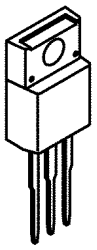
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA58M05S, TA58M06S, TA58M08S, TA58M09S TA58M10S, TA58M12S, TA58M15S

500 mA Low Dropout Voltage Regulator

The TA58M**S 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**S Series suitable for applications requiring low power consumption.



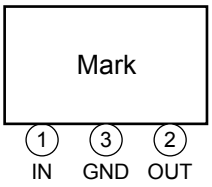
HSIP3-P-2.54A

Weight : 1.7 g (Typ.)

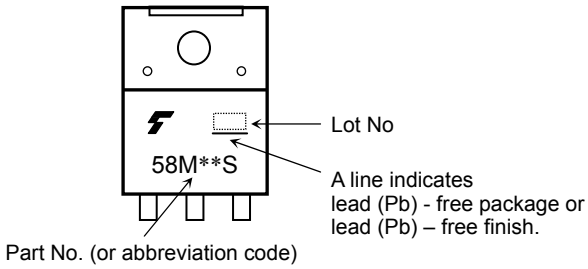
Features

- 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 : TO-220NIS

Pin Assignment



Marking



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

Pin Description

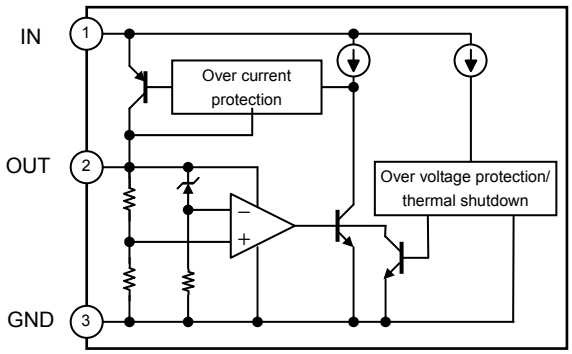
Pin No.	Symbol	Description
1	IN	Input terminal. Connected by capacitor (C_{IN}) to GND.
3	GND	Ground terminal
2	OUT	Output terminal. Connected by capacitor (C_{OUT}) to GND.

How to Order

Product No.	Package	Package Type and Capacity
TA58M** S(Q) (Note2)	TO-220NIS	Sack (50 pcs./sack)

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	$V_{IN\ (DC)}$	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	2	W
	Tc= 25°C		20	

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	$R_{th\ (j-a)}$	62.5	°C/ W
Thermal resistance, junction to case	$R_{th\ (j-c)}$	6.25	°C/ W

Protection Function (Reference)

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

TA58M05S
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	

TA58M06S
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	

TA58M08S
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	

TA58M09S
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	

TA58M10S
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	

TA58M12S
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	

TA58M15S

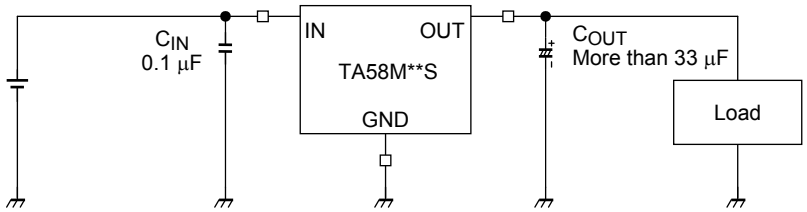
Electrical Characteristics (unless otherwise specified, T_j = 25°C)

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

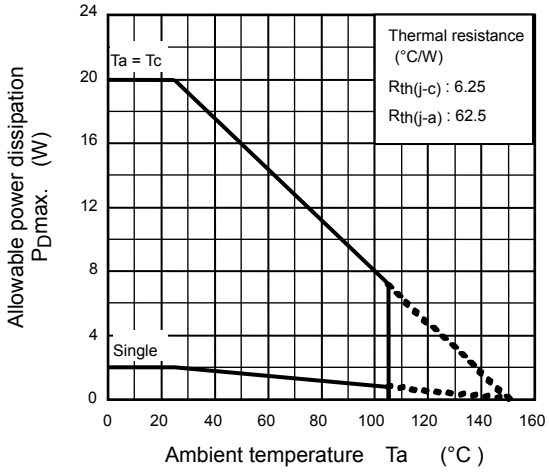
- Tj = 25°C in the measurement conditions of each item is a regulation for where the standard condition when a pulse test is carried out, and any drift in the electrical characteristic due to a rise in the junction temperature of the chip may be disregarded.

Standard Application Circuit

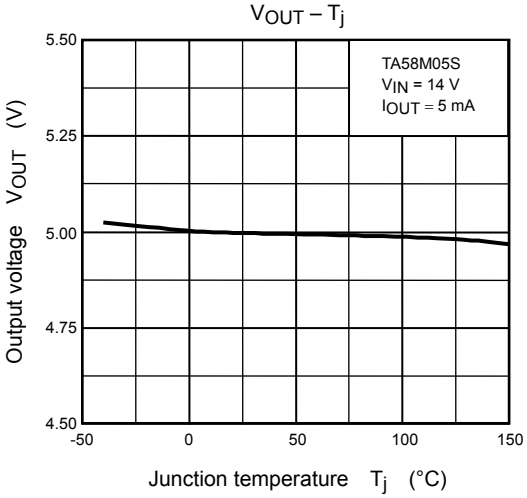


- Place C_{IN} as close as possible to the input terminal and GND. Place C_{OUT} as close as possible to the output terminal and GND. Although capacitor C_{OUT} acts to smooth the dc output voltage during suspension of output oscillation or load change, it might cause output oscillation in a cold environment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

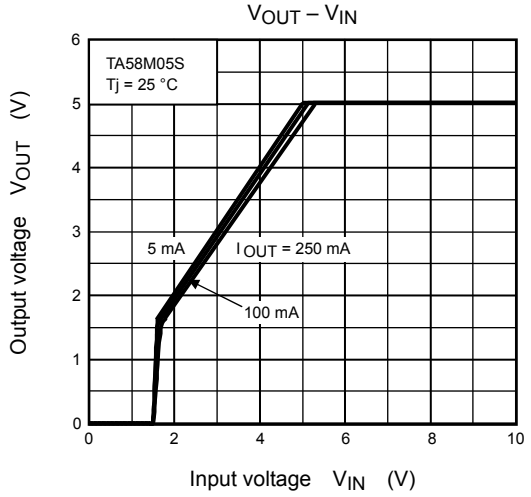
$P_D$max. – Ta



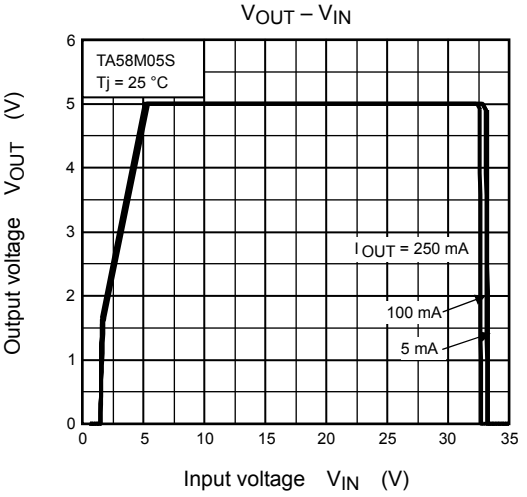
V_{OUT} – T_j



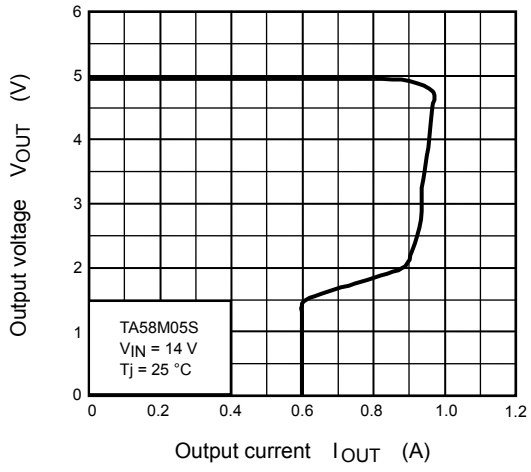
V_{OUT} – V_{IN}



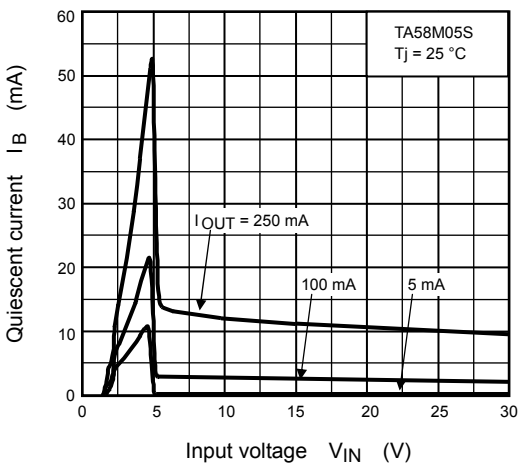
V_{OUT} – V_{IN}



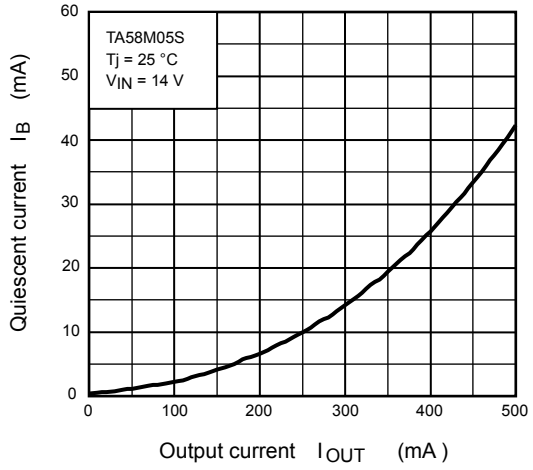
V_{OUT} – I_{OUT}



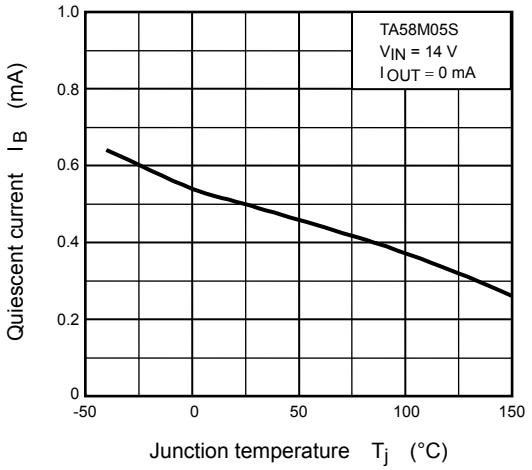
I_B – V_{IN}



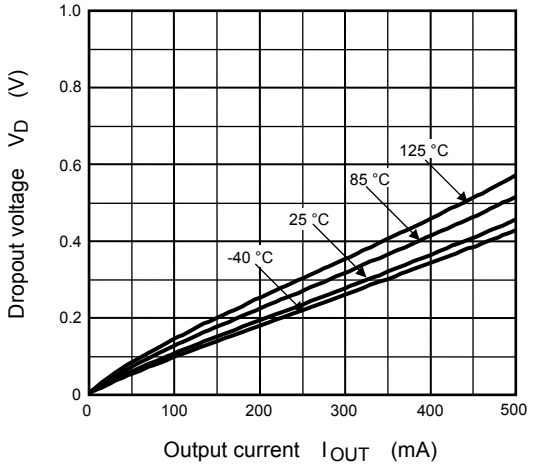
$I_B - I_{OUT}$



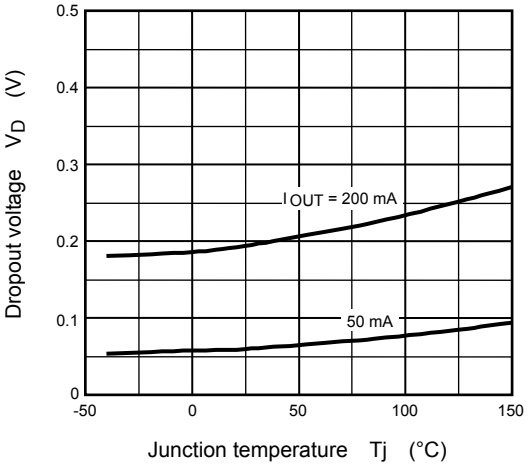
$I_B - T_j$



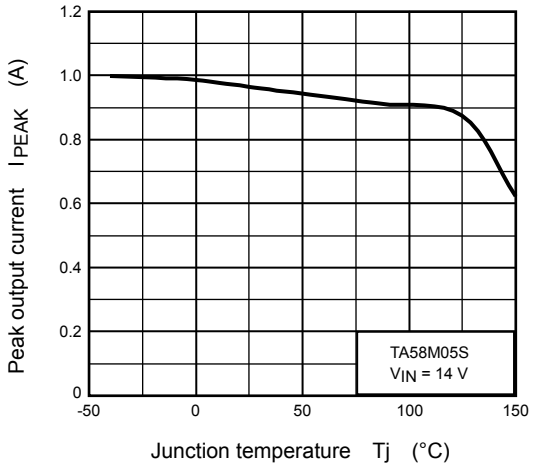
$V_D - I_{OUT}$



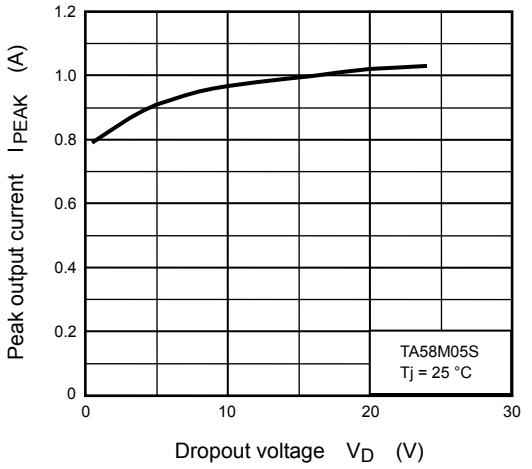
$V_D - T_j$



$I_{PEAK} - Tj$

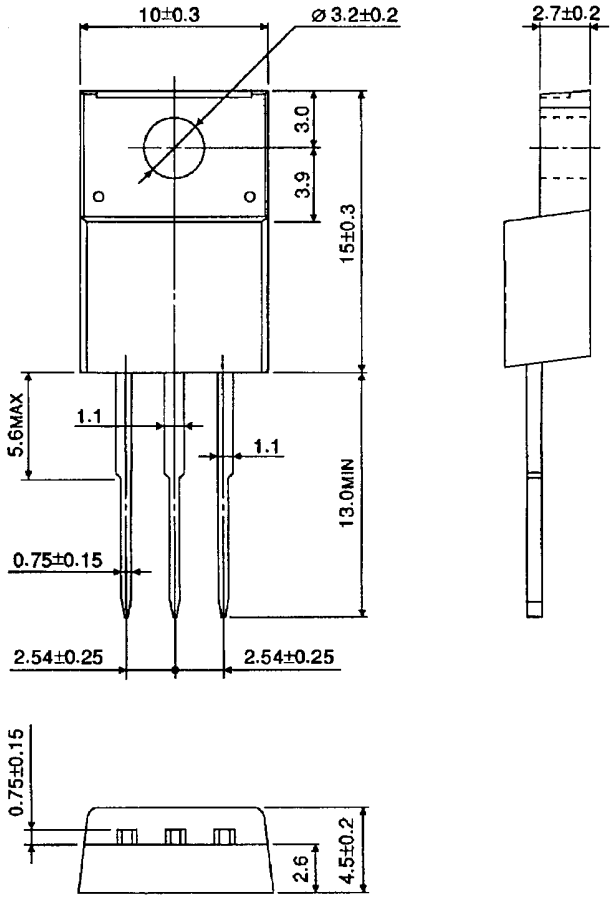


$I_{PEAK} - V_D$



Package Dimensions

HSIP3-P-2.54A Unit : mm



Weight: 1.7 g (Typ.)

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20070701-EN

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