CoolSET™-F3

ICE3A(B)0365/0565/1065/1565
ICE3A(B)2065/2565

ICE3A0565Z/2065Z

ICE3A(B)2065I/3065I/3565I
ICE3A(B)5065I/5565I

ICE3A(B)2065P/3065P/3565P
ICE3A(B)5065P/5565P

Off-Line SMPS Current Mode Controller with integrated 650V Startup Cell/CoolMOS™

Power Management & Supply

Infineon technologies

N e v e r   s t o p   t h i n k i n g .

Previous Version:

Page	Subjects (major changes since last revision)

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CoolSET™-F3

Off-Line SMPS Current Mode Controller with integrated 650V Startup Cell/ CoolMOS™

PG-DIP-7-1

PG-DIP-8-6

P-TO220-6-46

P-TO220-6-47

Product Highlights

- **Best in class in DIP7, DIP8, TO220, I2Pak packages**
- **Leadfree for DIP7 and DIP8 packages**
- **Active Burst Mode to reach the lowest Standby Power Requirements < 100mW**
- **Protection features (Auto Restart Mode) to increase robustness and safety of the system**
- **Adjustable Blanking Window for high load jumps to increase system reliability**
- **Isolated drain package for TO220/I2PAK**
- **Increased creepage distance for TO220/I2PAK**
- **Wide power class of products for various applications**
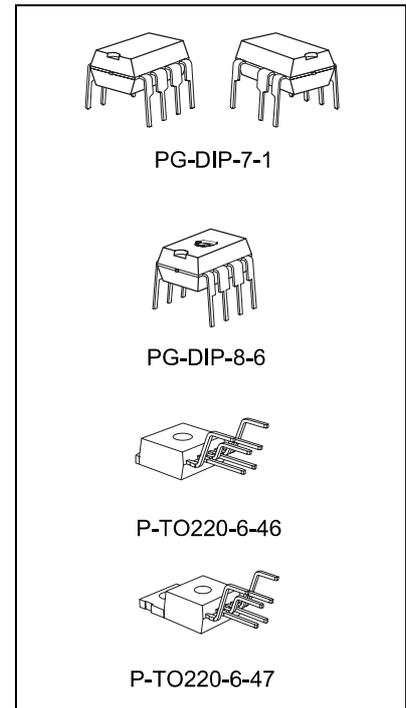
Features

- 650V avalanche rugged CoolMOS™ with built in switchable Startup Cell
- Active Burst Mode for lowest Standby Power @ light load controlled by Feedback signal
- Fast load jump response in Active Burst Mode
- 67/100 kHz fixed switching frequency
- Auto Restart Mode for Overtemperature Detection
- Auto Restart Mode for Overvoltage Detection
- Auto Restart Mode for Overload and Open Loop
- Auto Restart Mode for VCC Undervoltage
- Blanking Window for short duration high current
- User defined Soft Start
- Minimum of external components required
- Max Duty Cycle 72%
- Overall tolerance of Current Limiting < ±5%
- Internal PWM Leading Edge Blanking
- Soft switching for low EMI

Description

The new generation CoolSET™-F3 provides Active Burst Mode to reach the lowest Standby Power Requirements <100mW at no load. As the controller is always active during Active Burst Mode, there is an immediate response on load jumps without any black out in the SMPS. In Active Burst Mode the ripple of the output voltage can be reduced <1%. Furthermore, to increase the robustness and safety of the system, the device enters into Auto Restart Mode in the cases of Overtemperature, VCC Overvoltage, Output Open Loop or Overload and VCC Undervoltage. By means of the internal precise peak current limitation, the dimension of the transformer and the secondary diode can be lowered which leads to more cost efficiency. An adjustable blanking window prevents the IC from entering Auto Restart or Active Burst Mode unintentionally during high load jumps. The CoolSET™-F3 family consists a wide power class range of products for various applications.

Typical Application
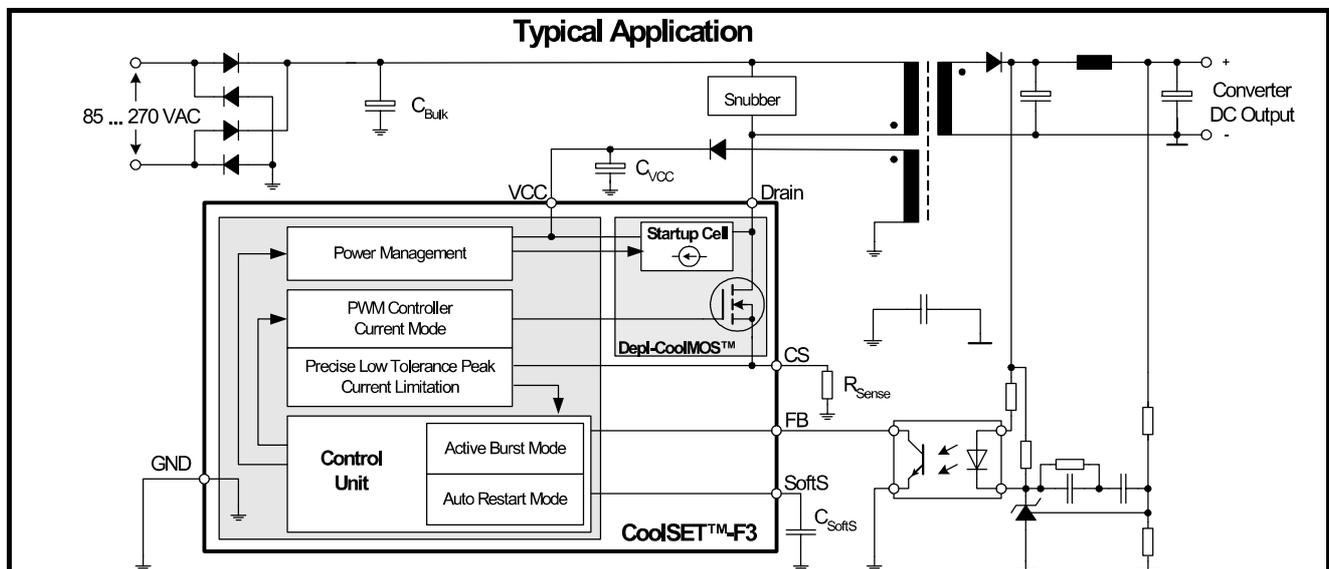
Ordering Codes

Type	Ordering Code	Package	V_{DS}	F_{OSC}	R_{DSon}[1]	230VAC ±15%[2]	85-265 VAC[2]
ICE3A0365	Q67040-S4666-A101	PG-DIP-8-6	650V	100kHz	6.45	22W	10W
ICE3A0565	Q67040-S4665-A101	PG-DIP-8-6	650V	100kHz	4.70	25W	12W
ICE3A1065	Q67040-S4664-A101	PG-DIP-8-6	650V	100kHz	2.95	32W	16W
ICE3A1565	Q67040-S4663-A101	PG-DIP-8-6	650V	100kHz	1.70	42W	20W
ICE3A2065	Q67040-S4662-A101	PG-DIP-8-6	650V	100kHz	0.92	57W	28W
ICE3A2565	Q67040-S4667-A101	PG-DIP-8-6	650V	100kHz	0.65	68W	33W
ICE3B0365	Q67040-S4636-A102	PG-DIP-8-6	650V	67kHz	6.45	22W	10W
ICE3B0565	Q67040-S4638-A102	PG-DIP-8-6	650V	67kHz	4.70	25W	12W
ICE3B1065	Q67040-S4669-A101	PG-DIP-8-6	650V	67kHz	2.95	32W	16W
ICE3B1565	Q67040-S4670-A101	PG-DIP-8-6	650V	67kHz	1.70	42W	20W
ICE3B2065	Q67040-S4671-A101	PG-DIP-8-6	650V	67kHz	0.92	57W	28W
ICE3B2565	Q67040-S4668-A101	PG-DIP-8-6	650V	67kHz	0.65	68W	33W

[1] typ @ T=25°C

[2] Calculated maximum input power rating at T_a=75°C, T_j=125°C and without copper area as heat sink.

Type	Ordering Code	Package	V_{DS}	F_{OSC}	R_{DSon}[1]	230VAC ±15%[2]	85-265 VAC[2]
ICE3A0565Z	Q67040-S4706-A101	PG-DIP-7-1	650V	100kHz	4.70	25W	12W
ICE3A2065Z	Q67040-S4707-A101	PG-DIP-7-1	650V	100kHz	0.92	57W	28W

[1] typ @ T=25°C

[2] Calculated maximum input power rating at T_a=75°C, T_j=125°C and without copper area as heat sink.

Type	Ordering Code	Package	V_{DS}	F_{OSC}	R_{DSon}[1]	230VAC ±15%[2]	85-265 VAC[2]
ICE3A2065I	Q67040-S4696-A101	P-TO-220-6-46	650V	100kHz	3.00	102W	50W
ICE3A3065I	Q67040-S4697-A101	P-TO-220-6-46	650V	100kHz	2.10	128W	62W
ICE3A3565I	Q67040-S4699-A101	P-TO-220-6-46	650V	100kHz	1.55	170W	83W
ICE3A5065I	Q67040-S4702-A101	P-TO-220-6-46	650V	100kHz	0.95	220W	105W
ICE3A5565I	Q67040-S4704-A101	P-TO-220-6-46	650V	100kHz	0.79	240W	120W
ICE3B2065I	Q67040-S4686-A101	P-TO-220-6-46	650V	67kHz	3.00	102W	50W
ICE3B3065I	Q67040-S4687-A101	P-TO-220-6-46	650V	67kHz	2.10	128W	62W
ICE3B3565I	Q67040-S4689-A101	P-TO-220-6-46	650V	67kHz	1.55	170W	83W
ICE3B5065I	Q67040-S4692-A101	P-TO-220-6-46	650V	67kHz	0.95	220W	105W
ICE3B5565I	Q67040-S4694-A101	P-TO-220-6-46	650V	67kHz	0.79	240W	120W
ICE3A2065P	Q67040-S4698-A101	P-TO-220-6-47	650V	100kHz	3.00	102W	50W
ICE3A3065P	Q67040-S4700-A101	P-TO-220-6-47	650V	100kHz	2.10	128W	62W
ICE3A3565P	Q67040-S4701-A101	P-TO-220-6-47	650V	100kHz	1.55	170W	83W
ICE3A5065P	Q67040-S4703-A101	P-TO-220-6-47	650V	100kHz	0.95	220W	105W
ICE3A5565P	Q67040-S4705-A101	P-TO-220-6-47	650V	100kHz	0.79	240W	120W
ICE3B2065P	Q67040-S4688-A101	P-TO-220-6-47	650V	67kHz	3.00	102W	50W
ICE3B3065P	Q67040-S4690-A101	P-TO-220-6-47	650V	67kHz	2.10	128W	62W
ICE3B3565P	Q67040-S4691-A101	P-TO-220-6-47	650V	67kHz	1.55	170W	83W
ICE3B5065P	Q67040-S4693-A101	P-TO-220-6-47	650V	67kHz	0.95	220W	105W
ICE3B5565P	Q67040-S4695-A101	P-TO-220-6-47	650V	67kHz	0.79	240W	120W

[1] typ @ T=25°C

[2] Calculated maximum continuous input power in an open frame design at T_a=50°C, T_j=125°C and R_{thCA}(external heatsink)=2.7K/W

Table of Contents

1 Pin Configuration and Functionality

1.1 Pin Configuration with PG-DIP-8-6

Pin	Symbol	Function
1	SoftS	Soft-Start
2	FB	Feedback
3	CS	Current Sense/ 650V[1] Depl-CoolMOS™ Source
4	Drain	650V[1] Depl-CoolMOS™ Drain
5	Drain	650V[1] Depl-CoolMOS™ Drain
6	n.c.	Not Connected
7	VCC	Controller Supply Voltage
8	GND	Controller Ground

[1] at T_j = 110°C

1.2 Pin Configuration with PG-DIP-7-1

Pin	Symbol	Function
1	SoftS	Soft-Start
2	FB	Feedback
3	CS	Current Sense/ 650V[1] Depl-CoolMOS™ Source
4	n.c.	Not connected
5	Drain	650V[1] Depl-CoolMOS™ Drain
-	-	-
7	VCC	Controller Supply Voltage
8	GND	Controller Ground

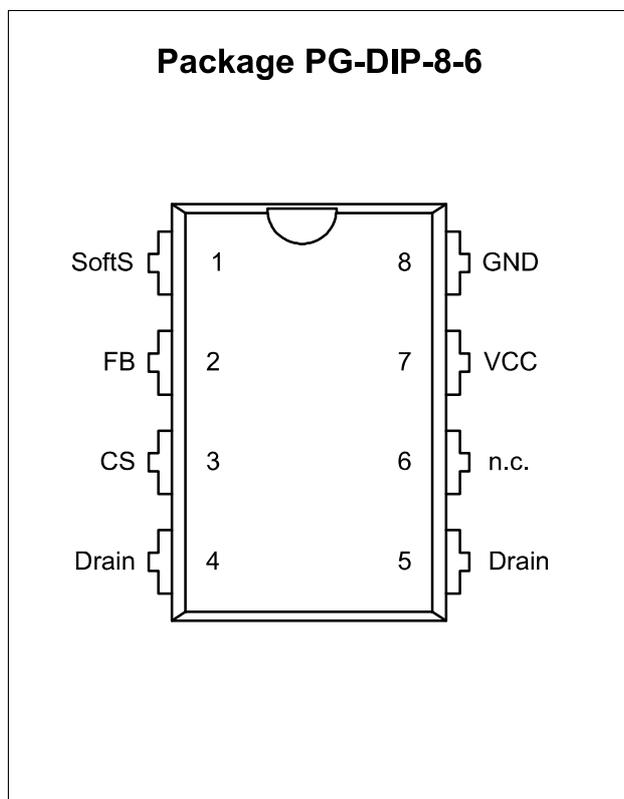[1] at T_j = 110°C

Figure 1   Pin Configuration PG-DIP-8-6(top view)
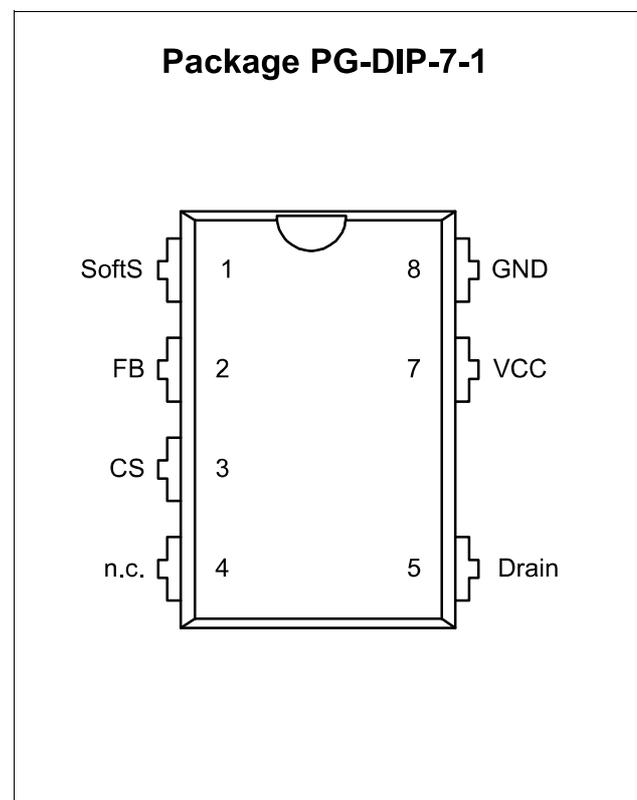
Note: Pin 4 and 5 are shorted within the DIP 8 package.

Figure 2   Pin Configuration PG-DIP-7-1(top view)

1.3 Pin Configuration with P-TO220-6-46

Pin	Symbol	Function
1	Drain	650V[1] Depl-CoolMOS™ Drain
3	CS	Current Sense/ 650V[1] Depl-CoolMOS™ Source
4	GND	Controller Ground
5	VCC	Controller Supply Voltage
6	SoftS	Soft-Start
7	FB	Feedback

[1] at T_j = 110°C

1.4 Pin Configuration with P-TO220-6-47

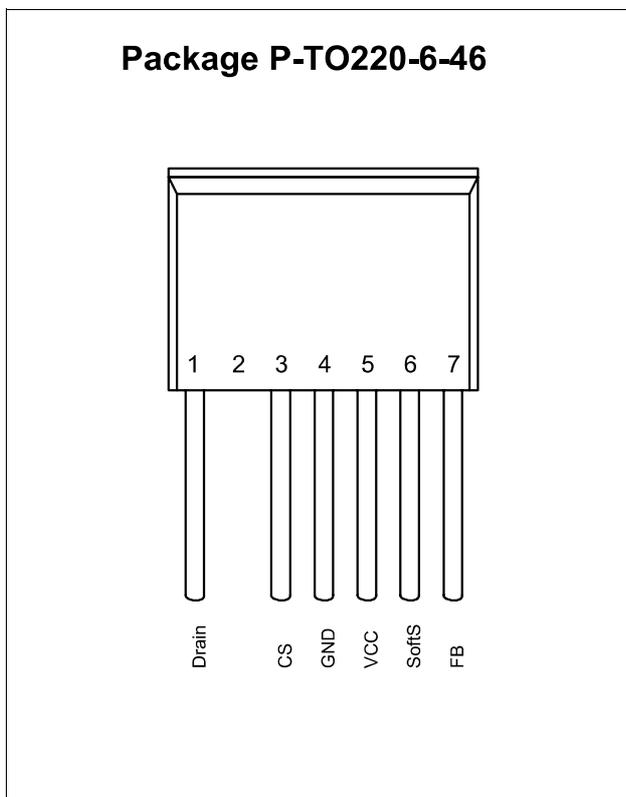| Pin	Symbol	Function
1	Drain	650V[1] Depl-CoolMOS™ Drain
3	CS	Current Sense/ 650V[1] Depl-CoolMOS™ Source
4	GND	Controller Ground
5	VCC	Controller Supply Voltage
6	SoftS	Soft-Start
7	FB	Feedback

[1] at T_j = 110°C

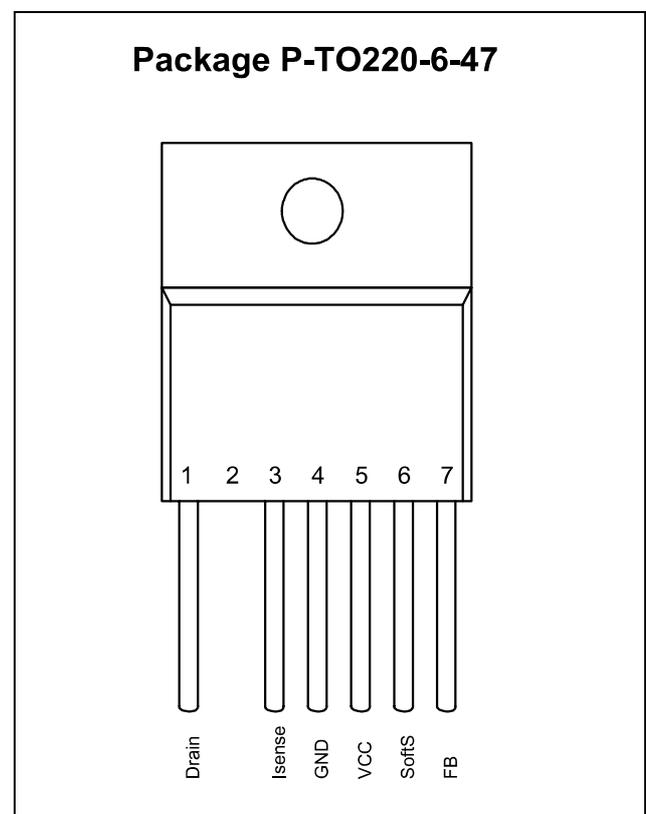
Figure 3 *Pin Configuration P-TO220-6-46(top view)*

Figure 4 *Pin Configuration P-TO220-6-47(top view)*

1.5 Pin Functionality

SoftS (Soft Start & Auto Restart Control)

The SoftS pin combines the functions of Soft Start during Start Up and error detection for Auto Restart Mode. These functions are implemented and can be adjusted by means of an external capacitor at SoftS to ground. This capacitor also provides an adjustable blanking window for high load jumps, before the IC enters into Auto Restart Mode.

FB (Feedback)

The information about the regulation is provided by the FB Pin to the internal Protection Unit and to the internal PWM-Comparator to control the duty cycle. The FB-Signal controls in case of light load the Active Burst Mode of the controller.

CS (Current Sense)

The Current Sense pin senses the voltage developed on the series resistor inserted in the source of the integrated Depl-CoolMOS™. If CS reaches the internal threshold of the Current Limit Comparator, the Driver output is immediately switched off. Furthermore the current information is provided for the PWM-Comparator to realize the Current Mode.

Drain (Drain of integrated Depl-CoolMOS™)

Pin Drain is the connection to the Drain of the internal Depl-CoolMOS^{TM}.

VCC (Power supply)

The VCC pin is the positive supply of the IC. The operating range is between 8.5V and 21V.

GND (Ground)

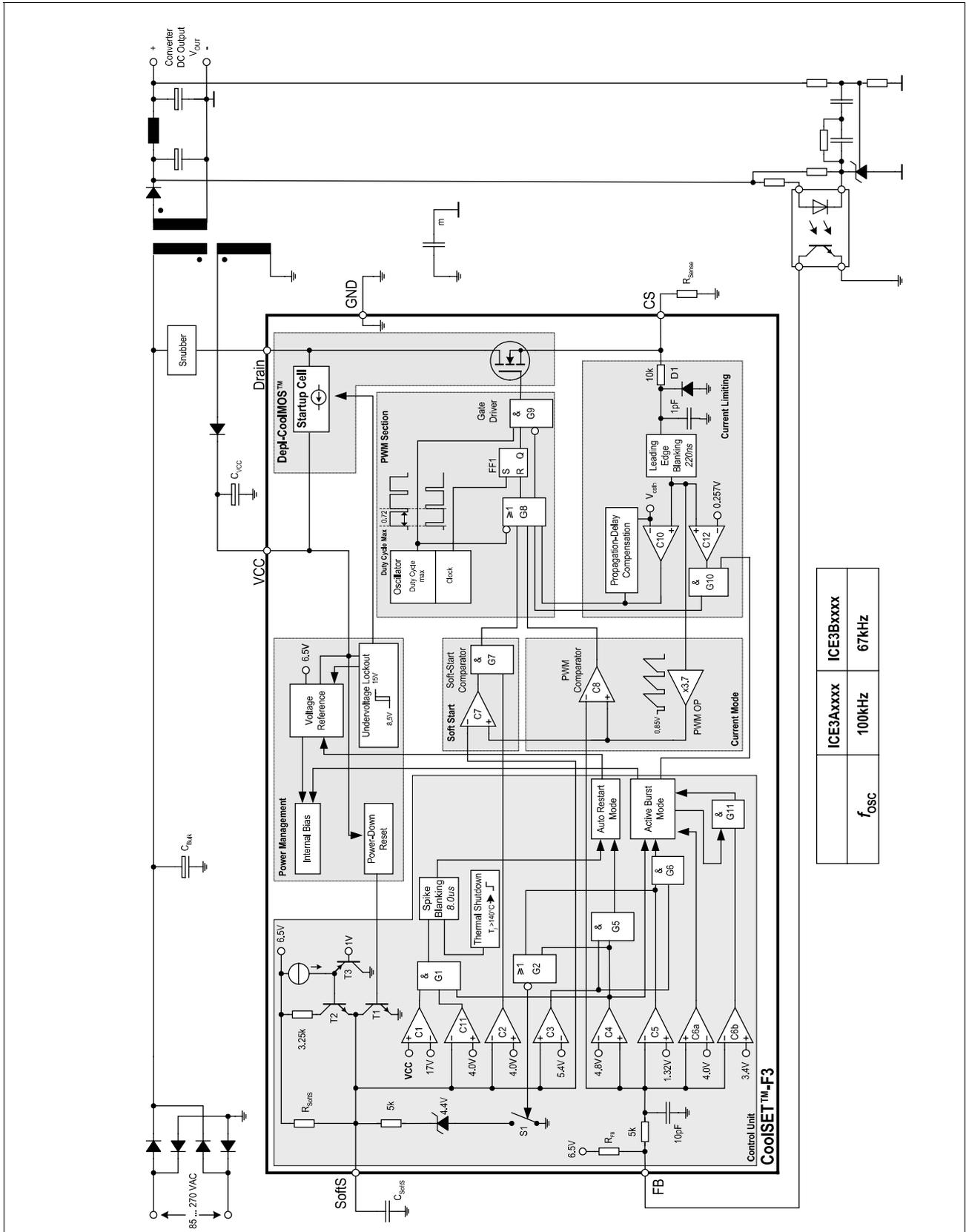The GND pin is the ground of the controller.

2 Representative Blockdiagram

Figure 5   Representative Blockdiagram