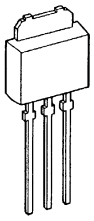
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA48M025F,TA48M03F,TA48M033F, TA48M0345F,TA48M04F,TA48M05F

2.5 V, 3 V, 3.3 V, 3.45 V, 4 V, 5 V Three-Terminal Low Dropout Voltage Regulator

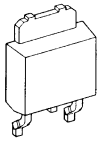
The TA48M**F series consists of fixed-positive-output, low dropout regulators with an output current of 500 mA (max). In response to the need for low voltage devices, the series offers devices with low output voltages of 2.5 V, 3 V, 3.3 V, 3.45 V, and 4 V, which are not included in the existing TA78DM**S series (0.5 A low dropout).

TA48M**F (S)



HSIP3-P-2.30B

TA48M**F (LBS1, S) (TE16L, S)



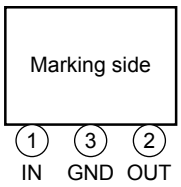
HSOP3-P-2.30A

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

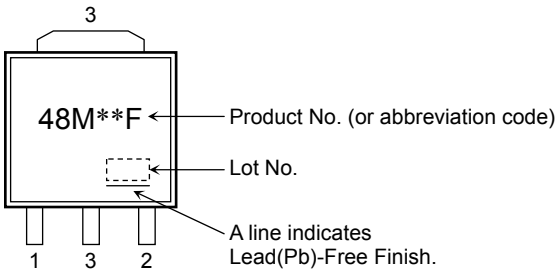
Features

- Maximum output current of 0.5 A
- Low standby current: 0.8 mA (typ.)
- Low dropout voltage: 0.65 V (max) @I_{OUT} = 0.5 A
- Protection function:
  overheat/overcurrent/overvoltage/reversed power supply connections.
- PW-Mold package:
  Surface-mount type for reflow soldering is also supported.

Pin Assignment



Marking



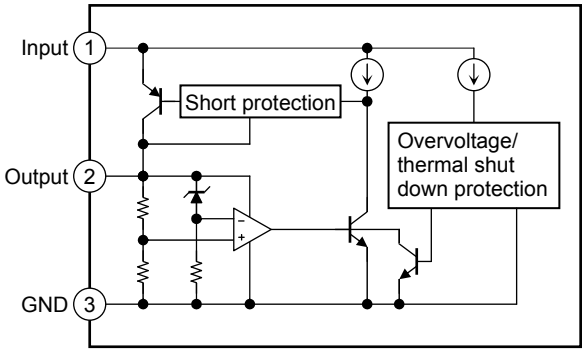
The product(s) in this document (“Product”) contain functions intended to protect the Product from temporary small overloads such as minor short-term overcurrent, overvoltage, or overheating. The protective functions do not necessarily protect Product under all circumstances. When incorporating Product 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.

Ordering Method (Note 1)

	Product Name	Package (Lead Type)	Packing Form
1	TA48M**F (S)	PW-Mold: Straight lead	Sack (200 pcs./sack)
2	TA48M**F (LBS1, S)	PW-Mold: Surface-mount	Stick (100 pcs. max)
	TA48M**F (TE16L, S)	PW-Mold: Surface-mount	Tape (700 pcs./reel)

Note 1: The "**" in each pro-forma product name is replaced with the output voltage of each product.
For example: for 3 V, "TA48M03F"

Block Diagram



Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Input voltage		V_{IN}	29	V
Output current		I_{OUT}	0.5	A
Power dissipation	(Ta = 25°C)	P_D	1	W
	(Tc = 25°C)		10	
Operating temperature		T_{opr}	−40 to 85	°C
Storage temperature		T_{stg}	−55 to 150	°C
Junction temperature		T_j	150	°C
Thermal resistance		$R_{th\ (j\text{-}c)}$	12.5	°C/W
		$R_{th\ (j\text{-}a)}$	125	

Note: 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

Characteristics	Symbol	Min	Typ.	Max	Unit
Overvoltage	V_{IN}	29	33	—	V
Overheat	T_j	—	175	—	°C

TA48M025F

Electrical Characteristics

(unless otherwise specified, V_{IN} = 4.5 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 μF, C_{OUT} = 10 μF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	2.4	2.5	2.6	V
		—	3.5 V ≤ V_{IN} ≤ 16 V, 5 mA ≤ I_{OUT} ≤ 500 mA, 0°C ≤ T_j ≤ 125°C	2.375	2.5	2.625	
Line regulation	Reg·line	—	3.5 V ≤ V_{IN} ≤ 16 V	—	7	18	mV
Load regulation	Reg·load	—	5 mA ≤ I_{OUT} ≤ 500 mA	—	45	90	mV
Quiescent current	I_B	—	3.5 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 0 mA	—	0.8	1.4	mA
		—	3.5 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 250 mA	—	12	25	
Output noise voltage	V_{NO}	—	10 Hz ≤ f ≤ 100 kHz, I_{OUT} = 50 mA	—	72	—	μVrms
Ripple rejection	R.R.	—	f = 120 Hz, 3.5 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 50 mA	62	72	—	dB
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.17	0.35	V
		—	I_{OUT} = 500 mA	—	0.35	0.65	
Peak circuit current	I_{PEAK}	—	—	0.60	1.15	1.40	A
Short circuit current	I_{SC}	—	—	0.60	1.15	1.40	A

TA48M03F

Electrical Characteristics

(unless otherwise specified, V_{IN} = 5 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 μF, C_{OUT} = 10 μF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	2.88	3.0	3.12	V
		—	4 V ≤ V_{IN} ≤ 16 V, 5 mA ≤ I_{OUT} ≤ 500 mA, 0°C ≤ T_j ≤ 125°C	2.85	3.0	3.15	
Line regulation	Reg·line	—	4 V ≤ V_{IN} ≤ 16 V	—	8	21	mV
Load regulation	Reg·load	—	5 mA ≤ I_{OUT} ≤ 500 mA	—	45	95	mV
Quiescent current	I_B	—	4 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 0 mA	—	0.8	1.4	mA
		—	4 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 250 mA	—	12	25	
Output noise voltage	V_{NO}	—	10 Hz ≤ f ≤ 100 kHz, I_{OUT} = 50 mA	—	90	—	μVrms
Ripple rejection	R.R.	—	f = 120 Hz, 4 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 50 mA	60	70	—	dB
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.17	0.35	V
		—	I_{OUT} = 500 mA	—	0.35	0.65	
Peak circuit current	I_{PEAK}	—	—	0.60	1.20	1.45	A
Short circuit current	I_{SC}	—	—	0.60	1.20	1.45	A

TA48M033F

Electrical Characteristics

(unless otherwise specified, V_{IN} = 5.3 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 μF, C_{OUT} = 10 μF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	3.168	3.3	3.432	V
		—	4.3 V ≤ V_{IN} ≤ 16 V, 5 mA ≤ I_{OUT} ≤ 500 mA, 0°C ≤ T_j ≤ 125°C	3.135	3.3	3.465	
Line regulation	Reg·line	—	4.3 V ≤ V_{IN} ≤ 16 V	—	10	23	mV
Load regulation	Reg·load	—	5 mA ≤ I_{OUT} ≤ 500 mA	—	45	105	mV
Quiescent current	I_B	—	4.3 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 0 mA	—	0.8	1.4	mA
		—	4.3 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 250 mA	—	12	25	
Output noise voltage	V_{NO}	—	10 Hz ≤ f ≤ 100 kHz, I_{OUT} = 50 mA	—	90	—	μVrms
Ripple rejection	R.R.	—	f = 120 Hz, 4.3 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 50 mA	60	70	—	dB
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.17	0.35	V
		—	I_{OUT} = 500 mA	—	0.35	0.65	
Peak circuit current	I_{PEAK}	—	—	0.60	1.20	1.45	A
Short circuit current	I_{SC}	—	—	0.60	1.20	1.45	A

TA48M0345F

Electrical Characteristics

(unless otherwise specified, V_{IN} = 5.45 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 μF, C_{OUT} = 10 μF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	3.312	3.45	3.588	V
		—	4.45 V ≤ V_{IN} ≤ 16 V, 5 mA ≤ I_{OUT} ≤ 500 mA, 0°C ≤ T_j ≤ 125°C	3.278	3.45	3.622	
Line regulation	Reg·line	—	4.45 V ≤ V_{IN} ≤ 16 V	—	12	25	mV
Load regulation	Reg·load	—	5 mA ≤ I_{OUT} ≤ 500 mA	—	45	110	mV
Quiescent current	I_B	—	4.45 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 0 mA	—	0.8	1.4	mA
		—	4.45 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 250 mA	—	12	25	
Output noise voltage	V_{NO}	—	10 Hz ≤ f ≤ 100 kHz, I_{OUT} = 50 mA	—	90	—	μVrms
Ripple rejection	R.R.	—	f = 120 Hz, 4.45 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 50 mA	60	70	—	dB
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.17	0.35	V
		—	I_{OUT} = 500 mA	—	0.35	0.65	
Peak circuit current	I_{PEAK}	—	—	0.60	1.20	1.45	A
Short circuit current	I_{SC}	—	—	0.60	1.20	1.45	A

TA48M04F

Electrical Characteristics

(unless otherwise specified, V_{IN} = 6 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 μF, C_{OUT} = 10 μF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	3.84	4.0	4.16	V
		—	5 V ≤ V_{IN} ≤ 16 V, 5 mA ≤ I_{OUT} ≤ 500 mA, 0°C ≤ T_j ≤ 125°C	3.8	4.0	4.2	
Line regulation	Reg·line	—	5 V ≤ V_{IN} ≤ 16 V	—	11	28	mV
Load regulation	Reg·load	—	5 mA ≤ I_{OUT} ≤ 500 mA	—	45	115	mV
Quiescent current	I_B	—	5 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 0 mA	—	0.9	1.4	mA
		—	5 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 250 mA	—	13	25	
Output noise voltage	V_{NO}	—	10 Hz ≤ f ≤ 100 kHz, I_{OUT} = 50 mA	—	110	—	μVrms
Ripple rejection	R.R.	—	f = 120 Hz, 5 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 50 mA	58	68	—	dB
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.17	0.35	V
		—	I_{OUT} = 500 mA	—	0.35	0.65	
Peak circuit current	I_{PEAK}	—	—	0.60	1.25	1.50	A
Short circuit current	I_{SC}	—	—	0.60	1.25	1.50	A

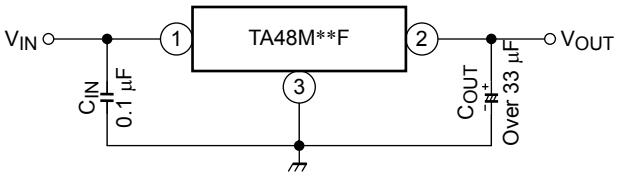
TA48M05F

Electrical Characteristics

(unless otherwise specified, V_{IN} = 7 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 μF, C_{OUT} = 10 μF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	4.8	5.0	5.2	V
		—	6 V ≤ V_{IN} ≤ 18 V, 5 mA ≤ I_{OUT} ≤ 500 mA, 0°C ≤ T_j ≤ 125°C	4.75	5.0	5.25	
Line regulation	Reg·line	—	6 V ≤ V_{IN} ≤ 18 V	—	15	35	mV
Load regulation	Reg·load	—	5 mA ≤ I_{OUT} ≤ 500 mA	—	50	135	mV
Quiescent current	I_B	—	6 V ≤ V_{IN} ≤ 18 V, I_{OUT} = 0 mA	—	1.0	1.4	mA
		—	6 V ≤ V_{IN} ≤ 18 V, I_{OUT} = 250 mA	—	13	25	
Output noise voltage	V_{NO}	—	10 Hz ≤ f ≤ 100 kHz, I_{OUT} = 50 mA	—	125	—	μVrms
Ripple rejection	R.R.	—	f = 120 Hz, 6 V ≤ V_{IN} ≤ 18 V, I_{OUT} = 50 mA	58	68	—	dB
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.17	0.35	V
		—	I_{OUT} = 500 mA	—	0.35	0.65	
Peak circuit current	I_{PEAK}	—	—	0.60	1.30	1.55	A
Short circuit current	I_{SC}	—	—	0.60	1.30	1.55	A

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.

Note: Depending on the type of capacitor being used to connect to the output, characteristics (capacitance, frequency and others) may decline and the output may oscillate. To prevent this, Toshiba recommends a tantalum electrolytic capacitor that has a small fluctuation in capacitance characteristics.

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.

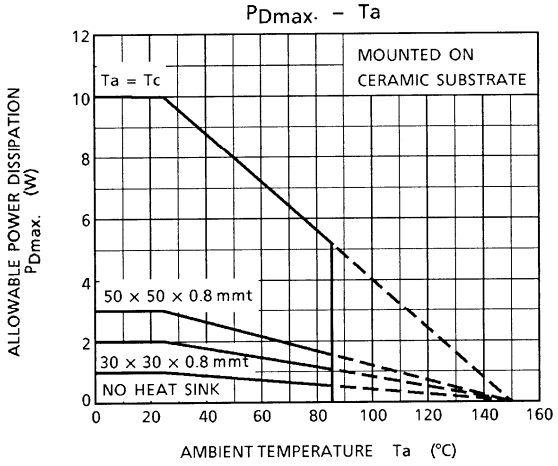
- Overheating Protection

  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.

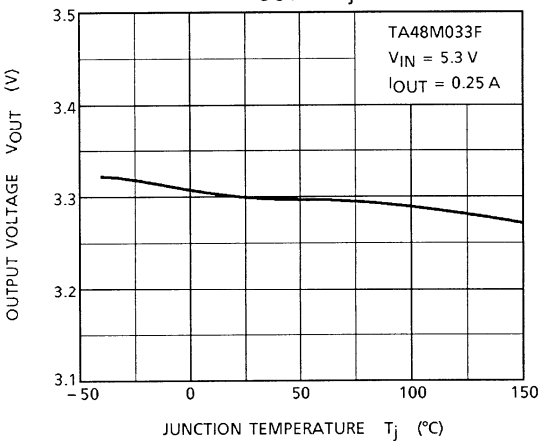
- Overvoltage Protection

  The overvoltage protection circuits in the Product are designed to temporarily protect Product from minor overvoltage of brief duration. When the overvoltage protective function in the Product activates, immediately cease application of overvoltage to Product. Improper usage of Product, such as application of voltage to Product exceeding the absolute maximum ratings, could cause the overvoltage protection circuit not to operate properly and/or damage Product permanently even before the protection circuit starts to operate.

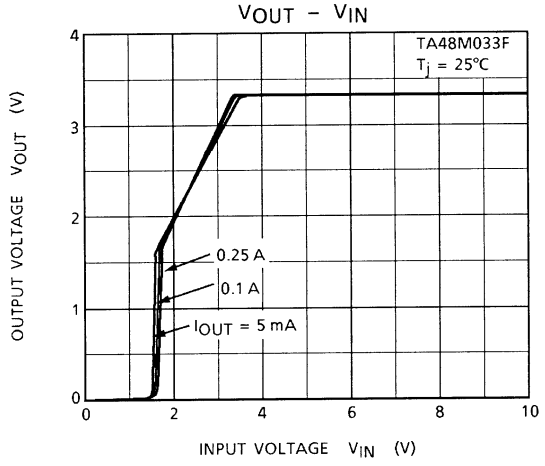
$P_{Dmax.}$ – Ta



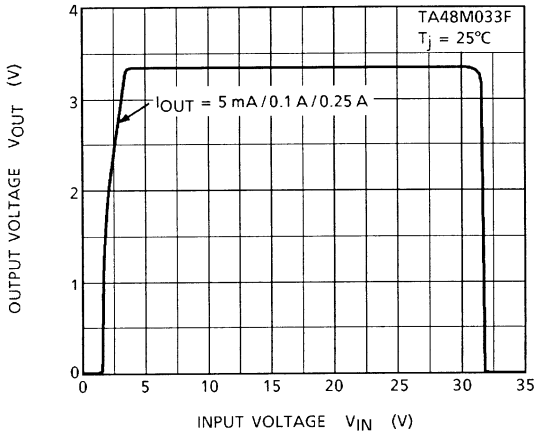
V_{OUT} – T_j



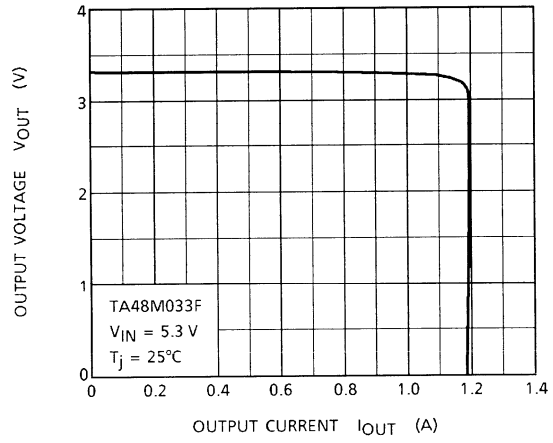
V_{OUT} – V_{IN}



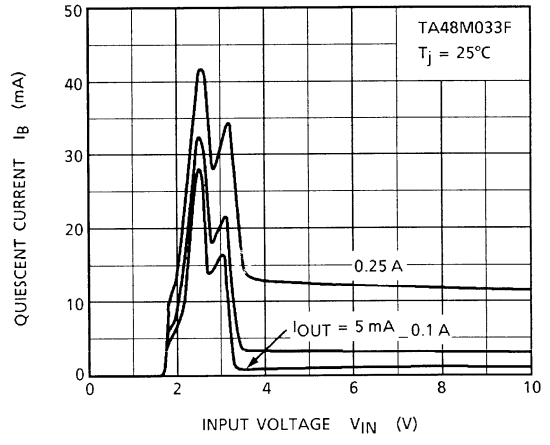
V_{OUT} – V_{IN}



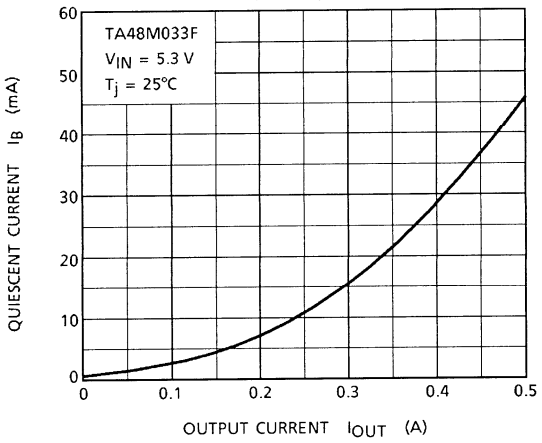
V_{OUT} – I_{OUT}



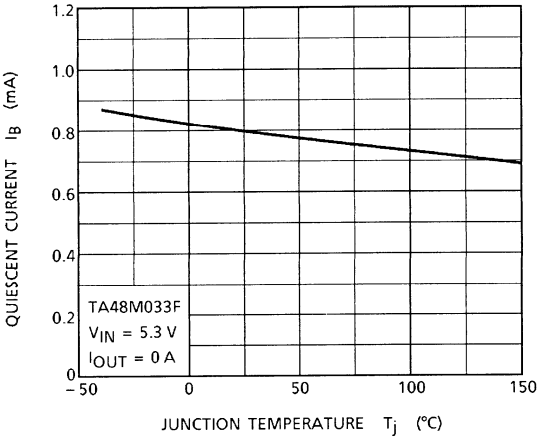
I_B – V_{IN}



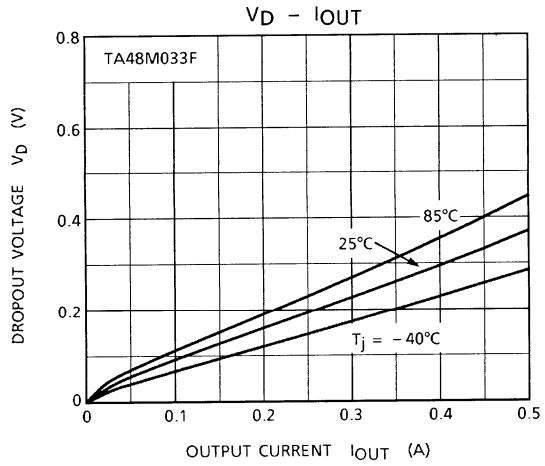
I_B – I_{OUT}



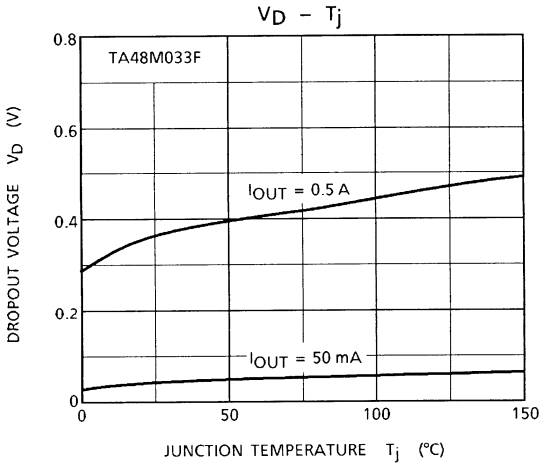
I_B – T_j



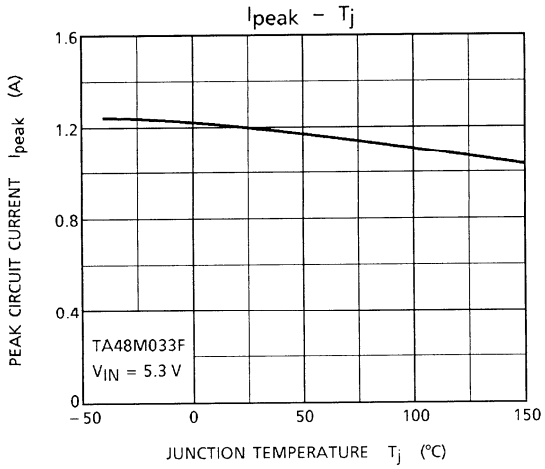
V_D – I_{OUT}



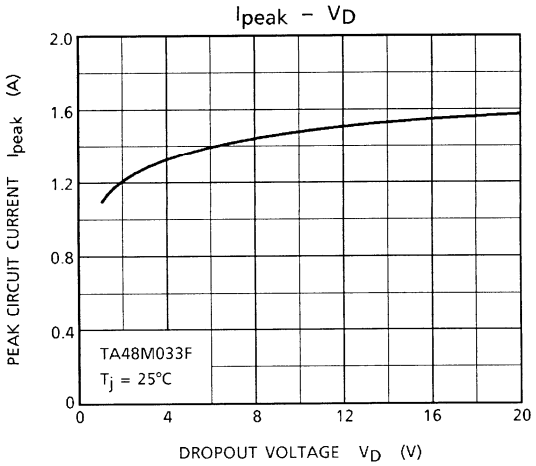
V_D – T_j



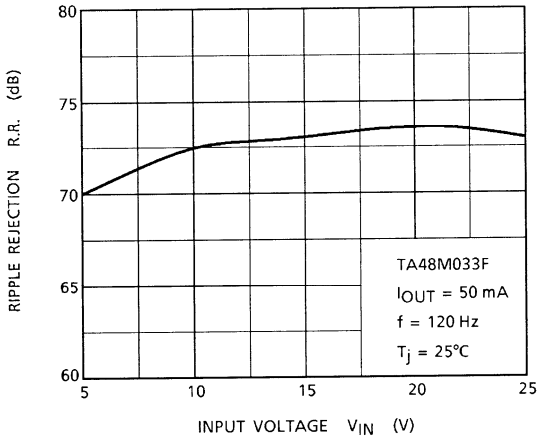
I_{peak} – T_j



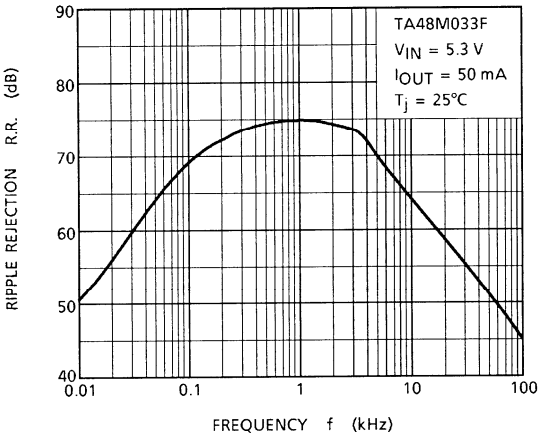
I_{peak} – V_D



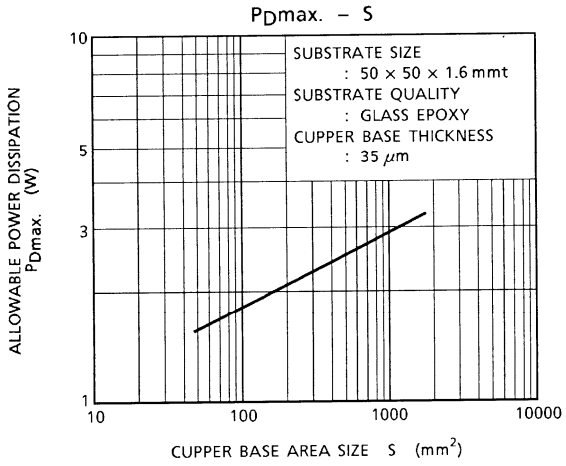
R.R. – V_{IN}



R.R. – f



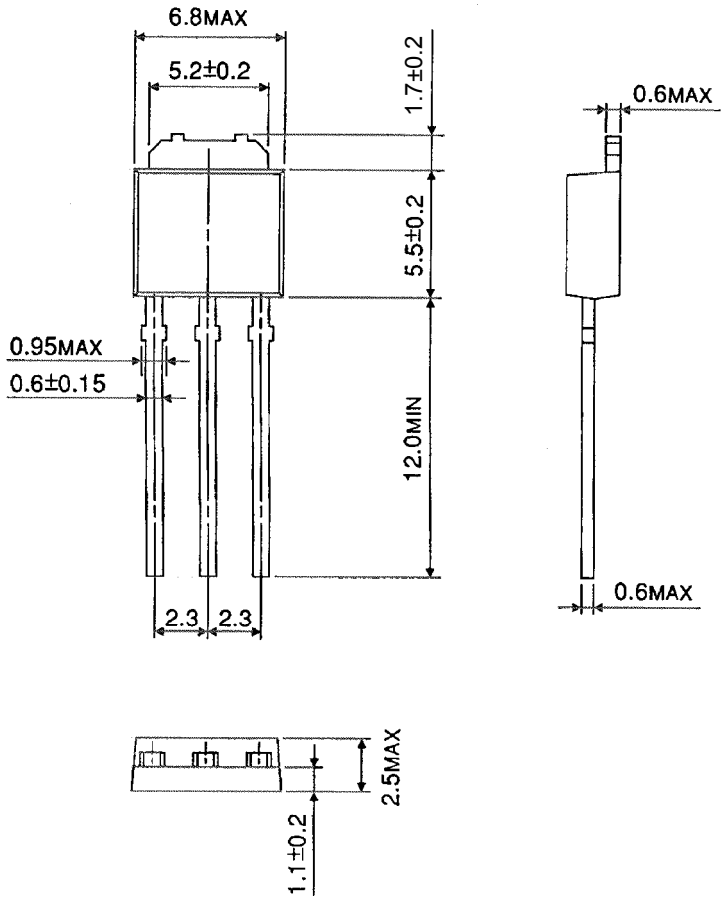
$P_D$max. – S



Package Dimensions

HSIP3-P-2.30B

Unit : mm

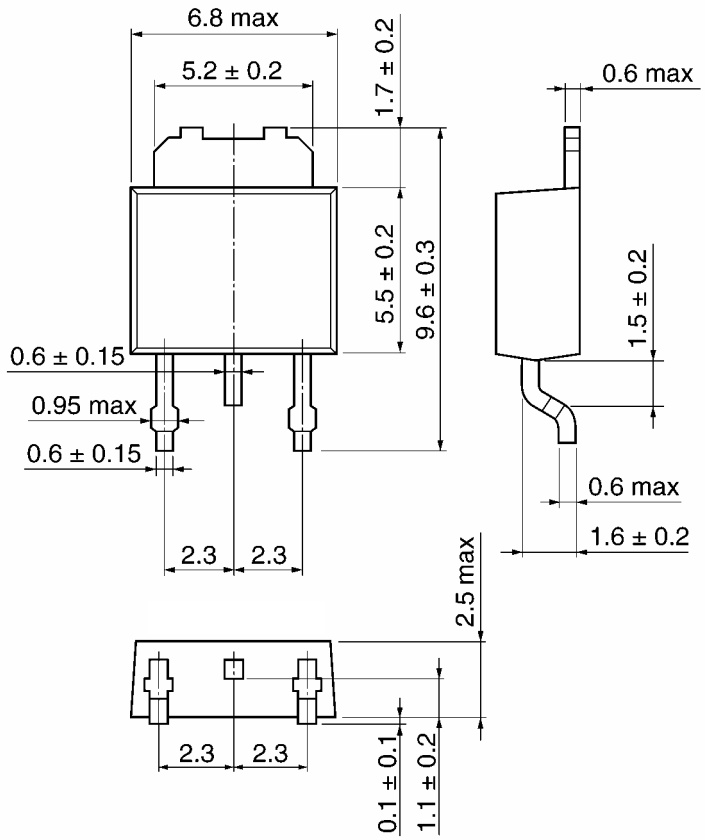


Weight: 0.36 g (typ.)

Package Dimensions

HSOP3-P-2.30A

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.
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