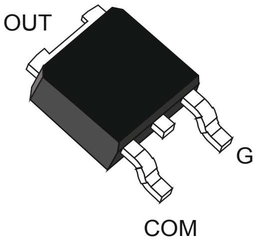
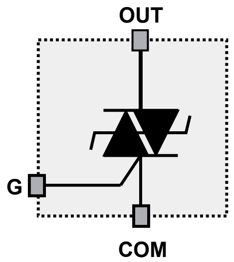
ACST1220H-8B

Datasheet

12 A overvoltage protected AC Switch



DPAK



Product status
ACST1220H-8B

Product summary	
$I_{T(RMS)}$	12 A
V_{DRM}/V_{RRM}	800 V
I_{GT}	20 mA
$T_j$max.	150 °C

Features

- 12 A AC Switch with self-overvoltage protection
- High junction temperature: T_j max. = 150 °C
- Symmetric 800 V blocking voltage
- DPAK power package
- Snubberless performance:
  - High static immunity dV/dt = 1 000 V/µs at 150 °C
  - Strong dynamic commutation: (dI/dt)c = 9 A/ms at 150 °C (lowercase)
- Halogen-free molding, lead-free plating
- ECOPACK2 power package

Applications

- Inrush current limiting circuits
- Heating resistor control, solid state relays
- Capacitor discharge circuit

Description

The ACST1220H-8B belongs to the ACST power switch family. This high-performance device is suited to home appliances or industrial systems.

This high temperature 12 A AC switch embeds a Triac structure with a high voltage clamping device to absorb the inductive turn-off energy and withstand line transients such as those described in the IEC 61000-4-5 standards.

Offering a low gate current triggering of only 20 mA, it benefits from ST Snubberless technology, enabling high level of noise immunity and turn-off commutation, the ACST1220H-8B eases PCB compliance with EMI standards such as IEC 61000-4-4 (fast transient burst test).

Package environmentally friendly ECOPACK2, RoHS (2011/65/EU) and halogen free compliant.

DPAK Package is UL-94, V0 flammability resin compliance and RoHS (2011/65/EU) compliant.

1 Characteristics

Table 1. Absolute maximum ratings (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)		T_C = 133 °C	12	A
I_{TSM}	Non repetitive surge peak on-state current, (T_j initial = 25 °C)	t_p = 16.7 ms	T_j = 25 °C	110	A
		t_p = 20 ms		100	
I^2t	I^2t value for fusing	t_p = 10 ms	T_j = 25 °C	66	A^2s
dI/dt	Critical rate of rise of on-state current, $I_G = 2 \times I_{GT}$, tr ≤ 100 ns	f = 50 Hz	T_j = 25 °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
I_{GM}	Peak forward gate current	t_p = 20 µs	T_j = 150 °C	1	A
P_{GM}	Peak gate power			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				

1. *According to test described by standard IEC 61000-4-5 for a load of L = 30 µH and R = 8 Ohm, refer to Figure 15.*

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

Symbol	Test Conditions	Quadrant	Value		Unit
I_{GT} (1)	V_D = 12 V, R_L = 33 Ω	I-II-III	Min.	1.75	mA
			Max.	20	
V_{GT}			Max.	1	V
V_{GD}	V_D = 400 V, R_L = 3.3 kΩ, T_j = 150 °C	I-II-III	Min.	0.2	V
I_L	$I_G = 1.2 \times I_{GT}$	I-II-III	Max.	40	mA
I_H (2)	I_T = 500 mA, gate open		Max.	30	mA
dV/dt (2)	V_D = 67 % V_{DRM}, gate open, T_j = 150 °C		Min.	1000	V/µs
(dI/dt)c (2)	Without snubber (dV/dt)c ≥ 20 V/µs), T_j = 150 °C		Min.	9	A/ms
V_{CL}	I_{CL} = 0.1 mA, t_P = 1 ms		Min.	850	V

1. *Minimum I_{GT} is guaranteed at 5% of I_{GT} max.*
2. *For both polarities of OUT referenced to COM.*

Table 3. **Static Characteristics**

Symbol	Test Conditions			Value	Unit
V_{TM} (1)	I_{TM} = 17 A, t_P = 380 µs	T_j = 25 °C	Max.	1.55	V
V_{TO} (1)	Threshold voltage	T_j = 150 °C	Max.	0.86	V
R_D (1)	Dynamic resistance	T_j = 150 °C	Max.	36	mΩ
I_{DRM}/I_{RRM}	$V_D = V_{DRM}$, $V_R = V_{RRM}$	T_j = 25 °C	Max.	1	µA
		T_j = 150 °C		4.5	mA

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

Table 4. **Thermal parameters**

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	Max.	1.2	°C/W
$R_{th(j-a)}$	Junction to ambient (S_{Cu} = 1.65 cm², thickness = 70 µm)	Typ.	70	

1.1 Characteristics (curves)

Figure 1. Maximum power dissipation versus on-state RMS current (full cycle)

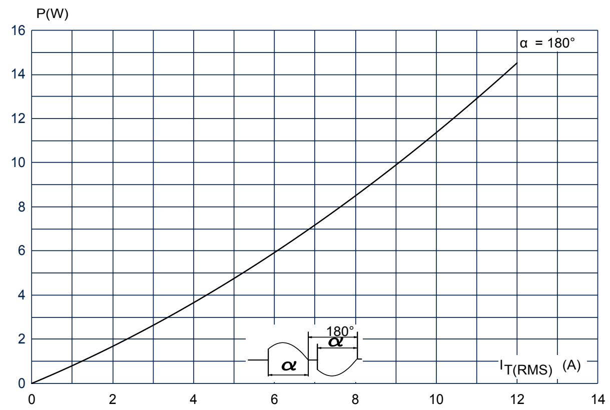


Figure 2. On-state RMS current versus case temperature (full cycle)

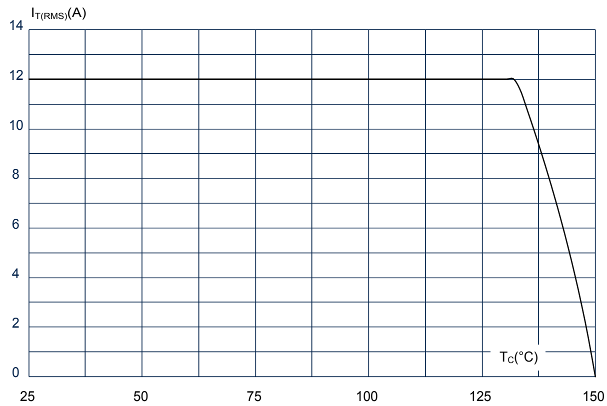


Figure 3. On-state RMS current versus ambient temperature (free air convection)

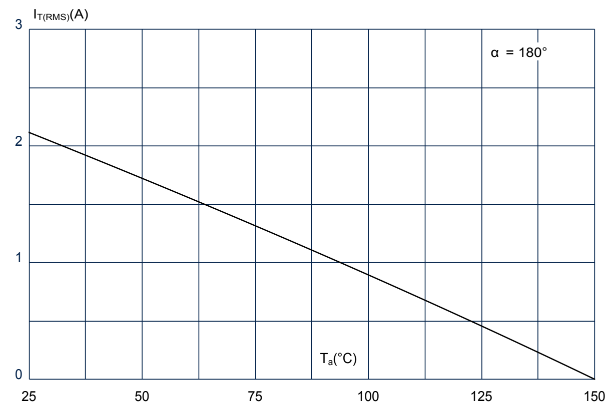


Figure 4. On-state characteristics (maximum values)

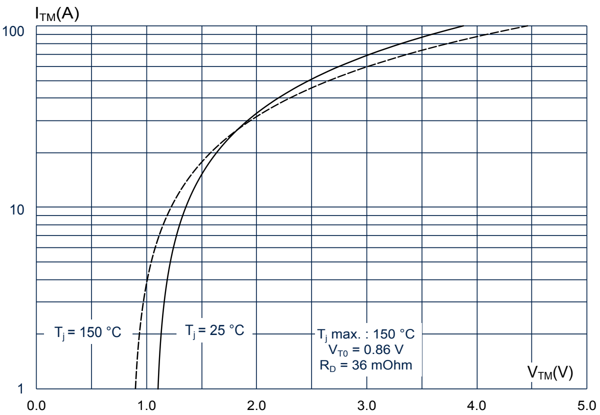


Figure 5. Surge peak on-state current versus number of cycles

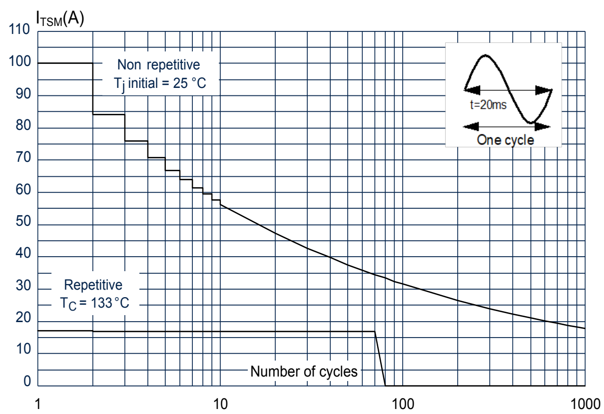


Figure 6. Non repetitive surge peak on-state current for a sinusoidal pulse with width t_p < 10 ms

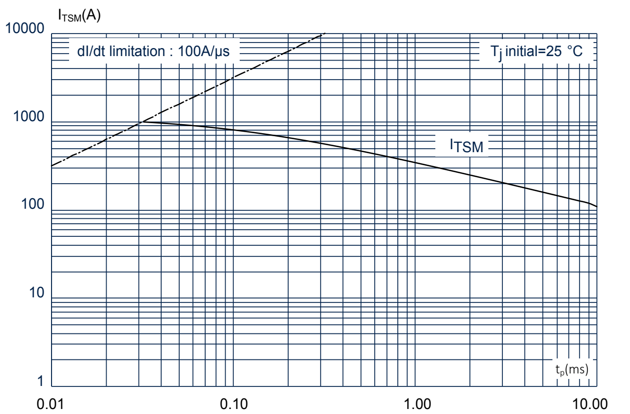


Figure 7. Relative variation of gate trigger current and voltage versus junction temperature (typical values)

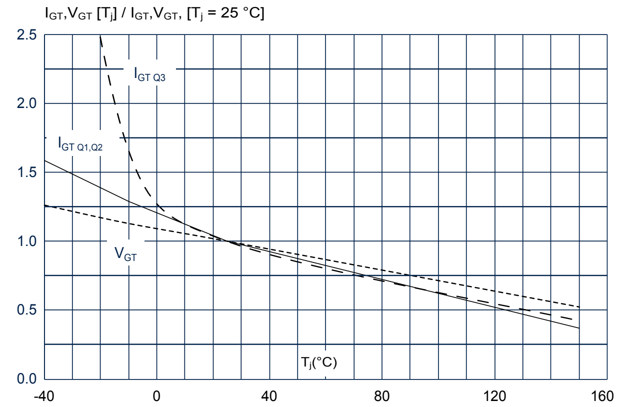


Figure 8. Relative variation of holding and latching current versus junction temperature (typical values)

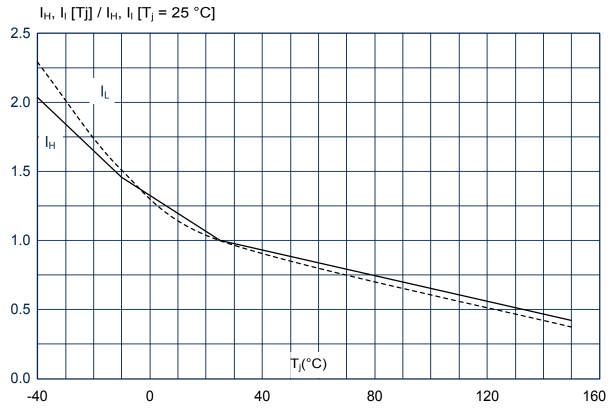


Figure 9. Relative variation of critical rate of decrease of main current versus junction temperature

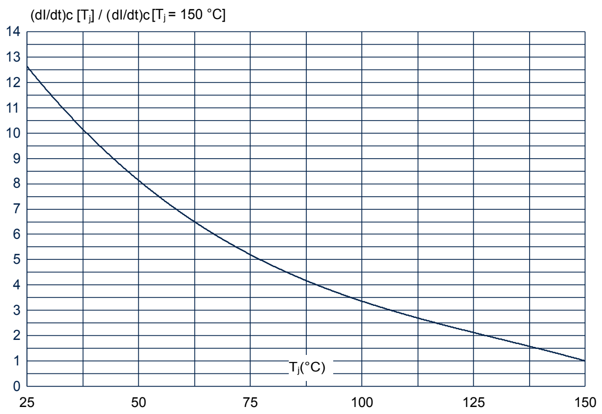


Figure 10. Relative variation of critical rate of decrease of main current (di/dt)c versus reapplied (dV/dt)c (typical values)

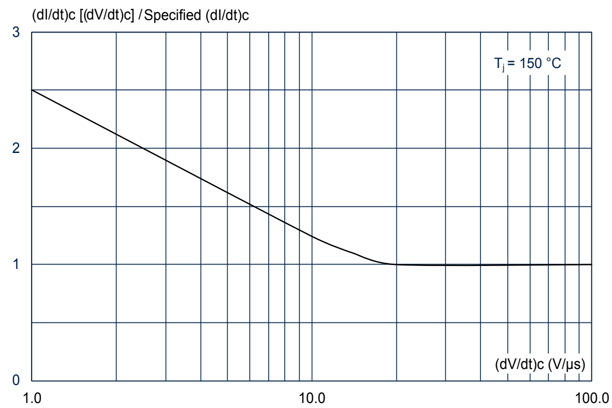


Figure 11. Relative variation of static dV/dt immunity versus junction temperature (typical values)

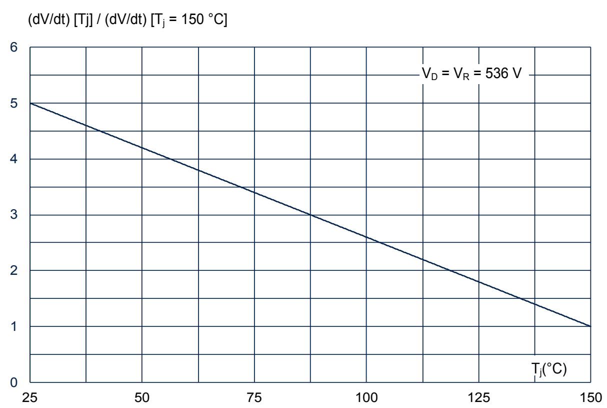


Figure 12. Relative variation of leakage current versus junction temperature

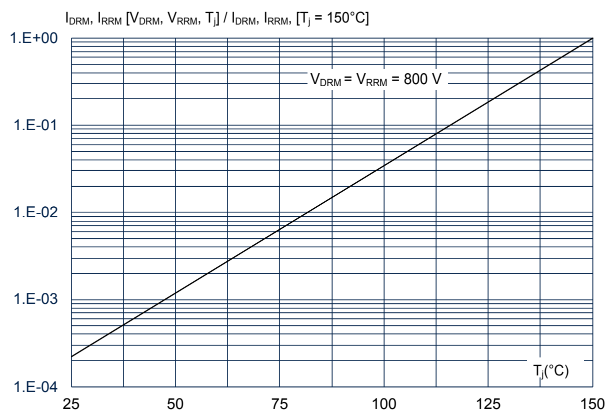


Figure 13. Relative variation of thermal impedance versus pulse duration

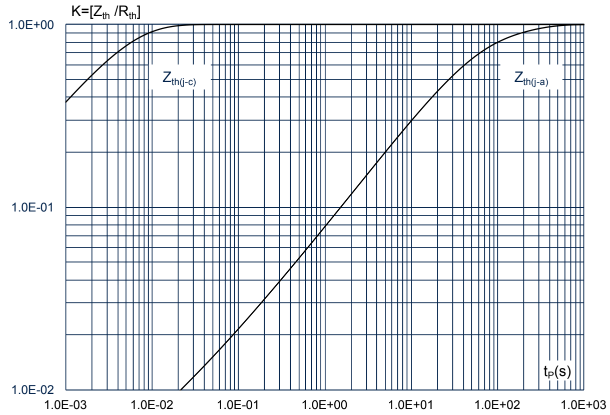
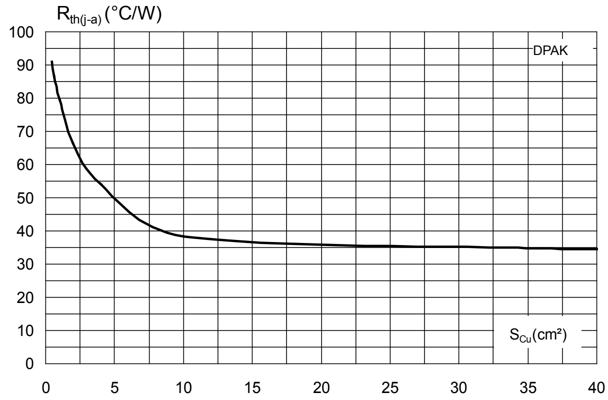


Figure 14. Thermal resistance junction to ambient versus copper surface under tab (typical values)



2 Application information

AC line transient voltage ruggedness.

In comparison with standard Triac, which need additional protection components against surge voltage, the ACST1220H-8B is self-protected against overvoltage, specified by the parameter V_{CL}. The ACST1220H-8B switch can safely withstand AC line transient voltages either by clamping the low energy spikes, such as the inductive spikes at switchoff, 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 15 represents the ACST1220H-8B 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 is limiting 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 ACST1220H-8B folds back safely to the on state as shown in Figure 16. The ACST1220H-8B recovers its blocking voltage capability after the surge and the next zero current crossing. Such a non repetitive test can be done at least 10 times on each AC line voltage polarity.

Figure 15. IEC61000-4-5 standard test schematic load : R = 8 Ohm, L = 30 µH, R_g = 100 Ω

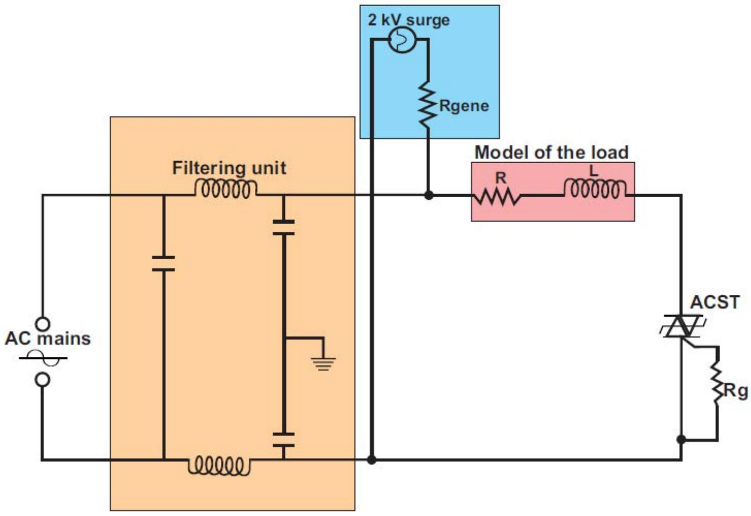
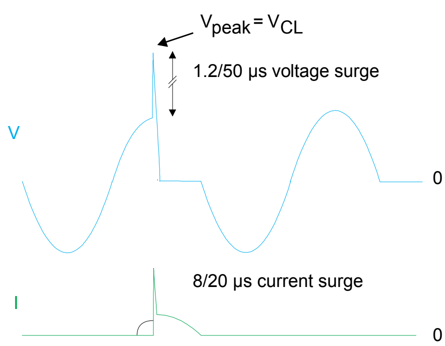


Figure 16. Typical voltage and current waveforms across the ACST1220H-8B during IEC61000-4-5 standard test



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 DPAK package information

- Molding compouned resin is halogen free and meets UL94 flammability standard, level V0
- Lead-free package leads plating

Figure 17. DPAK package outline

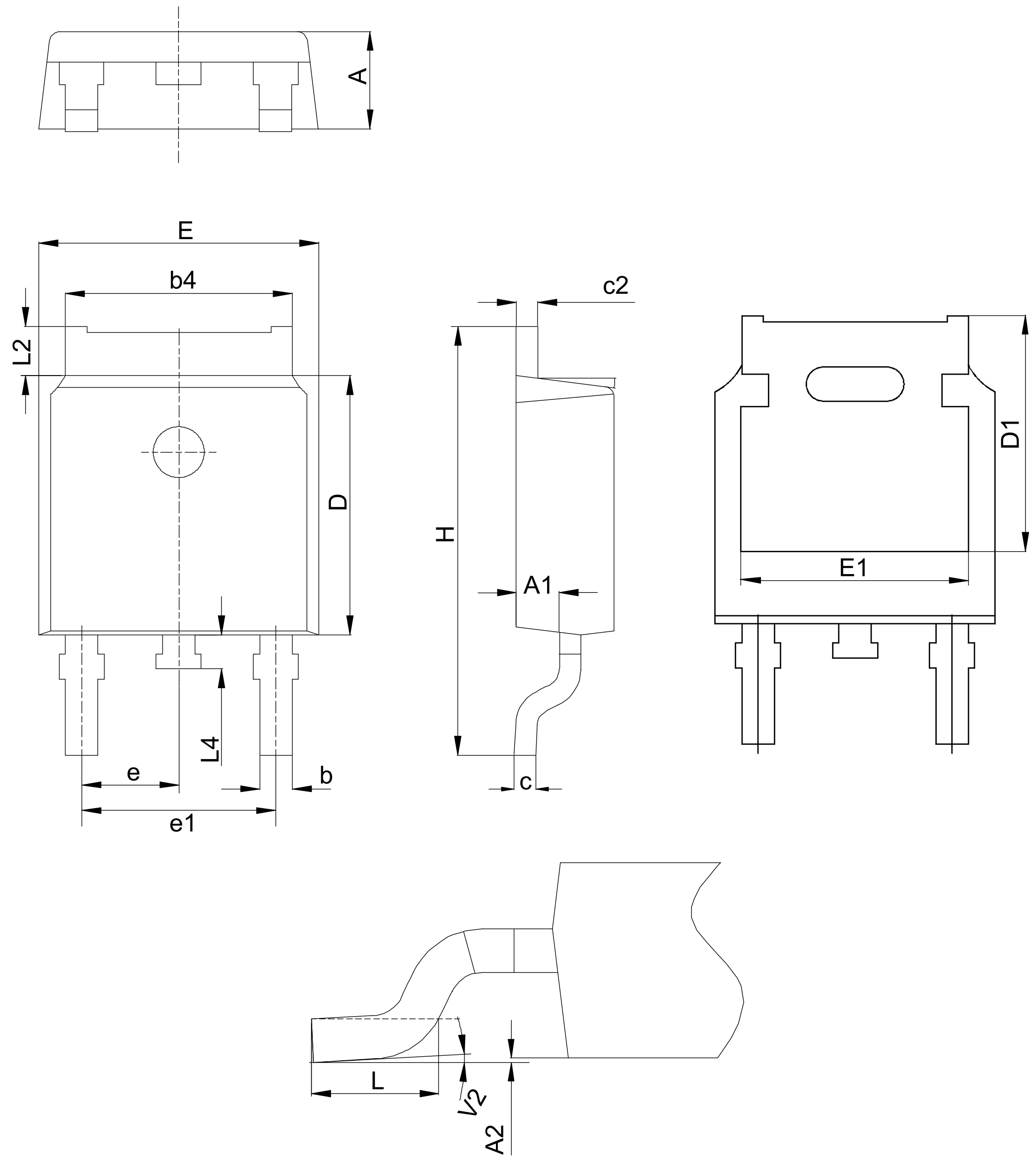


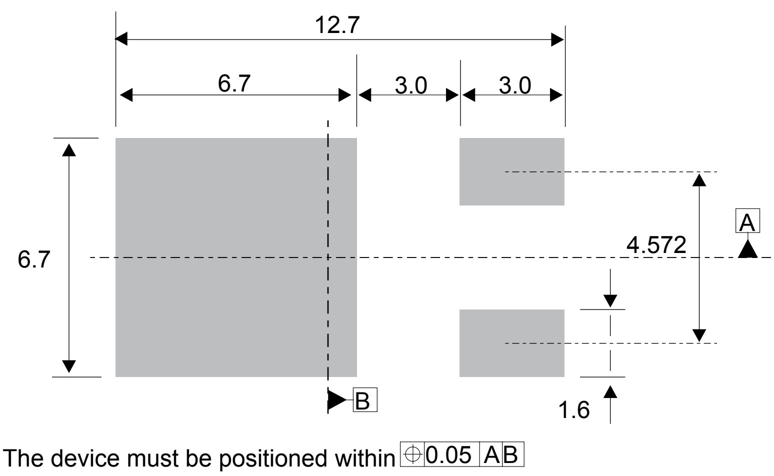
Table 5. DPAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[(1)]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.18		2.40	0.0858		0.0945
A1	0.90		1.10	0.0354		0.0433
A2	0.03		0.23	0.0012		0.0091
b	0.64		0.90	0.0252		0.354
b4	4.95		5.46	0.1949		0.2150
c	0.46		0.61	0.0181		0.0240
c2	0.46		0.60	0.0181		0.0236
D	5.97		6.22	0.2350		0.2449
D1	4.95		5.60	0.1949		0.2205
E	6.35		6.73	0.2500		0.2650
E1	4.32		5.50	0.1701		0.2165
e		2.286			0.0900	
e1	4.40		4.70	0.1732		0.1850
H	9.35		10.40	0.3681		0.4094
L	1.00		1.78	0.0394		0.0701
L2			1.27			0.0500
L4	0.60		1.02	0.0236		0.0402
V2[(2)]	-8°		+8°	-8°		+8°

1. *Dimensions in inches are given for reference only*
2. *Degree*

Note: *This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.*

Figure 18. DPAK recommended footprint (dimensions are in mm)



4 Ordering information

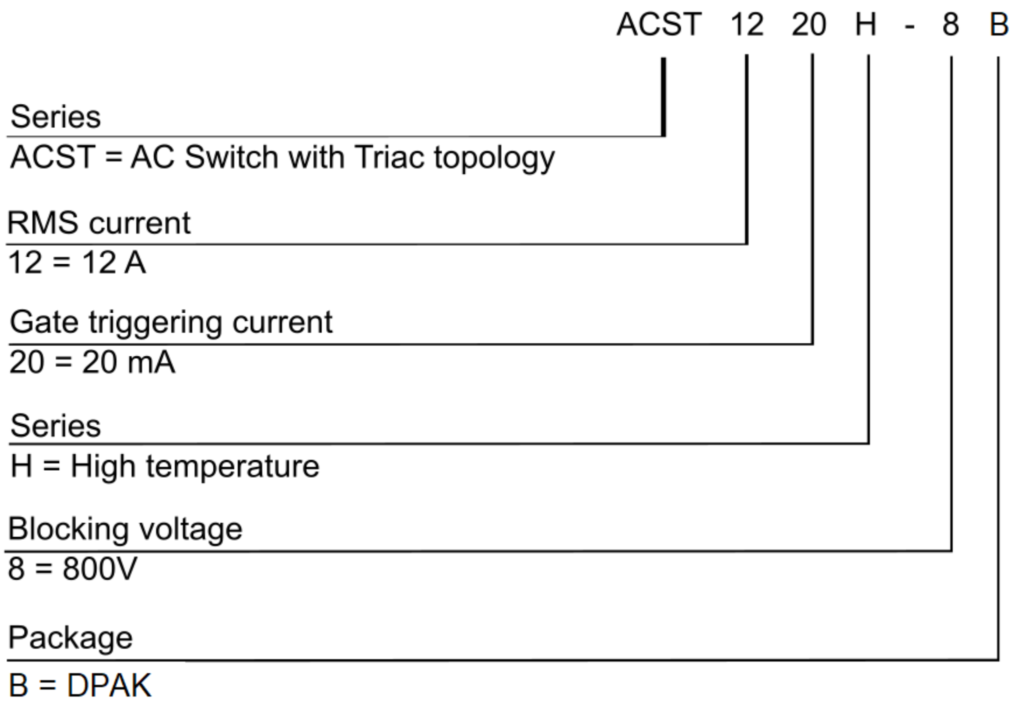


Figure 19. **Ordering information scheme**

Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
ACST1220H-8B	ACST1220H	DPAK	0.3 g	50	Tube

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
05-Sep-2023	1	Initial release.
19-Sep-2023	2	Updated Section 3.1 DPAK package information.