TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

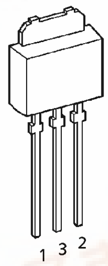
TA78M05F, TA78M06F, TA78M08F, TA78M09F, TA78M10F TA78M12F, TA78M15F, TA78M18F, TA78M20F, TA78M24F

0.5 A THREE TERMINAL POSITIVE VOLTAGE REGULATORS

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

The TA78M××F series of fixed-voltage monolithic integrated circuit voltage regulators is designed for a wide range of applications. These regulators employ internal current-limiting, thermal-shutdown and safe-area compensation, making them essentially indestructible. One of these regulators can drive up to 0.5 A of output current.

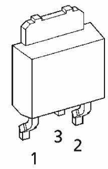
TA78XXF



P-HSIP3-2.30B

TA78XXF
(LBSTA1)
(TE16L / R)

1. INPUT
2. OUTPUT
3. COMMON (CASE)



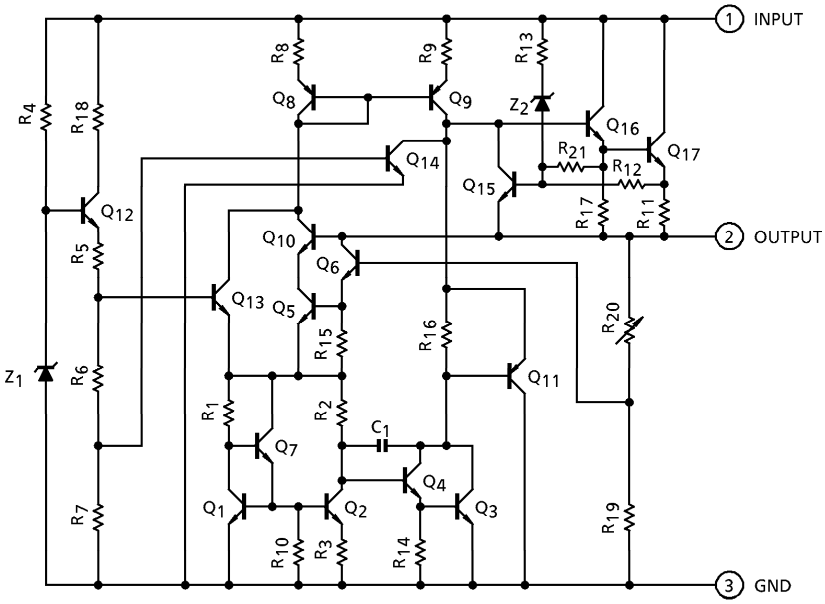
P-HSOP3-2.30A

Weight P-HSIP3-2.30B : 0.36 g (Typ.)
P-HSOP3-2.30A : 0.36 g (Typ.)

FEATURES

- Suitable for CMOS, TTL and the other Digital IC's Power Supply.
- Output Current in Excess of 0.5 A
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Packaged in POWER MOLD.

EQUIVALENT CIRCUIT



MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Input Voltage	TA78M05F	V_{IN}	35	V
	TA78M06F			
	TA78M08F			
	TA78M09F			
	TA78M10F			
	TA78M12F			
	TA78M15F			
	TA78M18F		40	
	TA78M20F			
	TA78M24F			
Power Dissipation	(Ta = 25°C)	P_D	1	W
	(Tc = 25°C)		10	
Operating Temperature		T_{opr}	−30~85	°C
Storage Temperature		T_{stg}	−55~150	°C
Junction Temperature		T_j	150	°C
Thermal Resistance		$R_{th\ (j\text{-}c)}$	12.5	°C / W
		$R_{th\ (j\text{-}a)}$	125	

TA78M05F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 10 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		4.8	5.0	5.2	V
Line Regulation		Reg·Line	1	T_j = 25°C	7 V ≦ V_{IN} ≦ 25 V I_{OUT} = 200 mA	—	4	100	mV
					8 V ≦ V_{IN} ≦ 25 V I_{OUT} = 200 mA	—	2	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	25	100	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	50	
Output Voltage		V_{OUT}	1	T_j = 25°C	7 V ≦ V_{IN} ≦ 20 V 5 mA ≦ I_{OUT} ≦ 350 mA	4.75	—	5.25	V
Quiescent Current		I_B	1	T_j = 25°C		—	4.5	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	8.5 V ≦ V_{IN} ≦ 25.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	50	200	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA 8 V ≦ V_{IN} ≦ 18 V, T_j = 25°C		60	67	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
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

TA78M06F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 11 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		5.75	6.0	6.25	V
Line Regulation		Reg·Line	1	T_j = 25°C	8 V ≦ V_{IN} ≦ 25 V, I_{OUT} = 200 mA	—	4	100	mV
					9 V ≦ V_{IN} ≦ 25 V, I_{OUT} = 200 mA	—	2	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	25	120	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	60	
Output Voltage		V_{OUT}	1	T_j = 25°C	8 V ≦ V_{IN} ≦ 21 V, 5 mA ≦ I_{OUT} ≦ 350 mA	5.7	—	6.3	V
Quiescent Current		I_B	1	T_j = 25°C		—	4.5	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	9.5 V ≦ V_{IN} ≦ 25.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	55	220	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 9 V ≦ V_{IN} ≦ 19 V, T_j = 25°C		58	65	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
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

TA78M08F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 14 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		7.7	8.0	8.3	V
Line Regulation		Reg·Line	1	T_j = 25°C	10.5 V ≦ V_{IN} ≦ 25 V, I_{OUT} = 200 mA	—	5	100	mV
					11 V ≦ V_{IN} ≦ 25 V, I_{OUT} = 200 mA	—	3	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	26	160	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	80	
Output Voltage		V_{OUT}	1	T_j = 25°C	10.5 V ≦ V_{IN} ≦ 23 V, 5 mA ≦ I_{OUT} ≦ 350 mA	7.6	—	8.4	V
Quiescent Current		I_B	1	T_j = 25°C		—	4.6	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	11 V ≦ V_{IN} ≦ 25.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	60	250	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 11.5 V ≦ V_{IN} ≦ 21.5 V, T_j = 25°C		55	62	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
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

TA78M09F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 15 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		8.64	9.0	9.36	V
Line Regulation		Reg·Line	1	T_j = 25°C	11.5 V ≦ V_{IN} ≦ 26 V, I_{OUT} = 200 mA	—	5	100	mV
					13 V ≦ V_{IN} ≦ 26 V, I_{OUT} = 200 mA	—	3	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	26	180	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	90	
Output Voltage		V_{OUT}	1	T_j = 25°C	11.5 V ≦ V_{IN} ≦ 24 V, 5 mA ≦ I_{OUT} ≦ 350 mA	8.55	—	9.45	V
Quiescent Current		I_B	1	T_j = 25°C		—	4.6	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	12 V ≦ V_{IN} ≦ 26.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	60	270	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 12.5 V ≦ V_{IN} ≦ 22.5 V, T_j = 25°C		54	61	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
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		—	− 1.1	—	mV / °C

TA78M10F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 16 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		9.6	10.0	10.4	V
Line Regulation		Reg·Line	1	T_j = 25°C	12.5 V ≦ V_{IN} ≦ 26 V, I_{OUT} = 200 mA	—	6	100	mV
					14 V ≦ V_{IN} ≦ 26 V, I_{OUT} = 200 mA	—	3	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	26	200	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	100	
Output Voltage		V_{OUT}	1	T_j = 25°C	12.5 V ≦ V_{IN} ≦ 25 V, 5 mA ≦ I_{OUT} ≦ 350 mA	9.5	—	10.5	V
Quiescent Current		I_B	1	T_j = 25°C		—	4.7	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	13 V ≦ V_{IN} ≦ 26.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	65	280	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 13.5 V ≦ V_{IN} ≦ 23.5 V, T_j = 25°C		52	59	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
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

TA78M12F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 19 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		11.5	12.0	12.5	V
Line Regulation		Reg·Line	1	T_j = 25°C	14.5 V ≦ V_{IN} ≦ 30 V, I_{OUT} = 200 mA	—	7	100	mV
					16 V ≦ V_{IN} ≦ 30 V, I_{OUT} = 200 mA	—	3	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	27	240	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	120	
Output Voltage		V_{OUT}	1	T_j = 25°C	14.5 V ≦ V_{IN} ≦ 27 V, 5 mA ≦ I_{OUT} ≦ 350 mA	11.4	—	12.6	V
Quiescent Current		I_B	1	T_j = 25°C		—	4.8	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	15 V ≦ V_{IN} ≦ 30.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	70	300	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 15 V ≦ V_{IN} ≦ 25 V, T_j = 25°C		50	57	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
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		—	− 1.6	—	mV / °C

TA78M15F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 23 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_{OUT}	1	T_j = 25°C	14.4	15.0	15.6	V
Line Regulation	Reg·Line	1	T_j = 25°C, 17.5 V ≦ V_{IN} ≦ 30 V, I_{OUT} = 200 mA	—	8	100	mV
Line Regulation	Reg·Line	1	T_j = 25°C, 20 V ≦ V_{IN} ≦ 30 V, I_{OUT} = 200 mA	—	4	50	mV
Load Regulation	Reg·Load	1	T_j = 25°C, 5 mA ≦ I_{OUT} ≦ 500 mA	—	27	300	mV
Load Regulation	Reg·Load	1	T_j = 25°C, 5 mA ≦ I_{OUT} ≦ 200 mA	—	10	150	mV
Output Voltage	V_{OUT}	1	T_j = 25°C, 17.5 V ≦ V_{IN} ≦ 30 V, 5 mA ≦ I_{OUT} ≦ 350 mA	14.25	—	15.75	V
Quiescent Current	I_B	1	T_j = 25°C	—	4.8	8.0	mA
Quiescent Current Change — Line	ΔI_{BI}	1	T_j = 25°C, 18 V ≦ V_{IN} ≦ 30.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
Quiescent Current Change — Load	ΔI_{BO}	1	T_j = 25°C, 5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	mA
Output Noise Voltage	V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz	—	80	450	μV_{rms}
Ripple Rejection	R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 18.5 V ≦ V_{IN} ≦ 28.5 V, T_j = 25°C	48	55	—	dB
Short Circuit Current Limit	I_{SC}	1	T_j = 25°C	—	960	—	mA
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

TA78M18F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 27 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		17.3	18.0	18.7	V
Line Regulation		Reg·Line	1	T_j = 25°C	21 V ≦ V_{IN} ≦ 33 V I_{OUT} = 200 mA	—	9	100	mV
					24 V ≦ V_{IN} ≦ 33 V I_{OUT} = 200 mA	—	5	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	28	360	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	180	
Output Voltage		V_{OUT}	1	T_j = 25°C	21 V ≦ V_{IN} ≦ 33 V 5 mA ≦ I_{OUT} ≦ 350 mA	17.1	—	18.9	V
Quiescent Current		I_B	1	T_j = 25°C		—	4.8	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	21.5 V ≦ V_{IN} ≦ 33.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	90	490	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA 22 V ≦ V_{IN} ≦ 32V, T_j = 25°C		46	53	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
Dropout Voltage		V_D	1	T_j = 25°C		—	1.7	—	V
Average Temperature Coefficient Of Output Voltage		T_{CVO}	1	I_{OUT} = 5mA		—	−2.5	—	mV / °C

TA78M20F

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, V_{IN} = 29 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		19.2	20.0	20.8	V
Line Regulation		Reg·Line	1	T_j = 25°C	23 V ≦ V_{IN} ≦ 35 V, I_{OUT} = 200 mA	—	10	100	mV
					24 V ≦ V_{IN} ≦ 35 V, I_{OUT} = 200 mA	—	6	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	28	400	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	200	
Output Voltage		V_{OUT}	1	T_j = 25°C	23 V ≦ V_{IN} ≦ 35 V, 5 mA ≦ I_{OUT} ≦ 350 mA	19.0	—	21.0	V
Quiescent Current		I_B	1	T_j = 25°C		—	4.9	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	23.5 V ≦ V_{IN} ≦ 35.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	95	540	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 24 V ≦ V_{IN} ≦ 34 V, T_j = 25°C		46	53	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
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		—	−3.0	—	mV / °C

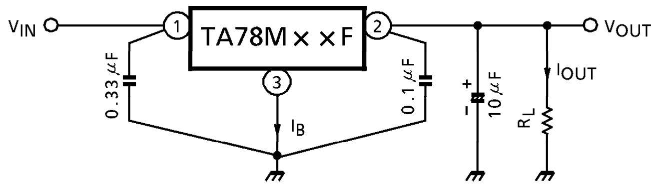
TA78M24F

ELECTRICAL CHARACTERISTICS

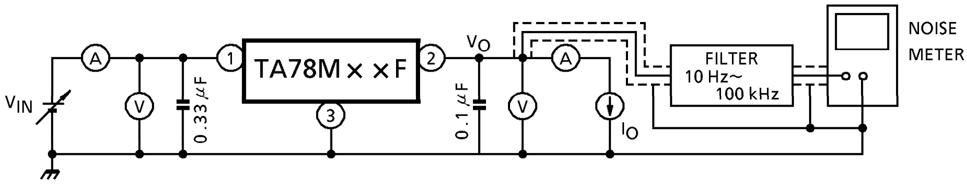
(Unless otherwise specified, V_{IN} = 33 V, I_{OUT} = 350 mA, 0°C ≦ T_j ≦ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Output Voltage		V_{OUT}	1	T_j = 25°C		23.0	24.0	25.0	V
Line Regulation		Reg·Line	1	T_j = 25°C	27 V ≦ V_{IN} ≦ 38 V, I_{OUT} = 200 mA	—	12	100	mV
					28 V ≦ V_{IN} ≦ 38 V, I_{OUT} = 200 mA	—	7	50	
Load Regulation		Reg·Load	1	T_j = 25°C	5 mA ≦ I_{OUT} ≦ 500 mA	—	30	480	mV
					5 mA ≦ I_{OUT} ≦ 200 mA	—	10	240	
Output Voltage		V_{OUT}	1	T_j = 25°C	27 V ≦ V_{IN} ≦ 38 V, 5 mA ≦ I_{OUT} ≦ 350 mA	22.8	—	25.2	V
Quiescent Current		I_B	1	T_j = 25°C		—	5.0	8.0	mA
Quiescent Current Change	Line	ΔI_{BI}	1	T_j = 25°C	27.5 V ≦ V_{IN} ≦ 38.5 V, I_{OUT} = 200 mA	—	—	0.8	mA
	Load	ΔI_{BO}	1		5 mA ≦ I_{OUT} ≦ 350 mA	—	—	0.5	
Output Noise Voltage		V_{NO}	2	Ta = 25°C, 10 Hz ≦ f ≦ 100 kHz		—	115	650	μV_{rms}
Ripple Rejection		R.R.	3	f = 120 Hz, I_{OUT} = 100 mA, 28 V ≦ V_{IN} ≦ 38 V, T_j = 25°C		46	53	—	dB
Short Circuit Current Limit		I_{SC}	1	T_j = 25°C		—	960	—	mA
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		—	−3.5	—	mV / °C

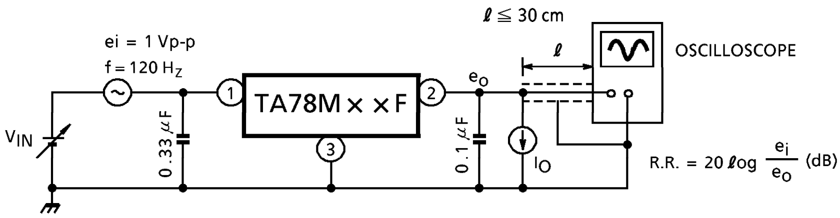
TEST CIRCUIT 1 / STANDARD APPLICATION

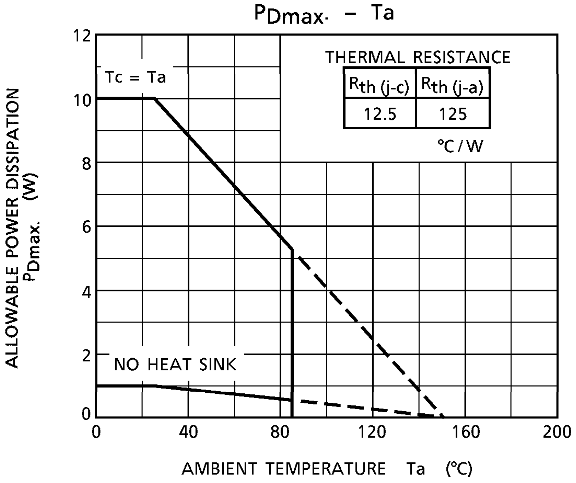


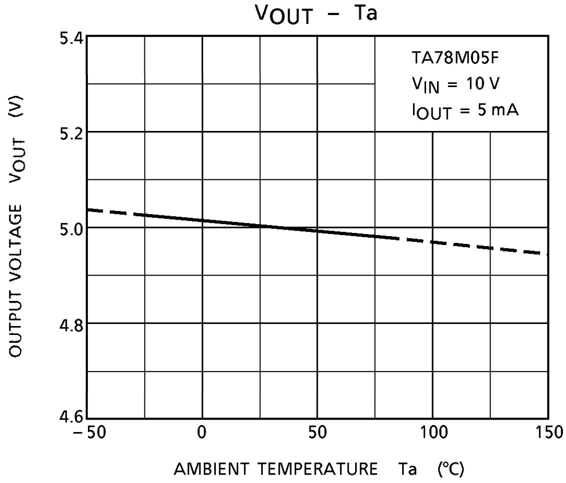
TEST CIRCUIT 2 V_{NO}

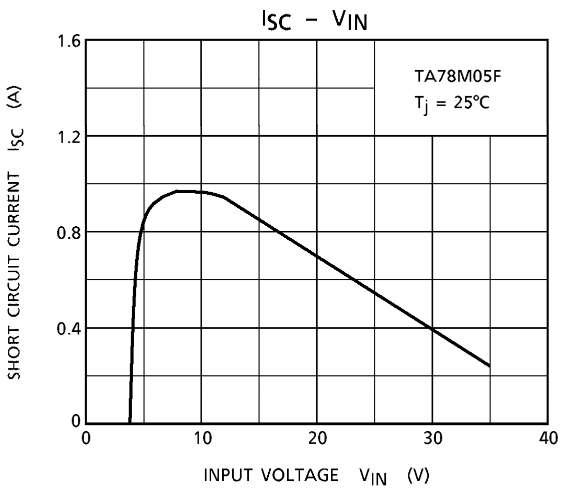


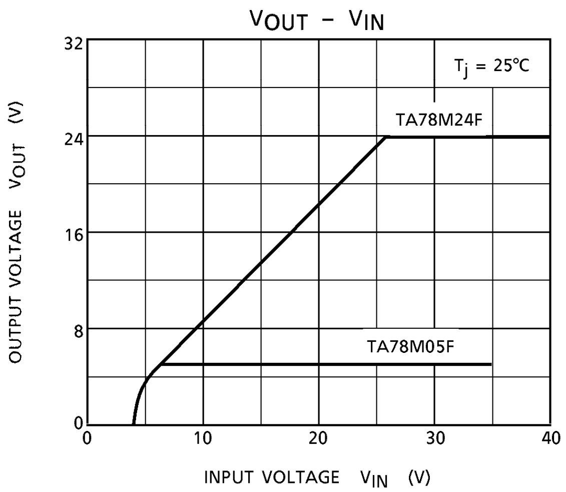
TEST CIRCUIT 3 R.R.

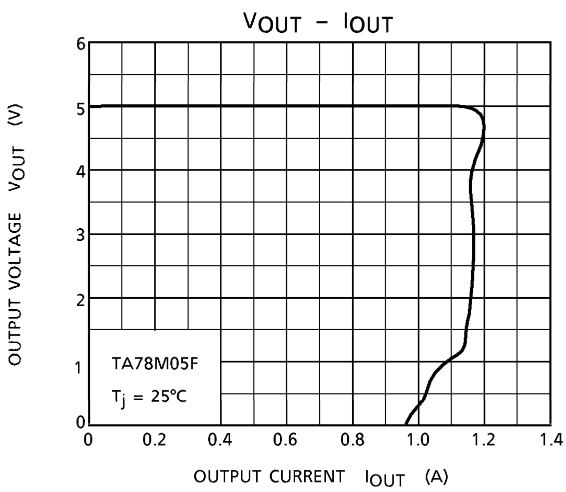


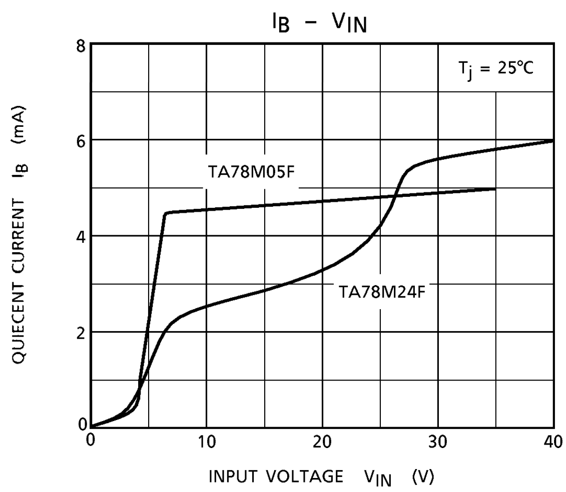

PDmax. – Ta
ALLOWABLE POWER DISSIPATION PDmax. (W)
AMBIENT TEMPERATURE Ta (°C)
Tc = Ta
NO HEAT SINK
THERMAL RESISTANCE
Rth (j-c) 12.5
Rth (j-a) 125
°C / W

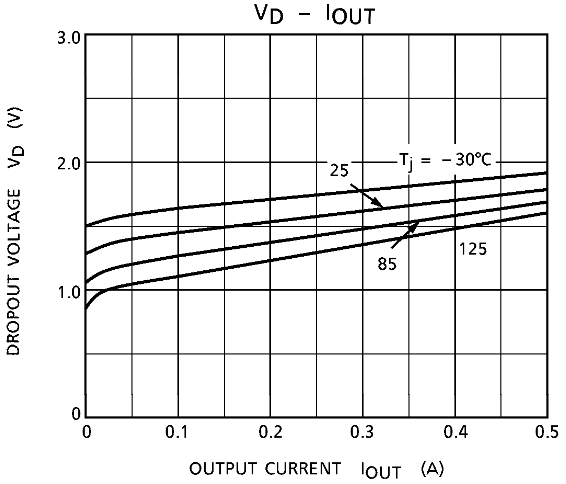

VOUT – Ta
TA78M05F
VIN = 10 V
IOUT = 5 mA
OUTPUT VOLTAGE VOUT (V)
AMBIENT TEMPERATURE Ta (°C)

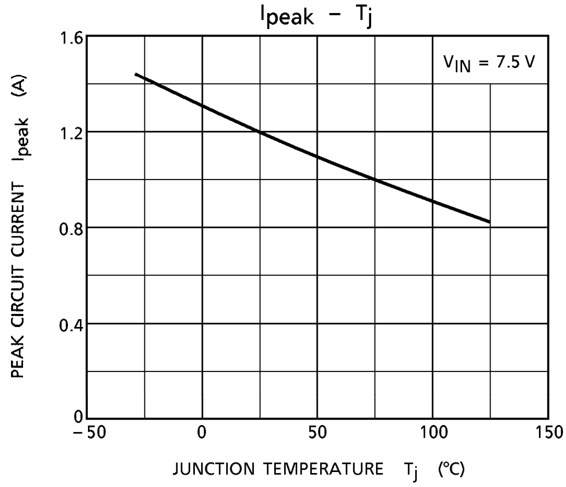

ISC – VIN
TA78M05F
Tj = 25°C
SHORT CIRCUIT CURRENT ISC (A)
INPUT VOLTAGE VIN (V)

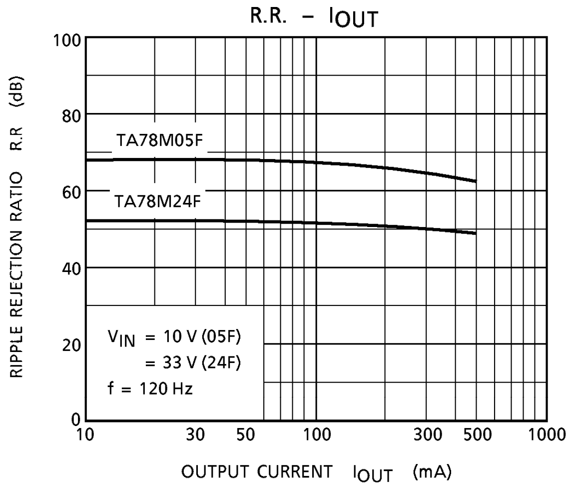

VOUT – VIN
Tj = 25°C
TA78M24F
TA78M05F
OUTPUT VOLTAGE VOUT (V)
INPUT VOLTAGE VIN (V)

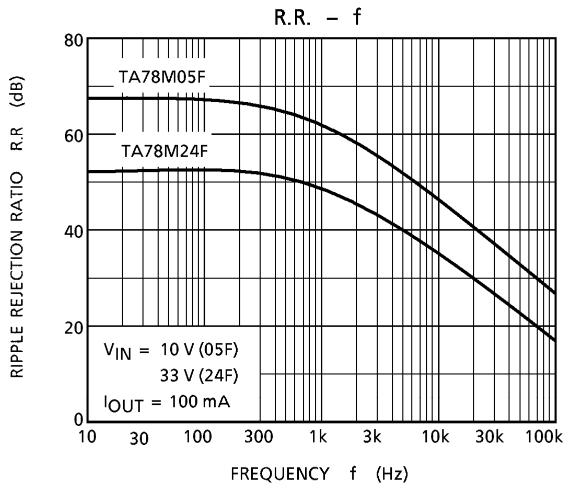

VOUT – IOUT
TA78M05F
Tj = 25°C
OUTPUT VOLTAGE VOUT (V)
OUTPUT CURRENT IOUT (A)


IB – VIN
Tj = 25°C
TA78M05F
TA78M24F
QUIECENT CURRENT IB (mA)
INPUT VOLTAGE VIN (V)


VD – IOUT
DROPOUT VOLTAGE VD (V)
OUTPUT CURRENT IOUT (A)
Tj = –30°C
25
85
125
3.0
2.0
1.0
0
0.1
0.2
0.3
0.4
0.5


Ipeak – Tj
VIN = 7.5 V
PEAK CIRCUIT CURRENT Ipeak (A)
JUNCTION TEMPERATURE Tj (°C)
1.6
1.2
0.8
0.4
0
–50
0
50
100
150

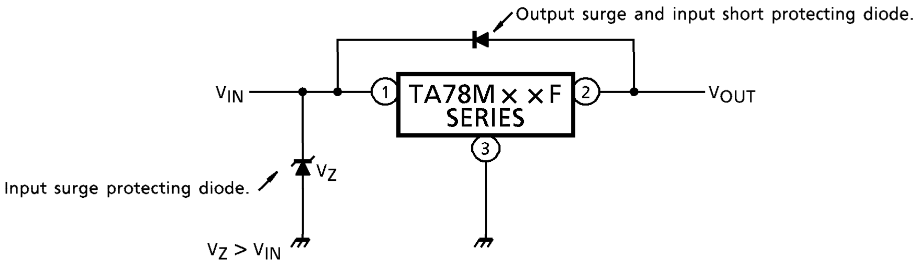

R.R. – IOUT
TA78M05F
TA78M24F
VIN = 10 V (05F)
= 33 V (24F)
f = 120 Hz
RIPPLE REJECTION RATIO R.R (dB)
OUTPUT CURRENT IOUT (mA)
100
80
60
40
20
0
10
30
50
100
300
500
1000


R.R. – f
TA78M05F
TA78M24F
VIN = 10 V (05F)
33 V (24F)
IOUT = 100 mA
RIPPLE REJECTION RATIO R.R (dB)
FREQUENCY f (Hz)
80
60
40
20
0
10
30
100
300
1k
3k
10k
30k
100k

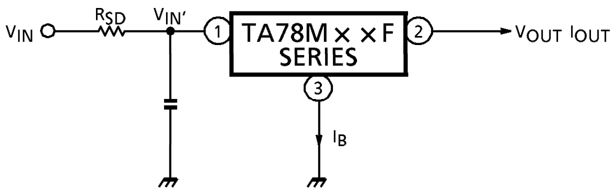
PRECAUTIONS ON APPLICATION

(1) In regard to GND, be careful not to apply a negative voltage to the input / output terminal. Further, special care is necessary in case of a voltage boost application.

(2) When a surge voltage exceeding maximum rating is applied to the input terminal or when a voltage in excess of the input terminal voltage is applied to the output terminal, the circuit may be destroyed.
Specially, in the latter case, great care is necessary.
Further, if the input terminal sorts to GND in a state of normal operation, the output terminal voltage becomes higher than the input voltage (GND potential) , and the electric charge of a chemical capacitor connected to the output terminal flows into the input side, which may cause the destruction of circuit.
In these cases, take such steps as a zener diode and a general silicon diode are connected to the circuit, as shown in the following figure.



(3) When the input voltage is too high, the power dissipation of three terminal regulator increases because of series regulator, so that the junction temperature rises. In such a case, it is recommended to reduce the power dissipation by inserting the power limiting resistor R_{SD} in the input terminal, and to reduce the junction temperature as a result.



The power dissipation P_D of IC is expressed in the following equation.

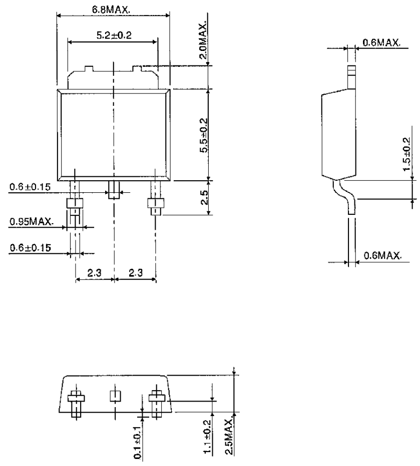
$$P_D = (V_{IN}' - V_{OUT}) \cdot I_{OUT} + V_{IN}' \cdot I_B$$

If V_{IN}' is reduced below the lowest voltage necessary for the IC, the parasitic oscillation will be caused according to circumstances.
In determing the resistance value of R_{SD}, design with margin should be made by making reference to the following equation.

$$R_{SD} < \frac{V_{IN} - V_{IN}'}{I_{OUT} + I_B}$$

(4) Connect the input terminal and GND, and the output terminal and GND, by capacitor respectively. The capacitances should be determined experimentally because they depend on prented patterns. In particular, adequate investigation should be made so that there is no problem even at time of high or low temperature.

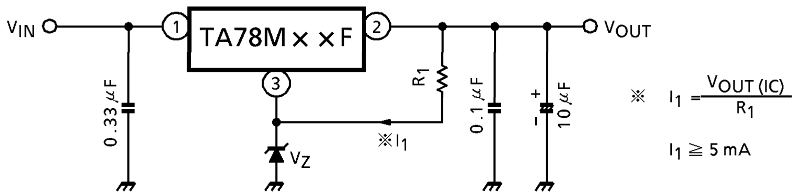
(5) The molded plastic portion of this unit, measuring 5.5 mm (L) by 6.5 mm (W) by 2.3 mm (T), is more compact compared to its equivalents TO-220.
The collector fin extends directly out of the main body, and can be soldered directly to the ceramic circuitboard, to significantly increase the collector power dissipation of the collector.
For obtaining high reliability on the heat sink design of the regulator IC, it is generally required to derate more than 20% of maximum junction temperature (T_j MAX.).
Further, full consideration should be given to the installation of IC to the heat sink.



APPLICATION CIRCUITS

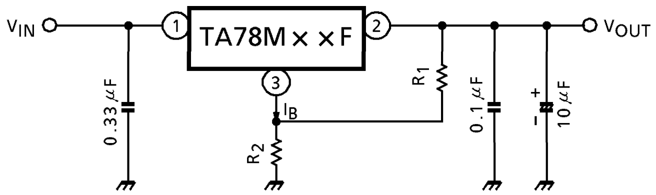
(1) VOLTAGE BOOST REGULATOR

(a) Voltage boost by use of zener diode



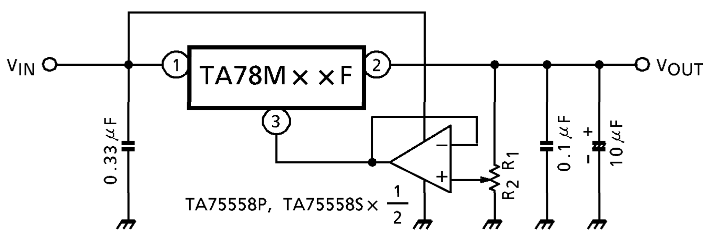
$$V_{OUT} = V_{OUT\,(IC)} + V_Z$$

(b) Voltage boost by use of resistor



$$V_{OUT} = V_{OUT\,(IC)} \left(1 + \frac{R_2}{R_1}\right) + R_2 \cdot I_B$$

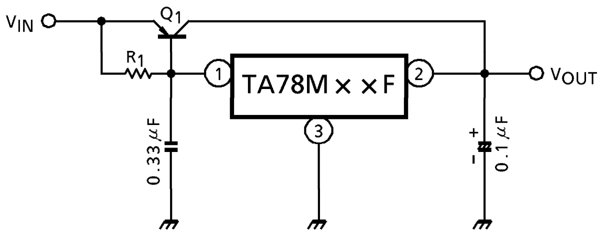
(c) Adjustable output regulator



$$V_{OUT} = V_{OUT\,(IC)} \left(1 + \frac{R_2}{R_1}\right)$$

(2) CURRENT BOOST REGULATOR

(a) CURRENT BOOST VOLTAGE REGULATOR



Heat sink is needed for Q_1

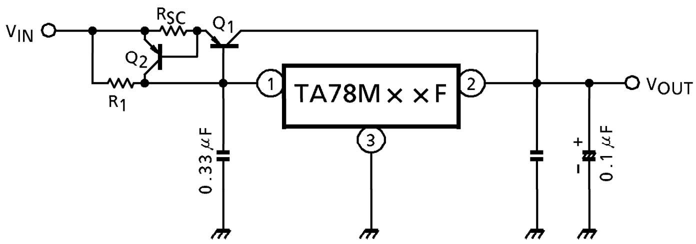
$$R_1 \leqq \frac{V_{BE1}}{I_{B\ MAX}}$$

where,

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

$I_{B\ MAX}$: Quiescent current of IC.

(b) SHORT-CIRCUIT PROTECTION

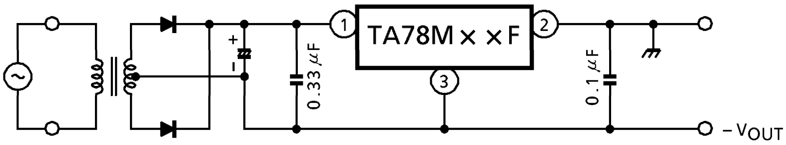


$$R_{SC} = \frac{V_{BE2}}{I_{SC}}$$

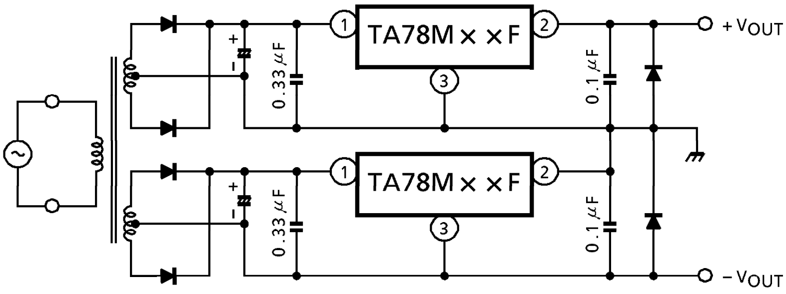
where,

I_{SC} : Short-circuit current

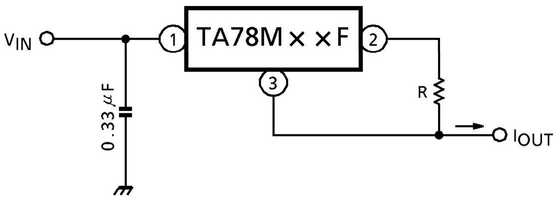
(3) NEGATIVE REGULATOR



(4) POSITIVE AND NEGATIVE REGULATOR



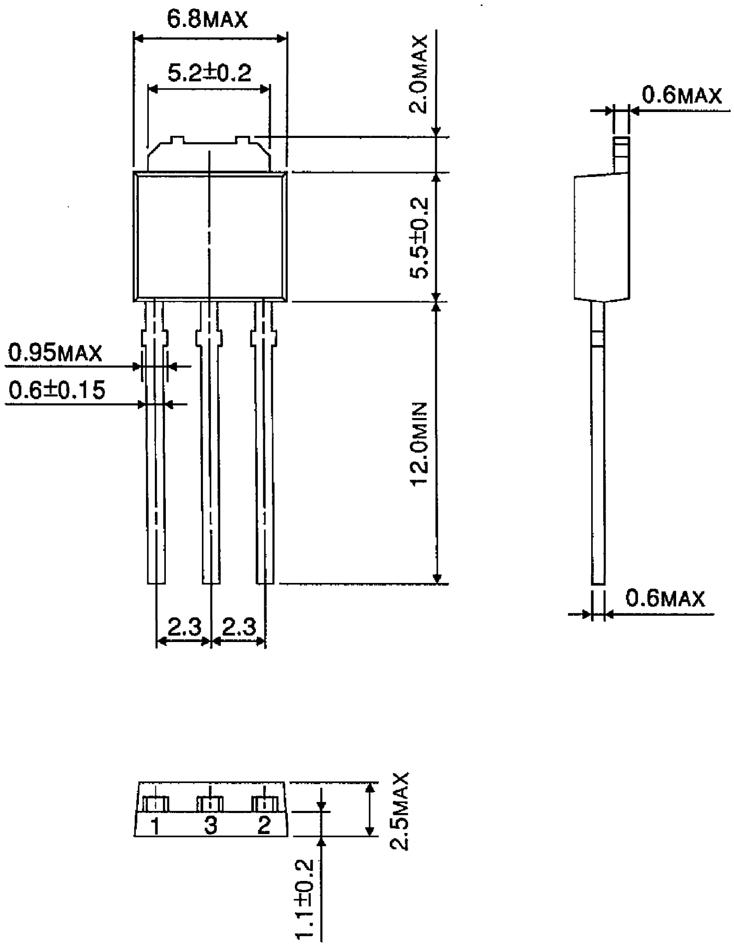
(5) CURRENT REGULATOR



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

PACKAGE DIMENSIONS
P-HSIP3-2.30B

Unit : mm

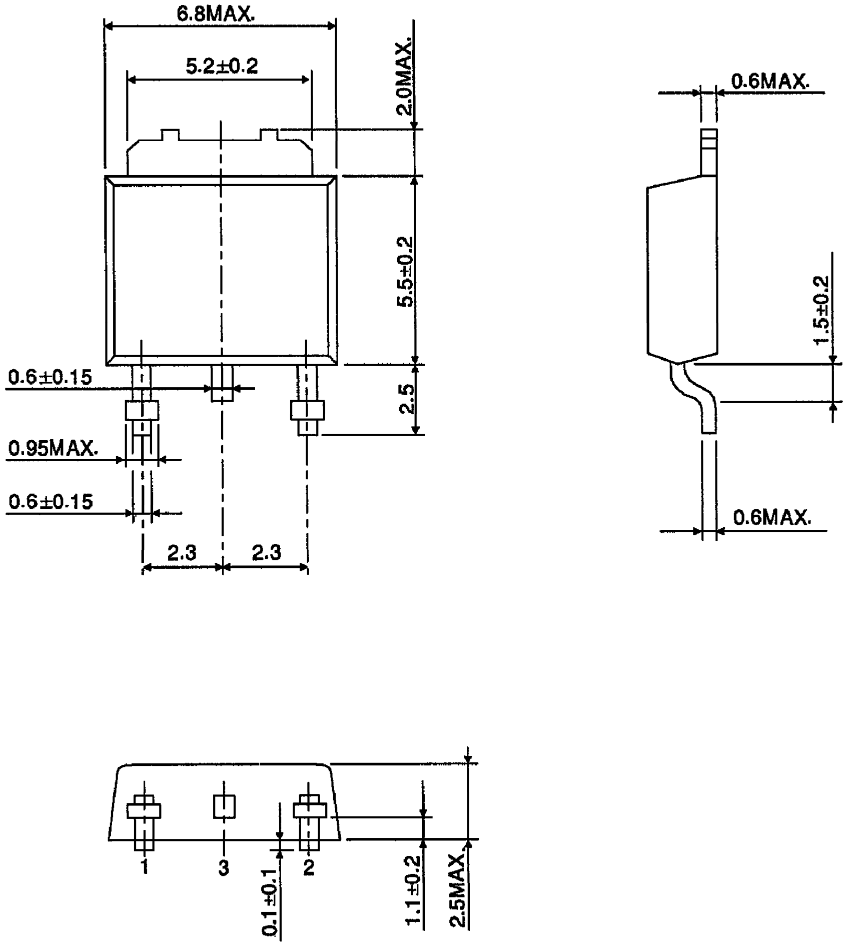


Weight : 0.36 g (Typ.)

PACKAGE DIMENSIONS

P-HSOP3-2.30A

Unit : mm



Weight : 0.36 g (Typ.)