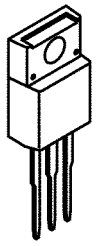
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA78033AS, TA7804AS, TA7805AS, TA7807AS, TA7808AS, TA7809AS

1 A Three-Terminal Positive Voltage Regulator

The TA78***AS series consists of fixed-positive-output voltage regulator ICs capable of sourcing current of up to 1A.



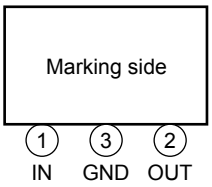
HSIP3-P-2.54A

Weight : 1.7 g (typ.)

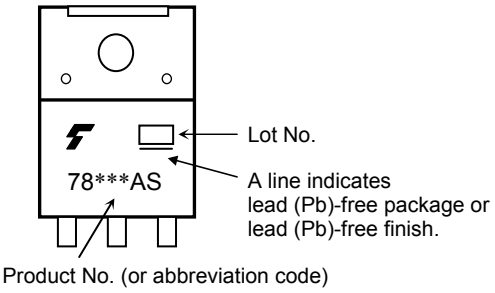
Features

- Maximum output current: 1 A
- Output voltage: 3.3 / 4.0 / 5.0 / 7.0 / 8.0 / 9.0 V
- Output voltage accuracy: V_{OUT} ± 4% (@T_j = 25°C)
- Protection function: over current protection /thermal shutdown /safe operating area(SOA)
- Package type: TO-220NIS

Pin Assignment



Marking



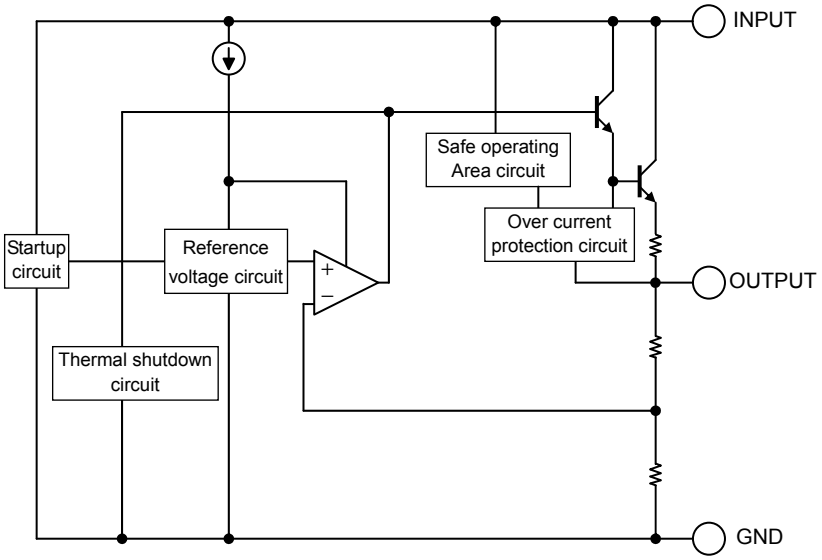
Note: The "***" in the each product number is replaces with the output voltage of each product.

How to Order(Note1)

	Product No.	Package	Packing Type and Unit for Orders
(1)	TA78***AS(Q)	TO-220NIS	Loose in bag: 50 (1 bag)

Note 1: The "***" in each pro-forma product number is replaced with the output voltage of each product.

Block Diagram



Absolute Maximum Ratings (Ta = 25°C) (Note2)

Characteristic		Symbol	Rating	Unit
Input voltage		V_{IN}	20	V
Output current		I_{OUT}	1	A
Operating Junction temperature		$T_{j(opr)}$	−40~135	°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		15	

Note 2: Do not apply current and voltage (including reverse polarity) to any pin that is not specified.

Note 3: 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	$R_{th\ (j-c)}$	8.33	°C / W

Protection Function (reference) (Note3)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Thermal shutdown	T_{SD}	$V_{IN} = V_{OUT} + 5$ V	—	175	—	°C
Peak circuit current	I_{PEAK}	$V_{IN} = V_{OUT} + 5$ V, $T_j = 25$°C	—	1.7	—	A
Short circuit current	I_{SC}	$V_{IN} = V_{OUT} + 5$ V, $T_j = 25$°C	—	1.5	—	A

Note 3: Ensure that the devices operate within the limits of the maximum rating when in actual use.

TA78033AS
Electrical Characteristics
(C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF, T_j = 25°C, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 8.3 V, I_{OUT} = 100 mA	3.168	3.300	3.432	V
		5.8V ≦ V_{IN} ≦ 16 V, 5 mA ≦ I_{OUT} ≦ 1 A	3.135	3.300	3.465	
Line regulation	Reg·line	5.8 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 500 mA	—	5	50	mV
Load regulation	Reg·load	V_{IN} = 8.3 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	5	50	mV
Quiescent current	I_B	V_{IN} = 8.3 V, I_{OUT} = 5 mA,	—	3	8	mA
Quiescent current change	ΔI_B	5.8 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 5 mA	—	—	1.3	mA
Output noise voltage	V_{NO}	V_{IN} = 8.3 V, I_{OUT} = 50 mA 10 Hz ≦ f ≦ 100 kHz	—	50	—	μVrms
Ripple rejection	R.R.	6.3 V ≦ V_{IN} ≤ 16 V, I_{OUT} = 50 mA f = 120 Hz	—	67	—	dB
Dropout voltage	V_D	I_{OUT} = 1 A	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 8.3 V, I_{OUT} = 5 mA, 0°C ≦ T_j ≦ 125°C	—	±0.33	—	mV/°C

TA7804AS
Electrical Characteristics
(C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF, T_j = 25°C, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 9 V, I_{OUT} = 100 mA	3.84	4.00	4.16	V
		6.5 V ≦ V_{IN} ≦ 16 V, 5 mA ≦ I_{OUT} ≦ 1 A,	3.8	4.0	4.2	
Line regulation	Reg·line	6.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 500 A	—	10	50	mV
Load regulation	Reg·load	V_{IN} = 9 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	10	50	mV
Quiescent current	I_B	V_{IN} = 9 V, I_{OUT} = 5 mA,	—	3	8	mA
Quiescent current change	ΔI_B	6.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 5 mA	—	—	1.3	mA
Output noise voltage	V_{NO}	V_{IN} = 9 V, I_{OUT} = 50 mA 10 Hz ≦ f ≦ 100 kHz	—	50	—	μVrms
Ripple rejection	R.R.	7 V ≦ V_{IN} ≤ 16 V, I_{OUT} = 50 mA f = 120 Hz	—	66	—	dB
Dropout voltage	V_D	I_{OUT} = 1 A	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 9 V, I_{OUT} = 5 mA, 0°C ≦ T_j ≦ 125°C	—	±0.4	—	mV/°C

TA7805AS
Electrical Characteristics
(C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF, T_j = 25°C, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 10 V, I_{OUT} = 100 mA	4.8	5.0	5.2	V
		7.5V ≦ V_{IN} ≦ 16 V, 5 mA ≦ I_{OUT} ≦ 1 A,	4.75	5.00	5.25	
Line regulation	Reg·line	7.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 500 mA	—	10	50	mV
Load regulation	Reg·load	V_{IN} = 10 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	10	50	mV
Quiescent current	I_B	V_{IN} = 10 V, I_{OUT} = 5 mA,	—	3	8	mA
Quiescent current change	ΔI_B	7.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 5 mA	—	—	1.3	mA
Output noise voltage	V_{NO}	V_{IN} = 10 V, I_{OUT} = 50 mA 10 Hz ≦ f ≦ 100 kHz	—	50	—	μVrms
Ripple rejection	R.R.	8 V ≦ V_{IN} ≤ 16 V, I_{OUT} = 50 mA f = 120 Hz	—	64	—	dB
Dropout voltage	V_D	I_{OUT} = 1 A	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 10 V, I_{OUT} = 5 mA, 0°C ≦ T_j ≦ 125°C	—	±0.5	—	mV/°C

TA7807AS
Electrical Characteristics
(C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF, T_j = 25°C, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 12 V, I_{OUT} = 100 mA	6.72	7.00	7.28	V
		9.5 V ≦ V_{IN} ≦ 16 V, 5 mA ≦ I_{OUT} ≦ 1 A,	6.65	7.00	7.35	
Line regulation	Reg·line	9.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 500 mA	—	15	50	mV
Load regulation	Reg·load	V_{IN} = 12 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	15	50	mV
Quiescent current	I_B	V_{IN} = 12 V, I_{OUT} = 5 mA,	—	3	8	mA
Quiescent current change	ΔI_B	9.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 5 mA	—	—	1.3	mA
Output noise voltage	V_{NO}	V_{IN} = 12 V, I_{OUT} = 50 mA 10 Hz ≦ f ≦ 100 kHz	—	60	—	μVrms
Ripple rejection	R.R.	10 V ≦ V_{IN} ≤ 16 V, I_{OUT} = 50 mA f = 120 Hz	—	60	—	dB
Dropout voltage	V_D	I_{OUT} = 1 A	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 12 V, I_{OUT} = 5 mA, 0°C ≦ T_j ≦ 125°C	—	±0.7	—	mV/°C

TA7808AS
Electrical Characteristics
(C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF, T_j = 25°C, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 13 V, I_{OUT} = 100 mA	7.68	8.00	8.32	V
		10.5V ≦ V_{IN} ≦ 16 V, 5 mA ≦ I_{OUT} ≦ 1 A,	7.6	8.0	8.4	
Line regulation	Reg·line	10.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 500 mA	—	15	50	mV
Load regulation	Reg·load	V_{IN} = 13 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	15	50	mV
Quiescent current	I_B	V_{IN} = 13 V, I_{OUT} = 5 mA,	—	3	8	mA
Quiescent current change	ΔI_B	10.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 5 mA	—	—	1.3	mA
Output noise voltage	V_{NO}	V_{IN} = 13 V, I_{OUT} = 50 mA 10 Hz ≦ f ≦ 100 kHz	—	70	—	μVrms
Ripple rejection	R.R.	11 V ≦ V_{IN} ≤ 16 V, I_{OUT} = 50 mA f = 120 Hz	—	60	—	dB
Dropout voltage	V_D	I_{OUT} = 1 A	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 13 V, I_{OUT} = 5 mA, 0°C ≦ T_j ≦ 125°C	—	±0.8	—	mV/°C

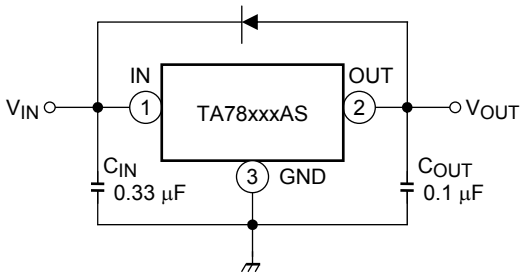
TA7809AS
Electrical Characteristics
(C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF, T_j = 25°C, unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	V_{IN} = 14 V, I_{OUT} = 100 mA	8.64	9.00	9.36	V
		11.5 V ≦ V_{IN} ≦ 16 V, 5 mA ≦ I_{OUT} ≦ 1 A,	8.55	9.00	9.45	
Line regulation	Reg·line	11.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 500 mA	—	15	50	mV
Load regulation	Reg·load	V_{IN} = 14 V, 5 mA ≦ I_{OUT} ≦ 1 A	—	15	50	mV
Quiescent current	I_B	V_{IN} = 14 V, I_{OUT} = 5 mA,	—	3	8	mA
Quiescent current change	ΔI_B	11.5 V ≦ V_{IN} ≦ 16 V, I_{OUT} = 5 mA	—	—	1.3	mA
Output noise voltage	V_{NO}	V_{IN} = 14 V, I_{OUT} = 50 mA 10 Hz ≦ f ≦ 100 kHz	—	75	—	μVrms
Ripple rejection	R.R.	12 V ≦ V_{IN} ≤ 16 V, I_{OUT} = 50 mA f = 120 Hz	—	60	—	dB
Dropout voltage	V_D	I_{OUT} = 1 A	—	2	—	V
Average temperature coefficient of output voltage	T_{CVO}	V_{IN} = 14 V, I_{OUT} = 5 mA, 0°C ≦ T_j ≦ 125°C	—	±0.9	—	mV/°C

Electrical Characteristics for All Products

Generally, the characteristics of power supply ICs vary with temperature.
The ratings at Tj = 25℃assume that a temperature increase has no effect on IC characteristics as ascertained by pulse tests.

Standard Application Circuit



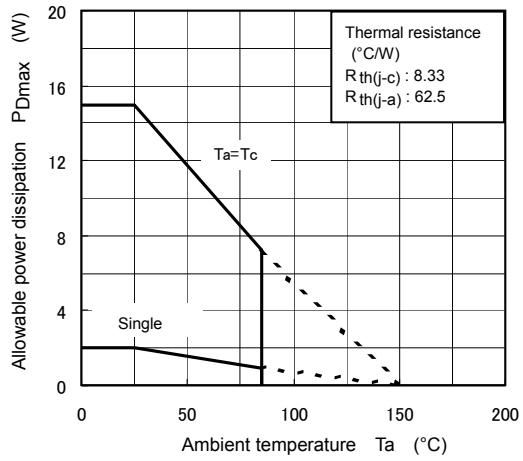
- Place C_{IN} as close as possible to the input terminal and GND. Place C_{OUT} as close as possible to the output terminal and GND. Although capacitor C_{OUT} acts to smooth the dc output voltage during suspension of output oscillation or load change, it might cause output oscillation in a cold environment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

The notice in case of application

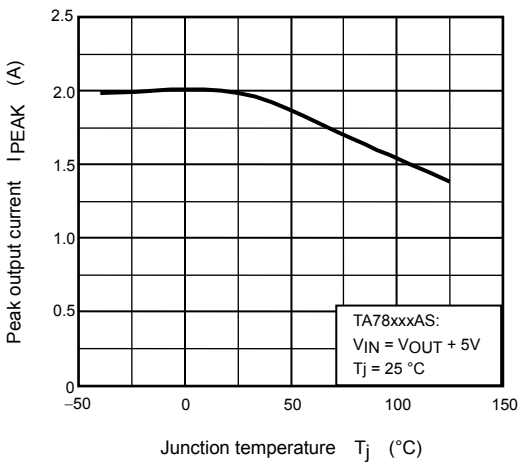
- If the input terminal shorts to GND in a state of normal operation, the output terminal voltage becomes higher than the input voltage (GND potential), and the electric charge of a chemical capacitor connected to the output terminal flows into the input side, which may cause the destruction of circuit.
  In these cases, take such steps as a zener diode and a general silicon diode are connected to the circuit, as shown in the above figure

- There is a possibility that internal parasitic devices may be generated when momentary transients cause a terminal's potential to fall below that of the GND terminal. In such case, that the device could be destroyed. The voltage of each terminal and any state must therefore never fall below the GND potential.

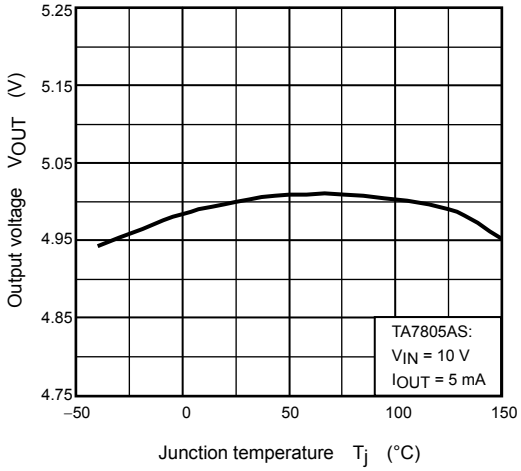
$P_D$max – Ta



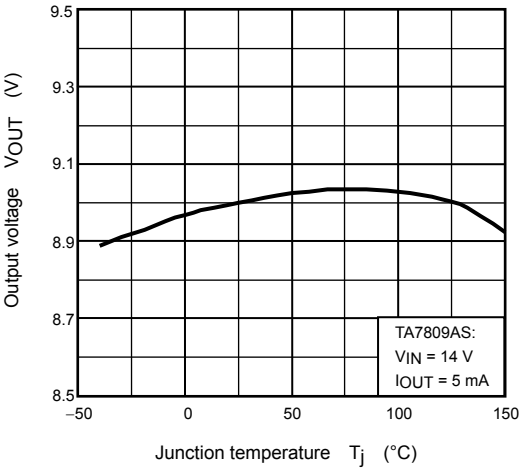
I peak – Tj



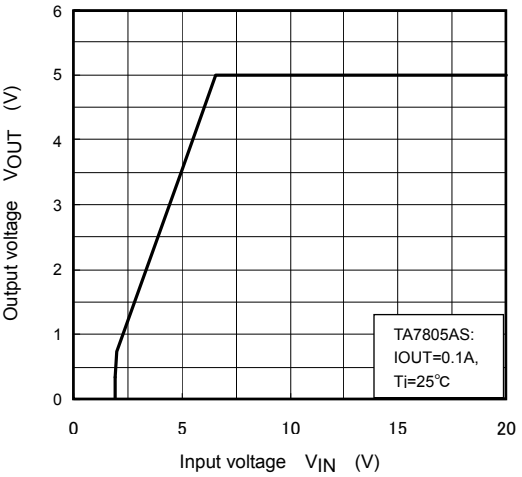
V_{OUT} – Tj



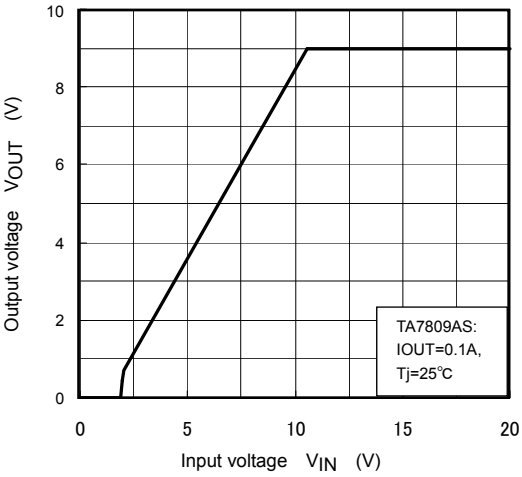
V_{OUT} – Tj



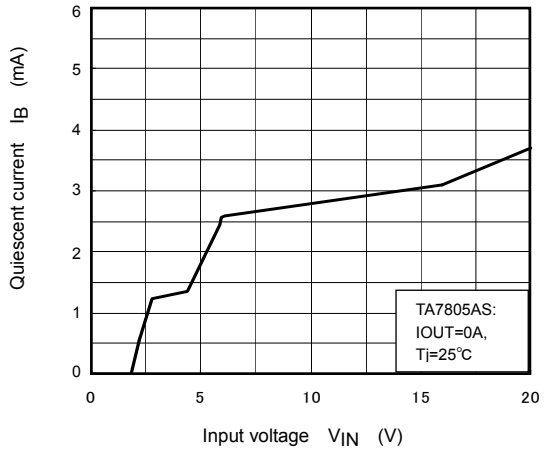
V_{OUT} – V_{IN}



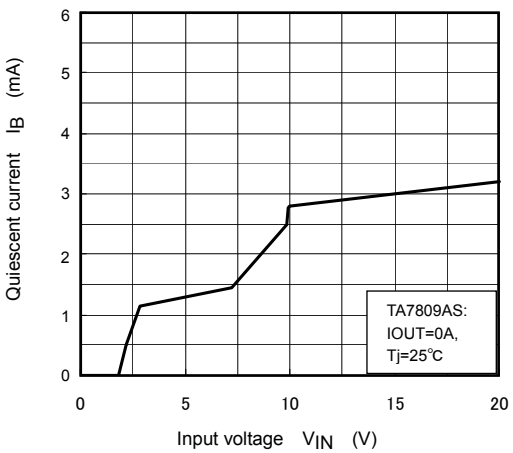
V_{OUT} – V_{IN}



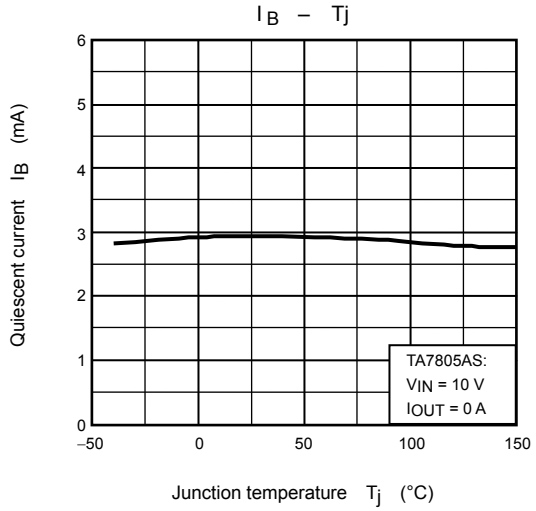
I_B – V_{IN}



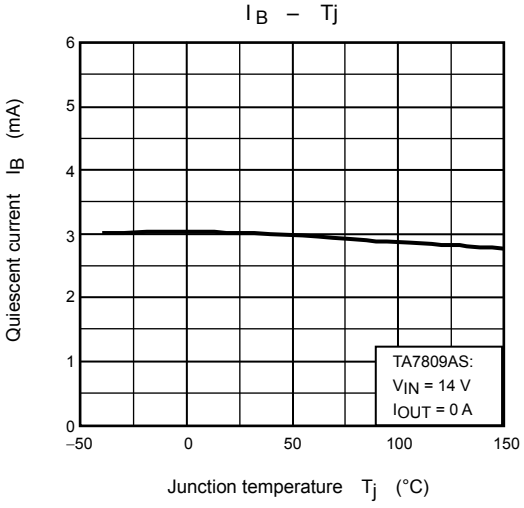
I_B – V_{IN}



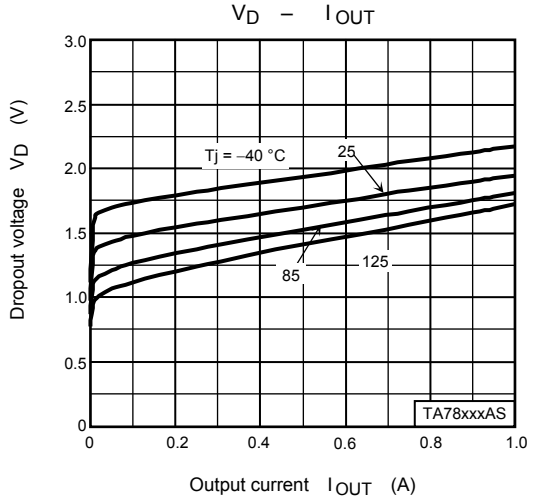
I_B – Tj



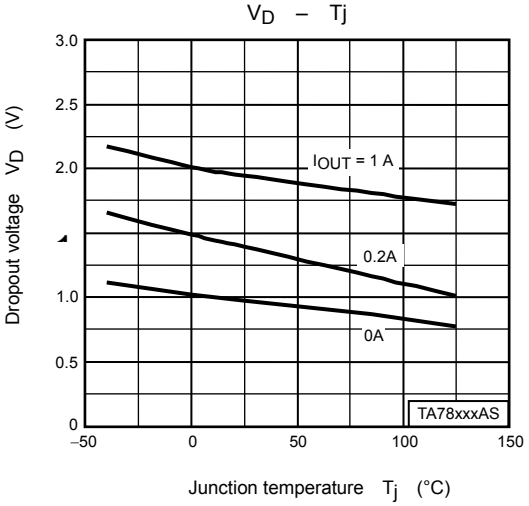
I_B – Tj



V_D – I_{OUT}

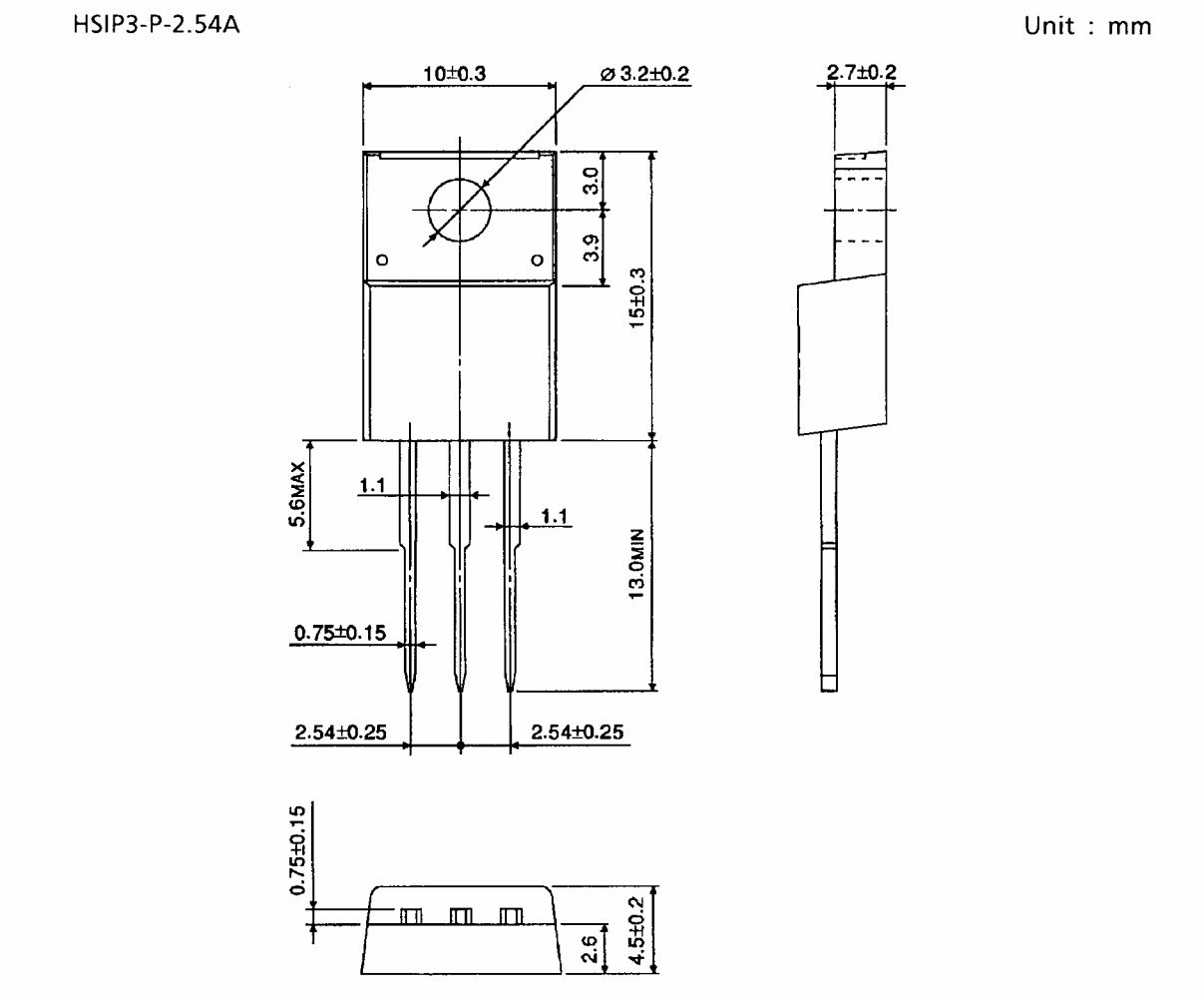


V_D – Tj



Package Dimensions

HSIP3-P-2.54A Unit : mm



Weight: 1.7 g (typ.)

RESTRICTIONS ON PRODUCT USE

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  In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the “Handling Guide for Semiconductor Devices,” or “TOSHIBA Semiconductor Reliability Handbook” etc.
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