

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 μs
- 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 μs

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.

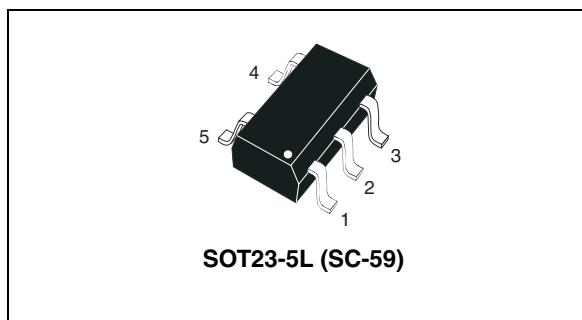
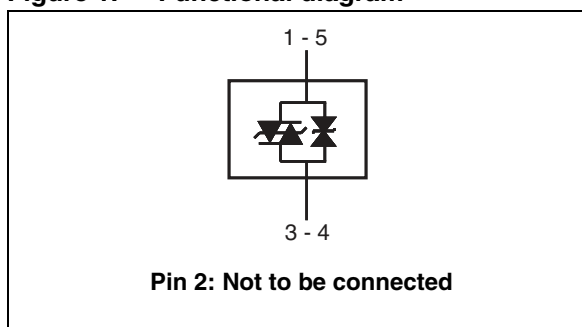


Figure 1. Functional diagram



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_{pp}	Peak pulse current (1)	$t_r = 8\text{ }\mu\text{s}, t_p = 20\text{ }\mu\text{s}$	30	A
		$t_r = 10\text{ }\mu\text{s}, t_p = 1000\text{ }\mu\text{s}$	18	A
T_{stg}	Storage temperature range	-55 to 150	$^{\circ}\text{C}$	
T_j	Operating junction temperature range	-40 to 125	$^{\circ}\text{C}$	
T_L	Maximum temperature for soldering during 10 s	260	$^{\circ}\text{C}$	

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

Figure 2. Pulse waveform

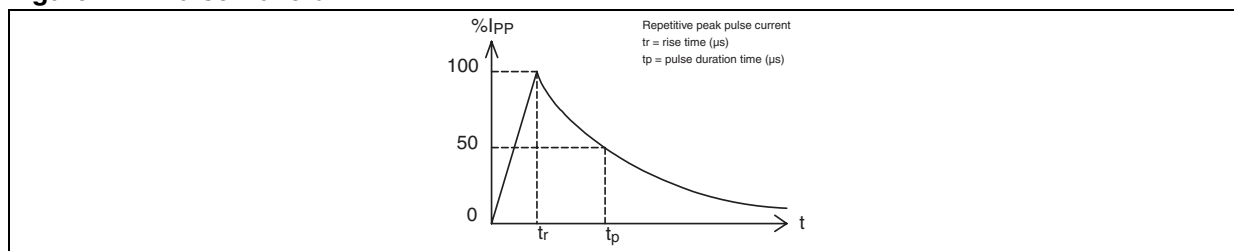


Table 2. Electrical characteristics ($T_{amb} = 25\text{ }^{\circ}\text{C}$)

Order code	$I_{RM} @ V_{RM}$		$V_{BR} @ I_{BR}$		$V_{BR} @ I_{BR}$		V_{BO}	I_H	C	ΔC
	max. μA	V	min. V	mA	typ. V	mA	max. V	typ. mA	max. pF(1)	typ. 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}

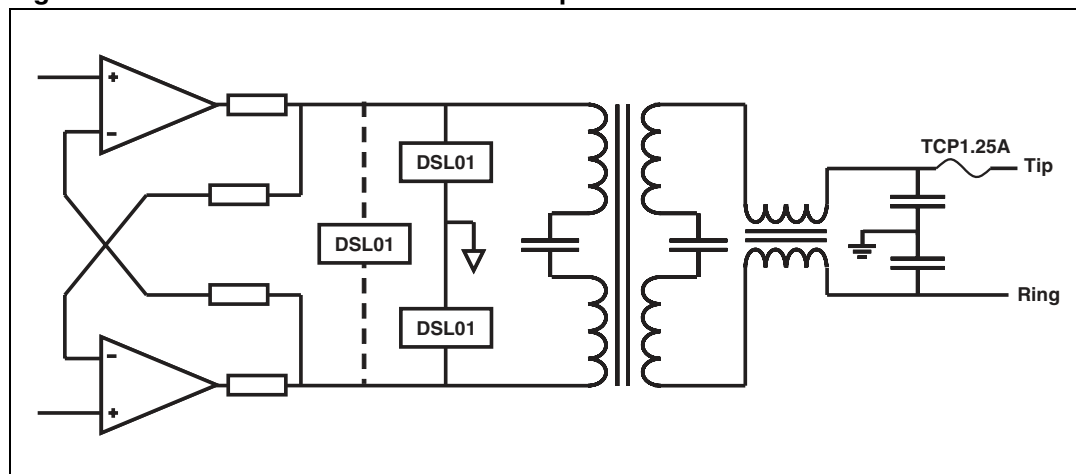
2 Application information

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 μ s). But, the key point is the low variation of the capacitance versus xDSL signal. This is designed to eliminate limitations in signal performance.

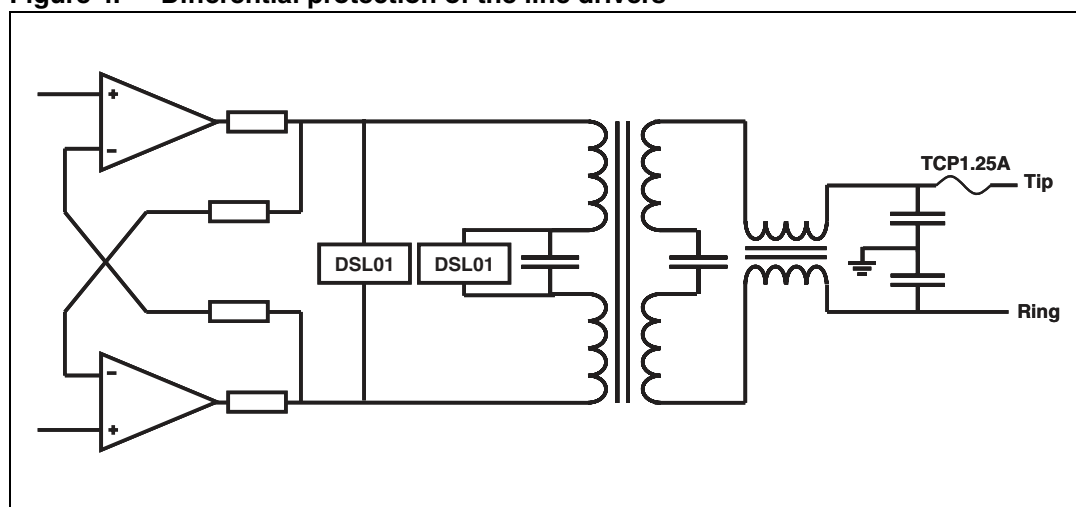
Figure 3 shows the schematic used for a complete protection (differential and common mode) but in some cases depending on the line driver circuitry only differential or common mode can be used.

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

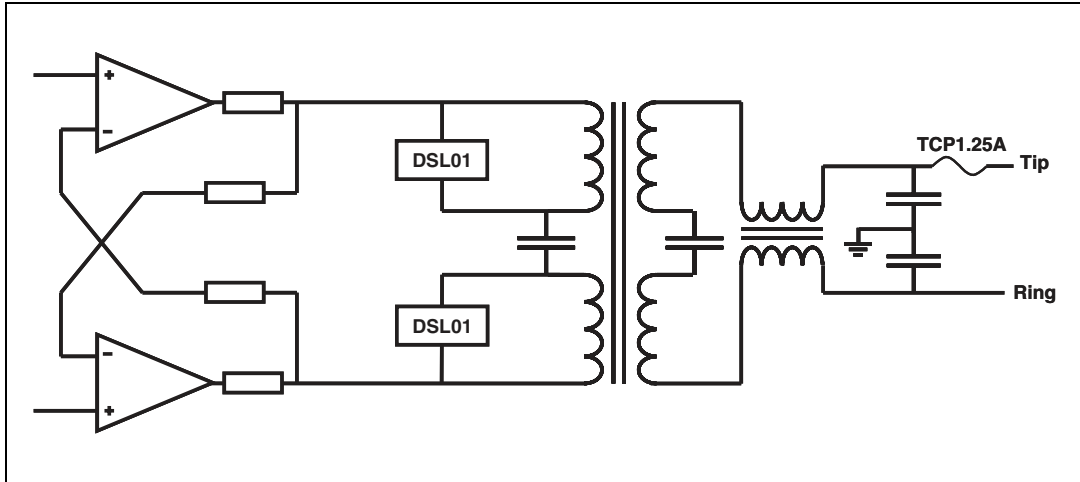
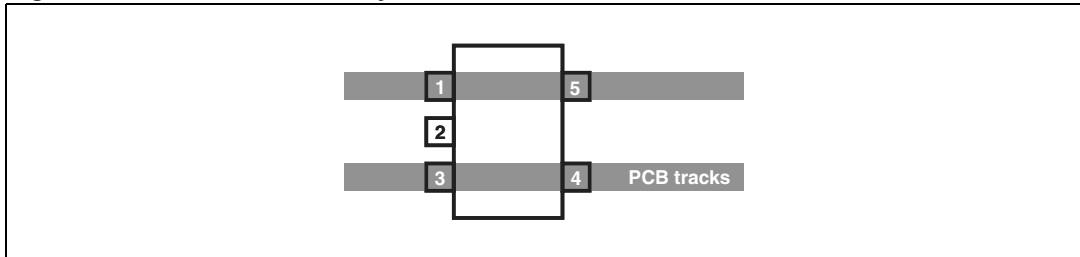


Figure 6. Recommended layout

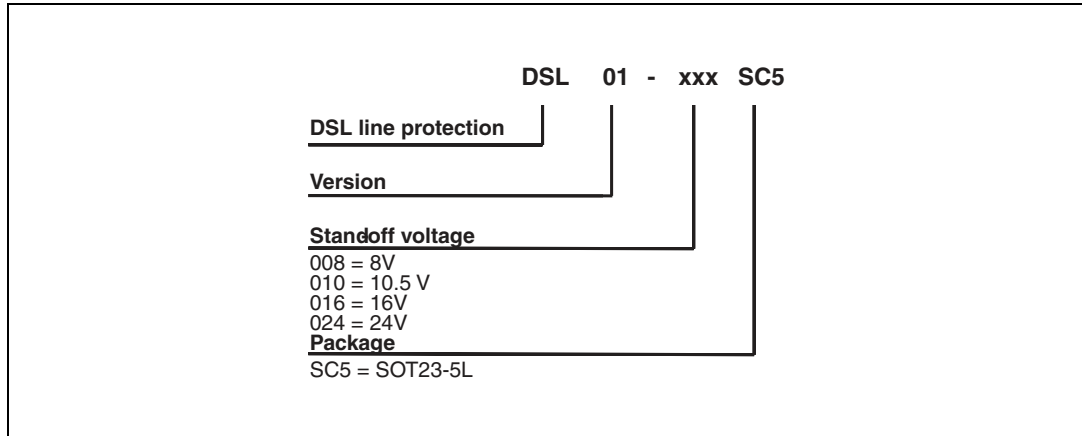


Concerning [Figure 6](#):

- 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

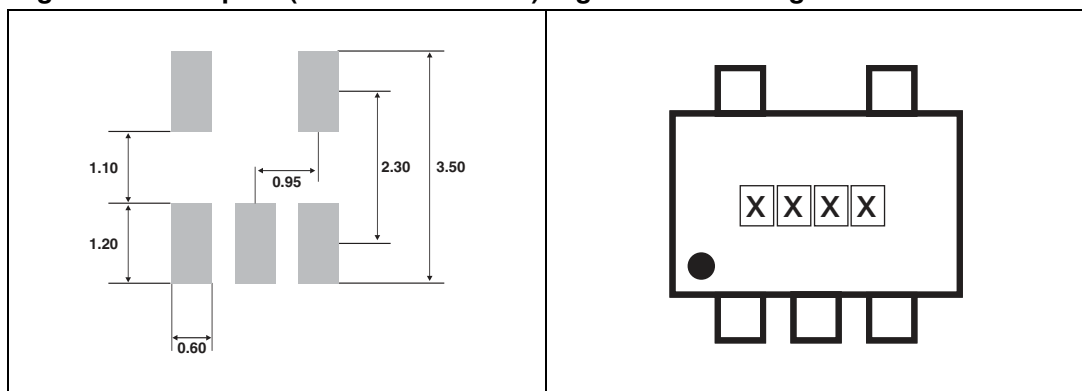
- Epoxy meets UL 94, V0
- Lead-free package

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. 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.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2010 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com