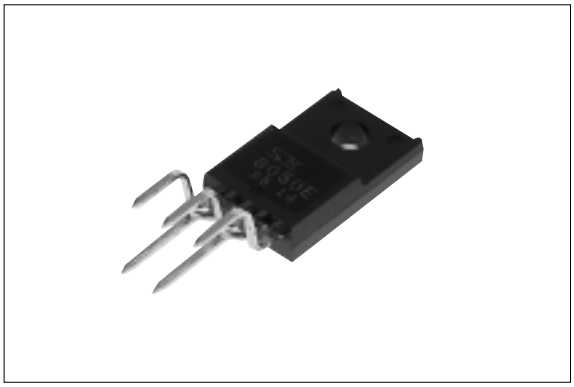
SI-8000E Series

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
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

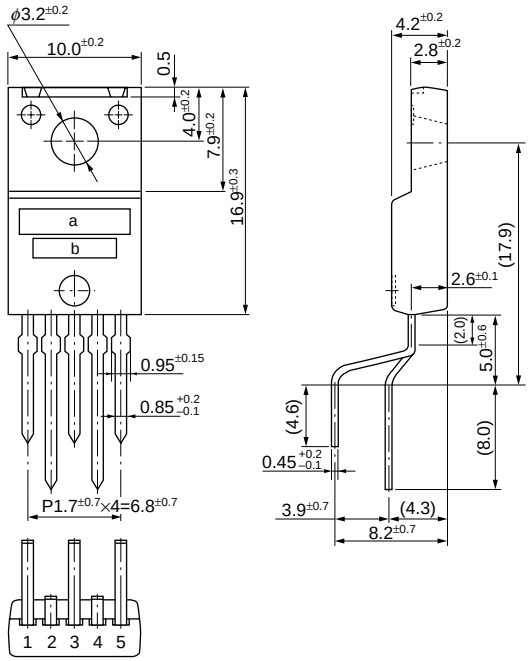
■Electrical Characteristics

(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	$\Delta V_O/\Delta T_a$		±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			

■External Dimensions

(unit: mm)



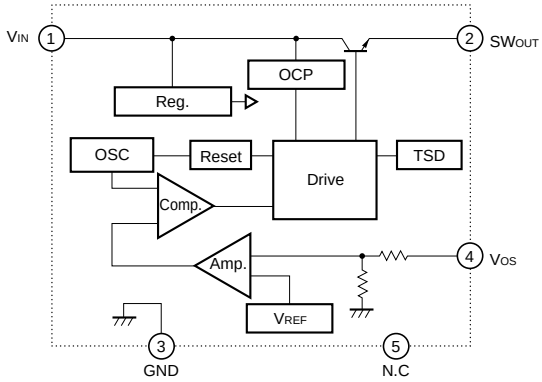
a. Part Number
b. Lot Number

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

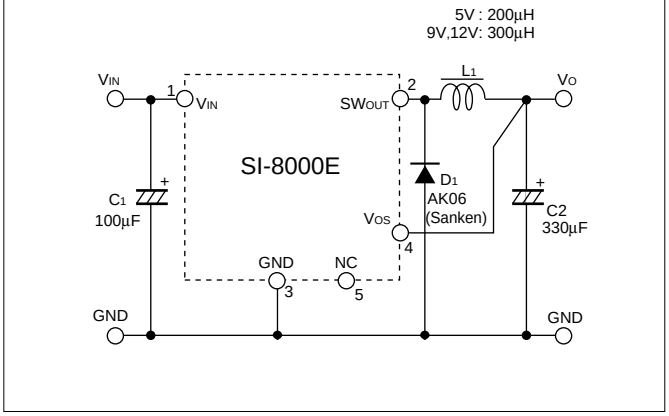
Plastic Mold Package Type
Flammability: UL94V-0
Weight: Approx. 2.3g

Forming No. 1101

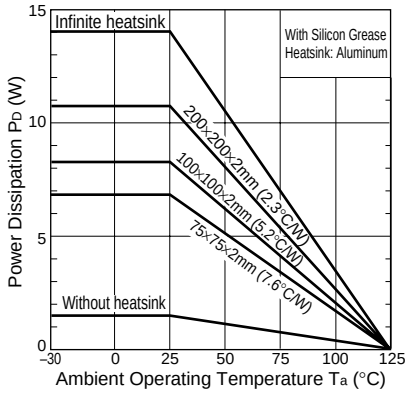
■Block Diagram



■Standard External Circuit



■T_a-P_D Characteristics



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

The efficiency depends on the input voltage and the output current. Thus, obtain the value from the efficiency graph on page 71 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 D_1 must be considered separately.

■Selecting External Components

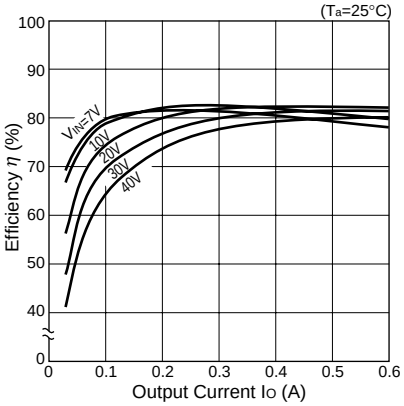
1. Inductor L_1
   1) It must be suited for switching regulators.
      Do not use inductors such as noise filters, because they generate excessive heat.
   2) It must have the appropriate inductance value.
      If the inductance is too small (150µH or lower), abnormal oscillation may occur causing 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 C_1 and C_2
   1) They must satisfy the breakdown 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) C_2 should a low-impedance type capacitor.
      A low-impedance type capacitor is recommended for C_2 to ensure reduced ripple voltage and stable switching operation.
3. Diode D_1
   The Sanken AK06 diode is recommended for D_1. 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, supplying a reverse voltage generated from the recovery or ON voltage of the diode may damage the IC.

Application

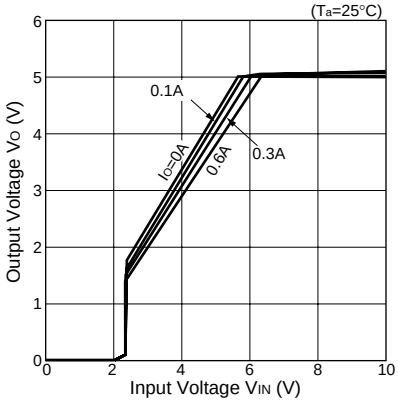
Variable output voltage
Output voltage can be adjusted in the same way as SI-8000S in page 77.

■Typical Characteristics

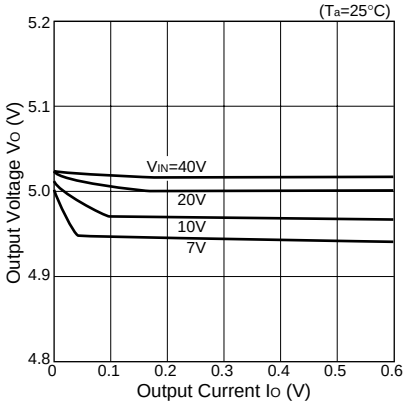
Efficiency Characteristics(SI-8050E)



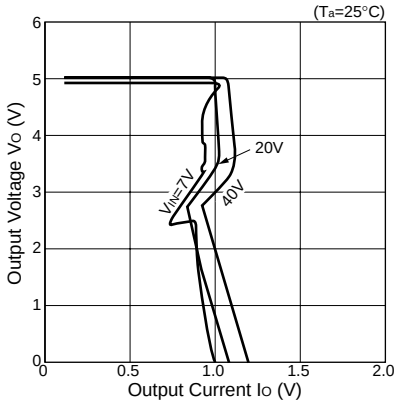
Output Voltage(SI-8050E)



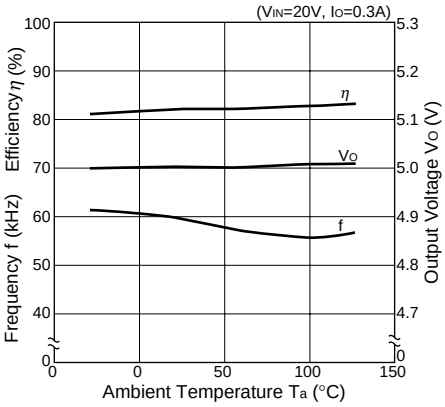
Load Regulation(SI-8050E)



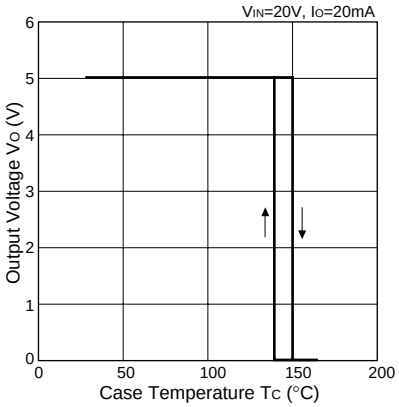
Overcurrent Protection Characteristics(SI-8050E)



Temperature Characteristics(SI-8050E)



Thermal Protection Characteristics(SI-8050E)



Note on Thermal Protection:

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