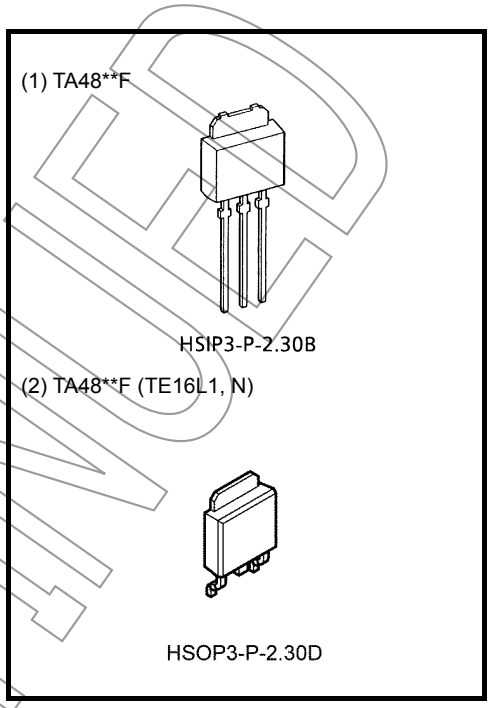
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA48018F, TA4802F, TA48025F, TA4803F, TA48033F, TA4805F

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 1 A

The TA48**F/S 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 which are used 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.

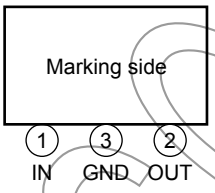


Weight
HSIP3-P-2.30B : 0.36 g (typ.)
HSOP3-P-2.30D : 0.36 g (typ.)

Features

- Maximum output current: 1 A
- Output voltage accuracy: V_{OUT} ± 3% (@T_j = 25°C)
- Low standby current: 800 μA (typ.) (@I_{OUT} = 0 A)
- Low starting quiescent current
- Low-dropout voltage: V_D = 0.5 V (max) (@I_{OUT} = 0.5 A)
- Protection function: overheat /overcurrent
- Package type: PW-Mold (TA48**F Series)
- TA48**F Series has a lead bending type package which is a surface-mountable package and can be used for reflow soldering.

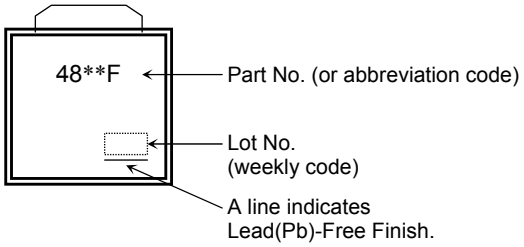
Pin Assignment



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.

Marking

(1) (2) TA48F** Series

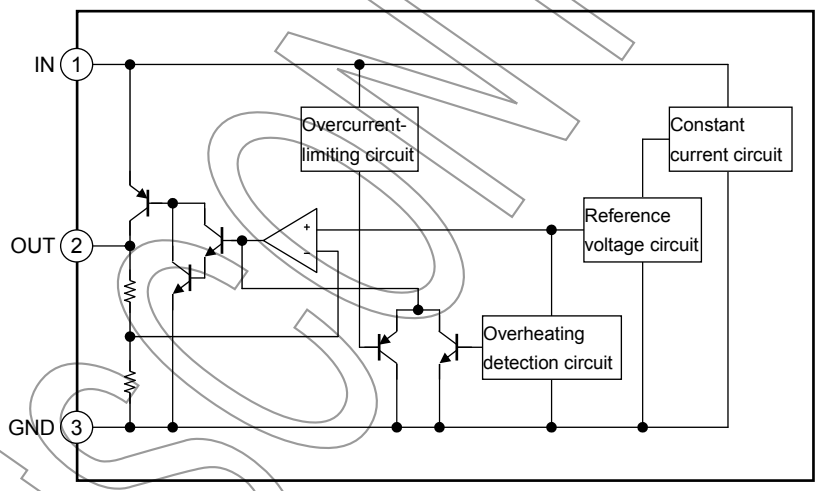


Note: The "**" part of each product number varies according to the output voltage of the product.

How to Order

	Product No.	Package	Packing Type and Unit for Orders
(1)	TA48**F	PW-Mold: Straight-lead package	Loose in bag: 200 (1 bag)
(2)	TA48**F (TE16L1, N)	PW-Mold: Surface-mount package	Embossed-tape packing: 2000 (1 tape)

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 temperature		Ta_{opr}	−40 to 85	°C
Junction temperature		T_j	150	°C
Storage temperature		T_{stg}	−55 to 150	°C
Power dissipation	(Ta = 25°C)	P_D	1	W
	(Tc = 25°C)	P_D	10	W
Thermal resistance	(junction to ambient)	$R_{th\ (j\text{-}a)}$	125	°C/W
	(junction to case)	$R_{th\ (j\text{-}c)}$	12.5	°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, $T_j = 25$°C	—	1.7	—	A
		$V_{IN} = 12$ V, $T_j = 25$°C	—	1.8	—	
Short circuit current	I_{SC}	$V_{IN} = V_{OUT} + 2$ V, $T_j = 25$°C	—	1.7	—	A
		$V_{IN} = 12$ V, $T_j = 25$°C	—	1.8	—	

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

TA48018F
Electrical Characteristics
(Unless otherwise specified C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 3.8 V, I_{OUT} = 0.5 A	1.746	1.8	1.854	V
		2.8 V ≤ V_{IN} ≤ 12 V, 5 mA ≤ I_{OUT} ≤ 1 A, 0°C ≤ T_j ≤ 125°C	1.72	1.8	1.88	
Line regulation	Reg·line	2.8 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 3.8 V, 5 mA ≤ I_{OUT} ≤ 1 A	—	5	20	mV
Quiescent current	I_B	2.8 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		2.8 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	0.7	5	mA
		V_{IN} = 2.5 V, I_{OUT} = 1 A	—	10	30	
Output noise voltage	V_{NO}	V_{IN} = 3.8 V, I_{OUT} = 50 mA 10 Hz ≤ f ≤ 100 kHz	—	75	—	μVrms
Ripple rejection	R.R.	2.8 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 50 mA f = 120 Hz	54	70	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.3	0.5	V
		I_{OUT} = 1 A	—	0.7	—	
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 3.8 V, I_{OUT} = 5 mA, 0°C ≤ T_j ≤ 125°C	—	0.15	—	mV/°C

TA4802F
Electrical Characteristics
(Unless otherwise specified, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 4.0 V, I_{OUT} = 0.5 A	1.94	2.0	2.06	V
		3.0 V ≤ V_{IN} ≤ 12 V, 5 mA ≤ I_{OUT} ≤ 1 A, 0°C ≤ T_j ≤ 125°C	1.91	2.0	2.09	
Line regulation	Reg·line	3.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 4.0 V, 5 mA ≤ I_{OUT} ≤ 1 A	—	5	20	mV
Quiescent current	I_B	3.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		3.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	0.7	5	mA
		V_{IN} = 2.6 V, I_{OUT} = 1 A	—	10	30	
Output noise voltage	V_{NO}	V_{IN} = 4.0 V, I_{OUT} = 50 mA 10 Hz ≤ f ≤ 100 kHz	—	80	—	μVrms
Ripple rejection	R.R.	3.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 50 mA f = 120 Hz	52	68	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.3	0.5	V
		I_{OUT} = 1 A	—	0.6	—	
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 4.0 V, I_{OUT} = 5 mA, 0°C ≤ T_j ≤ 125°C	—	0.18	—	mV/°C

TA48025F
Electrical Characteristics
(Unless otherwise specified, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 4.5 V, I_{OUT} = 0.5 A	2.425	2.5	2.575	V
		3.5 V ≤ V_{IN} ≤ 12 V, 5 mA ≤ I_{OUT} ≤ 1 A, 0°C ≤ T_j ≤ 125°C	2.388	2.5	2.612	
Line regulation	Reg·line	3.5 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 4.5 V, 5 mA ≤ I_{OUT} ≤ 1 A	—	5	20	mV
Quiescent current	I_B	3.5 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		3.5 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	0.9	5	mA
		V_{IN} = 2.65 V, I_{OUT} = 1 A	—	12	30	
Output noise voltage	V_{NO}	V_{IN} = 4.5 V, I_{OUT} = 50 mA, 10 Hz ≤ f ≤ 100 kHz	—	95	—	μVrms
Ripple rejection	R.R.	3.5 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 50 mA, f = 120 Hz	52	68	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.3	0.5	V
		I_{OUT} = 1 A	—	0.4	—	
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 4.5 V, I_{OUT} = 5 mA, 0°C ≤ T_j ≤ 125°C	—	0.24	—	mV/°C

TA4803F
Electrical Characteristics
(Unless otherwise specified, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 5.0 V, I_{OUT} = 0.5 A	2.91	3.0	3.09	V
		4.0 V ≤ V_{IN} ≤ 12 V, 5 mA ≤ I_{OUT} ≤ 1 A, 0°C ≤ T_j ≤ 125°C	2.865	3.0	3.135	
Line regulation	Reg·line	4.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 5.0 V, 5 mA ≤ I_{OUT} ≤ 1 A	—	5	20	mV
Quiescent current	I_B	4.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		4.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	1.1	5	mA
		V_{IN} = 2.8 V, I_{OUT} = 1 A	—	13	30	
Output noise voltage	V_{NO}	V_{IN} = 5.0 V, I_{OUT} = 50 mA, 10 Hz ≤ f ≤ 100 kHz	—	110	—	μVrms
Ripple rejection	R.R.	4.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 50 mA, f = 120 Hz	50	66	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.3	0.5	V
		I_{OUT} = 1 A	—	0.4	—	
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 5.0 V, I_{OUT} = 5 mA, 0°C ≤ T_j ≤ 125°C	—	0.28	—	mV/°C

TA48033F
Electrical Characteristics
(Unless otherwise specified, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 5.3 V, I_{OUT} = 0.5 A	3.2	3.3	3.4	V
		4.3 V ≤ V_{IN} ≤ 12 V, 5 mA ≤ I_{OUT} ≤ 1 A, 0°C ≤ T_j ≤ 125°C	3.152	3.3	3.448	
Line regulation	Reg·line	4.3 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 5.3 V, 5 mA ≤ I_{OUT} ≤ 1 A	—	5	20	mV
Quiescent current	I_B	4.3 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		4.3 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	1.1	5	mA
		V_{IN} = 2.8 V, I_{OUT} = 1 A	—	13	30	
Output noise voltage	V_{NO}	V_{IN} = 5.3 V, I_{OUT} = 50 mA 10 Hz ≤ f ≤ 100 kHz	—	115	—	μVrms
Ripple rejection	R.R.	4.3 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 50 mA f = 120 Hz	50	66	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.3	0.5	V
		I_{OUT} = 1 A	—	0.4	—	
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 5.3 V, I_{OUT} = 5 mA, 0°C ≤ T_j ≤ 125°C	—	0.3	—	mV/°C

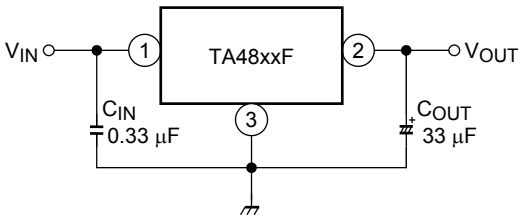
TA4805F
Electrical Characteristics
(Unless otherwise specified, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 7 V, I_{OUT} = 0.5 A	4.85	5.0	5.15	V
		6.0 V ≤ V_{IN} ≤ 12 V, 5 mA ≤ I_{OUT} ≤ 1 A, 0°C ≤ T_j ≤ 125°C	4.775	5.0	5.225	
Line regulation	Reg·line	6.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 7.0 V, 5 mA ≤ I_{OUT} ≤ 1 A	—	5	20	mV
Quiescent current	I_B	6.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 0 A	—	0.8	1.8	mA
		6.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 1 A	—	10	20	
Starting quiescent current	I_{Bstart}	V_{IN} = 2.1 V, I_{OUT} = 0 A	—	1.3	5	mA
		V_{IN} = 3.0 V, I_{OUT} = 1 A	—	14	30	
Output noise voltage	V_{NO}	V_{IN} = 7.0 V, I_{OUT} = 50 mA 10 Hz ≤ f ≤ 100 kHz	—	150	—	μVrms
Ripple rejection	R.R.	6.0 V ≤ V_{IN} ≤ 12 V, I_{OUT} = 50 mA f = 120 Hz	50	64	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.3	0.5	V
		I_{OUT} = 1 A	—	0.4	—	
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 7.0 V, I_{OUT} = 5 mA, 0°C ≤ T_j ≤ 125°C	—	0.45	—	mV/°C

Electrical Characteristics for All Products

Generally, the characteristics of power supply ICs change according to temperature fluctuations.
The specification T_j = 25°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 temperature.

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.

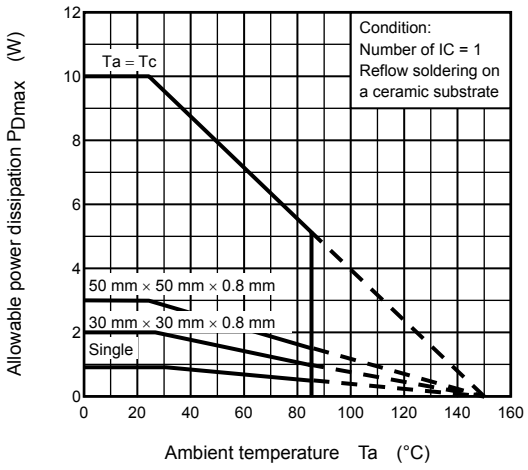
- Overcurrent Protection

  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.

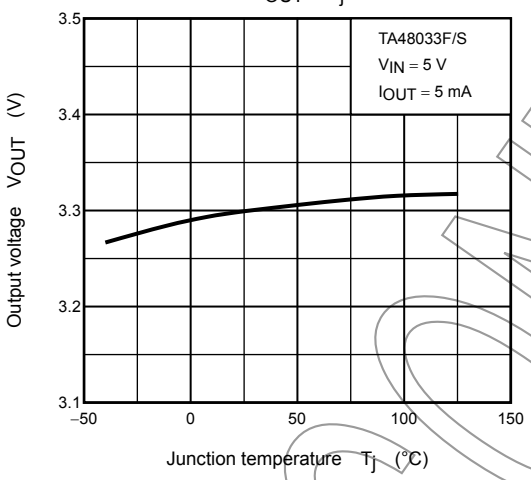
- Overheating Protection

  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.

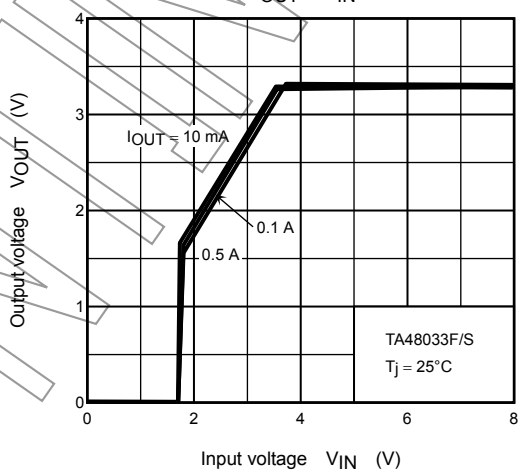
TA48**F
P_{Dmax} – Ta



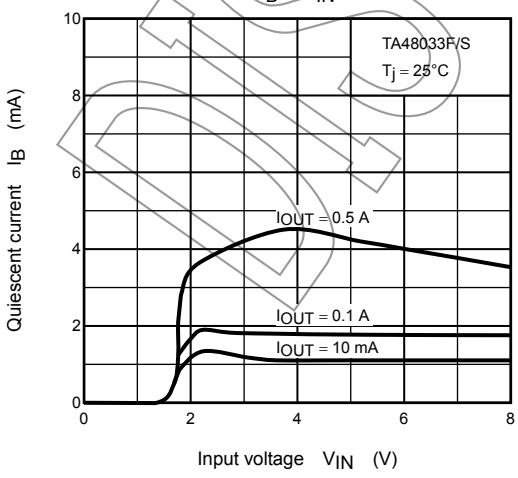
V_{OUT} – T_j



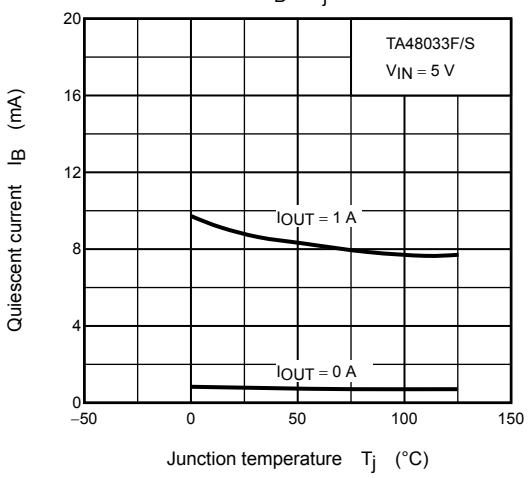
V_{OUT} – V_{IN}



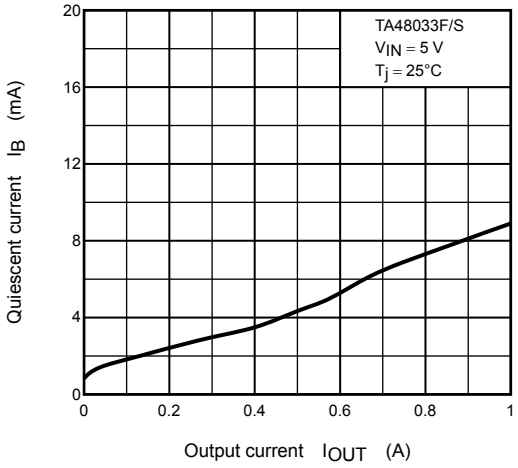
I_B – V_{IN}



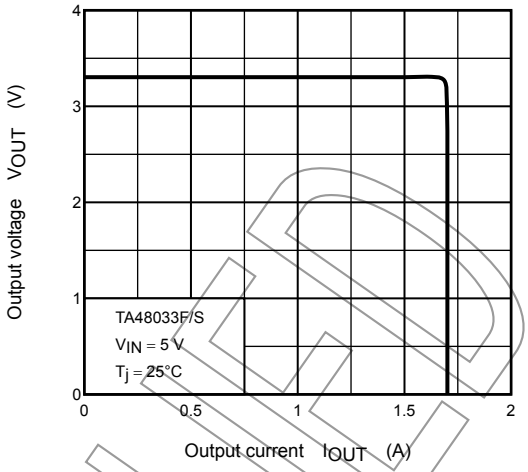
I_B – T_j



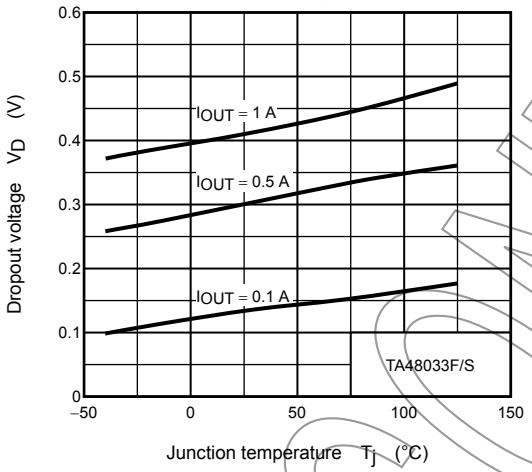
$I_B - I_{OUT}$



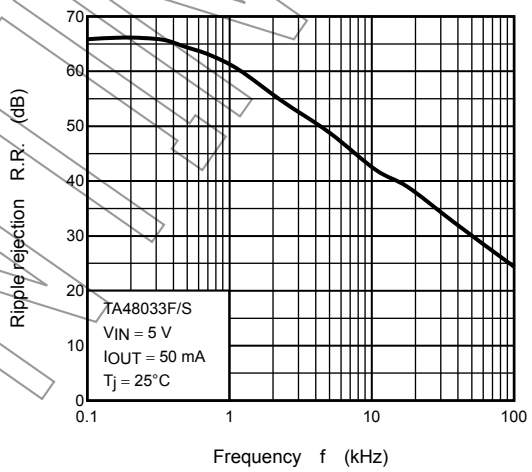
$V_{OUT} - I_{OUT}$



$V_D - T_j$



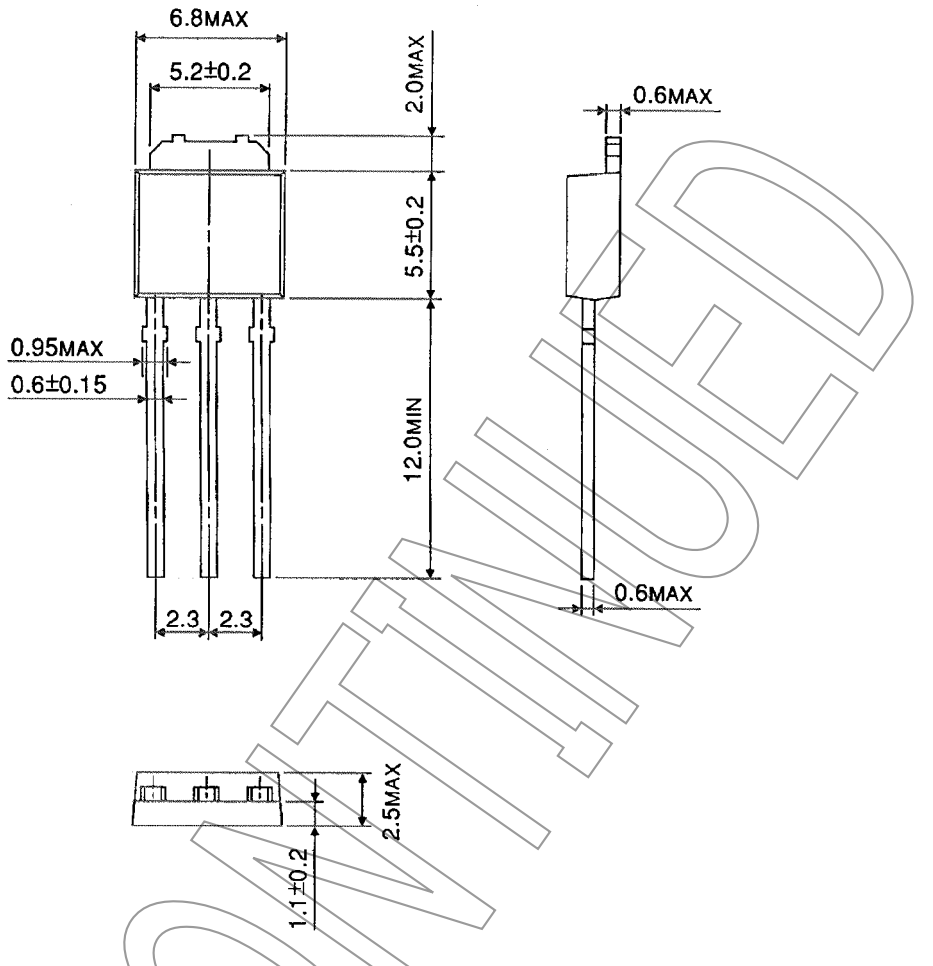
R.R. – f



Package Dimensions

HSIP3-P-2.30B

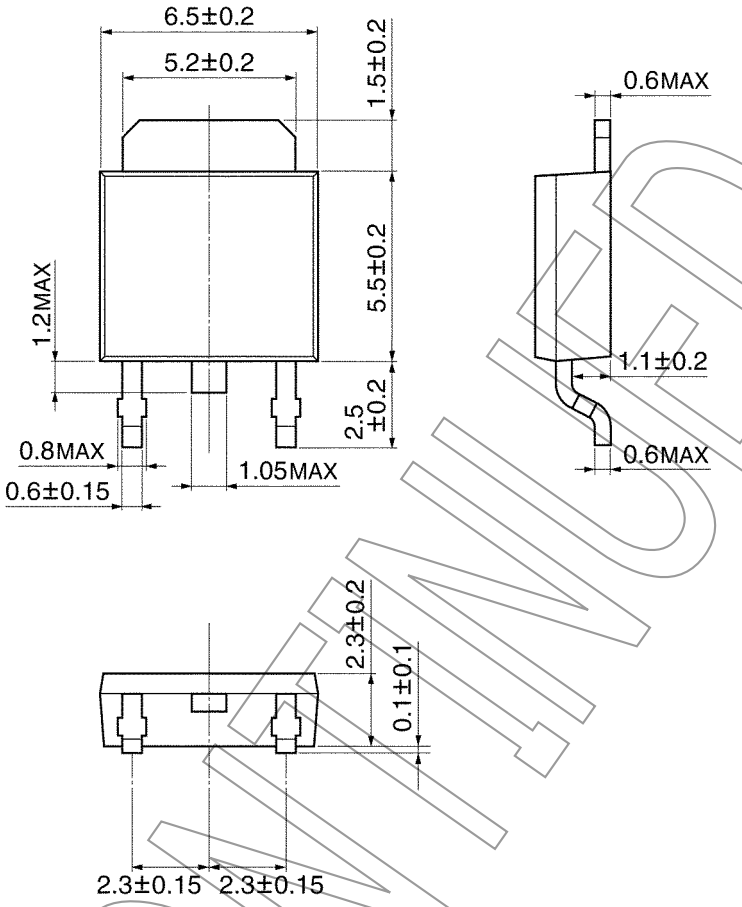
Unit : mm



Weight: 0.36 g (typ.)

Package Dimensions

HSOP3-P-2.30D Unit: mm



Weight: 0.36 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.
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.).These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in his document shall be made at the customer’s own risk.
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