

## Secondary protection for DSL lines

### Features

- Low capacitance devices:
  - DSL01-xxxSC5: Delta  $C_{typ} = 3.5 \text{ pF}$
- High surge capability: 30 A - 8/20  $\mu\text{s}$
- Voltage: 8 V, 10.5 V, 16 V, and 24 V
- RoHS package

### Benefits

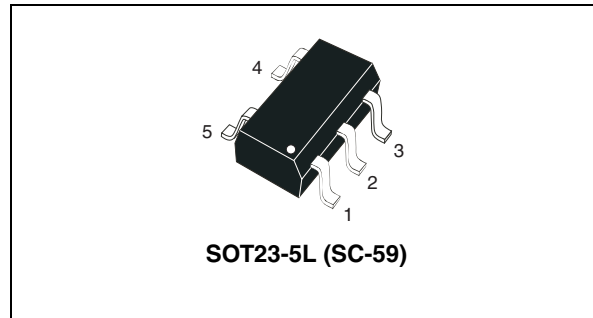
- Transil™ mode will clamp ESD and low energy surges without disturbing line drivers during transmission while high energy surges will be short circuited to avoid line driver damage.
- The low capacitance makes it suitable for ADSL2+ and VDSL signals.

### Complies with the following standards

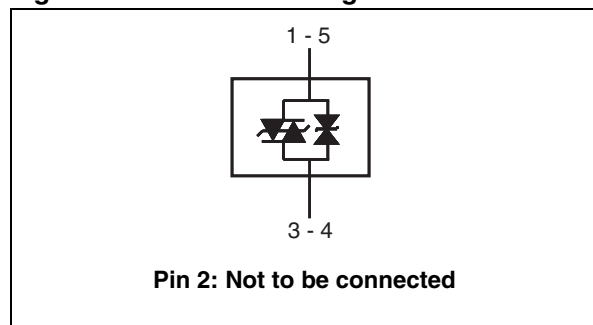
- IEC 61000-4-2, level 4
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- MIL STD 883G-Method 3015-7: Class 3
  - 25 kV (Human body model)
- IEC 61000-4-5, level 2: 24 A, 8/20  $\mu\text{s}$

### Applications

- Secondary protection to be located after the transformer of ADSL and VDSL modem either on central office or subscriber side.
- Replaces crowbar protection located on primary side.



**Figure 1. Functional diagram**



### Description

This device combines a Transil used for low energy surges and a Trisil™ for high energy surges. This combination provides a surge / capacitance trade-off compatible with high debit rates such as ADSL2+ and VDSL. The combination on the same die makes it compatible with SOT23-5L package.

TM: Transil and Trisil are trademarks of STMicroelectronics

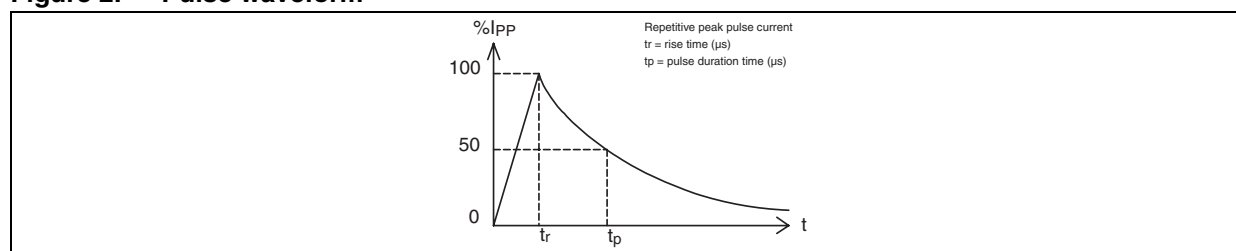
# 1 Characteristics

**Table 1. Absolute maximum ratings ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

Symbol	Parameter		Value	Unit
I <sub>pp</sub>	Peak pulse current <sup>(1)</sup>	t <sub>r</sub> = 8 μs, t <sub>p</sub> = 20 μs	30	A
		t <sub>r</sub> = 10 μs, t <sub>p</sub> = 1000 μs	18	A
T <sub>stg</sub>	Storage temperature range		-55 to 150	°C
T <sub>j</sub>	Operating junction temperature range		-40 to 125	°C
T <sub>L</sub>	Maximum temperature for soldering during 10 s		260	°C

1. For pulse waveform see [Figure 2](#).

**Figure 2. Pulse waveform**



**Table 2. Electrical characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

Order code	$I_{RM}$ @ $V_{RM}$		$V_{BR}$ @ $I_{BR}$		$V_{BR}$ @ $I_{BR}$		$V_{BO}$	$I_H$	C	$\Delta C$
	max. $\mu\text{A}$	V	min. V	mA	typ. V	mA	max. V	typ. mA	max. $\text{pF}^{(1)}$	typ. $\text{pF}^{(2)}$
DSL01-008SC5	0.5	8	9.5	1	11	10	20	100	20	3.5
DSL01-010SC5	0.5	10.5	11	1	12	10	25	100	17	3.5
DSL01-016SC5	0.5	16	18	1	20	10	40	100	15	3.5
DSL01-024SC5	0.5	24	25	1	28	10	45	100	12	3.5

1. Test conditions :  $V_R = 2\text{ V}$  bias,  $V_{RMS} = 1\text{ V}$ ,  $F = 1\text{ MHz}$

2. Measured between 1 V and  $V_{RM}$

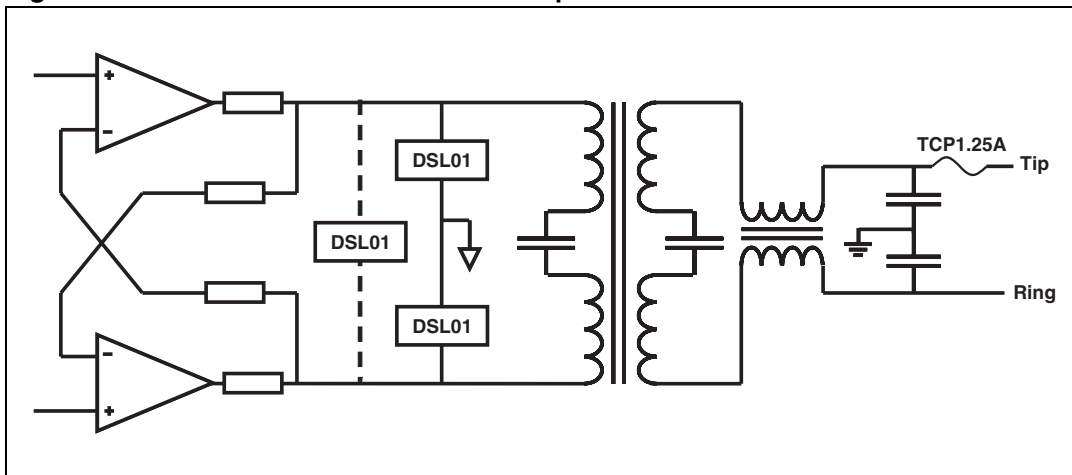
## 2 Application information

The DSL01 series has been designed to be implemented after the transformer of a DSL system to comply with world wide standards such as ITU-T K20/21 and Telecordia GR-1089 without using crowbar protection such as Trisils or gas tube before the transformer.

The planar technology used for the DSL01 provides an excellent trade-off between capacitance and surge capability, typically 12 pF for the DSL01-008, providing compliance with Telecordia GR-1089 (500A 2/10 $\mu$ s). But, the key point is the low variation of the capacitance versus xDSL signal. This is designed to eliminate limitations in signal performance.

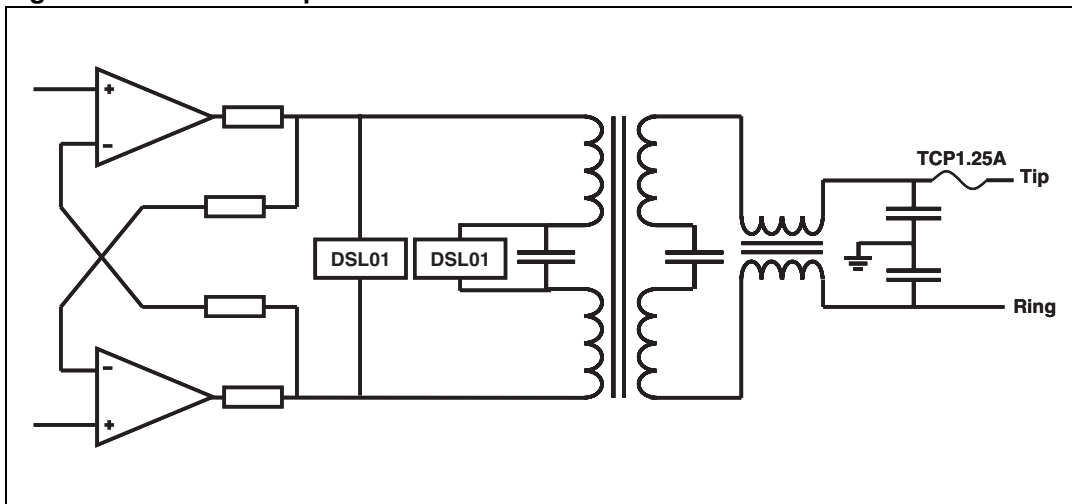
[Figure 3](#) shows the schematic used for a complete protection (differential and common mode) but in some cases depending on the line driver circuitry only differential or common can be used.

**Figure 3. Differential and common mode protection**



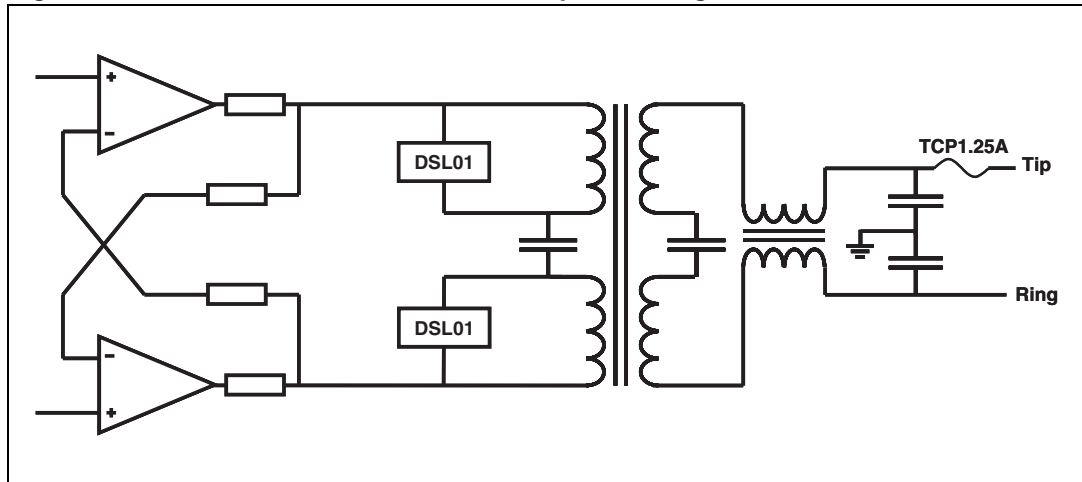
The topology shown in [Figure 4](#) is for differential protection of line drivers and capacitances.

**Figure 4. Differential protection of the line drivers**

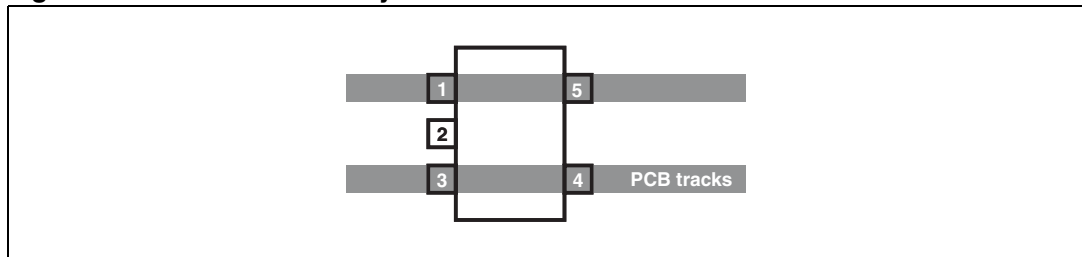


The topology shown in [Figure 5](#) is for protection connected to the output winding of the transformer.

**Figure 5. Protection connected to the output winding of the transformer**



**Figure 6. Recommended layout**

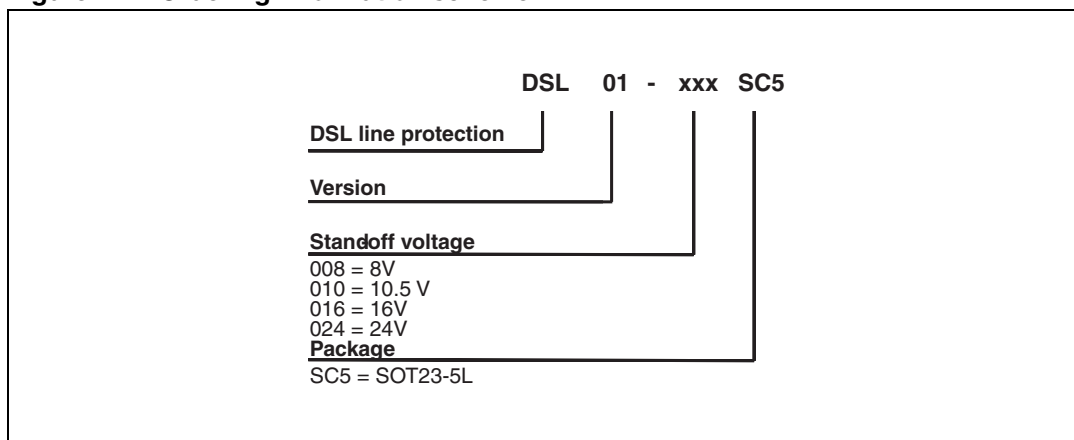


Concerning [Figure 6](#):

- Pins 1 and 5 must be connected together.
- Pins 3 and 4 must be connected together.
- Pin 2 must not be connected.

### 3 Ordering information scheme

Figure 7. Ordering information scheme



# 4 Package information

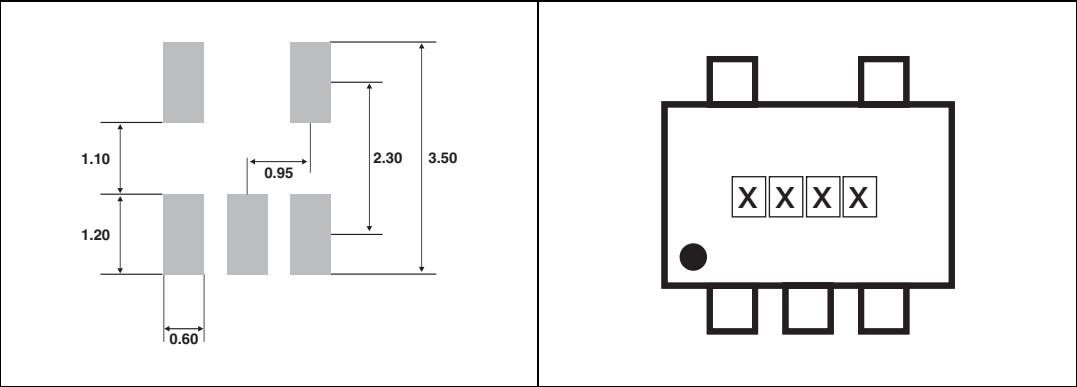
- Epoxy meets UL 94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

**Table 3. SOT23-5L dimensions**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.45	0.035		0.057
A1	0		0.10	0		0.004
A2	0.90		1.30	0.035		0.051
b	0.35		0.50	0.014		0.020
c	0.09		0.20	0.004		0.008
D	2.80		3.00	0.11		0.118
E	1.50		1.75	0.059		0.069
e		0.95			0.037	
H	2.60		3.00	0.102		0.118
L	0.10		0.60	0.004		0.024
M	0°		10°	0°		10°

**Figure 8. Footprint (dimensions in mm) Figure 9. Marking**



## 5 Ordering information

**Table 4. Ordering information**

Order code	Marking	Package	Weight	Base qty	Delivery mode
DSL01-008SC5	XT08	SOT23-5L	16 mg	3000	Tape and reel
DSL01-010SC5	XT12				
DSL01-016SC5	WT16				
DSL01-024SC5	WT24				

## 6 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
15-Nov-2006	1	Initial release.
26-Aug-2008	2	Added UL 94 and ECOPACK statements. Added part numbers DSL01-010SC5 and DSL01-024SC5.
28-Jun-2010	3	Added trademark symbol and statement for Trisil on the coverpage.

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