1 Characteristics

Table 1. **Absolute maximum ratings (T_{amb} = 25 °C, unless otherwise specified)**

Symbol	Parameter		Value	Unit
$I_{T(RMS)}$	On-state rms current (full sine wave), S = 5cm²	T_{amb} = 64 °C	0.45	A
		T_{tab} = 76 °C	0.8	
I_{TSM}	Non repetitive surge peak on-state current T_j initial = 25 °C, (full cycle sine wave)	t_p = 20 ms	13	A
		t_p = 16.7 ms	13.7	
I^2t	I^2t for fuse selection	t_p = 10 ms	1.1	A^2s
dI/dt	Critical rate of rise on-state current I_G = 2 x I_{GT}, tr ≤ 100 ns	f = 120 Hz, T_j = 125 °C	100	A/µs
V_{PP} (1)	Non repetitive line peak pulse voltage		2	kV
$P_{G(AV)}$	Average gate power dissipation	T_j = 125 °C	0.1	W
V_{GM}	Peak positive gate voltage	T_j = 125 °C	10	V
I_{GM}	Peak gate current (t_p = 20 µs)	T_j = 125 °C	1	A
T_{stg}	Storage temperature range		-40 to +150	°C
T_j	Operating junction temperature range		-30 to +125	°C

1. *according to test described by standard IEC 61000-4-5, see Figure 15. Overvoltage ruggedness test circuit for resistive and inductive loads, T_{amb} = 25 °C (conditions equivalent to IEC 61000-4-5 standard) for conditions*

Table 2. **Electrical characteristics (T_j = 25 °C, unless otherwise specified)**

Symbol	Test conditions	Quadrant	Value		Unit
I_{GT} (1)	V_{OUT} = 12 V, R_L = 33 Ω	II - III	Max.	10	mA
V_{GT}			Max.	1.0	V
V_{GD}	V_{OUT} = V_{DRM}, R_L = 3.3 kΩ, T_j = 125 °C	II - III	Min.	0.15	V
I_H	I_{OUT} = 100 mA		Max.	10	mA
I_L	I_G = 1.2 x I_{GT}		Max.	25	mA
dV/dt	V_{OUT} = 402 V, gate open, T_j = 125 °C		Min.	2000	V/µs
	V_{OUT} = 536 V, gate open, T_j = 125 °C			400	
(dI/dt)c	Without snubber (15 V/µs), T_j = 125 °C, turn-off time ≤20 ms		Min.	2	A/ms
V_{CL}	I_{CL} = 0.1 mA, t_p = 1 ms		Min.	850	V

1. *Minimum I_{GT} is guaranteed at 10% of I_{GT} max.*

Table 3. **Static electrical characteristics**

Symbol	Test conditions			Value	Unit
V_{TM} (1)	I_{TM} = 1.1 A, t_p = 500 µs	T_j = 25 °C	Max.	1.3	V
V_{T0} (1)	Threshold voltage	T_j = 125 °C	Max.	0.85	V
R_d (1)	Dynamic resistance	T_j = 125 °C	Max.	300	mΩ
I_{DRM} I_{RRM}	V_{OUT} = V_{DRM}/ V_{RRM}	T_j = 25 °C	Max.	2	µA
		T_j = 125 °C		0.2	mA

1. *For both polarities of OUT pin referenced to COM pin*

Table 4. **Thermal characteristics**

Symbol	Parameter	Max. value	Unit
$R_{th(j-l)}$	Junction to lead (AC)	60	°C/W
$R_{th(j-a)}$	Junction to ambient	150	

1.1 Characteristics (curves)

Figure 1. Maximum power dissipation versus rms on-state current

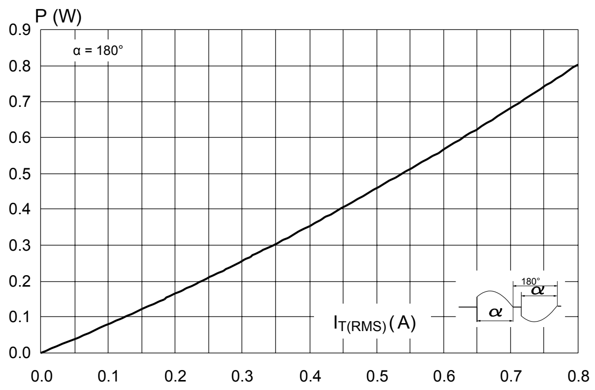


Figure 2. On-state rms current versus ambient temperature

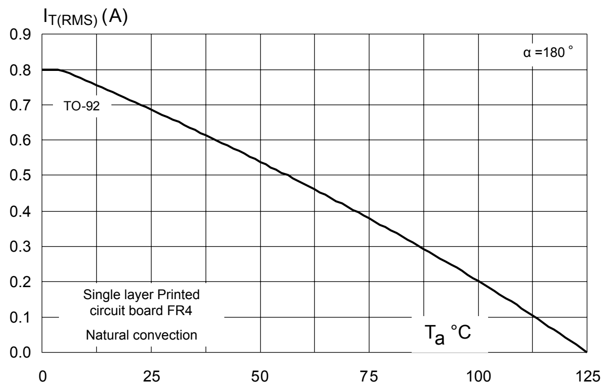


Figure 3. Relative variation of thermal impedance junction to ambient versus pulse duration

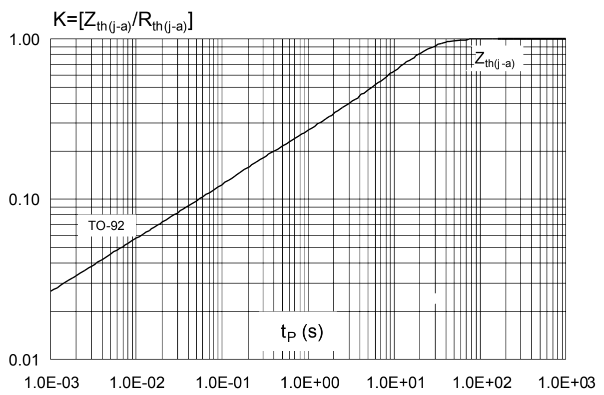


Figure 4. Relative variation of holding and latching current versus junction temperature

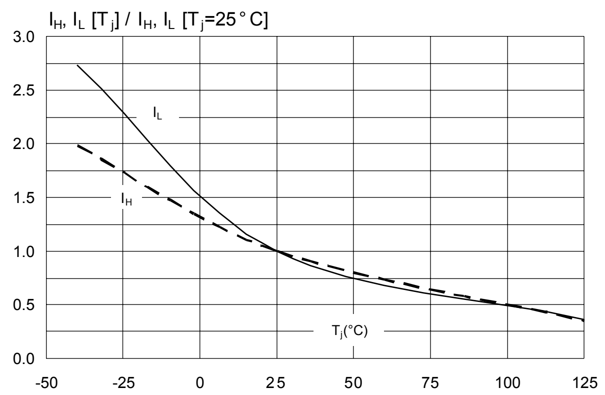


Figure 5. Relative variation of I_{GT} and V_{GT} versus junction temperature

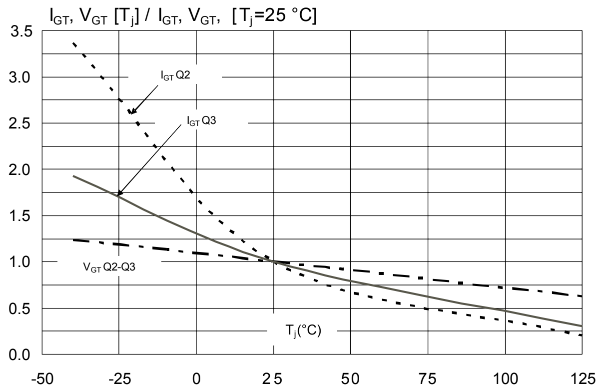


Figure 6. Surge peak on-state current versus number of cycles

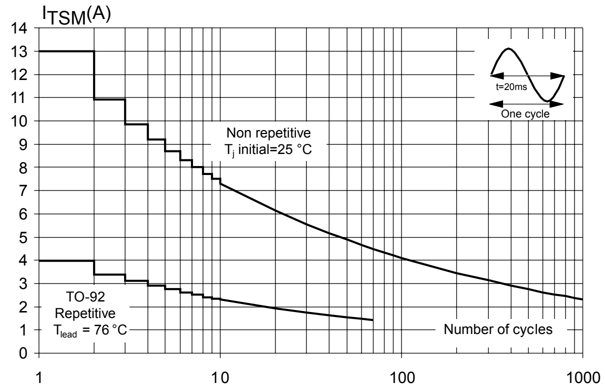


Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse

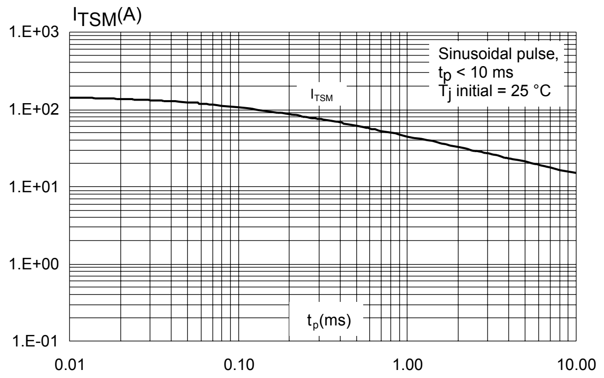


Figure 8. On-state characteristics (maximum values)

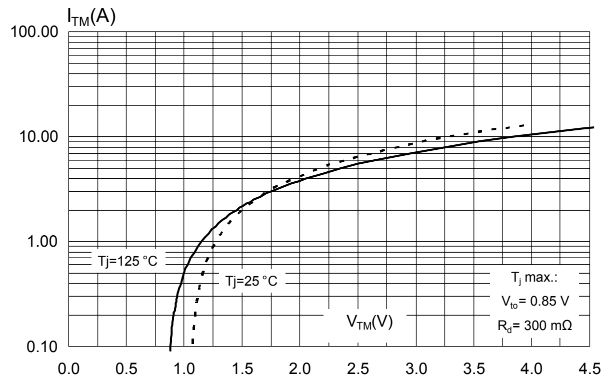


Figure 9. Relative variation of critical rate of decrease of main current versus junction temperature

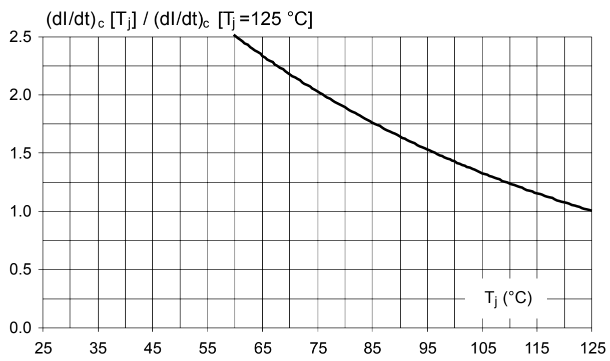


Figure 10. Relative variation of static dV/dt immunity versus junction temperature (typical values above 5 kV/µs)

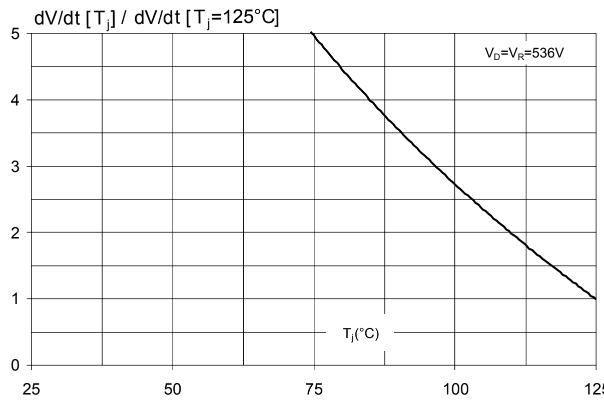


Figure 11. Relative variation of leakage current versus junction temperature

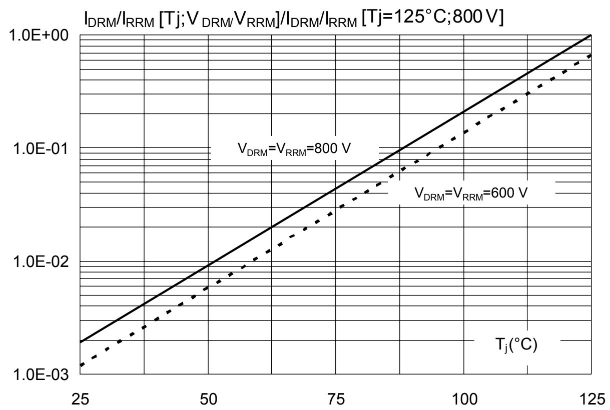
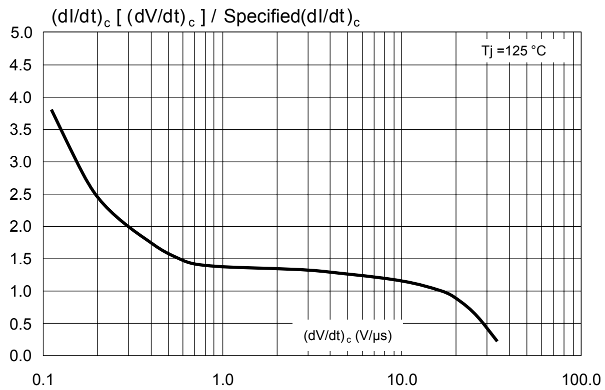


Figure 12. Relative variation of critical rate of decrease of main current (di/dt)c versus (dV/dt)c

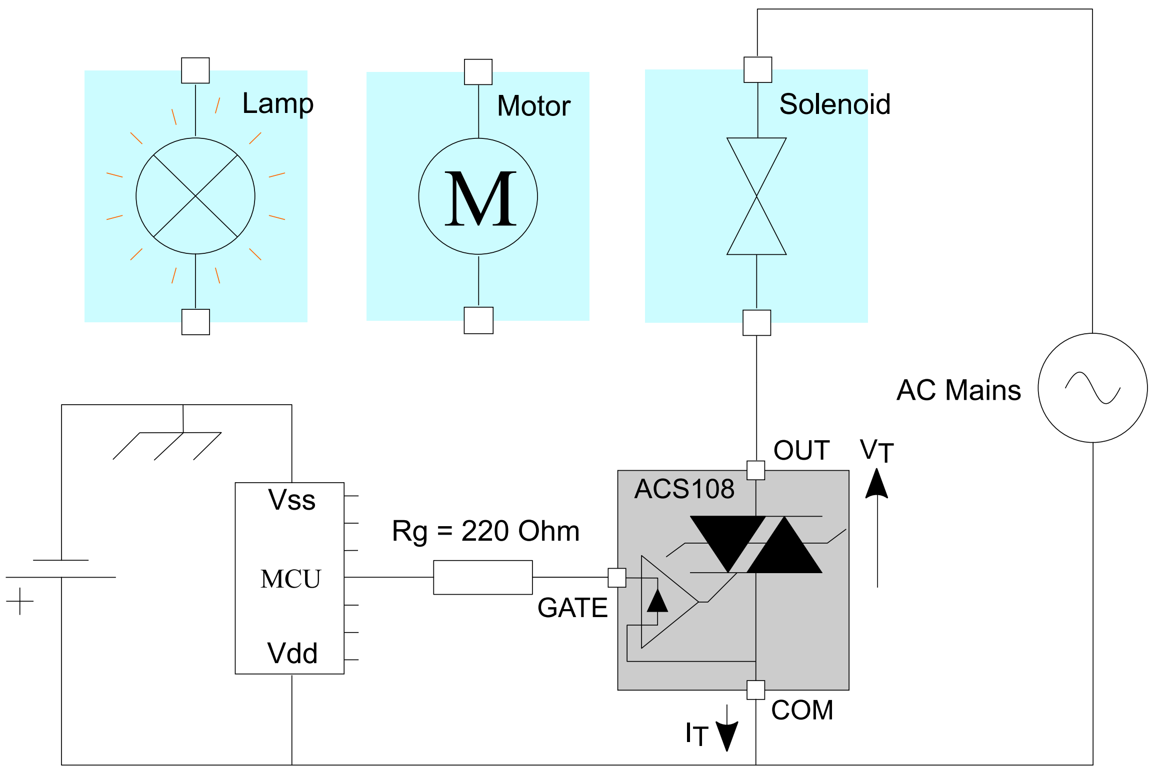


2 Alternating current mains switch - basic application

The ACS108 switch is triggered by a negative gate current flowing from the gate pin G. The switch can be driven directly by the digital controller through a resistor as shown in Figure 13. Typical application schematic

Thanks to its overvoltage protection and turn-off commutation performance, the ACS108 switch can drive a small power high inductive load with neither varistor nor additional turn-off snubber.

Figure 13. **Typical application schematic**



2.1 Protection against overvoltage: the best choice is ACS

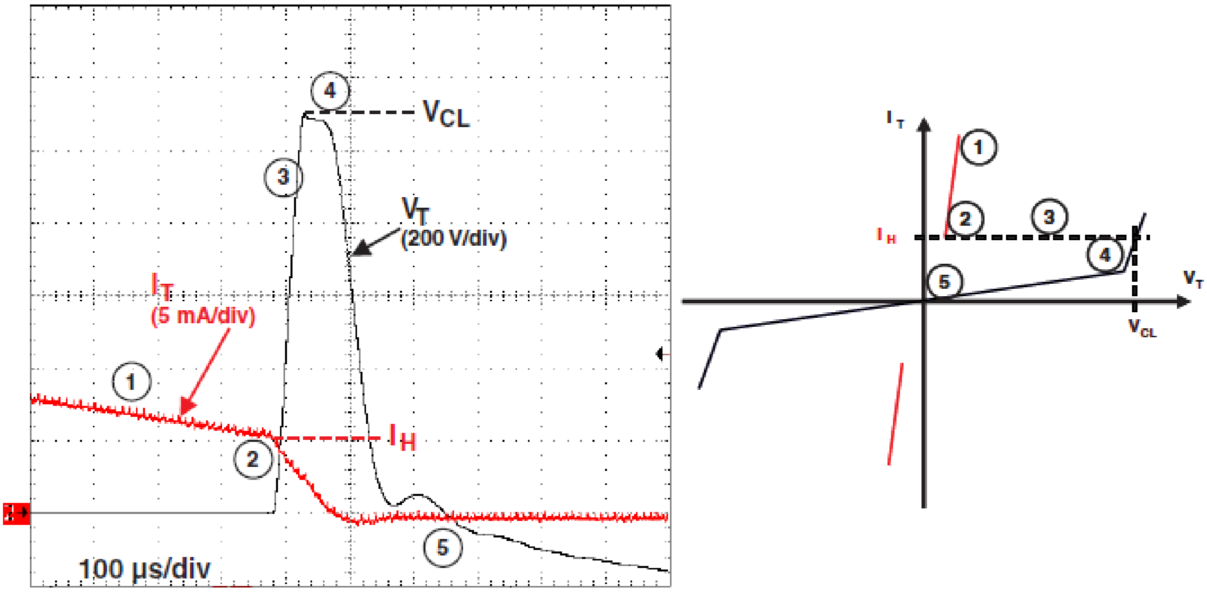
In comparison with standard Triacs the ACS108 is over-voltage self-protected, as specified by the parameter V_{CL}. This feature is useful in two operating conditions: in case of turn-off of very inductive load, and in case of surge voltage that can occur on the electrical network.

2.1.1 High inductive load switch-off: turn-off overvoltage clamping

With high inductive and low rms current loads the rate of decrease of the current is very low. An overvoltage can occur when the gate current is removed and the OUT current is lower than I_H.

As shown in Figure 14. Switching off of a high inductive load - typical clamping capability of ACS108 (T_{amb} = 25 °C), at the end of the last conduction half-cycle, the load current decreases ① . The load current reaches the holding current level I_H ② , and the ACS turns off ③ . The water valve, as an inductive load (up to 15 H), reacts as a current generator and an overvoltage is created, which is clamped by the ACS ④ . The current flows through the ACS avalanche 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 is dissipated in the clamping section that is designed for this purpose. When the energy has been dissipated, the ACS voltage falls back to the mains voltage value (230 V rms, 50 Hz) ⑤.

Figure 14. **Switching off of a high inductive load - typical clamping capability of ACS108 (T_{amb} = 25 °C)**



2.1.2 Alternating current mains transient voltage ruggedness

The ACS108 switch is able to withstand safely the AC mains transients either by clamping the low energy spikes or by breaking-over when subjected to high energy shocks, even with high turn-on current rises.

The test circuit shown in Figure 15. Overvoltage ruggedness test circuit for resistive and inductive loads, T_{amb} = 25 °C (conditions equivalent to IEC 61000-4-5 standard) is representative of the final ACS108 application, and is also used to test the AC switch according to the IEC 61000-4-5 standard conditions. Thanks to the load limiting the current, the ACS108 switch withstands the voltage spikes up to 2 kV above the peak mains voltage. The protection is based on an overvoltage crowbar technology. Actually, the ACS108 breaks over safely as shown in Figure 16. Typical current and voltage waveforms across the ACS108 (+2 kV surge, IEC 61000-4-5 standard). The ACS108 recovers its blocking voltage capability after the surge (switch off back at the next zero crossing of the current).

Such non-repetitive tests can be done 10 times on each AC mains voltage polarity.

Figure 15. **Overvoltage ruggedness test circuit for resistive and inductive loads, T_{amb} = 25 °C (conditions equivalent to IEC 61000-4-5 standard)**

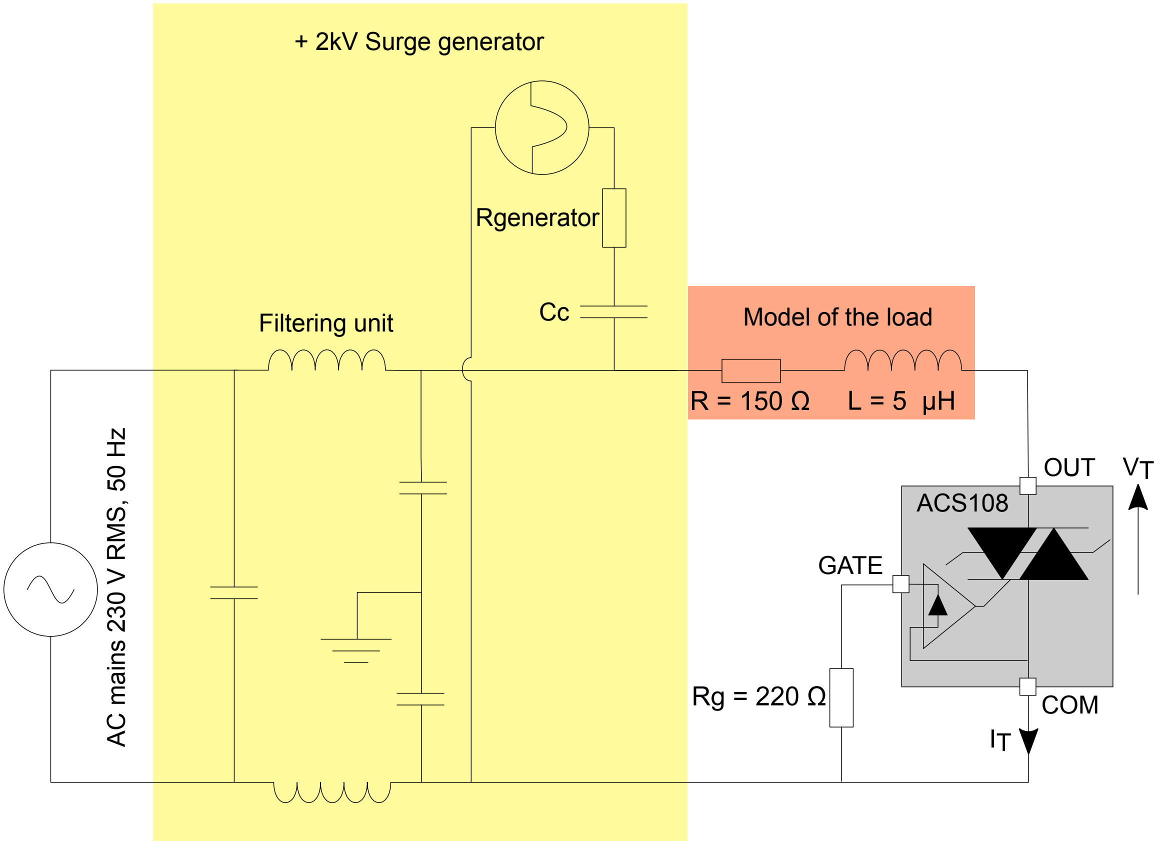
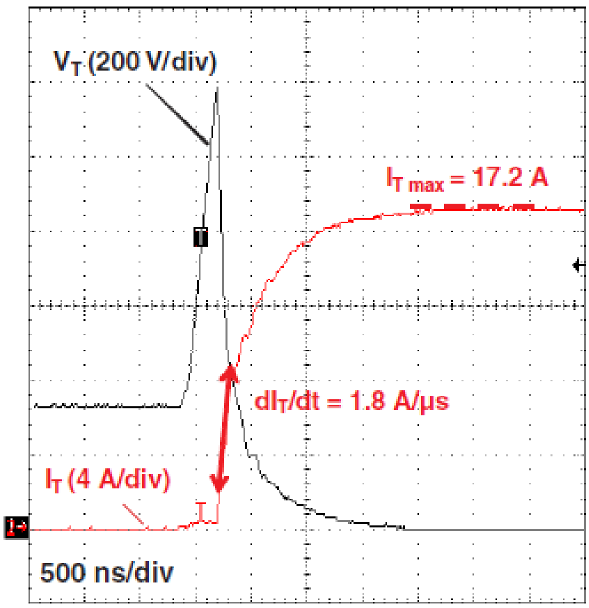


Figure 16. **Typical current and voltage waveforms across the ACS108 (+2 kV surge, IEC 61000-4-5 standard)**



3 Package information

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.

3.1 TO-92 package information

- Epoxy meets UL94, V0
- Lead free plating + halogen-free molding resin

Figure 17. TO-92 package outline

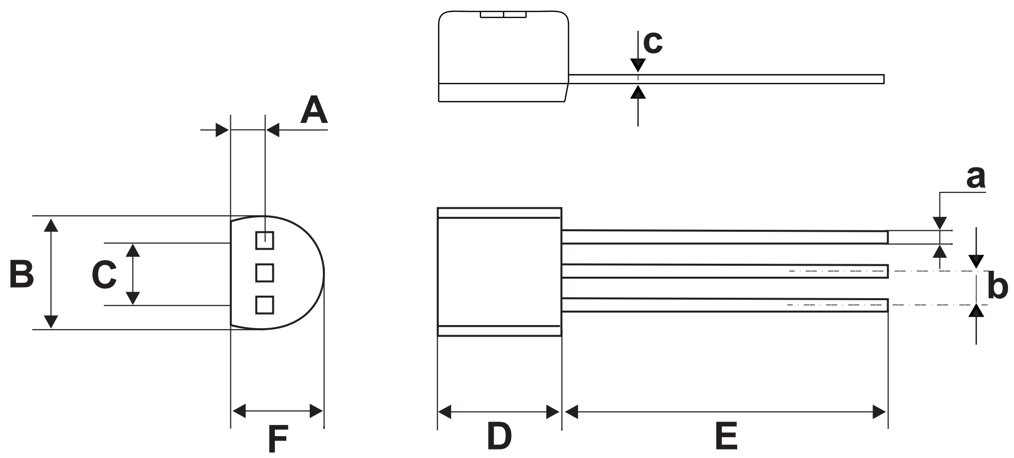


Table 5. TO-92 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		1.35			0.0531	
B			4.70			0.1850
C		2.54			0.1000	
D	4.40			0.1732		
E	12.70			0.5000		
F			3.70			0.1457
a			0.50			0.0197
b		1.27			0.500	
c			0.48			0.0189

1. *Inches dimensions given for information*

4 Ordering information

Figure 18. Ordering information scheme

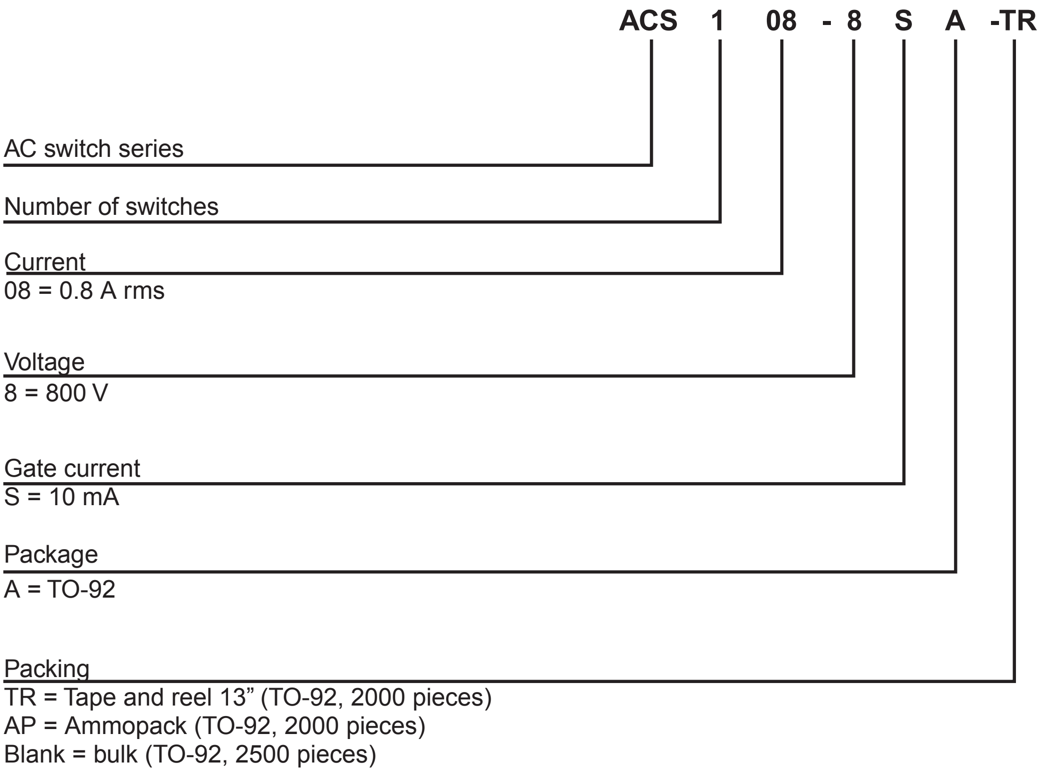


Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Packing mode
ACS108-8SA	ACS108 8SA[(1)]	TO-92	0.2 g	2500	Bulk
ACS108-8SA-TR				2000	Tape and reel
ACS108-8SA-AP				2000	Ammopack

1. *First row = ACS108, second row = 8SA*

Revision history

Table 7. Document revision history

Date	Version	Changes
25-Feb-2019	1	Initial release.