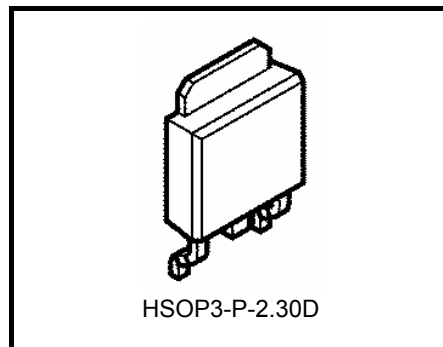


TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

# TA58M05F, TA58M06F, TA58M08F, TA58M09F TA58M10F, TA58M12F, TA58M15F

## 500 mA Low Dropout Voltage Regulator

The TA58M\*\*F Series consists of fixed-positive-output, low-dropout regulators with an output current of 500 mA (max) that utilize PNP transistors for the output stage. Low dropout voltage and standby current make the TA58M\*\*F Series suitable for applications requiring low power consumption.

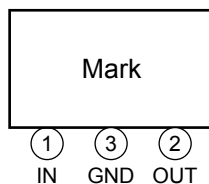


Weight: 0.36 g (typ.)

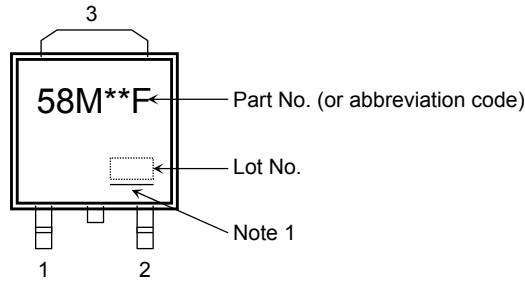
### Features

- Maximum output current : 500 mA
- Output voltage : 5 / 6 / 8 / 9 / 10 / 12 / 15 V
- Output voltage accuracy :  $V_{OUT} \pm 3\%$  (@ $T_j = 25^\circ\text{C}$ )
- Low-dropout voltage : 0.65 V (Max) (@ $I_{OUT} = 500$  mA)
- Protection function : Overcurrent protection / overheating protection / Reverse connection of power supply / 60 V load dump
- Package type : Surface-mount New PW-Mold

### 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 “\*\*” in each product name is replaced with the output voltage of each 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.

## Pin Description

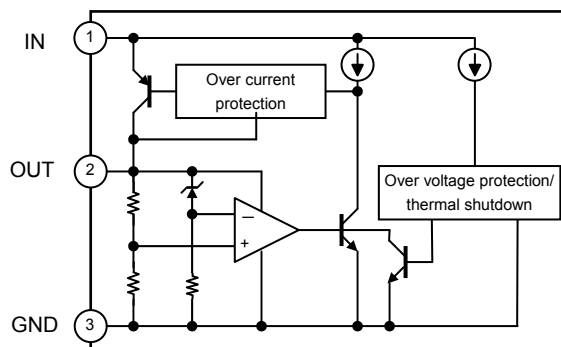
Pin No.	Symbol	Description
1	IN	Input terminal. Connected by capacitor ( $C_{IN}$ ) to GND.
3	GND	Ground terminal
2	OUT	Output terminal. Connected by capacitor ( $C_{OUT}$ ) to GND.

## How to Order

Product No.	Package	Package Type and Capacity
TA58M**F(TE16L1,NQ (Note3)	New PW-Mold: Surface-mount	Tape (2000 pcs/reel)

Note 3: 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 (DC)</sub>	29	V
	Pulse	V <sub>IN (Pulse)</sub>	60 (τ = 200 ms)	V
Output current		I <sub>OUT</sub>	500	mA
Operating temperature		T <sub>opr</sub>	-40 to 105	°C
Junction temperature		T <sub>j</sub>	150	°C
Storage temperature		T <sub>stg</sub>	-55 to 150	°C
Power dissipation	Ta = 25°C	P <sub>D</sub>	1	W
	Tc = 25°C		10	

Note 4: Do not apply current and voltage (including reverse polarity) to any pin that is not specified.

Note 5: 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 (j-a)</sub>	125	°C/ W
Thermal resistance, junction to case	R <sub>th (j-c)</sub>	12.5	°C/ W

## Protection Function (Reference)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Thermal shutdown	T <sub>SD</sub>	V <sub>IN</sub> = 14 V (05 to 06F)/ 16 V (08 to 10F)/ 18 V (12F)/ 20 V (15F)	—	170	—	°C
Thermal shutdown hysteresis width	T <sub>SD(hys)</sub>		—	20	—	°C
Peak circuit current	I <sub>PEAK</sub>	V <sub>IN</sub> = 14 V (05 to 06F)/ 16 V (08 to 10F)/ 18 V (12F)/ 20 V (15F), T <sub>j</sub> = 25°C	—	1	—	A
Short circuit current	I <sub>SC</sub>	V <sub>IN</sub> = 14 V (05 to 06F)/ 16 V (08 to 10F)/ 18 V (12F)/ 20 V (15F), T <sub>j</sub> = 25°C	—	600	—	mA
Overvoltage protection	V <sub>IN</sub>	T <sub>j</sub> = 25°C	29	33	—	V

Note 6: Ensure that the devices operate within the limits of the maximum rating when in actual use.

Note 7: When the input voltage exceeds 29 V, the overvoltage protection circuit is activated to turn off the output voltage.

## TA58M05F

### Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 14\text{ V}, I_{OUT} = 250\text{ mA}$	4.85	5.00	5.15	V
		$6\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$	4.8	5.0	5.2	
Line regulation	Reg·line	$9\text{ V} \leq V_{IN} \leq 16\text{ V}, I_{OUT} = 250\text{ mA}$	—	2	20	mV
		$6\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$	—	5	30	
Load regulation	Reg·load	$V_{IN} = 14\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$	—	20	60	mV
Quiescent current	$I_B$	$6\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$	—	0.5	1.0	mA
		$6\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$	—	35	80	
Dropout voltage	$V_D$	$I_{OUT} = 250\text{ mA}$	—	0.22	0.35	V
		$I_{OUT} = 500\text{ mA}$	—	0.42	0.65	

## TA58M06F

### Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 14\text{ V}, I_{OUT} = 250\text{ mA}$	5.82	6.00	6.18	V
		$7\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$	5.76	6.00	6.24	
Line regulation	Reg·line	$10\text{ V} \leq V_{IN} \leq 17\text{ V}, I_{OUT} = 250\text{ mA}$	—	2	20	mV
		$7\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$	—	5	30	
Load regulation	Reg·load	$V_{IN} = 14\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$	—	20	60	mV
Quiescent current	$I_B$	$7\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$	—	0.5	1.0	mA
		$7\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$	—	35	80	
Dropout voltage	$V_D$	$I_{OUT} = 250\text{ mA}$	—	0.22	0.35	V
		$I_{OUT} = 500\text{ mA}$	—	0.42	0.65	

## TA58M08F

### Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 16\text{ V}, I_{OUT} = 250\text{ mA}$	7.76	8.00	8.24	V
		$9\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$	7.68	8.00	8.32	
Line regulation	Reg·line	$12\text{ V} \leq V_{IN} \leq 19\text{ V}, I_{OUT} = 250\text{ mA}$	—	2	20	mV
		$9\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$	—	5	30	
Load regulation	Reg·load	$V_{IN} = 16\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$	—	20	70	mV
Quiescent current	$I_B$	$9\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$	—	0.5	1.0	mA
		$9\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$	—	35	80	
Dropout voltage	$V_D$	$I_{OUT} = 250\text{ mA}$	—	0.22	0.35	V
		$I_{OUT} = 500\text{ mA}$	—	0.42	0.65	

## TA58M09F

### Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 16\text{ V}, I_{OUT} = 250\text{ mA}$	8.73	9.00	9.27	V
		$10\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$	8.64	9.00	9.36	
Line regulation	Reg·line	$13\text{ V} \leq V_{IN} \leq 20\text{ V}, I_{OUT} = 250\text{ mA}$	—	2	20	mV
		$10\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$	—	5	30	
Load regulation	Reg·load	$V_{IN} = 16\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$	—	20	70	mV
Quiescent current	$I_B$	$10\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$	—	0.6	1.0	mA
		$10\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$	—	35	80	
Dropout voltage	$V_D$	$I_{OUT} = 250\text{ mA}$	—	0.22	0.35	V
		$I_{OUT} = 500\text{ mA}$	—	0.42	0.65	

## TA58M10F

### Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 16\text{ V}, I_{OUT} = 250\text{ mA}$	9.7	10.0	10.3	V
		$11\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$	9.6	10.0	10.4	
Line regulation	Reg·line	$14\text{ V} \leq V_{IN} \leq 21\text{ V}, I_{OUT} = 250\text{ mA}$	—	2	30	mV
		$11\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$	—	5	40	
Load regulation	Reg·load	$V_{IN} = 16\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$	—	20	80	mV
Quiescent current	$I_B$	$11\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$	—	0.6	1.2	mA
		$11\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$	—	35	80	
Dropout voltage	$V_D$	$I_{OUT} = 250\text{ mA}$	—	0.22	0.35	V
		$I_{OUT} = 500\text{ mA}$	—	0.42	0.65	

## TA58M12F

### Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{OUT}$	$V_{IN} = 18\text{ V}, I_{OUT} = 250\text{ mA}$	11.64	12.00	12.36	V
		$13\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}, -40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$	11.52	12.00	12.48	
Line regulation	Reg·line	$16\text{ V} \leq V_{IN} \leq 23\text{ V}, I_{OUT} = 250\text{ mA}$	—	2	30	mV
		$13\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 250\text{ mA}$	—	5	40	
Load regulation	Reg·load	$V_{IN} = 18\text{ V}, 5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$	—	20	80	mV
Quiescent current	$I_B$	$13\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 0\text{ A}$	—	0.7	1.2	mA
		$13\text{ V} \leq V_{IN} \leq 26\text{ V}, I_{OUT} = 500\text{ mA}$	—	35	80	
Dropout voltage	$V_D$	$I_{OUT} = 250\text{ mA}$	—	0.22	0.35	V
		$I_{OUT} = 500\text{ mA}$	—	0.42	0.65	

## TA58M15F

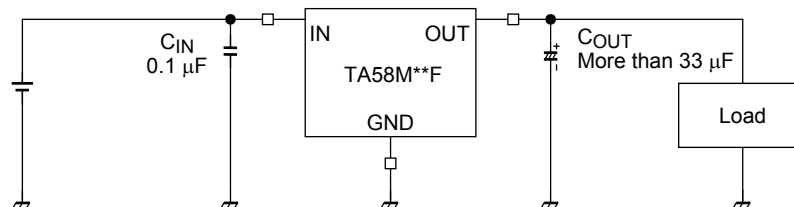
### Electrical Characteristics (unless otherwise specified, $T_j = 25^\circ\text{C}$ )

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	$V_{\text{OUT}}$	$V_{\text{IN}} = 20\text{ V}$ , $I_{\text{OUT}} = 250\text{ mA}$	14.55	15.00	15.45	V
		$16\text{ V} \leq V_{\text{IN}} \leq 26\text{ V}$ , $I_{\text{OUT}} = 250\text{ mA}$ , $-40^\circ\text{C} \leq T_j \leq 105^\circ\text{C}$	14.4	15.0	15.6	
Line regulation	Reg·line	$19\text{ V} \leq V_{\text{IN}} \leq 26\text{ V}$ , $I_{\text{OUT}} = 250\text{ mA}$	—	2	30	mV
		$16\text{ V} \leq V_{\text{IN}} \leq 26\text{ V}$ , $I_{\text{OUT}} = 250\text{ mA}$	—	5	40	
Load regulation	Reg·load	$V_{\text{IN}} = 20\text{ V}$ , $5\text{ mA} \leq I_{\text{OUT}} \leq 500\text{ mA}$	—	30	100	mV
Quiescent current	$I_{\text{B}}$	$16\text{ V} \leq V_{\text{IN}} \leq 26\text{ V}$ , $I_{\text{OUT}} = 0\text{ A}$	—	0.7	1.4	mA
		$16\text{ V} \leq V_{\text{IN}} \leq 26\text{ V}$ , $I_{\text{OUT}} = 500\text{ mA}$	—	35	80	
Dropout voltage	$V_{\text{D}}$	$I_{\text{OUT}} = 250\text{ mA}$	—	0.22	0.35	V
		$I_{\text{OUT}} = 500\text{ mA}$	—	0.42	0.65	

## 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

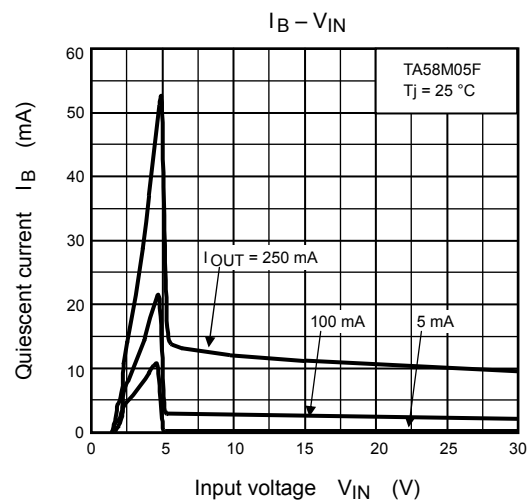
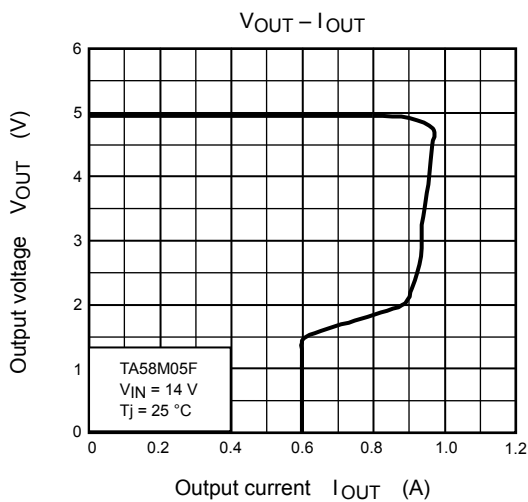
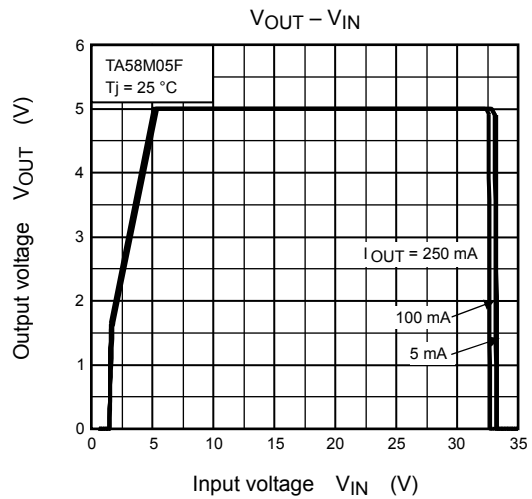
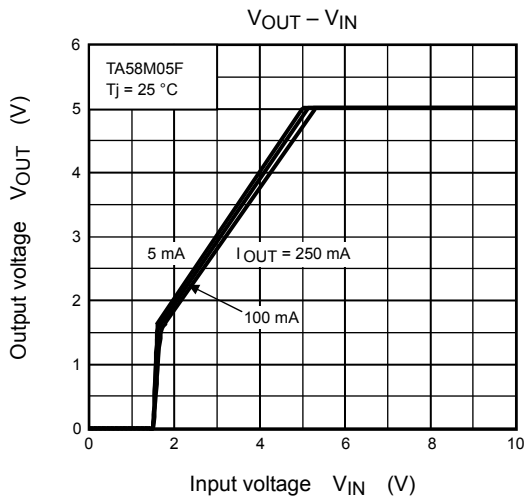
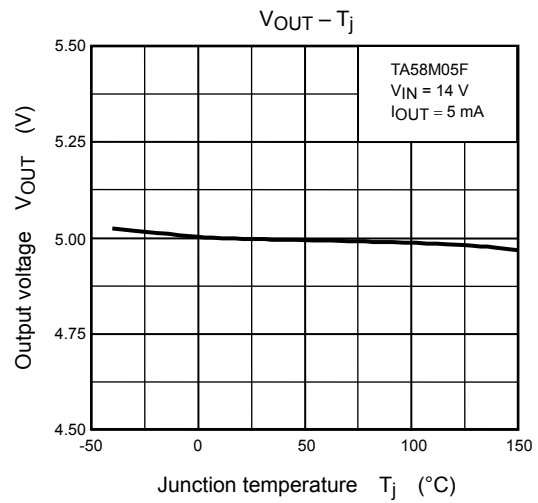
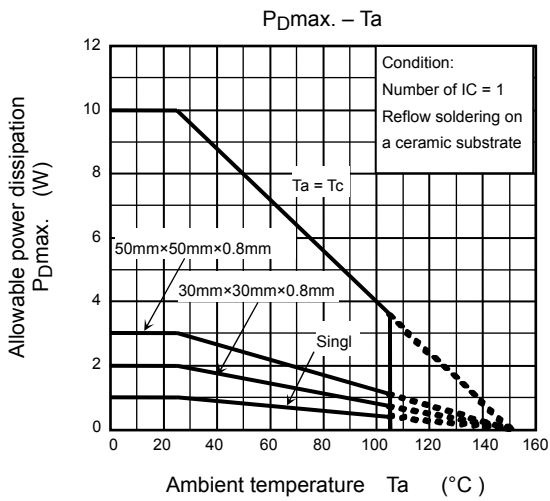


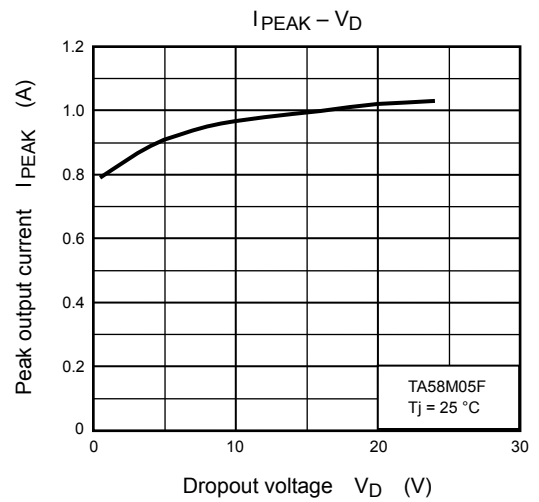
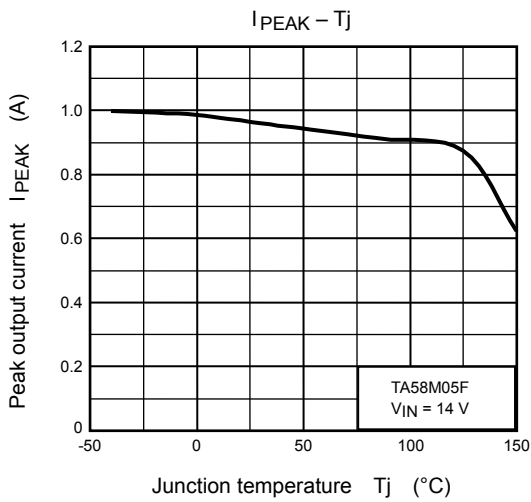
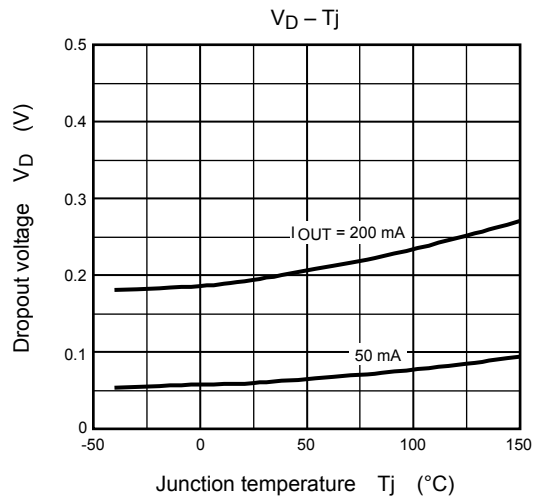
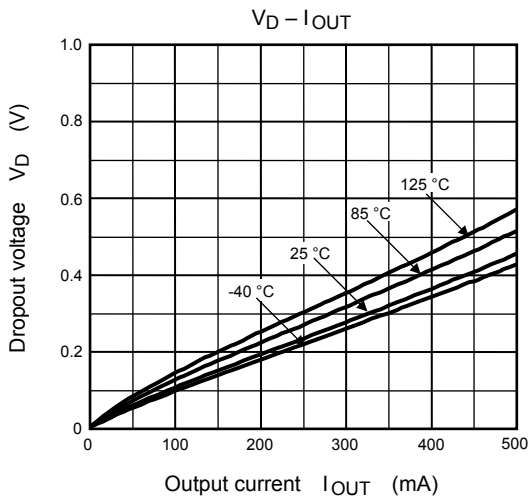
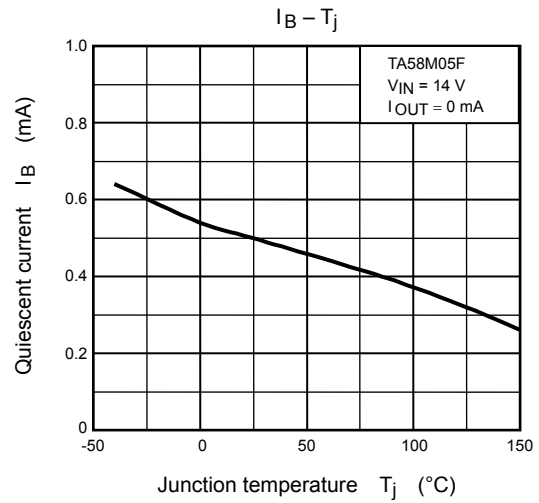
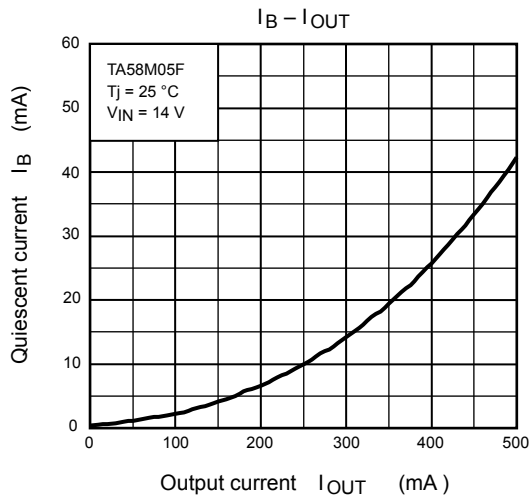
- Place  $C_{IN}$  as close as possible to the input terminal and GND. Place  $C_{OUT}$  as close as possible to the output terminal and GND. Although capacitor  $C_{OUT}$  acts to smooth the dc output voltage during suspension of output oscillation or load change, it might cause output oscillation in 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.



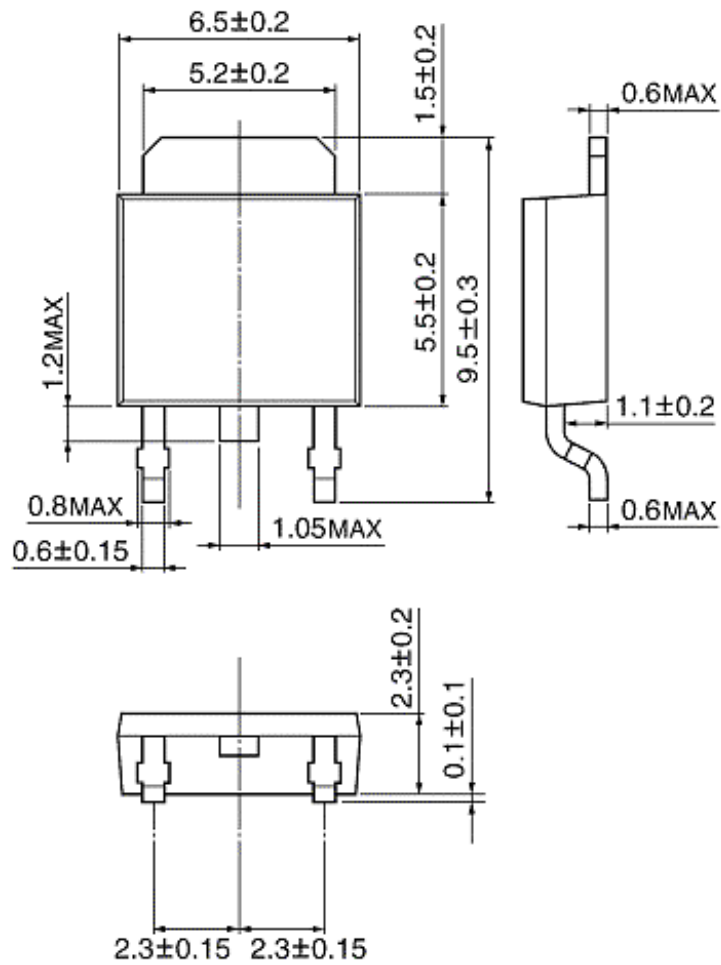




## Package Dimensions

HSOP-3-P-2.30D

Unit: mm



Weight: 0.36 g (typ.)

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