TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

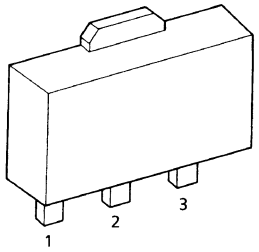
TA78L05F,TA78L06F,TA78L07F,TA78L08F,TA78L09F,TA78L10F, TA78L12F,TA78L15F,TA78L18F,TA78L20F,TA78L24F

5 V, 6 V, 7 V, 8 V, 9 V, 10 V, 12 V, 15 V, 18 V, 20 V, 24 V

3-Terminal Positive Voltage Regulators

Features

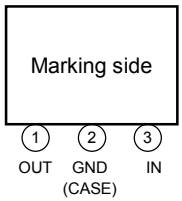
- Best suited to power supply for TTL/CMOS.
- No external parts needed.
- Built-in overheating protection.
- Built-in overcurrent protection.
- Max output current of 150mA. (T_j = 25°C).
- Packaged in PW-mini (SOT-89).



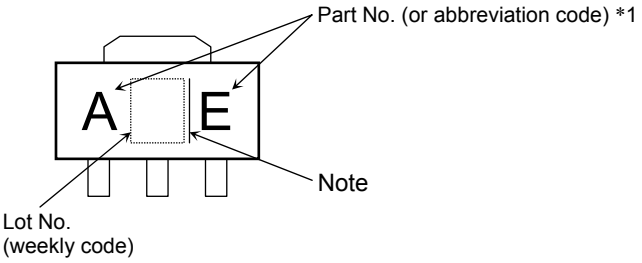
HSOP3-P-1.50

Weight: 0.05 g (Typ.)

Pin Assignment



Marking



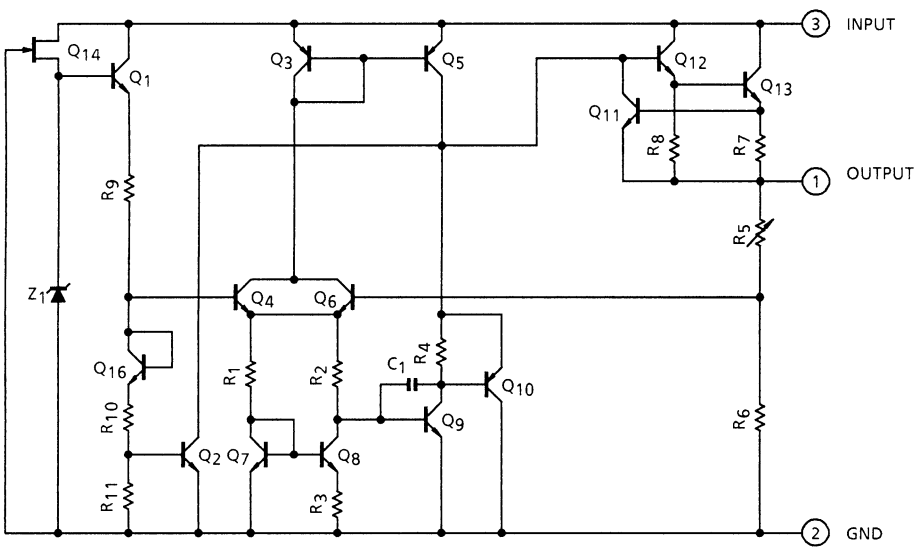
	Part No. (or abbreviation code)	Part No.
*1	AE	TA78L05F
	BE	TA78L06F
	KE	TA78L07F
	CE	TA78L08F
	DE	TA78L09F
	EE	TA78L10F
	FE	TA78L12F
	GE	TA78L15F
	HE	TA78L18F
	IE	TA78L20F
	JE	TA78L24F

Note: A line beside a Lot No. identifies the indication of product Labels.
Without a line: [[Pb]]/INCLUDES > MCV
With a line: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is the Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

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



Type Marking	
TA78L05F	AE
TA78L06F	BE
TA78L07F	KE
TA78L08F	CE
TA78L09F	DE
TA78L10F	EE
TA78L12F	FE
TA78L15F	GE
TA78L18F	HE
TA78L20F	IE
TA78L24F	JE

Absolute Maximum Ratings (Ta = 25°C)

Characteristics S		ymbol	Rating	Unit
0Input voltage	TA78L05F	V_{IN}	35	V
	TA78L06F			
	TA78L07F			
	TA78L08F			
	TA78L09F			
	TA78L10F			
	TA78L12F			
	TA78L15F			
	TA78L18F		40	
	TA78L20F			
	TA78L24F			
Output current		I_{OUT}	0.15	A
Power dissipation	(Ta = 25°C)	P_D 500		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		$R_{th\ (j-a)}$ 250		°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).

TA78L05F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 10 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		4.75	5.0	5.25	V
Line regulation	Reg·line	1	T_j = 25°C	7.0 V ≤ V_{IN} ≤ 20 V	— 55		150	mV
				8.0 V ≤ V_{IN} ≤ 20 V	— 45		100	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 11		60	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 5.0		30	
Output voltage	V_{OUT} 1		T_j = 25°C	7.0 V ≤ V_{IN} ≤ 20 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	4.65	— 5.35		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	4.65	— 5.35		
Quiescent current	I_B 1		T_j = 25°C		— 3.1		6.0	mA
			T_j = 125°C		—	—	5.5	
Quiescent current change	ΔI_B 1		T_j = 25°C	8.0 V ≤ V_{IN} ≤ 20 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 40		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 12		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 8.0 V ≤ V_{IN} ≤ 18 V, T_j = 25°C		41 49		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−0.6	—	mV/°C

TA78L06F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 11 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		5.7	6.0	6.3	V
Line regulation	Reg·line	1	T_j = 25°C	8.1 V ≤ V_{IN} ≤ 21 V	— 50		150	mV
				9.0 V ≤ V_{IN} ≤ 21 V	— 45		110	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 12		70	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 5.5		35	
Output voltage	V_{OUT} 1		T_j = 25°C	8.1 V ≤ V_{IN} ≤ 21 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	5.58	— 6.42		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	5.58	— 6.42		
Quiescent current	I_B 1		T_j = 25°C		— 3.1		6.0	mA
			T_j = 125°C		—	—	5.5	
Quiescent current change	ΔI_B 1		T_j = 25°C	9.0 V ≤ V_{IN} ≤ 20 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 40		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 14		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 9.0 V ≤ V_{IN} ≤ 19 V, T_j = 25°C		39 47		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−0.7	—	mV/°C

TA78L07F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 12 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		6.65	7.0	7.35	V
Line regulation	Reg·line	1	T_j = 25°C	9.2 V ≤ V_{IN} ≤ 22 V	— 50		160	mV
				10 V ≤ V_{IN} ≤ 22 V	— 45		115	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 13		75	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 6.0		40	
Output voltage	V_{OUT} 1		T_j = 25°C	9.2 V ≤ V_{IN} ≤ 22 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	6.51	— 7.49		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	6.51	— 7.49		
Quiescent current	I_B 1		T_j = 25°C		— 3.1		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	10 V ≤ V_{IN} ≤ 22 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 50		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 17		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 10 V ≤ V_{IN} ≤ 20 V, T_j = 25°C		37 46		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−0.75	—	mV/°C

TA78L08F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 14 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		7.6	8.0	8.4	V
Line regulation	Reg·line	1	T_j = 25°C	10.5 V ≤ V_{IN} ≤ 23 V	— 20		175	mV
				11 V ≤ V_{IN} ≤ 23 V	— 12		125	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 15		80	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 7.0		40	
Output voltage	V_{OUT} 1		T_j = 25°C	10.5 V ≤ V_{IN} ≤ 23 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	7.44	— 8.56		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	7.44	— 8.56		
Quiescent current	I_B 1		T_j = 25°C		— 3.1		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	11 V ≤ V_{IN} ≤ 23 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 60		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 20		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 12 V ≤ V_{IN} ≤ 23 V, T_j = 25°C		37 45		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−0.8	—	mV/°C

TA78L09F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 15 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		8.55	9.0	9.45	V
Line regulation	Reg·line	1	T_j = 25°C	11.4 V ≤ V_{IN} ≤ 24 V	— 80		200	mV
				12 V ≤ V_{IN} ≤ 24 V	— 20		160	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 17		90	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 8.0		45	
Output voltage	V_{OUT} 1		T_j = 25°C	11.4 V ≤ V_{IN} ≤ 24 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	8.37	— 9.63		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	8.37	— 9.63		
Quiescent current	I_B 1		T_j = 25°C		— 3.2		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	12 V ≤ V_{IN} ≤ 24 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 65		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 21		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 12 V ≤ V_{IN} ≤ 24 V, T_j = 25°C		36 44		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−0.85	—	mV/°C

TA78L10F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 16 V, I_{OUT} = 40 mA, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		9.5	10	10.5	V
Line regulation	Reg·line	1	T_j = 25°C	12.5 V ≤ V_{IN} ≤ 25 V	— 80		230	mV
				13 V ≤ V_{IN} ≤ 25 V	— 30		170	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 18		90	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 8.5		45	
Output voltage	V_{OUT} 1		T_j = 25°C	12.5 V ≤ V_{IN} ≤ 25 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	9.3	— 10.7		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	9.3	— 10.7		
Quiescent current	I_B 1		T_j = 25°C		— 3.2		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	13 V ≤ V_{IN} ≤ 25 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 70		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 22		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 13 V ≤ V_{IN} ≤ 24 V, T_j = 25°C		36 43		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−0.9	—	mV/°C

TA78L12F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 19 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		11.4	12	12.6	V
Line regulation	Reg·line	1	T_j = 25°C	14.5 V ≤ V_{IN} ≤ 27 V	— 120		250	mV
				16 V ≤ V_{IN} ≤ 27 V	— 100		200	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 20		100	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 10		50	
Output voltage	V_{OUT} 1		T_j = 25°C	14.5 V ≤ V_{IN} ≤ 27 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	11.16	— 12.84		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	11.16	—	12.84	
Quiescent current	I_B 1		T_j = 25°C		— 3.2		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	16 V ≤ V_{IN} ≤ 27 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 80		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 24		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 15 V ≤ V_{IN} ≤ 25 V, T_j = 25°C		36 41		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−1.0	—	mV/°C

TA78L15F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 23 V, I_{OUT} = 40 mA, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		14.25	15	15.75	V
Line regulation	Reg·line	1	T_j = 25°C	17.5 V ≤ V_{IN} ≤ 30 V	— 130		300	mV
				20 V ≤ V_{IN} ≤ 30 V	— 110		250	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 25		150	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 12		75	
Output voltage	V_{OUT} 1		T_j = 25°C	17.5 V ≤ V_{IN} ≤ 30 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	13.95	— 16.05		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	13.95	—	16.05	
Quiescent current	I_B 1		T_j = 25°C		— 3.3		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	20 V ≤ V_{IN} ≤ 30 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 90		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 30		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 18.5 V ≤ V_{IN} ≤ 28.5 V, T_j = 25°C		34 40		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−1.3	—	mV/°C

TA78L18F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 27 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		17.1	18	18.9	V
Line regulation	Reg·line	1	T_j = 25°C	21.4 V ≤ V_{IN} ≤ 33 V	— 32		325	mV
				22 V ≤ V_{IN} ≤ 33 V	— 27		275	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 30		170	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 15		75	
Output voltage	V_{OUT} 1		T_j = 25°C	21.4 V ≤ V_{IN} ≤ 33 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	16.74	— 19.26		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	16.74	—	19.26	
Quiescent current	I_B 1		T_j = 25°C		— 3.3		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	22 V ≤ V_{IN} ≤ 33 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 150		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 45		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 23 V ≤ V_{IN} ≤ 33 V, T_j = 25°C		32 38		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−1.5	—	mV/°C

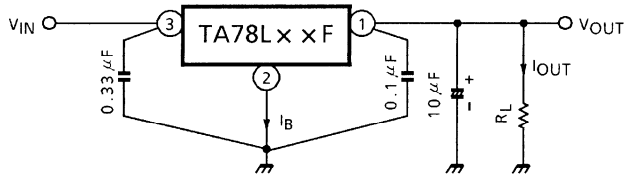
TA78L20F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 29 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		19.0	20	21.0	V
Line regulation	Reg·line	1	T_j = 25°C	23.5 V ≤ V_{IN} ≤ 35 V	— 33		330	mV
				24 V ≤ V_{IN} ≤ 35 V	— 28		285	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 33		180	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 17		90	
Output voltage	V_{OUT} 1		T_j = 25°C	23.5 V ≤ V_{IN} ≤ 35 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	18.6	— 21.4		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	18.6	— 21.4		
Quiescent current	I_B 1		T_j = 25°C		— 3.3		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	24 V ≤ V_{IN} ≤ 35 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 170		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 49		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 25 V ≤ V_{IN} ≤ 35 V, T_j = 25°C		31 37		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−1.7	—	mV/°C

TA78L24F
Electrical Characteristics
(Unless otherwise specified, V_{IN} = 33 V, I_{OUT} = 40 mA, C_{IN} = 0.33 µF, C_{OUT} = 0.1 µF, 0°C ≤ T_j ≤ 125°C)

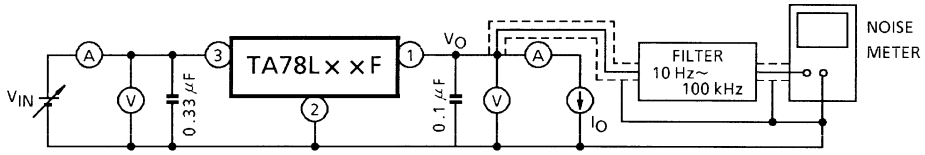
Characteristics S	ymbol	Test Circuit	Test Condition		Min	Typ.	Max	Unit
Output voltage	V_{OUT} 1		T_j = 25°C		22.8	24	25.2	V
Line regulation	Reg·line	1	T_j = 25°C	27.5 V ≤ V_{IN} ≤ 38 V	— 35		350	mV
				28 V ≤ V_{IN} ≤ 38 V	— 30		300	
Load regulation	Reg·load	1	T_j = 25°C	1.0 mA ≤ I_{OUT} ≤ 100 mA	— 40		200	mV
				1.0 mA ≤ I_{OUT} ≤ 40 mA	— 20		100	
Output voltage	V_{OUT} 1		T_j = 25°C	27.5 V ≤ V_{IN} ≤ 38 V, 1.0 mA ≤ I_{OUT} ≤ 40 mA	22.32	— 25.68		V
				1.0 mA ≤ I_{OUT} ≤ 70 mA	22.32	—	25.68	
Quiescent current	I_B 1		T_j = 25°C		— 3.5		6.5	mA
			T_j = 125°C		—	—	6.0	
Quiescent current change	ΔI_B 1		T_j = 25°C	28 V ≤ V_{IN} ≤ 38 V	—	—	1.5	mA
				1.0 mA ≤ I_{OUT} ≤ 40 mA	—	—	0.1	
Output noise voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≤ f ≤ 100 kHz		— 200		—	μV_{rms}
Long term stability	$\Delta V_{OUT}/\Delta t$ 1		—		— 56		—	mV/kh
Ripple rejection ratio	R.R.	3	f = 120 Hz, 29 V ≤ V_{IN} ≤ 39 V, T_j = 25°C		31 35		— dB	
Dropout voltage	V_D 1		T_j = 25°C		— 1.7		—	V
Average temperature coefficient of output voltage	T_{CVO} 1		I_{OUT} = 5 mA		—	−2.0	—	mV/°C

Test Circuit 1 / Standard Application



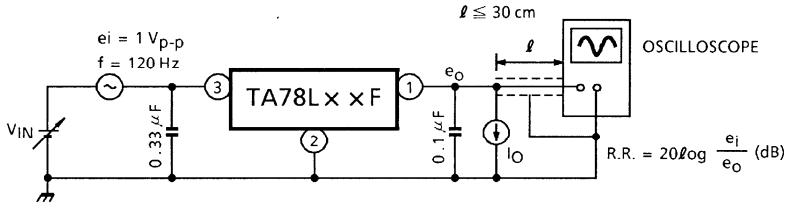
Test Circuit 2

V_{NO}

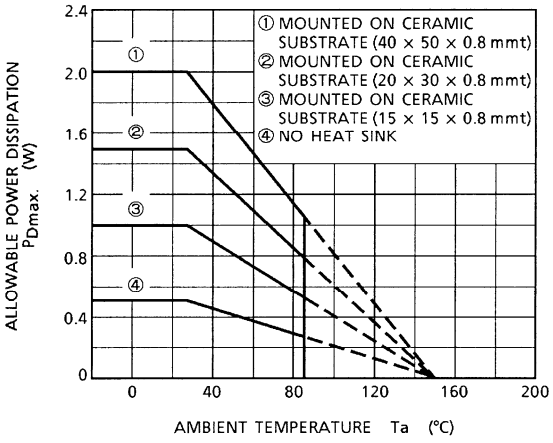


Test Circuit 3

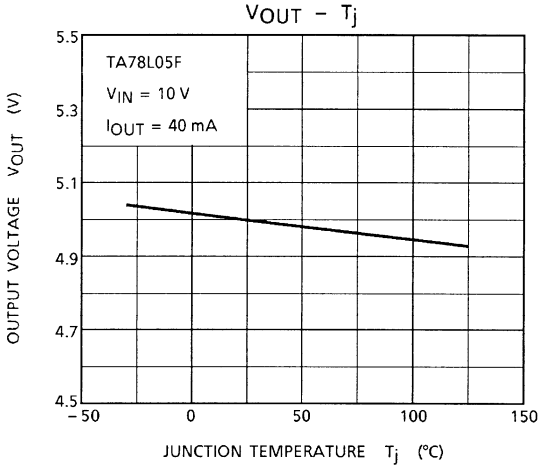
R.R.



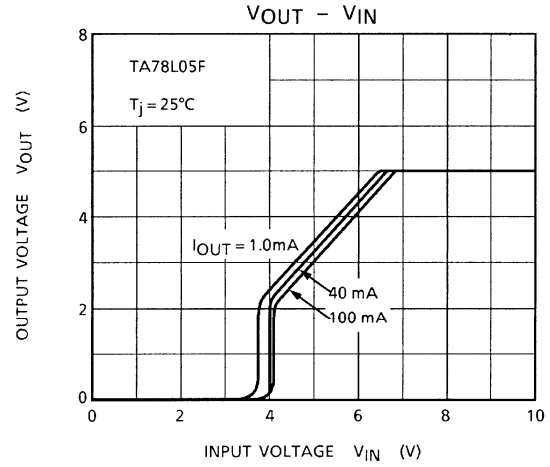
$P_{Dmax.}$ – Ta



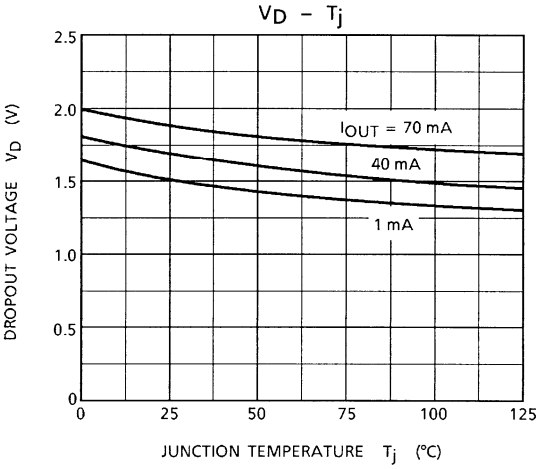
V_{OUT} – T_j



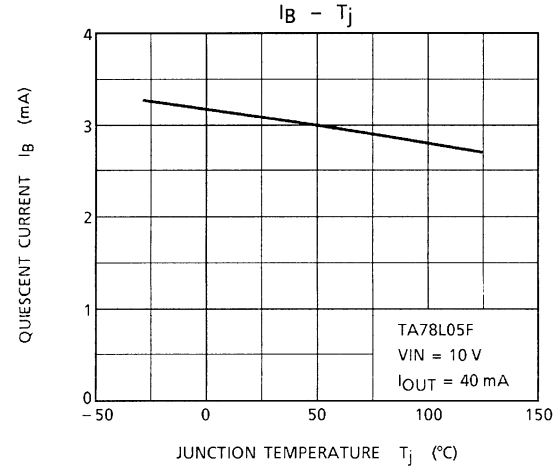
V_{OUT} – V_{IN}



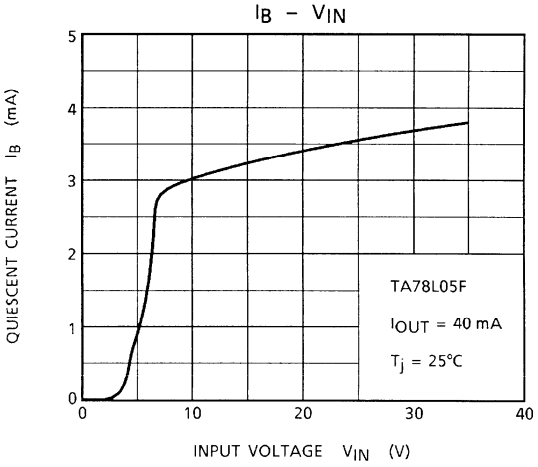
V_D – T_j

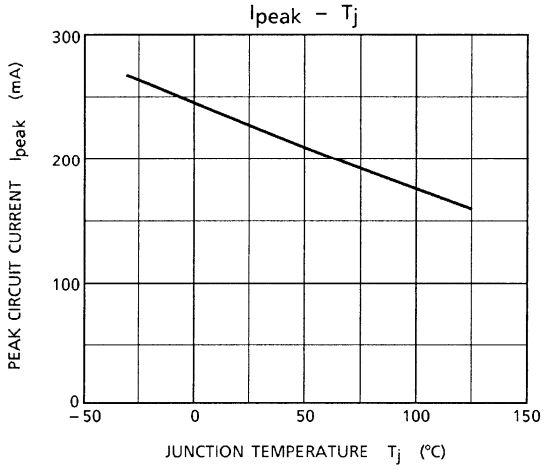


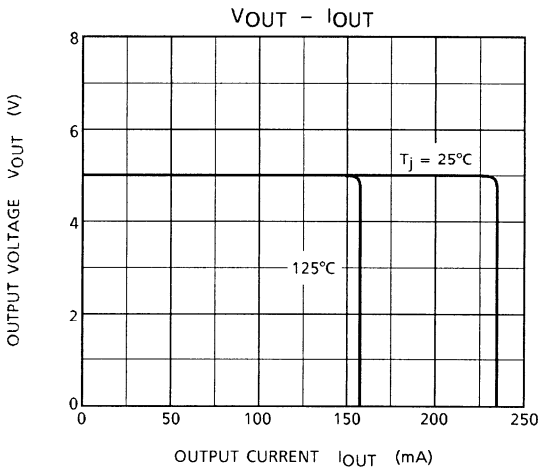
I_B – T_j



I_B – V_{IN}

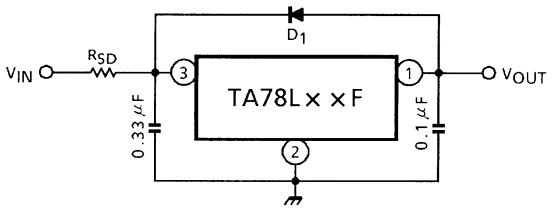



I_{peak} – T_j
PEAK CIRCUIT CURRENT I_{peak} (mA)
300
200
100
0
– 50
0
50
100
150
JUNCTION TEMPERATURE T_j (°C)


V_{OUT} – I_{OUT}
OUTPUT VOLTAGE V_{OUT} (V)
8
6
4
2
0
T_j = 25°C
125°C
0
50
100
150
200
250
OUTPUT CURRENT I_{OUT} (mA)

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.



D_1 : 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 D_1.

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

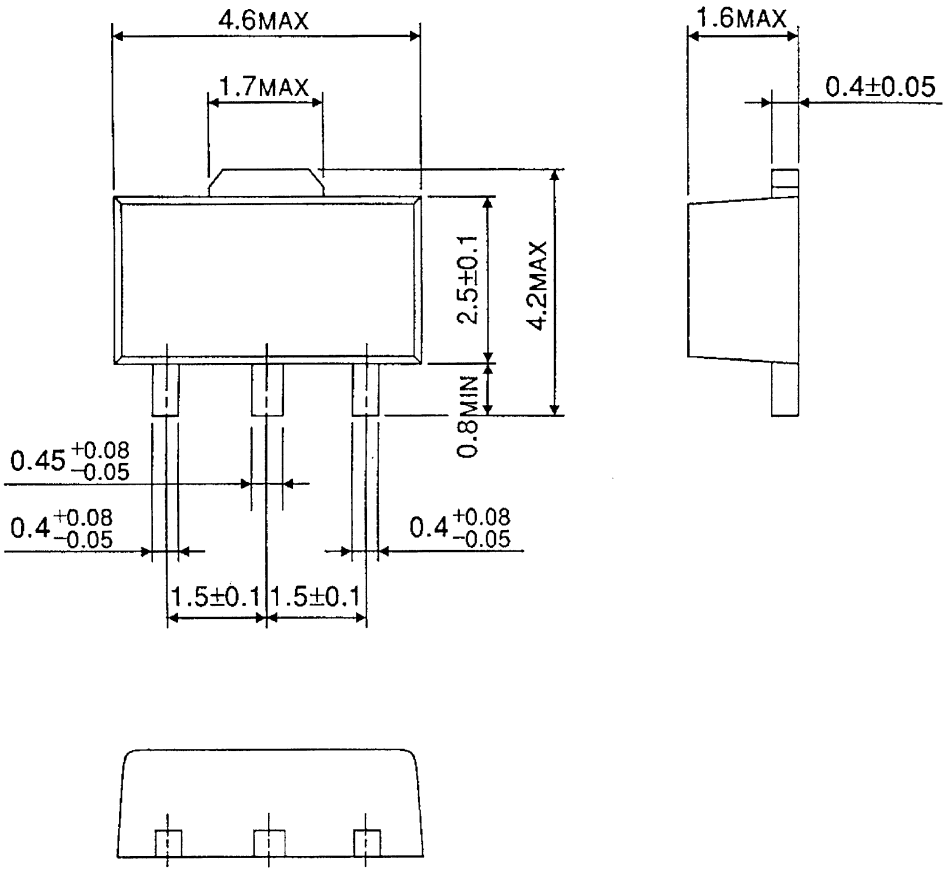
  The overcurrent protection circuits in the Product are designed to temporarily protect Product from minor overcurrent of brief duration. When the overcurrent protective function in the Product activates, immediately cease application of overcurrent to Product. Improper usage of Product, such as application 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.

Package Dimensions

HSOP3-P-1.50 Unit : mm



Weight : 0.05 g (Typ.)

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