



DSL REMOTE POWER FEEDER: 48V_{DC} INPUT, SINGLE ± 60 TO ± 100 V_{DC}/100mA OUTPUT

FEATURES

- ◆ Designed for Span Powering of ETSI & ANSI DSL Systems
- ◆ High Efficiency
- ◆ Input to Output Isolation
- ◆ Adjustable Output Voltage (120 to 200Vdc)
- ◆ Output Leakage
- ◆ Overload and No-Load Indications
- ◆ Outputs of Identical Units can be Paralleled for Increased Output Power
- ◆ 90 Days Warranty
- ◆ UL1950, CSA22.2-950 and EN60950 Approved
- ◆ Open Frame Package
- ◆ High Reliability SMD Assembly



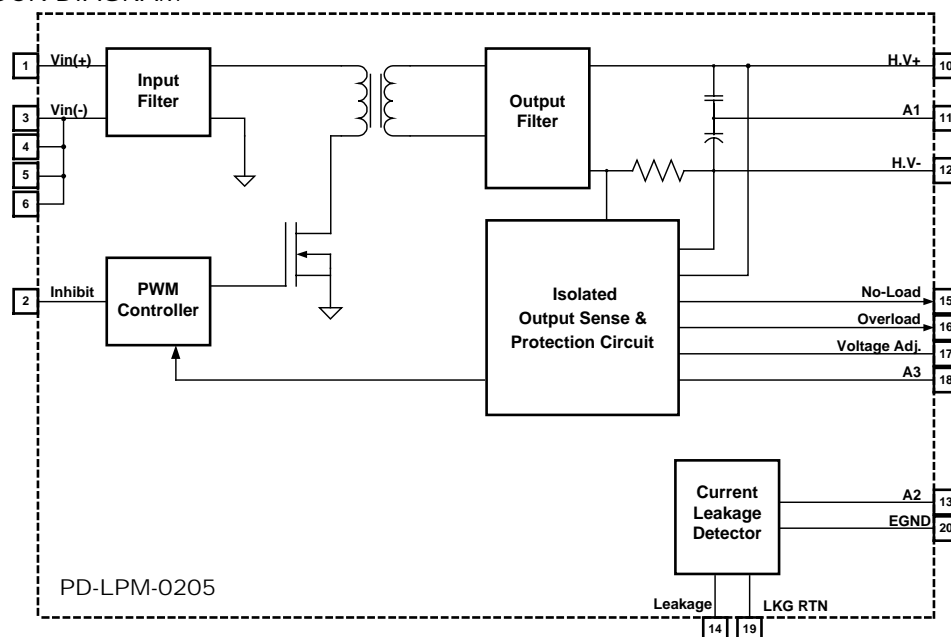
APPLICATIONS

- ◆ Open Frame Package
- ◆ T1/E1 HDSL Voice Pair Gain Systems
- ◆ DSL Remotely Energized Systems
- ◆ Supports Single Loop Configurations
- ◆ General Remote Power Feeding Applications
- ◆ 48Vdc Telecommunications Systems
- ◆ ETSI & ANSI Compatible Systems

DESCRIPTION

The PD-LPM-0205 is a 12 Watt DC/DC converter module designed especially for remote power feeding applications. The module may be located at the feeding side (LTU) and operates from 40 to 60Vdc input voltage. It provides an isolated balanced output of ± 60 to ± 100 Vdc/60 to 100mA. The module is designed to support peak output power of up to 14W at 30% duty cycle and maximum 3 seconds in duration. The output may be configured as a balanced, negative or positive supply rail in reference to earth ground. Output voltage and current limits may be adjusted in the specified range by adding an external resistor. A high precision current limiting circuit is implemented on the output. This feature enables delivery of maximum allowed current through the line, while maintaining the TNV safety requirements. The module also provides unique reporting signals, which are required for DSL terminals, indicating output line current leakage to earth ground, and Overload and No-Load conditions. For simple identification of the faulty wire, different indications are given for positive or negative leakage. The unit is protected against input under/over voltage, output overload and shorted output for an unlimited period. The PD-LPM-0205 is designed to work optimally while working in conjunction with the PowerDsine PD-NPM-03xx module series in the remote subsystem. Optimized design for HDSL voice pair gain system requirements simplify integration and reduce overall system cost and time to market.

INTERNAL BLOCK DIAGRAM

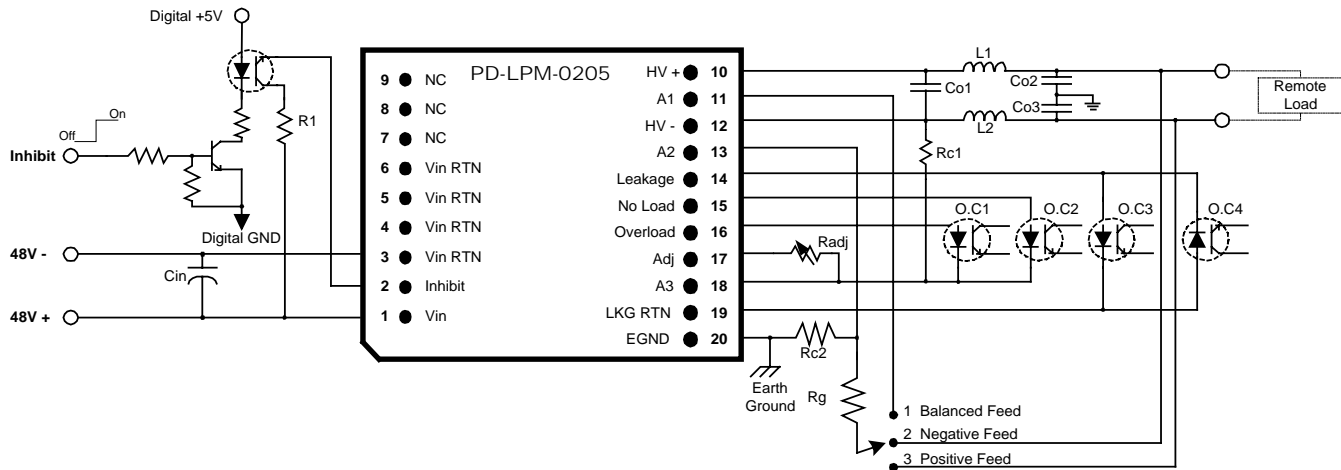




PD-LPM-0205

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TYPICAL APPLICATION 1



BALANCED/UNBALANCED OUTPUT CONFIGURATION

1. Output configured as a balanced to ground power supply $V_{out} = \pm V$ ($\pm 60 - \pm 100V$)
2. Output configured as a negative to ground power supply $V_{out} = -2*V$ ($-120 - -200V$)
3. Output configured as a positive to ground power supply $V_{out} = +2*V$ ($+120 - -200V$)

REPORT LINES

O.C1 - Activated when output is overloaded or shorted.

O.C2 - Activated when output is loaded with less than No Load current threshold.

O.C3 - Activated when leakage current from positive line to ground exceeds the leakage current threshold.

O.C4 - Activated when leakage current from negative line to ground exceeds the leakage current threshold.

COMPONENTS RECOMMENDATIONS

The system requirements and noise susceptibility should be considered when selecting output filter components.

Typical values are given below.

$C_{in} = 1$ to $47\mu F$, $ESR < 0.5\Omega$, $Co1 = 1$ to $47\mu F$, $ESR < 0.3\Omega$, $Co2, Co3 = 1$ to $22nF$, Ceramic Capacitor.

$L1, L2 = 100$ to $1000\mu H$, rated current $> 0.25A$.

R_g = Limits the current flowing through ground path (leakage current). Its value depends on output configuration and system requirements.

Example: For Output Voltage = $\pm 60V$ balanced configuration during fault conditions, when one of the outputs is shorted to the ground, the maximum voltage across R_g may be $60V$. Use $R_g = 3K\Omega$ to limit the maximum leakage current to $20mA$.

$Rc1$: This resistor determines the over current trip point.

$Rc1 = \infty$ (Not connected): Over current trip points = Set Output Current Limit.

$Rc2$: This resistor determines the leakage detection trip point.

$Rc2 = \infty$: Leakage current trip point = $2mA$ Typical

Over Current and Leakage Current detection levels are set according to the following calculation:

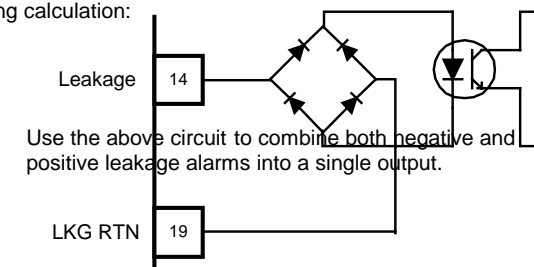
$$I_{overcurrent} = \frac{60 \times (Rc1 + 5)}{Rc1} [mA]$$

$$I_{leakage} = 2 + \frac{124}{Rc2} [mA]$$

$$R1 = 30-47K\Omega / 250mW$$

$$R_{adj} (\text{between pin 10 to 12}) \cong \frac{2915 - 14.3V_{out}}{V_{out} - 121} [K\Omega]$$

V_{out} measured between HV + and HV -





TYPICAL APPLICATION 2

The schematic diagram illustrates the internal structure of the HV module. It features two main functional blocks: an **Output filter** and a **Leakage Detector**, both enclosed in dashed boxes. The **Output filter** is connected to the high voltage supply lines: **H.V.+** (pin 10), **0** (pin 11), and **H.V.-** (pin 12). The **Leakage Detector** is connected to pin 13 through a 62Ω resistor and to pin 20. Pin 13 is also connected to a resistor R_g and a **Negative Feed** terminal. Pin 20 is connected to a **Positive Feed** terminal. The module also includes **Opto-Coupler 1** (pins 14 and 19) and **Opto-Coupler 2** (pins 14 and 19) for **Leakage Indication**. External connections for **+ High Voltage**, **0**, and **- High Voltage** are shown on the right. A ground symbol is connected to pin 20.

INHIBIT CIRCUIT

PD-LPM-0205

1. Input voltage (nominal 48Vdc, tolerance 40-60Vdc) must be applied by isolated DC source complying with the earthed SELV or TNV requirements of the UL1950, Third edition.
2. DC input must be protected by UL Listed fuse rated maximum T750mA, 250V (slow blow).
3. When applicable, protection from excessive voltage on the output should be tested in end-use equipment.

**DSL REMOTE POWER FEEDER: 48V_{DC} INPUT, ±60 TO ±100V_{DC}/100mA OUTPUT****ABSOLUTE MAXIMUM RATINGS***

Input Voltage	- 0.5 to 100V
Inhibit Input Voltage	- 0.5 to 30V
Storage Temperature	- 50°C to 100°C

*These are stress ratings. Exposure of the device to any of these conditions may adversely effect long-term reliability. Proper operation other than as specified in the PERFORMANCE / FUNCTIONAL SPECIFICATIONS is

PERFORMANCE / FUNCTIONAL SPECIFICATIONS

Unless otherwise indicated, the data below applies to the specified operating input voltage, load (resistive), and temperature range. C_{in}=10μF.

Parameter	Conditions	Min	Typ	Max	Unit
Input Data					
Input Voltage		40		60	V
Input Current	V _{in} = 40V, P _{out} =14W			450	mA
Input Reflected Ripple	Measured on C _{in} =10μF, ESR≤1Ω External Cap			300	mVp-p
Output Data					
Total Output Power	Continuous			12	W
	Peak @ Duty Cycle ≤ 0.3, T _{on} ≤ 3Sec			14	W
Output Voltage ²	Full Load (100mA), Radj = Not Connected	±58.5	±60.0	±61.5	V
Output Ripple and Noise	BW=20MHz measured on external output capacitor: 1μF<C _o 1<47μF, ESR≤0.3Ω @ 25°C Output Current > 5mA		100	150	mVp-p
Output Voltage Setting Range ²	Via an external resistor, Radj	±60		±100	V
Total Output Voltage Regulation (line/load/temperature)	Load: 20% to 100%			2	%
	Load: 0 to 100%			4	%
Current Limit Set	R _{c1} = Not Connected	54	56	58	mA
Output Current Limit Setting Range, see Typ. Application 1	Output current limit can be adjusted via external resistors, R _c , up to the rated maximum.	56		100	mA
Efficiency	40V ≤ V _{in} ≤ 60V, Load=12W, V _{out} =120V		87		%
	40V ≤ V _{in} ≤ 60V, Load=12W, V _{out} =200V		81		%
Control and Telemetry					
Inhibit Input High (Output Disabled)	Referenced to V _{in} RTN input (Pin 3-6)	2.4			V
Inhibit Input Low (Output Enabled)	Referenced to V _{in} RTN input (Pin 3-6)			0.5	V
Inhibit Input Current	V _{inhibit} = 0V		0		μA
	V _{inhibit} = 5V	350	430	500	μA
Overload Detection	Overload threshold is equal to the set output current limit				
No-Load Detection	% of maximum set output current limit	15	20	25	%
Leakage Detection	R _{c2} = Not Connected	1	2	3	mA
Protection Circuitry					
Input Over-Voltage Under Voltage Threshold	Trip Point	75			V
		33		40	V
Overload/Short Circuit Protection	Overload / short circuit conditions			Unlimited	Sec
General Data					
Internal Switching Frequency		200	220	240	kHz
Isolation Input to Output	1500Vdc, 10Sec	10			MΩ
Reliability	Calculated MTBF. Continuous operation at T _A = 40°C. Calculation method: Relux Bellcore Software Version 5.30.	1,000,000			Hours
Ambient Temperature (T _A)	Continuous Operation with No Derating Continuous Operation Derated by 250mW/°C.	-40		60	°C
		60		85	°C
Humidity	Non-Condensing, Per IEC 68-2-56			93	%

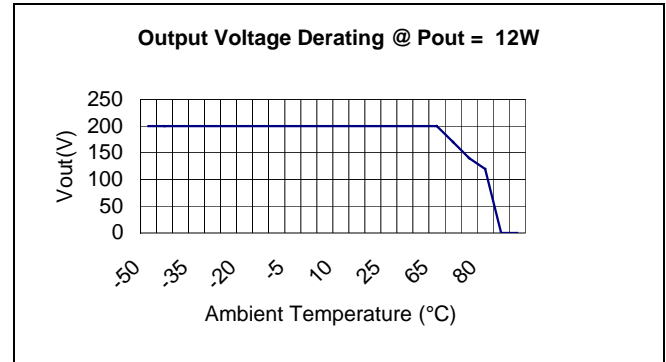
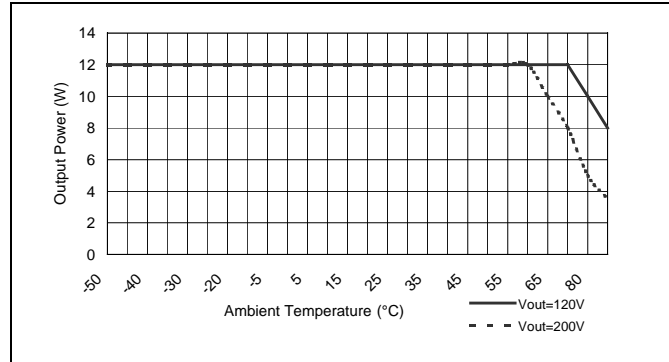
1. Outputs: Overload, No-Load and Leakage reporting signals are designed to directly drive Opto-Coupler LED with 2mA (no additional resistors are needed). High impedance load on these terminals may develop voltage up to 15Vdc with reference to the A3 terminal.
2. Output voltage can be adjusted in the range of ±60 to ±100V (120V to 200V) by connecting an external resistor, Radj, between the Adj. Terminal (pin 17) and the A3 terminal (pin 18).
 - Default setting, Radj not connected (Radj = ∞) → V_{out} = ±60V (voltage measured between HV+ and HV- = 120V).
 - Radj = 0 (Short Circuit) → V_{out} = ±100V (voltage measured between HV+ and HV- = 200V).
 - For setting V_{out} between ±60V to ±100V, refer to Radj calculation formula in the Typical Application section.
3. **Care should be taken when adjusting output current and output voltage so that the total output power does not exceed the unit's maximum rated output power.**
4. The PD-LPM-0205 is designed to meet EN55022 Class B Standard with an external EMI filter. Refer to xDSL Power Modules App. Note.



PD-LPM-0205

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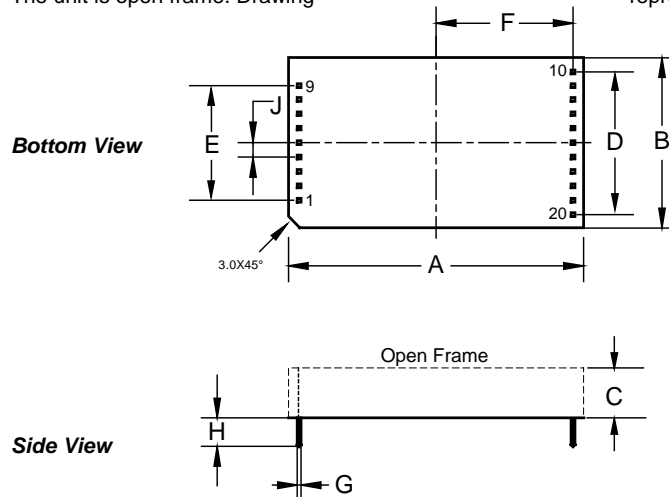
THERMAL DERATING



MECHANICAL DETAILS

The unit is open frame. Drawing

represents maximum dimensions and space occupied.



Dim	mm	Inch
A	52.80±0.40	2.080±0.016
B	30.00±0.40	1.180±0.016
C	12.70 Max	0.500 Max
D	25.40±0.25	0.100±0.01
E	20.32±0.25	0.800±0.01
F	24.13±0.125	0.950±0.005
G	0.64±0.10 Square Pin	0.025±0.004 Square Pin
H	4.00±0.50	0.157±0.02
J	2.54±0.25	0.100±0.01

PIN CONNECTIONS

Pin #	Symbol	Description
1	Vin	Input supply voltage (positive voltage in reference to the Vin RTN terminal)
2	Inhibit	Digital remote On/Off control. Logic voltage level relative to Pin 3. High level disables output.
3-6	Vin RTN	Return line for supply voltage
7-9	N.C	Not Connected
10	HV +	Positive high voltage output
11	A1	Ground connection for balanced ($\pm V$) operation. See typical application.
12	HV -	Negative high voltage output
13	A2	Leakage detection connection path. See typical application.
14	Leakage	Ground current Leakage indication output
15	No Load	Minimum output current indication output
16	Overload	Overload indication output
17	Adj	Output voltage adjustment input, connect resistor R_{adj} between pin 17 and 18
18	A3	Return line for No Load, Overload and Adjust lines.
19	LKG RTN	Return path for the Leakage detection indicator.
20	EGND	Connection to Earth ground