SI-3000LSA Series Surface-Mount, Low Current Consumption, Low Dropout Voltage Linear Regulator ICs

■Features

- Compact surface-mount package (SOP8)
- Output current: 1 A
- Low circuit current at output OFF: Iq(OFF) ≤ 1 μA (V_C = 0 V)
- Low dropout voltage: V_{DIF}≤0.8 V (at I_O = 1 A)
  V_{DIF} ≤1.2 V (I_O = 1 A) for SI-3018LSA
- 4 types of output voltages (1.8 V, 2.5 V, 3.3 V, 5.0 V) available
- Output ON/OFF control terminal voltage compatible with LS-TTL
- Built-in foldback-type-overcurrent and thermal protection circuits

■Absolute Maximum Ratings

(T_a=25°C)

Parameter	Symbol	Ratings	Unit
DC Input Voltage	V_{IN}	16	V
Output control terminal voltage	V_C	V_{IN}	V
DC Output Current	I_O	1	A
Power Dissipation	P_{D1}*1	1.16	W
	P_{D2}*2	1.1	W
Junction Temperature	T_j*3	–30 to +150	°C
Operating Ambient Temperature	T_{op}	–30 to +150	°C
Storage Temperature	T_{stg}	–30 to +150	°C
Thermal Resistance (Junction to Lead (pin 8))	$\theta_{j\text{-}l}$	36	°C/W
Thermal Resistance (Junction to Ambient Air)	$\theta_{j\text{-}a}$*2	100	°C/W

*1: When mounted on glass-epoxy board 56.5 × 56.5 mm (copper laminate area 100%).
*2: When mounted on glass-epoxy board 40 × 40 mm (copper laminate area 100%).
*3: Thermal protection circuits may be activated if the junction temperature exceeds 135°C.

■Applications

- Auxiliary power supplies for PC
- Battery-driven electronic equipment

■Recommended Operating Conditions

Parameter	Symbol	Ratings				Unit
		SI-3018LSA	SI-3025LSA	SI-3033LSA	SI-3050LSA	
DC Input Voltage Range	V_{IN}	3.1 to 3.5*1	*2 to 3.5*1	*2 to 5.2*1	*2 to 8.0	V
DC Output Current Range	I_O	0 to 1				A
Operating Junction Temperature	T_{jop}	–20 to +125				°C
Operating Ambient Temperature	T_{aop}	–30 to +85				°C

*1: V_{IN} (max) and I_O (max) are restricted by the relation $P_D = (V_{IN} - V_O) \times I_O$.
Please calculate these values referring to the reference data on page 15.
*2: Refer to the Dropout Voltage parameter.

■Electrical Characteristics

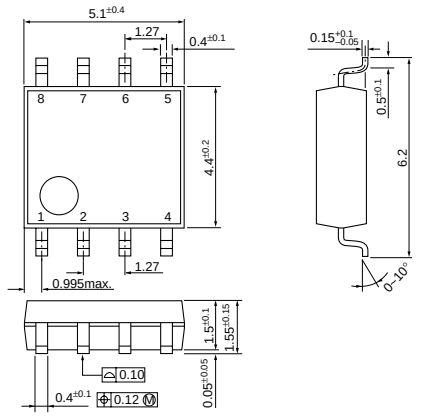
(T_a=25°C, V_C=2V unless otherwise specified)

Parameter		Symbol	Ratings												Unit
			SI-3018LSA			SI-3025LSA			SI-3033LSA			SI-3050LSA			
			min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	min.	typ.	max.	
Output Voltage		V_O	1.764	1.800	1.836	2.450	2.500	2.550	3.234	3.300	3.366	4.90	5.00	5.10	V
		Conditions	V_{IN}=3.3V, I_O=0.5A			V_{IN}=3.3V, I_O=0.5A			V_{IN}=5V, I_O=0.5A			V_{IN}=6.5V, I_O=0.5A			
Dropout Voltage		V_{DIF}		–				0.4			0.4			0.4	V
		Conditions		–		I_O≤0.5A			I_O≤0.5A			I_O≤0.5A			
				0.6	1.2			0.8			0.8			0.8	
		Conditions	I_O≤1A												
Line Regulation		ΔV_{LINE}		2	10		2	10		3	10			15	mV
		Conditions	V_{IN}=3.1 to 3.5V, I_O=0.3A			V_{IN}=3.1 to 3.5V, I_O=0.3A			V_{IN}=4.5 to 5.5V, I_O=0.3A			V_{IN}=6 to 7V, I_O=0.3A			
Load Regulation		ΔV_{OLOAD}		10	20		10	20		10	20			30	mV
		Conditions	V_{IN}=3.3V, I_O=0 to 1A			V_{IN}=3.3V, I_O=0 to 1A			V_{IN}=5V, I_O=0 to 1A			V_{IN}=6.5V, I_O=0 to 1A			
Temperature Coefficient of Output Voltage		$\Delta V_O/\Delta T_a$		±0.3			±0.3			±0.3			±0.5		mV/°C
		Conditions	V_{IN}=3.3V, I_O=5mA, T_j=0 to 100°C			V_{IN}=3.3V, I_O=5mA, T_j=0 to 100°C			V_{IN}=5V, I_O=5mA, T_j=0 to 100°C			V_{IN}=6.5V, I_O=5mA, T_j=0 to 100°C			
Ripple Rejection		R_{REJ}		60			57			55			55		dB
		Conditions	V_{IN}=3.3V, f=100 to 120Hz			V_{IN}=3.3V, f=100 to 120Hz			V_{IN}=5V, f=100 to 120Hz			V_{IN}=6.5V, f=100 to 120Hz			
Quiescent Circuit Current		I_q		1.7	2.5		1.7	2.5		1.7	2.5		1.7	2.5	mA
		Conditions	V_{IN}=3.3V, I_O=0A			V_{IN}=3.3V, I_O=0A			V_{IN}=5V, I_O=0A			V_{IN}=6.5V, I_O=0A			
Circuit Current at Output OFF		I_q(OFF)			1			1			1			1	μA
		Conditions	V_{IN}=3.3V, I_O=0A, V_C=0V			V_{IN}=3.3V, I_O=0A, V_C=0V			V_{IN}=5V, I_O=0A, V_C=0V			V_{IN}=6.5V, I_O=0A, V_C=0V			
Overcurrent Protection Starting Current*1,3		I_{S1}	1.2			1.2			1.2			1.2			A
		Conditions	V_{IN}=3.3V			V_{IN}=3.3V			V_{IN}=5V			V_{IN}=6V			
V_C Terminal	Control Voltage (Output ON)*2	V_C, IH	2.0			2.0			2.0			2.0			V
	Control Voltage (Output OFF)*2	V_C, IL			0.8			0.8			0.8			0.8	
	Control Current (Output ON)	I_C, IH		40	80		40	80		40	80		40	80	μA
		Conditions	V_C=2V												
	Control Current (Output OFF)	I_C, IL		0	–5		0	–5		0	–5		0	–5	μA
		Conditions	V_C=0V												

*1: I_{S1} is specified at the 5% drop point of output voltage V_O on the condition that V_{IN} = 3.3 V (5 V for SI-3033LSA), and I_O = 0.5 A.
*2: Output is OFF when the output control terminal VC is open. Each input level is equivalent to LS-TTL level. Therefore, the device can be driven directly by LS-TTLs.
*3: These products cannot be used in the following applications. Because these applications require a certain current at start-up and so the built-in foldback-type overcurrent protection may cause errors during start-up stage.
(1) Constant current load (2) Positive and negative power supply (3) Series-connected power supply (4) V_O adjustment by raising ground voltage

■External Dimensions (SOP8)

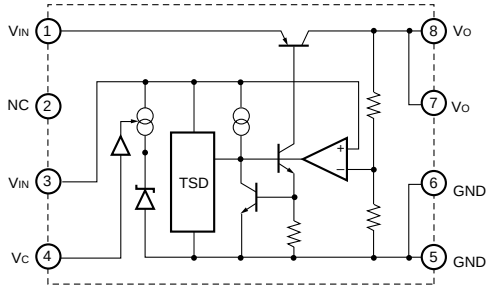
(Unit : mm)



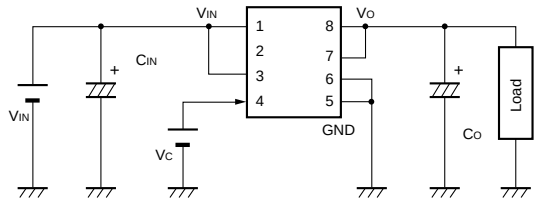
Pin Assignment
① V_{IN}
② NC (Leave open)
③ V_{IN}
④ V_C
⑤ GND
⑥ GND
⑦ V_O
⑧ V_O

Plastic Mold Package Type
Flammability: UL94V-0
Product Mass: Approx. 0.1g

■Block Diagram



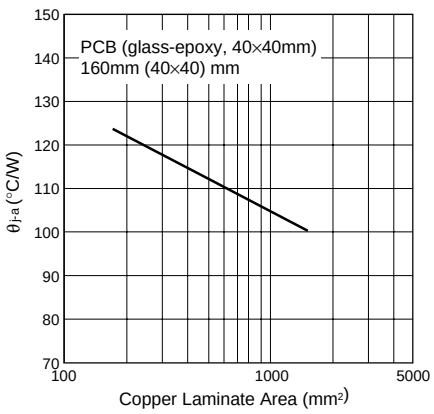
■Typical Connection Diagram



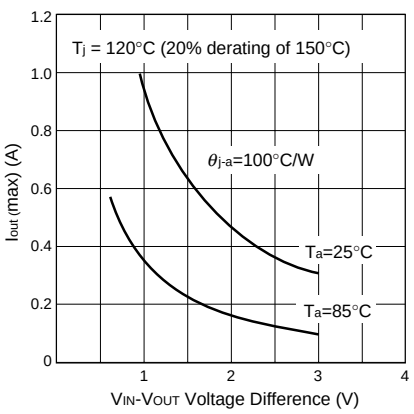
C_O: Output capacitor (22 μF or larger)
C_{IN}: Input capacitor (10 μF)
This capacitor is required in the case of an inductive input line or long wiring.
Tantalum capacitors are recommended for C_{IN} and C_O, particularly at low temperatures.
* Leave pin 2 open.

■Reference Data

PCB Copper Laminate Area vs. Junction to Ambient Air Thermal Resistance



Allowable Output Current (vs. V_{IN}-V_{OUT} Voltage Difference) V_{IN}-Io max

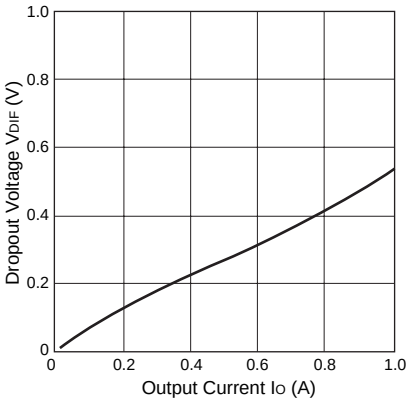


The inner frame stage, on which the PTr is mounted, is directly connected to the V_{OUT} pin.
Therefore, enlarging the copper laminate area around the V_{OUT} pin is really effective for a heat radiation.

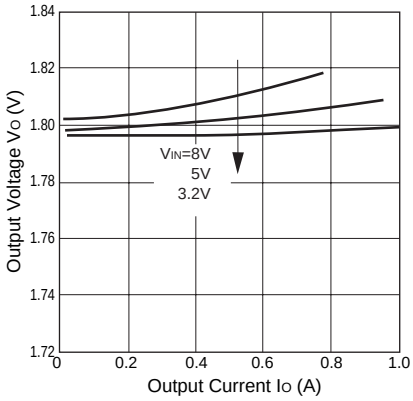
■Typical Characteristics of SI-3018LSA

(T_a=25°C)

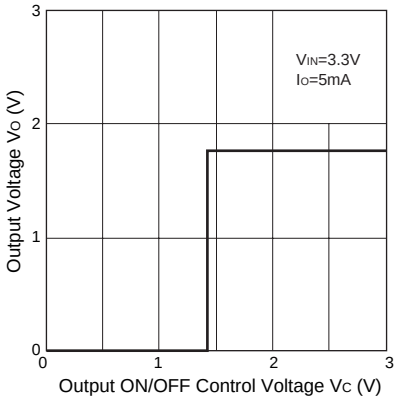
Io vs. VDIF Characteristics



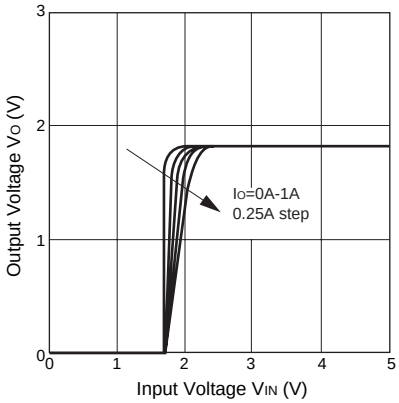
Load Regulation



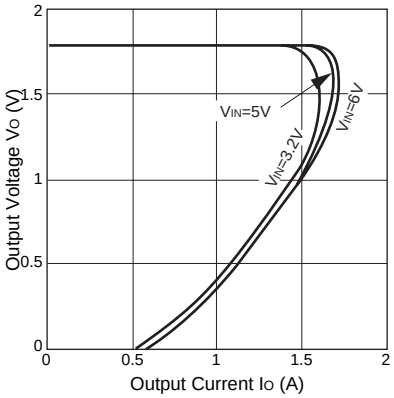
Output ON/OFF Control



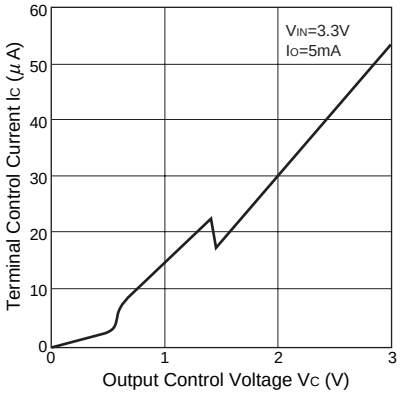
Output Voltage Characteristics



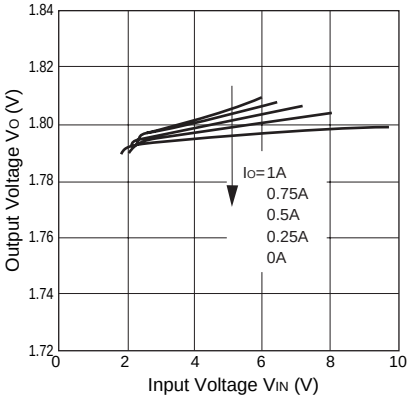
Overcurrent Protection Characteristics



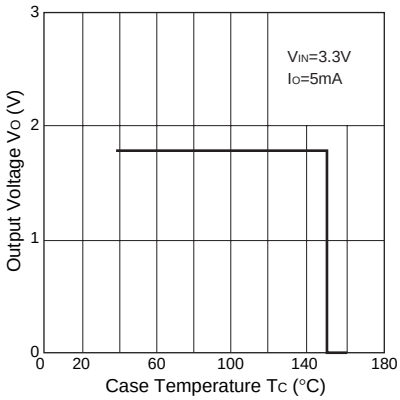
Output ON/OFF Control Current



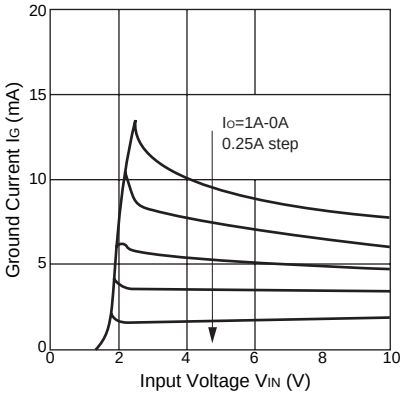
Line Regulation



Thermal Protection Characteristics



Circuit Current



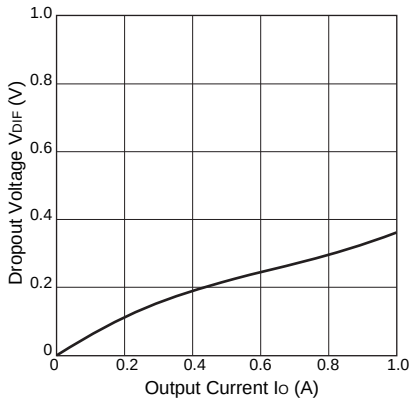
[Note on Thermal Protection]

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

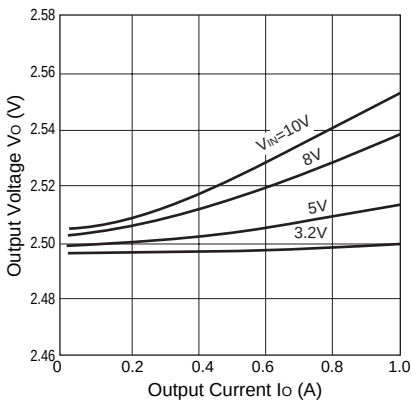
■Typical Characteristics of SI-3025LSA

(T_a=25°C)

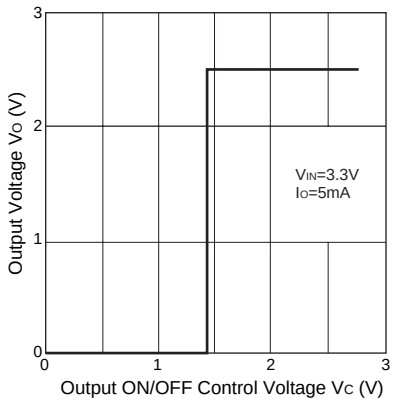
I_O vs. V_{DIF} Characteristics



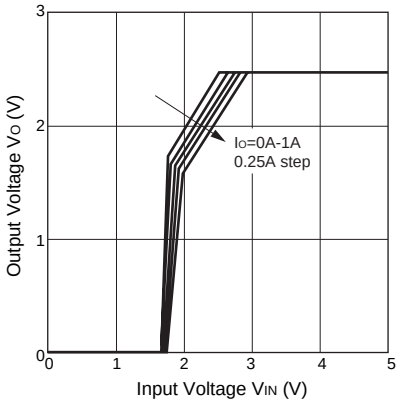
Load Regulation



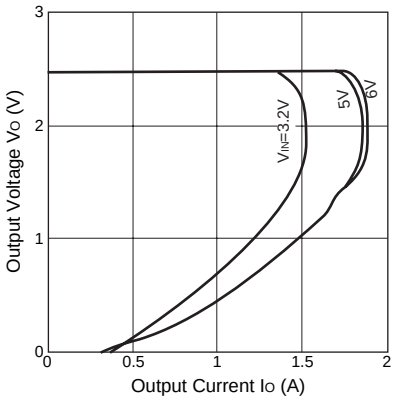
Output ON/OFF Control



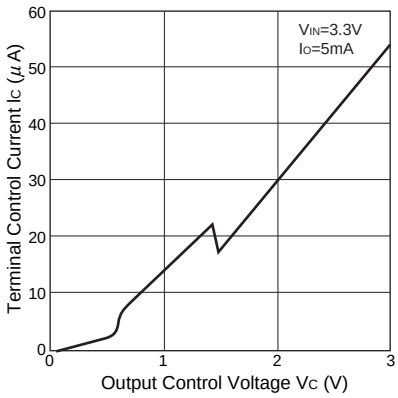
Output Voltage Characteristics



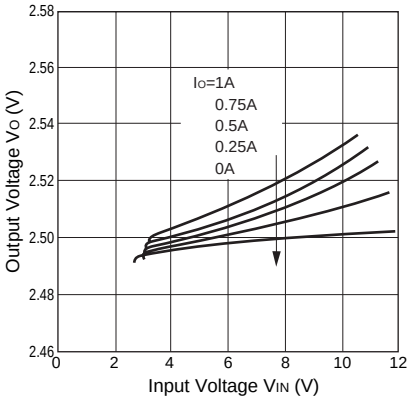
Overcurrent Protection Characteristics



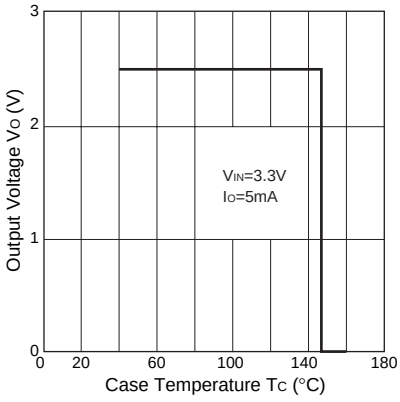
Output ON/OFF Control Current



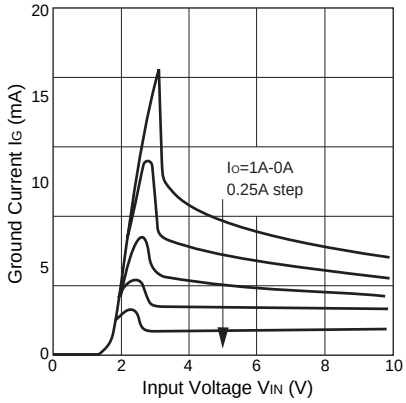
Line Regulation



Thermal Protection Characteristics



Circuit Current



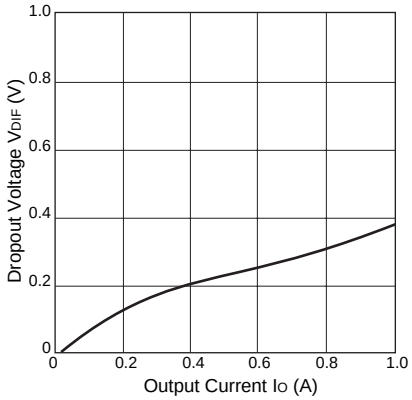
[Note on Thermal Protection]

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

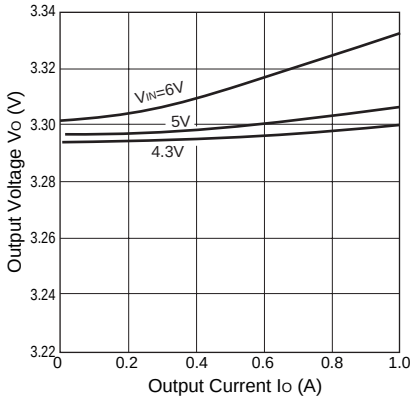
■Typical Characteristics of SI-3033LSA

(T_a=25°C)

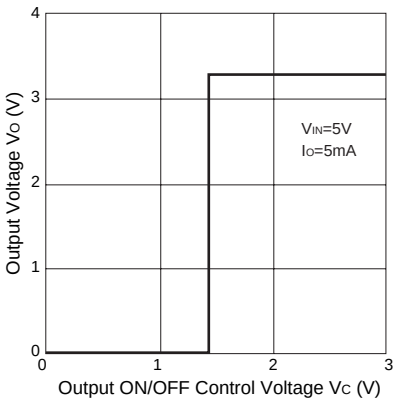
Io vs. VDIF Characteristics



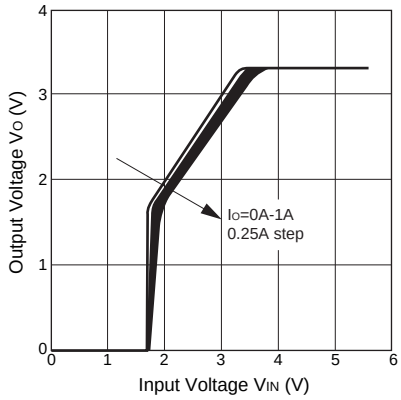
Load Regulation



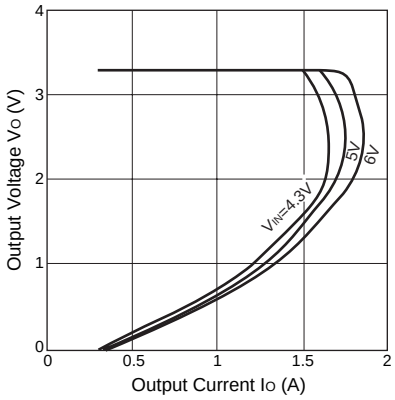
Output ON/OFF Control



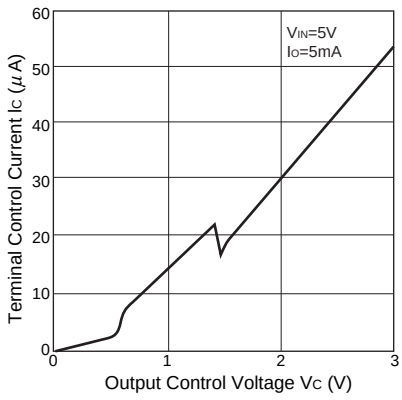
Output Voltage Characteristics



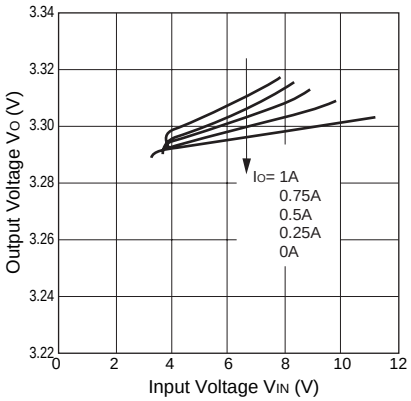
Overcurrent Protection Characteristics



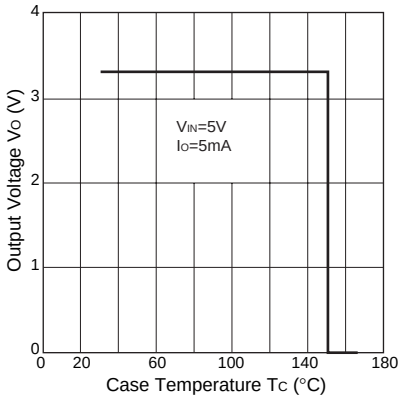
Output ON/OFF Control Current



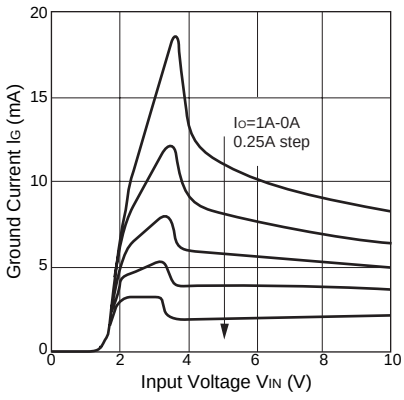
Line Regulation



Thermal Protection Characteristics



Circuit Current



[Note on Thermal Protection]

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