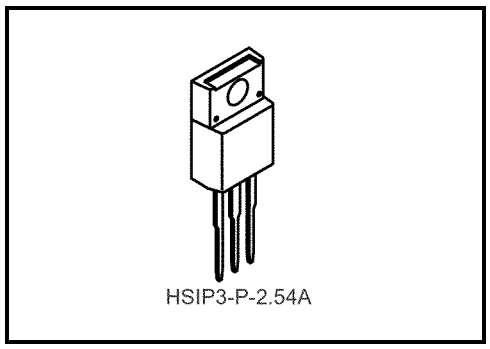
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

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.

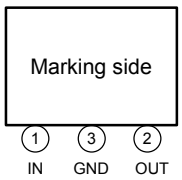


Weight: 1.7 g (typ.)

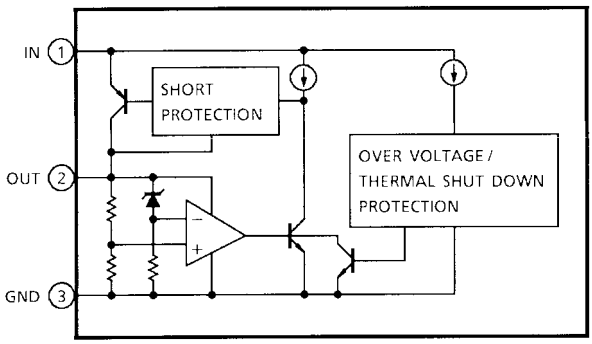
Features

- Low standby current of 500 μA 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



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	(Ta = 25°C)	P_D	2	W
	(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		$R_{th\ (j\text{-}c)}$	6.25	°C/W
		$R_{th\ (j\text{-}a)}$	62.5	
Storage temperature·time		T_{sol}	260 (10s)	°C

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 V, I_{OUT} = 10 mA, T_j = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	6.35 V ≤ V_{IN} ≤ 26 V, −40°C ≤ Ta ≤ 85°C	5.7	6.0	6.3	V
Line regulation	Reg·line	—	10 V ≤ V_{IN} ≤ 17 V	—	2	12	mV
			7 V ≤ V_{IN} ≤ 26 V	—	5	36	
Load regulation	Reg·load	—	10 mA ≤ I_{OUT} ≤ 200 mA	—	17	60	mV
Quiescent current	I_B	—	I_{OUT} ≤ 10 mA, 7 V ≤ V_{IN} ≤ 26 V	—	0.55	—	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

TA78DL08AS
Electrical Characteristics (Unless otherwise specified, V_{IN} = 16 V, I_{OUT} = 10 mA, T_j = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	8.35 V ≤ V_{IN} ≤ 26 V, −40°C ≤ Ta ≤ 85°C	7.6	8	8.4	V
Line regulation	Reg·line	—	12 V ≤ V_{IN} ≤ 19 V	—	3	16	mV
			9 V ≤ V_{IN} ≤ 26 V	—	6	45	
Load regulation	Reg·load	—	10 mA ≤ I_{OUT} ≤ 200 mA	—	22	80	mV
Quiescent current	I_B	—	I_{OUT} ≤ 10 mA, 9 V ≤ V_{IN} ≤ 26 V	—	0.6	—	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

TA78DL09AS
Electrical Characteristics (Unless otherwise specified, V_{IN} = 16 V, I_{OUT} = 10 mA, T_j = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	9.35 V ≤ V_{IN} ≤ 26 V, −40°C ≤ Ta ≤ 85°C	8.55	9	9.45	V
Line regulation	Reg·line	—	13 V ≤ V_{IN} ≤ 20 V	—	3	18	mV
			10 V ≤ V_{IN} ≤ 26 V	—	7	50	
Load regulation	Reg·load	—	10 mA ≤ I_{OUT} ≤ 200 mA	—	25	90	mV
Quiescent current	I_B	—	I_{OUT} ≤ 10 mA, 10 V ≤ V_{IN} ≤ 26 V	—	0.65	—	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

TA78DL10AS

Electrical Characteristics (Unless otherwise specified, V_{IN} = 16 V, I_{OUT} = 10 mA, T_j = 25°C)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	10.35 V ≤ V_{IN} ≤ 26 V, −40°C ≤ Ta ≤ 85°C	9.5	10	10.5	V
Line regulation	Reg·line	—	14 V ≤ V_{IN} ≤ 21 V	—	4	20	mV
			11 V ≤ V_{IN} ≤ 26 V	—	8	60	
Load regulation	Reg·load	—	10 mA ≤ I_{OUT} ≤ 200 mA	—	28	100	mV
Quiescent current	I_B	—	I_{OUT} ≤ 10 mA, 11 V ≤ V_{IN} ≤ 26 V	—	0.7	—	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

TA78DL12AS

Electrical Characteristics (Unless otherwise specified, V_{IN} = 18 V, I_{OUT} = 10 mA, T_j = 25°C)

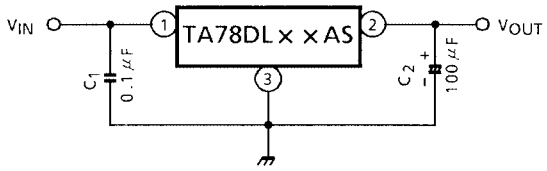
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	12.35 V ≤ V_{IN} ≤ 26 V, −40°C ≤ Ta ≤ 85°C	11.4	12	12.6	V
Line regulation	Reg·line	—	16 V ≤ V_{IN} ≤ 23 V	—	5	24	mV
			13 V ≤ V_{IN} ≤ 26 V	—	10	70	
Load regulation	Reg·load	—	10 mA ≤ I_{OUT} ≤ 200 mA	—	33	120	mV
Quiescent current	I_B	—	I_{OUT} ≤ 10 mA, 13 V ≤ V_{IN} ≤ 26 V	—	0.8	—	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

TA78DL15AS

Electrical Characteristics (Unless otherwise specified, V_{IN} = 20 V, I_{OUT} = 10 mA, T_j = 25°C)

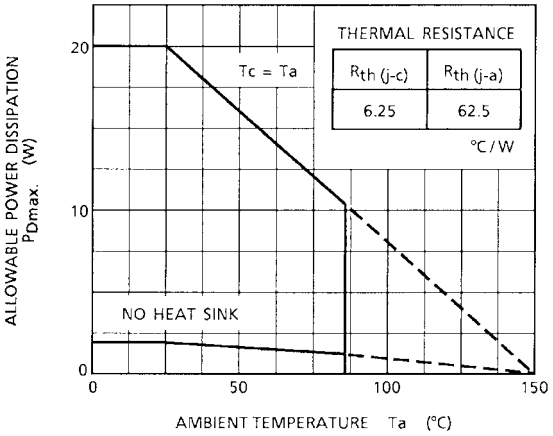
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	15.35 V ≤ V_{IN} ≤ 26 V, −40°C ≤ Ta ≤ 85°C	14.25	15	15.75	V
Line regulation	Reg·line	—	19 V ≤ V_{IN} ≤ 26 V	—	6	30	mV
			16 V ≤ V_{IN} ≤ 26 V	—	12	80	
Load regulation	Reg·load	—	10 mA ≤ I_{OUT} ≤ 200 mA	—	40	150	mV
Quiescent current	I_B	—	I_{OUT} ≤ 10 mA, 16 V ≤ V_{IN} ≤ 26 V	—	0.9	—	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

Application Circuit

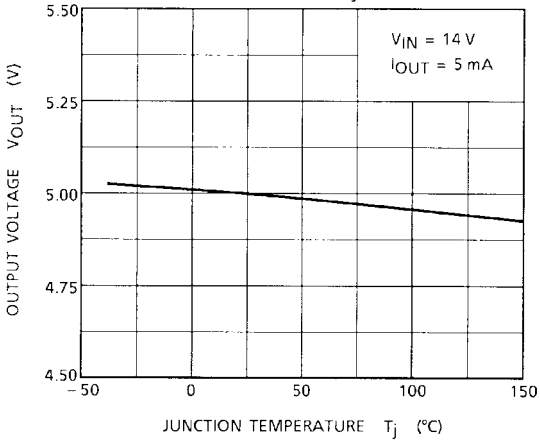


Capacitor C_{IN}/C_{OUT} must be guaranteed to operate of the temperature range that the regulator should be operated correctly.
The equivalent series resistance (ESR) of C_{OUT} must be less than 1 Ω in operating temperature range.

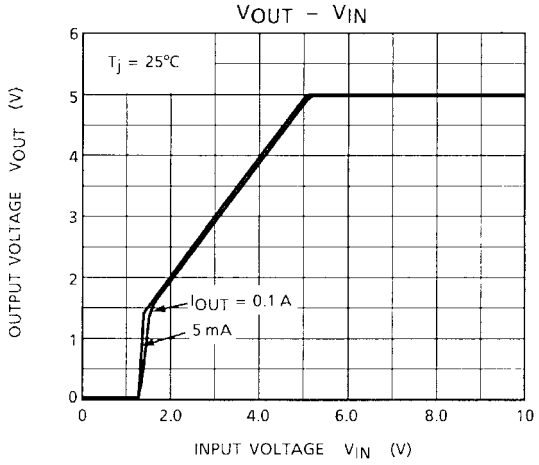
$P_{Dmax.}$ – Ta



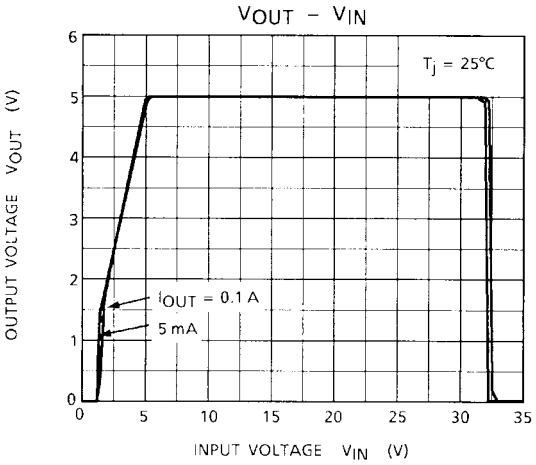
V_{OUT} – T_j



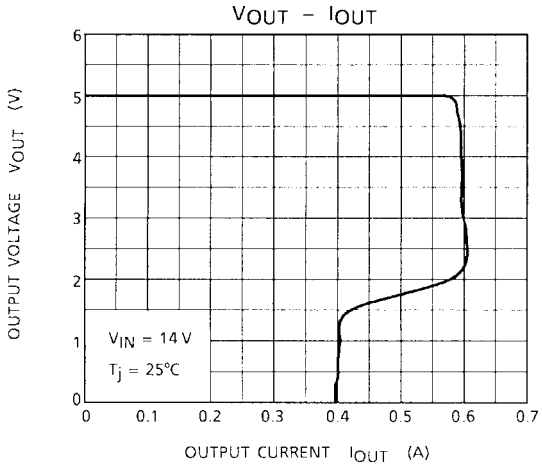
V_{OUT} – V_{IN}



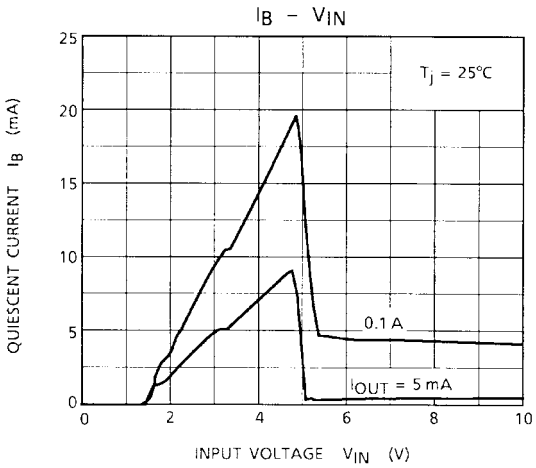
V_{OUT} – V_{IN}



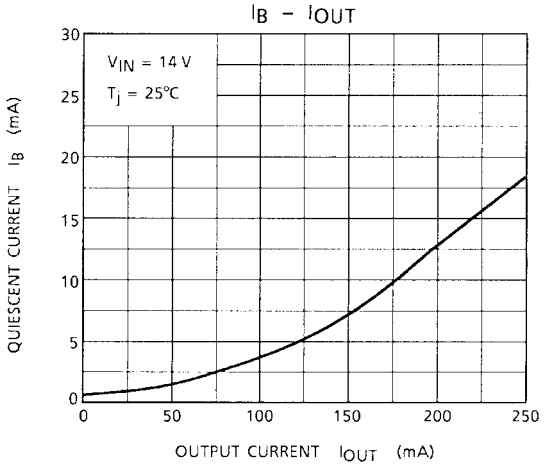
V_{OUT} – I_{OUT}



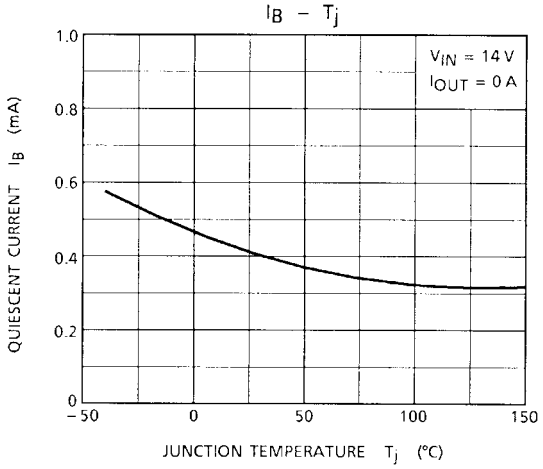
I_B – V_{IN}



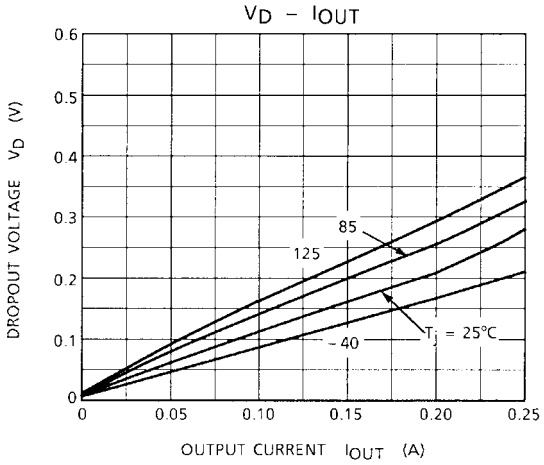
I_B – I_{OUT}



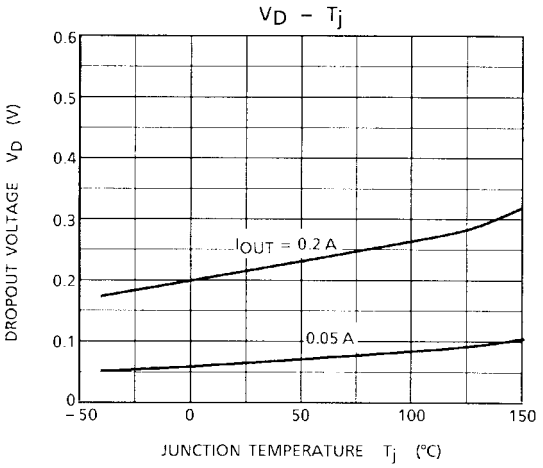
I_B – T_j



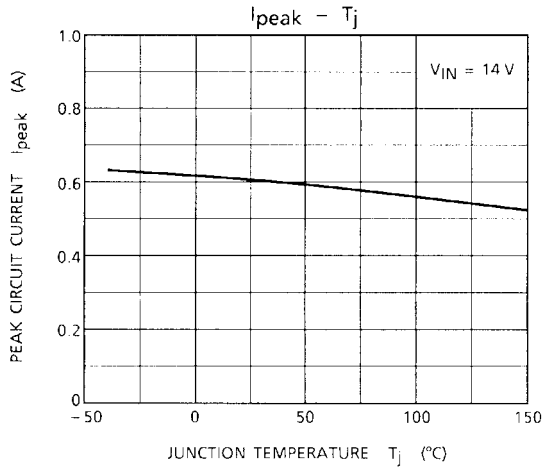
V_D – I_{OUT}



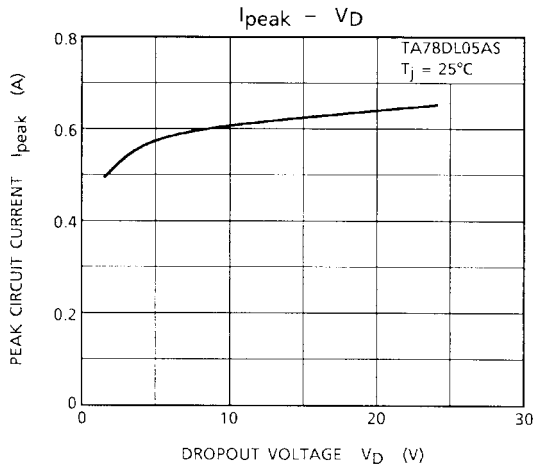
V_D – T_j



I_{peak} – T_j



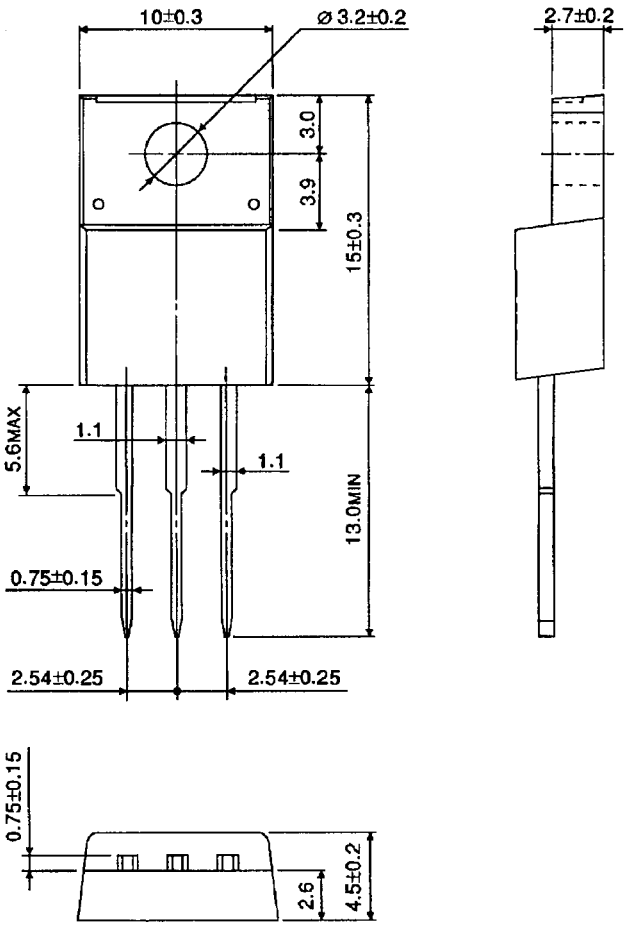
I_{peak} – V_D



Package Dimensions

HSIP3-P-2.54A

Unit: mm



Weight: 1.7 g (typ.)

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000707EBA

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