



# SGM42411Q/SGM42411NQ Fully Protected Low-side Drivers for Automotive Applications

## GENERAL DESCRIPTION

The SGM42411Q/SGM42411NQ family is low-side driver full protected by embedded protections and intended for a wide range of automotive applications. It is usually used to direct the resistance or inductive charge attached to one side of the battery. Built-in thermal shutdown, short-circuit, overload protection and over-voltage clamp protect the device in all kinds of harsh environments. If an overload condition occurs, the output current is limited to protect the device. During prolonged overloading, the device limits the dissipation energy to a safe level for heat interruption operations. The device has the function of thermal shutdown and automatic restart. Once the fault situation disappears, the device can operate normally, and the inductive load can be quickly demagnetized during decay time.

The device is AEC-Q100 qualified (Automotive Electronics Council (AEC) standard Q100 Grade 1) and it is suitable for automotive applications.

The SGM42411Q is available in a Green SOT-223-3 package. The SGM42411NQ is available in a Green SOT-223-3 package.

## FEATURES

- **AEC-Q100 Qualified for Automotive Applications**  
Device Temperature Grade 1  
 $T_A = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- **Full Set of Protections**
  - ◆ Short-Circuit Protection
  - ◆ Over-Voltage Protection
  - ◆ ESD Protection
  - ◆ Overload Protection
  - ◆ Thermal Shutdown with Automatic Restart
- **Output Clamp Voltage: 44V**
- **Continuous Drain Current: 2A (TYP)**
- **On-Resistance: 130m $\Omega$  (TYP)**
- **Power and Current Limitation**
- **SGM42411Q Available in a Green SOT-223-3 Package**
- **SGM42411NQ Available in a Green SOT-223-3 Package**

## SIMPLIFIED SCHEMATIC

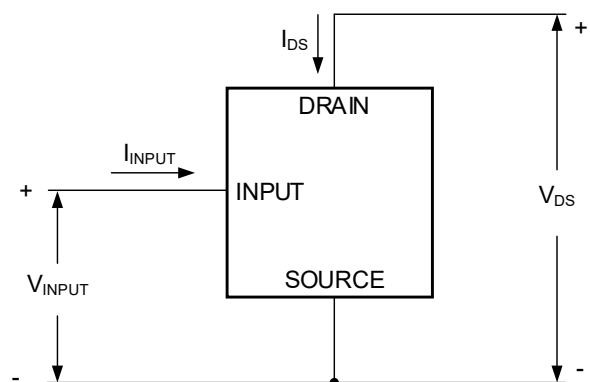
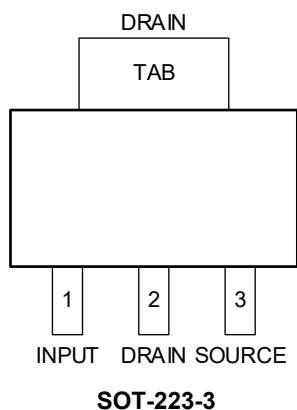


Figure 1. Current and Voltage Conventions

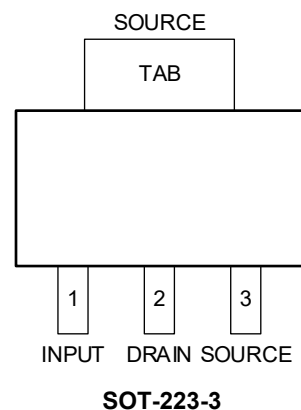


## PIN CONFIGURATIONS

SGM42411Q (TOP VIEW)



SGM42411NQ (TOP VIEW)



## PIN DESCRIPTION

PIN	NAME	FUNCTION
1	INPUT	Voltage Controlled Input Pin. Control the output switch state.
2	DRAIN	Drain.
3	SOURCE	Source.
TAB	DRAIN	Drain. For SGM42411Q.
	SOURCE	Source. For SGM42411NQ.

**ELECTRICAL CHARACTERISTICS**

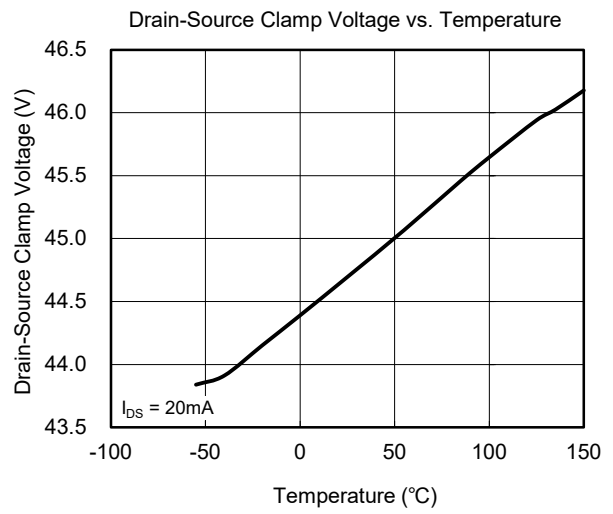
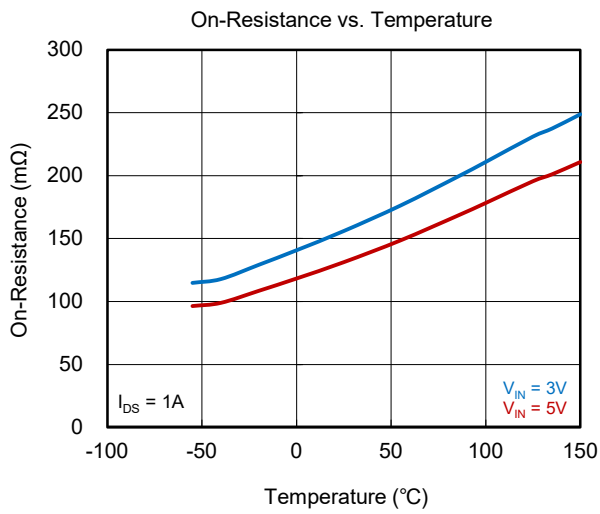
( $V_{IN} = 4.5V$  to  $5.5V$ ,  $T_J = -40^{\circ}C$  to  $+150^{\circ}C$ , typical values are measured at  $T_J = +25^{\circ}C$ , unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Power MOS Characteristics</b>						
Operating Supply Voltage	$V_{SUPPLY}$		3.5	5	5.5	V
On-Resistance	$R_{ON}$	$V_{IN} = 5V, I_{DS} = 1A$	$T_J = +25^{\circ}C$	130	170	m $\Omega$
			$T_J = +150^{\circ}C$		260	
Drain-Source Clamp Voltage	$V_{CLAMP}$	$V_{IN} = 0V, I_{DS} = 20mA$	41	44	49	V
Drain-Source Clamp Threshold Voltage	$V_{CLTH}$	$V_{IN} = 0V, I_{DS} = 2mA$	40			V
Off-State Output Current	$I_{DSS}$	$V_{IN} = 0V, V_{DS} = 13V$	$T_J = +25^{\circ}C$		1	$\mu A$
			$T_J = +150^{\circ}C$		3	$\mu A$
<b>Source-Drain Diode</b>						
Forward on Voltage	$V_{SD}$	$I_{DS} = 1A, V_{IN} = 0V$		0.87		V
<b>Input Characteristics <sup>(1)</sup></b>						
Supply Current from Input Pin	$I_{ISS}$	On-state: $V_{IN} = 5V, V_{DS} = 0V$		39	85	$\mu A$
Input Clamp Voltage	$V_{ICL}$	$I_S = 1mA$	6.3		7.2	V
		$I_S = -1mA$		-0.6		V
Input Threshold Voltage	$V_{INTH}$	$V_{DS} = V_{IN}, I_{DS} = 1mA$	1		3.5	V
<b>Switching Characteristics (<math>V_{CC} = 13V</math>) <sup>(1)</sup></b>						
Turn-On Delay Time	$t_{D\_ON}$	$R_L = 13\Omega, V_{CC} = 13V$		16.6		$\mu s$
Turn-Off Delay Time	$t_{D\_OFF}$	$R_L = 13\Omega, V_{CC} = 13V$		12.2		$\mu s$
Rise Time	$t_R$	$R_L = 13\Omega, V_{CC} = 13V$		17		$\mu s$
Fall Time	$t_F$	$R_L = 13\Omega, V_{CC} = 13V$		13		$\mu s$
Slew-Rate On	$-dV_{DS}/dt_{ON}$	80% to 20% $V_{CC}$		-0.65		V/ $\mu s$
Slew-Rate Off	$dV_{DS}/dt_{OFF}$	20% to 80% $V_{CC}$		0.85		V/ $\mu s$
Switching Energy Losses at Turn-On	$W_{ON}$	$R_L = 13\Omega, V_{CC} = 13V$		44.4		$\mu J$
Switching Energy Losses at Turn-Off	$W_{OFF}$	$R_L = 13\Omega, V_{CC} = 13V$		38.4		$\mu J$
<b>Protection and Diagnostics</b>						
DC Short-Circuit Current	$I_{LIMH}$	$V_{DS} = 13V, V_{IN} = 5V$	3.5	6	8.5	A
Short-Circuit Current during Thermal Cycling	$I_{LIML}$	$V_{DS} = 13V, T_R < T_J < T_{SD}, V_{IN} = 5V$		3.2		A
Step Response Current Limit	$t_{DLIM}$	$V_{DS} = 13V, V_{INPUT} = 5V$		21		$\mu s$
Shutdown Temperature	$T_{SD}$			170		$^{\circ}C$
Reset Temperature	$T_R$			160		$^{\circ}C$
Thermal Hysteresis ( $T_{SD} - T_R$ )	$T_{HYS}$			10		$^{\circ}C$

NOTE:

1.  $V_{IN} = 3.5V$  to  $5.5V$ .

TYPICAL PERFORMANCE CHARACTERISTICS



SWITCHING CHARACTERISTICS

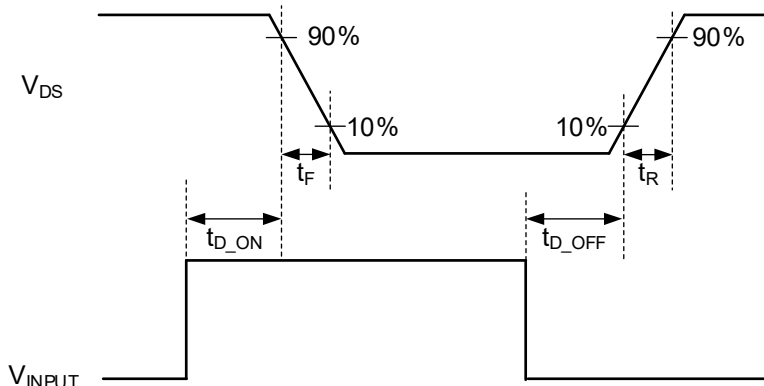


Figure 2. Switching Characteristics

TYPICAL APPLICATION CIRCUIT

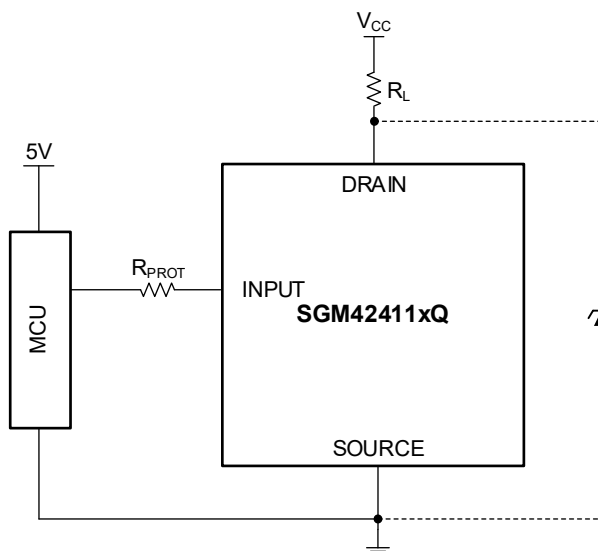


Figure 3. Application Schematic (SOT-223-3 Package)

NOTE: 1. For better surge protection, it is recommended to add a TVS (e.g. SGM18HU1ANXUGI2G) in parallel between the Drain and Source pin.

FUNCTIONAL BLOCK DIAGRAM

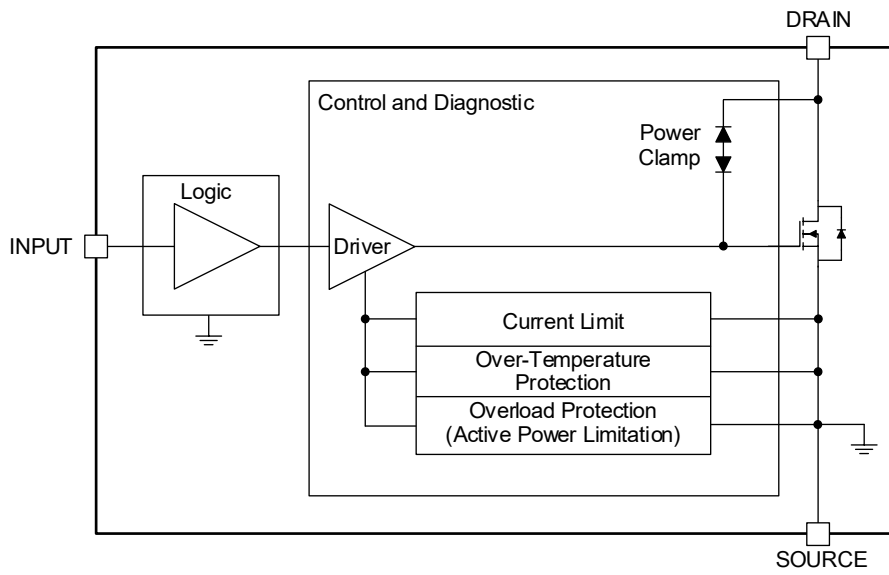


Figure 4. Block Diagram

### APPLICATION INFORMATION

#### MCU I/O Protection

In some severe conditions, such as the ISO7637-2 test, a negative pulse occurs on the GND pin. This pulse can cause damage on the connected microcontroller. Serial resistors are recommended to protect the microcontroller, when choosing the serial resistor, there are several factors need to consider, such as MCU I/O leakage current, low-side driver input threshold level, MCU I/O latch-up current limit. Please refer to example calculation below:

$$0.7/I_{LATCHUP} \leq R_{PROT} \leq (V_{OH\mu C} - V_{INTH})/I_{ISSMAX}$$

where  $I_{LATCHUP} \geq 20\text{mA}$ ,  $V_{OH\mu C} \geq 4.5\text{V}$ ,  $35\Omega \leq R_{PROT} \leq 21\text{k}\Omega$ .

Recommended values:  $R_{PROT} = 1\text{k}\Omega$ .

### REVISION HISTORY

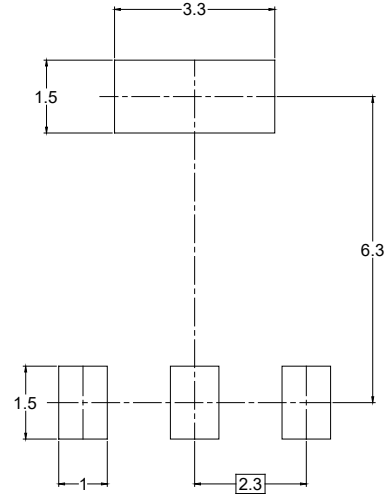
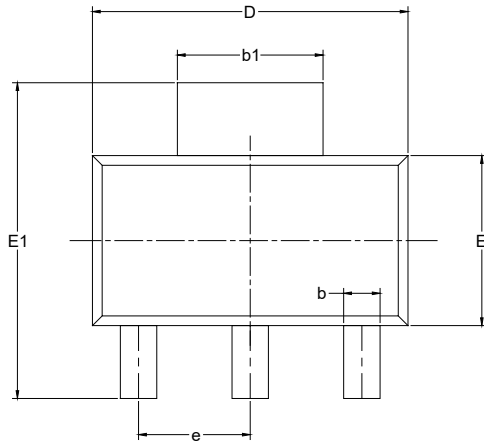
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

	Page
<b>JUNE 2026 – REV.A to REV.A.1</b>	
Added Model SGM42411NQ .....	All
<hr/>	
<b>Changes from Original to REV.A (APRIL 2026)</b>	Page
Changed from product preview to production data .....	All

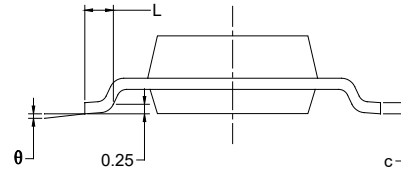
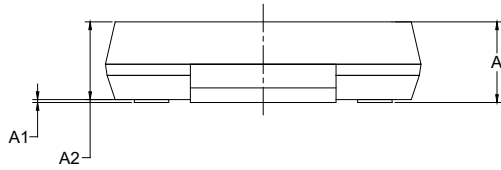
# PACKAGE INFORMATION

## PACKAGE OUTLINE DIMENSIONS

### SOT-223-3



RECOMMENDED LAND PATTERN (Unit: mm)



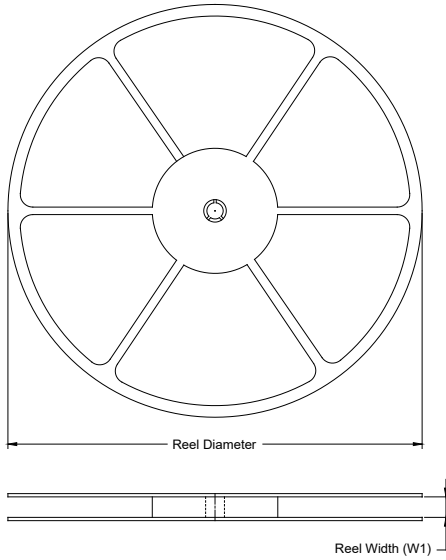
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.800		0.071
A1	0.020	0.100	0.001	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.840	0.026	0.033
b1	2.900	3.100	0.114	0.122
c	0.230	0.350	0.009	0.014
D	6.300	6.700	0.248	0.264
E	3.300	3.700	0.130	0.146
E1	6.700	7.300	0.264	0.287
e	2.300 BSC		0.091 BSC	
L	0.750		0.030	
$\theta$	0°	10°	0°	10°

**NOTES:**

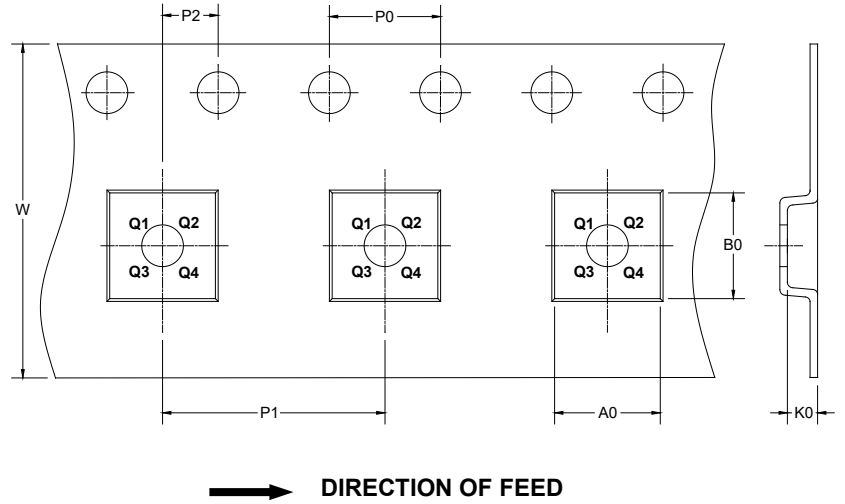
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

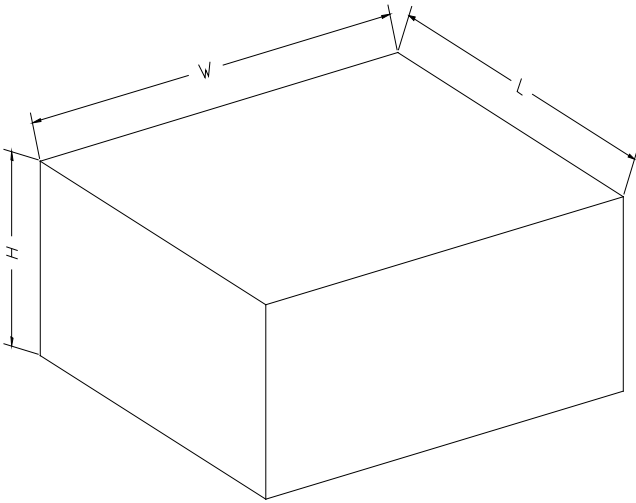
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-223-3	13"	12.4	6.55	7.25	1.90	4.0	8.0	2.0	12.0	Q3

DD0001

# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

## KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13"	386	280	370	5

DD0002