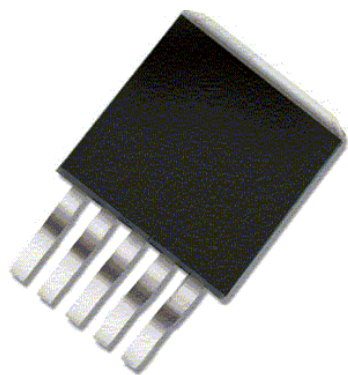
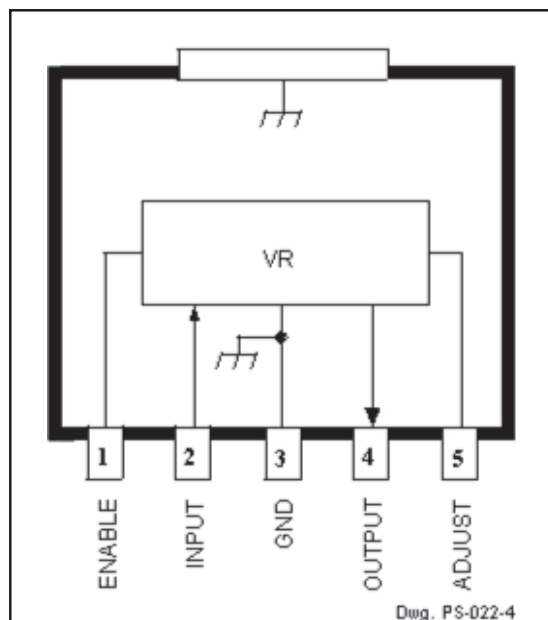


High-Current, Low-Dropout, 1.1~5 V Regulator



ABSOLUTE MAXIMUM RATINGS

Input Voltage, V_I	10 V
Output Current, I_O	3 A*
Enable Input Voltage, V_E	6 V
Junction Temperature, T_J	+125°C
Storage Temperature Range, T_S	-40°C to +125°C

* Output current rating is limited by input voltage, duty cycle, and ambient temperature. Under any set of conditions, do not exceed a junction temperature of +125°C.

Designed to meet the high-current requirements in industrial and consumer applications; embedded core, memory, or logic supplies; TVs, VCRs, and office equipment, the SI-3011ZD voltage regulator offers the reduced dropout voltage and low quiescent current essential for improved efficiency. This device delivers a regulated output at up to 3 A. Integrated thermal and overcurrent protection enhance overall system reliability. Devices with fixed output voltages of 2.5 or 3.3 V are also available.

Quiescent current does not increase significantly as the dropout voltage is approached, an ideal feature in standby/resume power systems where data integrity is crucial. Regulator accuracy and excellent temperature characteristics are provided by a bandgap reference. An LS-TTL/CMOS-compatible input gives the designer complete control over power up, standby, or power down. A pnp pass element provides a dropout voltage of less than 600 mV at 3 A of load current. Low output voltages eliminate the need for expensive PWM buck converters. The low dropout voltage permits more efficient regulation before output regulation is lost.

This device is supplied in a 5-lead surface-mount plastic package (TO-263) with ground tab to provide a low-resistance path for maximum heat dissipation. A similar device in a flange-mounted (TO-220-style) high-power package is the SI-3011ZF.

FEATURES

- 3 A Output Current
- Adjustable 1.1~5 V Output Voltage
- 0.6 V Maximum Dropout Voltage at $I_O = 3$ A
- Fast Transient Response
- 1 μ A Maximum Standby Current
- Remote Voltage Sensing
- Foldback Current Limiting
- Ground Tab for Superior Heat Dissipation
- Thermal Protection

APPLICATIONS

- TVs, VCRs, Electronic Games
- Embedded Core, Memory, or Logic Supplies
- Printers and Other Office Equipment
- Industrial Machinery
- Secondary-Side Stabilization of Multi-Output SMPS

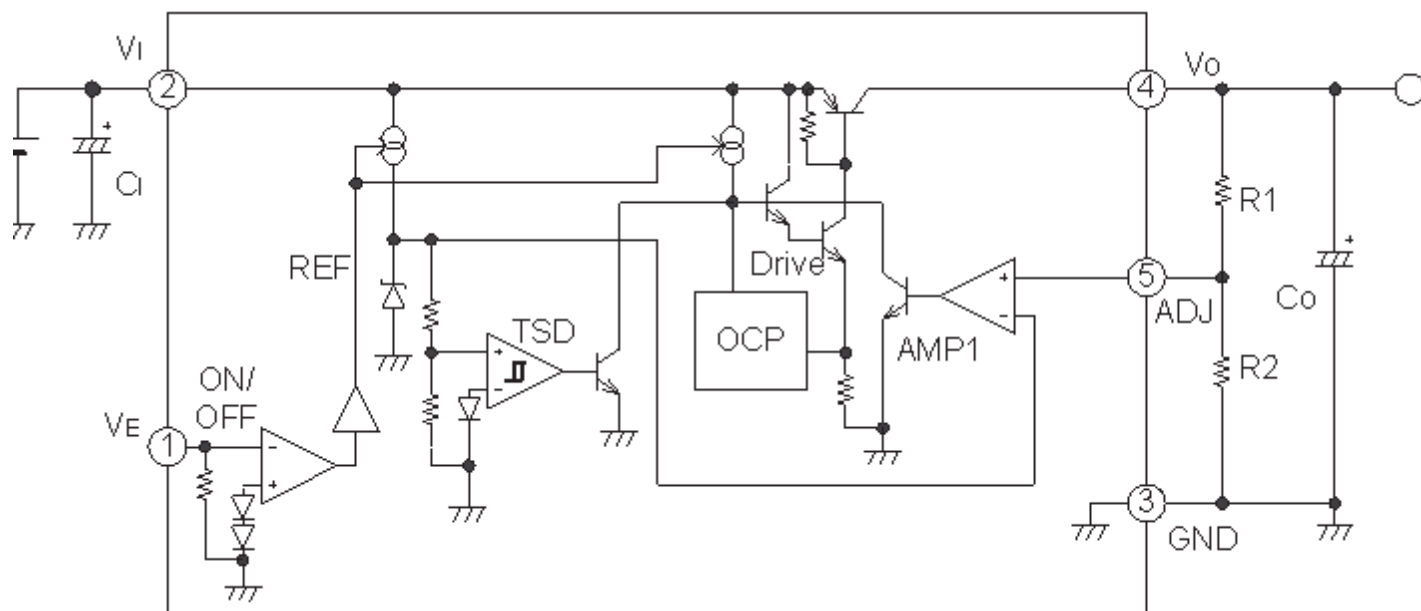
Always order by complete part number, e.g., **SI-3011ZD-TL**, where "TL" indicates tape and reel.

SI-3011ZD

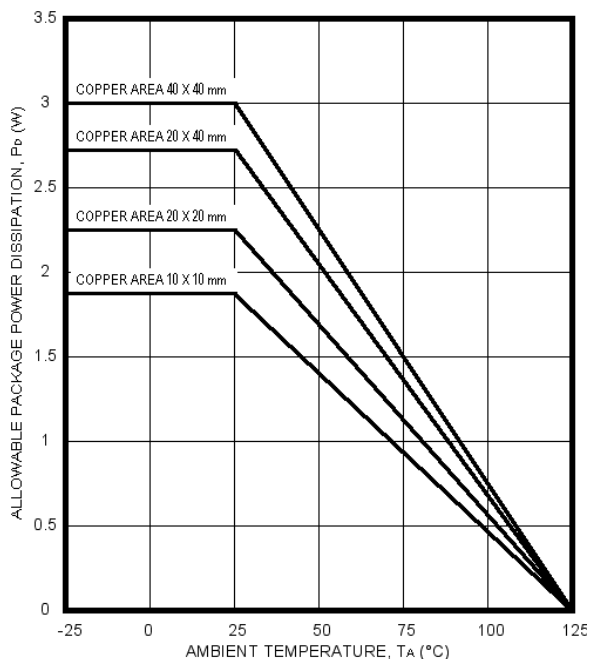
High-Current, Low-Dropout, 1.1~5 V Regulator

Linear
Regulators

FUNCTIONAL BLOCK DIAGRAM



Allowable Package Power Dissipation



Draw. G1C-003-7A

Recommended Operating Conditions

	Min	Max	Units
DC Input Voltage	—	6	V
DC Output Current	0	3	A
Adjustable Voltage Range	1.2	5	V
Operating Junction Temp.	-20	+100	°C

For the availability of parts meeting -40°C requirements, contact Sanken's Sales Representative.

This data sheet is based on Sanken data sheet SSJ-02059E

ELECTRICAL CHARACTERISTICS at $T_A = +25^\circ\text{C}$, $V_O = 2.5\text{ V}$ adjusted, $V_E = 2\text{ V}$ (unless otherwise noted).

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Output Voltage	V_O	$V_I = V_{O(\text{nom})} + 1\text{ V}$, $I_O = 10\text{ mA}$	—	$V_{O(\text{nom})}$	—	V
	$V_{O(\text{off})}$	$V_E = 0\text{ V}$	—	—	0.5	V
Output Volt. Temp. Coeff.	a_{VO}	$0^\circ\text{C} \leq T_J \leq 100^\circ\text{C}$	—	± 0.3	—	mV/ $^\circ\text{C}$
Internal Reference Voltage	V_{ref}	$V_I = V_{O(\text{nom})} + 1\text{ V}$, $I_O = 10\text{ mA}$	1.078	1.100	1.122	V
Output Short-Circuit Current	I_{OM}	$V_I = V_{O(\text{nom})} + 1\text{ V}$, see note	3.2	—	—	A
Line Regulation	$\Delta V_{O(\Delta V_I)}$	$V_I = 3.0 \sim 5.0\text{ V}$, $I_O = 10\text{ mA}$	—	—	10	mV
Load Regulation	$\Delta V_{O(\Delta I_O)}$	$V_I = 3.3\text{ V}$, $I_O = 0\text{ A} \sim 3.0\text{ A}$	—	—	40	mV
Dropout Voltage	$V_{\text{limin}} - V_O$	$I_O = 3.0\text{ A}$	—	—	0.6	V
Ground Terminal Current	I_{GND}	$V_I = V_{O(\text{nom})} + 1\text{ V}$, $I_O = 0\text{ mA}$, $V_E = 2.0\text{ V}$	—	1.0	1.5	mA
		$V_I = V_{O(\text{nom})} + 1\text{ V}$, $V_E = 0\text{ V}$	—	—	1.0	μA
Enable Input Voltage	V_{EH}	Output ON	2.0	—	—	V
	V_{EL}	Output OFF	—	—	0.8	V
Enable Input Current	I_{EH}	$V_E = 2.7\text{ V}$	—	—	100	μA
	I_{EL}	$V_E = 0\text{ V}$	—	0	-5.0	μA
Ripple Rejection Ratio	PSRR	$V_I = V_{O(\text{nom})} + 1\text{ V}$, $100\text{ Hz} \leq f \leq 120\text{ Hz}$	—	60	—	dB
Thermal Shutdown	T_J		135	152	—	$^\circ\text{C}$

Typical values are given for circuit design information only.

Note: Output short-circuit current is at point where output voltage has decreased 5% below $V_{O(\text{nom})}$.

SI-3011ZD

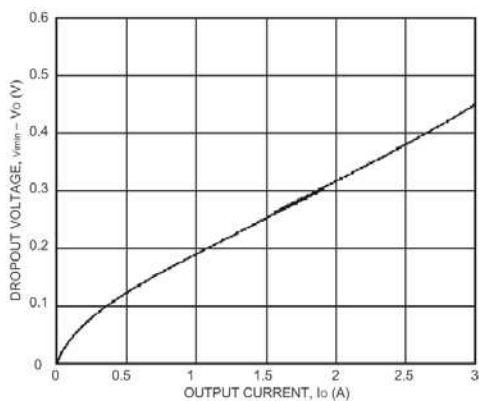
High-Current, Low-Dropout, 1.1~5 V Regulator

Linear
Regulators

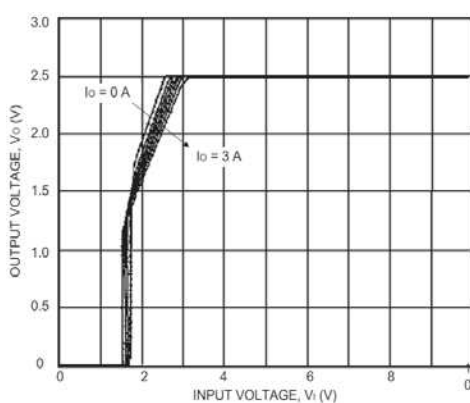
TYPICAL CHARACTERISTICS

($V_O = 2.5$ V adjusted, $T_A = 25^\circ\text{C}$)

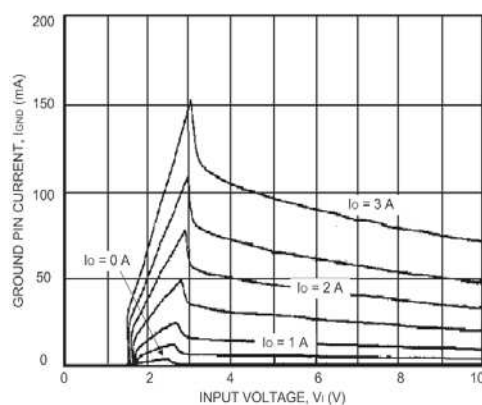
Dropout Voltage



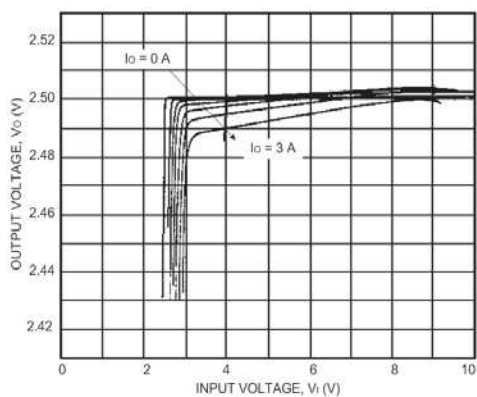
Low-Voltage Behavior



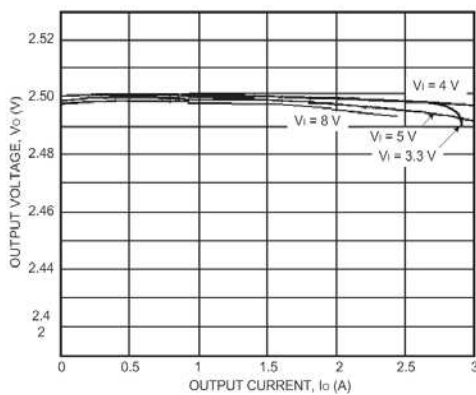
GND Pin Current



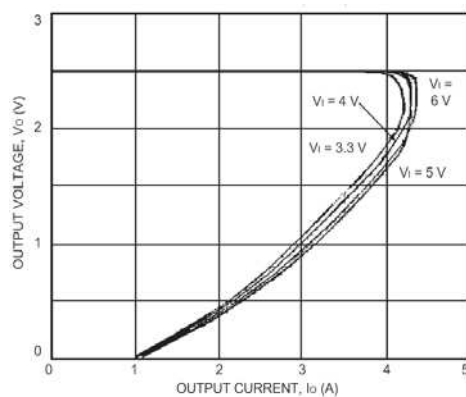
Line Regulation



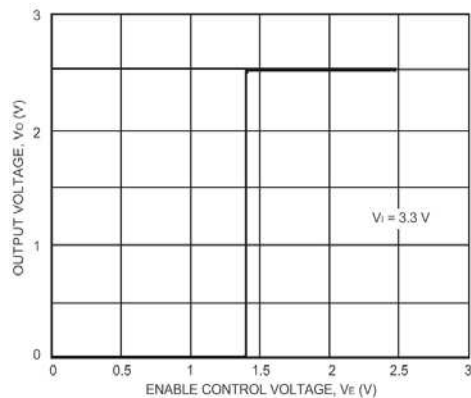
Load Regulation



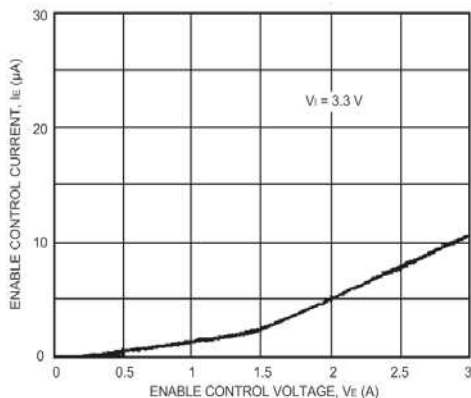
Overcurrent Protection



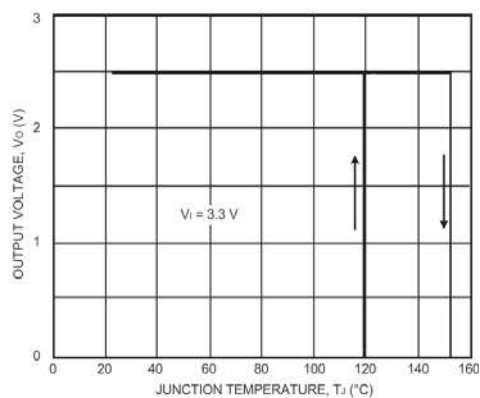
ENABLE Control Voltage



ENABLE Control Current



Thermal Protection



APPLICATIONS INFORMATION

Input Capacitor (C_I , 0.1 μ F to 10 μ F). This is necessary either when the input line includes inductance or when the wiring is long.

Output Capacitor (C_O , > 47 μ F). This device is not designed for a use with a very low ESR output capacitor such as a ceramic capacitor. Output oscillation may occur with that kind of capacitor.

Output Voltage Adjustable Resistors (R1 and R2). The output voltage is adjusted by R1 and R2. 10 k Ω or 11 k Ω for R2 is recommended.

$$R1 = (V_O - V_{ref}) / (V_{ref} / R2)$$

For an output voltage of 1.8 V or less, add a 10 k Ω resistor between ADJ and the junction of R1 and R2.

Determination of DC Input Voltage. The minimum input voltage $V_I(\min)$ should be higher than the sum of the fixed output voltage and the maximum rated dropout voltage. If setting the output voltage lower than 2.0 V, the minimum input voltage should be more than 2.4 V.

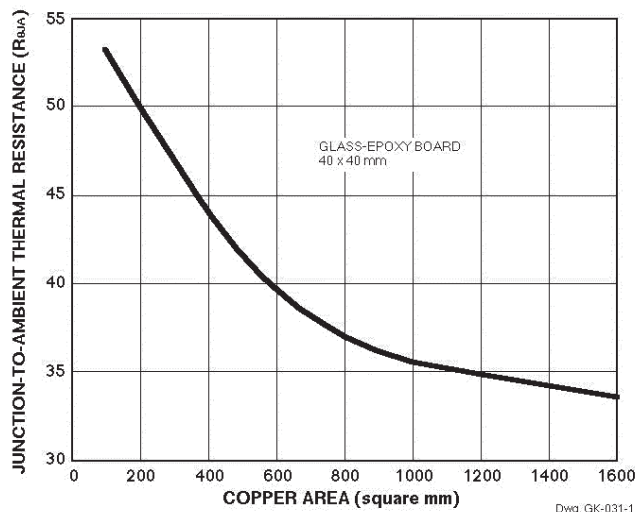
Overcurrent Protection. The SI-3000ZD series has a built-in fold-back type overcurrent protection circuit, which limits the output current at a start-up mode. It thus cannot be used in applications that require current at the start-up mode such as:

- (1) constant-current load,
- (2) power supply with positive and negative outputs to common load (a center-tap type power supply), or
- (3) raising the output voltage by putting a diode or a resistor between the device ground and system ground.

Thermal Protection. Circuitry turns off the pass transistor when the junction temperature rises above 135°C. It is intended only to protect the device from failures due to excessive junction temperatures and should not imply that output short circuits or continuous overloads are permitted.

Heat Radiation and Reliability. The reliability of the IC is directly related to the junction temperature (T_J) in its operation. Accordingly, careful consideration should be given to heat dissipation.

The inner frame on which the integrated circuit is mounted is connected to the GND terminal (pin 3). Therefore, it is very effective for heat radiation to enlarge the copper area that is connected to the GND terminal. The graph illustrates the effect of the copper area on the junction-to-ambient thermal resistance ($R_{\theta JA}$).



The junction temperature (T_J) can be determined from either of the following equations:

$$T_J = (P_D \times R_{\theta JA}) + T_A$$

or

$$T_J = (P_D \times R_{\theta JT}) + T_T$$

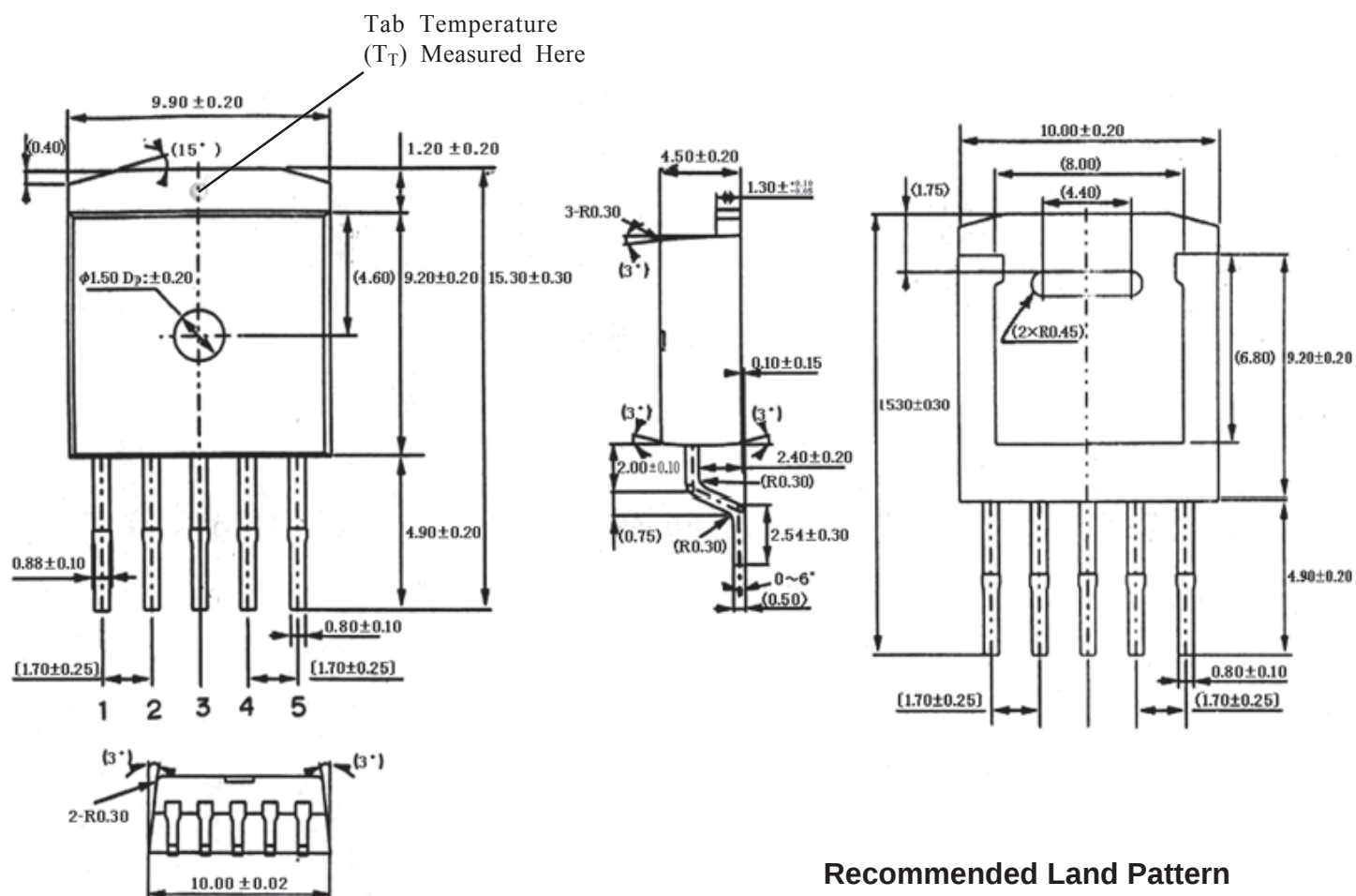
where $P_D = I_O \times (V_I - V_O)$ and $R_{\theta JT} = 3^\circ\text{C/W}$.

Parallel Operation. Parallel operation to increase load current is not permitted.

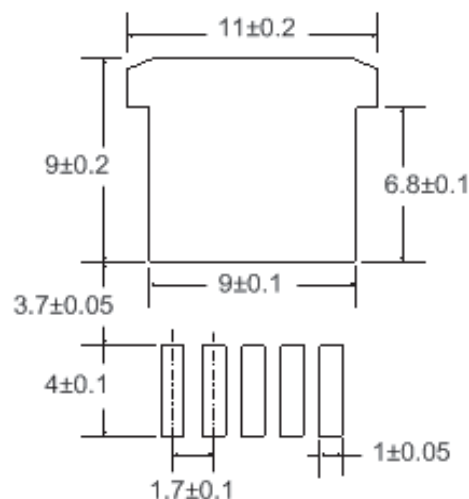
SI-3011ZD
High-Current,
Low-Dropout,
1.1~5 V Regulator

*Linear
Regulators*

Dimensions in Millimeters



Recommended Land Pattern



Notes:

1. Dimensions do not include mold protrusions.
2. () Is reference.
3. [] Is assembly out quality.
4. Heat sink side flash: 0.8 mm max.
5. Terminal finish: pure Sn, 2nd level interconnect category (e3)
6. Product weight: approximately 1.48 g

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In addition, it should be noted that since power devices or IC's including power devices have large self-heating value, the degree of derating of junction temperature affects the reliability significantly.

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