

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

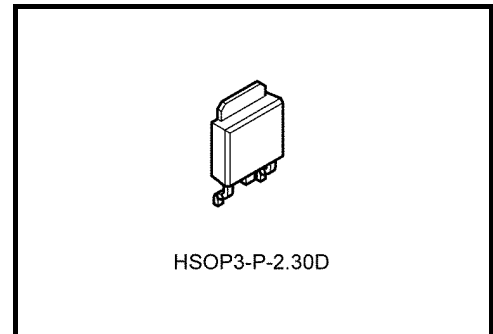
TA78033AF, TA7804AF, TA7805AF, TA7807AF, TA7808AF, TA7809AF

1 A Three-Terminal Positive Voltage Regulator

The TA78***AF series consists of fixed-positive-output voltage regulator ICs capable of sourcing current of up to 1A.

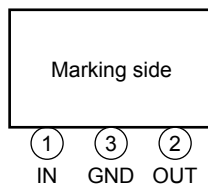
Features

- Maximum output current: 1 A
- Output voltage: 3.3 / 4.0 / 5.0 / 7.0 / 8.0 / 9.0 V
- Output voltage accuracy: $V_{OUT} \pm 4\%$ (@ $T_j = 25^\circ\text{C}$)
- Protection function: over current protection /thermal shutdown /safe operating area(SOA)
- Package type: New PW-Mold

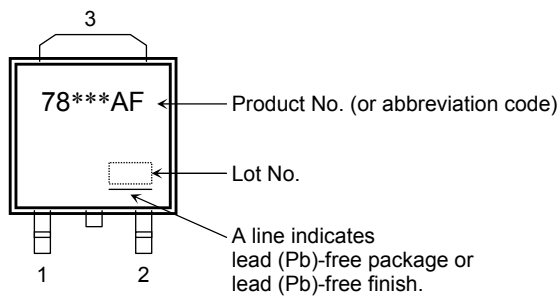


Weight : 0.36 g (typ.)

Pin Assignment



Marking



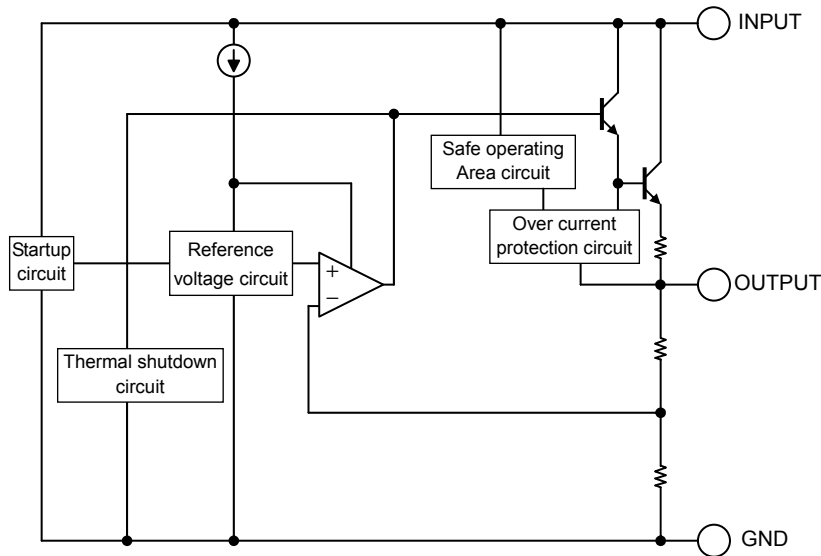
Note: The “***” in the each product number is replaces with the output voltage of each product.

How to Order(Note1)

Product No.	Package	Package Type and Capacity
TA78**AF (TE16L1,NQ TA78***AF (TE16L1NQ	New PW-Mold: Surface-mount	Tape (2000 pcs/reel)

Note 1: The “***” in each pro-forma product number is replaced with the output voltage of each product.

Block Diagram



Absolute Maximum Ratings (Ta = 25°C) (Note2)

Characteristic	Symbol	Rating	Unit	
Input voltage	V_{IN}	20	V	
Output current	I_{OUT}	1	A	
Operating Junction temperature	$T_{j(opr)}$	-40~135	°C	
Junction temperature	T_j	150	°C	
Storage temperature	T_{stg}	-55~150	°C	
Power dissipation	P_D	Ta = 25°C	1	W
		Tc = 25°C	10	

Note 2: Do not apply current and voltage (including reverse polarity) to any pin that is not specified.

Note 3: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Thermal characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, junction to ambient	$R_{th(j-a)}$	125	°C / W
Thermal resistance, junction to case	$R_{th(j-c)}$	12.5	°C / W

Protection Function (reference) (Note3)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Thermal shutdown	T_{SD}	$V_{IN} = V_{OUT} + 5V$	—	175	—	°C
Peak circuit current	I_{PEAK}	$V_{IN} = V_{OUT} + 5V, T_j = 25°C$	—	1.7	—	A
Short circuit current	I_{SC}	$V_{IN} = V_{OUT} + 5V, T_j = 25°C$	—	1.5	—	A

Note 3: Ensure that the devices operate within the limits of the maximum rating when in actual use.

TA78033AF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 0.1 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 8.3 \text{ V}$, $I_{OUT} = 100 \text{ mA}$	3.168	3.300	3.432	V
		$5.8 \text{ V} \leq V_{IN} \leq 13.3 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	3.135	3.300	3.465	
Line regulation	Reg·line	$5.8 \text{ V} \leq V_{IN} \leq 13.3 \text{ V}$, $I_{OUT} = 500 \text{ mA}$	—	5	50	mV
Load regulation	Reg·load	$V_{IN} = 8.3 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	5	50	mV
Quiescent current	I_B	$V_{IN} = 8.3 \text{ V}$, $I_{OUT} = 5 \text{ mA}$,	—	3	8	mA
Quiescent current change	ΔI_B	$5.8 \text{ V} \leq V_{IN} \leq 13.3 \text{ V}$, $I_{OUT} = 5 \text{ mA}$	—	—	1.3	mA
Output noise voltage	V_{NO}	$V_{IN} = 8.3 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	50	—	μVrms
Ripple rejection	R.R.	$6.3 \text{ V} \leq V_{IN} \leq 13.3 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $f = 120 \text{ Hz}$	—	67	—	dB
Dropout voltage	V_D	$I_{OUT} = 1 \text{ A}$	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 8.3 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	± 0.33	—	$\text{mV}/^\circ\text{C}$

TA7804AF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 0.1 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 9 \text{ V}$, $I_{OUT} = 100 \text{ mA}$	3.84	4.00	4.16	V
		$6.5 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$,	3.8	4.0	4.2	
Line regulation	Reg·line	$6.5 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $I_{OUT} = 500 \text{ A}$	—	10	50	mV
Load regulation	Reg·load	$V_{IN} = 9 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	10	50	mV
Quiescent current	I_B	$V_{IN} = 9 \text{ V}$, $I_{OUT} = 5 \text{ mA}$,	—	3	8	mA
Quiescent current change	ΔI_B	$6.5 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $I_{OUT} = 5 \text{ mA}$	—	—	1.3	mA
Output noise voltage	V_{NO}	$V_{IN} = 9 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	50	—	μVrms
Ripple rejection	R.R.	$7 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $f = 120 \text{ Hz}$	—	66	—	dB
Dropout voltage	V_D	$I_{OUT} = 1 \text{ A}$	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 9 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	± 0.4	—	$\text{mV}/^\circ\text{C}$

TA7805AF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 0.1 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 10 \text{ V}$, $I_{OUT} = 100 \text{ mA}$	4.8	5.0	5.2	V
		$7.5 \text{ V} \leq V_{IN} \leq 15 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$,	4.75	5.00	5.25	
Line regulation	Reg·line	$7.5 \text{ V} \leq V_{IN} \leq 15 \text{ V}$, $I_{OUT} = 500 \text{ mA}$	—	10	50	mV
Load regulation	Reg·load	$V_{IN} = 10 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	10	50	mV
Quiescent current	I_B	$V_{IN} = 10 \text{ V}$, $I_{OUT} = 5 \text{ mA}$,	—	3	8	mA
Quiescent current change	ΔI_B	$7.5 \text{ V} \leq V_{IN} \leq 15 \text{ V}$, $I_{OUT} = 5 \text{ mA}$	—	—	1.3	mA
Output noise voltage	V_{NO}	$V_{IN} = 10 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	50	—	μVrms
Ripple rejection	R.R.	$8 \text{ V} \leq V_{IN} \leq 15 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $f = 120 \text{ Hz}$	—	64	—	dB
Dropout voltage	V_D	$I_{OUT} = 1 \text{ A}$	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 10 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	± 0.5	—	$\text{mV}/^\circ\text{C}$

TA7807AF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 0.1 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 12 \text{ V}$, $I_{OUT} = 100 \text{ mA}$	6.72	7.00	7.28	V
		$9.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$,	6.65	7.00	7.35	
Line regulation	Reg·line	$9.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 500 \text{ mA}$	—	15	50	mV
Load regulation	Reg·load	$V_{IN} = 12 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	15	50	mV
Quiescent current	I_B	$V_{IN} = 12 \text{ V}$, $I_{OUT} = 5 \text{ mA}$,	—	3	8	mA
Quiescent current change	ΔI_B	$9.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 5 \text{ mA}$	—	—	1.3	mA
Output noise voltage	V_{NO}	$V_{IN} = 12 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	60	—	μVrms
Ripple rejection	R.R.	$10 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $f = 120 \text{ Hz}$	—	60	—	dB
Dropout voltage	V_D	$I_{OUT} = 1 \text{ A}$	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 12 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	± 0.7	—	$\text{mV}/^\circ\text{C}$

TA7808AF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 0.1 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 13 \text{ V}$, $I_{OUT} = 100 \text{ mA}$	7.68	8.00	8.32	V
		$10.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$,	7.6	8.0	8.4	
Line regulation	Reg·line	$10.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 500 \text{ mA}$	—	15	50	mV
Load regulation	Reg·load	$V_{IN} = 13 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	15	50	mV
Quiescent current	I_B	$V_{IN} = 13 \text{ V}$, $I_{OUT} = 5 \text{ mA}$,	—	3	8	mA
Quiescent current change	ΔI_B	$10.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 5 \text{ mA}$	—	—	1.3	mA
Output noise voltage	V_{NO}	$V_{IN} = 13 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	70	—	μVrms
Ripple rejection	R.R.	$11 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $f = 120 \text{ Hz}$	—	60	—	dB
Dropout voltage	V_D	$I_{OUT} = 1 \text{ A}$	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 13 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	± 0.8	—	$\text{mV}/^\circ\text{C}$

TA7809AF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 0.1 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

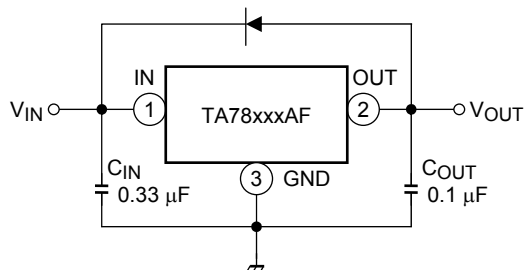
Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 14 \text{ V}$, $I_{OUT} = 100 \text{ mA}$	8.64	9.00	9.36	V
		$11.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$,	8.55	9.00	9.45	
Line regulation	Reg·line	$11.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 500 \text{ mA}$	—	15	50	mV
Load regulation	Reg·load	$V_{IN} = 14 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	15	50	mV
Quiescent current	I_B	$V_{IN} = 14 \text{ V}$, $I_{OUT} = 5 \text{ mA}$,	—	3	8	mA
Quiescent current change	ΔI_B	$12 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 5 \text{ mA}$	—	—	1.3	mA
Output noise voltage	V_{NO}	$V_{IN} = 14 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	75	—	μVrms
Ripple rejection	R.R.	$11.5 \text{ V} \leq V_{IN} \leq 16 \text{ V}$, $I_{OUT} = 50 \text{ mA}$ $f = 120 \text{ Hz}$	—	60	—	dB
Dropout voltage	V_D	$I_{OUT} = 1 \text{ A}$	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 14 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	± 0.9	—	$\text{mV}/^\circ\text{C}$

Electrical Characteristics for All Products

Generally, the characteristics of power supply ICs vary with temperature.

The ratings at $T_j = 25^\circ\text{C}$ assume that a temperature increase has no effect on IC characteristics as ascertained by pulse tests.

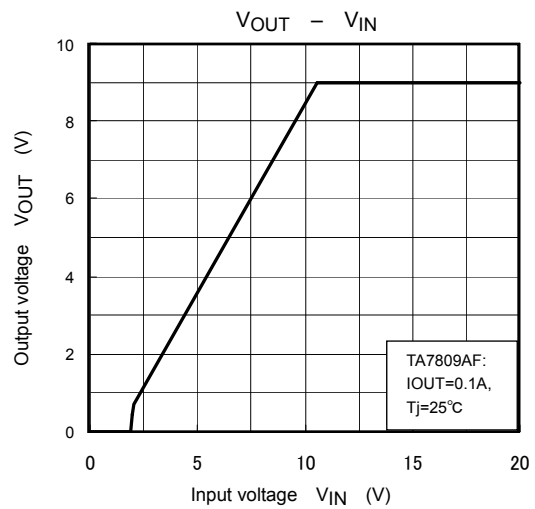
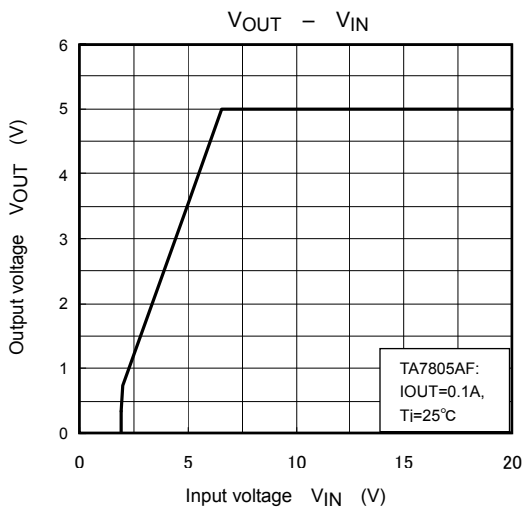
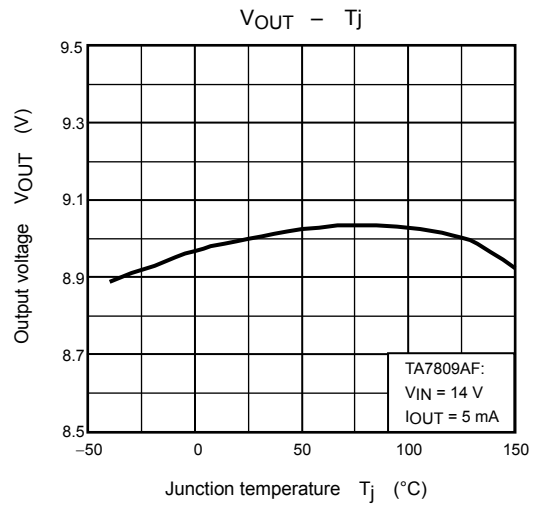
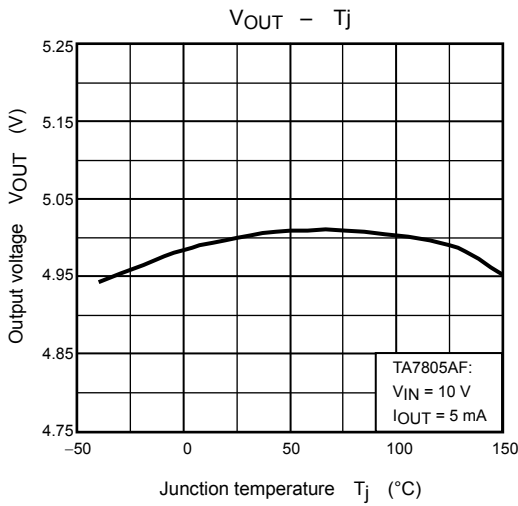
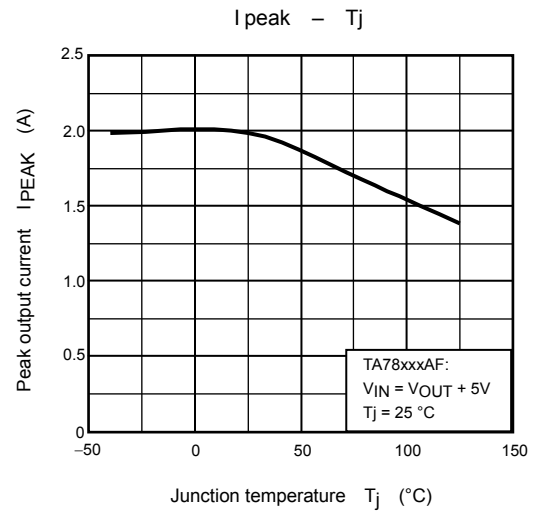
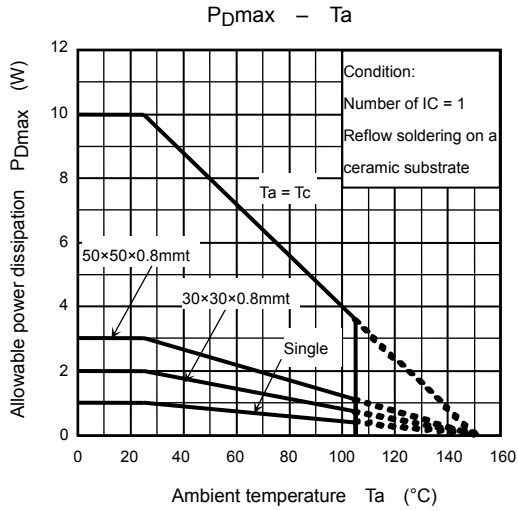
Standard Application Circuit

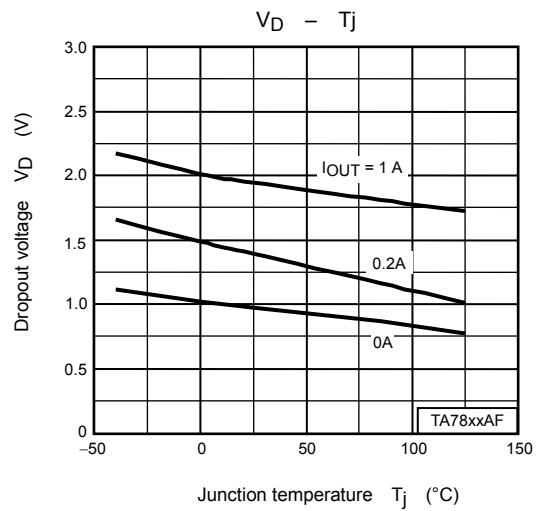
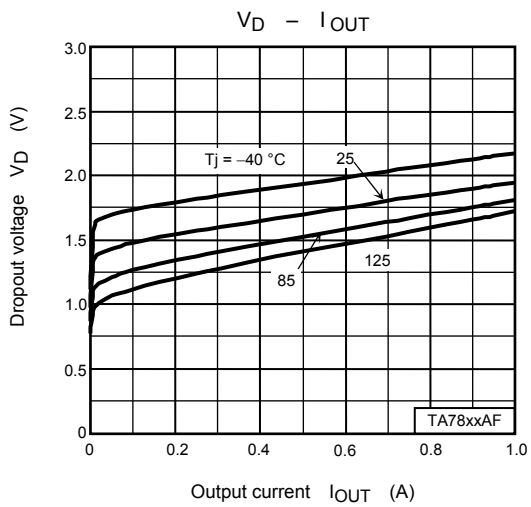
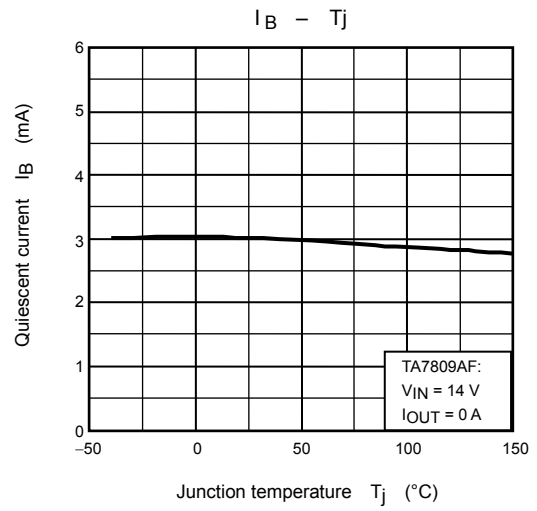
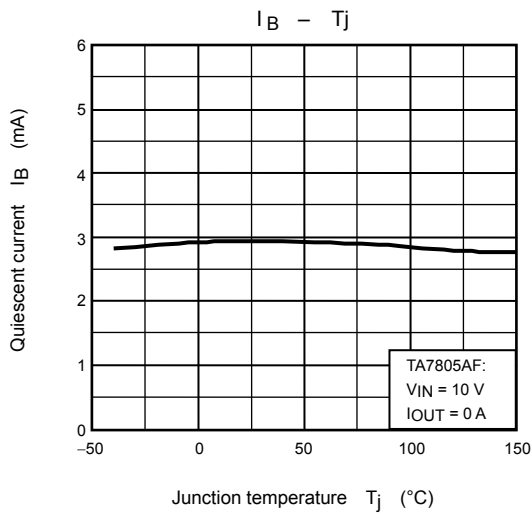
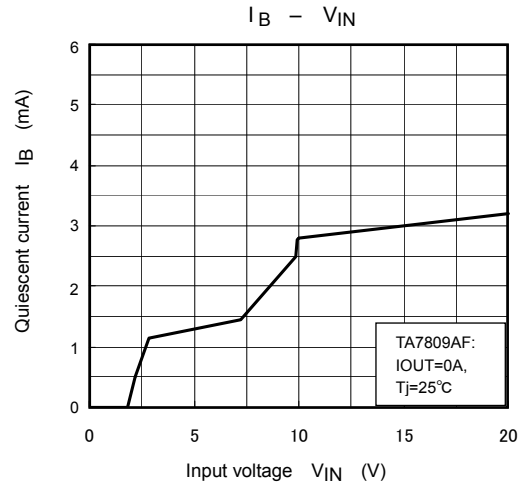
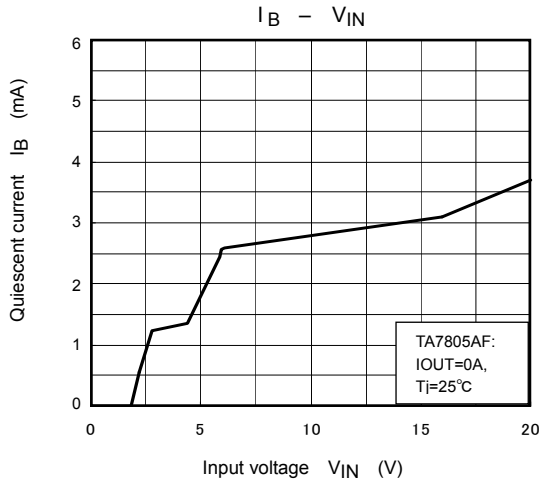


- Place C_{IN} as close as possible to the input terminal and GND. Place C_{OUT} as close as possible to the output terminal and GND. Although capacitor C_{OUT} acts to smooth the dc output voltage during suspension of output oscillation or load change, it might cause output oscillation in a cold environment due to increased capacitor ESR. It is therefore recommended to use a capacitor with small variations temperature sensitivity. The IC may oscillate due to external conditions (output current, temperature, or the type of the capacitor used). The type of capacitor required must be determined by the actual application circuit in which the IC is used.

The notice in case of application

- If the input terminal shorts to GND in a state of normal operation, the output terminal voltage becomes higher than the input voltage (GND potential), and the electric charge of a chemical capacitor connected to the output terminal flows into the input side, which may cause the destruction of circuit. In these cases, take such steps as a zener diode and a general silicon diode are connected to the circuit, as shown in the above figure
- There is a possibility that internal parasitic devices may be generated when momentary transients cause a terminal's potential to fall below that of the GND terminal. In such case, that the device could be destroyed. The voltage of each terminal and any state must therefore never fall below the GND potential.

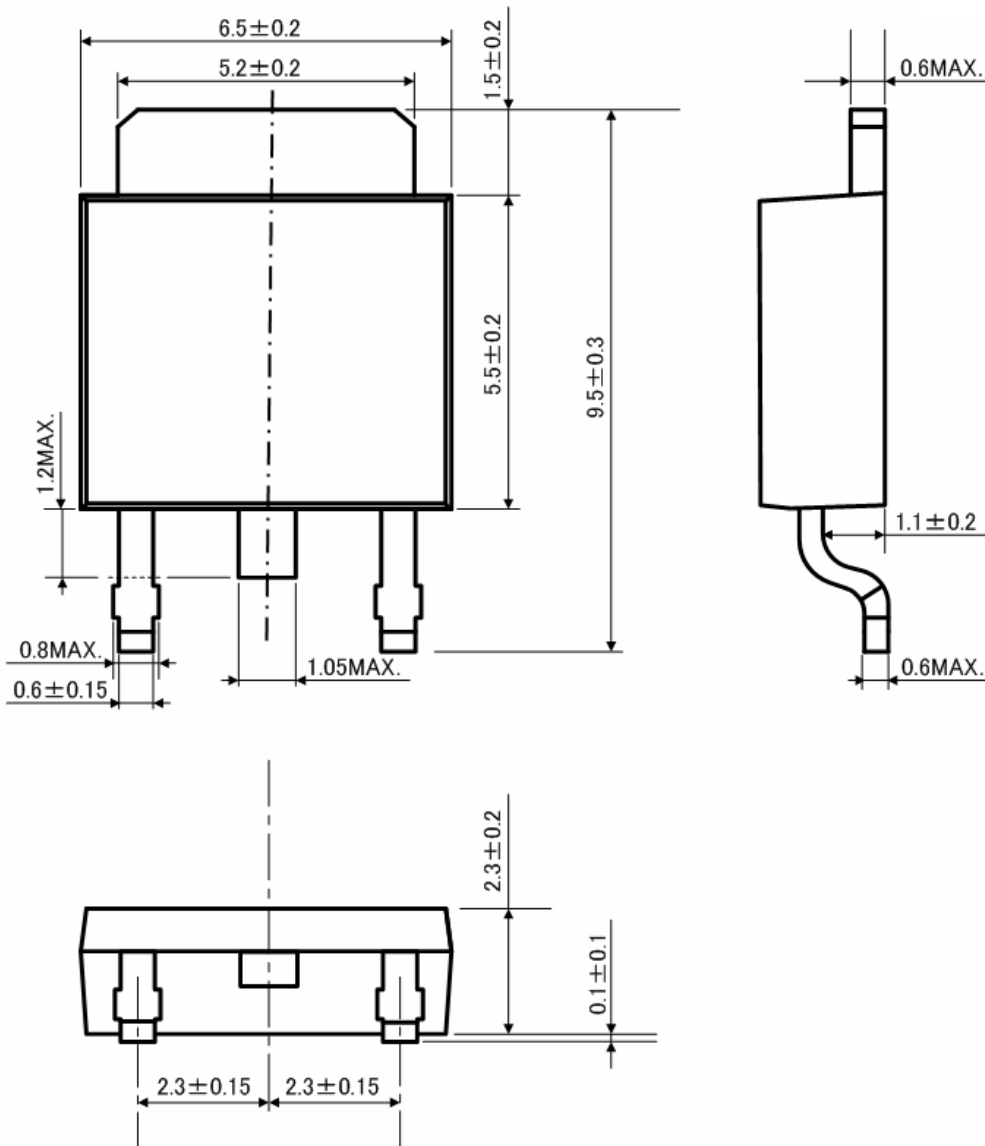




Package Dimensions

HSOP-3-P-2.30D

Unit : mm



Weight: 0.36 g (Typ.)

RESTRICTIONS ON PRODUCT USE

20070701-EN

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- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc.
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