

## GENERAL DESCRIPTION

The SGM33685L1 is a high performance RF front-end module (FEM), which integrates a power amplifier (PA), low noise amplifier (LNA), SP3T T/R switch, and a controller inside. There are two matching networks, one for high power and one for high efficiency.

The device is designed for IoT and industrial applications supporting the frequency range from 860MHz to 930MHz. External  $V_{REF}$  is not required.

The SGM33685L1 is available in a Green TLGA-4×4-24L package.

## FEATURES

- **VCC0/VCC1/VCC2 Supply Voltage: 3.2V to 5.0V**
- **Saturated Power**
  - ♦ 33.7dBm at  $V_{CC} = 5.0V$ , High Power Matching
  - ♦ 31.5dBm at  $V_{CC} = 5.0V$ , High Efficiency Matching
  - ♦ 30.2dBm at  $V_{CC} = 3.3V$ , High Power Matching
  - ♦ 28.0dBm at  $V_{CC} = 3.3V$ , High Efficiency Matching
- **1.5dB RX Noise Figure**
- **Integrated LNA with Bypass**
- **Controller Integrated**
- **Available in a Green TLGA-4×4-24L Package**  
(MSL3, 260°C per JEDEC J-STD-020)

## APPLICATIONS

Internet of Things  
Industrial Applications  
Smart Meters

## BLOCK DIAGRAM

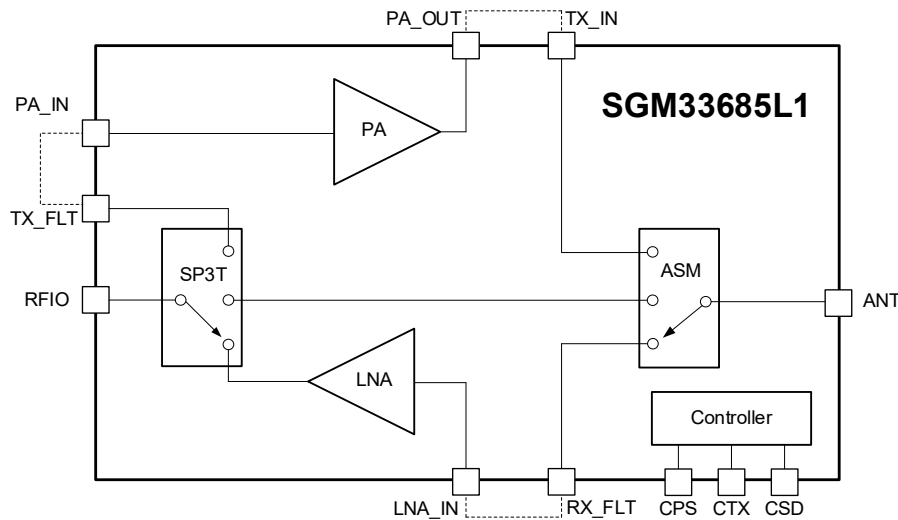


Figure 1. SGM33685L1 Block Diagram

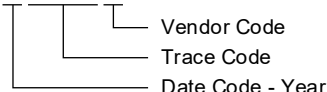
## PACKAGE/ORDERING INFORMATION

| MODEL      | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER       | PACKAGE MARKING             | PACKING OPTION      |
|------------|---------------------|-----------------------------|-----------------------|-----------------------------|---------------------|
| SGM33685L1 | TLGA-4×4-24L        | -40°C to +105°C             | SGM33685L1GTLAM24G/TR | SGM2A6<br>GTLAM24<br>XXXXXX | Tape and Reel, 3000 |

## MARKING INFORMATION

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

XXXXXX



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

|                                                        |                 |
|--------------------------------------------------------|-----------------|
| Supply Voltage $V_{CC0}$ , $V_{CC1}$ , $V_{CC2}$ ..... | 5.5V            |
| Control Voltage, CPS, CSD, CTX .....                   | 3.6V            |
| Max TX Input Power, $P_{IN}$ .....                     | 15dBm           |
| Max RX Input Power, $P_{IN}$ .....                     | 15dBm           |
| Package Thermal Resistance                             |                 |
| TLGA-4×4-24L, $\theta_{JA}$ .....                      | 34.4°C/W        |
| TLGA-4×4-24L, $\theta_{JB}$ .....                      | 10.3°C/W        |
| TLGA-4×4-24L, $\theta_{JC(TOP)}$ .....                 | 42.1°C/W        |
| TLGA-4×4-24L, $\theta_{JC(BOT)}$ .....                 | 7.2°C/W         |
| Storage Temperature Range .....                        | -40°C to +150°C |
| Lead Temperature (Soldering, 10s) .....                | +260°C          |
| ESD Susceptibility <sup>(1) (2)</sup>                  |                 |
| HBM .....                                              | ±750V           |
| CDM .....                                              | ±2000V          |

## NOTES:

1. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.
2. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.

## RECOMMENDED OPERATING CONDITIONS

|                                                                                  |                  |
|----------------------------------------------------------------------------------|------------------|
| Operating Frequency Range, $f_0$ .....                                           | 860MHz to 930MHz |
| Supply Voltage, $V_{CC0}$ , $V_{CC1}$ , $V_{CC2}$ .....                          | 3.2V to 5.0V     |
| Control Voltage, CPS <sub>IH</sub> , CSD <sub>IH</sub> , CTX <sub>IH</sub> ..... | 1.55V to 3.3V    |
| Control Voltage, CPS <sub>IL</sub> , CSD <sub>IL</sub> , CTX <sub>IL</sub> ..... | 0V to 0.45V      |
| Operating Ambient Temperature Range .....                                        | -40°C to +105°C  |
| Operating Ambient Temperature Range (TX Power > 30dBm) .....                     | -40°C to +85°C   |

## 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.

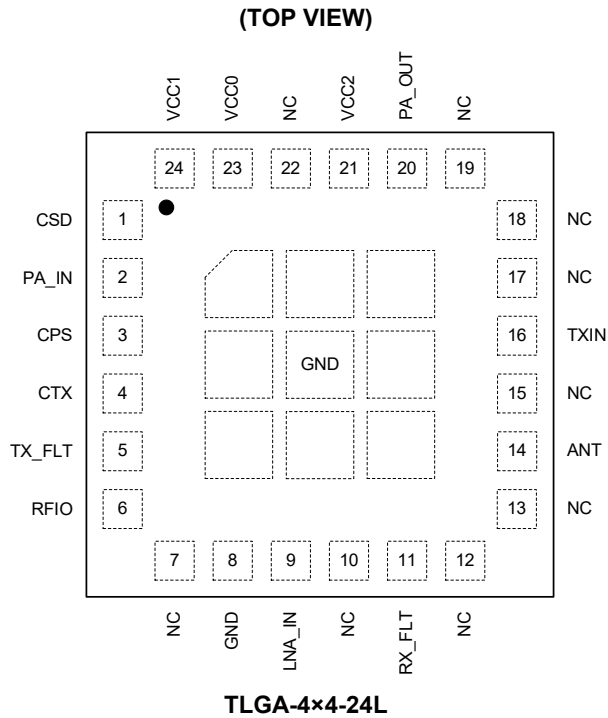
## ESD SENSITIVITY CAUTION

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.

## DISCLAIMER

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

## PIN CONFIGURATION



## PIN DESCRIPTION

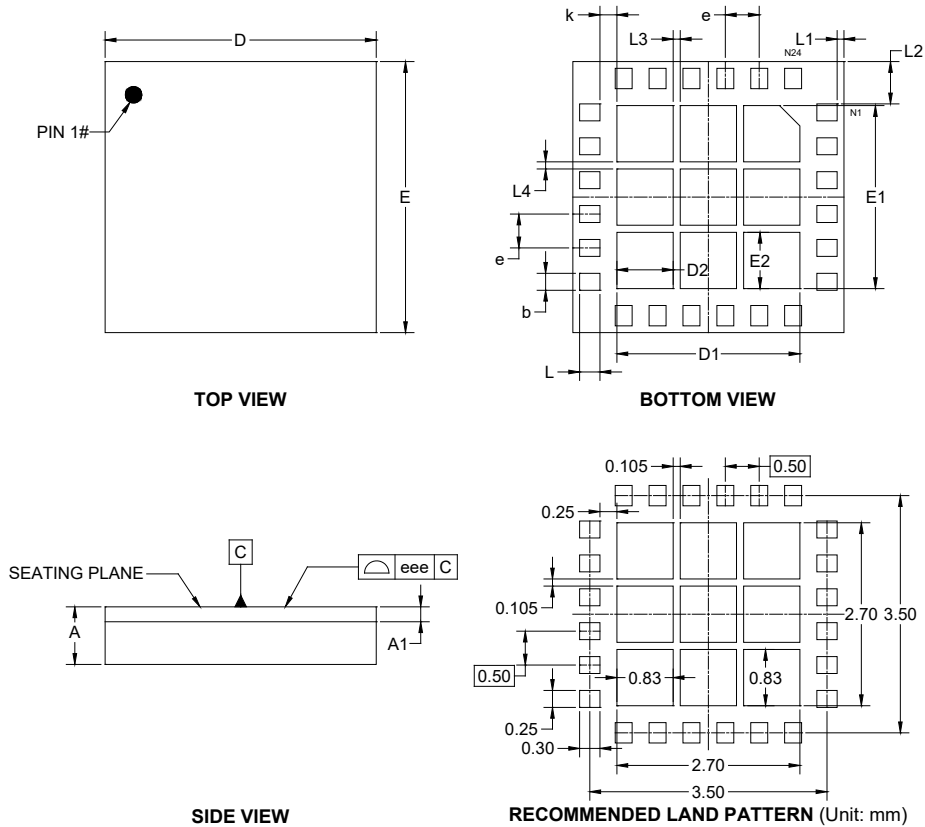
| PIN                               | NAME   | FUNCTION                                            |
|-----------------------------------|--------|-----------------------------------------------------|
| 1                                 | CSD    | Control Input Shutdown.                             |
| 2                                 | PA_IN  | PA Input from TX_FLT Pin.                           |
| 3                                 | CPS    | RX Path Select Control.                             |
| 4                                 | CTX    | TX Enable.                                          |
| 5                                 | TX_FLT | TX Input from SP2T.                                 |
| 6                                 | RFIO   | TX Input from Transceiver/RX Output to Transceiver. |
| 7, 10, 12, 13, 15, 17, 18, 19, 22 | NC     | No Connection.                                      |
| 8                                 | GND    | Ground.                                             |
| 9                                 | LNA_IN | LNA Input (from RX_FLT).                            |
| 11                                | RX_FLT | RX Signal from Antenna.                             |
| 14                                | ANT    | Antenna Port.                                       |
| 16                                | TXIN   | TX Input from PA_OUT Pin.                           |
| 20                                | PA_OUT | TX Output to TXIN Pin.                              |
| 21                                | VCC2   | Supply Voltage 2 for FEM.                           |
| 23                                | VCC0   | Supply Voltage 0 for FEM.                           |
| 24                                | VCC1   | Supply Voltage 1 for FEM.                           |
| Exposed Pad                       | GND    | Exposed Pad. Must be connected to ground.           |

**CONTROL LOGIC**

| Mode           | CPS | CSD | CTX |
|----------------|-----|-----|-----|
| RX Bypass Mode | 0   | 1   | 0   |
| RX LNA Mode    | 1   | 1   | 0   |
| TX Mode        | X   | 1   | 1   |
| Sleep Mode     | 0   | 0   | 0   |

## PACKAGE OUTLINE DIMENSIONS

### TLGA-4×4-24L



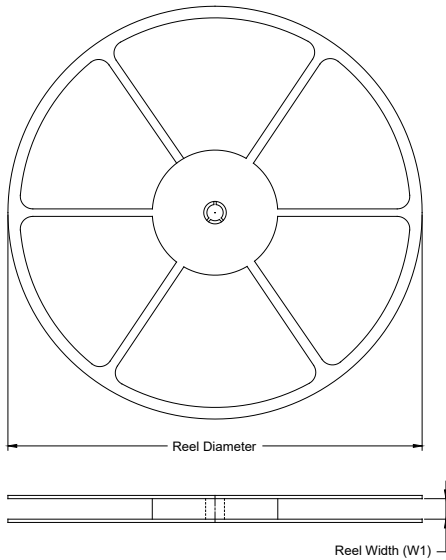
| Symbol | Dimensions In Millimeters |     |       |
|--------|---------------------------|-----|-------|
|        | MIN                       | NOM | MAX   |
| A      | 0.800                     | -   | 0.900 |
| A1     | 0.220 REF                 |     |       |
| b      | 0.200                     | -   | 0.300 |
| D      | 3.900                     | -   | 4.100 |
| E      | 3.900                     | -   | 4.100 |
| D1     | 2.600                     | -   | 2.800 |
| D2     | 0.830 REF                 |     |       |
| E1     | 2.600                     | -   | 2.800 |
| E2     | 0.830 REF                 |     |       |
| e      | 0.500 BSC                 |     |       |
| k      | 0.250 REF                 |     |       |
| L      | 0.250                     | -   | 0.350 |
| L1     | 0.100 REF                 |     |       |
| L2     | 0.625 REF                 |     |       |
| L3     | 0.105 REF                 |     |       |
| L4     | 0.105 REF                 |     |       |
| eee    | 0.100                     |     |       |

NOTE: This drawing is subject to change without notice.

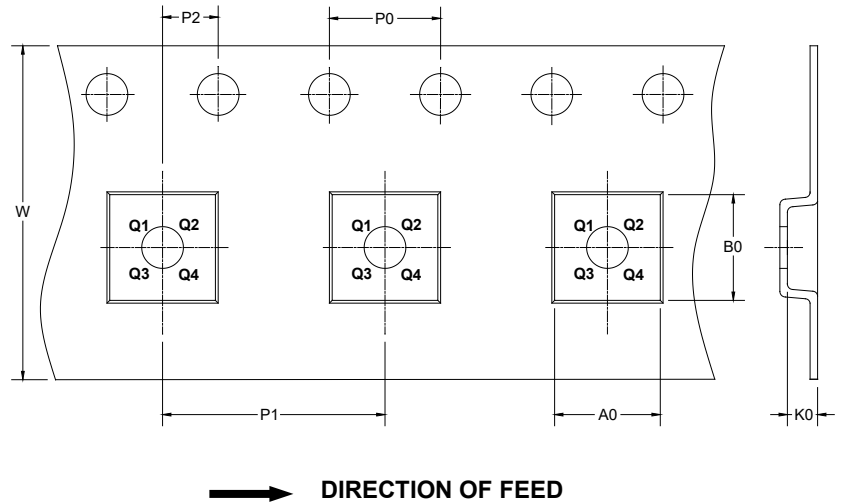
# PACKAGE INFORMATION

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



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

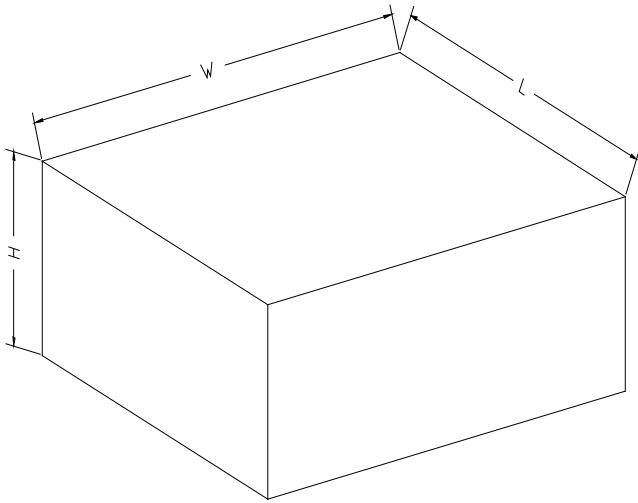
### KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TLGA-4×4-24L | 13"           | 12.4               | 4.30    | 4.30    | 1.10    | 4.0     | 8.0     | 2.0     | 12.0   | Q2            |

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<br>(mm) | Width<br>(mm) | Height<br>(mm) | Pizza/Carton |
|-----------|----------------|---------------|----------------|--------------|
| 13"       | 386            | 280           | 370            | 5            |

DD0002