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ORDERING INFORMATION

Device	Temperature Range	Package
MC3380P	0°C to +75°C	Plastic DIP

MC3380P

EMITTER COUPLED ASTABLE MULTIVIBRATOR
With Programmable Pulse Width and Current-Controlled Pulse Repetition Rate

The MC3380P is a monolithic device designed for use as a general building block in control and power supply applications.

Its extremely flexible design makes it useful in dc-dc converter applications and power supply regulator circuits. Its fixed pulse width, variable frequency mode of operation makes it useful in switching regulator applications with either fixed or variable loads. This device is capable of stepping up (Figures 5 and 9) or stepping down (Figure 14) dc input voltages, and can produce regulated multiple output dc voltages of either positive or negative polarity (Figure 14).

This device can also be used as a frequency source when configured as a multivibrator.

As a DC-DC Converter –
Differential Line Regulation (Figure 9) –
= 1 V (Max) @ V_{CC} = 3 to 7.5 V

As a Power Regulator –
Load Regulation (Figure 5) –
0.2% (Typ) @ P_D = 1 to 3 Watts

As a Multivibrator –
High Toggle Frequency = 100 kHz (Typ)

EMITTER COUPLED ASTABLE MULTIVIBRATOR

SILICON MONOLITHIC INTEGRATED CIRCUIT

PLASTIC PACKAGE
CASE 626

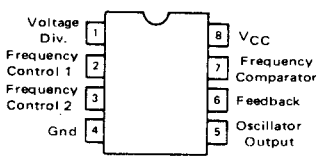

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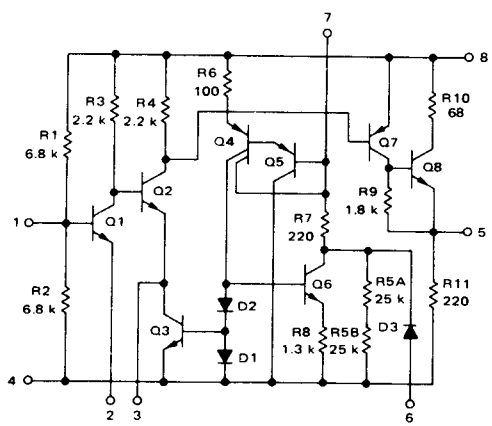
FIGURE 1 – CIRCUIT SCHEMATIC



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

Rating	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	10	Vdc
Output Current - Pin 8	I_O	100	mA
Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	300 3.0	mW mW/°C
Operating Ambient Temperature Range	T_A	0 to +75	°C
Storage Temperature Range	T_{stg}	-55 to +125	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C, V_{CC} = 5.0 Vdc, unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
EMITTER-COUPLED ASTABLE MULTIVIBRATOR					
Rise Time (C = 0.0034 μF, R1 = R2 = 10 kΩ, f = 100 kHz, Figure 4)	t_r	–	12	–	ns
Fall Time (C = 0.0034 μF, R1 = R2 = 10 kΩ, f = 100 kHz, Figure 4)	t_f	–	45	–	ns
Toggle Frequency (C = 0.002 μF, R1 = R2 = 10 k, Figures 2, 3, 4)	–	–	100	–	kHz
3-WATT REGULATOR					
Power Efficiency (Figure 5) (V_O = 200 Vdc @ 15 mAdc)	–	–	60	–	%
Load Regulation (Figure 5) (P_{out} < 3.0 W)	Reg_{load}	–	0.2	–	%
Line Regulation (Figure 5) (V_{CC} = 4.0 -6.0 Vdc)	Reg_{line}	–	0.3	–	%
Output Voltage (Figure 5)	V_O		200	–	V
Output Current (Figure 5)	I_O	–	15	–	mA
Supply Voltage (Figure 5)	V_{CC}	3.0	–	10	V
Supply Current (Figure 6) (I_{FB} = 0, R_L = ∞)	I_D	–	20	30	mA
Output Voltage High (Figure 6) (I_O = 2.0 mA, I_{FB} = 250 μA) (I_O = 25 mA, I_{FB} = 250 μA)	V_{OH}	 2.4 1.2	 3.5 1.5	 – –	V
Output Voltage Low (Figure 6) (I_O = -1.0 mA, I_{FB} = 600 μA)	V_{OL}	–	150	300	mV
Rise Time (Figure 7)	t_r	–	12	–	ns
On Time (Figure 7)	t_{on}	–	20	–	μs
Fall Time (Figure 7)	t_f	–	45	–	ns
Off Time (Figure 7)	t_{off}	–	20	–	μs
DC - DC CONVERTER					
Zener Bias Current (Figure 10) (V_{CC} = 5.0 Vdc, V_O > 2.4 Vdc) (V_{CC} = 5.0 Vdc, V_O < 0.4 Vdc)	I_{FB1} I_{FB2}	– 600	– –	250 –	μA μA
Output Current (Figure 11) (V_{CC} = 5.0 Vdc)	I_{OH}	25	35	–	mA
Output Resistance (Figure 12) (V_{CC} = 5.0 Vdc, I_O = -1.0 mA)	r_o	150	220	300	Ω
Shutdown Voltage (Figure 13) (V_O < 0.5 V)	V_{CC}	–	–	1.6	V
Supply Voltage (Figure 9)		3.0	–	7.0	V
Differential Line Regulation (Figure 9) (ΔV_{CC} = 3.0 to 7.0 Vdc)	ΔV_{reg}	-1.0	–	+1.0	V
Feedback Voltage (Figure 9) (V_{CC} = 5.0 Vdc)	V_F	0.6	–	1.1	V
Voltage Efficiency (Figure 9) (V_{CC} = 5.0 Vdc, Eff(%) = (V_{out}^2/(3.3 k) (I_{CC})(V_{CC}))	–	40	–	–	%

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FIGURE 2 – TYPICAL CAPACITANCE versus FREQUENCY

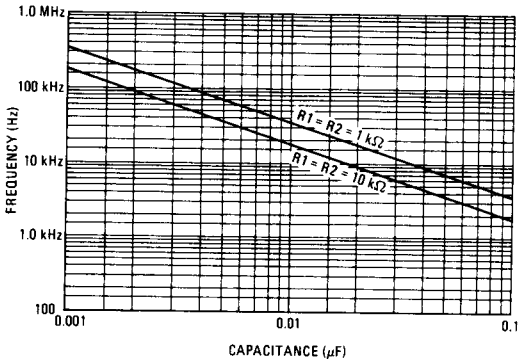


FIGURE 3 – TYPICAL DUTY CYCLE and FREQUENCY CHARACTERISTICS

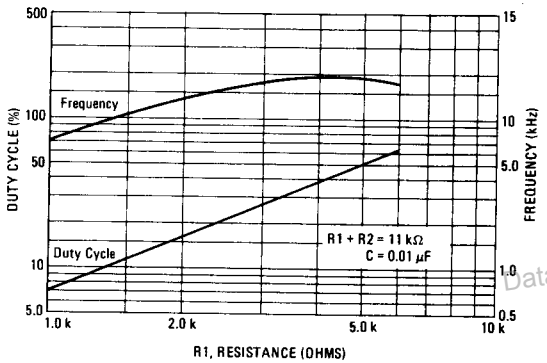


FIGURE 4 – ASTABLE MULTIVIBRATOR TEST CIRCUIT

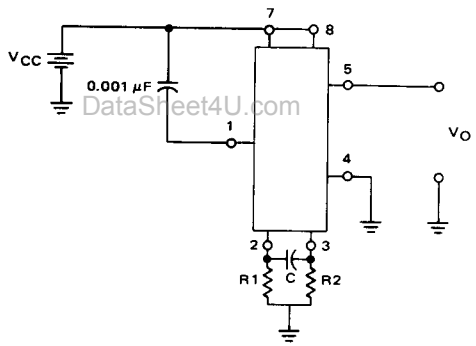
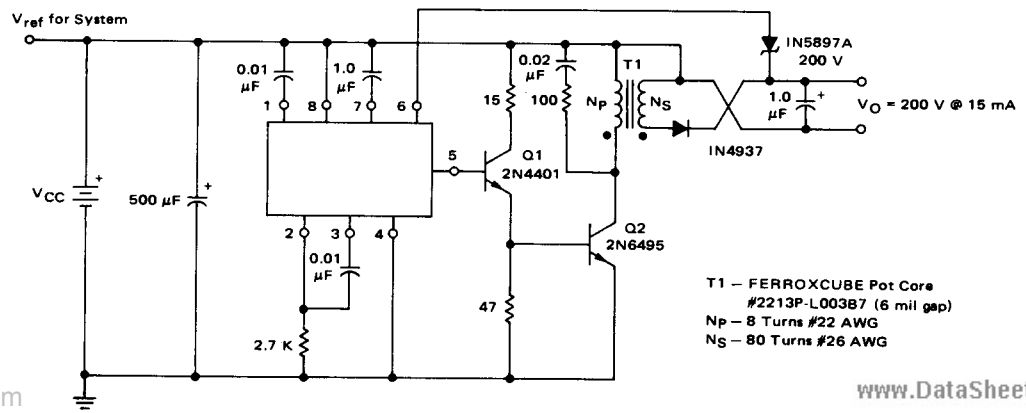


FIGURE 5 – 3-WATT SWITCHING REGULATOR APPLICATION CIRCUIT



T1 – FERROXCUBE Pot Core
#2213P-L00387 (6 mil gap)
NP – 8 Turns #22 AWG
NS – 80 Turns #26 AWG

3-Watt Switching Regulator - converts 5 V to 200 V for gas discharge displays such as Burroughs Panaplex and Beckman.

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FIGURE 6 – STATIC TEST CIRCUIT

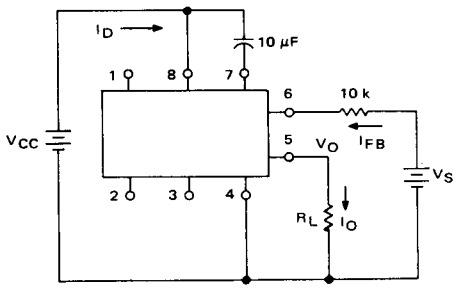
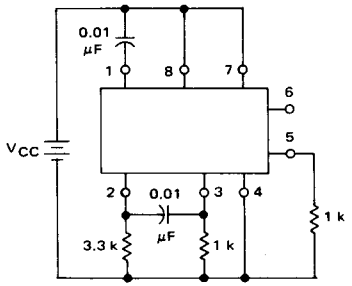


FIGURE 7 – DYNAMIC TEST CIRCUIT



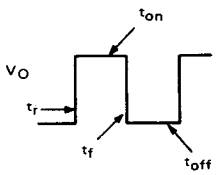


FIGURE 8 – SWITCHING WAVEFORMS AT Q2

Collector Current and Voltage Waveforms of 2N6495 (Q2) From Figure 5

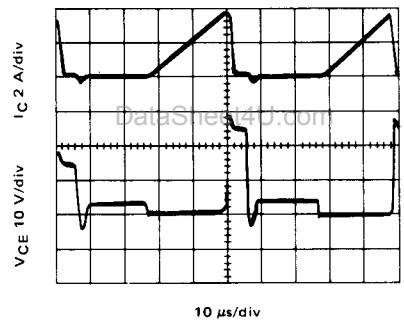
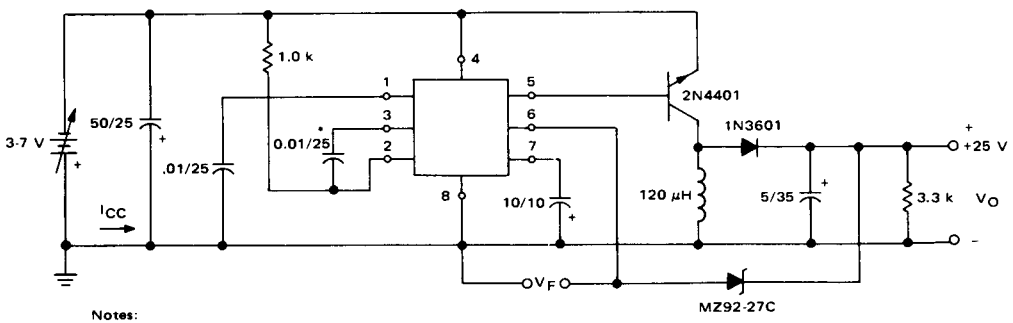


FIGURE 9 – TYPICAL APPLICATION IN 3 - 25 V DC-DC CONVERTER CONFIGURATION



Notes:
1. All resistor values in ohms, ± 1%, 1/4 W
2. All capacitor values in μF, = 20%, except * ± 5%.
3. All inductors ± 4%.

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DC - DC CONVERTER TEST CIRCUITS

FIGURE 10 – ZENER BIAS CURRENT TEST

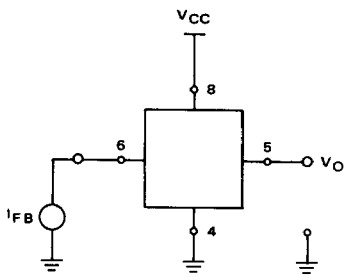

FIGURE 11 – OUTPUT CURRENT TEST

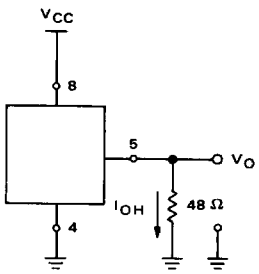

FIGURE 12 – OUTPUT RESISTANCE TEST

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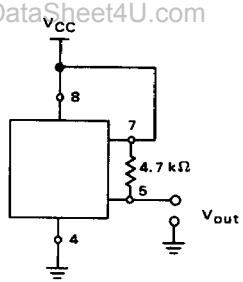

(Note: $r_o = \frac{V_{out}}{1\ mA}$)

FIGURE 13 – SHUTDOWN VOLTAGE AND TEST
(NOTE: Decrease V_{CC} until $V_O < 0.5$ V)

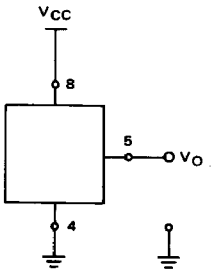

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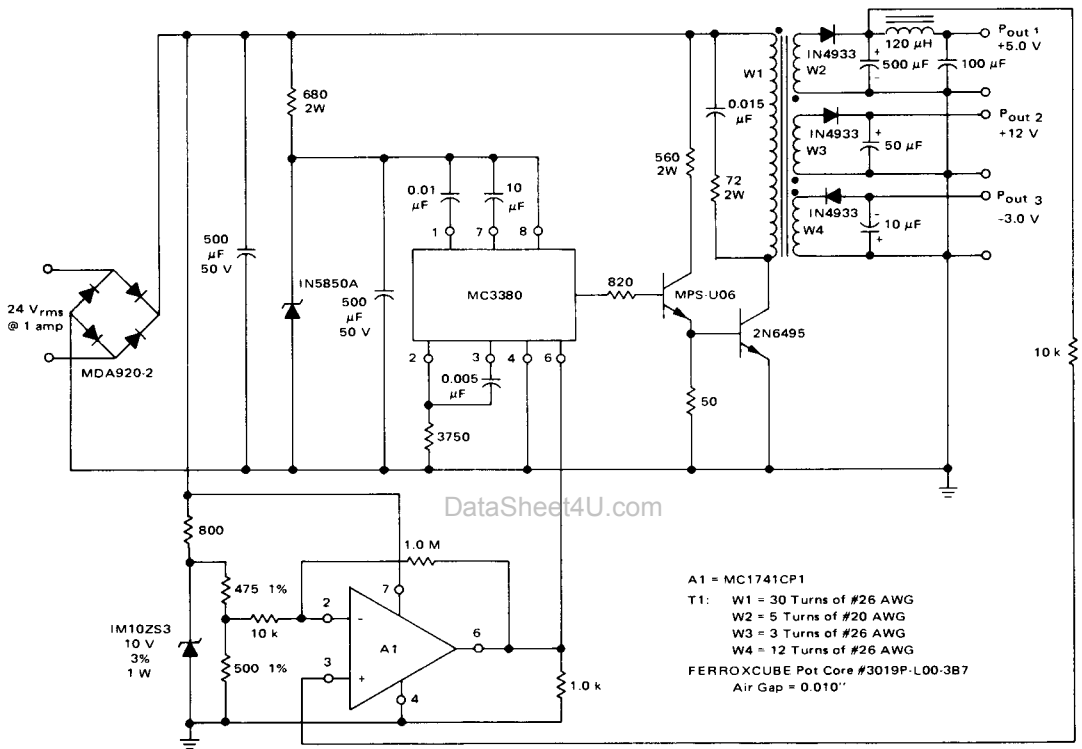
FIGURE 14 – TYPICAL APPLICATION AS MULTIPLE OUTPUT SWITCHING REGULATOR FOR USE WITH MPU'S



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TYPICAL PERFORMANCE
P_{out1} = 4 Watts
(V_O = 5 V ± 5%)
5 V Ripple Component = 50 mV
(120 Hz + 20 kHz)
P_{out2} = 600 mW
(V_O = 12 V ± 10%)
P_{out3} = 3 mW
(V_O = -3 V ± 10%)

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