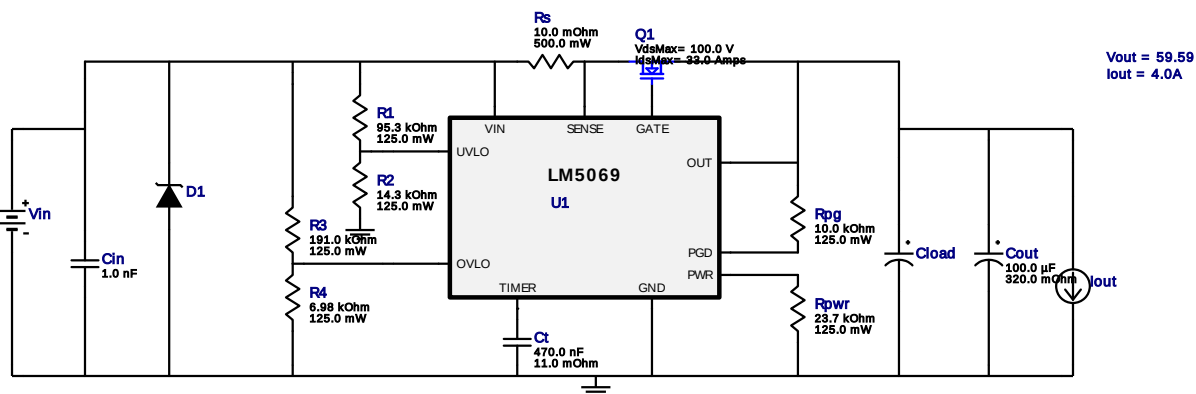
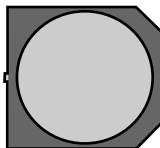


## WEBENCH® Design Report

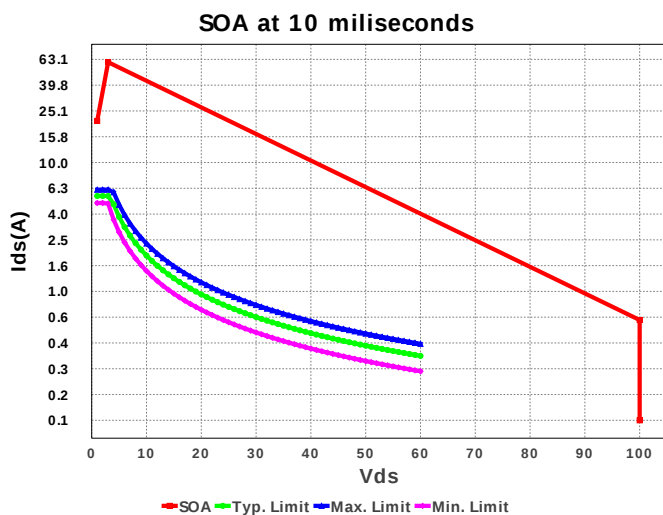
Design : 4800892/5 LM5069MM-1/NOPB  
LM5069MM-1/NOPB 30.0V-60.0V to 59.59V @ 5.0A



## Electrical BOM

| #  | Name | Manufacturer            | Part Number                       | Properties                                                        | Qty | Price  | Footprint                                                                                                                  |
|----|------|-------------------------|-----------------------------------|-------------------------------------------------------------------|-----|--------|----------------------------------------------------------------------------------------------------------------------------|
| 1. | Cin  | MuRata                  | GRM155R72A102KA01D<br>Series= X7R | Cap= 1.0 nF<br>VDC= 100.0 V<br>IRMS= 0.0 A                        | 1   | \$0.01 | <br>0402 3 mm <sup>2</sup>              |
| 2. | Cout | Panasonic               | EEV-FK1K101Q<br>Series= FK        | Cap= 100.0 uF<br>ESR= 320.0 mOhm<br>VDC= 80.0 V<br>IRMS= 500.0 mA | 1   | \$0.45 | <br>SM_RADIAL_H13 264 mm <sup>2</sup> |
| 3. | Ct   | AVX                     | 0805YC474KAT2A<br>Series= X7R     | Cap= 470.0 nF<br>ESR= 11.0 mOhm<br>VDC= 16.0 V<br>IRMS= 0.0 A     | 1   | \$0.02 | <br>0805 7 mm <sup>2</sup>            |
| 4. | D1   | Littelfuse              | 5.0SMDJ70A                        | Zener                                                             | 1   | \$0.85 | <br>SMC 83 mm <sup>2</sup>            |
| 5. | Q1   | International Rectifier | IRF540NSPBF                       | VdsMax= 100.0 V<br>IdsMax= 33.0 Amps                              | 1   | \$0.80 | <br>DDPAK 210 mm <sup>2</sup>         |
| 6. | R1   | Panasonic               | ERJ-6ENF9532V<br>Series= ERJ-6E   | Res= 95.3 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 | <br>0805 7 mm <sup>2</sup>            |
| 7. | R2   | Panasonic               | ERJ-6ENF1432V<br>Series= ERJ-6E   | Res= 14.3 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 | <br>0805 7 mm <sup>2</sup>            |
| 8. | R3   | Panasonic               | ERJ-6ENF1913V<br>Series= ERJ-6E   | Res= 191.0 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0%             | 1   | \$0.01 | <br>0805 7 mm <sup>2</sup>            |
| 9. | R4   | Panasonic               | ERJ-6ENF6981V<br>Series= ERJ-6E   | Res= 6.98 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0%              | 1   | \$0.01 | <br>0805 7 mm <sup>2</sup>            |

| #   | Name | Manufacturer              | Part Number                     | Properties                                           | Qty | Price  | Footprint                                                                                                     |
|-----|------|---------------------------|---------------------------------|------------------------------------------------------|-----|--------|---------------------------------------------------------------------------------------------------------------|
| 10. | Rpg  | Panasonic                 | ERJ-6ENF1002V<br>Series= ERJ-6E | Res= 10.0 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0805 7 mm <sup>2</sup>    |
| 11. | Rpwr | Panasonic                 | ERJ-6ENF2372V<br>Series= ERJ-6E | Res= 23.7 kOhm<br>Power= 125.0 mW<br>Tolerance= 1.0% | 1   | \$0.01 |  0805 7 mm <sup>2</sup>    |
| 12. | Rs   | Stackpole Electronics Inc | CSR1206FK10L0<br>Series= ?      | Res= 10.0 mOhm<br>Power= 500.0 mW<br>Tolerance= 1.0% | 1   | \$0.11 |  1206 11 mm <sup>2</sup>   |
| 13. | U1   | Texas Instruments         | LM5069MM-1/NOPB                 | Switcher                                             | 1   | \$1.30 |  MUB10A 24 mm <sup>2</sup> |



## Operating Values

| #   | Name             | Value                 | Category | Description                                 |
|-----|------------------|-----------------------|----------|---------------------------------------------|
| 1.  | Iin Avg          | 5.0 A                 | Current  | Calculated typical current limit            |
| 2.  | BOM Count        | 13                    | General  | Total Design BOM count                      |
| 3.  | FootPrint        | 641.0 mm <sup>2</sup> | General  | Total Foot Print Area of BOM components     |
| 4.  | Pout             | 297.967 W             | General  | Total output power                          |
| 5.  | Total BOM        | \$3.6                 | General  | Total BOM Cost                              |
| 6.  | Vout OP          | 59.593 V              | Op_point | Operational Output Voltage                  |
| 7.  | Efficiency       | 99.297 %              | Op_point | Steady state efficiency                     |
| 8.  | IOUT_OP          | 5.0 A                 | Op_point | Iout operating point                        |
| 9.  | Ilimit Max Act   | 6.15 A                | Op_point | Calculated maximum current limit            |
| 10. | Ilimit Min Act   | 4.85 A                | Op_point | Calculated minimum current limit            |
| 11. | Ilimit Typ Act   | 5.5 A                 | Op_point | Calculated typical current limit            |
| 12. | Lower OVLO       | 66.899 V              | Op_point | Lower OVLO (Overvoltage-Lockout) threshold  |
| 13. | Lower UVLO       | 19.161 V              | Op_point | Lower UVLO (Undervoltage-Lockout) threshold |
| 14. | Max FET Plim     | 23.51 W               | Op_point | Resulting Max FET Power Limit               |
| 15. | Min FET Plim     | 14.41 W               | Op_point | Resulting Min FET Power Limit               |
| 16. | T_insert         | 340.58 ms             | Op_point | Typical Insertion Time                      |
| 17. | T_start          | 4.418 s               | Op_point | Typical Restart Time                        |
| 18. | Typical FET Plim | 18.96 W               | Op_point | Resulting Typical FET Power Limit           |
| 19. | Upper OVLO       | 70.91 V               | Op_point | Upper OVLO (Overvoltage-Lockout) threshold  |
| 20. | Upper UVLO       | 21.162 V              | Op_point | Upper UVLO (Undervoltage-Lockout) threshold |
| 21. | VIN_OP           | 60.0 V                | Op_point | Vin operating point                         |
| 22. | IC Pd            | 2.111 W               | Power    | IC power dissipation                        |
| 23. | M1 Pd            | 1.783 W               | Power    | FET Power Dissipation                       |
| 24. | Total Pd         | 2.111 W               | Power    | Total Power Dissipation                     |
| 25. | Fault time       | 12.522 ms             |          | Fault Time                                  |

## Design Inputs

| #   | Name                  | Value  | Description             |
|-----|-----------------------|--------|-------------------------|
| 1.  | Iout                  | 4.0    | Maximum Output Current  |
| 2.  | OVLO                  | 70.0   | OVLO nominal            |
| 3.  | UVLO                  | 20.0   | UVLO nominal            |
| 4.  | VinMax                | 60.0   | Maximum input voltage   |
| 5.  | VinMin                | 30.0   | Minimum input voltage   |
| 6.  | base_pn               | LM5069 | Base Product Number     |
| 7.  | currentLimit          | 5.0    | Current limit           |
| 8.  | outputLoadCapacitance | 1.0    | Output Load capacitance |
| 9.  | source                | DC     | Input Source Type       |
| 10. | Ta                    | 30.0   | Ambient temperature     |

## Design Assistance

1. The LM5069 Webench Designer provides the design engineer with a fully functional HotSwap schematic for the positive voltage system. The created design calculates a complete BOM and the total cost of the BOM. Also, the Webench designer offers simulation to emulate the behavior of the device such as Power Sequence, Restart Sequence and Input Transients. To learn more about HotSwap devices and its applications, please refer to the following link: [http://www.ti.com/analog/docs/analogtechdoc\\_hh.tsp?viewType=mostuseful&techDoc=1&rootFamilyId=64&familyId=420&docCategoryId=1&Input3=Go](http://www.ti.com/analog/docs/analogtechdoc_hh.tsp?viewType=mostuseful&techDoc=1&rootFamilyId=64&familyId=420&docCategoryId=1&Input3=Go)

2. **LM5069 Product Folder** : <http://www.ti.com/product/lm5069> : contains the data sheet and other resources.

Texas Instruments' WEBENCH simulation tools attempt to recreate the performance of a substantially equivalent physical implementation of the design. Simulations are created using Texas Instruments' published specifications as well as the published specifications of other device manufacturers. While Texas Instruments does update this information periodically, this information may not be current at the time the simulation is built. Texas Instruments does not warrant the accuracy or completeness of the specifications or any information contained therein. Texas Instruments does not warrant that any designs or recommended parts will meet the specifications you entered, will be suitable for your application or fit for any particular purpose, or will operate as shown in the simulation in a physical implementation. Texas Instruments does not warrant that the designs are production worthy.

**You should completely validate and test your design implementation to confirm the system functionality for your application prior to production.**

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