

### GENERAL DESCRIPTION

The SGM42541 is a dual H-bridge motor driver suitable for automated positioning and movement control in equipment such as printers, scanners and robotic mechanisms. The SGM42541 has two H-bridge drivers, and can drive a bipolar stepper motor or two DC motors. The output driver block for each consists of N-MOSFETs configured as full H-bridge to drive the motor windings. With proper heatsinking, the SGM42541 can deliver up to 2A peak output current per channel (at  $V_M = 24V$  and  $T_J = +25^\circ C$ ).

A simple parallel digital control interface is compatible with industry-standard devices. Decay mode is programmable. Fast, slow and mixed decay modes can be provided according application requirements. A 2-bit current control scheme allows up to 4 discrete current levels.

A number of protection features are provided in the device including over-current, short-circuit, under-voltage lockout and thermal shutdown.

The SGM42541 is available in a Green TSSOP-28 (Exposed Pad) package.

### FEATURES

- **Motor Supply Voltage Range: 8V to 45V**
- **Dual H-Bridge Motor Driver**
- **PWM Control Interface**
- **2-Bit Current Control Supports up to 4 Current Levels**
- **Low On-Resistance:  $0.42\Omega$  for HS + LS,  $T_J = +25^\circ C$**
- **Up to 2A Drive Current at  $V_M = 24V$ ,  $T_J = +25^\circ C$**
- **Low Current Sleep Mode**
- **Built-in 3.3V Reference Output**
- **Full Set of Protections**
  - ◆ **Under-Voltage Lockout (UVLO)**
  - ◆ **Over-Current Protection (OCP)**
  - ◆ **Thermal Shutdown (TSD)**
  - ◆ **Fault Condition Indication Pin (nFAULT)**
- **Available in a Green TSSOP-28 (Exposed Pad) Package**

### APPLICATIONS

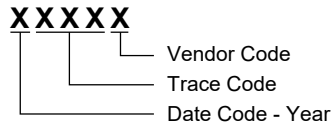
Printer and Scanner  
Stage Lighting

PACKAGE/ORDERING INFORMATION

| MODEL    | PACKAGE DESCRIPTION    | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER    | PACKAGE MARKING             | PACKING OPTION      |
|----------|------------------------|-----------------------------|--------------------|-----------------------------|---------------------|
| SGM42541 | TSSOP-28 (Exposed Pad) | -40°C to +85°C              | SGM42541YPTS28G/TR | SGM42541<br>YPTS28<br>XXXXX | Tape and Reel, 4000 |

MARKING INFORMATION

NOTE: XXXXX = Date Code, Trace Code and Vendor Code.



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

|   |                 |
|---|-----------------|
| Power Supply Voltage Range, $V_M$ .....     | -0.3V to 55V    |
| Power Supply Ramp Rate.....                 | 1V/ $\mu$ s     |
| Digital Pin Voltage .....                   | -0.5V to 6V     |
| xVREF Input Voltage Range, $V_{REF}$ .....  | -0.3V to 5.5V   |
| ISENx Pin Voltage <sup>(1)</sup> .....      | -0.7V to 0.7V   |
| Package Thermal Resistance                  |                 |
| TSSOP-28 (Exposed Pad), $\theta_{JA}$ ..... | 27°C/W          |
| Junction Temperature .....                  | +150°C          |
| Storage Temperature Range.....              | -65°C to +150°C |
| Lead Temperature (Soldering, 10s) .....     | +260°C          |
| ESD Susceptibility                          |                 |
| HBM.....                                    | 2000V           |
| CDM .....                                   | 1000V           |

ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

RECOMMENDED OPERATING CONDITIONS

|  |                 |
|--|-----------------|
| Power Supply Voltage Range, $V_M$ .....              | 8V to 45V       |
| xVREF Input Voltage <sup>(2)</sup> , $V_{REF}$ ..... | 1V to 3.5V      |
| V3P3 Load Current, $I_{V3P3}$ .....                  | 0mA to 10mA     |
| Externally Applied PWM Frequency, $f_{PWM}$ .....    | 0kHz to 100kHz  |
| Operating Junction Temperature Range.....            | -40°C to +125°C |

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

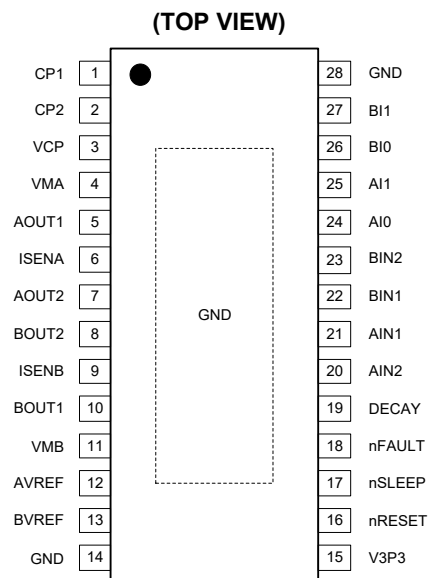
NOTES:

1. Transients of  $\pm 1V$  for less than 25ns are acceptable.
2. Operational at  $V_{REF}$  from 0V to 1V, but accuracy is degraded.

OVERSTRESS CAUTION

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

PIN CONFIGURATION



TSSOP-28 (Exposed Pad)

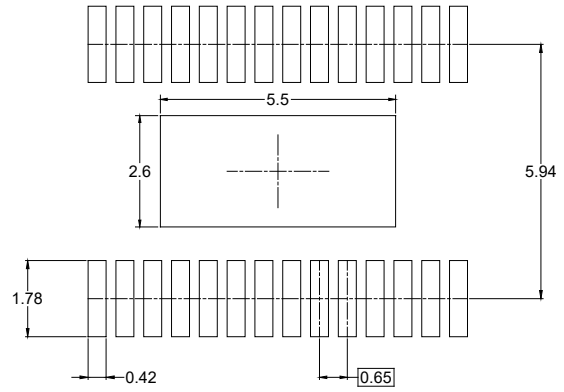
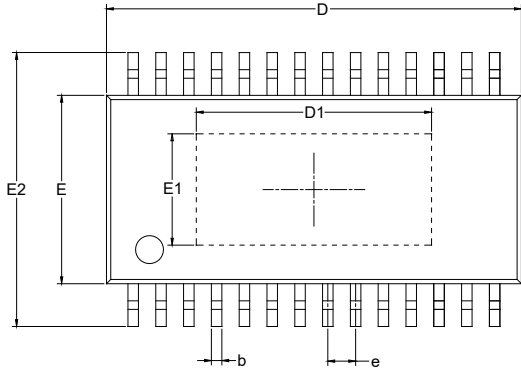
## PIN DESCRIPTION

| PIN         | NAME   | TYPE | FUNCTION   |  |
|-------------|--------|------|--|--|
| 1           | CP1    | I/O  | Charge Pump Flying Capacitor Connection Pins. A 0.01 $\mu$ F/50V capacitor is used between CP1 and CP2 pins.   |  |
| 2           | CP2    | I/O  |  |  |
| 3           | VCP    | I/O  | Gate Drive Voltage of the High-side Switches. Decouple with a 0.1 $\mu$ F/16V ceramic capacitor and a 1M $\Omega$ to VM pin.                                       |  |
| 4           | VMA    | -    | Power Supply for Bridge A.   | Connect these pins to the same motor supply (8V to 45V) and bypass with a 0.1 $\mu$ F ceramic capacitor to GND. Connect sufficient bulk capacitance to the common supply line. |
| 11          | VMB    | -    | Power Supply for Bridge B.   |  |
| 5           | AOUT1  | O    | Output 1 of Bridge A.  | Connect to motor winding A terminals 1 and 2 respectively.   |
| 7           | AOUT2  | O    | Output 2 of Bridge A.  |  |
| 10          | BOUT1  | O    | Output 1 of Bridge B.  | Connect to motor winding B terminals 1 and 2 respectively.   |
| 8           | BOUT2  | O    | Output 2 of Bridge B.  |  |
| 9           | ISENB  | I/O  | Bridge B I <sub>SENSE</sub> (GND). Connect through a current sense resistor to GND for bridge B.   |  |
| 6           | ISENA  | I/O  | Bridge A I <sub>SENSE</sub> (GND). Connect through a current sense resistor to GND for bridge A.   |  |
| 12          | AVREF  | I    | Bridge A Current Setting Reference Voltage Input. It can be driven independently with a DAC for microstepping, or tied to a fixed reference like V3P3.             |  |
| 13          | BVREF  | I    | Bridge B Current Setting Reference Voltage Input. It can be driven independently with a DAC for microstepping, or tied to a fixed reference like V3P3.             |  |
| 15          | V3P3   | O    | 3.3V Regulator Output. A 0.47 $\mu$ F/6.3V ceramic capacitor is used between V3P3 and GND pins. This source can be used to supply AVREF or BVREF reference inputs. |  |
| 16          | nRESET | I    | Reset Input. Active-low reset input with weak internal pull-down initializes internal logic and disables H-bridge outputs.   |  |
| 17          | nSLEEP | I    | Sleep Mode Input. Active-low logic input with weak internal pull-down. Apply high to enable device, and low to enter into the low-power sleep mode.                |  |
| 18          | nFAULT | OD   | Fault Indication Pin. Go low when a fault occurs (over-temperature, over-current).   |  |
| 19          | DECAY  | I    | Decay Mode Selection Input. Low = slow decay, open = mixed decay, high = fast decay. The pin is pulled down and pulled up internally inside the device.            |  |
| 20          | AIN2   | I    | Input 2 of Bridge A. Logic input for AOUT2. Internal pull-down.  |  |
| 21          | AIN1   | I    | Input 1 of Bridge A. Logic input for AOUT1. Internal pull-down.  |  |
| 22          | BIN1   | I    | Input 1 of Bridge B. Logic input for BOUT1. Internal pull-down.  |  |
| 23          | BIN2   | I    | Input 2 of Bridge B. Logic input for BOUT2. Internal pull-down.  |  |
| 24          | AI0    | I    | A Channel H-Bridge Current Set Inputs. 00 is for 100% full scale, 01 is for 71% full scale, 10 is for 31% full scale, 11 is for 0%. Internal pull-down.            |  |
| 25          | AI1    | I    |  |  |
| 26          | BI0    | I    | B Channel H-Bridge Current Set Inputs. 00 is for 100% full scale, 01 is for 71% full scale, 10 is for 31% full scale, 11 is for 0% full scale. Internal pull-down. |  |
| 27          | BI1    | I    |  |  |
| 14, 28      | GND    | -    | Ground.  |  |
| Exposed Pad | GND    | -    | Ground.  |  |

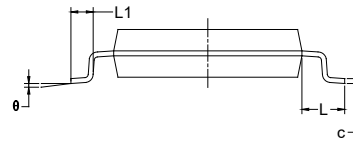
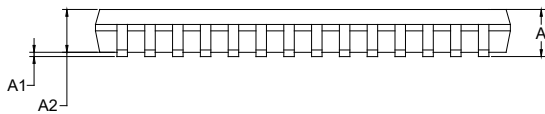
NOTE: I = input, O = output, OD = open-drain output, I/O = input/output.

## PACKAGE OUTLINE DIMENSIONS

### TSSOP-28 (Exposed Pad)



RECOMMENDED LAND PATTERN (Unit: mm)



| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      |                              | 1.200 |                         | 0.047 |
| A1     | 0.050                        | 0.150 | 0.002                   | 0.006 |
| A2     | 0.800                        | 1.050 | 0.031                   | 0.041 |
| b      | 0.190                        | 0.300 | 0.007                   | 0.012 |
| c      | 0.090                        | 0.200 | 0.004                   | 0.008 |
| D      | 9.600                        | 9.800 | 0.378                   | 0.386 |
| D1     | 5.300                        | 5.700 | 0.209                   | 0.224 |
| E      | 4.300                        | 4.500 | 0.169                   | 0.177 |
| E1     | 2.400                        | 2.800 | 0.094                   | 0.110 |
| E2     | 6.200                        | 6.600 | 0.244                   | 0.260 |
| e      | 0.650 BSC                    |       | 0.026 BSC               |       |
| L      | 1.000 BSC                    |       | 0.039 BSC               |       |
| L1     | 0.450                        | 0.750 | 0.018                   | 0.030 |
| θ      | 0°                           | 8°    | 0°                      | 8°    |

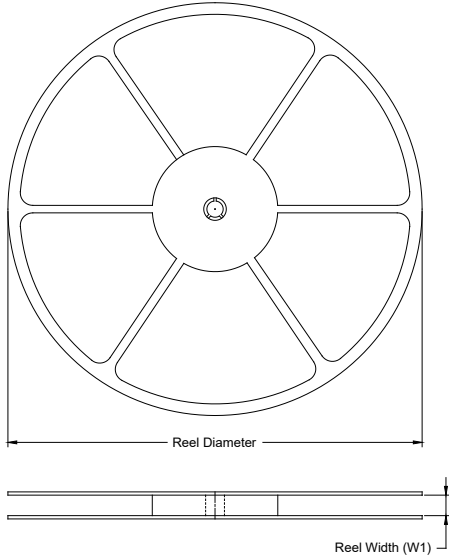
NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-153.

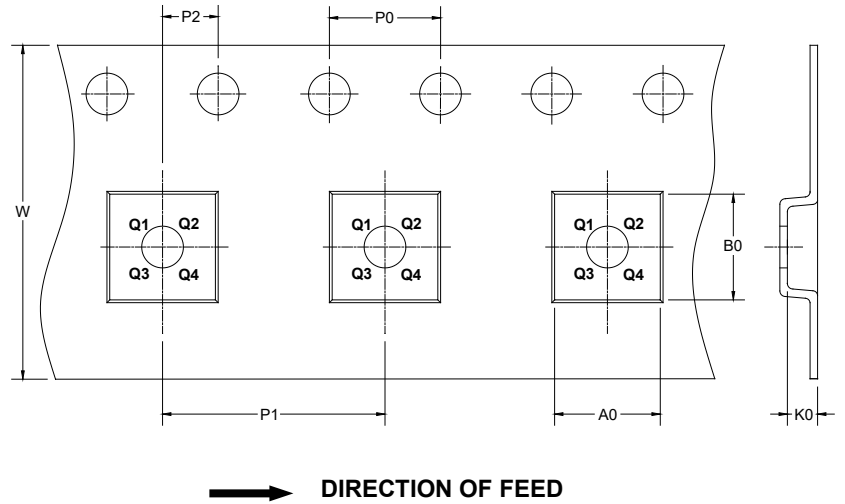
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



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

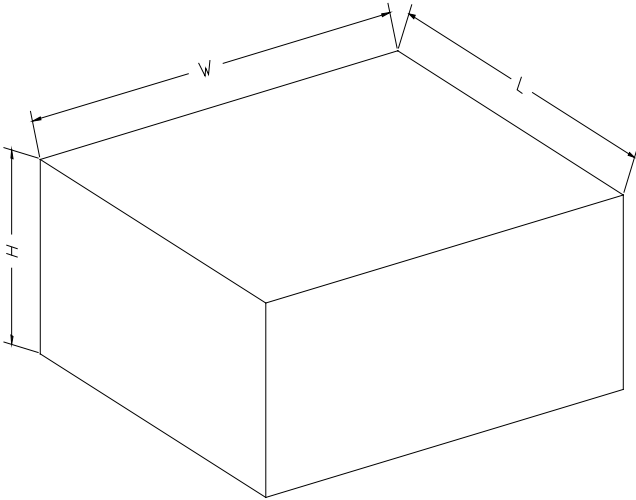
### KEY PARAMETER LIST OF TAPE AND REEL

| Package Type              | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|---------------------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TSSOP-28<br>(Exposed Pad) | 13"           | 16.4               | 6.80    | 10.25   | 1.60    | 4.0     | 8.0     | 2.0     | 16.0   | Q1            |

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# 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            |

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