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## ACST4 Series

### ASD™ AC Switch Family

### AC POWER SWITCH

#### MAIN APPLICATIONS

- AC static switching in appliance control systems
- Drive of low power high inductive or resistive loads like
  - spray pump in dishwashers
  - fan in air-conditioners

#### FEATURES

- Blocking voltage :  $V_{DRM} / V_{RRM} = +/-700V$
- Avalanche controlled :  $V_{CL\ typ} = 1100\ V$
- Nominal conducting current :  $I_{T(RMS)} = 4A$
- High surge current capability: 30A for 20ms full wave
- Gate triggering current :  $I_{GT} < 10\ mA$  or 25mA
- Switch integrated driver
- High noise immunity : static  $dV/dt > 500V/\mu s$

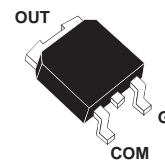
#### BENEFITS

- Enables equipment to meet IEC 61000-4-5
- High off-state reliability with planar technology
- No external overvoltage protection needed
- Reduces the power component factor
- Interfaces directly with the microcontroller
- Direct interface with the microcontroller for the ACST4-7S ( $I_{GT} < 10mA$ )

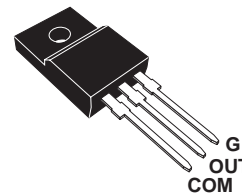
#### DESCRIPTION

The ACST4 belongs to the AC power switch family built around the ASD™ technology. This high performance device is adapted to home appliances or industrial systems and drives loads up to 4 A.

The ACS™ 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 IEC61000-4-5 standards.

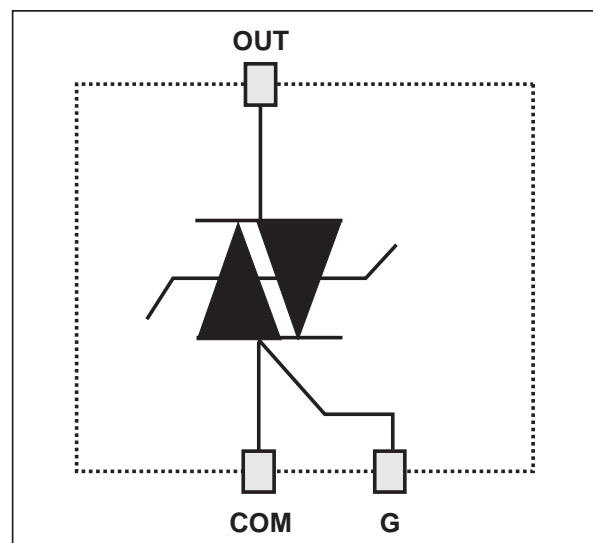


DPAK  
ACST4-7SB/CB



TO-220FPAB  
ACST4-7SFP/CFP

#### FUNCTIONAL DIAGRAM



## ACST4 Series

### 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   |                       | $T_j = -10\text{ °C}$ | 700           | V                  |
| $I_{T(RMS)}$        | RMS on-state current full cycle sine wave 50 to 60 Hz   | DPAK                  | $T_c = 110\text{ °C}$ | 4             | A                  |
|                     |   | TO-220FPAB            | $T_c = 100\text{ °C}$ |               |                    |
| $I_{TSM}$           | Non repetitive surge peak on-state current<br>$T_j$ initial = $25\text{ °C}$ , full cycle sine wave |                       | $F = 50\text{ Hz}$    | 30            | A                  |
|                     |   |                       | $F = 60\text{ Hz}$    | 33            | A                  |
| $I^2t$              | Fusing capability   |                       | $t_p = 10\text{ ms}$  | 6.4           | $A^2s$             |
| $di/dt$             | Repetitive on-state current critical rate of rise $I_G = 10\text{ mA}$ ( $t_r < 100\text{ ns}$ )    | $T_j = 125\text{ °C}$ | $F = 120\text{ Hz}$   | 50            | $A/\mu s$          |
| $V_{PP}$            | Non repetitive line peak pulse voltage  |                       | note 1                | 2             | kV                 |
| $T_{stg}$           | Storage temperature range   |                       |                       | - 40 to + 150 | $^{\circ}\text{C}$ |
| $T_j$               | Operating junction temperature range  |                       |                       | - 30 to + 125 | $^{\circ}\text{C}$ |
| $T_l$               | Maximum lead soldering temperature during 10s   |                       |                       | 260           | $^{\circ}\text{C}$ |

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

### GATE CHARACTERISTICS (maximum values)

| Symbol      | Parameter                                       | Value | Unit |
|-------------|---|-------|------|
| $P_{G(AV)}$ | Average gate power dissipation                  | 0.1   | W    |
| $P_{GM}$    | Peak gate power dissipation ( $t_p = 20\mu s$ ) | 10    | A    |
| $I_{GM}$    | Peak gate current ( $t_p = 20\mu s$ )           | 1     | V    |

### THERMAL RESISTANCES

| Symbol        | Parameter  |                              | Value | Unit                 |
|---------------|--|------------------------------|-------|----------------------|
| $R_{th(j-a)}$ | Junction to ambient                                  | $S = 0.5\text{ cm}^2$   DPAK | 70    | $^{\circ}\text{C/W}$ |
|               |  | TO-220FPAB                   | 60    | $^{\circ}\text{C/W}$ |
| $R_{th(j-l)}$ | Junction to case for full cycle sine wave conduction | DPAK                         | 2.6   | $^{\circ}\text{C/W}$ |
|               |  | TO-220FPAB                   | 4.6   | $^{\circ}\text{C/W}$ |

S = Copper surface under Tab

## 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   |
| $I_L$               | Latching current  |
| $V_{TM}$            | Peak on-state voltage drop                                |
| $V_{TO}$            | On state threshold voltage                                |
| $R_d$               | 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    |
| $(dI/dt)_c$         | Critical rate of decrease of commutating on-state current |
| $V_{CL}$            | Clamping voltage  |
| $I_{CL}$            | Clamping current  |

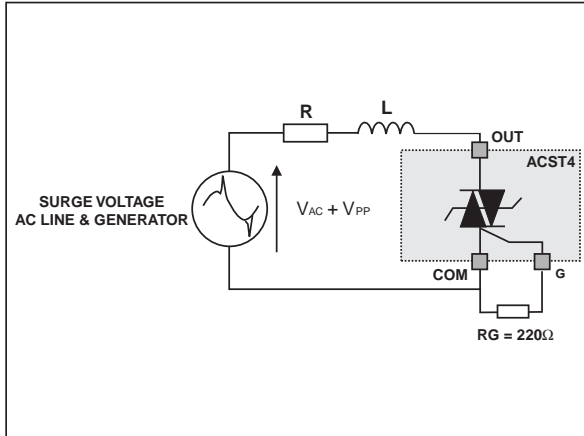
## ELECTRICAL CHARACTERISTICS

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

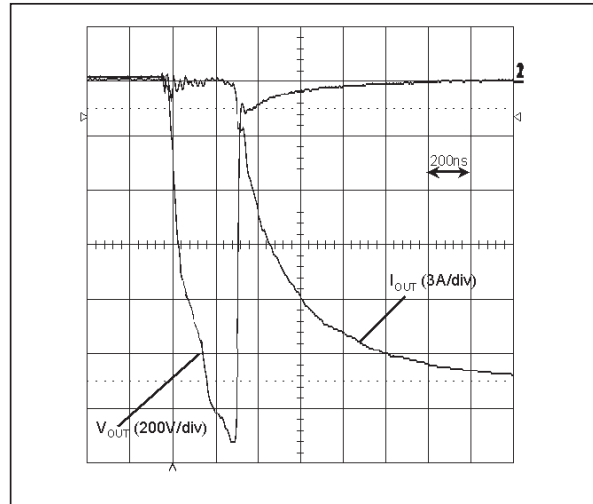
| Symbol              | Test Conditions                      |                 |                   |     | ACST4-7S | ACST4-7C | Unit       |
|---------------------|--------------------------------------|-----------------|-------------------|-----|----------|----------|------------|
| $I_{GT}$            | $V_{OUT}=12V$ (DC)<br>$R_L=33\Omega$ | QI - QII - QIII | $T_j=25^\circ C$  | MAX | 10       | 25       | mA         |
| $V_{GT}$            | $V_{OUT}=12V$ (DC)<br>$R_L=33\Omega$ | QI - QII - QIII | $T_j=25^\circ C$  | MAX | 1        | 1.1      | V          |
| $V_{GD}$            | $V_{OUT}=V_{DRM}$ $R_L=3.3k\Omega$   |                 | $T_j=125^\circ C$ | MIN | 0.2      |          | V          |
| $I_H$               | $I_{OUT}=100mA$ gate open            |                 | $T_j=25^\circ C$  | MAX | 20       | 35       | mA         |
| $I_L$               | $I_G=2 \times I_{GTmax}$             |                 | $T_j=25^\circ C$  | MAX | 40       | 60       | mA         |
| $V_{TM}$            | $I_{OUT}=5.6A$ $t_p=380\mu s$        |                 | $T_j=25^\circ C$  | MAX | 1.5      |          | V          |
| $V_{TO}$            |                                      |                 | $T_j=125^\circ C$ | MAX | 0.90     |          | V          |
| $R_d$               |                                      |                 | $T_j=125^\circ C$ | MAX | 100      |          | m $\Omega$ |
| $I_{DRM} / I_{RRM}$ | $V_{OUT}=700V$                       |                 | $T_j=25^\circ C$  | MAX | 10       |          | $\mu A$    |
|                     |                                      |                 | $T_j=125^\circ C$ | MAX | 500      |          |            |
| $dV/dt$             | $V_{OUT}=460V$ gate open             |                 | $T_j=110^\circ C$ | MIN | 200      | 500      | V/ $\mu s$ |
| $(dI/dt)_c$         | $(dV/dt)_c=15V/\mu s$                |                 | $T_j=125^\circ C$ | MIN | 2.0      | 2.5      | A/ms       |
| $V_{CL}$            | $I_{CL}=1mA$ $t_p=1ms$               |                 | $T_j=25^\circ C$  | TYP | 1100     |          | V          |



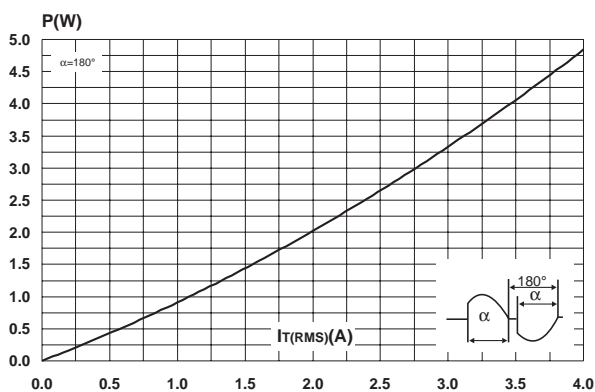
**Fig. B:** Overvoltage ruggedness test circuit for resistive and inductive loads according to IEC61000-4-5 standards.  
 $R = 150\Omega$ ,  $L = 10\mu\text{H}$ ,  $V_{PP} = 2\text{kV}$ .



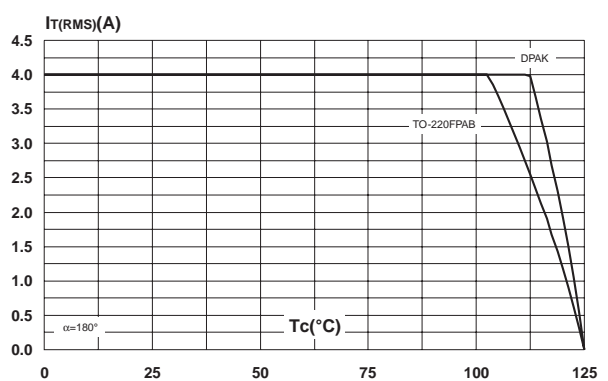
**Fig. C:** Current and Voltage of the ACST4 during IEC61000-4-5 standard test with R, L &  $V_{PP}$ .



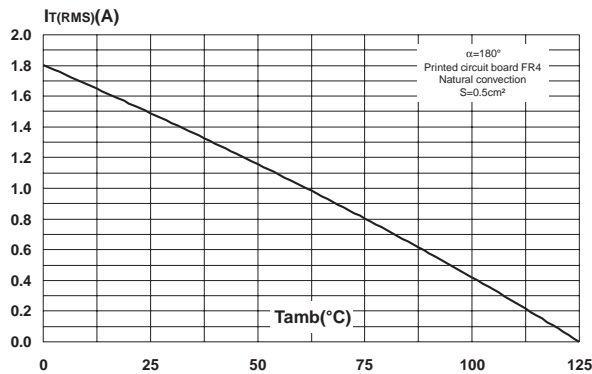
**Fig. 1:** Maximum power dissipation versus RMS on-state current.



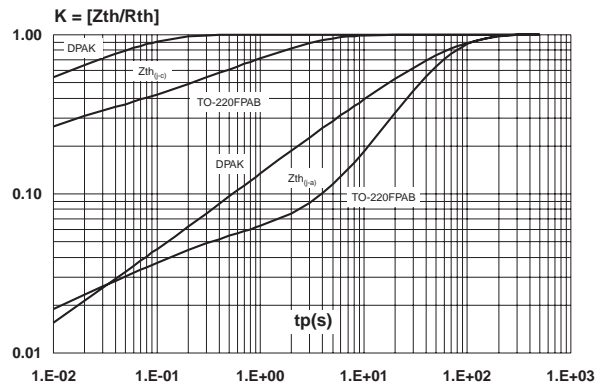
**Fig. 2-1:** RMS on-state current versus case temperature.



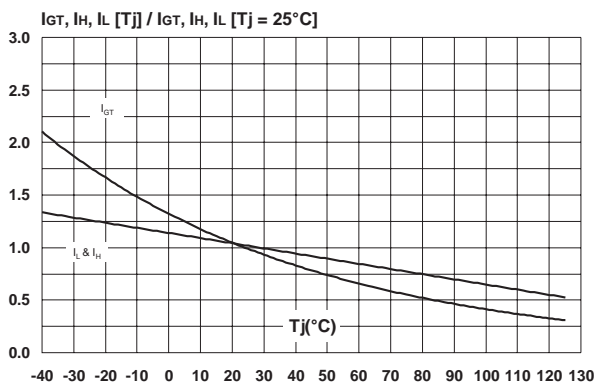
**Fig. 2-2:** RMS on-state current versus ambient temperature.



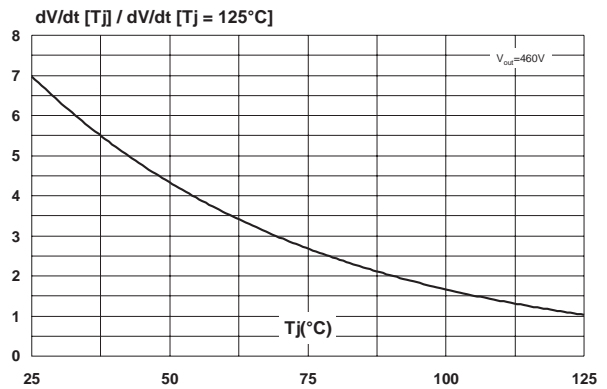
**Fig. 3:** Relative variation of thermal impedance versus pulse duration.



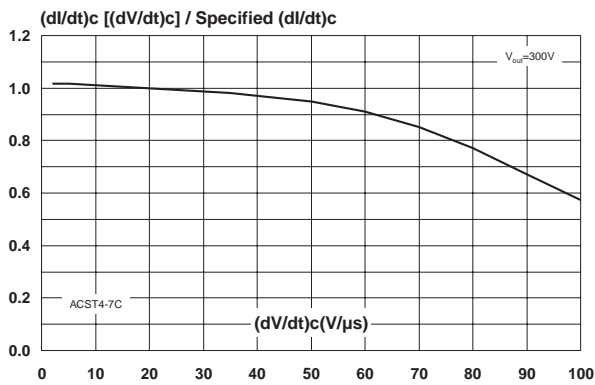
**Fig. 4:** Relative variation of gate trigger current, holding current and latching versus junction temperature (typical values).



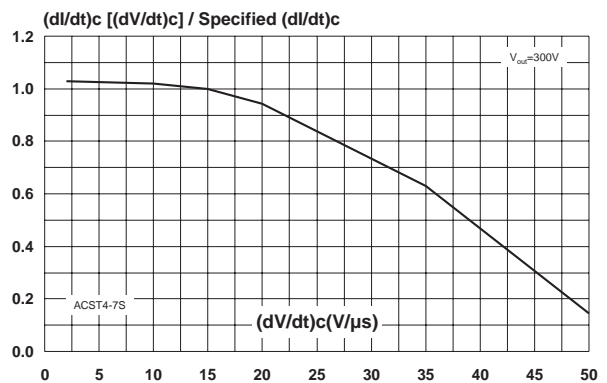
**Fig. 5:** Relative variation of static dV/dt versus junction temperature.



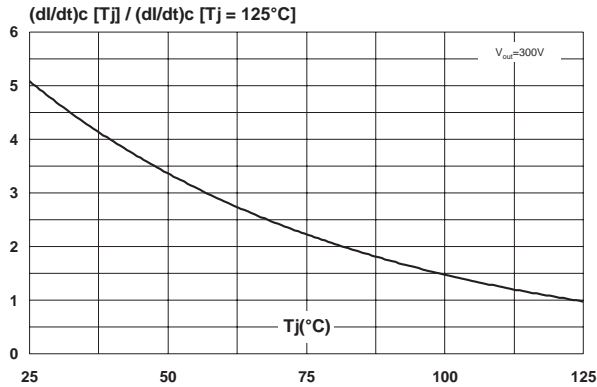
**Fig. 6-1:** Relative variation of critical rate of decrease of main current versus reapplied dV/dt (typical values).



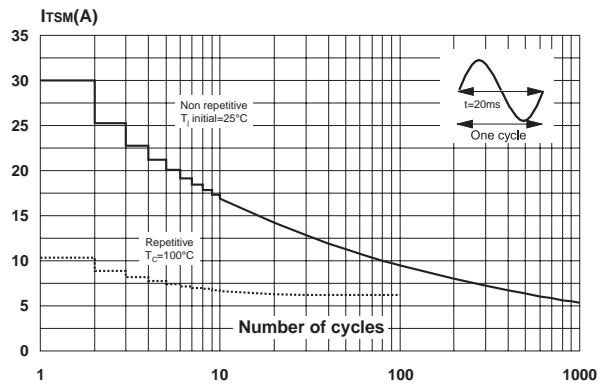
**Fig. 6-2:** Relative variation of critical rate of decrease of main current versus reapplied dV/dt (typical values).



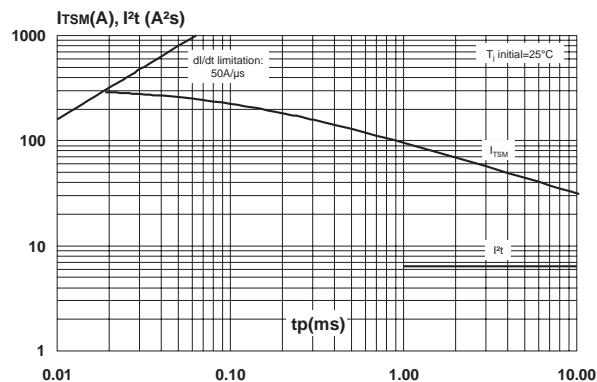
**Fig. 7:** Relative variation of critical rate of decrease of main current versus junction temperature.



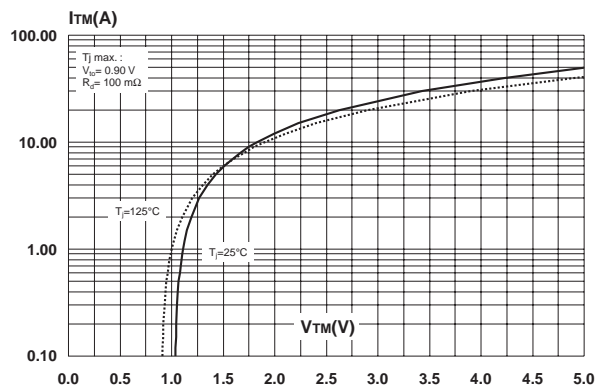
**Fig. 8:** Surge peak on-state current versus number of cycles.



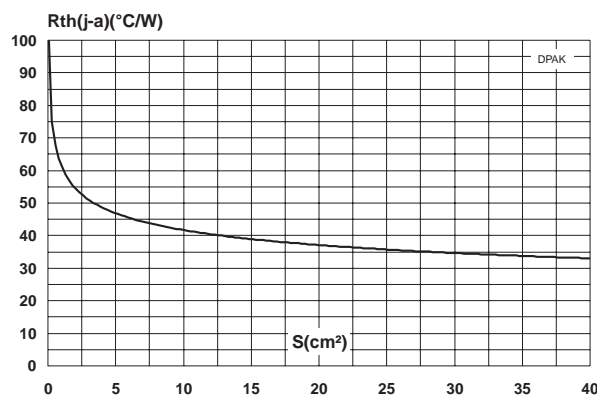
**Fig. 9:** Non repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ms}$ , and corresponding value of  $I^2t$ .



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



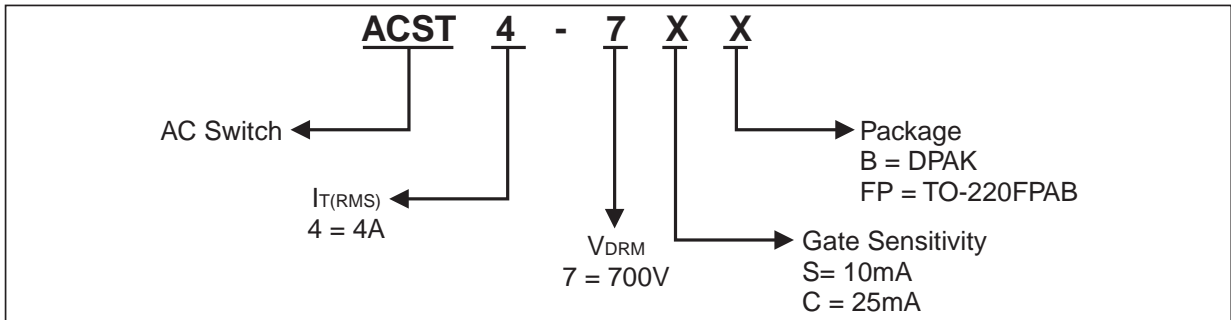
**Fig. 11:** Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35μm)



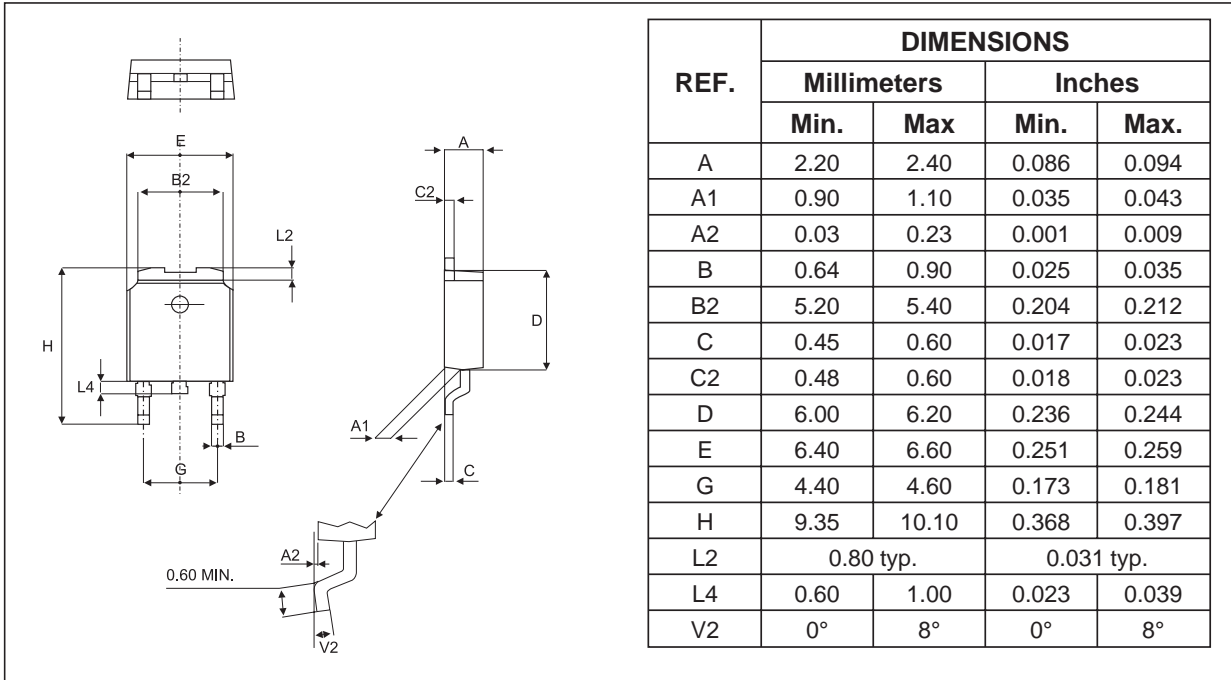


# ACST4 Series

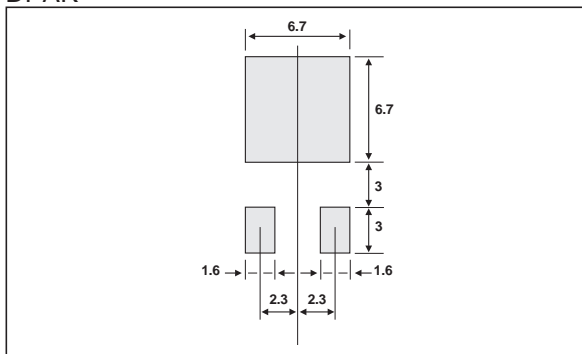
## ORDERING INFORMATION



## PACKAGE OUTLINE MECHANICAL DATA DPAK



## FOOT PRINT DPAK



**PACKAGE OUTLINE MECHANICAL DATA**  
**TO-220FPAB**

| 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 |

**OTHER INFORMATION**

| Ordering type | Marking | Package    | Weight | Base qty | Delivery mode |
|---------------|---------|------------|--------|----------|---------------|
| ACST4-7SB     | ACST47S | DPAK       | 0.3 g  | 75       | Tube          |
| ACST4-7SB-TR  | ACST47S | DPAK       | 0.3 g  | 2500     | Tape & reel   |
| ACST4-7SFP    | ACST47S | TO-220FPAB | 2.4 g  | 50       | Tube          |
| ACST4-7CB     | ACST47C | DPAK       | 0.3 g  | 75       | Tube          |
| ACST4-7CB-TR  | ACST47C | DPAK       | 0.3 g  | 2500     | Tape & reel   |
| ACST4-7CFP    | ACST47C | TO-220FPAB | 2.4 g  | 50       | Tube          |

- Epoxy meets UL94,V0

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