

## 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

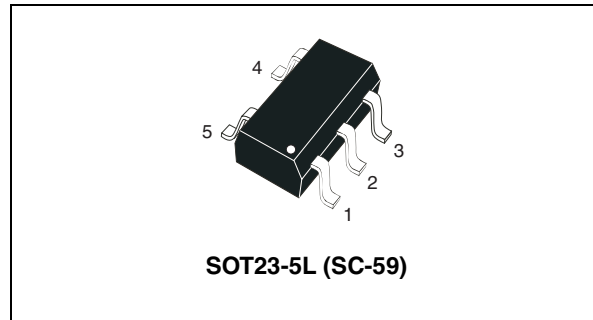
- Transil™ mode will clamp ESD and low energy surges without disturbing line drivers during transmission while high energy surges will be short circuited to avoid line driver damage.
- The low capacitance makes it suitable for ADSL2+ and VDSL signals

### Complies with the following standards

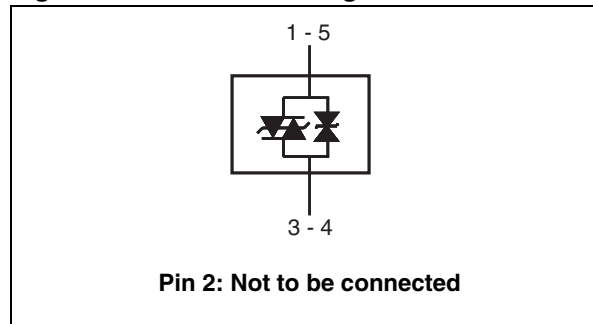
- IEC 61000-4-2, level 4
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- MIL STD 883G-Method 3015-7: Class 3
  - 25 kV (Human body model)
- IEC 61000-4-5, level 2: 24 A, 8/20  $\mu\text{s}$

### 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.

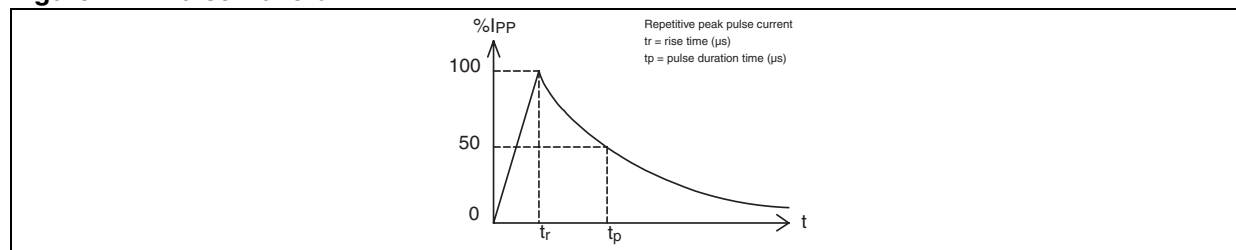
TM: Transil is a trademark of STMicroelectronics

# 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

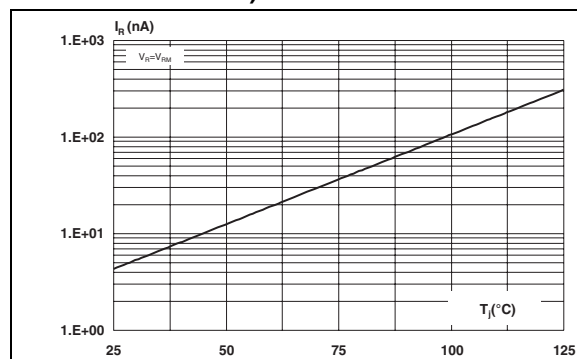
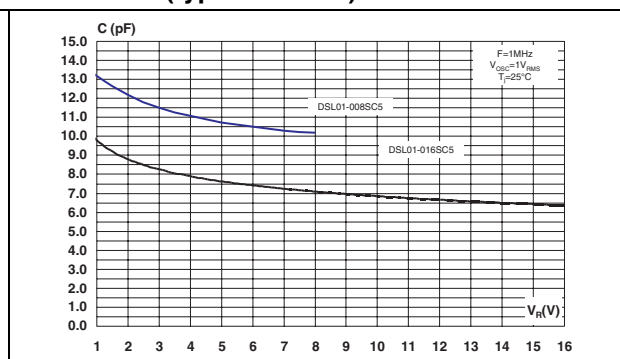
1. For pulse waveform see [Figure 2](#).

**Figure 2. Pulse waveform**

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

Type	$I_{RM}$ @ $V_{RM}$		$V_{BR}$ @ $I_{BR}$		$V_{BR}$ @ $I_{BR}$		$V_{BO}$	$I_H$	$C$	$\Delta C$
	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  $V_{RM}$

**Figure 3. Variation of leakage current versus reverse voltage applied (typical values)**

**Figure 4. Variation of junction capacitance versus reverse voltage applied (typical values)**


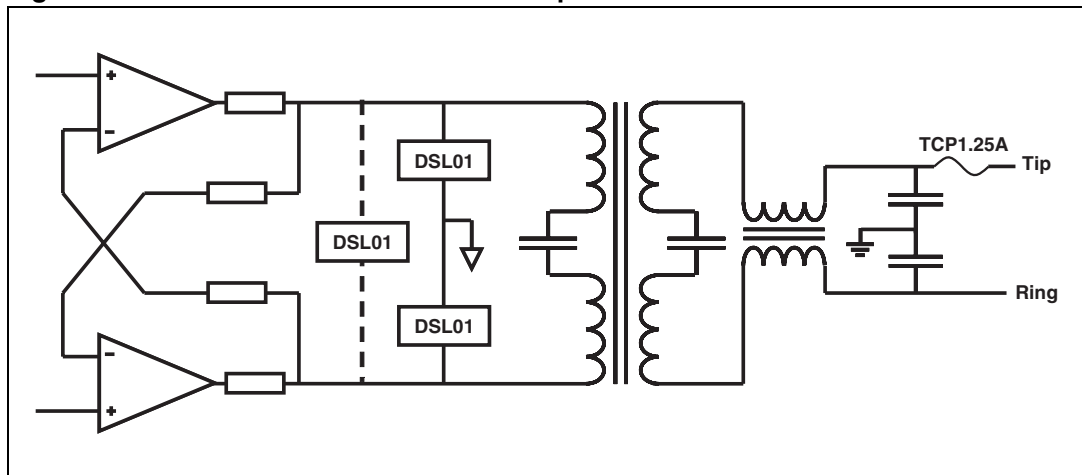
## 2 Application information

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.

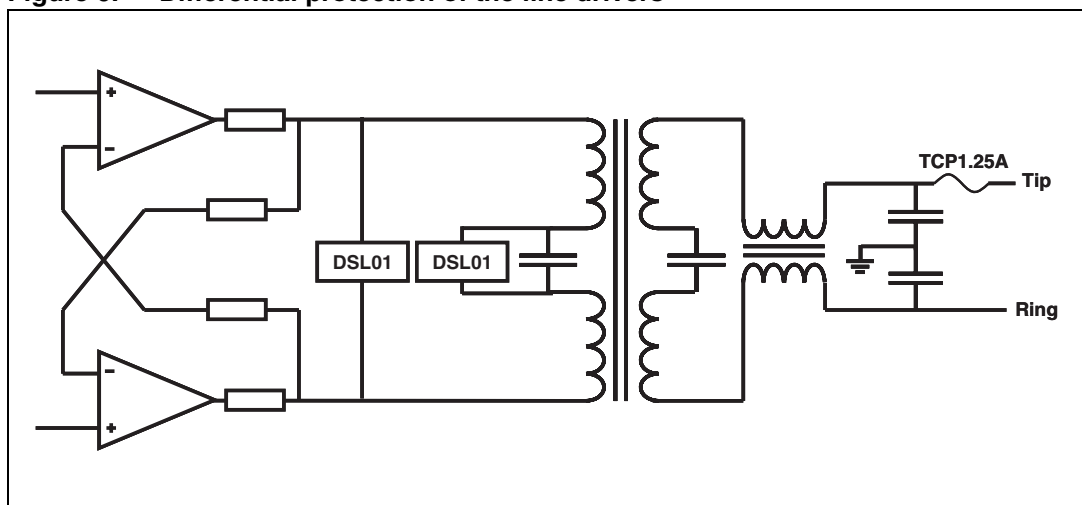
*Figure 5.* shows the schematic used for a complete protection (differential and common mode) but in some cases depending on the line driver circuitry only differential or common can be used.

**Figure 5. Differential and common mode protection**



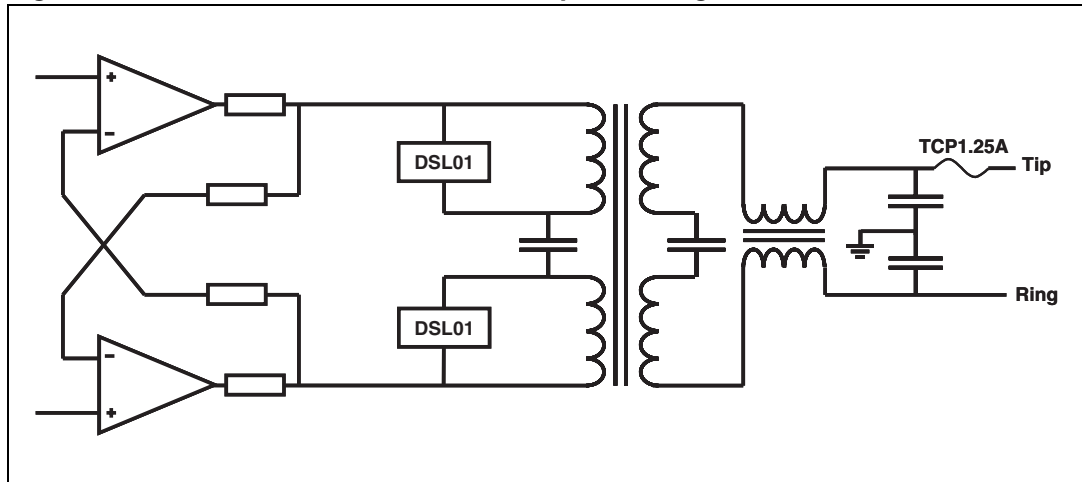
The topology shown in *Figure 6.* is for differential protection of line drivers and capacitances.

**Figure 6. Differential protection of the line drivers**

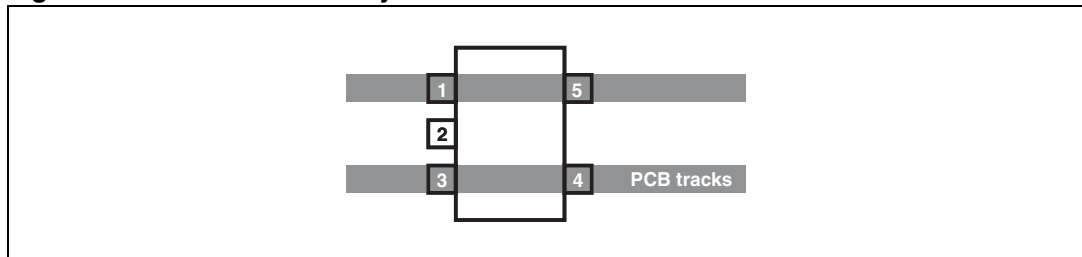


The topology shown in [Figure 7](#) is for protection connected to the output winding of the transformer.

**Figure 7. Protection connected to the output winding of the transformer**



**Figure 8. Recommended layout**

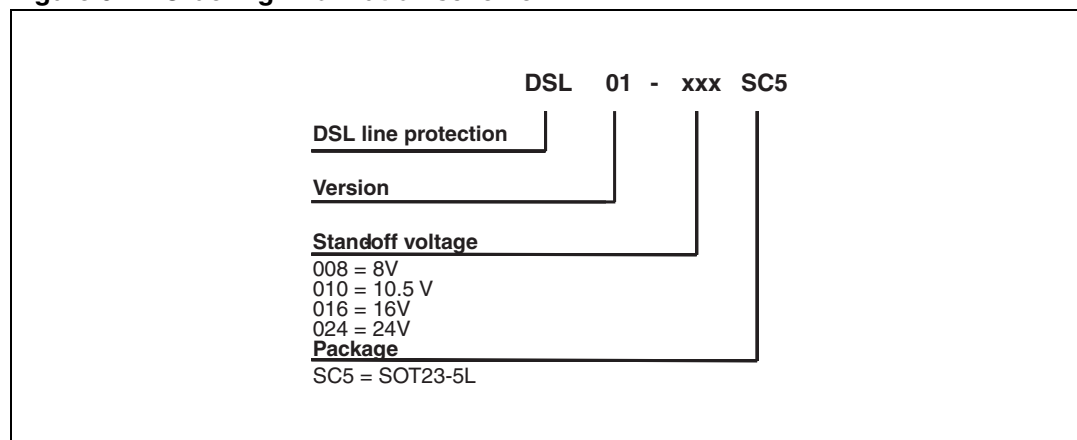


Concerning [Figure 8](#):

- 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 9. Ordering information scheme



# 4 Package information

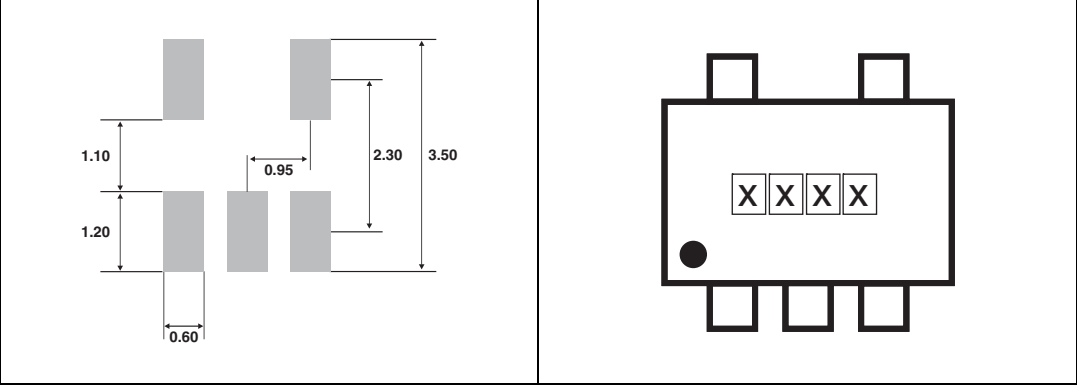
- Epoxy meets UL 94, V0

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at [www.st.com](http://www.st.com).

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 10. Footprint (dimensions in mm) Figure 11. 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	SOT23-5L	16 mg	3000	Tape and reel
DSL01-016SC5	WT16	SOT23-5L	16 mg	3000	Tape and reel
DSL01-024SC5	WT24	SOT23-5L	16 mg	3000	Tape and reel

## 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. Updated <a href="#">Figure 3</a> from relative to absolute typical values. Added part numbers DSL01-010SC5 and DSL01-024SC5.

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