

# AN8086S

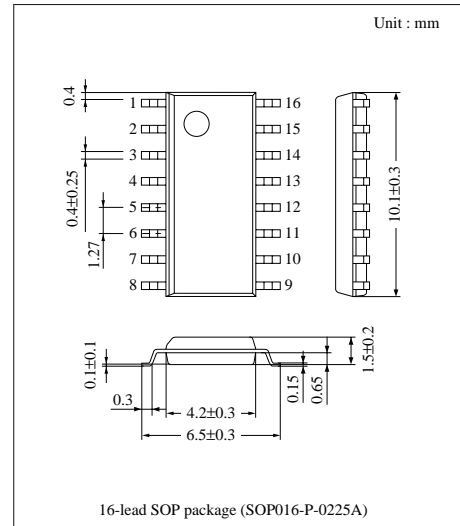
## Low Voltage Operation IC for DC-DC Converter

### ■ Overview

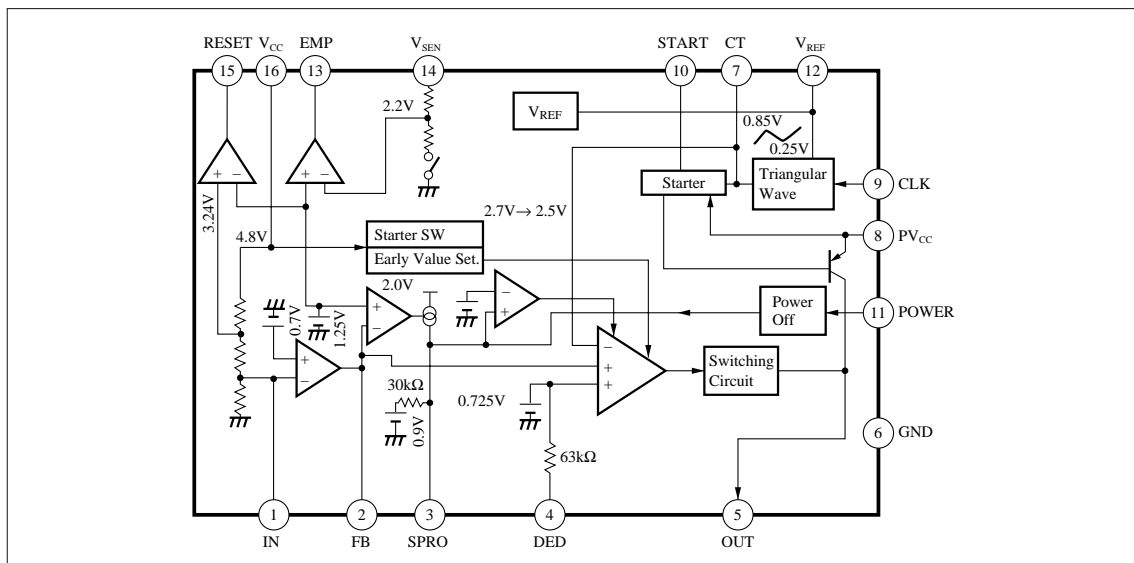
The AN8086S is an IC for controlling a DC-DC converter suitable for the switching power supply of various portable equipment. It can operate with input voltage 1.1V or more. The AN8086S is based on AN8083S with the output voltage in the secondary side changed to 3.6V.

### ■ Features

- Operable with low voltage input ( $PV_{CC} > 1.1V$ )
- Decreased voltage detection circuit built-in
- Short-circuit protection feature built-in
- Provided with reset output
- Synchronizable with outside clock
- Low consumption current in stand-by mode



### ■ Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Supply Voltage	V <sub>CC</sub>	14.4	V
	PV <sub>CC</sub>	14.4	
Power Dissipation	P <sub>D</sub>	380	mW
Operating Ambient Temperature	T <sub>opr</sub>	-20 ~ +75	°C
Storage Temperature	T <sub>stg</sub>	-55 ~ +125	°C

■ Recommended Operating Range (Ta=25°C)

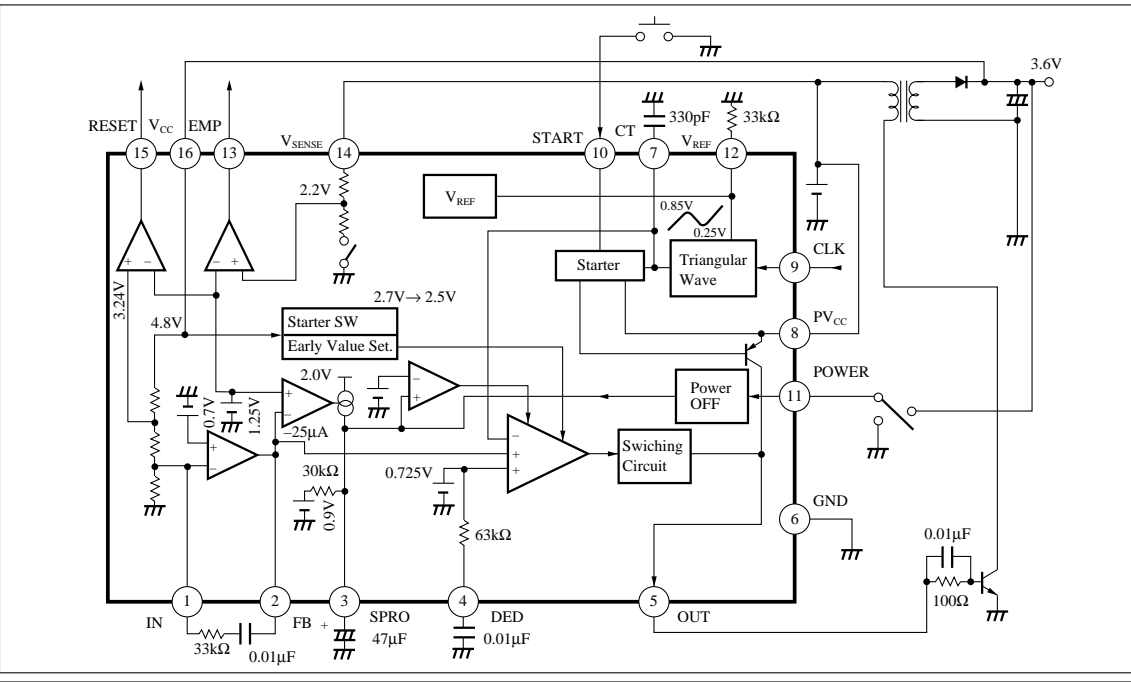
Parameter	Symbol	Range
Operating Supply Voltage Range	V <sub>CC</sub>	3.6V ~ 12V
	PV <sub>CC</sub>	1.1V ~ 12V

■ Electrical Characteristics (Ta=25°C)

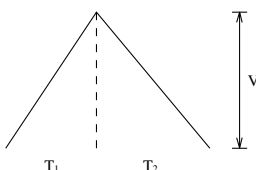
Parameter	Symbol	Condition	min.	typ.	max.	Unit
Power V <sub>CC</sub> Stand-by Mode Supply Current	I <sub>PVCC</sub>	V <sub>CC</sub> =0V, PV <sub>CC</sub> =3V	—	—	2	μA
Power V <sub>CC</sub> No Load Supply Current	I <sub>PVCC</sub>	V <sub>CC</sub> =3.1V, PV <sub>CC</sub> =3V	—	1.2	3	mA
Output Voltage	V <sub>O</sub>		—	3.6	—	V
Reset Output Threshold Voltage	V <sub>TH</sub> (RESET)		V <sub>TH</sub> ×0.85	V <sub>TH</sub> ×9	V <sub>TH</sub> ×0.95	V
Decreased Voltage Detection Threshold Voltage	V <sub>TH</sub> (VSEN)		2.1	2.2	2.3	V
Short-Circuit Protection Operating Voltage	V <sub>O</sub> (SPRO)	V <sub>IN</sub> =0V, V <sub>POWER</sub> =2V	1.35	—	2.1	V
Short-Circuit Protection Operating Voltage	V <sub>O</sub> (SPRO)	V <sub>IN</sub> =1V, V <sub>POWER</sub> =0V	1.7	—	3.2	V
Triangular oscillation Frequency in Normal Operation	f <sub>OSC1</sub>	R <sub>REF</sub> =33kΩ, CT=330pF	60	70	80	kHz
Triangular oscillation Frequency at Start	f <sub>OSC2</sub>	R <sub>REF</sub> =33kΩ, CT=330pF V <sub>CC</sub> =1.9V, PV <sub>CC</sub> =3V	80	100	120	kHz
Output Voltage	V <sub>OH</sub> (OUT)	I <sub>O</sub> =-20mA, V <sub>CT</sub> =0V	1.2	—	1.6	V
Output Voltage	V <sub>OL</sub> (OUT)	I <sub>O</sub> =20mA, V <sub>CT</sub> =1V	—	—	0.4	V

Note) Unless otherwise specified, V<sub>CC</sub>=4.8V, PV<sub>CC</sub>=3V

■ Application Circuit Example



### ■ Pin Description

Pin No.	Symbol	Description
1	IN	<ul style="list-style-type: none"> <li>Input pin for error amplifier</li> <li>Threshold voltage ; 0.7V</li> </ul>
2	FB	<ul style="list-style-type: none"> <li>Output pin for error amplifier</li> </ul>
3	SPRO	<ul style="list-style-type: none"> <li>Short-circuit protection input pin</li> <li>If output of error amplifier does not become "L" when <math>t = CV_{th}/I_{SPRO}</math> output of IC is not switched.</li> <li><math>I_{SPRO} = 25\mu A</math></li> <li><math>V_{th} = 0.9V</math></li> </ul>
4	DED	<ul style="list-style-type: none"> <li>Dead time control input</li> <li>Maximum duty ratio set to 85%.</li> </ul>
5	OUT	<ul style="list-style-type: none"> <li>Switching output pin</li> <li>Output current ; <math>I_O = 20mA</math> (max.)</li> </ul>
6	GND	<ul style="list-style-type: none"> <li>GND pin</li> </ul>
7	CT	<ul style="list-style-type: none"> <li>Triangular oscillating capacitor pin</li> </ul> <div style="display: flex; align-items: center; justify-content: space-around;">  <div style="text-align: center;"> <math display="block">T_1 = \frac{CV}{I \text{ (Discharged)}}</math> <math display="block">T_2 = \frac{CV}{I \text{ (Charged)}}</math> <math display="block">f = \frac{1}{T_1 + T_2}</math> </div> <div style="border: 1px solid black; padding: 5px; width: 150px;"> <math>I \text{ (Discharged)} = 52\mu A</math>  <math>I \text{ (Charged)} = 30\mu A</math>  <math>V = 0.58V</math> </div> </div> <p style="text-align: right;">In normal operation</p>
8	PV <sub>CC</sub>	<ul style="list-style-type: none"> <li>DC voltage input pin</li> <li>Operates with 1.1V or more.</li> </ul>
9	CLK	<ul style="list-style-type: none"> <li>Clock input</li> <li>It is used to synchronize triangular oscillation with clock input and operates at rise edge of clock.</li> <li>The threshold level is TTL level.</li> <li>It is open when not used.</li> </ul>
10	START	<ul style="list-style-type: none"> <li>Start pin</li> <li>Starts switching of starter (start at "L")</li> <li>Threshold voltage, <math>PV_{CC} - 0.9V</math></li> </ul>
11	POWER	<ul style="list-style-type: none"> <li>Power ON/OFF pin</li> <li>Output ON/OFF switching pin (Output is off at "L.")</li> </ul>
12	V <sub>REF</sub>	<ul style="list-style-type: none"> <li>Reference voltage pin</li> <li>1.25V output</li> <li>Charged and discharged current of triangular oscillation is determined by external R.</li> <li><math>I \text{ (Charged)} = \frac{V_{REF} - 0.7}{R_{REF} + 1k\Omega}</math></li> <li><math>I \text{ (Discharged)} = 1.40 \times I \text{ (Charged)}</math></li> </ul>
13	EMP	<ul style="list-style-type: none"> <li>Decreased voltage detection output pin</li> <li>"H" when detected by open collector output form</li> </ul>
14	V <sub>SEN</sub>	<ul style="list-style-type: none"> <li>Decreased voltage detection input pin</li> <li>Threshold voltage ; 2.2V</li> </ul>
15	Reset	<ul style="list-style-type: none"> <li>Reset output pin</li> <li>"H" when <math>V_{CC}</math> becomes <math>V_O \times 0.9V</math> or more</li> <li>Open collector output form</li> </ul>
16	V <sub>CC</sub>	<ul style="list-style-type: none"> <li>DC voltage input pin</li> <li>Operates with 3.6V or more.</li> </ul>