



SGM3785

2MHz, 1.5A Flash LED Driver in TDFN-3×2-14L Package

GENERAL DESCRIPTION

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The SGM3785 is the ideal power solution for high-power flash LEDs used with cell phone camera modules or digital still cameras. It is a highly integrated step-up DC/DC converter with very high switching frequency, fixed at 2MHz, providing a very small total solution for portable photo flash. The SGM3785 has separate Flash mode and Movie/Torch mode enable pins for maximum flexibility. Flash mode is usually used with 660ms timer control to generate a high intensity flash. The Flash mode and Movie/Torch mode maximum LED current is programmed by external resistors respectively, making the flash LED solution simple to control. The real LED current at Flash mode and Movie/Torch mode can be programmed by external PWM signal at ENM pin.

The two LED output sinks can be shorted together externally for higher power single flash LEDs, up to 1.5A continuous LED current. Thermal regulation is integrated in Flash mode to limit the IC's temperature and continuously provide the maximum allowed output current.

Various protection features are built into the SGM3785, including cycle-by-cycle input current limit protection, output over-voltage protection, LED fault (open or short) protection and thermal shutdown protection. The leakage current in shutdown is 0.1μA (TYP).

The SGM3785 is available in Green TDFN-3×2-14L package. It operates over an ambient temperature range of -40°C to +85°C.

FEATURES

- Input Voltage Range: 3V to 5V
- Dual Flash LED Outputs
- Drive Up to Total 1.5A or 0.75A per Channel
- High Efficiency LED Driver (Up to 90%)
- 2MHz Step-Up Converter
- Very Small Inductor: 1.0μH
- Independent Flash Mode Enable and Movie/Torch Mode Enable Pins
- Flash Mode and Movie/Torch Mode LED Current Can be Programmed via PWM Signal at ENM Pin
- One Resistor Sets Flash Mode LED Current
- One Resistor Sets Movie/Torch Mode LED Current
- Integrated Thermal Regulation Control
- 660ms Flash Timer Control
- 320kΩ Pull-Down Resistor on ENM or ENF Pin
- LED Open or Short Protection
- Output Over-Voltage Protection
- Cycle-by-Cycle Inductor Current Limit
- 0.1μA Shutdown Current
- Available in Green TDFN-3×2-14L Package
- Temperature Range: -40°C to +85°C

APPLICATIONS

Portable Equipments



2MHz, 1.5A Flash LED Driver in TDFN-3×2-14L Package

SGM3785

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDER NUMBER	MARKING INFORMATION	PACKAGE OPTION
SGM3785	TDFN-3×2-14L	-40°C to +85°C	SGM3785YTDP14G/TR	3785DP XXXXX	Tape and Reel, 3000

NOTE: XXXXX = Date Code and Vendor Code.

ABSOLUTE MAXIMUM RATINGS

VIN, VOUT, D1 and D2 Voltages.....	-0.3V to 6V
ENF, ENM, RSETF, RSETM	-0.3V to VIN + 0.3V
SW Voltage.....	-0.3V to 6.5V
Storage Temperature Range.....	-65°C to +150°C
Junction Temperature.....	150°C
Operating Temperature Range.....	-40°C to +85°C
Lead Temperature (Soldering 10 sec)	
.....	260°C
ESD Susceptibility	
HBM.....	2000V
MM.....	200V

NOTE:

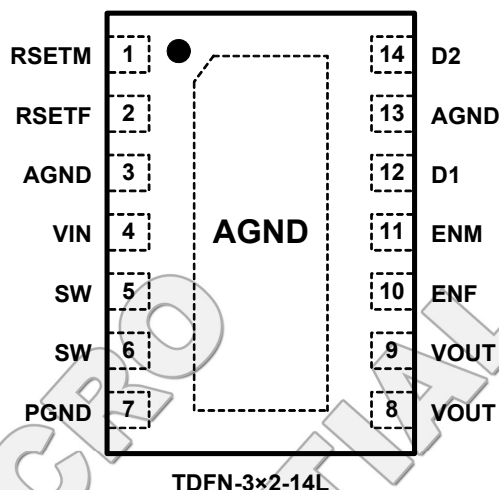
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

PIN CONFIGURATION (TOP VIEW)



PIN DESCRIPTION

PIN	NAME	FUNCTION
1	RSETM	Movie/Torch Mode Current Setting Pin.
2	RSETF	Flash Mode Current Setting Pin.
3, 13	AGND	Analog Ground Pin.
4	VIN	Input Supply Pin for the IC.
5, 6	SW	Switching Node of the Step-Up Converter.
7	PGND	Power Ground Pin.
8, 9	VOUT	Output Voltage Pin.
10	ENF	Flash Mode Enable Pin. This pin has an internal 320kΩ pull-down resistor to AGND. No matter the status of ENM, only when ENF = "High", Flash mode is in active and the flashing current is equal to $I_{SETF} \times D$. D is the duty cycle of PWM signal at ENM pin. The frequency of PWM is larger than 15kHz.
11	ENM	Movie/Torch Mode Enable Pin and PWM Dimming Pin of Flash Mode. This pin has an internal 320kΩ pull-down resistor to AGND. In Flash mode, the PWM signal at ENM pin is the flashing current dimming control. When ENF = "Low" and the time of ENM = "High" is not less than 5ms, Movie/Torch mode will be in active. The LED current should be equal to $I_{SETM} \times D$. D is the duty cycle of PWM signal at ENM pin. This PWM signal is sent to ENM pin after the first pulse which "High" level time is more than 5ms. When ENF = "Low" and the time of ENM = "Low" is not less than 5ms, the chip will enter into shutdown mode.
12	D1	Regulated Output Current Sink 1. Up to 0.75A current. D1 and D2 pins can be connected together to sink 1.5A combined.
14	D2	Regulated Output Current Sink 2. Up to 0.75A current. D1 and D2 pins can be connected together to sink 1.5A combined.
Exposed Pad	AGND	Exposed Pad. Connected to ground for electrical and thermal usage. Exposed pad is internally connected to analog ground pin.

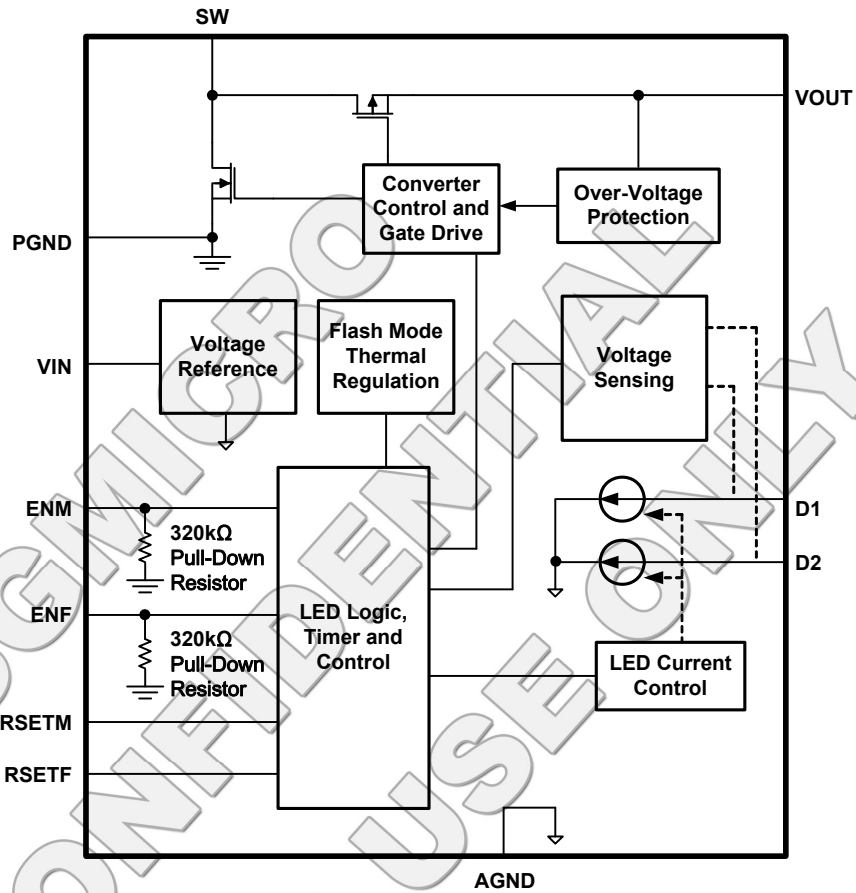
ELECTRICAL CHARACTERISTICS(V_{IN} = V_{EN} = 3.6V, T_A = 25°C, unless otherwise specified.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
IC SUPPLY						
Input Voltage Range	V _{IN}		3		5	V
Under-Voltage Lockout Threshold	UVLO	Rising edge		2.4		V
Under-Voltage Lockout Hysteresis	V _{HYS}			0.1		V
Supply Current	I _Q	Not switching		340		μA
Supply Current in Shutdown	I _{SHDN}	ENF = ENM = GND		0.1		μA
STEP-UP CONVERTER						
Oscillator Frequency	f _s			2		MHz
Internal Over-Voltage Threshold of OUT	V _{OVP}			5.3		V
Flash Mode Soft-Start Time	t _s			1		ms
CURRENT SINK						
Total Output Current, Movie/Torch Mode	I _D	ENM = HIGH, R _{SETM} = 75kΩ, D1 + D2, T _A = 25°C		200		mA
Total Output Current, Flash Mode		ENF = HIGH, ENM = GND, R _{SETF} = 12kΩ, D1 + D2, T _A = 25°C		1.5		A
Output Current Matching ⁽¹⁾		100mA each channel, T _A = 25°C		1.5		%
		750mA each channel, T _A = 25°C		0.7		%
LED Short Checking Current	I _{SHORT}			2.5		mA
CONTROL						
ENF, ENM Pin Logic Low Threshold	V _{IL}				0.6	V
ENF, ENM Pin Logic High Threshold	V _{IH}		1.5			V
ENF Internal Pull-Down Resistance	R _{PD(ENF)}			320		kΩ
ENM Internal Pull-Down Resistance	R _{PD(ENM)}			320		kΩ
Junction Thermal Shutdown Threshold				150		°C
Junction Thermal Shutdown Hysteresis				15		°C
DELAY TIME TO SHUTDOWN STATUS IN MOVIE/TORCH MODE (FOR PWM DIMMING LED CURRENT)						
Delay Time	t _D		5			ms
FLASH TIMER						
Hardware Flash Timer	t _{TIME}			660		ms
DELAY TIME OF ENM = "HIGH" TO ENTER INTO MOVIE/TORCH MODE						
Delay Time (Entering into Movie/Torch Mode)	t _M		5			ms
MINIMUM TIME OF LOGIC "HIGH" OF PWM SIGNAL						
Minimum Time of Logic "High" of PWM Signal	t _H		5			μs

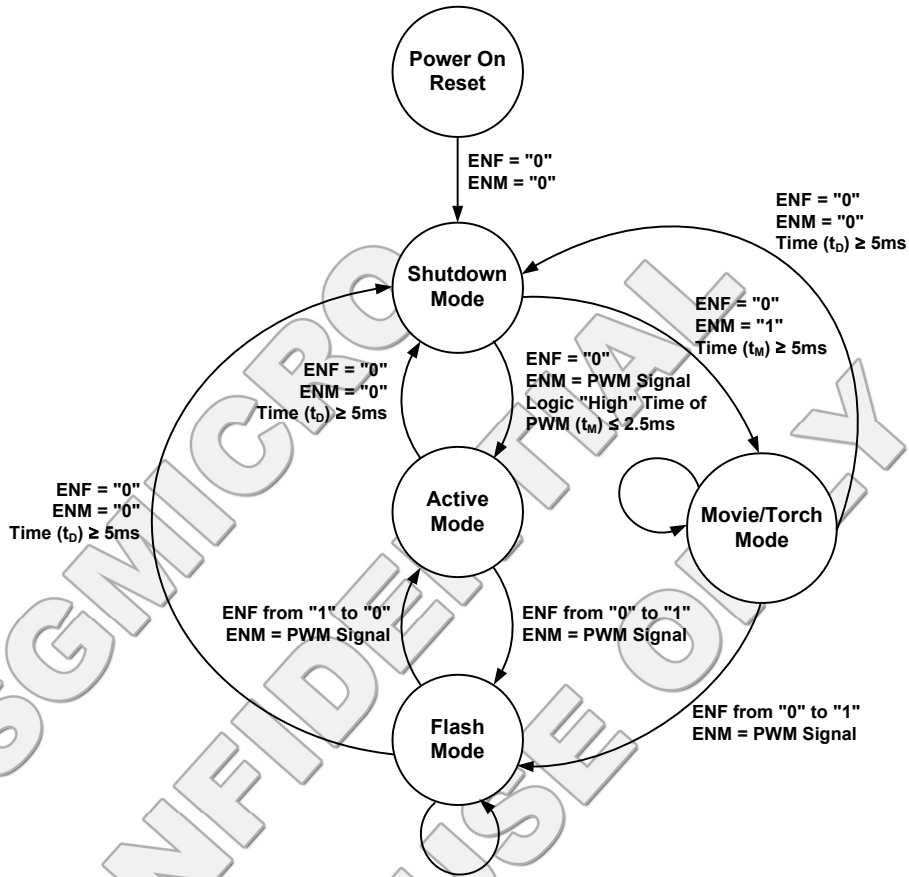
NOTE:

1. The current matching between channels is defined as $|I_{D1} - I_{D2}| / (I_{D1} + I_{D2})$.

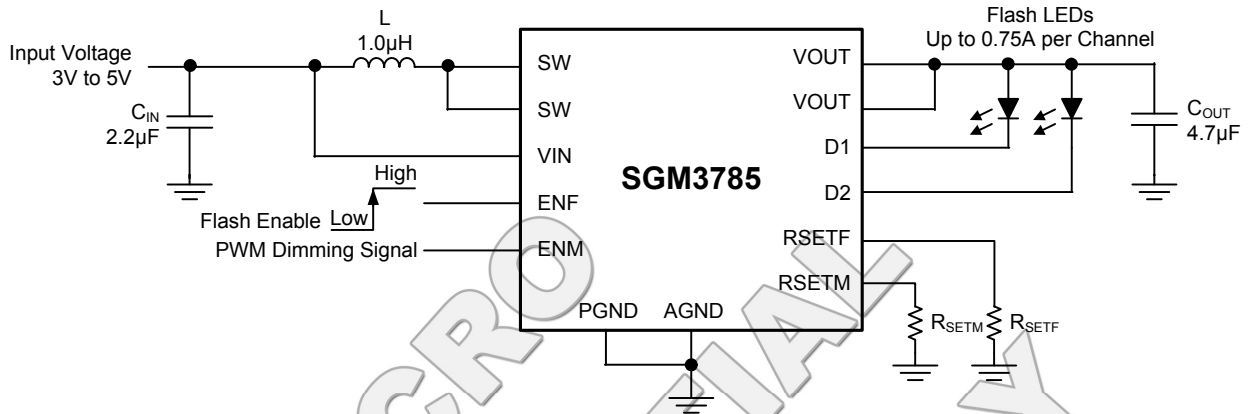
FUNCTIONAL BLOCK DIAGRAM



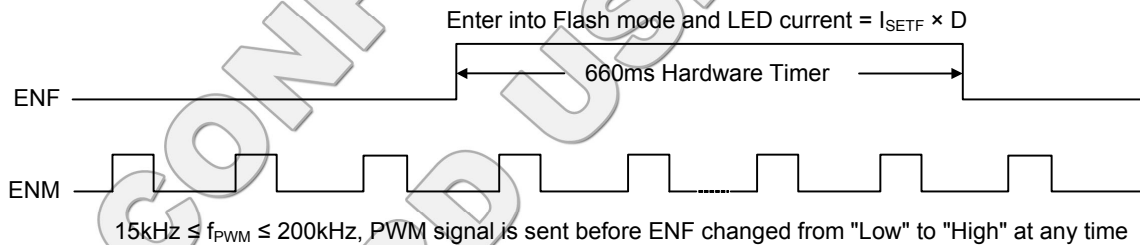
STATE DIAGRAM



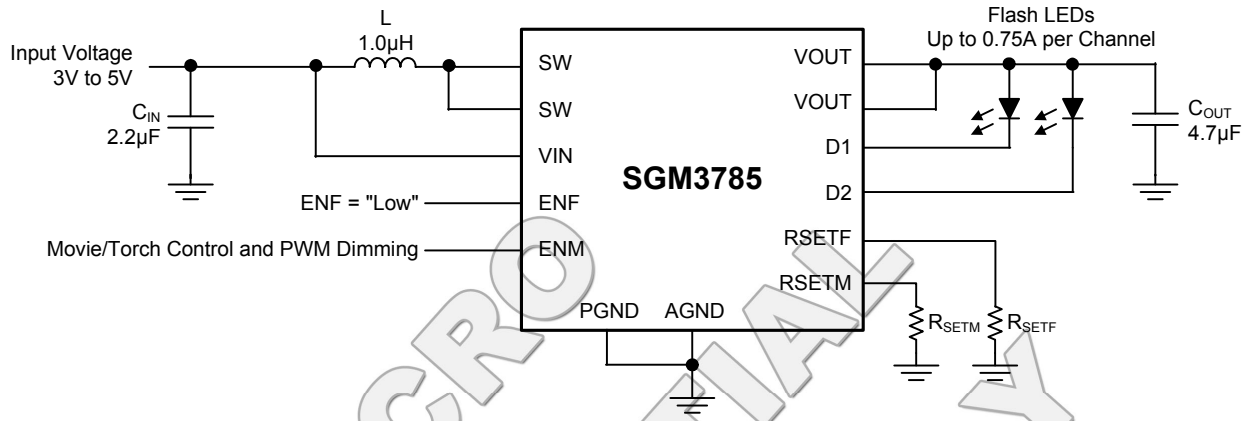
TYPICAL APPLICATION OF FLASH MODE



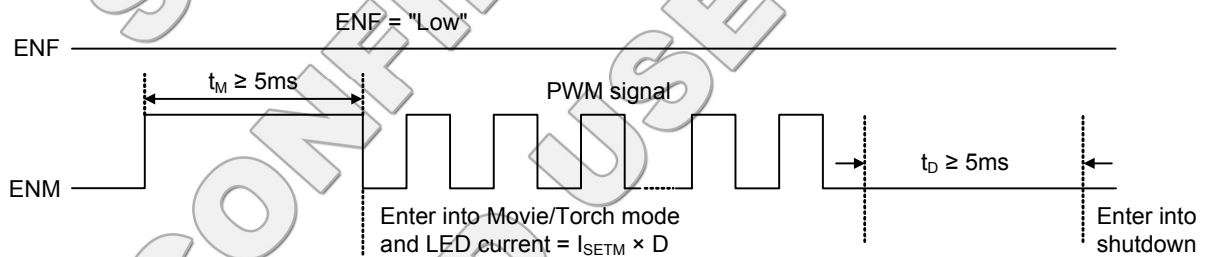
TIMING DIAGRAM OF FLASH MODE



TYPICAL APPLICATION OF MOVIE/TORCH MODE

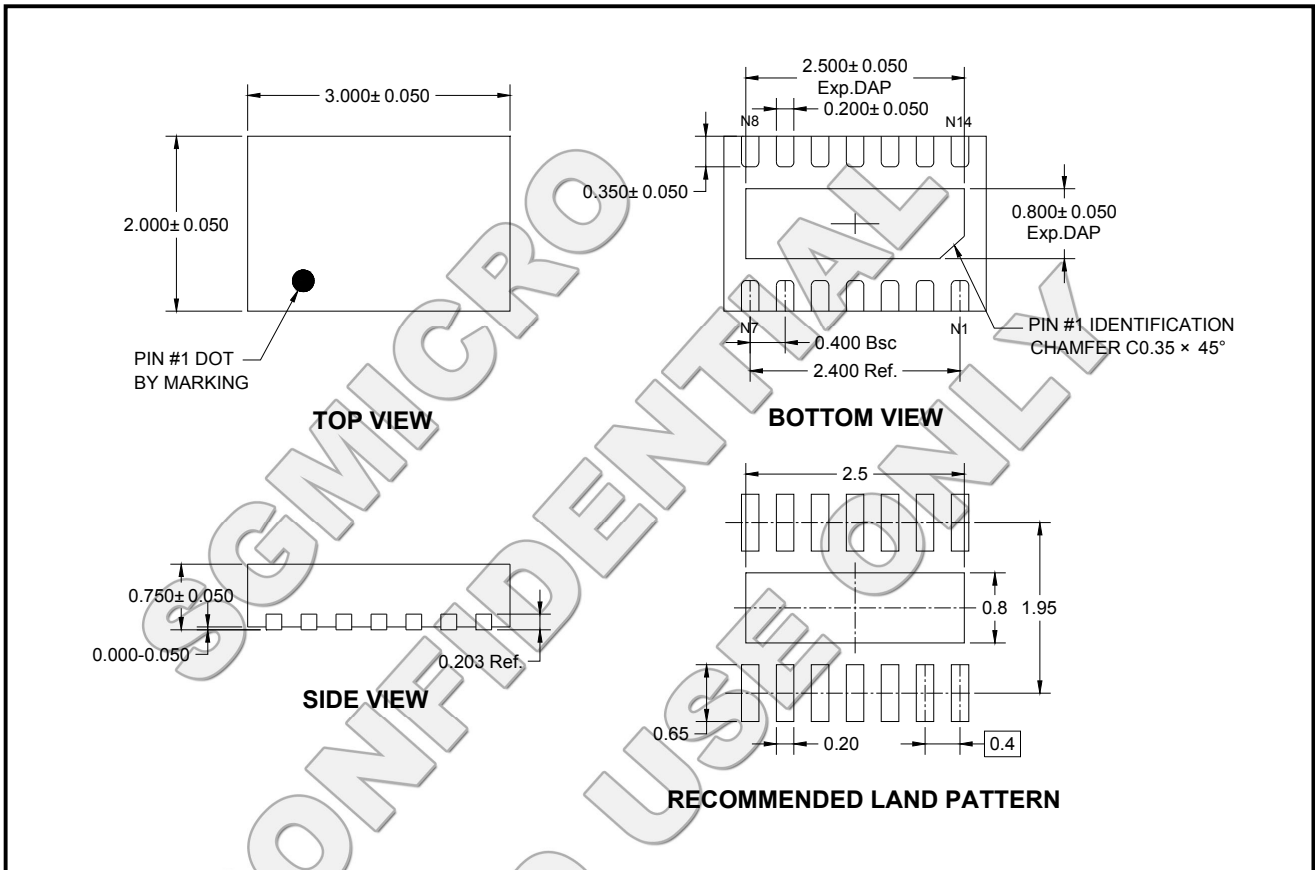


TIMING DIAGRAM OF MOVIE/TORCH MODE



PACKAGE OUTLINE DIMENSIONS

TDFN-3x2-14L

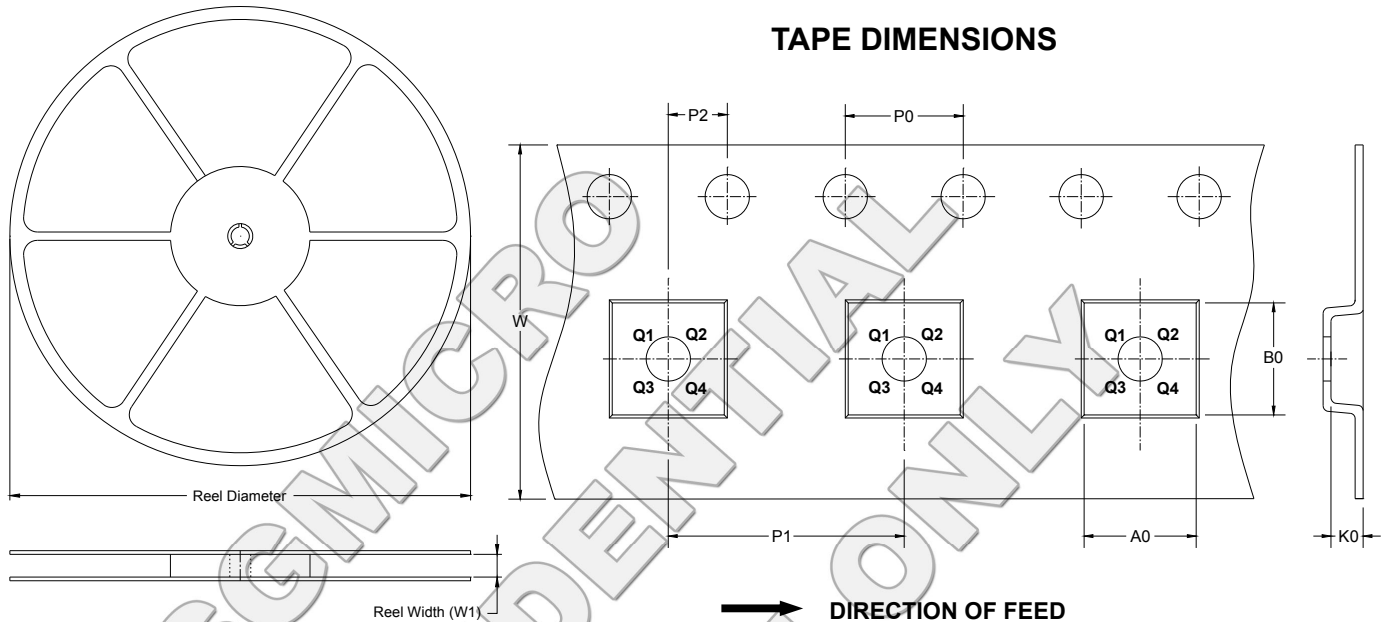


NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

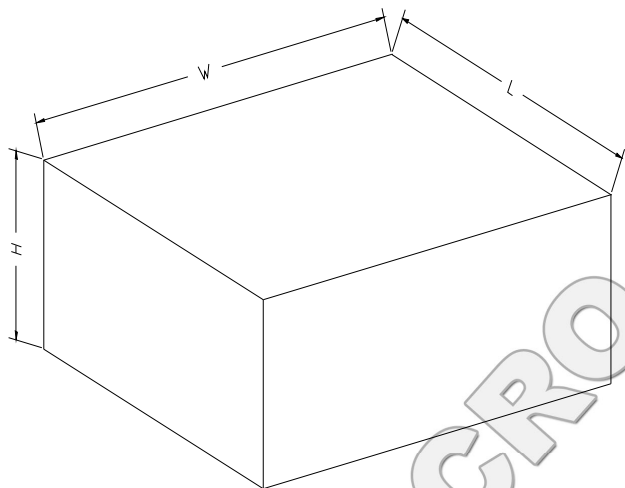
TAPE DIMENSIONS



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-3x2-14L	7"	9.0	2.30	3.30	1.10	4.00	4.00	2.00	8.00	Q1

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