SGM3741B
High Efficiency, 4-Channel, 38V Boost White LED Driver

GENERAL DESCRIPTION

The SGM3741B is a high efficiency constant-current white LED driver with a 600kHz boost DC/DC converter. With an internal 38V/2.2A power MOSFET, the SGM3741B supports up to 10 white LEDs in series and achieves uniform brightness. The SGM3741B supports two PWM signals to control the backlight brightness. The PWM frequency is in the range from 2kHz to 60kHz, thus avoiding audible noise from inductor or ceramic capacitor. Combining the two PWM signals gets very wide brightness dimming range. The PWM pin is always used for Content Adaptive Brightness Control (CABC).

The supply voltage operates from 3V to 18V and is well suited for various applications powered by 1-cell or 2-cell batteries.

The SGM3741B includes a comprehensive set of protection features such as 38.5V over-voltage protection, cycle-by-cycle current limit and thermal shutdown. Built-in soft-start circuitry avoids excessive inrush current during startup.

The SGM3741B is available in a Green TQFN-3×3-16L package. It operates over an ambient temperature range of -40℃ to +85℃.

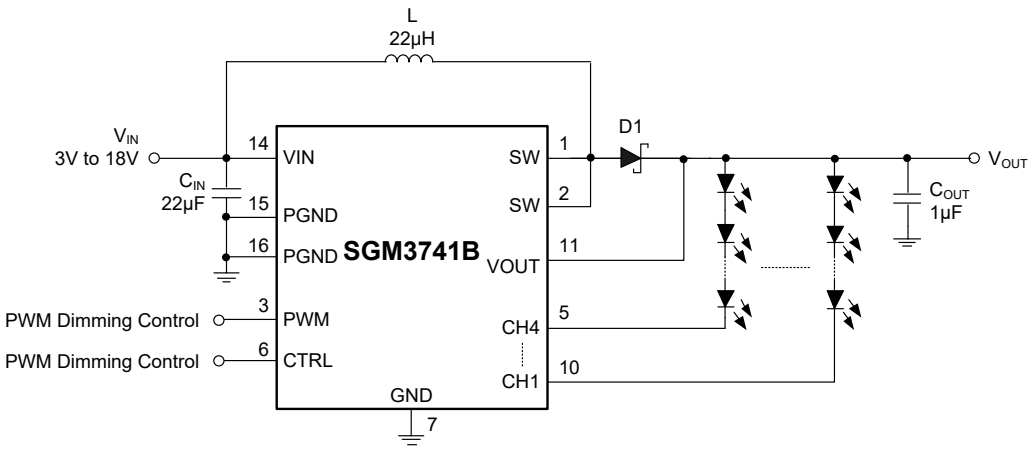
FEATURES

- **Input Voltage Range: 3V to 18V**
- **Integrated 38V/2.2A Switch with 0.25Ω On-Resistance**
- **High Efficiency Boost Bias Supply**
- **Support up to 10 LEDs in Series per String**
- **Switching Frequency: 600kHz**
- **25mA Constant Current per String**
- **Dual PWM Dimming Scheme for Large Dimming Range**
- **PWM Dimming Frequency: 2kHz to 60kHz**
- **1MΩ Pull-Down Resistor on CTRL Pin**
- **500kΩ Pull-Up Resistor on PWM Pin**
- **Automatic Soft-Start for Reducing Inrush Current**
- **No Leakage from V_{IN} to GND through LED String**
- **Protection Features**
  - **Over-Voltage Protection**
  - **Cycle-by-Cycle Current Limit**
  - **Thermal Shutdown**
- **-40℃ to +85℃ Operating Temperature Range**
- **Available in a Green TQFN-3×3-16L Package**

APPLICATIONS

TFT LCD Displays
Smart Phones

TYPICAL APPLICATION

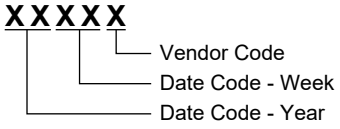


PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM3741B	TQFN-3×3-16L	-40℃ to +85℃	SGM3741BYTQ16G/TR	3741BTQ XXXXX	Tape and Reel, 4000

MARKING INFORMATION

NOTE: XXXXX = Date Code and Vendor Code.



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

SW, VOUT, CH1, CH2, CH3, CH4 to GND..... -0.3V to 40V
VIN to GND..... -0.3V to 20V
CTRL, PWM to GND..... -0.3V to 6V
Continuous SW Current..... Internally limited to 1.65A
Junction Temperature.....+150℃
Storage Temperature Range .....-65℃ to +150℃
Lead Temperature (Soldering 10s).....+260℃
ESD Susceptibility
HBM.....2000V
MM.....200V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range .....-40℃ to +85℃

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

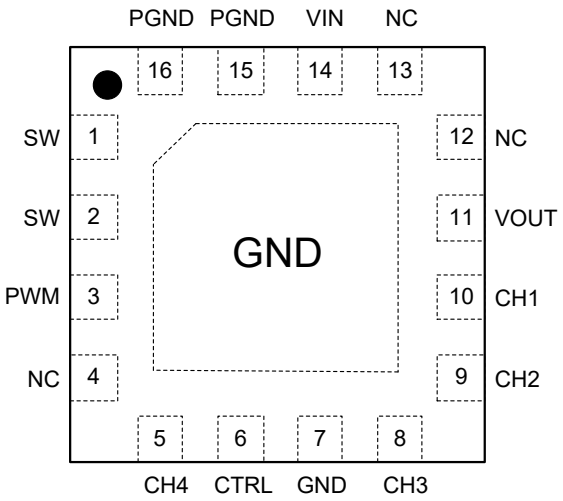
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

SGM3741B (TOP VIEW)



TQFN-3×3-16L

PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 2	SW	Boost Switching Node. Connect an inductor between the VIN and SW pins.
3	PWM	PWM Dimming Input. Pull it high or leave it floating if unused.
4, 12, 13	NC	No Connection.
5	CH4	Current Sink 4. Connect to the cathode of the LED.
6	CTRL	Enable Control and PWM Dimming Input.
7	GND	Ground Pin.
8	CH3	Current Sink 3. Connect to the cathode of the LED.
9	CH2	Current Sink 2. Connect to the cathode of the LED.
10	CH1	Current Sink 1. Connect to the cathode of the LED.
11	VOUT	Output Voltage Pin.
14	VIN	Input Supply Pin.
15, 16	PGND	Power Ground Pin.
Exposed Pad	GND	Exposed Pad. It should be soldered to PCB board and connected to GND.

ELECTRICAL CHARACTERISTICS

(V_{IN} = 3.6V, V_{CTRL} = V_{PWM} = 3V, L = 10μH, C_{IN} = 22μF, C_{OUT} = 1μF, Full = -40℃ to +85℃, typical values are at T_A = +25℃, unless otherwise specified.)

PARAMETER		SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Voltage		V_{IN}		Full	3		18	V
Power Switch Voltage Rating				Full			38	V
Switch Frequency				Full	480	600	700	kHz
Under-Voltage Lockout Threshold		V_{UVLO}	V_{IN} Rising	+25℃		2.3	2.5	V
Under-Voltage Lockout Hysteresis				+25℃		90		mV
Supply Current			Not Switching	+25℃		0.24		mA
			Switching	+25℃		0.8		mA
Supply Current in Shutdown		I_{SHDN}	CTRL = GND, V_{IN} = 3.6V	+25℃		0.4	1	μA
Switch Current Limit		I_{LIM}		+25℃	1.68	2.20	2.80	A
Switch On Resistance		$R_{DS(ON)}$	V_{IN} = 3.6V	+25℃		0.25	0.39	Ω
Switch Leakage Current			V_{SW} = 35V, CTRL = GND	+25℃		0.1	1	μA
Internal LED Current per Channel				+25℃	23.7	25	25.9	mA
LED Current Matching			I_{LED} = 25mA	+25℃	-1.3		1.3	%
Over-Voltage Protection Threshold			Measured at VOUT pin	Full	37.0	38.5	40.0	V
Thermal Shutdown Temperature						145		℃
Thermal Shutdown Hysteresis						15		℃
Control								
CTRL, PWM Threshold	Logic-High Voltage	V_{IH}	V_{IN} = 3V to 18V	Full	1.5			V
	Logic-Low Voltage	V_{IL}	V_{IN} = 3V to 18V	Full			0.4	V
Pull-Down Resistor		$R_{PULL-DOWN}$		+25℃		1		MΩ
Pull-Up Resistor		$R_{PULL-UP}$		+25℃		0.5		MΩ
CTRL Pin Logic High Pulse Width Timing		$t_{HIGH(MIN)}$		+25℃	0.4			μs
CTRL Pin Logic Low Pulse Width Timing		t_{LOW}		+25℃	0.4		1000	μs
CTRL Pin Shutdown Pulse Width Timing		t_{OFF}		+25℃	5.5			ms
Minimum PWM On-Time				+25℃	0.08			μs
PWM Dimming Frequency				Full	2		60	kHz
PWM Dimming Duty Cycle (1)			CTRL = HIGH	+25℃	0.5			%

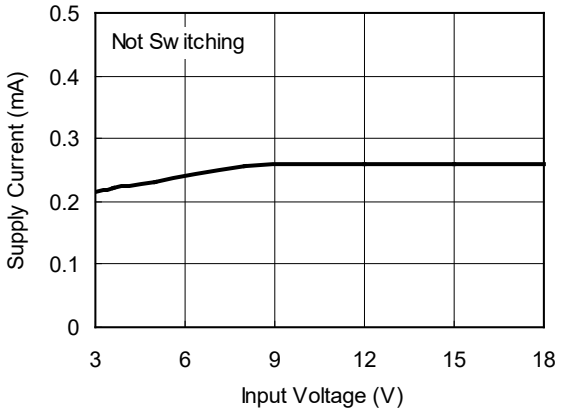
NOTE:

1. If CTRL pin PWM dimming is also used, the minimum PWM duty cycle for no blind dimming is decided by the following conditions: the minimum LED current dimmed by two PWM is 0.5% of the internal LED current per channel.

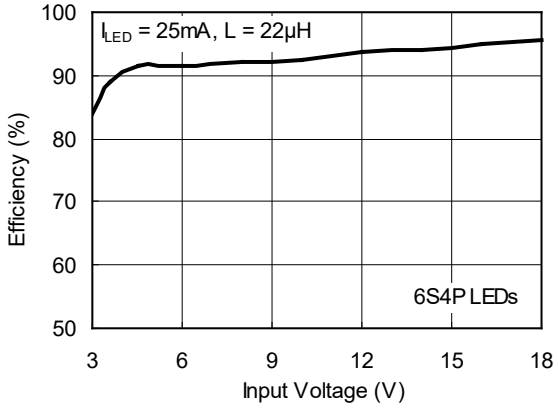
TYPICAL PERFORMANCE CHARACTERISTICS

V_{IN} = 3.6V, I_{LED} = 25mA, 6-Series 4-Parallel LEDs, L = 22μH, C_{IN} = 10μF, C_{OUT} = 1μF, T_A = +25℃, unless otherwise noted.

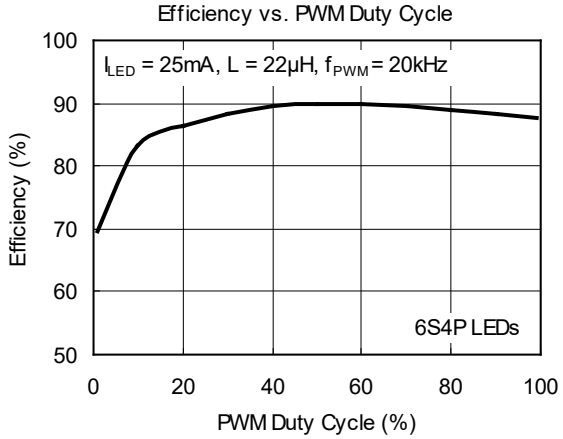
Supply Current vs. Input Voltage



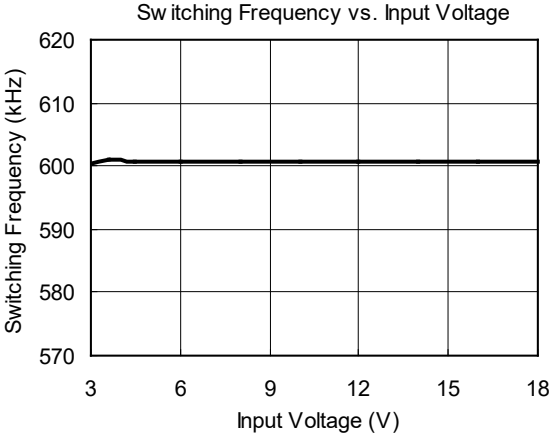
Efficiency vs. Input Voltage



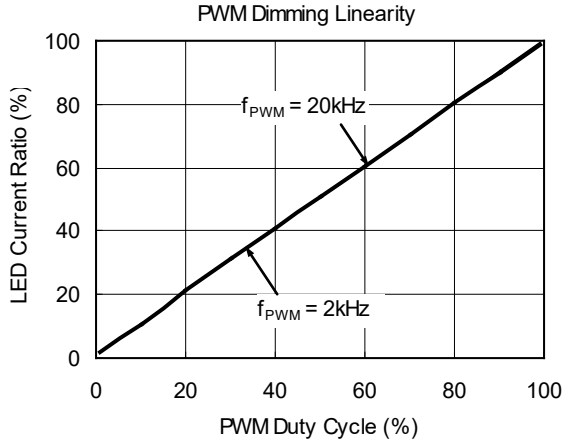
Efficiency vs. PWM Duty Cycle



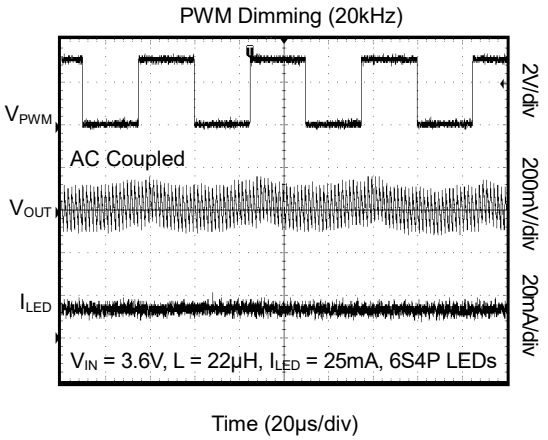
Switching Frequency vs. Input Voltage



PWM Dimming Linearity



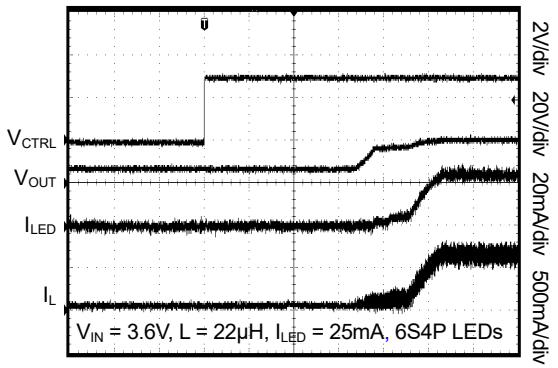
PWM Dimming (20kHz)



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

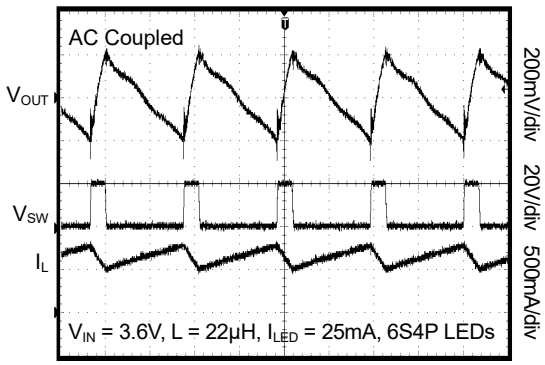
V_{IN} = 3.6V, I_{LED} = 25mA, 6-Series 4-Parallel LEDs, L = 22μH, C_{IN} = 10μF, C_{OUT} = 1μF, T_A = +25℃, unless otherwise noted.

Soft-Start



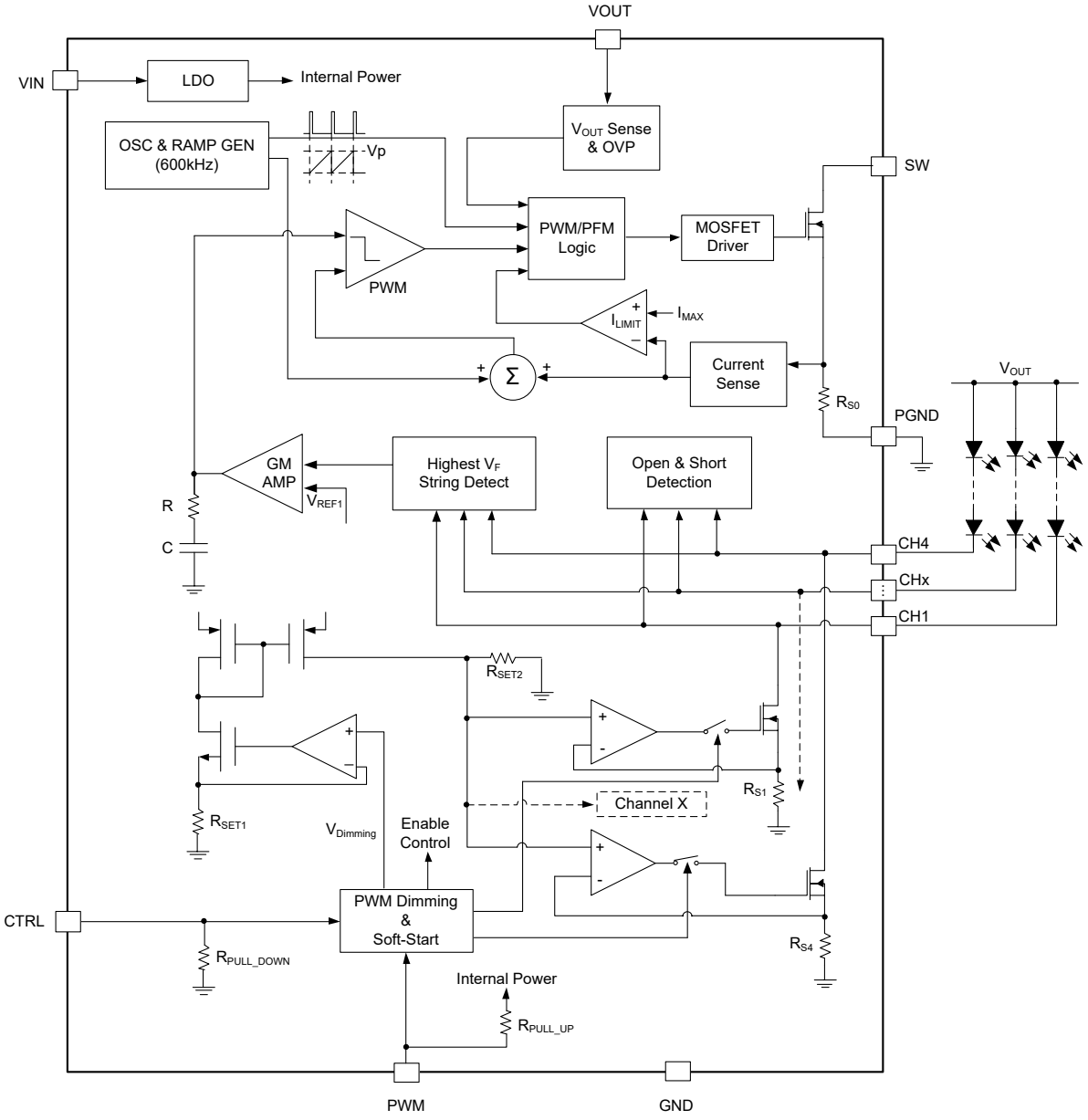
Time (2ms/div)

Steady State Switching



Time (800ns/div)

FUNCTIONAL BLOCK DIAGRAM



REVISION HISTORY

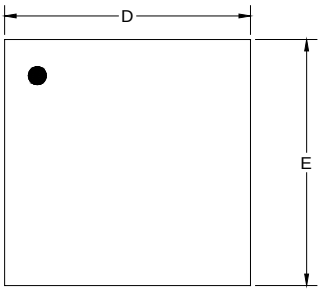
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

AUGUST 2015 – REV.A to REV.A.1	Page
Changed Electrical Characteristics section	4

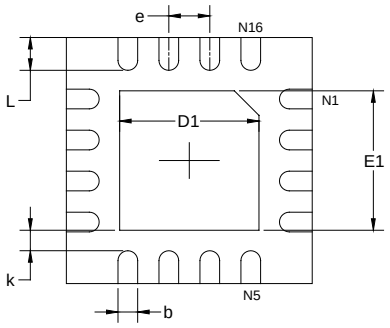
Changes from Original (NOVEMBER 2014) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

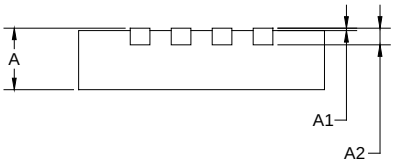
TQFN-3×3-16L



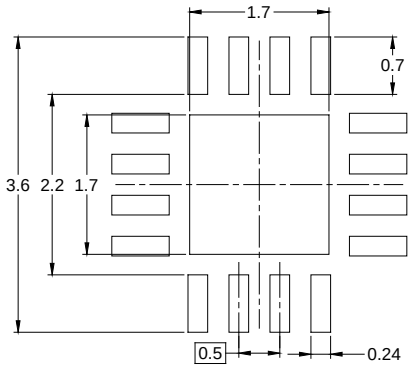
TOP VIEW



BOTTOM VIEW



SIDE VIEW

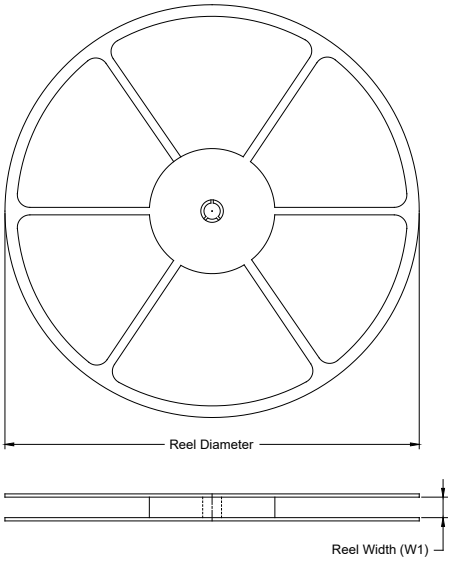


RECOMMENDED LAND PATTERN (Unit: mm)

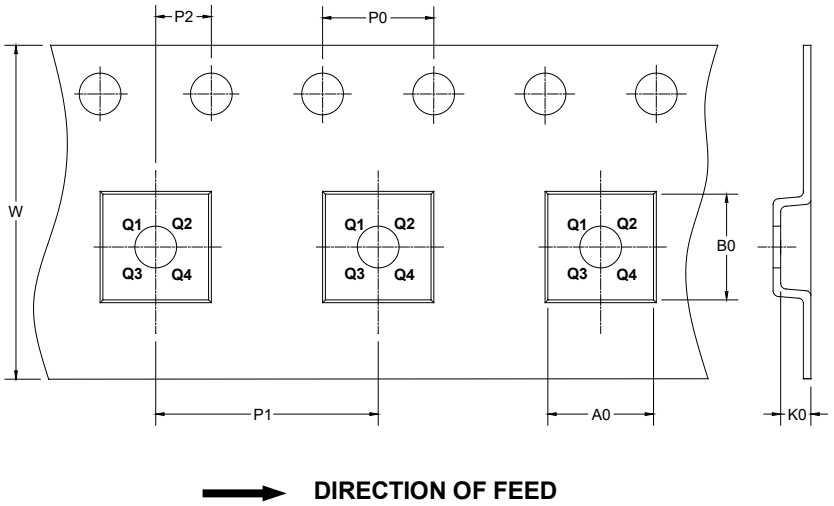
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



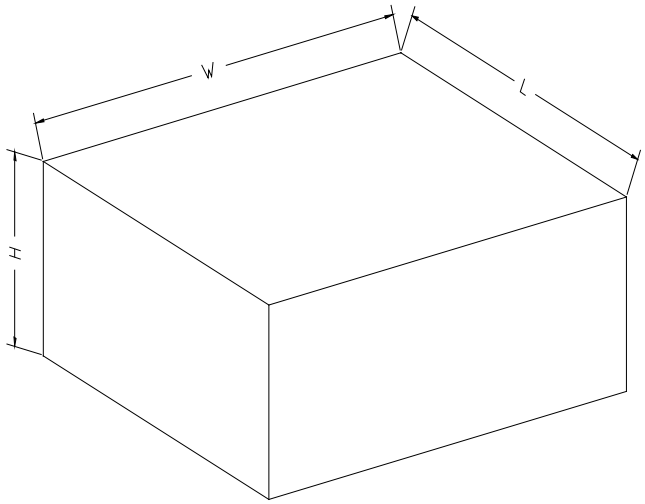
NOTE: The picture is only for reference. Please make the object as the standard.

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-3×3-16L	13″	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1

DD0001

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