

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA78DL05AS, TA78DL06AS, TA78DL08AS, TA78DL09AS, TA78DL10AS, TA78DL12AS, TA78DL15AS

5 V, 6 V, 8 V, 9 V, 10 V, 12 V, 15 V

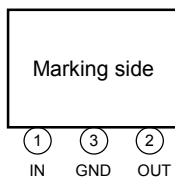
Three-Terminal Low Dropout Voltage Regulator

The TA78DL××AS series consists of positive fixed output voltage regulator IC capable of sourcing current up to 250 mA. Due to the features of low dropout voltage and low standby current, these devices are useful for battery powered equipment. This series includes current limiting, thermal shutdown, overvoltage protection, input fault protection and excessive transient protection circuits internally.

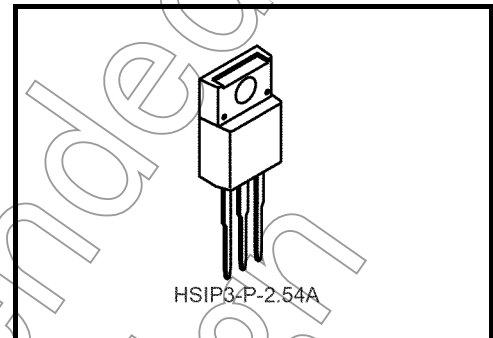
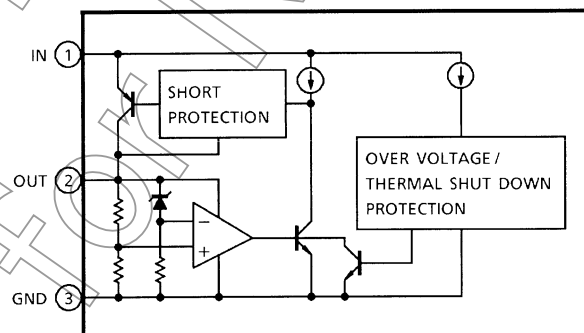
Features

- Low standby current of 500 μ A typical.
- Maximum output current up to 250 mA.
- Low dropout voltage of less than 0.6 V (@ $I_{OUT} = 0.2$ A).
- Multi-protection:
Reverse connection of power supply, 60 V load dump, thermal shut down and current limiting.
- Metal fin (tab) is fully covered with mold resin. (TO-220 NIS package)

Pin Assignment



Block Diagram



Weight: 1.7 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Operating input voltage	V _{IN}	29	V
Input voltage of surge	V _{IN}	60	V
Power dissipation	P _D	(Ta = 25°C)	2
		(Tc = 25°C)	20
Operating temperature	T _{opr}	-40~85	°C
Storage temperature	T _{stg}	-55~150	°C
Junction temperature	T _j	150	°C
Thermal resistance	R _{th (j-c)}	6.25	°C/W
	R _{th (j-a)}	62.5	
Storage temperature-time	T _{sol}	260 (10s)	°C

Note: 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).

TA78DL05AS

Electrical Characteristics (Unless otherwise specified, V_{IN} = 14 V, I_{OUT} = 10 mA, T_j = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V _{OUT}	—	5.35 V ≤ V _{IN} ≤ 26 V, -40°C ≤ Ta ≤ 85°C	4.75	5.0	5.25	V
Line regulation	Reg-line	—	9 V ≤ V _{IN} ≤ 16 V	—	2	10	mV
			6 V ≤ V _{IN} ≤ 26 V	—	4	30	
Load regulation	Reg-load	—	10 mA ≤ I _{OUT} ≤ 200 mA	—	14	50	mV
Quiescent current	I _B	—	I _{OUT} ≤ 10 mA, 6 V ≤ V _{IN} ≤ 26 V	—	0.5	1	mA
Dropout voltage	V _D	—	I _{OUT} = 50 mA	—	0.15	0.3	V
			I _{OUT} = 200 mA	—	0.4	0.6	
Max operating voltage	V _{IN}	—	—	29	33	—	V

TA78DL06AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 14\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	$6.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	5.7	6.0	6.3	V
Line regulation	Reg.line	—	$10\text{ V} \leq V_{IN} \leq 17\text{ V}$	—	2	12	mV
			$7\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	5	36	
Load regulation	Reg.load	—	$10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$	—	17	60	mV
Quiescent current	I_B	—	$I_{OUT} \leq 10\text{ mA}$, $7\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	0.55	—	mA
Dropout voltage	V_D	—	$I_{OUT} = 50\text{ mA}$	—	0.15	0.3	V
			$I_{OUT} = 200\text{ mA}$	—	0.4	0.6	
Max operating voltage	V_{IN}	—	—	29	33	—	V

TA78DL08AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	$8.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	7.6	8	8.4	V
Line regulation	Reg.line	—	$12\text{ V} \leq V_{IN} \leq 19\text{ V}$	—	3	16	mV
			$9\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	6	45	
Load regulation	Reg.load	—	$10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$	—	22	80	mV
Quiescent current	I_B	—	$I_{OUT} \leq 10\text{ mA}$, $9\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	0.6	—	mA
Dropout voltage	V_D	—	$I_{OUT} = 50\text{ mA}$	—	0.15	0.3	V
			$I_{OUT} = 200\text{ mA}$	—	0.4	0.6	
Max operating voltage	V_{IN}	—	—	29	33	—	V

TA78DL09AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	$9.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	8.55	9	9.45	V
Line regulation	Reg.line	—	$13\text{ V} \leq V_{IN} \leq 20\text{ V}$	—	3	18	mV
			$10\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	7	50	
Load regulation	Reg.load	—	$10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$	—	25	90	mV
Quiescent current	I_B	—	$I_{OUT} \leq 10\text{ mA}$, $10\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	0.65	—	mA
Dropout voltage	V_D	—	$I_{OUT} = 50\text{ mA}$	—	0.15	0.3	V
			$I_{OUT} = 200\text{ mA}$	—	0.4	0.6	
Max operating voltage	V_{IN}	—	—	29	33	—	V

TA78DL10AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	$10.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	9.5	10	10.5	V
Line regulation	Reg.line	—	$14\text{ V} \leq V_{IN} \leq 21\text{ V}$	—	4	20	mV
			$11\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	8	60	
Load regulation	Reg.load	—	$10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$	—	28	100	mV
Quiescent current	I_B	—	$I_{OUT} \leq 10\text{ mA}$, $11\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	0.7	—	mA
Dropout voltage	V_D	—	$I_{OUT} = 50\text{ mA}$	—	0.15	0.3	V
			$I_{OUT} = 200\text{ mA}$	—	0.4	0.6	
Max operating voltage	V_{IN}	—	—	29	33	—	V

TA78DL12AS

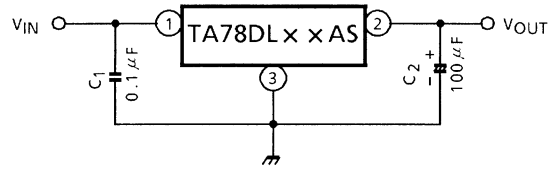
Electrical Characteristics (Unless otherwise specified, $V_{IN} = 18\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	$12.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	11.4	12	12.6	V
Line regulation	Reg.line	—	$16\text{ V} \leq V_{IN} \leq 23\text{ V}$	—	5	24	mV
			$13\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	10	70	
Load regulation	Reg.load	—	$10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$	—	33	120	mV
Quiescent current	I_B	—	$I_{OUT} \leq 10\text{ mA}$, $13\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	0.8	—	mA
Dropout voltage	V_D	—	$I_{OUT} = 50\text{ mA}$	—	0.15	0.3	V
			$I_{OUT} = 200\text{ mA}$	—	0.4	0.6	
Max operating voltage	V_{IN}	—	—	29	33	—	V

TA78DL15AS

Electrical Characteristics (Unless otherwise specified, $V_{IN} = 20\text{ V}$, $I_{OUT} = 10\text{ mA}$, $T_j = 25^\circ\text{C}$)

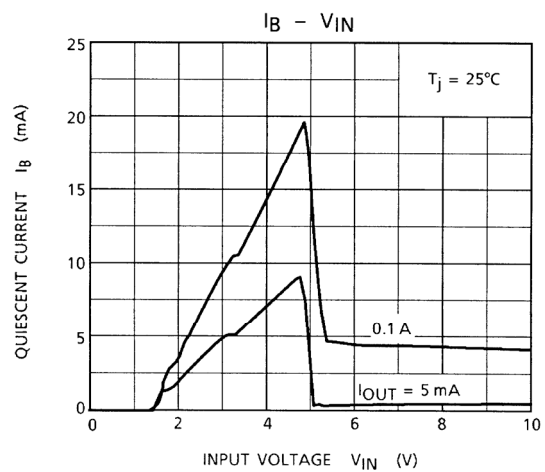
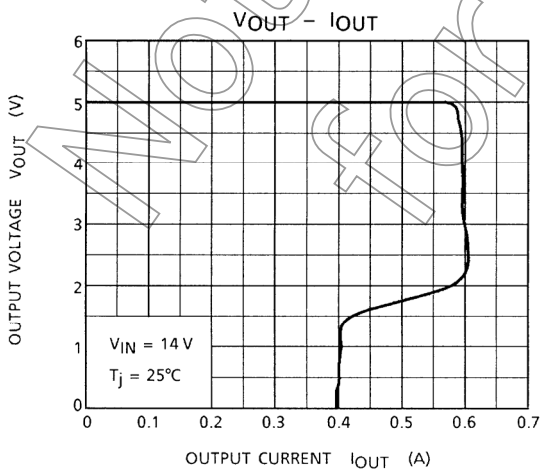
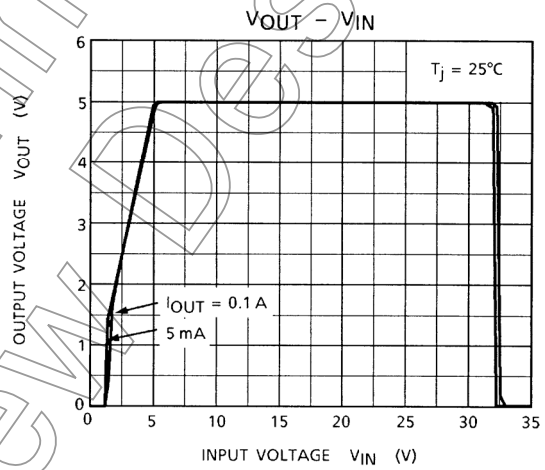
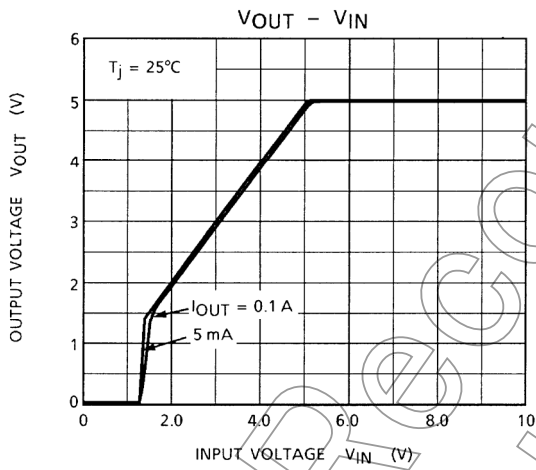
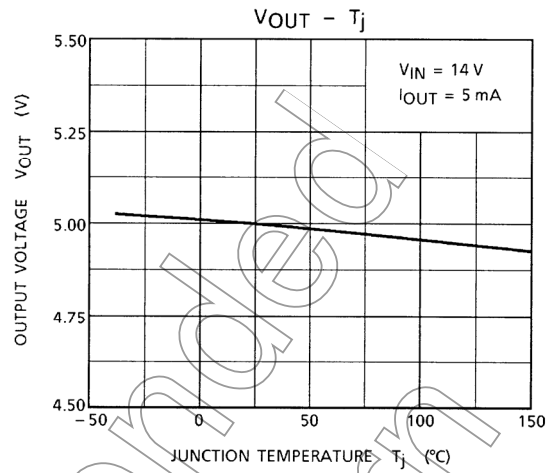
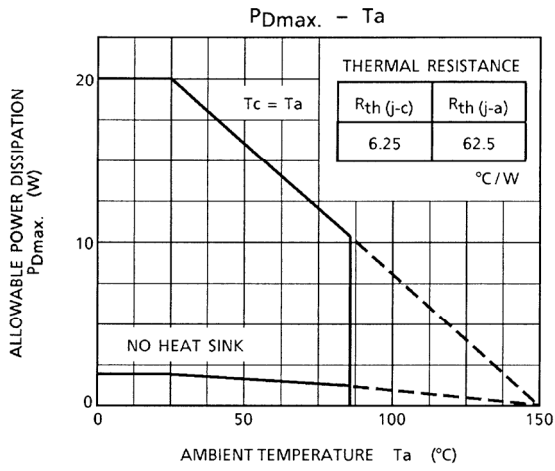
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	$15.35\text{ V} \leq V_{IN} \leq 26\text{ V}$, $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	14.25	15	15.75	V
Line regulation	Reg.line	—	$19\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	6	30	mV
			$16\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	12	80	
Load regulation	Reg.load	—	$10\text{ mA} \leq I_{OUT} \leq 200\text{ mA}$	—	40	150	mV
Quiescent current	I_B	—	$I_{OUT} \leq 10\text{ mA}$, $16\text{ V} \leq V_{IN} \leq 26\text{ V}$	—	0.9	—	mA
Dropout voltage	V_D	—	$I_{OUT} = 50\text{ mA}$	—	0.15	0.3	V
			$I_{OUT} = 200\text{ mA}$	—	0.4	0.6	
Max operating voltage	V_{IN}	—	—	29	33	—	V

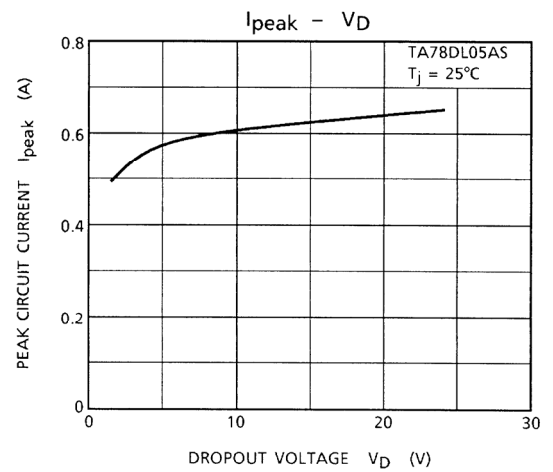
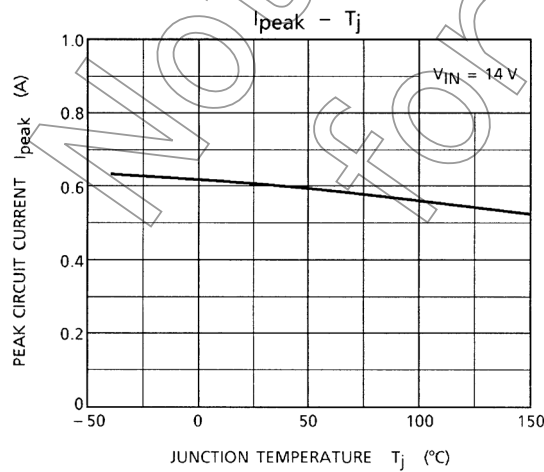
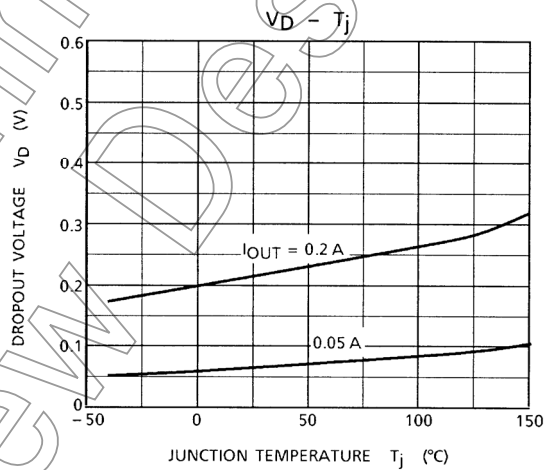
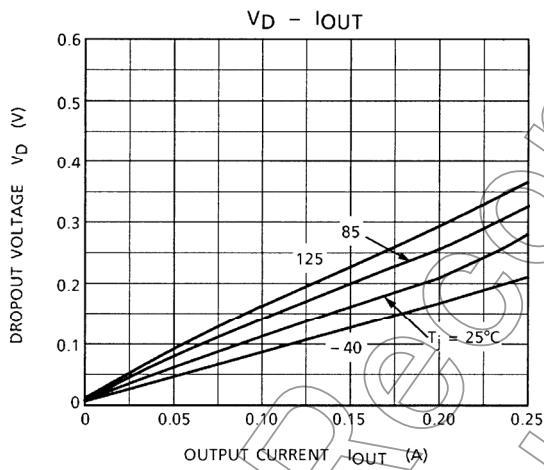
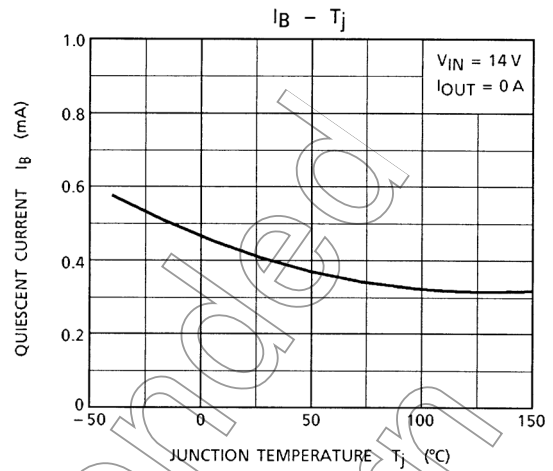
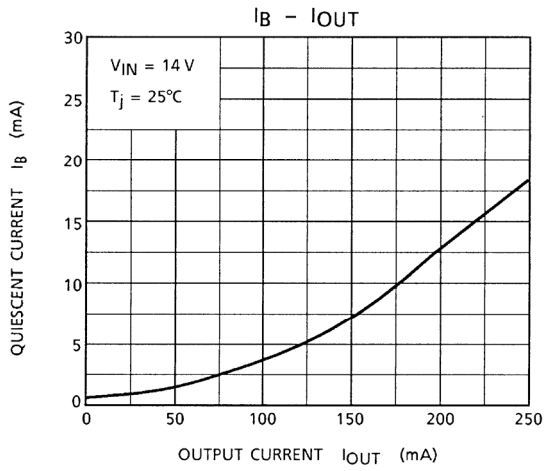
Application Circuit

Capacitor C_{IN}/C_{OUT} must be guaranteed to operate of the temperature range that the regulator should be operated correctly.

The equivalent series resistance (ESR) of C_{OUT} must be less than 1Ω in operating temperature range.

Not Recommended
for New Design

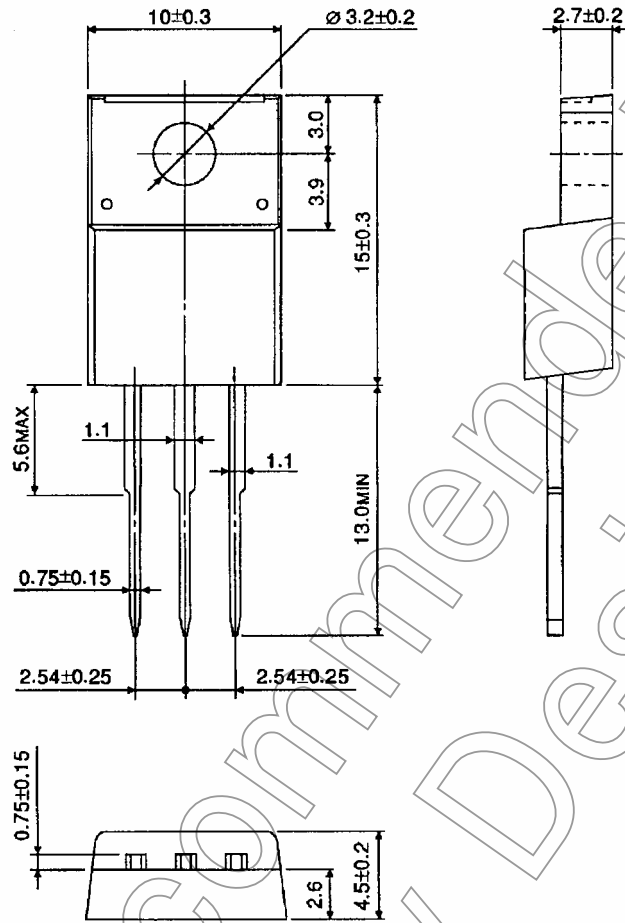




Package Dimensions

HSIP3-P-2.54A

Unit: mm



Weight: 1.7 g (typ.)

Not Recommended for New Design

RESTRICTIONS ON PRODUCT USE

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