

GENERAL DESCRIPTION

The SGM3785 is a highly integrated boost DC/DC converter with 2MHz fixed frequency. High switching frequency makes it easy to use tiny components and optimized for portable photo flash. The SGM3785 is ideal for high power flash LEDs which are suited for mobile phone camera modules and digital still cameras.

The SGM3785 offers excellent flexibility to enter flash mode and movie/torch mode through the ENF and ENM pins respectively. Flash mode is usually used with 660ms timer control to generate a high intensity flash. The maximal flash current and movie/torch current are respectively programmed through external resistors (R_{SETF} and R_{SETM}), which can provide simple control for the flash LED solution. The real LED current in flash mode and movie/torch mode can be programmed by external PWM signal on ENM pin.

The D1 and D2 pins can be tied together to drive higher power single flash LEDs, sinking up to 1.5A continuous current. The integrated thermal regulation in flash mode limits the temperature of the device. It can prevent the device from triggering thermal shutdown and provide the maximum LED output current continuously.

The SGM3785 provides very low shutdown current. It also includes a comprehensive set of protection features such as over-voltage protection, LED open or short protection and thermal shutdown.

The SGM3785 is available in a 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
- Up to Total 1.5A or Each 0.75A LED Current
- Up to 90% Efficiency
- Dual Flash LED Outputs
- Tiny Inductor: 1.0μH
- 2MHz Boost Converter
- Separate Flash Mode Enable and Movie/Torch Mode Enable Control Pins
- Flash Current and Movie/Torch Current can be Programmed through PWM Signal on ENM Pin
- Independent Resistors Set Flash Current and Movie/Torch Current Respectively
- Integrated Thermal Regulation Control
- 660ms Flash Timer Control
- 330kΩ Pull-Down Resistor on ENM and ENF Pins
- Protection Features
 - ◊ Output Over-Voltage Protection
 - ◊ LED Open or Short Protection
 - ◊ Cycle-by-Cycle Current Limit
- Less than 1μA Shutdown Current
- Available in a Green TDFN-3×2-14L Package
- Temperature Range: -40°C to +85°C

APPLICATIONS

Portable Equipment

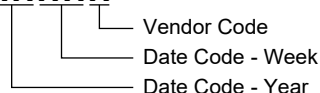
PACKAGE/ORDERING INFORMATION

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

MARKING INFORMATION

NOTE: XXXXX = Date 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

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
Package Thermal Resistance	
TDFN-3×2-14L, θ_{JA}	75°C/W
Junction Temperature.....	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s).....	+260°C
ESD Susceptibility	
HBM.....	2000V
MM.....	200V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range	-40°C to +85°C
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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.

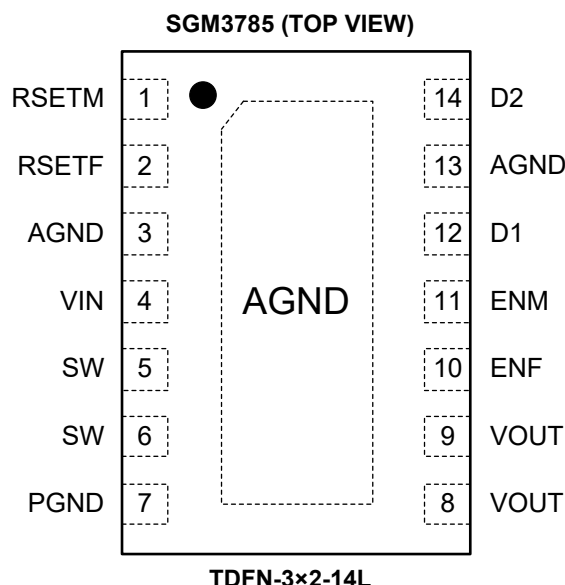
ESD SENSITIVITY CAUTION

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	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.
5, 6	SW	Boost Converter Switching Node.
7	PGND	Power Ground Pin.
8, 9	VOUT	Output Voltage Pin.
10	ENF	Flash Mode Enable Pin. It has an internal 330kΩ pull-down resistor to AGND. Regardless of ENM, only when ENF = "High", flash mode is in active and the flash current is equal to $I_{SETF} \times D$. D is the duty cycle of PWM signal on ENM pin. The frequency of PWM exceeds 15kHz.
11	ENM	Movie/Torch Mode Enable Pin and Flash Mode PWM Dimming Pin. This pin has an internal 330kΩ pull-down resistor to AGND. In flash mode, the PWM signal at ENM pin is the flash current dimming control. When ENF = "Low" and the time of ENM = "High" is not less than 5ms, Movie/Torch mode is 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, high level time of which is more than 5ms. When ENF = "Low" and the time of ENM = "Low" is not less than 5ms, the chip enters shutdown mode.
12	D1	Regulated Current Sink 1. It can sink up to 0.75A current. D1 and D2 pins can be connected together to sink total 1.5A.
14	D2	Regulated Current Sink 2. It can sink up to 0.75A current. D1 and D2 pins can be connected together to sink total 1.5A.
Exposed Pad	AGND	Exposed Pad. Connect to ground for electrical and thermal usage. Exposed pad is internally connected to analog ground pin.

ELECTRICAL CHARACTERISTICS

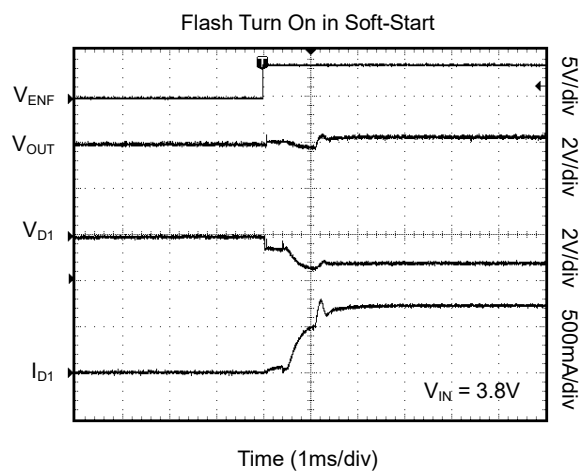
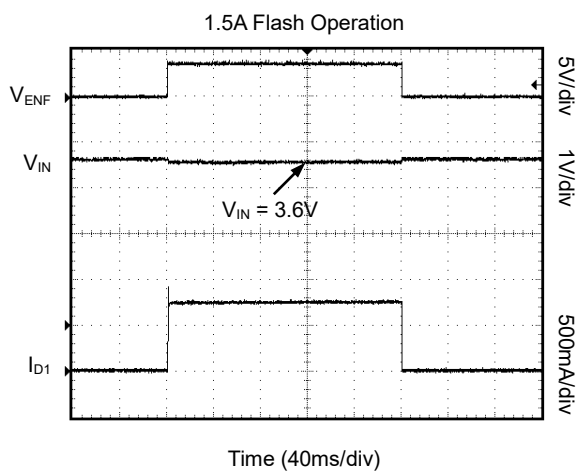
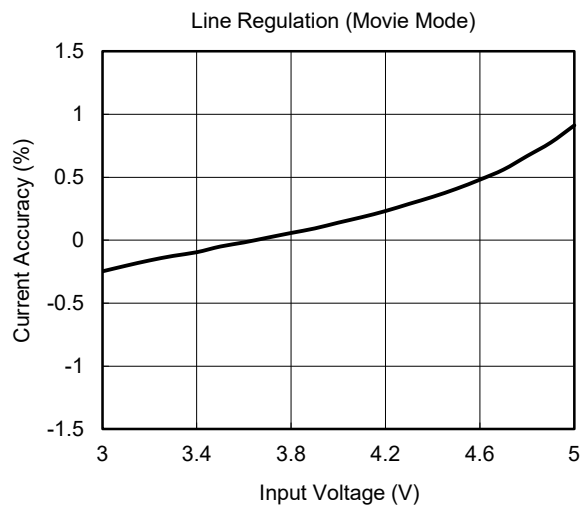
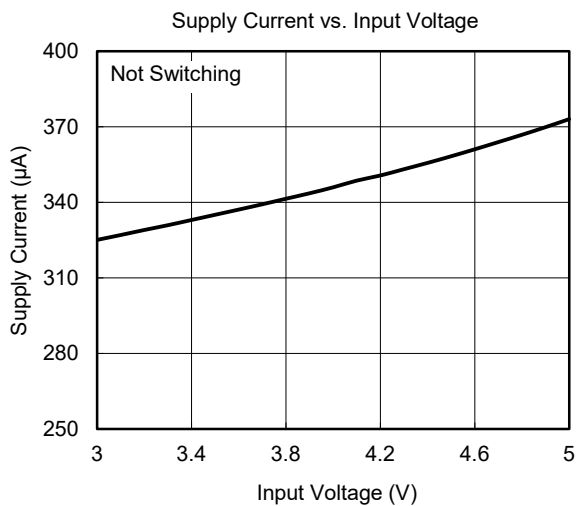
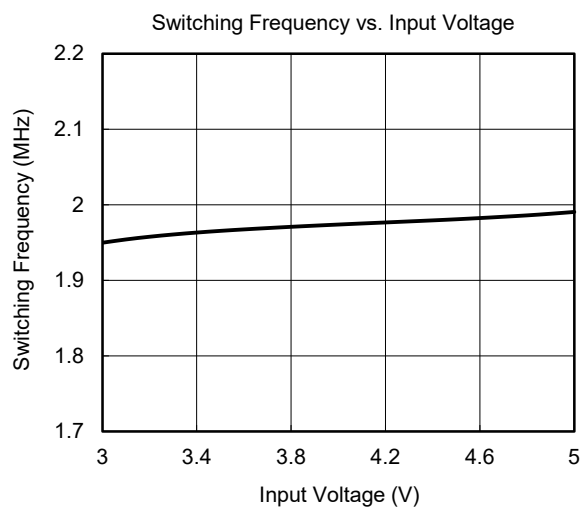
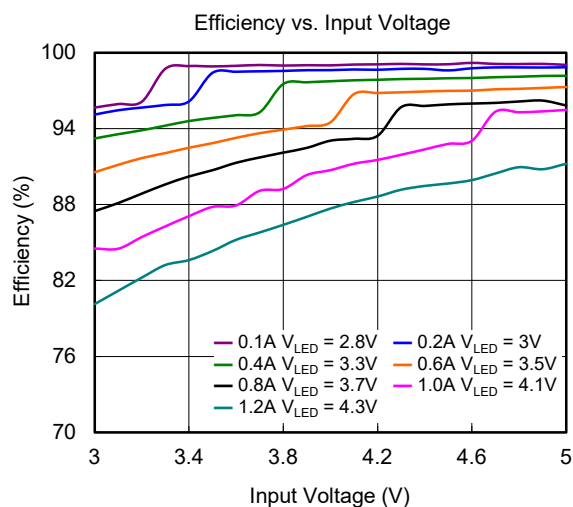
(V_{IN} = V_{EN} = 3.6V, T_A = +25°C, unless otherwise specified.)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
IC Supply						
Input Voltage Range	V _{IN}		3		5	V
Under-Voltage Lockout Threshold	UVLO	Rising edge	2.18	2.4	2.62	V
Under-Voltage Lockout Hysteresis	V _{HYS}			0.2		V
Supply Current	I _Q	Not switching		340	450	μA
Supply Current in Shutdown	I _{SHDN}	ENF = ENM = GND		0.1	1	μA
Boost Converter						
Peak NMOS Current Limit	I _{LIM}			3.4		A
Oscillator Frequency	f _S			2		MHz
Internal Over-Voltage Threshold of OUT	V _{OV}			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} = 71.5kΩ, D1 + D2, T _A = +25°C	175	200	225	mA
Total Output Current, Flash Mode		ENF = HIGH, ENM = GND, R _{SETF} = 11.5kΩ, D1 + D2, T _A = +25°C	1.32	1.5	1.68	A
Output Current Matching ⁽¹⁾		100mA each channel, T _A = +25°C, Movie/Torch mode		1.5	12	%
		750mA each channel, T _A = +25°C, Flash mode		0.7	10	%
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)}			330		kΩ
ENM Internal Pull-Down Resistance	R _{PD(ENM)}			330		kΩ
Junction Thermal Shutdown Threshold				150		°C
Junction Thermal Shutdown Hysteresis				28		°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}		600		800	ms
Delay Time of ENM = "High" to Enter Movie/Torch Mode						
Delay Time (Entering 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

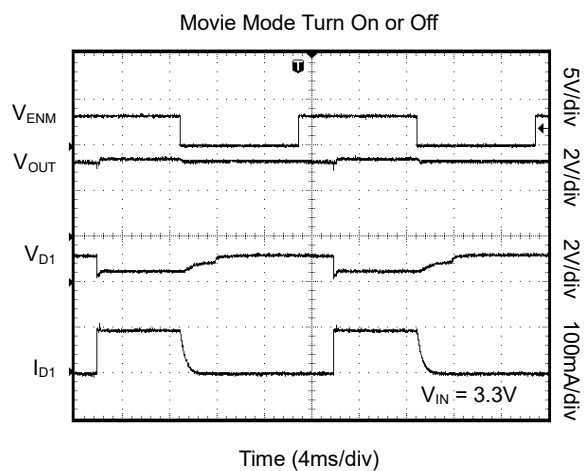
NOTE:

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

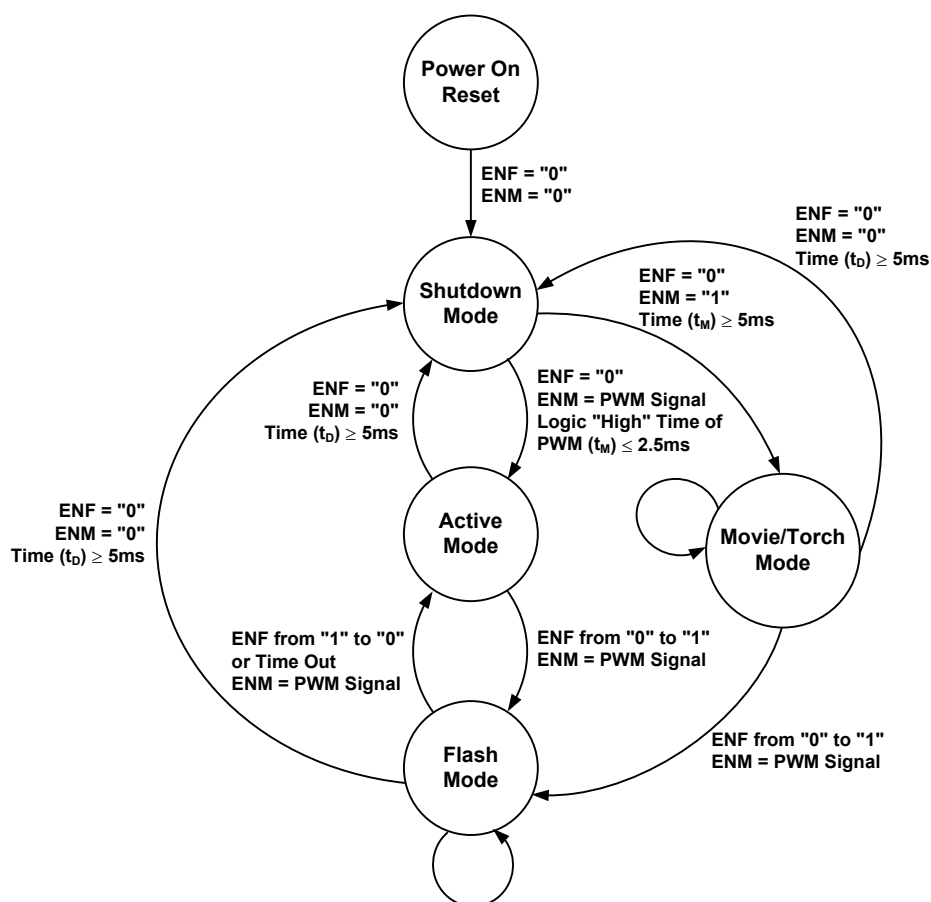
TYPICAL PERFORMANCE CHARACTERISTICS



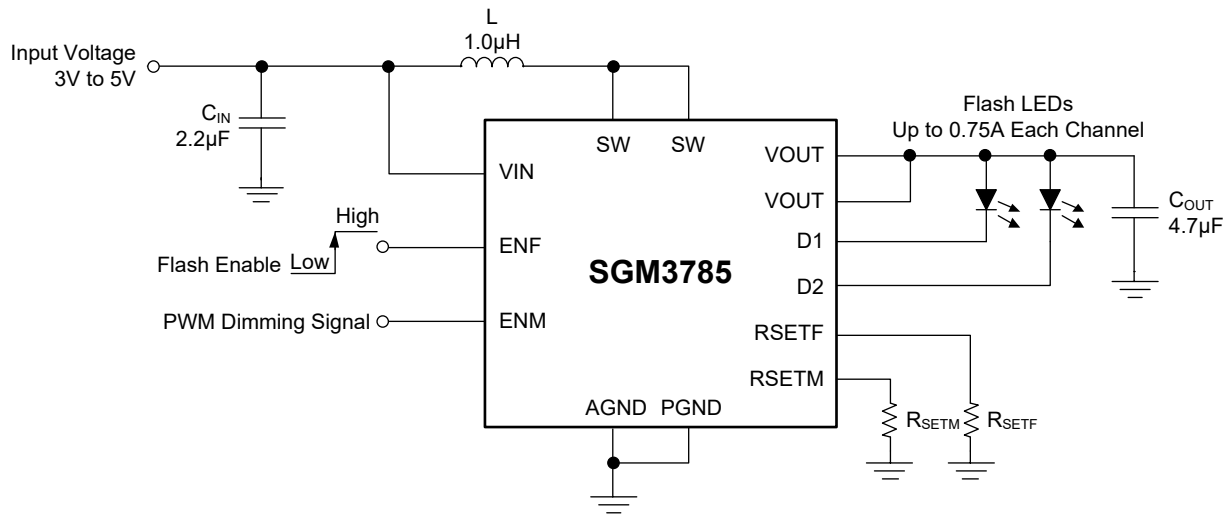
TYPICAL PERFORMANCE CHARACTERISTICS (continued)



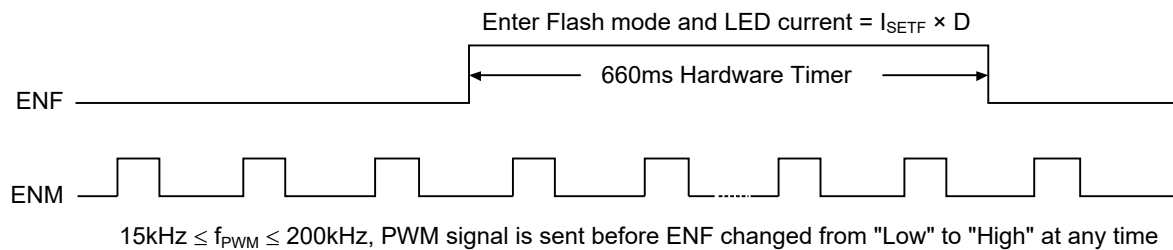
STATE DIAGRAM



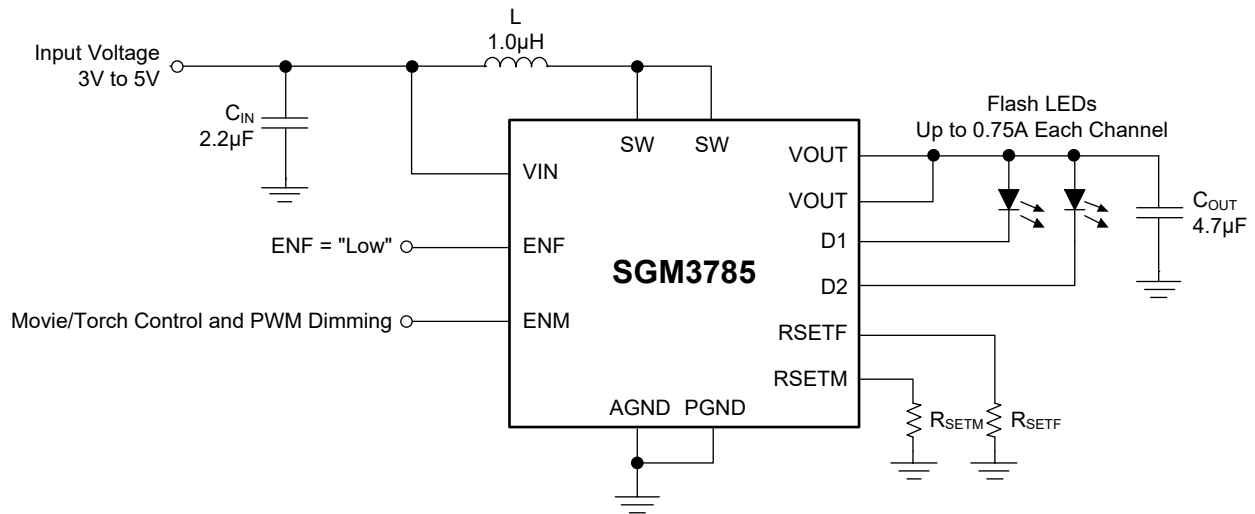
TYPICAL APPLICATION OF FLASH MODE



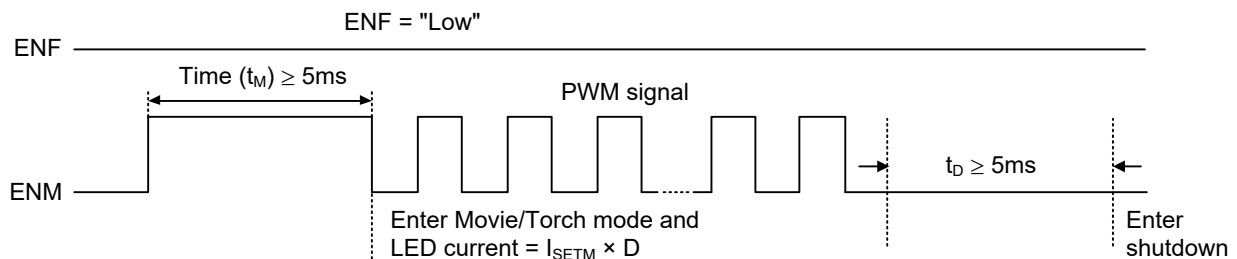
TIMING DIAGRAM OF FLASH MODE



TYPICAL APPLICATION OF MOVIE/TORCH MODE



TIMING DIAGRAM OF MOVIE/TORCH MODE



REVISION HISTORY

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

JANUARY 2019 – REV.A.3 to REV.A.4

Added Package Thermal Resistance	2
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NOVEMBER 2014 – REV.A.2 to REV.A.3

Updated Functional Description section	11
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SEPTEMBER 2014 – REV.A.1 to REV.A.2

Updated Electrical Characteristics section	4
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Updated Functional Description section	11
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AUGUST 2014 – REV.A to REV.A.1

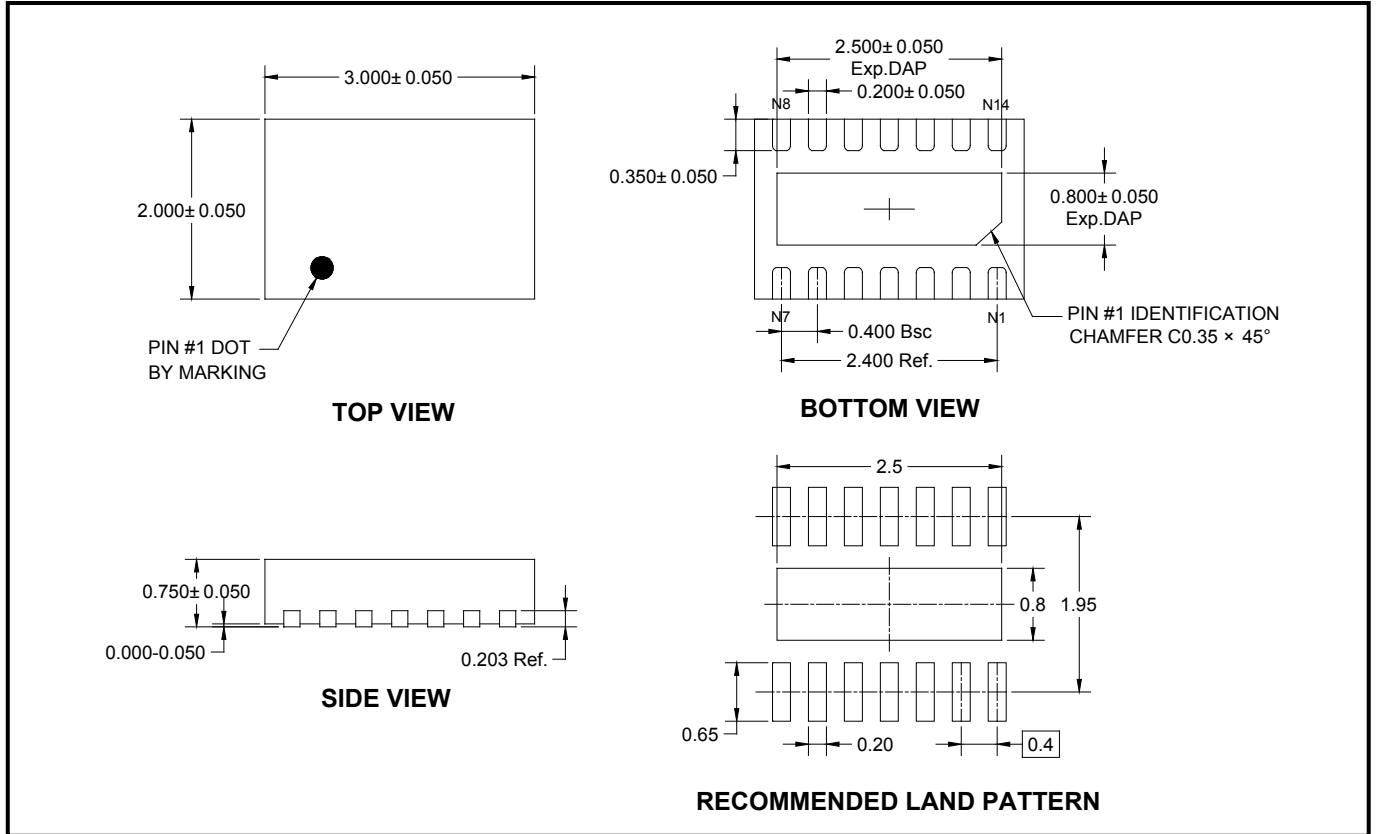
Updated Functional Description section	12
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Changes from Original (MARCH 2014) to REV.A

Changed from product preview to production data	All
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PACKAGE OUTLINE DIMENSIONS

TDFN-3×2-14L

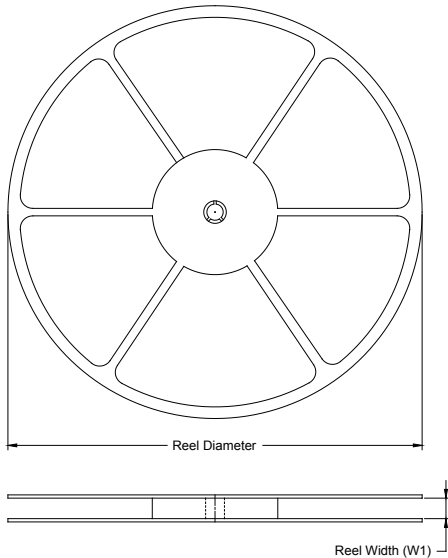


NOTE: All linear dimensions are in millimeters.

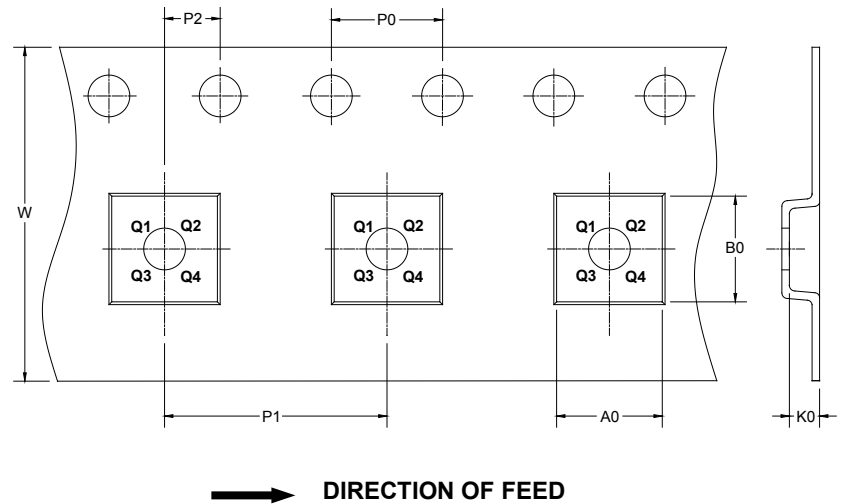
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

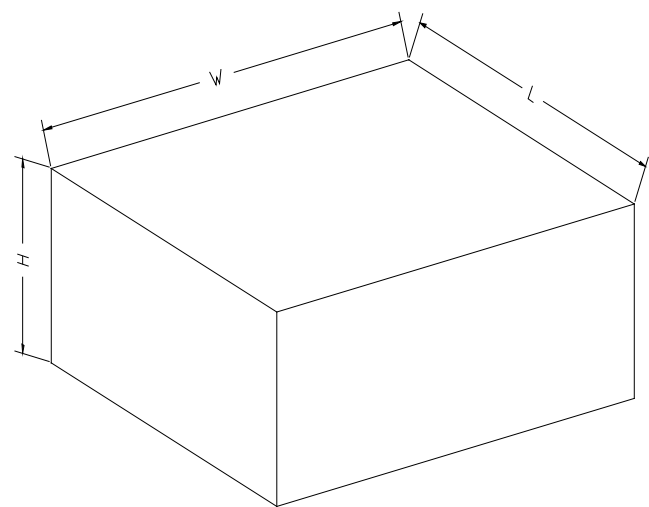
KEY PARAMETER LIST OF TAPE AND REEL

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-3×2-14L	7"	9.0	2.30	3.30	1.10	4.0	4.0	2.0	8.0	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

DD0002