

MAXIM

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

MXL1074/MXL1076

General Description

The MXL1074/MXL1076 are monolithic, bipolar, pulse-width modulation (PWM), switch-mode DC-DC regulators optimized for step-down applications. The MXL1074 is rated at 5A, while the MXL1076 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 MXL1074/MXL1076 also have a wide 8V to 40V input range in the step-down configuration. In inverting and step-up configurations, the input can be as low as 5V.

The MXL1074/MXL1076 are available in a 5-pin TO-220 package. The devices have a preset 100kHz oscillator frequency and a preset current limit of 6.5A for the MXL1074, and 2.6A for the MXL1076. The MXL1074/MXL1076 are pin compatible with the LT1074/LT1076.

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

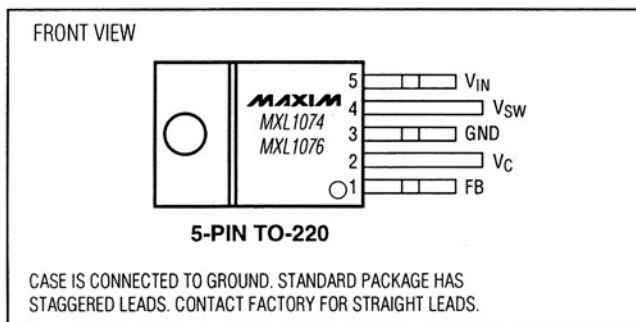
Features

- ◆ Input Range: Up to 40V
- ◆ 5A On-Chip Power Switch (MXL1074)
2A On-Chip Power Switch (MXL1076)
- ◆ Adjustable Output: 2.5V to 35V
- ◆ 100kHz Switching Frequency
- ◆ Excellent Dynamic Characteristics
- ◆ Few External Components
- ◆ 8.5mA Quiescent Current
- ◆ TO-220 Package

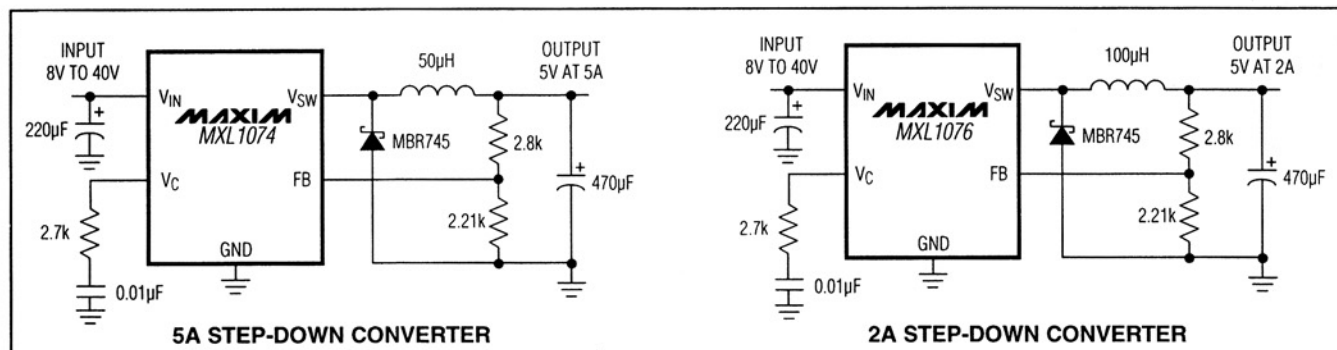
Ordering Information

| PART | TEMP. RANGE | PIN-PACKAGE |
|-----------|----------------|-------------|
| MXL1074CT | 0°C to +70°C | 5 TO-220 |
| MXL1074ET | -40°C to +85°C | 5 TO-220 |
| MXL1076CT | 0°C to +70°C | 5 TO-220 |
| MXL1076ET | -40°C to +85°C | 5 TO-220 |

Pin Configuration



Typical Operating Circuits



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

ABSOLUTE MAXIMUM RATINGS

| | |
|---|----------------|
| Input Voltage | 45V |
| Switch Voltage with Respect to Input Voltage | 50V |
| Switch Voltage with Respect to Ground Pin (V_{SW} negative) (Note 1) | 35V |
| Feedback Pin Voltage | -0.3V, +10V |
| Operating Temperature Ranges | |
| MXL1074CT/MXL1076CT | 0°C to +70°C |
| MXL1074ET/MXL1076ET | -40°C to +85°C |

Junction Temperature Ranges

| | |
|---|-----------------|
| MXL1074CT/MXL1076CT | 0°C to +125°C |
| MXL1074ET/MXL1076ET | -40°C to +125°C |
| Storage Temperature Range | -65°C to +160°C |
| Lead Temperature (soldering, 10sec) | +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 |
|-------------------------------------|---|---|-------------------------|-----|------|------|-------|
| Input Supply Voltage Range | | | | 8.0 | | 40.0 | V |
| Switch-On Voltage (Note 2) | MXL1074 | I _{SW} = 1A | T _j ≥ 0°C | | | 1.85 | V |
| | | | T _j < 0°C | | | 2.10 | |
| | | I _{SW} = 5A | T _j ≥ 0°C | | | 2.30 | |
| | | | T _j < 0°C | | | 2.50 | |
| | MXL1076 | I _{SW} = 0.5A | | | | 1.2 | |
| | | I _{SW} = 2A | | | | 1.7 | |
| Switch-Off Leakage | MXL1074 | V _{IN} ≤ 25V, V _{SW} = 0V | T _j = +25°C | | 5 | 300 | μA |
| | | V _{IN} = 40V, V _{SW} = 0V | T _j = +25°C | | 10 | 500 | |
| | MXL1076 | V _{IN} ≤ 25V, V _{SW} = 0V | T _j = +25°C | | | 150 | |
| | | V _{IN} = 40V, V _{SW} = 0V | T _j = +25°C | | | 250 | |
| Supply Current (Note 3) | V _{FB} = 2.5V, V _{IN} ≤ 40V | | | | 8.5 | 11 | mA |
| Minimum Supply Voltage | Normal Mode | | | | 7.3 | 8.0 | V |
| | Start-Up Mode (Note 4) | T _j ≥ 0°C | | | 3.5 | 4.8 | |
| | | T _j < 0°C | | | 3.5 | 5.0 | |
| Switch-Current Limit (Note 5) | MXL1074 | | | 5.5 | 6.5 | 8.5 | A |
| | MXL1076 | | | 2 | 2.6 | 3.2 | |
| Maximum Duty Cycle | | | | 85 | 90 | | % |
| Switching Frequency | | | T _j = +25°C | 90 | 100 | 110 | kHz |
| | | | T _j ≤ +125°C | 85 | | 120 | |
| | V _{FB} = grounded through 2kΩ (Note 5) | | T _j = +25°C | 20 | | | |
| Switching Frequency Line Regulation | 8V ≤ V _{IN} ≤ 40V | | | | 0.03 | 0.1 | %/V |

5A/2A 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 |
|--|---|------------------------------|-------|-----------|-----------|----------------|
| Error-Amplifier Voltage Gain | $1V \leq V_C \leq 4V$ | $T_j = +25^\circ C$ | | | 2000 | V/V |
| Error-Amplifier Transconductance | | $T_j = +25^\circ C$ | 3000 | 5000 | 9000 | μmho |
| Error-Amplifier Source Current | $V_{FB} = 2V$ | $T_j = +25^\circ C$ | 100 | 140 | 225 | μA |
| Error-Amplifier Sink Current | $V_{FB} = 2.5V$ | $T_j = +25^\circ C$ | 0.6 | 1.0 | 1.7 | 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 | $8V \leq V_{IN} \leq 40V$ | | | 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/ $^\circ C$ |
| Thermal Resistance Junction to Case (Note 6) | MXL1074 | | | | 2.5 | $^\circ C/W$ |
| | MXL1076 | | | | 4.0 | |

Note 1: Do not exceed switch-to-input voltage limitation.

Note 2: For switch currents between 1A and 5A, maximum switch on voltage can be calculated via linear interpolation.

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

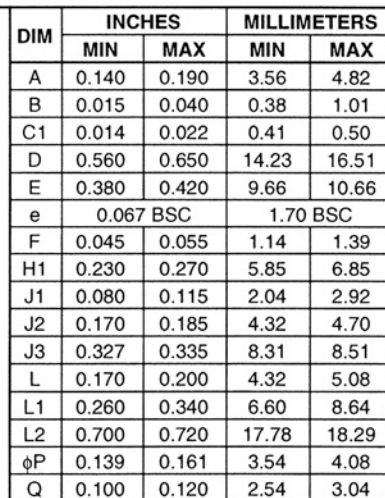
Note 5: To avoid extremely short switch-on times, the switch frequency is internally scaled down when V_{FB} is less than 1.3V. Switch current limit is tested with V_{FB} adjusted to give a 1 μs minimum switch-on time.

Note 6: Guaranteed, not production tested.

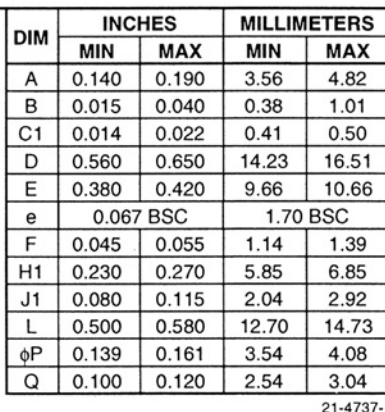
MXL1074/MXL1076

MXL1074/MXL1076

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to www.maxim-ic.com/packages.)



**5-PIN TO-220
(STAGGERED LEAD)
PACKAGE**



**5-PIN TO-220
(STRAIGHT LEAD)
PACKAGE**

CONTACT FACTORY FOR AVAILABILITY

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