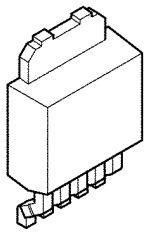
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA48S018F,TA48S02F,TA48S025F, TA48S03F,TA48S033F,TA48S05F

1-A Output Current and Low Dropout Voltage Regulator with ON/OFF Control Switch

The TA48S**F series is the small-surface mount type low-dropout regulator of output current 1 A (maximum) with ON/OFF control switch. By control of an EN (ON/OFF) terminal, only when required, a regulator can be operated (output ON). Therefore, it is suitable for power supply circuits, such as the AV and OA, a digital equipment with the power save function, and pocket information machines and equipment of a battery drive, and these newly developed regulators contribute to energy saving of various apparatus. Moreover, output voltage has line-up from 1.8 V, and it corresponds to under-voltage operation of various apparatus.



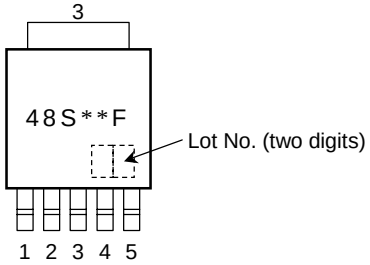
HSIP5-P-1.27A

Weight: 0.29 g (typ.)

Features

- Built-in ON/OFF control function (Active high)
- Maximum output current: 1 A
- Low output voltage: 1.8/2.0/2.5/3.0/3.3/5.0 V
- Output voltage accuracy: V_{OUT} ± 3% (@T_j = 25°C)
- Low standby current: 800 μA (typ.) (@I_{OUT} = 0 A)
- Low quiescent current (output OFF mode): 0.5μA (typ.)
- Low-dropout voltage: 0.5 V (max) (@I_{OUT} = 0.5 A)
- Protection function: Over current/Over temperature/ASO
- Package type: Surface-mount 5-pin PW-MOLD

Pin Assignment



1: INPUT (IN)
2: ENABLE (EN)
3: GND
4: NC
5: OUTPUT (OUT)

* Lot number: Last decimal digit of the year of manufacture and January to December is denoted by letter A to L respectively.

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

Pin Connections

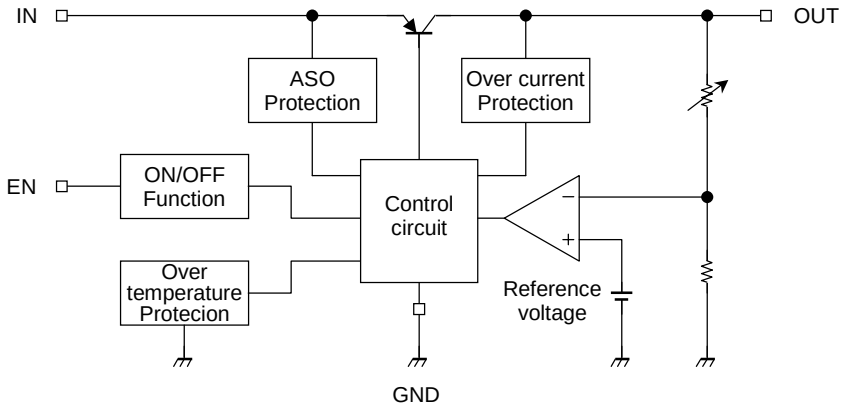
Pin No.	Symbol	Description
1	IN	Power supply input terminal. A capacitor (C_{IN}) is connected between GND.
2	EN	Output ON/OFF control terminal Output is ON when this pin at the “H” level, OFF when this pin open or at the “Low” level
3	GND	Ground terminal
4	NC	Non-connection
5	OUT	Output terminal. A capacitor (C_{OUT}) is connected between GND.

How to Order (Note 1)

Product No.	Package	Package Type and Capacity
TA48S**F (TE16L1)	PW-MOLD 5 Pin: Surface-mount	Tape (2000 pcs/reel)

Note 1: The “**” in the each product number is replaces with the output voltage of each product.

Block Diagram



Maximum Rating (Ta = 25°C) (Note 2)

Characteristic		Symbol	Rating	Unit
Input voltage		V_{IN}	16	V
EN Input voltage		V_{EN}	16	V
Output current		I_{OUT}	1	A
Operating temperature		T_{opr}	−40~85	°C
Junction temperature		T_j	150	°C
Storage temperature		T_{stg}	−55~150	°C
Power dissipation	Ta = 25°C	P_D	1	W
	Tc= 25°C		10	
Thermal resistance	junction-ambient	$R_{th(j-a)}$	125	°C/W
	junction-case	$R_{th(j-c)}$	12.5	

Note 2: Please don't impress current and voltage externally to the terminal if that is not specified. (include reverse polarity).

Protection Function (Reference) (Note 3)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Over temperature	T_{SD} (T_j)	—	—	160	—	°C
Peak circuit current	I_{PEAK}	$V_{IN} = V_{OUT} + 2$ V, $T_j = 25$°C	—	1.5	—	A
Short circuit current	I_{SC}	$V_{IN} = V_{OUT} + 2$ V, $T_j = 25$°C	—	1.5	—	A

Note 3: Please use devices within the limits of a maximum rating when these are actually used.

TA48S018F
Electrical Characteristics
(V_{EN} = 3.8 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C, unless otherwise specified)

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	53	65	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.3	0.5	V
		I_{OUT} = 1 A	—	0.5	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 2.8 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 3.8 V, I_{OUT} = 0.1 A	—	20	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 3.8 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S02F
Electrical Characteristics
(V_{EN} = 4.0 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C, unless otherwise specified)

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	65	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.25	0.5	V
		I_{OUT} = 1 A	—	0.4	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 3.0 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 4.0 V, I_{OUT} = 0.1 A	—	25	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 4.0 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S025F
Electrical Characteristics
(V_{EN} = 4.5 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C, unless otherwise specified)

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} = 2.7 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	64	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.2	0.5	V
		I_{OUT} = 1 A	—	0.3	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 3.5 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 4.5 V, I_{OUT} = 0.1 A	—	30	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 4.5 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S03F
Electrical Characteristics
(V_{EN} = 5.0 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C, unless otherwise specified)

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	63	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.2	0.5	V
		I_{OUT} = 1 A	—	0.3	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 4.0 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 5.0 V, I_{OUT} = 0.1 A	—	35	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 5.0 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S033F
Electrical Characteristics
(V_{EN} = 5.3 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C, unless otherwise specified)

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} = 2.9 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	48	61	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.2	0.5	V
		I_{OUT} = 1 A	—	0.3	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 4.3 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 5.3 V, I_{OUT} = 0.1 A	—	35	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 5.3 V, V_{EN} = 0 V	—	0.1	2	μA

TA48S05F
Electrical Characteristics
(V_{EN} = 7.0 V, C_{IN} = 0.33 μF, C_{OUT} = 10 μF, T_j = 25°C, unless otherwise specified)

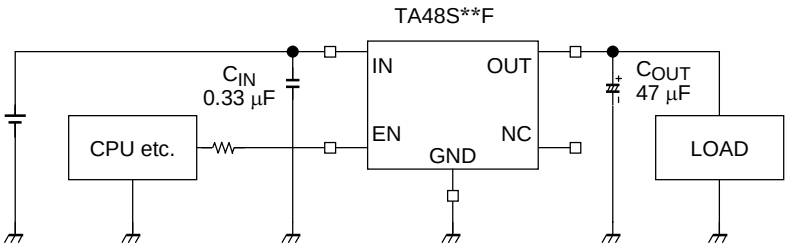
Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 7 V, I_{OUT} = 0.5 A	4.85	5.0	5.15	V
		6.0 V ≦ V_{IN} ≦ 12 V, 5 mA ≦ I_{OUT} ≦ 1 A, 0°C ≦ T_j ≦ 125°C	4.775	5.0	5.225	
Line regulation	Reg·line	6.0 V ≦ V_{IN} ≦ 12 V, I_{OUT} = 0.5 A	—	5	20	mV
Load regulation	Reg·load	V_{IN} = 7.0 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	5	30	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	48	60	—	dB
Dropout voltage	V_D	I_{OUT} = 0.5 A	—	0.2	0.5	V
		I_{OUT} = 1 A	—	0.3	—	
Quiescent current (OFF mode)	$I_{B(OFF)}$	V_{EN} = 0.4 V, 6.0 V ≦ V_{IN} ≦ 12 V	—	0.5	5	μA
Output control voltage (ON)	$V_{EN(ON)}$	I_{OUT} = 0.1 A	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	V_{IN} = V_{EN} = 7.0 V, I_{OUT} = 0.1 A	—	50	100	μA
Output control current (OFF)	$I_{EN(OFF)}$	V_{IN} = 7.0 V, V_{EN} = 0 V	—	0.1	2	μA

Precaution on Application

In T_j = 25°C within each item measurement condition, it is regulation in the state where a pulse examination is carried out and the drift of the property value by junction-temperature rise of a tip can be disregarded.

When a input voltage is impressed steeply, since output voltage may go up momentarily, a enable terminal voltage should be careful according to load conditions etc. also in the state of “Low”.

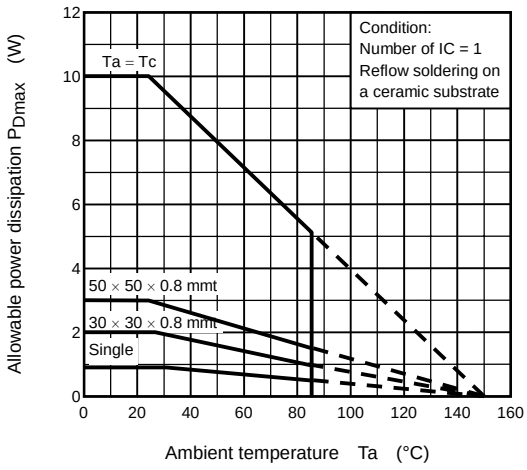
Standard Application Circuit



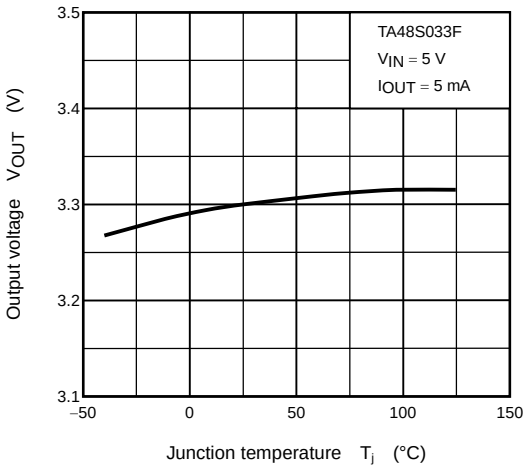
Connect the input terminal and GND, and the output terminal and GND, by capacitor respectively.

The capacitances should be determined experimentally. In particular, adequate investigation should be made so that there is no problem even at time of high or low temperature.

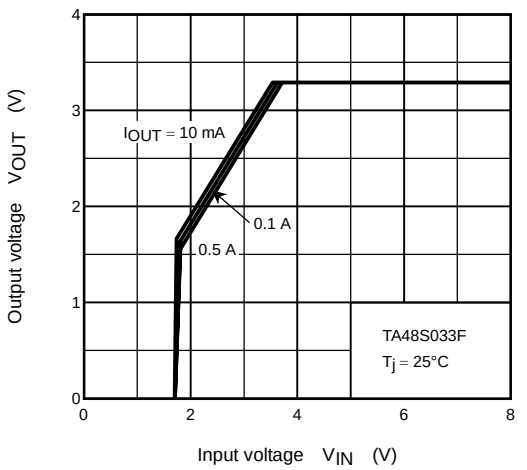
P_{Dmax} – Ta



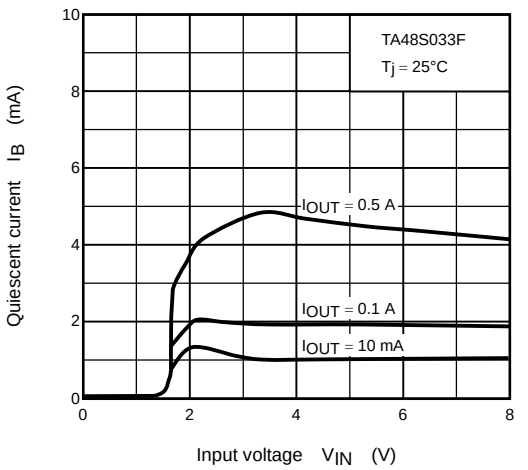
V_{OUT} – T_j



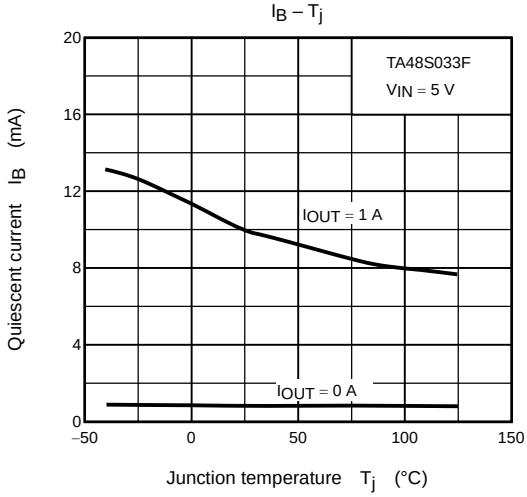
V_{OUT} – V_{IN}



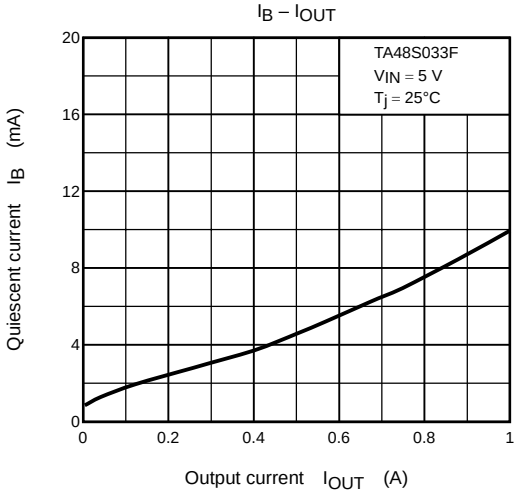
I_B – V_{IN}



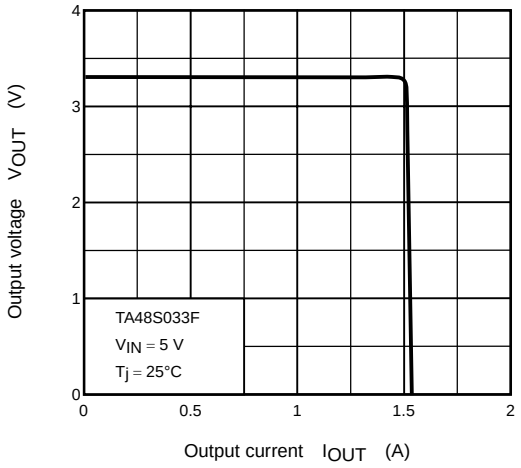
I_B – T_j



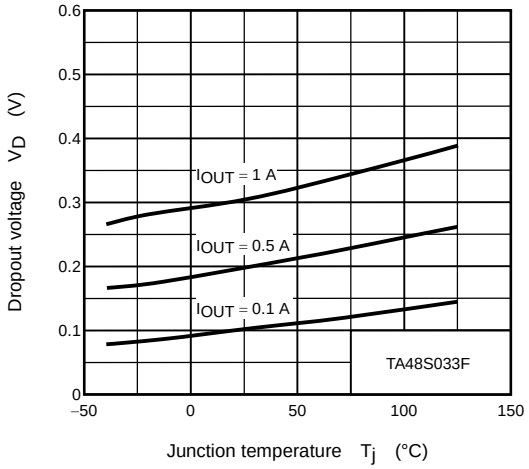
I_B – I_{OUT}



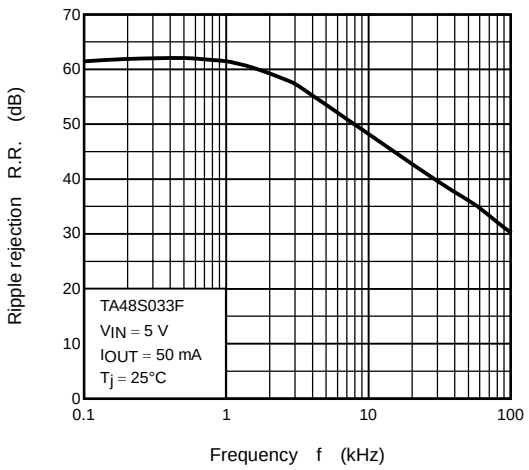
$V_{OUT} - I_{OUT}$



$V_D - T_j$

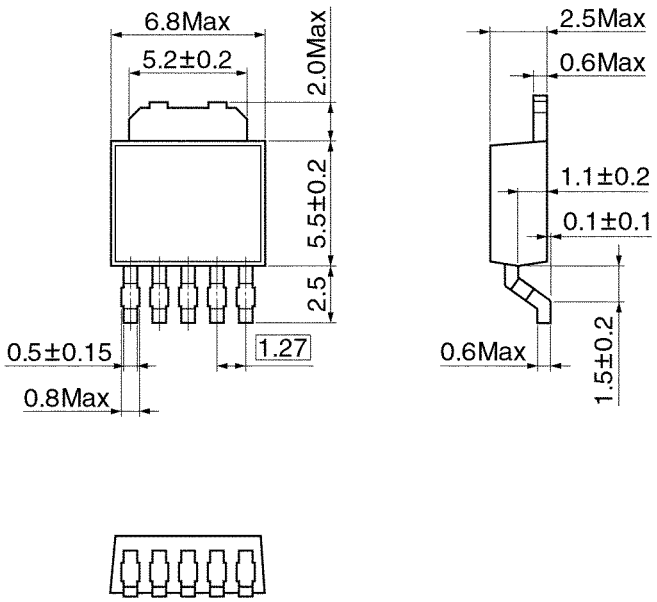


R.R. – f



Package Dimensions

HSIP5-P-1.27A Unit: mm



Weight: 0.29 g (typ.)

RESTRICTIONS ON PRODUCT USE

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  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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