GENERAL DESCRIPTION

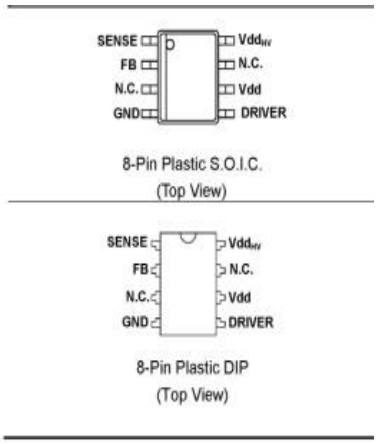
The 911K is a monolithic high voltage switching regulator-controller with PWM/PFM control that is specifically designed to operate from a rectified 85~265 VAC line source.

This device contains a reference voltage source, oscillation circuit, error amplifier, phase compensation circuit, PWM control circuit, power supply 600V MOS-transistor, and other components. Since the oscillation frequency is at high 90 kHz, with the addition of a small external component, the IC can function as switching regulator with high efficiency.

The 911K provides low-ripple power, high-efficiency, and excellent transient characteristics because of the PWM control circuit being capable of varying the duty ratio from 0% to 85% linearly and the optimized error amplifier with the phase compensation circuit.

The 911K contains PWM/PFM switching control circuit so that it operates in PWM mode at 5% or higher duty ratio and in PFM mode below 5% duty ratio to ensure high efficiency in all load ranges.

PIN CONFIGURATION



FEATURES

- Operate from a rectified 85~265 VAC line source
- Typical oscillation frequency: 90kHz
- Unnecessary external DC Power supply
- Output voltage external setting (FB) type available
- FB terminal voltage (V_{FB}) 1.0V
- Duty ratio: 0% to 5% typ.- PFM control, 5% to 85% typ. - PWM control
- Built-in current limiting circuit: Assigned by external resistor.
- Soft-start function: Built-in Soft-start circuit
- Built-in HV regulator

APPLICATIONS

- LED Drivers
- Back Lighting
- Energy Saving Illumination

TYPICAL APPLICATION

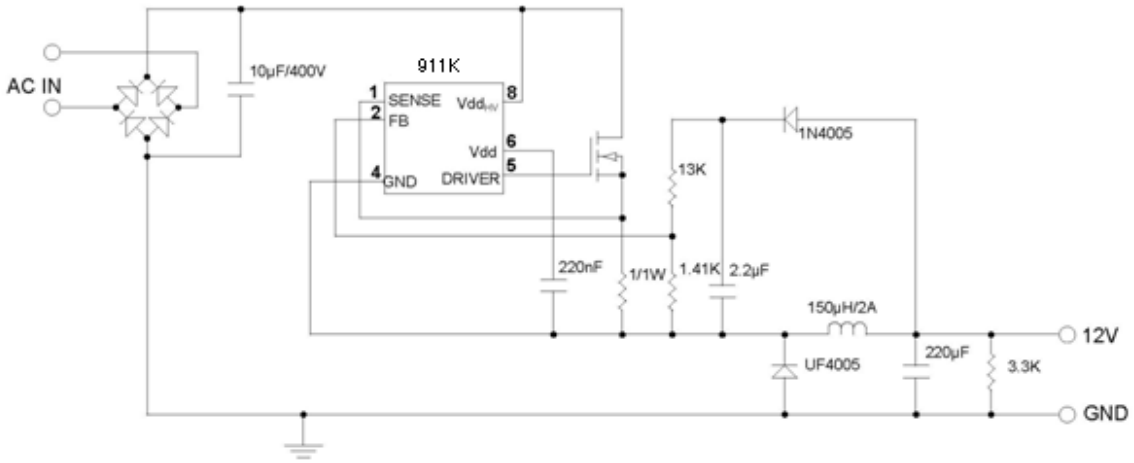


Fig. 1. 85 ~ 265V_{AC} input, 12V/0.5A Output Buck Converter

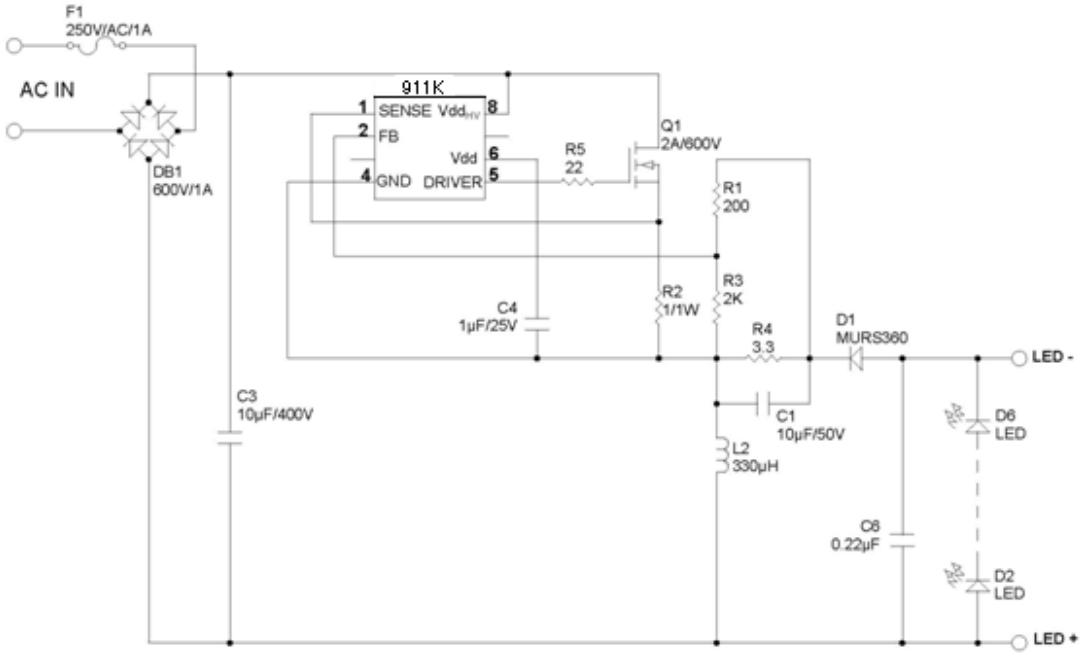


Fig. 2. 85 ~ 265V_{AC} input, Buck-Boost constant current mode
When LED's are opened, V_{OUT} = 400V_{DC}

ABSOLUTE MAXIMUM RATINGS *(Note 1)*

Parameter	Symbol	Ratings	Unit
Vdd pin voltage	Vdd	-0.3 to 16	V
Vdd_{HV} pin voltage	Vdd_{HV}	-0.3 to 600	V
DRIVER pin voltage	V_{DRIVER}	-0.3 to 16	V
DRIVER pin current	I_{DRIVER}	250	mA
FB pin voltage	V_{FB}	-0.3 to 16	V
SENSE pin voltage	V_{SENSE}	-0.3 to 16	V
Operational ambient temperature	T_A	-25 to +85	°C
Operational junction temperature	T_J	140	°C
Storage Temperature Range	T_{STG}	-65 to 150	°C

Note 1: Exceeding these ratings could cause damage to the device. All voltages are with respect to ground. Currents are positive into, negative out of the specified terminal

POWER DISSIPATION TABLE

DIP-8 PACKAGE	
Power dissipation (P_D), T_A = 25 °C	1.1W
Thermal Resistance-Junction to Ambient, θ_{JA}	95°C /W
SO-8 PACKAGE	
Power dissipation (P_D), T_A = 25 °C	670mW
Thermal Resistance-Junction to Ambient, θ_{JA}	165°C /W

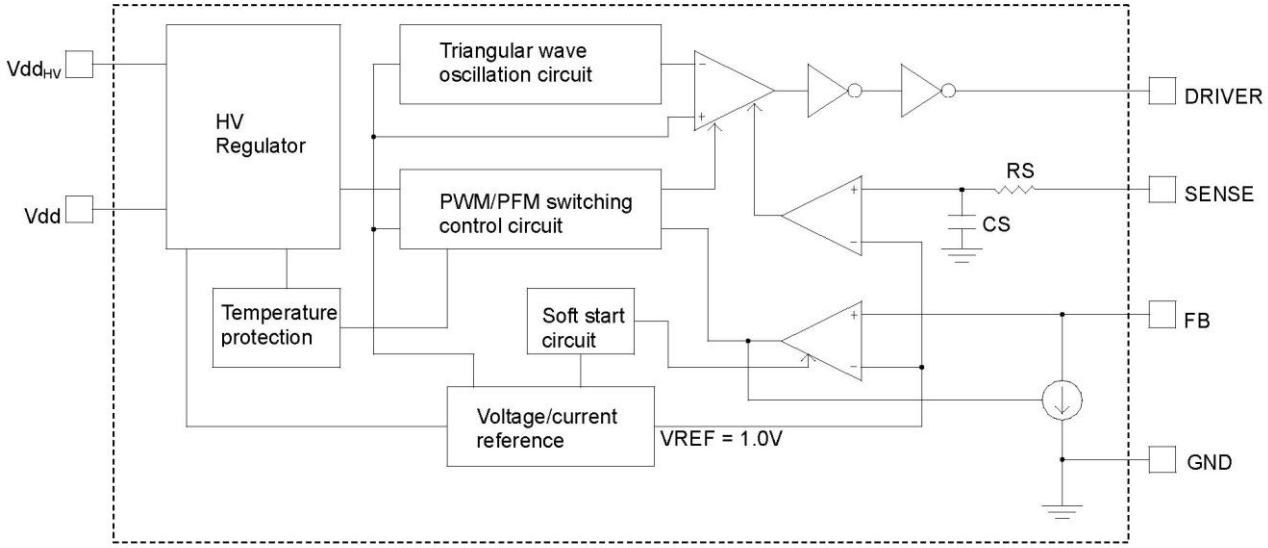
ELECTRICAL CHARACTERISTICS

Unless otherwise specified, T_A = -25 °C~85 °C, Vdd_{HV} = 120V_{DC}

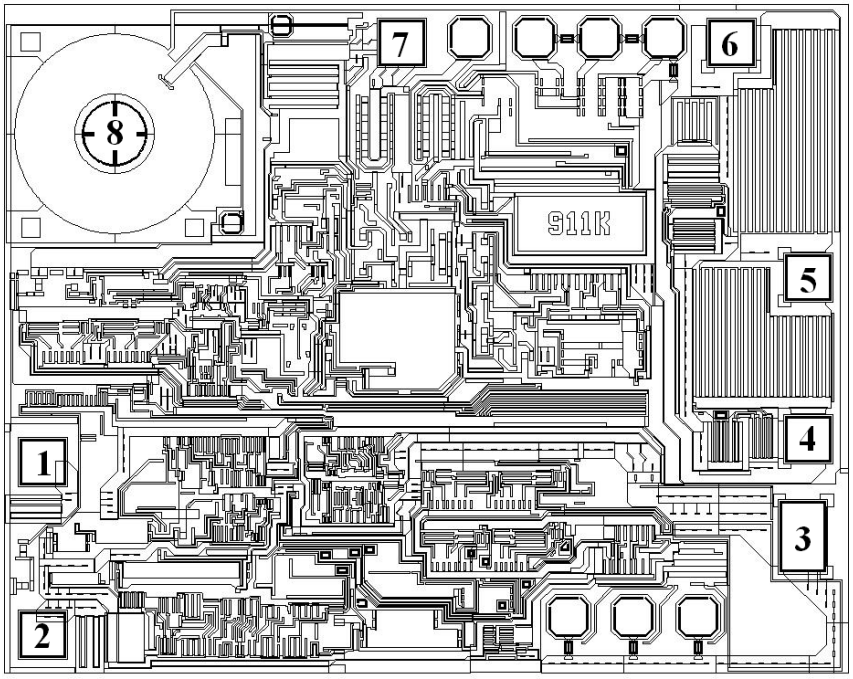
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output resistance at low level output voltage	R_{OL}	I_{OL} = 20mA	4.4	6.5	16	Ω
Output resistance at high level output voltage	R_{OH}	I_{OH} = -20mA	13	16	30	Ω
Minimum supply voltage	V_{HVmin}			22	30	V
Current consumption in static mode	I_{CC1}	I_{FB}=0.25mA	0.3	0.61	1.0	mA
Current consumption without load	I_{CC2}		0.4	0.67	1.0	mA
Current consumption with load	I_{CC3}	1nF Output Load on Pin 5	1.2	1.72	2.2	mA
Operating frequency	f_{OSC}		80	90	100	kHz
Maximum duty ratio	d_{max}	I_{FB}=1µA	77	81	92	%
PWM/PFM switch duty ratio	d_{min}			5.0		%
Duty ratio	d_{01mA}	I_{FB}=0.1mA		32		%
Maximum control current at FB pin	I_{FBmax}	Duty Cycle = 0 %		140	200	µA
FB pin voltage	V_{FB}	Switching Phase, I_{FB}=0.1mA (25°C)	0.98	1	1.02	V
FB pin voltage	V_{FB}	Switching Phase, I_{FB}=0.1mA	0.96		1.04	V
Load regulation	AV_{FB1}	I_{FB}=0.05mA~0.25mA		25	40	mV
Input bias current	I_{B-CS}	Through Pin 1	-4.0	0	4.0	µA

Threshold at current detector input	V_{CS-th}		0.9	0.98	1.05	V
Output voltage fall time	t_f	C_{DRIVER}=1nF, from 90% down to 10% of Output Signal			250	ns
Output voltage rise time	t_r	C_{DRIVER}=1nF, from 10% up to 90% of Output Signal			250	ns
Soft-start time	t_{SS}	From appearance pulses at DRIVER pin to increase Duty Cycle more 50%	4	9	15	ms
Start voltage at Vdd pin	Vstup		12.0	13.0	13.4	V
Overvoltage protection threshold	Vovp		14.4	15.4	16	V
On-voltage of high voltage power supply	Vcc-on		7.3	7.7	8.1	V
Off-voltage of high voltage power supply	Vcc-off		7.6	8.0	8.4	V
Thermal Shutdown	TOTP			150		°C

BLOCK DIAGRAM



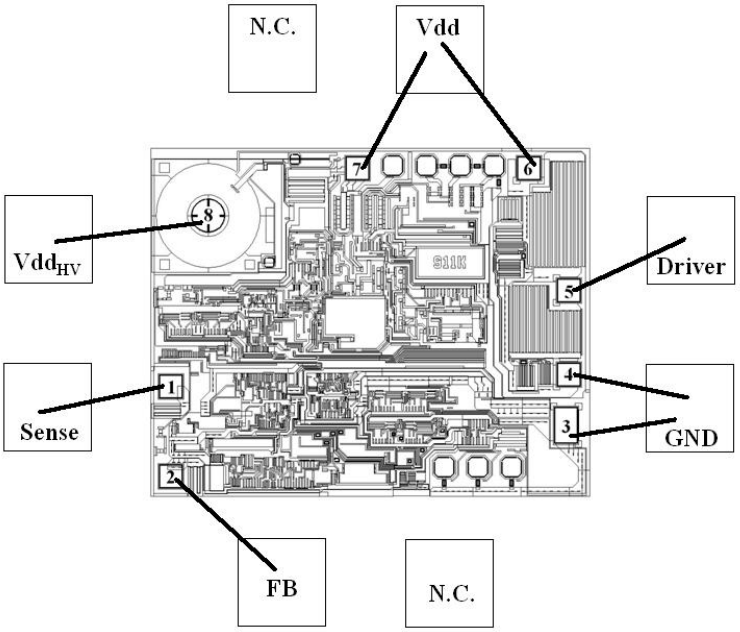
PAD LOCATION AND COORDINATES



Die size (including scribe line): 1.8x1.45mm^2

Pad #	Name (Package)	Pad opening size (µm x µm)	Pad centers coordinates (µm)	
			X	Y
1	SENSE	92x92	131	477
2	FB	92x92	131	131
3	GND	92x142	1655	328
4	GND	92x92	1655	524
5	DRIVER	92x92	1655	848
6	VDD	92x92	1511	1318
7	VDD	92x92	852	318
8	VDD_{HV}	Ø 130µm	275	1135

BONDING DIAGRAM



Package DIP-8, SOIC-8 (top view)

ASSEMBLY CHARACTERISTICS

No.	Assembly Characteristics	Value
1	Wafer Size	6 Inch
2	Wafer Thickness before Grinding	675+/-25µm
3	Scribe Street Width	80 µm
4	Chip Size (including Scribe Line)	1.80×1.45 mm^2
5	Die Attach Material	Substrate is connected to GND
6	Quantity of Bond Pad Metal Layers	1
7	Pad Thickness	1.2 µm
8	Composition of Metal Layers	Al+Si(1.0%)+Ti(0.5%)
9	Min. Bond Pad Opening Size	92×92 µm
10	Min. Bond Pad Pitch	165 µm
11	Min. Wire Diameters	1 mil (25.4 µm)
12	Circuit Under Pad Design (CUP)	No

ADDITIONAL INFORMATION

Pb-free products:

- RoHS compliant and compatible with the current requirements of IPC/JEDEC J-STD-020.

Green products:

- Lead-free (RoHS compliant).
- Halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

The appearance complies with the requirements of the company standards.