

ABSOLUTE MAXIMUM RATINGS

(Note 1)

Supply Voltage (V_{CC})	6V
Input Voltage (SHDN)	$-0.3V$ to $V_{CC} + 0.3V$
Output Current (I_{OUT})	50mA
Operating Temperature Range	
LTC1262C	$0^{\circ}C$ to $70^{\circ}C$
LTC1262I	$-40^{\circ}C$ to $85^{\circ}C$
Storage Temperature Range	$-65^{\circ}C$ to $150^{\circ}C$
Lead Temperature (Soldering, 10 sec)	$300^{\circ}C$

PACKAGE/ORDER INFORMATION

TOP VIEW N8 PACKAGE 8-LEAD PDIP S8 PACKAGE 8-LEAD PLASTIC SO $T_{JMAX} = 150^{\circ}C$, $\theta_{JA} = 100^{\circ}C/W$ (N8) $T_{JMAX} = 150^{\circ}C$, $\theta_{JA} = 150^{\circ}C/W$ (S8)	ORDER PART NUMBER
	LTC1262CN8 LTC1262CS8 LTC1262IS8
	S8 PART MARKING
	1262 1262I

Consult factory for Military grade parts.

ELECTRICAL CHARACTERISTICS

 $V_{CC} = 4.75V$ to $5.5V$, $T_A = -40^{\circ}C$ to $85^{\circ}C$, (Notes 2, 3), unless otherwise noted.

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{OUT}	Output Voltage	$0mA \leq I_{OUT} \leq 30mA$, $V_{SHDN} = 0V$, $0^{\circ}C \leq T_A \leq 70^{\circ}C$ $0mA \leq I_{OUT} \leq 30mA$, $V_{SHDN} = 0V$, $-40^{\circ}C \leq T_A \leq 85^{\circ}C$	11.4 11.2		12.6 12.6	V V
I_{CC}	Supply Current	No Load, $V_{SHDN} = 0V$, $0^{\circ}C \leq T_A \leq 70^{\circ}C$ No Load, $V_{SHDN} = 0V$, $-40^{\circ}C \leq T_A \leq 85^{\circ}C$		0.5 0.5	1.0 1.3	mA mA
I_{SHDN}	Shutdown Supply Current	No Load, $V_{SHDN} = V_{CC}$		0.5	10	μA
f_{OSC}	Oscillator Frequency	$V_{CC} = 5V$, $I_{OUT} = 30mA$		300		kHz
	Power Efficiency	$V_{CC} = 5V$, $I_{OUT} = 30mA$		74		%
R_{SW}	V_{CC} to V_{OUT} Switch Impedance	$V_{CC} = V_{SHDN} = 5V$, $I_{OUT} = 0mA$		0.18	2	$k\Omega$
V_{IH}	SHDN Input High Voltage		2.4			V
V_{IL}	SHDN Input Low Voltage				0.8	V
	SHDN Input Current	$V_{CC} = 5V$, $V_{SHDN} = 0V$, $0^{\circ}C \leq T_A \leq 70^{\circ}C$ $V_{CC} = 5V$, $V_{SHDN} = 0V$, $-40^{\circ}C \leq T_A \leq 85^{\circ}C$ $V_{CC} = 5V$, $V_{SHDN} = 5V$	-20 -35 0.06	-10 -10 10	-5 -5 10	μA μA μA
t_{ON}	Turn-On Time	$C1 = C2 = 0.22\mu F$, $C_{IN} = C_{OUT} = 4.7\mu F$, (Figures 1, 2)		500		μs
t_{OFF}	Turn-Off Time	$C1 = C2 = 0.22\mu F$, $C_{IN} = C_{OUT} = 4.7\mu F$, (Figures 1, 2)		3.3		ms

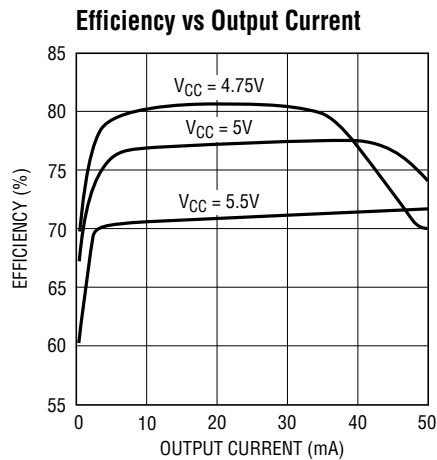
The ● denotes specifications which apply over the full operating temperature range.

Note 1: Absolute maximum ratings are those values beyond which the life of the device may be impaired.

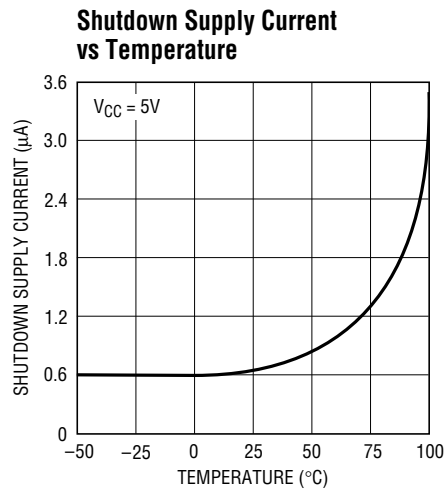
Note 2: All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to ground unless otherwise specified.

Note 3: All typicals are given at $V_{CC} = 5V$, $T_A = 25^{\circ}C$.

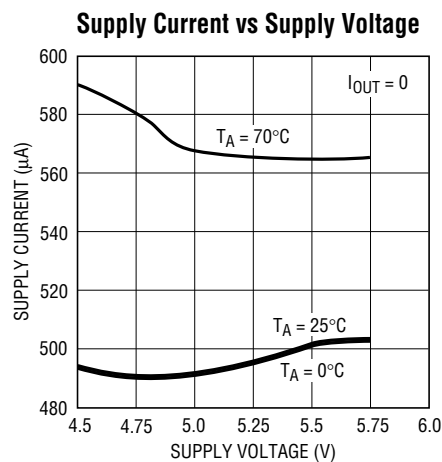
TYPICAL PERFORMANCE CHARACTERISTICS



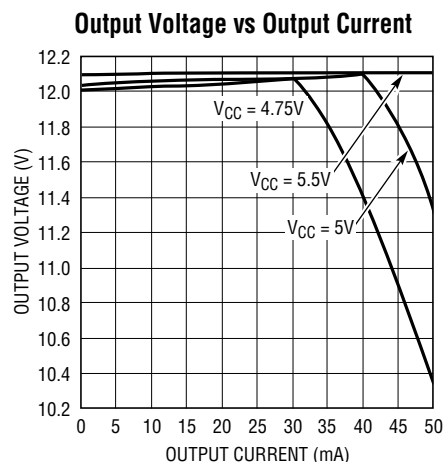
LTC1262 G01



LTC1262 G02



LTC1262 G03



1262 G04

PIN FUNCTIONS

C1⁻ (Pin 1): C1 Negative Input. Connect a 0.22µF capacitor C1 between C1⁺ and C1⁻.

C1⁺ (Pin 2): C1 Positive Input. Connect a 0.22µF capacitor C1 between C1⁺ and C1⁻.

C2⁻ (Pin 3): C2 Negative Input. Connect a 0.22µF capacitor C2 between C2⁺ and C2⁻.

C2⁺ (Pin 4): C2 Positive Input. Connect a 0.22µF capacitor C2 between C2⁺ and C2⁻.

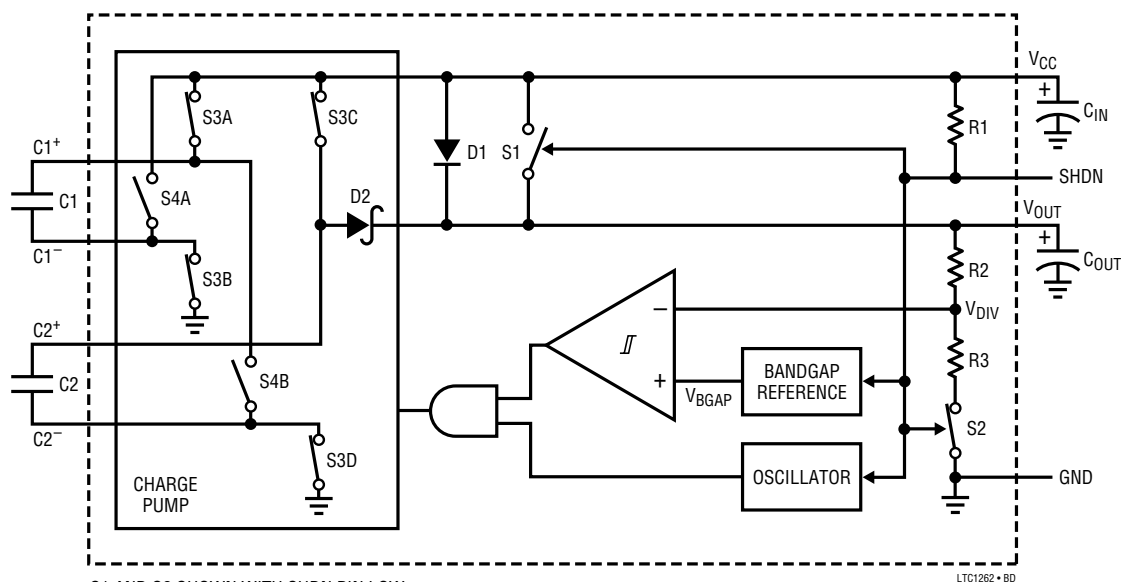
V_{CC} (Pin 5): Positive Supply Input Where $4.75V \leq V_{CC} \leq 5.5V$. Connect a 4.7µF bypass capacitor C_{IN} to ground.

V_{OUT} (Pin 6): 12V Output. Connect a 4.7µF bypass capacitor C_{OUT} to ground. When in the shutdown mode $V_{OUT} = V_{CC}$.

GND (Pin 7): Ground.

SHDN (Pin 8): Logic Level Shutdown Pin. Application of a logic low at SHDN pin will place the regulator in normal operation. With no external connection, or with SHDN tied to V_{CC}, the device will be put into shutdown mode. Connect to GND for normal operation. In shutdown mode the charge pump is turned off and $V_{OUT} = V_{CC}$.

BLOCK DIAGRAM



S1 AND S2 SHOWN WITH SHDN PIN LOW.
S3A, S3B, S3C, S3D, S4A AND S4B SHOWN WITH OSCILLATOR OUTPUT LOW AND $V_{DIV} < V_{BGAP} - V_{HYST}$.
COMPARATOR HYSTERISIS IS $\pm V_{HYST}$.

TIMING DIAGRAMS

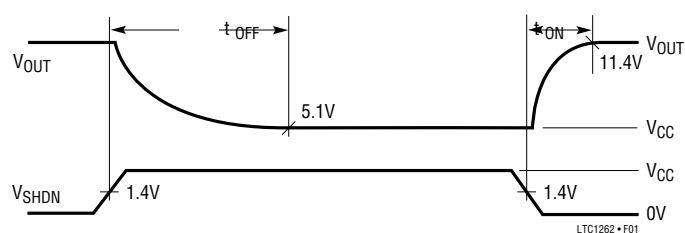


Figure 1. LTC1262 Timing Diagram

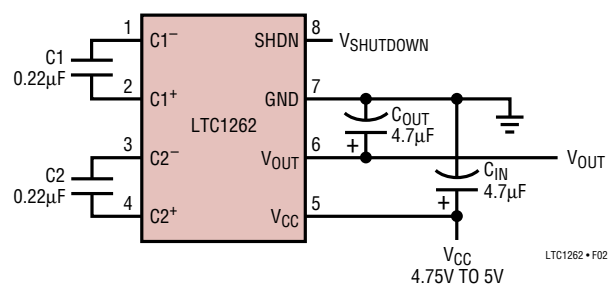


Figure 2. LTC1262 Timing Circuit

APPLICATIONS INFORMATION

Operation

The LTC1262 uses a charge pump tripler to generate 12V from a V_{CC} of 5V. The charge pump operates when clocked by a 300kHz oscillator. When the oscillator output is low, C1 and C2 are connected between V_{CC} and GND, charging them to V_{CC} . When the oscillator output goes high, C1 and C2 are stacked in series with the bottom plate of C1 pulled to V_{CC} . The top plate of C2 is switched to charge C_{OUT} and V_{OUT} rises. V_{OUT} is regulated to within 5% of 12V by an oscillator pulse gating scheme. A resistor divider senses V_{OUT} . When the output of the divider (V_{DIV}) is less than the output of a bandgap (V_{BGAP}) by the hysteresis voltage (V_{HYST}) of the comparator, oscillator pulses are applied to the charge pump to raise V_{OUT} . When V_{DIV} is above V_{BGAP} by V_{HYST} , the oscillator pulses are prevented from clocking the charge pump. V_{OUT} drops until V_{DIV} is below V_{BGAP} by V_{HYST} again. The gates of all internal switches are driven between V_{OUT} and GND. An internal diode ensures that the LTC1262 will start up under load by charging C_{OUT} to one diode drop below V_{CC} .

To reduce supply current the LTC1262 may be put into shutdown mode by floating the SHDN pin or taking it to V_{CC} . In this mode the bandgap, comparator, oscillator and resistor divider are switched off to reduce supply current to typically 0.5 μ A. At the same time an internal switch shorts V_{OUT} to V_{CC} ; V_{OUT} takes 3.3ms to reach 5.1V (see t_{OFF} in Figure 1). When the SHDN pin is low, the LTC1262 exits shutdown and the charge pump operates to raise V_{OUT} to 12V. V_{OUT} takes 500 μ s to reach the lower regulation limit of 11.4V (see t_{ON} in Figure 1).

Choice of Capacitors

The LTC1262 is tested with the capacitors shown in Figure 2. C1 and C2 are 0.22 μ F ceramic capacitors and C_{IN} and C_{OUT} are 4.7 μ F tantalum capacitors. Refer to Table 1 if other choices are desired.

Table 1. Recommended Capacitor Types and Values

CAPACITOR	CERAMIC	TANTALUM	ALUMINUM
C1, C2	0.22 μ F to 1 μ F	Not Recommended	Not Recommended
C_{OUT}	2 μ F (Min)	4.7 μ F (Min)	10 μ F (Min)
C_{IN}	1 μ F (Min)	4.7 μ F (Min)	10 μ F (Min)

C1 and C2 should be ceramic capacitors with values in the range of 0.22 μ F to 1 μ F. Higher values provide better load regulation. Tantalum capacitors are not recommended as the higher ESR of these capacitors degrades performance when the load current is above 25mA with $V_{CC} = 4.75$ V.

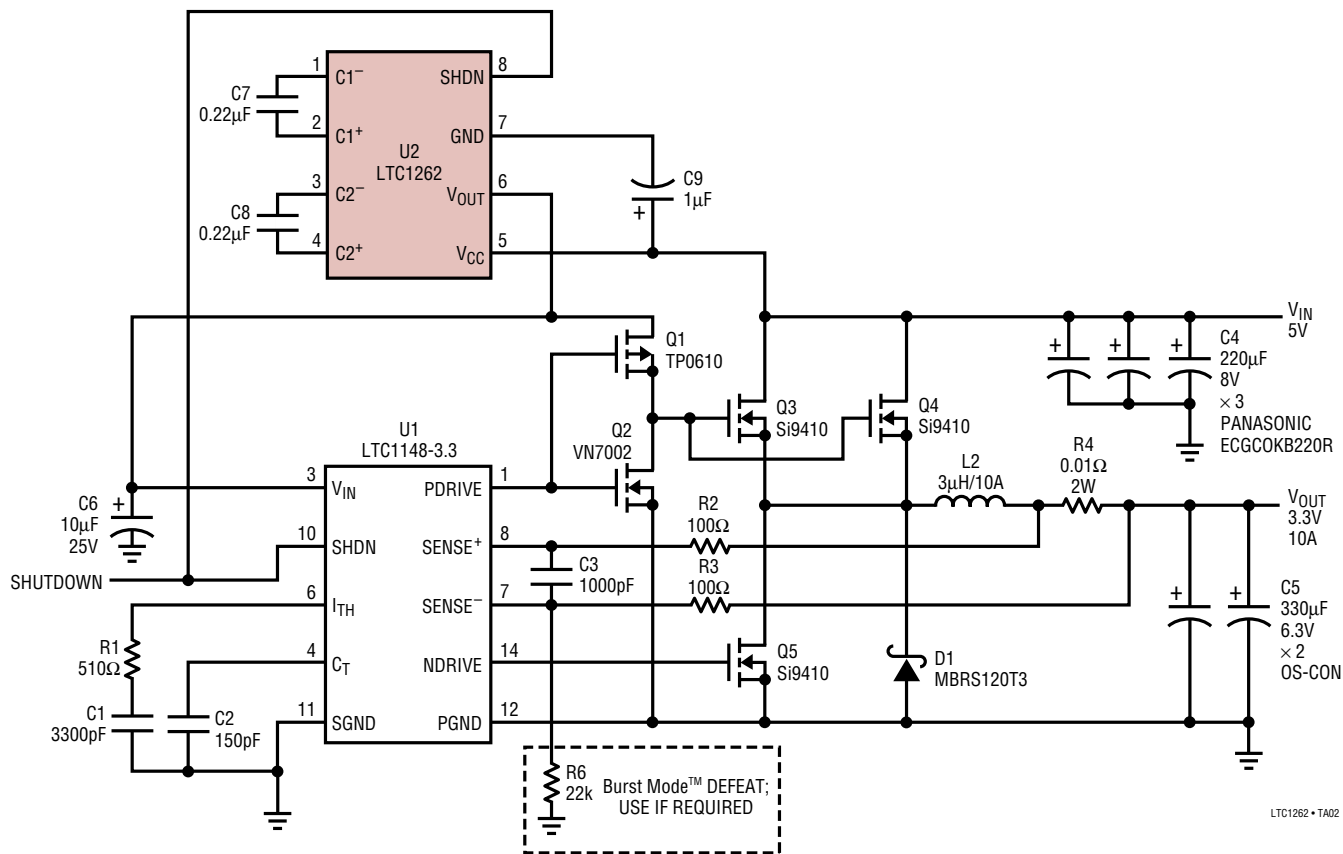
C_{IN} and C_{OUT} can be ceramic, tantalum or electrolytic capacitors. The ESR of C_{OUT} introduces steps in the V_{OUT} waveform whenever the charge pump charges C_{OUT} . This tends to increase V_{OUT} ripple. Ceramic or tantalum capacitors are recommended for C_{OUT} if minimum ripple is desired. The LTC1262 does not require a 0.1 μ F capacitor between V_{CC} and V_{OUT} for stability.

Maximum Load Current

The LTC1262 will source up to 50mA continuously without any damage to itself. **Do not short the V_{OUT} pin to ground.** If the V_{OUT} pin is shorted to ground, irreversible damage to the device will result.

TYPICAL APPLICATION

5V to 3.3V/10A Converter



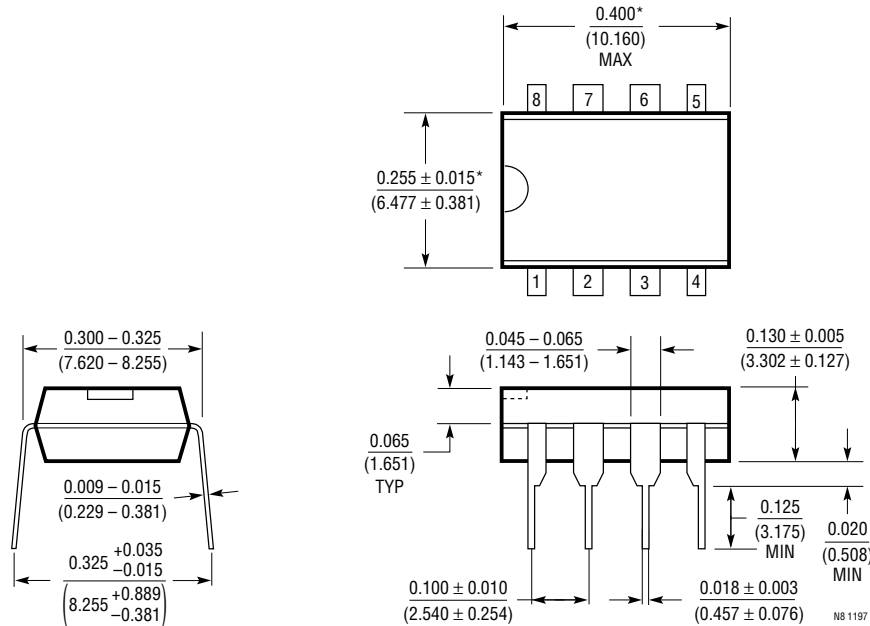
LTC1262 • TA02

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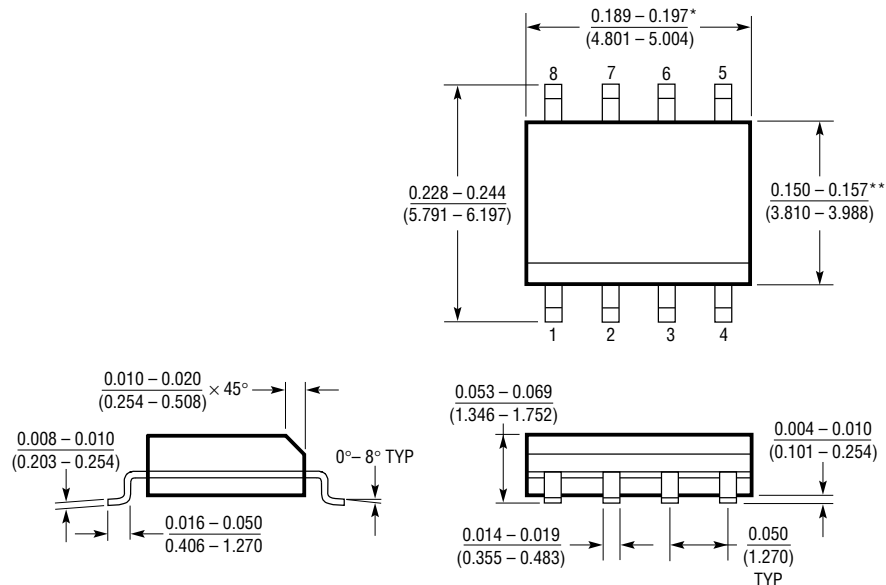
PACKAGE DESCRIPTION

Dimensions in inches (millimeters) unless otherwise noted.

N8 Package 8-Lead PDIP (Narrow 0.300) (LTC DWG # 05-08-1510)



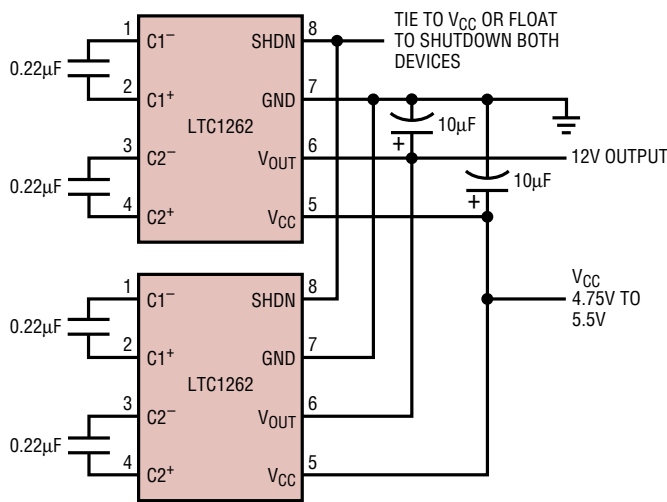
S8 Package 8-Lead Plastic Small Outline (Narrow 0.150) (LTC DWG # 05-08-1610)



S08 0996

TYPICAL APPLICATION

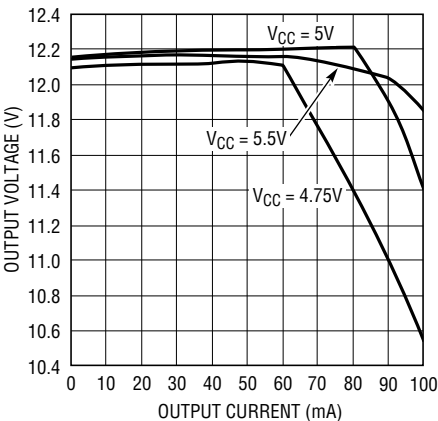
Paralleling Devices



NOTE: KEEP DEVICES CLOSE TOGETHER OR USE SEPARATE 4.7µF TANTALUM CAPACITORS IF THIS IS NOT POSSIBLE.

LTC1262 • TA03

Output Voltage vs Output Current for Two Paralleled Devices



1262 TA04

SEE FIGURE AT LEFT.

RELATED PARTS

PART NUMBER	DESCRIPTION	COMMENTS
LT1106*	Micropower Step-Up DC/DC Converter for PCMCIA Card Flash Memory	PCMCIA Card Power Control, 9µA I _{SHDN} , Small SMT Components, Requires External Inductor
LT1109-12	Micropower Low Cost DC/DC Converter Adjustable and Fixed 12V	Three-Lead Z Package, Requires External Inductor
LT1109A-12	Micropower DC/DC Converter Flash Memory VPP Generator Adjustable and Fixed 12V	Requires External Inductor
LT1301	Micropower High Efficiency 5V/12V Step-Up DC/DC Converter for Flash Memory	7µA I _{SHDN} , SMT Inductor and Capacitors
LT1309	500kHz Micropower DC/DC Converter for Flash Memory	Small SMT Inductor and Capacitors, 6µA I _{SHDN}

* See also LT1312/LT1313 PCMCIA VPP drivers/regulators, LT1314/LT1315 PCMCIA switch matrix and the LTC1470/LTC1471/LTC1472 Protected V_{CC} and VPP switching matrices