

SI-8000E Series

Full-Mold, Separate Excitation Switching Type

■Features

- Compact full-mold package (equivalent to TO220)
- High efficiency: 80 to 88%
- Requires only 4 external components
- Phase correction and output voltage adjustment performed internally
- Built-in reference oscillator (60kHz)
- Built-in overcurrent and thermal protection circuits

■Applications

- Power supplies for telecommunication equipment
- Onboard local power supplies



■Lineup

Part Number	SI-8050E	SI-8090E	SI-8120E
V _o (V)	5.0	9.0	12.0
I _o (A)	0.6		

■Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
DC Input Voltage	V _{IN}	43	V
Power Dissipation	P _{D1}	14(With infinite heatsink)	W
	P _{D2}	1.5(Without heatsink, stand-alone operation)	W
Junction Temperature	T _j	+125	°C
Storage Temperature	T _{stg}	−40 to +125	°C
SW Terminal Applied Reverse Voltage	V _{sw}	−1	V
Thermal Resistance(junction to case)	R _{th(j-c)}	7.0	°C/W
Thermal Resistance(junction to ambient air)	R _{th(j-a)}	66.7	°C/W

■Recommended Operating Conditions

Parameter	Symbol	Ratings			Unit
		SI-8050E	SI-8090E	SI-8120E	
DC Input Voltage Range	V _{IN}	7 to 40	11 to 40	14 to 40	V
Output Current Range	I _o	0 to 0.6			A
Operating Junction Temperature Range	T _{jop}	−30 to +125			°C
Operating Temperature Range	T _{op}	−30 to +125			°C

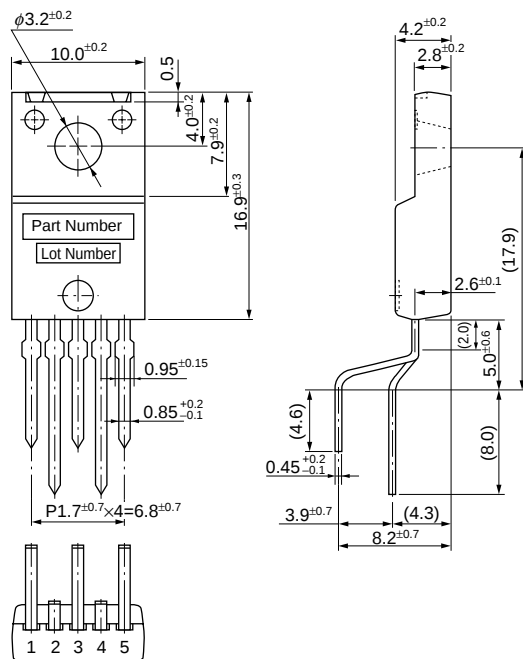
■Electrical Characteristics

(Ta=25°C)

Parameter	Symbol	Ratings									Unit
		SI-8050E			SI-8090E			SI-8120E			
		min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	
Output Voltage	V _O	4.80	5.00	5.20	8.64	9.00	9.36	11.52	12.00	12.48	V
	Conditions	V _{IN} =20V, I _O =0.3A			V _{IN} =21V, I _O =0.3A			V _{IN} =24V, I _O =0.3A			
Efficiency	η		80			86			88		%
	Conditions	V _{IN} =20V, I _O =0.3A			V _{IN} =21V, I _O =0.3A			V _{IN} =24V, I _O =0.3A			
Switching Frequency	f		60			60			60		kHz
	Conditions	V _{IN} =20V, I _O =0.3A			V _{IN} =21V, I _O =0.3A			V _{IN} =24V, I _O =0.3A			
Line Regulation	ΔV _{OLINE}		80	100		90	120		100	130	mV
	Conditions	V _{IN} =10 to 30V, I _O =0.3A			V _{IN} =14 to 30V, I _O =0.3A			V _{IN} =17 to 30V, I _O =0.3A			
Load Regulation	ΔV _{OLOAD}		30	40		50	80		70	95	mV
	Conditions	V _{IN} =20V, I _O =0.1 to 0.4A			V _{IN} =21V, I _O =0.1 to 0.4A			V _{IN} =24V, I _O =0.1 to 0.4A			
Temperature Coefficient of Output Voltage	ΔV _O /ΔT _a		±0.5			±1.0			±1.5		mV/°C
Ripple Rejection	R _{REJ}		45			45			45		dB
	Conditions	f=100 to 120Hz			f=100 to 120Hz			f=100 to 120Hz			
Overcurrent Protection Starting Current	I _{S1}	0.61			0.61			0.61			A
	Conditions	V _{IN} =10V			V _{IN} =14V			V _{IN} =17V			

■Outline Drawing

(unit: mm)

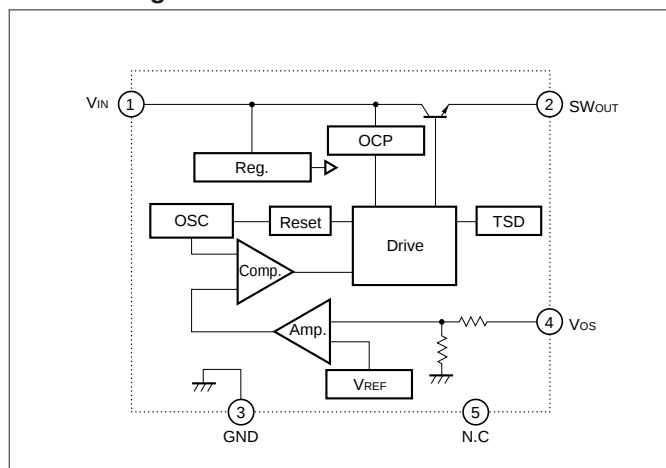


Plastic Mold Package Type
Flammability: UL94V-0
Weight: Approx. 2.3g

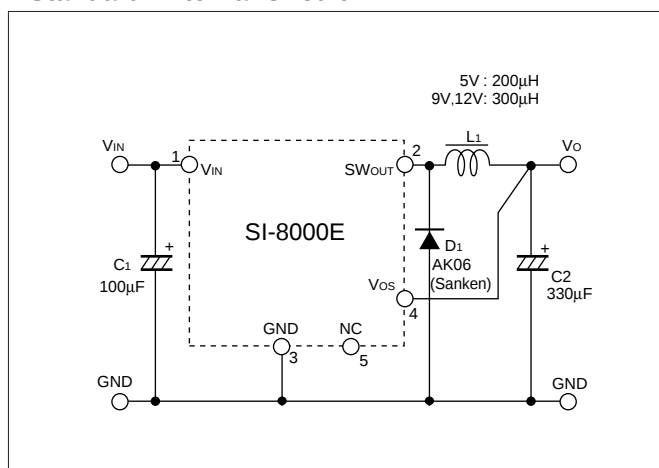
- ① V_{IN}
- ② SW_{OUT}
- ③ GND
- ④ V_{OS}
- ⑤ N.C

Forming No. 1101

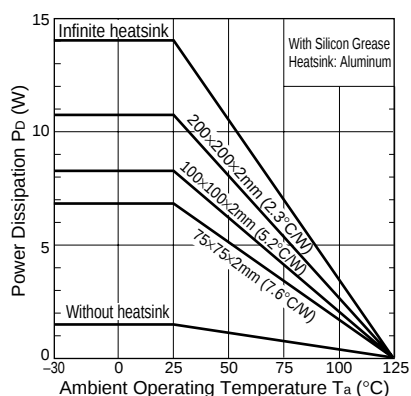
■Block Diagram



■Standard External Circuit



■Ta-PD Characteristics



$$P_D = V_O \cdot I_O \left(\frac{100}{\eta \chi} - 1 \right) - V_F \cdot I_O \left(1 - \frac{V_O}{V_{IN}} \right)$$

The efficiency depends on the input voltage and the output current. Thus, obtain the value from the efficiency graph on page 79 and substitute the percentage in the formula above.

V_O : Output voltage
 V_{IN} : Input voltage
 I_O : Output current
 $\eta \chi$: Efficiency (%)
 V_F : Diode forward voltage
 0.4V(AK06)

Thermal design for D₁ must be considered separately.

■Selecting External Components

1. Inductor L₁

- 1) It must be suited for switching regulators.

Do not use inductors as noise filters as they generate excessive heat.

- 2) It must have the appropriate inductance value.

If the inductance is too small (150μH or lower), abnormal oscillation may occur causing operation problems in the overcurrent protection circuit within the rated current range.

- 3) The rated current must be satisfied.

If the rated current is exceeded, magnetic saturation leads to overcurrent.

2. Capacitors C₁ and C₂

- 1) They must satisfy the withstand voltage and allowable ripple current.

Exceeding the ratings of these capacitors or using them without derating shortens their service lives and may also cause abnormal oscillation of the IC.

- 2) C₂ must be a low-impedance type capacitor.

A low-impedance type capacitor is recommended for C₂ to ensure minimum ripple voltage and stable switching operation.

3. Diode D₁

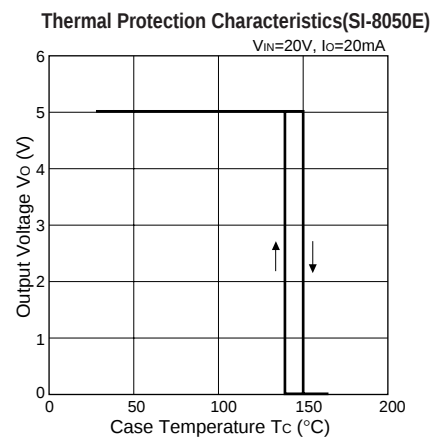
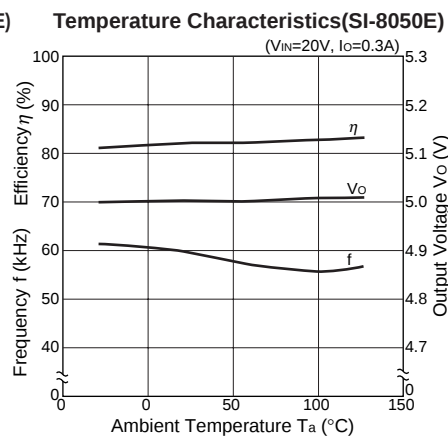
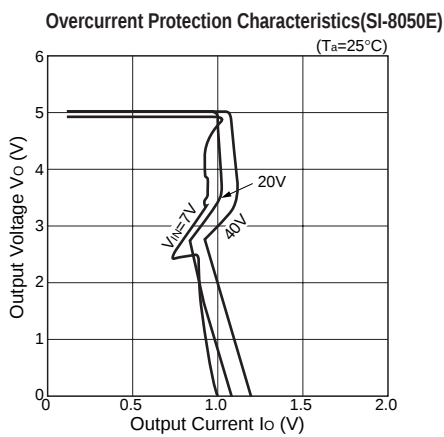
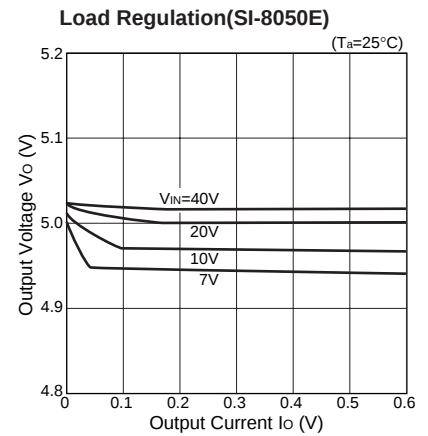
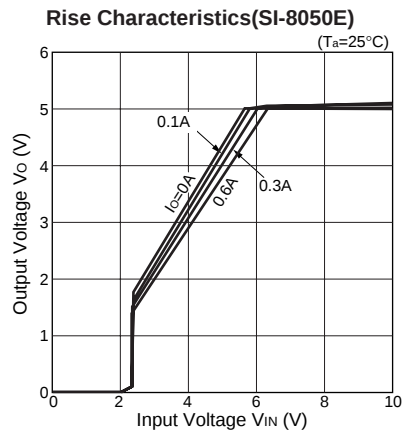
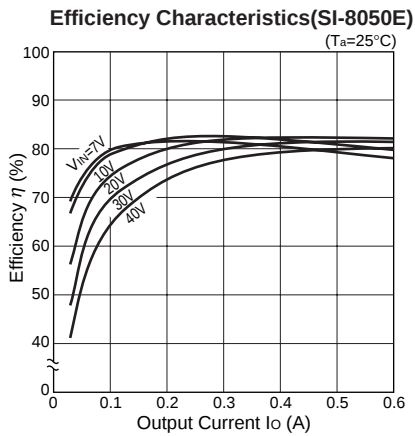
The Sanken AK06 diode is recommended for D₁. If you intended to use an equivalent diode, be sure to use a Schottky Barrier diode and make sure that the reverse voltage applied to terminal 2 of the IC does not exceed the value (−1V) given in the absolute maximum ratings. If you use a fast recovery diode or any other diode, application of a reverse voltage generated from the recovery or ON voltage of the diode may damage the IC.

Application

Variable output voltage

Output voltage can be adjusted in the same way as SI-8000S on page 85.

■Typical Characteristics



Note on Thermal Protection:

The thermal protection circuit is intended for protection against heat during instantaneous short-circuiting. Its operation is not guaranteed for short-circuiting over extended periods of time.