Step-up DC-DC Converter QX2305

General Description

The QX2305 is a high efficient step-up DC-DC converter IC.

The QX2305 uses a fixed off-time and 2MHz switching frequency can be achieved. The minimum off-time can be set by an external capacitor and resistor.

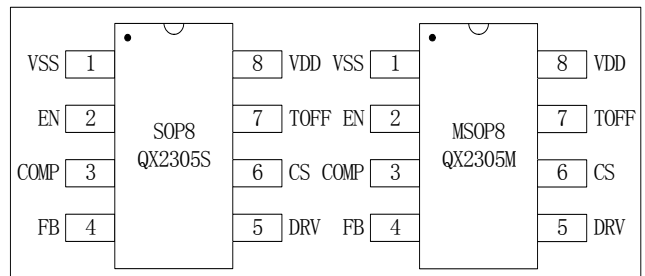The output voltage can be set by external resitance voltage divider.
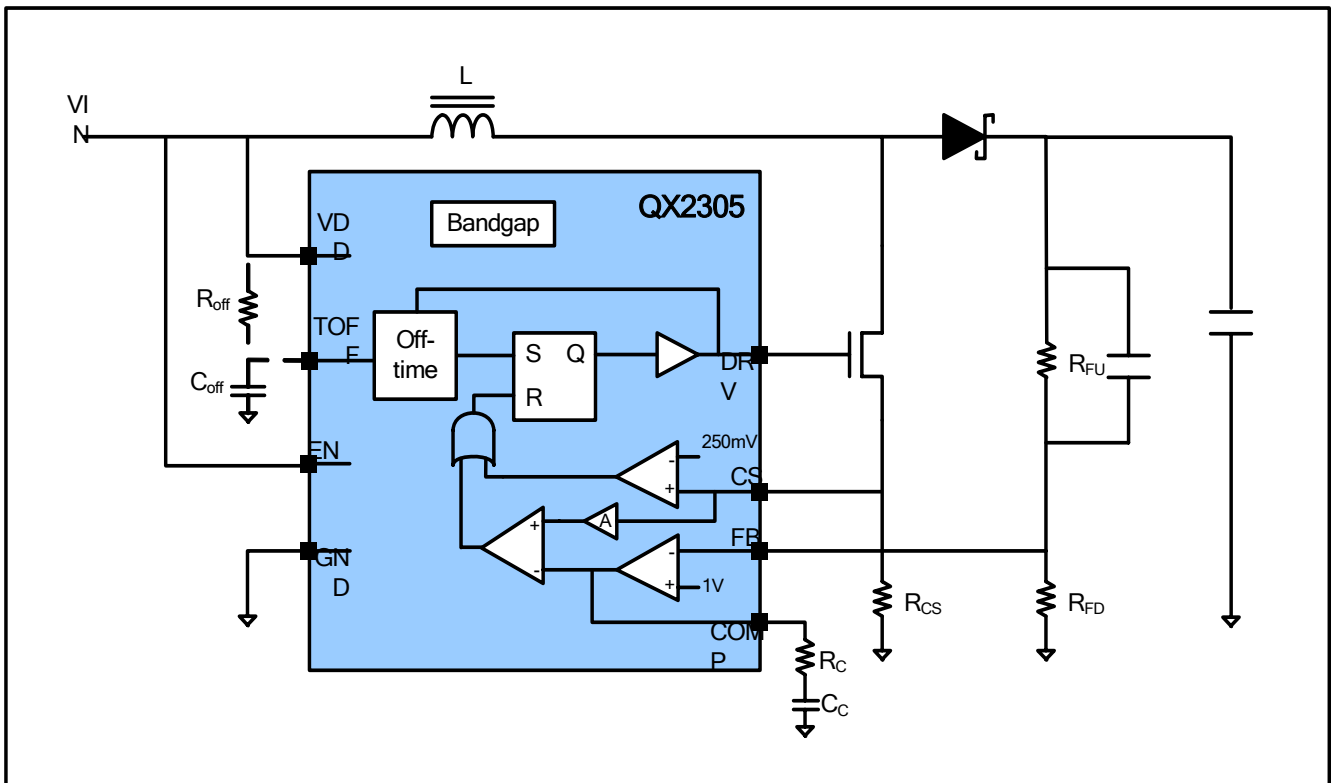
Applications

- **DC-DC Step-up Conversion**

Features

- High voltage application: 20mA to 2A
- Up to 90% efficiency
- Up to 2MHz switching frequency

Package

Block Diagram

Pin Assignment

Pin No.	Pin Name	Description
1	VSS	Ground
2	EN	Chip Enable
3	COMP	Compensation
4	FB	Voltage feedback
5	DRV	Driver
6	CS	Current sensing
7	TOFF	Off time selection
8	VDD	Power supply (2V-6.5V)

Absolute Maximum Ratings

Type	Symbol	Description	Value	Unit
Voltage	Vmax	Maximum voltage on VDD pins	8	V
	Vmin-max	Voltage range on EN, CS and FB pins	-0.3-VDD+0.3	V
Thermal	Tmin-max	Operation temperature range	-20-85	^{o}C
	Tstorage	Storage temperature range	-40-165	^{o}C
ESD	VESD	ESD voltage for human body model	2000	V

Electronic Characteristics

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Power supply	VDD		2.5		6.5	V
CS pin feedback voltage	V_{CS}		240	250	260	mV
FB pin feedback voltage	V_{FB}		970	1000	1030	mV
Operation current	IDD			0.5	1	mA
Off time (without R_{OFF} and C_{OFF})	T_{OFF0}			640		ns
Standby current	IDDQ				1	uA
EN pin high level voltage	V_{ENH}		2.0			V
EN pin low level voltage	V_{ENL}				0.8	V
DRV Rising Time	T_{RISE}	500pF cap on DRV pin			50	ns
DRV Falling Time	T_{FALL}	500pF cap on DRV pin			50	ns

Detail Description

The QX2305 works in two states:

- **ON State:** the external swith is on until one of the comparators outputs a high level voltage, the QX2305 goes to OFF state.
- **OFF State:** the external switch remains off until a fixed off time and the outputs of the two comparators are low, the QX2305 goes to ON state and repeat the ON and OFF process.
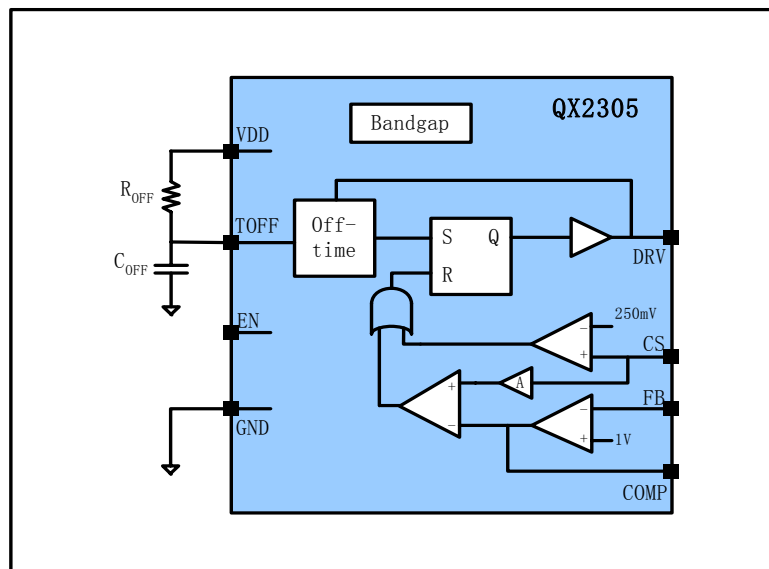
Fixed Off-Time

The fixed off time T_{OFF} is determined by R_{OFF} and C_{OFF} as:

$$T_{OFF} = 0.51 \bullet \frac{100K\Omega \bullet R_{OFF}}{R_{OFF} + 100K\Omega} \bullet (C_{OFF} + 12pF)$$

If TOFF pin is left open, the typical value of T_{OFF} is:

$$T_{OFF} = 612ns$$

The T_{OFF} can be reduced by adding R_{OFF} and be increased by adding C_{OFF}.

It works like a traditional current mode PWM DC-DC converter except that the off time is fixed and the working frequency is variable due to the values of VIN and VOUT. The comparator connected to CS pin is used for current limiting and the one connected to FB is used for voltage feedback.

## Package Information

MSOP8 PACKAGE OUTLINE DIMENSIONS
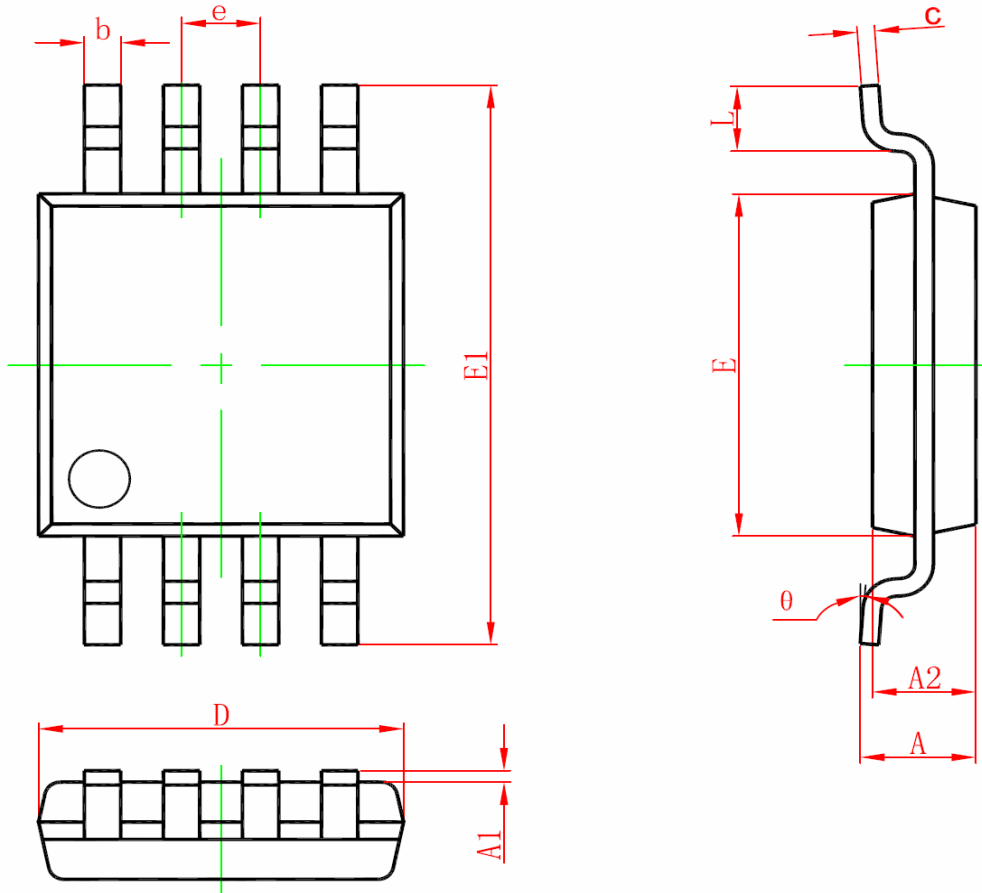
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

SOP8 PACKAGE OUTLINE DIMENSIONS
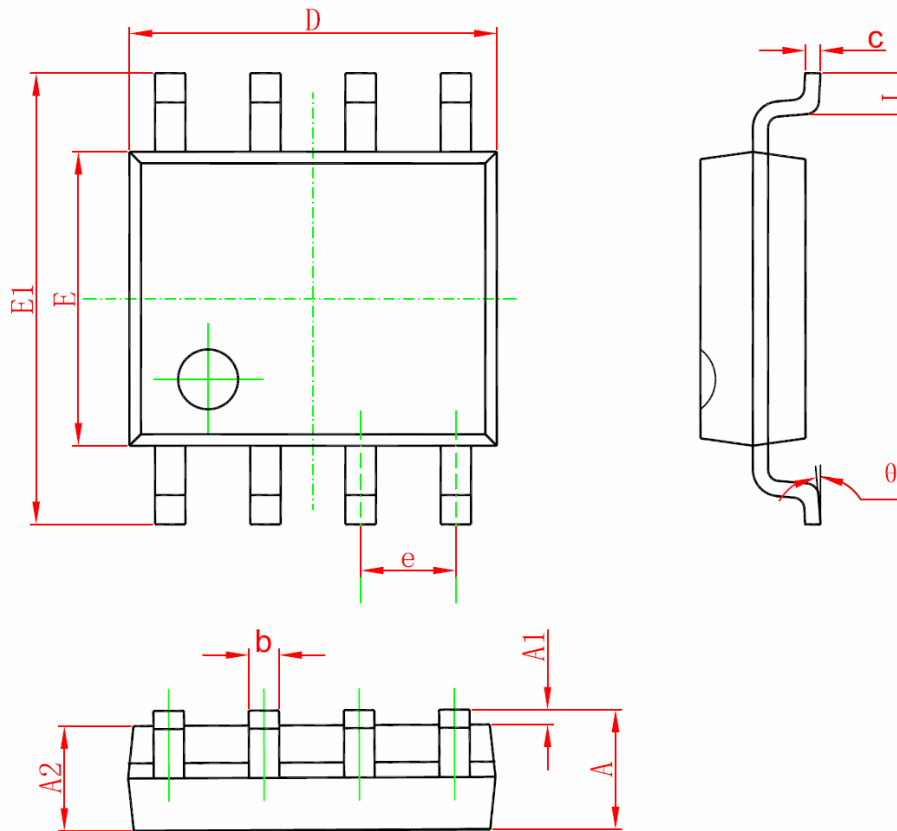
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°