Features

- Input Voltage:1.5V ~ 9V
- low static current: typ.=65uA @5V
- power conversion efficiency reaches 98%.
- voltage conversion efficiency reaches over 99%.
- peripheral components are simple, requiring only three small 10uF capacitors for external connection.
- package：DIP-8、SOP-8、MSOP-8、DFN-8



DIP-8



SOP-8


MSOP-8



DFN-8 3*3

Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
ICL7660N	DIP-8	ICL7660	TUBE	2000 pcs/box
ICL7660M/TR	SOP-8	ICL7660	REEL	2500 pcs/reel
ICL7660MM/TR	MSOP-8	ICL7660,7660	REEL	3000 pcs/reel
ICL7660DQ3/TR	DFN-8 3*3	7660	REEL	5000 pcs/reel

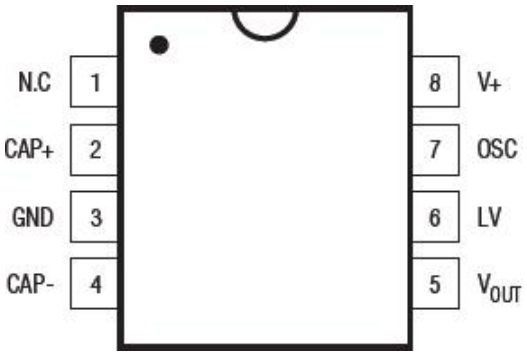
General Description

The ICL7660 series is a high-efficiency polarity-inverting power converter that delivers negative voltage output. Operating within a 1.5V-9V voltage range, this chip integrates an oscillator control circuit and four power MOSFET switches. With just three external capacitors, it generates a negative output voltage that is the opposite polarity of the input voltage. For example, when the input voltage V+ = 5V, the output voltage V_{OUT} = -5V. This product line is widely used in electronic devices such as data acquisition systems and portable instruments.

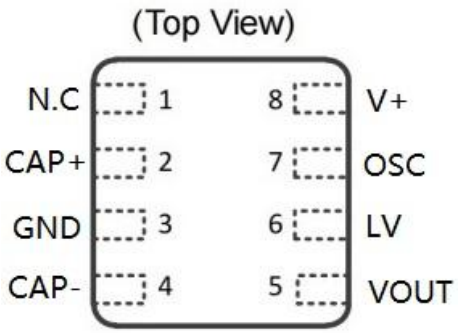
Applications

- Op-Amp Power Supplies
- Data-Acquisition Systems
- PAD、Portable Telephones
- Negative Supplies for Data Acquisition Systems and Instrumentation
- Can be used as a voltage converter or voltage divider
- Handheld Instruments

Pin Configurations



DIP-8/SOP-8/MSOP-8

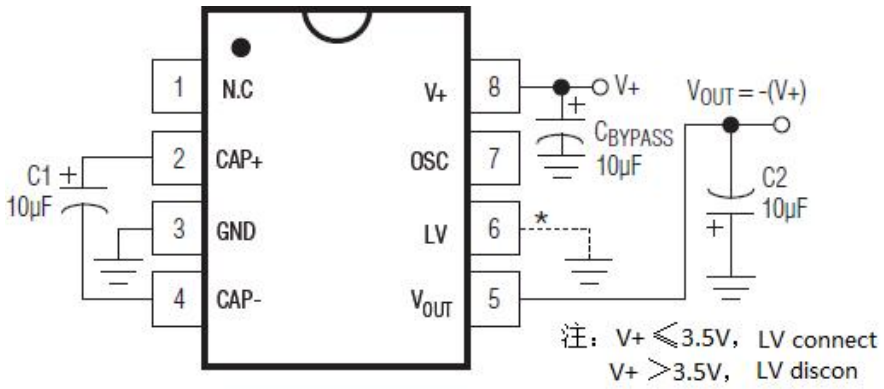


DFN-8 3*3

Pin Description

PIN. DIP8/SOP8/MSOP8/DFN8	NAME	FUNCTION
1	N.C	No Connection.
2	CAP+	Connection to positive terminal of Charge-Pump Capacitor.
3	GND	Ground.
4	CAP-	Connection to negative terminal of Charge-Pump Capacitor.
5	VOUT	Negative Voltage Output.
6	LV	Low-Voltage Operation.
7	OSC	Oscillator Control Input.
8	V+	Power-Supply Positive Voltage Input.

Typical application



Absolute Maximum Ratings

Item	Symbol	Parameter	Value	Unit
Voltage	V+	Input Voltage: V+ to GND	9	V
	Vout	Output Voltage :GND to VOUT	9	V
	Vin	Pin6/Pin7 port input voltage	-0.3 ~V+ +0.3	V
Current	I_{LV}	LV port input voltage	20	uA
Temperature	T_A	Operating Temperature Range	-25-60	℃
	T_S	Storage Temperature Range	-65-150	℃
	T_W	Lead Temperature	260,10s	℃

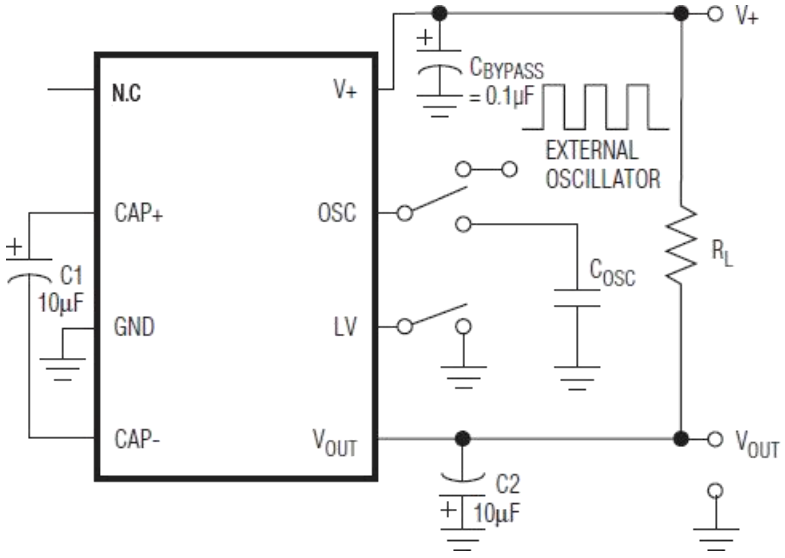
Note: Stress greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions outside those indicated in the operational sections of this specification are not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability

Electrical Characteristics

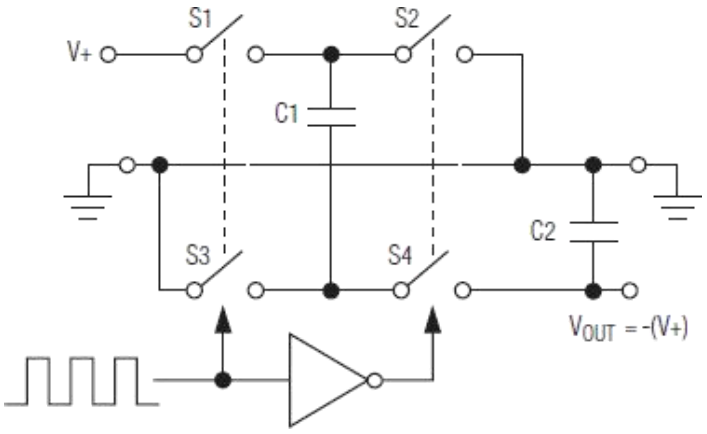
(Ta=25℃ unless otherwise noted,Refer to the test circuit diagram for the test circuit)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Current	I_{V+}	V+ = 5.0V,I_L=0mA,RL=∝, OSC/LV open		65	175	uA
Supply Voltage Range	V+	RL=10k，OSC/LV open	3		8	V
		RL=10k LV=GND, OSC open	1.5		3.5	
Output Resistance	R_{OUT}	f_{OSC}=5kHz，V+ = 5.0V，I_L=20mA，LV open		55	100	Ω
		f_{OSC}=2.7kHz, V+=2V, I_L=3mA,LV to GND			250	Ω
Power Efficiency	η_P	RL=5kΩ, f_{OSC}=5kHz, LV open	95	98		%
Voltage Conversion Efficiency	η_V	RL=∞, OSC/LV open	99.0	99.9		%/V
Oscillator Frequency	f_{OSC}	C_{OSC} = 1pF, LV to GND ，V+ =5V		10		kHz
Oscillator Impedance	R_{OSC}	V+ = 2V		1		MΩ
		V+ = 5V		100		KΩ

Test Circuit



Ideal Voltage Inverter



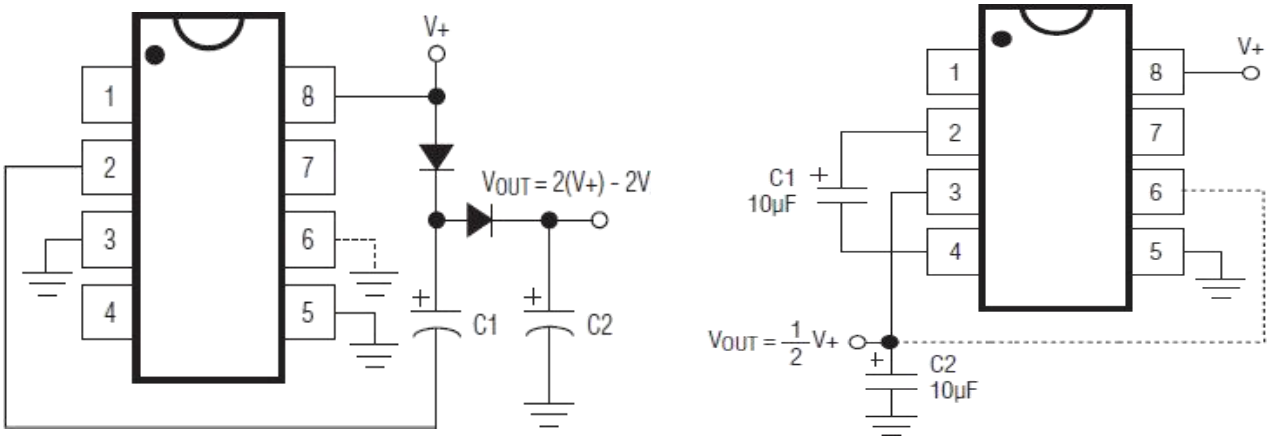
operational principle

During the first half of each cycle, switches S1 & S3 close and switches S2 & S4 open, which connects the bucket capacitor C1 across V+ and charges C1. During the second half of each cycle, switches S2 & S4 close and switches S1 & S3 open, which connects the positive terminal of C1 to ground and shifts the negative terminal to VOUT. This connects C1 in parallel with the reservoir capacitor C2. If the voltage across C2 is smaller than the voltage across C1, then charge flows from C1 to C2 until the voltages across them are equal. During successive cycles, C1 will continue pouring charge into C2 until the voltage across C2 reaches - (V+). In an actual voltage inverter, the output is less than - (V+) since the switches S1−S4 have resistance and the load drains charge from C2.The circuit is a high efficiency DC/DC power converter with low power loss.

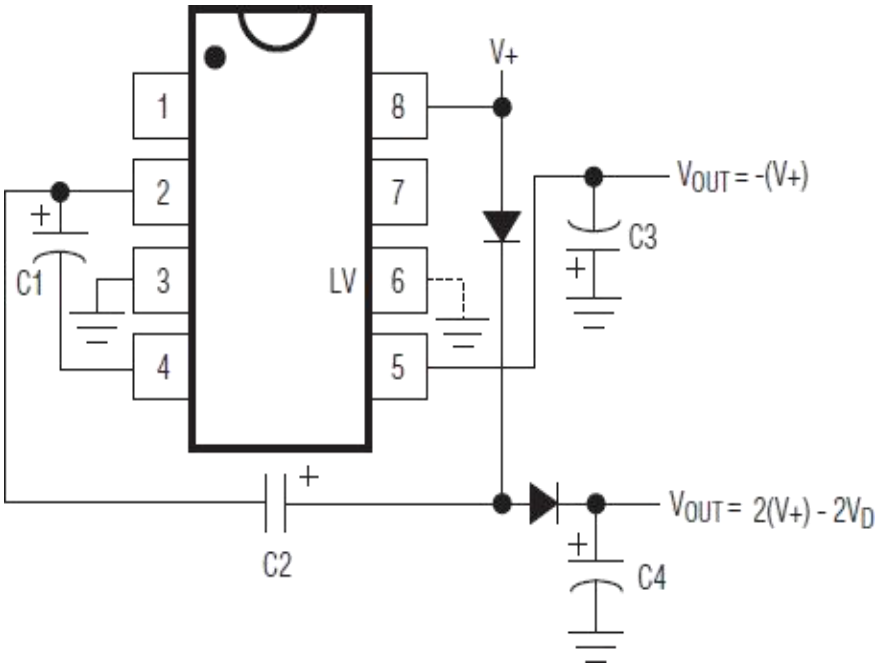
application line diagram

When the input voltage V+ ≤3.5V, connect the LV terminal as indicated by the dashed line in the circuit diagram; when the input voltage V+>3.5V, leave the LV terminal unconnected.

Voltage Doubler and Voltage Divider

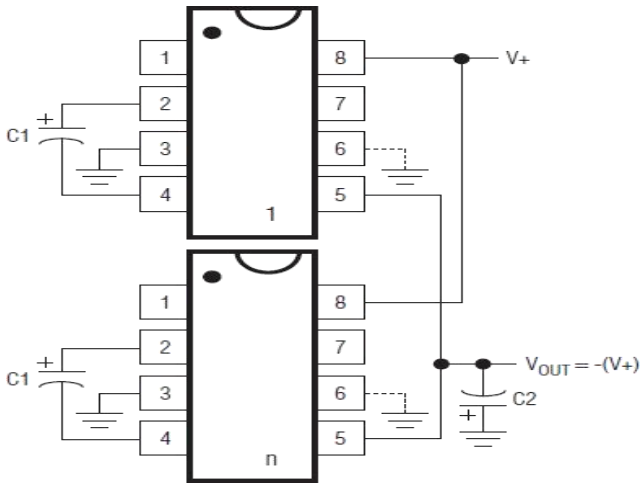


Combined Positive and Negative Converter



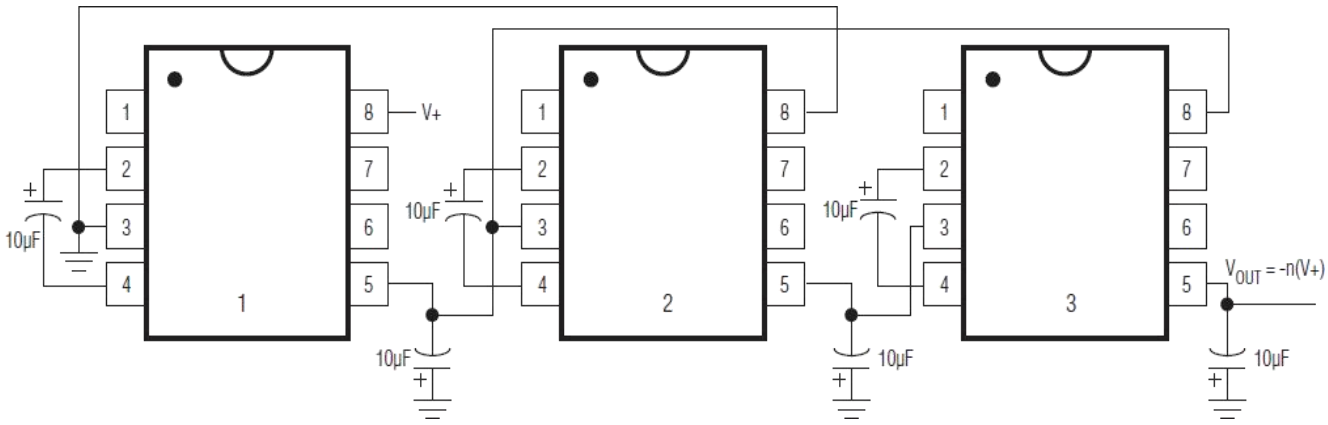
Paralleling ICL7660 to Reduce Output Resistance

ROUT= ROUT /n，” n ” is number of parallel chips



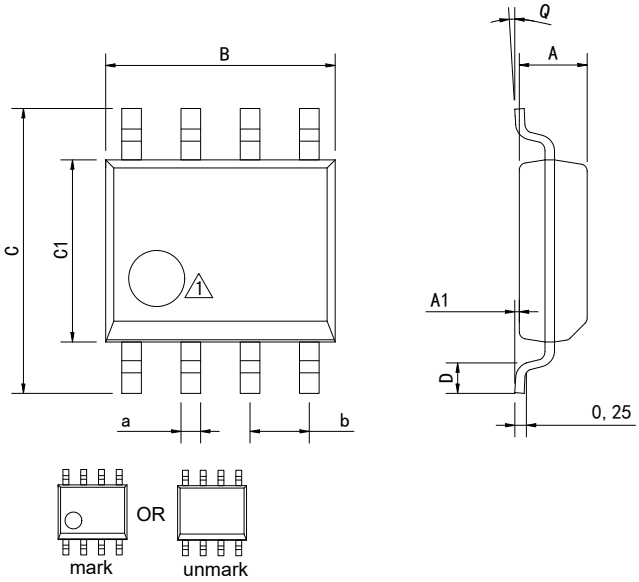
Cascading ICL7660 for Increased Output Voltage

VOUT=n*(V+)，” n “is the number of chips in series.



Physical Dimensions

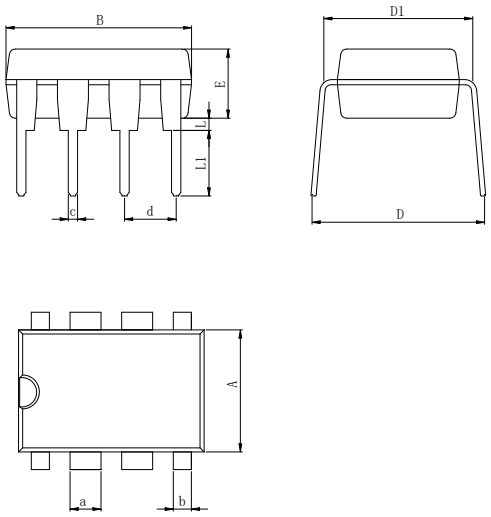
SOP-8



1 Package top mark may be in lower left corner or unmark

Dimensions In Millimeters(SOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

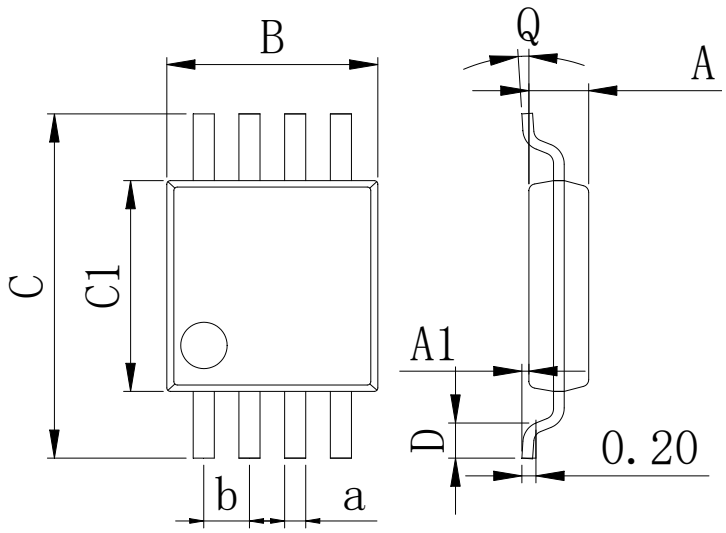
DIP-8



Dimensions In Millimeters(DIP-8)											
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	9.00	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	9.50	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

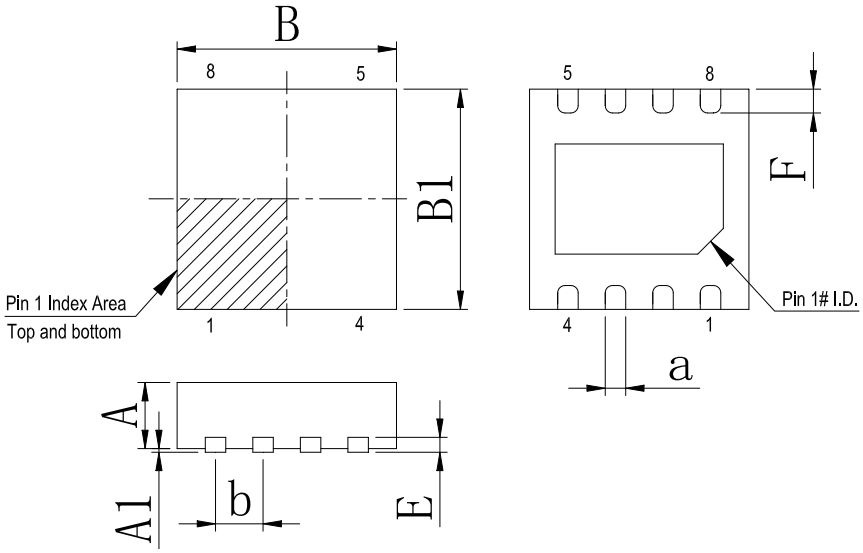
Physical Dimensions

MSOP-8



Dimensions In Millimeters(MSOP-8)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.80	0.05	2.90	4.75	2.90	0.35	0°	0.25	0.65 BSC
Max:	0.90	0.20	3.10	5.05	3.10	0.75	8°	0.35	

DFN-8 3*3



Dimensions In Millimeters(DFN-8 3*3)								
Symbol:	**A**	**A1**	**B**	**B1**	**E**	**F**	**a**	**b**
Min:	0.85	0.00	2.90	2.90	0.20	0.30	0.20	0.65 BSC
Max:	0.95	0.05	3.10	3.10	0.25	0.50	0.34	

Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2014-8	New	1-8
V1.1	2017-9	Updated DIP-8 dimension	1、5
V1.2	2024-10	Update Lead Temperature	3
V1.3	2025-12	Update important statements、Update SOP-8 Dimension drawing	5、8

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