

7 channel Composite Power Supply for Digital Camera Monolithic IC MM3200

Outline

MM3200 is a 7 channel complex power supply IC which supplies all power sources necessary for digital cameras: system 5V, logic 3.3V, core 1.8V, backlight, CCD, LCD). Having step-up, step-down, step-up/down (up or down can be set by choosing the terminals), power circuit design is made simpler. 2 channels are provided for 3.3V series power supply which is often used at high load, so that separate channel can be used for logic and other.

Features

1. synchronous commutation system (5V, 3.3V, and 1.8V series)
2. With FET built in, saves space and reduce the cost (3.3V system, 1.8V system, AUX1, AUX3)
3. Step-up and down can be selected (VM1 output)
4. 4 LED can be driven with constant current (AUX3)
5. LED open protection included (AUX3)
6. Wide range of operating frequency 100~1MHz
7. 2 channels of 3.3V series can be used to separate power supply for logic and other.
8. Soft starting
9. Overload protection
10. Output error detection

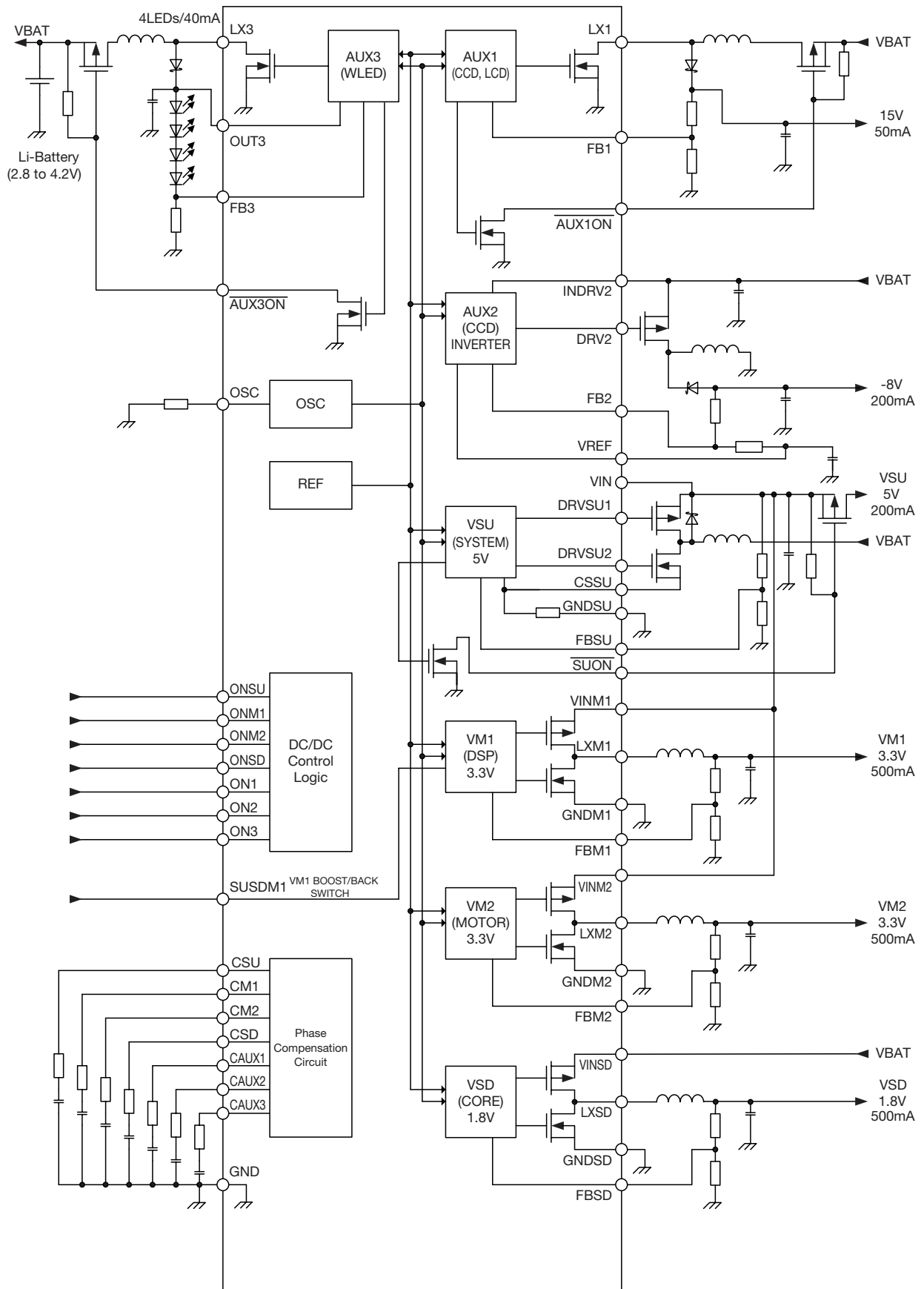
Package

QFN-48A

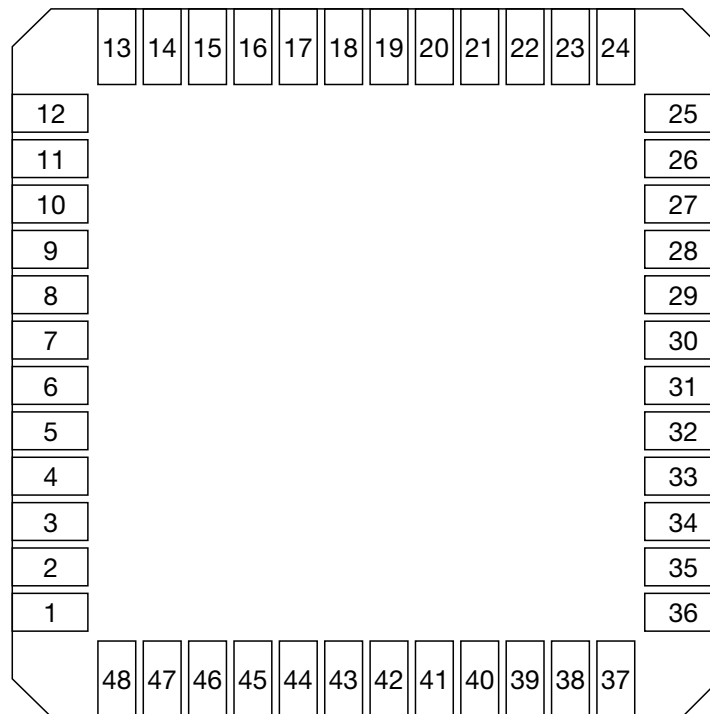
Applications

1. Digital still camera
-

Block Diagram



Pin Assignment



QFN-48A
(BOTTOM VIEW)

1	CAUX1	13	CAUX2	25	LXM2	37	GNDM1
2	FB1	14	FB2	26	VINM2	38	SUON
3	FB3	15	VREF	27	ONM2	39	AUX3ON
4	CAUX3	16	OSC	28	FBM2	40	CSD
5	OUT3	17	CSU	29	CM2	41	FBSD
6	ON3	18	FBSU	30	N.C.	42	ONSD
7	GND	19	ONSU	31	ONM1	43	VINS
8	LX3	20	GND _{SU}	32	FBM1	44	LXSD
9	V _{IN}	21	CSSU	33	CM1	45	GNDSD
10	DRV2	22	DRVSU2	34	SUSDM1	46	LX1
11	INDRV2	23	DRVSU1	35	VINM1	47	AUX1ON
12	ON2	24	GNDM2	36	LXM1	48	ON1

Pin Description

Pin No.	Symbol	I/O	Function
9	VIN		IC power input
16	OSC	I	Oscillator frequency control input
23	DRVSU1	O	PMOS gate drive terminal of step up converter's high side
22	DRVSU2	O	NMOS gate drive terminal of step up converter's low side
21	CSSU	I	Step-up converter current sense input
18	FBSU	I	Step-up converter feed-back input
19	ONSU	I	Step-up converter ON/OFF control input
17	CSU	I	Step-up converter compensation node
20	GNDSU		Step-up converter grand
38	SUON	O	Main converter1 ON signal output
35	VINM1	I/O	When SUSDM1=GND, power input of main converter1 When SUSDM1=VIN, output of main converter1
36	LXM1	I/O	MAIN converter1 switch node
37	GNDM1		MAIN converter1 GND
32	FBM1	I	MAIN converter1 feed-back input
31	ONM1	I	Main converter1 ON/OFF control input
33	CM1	I	Main converter1 compensation node
26	VINM2	I	Power input of main converter2
25	LXM2	O	MAIN converter2 switch node
24	GNDM2		MAIN converter2 GND
28	FBM2	I	Main converter2 feed-back input
27	ONM2	I	Main converter2 ON/OFF control input
29	CM2	I	Main converter2 compensation node
43	VINS	I	Step-down converter power input
44	LXSD	O	Step-down converter switch node
45	GNDSD		Step-down converter GND
41	FBSD	I	Step-down converter feed-back input
42	ONSD	I	Step-down converter on/off control input
40	CSD	I	Step-down converter compensation node
46	LX1	O	AUX1 switch node
2	FB1	I	AUX1 feed-back input
47	AUX1ON	O	AUX1 ON signal output
48	ON1	I	AUX1 ON/OFF control input
1	CAUX1	I	AUX1 compensation node
11	INDRV2	I	AUX2 power input
15	VREF	O	Reference voltage output for AUX2. Please connect an external condenser 0.1μF. When AUX2 is off, the voltage is 0V. Please do not use as power supply for devices of other types, and as reference power supply.
10	DRV2	O	AUX2 gate drive output
14	FB2	I	AUX2 feed-back input
12	ON2	I	AUX2 ON/OFF control input
13	CAUX2	I	AUX2 compensation node
39	AUX3ON	O	AUX3 ON signal output
8	LX3	O	AUX3 switch node
5	OUT3	I	AUX3 output open over-voltage detect input
3	FB3	I	AUX3 feed-back input
6	ON3	I	AUX3 ON/OFF control input
4	CAUX3	I	AUX3 compensation node
34	SUSDM1	I	Step-up/Step-down control input for main converter1
30	N.C.		No connect
7	GND		IC GND

Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Storage temperature	T _{STG}	-40~+125	°C
Operating temperature	T _{OPR}	-30~+85	°C
V _{IN} ,V _{IN} M1,V _{IN} M2,VSD Voltage	V _{IN_max.}	-0.3~+6.0	V
LX1,LX3,OUT3 Voltage	V _{LX_max.} V _{OUT3_max.}	-0.3~+18.0	V
Other PINs Volatage	V _{_max.}	-0.3~+6.0	V
Allowable loss	PD	4.13 *	W

note : * Bourd Spec. : 76.3 × 114.3 × 1.6mm FR-4

Cu Trace Rate : 200%

Soldering with substrate

Recommended Operating Conditions

Item	Symbol	Ratings	Units
Storage temperature	T _{OPR1}	-20~+75	°C
Input voltage range	V _{OPR}	+1.5~+5.5	V

Electrical Characteristics

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
GENERAL						
Step-up minimum start-up voltage	V _{sumin}			1.5	1.9	V
Shutdown supply current	I _{in1}			0.1	10	μA
Thermal shutdown detection	TSD			160		°C
Thermal shutdown release	TSR			140		°C
OSCILLATOR						
Oscillator frequency	f _{osc}	ROSC=51kΩ	0.8	1.0	1.2	MHz
		ROSC=680kΩ	80	100	120	kHz
STEP-UP DCDC						
FBSU regulation voltage	V _{FBSU}		0.88	0.9	0.92	V
Maximum on duty	MAXDUTYSU		90	95		%
Soft start time	t _{SSSU}		2	4	8	ms
CSU PIN voltage H	V _{CSUH}		1.6	1.8		V
CSU PIN voltage L	V _{CSUL}			0	0.2	V
CSU PIN current	I _{CSU}		±20	±30		μA
Error amp gain	A _v	DC	25	40		dB
Current limit	I _{lim}			2.5		A
ONSU PIN input voltage H	V _{ONSUH}		1.2			V
ONSU PIN input voltage L	V _{ONSUL}				0.3	V
ONSU to GND resistabce	R _{ONSU}			330		kΩ
DRVSU1 current	I _{DRVSU1}			±3		mA
DRVSU2 current	I _{DRVSU2}			±3		mA
Output overcrrrent detect	V _{FBOCP}	FB terminal voltage detection	0.4	0.45	0.5	V
CSSU-GND current sence resistance	R _{CSSU}			0.1		Ω
SUON PIN voltage L	V _{ONSUL}			0	0.2	V

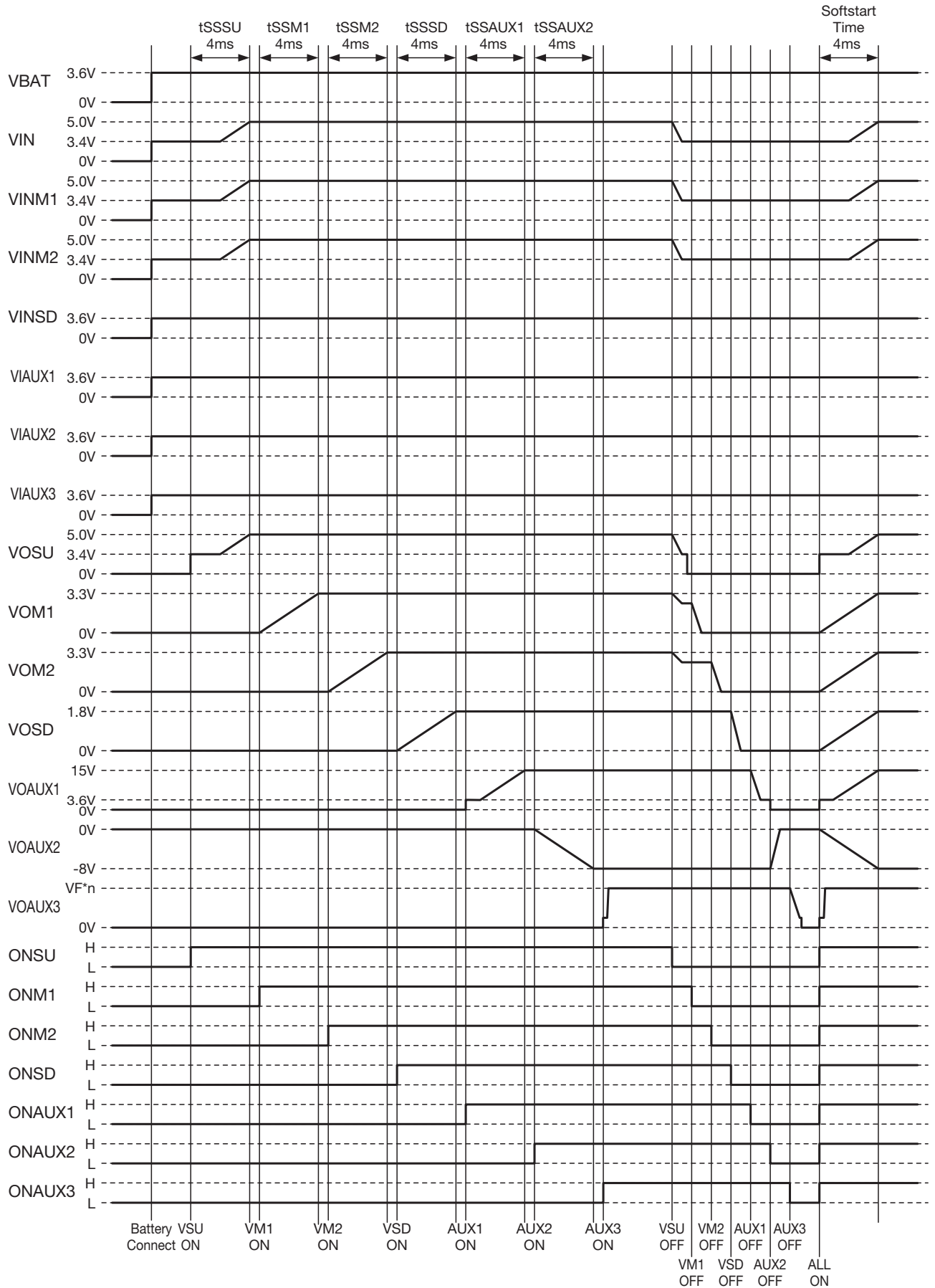
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
MAIN1 DCDC						
FBM1 regulation voltage	VFBM1		0.88	0.9	0.92	V
Maximum on duty	MAXDUTYM1-1	Step-up mode	90	95		%
	MAXDUTYM1-2	Step-down mode	90	95		%
Switch on resistance	NRONM1	N-channel		0.4		Ω
	PRONM1	P-channel		0.4		Ω
Soft start time	tSSM1		2	4	8	ms
CM1 PIN voltage H	VCM1H		1.6	1.8		V
CM1 PIN voltage L	VCM1L			0	0.2	V
CM1 PIN current	ICM1		± 20	± 30		μA
Error amp gain	Av	DC	25	40		dB
Current limit	Ilim			1		A
ONM1 PIN input voltage H	VONM1H		1.2			V
ONM1 PIN input voltage L	VONM1L				0.3	V
ONM1 to GND resistabce	RONM1			330		k Ω
SUSDM1 PIN input voltage H	VSUSDM1H		$V_{IN}-0.3$			V
SUSDM1 PIN input voltage L	VSUSDM1L				0.3	V
Output overcrrrent detect	VOCP	FB terminal voltage detection	0.4	0.45	0.5	V
Output overcrrrent detect delay	tOCP		1	2	3	ms
MAIN2 DCDC						
FBM2 regulation voltage	VFBM2		0.88	0.9	0.92	V
Maximum on duty	MAXDUTYM2		90	95		%
Switch on resistance	NRONM2	N-channel		0.4		Ω
	PRONM2	P-channel		0.4		Ω
Soft start time	tSSM2		2	4	8	ms
CM2 PIN voltage H	VCM2H		1.6	1.8		V
CM2 PIN voltage L	VCM2L			0	0.2	V
CM2 PIN current	ICM2		± 20	± 30		μA
Error amp gain	Av	DC	25	40		dB
Current limit	Ilim			1		A
ONM2 PIN input voltage H	VONM2H		1.2			V
ONM2 PIN input voltage L	VONM2L				0.3	V
ONM2 to GND resistabce	RONM2			330		k Ω
Output overcrrrent detect	VOCP	FB terminal voltage detection	0.4	0.45	0.5	V
Output overcrrrent detect delay	tOCP		1	2	3	ms

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
STEP-DOWN DCDC						
FBSD regulation voltage	VFBS		0.88	0.9	0.92	V
Maximum on duty	MAXDUTYS		90	95		%
Switch on resistance	NRONS	N-channel		0.4		Ω
	PRONS	P-channel		0.4		Ω
Soft start time	tSS		2	4	8	ms
CSD PIN voltage H	VCSDH		1.6	1.8		V
CSD PIN voltage L	VCSDL			0	0.2	V
CSD PIN current	ICSD		± 20	± 30		μA
Error amp gain	Av	DC	25	40		dB
Current limit	Ilim			1		A
ONSD PIN input voltage H	VONSDH		1.2			V
ONSD PIN input voltage L	VONSDL				0.3	V
ONSD to GND resistabce	RONS			330		k Ω
Output overcrrrent detect	VOCP	FB terminal voltage detection	0.4	0.45	0.5	V
Output overcrrrent detect delay	tOCP		1	2	3	ms
AUX1 DCDC						
FB1 regulation voltage	VFB1		0.88	0.9	0.92	V
Maximum on duty	MAXDUTYAUX1		90	95		%
Switch on resistance	RONAUX1			0.5		Ω
Soft start time	tSSAUX1		2	4	8	ms
CAUX1 PIN voltage H	VCAUX1H		1.6	1.8		V
CAUX1 PIN voltage L	VCAUX1L			0	0.2	V
CAUX1 PIN current	ICAUX1		± 20	± 30		μA
Error amp gain	Av	DC	25	40		dB
Current limit	Ilim			1		A
ON1 PIN input voltage H	VON1H		1.2			V
ON1 PIN input voltage L	VON1L				0.3	V
ON1 to GND Resistabce	RON1			330		k Ω
Output overcrrrent detect	VOCP	FB terminal voltage detection	0.4	0.45	0.5	V
Output Overcrrrent Detect Delay	tOCP		1	2	3	ms
AUX1ON PIN voltage L	VONAUX1L			0	0.2	V

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
AUX2 DCDC						
FB2 regulation voltage	VFB2		-0.1	0	0.1	V
Maximum on duty	MAXDUTYAUX2		90	95		%
Soft start time	tSSAUX2		2	4	8	ms
CAUX2 PIN voltage H	VCAUX2H		1.6	1.8		V
CAUX2 PIN voltage L	VCAUX2L			0	0.2	V
CAUX2 PIN current	ICAUX2		±20	±30		µA
Error amp gain	Av	DC	25	40		dB
ON2 PIN input voltage H	VON2H		1.2			V
ON2 PIN input voltage L	VON2L				0.3	V
ON2 to GND resistabce	RON2			330		kΩ
Output overcrrrent detect	VOCP	FB terminal voltage detection	0.4	0.45	0.5	V
Output overcrrrent detect delay	tOCP		1	2	3	ms
Reference voltage	VREF		0.88	0.9	0.92	V
AUX3 DCDC (White LED Driver)						
FB3 regulation voltage	VFB3		0.19	0.20	0.21	V
Maximum on duty	MAXDUTYAUX3		90	95		%
Switch on resistance	RONAUX3			1.0		Ω
Open protection voltage	VOVP			17		V
CAUX3 PIN voltage H	VCAUX3H		1.6	1.8		V
CAUX3 PIN voltage L	VCAUX3L			0	0.2	V
CAUX3 PIN current	ICAUX3		±20	±30		µA
Error amp gain	Av	DC	25	40		dB
Current limit	Ilim			0.5		A
ON3 PIN input voltage H	VON1H		1.2			V
ON3 PIN input voltage L	VON1L				0.3	V
ON3 to GND resistabce	RON1			330		kΩ
Output overcrrrent detect	VOCP	FB terminal voltage detection	0.085	0.1	0.115	V
Output overcrrrent detect delay	tOCP		1	2	3	ms
AUX3ON PIN voltage L	AUX3ONL			0	0.2	V

Timing chart

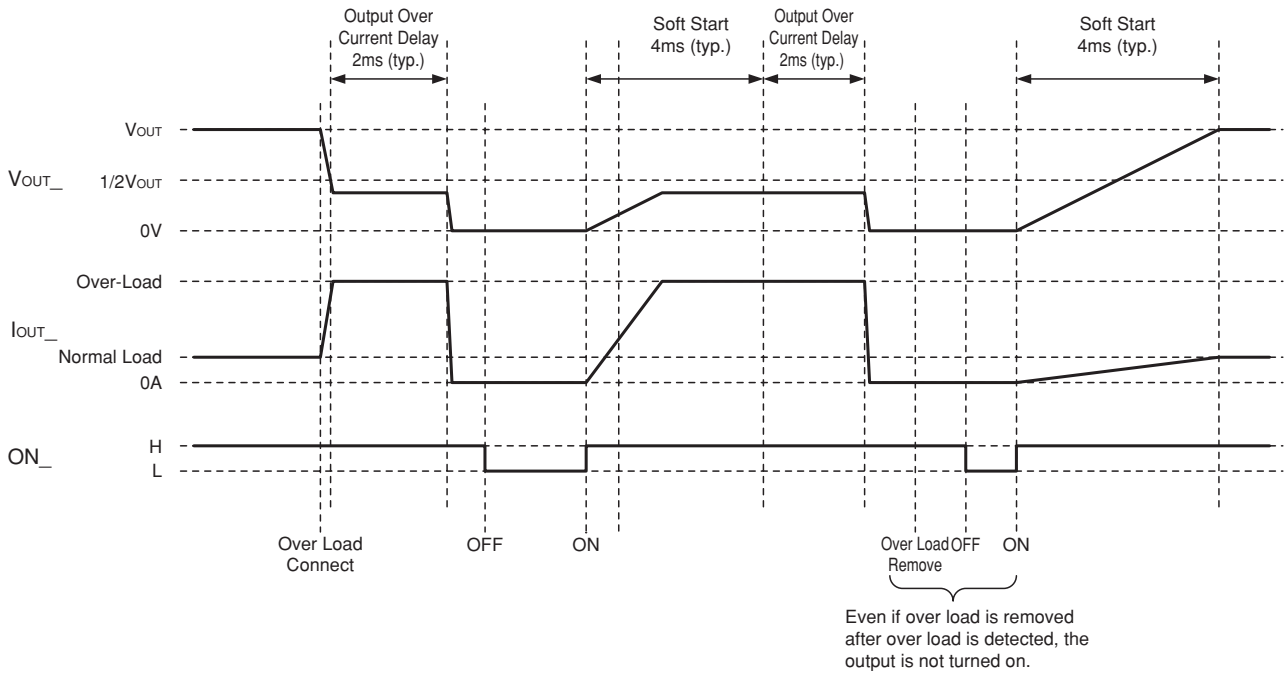
Start Up



■ Output Over Current Protection

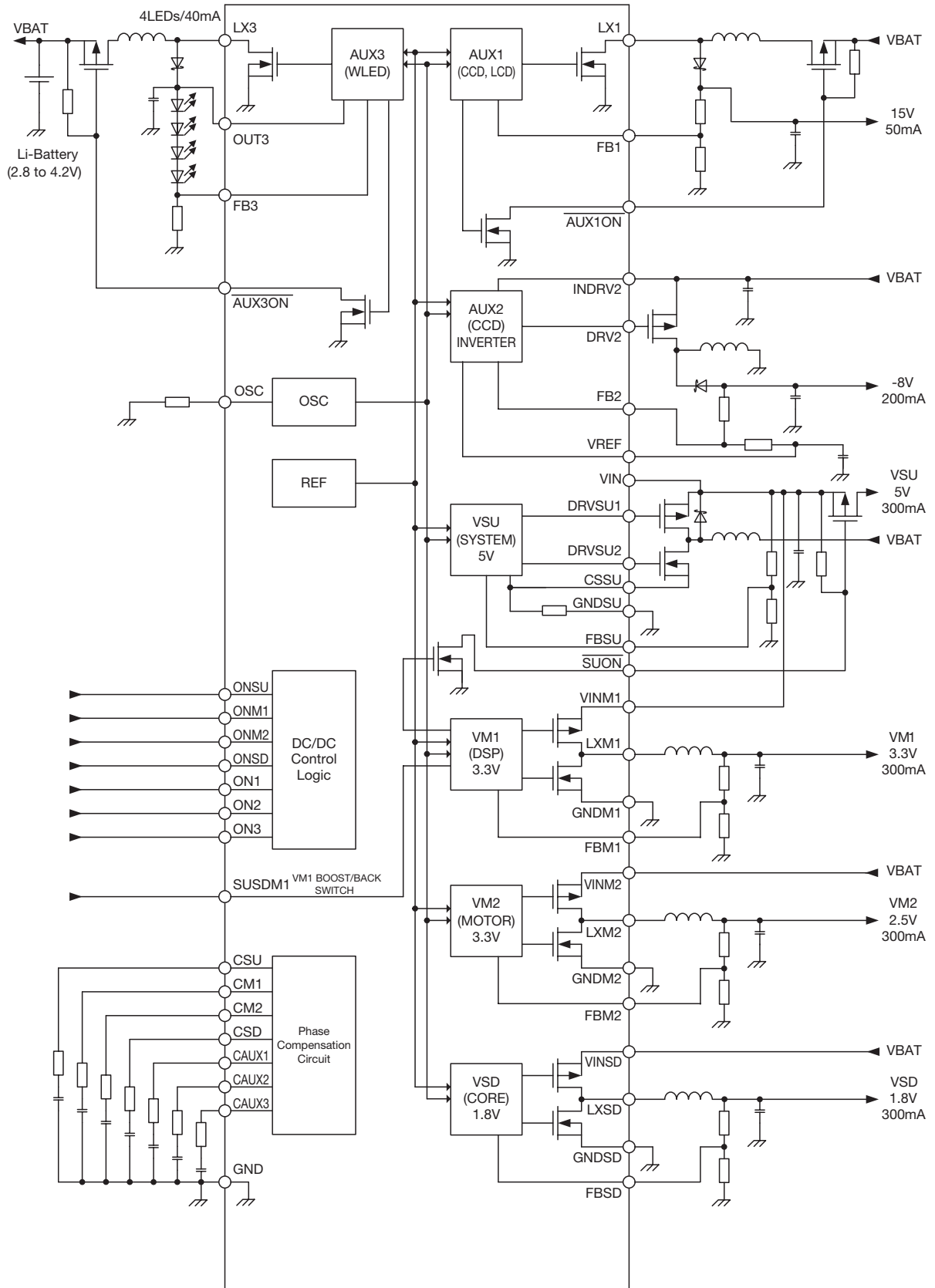
The same all channel operation

*Plus or minus reversing of V_{OUT} and I_{OUT} only to AUX2



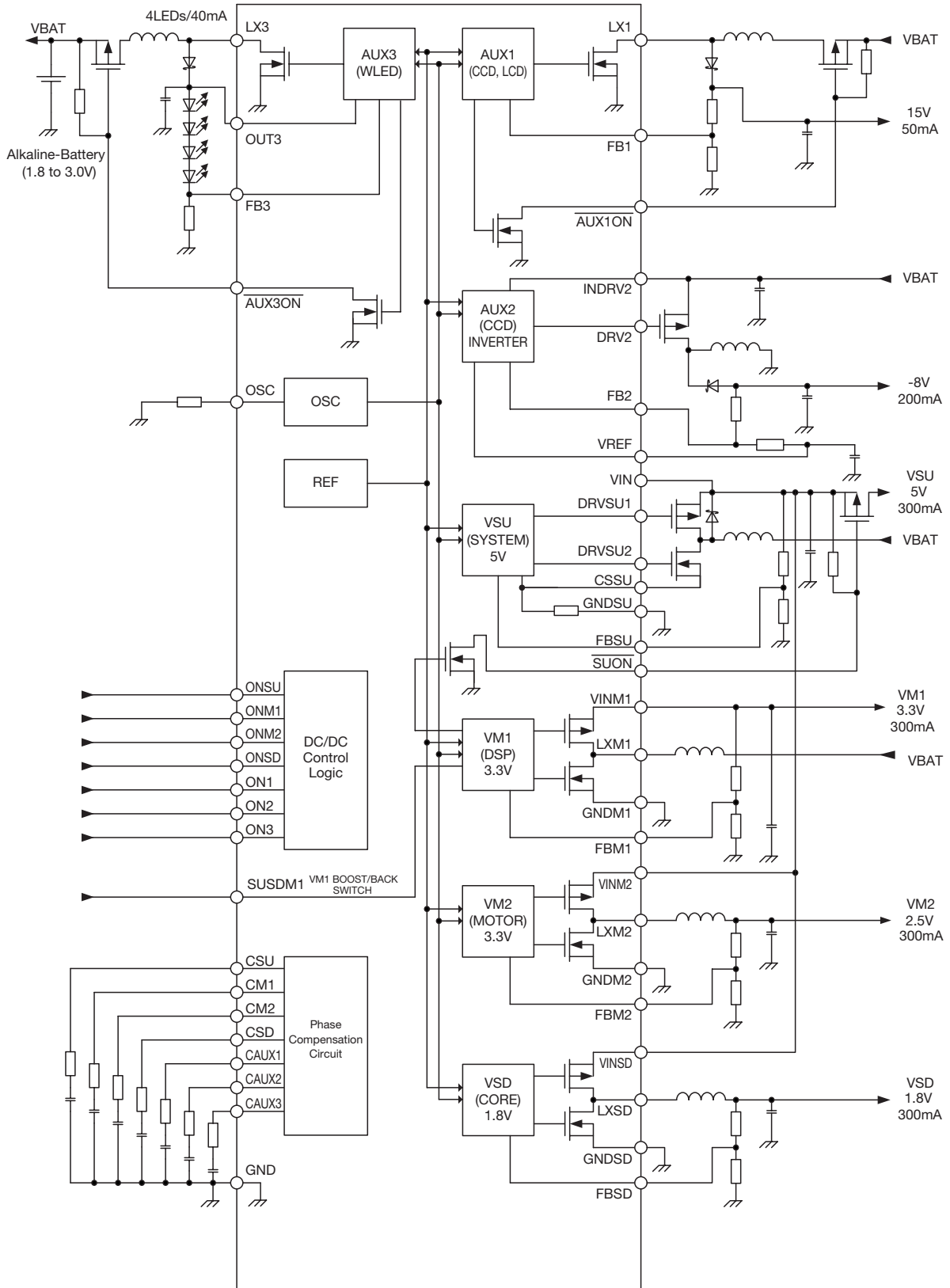
Application Circuit

for Li-ion Battery System



3.3V power supply is stepped down from 5.0V power supply. 1.8V and 2.5V power supplies are stepped down directly from the battery voltage.

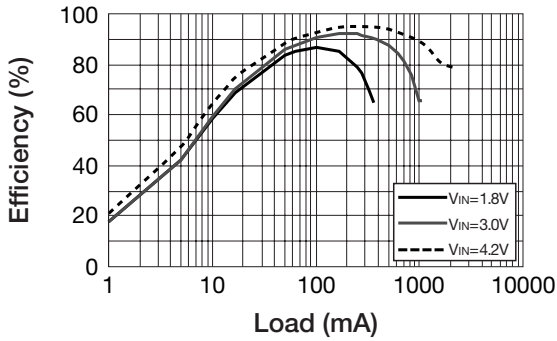
■ for Two R6 Batteries System



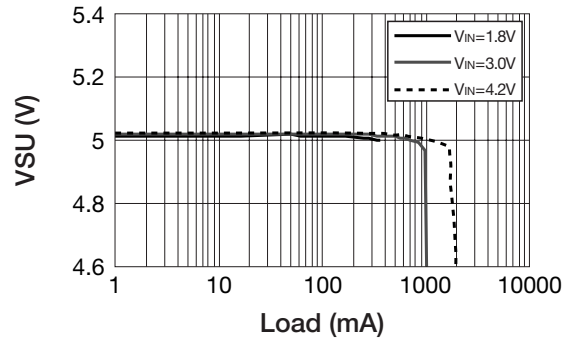
3.3V power supply is stepped up directly from the battery voltage. 1.8V and 2.5V power supplies are stepped down from 5.0V power supply.

Characteristics

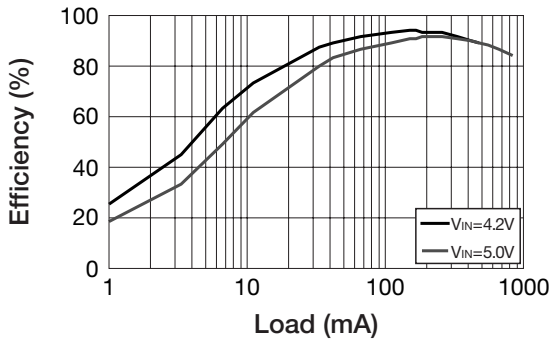
■ VSU Efficiency



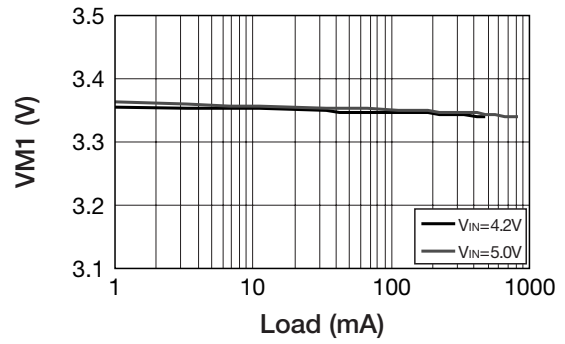
■ VSU Load-regration



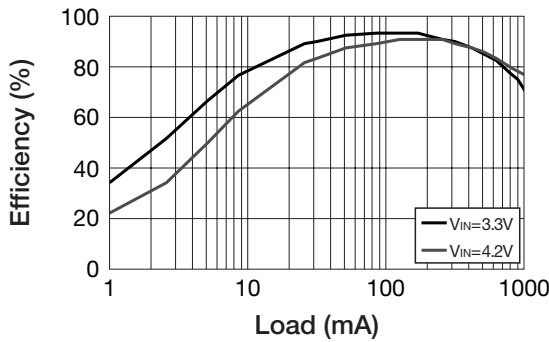
■ VM1 Efficiency (Step-down)



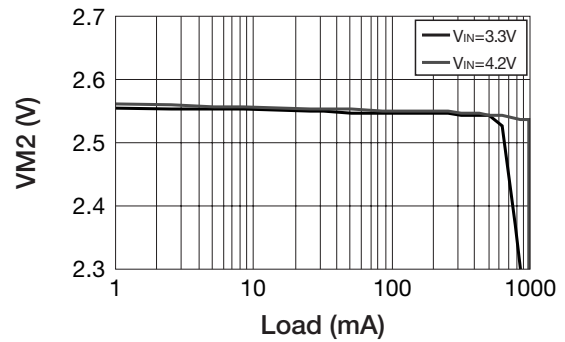
■ VM2 Loadreguration



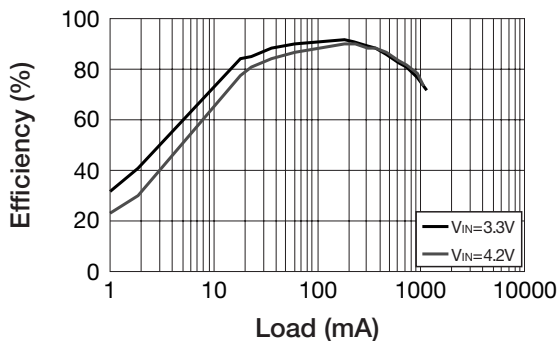
■ VM2 Efficiency



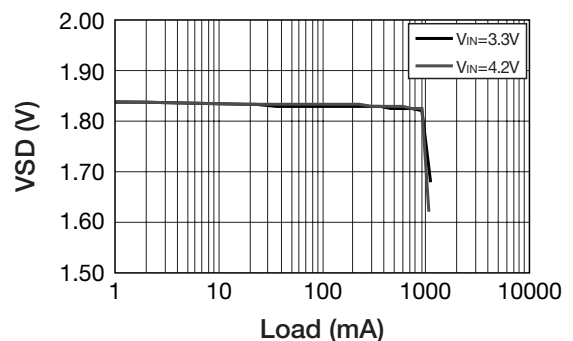
■ VM2 Loadreguration



■ VSD Efficiency

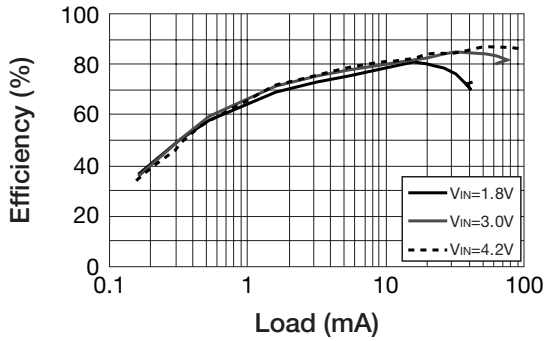


■ VSD Loadreguration

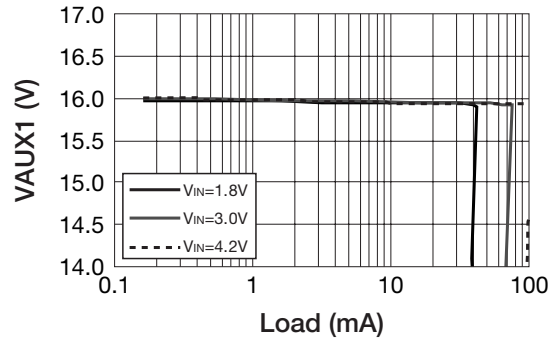


*The reference data

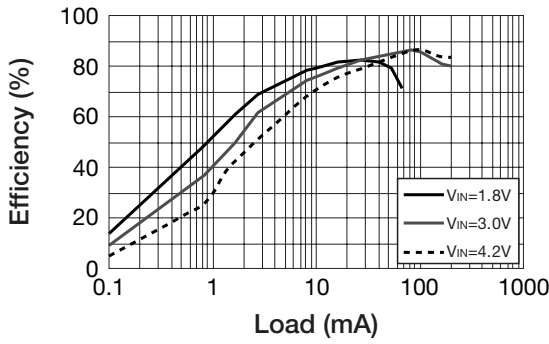
AUX1 Efficiency



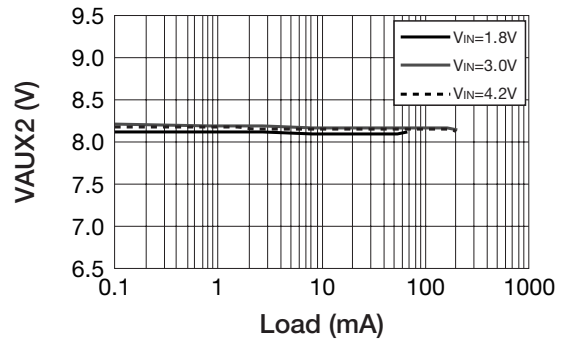
AUX1 Loadregulation



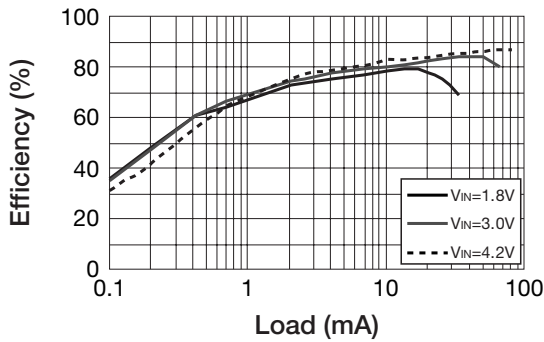
AUX2 Efficiency



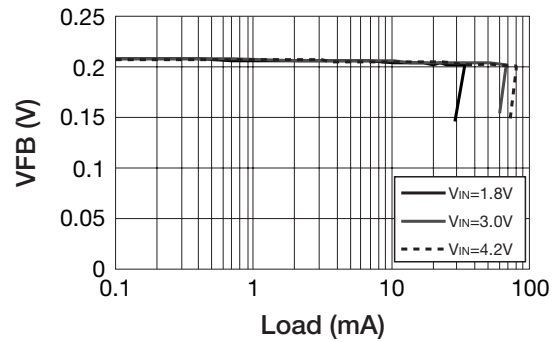
AUX2 Loadregulation



AUX3 Efficiency (nLED=4)



AUX3 Loadregulation (nLED=4)



ROSC - Oscillator Frequency

