TAIWAN SEMICONDUCTOR

TS19377
## 2A Buck (Step-down) WLED Driver

SOP-8

Pin Definition:
1. FB   8. GND
2. EN   7. GND
3. Comp   6. SW
4. Vcc   5. SW

General Description

TS19377 consists of step-down switching regulator with PWM control. These devise include a reference voltage source, oscillation circuit, error amplifier, internal PMOS and etc.

TS19377 provides low-ripple power, high efficiency, and excellent transient characteristics. The PWM control circuit is able to the duty ratio linearly from 0 up to 100%. An enable function, an over current protect function and short circuit protect function are built inside, and when OCP or SCP happens, the operation frequency will be reduced. Also, an internal compensation block is built in to minimum external component count.

With the addition of an internal P-channel Power MOS, a coil, capacitors, and a diode connected externally, these ICs can function as step-down switching regulators. They serve as ideal power supply units for portable devices when coupled with the SOP-8 package, providing such outstanding features as low current consumption. Since this converter can accommodate an input voltage up to 23V, it is also suitable for the operation via an AC adapter.

Features

- Input Voltage Range 3.6V~23V
- Output voltage: 0.25V~Vcc
- 2A Switch Output Current
- Duty ratio: 0%~100% PWM control
- 330kHz Switching Frequency
- Enable/Disable Functions
- Current limit and Thermal Shutdown
- Short Circuit Protections
- Built-in Internal SW P-CH MOS

Application
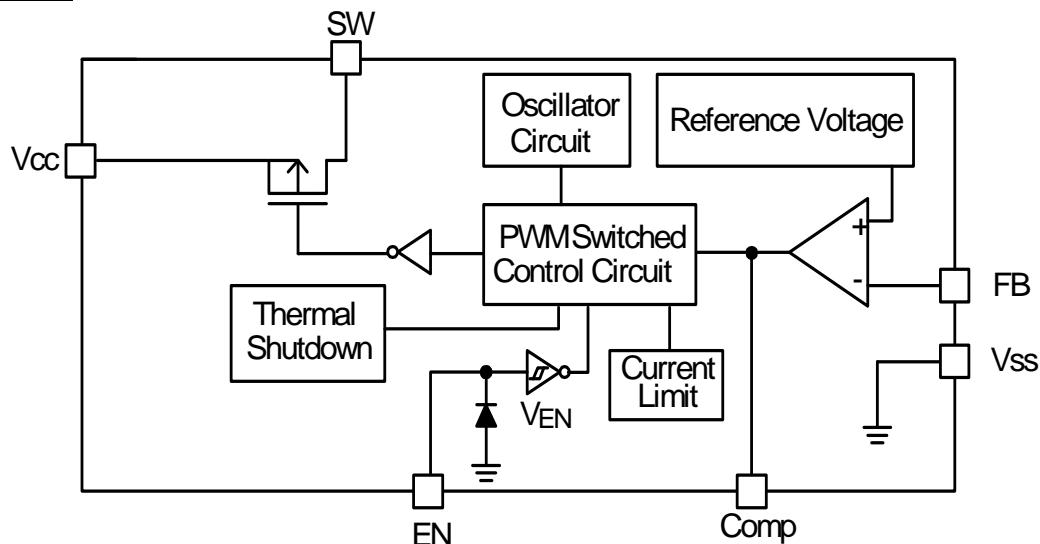
- White LED Backlighting
- White LED Driving
- Multiple LED Driving
- LED Lighting Equipment

Ordering Information

Part No.	Package	Packing
TS19377CS RLG	SOP-8	2.5Kpcs / 13" Reel

Note: "G" denotes Halogen Free Product.

Block Diagram

TS19377
2A Buck (Step-down) WLED Driver

Absolute Maximum Rating
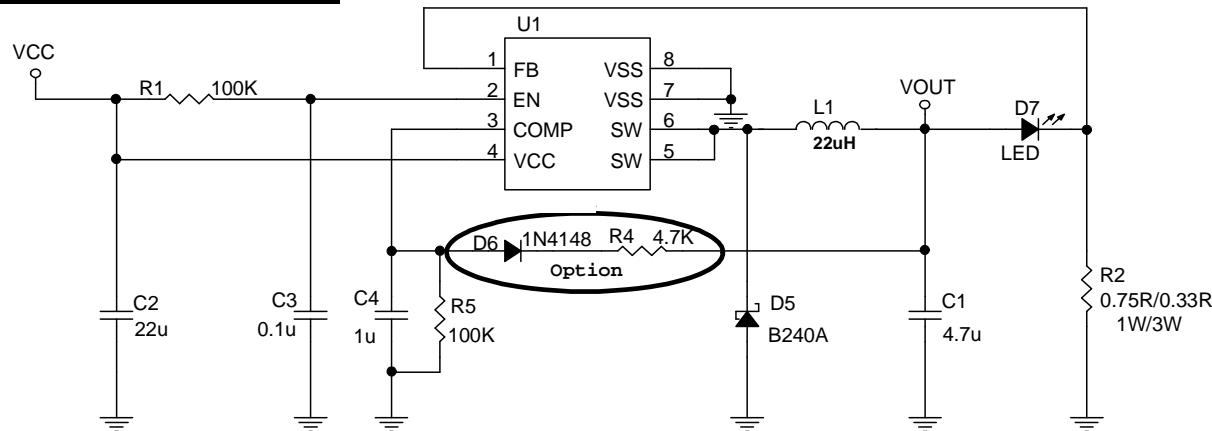
Parameter	Symbol	Limit	Unit
V_{CC} Pin Voltage	V_{CC}	V_{SS} - 0.3 to V_{SS} + 25	V
Feedback Pin Voltage	V_{FB}	V_{SS} - 0.3 to V_{CC}	V
ON/OFF Pin Voltage	V_{EN}	V_{SS} - 0.3 to V_{CC} + 0.3	V
Switch Pin Voltage	V_{SW}	V_{SS} - 0.3 to V_{CC} + 0.3	V
Power Dissipation	PD	Internally limited	mW
Storage Temperature Range	T_{ST}	-40 to +150	℃
Operating Temperature Range	T_{OP}	-40 to +125	℃
Operating Supply Voltage	V_{OP}	+3.6 to +23	V
Thermal Resistance from Junction to case	θ_{JC}	25	℃/W

Electrical Specifications (V_{IN}=12V, T_A =25°C, unless otherwise noted)

Parameter	Symbol	Conditions		Min	Typ	Max	Units
Feedback Voltage	V_{FB}	I_{OUT}=0.2A		0.24	0.25	0.26	V
Quiescent Current	I_{CCQ}	V_{FB}=1.2V force driver off		--	3	5	mA
Feedback Bias Current	I_{FB}	I_{OUT}=0.1A		--	0.1	0.5	uA
Shutdown Supply Current	I_{SD}	V_{EN} =0V		--	2	10	uA
Switch Current	I_{SW}			2.5	--	--	A
Line Regulation	$\Delta V_{OUT}/V_{OUT}$	V_{CC}=5V~23V, I_{OUT}=0.2A		--	1	2	%
Load Regulation	$\Delta V_{OUT}/V_{OUT}$	I_{OUT}=0.1 to 2A		--	0.2	0.5	%
Oscillation Frequency	F_{OSC}			260	330	400	KHz
EN Pin Logic input threshold voltage	V_{SH}	High (regulator ON)		2.0	--	--	V
	V_{SL}	Low (regulator OFF)		--	--	0.8	
EN Pin Input Current	I_{SH}	V_{EN}=2.5V (ON)		--	20	--	uA
	I_{SL}	V_{EN}=0.3V (OFF)		--	-10	--	uA
Internal MOSFET R_{DSON}	R_{DSON}	V_{CC}=5V, V_{FB}=0V		--	100	140	mΩ
		V_{CC}=12V, V_{FB}=0V		--	70	100	
Efficiency	EFFI	V_{OUT} = 5V	I_{OUT}=1A	--	91	--	%
			I_{OUT}=2A	--	91	--	
Thermal shutdown Temp	T_{SD}			--	140	--	℃

Typical Application Circuit

A: 1W/3W LED*1 for DC Input
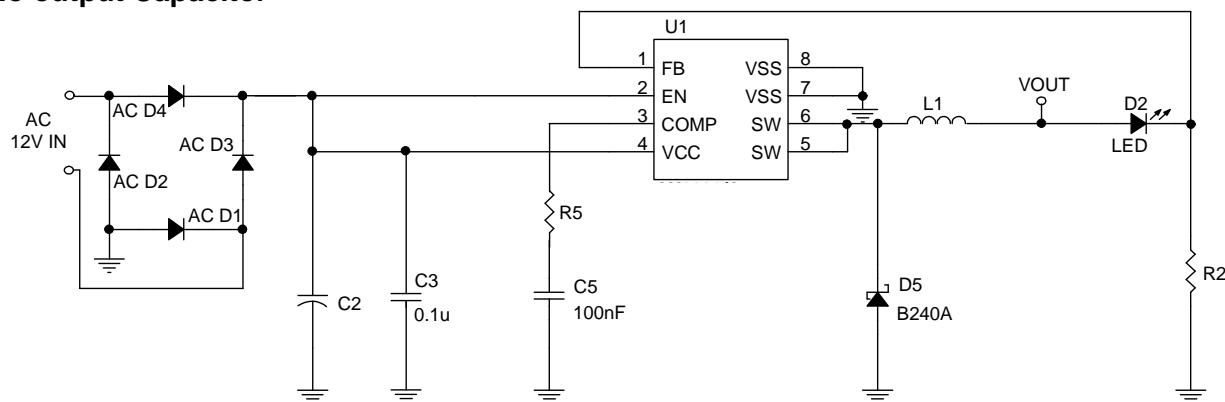
Recommend Bill of Material:

I_{LED}	R2		C2	R5	L1
350mA	0.715Ω	87.5mW	100uF	0.22K	
750mA	0.333Ω	189mW	220uF	0.47K	68uH
1000mA	0.250Ω	250mW	330uF	0.47K	

B: 1W/3W LED*1 for AC Input
❖ **No output Capacitor**

I_{LED}	R2		C2	R5	L1
350mA	0.715Ω	87.5mW	100uF	0.22K	
750mA	0.333Ω	189mW	220uF	0.47K	68uH
1000mA	0.250Ω	250mW	330uF	0.47K	

Function Descriptions

PWM Control

The TS19377 consists of DC/DC converters that employ a pulse-width modulation (PWM) system. In converters of the TS19377, the pulse width varies in a range from 0 to 100%, according to the load current. The ripple voltage produced by the switching can easily be removed through a filter because the switching frequency remains constant. Therefore, these converters provide a low-ripple power over broad ranges of input voltage and load current.

Setting I_{LED} Current

Application circuit item shows the basic application circuit with TS19377 adjustable output version. The external resistor sets the LED output current according to the following formula:

$$I_{LED}=(0.25V/R2)$$

Resistor select for LED output current setting

I_{LED}	R2	
350mA	0.715Ω	87.5mW
750mA	0.333Ω	189mW
1000mA	0.250Ω	250mW

RDS$_{(ON)}$ Current Liming

The current limit threshold is setting by the internal circuit.

Compensation

Please refer the table of application circuit. For DC input, the option circuit for compensation is connecting R4 and a 1N4148 diode to V_{OUT}. In order to protect short circuit and thermal shutdown release for LED.

Electrical Characteristics Curve
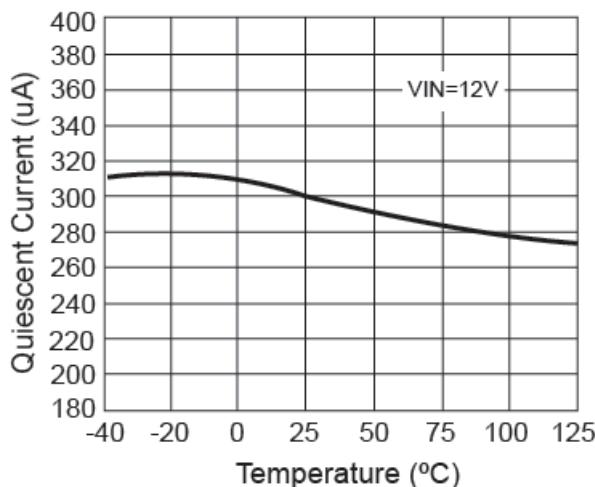
Figure 1. Quiescent Current vs. Temperature
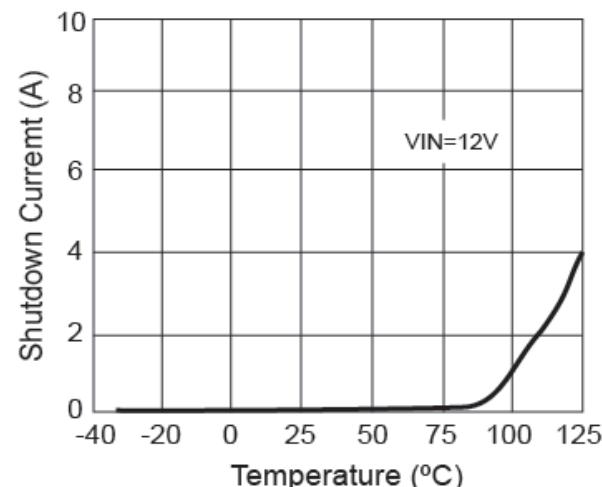
Figure 2. Shutdown Current vs. Temperature
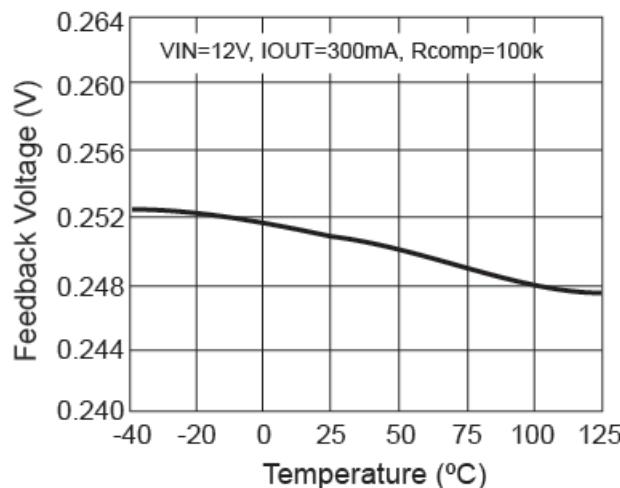
Figure 3. Feedback Voltage vs. Temperature
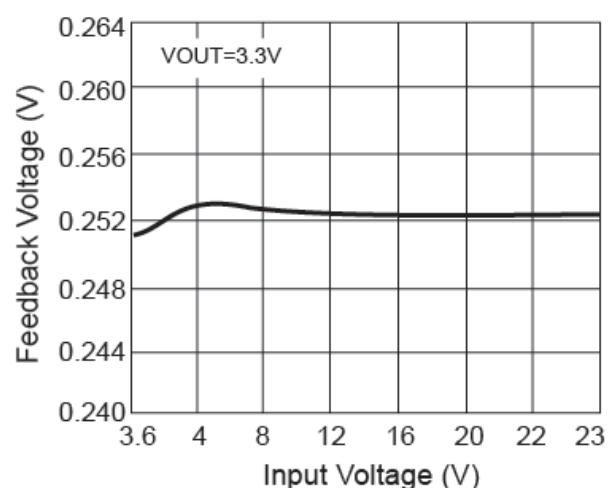

Figure 4. Feedback Voltage vs. Input Voltage
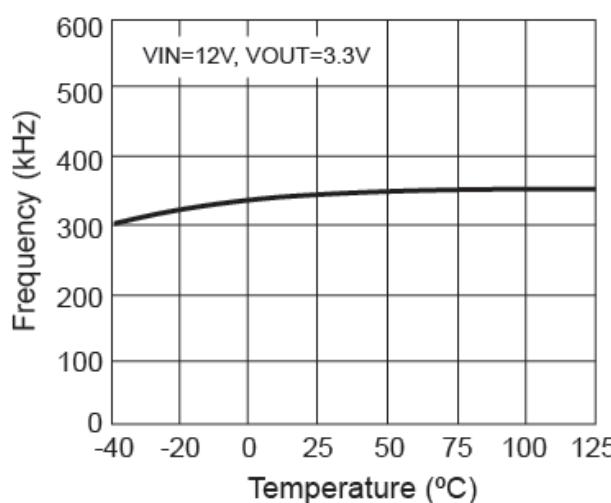

Figure 5. Frequency vs. Temperature
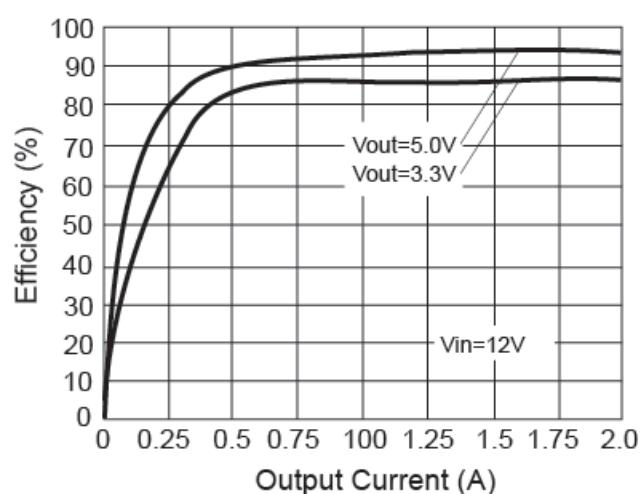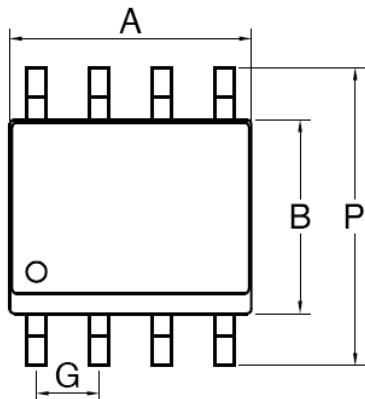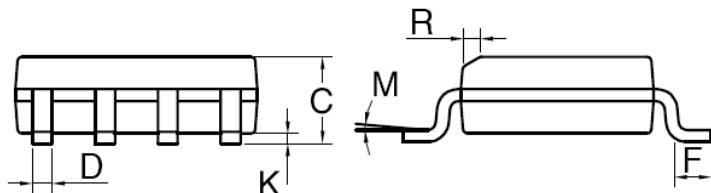
Figure 6. Efficiency vs. Output Current
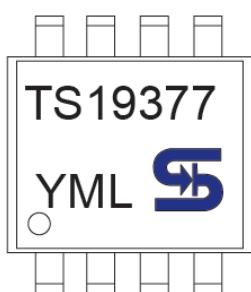
SOP-8 Mechanical Drawing

SOP-8 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX.
A	4.80	5.00	0.189	0.196
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27BSC		0.05BSC	
K	0.10	0.25	0.004	0.009
M	0º	7º	0º	7º
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

Marking Diagram

Y = Year Code

M = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apl, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug,
W=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)

L = Lot Code

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