

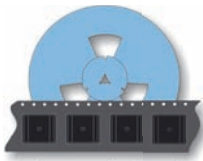
# LF200ES Series

## Low Cost, 2W SMT Single Output DC/DC Converters



### Key Features:

- 2W Output Power
- Ultra-Miniature SMT Case
- 1,000 VDC Isolation
- -40°C to +85°C Operation
- Single Output
- Low 0.24" Profile
- >3.5 MHour MTBF
- Industry Standard Pin-Out
- **LOWEST COST!**



**Tape/Reel Available**



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### Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

#### Input

| Parameter                      | Conditions   | Min. | Typ. | Max. | Units |
|--------------------------------|--------------|------|------|------|-------|
| Input Voltage Range            | 5 VDC Input  | 4.5  | 5.0  | 5.5  | VDC   |
|                                | 12 VDC Input | 10.8 | 12.0 | 13.2 |       |
| Reverse Polarity Input Current |              |      |      | 1.0  | A     |
| Input Filter                   | Capacitor    |      |      |      |       |

#### Output

| Parameter               | Conditions             | Min. | Typ. | Max.  | Units    |
|-------------------------|------------------------|------|------|-------|----------|
| Output Voltage Accuracy |                        |      | ±3.0 |       | %        |
| Line Regulation         | For Vin Change of 1%   |      |      | ±1.2  | %        |
| Load Regulation         | For Iout = 10% to 100% |      | ±8   | ±15   | %        |
| Output Ripple (20 MHz)  |                        |      | 75   | 150   | mV P - P |
| Output Noise (20 MHz)   |                        |      | 150  | 250   | mV P - P |
| Temperature Coefficient |                        |      |      | ±0.03 | %/°C     |
| Output Short Circuit    | Momentary (0.5 Sec.)   |      |      |       |          |

#### General

| Parameter             | Conditions  | Min.  | Typ. | Max. | Units |
|-----------------------|-------------|-------|------|------|-------|
| Isolation Voltage     | 60 Seconds  | 1,000 |      |      | VDC   |
| Isolation Resistance  | 500 VDC     | 1,000 |      |      | MΩ    |
| Isolation Capacitance | 100 kHz, 1V |       | 70   |      | pF    |
| Switching Frequency   |             |       | 100  |      | kHz   |

#### Environmental

| Parameter                   | Conditions          | Min. | Typ. | Max. | Units |
|-----------------------------|---------------------|------|------|------|-------|
| Operating Temperature Range | Ambient             | -40  | +25  | +85  | °C    |
| Storage Temperature Range   |                     | -55  |      | +125 | °C    |
| Cooling                     | Free Air Convection |      |      |      |       |
| Humidity                    | RH, Non-condensing  |      |      | 95   | %     |

#### Physical

|               |  |  |  |  |  |
|---------------|--|--|--|--|--|
| Case Size     | 0.70 x 0.72 x 0.24 Inches (17.78 x 18.03 x 6.0 mm) |  |  |  |  |
| Case Material | Non-Conductive Black Plastic (UL94-V0)             |  |  |  |  |
| Weight        | 0.05 Oz (1.5g)                                     |  |  |  |  |

#### Reliability Specifications

| Parameter | Conditions                      | Min. | Typ. | Max. | Units  |
|-----------|---------------------------------|------|------|------|--------|
| MTBF      | MIL HDBK 217F, 25°C, Gnd Benign | 3.5  |      |      | MHours |

#### Absolute Maximum Ratings

| Parameter                   | Conditions                  | Min. | Typ. | Max.  | Units |
|-----------------------------|-----------------------------|------|------|-------|-------|
| Input Voltage Surge (1 Sec) | 5 VDC Input                 | -0.7 |      | 7.0   | VDC   |
|                             | 12 VDC Input                | -0.7 |      | 15.0  |       |
| Lead Temperature            | 1.5 mm From Case For 10 Sec |      |      | 260.0 | °C    |
| Internal Power Dissipation  | All Models                  |      |      | 450   | mW    |

**Caution:** Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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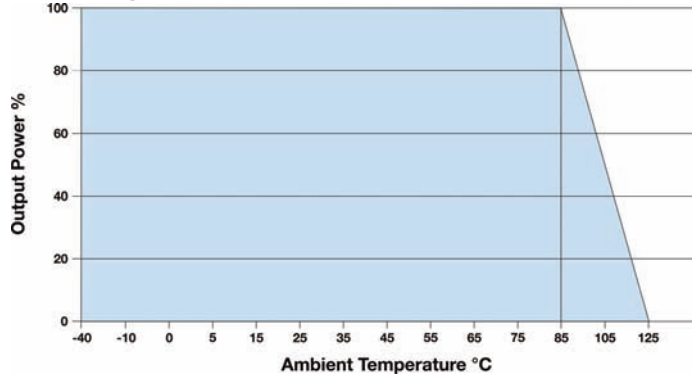
| Model Number | Input         |             |              |         | Output        |                   |                   | Efficiency (% , Typ) | Fuse Rating Slow-Blow (mA) |
|--------------|---------------|-------------|--------------|---------|---------------|-------------------|-------------------|----------------------|----------------------------|
|              | Voltage (VDC) |             | Current (mA) |         | Voltage (VDC) | Current (mA, Max) | Current (mA, Min) |                      |                            |
|              | Nominal       | Range       | Full-Load    | No-Load |               |                   |                   |                      |                            |
| LF201ES      | 5             | 4.5 - 5.5   | 494          | 30      | 5.0           | 400.0             | 40.0              | 81                   | 500                        |
| LF202ES      | 5             | 4.5 - 5.5   | 487          | 30      | 9.0           | 222.0             | 23.0              | 82                   | 500                        |
| LF203ES      | 5             | 4.5 - 5.5   | 477          | 30      | 12.0          | 167.0             | 17.0              | 84                   | 500                        |
| LF204ES      | 5             | 4.5 - 5.5   | 475          | 30      | 15.0          | 133.0             | 14.0              | 84                   | 500                        |
| LF211ES      | 12            | 10.8 - 13.2 | 203          | 15      | 5.0           | 400.0             | 40.0              | 82                   | 200                        |
| LF212ES      | 12            | 10.8 - 13.2 | 201          | 15      | 9.0           | 222.0             | 23.0              | 83                   | 200                        |
| LF213ES      | 12            | 10.8 - 13.2 | 197          | 15      | 12.0          | 167.0             | 17.0              | 85                   | 200                        |
| LF214ES      | 12            | 10.8 - 13.2 | 196          | 15      | 15.0          | 133.0             | 14.0              | 85                   | 200                        |

**Notes:**

- Output load regulation is specified for a load change of 10% to 100%.
- When measuring output ripple, it is recommended that an external 0.33  $\mu\text{F}$  ceramic capacitor be placed from the +Vout pin to the -Vout pin.
- During operation, care must be taken not to exceed the specified input range of the unit or to allow the output load to drop below the specified minimum (10% of full load). Operating the unit under either of these conditions could cause damage to the unit.
- These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors will enhance stability and reduce output ripple. Recommended capacitor values are:

| Vin    | Input Capacitor   | Vout   | Output Capacitor   |
|--------|-------------------|--------|--------------------|
| 5 VDC  | 4.7 $\mu\text{F}$ | 5 VDC  | 4.7 $\mu\text{F}$  |
| 12 VDC | 2.2 $\mu\text{F}$ | 9 VDC  | 2.2 $\mu\text{F}$  |
|        |                   | 12 VDC | 1.0 $\mu\text{F}$  |
|        |                   | 15 VDC | 0.47 $\mu\text{F}$ |

**Derating Curve**



For applications requiring very low output noise levels, a simple LC filter should be effective.

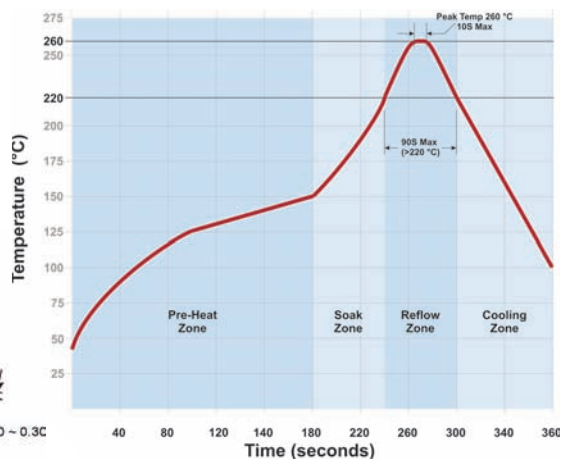
- It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection table above for the correct rating.

**Pin Connections**

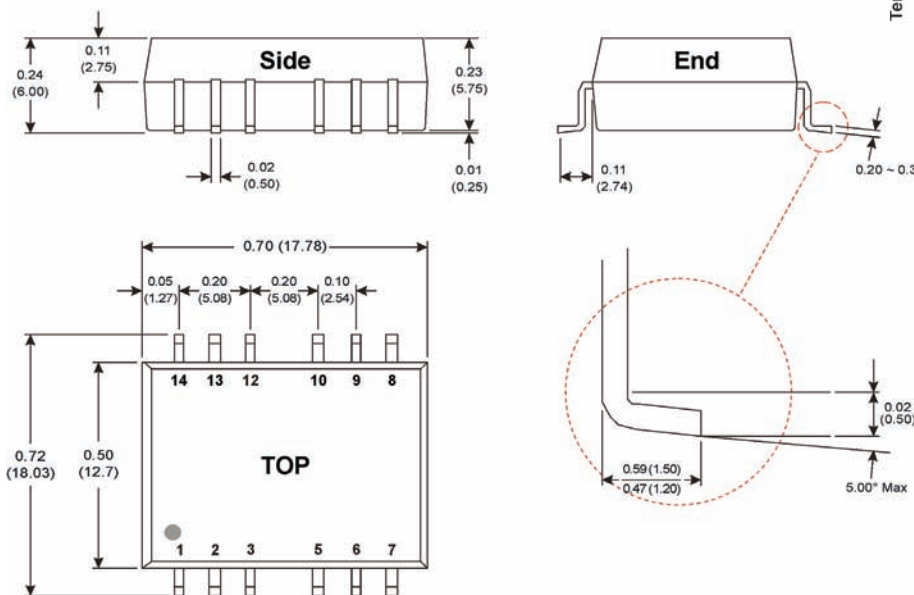
| Pin | Function | Pin | Function |
|-----|----------|-----|----------|
| 1   | -Vin     | 8   | NC       |
| 2   | +Vin     | 9   | NC       |
| 3   | NC       | 10  | NC       |
| 5   | NC       | 12  | NC       |
| 6   | -Vout    | 13  | NC       |
| 7   | +Vout    | 14  | NC       |

NC = No Connection

**Recommended Solder Profile**



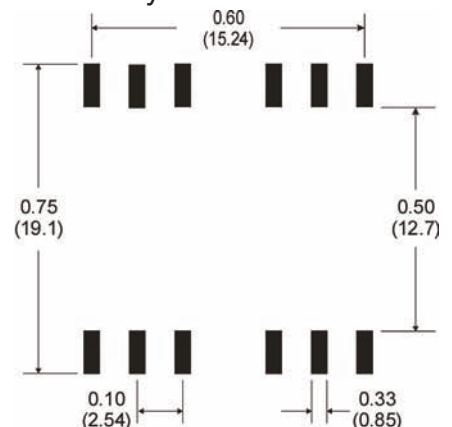
**Mechanical Dimensions**



**Notes:**

- All dimensions are typical in inches (mm)
- Tolerance x.xx =  $\pm 0.01$  ( $\pm 0.25$ )
- Pin 1 is marked by a "dot" or indentation on the unit

**Board Layout**



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