



# MediPlas

## Driver

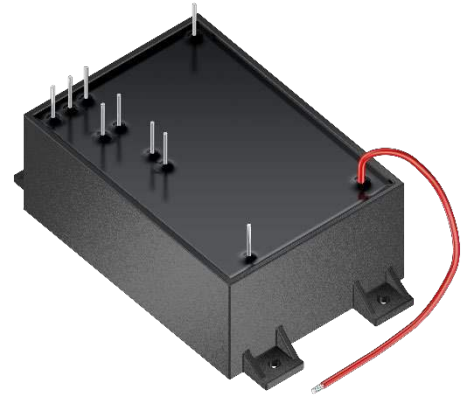
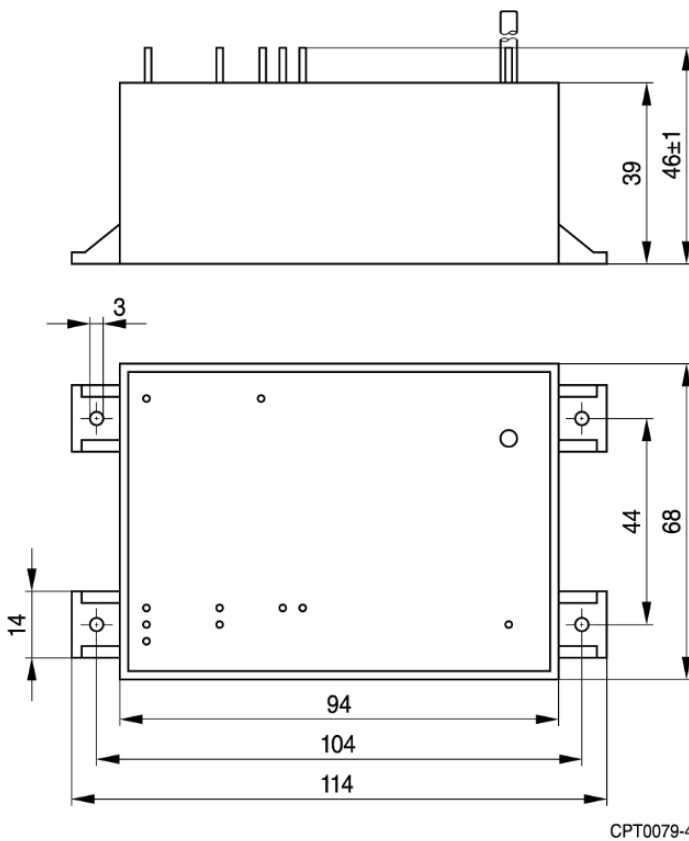
**Series/Type:** V 4.0  
**Ordering code:** Z63000Z2910Z1Z83  
Date: 2023-04-06  
Version: 7

**Preliminary data**
**Intended use**

HV driver for DBD loads

**Features**

- Compact
- Passive cooling
- Broad capacitance range of applicable loads
- Adjustable output voltage
- PWM power control input
- Process monitoring signal
- Overheating with auto recovery


**Dimensional drawings in mm**


**Preliminary data**
**Specification**
**Electrical data**

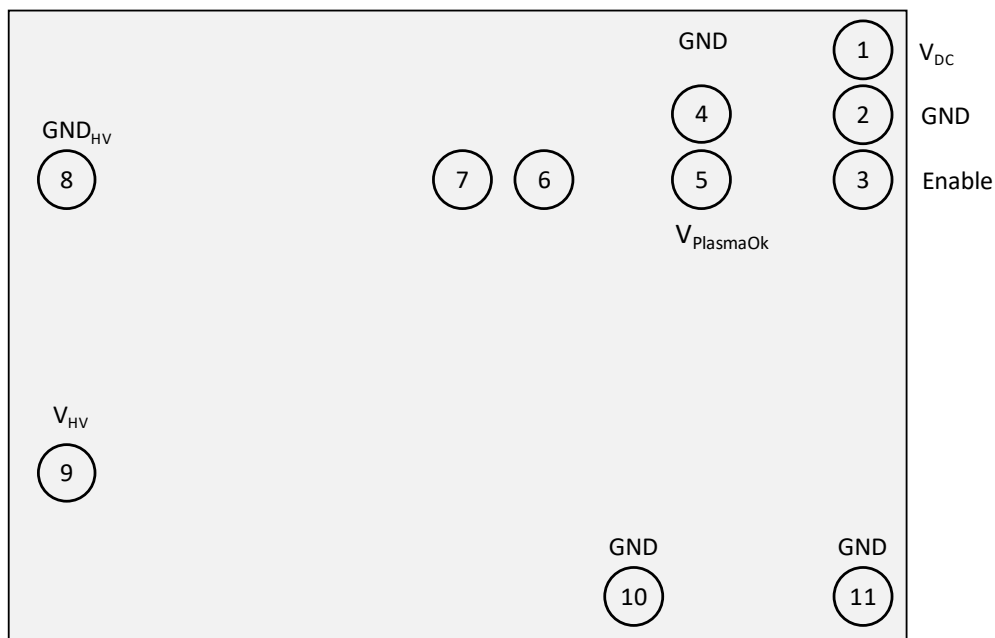
Output voltage range	2 ... 6 kV AC (proportional to input voltage)
Output frequency range	20 ... 40 kHz (auto resonant)
Input voltage range	12.0 ... 27.5 V DC
Maximal continuous input DC power	30 W
HV output connection	HV cable
Input/output connection	Pins Ø 1.3 mm
Protection functions	Reverse polarity (auto recovery) Input overvoltage (auto recovery) Input undervoltage (auto recovery) Overtemperature (auto recovery)
Control input: Enable	High-level input threshold: 2.0 ... 50 V Low-level input threshold: -0.3 ... 0.8 V (HV output control via PWM up to 100 Hz or DC ON/OFF)
Diagnostic output: PlasmaOk	PlasmaOk (attenuated analog feedback signal)
Steady state settling time	< 5 ms (load dependent)
Inrush current	6 A @ 30 V (< 500 µs); 40 A peak @ 30 V
Load capacitance range	2 ... 90 pF
Load resistance range	0.3 ... 1 MΩ
Stored energy	< 2.4 mJ

**Dimensions and weight**

Length	114 mm
Width	68 mm
Height	39 mm (without HV cable)
Cable length	160 ±5 mm
Mounting hole diameter	3 mm
Mounting hole spacing, length	104 mm
Mounting hole spacing, width	44 mm
Weight	~ 460 g

**Preliminary data****Environmental**

Operating temperature range	5 ... 40 °C
Humidity	< 80%, non-condensing
Maximum operating altitude	3000 m

**Preliminary data**
**Pin configuration**


Pin no.	Name	Comments
1	V <sub>DC</sub>	Supply voltage
2	GND	Ground potential (DC)
3	Enable	PWM or DC ON/OFF
4	GND	Ground potential (DC)
5	PlasmaOk	PlasmaOk signal voltage
6	Pin 1 for additional primary capacitance	Capacitance adjustment <sup>1)</sup>
7	Pin 2 for additional primary capacitance	Capacitance adjustment <sup>1)</sup>
8	GND <sub>HV</sub>	Ground potential for high voltage
9	V <sub>HV</sub>	High voltage
10	GND	Ground potential (DC)
11	GND	Ground potential (DC)

<sup>1)</sup> Primary capacitance to be matched to load capacitance for resonance frequency alignment

**Table 1: Pin input and output description**

**Preliminary data**
**Control/diagnostic signals**
**V<sub>DC</sub>**

The “V<sub>DC</sub>” input is the supply pin of the driver. Besides supplying the internal driver logic, the voltage level at “V<sub>DC</sub>” also determines the amplitude of the high voltage output. The AC voltage amplitude “V<sub>HV</sub>” is directly proportional to the “V<sub>DC</sub>” voltage level (see Figure 2: V<sub>HV</sub> output voltage dependency of the input voltage).

**Enable**

The CMOS compatible “Enable” input directly controls the high voltage output V<sub>HV</sub>. V<sub>HV</sub> can be activated by forcing the “Enable” pin to high state (> 2.0 V). Forcing the “Enable” to low state (< 0.80 V) will switch off “V<sub>HV</sub>”. A PWM can be used to control the output power of the driver to stabilize the operating point (self-heating of the driver and/or the load). If remote control or the PWM feature are not needed, connect “Enable” to “V<sub>DC</sub>” for continuous high voltage output operation. For electrical properties see Table 2: Electrical properties of “Enable” signal.

Parameters		Min.	Typ.	Max.	Unit
EN <sub>THH</sub>	High-level input threshold	2.0	-	50	V
EN <sub>THL</sub>	Low-level input threshold	-0.3	-	0.80	V
EN <sub>PWM</sub>	PWM frequency	-	50	100	Hz
EN <sub>D</sub>	Duty cycle	$\frac{1.06 \text{ ms} \times EN_{PWM}}{0.01}$	-	100	%
EN <sub>DEL</sub>	Enable delay time	0.58	0.75	1.06	ms

Table 2: Electrical properties of the "Enable" signal

**PlasmaOk**

The "PlasmaOk" signal is proportional to the gap discharge intensity. It is only provided during active gap discharge cycles and is load and process dependent. When the "Enable" signal is in the HIGH state, the "PlasmaOk" signal shows an analog signal proportional to the “V<sub>HV</sub>” gap discharge current. It is recommended to terminate the "PlasmaOk" signal with at least 100 kΩ. A smaller termination resistance will result in an attenuation of the signal level. If the "PlasmaOk" signal is not required, it can be left floating (e.g. non-discharging loads or if a feedback signal is not necessary).

**Preliminary data**
**Driver states**

Driver State	Inputs		Outputs	
	V <sub>DC</sub>	Enable	V <sub>HV</sub>	PlasmaOk
DISABLED	V <sub>DC</sub> < 5.1V	x	low	low
	5.1V < V <sub>DC</sub> < V <sub>DCUVLOT</sub>	x	low	low
	V <sub>DC</sub> > V <sub>DCOVPT</sub>	x	low	low
	V <sub>DCUVLOT</sub> < V <sub>DC</sub> < V <sub>DCOVPT</sub>	low	low	low
ENABLED	V <sub>DCUVLOT</sub> < V <sub>DC</sub> < V <sub>DCOVPT</sub>	high	low	low
	V <sub>DCUVLOT</sub> < V <sub>DC</sub> < V <sub>DCOVPT</sub>	high	HV-out	low <sup>2)</sup>
	V <sub>DCUVLOT</sub> < V <sub>DC</sub> < V <sub>DCOVPT</sub>	high	HV-out	Analog out <sup>3)</sup>

<sup>2)</sup> Expected behavior for non-discharging loads

<sup>3)</sup> Expected behavior for gap discharging loads

Table 3: Driver states and their assignment to inputs and outputs

**Protection functions**

Parameters		Min.	Typ.	Max.	Unit	Reset
V <sub>DCRP</sub>	Reverse polarity input voltage	-60	-	+60	V	Auto recovery
V <sub>DCOVPT</sub>	Overvoltage protection threshold	27.8	30.0	32.5	V	Auto recovery
V <sub>DCOVPH</sub>	Overvoltage protection hysteresis	-	-3.7	-	V	
V <sub>DCUVLOT</sub>	Undervoltage lockout threshold	8.4	9.4	10.4	V	Auto recovery
V <sub>DCUVLOH</sub>	Undervoltage lockout hysteresis	-	-1.4	-	V	Auto recovery
T <sub>OVT</sub>	Overtemperature protection	-	85	-	°C	Auto recovery
T <sub>OVT</sub> H	Overtemperature protection hysteresis	-	10	-	°C	Auto recovery

Table 4: Electrical properties of protection functions

Preliminary data

Permissible load parameters

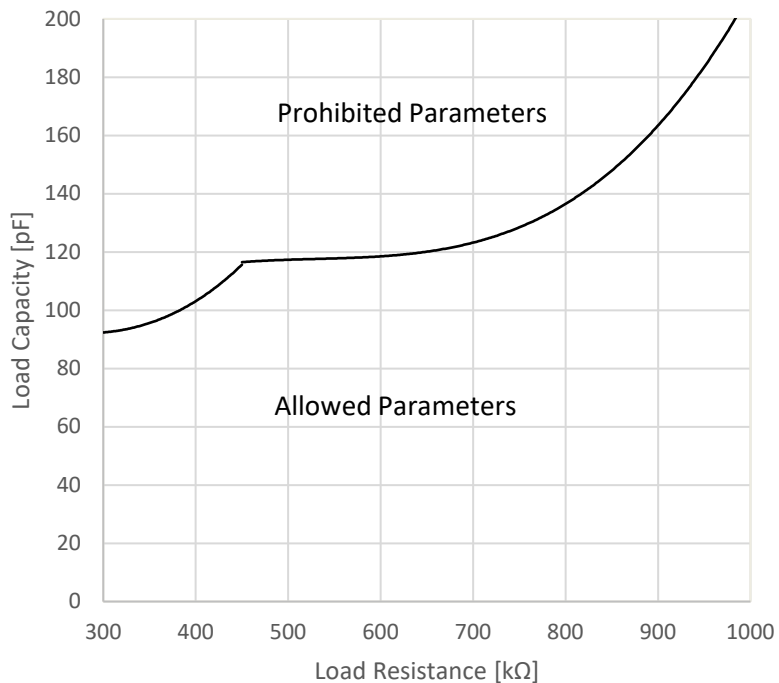


Figure 1: Range of permissible load parameters



Preliminary data

Input/output voltage dependency

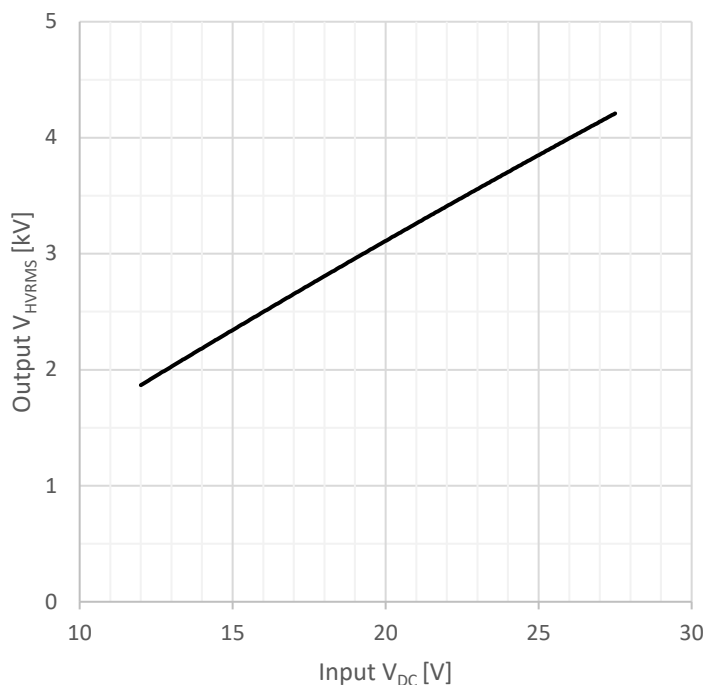


Figure 2: V<sub>HV</sub> output voltage dependency of the input voltage

Input voltage dependency on output apparent power

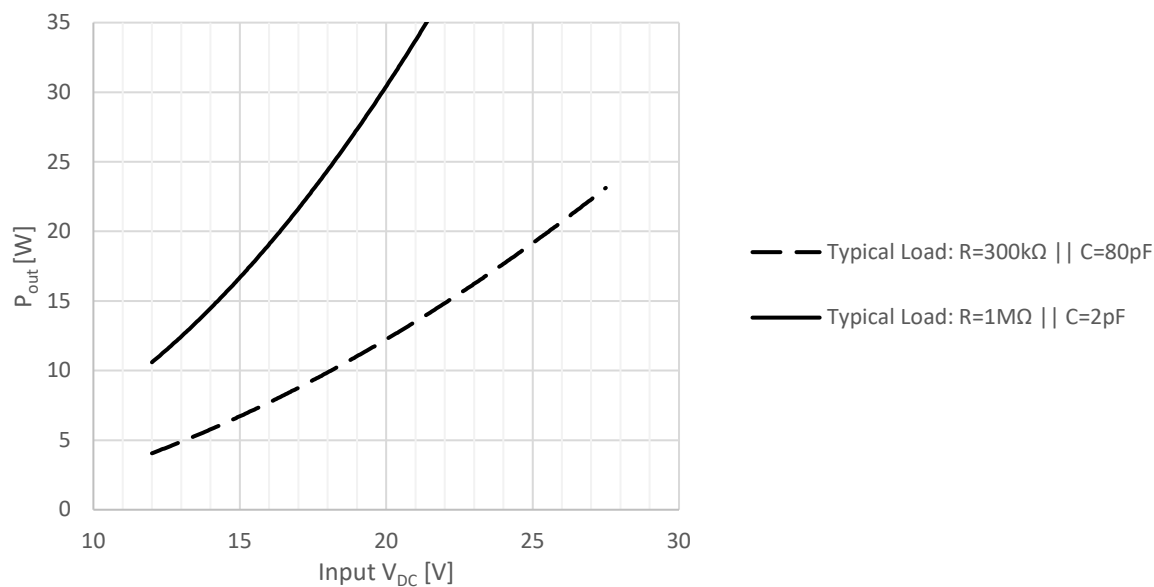











Figure 3: Output apparent power in dependence of the input voltage for typical loads

## Preliminary data

### Troubleshooting

- 1) Turn OFF supply voltage on “V<sub>DC</sub>”.
- 2) Check if “V<sub>DC</sub>” and “Enable” are correctly connected to the driver.
- 3) Check if “V<sub>HV</sub>” and “GND<sub>HV</sub>” are correctly connected to the load.
- 4) Check if one of the protection functions is active (see Table 4: Electrical properties of protection functions)
- 5) Check whether the load has a short circuit or the maximum permissible load parameters are exceeded (see Figure 1: Range of permissible load parameters).
- 6) Check “PlasmaOk” signal termination and connection to external signal measuring device/processing unit (see Control/diagnostic signals).
- 7) Turn ON supply voltage on “V<sub>DC</sub>”. Do not exceed maximum supply voltage of 27.5 V.
- 8) Increase supply voltage until an analog output voltage is measurable on “PlasmaOk” during “Enable” high phases. A “PlasmaOk” signal is only detectable at active gap discharges. Do not exceed the maximum DC power consumption of 30 W!

**Preliminary data**
**Cautions and warnings**

	<p>Important! The products delivered are engineering samples, which are not intended for commercial use in series products of the purchaser. TDK assumes no warranty. Any use is at the sole risk of the purchaser. In case of any questions, please contact TDK.</p>
	<p>Only <b>TECHNICALLY QUALIFIED SERVICE PERSONNEL</b> familiar with the principles of electrical safety should operate this supply. The power supply <b>SHOULD NOT BE EXPOSED TO WATER OR MOISTURE OR DUSTY ENVIRONMENTS</b> (pollution degree 2). Electrical safety must be always maintained.</p>
	<p>Danger due to high voltage! Always ensure that the high voltage parts are connected correctly. Do not open the device. If the device is damaged, disconnect the voltage supply and contact the manufacturer.</p>
	<p>Do not touch the device and connecting cables during operation. All parts of the device can carry high voltages during operation. After disconnecting the supply voltage, wait at least one minute and make sure by measurement that the input capacitors are discharged before touching the device.</p>
	<p>Do not use the device in a flammable or explosive atmosphere.</p>
	<p>Do not operate the device if it is damaged.</p>
	<p>The device is designed for indoor use only. Splashing water and/or excessive humidity may cause the device to destruct or fail.</p>
	<p>Never attempt to operate the power supply in any manner not described in this manual. Never remove <b>DANGER</b> and <b>WARNING</b> labels from the device. Replace lost or damaged labels immediately.</p>
	<p>When operating this device with plasma reactors (intended use), high EMI with other devices can/will occur. When used with a plasma reactor, it is recommended to keep the connecting cables short and shield both devices accordingly.</p>

### Preliminary data

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## Important notes

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