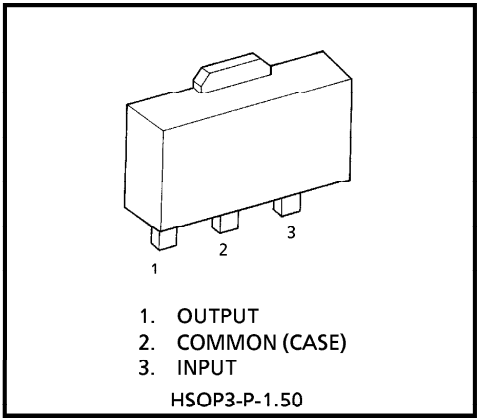


TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC
TA78L05F, TA78L06F, TA78L08F, TA78L09F, TA78L10F
TA78L12F, TA78L15F, TA78L18F, TA78L20F, TA78L24F

5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 20V, 24V
3-TERMINAL POSITIVE VOLTAGE REGULATORS

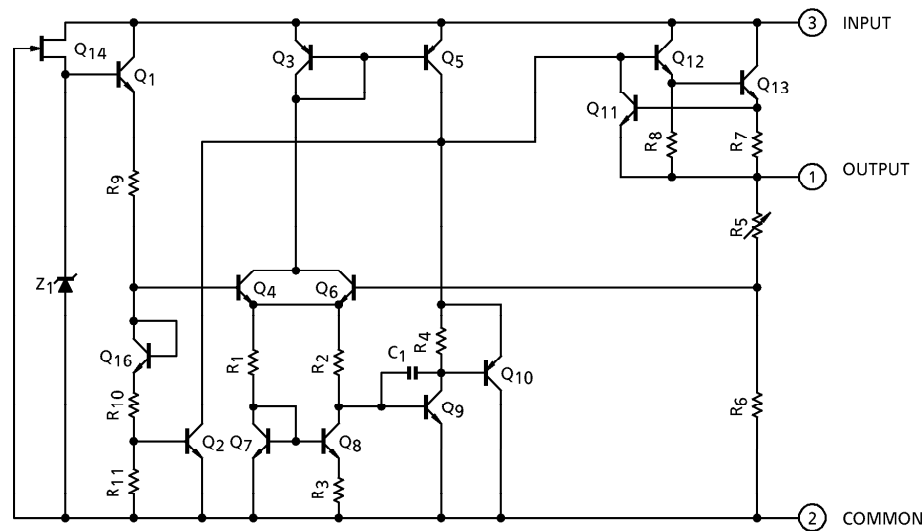
FEATURES

- Best suited to power supply for TTL / CMOS
- No external part needed
- Built-in thermal protective circuit
- Built-in short-circuit current limiting
- Max. output current 150mA. ($T_j = 25^{\circ}\text{C}$)
- Packaged in POWER MINI. (SOT-89)



Weight : 0.05g (Typ.)

EQUIVALENT CIRCUIT



TYPE	MARKING
TA78L05F	AE
TA78L06F	BE
TA78L08F	CE
TA78L09F	DE
TA78L10F	EE
TA78L12F	FE
TA78L15F	GE
TA78L18F	HE
TA78L20F	IE
TA78L24F	JE

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- The information contained herein is subject to change without notice.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Input Voltage	TA78L05F	V _{IN}	35	V
	TA78L06F			
	TA78L08F			
	TA78L09F			
	TA78L10F			
	TA78L12F			
	TA78L15F			
	TA78L18F		40	
	TA78L20F			
	TA78L24F			
Power Dissipation	(Ta = 25°C)	P _D	500	mW
Operating Temperature		T _{opr}	– 30~75	°C
Storage Temperature		T _{stg}	– 55~150	°C
Operating Junction Temperature		T _j	– 30~150	°C
Thermal Resistance		R _{th (j-a)}	250	°C / W

TA78L05F

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

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	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	7.0V ≤ V _{IN} ≤ 20V	—	55	mV	
			8.0V ≤ V _{IN} ≤ 20V	—	45	100		
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	11	mV	
				1.0mA ≤ I _{OUT} ≤ 40mA	—	5.0		30
Output Voltage	V _{OUT}	1	T _j = 25°C	7.0V ≤ V _{IN} ≤ 20V	4.65	—	5.35	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	8.0V ≤ V _{IN} ≤ 20V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	T _a = 25°C, 10Hz ≤ f ≤ 100kHz	—	40	—	μV _{rms}	
Long Term Stability	ΔV _{OUT} / Δt	1	—	—	12	—	mV / 1.0kh	
Ripple Rejection Ratio	R.R.	3	f = 120Hz 8.0V ≤ V _{IN} ≤ 18V, T _j = 25°C	41	49	—	dB	
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA	—	-0.6	—	mV / °C	

TA78L06F

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 11V$, $I_{OUT} = 40mA$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $0^\circ C \leq T_j \leq 125^\circ C$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	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	8.1V ≤ V _{IN} ≤ 21V	—	50	150	mV
				9.0V ≤ V _{IN} ≤ 21V	—	45	110	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	12	70	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	5.5	35	
Output Voltage	V _{OUT}	1	T _j = 25°C	8.1V ≤ V _{IN} ≤ 21V	5.58	—	6.42	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA	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	9.0V ≤ V _{IN} ≤ 20V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C 10Hz ≤ f ≤ 100kHz		—	40	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	14	—	mV / 1.0kh
Ripple Rejection Ratio	R.R.	3	f = 120Hz 9.0V ≤ V _{IN} ≤ 19V, T _j = 25°C		39	47	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	−0.7	—	mV / °C

TA78L08F

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

CHARACTERISTIC	SYMBOL	TEST CIR- CUI	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	10.5V ≤ V _{IN} ≤ 23V	—	20	175	mV
			11V ≤ V _{IN} ≤ 23V	—	12	125		
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	15	80	mV
			1.0mA ≤ I _{OUT} ≤ 40mA	—	7.0	40		
Output Voltage	V _{OUT}	1	T _j = 25°C	10.5V ≤ V _{IN} ≤ 23V	7.44	—	8.56	V
				1.0mA ≤ I _{OUT} ≤ 40mA	—	—	—	
				1.0mA ≤ I _{OUT} ≤ 70mA	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	11V ≤ V _{IN} ≤ 23V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	T _a = 25°C 10Hz ≤ f ≤ 100kHz	—	60	—	μV _{rms}	
Long Term Stability	ΔV _{OUT} / Δt	1	—	—	20	—	mV / 1.0kh	
Ripple Rejection Ratio	R.R.	3	f = 120Hz 12V ≤ V _{IN} ≤ 23V, T _j = 25°C	37	45	—	dB	
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA	—	-0.8	—	mV / °C	

TA78L09F

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

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	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	11.4V ≤ V _{IN} ≤ 24V	—	80	mV
			12V ≤ V _{IN} ≤ 24V	—	20	160	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	17	mV
			1.0mA ≤ I _{OUT} ≤ 40mA	—	8.0	45	
Output Voltage	V _{OUT}	1	T _j = 25°C	11.4V ≤ V _{IN} ≤ 24V	8.37	—	V
			1.0mA ≤ I _{OUT} ≤ 40mA	—	9.63		
			1.0mA ≤ I _{OUT} ≤ 70mA	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	12V ≤ V _{IN} ≤ 24V	—	—	1.5	mA
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1	
Output Noise Voltage	V _{NO}	2	T _a = 25°C 10Hz ≤ f ≤ 100kHz	—	65	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—	—	21	—	mV / 1.0kh
Ripple Rejection Ratio	R.R.	3	f = 120Hz 12V ≤ V _{IN} ≤ 24V, T _j = 25°C	36	44	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA	—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA	—	−0.85	—	mV / °C

TA78L10F

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

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	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	12.5V ≤ V _{IN} ≤ 25V	—	80	mV	
			13V ≤ V _{IN} ≤ 25V	—	30	170		
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	18	mV	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	8.5	45		
Output Voltage	V _{OUT}	1	T _j = 25°C	12.5V ≤ V _{IN} ≤ 25V	9.3	—	10.7	V
			1.0mA ≤ I _{OUT} ≤ 40mA					
			1.0mA ≤ I _{OUT} ≤ 70mA	9.3				
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	13V ≤ V _{IN} ≤ 25V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	T _a = 25°C 10Hz ≤ f ≤ 100kHz	—	70	—	μV _{rms}	
Long Term Stability	ΔV _{OUT} / Δt	1	—	—	22	—	mV / 1.0kh	
Ripple Rejection Ratio	R.R.	3	f = 120Hz 13V ≤ V _{IN} ≤ 24V, T _j = 25°C	36	43	—	dB	
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA	—	− 0.9	—	mV / °C	

TA78L12F

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

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	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	14.5V ≤ V _{IN} ≤ 27V	—	120	250	mV
				16V ≤ V _{IN} ≤ 27V	—	100	200	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	20	100	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	10	50	
Output Voltage	V _{OUT}	1	T _j = 25°C	14.5V ≤ V _{IN} ≤ 27V	11.16	—	12.84	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA	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	16V ≤ V _{IN} ≤ 27V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C 10Hz ≤ f ≤ 100kHz		—	80	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	24	—	mV / 1.0kh
Ripple Rejection Ratio	R.R.	3	f = 120Hz 15V ≤ V _{IN} ≤ 25V, T _j = 25°C		36	41	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	− 1.0	—	mV / °C

TA78L15F

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

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	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	17.5V ≤ V _{IN} ≤ 30V	—	130	300	mV
				20V ≤ V _{IN} ≤ 30V	—	110	250	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	25	150	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	12	75	
Output Voltage	V _{OUT}	1	T _j = 25°C	17.5V ≤ V _{IN} ≤ 30V	13.95	—	16.05	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	20V ≤ V _{IN} ≤ 30V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C 10Hz ≤ f ≤ 100kHz		—	90	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	30	—	mV / 1.0kh
Ripple Rejection Ratio	R.R.	3	f = 120Hz 18.5V ≤ V _{IN} ≤ 28.5V, T _j = 25°C		34	40	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	− 1.3	—	mV / °C

TA78L18F

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 27V$, $I_{OUT} = 40mA$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $0^\circ C \leq T_j \leq 125^\circ C$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	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	21.4V ≤ V _{IN} ≤ 33V	—	32	325	mV
				22V ≤ V _{IN} ≤ 33V	—	27	275	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	30	170	mV
				1.0mA ≤ I _{OUT} ≤ 40mA	—	15	75	
Output Voltage	V _{OUT}	1	T _j = 25°C	21.4V ≤ V _{IN} ≤ 33V	16.74	—	19.26	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	22V ≤ V _{IN} ≤ 33V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	Ta = 25°C 10Hz ≤ f ≤ 100kHz		—	150	—	μV _{rms}
Long Term Stability	ΔV _{OUT} / Δt	1	—		—	45	—	mV / 1.0kh
Ripple Rejection Ratio	R.R.	3	f = 120Hz 23V ≤ V _{IN} ≤ 33V, T _j = 25°C		32	38	—	dB
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA		—	1.7	—	V
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA		—	− 1.5	—	mV / °C

TA78L20F

ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 29V$, $I_{OUT} = 40mA$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $0^\circ C \leq T_j \leq 125^\circ C$)

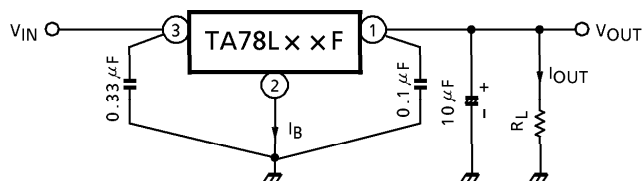
CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Output Voltage	V _{OUT}	1	T _j = 25°C	19.0	20	21.0	V	
Line Regulation	Reg.line	1	T _j = 25°C	23.5V ≤ V _{IN} ≤ 35V	—	33	330	mV
				24V ≤ V _{IN} ≤ 35V	—	28	285	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	33	180	mV
					1.0mA ≤ I _{OUT} ≤ 40mA	—	17	
Output Voltage	V _{OUT}	1	T _j = 25°C	23.5V ≤ V _{IN} ≤ 35V	18.6	—	21.4	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	24V ≤ V _{IN} ≤ 35V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	T _a = 25°C 10Hz ≤ f ≤ 100kHz	—	170	—	μV _{rms}	
Long Term Stability	ΔV _{OUT} / Δt	1	—	—	49	—	mV / 1.0kh	
Ripple Rejection Ratio	R.R.	3	f = 120Hz 25V ≤ V _{IN} ≤ 35V, T _j = 25°C	31	37	—	dB	
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA	—	− 1.7	—	mV / °C	

TA78L24F

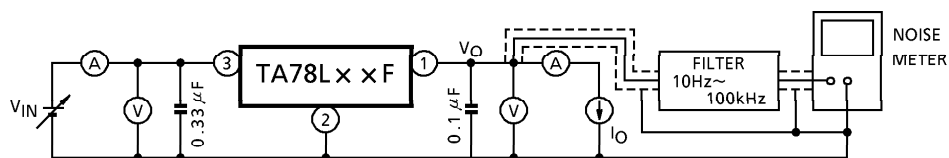
ELECTRICAL CHARACTERISTICS(Unless otherwise specified, $V_{IN} = 33V$, $I_{OUT} = 40mA$, $C_{IN} = 0.33\mu F$, $C_{OUT} = 0.1\mu F$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$)

CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	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	27.5V ≤ V _{IN} ≤ 38V	—	35	350	mV
				28V ≤ V _{IN} ≤ 38V	—	30	300	
Load Regulation	Reg.load	1	T _j = 25°C	1.0mA ≤ I _{OUT} ≤ 100mA	—	40	200	mV
					1.0mA ≤ I _{OUT} ≤ 40mA	—	20	
Output Voltage	V _{OUT}	1	T _j = 25°C	27.5V ≤ V _{IN} ≤ 38V	22.32	—	25.68	V
				1.0mA ≤ I _{OUT} ≤ 40mA				
				1.0mA ≤ I _{OUT} ≤ 70mA				
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	28V ≤ V _{IN} ≤ 38V	—	—	1.5	mA	
			1.0mA ≤ I _{OUT} ≤ 40mA	—	—	0.1		
Output Noise Voltage	V _{NO}	2	T _a = 25°C 10Hz ≤ f ≤ 100kHz	—	200	—	μV _{rms}	
Long Term Stability	ΔV _{OUT} / Δt	1	—	—	56	—	mV / 1.0kh	
Ripple Rejection Ratio	R.R.	3	f = 120Hz 29V ≤ V _{IN} ≤ 39V, T _j = 25°C	31	35	—	dB	
Dropout Voltage	V _{IN} -V _{OUT}	1	T _j = 25°C, I _{OUT} = 150mA	—	1.7	—	V	
Average Temperature Coefficient of Output Voltage	T _{CVO}	1	I _{OUT} = 5mA	—	− 2.0	—	mV / °C	

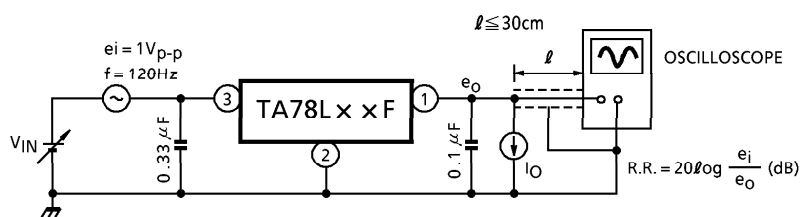
TEST CIRCUIT 1 / STANDARD APPLICATION

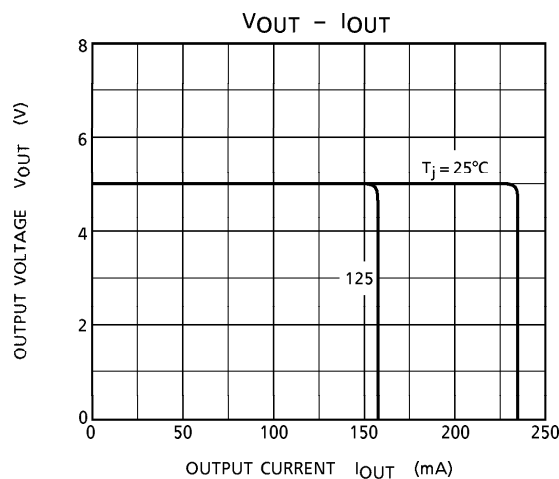
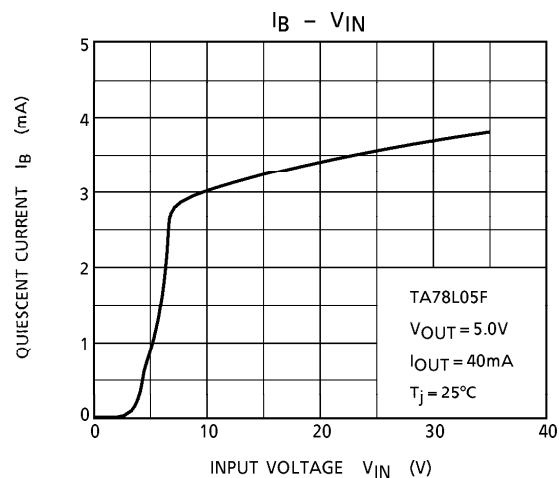
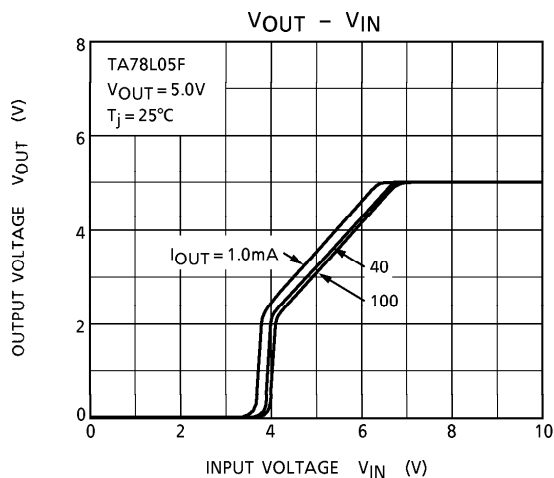
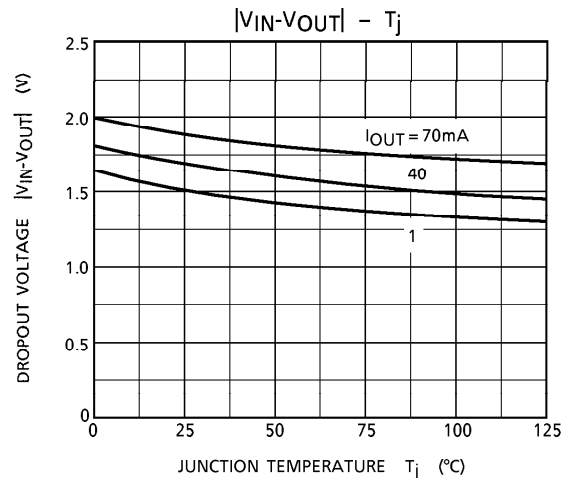
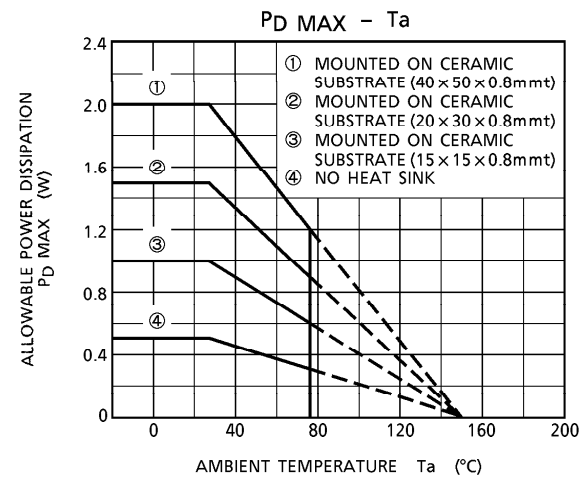


TEST CIRCUIT 2 V_{NO}



TEST CIRCUIT 3 R.R.



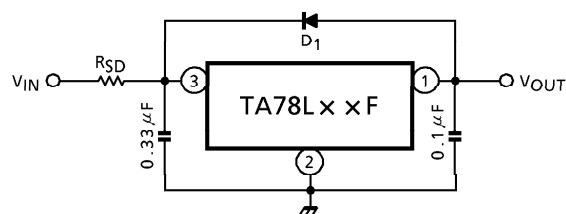


Precautions for Use

If high voltage in excess of output voltage (TYP. value) of IC is applied to its output terminal, IC may be destroyed. In this case, connect a Zener diode between the output terminal and GND to prevent application of excessive voltage. In particular, in such a current boosting circuit as shown in Application Circuit Example (2), if input voltage is suddenly applied by stages and furthermore, load is light, excessive voltage may be applied transiently to the output terminal of IC. In such a case as this, it may become necessary to increase capacity of output capacitor as appropriate, use a smaller R_1 (a resistor for bypassing IC bias current) or gradually rise input voltage in addition to use of a Zener diode as mentioned above.

APPLICATION CIRCUIT

(1) STANDARD APPLICATION



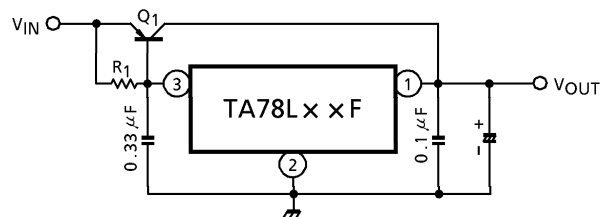
D_1 : IC protective diode

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.

(2) A. CURRENT BOOST VOLTAGE REGULATOR



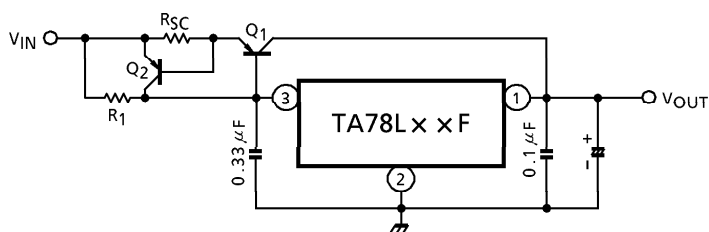
Use a required radiation plate for Q_1 .

$$R_1 \leq \frac{V_{BE1}}{I_B \text{ MAX}}$$

where, V_{BE1} : V_{BE} of external transistor Q_1 .

$I_B \text{ MAX}$: Max. bias current of IC.

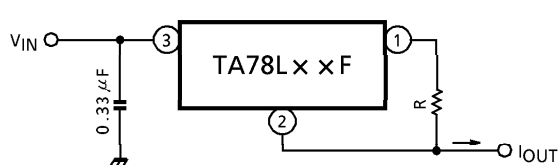
B. SHORT-CIRCUIT PROTECTION



$$R_{SC} = \frac{V_{BE2}}{I_{SC}}$$

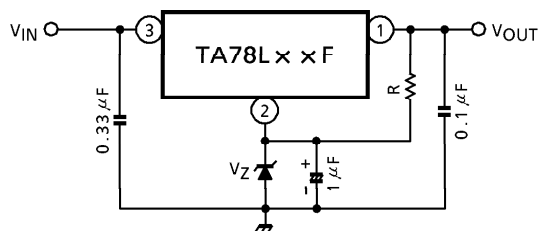
where, I_{SC} : Short-Circuit current

(3) CURRENT REGULATOR

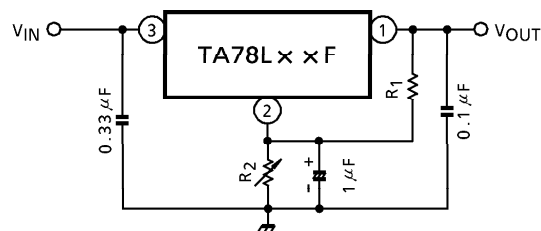


$$I_{OUT} = \frac{V_{OUT}}{R} + I_B$$

(4) VOLTAGE BOOST REGULATOR

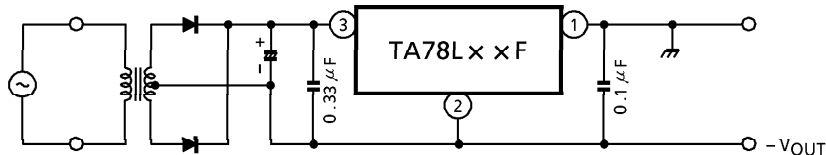


$V_{OUT} = V_Z + V_{OUT}(\text{of IC})$
Apply current of several mA to R.

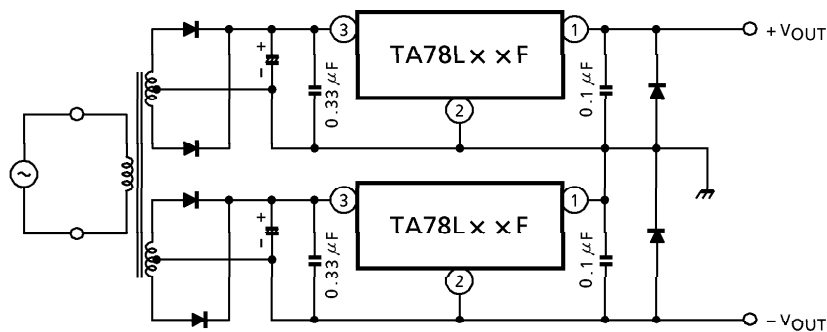


$$V_{OUT} = R_2 \left(I_B + \frac{V_{OUT}(\text{of IC})}{R_1} \right) + V_{OUT}(\text{of IC})$$

(5) NEGATIVE REGULATOR

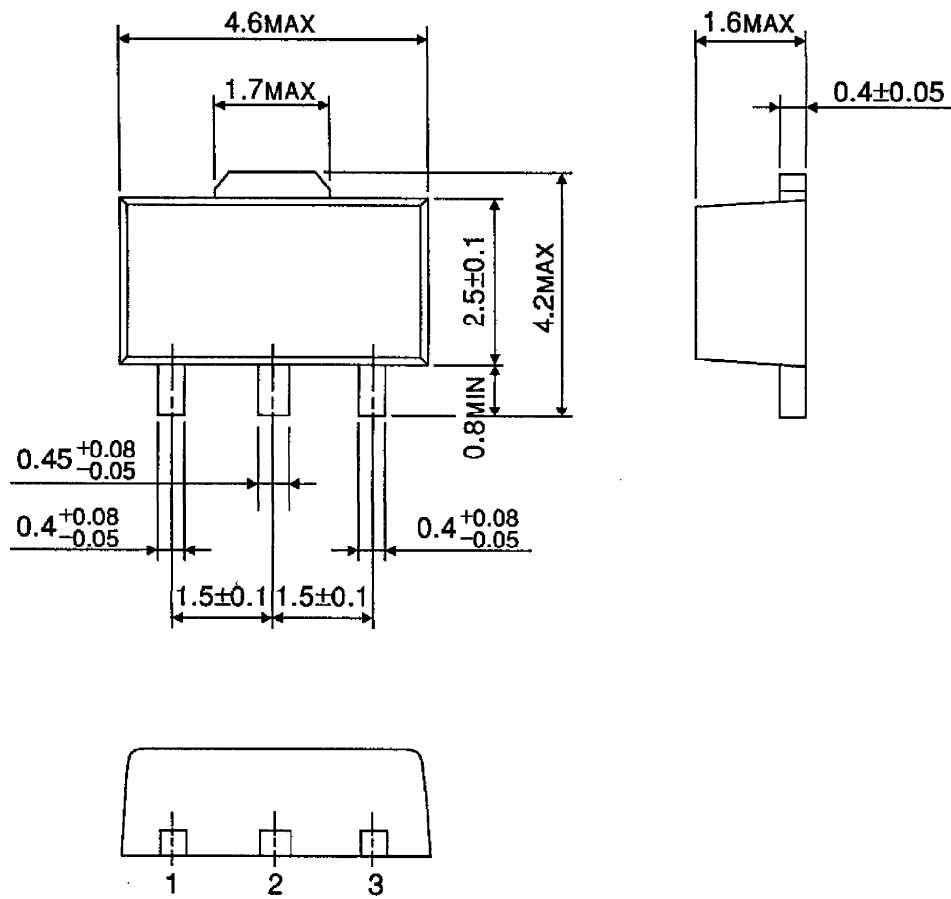


(6) POSITIVE AND NEGATIVE REGULATOR



OUTLINE DRAWING
HSOP3-P-1.50

Unit : mm



Weight : 0.05g (Typ.)