

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA78L05S, TA78L07S, TA78L08S TA78L09S, TA78L10S, TA78L12S, TA78L15S

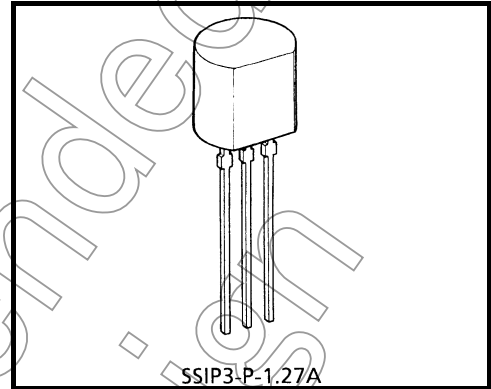
Three-Terminal Positive Voltage Regulators

5 V, 7 V, 8 V, 9 V, 10 V, 12 V, 15 V

The TA78L××S series of fixed voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications.

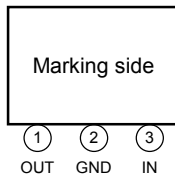
Features

- Suitable for TTL, C²MOS power supply.
- Internal overcurrent protection.
- Internal overheating protection.
- Maximum output current of 100 mA (T_j = 25°C).
- TO-92 package

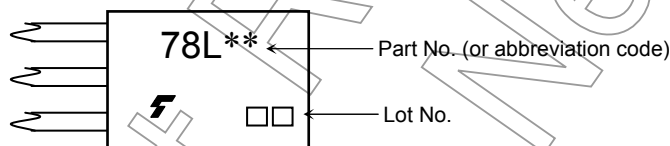


Weight: 0.21 g (typ.)

Pin Assignment

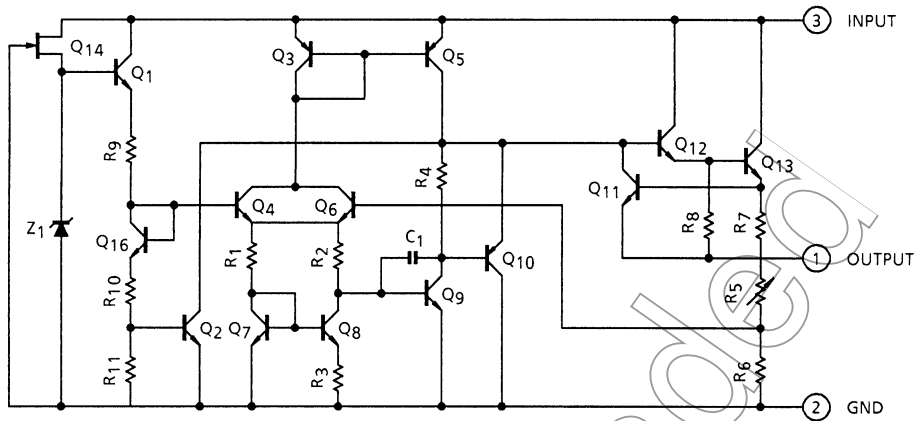


Marking



The product(s) in this document ("Product") contain functions intended to protect the Product from temporary small overloads such as minor short-term overcurrent 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.

Equivalent Circuit



Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Input voltage	V_{IN}	35	V
Output current	I_{OUT}	0.1	A
Power dissipation (Ta = 25°C)	P_D	600	mW
Operating temperature	T_{opr}	-30 to 85	°C
Storage temperature	T_{stg}	-55 to 150	°C
Junction temperature	T_j	150	°C
Thermal resistance	$R_{th(j-a)}$	208	°C/W

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).

TA78L05S

Electrical Characteristics

(Unless otherwise specified, $V_{IN} = 10\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	4.8	5.0	5.2	V	
Line regulation	Reg-line	1	$T_j = 25^\circ\text{C}$	$7.0\text{ V} \leq V_{IN} \leq 20\text{ V}$	—	55	150	mV
				$8.0\text{ V} \leq V_{IN} \leq 20\text{ V}$	—	45	100	
Load regulation	Reg-load	1	$T_j = 25^\circ\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	11	60	mV
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	5.0	30	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	$7.0\text{ V} \leq V_{IN} \leq 20\text{ V}$, $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	4.75	—	5.25	V
				$1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$	4.75	—	5.25	
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$	—	3.1	6.0	mA	
			$T_j = 125^\circ\text{C}$	—	—	5.5		
Quiescent current change	ΔI_B	1	$T_j = 25^\circ\text{C}$	$8.0\text{ V} \leq V_{IN} \leq 20\text{ V}$	—	—	1.5	mA
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	—	0.1	
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$	—	40	—	μV_{rms}	
Long term stability	$\Delta V_{OUT}/\Delta t$	1	—	—	12	—	mV/kh	
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $8\text{ V} \leq V_{IN} \leq 18\text{ V}$, $T_j = 25^\circ\text{C}$	41	49	—	dB	
Dropout voltage	V_D	1	$T_j = 25^\circ\text{C}$	—	1.7	—	V	
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-0.6	—	$\text{mV}/^\circ\text{C}$	

Not Recommended for New

TA78L07S

Electrical Characteristics

(Unless otherwise specified, $V_{IN} = 12\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	6.72	7.0	7.28	V	
Line regulation	Reg-line	1	$T_j = 25^\circ\text{C}$	$9.2\text{ V} \leq V_{IN} \leq 22\text{ V}$	—	50	160	mV
				$10\text{ V} \leq V_{IN} \leq 22\text{ V}$	—	45	115	
Load regulation	Reg-load	1	$T_j = 25^\circ\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	13	75	mV
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	6.0	40	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	$9.2\text{ V} \leq V_{IN} \leq 22\text{ V}$, $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	6.65	—	7.35	V
				$1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$	6.65	—	7.35	
					—	—	—	
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$	—	3.1	6.5	mA	
			$T_j = 125^\circ\text{C}$	—	—	6.0		
Quiescent current change	ΔI_B	1	$T_j = 25^\circ\text{C}$	$10\text{ V} \leq V_{IN} \leq 22\text{ V}$	—	—	1.5	mA
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	—	0.1	
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$	—	50	—	μV_{rms}	
Long term stability	$\Delta V_{OUT}/\Delta t$	1	—	—	17	—	mV/kh	
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $10\text{ V} \leq V_{IN} \leq 20\text{ V}$, $T_j = 25^\circ\text{C}$	37	46	—	dB	
Dropout voltage	V_D	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	—	1.7	—	V	
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-0.84	—	$\text{mV}/^\circ\text{C}$	

Not Recommended for New

TA78L08S

Electrical Characteristics

(Unless otherwise specified, $V_{IN} = 14\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	7.7	8.0	8.3	V	
Line regulation	Reg-line	1	$T_j = 25^\circ\text{C}$	$10.5\text{ V} \leq V_{IN} \leq 23\text{ V}$	—	20	175	mV
				$11\text{ V} \leq V_{IN} \leq 23\text{ V}$	—	12	125	
Load regulation	Reg-load	1	$T_j = 25^\circ\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	15	80	mV
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	7.0	40	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	$10.5\text{ V} \leq V_{IN} \leq 23\text{ V}$, $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	7.6	—	8.4	V
				$1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$	7.6	—	8.4	
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$	—	3.1	6.5	mA	
			$T_j = 125^\circ\text{C}$	—	—	6.0		
Quiescent current change	ΔI_B	1	$T_j = 25^\circ\text{C}$	$11\text{ V} \leq V_{IN} \leq 23\text{ V}$	—	—	1.5	mA
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	—	0.1	
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$	—	60	—	μV_{rms}	
Long term stability	$\Delta V_{OUT}/\Delta t$	1	—	—	20	—	mV/kh	
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $12\text{ V} \leq V_{IN} \leq 23\text{ V}$, $T_j = 25^\circ\text{C}$	37	45	—	dB	
Dropout voltage	V_D	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	—	1.7	—	V	
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-0.97	—	$\text{mV}/^\circ\text{C}$	

Not Recommended for New

TA78L09S

Electrical Characteristics

(Unless otherwise specified, $V_{IN} = 15\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	8.64	9.0	9.36	V	
Line regulation	Reg-line	1	$T_j = 25^\circ\text{C}$	$11.4\text{ V} \leq V_{IN} \leq 24\text{ V}$	—	80	200	mV
				$12\text{ V} \leq V_{IN} \leq 24\text{ V}$	—	20	160	
Load regulation	Reg-load	1	$T_j = 25^\circ\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	17	90	mV
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	8.0	45	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	$11.4\text{ V} \leq V_{IN} \leq 24\text{ V}$, $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	8.55	—	9.45	V
				$1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$	8.55	—	9.45	
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$	—	3.2	6.5	mA	
			$T_j = 125^\circ\text{C}$	—	—	6.0		
Quiescent current change	ΔI_B	1	$T_j = 25^\circ\text{C}$	$12\text{ V} \leq V_{IN} \leq 24\text{ V}$	—	—	1.5	mA
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	—	0.1	
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$	—	65	—	μV_{rms}	
Long term stability	$\Delta V_{OUT}/\Delta t$	1	—	—	21	—	mV/kh	
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $12\text{ V} \leq V_{IN} \leq 24\text{ V}$, $T_j = 25^\circ\text{C}$	36	44	—	dB	
Dropout voltage	V_D	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	—	1.7	—	V	
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-1.09	—	$\text{mV}/^\circ\text{C}$	

Not Recommended for New

TA78L10S

Electrical Characteristics

(Unless otherwise specified, $V_{IN} = 16\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	9.6	10	10.4	V	
Line regulation	Reg-line	1	$T_j = 25^\circ\text{C}$	$12.5\text{ V} \leq V_{IN} \leq 25\text{ V}$	—	80	230	mV
				$13\text{ V} \leq V_{IN} \leq 25\text{ V}$	—	30	170	
Load regulation	Reg-load	1	$T_j = 25^\circ\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	18	90	mV
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	8.5	45	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	$12.5\text{ V} \leq V_{IN} \leq 25\text{ V}$, $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	9.5	—	10.5	V
				$1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$	9.5	—	10.5	
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$	—	3.2	6.5	mA	
			$T_j = 125^\circ\text{C}$	—	—	6.0		
Quiescent current change	ΔI_B	1	$T_j = 25^\circ\text{C}$	$13\text{ V} \leq V_{IN} \leq 25\text{ V}$	—	—	1.5	mA
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	—	0.1	
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$	—	70	—	μV_{rms}	
Long term stability	$\Delta V_{OUT}/\Delta t$	1	—	—	22	—	mV/kh	
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $13\text{ V} \leq V_{IN} \leq 24\text{ V}$, $T_j = 25^\circ\text{C}$	36	43	—	dB	
Dropout voltage	V_D	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	—	1.7	—	V	
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-1.21	—	$\text{mV}/^\circ\text{C}$	

Not Recommended for New

TA78L12S

Electrical Characteristics

(Unless otherwise specified, $V_{IN} = 19\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	11.5	12	12.5	V	
Line regulation	Reg-line	1	$T_j = 25^\circ\text{C}$	$14.5\text{ V} \leq V_{IN} \leq 27\text{ V}$	—	120	250	mV
				$16\text{ V} \leq V_{IN} \leq 27\text{ V}$	—	100	200	
Load regulation	Reg-load	1	$T_j = 25^\circ\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	20	100	mV
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	10	50	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	$14.5\text{ V} \leq V_{IN} \leq 27\text{ V}$, $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	11.4	—	12.6	V
				$1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$	11.4	—	12.6	
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$	—	3.2	6.5	mA	
			$T_j = 125^\circ\text{C}$	—	—	6.0		
Quiescent current change	ΔI_B	1	$T_j = 25^\circ\text{C}$	$16\text{ V} \leq V_{IN} \leq 27\text{ V}$	—	—	1.5	mA
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	—	0.1	
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$	—	80	—	μV_{rms}	
Long term stability	$\Delta V_{OUT}/\Delta t$	1	—	—	24	—	mV/kh	
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $15\text{ V} \leq V_{IN} \leq 25\text{ V}$, $T_j = 25^\circ\text{C}$	36	41	—	dB	
Dropout voltage	V_D	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	—	1.7	—	V	
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-1.45	—	$\text{mV}/^\circ\text{C}$	

Not Recommended for New

TA78L15S

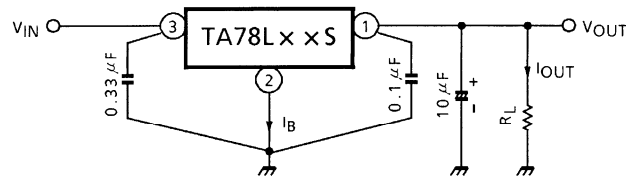
Electrical Characteristics

(Unless otherwise specified, $V_{IN} = 23\text{ V}$, $I_{OUT} = 40\text{ mA}$, $C_{IN} = 0.33\text{ }\mu\text{F}$, $C_{OUT} = 0.1\text{ }\mu\text{F}$, $0^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$)

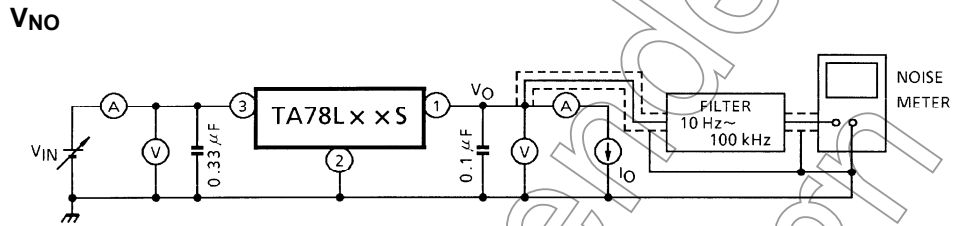
Characteristics	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	14.4	15	15.6	V	
Line regulation	Reg-line	1	$T_j = 25^\circ\text{C}$	$17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$	—	130	300	mV
				$20\text{ V} \leq V_{IN} \leq 30\text{ V}$	—	110	250	
Load regulation	Reg-load	1	$T_j = 25^\circ\text{C}$	$1.0\text{ mA} \leq I_{OUT} \leq 100\text{ mA}$	—	25	150	mV
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	12	75	
Output voltage	V_{OUT}	1	$T_j = 25^\circ\text{C}$	$17.5\text{ V} \leq V_{IN} \leq 30\text{ V}$, $1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	14.25	—	15.75	V
				$1.0\text{ mA} \leq I_{OUT} \leq 70\text{ mA}$	14.25	—	15.75	
Quiescent current	I_B	1	$T_j = 25^\circ\text{C}$	—	3.3	6.5	mA	
			$T_j = 125^\circ\text{C}$	—	—	6.0		
Quiescent current change	ΔI_B	1	$T_j = 25^\circ\text{C}$	$20\text{ V} \leq V_{IN} \leq 30\text{ V}$	—	—	1.5	mA
				$1.0\text{ mA} \leq I_{OUT} \leq 40\text{ mA}$	—	—	0.1	
Output noise voltage	V_{NO}	2	$T_a = 25^\circ\text{C}$, $10\text{ Hz} \leq f \leq 100\text{ kHz}$	—	90	—	μV_{rms}	
Long term stability	$\Delta V_{OUT}/\Delta t$	1	—	—	30	—	mV/kh	
Ripple rejection	R.R.	3	$f = 120\text{ Hz}$, $18.5\text{ V} \leq V_{IN} \leq 28.5\text{ V}$, $T_j = 25^\circ\text{C}$	34	40	—	dB	
Dropout voltage	V_D	1	$T_j = 25^\circ\text{C}$, $I_{OUT} = 100\text{ mA}$	—	1.7	—	V	
Average temperature coefficient of output voltage	T_{CVO}	1	$I_{OUT} = 5\text{ mA}$	—	-1.82	—	$\text{mV}/^\circ\text{C}$	

Not Recommended for New

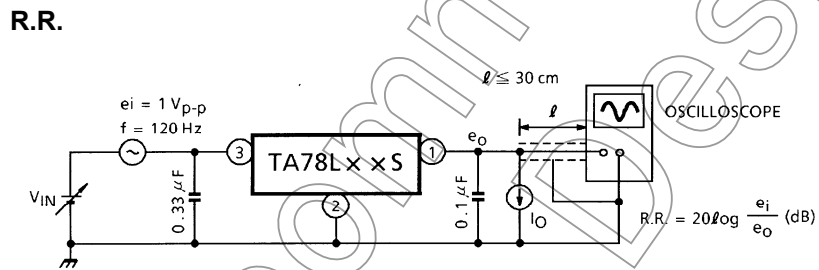
Test Circuit 1 / Standard Application



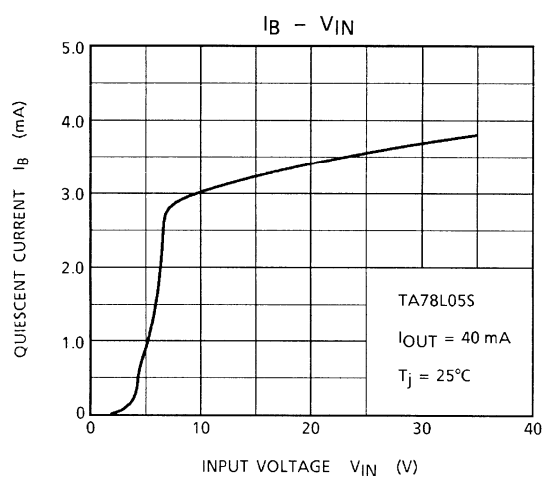
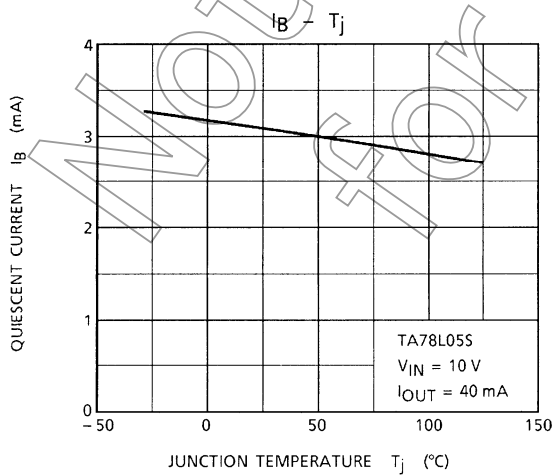
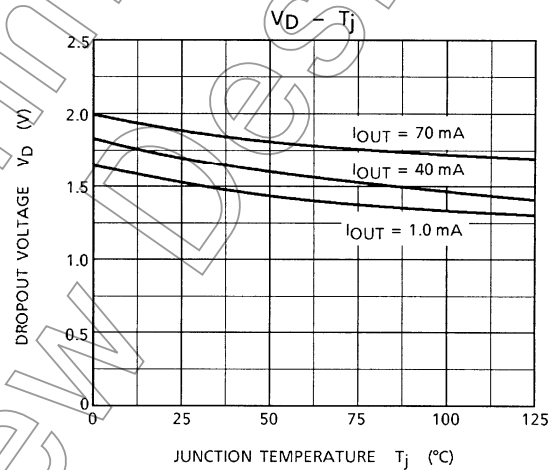
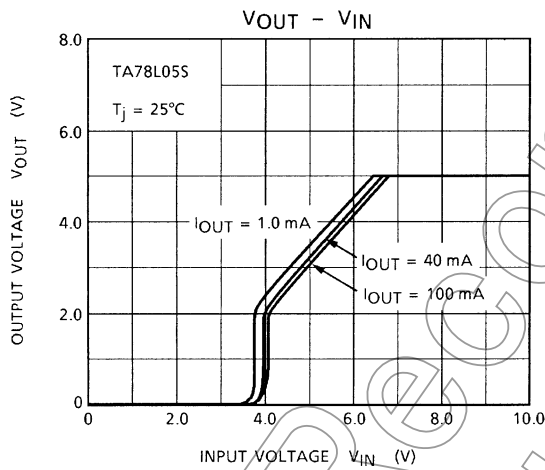
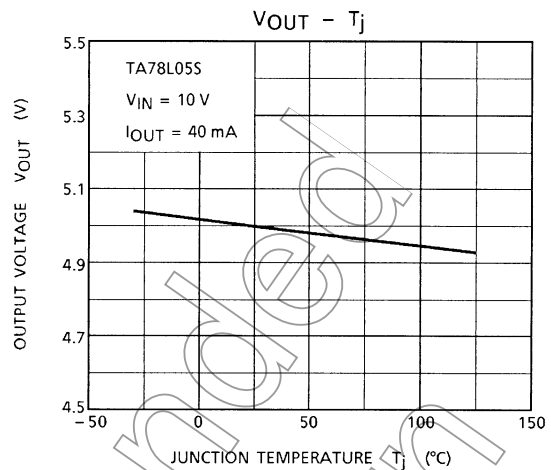
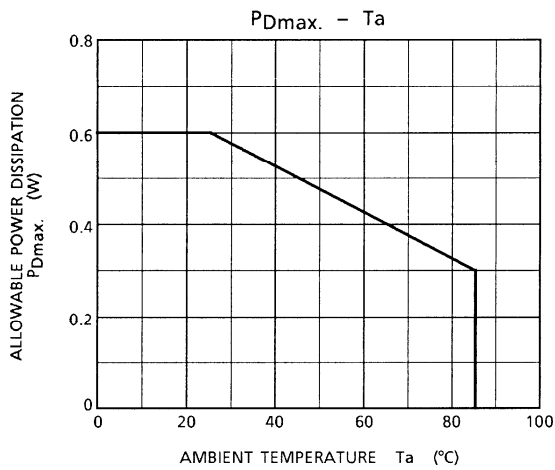
Test Circuit 2

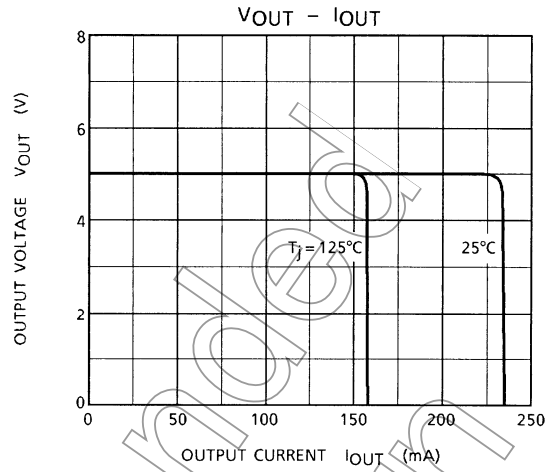
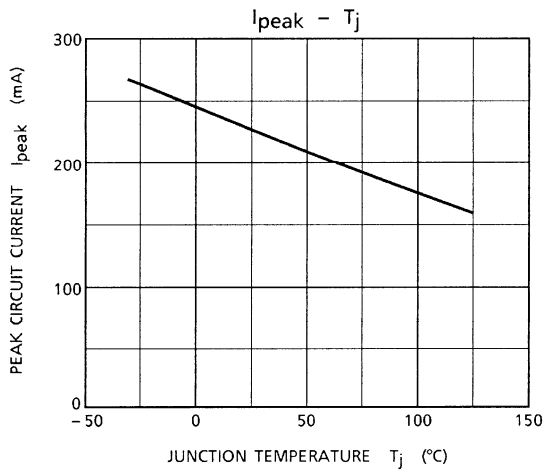


Test Circuit 3



Not Recommended for New

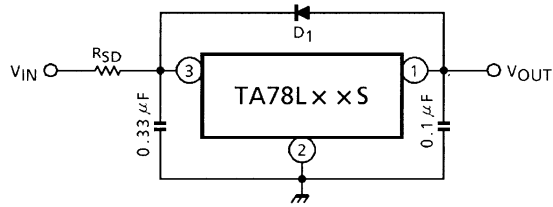




Not Recommended for New Design

Usage Precautions

Destruction of the IC may occur if high voltage in excess of the IC output voltage (typ. value) is applied to the IC output terminal. Where this possibility exists, connect a Zener diode between the output terminal and GND to prevent any application of excessive voltage.



D₁ : IC protective diode
 When surge voltage is applied to IC output terminal or $V_{IN} < V_{OUT}$ at the time of power ON/OFF, always connect the high speed switching diode D₁.
 R_{SD} : Power limiting resistor
 If V_{IN} is too high, always connect R_{SD} in order to reduce power consumption of IC.

- 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

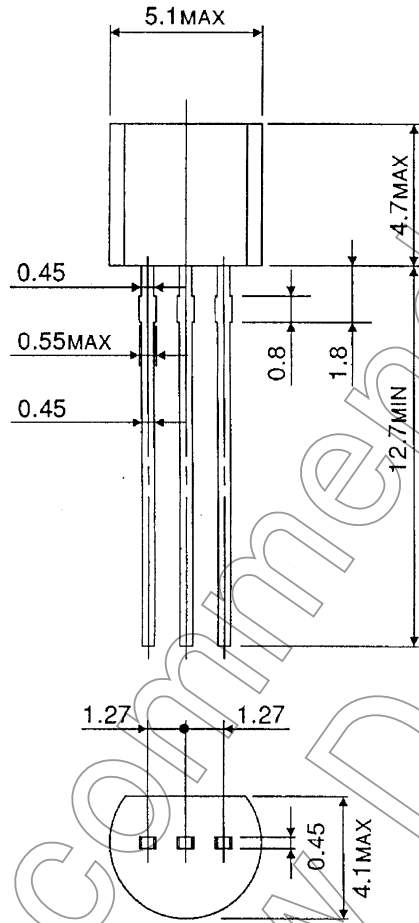
The thermal shutdown circuits in the Product are designed to temporarily protect Product from minor overheating of brief duration. When the overheating protective function in the Product activates, immediately correct the overheating situation. Improper usage of Product, such as the application of heat 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.

Not Recommended for New Design

Package Dimensions

SSIP3-P-1.27A

Unit : mm



Weight : 0.21 g (Typ.)

Not Recommended for New Design

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