.5\ V \leq V_{IN} \leq -30\ V$ $5\ mA \leq I_{OUT} \leq 1.0\ A$ $p \leq 15\ W$		−14.25	5%	−15.75	V
Quiescent Current		$T_J = 25°C$			1.5	3.0	mA
Quiescent Current Change	with line	$-17.5\ V \leq V_{IN} \leq -30\ V$				1.0	mA
	with load	$5\ mA \leq I_{OUT} \leq 1.0\ A$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			375		μV
Ripple Rejection		$f = 120\ Hz$, $-18.5\ V \leq V_{IN} \leq -28.5\ V$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\ A$, $T_J = 25°C$			1.1		V
Peak Output Current		$T_J = 25°C$			2.1		A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$, $0°C \leq T_J \leq 125°C$			−1.0		mV/°C

NOTE:

1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA7918

ELECTRICAL CHARACTERISTICS: $V_{IN} = -27$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu$F, $C_{OUT} = 1\,\mu$F, $-55°C \leq T_J \leq 150°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−17.3	−18.0	−18.7	V
Line Regulation		$T_J = 25°C$	$-21\text{ V} \leq V_{IN} \leq -33\text{ V}$		15	180	mV
			$-24\text{ V} \leq V_{IN} \leq -30\text{ V}$		5.0	90	mV
Load Regulation		$T_J = 25°C$	$5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$		12	180	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$		4.0	90	mV
Output Voltage		$-22\text{ V} \leq V_{IN} \leq -33\text{ V}$ $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ $p \leq 15\text{ W}$		−17.1	5%	−18.9	V
Quiescent Current		$T_J = 25°C$			1.5	3.0	mA
Quiescent Current Change	with line	$-22\text{ V} \leq V_{IN} \leq -33\text{ V}$				1.0	mA
	with load	$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$			25	80	$\mu V/V_{OUT}$
Ripple Rejection		$f = 120\text{ Hz}$, $-22\text{ V} \leq V_{IN} \leq -32\text{ V}$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\text{ A}$, $T_J = 25°C$			1.1	2.3	V
Peak Output Current		$T_J = 25°C$		1.3	2.1	3.3	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\text{ mA}$, $0°C \leq T_J \leq 150°C$				0.3	$mV/°C/V_{OUT}$
Short Circuit Current		$V_{IN} = -35\text{ V}$, $T_J = 25°C$				1.2	A

μA7918C

ELECTRICAL CHARACTERISTICS: $V_{IN} = -27$ V, $I_{OUT} = 500$ mA, $C_{IN} = 2\,\mu$F, $C_{OUT} = 1\,\mu$F, $0°C \leq T_J \leq 125°C$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−17.3	−18.0	−18.7	V
Line Regulation		$T_J = 25°C$	$-21\text{ V} \leq V_{IN} \leq -33\text{ V}$		15	360	mV
			$-24\text{ V} \leq V_{IN} \leq -30\text{ V}$		5.0	180	mV
Load Regulation		$T_J = 25°C$	$5\text{ mA} \leq I_{OUT} \leq 1.5\text{ A}$		12	360	mV
			$250\text{ mA} \leq I_{OUT} \leq 750\text{ mA}$		4.0	180	mV
Output Voltage		$-21\text{ V} \leq V_{IN} \leq -33\text{ V}$ $5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$ $p \leq 15\text{ W}$		−17.1	5%	−18.9	V
Quiescent Current		$T_J = 25°C$			1.5	3.0	mA
Quiescent Current Change	with line	$-21\text{ V} \leq V_{IN} \leq -33\text{ V}$				1.0	mA
	with load	$5\text{ mA} \leq I_{OUT} \leq 1.0\text{ A}$				0.5	mA
Output Noise Voltage		$T_A = 25°C$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$			450		μV
Ripple Rejection		$f = 120\text{ Hz}$, $-22\text{ V} \leq V_{IN} \leq -32\text{ V}$		54	60		dB
Dropout Voltage		$I_{OUT} = 1.0\text{ A}$, $T_J = 25°C$			1.1		V
Peak Output Current		$T_J = 25°C$			2.1		A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\text{ mA}$, $0°C \leq T_J \leq 125°C$			−1.0		mV/°C

NOTE:
1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA7924

ELECTRICAL CHARACTERISTICS: V_{IN} = −33 V, I_{OUT} = 500 mA, C_{IN} = 2 μF, C_{OUT} = 1 μF, −55°C ≤ T_J ≤ 150°C, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		T_J = 25°C		−23.0	−24.0	−25.0	V
Line Regulation		T_J = 25°C	−27 V ≤ V_{IN} ≤ −38 V		18	240	mV
			−30 V ≤ V_{IN} ≤ −36 V		6.0	120	mV
Load Regulation		T_J = 25°C	5 mA ≤ I_{OUT} ≤ 1.5 A		12	240	mV
			250 mA ≤ I_{OUT} ≤ 750 mA		4.0	120	mV
Output Voltage		−28 V ≤ V_{IN} ≤ −38 V 5 mA ≤ I_{OUT} ≤ 1.0 A p ≤ 15 W		−22.8		−25.2	V
Quiescent Current		T_J = 25°C			1.5	3.0	mA
Quiescent Current Change	with line	−28 V ≤ V_{IN} ≤ −38 V				1.0	mA
	with load	5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	mA
Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			25	80	μV/V_{OUT}
Ripple Rejection		f = 120 Ha, −28 V ≤ V_{IN} ≤ −38 V		54	60		dB
Dropout Voltage		I_{OUT} = 1.0 A, T_J = 25°C			1.1	2.3	V
Peak Output Current		T_J = 25°C		1.3	2.1	2.3	A
Average Temperature Coefficient of Output Voltage		I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 150°C				0.3	mV/°C/V_{OUT}
Short Circuit Current		V_{IN} = −35 V, T_J = 25°C				1.2	A

μA7924C

ELECTRICAL CHARACTERISTICS: V_{IN} = −33 V, I_{OUT} = 500 mA, C_{IN} = 2 μF, C_{OUT} = 1 μF, 0°C ≤ T_J ≤ 150°C, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		T_J = 25°C		−23.0	−24.0	−25.0	V
Line Regulation		T_J = 25°C	−27 V ≤ V_{IN} ≤ −38 V		18	480	mV
			−30 V ≤ V_{IN} ≤ −36 V		6.0	240	mV
Load Regulation		T_J = 25°C	5 mA ≤ I_{OUT} ≤ 1.5 A		12	480	mV
			250 mA ≤ I_{OUT} ≤ 750 mA		4.0	240	mV
Output Voltage		−27 V ≤ V_{IN} ≤ −38 V 5 mA ≤ I_{OUT} ≤ 1.0 A p ≤ 15 W		−22.8		−25.2	V
Quiescent Current		T_J = 25°C			1.5	3.0	mA
Quiescent Current Change	with line	−27 V ≤ V_{IN} ≤ −38 V				1.0	mA
	with load	5 mA ≤ I_{OUT} ≤ 1.0 A				0.5	mA
Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			600		μV
Ripple Rejection		f = 120 Hz, −28 V ≤ V_{IN} ≤ −38 V		54	60		dB
Dropout Voltage		I_{OUT} = 1.0 A, T_J = 25°C			1.1		V
Peak Output Current		T_J = 25°C			2.1		A
Average Temperature Coefficient of Output Voltage		I_{OUT} = 5 mA, 0°C ≤ T_J ≤ 125°C			−1.0		mV/°C

NOTE:

1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t_w ≤ 10 ms, duty cycle ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

DESIGN CONSIDERATIONS

The μA7900 fixed voltage regulator series has thermal overload protection from excessive power, internal short circuit protection which limits the circuit's maximum current, and output transistor safe area compensation for reducing the output current as the voltage across the pass transistor is increased.

Although the internal power dissipation is limited, the junction temperature must be kept below the maximum specified temperature (150°C for 7900, 125°C for 7900C) in order to meet data sheet specifications. To calculate the maximum junction temperature or heat sink required, the following thermal resistance values should be used:

Package	TYP θ_{JC}	MAX θ_{JC}	TYP θ_{JC}	MAX θ_{JA}
TO-3	3.5°C/W	5.5°C/W	40°C/W	45°C/W
TO-220	3.0°C/W	5.0°C/W	60°C/W	65°C/W

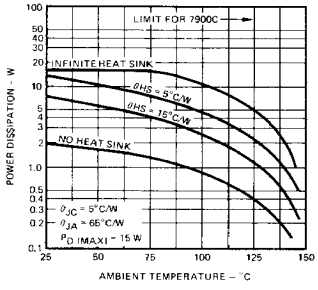
$$P_{D\,(MAX)} = \frac{T_{J\,(MAX)} - T_A}{\theta_{JC} + \theta_{CA}} \text{ or } \frac{T_{J\,(MAX)}\ T_A}{\theta_{JA}} \text{ (Without a heat sink)}$$

$$\theta_{CA} = \theta_{CS} + \theta_{SA}$$

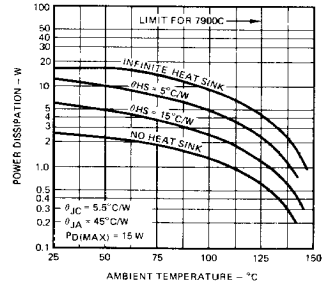
Solving for T_J: $T_J = T_A + P_D\,(\theta_{JC} + \theta_{CA})$ or $T_A + P_D\theta_{JA}$ (Without heat sink)

Where
- T_J = Junction Temperature
- T_A = Ambient Temperature
- P_D = Power Dissipation
- θ_{JA} = Junction to Ambient Thermal Resistance
- θ_{JC} = Junction to Case Thermal Resistance
- θ_{CA} = Case to Ambient Thermal Resistance
- θ_{CS} = Case to Heat Sink Thermal Resistance
- θ_{SA} = Heat Sink to Ambient Thermal Resistance

WORST CASE POWER DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE (TO-220)

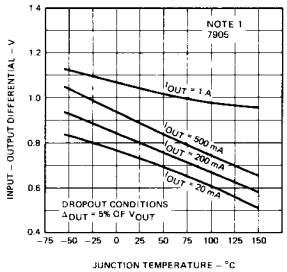


WORST CASE POWER DISSIPATION AS A FUNCTION OF AMBIENT TEMPERATURE (TO-3)

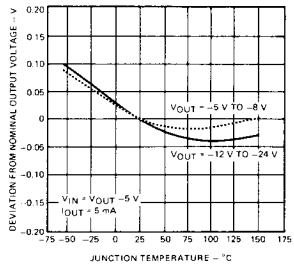


TYPICAL PERFORMANCE CURVES

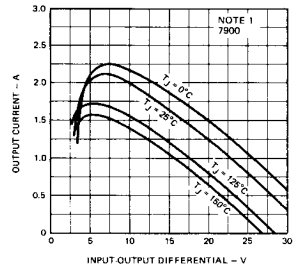
DROPOUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE



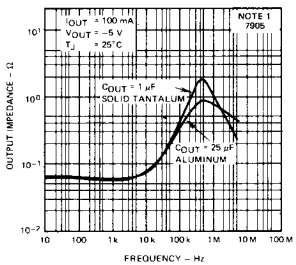
OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE



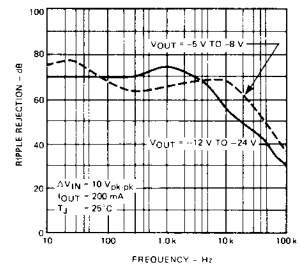
PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE



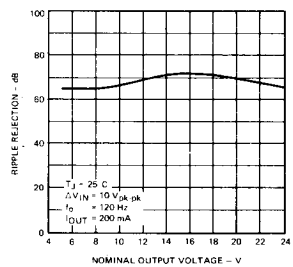
OUTPUT IMPEDANCE AS A FUNCTION OF FREQUENCY



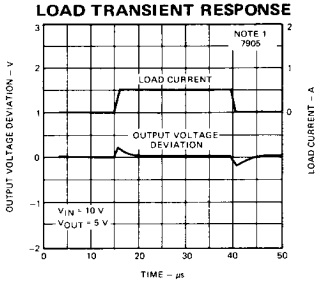
RIPPLE REJECTION AS A FUNCTION OF FREQUENCY



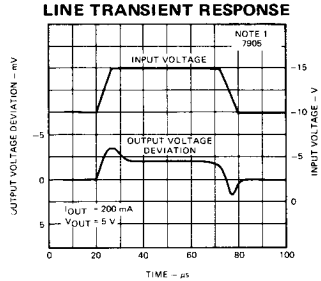
RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGES



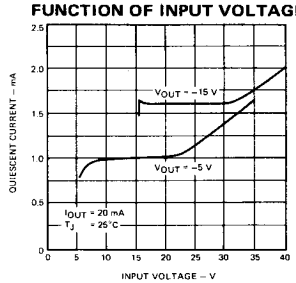
LOAD TRANSIENT RESPONSE



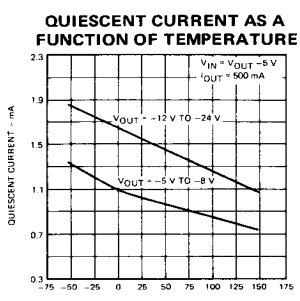
LINE TRANSIENT RESPONSE



QUIESCENT CURRENT AS A FUNCTION OF INPUT VOLTAGE



QUIESCENT CURRENT AS A FUNCTION OF TEMPERATURE

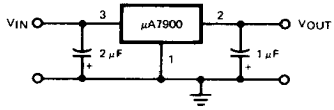


NOTE 1: The other μA7900 series devices have similar performance curves.

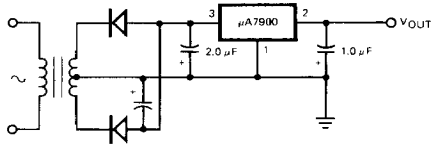
TYPICAL APPLICATIONS

Bypass capacitors are recommended for stable operation of the μA7900 series of regulators over the input voltage and output current ranges. Output bypass capacitors will improve the transient response of the regulator.

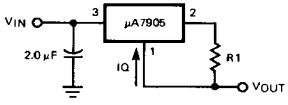
The bypass capacitors, (2 μF on the input, 1 μF on the output) should be ceramic or solid tantalum which have good high frequency characteristics. If aluminum electrolytics are used, their values should be 10 μF or larger. The bypass capacitors should be mounted with the shortest leads, and if possible, directly across the regulator terminals.



FIXED OUTPUT REGULATOR

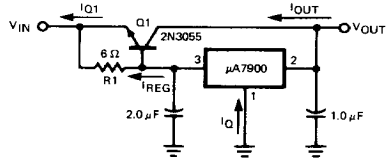


NEGATIVE OUTPUT VOLTAGE CIRCUIT



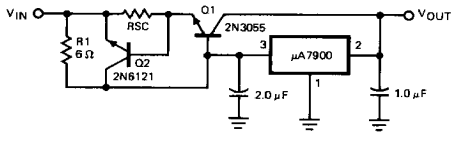
$$\text{OUTPUT CURRENT} = \frac{5.0\ \text{V}}{R1} + I_Q$$

BASIC CURRENT REGULATOR



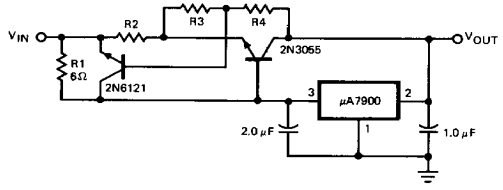
$$R1 = \frac{V_{BE(Q1)}}{I_{REG}} \qquad I_{Q1} = \beta(Q1)I_{REG}$$

HIGH CURRENT VOLTAGE REGULATOR

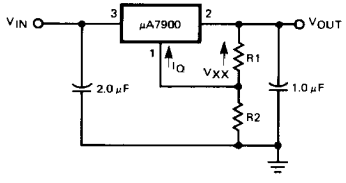


$$R_{SC} = \frac{V_{BE(Q2)}}{I_{SC}}$$

HIGH OUTPUT CURRENT, SHORT CIRCUIT PROTECTED

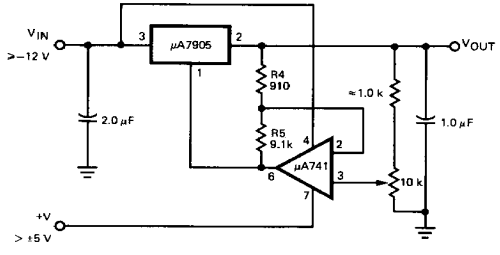


HIGH OUTPUT CURRENT, FOLDBACK CURRENT LIMITED



$$\left|V_{OUT}\right| = V_{XX}\left(1 + \frac{R2}{R1}\right) + I_Q R2$$

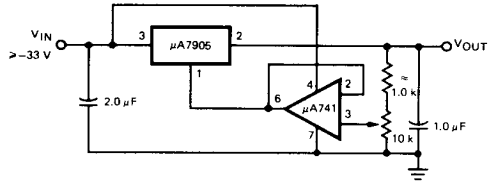
VARIABLE OUTPUT VOLTAGE REGULATOR



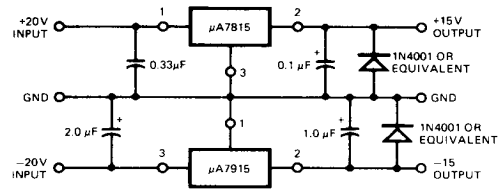
VARIABLE OUTPUT VOLTAGE, −0.5 V TO −10 V

TYPICAL APPLICATIONS (Cont'd)

VARIABLE OUTPUT VOLTAGE, −30 V TO −7 V



OPERATIONAL AMPLIFIER SUPPLY (± 15 V @ 1.0 A)



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