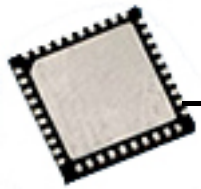


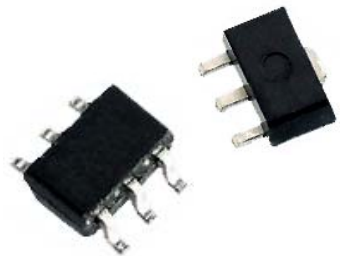
深圳市芯派科技有限公司 0755-33653783

Product Introduction

GS92A3 - Wide input range High efficiency COT Buck Converter



Green Solution Technology Co., Ltd.

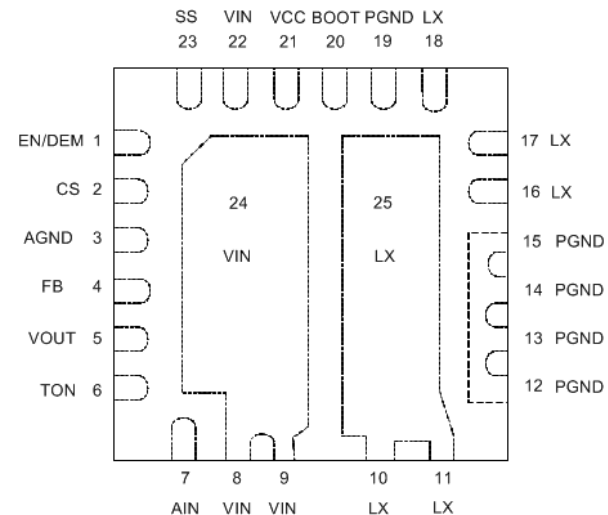


www.GStekic.com

GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

Single Synchronous Buck Converter

- Constant on Time
- Wide Output Load Range
- High efficiency
- Fast Transient Response
- Build-In 5V LDO



Product	Package	App. IOUT(A)	RDSON_H (mohm)	RDSON_L (mohm)	VIN(v)	VOUT Typ(v)	PKG Power Dissipation
GS92A2	TQFN23_4X4	3~5	70	70	3~28	1.5, 3.3, 5	3.5W
GS92A3	TQFN23_4X4	6~8	18	9.5	3~28	1.5, 3.3, 5	3.5W
GS9238	TQFN23_4X4	8	20	9.5	3~28	1.05, 1.5	3.5W
GS92A5	TQFN20_5X5	8~10	12	7	3~28	1.5, 3.3, 5	4.2W
GS92B3	TQFN20_5X5	8~10	12	7	3~28	1.5, 3.3, 5	4.2W

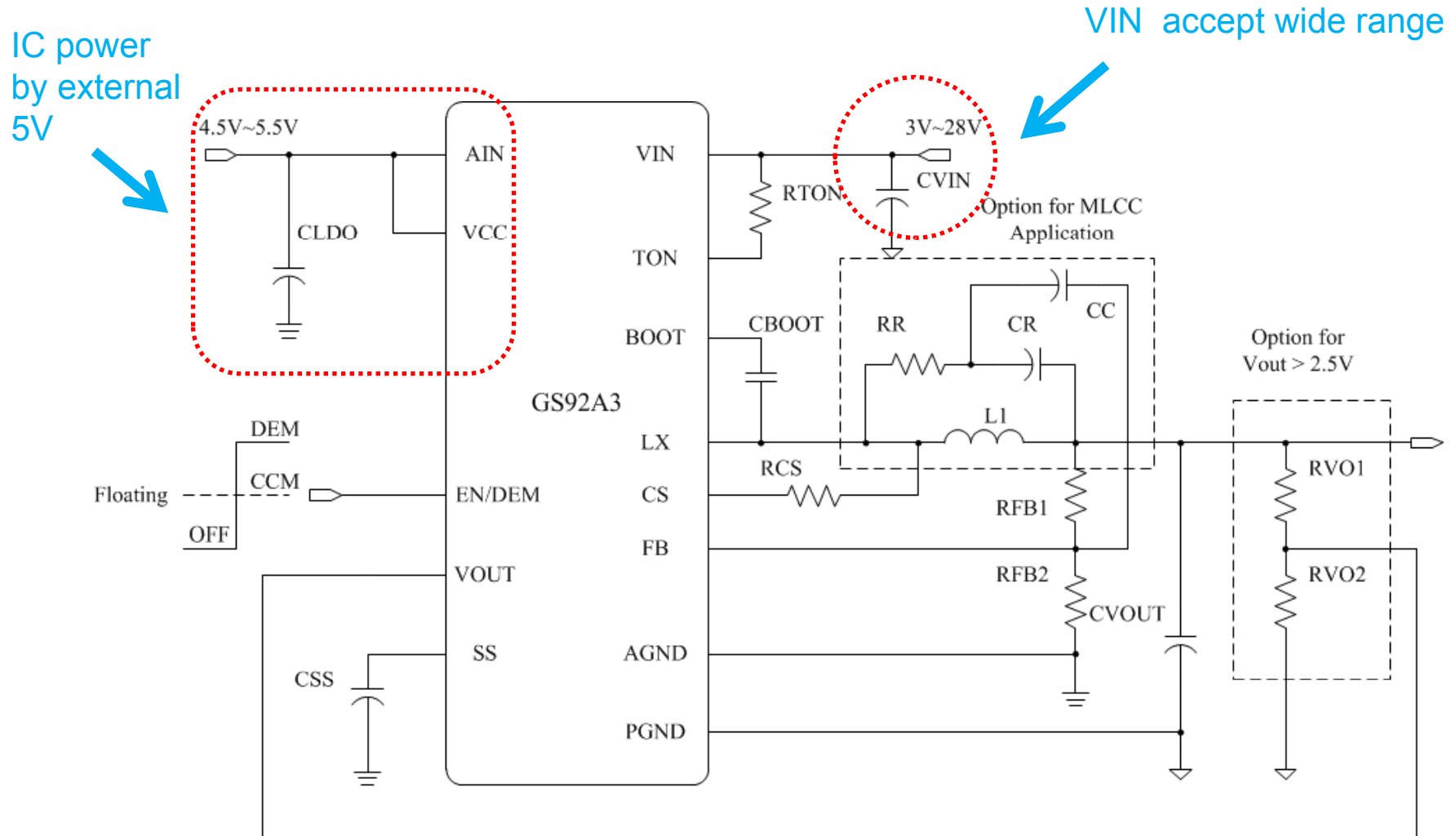
GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

Features

- Wide Input Voltage Range : 3V~28V
- Adjustable 0.8V~20V Output Range
- $\pm 1\%$ Output Voltage Accuracy over Line and Load
- Constant-on-time control scheme for fast transient and high Efficiency
- Programmable Operation Frequency from 100kHz to 600kHz
- Integrated 18 m Ω at LDO=5V N-Channel MOSFET For High Side
- Integrated 9.5 m Ω at LDO=5V N-Channel MOSFET For Low Side
- Selectable Forced PWM or automatic PFM/PWM mode
- Under-Voltage Protection
- Over-Voltage Protection
- FB Short Protection
- Internal 5V Pre-regulator
- External Adjustable Soft-Start and Soft-Stop
- Over Temperature Protection
- Programmable Over Current Protection
- TQFN23-4x4 package
- Green Product (RoHS, Lead-Free, Halogen-Free Compliant)

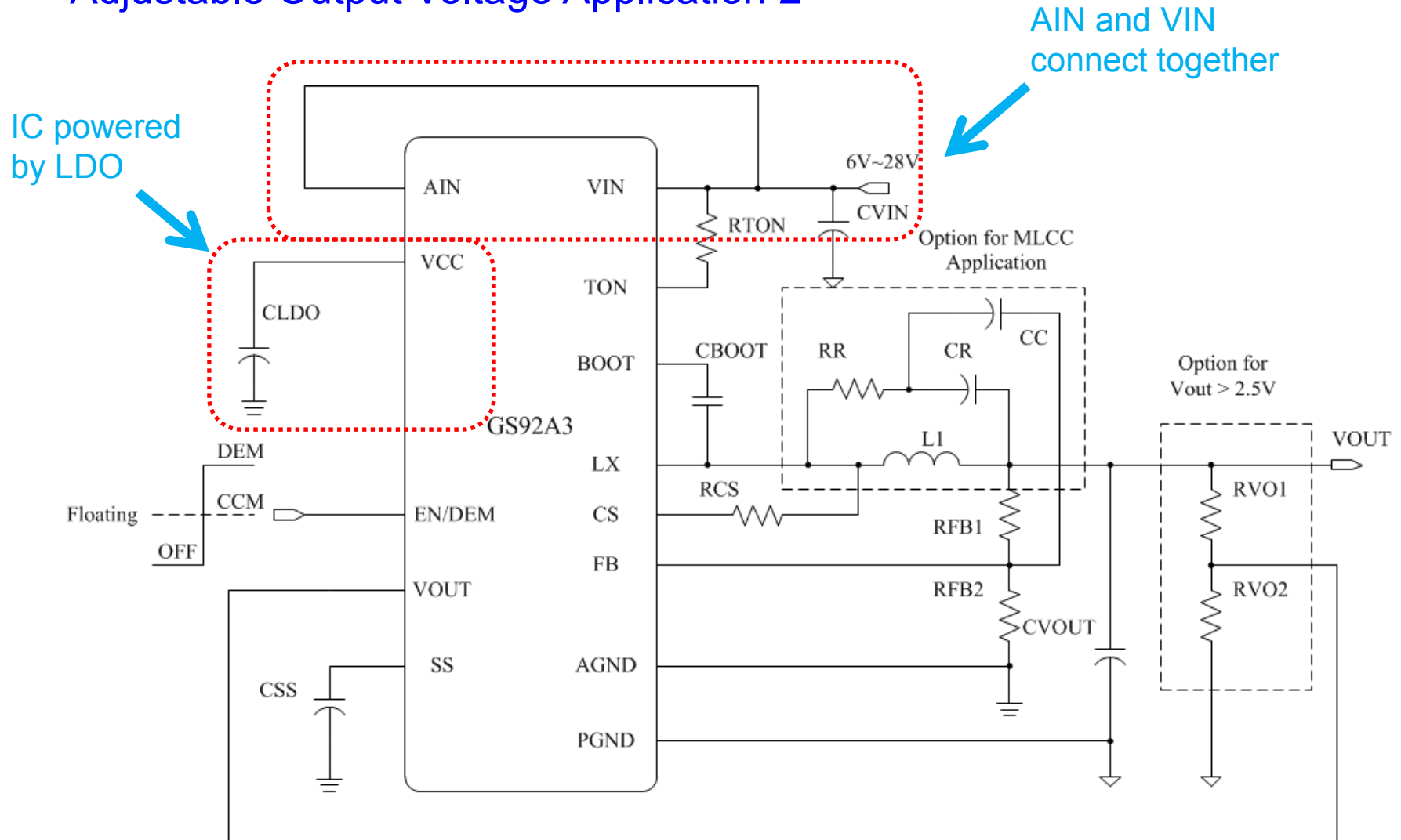
GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

Adjustable Output Voltage Application 1



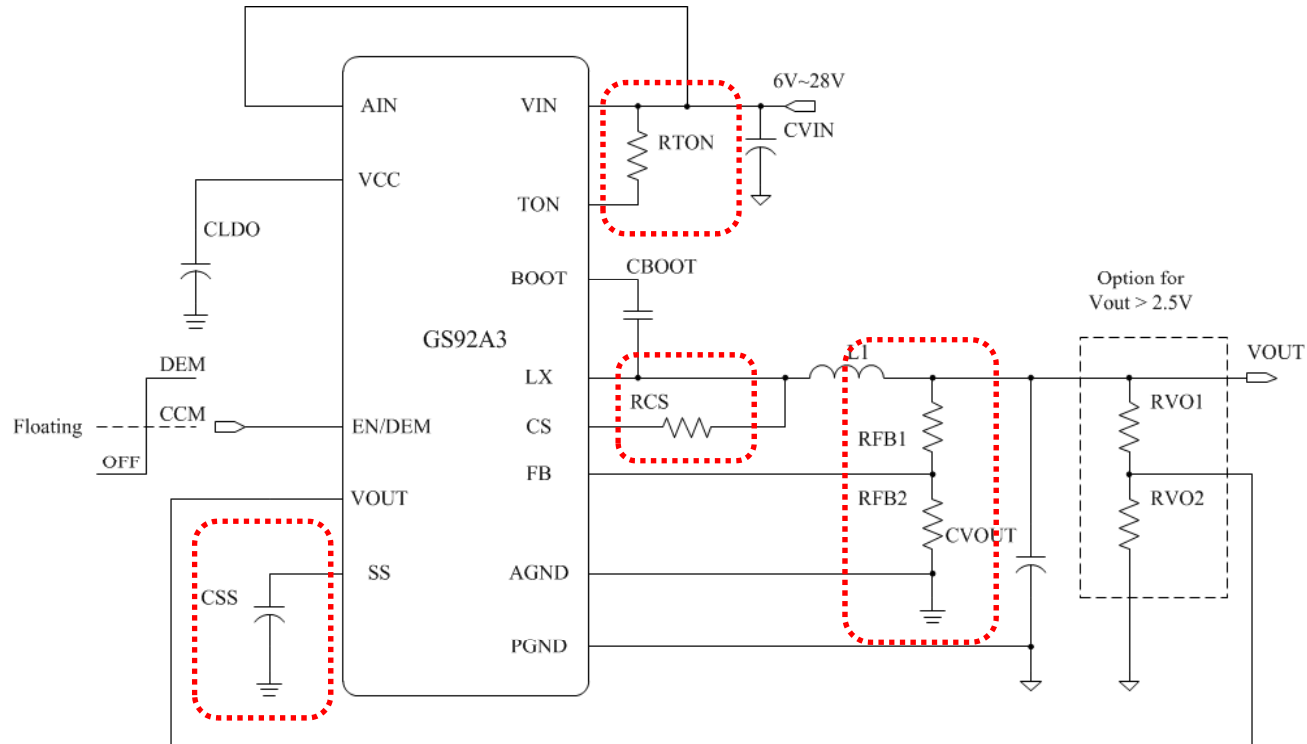
GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

Adjustable Output Voltage Application 2



GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

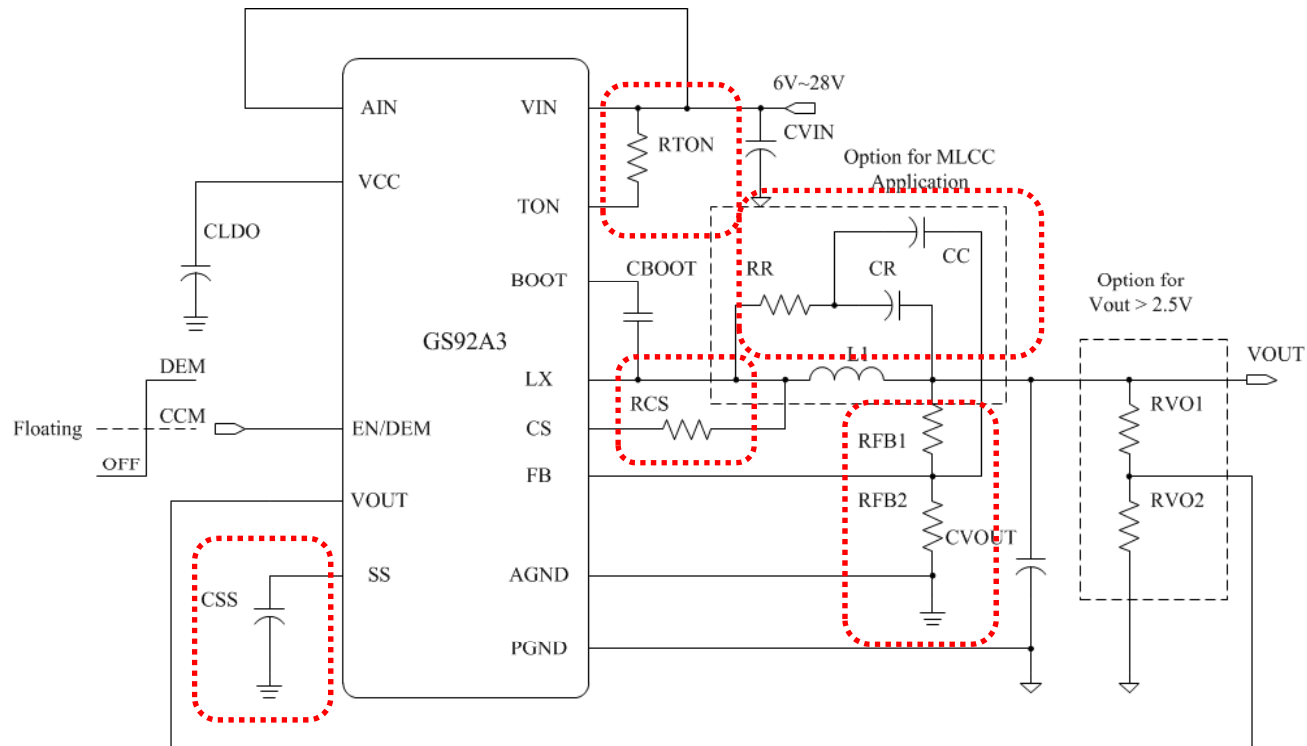
Easy Setting(Solid Cap)



1. VOUT Setting: RFB1 & RFB2
2. Frequency Setting: RTON
3. Current Limit: RCS
4. Soft Start Time Setting: CSS

GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

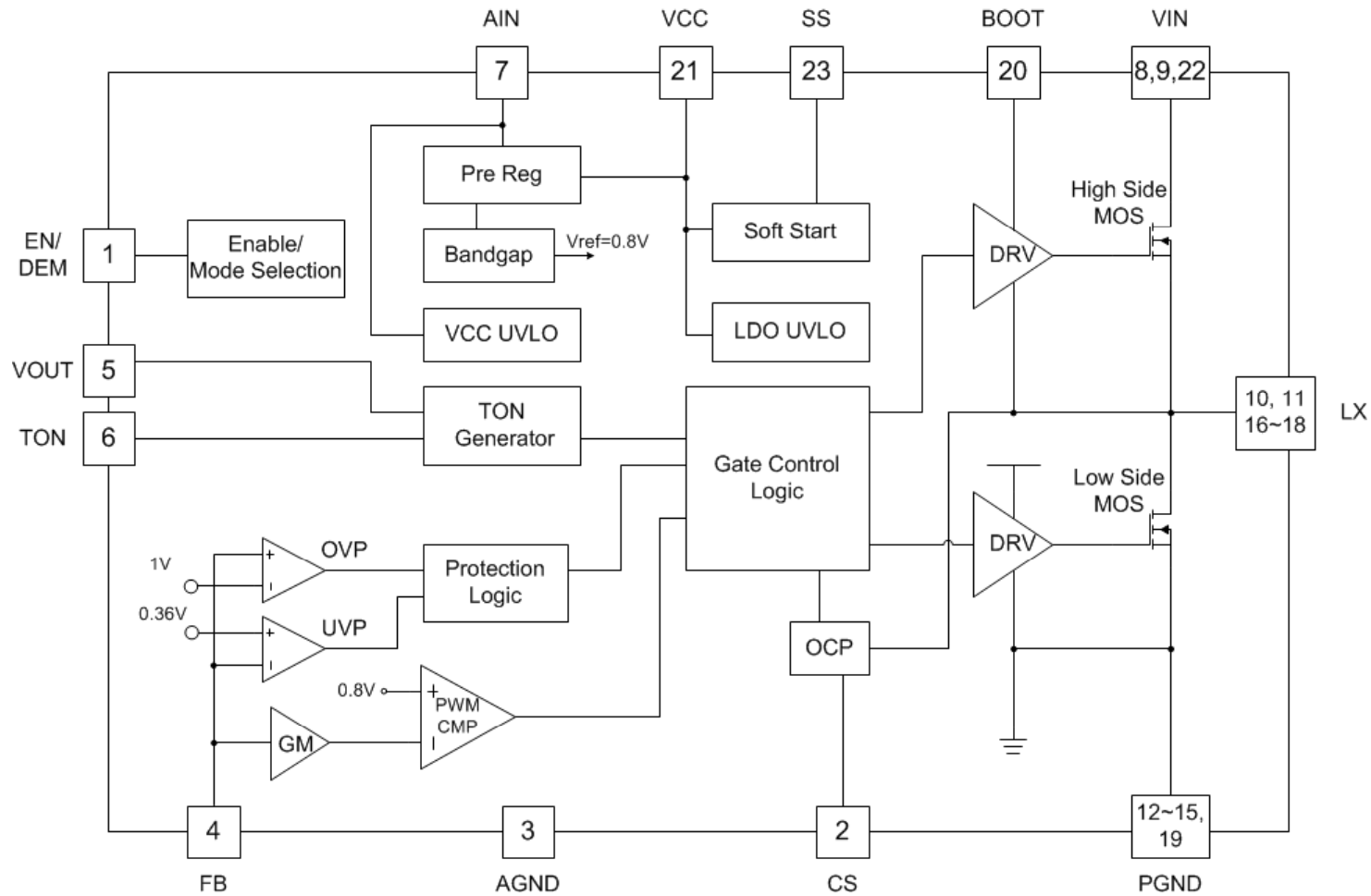
Easy Setting(MLCC Cap)



1. VOUT Setting: RFB1 & RFB2
2. Frequency Setting: RTON
3. Current Limit: RCS
4. Soft Start Time Setting: CSS
5. RCC Compensation

GStek GS92A3 – Wide input range High efficiency COT Buck Converter

Functional Block Diagram



GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

Pin Descriptions

No.	Name	I/O	Description
1	EN/DEM	I	Buck Enable Control Pin. EN=Low, Shutdown; EN=High, Auto-DEM Mode; EN=Floating, Forced CCM.
2	CS	I/O	Current Limit Detecting Input Pin. Connect LX Pin though an external resistor to set the current limit threshold.
3	AGND	O	Signal GND.
4	FB	I	Feedback Input. Adjust the output voltage with a resistive voltage-divider between the regulator's output and AGND.
5	VOUT	I	VOUT Pin offers the output information to the chip, in order to make the frequency setting more accuracy. When OVP condition occurs, through this pin discharge the energy of vout capacitor.
6	TON	I/O	On-Time Setting Input. Connect a resistor between VIN and TON to set the on time width.
7	AIN	I/O	Supply Input for internal analog circuitry.
8, 9, 22	VIN	I	Supply Input. VIN is the regulator input. All VIN pins must be connected together.
10, 11, 16~18	LX	I/O	Upper Driver Floating Ground for Buck Controller. Connect to an external inductor.
12~15, 19	PGND	O	Power Ground.
20	BOOT	I	Bootstrap Capacitor Connection. Connect a capacitor between BOOT and LX Pin.
21	VCC	I/O	Internal Linear Regulator Output.
23	SS	I/O	Soft-Start Time Setting Pin. Connect a capacitor between SS and AGND to set the soft-start time.

GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

Electrical Characteristics

($R_{TON}=300K\Omega$, $V_{IN}=12V$, $V_{OUT}=1.2V$, $EN/DEM=V_{IN}$, $T_A=25^\circ C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage (V_{AIN})						
Under voltage lock out (Rising)	V_{AIN_UVLO}			5.5		V
UVLO Hysteresis	$V_{AIN_UVLOHYS}$			0.2		V
5V Pre-regulator (V_{VCC})						
Output Voltage	V_{VCC}			5.15		V
Under voltage lock out (Rising)	V_{VCC_UVLO}			4.15		V
UVLO Hysteresis	$V_{VCC_UVLOHYS}$			0.3		V
Reference Voltage						
FB Reference Voltage	V_{FB}	$V_{VCC}=5V$		0.8		V
Enable Logic						
EN Logic Low Voltage	V_{EN_L}	EN Falling	--	--	0.6	V
EN Floating Voltage	V_{EN_F}	VIN Power On, Stable State(Forced CCM)	--	2.2	--	V
EN Logic High Voltage	V_{EN_H}	EN Rising(DEM)	3.1	--	--	V
Current Parameters						
Quiescent	I_Q	FB=0.85V, VIN=12V		830		uA
Soft start current	I_{SS}	VSS=0		10		uA
Shutdown Current	$I_{SHUTDOWN}$	EN=0, I(VIN)	--	4		uA
		EN=0, I(TON)	--	--	0.01	uA
		EN=0, I(EN)	-2	-1	--	uA
Logic Input Current	I_{EN}	EN=12V	--	13		uA
		EN=0V	-2	-1	--	uA

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Electrical Characteristics

($R_{TON}=300K\Omega$, $V_{IN}=12V$, $V_{OUT}=1.2V$, $EN/DEM=V_{IN}$, $T_A=25^\circ C$, unless otherwise specified)

System Time & Driver On-Resistance						
On-Time	T_{ON}	$V_{IN}=12V$, $V_{FB}=0.79V$, $R_{TON}=300K$, $V_{OUT}=1.2V$		300		ns
Minimum On-Time	T_{ON_Min}	$V_{IN}=12V$, $V_{FB}=0.79V$, $R_{TON}=1K$, $V_{OUT}=1.2V$		100		ns
Minimum Off-Time	T_{OFFMIN}	$V_{IN}=12V$, $V_{FB}=0.79V$, $R_{TON}=300K$		440		ns
High Side MOS $R_{DS(on)}$	R_{DSH}	BOOT-LX=5V		18		mohms
High Side Leakage	I_{LEAKH}			10		uA
Low Side MOS $R_{DS(on)}$	R_{DSL}	VCC-GND=5V		9.5		mohms
Low Side Leakage	I_{LEAKL}			10		uA
Current Sensing						
CS Set Source Current	I_{CS}	$V_{CS}=1V$		20		uA
ICS current temperature coefficient	TCS	On the bias of $T_A=25^\circ C$		4900		ppm/ $^\circ C$
Current Limit 1 (Rising)	I_{LIM1}	GND-LX, RCS=18K	324	360	396	mV
Current Limit 2 (Rising)	I_{LIM2}	GND-LX, RCS=10K	180	200	220	mV
Current Limit 3 (Rising)	I_{LIM3}	GND-LX, RCS=2.5K	35	50	65	mV
Zero Crossing Threshold	V_{T_0}	GND-LX	-10		10	mV

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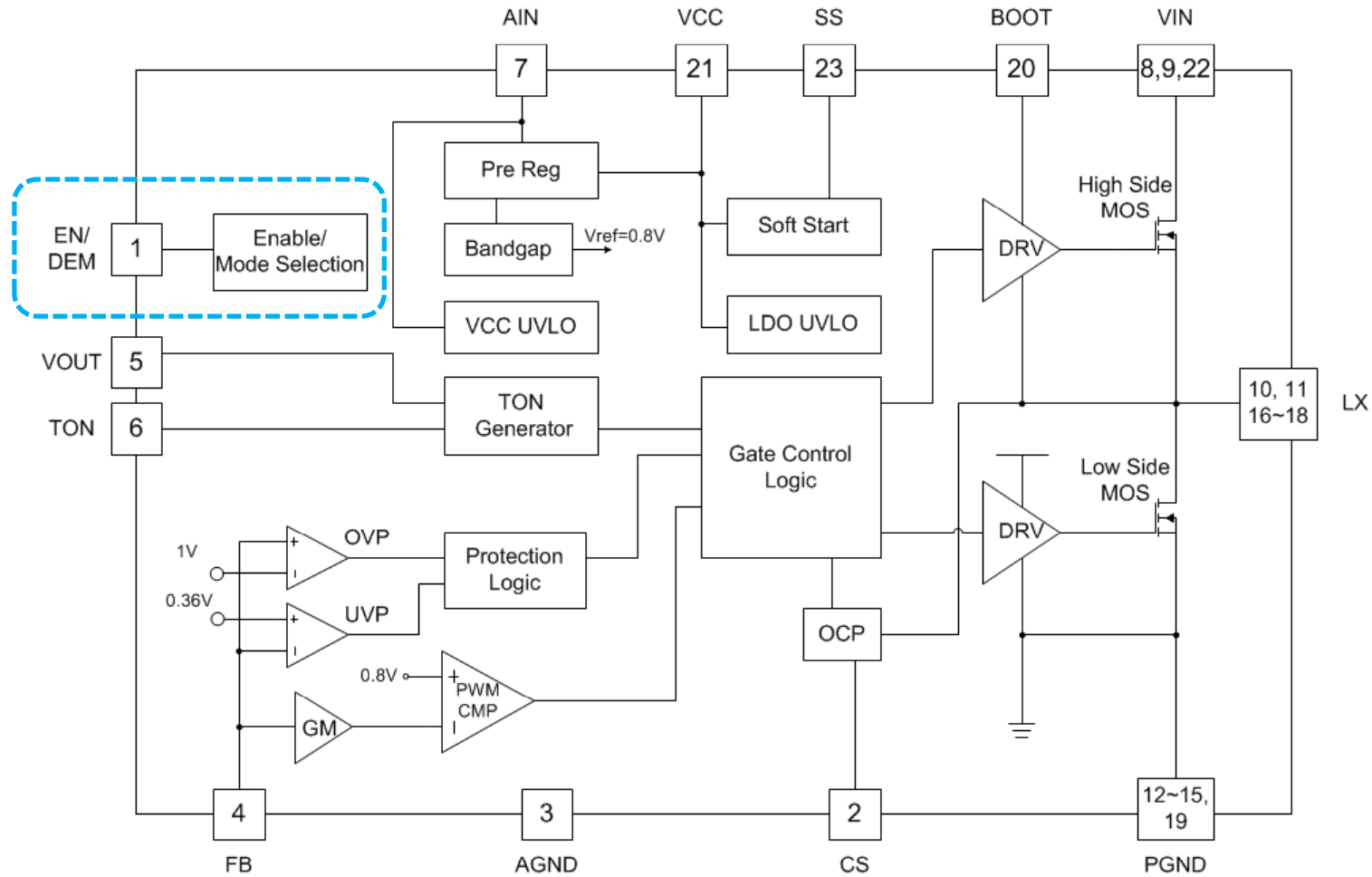
Electrical Characteristics

($R_{TON}=300K\Omega$, $V_{IN}=12V$, $V_{OUT}=1.2V$, $EN/DEM=V_{IN}$, $T_A=25^\circ C$, unless otherwise specified)

Voltage Fault Protection						
UVP Threshold	V_{UV_TH}	Measure at VFB, with respect to reference voltage		45		%
UVP Blank Time	T_{UV_B}	From Enable to UVP $80mV < VFB < UVP$ Threshold		$1.6 \times 10^8 \times C_{SS}$		ms
UVP Fault Delay	T_{UV_D}	Force VFB below UVP threshold		20		us
OVP Threshold	V_{OV_TH}	Measure at VFB, with respect to reference voltage		125		%
OVP Fault Delay	T_{OV_D}	Force VFB above OVP Threshold		20		us
Over Temperature Shutdown						
Thermal Shutdown Threshold	T_{TSDN}			150		$^\circ C$
Thermal Shutdown Hysteresis	T_{HYS_TSDN}			20		$^\circ C$
Bootstrap Diode						
Internal Boost Charging Switch On-Resistance	R_{BT_D}	VCC to BOOT, 10mA			120	ohms

GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

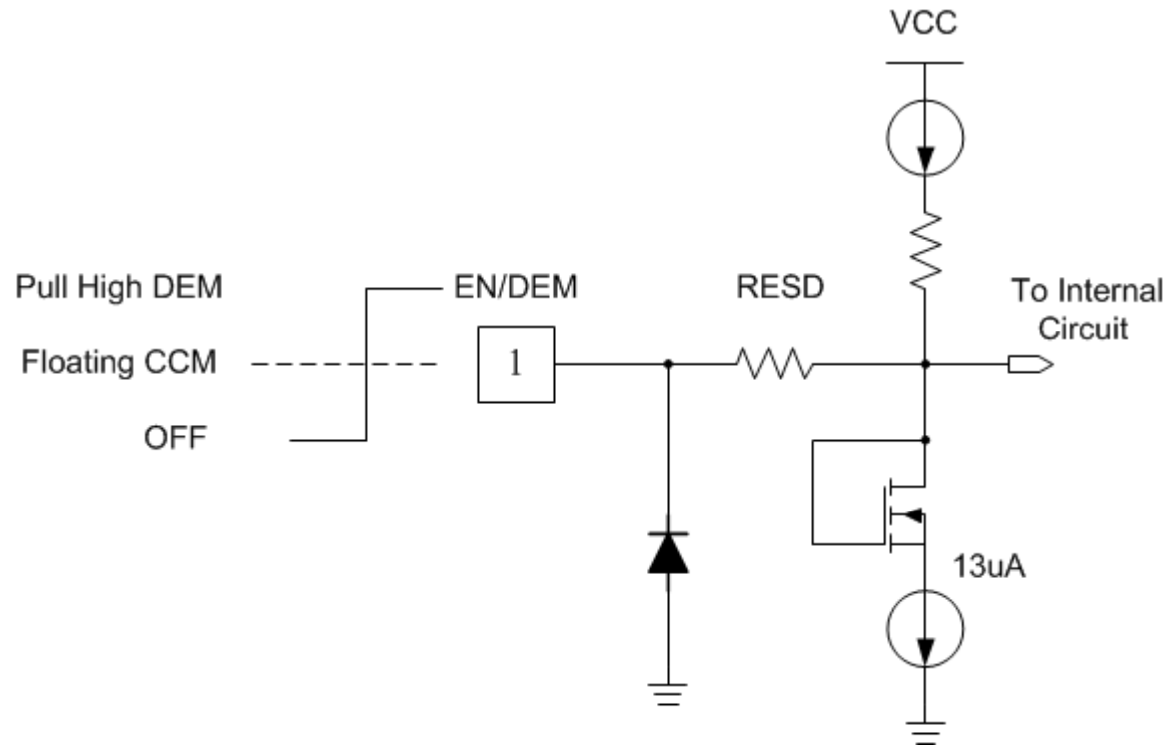
PIN Circuit- Enable Function (PIN 1 – EN/DEM)



GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

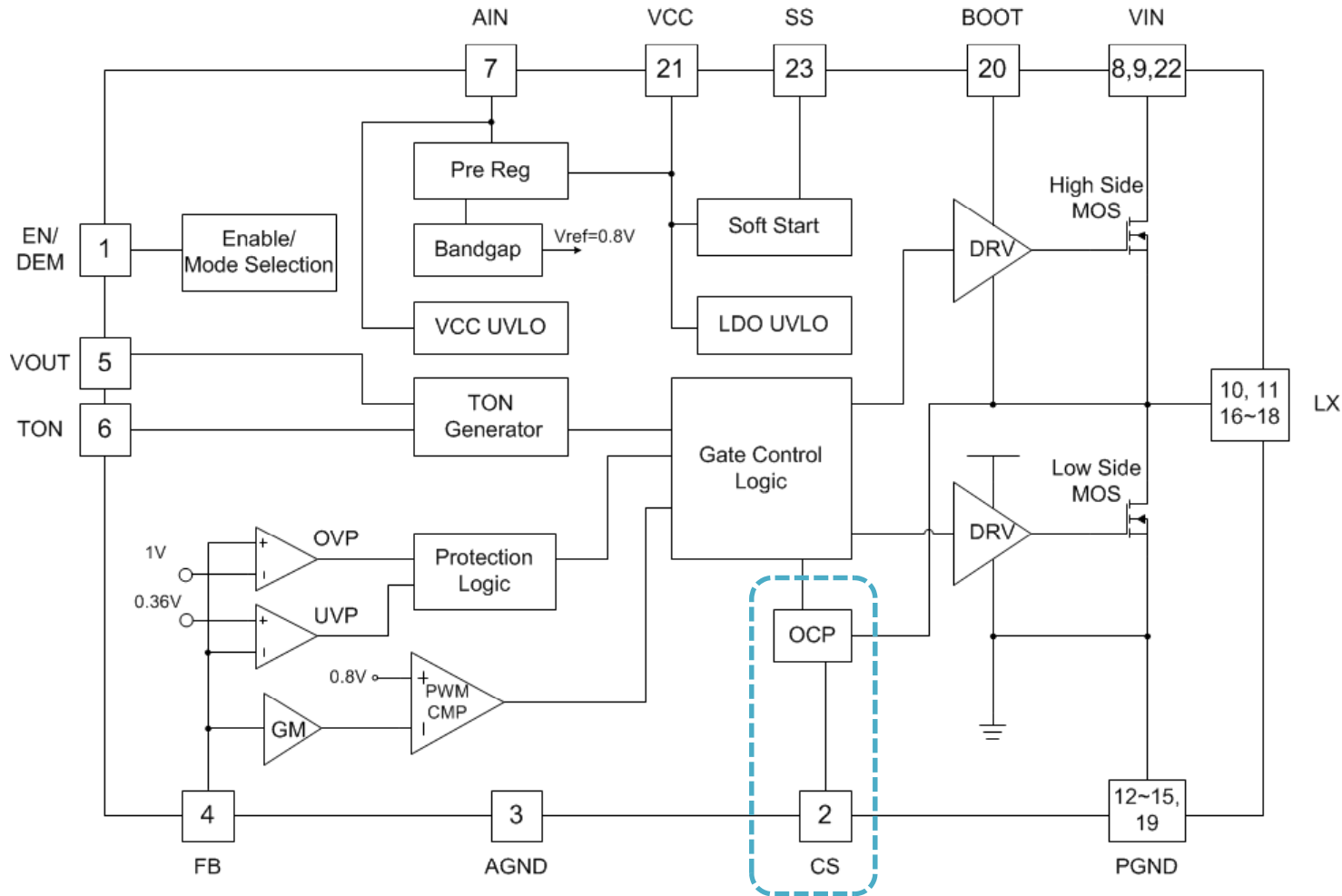
PIN Circuit- Enable Function (PIN 1 – EN/DEM)

Enable Logic						
EN Logic Low Voltage	V_{EN_L}	EN Falling	--	--	0.6	V
EN Floating Voltage	V_{EN_F}	VIN Power On, Stable State(Forced CCM)	--	2.2	--	V
EN Logic High Voltage	V_{EN_H}	EN Rising(DEM)	3.1	--	--	V



GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

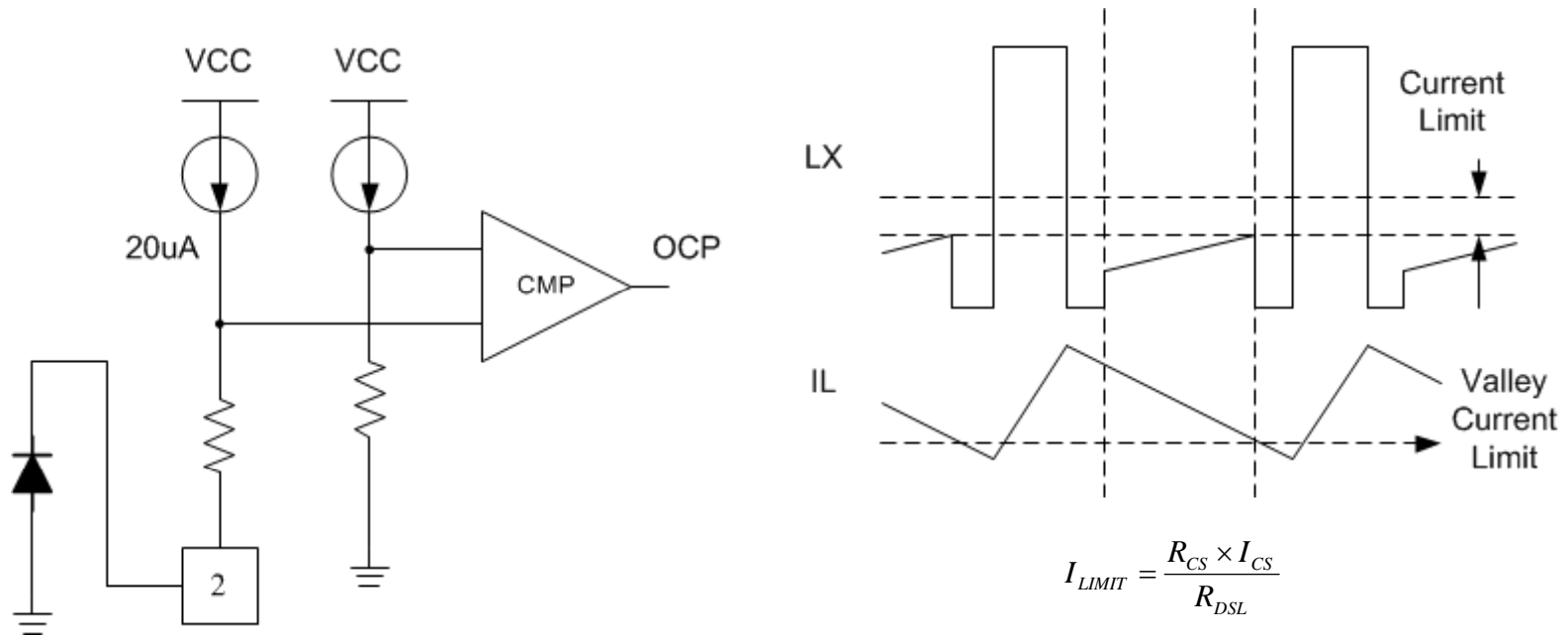
PIN Circuit- Current Limit Setting (PIN 2 – CS)



GStek GS92A3 – Wide input range High efficiency COT Buck Converter

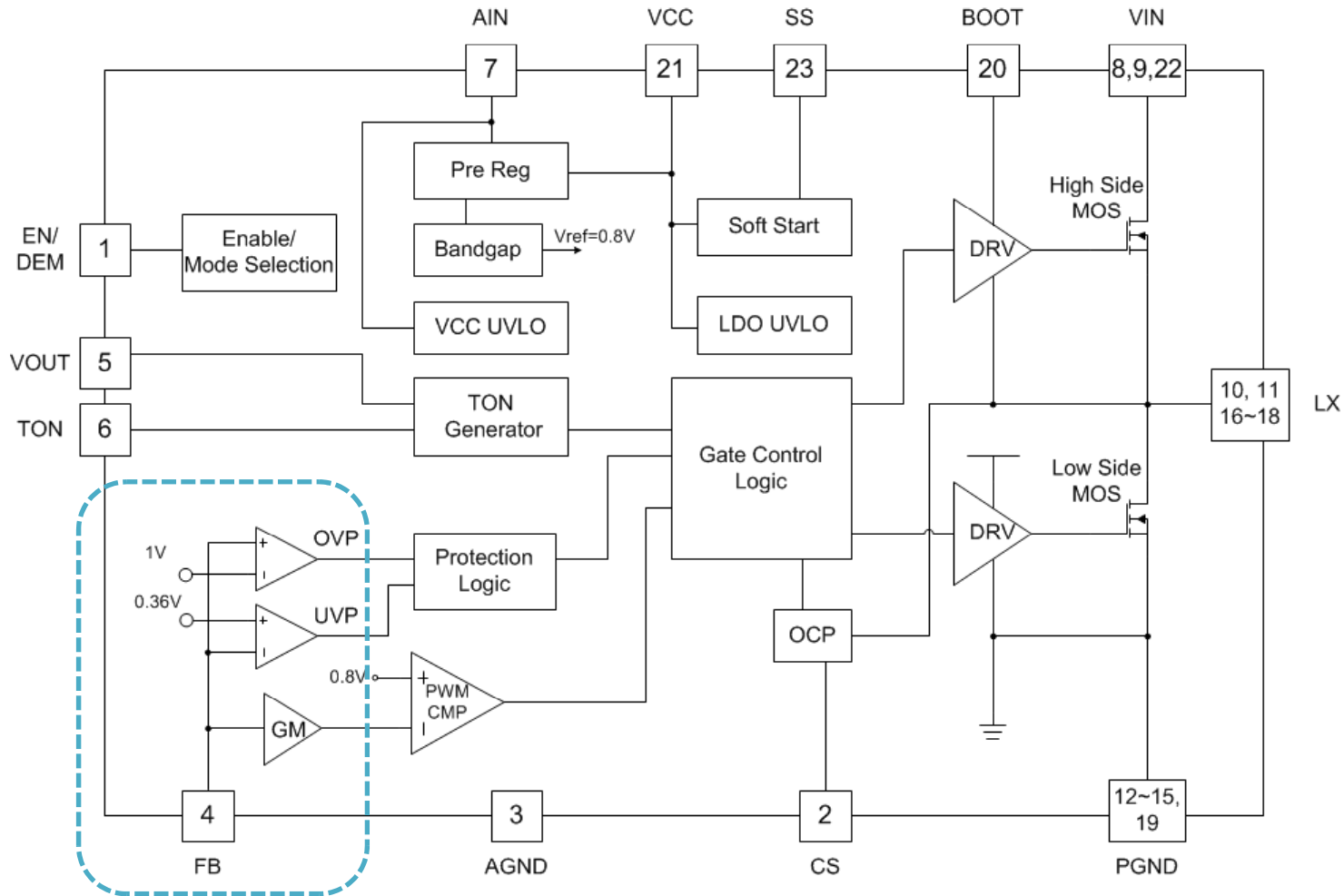
PIN Circuit- Current Limit Setting (PIN 2 – CS)

Current Sensing						
CS Set Source Current	I_{CS}	$V_{CS}=1V$		20		uA
ICS current temperature coefficient	TCS	On the bias of $T_A=25^{\circ}C$		4900		ppm/ $^{\circ}C$
Current Limit 1 (Rising)	I_{LIM1}	GND-LX, RCS=18K	324	360	396	mV
Current Limit 2 (Rising)	I_{LIM2}	GND-LX, RCS=10K	180	200	220	mV
Current Limit 3 (Rising)	I_{LIM3}	GND-LX, RCS=2.5K	35	50	65	mV



GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

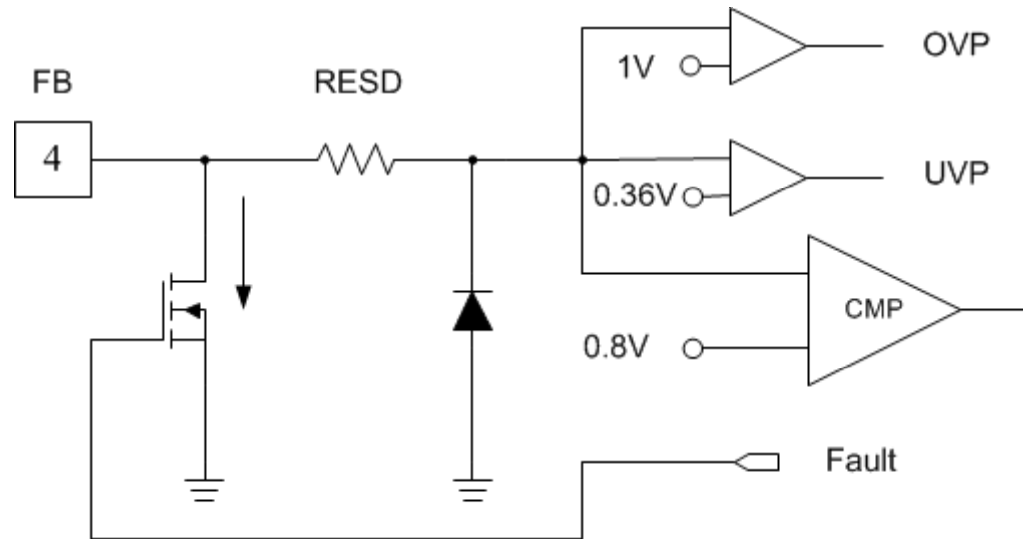
PIN Circuit- Feedback Function (PIN 4 – FB)



GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

PIN Circuit- Feedback Function (PIN 4 – FB)

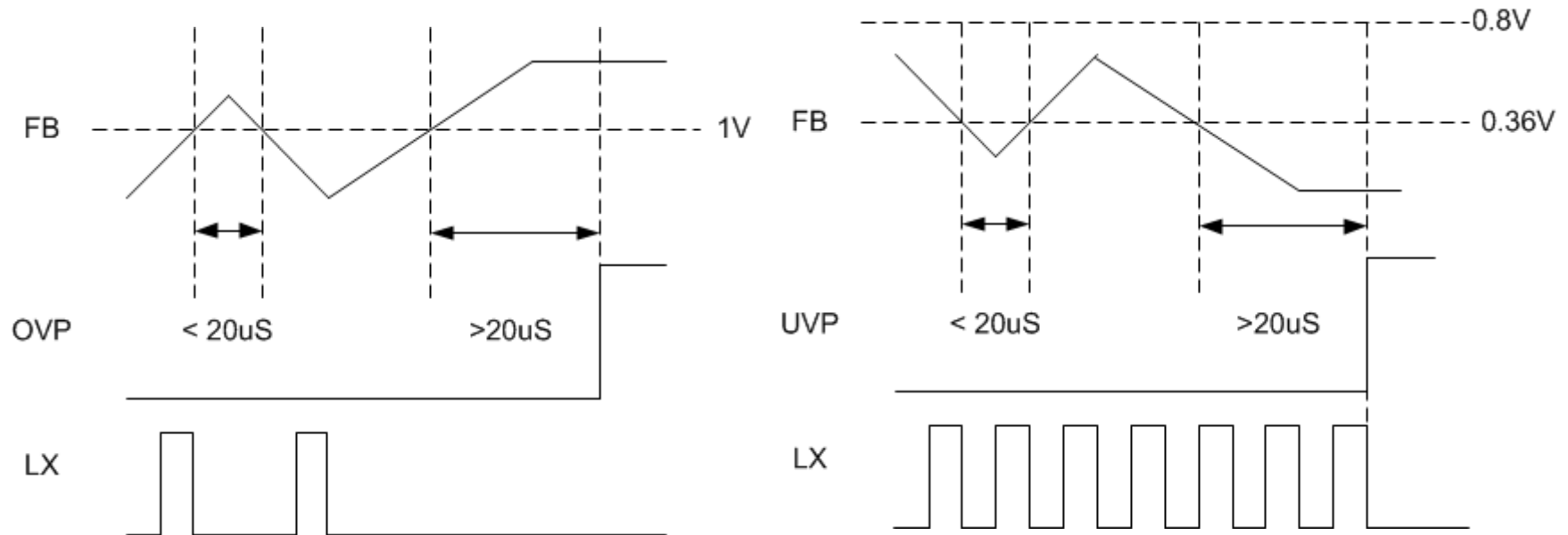
Reference Voltage						
FB Reference Voltage	V_{FB}	$V_{VCC}=5V$		0.8		V



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PIN Circuit- OVP & UVP Function (PIN 4 – FB)

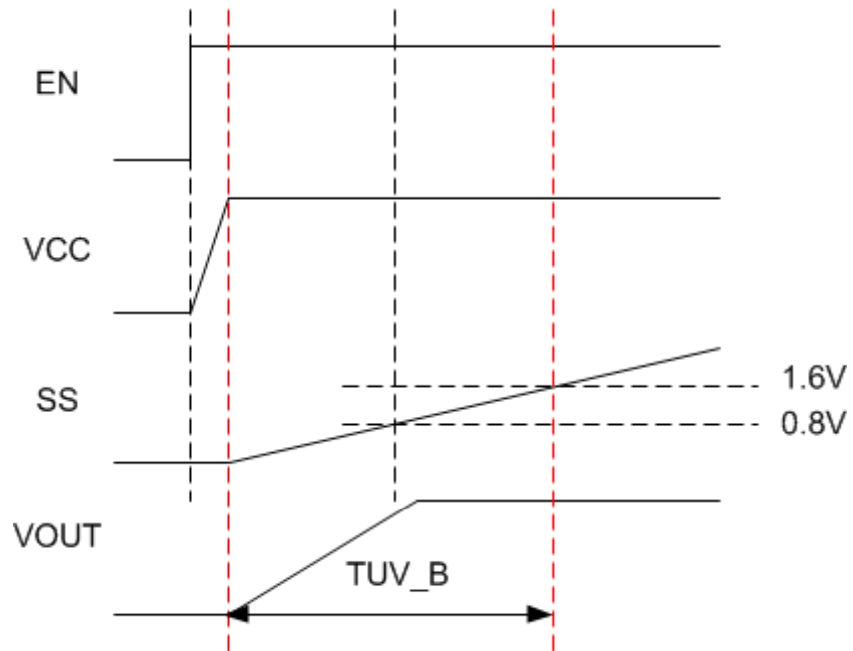
Voltage Fault Protection						
UVP Threshold	V_{UV_TH}	Measure at VFB, with respect to reference voltage		45		%
UVP Blank Time	T_{UV_B}	From Enable to UVP $80mV < VFB < UVP$ Threshold		$1.6 \times 10^8 \times C_{SS}$		ms
UVP Fault Delay	T_{UV_D}	Force VFB below UVP threshold		20		us
OVP Threshold	V_{OV_TH}	Measure at VFB, with respect to reference voltage		125		%
OVP Fault Delay	T_{OV_D}	Force VFB above OVP Threshold		20		us



GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

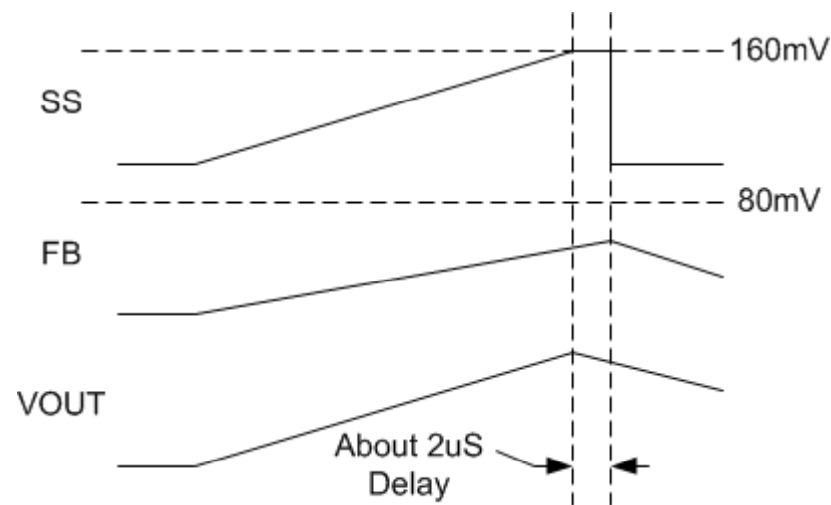
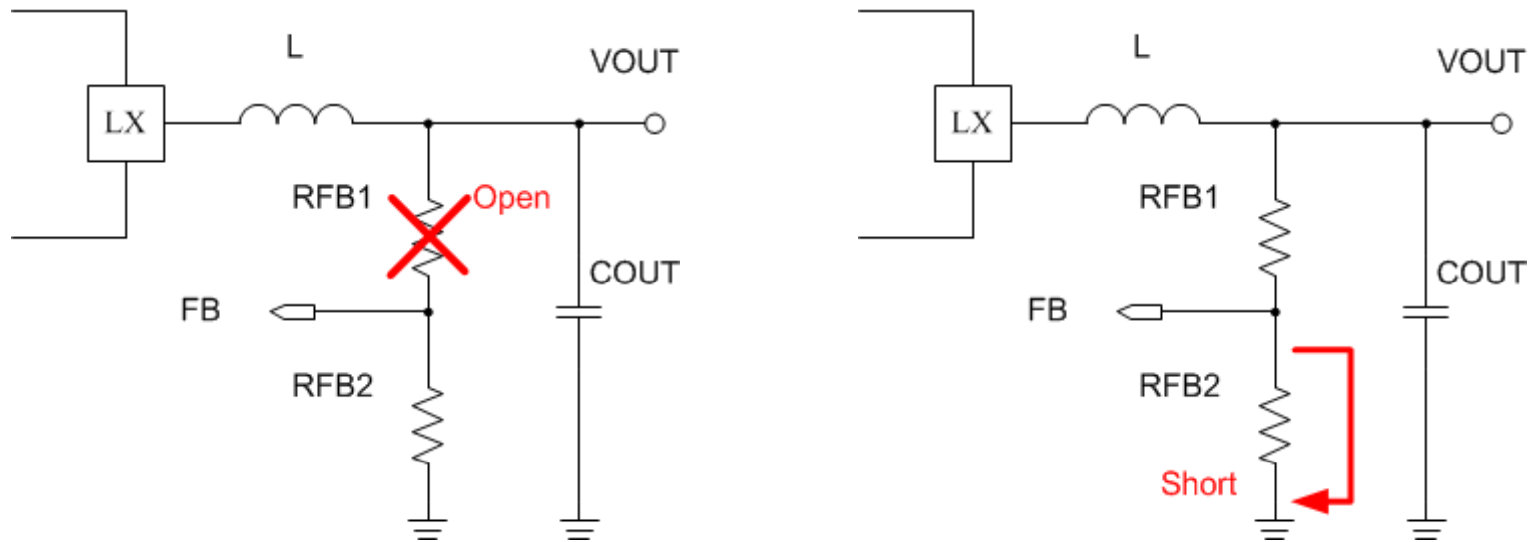
PIN Circuit- UVP Function (PIN 4 – FB)

UVP Blank Time	T_{UV_B}	From Enable to UVP $80mV < V_{FB} < \text{UVP Threshold}$	$1.6 \times 10^8 \times C_{SS}$	ms
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PIN Circuit- FB Short Function (PIN 4 – FB)

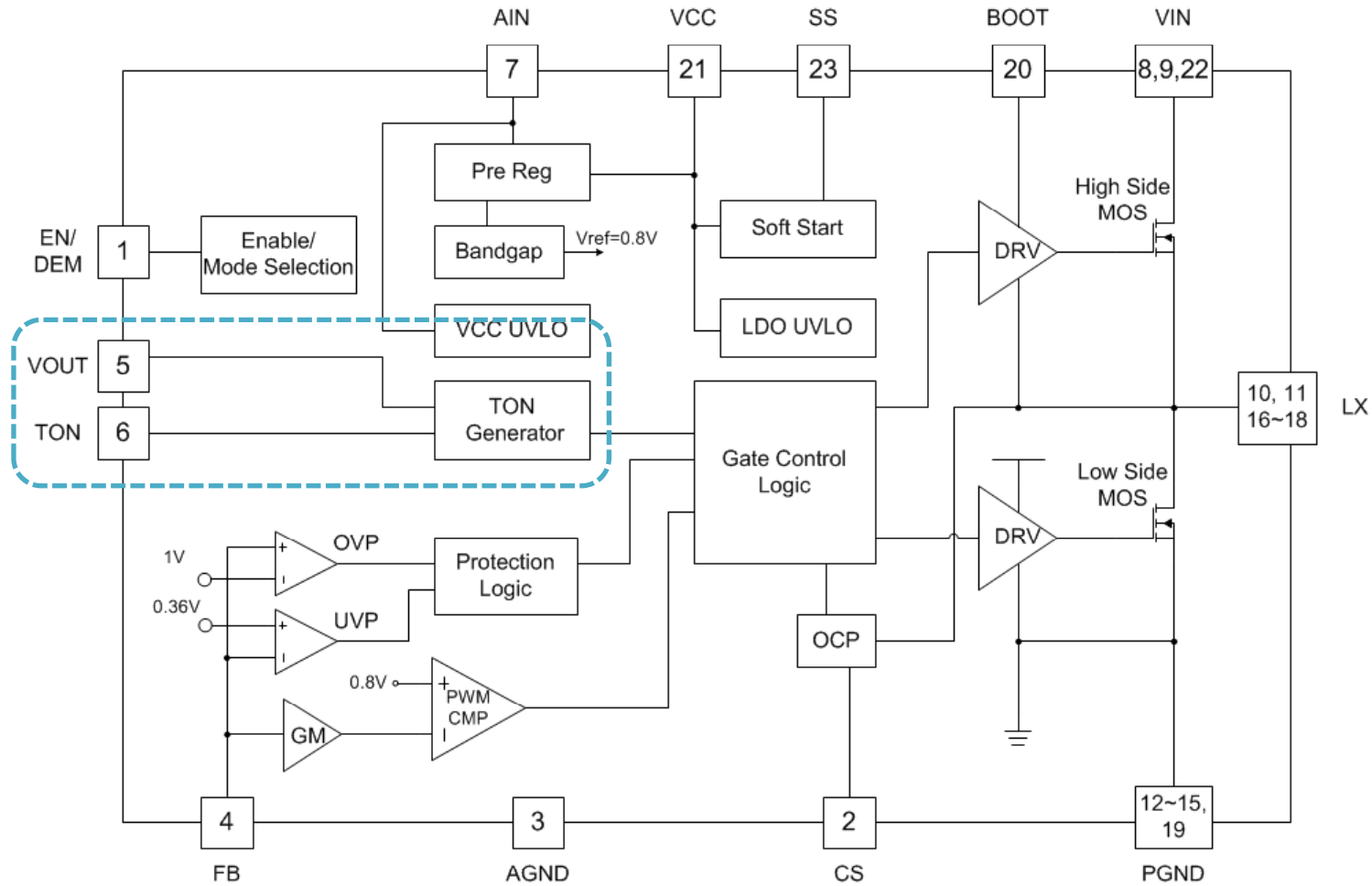


SS>160mV & FB<80mV

Confidential, for training only

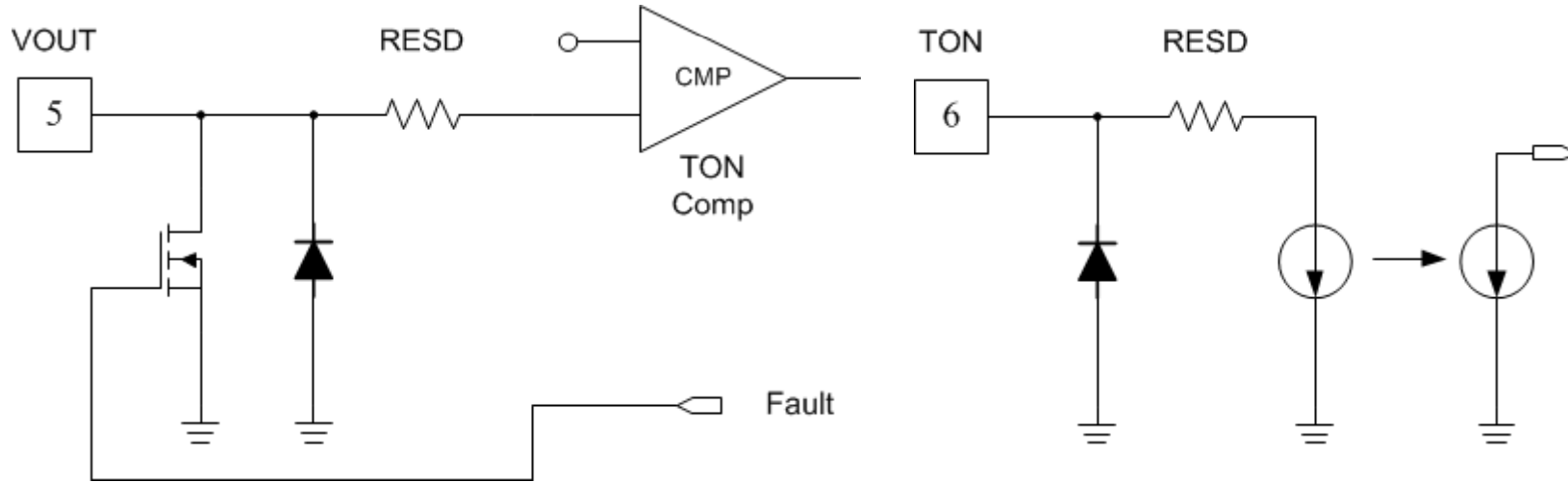
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PIN Circuit- VOUT & TON Function (PIN 5 – VOUT, PIN 6 - TON)



GStek **GS92A3** – Wide input range High efficiency COT Buck Converter

PIN Circuit- VOUT & TON Function (PIN 5 – VOUT, PIN 6 - TON)



$$T_{ON} = \frac{V_{OUT} \times 8p \times R_{TON}}{V_{IN} - 0.8}$$

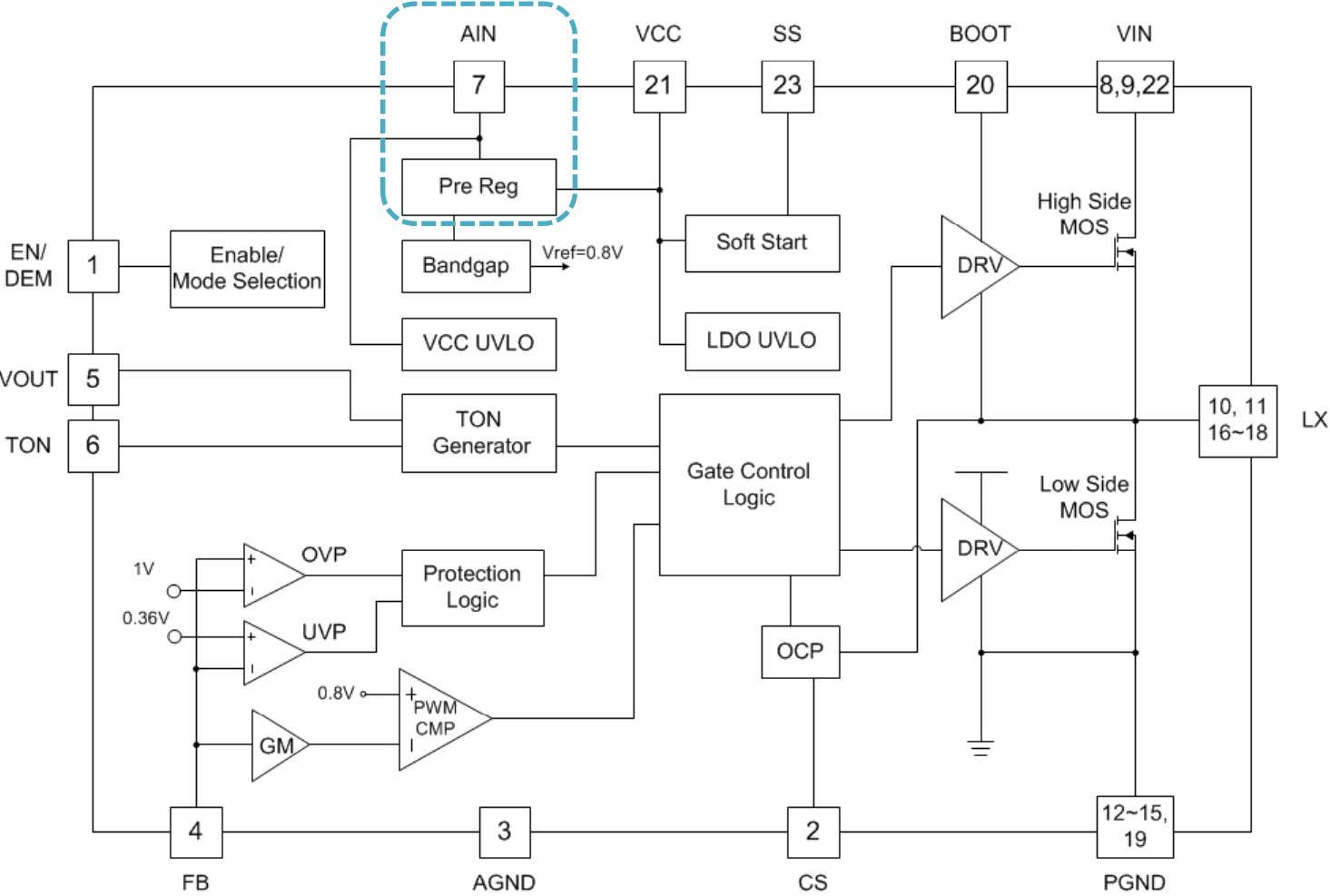
$$f_{SW} = \frac{V_{OUT}}{V_{IN} \times T_{ON}}$$

$$f_{SW} = \frac{1}{8p \times R_{TON}} (V_{OUT} \leq 2.5V)$$

$$f_{SW} = \frac{V_{OUT}}{20p \times R_{TON}} (V_{OUT} > 2.5V)$$

GStek GS92A3 – Wide input range High efficiency COT Buck Converter

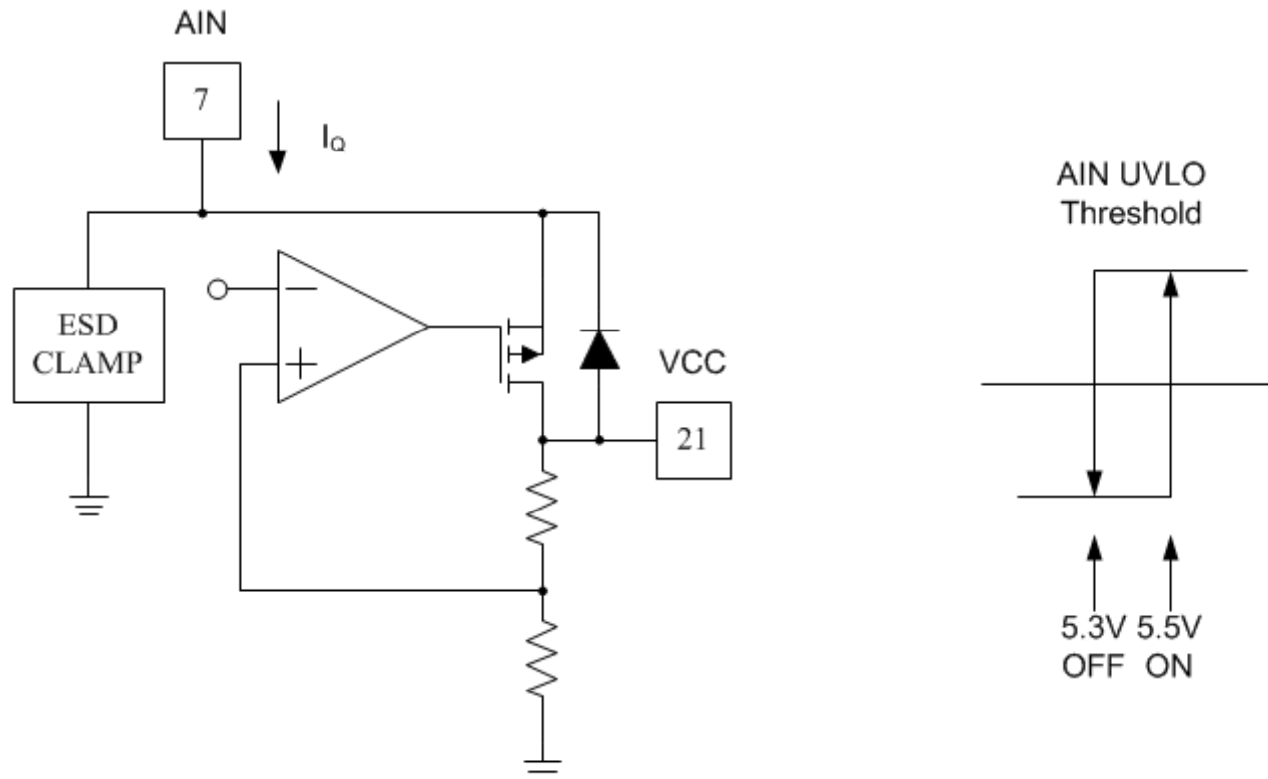
PIN Circuit- AIN Function (PIN 7 – AIN)



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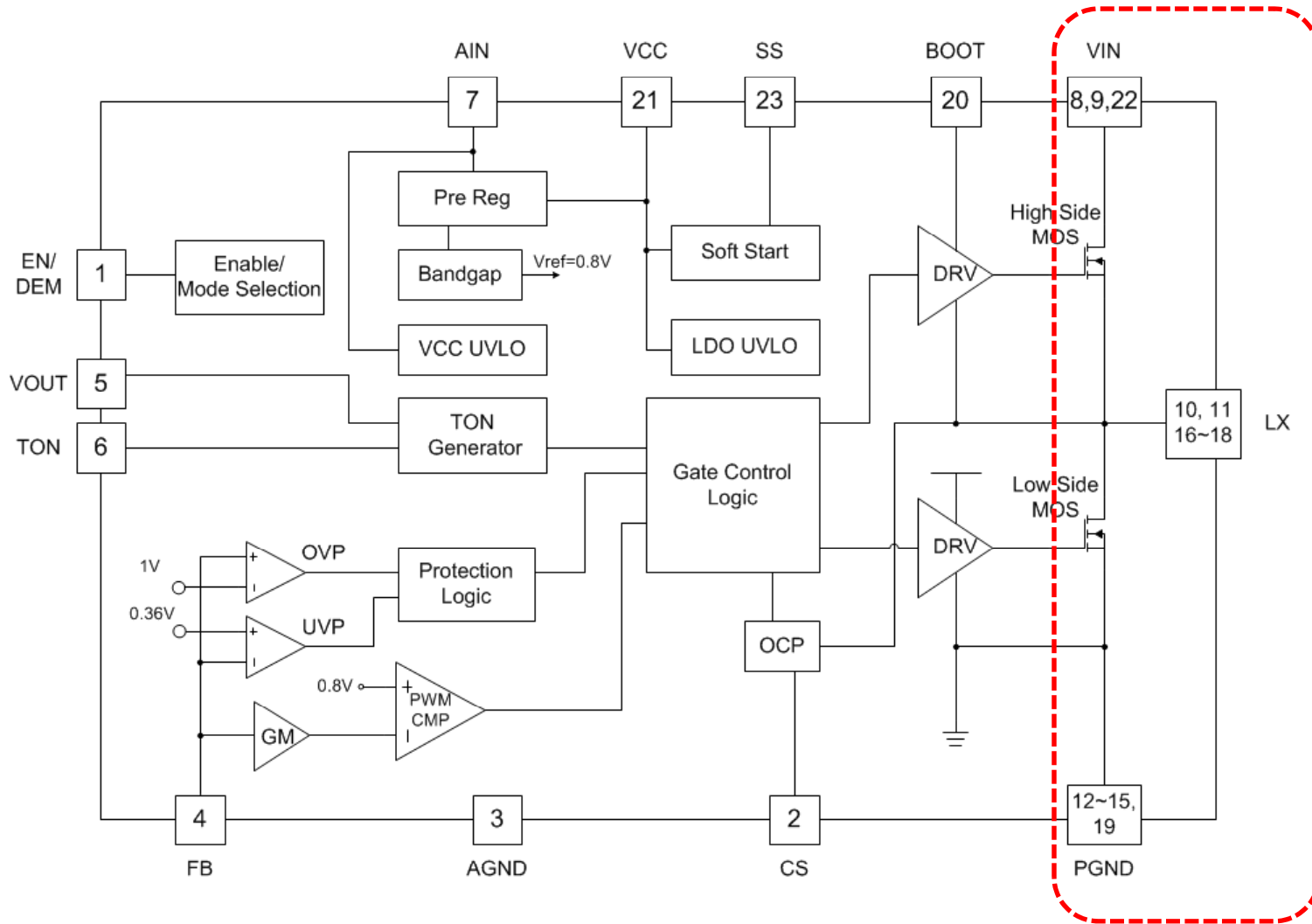
PIN Circuit- AIN Function (PIN 7 – AIN)

Supply Voltage (V _{AIN})						
Under voltage lock out (Rising)	V _{AIN_UVLO}			5.5		V
UVLO Hysteresis	V _{AIN_UVLOHYS}			0.2		V
Current Parameters						
Quiescent	I _Q	FB=0.85V, VIN=12V		830		uA



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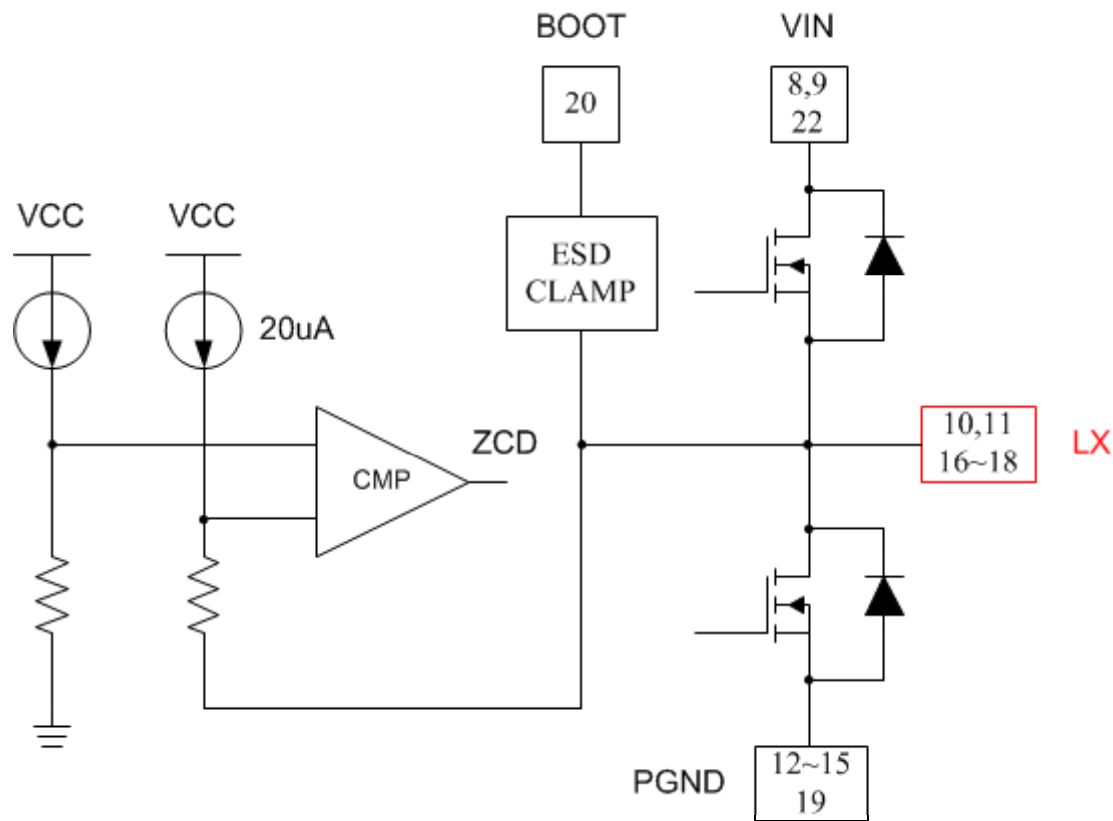
PIN Circuit- LX Function (PIN 10, 11, 16~18 – LX)



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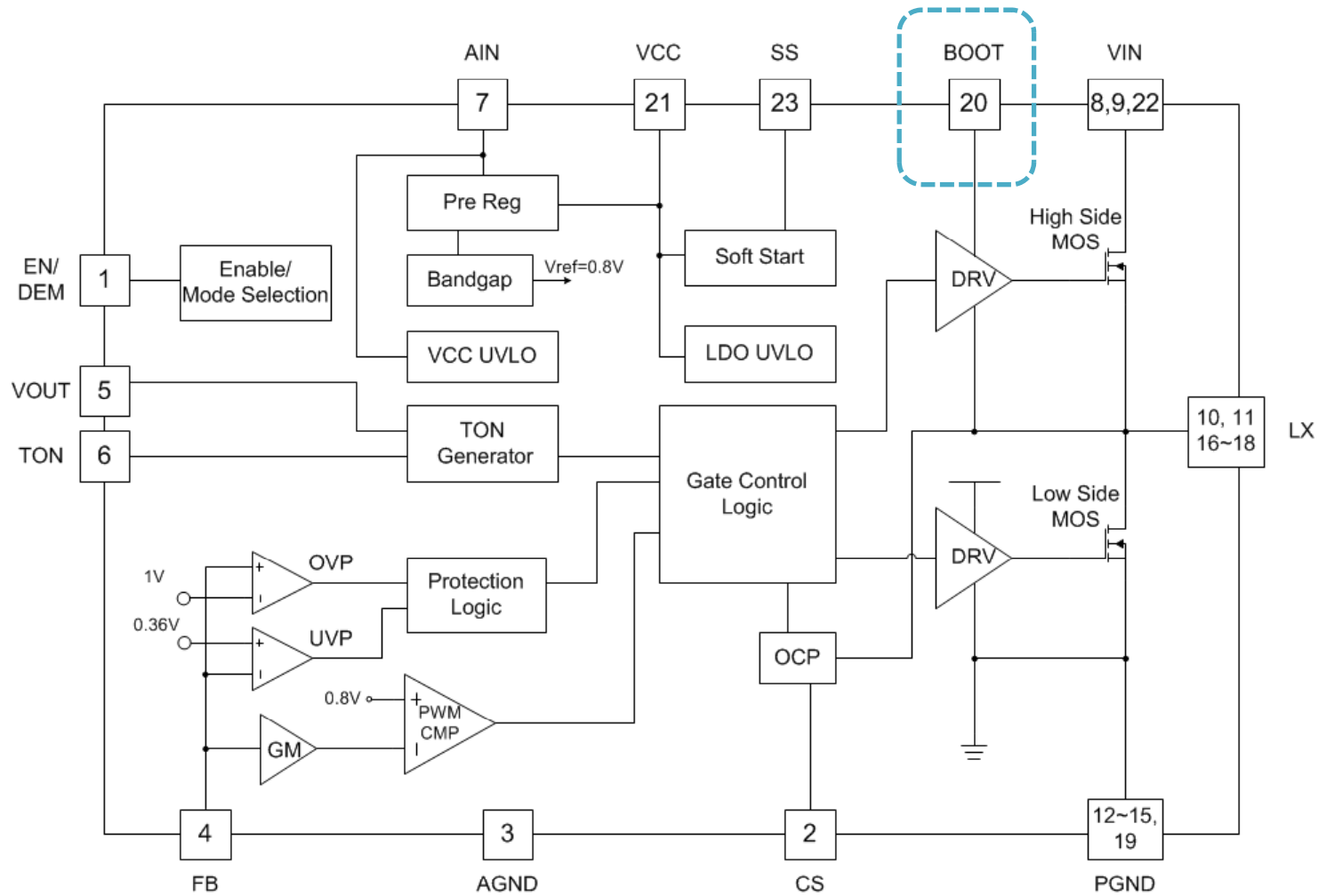
PIN Circuit- LX Function (PIN 10, 11, 16~18 – LX)

Current Sensing						
Zero Crossing Threshold	V_{T_0}	GND-LX	-10		10	mV



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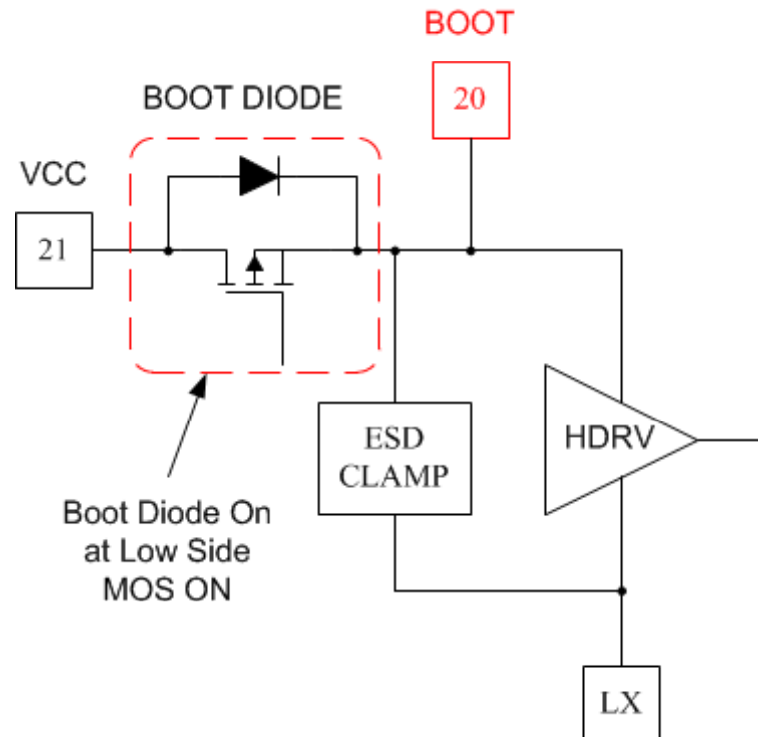
PIN Circuit- BOOT Diode Function (PIN 20 – BOOT)



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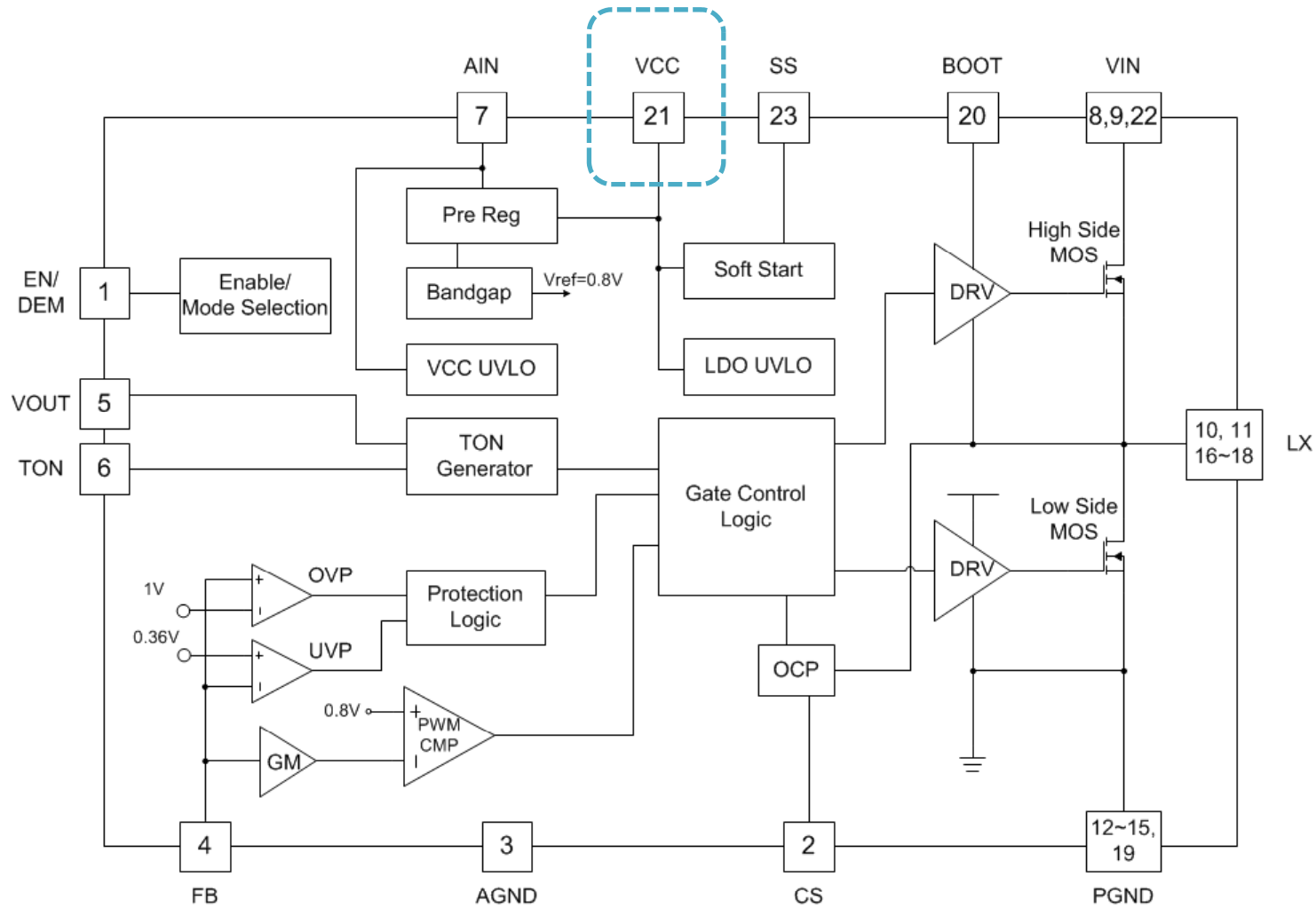
PIN Circuit- BOOT Diode Function (PIN 20 – BOOT)

Bootstrap Diode					
Internal Boost Charging Switch On-Resistance	R_{BT_D}	VCC to BOOT, 10mA			120 ohms



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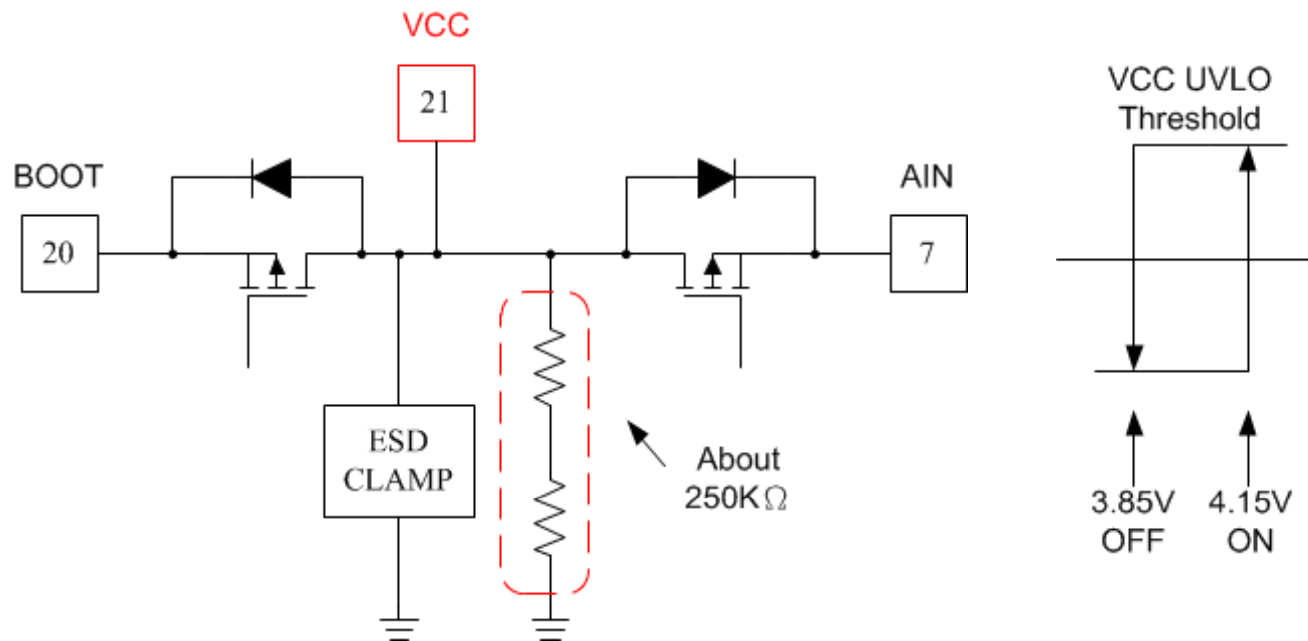
PIN Circuit- VCC Function (PIN 21 – VCC)



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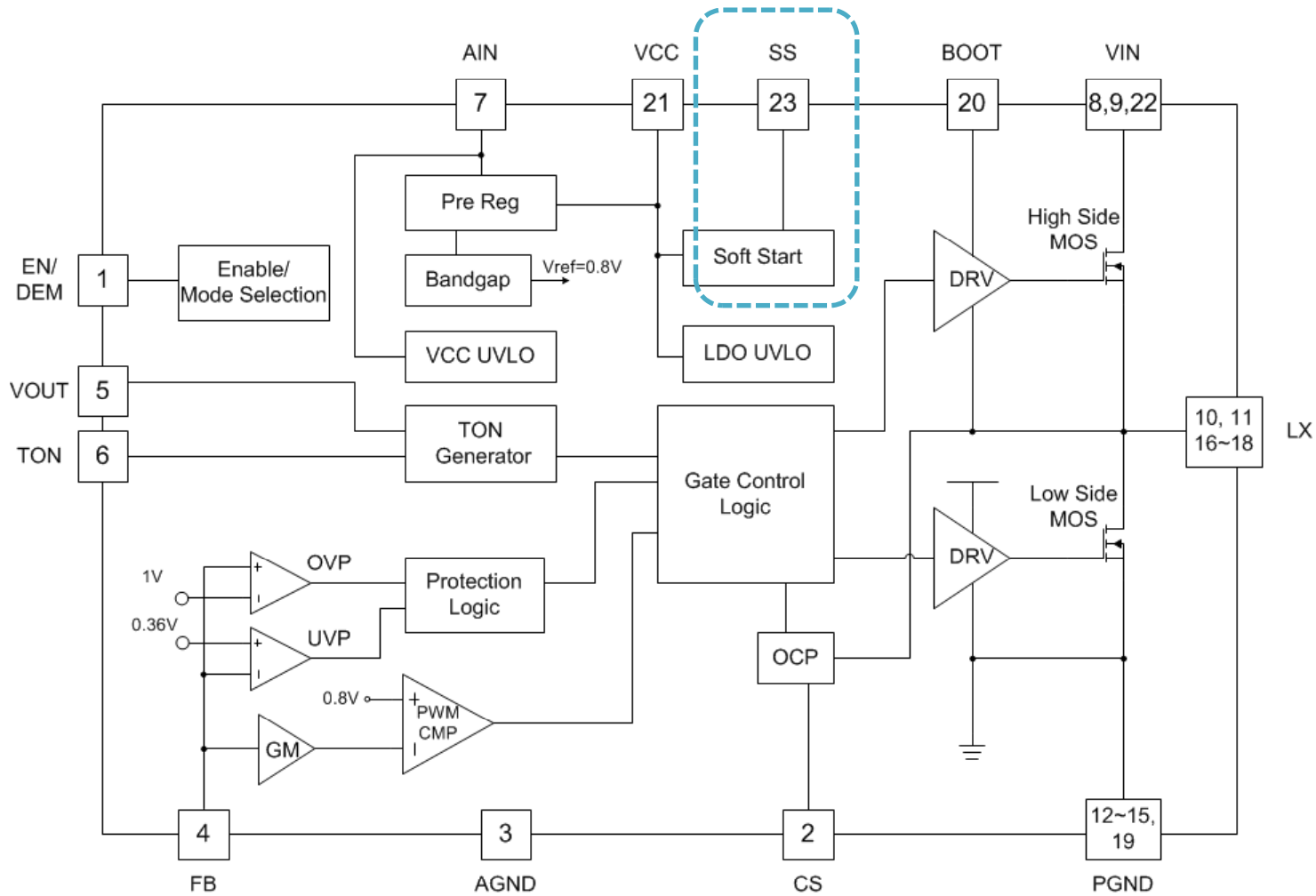
PIN Circuit- VCC Function (PIN 21 – VCC)

5V Pre-regulator (V _{VCC})						
Output Voltage	V _{VCC}			5.15		V
Under voltage lock out (Rising) UVLO Hysteresis	V _{VCC_UVLO}			4.15		V
	V _{VCC_UVLOHYS}			0.3		V



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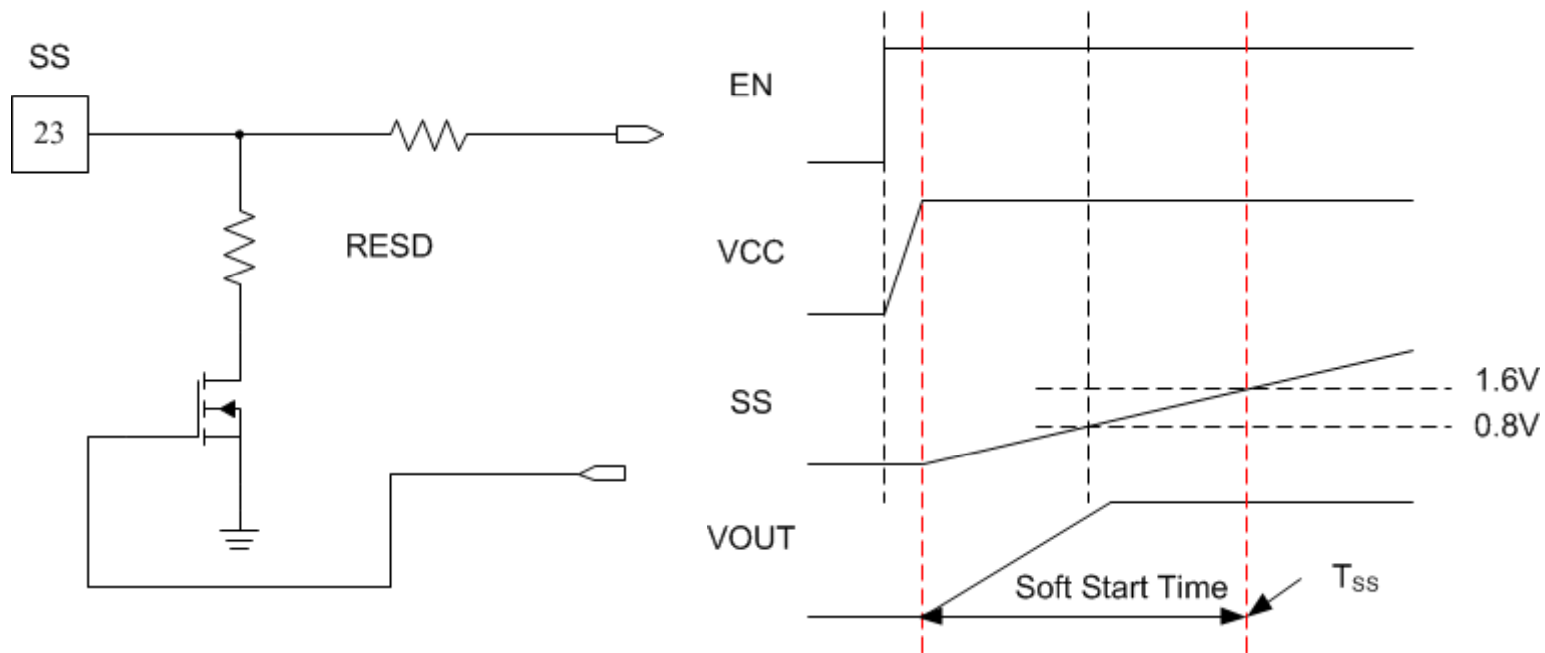
PIN Circuit- Soft Start Function (PIN 23 – SS)



GStek GS92A3 – Wide input range High efficiency COT Buck Converter

PIN Circuit- Soft Start Function (PIN 23 – SS)

Current Parameters						
Soft start current	I_{SS}	$V_{SS}=0$		10		μA



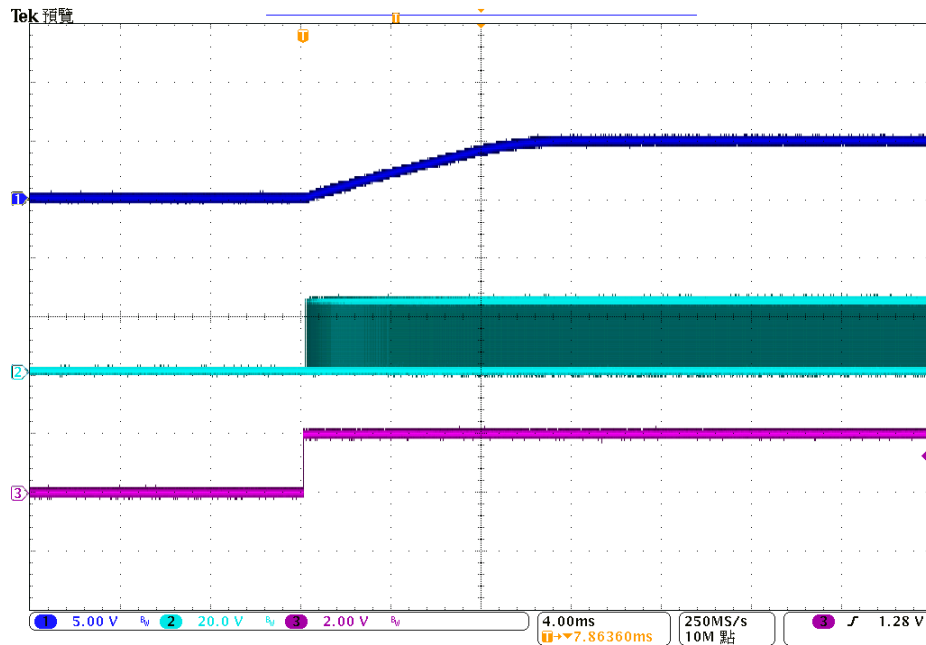
$$T_{SS} = \frac{1.6 \times C_{SS}}{I_{SS}} = 1.6 \times 10^8 \times C_{SS} (ms)$$

GStek GS92A3 – Wide input range High efficiency COT Buck Converter

1. Power on from EN

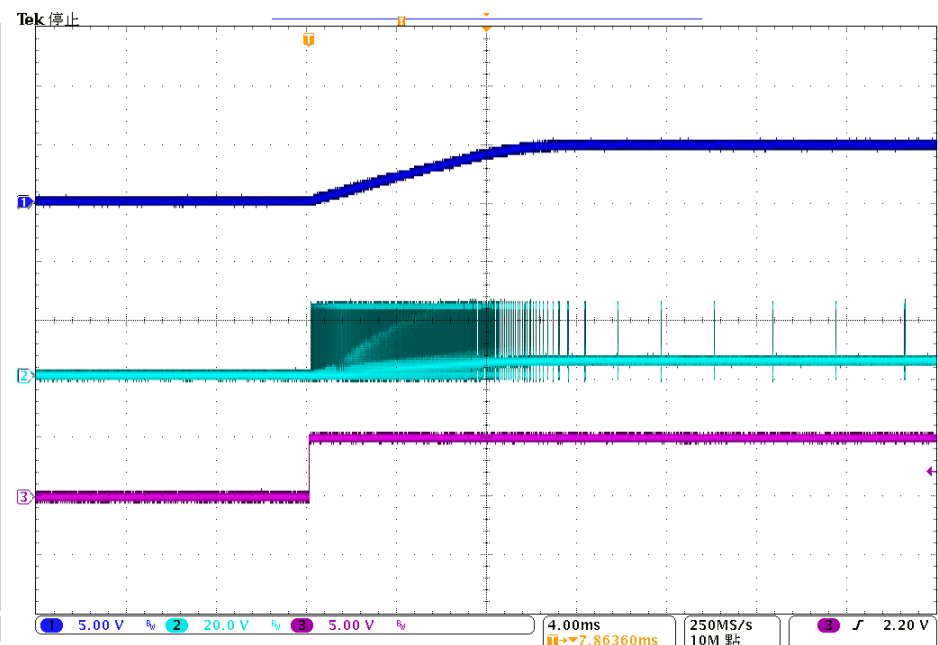
(CCM No Load)

CH1:VOUT CH2:LX CH3:EN



(DEM No Load)

CH1:VOUT CH2:LX CH3:EN

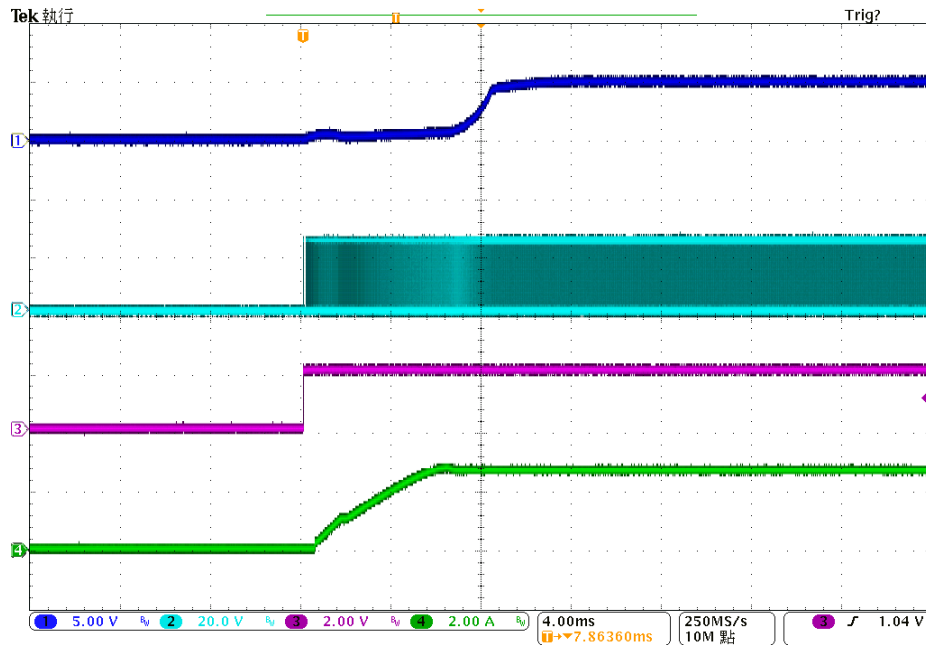


GStek GS92A3 – Wide input range High efficiency COT Buck Converter

1. Power on from EN

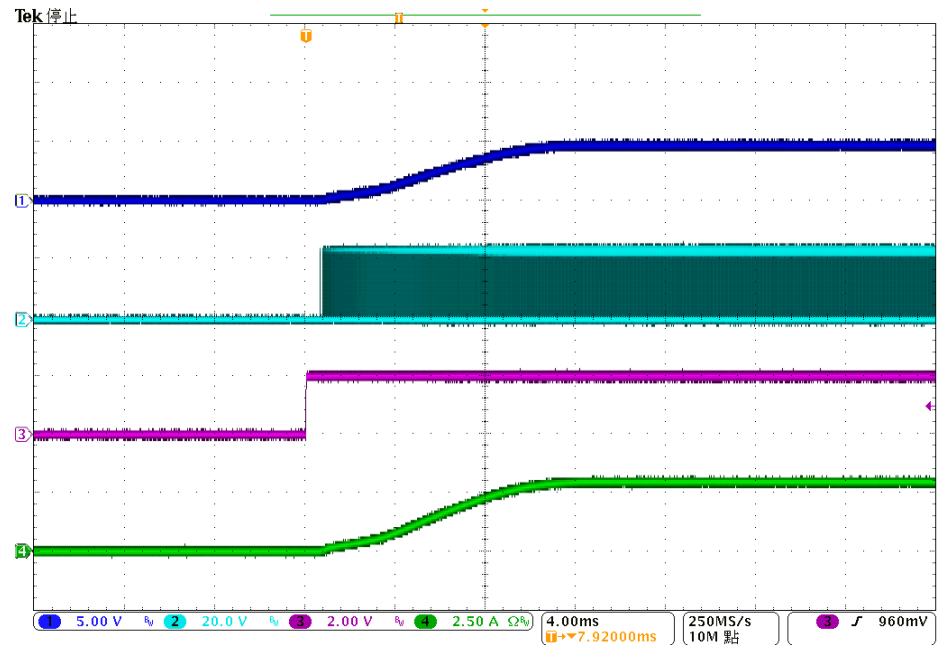
(3.4A Load)

CH1:VOUT CH2:LX CH3:EN CH4: IOUT



(1.47Ω Load)

CH1:VOUT CH2:LX CH3:EN CH4: IOUT

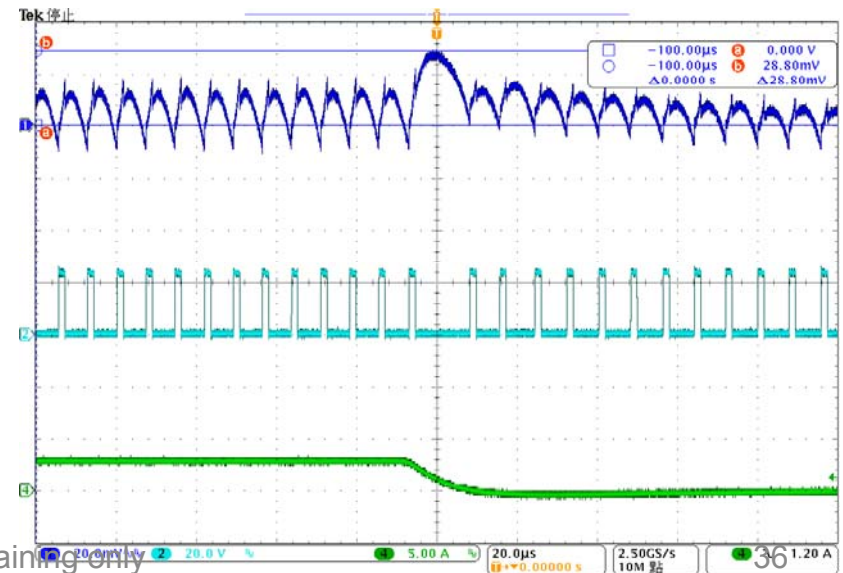
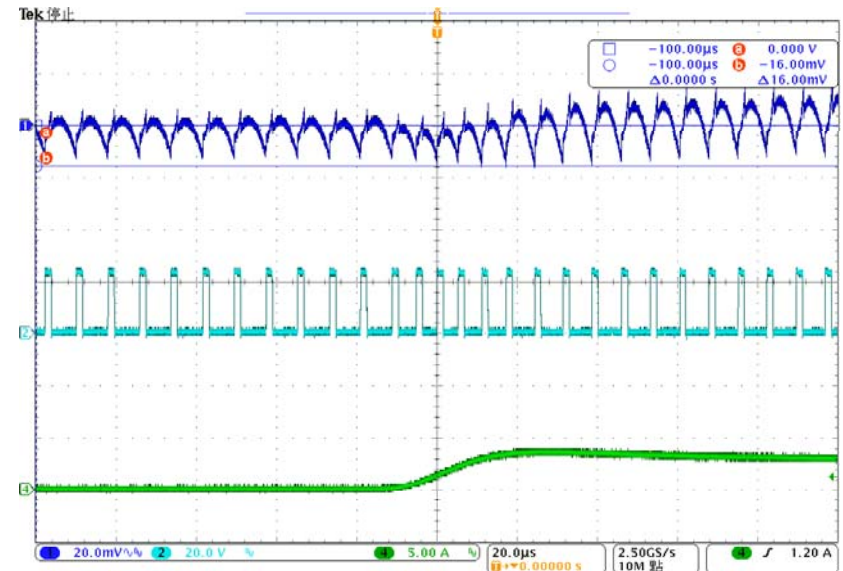
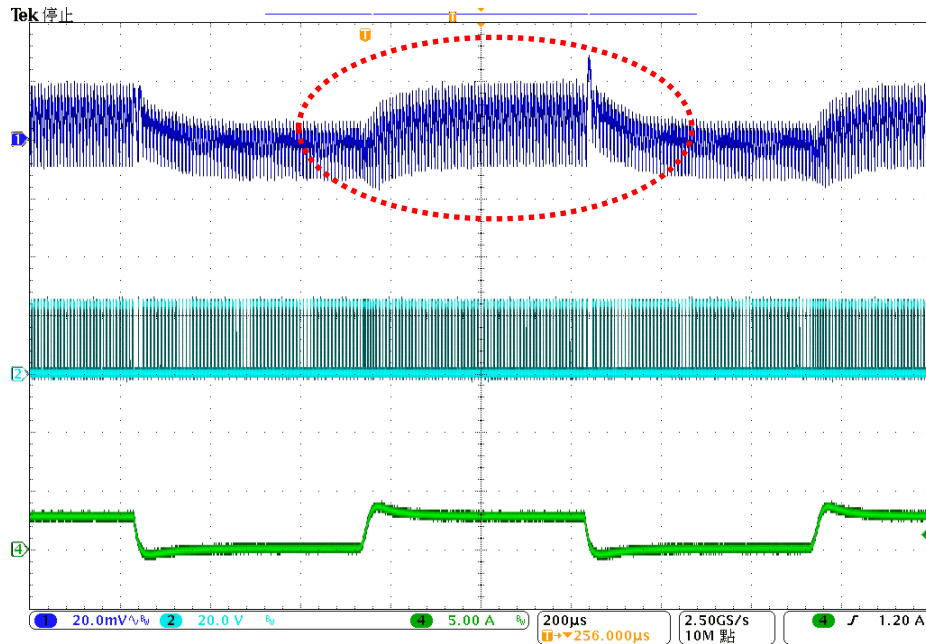


GStek GS92A3 – Wide input range High efficiency COT Buck Converter

2. Vout Load Transient

(CCM 0A->3.4A Load)

CH1:VOUT CH2:LX CH4: IOU

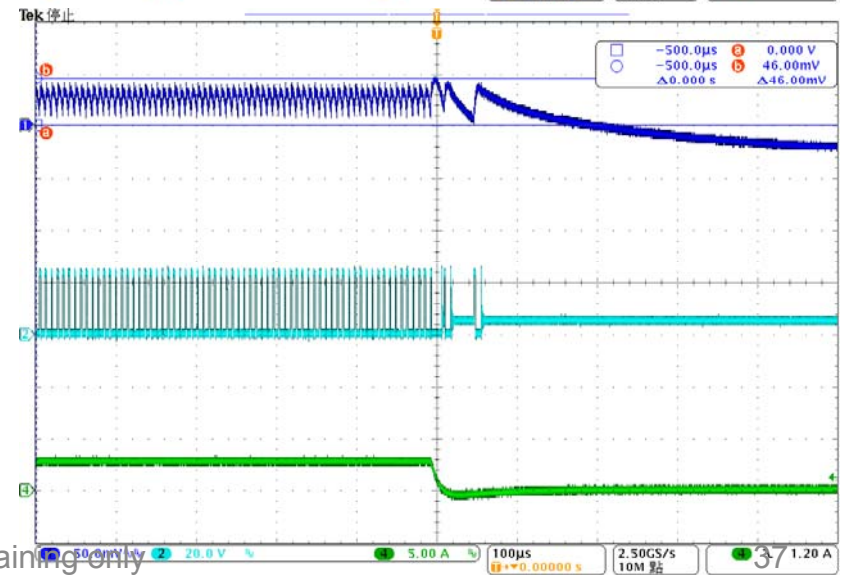
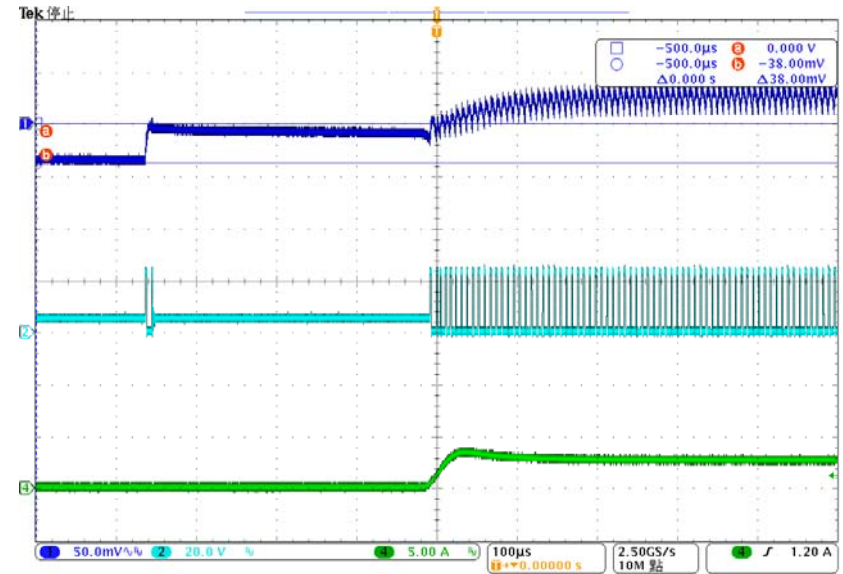
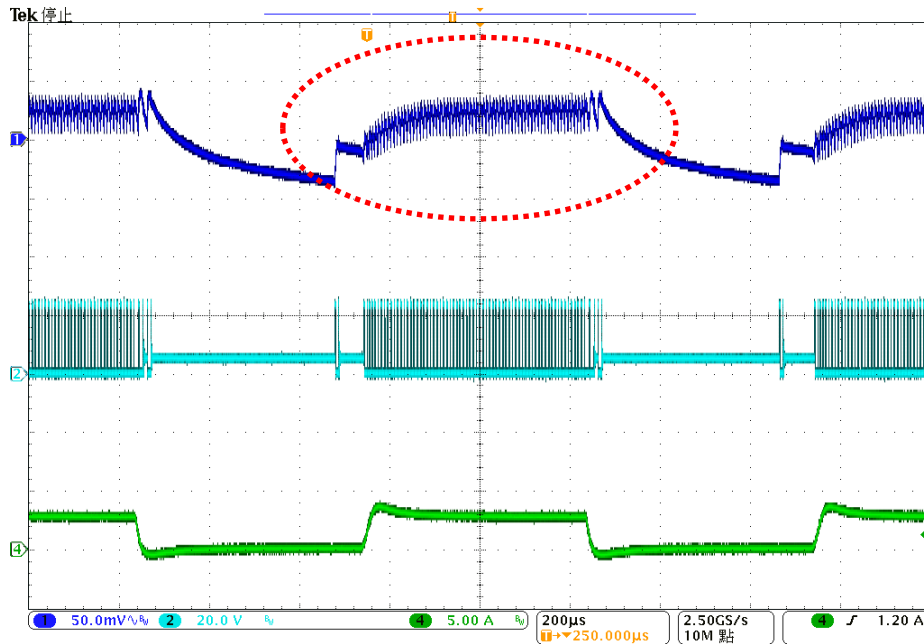


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2. Vout Load Transient

(DEM 0A->3.4A Load)

CH1:VOUT CH2:LX CH4: IOU

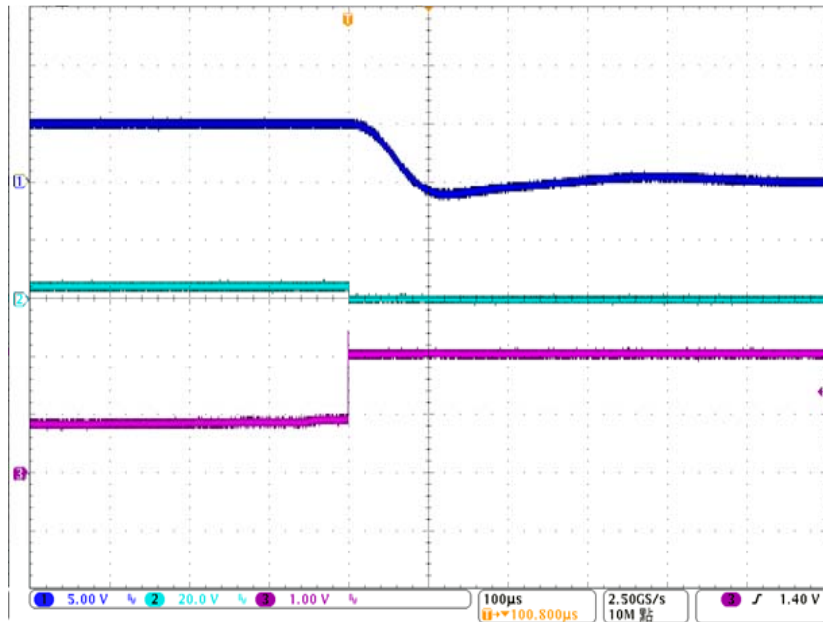


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3. OVP & UVP

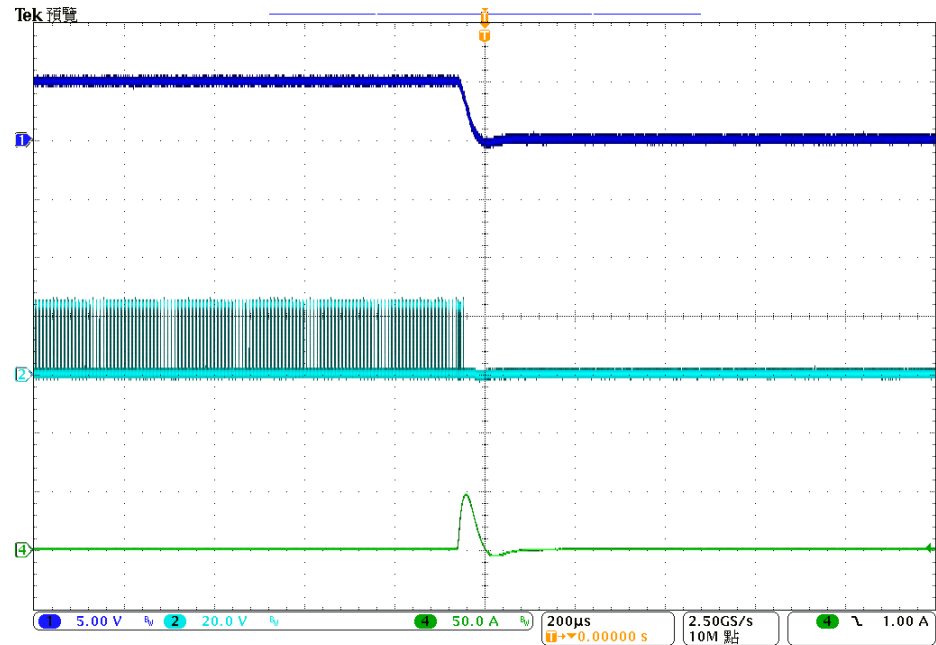
OVP:FB trigger

CH1:VOUT CH2:LX CH3: FB



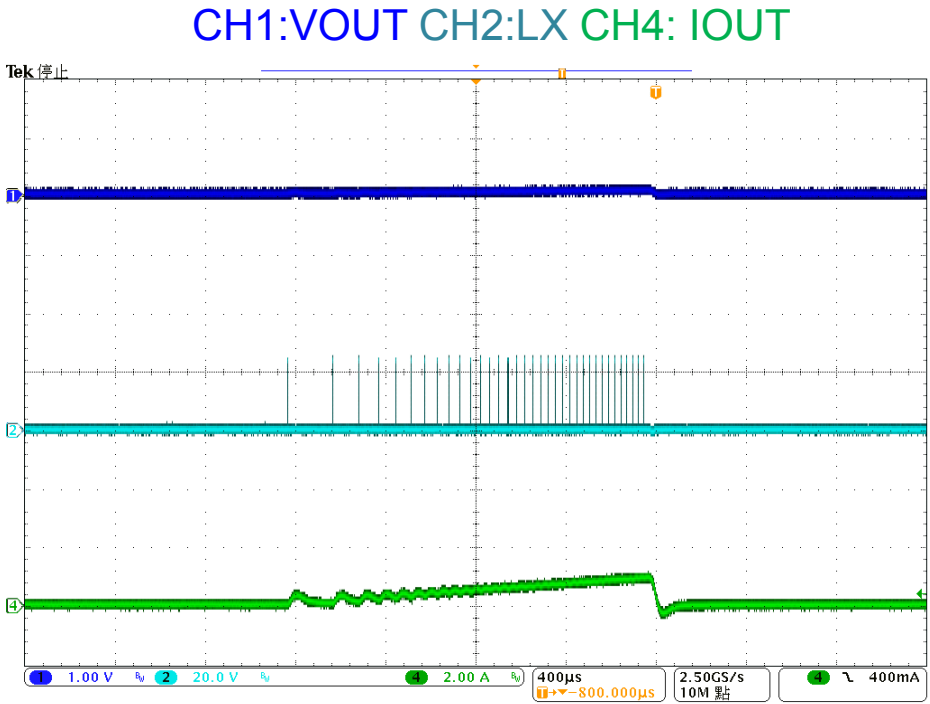
UVP

CH1:VOUT CH2:LX CH4: IOU



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4. Power on in short condition



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Thanks!

Q&A