ABSOLUTE RATINGS (limiting values)

For either positive or negative polarity of pin OUT voltage in respect to pin COM voltage

Symbol	Parameter	Value	Unit		
V _{DRM} / V _{RRM}	Repetitive peak off-state voltage	Tj = -10 °C	700	V	
I _{T(RMS)}	RMS on-state current full cycle sine wave	SOT-223	Ttab = 105 °C	1	Α
	50 to 60 Hz	DIL-8	Tlead = 110 °C		
I _{TSM}	Non repetitive surge peak on-state current	F =50 Hz	8	Α	
	Tj initial = 25°C, full cycle sine wave		F =60 Hz	11	Α
l ² t	Fusing capability	tp = 10ms	0.35	A²s	
dl/dt	Repetitive on-state current critical rate of rise I _G = 10mA (tr < 100ns)			50	A/μs
V _{PP}	Non repetitive line peak pulse voltage	note 1	2	kV	
Tstg	Storage temperature range	- 40 to + 150	°C		
Tj	Operating junction temperature range			- 30 to + 125	°C
TI	Maximum lead soldering temperature during		260	°C	

Note 1: according to test described by IEC61000-4-5 standard & Figure 3.

GATE CHARACTERISTICS (maximum values)

Symbol	Parameter	Value	Unit
P _{G (AV)}	Average gate power dissipation	0.1	W
I _{GM}	Peak gate current (tp = 20µs)	1	Α
V_{GM}	Peak positive gate voltage (in respect to pin COM)	5	V

THERMAL RESISTANCES

Symbol	Parameter	Value	Unit	
Rth (j-a)	Junction to ambient S = 5cm ²	SOT-223	60	°C/W
		DIL-8	60	°C/W
Rth (j-l)	Junction to tab/lead for full cycle sine wave conduction	SOT-223	20	°C/W
		DIL-8	15	°C/W

S = Copper surface under Tab

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PARAMETER DESCRIPTION

Parameter Symbol	Parameter description
I _{GT}	Triggering gate current
V _{GT}	Triggering gate voltage
V _{GD}	Non-triggering gate voltage
I _H	Holding current
IL	Latching current
V _{TM}	Peak on-state voltage drop
V _{TO}	On state threshold voltage
Rd	On state dynamic resistance
I _{DRM} / I _{RRM}	Maximum forward or reverse leakage current
dV/dt	Critical rate of rise of off-state voltage
(dV/dt)c	Critical rate of rise of commutating off-state voltage
(dl/dt)c	Critical rate of decrease of commutating on-state current
V _{CL}	Clamping voltage
I _{CL}	Clamping current

ELECTRICAL CHARACTERISTICSFor either positive or negative polarity of pin OUT voltage respect to pin COM voltage excepted note 3*.

Symbol	Test Cond	Values	Unit			
I _{GT}	V_{OUT} =12V (DC) R_L =140 Ω	QII - QIII	Tj=25°C	MAX	10	mA
V _{GT}	V_{OUT} =12V (DC) R_L =140 Ω	QII - QIII	Tj=25°C	MAX	1	V
V_{GD}	$V_{OUT}=V_{DRM}$ $R_L=3.3k\Omega$		Tj=125°C	MIN	0.15	V
I _H	I _{OUT} = 100mA gate open		Tj=25°C	MAX	45	mA
IL	I _G = 20mA		Tj=25°C	MAX	65	mA
V _{TM}	I _{OUT} = 1.4A tp=380μs		Tj=25°C	MAX	1.3	V
V _{TO}			Tj=125°C	MAX	0.8	V
Rd			Tj=125°C	MAX	300	mΩ
I _{DRM} /	V _{OUT} = 700V		Tj=25°C	MAX	2	μА
I _{RRM}			Tj=125°C	MAX	200	
dV/dt	V _{OUT} =460V gate open		Tj=110°C	MIN	500	V/μs
(dl/dt)c	(dV/dt)c = 20V/μs		Tj=125°C	MIN	0.5	A/ms
V _{CL}	I _{CL} = 1mA tp=1ms		Tj=25°C	TYP	1100	V

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AC LINE SWITCH BASIC APPLICATION

The ACS110 device is well adapted to Washing machine, dishwasher, tumble drier, refrigerator, water heaters, air-conditioning systems, microwave ovens and other cookware. It has been designed especially to switch on & off low power loads such as solenoid, valve, relay, dispenser, micro-motor, pump, fan and defrost heaters.

Pin COM: Common drive reference to connect to the power line neutral

Pin G: Switch Gate input to connect to the digital controller

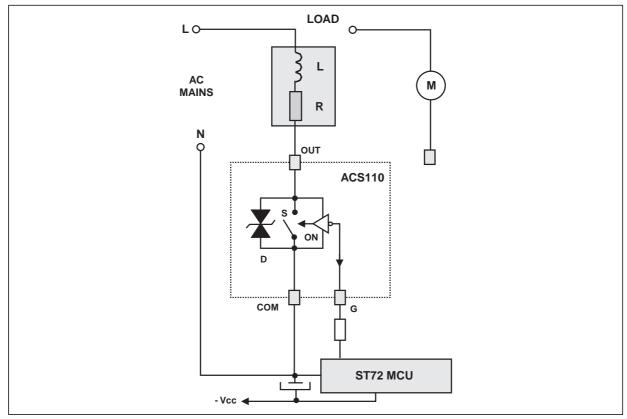
Pin OUT: Switch Output to connect to the load

This ACS™ switch is triggered with a negative gate current flowing out of the gate pin G. It can be driven directly by the digital controller through a resistor as shown on the typical application diagram.

Several ACS110 devices can be connected on the same cooling PCB pad, which is the COM pin.

Thanks to its thermal and turn off commutation performances, the ACS110 switch is able to drive with no turn off additional snubber an inductive load up to 1 A.

TYPICAL APPLICATION DIAGRAM



HIGH INDUCTIVE SWITCH-OFF OPERATION

At the end of the last conduction half-cycle, the load current reaches the holding current level I_H , and the ACSTM switch turns off. Because of the inductance L of the load, the current flows then through the avalanche diode D and decreases linearly to zero. During this time, the voltage across the switch is limited to the clamping voltage V_{CL} .

The energy stored in the inductance of the load depends on the holding current I_H and the inductance (up to 10 H); it can reach about 10 mJ and is dissipated in the clamping diode section. The ACS switch sustains the turn off energy because its clamping section is designed for that purpose.

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Fig. A: Turn-off operation of the ACS110 switch with an electro-valve: waveform of the pin OUT current I_{OUT} and Out-COM voltage V_{OUT}.

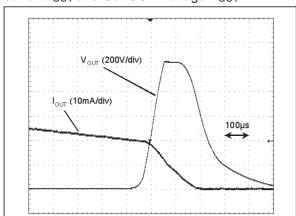
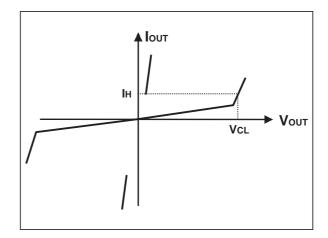


Fig. B: ACS110 switch static characteristic.



AC LINE TRANSIENT VOLTAGE RUGGEDNESS

The ACS110 switch is able to sustain safely the AC line transient voltages either by clamping the low energy spikes or by breaking over under high energy shocks, even with high turn-on current rises.

The test circuit of the figure C is representative of the final ACS application and is also used to stress the ACS switch according to the IEC 61000-4-5 standard conditions. Thanks to the load, the ACS switch sustains the voltage spikes up to 2 kV above the peak line voltage. It will break over safely even on resistive load where the turn on current rise is high as shown on figure D. Such non repetitive test can be done 10 times on each AC line voltage polarity.

Fig. C: Overvoltage ruggedness test circuit for resistive and inductive loads according to IEC61000-4-5 standards.

 $R = 150\Omega$, $L = 10\mu H$, $V_{PP} = 2kV$.

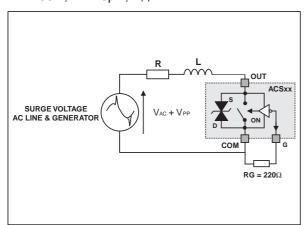
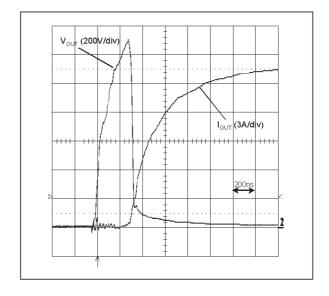


Fig. D: Current and Voltage of the ACS110 during IEC61000-4-5 standard test with R = 150Ω , L = 10μ H & V_{PP} = 2kV.



OTHER FIGURES

Maximum power dissipation vs RMS on state current.

RMS on-state current vs ambient temperature, case temperature and package

Relative variation of thermal impedance junction to ambient vs pulse duration and package

Relative variation of gate trigger current vs junction temperature

Relative variation of holding and latching current vs junction

Relative variation of dV/dt vs Tj

Relative variation of (dV/dt)_c vs (di/dt)_c

Surge peak on-state current vs number of cycles

Non repetitive surge peak on-state current for a sinusoidal pulse with tp<10ms, and corresponding of I2t.

On-state characteristics (maximal values)

Thermal resistance junction to ambient vs copper surface under tab

Relative variation of critical (di/dt)c vs junction temperature

Fig. 1: Maximum power dissipation versus RMS on-state current.

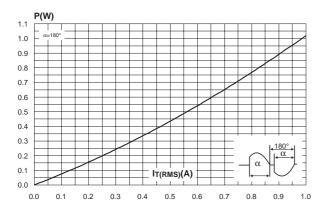


Fig. 2-1: RMS on-state current versus tab or lead temperature.

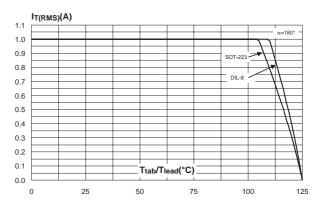


Fig. 2-2: RMS on-state current versus ambient temperature.

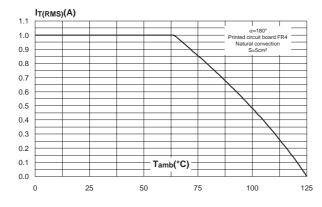


Fig. 3: Relative variation of thermal impedance junction to ambient versus pulse duration.

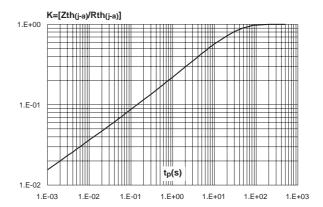


Fig. 4: Relative variation of gate trigger current, holding current and latching versus junction temperature (typical values).

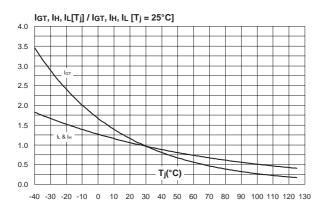


Fig. 6: Relative variation of critical rate of decrease of main current versus reapplied dV/dt (typical values).

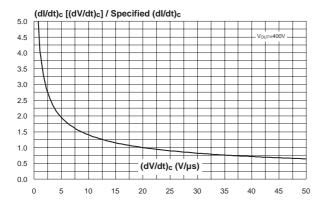


Fig. 8: Surge peak on-state current versus number of cycles.

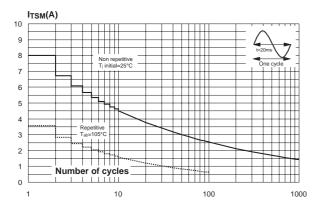


Fig. 5: Relative variation of static dV/dt versus junction temperature.

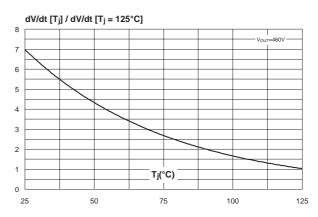


Fig. 7: Relative variation of critical rate of decrease of main current versus junction temperature.

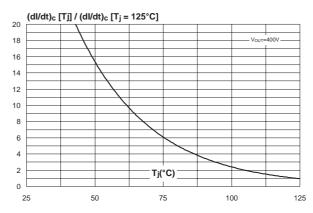
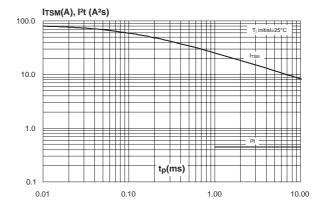


Fig. 9: Non repetitive surge peak on-state current for a sinusoidal pulse with width tp < 10ms, and corresponding value of l^2t .



 $\overline{\mathbf{A}}$

Fig. 10: On-state characteristics (maximum values).

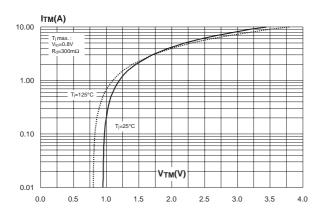
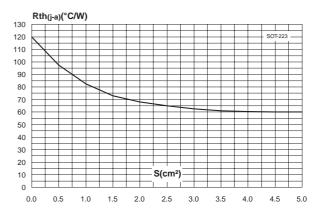
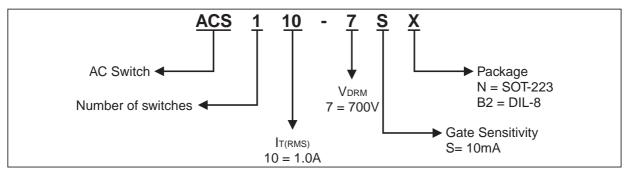


Fig. 11: Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: $35\mu m$)



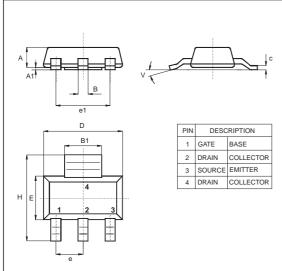
ORDERING INFORMATION



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PACKAGE OUTLINE MECHANICAL DATA

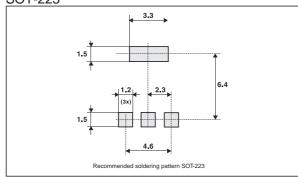
SOT-223



	DIMENSIONS						
REF.	Millimeters			Inches			
	Min.	Тур.	Max.	Min. Typ.		Max.	
Α			1.80			0.071	
A1	0.02		0.10	0.001		0.004	
В	0.60	0.70	0.85	0.024	0.027	0.033	
B1	2.90	3.00	3.15	0.114	0.118	0.124	
С	0.24	0.26	0.35	0.009	0.010	0.014	
D	6.30	6.50	6.70	0.248	0.256	0.264	
е		2.3			0.090		
e1		4.6			0.181		
Е	3.30	3.50	3.70	0.130	0.138	0.146	
Н	6.70	7.00	7.30	0.264	0.276	0.287	
V	10° max						

PACKAGE FOOT PRINT SOT-223

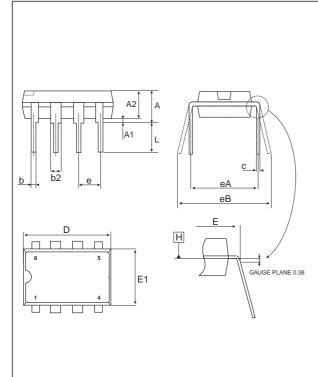




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PACKAGE OUTLINE MECHANICAL DATA

DIL-8



	DIMENSIONS						
REF.	Millimetres			Inches			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α			5.33			0.21	
A1	0.38			0.015			
A2	2.92	3.30	4.95	0.115	0.130	0.195	
b	0.36	0.46	0.56	0.014	0.018	0.022	
b2	1.14	1.52	1.78	0.045	0.060	0.070	
С	0.20	0.25	0.36	0.008	0.010	0.014	
D	9.02	9.27	10.16	0.355	0.365	0.40	
Е	7.62	7.87	8.26	0.30	0.310	0.325	
E1	6.10	6.35	7.11	0.240	0.25	0.280	
е		2.54			0.10		
eA		7.62			0.30		
eВ			10.92			0.430	
L	2.92	3.30	3.81	0.115	0.130	0.15	

OTHER INFORMATION

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
ACS110-7SN	ACS1107S	SOT-223	0.12 g	1000	Tape & reel
ACS110-7SB2	ACS1107S	DIL8	0.6 g	50	Tube

■ Epoxy meets UL94,V0

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