1 Characteristics

Table 2. Absolute ratings (limiting values)

Symbol	Parameter	Test conditions		Value	Unit
$I_{T(RMS)}$	On-state rms current (full sine wave)	T_c = 97 °C		12	A
I_{TSM}	Non repetitive surge peak on-state current (T_j initial = 25 °C)	t_p = 16.7 ms		105	A
		t_p = 20 ms		100	
I^2t	I^2t value for fusing (full cycle sine wave)	t_p = 10 ms		66	A²s
dI/dt	Critical rate of rise on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100$ ns	F = 60Hz	T_j = 150 °C	100	A/µs
V_{DRM}/V_{RRM}	Repetitive peak off-state voltage	T_j = 150 °C		800	V
V_{PP} (1)	Non repetitive line peak pulse voltage	T_j = 25 °C		2	kV
$(dI/dt)_{BO}$ (1)	Non repetitive critical current rate of rise at breakover	T_j = 25 °C		150	A/µs
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 150 °C	1	A
P_{GM}	Peak gate power	t_p = 20 µs	T_j = 150 °C	10	W
$P_{G(AV)}$	Average gate power dissipation	T_j = 150 °C		0.1	W
T_{stg}	Storage junction temperature range			-40 to +150	°C
T_j	Operating junction temperature range			-40 to +150	°C
T_L	Maximum lead temperature for soldering during 10 s			260	°C
$V_{ins(rms)}$	Insulation rms voltage (60 seconds)			1.500	V

1. according to test described by standard IEC 61000-4-5 (see *Figure 19*)

Table 3. Electrical characteristics

Symbol	Test conditions	Quadrant	T_j	Value		Unit
I_{GT}	V_D = 12 V, R_L = 33 Ω	I - II - III	25 °C	MAX.	35	mA
				MIN.	1.75	
V_{GT}	V_D = 12 V, R_L = 33 Ω	I - II - III	25 °C	MAX.	1.0	V
V_{GD}	$V_D = V_{DRM}$, R_L = 3.3 kΩ	I - II - III	150 °C	MIN.	0.2	V
I_H (1)	I_T = 500 mA, gate open		25 °C	MAX.	30	mA
I_L	$I_G = 1.2 \times I_{GT}$	I - II - III	25 °C	MAX.	40	mA
dV/dt (1)	V_D = 67% V_{DRM}/V_{RRM}, gate open		125 °C	MIN.	4000	V/µs
			150 °C	MIN.	2000	
(dI/dt)c (1)	Without snubber		125 °C	MIN.	12	A/ms
	(dI/dt)c = 15 V/µs		150 °C	MIN.	6	
V_{CL}	I_{CL} = 0.1 mA, t_p = 1 ms			MIN.	850	V

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

Table 4. Static characteristics

Symbol	Test conditions		Value		Unit
V_{TM} (1)	I_{TM} = 17 A, t_p = 380 µs	T_j = 25 °C	MAX.	1.5	V
V_{to} (1)	Threshold voltage	T_j = 150 °C	MAX.	0.9	V
R_d (1)	Dynamic resistance	T_j = 150 °C	MAX.	38	mΩ
I_{DRM} I_{RRM}	V_{OUT} = V_{DRM} / V_{RRM}	T_j = 25 °C	MAX.	1	µA
		T_j = 125 °C		500	µA
		T_j = 150 °C		1.2	mA

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

Table 5. Thermal characteristics

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	3.5	°C/W
$R_{th(j-a)}$	Junction to ambient (AC)	60	°C/W

Figure 2. Maximum power dissipation versus rms on-state current (full cycle)

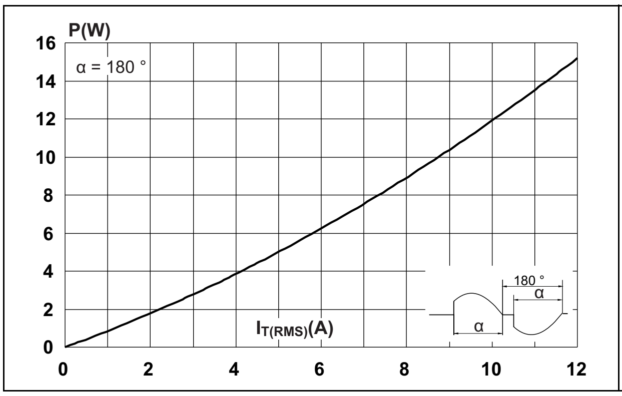


Figure 3. On-state rms current versus case temperature (full cycle)

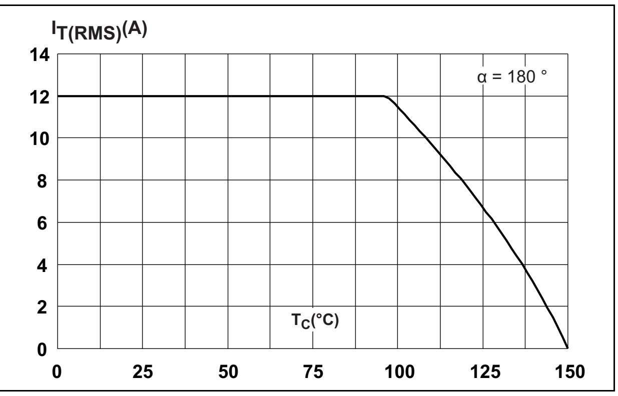


Figure 4. On-state rms current versus ambient temperature (free air convection)

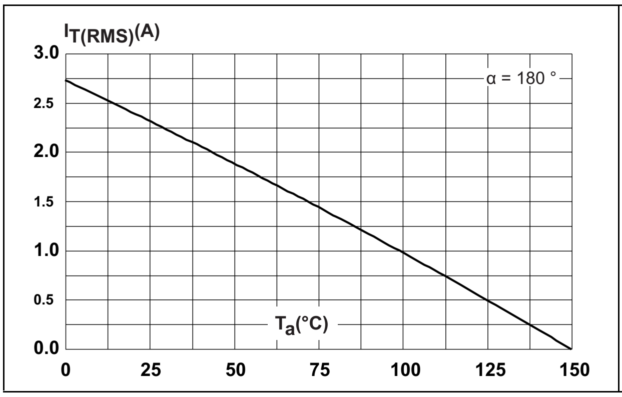


Figure 5. Relative variation of thermal impedance versus pulse duration

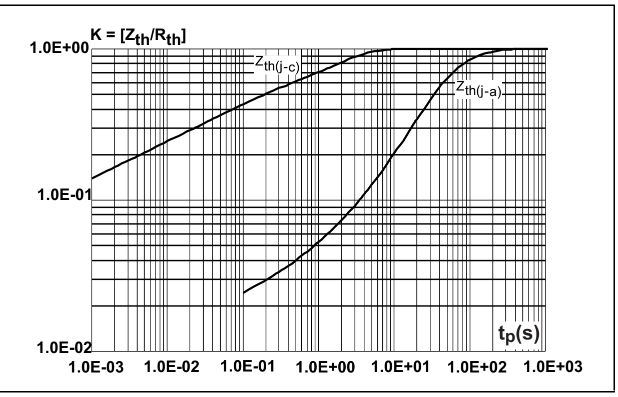


Figure 6. On-state characteristics (maximum values)

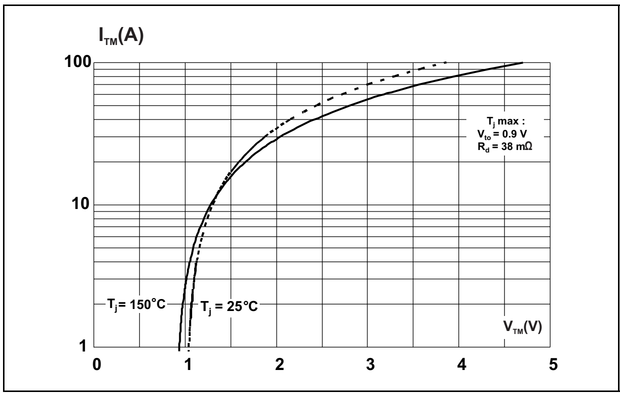


Figure 7. Surge peak on-state current versus number of cycles

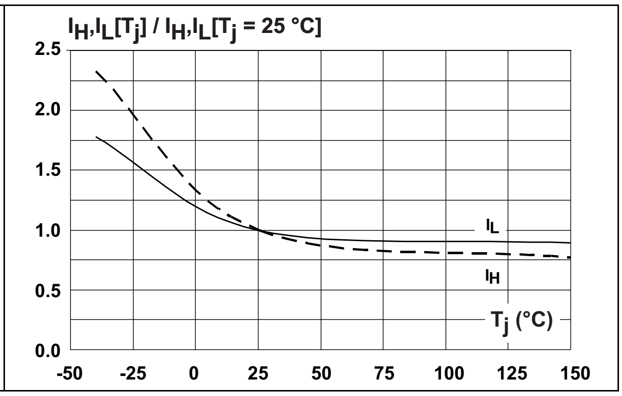


Figure 8. Non repetitive surge peak on-state current for a sinusoidal pulse with width tp < 10 ms, and corresponding value of I²t

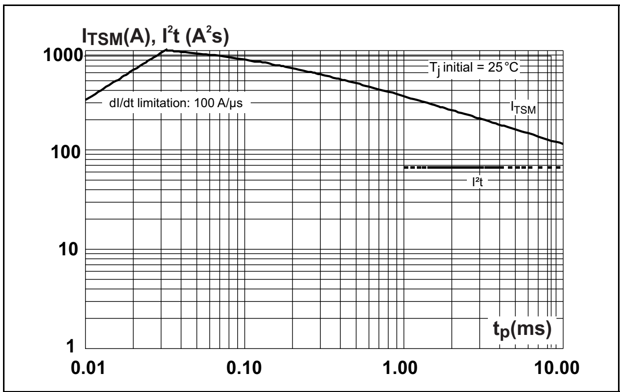


Figure 9. Relative variation of gate trigger current and gate trigger voltage versus junction temperature (typical values)

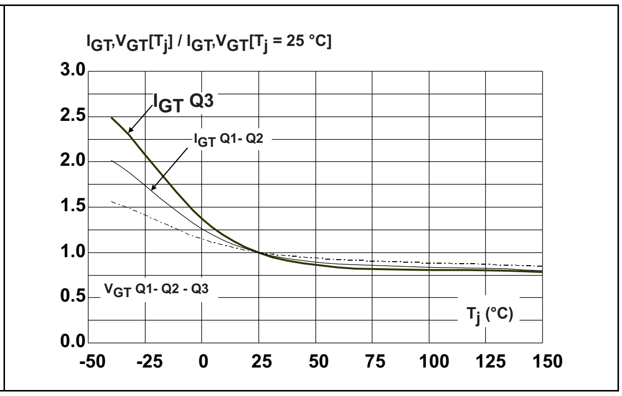


Figure 10. Relative variation of holding current and latching current versus junction temperature (typical values)

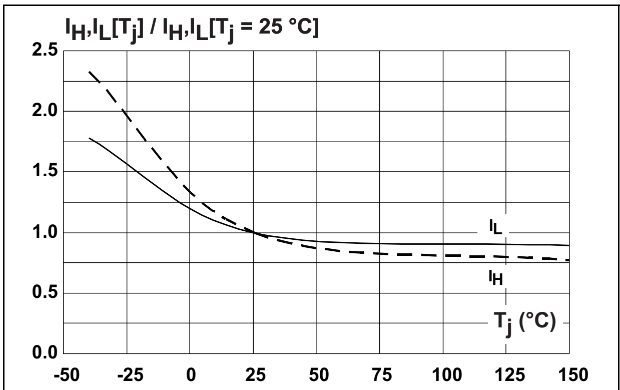


Figure 11. Relative variation of critical rate of decrease of main current (dI/dt)c versus reapplied (dV/dt)c

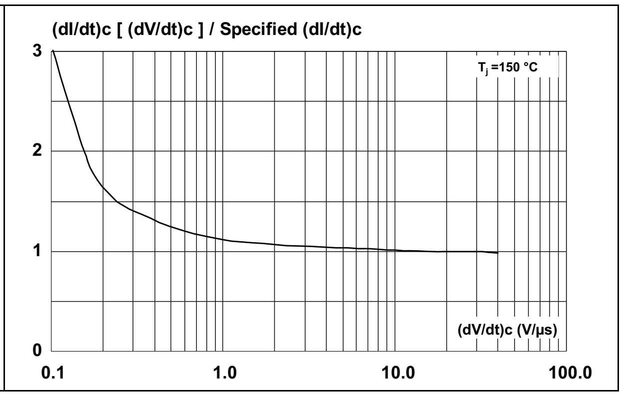


Figure 12. Relative variation of critical rate of decrease of main current versus junction temperature (typical values)

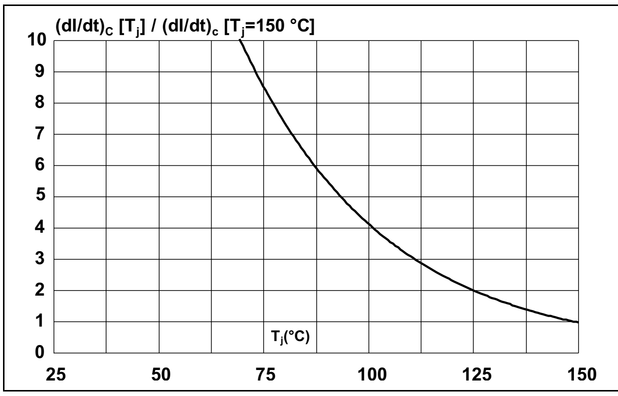


Figure 13. Relative variation of static dV/dt immunity versus junction temperature

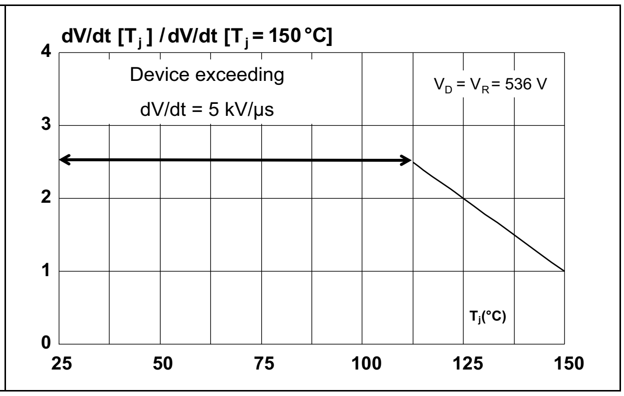


Figure 14. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)

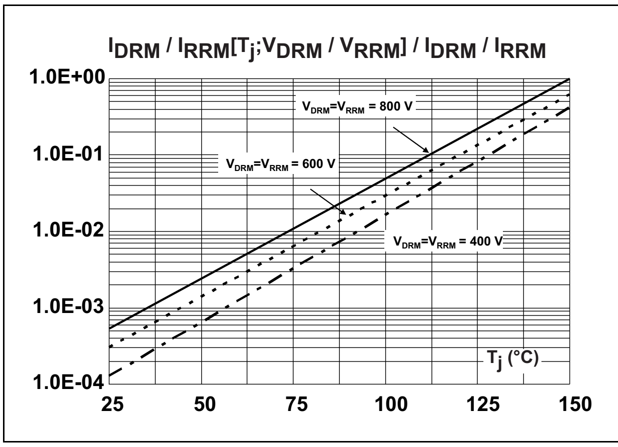
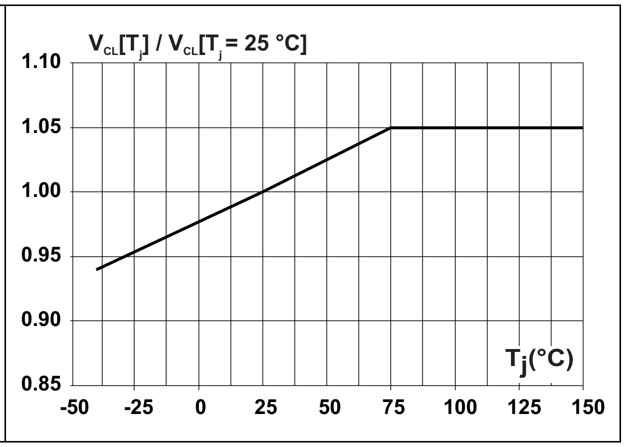


Figure 15. Relative variation of the maximum clamping voltage versus junction temperature (minimum values)



2 Application information

2.1 Typical application description

The ACST1235-8FP device has been designed to control medium power load, such as AC motors in home appliances. Thanks to its thermal and turn-off commutation performances, the ACST1235-8FP switch is able to drive an inductive load up to 12 A with no turn-off additional snubber. It also provides high thermal performances in static and transient modes such as the compressor inrush current or high torque operating conditions of an AC motor.

Figure 16. AC induction motor control - typical diagram

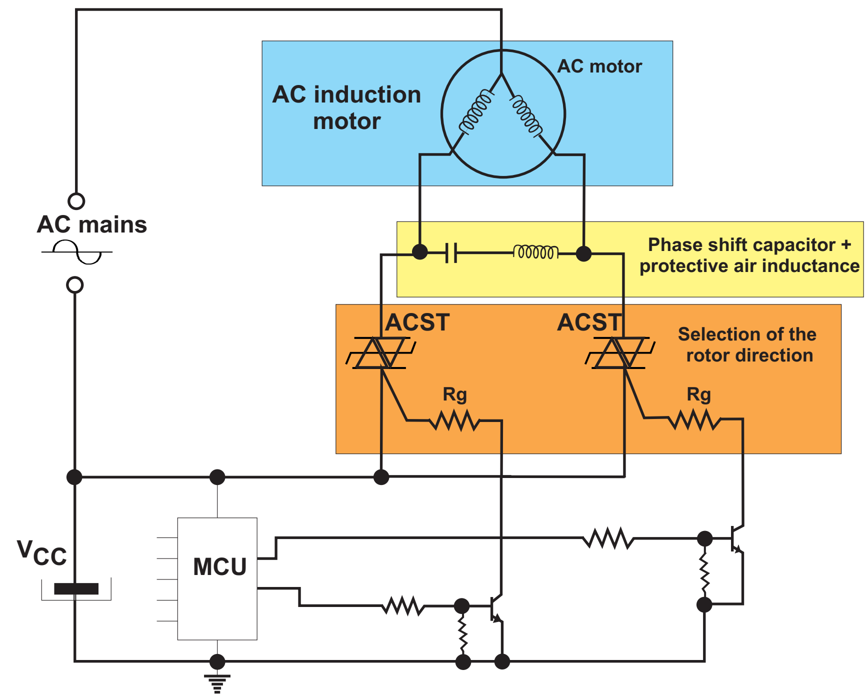
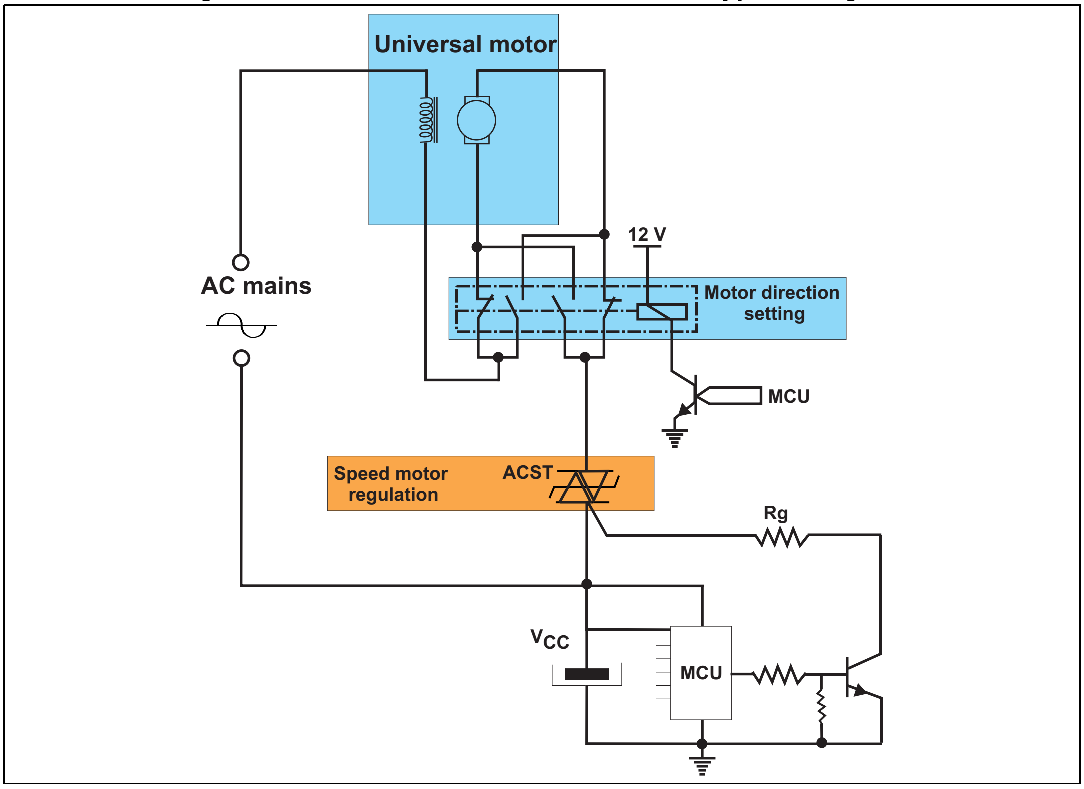
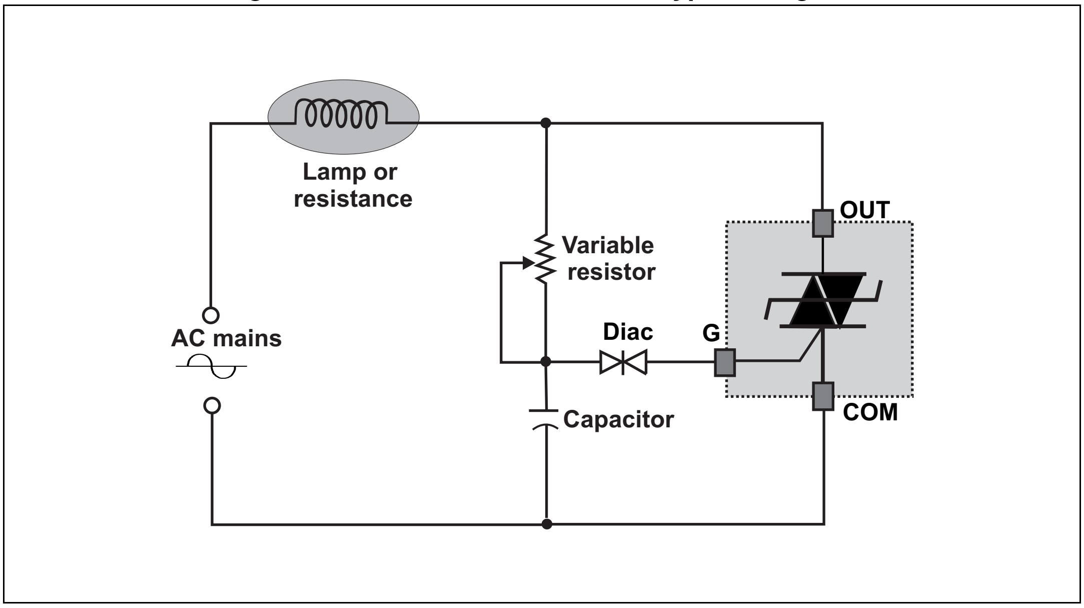


Figure 17. Universal drum motor control – typical diagram



The ACST1235-8FP device is also very effective in controlling resistive loads.

Figure 18. Resistive load control – typical diagram



2.2 AC line transient voltage ruggedness

In comparison with standard Triac, which need additional protection components against surge voltage, the ACST1235-8FP is self-protected against overvoltage, specified by the new parameter V_{CL}. The ACST1235-8FP switch can safely withstand AC line transient voltages either by clamping the low energy spikes, such as the inductive spikes at switch-off, or by switching to the on state (for less than 10 ms) to dissipate higher energy shocks through the load. This safety feature works even with high turn-on current ramp-up.

The test circuit of *Figure 19* represents the ACST1235-8FP application, and is used to stress the ACST switch according to the IEC 61000-4-5 standard conditions. With the additional effect of the load which limits the current, the ACST switch withstands the voltage spikes up to 2 kV on top of the peak line voltage. The protection is based on an overvoltage crowbar technology. The ACST1235-8FP folds back safely to the on state as shown in *Figure 20*. The ACST1235-8FP recovers its blocking voltage capability after the surge and the next zero crossing current. Such a non repetitive test can be done at least 10 times on each AC line voltage polarity.

Figure 19. Overvoltage ruggedness test circuit for resistive and inductive loads for IEC 61000-4-5 standards

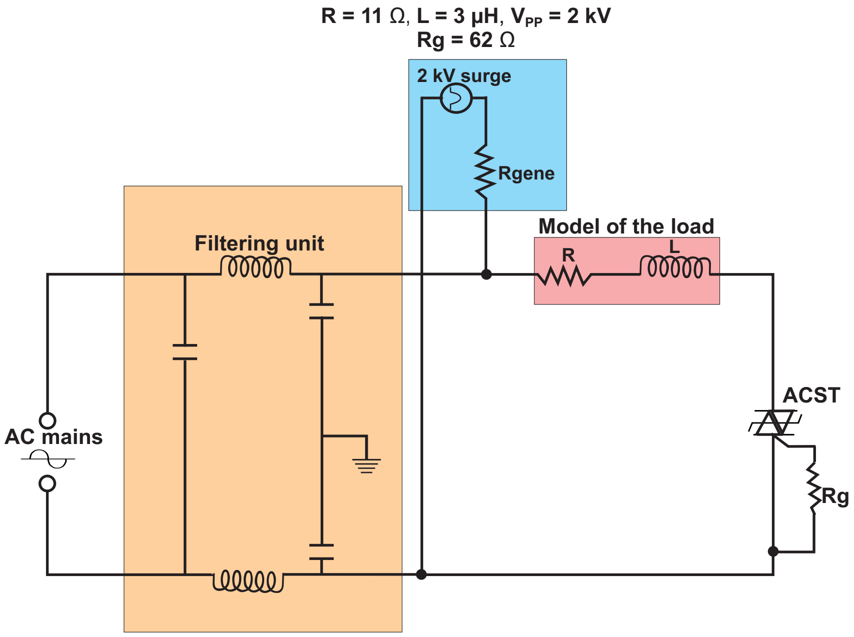
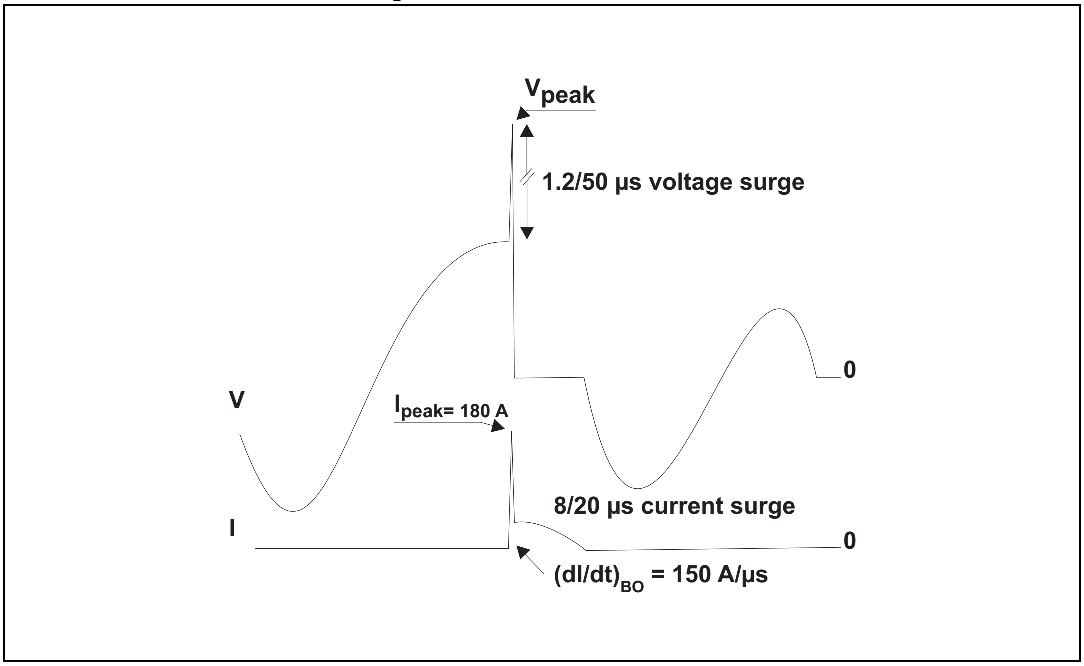


Figure 20. Typical voltage and current waveforms across the ACST1235-8FP during IEC 61000-4-5 standard test



3 Package information

- Lead-free package
- Recommended torque: 0.4 to 0.6 N·m

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.

Figure 21. TO-220FPAB dimension definitions

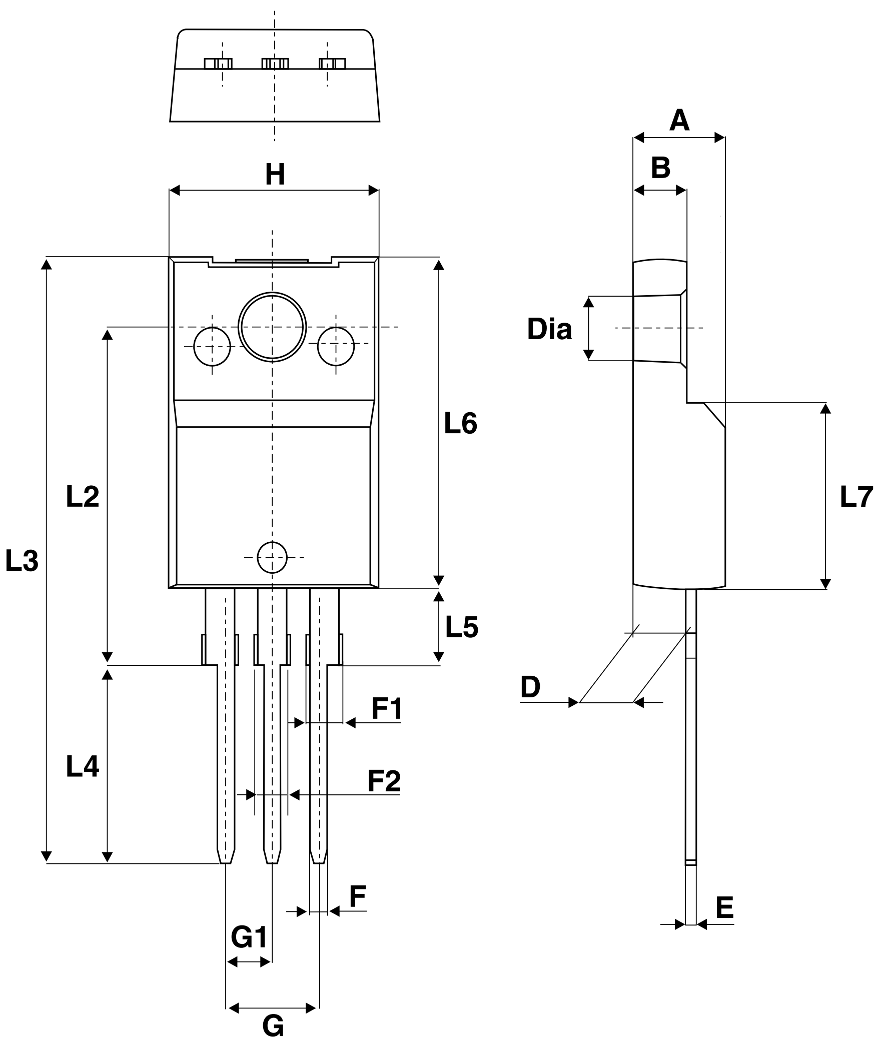


Table 6. TO-220FPAB dimension values

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1	0.030	0.039
F1	1.15	1.70	0.045	0.067
F2	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.4	2.7	0.094	0.106
H	10	10.4	0.393	0.409
L2	16 Typ.		0.63 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.6	0.386	0.417
L5	2.9	3.6	0.114	0.142
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia.	3.00	3.20	0.118	0.126

4 Ordering information

Figure 22. Ordering information scheme

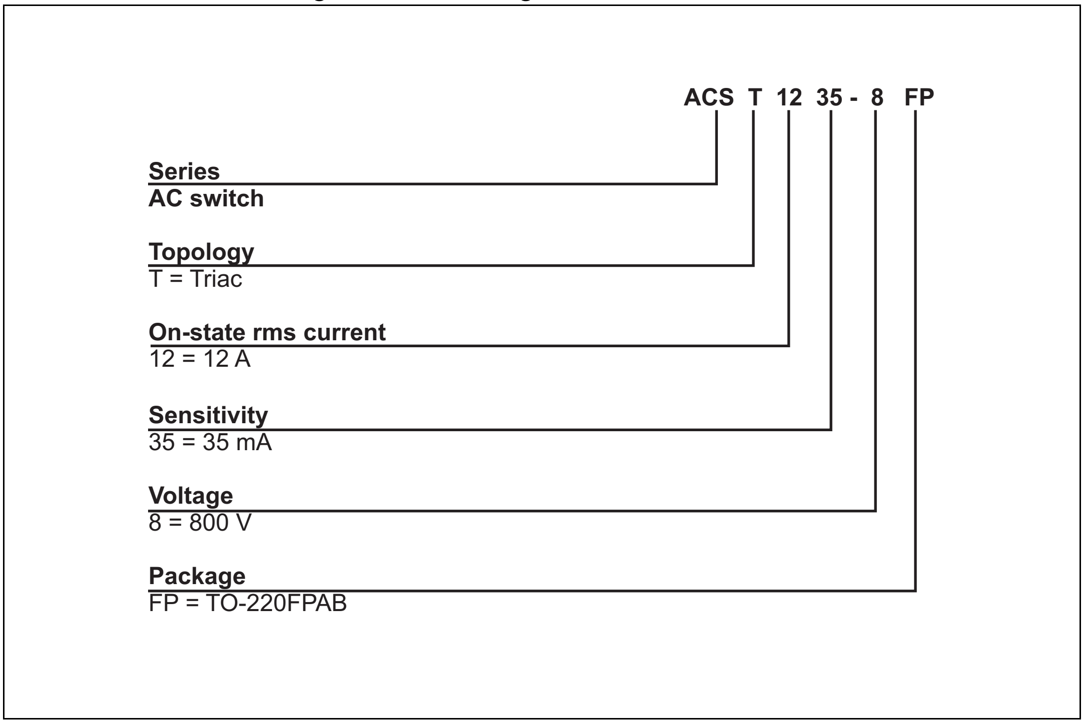


Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Packing mode
ACST1235-8FP	ACST1235-8	TO-220FPAB	2.0 g	50	Tube

5 Revision history

Table 8. Document revision history

Date	Revision	Changes
24-Apr-2014	1	First issue.

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