



## SMM4F12AVCL

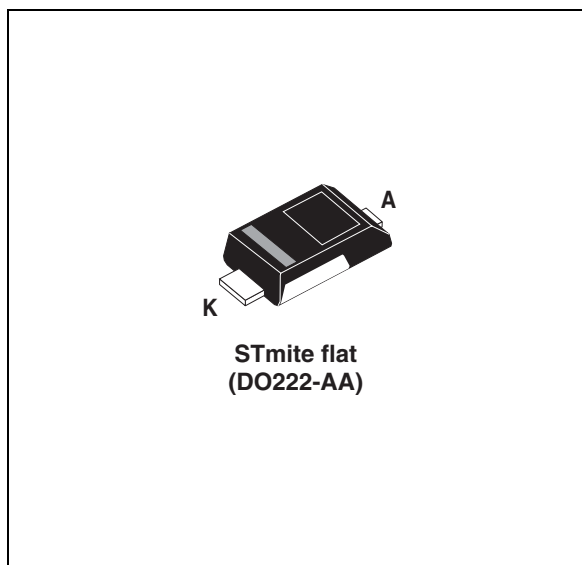
400 W low clamping voltage Transil™

### Features

- Typical peak pulse power:
  - 400 W (10/1000  $\mu$ s)
  - 2.4 kW (8/20  $\mu$ s)
- Stand off voltage: 12 V
- Unidirectional type
- Low clamping factor
- Low leakage current:
  - 0.2  $\mu$ A at 25 °C
  - 1  $\mu$ A at 85 °C
- Operating  $T_j$  max: 175 °C
- High power capability at 85 °C: 385 W
- JEDEC registered package outline
- RoHS package
- Halogen free molding compound

### Complies with the following standards

- IEC 61000-4-2 level 4:
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- MIL STD 883G-Method 3015-7: class3
  - 25 kV (human body model)



### Description

The SMM4F12AVCL Transil series has been designed to protect sensitive equipment against electro-static discharges according to IEC 61000-4-2, MIL STD 883 Method 3015, and electrical over stress such as IEC 61000-4-4 and 5. They are generally for surges below 400 W 10/1000  $\mu$ s.

This planar technology makes it compatible with high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time. Their low clamping voltages provide a better safety margin to protect sensitive circuits with extended life time expectancy such as HDD power combo voltage regulators.

Packaged in STmite flat, this minimizes PCB space consumption (footprint in accordance with IPC 7531 standard).

TM: Transil is a trademark of STMicroelectronics

# 1 Characteristics

**Table 1. Absolute ratings ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

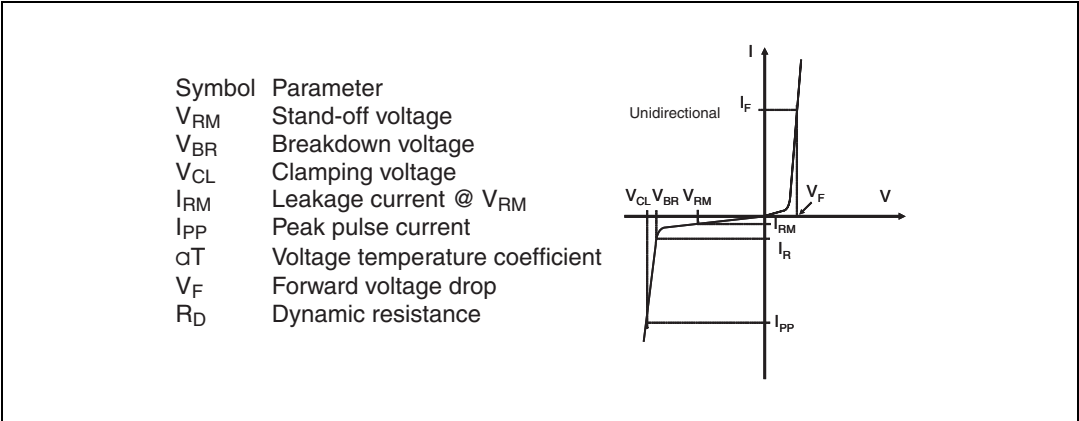
| Symbol    | Parameter                                            |                                         | Value       | Unit               |
|-----------|------------------------------------------------------|-----------------------------------------|-------------|--------------------|
| $V_{PP}$  | Peak pulse voltage (IEC 61000-4-2 contact discharge) |                                         | 30          | kV                 |
| $P_{PP}$  | Peak pulse power dissipation <sup>(1)</sup>          | $T_j \text{ initial} = T_{amb}$         | 400         | W                  |
| $P$       | Power dissipation on infinite heatsink               | $T_{amb} = 125\text{ }^{\circ}\text{C}$ | 2.5         | W                  |
| $T_{stg}$ | Storage temperature range                            |                                         | -65 to +175 | $^{\circ}\text{C}$ |
| $T_j$     | Operating junction temperature range                 |                                         | -55 to +175 | $^{\circ}\text{C}$ |
| $T_L$     | Maximum lead temperature for soldering during 10 s   |                                         | 260         | $^{\circ}\text{C}$ |

1. For a surge greater than the maximum values, the diode will fail in short-circuit.

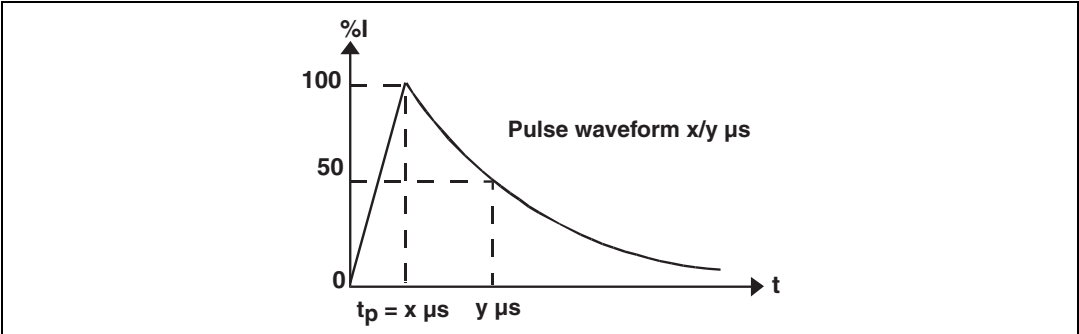
**Table 2. Thermal resistances**

| Symbol        | Parameter                                              | Value | Unit                 |
|---------------|--------------------------------------------------------|-------|----------------------|
| $R_{th(j-l)}$ | Junction to leads                                      | 20    | $^{\circ}\text{C/W}$ |
| $R_{th(j-a)}$ | Junction to ambient on PCB with recommended pad layout | 250   |                      |

**Figure 1. Electrical characteristics - parameter definitions**



**Figure 2. Definition of  $I_{PP}$  pulse**



**Table 3. Electrical characteristics - parameter values ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )<sup>(1)</sup>**

| Type        | $I_{RM} \text{ max@}V_{RM}$ |                       |    | $V_{BR} \text{ @}I_R^{(2)}$ |      |     |    | $V_{CL} \text{ @}I_{PP}$<br>10/1000 $\mu\text{s}$ |   | $R_D^{(3)}$<br>10/1000 $\mu\text{s}$ | $V_{CL} \text{ @}I_{PP}$<br>8/20 $\mu\text{s}$ |     | $R_D^{(3)}$<br>8/20 $\mu\text{s}$ | $\alpha T^{(4)}$         |
|-------------|-----------------------------|-----------------------|----|-----------------------------|------|-----|----|---------------------------------------------------|---|--------------------------------------|------------------------------------------------|-----|-----------------------------------|--------------------------|
|             | 25 $^{\circ}\text{C}$       | 85 $^{\circ}\text{C}$ |    | min                         | typ  | max |    | max                                               |   |                                      | max                                            |     |                                   | max                      |
|             | $\mu\text{A}$               |                       | V  | V                           |      |     | mA | V                                                 | A | $\Omega$                             | V                                              | A   | $\Omega$                          | 10-4/ $^{\circ}\text{C}$ |
| SMM4F12AVCL | 0.2                         | 1                     | 12 | 13                          | 13.5 | 14  | 1  | 14.3                                              | 1 | 0.3                                  | 22.9                                           | 100 | 0.09                              | 8.3                      |

1. Surge capability given for both directions

2. Pulse test:  $t_p < 50\text{ms}$ .

3. To calculate maximum clamping voltage at other surge currents, use the following formula  $V_{CLmax} = R_D \times I_{PP} + V_{BRmax}$

4. To calculate  $V_{BR}$  versus junction temperature, use the following formula:  $V_{BR} \text{ @ } T_j = V_{BR} \text{ @ } 25\text{ }^{\circ}\text{C} \times (1 + \alpha T \times (T_j - 25))$

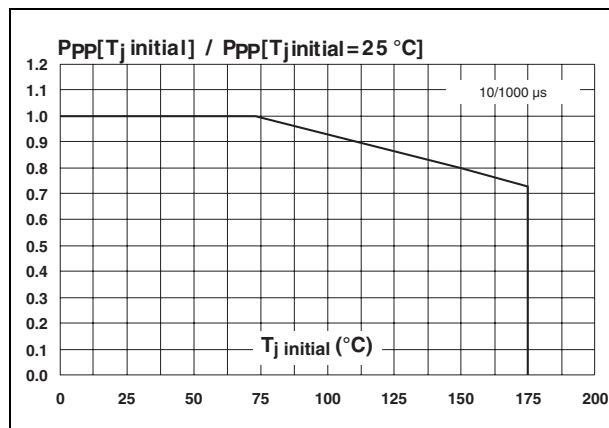
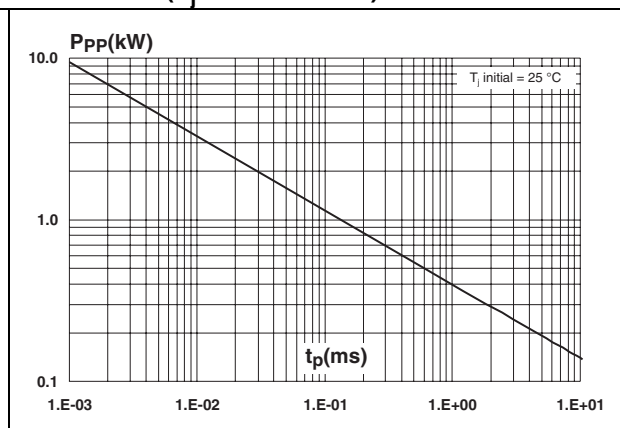
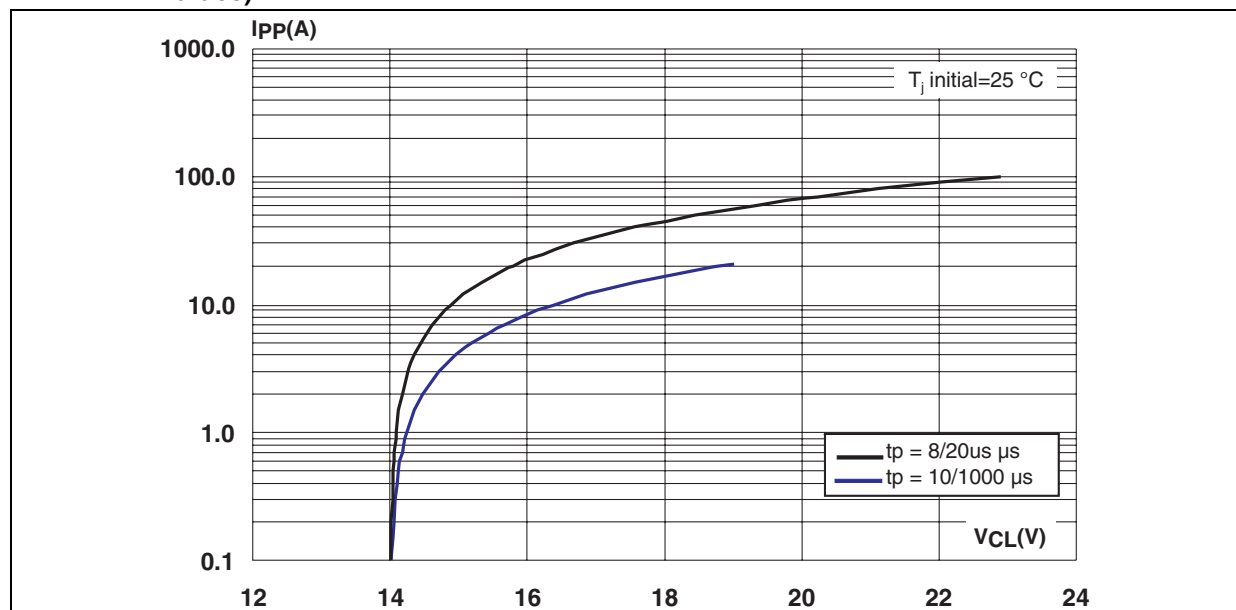
**Figure 3. Peak power dissipation versus initial junction temperature****Figure 4. Peak pulse power versus exponential pulse duration ( $T_j \text{ initial} = 25\text{ }^{\circ}\text{C}$ )****Figure 5. Clamping voltage versus peak pulse current (exponential waveform, maximum values)**

Figure 6. Relative variation of thermal impedance junction to ambient versus pulse duration

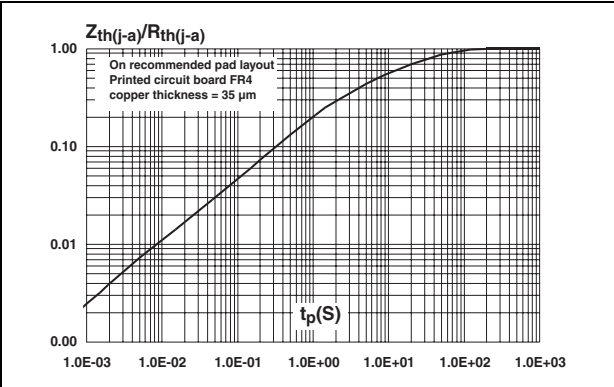
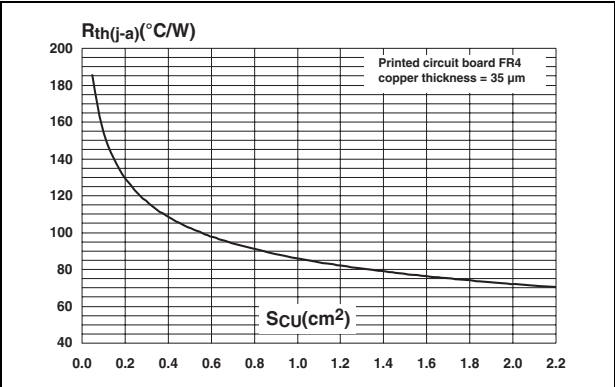
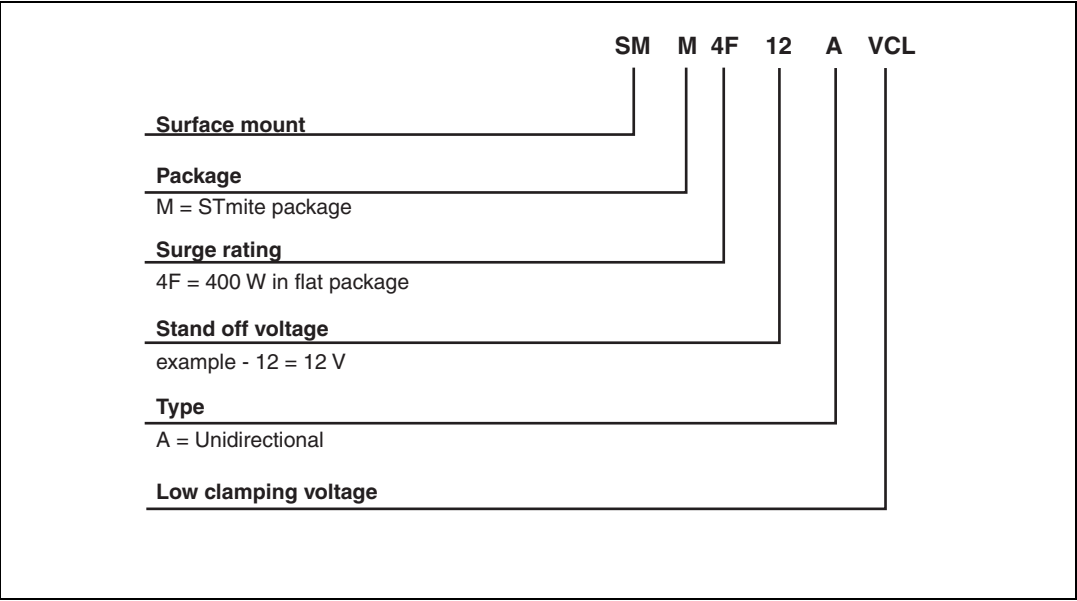


Figure 7. Thermal resistance junction to ambient versus copper surface under each lead



2 Ordering information scheme

Figure 8. Ordering information scheme



### 3 Package information

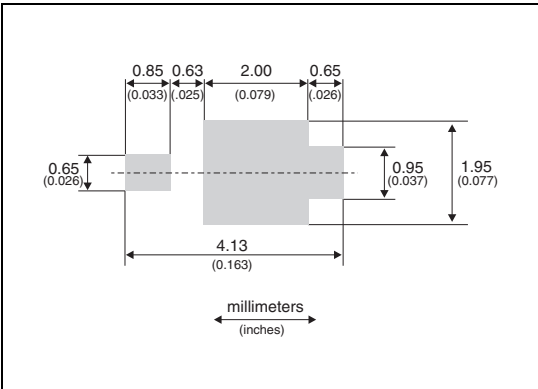
- Case: JEDEC DO-222AA molded plastic over Planar junction
- Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity: The band indicates cathode.
- Flammability: Epoxy meets UL94V-0
- RoHS package

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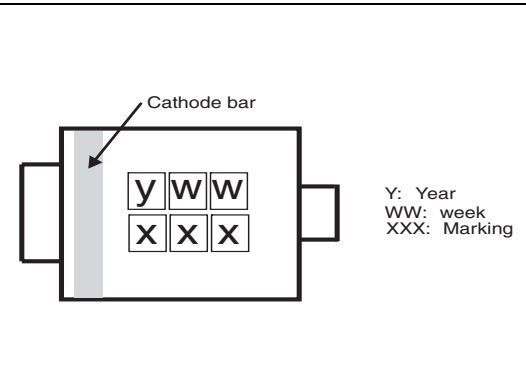
**Table 4. STmite flat dimensions**

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    | 0.80        | 0.85 | 0.95 | 0.031  | 0.033 | 0.037 |
| b    | 0.40        | 0.55 | 0.65 | 0.016  | 0.022 | 0.026 |
| b2   | 0.70        | 0.85 | 1.00 | 0.027  | 0.033 | 0.039 |
| c    | 0.10        | 0.15 | 0.25 | 0.004  | 0.006 | 0.009 |
| D    | 1.75        | 1.90 | 2.05 | 0.069  | 0.075 | 0.081 |
| E    | 3.60        | 3.80 | 3.90 | 0.142  | 0.150 | 0.154 |
| E1   | 2.80        | 2.95 | 3.10 | 0.110  | 0.116 | 0.122 |
| L    | 0.50        | 0.55 | 0.80 | 0.020  | 0.022 | 0.031 |
| L1   | 2.10        | 2.40 | 2.60 | 0.083  | 0.094 | 0.102 |
| L2   | 0.45        | 0.60 | 0.75 | 0.018  | 0.024 | 0.030 |
| L3   | 0.20        | 0.35 | 0.50 | 0.008  | 0.014 | 0.020 |

**Figure 9. STmite flat footprint dimensions**



**Figure 10. Marking information**



## 4 Ordering information

**Table 5. Ordering information**

| Order code  | Marking | Package     | Weight  | Base qty | Delivery mode |
|-------------|---------|-------------|---------|----------|---------------|
| SMM4F12AVCL | 4UL     | STmite flat | 16.7 mg | 12000    | Tape and reel |

## 5 Revision history

**Table 6. Document revision history**

| Date        | Revision | Changes      |
|-------------|----------|--------------|
| 13-Sep-2011 | 1        | First issue. |

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