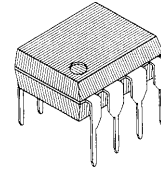


MB3776A SWITCHING REGULATOR CONTROLLER

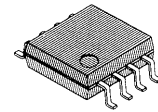
BUILT-IN POWER ON/OFF CONTROL APPLICABLE TO FIXED GAIN STANDARD AND LOW-VOLTAGE OPERATION

MB3776A is a PWM system switching regulator controller. Because of its low operating supply voltage and power-down, the MB3776A is ideal for use in DC/DC converters for battery-powered portable equipment.

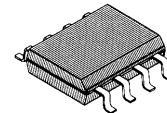
- Wide supply voltage range (2V to 15V)
- Wide oscillation frequency range, high-frequency oscillation (10 kHz to 500 kHz)
- Push-pull output. Drive current set with external resistor
- Built-in idle period circuit
- Internally set error amplifier gain, few external components
- Built-in power-down function



(DIP-8P-M01)



(FPT-8P-M01)



JEDEC STANDARD
(FPT-8P-M02)

ABSOLUTE MAXIMUM RATINGS (see Note)

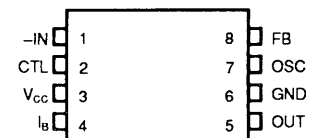
($T_A = 25^\circ\text{C}$)

Rating	Symbol	Condition	Value	Unit
Power supply voltage	V_{CC}		16	V
Error amplifier input voltage	V_I		-0.3 to +10	V
Output source current	I_{SOURCE}		-50	mA
Output sink current	I_{SINK}		50	mA
Power dissipation	P_D	$T_A \leq 25^\circ\text{C}$ (DIP)	550	mW
		$T_A \leq 25^\circ\text{C}$ EIAJ	*570	
		(SOP) JEDEC	*430	
Operating temperature	T_{op}		-30 to +75	$^\circ\text{C}$
Storage temperature	T_{STG}		-55 to +125	$^\circ\text{C}$

*The packages are mounted on the epoxy board (4 cm x 4 cm x 1.5 mm)

Note : Permanent device damage may occur if the above Absolute Maximum Ratings are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

PIN ASSIGNMENT (TOP VIEW)



This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

MB3776A

BLOCK DIAGRAM

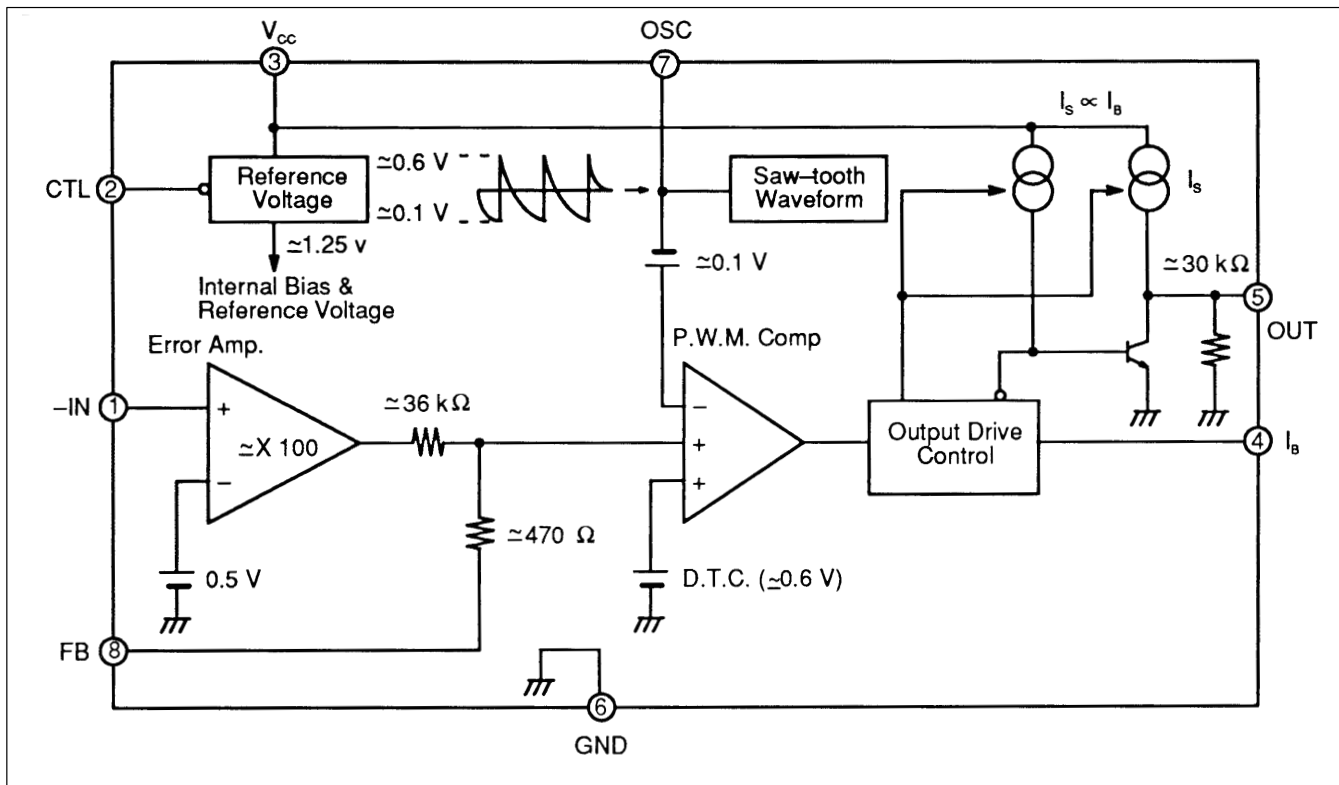


Figure 1. MB3776A Block Diagram

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Power Supply Voltage	V_{CC}	2.0		15	V
Error Amp. Input Voltage	V_I	-0.2		1.0	V
Output Source Current	I_{SOURCE}	-40			mA
Output Sink Current	I_{SINK}			40	mA
Phase Compensation Capacitor	C_P		0.1		μF
Timing Capacitor	C_T	100	1000	10000	pF
Timing Resistor	R_T	1.0	3.0	5.0	k Ω
Oscillator Frequency	f_{OSC}	10	200	500	kHz
Operating Temperature	T_{OP}	-30	25	75	$^{\circ}C$

ELECTRICAL CHARACTERISTICS

(TA = 25°C V = 6 V)

Parameter	Condition	Symbol	Value			Unit
			Min	Typ	Max	
Reference Section and Error Amplifier Section						
Input Threshold Voltage	V _{FB} = 450 mV	V _T	470	500	500	mV
V _T Input Stability	V _{CC} = 2.0V to 6.0V	V _{TdV1}	-5		5	mV
	V _{CC} = 6.0V to 15V	5V _{TdV2}	-5		5	mV
V _T Temperature Stability	T _A = -30°C to +75°C	V _{TdT}	-3		3	%
Input Bias Current	V _{IN} = 0V to 0.6V	I _B	-1.0	-0.2	1.0	μA
Voltage Gain		A _V	70	100	145	V/V
Frequency Band Width	A _V = 0 dB	BW		6	-	MHz
Sawtooth Waveform Oscillator Section						
Oscillator Frequency	R _T = 3.0 kΩ	f _{OSC}	160	200	240	kHz
	C _T = 1000 pF					
Frequency Input Stability	V _{CC} = 2.0V to 15V	f _{dV}		±2		%
Frequency Temperature Stability	T _A = -30°C to +75°C	f _{dT}		±10		%
Under Lockout Protection						
Threshold Voltage		V _{TH}		1.4		V
Dead-Time Control Section						
Maximum Duty Cycle	C _T = 1000 pF R _T = 3.0 kΩ V _{FB} = 0.9V	t _{DUTY}	60	70	85	%
Output Section						
Output Source Current	R _B = 820Ω, V _O = 1V	I _{SOURCE}	-40	-30	-20	mA
Output Sink Current	R _B = 820Ω, V _O = 0.3 V	I _{SINK}	30	60		mA
High-Level Output Voltage	R _B = 820 , V _O = 7V I _O = 15 mA	V _{OH}	5.5	6.0		V
Output Voltage	V _{CTL} = V _{CC} , I _O = 3m A	V _{OL}		0.1	0.2	V
Control Section						
Input Off Condition		I _{OFF}	-300			μA
Input On Condition		I _{ON}			-700	μA
Control Terminal Current	V _{CC} = 7V, V _{CTL} = 0 V	I _{CTL}	-1.3	-1		mA
Control Section						
Standby Current	V _{CTL} = V _{CC} or C _{TL} Terminal Open	I _{CCS}			0.5	μA
Average Supply Current	I _{CTL} = -700 μA R _B = 820Ω	I _{CC}		4.5	8	mA

MB3776A

TEST CIRCUIT

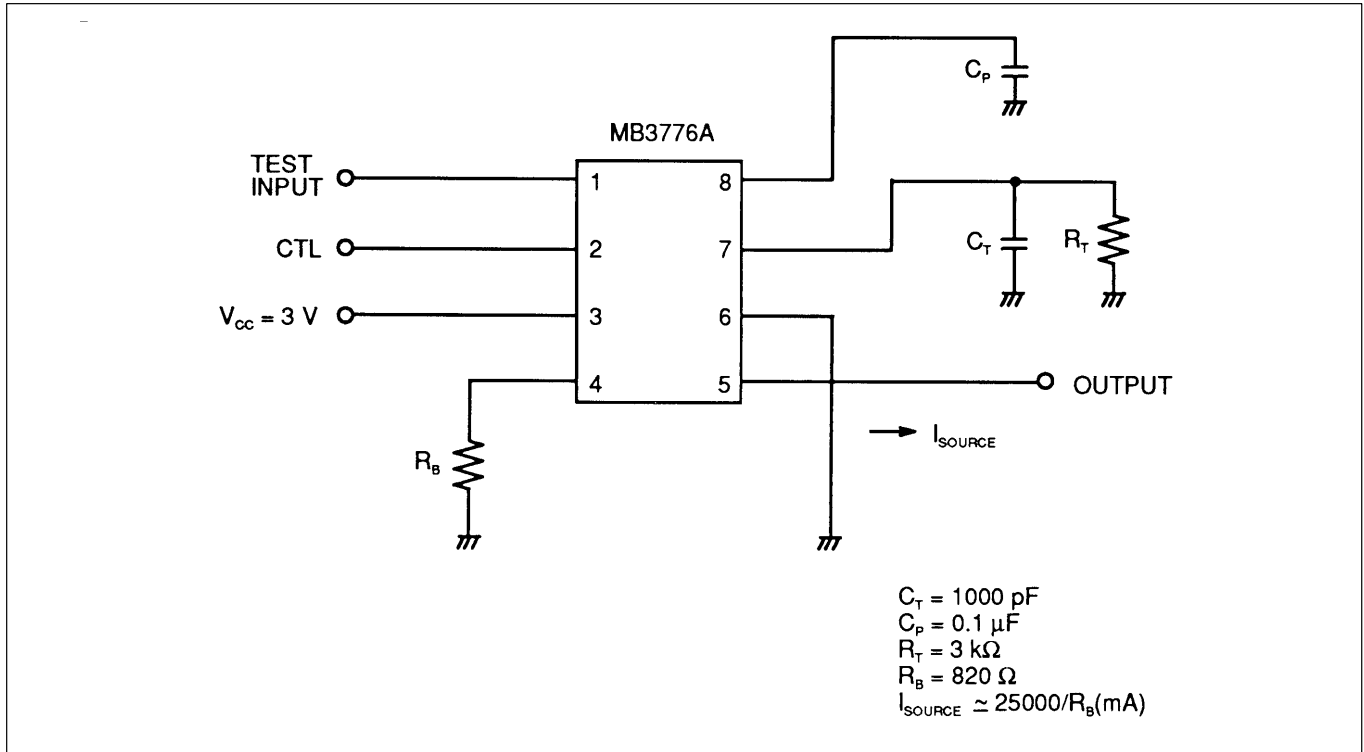


Figure 2. MB3776A Test Circuit

TIMING CHART (Internal Waveform)

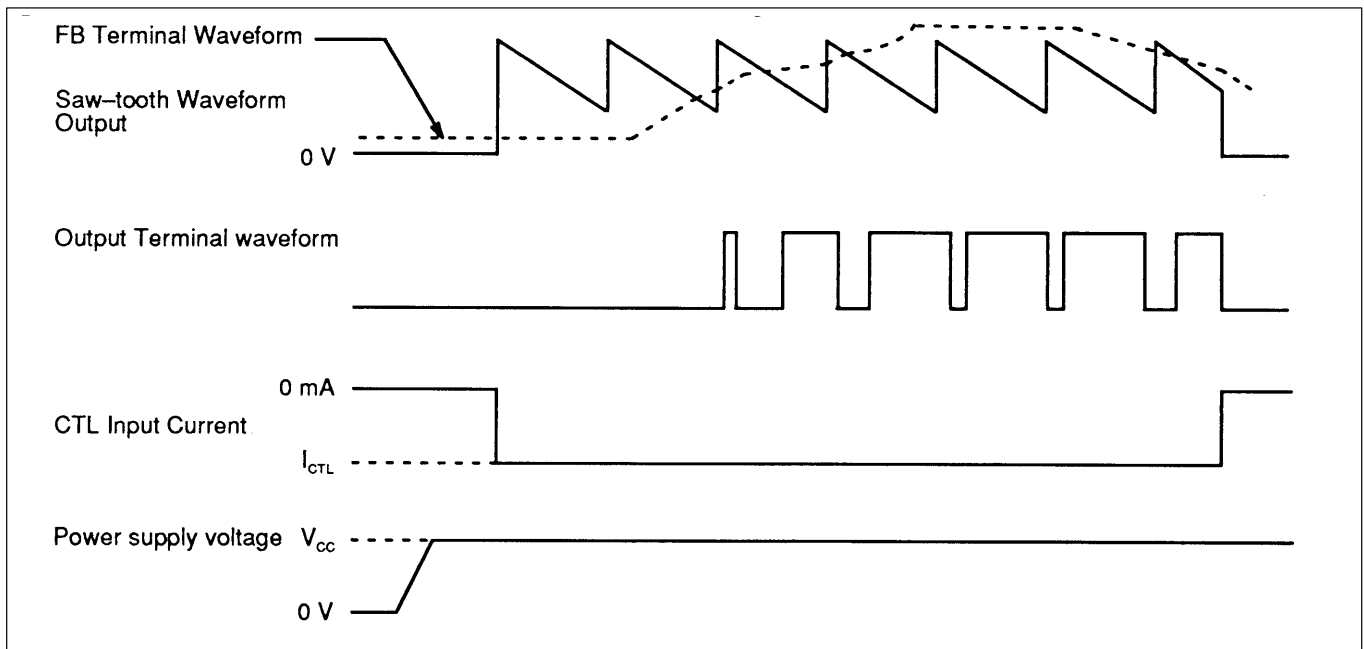


Figure 3. MB3776A Timing Chart

TYPICAL PERFORMANCE CHARACTERISTICS

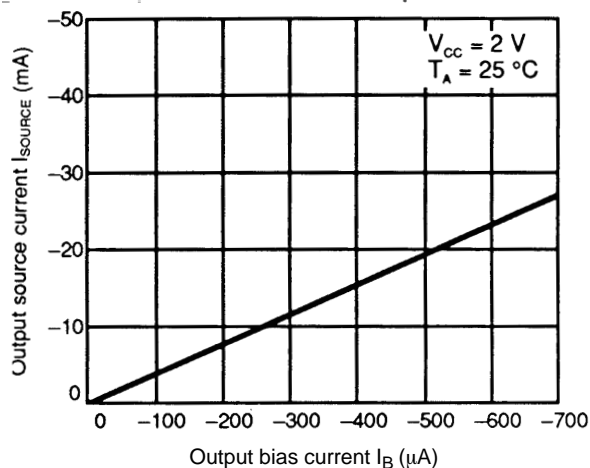


Figure 4. Output Bias Current vs. Output Source Current

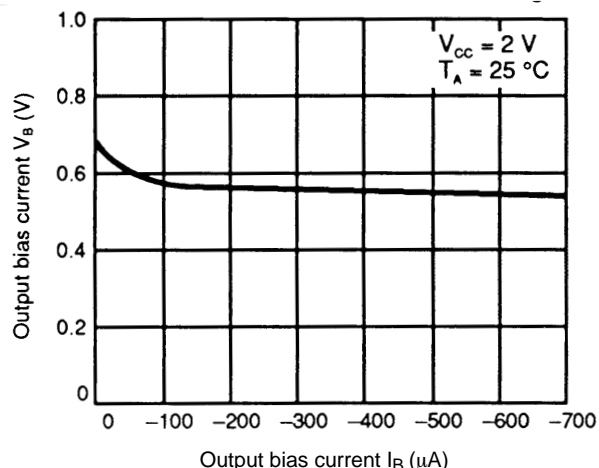


Figure 5. Output Bias Current vs. Output Bias Voltage

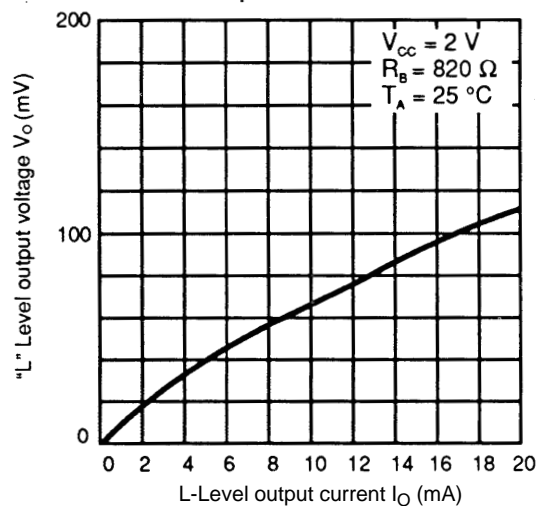


Figure 6. L-Level Output

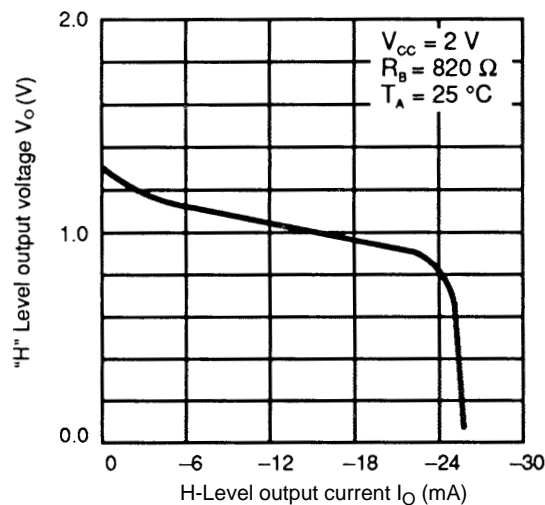


Figure 7. H-Level Output

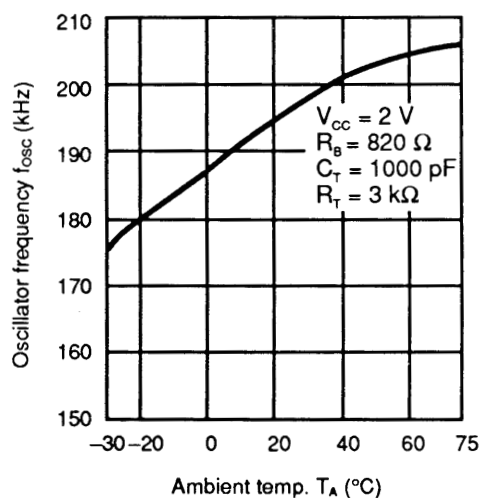


Figure 8. Ambient Temp. vs. Oscillator Frequency

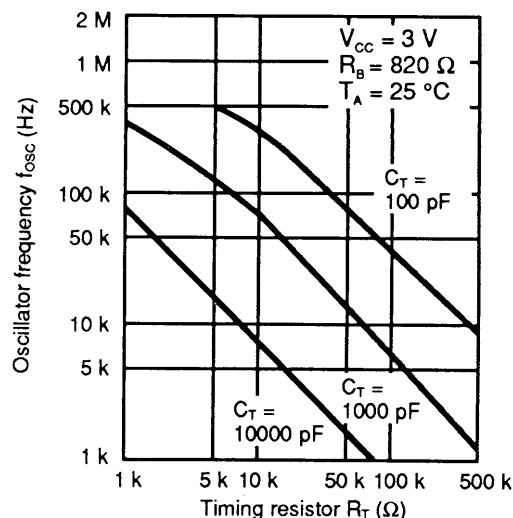


Figure 9. Timing Resistor vs. Oscillator Frequency

TYPICAL PERFORMANCE CHARACTERISTICS, continued

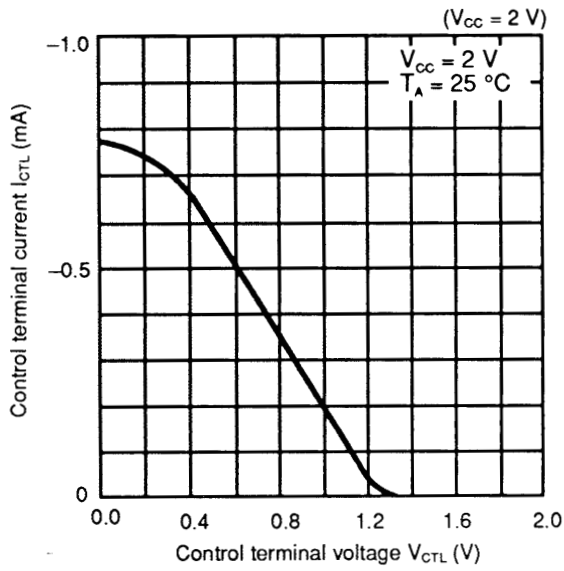


Figure 10. Control Terminal Voltage vs. Control Terminal Current

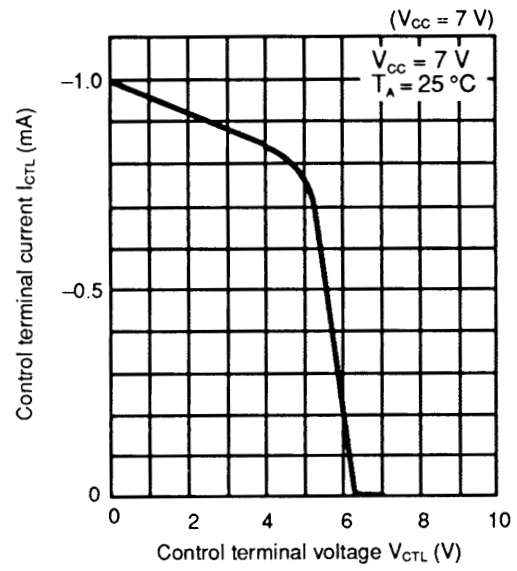


Figure 11. Control Terminal Voltage vs. Control Terminal Current

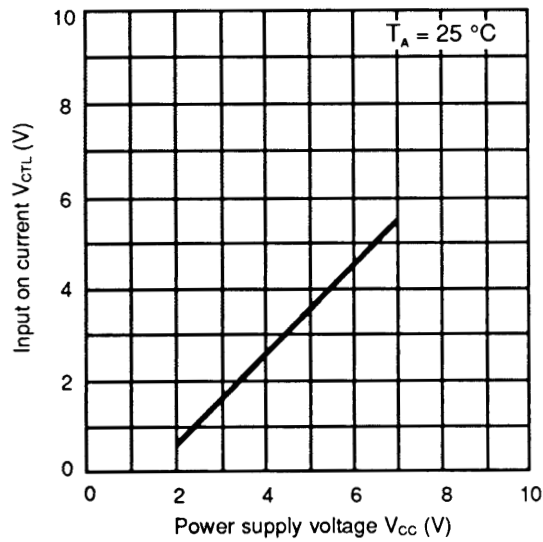
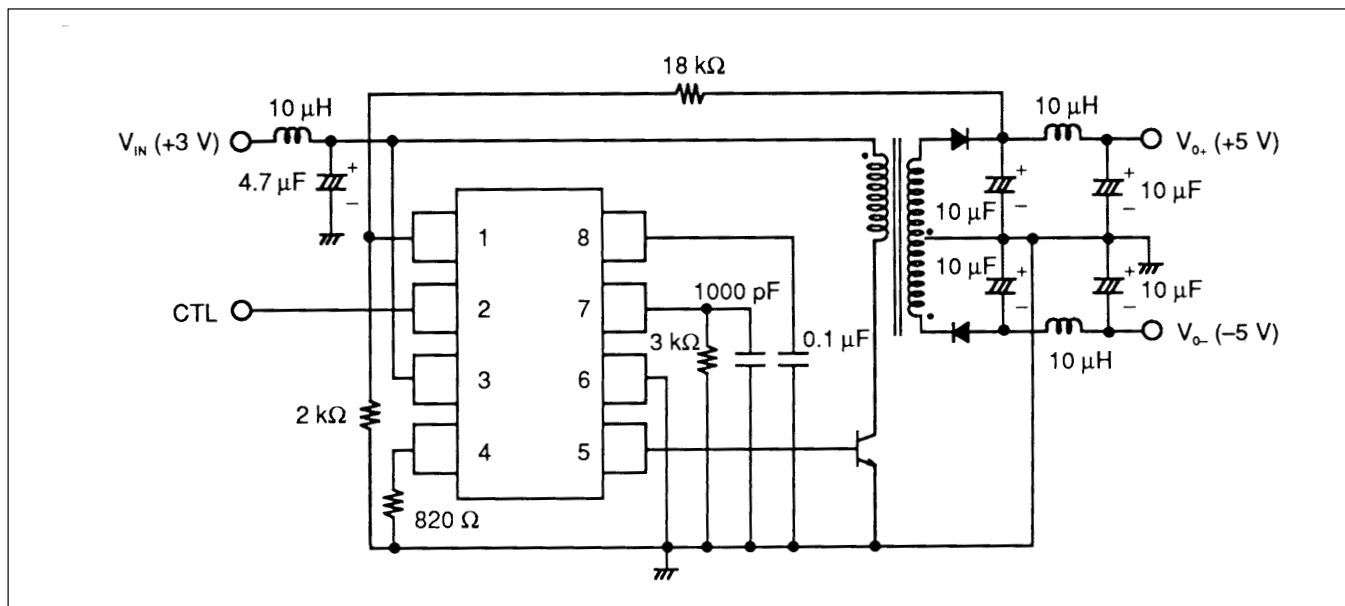


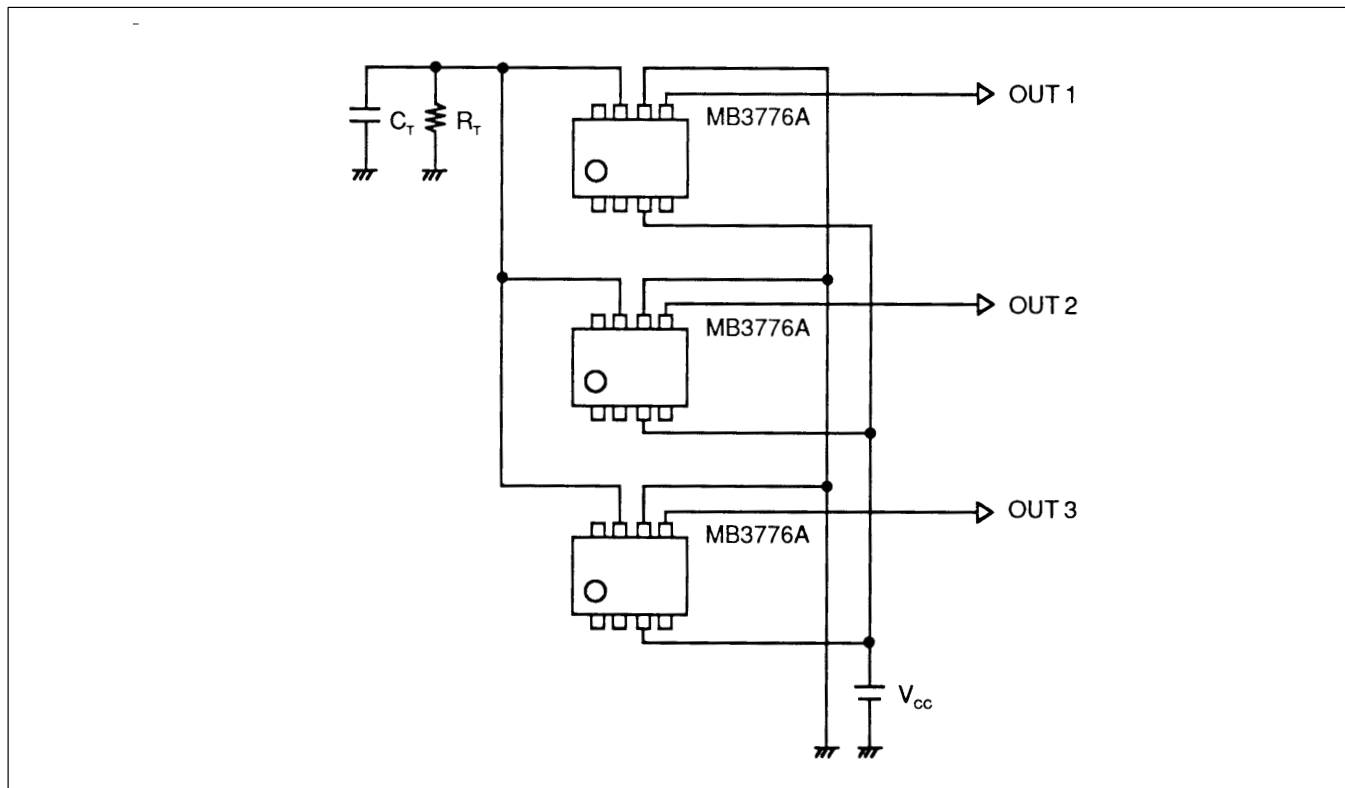
Figure 12. Power Supply Voltage vs. Input On Voltage

EXAMPLE APPLICATION CIRCUIT

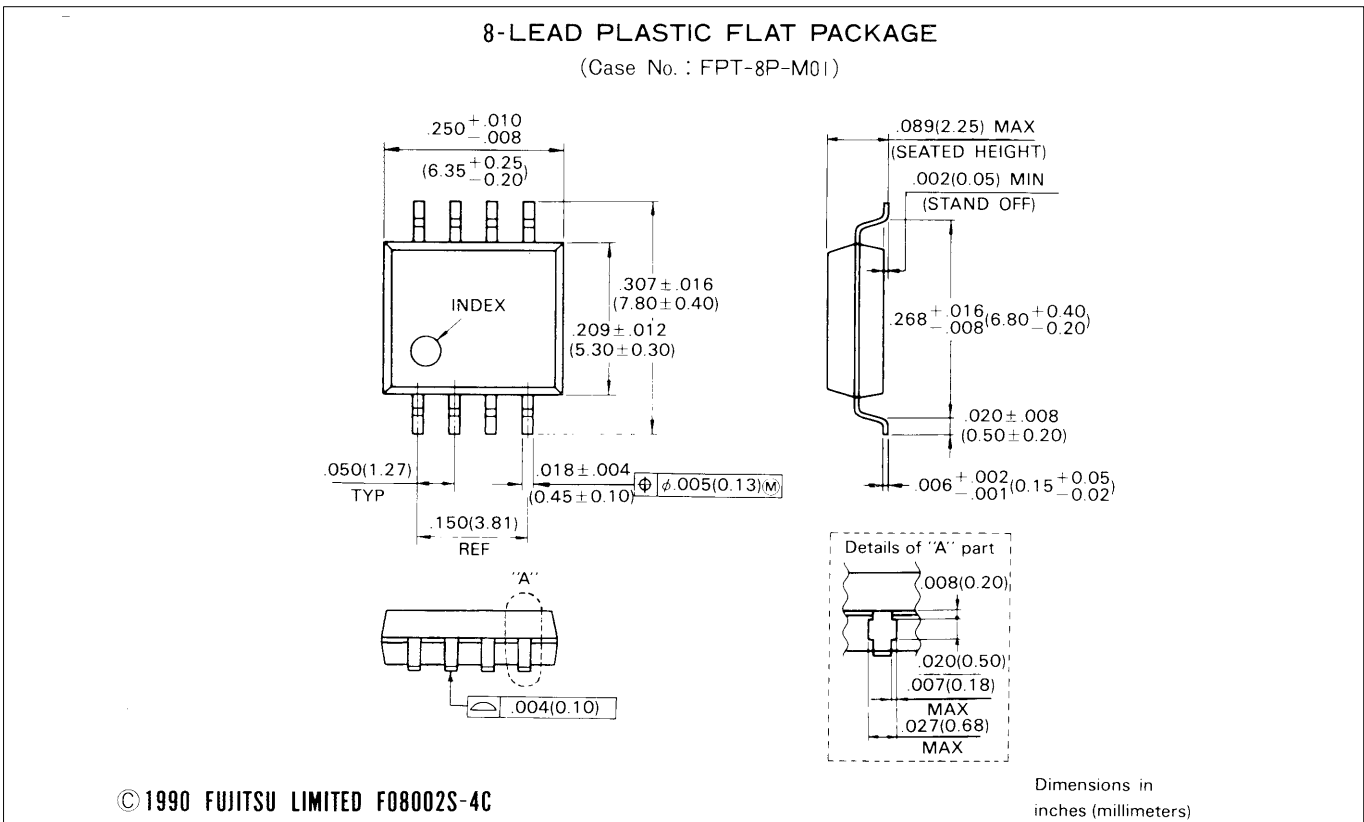
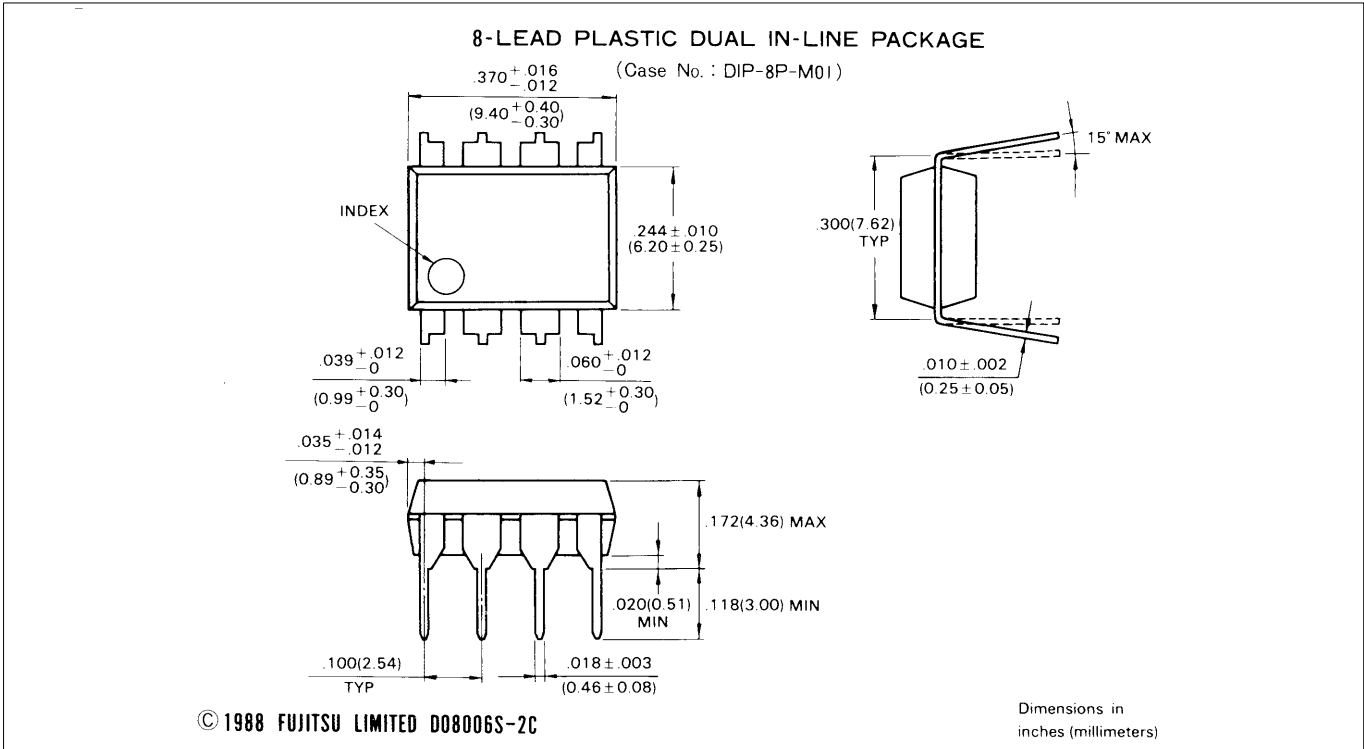


Synchronization

To synchronize MB3776A controllers, the OSC terminal of each IC is shared and the same specified capacitor and resistor used on a signal IC application is connected for self-excitation oscillation. The CTL terminal controls power on/off of each IC.



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