

EVALUATION KIT AVAILABLE

MAXIM

5V/12V/15V or Adjustable, High-Efficiency, Low I_Q , Step-Up DC-DC Controllers

General Description

The MAX770-MAX773 step-up switching controllers provide 90% efficiency over a 10mA to 1A load. A unique current-limited pulse-frequency-modulation (PFM) control scheme gives these devices the benefits of pulse-width-modulation (PWM) converters (high efficiency at heavy loads), while using less than 110 μ A of supply current (vs. 2mA to 10mA for PWM converters).

These ICs use tiny external components. Their high switching frequencies (up to 300kHz) allow surface-mount magnetics of 5mm height and 9mm diameter.

The MAX770/MAX771/MAX772 accept input voltages from 2V to 16.5V. Output voltages are preset at 5V, (MAX770), 12V (MAX771), and 15V (MAX772); they can also be adjusted using two resistors.

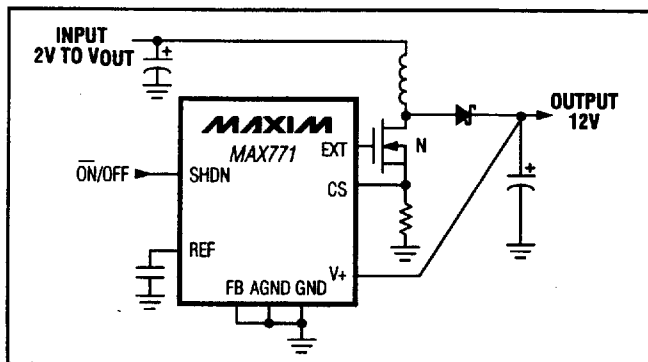
The MAX773 accepts inputs from 3V to 16.5V. For a wider input range, it features an internal shunt regulator that allows unlimited higher input voltages. The MAX773's output can be set to 5V, 12V, or 15V, or it can be adjusted with two resistors.

The MAX770-MAX773 drive external N-channel MOSFET switches, allowing them to power loads up to 15W. If less power is required, use the MAX756/MAX757 or MAX761/MAX762 step-up switching regulators with on-board MOSFETs.

Applications

Palmtops/Handy-Terminals
High-Efficiency DC-DC Converters
Battery-Powered Applications
Positive LCD-Bias Generators
Portable Communicators
Flash Memory Programmers

Typical Operating Circuit



Features

- ◆ 90% Efficiency for 10mA to 1A Load Currents
- ◆ Up to 15W Output Power
- ◆ 110 μ A Max Supply Current
- ◆ 5 μ A Max Shutdown Current
- ◆ 2V to 16.5V Input Range (MAX770/MAX771/MAX772)
- ◆ Internal Shunt Regulator for High Input Voltages (MAX773)
- ◆ Preset or Adjustable Output Voltages
 - MAX770: 5V or Adjustable
 - MAX771: 12V or Adjustable
 - MAX772: 15V or Adjustable
 - MAX773: 5V, 12V, 15V, or Adjustable
- ◆ Current-Limited PFM Control Scheme
- ◆ 300kHz Switching Frequency

Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
MAX770CPA	0°C to +70°C	8 Plastic DIP
MAX770CSA	0°C to +70°C	8 SO
MAX770C/D	0°C to +70°C	Dice*
MAX770EPA	-40°C to +85°C	8 Plastic DIP
MAX770ESA	-40°C to +85°C	8 SO
MAX770MJA	-55°C to +125°C	8 CERDIP**

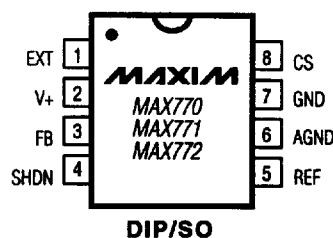
Ordering Information continued on last page.

* Contact factory for dice specifications.

** Contact factory for availability and processing to MIL-STD-883B.

Pin Configurations

TOP VIEW



Pin Configurations continued on last page.

MAXIM

Maxim Integrated Products 1

Call toll free 1-800-998-8800 for free samples or literature.

MAX770-MAX773

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ABSOLUTE MAXIMUM RATINGS

Supply Voltages

V+ to GND	-0.3V, 17V
V+ to SGND	-0.3V, 7V
SGND	-0.3V, (V+ + 0.3V)
EXT, CS, REF, LBO, LBI, SHDN, FB	-0.3V, (V+ + 0.3V)
EXTH, EXTL	-0.3V, (V+ + 0.3V)
V5, V12, V15	-0.3V, 17V
GND to AGND	0.1V, -0.1V
ISGND	50mA

Continuous Power Dissipation (T_A = +70°C)

8-Pin Plastic DIP (derate 9.09mW/°C above +70°C)	727mW
8-Pin SO (derate 5.88mW/°C above +70°C)	471mW
8-Pin Cerdip (derate 8.00mW/°C above +70°C)	640mW

14-Pin Plastic DIP (derate 10.00mW/°C above +70°C)	800mW
14-Pin SO (derate 8.33mW/°C above +70°C)	667mW
14-Pin Cerdip (derate 9.09mW/°C above +70°C)	727mW

Operating Temperature Ranges

MAX77_C	0°C to +70°C
MAX77_E	-40°C to +85°C
MAX77_MJ	-55°C to +125°C

Junction Temperatures

MAX77_C/E	+150°C
MAX77_MJ	+175°C

Storage Temperature Range

Lead Temperature (soldering, 10sec)	+300°C
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Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

(V+ = 5V, I_{LOAD} = 0mA, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS	
Input Voltage Range		MAX770-772 (internal feedback resistors)	2.0		16.5	V	
		MAX770-772C/E (external resistors)	3.0		16.5		
		MAX770-772MJA (external resistors)	3.1		16.5		
		MAX773C/E	3.0		16.5		
		MAX773MJD	3.1		16.5		
Minimum Start-Up Voltage		MAX770/MAX771/MAX772		1.8	2.0	V	
Supply Current		V+ = 16.5V, SHDN = 0V (normal operation)		85	110	μA	
Standby Current		V+ = 10.0V, SHDN ≥ 1.6V (shutdown)		2	5	μA	
		V+ = 16.5V, SHDN ≥ 1.6V (shutdown)		4			
Output Voltage (Note 1)		V+ = 2.0V to 5.0V, over full load range	4.80	5.0	5.20	V	
		V+ = 2.0V to 12.0V, over full load range	11.52	12.0	12.48		
		V+ = 2.0V to 15.0V, over full load range	14.40	15.0	15.60		
Output Voltage Line Regulation (Note 2)		Figure 2a, V+ = 2.7V to 4.5V, I _{LOAD} = 700mA, V _{OUT} = 5V		5		mV/V	
Output Voltage Load Regulation (Note 2)		Figure 2a, V+ = 3V, I _{LOAD} = 30mA to 1A, V _{OUT} = 5V		20		mV/A	
Maximum Switch On-Time	t _{ON(max)}		12	16	20	μs	
Minimum Switch Off-Time	t _{OFF(min)}		1.8	2.3	2.8	μs	
Efficiency		V+ = 4V, I _{LOAD} = 500mA, V _{OUT} = 5V		87		%	
Reference Voltage	V _{REF}	I _{REF} = 0μA	MAX77_C	1.4700	1.5	1.5300	V
			MAX77_E	1.4625	1.5	1.5375	
			MAX77_M	1.4550	1.5	1.5450	

5V/12V/15V or Adjustable High-Efficiency, Low IQ, Step-Up DC-DC Controllers

ELECTRICAL CHARACTERISTICS (continued)

(V+ = 5V, I_{LOAD} = 0mA, T_A = T_{MIN} to T_{MAX}, unless otherwise noted. Typical values are at T_A = +25°C.)

PARAMETERS	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
REF Load Regulation		$0\mu\text{A} \leq \text{I}_{\text{REF}} \leq 100\mu\text{A}$	MAX77_C/E	4	10	mV	
			MAX77_M	4	15		
REF Line Regulation		$3\text{V} \leq \text{V}_+ \leq 16.5\text{V}$		40	100	$\mu\text{V/V}$	
FB Trip-Point Voltage	V_{FB}	MAX77_C		1.4700	1.50	1.5300	V
		MAX77_E		1.4625	1.50	1.5375	
		MAX77_M		1.4550	1.50	1.5450	
FB Input Current	I_{FB}	MAX77_C		± 20		nA	
		MAX77_E		± 40			
		MAX77_M		± 60			
SHDN Input High Voltage	V_{IH}	$\text{V}_+ = 2.0\text{V}$ to 16.5V		1.6		V	
SHDN Input Low Voltage	V_{IL}	$\text{V}_+ = 2.0\text{V}$ to 16.5V			0.4	V	
SHDN Input Current		$\text{V}_+ = 16.5\text{V}$, SHDN = 0V or V_+			± 1	μA	
LBI Input Current		MAX773, $\text{V}_+ = 16.5\text{V}$, LBI = 1.5V			± 20	nA	
LBI Hysteresis		MAX773		20		mV	
LBI Delay		5mV overdrive		2.5		μs	
LBI Threshold Voltage		MAX773, LBI falling	MAX77_C	1.4700	1.50	1.5300	V
			MAX77_E	1.4625	1.50	1.5375	
			MAX77_M	1.4550	1.50	1.5450	
LBO Leakage Current		MAX773, $\text{V}_+ = 16.5\text{V}$, $\text{V}_{\text{LBO}} = 16.5\text{V}$		0.01	1.00	μA	
LBO Output Voltage Low	V_{OL}	MAX773, $\text{V}_+ = 5\text{V}$, LBO sinking 1mA		0.1	0.4	V	
Current-Limit Trip Level	V_{CS}	$\text{V}_+ = 5\text{V}$ to 16.5V		170	200	230	mV
CS Input Current				0.01	± 1	μA	
EXT Rise Time		$\text{V}_+ = 5\text{V}$, 1nF from EXT to ground (Note 3)		55		ns	
EXT Fall Time		$\text{V}_+ = 5\text{V}$, 1nF from EXT to ground (Note 3)		55		ns	
Supply Voltage in Shunt Mode	V_{SHUNT}	MAX773, $\text{I}_{\text{SHUNT}} = 1\text{mA}$ to 20mA , $\text{SGND} = 0\text{V}$, $\text{C}_{\text{SHUNT}} = 0.1\mu\text{F}$		5.5	6.3	V	

Note 1: Output voltage guaranteed using preset voltages. See Figure 7 graphs for output current capability versus input voltage.

Note 2: Output voltage line and load regulation depend on external circuit components.

Note 3: For the MAX773, EXT is EXTH and EXTL shorted together.

MAX770-MAX773