



# SGM2241xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

## GENERAL DESCRIPTION

The SGM2241xQ is a high voltage, low quiescent current and low dropout voltage linear regulator. It is capable of supplying 300mA output current with typical dropout voltage of 900mV. The operating input voltage range is from 2.5V to 40V and output voltage range is from 1.215V to 35V.

Other features include current limit and thermal shutdown protection. The SGM2241xQ is suitable for various automotive applications.

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

The SGM2241xQ is available in Green MSOP-8 (Exposed Pad) and TDFN-2×2-6AL packages. It operates over an operating temperature range of -40°C to +125°C.

## APPLICATIONS

Industrial Equipment  
Automotive Applications  
Battery-Powered Equipment  
Medical Equipment

## FEATURES

- AEC-Q100 Qualified for Automotive Applications  
Device Temperature Grade 1  
 $T_A = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$
- Operating Input Voltage Range: 2.5V to 40V
- Enable Pin Accept Voltages Higher than the Supply Voltage and up to 40V
- Fixed Output from 1.8V to 12V
- Adjustable Output from 1.215V to 35V
- 300mA Output Current
- Output Voltage Accuracy:  $\pm 1\%$  at  $+25^{\circ}\text{C}$
- Low Quiescent Current: 3.2 $\mu\text{A}$  (TYP)
- Low Dropout Voltage:  
900mV (TYP) at 300mA,  $V_{\text{OUT}} = 5.0\text{V}$
- Current Limiting and Thermal Protection
- With Output Automatic Discharge
- Stable with Small Case Size Ceramic Capacitors
- $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  Operating Temperature Range
- Available in Green MSOP-8 (Exposed Pad) and TDFN-2×2-6AL Packages

## TYPICAL APPLICATION

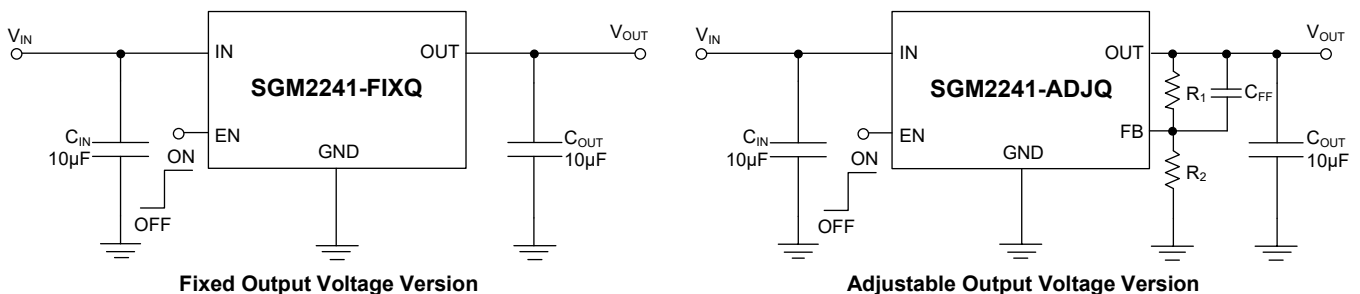


Figure 1. Typical Application Circuits

# Automotive 40V, 300mA, Low Quiescent SGM2241xQ Current and Low Dropout Voltage Linear Regulator

## PACKAGE/ORDERING INFORMATION

| MODEL        | PACKAGE DESCRIPTION     | SPECIFIED TEMPERATURE RANGE       | ORDERING NUMBER      | PACKAGE MARKING           | PACKING OPTION      |
|--------------|-------------------------|-----------------------------------|----------------------|---------------------------|---------------------|
| SGM2241-1.8Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-1.8QPMS8G/TR | 1EJPMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-2.5Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-2.5QPMS8G/TR | 1EKPM8S<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-3.0Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-3.0QPMS8G/TR | 1ELPMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-3.3Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-3.3QPMS8G/TR | 1B0PMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-3.6Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-3.6QPMS8G/TR | 1EMPMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-4.2Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-4.2QPMS8G/TR | 1ENPMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-5.0Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-5.0QPMS8G/TR | 1B1PMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-8.0Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-8.0QPMS8G/TR | 1EOPMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-9.0Q | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-9.0QPMS8G/TR | 1EPPMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-12Q  | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-12QPMS8G/TR  | 0UPPMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-ADJQ | MSOP-8<br>(Exposed Pad) | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-ADJQPMS8G/TR | 0UOPMS8<br>XXXXX<br>XX#XX | Tape and Reel, 4000 |
| SGM2241-1.8Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-1.8QTDI6G/TR | 1D1<br>XXXX               | Tape and Reel, 3000 |
| SGM2241-2.5Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-2.5QTDI6G/TR | 1D2<br>XXXX               | Tape and Reel, 3000 |
| SGM2241-3.0Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-3.0QTDI6G/TR | 1D3<br>XXXX               | Tape and Reel, 3000 |
| SGM2241-3.3Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-3.3QTDI6G/TR | 1D4<br>XXXX               | Tape and Reel, 3000 |
| SGM2241-3.6Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-3.6QTDI6G/TR | 1D5<br>XXXX               | Tape and Reel, 3000 |
| SGM2241-4.2Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-4.2QTDI6G/TR | 1D6<br>XXXX               | Tape and Reel, 3000 |
| SGM2241-5.0Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-5.0QTDI6G/TR | 1D7<br>XXXX               | Tape and Reel, 3000 |
| SGM2241-8.0Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-8.0QTDI6G/TR | 1D8<br>XXXX               | Tape and Reel, 3000 |
| SGM2241-9.0Q | TDFN-2×2-6AL            | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-9.0QTDI6G/TR | 1D9<br>XXXX               | Tape and Reel, 3000 |

# Automotive 40V, 300mA, Low Quiescent SGM2241xQ Current and Low Dropout Voltage Linear Regulator

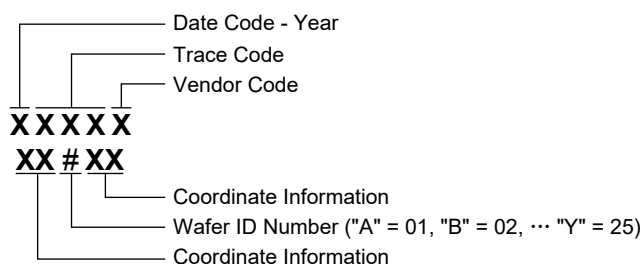
## PACKAGE/ORDERING INFORMATION (continued)

| MODEL        | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE       | ORDERING NUMBER      | PACKAGE MARKING | PACKING OPTION      |
|--------------|---------------------|-----------------------------------|----------------------|-----------------|---------------------|
| SGM2241-12Q  | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-12QTDI6G/TR  | 1DA<br>XXXX     | Tape and Reel, 3000 |
| SGM2241-ADJQ | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2241-ADJQTDI6G/TR | 1B7<br>XXXX     | Tape and Reel, 3000 |

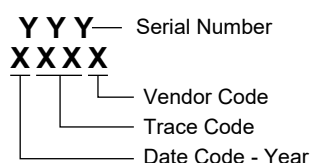
## MARKING INFORMATION

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

### MSOP-8 (Exposed Pad)



### TDFN-2×2-6AL



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

|                                          |                 |
|------------------------------------------|-----------------|
| IN, EN to GND                            | -0.3V to 45V    |
| OUT to GND                               | -0.3V to 45V    |
| FB to GND                                | -0.3V to 45V    |
| Package Thermal Resistance               |                 |
| MSOP-8 (Exposed Pad), $\theta_{JA}$      | 48.5°C/W        |
| MSOP-8 (Exposed Pad), $\theta_{JB}$      | 22.7°C/W        |
| MSOP-8 (Exposed Pad), $\theta_{JC(TOP)}$ | 56.5°C/W        |
| MSOP-8 (Exposed Pad), $\theta_{JC(BOT)}$ | 8.4°C/W         |
| TDFN-2×2-6AL, $\theta_{JA}$              | 62.9°C/W        |
| TDFN-2×2-6AL, $\theta_{JB}$              | 28.9°C/W        |
| TDFN-2×2-6AL, $\theta_{JC(TOP)}$         | 77.8°C/W        |
| TDFN-2×2-6AL, $\theta_{JC(BOT)}$         | 11.6°C/W        |
| Junction Temperature                     | +150°C          |
| Storage Temperature Range                | -65°C to +150°C |
| Lead Temperature (Soldering, 10s)        | +260°C          |
| ESD Susceptibility <sup>(1) (2)</sup>    |                 |
| HBM                                      | ±6000V          |
| CDM                                      | ±1000V          |

### NOTES:

- For human body model (HBM), all pins comply with AEC-Q100-002 specification.
- For charged device model (CDM), all pins comply with AEC-Q100-011 specification.

## RECOMMENDED OPERATING CONDITIONS

|                                       |             |
|---------------------------------------|-------------|
| Supply Voltage Range, V <sub>IN</sub> | 2.5V to 40V |
| Enable Input Voltage Range            | 0V to 40V   |

|                                                |                 |
|------------------------------------------------|-----------------|
| Input Effective Capacitance, C <sub>IN</sub>   | 0.5μF (MIN)     |
| Output Effective Capacitance, C <sub>OUT</sub> | 1μF to 100μF    |
| Operating Ambient Temperature Range            | -40°C to +125°C |
| Operating Junction Temperature Range           | -40°C to +150°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

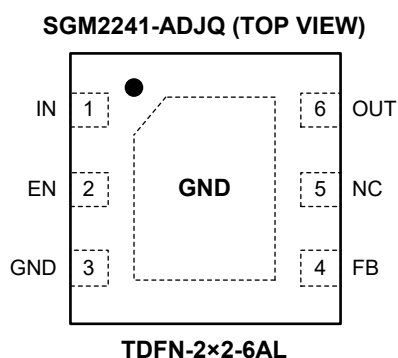
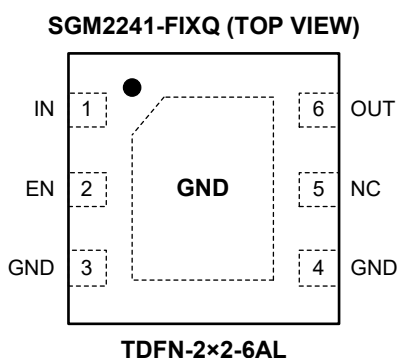
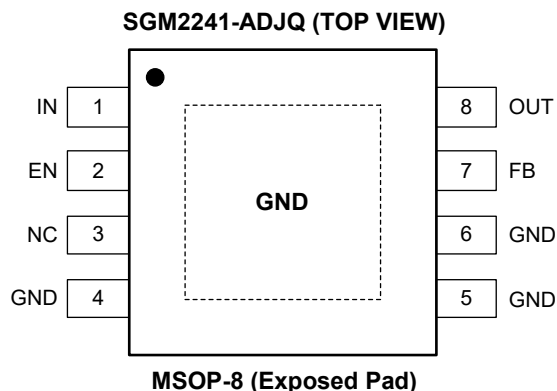
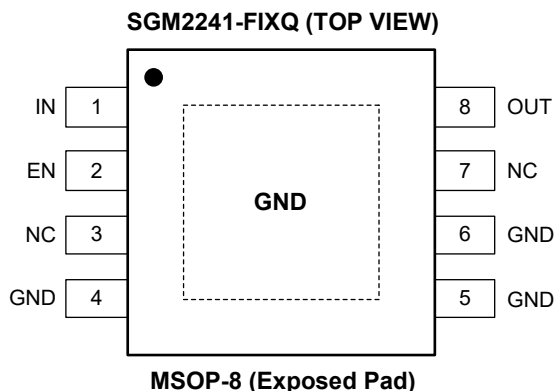
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

# SGM2241xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

## PIN CONFIGURATIONS



## PIN DESCRIPTION

| PIN                  |              | NAME | FUNCTION                                                                                                                                                                                                                 |
|----------------------|--------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MSOP-8 (Exposed Pad) | TDFN-2x2-6AL |      |                                                                                                                                                                                                                          |
| 1                    | 1            | IN   | Input Supply Voltage Pin. It is recommended to use a 1μF or larger ceramic capacitor from IN pin to ground to get good power supply decoupling. This ceramic capacitor should be placed as close as possible to IN pin.  |
| 2                    | 2            | EN   | Enable Pin. Drive EN high to turn on the regulator. Drive EN low to turn off the regulator.                                                                                                                              |
| 3                    | 5            | NC   | No Connection.                                                                                                                                                                                                           |
| 4, 5, 6              | 3            | GND  | Ground.                                                                                                                                                                                                                  |
| 7                    | —            | NC   | No Connection (Fixed Version Only).                                                                                                                                                                                      |
|                      | 4            | FB   | Feedback Voltage Input Pin (adjustable voltage version only). Connect this pin to the midpoint of an external resistor divider to adjust the output voltage. Place the resistors as close as possible to this pin.       |
|                      |              | GND  | Ground (Fixed Version Only).                                                                                                                                                                                             |
| 8                    | 6            | OUT  | Regulator Output Pin. It is recommended to use a ceramic capacitor with effective capacitance in the range of 1μF to 100μF to ensure stability. This ceramic capacitor should be placed as close as possible to OUT pin. |
| Exposed Pad          | Exposed Pad  | GND  | Exposed Pad. Connect it to GND internally. Connect it to a large ground plane to maximize thermal performance. This pad is not an electrical connection point.                                                           |

# SGM2241xQ Automotive 40V, 300mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

## FUNCTIONAL BLOCK DIAGRAMS

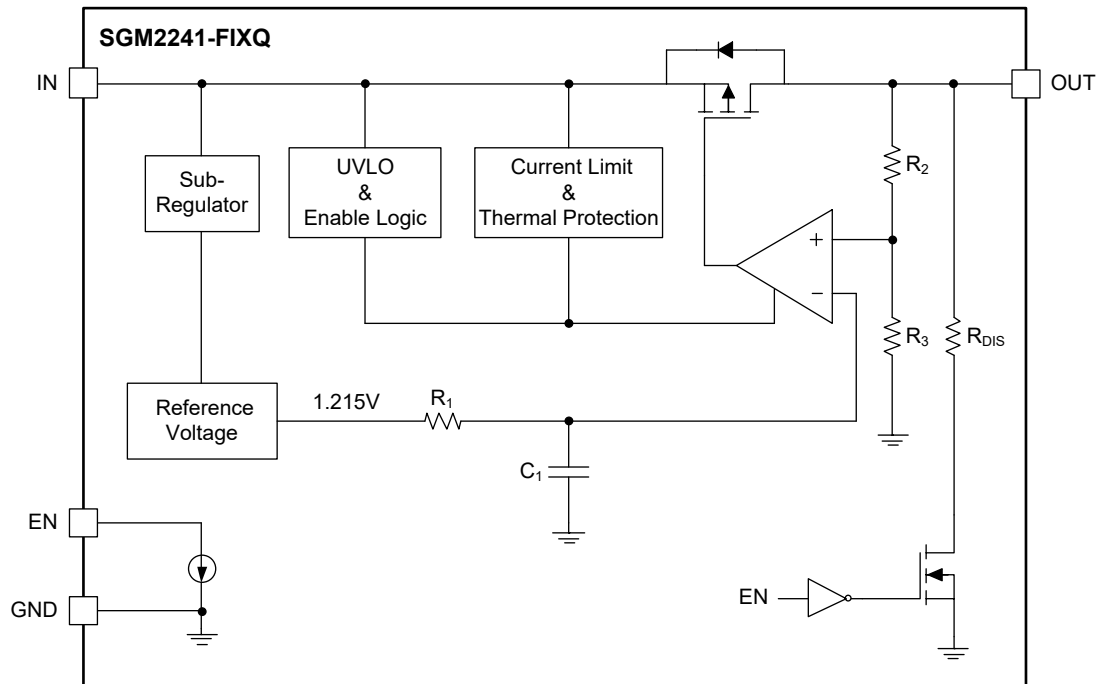


Figure 2. Block Diagram of Fixed Output Version

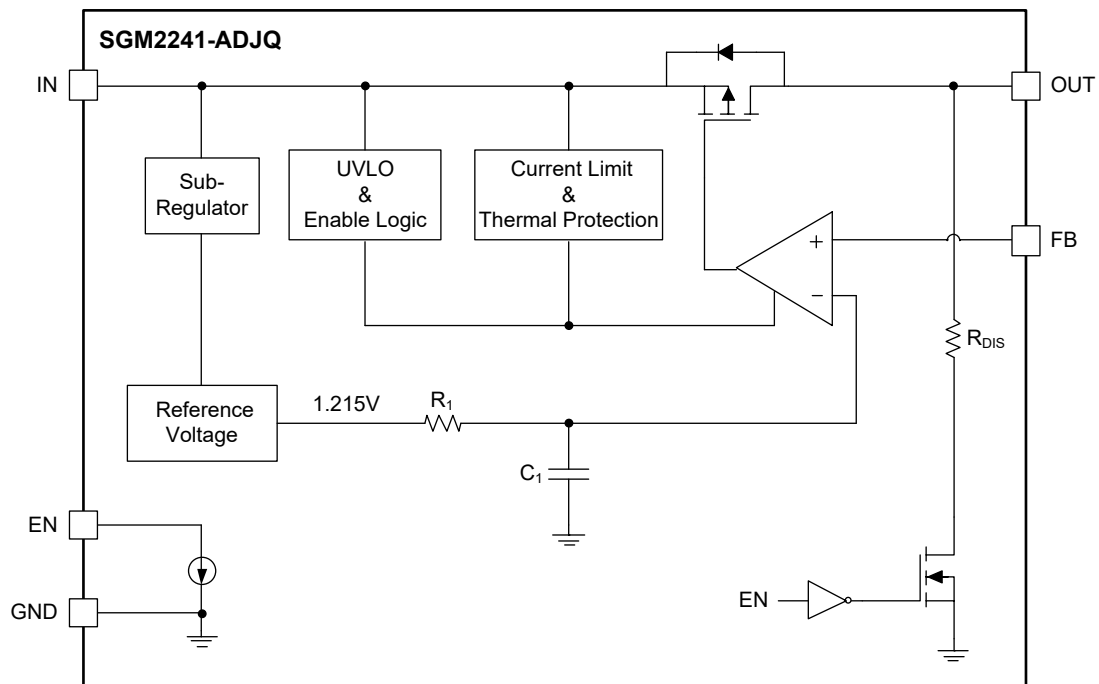
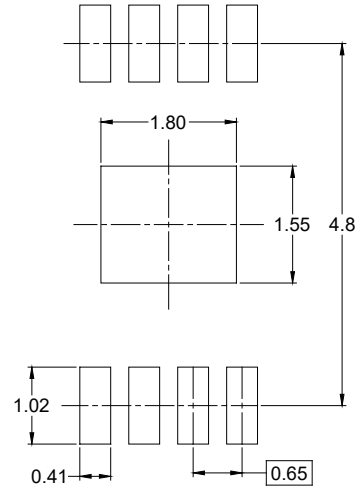
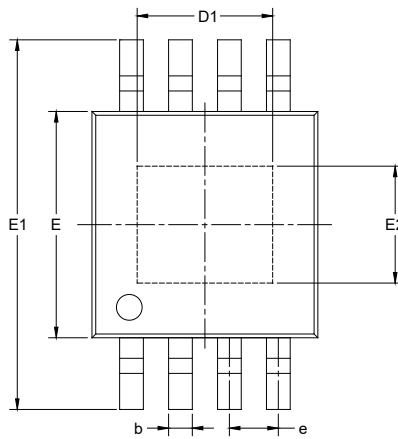


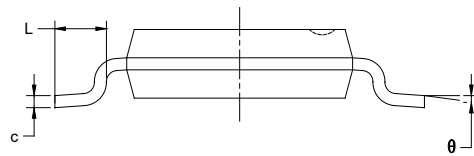
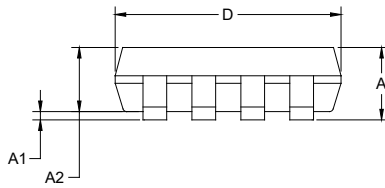
Figure 3. Block Diagram of Adjustable Output Version

## PACKAGE OUTLINE DIMENSIONS

### MSOP-8 (Exposed Pad)



RECOMMENDED LAND PATTERN (Unit: mm)



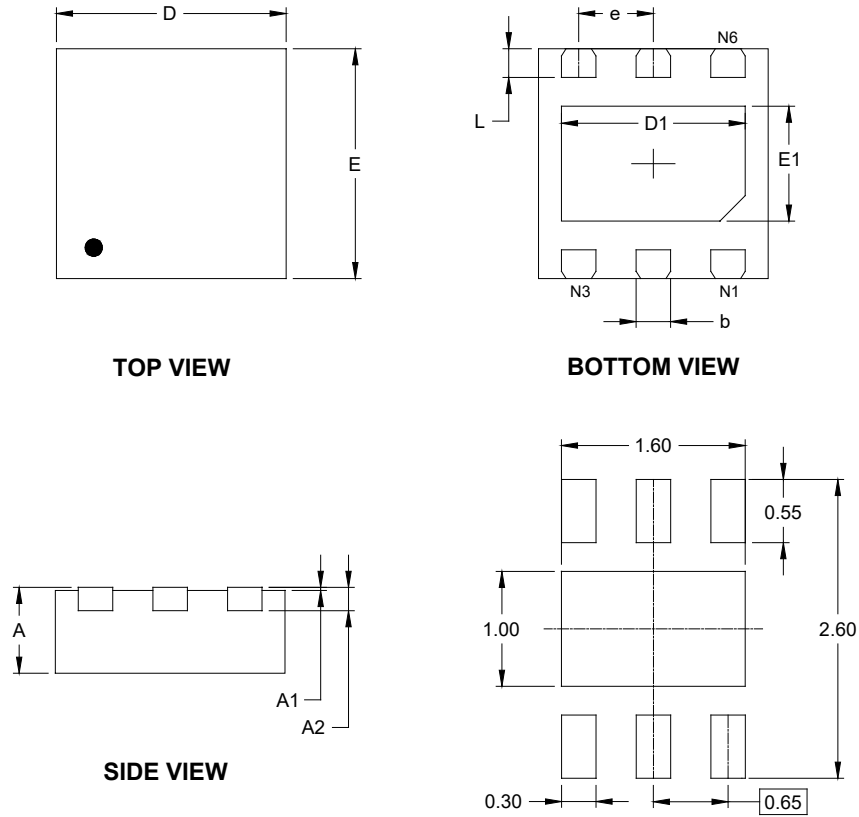
| Symbol   | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|----------|------------------------------|-------|-------------------------|-------|
|          | MIN                          | MAX   | MIN                     | MAX   |
| A        | 0.820                        | 1.100 | 0.032                   | 0.043 |
| A1       | 0.020                        | 0.150 | 0.001                   | 0.006 |
| A2       | 0.750                        | 0.950 | 0.030                   | 0.037 |
| b        | 0.250                        | 0.380 | 0.010                   | 0.015 |
| c        | 0.090                        | 0.230 | 0.004                   | 0.009 |
| D        | 2.900                        | 3.100 | 0.114                   | 0.122 |
| D1       | 1.700                        | 1.900 | 0.067                   | 0.075 |
| e        | 0.65 BSC                     |       | 0.026 BSC               |       |
| E        | 2.900                        | 3.100 | 0.114                   | 0.122 |
| E1       | 4.750                        | 5.050 | 0.187                   | 0.199 |
| E2       | 1.450                        | 1.650 | 0.057                   | 0.065 |
| L        | 0.400                        | 0.800 | 0.016                   | 0.031 |
| $\theta$ | 0°                           | 6°    | 0°                      | 6°    |

#### NOTES:

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

## PACKAGE OUTLINE DIMENSIONS

### TDFN-2×2-6AL



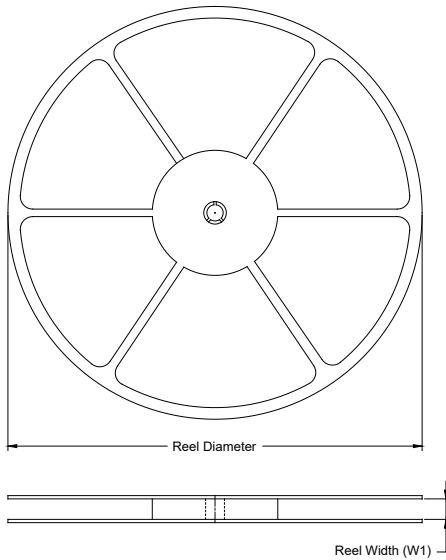
| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 0.700                        | 0.800 | 0.028                   | 0.031 |
| A1     | 0.000                        | 0.050 | 0.000                   | 0.002 |
| A2     | 0.203 REF                    |       | 0.008 REF               |       |
| D      | 1.900                        | 2.100 | 0.075                   | 0.083 |
| D1     | 1.500                        | 1.700 | 0.059                   | 0.067 |
| E      | 1.900                        | 2.100 | 0.075                   | 0.083 |
| E1     | 0.900                        | 1.100 | 0.035                   | 0.043 |
| b      | 0.250                        | 0.350 | 0.010                   | 0.014 |
| e      | 0.650 BSC                    |       | 0.026 BSC               |       |
| L      | 0.174                        | 0.326 | 0.007                   | 0.013 |

NOTE: This drawing is subject to change without notice.

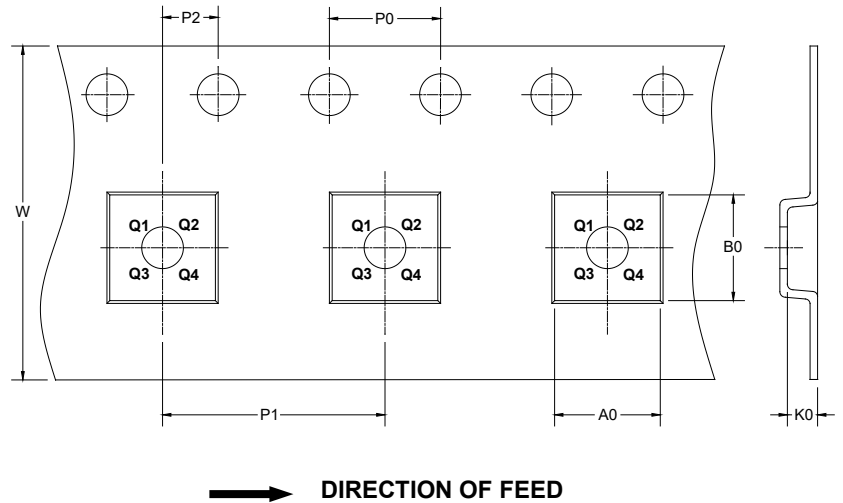
# PACKAGE INFORMATION

## 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

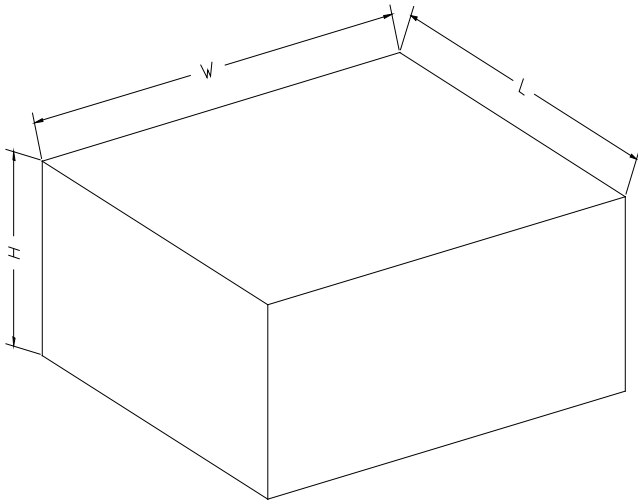
| Package Type         | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|----------------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| MSOP-8 (Exposed Pad) | 13"           | 12.4               | 5.20    | 3.30    | 1.50    | 4.0     | 8.0     | 2.0     | 12.0   | Q1            |
| TDFN-2×2-6AL         | 7"            | 9.5                | 2.30    | 2.30    | 1.10    | 4.0     | 4.0     | 2.0     | 8.0    | Q2            |

DD00001



## 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 |
|-------------|-------------|------------|-------------|--------------|
| 7" (Option) | 368         | 227        | 224         | 8            |
| 7"          | 442         | 410        | 224         | 18           |
| 13"         | 386         | 280        | 370         | 5            |

DD0002