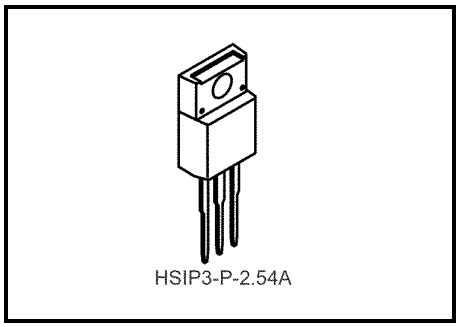
TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA78DM05S, TA78DM08S, TA78DM09S, TA78DM12S

5 V, 8 V, 9 V, 12 V

Three-Terminal Low Dropout Voltage Regulator

The TA78DM××S series consists of fixed-positive-output voltage regulator ICs capable of sourcing current of up to 500 mA. Due to the features of low dropout voltage and low standby current, these devices are useful for battery-powered equipment.

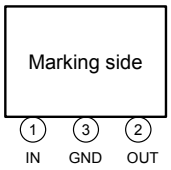


Weight: 1.7 g (typ.)

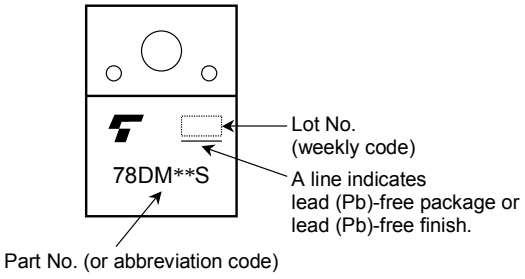
Features

- Low standby current of 800 μA typical.
- Maximum output current of 500 mA.
- Low dropout voltage: 0.75 V (max).
- 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)

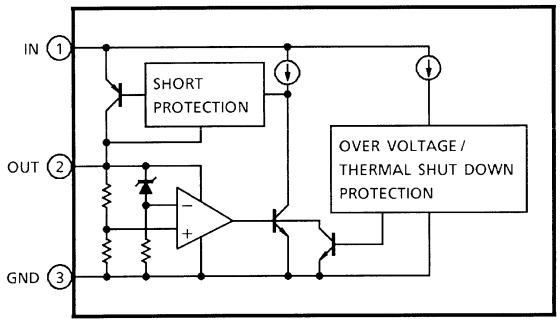
Pin Assignment



Marking



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
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

TA78DM05S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 14 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 µF, C_{OUT} = 100 µF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	4.75	5	5.25	V
			6 V ≤ V_{IN} ≤ 26 V, 5 mA ≤ I_{OUT} ≤ 250 mA	4.7	—	5.3	
Line regulation	Reg·line	—	6 V ≤ V_{IN} ≤ 26 V	—	3	30	mV
Load regulation	Reg·load	—	V_{IN} = 6 V, 5 mA ≤ I_{OUT} ≤ 500 mA	—	66	240	mV
			V_{IN} = 26 V, 5 mA ≤ I_{OUT} ≤ 500 mA	—	40	240	
Quiescent current	I_B	—	6 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 0 mA	—	0.8	1.4	mA
			6 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 250 mA	—	14	27	
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.2	0.35	V
			I_{OUT} = 500 mA	—	0.4	0.75	
Short circuit current limit	I_{SC}	—	—	—	0.7	—	A

TA78DM08S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 16 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 µF, C_{OUT} = 100 µF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	7.6	8	8.4	V
			9 V ≤ V_{IN} ≤ 26 V, 5 mA ≤ I_{OUT} ≤ 250 mA	7.52	—	8.48	
Line regulation	Reg·line	—	9 V ≤ V_{IN} ≤ 26 V	—	6	48	mV
Load regulation	Reg·load	—	V_{IN} = 9 V, 5 mA ≤ I_{OUT} ≤ 500 mA	—	54	380	mV
			V_{IN} = 26 V, 5 mA ≤ I_{OUT} ≤ 500 mA	—	47	380	
Quiescent current	I_B	—	9 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 0 mA	—	0.9	1.5	mA
			9 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 250 mA	—	16	27	
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.2	0.35	V
			I_{OUT} = 500 mA	—	0.4	0.75	
Short circuit current limit	I_{SC}	—	—	—	0.7	—	A

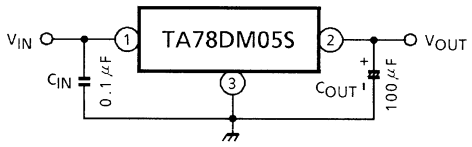
TA78DM09S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 16 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 µF, C_{OUT} = 100 µF)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	8.55	9	9.45	V
			10 V ≤ V_{IN} ≤ 26 V, 5 mA ≤ I_{OUT} ≤ 250 mA	8.46	—	9.54	
Line regulation	Reg·line	—	10 V ≤ V_{IN} ≤ 26 V	—	9	54	mV
Load regulation	Reg·load	—	V_{IN} = 10 V, 5 mA ≤ I_{OUT} ≤ 500 mA	—	47	430	mV
			V_{IN} = 26 V, 5 mA ≤ I_{OUT} ≤ 500 mA	—	50	430	
Quiescent current	I_B	—	10 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 0 mA	—	0.9	1.6	mA
			10 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 250 mA	—	16	27	
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.2	0.35	V
			I_{OUT} = 500 mA	—	0.4	0.75	
Short circuit current limit	I_{SC}	—	—	—	0.7	—	A

TA78DM12S
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 18 V, I_{OUT} = 250 mA, T_j = 25°C, C_{IN} = 0.1 µF, C_{OUT} = 100 µF)

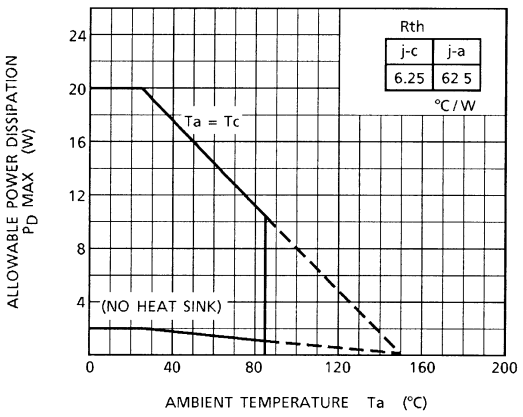
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Output voltage	V_{OUT}	—	—	11.4	12	12.6	V
			13 V ≤ V_{IN} ≤ 26 V, 5 mA ≤ I_{OUT} ≤ 250 mA	11.28	—	12.72	
Line regulation	Reg·line	—	13 V ≤ V_{IN} ≤ 26 V	—	10	72	mV
Load regulation	Reg·load	—	V_{IN} = 13 V, 5 mA ≤ I_{OUT} ≤ 500 mA	—	84	580	mV
			V_{IN} = 26 V, 5 mA ≤ I_{OUT} ≤ 500 mA	—	45	580	
Quiescent current	I_B	—	13 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 0 mA	—	1.0	1.7	mA
			13 V ≤ V_{IN} ≤ 26 V, I_{OUT} = 250 mA	—	16	27	
Dropout voltage	V_D	—	I_{OUT} = 250 mA	—	0.2	0.35	V
			I_{OUT} = 500 mA	—	0.4	0.75	
Short circuit current limit	I_{SC}	—	—	—	0.7	—	A

Application Circuit

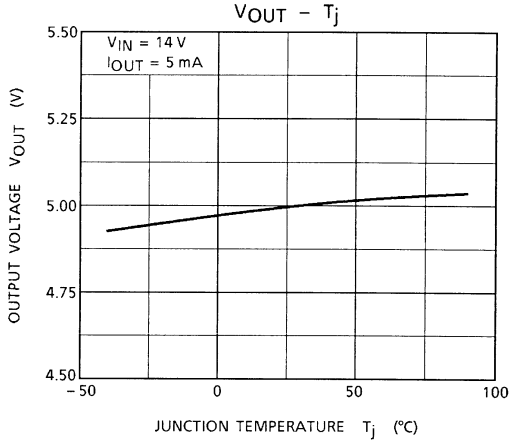


The capacitors C_{IN}/C_{OUT} must be guaranteed to operate within the temperature range in which the regulator operates correctly.
The equivalent series resistance (ESR) of C_{OUT} must be less than 1 Ω inside the operating temperature range.

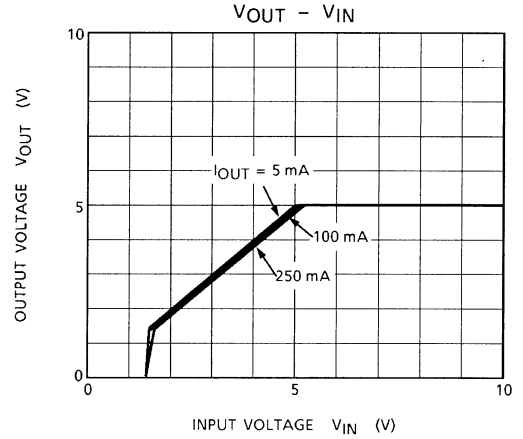
P_D MAX – Ta



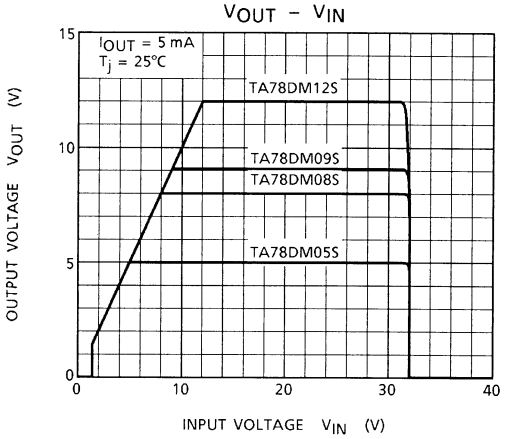
V_{OUT} – T_j



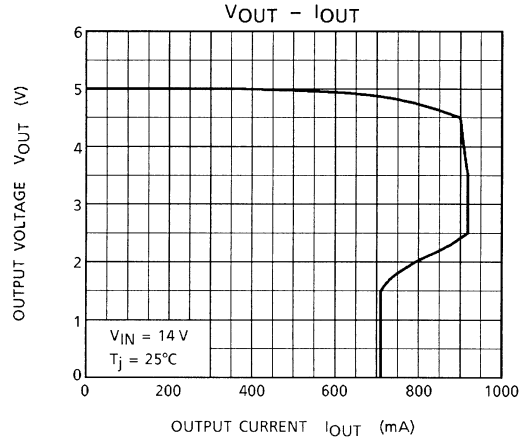
V_{OUT} – V_{IN}



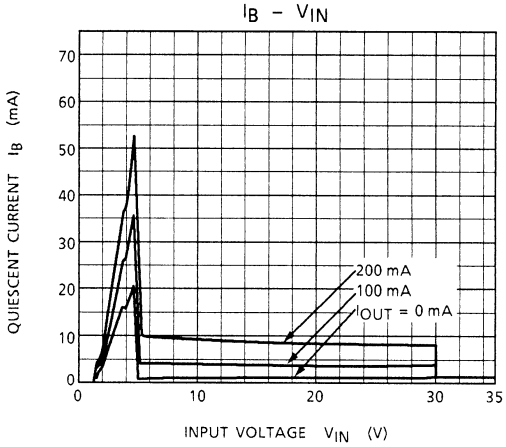
V_{OUT} – V_{IN}

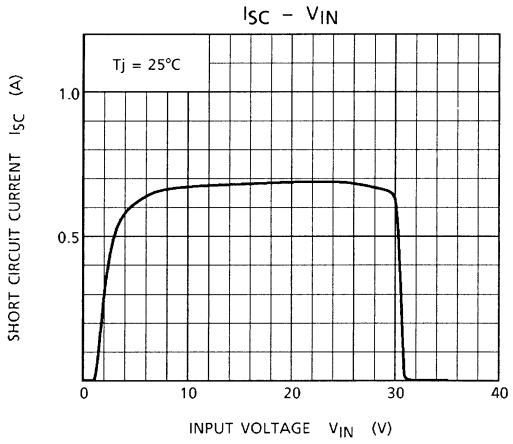


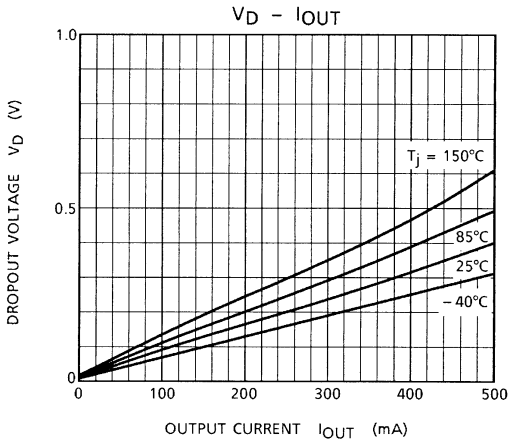
V_{OUT} – I_{OUT}

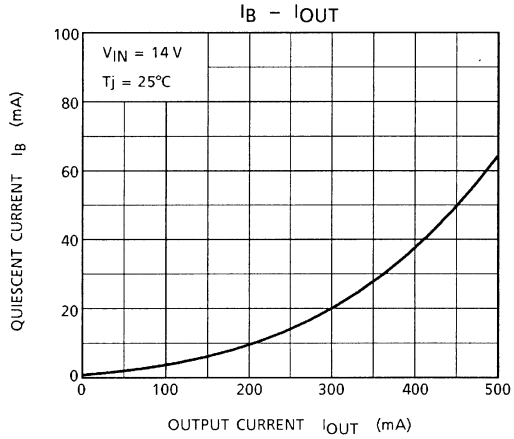


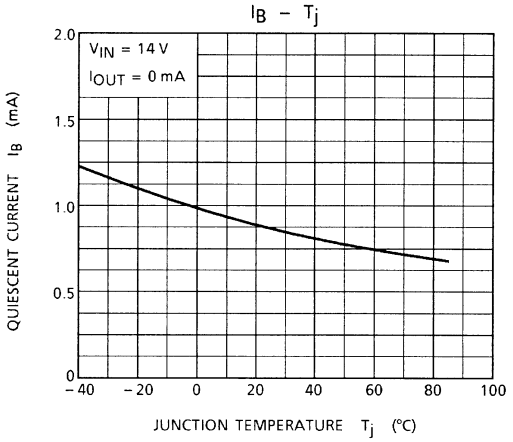
I_B – V_{IN}




I_{SC} – V_{IN}
Tj = 25°C
SHORT CIRCUIT CURRENT I_{SC} (A)
1.0
0.5
0
0
10
20
30
40
INPUT VOLTAGE V_{IN} (V)


V_D – I_{OUT}
DROPOUT VOLTAGE V_D (V)
1.0
0.5
0
T_j = 150°C
85°C
25°C
– 40°C
0
100
200
300
400
500
OUTPUT CURRENT I_{OUT} (mA)

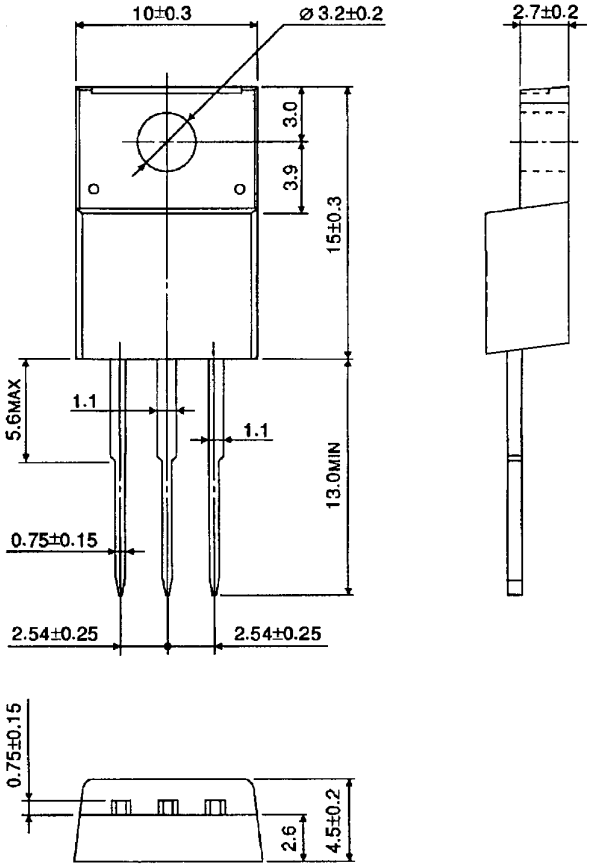

I_B – I_{OUT}
V_{IN} = 14 V
Tj = 25°C
QUIESCENT CURRENT I_B (mA)
100
80
60
40
20
0
0
100
200
300
400
500
OUTPUT CURRENT I_{OUT} (mA)


I_B – T_j
V_{IN} = 14 V
I_{OUT} = 0 mA
QUIESCENT CURRENT I_B (mA)
2.0
1.5
1.0
0.5
0
– 40
– 20
0
20
40
60
80
100
JUNCTION TEMPERATURE T_j (°C)

Package Dimensions

HSIP3-P-2.54A

Unit : mm



Weight: 1.7 g (typ.)

RESTRICTIONS ON PRODUCT USE

030619EBA

- The information contained herein is subject to change without notice.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of TOSHIBA or others.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
  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..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury (“Unintended Usage”). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer’s own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- TOSHIBA products should not be embedded to the downstream products which are prohibited to be produced and sold, under any law and regulations.