

MAXIM

2A/5A Step-Down, PWM, Switch-Mode DC-DC Regulators

General Description

The LT1074/LT1076 are monolithic, bipolar, pulse-width modulation (PWM), switch-mode DC-DC regulators optimized for step-down applications. The LT1074 is rated at 5A, while the LT1076 is rated at 2A. Few external components are needed for standard operation because the power switch, oscillator, and control circuitry are all on-chip. Employing a classic buck topology, these regulators perform high-current step-down functions, but can also be configured as an inverter, a negative boost converter, or a flyback converter.

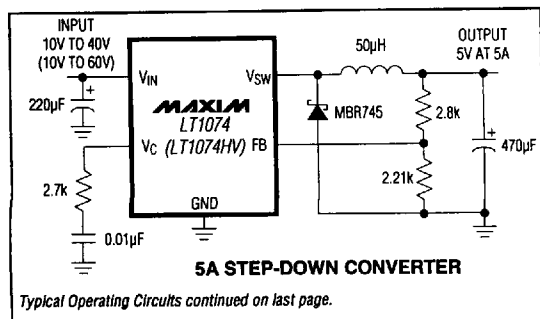
The regulators have excellent dynamic and transient-response characteristics, while featuring cycle-by-cycle current limiting to protect against overcurrent faults and short-circuit output faults. The LT1074/LT1076 also have a wide 8V to 40V input range (up to 60V for the high-voltage "HV" version) in the step-down configuration. In inverting and step-up configurations, the input can be as low as 5V.

The LT1074/LT1076 are available in 5-pin TO-220, 7-pin TO-220, and 4-pin TO-3 packages. The devices have a preset 100kHz oscillator frequency and a preset current limit of 6.5A for the LT1074, and 2.6A for the LT1076. The 7-pin package allows for adjustable current limit and micropower shutdown.

Applications

Distributed Power from High-Voltage Buses
High-Current, High-Voltage Step-Down Applications
High-Current Inverter
Negative Step-Up Converter
Multiple-Output Step-Down Converter
Isolated DC-DC Conversion

Typical Operating Circuits



Features

- ◆ Input Range: Up to 40V
Up to 60V (HV version)
- ◆ 5A On-Chip Power Switch (LT1074)
2A On-Chip Power Switch (LT1076)
- ◆ Adjustable Output: 2.5V to 40V
2.5V to 50V (HV version)
- ◆ 100kHz Switching Frequency
- ◆ Excellent Dynamic Characteristics
- ◆ Few External Components
- ◆ 8.5mA Quiescent Current
- ◆ TO-220, TO-3 Packages

Ordering Information

PART	TEMP. RANGE	PIN-PACKAGE
LT1074CT	0°C to +70°C	5 TO-220
LT1074CY	0°C to +70°C	7 TO-220†
LT1074CK	0°C to +70°C	4 TO-3†
LT1074C/D	0°C to +70°C	Dice*
LT1074ET	-40°C to +85°C	5 TO-220
LT1074EY	-40°C to +85°C	7 TO-220†
LT1074EK	-40°C to +85°C	4 TO-3†
LT1074MK	-55°C to +125°C	4 TO-3†
LT1074HVCT	0°C to +70°C	5 TO-220
LT1074HVCY	0°C to +70°C	7 TO-220†
LT1074HVCK	0°C to +70°C	4 TO-3†
LT1074HVC/D	0°C to +70°C	Dice*
LT1074HVET	-40°C to +85°C	5 TO-220
LT1074HVEY	-40°C to +85°C	7 TO-220†
LT1074HVEK	-40°C to +85°C	4 TO-3†
LT1074HVMK	-55°C to +125°C	4 TO-3†

Ordering Information continued on last page.

* Contact factory for dice specifications.

† Contact factory for package availability.

LT1074/LT1076

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ABSOLUTE MAXIMUM RATINGS

Input Voltage	
LT1074/LT1076	45V
LT1074HV/LT1076HV	64V
Switch Voltage with Respect to Input Voltage	
LT1074/LT1076	64V
LT1074HV/LT1076HV	75V
Switch Voltage with Respect to Ground Pin (V_{SW} Negative)	
LT1074/LT1076 (Note 8)	35V
LT1074HV/LT1076HV (Note 8)	45V
Feedback Pin Voltage	-0.3V, +10V
Shutdown Pin Voltage (not to exceed V_{IN})	40V
I_{LIM} Pin Voltage (forced)	5.5V

Operating Temperature Ranges:

LT1074_C_/HVC_	0°C to +70°C
LT1074_E_/HVE_	-40°C to +85°C
LT1074_M_/HVM_	-55°C to +125°C

Junction Temperature Ranges:

LT1074_C_/HVC_	0°C to +125°C
LT1074_E_/HVE_	-40°C to +125°C
LT1074_M_/HVM_	-55°C to +150°C

Storage Temperature Range -65°C to +160°C

Lead Temperature (soldering, 10 sec) +300°C

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

($V_{IN} = 25V$, $T_J = T_{MIN}$ to T_{MAX} , unless otherwise noted.)

PARAMETER	CONDITIONS			MIN	TYP	MAX	UNITS
Switch On Voltage (Note 1)	LT1074	$I_{SW} = 1A$	$T_J \geq 0^\circ C$			1.85	V
			$T_J < 0^\circ C$			2.10	
		$I_{SW} = 5A$	$T_J \geq 0^\circ C$			2.30	
			$T_J < 0^\circ C$			2.50	
	LT1076	$I_{SW} = 0.5A$				1.2	
		$I_{SW} = 2A$				1.7	
Switch Off Leakage	LT1074	$V_{IN} \leq 25V$, $V_{SW} = 0V$	$T_J = +25^\circ C$		5	300	μA
		$V_{IN} = V_{MAX}$, $V_{SW} = 0V$ (Note 2)	$T_J = +25^\circ C$		10	500	
	LT1076	$V_{IN} \leq 25V$, $V_{SW} = 0V$	$T_J = +25^\circ C$			150	
		$V_{IN} = V_{MAX}$, $V_{SW} = 0V$ (Note 2)	$T_J = +25^\circ C$			250	
Supply Current (Note 3)	$V_{FB} = 2.5V$, $V_{IN} \leq 40V$				8.5	11	mA
	$40V < V_{IN} < 60V$ (HV version only)				9	12	
	$V_{SHUT} = 0.1V$ (Note 4)				140	300	μA
Minimum Operating Supply Voltage					7.3	8.0	V
Minimum Start-Up Supply Voltage (Note 5)	$T_A \geq +25^\circ C$				3.5	4.8	V
	$T_A < +25^\circ C$				3.5	5.0	
Switch Current Limit (Note 6)	LT1074	I_{LIM} open		5.5	6.5	8.5	A
		$R_{LIM} = 10k\Omega$ (Note 7)	$T_J = +25^\circ C$		4.5		
		$R_{LIM} = 7k\Omega$ (Note 7)	$T_J = +25^\circ C$		3		
	LT1076	I_{LIM} open		2	2.6	3.2	
		$R_{LIM} = 10k\Omega$ (Note 7)	$T_J = +25^\circ C$		1.8		
		$R_{LIM} = 7k\Omega$ (Note 7)	$T_J = +25^\circ C$		1.2		

2A/5A Step-Down, PWM, Switch-Mode DC-DC Regulators

ELECTRICAL CHARACTERISTICS (continued)

($V_{IN} = 25V$, $T_J = T_{MIN}$ to T_{MAX} , unless otherwise noted.)

PARAMETER	CONDITIONS		MIN	TYP	MAX	UNITS
Maximum Duty Cycle			85	90		%
Switching Frequency		$T_J = +25^\circ C$	90	100	110	kHz
		$T_J \leq +125^\circ C$	85		120	
		$T_J > +125^\circ C$	85		125	
	V_{FB} = grounded through 2k Ω (Note 6)	$T_J = +25^\circ C$		20		
Switching Frequency Line Regulation	$8V \leq V_{IN} \leq V_{MAX}$ (Note 2)			0.03	0.1	%/V
Error-Amplifier Voltage Gain (Note 8)	$1V \leq V_C \leq 4V$	$T_J = +25^\circ C$		2000		V/V
Error-Amplifier Transconductance		$T_J = +25^\circ C$	3700	5000	8000	μmho
Error-Amplifier Source Current	$V_{FB} = 2V$	$T_J = +25^\circ C$	100	140	225	μA
Error-Amplifier Sink Current	$V_{FB} = 2.5V$	$T_J = +25^\circ C$	0.7	1.0	1.6	mA
Feedback Pin Bias Current	$V_{FB} = V_{REF}$			0.5	2	μA
Reference Voltage	$V_C = 2V$		2.155	2.210	2.265	V
Reference Voltage Tolerance	V_{REF} (nominal) = 2.21V	$T_J = +25^\circ C$		± 0.5	± 1.5	%
	All conditions of input voltage, output voltage, temperature and load current			± 1	± 2.5	
Reference Voltage Line Regulation	$8V \leq V_{IN} \leq V_{MAX}$ (Note 2)			0.005	0.02	%/V
V_C Voltage at 0% Duty Cycle		$T_J = +25^\circ C$		1.5		V
		$T_J = T_{MIN}$ to T_{MAX}		-4		mV/ $^\circ C$
Shutdown Pin Current	$V_{SHUT} = 5V$		5	10	20	μA
	$V_{SHUT} \leq V_{THRESHOLD} (\approx 2.5V)$				50	
Shutdown Thresholds	Switch duty cycle = 0%		2.2	2.45	2.7	V
	Fully shut down		0.1	0.3	0.5	
Thermal Resistance Junction to Case (Note 9)	LT1074				2.5	$^\circ C/W$
	LT1076				4.0	

Note 1: For switch currents between 1A and 5A, maximum switch on voltage can be calculated via linear interpolation.

Note 2: $V_{MAX} = 40V$ for LT1074/LT1076 and 60V for LT1074HV/LT1076HV.

Note 3: By setting the feedback pin (FB) to 2.5V, the V_C pin is forced to its low clamp level and the switch duty cycle is forced to zero, approximating the zero load condition.

Note 4: Device shutdown. Switch leakage current not included.

Note 5: For proper regulation, total voltage from V_{IN} to ground must be $\geq 8V$ after start-up.

Note 6: To avoid extremely short switch-on times, the switch frequency is internally scaled down when V_{FB} is less than 1.3V. Switch current limit is tested with V_{FB} adjusted to give a 1 μs minimum switch-on time.

Note 7: $R_{LIM} = \left[\frac{I_{LIM}}{1A} \times 2k\Omega \right] + 1k\Omega$ for LT1074 and $R_{LIM} = \left[\frac{I_{LIM}}{1A} \times 5.5k\Omega \right] + 1k\Omega$ for LT1076.

Note 8: Do not exceed switch-to-input voltage limitation.

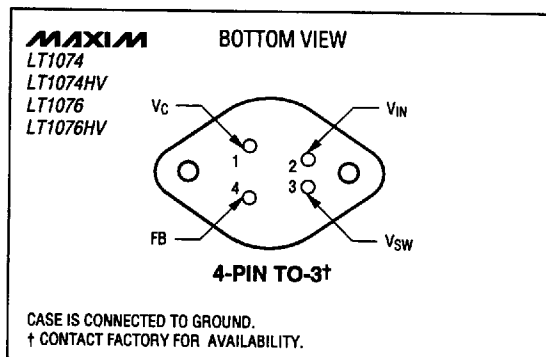
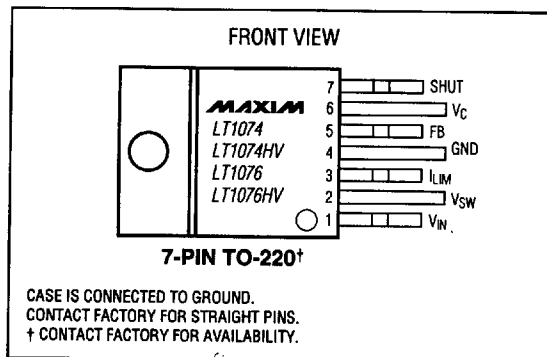
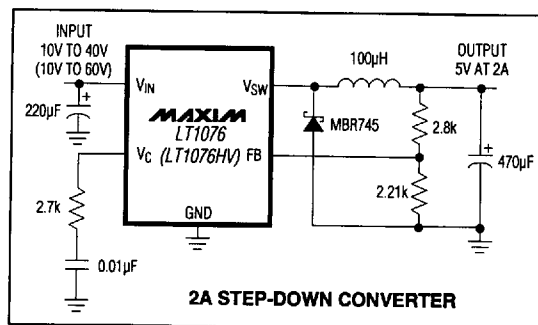
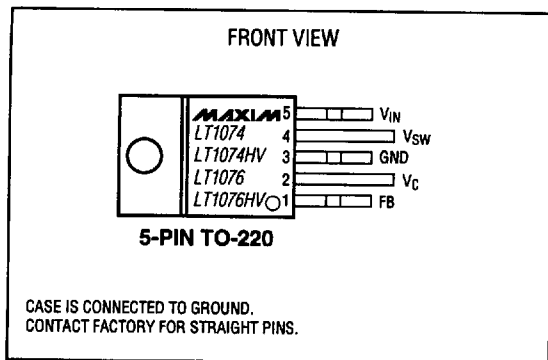
Note 9: Guaranteed, not production tested. All packages.

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LT1074/LT1076

Pin Configurations

Typical Operating Circuits (continued)



2A/5A Step-Down, PWM, Switch-Mode DC-DC Regulators

_Ordering Information (continued)

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LT1076CT	0°C to +70°C	5 TO-220
LT1076CY	0°C to +70°C	7 TO-220†
LT1076CK	0°C to +70°C	4 TO-3†
LT1076C/D	0°C to +70°C	Dice*
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