



# SGM6036

## 450nA Ultra-Low Power, Buck Converter with 600mA Output Current

### GENERAL DESCRIPTION

The SGM6036 family is a 600mA, 1.4MHz synchronous buck DC/DC converter with 450nA ultra-low quiescent current, which is ideal for powering special needs of ultra-low power applications and long battery life.

The SGM6036 operation voltage range is from 1.8V to 5.5V allowing the use of a regulated 5V input. The SGM6036 is available in both adjustable and fixed output voltage versions. The output voltage of SGM6036 can be programmed by an external resistor divider in adjustable version.

The SGM6036 delivers an output current of 600mA with a peak inductor current of 940mA. Besides, the SGM6036 series has UVLO function. It is disabled when the voltage on VIN reaches the UVLO condition. The SGM6031's UVLO level is continuously monitored.

Only inductor, C<sub>IN</sub> and C<sub>OUT</sub> capacitors are needed as external components to make a buck DC/DC converter solution. The SGM6036 is available in a Green UTDFN-1.5×2-6L package. It is rated over the -40°C to +85°C temperature range.

### FEATURES

- **High Efficiency at Low Output Currents:**  
Up to 90% with I<sub>OUT</sub> = 0.1mA
- **Ultra-Low Power Buck Converters**
- **600mA Maximum Output Current**
- **1.8V to 5.5V Input Voltage Range**
- **Fixed Output Voltages: 1.0V, 1.2V and 3.3V**
- **Output Adjustable from 1.0V to 3.3V**
- **450nA (TYP) Quiescent Current**
- **100% Duty Cycle (Pass Mode)**
- **-40°C to +85°C Operating Temperature Range**
- **Available in Green UTDFN-1.5×2-6L Package**

### APPLICATIONS

Energy Harvest Devices  
Ultra-Low Power Applications  
Low-Power Wireless Monitoring  
Backup Power Supply Circuits  
2-Cell and 3-Cell Alkaline-Powered Systems  
Portable Game Consoles  
Wearable Devices  
Thermal Electric Generator Harvesting  
Wireless Sensor Networks  
Smart Building Controls  
Environmental Monitoring

# 450nA Ultra-Low Power, Buck Converters with 600mA Output Current

## SGM6036

### PACKAGE/ORDERING INFORMATION

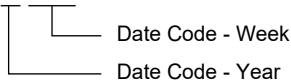
MODEL	V <sub>OUT</sub> (V)	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM6036-1.0	1.0	UTDFN-1.5×2-6L	-40°C to +85°C	SGM6036-1.0YUDT6G/TR	C30 XXX	Tape and Reel, 3000
SGM6036-1.2	1.2	UTDFN-1.5×2-6L	-40°C to +85°C	SGM6036-1.2YUDT6G/TR	C31 XXX	Tape and Reel, 3000
SGM6036-3.3	3.3	UTDFN-1.5×2-6L	-40°C to +85°C	SGM6036-3.3YUDT6G/TR	MP3 XXX	Tape and Reel, 3000
SGM6036-ADJ	ADJ	UTDFN-1.5×2-6L	-40°C to +85°C	SGM6036-ADJYUDT6G/TR	C37 XXX	Tape and Reel, 3000

### MARKING INFORMATION

NOTE: XXX = Date Code.

YYY — Serial Number

XXX



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

Input Voltage Range on VIN, EN, VOUT, FB, SW	-0.3V to 6V
Peak Currents VIN, VOUT	1100mA
Typical Thermal Resistance	
UTDFN-1.5×2-6L, $\theta_{JA}$	130°C/W
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM	7000V
MM	400V
CDM	1000V

### RECOMMENDED OPERATING CONDITIONS

Input Voltage Range	1.8V to 5.5V
Input Capacitance, C <sub>IN</sub>	22µF (MIN)
Output Capacitance, C <sub>OUT</sub>	10µF (MIN), 22µF (TYP)
Inductance, L	4.7µH (MIN)
Operating Junction Temperature Range	-40°C to +125°C
Operating Ambient Temperature Range	-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.

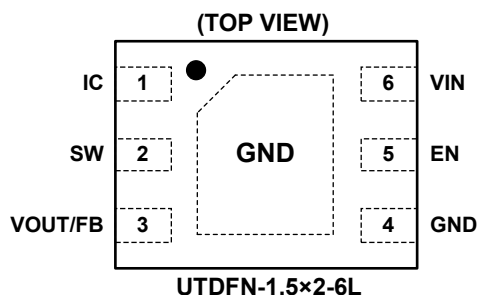
### ESD SENSITIVITY CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. 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 very small parametric changes could cause the device not to meet its 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

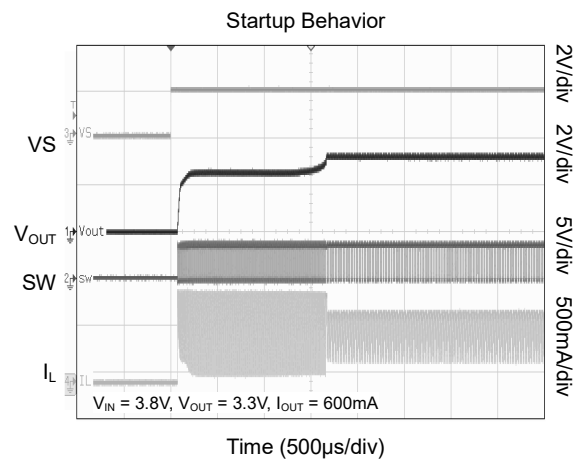
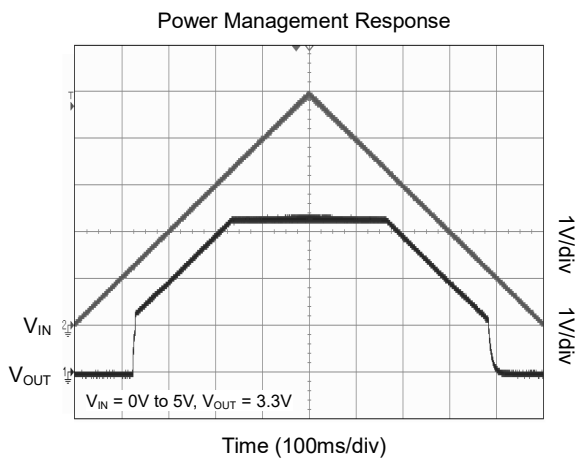
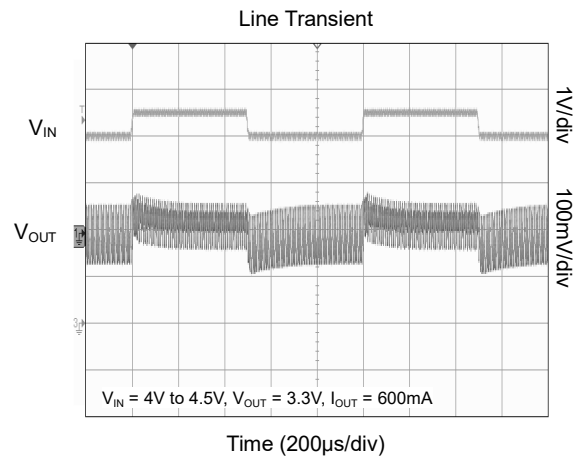
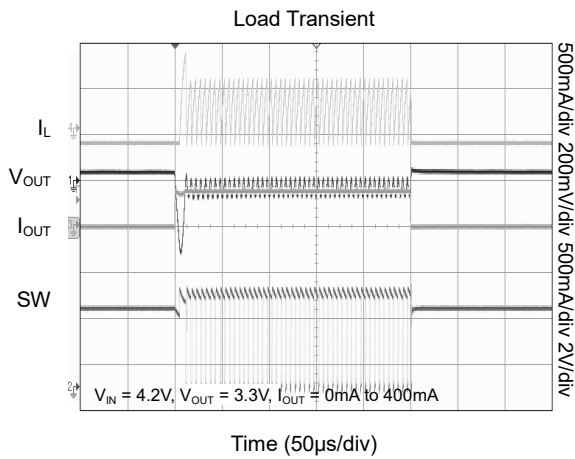
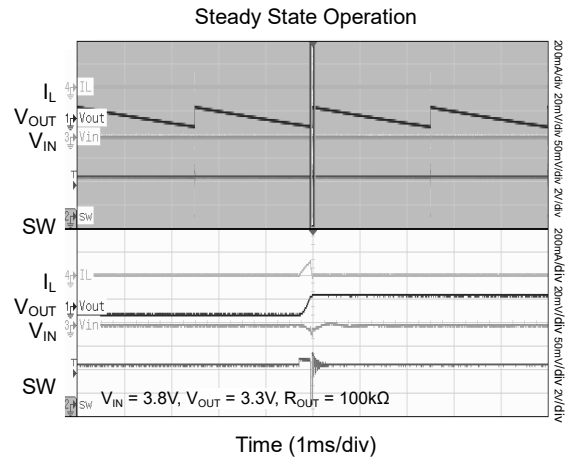
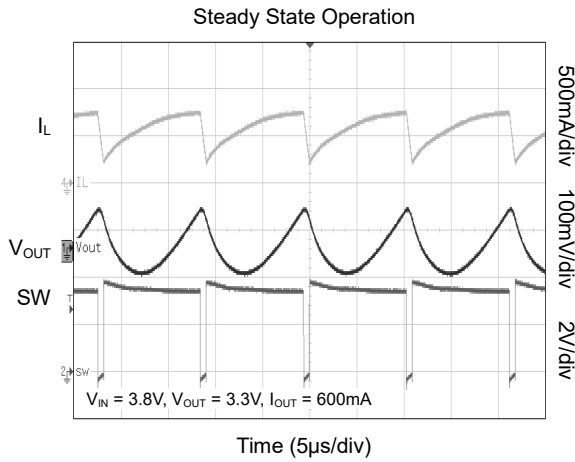
PIN	NAME	FUNCTION
1	IC	For Internal Connection.
2	SW	Switching Node. Connect to output inductor.
3	VOUT	Step-Down Regulator Output.
	FB	Feedback Input (adjustable voltage version only). The voltage at this pin is regulated to 1.0V. Connected to the resistor divider between output and ground to set output voltage.
4	GND	Ground. Power and IC ground. All signals are referenced to this pin.
5	EN	Enable Input. Input logic high to enable this circuit and logic low to shut down. Do not leave this pin unconnected. EN is recommended to be effective 10ms later than VIN.
6	VIN	Input Voltage. Connect to input power source.
Exposed Pad	GND	Connect to GND.

**ELECTRICAL CHARACTERISTICS**(V<sub>IN</sub> = 3.6V, V<sub>OUT</sub> = 3.3V, Full = -40°C to +85°C, typical values are at T<sub>A</sub> = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
<b>Quiescent Current</b>							
Buck Enabled State	I <sub>Q</sub>	No load, no switching	+25°C		450	715	nA
<b>Output</b>							
Feedback Voltage	V <sub>FB</sub>		+25°C	0.98	1.0	1.02	V
Output Accuracy			+25°C	-2		2	%
			Full	-3		3	
Output Line Regulation		V <sub>IN</sub> = 3.6V to 5.5V, I <sub>OUT</sub> = 100μA	+25°C		0.3		%/V
Output Load Regulation		I <sub>OUT</sub> = 100μA to 600mA	+25°C		0.005		%/mA
Output Ripple		I <sub>OUT</sub> = 1mA	+25°C		15		mV <sub>PP</sub>
<b>Power Switch</b>							
High-side Switch On-Resistance	R <sub>DS(ON)</sub>		+25°C		510	620	mΩ
Low-side Switch On-Resistance			+25°C		540	710	
Cycle-by-Cycle Current Limit	I <sub>LIM</sub>		+25°C	790	940	1100	mA
Maximum Switching Frequency	f <sub>SW</sub>		+25°C		1.4		MHz
<b>Input</b>							
Input Under Voltage Protection	V <sub>IN_UVLO</sub>	V <sub>IN</sub> falling	+25°C	1.14	1.21		V
<b>EN</b>							
Voltage for EN High Setting	V <sub>IH</sub>		Full	1.1			V
Voltage for EN Low Setting	V <sub>IL</sub>		Full			0.4	V
<b>Thermal Shutdown</b>							
Thermal Shutdown	T <sub>TSD</sub>				160		°C
Thermal Shutdown Hysteresis	T <sub>HYS</sub>				20		°C

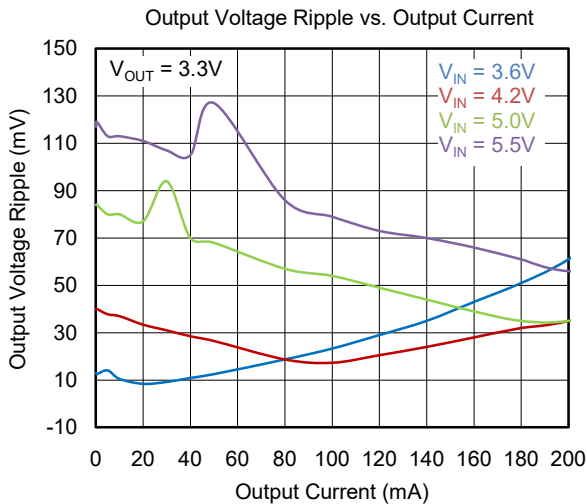
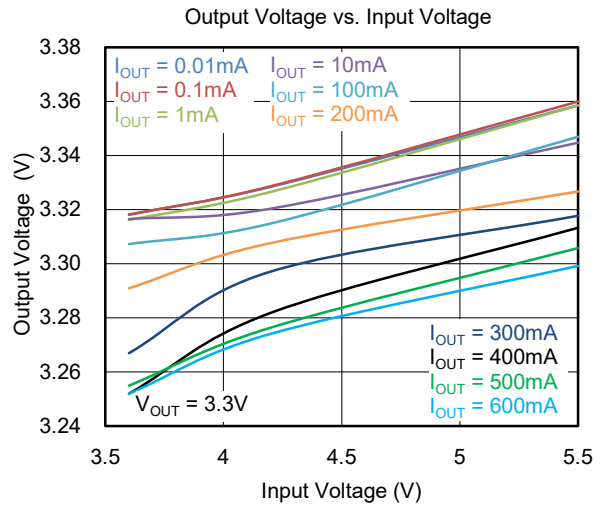
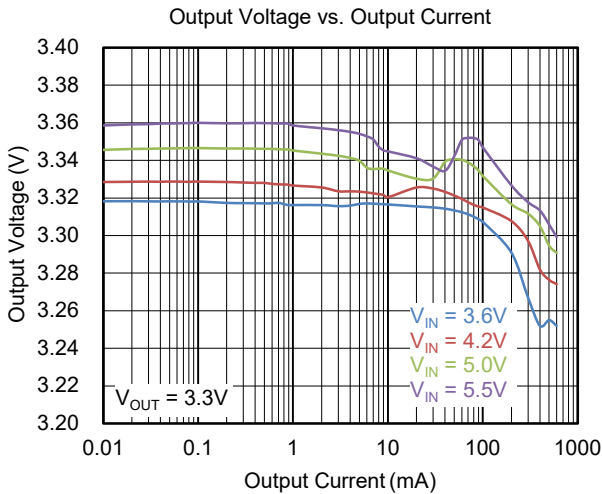
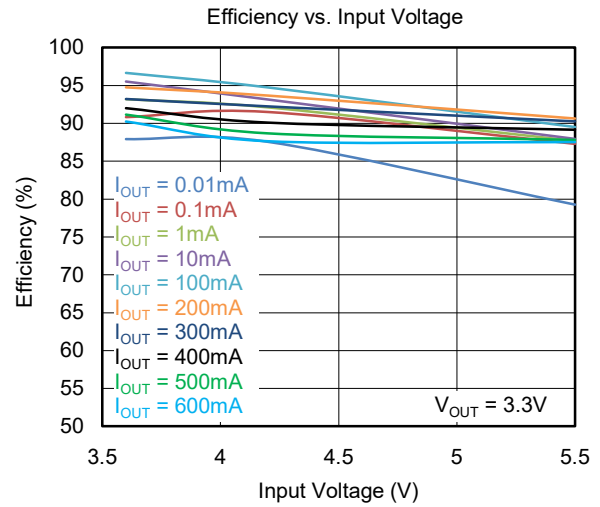
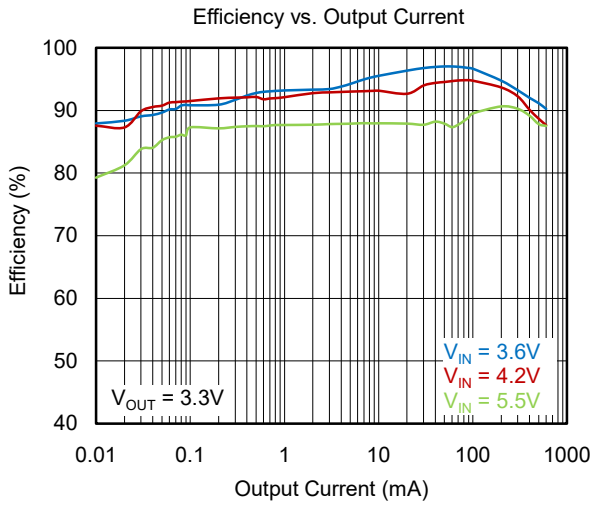
TYPICAL PERFORMANCE CHARACTERISTICS

T<sub>A</sub> = +25°C, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T<sub>A</sub> = +25°C, unless otherwise noted.



FUNCTIONAL BLOCK DIAGRAM

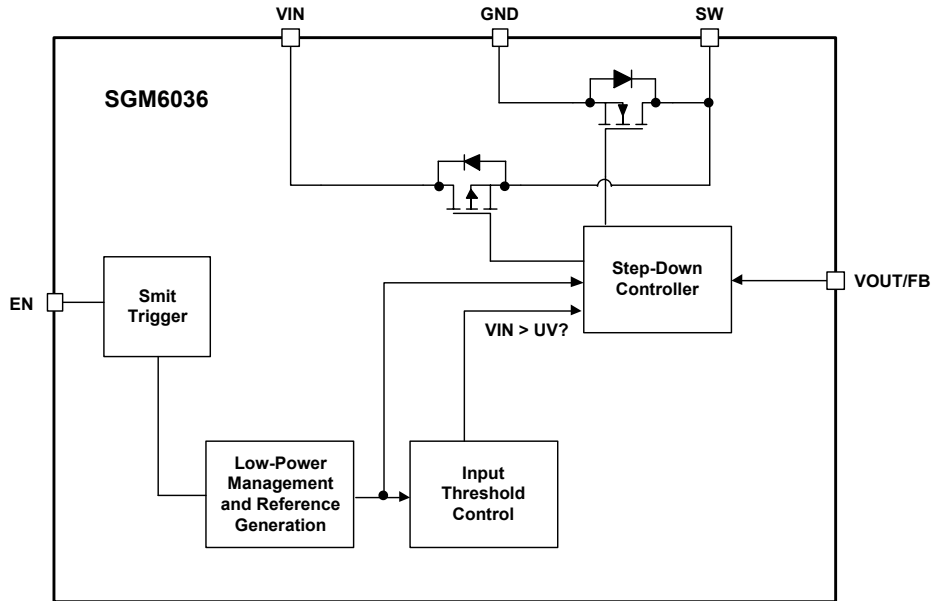


Figure 1. Block Diagram

TYPICAL APPLICATION CIRCUITS

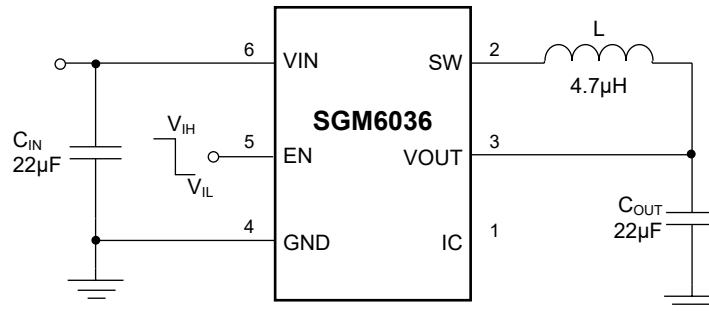


Figure 2. Fixed Voltage Typical Application Circuit

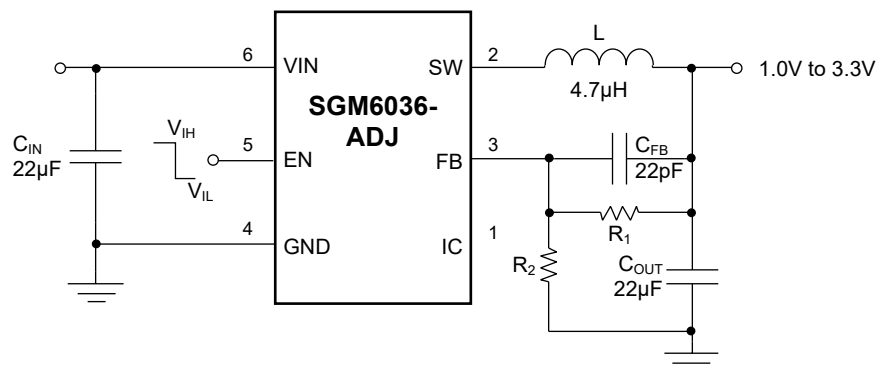


Figure 3. Adjustable Voltage Typical Application Circuit

**REVISION HISTORY**

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

<b>NOVEMBER 2020 – REV.A to REV.A.1</b>	<b>Page</b>
Updated Fixed Output Voltages .....	All

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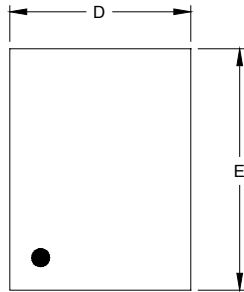
<b>Changes from Original (MARCH 2019) to REV.A</b>	<b>Page</b>
Changed from product preview to production data.....	All

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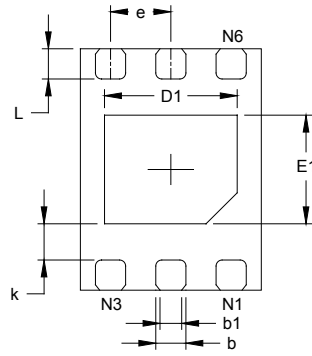


PACKAGE OUTLINE DIMENSIONS

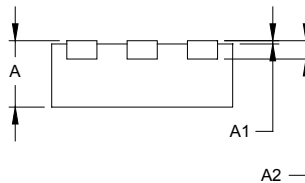
UTDFN-1.5×2-6L



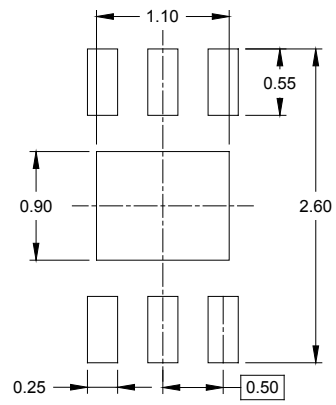
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.500	0.600	0.020	0.024
A1	0.000	0.050	0.000	0.002
A2	0.152 REF		0.006 REF	
D	1.400	1.600	0.055	0.063
D1	1.000	1.200	0.039	0.047
E	1.900	2.100	0.075	0.083
E1	0.800	1.000	0.031	0.039
k	0.300 REF		0.012 REF	
b	0.200	0.300	0.008	0.012
b1	0.180 REF		0.007 REF	
e	0.500 BSC		0.020 BSC	
L	0.200	0.300	0.008	0.012

# 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
UTDFN-1.5×2-6L	7"	9.5	1.70	2.30	0.75	4.0	4.0	2.0	8.0	Q2

000001

# 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

DD0002