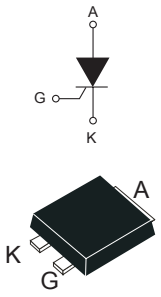
X0115MUF

Datasheet

1 A sensitive gate SCR thyristor



SMBflat-3L

Features

- On-state rms current, 1 A
- Narrow sensitive gate current from 30 µA to 150 µA
- Repetitive peak off-state voltage, 600 V
- Non-repetitive surge peak off-state voltage, 750 V
- Compact and ultraflat SMBflat-3L package with creepage distance of 3.4 mm

Applications

- Ground-fault circuit interrupter (GFCI, RCB, RCD)
- Arc-fault circuit interrupter (AFCI)
- Overvoltage crowbar protection in power supplies
- Capacitive ignition circuits
- Low consumption triggering switches

Product status link
X0115MUF

Product summary	
$I_{T(RMS)}$	1 A
V_{DRM}/V_{RRM}	600 V
$T_{j(max.)}$	125 °C

Description

Thanks to highly sensitive triggering levels, the 1 A X0115MUF SCR thyristor is suitable for all applications where available gate current is limited. The X0115MUF offers a high blocking voltage of 600 V, and a surge peak voltage of 750 V, ideal for applications like ground fault circuit interrupter (GFCI) and arc fault circuit interrupters (AFCI).

The surface mount SMBflat-3L package allows modern, compact, SMD based designs for automated manufacturing. Its 3.4 mm creepage distance guarantees a 250 V functional isolation (UL 840) at a level 2 pollution degree.

1 Characteristics

Table 1. Absolute maximum ratings (limiting values)

Symbol	Parameters			Value	Unit
$I_{T(RMS)}$	On-state RMS current (180° conduction angle)		T_l = 113 °C	1	A
$I_{T(AV)}$	Average on-state current (180° conduction angle)			0.64	A
I_{TSM}	Non repetitive surge peak on-state current (T_j initial = 25 °C)	t_p = 8.3 ms	T_j = 25 °C	12	A
		t_p = 10 ms		11	
I^2t	I^2t value for fusing	t_p = 10 ms	T_j = 25 °C	0.60	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , $t_r \leq$ 100 ns	F = 60 Hz	T_j = 25 °C	75	A/µs
V_{DRM} / V_{RRM}	Repetitive peak off-state voltage		T_j = 125 °C	600	V
V_{DSM} / V_{RSM}	Non repetitive surge peak off-state voltage	t_p = 10 ms	T_j = 25 °C	750	V
I_{GM}	Peak forward gate current	t_p = 20 µs	T_j = 125 °C	1.2	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125 °C	0.2	W
T_{stg}	Storage junction temperature range			-40 to +150	°C
T_j	Operating junction temperature range			-40 to +125	°C

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

Symbol	Parameters	Value		Unit
I_{GT}	V_D = 12 V, R_L = 140 Ω	Min.	30	µA
		Max.	150	
V_{GT}		Max.	0.8	V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ, R_{GK} = 1 kΩ, T_j = 125 °C	Min.	0.2	V
V_{RG}	I_{RG} = 10 µA	Min.	5	V
I_H	I_T = 50 mA, R_{GK} = 1 kΩ	Max.	5	mA
I_L	I_G = 1.2 I_{GT}, R_{GK} = 1 kΩ	Max.	6	mA
dV/dt	V_D = 67 % V_{DRM}, R_{GK} = 1 kΩ, T_j = 125 °C	Min.	80	V/µs
t_q	I_T = 1.6 A, V_D = 400 V, (dI_T/dt) = 0.2 A/µs, V_R = 2 V, dV_D/dt = 10 V/µs, I_{GT} = 20 mA, t_p = 100 µs, R_{GK} = 220 Ω, T_j = 125 °C	Typ.	28	µs

Table 3. Static characteristics

Symbol	Test conditions		Value		Unit
V_T	I_{TM} = 2.0 A, t_p = 380 µs	T_j = 25 °C	Max.	1.40	V
V_{TO}	Threshold on-state voltage	T_j = 125 °C	Max.	0.90	V
R_d	Dynamic resistance	T_j = 125 °C	Max.	230	mΩ
I_{DRM} / I_{RRM}	V_D = V_{DRM}, V_R = V_{RRM}, R_{GK} = 1 kΩ	T_j = 25 °C	Max.	1	µA
		T_j = 125 °C		150	µA

Table 4. Thermal resistance

Symbol	Parameters	Value	Unit
$R_{th(j-l)}$	Junction to lead (DC)	15	°C/W
$R_{th(j-a)}$	Junction to ambient (DC) for 5 cm^2 copper surface	75	

1.1 Characteristics (curves)

Figure 1. Maximum average power dissipation versus average on-state current

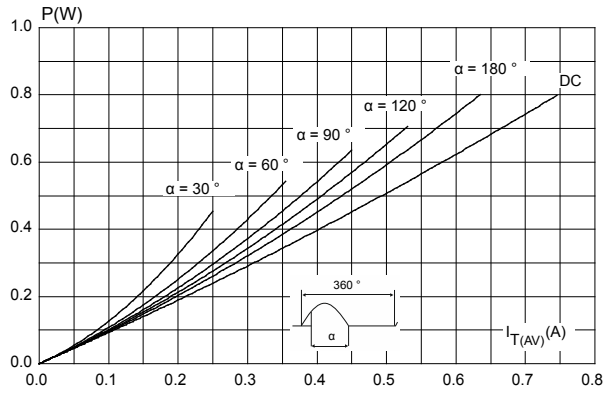


Figure 2. On-state characteristics (maximum values)

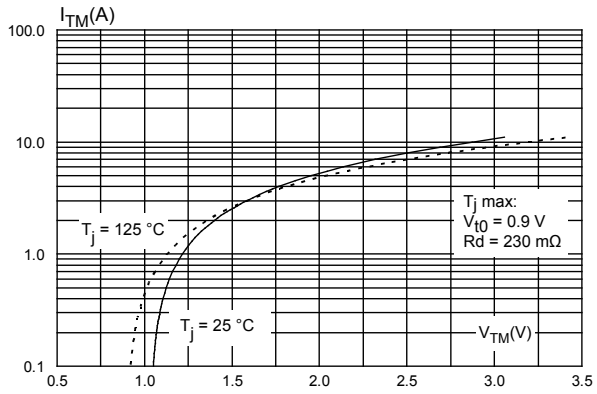


Figure 3. Average and D.C. on-state current versus ambient temperature for 1 cm² S_{Cu} surface

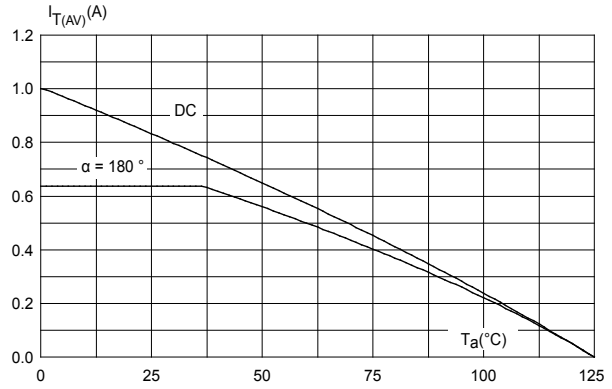


Figure 4. Average and D.C. on-state current versus lead temperature

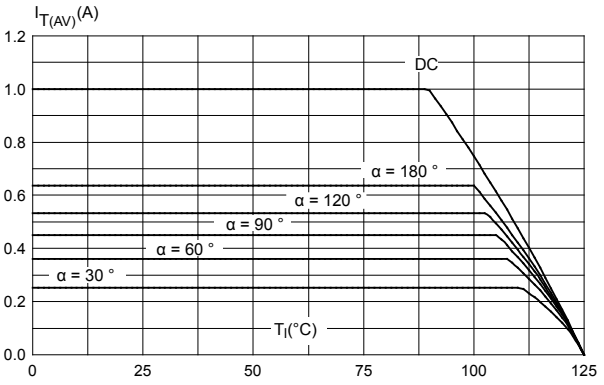


Figure 5. Surge peak on-state current versus number of cycles

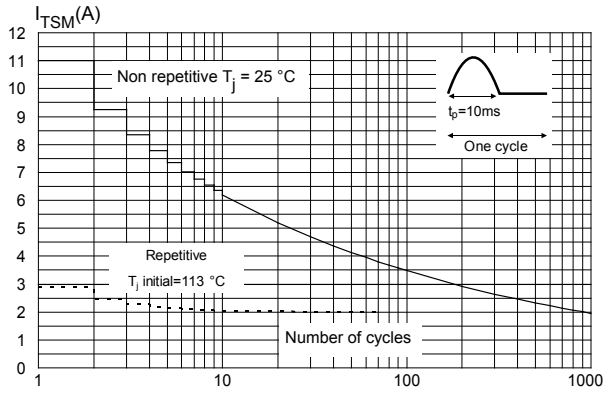


Figure 6. Non repetitive surge peak on-state current for a sinusoidal pulse with width t_p < 10 ms

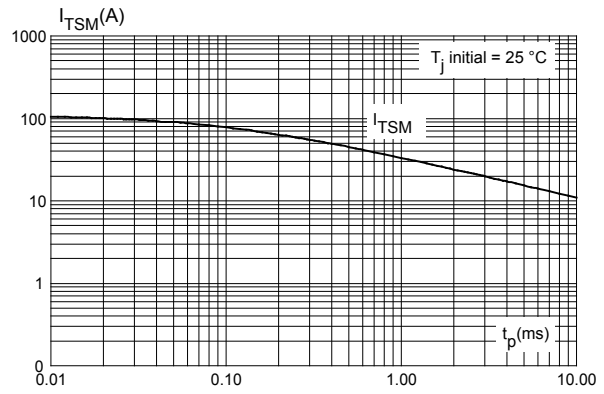


Figure 7. Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

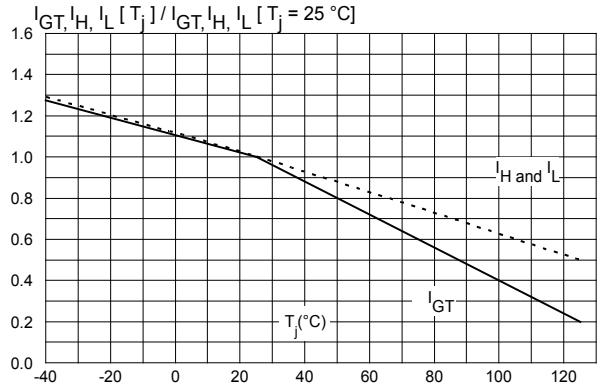


Figure 8. Relative variation of holding current versus gate-cathode resistance (typical values)

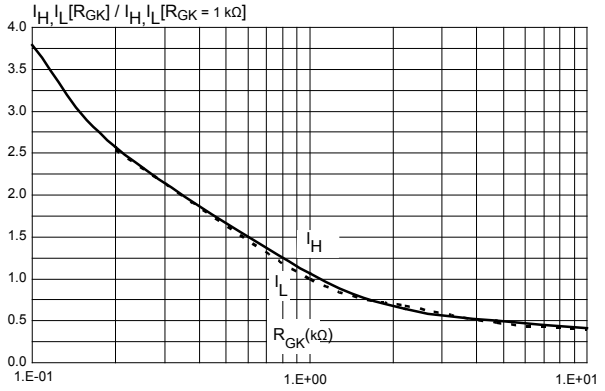


Figure 9. Relative variation of static dV/dt immunity versus junction temperature

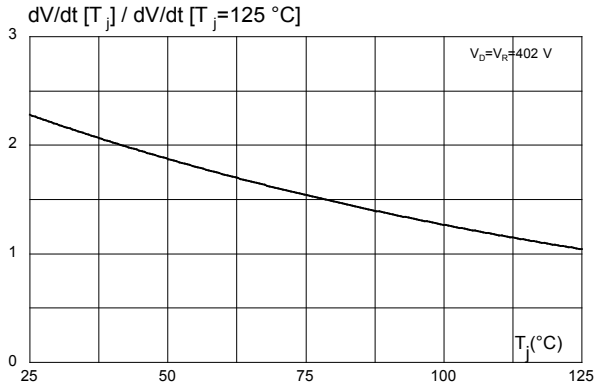


Figure 10. Relative variation of dV/dt immunity versus gate-cathode resistance (typical values)

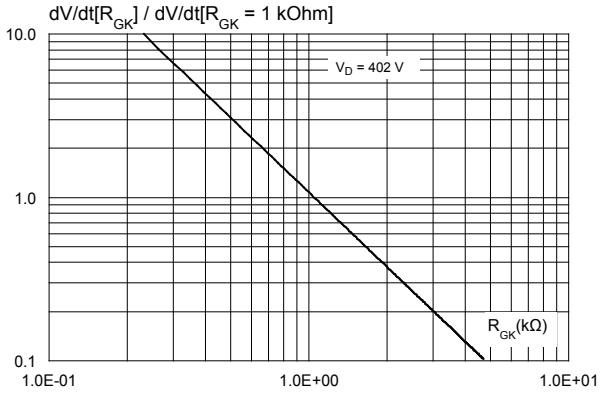


Figure 11. Relative variation of dV/dt immunity versus gate-cathode capacitance (typical value)

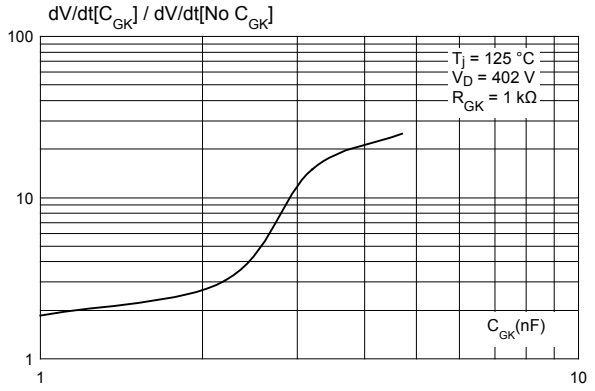


Figure 12. Relative variation of thermal impedance junction to lead and junction to ambient versus pulse duration

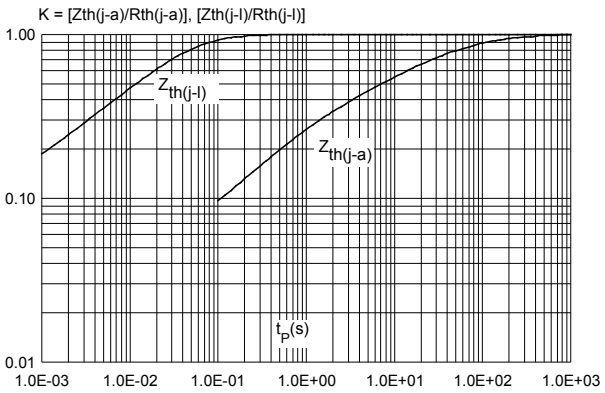
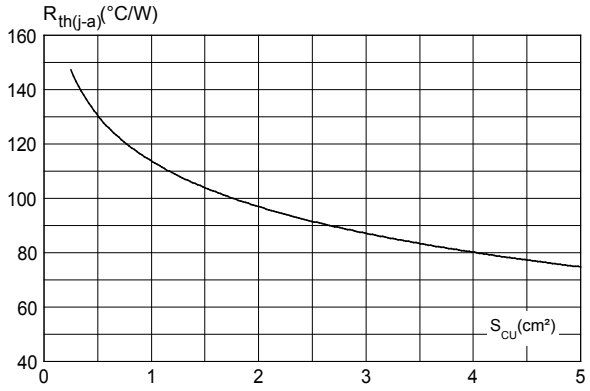


Figure 13. Typical thermal resistance junction to ambient versus copper surface under anode (epoxy FR4, e_{CU} = 35 µm, SMBflat-3L)



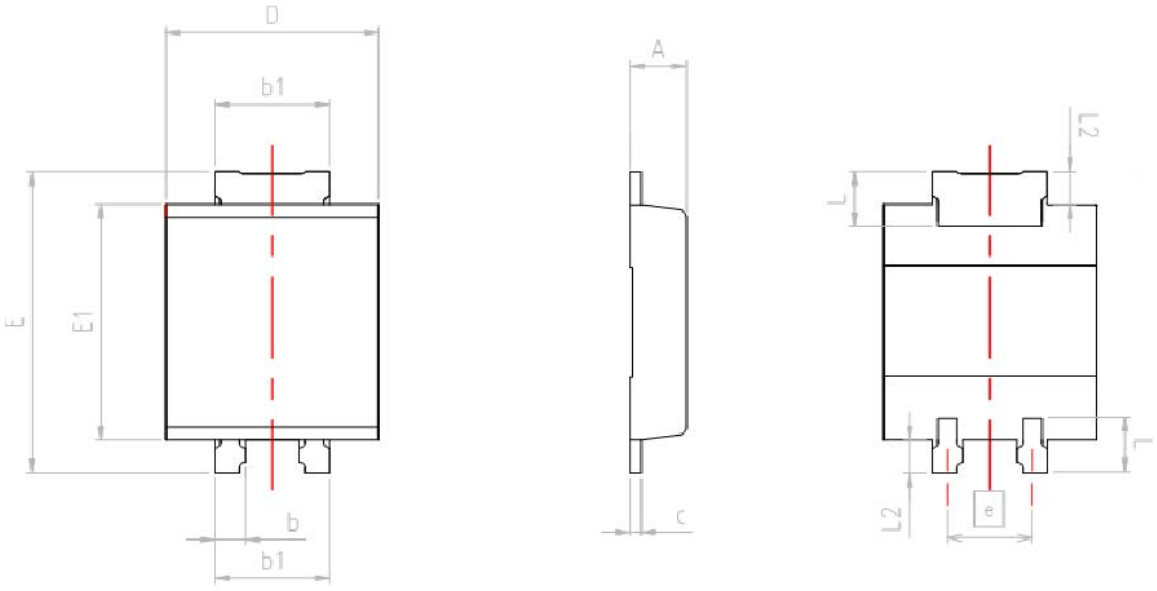
2 Package information

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.

2.1 SMBflat-3L package information

- Epoxy meets UL94, V0
- Lead-free package

Figure 14. SMBflat-3L package outline

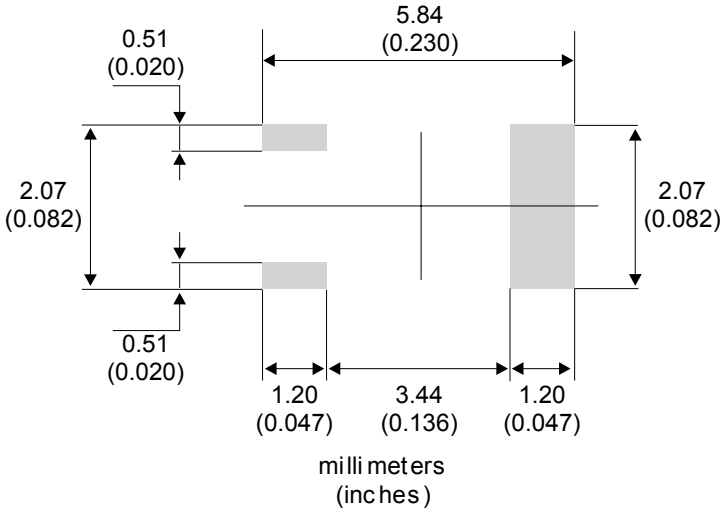


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions in the following table are guaranteed.

Table 5. SMBflat-3L mechanical data

Ref.	Dimensions					
	Millimeters			Inches (dimensions are for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.10	0.0354		0.0433
b	0.35		0.65	0.0138		0.0256
b1	1.95		2.20	0.0768		0.0866
c	0.15		0.40	0.0059		0.0157
D	3.30		3.95	0.1299		0.1555
E	5.10		5.60	0.2008		0.2205
E1	4.05		4.60	0.1594		0.1811
L	0.75		1.50	0.0295		0.0591
L2		0.60			0.0236	
e		1.60			0.0630	

Figure 15. **Footprint recommendations, dimensions in mm (inches)**



Note: This drawing may not be in scale; however, all the specified dimensions are guaranteed.

3 Ordering information

Figure 16. **Ordering information scheme**

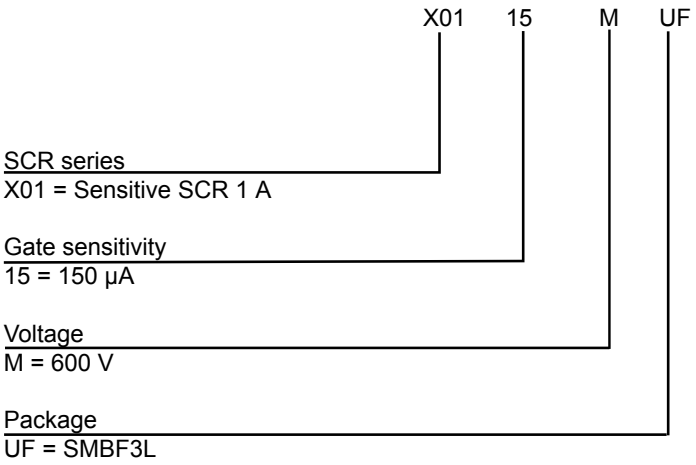


Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
X0115MUF	X1M	SMBflat-3L	47 mg	5000	Tape and reel

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
30-Jul-2019	1	First issue.
10-Oct-2019	2	Updated Table 2. Electrical characteristics (Tj = 25 °C, unless otherwise specified).
11-Apr-2023	3	Updated Figure 14, and Table 5.
28-Jul-2023	4	Updated Table 2.

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