

## GENERAL DESCRIPTION

The SGM2236xQ is a high voltage, low quiescent current and low dropout voltage linear regulator. It is capable of supplying 200mA output current with typical dropout voltage of 500mV. 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 SGM2236xQ 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 SGM2236xQ is available in Green TDFN-2×2-6AL and TDFN-3×3-8JL 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
- 200mA Output Current
- Output Voltage Accuracy:  $\pm 1\%$  at  $+25^{\circ}\text{C}$
- Low Quiescent Current: 3.2 $\mu\text{A}$  (TYP)
- Low Dropout Voltage:  
500mV (TYP) at 200mA,  $V_{OUT} = 5.0\text{V}$
- 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 TDFN-2×2-6AL and TDFN-3×3-8JL Packages

## TYPICAL APPLICATION

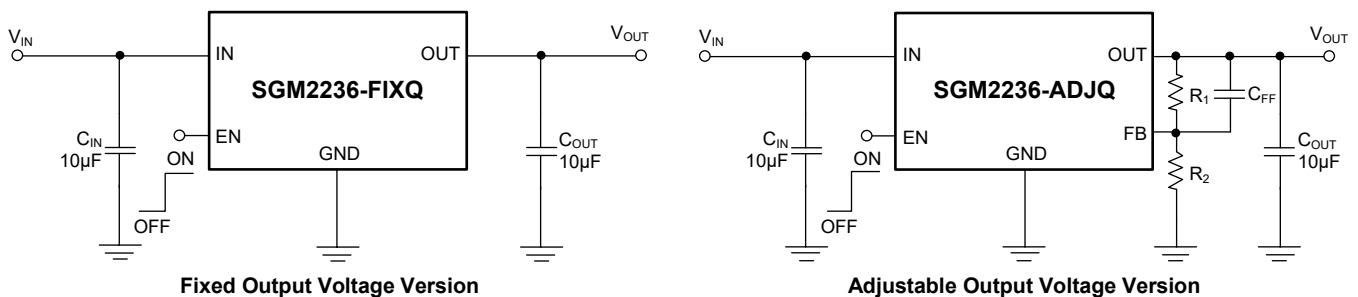


Figure 1. Typical Application Circuits

# SGM2236xQ Automotive 40V, 200mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

## PACKAGE/ORDERING INFORMATION

| MODEL        | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE       | ORDERING NUMBER      | PACKAGE MARKING            | PACKING OPTION      |
|--------------|---------------------|-----------------------------------|----------------------|----------------------------|---------------------|
| SGM2236-1.8Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-1.8QTDI6G/TR | 1A1<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-2.5Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-2.5QTDI6G/TR | 1A2<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-3.0Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-3.0QTDI6G/TR | 1A3<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-3.3Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-3.3QTDI6G/TR | 0UN<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-3.6Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-3.6QTDI6G/TR | 1A4<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-4.2Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-4.2QTDI6G/TR | 1A5<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-5.0Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-5.0QTDI6G/TR | 1A6<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-8.0Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-8.0QTDI6G/TR | 1A7<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-9.0Q | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-9.0QTDI6G/TR | 1A8<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-12Q  | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-12QTDI6G/TR  | 1A9<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-ADJQ | TDFN-2×2-6AL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-ADJQTDI6G/TR | 0UM<br>XXXX                | Tape and Reel, 3000 |
| SGM2236-1.8Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-1.8QTHI8G/TR | 1AATHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-2.5Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-2.5QTHI8G/TR | 1ABTHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-3.0Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-3.0QTHI8G/TR | 1ACTHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-3.3Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-3.3QTHI8G/TR | 158THI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-3.6Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-3.6QTHI8G/TR | 1ADTHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-4.2Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-4.2QTHI8G/TR | 1AETHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-5.0Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-5.0QTHI8G/TR | 170THI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-8.0Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-8.0QTHI8G/TR | 1AFTHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-9.0Q | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-9.0QTHI8G/TR | 1AGTHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |

# Automotive 40V, 200mA, Low Quiescent SGM2236xQ Current and Low Dropout Voltage Linear Regulator

## PACKAGE/ORDERING INFORMATION (continued)

| MODEL        | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE       | ORDERING NUMBER      | PACKAGE MARKING            | PACKING OPTION      |
|--------------|---------------------|-----------------------------------|----------------------|----------------------------|---------------------|
| SGM2236-12Q  | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-12QTHI8G/TR  | 1AHTHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |
| SGM2236-ADJQ | TDFN-3×3-8JL        | -40°C to +125°C (T <sub>A</sub> ) | SGM2236-ADJQTHI8G/TR | 1AITHI<br>XXXXXX<br>YYYYYY | Tape and Reel, 4000 |

## MARKING INFORMATION

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

### TDFN-2×2-6AL

Y Y Y — Serial Number  
 X X X X — Vendor Code  
 — Trace Code  
 — Date Code - Year

### TDFN-3×3-8JL

— Date Code - Year  
 — Trace Code  
 — Vendor Code  
 X X X X X  
 Y Y Y Y Y  
 — Lot Number

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  
 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  
 TDFN-3×3-8JL,  $\theta_{JA}$  ..... 50.2°C/W  
 TDFN-3×3-8JL,  $\theta_{JB}$  ..... 22.5°C/W  
 TDFN-3×3-8JL,  $\theta_{JC(TOP)}$  ..... 52.2°C/W  
 TDFN-3×3-8JL,  $\theta_{JC(BOT)}$  ..... 11°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:

1. For human body model (HBM), all pins comply with AEC-Q100-002 specification.
2. 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.

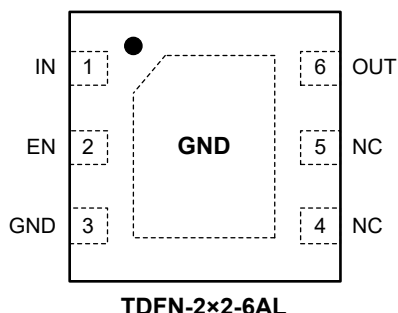
## DISCLAIMER

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

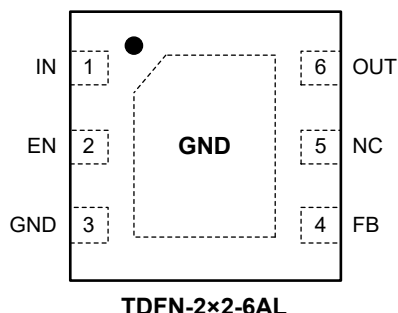
# SGM2236xQ Automotive 40V, 200mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

## PIN CONFIGURATIONS

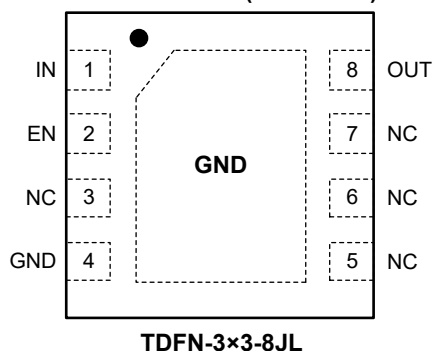
SGM2236-FIXQ (TOP VIEW)



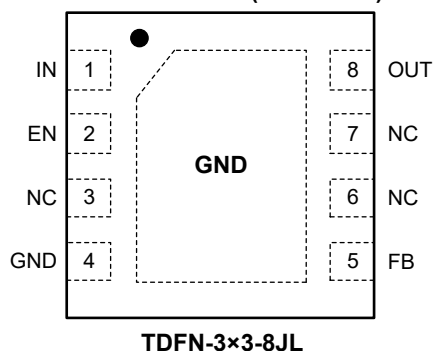
SGM2236-ADJQ (TOP VIEW)



SGM2236-FIXQ (TOP VIEW)



SGM2236-ADJQ (TOP VIEW)



## PIN DESCRIPTION

| PIN          |              | NAME | FUNCTION                                                                                                                                                                                                                             |
|--------------|--------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TDFN-2x2-6AL | TDFN-3x3-8JL |      |                                                                                                                                                                                                                                      |
| 1            | 1            | IN   | Input Supply Voltage Pin. It is recommended to use a 1 $\mu$ F 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            | 4            | GND  | Ground.                                                                                                                                                                                                                              |
| 4            | 5            | 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.                   |
|              |              | NC   | No Connection (Fixed Version Only).                                                                                                                                                                                                  |
| 6            | 8            | OUT  | Regulator Output Pin. It is recommended to use a ceramic capacitor with effective capacitance in the range of 1 $\mu$ F to 100 $\mu$ F to ensure stability. This ceramic capacitor should be placed as close as possible to OUT pin. |
| 5            | 3, 6, 7      | NC   | No Connection.                                                                                                                                                                                                                       |
| 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.                                                                       |

# SGM2236xQ Automotive 40V, 200mA, Low Quiescent Current and Low Dropout Voltage Linear Regulator

## FUNCTIONAL BLOCK DIAGRAMS

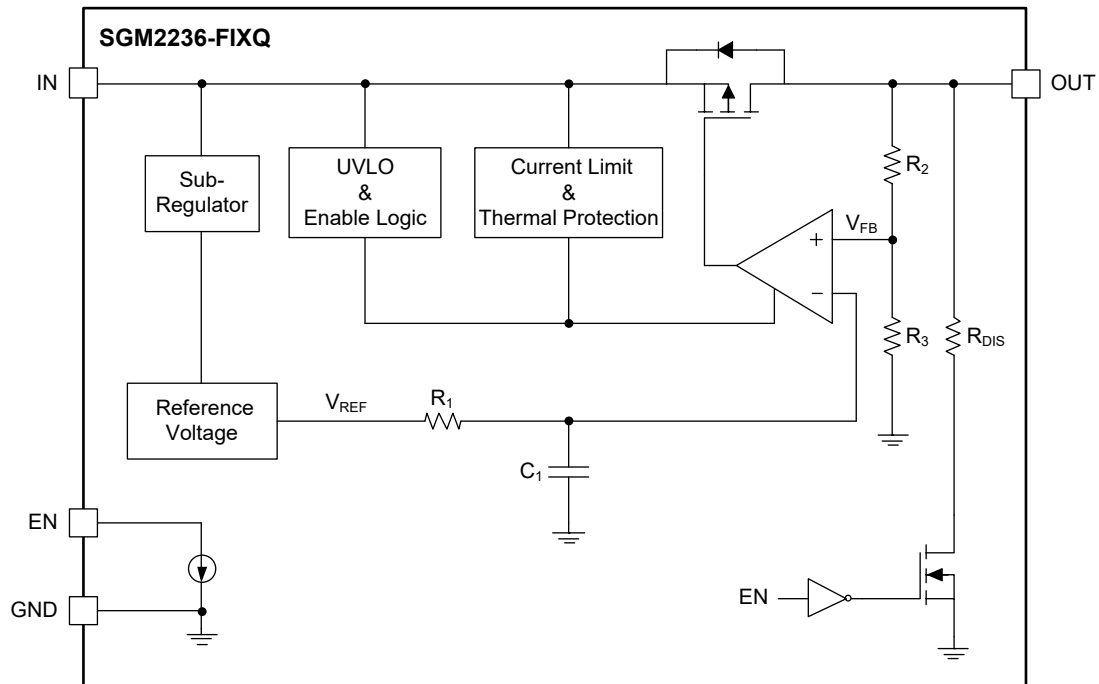


Figure 2. Block Diagram of Fixed Output Version

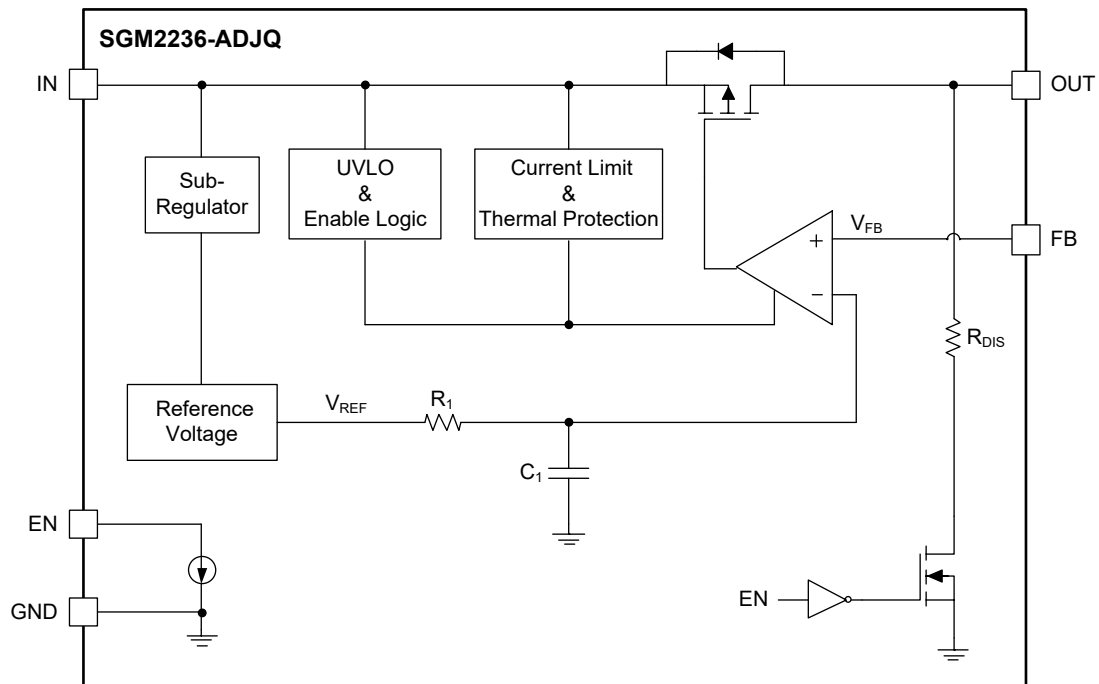
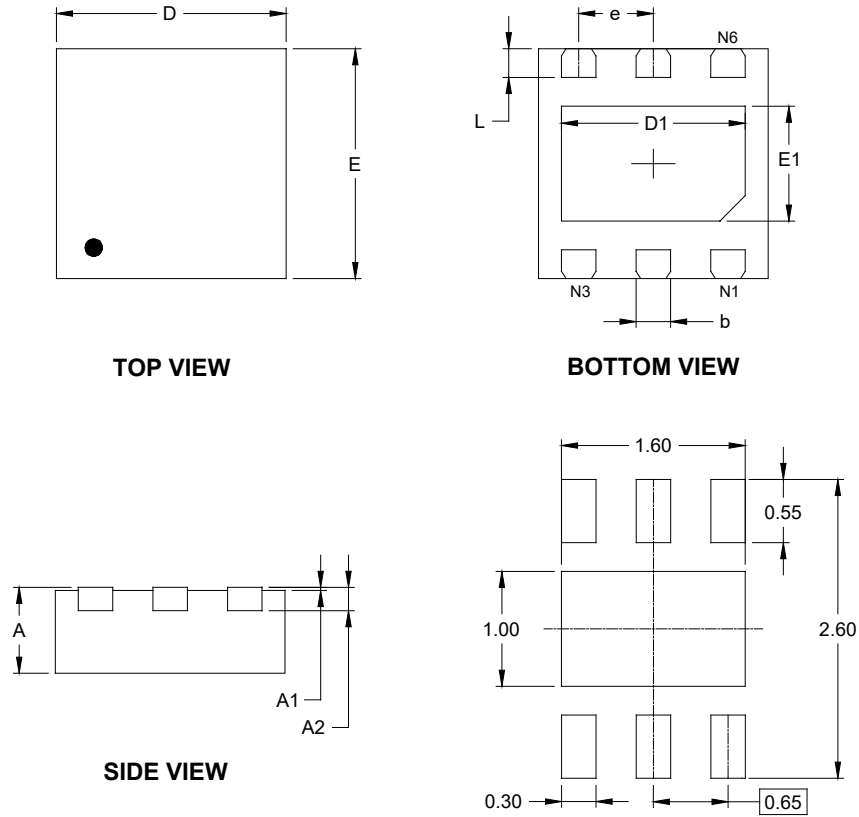


Figure 3. Block Diagram of Adjustable Output Version

## PACKAGE OUTLINE DIMENSIONS

### TDFN-2×2-6AL

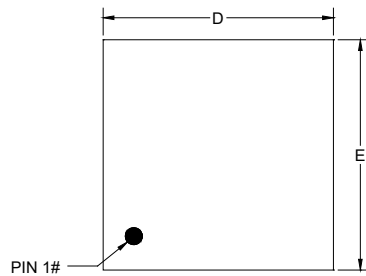


| Symbol | Dimensions<br>In Millimeters |       | Dimensions<br>In Inches |       |
|--------|------------------------------|-------|-------------------------|-------|
|        | MIN                          | MAX   | MIN                     | MAX   |
| A      | 0.700                        | 0.800 | 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 |

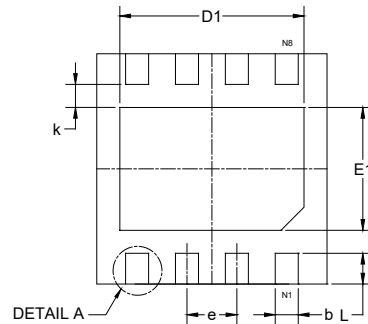
NOTE: This drawing is subject to change without notice.

## PACKAGE OUTLINE DIMENSIONS

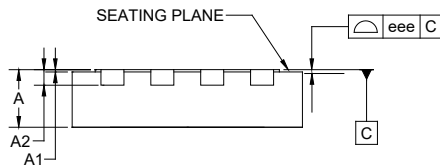
### TDFN-3×3-8JL



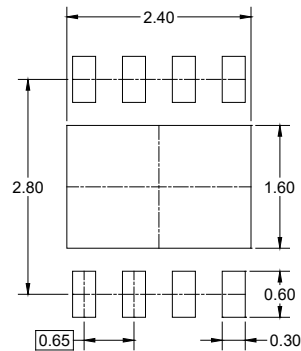
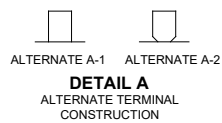
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

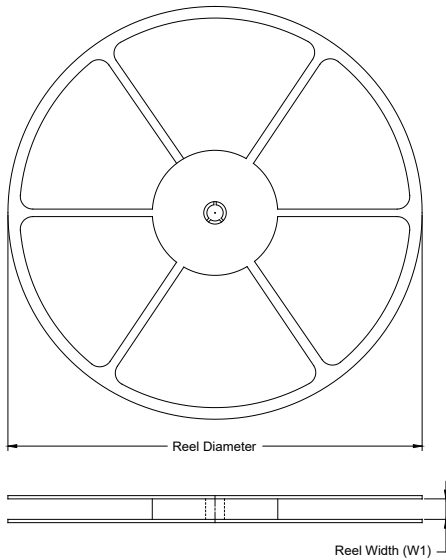
| Symbol | Dimensions In Millimeters |     |       |
|--------|---------------------------|-----|-------|
|        | MIN                       | NOM | MAX   |
| A      | 0.700                     | -   | 0.800 |
| A1     | 0.000                     | -   | 0.050 |
| A2     | 0.203 REF                 |     |       |
| b      | 0.250                     | -   | 0.350 |
| D      | 2.900                     | -   | 3.100 |
| D1     | 2.300                     | -   | 2.500 |
| E      | 2.900                     | -   | 3.100 |
| E1     | 1.500                     | -   | 1.700 |
| e      | 0.650 BSC                 |     |       |
| k      | 0.300 REF                 |     |       |
| L      | 0.300                     | -   | 0.500 |
| eee    | 0.080                     |     |       |

NOTE: This drawing is subject to change without notice.

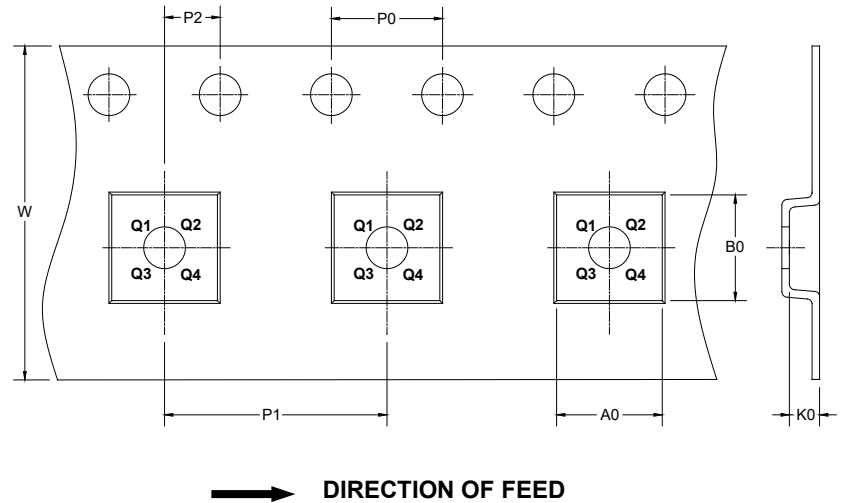
## PACKAGE INFORMATION

### 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

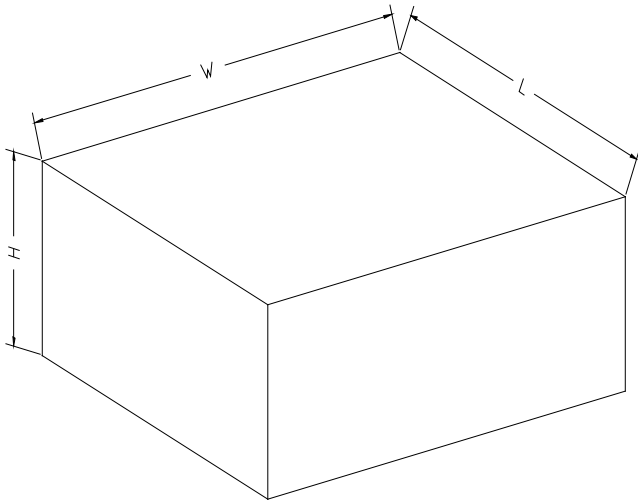
| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TDFN-2×2-6AL | 7"            | 9.5                | 2.30    | 2.30    | 1.10    | 4.0     | 4.0     | 2.0     | 8.0    | Q1            |
| TDFN-3×3-8JL | 13"           | 12.4               | 3.35    | 3.35    | 1.13    | 4.0     | 8.0     | 2.0     | 12.0   | Q1            |

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