

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

## TA48L018F, TA48L02F, TA48L025F, TA48L03F, TA48L033F, TA48L05F

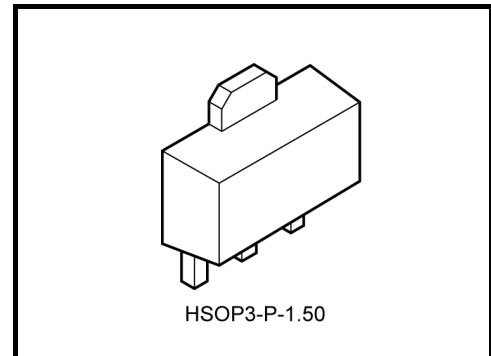
1.8 V, 2 V, 2.5 V, 3 V, 3.3 V, 5 V

Three-Terminal Low Dropout Voltage Regulator with Output Current of 0.15 A

The TA48L\*\*F 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: 1.8 V, 2 V, 2.5 V, 3 V, 3.3 V, 5 V.

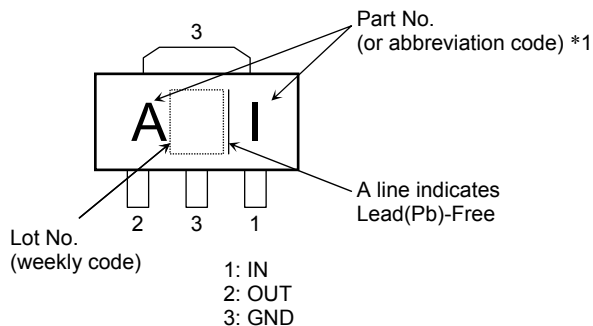
### Features

- Maximum output current: 0.15 A
- Output voltage accuracy:  $V_{OUT} \pm 3\%$  (@ $T_j = 25^\circ\text{C}$ )
- Low standby current: 400  $\mu\text{A}$  (typ.) (@ $I_{OUT} = 0\text{ A}$ )
- Low-dropout voltage:  $V_D = 0.5\text{ V}$  (max) (@ $I_{OUT} = 100\text{ mA}$ )
- Protection function: overheat/overcurrent
- Package type: PW-Mini (SOT-89) package



Weight: 0.05 g (typ.)

### Pin Assignment / Marking



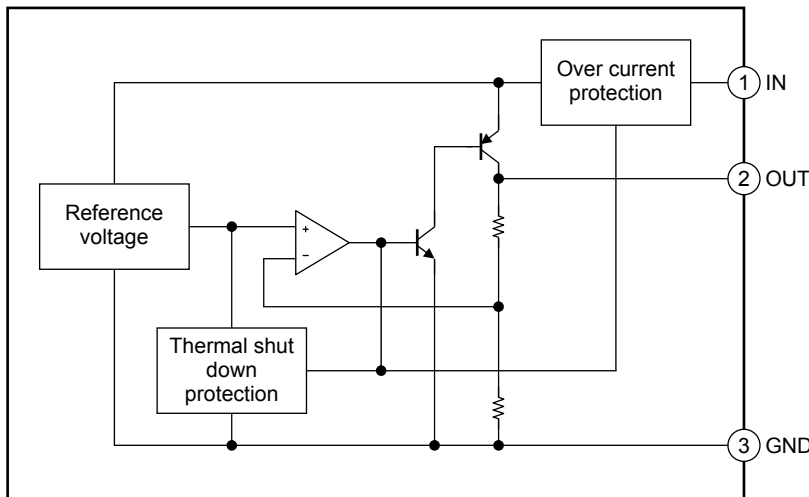
	Part No. (or abbreviation code)	Part No.
*1	AI	TA48L018F
	BI	TA48L02F
	CI	TA48L025F
	DI	TA48L03F
	EI	TA48L033F
	FI	TA48L05F

### How to Order

Product No.	Package	Packing Type and Unit for Orders
TA48L**F	PW-Mini (SOT-89) Surface-mount package	On cut tape (TE12L): 100/tape section
TA48L**F (TE12L)		Embossed tape: 1000 pcs/tape

The product(s) in this document ("Product") contain functions intended to protect the Product from temporary small overloads such as minor short-term overcurrent or overheating. The protective functions do not necessarily protect Product under all circumstances. When incorporating Product into your system, please design the system (1) to avoid such overloads upon the Product, and (2) to shut down or otherwise relieve the Product of such overload conditions immediately upon occurrence. For details, please refer to the notes appearing below in this document and other documents referenced in this document.

**Block Diagram**



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

Characteristics	Symbol	Rating	Unit
Input voltage	$V_{IN}$	16	V
Output current	$I_{OUT}$	0.15	A
Operating temperature	$T_{opr}$	-40 to 85	°C
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-55 to 150	°C
Power dissipation	$P_D$	0.5	W
Thermal resistance (Junction to ambient)	$R_{th(j-a)}$	250	°C/W

Note 1: External current and voltage (including negative voltage) should not be applied to pins not specified.

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).

**Protection Function (reference)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Thermal shutdown	$T_{SD} (T_j)$	—	—	160	—	°C
Peak circuit current	$I_{PEAK}$	$V_{IN} = V_{OUT} + 2 V, T_j = 25^\circ C$	—	0.27	—	A
Short circuit current	$I_{SC}$	$V_{IN} = V_{OUT} + 2 V, T_j = 25^\circ C$	—	0.27	—	A

Note 3: The maximum ratings should not be exceeded when the IC is actually used.

## TA48L018F

### Electrical Characteristics

( $C_{IN} = 0.33 \mu F$ ,  $C_{OUT} = 3.3 \mu F$ ,  $T_j = 25^\circ C$ , unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 3.8 V$ , $I_{OUT} = 40 mA$	1.746	1.8	1.854	V
		$2.8 V \leq V_{IN} \leq 12 V$ , $5 mA \leq I_{OUT} \leq 100 mA$ , $0^\circ C \leq T_j \leq 125^\circ C$	1.71	1.8	1.89	
Line regulation	Reg · line	$2.8 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 40 mA$	—	2	20	mV
Load regulation	Reg · load	$V_{IN} = 3.8 V$ , $5 mA \leq I_{OUT} \leq 150 mA$	—	18	40	mV
Quiescent current	$I_B$	$2.8 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 0 A$	—	0.4	0.8	mA
		$2.8 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 100 mA$	—	1	5	
Starting quiescent current	$I_{Bstart}$	$V_{IN} = 2.1 V$ , $I_{OUT} = 0 A$	—	0.5	1.5	mA
		$V_{IN} = 2.1 V$ , $I_{OUT} = 100 mA$	—	5	20	
Output noise voltage	$V_{NO}$	$V_{IN} = 3.8 V$ , $I_{OUT} = 40 mA$ , $10 Hz \leq f \leq 100 kHz$	—	45	—	$\mu V_{rms}$
Ripple rejection	R.R.	$2.8 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 40 mA$ , $f = 120 Hz$	54	72	—	dB
Dropout voltage	$V_D$	$I_{OUT} = 40 mA$	—	0.28	0.4	V
		$I_{OUT} = 100 mA$	—	0.32	0.5	
Average temperature coefficient of output voltage	$T_{CVO}$	$V_{IN} = 3.8 V$ , $I_{OUT} = 5 mA$ , $0^\circ C \leq T_j \leq 125^\circ C$	—	0.3	—	$mV/^\circ C$

## TA48L02F

### Electrical Characteristics

( $C_{IN} = 0.33 \mu F$ ,  $C_{OUT} = 3.3 \mu F$ ,  $T_j = 25^\circ C$ , unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 4.0 V$ , $I_{OUT} = 40 mA$	1.94	2.0	2.06	V
		$3.0 V \leq V_{IN} \leq 12 V$ , $5 mA \leq I_{OUT} \leq 100 mA$ , $0^\circ C \leq T_j \leq 125^\circ C$	1.90	2.0	2.10	
Line regulation	Reg · line	$3.0 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 40 mA$	—	2	20	mV
Load regulation	Reg · load	$V_{IN} = 4.0 V$ , $5 mA \leq I_{OUT} \leq 150 mA$	—	18	40	mV
Quiescent current	$I_B$	$3.0 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 0 A$	—	0.4	0.8	mA
		$3.0 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 100 mA$	—	1	5	
Starting quiescent current	$I_{Bstart}$	$V_{IN} = 2.1 V$ , $I_{OUT} = 0 A$	—	0.5	1.5	mA
		$V_{IN} = 2.1 V$ , $I_{OUT} = 100 mA$	—	5	20	
Output noise voltage	$V_{NO}$	$V_{IN} = 4.0 V$ , $I_{OUT} = 40 mA$ , $10 Hz \leq f \leq 100 kHz$	—	55	—	$\mu V_{rms}$
Ripple rejection	R.R.	$3.0 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 40 mA$ , $f = 120 Hz$	52	70	—	dB
Dropout voltage	$V_D$	$I_{OUT} = 40 mA$	—	0.2	0.35	V
		$I_{OUT} = 100 mA$	—	0.3	0.5	
Average temperature coefficient of output voltage	$T_{CVO}$	$V_{IN} = 4.0 V$ , $I_{OUT} = 5 mA$ , $0^\circ C \leq T_j \leq 125^\circ C$	—	0.35	—	$mV/^\circ C$

## TA48L025F

### Electrical Characteristics

( $C_{IN} = 0.33 \mu\text{F}$ ,  $C_{OUT} = 3.3 \mu\text{F}$ ,  $T_j = 25^\circ\text{C}$ , unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 4.5 \text{ V}$ , $I_{OUT} = 40 \text{ mA}$	2.425	2.5	2.575	V
		$3.5 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $5 \text{ mA} \leq I_{OUT} \leq 100 \text{ mA}$ , $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	2.375	2.5	2.625	
Line regulation	Reg · line	$3.5 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $I_{OUT} = 40 \text{ mA}$	—	2	20	mV
Load regulation	Reg · load	$V_{IN} = 4.5 \text{ V}$ , $5 \text{ mA} \leq I_{OUT} \leq 150 \text{ mA}$	—	18	40	mV
Quiescent current	$I_B$	$3.5 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $I_{OUT} = 0 \text{ A}$	—	0.4	0.8	mA
		$3.5 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $I_{OUT} = 100 \text{ mA}$	—	1	5	
Starting quiescent current	$I_{Bstart}$	$V_{IN} = 2.4 \text{ V}$ , $I_{OUT} = 0 \text{ A}$	—	0.5	1.5	mA
		$V_{IN} = 2.4 \text{ V}$ , $I_{OUT} = 100 \text{ mA}$	—	7	20	
Output noise voltage	$V_{NO}$	$V_{IN} = 4.5 \text{ V}$ , $I_{OUT} = 40 \text{ mA}$ , $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	65	—	$\mu\text{V}_{rms}$
Ripple rejection	R.R.	$3.5 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $I_{OUT} = 40 \text{ mA}$ , $f = 120 \text{ Hz}$	52	70	—	dB
Dropout voltage	$V_D$	$I_{OUT} = 40 \text{ mA}$	—	0.16	0.35	V
		$I_{OUT} = 100 \text{ mA}$	—	0.27	0.5	
Average temperature coefficient of output voltage	$T_{CVO}$	$V_{IN} = 4.5 \text{ V}$ , $I_{OUT} = 5 \text{ mA}$ , $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.45	—	$\text{mV}/^\circ\text{C}$

## TA48L03F

### Electrical Characteristics

( $C_{IN} = 0.33 \mu\text{F}$ ,  $C_{OUT} = 3.3 \mu\text{F}$ ,  $T_j = 25^\circ\text{C}$ , unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 5.0 \text{ V}$ , $I_{OUT} = 40 \text{ mA}$	2.91	3.0	3.09	V
		$4.0 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $5 \text{ mA} \leq I_{OUT} \leq 100 \text{ mA}$ , $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	2.85	3.0	3.15	
Line regulation	Reg · line	$4.0 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $I_{OUT} = 40 \text{ mA}$	—	2	20	mV
Load regulation	Reg · load	$V_{IN} = 5.0 \text{ V}$ , $5 \text{ mA} \leq I_{OUT} \leq 150 \text{ mA}$	—	18	40	mV
Quiescent current	$I_B$	$4.0 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $I_{OUT} = 0 \text{ A}$	—	0.4	0.8	mA
		$4.0 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $I_{OUT} = 100 \text{ mA}$	—	1	5	
Starting quiescent current	$I_{Bstart}$	$V_{IN} = 2.8 \text{ V}$ , $I_{OUT} = 0 \text{ A}$	—	0.5	1.5	mA
		$V_{IN} = 2.8 \text{ V}$ , $I_{OUT} = 100 \text{ mA}$	—	7	20	
Output noise voltage	$V_{NO}$	$V_{IN} = 5.0 \text{ V}$ , $I_{OUT} = 40 \text{ mA}$ , $10 \text{ Hz} \leq f \leq 100 \text{ kHz}$	—	80	—	$\mu\text{V}_{rms}$
Ripple rejection	R.R.	$4.0 \text{ V} \leq V_{IN} \leq 12 \text{ V}$ , $I_{OUT} = 40 \text{ mA}$ , $f = 120 \text{ Hz}$	50	68	—	dB
Dropout voltage	$V_D$	$I_{OUT} = 40 \text{ mA}$	—	0.16	0.35	V
		$I_{OUT} = 100 \text{ mA}$	—	0.27	0.5	
Average temperature coefficient of output voltage	$T_{CVO}$	$V_{IN} = 5 \text{ V}$ , $I_{OUT} = 5 \text{ mA}$ , $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$	—	0.5	—	$\text{mV}/^\circ\text{C}$

## TA48L033F

### Electrical Characteristics

( $C_{IN} = 0.33 \mu F$ ,  $C_{OUT} = 3.3 \mu F$ ,  $T_j = 25^\circ C$ , unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 5.3 V$ , $I_{OUT} = 40 mA$	3.2	3.3	3.4	V
		$4.3 V \leq V_{IN} \leq 12 V$ , $5 mA \leq I_{OUT} \leq 100 mA$ , $0^\circ C \leq T_j \leq 125^\circ C$	3.135	3.3	3.465	
Line regulation	Reg · line	$4.3 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 40 mA$	—	2	20	mV
Load regulation	Reg · load	$V_{IN} = 5.3 V$ , $5 mA \leq I_{OUT} \leq 150 mA$	—	18	40	mV
Quiescent current	$I_B$	$4.3 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 0 A$	—	0.4	0.8	mA
		$4.3 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 100 mA$	—	1	5	
Starting quiescent current	$I_{Bstart}$	$V_{IN} = 3.0 V$ , $I_{OUT} = 0 A$	—	0.5	1.5	mA
		$V_{IN} = 3.0 V$ , $I_{OUT} = 100 mA$	—	7	20	
Output noise voltage	$V_{NO}$	$V_{IN} = 5.3 V$ , $I_{OUT} = 40 mA$ , $10 Hz \leq f \leq 100 kHz$	—	85	—	$\mu V_{rms}$
Ripple rejection	R.R.	$4.3 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 40 mA$ , $f = 120 Hz$	50	68	—	dB
Dropout voltage	$V_D$	$I_{OUT} = 40 mA$	—	0.16	0.35	V
		$I_{OUT} = 100 mA$	—	0.27	0.5	
Average temperature coefficient of output voltage	$T_{CVO}$	$V_{IN} = 5.3 V$ , $I_{OUT} = 5 mA$ , $0^\circ C \leq T_j \leq 125^\circ C$	—	0.55	—	$mV/^\circ C$

## TA48L05F

### Electrical Characteristics

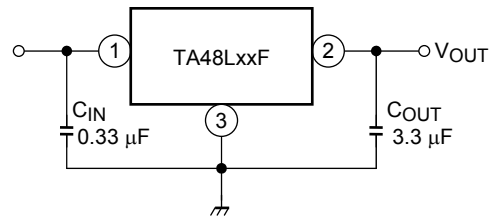
( $C_{IN} = 0.33 \mu F$ ,  $C_{OUT} = 3.3 \mu F$ ,  $T_j = 25^\circ C$ , unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 7.0 V$ , $I_{OUT} = 40 mA$	4.85	5.0	5.15	V
		$6.0 V \leq V_{IN} \leq 12 V$ , $5 mA \leq I_{OUT} \leq 100 mA$ , $0^\circ C \leq T_j \leq 125^\circ C$	4.75	5.0	5.25	
Line regulation	Reg · line	$6.0 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 40 mA$	—	2	20	mV
Load regulation	Reg · load	$V_{IN} = 7.0 V$ , $5 mA \leq I_{OUT} \leq 150 mA$	—	18	45	mV
Quiescent current	$I_B$	$6.0 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 0 A$	—	0.4	0.8	mA
		$6.0 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 100 mA$	—	1	5	
Starting quiescent current	$I_{Bstart}$	$V_{IN} = 4.5 V$ , $I_{OUT} = 0 A$	—	0.5	1.5	mA
		$V_{IN} = 4.5 V$ , $I_{OUT} = 100 mA$	—	7	20	
Output noise voltage	$V_{NO}$	$V_{IN} = 7.0 V$ , $I_{OUT} = 40 mA$ , $10 Hz \leq f \leq 100 kHz$	—	135	—	$\mu V_{rms}$
Ripple rejection	R.R.	$6.0 V \leq V_{IN} \leq 12 V$ , $I_{OUT} = 40 mA$ , $f = 120 Hz$	50	64	—	dB
Dropout voltage	$V_D$	$I_{OUT} = 40 mA$	—	0.16	0.35	V
		$I_{OUT} = 100 mA$	—	0.27	0.5	
Average temperature coefficient of output voltage	$T_{CVO}$	$V_{IN} = 7.0 V$ , $I_{OUT} = 5 mA$ , $0^\circ C \leq T_j \leq 125^\circ C$	—	0.85	—	$mV/^\circ C$

## Electrical Characteristics for All Products

Generally, the characteristics of power supply ICs change according to temperature fluctuations. The specification  $T_j = 25^\circ\text{C}$  is based on a state where temperature increase has no effect (assuming no fluctuation in the characteristics) as ascertained by pulse tests.

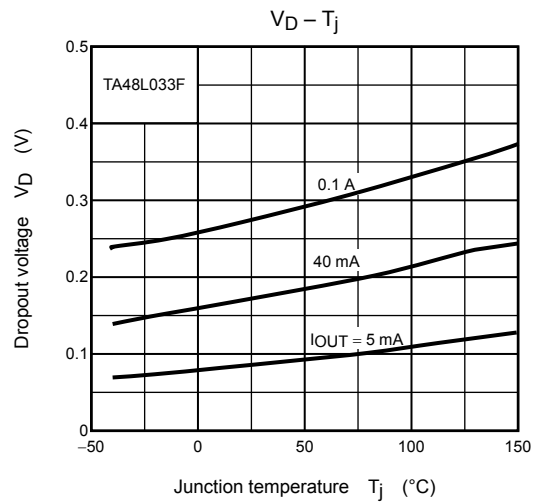
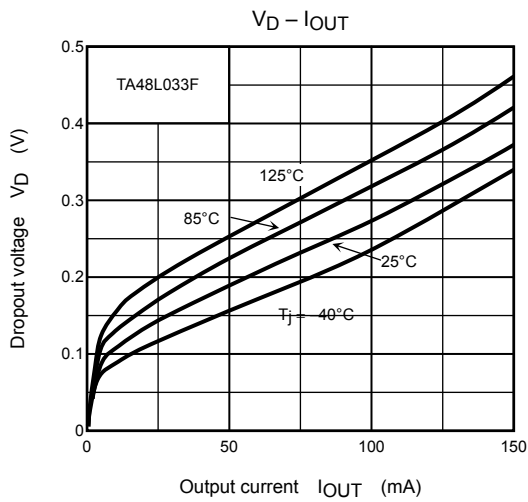
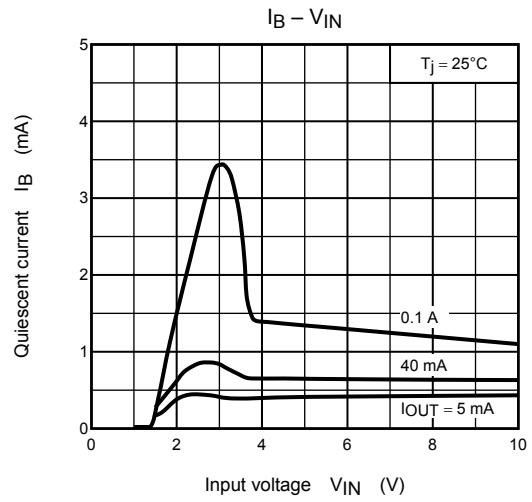
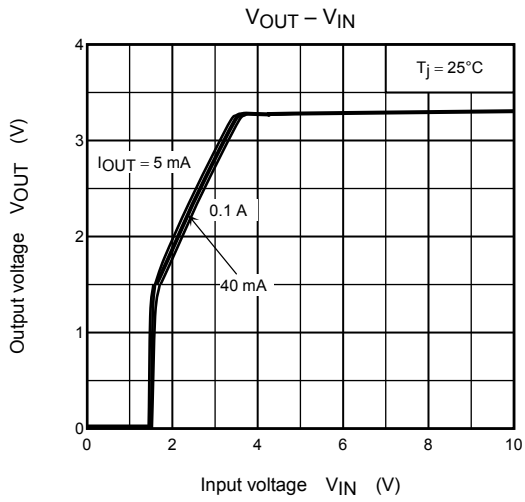
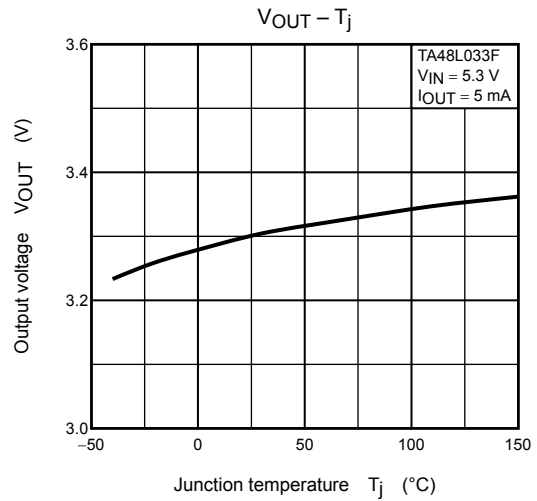
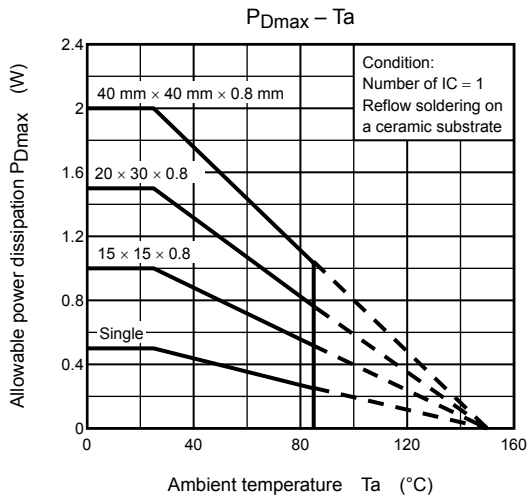
## Standard Application Circuit

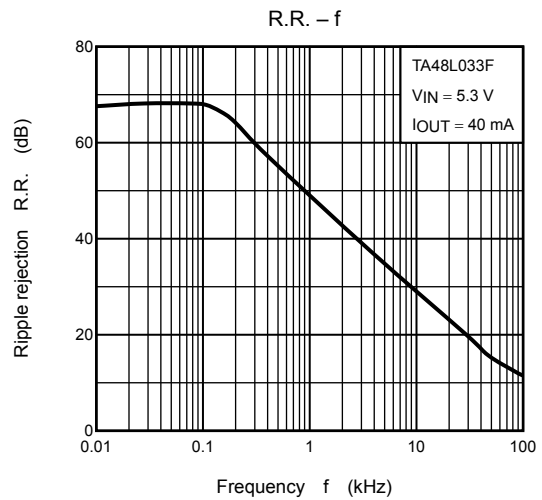
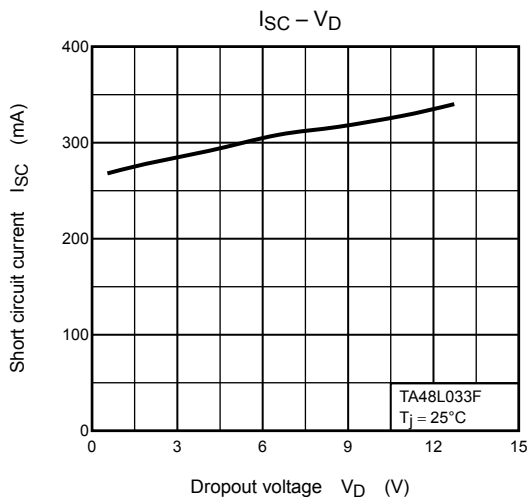
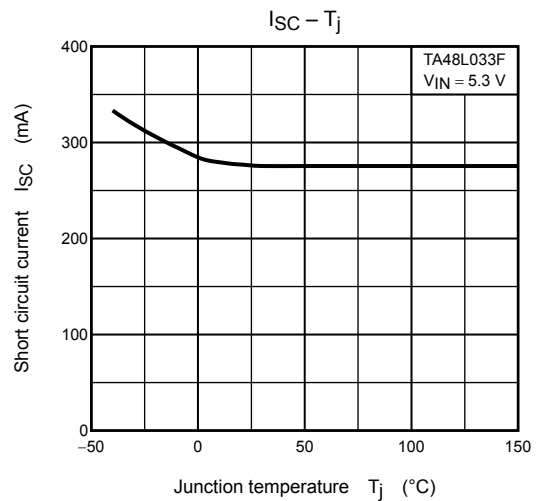
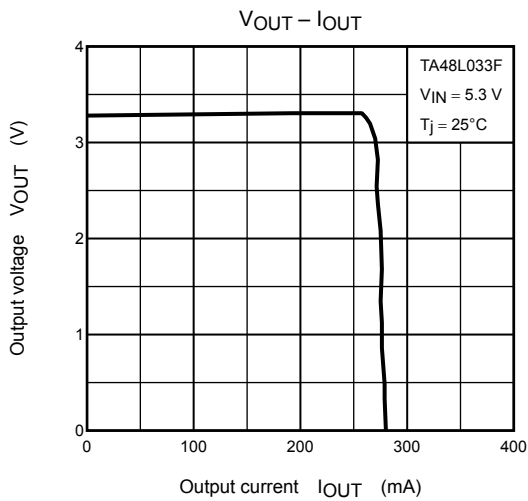
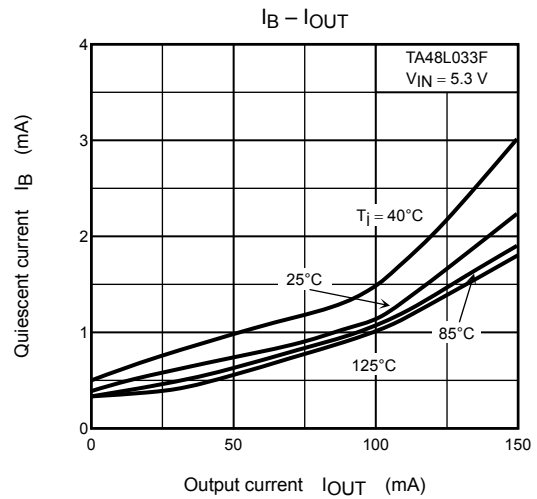
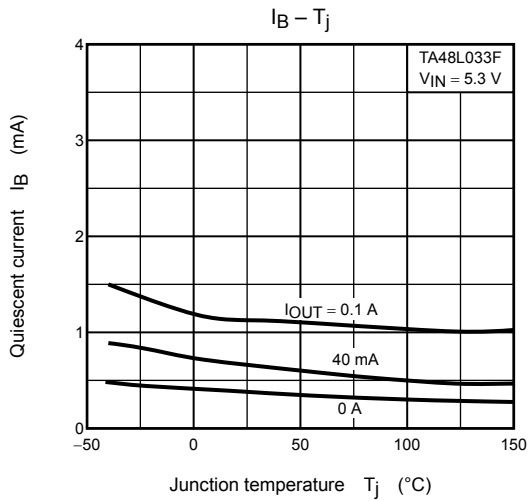


Be sure to connect a capacitor near the input terminal and output terminal between both terminals and GND. The capacitances should be determined experimentally. In particular, adequate investigation should be made so that there is no problem even in high or low temperatures.

## Usage Precautions

- Low voltage  
Do not apply voltage to the Product that is lower than the minimum operating voltage, or the Product's protective functions will not operate properly and the Product may be permanently damaged.
- Overcurrent Protection  
The overcurrent protection circuits in the Product are designed to temporarily protect Product from minor overcurrent of brief duration. When the overcurrent protective function in the Product activates, immediately cease application of overcurrent to Product. Improper usage of Product, such as application of current to Product exceeding the absolute maximum ratings, could cause the overcurrent protection circuit not to operate properly and/or damage Product permanently even before the protection circuit starts to operate.
- Overheating Protection  
The thermal shutdown circuits in the Product are designed to temporarily protect Product from minor overheating of brief duration. When the overheating protective function in the Product activates, immediately correct the overheating situation. Improper usage of Product, such as the application of heat to Product exceeding the absolute maximum ratings, could cause the overheating protection circuit not to operate properly and/or damage Product permanently even before the protection circuit starts to operate.



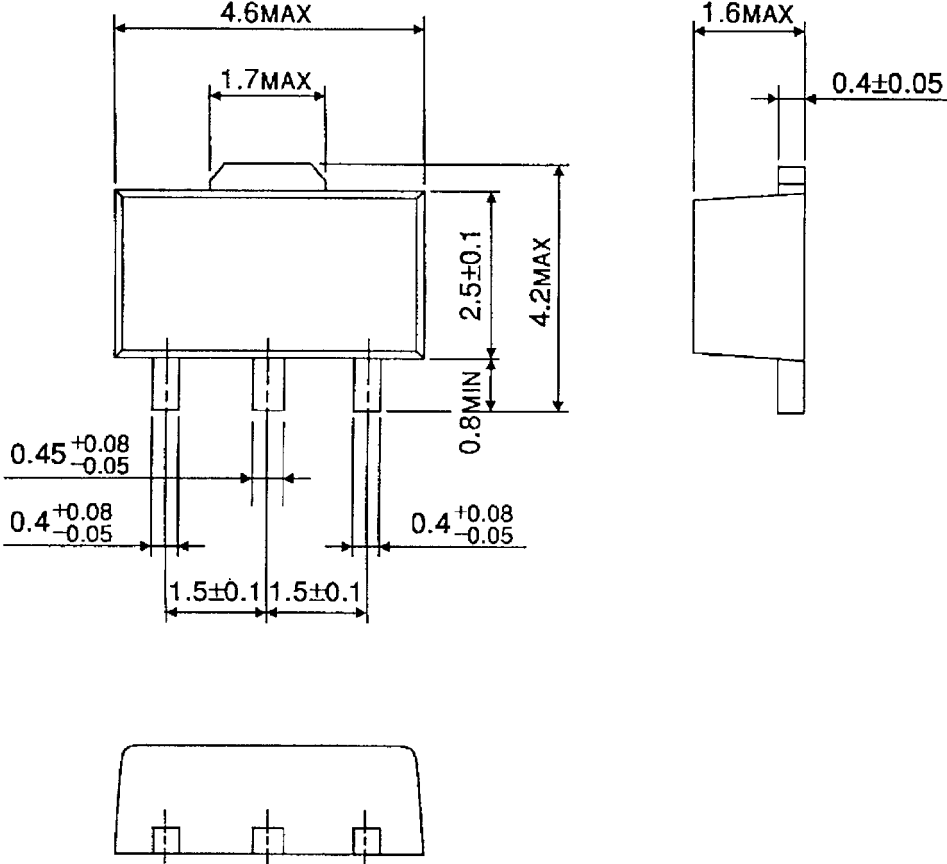




**Package Dimensions**

HSOP3-P-1.50

Unit : mm



Weight: 0.05 g (typ.)

**RESTRICTIONS ON PRODUCT USE**

20070701-EN GENERAL

- The information contained herein is subject to change without notice.
- 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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