

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

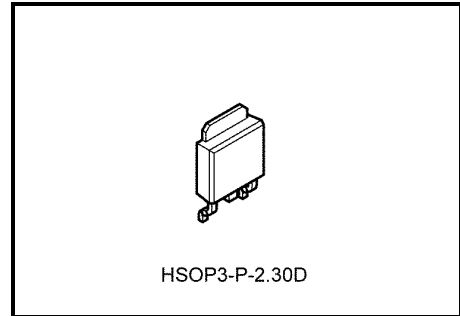
TA48015BF, TA48018BF, TA48025BF, TA48033BF, TA4805BF, TA4808BF, TA4809BF

1 A Three-Terminal Low-Dropout Voltage Regulator

The TA48***BF series consists of fixed-positive-output, low-dropout regulators with an output current of 1 A (max) that utilize V-PNP transistors for the output stage. In response to the need for low-voltage and low-power dissipation devices for use in consumer electronics and industrial appliances, the series offers devices with low output voltages: 1.5 V, 1.8 V, 2.5 V, 3.3 V, 5 V, 8 V, 9 V

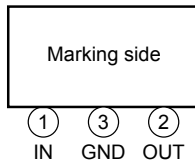
Features

- Maximum output current: 1 A
- Low output voltage : 1.5 / 1.8 / 2.5 / 3.3 / 5.0 / 8.0 / 9.0 V
- Output voltage accuracy: $V_{OUT} \pm 3\%$ (@ $T_j = 25^\circ\text{C}$)
- Low standby current: 850 μA (typ.) (@ $I_{OUT} = 0\text{ A}$)
- Low starting quiescent current
- Low-dropout voltage: $V_D = 0.5\text{ V}$ (max) (@ $I_{OUT} = 0.5\text{ A}$)
(1.1V only for TA48015BF)
- C_{OUT} (reference): 2.2 μF (multi-layer ceramic type)
- Protection function: Over current protection / Thermal shutdown / SOA
- Package type: Surface-mount New PW-Mold



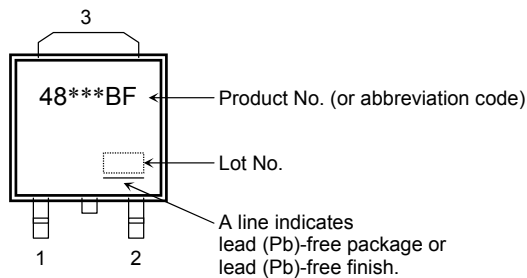
Weight
HSOP3-P-2.30D : 0.36 g (typ.)

Pin Assignment



Marking

TA48***BF Series

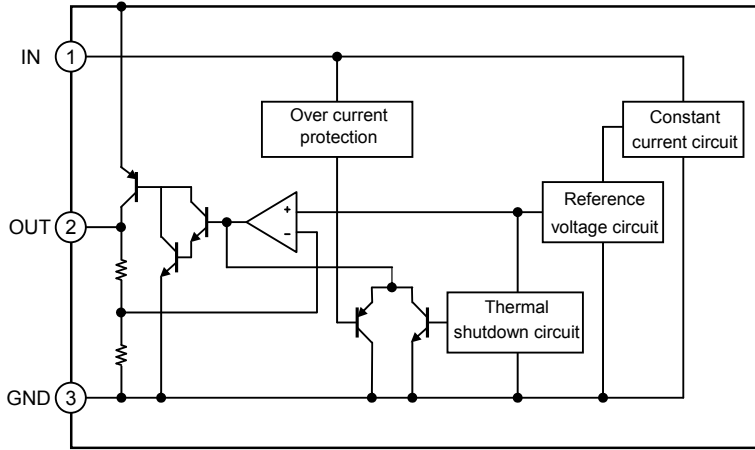


Note: The "****" part of each product number varies according to the output voltage of the product.
Be careful of static electricity when handling.

How to Order

	Product No.	Package	Packing Type and Unit for Orders
	TA48***BF (T6L1, NQ)	New PW-MOLD: Surface-mount	Tape (2000 pcs/reel)

Block Diagram



Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Input voltage	V _{IN}	16	V
Output current	I _{OUT}	1	A
Operating junction temperature	T _{j(opr)}	-40~150	°C
Junction temperature	T _j	150	°C
Storage temperature	T _{stg}	-55~150	°C
Power dissipation	Ta = 25°C	P _D	W
	Tc = 25°C		

Note 1: Do not apply external current and voltage (including negative voltage) to non-specified pins.

Note 2: 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)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Thermal shutdown	T _{SD}	V _{IN} = 3.4 V (015~018BF) / 3.5 V (025BF)	150	175	—	°C
Thermal shutdown hysteresis width	T _{SD(hys)}	4.3 V (033BF) / 6.0 V (05BF) / 9.0 V (08BF) / 10.0 V (09BF)	—	20	—	°C
Peak circuit current	I _{PEAK}	V _{IN} = V _{OUT} + 2 V, T _j = 25°C	—	1.7	—	A
		V _{IN} = 12 V, T _j = 25°C	—	1.8	—	A
Short circuit current	I _{SC}	V _{IN} = V _{OUT} + 2 V, T _j = 25°C	—	1.2	—	A
		V _{IN} = 12 V, T _j = 25°C	—	1.3	—	A

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

TA48015BF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 2.2 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 3.5 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	1.455	1.500	1.545	V
		$3.4 \text{ V} \leq V_{IN} \leq 6.5 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	1.44	1.50	1.56	
Line regulation	Reg·line	$3.4 \text{ V} \leq V_{IN} \leq 6.5 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	—	4.5	20.0	mV
Load regulation	Reg·load	$V_{IN} = 3.5 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	2	20	mV
Quiescent current	I_B	$3.4 \text{ V} \leq V_{IN} \leq 6.5 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.85	1.70	mA
		$3.4 \text{ V} \leq V_{IN} \leq 6.5 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	10	20	
Starting quiescent current	I_{Bstart}	$V_{IN} = 2.1 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.7	2.3	mA
		$V_{IN} = 3.4 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	13.0	28.5	
Output noise voltage	V_{NO}	$V_{IN} = 3.5 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	75	—	μV_{rms}
Ripple rejection	R.R.	$3.5 \text{ V} \leq V_{IN} \leq 6.5 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $f = 120 \text{ Hz}$	54	65	—	dB
Dropout voltage	V_D	$I_{OUT} = 0.5 \text{ A}$	—	0.95	1.10	V
		$I_{OUT} = 1 \text{ A}$	—	1.9	—	
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 3.5 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.14	—	$\text{mV}/^\circ\text{C}$

TA48018BF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 2.2 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 3.8 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	1.746	1.800	1.854	V
		$3.4 \text{ V} \leq V_{IN} \leq 6.8 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	1.728	1.800	1.872	
Line regulation	Reg·line	$3.4 \text{ V} \leq V_{IN} \leq 6.8 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	—	5.6	20.0	mV
Load regulation	Reg·load	$V_{IN} = 3.8 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	2.4	20.0	mV
Quiescent current	I_B	$3.4 \text{ V} \leq V_{IN} \leq 6.8 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.85	1.70	mA
		$3.4 \text{ V} \leq V_{IN} \leq 6.8 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	10	20	
Starting quiescent current	I_{Bstart}	$V_{IN} = 2.1 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.7	2.3	mA
		$V_{IN} = 3.4 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	14.0	28.5	
Output noise voltage	V_{NO}	$V_{IN} = 3.8 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	75	—	μV_{rms}
Ripple rejection	R.R.	$3.4 \text{ V} \leq V_{IN} \leq 6.8 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $f = 120 \text{ Hz}$	54	66	—	dB
Dropout voltage	V_D	$I_{OUT} = 0.5 \text{ A}$	—	0.41	0.50	V
		$I_{OUT} = 1 \text{ A}$	—	1.6	—	
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 3.8 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.15	—	$\text{mV}/^\circ\text{C}$

TA48025BF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 2.2 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 4.5 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	2.425	2.500	2.575	V
		$3.5 \text{ V} \leq V_{IN} \leq 7.5 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	2.4	2.5	2.6	
Line regulation	Reg·line	$3.5 \text{ V} \leq V_{IN} \leq 7.5 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	—	6.7	20.0	mV
Load regulation	Reg·load	$V_{IN} = 4.5 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	2.9	20.0	mV
Quiescent current	I_B	$3.5 \text{ V} \leq V_{IN} \leq 7.5 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.85	1.70	mA
		$3.5 \text{ V} \leq V_{IN} \leq 7.5 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	10	20	
Starting quiescent current	I_{Bstart}	$V_{IN} = 2.1 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	2.2	3.5	mA
		$V_{IN} = 3.4 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	16.0	28.5	
Output noise voltage	V_{NO}	$V_{IN} = 4.5 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	95	—	μV_{rms}
Ripple rejection	R.R.	$3.5 \text{ V} \leq V_{IN} \leq 7.5 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $f = 120 \text{ Hz}$	52	64	—	dB
Dropout voltage	V_D	$I_{OUT} = 0.5 \text{ A}$	—	0.32	0.50	V
		$I_{OUT} = 1 \text{ A}$	—	0.88	—	
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 4.5 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.2	—	$\text{mV}/^\circ\text{C}$

TA48033BF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 2.2 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 5.3 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	3.201	3.300	3.399	V
		$4.3 \text{ V} \leq V_{IN} \leq 8.8 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	3.168	3.300	3.432	
Line regulation	Reg·line	$4.3 \text{ V} \leq V_{IN} \leq 8.8 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	—	8.3	20.0	mV
Load regulation	Reg·load	$V_{IN} = 5.3 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	3.7	20.0	mV
Quiescent current	I_B	$4.3 \text{ V} \leq V_{IN} \leq 8.8 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.85	1.70	mA
		$4.3 \text{ V} \leq V_{IN} \leq 8.8 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	10	20	
Starting quiescent current	I_{Bstart}	$V_{IN} = 2.1 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	3.3	4.0	mA
		$V_{IN} = 3.5 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	17.0	28.5	
Output noise voltage	V_{NO}	$V_{IN} = 5.3 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	115	—	μV_{rms}
Ripple rejection	R.R.	$4.3 \text{ V} \leq V_{IN} \leq 8.8 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $f = 120 \text{ Hz}$	50	62	—	dB
Dropout voltage	V_D	$I_{OUT} = 0.5 \text{ A}$	—	0.32	0.50	V
		$I_{OUT} = 1 \text{ A}$	—	0.69	—	
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 5.3 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.3	—	$\text{mV}/^\circ\text{C}$

TA4805BF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 2.2 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 7 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	4.85	5.00	5.15	V
		$6 \text{ V} \leq V_{IN} \leq 10 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	4.8	5.0	5.2	
Line regulation	Reg·line	$6 \text{ V} \leq V_{IN} \leq 10 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	—	10	20	mV
Load regulation	Reg·load	$V_{IN} = 7 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	4.2	20.0	mV
Quiescent current	I_B	$6 \text{ V} \leq V_{IN} \leq 10 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.85	1.70	mA
		$6 \text{ V} \leq V_{IN} \leq 10 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	10	20	
Starting quiescent current	I_{Bstart}	$V_{IN} = 2.1 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	2.5	4.2	mA
		$V_{IN} = 4.5 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	18.0	28.5	
Output noise voltage	V_{NO}	$V_{IN} = 7 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	150	—	μV_{rms}
Ripple rejection	R.R.	$6 \text{ V} \leq V_{IN} \leq 10 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $f = 120 \text{ Hz}$	48	60	—	dB
Dropout voltage	V_D	$I_{OUT} = 0.5 \text{ A}$	—	0.32	0.50	V
		$I_{OUT} = 1 \text{ A}$	—	0.69	—	
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 7 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.45	—	$\text{mV}/^\circ\text{C}$

TA4808BF

Electrical Characteristics

($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 2.2 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 10 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	7.76	8.00	8.24	V
		$9 \text{ V} \leq V_{IN} \leq 13 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	7.68	8.00	8.32	
Line regulation	Reg·line	$9 \text{ V} \leq V_{IN} \leq 13 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	—	12.5	20.0	mV
Load regulation	Reg·load	$V_{IN} = 10 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	9.4	30.0	mV
Quiescent current	I_B	$9 \text{ V} \leq V_{IN} \leq 13 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.9	1.7	mA
		$9 \text{ V} \leq V_{IN} \leq 13 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	10	20	
Starting quiescent current	I_{Bstart}	$V_{IN} = 2.1 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	2.6	4.4	mA
		$V_{IN} = 7.2 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	20.0	28.5	
Output noise voltage	V_{NO}	$V_{IN} = 10 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	225	—	μV_{rms}
Ripple rejection	R.R.	$9 \text{ V} \leq V_{IN} \leq 13 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $f = 120 \text{ Hz}$	45	56	—	dB
Dropout voltage	V_D	$I_{OUT} = 0.5 \text{ A}$	—	0.32	0.50	V
		$I_{OUT} = 1 \text{ A}$	—	0.69	—	
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 10 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.7	—	$\text{mV}/^\circ\text{C}$

TA4809BF

Electrical Characteristics

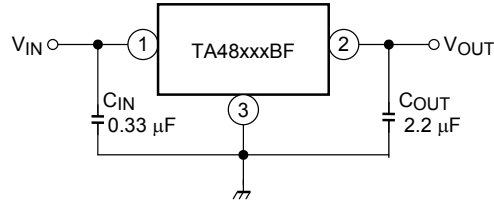
($C_{IN} = 0.33 \mu\text{F}$, $C_{OUT} = 2.2 \mu\text{F}$, $T_j = 25^\circ\text{C}$, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	$V_{IN} = 11 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	8.73	9.00	9.27	V
		$10 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	8.64	9.00	9.36	
Line regulation	Reg·line	$10 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $I_{OUT} = 0.5 \text{ A}$	—	12.5	20.0	mV
Load regulation	Reg·load	$V_{IN} = 11 \text{ V}$, $5 \text{ mA} \leq I_{OUT} \leq 1 \text{ A}$	—	9.4	30.0	mV
Quiescent current	I_B	$10 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	0.9	1.7	mA
		$10 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	10	20	
Starting quiescent current	I_{Bstart}	$V_{IN} = 2.1 \text{ V}$, $I_{OUT} = 0 \text{ A}$	—	2.6	4.4	mA
		$V_{IN} = 8.2 \text{ V}$, $I_{OUT} = 1 \text{ A}$	—	20.0	28.5	
Output noise voltage	V_{NO}	$V_{IN} = 11 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	250	—	μV_{rms}
Ripple rejection	R.R.	$10 \text{ V} \leq V_{IN} \leq 14 \text{ V}$, $I_{OUT} = 50 \text{ mA}$, $f = 120 \text{ Hz}$	44	55	—	dB
Dropout voltage	V_D	$I_{OUT} = 0.5 \text{ A}$	—	0.32	0.50	V
		$I_{OUT} = 1 \text{ A}$	—	0.69	—	
Average temperature coefficient of output voltage	T_{CVO}	$V_{IN} = 11 \text{ V}$, $I_{OUT} = 5 \text{ mA}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.8	—	$\text{mV}/^\circ\text{C}$

Electrical Characteristics for All Products

- $T_j = 25^\circ\text{C}$ in the measurement conditions of each item is the standard condition when a pulse test is carried out, and any drift in the electrical characteristic due to a rise in the junction temperature of the chip may be disregarded.

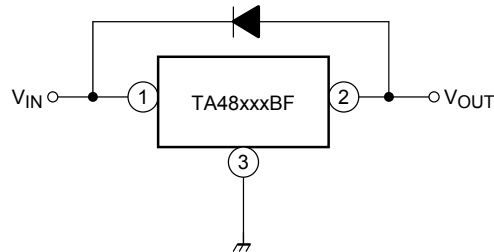
Standard Application Circuit

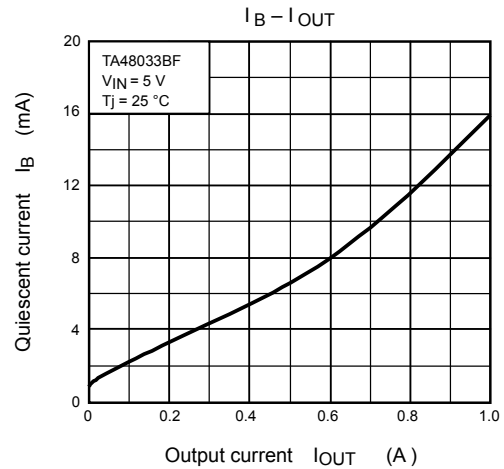
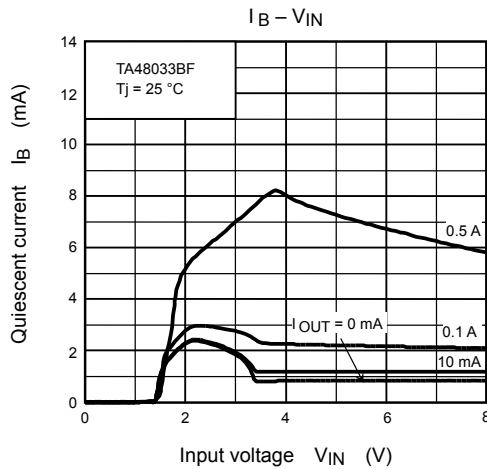
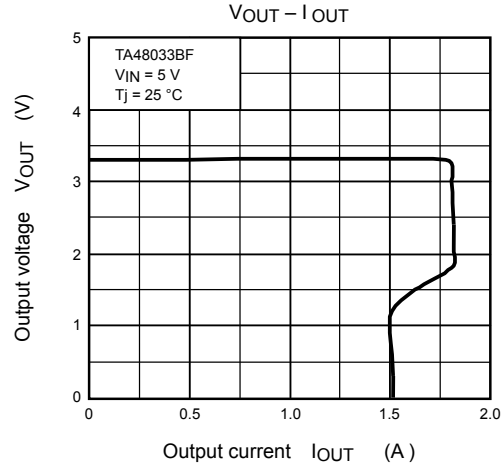
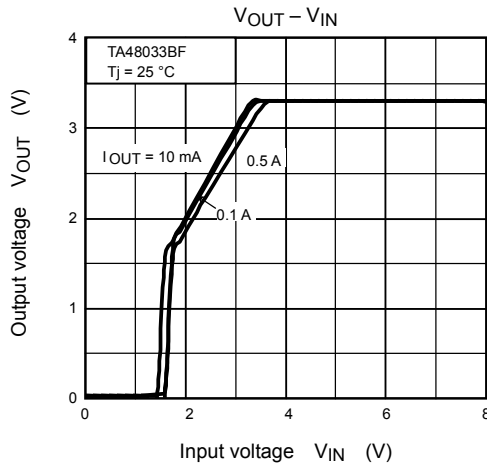
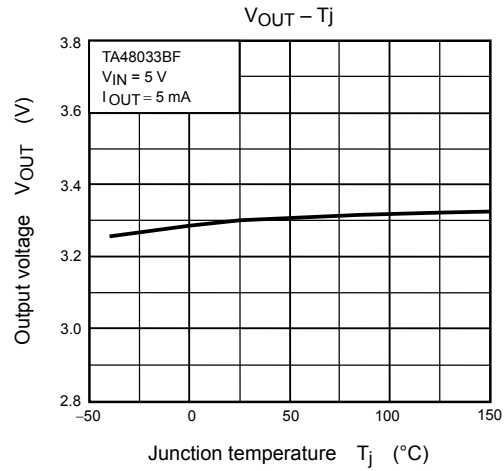
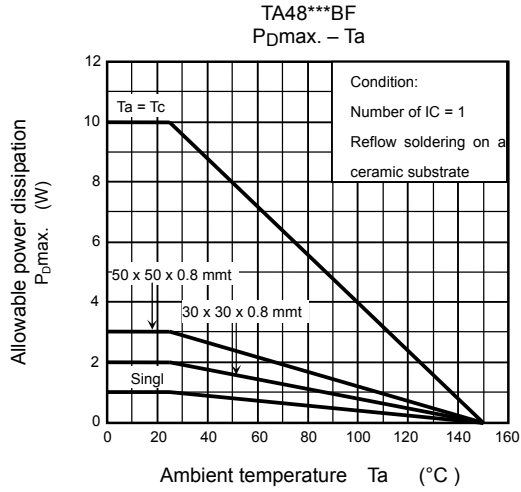


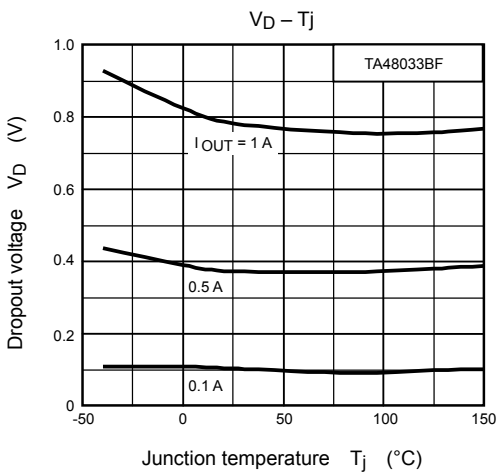
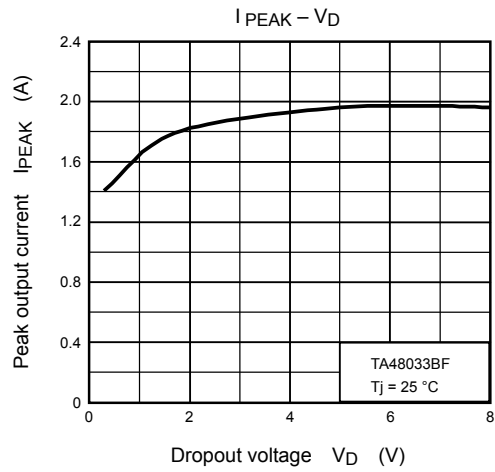
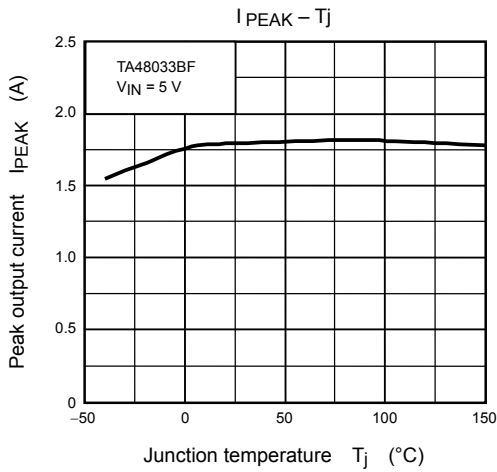
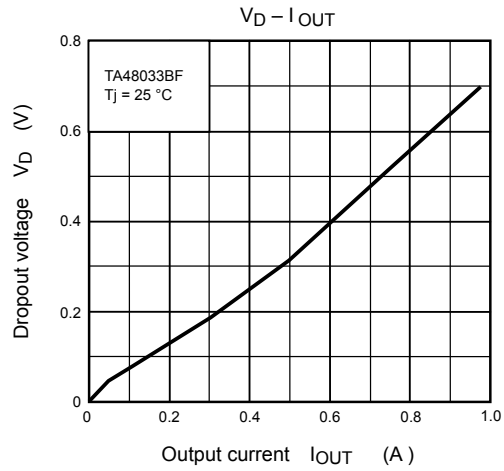
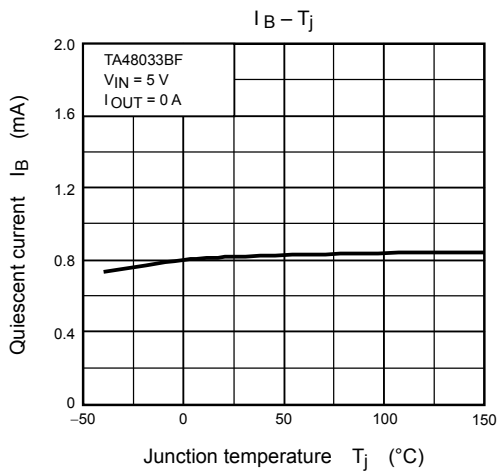
- Be sure to connect a capacitor near the input terminal and output terminal between both terminals and GND. The use of a monolithic ceramic capacitor (B Characteristic or X7R) of low ESR (equivalent series resistance) is recommended. The IC may oscillate due to external conditions (output current, temperature, 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.

Precautions in application

- The IC might be destroyed if a voltage greater than the input terminal voltage is applied to the output terminal, or if the input terminal is connected to GND during operation. To prevent such an occurrence, connect a diode as in the following diagram.



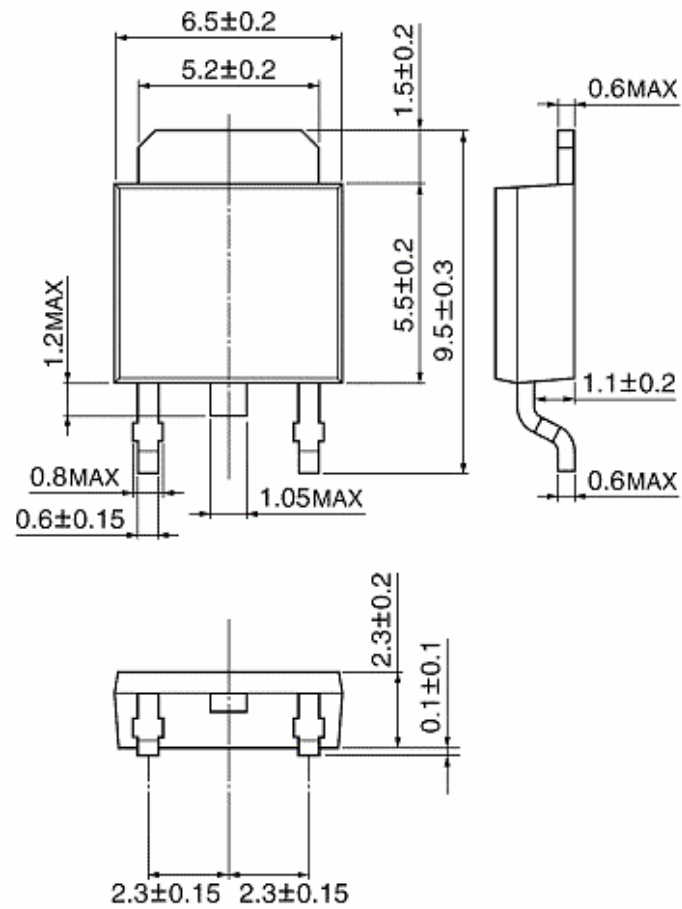




Package Dimensions (TA48xxxBF)

HSOP-3-P-2.30D

Unit : mm



Weight: 0.36 g (typ.)

RESTRICTIONS ON PRODUCT USE

20070701-EN

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