



# ACE7255E

## 24V, 2A, Forced PWM Synchronous Step-Down Converter

### Description

ACE7255E is a wide input range, high-efficiency and high frequency DC-to-DC step-down switching regulator, capable of delivering up to 2A of output current. With a fixed switching frequency of 1MHz, this current mode PWM controlled converter allows the use of small external components, such as ceramic input and output caps, as well as small inductors. ACE7255E also employs a forced PWM control scheme, thereby ensuring the minimum ripple voltage. Its input can withstand a voltage surge as high as 30V, making it an ideal solution for industrial applications such as Surveillance Camera, LCD TV, Set Top Box, etc.

### Features

- Wide Input Range: 4.2V-24V
- Forced PWM control
- 1MHz switching frequency
- Capable of Delivering 2A
- No External Compensation Needed
- Current Mode Control
- Thermal Shutdown and UVLO
- Excellent Load and Line Transient Response

### Application

- Surveillance Camera
- Set Top Box
- LCD TV

### Absolute Maximum Rating

Parameter		Value
IN,SW,EN Voltage		-0.3V to 24V
BST Voltage		-0.3V to SW+6V
FB Voltage		-0.3V to 6V
Operating Temperature Range		-40°C to 85°C
Storage Temperature Range		-55°C to 150°C
Thermal Resistance	$\theta_{JA}$	180°C/W
	$\theta_{JC}$	90°C/W
Lead Temperature (Soldering 10ssec)		260°C
ESD HBM (Human Body Mode)		2KV
ESD MM (Machine Mode)		200V

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

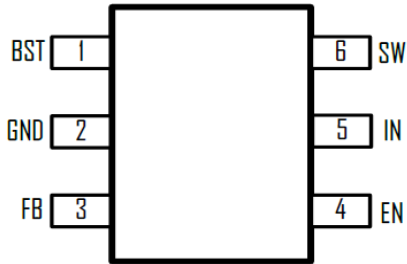


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### Packaging Type

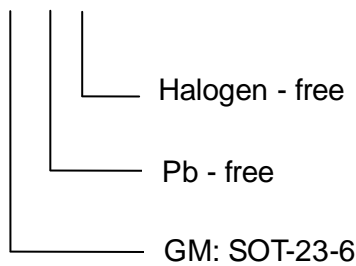
SOT-23-6



SOT-23-6	Description	Function
1	BST	Bootstrap pin. Connect a 10nF capacitor from this pin to SW.
2	GND	Ground
3	FB	Feedback Input. Connect an external resistor divider from the output to FB and GND to set $V_{OUT}$
4	EN	Enable pin for the IC. Drive this pin high to enable the part, low to disable.
5	IN	Supply Voltage. Bypass with a 10 $\mu$ F ceramic capacitor to GND.
6	SW	Inductor Connection. Connect an inductor Between SW and the regulator output.

### Ordering information

ACE7255E XX + H

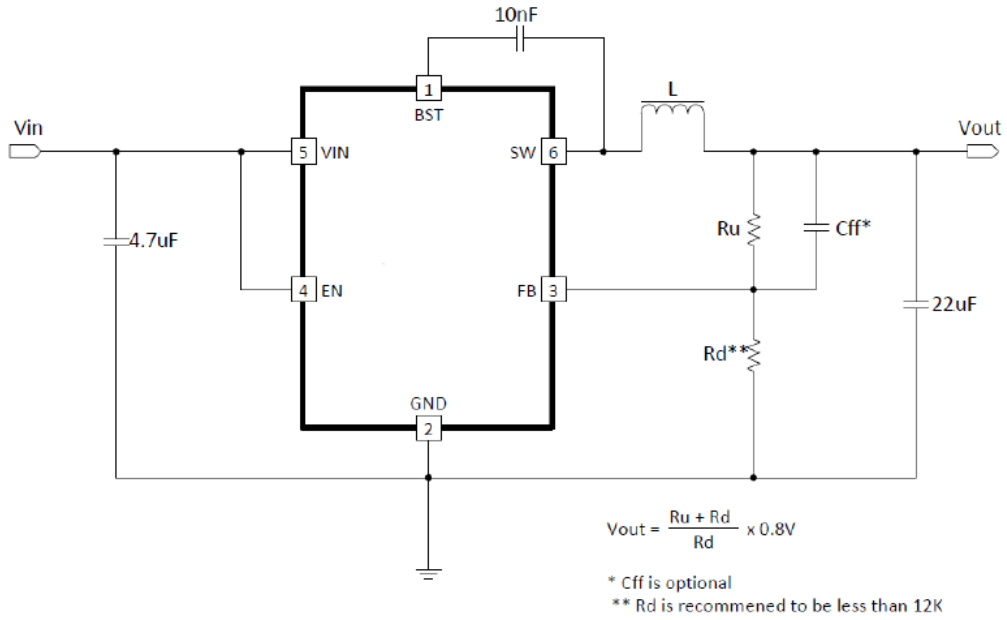




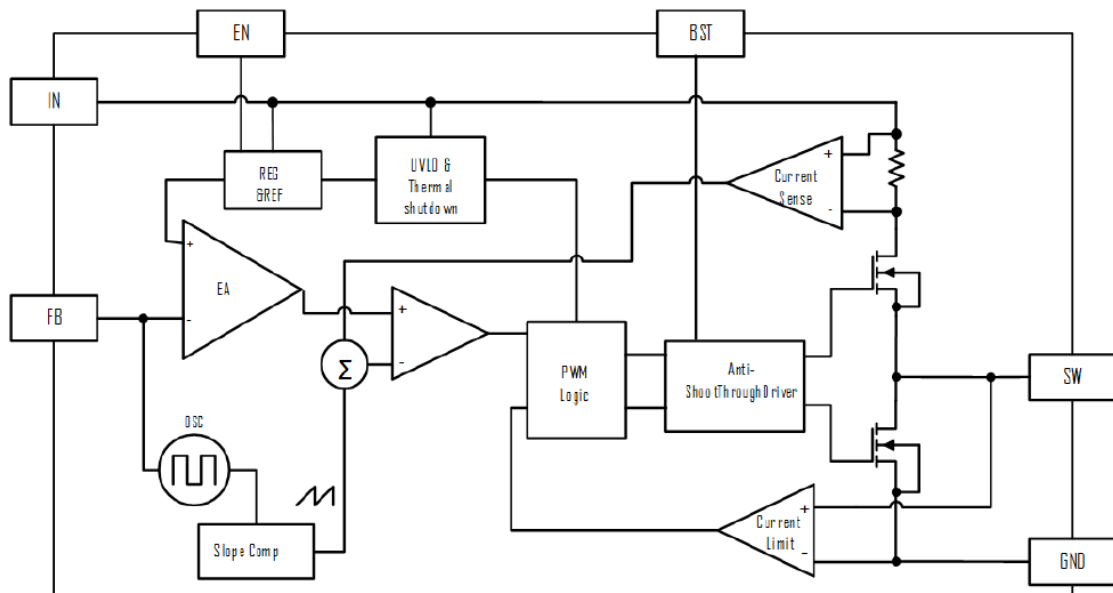
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### Typical Application



### Block Diagram





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### Electrical Characteristics

$V_{IN} = 12V$ , unless otherwise specified. Typical values are at  $T_A=25^{\circ}C$

Parameter	Conditions	Min	Typ	Max	Unit
Input Voltage Range		4.2		24	V
Input UVLO	Rising, Hysteresis=340mV		4.2		V
Input Supply Current	$V_{in}=12V$ , $I_{out}=0$ , $V_{fb}=0.85V$ , no switching		750		$\mu A$
Input Shutdown Current			7	14	$\mu A$
FB Voltage		0.784	0.8	0.816	V
FB Input Current			0	1	$\mu A$
Switching Frequency			1000		kHz
Maximum Duty Cycle			99		%
Short Circuit Hiccup Time	On Time		2		mS
	Off Time		6		mS
FB Hiccup Threshold			0.2		V
High Side Switch On Resistance			160		m $\Omega$
Low Side Switch On Resistance			95		m $\Omega$
High Side Current Limit			3.5		A
SW Leakage Current	$I_N=SW=12V$			20	$\mu A$
EN Rising Threshold			1.5		V
EN Falling Threshold			1.3		V
EN Input Current	$V_{EN}=2V$		1		$\mu A$
Thermal Shutdown	Rising, Hysteresis =40 $^{\circ}C$		150		$^{\circ}C$



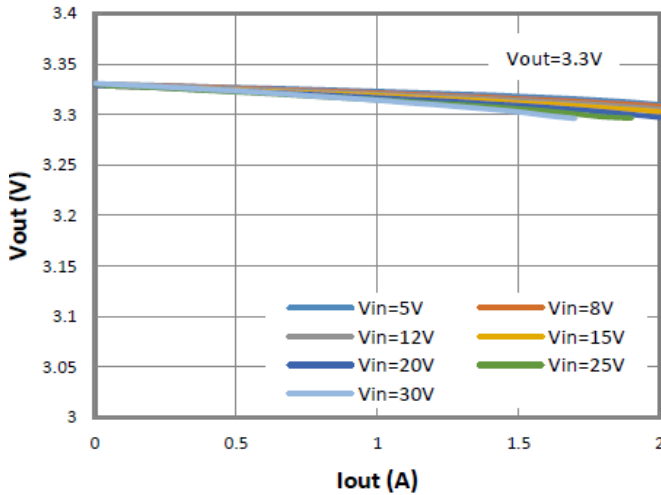
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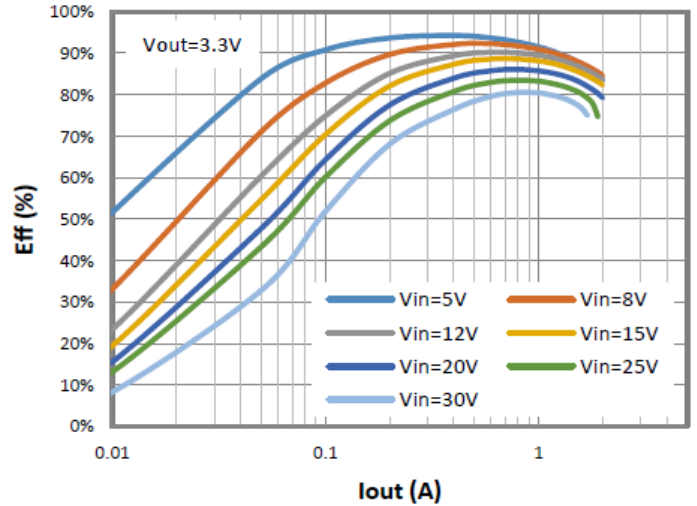
### Typical Characteristics

(Typical values are at TA=25°C unless otherwise specified)

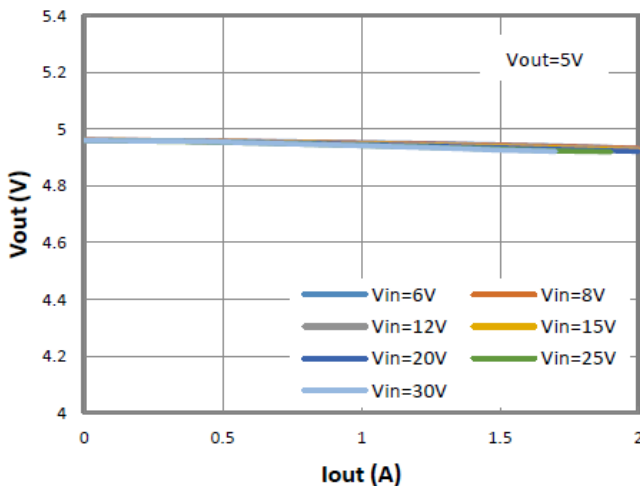
**Vost Vs. Iout**



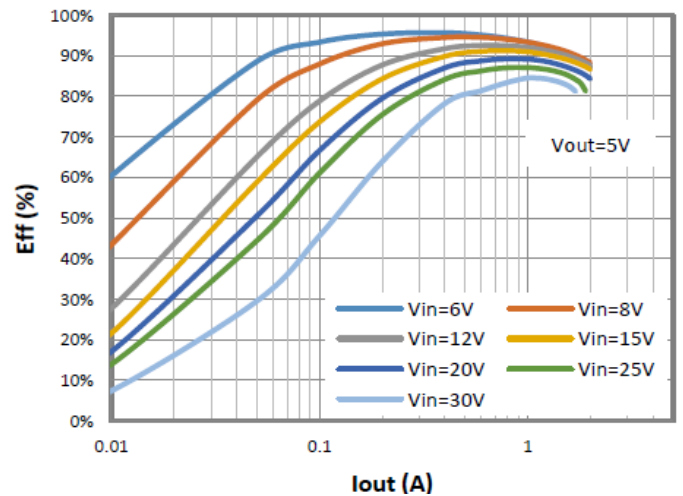
**Eff Vs. Iout**



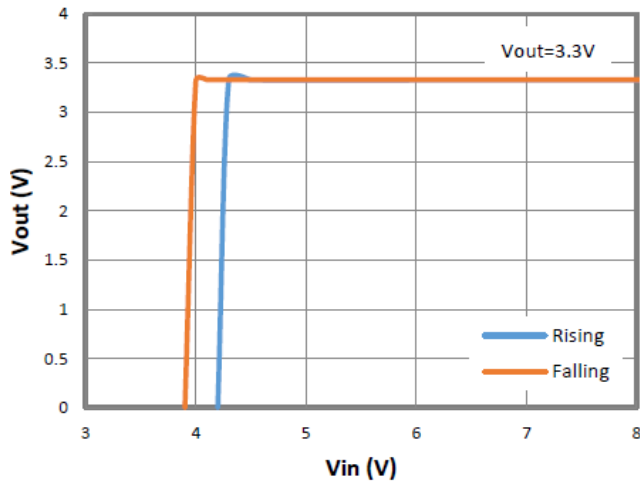
**Vout Vs. Iout**



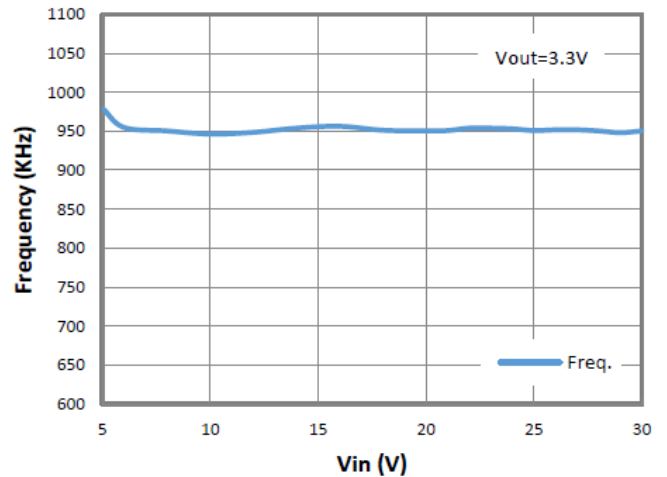
**Eff Vs. Iout**



**VIN UVLO**



**Freq Vs. Vin**

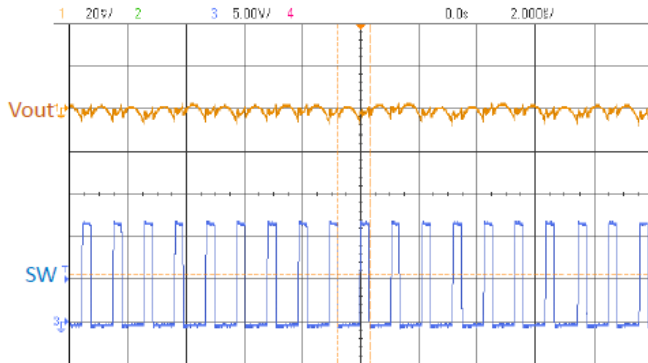




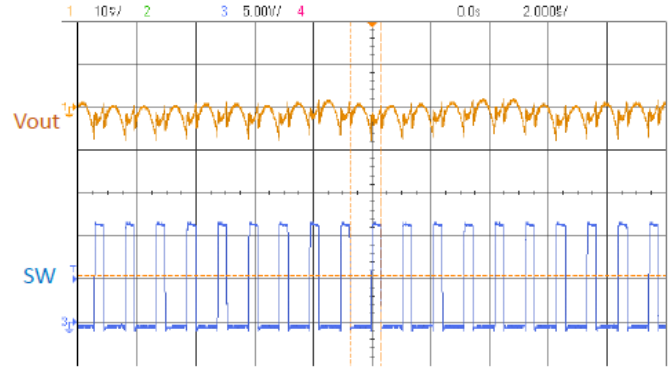
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## 24V, 2A, Forced PWM Synchronous Step-Down Converter

Switching Waveform at Iout = 0A  
(Vin=12V, Vout=3.3V)



Switching Waveform at Iout = 1A  
(Vin=12V, Vout=3.3V)



### Functional Description

The ACE7255E is a synchronous buck regulator ICs that integrates the PWM control, top and bottom switches on the same die to minimize the switching transition loss and conduction I

The ACE7255E is a wide input range, high efficiency, DC-to-DC step-down switching regulator, capable of delivering up to 2A of output current, integrated with a 160mΩ high side and 95mΩ low side MOSFET. It uses PWM current-mode control scheme. An error amplifier integrates error between the FB signal and the internal reference voltage. The output of the integrator is then compared to the sum of a current-sense signal and the slope compensation ramp. This operation generates a PWM signal that modulates the duty cycle of the power MOSFET to achieve regulation for output voltage.

### Forced PWM Operation

A forced PWM DC-DC regulator always switches at a fixed frequency even when the output load is small. This is to ensure a minimum output voltage ripple over the full load range. It may induce a relatively large (about 10mA when Vin=12V) input current when load is zero.

### Enable

EN is a digital control pin that turns the ACE7255E on and off. Drive EN High to turn on the regulator, drive it Low to turn it off. An internal 1MΩ resistor from EN pin to GND allows EN to float to shutdown the chip. Connecting the EN pin through a pull up resistor or shorted EN to IN will automatically turn on the chip whenever plug in IN.

### Over Current Protection and Hiccup

ACE7255E has a cycle-by-cycle over current limit for when the inductor current peak value is over the set current limit threshold. When the output voltage drop until FB falls below UV threshold (0.2V), the ACE7255E will enter hiccup mode. It will turn off the chip immediately for 6mS. After that, it will try to re-starts as normal for 2mS. After 2mS, if FB is still below UV threshold, then the chip enters hiccup mode again. If FB is higher than UV threshold, it will enter the normal mode.



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#### Over-Temperature Protection

Thermal protection disables the output when the junction temperature rises to approximately 150°C, allowing the device to cool down. When the junction temperature cools to approximately 110°C, the output circuitry is again enabled. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits regulator dissipation, protecting the device from damage as a result of overheating.

#### Application Information

##### External Output Voltage Setting

In external Output Voltage Setting Version selected, the ACE7255E regulator is programmed using an external resistor divider. The output voltage is calculated using below equation.

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_u}{R_d}\right)$$

Where:  $V_{REF} = 0.8V$  typically (the internal reference voltage)

Resistors  $R_d$  has to be between 1kOhm to 12kOhm and thus  $R_u$  is calculated by following equation.

$$R_u = \left(\frac{V_{OUT}}{V_{REF}} - 1\right) \times R_d$$

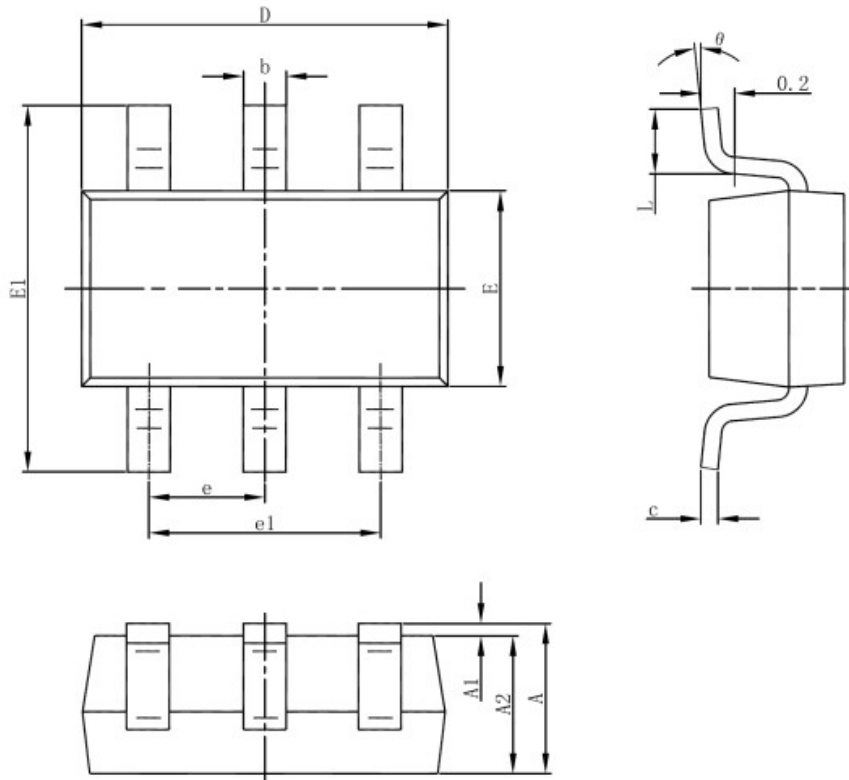


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### Packing Information

SOT-23-6



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°



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### Notes

ACE does not assume any responsibility for use as critical components in life support devices or systems without the express written approval of the president and general counsel of ACE Electronics Co., LTD. As sued herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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