致新科技

Global Mixed-mode Technology

G5177

Sync. Rectifier Step Up Converter

Features

- **Up to 93% Efficiency at V_{OUT} = 5V from 3.3V Input**
- **Low 50µA Quiescent Current**
- **Guaranteed 1.8A Output Current at V_{OUT} = 5V from 3.0V Input**
- **1MHz PWM Switching Frequency**
- **Synchronous and Embedded Power Mosfets; No Schottky Diode Required**
- **Internal Soft-Start to Limit Inrush Current**
- **Adjustable Output**
- **Adjustable Output Current Limit**
- **Output Shutdown**
- **Current Mode Operation with Internal Compensation for Excellent Line and Load Transient Response**
- **Overload/Short-Circuit Protection with hiccup control**
- **Shutdown Current <1µA**
- **Thermal Shutdown**
- **Compact 10-Pin, 3mm x 3mm TDFN Package**

Application

- **iPad-like computers, smart phones and portable handheld devices.**

General Description

The G5177 is a compact, high-efficiency, synchronous step-up converter with power Mosfets embedded and with output shutdown and adjustable output current limiting with foldback for a single-cell Li-ion/polymer battery. The G5177 uses only 50µA (typ) quiescent current and allows the converter to switch only when needed at no load and light loads, and when load is higher than 100mA, it uses fixed-frequency PWM technique at 1MHz. It features a current mode control for fast transient response with internal compensation. The G5177 includes cycle-by-cycle current limit to maximum inductor current and over-temperature protection circuit. The G5177 is suitable for iPad-like computers, smart phones and portable handheld devices.

The G5177 is available in a 3mm X 3mm TDFN package. The operating temperature range is from -45°C to +85°C.

Ordering Information

ORDER NUMBER	MARKIMG	TEMP. RANGE	PACKAGE (Green)
G5177RE1U	5177	0°C to +85°C	TDFN 3X3-10

Note: RE: TDFN3X3-10
    1: Bonding Code
    U: Tape & Reel

Pin Configuration

G5177

LX	1	10	VOUT
LX	2	9	VOUT
VBAT	3	8	OC
ILM0	4	7	FB
ILM1	5	6	GND

Thermal Pad (GND)

TDFN3X3-10
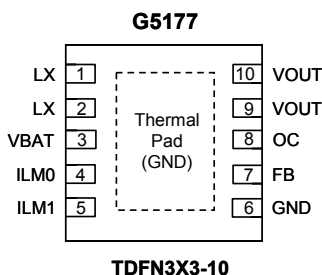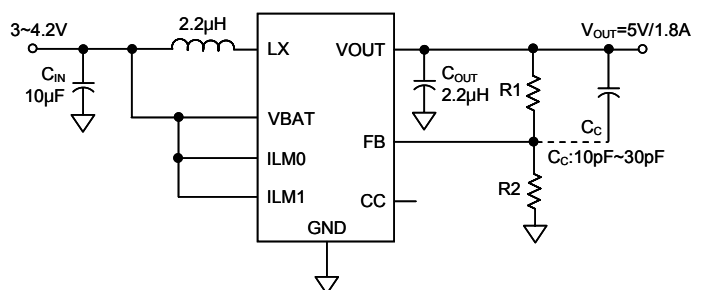
Note: Recommend connecting the Thermal Pad to the Ground for excellent power dissipation.

Typical Application Circuit

VOUT=VREF*(1+R1/R2), where VREF typical is 1.23V

Absolute Maximum Ratings

VOUT to GND . . . . -0.3V to 6V

LX to GND . . . . -0.3V to 6V

ILIM0 to GND . . . . -0.3V to 6V

ILIM1 to GND . . . . -0.3V to 6V

FB to GND . . . .-0.3V to 6V

BAT to GND . . . .-0.3V to 6V

Thermal Resistance of Junction to Ambient (θ_{JA})

TDFN3X3-10 . . . . 125°C/W

Continuous Power Dissipation (T_A = +25°C)

TDFN3X3-10 . . . . TBD

Storage Temperature . . . . -55~150°C

Operation Temperature. . . . . -40~85°C

Electrical Characteristics

(V_{OUT} = 5V, V_{BAT} = 3.6V, L = 2.2µH, C_{IN} = 10µF, C_{OUT} = 22µF, T_A = 25°C)

The device is not guaranteed to function outside its operating conditions. Parameters with MIN and/or MAX limits are 100% tested at +25°C, unless otherwise specified.
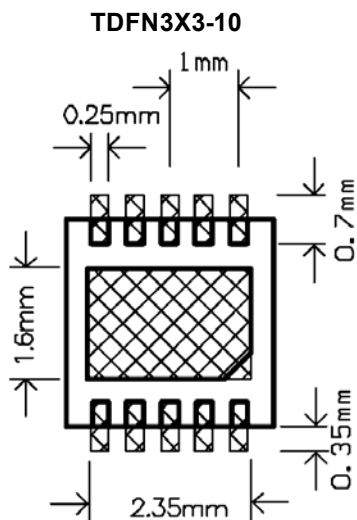
PARAMETER	Description	CONDITIONS	MIN	TYP	MAX	UNITS
General						
V_{BAT}	Input operation voltage		2.5	---	5.5	V
V_{OUT}	Output voltage	Line and Load Regulation in CCM (IL>100mA) V_{BAT}=2.5~4.5	4.925	5	5.075	V
I_{BAT}	Input Quiescent current	V_{BAT} =3.6 FB>1.3 No load, no switching (exclude input current from ILM0&ILM1)	---	50	70	µA
I_{BAT}	Shutdown supply current	ILIM0=ILIM1=0	---	0.1	1	µA
Oscillator						
Fosc	Switching Frequency		0.8	1.0	1.2	MHz
SS	Soft-Start Interval		---	6	---	ms
V_{FB}	FB Regulation Voltage		1.212	1.23	1.248	V
I_{FB}	FB Input Current	FB=1.0V	---	---	100	nA
T_deglitch	OC De-Glitch	OC flag from 1 to 0	---	6	---	ms
T_precharge+T_deglitch	Startup into a short-Circuit	OC flag from 1 to 0	---	12	---	ms
T_scp_restart	Restart time in SCP	OC flagkeep 0	---	64	---	ms
T_short_response	short-Circuit Response Time	V_{OUT} < V_{OUT} X25%,	---	Tosc	---	µs
T_oc_response	Current Limit Response Time		---	Tosc	---	µs
D_{max}	Maximum Duty Cycle	FB=0.95V	86	92	98	%
DC-DC Switches						
I_{PVOUT_LK}	VOUT Leakage Current	ILIM0=ILIM1=0, V_{OUT}=5V	---	1	5	µA
I_{LX_LK}	LX Leakage Current	ILIM0=ILIM1=0, V_{OUT}=5V	---	1	5	µA
R_{ON}-N	Switch ON Resistance		---	40	70	mΩ
R_{ON}-P			---	60	100	
I_LIM	Peak Current Limit	ILIM0=0, ILIM1=0	---	0	---	A
		ILIM0=1, ILIM1=0	---	1.6	---	
		ILIM0=0, ILIM1=1	---	2.63	---	
		ILIM0=1, LIMI1=1	3.91	4.6	5.3	
	Efficiency	ILIM0=1, ILIM1=1, V_{BAT}=3.3V, V_{OUT}=5V, I_{OUT}=1.8A	---	85	---	%
	Shutdown Pull-Low Resistance	ILIM0=0, ILIM1=0	---	75	150	Ω

Electrical Characteristics (Continued)

PARAMETER	Description	CONDITIONS	MIN	TYP	MAX	UNITS
Protection Block						
V_{SCP}	VOUT Short-Circuit Threshold	Falling Edge	---	$V_{OUT}(1-0.27)$	---	V
V_{SCP}	VOUT Short-Circuit Threshold	Ring Edge	---	$V_{OUT}(1-0.19)$	---	V
V_{UVLO}	VBAT UVLO Threshold	Falling Edge	1.9	2.0	2.1	V
V_{UVLO}	VBAT UVLO Threshold	Rling Edge	2.1	2.2	2.3	V
	Thermal Shutdown Threshold	Rising Edge, 20°C hysteresis	---	150	---	°C
Control Block						
Vih_ilm	ILIM0, ILIM1 Input High Level		1.5	---	5.5	V
Vil_ilm	ILIM0, ILIM1 Input Low Level		0	---	0.5	V
Rin_ilm	ILIM0, ILIM1, Internal Pull-Low Resistance		400	500	600	KΩ

***note1:If ILIM0&ILIM1 connect to Vbat , It will consume current I_ilim= Vbat/500k**

Minimum Footprint PCB Layout Section

TDFN3X3-10

Pin Description

| PIN	NAME	FUNCTION
1,2	LX	Inductor Node.
3	VBAT	IC Power Supply Input.
4	ILIM0	Output Current Limit Setting, and On/Off Control.
5	ILIM1	Output Current Limit Setting, and On/Off Control.
6	GND	IC Analog Ground.
7	FB	Converter Feedback Input.
8	OC	Open-Drain Flag for Over-Current, Short-Circuit, or Thermal Shutdown; Active Low.
9,10	VOUT	Converter Output.
	EP	Exposed Paddle. Connect to the ground plane to optimize thermal performance. EP is internally connected to GND. EP must be connected to GND at a single point with a star ground connection.

## Block Diagram
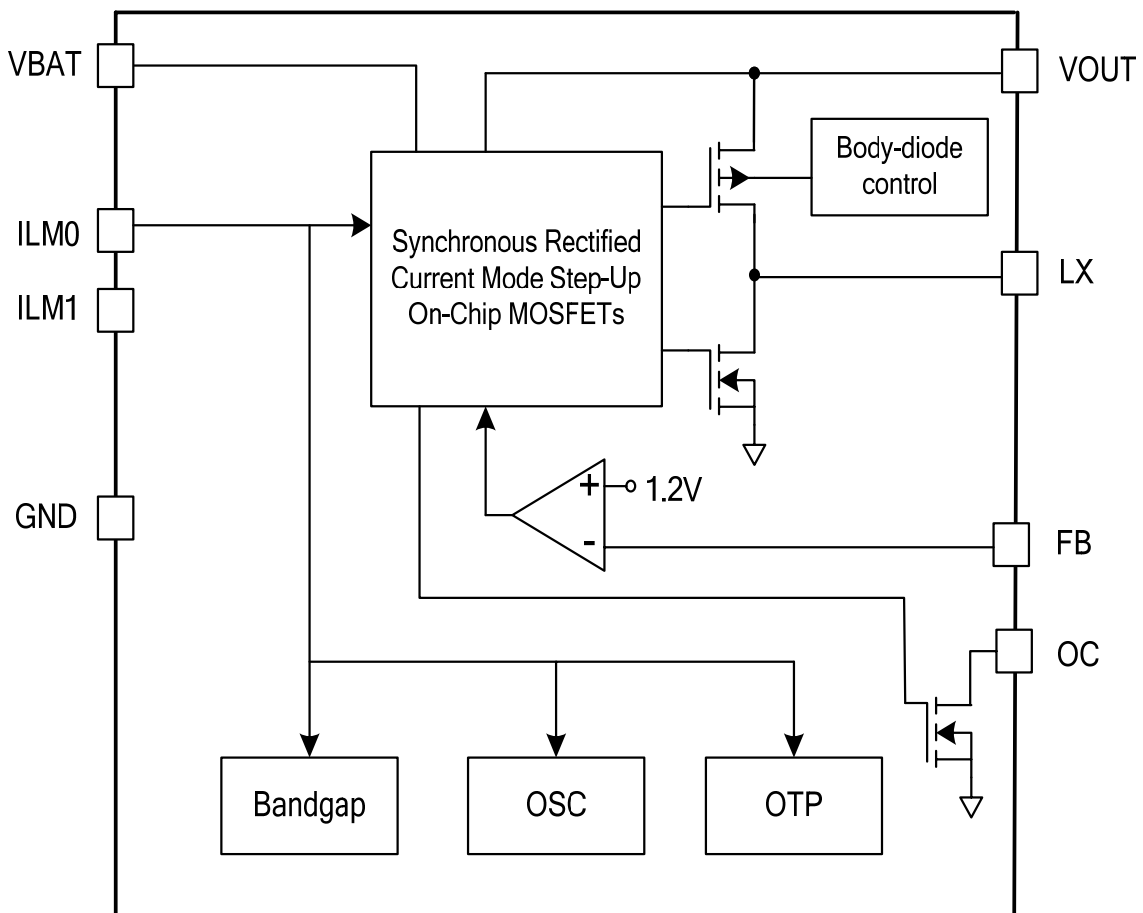
Function Description

The G5177 current-mode step-up DC-DC switching converter uses a fixed-frequency PWM architecture with output shutdown. In light-load mode, the converter switches when needed, consuming only 30μA of quiescent current. In heavy-load mode of higher than 100mA, the converter switches every cycle at a constant frequency as fixed-PWM, thus enabling noise filtering. The G5177 is highly efficient, with internal and synchronous switches. Shutdown reduces the quiescent current to less than 0.1μA. Low quiescent current and high efficiency make this device ideal for portable equipment.

The G5177 step-up DC-DC switching converter typically generates a 5V output voltage from a single-cell battery input voltage. The output current limit is adjustable to be set at 0.5A, 1.0A and 1.8A respectively by the preset pins of ILIM0 and ILIM1, as Table 1. The OC pin (open-drain) is asserted (active low) when an over-current, short-circuit or thermal shutdown condition is encountered after a 6-ms deglitch timeout. The OC pin remains asserted until the over-current or over-temperature condition is removed, and during the state of short-circuit after precharge is end, the converter will turn off 64ms first and then turn on 1ms cycle by cycle to protect converter under short circuit operation . Internal soft-start limits the inrush current to less than 500mA under no-load conditions during startup. The G5177 has a preset output of 5V and is adjustable by 2 external resistors with calculating the value for R1 as R1 = R2 (VOUT/VFB - 1).

The G5177 switches at a 1MHz frequency, allowing for tiny external components. The G5177 is optimized for use in iPad-like computers, smart phones, portable handheld devices and other applications requiring low quiescent current for maximum battery life.

Package Information
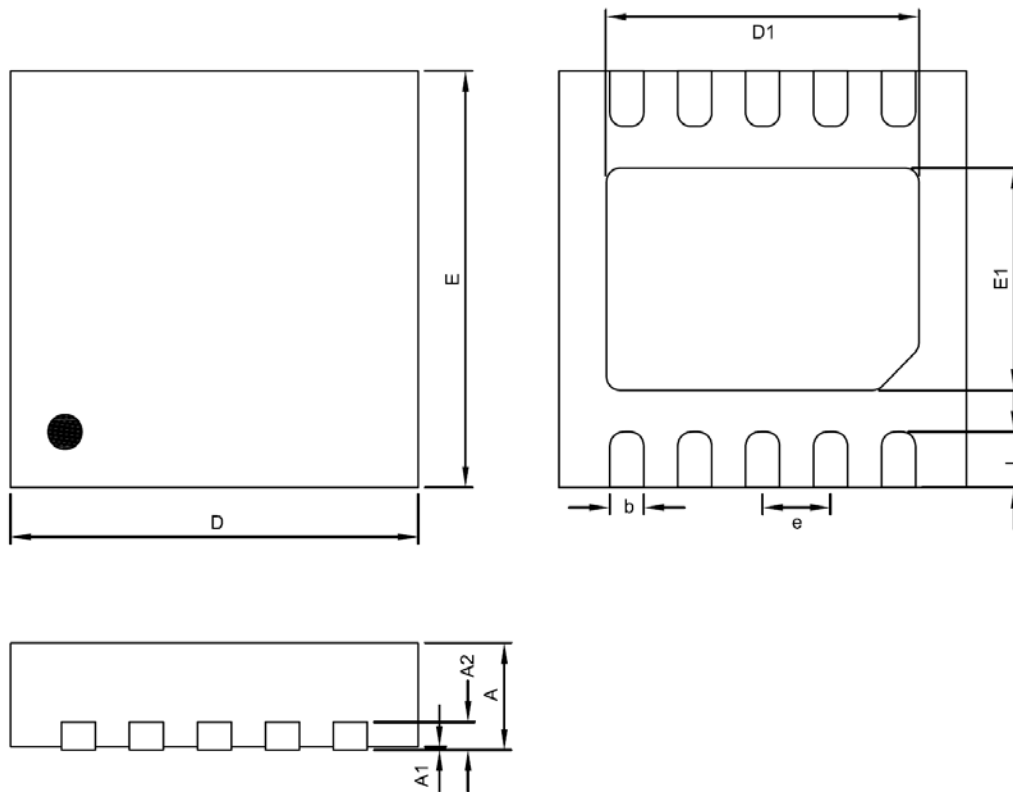
TDFN3X3-10 Package

Symble	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.70	0.75	0.80	0.0276	0.0295	0.0315
A1	0.00	- - -	0.05	0.0000	- - -	0.0020
A2	0.19	0.20	0.21	0.0075	0.0079	0.0083
D	2.95	3.00	3.05	0.1161	0.1181	0.1201
E	2.95	3.00	3.05	0.1161	0.1181	0.1201
D1	2.20	2.30	2.40	0.0866	0.0906	0.0945
E1	1.40	1.50	1.60	0.0551	0.0591	0.0630
b	0.18	0.25	0.30	0.0071	0.0098	0.0118
e	0.50 BSC			0.0197 BSC		
L	0.35	0.40	0.45	0.0138	0.0157	0.0177

Taping Specification

Feed Direction
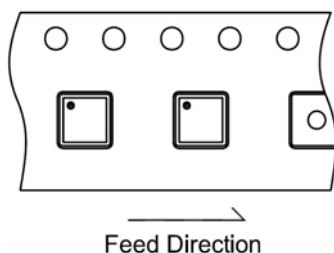
PACKAGE	Q'TY/REEL
TDFN3X3-10	3,000 ea