BIPOLAR ANALOG INTEGRATED CIRCUITS

μPC7800H SERIES

T-58-11-13

THREE TERMINAL POSITIVE VOLTAGE REGULATORS

DESCRIPTION

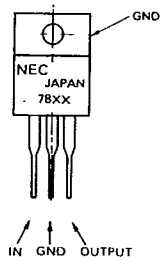
The μPC7800H series are monolithic three terminal positive regulators which employ internally current limiting, thermal shut down, and safe-area compensation, make them essentially indestructible.

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.

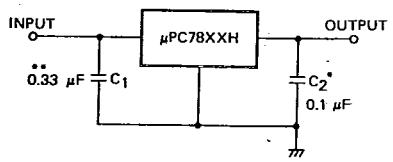
FEATURES

- Output current in excess of 1 A
- No external component required
- Internal thermal overload protection

CONNECTION DIAGRAM



TYPICAL APPLICATION



Notes: C_1 & C_2 are required if regulator is located an appreciable distance from power supply filter and load. Also C_2 improve transient response. The wire length of IC to C_1 or C_2 must be shorter than 20 mm.

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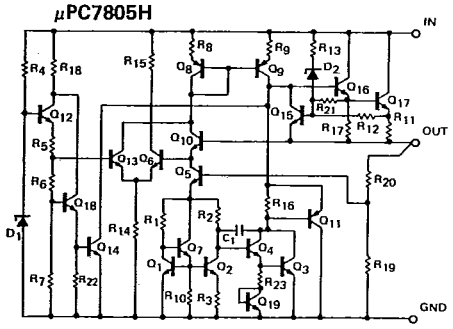
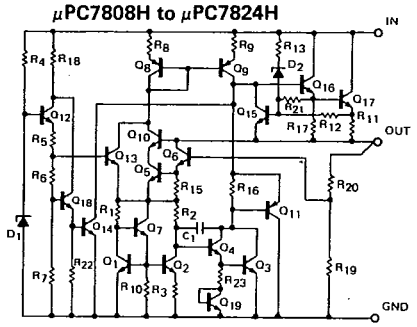
EQUIVALENT CIRCUIT

μPC7805H



μPC7808H to μPC7824H



μPC7800H SERIES

T-58-11-13

μPC7805H

ABSOLUTE MAXIMUM RATINGS

Input Voltage	V_{IN}	35	V
Internal Power Dissipation	$P_{T(T_C=25\,^\circ C)}$	20 note	W
Operating Ambient Temperature Range	T_{opt}	−20 to +80	°C
Operating Junction Temperature Range	$T_{opt(j)}$	−20 to +150	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
Thermal Resistance (Junction to Case)	$R_{th(j-c)}$	4	°C/W
Thermal Resistance (Junction to Ambient)	$R_{th(j-a)}$	83	°C/W

Note: Internally Limited
When junction temperature rises up to 150 °C the internal circuit shutdown output voltage.

RECOMMENDED OPERATING CONDITIONS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage	V_{IN}	7	10	25	V
Output Current	I_O	0.005	0.5	1	A
Operating Junction Temperature Range	$T_{opt(j)}$	−20		+125	°C

ELECTRICAL CHARACTERISTICS (V_{IN}=10 V, I_O=500 mA, 0 °C ≦ T_j ≦ +125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITON
Output Voltage	V_O	4.8	5.0	5.2	V	T_j=25 °C
		4.75		5.25		7 V≦V_{IN}≦20 V, 5 mA≦I_O≦1.0 A, P_T≦15 W
Line Regulation	REG_{IN}		15	100	mV	T_j=25 °C, 7 V≦V_{IN}≦25 V
			4	50		T_j=25 °C, 8 V≦V_{IN}≦12 V
Load Regulation	REG_L		4	100	mV	T_j=25 °C, 5 mA≦I_O≦1.5 A
			2	50		T_j=25 °C, 250 mA≦I_O≦750 mA
Quiescent Current	I_{BIAS}		5.3	8.0	mA	T_j=25 °C
Quiescent Current Change	ΔI_{BIAS}			1.3	mA	7 V≦V_{IN}≦25 V
				0.5		5 mA≦I_O≦1.0 A
Output Noise Voltage	V_n		40	200	$\mu V_{r.m.s.}$	T_a=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection	RR	62	69		dB	f=120 Hz, 8 V≦V_{IN}≦18 V
Dropout Voltage	V_{DIF}		1.8		V	T_j=25 °C, I_O=1.0 A
Short Circuit Current	I_{oshort}		1.1		A	T_j=25 °C, V_{IN}=25 V
Peak Output Current	I_{opeak}	1.7	2.2	2.8	A	T_j=25 °C, V_{IN}=10 V
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$		0.4		mV/°C	I_O=5 mA, 0 °C≦T_j≦+125 °C

T-58-11-13

μPC7808H

ABSOLUTE MAXIMUM RATINGS

Input Voltage	V_{IN}	35	V
Internal Power Dissipation	$P_T(T_C=25\,^\circ C)$	20 note	W
Operating Ambient Temperature Range	T_{opt}	−20 to +80	°C
Operating Junction Temperature Range	$T_{opt(j)}$	−20 to +150	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
Thermal Resistance (Junction Case)	$R_{th(j-c)}$	4	°C/W
Thermal Resistance (Junction to Ambient)	$R_{th(j-a)}$	83	°C/W

Note: Internally Limited
When function temperature rises up to 150 °C the internal circuit shutdown output voltage.

RECOMMENDED OPERATING CONDITIONS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage	V_{IN}	10.5	14	25	V
Output Current	I_O	0.005	0.5	1	A
Operating Junction Temperature Range	$T_{opt(j)}$	−20		+125	°C

ELECTRICAL CHARACTERISTICS (V_{IN}=14 V, I_O=500 mA, 0 °C ≦ T_j ≦ +125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	V_O	7.7	8.0	8.3	V	T_j=25 °C
		7.6		8.4		10.5 V≦V_{IN}≦23 V, 5 mA≦I_O≦1.0 A, P_T≦15 W
Line Regulation	REG_{IN}		34	160	mV	T_j=25 °C, 10.5 V≦V_{IN}≦25 V
			18	80		T_j=25 °C, 11 V≦V_{IN}≦17 V
Load Regulation	REG_L		24	160	mV	T_j=25 °C, 5 mA≦I_O≦1.5 A
			8	80		T_j=25 °C, 250 mA≦I_O≦750 mA
Quiescent Current	I_{BIAS}		4.7	8.0	mA	T_j=25 °C
Quiescent Current Change	ΔI_{BIAS}			1.0	mA	10.5 V≦V_{IN}≦25 V
				0.5		5 mA≦I_O≦1.0 A
Output Noise Voltage	V_n		50	250	$\mu V_{r.m.s.}$	T_a=25°C, 10 Hz≦f≦100 kHz
Ripple Rejection	RR	56	63		dB	f=120 Hz, 11.5 V≦V_{IN}≦21.5 V
Dropout Voltage	V_{DIF}		1.8		V	T_j=25 °C, I_O=1.0 A
Short Circuit Current	I_{oshort}		1.0		A	T_j=25 °C, V_{IN}=25 V
Peak Output Current	I_{opeak}	1.7	2.3	2.8	A	T_j=25 °C, V_{IN}=14 V
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$		0.4		mV/°C	I_O=5 mA, 0 °C≦T_j≦+125 °C

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T-58-11-13

μPC7812H

ABSOLUTE MAXIMUM RATINGS

Input Voltage	V_{IN}	35	V
Internal Power Dissipation	P_T (T_C=25 °C)	20 note	W
Operating Ambient Temperature Range	T_{opt}	−20 to +80	°C
Operating Junction Temperature Range	$T_{opt(j)}$	−20 to +150	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
Thermal Resistance (Junction to Case)	$R_{th(j-c)}$	4	°C/W
Thermal Resistance (Junction to Ambient)	$R_{th(j-a)}$	83	°C/W

Note: Internally Limited
When junction temperature rises up to 150 °C the internal circuit shutdown output voltage.

RECOMMENDED OPERATING CONDITIONS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage	V_{IN}	14.5	19	30	V
Output Current	I_O	0.005	0.5	1	A
Operating Junction Temperature Range	$T_{opt(j)}$	−20		+125	°C

ELECTRICAL CHARACTERISTICS (V_{IN}=19 V, I_O=500 mA, 0 °C ≦ T_j ≦ +125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	V_O	11.5	12.0	12.5	V	T_j=25 °C
		11.4		12.6		14.5 V≦V_{IN}≦27 V, 5 mA≦I_O≦1.0 A, P_T≦15 W
Line Regulation	REG_{IN}		44	240	mV	T_j=25 °C, 14.5 V≦V_{IN}≦30 V
			16	120		T_j=25 °C, 16 V≦V_{IN}≦22 V
Load Regulation	REG_L		45	240	mV	T_j=25 °C, 5 mA≦I_O≦1.5 A
			16	120		T_j=25 °C, 250 mA≦I_O≦750 mA
Quiescent Current	I_{BIAS}		4.7	8.0	mA	T_j=25 °C
Quiescent Current Change	ΔI_{BIAS}			1.0	mA	14.5 V≦V_{IN}≦30 V
				0.5		5 mA≦I_O≦1.0 A
Output Noise Voltage	V_n		70	300	μVr.m.s.	T_a=25° C, 10 Hz≦f≦100 kHz
Ripple Rejection	RR	55	60		dB	f=120 Hz, 15 V≦V_{IN}≦25 V
Dropout Voltage	V_{DIF}		1.8		V	T_j=25 °C, I_O=1.0 A
Short Circuit Current	I_{oshort}		0.7		A	T_j=25 °C, V_{IN}=30 V
Peak Output Current	I_{opeak}	1.7	2.3	2.8	A	T_j=25 °C, V_{IN}=19 V
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$		0.8		mV/°C	I_O=5 mA, 0 °C≦T_j≦+125 °C

T-58-11-13

μPC7815H

ABSOLUTE MAXIMUM RATINGS

Input Voltage	V_{IN}	35	V
Internal Power Dissipation	$P_T(T_C=25\,^\circ C)$	20 note	W
Operating Ambient Temperature Range	T_{opt}	−20 to +80	°C
Operating Junction Temperature Tange	$T_{opt(j)}$	−20 to +150	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
Thermal Resistance (Junction to Case)	$R_{th(j-c)}$	4	°C/W
Thermal Resistance (Junction to Ambient)	$R_{th(j-a)}$	83	°C/W

Note: Internally Limited
When junction temperature rises up to 150 °C the internal circuit shutdown output voltage.

RECOMMENDED OPERATING CONDITIONS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage	V_{IN}	17.5	23	30	V
Output Current	I_O	0.005	0.5	1	A
Operating Junction Temperature Range	$T_{opt(j)}$	−20		+125	°C

ELECTRICAL CHARACTERISTICS (V_{IN}=23 V, I_O=500 mA, 0 °C ≦ T_j ≦ +125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	V_O	14.4	15.0	15.6	V	T_j=25 °C
		14.25		15.75		17.5 V≦V_{IN}≦30 V, 5 mA≦I_O≦1.0 A, P_T≦15 W
Line Regulation	REG_{IN}		46	300	mV	T_j=25 °C, 17.5 V≦V_{IN}≦30 V
			22	150		T_j=25 °C, 20 V≦V_{IN}≦26 V
Load Regulation	REG_L		66	300	mV	T_j=25 °C, 5 mA≦I_O≦1.5 A
			24	150		T_j=25 °C, 250 mA≦I_O≦750 mA
Quiescent Current	I_{BIAS}		4.7	8.0	mA	T_j=25 °C
Quiescent Current Change	ΔI_{BIAS}			1.0	mA	17.5 V≦V_{IN}≦30 V
				0.5		5 mA≦I_O≦1.0 A
Output Noise Voltage	V_n		85	400	$\mu V_{r.m.s.}$	T_a=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection	RR	54	58		dB	f=120 Hz, 18.5 V≦V_{IN}≦28.5 V
Dropout Voltage	V_{DIF}		1.8		V	T_j=25 °C, I_O=1.0 A
Short Circuit Current	I_{oshort}		0.7		A	T_j=25 °C, V_{IN}=30 V
Peak Output Current	I_{opeak}	1.7	2.3	2.8	A	T_j=25 °C, V_{IN}=23 V
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$		1.0		mV/°C	I_O=5 mA, 0 °C≦T_j≦+125 °C

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μPC7800H SERIES

T-58-11-13

μPC7818H

ABSOLUTE MAXIMUM RATINGS

Input Voltage	V_{IN}	35	V
Internal Power Dissipation	$P_{T(T_C=25\,^\circ C)}$	20 note	W
Operating Ambient Temperature Range	T_{opt}	−20 to +80	°C
Operating Junction Temperature Range	$T_{opt(j)}$	−20 to +150	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
Thermal Resistance (Junction to Case)	$R_{th(j-c)}$	4	°C/W
Thermal Resistance (Junction to Ambient)	$R_{th(j-c)}$	83	°C/W

Note: Internally Limited
When junction temperature rises up to 150 °C the internal circuit shutdown output voltage.

RECOMMENDED OPERATING CONDITIONS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage	V_{IN}	21	27	33	V
Output Current	I_O	0.005	0.5	1	A
Operating Junction Temperature Range	$T_{opt(j)}$	−20		+125	°C

ELECTRICAL CHARACTERISTICS (V_{IN}=27 V, I_O=500 mA, 0 °C ≦ T_j ≦ +125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	V_O	17.3	18.0	18.7	V	T_j=25 °C
		17.1		18.9		21 V≦V_{IN}≦33 V, 5 mA≦I_O≦1.0 A, P_T≦15 W
Line Regulation	REG_{IN}		52	360	mV	T_j=25 °C, 21 V≦V_{IN}≦33 V
			26	180		T_j=25 °C, 24 V≦V_{IN}≦30 V
Load Regulation	REG_L		100	360	mV	T_j=25 °C, 5 mA≦I_O≦1.5 A
			32	180		T_j=25 °C, 250 mA≦I_O≦750 mA
Quiescent Current	I_{BIAS}		5.0	8.0	mA	T_j=25 °C
Quiescent Current Change	ΔI_{BIAS}			1.0	mA	21 V≦V_{IN}≦33 V
				0.5		5 mA≦I_O≦1.0 A
Output Noise Voltage	V_n		95	450	$\mu V_{r.m.s.}$	T_a=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection	RR	53	56		dB	f=120 Hz, 22 V≦V_{IN}≦32 V
Dropout Voltage	V_{DIF}		1.8		V	T_j=25 °C, I_O=1.0 A
Short Circuit Current	I_{oshort}		0.7		A	T_j=25 °C, V_{IN}=33 V
Peak Output Current	I_{opeak}	1.7	2.3	2.8	A	T_j=25 °C, V_{IN}=27 V
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$		1.2		mV/°C	I_O=5 mA, 0 °C≦T_j≦+125 °C

T-58-11-13

μPC7824H

ABSOLUTE MAXIMUM RATINGS

Input Voltage	V_{IN}	40	V
Internal Power Dissipation	$P_T(T_C=25\,^\circ C)$	20 note	W
Operating Ambient Temperature Range	T_{opt}	−20 to +80	°C
Operating Junction Temperature Range	$T_{opt(j)}$	−20 to +150	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C
Thermal Resistance (Junction to Case)	$R_{th(j-c)}$	4	°C/W
Thermal Resistance (Junction to Ambient)	$R_{th(j-a)}$	83	°C/W

Note: Internally Limited
When junction temperature rises up to 150 °C the internal circuit shutdown output voltage.

RECOMMENDED OPERATING CONDITIONS

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Voltage	V_{IN}	27	33	38	V
Output Current	I_O	0.005	0.5	1	A
Operating Junction Temperature Range	$T_{opt(j)}$	−20		+125	°C

ELECTRICAL CHARACTERISTICS (V_{IN}=33 V, I_O=500 mA, 0 °C ≦ T_j ≦ +125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	V_O	23.0	24.0	25.0	V	T_j=25 °C
		22.8		25.2		27 V≦V_{IN}≦38 V, 5 mA≦I_O≦1.0 A
Line Regulation	REG_{IN}		64	480	mV	T_j=25 °C, 27 V≦V_{IN}≦38 V
			34	240		T_j=25 °C, 30 V≦V_{IN}≦36 V
Load Regulation	REG_L		130	480	mV	T_j=25 °C, 5 mA≦I_O≦1.5 A
			44	240		T_j=25 °C, 250 mA≦I_O≦750 mA
Quiescent Current	I_{BIAS}		5.0	8.0	mA	T_j=25 °C
Quiescent Current Change	ΔI_{BIAS}			1.0	mA	27 V≦V_{IN}≦38 V
				0.5		5 mA≦I_O≦1.0 A
Output Noise Voltage	V_n		120	500	$\mu V_{r.m.s.}$	T_a=25° C, 10 Hz≦f≦100 kHz
Ripple Rejection	RR	50	54		dB	f=120 Hz, 28 V≦V_{IN}≦38 V
Dropout Voltage	V_{DIF}		2.0		V	T_j=25 °C, I_O=1.0 A
Short Circuit Current	I_{oshort}		0.4		A	T_j=25 °C, V_{IN}=38 V
Peak Output Current	I_{opeak}	1.7	2.4	2.8	A	T_j=25 °C, V_{IN}=33 V
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$		1.4		mV/°C	I_O=5 mA, 0 °C≦T_j≦+125 °C

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μPC7800H SERIES

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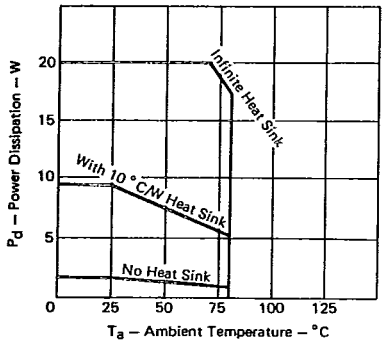
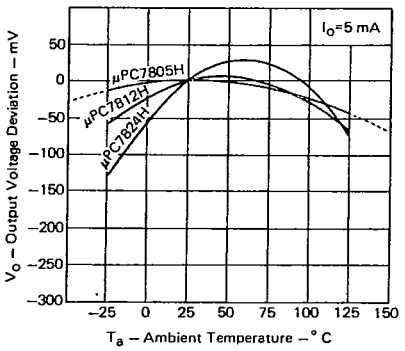
TYPICAL CHARACTERISTICS (T_a=25 °C)

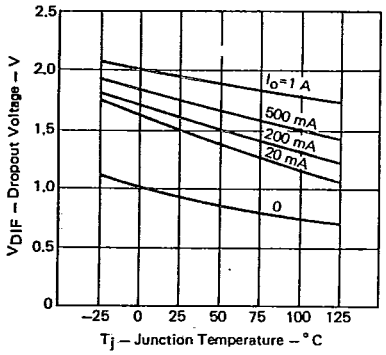
WORST CASE POWER DISSIPATION vs. AMBIENT TEMPERATURE



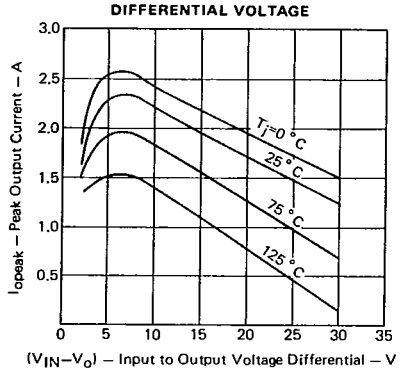
OUTPUT VOLTAGE vs. AMBIENT TEMPERATURE



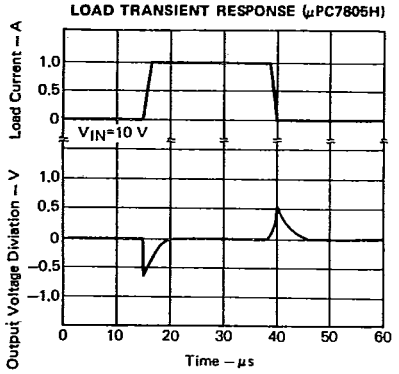
DROPOUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE



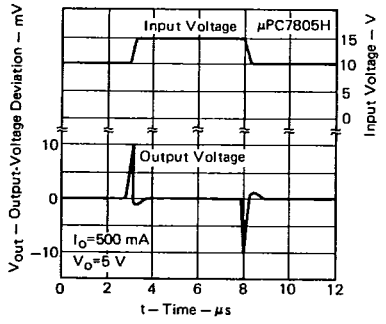
PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT/OUTPUT DIFFERENTIAL VOLTAGE



LOAD TRANSIENT RESPONSE (μPC7805H)



LINE TRANSIENT RESPONSE



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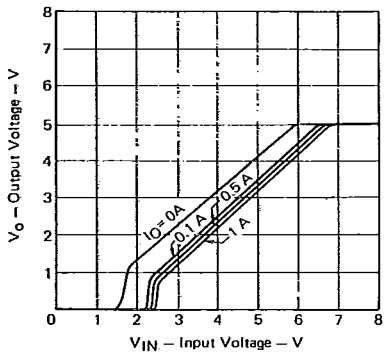
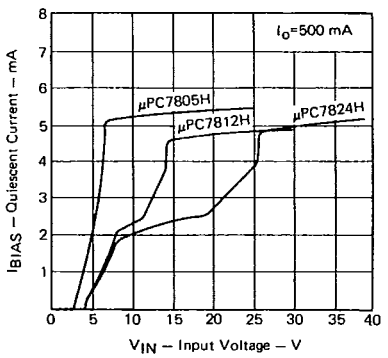
DROPOUT CHARACTERISTICS (μPC7805H)



QUIESCENT CURRENT



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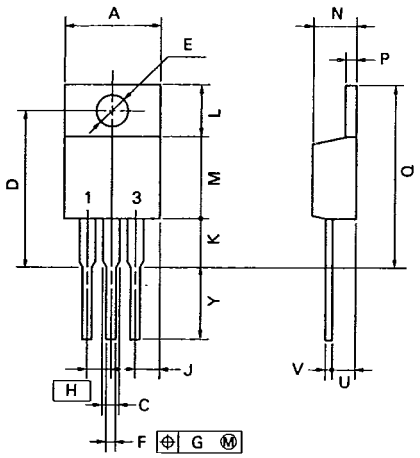
PACKAGE DIMENSIONS (Unit: mm)

Typical values unless specified



P3HP-254B

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.	0.41 MAX.
C	1.2 MIN.	0.047 MIN.
D	$17.3^{\pm 0.3}$	$0.681^{\pm 0.012}$
E	$\phi 3.6^{\pm 0.1}$	$\phi 0.142^{-0.004}_{+0.005}$
F	$0.75^{\pm 0.1}$	$0.03^{-0.004}_{+0.005}$
G	0.25	0.01
H	2.54	0.1
J	2.66 MAX.	0.105 MAX.
K	5.2 MIN.	0.205 MIN.
L	6.5 TYP.	0.256
M	8.5 TYP.	0.335
N	$4.6^{\pm 0.2}$	$0.181^{\pm 0.008}$
P	$1.3^{\pm 0.1}$	$0.051^{-0.004}_{+0.005}$
Q	22.52 MAX.	0.887 MAX.
U	3.0 MAX.	0.119 MAX.
V	$0.45^{\pm 0.1}$	$0.018^{-0.004}_{+0.005}$
Y	$8.5^{\pm 0.7}$	$0.335^{\pm 0.028}$