

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC7900A Series

THREE TERMINAL NEGATIVE VOLTAGE REGULATOR

DESCRIPTION

μ PC7900A series are monolithic three terminal negative regulators which employ internally current limiting, thermal shut down, output transistor safe operating area protection 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 wide single point regulation.

FEATURES

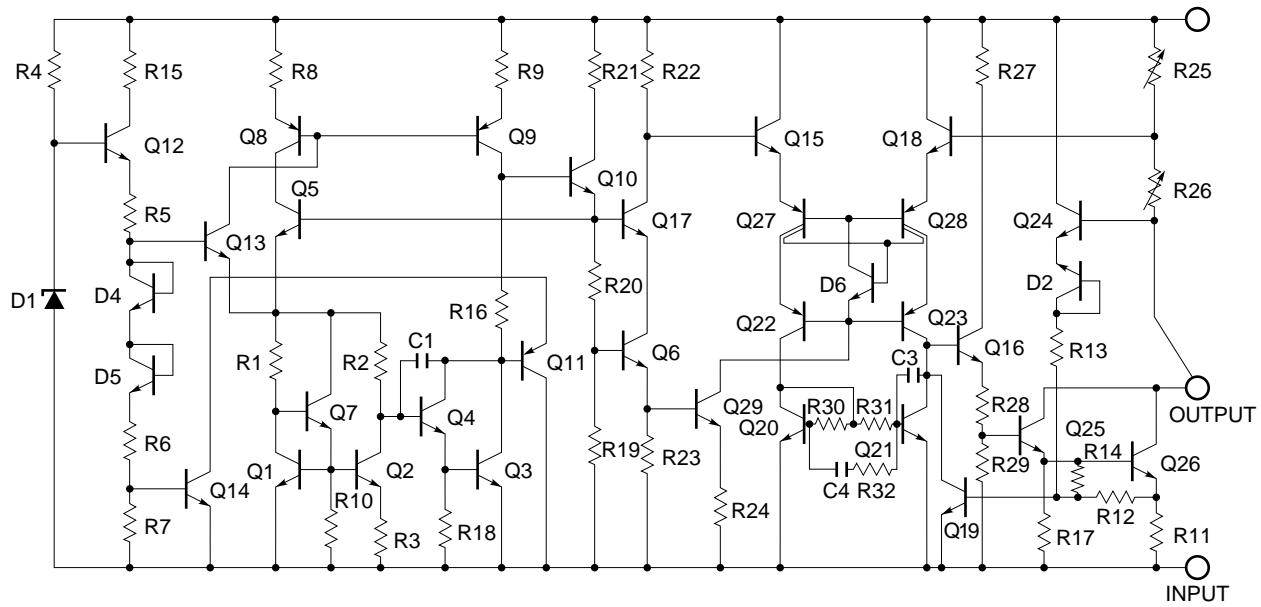
- Wide operation temperature range.
T_A: -30 °C to +85 °C
- Good load regulation.
7 mV TYP. (250 mA \leq I_o \leq 750 mA): μ PC7905AHF
- Low noise.

ORDERING INFORMATION

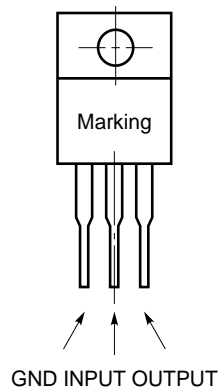
Part Number	Output Voltage	Package
μ PC7905AHF	-5 V	MP-45G (ISOLATED TO-220)
μ PC7908AHF	-8 V	MP-45G (ISOLATED TO-220)
μ PC7912AHF	-12 V	MP-45G (ISOLATED TO-220)
μ PC7915AHF	-15 V	MP-45G (ISOLATED TO-220)
μ PC7918AHF	-18 V	MP-45G (ISOLATED TO-220)
μ PC7924AHF	-24 V	MP-45G (ISOLATED TO-220)

The information in this document is subject to change without notice.

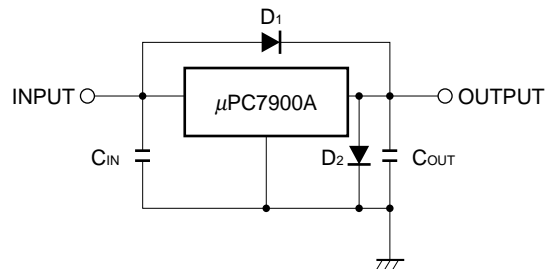
EQUIVALENT CIRCUIT



CONNECTION DIAGRAM



TYPICAL CONNECTION



C_{IN} : More than $2.2 \mu F$

C_{OUT} : More than $0.33 \mu F$

D_1 : Needed for $V_{IN} > V_O$

D_2 : Needed for $V_O > GND$

ABSOLUTE MAXIMUM REATINGS ($T_A = 25\text{ }^{\circ}\text{C}$)

Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	-35/-40 Note 1	V
Internal Power Dissipation	P_T	15 Note 2	W
Operating Ambient Temperature Range	T_A	-30 to +85	$^{\circ}\text{C}$
Operating Junction Temperature Range	T_J	-30 to +150	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	-55 to +150	$^{\circ}\text{C}$
Thermal Resistance (junction to case)	$R_{th(J-C)}$	5.0	$^{\circ}\text{C/W}$
Thermal Resistance (junction to ambient)	$R_{th(J-A)}$	65	$^{\circ}\text{C/W}$

Note 1. μ PC7905A, 08A, 12A, 15A, 18A: -35 V, μ PC7924A: -40 V

2. Internally limited

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Part Number	MIN.	TYP.	MAX.	Unit
Input Voltage	V_{IN}	μ PC7905AHF	-7	-10	-25	V
		μ PC7908AHF	-10.5	-14	-25	
		μ PC7912AHF	-14.5	-19	-30	
		μ PC7915AHF	-17.5	-23	-30	
		μ PC7918AHF	-21	-27	-33	
		μ PC7924AHF	-27	-33	-38	
Output Current	I_O	All	0.005		1	A
Operating Ambient Temperature	T_A	All	-30		+85	$^{\circ}\text{C}$
Operating Junction Temperature Range	T_J	All	-30		+125	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

μPC7905A

(V_{IN} = -10 V, I_O = 500 mA, 0 °C ≤ T_J ≤ +125 °C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V _O	T _J = 25 °C	-4.8	-5.0	-5.2	V
		-7 V ≤ V _{IN} ≤ -20 V, 5 mA ≤ I _O ≤ 1 A, P _T ≤ 15 W	-4.75		-5.25	
		-30 °C ≤ T _J ≤ +125 °C	-4.75		-5.25	
Line Regulation	REG _{IN}	T _J = 25 °C, -7 V ≤ V _{IN} ≤ -25 V		25	100	mV
		T _J = 25 °C, -8 V ≤ V _{IN} ≤ -12 V		3	50	
Load Regulation	REG _L	T _J = 25 °C, 5 mA ≤ I _O ≤ 1.5 A		30	100	mV
		T _J = 25 °C, 250 mA ≤ I _O ≤ 750 mA		7	50	
Quiescent Current	I _{BIAS}	T _J = 25 °C		3.6	6.0	mA
Quiescent Current Change	ΔI _{BIAS}	-7 V ≤ V _{IN} ≤ -25 V			1.3	mA
		5 mA ≤ I _O ≤ 1 A			0.5	
Output Noise Voltage	V _n	T _J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		77		μV _{r.m.s}
Ripple Rejection	R•R	T _J = 25 °C, f = 120 Hz, -8 V ≤ V _{IN} ≤ -18 V, I _O = 500 mA	56	63		dB
Dropout Voltage	V _{DIF}	T _J = 25 °C, I _O = 1 A		1.2		V
Peak Output Current	I _{Opeak}	T _J = 25 °C	1.6	2.2	2.8	A
Temperature Coefficient of Output Voltage	ΔV _O /ΔT	I _O = 5 mA		0.36		mV/°C

μPC7908A

(V_{IN} = -14 V, I_O = 500 mA, 0 °C ≤ T_J ≤ +125 °C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V _O	T _J = 25 °C	-7.7	-8.0	-8.3	V
		-10.5 V ≤ V _{IN} ≤ -23 V, 5 mA ≤ I _O ≤ 1 A, P _T ≤ 15 W	-7.6		-8.4	
		-30 °C ≤ T _J ≤ +125 °C	-7.6		-8.4	
Line Regulation	REG _{IN}	T _J = 25 °C, -10.5 V ≤ V _{IN} ≤ -25 V		33	150	mV
		T _J = 25 °C, -11 V ≤ V _{IN} ≤ -17 V		14	75	
Load Regulation	REG _L	T _J = 25 °C, 5 mA ≤ I _O ≤ 1.5 A		40	160	mV
		T _J = 25 °C, 250 mA ≤ I _O ≤ 750 mA		14	80	
Quiescent Current	I _{BIAS}	T _J = 25 °C		3.9	6.0	mA
Quiescent Current Change	ΔI _{BIAS}	-10.5 V ≤ V _{IN} ≤ -25 V			1.0	mA
		5 mA ≤ I _O ≤ 1 A			0.5	
Output Noise Voltage	V _n	T _J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		130		μV _{r.m.s}
Ripple Rejection	R•R	T _J = 25 °C, -11.5 V ≤ V _{IN} ≤ -21.5 V, f = 120 Hz, I _O = 500 mA	52	58		dB
Dropout Voltage	V _{DIF}	T _J = 25 °C, I _O = 1 A		1.2		V
Peak Output Current	I _{Opeak}	T _J = 25 °C	1.6	2.2	2.8	A
Temperature Coefficient of Output Voltage	ΔV _O /ΔT	I _O = 5 mA		0.32		mV/°C

μ PC7912A(V_{IN} = -19 V, I_O = 500 mA, 0 °C ≤ T_J ≤ +125 °C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V _O	T _J = 25 °C	-11.5	-12	-12.5	V
		-14.5 V ≤ V _{IN} ≤ -27 V, 5 mA ≤ I _O ≤ 1 A, P _T ≤ 15 W	-11.4		-12.6	
		-30 °C ≤ T _J ≤ +125 °C	-11.4		-12.6	
Line Regulation	REG _{IN}	T _J = 25 °C, -14.5 V ≤ V _{IN} ≤ -30 V		60	200	mV
		T _J = 25 °C, -16 V ≤ V _{IN} ≤ -22 V		25	100	
Load Regulation	REG _L	T _J = 25 °C, 5 mA ≤ I _O ≤ 1.5 A		70	220	mV
		T _J = 25 °C, 250 mA ≤ I _O ≤ 750 mA		20	110	
Quiescent Current	I _{BIAS}	T _J = 25 °C		4.1	6.2	mA
Quiescent Current Change	ΔI _{BIAS}	-14.5 V ≤ V _{IN} ≤ -30 V			1.0	mA
		5 mA ≤ I _O ≤ 1 A			0.5	
Output Noise Voltage	V _n	T _J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		140		μV _{r.m.s}
Ripple Rejection	R•R	T _J = 25 °C, f = 120 Hz, -15 V ≤ V _{IN} ≤ -25 V, I _O = 500 mA	49	56		dB
Dropout Voltage	V _{DIF}	T _J = 25 °C, I _O = 1 A		1.2		V
Peak Output Current	I _{Opeak}	T _J = 25 °C	1.6	2.2	2.8	A
Temperature Coefficient of Output Voltage	ΔV _O /ΔT	I _O = 5 mA		0.04		mV/°C

 μ PC7915A(V_{IN} = -23 V, I_O = 500 mA, 0 °C ≤ T_J ≤ +125 °C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V _O	T _J = 25 °C	-14.4	-15	-15.6	V
		-17.5 V ≤ V _{IN} ≤ -30 V, 5 mA ≤ I _O ≤ 1 A, P _T ≤ 15 W	-14.25		-15.75	
		-30 °C ≤ T _J ≤ +125 °C	-14.25		-15.75	
Line Regulation	REG _{IN}	T _J = 25 °C, -17.5 V ≤ V _{IN} ≤ -30 V		60	200	mV
		T _J = 25 °C, -20 V ≤ V _{IN} ≤ -26 V		30	100	
Load Regulation	REG _L	T _J = 25 °C, 5 mA ≤ I _O ≤ 1.5 A		100	300	mV
		T _J = 25 °C, 250 mA ≤ I _O ≤ 750 mA		30	150	
Quiescent Current	I _{BIAS}	T _J = 25 °C		4.2	6.2	mA
Quiescent Current Change	ΔI _{BIAS}	-17.5 V ≤ V _{IN} ≤ -30 V			1.0	mA
		5 mA ≤ I _O ≤ 1 A			0.5	
Output Noise Voltage	V _n	T _J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		240		μV _{r.m.s}
Ripple Rejection	R•R	T _J = 25 °C, f = 120 Hz, -18.5 V ≤ V _{IN} ≤ -28.5 V, I _O = 500 mA	47	54		dB
Dropout Voltage	V _{DIF}	T _J = 25 °C, I _O = 1 A		1.2		V
Peak Output Current	I _{Opeak}	T _J = 25 °C	1.6	2.2	2.8	A
Temperature Coefficient of Output Voltage	ΔV _O /ΔT	I _O = 5 mA		1.2		mV/°C

μ PC7918A

($V_{IN} = -27\text{ V}$, $I_O = 500\text{ mA}$, $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$)

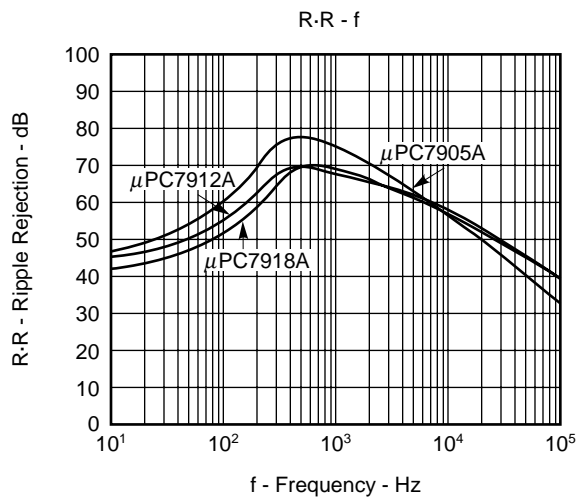
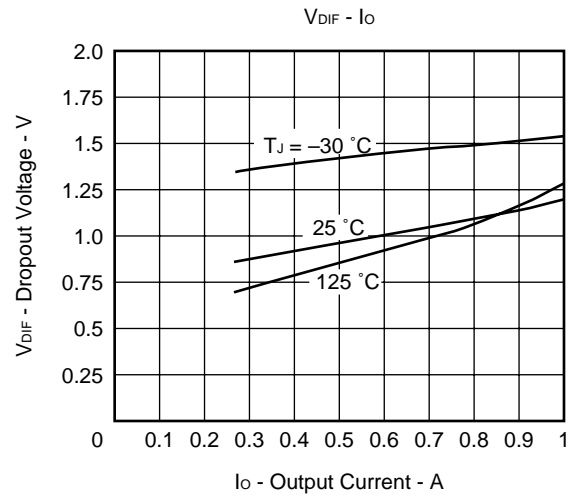
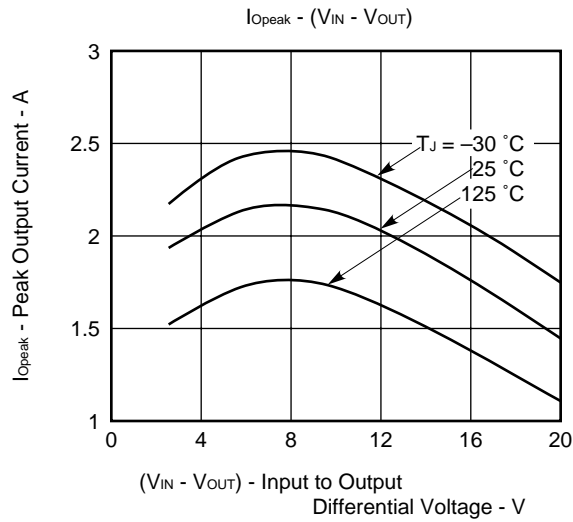
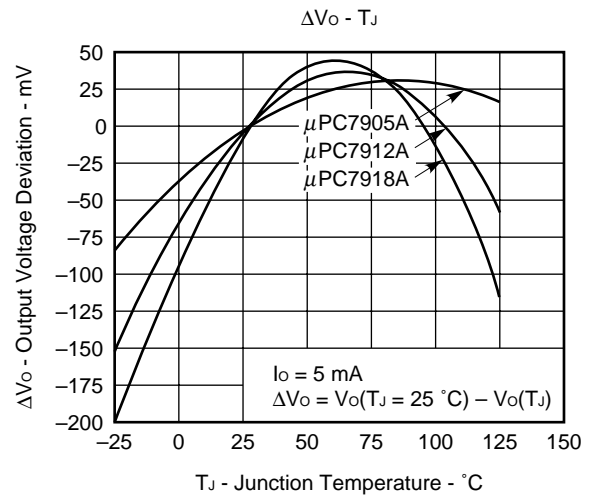
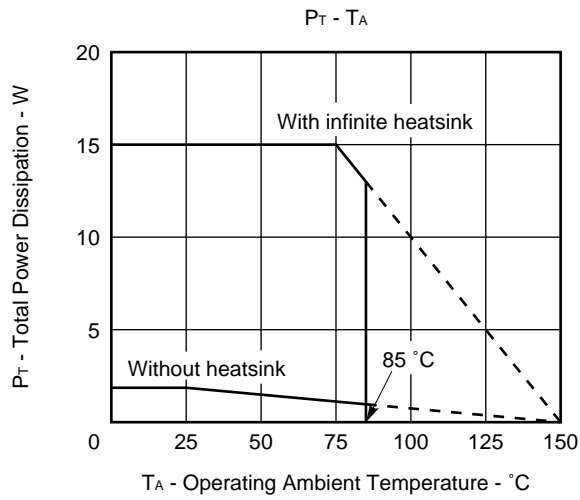
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	$T_J = 25\text{ }^{\circ}\text{C}$	-17.3	-18	-18.7	V
		$-21\text{ V} \leq V_{IN} \leq -33\text{ V}$, $5\text{ mA} \leq I_O \leq 1\text{ A}$, $P_T \leq 15\text{ W}$	-17.1		-18.9	
		$-30\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$	-17.1		-18.9	
Line Regulation	REG_{IN}	$T_J = 25\text{ }^{\circ}\text{C}$, $-21\text{ V} \leq V_{IN} \leq -33\text{ V}$		60	240	mV
		$T_J = 25\text{ }^{\circ}\text{C}$, $-24\text{ V} \leq V_{IN} \leq -30\text{ V}$		30	120	
Load Regulation	REG_L	$T_J = 25\text{ }^{\circ}\text{C}$, $5\text{ mA} \leq I_O \leq 1.5\text{ A}$		125	360	mV
		$T_J = 25\text{ }^{\circ}\text{C}$, $250\text{ mA} \leq I_O \leq 750\text{ mA}$		47	180	
Quiescent Current	I_{BIAS}	$T_J = 25\text{ }^{\circ}\text{C}$		4.1	6.5	mA
Quiescent Current Change	ΔI_{BIAS}	$-21\text{ V} \leq V_{IN} \leq -33\text{ V}$			1.0	mA
		$5\text{ mA} \leq I_O \leq 1\text{ A}$			0.5	
Output Noise Voltage	V_n	$T_J = 25\text{ }^{\circ}\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$		190		$\mu\text{Vr.m.s}$
Ripple Rejection	$R \cdot R$	$T_J = 25\text{ }^{\circ}\text{C}$, $f = 120\text{ Hz}$, $-22\text{ V} \leq V_{IN} \leq -32\text{ V}$, $I_O = 500\text{ mA}$	45	53		dB
Dropout Voltage	V_{DIF}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_O = 1\text{ A}$		1.2		V
Peak Output Current	I_{Opeak}	$T_J = 25\text{ }^{\circ}\text{C}$	1.6	2.2	2.8	A
Temperature Coefficient of Output Voltage	$ \Delta V_O/\Delta T $	$I_O = 5\text{ mA}$		0.24		$\text{mV}/^{\circ}\text{C}$

μ PC7924A

($V_{IN} = -33\text{ V}$, $I_O = 500\text{ mA}$, $0\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$)

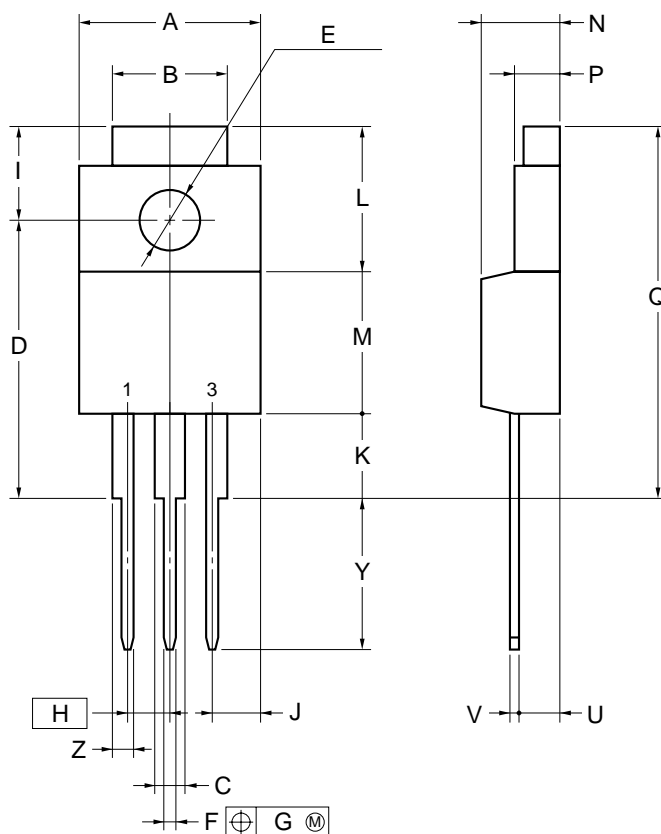
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	$T_J = 25\text{ }^{\circ}\text{C}$	-23.0	-24	-25.0	V
		$-27\text{ V} \leq V_{IN} \leq -38\text{ V}$, $5\text{ mA} \leq I_O \leq 1\text{ A}$, $P_T \leq 15\text{ W}$	-22.8		-25.2	
		$-30\text{ }^{\circ}\text{C} \leq T_J \leq +125\text{ }^{\circ}\text{C}$	-22.8		-25.2	
Line Regulation	REG_{IN}	$T_J = 25\text{ }^{\circ}\text{C}$, $-27\text{ V} \leq V_{IN} \leq -38\text{ V}$		70	280	mV
		$T_J = 25\text{ }^{\circ}\text{C}$, $-30\text{ V} \leq V_{IN} \leq -36\text{ V}$		37	140	
Load Regulation	REG_L	$T_J = 25\text{ }^{\circ}\text{C}$, $5\text{ mA} \leq I_O \leq 1.5\text{ A}$		160	480	mV
		$T_J = 25\text{ }^{\circ}\text{C}$, $250\text{ mA} \leq I_O \leq 750\text{ mA}$		60	240	
Quiescent Current	I_{BIAS}	$T_J = 25\text{ }^{\circ}\text{C}$		4.2	6.5	mA
Quiescent Current Change	ΔI_{BIAS}	$-27\text{ V} \leq V_{IN} \leq -38\text{ V}$			1.0	mA
		$5\text{ mA} \leq I_O \leq 1\text{ A}$			0.5	
Output Noise Voltage	V_n	$T_J = 25\text{ }^{\circ}\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$		240		$\mu\text{Vr.m.s}$
Ripple Rejection	$R \cdot R$	$T_J = 25\text{ }^{\circ}\text{C}$, $f = 120\text{ Hz}$, $-28\text{ V} \leq V_{IN} \leq -38\text{ V}$, $I_O = 500\text{ mA}$	43	49		dB
Dropout Voltage	V_{DIF}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_O = 1\text{ A}$		1.2		V
Peak Output Current	I_{Opeak}	$T_J = 25\text{ }^{\circ}\text{C}$	1.6	2.2	2.8	A
Temperature Coefficient of Output Voltage	$ \Delta V_O/\Delta T $	$I_O = 5\text{ mA}$		1.1		$\text{mV}/^{\circ}\text{C}$

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$)



μPC7900AHF Series

3PIN PLASTIC SIP (MP-45G)



NOTE

Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	10.4 MAX.	0.410 MAX.
B	7.0	0.276
C	1.2 MIN.	0.047 MIN.
D	17.0±0.3	0.669 ^{+0.013} _{-0.012}
E	φ3.3±0.2	φ0.130±0.008
F	0.75±0.10	0.030 ^{+0.004} _{-0.005}
G	0.25	0.010
H	2.54 (T.P.)	0.100 (T.P.)
I	5.0±0.3	0.197±0.012
J	2.66 MAX.	0.105 MAX.
K	4.8 MIN.	0.188 MIN.
L	8.5	0.335
M	8.5	0.335
N	4.5±0.2	0.177±0.008
P	2.8±0.2	0.110 ^{+0.009} _{-0.008}
Q	22.4 MAX.	0.882 MAX.
U	2.4±0.5	0.094 ^{+0.021} _{-0.020}
V	0.65±0.10	0.026 ^{+0.004} _{-0.005}
Y	8.9±0.7	0.350±0.028
Z	1.0 MIN.	0.039 MIN.

P3HF-254B-2

RECOMMENDED SOLDERING CONDITIONS

When soldering this product, it is highly recommended to observe the conditions as shown below. If other soldering processes are used, or if the soldering is performed under different conditions, please make sure to consult with our sales offices.

For more details, refer to our document “**SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL**” (C10535E).

TYPES OF THROUGH HOLE MOUNT DEVICE

μPC7900AHF Series

Soldering Process	Soldering Conditions	Symbol
Wave soldering	Solder temperature: 260 °C or below. Flow Time: 10 seconds or below.	

REFERENCE

Document Name	Document No.
NEC semiconductor device reliability/quality control system.	IEI-1212
Quality grade on NEC semiconductor devices.	C11531E
Semiconductor device mounting technology manual.	C10535E
IC package manual.	C10943X
Guide to quality assurance for semiconductor devices.	MEI-1202
Semiconductors selection guide.	X10679E

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Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

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Anti-radioactive design is not implemented in this product.