NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT
μPC7900A Series

THREE TERMINAL NEGATIVE VOLTAGE REGULATOR

DESCRIPTION

μPC7900A 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

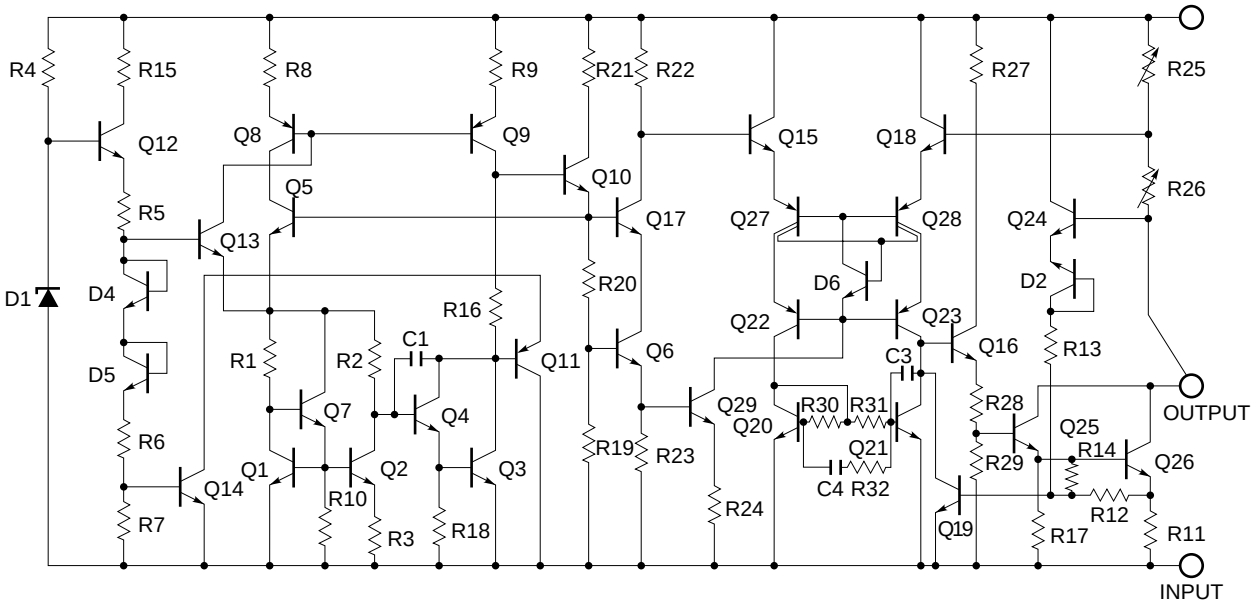
- Wide operation temperature range.
  T_A: –30 ˚C to +85 ˚C
- Good load regulation.
  7 mV TYP. (250 mA ≤ I_O ≤ 750 mA): μPC7905AHF
- Low noise.

ORDERING INFORMATION

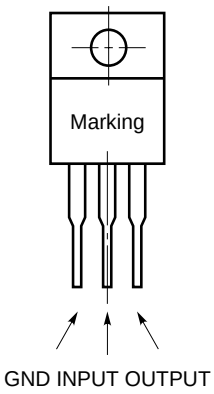
Part Number	Output Voltage	Package
μPC7905AHF	–5 V	MP-45G (ISOLATED TO-220)
μPC7908AHF	–8 V	MP-45G (ISOLATED TO-220)
μPC7912AHF	–12 V	MP-45G (ISOLATED TO-220)
μPC7915AHF	–15 V	MP-45G (ISOLATED TO-220)
μPC7918AHF	–18 V	MP-45G (ISOLATED TO-220)
μPC7924AHF	–24 V	MP-45G (ISOLATED TO-220)

Document No. G10640EJ3V0DS00 (3rd edition)
(Previous No. IC-3486)
Date Published March 1997 N
Printed in Japan

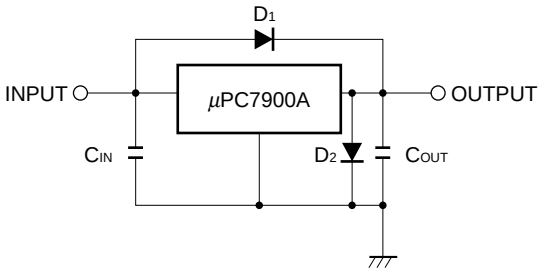
EQUIVALENT CIRCUIT



CONNECTION DIAGRAM



TYPICAL CONNECTION



C_{IN} : More than 2.2 μF

C_{OUT} : More than 0.33 μF

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

D_2 : Needed for $V_O >$ GND

ABSOLUTE MAXIMUM REATINGS (T_A = 25 °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	°C
Operating Junction Temperature Range	T_J	–30 to +150	°C
Storage Temperature Range	T_{stg}	–55 to +150	°C
Thermal Resistance (junction to case)	$R_{th(J-C)}$	5.0	°C/W
Thermal Resistance (junction to ambient)	$R_{th(J-A)}$	65	°C/W

Note 1. μPC7905A, 08A, 12A, 15A, 18A: –35 V, μPC7924A: –40 V

2. Internally limited

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Part Number	MIN.	TYP.	MAX.	Unit
Input Voltage	V_{IN}	μPC7905AHF	–7	–10	–25	V
		μPC7908AHF	–10.5	–14	–25	
		μPC7912AHF	–14.5	–19	–30	
		μPC7915AHF	–17.5	–23	–30	
		μPC7918AHF	–21	–27	–33	
		μPC7924AHF	–27	–33	–38	
Output Current	I_O	All	0.005		1	A
Operating Ambient Temperature	T_A	All	–30		+85	°C
Operating Junction Temperature Range	T_J	All	–30		+125	°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 Noize Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		77		μVr.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 = 1A		1.2		V
Peak Output Current	I_{Opeak}	T_J = 25 °C	1.6	2.2	2.8	A
Temperature Coefficient of Output Voltage	$\lvert\Delta V_O/\Delta T\rvert$	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 Noize Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		130		μVr.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	$\lvert\Delta V_O/\Delta T\rvert$	I_O = 5 mA		0.32		mV/°C

μPC7912A

(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 ≤ 1A			0.5	
Output Noize Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		140		μVr.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 = 1A		1.2		V
Peak Output Current	I_{Opeak}	T_J = 25 °C	1.6	2.2	2.8	A
Temperature Coefficient of Output Voltage	$\lvert\Delta V_O/\Delta T\rvert$	I_O = 5 mA		0.04		mV/°C

μPC7915A

(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 Noize Voltage	V_n	T_J = 25 °C, 10 Hz ≤ f ≤ 100 kHz		240		μVr.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	$\lvert\Delta V_O/\Delta T\rvert$	I_O = 5 mA		1.2		mV/°C

μPC7918A

(V_{IN} = –27 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	–17.3	–18	–18.7	V
		–21 V ≤ V_{IN} ≤ –33 V, 5 mA ≤ I_O ≤ 1 A, P_T ≤ 15 W	–17.1		–18.9	
		–30 ˚C ≤ T_J ≤ +125 ˚C	–17.1		–18.9	
Line Regulation	REG_{IN}	T_J = 25 ˚C, –21 V ≤ V_{IN} ≤ –33 V		60	240	mV
		T_J = 25 ˚C, –24 V ≤ V_{IN} ≤ –30 V		30	120	
Load Regulation	REG_L	T_J = 25 ˚C, 5 mA ≤ I_O ≤ 1.5 A		125	360	mV
		T_J = 25 ˚C, 250 mA ≤ I_O ≤ 750 mA		47	180	
Quiescent Current	I_{BIAS}	T_J = 25 ˚C		4.1	6.5	mA
Quiescent Current Change	ΔI_{BIAS}	–21 V ≤ V_{IN} ≤ –33 V			1.0	mA
		5 mA ≤ I_O ≤ 1 A			0.5	
Output Noize Voltage	V_n	T_J = 25 ˚C, 10 Hz ≤ f ≤ 100 kHz		190		μVr.m.s
Ripple Rejection	R•R	T_J = 25 ˚C, f = 120 Hz, –22 V ≤ V_{IN} ≤ –32 V, I_O = 500 mA	45	53		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	$\lvert\Delta V_O/\Delta T\rvert$	I_O = 5 mA		0.24		mV/˚C

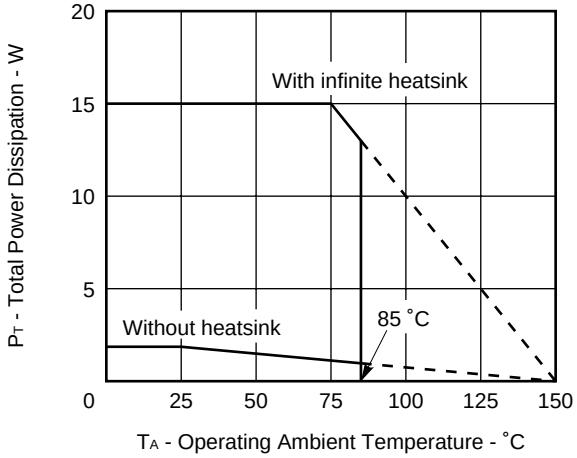
μPC7924A

(V_{IN} = –33 V, I_O = 500 mA, 0 ˚C ≤ T_J ≤ +125 ˚C)

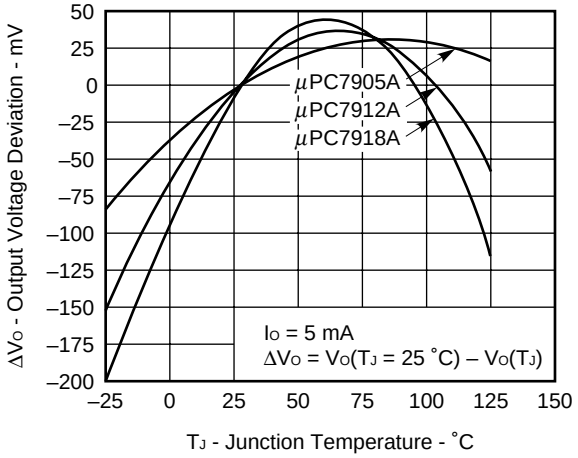
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25 ˚C	–23.0	–24	–25.0	V
		–27 V ≤ V_{IN} ≤ –38 V, 5 mA ≤ I_O ≤ 1 A, P_T ≤ 15 W	–22.8		–25.2	
		–30 ˚C ≤ T_J ≤ +125 ˚C	–22.8		–25.2	
Line Regulation	REG_{IN}	T_J = 25 ˚C, –27 V ≤ V_{IN} ≤ –38 V		70	280	mV
		T_J = 25 ˚C, –30 V ≤ V_{IN} ≤ –36 V		37	140	
Load Regulation	REG_L	T_J = 25 ˚C, 5 mA ≤ I_O ≤ 1.5 A		160	480	mV
		T_J = 25 ˚C, 250 mA ≤ I_O ≤ 750 mA		60	240	
Quiescent Current	I_{BIAS}	T_J = 25 ˚C		4.2	6.5	mA
Quiescent Current Change	ΔI_{BIAS}	–27 V ≤ V_{IN} ≤ –38 V			1.0	mA
		5 mA ≤ I_O ≤ 1 A			0.5	
Output Noize Voltage	V_n	T_J = 25 ˚C, 10 Hz ≤ f ≤ 100 kHz		240		μVr.m.s
Ripple Rejection	R•R	T_J = 25 ˚C, f = 120 Hz, –28 V ≤ V_{IN} ≤ –38 V, I_O = 500 mA	43	49		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	$\lvert\Delta V_O/\Delta T\rvert$	I_O = 5 mA		1.1		mV/˚C

TYPICAL CHARACTERISTICS (T_A = 25 °C)

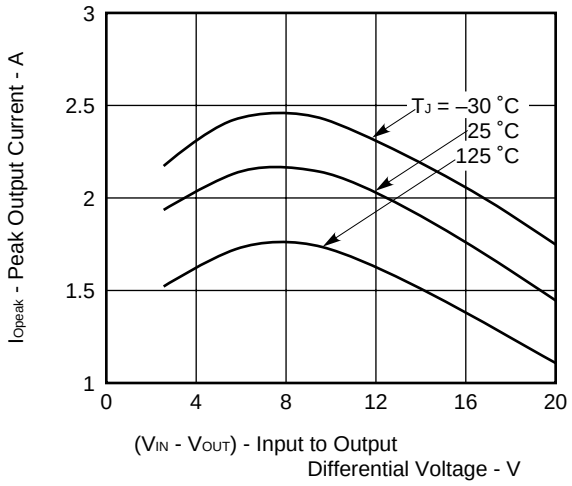
P_T - T_A



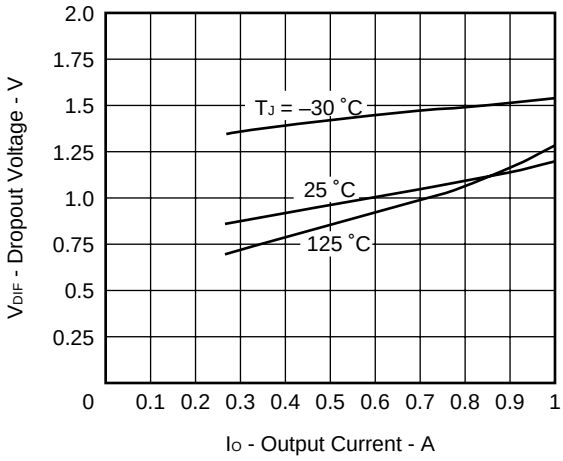
ΔV_O - T_J



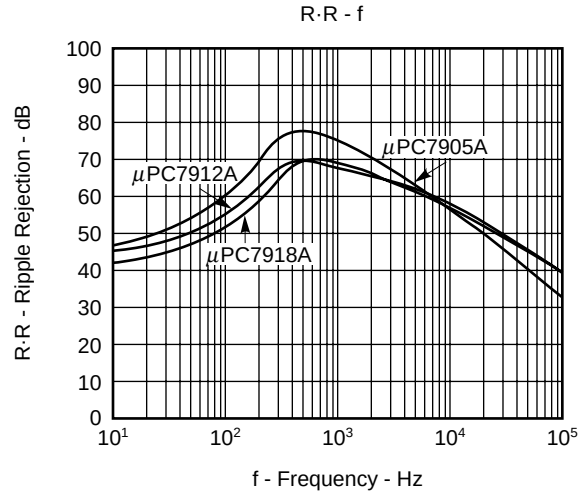
I_{Opeak} - (V_{IN} - V_{OUT})



V_{DIF} - I_O

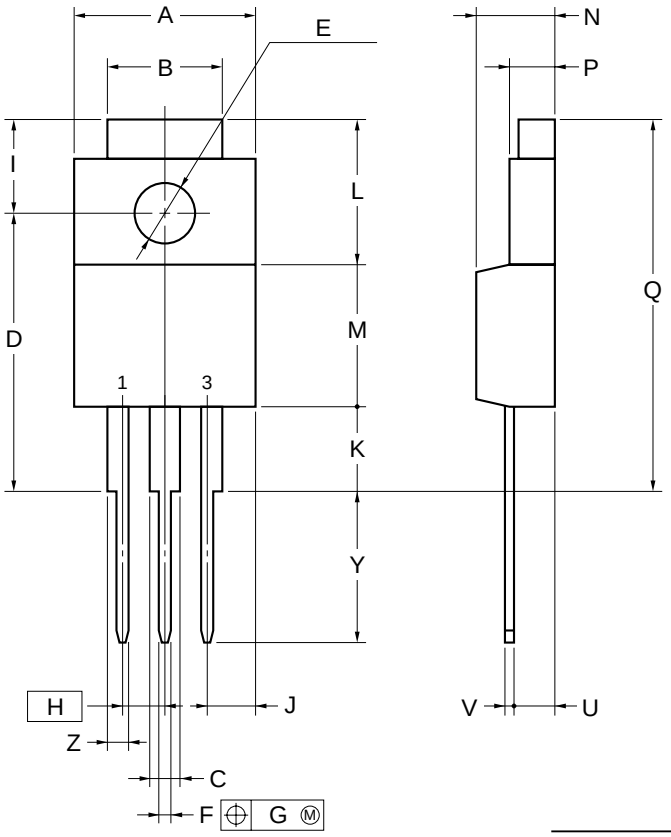


R·R - f



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

[MEMO]

[MEMO]

[MEMO]

M4 96.5