4+2CH PMU for Wearable / Sports-CAM & IP-CAM Application

Features

- **2.8V ~ 5.5V Input Voltage Operation.**
- **95% Efficient DC/DC Converter**
- **Built-in 4-ch synchronous buck converter, 1-ch power switch, and 1-ch low quiescent current LDO for RTC.**
- **Bucks can be set to lower quiescent current at low load.**
- **Low Power consumption (Sleep Mode) < 20μA.**
- **1.5/ 3MHz switching frequency.**
- **Built-In Power ON/OFF Sequence for PMU.**
- **Built-In Short Circuit Protection (SCP), Under Voltage Protection (UVP), and cycle-by cycle current limit for DC/DC Converters.**
- **Real Time Clock**
- **Built-In Thermal Shutdown Function.**
- **Built-In VCC OVP Function.**
- **TQFN4x4-28 Package.**

General Description

The I2225 provide a complete power supply solution for wearable / sports-cam & IP-CAM application. It contains four dc/dc converters, one power switch and one low quiescent current LDO to power each critical blocks of the system, and is optimized for maximum battery life, featuring a low ground current when in standby mode operation. All channels DC/DC converters operate at selectable frequency of 1.5/3.0MHz to optimize size, cost, and efficiency. All Synchronous converters operate at pulse skipping mode at light load.

The I2225 is available in TQFN4x4-28 package.

Applications

- **Wearable/Sports camera**
- **IP camera**
- **DSC**

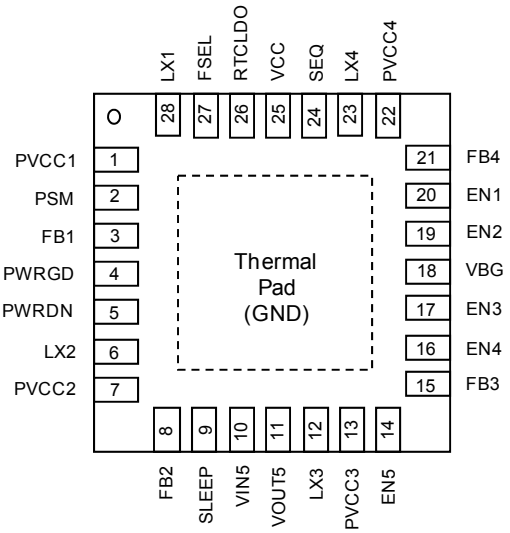
Ordering Information

ORDER NUMBER	MARKING	TEMP. RANGE	PACKAGE (Green)
I2225RV1U	2225	-40°C~+105°C	TQFN4x4-28

Note: RV:TQFN4x4-28
1: Bonding code
U: Tape & Reel
Green : Lead Free / Halogen Free.

Pin Configuration

Top View



i2225 TQFN4X4-28

Note: Recommend connecting the Thermal Pad to the round for excellent power dissipation.

Absolute Maximum Ratings

VCC, PVCC1, PVCC2, PVCC3, PVCC4, VIN5 . . . . . -0.3V to +6.3V
FB1, FB2, FB3, FB4, VOUT5, RTCOUT . . . . . -0.3V to +6.3V
LX1, LX2, LX3, LX4. . . . . -0.3V to +6.3V
EN1, EN2, EN3, EN4, EN5, SLEEP, PSM, SEQ, VBG, PWRGD, FSEL, PWR-DOWN . . . . . -0.3V to +6.3V
Thermal Resistance Junction to Ambient, (θ_{JA})
TQFN4X4-28 . . . . . 32°C/W
Continuous Power Dissipation (T_A=25°C)
TQFN4X4-28 . . . . . 4300mW
Thermal Resistance Junction to Case, (θ_{JC})
TQFN4X4-28 . . . . . 15°C/W
Operating Ambient Temperature . . . . . -40°C to 105°C
Storage Temperature Range. . . . . -55°C to +150°C
Reflow Temperature (soldering, 10 sec) . . . . . 260°C
ESD (HBM) 2kV
ESD (MM) 200V

1. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.
2. Device is ESD sensitive. Handling precaution recommended. The Human Body model is a 100pF capacitor discharged through a 1.5KΩ resistor into each pin.

Electrical characteristics

(VCC=PVCC1=PVCC2=PVCC3=PVCC4=3.7, VIN5=1.2V, LDOINx=3.7V, 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	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
GENERAL						
VCC minimum Startup Voltage	V_{VCC_ST}		---	---	2.6	V
VCC Operating Voltage for PMU	V_{VCC_PMU}		2.8	---	5.5	V
VCC Over Voltage threshold	V_{VCC_OVLO}		5.8	6.0	---	V
PMU Stand-by Supply Current	I_{VCC}	ALL converters off.	---	80	100	µA
		ALL DCDC enter ECO mode, and without loading current.	---	150	250	uA
PMU Shutdown Current	I_{PMU_SD}	PMU shutdown.	---	10	---	µA
Quiescent current for each DC/DC converter	I_{Q_DCDC}	DCDC1~DCDC4 in ECO mode	---	5	---	µA
OSCILLATOR						
Frequency	F_{OSC}	FSEL connect to VCC or GND	2.6	3.0	3.4	MHz
	F_{OSC}	R_{FSEL}=120kΩ or 20kΩ.	1.3	1.5	1.7	MHz
CH1 DC/DC Buck Converter						
Soft-Start Internal	SS_CH1		---	2.4	---	mS
FB regulation voltage accuracy	VFB1		0.788	0.8	0.812	V
Maximum Duty Cycle	D_{max1}		---	100	---	%
PVCC Leakage Current	I_{PVCC1_LK}	V_{LX1}=0V, PVCC1=5.0V	---	1	5	µA
LX Leakage Current	I_{LX1_LK}	V_{LX1}=5.0V	---	1	5	µA
Switch ON Resistance	Ron1-N		---	90	---	mΩ
	Ron1-P		---	150	---	
Peak Current Limit	I_{LIM_CH1}		---	4.4	---	A
Under Voltage Protection Threshold	$\%V_{UVP\_CH1}$	$\%V_{UVP\_CH1}=VFB_{UVP1}/VFB1$	---	87.5	---	%

Electrical characteristics (Continued)

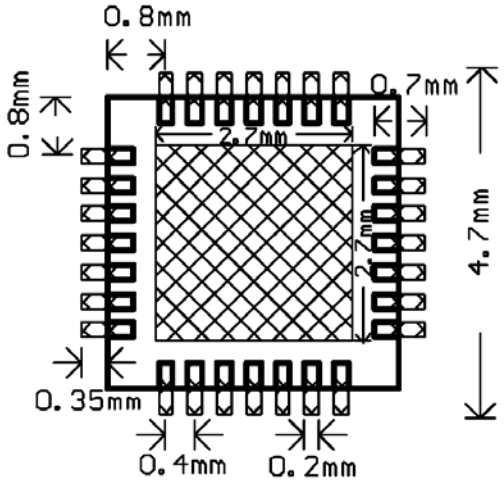
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
CH2 DC/DC Buck Converter						
Soft-Start Internal	SS_CH2		---	2.4	---	mS
FB regulation voltage accuracy	VFB2		0.788	0.8	0.812	V
Maximum Duty Cycle	D_{max2}		---	100	---	%
PVCC Leakage Current	I_{PVCC2_LK}	V_{LX2}=0V, PVCC2=5.0V	---	1	5	µA
LX Leakage Current	I_{LX2_LK}	V_{LX2}=5.0V	---	1	5	µA
Switch ON Resistance	Ron2-N		---	200	---	mΩ
	Ron2-P		---	250	---	
Peak Current Limit	I_{LIM_CH2}		---	2.5	---	A
Under Voltage Protection Threshold	$\%V_{UVP\_CH2}$	$\%V_{UVP\_CH2}=VFB_{UVP2}/VFB2$	---	87.5	---	%
CH3 DC/DC Buck Converter						
Soft-Start Internal	SS_CH3		---	2.4	---	mS
FB regulation voltage accuracy	VFB3		0.788	0.8	0.812	V
Maximum Duty Cycle	D_{max3}		---	100	---	%
PVCC Leakage Current	I_{PVCC3_LK}	V_{LX3}=0V, PVCC3=5.0V	---	1	5	µA
LX Leakage Current	I_{LX3_LK}	V_{LX3}=5.0V	---	1	5	µA
Switch ON Resistance	Ron3-N		---	200	---	mΩ
	Ron3-P		---	150	---	
Peak Current Limit	I_{LIM_CH3}		---	3.1	---	A
Under Voltage Protection Threshold	$\%V_{UVP\_CH3}$	$\%V_{UVP\_CH3}=VFB_{UVP3}/VFB3$	---	87.5	---	%
CH4 DC/DC Buck Converter						
Soft-Start Internal	SS_CH4		---	2.4	---	mS
FB regulation voltage accuracy	VFB4		0.788	0.8	0.812	V
Maximum Duty Cycle	D_{max4}		---	100	---	%
PVCC Leakage Current	I_{PVCC4_LK}	V_{LX4}=0V, PVCC4=5.0V	---	1	5	µA
LX Leakage Current	I_{LX4_LK}	V_{LX4}=5.0V	---	1	5	µA
Switch ON Resistance	Ron4-N		---	200	---	mΩ
	Ron4-P		---	250	---	
Peak Current Limit	I_{LIM_CH4}		---	2.5	---	A
Under Voltage Protection Threshold	$\%V_{UVP\_CH4}$	$\%V_{UVP\_CH4}=VFB_{UVP4}/VFB4$	---	87.5	---	%
CH5 Power Switch						
Input voltage range (N-Switch)	V_{VIN5-N}	RFSEL=20kΩ or FSEL=GND	1.0	1.8	VCC-1	V
Input voltage range (P-Switch)	V_{VIN5-P}	RFSEL=120kΩ or FSEL=VCC	2.2	3.0	VCC	V
Shutdown Current	I_{SD_SW5}	CH5 shutdown	---	---	1	uA
Quiescent Current	I_{Q_SW5}	CH5 enable	---	30	---	uA
Switch ON Resistance	Ronsw5-N	V_{VIN5}=1.2V, I_{SWO5}=100mA	---	350	---	mΩ
	Ronsw5-P	V_{VIN5}=3.0V, I_{SWO5}=100mA	---	350	---	mΩ
Soft-Start Internal	SS_{SW5}		---	2.4	---	mS
Output current limit	I_{LIMSW1}		---	400	---	mA
Short Circuit Protection Threshold	V_{SCP_SW5}		---	0.75	---	V
Discharge Resistance	D_{DIS_SW5}		---	30	---	Ω

Electrical characteristics (Continued)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
RTCLDO						
Input voltage range	V_{VINRTC}	VCC	2.5	---	5.5	V
Standby current	I_{Q1_RTC}	V_{VCC}=3.7v	---	5	8	µA
Output voltage	V_{RTCO}	Io=0.1mA	---	3.1	---	V
Dropout Voltage	V_{DO1_RTC}	Io=50mA	---	---	1000	mV
Maximum Output Current		V_{VCC}=4.2v, RTCO=95%*V_{SET}	60	---	200	mA
Soft-Start Internal	SS_{RTCLDO}		---	500	---	µS
Protection						
UVP Protection Fault Delay	T_{D_Fault}	DCDC1~DCDC4	128	---	---	mS
Thermal Shutdown Detect	T_{SD}		---	150	---	°C
Thermal Shutdown Hysteresis	ΔT_{SD}		---	20	---	°C
Control Signal						
Logic-Input Threshold (EN1~5, PSM, SLEEP, PWR-DOWN)	V_{TH}	High threshold	1.4	---	---	V
	V_{TL}	Low threshold	---	---	0.5	V
Internal pull high resistance (PWR-DOWN)	R_{PULLH}		---	100	---	kΩ
EN1~5 sink current	$I_{EN1\sim5\_SINK}$	EN1~5=5V	---	5	10	µA
Open-Drain Output Low Voltage (PWRGD)	V_{ODLOW}	I_{SINK}=5mA, V_{VCC}=3.7V	---	---	100	mV
Open-Drain Output Leakage Current (PWRGD)	I_{LK_OD}	V_{OD}=5V	---	---	1	µA
PWRGD Delay Time	T_{DLY_PWRGD}		10	---	---	mS

Minimum Footprint PCB Layout Section

TQFN4X4-28

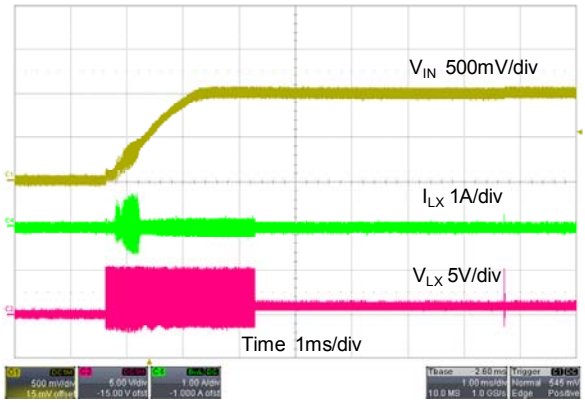


Typical Performance Characteristics

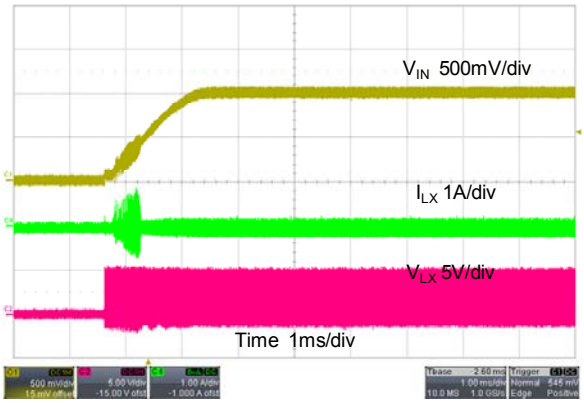
(Fsw=1.5MHz, L=2.2μH, T_A=25°C, unless otherwise noted.)

1. start up

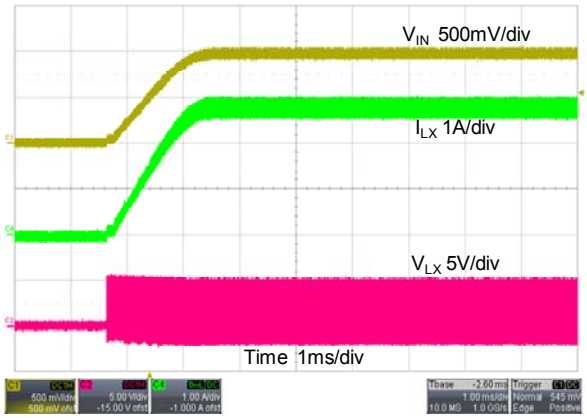
CH1 VIN=3.6V, Vout=1.0V, NO Load (PSM)



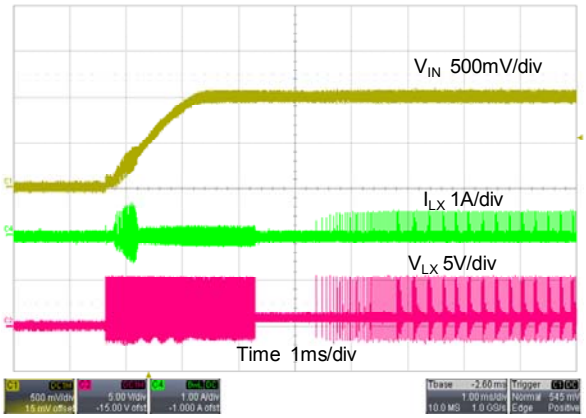
CH1 VIN=3.6V, Vout=1.0V, NO Load (PWM)



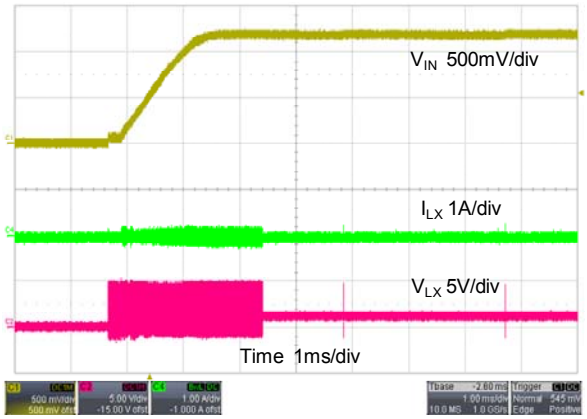
CH1 VIN=3.6V, Vout=1.0V, Iout=2.9A



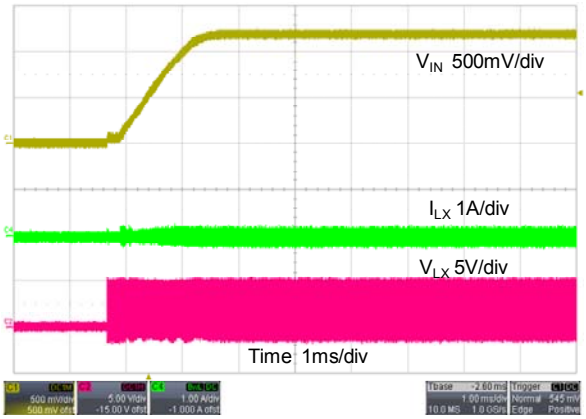
CH1 VIN=3.6V, Vout=1.0V, Iout=30mA (PSM)



CH2 VIN=3.6V, Vout=1.2V, NO load (PSM)



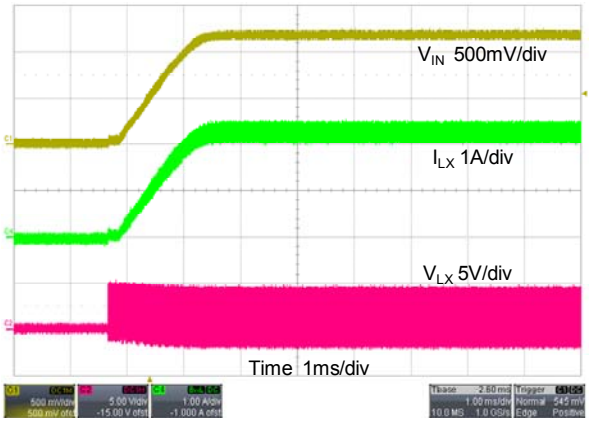
CH2 VIN=3.6V, Vout=1.2V, NO load (PWM)



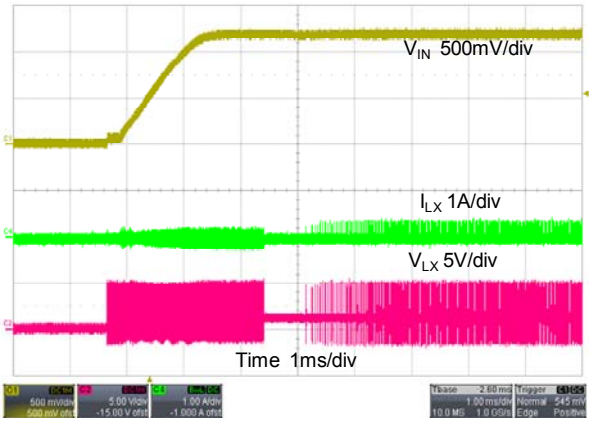
Typical Performance Characteristics (continued)

1. start up

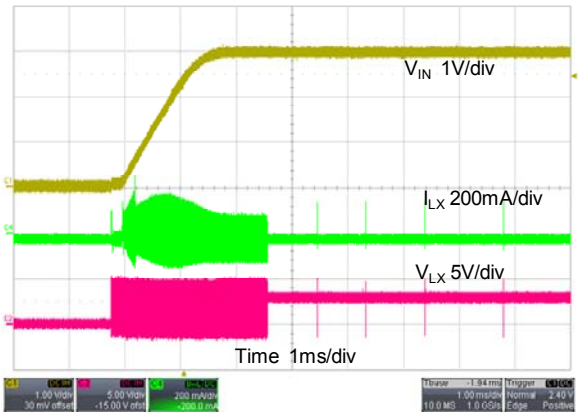
CH2 VIN=3.6V, Vout=1.2V, Iout=2A



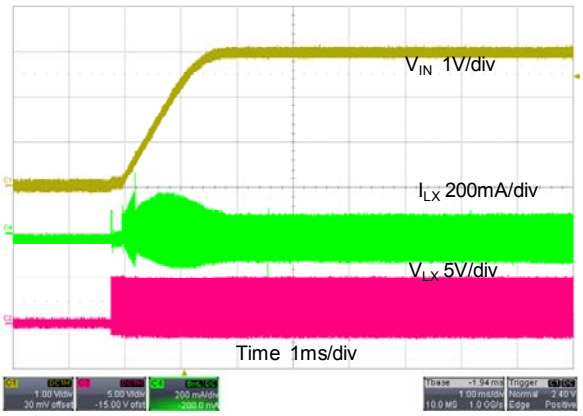
CH2 VIN=3.6V, Vout=1.2V,Iout=30mA



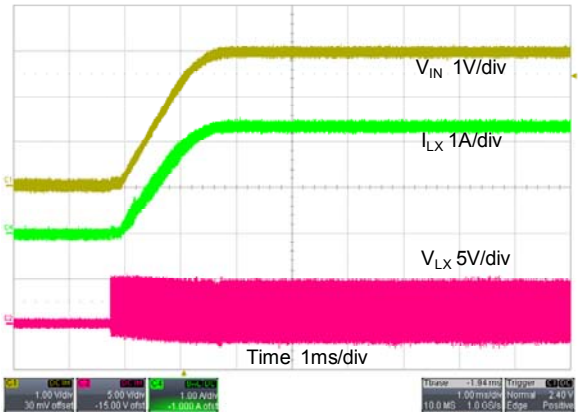
CH3 VIN=3.6V, Vout=3V, NO load (PSM)



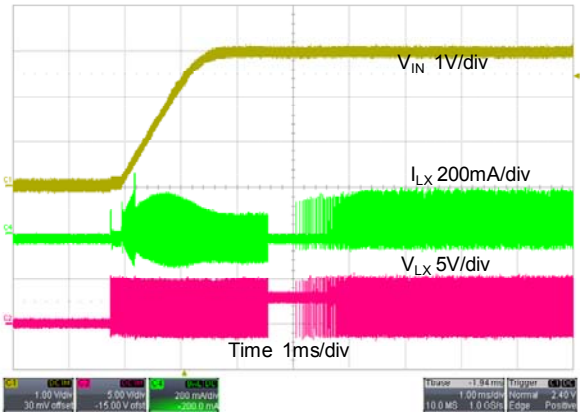
CH3 VIN=3.6V, Vout=3V, NO load (PWM)



CH3 VIN=3.6V, Vout=3V, Iout=2.3A



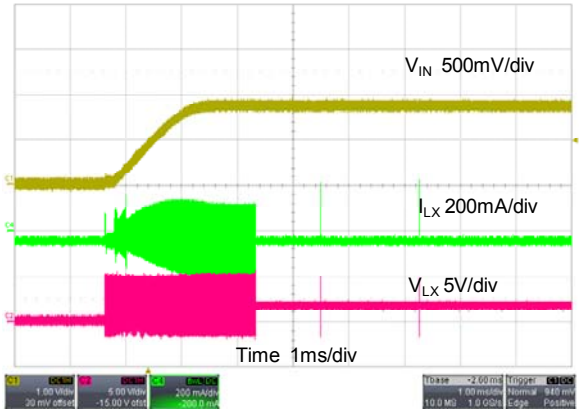
CH3 VIN=3.6V, Vout=3V, Iout=30mA (PSM)



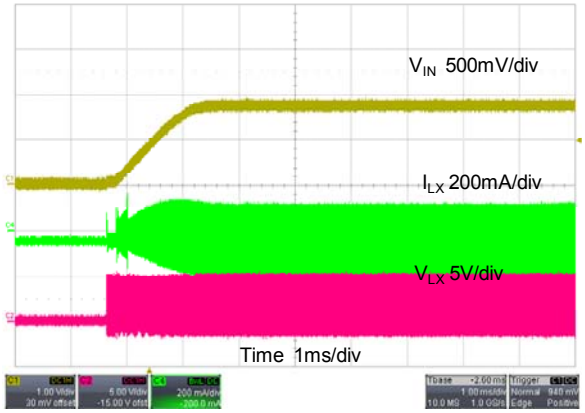
Typical Performance Characteristics (continued)

1. start up

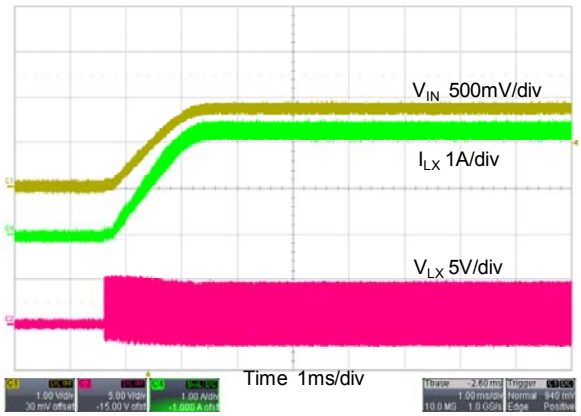
CH4 VIN=3.6V, Vout=1.8V, NO load (PSM)



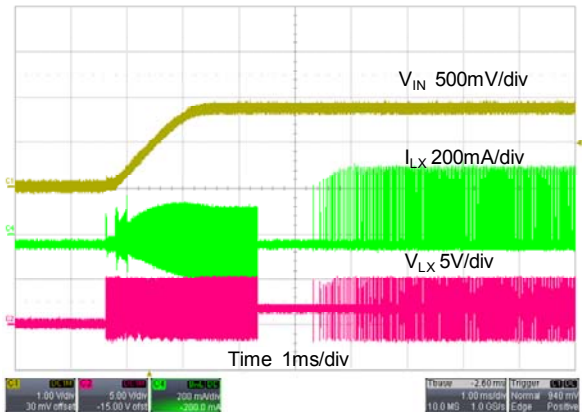
CH4 VIN=3.6V, Vout=1.8V, NO load (PWM)



CH4 VIN=3.6V, Vout=1.8V, Iout=2A



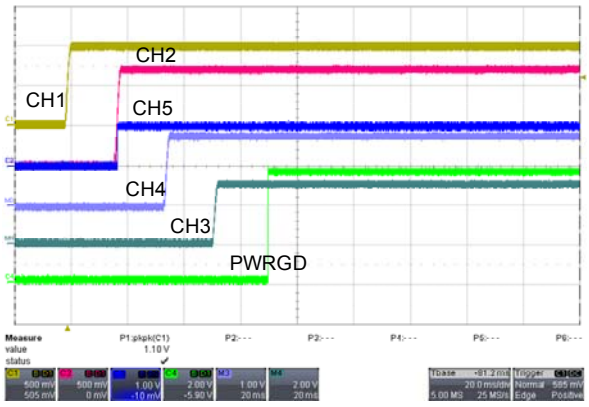
CH4 VIN=3.6V, Vout=1.8V, Iout=30mA



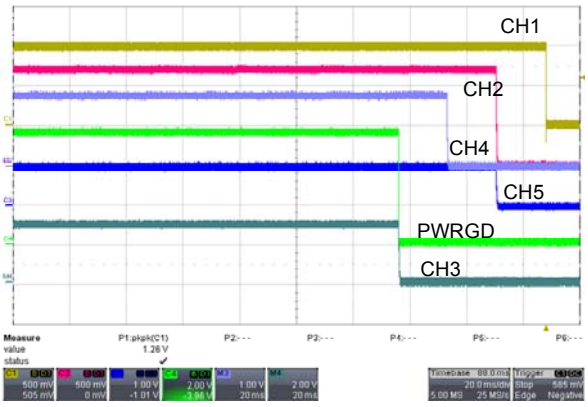
Typical Performance Characteristics (continued)

2. Power on sequence

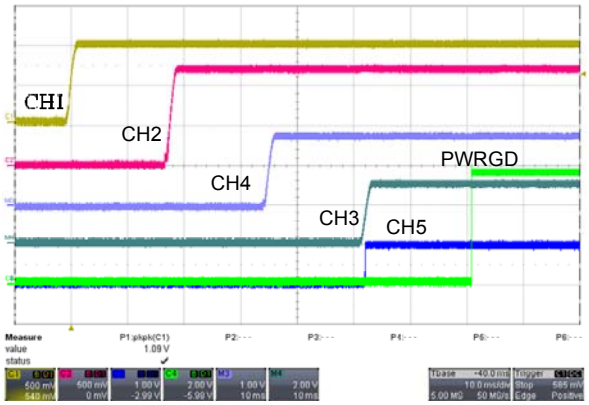
VIN=3.6V, Rseq=12k, EN1=high



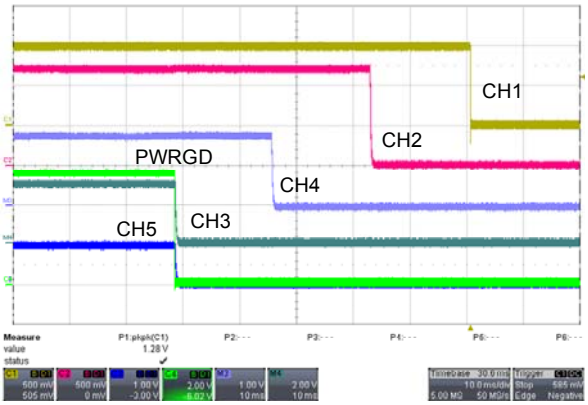
VIN=3.6V, Rseq=12k, EN1=low



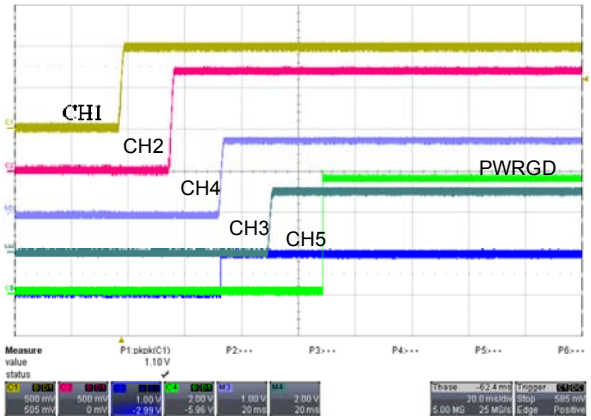
VIN=3.6V, Rseq=30k, EN1=high



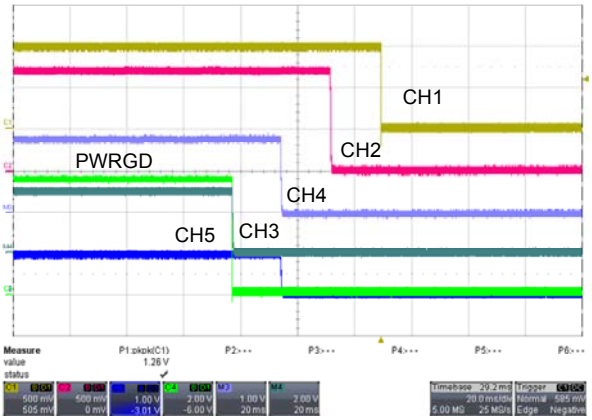
VIN=3.6V, Rseq=30k, EN1=low



VIN=3.6V, Rseq=60k, EN1=high



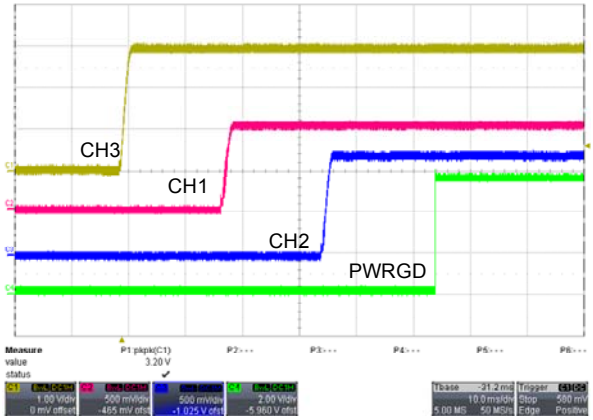
VIN=3.6V, Rseq=60k, EN1=low



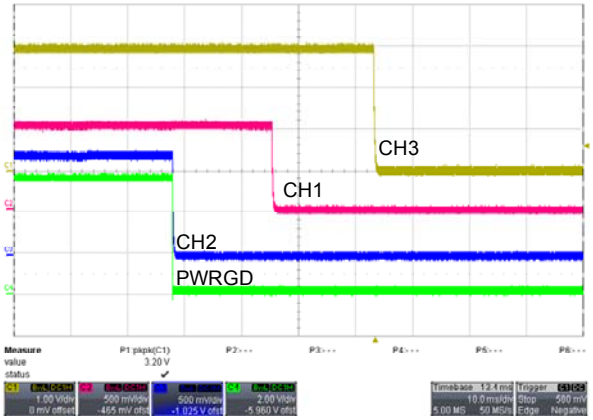
Typical Performance Characteristics (continued)

2. Power on sequence

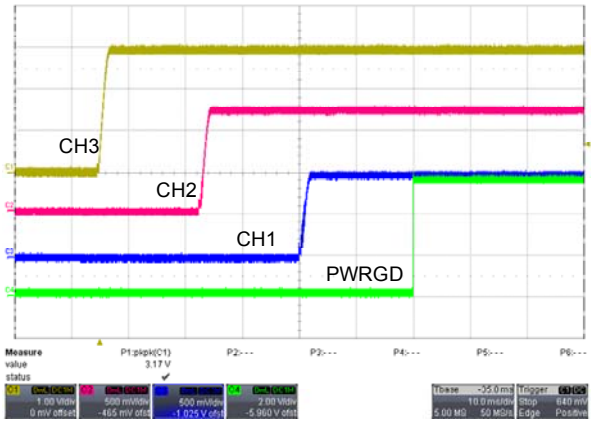
VIN=3.6V, Rseq=120k, EN1=high



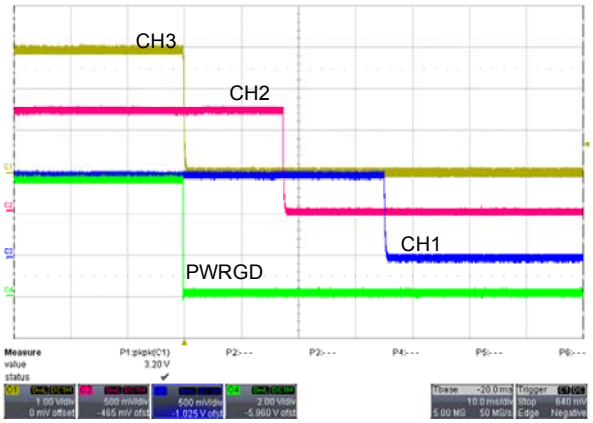
VIN=3.6V, Rseq=120k, EN1=low



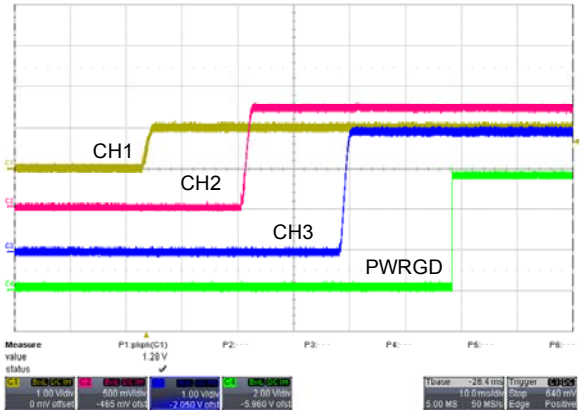
VIN=3.6V, Rseq=300k, EN1=high



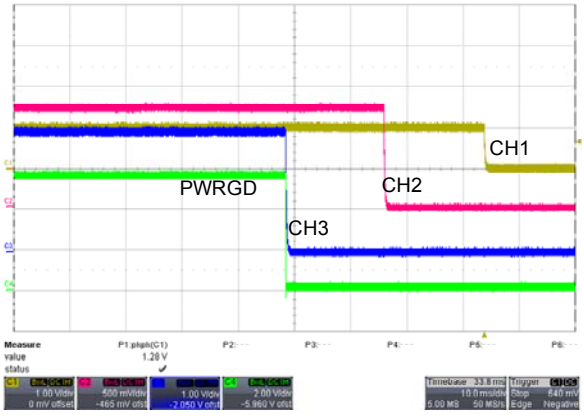
VIN=3.6V, Rseq=300k, EN1=low



VIN=3.6V, Rseq=Vcc, EN1=high



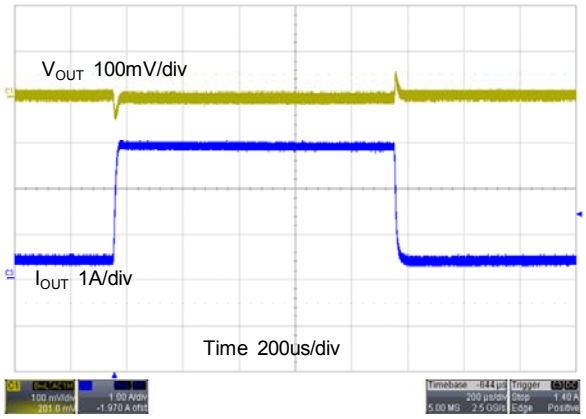
VIN=3.6V, Rseq=Vcc, EN1=low



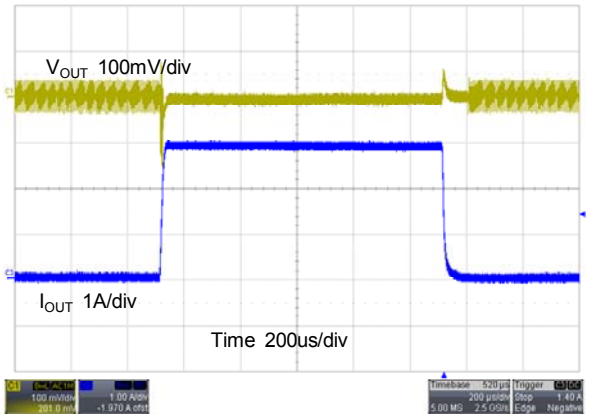
Typical Performance Characteristics (continued)

3. Load transient

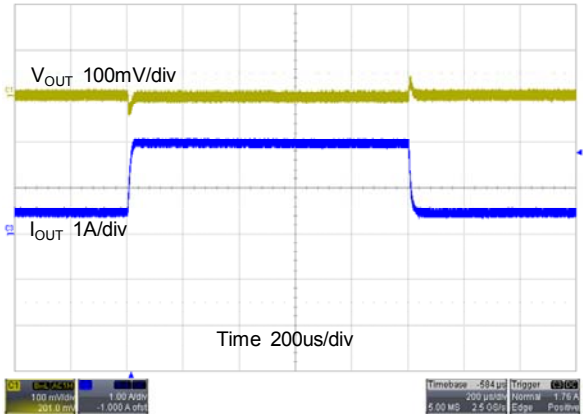
CH1, Fsw=1.5MHz, Iout=500mA~3A, VIN=4.2V



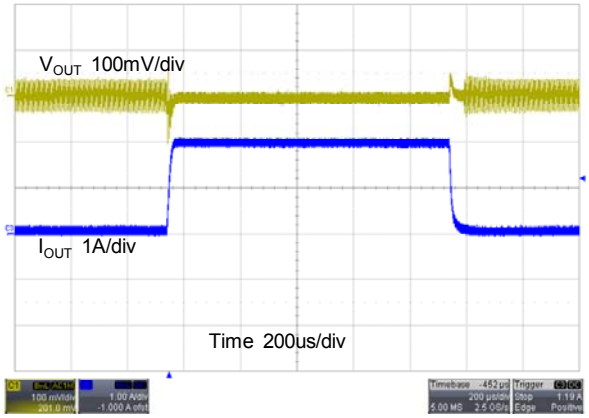
CH1, Fsw=1.5MHz, Iout=100mA~3A, VIN=4.2V



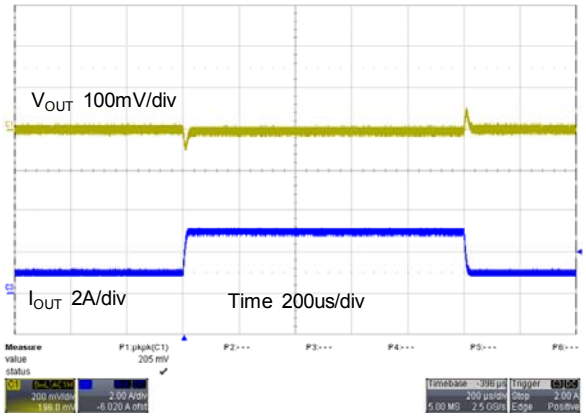
CH2, Fsw=1.5MHz, Iout=500mA~2A, VIN=4.2V



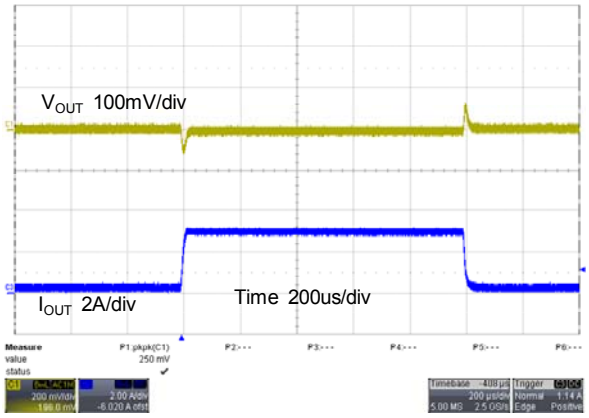
CH2, Fsw=1.5MHz, Iout=100mA~2A, VIN=4.2V



CH3, Fsw=1.5MHz, Iout=500mA~3A, VIN=4.2V



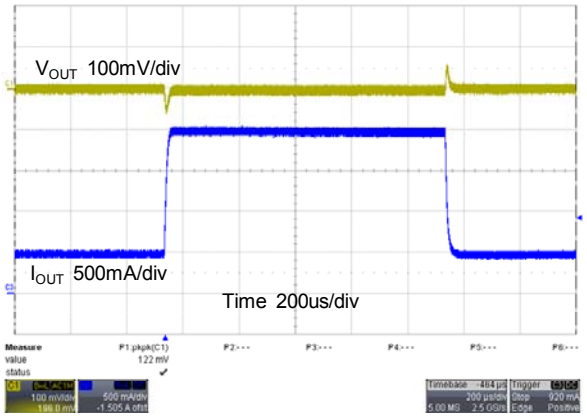
CH3, Fsw=1.5MHz, Iout=100mA~3A, VIN=4.2V



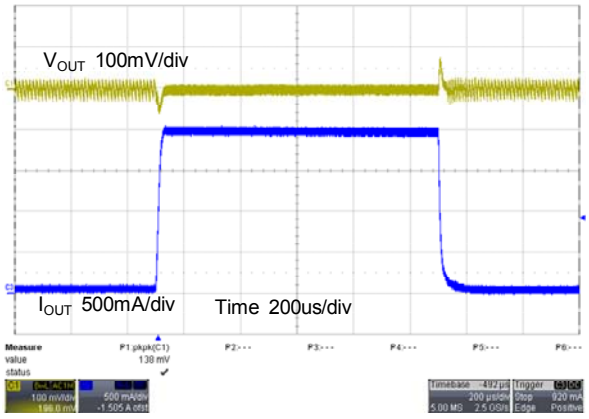
Typical Performance Characteristics (continued)

3. Load transient

CH4, Fsw=1.5MHz, Iout=500mA~2A, VIN=4.2V

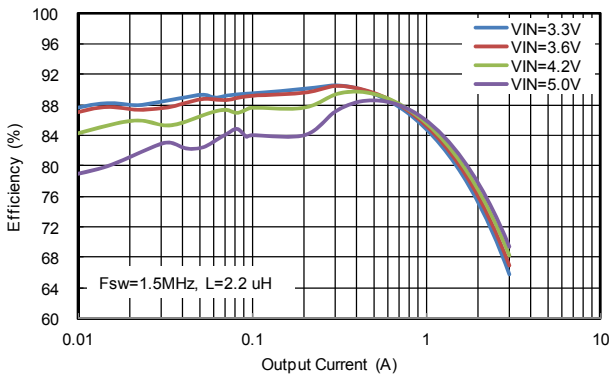


CH4, Fsw=1.5MHz, Iout=100mA~2A, VIN=4.2V

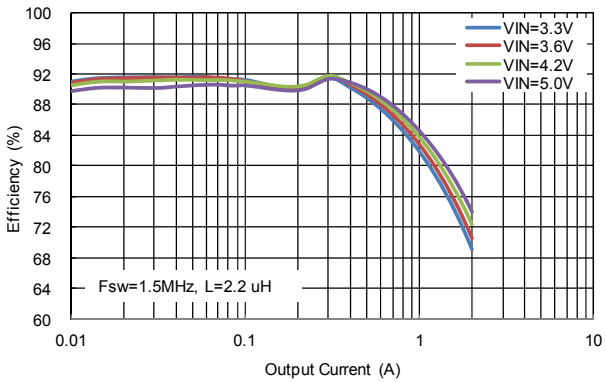


4. Efficiency

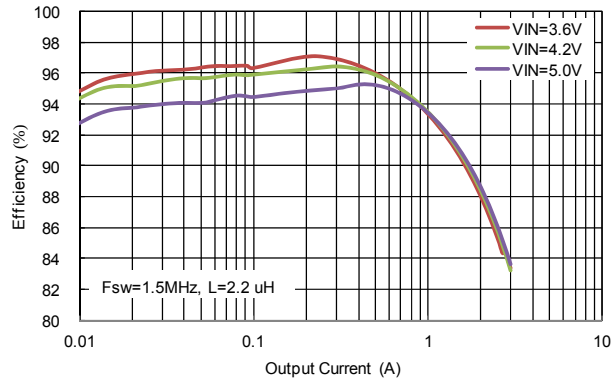
CH1, Fsw=1.5MHz, Iout=0~3A, Vout=1V



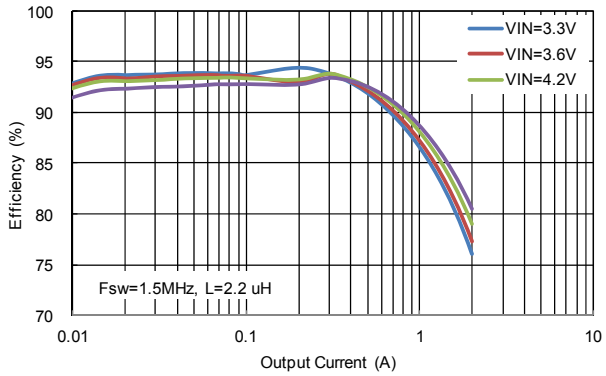
CH2, Fsw=1.5MHz, Iout=0~2A, Vout=1.2V



CH3, Fsw=1.5MHz, Iout=0~3A, Vout=3V



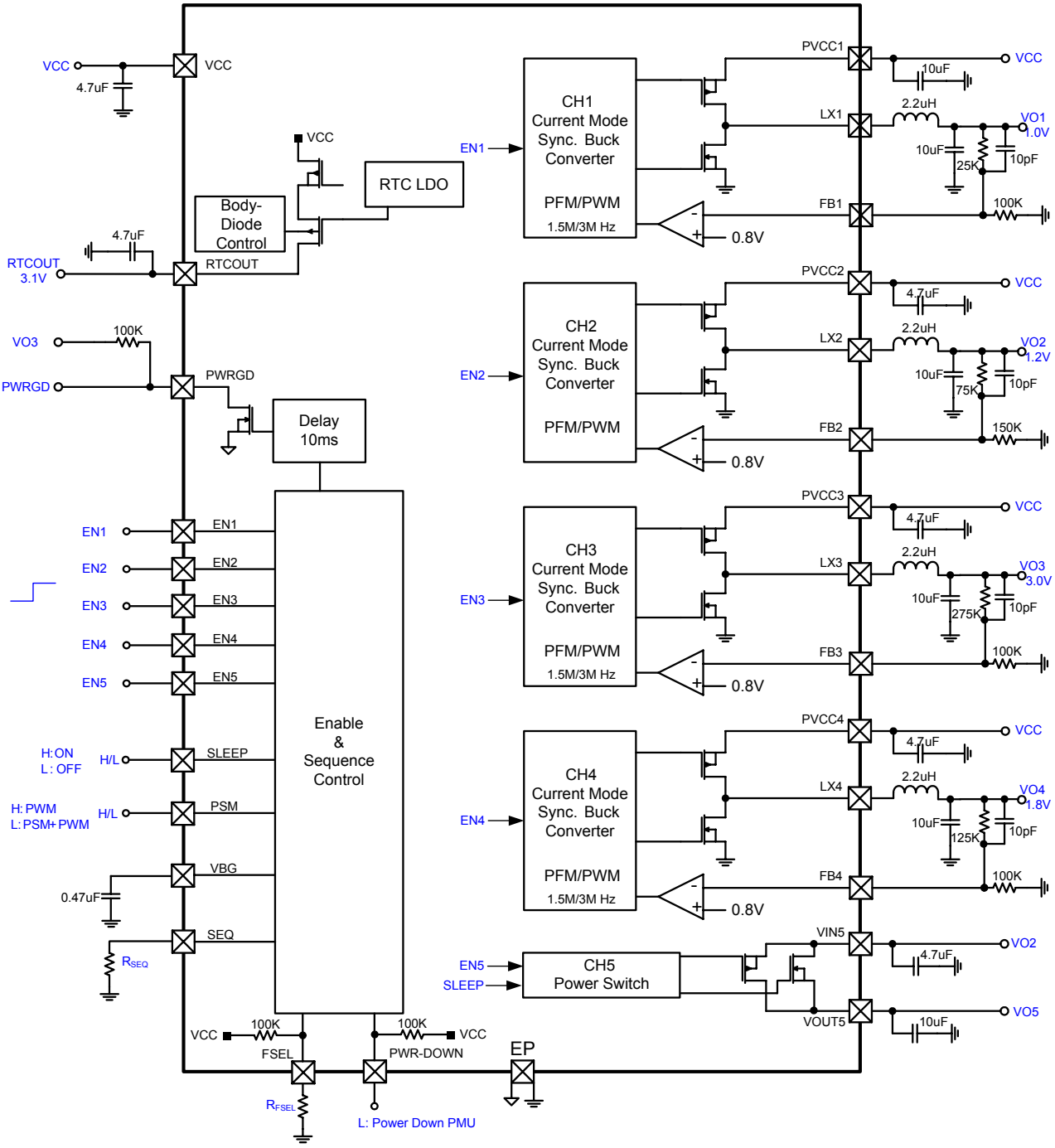
CH4, Fsw=1.5MHz, Iout=0~2A, Vout=1.8V



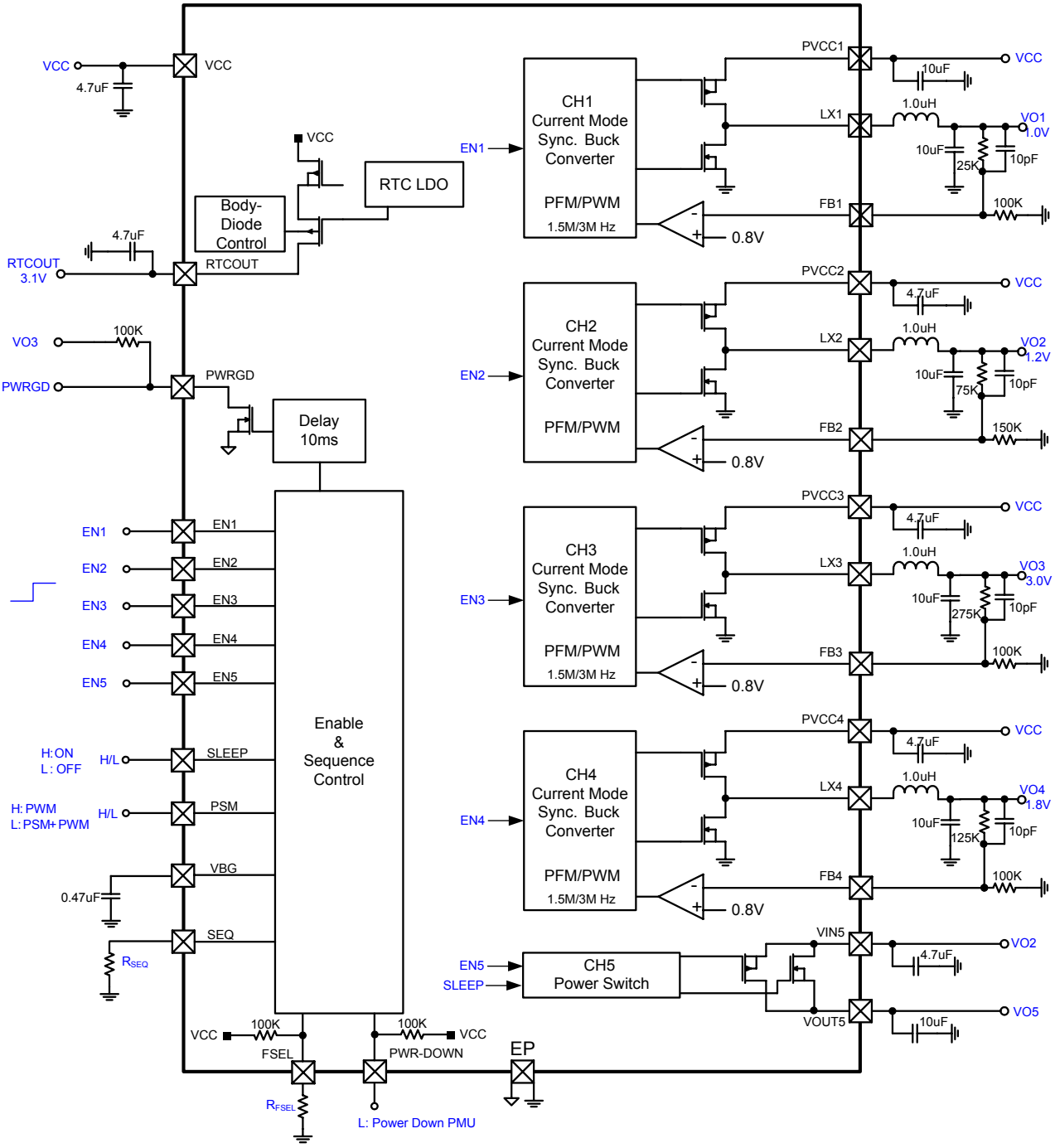
Pin Description

Pin No	Pin Name	Function
1	PVCC1	Power Input of DCDC1 Buck Converter.
2	PSM	Setting the operating mode of DC/DC1~4.
3	FB1	Sensing Input of DCDC1 Buck Converter's feedback voltage.
4	PWRGD	Indicator of PMU power on/off with open drain output.
5	PWRDN	Power down pin of I2225
6	LX2	Inductor switch node of DCDC2 Buck Converter.
7	PVCC2	Power Input of DCDC2 Buck Converter.
8	FB2	Sensing Input of DCDC2 Buck Converter's output voltage.
9	SLEEP	Control the operation status of PMU.
10	VIN5	Power Input of Power Switch (CH5)
11	VOUT5	Power Output of Power Switch (CH5)
12	LX3	Inductor switch node of DCDC3 Buck Converter.
13	PVCC3	Power Input of DCDC3 Buck Converter.
14	EN5	Power on/off signal of Power Switch (CH5).
15	FB3	Sensing Input of DCDC3 Buck Converter's output voltage.
16	EN4	Power on/off signal of DCDC4.
17	EN3	Power on/off signal of DCDC3.
18	VBG	1.21V Reference Voltage Output. Bypass this pin to ground with a 0.47μF ceramic capacitor.
19	EN2	Power on/off signal of DCDC2.
20	EN1	Power on/off signal of DCDC1.
21	FB4	Sensing Input of DCDC4 Buck Converter's output voltage.
22	PVCC4	Power Input of DCDC4 Buck Converter.
23	LX4	Inductor switch node of DCDC4 Buck Converter.
24	SEQ	Setting the Power on/off timing sequence.
25	VCC	IC Power Supply Input pin. Bypass with a 10μF or greater ceramic capacitor.
26	RTCLDO	RTC LDO Output.
27	FSEL	Setting the DC/DC switching frequency and the Power MOS type (p/n) for CH5
28	LX1	Inductor switch node of DCDC1 Buck Converter.
EP	GND	Power Ground of DCDC1~4 Buck Converters and Digital/Analog ground. The Exposed Pad must be soldered to a large PCB and connected to GND for maximum power dissipation.

Block Diagram & Application circuit (1.5MHz)



Block Diagram & Application circuit (3.0MHz)



Function Description

PMU

The I2225 includes four DC/DC Converters, one Power Switch, and one LDO to generate a multiple-output power-supply system.

	Topology	FB voltage	V_{OUT} range	Current rating	ON/OFF Control
DCDC1	1.5/3MHz Sync. Buck Converter	0.8V	Set the V_{OUT1} range from 0.8V to 1.5V.	3.5A	Controlled by EN1~EN5
DCDC2	1.5/3MHz Sync. Buck Converter	0.8V	Set the V_{OUT2} range from 1.0V to 3.0V	2.0A	
DCDC3	1.5/3MHz Sync. Buck Converter	0.8V	Set the V_{OUT3} range from 2.8V to 3.4V.	2.5A	
DCDC4	1.5/3MHz Sync. Buck Converter	0.8V	Set the V_{OUT4} range from 1.0V to 3.0V.	2.0A	
SW5	P/NMOS Switch	-	0.8V to VCC	300mA	
RTCLDO	PMOS LDO	-	3.1V	50mA	Always On if PWRDN=1 Shut down if PWRDN=0

Detail Pin Description

PWRGD

PWRGD	Operation mode
Power Good	High
No Power Good	Low

FSEL

FSEL	Switch Frequency	P/NMOS for CH5
Short to VCC	3MHz	PMOS
120KΩ	1.5MHz	PMOS
20KΩ	1.5MHz	NMOS
Connect to GND	3MHz	NMOS

PSM

PSM	Operation mode
High	PWM
Low	PSM+PWM

SLEEP (SEQ=12KΩ Only)

SLEEP	EN1	CH2	Other Channels
Low	Low	Shutdown	Shutdown
Low	High	Operation	Operation
High	Low	Operation	Shutdown
High	High	Operation	Operation

SLEEP (SEQ=30KΩ Only)

SLEEP	EN1	CH3	Other Channels
Low	Low	Shutdown	Shutdown
Low	High	Operation	Operation
High	Low	Operation	Shutdown
High	High	Operation	Operation

SLEEP (SEQ=60KΩ Only)

SLEEP	EN1	CH4	Other Channels
Low	Low	Shutdown	Shutdown
Low	High	Operation	Operation
High	Low	Operation	Shutdown
High	High	Operation	Operation

PMU Power ON/OFF Initiation

The following conditions are available to turn on the PMU of I2225:

- EN1 is high when R_SEQ is connected a resistor to GND.
- One of EN1~EN4 is high when R_SEQ is shorted to VCC.

PMU Power ON/OFF Sequence

When the power on condition is met, these four DC/DC converters and Power Switch (CH5) start up in sequence set by R_SEQ pin. The open-drain output PWRGD is high with 10ms time delay from start up sequence is finished (or all CH1~4 turn ON when R_SEQ is shorted to VCC). When power off, all channels start the power off sequence. The detail sequence setting and timing are shown below.

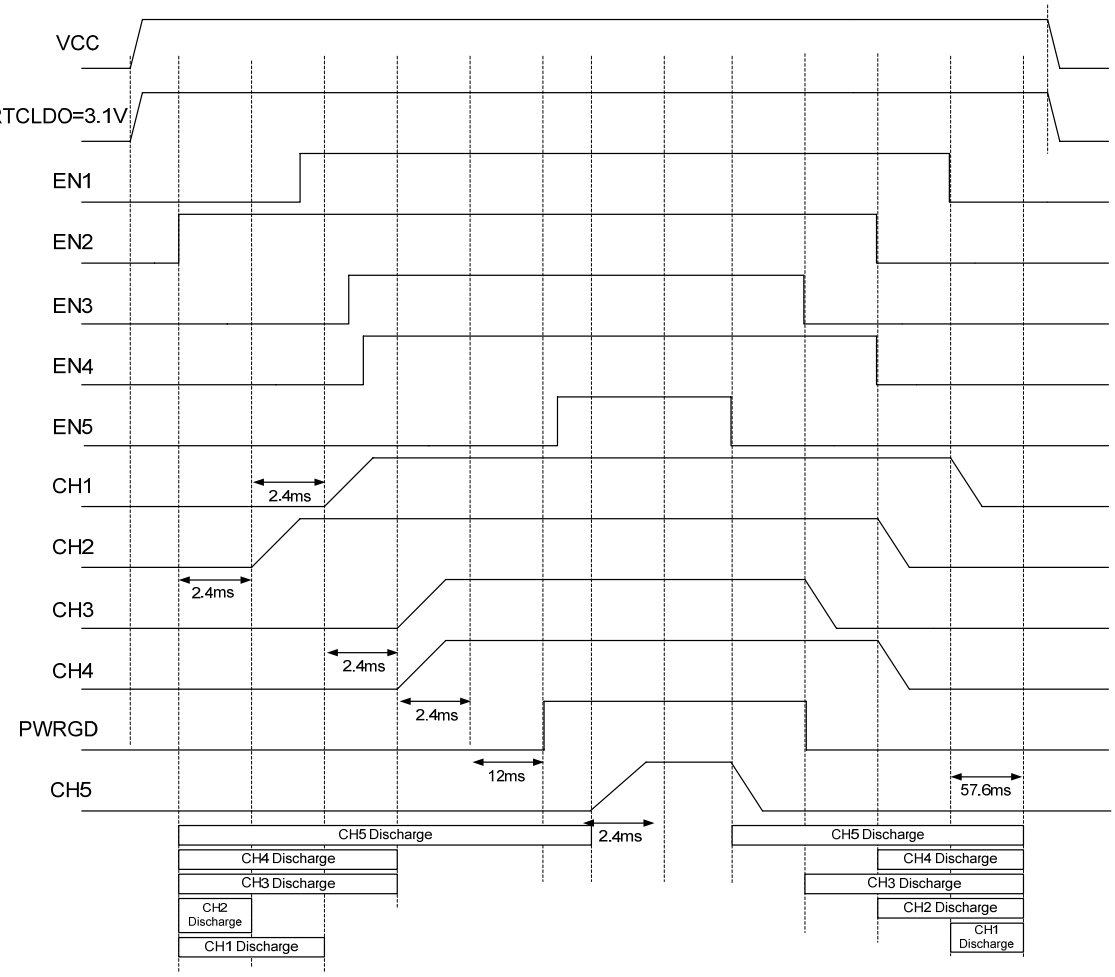
Power on/off timing sequence setting:

R_SEQ	Status	EN Control	Sequence	Note
Short to GND	Power-on	One of EN1~3=H	All Channel Independent	PWRGD is high after 10ms delay from all CH1~4 are ON.
	Power-off	All of EN1~3=L	Operation	PWRGD is low if one of CH1~4 is OFF.
12KΩ	Power-on	EN1=H,EN2/3/4=0	CH1→ CH2/5→ CH4→ CH3→ PWRGD	Support SLEEP Mode (Self-Refresh)
	Power-off	EN1=L	PWRGD→ CH3→ CH4→ CH2/5→ CH1	Support SLEEP Mode (Self-Refresh)
30KΩ	Power-on	EN1=H,EN2/3/4=0	CH1→ CH2→ CH4→ CH3/5→ PWRGD	Support SLEEP Mode (BT Wake-up)
	Power-off	EN1=L	PWRGD→ CH3/5→ CH4→ CH2→ CH1	Support SLEEP Mode (BT Wake-up)
60KΩ	Power-on	EN1=H,EN2/3/4=0	CH1→CH2→CH4/5→ CH3→PWRGD	Support SLEEP MODE (BT Wake-up)
	Power-off	EN1 = L	PWRGD →CH3→CH4/5→CH2→CH1	Support SLEEP MODE (BT Wake-up)
120KΩ	Power-on	EN1=H,EN2/3=0	CH3-> CH1-> CH2-> PWRGD	CH4/5 Independent Control ON/OFF
	Power-off	EN1=L	PWRGD-> CH2 -> CH1-> CH3	CH4/5 Independent Control ON/OFF
300KΩ	Power-on	EN1=H,EN2/3=0	CH3-> CH2-> CH1-> PWRGD	CH4/5 Independent Control ON/OFF
	Power-off	EN1=L	PWRGD-> CH3 -> CH2-> CH1	CH4/5 Independent Control ON/OFF
Short to VCC	Power-on	EN1=H,EN2/3=0	CH1-> CH2-> CH3-> PWRGD	CH4/5 Independent Control ON/OFF
	Power-off	EN1=L	PWRGD-> CH3 -> CH2-> CH1	CH4/5 Independent Control ON/OFF

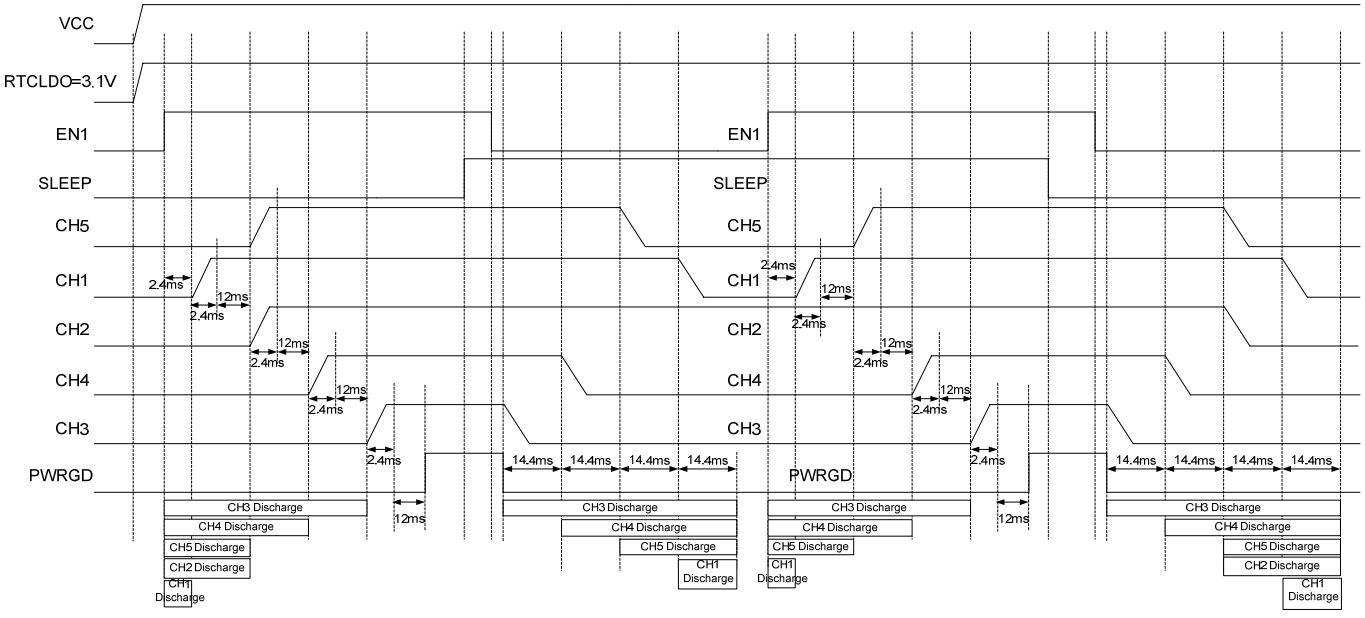
*If CH5 is in the sequence, connect VIN5 to VCC or the channel output that established with/before CH5 (even if VOUT5 is not in use).

Power ON/OFF Sequence Timing Diagram:

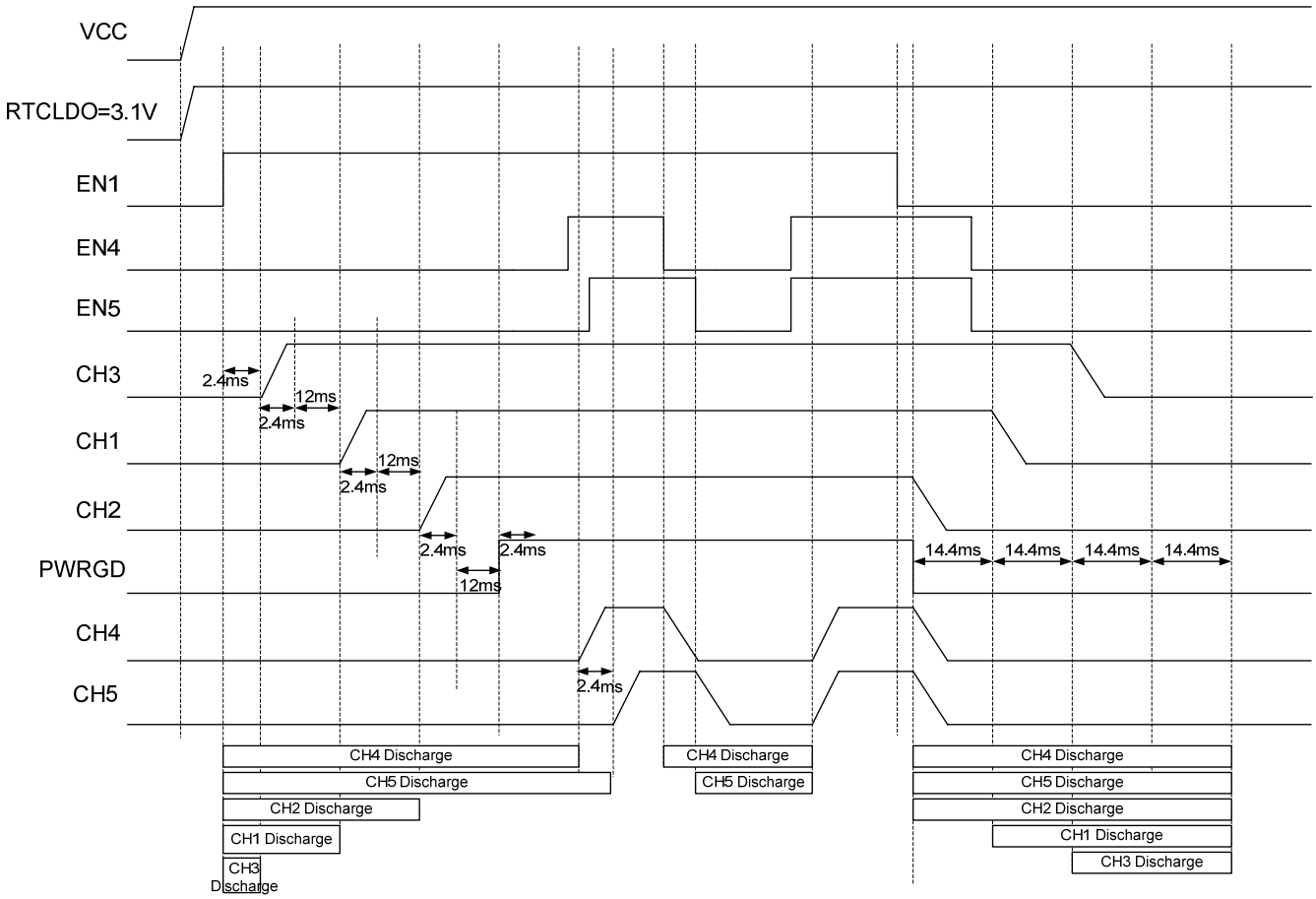
1. R_SEQ short to GND



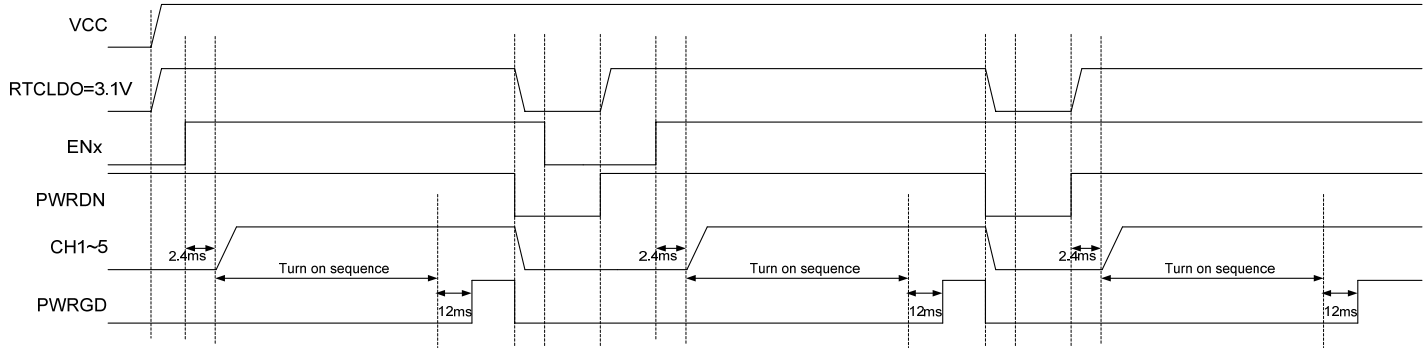
2. R_SEQ=12kΩ



3. R_SEQ=120kΩ



4. PWRDN timing

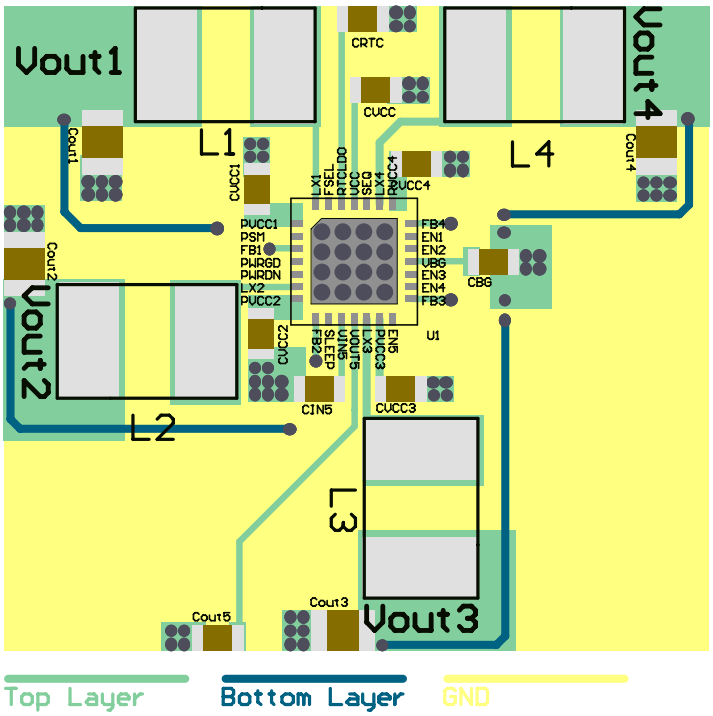


PMU Fault Protection

I2225 PMU provides VCC over voltage protection, over-current protection, under-voltage protection, short-circuit protection, and thermal shutdown protection to achieve complete protection.

	Protection type	Threshold	Protection methods	Reset Method
VCC	UVLO	VCC<2.34V	IC shutdown	Reset by the power-on/off initiation conditions
	OVP	VCC>6.15V	IC shutdown	Reset by the power-on/off initiation conditions
DCDC1 Buck	Current Limit	PMOS current>4.4A	PMOS Off, NMOS on	Automatic Reset at next cycle
	UVP	FB1,3<0.7V	IC shutdown if period above 128ms	Reset by the power- on/off initiation conditions
DCDC3 Buck	Current Limit	PMOS current>3.1A	PMOS Off, NMOS on	Automatic Reset at next cycle
	UVP	FB1,3<0.7V	IC shutdown if period above 128ms	Reset by the power- on/off initiation conditions
DCDC2,4 Buck	Current Limit	PMOS current>2.5A	PMOS Off, NMOS on	Automatic Reset at next cycle
	UVP	FB2,4 <0.7V	IC shutdown if period above 128ms	Reset by the power- on/off initiation conditions
Power Switch 5	Current Limit	P/NMOS current>400mA		P/NMOS current<400mA
	SCP	VOUT5<0.7V	P/NMOS Off	Reset by the power- on/off initiation conditions
Thermal	TSD	Junction Temp. >150°C	IC shutdown	Reset by the power- on/off initiation conditions

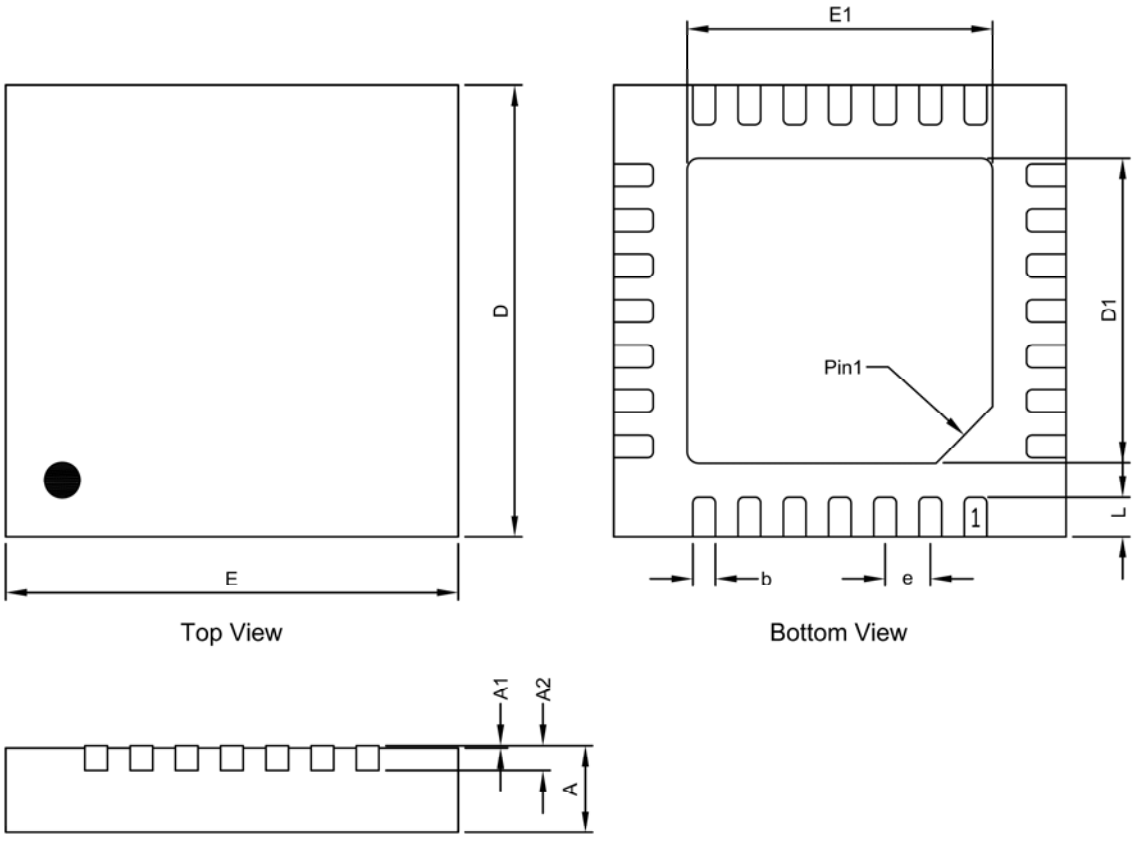
PCB Layout Guideline



1. Place the CVCCx as close to the PVCCx pin as possible.
2. Keep the traces for the CVCCx, inductor and the COUTx, short, direct and wide.
3. Keep the Feed-back path away from switching high current paths, and place the FB voltage divider circuit as close to VOUTx pin as possibly.

*Note: x represents the channel number.

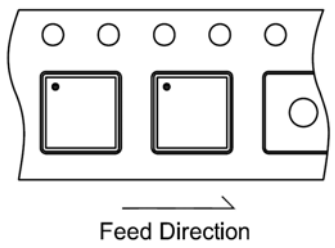
Package Information



TQFN4X4-28 Package

Symbol	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	0.20 REF			0.0079 REF		
D	3.95	4.00	4.05	0.1555	0.1575	0.1594
E	3.95	4.00	4.05	0.1555	0.1575	0.1594
D1	2.55	2.65	2.75	0.1004	0.1043	0.1083
E1	2.55	2.65	2.75	0.1004	0.1043	0.1083
b	0.15	0.20	0.25	0.0059	0.0079	0.0098
e	0.40 BSC			0.0157 BSC		
L	0.30	0.40	0.45	0.0118	0.0157	0.0177

Taping Specification



PACKAGE	Q'TY/REEL
TQFN4X4-28	3,000 ea