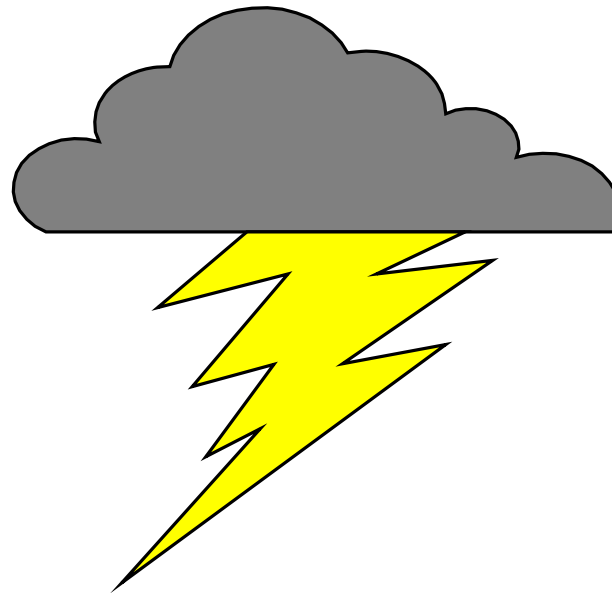


AN-OVP

Overvoltage Protection

For Silvertel SLICs and Trunks

Mar 2015 Rev 2.13 © Silver Telecom 2015



***Engineering
Advantage***

Regulatory Specifications

- **FCC Part 68 (now TIA-968-B) USA**
Must have this approval for connection to USA PSTN. Specifies hi-pot and lightning tests. Must survive Type B surge with no damage On Hook and Off Hook. Type A surge may cause some damage. Severe test up to 1.5kV 200A
- **ITU-T K20 (network) and K21 (subscriber)**
Many countries use all or parts of this as a reference. Specifies lightning and power contact tests with various levels of severity
- **Telcordia GR1089-CORE**
Comprehensive EMC spec. Used by network providers in USA. Lightning tests more severe than FCC 68, also includes power contact.
- **UL60950**
Mandatory USA safety specification. Requires 600VAC power cross test. Very severe, needs special fuses or PTC devices to meet it.
- Many other individual country specifications may need to be met.



***Engineering
Advantage***

3 Levels of Protection

- **1 Electrostatic Discharge**

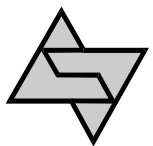
Minimum level of protection. Suitable for wiring within buildings. Protects against static discharge from handling and installation.

- **2 Lightning**

Average level of protection. Suitable for normal outside wiring. Protects against static and lightning up to 1.5kV.

- **3 Power Contact**

Highest level of protection. Suitable for outside wiring which may contact power cables. Protects against static, lightning up to 1.5kV or 4kV and power voltages of 250V or 600V.



Silvertel

***Engineering
Advantage***

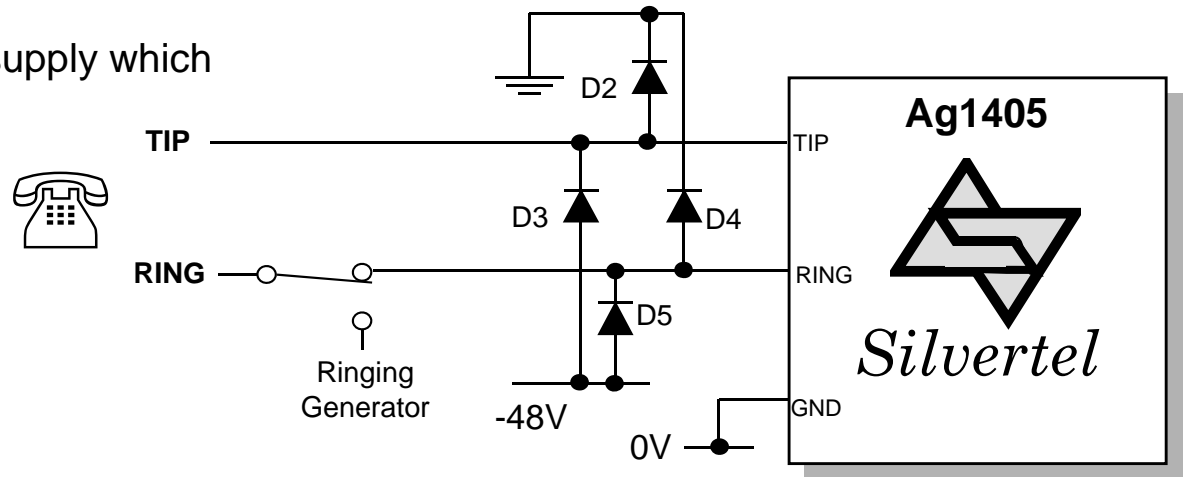
Different protection for SLICs and Trunks

- SLICs are ground referenced
Simple protection requires only diode clamping from Tip and Ring to Ground and -48V.
- Trunks are floating - no ground reference
Simple protection requires special overvoltage devices from Tip to Ring.
Diode clamping from Tip and Ring to ground and -48V must **not** be used. It prevents correct operation of telephone ringing

SLIC protection Level 1

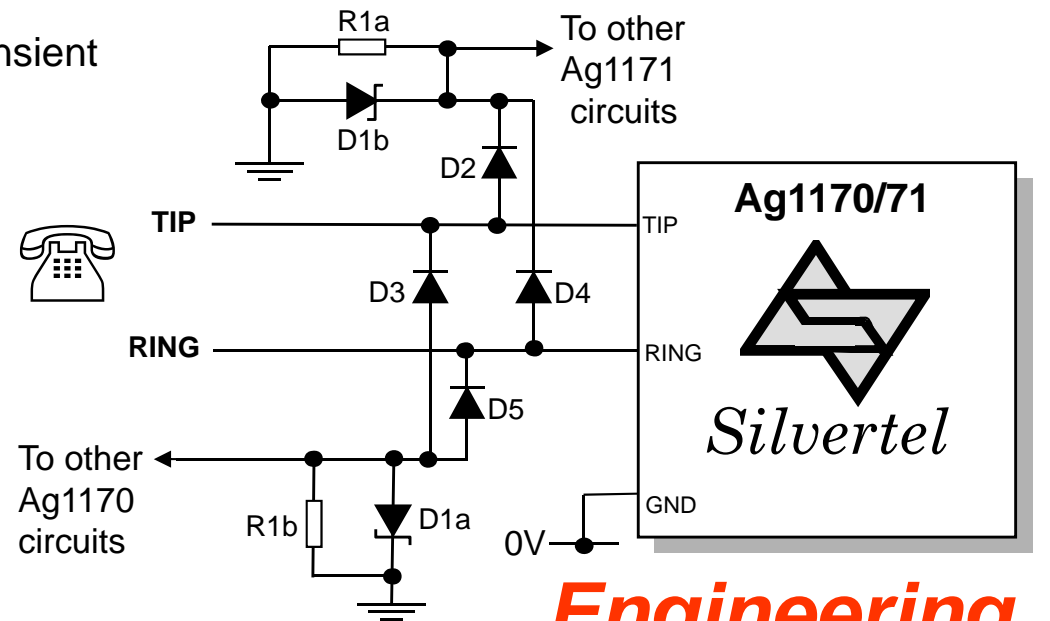
- For C.O. applications with large -48V power supply which can take transient overcurrent

D2 - 5 = 1N4004 or Diode bridge MB4S or similar



- For applications with small DC/DC power supply transient overcurrent is taken by clamp diode

D2 - 5 = 1N4004 or Diode bridge MB4S or similar
 D1_x = Transorb type clamp diode, 75V standoff
 Vishay BZT03C82, P6KE82A, SMAJ70
 or similar, only one needed per linecard
 R1_x = 0R link
 Fit R1a/D1a for negative Vbat SLICs e.g. Ag1170
 Fit R1b/D1b for positive Vbat SLICs e.g. Ag1171

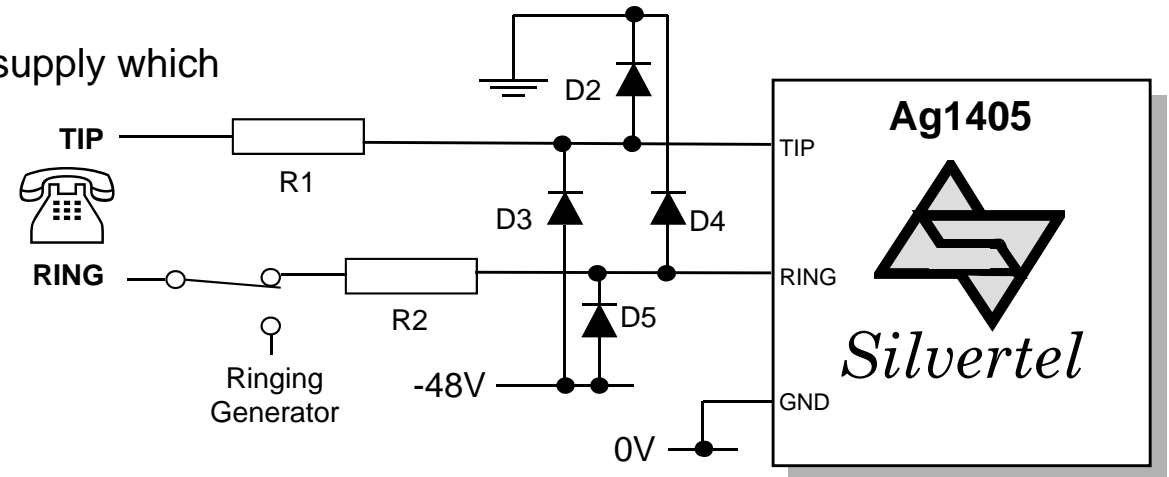


**Engineering
Advantage**

SLIC protection Level 2

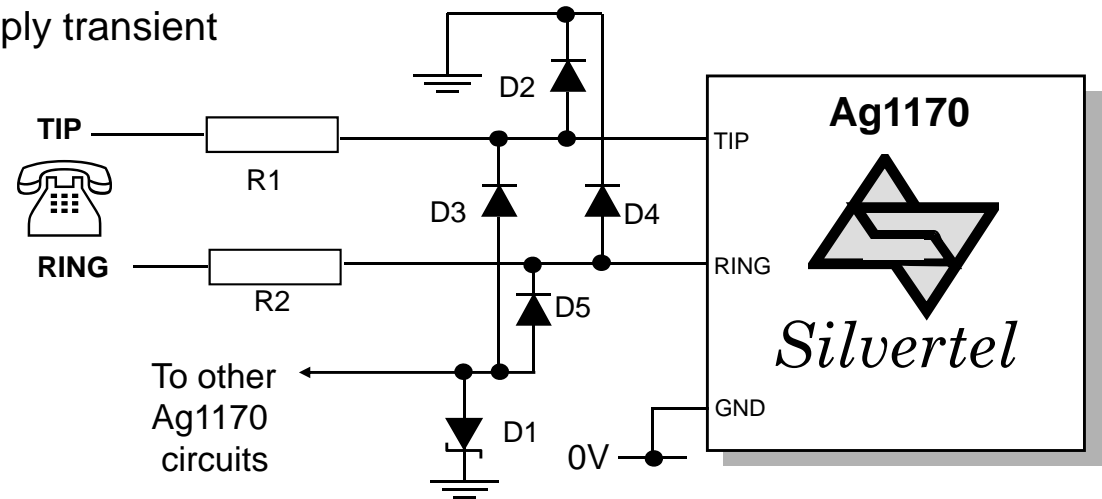
- For C.O. applications with large -48V power supply which can take transient overcurrent

D2 - 5 = 1N4004 or Diode bridge MB4S or similar
R1-2 = 47R 2W 5% wirewound



- For applications with small DC/DC power supply transient overcurrent is taken by clamp diode

D2 - 5 = 1N4004 or Diode bridge MB4S or similar
R1-2 = 47R 2W 5% wirewound
D1 = Tranzorb type clamp diode, 75V standoff
Vishay BZT03C82, P6KE82A, SMAJ70 for general use.
Littelfuse 5KP75A for ITU-T K20, KN61000-4-5, FCC 68
Littelfuse 15KP75A for GR1089-CORE
only one needed per line card
Position of D1 and ground link may be changed to use negative or positive Vbat SLICs – see Level 1 drawing

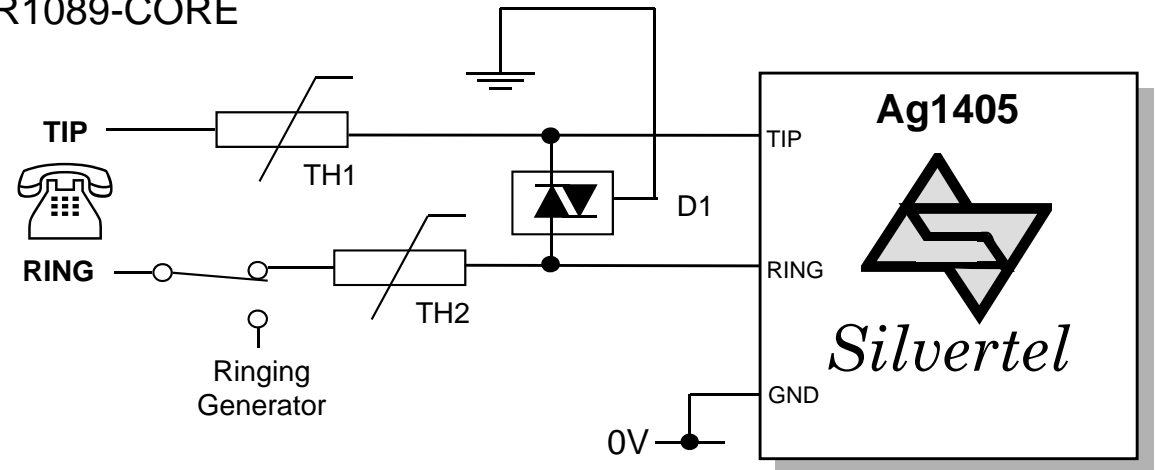


**Engineering
Advantage**

SLIC protection Level 3

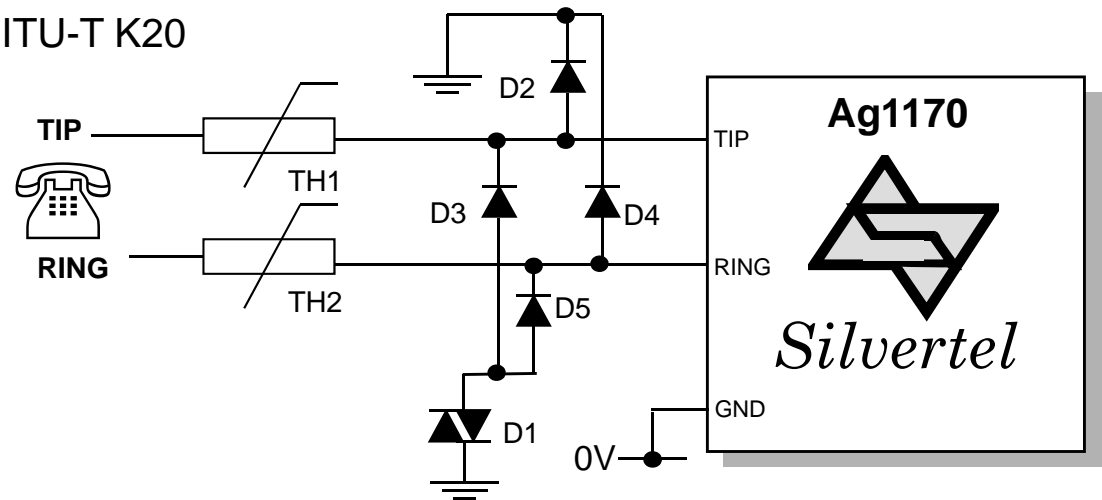
- For C.O. applications in USA. FCC 68 and GR1089-CORE

D1 = Littelfuse P0901CA2LRP or similar
 TH1-2 = PTC Thermistor 600VAC
 Raychem TR600-150 or similar



- For Korea and worldwide application specifying ITU-T K20

D2 - 5 = 1N4004 or Diode bridge e.g. DF04S, MB4S
 D1 = Sidactor type foldback clamp diode 75V standoff
 Littelfuse P0900SALRP or similar, one per SLIC
 TH1-2 = PTC thermistor 250VAC
 Raychem TR250-120 or similar
 Position of D1 and ground link may be changed to use
 negative or positive Vbat SLICs – see Level 1 drawing

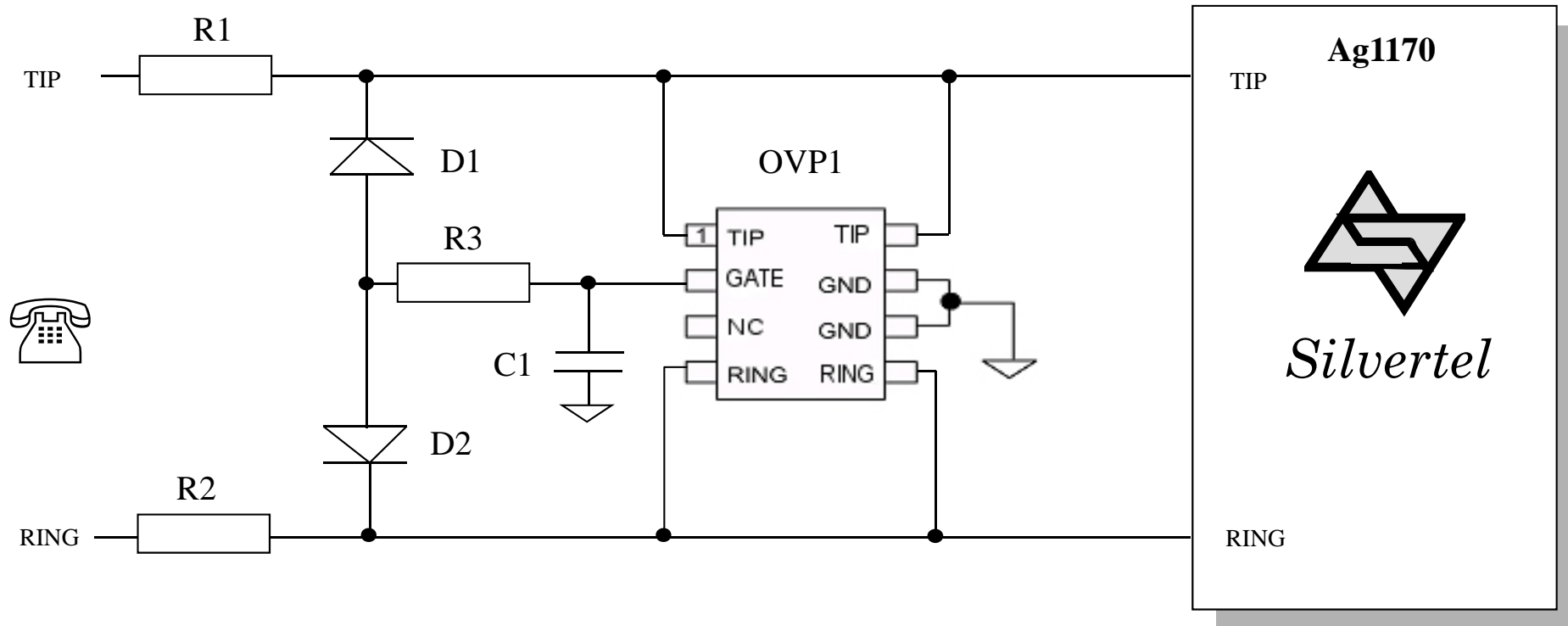


**Engineering
 Advantage**

SLIC programmable protection

For highest level of protection for Silvertel ringing SLICs use a programmable device

- For all SLICs with negative battery
- Level 2 protection for ITU-K20 shown



C1 = 100nF/50V/X7R ceramic; D1, D2 = 1N4148 (or similar); R3 = 10K chip 0805
R1, R2 = 47R/2W/5% wirewound (optional for high current); OVP1 = ST LCP1521S (or similar)

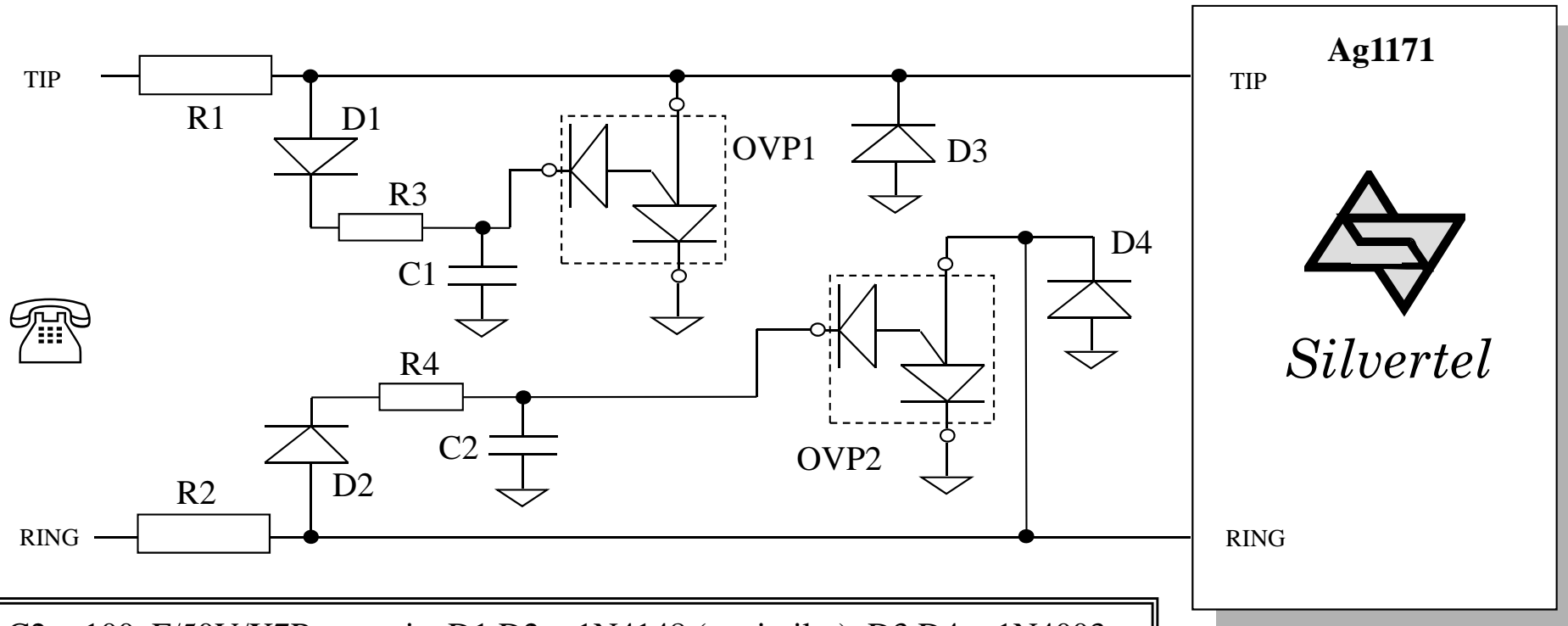


**Engineering
Advantage**

SLIC programmable protection

For highest level of protection for Silvertel ringing SLICs use a programmable device

- For all SLICs with positive battery
- Level 2 protection for ITU-K20 shown



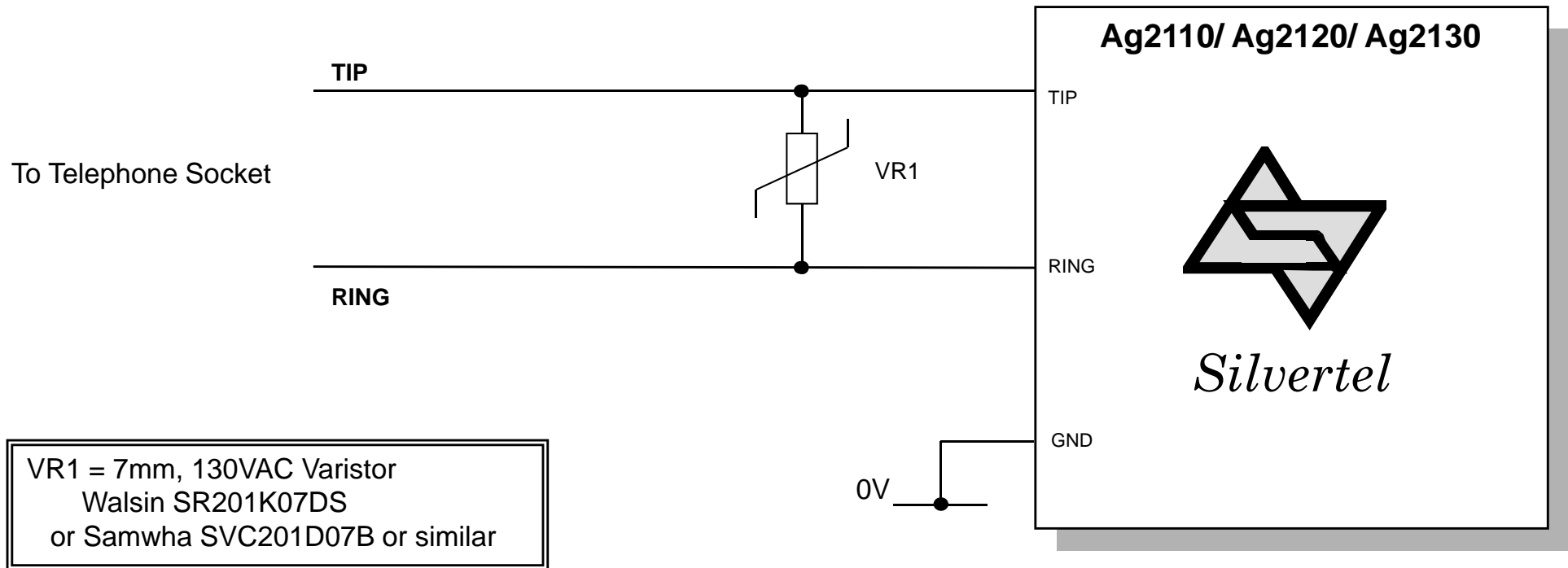
C1,C2 = 100nF/50V/X7R ceramic; D1,D2 = 1N4148 (or similar); D3,D4 = 1N4003
R1, R2 = 47R/2W/5% wirewound (optional for high current); R3,R4 = 10k chip 0805
OVP1,OVP2 = Littelfuse B2050CA (or similar)



**Engineering
Advantage**

Trunk protection Level 1

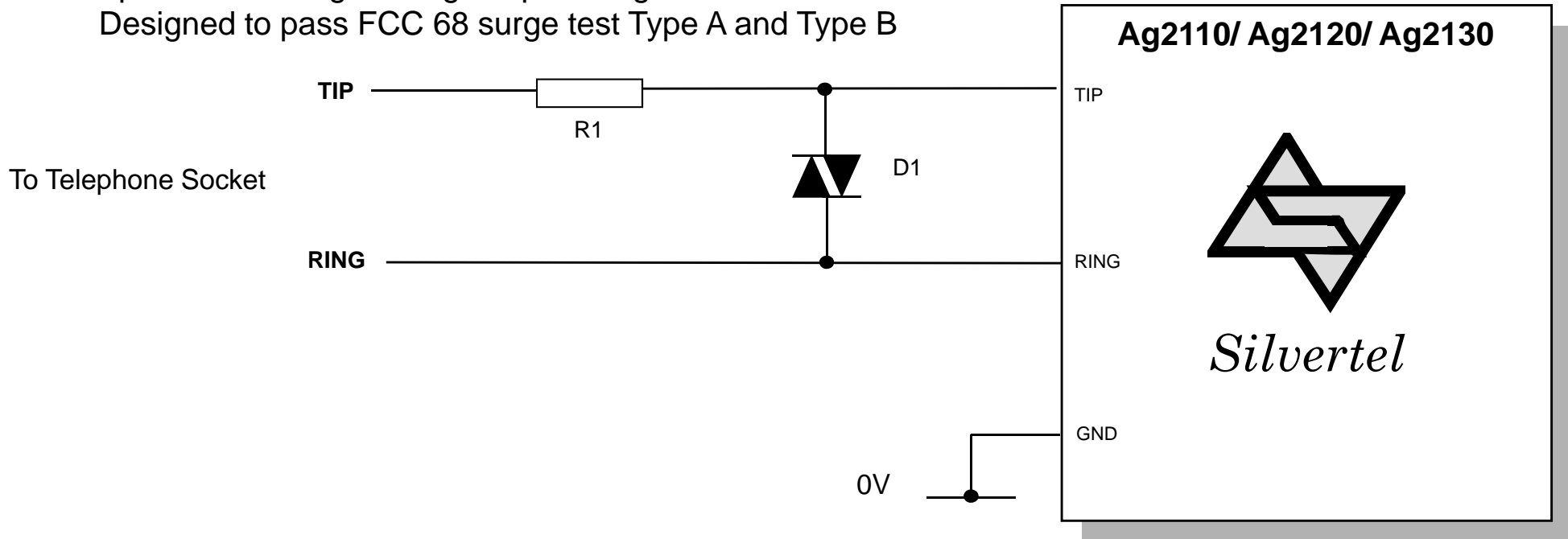
- On Hook protection for general applications worldwide



**Engineering
Advantage**

Trunk protection Level 2

- On Hook protection only, for applications worldwide up to 1500V surge voltage Tip to Ring and T/R to Gnd. Designed to pass FCC 68 surge test Type A and Type B



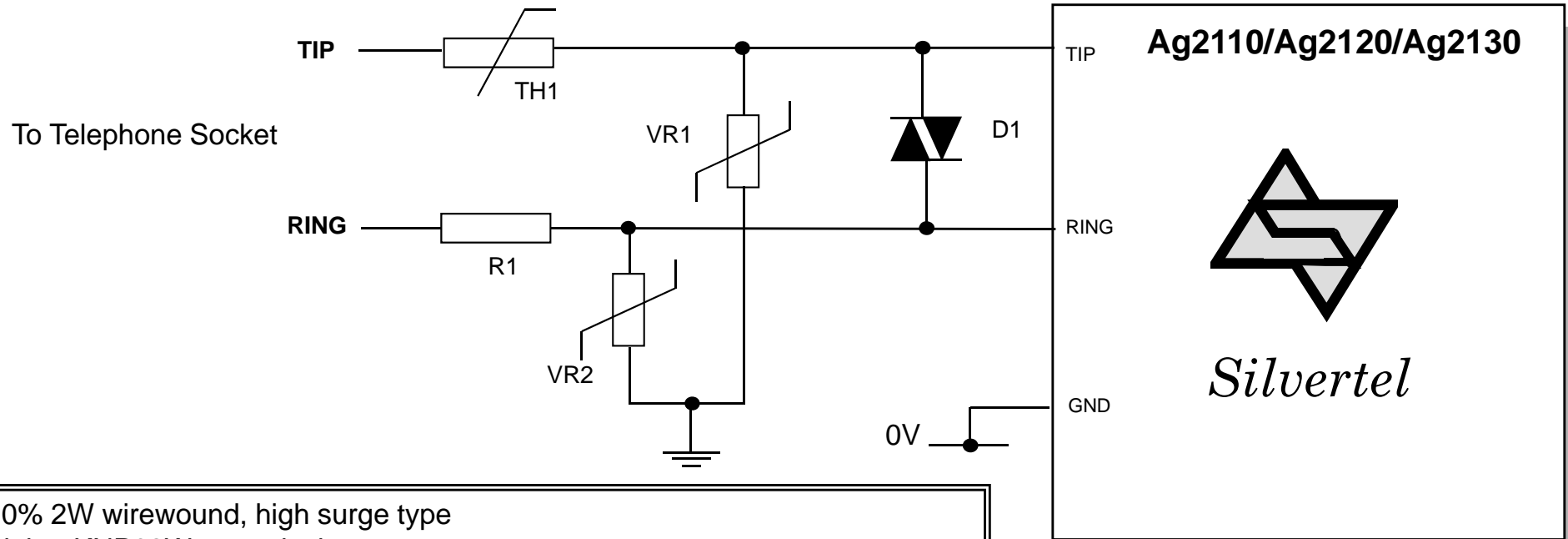
R1 = 33R 10% 2W wirewound, high surge type Royalohm KNP02W or equivalent
D1 = Sidactor type bi-directional foldback clamp diode
For FCC68 Type B 150VAC ringing use Littelfuse P2600SALRP or Bourns TISP4300M3
For countries with 120VAC max. ringing use Littelfuse P2300SALRP or Bourns TISP4265M3
For countries with 100VAC max. ringing use Littelfuse P2100SALRP or Bourns TISP4240M3



**Engineering
Advantage**

Trunk protection Level 3

- On Hook protection only for applications worldwide
up to 4kV surge voltage T/R to Gnd, 2kV surge voltage Tip to Ring



R1 = 33R 10% 2W wirewound, high surge type

Royalohm KNP02W or equivalent

TH1 = Raychem TR600-150 for USA UL60950 600VAC power contact

TH1 = Raychem TR250-120 for rest of world ITU-T K20 250VAC power contact

D1 = Littelfuse P2600SALRP or Bourns TISP4300M3 for USA

D1 = Littelfuse P2300SALRP or Bourns TISP4265M3 for rest of world

VR1, VR2 = Not Fitted for USA or 1.5kV surge T/R to Gnd

VR1, VR2 = Varistor 7mm 250VAC for 4kV surge T/R to Gnd e.g. Korea

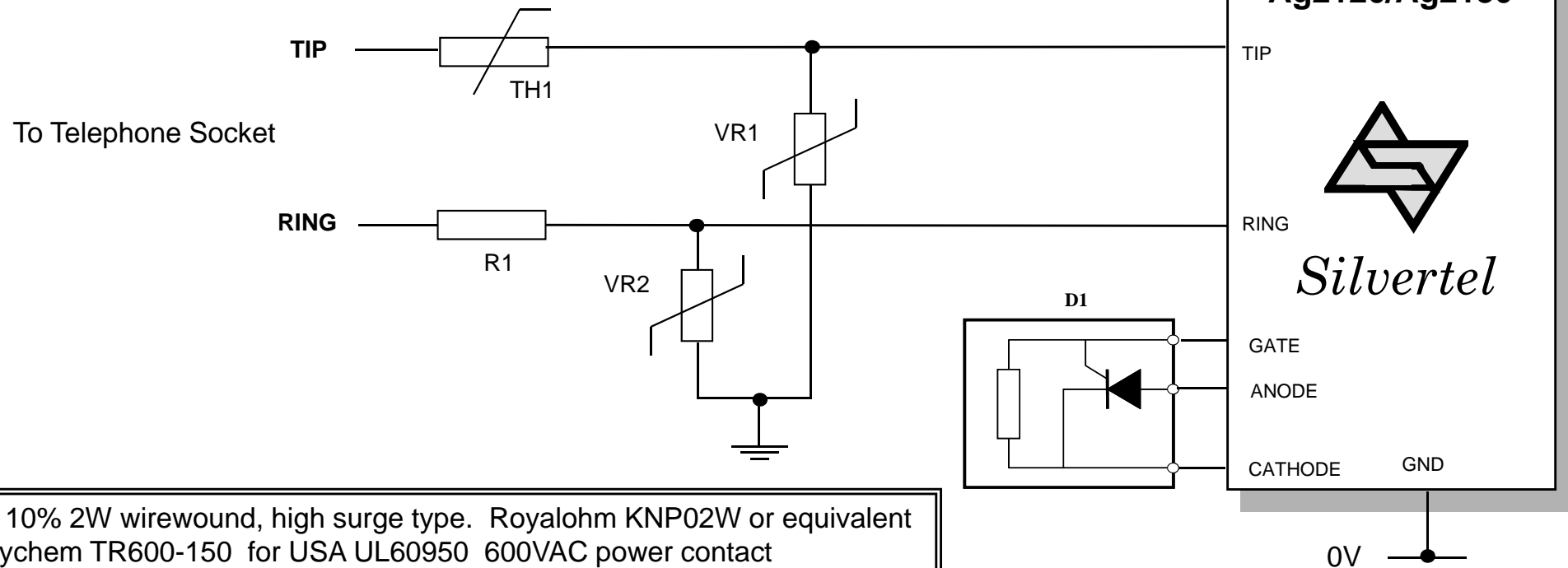
Walsin SR391K07DS or Samwha SVC391D07A or equivalent



**Engineering
Advantage**

Ag2120, Ag2130 Off Hook Protection

- The Ag2120 and Ag2130 have special provision for protection while Off Hook as well as On Hook
- For applications worldwide up to 4kV surge voltage T/R to Gnd, 2kV surge voltage Tip to Ring
- Must use in USA. Must pass TIA-968 tests after Type B surge is applied Off Hook.



R1 = 47R 10% 2W wirewound, high surge type. Royalohm KNP02W or equivalent
 TH1 = Raychem TR600-150 for USA UL60950 600VAC power contact
 TH1 = Raychem TR250-120 for ITU-T K20 250VAC power contact
 D1 = ST TPP25011 or Bourns TISP8250
 VR1, VR2 = Not Fitted for USA or 1.5kV surge T/R to Gnd
 VR1, VR2 = Varistor 7mm 250VAC for 4kV surge T/R to Gnd e.g. Korea
 Walsin SR391K07DS or Samwha SVC391D07A or equivalent



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Advantage**

Ag2120, Ag2130 Safety Considerations

The Ag2120 and Ag2130 are safety tested and approved under the international CB scheme to the following standards:-

EN60950-1:2001

IEC60950-1:First Edition 2001

AS/NZ60950-1:2003

UL60950-1:2003 1st Edition

CSA 22.2 No.60950-1-03 1st Edition

In order to maintain this approval when the Ag2120/Ag2130 is incorporated into a host system care must be taken to maintain the user protection provided by these parts. Adequate separation of the line side circuitry from components connected to the protected user circuitry must be provided so that the safety isolation barrier is not compromised. Also, the system should be housed in a fire enclosure of suitable flame retardant material.

For USA and Canada, additionally, the line cord connecting the system to the network must have minimum 26AWG conductors.

On request Silvertel can supply copies of the CB Approval Certificates for the Ag2120 and/or Ag2130.



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