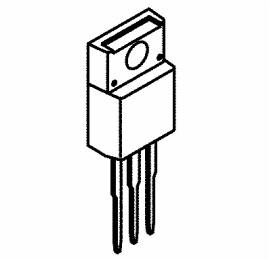
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA58L05S,TA58L06S,TA58L08S,TA58L09S TA58L10S,TA58L12S,TA58L15S

250 mA Low Dropout Voltage Regulator

The TA58L**S Series consists of fixed-positive-output, low-dropout regulators with an output current of 250 mA (max) that utilize PNP transistors for the output stage. Low dropout voltage and standby current make the TA58L**S Series suitable for applications requiring low power consumption.



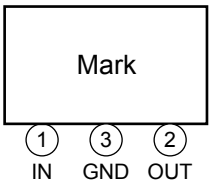
HSIP3-P-2.54A

Weight : 1.7 g (typ.)

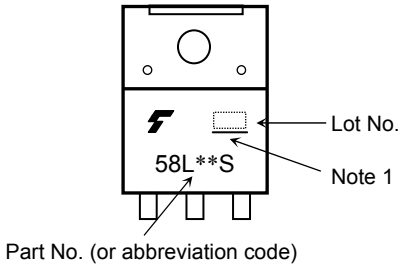
Features

- Maximum output current : 250 mA
- Output voltage : 5/ 6/ 8/ 9/ 10/ 12/ 15 V
- Output voltage accuracy : V_{OUT} ± 3% (@T_j = 25°C)
- Low-dropout voltage : 0.4 V (max) (@I_{OUT} = 200 mA)
- Protection function : Overcurrent protection / overheating protection / Reverse connection of power supply / 60 V load dump
- Package type : TO-220NIS

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

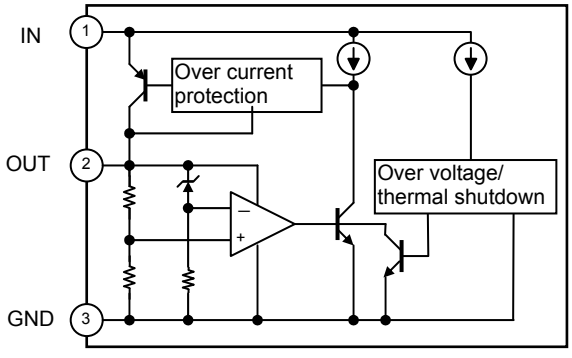
Pin No.	Symbol	Description
1	IN	Input terminal. Connected by capacitor (C_{IN}) to GND.
3	GND	Ground terminal
2	OUT	Output terminal. Connected by capacitor (C_{OUT}) to GND.

How to Order

Product No.	Package	Package Type and Capacity
TA58L**S(Q) (Note 3)	TO-220NIS	Loose in bag: 50 (1 bag)

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	$V_{IN\ (DC)}$	29	V
	Pulse	$V_{IN\ (Pulse)}$	60 (τ =200ms)	V
Output current		I_{OUT}	250	mA
Operating temperature		T_{opr}	−40 to 105	°C
Junction temperature		T_j	150	°C
Storage temperature		T_{stg}	−55 to 150	°C
Power dissipation	Ta = 25°C	P_D	2	W
	Tc = 25°C		20	

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	$R_{th\ (j-a)}$	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 to 06S)/ 16 V (08 to 10S)/ 18 V (12S)/ 20 V (15S)	—	170	—	°C
Peak circuit current	I_{PEAK}	V_{IN} = 14 V (05 to 06S)/ 16 V (08 to 10S)/ 18 V (12S)/ 20 V (15S), T_j = 25°C	—	600	—	mA
Short circuit current	I_{SC}	V_{IN} = 14 V (05 to 06S)/ 16 V (08 to 10S)/ 18 V (12S)/ 20 V (15S), T_j = 25°C	—	330	—	mA
Overvoltage protection	V_{IN}	T_j = 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.

TA58L05S
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} = 10 mA	4.85	5.00	5.15	V
		5.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA, -40°C ≤ Ta ≤ 105°C	4.8	5.0	5.2	
Line regulation	Reg·line	9 V ≤ V_{IN} ≤ 16 V, I_{OUT} = 10 mA	—	1	10	mV
		5.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA	—	2	15	
Load regulation	Reg·load	V_{IN} = 14 V, 10 mA ≤ I_{OUT} ≤ 250 mA	—	10	30	mV
Quiescent current	I_B	6 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 0 A	—	0.45	1.00	mA
		6 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 250 mA	—	25	50	
Dropout voltage	V_D	I_{OUT} = 50 mA	—	0.08	0.20	V
		I_{OUT} = 200 mA	—	0.22	0.40	

TA58L06S
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} = 10 mA	5.82	6.00	6.18	V
		6.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA, -40°C ≤ Ta ≤ 105°C	5.76	6.00	6.24	
Line regulation	Reg·line	10 V ≤ V_{IN} ≤ 17 V, I_{OUT} = 10 mA	—	1	10	mV
		6.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA	—	2	15	
Load regulation	Reg·load	V_{IN} = 14 V, 10 mA ≤ I_{OUT} ≤ 250 mA	—	10	30	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} = 250 mA	—	25	50	
Dropout voltage	V_D	I_{OUT} = 50 mA	—	0.08	0.20	V
		I_{OUT} = 200 mA	—	0.22	0.40	

TA58L08S
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} = 10mA	7.76	8.00	8.24	V
		8.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA, -40°C ≤ Ta ≤ 105°C	7.68	8.00	8.32	
Line regulation	Reg·line	12 V ≤ V_{IN} ≤ 19 V, I_{OUT} = 10 mA	—	1	10	mV
		8.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA	—	2	15	
Load regulation	Reg·load	V_{IN} = 16 V, 10 mA ≤ I_{OUT} ≤ 250 mA	—	10	40	mV
Quiescent current	I_B	9 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 0 A	—	0.55	1.00	mA
		9 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 250 mA	—	25	50	
Dropout voltage	V_D	I_{OUT} = 50 mA	—	0.08	0.20	V
		I_{OUT} = 200 mA	—	0.22	0.40	

TA58L09S
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} = 10 mA	8.73	9.00	9.27	V
		9.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA, -40°C ≤ Ta ≤ 105°C	8.64	9.00	9.36	
Line regulation	Reg·line	13 V ≤ V_{IN} ≤ 20 V, I_{OUT} = 10 mA	—	1	12	mV
		9.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA	—	2	20	
Load regulation	Reg·load	V_{IN} = 16 V, 10 mA ≤ I_{OUT} ≤ 250 mA	—	12	40	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} = 250 mA	—	25	50	
Dropout voltage	V_D	I_{OUT} = 50 mA	—	0.08	0.20	V
		I_{OUT} = 200 mA	—	0.22	0.40	

TA58L10S
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} = 10 mA	9.7	10.0	10.3	V
		10.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA, -40°C ≤ Ta ≤ 105°C	9.6	10.0	10.4	
Line regulation	Reg·line	14 V ≤ V_{IN} ≤ 21 V, I_{OUT} = 10 mA	—	1	12	mV
		10.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA	—	2	20	
Load regulation	Reg·load	V_{IN} = 16 V, 10 mA ≤ I_{OUT} ≤ 250 mA	—	12	40	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} = 250 mA	—	25	50	
Dropout voltage	V_D	I_{OUT} = 50 mA	—	0.08	0.20	V
		I_{OUT} = 200 mA	—	0.22	0.40	

TA58L12S
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} = 10 mA	11.64	12.00	12.36	V
		12.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA, -40°C ≤ Ta ≤ 105°C	11.52	12.00	12.48	
Line regulation	Reg·line	16 V ≤ V_{IN} ≤ 23 V, I_{OUT} = 10 mA	—	1	12	mV
		12.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA	—	2	20	
Load regulation	Reg·load	V_{IN} = 18 V, 10 mA ≤ I_{OUT} ≤ 250 mA	—	20	50	mV
Quiescent current	I_B	13 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 0 A	—	0.65	1.20	mA
		13 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 250 mA	—	25	50	
Dropout voltage	V_D	I_{OUT} = 50 mA	—	0.08	0.20	V
		I_{OUT} = 200 mA	—	0.22	0.40	

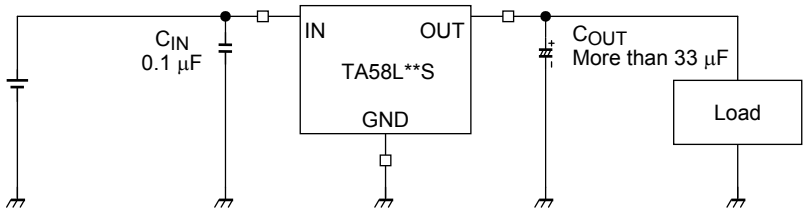
TA58L15S
Electrical Characteristics (unless otherwise specified, T_j = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 20 V, I_{OUT} = 10 mA	14.55	15.00	15.45	V
		15.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA, -40°C ≤ Ta ≤ 105°C	14.4	15.0	15.6	
Line regulation	Reg·line	19 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA	—	1	12	mV
		15.35 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 10 mA	—	2	20	
Load regulation	Reg·load	V_{IN} = 20 V, 10 mA ≤ I_{OUT} ≤ 250 mA	—	20	60	mV
Quiescent current	I_B	16 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 0 A	—	0.75	1.40	mA
		16 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 250 mA	—	25	50	
Dropout voltage	V_D	I_{OUT} = 50 mA	—	0.08	0.20	V
		I_{OUT} = 200 mA	—	0.22	0.40	

Electrical Characteristics Common to All Products

- T_j = 25°C in the measurement conditions of each item is 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. Also, ensure that the regulator performance is satisfactory over the operating temperature range of the target system..

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.

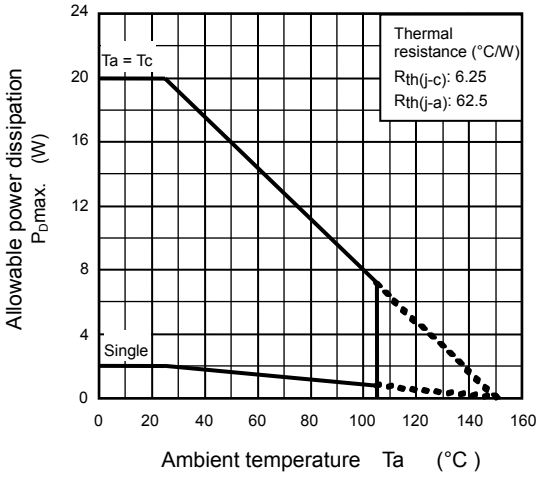
- Overheating Protection

  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.

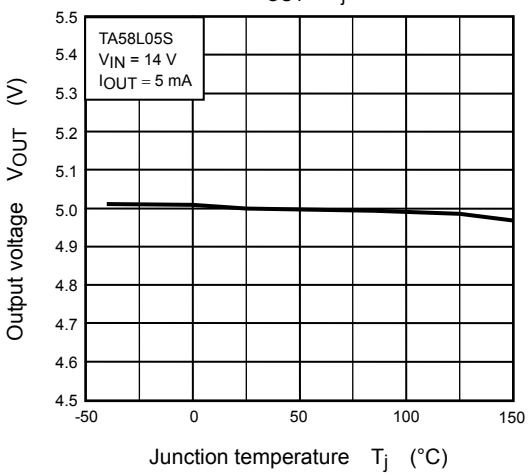
- Overvoltage Protection

  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.

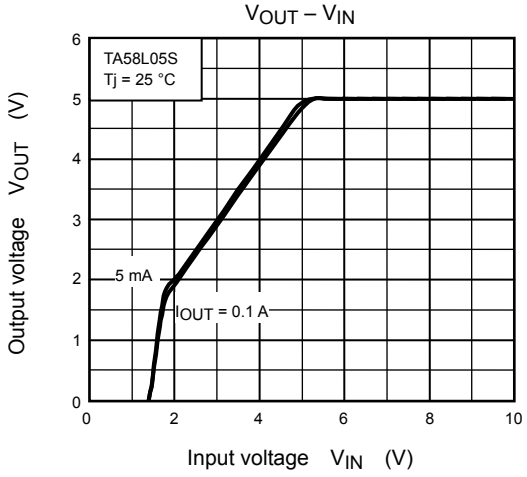
$P_D$max. – Ta



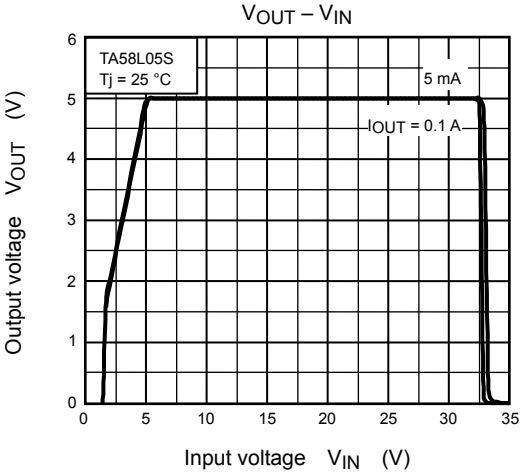
V_{OUT} – T_j



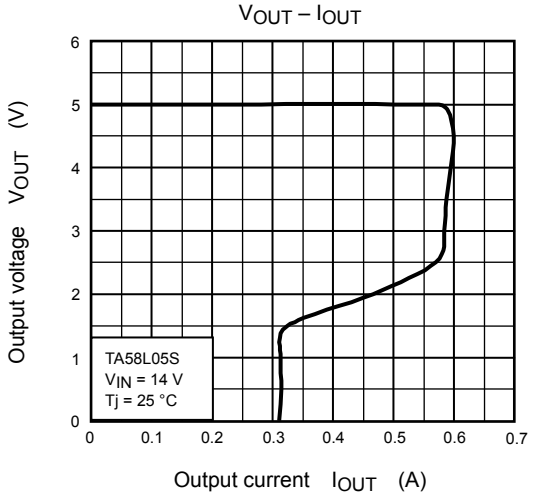
V_{OUT} – V_{IN}



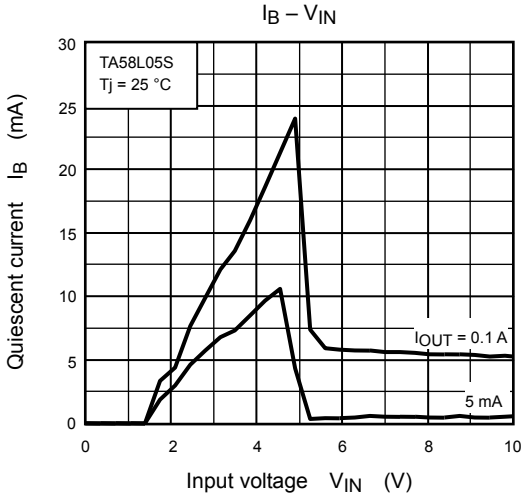
V_{OUT} – V_{IN}



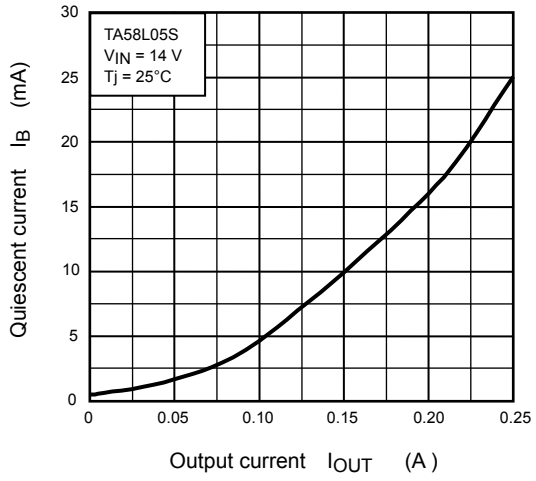
V_{OUT} – I_{OUT}



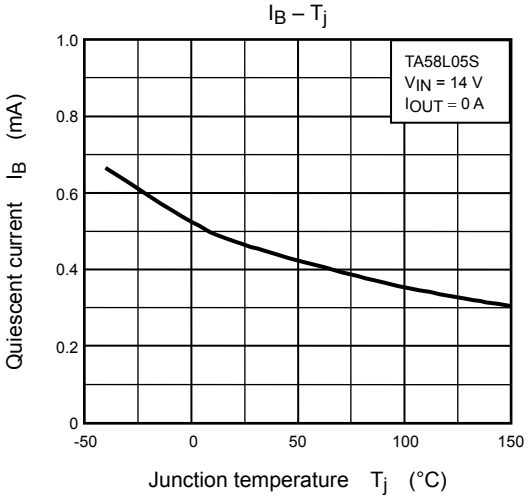
I_B – V_{IN}



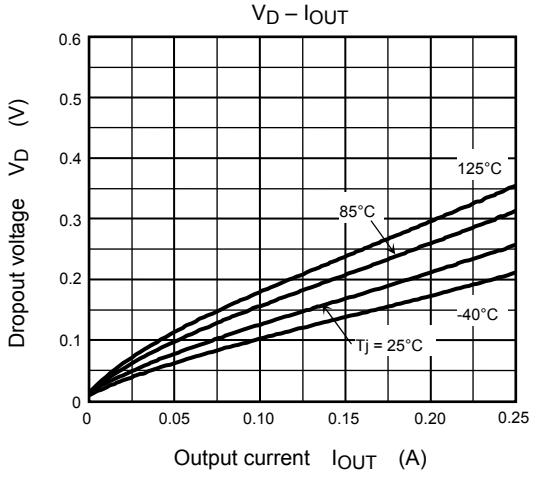
$I_B - I_{OUT}$



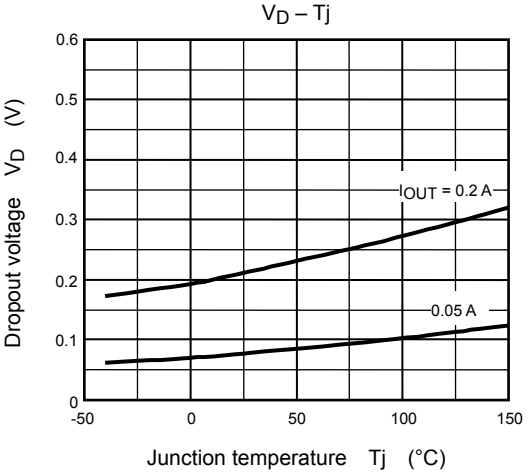
$I_B - T_j$



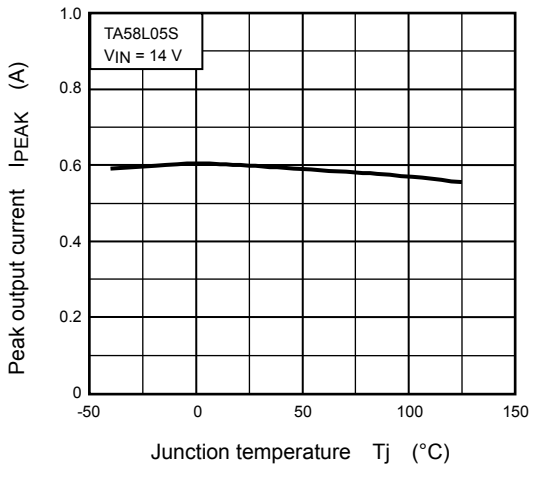
$V_D - I_{OUT}$



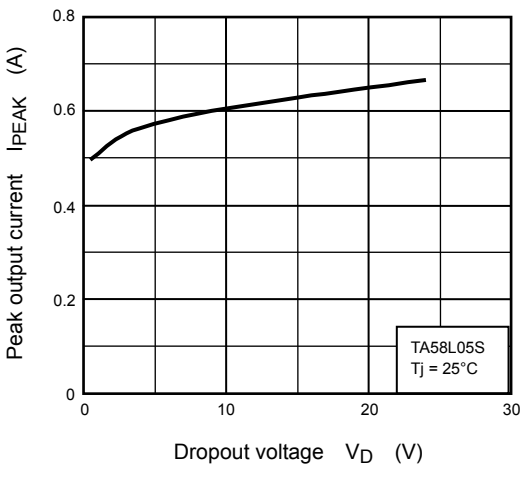
$V_D - Tj$



$I_{PEAK} - Tj$

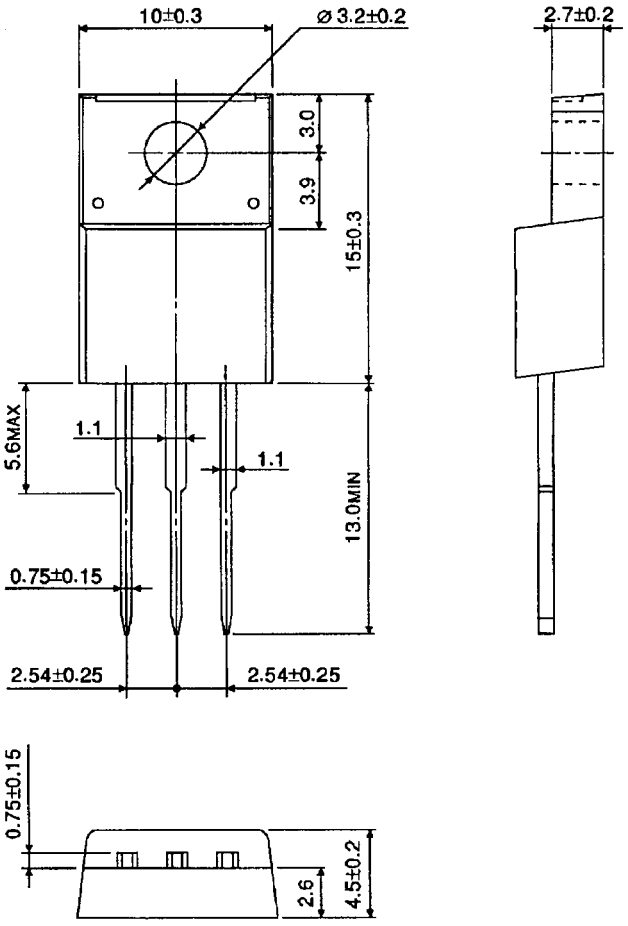


$I_{PEAK} - V_D$



Package Dimensions

HSIP3-P-2.54A Unit: mm



Weight: 1.7 g (typ.)

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