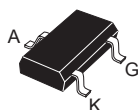
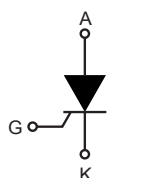


0.8 A sensitive gate SCR thyristor in SOT23-3L



SOT23-3L



Features

- On-state rms current, 0.8 A sensitive
- Repetitive peak off-state voltage, 600 V
- Non-repetitive surge peak off-state voltage, 750 V
- Narrow sensitive gate current range [30 to 150] μA
- Compact SOT23-3L package:
 - Creepage distance of 1.1 mm
 - 9 mm² footprint

Applications

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

Description

Thanks to highly sensitive triggering levels, X0115ML SCR thyristor is suitable for all applications where available gate current is limited. The X0115ML 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 SOT23-3L package provides the smallest SCR footprint while keeping 1.1 mm creepage distance, guaranteeing 120 V functional insulation (UL-840) at level 2 pollution degree without extra certification.

Product status link	
X0115ML	
Product summary	
$I_{T(RMS)}$	0.8 A
V_{DRM}/V_{RRM}	600 V
V_{DSM}/V_{RSM}	750 V
I_{GT}	[30-150] μA

1 Characteristics

Table 1. Absolute maximum ratings (limiting values)

Symbol	Parameters			Value	Unit
I _{T(RMS)}	On-state RMS current (180° conduction angle)		T _C = 41 °C	0.8	A
I _{T(AV)}	Average on-state current (180° conduction angle)			0.5	A
I _{TSM}	Non repetitive surge peak on-state current	t _p = 8.3 ms	T _j = 25 °C	7.6	A
	(T _j initial = 25 °C)	t _p = 10 ms		7	
	One surge every 500 ms, 50 surges	t _p = 8.3 ms	T _{AMB} = 105 °C	5	
I ² t	I ² t value for fusing	t _p = 10 ms	T _j = 25 °C	0.25	A ² s
di/dt	Critical rate of rise of on-state current I _G = 2 x I _{GT} , t _r ≤ 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 ($T_j = 25\text{ °C}$, unless otherwise specified)

Symbol	Parameters	Value		Unit
I_{GT}	$V_D = 12\text{ V}$, $R_L = 33\text{ }\Omega$	Min.	30	μA
		Max.	150	
V_{GT}		Max.	0.8	V
V_{GD}	$V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$, $R_{GK} = 1\text{ k}\Omega$, $T_j = 125\text{ °C}$	Min.	0.2	V
V_{RG}	$I_{RG} = 10\text{ }\mu\text{A}$	Min.	5	V
I_H	$I_T = 50\text{ mA}$, gate open, $R_{GK} = 1\text{ k}\Omega$	Max.	5	mA
I_L	$I_G = 1.2 I_{GT}$, $R_{GK} = 1\text{ k}\Omega$	Max.	6	mA
dV/dt	$V_D = 67\text{ }\%$ V_{DRM} , gate open, $R_{GK} = 1\text{ k}\Omega$, $T_j = 125\text{ °C}$	Min.	80	V/ μ s

Table 3. Static characteristics

Symbol	Test conditions		Value		Unit
V _{TM}	I _{TM} = 1.6 A, t _p = 380 μs	T _j = 25 °C	Max.	1.7	V
V _{TO}	Threshold on-state voltage	T _j = 125 °C	Max.	1.06	V
R _d	Dynamic resistance	T _j = 125 °C	Max.	540	mΩ
I _{DRM} / I _{RRM}	V _T = V _{DRM} , V _T = 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)	Typ. 60	°C/W
$R_{th(j-a)}$	Junction to ambient (DC) for 5 cm ² copper surface	Typ. 400	

1.1 Characteristics (curves)

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

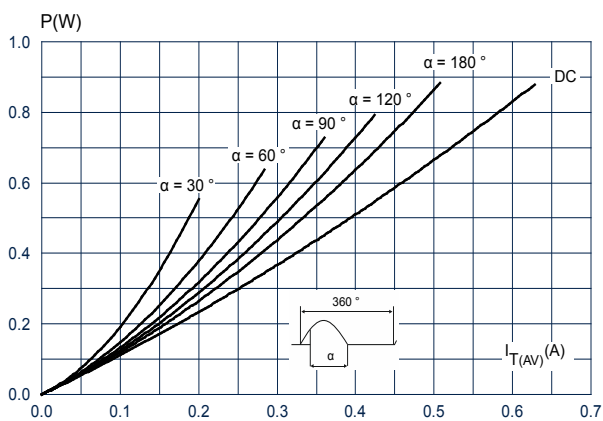


Figure 2. Average and DC on-state current versus lead temperature

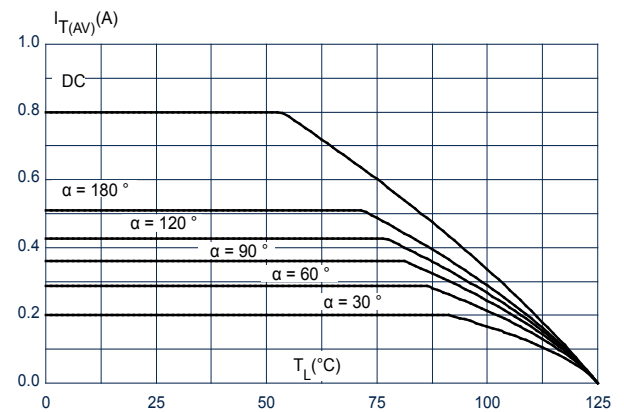


Figure 3. On-state characteristics (maximum values)

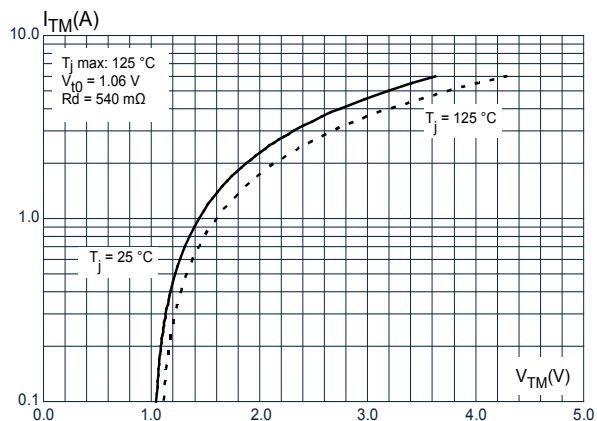


Figure 4. Average and D.C. on-state current versus ambient temperature

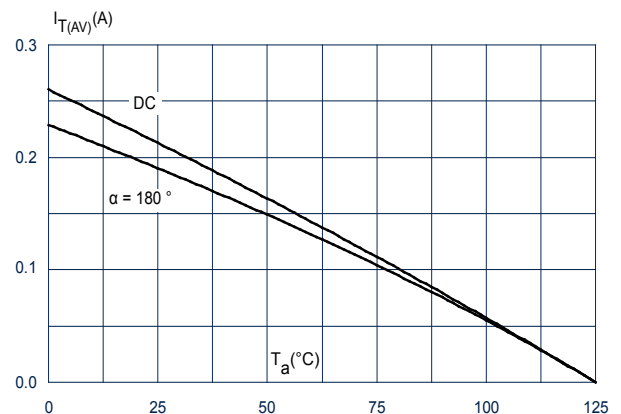


Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration

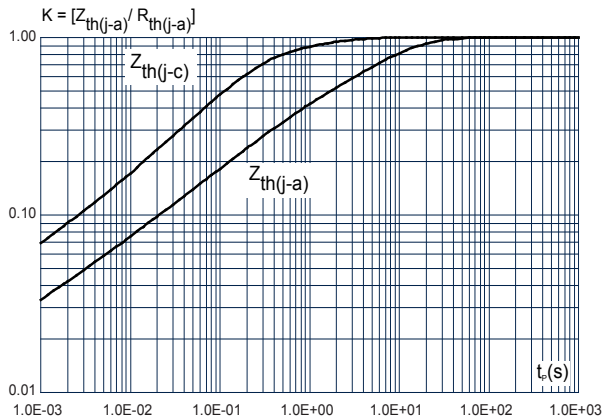


Figure 6. Surge peak on-state current versus number of cycles

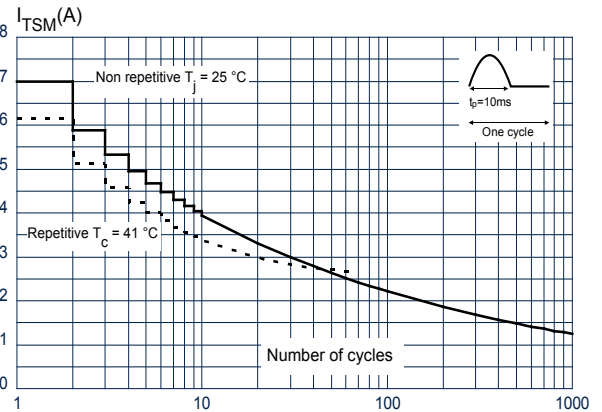


Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms

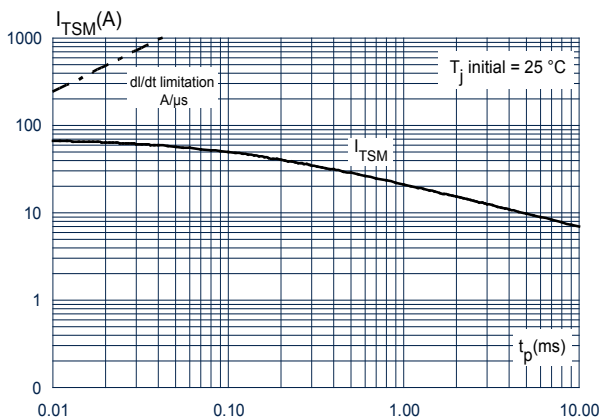


Figure 8. Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

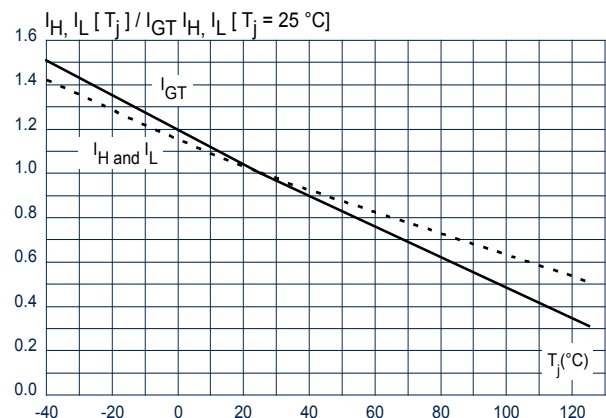


Figure 9. Relative variation of holding current versus gate-cathode resistance (typical values)

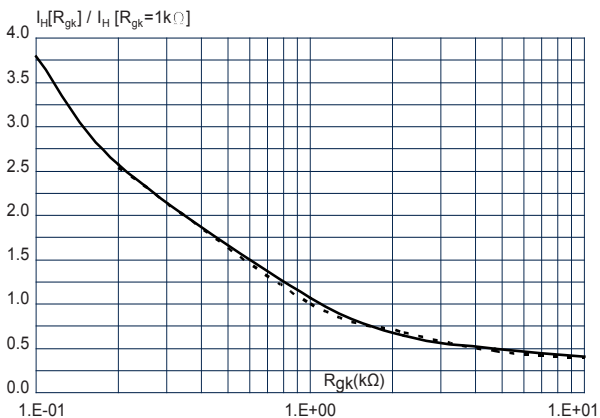


Figure 10. Relative variation of static dV/dt immunity versus junction temperature

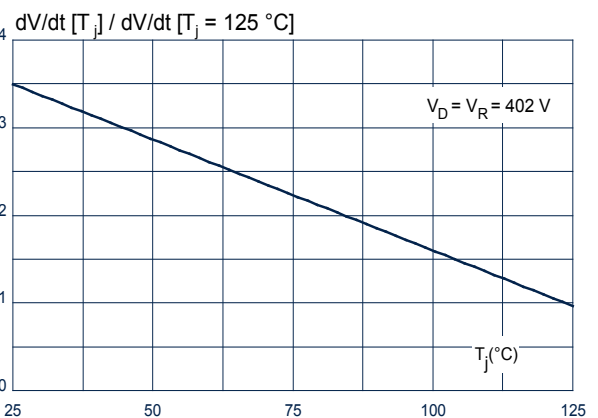


Figure 11. Relative variation of dV/dt immunity versus gate-cathode resistance (typical values)

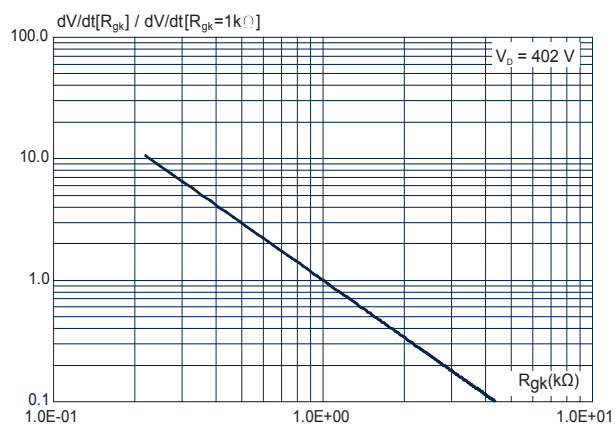


Figure 12. Relative variation of dV/dt immunity versus gate-cathode capacitance (typical values)

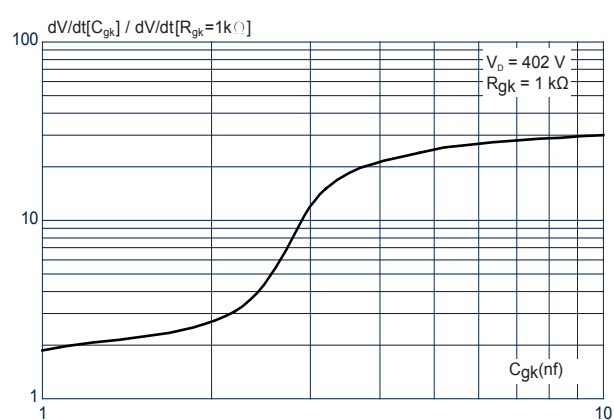
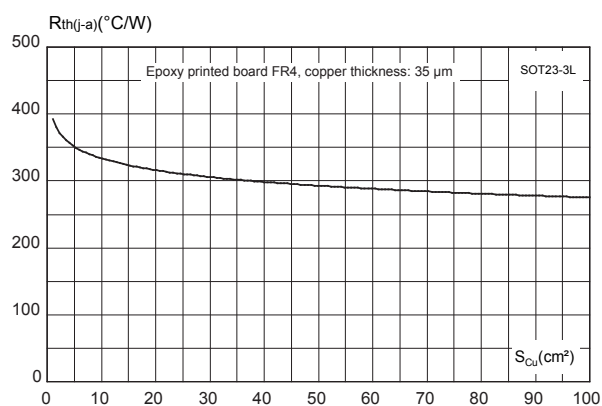


Figure 13. Typical thermal resistance junction to ambient versus copper surface under anode (epoxy FR4, $e_{Cu} = 35\mu m$, SOT-23-3L)



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 SOT23-3L package information

- Lead-free package
- Halogen free molding resin
- Epoxy meets UL94, V0

Figure 14. SOT23-3L package outline

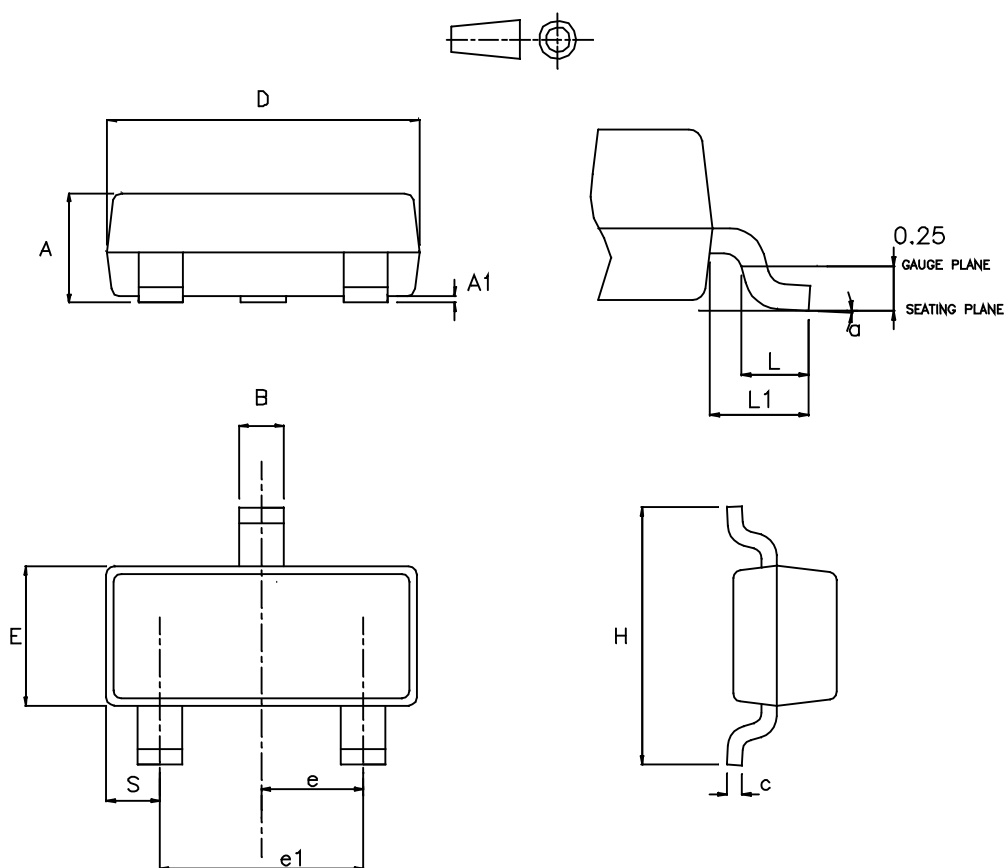
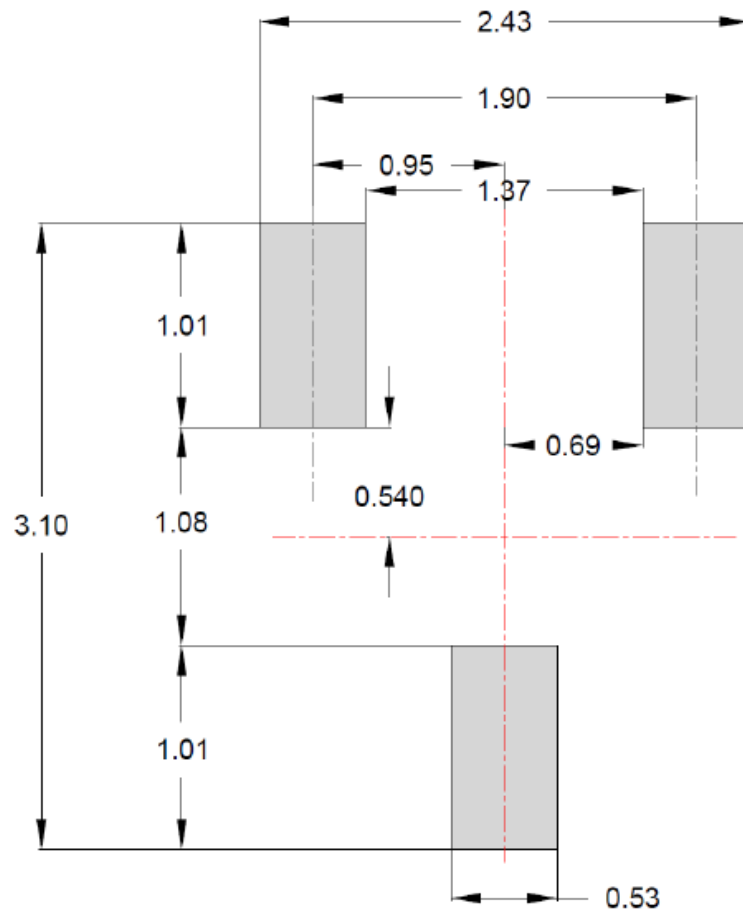


Table 5. SOT23-3L package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.89		1.25	0.035		0.0493
A1	0		0.15	0		0.006
B	0.30		0.51	0.0118		0.0201
C	0.085		0.20	0.0033		0.0079
D	2.75		3.04	0.1082		0.1197
E	1.20		1.75	0.0472		0.0689
e	0.85	0.95	1.05	0.0334	0.0374	0.0414
e1	1.70	1.90	2.10	0.0669	0.0748	0.0827
H	2.10		3.00	0.0826		0.1182
L	0.25		0.61	0.0098		0.0241
L1		0.55			0.0217	
S	0.35		0.65	0.0137		0.0256
a	0°		8°	0°		8°

Figure 15. Footprint recommendations, dimensions in mm



3 Ordering information

Figure 16. Ordering information scheme

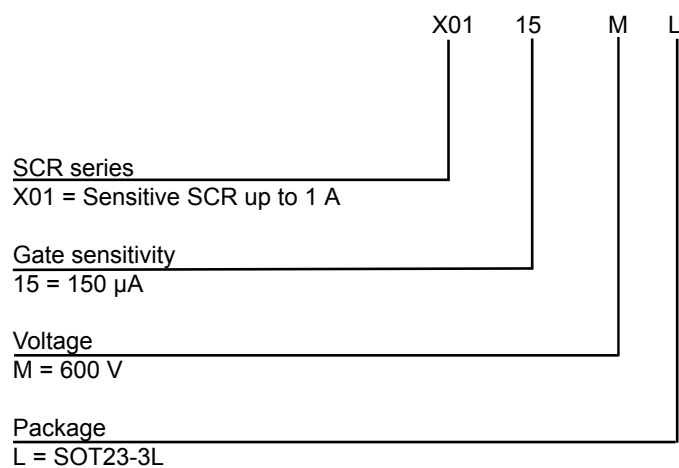


Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
X0115ML	X1M	SOT23-3L	0.01 mg	3000	Tape and reel

Revision history

Table 7. Document revision history

Date	Revision	Changes
16-Jul-2021	1	First issue.
10-Dec-2021	2	Updated Table 1 and Figure 6 .
28-Jan-2022	3	Updated Table 2 .

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