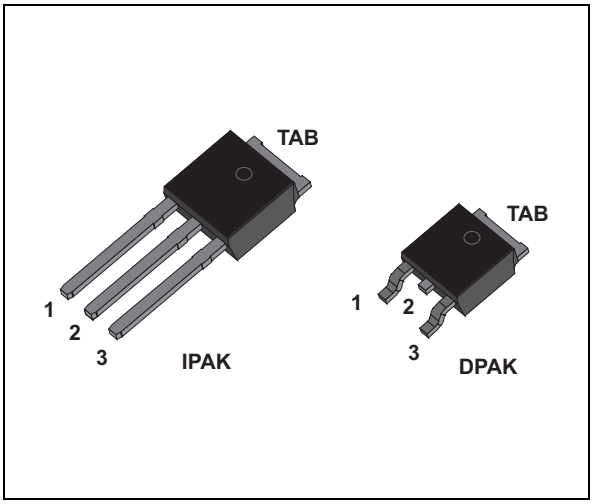
FLC10

Fire lighter circuit

Datasheet – production data



Features

- Dedicated thyristor structure for capacitance discharge ignition operation
- High pulse current capability:
  - 240 A at t_p = 10 µs
- 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

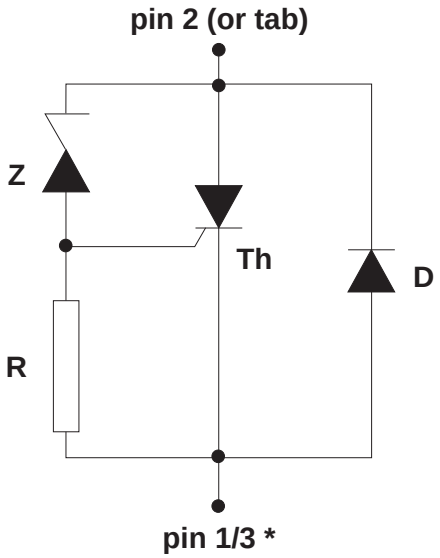
Description

The FLC10 series has been especially developed for high power 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 Ω resistor

Figure 1. Functional diagram



*** Pin1 and pin3 must be shorted together in the application circuit layout**

This is information on a product in full production. www.st.com

1 Characteristics

Table 1. Absolute ratings (limiting values)

Symbol	Parameter		Value	Unit
I_{TRM}	Repetitive surge peak on state current for thyristor -30° C ≤ T_{amb} ≤ 120° C	t_p = 10 µs (*Figure 3*)	240	A
I_{FRM}	Repetitive surge peak on state current for diode -30° C ≤ T_{amb} ≤ 120° C			
dI/dt	Critical rate of rise time on state current -30° C ≤ T_{amb} ≤ 120° C		200	A/µs
T_{stg} T_j	Storage junction temperature range Maximum junction temperature		- 40 to + 150 + 125	° C
T_{oper}	Operating temperature range		- 30 to + 120	° C
T_L	Maximum lead temperature for soldering during 10s		260	° C

Table 2. Thermal resistance

Symbol	Parameter	Value	Min.
$R_{th(j-a)}$	IPAK thermal resistance junction to ambient	100	° C/W
$R_{th(j-a)}$	DPAK thermal resistance junction to ambient S = 0.5 cm²	70	° C/W

Figure 2. Electrical characteristics (definitions)

Symbol = Parmeter

V_{RM} = Stand-off voltage
V_{BO} = Breakover voltage
V_T = On-state voltage
V_F = Diode forward drop
I_{BO} = Breakover current
I_{RM} = Leakage current
αT = Temperature coefficient for V_{BO}

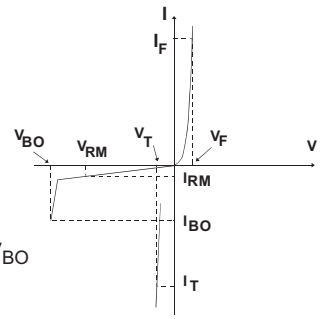


Table 3. Electrical characteristics: diode (D) parameter

Symbol	Test Conditions			Value	Unit
V_F	I_F = 2 A $t_p \leq$ 500 µs	T_j = 25° C	MAX	1.7	V

Table 4. Electrical characteristics: Thyristor (Th) and Zener (Z) parameters

Symbol	Test Conditions		Min.	Typ.	Max	Unit
I_{RM}	V_{RM} = 200 V	T_j = 25° C			1	µA
		T_j = 125° C			100	µA
V_{BO}	at I_{BO}	T_j = 25° C	200	225	250	V
I_{BO}	at V_{BO}	T_j = 25° C			0.5	mA
V_T	I_T = 2 A, $t_p \leq$ 500 µs	T_j = 25° C			1.7	V
α T				13		10^{-4}/° C

Figure 3. Test current waveform

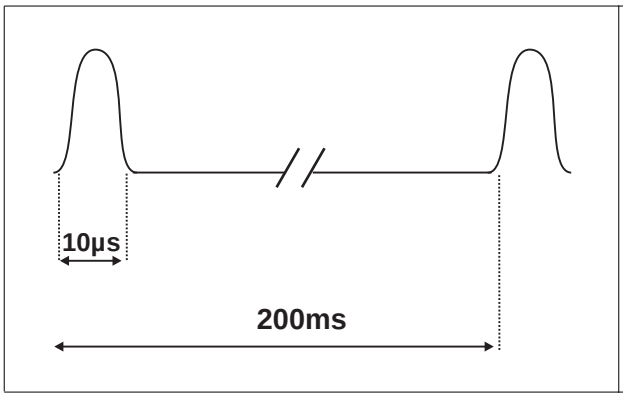


Figure 4. Relative variation of breakover current versus junction temperature

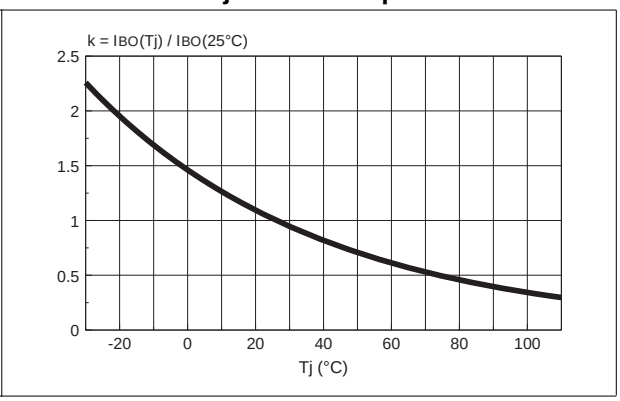
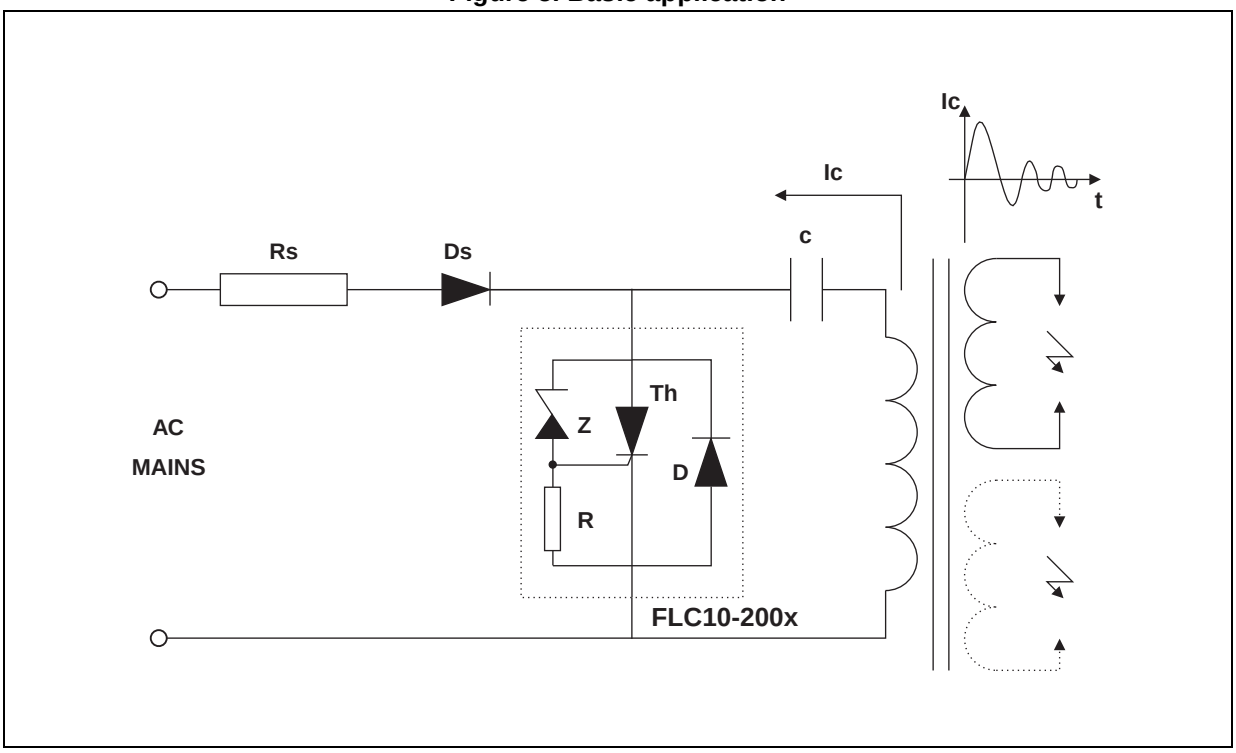


Figure 5. Basic application



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

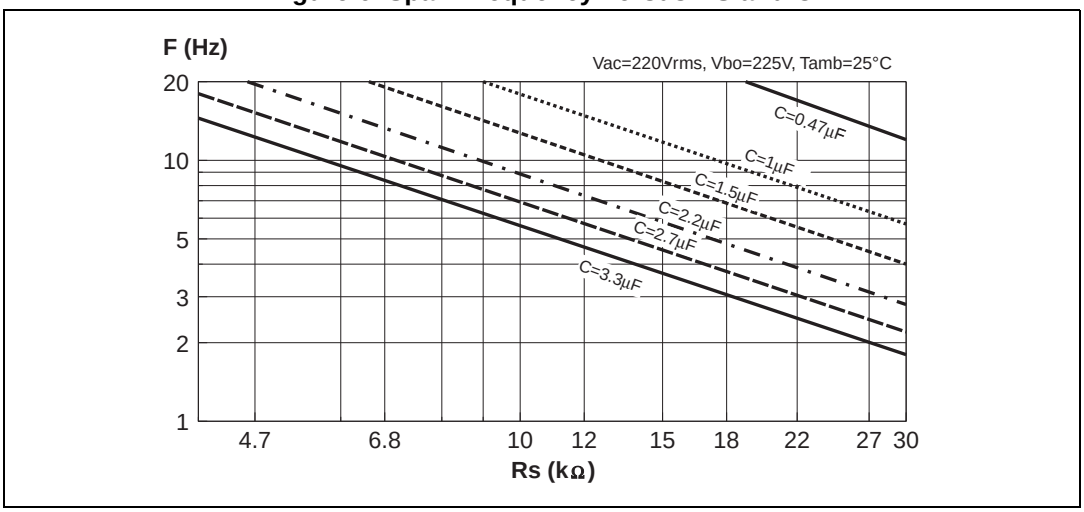
The Rs resistor allows, in addition with the capacitor C, the spark frequency to be adjusted and the current from the mains to be limited. Its value shall allow the thyristor Th to fire even in the worst case. In this case the system must fire with the lower RMS mains voltage value while the breakdown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

The maximum Rs value is equal to:

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

(1) See *Figure 4*

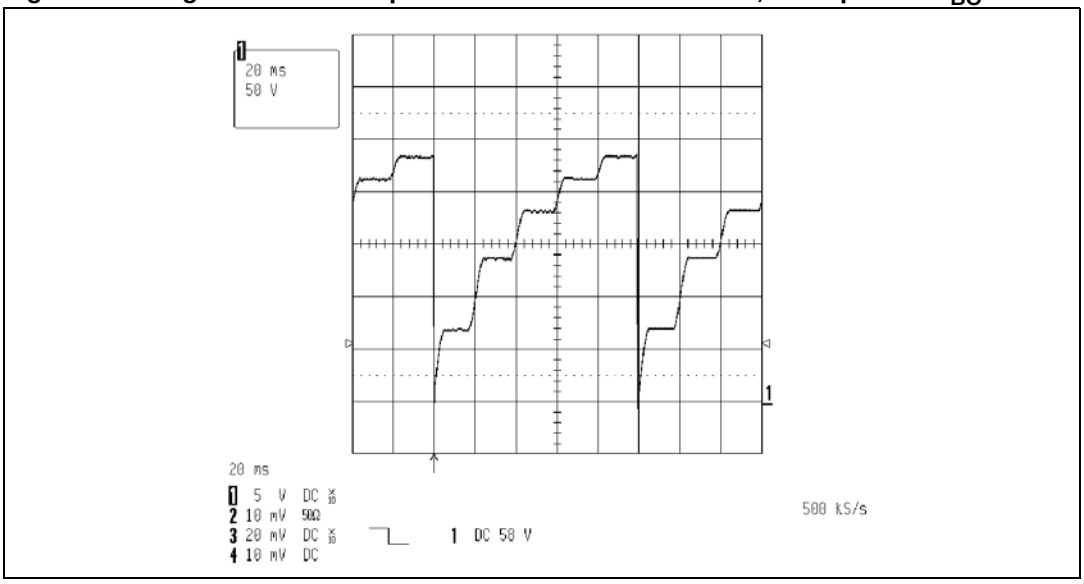
Figure 6. Spark frequency versus RS and C



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 RS = 15 k Ω and C = 1 µF.

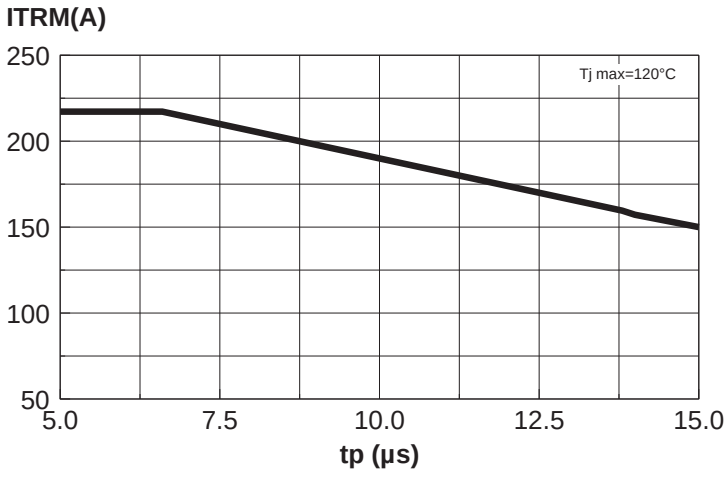
Figure 7. Voltage across the capacitance with Rs = Rs 15 kΩ, C = 1 µF and V_{BO} = 225 V



Peak current limit

This component is designed to withstand I_{TRM} = 190 A for a pulse duration of 10 µs for an ambient temperature of 120° 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 µs, see *Figure 3*)

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

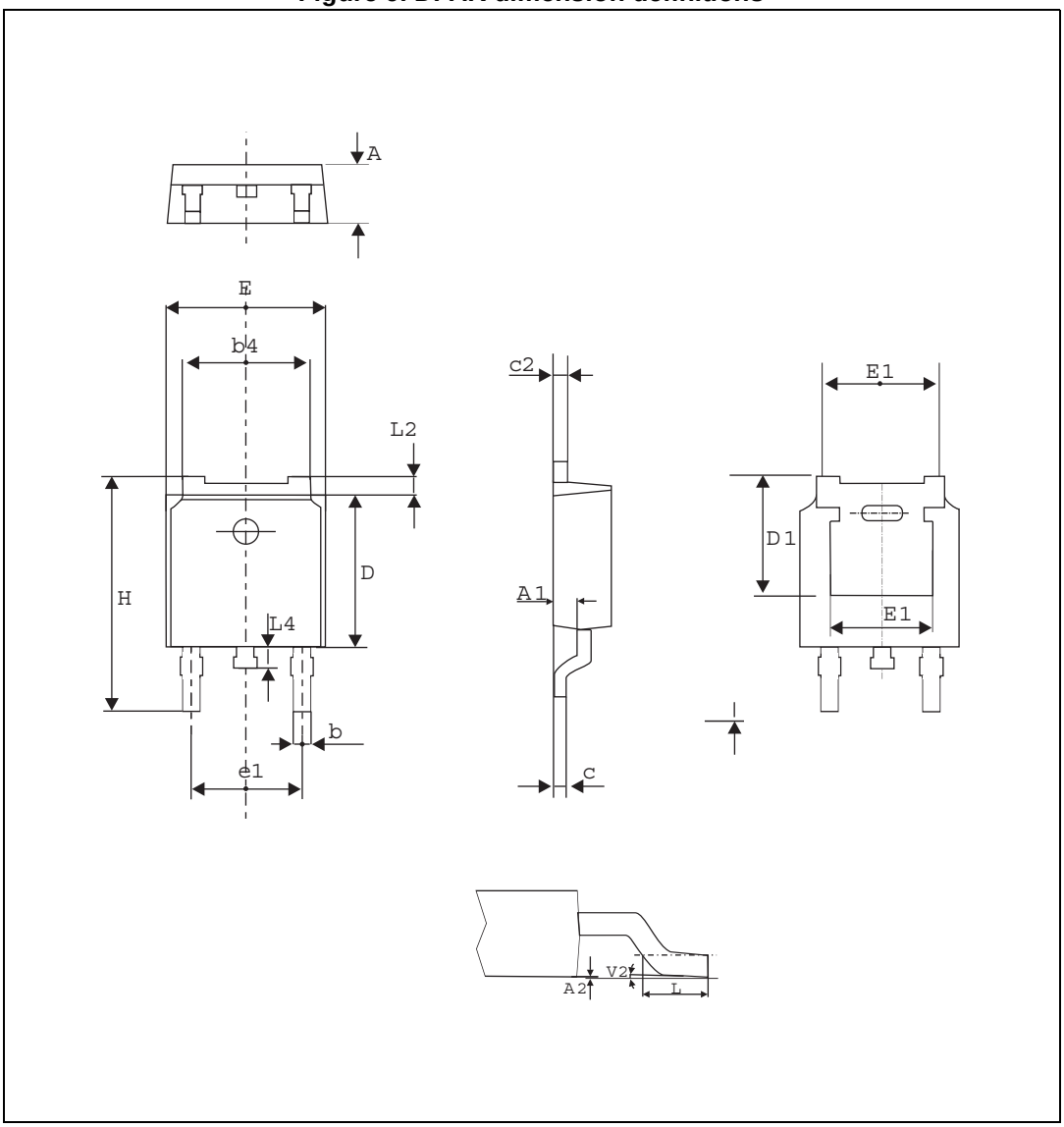
- For the thyristor: $P = 1.18 \times I_{T(AV)} + 0.035\ I^2_{T(RMS)}$
- For the diode: $P = 0.67 \times I_{F(AV)} + 0.106\ I^2_{F(RMS)}$

2 Package information

- Epoxy meets UL94, V0
- 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 9. DPAK dimension definitions



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

Table 5. 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)

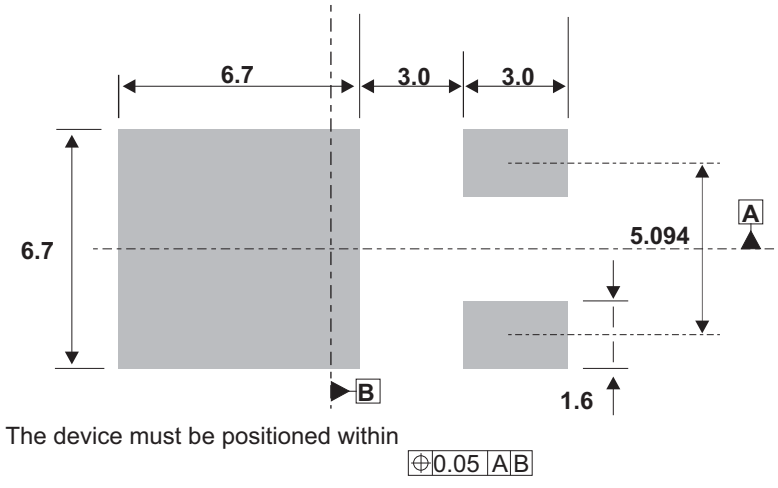
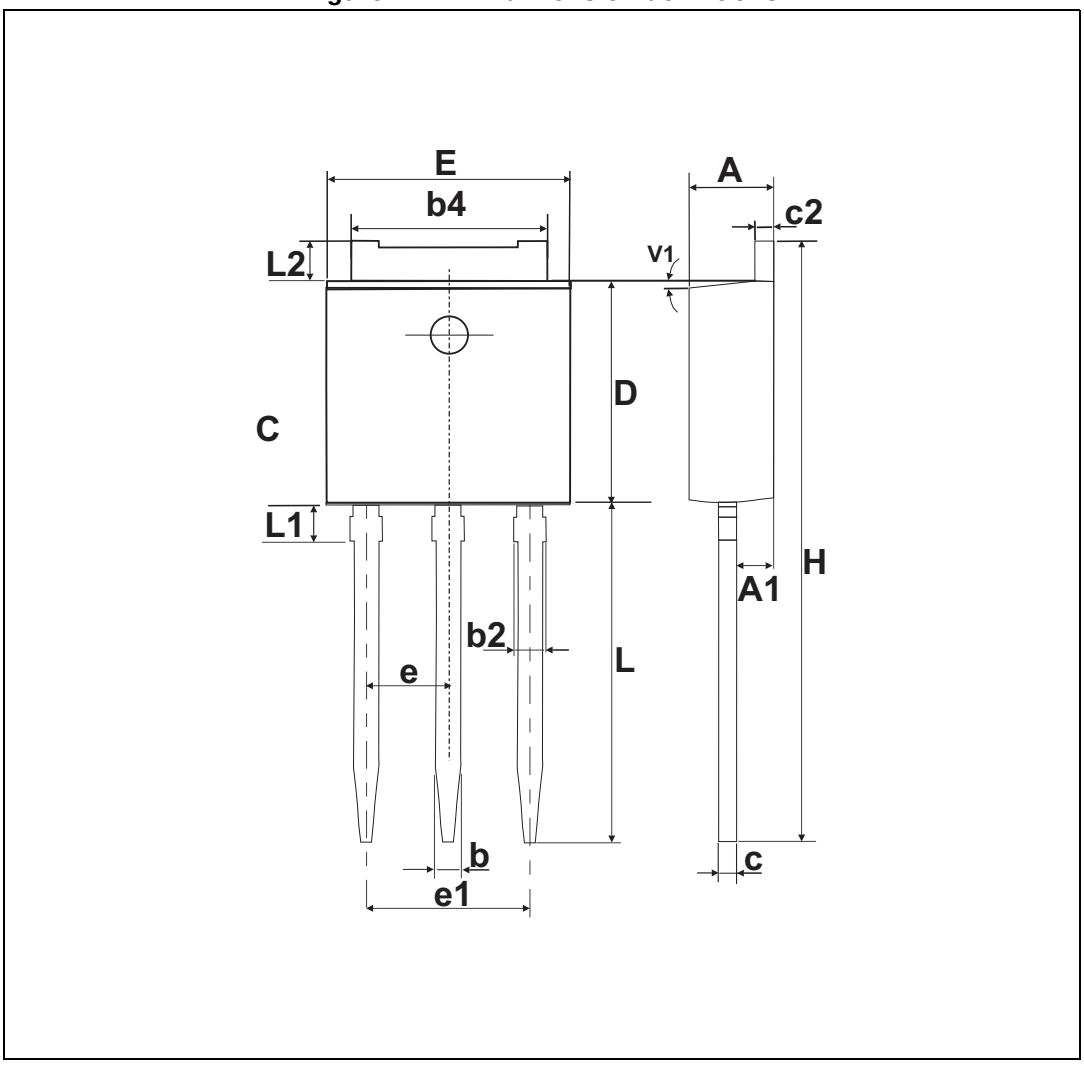


Figure 11. IPAK dimension definitions



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

Table 6. 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

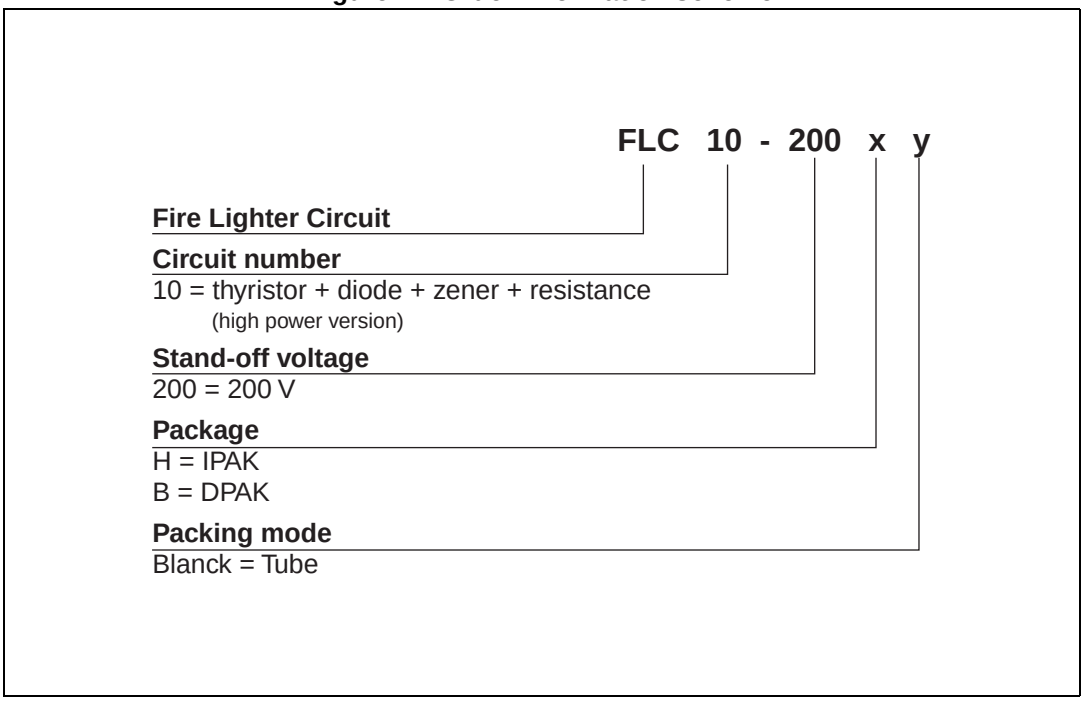


Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
FLC10-200H	FLC01-200H	IPAK	0.4 g	75	Tube
FLC10-200B	FLC01-200B	DPAK	0.3 g	75	Tape and reel

4 Revision history

Table 8. Document revision history

Date	Revision	Changes
Sept-2001	7	First issue.
04-Jun-2014	8	Updated DPAK and IPAK package information and reformatted to current standard.

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