Description

The Uni-Imp Series of ultra fast surge protectors, protects sensitive components against overvoltages without regard to rate of voltage rise. The voltage at which the Uni-Imp trips does not vary by more than ±10 percent from slow DC overvoltages to 200kV/µs transients. When subjected to rapidly rising voltages (5kV/µs or more) a tolerance of ±20 percent must be applied. Any trip voltage is available from 550V to 20kV.

Lifetime

The lifetime of the Uni-Imp can be approximated in terms of the cumulative charge, in coulombs (Q) that can be passed through the device without changing its trip voltage by more than 20 percent. Expressing the height of a current pulse in amperes and its duration in seconds, the area under the pulse is the coloumb of charge contained in it.

Example 1:
A 2.0kV Uni-Imp is required to pass a 3,000 peak amp pulse having a 10µs half-width. Approximating the pulse shape by a triangle, the charge contained in the pulse is:

$$q = 3{,}000 \text{ amps} \times 10^{-5} \text{ sec} = 0.03 \text{ coulombs}$$

The life curve shows that a 2.0kV unit has a Q = 110 coulomb capability. Thus, its life under these conditions is approximately:

$$\text{Life} = Q/q = 110/.03 = 3{,}667 \text{ discharges}$$

Example 2:
A 10kV Uni-Imp when tripped by a transient overvoltage must dump a 1.5µF capacitor charged to 9kV. The charge stored in the capacitor is:

$$q = CV = 1.5 \times 10^{-6} \text{ farads} \times 9{,}000 \text{ Volts} = 13.5 \times 10^{-3}$$

In this case, the life curve shows the cumulative charge capability is Q = 65 coulombs and the approximate lifetime of the Uni-Imp will be:

$$\text{Life} = Q/q = (65/13.5) \times 10^{3} = 4{,}800 \text{ discharges}$$

Reaction Time

The Uni-Imp can be considered to have zero reaction time over the range of transient speeds encountered in almost any application. For very special situations, such as EMP protection, it is of interest to know the ultimate limit of the transition time required for the Uni-Imp to go from the open circuit condition to the start of conduction.

Tests were made at two independent laboratories with sub nanosecond rise-time pulse generators at 4000kV/µs and 5600kV/µs. The results showed the limiting transition time to be two nanoseconds from the time the pulse is applied, regardless of the particular trip voltage of the Uni-Imp tested (0.55, 2.0, 4.0, 6.0, and 8.0kV.)

Thus, if the transient is sufficiently fast that the trip voltage is reached in less than 2ns, the Uni-Imp will allow the voltage to overshoot. The limiting ramp speed for zero overshoot as a function of the trip voltage is given by:

$$S_L = V_T / (2.0 \times 10^{-3}) \text{kV/µs}$$

where V_T is the trip voltage, in kV. For transients faster than this, the voltage overshoot is given by:

$$\Delta V = (2.0 \times 10^{-3})\, S - V_T$$

where S is the pulse rise-time in kV/µs

Table 1:
Environmental Testing

All units meet the requirements of MIL-STD 202 as outlined below		
Parameter	**Test Specifications**	**Test Conditions**
Vibration	204B	C
Shock	213A 213A 213A	A except 100 g's C C except 1ms
Humidity	103B	B
Temperature Cycling	102A	C
Barometric Pressure	105C	B
Thermal Shock	107	B

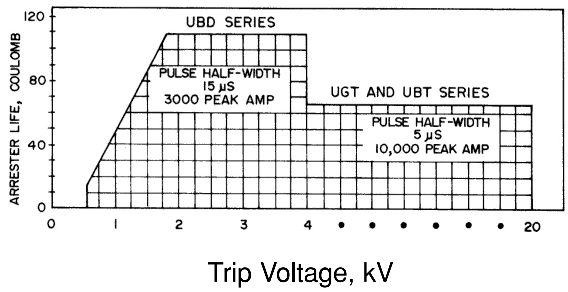
Table 2:
Ratings & Characteristics

Series	Trip Voltage (kV) See Notes	Capacitance (pF)
UBD	.55	<20
	.60	<20
	.65	<20
	.75	<20
	.85	<20
	1.00	<15
	1.20	<15
	1.50	<15
	2.00	<10
	2.50	<10
	3.00	<5
	4.00	<5
UBT & UGT	4.00	<5
	5.00	<3
	6.00	<3
	7.50	<2
	10.00	<2
	12.00	<2
	15.00	<2
	20.00	<2

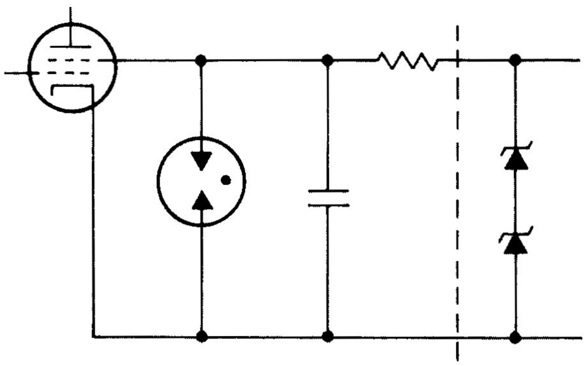
Notes:
Operating temperature range: -65°C to +85°C.
Insulation Resistance: 10,000MΩ for UBD, UBT and UGT Series.
Resistance measured at 100Vdc.
The maximum pulse and minimum DC breakdowns, over the lifetime of the arrester, are defined in terms of the trip voltage, V_T:

Maximum Pulse Breakdown = V_T + 20 percent
Minimum DC Breakdown = V_T - 20 percent

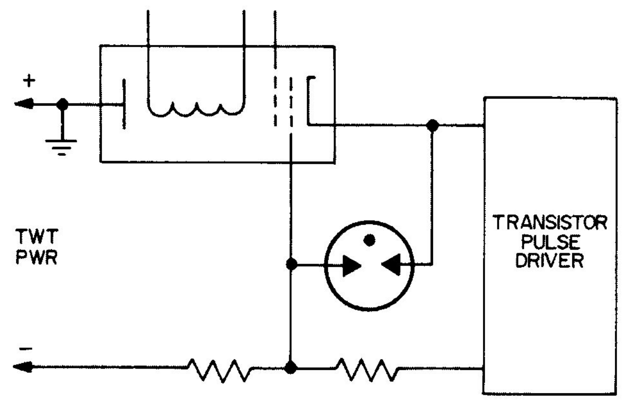
Uni-Imp Lifetime



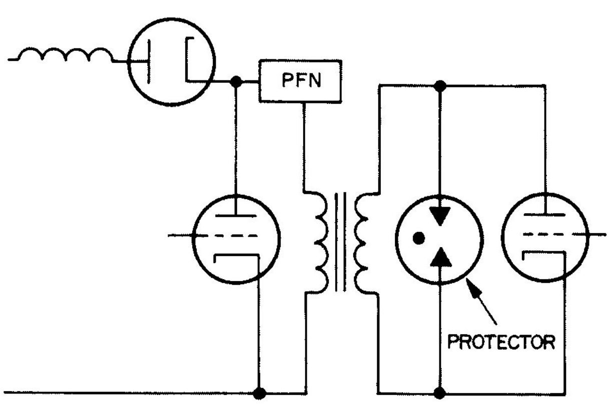
Uni-Imp Applications



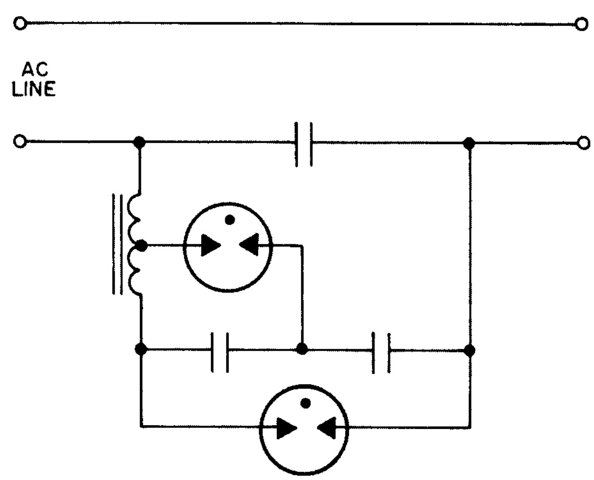
Protection for Solid State Power Supplies



TWT Protection



Magnetron Pulse Transformer Protection



Protecting Phase Correction Capacitors

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