

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

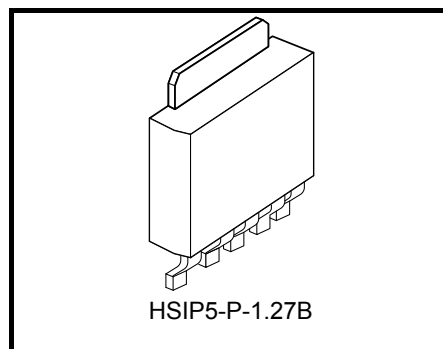
## TA58MS05F, TA58MS06F, TA58MS08F, TA58MS09F, TA58MS12F

### 500 mA Output Current and Low Dropout Voltage Regulator with ON/OFF Control Switch

The TA58MS\*\*F series consists of small-surface mount type low-dropout regulators with an output current of 1 A (maximum) and an ON/OFF control switch. Control by an EN (ON/OFF) terminal enables the regulator to be operated only when required (output ON). Low dropout voltage and standby current make the TA58MS\*\*F Series suitable for applications requiring low power consumption.

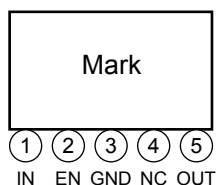
#### Features

- Built-in ON/OFF control function (active high)
- Maximum output current : 500 mA
- Output voltage : 5 / 6 / 8 / 9 / 12 V
- Output voltage accuracy :  $V_{OUT} \pm 3\%$  ( $@T_j = 25^\circ\text{C}$ )
- Low quiescent current : 2.5 mA (Typ.) ( $@I_{OUT} = 0\text{ A}$ )
- Low standby current (output OFF mode): 1 $\mu\text{A}$  (Typ.)
- Low-dropout voltage : 0.7 V (Max) ( $@I_{OUT} = 500\text{ mA}$ )
- Protection function : Over current protection/ thermal shutdown / Reverse connection of power supply / 60 V load dump
- Package type : Surface-mount New PW-Mold5pin

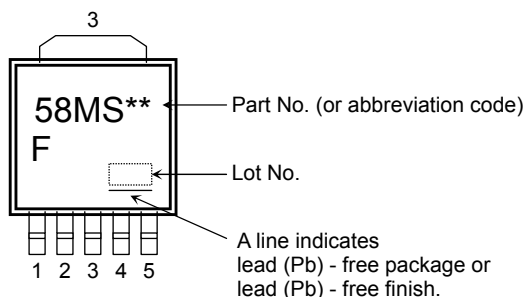


Weight : 0.36 g (Typ.)

#### Pin Assignment



#### Marking



Note 1: The "\*\*\*" in each product name is replaced with the output voltage of each product.

## Pin Description

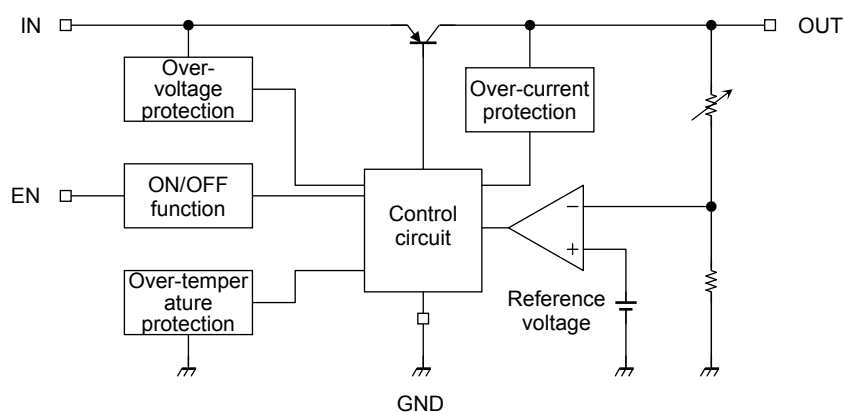
Pin No.	Symbol	Description
1	IN	Input terminal. Connected by capacitor ( $C_{IN}$ ) to GND.
2	EN	Output ON/OFF control terminal. Output is ON when this pin is set to "High", OFF when this pin is open or set to "Low".
3	GND	Ground terminal
4	NC	Non-connection
5	OUT	Output terminal. Connected by capacitor ( $C_{OUT}$ ) to GND.

## How to Order

Product No.	Package	Package Type and Capacity
TA58MS**F (TE16L1,Q (Note2)	New PW-Mold5pin : Surface-mount	Tape (2000 pcs/reel)

Note 2: The "\*\*\*" in each product number is replaced with the output voltage of each product.

## Block Diagram



## Absolute Maximum Rating (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Input voltage	DC	V <sub>IN</sub> (DC)	29	V
	Pulse	V <sub>IN</sub> (Pulse)	60( $\tau$ =200ms)	V
EN Input voltage		V <sub>EN</sub>	V <sub>IN</sub> (DC)	V
Output current		I <sub>OUT</sub>	500	mA
Junction temperature		T <sub>j</sub>	150	°C
Storage temperature		T <sub>stg</sub>	–55~150	°C
Power dissipation	Ta = 25°C	P <sub>D</sub>	1	W
	Tc= 25°C		10	

Note 3: Do not apply current and voltage (including reverse polarity) to any pin that is not specified.

Note 4: 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).

## Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, junction to ambient	R <sub>th</sub> (j-a)	125	°C/ W
Thermal resistance, junction to case	R <sub>th</sub> (j-c)	12.5	°C/ W

## Recommended operating conditions

Characteristic	Symbol	Min	Typ.	Max	Unit
Operating junction temperature	T <sub>j(opr)</sub>	–40	—	135	°C

## Protection Function (Reference)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Thermal shutdown	T <sub>SD</sub>	V <sub>IN</sub> = 14 V (05~06F)/ 16 V (08~09F)/ 18 V (12F)	—	175	—	°C
Peak circuit current	I <sub>PEAK</sub>	V <sub>IN</sub> = 14 V (05~06F)/ 16 V (08~09F)/ 18 V (12F), T <sub>j</sub> = 25°C	—	1	—	A
Short circuit current	I <sub>SC</sub>	V <sub>IN</sub> = 14 V (05~06F)/ 16 V (08~09F)/ 18 V (12F), T <sub>j</sub> = 25°C	—	200	—	mA
Over voltage protection	V <sub>IN</sub>	T <sub>j</sub> = 25°C	29	45	—	V

Note 5: Ensure that the devices operate within the limits of the maximum rating when in actual use.

Note 6: When the input voltage exceeds 29 V, the overvoltage protection circuit is activated to turn off the output voltage.

## TA58MS05F

Electrical Characteristics (unless otherwise specified,  $V_{EN} = V_{IN}$ ,  $C_{IN} = 1 \mu F$ ,  $C_{OUT} = 10 \mu F$ ,  $T_j = 25^\circ C$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 14 V$ , $I_{OUT} = 10 mA$	4.85	5.00	5.15	V
		$6 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$ , $-40^\circ C \leq T_j \leq 105^\circ C$	4.8	5.0	5.2	
Line regulation	Reg·line	$6 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$	—	3	20	mV
Load regulation	Reg·load	$V_{IN} = 14 V$ , $10 mA \leq I_{OUT} \leq 500 mA$	—	10	30	mV
Quiescent current	$I_B$	$6 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 0 A$	—	2.5	5.0	mA
		$6 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 500 mA$	—	30	50	
Quiescent current (OFF mode)	$I_{B(OFF)}$	$6 V \leq V_{IN} \leq 26 V$ , $V_{EN} = 0.4 V$	—	0.1	1.0	$\mu A$
Dropout voltage	$V_D$	$I_{OUT} = 250 mA$	—	0.3	0.4	V
		$I_{OUT} = 500 mA$	—	0.5	0.7	
Output control voltage (ON)	$V_{EN(ON)}$	—	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	$V_{IN} = 14 V$ , $V_{EN} = 5 V$	—	125	175	$\mu A$

## TA58MS06F

Electrical Characteristics (unless otherwise specified,  $V_{EN} = V_{IN}$ ,  $C_{IN} = 1 \mu F$ ,  $C_{OUT} = 10 \mu F$ ,  $T_j = 25^\circ C$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 14 V$ , $I_{OUT} = 10 mA$	5.82	6.00	6.18	V
		$7 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$ , $-40^\circ C \leq T_j \leq 105^\circ C$	5.76	6.00	6.24	
Line regulation	Reg·line	$7 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$	—	3	20	mV
Load regulation	Reg·load	$V_{IN} = 14 V$ , $10 mA \leq I_{OUT} \leq 500 mA$	—	10	30	mV
Quiescent current	$I_B$	$7 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 0 A$	—	2.5	5.0	mA
		$7 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 500 mA$	—	30	50	
Quiescent current (OFF mode)	$I_{B(OFF)}$	$7 V \leq V_{IN} \leq 26 V$ , $V_{EN} = 0.4 V$	—	0.1	1.0	$\mu A$
Dropout voltage	$V_D$	$I_{OUT} = 250 mA$	—	0.3	0.4	V
		$I_{OUT} = 500 mA$	—	0.5	0.7	
Output control voltage (ON)	$V_{EN(ON)}$	—	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	$V_{IN} = 14 V$ , $V_{EN} = 5 V$	—	125	175	$\mu A$

## TA58MS08F

Electrical Characteristics (unless otherwise specified,  $V_{EN} = V_{IN}$ ,  $C_{IN} = 1 \mu F$ ,  $C_{OUT} = 10 \mu F$ ,  $T_j = 25^\circ C$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 16 V$ , $I_{OUT} = 10 mA$	7.76	8.00	8.24	V
		$9 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$ , $-40^\circ C \leq T_j \leq 105^\circ C$	8.68	8.00	8.32	
Line regulation	Reg·line	$9 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$	—	3	20	mV
Load regulation	Reg·load	$V_{IN} = 16 V$ , $10 mA \leq I_{OUT} \leq 500 mA$	—	10	30	mV
Quiescent current	$I_B$	$9 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 0 A$	—	2.5	5.0	mA
		$9 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 500 mA$	—	30	50	
Quiescent current (OFF mode)	$I_{B(OFF)}$	$9 V \leq V_{IN} \leq 26 V$ , $V_{EN} = 0.4 V$	—	0.1	1.0	$\mu A$
Dropout voltage	$V_D$	$I_{OUT} = 250 mA$	—	0.3	0.4	V
		$I_{OUT} = 500 mA$	—	0.5	0.7	
Output control voltage (ON)	$V_{EN(ON)}$	—	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	$V_{IN} = 16 V$ , $V_{EN} = 5 V$	—	125	175	$\mu A$

## TA58MS09F

Electrical Characteristics (unless otherwise specified,  $V_{EN} = V_{IN}$ ,  $C_{IN} = 1 \mu F$ ,  $C_{OUT} = 10 \mu F$ ,  $T_j = 25^\circ C$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 16 V$ , $I_{OUT} = 10 mA$	8.73	9.00	9.27	V
		$10 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$ , $-40^\circ C \leq T_j \leq 105^\circ C$	8.64	9.00	9.36	
Line regulation	Reg·line	$10 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$	—	3	20	mV
Load regulation	Reg·load	$V_{IN} = 16 V$ , $10 mA \leq I_{OUT} \leq 500 mA$	—	10	30	mV
Quiescent current	$I_B$	$10 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 0 A$	—	2.5	5.0	mA
		$10 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 500 mA$	—	30	50	
Quiescent current (OFF mode)	$I_{B(OFF)}$	$10 V \leq V_{IN} \leq 26 V$ , $V_{EN} = 0.4 V$	—	0.1	1.0	$\mu A$
Dropout voltage	$V_D$	$I_{OUT} = 250 mA$	—	0.3	0.4	V
		$I_{OUT} = 500 mA$	—	0.5	0.7	
Output control voltage (ON)	$V_{EN(ON)}$	—	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	$V_{IN} = 16 V$ , $V_{EN} = 5 V$	—	125	175	$\mu A$

## TA58MS12F

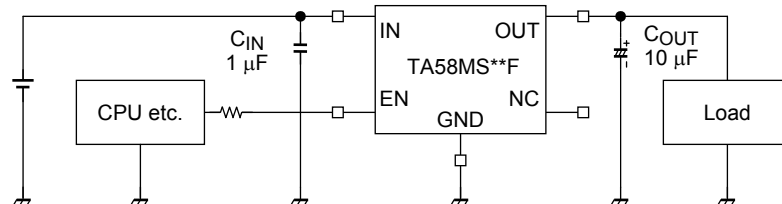
Electrical Characteristics (unless otherwise specified,  $V_{EN} = V_{IN}$ ,  $C_{IN} = 1 \mu F$ ,  $C_{OUT} = 10 \mu F$ ,  $T_j = 25^\circ C$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 18 V$ , $I_{OUT} = 10 mA$	11.64	12.00	12.36	V
		$13 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$ , $-40^\circ C \leq T_j \leq 105^\circ C$	11.52	12.00	12.48	
Line regulation	Reg·line	$13 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 10 mA$	—	3	20	mV
Load regulation	Reg·load	$V_{IN} = 18 V$ , $10 mA \leq I_{OUT} \leq 500 mA$	—	10	30	mV
Quiescent current	$I_B$	$13 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 0 A$	—	2.5	5.0	mA
		$13 V \leq V_{IN} \leq 26 V$ , $I_{OUT} = 500 mA$	—	30	50	
Quiescent current (OFF mode)	$I_{B(OFF)}$	$13 V \leq V_{IN} \leq 26 V$ , $V_{EN} = 0.4 V$	—	0.1	1.0	$\mu A$
Dropout voltage	$V_D$	$I_{OUT} = 250 mA$	—	0.3	0.4	V
		$I_{OUT} = 500 mA$	—	0.5	0.7	
Output control voltage (ON)	$V_{EN(ON)}$	—	2	—	—	V
Output control voltage (OFF)	$V_{EN(OFF)}$	—	—	—	0.8	V
Output control current (ON)	$I_{EN(ON)}$	$V_{IN} = 18 V$ , $V_{EN} = 5 V$	—	125	175	$\mu A$

## Electrical Characteristics Common to All Products

- $T_j = 25^\circ\text{C}$  in the measurement conditions of each item is a regulation for where the standard condition when a pulse test is carried out, and any drift in the electrical characteristic due to a rise in the junction temperature of the chip may be disregarded.

## Standard Application Circuit

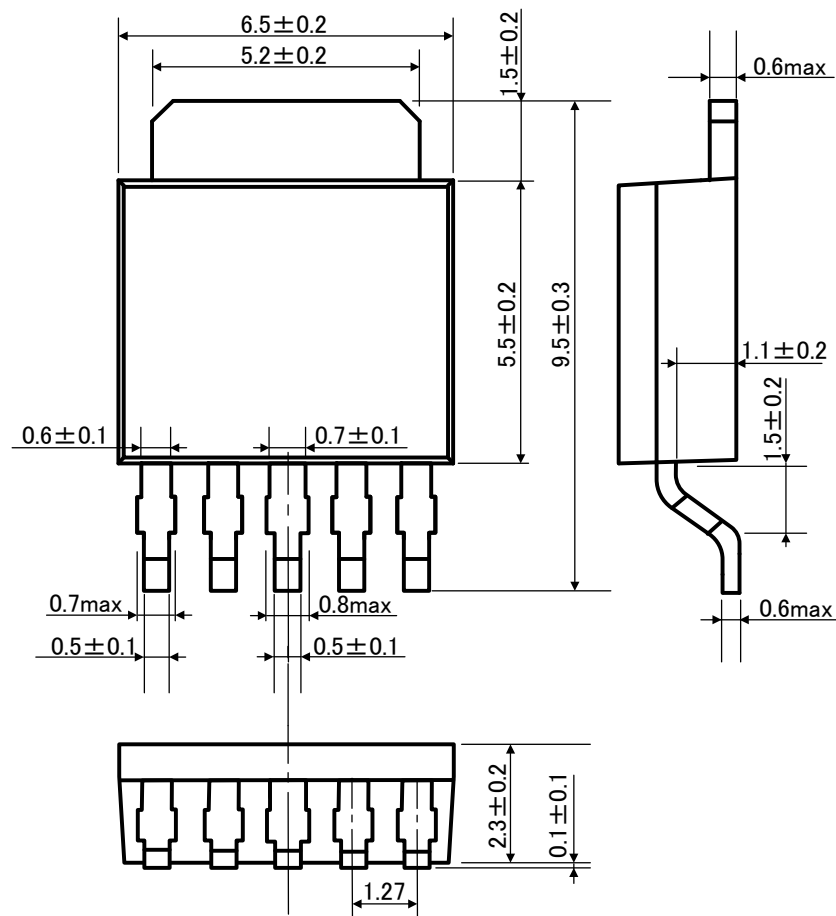


- Place C<sub>IN</sub> as close as possible to the input terminal and GND. Place C<sub>OUT</sub> as close as possible to the output terminal and GND. Although capacitor C<sub>OUT</sub> acts to smooth the dc output voltage during suspension of output oscillation or load change, it might cause output oscillation in a cold environment due to increased capacitor ESR. It is therefore recommended to use a capacitor with small temperature sensitivity. Also, ensure that the regulator performance is satisfactory over the operating temperature range of the target system.
- Note that, depending on the load conditions, a steep increase in the input voltage (V<sub>IN</sub>) may cause a momentary rise in output voltage (V<sub>OUT</sub>) even if the EN (enable) pin is Low.

## Package Dimensions

HSIP5-P-1.27B

Unit : mm



Weight: 0.36 g (Typ.)



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20070701-EN

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