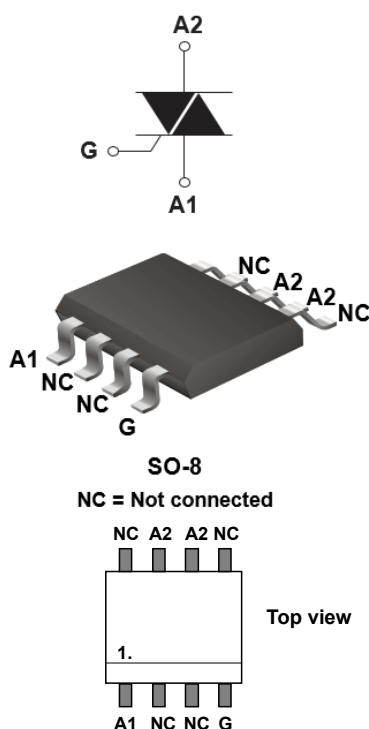


1 A, 10 mA, 4-triggering quadrant Triac in SO-8



Features

- Low current Triac, $I_{T(RMS)} = 1\text{ A}$
- Logic level 4-triggering quadrants
- SMD package with $4.9 \times 6\text{ mm}^2$ total size
- 4 mm A1-A2 creepage distance compatible with IEC 60664-1 pollution degree 3 at 250 V, overvoltage category 2, material group 3a and 3b
- ECOPACK2 compliant component
- Dual footprint compatible with SO-8 and SOT-223

Applications

- General purpose AC line load switching
- Actuator AC drive circuit such as electro-valve, dispenser, pump, fan
- LED / lamps control
- High voltage solenoid drive circuit such as breaker interrupter and relay
- Major and small home appliances
- Home and industrial automation systems

Description

The Z0109M1 Triac, housed in SO-8 surface mount package, enables compact power control designs compatible with automated assembly lines.

This device achieves an on/off and phase angle control where low triggering energy is required.

It can be controlled directly from a microcontroller and is able to drive resistive or inductive low current AC loads.

Table 1. Table pin name

Symbol	Type	Description	Pin
G	Drive	Gate	4
A1	Power	Anode1	1
A2	Power	Anode2	6, 7
NC		Not connected	2,3,5,8

Product status link

[Z0109M1](#)

Product summary

$I_{T(RMS)}$	1 A
V_{DRM}/V_{RRM}	600 V
V_{DSM}/V_{RSM}	700 V
I_{GT}	10 mA

1 Characteristics

Table 2. Absolute maximum ratings (limiting values, $T_j = 25\text{ °C}$ unless otherwise stated)

Symbol	Parameters			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	SO-8	$T_{LEAD} = 90\text{ °C}$	1	A
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C)	$f = 50\text{ Hz}$	$t_p = 20\text{ ms}$	8	A
		$f = 60\text{ Hz}$	$t_p = 16.7\text{ ms}$	8.5	
I^2t	I^2t value for fusing	$t_p = 10\text{ ms}$		0.35	A^2s
V_{DRM}/V_{RRM}	Repetitive peak off-state voltage		$T_j = 125\text{ °C}$	600	V
V_{DSM}/V_{RSM}	Non Repetitive peak off-state voltage	$t_p = 10\text{ ms}$	$T_j = 25\text{ °C}$	700	V
di/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$	$f = 120\text{ Hz}$	$T_j = 25\text{ °C}$	50	$A/\mu s$
I_{GM}	Peak gate current	$t_p = 20\text{ }\mu s$	$T_j = 125\text{ °C}$	1	A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 125\text{ °C}$	0.1	W
T_{stg}	Storage junction temperature range			-40 to +150	$^{\circ}C$
T_j	Operating junction temperature range			-40 to +125	$^{\circ}C$

Table 3. Electrical characteristics ($T_j = 25\text{ °C}$, unless otherwise specified)

Symbol	Parameters	Quadrant		Value	Unit
$I_{GT}^{(1)}$	$V_D = 12\text{ V}$, $R_L = 30\text{ }\Omega$	I - II - III - IV	Max.	10	mA
V_{GT}			Max.	1.3	V
V_{GD}	$V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$, $T_j = 125\text{ °C}$	All	Min.	0.2	V
$I_H^{(2)}$	$I_T = 50\text{ mA}$		Max.	10	mA
I_L	$I_G = 1.2 I_{GT}$	I - III - IV	Max.	15	mA
		II	Max.	25	
$dV/dt^{(2)}$	$V_D = 67\text{ }\%$ V_{DRM} gate open, $T_j = 110\text{ °C}$		Min.	50	$V/\mu s$
$(dV/dt)_c^{(2)}$	$(di/dt)_c = 0.44\text{ A/ms}$, $T_j = 110\text{ °C}$		Min.	2	$V/\mu s$

1. Minimum I_{GT} is guaranteed at 5 % of I_{GT} max.

2. For both polarities of A2 referenced to A1

Table 4. Static electrical characteristics

Symbol	Test conditions	T_j		Value	Unit
$V_T^{(1)}$	$I_{TM} = 1.4\text{ A}$, $t_p = 380\text{ }\mu s$	25 °C	Max.	1.60	V
$V_{TO}^{(1)}$	Threshold on-state voltage	125 °C	Max.	0.95	V
$R_d^{(1)}$	Dynamic resistance	125 °C	Max.	0.43	Ω
I_{DRM} I_{RRM}	$V_D = V_R = V_{DRM} = V_{RRM}$	25 °C	Max.	5	μA
		125 °C		0.5	mA

1. For both polarities of A2 referenced to A1

Table 5. Thermal resistance

Symbol	Parameters		Value	Unit
$R_{th(j-l)}$	Junction to lead (AC), leads #6 and #7		19	°C/W
$R_{th(j-a)}$	Junction to ambient	Scu = 1 cm ²	140	
		Scu = minimum footprint	190	

1.1 Characteristics (curves)

Figure 1. Maximum power dissipation versus on-state RMS current (full cycle)

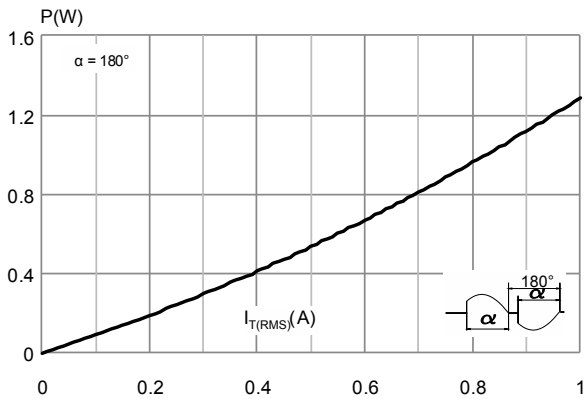


Figure 2. On-state RMS current versus lead pin# 6 and 7 temperature (full cycle)

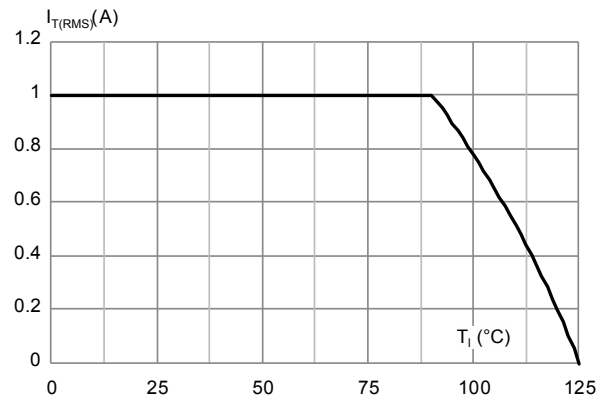


Figure 3. On-state RMS current versus ambient temperature (free air convection, full cycle)

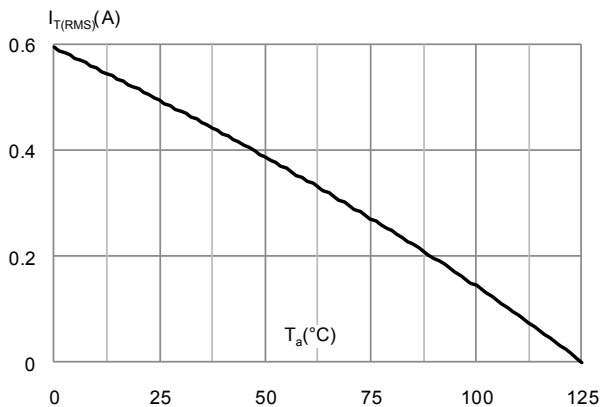


Figure 4. Relative variation of thermal impedance versus pulse duration

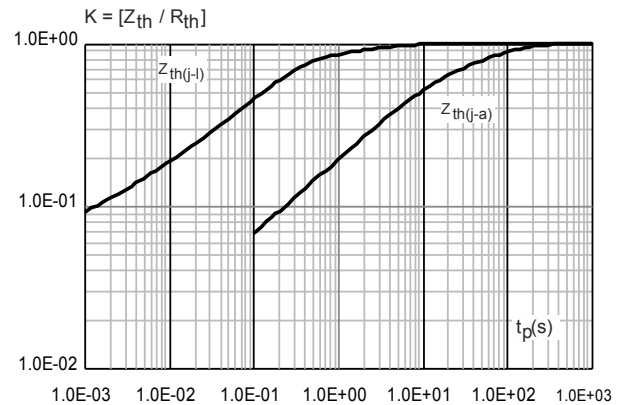


Figure 5. Surge peak on-state current versus number of cycles

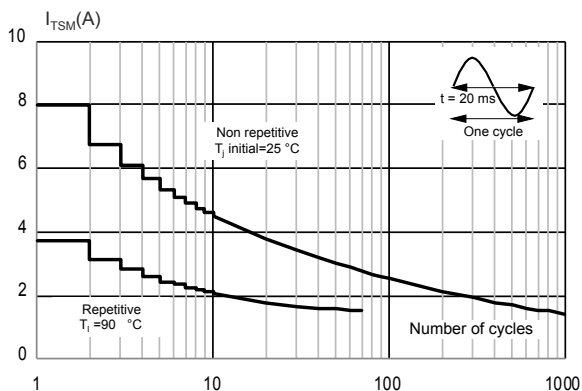


Figure 6. Non-repetitive surge peak on-state current for sinuzoidal pulse with width $t_p < 10$ ms

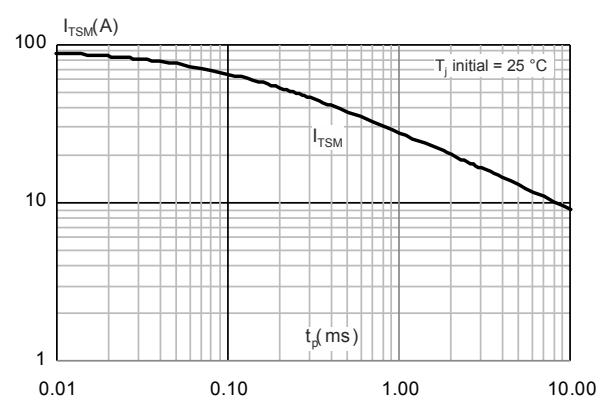


Figure 7. On-state characteristics (maximum values)

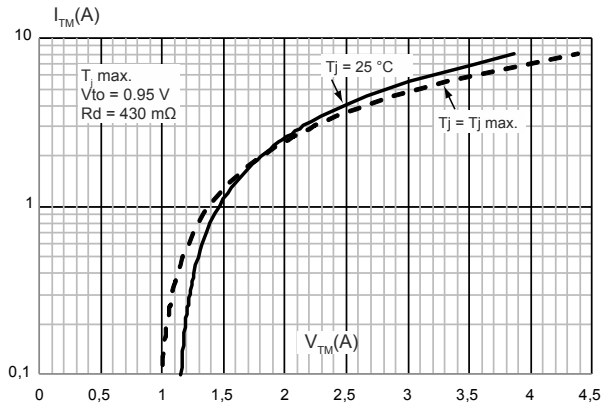


Figure 8. Relative variation of holding current and latching current versus junction temperature (typical values)

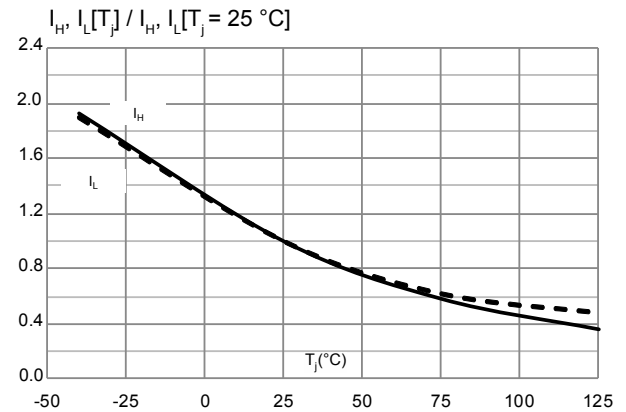


Figure 9. Relative variation of gate trigger current (I_{GT}) and voltage (V_{GT}) versus junction temperature (typical values)

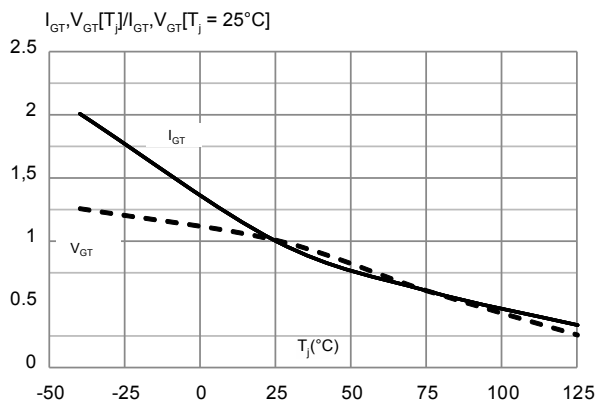


Figure 10. Relative variation of critical rate of decrease of main current ($(dl/dt)_c$) versus reapplied ($(dV/dt)_c$)

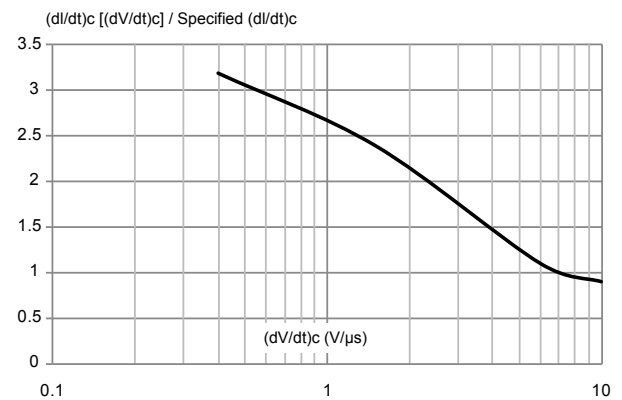


Figure 11. Relative variation of static dV/dt immunity versus junction temperature (typical values)

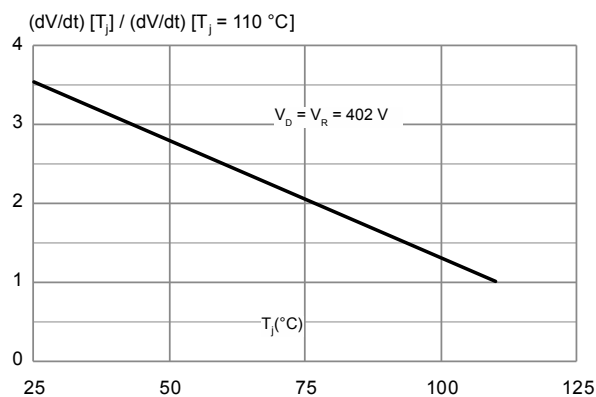


Figure 12. Relative variation of critical rate of decrease of main current ($(dl/dt)_c$) versus junction temperature

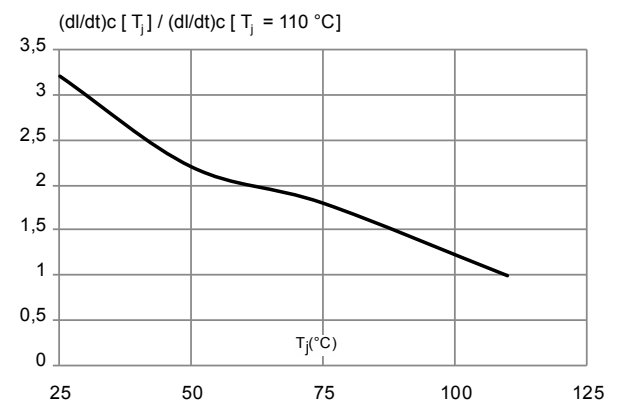


Figure 13. Relative variation of leakage current versus junction temperature

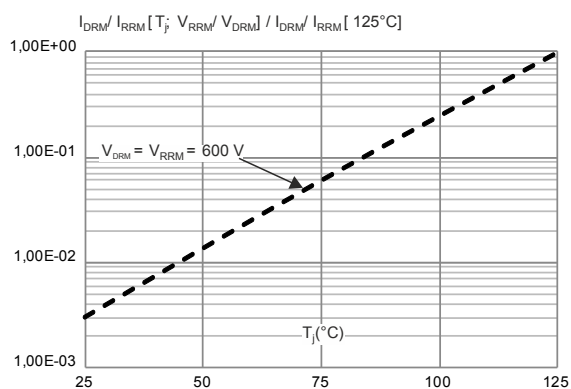
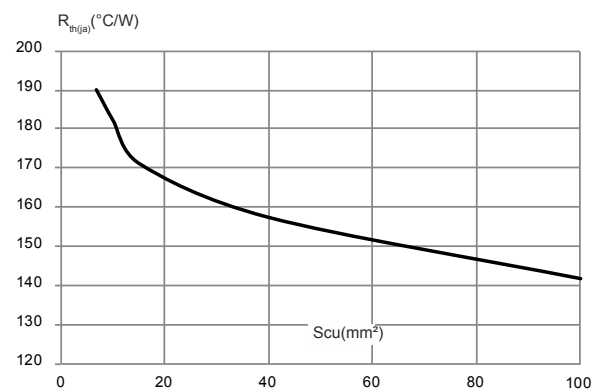


Figure 14. SO-8 Thermal resistance junction to ambient versus copper surface under pin 6 and 7



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 SO-8 package information

Figure 15. SO8 package outline

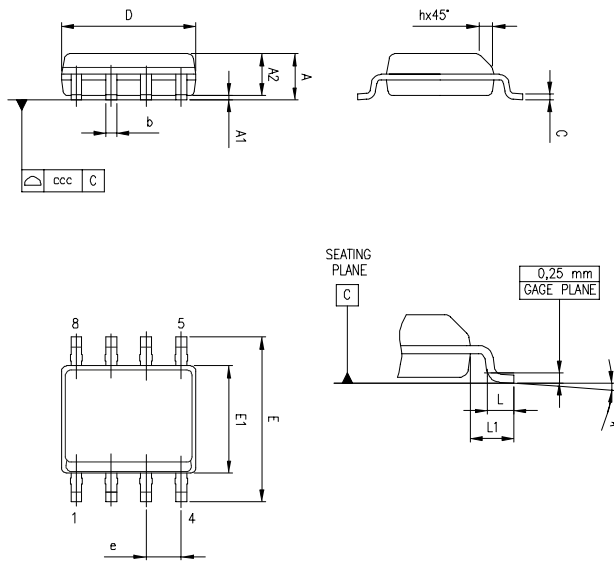


Table 6. SO-8 mechanical data

Symbol	Millimeters			Inches ⁽¹⁾		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.0680
A1	0.10		0.25	0.0030		0.0090
A2	1.25			0.0490		
b	0.28		0.48	0.0110		0.0180
c	0.17		0.23	0.0060		0.0090
D	4.80	4.90	5.00	0.1890	0.1920	0.1960
E	5.80	6.00	6.20	0.2280	0.2360	0.2440
E1	3.80	3.90	4.00	0.1490	0.1530	0.1570
e		1.27			0.0500	
h	0.25		0.50	0.0090		0.0190
L	0.40		1.27	0.0150		0.0500
L1		1.04			0.0400	
k	0°		8°	0°		8°
ccc			0.10			0.004

1. Values in inches are converted from mm and rounded to 4 decimal digits.

Figure 16. Recommended SO-8 Triac footprint in mm

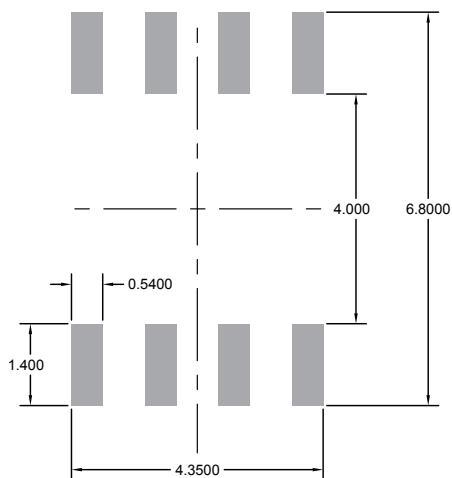
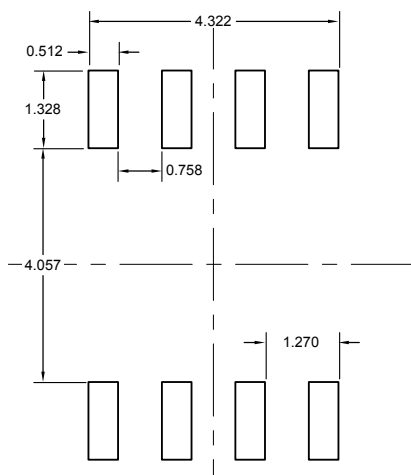


Table 7. Product pin assignment

Pin #	1	2	3	4	5	6	7	8
Assignment	A1	NC	NC	G	NC	A2	A2	NC
NC = Not connected								

Figure 17. SO-8 stencil definitions (dimensions are in mm)



3 Application recommendation

By using the following dual footprint your design will be compatible with both SO-8 and SOT-223 packages.

Figure 18. Recommended dual footprint in mm

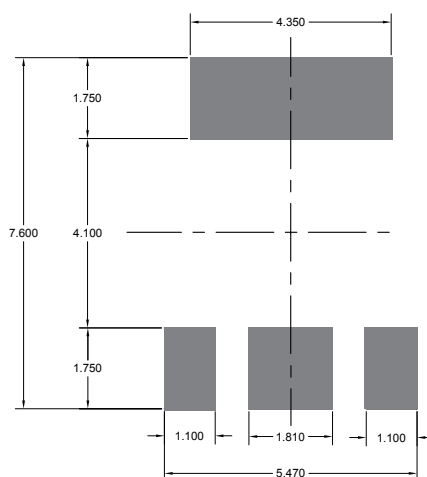


Figure 19. Recommended dual footprint in mm for compatibility with SO-8 and SOT-223 packages

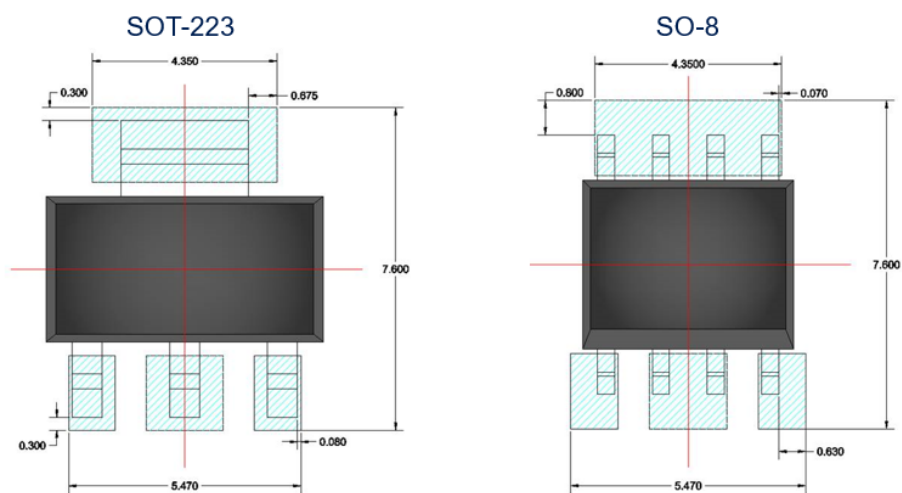
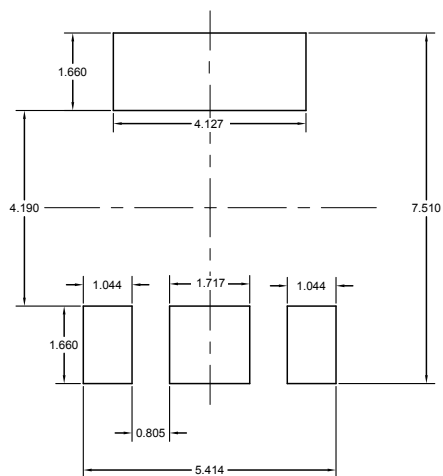


Figure 20. Dual footprint stencil definitions (dimensions are in mm)



4 Ordering information

Table 8. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
Z0109M1	Z0109M1	SO-8	0.1 g	2500	Tape and reel 13"

Revision history

Table 9. Document revision history

Date	Revision	Changes
15-Nov-2019	1	Initial release.

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