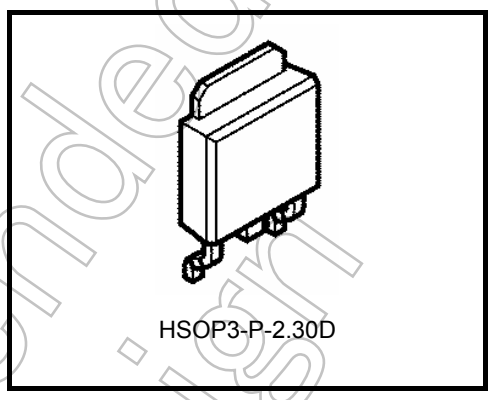
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

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, 3.3 V etc.

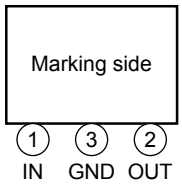


Weight
HSOP3-P-2.30D: 0.36 g (typ.)

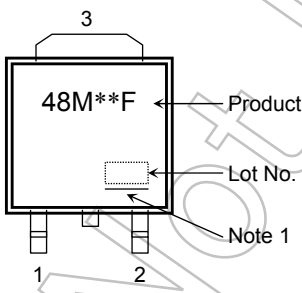
Features

- Maximum output current of 0.5 A
- Low standby current: 800 μA (typ.)
- Low dropout voltage: 0.65 V (max) @I_{OUT} = 0.5 A
- Protection function: overcurrent/overheat/overvoltage/reversed power supply connections.
- New PW-Mold package (Surface-mount type)

Pin Assignment



Marking



Note 1: A line under a Lot No. identifies the indication of product Labels.
Not underlined: [[Pb]]/INCLUDES > MCV
Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Note 2: The "**" part of each product number varies according to the output voltage of the product.

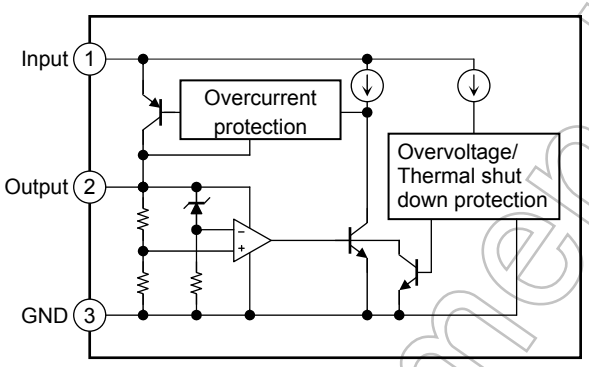
The product(s) in this document ("Product") contain functions intended to protect the Product from temporary small overloads such as minor short-term overcurrent, overvoltage, or overheating. The protective functions do not necessarily protect Product under all circumstances. When incorporating Product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

Product Name	Package (Lead Type)	Packing Form
TA48M**F (T6L1, SNQ)	New PW-Mold: Surface-mount	Tape (2000 pcs ./ reel)

Note: The "**" in each pro-forma product name is replaced with the output voltage of each product.

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 junction temperature		T_{jopr}	−40 to 150	°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 (reference)

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

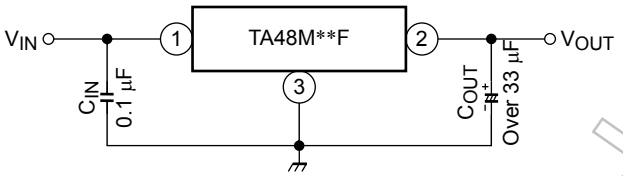
TA48M05F

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



- 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.

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

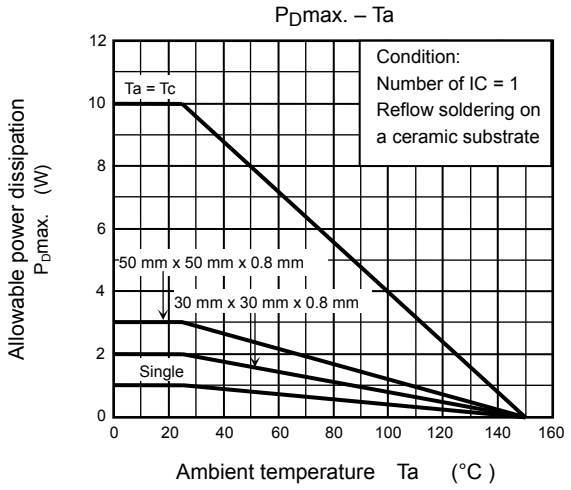
  The overcurrent protection circuits in the Product are designed to temporarily protect Product from minor overcurrent of brief duration. When the overcurrent protective function in the Product activates, immediately cease application of overcurrent to Product. Improper usage of Product, such as application 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.

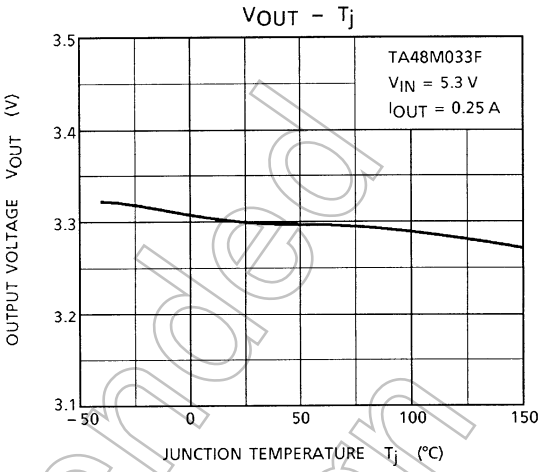
- Overheating Protection

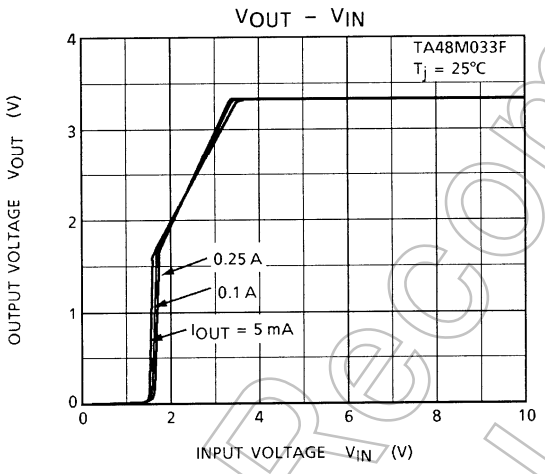
  The thermal shutdown circuits in the Product are designed to temporarily protect Product from minor overheating of brief duration. When the overheating protective function in the Product activates, immediately correct the overheating situation. Improper usage of Product, such as the application of heat 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.

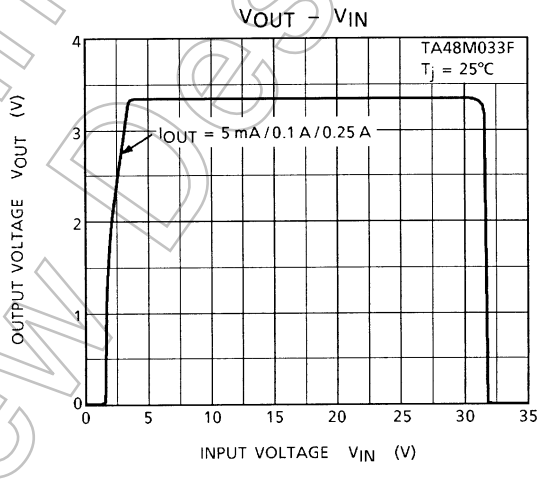
- Overvoltage Protection

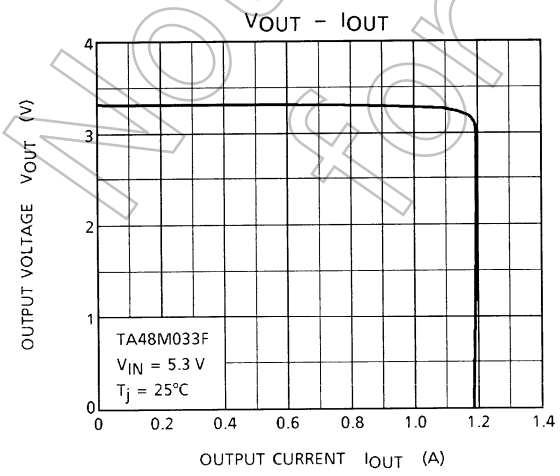
  The overvoltage protection circuits in the Product are designed to temporarily protect Product from minor overvoltage of brief duration. When the overvoltage protective function in the Product activates, immediately cease application of overvoltage to Product. Improper usage of Product, such as application 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.

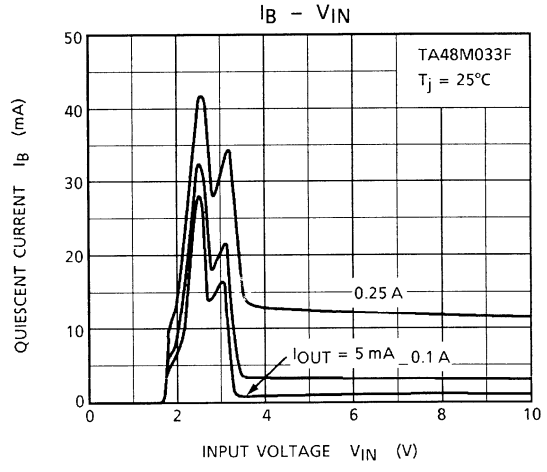




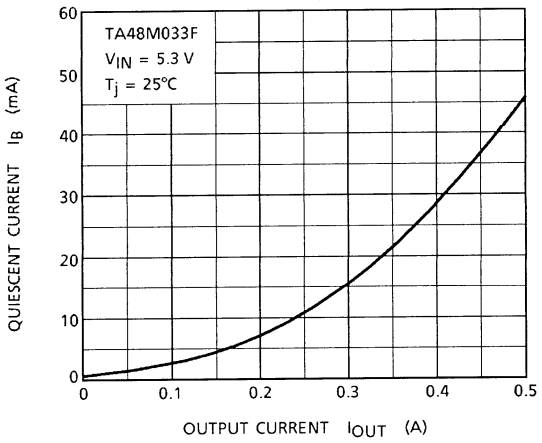




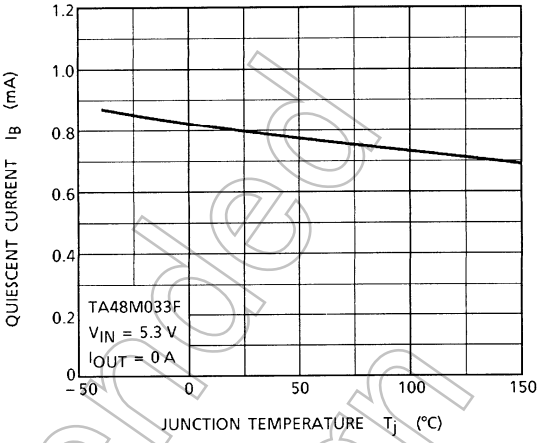




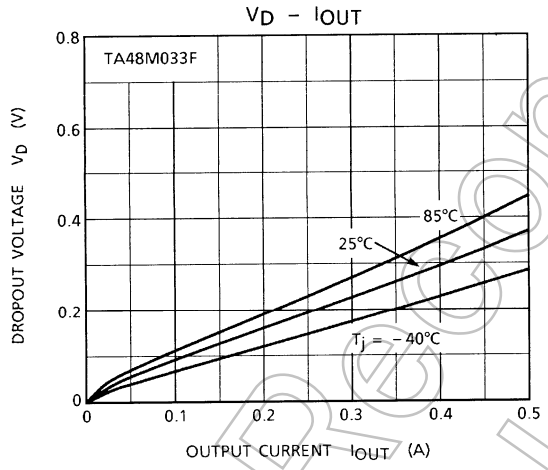
I_B – I_{OUT}



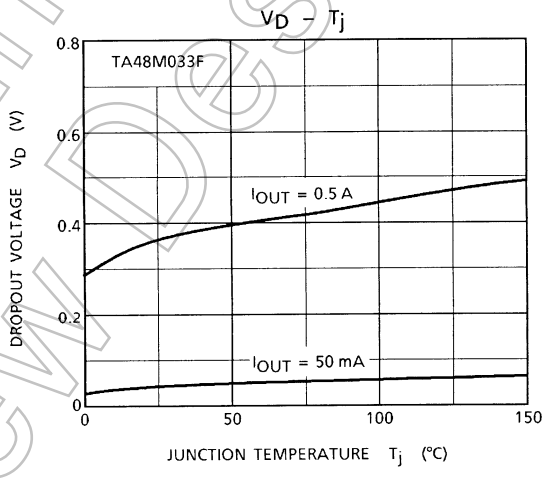
I_B – T_j



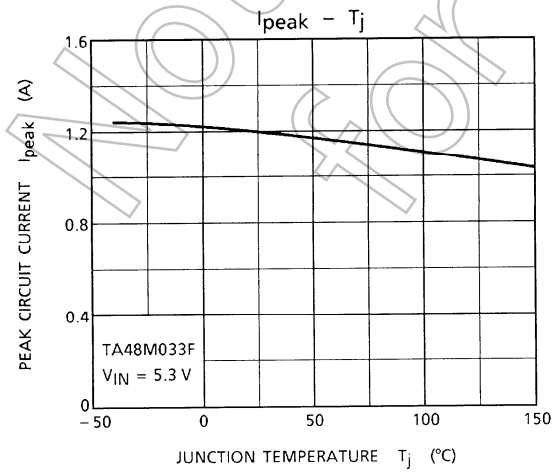
V_D – I_{OUT}



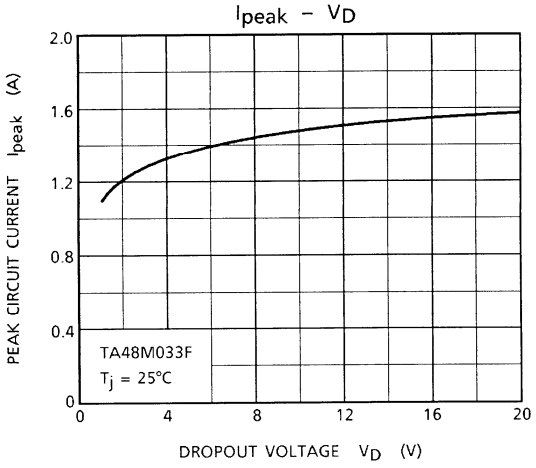
V_D – T_j



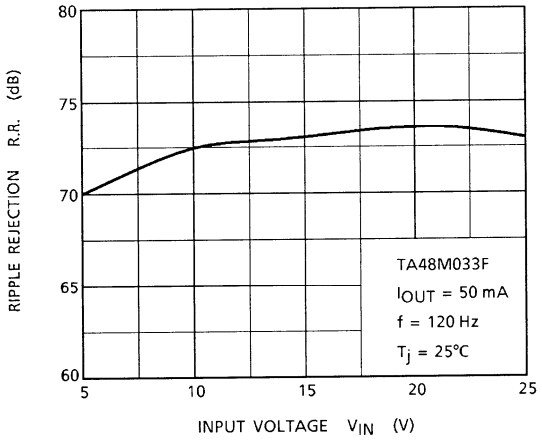
I_{peak} – T_j



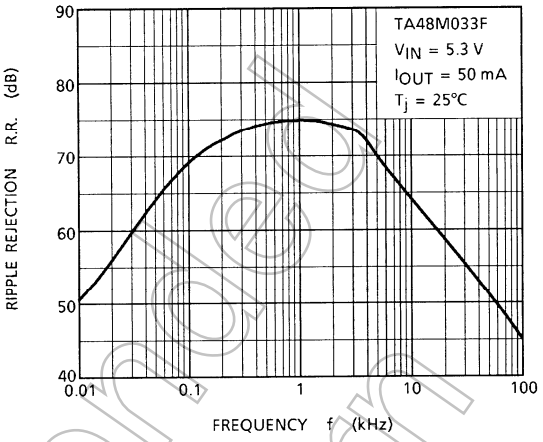
I_{peak} – V_D



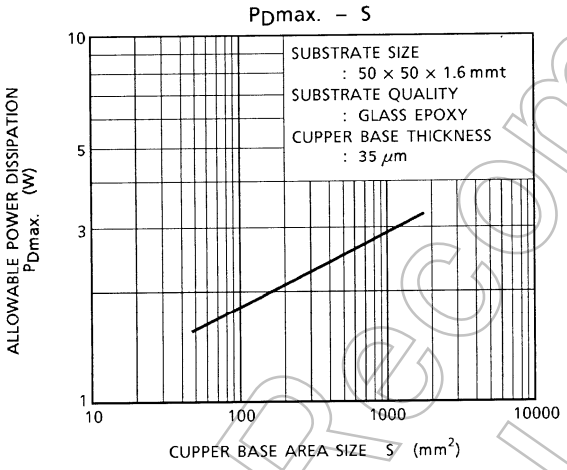
R.R. – V_{IN}



R.R. – f

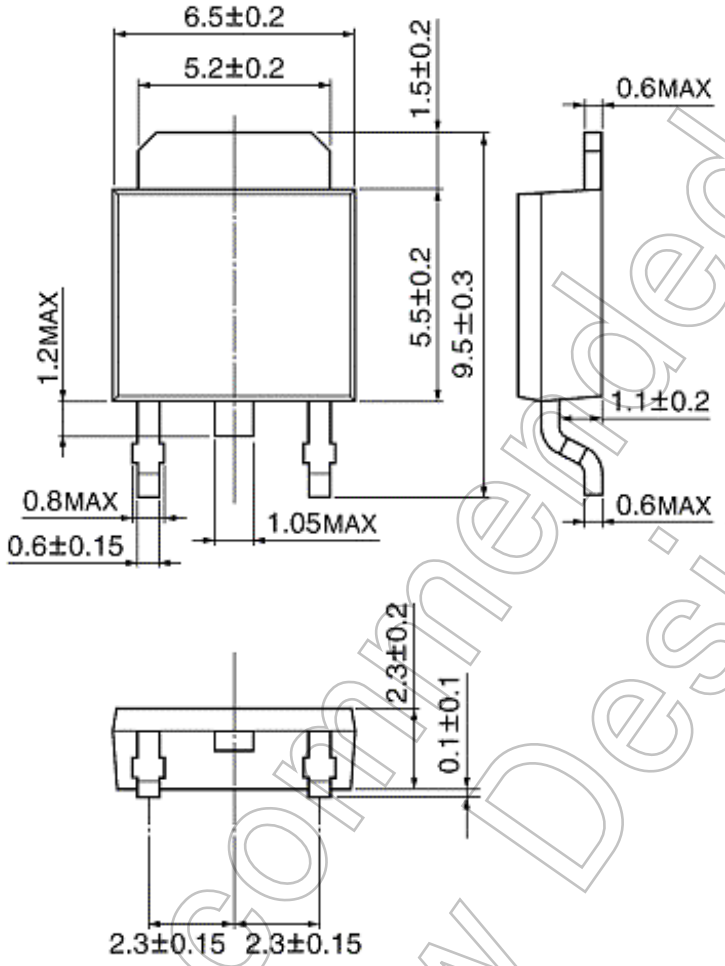


$P_D$max. – S



Package Dimensions

HSOP3-P-2.30D Unit: mm



Weight: 0.36 g (typ.)

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