µPC7900H SERIES

Three Terminal Negative Regulators

GENERAL DESCRIPTION

The µPC7900H series are monolithic three terminal negative regulators which employ internally current limiting, thermal shut down, and safe-area compensation, make them essentially indestructible. They are intended as fixed-voltage regulators in a wide range of application including local on card regulation for elimination of distribution problems associated with single point regulation.

FEATURES

- Output current in excess of 1 A
- No external component required
- Internal thermal overload protection
- Internal short circuit current limiting
- Low output resistance 70 mΩ

EQUIVALENT CIRCUIT

NOTE: Ⓐ −5V to −8V OPTIONS
Ⓑ −2V to −24V OPTIONS

ORDERING INFORMATION

µPC7900H

3 pin SIP
(Single In-Line Package)
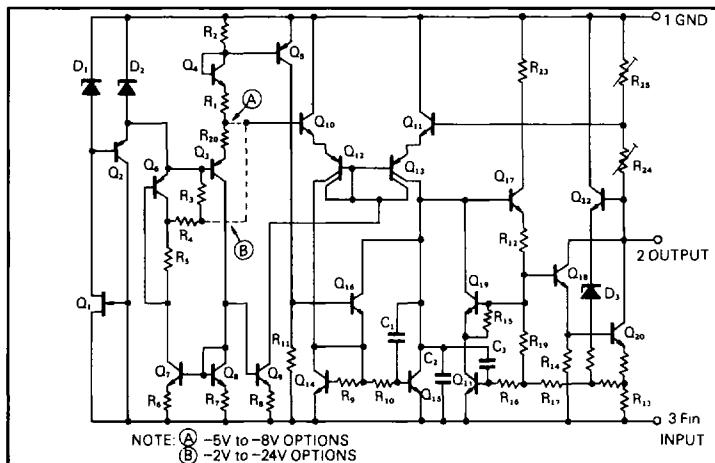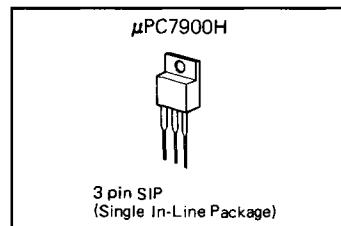
CONNECTION DIAGRAM (Top View)

INPUT

NEC
JAPAN
79XX

1 3 2

GND INPUT OUTPUT
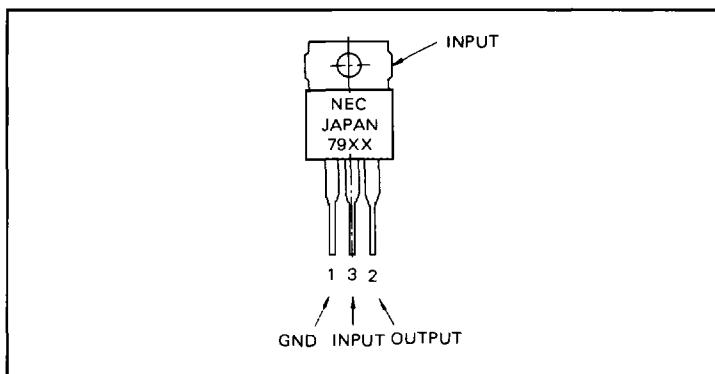
TYPICAL APPLICATION
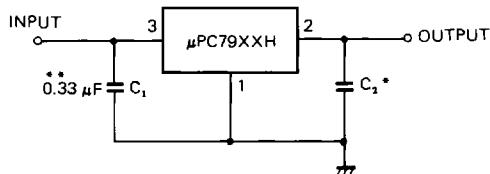
Notes: * Although no output capacitor is needed for stability,
it does improve transient response.
** Required if regulator is located an appreciable
distance from power supply filter.

ABSOLUTE MAXIMUM RATINGS

Input Voltage	(μPC7905H/08H/12H/15H/18H)	−35	V
	(μPC7924H)	−40	V
Internal Power Dissipation	Internally Limited		
Operating Temperature Range	−20 to +80	°C	
Storage Temperature Range	−55 to +150	°C	
Lead Temperature	Soldering 10 s 230	°C	
Operating Junction Temperature Range	0 to 125	°C (Continuous)	
Operating Junction Temperature Range	0 to 200	°C (short term, 30 min. MAX.)	

ELECTRICAL CHARACTERISTICS μPC7905H (V_{IN} = −10 V, Io =−500 mA, 0°C ⩽ Tj ⩽ 125°)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Output Voltage	Vo	−4.8	−5.0	−5.2	V	Tj = 25°C
		−4.75		−5.25		−7 V ⩽ V_{IN} ⩽ − 20 V, −5 mA ⩽ Io ⩽ −1.0 A, P_T ⩽ 15 W
Line Regulation	REG_{IN}		3	100	mV	Tj = 25°C, −7 V ⩽ V_{IN} ⩽ −25 V
			1	50		Tj = 25°C, −8 V ⩽ V_{IN} ⩽ −12 V
Load Regulation	REG_L		70	150	mV	Tj = 25°C, −5 mA ⩽ Io ⩽ −1.5 A
			20	80		Tj = 25°C, −250 mA ⩽ Io ⩽ −750 mA
Quiescent Current	I_{BIAS}		1.0	2.0	mA	Tj = 25°C
Quiescent Current Change	$ΔI_{BIAS}$			1.3	mA	−7 V ⩽ V_{IN} ⩽ −25 V
				0.5		−5 mA ⩽ Io ⩽ −1.0 A
Output Noise Voltage	N_L		100		μV	Ta = 25°C, 10 Hz ⩽ f ⩽ 100 kHz
Ripple Rejection		54	62		dB	f=120 Hz, −8 V⩽V_{IN}⩽−18 V, Io=−500 mA
Dropout Voltage			1.1		V	Io = −1.0 A, Tj = 25°C
Peak Output Current	Iopeak		−2.1		A	Tj = 25°C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−0.4		mV/°C	Io = −5 mA, 0°C ⩽ Tj ⩽ 125°C

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ELECTRICAL CHARACTERISTICS μPC7908H (V_{IN} = −14 V, Io=−500 mA, 0°C < Tj < 125°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Output Voltage	Vo	−7.7	−8.0	−8.3	V	Tj = 25°C
		−7.6		−8.4		−10.5 V ⩽ V_{IN} ⩽ −23 V, −5 mA ⩽ Io ⩽ −1.0 A, P_T ⩽ 15 W
Line Regulation	REG_{IN}		6.0	160	mV	Tj = 25°C, −10.5 V ⩽ V_{IN} ⩽ −25 V
			2.0	80		Tj = 25°C, −11 V ⩽ V_{IN} ⩽ −17 V
Load Regulation	REG_L		80	200	mV	Tj = 25°C, −5 mA ⩽ Io ⩽ −1.5 A
			30	100		Tj = 25°C, −250 mA ⩽ Io ⩽ −750 mA
Quiescent Current	I_{BIAS}		1.0	2.0	mA	Tj = 25°C
Quiescent Current Change	ΔI_{BIAS}			1.0	mA	−10.5 V ⩽ V_{IN} ⩽ −25 V
				0.5		−5 mA ⩽ Io ⩽ −1.0 A
Output Noise Voltage	N_L		200		μV	Ta = 25°C, 10 Hz ⩽ f ⩽ 100 kHz
Ripple Rejection		54	62		dB	f = 120 Hz, −11.5 V ⩽ V_{IN} ⩽ −21.5 V, Io = −500 mA
Dropout Voltage			1.1		V	Io = −1.0 A, Tj = 25°C
Peak Output Current	Iopeak		−2.1		A	Tj = 25°C
Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta T$		−0.6		mV/°C	Io = −5 mA, 0°C ⩽ Tj ⩽ 125°C

ELECTRICAL CHARACTERISTICS μPC7912H (V_{IN} = −19 V, Io=−500 mA, 0°C < Tj < 125°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Output Voltage	Vo	−11.5	−12.0	−12.5	V	Tj = 25°C
		−11.4		−12.6		−14.5 V ⩽ V_{IN} ⩽ −27 V, −5 mA ⩽ Io ⩽ −1.0 A, P_T ⩽ 15 W
Line Regulation	REG_{IN}		10	240	mV	Tj = 25°C, −14.5 V ⩽ V_{IN} ⩽ −30 V
			3.0	120		Tj = 25°C, −16 V ⩽ V_{IN} ⩽ −22 V
Load Regulation	REG_L		85	240	mV	Tj = 25°C, −5 mA ⩽ Io ⩽ −1.5 A
			30	120		Tj = 25°C, −250 mA ⩽ Io ⩽ −750 mA
Quiescent Current	I_{BIAS}		1.5	3.0	mA	Tj = 25°C
Quiescent Current Change	ΔI_{BIAS}			1.0	mA	−14.5 V ⩽ V_{IN} ⩽ −30 V
				0.5		−5 mA ⩽ Io ⩽ −1.0 A
Output Noise Voltage	N_L		300		μV	Ta = 25°C, 10 Hz ⩽ f ⩽ 100 kHz
Ripple Rejection		54	62		dB	f = 120 Hz, −15 V ⩽ V_{IN} ⩽ −25 V, Io = −500 mA
Dropout Voltage			1.1		V	Io = −1.0 A, Tj = 25°C
Peak Output Current	Iopeak		−2.1		A	Tj = 25°C
Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta T$		−0.8		mV/°C	Io = −5 mA, 0°C ⩽ Tj ⩽ 125°C

ELECTRICAL CHARACTERISTICS µPC7915H (V$_{IN}$ = −23 V, Io = −500 mA, 0°C ⩽ Tj ⩽ 125°C)

| CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Output Voltage	Vo	−14.4	−15.0	−15.6	V	Tj = 25°C
		−14.25		−15.75		−17.5 V ⩽ V$_{IN}$ ⩽ −30 V, −5 mA ⩽ Io ⩽ −1.0 A, P$_T$ ⩽ 15 W
Line Regulation	REG$_{IN}$		11	300	mV	Tj = 25°C, −17.5 V ⩽ V$_{IN}$ ⩽ −30 V
			3.0	150		Tj = 25°C, −20 V ⩽ V$_{IN}$ ⩽ −26 V
Load Regulation	REG$_L$		90	300	mV	Tj = 25°C, −5 mA ⩽ Io ⩽ −1.5 A
			30	150		Tj = 25°C, −250 mA ⩽ Io ⩽ −750 mA
Quiescent Current	I$_{BIAS}$		1.5	3.0	mA	Tj = 25°C
Quiescent Current Change	ΔI$_{BIAS}$			1.0	mA	−17.5 V ⩽ V$_{IN}$ ⩽ −30 V
				0.5		−5 mA ⩽ Io ⩽ −1.0 A
Output Noise Voltage	N$_L$		375		µV	Ta = 25°C, 10 Hz ⩽ f ⩽ 100 kHz
Ripple Rejection		54	60		dB	f = 120 Hz, −18.5 V ⩽ V$_{IN}$ ⩽ −28.5 V, Io = −500 mA
Dropout Voltage			1.1		V	Io = −1.0 A, Tj = 25°C
Peak Output Current	Iopeak		−2.1		A	Tj = 25°C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.0		mV/°C	Io = −5 mA, 0°C ⩽ Tj ⩽ 125°C

ELECTRICAL CHARACTERISTICS µPC7918H (V$_{IN}$ = −27 V, Io = −500 mA, 0°C ⩽ Tj ⩽ 125°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Output Voltage	Vo	−17.3	−18.0	−18.7	V	Tj = 25°C
		−17.1		−18.9		−21 V ⩽ V$_{IN}$ ⩽ −33 V, −5 mA ⩽ Io ⩽ −1.0 A, P$_T$ ⩽ 15 W
Line Regulation	REG$_{IN}$		15	360	mV	Tj = 25°C, −21 V ⩽ V$_{IN}$ ⩽ −33 V
			5.0	180		Tj = 25°C, −24 V ⩽ V$_{IN}$ ⩽ −30 V
Load Regulation	REG$_L$		90	360	mV	Tj = 25°C, −5 mA ⩽ Io ⩽ −1.5 A
			30	180		Tj = 25°C, −250 mA ⩽ Io ⩽ −750 mA
Quiescent Current	I$_{BIAS}$		1.5	3.0	mA	Tj = 25°C
Quiescent Current Change	ΔI$_{BIAS}$			1.0	mA	−21 V ⩽ V$_{IN}$ ⩽ −33 V
				0.5		−5 mA ⩽ Io ⩽ −1.0 A
Output Noise Voltage	N$_L$		450		µV	Ta = 25°C, 10 Hz ⩽ f ⩽ 100 kHz
Ripple Rejection		54	60		dB	f = 120 Hz, −22 V ⩽ V$_{IN}$ ⩽ −32 V, Io = −500 mA
Dropout Voltage			1.1		V	Io = −1.0 A, Tj = 25°C
Peak Output Current	Iopeak		−2.1		A	Tj = 25°C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.0		mV/°C	Io = −5 mA, 0°C ⩽ Tj ⩽ 125°C

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ELECTRICAL CHARACTERISTICS μPC7924H (V_{IN} = −33 V, Io = −500 mA, 0°C ≤ Tj ≤ 125°C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Output Voltage	Vo	−23.0	−24.0	−25.0	V	Tj = 25°C
		−22.8		−25.2		−27 V ≤ V_{IN} ≤ −38 V, −5 mA ≤ Io ≤ −1.0 A
Line Regulation	REG_{IN}		18	480	mV	Tj = 25°C, −27 V ≤ V_{IN} ≤ −38 V
			6	240		Tj = 25°C, −30 V ≤ V_{IN} ≤ −36 V
Load Regulation	REG_L		90	480	mV	Tj = 25°C, −5 mA ≤ Io ≤ −1.5 A
			30	240		Tj = 25°C, −250 mA ≤ Io ≤ −750 mA
Quiescent Current	I_{BIAS}		1.5	3.0	mA	Tj = 25°C
Quiescent Current Change	ΔI_{BIAS}			1.0	mA	−27 V ≤ V_{IN} ≤ −38 V
				0.5		−5 mA ≤ Io ≤ −1.0 A
Output Noise Voltage	N_L		600		μV	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz
Ripple Rejection		51	59		dB	f = 120 Hz, −28 V ≤ V_{IN} ≤ −38 V, Io = −500 mA
Dropout Voltage			1.1		V	Io = −1.0 A, Tj = 25°C
Peak Output Current	Iopeak		−2.1		A	Tj = 25°C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.0		mV/°C	Io = −5 mA, 0°C ≤ Tj ≤ 125°C

TYPICAL CHARACTERISTICS (Ta = 25°C)

POWER DISSIPATION vs. AMBIENT TEMPERATURE

CURRENT LIMITING CHARACTERISTICS
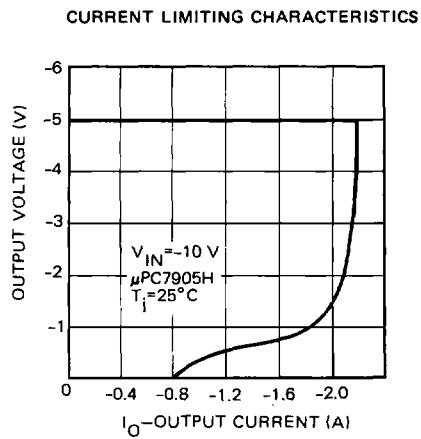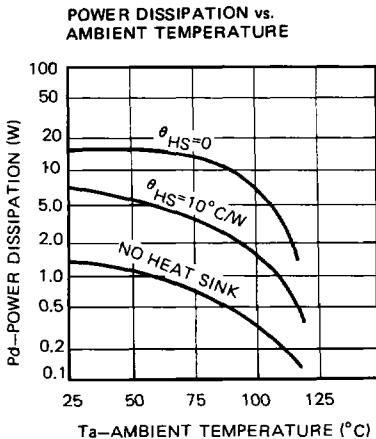
PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT/OUTPUT DIFFERENTIAL VOLTAGE

I_{peak}—PEAK OUTPUT CURRENT (A)

$T_j = 25°C$

$T_j = 125°C$

V_{DIF}—INPUT-OUTPUT DIFFERENTIAL (V)

LOAD TRANSIENT RESPONSE

LOAD CURRENT (A)

OUTPUT VOLTAGE DEVIATION (V)

$V_{IN} = -10$ V
μPC7905H
C_{IN}, $C_{OUT} = 0$

TIME (μs)

LINE TRANSIENT RESPONSE

INPUT VOLTAGE (V)

OUTPUT VOLTAGE DEVIATION (V)

$I_O = -200$ mA, $T_j = 25°C$
μPC7905H

TIME (μs)
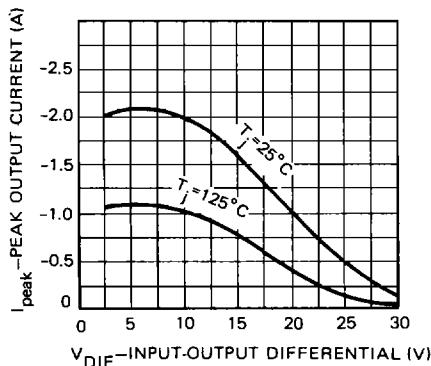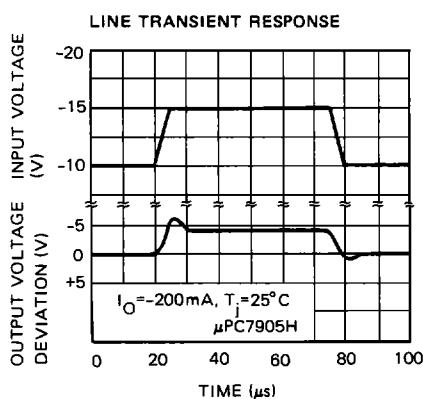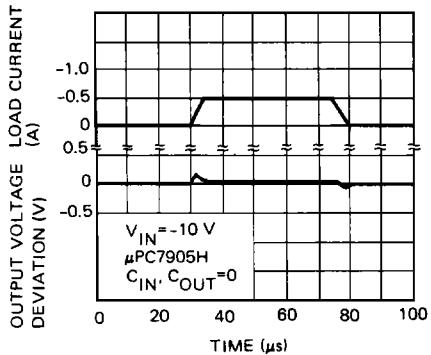
OUTPUT IMPEDANCE AS A FUNCTION OF FREQUENCY

OUTPUT IMPEDANCE (Ω)

μPC7905H
$V_{IN} = -10$ V
$I_O = -100$ mA
$T_j = 25°C$
C_{IN}, $C_{OUT} = 0$

FREQUENCY (Hz)

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