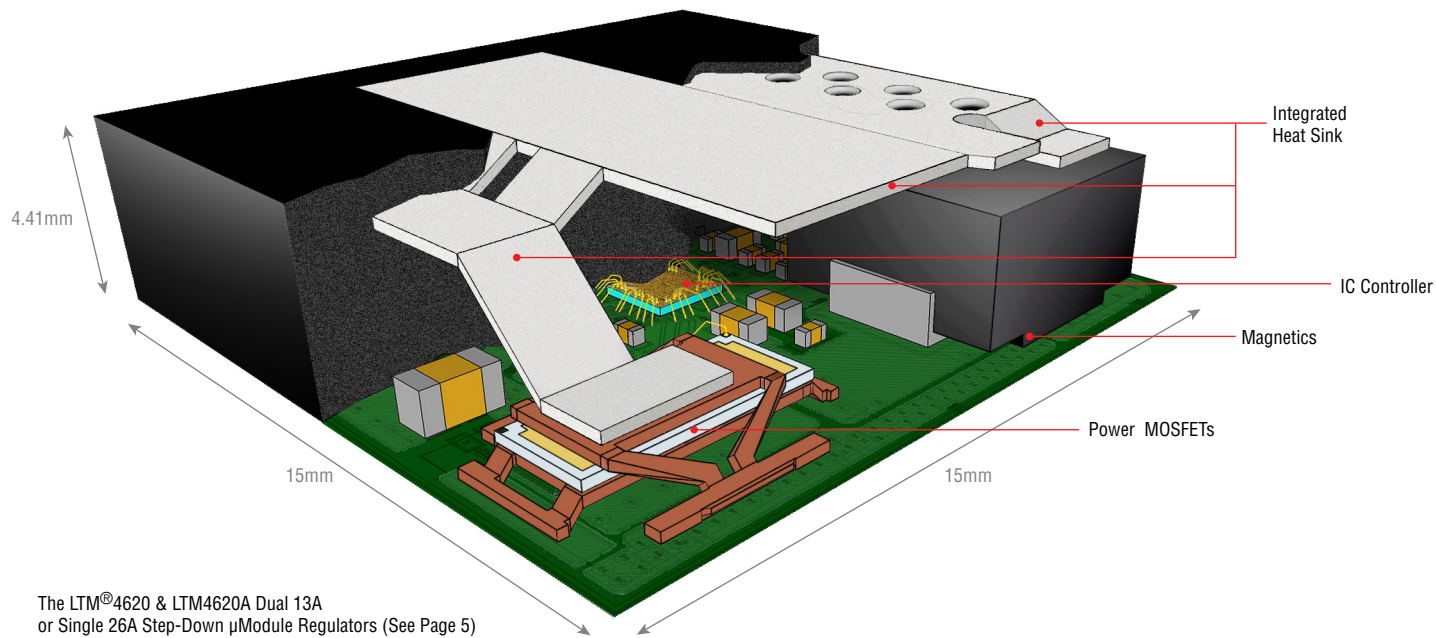


# μModule Power Products

Simplify Complex Power Circuits



A μModule<sup>®</sup> Power Product Simplifies Implementation, Verification, and Manufacturing of Complex Power Circuits by Integrating the Power Function in a Compact Molded Plastic Package.

L<sup>®</sup> LINEAR TECHNOLOGY  
LTM4620  
6.25 × 6.25

L<sup>®</sup> LINEAR TECHNOLOGY  
LTM4620A  
6.25 × 11.25

L<sup>®</sup> LINEAR TECHNOLOGY  
LTM4620  
9 × 11.25

L<sup>®</sup> LINEAR TECHNOLOGY  
LTM4620A  
9.25 × 15

L<sup>®</sup> LINEAR TECHNOLOGY  
LTM4620  
11.25 × 15

L<sup>®</sup> LINEAR TECHNOLOGY  
LTM4620  
15 × 15

L<sup>®</sup> LINEAR TECHNOLOGY  
LTM4620  
15 × 15

L<sup>®</sup> LINEAR TECHNOLOGY  
LTM4620  
16 × 16



Low Output Voltage Ripple



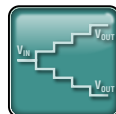
Inverting



LED Driver



Step Down



Step Up & Down



EN55022 Class B Certified



Isolated



Battery Charger

Page 3

Page 4-5

Page 6

Page 7

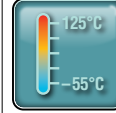

In BGA & LGA Packages

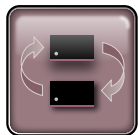
Dimensions in mm



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FEATURE

| FUNCTION   |  |  |  |  |  |  |  |  |  |  |  |  |  |           |
|--|---|---|---|---|---|--|---|---|---|---|---|---|---|-----------|
|  | Low Output Voltage Ripple   | Inverting   | EN55022 Class B   | Current Limit   | Synchronizable  | Paralleleable  | Multiple Output   | Wide Temperature  | Precision Remote Sense  | Output Sequencing   | Voltage Margining   | Package   | Pin Compatible  |           |
|  |  | Page 3  | Page 3  | -   | -   | -  | -   | Page 6  | Page 7  | -   | -   | -   | Page 7  | -         |
|  |  | Page 3 (SEPIC)  | Page 3  | -   | -   | Page 6   | Page 6  | -   | Page 7  | -   | -   | -   | Page 6  | -         |
|  |  | -   | -   | -   | Page 7  | -  | Page 7  | -   | -   | -   | -   | -   | -   | -         |
|  |  | Page 3  | Page 3 (See Note)   | Page 7  | Pages 4 & 5   | Pages 4 & 5  | Pages 4 & 5   | Page 6  | Page 7  | Page 8  | Page 9  | Page 9  | Pages 4 & 5   | See Below |
|  | -   | -   | -   | -   | Page 3  | -  | -   | -   | -   | -   | -   | -   | -   |           |



Pin Compatible

| Function          | Device 1                             | Device 2                              | Device 3                               | Device 4                              | Comments   |
|-------------------|--------------------------------------|---------------------------------------|--|---------------------------------------|------------|
| Step-Down         | LTM8022 (36V <sub>IN</sub> , 1A)     | LTM8023 (36V <sub>IN</sub> , 2A)      |  |                                       | See Page 4 |
| Step-Down         | LTM4602 (20V <sub>IN</sub> , 6A)     | LTM4600 (20V <sub>IN</sub> , 10A)     |  |                                       | See Page 4 |
| Step-Down         | LTM4603 (20V <sub>IN</sub> , 6A)     | LTM4601 (20V <sub>IN</sub> , 12A)     |  |                                       | See Page 4 |
| Step-Down         | LTM4627 (20V <sub>IN</sub> , 15A)    | LTM4637 (20V <sub>IN</sub> , 20A)     |  |                                       | See Page 4 |
| Dual Step-Down    | LTM4628 (5.5V <sub>OUT</sub> , 2x8A) | LTM4620 (2.5V <sub>OUT</sub> , 2x13A) | LTM4620A (5.3V <sub>OUT</sub> , 2x13A) | LTM4630 (1.8V <sub>OUT</sub> , 2x18A) | See Page 4 |
| Step Up & Down    | LTM4605 (16V <sub>OUT</sub> , 5A)    | LTM4607 (24V <sub>OUT</sub> , 5A)     | LTM4609 (34V <sub>OUT</sub> , 4A)      |                                       | See Page 6 |
| Low EMI Step-Down | LTM8031 (36V <sub>IN</sub> , 1A)     | LTM8032 (36V <sub>IN</sub> , 2A)      |  |                                       | See Page 7 |
| Low EMI Step-Down | LTM4606 (28V <sub>IN</sub> , 6A)     | LTM4612 (36V <sub>IN</sub> , 5A)      |  |                                       | See Page 7 |



Low Output Voltage Ripple

| Topology                             | Input Voltage (V) |     | Output Voltage (V) |     | Total Output Capability | Clock Sync Range (MHz) | LDO Outputs | Paralleleable Outputs (Total I <sub>OUT</sub> ) | V <sub>OUT</sub> Noise (mV) | BGA Package Dimensions (mm) | Part Number                                  |
|--------------------------------------|-------------------|-----|--------------------|-----|-------------------------|------------------------|-------------|---|-----------------------------|-----------------------------|--|
|                                      | Min               | Max | Min                | Max |                         |                        |             |   |                             |                             |  |
| Sync Buck Plus 5 LDO Post Regulators | 6                 | 36  | 0                  | 24  | 5A                      | 0.2 to 1.0             | 1.1A × 5    | x10 (10A)                                       | 3.5                         | 15 × 15 × 3.4               | LTM8001 <span style="float:right">new</span> |
| Sync Buck Plus LDO Post Regulator    | 6                 | 36  | 0.8                | 1.8 | 5A                      | 0.2 to 1.0             | 5A × 1      | –   | 0.75                        | 15 × 15 × 4.9               | LTM8028 <span style="float:right">new</span> |
| 725V Isolated Flyback                | 3.1               | 32  | 1.2                | 12  | 1.5W                    | –                      | 1           | –   | 1.0                         | 9 × 11.25 × 4.9             | LTM8048 <span style="float:right">new</span> |
| SEPIC or Inverting                   | 2.8               | 18  | ±2.5               | ±15 | Up to 0.7               | 0.2 to 2.0             | None        | –   | 1.0                         | 6.25 × 11.25 × 4.9          | LTM8045 <span style="float:right">new</span> |

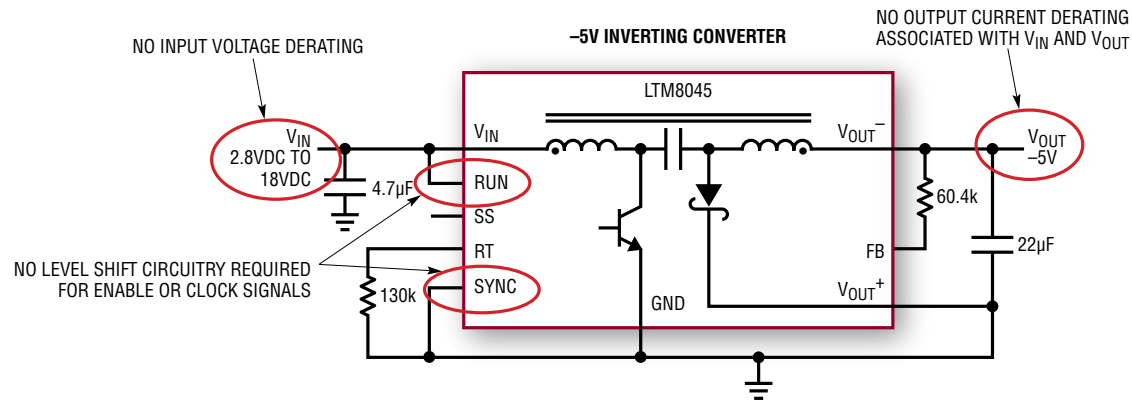


Inverting

| Topology              | Input Voltage (V) |     | Output Voltage (V) |     | Total Output Capability | Clock Sync Range (MHz) | LDO Outputs | V <sub>OUT</sub> Noise (mV) | BGA Package Dimensions (mm) | Part Number                                  |
|-----------------------|-------------------|-----|--------------------|-----|-------------------------|------------------------|-------------|-----------------------------|-----------------------------|--|
|                       | Min               | Max | Min                | Max |                         |                        |             |                             |                             |  |
| SEPIC or Inverting    | 2.8               | 18  | -2.5               | -15 | Up to 0.7A              | 0.2 to 2.0             | None        | 1.0                         | 6.25 × 11.25 × 4.9          | LTM8045 <span style="float:right">new</span> |
| 725V Isolated Flyback | 3.1               | 32  | -2.5               | -12 | 1.5W                    | –                      | None        | 34                          | 9 × 11.25 × 4.9             | LTM8047 <span style="float:right">new</span> |

Note: The two parts above represent the simplest  $\mu$ Module power product solution for inverting regulators. While all  $\mu$ Module step-down regulators can be reconfigured as an inverter on the PCB, they are subject to three extra design steps described in Design Note DN1021 which are summarized as LTM8045 advantages below.

### Advantages of the LTM8045 vs Step-Down Regulators When Used as an Inverter



LED Driver

| Input Voltage (V) |     | Output Voltage (V) |     | LED Drive Current (A) | Dimming        | Sync Range (MHz) | Open LED Protection | LGA Package Dimensions (mm) | Part Number |
|-------------------|-----|--------------------|-----|-----------------------|----------------|------------------|---------------------|-----------------------------|-------------|
| Min               | Max | Min                | Max |                       |                |                  |                     |                             |             |
| 3                 | 30  | 2                  | 32  | 1                     | Analog and PWM | –                | Yes                 | 9 × 15 × 2.8                | LTM8042     |
| 3                 | 30  | 2                  | 32  | 0.35                  | Analog and PWM | 0.3 to 2.5       | Yes                 | 9 × 15 × 2.8                | LTM8042-1   |
| 4                 | 36  | 2.5                | 13  | 1                     | Analog and PWM | 0.3 to 2.5       | Yes                 | 9 × 15 × 4.3                | LTM8040     |



Step-Down

| Output Channels | Input Voltage (V) |      | Output Voltage (V) |     | Output Current (A) | Sync Range (MHz) | Parallelable Outputs (Total I <sub>OUT</sub> ) | Adjustable Current Limit | Package Dimensions (mm)            | Package    | Part Number |
|-----------------|-------------------|------|--------------------|-----|--------------------|------------------|--|--------------------------|------------------------------------|------------|-------------|
|                 | Min               | Max  | Min                | Max |                    |                  |  |                          |                                    |            |             |
| 1               | 4                 | 36   | 1.2                | 5   | 0.2                | –                | –  | –                        | 6.25 × 6.25 × 2.3                  | LGA        | LTM8020     |
| 1               | 3                 | 36   | 0.8                | 5   | 0.5                | –                | –  | –                        | 6.25 × 11.25 × 2.8                 | LGA        | LTM8021     |
| 1               | 4.5               | 36   | 1.2                | 18  | 0.6                | –                | –  | –                        | 6.25 × 11.25 × 3.4                 | BGA        | LTM8029     |
| 1               | 3.6               | 36   | 0.8                | 10  | 1                  | 0.25 to 2.0      | –  | –                        | 9 × 11.25 × 2.8                    | LGA        | LTM8022     |
| 1               | 3.6               | 36   | 0.8                | 10  | 1                  | 0.25 to 2.0      | –  | –                        | 9 × 15 × 2.8                       | LGA        | LTM8031     |
| 5               | 6                 | 36   | 0                  | 24  | 1                  | 0.2 to 1.0       | ×10 (10A)                                      | •                        | 15 × 15 × 3.4                      | BGA        | LTM8001     |
| 1               | 3.6               | 36   | 0.8                | 10  | 2                  | 0.25 to 2.0      | –  | –                        | 9 × 11.25 × 2.8<br>9 × 11.25 × 3.4 | LGA<br>BGA | LTM8023     |
| 1               | 3.6               | 36   | 0.8                | 10  | 2                  | 0.25 to 2.0      | –  | –                        | 9 × 15 × 2.8<br>9 × 15 × 3.4       | LGA<br>BGA | LTM8032     |
| 1               | 3.6               | 58   | 0.8                | 24  | 2                  | 0.25 to 2.0      | ×4 (8A)  | –                        | 9 × 15 × 4.9                       | BGA        | LTM8050     |
| 1               | 3.6               | 36   | 0.8                | 24  | 3                  | 0.25 to 2.0      | ×2 (6A)  | –                        | 9 × 15 × 4.3                       | LGA        | LTM8025     |
| 1               | 3.6               | 36   | 0.8                | 24  | 3                  | 0.25 to 2.0      | ×2 (6A)  | –                        | 11.25 × 15 × 4.3                   | LGA        | LTM8033     |
| 1               | 2.375             | 5.5  | 0.8                | 5   | 4                  | –                | ×2 (8A)  | –                        | 9 × 15 × 2.3                       | LGA        | LTM4604A    |
| 2               | 2.375             | 5.5  | 0.8                | 5   | 4                  | –                | ×2 (8A)  | –                        | 15 × 15 × 2.8                      | LGA        | LTM4614     |
| 3               | 2.375             | 5.5  | 0.8                | 5   | 4, 4, 1.5          | –                | ×2 (8A)  | –                        | 15 × 15 × 2.8                      | LGA        | LTM4615     |
| 1               | 4                 | 14   | 0.6                | 5.5 | 4                  | –                | –  | –                        | 6.25 × 6.25 × 5.0                  | BGA        | LTM4624     |
| 2               | 4.5               | 26.5 | 0.8                | 5   | 4                  | 0.25 to 0.78     | ×2 (8A)  | –                        | 15 × 15 × 2.8                      | LGA        | LTM4619     |
| 1               | 4.5               | 60   | 2.5                | 24  | 4                  | 0.12 to 0.5      | –  | –                        | 15 × 15 × 4.3                      | LGA        | LTM8027     |
| 1               | 6                 | 36   | 0.8                | 1.8 | 5                  | 0.2 to 1.0       | ×2 (10A)                                       | •                        | 15 × 15 × 4.9                      | BGA        | LTM8028     |
| 1               | 6                 | 36   | 1.2                | 24  | 5                  | 0.1 to 1.0       | ×2 (10A)                                       | •                        | 11.25 × 15 × 2.8                   | LGA        | LTM8026     |
| 1               | 5                 | 36   | 3.3                | 15  | 5                  | 0.2 to 1.3       | ×2 (10A)                                       | –                        | 15 × 15 × 2.8                      | LGA        | LTM4612     |
| 1               | 6                 | 36   | 1.2                | 24  | ±5                 | 0.1 to 1.0       | –  | •                        | 11.25 × 15 × 2.8                   | LGA        | LTM8052     |
| 1               | 6                 | 36   | 1.2                | 24  | ±5                 | 0.1 to 1.0       | –  | •                        | 11.25 × 15 × 2.8                   | LGA        | LTM8052A    |
| 1               | 4.5               | 20   | 0.6                | 5   | 6                  | –                | –  | –                        | 15 × 15 × 2.8                      | LGA        | LTM4602     |
| 1               | 4.5               | 20   | 0.6                | 5   | 6                  | 0.7 to 1.3       | ×4 (24A)                                       | –                        | 15 × 15 × 2.8                      | LGA        | LTM4603     |
| 1               | 4.5               | 26.5 | 0.8                | 5   | 6                  | 0.4 to 0.78      | ×2 (12A)                                       | –                        | 9 × 15 × 4.3                       | LGA        | LTM4618     |
| 1               | 4.5               | 28   | 0.6                | 5   | 6                  | –                | –  | –                        | 15 × 15 × 2.8                      | LGA        | LTM4602HV   |
| 1               | 4.5               | 28   | 0.6                | 5   | 6                  | 0.7 to 1.3       | ×4 (24A)                                       | –                        | 15 × 15 × 2.8                      | LGA        | LTM4603HV   |
| 1               | 4.5               | 28   | 0.6                | 5   | 6                  | 0.63 to 1.0      | ×2 (12A)                                       | –                        | 15 × 15 × 2.8                      | LGA        | LTM4606     |
| 1               | 2.7               | 5.5  | 0.6                | 5   | 8                  | 0.75 to 2.25     | ×4 (32A)                                       | –                        | 9 × 15 × 2.8                       | LGA        | LTM4608A    |
| 2               | 2.7               | 5.5  | 0.6                | 5   | 8                  | 0.75 to 2.25     | ×4 (32A)                                       | –                        | 15 × 15 × 2.8<br>15 × 15 × 3.4     | LGA<br>BGA | LTM4616     |
| 2               | 4.5               | 26.5 | 0.6                | 5.5 | 8                  | 0.4 to 0.78      | ×4 (32A)                                       | –                        | 15 × 15 × 4.3<br>15 × 15 × 4.9     | LGA<br>BGA | LTM4628     |
| 1               | 5                 | 36   | 3.3                | 15  | 8                  | 0.2 to 1.3       | ×2 (16A)                                       | –                        | 15 × 15 × 4.3                      | LGA        | LTM4613     |
| 1               | 4.5               | 16   | 0.6                | 3.3 | 10                 | 0.3 to 0.8       | ×3 (30A)                                       | –                        | 9 × 15 × 4.9                       | BGA        | LTM4649     |
| 1               | 4.5               | 20   | 0.6                | 5   | 10                 | –                | –  | –                        | 15 × 15 × 2.8                      | LGA        | LTM4600     |
| 1               | 4.5               | 28   | 0.6                | 5   | 10                 | –                | –  | –                        | 15 × 15 × 2.8                      | LGA        | LTM4600HV   |

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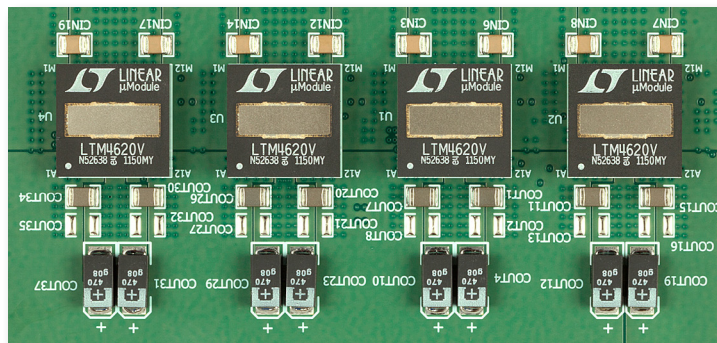


Step-Down

| Output Channels | Input Voltage (V) |     | Output Voltage (V) |     | Output Current (A) | Sync Range (MHz) | Parallelable Outputs (Total I <sub>OUT</sub> ) | Adjustable Current Limit | Package Dimensions (mm)        | Package    | Part Number                                    |
|-----------------|-------------------|-----|--------------------|-----|--------------------|------------------|--|--------------------------|--------------------------------|------------|--|
|                 | Min               | Max | Min                | Max |                    |                  |  |                          |                                |            |  |
| 1               | 4.5               | 36  | 0.8                | 34  | 10                 | 0.2 to 0.4       | ×4 (40A)                                       | –                        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4609  |
| 1               | 4.5               | 36  | 0.8                | 24  | 10                 | 0.2 to 0.4       | ×4 (40A)                                       | –                        | 15 × 15 × 2.8                  | LGA        | LTM4607  |
| 1               | 4                 | 38  | 0.6                | 6   | 10                 | 0.175 to 0.66    | ×4 (40A)                                       | –                        | 15 × 15 × 5.0                  | BGA        | LTM4641 <span style="color: blue;">new</span>  |
| 1               | 4.5               | 20  | 0.8                | 16  | 12                 | 0.2 to 0.4       | ×4 (48A)                                       | –                        | 15 × 15 × 2.8                  | LGA        | LTM4605  |
| 1               | 4.5               | 20  | 0.6                | 5   | 12                 | 0.6 to 1.1       | ×4 (48A)                                       | –                        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601†                                       |
| 1               | 4.5               | 20  | 0.6                | 5   | 12                 | 0.6 to 1.1       | ×4 (48A)                                       | –                        | 15 × 15 × 2.8                  | LGA        | LTM4601-1†                                     |
| 1               | 4.5               | 20  | 0.6                | 5   | 12                 | 0.6 to 1.1       | ×4 (48A)                                       | –                        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601A†‡                                     |
| 1               | 4.5               | 20  | 0.6                | 5   | 12                 | 0.6 to 1.1       | ×4 (48A)                                       | –                        | 15 × 15 × 2.8                  | LGA        | LTM4601A-1†‡                                   |
| 1               | 4.5               | 28  | 0.6                | 5   | 12                 | 0.6 to 1.1       | ×4 (48A)                                       | –                        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601AHV†‡                                   |
| 1               | 4.5               | 28  | 0.6                | 5   | 12                 | 0.6 to 1.1       | ×4 (48A)                                       | –                        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601HV†                                     |
| 2               | 4.5               | 16  | 0.6                | 2.5 | 13                 | 0.4 to 0.78      | ×8 (100A)                                      | –                        | 15 × 15 × 4.4                  | LGA        | LTM4620 <span style="color: blue;">new</span>  |
| 2               | 4.5               | 16  | 0.6                | 5.3 | 13                 | 0.4 to 0.78      | ×8 (100A)                                      | –                        | 15 × 15 × 4.4                  | LGA        | LTM4620A <span style="color: blue;">new</span> |
| 1               | 1.5               | 5.5 | 0.8                | 5   | 15                 | 0.36 to 0.71     | ×4 (60A)                                       | –                        | 15 × 15 × 4.3                  | LGA        | LTM4611  |
| 1               | 4.5               | 20  | 0.6                | 5   | 15                 | 0.4 to 0.8       | ×4 (60A)                                       | –                        | 15 × 15 × 4.3<br>15 × 15 × 4.9 | LGA<br>BGA | LTM4627  |
| 2               | 4.5               | 15  | 0.6                | 1.8 | 18                 | 0.4 to 0.78      | ×4 (144A)                                      | –                        | 16 × 16 × 4.4                  | LGA        | LTM4630 <span style="color: blue;">new</span>  |
| 1               | 4.5               | 20  | 0.6                | 5.5 | 20                 | 0.25 to 0.8      | ×4 (80A)                                       | –                        | 15 × 15 × 4.3                  | LGA        | LTM4637 <span style="color: blue;">new</span>  |

† LTM4601, LTM4601A, LTM4601HV and LTM4601AHV offer precision remote sense (see page 8). Devices ending with “-1” do not.  
‡ LTM4601A, LTM4601A-1 and LTM4601AHV have redundant pads for enhanced solder joint strength to the PCB.

### Four LTM4620s with Integrated Heat Sink and High Efficiency Deliver 100A with Low Temperature Rise



TechClip Video Available (Page 12)

Four LTM4620s Deliver 100A at 1.0V<sub>OUT</sub> from 12V<sub>IN</sub> with a 60°C Temperature Rise.  
(200LFM Airflow, No External Heat Sink, T<sub>A</sub> = 28°C) <http://video.linear.com/126>



Multiple Output

| Function              | Output Channels | Input Voltage (V) |      | Output Voltage (V) |     | Output Capability (Per Channel) | Sync Range (MHz) | Paralleable Outputs (Total I <sub>OUT</sub> ) | Package Dimensions (mm)        | Package    | Part Number |
|-----------------------|-----------------|-------------------|------|--------------------|-----|---------------------------------|------------------|---|--------------------------------|------------|-------------|
|                       |                 | Min               | Max  | Min                | Max |                                 |                  |   |                                |            |             |
| Step-Down             | 2               | 2.375             | 5.5  | 0.8                | 5   | 2 × 4A                          | –                | ×2 (8A)                                       | 15 × 15 × 2.8                  | LGA        | LTM4614     |
|                       | 2               | 4.5               | 26.5 | 0.8                | 5   | 2 × 4A                          | 0.25 to 0.78     | ×2 (8A)                                       | 15 × 15 × 2.8                  | LGA        | LTM4619     |
|                       | 2               | 2.7               | 5.5  | 0.6                | 5   | 2 × 8A                          | 0.75 to 2.25     | ×4 (32A)                                      | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4616     |
|                       | 2               | 4.5               | 26.5 | 0.6                | 5.5 | 2 × 8A                          | 0.4 to 0.78      | ×4 (32A)                                      | 15 × 15 × 4.3                  | LGA        | LTM4628     |
|                       | 2               | 4.5               | 16   | 0.6                | 2.5 | 2 × 13A                         | 0.4 to 0.78      | ×8 (100A)                                     | 15 × 15 × 4.4                  | LGA        | LTM4620     |
|                       | 2               | 4.5               | 16   | 0.6                | 5.3 | 2 × 13A                         | 0.4 to 0.78      | ×8 (100A)                                     | 15 × 15 × 4.4                  | LGA        | LTM4620A    |
| 725V Isolated Flyback | 2               | 3.1               | 32   | 1.2                | 12  | 1.5W Combined                   | –                | –   | 9 × 11.25 × 4.9                | BGA        | LTM8048     |
| Step-Down             | 3               | 2.375             | 5.5  | 0.8                | 5   | 4A, 4A, 1.5A                    | –                | ×2 (8A)                                       | 15 × 15 × 2.8                  | LGA        | LTM4615     |
|                       | 5               | 6                 | 36   | 0                  | 24  | 5 × 1A                          | 0.2 to 1.0       | ×10 (10A)                                     | 15 × 15 × 3.4                  | BGA        | LTM8001     |

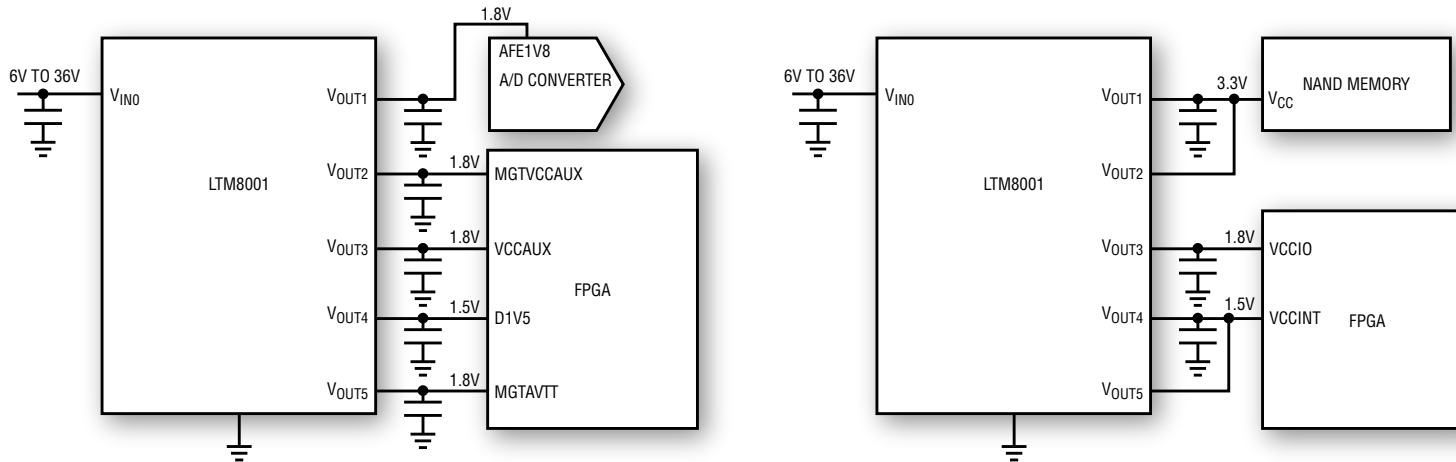
new

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LTM8001's Outputs Are Configurable from Five 1A Outputs to a Single 5A and Everything in Between



Step-Up & Down

| Input Voltage (V) |     | Output Voltage (V) |     | Output Current (A) | Clock Sync Range (MHz) | Extended Temp Range | Paralleable Output (Total I <sub>OUT</sub> ) | Inductor | Package Dimensions (mm)        | Package    | Part Number |
|-------------------|-----|--------------------|-----|--------------------|------------------------|---------------------|--|----------|--------------------------------|------------|-------------|
| Min               | Max | Min                | Max |                    |                        |                     |  |          |                                |            |             |
| 2.8               | 18  | ±2.5               | ±15 | Up to 0.7          | 0.2 to 2.0             | –55°C to 125°C      | –  | Internal | 6.25 × 11.25 × 4.9             | BGA        | LTM8045     |
| 5                 | 36  | 0.8                | 34  | 4†                 | 0.2 to 0.4             | –55°C to 125°C      | ×4 (16A)                                     | External | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4609     |
| 4.5               | 20  | 0.8                | 16  | 5†                 | 0.2 to 0.4             | –                   | ×4 (20A)                                     | External | 15 × 15 × 2.8                  | LGA        | LTM4605     |
| 4.5               | 36  | 0.8                | 24  | 5†                 | 0.2 to 0.4             | –                   | ×4 (20A)                                     | External | 15 × 15 × 2.8                  | LGA        | LTM4607     |

new

† In step-up mode. Output current in step-down mode is approximately 2x greater for the LTM4605, LTM4607, and LTM4609.



EN55022 Class B

| Function  | Input Voltage (V) |     | Output Voltage (V) |     | Output Current (A) | EN55022B Certified  | Sync Range (MHz) | Package Dimensions (mm)      | Package    | Part Number |
|-----------|-------------------|-----|--------------------|-----|--------------------|---|------------------|------------------------------|------------|-------------|
|           | Min               | Max | Min                | Max |                    |   |                  |                              |            |             |
| Step-Down | 4                 | 36  | 1.2                | 5   | 0.2                | Certificates and PCB Gerber Files Available at <a href="http://www.linear.com/ClassB">www.linear.com/ClassB</a> | -                | 6.25 x 6.25 x 2.3            | LGA        | LTM8020     |
|           | 3                 | 36  | 0.8                | 5   | 0.5                |   | -                | 6.25 x 11.25 x 2.8           | LGA        | LTM8021     |
|           | 3.6               | 36  | 0.8                | 10  | 1                  |   | 0.25 to 2.0      | 9 x 15 x 2.8                 | LGA        | LTM8031     |
|           | 3.6               | 36  | 0.8                | 10  | 2                  |   | 0.25 to 2.0      | 9 x 15 x 2.8<br>9 x 15 x 3.4 | LGA<br>BGA | LTM8032     |
|           | 3.6               | 36  | 0.8                | 24  | 3                  |   | 0.25 to 2.0      | 11.25 x 15 x 4.3             | LGA        | LTM8033     |
|           | 5                 | 36  | 3.3                | 15  | 5                  |   | 0.18 to 1.3      | 15 x 15 x 2.8                | LGA        | LTM4612     |
|           | 4.5               | 28  | 0.6                | 5   | 6                  |   | 0.7 to 1.1       | 15 x 15 x 2.8                | LGA        | LTM4606     |
|           | 5                 | 36  | 3.3                | 15  | 8                  |   | 0.18 to 1.3      | 15 x 15 x 4.3                | LGA        | LTM4613     |



Isolated

| Isolation Voltage | Output Channels | Input Voltage (V) |     | Output Voltage (V) |     | Output Ripple       | Output Power  | Sync Range (MHz) | BGA Package Dimensions (mm) | Part Number           |
|-------------------|-----------------|-------------------|-----|--------------------|-----|---------------------|---------------|------------------|-----------------------------|-----------------------|
|                   |                 | Min               | Max | Min                | Max |                     |               |                  |                             |                       |
| 725VDC            | 1               | 3.1               | 32  | 2.5                | 12  | 35mV <sub>P-P</sub> | 1.5W          | -                | 9 x 11.25 x 4.9             | LTM <sup>®</sup> 8047 |
|                   | 2               | 3.1               | 32  | 1.2                | 12  | 1mV <sub>P-P</sub>  | 1.5W Combined | -                | 9 x 11.25 x 4.9             | LTM8048               |



Battery Charger

| Input Voltage (V) |     | Output Voltage (V) |      | Maximum Charge Current (A) | Supported Battery Chemistries    | Adjustable Current Limit | MPPT | Auto Recharge | Paralleleable Output | Clock Sync Range (MHz) | LGA Package Dimensions (mm) | Part Number |
|-------------------|-----|--------------------|------|----------------------------|----------------------------------|--------------------------|------|---------------|----------------------|------------------------|-----------------------------|-------------|
| Min               | Max | Min                | Max  |                            |                                  |                          |      |               |                      |                        |                             |             |
| 4.95              | 32  | 4.1                | 8.4  | 2                          | Li-Ion, Li-Polymer               | •                        | -    | •             | -                    | -                      | 9 x 15 x 4.3                | LTM8061     |
| 4.95              | 32  | 3.3                | 14.4 | 2                          | Li-Ion, Li-Polymer, SLA, LiFePO4 | -                        | •    | •             | x3 (6A)              | -                      | 9 x 15 x 4.3                | LTM8062     |
| 4.95              | 32  | 3.3                | 18.8 | 2                          | Li-Ion, Li-Polymer, SLA, LiFePO4 | -                        | •    | •             | x3 (6A)              | -                      | 9 x 15 x 4.3                | LTM8062A    |



Wide Temperature

| Operating Temperature Range -55°C to 125°C | Function | Output Channels | Input Voltage (V)     |      | Output Voltage (V) |            | Output Capability (Per Channel) | Sync Range (MHz) | EN55022B Certified                 | Package Dimensions (mm) | Package  | Part Number |
|--|----------|-----------------|-----------------------|------|--------------------|------------|---------------------------------|------------------|------------------------------------|-------------------------|--|-------------|
|  |          |                 | Min                   | Max  | Min                | Max        |                                 |                  |                                    |                         |  |             |
|  |          |                 | 725V Isolated Flyback | 1    | 3.1                | 32         |                                 |                  |                                    |                         |  |             |
|  | 2        | 3.1             | 32                    | 1.2  | 12                 | 1.5W       | -                               | -                | 9 x 11.25 x 4.9                    | BGA                     | LTM8048MP  |             |
| Step-Up & Down                             | 1        | 2.8             | 18                    | ±2.5 | ±15                | Up to 0.7A | 0.2 to 2.0                      | -                | 6.25 x 11.25 x 4.9                 | BGA                     | LTM8045MP <span style="float: right;">new</span> |             |
|  |          | 4.5             | 36                    | 0.8  | 34                 | 4A         | 0.2 to 0.4                      | -                | 15 x 15 x 2.8<br>15 x 15 x 3.4     | LGA<br>BGA              | LTM4609MP  |             |
| Step-Down                                  | 1        | 4               | 36                    | 1.2  | 5                  | 0.2A       | -                               | •                | 6.25 x 6.25 x 2.3                  | LGA                     | LTM8020MP  |             |
|  |          | 4.5             | 36                    | 1.2  | 18                 | 0.6A       | -                               | -                | 6.25 x 11.25 x 3.4                 | BGA                     | LTM8029MP  |             |
|  |          | 3.6             | 36                    | 0.8  | 10                 | 1A         | 0.25 to 2.0                     | -                | 9 x 11.25 x 2.8                    | LGA                     | LTM8022MP  |             |
|  |          | 3.6             | 36                    | 0.8  | 10                 | 1A         | 0.25 to 2.0                     | •                | 9 x 15 x 2.8                       | LGA                     | LTM8031MP  |             |
|  |          | 3.6             | 36                    | 0.8  | 10                 | 2A         | 0.25 to 2.0                     | -                | 9 x 11.25 x 2.8<br>9 x 11.25 x 3.4 | LGA<br>BGA              | LTM8023MP  |             |
|  |          | 3.6             | 36                    | 0.8  | 10                 | 2A         | 0.25 to 2.0                     | •                | 9 x 15 x 2.8<br>9 x 15 x 3.4       | LGA<br>BGA              | LTM8032MP  |             |
|  |          | 3.6             | 58                    | 0.8  | 24                 | 2A         | 0.25 to 2.0                     | -                | 9 x 15 x 4.9                       | BGA                     | LTM8050MP <span style="float: right;">new</span> |             |
|  |          | 3.6             | 36                    | 0.8  | 24                 | 3A         | 0.25 to 2.0                     | -                | 9 x 15 x 4.3                       | LGA                     | LTM8025MP  |             |
|  |          | 3.6             | 36                    | 0.8  | 24                 | 3A         | 0.25 to 2.0                     | •                | 11.25 x 15 x 4.3                   | LGA                     | LTM8033MP  |             |
|  |          | 4.5             | 60                    | 2.5  | 24                 | 4A         | 0.12 to 0.5                     | -                | 15 x 15 x 4.3                      | LGA                     | LTM8027MP  |             |



Wide Temperature  
(Continued)

| Function  | Output Channels | Input Voltage (V) |     | Output Voltage (V) |     | Output Capability (Per Channel) | Sync Range (MHz) | EN55022B Certified             | Package Dimensions (mm)        | Package    | Part Number  |
|-----------|-----------------|-------------------|-----|--------------------|-----|---------------------------------|------------------|--------------------------------|--------------------------------|------------|--------------|
|           |                 | Min               | Max | Min                | Max |                                 |                  |                                |                                |            |              |
| Step-Down | 1               | 6                 | 36  | 1.2                | 24  | 5A                              | 0.1 to 1.0       | –                              | 11.25 × 15 × 2.8               | LGA        | LTM8026MP    |
|           |                 | 6                 | 36  | 0.8                | 1.8 | 5A                              | 0.2 to 1.0       | –                              | 15 × 15 × 4.9                  | BGA        | LTM8028MP    |
|           |                 | 5                 | 36  | 3.3                | 15  | 5A                              | 0.2 to 1.3       | •                              | 15 × 15 × 2.8                  | LGA        | LTM4612MP    |
|           |                 | 4.5               | 28  | 0.6                | 5   | 6A                              | 0.63 to 1.0      | •                              | 15 × 15 × 2.8                  | LGA        | LTM4606MP    |
|           |                 | 2.7               | 5.5 | 0.6                | 5   | 8A                              | 0.75 to 2.25     | –                              | 9 × 15 × 2.8                   | LGA        | LTM4608AMP   |
|           |                 | 5                 | 36  | 3.3                | 15  | 8A                              | 0.2 to 1.3       | •                              | 15 × 15 × 4.3                  | LGA        | LTM4613MP    |
|           |                 | 4.5               | 28  | 0.6                | 5   | 10A                             | –                | –                              | 15 × 15 × 2.8                  | LGA        | LTM4600HVMP  |
|           |                 | 4                 | 38  | 0.6                | 6   | 10A                             | 0.175 to 0.66    | –                              | 15 × 15 × 5.0                  | BGA        | LTM4641MP    |
|           |                 | 4.5               | 28  | 0.6                | 5   | 12A                             | 0.6 to 1.1       | –                              | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601AHVMP |
|           | 4.5             | 20                | 0.6 | 5                  | 15A | 0.4 to 0.8                      | –                | 15 × 15 × 4.9                  | BGA                            | LTM4627MP  |              |
| 2         | 2.7             | 5.5               | 0.6 | 5                  | 8A  | 0.75 to 2.25                    | –                | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA                     | LTM4616MP  |              |

MP-grade devices (indicated by the MP suffix) are tested at cold, room and hot with operation guaranteed over the –55°C to 125°C temperature range.



Precision  
Remote Sense

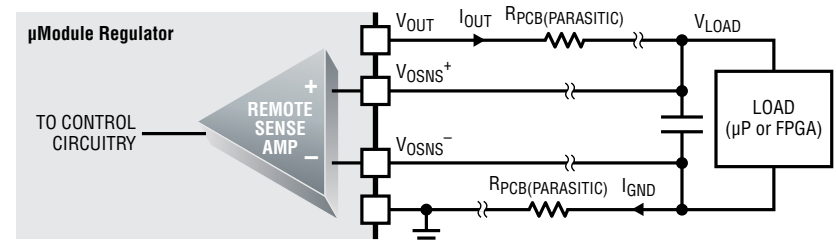
| Function  | Output Channels | Input Voltage (V) |      | Output Voltage (V) |                  | Output Current (Per Channel in Amps) | V <sub>OUT</sub> Accuracy | Sync Range (MHz) | Package Dimensions (mm)        | Package    | Part Number |
|-----------|-----------------|-------------------|------|--------------------|------------------|--------------------------------------|---------------------------|------------------|--------------------------------|------------|-------------|
|           |                 | Min               | Max  | Min                | Max <sup>1</sup> |                                      |                           |                  |                                |            |             |
| Step-Down | 1               | 4.5               | 20   | 0.6                | 3.3              | 6                                    | ±1.5%                     | 0.7 – 1.3        | 15 × 15 × 2.8                  | LGA        | LTM4603     |
|           | 1               | 4.5               | 28   | 0.6                | 3.3              | 6                                    | ±1.5%                     | 0.7 – 1.3        | 15 × 15 × 2.8                  | LGA        | LTM4603HV   |
|           | 2               | 4.5               | 26.5 | 0.6                | 3.3              | 8                                    | ±1.5%                     | 0.4 – 0.78       | 15 × 15 × 4.3                  | LGA        | LTM4628     |
|           | 1               | 4.5               | 16   | 0.6                | 3.3              | 10                                   | ±1.5%                     | 0.3 to 0.8       | 9 × 15 × 4.9                   | BGA        | LTM4649     |
|           | 1               | 4.5               | 38   | 0.6                | 6                | 10                                   | ±1.5%                     | –                | 15 × 15 × 5.0                  | BGA        | LTM4641     |
|           | 1               | 4.5               | 20   | 0.6                | 3.3              | 12                                   | ±1.5%                     | 0.6 – 1.1        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601     |
|           | 1               | 4.5               | 20   | 0.6                | 3.3              | 12                                   | ±1.5%                     | 0.6 – 1.1        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601A†   |
|           | 1               | 4.5               | 28   | 0.6                | 3.3              | 12                                   | ±1.5%                     | 0.6 – 1.1        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601AHV† |
|           | 1               | 4.5               | 28   | 0.6                | 3.3              | 12                                   | ±1.5%                     | 0.6 – 1.1        | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601HV   |
|           | 2               | 4.5               | 16   | 0.6                | 2.5              | 13                                   | ±1.5%                     | 0.4 – 0.78       | 15 × 15 × 4.4                  | LGA        | LTM4620     |
|           | 2               | 4.5               | 16   | 0.6                | 3.3              | 13                                   | ±1.5%                     | 0.4 – 0.78       | 15 × 15 × 4.4                  | LGA        | LTM4620A    |
|           | 1               | 1.5               | 5.5  | 0.8                | 3.7              | 15                                   | ±2.0%                     | 0.36 – 0.71      | 15 × 15 × 4.3                  | LGA        | LTM4611     |
|           | 1               | 4.5               | 20   | 0.6                | 3.3              | 15                                   | ±1.5%                     | 0.4 – 0.8        | 15 × 15 × 4.3<br>15 × 15 × 4.9 | LGA<br>BGA | LTM4627     |
|           | 2               | 4.5               | 15   | 0.6                | 1.8              | 18                                   | ±1.5%                     | 0.4 to 0.78      | 16 × 16 × 4.4                  | LGA        | LTM4630     |
|           | 1               | 4.5               | 20   | 0.6                | 3.3              | 20                                   | ±1.5%                     | 0.25 – 0.8       | 15 × 15 × 4.3                  | LGA        | LTM4637     |

1. When internal remote sense amplifier is in use. See the Step-Down table on page 4 for maximum output voltage when the remote sense amplifier is not in use.

† LTM4601A and LTM4601AHV have redundant pads for enhanced solder joint strength to the PCB.

## PCB Voltage Drop Compensation for 1.5% or 2.0% Voltage Regulation at the Load

If PCB design limitations require the DC/DC converter to be placed away from a high current load, the  $\mu$ Module regulators listed above offer an onboard differential sense amplifier to correct for PCB voltage losses between  $V_{OUT}$  and  $V_{LOAD}$  as well as the ground return path. As a result, these devices guarantee voltage accuracy of  $\pm 2.0\%$  or better over line, load and temperature.







Output Sequencing

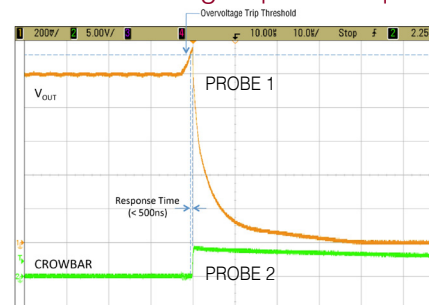
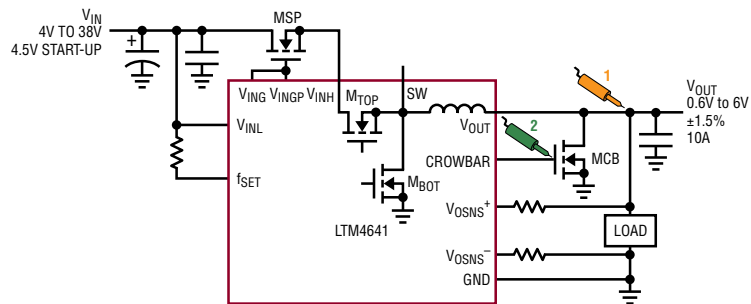


Voltage Margining

| Function                  | Input Voltage (V) |      | Output Voltage (V) |          | Output Current (Per Channel in Amps) | V <sub>OUT</sub> Margin Up/Down | Output Sequencing | Package Dimensions (mm)        | Package    | Part Number  |
|---------------------------|-------------------|------|--------------------|----------|--------------------------------------|---------------------------------|-------------------|--------------------------------|------------|--------------|
|                           | Min               | Max  | Min                | Max      |                                      |                                 |                   |                                |            |              |
| Step-Down                 | 2.375             | 5.5  | 0.8                | 5        | 4                                    | -                               | •                 | 9 × 15 × 2.3                   | LGA        | LTM4604A     |
|                           | 4                 | 14   | 0.6                | 5.5      | 4                                    | -                               | •                 | 6.25 × 6.25 × 5.0              | BGA        | LTM4624      |
|                           | 5                 | 36   | 3.3                | 15       | 5                                    | Adjustable                      | •                 | 15 × 15 × 2.8                  | LGA        | LTM4612      |
|                           | 6                 | 36   | 0.8                | 1.8      | 5                                    | Adjustable                      | -                 | 15 × 15 × 4.9                  | BGA        | LTM8028      |
|                           | 4.5               | 20   | 0.6                | 5        | 6                                    | Adjustable                      | •                 | 15 × 15 × 2.8                  | LGA        | LTM4603      |
|                           | 4.5               | 26.5 | 0.8                | 5        | 6                                    | -                               | •                 | 9 × 15 × 4.3                   | LGA        | LTM4618      |
|                           | 4.5               | 28   | 0.6                | 5        | 6                                    | Adjustable                      | •                 | 15 × 15 × 2.8                  | LGA        | LTM4603HV    |
|                           | 4.5               | 28   | 0.6                | 5        | 6                                    | Adjustable                      | •                 | 15 × 15 × 2.8                  | LGA        | LTM4606      |
|                           | 2.7               | 5.5  | 0.6                | 5        | 8                                    | 5%, 10%, 15%                    | •                 | 9 × 15 × 2.8                   | LGA        | LTM4608A     |
|                           | 5                 | 36   | 3.3                | 15       | 8                                    | Adjustable                      | •                 | 15 × 15 × 4.3                  | LGA        | LTM4613      |
|                           | 4.5               | 16   | 0.6                | 3.3      | 10                                   | -                               | •                 | 9 × 15 × 4.9                   | BGA        | LTM4649      |
|                           | 4                 | 38   | 0.6                | 6        | 10                                   | -                               | •                 | 15 × 15 × 5.0                  | BGA        | LTM4641      |
|                           | 4.5               | 28   | 0.6                | 5        | 12                                   | Adjustable                      | •                 | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601†     |
|                           | 4.5               | 20   | 0.6                | 5        | 12                                   | Adjustable                      | •                 | 15 × 15 × 2.8                  | LGA        | LTM4601-1†   |
|                           | 4.5               | 20   | 0.6                | 5        | 12                                   | Adjustable                      | •                 | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601A†‡   |
|                           | 4.5               | 20   | 0.6                | 5        | 12                                   | Adjustable                      | •                 | 15 × 15 × 2.8                  | LGA        | LTM4601A-1†‡ |
|                           | 4.5               | 20   | 0.6                | 5        | 12                                   | Adjustable                      | •                 | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601AHV†‡ |
|                           | 4.5               | 28   | 0.6                | 5        | 12                                   | Adjustable                      | •                 | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4601HV†   |
|                           | 1.5               | 5.5  | 0.8                | 5        | 15                                   | -                               | •                 | 15 × 15 × 4.3                  | LGA        | LTM4611      |
|                           | 4.5               | 20   | 0.6                | 5        | 15                                   | -                               | •                 | 15 × 15 × 4.3                  | LGA        | LTM4627      |
| 4.5                       | 20                | 0.6  | 5.5                | 20       | -                                    | •                               | 15 × 15 × 4.3     | LGA                            | LTM4637    |              |
| Multiple Output Step-Down | 2.375             | 5.5  | 0.8                | 5        | Dual: 4                              | -                               | •                 | 15 × 15 × 2.8                  | LGA        | LTM4614      |
|                           | 2.375             | 5.5  | 0.8                | 5        | Triple: 4, 4, 1.5                    | -                               | •                 | 15 × 15 × 2.8                  | LGA        | LTM4615      |
|                           | 4.5               | 26.5 | 0.8                | 5        | Dual: 4                              | -                               | •                 | 15 × 15 × 2.8                  | LGA        | LTM4619      |
|                           | 2.7               | 5.5  | 0.6                | 5        | Dual: 8                              | 5%, 10%, 15%                    | •                 | 15 × 15 × 2.8<br>15 × 15 × 3.4 | LGA<br>BGA | LTM4616      |
|                           | 4.5               | 26.5 | 0.6                | 5.5      | Dual: 8                              | -                               | •                 | 15 × 15 × 4.3                  | LGA        | LTM4628      |
|                           | 4.5               | 16   | 0.6                | 2.5      | Dual: 13                             | -                               | •                 | 15 × 15 × 4.4                  | LGA        | LTM4620      |
|                           | 4.5               | 16   | 0.6                | 5.3      | Dual: 13                             | -                               | •                 | 15 × 15 × 4.4                  | LGA        | LTM4620A     |
| 4.5                       | 15                | 0.6  | 1.8                | Dual: 18 | -                                    | •                               | 16 × 16 × 4.4     | LGA                            | LTM4630    |              |

† LTM4601, LTM4601A, LTM4601HV and LTM4601AHV offer precision remote sense (see page 8). Devices ending with “-1” do not.  
‡ LTM4601A, LTM4601A-1 and LTM4601AHV have redundant pads for enhanced solder joint strength to the PCB.

### LTM4641: 10A Step-Down $\mu$ Module Regulator with Extensive Built-In Protection for High Uptime Requirement Systems





Reliability

|   | LTM80xx                |          | LTM46xx                |          |
|---|------------------------|----------|------------------------|----------|
|   | Device Hours or Cycles | Failures | Device Hours or Cycles | Failures |
| High Temperature Bake (150°C)                     | 8,952,000              | 0        | 30,344,000             | 0        |
| Operating Life Test (125°C Equivalent)            | 1,167,000              | 0        | 2,636,000              | 0        |
| Temperature Cycle <sup>1</sup> (-65°C to 150°C)   | 10,456,000             | 0        | 16,806,000             | 0        |
| Thermal Shock Cycle <sup>1</sup> (-65°C to 150°C) | 10,373,000             | 0        | 12,896,848             | 0        |
| Board Mount Temperature Cycle (-40°C to 125°C)    | 1,022,000              | 0        | 2,118,000              | 0        |

<sup>1</sup> After J-STD-020 Level 3 preconditioning

To download the full reliability reports, visit [www.linear.com/umodule](http://www.linear.com/umodule)

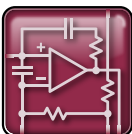


Environmental Compliance

µModule power products in BGA packages with SAC305 solder balls and LGA packages are halogen-free and RoHS compliant. Select products are also available in BGA packages with SnPb solder balls. Contact your Linear Technology authorized sales representative for details. The materials declaration file for all released products is available at: [www.linear.com/umodule](http://www.linear.com/umodule)



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Design Support

## Design and Application Support

### Thermal Performance

- AN110 LTM4601 DC/DC µModule Regulator Thermal Performance
- AN119B Powering Complex FPGA-Based Systems—Thermal Performance

### PCB Layout and Assembly

- AN117 DC/DC µModule Regulator Printed Circuit Board Design Guidelines
- Schematic Symbols and PCB Footprints

### Electrical Performance

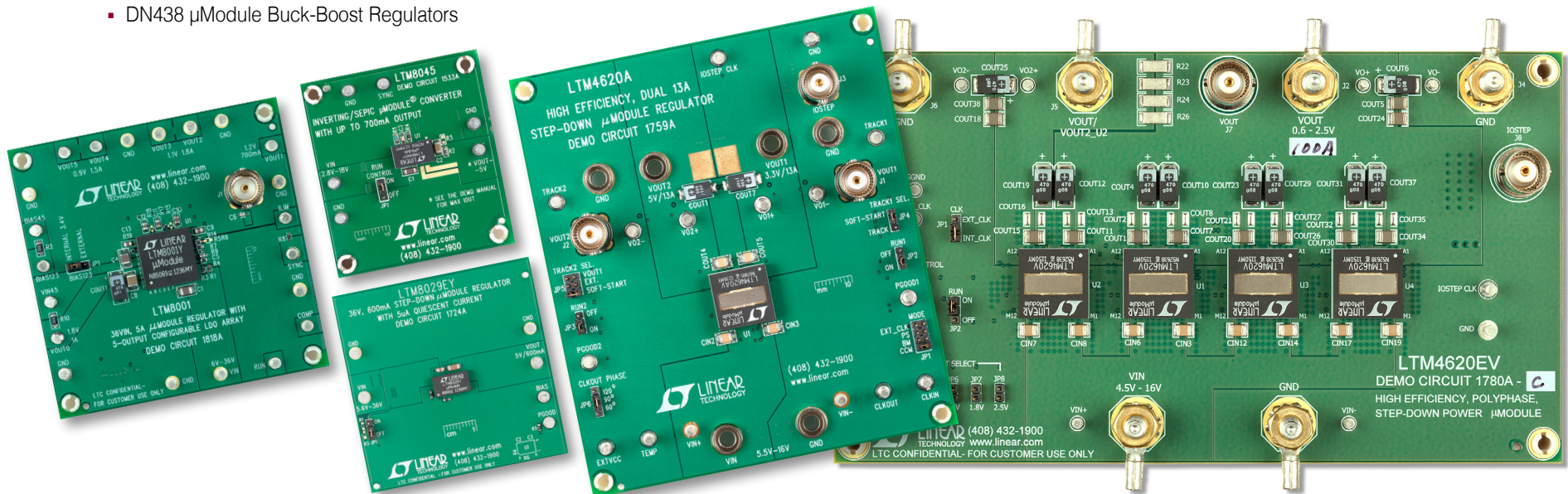
- AN119A Powering Complex FPGA-Based Systems—Electrical Performance
- DN385 10A High Performance Point-of-Load DC/DC µModule Regulator
- DN411 Simple and Compact 4-Output Point-of-Load DC/DC µModule System
- DN430 8A Low Voltage, Low Profile DC/DC µModule Regulator
- DN438 µModule Buck-Boost Regulators

### Demonstration Circuits

Demonstration circuits along with associated bill of materials (BOM) and Gerber files are available for all products. Current sharing boards are available for select regulators.



Scan to access these documents or visit [www.linear.com/umodule](http://www.linear.com/umodule)





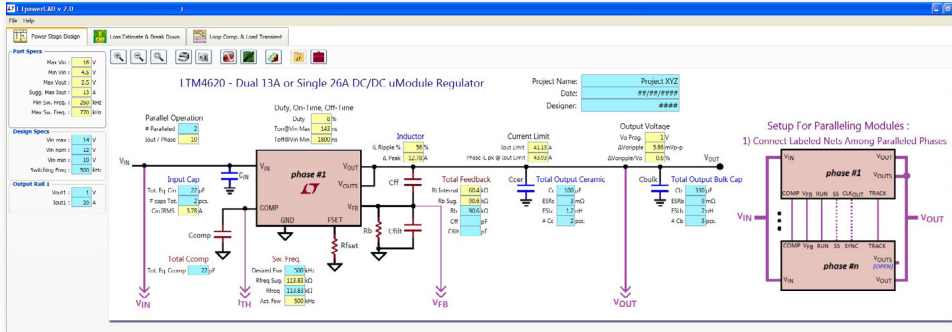
Design Support (Continued)

## New! LTpowerCAD Power Supply Design Tool - Version 2.0

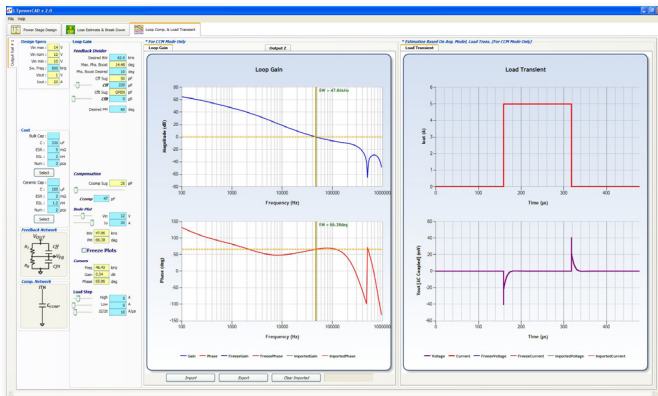
LTpowerCAD™ is a free and easy-to-use power supply design tool with a user-friendly graphical user interface (GUI) and powerful design features. It helps power supply designers to select a solution for given supply specifications, choose power stage components, estimate regulator efficiency and power loss, and optimize supply loop stability and load transient performance. It is a fast offline tool running on Windows PC, and now includes a sync-release feature to ensure your program and component library are the most up-to-date. Once a circuit design is completed, it is easily exportable to the LTspice® simulation platform.



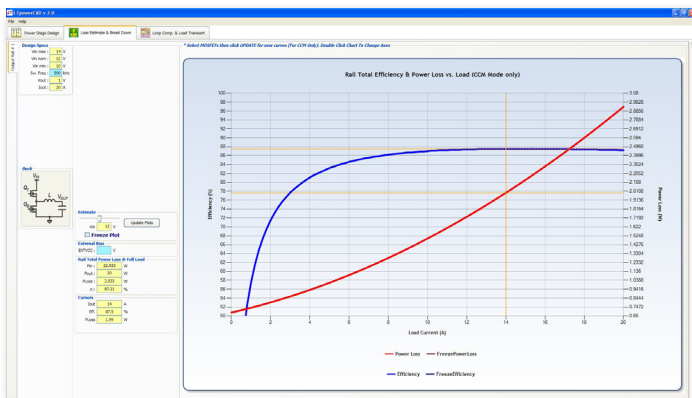
Scan to download the software or visit [www.linear.com/ltpowercad](http://www.linear.com/ltpowercad)



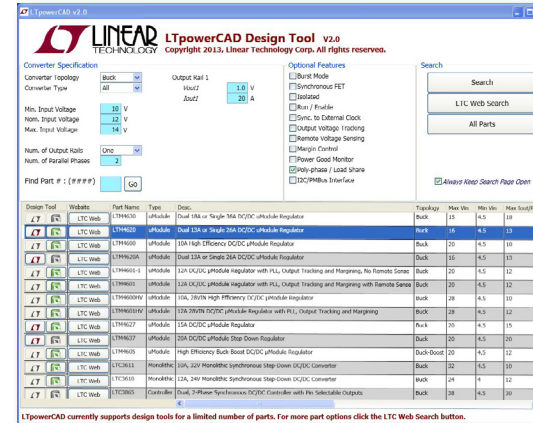
Power Stage Design



Loop Gain and Load Transient Response Analysis



Efficiency and Power Loss Analysis



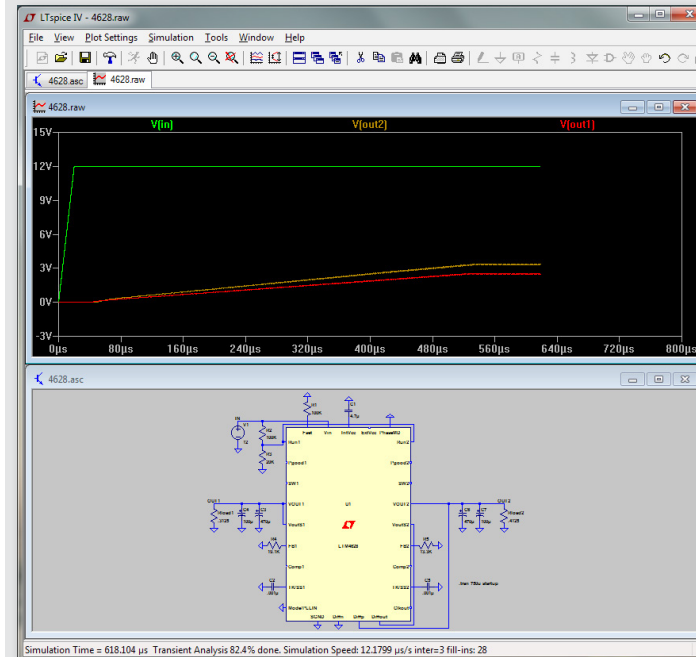
Part Search and Selection

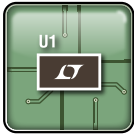
## LTspice Circuit Simulation Tool

LTspice is a free, simple and powerful circuit simulation tool with a library containing all Linear Technology products, as well as commonly used discrete passive and transistor components.



Scan to download the software or visit [www.linear.com/ltpspice](http://www.linear.com/ltpspice)





PCB Assembly

## PCB Assembly Guidelines

For detailed assembly and rework recommendations, the following documents are available for download at: [www.linear.com/umodule](http://www.linear.com/umodule)

- Assembly Considerations for Linear Technology  $\mu$ Module LGA Package
- Assembly Considerations for Linear Technology  $\mu$ Module BGA Package
- $\mu$ Module LGA Package Care and Assembly Instructions



TechClips

## TechClip Videos

A library of technical videos covering key performance topics on  $\mu$ Module Power Products

LTM4611 - Ultralow  $V_{IN}$ , 15A DC/DC  $\mu$ Module Regulator

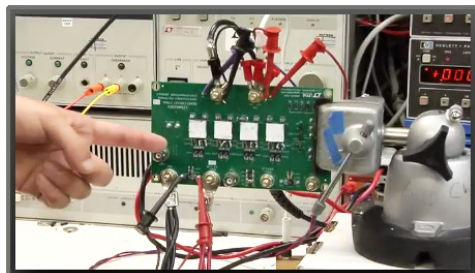
- Efficiency
- Thermal
- Ripple Measurement (shown)



Scan to watch video  
<http://video.linear.com/57>

LTM4620 – 20V, Dual 13A or Single 26A DC/DC  $\mu$ Module Regulator

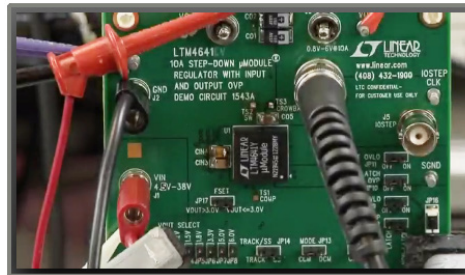
- Efficiency (shown)
- Thermal Performance
- Short Circuit Protection
- Current Sharing at 100A



Scan to watch video  
<http://video.linear.com/124>

LTM4641 - 38V, 10A DC/DC  $\mu$ Module Regulator with Advanced Input and Load Protection

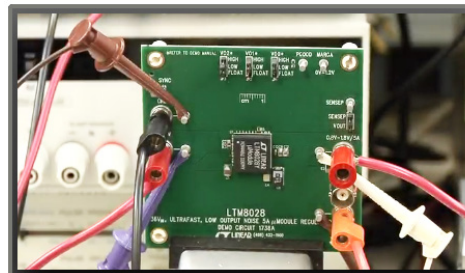
- Efficiency
- Output Overvoltage Response
- Over Current Protection (shown)
- 80V Input Surge Protection
- Paralleled Output at 20A



Scan to watch video  
<http://video.linear.com/144>

LTM8028 - 36V<sub>IN</sub>, UltraFast™, Low Output Noise 5A  $\mu$ Module Regulator

- Load Regulation (shown)
- Output Noise Spectrum
- Power Loss & Thermal



Scan to watch video  
<http://video.linear.com/154>