

LPM/LMM616 Series

AC-DC Modular Power Supply

5, 10, 12, 20, 24, 36 & 48 V Single-Output Modules
10 & 20 V Dual-Output Modules



The LPM/LMM616 Series is a modular 1600 Watt AC-DC power supply that provides a market-leading power density of 18 watts per cubic inch and has an extra low 1U profile. The LMM is the medically approved version. From here on only the LPM version will be discussed, differences for the LMM version will be noted. The LPM616 offers the flexibility of a modular architecture and the combination of high efficiency and high power density.

Designed for use where a unique set of voltage and current requirements is needed, the supply's six slots can be configured with PCB-based output modules to deliver up to twelve outputs. The LPM output modules operate in any chassis position and can provide up to 1600 watts total power from a 150 VAC input and 1300 watts from a 100 VAC input. Forced-air cooling with airflow direction from input to output is provided by internal fans.

For LPM616 supplies using less than the six-slot capability, blanking plates are installed for safety purposes and to optimize airflow within the chassis. The supplies are pre-set with default output module settings or with the customer's desired output settings prior to delivery. The LPM616 chassis can be populated with the output modules listed in Module Selection table. Conformal coating is available on request, please consult with the factory.

Applications

LPM616 (Industrial)

- Industrial equipment
- Telecommunications
- Test and measurement
- Automation and Peripherals
- Audio/broadcast
- Linear and rotary motion

LMM616 (Medical)

- Imaging Equipment and Ultrasound
- Anesthesiology
- Surgical Devices
- Diagnostic Equipment
- Patient Beds
- Home Healthcare

Key Features & Benefits

- **Wide input voltage range from DC to 440 Hz AC**
- **Standard output voltages of 1.5 to 54 VDC**
- Efficiencies up to 86% typical
- Extra-Low 1U profile: 1.6 inch
- Overall Dimensions: 303.7 x 127 x 40.64 mm (11.9 x 5 x 1.6 in)
- High power density design of 18 Watts/cubic inch
- 1 to 6 isolated output slots, fully user configurable
- Power Factor Correction (PFC) IEC 61000-3-2 compliant
- 1300 W @ 115 VAC or 1600 W @ 230 VAC of total output power
- Zero-load operation
- Single-wire current sharing
- Universal input AC range
- Individual control signals on each module
- Auxiliary power 5 V (1 A)

1. MODEL SELECTION

| MODULE | P/N ³ | NO. OF SLOTS REQUIRED | FACTORY-SET SINGLE-OUTPUT [VDC] | MODULE ADJUSTABLE RANGE [VDC] | MAX. OUTPUT CURRENT [AMPS] | MAX. OUTPUT POWER ² [WATTS] |
|--------|------------------|-----------------------|---------------------------------|-------------------------------|----------------------------|--|
| E | LPM126-OUTA1-05 | 1 | 5 | 2.0 to 5.3 | 53 | 265 |
| F | LPM126-OUTA1-12 | 1 | 12 | 5.2 to 15 | 22 | 265 |
| G | LPM126-OUTA1-24 | 1 | 24 | 14 to 30 | 11 | 265 |
| H | LPM126-OUTA1-36 | 1 | 36 | 29 to 44 | 7.4 | 265 |
| J | LPM126-OUTA1-48 | 1 | 48 | 43 to 54 | 5,5 | 265 |
| K | LPM109-OUTA1-10 | 1 | 15 | 1.5 to 15 | 6 | 90 |
| L | LPM109-OUTA1-20 | 1 | 30 | 3 to 32 | 3 | 90 |
| M | LPM118-OUTA2-10 | 1 | 15 | 2x 1.5 to 15 | 2x 6 | 2x 90 |
| N | LPM118-OUTA2-20 | 1 | 30 | 2x 3 to 32 | 2x 3 | 2x 90 |
| 0 | LPM100-BLAN | 1 | Blank Panel (Slot Cover) | | | |

¹ To determine your desired power supply's part number, please refer to *Figure 2* for a detailed part number description. Use the LPM Configurator on our website or use our contacts page to locate a distributor for further assistance.

² For the power derating specification please see section 1.4 below.

³ Add -C for Conformal coating option.

1.1. OUTPUT VOLTAGE ADJUSTMENT

Each LPM616 module's output voltage is adjustable by means of a trimmer located on the module. For the modules E<->J the trimmer is accessible through the adjustment hole located on the bottom of the power supply (*Figure 10*). For the modules K<->N the trimmer is accessible from rear side of the power supply (*Figure 5*).

1.2. PARALLEL CONNECTIONS

Depending on certain situations where current requirements exceed one module's capability, the configurator will process a solution using parallel connections. Paralleling busbars are available to make connections requiring higher current needs. For correct current sharing functionality, it is necessary to interconnect Current Share pins of the modules that will operate in parallel using signal wires. Only E-J modules can be connected in parallel. For more details read the section 10.3, see *Figure 15*.

1.3. SERIAL CONNECTIONS

To increase output voltage, it is possible to connect modules in series. Serial busbars are available (see section 10.4) to make connections requiring higher voltage needs. The output of LPM616 is rated as SELV circuit, so the output voltages are guaranteed to be less than 60V. The series combination of modules can exceed this SELV voltage, so in this case the users must take adequate precautions to prevent direct contact with conductive parts. The maximal total voltage **must not exceed 200 V**. It is recommended to only connect the same modules with same output current rating.

The voltage sense pins VS+, VS- available on modules LPM126 must be connected according to *Figure 17*.

1.4. POWER DERATING

When specifying an LPM616 power supply in an application it is necessary to ensure that LPM616-CHAS and modules (LPM126, LPM118 and LPM109) are operating within their power output capabilities, taking into account the temperature derating and input voltage derating. The maximum permissible output power that may be drawn from LPM616-CHAS and modules is given in the *Figure 1*.

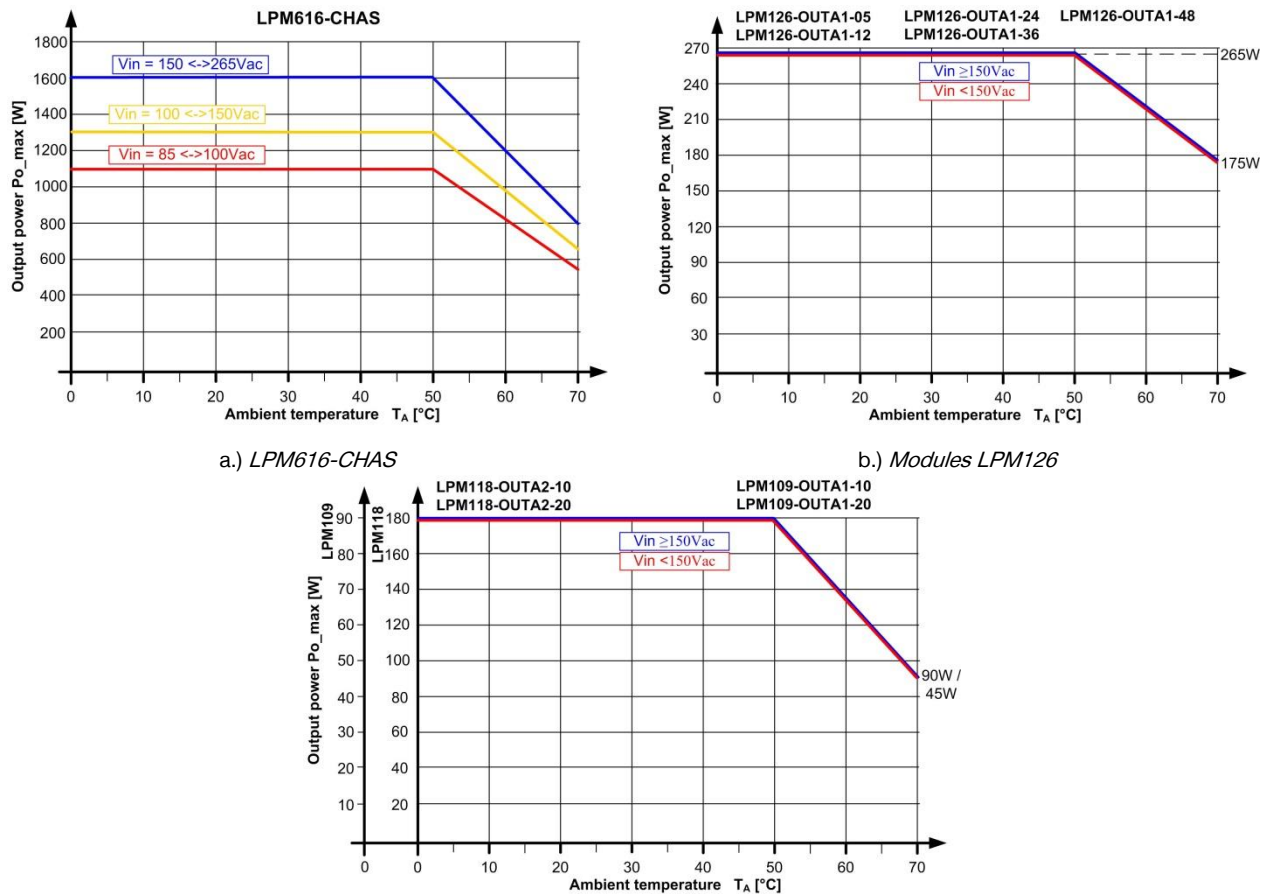


Figure 1. Power Derating Curves

2. PART NUMBERING AND ORDERING INFORMATION

2.1 CHASSIS IDENTIFICATION NUMBERING

First left-to-right sequence of the part number (4 characters):

LPM616 Low Profile Modular 6-slot, 1600 W, with single-phase AC input. (Figure 2)

NOTE: Chassis and modules are RoHS-6 compliant.

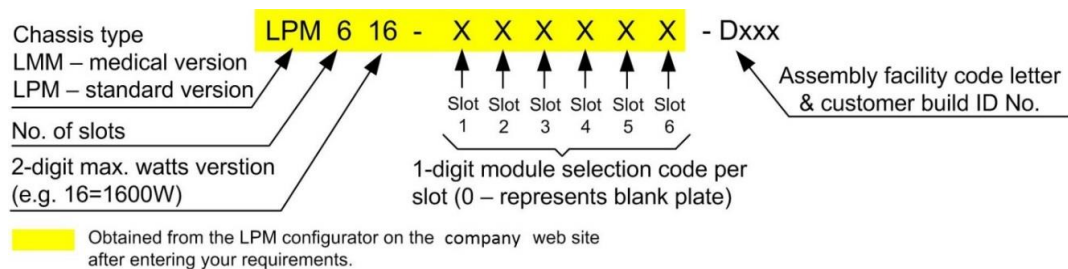


Figure 2. LPM 6-Slot Model Part Number Description


Example: After entering your requirements, the web Configurator optimized part number recommended could be: LPM616-000HEG-DXXX which represents: Low Profile Modular Series with single-phase AC input, 6-slot, 1600 W chassis with modules of: 3x blank panel "0" in slots 1 to 3, modules H, E, G in slots 4 to 6, respectively. Besides the blank panels in slots 1-3, the example's modules in this case would represent desired DC output voltages as follows: Slot 4 = H for 36V, Slot 5 = E for 3.3V and Slot 6 = G for 24V.

Assembly facility code and customer build ID No. are established during actual power supply assembly.

The slots numbering when viewing the unit from the rear, or output side is 1 - 6 from left to right.

3. SAFETY SPECIFICATIONS

3.1 SAFETY APPROVALS

| LPM616 (INDUSTRIAL) | LMM616 (MEDICAL) | |
|--|--|--|
| <ul style="list-style-type: none"> UL/CSA 60950-1 2nd IEC 60950-1 2nd EN 60950-1 2nd CE Mark for LVD | <ul style="list-style-type: none"> UL/CSA 60601-1, 3rd IEC 60601-1, 3rd EN 60601-1, 3rd |  |

3.2 INSULATION SAFETY RATINGS

| TEST POINTS | MINIMUM TEST VOLTAGE | INSULATION SAFETY RATING |
|--------------------|----------------------|--------------------------|
| Input-to-Chassis | 2120 VDC / min. 1 s | Basic Insulation |
| Input-to-Output | 4240 VDC / min. 1 s | Reinforced Insulation |
| Outputs-to-Chassis | 200 VDC / min. 1 s | Functional Insulation |
| Output-to-Output | 200 VDC / min. 1 s | Functional Insulation |

4. ENVIRONMENTAL AND RELIABILITY SPECIFICATIONS

4.1 ENVIRONMENTAL SPECIFICATION

| PARAMETER | CONDITIONS / DESCRIPTION | MIN | NOM | MAX | UNITS |
|-----------------------|--|-----|-----|---------------|-------------------|
| Cooling | Internal DC fan, air intake is from the AC connector side exiting at the DC module side | | | | |
| Audible Noise | Single unit, 6 modules assembled and full loaded, on a table at 1m distance | | 56 | 70 | dBA |
| Operating Temperature | Full power; derated linearly from 100% load @ 50°C to 50% load @ 70°C (for detail see section 1.4) | -20 | 25 | 50 | °C |
| Storage Temperature | | -40 | | 75 | °C |
| Humidity | 95% relative humidity @ 25 °C, non-condensing | | | | |
| Vibration | Operating: Swept 5-500-5 Hz profile, 3 axis, 5 sweep cycles per axis Non-operating: Swept 5-500-5 Hz profile, 3 axis, 5 sweep cycles per axis | | | 1 | Gpk |
| Shock | Operating: 11 ms, half sine, 10 shocks per face Non-operating: 11 ms, half sine, 3 shocks per face | | | 4 20 40 | Gpk Gpk Gpk |

4.2 RELIABILITY

| PARAMETER | CONDITIONS / DESCRIPTION | MIN | NOM | MAX | UNITS |
|-------------------|--|---------|-----|-----|-------|
| Calculated MTBF | According to MIL-HDBK217, Ground benign 30°C, NOTE: Calculation was done for LPM616-EFGHJJ | 250,000 | | | hours |
| Demonstrated MTBF | Tamb = 25°C | 250,000 | | | hours |

5. FAULT PROTECTION

| PARAMETER | CONDITIONS / DESCRIPTION | MIN | NOM | MAX | UNITS |
|-------------------------------|---|--|-----|------------------|-------------------------|
| Input Fuse | One fuse, non-user serviceable, located on line leg of AC input, Fast Acting type | | 16 | | A |
| Inrush Current Limitation | Provided by NTC | See <i>Input Specification</i> section | | | |
| Short Circuit Protection | Provided by Current Limit circuit | 105 ¹ | | 125 ¹ | % I _{o_nom} |
| Output Overvoltage Protection | Latching (unit needs to be turned-off and on) | 10 | | 25 | % V _{o_nom} |
| Over Temperature | OT with auto restart | | | 70 | °C amb |

¹ 100-150% for K, M modules
100-200% for L, N modules

6. EMC SPECIFICATIONS

6.1 EMC IMMUNITY

| PARAMETER | CONDITIONS / DESCRIPTION | CRITERION |
|------------------------------------|--|----------------------|
| Electrostatic Discharge (ESD) | IEC/EN61000-4-2; GR-1089 R2-1, R2-2, R2-3 Level 4: contact: ±8 kV, air: ±15 kV | Perform, criterion B |
| RF Susceptibility | IEC/EN 61000-4-3; Level 3: 10 V/m; 80 MHz to 1000 MHz; AM 80%, 1 kHz radiated; RF electromagnetic field | Perform, criterion A |
| Fast transient / burst | IEC/EN 61000-4-4; Level 3; ±2 kV, 5 kHz electrical fast transient / burst immunity test | Perform, criterion B |
| Surge | IEC61000-4-5, level 3; line to earth: ±2 kV, line to line: ±1 kV surge immunity test | Perform, criterion B |
| RF conducted disturbance | IEC/EN 61000-4-6; Level 3; GR-108; 10V, 0.15 to 80 MHz, AM 80%, 1kHz | Perform, criterion A |
| Voltage dips / short interruptions | IEC/EN 61000-4-11; Voltage dips, interruptions and variations. (Interpretation: dip below V _{i min} with P _{o nom} = hold-up time 10 ms) 1a: Dip 30%, 100 ms | Perform, criterion B |
| | 1a: Dip 30%, 200 ms | Perform, criterion B |
| | 1a: Dip 60%, 10 ms | Perform, criterion A |
| | 1a: Dip 60%, 100 ms | Perform, criterion B |
| | 1a: Dip >95%, 10 ms (interruption) | Perform, criterion A |
| | 1a: Dip >95%, 100 ms (interruption) | Perform, criterion B |

6.2 EMC EMISSION

| PARAMETER | CONDITIONS / DESCRIPTION | CRITERION |
|------------------------------------|---|--|
| Conducted Emission EN55022, FCC | EN 55022, FCC – EN 55022, and CISPR 22 Class B, FCC 47CFR15 unintentional radiators; standalone at all nominal input voltages and measured in Po1: 0, 50%, 100%; signal connections open | Class B; min. 3dB/μV margin |
| Radiated Emission EN55022, FCC | EN 55022, FCC – EN 55022, and CISPR 22 Class B, FCC 47CFR15 unintentional radiators; standalone at all nominal input voltages and measured in Po1: 0, 50%, 100%; signal connections open | Radiated Class B QSP / AVG min. 3 dB margin |
| Input Current Harmonics | EN 61000-3-2, sine wave input, Class D; measured standalone at all V _{in} nominal at power levels between 0 and rated | Pass |

7. ELECTRICAL SPECIFICATIONS

7.1 INPUT SPECIFICATIONS

| PARAMETER | CONDITIONS / DESCRIPTION | MIN | NOM | MAX | UNITS |
|-------------------------|--|------|-----------|------------------|-------|
| Input AC Voltage Range | Continuous Voltage Range Po = 1100 W from 85-100 VAC Po = 1300 W from 100-150 VAC Po = 1600 W from 150-264 VAC | 85 | 115/230 | 264 | VAC |
| Input DC Voltage Range | Po = 1100 W from 120-140 VDC Po = 1300 W from 140-210 VDC Po = 1600 W from 210-380 VDC | 120 | | 380 ³ | VDC |
| Input Overvoltage Range | At max. power, no input OVP shutdown | | | 300 | VAC |
| Ground continuity | | | | 0.1 ¹ | Ohm |
| Leakage Current | @ 264 VAC, 60 Hz, Commercial LPM / Medical LMM | | | 1.5 / 0.5 | mA |
| Frequency | AC line | 47 | 50/60/400 | 440 | Hz |
| Power Factor | Active PFC meets requirements of EN 61000-3-2 at full load ,120/230 VAC input | 0.98 | | | |
| Input Current | Steady state, 85 VAC at 1100W | | | 16 | A rms |
| Inrush Current | 180 VAC, Max Power, 25°C, acc. prETS300-132-1 230 VAC, Max Power, 25°C, acc. prETS300-132-1 (Repeat rate >1min) | | 60 | | A pk |
| Efficiency ² | Vi = 230 VAC 100% loading | 85 | 86 | | % |
| | Vi = 230 VAC 30-80% loading | 82 | 83 | | % |
| | Vi = 115 VAC 100% loading | 82 | 83 | | % |
| | Vi = 115 VAC 30-80% loading | 78 | 80 | | % |

¹ For any combination of output modules, any valid load and voltage setting

² Efficiency typical for standard configuration EFGHJJ and nominal output voltage settings

³ Vin max = 240 Vdc for LMM version

7.2 INPUT - SIGNALS, FEATURES AND INDICATOR DESCRIPTIONS

| SIGNAL NAME | PIN | DESCRIPTION |
|---|-----------------------|---|
| Auxiliary Output - 5V - | 1,2 vs 3,4 (RTN_D) | Output is available when the AC input is over 85 VAC. The output nominal output voltage is 5.0 V at maximum current rating of 1.0A. Over current protection occurs above 1.5 A. The output is referenced to logic return, RTN_D. |
| Input AC Indication - PFAIL - | 5 | Open Collector output with 20 mA pull-down capability referenced to logic return RTN_D. PFAIL open or High state indicates the warning that the input is out of the limit (the input voltage falls below 85 VAC or rises over 264 VAC) 5 ms before the output goes below the lower regulation limit. PFAIL will turn-off the green Input OK LED. |
| Fan Fail / OTP Indication - FAN_FAIL - | 6 | PFAIL LOW state indicates that the input voltage is within the operating range. Open Collector output pin with 20 mA pull-down capability referenced to logic return RTN_D. FAN_FAIL open or High state indicates the fan fail / over temperature condition min. 100 ms before the unit shuts-down. A fan fail / OTP will turn-off the green FAN OK LED. FAN_FAIL LOW state indicates normal fan operation, no OTP. |

7.3 OUTPUT SPECIFICATIONS

| PARAMETER | CONDITIONS/DESCRIPTION | MIN | NOM | MAX | UNITS |
|------------------------------|--|-------------------------------------|---------------------------|---------------------------|----------|
| Output Power | Two fans for internal cooling | | 1600 | | W |
| Output DC Voltages / Modules | All output modules work in any chassis position and are max 1U high PCB-based | | | - | |
| Current Share ³ | Active single-wire current share (modules E-J) Maximum difference in currents between two modules – percentage of one module nominal current. | | | ±10 | % |
| Line Regulation | Input from 85 to 264 VAC, 80% load | | 1.0 | | % Vo_nom |
| Load Regulation | From 0-100% load, Input >180 VAC, Vo_nom | | 1.0 | | % Vo_nom |
| Thermal Drift | After 15-minute warm-up period | | 0.02 | | %/°C |
| Total Regulation | Variation of line, load and temperature drift | | 2.0 | | % Vo_nom |
| Output Adjust. Range | | See <i>Module Selection Table 1</i> | | | |
| Dynamic Response | Deviation for 10-90% or 90-10% load changes at a rate of 1A/μs, (constant current mode, Vo reach 1% band around V _o set) | | | 4 ^{1,2} 2000 | % μs |
| | Deviation for 50-100% or 100-50% load steps with 1A/μs rate. (constant current mode, Vo reach 1% band around V _o set) | | | 3 ¹ 400 | % μs |
| Output Ripple & Noise | BW = 20MHz; Filter 10nF/10uF; over line and load, 25°C | | | 1% of Vo_nom ¹ | mVpk-pk |
| CM Noise | Output to chassis, over line and load (Measured across 50 Ohms, with 10 μH / 10nF in parallel) | | 220 | 500 | mVpp |
| Overshoot | Output voltage overshoot at turn-on | | 4 | | % Vo_nom |
| Turn-On Characteristics | Turn ON at minimum and nominal output current | | Monotonous characteristic | | - |
| Turn-Off Characteristics | Turn OFF at minimum and nominal output current | | Monotonous characteristic | | - |
| Turn-On Time | Time required for output within regulation after initial application of AC input | | | 1.5 | s |
| | Time required for output within regulation after removing inhibit | | | 100 | ms |
| Hold-up Time | Vo is required to stay within 95% regulation after AC is removed. Measured from the last AC peak, VAC min and full load. | 10 | | | ms |
| Remote Sense ³ | Total compensation for cable losses | | 250 | 500 | mV |
| Over-current Protect. | Automatic recovery / Hiccup by K-N modules | | | 130 - 180 | % |

7.4 OUTPUT - SIGNALS, FEATURES AND INDICATOR DESCRIPTIONS

7.4.1 MODULES E, F, G, H, J

| SIGNAL NAME | PIN | DESCRIPTION |
|---------------------------------------|-----|--|
| Positive Sense Wire - VS+ - | 1 | Output voltage sense wire. Internally connected to Vout+ via 51 Ω. It is recommended to connect sense wire at positive load point. |
| Negative Sense Wire - VS- - | 2 | Output voltage sense wire. Internally connected to Vout- via 51 Ω. It is recommended to connect sense wire at negative load point. |
| Current Share - CSH - | 3 | Common wire for parallel connected modules to achieve proper current sharing between the modules. Referenced to the Common pin. Interconnect CS pin on all parallel working modules. Active current share pin enables control of output voltage. Pulling-up this pin to 5V is possible to increase the output voltage. Pull-down of this pin has no effect. Voltage on this pin is 3.5V at nominal module current. |
| Common | 4 | Reference pin to CSH |
| N/C | 5 | |
| N/C | 6 | |
| Output Good Indication - PG_HI - | 7 | Open collector output with 20mA pull-down capability, max. 15V (recommended Rpull-up=1k, Vcc=5V). Referenced to PG_LO. PG_HI open or High state indicates that the module output voltage is below lower regulation limit. A PG_HI fail state turns the GREEN DC OK LED to RED. PG_HI LOW state indicates the module output voltage is within normal operation limits. |
| - PG_LO - | 8 | Reference pin to PG_HI |
| Output Inhibit Function - INH_HI - | 9 | An opto-isolated input with 2-10mA current capability. Apply +(3-15)V on INH_HI and RTN on INH_LO (e.g. from the Auxiliary Output 5V) to activate the inhibit function. INH_HI OPEN OR LOW state ENABLES the module output. INH_HI HIGH state INHIBITES the module output. |
| - INH_LO - | 10 | Reference pin to INH_HI |

7.4.1 MODULES E, F, G, H, J

| SIGNAL NAME | PIN | DESCRIPTION |
|---|-----|--|
| - INH_LO_B - | 1 | Reference pin to INH_HI_B |
| Output Inhibit Function - INH_HI_B - | 2 | An opto-isolated input with 2-10 mA current capability. Apply +(3-15) V on INH_HI_B and RTN on INH_LO_B (e.g. from the Auxiliary Output 5 V) to activate the inhibit function. INH_HI OPEN OR LOW state ENABLES the module output. INH_HI HIGH state INHIBIT the module output. |
| - PG_LO_B - | 3 | Reference pin to PG_HI_B |
| Output Good Indication - PG_HI_B - | 4 | Open collector output with 20 mA pull-down capability, max. 15 V (recommended Rpull-up = 1 k, Vcc = 5 V). Referenced to PG_LO_B. PG_HI open or High state indicates that the module output voltage is below lower regulation limit. A PG_HI fail state turns the GREEN DC OK LED to RED. PG_HI LOW state indicates that the module output voltage is within normal operation limits. |
| N/C | 5 | |
| N/C | 6 | |
| - INH_LO_A - | 7 | Reference pin to INH_HI_A |
| Output Inhibit Function - INH_HI_A - | 8 | An opto-isolated input with 2-10mA current capability. Apply +(3-15) V on INH_HI_A and RTN on INH_LO_A (e.g. from the Auxiliary Output 5 V) to activate the inhibit function. INH_HI OPEN OR LOW state ENABLES the module output. INH_HI HIGH state INHIBIT the module output. |
| - PG_LO_A - | 9 | Reference pin to PG_HI_A |
| Output Good Indication - PG_HI_A - | 10 | Open collector output with 20mA pull-down capability, max. 15 V (recommended Rpull-up = 1 k, Vcc = 5 V). Referenced to PG_LO_A. PG_HI open or High state indicates that the module output voltage is below lower regulation limit. A PG_HI fail state turns the GREEN DC OK LED to RED. PG_HI LOW state indicates that the module output voltage is within normal operation limits. |

7.5 VISUAL ALARMS DESCRIPTION

| ALARM NAME | LED POSITION | DESCRIPTION |
|---------------|---|--|
| Input AC Good | Front panel – LED2 (see Fig.6) | ON state LED indicates operation within specified input voltage range. GREEN LED indicator goes to an OFF condition on PFAIL signal failure state. |
| Fan Good | Front panel – LED1 (see Fig.6) | ON state LED indicates normal fan operation and no OTP status. GREEN LED indicator goes to an OFF condition on FAN_FAIL / OTP signal failure state. |
| Output Good | Module connector / rear side (see Fig.7.1) | GREEN LED indicates that module output voltage is within normal operation limits. GREEN LED indicator goes to RED on PG_HI signal failure state. |

8. CONNECTOR DETAILS

8.1 INPUT CONNECTOR INFORMATION

LPM616 front panel connector pinout refers to *Figure 3* and chapter 8.2 and 8.3. The input signal connector is Cvilux part number: CI3306P1H10, the mating part is Cvilux CI3306S0010, Molex 50-57-9406 or Taiwan King Pin P553L-06(LF).

NOTE: See chapter 10.1 Mating Connections and cables for Input cable information.



Figure 3. LPM616 Front Panel Connectors Pinout View

8.2 INPUT POWER CONNECTOR PINOUT

| SIGNAL NAME | PIN # | TYPE | RECOMMENDED WIRES | V MAX I MAX |
|-------------|-------|----------------------|--------------------------------------|----------------|
| Earth | | Earth / Chassis | Min. 1,5 mm ² | |
| AC Neutral | N | Input Power AC | e.g. Interpower 86230120 | 264 Vrms |
| AC Line | L | Input Power AC Fused | Max. torque on screws (M4x6): 1,5 Nm | 16 Arms |

CAUTION:

During the operation must be the input power connector protected by the plastic cover!
The cover may be removed (by the help of a screwdriver) only when the input cable is disconnected from the mains.

8.3 INPUT SIGNAL CONNECTOR PINOUT

(Mating connector: Molex 50-57-9406, Pins: Molex 16-02-0082)

| SIGNAL NAME | PIN # | WIRE COLOR | TYPE | SIGNAL REFERENCE | LOW LEVEL HIGH LEVEL | V MAX I MAX |
|-------------|-------|------------|---------------------------------|------------------|-------------------------|----------------|
| +5V | 1 | Red | Aux Output | RTN_D | - | 5.0 VDC |
| +5V | 2 | Red | Aux Output | RTN_D | - | 1.0 ADC |
| RTN_D | 3 | Black | Logic Reference Potential | - | - | - |
| RTN_D | 4 | Black | Logic Reference Potential | - | - | - |
| PFAIL | 5 | Yellow | Open Collector Output + ZD 5.6V | RTN_D | <400mV@ 20mA Pull up | - 20 mA |
| FAN_FAIL | 6 | Green | Open Collector Output + ZD 5.6V | RTN_D | <400mV@ 20mA Pull up | - 20 mA |



| | | |
|--|---|---|
| Asia-Pacific +86 755 298 85888 | Europe, Middle East +353 61 225 977 | North America +1 408 785 5200 |
|--|---|---|

8.4 MODULE POWER OUTPUTS PINOUT

8.4.1 MODULES E, F, G, H, J - A, B BUS-BAR

| SIGNAL NAME | PIN # | TYPE | SIGNAL REFERENCE | LOW LEVEL HIGH LEVEL | V MAX I MAX |
|-------------|-------|-----------------|------------------|----------------------|------------------------------|
| Vout+ | Vout+ | Output Power DC | Vout- | - | See Module Selection Table 1 |
| Vout- | Vout- | Output Power DC | - | - | See Module Selection Table 1 |

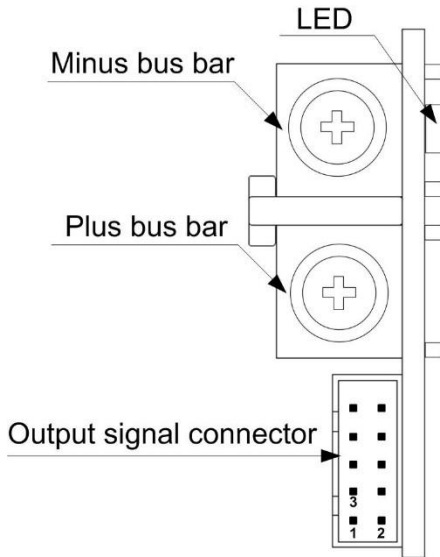
Connector type: Bus-bar see Figure 4
Mating part: Ring terminal for M4 screw, with appropriate cross section for wire.

8.4.2 MODULES K, L, M, N

| SIGNAL NAME | PIN # | TYPE | SIGNAL REFERENCE | LOW LEVEL HIGH LEVEL | V MAX I MAX |
|---------------------|--------|-------------------|------------------|----------------------|------------------------------|
| Vout1+ | Vout1+ | Output 1 Power DC | Vout1- | - | See Module Selection Table 1 |
| Vout1- | Vout1- | Output 1 Power DC | - | - | See Module Selection Table 1 |
| Vout2+ ¹ | Vout2+ | Output 2 Power DC | Vout2- | - | See Module Selection Table 1 |
| Vout2- ¹ | Vout2- | Output 2 Power DC | - | - | See Module Selection Table 1 |

¹ valid only for two outputs modules M and N.

Connector type: Phoenix Contact 1803277
Mating part: Phoenix Contact 1850660



Note: Bus bar screw M4x10mm, max. torque 1.5Nm

Figure 4. Modules E, F, G, H, J Power Output Connectors

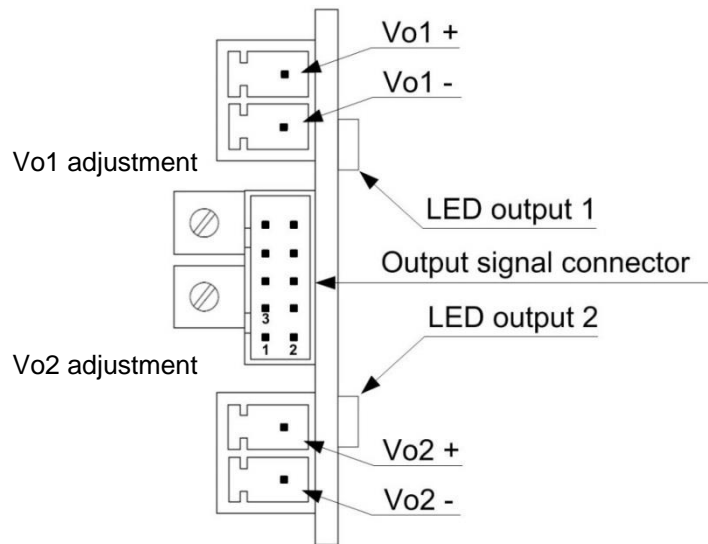


Figure 5. Modules K, L, M, N Power Output Connectors

8.5 MODULE SIGNAL OUTPUT CONNECTOR PINOUT

The output signal connector provides signal information across its 10-pin output, for position of the output signal connector please see *Figure 4* and *Figure 5*.

Connector type: JST S10B-PHDSS-B
Mating part: JST housing PHDR-10VS, Pins SPHD-002T-P0.5 (AWG 28-24) or SPHD-001T-P0.5 (AWG 26-22)

8.5.1 MODULES E, F, G, H, J

| SIGNAL NAME | PIN # | TYPE | SIGNAL REFERENCE | LOW LEVEL HIGH LEVEL | V MAX I MAX |
|-------------|-------|--|------------------|------------------------------------|----------------|
| VS+ | 1 | Output voltage sense wire. Internally connected to Vout+ via 51 Ω | Vout+ | - | 0.5 V 10 mA |
| VS- | 2 | Output voltage sense wire. Internally connected to Vout- via 51 Ω | Vout- | - | 0.5 V 10 mA |
| CSH | 3 | Active Current Share pin | Common | - | 5 V - |
| Common | 4 | Reference pin to CSH | - | - | - |
| N/C | 5 | - | - | - | - |
| N/C | 6 | - | - | - | - |
| PG_HI | 7 | Open collector output | PG_LO | <400mV@5mA Pull up | 15 V 20 mA |
| PG_LO | 8 | Reference for PG_HI | - | - | - 20 mA |
| INH_HI | 9 | Input, protected by 18V Zener diode | INH_LO | LED with a serial resistor 2 kOhms | 15 V 10 mA |
| INH_LO | 10 | Reference for INH_HI | - | - | - 10 mA |

8.5.2 MODULES K, L, M, N

| SIGNAL NAME | PIN # | TYPE | SIGNAL REFERENCE | LOW LEVEL HIGH LEVEL | V MAX I MAX |
|-------------|-------|-------------------------------------|------------------|------------------------------------|----------------|
| INH_LO_B | 1 | Reference for INH_HI_B | - | - | - 10 mA |
| INH_HI_B | 2 | Input, protected by 18V Zener diode | INH_LO_B | LED with a serial resistor 2 kOhms | 15 V 10 mA |
| PG_LO_B | 3 | Reference for PG_HI_B | - | - | - 20 mA |
| PG_HI_B | 4 | Open collector output | PG_LO_B | <400mV@5mA Pull up | 15 V 20 mA |
| N/C | 5 | - | - | - | - |
| N/C | 6 | - | - | - | - |
| INH_LO_A | 7 | Reference for INH_HI_A | - | - | - 10 mA |
| INH_HI_A | 8 | Input, protected by 18V Zener diode | INH_LO_A | LED with a serial resistor 2 kOhms | 15 V 10 mA |
| PG_LO_A | 9 | Reference for PG_HI_A | - | - | - 20 mA |
| PG_HI_A | 10 | Open collector output | PG_LO_A | <400mV@5mA Pull up | 15 V 20 mA |

9. MECHANICAL SPECIFICATIONS

| PARAMETER | CONDITIONS/DESCRIPTION |
|--------------------|---|
| Overall Dimensions | 303.7 x 127 x 40.64 mm 11.9 x 5.0 x 1.6 in |
| Weight | 1.94 kg (including 6 modules) |

All drawing dimensions are shown in millimeters, unless otherwise noted.

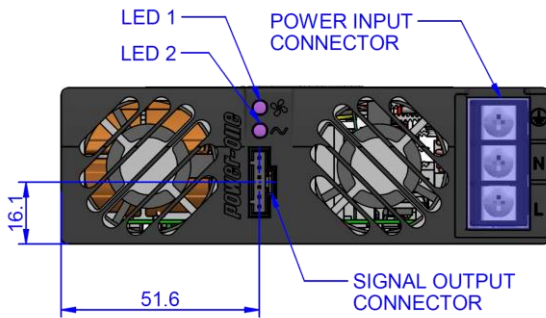


Figure 6. Front View

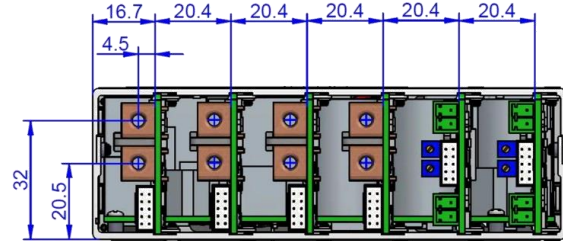


Figure 7. Rear View

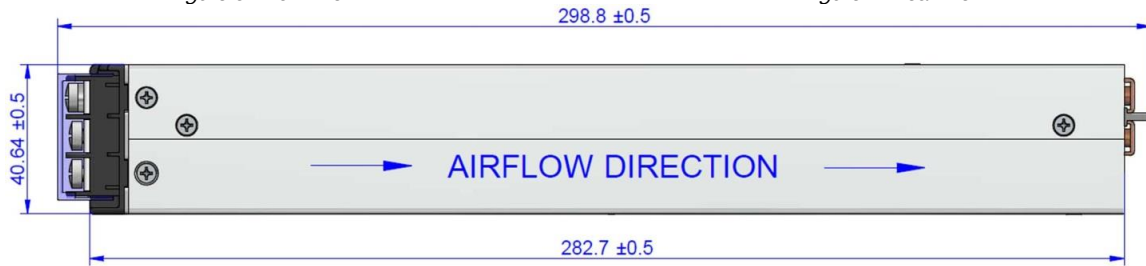


Figure 8. Side View

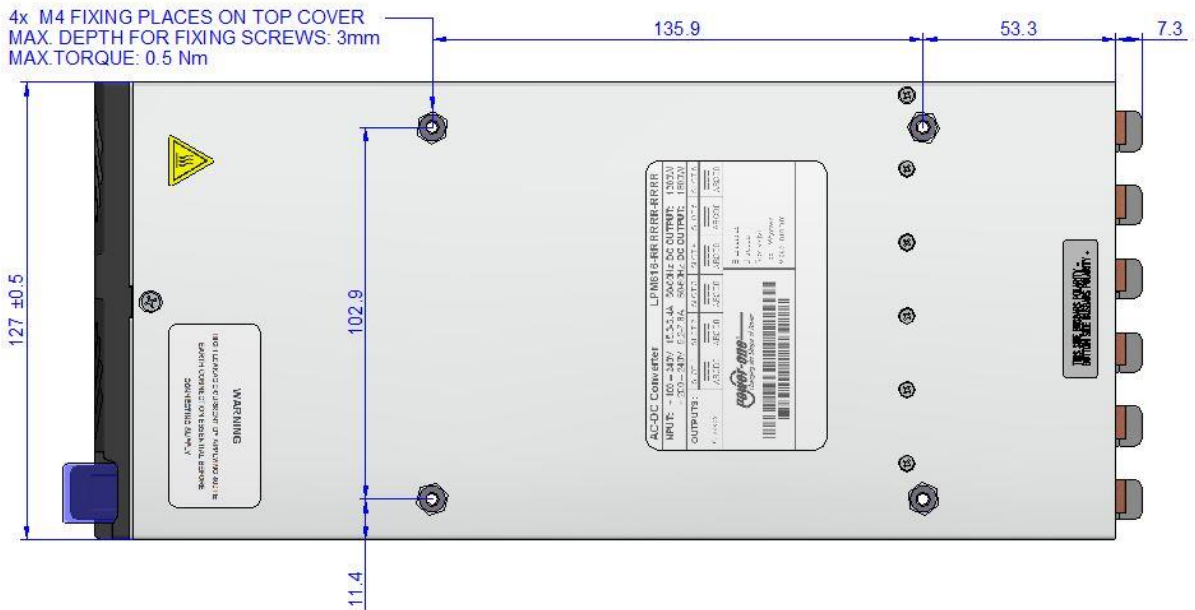


Figure 9. Top View

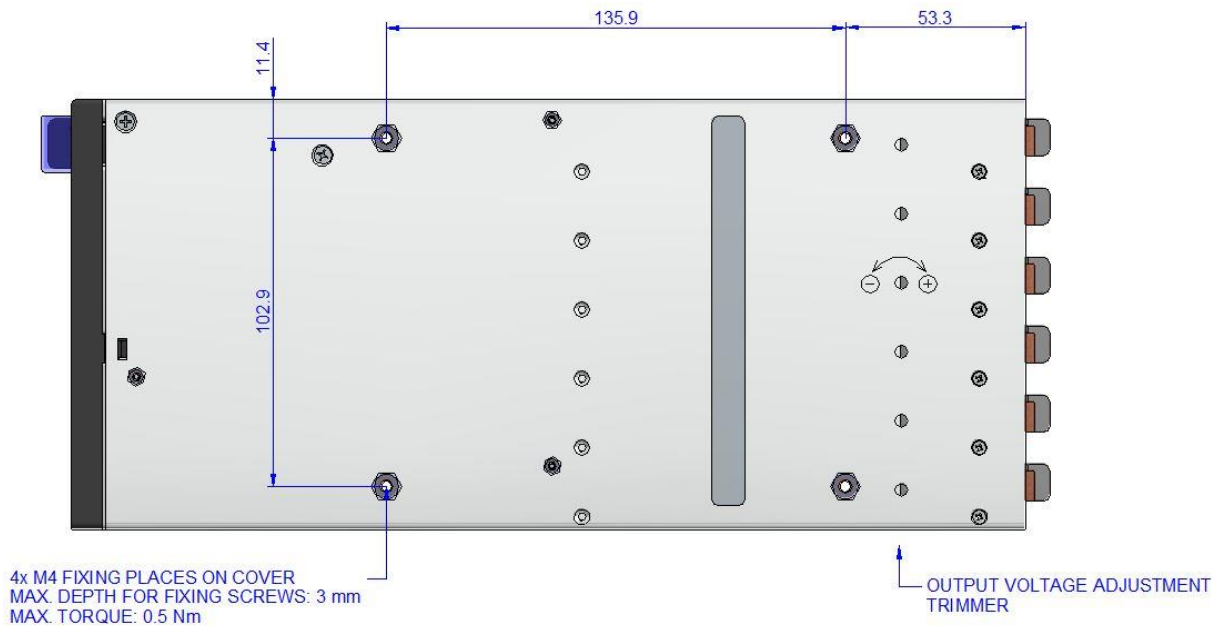


Figure 10. Bottom View

10. ACCESSORIES

10.1 MATING CONNECTIONS AND CABLES

All the power and signal cables and mating connectors are not included in the LPM616 standard package. These all need to be ordered extra.

| | | |
|---|--|----------------------------------|
| Front panel signal cable: | Bel Power Solutions accessory LPM000-LEAD-03 | see Figure 11 |
| Output signal cable: CSH cable for parallel modules: | Bel Power Solutions accessory LPM000-LEAD-04 BPS accessory LPM000-LEAD-20 (2 modules), LPM000-LEAD-40 (3, 4 modules), LPM000-LEAD-60 (5, 6 modules) | see Figure 12a see Figure 12b |
| Mating connector: | JST, housing PHDR-10VS, pins SPHD-002T-P0.5 (AWG 28-24) | |
| Output power cable (for LPM126): | 14AWG – 10AWG depend on the output current, min. thermal class 105°C, lug terminal 4mm 6mm ² | |
| Output power cable (for LPM109/118): | Bel Power Solutions accessory LPM000-LEAD-05, | see Figure 12c |



Figure 11. LPM000-LEAD-03: Front panel signal cable (1.8 m)

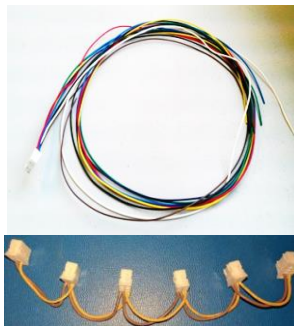


Figure 12a,b - LPM000-LEAD-04, LPM000-LEAD-60: Output signal, CSH cable (0.4 - 0.75m)





Figure 12c - LPM000-LEAD-05: Output power cable for modules K-N (0.75m)

10.2 SIGNAL OUTPUT WIRE COLORS

| PIN # | SIGNAL NAME BY MODULES E, F, G, H, J | SIGNAL NAME BY MODULES K, L, M, N | WIRE COLOR |
|-------|--------------------------------------|-----------------------------------|------------|
| 1 | VS+ | PG_HI_A | Red |
| 2 | VS- | PG_LO_A | Blue |
| 3 | CSH | INH_HI_A | Yellow |
| 4 | Common | INH_LO_A | White |
| 5 | N/C | N/C | - |
| 6 | N/C | N/C | - |
| 7 | PG_HI | PG_HI_B | Violet |
| 8 | PG_LO | PG_LO_B | Brown |
| 9 | INH_HI | INH_HI_B | Black |
| 10 | INH_LO | INH_LO_B | Green |

10.3 PARALLELING BUSBARS (ONLY FOR MODULES E-J)

| ITEM | DESCRIPTION | MODEL |
|----------------|---|--|
| LPM000-BBAR-07 | Busbar for parallel connection of two modules, central screw M5, max. 100A ¹ . Two pieces are in one package LPM000-BBAR-07. |  |
| LPM000-BBAR-08 | Busbar washer with 1 opening for odd module paralleling. Two pieces are in one package LPM000-BBAR-08. |  |

NOTES:

- ¹ For load current over 100 A use two or more cables connected to separate busbars.
- ² By using busbars (paralleling modules) you will need also the signal output leads LPM000-LEAD-04, one for each connected module.
- ³ The interconnection is shown in *Figure 15* (especially all pins 3 - CSH and all pins 4 - Common must be reconnected). Modules K-N cannot be connected in parallel.

The example of LPM616-0000EE-DXXX assembly configuration (two modules in parallel) is shown in *Figure 13*. One set of busbars LPM000-BBAR-07 + 2x LPM-LEAD-04 are necessary for connection.

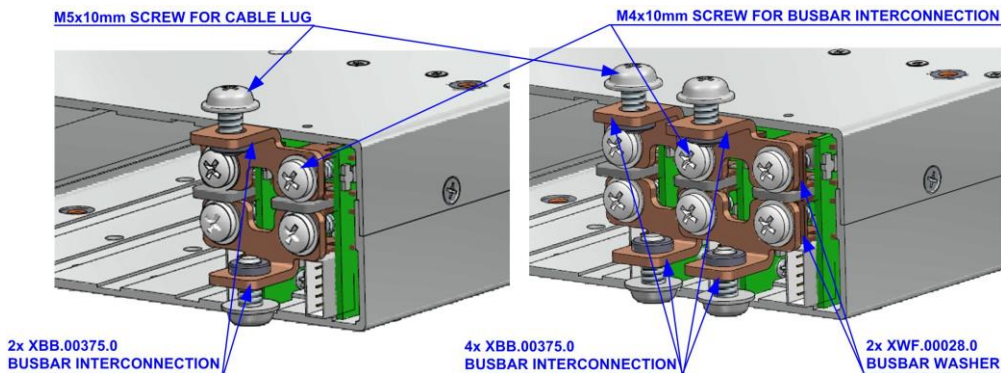


Figure 13. LPM616-0000EE-DXXX Parallel Configuration

Figure 14. LPM616-000EEE-DXXX Parallel Configuration

An example of LPM616-000EEE-DXXX assembly configuration (three modules in parallel) is in the *Figure14*. Two sets of busbars LPM000-BBAR-07 + one set of LPM000-BBAR-08 + 3x LPM-LEAD-04 is necessary for connection.

Note, for odd number of modules in parallel it is necessary to use also one set of busbar washers LPM000-BBAR-08.

To connect the load for higher output currents, use more cables for each pole. For example, for 300 A output current (LPM616-EEEEEE-DXXX) connect minimal three power cables for each pole (3x 42mm² for one pole). Use min. 105°C thermal class isolation.

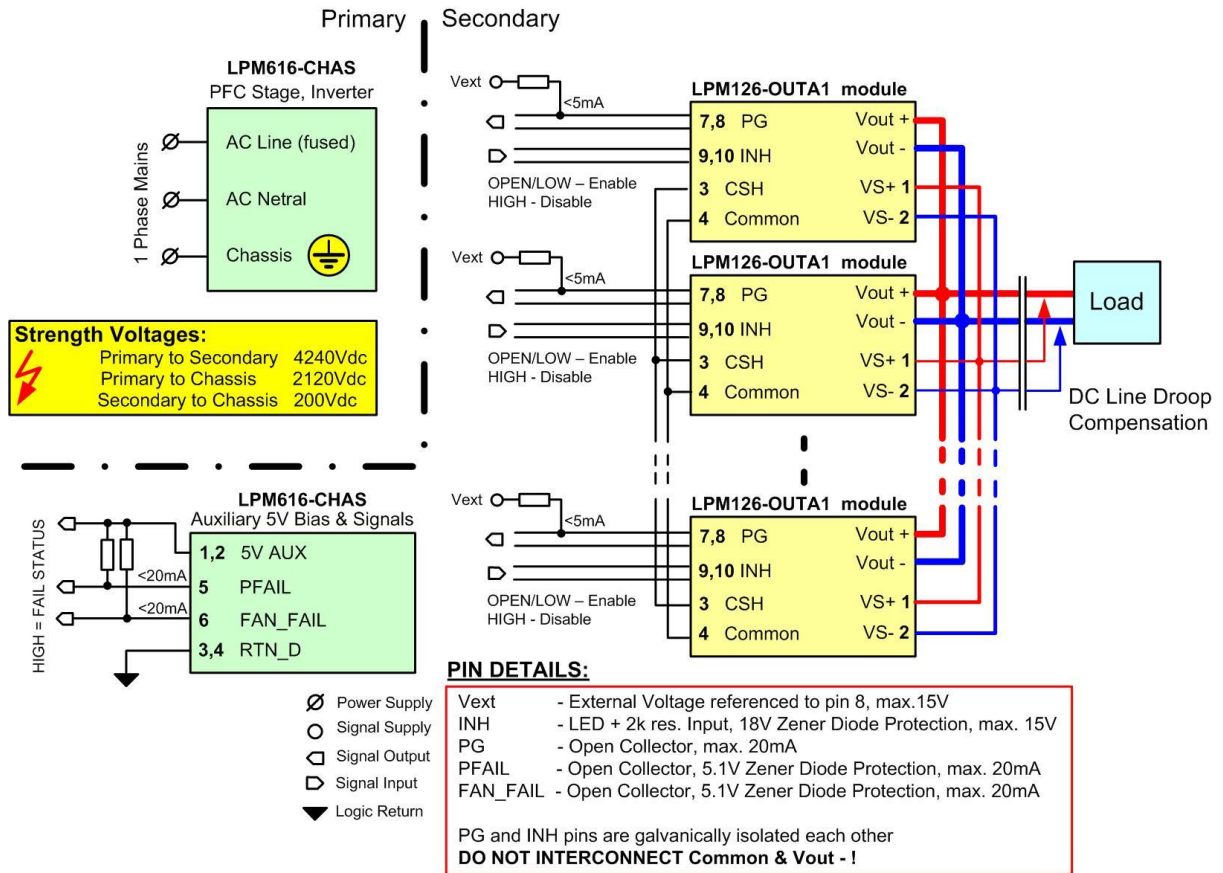
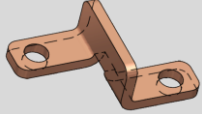


Figure 15. LPM616 – Paralleling Connection Diagram for LPM126 Modules

10.4 SERIAL BUSBARS (ONLY FOR MODULES E-J)

| ITEM | DESCRIPTION | MODEL |
|----------------|--|---|
| LPM000-BBAR-09 | Busbar for serial connection of two modules. |  |

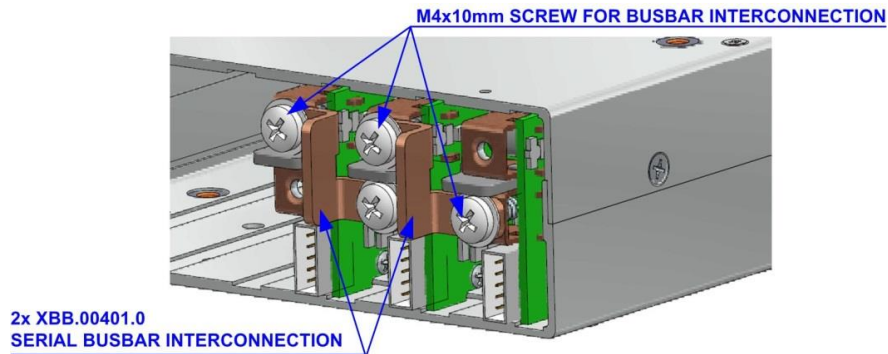


Figure 16. LPM616-000EEE-DXXX Serial Configuration

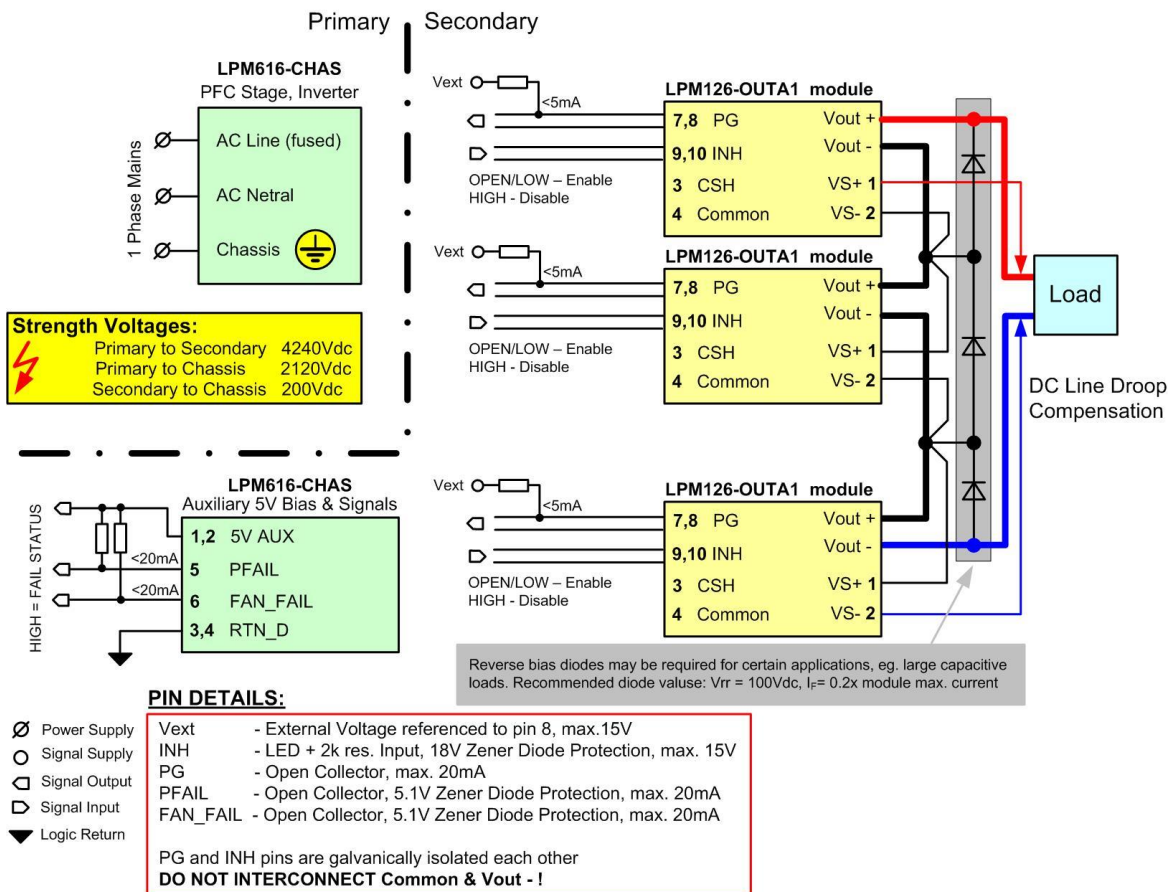


Figure 17. LPM616 - Serial Connection Diagram for LPM126 Modules

For more information on these products consult: tech.support@psbel.com

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