MOTOROLA

MPC1000

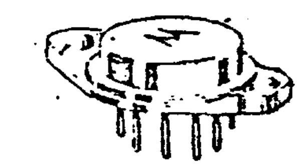
HIGH POWER POSITIVE VOLTAGE REGULATOR

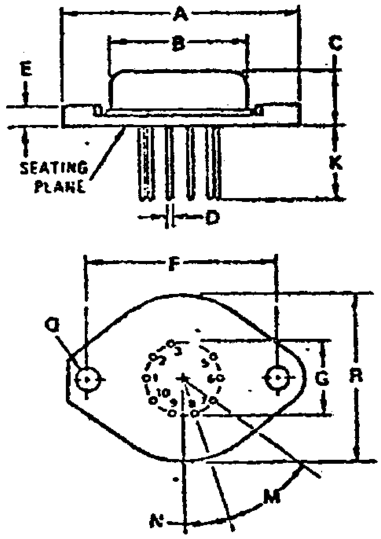
The MPC1000 is a positive voltage regulator designed to deliver load current to 10 Adc. Output current capability can be increased further through use of one or more external pass transistors. The MPC1000 is specified for operation over the junction temperature range (−55 to +175°C)

- 100 Watt Power Capability
- Output Voltage Adjustable — 2 to 35 Vdc
- Output Current to 10 Adc Without External Pass Transistors
- 0.1% Line and Load Regulation
- Temperature Stability 0.005%/°C Typ
- Adjustable Overload Protection

VOLTAGE REGULATOR

HIGH-CURRENT
10 AMPERE





DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	—	38.61	—	1.520
B	—	21.03	—	0.830
C	6.35	8.13	0.250	0.320
D	0.97	1.09	0.038	0.043
E	—	3.43	—	0.135
F	29.90	30.40	1.177	1.197
G	11.94 BSC		0.470 BSC	
K	7.11	8.13	0.280	0.320
M	35° BSC		35° BSC	
N	15° BSC		15° BSC	
Q	3.84	4.09	0.151	0.161
R	—	26.67	—	1.050

NOTE:
1. LEADS WITHIN 0.13 mm (0.005) DIA OF TRUE POSITION AT MAXIMUM MATERIAL CONDITION.

CASE 662-01

SOCKET/WASHER NOTE:

Mica Insulating Washer: Electronic Essentials Part No. MI-9-1000

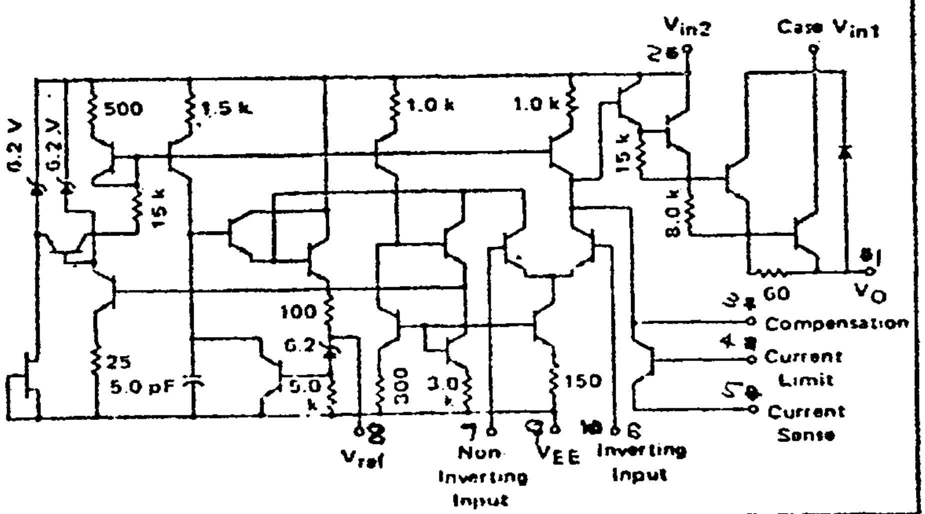
Socket: Electronic Essentials
Part No. MS 9-1000
Electronic Essentials, Inc.
49 Bleeker Street
New York, New York 10012

The Case 662-01 pin configuration is compatible with 9 pin miniature vacuum tube sockets.

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

Rating	Symbol	Value	Unit
Pulse Voltage from V_{in2} to V_{EE} (50 ms)	$V_{in2(p)}$	50	V_{peak}
Continuous Voltage from V_{in2} to V_{EE}	V_{in2}	40	Vdc
Input-Output Voltage Differential	V_{in1}-V_O	60	Vdc
Output Current	I_L	10	Adc
Current from V_{ref}	I_{ref}	15	mA
Internal Power Dissipation @ T_C = 25°C Derate above T_C = 25°C	P_D $1/R_{\theta JC}$	100 0.667	Watts W/°C
Operating Junction Temperature Range	T_J	-55 to +175	°C
Storage Temperature Range	T_{stg}	-65 to +175	°C
Operating Case Temperature Range	T_C	-55 to +150	°C

FIGURE 1 — CIRCUIT SCHEMATIC



DS 3259 R1

ELECTRICAL CHARACTERISTICS ($T_C = 25^oC$, $V_{in1} = V_{in2} = 12$ Vdc, $V_{EE} = 0$, $V_O = 5.0$ Vdc, $I_L = 10$ mAdc, unless otherwise noted.)

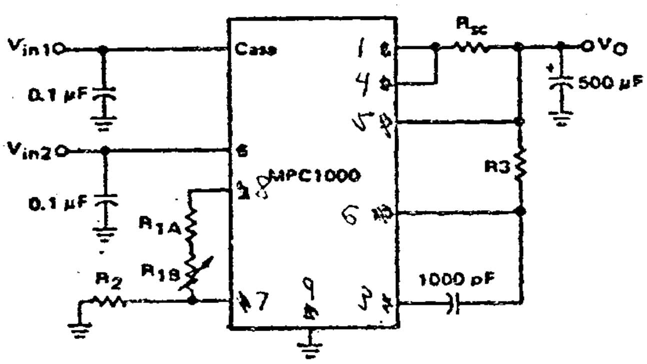
Characteristic	Figure No.	Note	Symbol	Min	Max	Unit
Input Voltage Range	2	1	V_{in2}	9.5	40	Vdc
Output Voltage Range	2	–	V_O	2.0	35	Vdc
Input-Output Voltage Differential (I_L = 10 mAdc)	2	2	V_{in1}-V_O V_{in2}-V_O	– –	60 38	Vdc
(I_L = 4.0 Adc)	2	2	V_{in1}-V_O V_{in2}-V_O	3.0 5.0	– –	
Reference Voltage	2	3	V_{ref}	6.8	7.5	Vdc
Standby Current Drain (I_L = 0, $V_{in1} = V_{in2}$ = 30 Vdc, V_O = 5.0 Vdc)	2	8	I_{IB}	–	5.0	mAdc
Line Regulation ($V_{in1} = V_{in2}$ = 12 Vdc to 15 Vdc)	2	2,6	Reg_{in}	–	0.1	$\%V_O$
($V_{in1} = V_{in2}$ = 12 Vdc to 40 Vdc)	2	2,6	Reg_{in}	–	0.5	$\%V_O$
Load Regulation (I_L = 100 mAdc to I_L = 4.0 Adc, pulsed)	2	2,4,7	Reg_{load}	–	0.1	$\%V_O$

TEMPERATURE PERFORMANCE (I_L = 10 mAdc, V_O = 5.0 Vdc, $V_{EE} = 0$, unless otherwise noted.)

Characteristic	Figure No.	Note	Symbol	Max	Unit
Line Regulation ($V_{in1} = V_{in2}$ = 12 Vdc to 15 Vdc)	2	2,6	Reg_{in}		
$T_C = -55^oC$				0.5	$\%V_O$
$T_C = +125^oC$				0.5	$\%V_O$
Load Regulation (I_L = 100 mAdc to 4.0 Adc, $V_{in1} = V_{in2}$ = 12 Vdc)	2	2,4,7	Reg_{load}		
$T_C = -55^oC$				0.6	$\%V_O$
$T_C = +125^oC$				0.6	$\%V_O$
Temperature Coefficient of Output Voltage ($V_{in1} = V_{in2}$ = 12 Vdc, I_L = 1.0 Adc, $\Delta T_C = 180^oC$, $T_C = -55^oC$ to $+125^oC$)	2	2,4,5	TC_{VO}	0.015	$\%V_O/^oC$

TYPICAL CIRCUIT CONNECTIONS

FIGURE 2 – $V_O < V_{ref}$



Parameter Values for Best Results

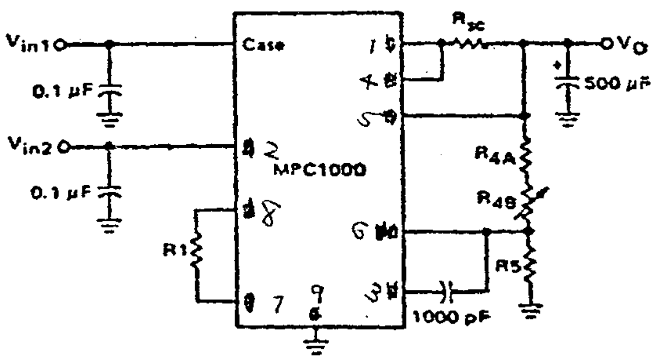
R1	$\geq \frac{R2\,(V_{ref} - V_O)}{V_O}$
R2	10 k < R1 + R2 < 100 k
R3	$= \left[\frac{R1\ R2}{R1 + R2}\right]$
R_{sc}	$\geq \frac{0.66}{I_{sc}}$ @ $T_J = 25^oC$

To Allow For Variations In V_{ref}

(1) $R_{1A} \leq \frac{R_{2min}\,(V_{ref(min)} - V_O)}{V_O}$

(2) $(R_{1A} + R_{1B}) \geq \frac{R_{2max}\,(V_{ref(max)} - V_O)}{V_O}$

FIGURE 3 – $V_O > V_{ref}$



Parameter Values for Best Results

R1	$= \frac{R4\ R5}{R4 + R5}$
R4	$\geq \frac{R5\,(V_O - V_{ref})}{V_{ref}}$
R5	10 k < R5 < 100 k
R_{sc}	$\geq \frac{0.66}{I_{sc}}$ @ $T_J = 25^oC$

To Allow For Variations In V_{ref}

(1) $R_{4A} \leq \frac{R5_{min}\,(V_O - V_{ref(min)})}{V_{ref(min)}}$

(2) $(R_{4A} + R_{4B}) \geq \frac{R5_{max}\,(V_O - V_{ref(max)})}{V_{ref(max)}}$

In most applications V_{in1} and V_{in2} can be connected together to eliminate one of the two capacitors shown in the above connection diagram. In either situation all capacitors should be as close as possible to the device to minimize lead inductance.

1. "Minimum Input Voltage" is the minimum "total instantaneous input voltage" required to properly bias the internal zener reference diode.
2. Set R_{sc} = 0 (short circuit)
3. V_{ref} voltage is measured from Pin 2 to Pin 3.
4. Pulse test conditions: Load current must be switched from minimum to maximum value at a repetition rate of 10 pps or less with a duty cycle of 1% or less in order to minimize heating effects.
5. The temperature coefficient of output voltage is defined as:

$$T_{CVO} = \frac{\pm(V_{O\,max} - V_{O\,min})\,(100)}{(\Delta T_C)\,(V_O\ @\ T_C = 25^{\circ}C)}$$

6. The input line regulation is defined as:

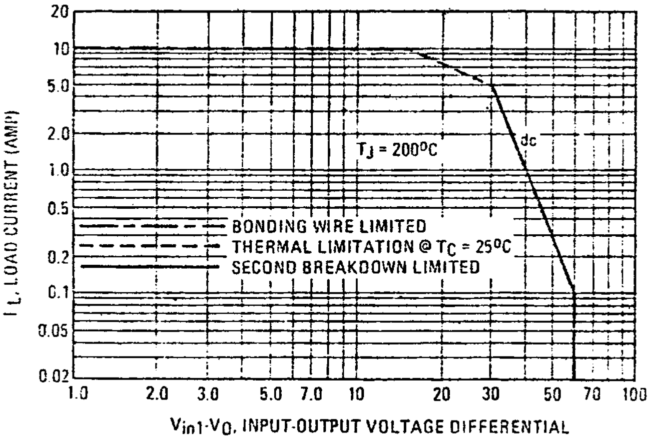
$$Reg_{in} = \frac{\pm\,(V_O\ @\ V_{in\,high} - V_O\ @\ V_{in\,low})}{V_O\ @\ V_{in\,low}} \times 100$$

7. Load regulation is defined as:

$$Reg_{load} = \frac{\pm\,(V_O\ @\ I_{Llow} - V_O\ @\ I_{Lhigh})\,(100)}{(V_O\ @\ I_{Llow})}$$

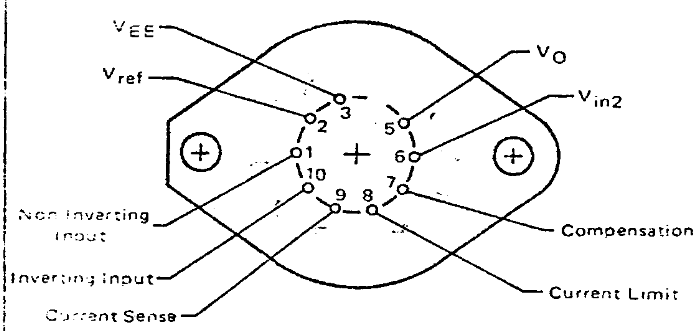
8. Standby current drain is defined as that value of current measured at Pins 6 and Case when R_L is open circuited.

FIGURE 3 – ACTIVE-REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a power semiconductor: average junction temperature and second breakdown. Safe operating area curves indicate I_L, $(V_{in1} - V_O)$ limits of the circuit that must be observed for reliable operation;

FIGURE 4 – PIN CONNECTION – BOTTOM VIEW



NOTE: Case is V_{in1}

FIGURE 5 – CURRENT LIMITING CHARACTERISTICS

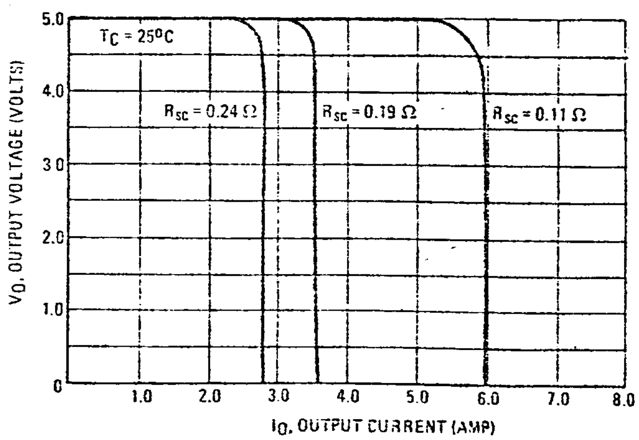


FIGURE 6 – LINE REGULATION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL

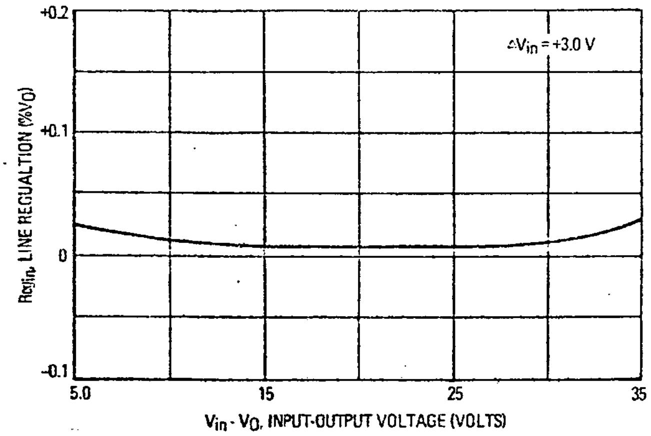


FIGURE 7 – STANDBY CURRENT DRAIN AS A FUNCTION OF INPUT VOLTAGE

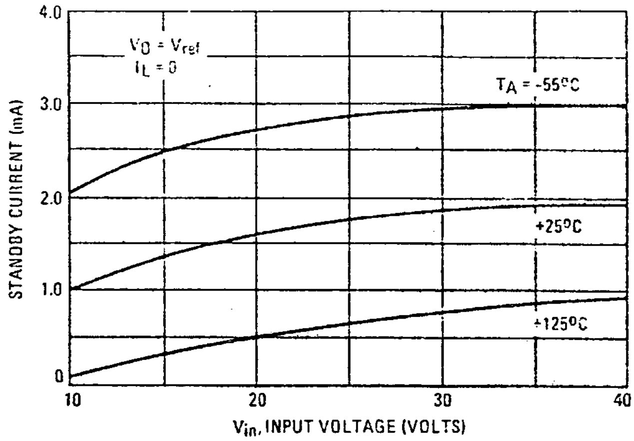


FIGURE 8 – LOAD TRANSIENT RESPONSE

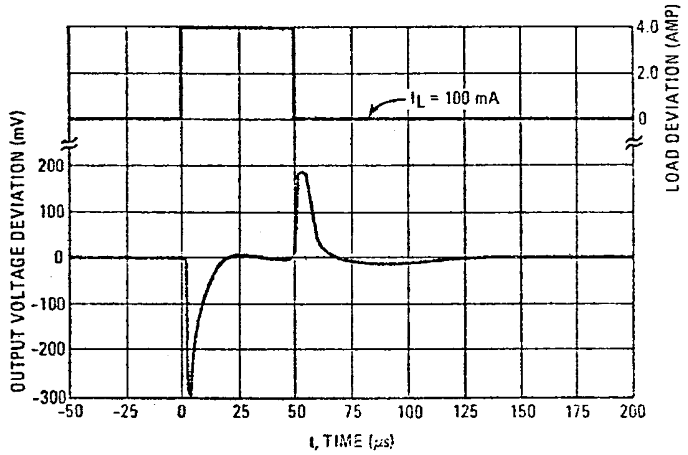


FIGURE 9 – LOAD REGULATION CHARACTERISTICS WITHOUT CURRENT LIMITING

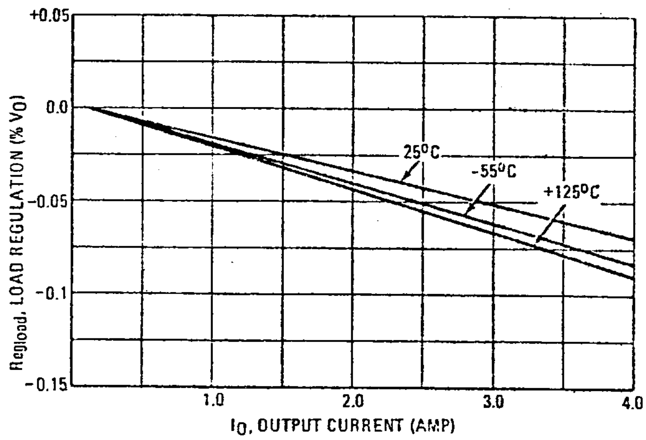
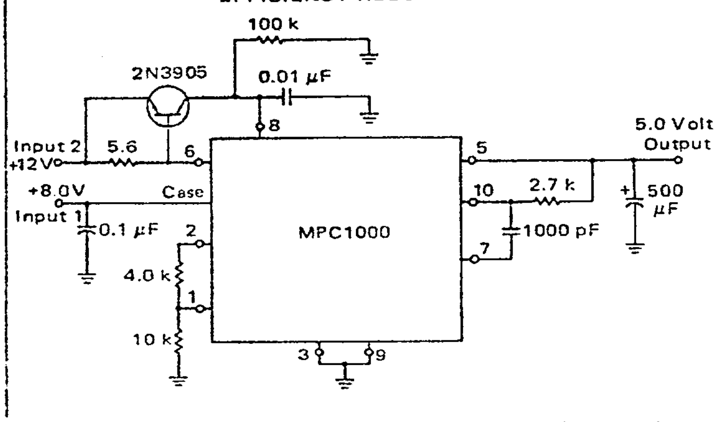


FIGURE 10 – 5 VOLT, 10 AMPERE HIGH EFFICIENCY REGULATOR



Regulator is protected by current limiting if input 1 is removed.

FIGURE 11 – 5 VOLT, 50 AMPERE POWER REGULATOR WITH REMOTE SENSE