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MOTOROLA
SEMICONDUCTORS
P.O. BOX 20912 • PHOENIX, ARIZONA 85036

MC78M00 Series

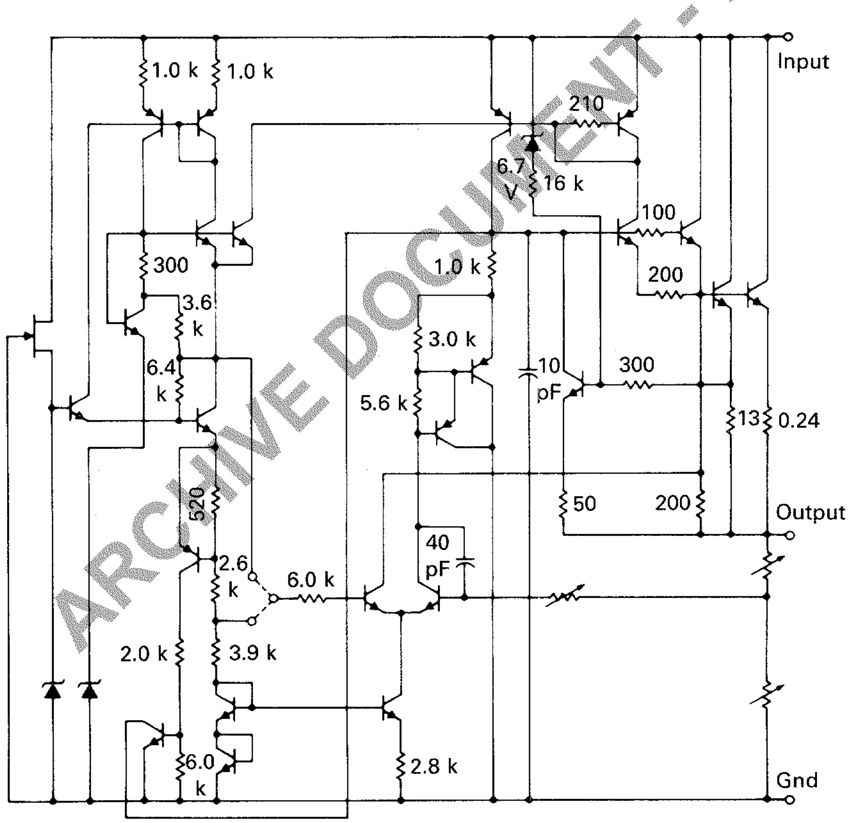
THREE-TERMINAL MEDIUM CURRENT POSITIVE VOLTAGE REGULATORS

The MC78M00 Series positive voltage regulators are identical to the popular MC7800 Series devices, except that they are specified for only half the output current. Like the MC7800 devices, the MC78M00 three-terminal regulators are intended for local, on-card voltage regulation.

Internal current limiting, thermal shutdown circuitry and safe-area compensation for the internal pass transistor combine to make these devices remarkably rugged under most operating conditions. Maximum output current, with adequate heatsinking is 500 mA.

- No External Components Required
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation

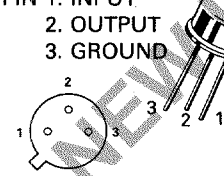
EQUIVALENT SCHEMATIC DIAGRAM



TYPE NO./VOLTAGE		
MC78M05B,C 5.0 Volts MC78M06B,C 6.0 Volts MC78M08B,C 8.0 Volts	MC78M12B,C 12 Volts MC78M15B,C 15 Volts MC78M18B,C 18 Volts	MC78M20B,C 20 Volts MC78M24B,C 24 Volts

THREE-TERMINAL MEDIUM CURRENT POSITIVE FIXED VOLTAGE REGULATORS

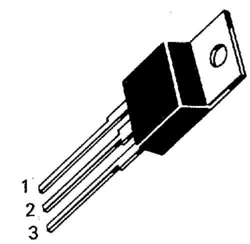
PIN 1. INPUT
2. OUTPUT
3. GROUND



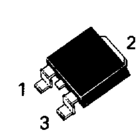
(Bottom View)

G SUFFIX
METAL PACKAGE
CASE 79-05
(Case connected to Pin 3)

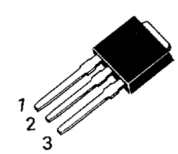
T SUFFIX
PLASTIC PACKAGE
CASE 221A-05
(Heatsink surface connected to Pin 2)



(All 3 Plastic Types)
PIN 1. INPUT
2. GROUND
3. OUTPUT
(Heatsink surface connected to Pin 2)



DT SUFFIX
PLASTIC PACKAGE
CASE 369A-03
DPAK



DT-1 SUFFIX
PLASTIC PACKAGE
CASE 369-03
DPAK

ORDERING INFORMATION

Device	Tested Operating Junction Temp. Range	Package
MC78MXXCG*	T_J = 0°C to +125°C	Metal Can
MC78MXXCDT** MC78MXXCDT-1**		DPAK
MC78MXXCT		Plastic Power
MC78MXXBT#	T_J = −40°C to +125°C	Plastic Power

XX Indicates nominal voltage.
* Available in 5, 8, 12 and 15 volt devices.
** Available in 5, 12 and 15 volt devices.
# Automotive temperature range selections are available with special test conditions and additional tests in 5, 8, 12 and 15 volt devices. Contact your local Motorola sales office for information.

MAXIMUM RATINGS (T_A = +25°C unless otherwise noted.)

Rating	Symbol	Value	Unit
Input Voltage (5.0 V–18 V) (20 V–24 V)	V_I	35 40	Vdc
Power Dissipation (Package Limitation) Plastic Package T_A = 25°C Derate above T_A = 25°C T_C = 25°C Derate above T_C = 110°C Metal Package T_A = 25°C Derate above T_A = 25°C T_C = 25°C Derate above T_C = 85°C	 P_D θ_{JA} P_D θ_{JC} P_D θ_{JA} P_D θ_{JC}	 Internally Limited 70 Internally Limited 5.0 Internally Limited 185 Internally Limited 25	 °C/W °C/W °C/W °C/W
Operating Junction Temperature Range MC78MXXC MC78MXXB	T_J	0 to +150 −40 to +150	°C
Storage Temperature Range	T_{stg}	−65 to +150	°C

MC78M05 ELECTRICAL CHARACTERISTICS (V_I = 10 V, I_O = 350 mA, 0°C < T_J < +125°C, P_D ≤ 5.0 W unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	4.8	5.0	5.2	Vdc
Line Regulation (T_J = +25°C, 7.0 Vdc ≤ V_I ≤ 25 Vdc, I_O = 200 mA)	Reg_{line}	—	3.0	50	mV
Load Regulation (T_J = +25°C, 5.0 mA ≤ I_O ≤ 500 mA) (T_J = +25°C, 5.0 mA ≤ I_O ≤ 200 mA)	Reg_{load}	 — —	 20 10	 100 50	mV
Output Voltage (7.0 Vdc ≤ V_I ≤ 25 Vdc, 5.0 mA ≤ I_O ≤ 200 mA) (7.0 Vdc ≤ V_I ≤ 20 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)	V_O	4.75	—	5.25	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	—	3.2	6.0	mA
Quiescent Current Change (8.0 Vdc ≤ V_I ≤ 25 Vdc, I_O = 200 mA) (5.0 mA ≤ I_O ≤ 350 mA)	ΔI_{IB}	 — —	 — —	 0.8 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	40	—	μV
Ripple Rejection (T, DT and DT-1 suffixes only) (I_O = 100 mA, f = 120 Hz, 8.0 V ≤ V_I ≤ 18 V) (I_O = 300 mA, f = 120 Hz, 8.0 ≤ V_I ≤ 18 V, T_J = 25°C)	RR	 62 62	 — 80	 — —	dB
Dropout Voltage (T_J = +25°C)	V_I-V_O	—	2.0	—	Vdc
Short Circuit Current Limit (T_J = +25°C, V_I = 35 V)	I_{OS}	—	50	—	mA
Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)	$\Delta V_O/\Delta T$	—	±0.2	—	mV/°C
Peak Output Current (T_J = 25°C)	I_O	—	700	—	mA

MC78M06 ELECTRICAL CHARACTERISTICS (V_I = 11 V, I_O = 350 mA, 0°C < T_J < +125°C, P_D ≤ 5.0 W unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	5.75	6.0	6.25	Vdc
Line Regulation (T_J = +25°C, 8.0 Vdc ≤ V_I ≤ 25 Vdc, I_O = 200 mA)	Reg_{line}	—	5.0	50	mV
Load Regulation (T_J = +25°C, 5.0 mA ≤ I_O ≤ 500 mA) (T_J = +25°C, 5.0 mA ≤ I_O ≤ 200 mA)	Reg_{load}	 — —	 20 10	 120 60	mV
Output Voltage (8.0 Vdc ≤ V_I ≤ 25 Vdc, 5.0 mA ≤ I_O ≤ 200 mA) (8.0 Vdc ≤ V_I ≤ 21 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)	V_O	5.7	—	6.3	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	—	3.2	6.0	mA
Quiescent Current Change (9.0 Vdc ≤ V_I ≤ 25 Vdc, I_O = 200 mA) (5.0 mA ≤ I_O ≤ 350 mA)	ΔI_{IB}	 — —	 — —	 0.8 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	45	—	µV
Ripple Rejection (T suffix only) (I_O = 100 mA, f = 120 Hz, 9.0 V ≤ V_I ≤ 19 V) (I_O = 300 mA, f = 120 Hz, 9.0 V ≤ V_I ≤ 19 V, T_J = 25°C)	RR	 59 59	 — 80	 — —	dB
Dropout Voltage (T_J = +25°C)	V_I-V_O	—	2.0	—	Vdc
Short Circuit Current Limit (T_J = +25°C, V_I = 35 V)	I_{OS}	—	50	—	mA
Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)	$\Delta V_O/\Delta T$	—	±0.2	—	mV/°C
Peak Output Current (T_J = 25°C)	I_O	—	700	—	mA

MC78M08 ELECTRICAL CHARACTERISTICS (V_I = 14 V, I_O = 350 mA, 0°C < T_J < +125°C, P_D ≤ 5.0 W unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	7.7	8.0	8.3	Vdc
Line Regulation (T_J = +25°C, 10.5 Vdc ≤ V_I ≤ 25 Vdc, I_O = 200 mA)	Reg_{line}	—	6.0	50	mV
Load Regulation (T_J = +25°C, 5.0 mA ≤ I_O ≤ 500 mA) (T_J = +25°C, 5.0 mA ≤ I_O ≤ 200 mA)	Reg_{load}	 — —	 25 10	 160 80	mV
Output Voltage (10.5 Vdc ≤ V_I ≤ 25 Vdc, 5.0 mA ≤ I_O ≤ 200 mA) (10.5 Vdc ≤ V_I ≤ 23 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)	V_O	7.6	—	8.4	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	—	3.2	6.0	mA
Quiescent Current Change (10.5 Vdc ≤ V_I ≤ 25 Vdc, I_O = 200 mA) (5.0 mA ≤ I_O ≤ 350 mA)	ΔI_{IB}	 — —	 — —	 0.8 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	52	—	µV
Ripple Rejection (T suffix only) (I_O = 100 mA, f = 120 Hz, 11.5 V ≤ V_I ≤ 21.5 V) (I_O = 300 mA, f = 120 Hz, 11.5 V ≤ V_I ≤ 21.5 V, T_J = 25°C)	RR	 56 56	 — 80	 — —	dB
Dropout Voltage (T_J = +25°C)	V_I-V_O	—	2.0	—	Vdc
Short Circuit Current Limit (T_J = +25°C, V_I = 35 V)	I_{OS}	—	50	—	mA
Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)	$\Delta V_O/\Delta T$	—	±0.2	—	mV/°C
Peak Output Current (T_J = 25°C)	I_O	—	700	—	mA

MC78M12 ELECTRICAL CHARACTERISTICS (V_I = 19 V, I_O = 350 mA, 0°C < T_J < +125°C, P_D ≤ 5.0 W unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	11.5	12	12.5	Vdc
Line Regulation (T_J = +25°C, 14.5 Vdc ≤ V_I ≤ 30 Vdc, I_O = 200 mA)	Reg_{line}	—	8.0	50	mV
Load Regulation (T_J = +25°C, 5.0 mA ≤ I_O ≤ 500 mA) (T_J = +25°C, 5.0 mA ≤ I_O ≤ 200 mA)	Reg_{load}	 — —	 25 10	 240 120	mV
Output Voltage (14.5 Vdc ≤ V_I ≤ 27 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)	V_O	11.4	—	12.6	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	—	3.2	6.0	mA
Quiescent Current Change (14.5 Vdc ≤ V_I ≤ 30 Vdc, I_O = 200 mA) (5.0 mA ≤ I_O ≤ 350 mA)	ΔI_{IB}	 — —	 — —	 0.8 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	75	—	µV
Ripple Rejection (T, DT and DT-1 suffixes only) (I_O = 100 mA, f = 120 Hz, 15 V ≤ V_I ≤ 25 V) (I_O = 300 mA, f = 120 Hz, 15 V ≤ V_I ≤ 25 V, T_J = 25°C)	RR	 55 55	 — 80	 — —	dB
Dropout Voltage (T_J = +25°C)	V_I-V_O	—	2.0	—	Vdc
Short Circuit Current Limit (T_J = +25°C, V_I = 35 V)	I_{OS}	—	50	—	mA
Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)	$\Delta V_O/\Delta T$	—	±0.3	—	mV/°C
Peak Output Current (T_J = 25°C)	I_O	—	700	—	mA

MC78M15 ELECTRICAL CHARACTERISTICS (V_I = 23 V, I_O = 350 mA, 0°C < T_J < +125°C, P_D ≤ 5.0 W unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	14.4	15	15.6	Vdc
Input Regulation (T_J = +25°C, 17.5 Vdc ≤ V_I ≤ 30 Vdc, I_O = 200 mA)	Reg_{line}	—	10	50	mV
Load Regulation (T_J = +25°C, 5.0 mA ≤ I_O ≤ 500 mA) (T_J = +25°C, 5.0 mA ≤ I_O ≤ 200 mA)	Reg_{load}	 — —	 25 10	 300 150	mV
Output Voltage (17.5 Vdc ≤ V_I ≤ 30 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)	V_O	14.25	—	15.75	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	—	3.2	6.0	mA
Quiescent Current Change (17.5 Vdc ≤ V_I ≤ 30 Vdc, I_O = 200 mA) (5.0 mA ≤ I_O ≤ 350 mA)	ΔI_{IB}	 — —	 — —	 0.8 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	90	—	µV
Ripple Rejection (T, DT and DT-1 suffixes only) (I_O = 100 mA, f = 120 Hz, 18.5 V ≤ V_I ≤ 28.5 V) (I_O = 300 mA, f = 120 Hz, 18.5 V ≤ V_I ≤ 28.5 V, T_J = 25°C)	RR	 54 54	 — 70	 — —	dB
Dropout Voltage (T_J = +25°C)	V_I-V_O	—	2.0	—	Vdc
Short Circuit Current Limit (T_J = +25°C, V_I = 35 V)	I_{OS}	—	50	—	mA
Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)	$\Delta V_O/\Delta T$	—	±0.3	—	mV/°C
Peak Output Current (T_J = 25°C)	I_O	—	700	—	mA

MC78M18 ELECTRICAL CHARACTERISTICS (V_I = 27 V, I_O = 350 mA, 0°C < T_J < +125°C, P_D ≤ 5.0 W unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	17.3	18	18.7	Vdc
Line Regulation (T_J = +25°C, 21 Vdc ≤ V_I ≤ 33 Vdc, I_O = 200 mA)	Reg_{line}	—	10	50	mV
Load Regulation	Reg_{load}				mV
(T_J = +25°C, 5.0 mA ≤ I_O ≤ 500 mA)		—	30	360	
(T_J = +25°C, 5.0 mA ≤ I_O ≤ 200 mA)		—	10	180	
Output Voltage (21 Vdc ≤ V_I ≤ 33 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)	V_O	17.1	—	18.9	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	—	3.2	6.5	mA
Quiescent Current Change	ΔI_{IB}				mA
(21 Vdc ≤ V_I ≤ 33 Vdc, I_O = 200 mA)		—	—	0.8	
(5.0 mA ≤ I_O ≤ 350 mA)		—	—	0.5	
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	100	—	µV
Ripple Rejection (T suffix only)	RR				dB
(I_O = 100 mA, f = 120 Hz, 22 V ≤ V_I ≤ 32 V)		53	—	—	
(I_O = 300 mA, f = 120 Hz, 22 V ≤ V_I ≤ 32 V, T_J = 25°C)		53	70	—	
Dropout Voltage (T_J = +25°C)	V_I-V_O	—	2.0	—	Vdc
Short Circuit Current Limit (T_J = +25°C, V_I = 35 V)	I_{OS}	—	50	—	mA
Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)	$\Delta V_O/\Delta T$	—	±0.3	—	mV/°C
Peak Output Current (T_J = 25°C)	I_O	—	700	—	mA

MC78M20 ELECTRICAL CHARACTERISTICS (V_I = 29 V, I_O = 350 mA, 0°C < T_J < +125°C, P_D ≤ 5.0 W unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	19.2	20	20.8	Vdc
Line Regulation (T_J = +25°C, 23 Vdc ≤ V_I ≤ 35 Vdc, I_O = 200 mA)	Reg_{line}	—	10	50	mV
Load Regulation	Reg_{load}				mV
(T_J = +25°C, 5.0 mA ≤ I_O ≤ 500 mA)		—	30	400	
(T_J = +25°C, 5.0 mA ≤ I_O ≤ 200 mA)		—	10	200	
Output Voltage (23 Vdc ≤ V_I ≤ 35 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)	V_O	19	—	21	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	—	3.2	6.5	mA
Quiescent Current Change	ΔI_{IB}				mA
(23 Vdc ≤ V_I ≤ 35 Vdc, I_O = 200 mA)		—	—	0.8	
(5.0 mA ≤ I_O ≤ 350 mA)		—	—	0.5	
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	110	—	µV
Ripple Rejection (T suffix only)	RR				dB
(I_O = 100 mA, f = 120 Hz, 24 V ≤ V_I ≤ 34 V)		52	—	—	
(I_O = 300 mA, f = 120 Hz, 24 V ≤ V_I ≤ 34 V, T_J = 25°C)		52	70	—	
Dropout Voltage (T_J = +25°C)	V_I-V_O	—	2.0	—	Vdc
Short Circuit Current Limit (T_J = +25°C, V_I = 35 V)	I_{OS}	—	50	—	mA
Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)	$\Delta V_O/\Delta T$	—	±0.5	—	mV/°C
Peak Output Current (T_J = 25°C)	I_O	—	700	—	mA

MC78M24 ELECTRICAL CHARACTERISTICS (V_I = 33 V, I_O = 350 mA, 0°C < T_J < +125°C, P_D ≤ 5.0 W unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	23	24	25	Vdc
Line Regulation (T_J = +25°C, 27 Vdc ≤ V_I ≤ 38 Vdc, I_O = 200 mA)	Reg_{line}	—	10	50	mV
Load Regulation (T_J = +25°C, 5.0 mA ≤ I_O ≤ 500 mA) (T_J = +25°C, 5.0 mA ≤ I_O ≤ 200 mA)	Reg_{load}	 — —	 30 10	 480 240	mV
Output Voltage (27 Vdc ≤ V_I ≤ 38 Vdc, 5.0 mA ≤ I_O ≤ 350 mA)	V_O	22.8	—	25.2	Vdc
Input Bias Current (T_J = +25°C)	I_{IB}	—	3.2	7.0	mA
Quiescent Current Change (27 Vdc ≤ V_I ≤ 38 Vdc, I_O = 200 mA) (5.0 mA ≤ I_O ≤ 350 mA)	ΔI_{IB}	 — —	 — —	 0.8 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	170	—	µV
Ripple Rejection (T suffix only) (I_O = 100 mA, f = 120 Hz, 28 V ≤ V_I ≤ 38 V) (I_O = 300 mA, f = 120 Hz, 28 V ≤ V_I ≤ 38 V, T_J = 25°C)	RR	 50 50	 — 70	 — —	dB
Dropout Voltage (T_J = +25°C)	V_I-V_O	—	2.0	—	Vdc
Short Circuit Current Limit (T_J = +25°C)	I_{OS}	—	50	—	mA
Average Temperature Coefficient of Output Voltage (I_O = 5.0 mA)	$\Delta V_O/\Delta T$	—	±0.5	—	mV/°C
Peak Output Current (T_J = 25°C)	I_O	—	700	—	mA

DEFINITIONS

Line Regulation — The change in output voltage for a change in the input voltage. The measurement is made under conditions of low dissipation or by using pulse techniques such that the average chip temperature is not significantly affected.

Load Regulation — The change in output voltage for a change in load current at constant chip temperature.

Maximum Power Dissipation — The maximum total device dissipation for which the regulator will operate within specifications.

Input Bias Current — That part of the input current that is not delivered to the load.

Output Noise Voltage — The rms ac voltage at the output, with constant load and no input ripple, measured over a specified frequency range.

Long Term Stability — Output voltage stability under accelerated life test conditions with the maximum rated voltage listed in the devices' electrical characteristics and maximum power dissipation.

TYPICAL PERFORMANCE CURVES

FIGURE 1 — WORST CASE POWER DISSIPATION versus AMBIENT TEMPERATURE TO-220AB (CASE 221A)

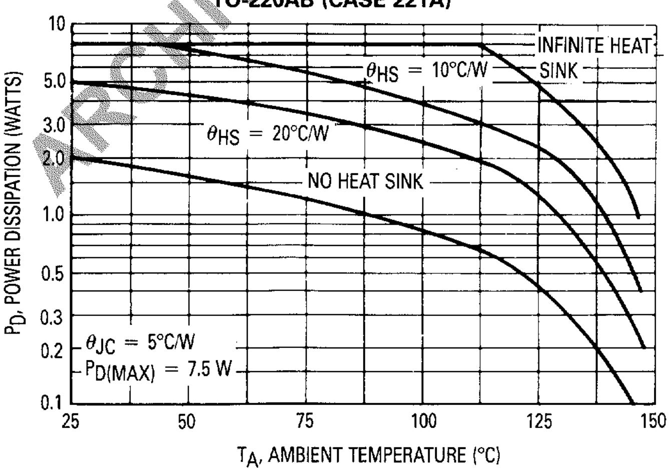
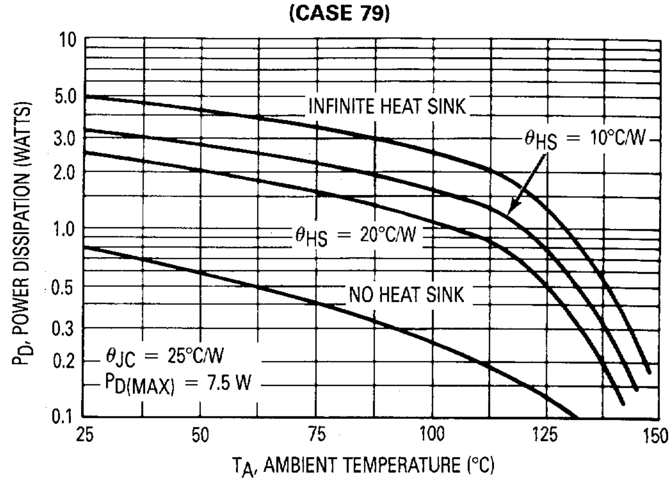


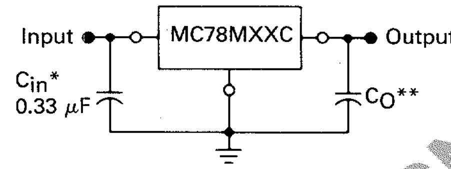
FIGURE 2 — WORST CASE POWER DISSIPATION versus AMBIENT TEMPERATURE (CASE 79)



STANDARD APPLICATION

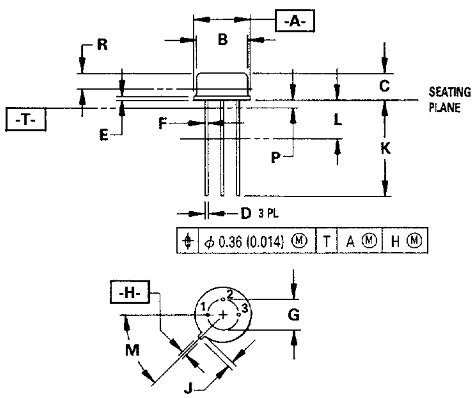
A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

* = C_{in} is required if regulator is located an appreciable distance from power supply filter.



** = C_O improves stability and transient response.

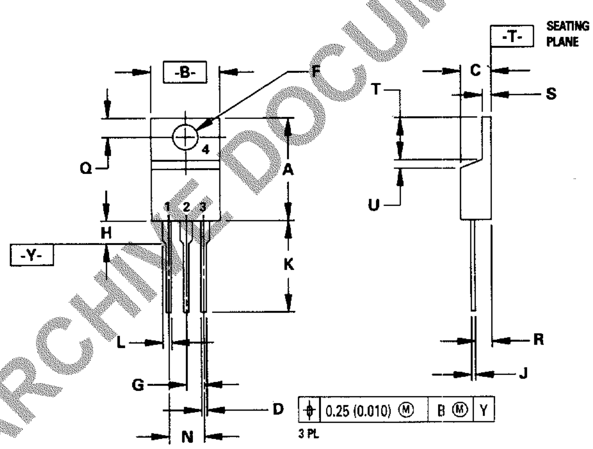
OUTLINE DIMENSIONS



G SUFFIX
METAL PACKAGE
CASE 79-05

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION J MEASURED FROM DIMENSION A MAXIMUM.
4. DIMENSION B SHALL NOT VARY MORE THAN 0.25 (0.010) IN ZONE R. THIS ZONE CONTROLLED FOR AUTOMATIC HANDLING.
5. DIMENSION F APPLIES BETWEEN DIMENSION P AND L. DIMENSION D APPLIES BETWEEN DIMENSION L AND K MINIMUM. LEAD DIAMETER IS UNCONTROLLED IN DIMENSION P AND BEYOND DIMENSION K MINIMUM.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	9.02	9.29	0.355	0.366
B	8.01	8.50	0.315	0.335
C	4.20	4.57	0.165	0.180
D	0.44	0.53	0.017	0.021
E	0.44	0.88	0.017	0.035
F	0.41	0.48	0.016	0.019
G	5.08 BSC		0.200 BSC	
H	0.72	0.86	0.028	0.034
J	0.74	1.01	0.029	0.040
K	12.70	19.05	0.500	0.750
L	6.35	—	0.250	—
M	45° BSC		45° BSC	
P	—	1.27	—	0.050
R	2.54	—	0.100	—



T SUFFIX
PLASTIC PACKAGE
CASE 221A-05

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.23	15.87	0.560	0.625
B	9.66	10.66	0.380	0.420
C	3.56	4.82	0.140	0.190
D	0.51	1.14	0.020	0.045
F	3.53	3.93	0.139	0.155
G	2.54 BSC		0.100 BSC	
H	—	7.11	—	0.280
J	0.31	1.14	0.012	0.045
K	12.70	14.73	0.500	0.580
L	1.15	1.77	0.045	0.070
N	5.08 BSC		0.200 BSC	
Q	2.54	3.42	0.100	0.135
R	2.04	2.92	0.080	0.115
S	0.51	1.39	0.020	0.055
T	5.97	6.47	0.235	0.255
U	0.00	1.27	0.000	0.050

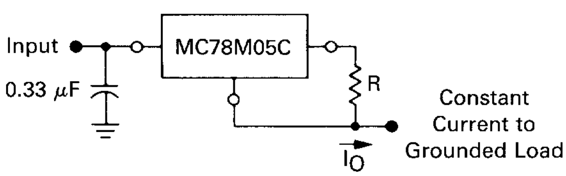
APPLICATIONS INFORMATION

DESIGN CONSIDERATIONS

The MC78M00 Series of fixed voltage regulators are designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, Internal Short Circuit Protection that limits the maximum current the circuit will pass, and Output Transistor Safe-Area Compensation that reduces the output short circuit current as the voltage across the pass transistor is increased.

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33 μF or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

FIGURE 9 — CURRENT REGULATOR



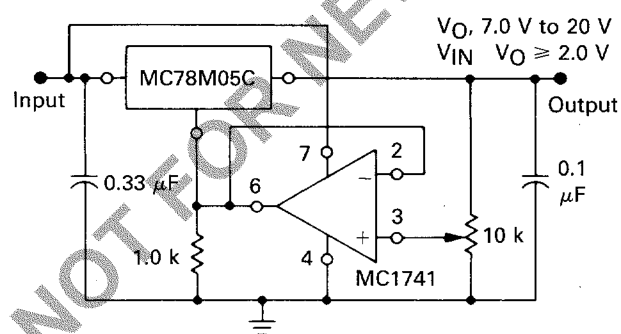
The MC78M00 regulators can also be used as a current source when connected as above. In order to minimize dissipation the MC78M05C is chosen in this application. Resistor R determines the current as follows:

$$I_O = \frac{5.0\ V}{R} + I_{IB}$$

I_{IB} = 1.5 mA over line and load changes

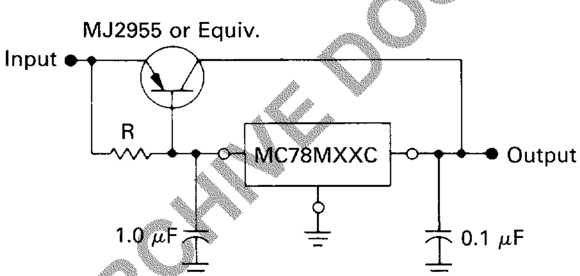
For example, a 500 mA current source would require R to be a 10 ohm, 10 W resistor and the output voltage compliance would be the input voltage less 7.0 volts.

FIGURE 10 — ADJUSTABLE OUTPUT REGULATOR



The addition of an operational amplifier allows adjustment to higher or intermediate values while retaining regulation characteristics. The minimum voltage obtainable with this arrangement is 2.0 volts greater than the regulator voltage.

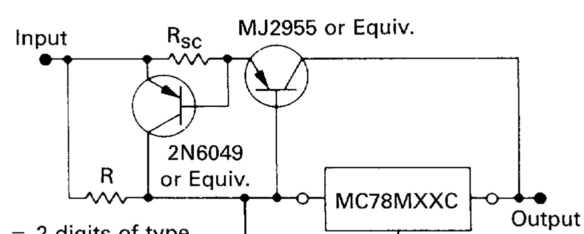
FIGURE 11 — CURRENT BOOST REGULATOR



XX = 2 digits of type number indicating voltage.

The MC78M00 series can be current boosted with a PNP transistor. The MJ2955 provides current to 5.0 amperes. Resistor R in conjunction with the V_{BE} of the PNP determines when the pass transistor begins conducting; this circuit is not short circuit proof. Input output differential voltage minimum is increased by V_{BE} of the pass transistor.

FIGURE 12 — CURRENT BOOST WITH SHORT-CIRCUIT PROTECTION



XX = 2 digits of type number indicating voltage.

The circuit of Figure 7 can be modified to provide supply protection against short circuits by adding a short circuit sense resistor, R_{SC}, and an additional PNP transistor. The current sensing PNP must be able to handle the short-circuit current of the three-terminal regulator. Therefore, a two-ampere plastic power transistor is specified.

TYPICAL PERFORMANCE CURVES

FIGURE 3 — PEAK OUTPUT CURRENT versus DROPOUT VOLTAGE

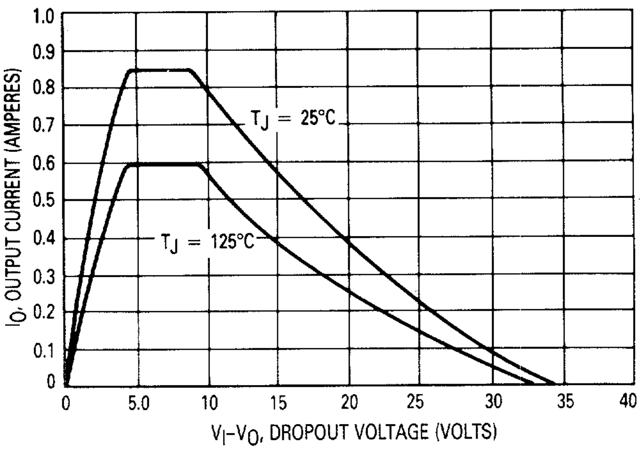


FIGURE 4 — DROPOUT VOLTAGE versus JUNCTION TEMPERATURE

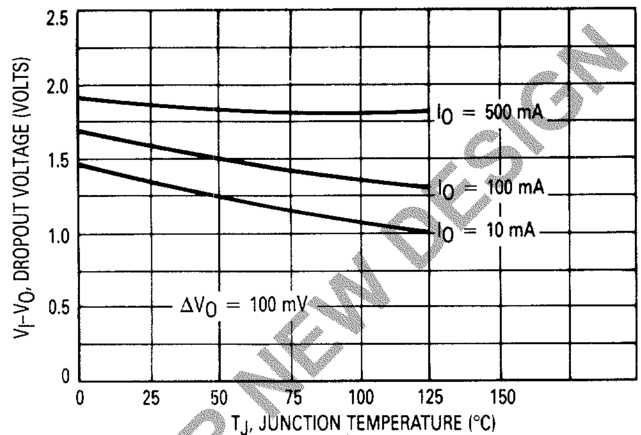


FIGURE 5 — RIPPLE REJECTION versus FREQUENCY

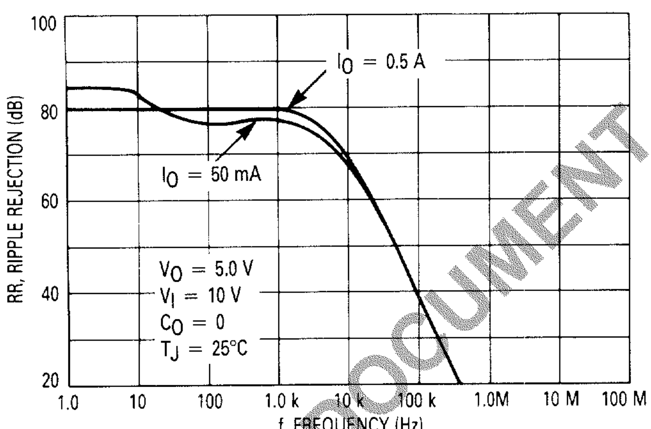


FIGURE 6 — RIPPLE REJECTION versus OUTPUT CURRENT

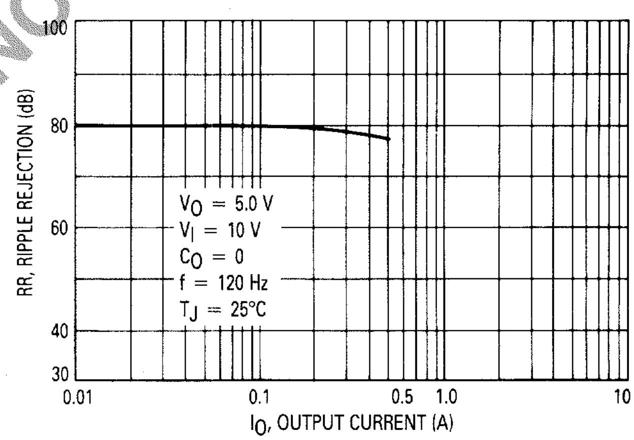


FIGURE 7 — BIAS CURRENT versus INPUT VOLTAGE

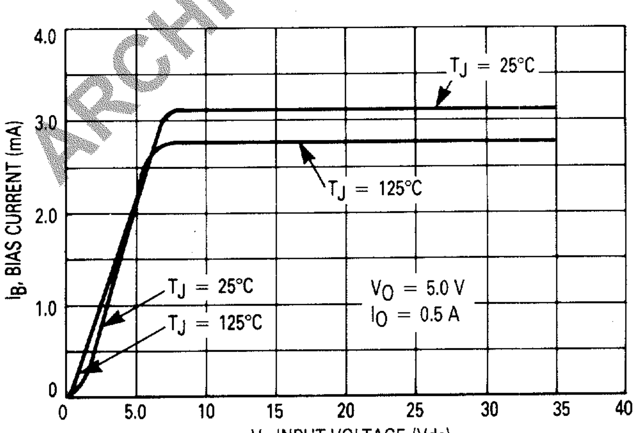
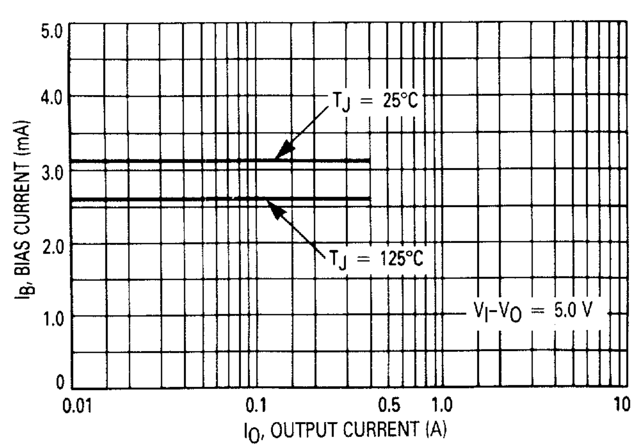
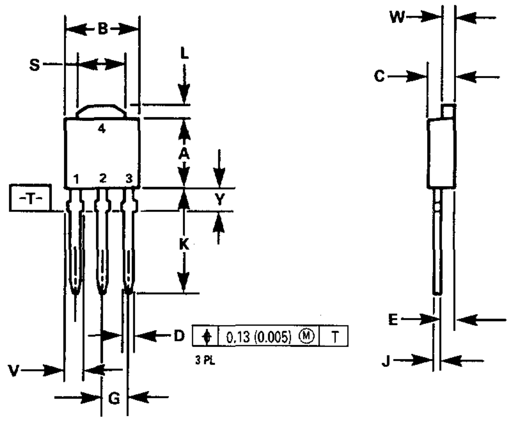


FIGURE 8 — BIAS CURRENT versus OUTPUT CURRENT

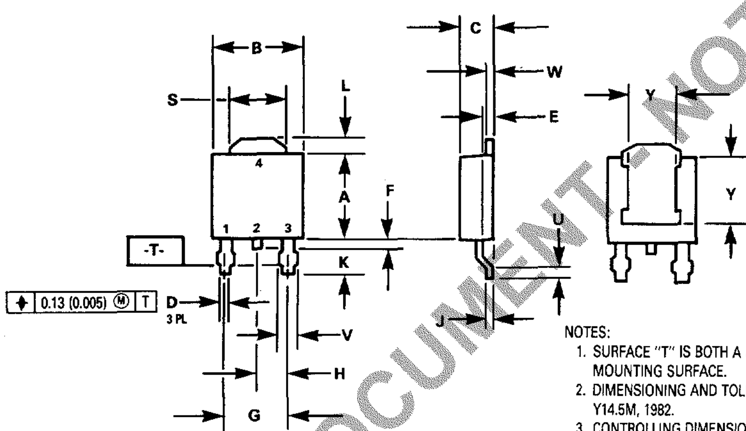




DT-1 SUFFIX
PLASTIC PACKAGE
CASE 369-03
DPAK

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.97	6.22	0.235	0.245
B	6.35	6.73	0.250	0.265
C	2.19	2.38	0.086	0.094
D	0.64	0.88	0.025	0.035
E	0.97	1.06	0.038	0.042
G	2.29 BSC		0.090 BSC	
J	0.46	0.58	0.018	0.023
K	8.89	9.65	0.350	0.380
L	0.89	1.27	0.035	0.050
S	5.21	5.46	0.205	0.215
V	0.77	1.14	0.030	0.045
W	0.84	0.94	0.033	0.037
Y	1.91	2.28	0.075	0.090

NOTES:
1. SURFACE "T" IS BOTH A DATUM AND A MOUNTING SURFACE.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
3. CONTROLLING DIMENSION: INCH.



DT SUFFIX
PLASTIC PACKAGE
CASE 369A-03
DPAK

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.97	6.22	0.235	0.245
B	6.35	6.73	0.250	0.265
C	2.19	2.38	0.086	0.094
D	0.69	0.88	0.027	0.035
E	0.97	1.06	0.038	0.042
F	0.64	0.88	0.025	0.035
G	4.58 BSC		0.180 BSC	
H	2.29 BSC		0.090 BSC	
J	6.46	0.58	0.018	0.023
K	2.59	2.89	0.102	0.114
L	0.89	1.27	0.035	0.050
S	5.21	5.46	0.205	0.215
U	0.51	—	0.020	—
V	0.77	1.14	0.030	0.045
W	0.84	0.94	0.033	0.037
Y	4.32	—	0.170	—

NOTES:
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