

## 100V Input, 10A Output, Synchronous Step-down Controller

### General Description

The ET8A100KE is a high voltage, synchronous step-down controller operates over a wide range input voltage 9V to 100V and delivers 10A continuous load current with up to 96% efficiency.

The ET8A100KE operates with fixed frequency peak current control with built-in compensation eliminates the need for external components. Cycle-by-cycle current limit in high-side MOSFET protects the converter in an overload condition. Hiccup mode protection is triggered if the over-current condition has persisted for longer than the present time.

The ET8A100KE exhibits protection feature that protect the load from faults like under-voltage, over-current and over-temperature. The ET8A100KE is available in an SOP10 package.

### Features

- 9V to 100V input voltage range
- 10A continuous output current
- 96% Peak Efficiency
- 600 $\mu$ A operating quiescent current
- Peak Current mode control
- 150 kHz Fixed Frequency
- Internal compensation for ease of use
- Up to 91% duty cycle
- 0.8V voltage reference
- 1 $\mu$ A shutdown current
- 150ms Hiccup mode short circuit protection Function
- Thermal shutdown Function
- Package:

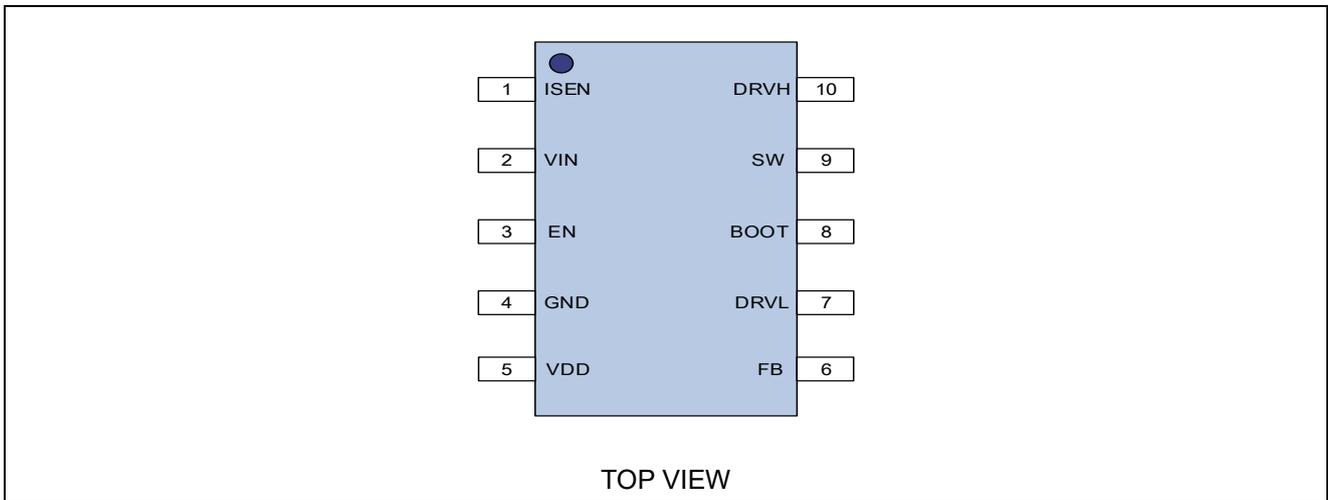
Part No.	Package	Body Size	Reel
ET8AK100KE	SOP10	8.5mm × 8.5mm	2500pcs/reel

### Applications

- Charger in vehicle
- Battery Chargers
- Power adapter

# ET8A100KE

## Pin Configuration

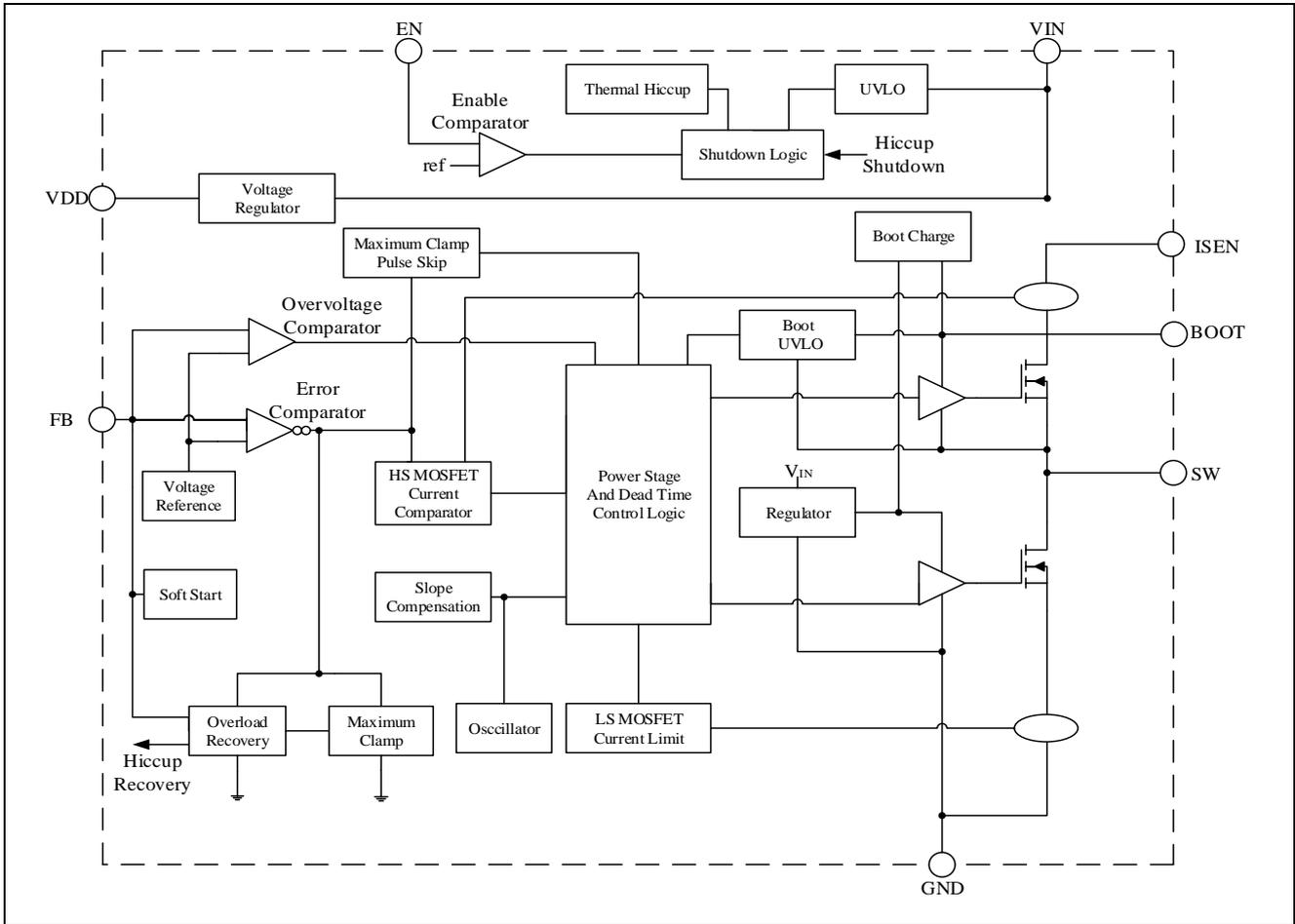


## Pin Function

Pin No.	Pin Name	Pin Function
1	ISEN	Connecting a resistance from ISEN to VIN sets the output short circuit detection threshold.
2	VIN	<b>Input supply.</b> VIN supplies power to all of the internal control circuitries, both BOOT regulators, and the high-side switch.
3	EN	<b>Enable input.</b> Pull EN below the specified threshold to shut down the MST8A100KD. Pull EN above the specified threshold or leave EN floating to enable the MST8A100KD.
4	GND	<b>Ground.</b> GND should be placed as close to the output capacitor as possible to avoid the high-current switch paths. Connect the exposed pad to GND plane for optimal thermal performance.
5	VDD	Power input to the controller.
6	FB	<b>Feedback.</b> FB is the input to the voltage hysteretic comparators. The average FB voltage is maintained at 800mV by loop regulation.
7	DRVL	<b>Low Drive.</b> Bootstrapped output for driving the gate of the low side N channel FET.
8	BOOT	<b>Bootstrap.</b> BOOT is the positive power supply for the internal, floating, high-side MOSFET driver. Connect a bypass capacitor between BOOT and SW.
9	SW	<b>Switch node.</b> SW is the output from the high-side switch. A low forward voltage Schottky rectifier to ground is required. The rectifier must be placed close to SW to reduce switching spikes.
10	DRVH	<b>High Drive.</b> Bootstrapped output for driving the gate of the high side N channel FET.

# ET8A100KE

## Block Diagram



## Absolute Maximum Ratings

Item	Description	Range	Unit
$V_{SW}, V_{EN}, V_{IN}, V_{ISEN}$	SW, EN, VIN, ISEN Voltage	-0.3 ~ +105	V
$V_{FB}, V_{DD}$	VDD, FB Voltage	-0.3 ~ +7	V
$V_{BOOT}$	BOOT Voltage	$V_{SW}-0.3 \sim V_{SW}+7$	V
$T_{STG}$	Storage Junction Temperature	-65 ~ 150	°C
$T_J$	Operating Junction Temperature	-40 to 150	°C
$T_{SOLD}$	Lead Temperature (Soldering 10 sec.)	260	°C
ESD	Human Body Model	±2000	V
	Charger Device Model	±200	V

**Note:** exceeding the range specified by the rated parameters will cause damage to the chip, and the working state of the chip beyond the range of rated parameters cannot be guaranteed. Exposure outside the rated parameter range will affect the reliability of the chip.

# ET8A100KE

## Electrical Characteristics

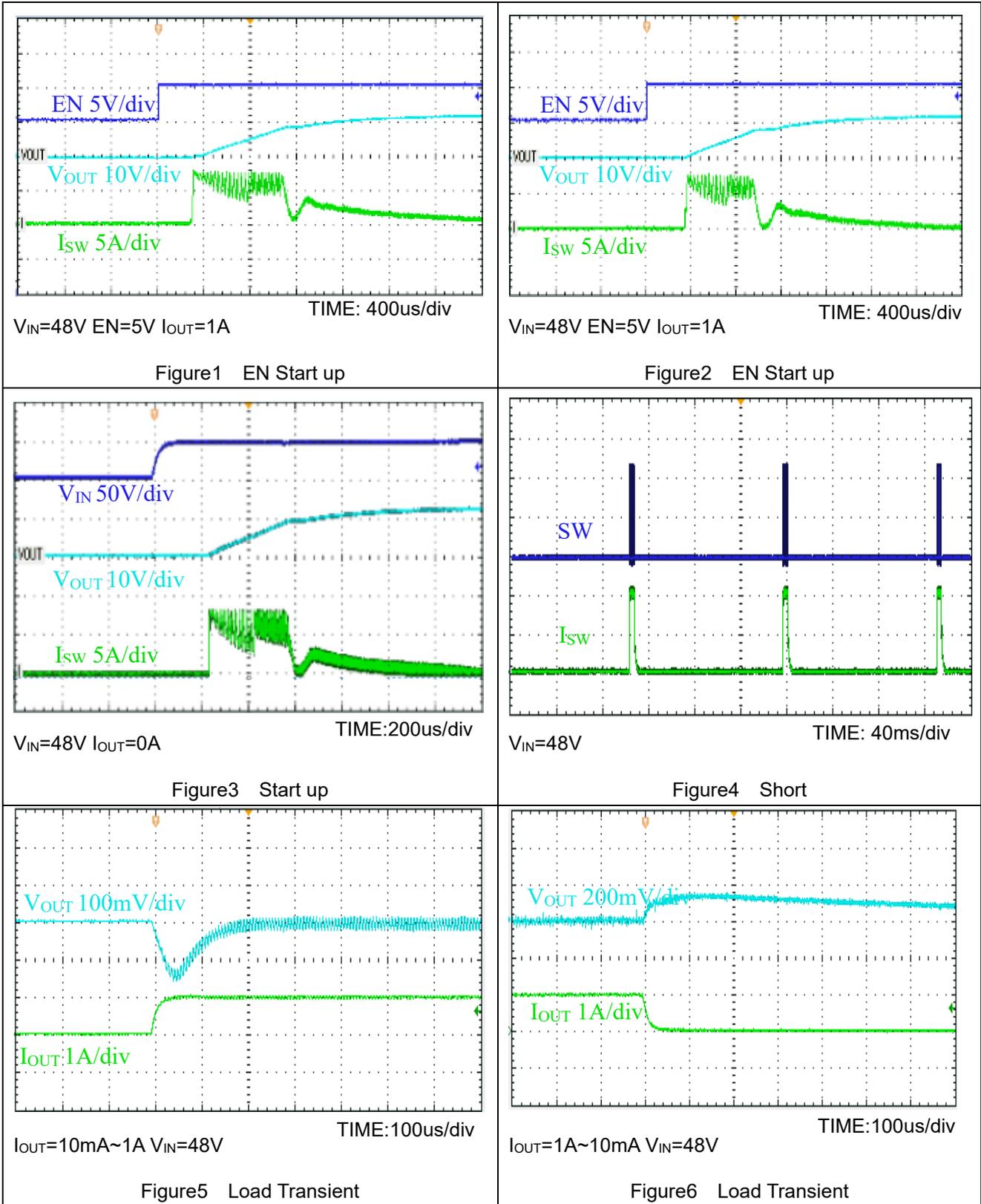
( $V_{IN}=48V$ ,  $V_{OUT}=12V$ , Typical values are at.  $T_A=25^{\circ}C$  unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>VCC SUPPLY VOLTAGE</b>						
Input Voltage	$V_{IN}$		9	-	100	V
UVLO	$V_{STRAT}$		-	8	-	V
UVLO Hysteresis	$V_{UVLO1}$		-	0.3	-	V
Shutdown Supply Current	$I_{SHUT}$	EN=0V	-	9	-	uA
Input Quiescent Current	$I_Q$	$V_{FB}=1V$	-	500	-	uA
<b>ENABLE</b>						
Enable Threshold Voltage	$V_{EN}$		2.2	-	100	V
Enable Threshold Voltage Hysteresis	$V_{UVLO2}$		-	0.2	-	V
<b>FEEDBACK</b>						
FB Reference Threshold	$V_{FB}$		-	0.8	-	V
Feedback Short Voltage	$V_{FB(short)}$		-	0.35	-	V
Feedback Short Voltage Hysteresis	$V_{FB2}$		-	0.42	-	V
<b>OSCILLATOR</b>						
Switching Frequency	F	$I_{OUT}=500mA$	-	150	-	kHz
Maximum Duty Cycle	$D_{MAX}$	$V_{IN}=12V$	-	91	-	%
<b>VDD</b>						
VDD Voltage	$V_{DD}$			5.4		V
<b>SENSE VOLTAGE</b>						
Cycle-by-cycle Sense Voltage	$V_{SEN}$		-	300	-	mV
<b>THERMAL SHUTDOWN</b>						
Thermal shutdown Temp	$T_{SD}$		-	117	-	$^{\circ}C$
Thermal shutdown Temp Hysteresis	$T_{SH}$		-	30	-	$^{\circ}C$

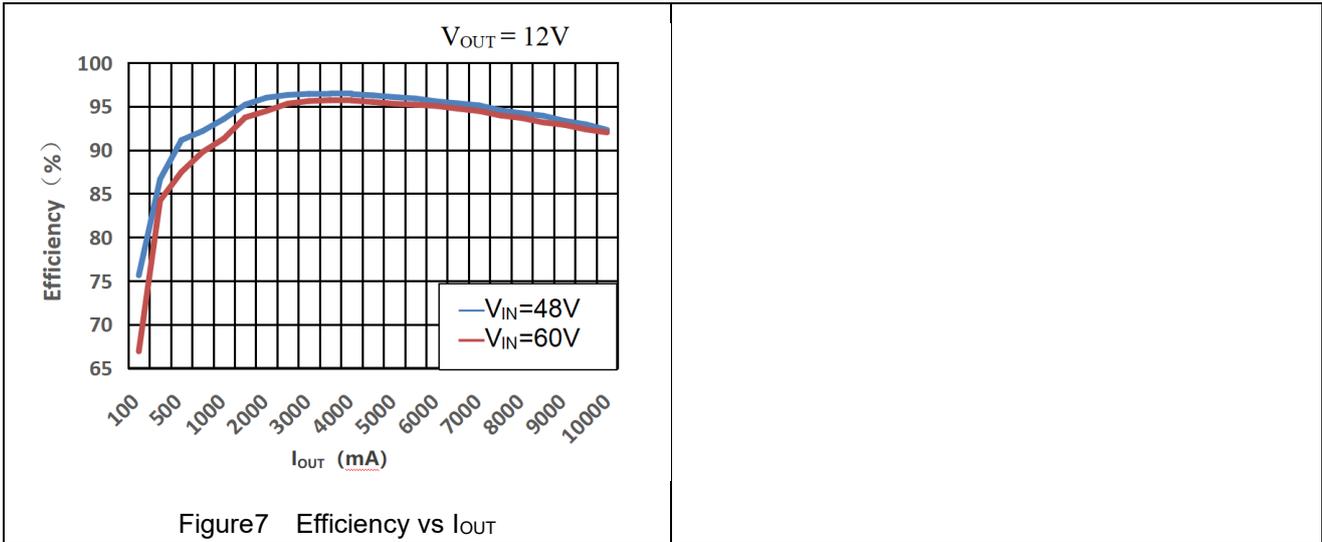
# ET8A100KE

## Typical Characteristics

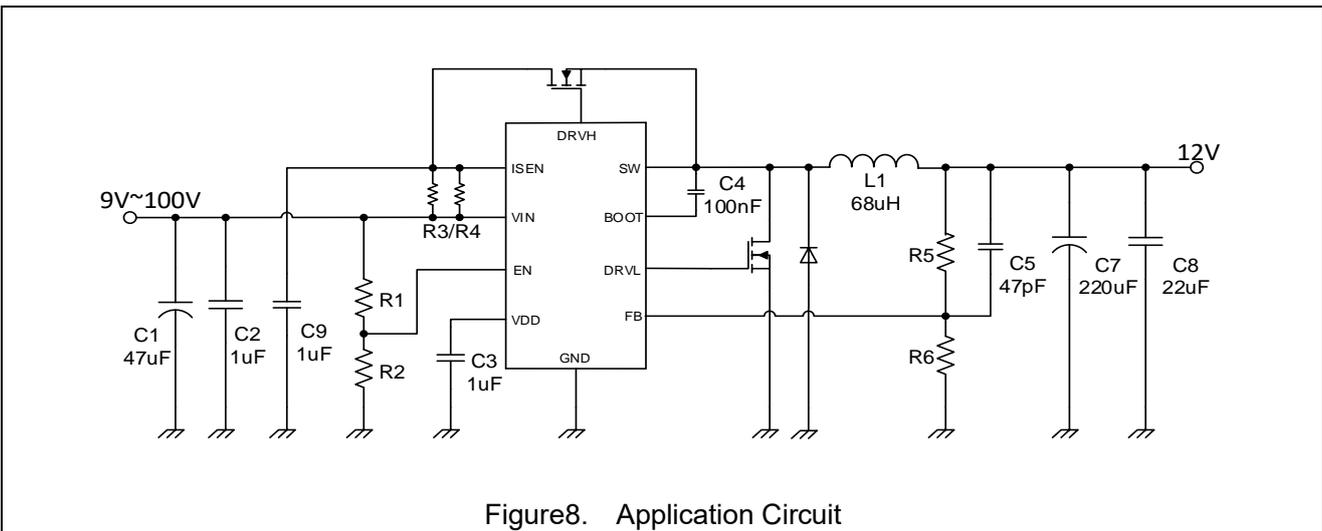
(At  $T_A=25^{\circ}\text{C}$ ,  $V_{IN}=48\text{V}$ ,  $V_{OUT}=12\text{V}$ , Unless Otherwise Noted)



# ET8A100KE



## Application Circuits



## Applications Information

### Over-current Protection

The ET8A100KE implements current-mode control which uses the internal COMP voltage to control the turn on and the turnoff of the high-side MOSFET on a cycle-by-cycle basis.

During each cycle, the switch current and the current reference generated by the internal COMP voltage are compared. When the peak switch current intersects the current reference the high-side switch turns off.

Furthermore, if an output overload condition occurs for more than the hiccup wait time, which is programmed for 512 switching cycles, the device shuts down and restarts after the hiccup time of 16384 cycles. The hiccup mode helps to reduce the device power dissipation under severe over-current conditions.

# ET8A100KE

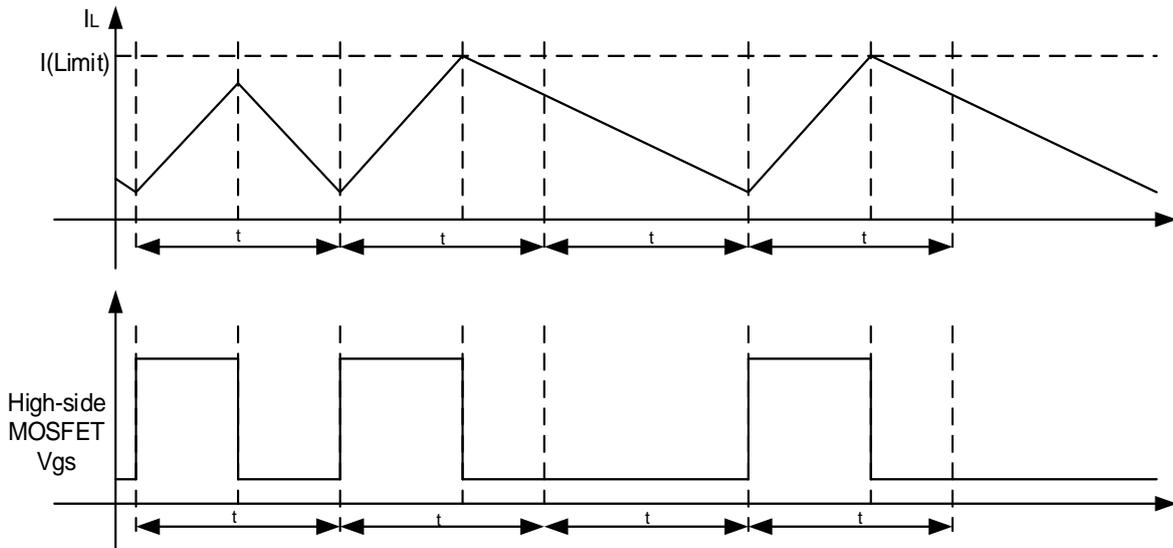


Figure9. Over-current Protection

## Hiccup mode

If an output overload condition occurs for more than the hiccup wait time, which is programmed for 512 switching cycles ( $T_1$ ), the device shuts down and restarts after the hiccup time of 16384 cycles ( $T_2$ ). The hiccup mode helps to reduce the device power dissipation under severe over-current conditions.

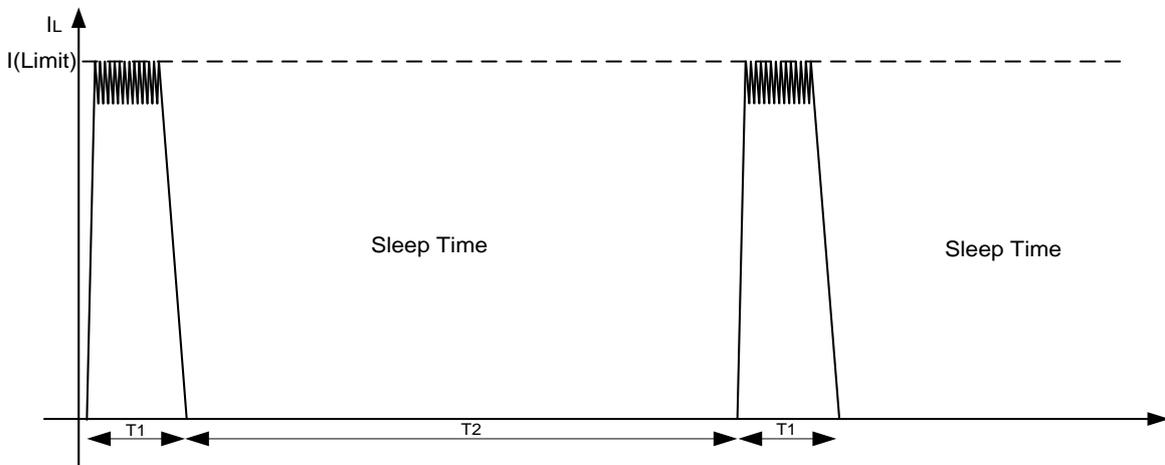


Figure10. Hiccup Mode

## C1

This capacitor's purpose is to supply most of the switch current during the on-time, and limit the voltage ripple at  $V_{IN}$ . To allow for the capacitor's tolerance, temperature effects, and voltage effects, a 47  $\mu\text{F}$  capacitor is used.

## C2

This capacitor helps avoid supply voltage transients and ringing due to long lead inductance at  $V_{IN}$ . A low ESR, 1  $\mu\text{F}$  ceramic chip capacitor is recommended, located close to the ET8A100KE.

# ET8A100KE

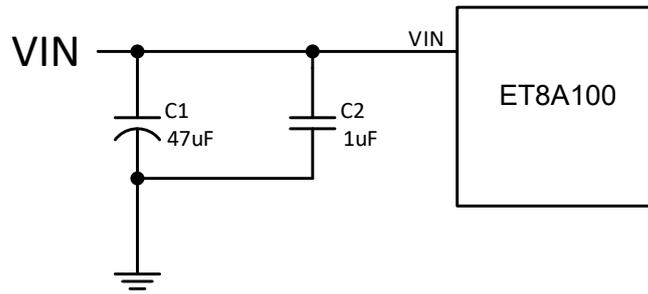


Figure11. The Capacitor on the VIN

## L1

The inductance is determined based on the switching frequency, load current, inductor ripple current, and the minimum and maximum input voltages designated  $V_{IN(min)}$  and  $V_{IN(max)}$ , respectively. The peak inductor current during an overload condition is limited to 10A nominal. Use the value of  $47\mu H$ , 15A to prevent saturation.

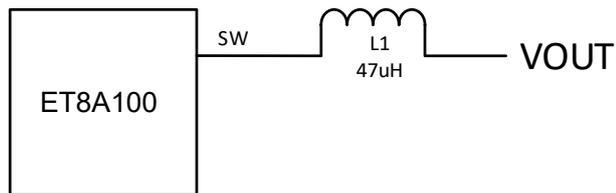


Figure12. The Inductor on the Choice

## C4/C5

The output capacitor filters the inductor ripple current and provides a source of charge for transient load conditions. The best performance is typically obtained using ceramic or polymer electrolytic type components. Typical tradeoffs are that the ceramic capacitor provides extremely low ESR to reduce the output ripple voltage and noise spikes. In order to meet output ripple specification, we should choose a ceramic capacitor of 22µF and a polymer electrolytic capacitor of 100µF.

## R1/R2

The output voltage ( $V_{OUT}$ ) is programmed by two external resistors as shown in the Figure9. The regulation point can be calculated as follows:

$$V_{OUT} = 0.8 \times (R1 + R2) / R2$$

# ET8A100KE

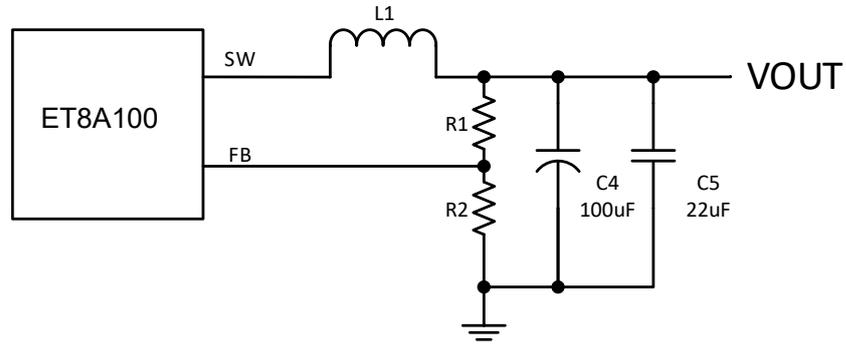


Figure13. Output Capacitors and Output Configuration

## Layout

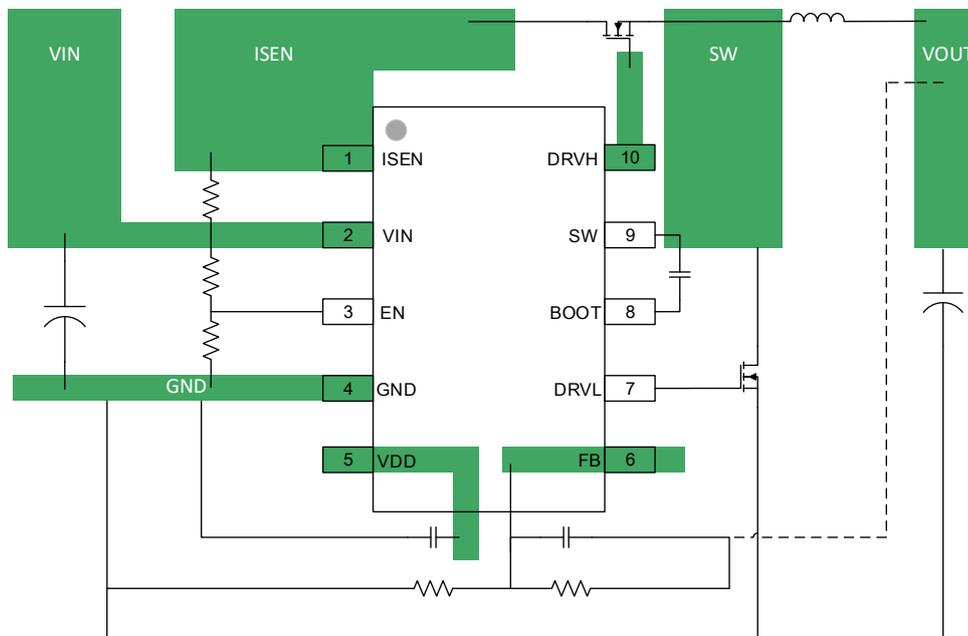
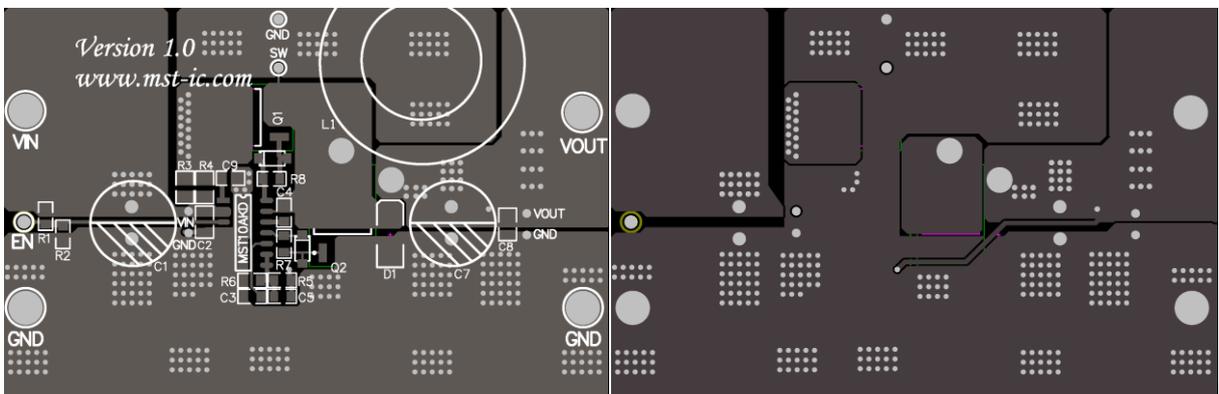


Figure14. PCB Layout Example



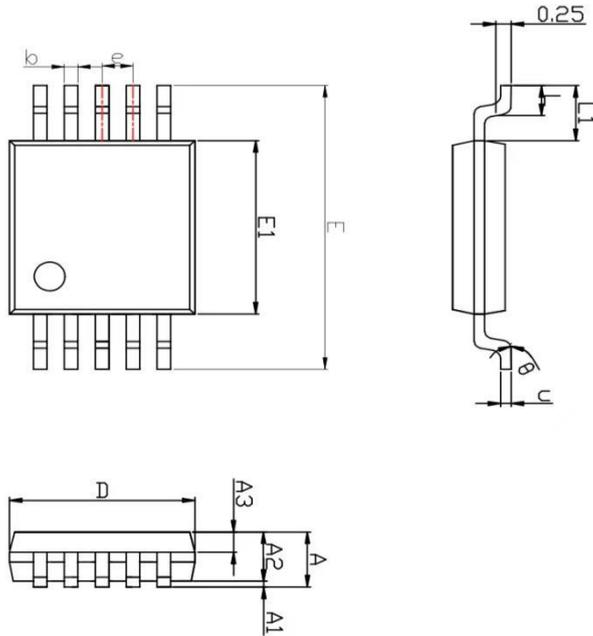
Top Layer

Bottom Layer

# ET8A100KE

## Package Dimension

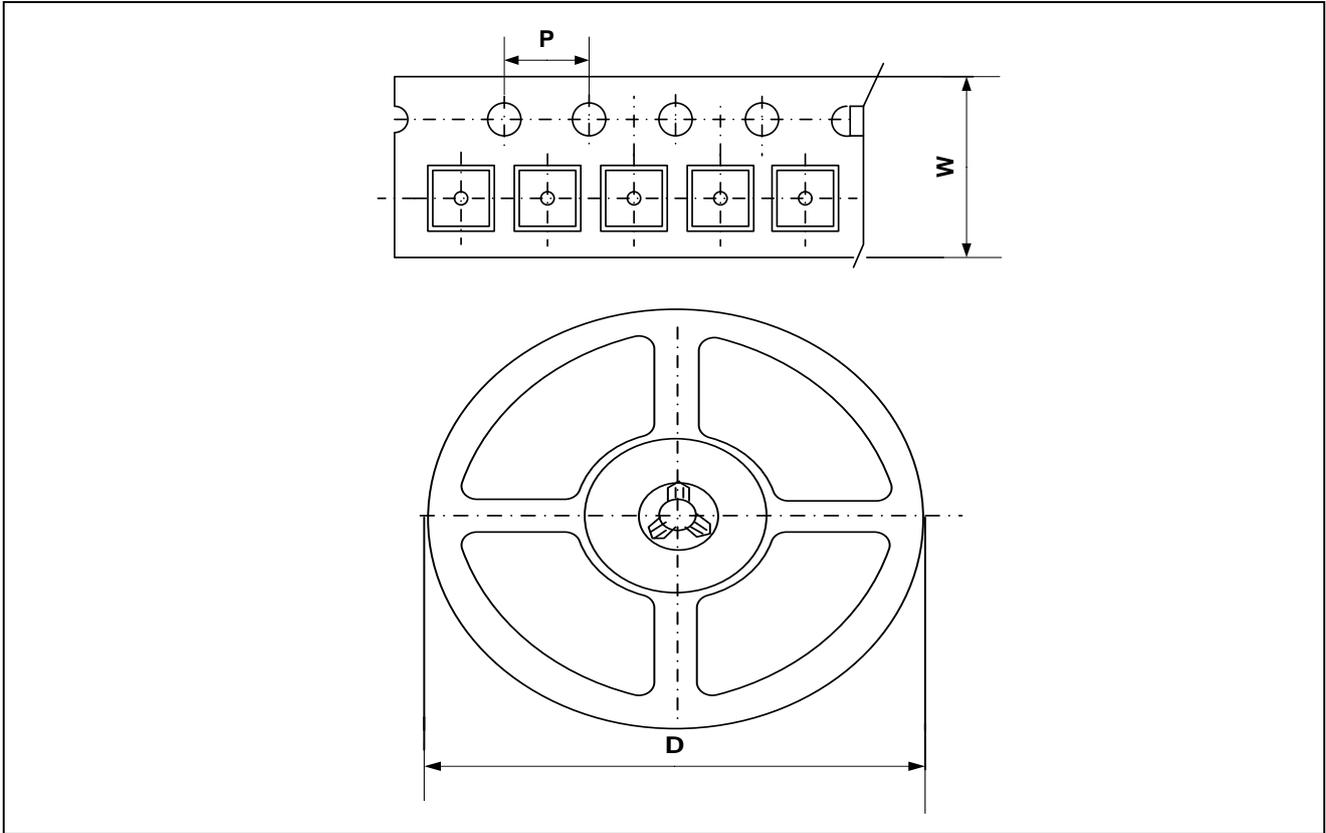
SOP10



Symbol	Unit: mm		
	Min	Typ	Max
A	---	---	1.10
A1	0.05	0.10	0.15
A2	0.80	0.85	0.90
A3	0.30	0.35	0.40
b	0.17	0.20	0.23
c	0.13	0.15	0.17
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.50BSC		
L	0.40	0.55	0.70
L1	0.90	0.95	1.00
θ	0°	---	8°

# ET8A100KE

## Packing Information



Type	W(mm)	D(mm)	Qty (pcs)
SOP10	16.0±0.1 mm	330±1 mm	2500pcs

## Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2022-05-18	Offed Version	Shibo	Shibo	Zhuji
1.1	2023-2-22	Update form	Shibo	Xingxiaolin	