

CMOS Voltage Converters

The Intersil HM7660 are monolithic CMOS power supply circuits which offer unique performance advantages over previously available devices. The HM7660 performs supply voltage conversions from positive to negative for an input range of +1.5V to +10.0V resulting in complementary output voltages of -1.5V to -10.0V.

Only 2 noncritical external capacitors are needed for the charge pump and charge reservoir functions.

The HM7660 can also be connected to function as voltage doublers and will generate output voltages up to +18.6V with a +10V input.

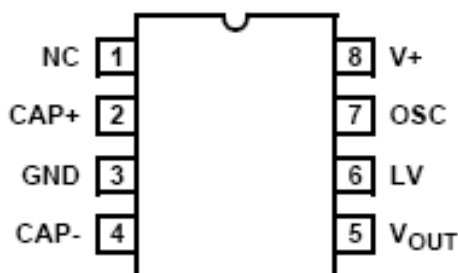
Contained on the chip are a series DC supply regulator, RC oscillator, voltage level translator, and four output power MOS switches. A unique logic element senses the most negative voltage in the device and ensures that the output N-Channel switch source-substrate junctions are not forward biased. This assures latchup free operation. The oscillator, when unloaded, oscillates at a nominal frequency of 10kHz for an input supply voltage of 5.0V. This frequency can be lowered by the addition of an external capacitor to the "OSC" terminal, or the oscillator may be overdriven by an external clock.

The "LV" terminal may be tied to GROUND to bypass the internal series regulator and improve low voltage (LV) operation. At medium to high voltages (+3.5V to +10.0V), the LV pin is left floating to prevent device latchup.

Pinouts

DIP 8

TOP VIEW



Features

- Simple Conversion of +5V Logic Supply to $\pm 5V$ Supplies
- Simple Voltage Multiplication ($V_{OUT} = (-) nV_{IN}$)
- Typical Open Circuit Voltage Conversion Efficiency 99.9%
- Typical Power Efficiency 98%
- Wide Operating Voltage Range
- HM7660 1.5V to 10.0V
- Easy to Use - Requires Only 2 External Non-Critical Passive Components

Applications

- On Board Negative Supply for Dynamic RAMs
- Localized μ Processor (8080 Type) Negative Supplies
- Inexpensive Negative Supplies
- Data Acquisition Systems

Pin Description

Name	Pin#	Function
NC	1	
CAP+	2	"+" Capacitor Plate
GND	3	Ground
CAP-	4	"-" Capacitor Plate
V_{OUT}	5	Output Voltage
LV	6	Low Supply Voltage
OSC	7	Oscillator
V+	8	Supply Voltage

Absolute Maximum Ratings

Supply Voltage

HM7660 +10.5V

LV and OSC Input Voltage -0.3V to (V+ +0.3V) for V+ < 5.5V
 (V+ -5.5V) to (V+ +0.3V) for V+ > 5.5V

Current into LV 20μA for V+ > 3.5V

Temperature Range. 0°C to 70°C

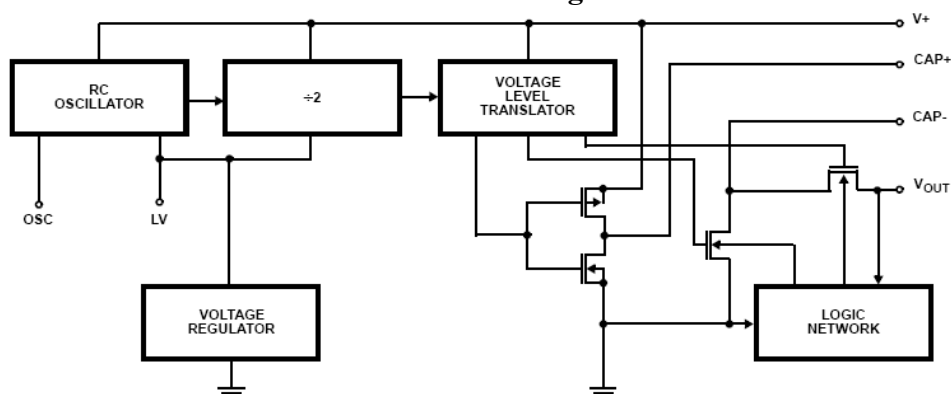
Thermal Resistance, θ_{JA} (°C/W).150

Maximum Storage Temperature Range. -65°C to 150°C

Electrical Characteristics (V+ = 5V, T_A = 25°C, C_{OSC} = 0, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	I+	R _L = ∞	-	170	500	μA
Supply Voltage Range - Lo	VL+	MIN ≤ T _A ≤ MAX, R _L = 10kΩ, LV to GND	1.5	-	3.5	V
Supply Voltage Range - Hi	VL+	MIN ≤ T _A ≤ MAX, R _L = 10kΩ, LV to Open	3.0	-	10.0	V
Output Source Resistans	R _{OUT}	I _{OUT} = 20mA, T _A = 25°C	-	55	100	Ω
		I _{OUT} = 20mA, 0°C ≤ T _A ≤ 70°C	-	-	120	
		V+ = 2V, I _{OUT} = 3mA, LV to GND, 0°C ≤ T _A ≤ 70°C	-	-	300	
Oscillator Frequency	f _{OSC}		8	-	18	kHz
Power Efficiency	P _{EF}	R _L = 5kΩ	95	98	-	%
Voltage Conversion Efficiency	V _{OUT EF}	R _L = ∞	97	99.9	-	%
Oscillator Impedance	Z _{OSC}	V+ = 2V	-	1.0	-	MΩ
		V+ = 5V	-	100	-	kΩ

Functional Block Diagram



TYPICAL APPLICATION CIRCUITS

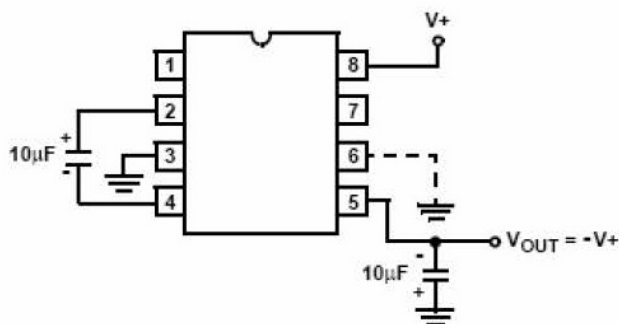


FIGURE 1. SIMPLE NEGATIVE CONVERTER

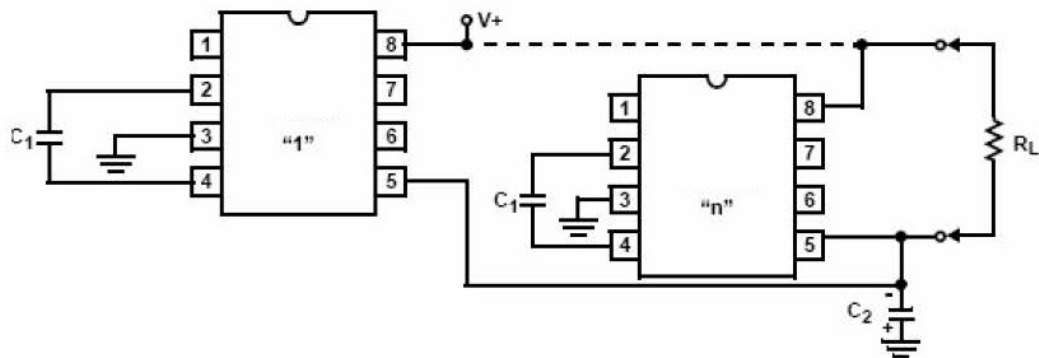


FIGURE 2. PARALLELING DEVICES

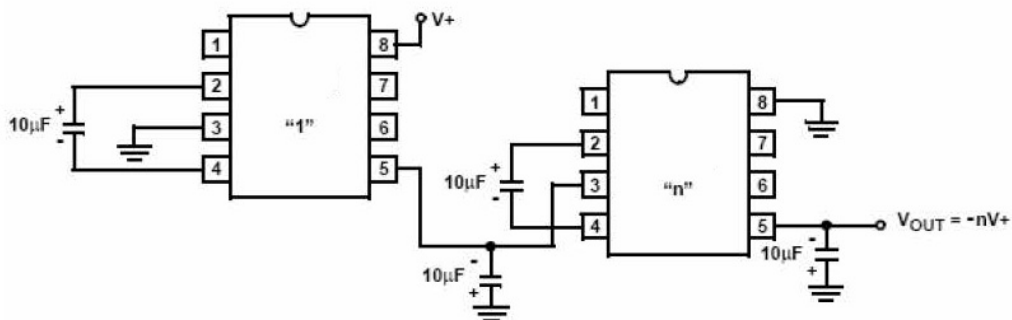


FIGURE 3. CASCADING DEVICES FOR INCREASED OUTPUT VOLTAGE

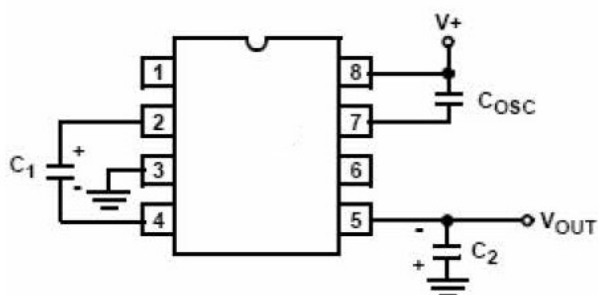


FIGURE 4. LOWERING OSCILLATOR FREQUENCY

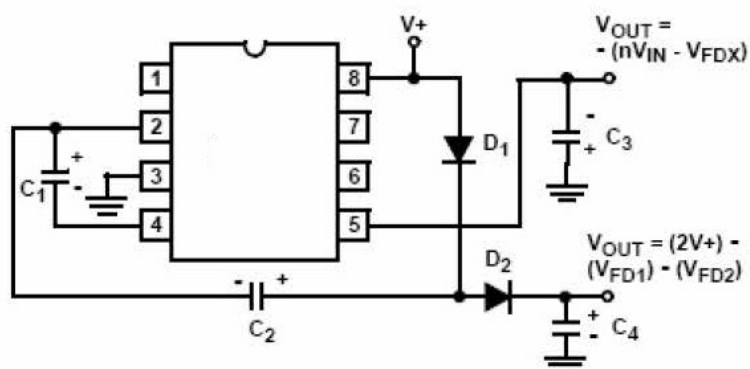


FIGURE 5. COMBINED NEGATIVE VOLTAGE CONVERTER AND POSITIVE DOUBLER

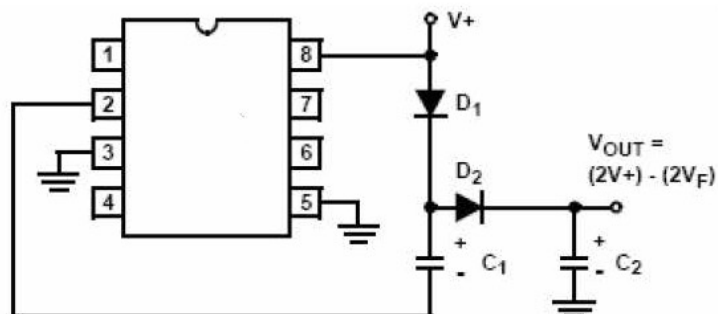


FIGURE 6. POSITIVE VOLT DOUBLER

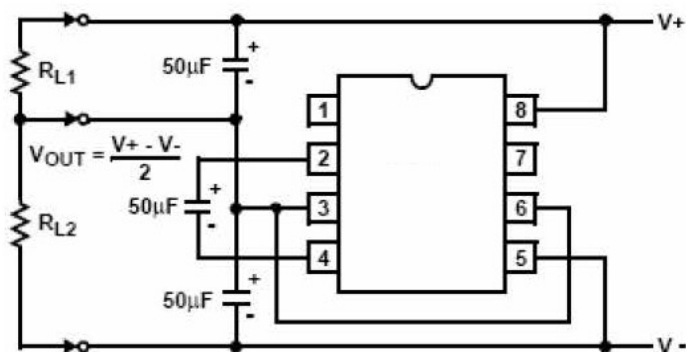


FIGURE 7. SPLITTING A SUPPLY IN HALF