BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC78M00H SERIES

T-58-11-13

THREE TERMINAL POSITIVE VOLTAGE REGULATORS

DESCRIPTION

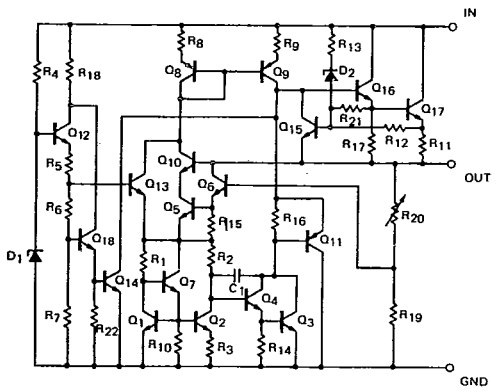
The μPC78M00H series are monolithic three terminal positive regulators which employ internally current limiting, thermal shut down, and safe-area compensation, make them essentially indestructible.

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.

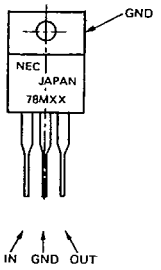
FEATURES

- Output current in excess of 0.5 A
- No external component required
- Internal thermal overload protection
- Internal short circuit current limiting

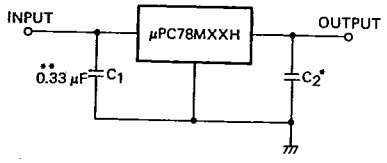
EQUIVALENT CIRCUIT



CONNECTION DIAGRAM



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.

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ABSOLUTE MAXIMUM RATINGS

Input Voltage	μPC78M05H/08H/10H/12H/15H/18H	35	V
	μPC78M24H	40	V
Internal Power Dissipation		Internally Limited	
Operating Temperature Range		−20 to +85	°C
Storage Temperature Range		−55 to +150	°C
Lead Temperature		Soldering 10 sec 230	°C
Operating Junction Temperature Rang		0 to 125	°C (Continuous)
Operating Junction Temperature Rang		0 to 200	°C (short term, 30 MIN. MAX.)

ELECTRICAL CHARACTERISTICS μPC78M05H (V_{IN}=10 V, I_O=350 mA, 0 °C ≦ Tj ≦ 125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	V_O	4.8	5.0	5.2	V	Tj=25 °C
		4.75		5.25		7 V≦V_{IN}≦20 V, 5 mA≦I_O≦350 mA
Line Regulation	REG_{IN}		3	100	mV	Tj=25 °C, 7 V≦V_{IN}≦25 V, I_O=200 mA
			1	50		Tj=25 °C, 8 V≦V_{IN}≦25 V, I_O=200 mA
Load Regulation	REG_L		20	100	mV	Tj=25 °C, 5 mA≦I_O≦500 mA
			10	50		Tj=25 °C, 5 mA≦I_O≦200 mA
Quiescent Current	I_{BIAS}		4.5	6.0	mA	Tj=25 °C
Quiescent Current Change	ΔI_{BIAS}			0.8	mA	8 V≦V_{IN}≦25 V, I_O=200 mA
				0.5		5 mA≦I_O≦350 mA
Output Noise Voltage	N_L		40		μV	Ta=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection		62	80		dB	Tj=25 °C, f=120 Hz, 8 V≦V_{IN}≦18 V, I_O=300 mA
Dropout Voltage			2.0		V	Ta=25 °C
Short Circuit Current	I_{oshort}		250		mA	Tj=25 °C, V_{IN}=35 V
Peak Output Current	I_{opeak}		1.0		A	Tj=25 °C
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$		−1.0		mV/°C	I_O=5 mA

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ELECTRICAL CHARACTERISTICS μPC78M08H (V_{IN}=14 V, I_O=350 mA, 0 °C ≦ Tj ≦ 125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
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≦I_O≦350 mA
Line Regulation	REG_{IN}		6.0	100	mV	Tj=25 °C, 10.5 V≦V_{IN}≦25 V, I_O=200 mA
			2.0	50		Tj=25 °C, 11 V≦V_{IN}≦25 V, I_O=200 mA
Load Regulation	REG_L		25	160	mV	Tj=25 °C, 5 mA≦I_O≦500 mA
			10	80		Tj=25 °C, 5 mA≦I_O≦200 mA
Quiescent Current	I_{BIAS}		4.6	6.0	mA	Tj=25 °C
Quiescent Current Change	ΔI_{BIAS}			0.8	mA	10.5 V≦V_{IN}≦25 V, I_O=200 mA
				0.5		5 mA≦I_O≦350 mA
Output Noise Voltage	N_L		52		μV	Ta=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection		56	80		dB	Tj=25 °C, f=120 Hz, 11.5 V≦V_{IN}≦21.5 V I_O=300 mA
Dropout Voltage			2.0		V	Ta=25 °C
Short Circuit Current	I_{oshort}		250		mA	Tj=25 °C, V_{IN}=35 V
Peak Output Current	I_{opeak}		1.0		A	Tj=25 °C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.0		mV/°C	I_O=5 mA

ELECTRICAL CHARACTERISTICS μPC78M10H (V_{IN}=17 V, I_O=350 mA, 0 °C≦Tj≦125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	Vo	9.6	10	10.4	V	Tj=25 °C
		9.5		10.5		12.5 V≦V_{IN}≦25 V, 5 mA≦I_O≦350 mA
Line Regulation	REG_{IN}		7.0	100	mV	Tj=25 °C, 12.5 V≦V_{IN}≦28 V, I_O=200 mA
			2.0	50		Tj=25 °C, 14 V≦V_{IN}≦28 V, I_O=200 mA
Load Regulation	REG_L		25	200	mV	Tj=25 °C, 5 mA≦I_O≦500 mA
			10	100		Tj=25 °C, 5 mA≦I_O≦200 mA
Quiescent Current	I_{BIAS}		4.5	6.0	mA	Tj=25 °C
Quiescent Current Change	ΔI_{BIAS}			0.8	mA	12.5 V≦V_{IN}≦28 V, I_O=200 mA
				0.5		5 mA≦I_O≦350 mA
Output Noise Voltage	N_L		70		μV	Ta=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection		55	80		dB	Tj=25 °C, f=120 Hz, 13 V≦V_{IN}≦23 V, I_O=300 mA
Dropout Voltage			2.0		V	Ta=25 °C
Short Circuit Current	I_{oshort}		250		mA	Tj=25 °C, V_{IN}=35 V
Peak Output Current	I_{opeak}		1.0		A	Tj=25 °C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.0		mV/°C	I_O=5 mA

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ELECTRICAL CHARACTERISTICS μPC78M12H (V_{IN}=19 V, I_O=350 mA, 0 °C ≦ Tj ≦ 125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
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≦I_O≦350 mA
Line Regulation	REG_{IN}		8.0	100	mV	Tj=25 °C, 14.5 V≦V_{IN}≦30 V, I_O=200 mA
			2.0	50		Tj=25 °C, 16 V≦V_{IN}≦30 V, I_O=200 mA
Load Regulation	REG_L		25	240	mV	Tj=25 °C, 5 mA≦I_O≦500 mA
			10	120		Tj=25 °C, 5 mA≦I_O≦200 mA
Quiescent Current	I_{BIAS}		4.8	6.0	mA	Tj=25 °C
Quiescent Current Change	ΔI_{BIAS}			0.8	mA	14.5 V≦V_{IN}≦30 V, I_O=200 mA
				0.5		5 mA≦I_O≦350 mA
Output Noise Voltage	N_L		75		μV	Ta=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection		55	80		dB	Tj=25 °C, f=120 Hz, 15 V≦V_{IN}≦25 V I_O=300 mA
Dropout Voltage			2.0		V	Ta=25 °C
Short Circuit Current	I_{oshort}		250		mA	Tj=25 °C, V_{IN}=35 V
Peak Output Current	I_{opeak}		1.0		A	Tj=25 °C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.0		mV/°C	I_O=5 mA

ELECTRICAL CHARACTERISTICS μPC78M15H (V_{IN}=23 V, I_O=350 mA, 0 °C ≦ Tj ≦ 125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	Vo	14.4	15	15.6	V	Tj=25 °C
		14.25		15.75		17.5 V≦V_{IN}≦30 V, 5 mA≦I_O≦350 mA
Line Regulation	REG_{IN}		10	100	mV	Tj=25 °C, 17.5 V≦V_{IN}≦30 V, I_O=200 mA
			3.0	50		Tj=25 °C, 20 V≦V_{IN}≦30 V, I_O=200 mA
Load Regulation	REG_L		25	300	mV	Tj=25 °C, 5 mA≦I_O≦500 mA
			10	150		Tj=25 °C, 5 mA≦I_O<200 mA
Quiescent Current	I_{BIAS}		4.8	6.0	mA	Tj=25 °C
Quiescent Current Change	ΔI_{BIAS}			0.8	mA	17.5 V≦V_{IN}≦30 V, I_O=200 mA
				0.5		5 mA≦I_O≦350 mA
Output Noise Voltage	N_L		90		μV	Ta=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection		54	70		dB	Tj=25 °C, f=120 Hz, 18.5 V≦V_{IN}≦28.5 V I_O=300 mA
Dropout Voltage			2.0		V	Ta=25 °C
Short Circuit Current	I_{oshort}		250		mA	Tj=25 °C, V_{IN}=35 V
Peak Output Current	I_{opeak}		1.0		A	Tj=25 °C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.0		mV/°C	I_O=5 mA

ELECTRICAL CHARACTERISTICS μPC78M18H (V_{IN}=27 V, I_O=350 mA, 0 °C ≦ Tj ≦ 125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
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≦I_O≦350 mA
Line Regulation	REG_{IN}		10	100	mV	Tj=25 °C, 21 V≦V_{IN}≦33 V, I_O=200 mA
			4.0	50		Tj=25 °C, 24 V≦V_{IN}≦30 V, I_O=200 mA
Load Regulation	REG_L		30	360	mV	Tj=25 °C, 5 mA≦I_O≦500 mA
			10	180		Tj=25 °C, 5 mA≦I_O≦200 mA
Quiescent Current	I_{BIAS}		4.8	6.0	mA	Tj=25 °C
Quiescent Current Change	ΔI_{BIAS}			0.8	mA	27 V≦V_{IN}≦38 V, I_O=200 mA
				0.5		5 mA≦I_O≦350 mA
Output Noise Voltage	N_L		100		μV	Ta=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection		53	70		dB	Tj=25 °C, f=120 Hz, 22 V≦V_{IN}≦32 V I_O=300 mA
Dropout Voltage			2.0		V	Ta=25 °C
Short Circuit Current	I_{oshort}		250		mA	Tj=25 °C V_{IN}=35 V
Peak Output Current	I_{opeak}		1.0		A	Tj=25 °C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.0		mV/°C	I_O=5 mA

ELECTRICAL CHARACTERISTICS μPC78M24H (V_{IN}=33 V, I_O=350 mA, 0 °C ≦ Tj ≦ 125 °C)

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Output Voltage	Vo	23	24	25	V	Tj=25 °C
		22.8		25.2		27 V≦V_{IN}≦38 V, 5 mA≦I_O≦350 mA
Line Regulation	REG_{IN}		10	100	mV	Tj=25 °C, 27 V≦V_{IN}≦38 V, I_O=200 mA
			5.0	50		Tj=25 °C, 28 V≦V_{IN}≦38 V, I_O=200 mA
Load Regulation	REG_L		30	480	mV	Tj=25 °C, 5 mA≦I_O≦500 mA
			10	240		Tj=25 °C, 5 mA≦I_O≦200 mA
Quiescent Current	I_{BIAS}		5.0	6.0	mA	Tj=25 °C
Quiescent Current Change	ΔI_{BIAS}			0.8	mA	27 V≦V_{IN}≦38 V, I_O=200 mA
				0.5		5 mA≦I_O≦350 mA
Output Noise Voltage	N_L		170		μV	Ta=25 °C, 10 Hz≦f≦100 kHz
Ripple Rejection		50	70		dB	Tj=25 °C, f=120 Hz, 28 V≦V_{IN}≦38 V I_O=300 mA
Dropout Voltage			2.0		V	Ta=25 °C
Short Circuit Current	I_{oshort}		250		mA	Tj=25 °C, V_{IN}=35 V
Peak Output Current	I_{opeak}		1.0		A	Tj=25 °C
Temperature Coefficient of Output Voltage	ΔVo/ΔT		−1.2		mV/°C	I_O=5 mA, 0 °C≦Tj≦125 °C

μPC78M00H SERIES

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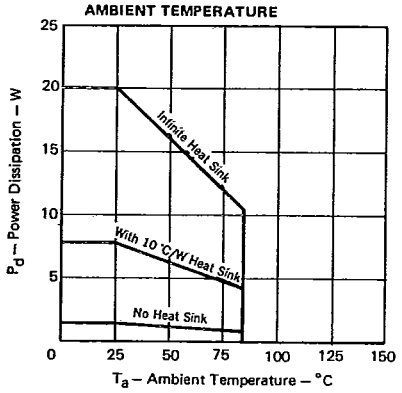
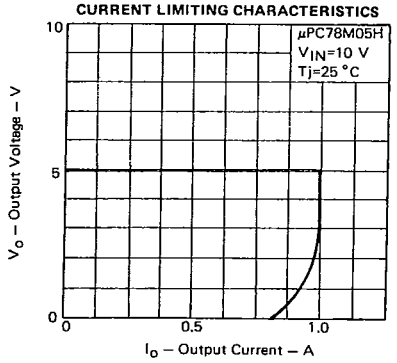
TYPICAL CHARACTERISTICS (Ta=25 °C)

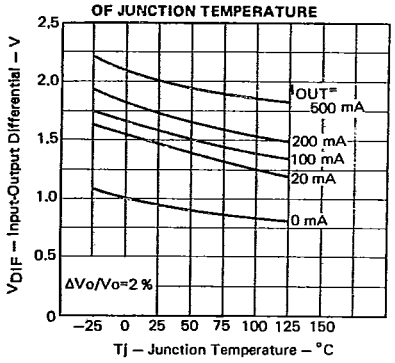
WORST CASE POWER DISSIPATION vs. AMBIENT TEMPERATURE



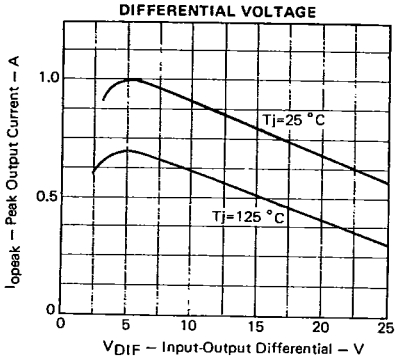
CURRENT LIMITING CHARACTERISTICS



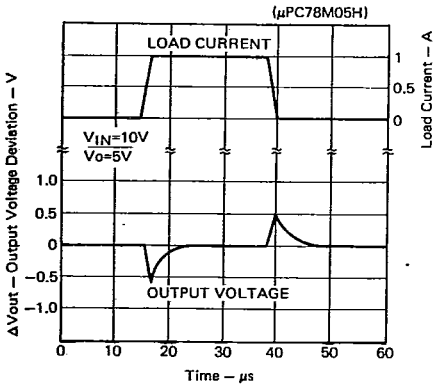
DROPOUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE



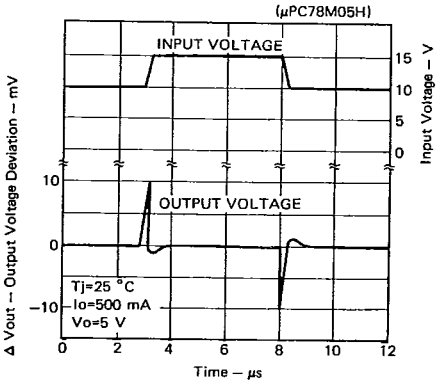
PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT/OUTPUT DIFFERENTIAL VOLTAGE



LOAD TRANSIENT RESPONSE (μPC78M05H)



LINE TRANSIENT RESPONSE (μPC78M05H)



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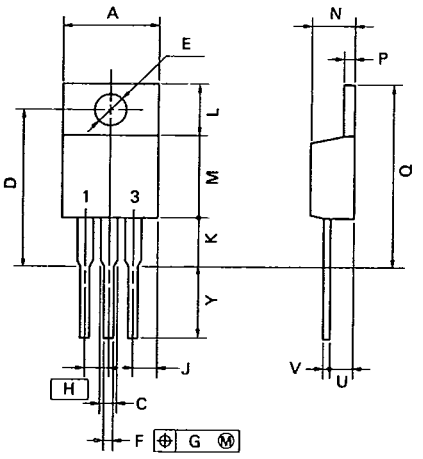
PACKAGE DIMENSIONS (Unit: mm)

Typical values unless specified



P3HP-254B

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	$\phi 3.6^{\pm 0.1}$	$\phi 0.142^{+0.005}_{-0.004}$
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	$8.5^{\pm 0.7}$	$0.335^{\pm 0.028}$

NOTE

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

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