

GENERAL DESCRIPTION

The SGM33685B is a power amplifier (PA) which can support 746MHz to 756MHz. The device uses advanced InGaP/GaAs HBT (heterojunction bipolar transistor) process, so it features high linearity, high efficiency and high ruggedness.

The SGM33685B is available in a Green TQFN-3×3-16L package.

APPLICATIONS

Repeater
ISM Band PA
LTE Femtocell

FEATURES

- **Supply Voltage: 3.3V and 5V**
- **Signal Gain at 5V:**
33dB at 746MHz to 756MHz
- **Signal Gain at 3.3V:**
32dB at 746MHz to 756MHz
- **P_{1dB} Output Power at 5V:**
30.0dBm at 746MHz to 756MHz
- **P_{1dB} Output Power at 3.3V:**
29.0dBm at 746MHz to 756MHz
- **On-Chip 50Ω Matching for Input Port**
- **Available in a Green TQFN-3×3-16L Package**

BLOCK DIAGRAM

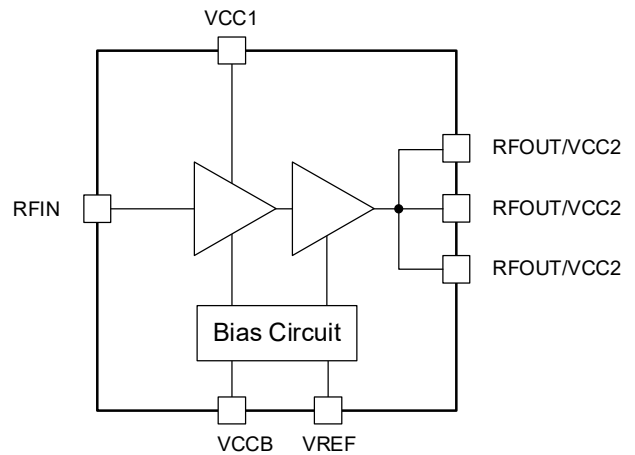


Figure 1. SGM33685B Block Diagram

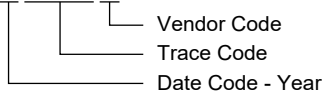
PACKAGE/ORDERING INFORMATION

| MODEL | PACKAGE DESCRIPTION | SPECIFIED TEMPERATURE RANGE | ORDERING NUMBER | PACKAGE MARKING | PACKING OPTION |
|-----------|---------------------|-----------------------------|--------------------|-----------------|---------------------|
| SGM33685B | TQFN-3x3-16L | -40°C to +105°C | SGM33685BGTQ16G/TR | 0AITQ XXXXX | Tape and Reel, 4000 |

MARKING INFORMATION

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

XXXXX



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_{CC} 5.5V
- Bias Control Voltage, V_{REF} 3.2V
- RFIN, Under 50Ω Output Terminated, P_{IN} 10dBm
- Storage Temperature Range -40°C to +150°C
- Lead Temperature (Soldering, 10s) +260°C
- ESD Susceptibility ⁽¹⁾
- HBM..... ±1000V

NOTE:

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

RECOMMENDED OPERATING CONDITIONS

- Operating Frequency Range..... 746MHz to 756MHz
- Supply Voltage Range, V_{CC1} , V_{CC2} , V_{CCB} 3.3V to 5.0V
- Bias Control Voltage, V_{REF} 2.5V to 2.9V
- 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.

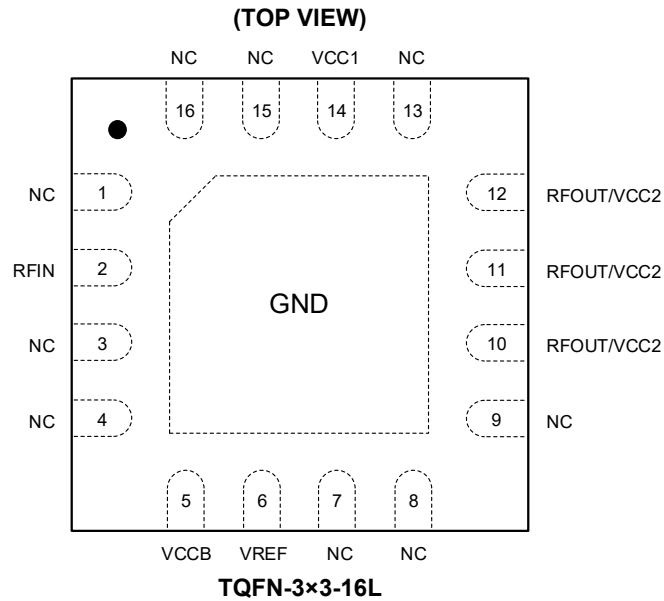
ESD SENSITIVITY CAUTION

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

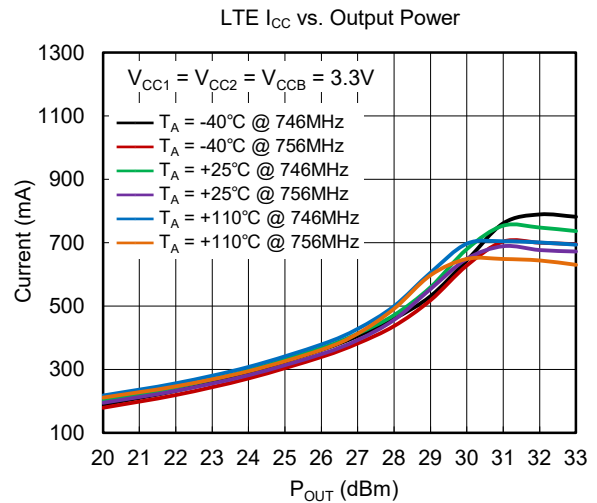
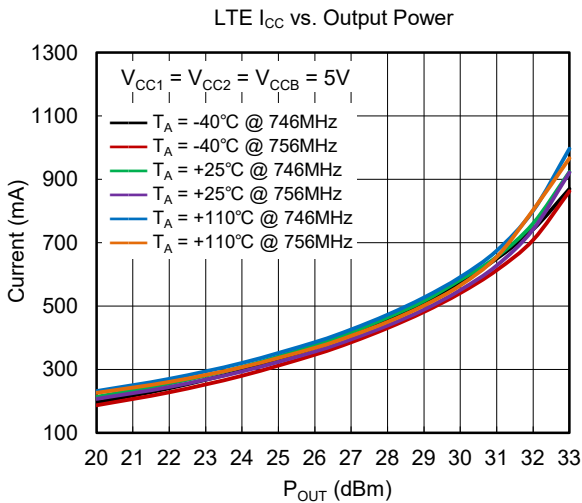
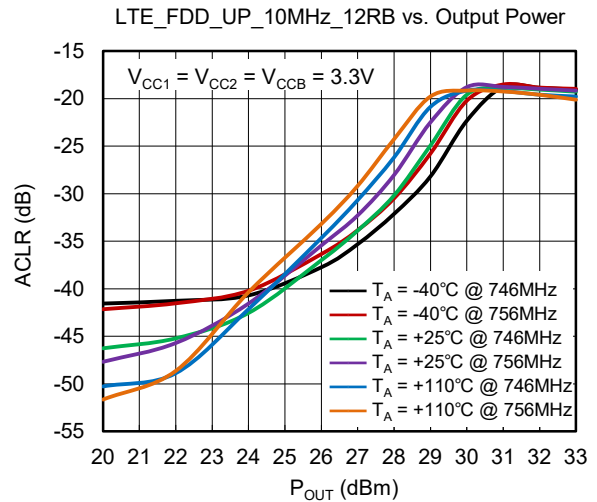
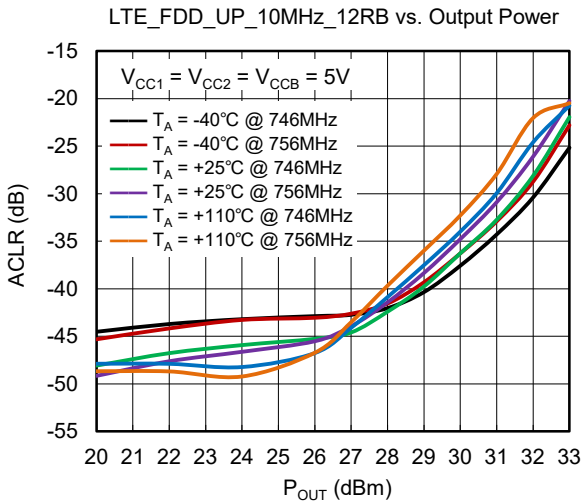
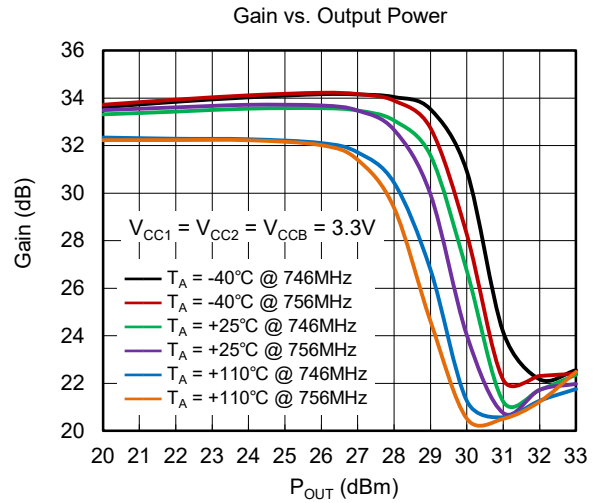
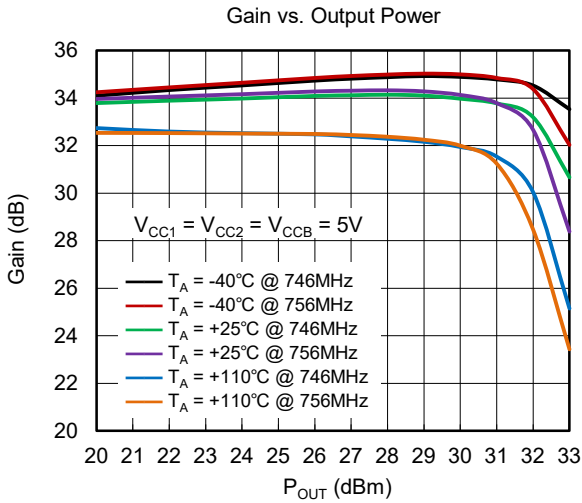
| PIN | NAME | FUNCTION |
|------------------------------|------------|--|
| 1, 3, 4, 7, 8, 9, 13, 15, 16 | NC | No Connection. These pins cannot be connected to ground. |
| 2 | RFIN | RF Input. |
| 5 | VCCB | Power Supply for Bias Control Circuit. |
| 6 | VREF | Bias Control Voltage. |
| 10, 11, 12 | RFOUT/VCC2 | RF Output and Power Supply for Power Stage-2. These pins are connected internally. |
| 14 | VCC1 | Power Supply for Power Stage-1. |
| Exposed Pad | GND | Ground. Exposed pad must be connected to ground. |

ELECTRICAL CHARACTERISTICS(T_A = +25°C, 50Ω system with V_{CC1} = V_{CC2} = V_{CCB} = 5V and 3.3V, V_{REF} = 2.8V, unless otherwise noted.)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNITS |
|---|------------------|---|------|------|-----|-------|
| Characteristics at V_{CC} = 5V | | | | | | |
| Frequency Range | f ₀ | | 746 | 751 | 756 | MHz |
| Small Signal Gain | G | P _{IN} = -30dBm | 31.5 | 33 | | dB |
| 1dB Output Compression Point | P _{1dB} | 1dB gain compression at 751MHz, CW | | 30 | | dBm |
| Power Added Efficiency | PAE | P _{OUT} = 30dBm | | 30 | | % |
| Current Consumption | I _{CC} | Quiescent (no RF) | | 103 | 145 | mA |
| | | P _{OUT} = 30dBm | | 620 | 750 | |
| Bias Current | I _{REF} | Quiescent (no RF) | | 3 | | mA |
| Input Return Loss | RL _I | P _{IN} = -20dBm | | 20 | | dB |
| Output Return Loss | RL _O | P _{IN} = -20dBm | | 5 | | dB |
| 2 nd Harmonics | 2f ₀ | f ₀ = 751MHz, P _{OUT} = 30dBm | | -12 | | dBm |
| 3 rd Harmonics | 3f ₀ | f ₀ = 751MHz, P _{OUT} = 30dBm | | -33 | | dBm |
| Turn On/Off Time | t _S | 50% control to 90/10%RF | | 200 | 300 | ns |
| Stability | S | Load VSWR = 6:1, all phase angles, RBW = 1MHz, P _{OUT} = 30dBm | | -36 | | dBm |
| Ruggedness | Ru | No damage or permanent degradation at P _{OUT} = 32dBm, all phases angles | | 10:1 | | VSWR |
| Characteristics at V_{CC} = 3.3V | | | | | | |
| Frequency Range | f ₀ | | 746 | | 756 | MHz |
| Small Signal Gain | G | P _{IN} = -30dBm | 31 | 32 | | dB |
| 1dB Output Compression Point | P _{1dB} | 1dB gain compression at 751MHz, CW | | 29 | | dBm |
| Power Added Efficiency | PAE | P _{OUT} = 27dBm | | 33 | | % |
| Current Consumption | I _{CC} | Quiescent (no RF) | | 94 | 140 | mA |
| | | P _{OUT} = 27dBm | | 458 | 580 | |
| Bias Current | I _{REF} | Quiescent (no RF) | | 3 | | mA |
| Input Return Loss | RL _I | P _{IN} = -20dBm | | 20 | | dB |
| Output Return Loss | RL _O | P _{IN} = -20dBm | | 5 | | dB |
| 2 nd Harmonics | 2f ₀ | f ₀ = 751MHz, P _{OUT} = 27dBm | | -15 | | dBm |
| 3 rd Harmonics | 3f ₀ | f ₀ = 751MHz, P _{OUT} = 27dBm | | -37 | | dBm |
| Turn On/Off Time | t _S | 50% control to 90/10%RF | | 200 | 300 | ns |

TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25°C, 50Ω system with V_{CC1} = V_{CC2} = V_{CCB} = 5V and 3.3V, V_{REF} = 2.8V, unless otherwise noted.



TYPICAL APPLICATION CIRCUIT

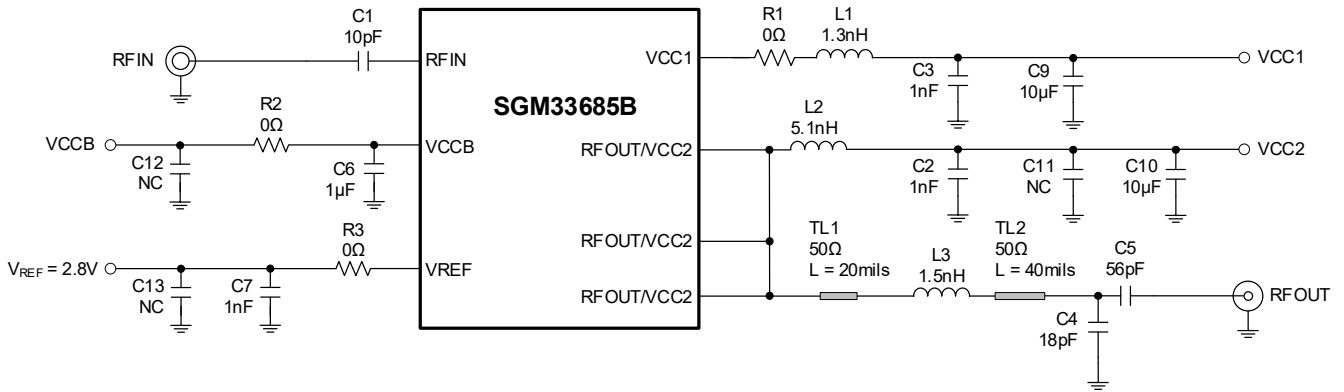


Figure 2. SGM33685B Typical Application Circuit

Table 1. Evaluation Board Bill of Material

| COMPONENT | VALUE | DESCRIPTION |
|---------------|-------|-------------------------------|
| IC | | SGM33685B |
| C1 | 10pF | Matching capacitor |
| C2, C3, C7 | 1nF | De-coupling capacitor |
| C6 | 1μF | De-coupling capacitor |
| C4 | 18pF | Matching capacitor (GJM) |
| C5 | 56pF | DC blocking capacitor (GJM) |
| C9, C10 | 10μF | Matching capacitor |
| C11, C12, C13 | NC | No connection |
| R1, R2, R3 | 0Ω | |
| L1 | 1.3nH | RF choke inductor |
| L2 | 5.1nH | RF choke inductor (size 0603) |
| L3 | 1.5nH | Matching inductor |

EVALUATION BOARD LAYOUT

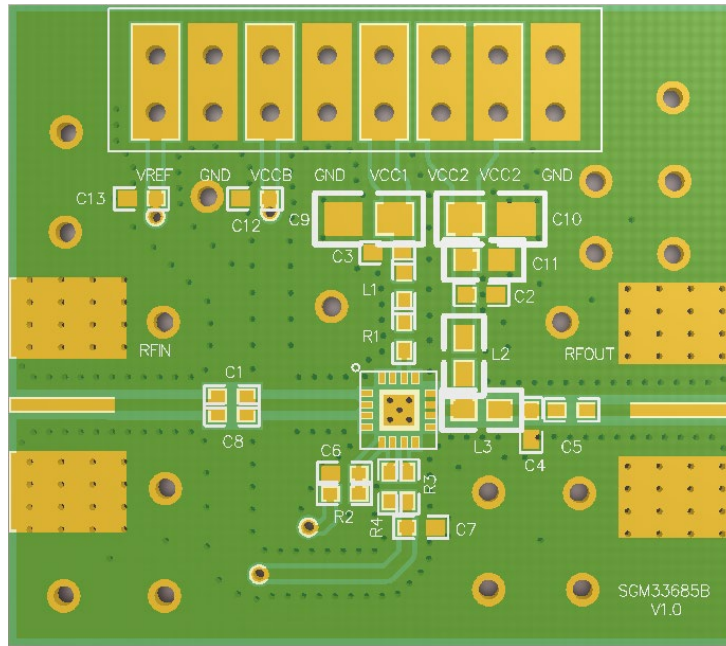


Figure 3. Evaluation Board Layout

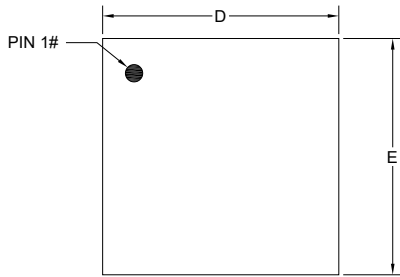
REVISION HISTORY

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

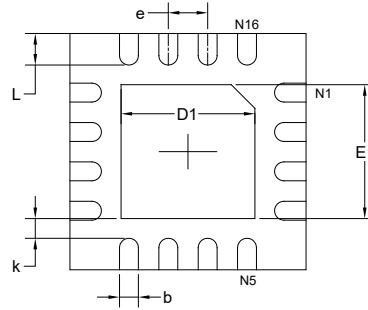
| JUNE 2026 – REV.A.1 to REV.A.2 | Page |
|--|---------|
| Updated Recommended Operating Conditions, Typical Application Circuit and Evaluation Board Layout..... | 2, 6, 7 |
| MAY 2024 – REV.A to REV.A.1 | Page |
| Updated Absolute Maximum Ratings..... | 2 |
| Changes from Original (FEBRUARY 2024) to REV.A | Page |
| Changed from product preview to production data..... | All |

PACKAGE OUTLINE DIMENSIONS

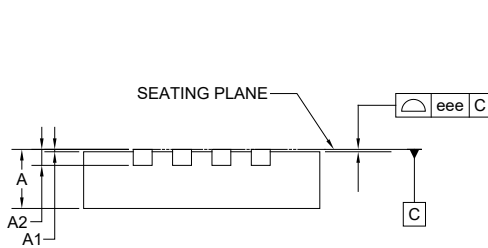
TQFN-3×3-16L



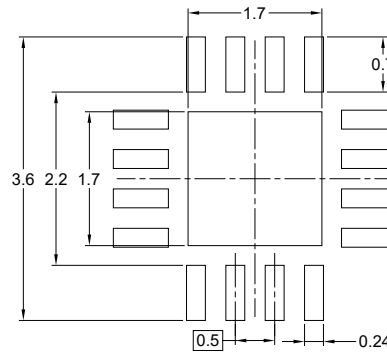
TOP VIEW



BOTTOM VIEW



SIDE VIEW



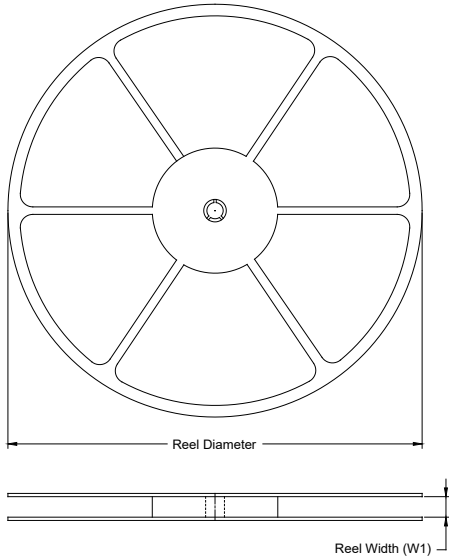
RECOMMENDED LAND PATTERN (Unit: mm)

| Symbol | Dimensions In Millimeters | | Dimensions 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 | 2.900 | 3.100 | 0.114 | 0.122 |
| D1 | 1.600 | 1.800 | 0.063 | 0.071 |
| E | 2.900 | 3.100 | 0.114 | 0.122 |
| E1 | 1.600 | 1.800 | 0.063 | 0.071 |
| k | 0.200 MIN | | 0.008 MIN | |
| b | 0.180 | 0.300 | 0.007 | 0.012 |
| e | 0.500 TYP | | 0.020 TYP | |
| L | 0.300 | 0.500 | 0.012 | 0.020 |
| eee | 0.080 | | 0.003 | |

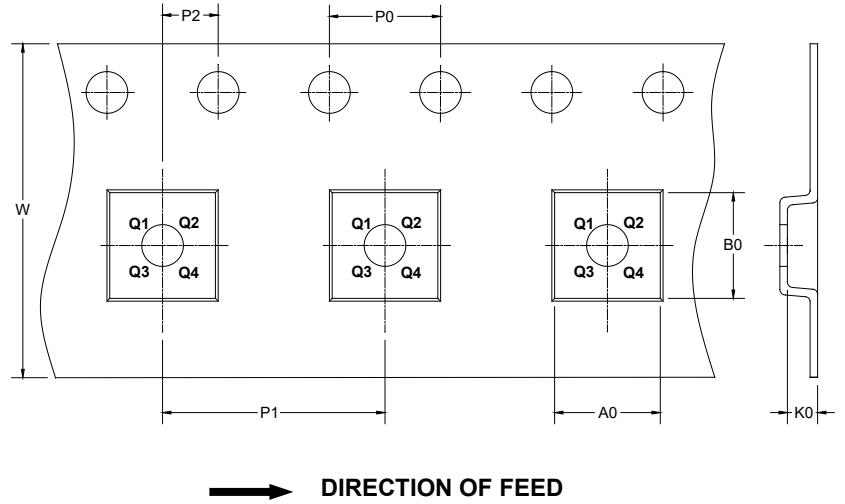
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

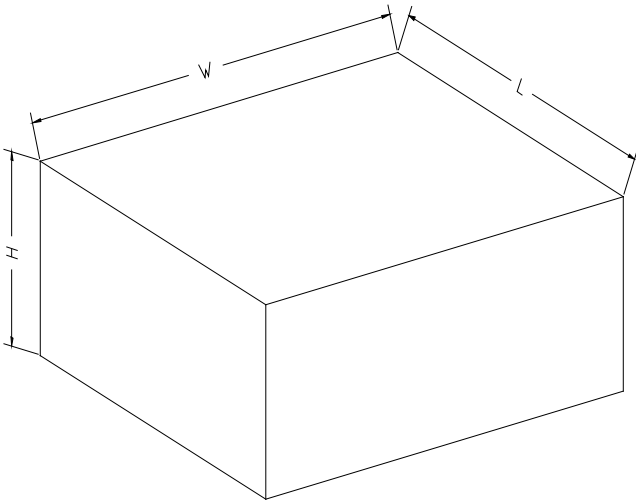
KEY PARAMETER LIST OF TAPE AND REEL

| Package Type | Reel Diameter | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P0 (mm) | P1 (mm) | P2 (mm) | W (mm) | Pin1 Quadrant |
|--------------|---------------|--------------------|---------|---------|---------|---------|---------|---------|--------|---------------|
| TQFN-3x3-16L | 13" | 12.4 | 3.30 | 3.30 | 1.10 | 1.50 | 4.0 | 8.0 | 2.0 | 12.0 |

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