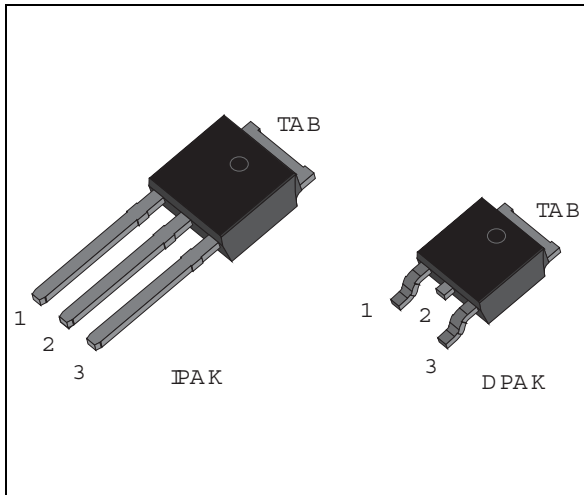


## Fire lighter circuit

Datasheet – production data



### Features

- Dedicated thyristor structure for capacitance discharge ignition operation
- High pulse current capability:
  - 190 A at  $t_p = 10 \mu s$
- Fast turn-on operation
- Designed for high ambient temperature (up to 120° C)

### Benefits

- Space saving thanks to monolithic function integration
- High reliability with planar technology

### Description

The FLC01 series has been especially developed for capacitance discharge operation. The main applications are gas lighters or ignitors such as cookers / gas boilers / gas hobs...

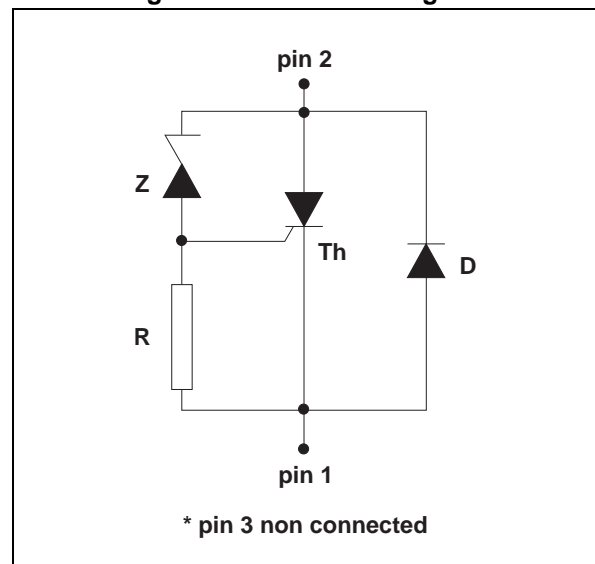
It provides a fully integrated function, with high performance and reliability levels, adapted to severe and hot temperature environment.

- **Th**: Thyristor for switching operation
- **Z**: Zener diode to set the threshold voltage
- **D**: Diode for reverse conduction
- **R**: 2 k $\Omega$  resistor

**Table 1. Device summary**

| Symbol             | Value | Unit |
|--------------------|-------|------|
| $I_{T(rms)}$       | 4     | A    |
| $V_{DRM}, V_{RRM}$ | 600   | V    |
| $I_{GT}$           | 5     | mA   |

**Figure 1. Functional diagram**



# 1 Characteristics

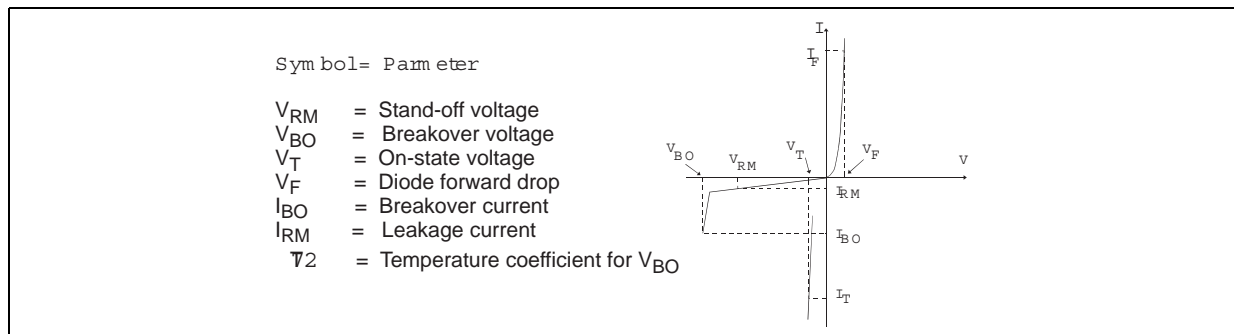
**Table 2. Absolute ratings (limiting values)**

| Symbol             | Parameter   | Value                  | Unit         |
|--------------------|---|------------------------|--------------|
| $I_{TRM}$          | Repetitive surge peak on state current for thyristor<br>$-30^{\circ} C \leq T_{amb} \leq 120^{\circ} C$ | 190                    | A            |
| $I_{FRM}$          | Repetitive surge peak on state current for diode<br>$-30^{\circ} C \leq T_{amb} \leq 120^{\circ} C$     |                        |              |
| dI/dt              | Critical rate of rise time on state current $-30^{\circ} C \leq T_{amb} \leq 120^{\circ} C$             | 120                    | A/ $\mu$ s   |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Maximum junction temperature                                      | - 40 to + 150<br>+ 125 | $^{\circ} C$ |
| $T_{oper}$         | Operating temperature range   | - 30 to + 120          | $^{\circ} C$ |
| $T_L$              | Maximum lead temperature for soldering during 10s   | 260                    | $^{\circ} C$ |

**Table 3. Thermal resistance**

| Symbol        | Parameter                              | Value | Min.           |
|---------------|--|-------|----------------|
| $R_{th(j-a)}$ | Thermal resistance junction to ambient | 100   | $^{\circ} C/W$ |

**Figure 2. Electrical characteristics (definitions)**



**Table 4. Electrical characteristics: diode (D) parameter**

| Symbol | Test Conditions   | Value | Unit |
|--------|---|-------|------|
| $V_F$  | $I_F = 2 A$ $t_p \leq 500 \mu s$ $T_j = 25^{\circ} C$ MAX | 1.7   | V    |

**Table 5. Electrical characteristics: Thyristor (Th) and Zener (Z) parameters**

| Symbol     | Test Conditions                  | Min.                  | Typ. | Max | Unit    |                 |
|------------|----------------------------------|-----------------------|------|-----|---------|-----------------|
| $I_{RM}$   | $V_{RM} = 200 V$                 | $T_j = 25^{\circ} C$  |      | 1   | $\mu A$ |                 |
|            |                                  | $T_j = 125^{\circ} C$ |      | 10  | $\mu A$ |                 |
| $V_{BO}$   | at $I_{BO}$                      | $T_j = 25^{\circ} C$  | 206  | 220 | 233     | V               |
| $I_{BO}$   | at $V_{BO}$                      | $T_j = 25^{\circ} C$  |      | 0.5 |         | mA              |
| $V_T$      | $I_T = 2 A$ $t_p \leq 500 \mu s$ | $T_j = 25^{\circ} C$  |      | 1.7 |         | V               |
| $\alpha_T$ |                                  |                       | 0.27 |     |         | V/ $^{\circ} C$ |

Figure 3. Test current waveform

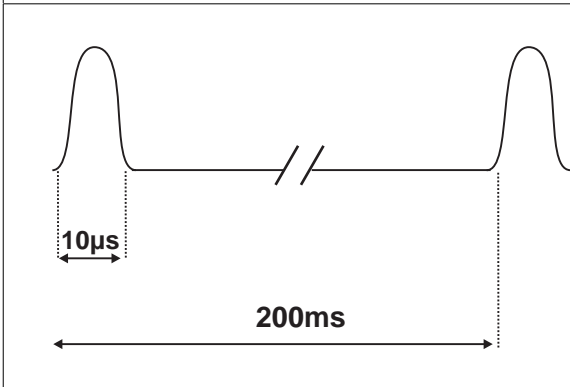


Figure 4. Relative variation of breakover current versus junction temperature

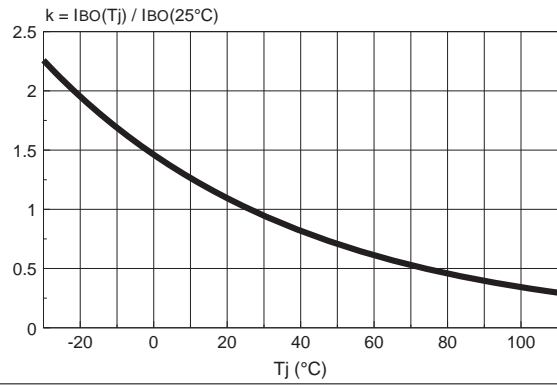
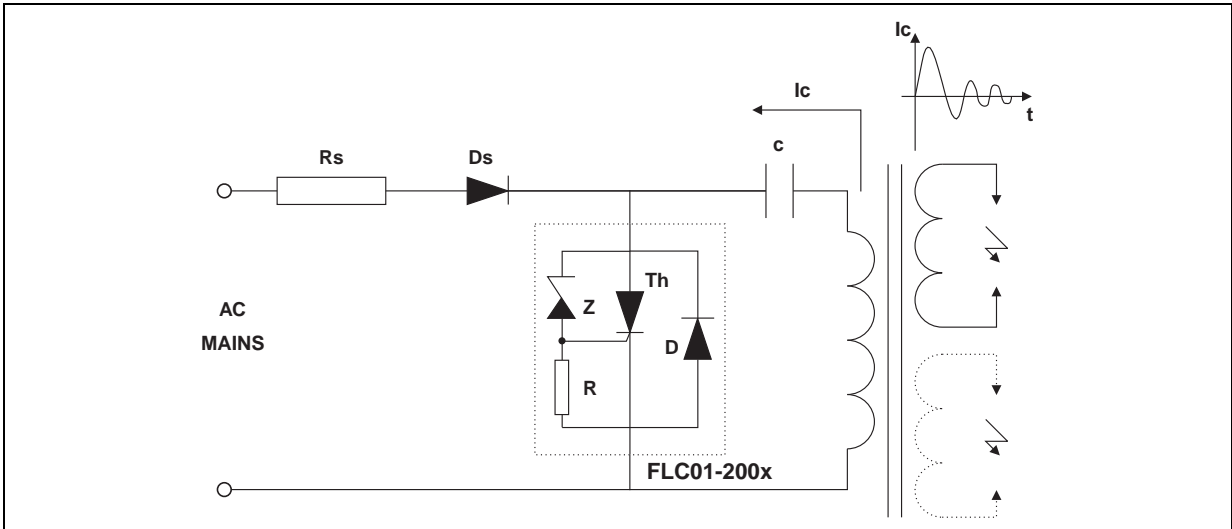


Figure 5. Basic application



The applications of the lighter using the capacitance discharge topology operate in 2 phases:

**Phase 1**

The energy coming from the mains is stored into the capacitor C. For that, the AC voltage is rectified by the diode Ds.

**Phase 2**

At the end of the phase 1, the voltage across the capacitor C reaches the avalanche threshold of the zener. Then a current flows through the gate of the thyristor Th which fires.

- The firing of the thyristor causes an alternating current to flow through the capacitor C
- The positive parts of this current flow through C, Th and the primary of the HV transformer
- The negative parts of the current flow through C, D and the primary of the HV transformer

**RS resistor calculation**

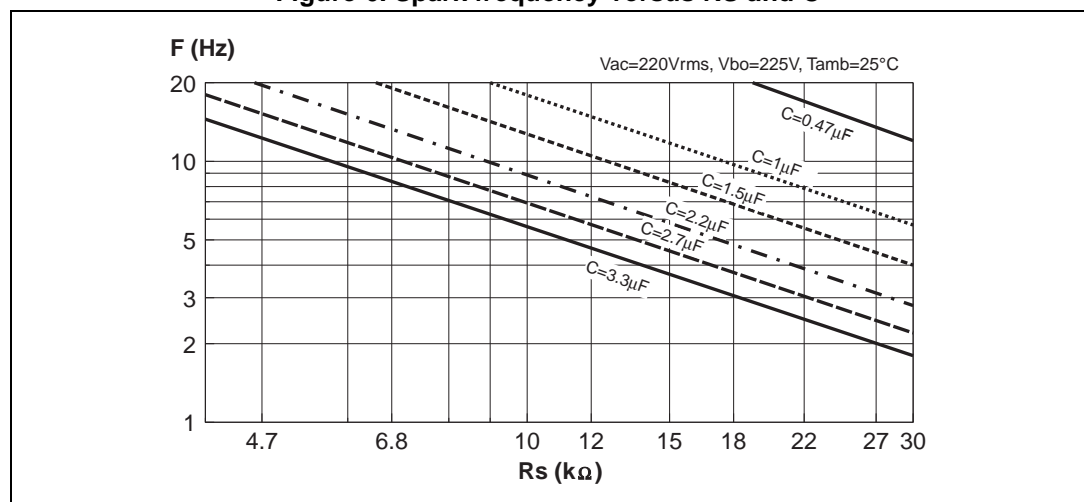
The Rs resistor allows, in addition with the capacitor C, the spark frequency to be adjusted and the current from the mains to be limited. Its value shall allow the thyristor Th to fire even in the worst case. In this case the system must fire with the lower RMS mains voltage value while the breakdown voltage and current of the FLC are at the maximum.

The maximum Rs value is equal to:

$$R_{smax} = \frac{(V_{AC \min} \cdot \sqrt{2}) - [V_{BO \max} \cdot (1 + \alpha T \cdot (T_{amb} - 25))]}{k \cdot I_{BO} (1)}$$

(1) See [Figure 4](#)

**Figure 6. Spark frequency versus RS and C**

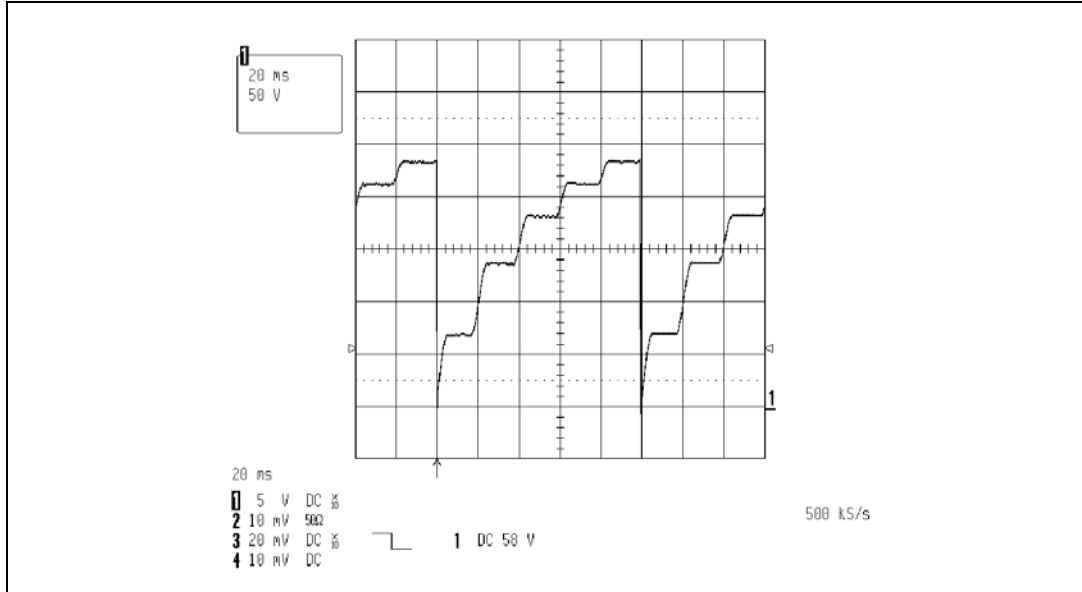


The couple Rs/C can be chosen with the previous curve.

Keep in mind the Rs maximum limit for which the system would not work when the AC mains is minimum.

The next curve on the next page shows the behavior with  $R_S = 15\text{ k}\Omega$  and  $C = 1\text{ }\mu\text{F}$ .

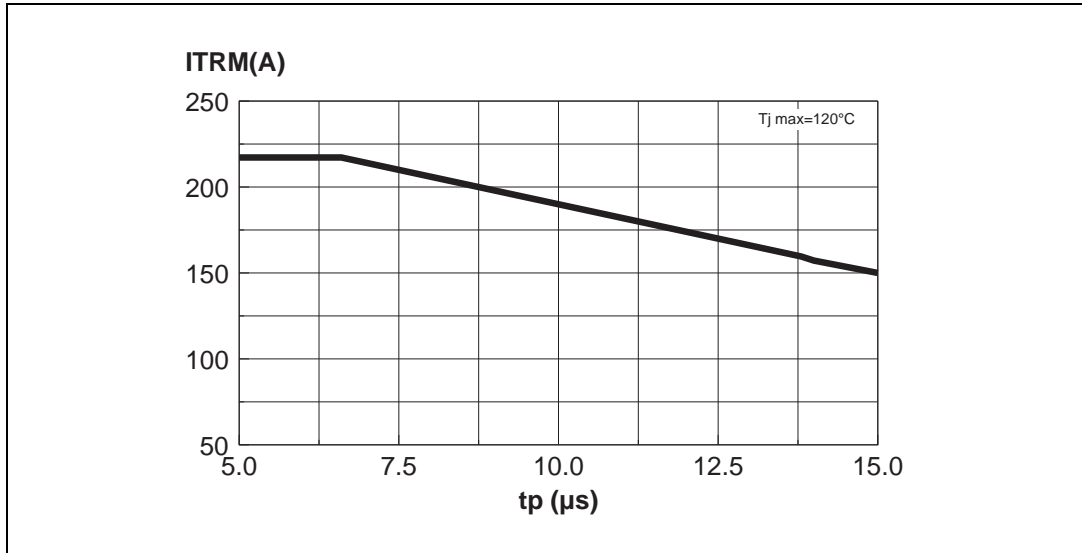
**Figure 7. Voltage across the capacitance with  $R_S = 15\text{ k}\Omega$ ,  $C = 1\text{ }\mu\text{F}$  and  $V_{BO} = 225\text{ V}$**



**Peak current limit**

This component is designed to withstand  $I_{TRM} = 190\text{ A}$  for a pulse duration of  $10\text{ }\mu\text{s}$  for an ambient temperature of  $120^\circ\text{C}$  in repetitive surge. The curve of peak current versus the pulse duration allows us to verify if the application is within the FLC operating limit.

**Figure 8. Peak current limit versus pulse duration**



**Power losses (for  $10\text{ }\mu\text{s}$ , see [Figure 3](#))**

To evaluate the power losses, please use the following equations:

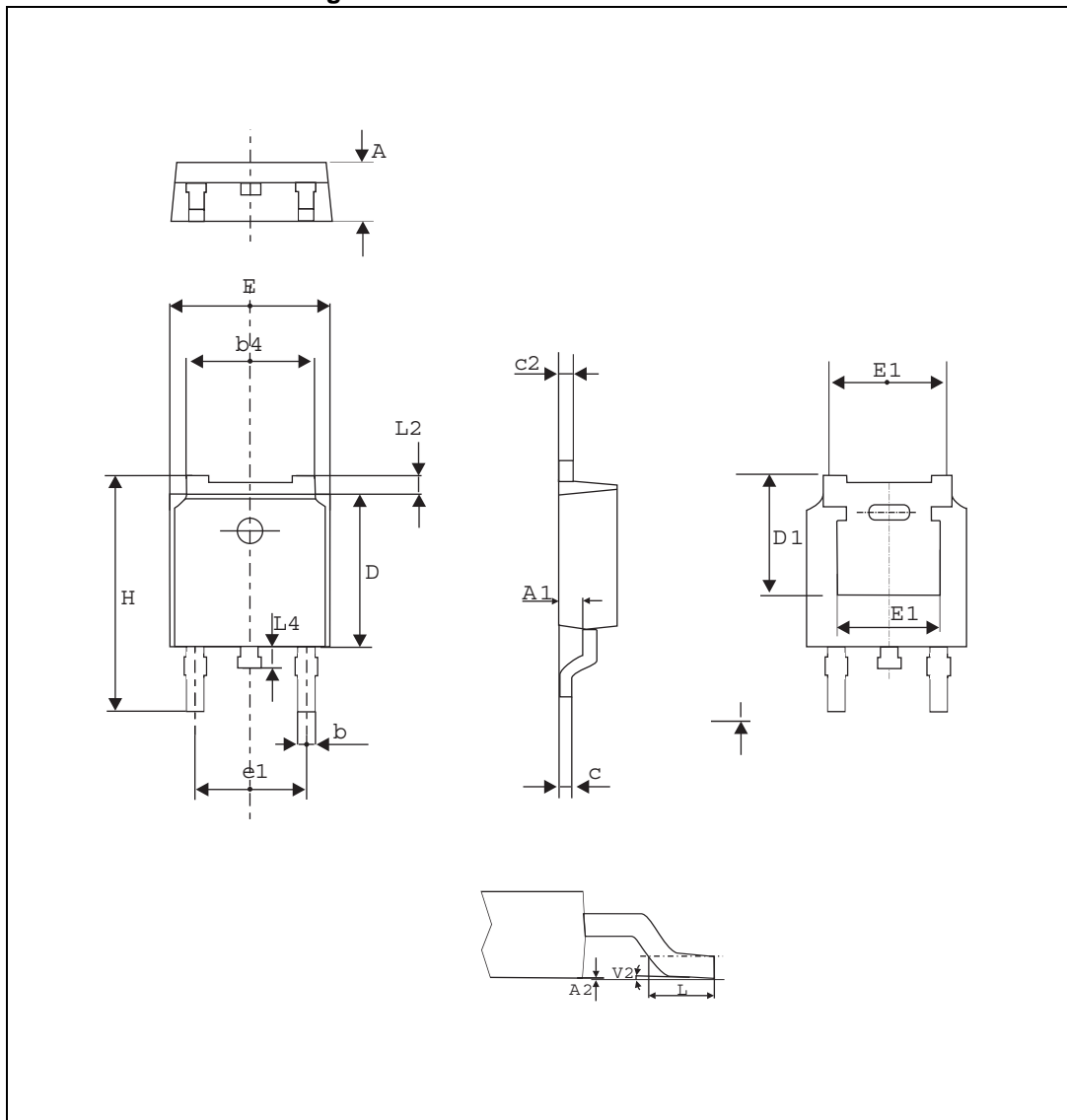
- For the thyristor:  $P = 1.18 \times I_{T(AV)} + 0.035 I_{T(RMS)}^2$
- For the diode:  $P = 0.67 \times I_{F(AV)} + 0.106 I_{F(RMS)}^2$

## 2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- Recommended torque: 0.4 to 0.6 N·m

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Figure 9. DPAK dimension definitions



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

Table 6. DPAK dimension values

| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 2.18        |      | 2.40  | 0.086  |       | 0.094 |
| A1   | 0.90        |      | 1.10  | 0.035  |       | 0.043 |
| A2   | 0.03        |      | 0.23  | 0.001  |       | 0.009 |
| b    | 0.64        |      | 0.90  | 0.025  |       | 0.035 |
| b4   | 4.95        |      | 5.46  | 0.195  |       | 0.215 |
| c    | 0.46        |      | 0.61  | 0.018  |       | 0.024 |
| c2   | 0.46        |      | 0.60  | 0.018  |       | 0.023 |
| D    | 5.97        |      | 6.22  | 0.235  |       | 0.244 |
| D1   | 5.10        |      |       | 0.201  |       |       |
| E    | 6.35        |      | 6.73  | 0.250  |       | 0.264 |
| E1   |             | 4.32 |       |        | 0.170 |       |
| e1   | 4.40        |      | 4.70  | 0.173  |       | 0.185 |
| H    | 9.35        |      | 10.40 | 0.368  |       | 0.409 |
| L    | 1.00        |      | 1.78  | 0.039  |       | 0.070 |
| L2   |             |      | 1.27  |        |       | 0.05  |
| L4   | 0.60        |      | 1.02  | 0.023  |       | 0.040 |
| V2   | 0°          |      | 8°    | 0°     |       | 8°    |

Figure 10. Footprint (dimensions in mm)

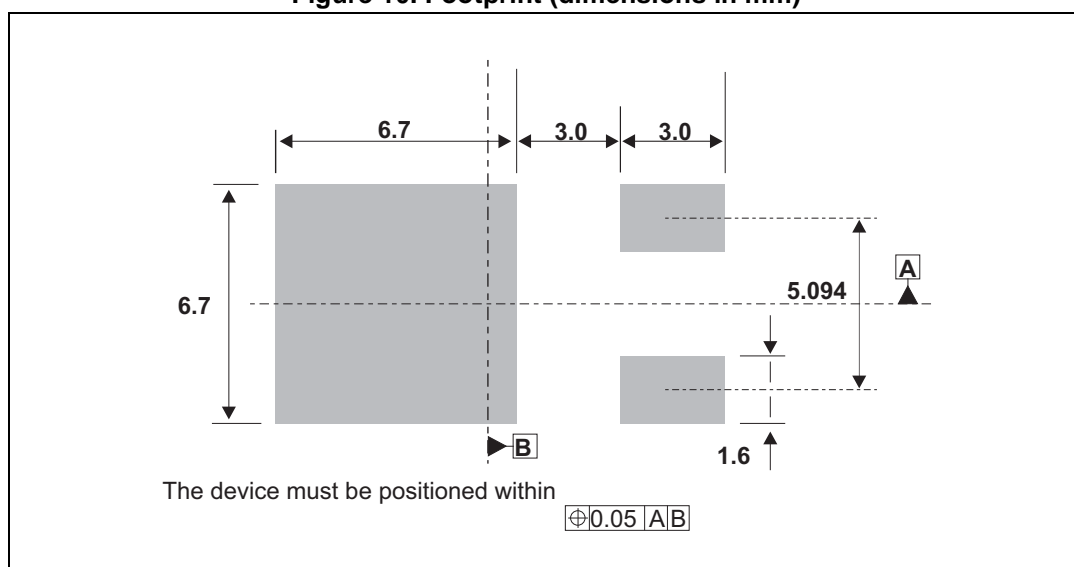
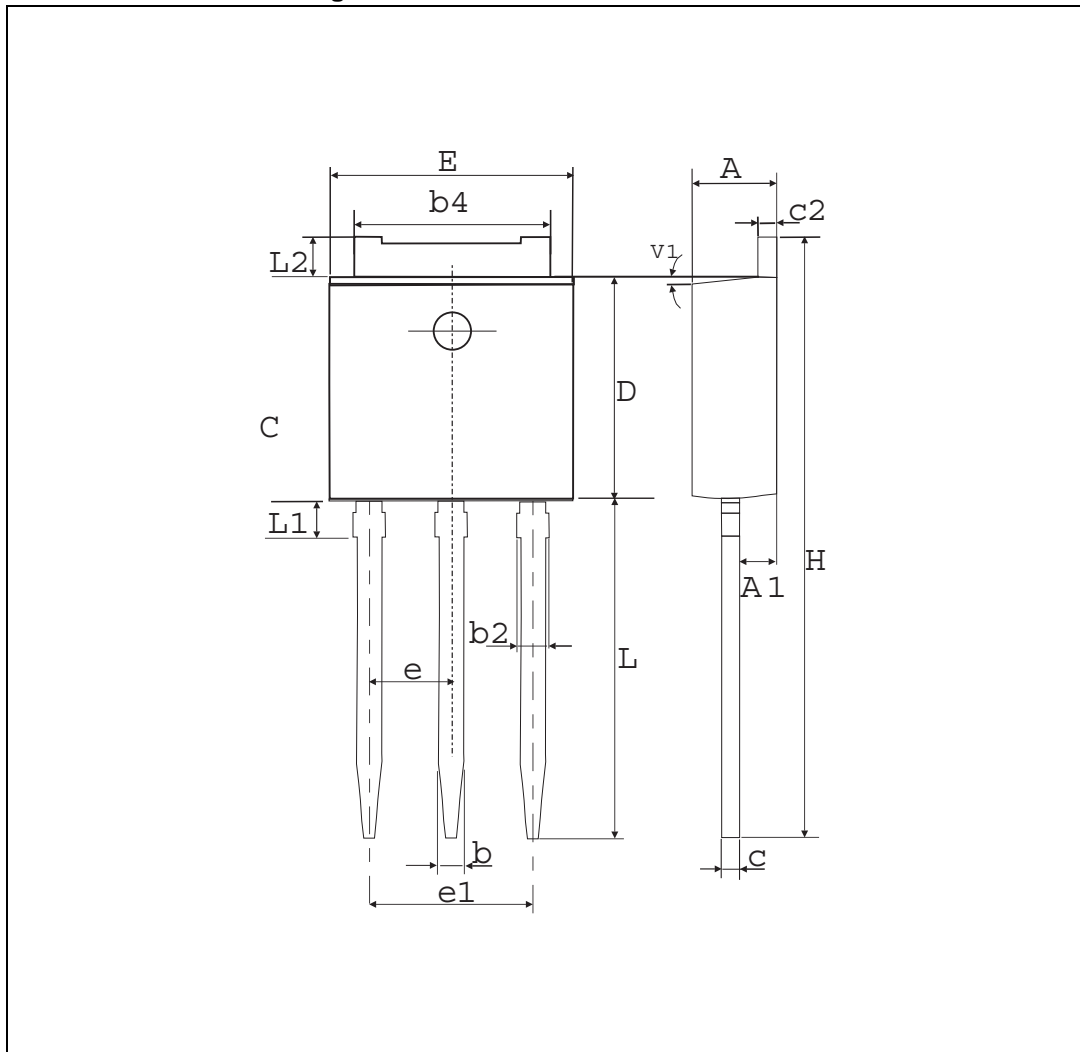


Figure 11. IPAK dimension definitions



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



Table 7. IPAK dimension values

| Ref. | Dimensions  |       |      |        |       |       |
|------|-------------|-------|------|--------|-------|-------|
|      | Millimeters |       |      | Inches |       |       |
|      | Min.        | Typ.  | Max. | Min.   | Typ.  | Max.  |
| A    | 2.20        |       | 2.40 | 0.086  |       | 0.094 |
| A1   | 0.90        |       | 1.10 | 0.035  |       | 0.043 |
| b    | 0.64        |       | 0.90 | 0.025  |       | 0.035 |
| b2   |             |       | 0.95 |        |       | 0.037 |
| b4   | 5.20        |       | 5.43 | 0.204  |       | 0.213 |
| c    | 0.45        |       | 0.60 | 0.017  |       | 0.023 |
| c2   | 0.46        |       | 0.60 | 0.018  |       | 0.023 |
| D    | 6           |       | 6.20 | 0.236  |       | 0.244 |
| E    | 6.40        |       | 6.70 | 0.252  |       | 0.263 |
| e    |             | 2.28  |      |        | 0.090 |       |
| e1   | 4.40        |       | 4.60 | 0.173  |       | 0.181 |
| H    |             | 16.10 |      |        | 0.634 |       |
| L    | 9           |       | 9.60 | 0.354  |       | 0.377 |
| L1   | 0.8         |       | 1.20 | 0.031  |       | 0.047 |
| L2   |             | 0.80  | 1.25 |        | 0.031 | 0.049 |
| V1   |             | 10°   |      |        | 10°   |       |

### 3 Ordering information

Figure 12. Order information scheme

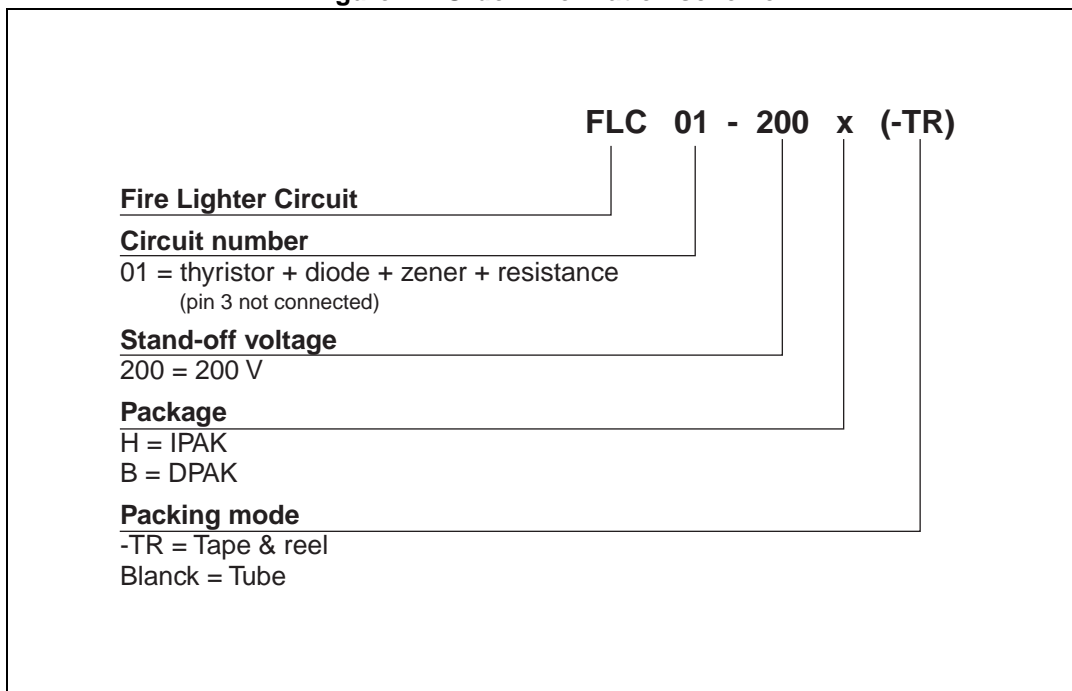


Table 8. Ordering information

| Order code    | Marking    | Package | Weight | Base qty | Delivery mode |
|---------------|------------|---------|--------|----------|---------------|
| FLC01-200H    | FLC01-200H | IPAK    | 0.4 g  | 75       | Tube          |
| FLC01-200B    | FLC01-200B | DPAK    | 0.3 g  | 75       | Tube          |
| FLC01-200B-TR | FLC01-200B | DPAK    | 0.3 g  | 2500     | Tape and reel |

### 4 Revision history

Table 9. Document revision history

| Date        | Revision | Changes  |
|-------------|----------|--|
| April-2002  | 6C       | First issue.   |
| 27-May-2014 | 7        | Updated DPAK and IPAK package information and reformatted to current standard. |

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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

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