

Brief Description

This IP is a sub-PMIC for parallel LED backlight, LED flash light and subsystem requiring two independent power supplies. It is ideal for cell phone with camera module and other handheld portable devices with LCD panel. It can drive four parallel WLEDs with up to 25mA current each and one 150mA flash LED. By monitoring each LED current, it achieves a high performance current match between each LED. Two LDOs can supply 150mA and 250mA respectively with 70dB PSRR and 30 uV noise, which are absolutely good for noise sensitive application like image processing. The adaptive 1x/1.5x/2x switchover charge pump gives very high efficiency during entire Li+ battery life. The 1.3MHz switch frequency allows for tiny external capacitors. Two enable inputs (ENL and ENF) provide simple on/off control and maximum Flash light current, LED brightness adjustment.

Highlights

- 4W LED back-light driver with Up-to 25 mA current (Charge pump)
- 1W LED flash Driver with up-to 200 mA current (Charge pump)
- 85% average efficiency with over 2.7 V to 4.2 V battery range
- 1% current match with each WLED
- 2 internal 30 uV Low noise 1.8V_150mA / 2.8V_300mA LDOs for RF power supply
- flexible WLED dimming control by PWM
- flexible Flash light Control by PWM
- soft start, over voltage and thermal protection
- adaptive 1X/1.5X/2X mode switch
- designed in 0.6um 1P 3 M CMOS
- estimated chip Size 1.51mm X 2.51mm

Pin Description

<i>Pin</i>	<i>Symbol</i>	<i>Description</i>
1	VIN	Power supply for chip and LDO.
2	GND	Analogue ground for chip internal control circuit and LDO output
3	BYP	Voltage Reference Bypass.
4	LDO1	LDO output.
5	LD02	
6	ENLDO	Enable input for dual LDO.

7	ENL	ENL is WLED dimming control and enable input & ENF is Flash light dimming and enable input. When ENL/ENF is low for 100ms, the WLED/flash light is shut down. When a 100Hz to 100KHz PWM signal connects, the duty cycle of the PWM determines the current through the WLED/flash light.
8	ENF	
9	FLASH	Flash light driver output. Connect to the cathode of the flash light WLED. It has 150mA maximum continuous current capability (300mA of 500ms pulsed current)
10	VFSEL	Logic input for selecting the output voltage. VFSEL = 0, VOUT = 4.5V; VFSEL = 1, VOUT = 4.5V
11~14	LED4~ LED1	LED Drive Output. Connect to the cathode of the backlighting WLED. It has 25mA maximum current capability.
15	OUT	Pump Output. Connect OUT to all LED anodes.
16	PGND	Power ground for charge pump. Connect PGND to system ground.
17	C3N	Connect charge Pump capacitor between C3N and C3P.
18	C3P	
19	C2N	Connect charge pump capacitor between C2N and C2P.
20	C2P	

Chip Specifications

General Electrical Characteristics

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<i>Parameter</i>	<i>Symbol</i>	<i>Conditions</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
Supply Voltage						
Input Voltage Range			2.7	-	5.5	V
Supply Current		1.5x,2X Mode, ENLDO on, no load	-	2	-	mA
		1x mode, ENLDO on, No load	-	0.3	-	
Supply Voltage						
Supply Current		LED off, ENLDO on, No load	-	0.1	-	uA
Shutdown Current		LDO, LED and Charge Pump Off	-	0.1	1.0	uA
UVLO Threshold		Rising	2.4	2.55	2.7	V
		Falling	2.3	2.45	2.6	V
Logic Input Pins						
Input High	V _{IH}	All Input Pins(ENLDO, ENL,ENF,VFSEL)	1.5	-	-	V
Input Low	V _{IL}		-	-	0.5	V
Enable Input Leakage Current		V _{EN} = V _{IM} or GND	-1	-	1	uA
Charge Pump						
Maximum Output Voltage	V _{oUT}	VFSEL=1	4.5	5.0	5.5	V
		VFSEL=0	4.2	4.5	4.8	V
Mode Transition Input Voltage Hysteresis			-	100	-	mV
1xto 1.5xor 1.5xto 2x Transition Threshold			90	100	110	mV
Maximum Output Current		V _{IN} > 3.2V, V _{oUT} =4V	300	-	-	mA
Maximum Short- Circuit Current		V _{QUT} < 1-25V	-	200	-	mA

Open Loop		1x Mode, (VIN - VOUT) / IoUT	-	0.3	1	Ohm.
OUT Resistance		1.5x and 2x Mode (VIN - VOUT) /	-	1	3	
Switching Frequency			-	1.3	-	MHz
Charge Pump						
OUT Pull-down Resistance in Shutdown			-	5	-	kOhm
LED Driver						
Enable Input Leakage Current		V _{EN} = V _{IM} or GND	-1	-	1	uA
LED Current Accuracy			-5	-	5	%
LED to LED Current Matching			-	±1	±3	%
LED Driver						
Maximum LED Sink Current			25	-	-	mA
Maximum FLASH Sink Current		VFSEL=1 Continuous Current	150	200		mA
		VFSEL=0 Continuous Current	200	250		
Minimum LED Driver Pin Voltage		100% sink current	-	80	120	mV
1.5x,2x Mode Regulation Voltage at LED Drive Pin			130	150	-	mV
Leakage Current		Shut down, V _{LED} = 5V	-	0.01	1	uA
LDO1						
Output Voltage			1.77	1.8	1.83	V
Maximum Output Current			250	-	-	mA
Current Limit		V _{LDOi} = 0V	320	400	500	mA

Pull-down discharge Resistance in Shutdown	RDISCH		-	200	-	Ohm
Power Supply Rejection Ratio		@1kHz	-70	-	-	dB
Output Noise Voltage		BW = 10Hz to 100kHz	-	30	-	UVrms
Dropout Voltage		Ildoi =250mA	-	100	200	mV
LD02						
Output Voltage			2.75	2.8	2.85	V
Maximum Output Current			150	-	-	mA
Current Limit		V _{LD02} = 0V	200	250	300	mA
Pull-down discharge Resistance in Shutdown	RDISCH		-	200	-	Ohm
Power Supply Rejection Ratio		@1kHz	-70	-	-	dB
Output Noise Voltage		BW = 10Hz to 100kHz	-	30	-	UVRMS
Dropout Voltage		ILDO2= 150mA	-	70	150	mV
Thermal Shutdown (TSD)						
Threshold			125	140	155	°C
Hysteresis			-	15	-	°C
Regulation						
LDO Line Regulation		V _{IN} = V _{LD0_} +0.5V to 5.5V; I _{LD0_} = 100uA		0.02%	0.1%	%/v
LDO Load Regulation		V _{IN} = V _{LD0_} +0.5V; I _{LD0_} = 0.1mA to 50% I _{MAX}		0.1%	0.5%	%/v
LDO Enable time		ENLDO = high to reach 90% of V _{LD0_}		30	100	us
LED Driver Soft Start Time		Enable ON to LED reach 90% setting current		0.5	1.0	ms

Application

Cellular Telephones

Other Lithium-Ion/Polymer Battery-Powered Devices