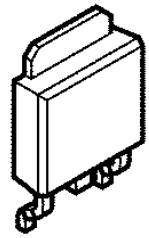
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

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.



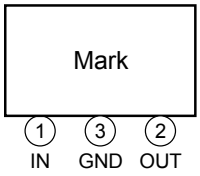
HSOP3-P-2.30D

Weight : 0.36 g (Typ.)

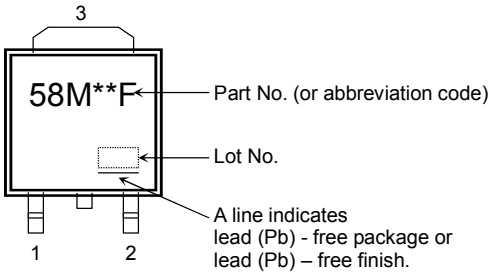
Features

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

Pin Assignment



Marking



Note1: The "**" in each product name is replaced with the output voltage of each product.

Pin Description

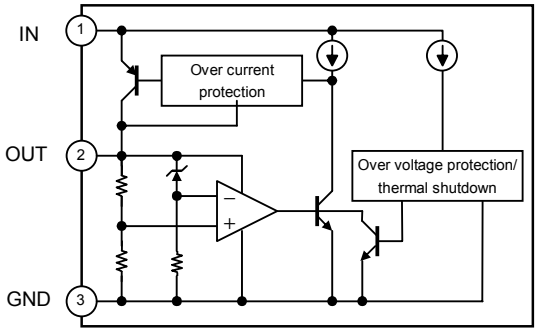
Pin No.	Symbol	Description
1	IN	Input terminal. Connected by capacitor (C_{IN}) to GND.
3	GND	Ground terminal
2	OUT	Output terminal. Connected by capacitor (C_{OUT}) to GND.

How to Order

Product No.	Package	Package Type and Capacity
TA58M**F(TE16L1,NQ (Note2)	New PW-Mold: Surface-mount	Tape (2000 pcs/reel)

Note2: The "**" in each product number is replaced with the output voltage of each product.

Block Diagram



Maximum Rating (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Input voltage	DC	$V_{IN\ (DC)}$	29	V
	Pulse	$V_{IN\ (Pulse)}$	60(τ =200ms)	V
Output current		I_{OUT}	500	mA
Operating temperature		T_{opr}	−40~105	°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	

Note3: Do not apply current and voltage (including reverse polarity) to any pin that is not specified.

Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, junction to ambient	$R_{th\ (j-a)}$	125	℃/ W
Thermal resistance, junction to case	$R_{th\ (j-c)}$	12.5	℃/ W

Protection Function (Reference)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Thermal shutdown	T_{SD}	V_{IN} = 14 V (05~06F)/ 16 V (08~10F)/ 18 V (12F)/ 20 V (15F)	—	170	—	°C
Thermal shutdown hysteresis width	$T_{SD(hys)}$		—	20	—	°C
Peak circuit current	I_{PEAK}	V_{IN} = 14 V (05~06F)/ 16 V (08~10F)/ 18 V (12F)/ 20 V (15F), T_j = 25°C	—	1	—	A
Short circuit current	I_{SC}	V_{IN} = 14 V (05~06F)/ 16 V (08~10F)/ 18 V (12F)/ 20 V (15F), T_j = 25°C	—	600	—	mA
Overvoltage protection	V_{IN}	T_j = 25°C	29	33	—	V

Note4: Ensure that the devices operate within the limits of the maximum rating when in actual use.

Note5: 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°C)

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

TA58M06F
Electrical Characteristics (unless otherwise specified, T_j = 25°C)

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

TA58M08F
Electrical Characteristics (unless otherwise specified, T_j = 25°C)

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

TA58M09F
Electrical Characteristics (unless otherwise specified, T_j = 25°C)

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

TA58M10F
Electrical Characteristics (unless otherwise specified, T_j = 25°C)

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

TA58M12F
Electrical Characteristics (unless otherwise specified, T_j = 25°C)

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

TA58M15F

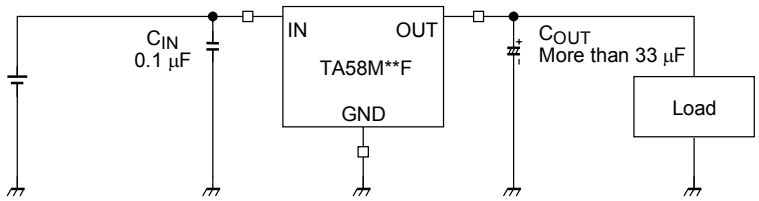
Electrical Characteristics (unless otherwise specified, T_j = 25°C)

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

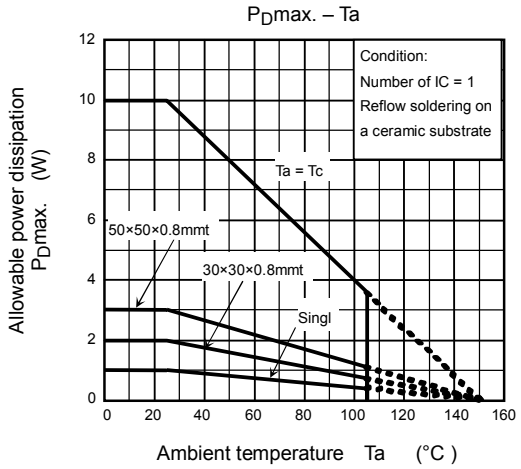
Electrical Characteristics Common to All Products

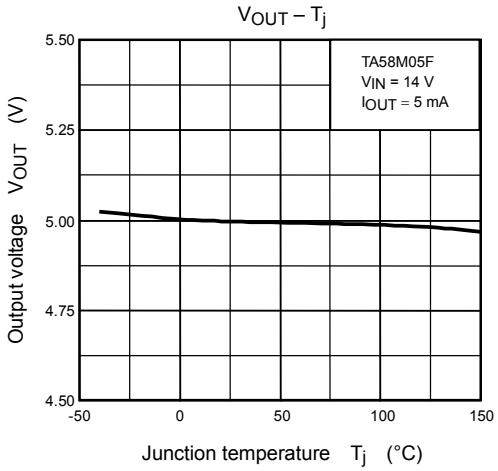
- Tj = 25°C in the measurement conditions of each item is a regulation for where the standard condition when a pulse test is carried out, and any drift in the electrical characteristic due to a rise in the junction temperature of the chip may be disregarded.

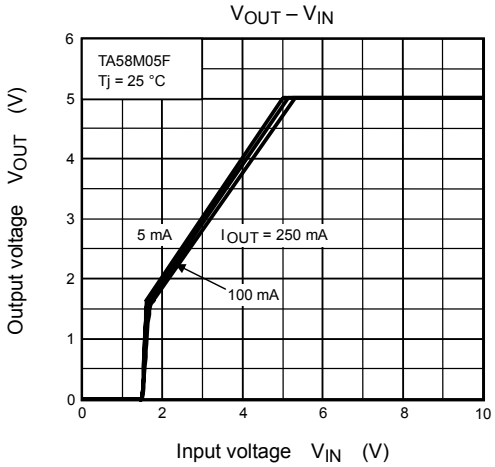
Standard Application Circuit

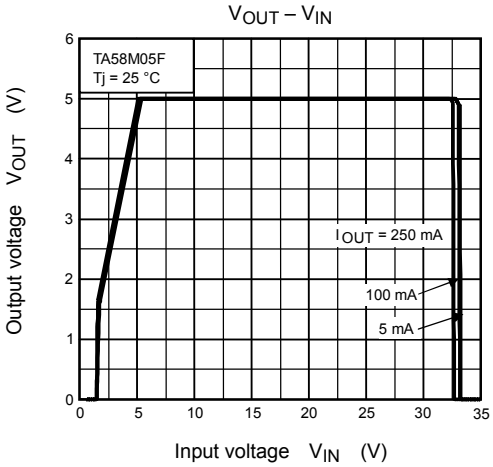


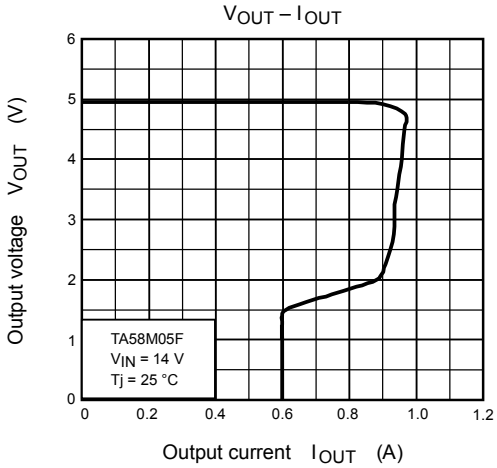
- Place C_{IN} as close as possible to the input terminal and GND. Place C_{OUT} as close as possible to the output terminal and GND. Although capacitor C_{OUT} acts to smooth the dc output voltage during suspension of output oscillation or load change, it might cause output oscillation in a cold environment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

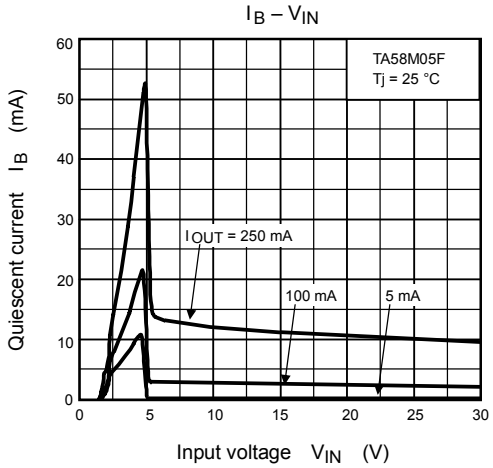

PDmax. – Ta
Condition:
Number of IC = 1
Reflow soldering on
a ceramic substrate
Ta = Tc
50×50×0.8mmt
30×30×0.8mmt
Singl
Allowable power dissipation PDmax. (W)
Ambient temperature Ta (°C)

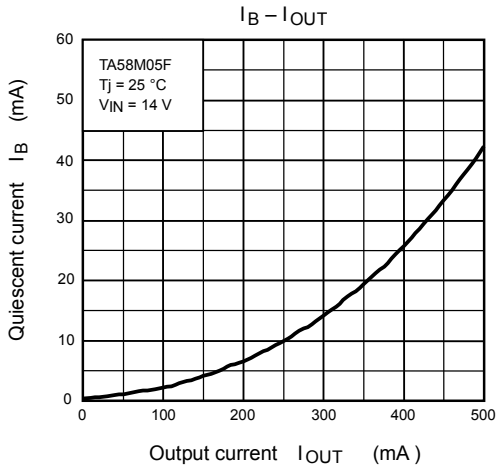

VOUT – Tj
TA58M05F
VIN = 14 V
IOUT = 5 mA
Output voltage VOUT (V)
Junction temperature Tj (°C)

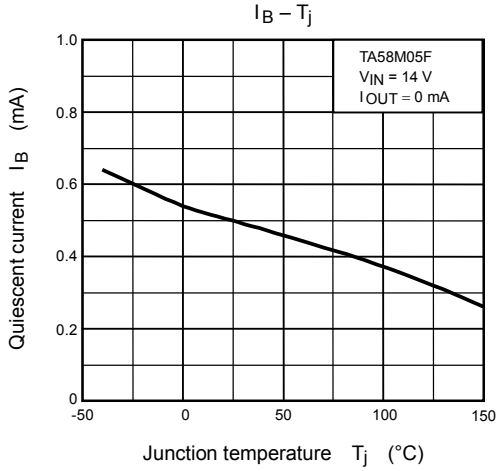

VOUT – VIN
TA58M05F
Tj = 25 °C
5 mA
IOUT = 250 mA
100 mA
Output voltage VOUT (V)
Input voltage VIN (V)

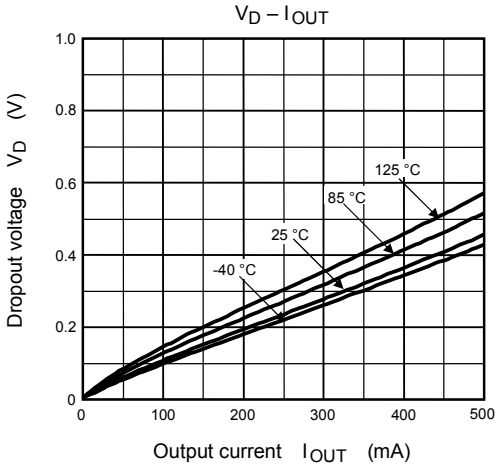

VOUT – VIN
TA58M05F
Tj = 25 °C
IOUT = 250 mA
100 mA
5 mA
Output voltage VOUT (V)
Input voltage VIN (V)

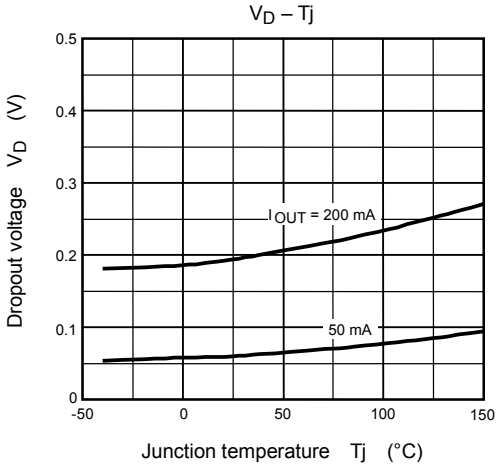

VOUT – IOUT
TA58M05F
VIN = 14 V
Tj = 25 °C
Output voltage VOUT (V)
Output current IOUT (A)

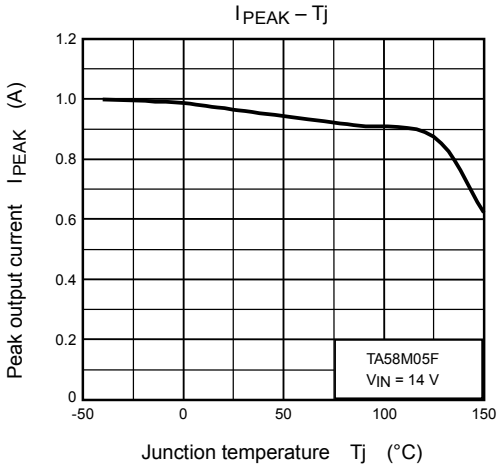

IB – VIN
TA58M05F
Tj = 25 °C
IOUT = 250 mA
100 mA
5 mA
Quiescent current IB (mA)
Input voltage VIN (V)

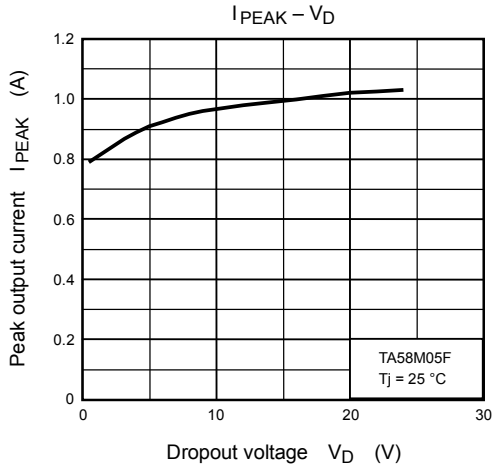

$I_B - I_{OUT}$
TA58M05F
Tj = 25 °C
V_{IN} = 14 V
Quiescent current I_B (mA)
Output current I_{OUT} (mA)
0
10
20
30
40
50
60
0
100
200
300
400
500


$I_B - T_j$
TA58M05F
V_{IN} = 14 V
I_{OUT} = 0 mA
Quiescent current I_B (mA)
Junction temperature T_j (°C)
0
0.2
0.4
0.6
0.8
1.0
-50
0
50
100
150


$V_D - I_{OUT}$
125 °C
85 °C
25 °C
-40 °C
Dropout voltage V_D (V)
Output current I_{OUT} (mA)
0
0.2
0.4
0.6
0.8
1.0
0
100
200
300
400
500

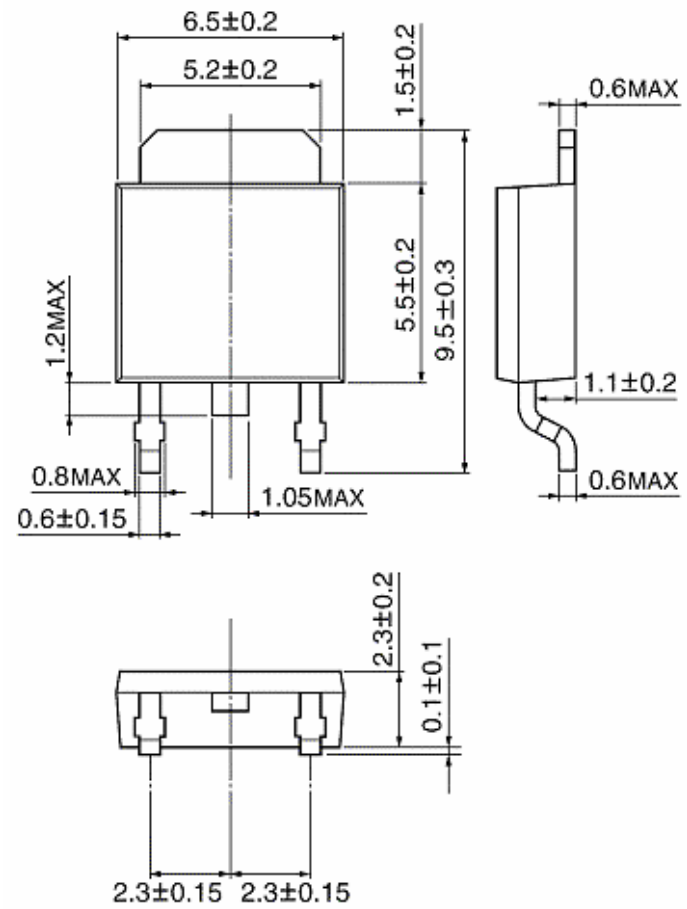

$V_D - Tj$
I_{OUT} = 200 mA
50 mA
Dropout voltage V_D (V)
Junction temperature Tj (°C)
0
0.1
0.2
0.3
0.4
0.5
-50
0
50
100
150


$I_{PEAK} - Tj$
TA58M05F
V_{IN} = 14 V
Peak output current I_{PEAK} (A)
Junction temperature Tj (°C)
0
0.2
0.4
0.6
0.8
1.0
1.2
-50
0
50
100
150


$I_{PEAK} - V_D$
TA58M05F
Tj = 25 °C
Peak output current I_{PEAK} (A)
Dropout voltage V_D (V)
0
0.2
0.4
0.6
0.8
1.0
1.2
0
10
20
30

Package Dimensions

HSOP-3-P-2.30D Unit : mm



Weight: 0.36 g (Typ.)

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