

# IPAD™ – protection and rectifiers for computer applications



June 2005

# Contents

## Overview mapping kits

Motherboard (desktop and notebook)	4
Optical and hard disk drive	4
Photo, multifunction and standalone printers	5
Personal Digital Assistant (PDA)	5

## Design guide for point-to-point

USB 2.0 high-speed	6
PS/2	6
Flash card memory slots	7
IEEE1284 parallel interface	7
USB 2.0 low and full-speed	7

## Design guide for audio and video

Handheld audio	8
Computer audio	9
DVI	9
S-VHS	9

## Design guide for networking and power

IEEE1394a/b	10
Ethernet 10/100	10
Modem 56k and ADSL	11
Battery powered computer application: Schottky and protection diodes	11
Battery powered computer application: Transky™ diodes	11

## Power topology in hard disk drive

Boost converter in hard disk drive	12
Buck/Boost converter in hard disk drive	12

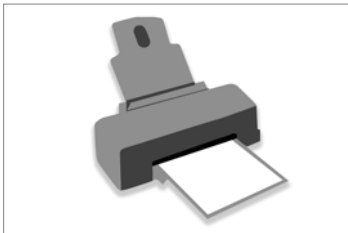
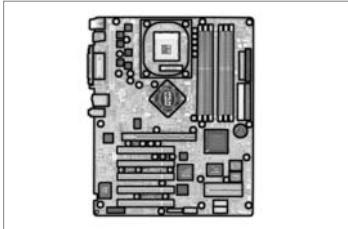
## Part number list

Part number list	13/14
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# Introduction

This brochure describes the IPAD, ASD protection and rectifier product portfolio suitable for major computer applications:

- Motherboards for desktop and notebook
- Optical and hard disk drives
- Printers
- Personal Digital Assistant (PDA)



To help designers, we have also provided detailed technical explanations for the following sub-applications:

- Point-to-point connection
- Audio and video function
- Networking
- Power management

# Overview mapping kits

## Motherboard (desktop and notebook)

### ESD protection

- ESDA6V1-4BC6
- ESDA5V3SC6
- ESDA5V3L
- ESDALC6V1P3

AUDIO

### IEEE1394a/b

- ESD protection
- DVIULC6-4SC6
- EMI filter and termination
- ST1394-01SC6

NETWORKING

### Modem pots

- Lightning protection
- SMP100LC-xxx/MC-xxx
  - SMP30-xxx
  - SMP50-xxx
  - SMP80-xxx

NETWORKING

### Ethernet

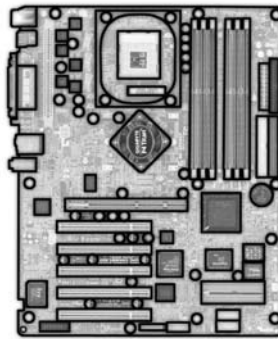
- ESD protection
- USBLC6-2SC6/2P6
  - USBLC6-4SC6
  - DALC208SC6

NETWORKING

### Power management

- Asynchronous  $V_{RM}$
- High current 30V Schottky
- Signal function – charge pump
- BAT54J/AW/CW/SWFILM

POWER



### DVI

- ESD protection
- DVIULC6-4SC6

VIDEO

### S-VHS and composite

- ESD protection
- DALC208SC6
  - ESDA5V3L
  - ESDALC6V1P3

VIDEO

### VGA (D-SUB)

- ESD protection
- DALC208SC6

VIDEO

### Flash card memory slot

- ESD protection
- USBLC6-4SC6
  - ESDALC6V1W5/5W6
  - DALC208SC6

POINT TO POINT

### EMI filter

- EMIF04-MMC0xF2
- EMIF06-HMC01F2
- EMIF04-2005QCF

### PS/2

- ESD protection
- KBMF01SC6
- EMI filter and termination

POINT TO POINT

### IEEE1284

- ESD protection
- ESDA6V1S3
- EMI filter and termination
- ST1284-0xA8

POINT TO POINT

### USB 2.0 high-speed

- ESD protection
- USBLC6-4SC6
  - USBLC6-2SC6
  - USBLC6-2P6

POINT TO POINT

## Optical and hard disk drive

### Power management

- DC/DC
- STPS0520Z/STPS0530Z
  - STPS120M/STPS130M
  - STPS1L20M/STPS1L30M
  - STPS2L30A/STPS2L25U/STPS2L40U
  - STPS340x/STPS3L40x

POWER



### Power rail

- EOS protection
- SM2T3V3A/SM2T6V8A/SM2T14A
  - SMLVT3V3
  - SMAJ5.0A-TR/SMBJ5.0A-TR
  - SMBJ12AVCL/SMBJ13A-TR

POWER

### Signal function – charge pump

- BAT54J/AW/CW/SWFILM

### USB 2.0 high-speed

- ESD protection
- USBLC6-2SC6
  - USBLC6-2P6

POINT TO POINT

### IEEE1394a/b

- ESD protection
- DVIULC6-4SC6
- EMI filter and termination
- ST1394-01SC6

POINT TO POINT

# Photo, multifunction and standalone printers

## Ethernet

ESD protection

- USBLC6-2SC6/2P6
- USBLC6-4SC6

NETWORKING

## Modem

Lightning protection

- SMP100LC-xxx/MC-xxx
- SMP30-xxx
- SMP50-xxx
- SMP80-xxx

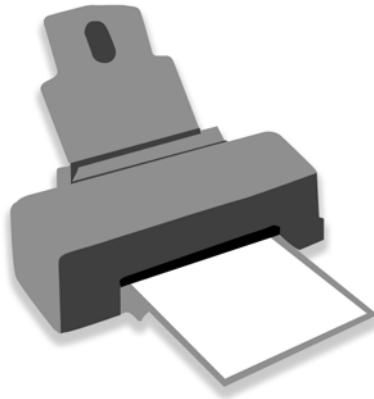
NETWORKING

## Print-head

ESD protection

- ESDA17SC6
- ESDA17-5SC6
- ESDA19SC6
- ESDA19-5SC6

NETWORKING



## Power management

DC/DC converters/ $V_{regs}$

- Schottky 0.5 to 5A/20 to 60V
- SOD123/STmite/SMA/SMD/DPACK
- STPS160A
- STPS3100B

POWER

## Flash card memory slot

ESD protection

- ESDALC6V1W5/5W6
- USBLC6-4SC6

EMI filter

- EMIF04-MMC0xF2
- EMIF06-HMC01F2
- EMIF04-2005QCF

POINT TO POINT

## USB 2.0 high-speed

ESD protection

- USBLC6-4SC6
- USBLC6-2SC6
- USBLC6-2P6

POINT TO POINT

## IEEE1284

ESD protection

- ESDA6V1S3

EMI filter and termination

- ST1284-0xA8

POINT TO POINT

# PDA

## LCD screen

ESD protection and EMI filter

- EMIF10-LCD01F1

## Microphone, earpiece and speaker-phone

ESD protection

EMI filter and termination

- EMIF01-10005W5
- EMIF02-MIC0xF2
- EMIF02-SPK0xF2
- EMIF06-xxxxF2

AUDIO



## Flash card memory slot

ESD protection

- USBLC6-4SC6
- ESDALC6V1W5/5W6
- DALC208SC6

EMI Filter

- EMIF04-MMC0xF2
- EMIF04-HMC01F2
- EMIF04-2005QCF

POINT TO POINT

## USB 2.0 low to high-speed

ESD protection

- USBLC6-2SC6
- USBLC6-2P6

EMI filter and termination

- EMIF02-USB01/04Fx
- USBUF01/02W6/P6

POINT TO POINT

## Power management

Reverse battery protection

Boost Schottky diode

- STPS0520Z/STPS0530Z
- STPS120M/STPS130M
- STPS1L20M/STPS1L30M

Signal function – charge pump

- BAT54J/AW/CW/SWFILM

POWER

## Power rail

EOS protection

- Transky SMYT18AM
- SMAJxxA-TR
- SM2T3V3A/SM2T6V8A/SM2T14A

POWER

## Bottom connector

ESD protection

- ESDA6V1W6/5W6

EMI filter

- EMIF01-10005W5

POINT TO POINT

# Design guide for point-to-point

## USB 2.0 high-speed

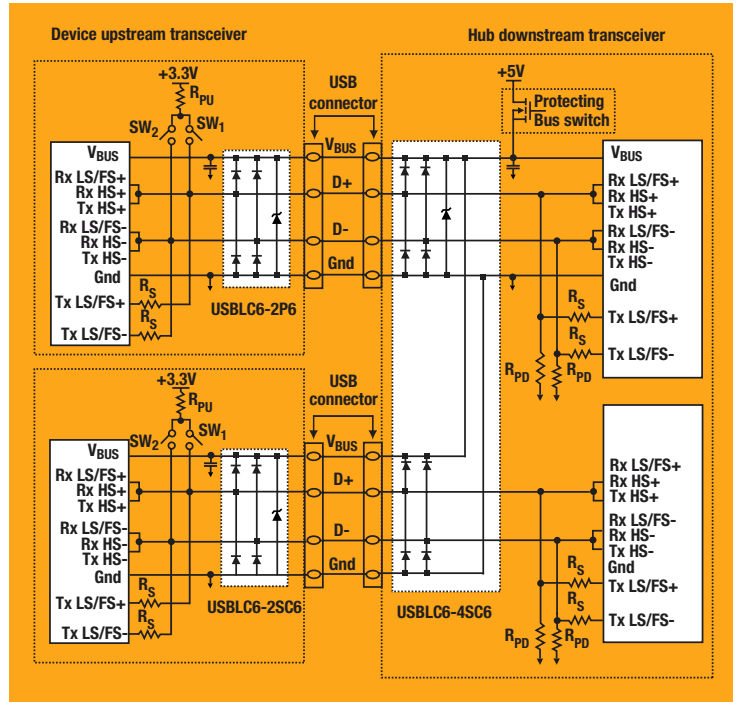
### Features

- Data line and  $V_{BUS}$  ESD protection
- Very low line capacitance ( $<3\text{pF}$  typ.)
- SOT23-6L and SOT-666 packages

### Benefits

- +/-15kV air and contact discharge ESD protection (compliant with IEC61000-4-2, level 4)
- No signal distortion
- EMI-free layout
- Low-profile and small-footprint solution

Mode	SW1	SW2
Low-speed LS	Open	Closed
Full-speed FS	Closed	Open
High-speed HS	Closed then open	Open



## PS/2

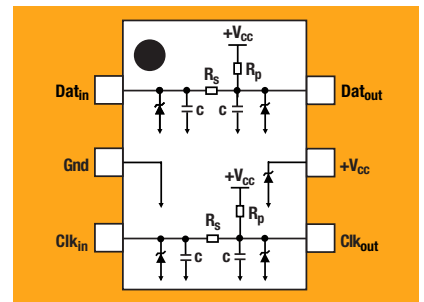
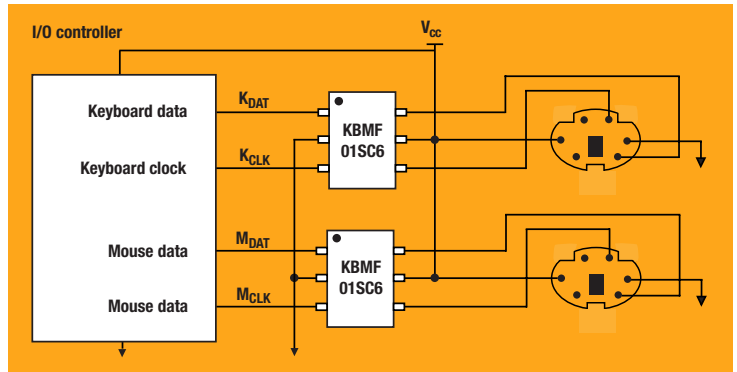
### Features

- Integrated passives components for pull-up and low-pass filter functions
- ESD protection for clock and data line
- SOT23-6L package

### Benefits

- Complies with FCC part 15 (EMI) and IEC61000-4-2 ( $\pm 15\text{kV}$  air and contact discharge, level 4)
- EMI filtering and line termination for mouse and keyboard ports
- Space saving (replaces 11 discretes)

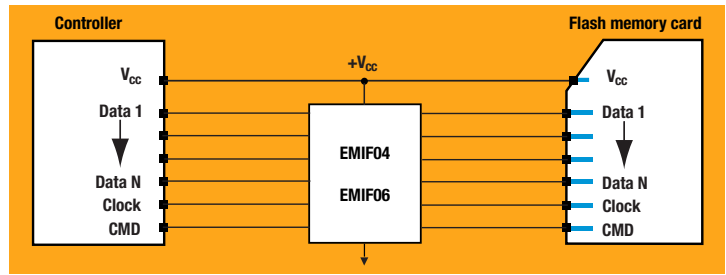
Part number	$R_s$	$R_p$	C
Code 01	$39\Omega$	$4.7\Omega$	$120\text{pF}$
Tolerance	$\pm 10\%$	$\pm 10\%$	$\pm 20\%$



# Flash card memory slots

## Features

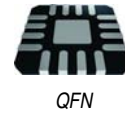
- Up to six control/data lines, ESD protection and EMI filter
- Supply pin ESD-protected
- Low line capacitance (<20pF)
- Flip-Chip or QFN packages



## Benefits

- +/-15kV air and +/-8kV contact discharge ESD protection (compliant with IEC61000-4-2, level 4)
- Provides EMI filter + integrated resistor termination
- Low profile and large space savings (replaces up to 24 discretes)
- Broad frequency range filter (<-26dB rejection at 3GHz)
- Suitable for high data rate exchange

Part number	Number of protected lines	Package
EMIF06-HMC01F2	6	Flip-Chip
EMIF04-2005QCF	4	QFN
EMIF04-MMC02F2	4	Flip-Chip



# IEEE1284 parallel interface

## Features

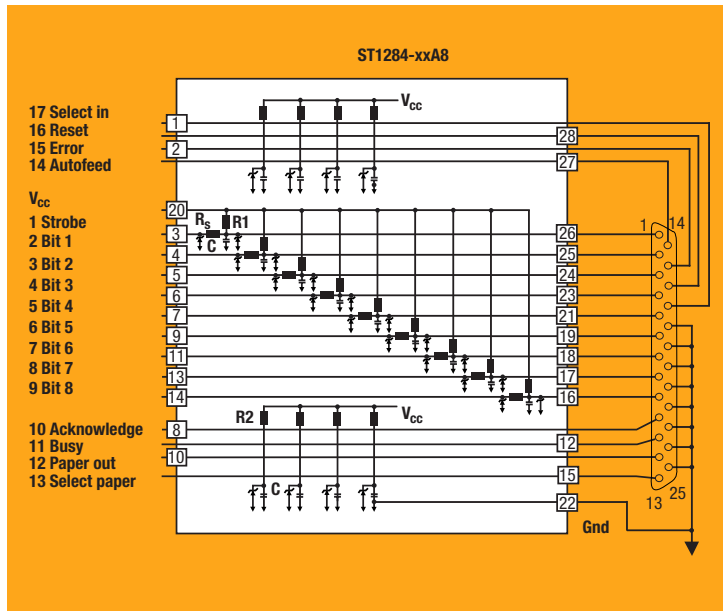
- Integrated termination resistors
- EMI filtering with integrated low-pass filter on dataline and strobe
- 17-line ESD protection
- QSOP28 package



## Benefits

- Complies with FCC part 15 (EMI) and IEC61000-4-2 (15kV ESD protection, air discharge level 4)
- Impedance matching with cable and controller
- Space saving (replaces up to 69 discretes)

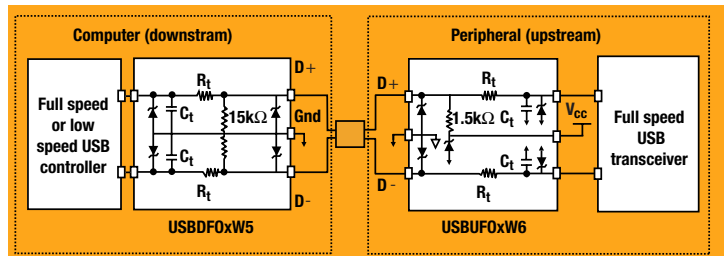
Part number	Rs (Ω)	R1 (kΩ)	R2 (kΩ)	C (pF)
ST1284-01A8	33	4.7	4.7	180
ST1284-02A8	33	2.2	2.2	220
ST1284-03A8	39	1	5.1	150



# USB 2.0 low and full-speed

## Features

- ESD protection
- EMI Filtering with integrated low-pass filter
- Integrated pull-up, pull-down and series termination resistors
- SOT323-5/6L and SOT-666 packages



## Benefits

- +/-15kV air and +/-8kV contact discharge ESD protection (compliant with IEC61000-4-2, level 4)
- Low profile and large space savings (replaces 8 discretes)
- EMI-free layout

# Design guide for audio and video

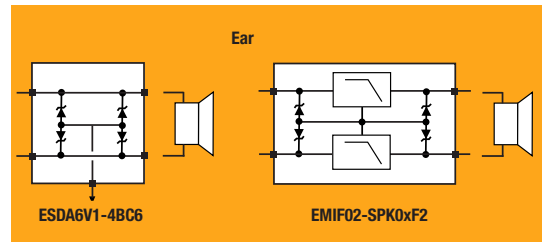
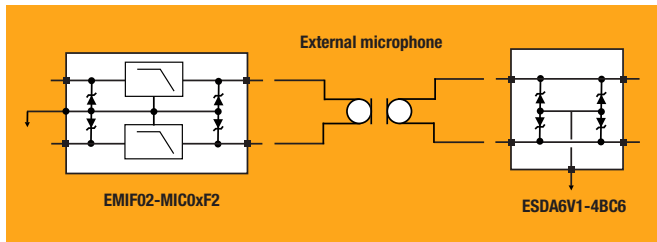
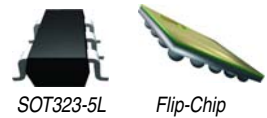
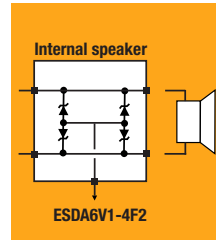
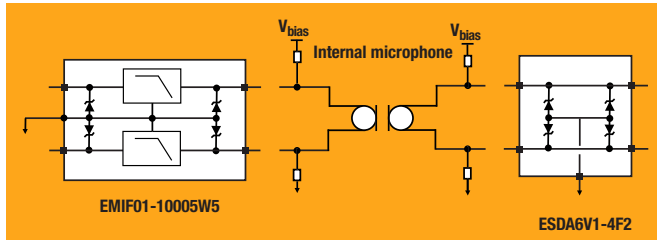
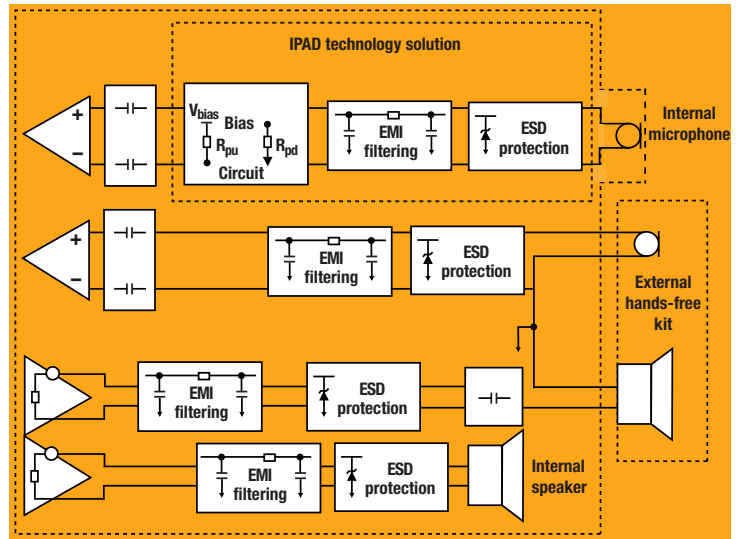
## Handheld audio

### Features

- ESD protection
- Integrated low-pass filter for EMIF0x-MIC0xF2, EMIF01-1005W5 and EMIF02-SPK0xF2
- Flip-Chip or SOT323-5L package

### Benefits

- EMI low pass filter with EMIF products
- Replaces up to 10 discretes
- Complies with FCC part 15 (EMI) and IEC61000-4-2 ( $\pm 15\text{kV}$  ESD protection, air discharge level 4)



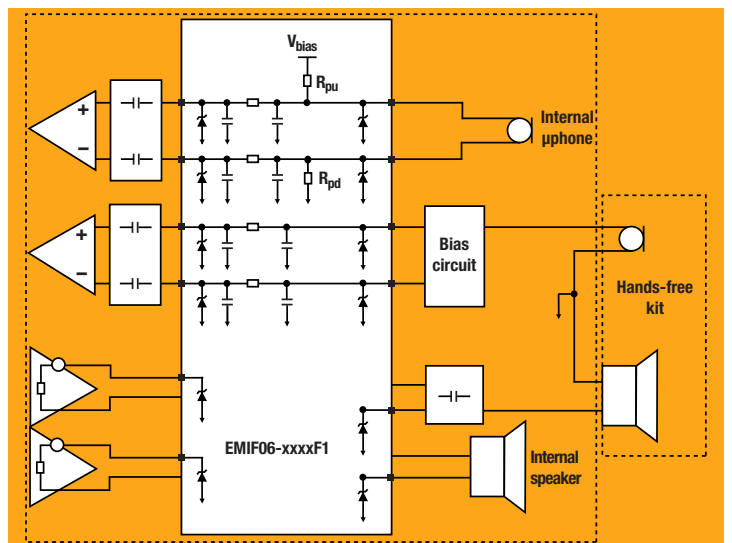
## Computer audio

### Features

- ESD protection
- Integrated low pass-filter and pull up and pull down resistors
- Flip-Chip package

### Benefits

- EMI low pass filter with EMIF products
- Complies with FCC part 15 (EMI) and IEC61000-4-2 ( $\pm 15\text{kV}$  ESD protection, air discharge level 4)





# Computer audio

## Features

- 5V uni or bidirectional ESD protection for audio lines
- Low capacitance (12pF typ.)
- SOT-23 and SC-89 and SOT-323 packages



SOT323-6L

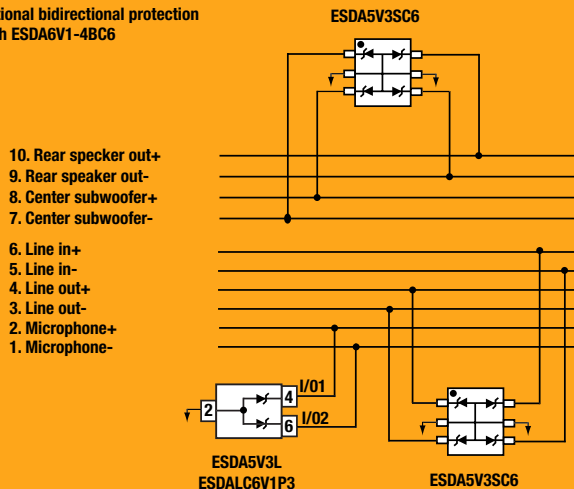


SC-89

## Benefits

- +/-15kV air and +/-8kV contact discharge ESD protection (compliant with IEC61000-4-2, level 4)
- Very low crosstalk

Optional bidirectional protection with ESDA6V1-4BC6



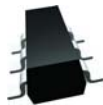
# DVI\*

## Features

- 4-line ESD protection
- Ultra-low capacitance (0.85pF typ.)
- SOT23-6L package
- Deviates clamping current to ground

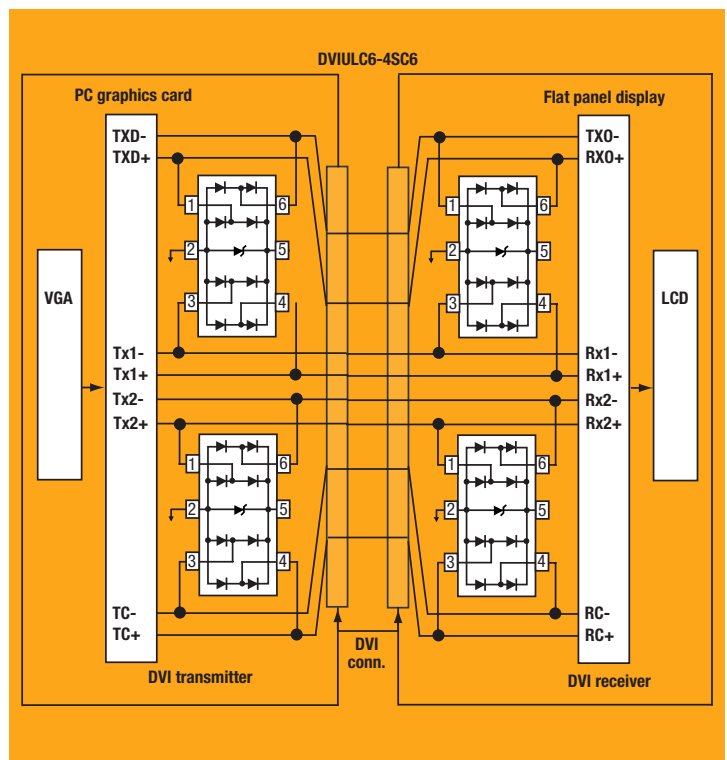
## Benefits

- +/-15kV air and +/-8kV contact discharge ESD protection (compliant with IEC61000-4-2, level 4)
- No signal distortion due to world leading trade-off line capacitance value/ESD performance



SOT23-6L

\* Released in 2005



# S-VHS

## Features

- 5V unidirectional ESD protection for video lines
- Low capacitance (12pF typ.)
- SOT-23 and SC-89 packages

## Benefits

- +/-15kV air and +/-8kV contact discharge ESD protection (compliant with IEC61000-4-2, level 4)
- Very low crosstalk

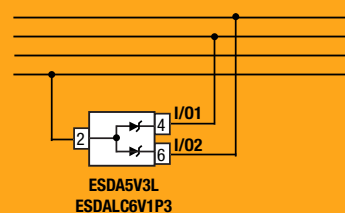


SOT-23



SC-89

- 4. Chrominance
- 3. Luminance
- 2. Chrominance Gnd
- 1. Luminance Gnd



# Design guide for networking and power

## IEEE1394a/b

### Features (ST1394-01SC6)

- Line termination for two twisted pairs TPA and TPB (1% matching tolerance resistor)
- Complies with IEEE1394 requirement for differential and common mode impedance on TPA and TPB line

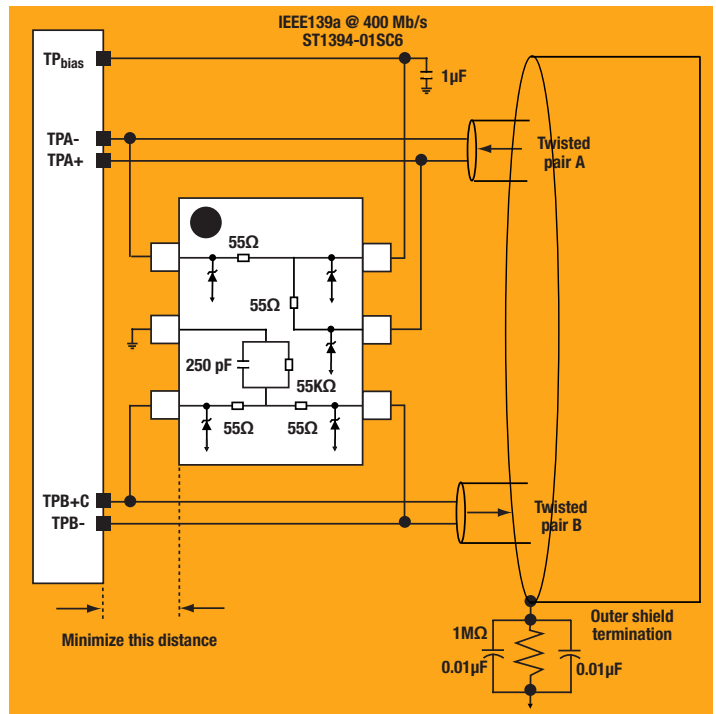
### Features (ST1394-01SC6 and DVIULC6-4SC6\*)

- ESD protection
- SOT23-6L package

### Benefits

- ST1394-01SC6 replaces 7 discretes
- ST1394-01SC6 provides full impedance matching for data integrity with optimized ESD protection
- DVIULC6-4SC6 complies with IEC61000-4-2, level 4 (+/-15kV air and +/-8kV contact discharge ESD protection) while providing optimized signal integrity

\* Released in 2005



## Ethernet 10/100

### Secondary protection (USBLC6-4SC6)

### Features

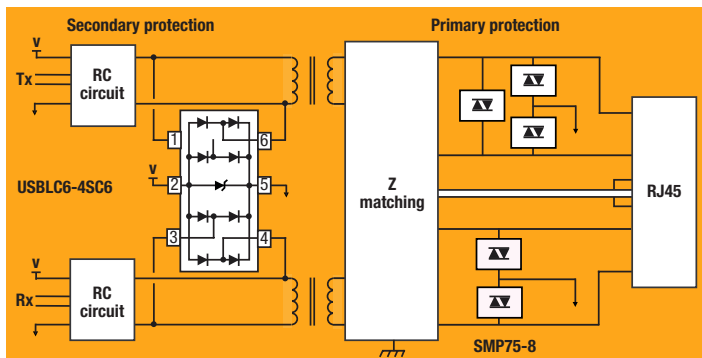
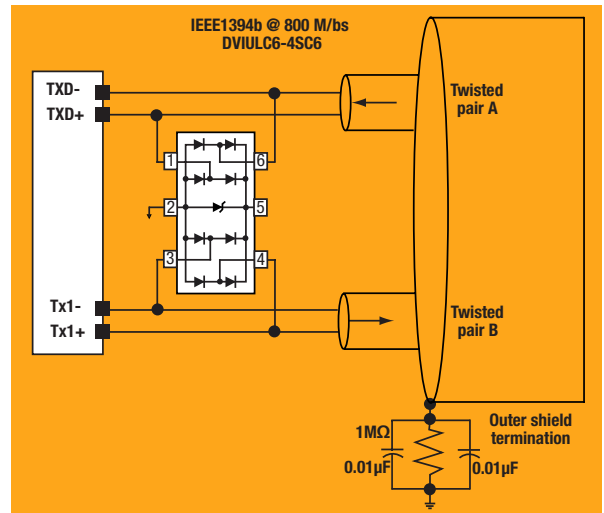
- Maximum parasitic line capacitance = 5pF



SOT23-6L

### Benefits

- 4-line protection in one package
- Complies with IEC61000-4-2, level 4 (+/-15kV air and +/- 8kV contact discharge ESD protection)



### Primary protection (SMP75-8)

### Features

- Very low stand-off voltage: 8V
- Low leakage current (<2µA max.)



SMB

### Benefits

- Bellcore TR-NWT-000974 compliant

# Modem 56k and ADSL

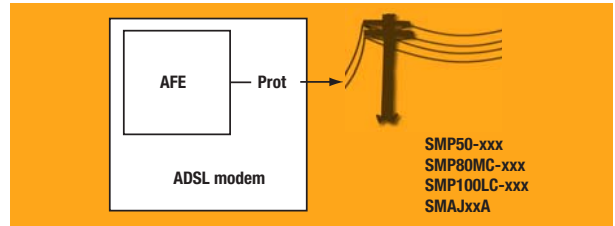
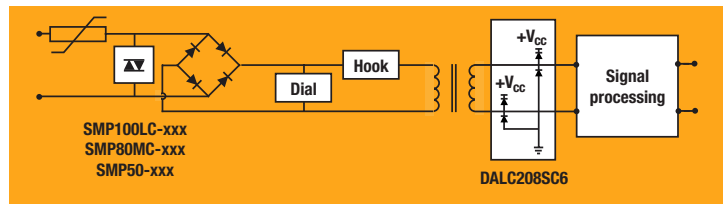
## Features

- Lightning protection of modem up to 100A, 10/1000µs
- Low capacitance (15pF typ @ 270V)
- Low-profile SMA/SMB and SOT23-6L

## Benefits

- Complies with FCC Part 68
- Complies with ITU-T K20/K21
- Suitable for xDSL

Part number	Features	C <sub>typ</sub>	Package
SMP100LC-xxx	100A, 10/1000µs	30pF	SMB
SMP80MC-xxx	80A, 10/1000µs	15pF	SMA
SMP50-xxx	50A, 10/1000µs	15pF	SMA
SMAJxxA	Standoff voltage: 5 to 188V	-	SMA
DALC208SC6	VRRM=9V	7pF	SOT23-6L



SMA/SMB



SOT23-6L

# Battery powered computer application: Schottky and protection diodes



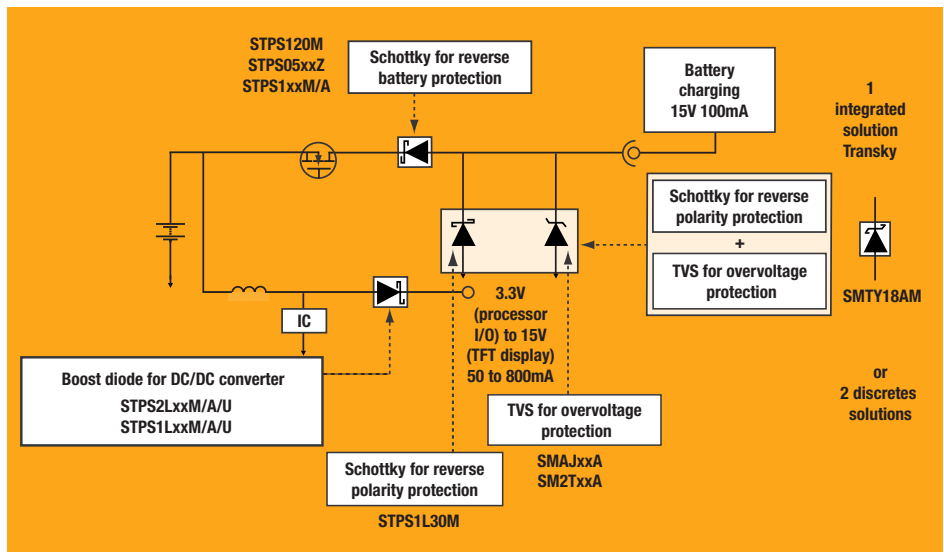
SMA/SMB/SMC



SOD-323



STmite



# Battery powered computer application: Transky

## Features

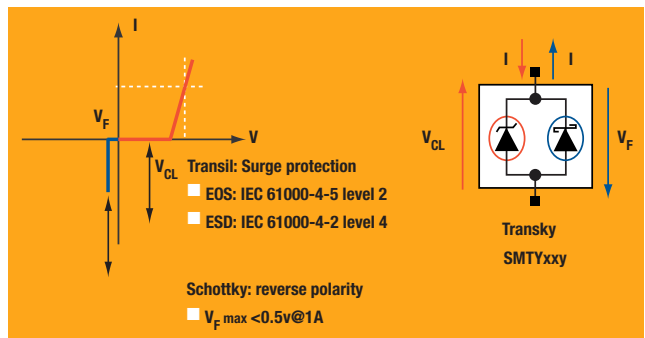
- Combination of Transil (TVS) + Schottky diode on the same die
- Operating voltage up to 16V
- STmite package

## Benefits

- Single power device in place of two
- Offers low clamping voltages for both over and undershoots

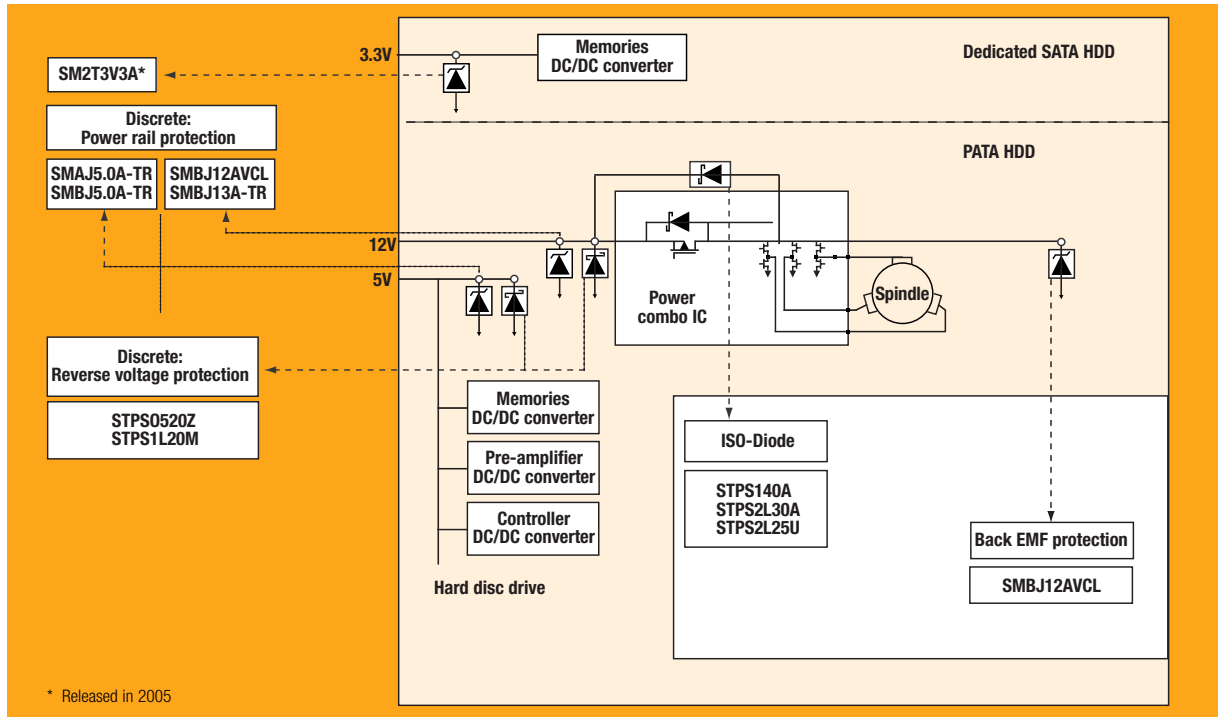


STmite

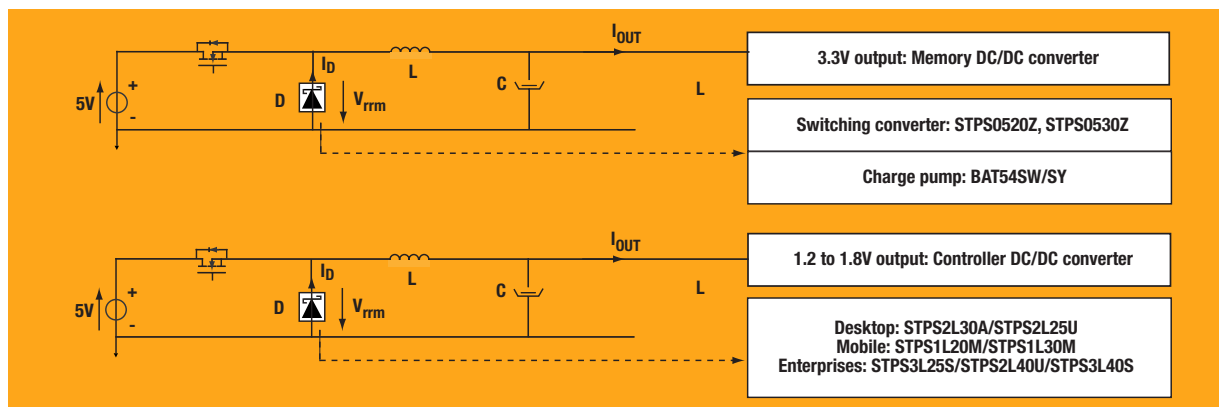


# Power topology in hard disc drive

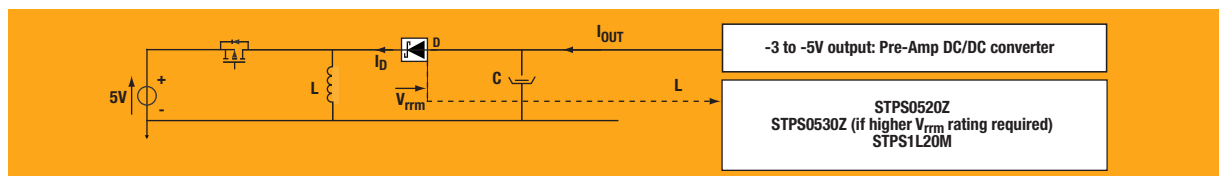
## Boost converter in HDD



## Buck converter in HDD



## Buck/boost converter



# Part number list

Subsystem	Part number rectifier	Description	Specifications				Package
			V <sub>RM</sub> (V)	V <sub>F</sub> @ I <sub>av</sub> (V)	I <sub>av</sub> (A)	IR max (μA) @ V <sub>RRM</sub>	
DC/DC	STPS05xxZ/M	0.5A, 20,30 and 40V Schottky low leakage current	20,30,40	0.30	0.5	50	SOD-123 STmite
	STPS1xxA/U/Z/M	1A, 20,30 and 40V Schottky low leakage current	20,30,40	0.51	1	12	SOD-123/ SMA/SMB/ STmite
	STPS1LxxA/U/M	1A, 20, 30 and 40V Schottky low forward voltage	20,30,40	0.42	1	390	SMA/SMB/ STmite
	STPS2LxxA/U	2A, 25 and 40V Schottky low forward voltage	25,40	0.38	2	220	SMA/SMB
	STPS340U/B/S	3A, 40V Schottky low leakage current	40	0.57	3	20	SMB/DPAK/ SMC
	STPS3LxxS	3A, 25 and 40V Schottky low forward voltage	25,40	0.44	3	100	SMC
Charge pump	BAT54A/C/SFILM	Signal Schottky	30	0.90	0.3	1	SOT-23
	BAT54J/AW/CW/SWFILM	Signal Schottky	30	0.90	0.3	1	SOD-323/ SOT-323

Subsystem	Part number IPAD	Description	Specifications				Package
			No. of protected lines	C <sub>typ</sub> (pF)	R <sub>I/O</sub> (Ohm)	Protection level	
USB 1.1 upstream	USBUF01P6	Line termination + ESD protection + EMI filter + Pull-up resistor	2	47	22	IEC61000-4-2 level 4	SOT-666
	EMIF02-USB01		2	40	33	IEC61000-4-2 level 4	Flip-Chip
	USBUF01W6/ USBUF02W6		2	47	33/22	IEC61000-4-2 level 4	SOT-323
USB 1.1 downstream	USBDF01W5/ USBDF02W5		2	47	33/15	IEC61000-4-2 level 4	SOT-323
IEEE1284	ST1284-01A8/ ST1284-02A8/ ST1284-03A8		17	180/220/150	33/33/39	IEC61000-4-2 level 4	QSOP28
MMC memory slot	EMIF04-MMC02F2		4	20	50	IEC61000-4-2 level 4	Flip-Chip
	EMIF04-2005QCF		4	45	200	IEC61000-4-2 level 4	QCF
HMC memory slot	EMIF06-HMC01F2		6	20	50	IEC61000-4-2 level 4	Flip-Chip
PS/2	KBMF01SC6		2	120	39	IEC61000-4-2 level 4	SOT23-6L
IEEE1394	ST1394-01SC6		Line termination + TPA+/- and TPB+/- ESD protection	4	5	110	IEC61000-4-2 Level 2
Microphone/ bottom connector	EMIF01-10005W5	Line termination + ESD protection + EMI filter	2	50	100	IEC61000-4-2 level 4	SOT323-5L
Microphone	EMIF02-MIC02F2		2	16	470	IEC61000-4-2 level 4	Flip-Chip
Speakerphone	EMIF02-SPK01F2		2	200	10	IEC61000-4-2 level 4	Flip-Chip
Speakerphone + microphone	EMIF06-xxxxF2	ESD protection + EMI filter + Pull up and down resistors	6	-	-	IEC61000-4-2 level 4	Flip-Chip
LCD Screen	EMIF10-LCD01F2	ESD protection + EMI filter	10	35	100	IEC61000-4-2 Level 4	Flip-Chip

# Part number list

Subsystem	Part number protection	Description	Specifications				Package
			No. of protected lines	C <sub>typ</sub> (pF)	V <sub>BR</sub> min (V)	Protection level	
USB 2.0	USBLC6-2SC6	Low capacitance ESD protection for dataline and V <sub>BUS</sub>	2	< 5	6	IEC61000-4-2 level 4	SOT23-6L
	USBLC6-2P6		2	< 5	6	IEC61000-4-2 level 4	SOT-666
	USBLC6-4SC6		4	< 5	6	IEC61000-4-2 level 4	SOT23-6L
USB 1.1	USB6B1	EOS + ESD protection	2	25	6	IEC61000-4-2	SO-8
Flash card memory slot – dataline	ESDA6V1W5/ ESDA6V1-5W6/ ESDA6V1P6/ ESDA6V1-5P6	ESD protection	5/4	50	6.1	IEC61000-4-2 level 4	SOT-323/ SOT-666
	ESDALC6V1W5/ ESDALC6V1-5W6	Low capacitance ESD protection	4	12	6.1	IEC61000-4-2 level 4	SOT-323
	USBLC6-4SC6	ESD protection	4	< 5	6	IEC61000-4-2 level 4	SOT23-6L
IEEE1284 – dataline	ESDA6V1S3/ESDA6V2S6	ESD protection	18	100	6.1/6.2	IEC61000-4-2 level 4	S0-20/ SSOP20
IEEE1394	DVIULC6-4SC6	TPA+/- and TPB+/- ESD protection	4	< 1	6	IEC61000-4-2 level 4	SOT23-6L
Ethernet	USBLC6-2SC6	Low capacitance protection	2	< 5	6	IEC61000-4-2 level 4	SOT23-6L
	USBLC6-2P6		2	< 5	6	IEC61000-4-2 level 4	SOT-666
	USBLC6-4SC6		4	< 5	6	IEC61000-4-2 level 4	SOT23-6L
Modem	SMP100LC-xxx	Lightning protection	1	30	-	IEC61000-4-5	SMC
	SMP100MC-xxx		1	20	-	IEC61000-4-5	SMB
	SMP30-xxx		1	25-40	-	IEC61000-4-5	SMA
	SMP50-xxx		1	15	-	IEC61000-4-5	SMA
	SMP75-xxx		1	< 75	-	BellcoreTR-NWT-000974	SMB
	SMP80MC-xxx		1	15	-	IEC61000-4-5	SMB
	ESDA5V3SC6		4	280	-	IEC61000-4-2 level 4	SOT23-6L
Audio	ESDA5V3L	4	220	-	IEC61000-4-2 level 4	SOT-23	
	ESDA6V1-4BC6	4	45	6.1	IEC61000-4-2 level 4	SOT23-6L	
	ESDA6V1-4F2	4	< 250	6.1	IEC61000-4-2 level 4	Flip Chip	
	ESDALC6V1P3	2	12	6.1	IEC61000-4-2 level 4	SC-89	
	DALC208SC6	4	7	-	IEC61000-4-2 level 4	SOT23-6L	
S-VHS/ composite	ESDA14V2L	1	90	14.2	IEC61000-4-2 level 4	SOT-23	
	ESDA5V3L	1	220	5.3	IEC61000-4-2 level 4	SOT-23	
	ESDALC6V1P3	2	12	6.1	IEC61000-4-2 level 4	SC-89	
VGA Filter	DALC208SC6	4	7	-	IEC61000-4-2 level 4	SOT23-6L	
Print-head – dataline	ESDA17SC6/ ESDA19SC6	4	85/80	17/19	IEC61000-4-2 level 4	SOT23-6L	
Print-head	ESDA17-5SC6/ ESDA19-5SC6	5	33	17/19	IEC61000-4-2 level 4	SOT23-6L	
DVI	DVIULC6-4SC6	4	0.85	6	IEC61000-4-2 level 4	SOT23-6L	

Subsystem	Part number TRANSIL	Description	Specifications					Package
			Peak pulse power (W)	V <sub>RM</sub> min @ I <sub>RM</sub> (V @ μA)	V <sub>BR</sub> min @ 1mA (V)	V <sub>CL</sub> @ I <sub>pp</sub> with 10/1000 pulse waveform	Schottky VF @ 1A (V)	
Power rail 3.3V	SM2T3V3A	Transient voltage protection	200	3.3 @ 500	3.6	6.8 @ 30	-	STmite
	SMLV3V3		600	3.3 @ 200	4.1	7.3 @ 50	-	SMB
Power rail 5V	SM2T6V8A		200	5 @ 50	6.4	9.2 @ 19.6	-	STmite
	SMAJ5.0A-TR		400	5 @ 800	6.4 @ 10mA	9.2 @ 43.5	-	SMA
	SMBJ5.0A-TR		600	5 @ 800	6.4 @ 10mA	9.2 @ 68	-	SMB
Power rail 12V	SM2T14A	Transient voltage protection	200	12 @ 1	13.3	19.9 @ 9	-	STmite
	SMBJ12AVCL		600	12 @ 5	13.2	19.5 @ 31	-	SMB
Power rail 18V	SMYT18AM	Transient voltage protection + Schottky diode	200	16 @ 4	-	20 @ 1	0.48 @ 0.85	STmite



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