IL700D

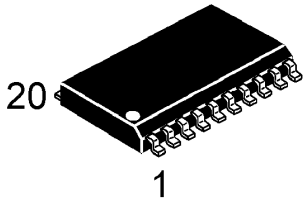
HIGH VOLTAGE HIGH-FREQUENCY STEP-UP SWITCHING REGULATOR-CONTROLLER

The IL700D is a monolithic high voltage switching regulator-controllers with PWM/PFM control that is specifically designed to operate from a rectified 220 VAC line source. This device contain a reference voltage source, oscillation circuit, error amplifier, phase compensation circuit, PWM control circuit, power supply 450 V MOS-transistor, 700 V DMOS power switch, and other components. Since the oscillation frequency is a high 600 kHz, with the addition of a small external component, the IC can function as switching regulator with high efficiency.

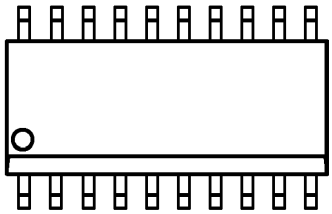
The IL700D provides low-ripple power, high-efficiency, and excellent transient characteristics thanks to a PWM control circuit capable of varying the duty ratio linearly from 0% to 82% and optimized error amplifier, and phase compensation circuit.

The IL700D contains a PWM/PFM switching control circuit so that it operates using PWM control with a duty ratio of 27% or higher and using PFM control with a duty ratio of lower than 27% to ensure high efficiency in all load ranges.

Pin No.	Pin Name	Function
1	NC	Not used
2	Vdd_{HV}	IC high power supply
3	NC	Not used
4	Vdd	IC internal low power supply
5	Vz	Voltage on zener diode
6	CVREF	Reference voltage source pass capacitor connection pin
7	GND	Gnd pin
8	FB	FB for external setting type
9	CSS	Soft-start capacitor connection pin
10	SENSE	Current limit detection pin
11	NC	Not used
12	NC	Not used
13	NC	Not used
14	NC	Not used
15	SOURCE	Power switch source
16	SOURCE	Power switch source
17	SOURCE	Power switch source
18	NC	Not used
19	NC	Not used
20	DRAIN	Power Switch Drain



SO–20



SO–20

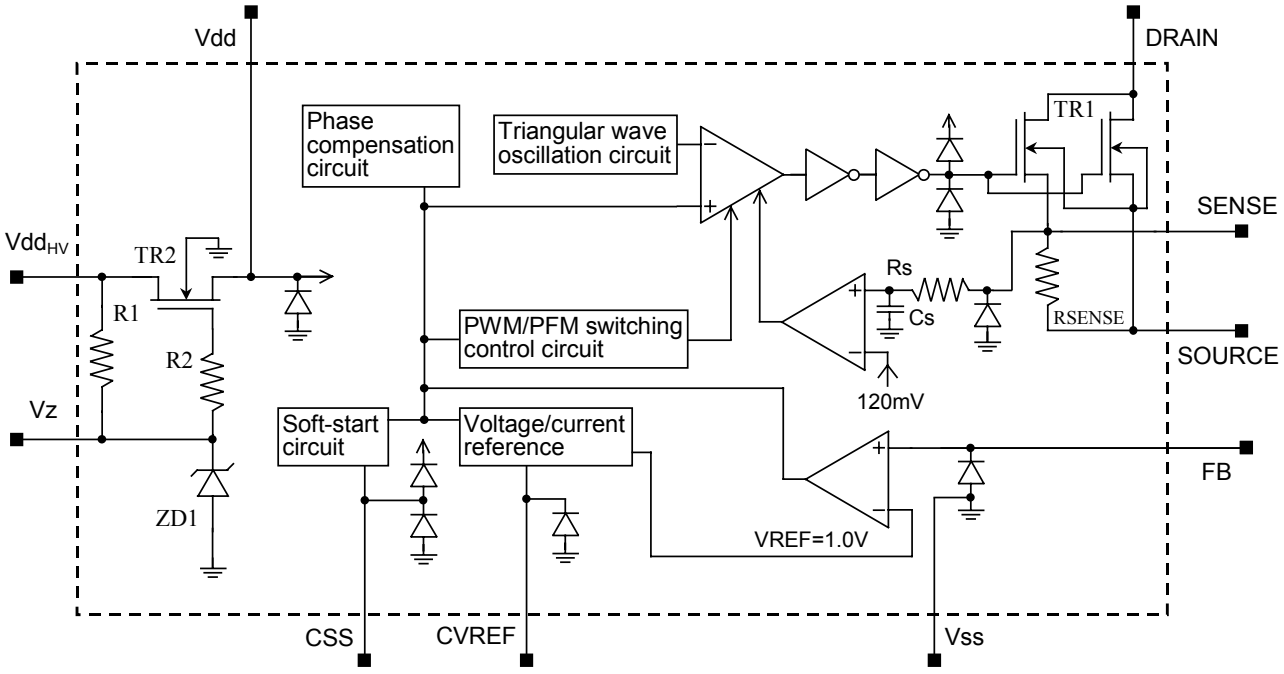
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IL235Z

Features

- Operate from a rectified 220 VAC line source.
- Oscillation frequency: 600 kHz.
- Output voltage external setting (FB) type available.
  FB terminal voltage (V_{FB}) 1.0 V.
- Minimum of external components. The only peripheral components that can be used with IC are a coil, a diode, capacitors, and a resistor.
- Built-in converter of high voltage in low voltage, using 450 V MOS-transistor and Zener diode.
- Built-in 700 V DMOS power switch.
- Duty ratio: 0% to 27% typ. PFM control
  27% to 82% typ. PWM control
- Built-in current limiting circuit: Assigned by internal resistor (RSENSE).
- Soft-start function: Can be set with an external capacitor (C_{SS}).

Block diagram



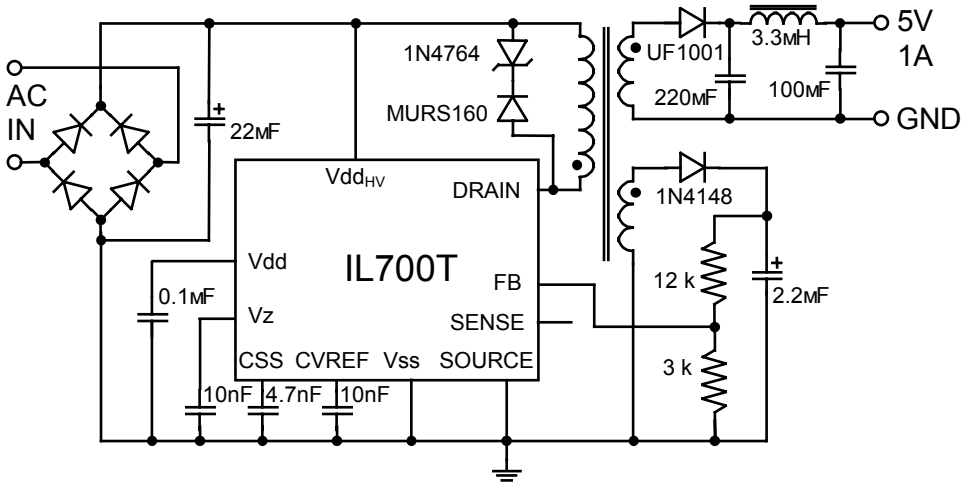
* - Pin number are defined during designing

ABSOLUTE MAXIMUM RATING (Ta=25ºC unless otherwise specified)

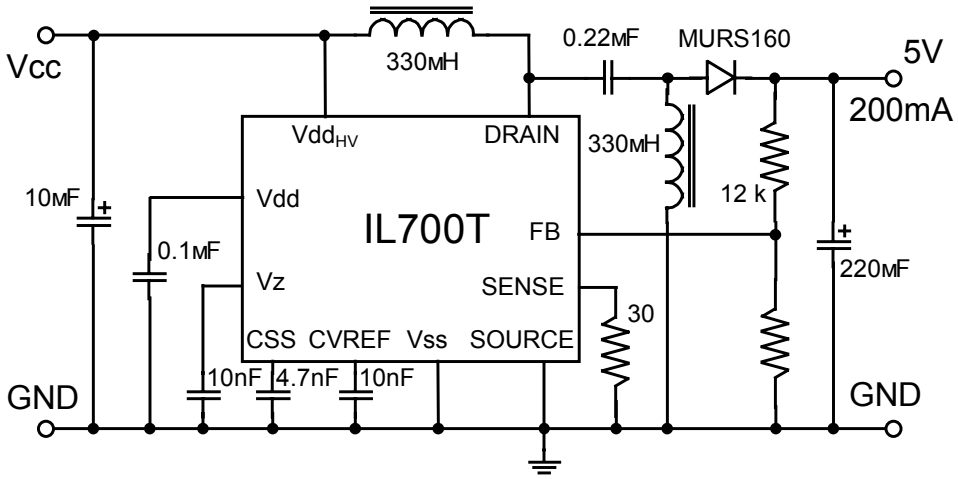
Item	Symbol	Ratings	Units
Vdd pin voltage	Vdd	Vss-0.3 to 16	V
Vdd_{HV} pin voltage	Vdd_{HV}	Vss-0.3 to 450	V
DRAIN pin voltage	V_{DRAIN}	Vss-0.3 to 700	V
DRAIN pin current	I_{DRAIN}	300	mA
FB pin voltage	V_{FB}	Vss-0.3 to 16	V
CVREF pin voltage	V_{CVREF}	Vss-0.3 to Vdd+0.3	V
CSS pin voltage	V_{CSS}	Vss-0.3 to Vdd+0.3	V
SENSE pin voltage	V_{SENSE}	Vss-0.3 to Vdd+0.3	V
Vz pin voltage	Vz	Vss-0.3 to Vdd+0.3	V
Power dissipation	P_D	650	mW

ELECTRICAL CHARACTERISTICS (Ta=25ºC unless otherwise specified)

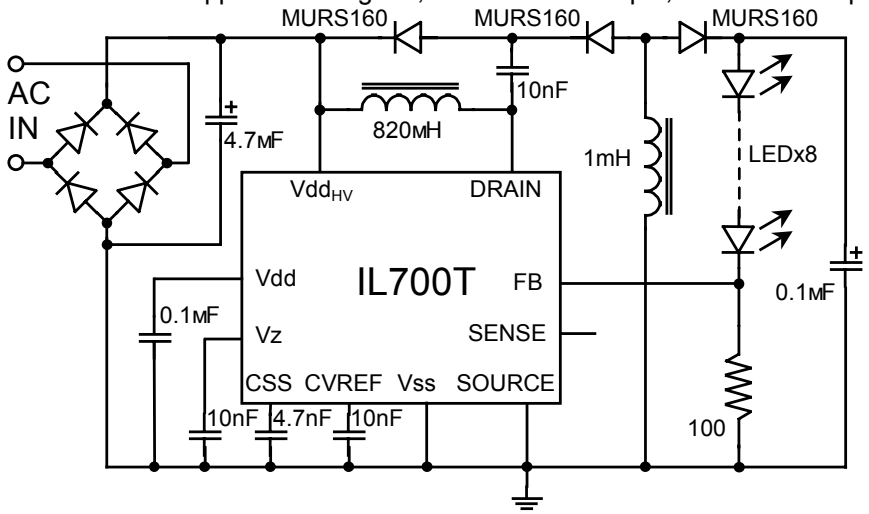
Parameter	Conditions	Sym-bol	IL700D			Unit
			Min	Typ	Max	
FB pin voltage	Vdd_{HV}=220V, Duty=50%, Ta=25°C	V_{FB}	0.98	1.0	1.02	V
FB pin voltage	Vdd_{HV}=220V, Duty=50%, Ta= -25°C +85°C	V_{FB}	0.97	1.0	1.03	V
Line regulation	30V ≤ Vdd_{HV} ≤ 300V, Duty=50%	ΔV_{FB1}	-	-	40	mV
Oscillation start voltage	No external component. The voltage is applied to Vdd_{HV}	V_{ST}	-	-	20	V
Current consumption in static mode	Vdd_{HV}=220V, V_{FB}=1.5V	I_{SS1}	-	-	1	mA
Current consumption in dynamic mode	Vdd_{HV}=220V, V_{FB}=0.5V	I_{SS2}	-	-	4	mA
Current limit detection voltage	Judge oscillation stop in “H”, at DRAIN pin, Ta=25°C	V_{SENSE}	90	120	150	mV
Current limit detection voltage	Judge oscillation stop in “H”, at DRAIN pin Ta= -25°C +85°C	V_{SENSE}	80	120	160	mV
DRAIN pin output current	Vdd_{HV}=220V	I_{DRAIN}	68	-	172	mA
Oscillation frequency	Vdd_{HV}=220V. Measure waveform at DRAIN pin Ta=25°C	f_{OSC}	510	600	690	kHz
Oscillation frequency	Vdd_{HV}=220V. Measure waveform at DRAIN pin Ta= -25°C +85°C	f_{OSC}	500	600	700	kHz
Maximum duty ratio	Vdd_{HV}=220V. Measure waveform at DRAIN pin	MaxDuty	73	82	89	%
PWM/PFM-control switch duty ratio	Vdd_{HV}=220V. Under no load	PFMDuty	19	27	35	%
Drain-Source Off-State Leakage Current	V_{DRAIN}=220V	$I_{DRAIN(off)}$	-	-	50	μA
Soft-Start time	Vdd_{HV}=220V, C_{SS}=4700pF, I_{OUT}=50mA. Measure time until oscillation occurs at DRAIN pin	T_{SS}	3.0	-	14.0	ms



Application Diagram, 85 - 265 VAC Input, 5V/1A Output
Flyback Converter



Application Diagram, 100 - 400 VDC Input, 5V/200mA Output SEPIC Converter



Application Diagram, 85 - 265 VAC Input, 1÷100V/10mA Output